Mary Sears.

Prof. Steenstrup
with the compli
A. Agass

ILLUSTRATED CATALOGUE

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY,

AT HARVARD COLLEGE.

Published by order of the Legislature of Massachusetts.

No. II.

NORTH AMERICAN ACALEPHÆ.

BY

ALEXANDER AGASSIZ.

CAMBRIDGE:
FOR SALE BY SEVER AND FRANCIS.
1865.

ILLUSTRATED CATALOGUE

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY,

AT HARVARD COLLEGE.

Published by order of the Legislature of Massachusetts.

No. II.

NORTH AMERICAN ACALEPHÆ.

BY

ALEXANDER AGASSIZ.

CAMBRIDGE:
FOR SALE BY SEVER AND FRANCIS.
1865.

University Press: Welch, Bigelow, & Co.,
Cambridge.

THE publication of the Illustrated Catalogue of the Museum of Comparative Zoölogy has been undertaken with a threefold object. In the first place, like the catalogues of most institutions of a similar character, it is intended to make the contents of our Museum generally known, and to facilitate our exchanges. In the second place, to be the medium of publication of the novelties received at the Museum, which require to be described and illustrated by diagrams or wood-cuts, or more elaborate plates. Finally, it is hoped that it may be the basis of a systematic revision of such natural groups of the animal kingdom as are most fully represented in our collections, and that it may, as far as possible, present to the scientific world the results of the investigations carried on in the Museum with a view of ascertaining the natural limits of the Faunæ at the present time and in past ages, and the genetic relations which may exist between the order of succession of organized beings upon the earth, their mode of growth, and their metamorphoses during their embryonic life, and the plan and complication of their structure in their adult condition.

The means for publishing this work have been most liberally granted by the Legislature, at a time when, in a less enlightened assembly, the material cares of the community would have engaged their exclusive attention.

L. AGASSIZ.

CAMBRIDGE, *March* 28, 1865.

PREFACE.

THE progress of our knowledge of the Class of Acalephs is at present so closely linked with every new observation which may be brought up in the history of the development of these animals, that it has been thought advisable to extend this Catalogue somewhat, and not make it simply an enumeration of the Acalephs in the collection of the Museum of Comparative Zoölogy at Cambridge. It has, however, been limited to the North American species; and even many of the Sertularians, Campanularians, and Tubularians in the collection are not described or mentioned here, because our information with regard to them is too scanty to be available. The mere enumeration, with short descriptions, of Hydroids, the development of which has not been fully traced, would probably only add, in the course of a few years, synonymes to some of the Medusæ, the adult stages of which may be well known, and would not advance in the least degree our acquaintance with the North American Acalephs. To make this Catalogue useful to American students, a few species described by other authors, of which there are no specimens in the Museum collection, are added, to facilitate further investigations. This is done with the less hesitation, as it is hoped that in a short time most of the species thus enumerated will have been figured in the diagrams of the Museum.

In the descriptions of the species, constant reference has been made to the bearing of the facts discussed, on the classification of Acalephs, and consequently much has been introduced which would be out of place in a descriptive catalogue. The wood-cuts, with the exception of a few borrowed from the Contributions to the Natural History of the United States by Professor Agassiz, have all been drawn on wood from nature by myself, and, though not highly finished, will yet generally give a better idea of the Acalephs, in this simple outline, than could have been done by a more finished wood-cut. Such an elaborate catalogue of Acalephs may seem somewhat out of place here, but as special attention has been paid to them in the Museum at Cambridge, and as Professor Agassiz has introduced there a large number of diagrams, all copied from original drawings, to illustrate the structure and colors of animals which were too small or too perishable to be preserved in the ordinary way, these valuable materials have been extensively used in the preparation of this Catalogue, as forming actually a part of the collections exhibited in the show-cases. The diagrams, as well as the authorities from which they are taken, are carefully enumerated below, after the specimens preserved in the collection.

For the facilities I have enjoyed in collecting the materials for this Catalogue I am mainly indebted to Mr. and Mrs. J. M. Forbes, to Professor A. D. Bache, Superintendent of the Coast Survey, to Mr. T. G. Cary, and to Professor Agassiz. I have also to thank, for specimens and valuable information, Professor Joseph Leidy, Dr. Fritz Müller of Desterro, Dr. W. Stimpson, and Professor H. J. Clark, who had already arranged the greater part of the Hydroids before the collection of Acalephs was placed in my charge. The Museum is also indebted for specimens to many other persons, whose names will be referred to in connection with the different species.

A. AGASSIZ.

CAMBRIDGE, MASS., *February*, 1865.

CONTENTS.

LIST OF THE WOOD-CUTS.

[NOTE. — Unless otherwise credited, the Figures are drawn from nature by Alex. Agassiz.]

NORTH AMERICAN ACALEPHÆ.

BIBLIOGRAPHY.

No memoirs published previous to 1860 have been included in this list, as they can be found in Agassiz's *Bibliographia Zoologiæ et Geologiæ*, and in Carus and Engelmann's *Bibliotheca Zoologica*.

Agassiz, A. The Acalephian Fauna of the Southern Coast of Massachusetts, Buzzard's Bay; in Proc. Bost. Soc. Nat. Hist., VIII. p. 224. 1861.

" " Mode of Development of the Marginal Tentacles of the Free Medusæ of some Hydroids; in Proc. Bost. Soc. Nat. Hist., IX. p. 81. 1862.

" " Nanomia cara; in Proc. Bost. Soc. Nat. Hist., IX. p. 181. 1863.

" " Halopsis ocellata; in Proc. Bost. Soc. Nat. Hist., IX. p. 219. 1863.

Agassiz, L. Contributions to the Natural History of the United States (Acalephæ). Vols. III. and IV. Boston. 1860–1862.

" " Methods of Study in Natural History. Boston. 1863.

Alder, J. Supplement to a Catalogue of Zoophytes of Northumberland and Durham; in Trans. Tyneside Nat. Club, V. p. 225.

" " Description of some New and Rare Zoophytes found on the Coast of Northumberland; in Ann. & Mag. N. H., IX. p. 311. 1862.

" " Observations on British Zoophytes; in Edinb. New Phil. Journ., p. 144. 1862.

" " Descriptions of a Zoophyte and two Species of Echinodermata new to Britain; in Ann. & Mag. N. H., V. p. 73. 1860.

Allman, J. G. On Laomedea tenuis; in Rep. Br. Ass. Adv. Sc. for 1859, p. 143. Trans. Sec.

" " On the Generative Zoöid of Clavatella; in Br. Ass. Adv. Sc. for 1862, p. 100.

" " Note on the Structure and Terminology of the Reproductive System in the Corynidæ and Sertularidæ; in Ann. & Mag. N. H., VI. p. 1. 1860.

" " On the Reproductive System in the Hydroidea; in Rep. Br. Ass. Adv. Sc. 1863. London. 1864. p. 351.

" " Note on Carduella cyathiformis; in Ann. & Mag. N. H., VI. p. 40. 1860.

" " On the Structure of Carduella cyathiformis, a Contribution to our Knowledge of the Lucernariadæ; in Trans. Mic. Soc., p. 125. London. 1860.

" " Notes on the Hydroid Zoophytes; in Ann. & Mag. N. H., VIII. p. 168. 1861.

" " Notes on the Phosphorescence of Beroe; in Proc. Roy. Soc. Edinb., IV. p. 528, Jan. 1862. Same in Edinb. New Phil. Journ., 1862, XV. p. 284.

" " Contributions to our Knowledge of the Structure and Development of the Beroidæ; in Proc. Roy. Soc. Edinb., IV. p. 519, Jan. 1862. Same in Edinb. New Phil. Journ., 1862, XV. p. 287.

" " On the Structure of Lucernariadæ; in Rep. Brit. Ass. Adv. Sc. for 1859, p. 143. London. 1860. Trans. Sec.

" " On Dicoryne stricta, a new Genus and Species of the Tubularidæ; in Rep. Br. Ass. Adv. Sc. for 1859, p. 142. London. 1860.

" " Notes on the Hydroidea. I. On the Structure of Corymorpha nutans. II. Diagnosis of new Species of Tubularidæ obtained, during the Autumn of 1862, on the Coasts of Shetland and Devonshire; in Ann. & Mag. N. H., Jan. 1863, XI. p. 1.

" " Notes on the Hydroidea; in Ann. & Mag. N. H., July, 1864.

" " On the Structure of Corymorpha nutans; in Rep. Br. Ass. Adv. Sc. for 1862, p. 101. Trans. Sec.

Allman, J. G. On the Construction and Limitation of Genera among the Hydroidea; in Ann. & Mag. N. H., XIII. 1864.
" " On some new British Tubularidæ; in Rep. Br. Ass. Adv. Sc. for 1862, p. 101.
" " Rep. on the Reprod. Syst. in the Hydroidea; in Rep. Br. A. A. S. f. 1863, p. 351.
" " On the Occurrence of Amæbiform Protoplasm, and the Emission of Pseudopodia among the Hydroidea; in Ann. & Mag. N. H. March, 1864.
Beneden, J. P. van. On the Strobilation of the Scyphistomata; in Ann. & Mag. N. H., 1860, V. p. 504. From Acad. Belg.
Boeck, Chr. Beskrivelse over en Tubularie fra Belsund paa Spitzbergen, Tubularia regalis, in Forhandl. Vid. Selsk. (Aar 1859.) Christiania. 1860. pp. 59, 66, 151.
Bronn, H. G. Die Klassen u. Ordnungen des Thier-Reichs (Actinozoa). Leipzig u. Heidelberg. 1860.
Busk, G. On a new Hydroid Polype belonging to the Genus Cordylophora *All.*, discovered by Senator Kirchenpauer of Ritzebüttel; in Mic. Jour., p. 283. 1861.
Claparède, A. R. E. Beiträge zur Fauna der Schottischen Küste; in Zeits. f. Wiss. Zool., X. p. 401. 1860.
" " Beobachtungen über Anatomie u. Entwickelungsgeschichte Wirbelloser Thiere. Leipzig. 1863.
" " in Bibliog. Univ. de Genève, XV. p. 150. 1862.
Clark, H. J. Lucernaria, the Cœnotype of Acalephæ; in Proc. Bost. Soc. N. H., p. 47. 1862.
" " Prodromus of the History, Structure, and Physiology of the order of Lucernariæ; in Journ. Bost. Soc. Nat. Hist., VII. 1863.
" " Lucernaria, ... ; in Am. Journ. Arts and Sciences, May, 1863.
" " " . . . . ; in Ann. & Mag. N. H., XII. p. 19. 1863.
" " in Agassiz's Contrib. Nat. Hist. U. S., Vols. III. and IV. passim.
" " Tubularia not Parthenogenous; in Am. Journ. Arts and Sciences. Jan. 1864.
Claus, C. Neue Beobachtungen über die Structur u. Entwickelung der Siphonophoren; in Zeit. f. Wiss. Zool., XII. p. 536. Jan. 1863.
" " Ueber Physophora hydrostatica, nebst Bemerkungen über andere Siphonophoren; in Zeit. f. Wiss. Zool., X. p. 8. 1860.
Dawson, J. W. Zoölogical Classification, or Cœlenterata and Protozoa *versus* Radiata; in Can. Nat. & Geol., VII. p. 438.
" " Elementary Views of the Classification of Animals; in Can. Nat. & Geol., Aug. 1864.
Edwards, H. Milne et Haime, J. Histoire Naturelle des Coralliaires, T. III. Paris. 1860.
Fuller, C. B. In Journ. Portland Soc. N. H., I. pp. 64, 91. 1862.
" " Report on Marine Zoölogy; in Second Annual Report Nat. Hist. & Geol. of the State of Maine, p. 129. 1863.
Gegenbaur, C. Neue Beiträge zur Näheren Kenntniss der Siphonophoren; in Nova Acta Acad. Nat. Cur. 1860.
Gosse, P. H. Evenings with the Microscope. New York. 1864.
" " The Blue Cyanea; in Intellectual Observer, Oct. 1863.
" " On the Lucernaria cyathiformis of Sars; in Ann. & Mag. N. H., V. p. 480. 1860.
Greene, J. R. Manual of the Sub-kingdom Cœlenterata. London. 1861.
" " Recent Contributions to the Literature of the Sub-kingdom Cœlenterata; in Nat. Hist. Rev., I. 1861.
" " Review of Agassiz's Contrib. to Nat. Hist. U. S.; in Nat. Hist. Rev. III. 1863.
" " On Sertularia tricuspidata, and on the Genus Huxleya; in Ann. & Mag. N. H., V. p. 431. 1860.
" " A Word on Embryology, with Reference to the Mutual Relations of the Sub-kingdoms of Animals; in Rep. Br. Ass. Adv. Sc., p. 132. 1860. Trans. Sec.
Grube, E. Ausflug nach Triest u. dem Quarnero. Berlin. 1861.
Hincks, Thos. On New Australian Hydrozoa; in Ann. & Mag. N. H., VII. p. 279. 1861.
" " On the Production of similar Medusoids by certain Hydroid Polypes belonging to different Genera; in Rep. Br. Ass. Adv. Sc. f. 1862, p. 107. Trans. Sec.
" " On Clavatella, a new Genus of Corynoid Polyps, and its Reproduction; in Ann. & Mag. N. H., VIII. p. 73. 1861.
" " A Catalogue of Zoophytes of South Devon and South Cornwall; in Ann. & Mag. N. H., VIII. pp. 172, 251, 290, 360. 1861.

Hincks, Thos. Catalogue of Zoophytes of South Devon and South Cornwall; in Ann. & Mag. N. H., IX. pp. 22, 200, 303, 467. 1862.
" " On the Production of Similar Gonozoöids by Hydroid Polyps belonging to different Genera; in Ann. & Mag. N. H., X. p. 459. 1862.
" " Catalogue of the Zoophytes of South Devon and South Cornwall; in Ann. & Mag. N. H., X. p. 360. 1862.
" " On some new British Hydroids; in Ann. & Mag. N. H., XI. p. 45. 1863.
" " On the Development of the Hydroid Polyps, Clavatella and Stauridia, with Remarks on the Relation between the Polyp and the Medusoid, and between the Polyp and the Medusa; in Rep. Brit. Ass. Adv. Science, p. 145. 1861. Trans. Sec.

Hodge, Geo. Contributions to the Marine Zoölogy of Seaham Harbor. Occurrence of Corymorpha nutans at Seaham; in Trans. Tyneside Nat. Field Club, V. Pt. II. p. 78. 1861.
" " On a new Hydroid Zoophyte (Podocoryne Alderi); in Trans. Tyneside Nat. Field Club, V. Pt. II. p. 82. 1861.

Houghton, W. On the Hydra rubra of Mr. Lewes; in Ann. & Mag. N. H., V. p. 228. 1860.

Huxley, Thos. H. Elements of Comparative Anatomy. London. 1862.

Jäger, G. Ueber das spontane Zerfallen der Süsswasserpolypen nebst einigen Bemerkungen über Generationswechsel; in Sitzb. d. Akad. Wien., XXXIX. p. 321. 1860.

Jourdain. Note sur les organes génitaux de la Cyanea aurita *Cuv.*; in Comptes Rendus, Vol. LV. p. 834. 1862.

Keferstein, W. Untersuchungen ueber niedere Seethiere; in Zeits. f. Wiss. Zool., XII. p. 1. June, 1862. I. Ueber die Gattung Lucernaria *O. F. Müller*; in Zeits. f. Wiss. Zool., XII. p. 1. II. Ueber einige Quallen; in Zeits. f. Wiss. Zool., XII. p. 26.
" " u. Ehlers, E. Auszug aus den Untersuchungen vom Mittelmeer; in Wiegmann's Archiv, 1860. I. p. 324.
" " Same in Nachricht. der Univ. u. Ges. d. Wiss. Göttingen, No. 23, p. 25. 1860.

Kirchenpauer. Die Seetonnen der Elbmündung. Ein Beitrag zur Thier u. Pflanzen Topographie; in Abhandl. d. Naturh. Vereins, IV_3. Hamburg. 1862.

Krohn, A. Beobachtungen über den Bau u. die Fortpflanzung der Eleutheria *Quatref.*; in Wieg. Archiv, 1861. I. p. 157.
" Observations on the Structure and Reproduction of Eleutheria *Quatref.*; in Ann. & Mag. N. H., IX. p. 1. 1862.

Lacaze-DuThiers, H. Embryogénie des Rayonnés, Reproduction généagénitique des Porpites; in Comptes-Rendus, LV. p. 851. Nov. 1861.
" " On the Reproduction of Porpita; in Ann. & Mag. N. H., p. 186. 1862.

Leuckart, R. Bericht ueber die Leistungen in der Naturgeschichte der niederen Thiere; in Archiv für Nat. 1860–1863.

Lewes, G. H. New British Species of Hydra; in Ann. & Mag. N. H., V. p. 71. 1860.

Lütken, Chr. F. Forvandlingerne i Dyreriget; in Tids. for pop. Frem. af Nat. 1861–62.

McAndrew, R. List of the British Marine Invertebrate Fauna; in Rep. Br. Ass. Adv. Sc., p. 217. 1860.

Mettenheimer, C. Ueber die Gesichtsorgane des violetten Seesterns, nebst Beobachtungen über die Ohrenqualle u. Versuchen über die Motilität derselben; in Archiv f. Anat. u. Phys., p. 214. 1862.

Meyer, A. u. Möbius, K. Kurzer Ueberblick der in der Kieler Bucht von uns beobachteten wirbellosen Thiere, als Vorläufer einer Fauna derselben; in Archiv f. Nat., 1862. I. p. 229.

Müller, Fr. Cunina Köllikeri *F. Müll.*; Beitrag zur Naturgeschichte der Æginiden; in Archiv f. Nat., I. p. 42. 1861.
" " Polypen ü. Quallen v. Santa Catharina, Olindias sambaquiensis; in Archiv f. Nat., 1861. I. p. 312.
" " Ueber die Angebliche Bilateralsymmetrie der Rippenquallen; in Archiv f. Nat., 1861. I. p. 320.
" " Ueber die System. Stellung der Charibdeiden; in Archiv f. Nat., 1861. I. p. 302.
" " On the Systematic Position of the Charibdeidæ; in Ann. & Mag. N. H., X. p. 6. 1862.
" " Ueber die Ursache der Strömungen in der Leibeshöle der Sertularien; in Archiv f. Nat., I. p. 34. 1863.

MURRAY, A. Descriptions of New Sertularidæ from the Californian Coast; in Ann. & Mag. N. H., V. p. 250. 1860.

" " On Sertularia tricuspidata; in Ann. & Mag. N. H., V. p. 504. 1860.

NORMAN, A. M. On Undescribed British Hydrozoa, Actinozoa, and Polyzoa; in Ann. & Mag. N. H., XIII. p. 82. Jan. 1864.

" " On the Crustacea, Echinodermata, and Zoophytes obtained in a Deep-Sea Dredging, off the Shetland Islands in 1861; in Rep. Br. Ass. Adv. Sc., p. 151. 1861. Trans. Sec.

PACKARD, A. S. JR. A List of Animals dredged near Caribou Island, Southern Labrador; in Canadian Nat. & Geolog. Dec. 1863.

PAGENSTECHER, H. Untersuchungen über niedere Seethiere aus Cette; VIII. Zur näheren Kenntniss der Vellelidenform Rataria, nebst Betrachtungen über die Velleliden im Allgemeinen; in Zeits. f. Wiss. Zool., XII. p. 496. Jan. 1863.

PEACH, C. W. On the Zoophytes of Caithness; in Rep. Br. Ass. Adv. Sc., p. 155. 1859. Trans. Sec.

PETERS, W. C. H., CARUS, J. V., & GERSTAECKER, C. E. A. Handbuch der Zoologie. Leipzig. 1863.

PRICE, JOHN. On the Genus Cydippe; in Rep. Br. Ass. Adv. S. 1859, p. 155. London. 1860. Trans. Sec.

QUATREFAGES, A. DE. Métamorphoses de l'homme et des animaux. Paris. 1862.

SARS, M. Ueber das Ammengeschlecht Corymorpha und seine Arten, nebst den von diesen aufge ammten Medusen; in Archiv f. Nat., 1860. I. p. 341.

" " Bemaerkninger over norske Cœlenterater; in Vidensk. Selks. Forh., p. 140. Christiania. 1860.

" " Tegninger af og Oplysninger om nogle Cœlenterater fra Norges Kyster; in Skand. Naturf. Möde i Kjöbenhavn. 1860. p. 690.

" " On the Nurse Genus Corymorpha and its Species, together with the Medusæ produced from them; in Ann. & Mag. N. H., VIII. p. 353. 1861.

" " Bemaerkninger over d. norske Hydroider; in Videns. Selks. Forhand. 1862.

" " Geologiske og zoologiske Jagttagelser anstillede paa en Reise i en Deel af Trondhjems Stift. Christiania. 1863.

SIEBOLD, K. TH. V. Ueber Parthenogenesis. München. 1862.

SEMPER, K. Reisebericht von Dr. Karl Semper, Briefliche Mittheilung, an A. Kölliker; in Zeits. f. Wiss. Zool., X. p. 558.

STEENSTRUP, J. B. Om de ved Norges Kyst forekommende Arter af Slaegten Lucernaria; in Forhand. Vid. Selsk. i Christiania, Aar 1860. Christiania. 1861. p. 145.

" " Bidrag til Kundsab om de nordiske Lucernarier; in Vidensk. Med. 1859, p. 106. Kjöbenhavn. 1860.

TROSCHEL, F. H. Handbuch der Zoologie. Berlin. 1864. 6te Auflage.

VERRILL, A. E. List of Polyps and Corals sent by the Museum of Comparative Zoölogy to other Institutions in Exchange, with Annotations; in Bulletin Museum Comparative Zoölogy, No. 3. Cambridge. 1864.

WRIGHT, T. S. On the Reproduction of Thaumantias inconspicua; in Quart. Journ. Mic. Scien., p. 221. 1862.

" " Observations on British Zoophytes and Protozoa; in Edinb. New Phil. Journ., XVI. p. 154. 1862.

" " Observations on British Zoophytes; in Quart. Journ. Mic. Scien., p. 45. 1863.

" " On the Reproduction of Æquorea vitrea; in Edinb. New Phil. Journ., XV. p. 144. 1862.

" " Observations on British Protozoa and Zoophytes; in Ann. & Mag. N. H., VIII. p. 120. 1861.

" " On Hermaphrodite Reproduction in Chrysaora hyoscella; in Ann. & Mag. N. H., VII. p. 357. 1861.

" " Observations on British Zoophytes and Protozoa; on Atractylis coccinea; in Edinb. New Phil. Journ., XIV. p. 150. 1861.

WOOD, W. In Journ. Portland Soc. Nat. Hist., I. p. 63. 1862.

NORTH AMERICAN ACALEPHÆ.

ORDER CTENOPHORÆ ESCH.

Ctenophoræ Esch. Syst. der Acalephen, p. 20. 1829.
Ctenophoræ Gegenbaur. Archiv. f. Naturg., 1856. I. p. 163.
Ctenophoræ Agass. 1860. Cont. Nat. Hist. U. S., III. p. 289. 1860.
Ciliogrades Blainv. Man. d'Actin., p. 143. 1830.
Béroides Less. Zooph. Acal., p. 61. 1843.

The affinities of the Ctenophoræ have become one of the most fertile topics of discussion among recent investigators. Vogt, following Quoy, removes them from the Acalephs altogether. Huxley places them in close proximity to Polyps. Clark has made a special class of them, equivalent to Echinoderms, while Milne Edwards and Agassiz, after a careful revision of the whole subject, have followed Cuvier and Eschscholtz, and retained them as an order of Acalephæ. These various views of the true relations of the Ctenophoræ are based upon very different grounds, and are urged with more or less force in accordance with the degree of importance attached by investigators to the details of structure upon which they separate the Ctenophoræ from the Acalephæ, and refer them to other classes of the Animal Kingdom ; the apparent bilaterality so strongly developed in some of the families (as Cestum, Bolina, and Mertensia) being urged by Vogt as the principal ground for removing them from Acalephs, and associating them with the Mollusks; while Huxley places them with Polyps on the ground of the special structure of their digestive cavity; and Clark simply states his belief in their separation as a class, without furnishing us any proofs. We are able to throw new light on this question by a series of facts derived from their embryological development, hitherto unnoticed. As the observations of Dujardin on the development of Coryne gave us the key which led to the ultimate separation of the Hydroids from the Polyps, so I hope to be able to show that the development of the Ctenophoræ gives us a true insight into the disputed affinities of these animals.

Before the publication of the valuable observations of McCrady on the development of a species of Bolina, little was known of their embryology except the mere fact, derived from the few casual observations of Müller, Wright, Boeck, and Price, that the Ctenophoræ were probably all reproduced from eggs, and that at an early age they gave unmistakable signs of their parentage. McCrady's observations showed us how great were the changes of figure their young undergo before they assume the aspect of the parent. It has been my good fortune to trace these changes in several of our species of Ctenophoræ somewhat in detail, and I shall make use of the material thus afforded in discussing the position of these animals, as well as their pretended bilaterality, and, by comparing their mode of development with that of Polyps, Acalephs, and Echinoderms, endeavor to ascertain whether their association with them into one great branch of the Animal Kingdom is true to nature, or whether the affinities between the mode of execution in the plan of the members of the Cœlenterata are really of such a character as to justify their separation from the other Radiates as one great branch of the Animal Kingdom.

Let us first examine the character of the Cœlenterata and of the Radiata as they are understood. What is common to Polyps, Acalephs, and Echinoderms is a vertical axis, or rather an axis through which we can pass a plane at right angles, and in this plane draw two axes at right angles to each other. These axes, of course, are not equally prominent in Polyps, Acalephs, and Echinoderms; taking, for instance, the three axes as we find them in some of the Spatangoids, we have a vertical axis, a cœliac axis, and a diacœliac axis, the mouth and anus being placed in such a position with reference to the cœliac axis as to give us a right and left, an anterior and a posterior extremity. In the Acalephs, it is only among the Ctenophoræ that we can distinguish between the cœliac and diacœliac; but we have neither right nor left — no anterior or posterior — side; while in Polyps we can distinguish their axes with greater exactness than in the Hydroids and Discophoræ. We are so accustomed to impose our notions of symmetry on everything we meet, that it is difficult to divest ourselves of the idea that every animal has not necessarily a right and a left side, an anterior and a posterior extremity; we start with the idea that such relations must exist in all animals, however disguised, and under this impression we try to reconcile plans which are totally distinct. If, however, we admit the idea of different plans as the foundation of animal life, we must give up all attempt to find some passage from one to the other. Animals the equation of which could be represented by that of a sphere, or by that of two parallel planes, or of a series of cylinders, or of two parallel cylinders, can never pass from one to the other; the equation of a sphere cannot be transformed into that of a plane, nor into a cylinder; the equations representing each of these figures include, it is true, all the possible spheres or all the possible cylinders which may be constructed by changing the values of the variables, but can never be transformed one into the other. The infinite variety of forms, and apparently aberrant types, constantly met with among animals, has been the main cause of our difficulty in referring them to their proper plan. It is not always an easy matter to reduce an equation to its simplest form, and find out what it is; it may be concealed by coefficients which will disappear only after repeated operations, and then only enable us to determine of what degree the equation is. These coefficients in an equation may be compared to the modifications of those parts which appear to affect the mode of execution in animals; and it may not always be an easy matter nor a possible one, in the present state of our knowledge, to solve these organic equations. The history of Science is full of examples of this kind; and we may have to discover new methods in Natural History, as well as in Mathematics, before we can proceed with our eliminations, or arrive at a solution. Thus the plan of radiation may be so carried out, by a modification of some of the parts, as to appear at first sight to be bilateral; but analyze these modifications carefully, and beneath them all can be traced the plan of radiation, hidden only by external features of bilaterality. Such is eminently the case in the larvæ of Echinoderms, and to a less degree in the imitations of Echinoderm larvæ, the Ctenophoræ. Bilaterality seems at first sight to be the plan upon which these animals are built; but an elimination of the deceptive coefficients will show the plan of radiation underlying this apparent bilaterality.

The figures here given of very young Ctenophoræ show no indication of this bilaterality, at least no more than can be traced in any four-rayed jelly-fish. The tubes are as yet all of equal size, no prominence is given to one side over the other, and the only hint of bilaterality is the early distinction of the longitudinal and of the transverse axis by the position of the tentacles. No lateral appendages developing into immense lobes, as in the adults, can as yet be detected. The characteristic feature of the eggs of the Ctenophoræ is the great diameter of the envelope compared to the yolk, which is hardly more than one third the diameter of the egg. The whole yolk is transformed by segmentation into the embryo; this at an early period assumes a very slightly pear-shaped form, and is moved by means of a few pairs of large locomotive combs, equalling in length the diameter of the embryos. This is the first indication we have that the embryo is a Ctenophore; and the early stages are marked by the constant and violent flapping of the combs, arranged in four bunches near the abactinal pole, immediately at the base of the large eye, also disproportionately large in the young, containing but few granules, and seeming almost like a glass ball fastened to the top of this active embryo. During this stage the young Ctenophore is moving about somewhat slowly within the envelope of the egg. With increasing age the locomotive flappers descend somewhat along the spheromeres, and we find at the opposite extremity from the eye the first trace of a small cavity (the digestive cavity of the adult), which increases in size till it becomes spherical. At about this time there is found, between the four clusters of the locomotive flappers, a second cavity, which has at first no connection whatever with the digestive cavity, and develops independently of it. This second formed cavity, now a large rectangular bag, slightly lobed between each of the four clusters of locomotive flappers, is the chymiferous cavity, from which the funnel and the chymiferous tubes take their origin in somewhat older stages. With advancing age the walls of the two cavities become more circumscribed, and at the same time more clearly defined, approaching each other constantly, until finally they open into each other. The digestive cavity and the chymiferous tubes diminish in diameter, becoming more circumscribed, and losing little by little the character of broad pouches for that of narrow tubes, extending through the gelatinous mass. The locomotive flappers extend with the chymiferous tubes along each one of the four pouches, which have given rise to two chymiferous tubes, one long and one short one, developing independently. This difference is barely perceptible in the adult Pleurobrachia; it is well marked in Mertensia, still better in Idyia, quite prominent in Lesueuria, and takes its greatest development in Bolina, where adjoining tubes anastomose after almost endless windings through the large lobes formed by the lateral projections of the gelatinous mass. The cause of the predominence of some of the spheromeres over the others, is the unequal development of these two sets of tubes, which may or may not extend into lobes, thus giving to the Ctenophoræ the appearance of bilateral animals. But examine this same development in another class of Radiates, among the Echinoderms, in the Spatangoids, for instance, where the odd ambulacrum is the one which takes the least development, when the other four are more equally developed, and no one will for that reason forget their radiate character, and call them strictly bilateral animals.

We can thus distinguish, among Spatangoids, an anterior and a posterior extremity, a right and a left side. In Ctenophoræ, owing to the peculiar manner in which the difference between the chymiferous tubes is developed, we are enabled to distinguish simply two diameters, but not an anterior and a posterior extremity, or a right and a left side; it seems, therefore, scarcely logical to call these animals bilateral, when in reality they show less sign of bilaterality than the Spatangoids, which no one, except Huxley, seems to doubt belong to Radiates.* The axes we can thus distinguish among the Ctenophoræ by the unequal development of the chymiferous tubes, would not enable us to decide whether the long tubes of the different genera were the same tubes developed more fully in the different species. For instance, we should at first

* See analysis of this view in Agassiz's Contributions, Vol. V. p. 60, by A. Agassiz.

sight suppose the long tubes of Pleurobrachia, of Mertensia, of Idyia, of Bolina, of Lesueuria, to be homologous, but such is not really the case; and the only means we have of determining this is the plane passing through the tentacles, enabling us to ascertain whether the longitudinal axis is in the trend, or at right angles to that plane. We shall soon see that in Pleurobrachia and Mertensia the plane, including the tentacles, passes through the long axis, while in Bolina and Lesueuria it passes through the short axis; that the long tubes are on each side of the tentacles, and consequently that the long tubes of Mertensia and the long tubes of Bolina are not homologous; but what corresponds strictly to the long tubes of Pleurobrachia and Mertensia are the short tubes placed on each side of the tentacular system. The lateral tubes invariably in the plane of the tentacular system give us the means of determining to which of these two classes Idyia belongs, and we find that its longitudinal axis corresponds with that of Bolina, the lateral tubes being in the shorter axis, as in the last-named genus, while in Pleurobrachia, as in Mertensia, they are in the longer axis. Such is the origin of the characters which give to some members of the Ctenophoræ their remarkable bilateral appearance. It is simply a modification of what is perfectly familiar to us among Echinoderms, and especially among the Spatangoids; but owing to the bilateral character of their development, the Ctenophoræ make us lose sight entirely of the original radiate plan upon which these animals are built. Viewing, however, this differentiation of the axis in all its stages, as we find it in Pleurobrachia, in Idyia, in Mertensia, in Lesueuria, in Bolina, we constantly keep before our eyes the original formula from which the other members are derived.

Examined in the light of prophetic beings, the bilaterality of the Acalephs is but another of those wonderful links which unite in one great whole the different members of the Animal Kingdom. As the Polyps are the prophetic representatives of the Acalephs in their embryonic condition, the Hydroid state, so must we look at the Ctenophoræ as the prophetic type of those still more wonderful beings, the Echinoderm larvæ, in which bilateral symmetry is carried to such an extent that even the great mind of a Müller is led to consider them as exhibiting a direct passage from a bilateral to a radiate plan of structure. In the bilateral symmetry of the Ctenophoræ we are constantly reminded of the general appearance of Echinoderm larvæ, in which the radiate structure should still be so far apparent as not to be concealed by the bilateral symmetry.

Looking at the Ctenophoræ as prophetic animals, we are able to understand the separation of the digestive cavity into two distinct parts. It is only what we find more fully developed in the Echinoderm larvæ; the separation of a sort of alimentary canal, in Ctenophoræ, from the rest of the digestive apparatus, exactly corresponding to what exists in Echinoderm larvæ. The connection between the water system and the digestive system is likewise precisely similar to that of Echinoderms in their larval state; for although in the adult Star-fish, or Sea-urchin, or Ophiuran, there is no apparent connection between the ambulacral and the digestive system, yet in the young larvæ we can see that this connection exists, the water system being formed by diverticula from the digestive cavity; while the injections of Professor Agassiz have proved the existence, in the adult, of a similar connection in Echinarachnius, in Mellita, and in Clypeaster.

It was only after the embryos of Echinoderms had been compared with Ctenophoræ that undoubted evidence of their identity of plan was obtained. The embryological development of Ctenophoræ leaves no doubt as to the Acalephian character of the order. It remains only for us to see whether the Ctenophoræ form a group of equal value with the rest of the Acalephs, or stand simply as an equivalent of the other two orders, the Discophoræ and the Hydroids. The careful examination lately made of many genera of which we had no definite knowledge before, as well as their embryology, has now left it difficult to decide whether the Discophoræ and Hydroids are independent orders, or whether the distinction established between the Discophoræ and Hydroids is merely a subordinal division in a great order, including these two. If so, this order might be called the Medusidæ, in opposition to the Ctenophoræ, which are an order perfectly and accurately circumscribed; the presence of locomotive flappers being as characteristic for the Ctenophoræ, and as constant a feature of Ctenophoræ among Acalephæ, as feathers are for the class of Birds among Vertebrates. These flappers exist almost from the earliest embryonic stages, and thus far not a single exception is known to the rule. Fritz Müller and Agassiz have shown that it is hardly natural to associate the Charibdeidæ and Æginidæ with the Hydroids, and the latter has proposed to unite them with Discophoræ, while the former would make a separate order of them. This seems hardly justifiable, as there are as many reasons — their marginal appendages, genital organs, &c. — for uniting them with Discophoræ, as for leaving them with the Hydroids, — the shape of the bell, the great development of the veil. If, in addition, we take into account what we have observed in the Trachynemidæ, it will be seen that we can no longer draw the line between the Discophoræ and Hydroids as distinctly as before; while the creation of a third group equivalent to these two, to contain the families in dispute, does not bring us any nearer to the solution of the problem. A more accurate knowledge of the tropical forms will go far to settle this point; and in the mean while, with this explanation, I will place temporarily (until further information can be gained) the Æginidæ and the Trachynemidæ among the Discophoræ, with the full expectation that future researches will give us better reasons than we have at present for abandoning, as contrary to nature, two orders which have thus far been almost universally acknowledged by all investigators of Medusæ. If the Discophoræ are to be united with the Hydroids, we shall have to divide the Acalephs into two orders, Ctenophoræ and Medusidæ; the different suborders of the latter division including all the suborders of the Discophoræ of Eschscholtz, and those of the Hydroids as limited by Professor Agassiz.

The remarkable changes of form the Ctenophoræ undergo until they attain their adult state, will necessitate at no very distant time a complete revision of the Ctenophoræ, as soon as the embryology of a sufficient number of families has become well known. What is now especially wanting is an embryology of Cestum, which would give us, with what has been shown here of the embryology of the three other suborders of Ctenophoræ, a standard for an embryological classification of the Ctenophoræ. We can already see that many of the genera of Eschscholtz (*Medea* and *Pandora*), as has already been suggested by Professor Agassiz and by McCrady, are only embryonic stages; all such species as the *Cydippe quadricostata* of Sars (*Bolina norvegica*), the *Cydippe brevicostata* of Will (*Chiaja multicornis* M. Edw.), and the *Sicyosoma rutilum* of Gegenbaur, are undoubtedly undeveloped stages of some of the well-known Ctenophoræ of the Northern Ocean, the Adriatic, and the Mediterranean. From what has been shown of the transformations of *Bolina alata*, I should even be inclined to consider the *Cydippe hormiphora* of Gegenbaur as one of the stages of growth of *Euramphæa vexilligera* Gegenb. It seems to me that there is between these two species the same relation which exists between some of the stages here figured of *Bolina alata*. The material at my command is too imperfect to attempt anything more definite than the few hints here thrown out for more fortunate observers.

Professor Agassiz, in his third volume of the Contributions, intended to give an embryology of some of our species of Ctenophoræ. He made many observations previous to 1856, which, however, were never noted down; only a couple of sketches of a young Pleurobrachia were drawn by Mr. Sonrel; and during the subsequent summers other and more pressing work compelled him to forego his intentions. The observations here presented, in the descriptions of our common species, were made independently during the summers of 1860–63.

SUBORDER LOBATÆ ESCH.

Lobatæ ESCH. Isis., p. 741. 1825.
Lobatæ AGASS. Cont. Nat. Hist. U. S., III. p. 289. 1860.
Mnemiidæ ESCH. Syst. d. Acalephen, p. 29. 1829.

In the Lobatæ we find that the diameter passing through the tentacular apparatus is invariably the smaller, while the compression of the spherosome is in the plane at right angles to it. This is reversed in the Saccatæ. The spheromeres at the extremity of the longer transverse axis, the cœliac axis, develop into lobes.

Family BOLINIDÆ Agassiz.

Bolinidæ AGASS. Cont. Nat. Hist. U. S., III. pp. 200, 289. 1860.

The family of Bolinidæ has here a somewhat different circumscription from that ascribed to it by Professor Agassiz in his "Contributions." The genus Lesueuria, of which no species was known on our coast in 1860, has been removed from the Mnemiidæ to the Bolinidæ. It is evident from the description hereafter given of Lesueuria, that this genus is only a Bolina with diminutive lateral lobes. The genus Mnemiopsis also is shown to belong to the Bolinidæ, and not the Mnemidæ.

BOLINA MERT.

Bolina MERT. Mém. Acad. St. Petersb., II. p. 513. 1833.
Bolina AGASS. Mem. Am. Acad., IV. p. 349. 1849.
Bolina AGASS. Cont. Nat. Hist. U. S., III. p. 249. 1860.
Mnemia SARS (*non* Esch.). Beskriv., p. 32. 1835.
Alcinoe LESS. (*non* Rang). Zooph. Acal., p. 88. 1843.
Anais LESS. Zooph. Acal., p. 101. 1843.

Bolina septentrionalis MERT.

Bolina septentrionalis MERT. (*non* Agass.). Acad. St. Petersb., p. 515, Pl. VII. 1833.
Bolina septentrionalis LESS. Zooph. Acal., p. 83. 1843.

Off Matthæi Island, Behring's Straits (Mertens).

Bolina alata Agass.

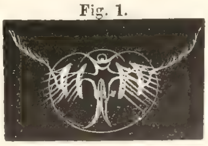
Bolina alata Agass. Mem. Am. Acad., Vol. IV. Pt. 2, p. 349, Pls. 6, 7, 8. 1849.
Bolina alata Agass. Contrib. Nat. Hist. U. S., Vol. III. pp. 249, 289.
Alcynöe vermicularis Gould (*non* Rang). Inverteb. of Mass., p. 349. 1841.
Bolina alata Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Bolina alata Packd. A List of Animals dredged near Caribou Island, Can. Nat. & Geol. 1863.

It is quite remarkable that there should be no mention made by Fabricius of a single Ctenophore which may be identified with any species of the genus Bolina. There is hardly a more common Medusa than the *Bolina alata* of our coast; and the occurrence of so many of our species of Ctenophoræ on the coast of Greenland makes the absence of Bolina the more striking, and quite interesting in a geographical point of view, as we should thus have among Acalephs a case of geographical distribution analogous to that of Echinarachnius, which does not extend farther north than Labrador.

To the description of the adult given by Professor Agassiz I have nothing of importance to add, with the exception that the chymiferous tubes which run along the edge of the lateral lobes, when seen from the narrow side, should unite, and thus complete the circuit (Fig. 16), instead of stopping short at a little distance apart, as they have been represented by him. This connection takes place at an early period of the development. (See Fig. 8.)

The compression of the spherosome of Bolina and of Pleurobrachia is in different planes, otherwise it would be exceedingly difficult to distinguish a very young Pleurobrachia from a young Bolina. In the young Bolina, as has been shown already by McCrady, we find long tentacles; so that the younger stages of this Medusa are so unlike the adult, that it would be the most natural error to commit, to consider it the young of Pleurobrachia. The accompanying figures (1–3) are taken immediately after the escape of the young from the egg. It will be noticed, when compared to Pleurobrachia, that besides the position of the tentacular organ, the outline of the spherosome is somewhat different, and that the ambulacra are quite narrow. The digestive cavity also fills a comparatively small space. (Fig. 2.) The extreme tenuity of the tubes soon becomes a character by which the young Bolina is at once distinguished from the young Pleurobrachia, as well as its ellipsoid shape, which greatly increases

Fig. 1.



In all the young Ctenophoræ the following lettering has been adopted: *d*, digestive cavity; *a*, anal rosette; *t*, tentacle; *c*, long ambulacral tube (longitudinal ambulacra); *c'*, short ambulacral tube (lateral ambulacra); *e*, eye speck; *f*, funnel; *o*, ambulacral cavity; *l*, lateral tubes. *c'* is the longest tube at first, and *c* the shorter; *n*, lobes of spherosome; the names are taken from the adult.

Fig. 1. Young Bolina, seen from the narrow side.

with age. (Fig. 4, which is Fig. 6 seen from abactinal side.) We soon perceive in the young of this species changes of shape similar to those to be described in Idyia and Pleurobrachia: the outline becomes more elongated; the lateral tubes, at first simple diverticula from the main

Fig. 2.

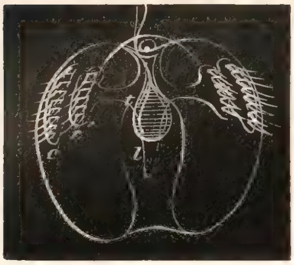


Fig. 3.

Fig. 4.

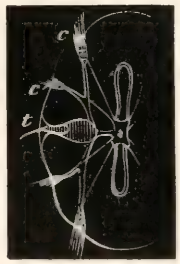


Fig. 5.

ambulacral tubes (*l*, Fig. 5), extend to the level of the opening of the mouth (Fig. 6). We can also trace a difference in the rapidity of growth of the ambulacral tubes, but, contrary to what we find in other genera, we observe the tentacular ambulacra are the most rapid in their growth. When they reach the bottom of the spherosome, they bend towards each other (Fig. 7), and finally join (Fig. 8), but have at present no connection with the lateral tubes near the mouth. It will be noticed by the figure (*n*, Fig. 8) that that part of the spherosome which contains the junction of the two lateral ambulacra (Figs. 9, *n*, 10), has a tendency to expand beyond the level of the mouth; this is the first appearance of the lobes of the adult Bolina. This part of the spherosome increases rapidly in dimensions, and we have a minute Ctenophore with well-marked lobes, like a Bolina, and highly developed tentacles, like a Pleurobrachia (Fig. 11). Still greater changes are yet to take place; we soon perceive that

Fig. 6.

Fig. 7.

Fig. 2. Bolina in state of Fig. 1, seen from the broad side.
Fig. 3. Somewhat younger than Fig. 1, seen from the abactinal pole.
Fig. 4. Young Bolina, seen from the abactinal side, somewhat older than previous figures.
Fig. 5. Formation of lateral tubes in young Bolina.
Fig. 6. Bolina in which lobes begin to appear, seen from narrow side, same state as Fig. 4.
Fig. 7. Somewhat more advanced than Fig. 6, the tube c' not yet having formed the circuit; seen from the actinal side.

the long ambulacra do not remain regularly arched, but bend towards the vertical axis (Figs. 12, 13); this bend is soon changed into a loop, which passes through a corresponding protuberance of the spherosome. This becomes the auricle, from the angle of which (Fig. 14) we also perceive a branch of the chymiferous tube, which soon pushes its way through the gelatinous mass, and forms a junction with the lateral tubes, exactly as we shall find it to be the case with Idyia. In the mean time the other ambulacra have been increasing in length, and we find that they reach almost to the lower end of the lobe; when there, they make a sharp angle, turn upward, and form thus the beginning (Figs. 12, 13) of the complicated system of windings which we find in the lobes of the adult Bolina. During the later stages of growth the tentacular apparatus has been shifting its position, the opening coming nearer and nearer to the level of the mouth; the tentacular bulb lengthening in proportion, and finally appearing like a long, narrow rod, with a slight swelling at the extremity, from which the remnants of the threads of the tentacles are suspended. The only changes necessary to make this young an adult Bolina, are changes of quantity. The apparent difference in the mode of growth of the

Fig. 8.

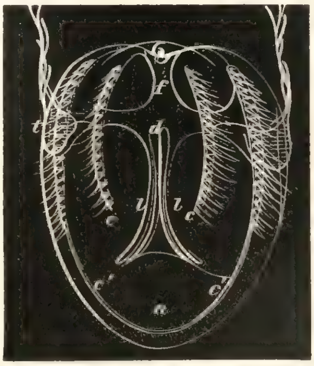


Fig. 9.

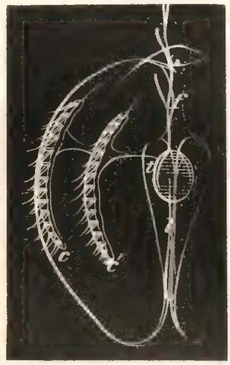


Fig. 10.

Fig. 11.

Fig. 12.

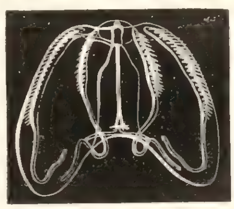


Fig. 13.

Fig. 8. The tentacular ambulacra have united, and the lobes (*n*) project well beyond the opening of the mouth.

Fig. 9. About in the condition of Fig. 2, seen from the broad side.

Fig. 10. Somewhat younger than Fig. 8, seen from the broad side.

Fig. 11. Fig. 8, seen from the broad side.

Fig. 12. Bolina with first appearance of the auricles, seen from the broad side.

Fig. 13. Bolina of stage of Fig. 12, seen from the narrow side.

lateral and longitudinal tubes is entirely done away with in subsequent changes, as we find that the short ambulacra are the lateral ambulacra, though at first they are more rapid in their growth, but are afterwards outstripped by the rapid increase in length of the longitudinal tubes; but it must be remembered that, in this genus, the flattening of the spherosome takes place in different planes from Idyia and Pleurobrachia. The young Bolina has now attained a condition in which it will be very easy to recognize the different parts of the adult, if compared in homologous positions. Fig. 15 is an adult seen from the broad side, corresponding to Fig. 12; Fig. 16 is an adult seen from the narrow side, corresponding to Fig. 13; Fig. 17 is an adult Bolina, seen from the actinal side, corresponding to Fig. 14; and in Fig. 18 we have the adult seen from the abactinal pole.

Fig. 14.

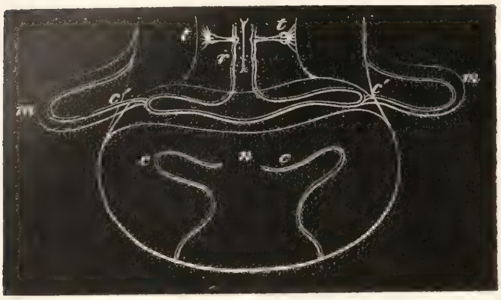


Fig. 15.

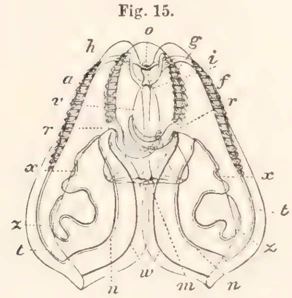


Fig. 17.

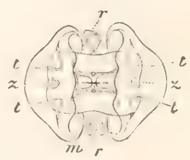


Fig. 18.

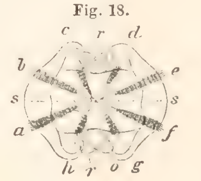
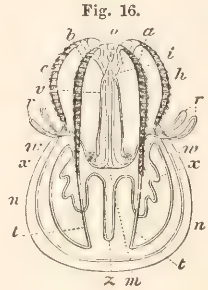


Fig. 16.



Coast of New England, and northward to the Bay of Fundy (Agassiz).

Museum diagrams Nos. 1, 2, after L. Agassiz.

Fig. 14. Fig. 13 seen from the actinal pole, and more magnified. *r*, circular tube; *m*, auricles.

Fig. 15. Adult Bolina seen from the broad side. *a, f*, longitudinal ambulacra; *g, h*, lateral ambulacra; *o*, eye-speck; *i – m*, digestive cavity; *i – o*, funnel; *v*, lateral tube leading to tentacular apparatus just on level of mouth, *m*; *r, r*, auricles; *t, t*, prolongation of the longitudinal ambulacra; *n, n*, same tubes turning upwards, bending down at *x, x*; *z, z*, point of junction of tubes from opposite sides; *w*, prolongation of tubes from the lateral ambulacra. About half natural size.

Fig. 16. Fig. 15 seen from the narrow side. *a, b*, longitudinal ambulacra; *c, h*, lateral ambulacra; other letters, as in Fig. 15.

Fig. 17. Bolina seen from the actinal pole; lettering as above.

Fig. 18. Bolina seen from the abactinal pole. *a, b, e, f*, longitudinal ambulacra; *c, d, g, h*, lateral ambulacra; *s, s*, circumscribed area; other letters, as above.

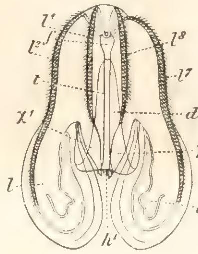
Bolina vitrea Agass.

Bolina vitrea Agass. Contrib. Nat. Hist. U. S., Vol. III. pp. 269, 289, Fig. 93. 1860.
? *Bolina littoralis* McCr. On the Development of two Species of Ctenophoræ, 1857; Proc. Elliot Soc. N. H., p. 1. 1858.

The *Bolina littoralis* McCr. is probably either this species, or one of our species of Mnemiopsis; but not having the means to determine this point, a figure (Fig. 19) of the *Bolina vitrea* Agass. is added here, to serve as a basis for its identification hereafter.

Reef of Florida (Agassiz); Charleston (McCrady).

Fig. 19.



Bolina microptera A. Agass.

Bolina septentrionalis Agass. (*non* Mertens). Cont. Nat. Hist. U. S., III. p. 289. 1860.

The discovery of several species of Bolinidæ on the eastern coast of North America, belonging to different genera, which had all been confounded together, has induced me to examine anew the descriptions and drawings of the species of Bolina observed on the northwest coast. I have become satisfied that the species of Bolina here noticed is not the *B. septentrionalis* of Mertens, but differs specifically from it. It is quite elongated; the lateral lobes are very short, with complicated windings of the long ambulacral tubes. This species resembles in outline more the *Bolina vitrea* Agass. than any other. It has, like it, a long digestive cavity, but differs from it in the proportions of the lateral lobes, and the complexity of the windings of the long ambulacra. It is, like the *B. vitrea*, perfectly transparent and nearly colorless, of a slight bluish tinge; the polar diameter measures about two inches. Found in June, in the Straits of Rosario, Washington Territory.

Gulf of Georgia, W. T. (A. Agassiz).

MNEMIOPSIS Agass.

Mnemiopsis Agass. Cont. Nat. Hist. U. S., III. pp. 269, 290. 1860.

The genus Mnemiopsis is remarkable among the Bolinidæ for the peculiar structure of the tentacular apparatus, which sends a branch along a deep furrow, protected by a lappet, to the base of the auricles.

Fig. 19. Bolina vitrea seen from the broad side. l^2, l^7, long ambulacra; l^1, l^8, short ambulacra; f, funnel; d, digestive cavity; t, tentacular tube; χ^1, χ^8, auricles; l, l, anterior and posterior lobes; h', tentacle.

Mnemiopsis Gardeni Agass.

Mnemiopsis Gardeni Agass. Cont. Nat. Hist. U. S., III. pp. 269, 290, Figs. 95, 96. 1860.

Fig. 20.

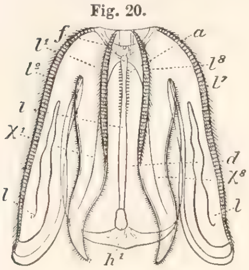
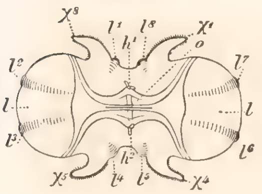


Fig. 21.



The accompanying figures (Figs. 20, 21) of *Mnemiopsis Gardeni* Agass. are here introduced to show how striking are the differences in the proportions of the two Medusæ of this genus found upon our coast. The great length of the digestive cavity, together with the size of the auricles and lobes, enable us at once to distinguish this species from its ally, the *Mnemiopsis Leidyi* A. Agass. The genus Mnemiopsis had been placed by Professor Agassiz among the Mnemiidæ, on account of the deep furrow separating the anterior and posterior lobes from the lateral spheromeres. The differences of form based upon this structural feature, which are in such striking contrast in Bolina and *Mnemiopsis Gardeni*, are far from being marked when we compare *Bolina alata* and *Mnemiopsis Leidyi*.

Charleston, S. C. (L. Agassiz).

Mnemiopsis Leidyi A. Agass.

This Medusa would readily be mistaken for a true Bolina, at first glance; a closer examination, however, will show that, notwithstanding the short digestive cavity which reminds us of Bolina, we have the deep furrow separating the anterior and posterior lobes from the lateral spheromeres. The long ambulacra are covered with locomotive flappers to the actinal margin, and we have long auricles, showing that this is a Mnemiopsis, with longer anterior and posterior lobes than we have in the *Mnemiopsis Gardeni* Agass.

This species grows very large, specimens measuring six and even eight inches in length are frequently found. Like the other Ctenophoræ of our coast, it is gregarious; thousands being collected together basking in the sun. It is exceedingly phosphorescent; and when passing through shoals of these Medusæ, varying in size from a pin's head to several inches in length, the whole water becomes so brilliantly luminous that an oar dipped in the water up to the

Fig. 20. Mnemiopsis Gardeni seen from the broad side. *a*, folds of digestive cavity. Lettering of Figs. 20 and 21 same as Fig. 19.

Fig. 21. Fig. 20 seen from the actinal pole. *o*, mouth; l^4, l^5, lateral ambulacra; χ^4, χ^5, auricles; l^2, l^3, l^6, l^7, anterior and posterior ambulacra.

handle can plainly be seen, on dark nights, by the light produced by this illumination. The seat of the phosphorescence is confined to the rows of locomotive flappers, and so exceedingly sensitive are they that the slightest shock to the jar in which these Medusæ are kept is sufficient to make them plainly visible by the light emitted from the eight phosphorescent ambulacra. This species is long, almost ellipsoidal, when at rest. (Fig. 22.) The auricles extend about one third their length beyond the oral aperture (*o*, Fig. 22), taking their origin on a level with the eye-speck (*a*, Fig. 22). The prolongation of the chymiferous tubes, and their manner of anastomosing, is exceedingly simple; we find nothing of the complicated bends and turns (Fig. 23)

Fig. 22.

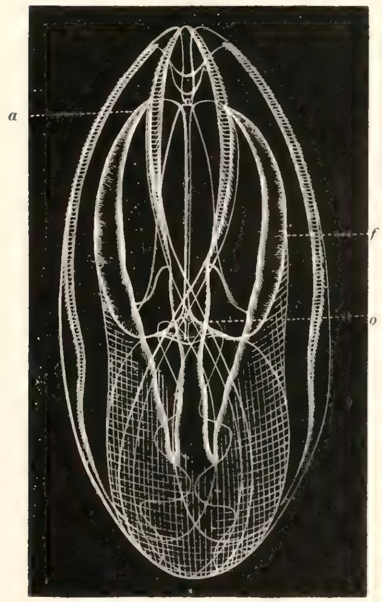
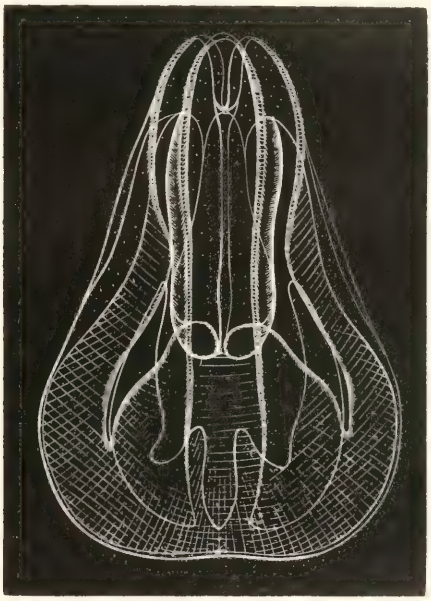


Fig. 23.



of the same tubes which we have in *Bolina alata* (Fig. 16). *Bolina alata* ranks among the most perishable of all our Medusæ; but this species seems to be very hardy, as I kept one large specimen alive for three weeks, during the whole of my stay at Naushon. This specimen also laid eggs, which were developed into small Mnemiopsidæ, after passing through stages in which it was almost impossible to say whether the Medusa was a young Pleurobrachia or not. As is the case in Bolina, the long tentacles, the globular outline of the young, resembled so closely the young of Pleurobrachia, which were developing at the same time in another bottle, that frequently I would be unable, after leaving them for some time, to decide at once to which

Fig. 22. Mnemiopsis Leidyi seen from the broad side. *o*, starting-point of branch of tentacular apparatus extending along the furrow, *f*, to *a*, the base of the auricles.

Fig. 23. The same as Fig. 22, seen from the narrow side.

species the young belonged, as the difference between the diameters is far less marked than in Bolina. As they advance in size, the lobes become developed, the tentacles disappear, and they can be readily distinguished. The development goes on in the envelope for a week or ten days after the eggs are laid, the young Medusa not breaking through the outer membrane before it is well advanced, and capable of guiding its motions through the water. The difference between the two transverse diameters of the spherosome is not as great as in Bolina, as will readily be seen by comparing the broad and narrow views of this Ctenophore (Figs. 22, 23). What is very peculiar in the genus Mnemiopsis is the peculiar development of the tentacular apparatus. It is not, as in Bolina, reduced to a simple bulb, with a few tentacles clustered at the base; but is more like what we find in Lesueuria, where the threads of the tentacular bulb are quite long, and have a decided tendency to spread fan-shaped on both sides of the bulb. We have a rather small tentacular bulb placed at the end of a long, slender tube, a short distance above the opening of the actinostome (*o*, Fig. 22). This tentacular bulb is protected by a kind of two-lapped hood (Fig. 24), the folds of which extend on each side along a groove towards the abactinal pole, to the very origin of the auricles, at *a*, Fig. 22, taking their origin at *o*, Fig. 22; their origin from the bulb is better seen in Fig. 24, where a portion of the two branches of the tentacular apparatus, extending along this groove, is represented. It is exactly as if we had the tentacles of a Pleurobrachia, instead of swimming and floating freely about, protected by a kind of cover, and thus pressed towards the spherosome, and prevented from moving freely about. The whole spherosome is covered with minute spots, clusters of lasso cells scattered irregularly over the surface. (See Fig. 23.)

Fig. 24.

From what we know of the amount of water which enters into the composition of Acalephs, and when we remember that not more than one half of one per cent. is animal matter, it seems strange that anything like a parasite should be found upon these Acalephs, and stranger still that this parasite should be able to find enough to live upon in such a delicate animal. As early as 1835 Sars had observed a species of intestinal worm (*Scolex acalepharum*) upon a large species of *Mnemia* (*M. norvegica* Sars), ten and even twelve specimens being found at-

Fig. 24. A part of the tentacular apparatus, near the opening of the actinostome, to show the mode in which the branches of the tentacle extend, under cover of a lappet, towards the abactinal extremity.

tached to the inner wall, near the upper part of the furrow, separating the lobes from the spherosome. Foster, in 1841, found a species of Filaria, which he called *Tetrastoma Playfairii*, upon a species of Cydippe; Greene and others have also seen parasites upon Hydroid Medusæ; and finally, in this species, five to eight worms, which resemble more a leech than anything else, though I cannot refer them to any of the genera which are described, attaining a length of an inch, and even an inch and a half, are frequently found attached to the inner wall, in the upper part of the long furrow, near the eyespeck. Hardly a specimen of this Medusa is found which has not one or two of these parasites. It is a long, flesh-colored, cylindrical worm, with five longitudinal white lines extending the whole length; the mouth, by which it is fastened to the jelly-fish, occupying the whole of the anterior part. This mouth can be closed, extended to a point, and, when inserted in the substance of the jelly-fish, it is expanded again like the mouth of a trumpet, and the worm is firmly fastened. These worms are sluggish in their movements, and when detached and disturbed hardly show signs of life by the slow contractions of their body. The worms live several days after they have been separated from the Medusæ.

Naushon, Buzzard's Bay (A. Agassiz).

LESUEURIA MILNE EDW.

Lesueuria MILNE EDW. Ann. Sc. Nat., XVI., 1841, p. 199.
Lesueuria LESS. Zooph. Acal., p. 90. 1843.
Lesueuria AGASS. Cont. Nat. Hist. U. S., III. p. 290. 1860.

Lesueuria hyboptera A. AGASS.

In Lesueuria the tentacular ambulacra are by far the most developed; the locomotive flappers of the short ambulacra extend but to the beginning of the auricle; the immense size of this apparatus, projecting beyond the level of the mouth, and the winding of the tube running through the auricle, before it joins the lateral chymiferous tube, gives this tube a great length when compared to the longitudinal ambulacra, which run in an almost straight course from the abactinal pole till they meet the horizontal part of the tentacular branch which connects near the mouth with the opposite tentacular apparatus. The tentacular apparatus is similar to that of Bolina, and is also situated in the short transverse axis. The lobes of a Lesueuria can hardly be called by that name, as what corresponds to the lobes of Bolina are small projections scarcely reaching below the level of the mouth, and in which all we find corresponding to the complicated windings of the longitudinal ambulacra are a few short, straight projections of the ambulacral tubes, running like spurs into the thickness of the spherosome.

The outline of our Lesueuria (Fig. 25) is entirely different from that of the Mediterranean; the latter is quite ellipsoidal, while the North American species shows a strong tendency to bulging out near the actinostome, and to imitate in its outline that of Bolina, mutilated specimens of which, when seen swimming in the water, can easily be mistaken for this species. It is only on noticing the position of the mouth, the great length of the auricles, that the mistake becomes apparent. Lesueuria is as transparent as Bolina, and even more sluggish; it grows to a large size, four inches in polar diameter, and is exceedingly abundant during September, large numbers being visible on almost any clear, hot day. Its phosphorescence is a very peculiar bluish light, of an exceedingly pale steel color, but very intense.

What is peculiar to our species is the almost rectangular outline which it has when seen from the broad side (Fig. 25). The shortness

Fig. 25.

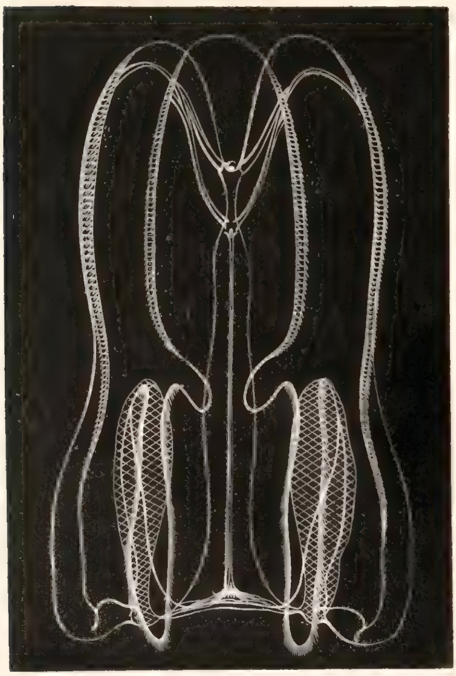
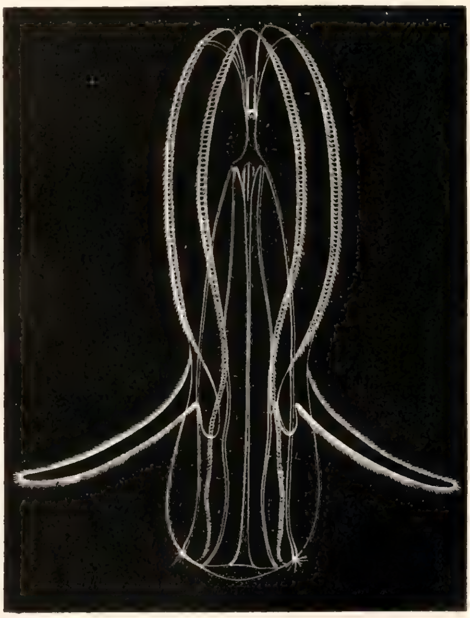


Fig. 26.



of the funnel; the extreme tenuity of the chymiferous tubes; the deep depression, or rather cut, in which the eye-speck is situated, for the abactinal part of the gelatinous spheromeres joins so closely above this that the eye-speck literally seems imbedded in the solidity of the

Fig. 25. Lesueuria seen from the broad side, natural size.
Fig. 26. Fig. 25 seen from the narrow side.

spherosome. The lateral tubes are also very attenuated, and bulge well out from the digestive cavity, as is seen in a profile view from the narrow side (Fig. 26). The view from the narrow side shows this species to be compressed to a far greater extent than anything we know in Bolina; approaching almost to Mertensia. When in motion the auricles are often held out extended from the body (Fig. 26), one pair bending one way, and the other in the opposite direction, as is shown in Fig. 27; the outline of the body when seen from the abactinal pole is nearly elliptical (Fig. 27), and we have not the strongly-ribbed appearance so characteristic of the other Ctenophoræ. The connection between the lateral and longitudinal ambulacra, forming a circular tube round the actinostome, can be traced in Fig. 28, and it differs in no essential way in its mode of formation from what we observe in Bolina.

Fig. 27.

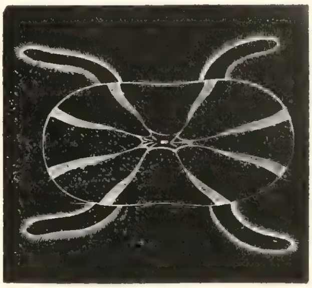
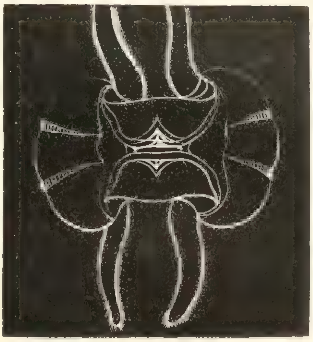


Fig. 28.



Massachusetts Bay, and Newport, R. I. (A. Agassiz).

Museum diagram No. 2 after A. Agassiz.

Family OCYROEÆ Less.

Ocyroeæ Less. Zooph. Acal., p. 98. 1843.
Ocyroeæ Agass. Cont. Nat. Hist. U. S., III. p. 292. 1860.

OCYROE Rang.

Ocyroe Rang (*non* Pér. et Les.). Mém. de la Soc. d'Hist. Nat., IV. p. 170. 1829.
Ocyroe Less. Zooph. Acal., p. 98. 1843.
Ocyroe Agass. Cont. Nat. Hist. U. S., III. p. 292. 1860.

Ocyroe maculata Rang.

Ocyroe maculata Rang. Mém. Soc. d'Hist. Nat. de Paris, IV. 1829, Pl. 20, Fig. 1.
Ocyroe maculata Less. Zooph. Acal., p. 99. 1843.
Ocyroe maculata Agass. Cont. Nat. Hist. U. S., III. p. 292. 1860.

Antilles (Rang).

Fig. 27. Lesueuria seen from the abactinal pole.
Fig. 28. Seen from the actinal pole, to show the connection of the lateral and longitudinal ambulacra.

Suborder SACCATÆ Agassiz.

Saccatæ Agass. Cont. Nat. Hist. U. S., III. p. 293. 1860.
Callianiridæ Esch. Syst. der Acal., p. 21. 1829.

Family MERTENSIDÆ Agass.

Mertensidæ Agass. Cont. Nat. Hist. U. S., III. pp. 196, 293. 1860.

MERTENSIA Less.

Mertensia Less. (*non* Gegenb.). Zooph. Acal., p. 100. 1843.

Mertensia ovum Mörch.

Cydippe (*Mertensia*) *ovum* Mörch. In Nat. Bid. til en Besk. af Grönland, p. 97. 1857.
Beroe ovum Fab. Faun. Groenl. 1780. No. 355.
Beroe cucullus Mod. Svensk. Vet. Ak. Nya Handl., XI. 1790.
Beroe pileus Scor. (*nec* Fab. *nec* Müll.). Arct. Reg., II. Pl. XVI. Fig. 4. 1820.
Cydippe ovum Esch. Syst. d. Acal., p. 25. 1829.
Cydippe cucullus Esch. Syst. d. Acal., p. 25. 1829.
Mertensia Scoresbyi Less. Zooph. Acal., p. 100. 1843.
Cydippe cucumis Less. (syn. not correct). Zooph. Acal., p. 105. 1843.
Mertensia cucullus Agass. Cont. Nat. Hist. U. S., III. p. 293. 1860.

The compression of Mertensia coincides with that of Pleurobrachia. The axis passing through the tentacular apparatus is more than twice as long as the cœliac diameter. What is very characteristic of this genus is the great distance at which the lateral chymiferous tubes are placed from the digestive cavity, and the close connection which is shown there to exist between the tentacular apparatus and the lateral tubes, the base of the tentacular apparatus seeming to give rise to this long, slender tube, enclosing the digestive cavity in its two wide arches, when seen from the broad side. (Fig. 29.) The spherosome rises so much above the opening for the passage of the tentacular apparatus, that it seems, in adult specimens, as if the tentacular ambulacra were the longest.

Only one large adult specimen of this jelly-fish has been taken in our Bay. It was at first mistaken for a large Pleurobrachia; but the great flattening of the spherosome, and the peculiar spiral motion which they keep up while active, soon enables one to distinguish them readily from that genus, while swimming in the water. The color, also, is of a light-pink hue; the spermaries are of a very brilliant crimson, the ovaries being more dull. It has the rosette of an Idyia, with the edges smooth; the circumscribed area is quite small; the tentacles are but moderately long, apparently not capable of as great expansion as Pleurobrachia. Our species of Mertensia is exceedingly delicate; the specimens taken at Nahant and Eastport, though treated with the greatest care, not living more than a couple of hours when brought into confinement. I suppose this to be the *Beroe ovum* of Fabricius.

Fig 29.

The difference between the tentacular chymiferous tubes and the median pairs is very marked in young specimens. In the youngest Mertensia observed, we find the same pear-shaped form noticed in young Pleurobrachia. (See Fig. 41.) The ambulacra, however, are far more advanced in comparison to the tentacles, and occupy nearly the whole of the spherosome (Fig. 30); the pouches of the ambulacra concealing almost entirely the digestive cavity. There are also very prominent orange pigment-cells, which are not found in the young of Pleurobrachia, along the rows of locomotive flappers; the tentacles remain simple much longer than in Pleurobrachia. The young Mertensia is not as much compressed as the young Pleurobrachia (compare Figs. 31 and 46, representing almost corresponding stages of Mertensia and of Pleurobrachia).

Fig. 30.

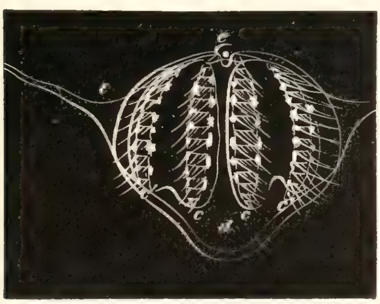


Fig. 31.

The compression goes on increasing with age, and in the adult it has become one of the striking characteristics of the genus. With advancing age the actinal part of the young Medusa becomes more prominent, while the ambulacra have remained nearly unchanged, the long and short ambulacra not retaining quite the same proportions they had before they were almost equally developed; the funnel has become

Fig. 29. Adult Mertensia seen from the broad side.
Fig. 30. Young Mertensia seen from the broad side, with a simple tentacle.
Fig. 31. The same as Fig. 30, seen from the abactinal pole.

formed, the digestive cavity (d) and the lateral tubes (l) are well defined. (Fig. 32.) In a view from below of this same individual (Fig. 33) we notice the narrowing of the large ambulacral pouch into somewhat more circumscribed tubes. In the next stage which is here represented (Fig. 34), the ambulacra have assumed still more the aspect of tubes, the funnel has elongated, the tentacles have begun to send out lateral processes, the lateral tubes extend nearly to the level of the mouth, the actinal part of the young Medusa having taken a still greater development, and having become as long as the ambulacral part. The tubes, both ambulacral and lateral, when seen from below (Fig. 35), are also more narrowed and better circumscribed. In the next stage the development of the actinal part of the spherosome (Figs. 36, 37) has become so striking, that we cannot fail to recognize in the young Acaleph a Mertensia. The difference between the cœliac and diacœliac axis is quite prominent, giving to the animal, when viewed from the broad (Fig. 36) or narrow side (Fig. 37), a totally different aspect. The tentacular apparatus differs from that of Pleurobrachia in being limited to the abactinal part of the spherosome, and not extending towards the actinostome, as in Pleurobrachia. In the young stages the lateral tubes are still quite close to the digestive cavity, and do not yet flare out, as in the adult. (See Figs. 29, 36.) The ambulacra are very nearly equally developed, the tentacular pairs and the median tubes differing but slightly in length. The tentacles are lashed and covered with large orange pigment-spots, similar to those of the rows of locomotive

Fig. 32.

Fig. 33.

Fig. 34.

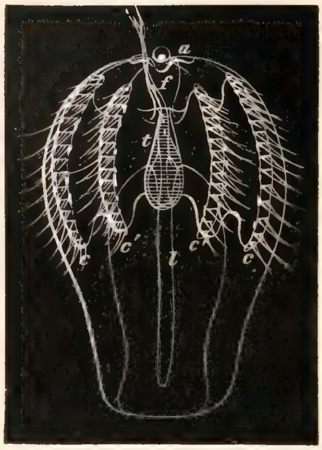


Fig. 35.

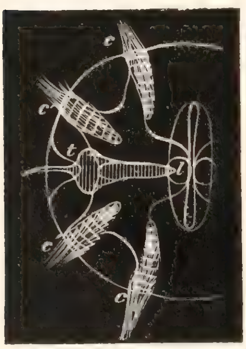


Fig. 32. Somewhat more advanced Mertensia, seen from the narrow side; the lateral tubes, l, are present.

Fig. 33. The same as Fig. 32, seen from the actinal pole.

Fig. 34. Still more advanced Mertensia, seen from the narrow side.

Fig. 35. The same as Fig. 34, seen from the actinal pole; the tubes are circumscribed, and the tentacular apparatus isolated.

flappers. The pigment-spots become smaller and less conspicuous with advancing age.

Fig. 36.

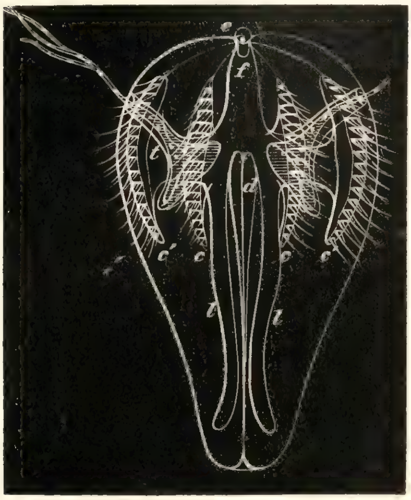
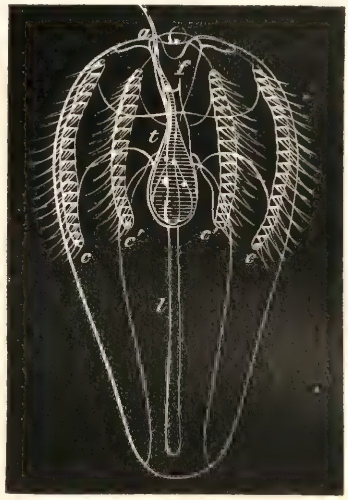


Fig. 37.



This species is exceedingly common in Eastport harbor, during the month of September.

Arctic Ocean (Mertens, Scoresby); Baffin's Bay (Fabricius); Massachusetts Bay, and Eastport, Me. (A. Agassiz).

Museum diagram No. 3 after Alex. Agassiz.

Family CYDIPPIDÆ Gegenb. (*rest.* Ag.)

Cydippidæ Gegenb. Archiv f. Nat., 1856, I. p. 196.
Callianiridæ Esch. (*p. p.*) Syst. d. Acal., p. 21. 1829.
Cydippidæ Agass. Cont. Nat. Hist. U. S., III. p. 293. 1860.

PLEUROBRACHIA Flem.

Pleurobrachia Flem. Phil. Zoöl., II. p. 612.
Cydippe Esch. Syst. der Acal., p. 29. 1829.
Cydippe Less. Zooph. Acal., p. 104. 1843.
Pleurobrachia Agass. Mem. Am. Acad., IV. 1849, p. 314.
Pleurobrachia Agass. Cont. Nat. Hist. U. S., III. p. 203. 1860.

Fig. 36. Still further advanced Mertensia, seen from the broad side.

Fig. 37. Young Mertensia about in the same condition as that of the preceding figure, seen from the narrow side. The main branches of the ambulacral system have lost the character of pouches.

Pleurobrachia rhododactyla Agass.

Pleurobrachia rhododactyla Agass. Mem. Am. Acad., IV. p. 314, Pls. 1, 2, 3, 4, 5.
Pleurobrachia rhododactyla Agass. Cont. Nat. Hist. U. S., III. pp. 203, 294, Pl. 2ª. 1860.
Beroe pileus Fab. (*non* Flem., Müll., and Esch.). Faun. Grönl. 1780. No. 354.
Cydippe pileus Gould. Rep. Inv. Mass., p. 349. 1841.
Pleurobrachia rhododactyla Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Cydippe pileus Mörch. In Naturhist. Bid. til en Besk. af Grönland, p. 97. 1857.
Pleurobrachia Scoresbyi Mörch. In Naturh. Bid. til en Besk. af Grönland, p. 98. 1857.
Pleurobrachia rhododactyla Packard. List of Animals dredged near Caribou Island. 1863.

The young Pleurobrachia early assumes an outline resembling the adult; it is slightly pear-shaped, with two very small protuberances, like buttons, indicating the first appearance of the tentacles (Figs. 38–40, *t*), and has a very large transparent sphere (*e*) with two or

Fig. 38.

Fig. 40.

Fig. 39.

three granules, as an eye-speck. The first cavity formed in this embryo is a small spherical space (Figs. 38–40, *d*) near the pole opposite the eye-speck. As this grows larger it becomes elliptical, reaching to

Fig. 41.

Fig. 42.

Fig. 43.

the base of the tentacular (Fig. 41, *t*) knob, which now extends, like the handle of a jar, beyond the outline; this cavity is the digestive cavity, and there is up to this time no sign of ambulacral tubes or cavi-

Fig. 38. Young Pleurobrachia seen from the broad side.
Fig. 39. Same as Fig. 38, seen from the narrow side.
Fig. 40. Same as Fig. 38, seen from below.
Fig. 41. Pleurobrachia somewhat more advanced, seen from the broad side.
Fig. 42. Same as Fig. 43, seen from above.
Fig. 43. Same as Fig. 42, seen from the broad side, older than Fig. 41.

ties of any kind. The position of the ambulacral system is early well defined by four short double rows of combs, each row not having more than three or four combs (Figs. 38 – 41). The spherosome early shows the great difference in the size of the longitudinal and cœliac diameters, the tentacular diameter being nearly twice as long as the other (Figs. 40, 42). The locomotive rows extend rapidly to the level of the upper part of the digestive cavity. At this time the ambulacral cavity makes its appearance as a small spherical cavity, in the same way as the digestive cavity. The ambulacral cavity increases rapidly, soon attains the size of the digestive cavity, and occupies the whole of the abactinal extremity of the animal (Fig. 43, *o*). At this time the young Pleurobrachia is quite pear-shaped, with solid tentacles about as long as the polar diameter. The ocular sphere is large, very prominent (Fig. 43, *e*). There are two large elliptical cavities, of nearly equal size (Fig. 43, *o*, *d*). In the next stage the two cavities differ in their outline, the ambulacral cavity becoming more and more rectangular, and the digestive cavity triangular, the two being separated by a wall which grows thinner and thinner. The combs of the ambulacral rows increase in size, and the flappers are quite long, equalling in length half the transverse diameter of the spherosome. The ambulacral cavity extends towards the abactinal region on both sides of the thickening of the wall, supporting the sensitive bulb. This is the first sign of the formation of the funnel (Fig. 44, *f*), and its division into the two branches, opening outwards. The compression of the digestive cavity is plainly seen at this stage, as when seen facing the tentacles the cavity comes close to the outer wall (Fig. 44), while when seen at right angles to the tentacular diameter it occupies but a much smaller space (Fig. 45). The tentacular bulb becomes more isolated, the tentacle is about three times as long as the polar diameter. During all this time, and from the first appearance of the locomotive flappers, the young Medusa moves about with the greatest rapidity, turning over in every possible direction, running round and round, with the digestive cavity forward, in the envelope of the egg, as if trying to make its escape from it; while at other times the young Medusa remains

Fig. 44.

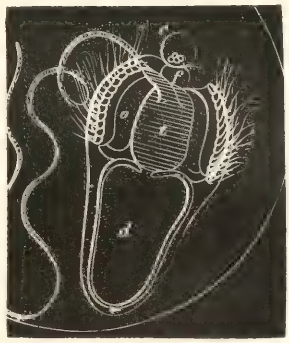


Fig. 45.

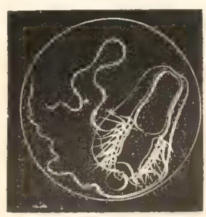
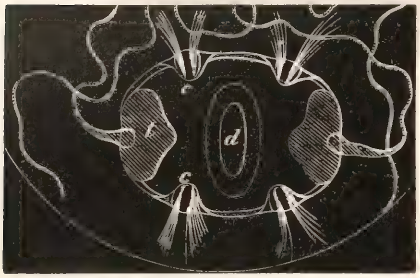


Fig. 44. Pleurobrachia in which the digestive cavity and the ambulacral cavity are already connected, immediately before the escape of the Medusa from the egg.

Fig. 45. Same as Fig. 44, somewhat less magnified, to show the relative size of egg envelope and embryo.

poised in the centre of the egg, rotating slowly on its axis, imitating, while still in the egg, all the movements which are so characteristic of the adult. The young Medusa, before it escapes from the egg, occupies a comparatively small space, having thus ample room for its manifold movements. In Fig. 44 the outline of a part of the egg is seen; Fig. 45 is the same as Fig. 44 from the opposite side, showing the whole egg.

Fig. 46.



Before the young leaves the egg, we find that the ambulacral cavity and digestive cavity connect by means of a small opening in the centre of the dividing wall, and at the same time a depression at the actinal pole soon increases sufficiently to pierce through the wall, and make an opening, the mouth (Fig. 46). The young Pleurobrachia now makes its escape from the egg, and the changes it undergoes are very rapid; the funnel becomes well isolated, and the digestive cavity quite compressed, and we see the first sign of the separation of the double row of locomotive flappers into two very distinct rows. At the same time, when facing

Fig. 47.

the tentacular bulb, we see a small triangular pouch extending along the digestive cavity, which, when seen in profile, plainly appears to be nothing but a cœcum of the ambulacral cavity, formed exactly as in Bolina (Fig. 5). These pouches are the rudimentary lateral chymiferous tubes so characteristic of Ctenophoræ. At this stage the ambulacral flappers are not as near the abactinal pole as in former stages, on account of the elongation of portions of the spherosome. The lateral tubes increase rapidly in length, and soon extend to the level of the mouth (Fig. 47, *l*), while the forking of the ambulacral tubes becomes more deep. We notice also at this time a marked difference in the size of the ambulacral tubes. The tentacular ambulacra (those on each side of the tentacular apparatus) are much shorter than the longitudinal ambulacra (Fig. 48, *c*). The tentacle, also, is no longer a simple solid thread; long, slender offshoots, similar to the tentacle, have developed near the

Fig. 46. Same as Fig. 44, seen from actinal side.

In all the preceding figures the embryo has been drawn without the egg envelope; but it must be remembered that the little Medusa does not escape from the egg till it reaches the condition of Fig. 44.

Fig. 47. Pleurobrachia swimming freely about, in which the lateral tubes, the funnel, have become highly developed; seen from the broad side.

point of attachment, and the peculiar abactinal system (Fig. 48) has also made its appearance. The young Pleurobrachia has now all the

Fig. 48.

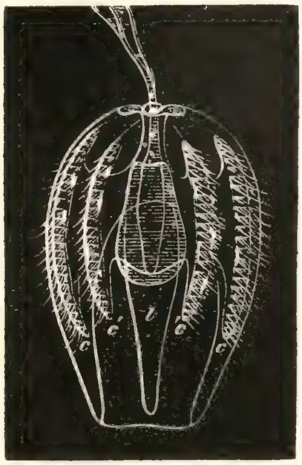
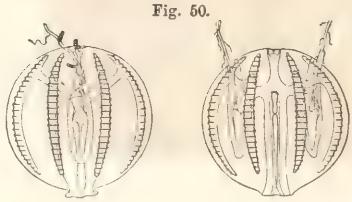


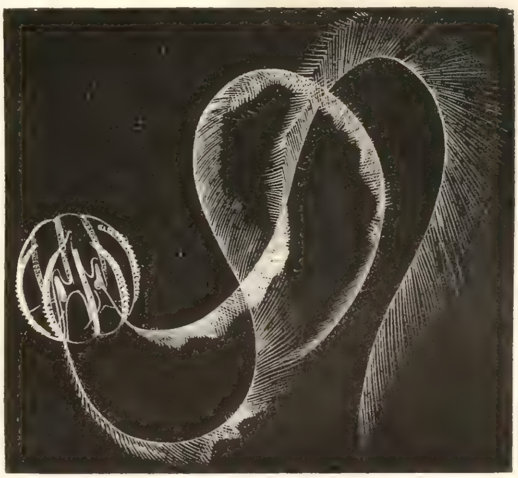
Fig. 49.

Fig. 50.



appearance of the adult, only it is more pear-shaped, and it is about one half of an inch in polar diameter. The ambulacra are yellowish, with large orange pigment-cells on the surface of the ambulacral tubes (Fig. 49).

Fig. 51.



The difference between the axes, the cœliac and the diacœliac, grows less and less with advancing age, till they assume the almost identical outlines of the adult, as seen in Fig. 50, which represents the cœliac and diacœliac views of an adult. In Figs. 47 and 48 we have also the first trace of the cirri which assume such graceful shape in the tentacles of the adult Medusa (Fig. 51); the cirri begin nearest the tentacular bulb, and there are at first but two or three at the base of each tentacle.

Greenland (Fabricius); New England (Agassiz).

Cat. No. 366, Nova Scotia, Anticosti Expedition, 1861.

Museum diagrams Nos. 4, 5, after L. Agassiz and Alex. Agassiz.

Fig. 48. Somewhat less advanced than Fig. 47, showing the lateral tubes from the narrow side, as a prolongation of the ambulacral cavity.

Fig. 49. Pleurobrachia about in condition of Fig. 47, seen from actinal pole.

Fig. 50. Adult Pleurobrachia, from the head and narrow side, natural size.

Fig. 51. Adult Pleurobrachia in a natural attitude, natural size.

Pleurobrachia Bachei A. Agass.

Pleurobrachia Bachei A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., III. p. 294. 1860.

Pleurobrachia Bachei A. Agass. resembles *Pleurobrachia rhododactyla* in its general appearance, having about the same size; the color of the spherosome and of the tentacles being nearly the same. The opening of the tentacular sac, however, is at a greater distance from the pole, and the tentacles come out more from the side of the spherosome than in *Pleurobrachia rhododactyla.* The cœliac cavity is also shorter, the funnel is longer, and the actinal portion of the sac shorter. The branches leading from the digestive cavity to the chymiferous tubes are much longer and more slender, the junction being above the opening of the tentacular sac, while in *Pleurobrachia rhododactyla* it is below, nearer the actinal pole. The greatest swelling of the spherosome is nearer the actinal pole, not in the middle of the actinal axis.

Found in the Gulf of Georgia, and entrance of Admiralty Inlet, W. T., during the whole Summer of 1859, from May to September.

Washington Territory (A. Agassiz).

Cat. No. 288, Gulf of Georgia, W. T., 1859, A. Agassiz.

JANIRA Oken.

Janira Oken. Lehrb. d. Naturg., III. 1815.

Janira cucumis Less.

Janira cucumis Less. Zooph. Acal., p. 104. 1843.
Beroe cucumis Mert. (*non* Fab. *n.* Esch.). Mém. Ac. St. Pet., p. 522, Pl. VIII. 1843.
Janira cucumis Agass. Cont. Nat. Hist. U. S., III. p. 294. 1860.

Between Sitka and Unalaschka (Mertens).

DRYODORA Agass.

Dryodora Agass. Cont. Nat. Hist. U. S., III. p. 196. 1860.
Eschscholtzia Less. (*ex. p.*). Zooph. Acal., p. 102. 1843.
Mertensia Gegenbaur (*non* Less.). Archiv f. Nat., 1856. I. p. 198.

Dryodora glandiformis Agass.

Dryodora glandiformis Agass. Cont. Nat. Hist. U. S., III. p. 294. 1860.
Beroe glandiformis Mert. Mém. Acad. St. Pet., p. 530, Pl. XI. 1833.
Eschscholtzia glandiformis Less. Zooph. Acal., p. 102. 1843.
Mertensia glandiformis Gegenb. Archiv f. Nat., 1856, I. p. 198.

Behring's Strait (Mertens).

SUBORDER EURYSTOMÆ LEUCK.

Eurystomæ LEUCK.; in Van d. Hoeven Handbuch d. Zool. German Transl. 1850.
Eurystomæ AGASS. Cont. Nat. Hist. U. S., III. p. 295. 1860.

Family BEROIDÆ Esch.

Beroidæ ESCH. Syst. d. Acal., p. 38. 1829.
Beroidæ AGASS. Cont. Nat. Hist. U. S., III. p. 295. 1860.

BEROE BROWN.

Beroe BROWN. Nat. Hist. Jam., p. 384. 1756.
Medea ESCH. (*ex p.*). Syst. d. Acal., p. 38. 1829.
Cydalisia LESS. Zool. de la Coq., p. 101. 1829.
Cydalisia LESS. Zooph. Acal., p. 138. 1843.
Beroe AGASS. Cont. Nat. Hist. U. S., III. p. 295. 1860.

Beroe punctata CHAM. & EYSEN.

Beroe punctata CHAM. & EYS. Nov. Act., X. p. 361, Pl. 31, Fig. 1.
Beroe punctata ESCH. Syst. d. Acal., p. 37. 1829.
Beroe punctata BLAINV. Man. d'Actin., Pl. 7, Fig. 2. 1830.
Cydalisia punctata LESS. Zooph. Acal., p. 139. 1843.
Beroe punctata McCR. Proc. Elliot Soc. N. H., p. 1. 1858.
Beroe punctata AGASS. Cont. Nat. Hist. U. S., III. p. 295. 1860.

McCrady has identified a species of Beroe found at Charleston with the *B. punctata* Esch. I am inclined to think that it may prove to be one of the species of Idyopsis found on the coast of Florida.

Charleston, S. C. (McCrady).

IDYIA FREM.

Idyia FREM. Nouv. Bull. Soc. Phil., 1809, p. 329.
Medea ESCH. (*ex. p.*). Syst. d. Acal., p. 38. 1829.
Idyia LESS. Zooph. Acal., p. 132. 1843.
Idyia MERT. Mém. Acad. St. Petersb., II. p. 532. 1833.
Idyia AGASS. Cont. Nat. Hist. U. S., III. p. 295. 1860.

Idyia ovata LESS.

Idyia ovata LESS. Zooph. Acal., p. 134. 1843.
Beroe BROWN. Nat. Hist. Jam., p. 384. 1756.
Medusa Beroe LINN: Syst. Nat. ed. X. p. 660.
Beroe ovata ESCH. Syst. d. Acal., p. 36. 1829.
Idyia ovata AGASS. Cont. Nat. Hist. U. S., III. p. 295. 1860.

Is this not one of our species of Idyopsis?

Jamaica (Patrick Brown).

Idyia cucumis Less.

Idyia cucumis Less. Zooph. Acal., p. 133. 1843.
Beroe cucumis Fab. Fauna Grönl., 1780, No. 353.
Beroe cucumis Esch. Syst. d. Acal., p. 36. 1829.
Medea fulgens Less. Zooph. Acal., p. 136. 1843.
Beroe cucumis Mörch; in Naturh. Bid. af Grönland, p. 98. 1857.
Idyia cucumis Agass. Cont. Nat. Hist. U. S., III. p. 296. 1860.
? *Idyia borealis* Less. Zooph. Acal., p. 134. 1843.

The many species of Idyia which are described from the arctic parts of the Atlantic Ocean, and which have been identified with *Idyia cucumis* and *Idyia borealis* Less. by Professor Agassiz, are probably all identical with the *Beroe cucumis* of Fabricius.

Baffin's Bay (Fabricius).

Idyia roseola Agass.

Idyia roseola Agass. Cont. Nat. Hist. U. S., III. pp. 270, 296, Pls. 1, 2. 1860.
Idyia roseola Pack. List of Animals dredged near Caribou Island. 1863.

In the youngest Idyia which I have had the opportunity to observe the digestive cavity, the eight ambulacral rows, the lateral chymiferous tubes were already developed. When seen from above, the ambulacral cavity has the shape of an eight-lobed rosette, with loops of different size.

Fig. 52.

Fig. 53.

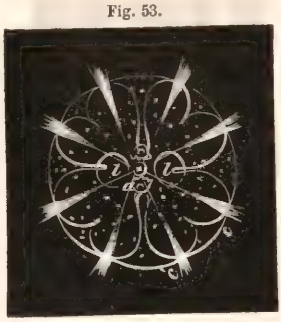


Fig. 54.

occupying half the space of the spherosome, seen in profile (Fig. 52), and the whole when seen from the abactinal pole (Fig. 53). We are struck by the immense size of the lateral tubes (l), and find that the inequality in the lobes of the ambulacral cavity is caused by the greater size of

In Idyia, owing to a mistake in the lettering of the figures, c' is the long tube, and c the short ambulacral tube, so that the lettering of Idyia does not exactly correspond to that of the other young Ctenophoræ.

Fig. 52. Young Idyia, seen from the narrow side.
Fig. 53. Fig. 52, seen from abactinal pole.
Fig. 54. Young Idyia, in which the ambulacral tubes are distinct, seen from the narrow side.

the longitudinal ambulacra, the rows of locomotive flappers extending but little way from the abactinal pole, as is the case in Pleurobrachia. We find also the whole spherosome covered with large pigment cells.

Fig. 56.

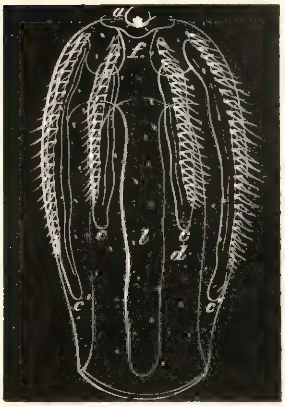


Fig. 55.

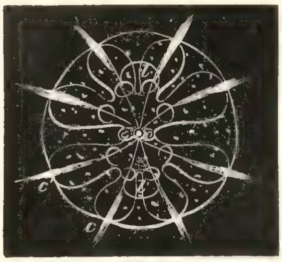


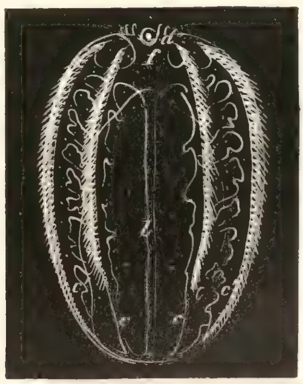
Fig. 57.

In specimens slightly older, the difference in size between these two sets of tubes becomes more marked in proportion as they become separated and distinct, as is seen in the two figures, in profile (Fig. 56) and

Fig. 59.

Fig. 58.

Fig. 60.



from above (Fig. 55). The manner in which the ambulacral tubes are formed, by the drawing up into loops of the original chymiferous cavity, is very easily followed in Idyia. It is the same in all the Ctenophoræ

Fig. 55. Fig. 54, seen from the abactinal pole.

Fig. 56. Somewhat more advanced than Fig. 54, seen from the broad side.

Fig. 57. The chymiferous tubes, c', have extended to level of actinostome; narrow side.

Fig. 58. The chymiferous tubes, c', have united with the lateral tubes, and formed a circular tube, towards which the short ambulacra, c, are fast pushing their way. First trace of the ramifications on the long tubes, c'. Figs. 58 – 60 are seen from the broad side.

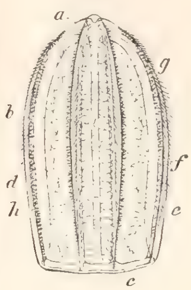
Fig. 59. The short ambulacra, c, have nearly united with the circular tube; the spurs of the ambulacra have become more numerous and quite prominent.

Fig. 60. The circuit is now complete between the short and long ambulacra. The spurs or ramifications of the chymiferous tubes are numerous, resembling somewhat those of the adult.

I have observed; but as the tubes of the other genera are so soon hidden by the rows of locomotive flappers, it becomes more difficult to follow this separation than in Idyia, where the ambulacra retain always a great size, and develop faster than the rows of flappers which cover them. The longitudinal ambulacra increase rapidly in length, pushing their way through the gelatinous mass (Fig. 56, c') till they reach the level of the mouth (Fig. 57); they then bend inwards (Fig. 58) till they meet the lateral chymiferous tube. The lateral ambulacra go through the same process (Figs. 58, 59); and thus we have formed, by the junction of the ambulacra with the lateral chymiferous tubes, a circular tube round the mouth. (Fig. 60.) The distinction between the longitudinal and lateral ambulacra is always maintained by the length of the rows of locomotive flappers which cover the ambulacral tubes. The fringed abactinal apparatus is in the young a circular ring; afterwards it has four folds developed at the extremity nearest the sensitive bulb (Figs. 59, 61), which soon become fringes similar to those of the adult. Shortly before the circuit is thus completed (Figs. 58, 59), the ambulacra of the young Idyia give out a few lateral processes, the first traces of the ramifications of the ambulacra of the adult (Fig. 62), which become more and more numerous until the processes branch as in Fig. 60.

Fig. 61.

Fig 62.



The short chymiferous tubes are, as in Pleurobrachia, on each side of the lateral tubes, while in Bolina this is not the case, the long tubes being near the short transverse axis.

Coast of New England, and northward to Bay of Fundy (Agassiz).

Catalogue No. 368, Nova Scotia, Anticosti Expedition, 1861.

Museum diagrams Nos. 6, 7, after Alex. Agassiz and L. Agassiz.

Idyia cyathina A. Agass.

Idyia cyathina A. Agass.; in Agassiz's Contrib. Nat. Hist. U. S., Vol. III. p. 296. 1860.

This species differs from the *Idyia roseola* Agass. of the coast of New England, by the sudden widening of the spherosome from the abactinal pole. It is widest at two thirds the distance from the mouth; it then tapers as suddenly for another third of the distance to the mouth, and

Fig. 61. Fig. 57, seen from the abactinal pole.

Fig. 62. Adult Idyia, reduced in size one half. *a*, anal opening; *b*, lateral radiating tube; *c*, circular tube; *d*, *e*, *f*, *g*, *h*, vertical rows of flappers. Seen from the broad side.

then very gradually. The actinal extremity of the spherosome is slender and exceedingly movable, and the edges of the actinostome can be extended so that it presents the appearance of two distinct lobes. The ovaries and spermaries are much longer sacs than in *I. roseola*, and not so numerous. The locomotive flappers do not extend as far down the chymiferous tubes as they do in our species, though this difference may only be one of age. Found in the Gulf of Georgia, W. T., and in the eastern part of the Straits of Fuca, during the summer of 1859. The habits of this Idyia are somewhat different from those of our species. Instead of the sluggish movements which characterize *Idyia roseola*, *Idyia cyathina* is very active, and seems to retain the embryonic features of the genus, — short rows of flappers, and great activity in its adult condition.

Northwest coast of North America (A. Agassiz).

Cat. No. 287, Gulf of Georgia, W. T., A. Agassiz, 1859.

IDYIOPSIS Agass.

Idyiopsis Agass. Cont. Nat. Hist. U. S., III. pp. 288, 296. 1860.

Short vertical axis; ambulacra very prominent; interambulacra concave; fringes of circumscribed area arranged in two prolonged circles; numerous branching tubes arising from circular tube; compression of the body very striking. (Agassiz.)

Idyiopsis Clarkii Agass.

Idyiopsis Clarkii Agass. Cont. Nat. Hist. U. S., III. pp. 288, 296, Figs. 101, 102. 1860.

It remains yet to be shown whether the two species of Idyiopsis here mentioned may not be identical with species of Idyia described by Eschscholtz as found on the Brazilian coast and in the Gulf of Mexico. The figures of Idyiopsis given by Professor Agassiz are here reproduced. (Figs. 63, 64.)

South Carolina (L. Agassiz).

Fig. 63.

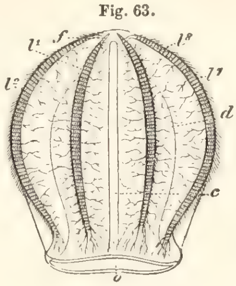


Fig. 64.

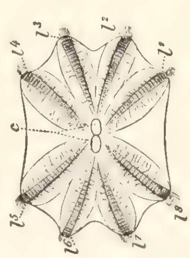


Fig. 63. Idyiopsis Clarkii seen from the broad side. *f*, funnel; l^2, l^7, anterior and posterior ambulacra; l^1, l^8, lateral ambulacra; *d*, digestive cavity; *o*, mouth; *c*, the lateral tube.

Fig. 64. Fig. 63, seen from the abactinal pole. *c*, circumscribed area; l^1, l^8, l^4, l^5, lateral ambulacra; l^2, l^3, l^6, l^7, anterior and posterior ambulacra.

Idyiopsis affinis Agass.

Idyiopsis affinis Agass. Cont. Nat. Hist. U. S., III. pp. 288, 296. 1860.

Gulf of Mexico, Tortugas, and Florida (L. Agassiz).

Order DISCOPHORÆ Esch.

Medusariæ Lamk. (*p. p.*). 1816.
Méduses Pér. et Les. (*p. p.*). 1809.
Discophoræ planerocarpæ Esch. Syst. d. Acal. 1829.
Discophoræ cryptocarpæ Esch. Syst. d. Acal. 1829.
Pulmograda Bl. (*p. p.*). Manuel d'Actinologie. 1830.
Medusidæ Br. (*p. p.*). Mém. Acad. St. Petersb. 1833.
Medusæ Less. (*p. p.*) Zooph. Acal. 1843.
Steganophthalma Forbes. Brit. Nak. Medusæ. 1848.
Acraspeda Gegenb. Syst. d. Med.; in Z. f. W. Zool. 1856.
Craspedota Gegenb. (*p. p.*). Syst. d. Med.; in Z. f. W. Zool. 1856.
Lucernariadæ Huxl. (*non* Johnst.). Lectures on Genl. Nat. Hist. . . . 1856.
Discophoræ Agass. Cont. Nat. Hist. U. S., IV. 1862.

Suborder RHIZOSTOMEÆ Agass.

Rhizostomeæ Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 9, 131. 1862.
Rhizostomidæ Esch. Syst. der Acal., p. 42. 1829.
Polystomæ Br. Mém. Acad. St. Petersb. 1835, Prod., p. 228.
Rhizostomidées Less. Zooph. Acal., p. 404. 1843.

Family RHIZOSTOMIDÆ Esch.

Rhizostomidæ Esch. Syst. der Acal., p. 42. 1829.
Rhizostomidæ Agass. Cont. Nat. Hist. U. S., Vol. IV. p. 149. 1862.

STOMOLOPHUS Agass.

Stomolophus Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 138, 151. 1862.

Stomolophus meleagris Agass.

Stomolophus meleagris Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 138, 151; III. Pl. 14.
Cephea rhizostoma Gibbes (*non* Lamk.). Fauna of South Carolina. 1847.

Atlantic Ocean, coast of Georgia.
Catalogue No. 335, Warsaw Shoals, Georgia, L. Agassiz.
Museum diagram No. 8 after L. Agassiz.

Family POLYCLONIDÆ Agass.

Polyclonidæ Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 140, 159. 1862.

POLYCLONIA Br.

Polyclonia Br. Mém. Acad. St. Petersburg, p. 396, Pls. 21 – 23. 1838.
Polyclonia Agass. Cont. Nat. Hist. U. S., IV. p. 139. 1862.

Polyclonia frondosa Agass.

Polyclonia frondosa Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 139, 159, III. Pls. 13, 13a.
Medusa frondosa Pall. Spicil. Zool., p. 30, Pl. 2, Figs. 1 – 3.
Cassiopea frondosa Lamk. (*non* Til.). Anim. s. Vert., II. p. 512.
Cassiopea frondosa Esch. Syst. d. Acal., p. 43. 1829.
Cassiopea Pallas Pér. et Les. Hist. Gén. d. Méd.; in An. Mus., XIV. p. 45.
Medusa frondosa Bosc. Hist. Nat. d. Vers., II. p. 170.
Cassiopea frondosa Less. Zooph. Acal., p. 405. 1843.

West Indies (Pallas); Florida, Key West, and Key Largo (L. Agassiz).
Cat. No. 332, Tortugas, Fla., March, 1858, L. Agassiz.
Cat. No. 333, Key West, Fla., March, 1858, L. Agassiz and J. E. Mills.
Cat. No. 334, Key West, Fla., March, 1858, L. Agassiz and J. E. Mills.
Cat. No. 346, Florida, L. Agassiz.
Cat. No. 383, Havana, Professor F. Poey.
Museum diagram No. 8, after L. Agassiz.

Suborder SEMÆOSTOMEÆ Agass.

Semæostomeæ Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 9, 159. 1862.

Family AURELIADÆ Agass.

Aureliadæ Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 80, 159. 1862.

AURELIA Pér. et Les.

Aurelia Pér. et Les. Ann. du Mus., XIV. p. 45. 1809.
Aurelia Less. Zooph. Acal., p. 348. 1843.
Aurelia Agass. Cont. Nat. Hist. U. S., IV. p. 159. 1862.
Medusa Linn. Faun. Suec., p. 511.
Medusa Esch. Syst. der Acal., p. 61. 1829.
Ephyra Pér. et Les. Hist. Gén. des Méd., p. 42.
Ocyroe Pér. et Les. Hist. Gén. des Méd., p. 43.
Evagora Pér. et Les. Hist. Gén. des Méd., p. 31.
Scyphistoma Sars. Bidrag til Söedyrenes Nat. 1829.
Rhizostoma Esch. Syst. d. Acal., p. 45. 1829.
Strobila Sars. Beskriv. . . . over Polyp, . . . p. 16. 1835.
Diplocraspedon Br. Prod. Mém. Acad. St. Petersburg, p. 226. 1835.
Monocraspedon Br. Prod. Mém. Acad. St. Petersburg, p. 225. 1835.
Claustra Less. Zooph. Acal., p. 378. 1843.
Biblis Less. Zooph. Acal., p. 339. 1843.

Aurelia flavidula Pér. et Les.

Aurelia flavidula Pér. et Les. Ann. Mus., XIV. p. 47. 1809.
Aurelia flavidula Less. Zooph. Acal., p. 376. 1843.
Medusa aurita Fab. Faun. Grön., No. 356. 1780.
Aurelia aurita Gould. Rep. Inv. Mass., p. 348. 1841.
Aurelia flavidula Gould. Rep. Inv. Mass., p. 348. 1841.
Ephyra octolobata Gould. Rep. Inv. Mass., p. 348. 1841.
Aurelia aurita Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Aurelia aurita Mörch ; in Nat. Bid. til en Besk. af Grönl., p. 95. 1857.
Aurelia sex-ovariis Mörch ; in Nat. Bid. til en Besk. af Grönl., p 95. 1857.
Aurelia flavidula Agass. Cont. Nat. Hist. U. S., III. Pls. 6, 7, 8, 9, 11, 11^a, 11^b; Pl. 10, Figs. 18, 22, 31, 32, 36 ; Pl. 10^a, Figs. 4^b, 13, 15^a, 16 – 41 ; Pl. 11^c, Figs. 1 – 13 ; IV. pp. 10, 160.
Aurelia flavidula Packard. A List of Animals . . . 1863.

Fig. 65.

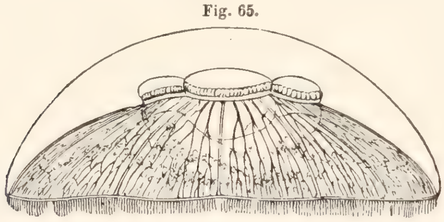
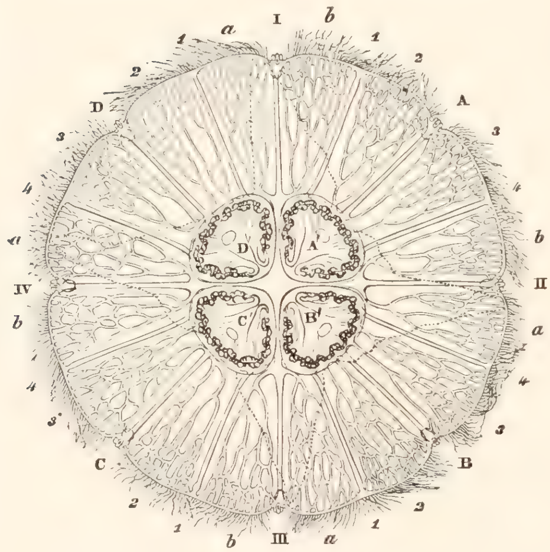


Fig. 66.



Occurs from March to the end of October; they collect together, and form large banks at the spawning season. Professor Agassiz has already spoken of the possibility of this species proving identical with the Northern European *Aurelia aurita*. But this, as well as the identity of *Cyanea arctica* with the European representative, can only be decided after renewed examination of these species.

Figs. 65, 66 are copied from Professor Agassiz's Contributions ; they give a profile, and a view from the abactinal pole, of our Aurelia.

Greenland (Fabricius) ; New England (Gould, Agassiz).

Cat. No. 337, Nahant, 1861, L. Agassiz.
Cat. No. 338, Nahant, 1861, A. Agassiz.
Cat. No. 339, Nahant, 1858, L. Agassiz.
Cat. No. 340, Boston, 1862, H. J. Clark.
Cat. No. 341, Trenton, Me., 1860, Verrill and Shaler.
Cat. No. 347, Boston, 1862, H. J. Clark.
Cat. No. 367, Gulf of St. Lawrence, 1861, Anticosti Expedition.
Museum diagrams Nos. 9, 10, 11, after L. Agassiz.

Fig. 65 is a profile view of Aurelia flavidula, much reduced.

Fig. 66 an abactinal view of Aurelia flavidula. I, II, III, IV, are the ambulacral zones ; A, B, C, D, the interambulacral zones ; 1, 2, 3, 4, *a*, *b*, the respective halves of these systems.

Aurelia labiata Cham. et Eysen.

Aurelia labiata Cham. et Eysenh. N. Acta, X. p. 358, Pl. 38, Fig. 1.
Medusa labiata Esch. Syst. d. Acal., p. 64. 1829.
Ocyroe labiata Bl. Man. d'Actinol., Pl. 42, Figs. 1, 2. 1834.
Aurelia labiata Less. Zooph. Acal., p. 377. 1843.
Aurelia labiata Agass. Cont. Nat. Hist. U. S., IV. p. 160. 1862.

Many of the Discophoræ of the southern part of the Northwest Coast must breed during the whole year, as I have found the adult with the ovaries fully developed during nearly every month of the year, in the harbor of San Francisco. This is at least the case with Phacellophora and Aurelia, which are the two most common genera of the harbor of San Francisco. Further north, however, in the Gulf of Georgia, the Discophoræ pass the winter in their hydra state.

North California (Cham. and Eysen.); California (Eschscholtz); San Francisco Bay (A. Agassiz).

Aurelia marginalis Agass.

Aurelia marginalis Agass. Cont. Nat. Hist. U. S., IV. pp. 86, 160. 1862.

Florida, Key West (L. Agassiz).
Cat. No. 352, Key West, Fla., L. Agassiz.

Family STHENONIÆ Agass.

Sthenoniæ Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 115, 161. 1862.

HECCÆDECOMMA Br.

Heccædecomma Brandt. Mém. Acad. St. Petersb., p. 300. 1838.
Heccædecomma Agass. Cont. Nat. Hist. U. S., IV. p. 161. 1862.

Heccædecomma ambiguum Br.

Heccædecomma ambiguum Br. Mém. Acad. St. Petersb., p. 300, Pls. 27, 28. 1838.
Heccædecomma ambiguum Agass. Cont. Nat. Hist. U. S., IV. p. 161. 1862.
Cyanea ambigua Less. Zooph. Acal., p. 388. 1843.

A species of this genus was observed in the Straits of Fuca, agreeing with the description and figures of Mertens so closely, that it is probable he observed this same species on the coast of Russian North America.

Port Townshend, W. T. (A. Agassiz).

PHACELLOPHORA Br.

Phacellophora Br. (*non* Huxl.). Prod. Mém. Acad. St. Pet., p. 223. 1835.
Phacellophora Less. Zooph. Acal., p. 343. 1843.
Phacellophora Agass. Cont. Nat. Hist. U. S., IV. p. 161. 1862.

Phacellophora camtschatica Br.

Phacellophora camtschatica Br. Mém. Acad. St. Petersb., p. 366, Pl. 8. 1838.
Phacellophora camtschatica Less. Zooph. Acal., p. 344. 1843.
Phacellophora camtschatica Agass. Cont. Nat. Hist. U. S., IV. p. 161. 1862.

The number of species of large Discophorous Medusæ found on the western coast of North America gives to the Acalephian Fauna of California a very characteristic stamp, when compared with that of the eastern coast.

Petropaulowsk (Mertens); San Francisco Bay (A. Agassiz).

Family CYANEIDÆ Agass.

Cyaneidæ Agass. Cont. Nat. Hist. U. S., Vol. IV. pp. 114, 161. 1862.

CYANEA Pér. et Les.

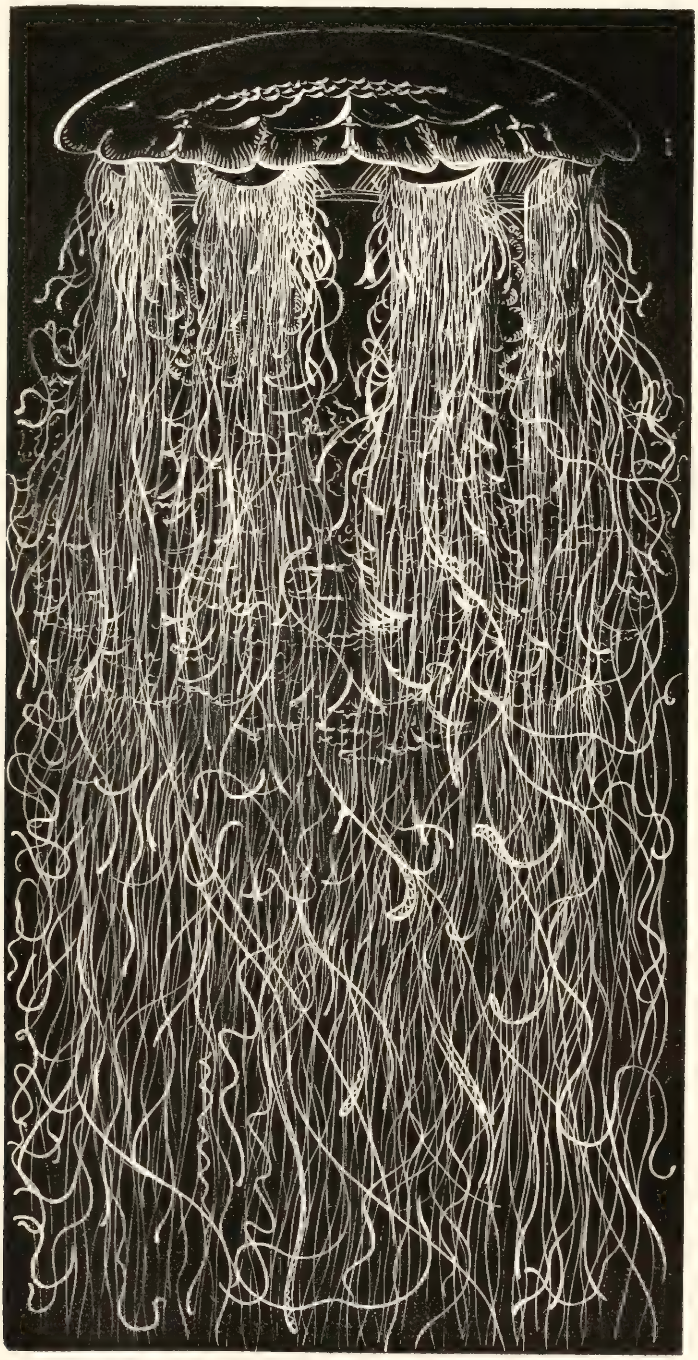
Cyanea Pér. et Les. Ann. du Mus., XIV. p. 51. 1809.
Cyanea Esch. Syst. der Acal., p. 67. 1829.
Cyanea Cuv. Règ. An. 1818.
Cyanea Less. Zooph. Acal., p. 379. 1843.
Cyanea Agass. Cont. Nat. Hist. U. S., Vol. IV. p. 161. 1862.

Cyanea arctica Pér. et Les.

Cyanea arctica Pér. et Les. Ann. Mus., XIV. p. 51. 1809.
Cyanea arctica Agass. Cont. Nat. Hist. U. S., IV. pp. 87, 162; Vol. III., Pls. 3, 4, 5, 5ᵃ; Pl. 10, Figs. 1–17, 19–21, 23–30, 33–35, 37–38; Pl. 10ᵃ, Figs. 1–4ᵃ, 5–12ᵃ, 14, 15, 17–40.
Medusa capillata Fab. (*non* Lin.) Faun. Groenl. No. 358. 1780.
Cyanea Postelsii Gould (*non* Br.). Rep. Inv. Mass., p. 347.
Cyanea Postelsii Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Cyanea arctica Mörch. In Naturh. Bid. til en Besk. af Grönl., p. 95. 1857.
Cyanea arctica Packard. Canad. Nat. Dec. 1863.

This species attains an enormous size. I measured myself a specimen at Nahant, the disk of which had attained a diameter of seven and a half feet, the tentacles extending to a length of more than one hundred and twenty feet. Our total ignorance of the young of these large Discophoræ is due to their peculiar habits. As has already been suggested, they probably remain a great part of the time groping about the bottom of the sea, apparently coming to the surface only in their adult condition. Having accidentally visited the wharves of Province-

Fig. 67.



town harbor early one morning, between four and five, I was astonished to perceive what a large number of young Cyaneæ were floating

Fig. 67. Cyanea arctica very much reduced. The tentacles are cut off for want of room.

about, measuring all the way from a quarter of an inch to three inches in diameter. On my return to the same place at seven o'clock, although not a breath of air had ruffled the surface, they had all returned to deeper water. The early habits of the young Cyanea may be only one of many similar instances of early rising among Acalephs. Fig. 67 is copied from the Contributions of Professor Agassiz.

Greenland (Fabricius); Northeastern Coast of America, from Bay of Fundy to Boston Harbor (Gould, Agassiz); Long Island Sound, Vineyard Sound (A. Agassiz).

Cat. No. 326, Chelsea Beach, Oct. 1851, L. Agassiz.

Cat. No. 327, Nahant, Aug. 1858, L. Agassiz.

Cat. No. 328, Nahant, Aug. 1858, L. Agassiz.

Cat. No. 369, Gulf of St. Lawrence, 1861, Anticosti Expedition.

Museum diagrams Nos. 12, 13, after L. Agassiz.

Cyanea fulva Agass.

Cyanea fulva Agass. Cont. Nat. Hist. U. S., IV. pp. 119, 162. 1862.

The youngest specimen of Cyanea which has been observed measured about one third of an inch in diameter. Its peculiar habit of always remaining at the bottom of the vessel in which it was kept, seemed to explain — until the observations, above mentioned, of the early habits of *Cyanea arctica* — the periodic appearance of adult Medusæ at certain times of the year, simply for the purpose of spawning, while for the remainder of their life they remain groping near the bottom. In general appearance the young Cyanea resembles the Cyaneidæ. It has but few marginal tentacles, the centre one being developed far above the others; the separate lobes of the actinostome are, however, distinct, and do not form the inextricable mass of curtains surrounding the actinostome of a Cyanea. The digitate appendages are developed in pairs on each side of a median line, indicating the position of the future genital organs. This gives us at once the relative position of the Cyaneidæ and Pelagidæ, the latter being only permanent forms resembling somewhat embryonic Cyaneidæ.

Long Island Sound (L. Agassiz); Vineyard Sound (A. Agassiz).

Cat. No. 331, Naushon, A. Agassiz, Sept. 1861. Young.

Cyanea versicolor Agass.

Cyanea versicolor Agass. Cont. Nat. Hist. U. S., IV. pp. 119, 162. 1862.

South Carolina (L. Agassiz).

Cat. No. 329, Charleston, S. C., 1852, L. Agassiz.

Cyanea Postelsii Br.

Cyanea Postelsii Br. Mém. Ac. St. Pet., p. 375, Pl. 12, 13, 13a. 1838.
Cyanea Postelsii Agass. Cont. Nat. Hist. U. S., IV. p. 162. 1862.
Cyaneopsis behringiana Br. Mém. Ac. St. Pet., Pl. 11, Fig. 1. 1838. Young?
?*Cyanea ferruginea* Esch. Syst. d. Acal., p. 70. 1829.
Cyanea Postelsii Less. Zooph. Acal., p. 387. 1843.

This species is extremely abundant during the Fall, in the Gulf of Georgia and the Straits of Fuca, and rivals in size its representative on the eastern shores of North America.

Kamtschatka, Aleutian Islands, and Western Coast of North America (Eschscholtz); North Pacific, Norfolk Sound, between Sitka and Unalaschka (Mertens); Port Townsend, W. T. (A. Agassiz).

Family PELAGIDÆ Geg.

Pelagidæ Gegenb. Zeitsch. f. Wiss. Zool., VIII. p. 210. 1856.
Pelagidæ Agass. Cont. Nat. Hist. U. S., IV. pp. 121, 163. 1862.

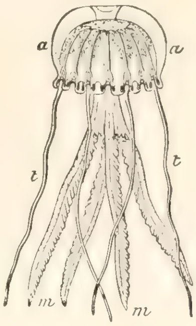
PELAGIA Pér. et Les.

Pelagia Pér. et Les. Ann. du Mus., XIV. p. 37. 1809.
Pelagia Esch. Syst. der Acal., p. 72. 1829.
Pelagia Less. Zooph. Acal., p. 388. 1843.
Pelagia Agass. Cont. Nat. Hist. U. S., IV. p. 163. 1862.
Dianœa Lam. Syst. An. s. Vert., II. p. 507.

Pelagia cyanella Pér. et Les.

Pelagia cyanella Pér. et Les. Ann. du Mus., XIV. p. 37. 1809.
Pelagia cyanella Esch. Syst. der Acal., p. 75. 1829.
Pelagia cyanella Bosc. Hist. Nat. des Vers., II. p. 140, Pl. 17, Fig. 3.
Pelagia cyanella Agass. Cont. Nat. Hist. U. S., IV. pp. 128, 164, III. Pls. 13, 13a, Pl. 12.
Medusa pelagia Swartz. Konig. Vetensk. Akad. 1788.
Medusa pelagia Löffling. Reise, p. 105.
Medusa pelagia Lin. Syst. Nat.
Pelagia americana Pér. et Les. Ann. du Mus., XIV. p. 39. 1809.
Pelagia noctiluca Cham.; in Choris' Voyage Pittoresque, p. 3.
Pelagia denticulata Pér. et Les. Ann. du Mus., XIV. p. 38.
Dianœa cyanella Lamk. An. s. Vertèb., II. p. 507.
Dianœa denticulata Lamk. An. s. Vertèb., II. p. 507.

Fig. 68.



This species (Fig. 68) is found along the Florida Reef. In this genus the eggs develop directly into the young Medusæ, and the embryos are never attached to the ground.

Caribbean Sea (Swartz, Löffling); Coast of Florida, Tortugas (L. Agassiz).

Fig. 68. Pelagia cyanella Pér. et Les. (copied from Agassiz's Contributions). *a*, umbrella; *m*, actinal appendages; *t*, marginal tentacles.

Pelagia Brandtii Agass.

Pelagia Brandtii Agass. Cont. Nat. Hist. U. S., IV. p. 164. 1862.
Pelagia denticulata Br. (*non* Pér. et Les.). Mém. Acad. St. Pet., p. 383, Pl. 14, Fig. 2. 1838.

Aleutian Islands (Mertens).

DACTYLOMETRA Agass.

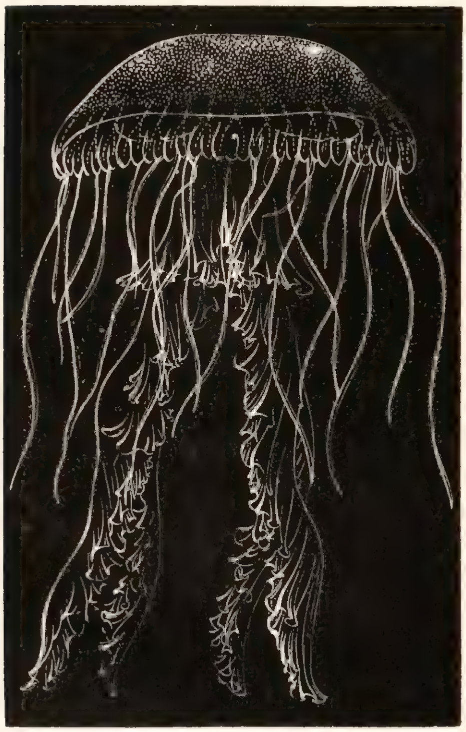
Dactylometra Agass. Cont. Nat. Hist. U. S., IV. pp. 125, 166. 1863.
Chrysaora Esch. (*p. p.*). Syst. d. Acal., p. 78. 1829.

Dactylometra quinquecirra Agass.

Dactylometra quinquecirra Agass. Cont. Nat. Hist. U. S., IV. pp. 125, 166. 1862.
Pelagia quinquecirra Des. Proc. Bost. Soc. N. H., p. 76. 1848.

Mr. Desor has described, in the Proceedings of the Boston Society of Natural History, a Pelagia under the name of *P. quinquecirra;* as his description is hardly sufficient to enable one to recognize it, I add the following particulars, on the supposition that the Pelagia which I found at Naushon is identical with the one described by Mr. Desor.

Fig 69.



Several specimens of this Pelagia were taken at Naushon, the disk measuring from four to eight inches in transverse diameter, and one and a quarter to two inches in height. The general color of the disk is yellowish blue, the surface being covered with reddish-brown spots (Fig. 69), crowded more thickly towards the abactinal pole. The spotted surface does not reach the margin of the disk; only dotted lines extend from the lobes until they are lost in the more numerous spots of the central part. The marginal tentacles have the same color as the spots of the disk. There are five between each of the eight eyes, arranged, one, the largest, in the middle of the broader central lobe, and one on each side

Fig. 69. Dactylometra quinquecirra Agass. one fourth the natural size.

of the smaller lobe, the shorter tentacles being placed nearest the eyes. There are eight marginal lobes in which the eyes are placed, eight large lobes in the middle of the space between the eyes, from which the large tentacles arise, and the space between this large lobe and the lobe of the eye is occupied by the small lobes on the sides of which the smaller marginal tentacles are placed, — making in all thirty-two marginal lobes. The fringes of the actinostome extend in four simple thick lobes, with frilled edges, about twice the length of the transverse diameter; they are flesh color. The ovaries are seen from above as four large yellow bunches. These Medusæ are nocturnal in their habits; they are only occasionally found floating at the surface during the day, while at night, in the same localities, the bottom swarms with these large masses of dull phosphorescence, moving about with the greatest rapidity. When kept in tanks, they remain torpid during the day at the bottom of the jars, and when night comes on begin to become more animated, and soon move briskly about, emitting a dull phosphorescent light. This Pelagia is always accompanied by a species of Clupeoid, found in the folds of the fringes of the actinostome, moving along with the jelly-fish, which, when they are pushed off accidentally, rush back to their place of shelter. From twenty to thirty specimens have been found swimming in the fringes of the actinostome. It is strange that the fish should go there for shelter, for every once in a while one of them pays the penalty by being swallowed, without this disturbing the others in the least; they in their turn find food in the lobes of the actinostome, and even eat the folds themselves, until their turn comes to be used as food. I have seen in this way three fishes eaten during the course of as many days. The specimens measured about an inch in length. Sars, Leuckart, and Peach have observed this same kind of parasitism of certain species of fishes upon other Discophoræ. Nor is this limited to Acalephs; some species of Holothurians, and even a Culcita, are said to give refuge to fishes.

It is somewhat strange that almost all the Medusæ which have been observed are found in the brighest sunshine only, or in very dark nights. Early in the morning, and till about ten o'clock, even on clear days, Medusæ do not make their appearance, while from eleven till one or two o'clock they can be caught in abundance. After that time they disappear gradually, and late in the afternoon, towards sunset, it is rare to see a single jelly-fish. Between nine and twelve o'clock at night, they come to the surface again; and that hour, in fact, is one of the most favorable for collecting, in spite of the darkness.

Nantucket Bay (Desor); Naushon (A. Agassiz); between Bermudas and Azores (J. Drayton).

Cat. No. 343, Naushon, Mass., Sept. 1861, A. Agassiz.

Cat. No. 388, Bermudas, A. S. Bickmore.

POLYBOSTRICHA Br.

Polybostricha Br. Mém. Acad. St. Petersb., p. 384. 1838.
Polybostricha Agass. Cont. Nat. Hist. U. S., IV. pp. 126, 166. 1862.

The species of Polybostricha and Melanaster which are here enumerated were observed during a calm off the bar of San Francisco; and although tolerably accurate notes were taken at the time, yet they are not sufficient to warrant the description of these species under new names. They are therefore mentioned here more for the sake of the geographical distribution of these genera; and as some of the marine animals of Kamtschatka are found on the coast of California, it is by no means improbable that the species I have referred to the figures of Brandt will prove, on closer examination, to be identical with them.

Polybostricha helvola Br.

Polybostricha helvola Br. Mém. Acad. St. Petersb., Pl. 15, p. 384. 1838.
Polybostricha helvola Agass. Cont. Nat. Hist. U. S., IV. p. 166. 1862.
Chrysaora helvola Less. Zooph. Acal., p. 402. 1843.
Polybostricha sp. A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 166.

Aleutian Islands, Sitka (Mertens); Punta de los Reyes, California (A. Agassiz).

MELANASTER Agass.

Melanaster Agass. Cont. Nat. Hist. U. S., IV. pp. 126, 166. 1862.
Chrysaora Br. (*p. p.*). Mém. Acad. St. Petersb., p. 385. 1838.

Melanaster Mertensii Agass.

Melanaster Mertensii Agass. Cont. Nat. Hist. U. S., IV. p. 166. 1862.
Chrysaora melanaster Br. Mém. Acad. St. Petersb., Pls. 16, 17, p. 385. 1838.
Chrysaora melanaster Less. Zooph. Acal., p. 403. 1843.
Melanaster sp. A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 166. 1862.

Kamtschatka and Avatska Bay (Mertens); off San Francisco Bar (A. Agassiz).

Suborder HAPLOSTOMEÆ Agass.

Haplostomeæ Agass. (excl. *Lucernariæ* A. Ag.). Cont. Nat. Hist. U. S., IV. p. 167. 1862.

Family THALASSANTHEÆ Less.

Thalassantheæ Less. Zooph. Acal., p. 298. 1843.
Thalassantheæ Agass. Cont. Nat. Hist. U. S., IV. p. 167. 1862.
Æginidæ Gegenb. Zeits.. f. W. Zool., VIII. p. 258. 1856.
Æginidæ McCr. Gymn. Charl. Harb., p. 107.

FOVEOLIA Pér. et Les.

Foveolia Pér. et Les. Ann. du Mus., XIV. p. 27. 1809.
Foveolia Agass. Cont. Nat. Hist. U. S., IV. p. 168. 1862.
Cunina Esch. Syst. d. Acal., p. 116. 1829.
Cunina Bl. Man. d'Actinol., p. 279. 1834.
Cunina Less. Zooph. Acal., p. 301. 1843.
Cunina Lamk. Syst. Anim. s. Vert., III. p. 142.
Cunina Gegenb. Zeit. f. Wiss. Zool., p. 259. 1856.
Cunina McCr. Proc. Elliot Soc., p. 108. 1857.

Foveolia octonaria A. Agass.

Cunina octonaria McCr. Proc. Elliot Soc., Pl. XII. Figs. 4, 5, p. 109.
Cunina octonaria Agass. Cont. Nat. Hist. U. S., IV. p. 168. 1862.
Cunina octonaria McCr. Pls. 4, 5, 6, 7, for Embryolog. Hist.; Elliot Soc., pp. 1-36. 1856.

Charleston, S. C. (McCrady).
Museum diagram No. 15, after McCrady.

CAMPANELLA Bl.

Campanella Bl. (*non* Less.). Man. d'Actin., p. 286. 1834.
Campanella Agass. Cont. Nat. Hist. U. S., IV. p. 169. 1862.
Æginopsis J. Müll. (*non* Br.). Archiv f. Anat., p. 272. 1851.

Fritz Müller was the first to show (Wieg. Archiv., 1861) that the position of the Æginidæ and Charybdeidæ among the Hydroids was not a natural one. He proposed for the reception of these groups a new division equivalent to the Discophoræ and Hydroids. But as he considers the Ctenophoræ and Hydromedusæ as the two great divisions of the Acalephs, his group of Ægineæ would hold very nearly the same rank as that which we are induced to assign to it here, — that of a suborder among Discophoræ. From the examination of the only species of Campanella thus far found on our coast, and a comparison with the two species of Trachynema here enumerated, I am inclined to add, near this suborder, two other families, the position of which in the different systems of classification has always been a great puzzle. I mean the Trachynemidæ and the Geryonidæ (Persa, Aglauridæ).* The peculiar solid character of the bell of these families, incapable of contraction to any extent, is in striking contrast with the transparent filmy disk of the true Hydroids, reminding us of the solid mass of the larger Discophoræ. The character of the development, also, which takes place directly from the egg, differs from that of the true Hydroids, and we should thus remove from them those Jelly-fishes which do not pass through an alternate generation. The peculiar character of the marginal appendages of the Trachynemidæ, so different from anything found among the true Hydroids, and which resemble so closely those of the Charybdeidæ, is another character in favor of this division, as well as the nature of the veil, which is a thick, solid, folded membrane, approaching somewhat in character the actinal pouches formed by the veil of Campanella.

Campanella pachyderma A. Agass.

This small Medusa is particularly interesting on account of the light it throws on the systematic position of the Æginidæ. Having the general appearance of the Æginidæ, it has, however, distinctly marked radiating and circular tubes; the genital organs are developed, as in that family, in horseshoe-shaped pouches arranged round the base of the proboscis, which projects through a small space left by the pendent folds of the veil beyond the level of its actinal surface. The circular tube is thus apparently placed at nearly one third of the height of the bell, owing to the great expansion of the eight lobes of the lower floor. The veil is attached at the inner extremity near the genital pouches, and between every two of the chymiferous tubes it is drawn up, forming a distinctly marked indentation. The position of the genital pouches is very similar to what we find among other Discophoræ, as the Lucernariæ and Cuninidæ, for instance, where they form an elongated lobed rosette round the centre. The genital pouches extend in a continuous line round the base of the proboscis. The shape of the bell is a somewhat depressed hemisphere, flaring slightly at the base; the tentacles are carried somewhat stiffly (Fig. 70), and are capable of but limited contraction and expansion; the proboscis equals in length the height of the bell; it is conical, and terminates in a smooth opening. The veil is not very opaque, and when the medusa is seen from the actinal side (Figs. 71, 72), the chymiferous tubes, as well as the circular tube,

* From the figure given by Gegenbaur of the pedunculated marginal bodies in Aglaura, the affinity to Trachynema (Circe) is unquestionable.

can readily be seen through its thickness. The bell itself is of a dirty yellowish color, with dark sorrel-colored spots scattered thickly over its

Fig. 70.

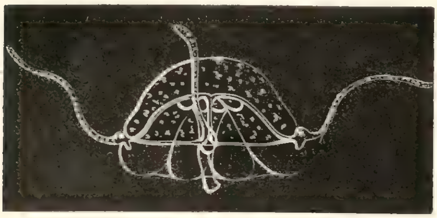
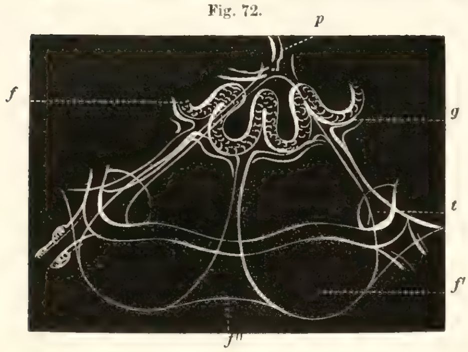


Fig. 71.

Fig. 72.



surface; these pigment spots are similar to the little bunches of lasso cells found on the surface of Aurelia. The pouches are capable of

Fig. 73.

Fig. 74.

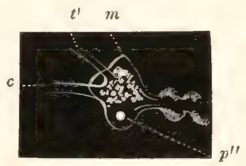
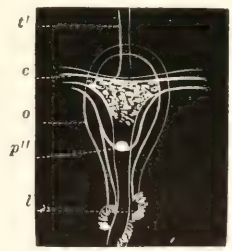


Fig. 75.



expansion and contraction, as it will often be seen that the proboscis has considerable play when the pouches are thrown out beyond the

Fig. 70. Profile view of Campanella.

Fig. 71. Actinal view of Fig. 70; the tentacles are cut off.

Fig. 72 is a somewhat more magnified view of Fig. 71, in which the pouches are thrown out beyond the circular tube. *p* is the outer wall of the proboscis; *g*, the genital pouches; *f*, the place of attachment of the veil, as seen from the actinal side; *f'*, one of the pouches formed by the veil; *f''*, the part of the veil intermediate between two pouches; *t*, the base of a tentacle.

Fig. 73 is a view of a part of the actinal surface in the condition of Fig. 71, when the pouches are drawn closely round the proboscis; lettering as in Fig. 72. *p'*, interior of proboscis.

Fig. 74 is a magnified profile view of a portion of the base of a tentacle. *c*, the circular tube; *t'*, the chymiferous tube; *p''*, the pigment spot on lower surface of bulb; *m*, the upper part of sensitive bulb, in which pigment cells are loosely scattered.

Fig. 75. View of basal portion of tentacle, seen from above; lettering as in Fig. 74. *l*, clusters of lasso cells; *o*, outer wall of bulb.

margin of the circular tube (Fig. 72), while at other times it is closely hemmed in on all sides. (Fig. 73.) The base of the tentacles swells out above and below the chymiferous tube, forming a large bulb, in the upper portion of which pigment-cells of a brownish-red color (Fig. 73, *m*) are loosely scattered, while in the lower portion (Figs. 74, 75, *p''*) a dark concentrated pigment-spot is found. The tentacles are hollow, and are surrounded for their whole length by clusters of lasso cells (Fig. 75, *l*) similar to those of young Tubularian Medusæ, such as Coryne and Syndiction.

The size of this Medusa is about one twentieth of an inch in diameter.

Found at Nahant, September, Alex. Agassiz.

Museum diagram No. 16, after Alex. Agassiz.

ÆGINOPSIS Br.

Æginopsis Br. (*non* J. Müller). Prod. Mém. Acad. St. Petersburg, p. 222. 1835.
Æginopsis Agass. Cont. Nat. Hist. U. S., IV. p. 170. 1862.
Æginopsis Less. Zooph. Acal., p. 304. 1843.

Æginopsis Laurentii Br.

Æginopsis Laurentii Br. Mém. Ac. St. Petersb., Pl. 6, p. 363. 1838.
Æginopsis Laurentii Less. Zooph. Acal., p. 304. 1843.
Æginopsis Laurentii Agass. Cont. Nat. Hist. U. S., IV. p. 170. 1862.

Laurent Bay, Behring's Straits (Mertens).

Suborder TRACHYNEMIDÆ A. Agass.

Forbes, in his Natural History of the British Naked-eyed Medusæ, characterized as a family the Circeidæ; at that time only a few other species of this group were known, but so imperfectly described that even at the present day the natural affinities of these Medusæ are far from being well ascertained. Gegenbaur, who has studied Medusæ which I suppose to be only the young of closely allied forms, has also separated his young Medusæ as a distinct family, under the name of Trachynemidæ. The *Dianæa conica* of Lesson may even prove to be the adult of his *Trachynema ciliatum*, as it is evident from the drawing of Lesson* that he has figured there a Medusa closely allied to *Circe* Forbes, and perhaps identical with it. A comparison of *Trachynema ciliatum* (Geg. Pl. IX. Fig. 6) with the young specimens of Circe here figured, will show the close affinity of these two Medusæ. The family name of Trachynemidæ ought therefore yield to that proposed

* Ann. Scien. Nat., Vol. X. Pl. 6, Fig. 3.

by Forbes; unfortunately, the name Circe had already been applied to a genus of Mollusks, before Brandt proposed it in 1838, and we have therefore retained the name of Gegenbaur. Gegenbaur placed these Medusæ in the vicinity of the Eucopidæ; but a close examination of their characters, to which I have already referred when speaking of Campanella, leads us to remove them — as well as the Aglauridæ, Geryonidæ, and Leuckartidæ — to the Discophoræ Haplostomeæ, as a separate suborder closely allied to the Æginidæ. Dr. Fritz Müller, to whom I had suggested the probability of Circe being the adult of Trachynema, says, in one of his letters, that he has found Trachynema near Desterro; "in consequence of this, it is highly probable that they are the young of Tamoia, never having met with Circe on our coast." If this should prove to be the case, we have a very strong argument in favor of joining the Trachynemidæ (Circeans) with the Discophoræ.

Family TRACHYNEMIDÆ Gegenb.

Trachynemidæ GEGENB. Zeit. f. Wiss. Zool., VIII. p. 249. 1856.
Circeidæ FORBES. Brit. Naked-eyed Medusæ, p. 34. 1848.
Circeidæ AGASS. Cont. Nat. Hist. U. S., IV. p. 348. 1862.
Trachynemidæ AGASS. Cont. Nat. Hist. U. S., IV. p. 365. 1862.

TRACHYNEMA Gegenb.

Trachynema GEGENB. Generationswechsel, p. 50. 1854.
Circe MERTENS. Br. Mém. Acad. St. Petersb., p. 219. 1835. (Preoccupied in Moll.)
Circe FORBES. Brit. Nak. Medusæ, p. 34. 1848.
Circe LESS. Zooph. Acal., p. 285. 1843.
Circe AGASS. Cont. Nat. Hist. U. S., IV. p. 348. 1862.

Trachynema camtschaticum A. Agass.

Circe camtschatica BR. Mém. Acad. St. Pet., p. 354, Pl. I. Figs. 1–5. 1838.
Circe camtschatica AGASS. Cont. Nat. Hist. U. S., IV. p. 348. 1862.
Circe camtschatica LESS. Zooph. Acal., p. 285. 1843.
Circe impatiens AGASS. Cont. Nat. Hist. U. S., IV. p. 349. 1862.

A few specimens of this beautiful little jelly-fish (Fig. 76) were caught on the shores of Galiano Island, in the Gulf of Georgia, W. T. The greatest diameter is situated on a level with the point of suspension of the ovaries. The ovaries are flat, triangular-shaped (Fig. 77), the chymiferous tubes very slender. The solid prolongation of the abactinal portion of the spherosome, which extends, in the Eastern species, to a short distance of the actinostome, is much shorter (Fig. 78); the chymiferous cavity is especially long, and extends to the actinal pole in the ordinary state of expansion (Figs. 76, 79); it is only slightly contractile, and terminates in four stout lappets. (Fig. 80.) The outline of the abactinal portion of the spherosome is conical, with two very slight curves, one immediately above the point where the

Fig. 76.

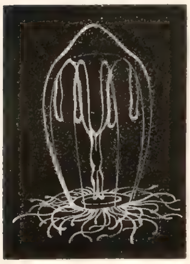


Fig. 77.

Fig. 79.

Fig. 78.

chymiferous tubes turn towards the actinal pole, along the solid prolongation of the spheromere, and the other nearer the abactinal pole. The outline of the spherosome bends very suddenly towards the abactinal pole immediately above the point of attachment of the ovaries, somewhat as we have it in younger specimens of Trachynema. The number of spheromeres is eight, and that of the oral appendages four. The ambulacral tentacles (40 to 48) are rather contractile, and when contracted appear as if they had been knotted. The general color is very pale pink; the ovaries, ambulacral tentacles, and the proboscis being of a light-brown color. Although generally this medusa moves very slowly, when disturbed its movements are very rapid; and instead of continuing in the same direction, the animal draws all its tentacles inside of the actinal veil, and then suddenly throws them out again, this contraction turning the medusa almost upside down, and starts off in nearly the opposite direction from that which it had previously pursued. This species was only seen during a short time in July.

Fig. 80.

The drawing of Brandt seems to have misled Forbes; he speaks of the want of ocelli of the British species as distinguishing it from the *C. camtschatica;* what Forbes has taken for ocelli are only sections of the chymiferous tubes leading into the peripheric tube.

Kamtschatka (Mertens); Galiano Island, Gulf of Georgia, W. T. (Alex. Agassiz).

Cat. No. 282, Gulf of Georgia, W. T., 1859, A. Agassiz.

Fig. 76. Profile view of Trachynema camtschaticum, slightly magnified.

Fig. 77. One of the genital organs. *g*, point of attachment to chymiferous tube.

Fig. 78. Section of Trachynema to show the size of the gelatinous prolongation, *p*, and the mode of attachment of the genital organs, *g*.

Fig. 79. Chymiferous cavity of Trachynema at the end of the gelatinous proboscis.

Fig. 80. View of Trachynema from above, to show the shape of the lips of the actinostome. *c*, chymiferous cavity at base of proboscis into which the tubes lead; *p*, gelatinous part of proboscis; *l*, lips of actinostome; *o*, opening formed by contraction of part of the chymiferous cavity.

Trachynema digitale A. Agass.

Medusa digitalis Fab. Faun. Groenl. No. 361. 1780.
Turris (*Circe*) *digitalis* Mörch (*non* Forbes). Besk. af Grönl., p. 95. 1857.
Eirene digitale Esch. Syst. der Acal., p. 95. 1829.

There is considerable doubt as to the specific difference of this species of Trachynema from the English Circe of Forbes, and from the *Circe camtschatica* of Brandt, the series of young observed at Nahant being the only one which gives us any measure of the changes one species undergoes during its growth. It is evident from the figure of Forbes that the genital organs are but slightly developed; in the north-

Fig. 81.

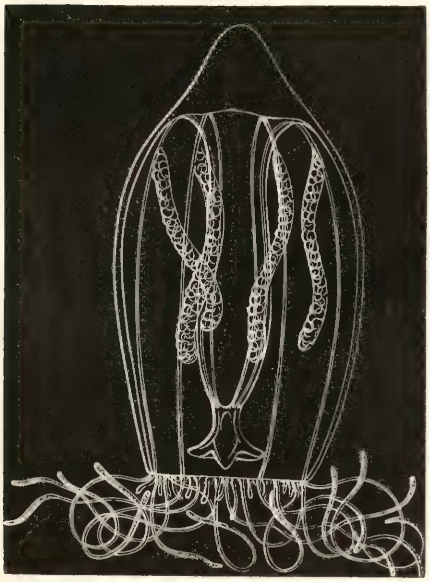


Fig. 82.

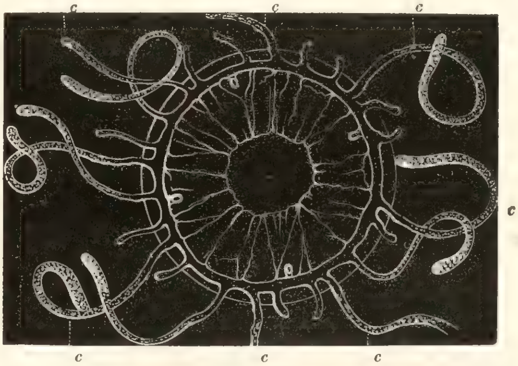
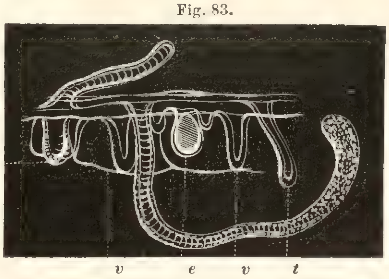


Fig. 83.



western species the only specimens observed were all males, while the only adults of this species obtained on our coast were females. This question must be left undecided until we have a complete history of the English species.

The adult medusa (Fig. 81) is characterized by the thinness of the bell, the great size of the gelatinous proboscis, which extends nearly to

Fig. 81. Adult female Trachynema, seen in profile; magnified.

Fig. 82. Actinal view of the veil and circular tube of a very young Trachynema. *c*, *c*, *c*, *c*, tentacles opposite the chymiferous tubes; greatly magnified.

Fig. 83. Profile view of a part of the circular tube to show the folds of the veil. *e*, one of the pedunculated marginal capsules; *t*, young tentacle; *v*, folds of the veil; somewhat more magnified than Fig. 82.

the level of the circular tube, and the small size of the digestive cavity. The eight chymiferous tubes are broad, and their course can readily be traced along the proboscis. The summit of the bell is quite conical; the chymiferous tubes lead into a broad circular tube, opening into the tentacles, which are hollow; the tentacles appear to be easily lost, as it is rare to obtain adult specimens in which we find anything more than mere stumps in the place of tentacles. I have been unable on this account to ascertain the normal number of tentacles in the adult; they never seem to become very numerous. (See Fig. 81.) A tentacle is placed opposite the base of each chymiferous tube, *c*, *c*, *c*, . . Fig. 82, being a view from the actinal side of the youngest Circe observed; between the chymiferous tubes there are in these young Medusæ two other tentacles. We find also four marginal capsules in the young as well as the adult; their number does not increase with age. The capsules are large, ellipsoidal, garnet-colored bodies, enclosed in a fold, standing out from the circular tube as if attached by a short peduncle. (*e*, Fig. 83.) The veil is thick, snugly folded at the inner margin (Fig. 82), the larger folds extending to the circular tube. Owing to the slight contractility of the bell of these Medusæ, they use the veil as

Fig. 84.

Fig. 85.

their principal means of propulsion, bending it into the cavity of the bell, and then throwing it out with great force (see Fig. 86); we have nothing of the graceful motions of the gelatinous disk, so characteristic of the Hydroid Medusæ. In an adult, when seen in profile, the folds of the veil are so thick that they are easily mistaken for rudimentary tentacles (*v*, *v*, Fig. 83); it is only when we see the veil turned in, or expanded fully outside of the bell, that their true nature is understood. In adult females, the cavity of the bell is almost filled by the eight sausage-like ovaries which hang down from near the upper part of the chymiferous tubes, almost to the extremity of the gelatinous proboscis. (Fig. 81.) They are of a milky color, the bell is of a slightly pinkish tint; far from being transparent, it has a horny look, and be-

Fig. 84. Profile view of a young Trachynema, about one eighth of an inch in height.
Fig. 85. Trachynema somewhat more advanced than Fig. 84.

comes wrinkled between the chymiferous tubes; the tentacles, when contracted, become crimson at the extremity.

The young Medusæ are very different in shape from the adults. Small specimens, measuring not quite an eighth of an inch in height (Fig. 84), are quite globular; they have but few tentacles (Fig. 82), the ovaries are not developed, the gelatinous proboscis is a mere knob at the bottom of the bell, from which hangs down quite a long digestive cavity. The abactinal part of the bell projects but slightly beyond the general outline. It is in this stage that it resembles so closely the *Trachynema ciliatum* of Gegenbaur. When disturbed, they carry the lips of the actinostome turned up, in a very characteristic manner, as Gegenbaur has figured them. In somewhat older specimens (Fig. 85) the bell has become more elongated, the tentacles more numerous, the ovaries make their appearance as small pouches, as in Eucope, and the gelatinous proboscis has extended somewhat into the cavity of the bell. In still older forms (Fig. 86) these parts have all taken a more prominent development, and we readily recognize, in the somewhat elongated bell, with the large proboscis and slightly pendent ovaries, the future adult Trachynema (Fig. 81), in which the development of the gelatinous proboscis, of the ovaries, of the tentacles, the lengthening of the bell, and its increase in thickness at the abactinal extremity, have been carried still further. The adult medusæ attain a height of an inch or an inch and a half.

Fig. 86.

I have identified this Medusa with the *Medusa digitalis* of Fabricius. Forbes had, in his Naked-eyed Medusæ, supposed a species of Turris to be identical with it; after a careful perusal of the description of Fabricius, I am satisfied that it does not belong to the genus Turris, but to Circe of Brandt, or Trachynema of Gegenbaur. Mörch, in his List of Medusæ of Greenland, retains the generic name of Forbes, and makes it synonymous with Circe; this is certainly a very different interpretation of the genus Turris of Lesson from what it has received thus far by any writer on Acalephs.

Baffin's Bay (Fabricius); Massachusetts Bay, Nahant (Alex. Agassiz).

Cat. No. 376, Nahant, Mass., A. Agassiz. Medusæ.

Cat. No. 377, Nahant, Mass., A. Agassiz. Medusæ.

Cat. No. 449, Nahant, Mass., A. Agassiz. Medusæ.

Museum diagram Nos. 16, after Alex. Agassiz.

Fig. 86. Young Trachynema, measuring over one third of an inch in height; the veil is thrown out beyond the level of the circular tube.

PERSA McCr.

Persa McCr. Gymn. Charl. Harb. 1857.
Persa Agass. Cont. Nat. Hist. U. S., IV. p. 349. 1862.

Persa incolorata McCr.

Persa incolorata McCr. Gymn. Charl. Harb., p. 104, Pl. 12, Fig. 3. 1857.
Persa incolorata Agass. Cont. Nat. Hist. U. S., IV. p. 349. 1862.

Charleston Harbor (McCrady).

Family LEUCKARTIDÆ Agass.

Leuckartidæ Agass. Cont. Nat. Hist. U. S., IV. p. 364. 1862.
Geryonidæ Esch. (*p. p.*). Syst. d. Acal., p. 86. 1829.

LIRIOPE Gegenb.

Liriope Gegenb. (*non* Less.). Zeit. f. W. Zool., p. 256. 1856.
Geryonia Less. Zooph. Acal., p. 329. 1843.
Geryonia Esch. (*p. p.*). Syst. d. Acal., 1829. (*Non* Pér. et Les.)
Dianœa Q. and G. Voyage de l'Uranie, p. 566.
Eurybia Esch. Syst. d. Acal., p. 118. 1829. Young ?
Eurybiopsis Gegenb. Zeit. f. Wiss. Zool., p. 247. 1856.
Liriope Agass. Cont. Nat. Hist. U. S., IV. p. 365. 1862.

Liriope tenuirostris Agass.

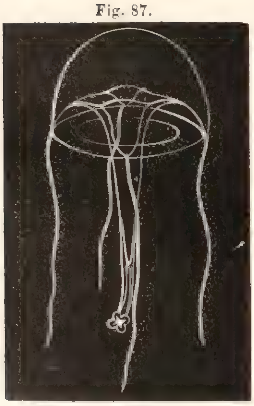
Liriope tenuirostris Agass. Cont. Nat. Hist. U. S., Vol. IV. p. 365. 1862.

Florida, Key West (L. Agassiz).

Liriope scutigera McCr.

Liriope scutigera McCr. Gymn. Charl. Harb., p. 106.
Liriope scutigera Agass. Cont. Nat. Hist. U. S., IV. p. 365. 1862.

Fig. 87.



In company with *Liriope tenuirostris* is found another species of Liriope (Fig. 87), which may prove identical with the *Liriope scutigera* of McCrady, although it differs in the shape of the ovaries, which are more heart-shaped than he describes. The description of McCrady agrees better with the figure of *Liriope catherinensis* of Fritz Müller, with which it may prove identical.

Charleston, S. C. (McCrady).

Fig. 87. Liriope scutigera McCr. ?

Suborder LUCERNARIÆ Johnst.

Lucernariadæ Johnst. (*non* Huxl.). Brit. Zooph., p. 244, Second Edition.
Calycozoa Leuck. Morphol. u. Verwandtschaft der Wirbell. Thiere, p. 20. 1848.
Podactinaria Edw. and Haime. Brit. Foss. Corals. 1850.
Lucernariadæ Agass. Cont. Nat. Hist. U. S., IV. p. 175. 1862.
Lucernariæ H. J. Clark. Proc. Bost. Soc. Nat. Hist., p. 47. 1862.
Lucernariæ H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 531. 1863.

Clark has made of the Lucernariæ an order equivalent to the Hydroids and the Discophoræ; but it should be remembered at the same time that his Acalephæ correspond to the Hydroid and Discophorous Medusæ of other authors, and do not include the Ctenophoræ. We would reduce this group to the level of a suborder; for, as Professor Agassiz has very justly said, the Lucernariæ are only pedunculated Discophoræ, and have no claim to be considered as a group of a higher value than a suborder. They seem to bear the same relation to the free Discophoræ which the Pentacrinidæ do to the Comatulidæ. Their mode of development may show that their separation as a distinct suborder is giving even too much weight to their embryonic character; and we may find, with future investigations, a somewhat similar relation between them and the Strobila, from which free Discophoræ are produced, as that which we have between the free and sessile species of Tubularians.

Family CLEISTOCARPIDÆ H. J. Clark.

Cleistocarpidæ H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 535. 1863.

HALIMOCYATHUS H. J. Clark.

Halimocyathus H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 536. 1863.

Halimocyathus platypus H. J. Clark.

Halimocyathus platypus H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 537.

Chelsea Beach, Mass. (H. J. Clark).

MANANIA H. J. Clark.

Manania H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 541. 1863.

Manania auricula H. J. Clark.

Manania auricula H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 542. 1862.
Lucernaria auricula Fab. (*non* Müll.). Fauna Groenl., 1780, No. 332.
Lucernaria typica Greene. Nat. Hist. Rev., p. 132. 1858.
Lucernaria Fabricii Agass. Cont. Nat. Hist. U. S., IV. p. 176. 1862.

I give here only the principal synonymes. For the remaining synonymes of this and other species of Lucernariæ, I would refer to the papers of Professor Clark.

Swampscott (Agassiz); Greenland (Fabricius); Eastport, Maine (W. Stimpson).

Family ELEUTHEROCARPIDÆ H. J. Clark.

Eleutherocarpidæ H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 536. 1863.

LUCERNARIA Müll.

Lucernaria Müll. Prod. Zool. Dan. 1776.
Lucernaria Agass. (*p. p.*). Cont. Nat. Hist. U. S., IV. p. 175. 1862.
Lucernaria H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 551. 1863.

Lucernaria quadricornis Müll.

Lucernaria quadricornis Müll. Zool. Dan., I. p. 51, Pl. 39, Figs. 1–6.
Lucernaria quadricornis Sars. Fauna Littor., p. 20, Pl. 3, Figs. 1–7.
Lucernaria quadricornis Johnst. Br. Zooph., p. 252, Pl. 15, Figs. 3–7.
Lucernaria fascicularis Flem. Wern. Soc., II. p. 248.
Lucernaria quadricornis Agass. Cont. Nat. Hist. U. S., IV. p. 175. 1862.
Lucernaria quadricornis Stimps. Mar. Inv. Grand Manan, p. 8. 1853.
Lucernaria quadricornis H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 551. 1863.
Lucernaria quadricornis Edw. & Haime. Hist. des Cor., III. p. 459.

Grand Manan (W. Stimpson); Massachusetts Bay, Chelsea Beach, and Swampscott (Dr. A. A. Gould and L. Agassiz); Greenland (Fabricius).

Cat. No. 324, Owl's Head, Maine, W. Stimpson.

Museum diagram No. 14, after L. Agassiz.

HALICLYSTUS H. J. Clark.

Haliclystus H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 559. 1863.

Haliclystus auricula H. J. Clark.

Haliclystus auricula H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 559. 1863.
Lucernaria auricula Müll. Zool. Dan., Pl. 152.
Lucernaria auricula Mont. Lin. Trans., IX. Pl. 7, Fig. 5.
Lucernaria auricula Johnst. Br. Zooph., p. 246, Second Edition.
Lucernaria auricula Sars. Bidr. Söe. dyr., Pl. 4, Fig. 1 – 13.
Lucernaria octoradiata Lamk. An. s. Vert., II. p. 414. 1816.
Lucernaria auricula Edw. & Haime. Hist. d. Coralli, III. p. 458.
Lucernaria auricula Agass. Cont. Nat. Hist. U. S., IV. p. 176. 1862.
Haliclystus auricula Pack. List of Animals. 1863.

Without attempting a critical revision of the Lucernariæ, which has become necessary in consequence of the somewhat contradictory statements of Sars, Edwards, Allman, Gosse, Keferstein, and Clark, and for which the materials in the Museum do not afford sufficient data, I have adopted the generic names of Clark, as it is plain, from what was already suggested by M. Edwards, that the Lucernaridæ do not belong to a single genus, but that several genera can very justly be distinguished upon the single genus of Lucernaria of previous authors.

Fig. 88.

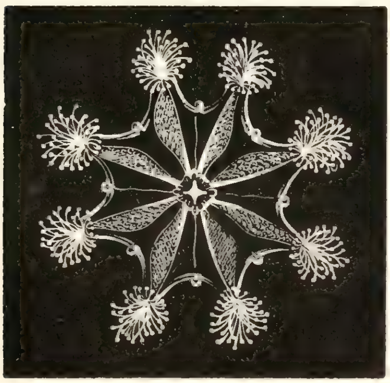


Fig 89.

The figures here introduced are of our common Lucernaria (Figs. 88, 89), and will give a tolerable idea of the varied attitudes they assume. This species is quite common, found attached to eel-grass. For a further knowledge of this group of Acalephs, I would refer to the original papers quoted above.

Fig. 90.

The young of our Lucernaria (Fig. 90) shows how much still remains to be done respecting the changes which it undergoes. In a small Lucernaria, of one

Fig. 88. Haliclystus auricula, seen from the actinal pole.

Fig. 89. Different attitudes of Lucernaria, of Fig. 88, attached to sea-weed, contracted, expanded, or with the disk thrown back, and the actinostome projecting like a proboscis. These figures are of natural size.

Fig. 90. Young Lucernaria, magnified, about one tenth of an inch in height. *a*, anchors still retaining the shape of the tentacles, *t*.

tenth of an inch in height, the arrangement of the tentacles is totally different from that of the adult. They are as yet not arranged in clusters, but placed at regular intervals in one line on the edge of the disk. No difference can at present be detected between the anchors (*a*, Fig. 90) and the tentacles (*t*, Fig. 90) of the disk, showing plainly that the anchors, as Professor Clark has proved, are only modified tentacles; the peduncle is also quite short, and stout in proportion to the disk. The young Lucernaria is in this state a close representative of the genus Carduella of Allman, which may possibly prove to be only the young of some European species.

Greenland (Steenstrup); Anticosti (Verrill, Shaler, and Hyatt); Massachusetts Bay (H. J. Clark).

Cat. No. 320, Nahant, Mass., A. Agassiz, May, 1862.
Cat. No. 321, Chelsea Beach, L. Agassiz.
Cat. No. 322, Mount Desert Islands, Maine, W. Stimpson.
Cat. No. 323, Anticosti Island, Anticosti Expedition, August, 1861.
Cat. No. 380, Anticosti Island, Anticosti Expedition, August, 1861.

Haliclystus salpinx H. J. Clark.

Haliclystus salpinx H. J. Clark. Journ. Bost. Soc. Nat. Hist., p. 563. 1863.

Mount Desert Islands, Maine (Stimpson).

Order HYDROIDÆ Johnst. (*mod.* Agass.).

Anthozoa Hydroida Johnst. Brit. Zooph., Second Edition, p. 5.
Gymnophthalma Forbes. Brit. Naked-eyed Medusæ. 1848.
Coralliaria Tabulata, *Rugosa*, and *Hydraria* Milne Edw. & Haime.
Hydromedusæ et *Siphonophoræ* Vogt. Siph. de Nice.
Hydroidea, *Medusida Craspedota*, and *Siphonophora* Gegenb. Zeit. f. W. Zool. 1856.
Hydroidæ McCr. (*p. p.*). Proc. Elliot Soc. 1857.
Hydrozoa Huxl. Ray Soc. 1859.
Hydroidæ Agass. Cont. Nat. Hist. U. S., III. 1860. IV. p. 337.

From want of materials, no writer on Acalephs has thus far attempted to make use of the embryological characters noticed in the development of young Hydroid Medusæ and of the young Hydraria. From the observations of Wright on the development of *Thaumantias inconspicua*, of Æquorea, and from what I have had occasion to observe myself on the Hydroid of Melicertum and of Tima, we have acquired sufficient information to satisfy ourselves that Tubularian-like Hydroids stand lower than the Campanularians; while such forms as the Hydroids of

Melicertum, of Trichyra, and Lafœa, stand intermediate between them. Resembling the youngest stages of the Campanularian Hydrarium we have such forms as Clava and Rhyzogeton; while the more branching forms, Eudendrium and Bougainvillia, remind us already of somewhat older stages. Lower still we must place Hydractinia, where the polymorphism of the individuals is an evident sign of inferiority, reminding us of the free communities formerly separated from the Hydroids as Siphonophores. From the close resemblance of the animal of the Tabulata to such forms as Halocharis and the fresh-water Hydra, we must consider them as an order, or perhaps only a suborder standing in close relation to the Tubularians. Unsatisfactory as this may seem, these few facts throw much light on our knowledge of the relations of the Hydroids. Somewhat more satisfactory and more general results can be obtained by comparing the young Medusæ in their various stages of growth. As I have already shown, in a short paper on the order of appearance of the tentacles of Hydroid Medusæ, the young, when liberated, undergo great changes before arriving at their mature condition; and it requires a thorough knowledge of all these changes to be able to recognize one and the same species in its various stages of growth, and not to divide, as has been done so far, different species by the number of tentacles, of marginal bodies, or the size of the ovaries. The main characteristic of the greater number of Tubularians, when first liberated, is the totally different shape of the bell from that of the adult. The bell is very deep, the number of tentacles is small (Turritopsis, Bougainvillia, and Nemopsis); in the adult the shape of the bell has become quite globular, the tentacles have increased in number, the ovaries, which are generally absent or but slightly developed in the young Medusæ, have taken a development corresponding to their age. Applying this to the standing of the different Tubularians, we should place genera such as Clava and Eudendrium, in which the Medusæ are always sessile, lowest in their families; next, the old genus Tubularia, such as Tubularia proper, next Corymorpha, Hybocodon, then Ectopleura, where we find the Medusæ losing almost entirely their embryonic character. From these we pass to Sarsia, Syndictyon, Dipurena, Saphenia, Turris, and Turritopsis. We then have families where the localization of the tentacles, the position of the ovaries along the proboscis, and partly along the chymiferous tubes, is a character of superiority, such as Dysmorphosa, Lizzia, Bougainvillia, and Nemopsis, having a limited number of tentacles placed at stated points along the circular tube. Closely allied to these are such more Campanularian-like forms, as Melicertum, Ptychogenia, and Staurophora, where the number of tentacles is large, but which want the peculiar marginal bodies so characteristic of Campanularian Medusæ, and where the genital organs are intimately connected with the digestive cavity. The young of these Medusæ (Melicertum and

Staurophora) have, like the young Tubularian Medusæ, a deep bell and few tentacles; these characters they lose with advancing age. The young Medusæ of the greater part of the Campanularian Hydroids, with the exception of the Eucopidæ and some of the Æquoridæ, also have, immediately after they are liberated, a form totally unlike that which they eventually assume. A young Clytia or Oceania has a deep bell, only a couple of long tentacles, and few marginal capsules, having a totally different arrangement from what we find in the adult. With advancing age, the tentacles and marginal bodies increase in number, the disk becomes flattened, and ovaries make their appearance along the chymiferous tubes. In the Eucopidæ the number of tentacles with which the young Medusæ are liberated is far greater, the marginal capsules being constant in young and old. The same is the case with the Æquoridæ; they are liberated with many tentacles, and the disk, like that of the Eucopidæ, is quite flat. We find also among the Campanularians, in some genera, a tendency to localization of the tentacles, as in Eucheilota; or to great complexity of the marginal capsules, as in Tima and Tiaropsis; and finally a great development of the gelatinous proboscis, as in Eutima, Geryonia, and Tima. The gelatinous prolongation of the disk we must regard as an embryonic feature; the great number of chymiferous tubes is likewise a character of inferiority; so that we would place lowest among the Campanularians the Geryonopsidæ, all these having tolerably deep bells and few tentacles, more resembling the Tubularians; next the Æquoridæ, some of which, in their young stages (Halopsis), resemble the Medusæ of Tubularians, with their high bell and few tentacles; next would come the Eucopidæ, having still a large number of tentacles, but where the marginal capsules are limited in number, and in which the young Medusæ at no time resemble the young Medusæ of Tubularians; finally, highest of all the Campanularians would stand the Oceanidæ, where the number of tentacles is not very great, and the complication as well as localization of the marginal capsules is very definite. The ovaries likewise guide us somewhat in this classification; they extend along the proboscis and chymiferous tubes in Tima and the Geryonopsidæ; in the Æquoridæ they take their origin from the base of the digestive cavity; in the Eucopidæ they are limited, as well as in the Oceanidæ, to definite parts of the chymiferous tubes.

Were we to judge simply from the nature of the Medusæ of the so-called Siphonophoræ, the swimming bells and the sexual Medusæ, we should be justified in uniting them with the same order as Hydroids, making, of the different orders which had been proposed before, only suborders of the great order of Hydroids, and thus not recognizing the class of Siphonophoræ, as recently modified by some naturalists. There is perhaps no stronger case to be brought up in confirmation of this view, than the fact that the free Medusæ of Velella are so closely allied to the Medusæ of some of our Tubularians, that McCrady even proposed to separate the Velellidæ from the Siphonophoræ, and to place them next the Tubularians; the sexual Medusæ, also, of several of these free Hydroids resemble very closely other Medusæ, as those of Hybocodon, Corymorpha, and the like. When we add to this the strong argument derived from the homology of the development of the Hydroids, whether free or floating, as is shown hereafter from Nanomia, we can have but little hesitation in acknowledging the value of the order of Hydroids as first limited by Professor Agassiz, and the return, as proposed by him, to the old subdivisions of Eschscholtz, the great master in the classification of the Acalephæ, whose views seem to stand out brighter with every fresh investigation. For certainly the subdivision by Leuckart of the Siphonophoræ into two suborders, and the uniting of Physalia and Porpita and the like into one order with Agalma and its allies, is a disregard of the true value of the ordinal characters which are to be found in the combination of the float with the rest of the community, such as we find developed in the three great phases of embryonic growth of a Physophore. (See Nanomia.) As to the true position of the different orders of the old group of Siphonophoræ among the Hydroids, we cannot fail to consider them as lowest in the series; they form communities, the different individuals of which never attain the high degree of complication and the individuality so characteristic of the Campanularian Medusæ, and they must therefore rank lowest, next to Hydractinia and the like, which form the connecting link between them and the truly fixed Hydroids.

In the limitation of the families of Hydroids, it is very difficult to draw any line of demarcation, whenever we attempt to separate, as distinct families, those Medusæ which are always sessile, from those which lead an independent existence. The close affinity existing between the Hydroids of genera in which we have free and sessile Medusæ, seems to preclude the idea of separating them as distinct families, notwithstanding the great difference of form between the adult Medusæ. As our knowledge of the embryology of Hydroids becomes more extended, cases occur more frequently in which Hydroids, so closely allied that it is difficult to distinguish them generically, unless it be in the breeding season, produce Medusæ which are either sessile, or lead an independent existence; for instance, the many species of Campanularians closely allied to Laomedea, the Tubularians of the genus Tubularia, and the different species formerly referred to Eudendrium. We must combine, as far as we are able from existing information, our knowledge of the Medusa and of the Hydrarium; this seems the only rational method, and one which has already lead those who have adopted it to very important relations of the true affinities of Acalephæ. This view of the proper method to be followed in the classification of Hydroids has been frequently employed by Agassiz, Leuckart, and Vogt. Sars, in his paper on Corymorpha, has developed it fully, quoting many instances in support of this theory. Allman, in a recent paper on the Classification of Hydroids, has carried the same method out for the Tubularians.

SUBORDER SERTULARIÆ AGASS.

Sertulariæ AGASS. Cont. Nat. Hist. U. S., IV. p. 348. 1862.
Sertularina EHRENB. Corall. des roth. Meeres.
Sertularina JOHNST. Brit. Zooph., p. 56.

Family OCEANIDÆ Esch. (*rest.* AG.).

Oceanidæ ESCH. Syst. d. Acal., p. 96. 1829.
Eucopidæ GEGENB. (*p. p.*). Versuch eines Syst. d. Med., p. 241. 1856.
Oceanidæ AGASS. Cont. Nat. Hist. U. S., IV. p. 352. 1862.

The free Medusæ which belong to this family are characterized in their adult condition by the flatness of the bell, and its thinness, long, hollow tentacles, not very numerous, four chymiferous tubes, marginal capsules, and a short proboscis. The Hydrarium is remarkable for its ringed or pedunculated reproductive calycles.

The genus Thaumantias, until the time of Forbes, contained in it Medusæ belonging to several genera. Forbes first proposed to divide it, and suggested the name Cosmetira for his *Thaumantias pilosella.* Gegenbaur, in 1856, proposed another name, that of Eucope, which included several species of the genus Thaumantias, belonging to a different family, the Eucopidæ.

As long as the numerous species of Thaumantias, described by Forbes, have not been investigated again with special reference to the marginal capsules, it is impossible to assign many of them their true position in the genera Eucope, Oceania, and Laodicea, which have been distinguished in these Acalephs. It seems to me doubtful whether the genus Epenthesis of McCrady can be retained, and I think it will eventually prove identical with Oceania, if we limit the genus to such species as *Thaumantias hemisphærica* of Forbes. The Hydra of Oceania is a Wrightia; that of the *Eucope diaphana* of our coast is a Laomedea, resembling the *L. geniculata* of England. The genus Eucope of Gegenbaur would be limited to those species which have small ovaries, occupying but a short space of the chymiferous tubes; and instead of having the long, thin, and exceedingly contractile tentacles of Oceania, have short, stout, knotty tentacles, which are carried straight from the edge of the disk, are hardly contractile, and have a prolongation inside of the circular tube.

TIAROPSIS Agass.

Tiaropsis Agass. Mem. Am. Acad., IV. p. 289. 1849.
Tiaropsis Agass. Cont. Nat. Hist. U. S., IV. p. 355. 1862.

Tiaropsis diademata Agass.

Tiaropsis diademata Agass. Mem. Am. Acad., IV. p. 289, Pl. 6.
Tiaropsis diademata Agass. Cont. Nat. Hist. U. S., III. p. 354, Pl. 31, Figs. 9–15; IV. pp. 308–311, Figs. 45–48. 1862.
Tiaropsis diademata A. Agass. Proc. Bost. Soc. Nat. Hist., IX. p. 93, Fig. 10.
Tiaropsis diademata Mörch.; in Beskriv. af Groenland. 1857.

This Medusa is one of the earliest visitants of our wharves in the spring. In company with Sarsia and Syndictyon, it occurs in great numbers during the spring months; it attains its full size in a comparatively short period (Fig. 91), spawns during April and May, and after that it is found but rarely, disappearing totally during the summer. Although so common, the Hydroid of this Medusa has not been observed. Young Medusæ (Fig. 92), which are fully described in Pro-

Fig. 91.

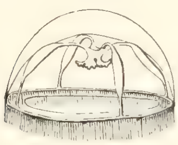
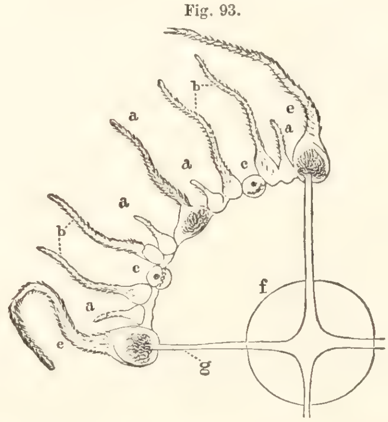


Fig. 92

Fig. 93.



fessor Agassiz's Contributions, are exceedingly numerous. The tentacles develop independently of the eyes, while the latter never increase in number. (See Fig. 93.) For a more detailed description of their mode of growth, see also my paper on the marginal tentacles of Hydroids.

The *Thaumantias Pattersonii* of Greene seems to me, as far as I can make out from his description and figures, to belong to the genus Tiaropsis. There must be some error in his view from above, in which he represents black ocelli at the base of the chymiferous tubes; I doubt if

Fig. 91. Tiaropsis diademata, natural size.
Fig. 92. Young Tiaropsis, having twenty-four tentacles.
Fig. 93. Young Tiaropsis, having forty tentacles. *c*, eye-speck; *f*, digestive cavity; *g*, chymiferous tube; *e*, primary tentacles; *a*, middle tentacle; *b*, third set of tentacles in pairs; *a*, fourth and fifth sets of pairs of tentacles.

this is really the case, as we have nothing of the sort among any of the other Hydroid Medusæ.

Massachusetts Bay (Agassiz).

Cat. No. 266, Boston, April, 1862, A. Agassiz. Medusa.
Cat. No. 267, Boston, May, 1862, A. Agassiz. Medusa.
Cat. No. 358, Boston, May, 1862, H. J. Clark. Medusa.

OCEANIA Pér. et Les.

Oceania Pér. et Les. Ann. du Mus., XIV. p. 32. 1809.
Thaumantias Esch. Syst. d. Acal., p. 79. 1829.
Oceania Less. Zooph. Acal., p. 318. 1843.
Phialidium Leuck. Arch. f. Nat., I. 1856.
Epenthesis McCr. Gymn. Charl. Harb., p. 89.
Oceania Agass. Cont. Nat. Hist. U. S., IV. p. 352. 1862.
Wrightia Agass. Cont. Nat. Hist. U. S., IV. p. 354. 1862. Hydrarium.

Oceania folleata Agass.

Oceania folleata Agass. Cont. Nat. Hist. U. S., IV. p. 353. 1862.
Epenthesis folleata McCr. Gymn. Charl. Harb., p. 89.

Charleston Harbor (McCrady).

Oceania languida A. Agass.

Oceania languida A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 353. 1862.
Hydrarium. The American species of *Wrightia* mentioned in a note by Professor Agassiz, in Cont. Nat. Hist. U. S., IV. p. 354. 1862.
? Campanularia syringa Stimps. Mar. Inv. Grand Manan, p. 8. 1853.

It must remain doubtful whether this species is not the *Epenthesis folleata* McCr. found in Charleston Harbor. McCrady observed only a single specimen, and his description is too short not to leave some doubt on this point. His single specimen, moreover, was not in a normal condition, as he says there were five labial appendages. From the fact that there is but one marginal capsule between each tentacle in the Charleston species, and rarely two, while there are always two, and frequently three, in the specimens taken on our coast, I would infer that they are distinct species.

Fig. 94.

c

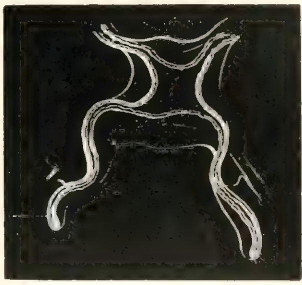
b

The capsules are small, and contain only one large granule. The bulbs at the base of the tentacles (*b*, Fig. 94) are large swellings, colored with dark pigment-cells; the tentacles are thread-like, very extensible, with lasso-cells scattered

Fig. 94. Two marginal tentacles, with a portion of the circular tube. *c*, one of the marginal capsules in process of division; *b*, sensitive bulb of tentacle.

irregularly all over the surface; the walls of the tentacles are thin, leaving a wide tube running to their extremity; the labial folds of the short digestive cavity are simple, the edges not being fringed (*f*, Fig. 95); the bell is perfectly transparent and exceedingly thin, remaining of the same thickness close to the edge; the veil is of medium size. The ovaries and the base of the digestive cavity are light brown; the base of the tentacles is somewhat darker. The number of tentacles is from thirty-two to forty; the Medusa measures from three fourths to seven eighths of an inch in size. The marginal capsules are formed by division, a small portion of the capsule being separated by a constriction, and a granule developed in it (*c*, Fig. 94) forms the new capsule, which gradually becomes more and more distinct in older specimens.

Fig 95.



The observations of Wright on *Laomedea acuminata*, combined with the development given here of a Medusa (Fig. 96) similar to the one he observed, give us the complete history of the genus Oceania. It is particularly important on account of the light it throws on the probable identity of many of the species described by Forbes under the name of Thaumantias, and which are distinguished by the greater or smaller number of tentacles, and the position and size of the ovaries. Differences, similar to those by which he has distinguished such a large number of species, are readily traced in the different stages of our Oceania. Professor Agassiz had separated the Hydroid figured by Wright, as a distinct genus, from Clytia, on account of the peculiar position of the marginal capsules, totally different from what is observed in that genus. The development of the Medusa shows this to be a correct appreciation of the differences noticed in the young; but as the genus of the adult Medusa is one already well known, Wrightia, the name given to the Hydrarium by Professor Agassiz, must be rejected. We have on our coast two species of Wrightiæ, one of which produces planulæ, and resembles, in its general appearance and mode of branching, the *Laomedea acuminata* figured by Wright in the Edinburgh New Philosophical Journal for 1856; the latter, however, produces Medusæ, while the second species is closely allied to the European *Campanularia syringa*; it has reproductive calycles similar to the calycles of the *Campanularia fastigiata* Alder; it differs considerably from the figure of the *C. syringa* given by Van Beneden, the stolon of our species being as strongly ringed as the pedicel; the calycle is likewise slightly constricted in the middle. This species has not been found with

Fig. 95. Magnified view of the actinostome. *T*, chymiferous tube; *f*, one of the four simple lobes of the actinostome.

reproductive calycles in March, April, or September; I am therefore unable to state whether it is the Hydrarium of our common Oceania.

A very young Oceania (Fig. 96), soon after its escape from the reproductive calycle, has a very deep bell (Fig. 96), two long tentacles and two rudimentary ones at the base of the chymiferous tubes. It resembles in its general appearance and motion the Medusa of *Clytia bicophora;* the bell is covered with large lasso cells, scattered irregularly over the surface; it can at once be distinguished from the latter

Fig. 96.

Fig. 97.

Fig. 98.

Medusa by the absence of ovaries, the two long tentacles (*t*, Fig. 97), and by what characterizes at once this genus, the position of the marginal capsules (*c*, Fig. 97) on each side of the primary tentacles (*t*, *t'*, Fig. 97), at the base of the chymiferous tubes, while in Clytia they are placed on each side of the secondary rudimentary tentacle, half-way between the chymiferous tubes. The young Medusa, in more advanced stages, has become quite conical (Fig. 98), the ovaries are forming, and, besides the two original long tentacles, we have the two rudimentary primary tentacles fully formed, as well as eight others half-way between the chymiferous tubes, and rudiments of eight additional tentacles half-way between these and the chymiferous tubes. The proboscis has likewise somewhat lengthened. In still older specimens, in which the fourth set of rudimentary tentacles has developed (t^4, Fig. 99), and in which we can trace the position of the remaining sixteen tentacles (t'', Fig. 99), the ovaries have also taken a greater development, and are now ellipti-

Fig. 99.

Fig. 96. Young Medusa of Oceania languida, immediately after escaping from the reproductive calycle.

Fig. 97. The same, seen from the actinal pole, to show the position of the marginal capsules, *c*, on the sides of the tentacles, *t*, *t'*.

Fig. 98. Somewhat more advanced Medusa, in which traces of the ovaries can be detected.

Fig. 99. Quarter of the disk of a still more advanced Oceania, where the remaining tentacles of the adult (t'') are developing between the tentacles, t^1, t^4, t^3, t^4, t^2, as well as additional marginal capsules, *c*.

cal pouches, occupying about one fifth of the length of the chymiferous tubes. With advancing age the bell of the Oceania grows more and more flattened, until, in the adult (Fig. 100), it has assumed the shape of a flat segment of a sphere. New marginal capsules are developed at the same time with the rudimentary tentacles, one between every two tentacles in the younger stages; afterwards there are from two to three capsules between the tentacles in the adult. The genital organs of the adult Medusa occupy more than two thirds the length of the chymiferous tubes; when distended with eggs, as in Fig. 101, they hang in irregular lobes from the point of attachment, a; the eggs are quite large; there is no difference in the shape of the male and female genital organs, those of the males are simply somewhat darker brownish-colored than the ovaries. These Medusæ are among the most common on our shores; they attain their full size during September, when they are frequently met in immense shoals on warm, still, sunny days, collected together for spawning. The young (Fig. 96) make their appearance as early as the end of May. The adult Medusæ assume the most extraordinary attitudes as they float along, carried about by the current; the disk is so extremely flexible that at times it seems almost as if the Medusa had rolled itself up, as in Figure 102, the tentacles being the strings by which the two edges have become fastened together. They are exceedingly lazy in all their movements, hardly contracting their tentacles when disturbed, contrasting strangely with their former activity in younger stages (Fig. 96), when they move through the water with short, rapid jerks, stopping only to take a more vigorous start. The young Medusæ of Campanularians are all very active, whatever may be the habits of the adults, while in the Tubularians we have generally in the young Medusæ the temperament of the adult. Young Medusæ of Bougainvillia, Lizzia, and Zanclea are lazy, like the adult;

Fig. 100.

Fig. 101.

Fig. 102.

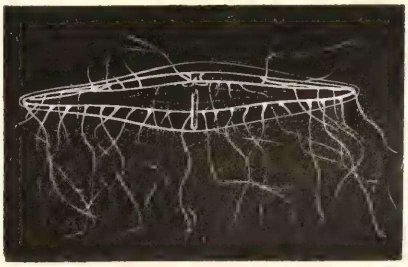


Fig. 100. Adult Oceania languida, natural size.
Fig. 101. Magnified view of an ovary. a, abactinal part of the genital organ.
Fig. 102. Peculiar attitude sometimes assumed by these Medusæ.

while Sarsia, Nemopsis, and Margelis are as active when young as when full grown.

Eastport, Maine (L. Agassiz); Massachusetts Bay (A. Agassiz); Buzzard's Bay (A. Agassiz).

Cat. No. 280, Naushon, A. Agassiz, September, 1861. Medusa.

Cat. No. 450, Nahant, A. Agassiz, June, 1864. Medusa.

Oceania gregaria A. Agass.

Oceania gregaria A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 353. 1862.

This Medusa is somewhat smaller than its Eastern representative. It differs from it strikingly by the great length of the slender lips of the actinostome (Fig. 103); the color of the genital organs and of the sensitive bulb of the tentacles is a beautiful pale yellow, in strong contrast to the dark coloring of our species; the marginal tentacles are only moderately contractile. The whole surface of the water for several miles was often thickly covered with these Medusæ. Found in the Gulf of Georgia, from June to October.

Fig. 103.

Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 124, Gulf of Georgia, W. T., June, 1859, A. Agassiz. Medusa.

EUCHEILOTA McCr.

Eucheilota McCr. Gymn. Charl. Harb., p. 84.
Eucheilota Agass. Cont. Nat. Hist. U. S., IV. p. 353. 1862.

Eucheilota ventricularis McCr.

Eucheilota ventricularis McCr. Gymn. Charl. Harbor, p. 85, Pl. 11, Figs. 1–3; Pl. 1, Figs. 1, 2.
Eucheilota ventricularis Agass. Cont. Nat. Hist. U. S., IV. p. 353. 1862.
Eucheilota ventricularis A. Agass. Proc. Bost. Soc. Nat. Hist., IX. Figs. 16, 17.

Fig. 104.

The small Medusa represented in Fig. 104 is exceedingly common at Naushon, and I suppose it to be a young of this species, though I did not trace its development long enough to satisfy myself fully on this point. It has the characters of the genus as given by McCrady, with the exception of the ovaries, which were not yet developed in the oldest specimens observed. Young specimens, of a sixteenth of an inch in diameter, have four tentacles, one opposite each of the chymiferous tubes, of the length of the diameter of the

Fig. 103. One of the four lips of the actinostome of Oceania gregaria.
Fig. 104. Young of Eucheilota ventricularis McCr.

bell, with tentacular cirri well developed; two marginal capsules between each tentacle, and rudiments of four additional tentacles halfway between the capsules. (Fig. 105.) These tentacles have at first no lateral cirri; it is only when they have assumed the shape of the lower basal part of a full-grown tentacle that the cirri appear like two round knobs, which are rapidly developed into lateral cirri before the lash of the tentacle has been formed. The form of the young Medusa, with only four tentacles, is globular, but it soon becomes flattened as it advances in growth. The digestive cavity is a simple long tube, hanging stiffly in the interior of the bell, which has a very small circular opening; the chymiferous tubes are wide; the basal swelling of the tentacle is large and conical, narrowing very rapidly into the thread of the tentacle itself, which is exceedingly slender, with thin walls, and lasso cells scattered irregularly over its surface. The marginal capsules contain only one granule, while McCrady's species contains three or four. This may prove to be the specific difference between these young specimens and the Charleston species, as I have not, even in those specimens which had already eight tentacles, found more than one granule, except in a single case two, in one of the capsules.

Fig. 105.

Charleston, S. C. (McCrady); Buzzard's Bay, Naushon (A. Agassiz).

Eucheilota duodecimalis A. Agass.

Eucheilota duodecimalis A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 353. 1862.

This species differs from the above in having twelve marginal capsules, one on each side of the four large tentacles (*c*, Fig. 107), and one in the middle of the circular tube (Fig. 106); there are four long tentacles, with lateral cirri (*t*′, Fig. 107) and long slender lashes, which are covered with lasso cells; the chymiferous tubes are wide, and from their point of junction with the circular tube arise ribbon-shaped genital organs (*o*, Fig. 107), which do not extend more than one third of the length of the chymiferous tube (Fig. 106); the disk is of very uniform thickness, the inner and outer surface of the bell being almost concentric to the very

Fig. 106.

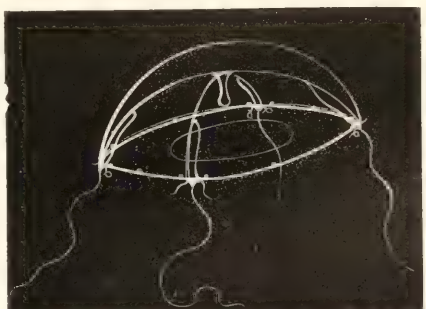


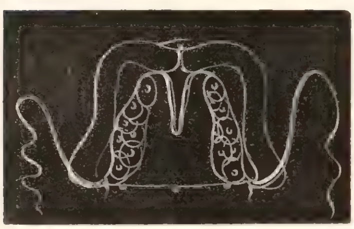
Fig. 105. More magnified view of a quarter of the disk, to show the position of the capsules and tentacular cirri. 2, the second set of tentacles in Figs. 104, 105.

Fig. 106. Eucheilota duodecimalis A. Agass.; greatly magnified.

Fig. 107.

edge ; in the cavity hangs a short urn-shaped digestive sac, attached to the four chymiferous tubes by a circular base, and not quadrangular, as in the *E. ventricularis ;* there is only a single granule in each of the marginal capsules. This species seems to be full grown, as the sexual glands were very much distended with spermaries, and I could not see any traces of additional tentacles ; however, as the presence of eggs and spermaries is far from being a criterion of maturity among these animals, we must have further materials to decide this point. Only three specimens of this species were found, — a very young female, the male here figured, and an older female (Fig. 107[a]), in which the ovaries were filled with apparently mature eggs, the genital pouches extending from the base of the chymiferous tubes to the base of the proboscis ; the thickness of the bell and its shape is totally different from that of the male, if it belongs to the same species ; the bell is of uniform thickness, quite squarish in outline ; the trace of the connection with the Hydrarium is still very distinct, and the tentacles are carried in the erect manner so characteristic of young Hydroid Medusæ, showing that, in spite of its well-developed ovaries, it must have but recently been liberated from its

Fig. 107[a].



Hydrarium. The character of the difference between the young of these two species of Eucheilota makes it highly probable that the *E. duodecimalis* may form, when its adult is known, the basis for a separate genus ; we find in the arrangement of the capsules differences similar in character to those observed between the young of Oceania and of Clytia, the adult Medusæ of which are generically distinct, I cannot help surmising that we shall find differences of a like nature when the adult of *E. duodecimalis* becomes known. This is the more probable now that we know the young of *E. ventricularis*, the adult of which has so much the general appearance of an Oceania.

Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 453, Naushon, July, 1864, A. Agassiz. Medusa.

Fig. 107. Junction of one of the chymiferous tubes with the circular tube. *o*, spermary ; *c*, marginal capsule ; *t*, one of the four primary tentacles ; *t'*, tentacular cirri.

Fig. 107[a]. Female Medusa of Eucheilota duodecimalis ; greatly magnified.

CLYTIA Lamx.

Clytia Lamx. Bull. Soc. Phil.
Clytia Agass. Cont. Nat. Hist. U. S., IV. pp. 297, 354. 1862.
Calicella Hincks.
Trochopyxis Agass. Cont. Nat. Hist. U. S., IV. pp. 297, 354. 1862.
? *Platypyxis* Agass. Cont. Nat. Hist. U. S., IV. pp 306, 354. 1862.

The adult Medusa of *Platypyxis cylindrica* of Professor Agassiz is not known; he has separated this genus from Clytia from the character of the reproductive calycles only. The young Medusæ are very much alike, and we may have a case here, the reverse of what we find in Sarsia and Syndictyon, of Medusæ very similar in their younger stages, but totally different in the adult forms.

Clytia intermedia Agass.

Clytia intermedia Agass. Cont. Nat. Hist. U. S., IV. p. 305, Pl. 29, Figs. 10, 11. 1862.

Cat. No. 143, Nahant, Mass., April, 1855, H. J. Clark. Hydrarium.

Clytia volubilis A. Agass.

Campanularia volubilis Alder (*non* Auct). Cat. Zooph. Northumb. and Durham, p. 35.

Alder was the first to distinguish the several species which have been confounded under the name *C. volubilis* by different authors. Specimens in no way to be distinguished from the European *C. volubilis* have been found on our coast with their reproductive calycles, seeming to leave little doubt that the specimens here catalogued belong to this species.

Massachusetts Bay (L. Agassiz); Cape Cod (L. Agassiz).

Cat. No. 145, Norway, Sars. Hydromedusarium.

Cat. No. 146, Cape Cod, June, 1857, Captain N. E. Atwood. Hydromedusarium.

Cat. No. 432, Sea Coal Bay, N. S., 1861, Anticosti Expedition. Hydromedusarium.

Cat. No. 435, Mingan Islands, 1861, Anticosti Expedition. Hydromedusarium.

Clytia bicophora Agass.

Clytia bicophora Agass. Cont. Nat. Hist. U. S., IV. pp. 304, 354, Pl. 27, Figs. 8, 9 (as *C. cylindrica*); Pl. 29, Figs. 6–9. 1862.
Clytia bicophora A. Agass. Proc. Boston Soc. Nat. Hist., IX. Figs. 14, 15.
Clytia cylindrica Agass. (*p. p.*). Cont. Nat. Hist. U. S., IV. Fig. 14. 1862.

Under the name of *Eucope campanulata, Eucope Thaumantoides,* and *Eucope affinis*, Gegenbaur has described three species, which, to judge from the development of a similar Medusa of our coast, *Clytia bicophora*, are probably only different ages of the same species. The difference in shape of the ovaries in the different stages of the males and females, as seen in our Oceania, may account for the difference of form which Gegenbaur has found in the genital glands: I have been able to observe the same differences in our Clytia. The difference in the shape of the bell of his species is similar to what we find at different periods in our Clytia. When hatched from the calycle, the bell is globular (Fig. 108); the digestive cavity is a simple cylinder; the ovaries are hardly visible, as very short narrow lines on both sides of part of the upper half of the radiating tubes; there are only four tentacles. As it grows older, the actinal portion of the bell bulges out; the second set of tentacles, which were small bulbs, have now grown out, and there are traces of eight other tentacles (Fig. 109); the ovaries are also larger. At this stage the bell has the shape of a segment of a sphere, and has entirely lost its globular outline, the marginal capsules have not increased in number, there are only two between each radiating tube, just as we have them in the young Medusa at the time when they are freed from the reproductive calycle. In the next stage of the Medusa the rudimentary tentacles of Fig. 109 have developed into long flexible lashes, usually carried curled up, as in Fig. 110. In the adult of this Medusa there are no traces of any additional tentacles; though not measuring more than a quarter of an inch in diameter, yet they are very conspicuous on account of the accumulations of black pigment-cells in the bulb of the tentacles; two additional marginal capsules have also been formed, one on each side of the four primary tentacles; the ovaries are brownish purse-like

Fig. 108.

Fig. 109.

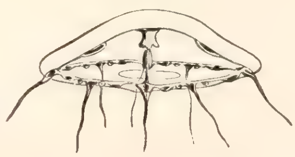
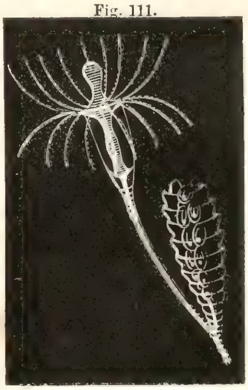


Fig. 110.

Fig. 108. Clytia bicophora, immediately after its escape from the reproductive calycle.
Fig. 109. A somewhat older Clytia bicophora.
Fig. 110. An adult Clytia bicophora, measuring one quarter of an inch.

glands, extending towards the base of the proboscis. The Hydrarium (see figure of Professor Agassiz in Vol. IV. Pl. 29, Fig. 6) grows from three quarters to an inch in height, in small tufts attached to Fucus; the calycles are strongly compressed (Fig. 111), and differ as much in their proportions as those of *C. cylindrica*, when seen from the broad or from the narrow side. This species may yet prove identical with the *Clytia Johnstoni* of Alder. According to the figure of Wright of the Medusa of *Campanularia Johnstoni*, it can hardly be distinguished from the Medusa of our *Clytia bicophora;* the Medusa of *C. volubilis* figured by Hincks resembles also closely our Clytia Medusæ. The Medusa figured by Dalyell as the young of *M. fimbriata*, on Pl. 52, Fig. 4, Rare and Remarkable Animals of Scotland, is undoubtedly a young Medusa of *C. Johnstoni*, to judge from its characteristic attitude. If the figure which Gosse has given of the calycle of this same species in his "Devonshire" is correct, there can be but little question as to their specific difference; the peculiar species figured by Gosse has, however, not been noticed by other English observers. The Medusæ of *Clytia cylindrica* and of *Clytia bicophora* are so alike, immediately after their escape from the reproductive calycles, that when the development of *Clytia cylindrica* was first discovered, the Medusæ which are here figured as *Clytia bicophora* (Fig. 41, Agassiz's Cont. Nat. Hist., p. 307) were mistaken for the adult of the Medusæ of *Clytia cylindrica*. As the *Clytia bicophora* is very common at Nahant, the complete development of the Medusa has been traced, and the error is here corrected.

Fig. 111.



Eastport, Maine (W. Stimpson); Massachusetts Bay (Agassiz); Vineyard Sound and Naushon (L. and A. Agassiz).

Cat. No. 133, Eastport, Maine, July, 1852, W. Stimpson. Hydromedusarium.

Cat. No. 134, Beverly, Mass., July, 1861, A. Agassiz. Hydrarium.

Cat. No. 135, Vineyard Sound, July, 1849, L. Agassiz. Hydromedusarium.

Cat. No. 136, Grand Manan, August, 1857, J. E. Mills. Hydromedusarium.

Cat. No. 137, Nahant, Dec. 1855, H. J. Clark. Hydromedusarium.

Cat. No. 154, Eastport, Maine, July, 1852, W. Stimpson.

Cat. No. 401, Nahant, June, 1862, A. Agassiz. Hydromedusarium.

Cat. No. 443, Nahant, June, 1864, A. Agassiz. Medusa.

Museum diagram No. 17, after L. and A. Agassiz.

Fig. 111. Sterile Hydra and reproductive calycle, seen from the broad side.

PLATYPYXIS Agass.

Platypyxis Agass. Cont. Nat. Hist. U. S., IV. pp. 306, 354. 1862.

Platypyxis cylindrica Agass.

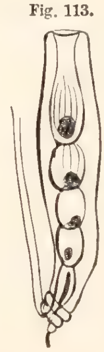
Clytia (*Platypyxis*) *cylindrica* Agass. Cont. Nat. Hist. U. S., IV. pp. 306, 354 (*non* Pl. 27, Figs. 8, 9); p. 307, Figs. 42–44 (*non* Fig. 41). 1862.
Campanularia volubilis Leidy. Mar. Inv. Faun. N. Y. and R. I., p. 6. 1855.
Campanularia noliformis McCr. Gymn. Charl. Harb., p. 92, Pl. 11, Fig. 4. ?

The reproductive calycle is conical, smooth, strongly compressed in one direction, with a slight constriction near the free end, which flares outwards (Fig. 112); there are from three to four young Medusæ developing simultaneously, though only one seems to escape at a time, and not several in close succession, as is the case with Laomedea; the Medusa nearest the upper extremity occupies more than half of the whole space; there is nothing here like the corrugations which

Fig. 112.

Fig. 114.

Fig. 113.



Gosse has figured in his *C. volubilis*, or of the spur which projects beyond the point of attachment of the calycle; when seen edgeways, the calycle is strongly bent at the base (Fig. 113), and the upper edges do not flare out, as when seen from the broad side. The Hydrarium (Fig. 114) is found in shady places, near low-water-mark, and immediately beyond it; largest specimens about an eighth of an inch in height.

Charleston, S. C. (McCrady); Point Judith (Leidy); Massachusetts Bay, Nahant (L. Agassiz); Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 141, Naushon, Sept. 1861, A. Agassiz. Hydromedusarium.

Cat. No. 142, Nahant, Mass., Sept. 1854, H. J. Clark. Hydrarium.

Fig. 112. Reproductive calycle of P. cylindrica, seen from the broad side.
Fig. 113. The same, seen from the narrow side.
Fig. 114. Sterile Hydra of P. cylindrica.

ORTHOPYXIS Agass.

Orthopyxis Agass. Cont. Nat. Hist. U. S., IV. pp. 297, 355. 1862.
Clytia Lamx (*p. p.*). Bull. Soc. Phil. 1812.
? *Silicularia* Meyen. Nov. Act., XVI. 1834.

Orthopyxis poterium Agass.

Orthopyxis poterium Agass. Cont. Nat. Hist. U. S., IV. pp. 297, 302, Fig. 40; p. 355; Pls. 28, 29, Figs. 1–5. 1862.

Massachusetts Bay (Agassiz); Nova Scotia (Anticosti Expedition).
Cat. No. 125, Nahant, April, 1856, H. J. Clark. Hydromedusarium.
Cat. No. 126, Nahant, June, 1861, A. Agassiz. Hydrarium.
Cat. No. 127, Nahant, July, 1861, A. Agassiz. Hydrarium.
Cat. No. 128, Nahant, August, 1861, A. Agassiz. Hydrarium.
Cat. No. 129, Nahant, September, 1854, H. J. Clark. Hydrarium.
Cat. No. 130, Nahant, December, 1854, H. J. Clark. Hydrarium.
Cat. No. 131, Nahant, March, 1856, H. J. Clark. Hydrarium.
Cat. No. 400, Nahant, Mass., 1862, A. Agassiz.
Cat. No. 414, Mingan Islands, N. S., Anticosti Expedition, 1861.
Museum Diagram No. 18, after L. Agassiz.

Family EUCOPIDÆ Gegenb.

Eucopidæ Geg. (*emend* Agass.). Zeit. f. Wiss. Zool., p. 241. 1856.
Eucopidæ Agass. Cont. Nat. Hist. U. S., IV. p. 351. 1862.

Great confusion has always existed in the identifications made of the different species of Campanularians, on account of the difficulty of distinguishing in certain stages closely allied species. If, however, we are fortunate enough to examine them at the breeding season, when the characteristic reproductive calycles of the different species are in their full development, our task will be greatly facilitated; and any doubts we may still have of the identity or difference of closely allied species will be entirely removed, should we succeed in tracing the development of the young Medusa. Although we may find it impossible to distinguish, at certain stages of growth, young Medusæ, it by no means follows that these Medusæ, which have developed from Campanularians easily distinguished, are identical. (Compare the different Campanularians figured in the sequel.) Whenever we succeed in tracing the complete history of any one of our Jelly-fishes, we always find that we are able to distinguish readily closely allied species, which our previous ignorance had led us to consider as identica. ; as, for example, the Medusæ of *Eucope polygena*, *Eucope diaphana*, *Eucope pyriformis*, and *Eucope articulata*. The strongest case we can cite is perhaps that of Syndictyon and Coryne, the adult Medusæ of which had long been distinguished by the difference of color of the sensitive bulb; but whether this was anything more than mere individual differences could not be ascertained till we became acquainted with the complete development of the former genus, which will be found given in its place in this Catalogue. Hincks, after some observations limited to two genera of Hydroids, came to the conclusion that we could have Medusæ, generically identical, developed from Hydroids generically distinct; this is so entirely opposed to anything known in the history of the development of these animals, and so totally disproved by the examples of Campanularians here described, that I believe that, when the complete history of the two Medusæ described by Hincks is fully known, we shall find we have only a case of very close affinity at one stage of their development, and that, as we become acquainted with their more advanced stages, differences will be perceptible.

The different species of Eucopidæ found on our coast, of which we know the development, explain many of the contradictory statements of European writers concerning the mode of development of the different species of Eucope. It has been shown only more recently that many of the species, so closely allied as to be readily mistaken at any time, except the breeding season, were reproduced, on the one hand by Planulæ, and on the other by Medusæ; and now it is found that the Medusæ produced from Hydroids which have been considered identical species, develop into very different adult forms. See, for example, the differences in the Medusæ of *Laomedea geniculata*, figured by Wright and Gosse; one has ovaries and the other has none, immediately after its escape from the reproductive calycle, as in our *Eucope diaphana* and *Eucope articulata*. The *Laomedea gelatinosa* of Van Beneden has twenty-four tentacles and ovaries, as in our *Eucope pyriformis*, to which it is closely allied, while the Medusa of *Laomedea gelatinosa* of English writers has sixteen tentacles at first, and is an Obelia. The European Campanularians require a thorough revision in order to extricate them from the confusion existing in their synonymy, and this can only be done after a thorough acquaintance with the development of their Medusæ.

The *Laomedea dichotoma* of Dalyell is probably the same as the *Campanularia gelatinosa* of Van Beneden. The same confusion occurs in the fourth volume of Professor Agassiz's Contributions; the Eucope which is there figured as *Eucope diaphana* Agass., and the Campanularian of that name (Plate 34), is not the Hydroid of *Eucope diaphana*, as will be seen in the description of the latter. The

Eucope diaphana of the fourth volume (not that of the Memoirs of the American Academy) is probably identical with the English *Eucope geniculata* of Wright, not that of Gosse, and it may hereafter be designated as *Eucope alternata.*

EUCOPE Gegenb.

Eucope Gegenb. Versuch eines System; Zeit. f. Wiss. Zool., p. 241. 1856.
Eucope Agass. Cont. Nat. Hist. U. S., IV. p. 351. 1864.

Eucope diaphana Agass.

Eucope diaphana Agass. (*ex p.*). Cont. Nat. Hist. U. S., IV. Pl. 33, Fig. 2. Hydrarium. 1862.
Thaumantias diaphana Agass. Mem. Am. Acad., IV. p. 300, Figs. 1, 2.
Eucope diaphana A. Agass. Proc. Bost. Soc. Nat. Hist., IX. p. 92, Figs. 7–9.
Thaumantias diaphana Mörch; in Beskriv. af Grönland, p. 96. 1857.

This is by far the most common of our Jelly-fishes; it does not grow to a large size, adult specimens not measuring more than a quarter of an inch across the disk. On escaping from the reproductive calycle, the little medusa has but twenty-four tentacles, and is constantly swimming with the disk turned inside out, as in Fig. 115; at the base of two of the tentacles (t', t', Fig. 116), situated on both sides of the middle tentacle, between the chymiferous tubes, are found large spherical capsules; there are no traces of ovaries to be found in this early stage, it is not till the second set of tentacles begin to develop (2, Fig. 117) that they make their appearance. Young tentacles do not possess the root-like projection at their base; this is only developed in older tentacles of more advanced Medusæ. (See Fig. 120.) With advancing age the Medusæ lose the habit of swimming with the proboscis uppermost, and gradually assume the usual mode of swimming of Jelly-fishes. The young Eucope of Fig. 117 develops rapidly additional tentacles, the ovaries increase in size, and we soon have an adult Medusa, with large bag-like ovaries, a

Fig 115.

Fig. 116.

Fig 117.

Fig. 115. A Eucope diaphana just after its escape from the reproductive calycle, seen in profile.

Fig. 116. One quarter of the disk of the same, seen from above. t, tentacle opposite chymiferous tube; t', t', tentacles with capsules.

Fig. 117. A more advanced Eucope, in which the second set of tentacles (2) is developing between the original tentacles (1).

short proboscis, and an extremely attenuated disk, as in Fig. 118. Fig. 119, which is a still more magnified view of a quarter of the disk, seen

Fig. 118.

from above, shows the extraordinary increase of the number of tentacles, and the position of the genital organs near the circular tube. As the Medusæ become older, a sort of sensitive bulb is formed at the base of the tentacles, in which a little pigment matter is accumulated (b, Fig. 120); this bulb is hardly perceptible in younger

Fig. 119.

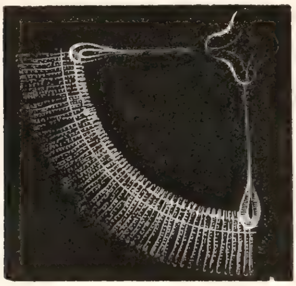
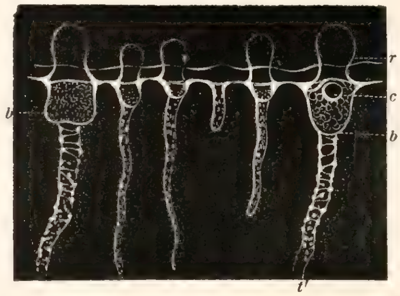


Fig. 120.



tentacles, and is totally wanting in the young Medusæ. The original number of the capsules between every two chymiferous tubes is not changed as the tentacles become more numerous; in adult specimens (Fig. 119) there are only two to be found, as in the youngest Medusæ, just escaped from the calycle. When examining a part of the circular tube of a Eucope somewhat more advanced than the stage represented in Fig. 117, we find only a great increase in the sensitive bulbs and the root of the tentacles (r, Fig. 120), but we can perceive nowhere, in any of the most advanced tentacles, the least trace of additional capsules, such as are found in the two tentacles, t', t', Fig. 116, and t', Fig. 120. The capsules (c, Fig. 120) have the same shape and position they had in younger Medusæ. The

Fig. 121.

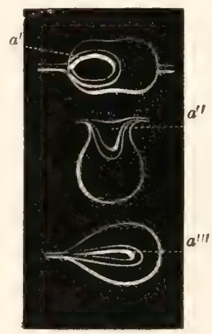


Fig. 122.

genital organs, at first mere swellings of the chymiferous tubes (Fig. 117), soon develop into regular pouches, which hang down on both sides of the tube; the tube also forms a sort of pocket at the point of attachment of the pouch. (a', a'', a''', Fig. 121.) This pocket is readily seen in the male (Fig. 121); its shape, when seen from above, changes considerably according to the position of the genital pouch. (a', a''', Fig. 121.) The shape of the spermaries has

Fig. 118. An adult Eucope diaphana, seen in profile.

Fig. 119. A quarter of Fig. 118, more magnified.

Fig. 120. Magnified view of the circular tube of a young Eucope. b, sensitive bulb; r, root of tentacle; c, capsule; t', tentacle with capsule.

Fig. 121. Spermaries; a', seen from above; a'', in profile; a''', different attitude from above.

Fig. 122. Female genital organs.

a tendency to be somewhat rectangular or bottle-shaped (Fig. 121), while the ovaries, when distended with eggs (Fig. 122), are more generally spherical; the number of eggs in an adult female are not numerous, not more than twelve to fifteen; the eggs are quite large, and have a very sharply defined germinative vesicle. The proboscis (Fig. 123) lengthens but little in older Medusæ, almost the only change being the greater mobility of the lips of the actinostome; the veil is totally wanting in young Medusæ, and in the adult is a very narrow ribbon round the circular tube, hardly extending beyond the root of the tentacles, so that it easily escapes notice.

Fig. 123.

This Medusa is exceedingly phosphorescent, having a very white brilliant light, which is given out most strongly at the base of the long tentacles. These Medusæ appear as early as March, and are found as late as November. The Hydrarium (Fig. 124) grows to but little more than an inch in height, and resembles *Laomedea geniculata;* but the absence of the knee at the base of the sterile Hydra, and the long ringed branch supporting it, distinguish it at once from that species. The calycle is elliptical, arching regularly towards the centre, and tapering at the two ends (Fig. 125); from twelve to fifteen Medusæ develop in each calycle. Found at near low-water-mark, attached to the base of *Fucus vesiculosus.*

Fig. 124.

It may be that the Medusa of *Laomedea geniculata* of Gosse, figured on Plate IV. of his "Devonshire," may prove to be the young of *Thaumantias lucida* of Forbes, which is the English representative of our *Eucope diaphana.* Should this be the case, the two species are evidently distinct, and representative species in the Acadian and Lusitanian Fauna. Is not the *Medusa fimbriata* of Dalyell (Pl. 52, Figs. 6, 7) the same as the Medusa of *Laomedea geniculata,* and is it not also identical with the *Thaumantias lucida* of Forbes?

Fig. 125.

Massachusetts Bay, Nahant (Agassiz); Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 78, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 79, Naushon, Sept. 1861, A. Agassiz. Hydromedusarium.

Cat. No. 281, Naushon, Sept. 1861, A. Agassiz. Hydromedusarium.

Fig. 123. Proboscis of an adult Medusa.
Fig. 124. Hydrarium of Eucope diaphana, natural size.
Fig. 125. Magnified view of sterile Hydra and of a reproductive calycle.

Eucope alternata A. Agass.

Eucope diaphana Agass. (*ex. p.*). Cont. Nat. Hist. U. S., IV. pp. 322, 352, Pl. 34, Figs. 1–9. 1862. Non *Th. diaphana* Agass., Mem. Am. Ac.

This species was at first mistaken by Professor Agassiz for the young of *Thaumantias diaphana*, figured in the Memoirs of the American Academy. The development of the Hydrarium of these two closely allied forms shows that two species have been confounded.

Massachusetts Bay, Nahant (Agassiz).

Cat. No. 83, Nahant, Mass., Aug. 1861, A. Agassiz. Hydromedusarium.

Cat. No. 84, Nahant, September, 1854, H. J. Clark. Hydrarium.

Cat. No. 85, Nahant, May, 1862, A. Agassiz. Hydrarium.

Cat. No. 86, Nahant, July, 1861, A. Agassiz. Hydrarium.

Cat. No. 87, Nantasket, April, 1861, H. B. Rice. Hydrarium.

Cat. No. 88, Nahant, L. Agassiz.

Cat. No. 394, Nahant, July, 1862, A. Agassiz. Hydromedusarium.

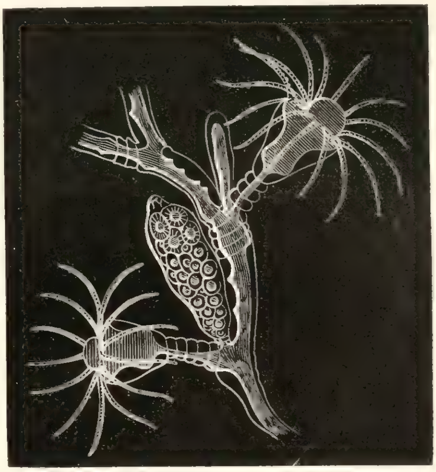
Cat. No. 395, Nahant, June, 1862, A. Agassiz. Hydromedusarium.

Eucope polygena A. Agass.

The only adult Medusa of the genus Eucope, of which we know the complete development, being *Eucope diaphana*, it is not possible at present to decide whether we have not among these closely allied Campanularians the Hydraria of several genera. There are certainly differences among the young Medusæ, at the moment of escaping from the calycles, which must give them totally distinct characters when adult, to judge by what we know of the mode of development of marginal tentacles, and the increase in size of the genital organs. There is a great similarity in the young Medusæ of *Eucope articulata*, *E. pyriformis*, *E. alternata*, and *E. polygena*, all these species having twenty-four hollow tentacles, and ovaries close to the base of the proboscis, at the time they escape from the reproductive calycles; while in *E. diaphana* and *E. geniculata* Gosse we have twenty-four tentacles, nearly solid, and no ovaries in the younger stages. Another type occurs in *Obelia commissuralis* and *Laomedea gelatinosa* of English authors, where the Medusa has sixteen tentacles and no ovaries; and finally there is a still different type in the *Eucope fusiformis* and *Laomedea divaricata* of McCrady, in which we find forty-eight tentacles at the time of hatching, and long spindle-shaped genital organs along the chymiferous tubes. These are undoubtedly good structural characters upon which genera can easily be distinguished, but it would be premature to make all these divisions until we know, from actual observations, in what manner these differences of the young Medusæ are carried out in the adult. The Hydrarium and the Medusa of several species are described here under the generic name of Eucope, simply to call attention to the great structural differences found among Campanularians apparently so closely related.

Eucope polygena is remarkable for the short stems of the sterile Hydra, the stoutness of the main stem, and the great number of Medusæ developed in a single reproductive calycle; the bell is flaring, with a smooth edge, and rather shallow; the reproductive calycles are elliptical, slightly wavy (Fig. 126), and somewhat bottle-shaped at the extremity. The Medusa resembles closely that figured by Professor Agassiz as *Eucope diaphana*, in Vol. IV. Pl. 34, Fig. 9, Contributions to the Natural History of the United States; the tentacles are larger in proportion to the size of the disk. This species is found growing on stems of Laminaria, in small branching tufts, of one to two inches in height.

Fig. 126.



Cat. No. 393, Nahant, June, 1862, A. Agassiz. Hydromedusarium.
Cat. No. 399, Nahant, June, 1862, A. Agassiz. Hydromedusarium.

Eucope parasitica A. Agass.

This species is closely allied to the *E. polygena;* it has, like it, short branches, composed of not more than three or four rings, supporting the sterile Hydræ; the inner walls of the stems are parallel to the outer wall; the sterile Hydræ go off nearly at right angles to the stem; the reproductive calycles are very graceful, terminating with a peculiar mitre-shaped top. The Medusa has twenty-four tentacles; it has thus far only been found growing on a species of Penella, parasitic on *Orthagoriscus mola.*

Massachusetts Bay, Nahant (A. Agassiz).
Cat. No. 80, Nahant, August, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 81, Nahant, August, 1856, L. Agassiz. Hydromedusarium.

Fig. 126. Magnified view of part of main stem of E. polygena.

Eucope pyriformis A. Agass.

Laomedea gelatinosa Leidy (*non* Auct.). Mar. Inv. New York and Rhode Island, p. 6. 1855.

Fig. 127.

This Medusa has, on its escape from the reproductive calycles, small pear-shaped ovaries placed close to the digestive cavity (Fig. 127), which is short and almost globular; there are four chymiferous tubes; the tentacles are shorter than in *Obelia commissuralis*, and not as slender; at the moment of hatching there are twenty-four tentacles, five between each of the chymiferous tubes (Fig. 128), and two large marginal capsules, with one granule in each, placed a little on one side (towards the circular tube) of the two tentacles adjoining the middle one between the chymiferous tubes; the lasso cells are arranged in broken rings round the tentacles. The Hydrarium (Fig. 129) is found growing in large quantities on the eel-grass; the walls of the tube run parallel to the outer envelope; there are no knees or breaks in the continuity, nor are there any swellings where the reproductive calycles are attached; the branches are wide apart, the whole tuft spreading like a bush; the bell of the hydra is short and flaring, and is attached to the main stem by a long branch, having from twelve to fifteen rings. The reproductive calycles vary greatly in shape during their growth; when small, they are almost rectangular, with rounded corners, and a slight constriction in the middle; as they become larger, they grow more pear-shaped; and in still more advanced stages the calycles assume the shape of an elongated ellipse, with a pointed cap, and three or four deep constric-

Fig. 128.

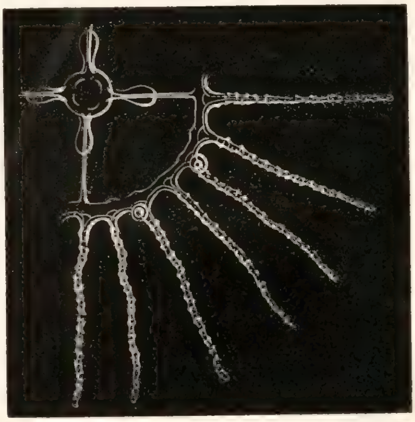


Fig. 129.

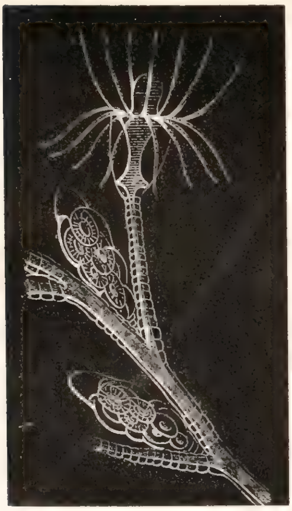


Fig. 127. E. pyriformis, seen in profile; greatly magnified.
Fig. 128. Quarter of disk of same Medusa.
Fig. 129. Portion of Hydrarium of E. pyriformis; magnified.

tions. There are from nine to twelve Medusæ growing in each calycle at once.

This species is closely allied to the *Campanularia gelatinosa* of Van Beneden, and to the *Campanularia dichotoma* of Dalyell. The details of structure of the Hydrarium, especially the reproductive calycles and the stem of the sterile Hydra, seem to prove that they are different species. The mode of branching is the same in both. Compare Van Beneden, Pl. 1, Fig. 1, Campanulaires de la Côte d'Ostende, and the figures of the Medusæ here given.

Point Judith (Leidy); Beverly, Massachusetts Bay (Alex. Agassiz); Grand Manan (Mills).

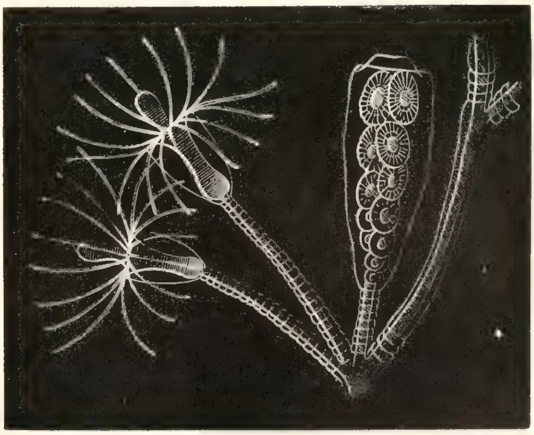
Cat. No. 74, Beverly, Mass., July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 75, Nahant, Mass., July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 76, Grand Manan, Aug. 1857, J. E. Mills. Hydrarium.
Cat. No. 77, Grand Manan, Aug. 1857, J. E. Mills. Hydrarium.

Eucope articulata A. Agass.

This species is so closely allied to *Eucope pyriformis* that the Medusæ can hardly be distinguished. The Medusa of *Eucope articulata* (Fig. 130) has more slender marginal tentacles, and the lips of the actinostome are deeply cleft and extremely movable, which is quite the contrary of what we find in young Medusæ of Eucopidæ. The

Fig. 130.

Fig. 131.



Hydrarium is at once recognized by the extraordinary length of the ringed branch supporting the sterile Hydræ, the cups of which are quite deep and narrow. The reproductive calycle (Fig. 131) resembles in shape that of *Obelia commissuralis*, but is in addition supported upon

Fig. 130. Quarter of the disk of Eucope articulata; magnified.
Fig. 131. Portion of a Hydrarium of Eucope articulata.

a larger pedicel, having from eight to ten rings. It is very common to see the sterile Hydræ, placed as in the figure (Fig. 131), in pairs at the base of the reproductive calycle. The Hydrarium grows to about the size of the *Eucope pyriformis*, from three to four and even five inches high, and is readily mistaken for the Hydrarium of *Obelia commissuralis.* It grows in pools on rocks at low-water-mark.

Cat. No. 396, Nahant, June, 1862, A. Agassiz. Hydromedusarium.

Cat. No. 397, Nahant, June, 1862, A. Agassiz. Hydromedusarium.

Eucope ? fusiformis A. Agass.

Eucope ? A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 91, Fig. 6.

From a Hydrarium, in which the cavity of the main stem passes from one side to the other (*s, s,* Fig. 132), similar in its mode of branching to that of *Eucope diaphana,* but in which the Hydræ, remarkable for their small bell, *b,* are attached to the main stem by short branches, not having more than three or four rings (Fig. 132), is produced a small Medusa of a sixteenth of an inch in diameter, having, when hatched, four long fusiform ovaries (Fig. 133), occupying nearly the whole length of the chymiferous tubes, and forty-eight long, slender tentacles, having well-developed rootlets, usually carried quite stiffly, with two marginal capsules between each pair of chymiferous tubes, occupying the same position as in *E. diaphana,* when it has forty-eight tentacles. The digestive cavity is quite long and movable, and differs from that of the last species by the more marked lobes of the actinostome. The different species of Eucopidæ, thus far described, can easily be distinguished by the number of tentacles, the presence or absence of the ovaries, and their position when they escape from the reproductive calycles. Among the many specimens of *E. diaphana* which I had occasion to examine, I have only found two in which there were not twenty-four tentacles on hatching, and in the *Obelia commissuralis* and *E. pyriformis* the same holds good; the number of tentacles at the time of escape from the calycles being very constant.

Fig. 132.

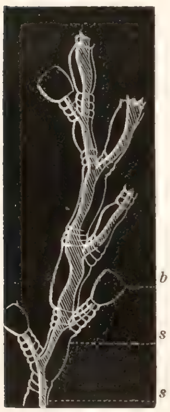


Fig. 133.

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 90, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Fig. 132. Hydrarium of Eucope fusiformis; magnified.
Fig. 133. Quarter of the disk of the Medusa of Eucope fusiformis; greatly magnified.

Eucope ? divaricata A. Agass.

Laomedea divaricata McCr. Gymn. Charl. Harb., p. 93.

An examination, by Professor Clark, of the reproductive calycles of specimens collected at Charleston by Professor Agassiz, shows that the Medusæ have forty-eight tentacles. The Hydrarium is closely related to that of the *Eucope pyriformis*, which, together with the present species, will probably form the basis for a new genus.

Charleston, S. C. (L. Agassiz).

Cat. No. 82, Charleston, S. C., January, 1852, L. Agassiz.

OBELIA Pér. et Les.

Obelia Pér. et Les. ? in Ann. du Mus., XIV. p. 43. 1809.
Obelia Agass. Cont. Nat. Hist. U. S., IV. p. 351. 1862.
Obelia McCr. Gymn. Charl. Harb., p. 94.

Obelia commissuralis McCr.

Obelia commissuralis McCr. Gymn. Charl. Harb., p. 95, Pl. 11, Figs. 5 – 7.
Obelia commissuralis Agass. Cont. Nat. Hist. U. S., IV. pp. 315, 351, Pls. 33 (*non* Fig. 2), 34, Figs. 10 – 21. 1862.
Obelia commissuralis A. Agass. Proc. Bost. Soc. Nat. Hist., IX. p. 91, Fig. 5.
Laomedea dichotoma Leidy (*non* Auct.). Mar. Inv. N. J. and R. I., p. 6, Pl. XI. Fig. 36. 1855.
Laomedea gelatinosa Stimps. (*non* Auct.). Mar. Inv. Grand Manan, p. 8. 1853.
Laomedea gelatinosa Gould. Rep. Inv. Mass. Bay, p. 350. 1841.

The *Obelia commissuralis* of McCrady, which extends from Charleston to the coast of New England, and even as far as Grand Manan, has an exceedingly slender polypidon and branches very profusely; the branches, stretching in graceful curves on both sides of the main stem, reach their greatest length about midway, and then taper very gradually towards the upper extremity. It can at once be distinguished on account of its peculiar mode of growth; it attains from five to six and even seven inches in length. At the time when it bears reproductive calycles, it is still more easily distinguished from the allied species by the shape of the calycles; they are slender, conical, the base of the cone with its rounded edges being surmounted by a short neck (Fig. 134); they bear from ten to

Fig. 134.

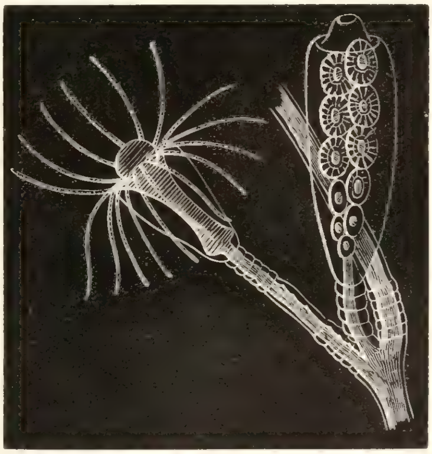
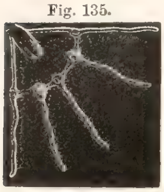


Fig. 134. Portion of stem of Hydrarium of Obelia commissuralis.

twelve and even sixteen Medusæ. The young Medusa (Fig. 135), when hatched, has sixteen tentacles, four chymiferous tubes, a rather long cylindrical digestive cavity, with four labial lobes; there are no ovaries yet developed. I have not found these Medusæ in a more advanced condition, though they become free in the first weeks of July, and are found during the whole summer, as late as September, but in no case were there any ovaries developed. In confinement they do not prosper, and after a few days die, without assuming a different shape from that in which they become free. The tentacles are slender, as long as the diameter of the disk; in two of the tentacles there are large marginal capsules in a swelling on the under side; the re-entering spur of the tentacles is small. There is considerable difference between the Hydrarium of the specimens found at Charleston and those of our coast; the Charleston specimens are uniformly thinner and more slender; it remains yet to be seen whether any further specific differences can be detected in the Medusæ. If Van Beneden's figure of the *Campanularia geniculata* is correct, the European and the American species of Obelia are distinct.

Fig. 135.



Absecom Beach (Leidy); Charleston (McCrady); Buzzard's Bay, Naushon (A. Agassiz); Massachusetts Bay and Grand Manan (Agassiz).

Cat. No. 65, Charleston, S. C., January, 1852, L. Agassiz. Hydromedusarium.

Cat. No. 66, Charleston, S. C., February, 1852, L. Agassiz. Hydromedusarium.

Cat. No. 67, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 68, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 69, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 70, Nahant, Sept. 1861, A. Agassiz. Hydromedusarium.

Cat. No. 71, Grand Manan, Sept. 1857, J. E. Mills. Hydromedusarium.

Cat. No. 72, Nahant, July, 1857, L. Agassiz.

Cat. No. 73, Newport, R. I., Dr. Leidy.

Cat. No. 392, Nahant, July, 1862, A. Agassiz.

Fig. 135. Quarter-disk of the Medusa of Obelia commissuralis.

LAOMEDEA Lamx.

Laomedea Lamx.; in Bull. Soc. Phil. 1812.
Laomedea Agass. Cont. Nat. Hist. U. S., IV. p. 352. 1862.
Campanularia Lamk. (*p. p.*). An. s. Vert., II. p. 129.

Laomedea rigida A. Agass.

This species is remarkable for its peculiar mode of growth. At first glance it would readily be mistaken for a species of Dynamena, so regular is the succession of the hydræ along the stem, and also on account of the absence of branches. The sterile and reproductive hydræ are found on the sides of the main stem, attached by a very short pedicel, and alternate so regularly on each side that its Campanularian nature is noticed only after a careful examination. The sterile hydræ resemble those of *Laomedea amphora*, while the reproductive calycles are identical in shape with those of *Obelia commissuralis*. The main stems of a cluster are closely crowded together, and attain a height of three to four inches.

Cat. No. 122, San Francisco, Cal., December, 1859, A. Agassiz. Hydromedusarium.

Laomedea amphora Agass.

Laomedea amphora Agass. Cont. Nat. Hist. U. S., IV. pp. 311, 314, Fig. 50; p. 352, Pls. 30, 31, Figs. 1–8. 1862.

Massachusetts Bay (Agassiz); Grand Manan (Mills); Long Island Sound (Leidy, A. Agassiz).

Cat. No. 91, Nahant, July, 1852, H. J. Clark. Hydromedusarium.
Cat. No. 92, Nahant, July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 93, Nahant, July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 94, Nahant, March, 1861, H. J. Clark. Hydromedusarium.
Cat. No. 95, Nahant, April, 1855, H. J. Clark. Hydrarium.
Cat. No. 96, Nahant, 1857, L. Agassiz. Hydrarium.
Cat. No. 97, Nahant, March, 1856, H. J. Clark. Hydromedusarium.
Cat. No. 98, Naushon, Sept. 1861, A. Agassiz. Hydromedusarium.
Cat. No. 99, Grand Manan, Aug. 1857, J. E. Mills. Hydromedusarium.
Cat. No. 100, Newport, R. I., S. Powell. Hydromedusarium.
Cat. No. 101, Newport, R. I., Dr. J. Leidy. Hydromedusarium.
Cat. No. 102, Boston, March, 1856, H. J. Clark.
Cat. No. 114, Nahant, Sept. 1854, H. J. Clark. Young ?
Cat. No. 398, Nahant, July, 1862, A. Agassiz.
Museum Diagram No. 18, after L. Agassiz.

Laomedea gigantea A. Agass.

This species of Laomedea, found growing in the brackish water of Charles River, grows to an enormous size, as much as fifteen to twenty inches. It sends off only short branches from the stout principal stem, so that in its general appearance it resembles somewhat *Sertularia cupressina;* the branches, however, are very closely arranged round the main stem; near the extremity we often find, in very large specimens, the branches spreading out somewhat fan-shaped. It can readily be distinguished from its congener, the *L. amphora*, by the shape of the calycles, which are totally different; they are elliptical, flaring but slightly towards the opening, and taper off somewhat suddenly, with a bottle-shaped extremity entirely unlike the calycles of *L. amphora.*

Boston Harbor (H. J. Clark).

Cat. No. 103, Boston, July, 1861, H. J. Clark. Hydromedusarium.

Cat. No. 104, Boston, July, 1861, H. J. Clark. Hydromedusarium.

Cat. No. 105, Boston, July, 1861, H. J. Clark. Hydromedusarium.

Laomedea pacifica A. Agass.

This is another gigantic species closely allied to *Laomedea amphora;* the reproductive calycles are similar in both; the main stem of this species is exceedingly stout; the mode of branching resembles that of *L. gelatinosa.* Specimens of this species have been collected by Dr. Stimpson, of the North Pacific Exploring Expedition under Commodore Rodgers, in Behring's Straits, and in Avatska Bay, Kamtschatka.

Gulf of Georgia, W. T. (A. Agassiz); San Francisco, Cal. (A. Agassiz).

Cat. No. 117, Gulf of Georgia, W. T., June, 1859, A. Agassiz.

Cat. No. 118, San Francisco, Cal., December, 1859, A. Agassiz.

Cat. No. 120, San Francisco, Cal., December, 1859, A. Agassiz. Hydromedusarium.

Family ÆQUORIDÆ Esch. (*rest.* Ag.)

Æquoridæ Esch. (*emend.* Agass.). Syst. d. Acal., p. 108. 1829.
Æquoridæ Agass. Cont. Nat. Hist. U. S., IV. p. 359. 1862.

RHEGMATODES A. Agass.

Rhegmatodes A. Agass.; in Agass. Cont. Nat. Hist. U. S., IV. p. 361. 1862.

Umbrella flat, chymiferous tubes numerous, digestive cavity short, with small lips scarcely fimbriated; the chymiferous tubes extend along the prolongation of the umbrella into the cavity of the bell; large tentacles, somewhat more numerous than the chymiferous tubes, very contractile. To this genus I suppose that Gosse's *Æquorea forbesiana* belongs; it is closely allied to Stomobrachium Brandt (*non* Forbes), and differs from it in not having numerous long marginal tentacles, in the greater number of radiating tubes, and the numerous short lips at the extremity of the digestive cavity. Like Æquorea and Zygodactyla, it has marginal capsules, and the peculiar spur at the base of the large tentacles. Two species of this genus have been noticed on our coast; the one in Florida, bv Professor Agassiz, and the other at Naushon.

Rhegmatodes tenuis A. Agass.

Rhegmatodes tenuis A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 361. 1862.

This is a large species; specimens measuring between three and four inches have frequently been found. The spherosome is thick (Fig. 136) along the polar axis, bulging, in the shape of a rounded obtuse cone,

Fig. 136.

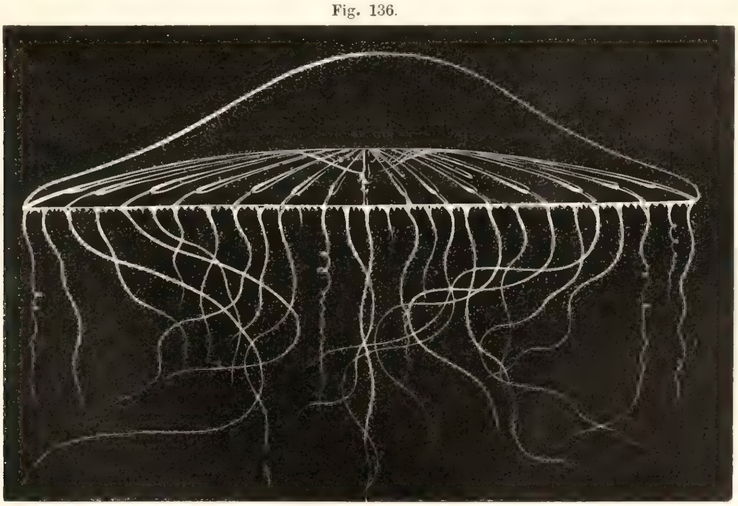
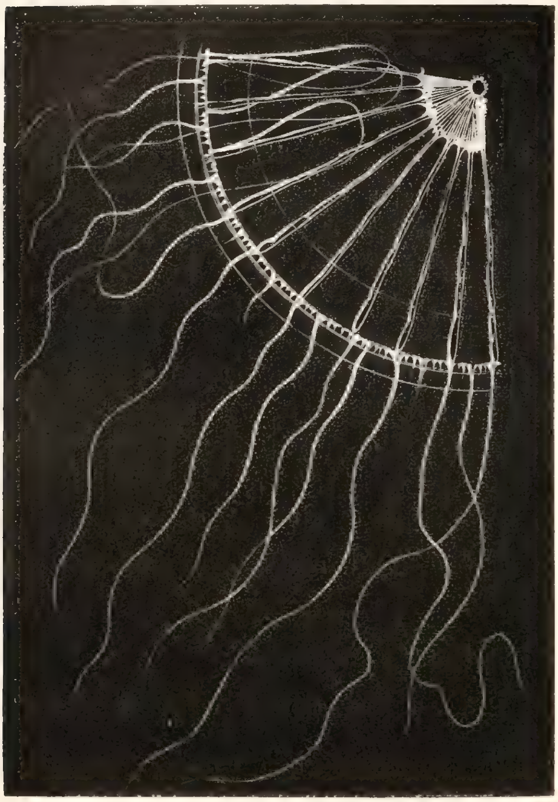


Fig. 136. A profile view, natural size, of Rhegmatodes tenuis.

into the interior cavity; the chymiferous tubes extending nearly to the apex, leaving but a short digestive cavity, the edges of which scarcely meet (Fig. 137), so that, when the actinostome is closed, the lips resemble a piece of catgut tied by a string close to the end; the marginal tentacles are long, generally carried extended, and when contracted twist only two or three times, and are not carried tightly curled, as in Zygodactyla; the ovaries are very narrow, and extend almost the whole length of the chymiferous tubes, from the upper margin of the digestive cavity, to about one tenth the length of the radiating tube from the circular tube; the ovaries hang down in two masses on each side of the chymiferous tubes; there is no connection between the two pouches, except near their point of attachment, where they unite again.

Fig. 137.



Younger specimens, measuring about one and a half to two inches, and not having more than sixteen to twenty-four chymiferous tubes, resemble Stomobrachium; they differ, however, in the small number of tentacles. The marginal capsules are large, elliptical; the granules placed far apart, two in each (*c*, Fig. 138); the tentacles taper rapidly from the base (*t*, Fig. 138), the walls are thin, the lasso cells scattered irregularly over the whole surface. At the base of the large tentacles we find a very prominent projection (*s*, Fig. 138), in the shape of a small tentacle opening into the circular tube; it is not exactly a spur, as in Lafœa; it develops only after the rudimentary tentacles, being a button scarcely to be recognized when the tentacle is already quite well formed; there are usually only rudimentary tenta-

Fig. 138.

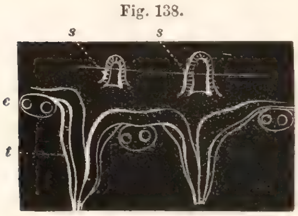


Fig. 137. Quarter of the disk of Fig. 136, seen from the actinal side.

Fig. 138. A magnified portion of the circular canal, showing the position of the spur of the tentacles, *s*, *s*, and of the marginal capsules, *c*, between the tentacles, *t*.

cles between the chymiferous tubes, except one large tentacle in the middle of the space; there is always one marginal capsule between the adjoining tentacles. These Medusæ are slow in their movements, allowing themselves to be carried along with the current, after one or two pulsations; they swim near the surface. Found at Naushon in September.

Buzzard's Bay, Naushon (A. Agassiz).

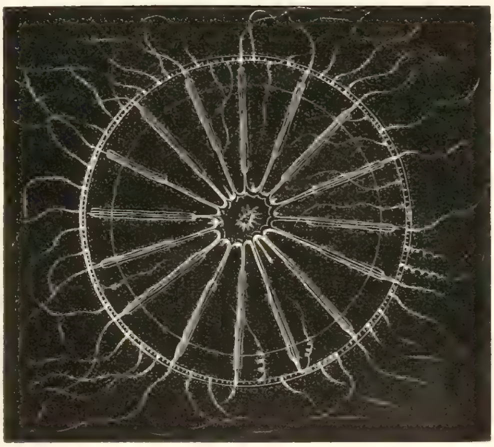
Cat. No. 278, Naushon, September, 1861, A. Agassiz. Medusa.

Rhegmatodes floridanus Agass.

Rhegmatodes floridanus Agass. Cont. Nat. Hist. U. S., IV. p. 361. 1862.

A second species of this genus (Fig. 139) is found along the Florida Reefs. It resembles the young of the northern species at the time when it has from sixteen to twenty-four chymiferous tubes; the part of the gelatinous disk which projects into the interior cavity of the bell is larger, giving the spherosome a somewhat heavy look; the fringes of the actinostome are longer; the ovaries are confined to a small part of the chymiferous tubes, and do not begin at the point of junction of their upper extremity, but a short distance from it; the circular tube is large; in specimens having sixteen chymiferous tubes, there were forty marginal tentacles; in specimens having twenty, there were sixty. This species is much smaller than its northern representative, specimens having already sixteen chymiferous tubes not being more than an inch in diameter; while specimens of the northern species, which have attained the same development, measure about two inches. The marginal capsules contain two to three granules each.

Fig. 139.



Additional chymiferous tubes in the Æquoridæ are developed from the digestive cavity, as has already been shown by Kölliker, and not from the vertical tube, as is the case in the branching tubes of Willia. They are at first simple short sacs, which gradually extend in length till they become long tubes, opening into the circular tube; the chymiferous tubes and the marginal tentacles are not developed with equal regularity, in the order of their cycles; the chymiferous tubes especially are very irregularly formed, and nothing is more common

Fig. 139. Rhegmatodes floridanus, natural size.

than to find specimens having twenty or twenty-two chymiferous tubes, instead of the normal number. The same is the case in the order of development of the chymiferous tubes of Zygodactyla, and the other Æquoridæ which I have had occasion to observe. The tubes are frequently added all on one side of the spherosome, and will be nearly fully formed before they begin to be developed in the other half. The specimens observed of this species are evidently not full-grown, as the ovaries were but imperfectly developed.

Key West, Florida (L. Agassiz).

STOMOBRACHIUM Brandt.

Stomobrachium Br. (*non* Forbes). Prod.; in Mém. Acad. St. Petersb., p. 220. 1835.
Stomobrachium Less. Zooph. Acal., p. 315. 1843.
Stomobrachium Agass. Cont. Nat. Hist. U. S., IV. p. 361. 1862.

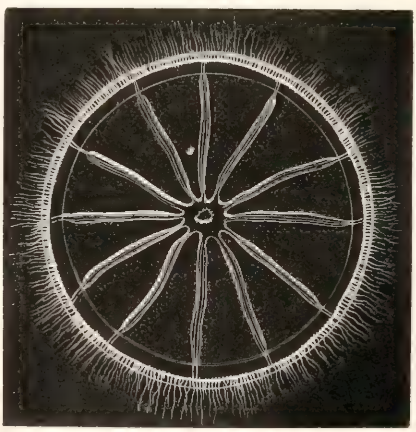
Stomobrachium tentaculatum Agass.

Stomobrachium tentaculatum Agass. Cont. Nat. Hist. U. S., IV. p. 361. 1862.
Stomobrachium lenticulare Gould (*non* Br.). Rep. Inv. Mass., p. 349. 1841.
? *Medusa bimorpha* Fab. Fauna Grönlandica, No. 356. 1781.

This species is occasionally found at Nahant during July. It has twelve chymiferous tubes, a small digestive cavity, the folds of the actinostome hanging down in four lobes, placed at right angles to one another; these lobes are triangular (Fig. 140), the apex of the triangle

Fig. 140.

Fig. 141.



being placed nearer the origin of the chymiferous tubes; the edges are frilled; the trend of the triangles is in the direction of four of the chymiferous tubes. Between each two of the chymiferous tubes (Fig. 141) there are from thirty to forty tentacles, in all stages of

Fig. 140. The actinostome of Stomobrachium tentaculatum, magnified to show the peculiar mode of carrying the folds of the digestive cavity.

Fig. 141. Stomobrachium tentaculatum, seen from the abactinal pole; natural size.

development; they are not capable of great expansion, and when shortened, the extremities are curled up. The ovaries, which are linear, extend along the chymiferous tubes in such a way as to leave both the actinal and abactinal extremities free (Fig. 142); the spherosome increases very gradually in thickness from the circular tube towards the abactinal pole. This species differs from the *S. lenticulare* of the Falkland Islands, in having a smaller free area, longer chymiferous tubes, and more numerous tentacles; it grows from one and a half to two inches in diameter, and half an inch in height, is sluggish in its movements, is colorless, and has a gelatinous disk of considerable consistency. These Medusæ are frequently found thrown up on the sandy beaches, encased in sand in such a way as to be preserved from decomposition and loss of shape for several days. This may explain the mode in which the few fossil Medusæ known have been formed.

Fig. 142.

Massachusetts Bay, Nahant (L. Agassiz).

HALOPSIS A. Agass.

Halopsis A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 219. 1863.

The genera Berenix and Carisochroma have been placed by Professor Agassiz among the Williadæ on account of their forking chymiferous tubes. The discovery of Halopsis shows this association to be unnatural, and that most probably, when the genera Berenix and Carisochroma are better known, they will be associated with Halopsis into a distinct family, the Berinicidæ of Eschscholtz. Whatever may be the result, it is at least highly probable that their closer relations are with the Æquoridæ, and not with the Tubularian family of the Williadæ.

Halopsis ocellata A. Agass.

Halopsis ocellata A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 219. 1863.

The genus Halopsis differs from the other Æquoridæ by the presence of large compound eyes, as in Tiaropsis, from three to six between every two of the chymiferous tubes. There are likewise long tentacular cirri; the flatness of the disk, the large number of tentacles, the nature of the digestive cavity and of the genital organs, place this genus among the Æquoridæ. Two species are found on our coast,

Fig. 142. The same as Fig. 141, seen in profile.

which are so closely allied that, were not the complete history of their earlier stages known, they would readily have been mistaken for different ages of the same species.

Fig. 143.

The first species, *Halopsis ocellata,* would at first glance be taken for a Stomobrachium; on examination we find that the chymiferous tubes take their origin in clusters of three to five (in adults), radiating, like the spokes of a fan (Fig. 143), from a large cross-shaped cavity (Fig. 144), from which hangs down a short digestive cavity, terminating in four lips. When seen in profile, the disk is quite flat, regularly arched, the genital organs extend nearly to the circular tube (Fig. 145), occupying almost the whole length of the chymiferous tubes. The tentacles are very numerous, and capable of great expansion and contraction (Figs. 143, 145); there are as many tentacular cirri as tentacles (*c*, Fig. 146); they are long, slender, of uniform diameter; the main tentacles (*t*, *t*, Fig. 146) bulge out prominently immediately at the circular tube, tapering very rapidly. The compound eyes are large (*e*, Fig. 146); the granules in them are arranged in two rows, from six to seven in each row (Fig. 147); the structure of these compound eyes is similar to those of Tiaropsis. These Medusæ are exceedingly sluggish in their movements; they are colorless, the genital organs having a slight grayish tinge at the time of spawning. Found at Nahant, from July to September, quite commonly. In young specimens, measuring not more than an inch in diameter, there are only four chymiferous tubes (Fig. 148), uniting in the form of a cross; there are no signs of genital organs; the shape of the disk is somewhat more hemispherical than in the

Fig. 144.

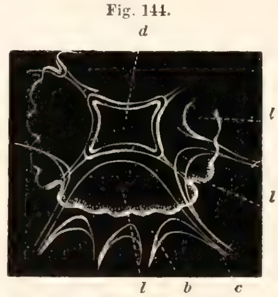


Fig. 145.

Fig. 143. Portion of the disk of Halopsis ocellata, seen from the abactinal pole, somewhat reduced.

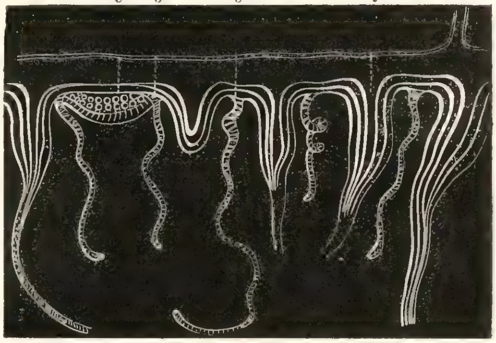
Fig. 144. Cavity from which the chymiferous tubes radiate. *d*, opening of actinostome; *c*, chymiferous tube; *b*, connecting fold between the point of attachment of two chymiferous tubes; *l*, lips of actinostome.

Fig. 145. Profile of Halopsis ocellata; natural size.

adult. Specimens measuring an inch and a half in diameter have as many as twelve chymiferous tubes, the cavity from which the tubes originate being irregularly shaped; it is not till the Medusa measures from two to two and a half inches in diameter, that it takes the regular star-shaped form of Fig. 143; it is then also that the genital organs first appear, like threads on each side of the tubes. Additional chymiferous tubes are formed quite irregularly as diverticula sent off from the digestive pouch, as in other Æquoridæ. It is quite a common thing in this species to have two actinostomes, in specimens where the central cavity is very elongated and irregular in outline, a beginning, perhaps, of a transverse fission similar to that observed by Kölliker in Stomobrachium, but which I have never noticed in our species. In a still younger Medusa (Fig. 149), not measuring more than a fifth of an inch in height, and which I suppose to be the young of this species (it cannot be the young of *Tiaropsis diademata;* see the drawings of the young of that species), we find already four eyes between

Fig. 146.

e c c t



c t

Fig. 149.

Fig. 147.

Fig. 148.

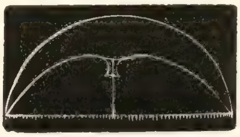
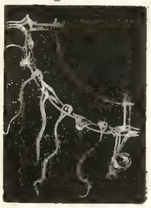


Fig. 150.



two of the chymiferous tubes (Fig. 150), but having only two to three granules in each, one large tentacle at the base of the chymiferous tubes, one in the middle, and rudimentary tentacles of the third set in the intermediate spaces; on each side of these rudimentary tentacles are long cirri; there are no ovaries. It is interesting to see that among the Æquoridæ, the flattest of our Medusæ, the young have a deep bell (Fig. 149), which becomes gradually shallower, as in the other Campanularians. The deep bell of the young Halopsis is totally different from the other form of young Æquorea figured hereafter, which resembles

Fig. 146. Magnified part of circular tube. *c*, tentacular cirri; *e*, compound eye; *t*, main tentacles.

Fig. 147. Magnified view of one of the eyes, to show arrangement of granules.

Fig. 148. Young Halopsis ocellata, natural size.

Fig. 149. Young Halopsis ocellata, a fifth of an inch in height.

Fig. 150. Magnified portion of circular tube of Fig. 149. *c, c, c, c*, cirri; at base of each is placed an eye.

more a Eucope. This may eventually show us two modes of development among the Æquoridæ into forms, forming groups corresponding to those of the Oceanidæ and Eucopidæ as here limited, in one of which the young Medusa has a deep bell and few tentacles, as in Clytia and Oceania, while in the other group they have, when hatched from the reproductive calycles, a flat disk and many tentacles, as in Eucope and Obelia.

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 364, Nahant, August, 1862, A. Agassiz. Medusa.

Cat. No. 375, Nahant, 1863, A. Agassiz. Medusa.

Halopsis cruciata A. Agass.

During the early part of the summer there is frequently found a Medusa, at first supposed to be the young of *Halopsis ocellata;* a comparison of the size, the character of the genital organs, and the number of tentacles, shows this to be impossible. *H. cruciata* never grows to more than one and a half to two inches in diameter. The tentacles are much less numerous (Fig. 151), the genital organs are lobed pouches, hanging down in folds from the chymiferous tubes; there are only three compound eyes between every two of the chymiferous tubes; these three eyes are already present in the youngest Medusæ observed, which measure hardly half an inch in diameter, and in which the genital organs are already well developed, while in the young of *H. ocellata,* in specimens measuring nearly two inches, and having as many as twelve chymiferous tubes, we find no trace of them. The bell of these young Medusæ is very high; the eyes differ from those of *H. ocellata,* having only four or five granules arranged in a single row; the tentacular cirri and the large tentacles are essentially the same in both species; the spermaries of the males are quite slender and more linear, compared to the heavily filled, convoluted genital pouches of the females. The genital organs are of a light pink color, as well as the bell.

Fig. 151.

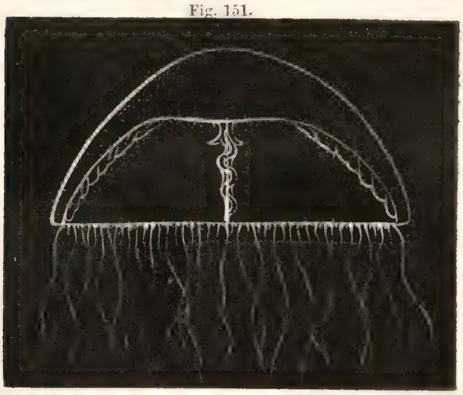


Fig. 152.

Fig. 151. A profile view, somewhat magnified, of Halopsis crucia

Fig. 152. A natural attitude of the same species; both females.

May not the *T. gibbosa* of Forbes be a young Halopsis? They resemble the young of this species; also *T. globosa*, and perhaps *T. pilosella.* We have here again one of those ever-returning questions of the generic identity or difference of species, showing great structural differences, such as we find between these two species; the discovery of the Hydrarium will settle the point. *H. cruciata,* with its high bell (Figs. 151, 152), its four chymiferous tubes, the nature of its compound eyes, and its habits, would seem to be associated with Tiaropsis, among the Oceanidæ; while the tentacular cirri and the arrangement of the compound eyes place it in the closest relationship to *H. ocellata.*

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 374, Nahant, 1863, A. Agassiz. Medusæ.

Cat. No. 379, Nahant, June, 1862, A. Agassiz. Medusæ.

Cat. No. 445, Nahant, June, 1864, A. Agassiz. Medusæ.

ZYGODACTYLA Brandt.

Zygodactyla Br. Prod.; in Mém. Acad. St. Petersburg, p. 221. 1835.
Rhacostoma Agass.; in Proc. Bost. Soc. Nat. Hist., III. p. 342. 1850.

Zygodactyla groenlandica Agass.

Zygodactyla groenlandica Agass. Cont. Nat. Hist. U. S., IV. p. 360. 1862.
Æquorea groenlandica Pér. et Les.; in Ann. du Mus., XIV. p. 27. 1809.
Medusa æquorea Fab. Fauna Groenlandica. No. 357. 1780.
Rhacostoma atlanticum Agass.; in Proc. Bost. Soc. Nat. Hist., III. p. 342. 1862.
Æquorea globularis Mörch.; in Besk. af Grönland, p. 96. 1857.
Æquorea groenlandica Less. Zooph. Acal., p. 313. 1843.

This species, of which a short description was given by Professor Agassiz in the Proceedings of the Boston Society of Natural History for 1850, who supposed it to be an undescribed species, is one of the largest of our naked-eyed Medusæ. It is not uncommon to find specimens measuring as much as fifteen inches in diameter when fully extended. There are in full-grown specimens from eighty to a hundred chymiferous tubes (Fig. 153), with three and even four long retractile marginal tentacles between every two chymiferous tubes; the pendent membrane, which forms the digestive cavity, is very contractile, having a circular opening, with short lips and fimbriated edges, corresponding to the chymiferous tubes, which appear to be hardly long enough, when expanded (Fig. 153), to close up the edges, while at other times the lips of the actinostome hang down far below the level of the circular canal, like a sheaf (Fig. 154), and at other times the lips hang down loosely from what seems a small opening, or flare out so as to measure five or six times the diameter of their base. The chymiferous tubes extend a short distance down the bulging part of the spherosome, the free space left in the centre

Fig. 153.

having a radius of about one third that of the spherosome itself. The lips of the actinostome are formed by the folding of the membrane of the digestive cavity along the direction of the radius; as the membrane becomes more and more fimbriated, the fold becomes deeper and deeper, and projects beyond the general outline, like an exceedingly delicate frill. The tentacles at the base are swollen, taper very suddenly, are hollow (Fig. 155), the walls of the tentacles are thin, and the lasso cells are arranged irregularly over the whole surface in small clusters. At the base of each of the large tentacles there is a small hollow spur (*s*, Fig. 155) projecting inward, the walls of which are thick, and made up of large cells; the rudimentary tentacles are swollen at the extremity, and the spur is not developed until the lash of the tentacle becomes apparent; the marginal capsules are large, ellipsoid, with two large granules in each. In young specimens of Zygodactyla, not having more than forty large chymiferous tubes reaching to the margin, we find the other tubes but slightly developed, two or three sometimes between each of the larger tubes extending from the upper edge of the digestive cavity to various distances from it;

Fig. 154.

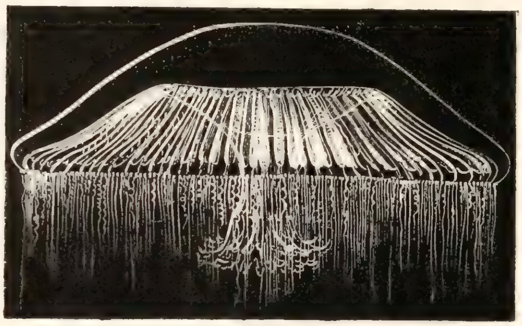


Fig. 155.

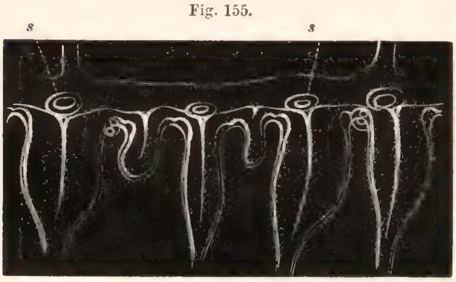


Fig. 153. Abactinal view of Zygodactyla groenlandica.
Fig. 154. Profile view of Fig. 153, half natural size.
Fig. 155. Portion of the circular tube, showing the mode of development of the marginal tentacles. *s*, spur of marginal tentacles.

these rudimentary tubes are mere threads, running a short distance, and then suddenly terminating, or tapering gradually to a point. In the latter part of June, or early in July, the Zygodactylæ are all in this condition, while later in the season, in August and the latter part of September, they attain their full size, all the chymiferous tubes being about equally developed. The lips of the actinostome are so readily movable that the outline of its edge will assume the most varied shapes, the opening being either concentric and perfectly circular, or else thrown entirely to one side, or assuming a pear-shaped form, closing at another time like the actinostome of an Actinia, and then suddenly spreading into a pentagonal opening; or the membrane of the digestive cavity is expanded to its fullest capacity, extending far below the circular tube, and leaving but a very small elliptical actinostome, from which a sheaf of long, slender, highly fimbriated, lanceolate lips are suspended.

Notwithstanding the facility with which this species is kept alive, I have never succeeded in raising the eggs, as is so easily done with Tima and Melicertum, and can therefore add nothing to the observations of Wright on the Hydrarium of *Æquorea vitrina.*

Among the numerous young Eucopidæ, daily examined, are frequently found exceedingly small Medusæ, not larger than the head of a pin, which I suppose to be the young of Zygodactyla. They resemble the Eucopidæ, but differ in having rather more slender tentacles, and a very peculiar gelatinous projection of the disk, at the base of which are situated four round genital organs (Fig. 156); there are four chymiferous tubes opening into a large cavity, leading into a slightly pendent stomach, exactly as would be the case in a Zygodactyla, if we were to reduce the chymiferous tubes to four, and make the genital organs round. The youngest Medusæ have already twenty-four tentacles, and the next size, scarcely larger, forty-eight; from this large number of tentacles, as well as the peculiar projection of the gelatinous disk, and the large cavity from which the chymiferous tubes take their origin, I have but little doubt that they are the young of Æquoridæ, probably of our Zygodactyla. The small size of these Medusæ, coupled with their habit of living at the bottom, till late in the fall, when they make their appearance as full-grown Medusæ, will readily account for their having escaped our notice thus far. These young Æquoridæ are quite common early in June; their further development could not be traced, as they do not thrive in confinement.

Fig. 156.

Fig. 156. Young Zygodactyla, greatly magnified.

Greenland (Fabricius); Maine, and Massachusetts Bay (L. Agassiz); Naushon (A. Agassiz).

Cat. No. 277, Naushon, September, 1861, Alex. Agassiz. Medusa.

Zygodactyla crassa A. Agass.

This species, which grows to almost as large a size as *Zygodactyla groenlandica,* can be recognized at first glance by the small number and great size of the genital organs; there are not more than thirty-two chymiferous tubes (Fig. 158) in a Medusa measuring ten inches in diameter, while in a specimen of *Z. groenlandica* of the same size we should find at least eighty to ninety; the ovaries have an extraordinary development, and bulge out at the time of spawning fully as much as the ovaries of Melicertum, hanging very much in the same manner from the chymiferous tubes (Fig. 157); the radius of the digestive cavity is larger; the number of lips of the actinostome corresponds to that of the radiating tubes (Fig. 158); the digestive cavity is far less capable of expansion and contraction than in *Z. groenlandica;* the marginal tentacles are much heavier and more massive; the color of the base is slightly greenish-blue, as well as the genital organs; the latter have a rather more yellowish hue. Found at

Fig. 157.

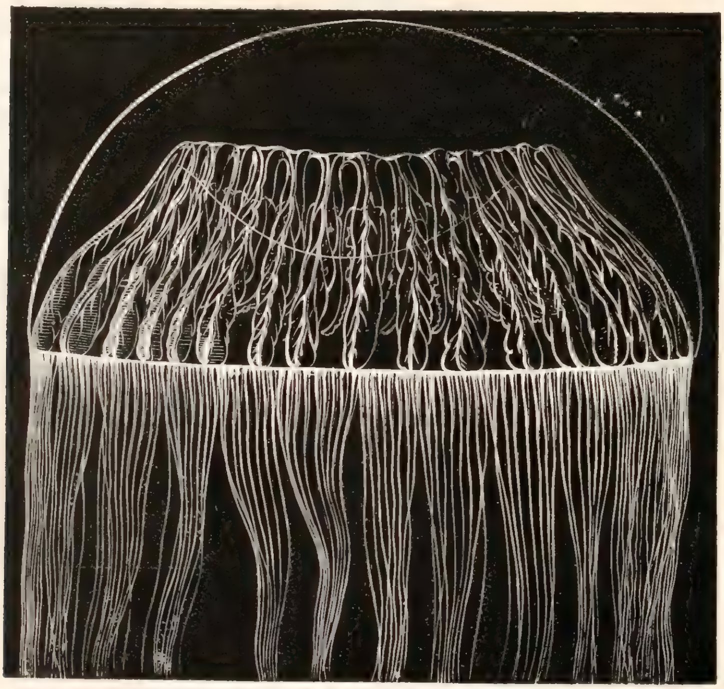
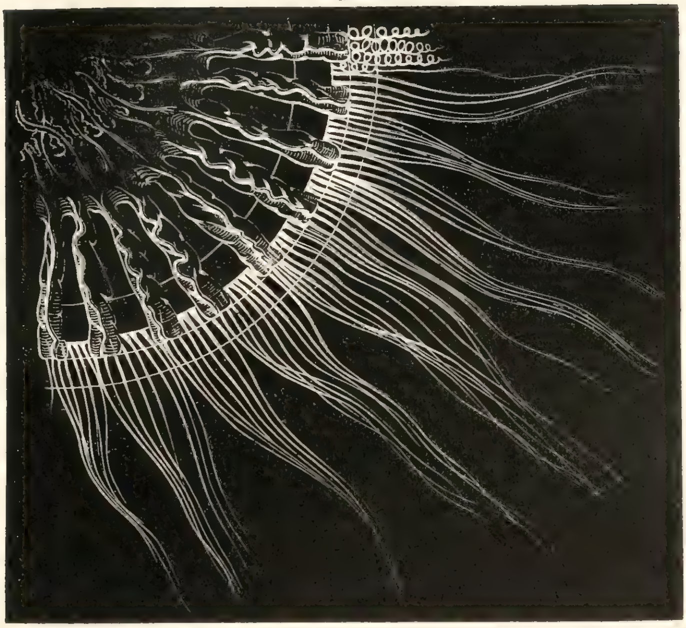


Fig. 157. Profile view of Zygodactyla crassa, somewhat reduced in size.

Fig. 158.



Nahant, in company with the *Z. groenlandica.* The color of the males is somewhat more pinkish than that of the females.

Massachusetts Bay, Nahant (A. Agassiz).

Zygodactyla cyanea Agass.

Zygodactyla cyanea Agass. Cont. Nat. Hist. U. S., IV. p. 361. 1862.

Fig. 159.

This species is of a light-blue color; can readily be distinguished from *Z. groenlandica* by the great thickness of the spherosome, and the large digestive cavity; the actinostome is bordered by a number of very small and finely fimbriated lips (Fig. 159); the chymiferous tubes do not curve down and extend along the projection of the spherosome in the inner cavity of the bell; at their highest point they empty into the digestive cavity, the radius of which is more than one half that of the spherosome itself, leaving but a short space between the abactinal edge of the digestive cavity and the circular tube; the chymiferous tubes are numerous, ninety to a hundred, usually placed opposite a long and exceedingly contractile tentacle; these are generally

Fig. 158. Quarter of the disk of Z. crassa.

Fig. 159. Portion of the disk of Zygodactyla cyanea, from the abactinal pole.

carried curled tightly to the edge of the disk. Found in great numbers, from February to May, along the Florida Reef.

Florida, Key West (L. Agassiz).

Cat. No. 349, Florida, L. Agassiz. Medusa.

Cat. No. 350, Tortugas, Fla., May, 1858, L. Agassiz. Medusa.

Zygodactyla cœrulescens Br.

Zygodactyla cœrulescens Br.; in Mém. Acad. St. Petersb., p. 360, Pl. 5. 1838.
Zygodactyla cœrulescens Agass. Cont. Nat. Hist. U. S., IV. p. 360. 1862.
Mesonema cœrulescens Br.; in Mém. Acad. St. Petersb., p. 360. 1838.
Mesonema cœrulescens Less. Zooph. Acal., p. 307. 1843.

Entrance of Straits of Fuca (A. Agassiz).

CREMATOSTOMA A. Agass.

Crematostoma A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 360. 1862.

The genera of Æquoridæ found on the Pacific coast are either identical with those of our coast, or have representatives which give to the members of that family found on the two sides of the continent a striking similarity. Stomobrachium, Zygodactyla, and Æquorea are found both in the Atlantic and Pacific; we have Rhegmatodes, which has as yet no representative on the Pacific coast of North America, while Crematostoma has not been found on the Atlantic side.

This genus recalls Zygodactyla, in having a large digestive cavity; it is, however, much less contractile than in that genus, and hangs always far below the level of the circular tube. The actinostome, as in Zygodactyla, is surrounded by a number of narrow, lanceolate, fimbriated lips, one for each chymiferous tube, which are from sixty to eighty in number.

Crematostoma flava A. Agass.

Crematostoma flava A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 360. 1862.

The lower part of the digestive cavity, immediately above the actinostome, is alone capable of considerable contraction, the digestive cavity hanging down like a large cylindrical sac, with numerous longitudinal folds extending from the origin of the chymiferous tubes along the whole length of the sac to the actinostome. The chymiferous tubes are broad, extending a short distance along the projection of the spherosome into the cavity of the bell. The ovaries extend the whole length of the chymiferous tubes, they are linear (Fig. 159[a]); opposite each of the chymiferous tubes there is one large tentacle, very contractile, with a slight swelling at the base; between the chymiferous tubes, one smaller tentacle and marginal capsules; the chymiferous tubes, near the base of the digestive cavity, anastomose frequently; the section of the spherosome resembles that of Zygodactyla more than any other genus of the family. The disk increases rapidly from the circular tube, and remains then of the same thickness to the base of the projection of the disk in the inner cavity; here the outline of the inner bell suddenly curves down, and projects like a spherical segment, nearly hemispherical, in the cavity of the bell, the outline of the outer bell having a slight constriction at this point, and from there curving gradually to the abactinal pole. From three to four inches in diameter; specimens one and a half inches high, measured three and a half inches in diameter.

Fig. 159[a].

Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 123, Gulf of Georgia, W. T., June, 1859, A. Agassiz. Medusa.

ÆQUOREA Pér. et Les.

Æquorea Pér. et Les.; in Ann. du Mus., p. 22. 1809.
Æquorea Less. (*p. p.*). Zooph. Acal., p. 305. 1843.
Æquorea Agass. Cont. Nat. Hist. U. S., IV. p. 359. 1862.

Æquorea ciliata Esch.

Æquorea ciliata Esch. Syst. der Acal., p. 109, Pl. 9, Fig. 1. 1829.
Æquorea ciliata Agass. Cont. Nat. Hist. U. S., IV. p. 359. 1862.
Æquorea ciliata Less. Zooph. Acal., p. 306. 1843.

Northwest Coast of North America, Lat. 41° to 51° N. (Eschscholtz); Straits of Fuca (A. Agassiz).

Fig. 159[a]. Crematostoma flava A. Agass.

Æquorea albida A. Agass.

Æquorea albida A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 359. 1862.

The genus Æquorea, as generally received, includes species which have been separated from it, under the name of Zygodactyla, by Brandt, and to which the *Æquorea vitrina* of Gosse also belongs. The long pendent membrane of the digestive cavity, with the actinostome surrounded with numerous lanceolate and strongly fimbriated folds, at once distinguishes this genus from Rhegmatodes, which includes such species as *Rhegmatodes tenuis* and *floridanus*, and the *Æquorea forbesiana* of Gosse, in which the chymiferous tubes are not numerous, the tentacles few in number, and the digestive cavity not capable of extension as in Zygodactyla, the lips of the actinostome being short and simple folds. Æquorea is distinguished from both these genera by having a greater number of chymiferous tubes, the ovaries extending for their whole length, from the circular tube to the membrane of the digestive cavity. The tentacles are numerous, the spurs at the base of the large tentacles being more closely connected with them than in the other genera of this family. The actinostome is a simple opening, without appendages such as we find in Zygodactyla, Stomobrachium, and others, having only slight indentations formed along its margin, giving the opening a somewhat polygonal shape (Fig. 160); and when entirely closed, the edges of the actinostome meet, forming a slight button. The spherosome has a slight indentation near the abactinal pole, the bell diminishing very gradually in thickness towards the circular tube (Fig. 161); the gelatinous disk hardly projects into the cavity of the bell; the chymiferous tubes run into the digestive cavity at their highest point, the radius of the digestive cavity being about one third that of the spherosome; the chymiferous tubes are narrow, there are three or four marginal tentacles between every two chymiferous tubes, and two or three

Fig. 160.

Fig. 161.

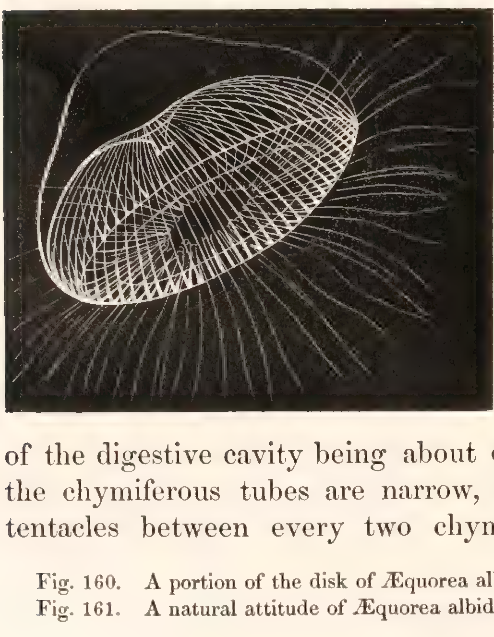
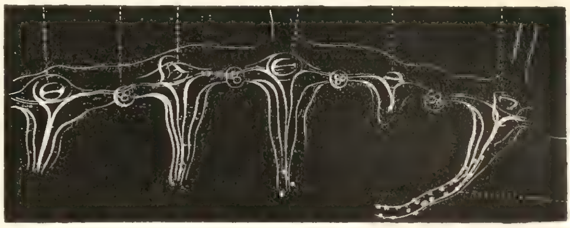


Fig. 160. A portion of the disk of Æquorea albida, from the abactinal pole.
Fig. 161. A natural attitude of Æquorea albida.

marginal capsules, two for every large tentacle, between the tubes, in each of which there are from three to four granules arranged in a cluster in the centre; the capsules are perfectly spherical (*c*, Fig. 162); the walls of the tentacles taper very gradually from the circular tube, the swelling has but little prominence, and the pigment cells at their base are not numerous, scarcely coloring it; the lasso cells are arranged in small knobs, scattered, at some distance from one another, all over the surface of the tentacles; the spur of the tentacles (*s*, Fig. 162) is placed directly opposite the large tentacle on the other side of the circular tube; the walls of this spur are thick, and its hollow space appears like a small elliptical opening when seen from above; the undeveloped tentacles are solid conical protuberances, from which the cavity of the tentacle is little by little hollowed out; the tentacles are usually carried tightly twisted like a corkscrew; when in motion, the tentacles are fully expanded, then bent at right angles and drawn inside the veil and slowly thrown out, the tentacles almost closing the opening of the cavity of the bell, giving these Medusæ the appearance of having numerous long tentacles (Fig. 161) arising from a small circular tube, the chymiferous tubes and the tentacles in their prolongation making almost a complete sphere. Specimens from one to two and a half inches in diameter were taken at Naushon during September.

Fig. 162.



Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 279, Naushon, Mass., Sept. 1861, A. Agassiz. Medusa.

Fig. 162. Magnified view of part of the marginal tube. *c*, capsule; *s*, spur of the tentacles, *t*.

Family GERYONOPSIDÆ Agass.

Geryonopsidæ Agass. Cont. Nat. Hist. U. S., IV. p. 362. 1862.
Geryonidæ Esch. (*p. p.*). Syst. der Acal., p. 86. 1829.

EIRENE Esch.

Eirene Esch. Syst. der Acal., p. 94. 1829.
Geryonopsis Forbes. Naked-eyed Medusæ, p. 39. 1848.
Phortis McCr. Gymn. Charl. Harb., p. 90.
Eirene Agass. Cont. Nat. Hist. U. S., IV. p. 362. 1862.

Eirene gibbosa Agass.

Eirene gibbosa Agass. Cont. Nat. Hist. U. S., IV. p. 362. 1862.
Phortis gibbosa McCr. Gymn. Charl. Harb., p. 91.

Charleston Harbor (McCrady).

Eirene cœrulea Agass.

Eirene cœrulea Agass. Cont. Nat. Hist. U. S., IV. p. 362. 1862.

The spherosome increases rapidly in thickness from the circular tube to the peduncle, which tapers quickly, and when fully expanded does not reach much beyond the level of the veil (Fig. 163); the ovaries are linear, slightly convoluted, do not extend the whole length of the chymiferous tubes, but begin about half-way up, between the circular tube and the base of the peduncle, extending close to the digestive sac, which is terminated by four short lips with slightly fimbriated edges; the outline of the spherosome is hemispherical; the tentacles are numerous, in the largest specimens measuring an inch and a quarter across the disk, and an inch in height; there were as many as thirty to thirty-five short tentacles between every two chymiferous tubes; the gelatinous disk has a slight tinge of blue. Found at Key West and the Tortugas in April.

Fig. 163.

Florida, Key West (L. Agassiz).

Fig. 163. Eirene cœrulea.

TIMA Esch.

Tima Esch. Syst. der Acal., p. 103. 1829.
Eirene Esch. (*p. p.*). Syst. der Acal., p. 94. 1829.
Dianœa Delle Ch. Mem. sulla Storia e Notomia. 1823–29.
Tima Less. Zooph. Acal., p. 333. 1843.
Tima Agass. Cont. Nat. Hist. U. S., IV. p. 362. 1862.

Tima formosa Agass.

Tima formosa Agass. Cont. Nat. Hist. U. S., IV. p. 362. 1862.

Spherosome greater than a hemisphere, with edges slightly receding from the polar axis, near the circular tube. The disk increases in thickness very gradually to the bend of the chymiferous tubes (Fig. 164), where the gelatinous disk extends in a broad cone, slowly diminishing in diameter, till it reaches somewhat beyond the level of the veil. This peduncle is contractile, extending at times the diameter of the inner cavity of the bell beyond the circular tube; the sexual organs

Fig. 164.

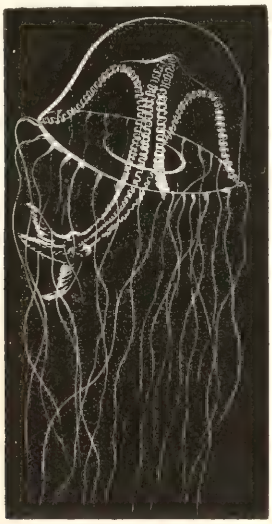


Fig. 165.

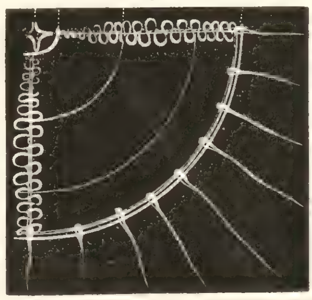
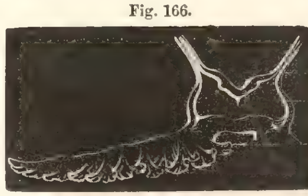


Fig. 166.



extend from the circular tube (Fig. 165) the whole length of the chymiferous tubes, and nearly to the end of the peduncle; the four chymiferous tubes open into a short digestive cavity (*c*, Fig. 166); the actinostome is surrounded by four very slender, long, lanceolate, fimbriated lips. (*l*, Fig. 166.) There are thirty-two long contractile tentacles, seven between every two chymiferous tubes, and one opposite each tube; the ovaries consist of series of little pouches hanging down on

Fig. 164. Tima formosa, half natural size.
Fig. 165. Quarter-disk, from the abactinal pole; natural size.
Fig. 166. Digestive cavity and actinostome. *t*, termination of chymiferous tube; *c*, digestive cavity; *l*, one of the four fimbriated lips of the actinostome.

Fig. 167.

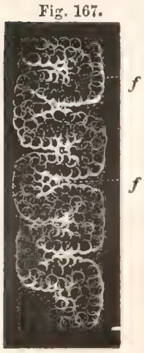
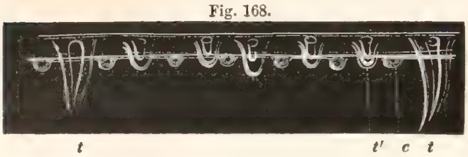


Fig. 168.



both sides of the chymiferous tubes (Fig. 167); the tentacles have a very prominent pouch, strongly compressed laterally, at the point of junction with the marginal tubes; between the larger principal tentacles (*t*, Fig. 168) we find a number of small pouches, rudimentary tentacles (*t'*, Fig. 168), which are never developed fully, yet appear to be included in the regular cycle of tentacles, to judge from the number we find at different stages of growth; between the smaller tentacles we find marginal capsules (*c*, Fig. 168), with four to five granules arranged near the periphery; the circular tube is large and very prominent; the spherosome is perfectly colorless, but the ovaries, as well as the base of the tentacles, are of a beautiful milky white, which makes these Jellyfishes a very prominent object in the water; they do not come near the surface, but remain usually four or five feet below; they are found during the whole year, adult specimens having been taken in June, October, December, and March. The young Medusa (Fig. 169) differs widely from the adult; there are no ovaries in specimens measuring more than an inch in diameter; the chymiferous tubes extend along the short proboscis (*t*, Fig. 170), opening into a digestive cavity, *d*, which terminates with four rather simple lips, more like the actinostome of a Lafœa; there are but three large marginal tentacles between adjoining chymiferous tubes, and no signs of any further cycles of tentacles in

Fig. 169.

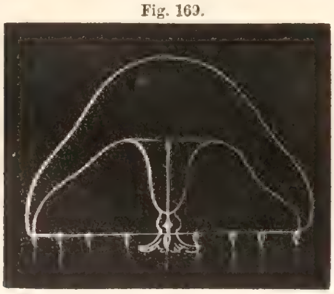
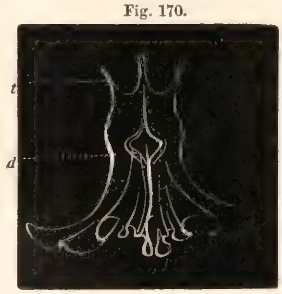


Fig. 170.



the specimen figured here; marginal capsules were likewise not yet developed. The young Medusa of Tima is another case to be added to Melicertum, Lafœa, and Atractylis, where there are no marginal

Fig. 167. Portion of the ovary. *f*, *f*, lobes running on either side of the chymiferous tubes.

Fig. 168. A magnified portion of the circular tube. *t*, *t*, principal tentacles; *t'*, rudimentary tentacles; *c*, marginal capsules.

Fig. 169. Young Tima formosa, natural size.

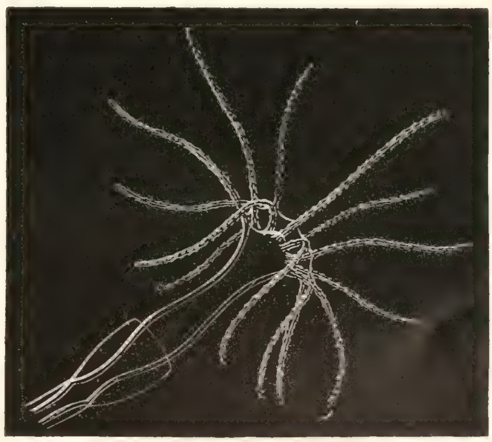
Fig. 170. Digestive cavity of Fig. 169. *t*, termination of chymiferous tubes; *d*, digestive cavity.

capsules along the circular tube, and yet these Medusæ have all been traced to a Campanularian-like Hydrarium. Tima differs from the other genera just mentioned, in developing eventually these marginal capsules, which are always wanting, at least in the shape of capsules with limestone concretions, in the above-mentioned genera. See the magnified portion of the circular tube of Tima (Fig. 168), and compare this, crowded with marginal capsules, to the circular tube of Melicertum and Lafœa. Having kept in confinement males and females of this species, I succeeded in raising from the eggs the Planula, and ultimately the Hydrarium, as in the case of Melicertum, where further details will be found concerning the mode of development of the Planula into the Hydrarium; as this is identical in both, I shall only describe the Planula and Hydrarium as far as they differ from those of the Melicertum.

Fig. 171.

The Planula is more pear-shaped (*p*, Fig. 171) than that of the Melicertum, and takes a far greater elongation before attaching itself. (*p′*, Fig. 171.) The Hydrarium is also more slender, the cup is more distinct, the tentacles are quite long and slender, and are connected at the base by a web (Fig. 172); this seems to be a mere embryonic feature, as I have noticed the same web in several young Campanularians. The Hydrarium here figured attained its present features at the end of six months. The communities are very small tufts, barely perceptible to the naked eye; they appeared like a few slender threads on the side of the glass vessel in which the Planula was raised; I did not succeed in raising the Hydrarium to observe its further development.

Fig. 172.



Massachusetts Bay (L. Agassiz).

Cat. No. 276, Cape Cod, March, 1862, A. S. Bickmore. Medusa.

Cat. No. 372, Nahant, September, 1863, A. Agassiz. Medusa.

Museum Diagram No. 17, after A. Agassiz.

Fig. 171. *p*, young planula; *p′*, planula immediately before attaching itself.

Fig. 172. Single Hydra of the tuft of a Tima Hydrarium, greatly magnified.

EUTIMA McCr.

Eutima McCr. Gymn. Charl. Harbor, p. 87.
Eutima Agass. Cont. Nat. Hist. U. S., IV. p. 363. 1862.

Eutima mira McCr.

Eutima mira McCr. Gymn. Charl. Harb., p. 88, Pl. 11, Figs. 8, 9.
Eutima mira Agass. Cont. Nat. Hist. U. S., IV. p. 363. 1862.

Charleston, S. C. (McCrady).

Eutima variabilis McCr.

Eutima variabilis McCr. Gymn. Charl. Harb., p. 88.
Eutima variabilis Agass. Cont. Nat. Hist. U. S., IV. p. 363. 1862.

Charleston, S. C. (McCrady).

Eutima limpida A. Agass.

Eutima limpida A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 363. 1862.

This species (Fig. 173) resembles closely the *Eutima mira* of Charleston Harbor; like it, it has only four long tentacles (with one short cirrus on each side of the tentacle, Fig. 176), one opposite each chymiferous tube, two large marginal capsules between each two ten-

Fig. 173.

Fig. 174.

tacles (Fig. 174), arranged at equal distances round the marginal tube, and a number of rudimentary tentacles which are never further developed. The gelatinous part of the disk, which projects in the proboscis (*g*, Fig. 175), is shorter than in the Charleston species; it does not extend much more than the height of the bell beyond the level of the veil; the tentacles also are shorter, and have no swelling; the diges-

Fig. 173. Profile of Eutima limpida, reduced in size.
Fig. 174. Quarter-disk of Fig. 173.

tive cavity (c, Fig. 175) is very short; it is situated at the extremity of the narrow flexible sac, extending from g to c, Fig. 175, and terminates in a flat quadrangular disk (d, Fig. 175), which is sometimes folded in the shape of forceps, although generally kept stretched out flat, like the sucking disk of a leech; in the centre of this disk we find the actinostome, which is a very small rosette-shaped opening, with four loops. The genital glands (o, Fig. 175) are narrow; they rise almost from the circular tube, and follow the chymiferous tubes along

Fig. 175

Fig. 176.

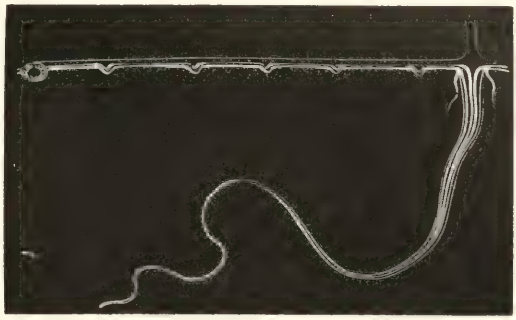


Fig. 177.

Fig. 178.

the gelatinous prolongation of the disk, nearly to the level of the veil. (o', Fig. 175.) The tentacles are hollow and have no swelling at the base (Fig. 176), the walls being thicker and tapering gradually to the extremity. In the marginal capsules (Fig. 177), which are so large that they can be seen with the naked eye, there are from twelve to thirteen granules arranged in a circle near the periphery of the capsule. The rudimentary tentacles (t, Fig. 178) are mere triangular expansions

Fig. 175. Magnified view of the proboscis and genital organs. g, terminal point of gelatinous prolongation of the disk; o, part of genital organs extending along the bell; o', terminal point of genital organs along the gelatinous prolongation of the bell; c, digestive cavity; d, actinostome in its usual mode of expansion.

Fig. 176. Magnified portion of the circular canal, with a primary tentacle and tentacular cirri, to show the rudimentary tentacles between the chymiferous tubes and the capsules, c.

Fig. 177. Magnified marginal capsule, showing the circular arrangement of the granules.

Fig. 178. Still more magnified view of the rudimentary tentacles. c, circular tube; t, rudimentary tentacles.

of the circular tube, *c*. The bell widens very rapidly towards the lower floor, and is perfectly transparent; the ovaries, as well as the tentacles and the proboscis, are colorless; the diameter of the bell is nearly two inches, and the polar diameter about half an inch; the proboscis is usually carried as in Fig. 173, and, as the digestive cavity is capable of but slight contraction, it bears usually the proportions of that figure to the diameter of the bell. Found in Buzzard's Bay during September.

Buzzard's Bay, Naushon (A. Agassiz).

Eutima pyramidalis Agass.

Eutima pyramidalis Agass. Cont. Nat. Hist. U. S., IV. p. 363. 1862.

The spherosome is hemispherical, and more heavy than in either *Eutima limpida* or *E. mira;* the proboscis is shorter, and tapers rapidly; the tentacles are short; the oral leaflets are rounded and separated by an indentation from one another, the edge of the leaflets being finely scalloped; the digestive cavity is short.

Florida, Key West (L. Agassiz).

Family POLYORCHIDÆ A. Agass.

Polyorchidæ A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 349. 1862.

This family is characterized by the peculiar structure of the chymiferous tubes, which, sending off diverticula at right angles to the main tube, give these Medusæ a very peculiar aspect. With the exception of Polyorchis, we know of only one other genus, Olindias Fr. Müll., which has the same structure of the chymiferous tubes. Müller, at the close of his description of *O. sambaquiensis*, says it is characteristic of the uncertainty which still exists in the classification of Acalephæ, that the attempt to assign to this Medusa its position in the systems of Eschscholtz, Forbes, or Lütken, places them in families with which they have no affinities, and we cannot even assign them to any of the families of Gegenbaur; the only genus to which it seems to have any relation is Melicertum Oken. This suggestion of Müller, as to the affinities of his genus Olindias, is fully borne out by the examination of the *Melicertum penicillatum* of Eschscholtz, which has, like it, peculiar chymiferous tubes, and also the discovery of Gonionemus, a genus having the general appearance of Olindias without the ramifying chymiferous tubes. Gonionemus shows us the close relation that exists between these genera and Melicertum, although the differences existing between Olindias and Polyorchis on one side, and Gonionemus and Melicertum on the other, are such as to form very natural families.

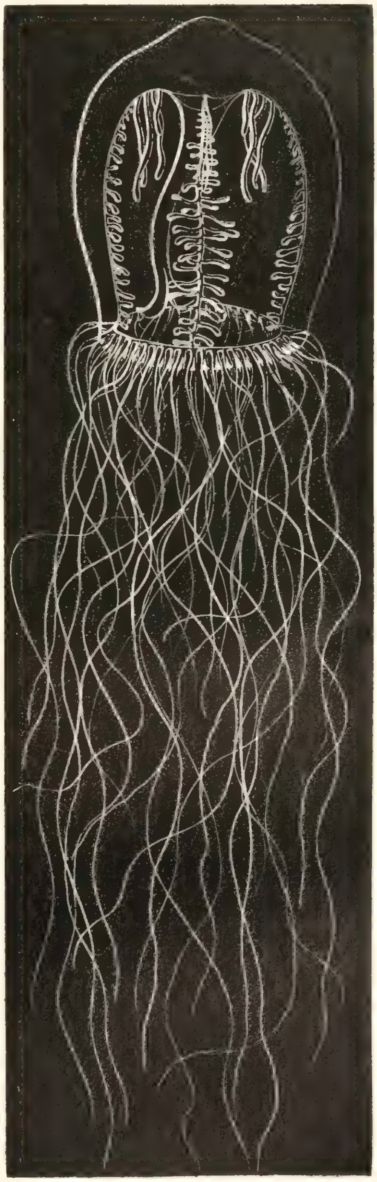
POLYORCHIS A. Agass.

Polyorchis A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 349. 1862.
Melicertum Esch. (*p. p.*). Syst. der Acal., p. 105. 1829.

Polyorchis penicillata A. Agass.

Polyorchis penicillata A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 349. 1862.
Melicertum penicillatum Esch. Syst. der Acal., p. 106, Pl. 8, Fig. 4. 1829.
Aglaura penicillata Bl. Man. d'Actinol., Pl. 33, Fig. 4.
Melicertum penicillata Less. Zooph. Acal., p. 293. 1843.

Fig. 179.



This strange Jelly-fish I first found in great numbers, while becalmed at the entrance of the Straits of San Juan de Fuca, in October, in company with large numbers of a Medusa which I suppose to be the *Mesonema* (*Zygodactyla*) *cœrulescens* found by Brandt in the latitude of San Francisco, and which I had afterwards occasion to observe again near Punta de los Reyes, about twenty miles northwest of San Francisco. It is also quite common in the harbor of San Francisco during the winter months. It combines the characters of several families, has the long, pendent digestive cavity of the Thaumantiadæ (Fig. 179); the ovaries hang independently, four in number to each chymiferous tube (Fig. 180), near the base of the digestive cavity, as in the Trachynemidæ. But what is very peculiar is the structure of the chymiferous tubes; instead of being simple or forking tubes, as we generally find in the Hydroids, they remind us of the structure of the chymiferous tubes in Idyia, sending off short shoots into the gelatinous disk at right angles, alternat-

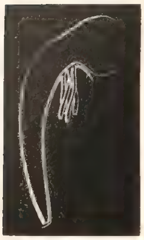
Fig. 180.

Fig. 179. A profile view, somewhat magnified, of Polyorchis penicillata.

Fig. 180. Ovaries of one of the chymiferous tubes.

ing with each other (Fig. 179); this gives to these Medusæ a very peculiar appearance, differing entirely from any other family of Hydroids, and for which I would propose the name of Polyorchidæ. The

Fig. 181.



polar axis is the longest; the spherosome has its greatest width at the level of the ovaries (Fig. 179); from this point it turns rapidly towards the abactinal pole, while it scarcely tapers towards the actinostome, giving the spherosome the appearance of a cylinder with a rounded top; the thickness of the spherosome is very uniform, projecting but slightly in the inner cavity of the bell (Fig. 181), at the point of attachment of the digestive cavity; the digestive cavity is long, slender, and exceedingly movable, terminating in four lobes (Fig. 182), and extending to the opening of the veil; there are four genital organs of unequal length, attached at the highest point (Fig. 180) of the four chymiferous tubes, hanging freely in the cavity of the bell; they are arranged one behind the other, along the upper extremity of the chymiferous tubes, the longest equalling half the height of the inner bell. The diverticula from the main tubes commence immediately at the base of the ovaries, where they are quite small; they gradually increase in size for about half the length of the chymiferous tubes, whence they continue nearly of the same size to the

Fig. 182

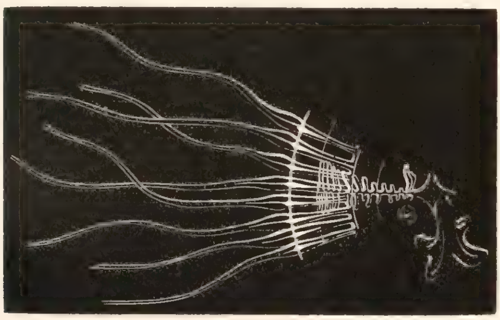


Fig. 183.

circular tube; the offshoots are somewhat more numerous in the lower part of the tube. (Fig. 179.) The tentacles are very contractile (compare Figs. 183 and 179); when drawn up, they are scarcely half the length of the spherosome; they project horizontally from the chymiferous tubes for a short distance, and from the point where a conical dark-purple ocellus is placed are then bent at right angles to their former direction; it is only the lower part of the tentacle which is capable of expansion; when the tentacles are fully expanded, they extend three or four times the length of the bell. The genital sacs, the chymiferous tubes, the tentacles, and the digestive cavity, are of a

Fig. 181. Section of the bell.
Fig. 182. Part of the disk of Fig. 179, seen from the abactinal pole.
Fig. 183. Two of the marginal tentacles in a contracted state.

light reddish-brown color; the bell has a yellowish tint. The motions of this Medusa are rather sluggish; they are very conspicuous in the water on account of their wreath of dark-purple ocelli; they are gregarious, move near the top of the water, the bell almost striking the surface, and when disturbed return to the surface immediately. There are thirty-six tentacles, eight between each of the four chymiferous tubes, and one at the base of each tube; the four lobes of the actinostome are long, and flare out considerably beyond the diameter of the digestive cavity, which is of a uniform length, widening very gradually to the point of junction with the chymiferous tubes; the main chymiferous tubes are slightly winding; the lower knotty, club-shaped diverticula have a tendency to bend downwards towards the circular tube; the veil is narrow; the ovaries are one third the length of the spherosome. These Jelly-fishes attain a height of nearly two inches; but smaller specimens, measuring only an inch in height, showed, except the size, no differences; the character of the marginal capsules of this Medusa, if there are any, has not been examined.

This is undoubtedly the *Melicertum penicillatum* of Eschscholtz, though from his description and figures the characteristic features of this Medusa are not very evident.

California (Eschscholtz); Gulf of Georgia (A. Agassiz); San Francisco, Cal. (A. Agassiz).

Cat. No. 283, San Francisco, Cal., Dec. 1859, A. Agassiz. Medusa.
Cat. No. 284, San Francisco, Cal., Jan. 1854, T. G. Cary. Medusa.
Cat. No. 285, Gulf of Georgia, W. T., 1859, A. Agassiz. Medusa.

Family LAODICEIDÆ Agass. (*emend.* A. Agass.).

Laodiceidæ Agass. Cont. Nat. Hist. U. S., IV. p. 350. 1862.
Thaumantiadæ Gegenb.; in Zeit. f. Wiss. Zool., p. 236. 1856.

The family name of Laodiceidæ given to the Thaumantiadæ Gegenb. by Professor Agassiz, may, in its turn, yield to that of Lafœadæ, should it be found that the Hydrarium of Laodicea Less. is invariably a Lafœa. The name Laodiceidæ is here retained, as the Medusæ, associated under that generic name, present differences which, when the Hydrarium becomes known, may warrant our retaining the name Laodicea for some of them, and thus the genus which has given the family name may still be retained, even if for the present we substitute for some of the species of Laodicea the older name of Lafœa of Lamouroux. The Laodiceidæ are here extended to include the Melicertidæ, which certainly are closely related, and can hardly be divided into distinct families, if we are to judge from the young Medusæ and the Hydrarium of these genera.

LAFŒA Lamx.

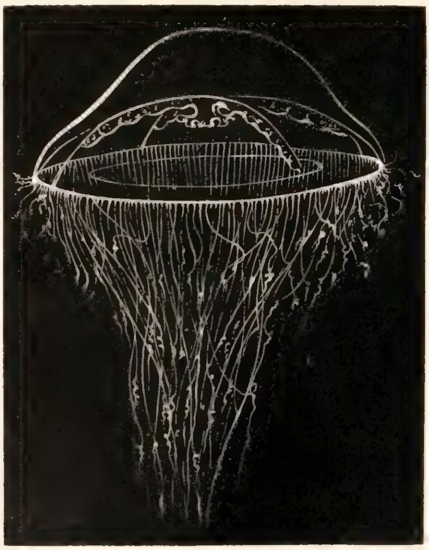
Lafœa Lamx. Expos. Méth. 1812.
Lafœa Agass. Cont. Nat. Hist. U. S., IV. p. 351. 1862.
Lafœa A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 91.
Atractylis Wright; in Ann. & Mag., VIII. p. 129. 1861.
Campanulina Van Ben.; in Bull. Acad. de Belg., XIV. No. 5. 1847.
Laodicea Agass. (*p. p. non* Less.). Cont. Nat. Hist. U. S., IV. p. 350. 1862.

Lafœa calcarata A. Agass.

Laodicea calcarata A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 350. 1862.
Lafœa cornuta Agass. (*non* Lamx.). Cont. Nat. Hist. U. S., IV. p. 351. 1861.
Campanularia dumosa Leidy. Mar. Inv. N. J. and R. I., p. 6.
Lafœa cornuta A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 91, Fig. 4.

The Medusa of Lafœa described in the Contributions of Professor Agassiz, Vol. IV. p. 351, was referred by him to *Lafœa cornuta* of Lamouroux. Having, however, since that time found at Nahant a young Medusa closely allied to the one to be here described, I am inclined to doubt this identification, even though I have not observed its Hydrarium, as I have done for the Lafœa of Naushon; the absence of pigment-spots at the base of the tentacles, and the different number of tentacles at the time when the Medusæ are liberated from the reproductive calycles, easily distinguishes these two Medusæ. The Lafœan Medusa found at Naushon was also followed in its more advanced stages, till we could connect it with the young of the Medusa before described as *Laodicea calcarata.*

Fig. 184.



The largest specimens observed were an inch in diameter; the bell is perfectly transparent (Fig. 184), and, were it not for the four dark-yellowish ovaries, it would readily escape notice; they hang down like short curtains in close folds, extending almost the whole length of the chymiferous tubes, from the digestive cavity where they run into the folds of its base (Fig. 185), to the circular tube; the digestive cavity is short, and the actinostome divides into four thin, convoluted folds, projecting beyond the edge of the digestive cavity to twice its diam-

Fig. 184. Adult Medusa of Lafœa calcarata; magnified.

eter (Fig. 186); the chymiferous tubes are narrow; the tentacles have their greatest diameter directly at the circular tube; they are, however, unequally developed, and vary greatly in character. The large tentacles are very contractile; near the base they have a swelling which consists of small granular cells, with a spot of dark-violet pigment-cells on its lower surface (Fig. 187); on the opposite side of this bulb we find a spur-like projection (see *t*, Fig. 187), consisting of large, transparent, polygonal cells; from this point the tentacle tapers very gradually, and is also made up of larger cells than the basal swelling;

Fig. 185.

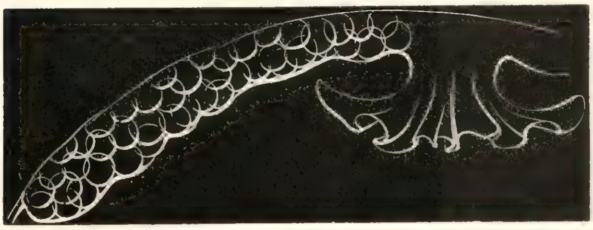
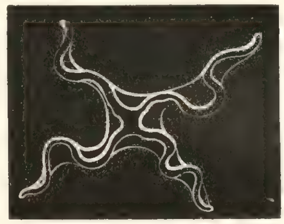


Fig. 186.



these cells are arranged in two rows, and through them runs a thin tube to the tip of the tentacle; the lasso cells are numerous, and run in a zigzag manner all over the surface of the large tentacles. When new tentacles are formed in the adult Medusæ, it is the spur which is first developed, and afterwards the swelling with the pigment-cells; the tentacle has then a triangular appearance, and is turned in the opposite direction from the spur; from this time it lengthens very rapidly, though many of the tentacles are never fully developed. There are besides long thread-like tentacles, which are not hollow, and are exceedingly

Fig. 187.

Fig. 188.

contractile (*c*, Fig. 187); in adult specimens they are not distributed regularly, but in young specimens of a quarter of an inch in diameter, having not more than sixteen large tentacles, and sixteen smaller ones (like the large ones) placed between them, we find on the side of each of these sixteen larger tentacles one of these cirri (Fig. 194); but as the number of tentacles increases, the cirri are not formed with the same regularity. We find still a third kind of tentacle: club-shaped

Fig. 185. One of the ovaries and the actinostome.

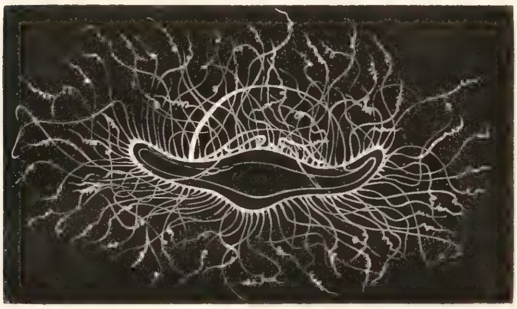
Fig. 186. Actinostome, actinal view.

Fig. 187. Magnified view of a portion of the circular tube. *t*, one of the large tentacles, with spur and pigment-cells; *c*, one of the cirri; *k*, club-shaped appendage.

Fig. 188. Actinostome and rudimentary ovaries of young Medusa, seen in profile.

appendages (*k*, Fig. 187) made up of large polygonal cells, perfectly transparent, one or two sometimes placed between each of the larger tentacles. The large tentacles have the same color as the ovaries. The young Medusæ differ from the adult in the extent of the ovaries, which are limited to the upper part of the chymiferous tubes, close to the digestive cavity (Fig. 188); the ovaries gradually extend further towards the circular tube as they grow older; the digestive cavity is a simple cylinder pressed in, forming small lips; the tentacles also, as described above, are less numerous. The adult Medusa is very active, moving with great rapidity, by drawing its tentacles into the bell, throwing them out again with violence, and allowing itself to be carried along by the momentum it has acquired; twisting its tentacles during that time, and spreading them in every conceivable manner. When it is lazily carried along, the bell often assumes strange attitudes; the thick upper part of the disk becomes rounded, and the thin portion of the umbrella is projected beyond it, like the rim of a four-cornered hat. (Fig. 189.) At other times it seems as if the umbrella had been tied in the middle, the upper and lower part of the disk almost joining in the middle at an obtuse angle. The next moment the disk becomes perfectly flat, the tentacles are drawn up in close knots or shortly-twisted coils, so that it scarcely seems to be the same animal, which in a moment assumes again a globular shape, and darts off to go through the same changes of form.

Fig. 189.



The Medusa in its youngest stage resembles closely the figure given by Wright of the Medusa of *A. repens* in the Edinburgh Philosophical Journal. The Hydromedusarium differs so much, that it does not seem to belong to the same genus as the English species; it is found growing along the stems of a species of Dynamena, found just below the line of low-water-mark. The individuals are arranged, in a quincunx manner, on both sides of a long, slender, creeping stem, which does not branch. It resembles a true Campanularia in having a transparent bell disconnected from the stem. Other-

Fig. 190.

Fig. 189. Different attitude of the Medusa of Fig. 184.

Fig. 190. Hydrarium of Lafœa calcarata; the extremity of the reproductive calycle is somewhat injured. See Fig. 191.

wise the sterile Hydra reminds us of a true Sertularian, with a few thick tentacles, and a long digestive cavity, capable of great expansion. The bell is attached to the stolon by a short stem, a mere bend in its lower portion, so that the sterile individuals are set off a short distance from the main stem. (Fig. 190.) The reproductive calycles are gigantic, compared to the size of the sterile individuals. (Fig. 190.) They are few in number, not more than two or three to a stem, and resemble those of *L. amphora;* only one or two Medusæ are developed simultaneously, the more advanced one filling the cavity of the capsule almost entirely. (Figs. 190, 191.) The sterile individuals recall the Tubularians, as do in fact all the Sertularians, in which the connection between the bell of the sterile individuals and the digestive cavity is not as intimate as in the true Campanularians, giving us at the same time a measure of the embryonic standing of the Tubularians, the Sertularians, and the Campanularians; the Medusæ of this Sertularian-like Hydromedusarium resemble more those of the Tubularians than those of the Campanularians. The vertical diameter of the Medusa is greater than the transverse; the bell is of moderate thickness, the abactinal part being slightly conical (Fig. 192); the digestive cavity is short, and consists of four simple lobes, giving the actinostome the shape of a cross. When it escapes from the reproductive calycle, it has only two long tentacles, two slightly developed

Fig. 191.

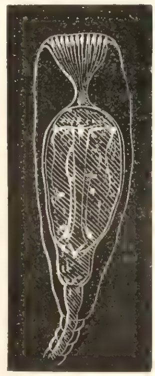


Fig. 192.

Fig. 193.

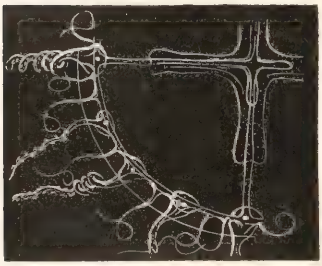
ones, and four more hardly perceptible in the middle of the space between the four chymiferous tubes (Fig. 193); at the base of all the tentacles, and over the whole surface of the digestive cavity, we find large yellow cells scattered irregularly; the long tentacles are highly contractile; a spiral of lasso cells, diminishing in size, and beginning at a small distance from the sensitive bulb, winds round the tentacles;

Fig. 191. Uninjured reproductive calycle.
Fig. 192. Medusa immediately after its escape from the reproductive calycle.
Fig. 193. A Medusa somewhat more advanced, from the abactinal pole.

at the base of the tentacles the walls are thick, and the sensitive swelling quite prominent, having a dark pigment-spot. The Medusa, when it escapes from the reproductive calycle, has a vertical diameter of about one twentieth to one sixteenth of an inch; the Hydromedusarium is from a quarter to an inch long.

In the next stage observed (Fig. 194) we find the rudimentary tentacles of the previous stage fully developed, and at the same time the thread-like cirri of the adult Lafœa. This stage is important, connecting as it does, without any doubt, two Medusæ which had thus far been placed in different genera. The digestive cavity and the ovaries are nearly in the same condition as that observed in young Medusæ, where the spur and the different kinds of marginal appendages were as well developed as in the adult; we have as yet, however, in the present stage (Fig. 194), no trace of the spur or of the club-like appendages of the circular tube found in the adult. These club-like appendages of Lafœa and of Ptychogena show that the marginal capsules, the compound eyes, the cirri, and the different rudimentary appendages, are only modified tentacles.

Fig. 194.



Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 151, Naushon, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 271, Naushon, 1861, A. Agassiz. Medusa.

Cat. No. 438, Naushon, 1864, A. Agassiz. Medusa.

Lafœa cornuta Lamx.

Lafœa cornuta Lamx. Expos. Méthod. 1812.

Newfoundland (Lamouroux).

Lafœa dumosa Sars.

Lafœa dumosa Sars; in Vidensk. Forh. 1862.
Campanularia dumosa Johnst. Brit. Zooph. 1838.

Massachusetts Bay (A. Agassiz). Medusa.

Cat. No. 433, Sea-Coal Bay, N. S., Anticosti Expedition, 1861. Hydrarium.

Fig. 194. Young Medusa still further advanced than Fig. 193.

LAODICEA Less.

Laodicea Less. Zooph. Acal., p. 294. 1843.
Laodicea Agass. Cont. Nat. Hist. U. S., IV. p. 350. 1862.
Cosmetira Forbes. Brit. Naked-eyed Medusæ, p. 42. 1848.
Thaumantias Gegenb. (*non* Esch.) ; in Zeit. f. W. Zool., p. 237. 1856.

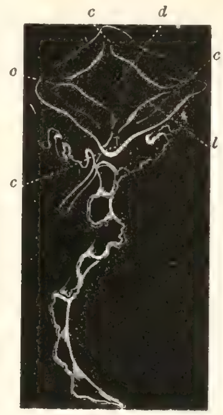
Laodicea cellularia A. Agass.

Laodicea cellularia A. Agass. ; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 350. 1862.

I am somewhat doubtful whether this species (Fig. 195) belongs to the genus Laodicea, as the examination of the tentacles could not be made sufficiently accurate to determine this point. The general form

Fig. 195

Fig. 196.



of the ovaries, however, is the same, beginning at the digestive cavity, and running in the form of small hanging lobes along the chymiferous tubes, close to the circular tube. The digestive cavity is so short that the edge, which extends in the shape of four long, narrow lips, deeply frilled (Fig. 196), seems the continuation of the chymiferous tubes, reminding us somewhat of the structure of the actinostome of the Æquoridæ, as in Stomobrachium. The epithelial cells are large, irregular, and hexagonal, and can easily be seen with the naked eye. The color of the spherosome is light violet, the ovaries and digestive cavity being of a darker color, and the base of the circular tentacles of a still stronger shade. There are about twenty-four tentacles between each of the four chymiferous tubes, and a tentacle opposite each tube. Found in the Gulf of Georgia and at Port Townsend, from July to September.

Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 270, Gulf of Georgia, W. T., 1859, A. Agassiz. Medusa.

Fig. 195. Laodicea cellularia.

Fig. 196. One of the lips of the actinostome. *c, c, c, c*, termination of the chymiferous tubes into the digestive cavity, *d*; *l*, fold of the actinostome connecting the lips of the actinostome.

COSMETIRA Forbes.

A remarkable Hydroid Medusa, belonging to the genus Cosmetira of Forbes, was brought home by the Anticosti Expedition.

Magdalen Islands, Gulf of St. Lawrence.

Cat. No. 371, Magdalen Islands, N. S., Anticosti Expedition. Medusa.

Family MELICERTIDÆ Agass.

Melicertidæ Agass. Cont. Nat. Hist. U. S., IV. p. 349. 1862.

GONIONEMUS A. Agass.

Gonionemus A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 350. 1862.

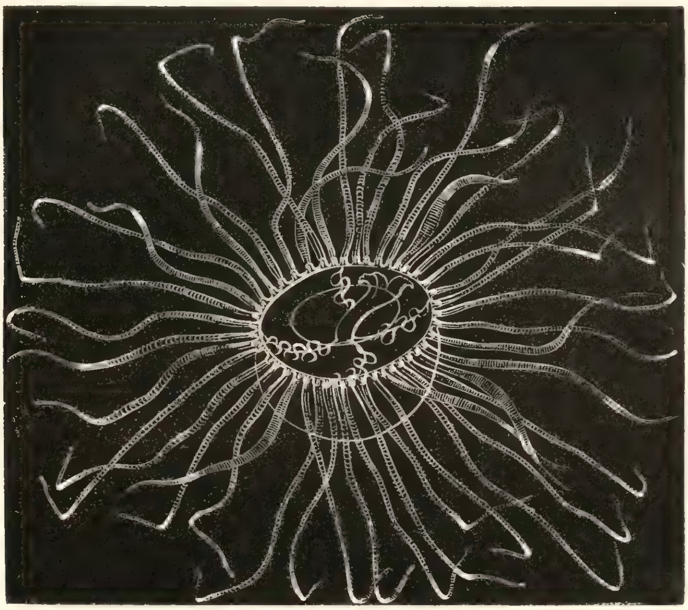
Gonionemus has a general resemblance to Melicertum, but differs from it by the shape of the ovaries and of the spherosome. The spherosome is an oblate half-spheroid, cut from pole to pole; the ovaries are in lobes alternating on the sides of the chymiferous tubes, and extending their whole length, from the digestive cavity to the circular tube; the digestive cavity is long, and very flexible; the tentacles are numerous, large, and exceedingly contractile; chymiferous tubes four in number.

Gonionemus vertens A. Agass.

Gonionemus vertens A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 350. 1862.

This Medusa was quite commonly found during the month of July, swimming in patches of kelp. It at once attracted my attention by its peculiar mode of moving. I could see these Jelly-fishes, with the tentacles spread out to their fullest extent, sinking slowly to the bottom, the disk turned downward; the moment a blade of kelp touches the disk, they stop, bend their tentacles like knees, and remain attached to the sea-weed by means of their lasso cells (Fig. 197), which are arranged in rings scattered thickly over the surface of the tentacles; after remaining attached in this way a moment, with their tentacles extended and mouth turned upwards, they suddenly let go their hold, turn upside down, contract their tentacles (Fig. 198) to a third of their former length, and begin their upward movements by means of short, rapid jerks, given by the sudden expanding and contracting of the tentacles as they are violently thrown out from the cavity covered by the veil. They keep up this rapid motion until they reach the surface of the water; at the instant the upper part of the disk touches the top of the water, the Medusa inverts itself, and sinks, with its tentacles fully expanded, until it reaches the bottom, or another piece of sea-weed, where it attaches itself, and after remaining suspended a little while, repeats the same operation; when attached, it requires strength enough to break the tentacles to make them loose

Fig. 197.



their hold. I have never found single individuals, but have always seen them in large numbers swimming among the sea-weed in the manner described. The form of the spherosome is that of an oblate spheroid, cut in two by a plane passing through the north and south poles, the plane of intersection containing the circular tube; there are sixty-four tentacles, fifteen between each chymiferous tube, placed so closely together that they seem all to unite at the base. The tentacles, when contracted, resemble a scythe fastened by a band to the circular tube (Fig. 199); the pigment-cells are numerous, and give the circular tube the appearance of having a large row of violet knobs, to which the tentacles are attached. There is one part of the tentacle, near the tip, which seems to be more thickly covered by lasso-cells, and by which the Jelly-fishes attach themselves; when the tentacles are fully expanded, they always make an angle at that point, as if they had been broken, and the parts joined together again. (Fig. 197.) The

Fig. 198.

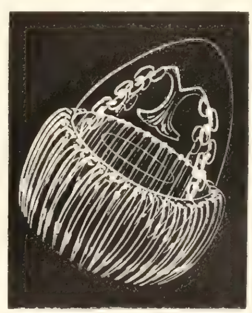


Fig. 197. Gonionemus vertens, as it appears when attached by its tentacles.
Fig. 198. Gonionemus vertens, in motion; natural size.

ovaries are frill-like lobes (Fig. 200), passing from one side to the other of the chymiferous canal; the chymiferous tubes are slender, and appear like four dark-violet threads, connecting the different lobes of the

Fig. 201.

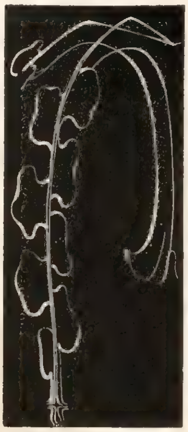


Fig. 200.

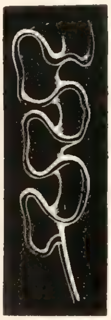


Fig. 199.

ovaries. (Fig. 201.) The digestive cavity reaches about two thirds of the length of the chymiferous tubes; it is very flexible, but scarcely contractile (Fig. 201), ending in four large lobes, capable of extending far beyond the main wall of the digestive cavity; the veil is large, leaving an opening of half the diameter across the circular tube.

Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 286, Gulf of Georgia, W. T., 1859, A. Agassiz.

MELICERTUM Oken.

Melicertum Oken. Lehrb. der Naturg. 1816.
Melicertum Agass. Cont. Nat. Hist. U. S., IV. p. 349. 1862.
Melicerta Pér. et Les. (*p. p.*); in Ann. du Mus., XIV. p. 40. 1809.
Campanella Less. (*non* Bl.). Zooph. Acal., p. 281. 1843.
Stomobrachium Forbes (*non* Br.). Naked-eyed Medusæ, p. 30. 1848.

Melicertum campanula Esch.

Melicertum campanula Esch. Syst. der Acal., p. 105. 1829.
Melicertum campanula Agass. Cont. Nat. Hist. U. S., IV. p. 349. 1862.
Melicertum campanula A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 96, Figs. 18, 19.
Melicerta campanula Pér. et Les.; in Ann. du Mus., p. 40. 1809.
Medusa campanula Fab. Fauna Grönlandica. 1780. No. 360.
Medusa campanulata Bosc. Hist. Nat. d. Vers., II. p. 170.
Campanella Fabricii Less. Zooph. Acal., p. 281. 1843.
Campanella campanula Mörch; in Beskriv. af Grönland, p. 95. 1857.

This Medusa, first mentioned by Fabricius, has, like many others so characteristically described by him, escaped notice entirely, till it was

Fig. 199. The bend of a contracted tentacle.
Fig. 200. A portion of the genital organs.
Fig. 201. One chymiferous tube and half of the digestive cavity.

observed on the coast of New England. Undoubtedly a few others of the Jelly-fishes he has enumerated will prove identical with species since described, on the coast of England and on our own shores. A Medusa of this same genus was figured and described by Forbes under the name of *Stomobrachium octocostatum;* from the figure of Forbes it is evidently not a Stomobrachium, and is probably this same Medusa which he found in the North of Scotland. Fig. 202 is a profile view, natural size, of the Melicertum, one of the most common of our naked-eyed Medusæ. In the fall, at the time of spawning, it literally swarms at the surface, and on sunny days seems particularly to delight to come to the surface, where it remains in the afternoon until dark, being one of the few Medusæ (*Zygodactyla groenlandica* has the same habit) which are to be met with in the afternoon. The genus Melicertum is closely related to the Æquoridæ, by the number of its radiating tubes (of which there are eight), and to Staurophora, by the blending of the genital organs with the actinostome, and the total absence of marginal bodies, such as capsules, cirri, and so forth. If the small Medusæ here figured (Figs. 203, 204) are in reality the young of Melicertum, — Melicertum being the only Medusa allied to Staurophora which has no eye-specks, — the close affinity between them is still more strongly marked in the young of these two genera, which can only be distinguished from one another by the presence or absence of eye-specks.

Fig. 202.

From an examination of the Medusa of *Lafœa calcarata*, I had already come to the conclusion that the young Medusa was nearly related to Staurophora and Melicertum. Having succeeded in finding another Medusa evidently closely allied to it, I was not surprised in recognizing a Melicertum of younger stage than any which I had observed before. With the stage represented in Fig. 205, which has been traced until there could be no doubt as to the genus to which the young Medusa belonged, I was sufficiently familiar, from its frequent occurrence in the latter part of the spring, to recognize at once in

Fig. 202. Profile of Melicertum campanula, natural size.

Fig. 203 only a somewhat younger form of the same Medusa. We have thus established, by the observation of this Medusa, as well as from the young Hydrarium of Melicertum and Lafœa, the probable character of the Hydrarium from which Melicertum, Staurophora, and those Medusæ which have no marginal capsules, are developed; showing that they hold an intermediate position between the Campanu-

Fig. 203.

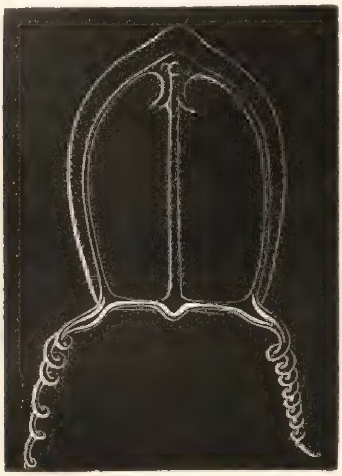


Fig. 204.

larians and the Tubularians, being more closely allied to the latter in their embryonic condition, and assuming as adult Medusæ somewhat the aspect of Campanularian Medusæ. The *Trichydra pudica* of Wright is also closely allied to Lafœa and Staurophora. In the young Medusa we have at first only two primary tentacles (Fig. 204) and two rudimentary ones, and in the next stage there are sixteen. (Fig. 205.)

The presence of eye-specks at the base of the tentacles of the young Medusæ of *Lafœa calcarata* and of *Staurophora laciniata* are the surest means of distinguishing them with accuracy. The differences in the shape of the bell between these youngest Medusæ (Fig. 203) and somewhat older stages (Fig. 205), are of a similar character to those we are familiar with among the young Campanularian Medusæ of other genera. To judge from analogy, I strongly suspect that the young Medusa of Staurophora will in its turn be a Medusa, similar to these Lafœan forms, having at first but two primary tentacles. In the next

Fig. 205.

Fig. 203. Profile view of very young Medusa of Melicertum campanula; Lafœan like. See Fig. 192.

Fig. 204. Half the disk of the same, seen from the actinal pole.

Fig. 205. Young Melicertum, with only four completely formed chymiferous tubes. 1c, first set of chymiferous tubes; 2c, second set; 1, 2, 3, tentacles of the first, second, and third sets.

stage (Fig. 205), which is undoubtedly a young Melicertum, we find the second set of four chymiferous tubes developing (2_c, Fig. 205); they arise, as in the Æquoridæ, from the digestive cavity, and extend towards the circular tube; there are at this stage sixteen tentacles, usually carried curled up, as in the accompanying figure. I have not seen the young Melicertum in stages intermediate between those slightly more advanced than Fig. 205, and when they are fully developed, as in Fig. 202, where the genital organs extend to the circular tube, and the marginal tentacles have become exceedingly numerous.

Fig. 206.

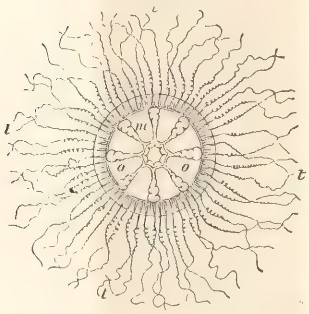


Fig. 207.

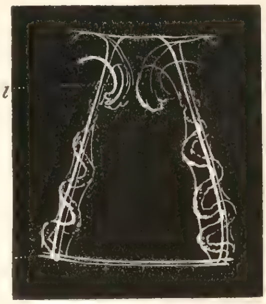
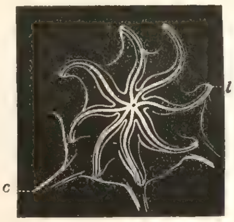


Fig. 208.



The spherosome is regularly bell-shaped; it is capable of very varied expansion and contraction, appearing at some times almost rectangular, then as if tied in the middle, swelling at both poles, again flaring at the abactinal extremity, and strongly contracted at the circular tube, or flattened like a quoit. The tentacles may expand several times the polar diameter of the bell, or contract, by curling close to the circular tube. The bell is of a light ochre color; the genital organs, as well as the base of the tentacles, are of a darker shade. When seen from above (as Fig. 206), the radiating tubes open into a sort of cavity, as in the Æquoridæ, the folds of one genital organ extending across to the next, as seen in Figs. 207, 208; the ovaries are convoluted (Fig. 207), extending from *l*, Fig. 207, to the circular tube, where they have their greatest diameter; the lips of the actinostome are carried in eight folds (Fig. 208), each one, *l*, corresponding to one of the radiating tubes, *c*, as in the Æquoridæ; the lips project but little into the cavity of the bell. The tentacles are hollow, somewhat dumb-bell shaped at the base

Fig. 209.

Fig. 206. The same, seen from the abactinal pole. *m*, mouth; *o*, genital organs; *t*, tentacles.

Fig. 207. Magnified view of two chymiferous tubes and genital glands. *l*, lips of actinostome.

Fig. 208. Mode of carrying the lips of the actinostome. *l*, lips of actinostome; *c*, chymiferous tube.

Fig. 209. Magnified view of marginal tentacles.

(Fig. 209), and taper rapidly; they are thickly covered with lasso-cells.

Artificial fecundation of these Medusæ can be very readily made by keeping males and females for a day or two together in a glass jar, when we shall find, swimming near the bottom, innumerable spherical embryos (Fig. 210), in which the spheres of segmentation are still

Fig. 210

Fig. 211.

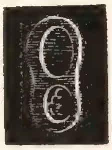


Fig. 212.

Fig. 213.

visible; these elongate (Fig. 211), a cavity is formed at the blunt end, and we have a somewhat pear-shaped embryo, strongly ciliated, with walls of uniform thickness (Fig. 212), swimming about with great velocity; these embryos attach themselves by the blunt end (Fig. 213), and soon elongate, as in the two middle figures of Fig. 213; the slender extremity next swells (Fig. 214), and this is the first trace of the sterile Hydra head. The wall of this swelling soon becomes somewhat indented, as in Fig. 214, where we have some of the successive stages of the sterile Hydra, until it forms a small horny bell, covering only the base of the long, sterile Hydra head, which terminates with ten stout, short tentacles, connected by a web. This Hydrarium differs considerably from that of Lafœa, but it still has sufficient resemblance to show their connection; it is one of the easiest to raise, the Planulæ are very hardy, and the development of the Hydrarium is readily followed. It grows in small tufts, which after six months had not attained a greater height than one third of an inch.

Fig. 214.

Greenland (Fabricius); Massachusetts Bay (Agassiz).

Cat. No. 351, Grand Manan, L. Agassiz. Medusa.

Cat. No. 373, Nahant, 1863, A. Agassiz. Medusa.

Cat. No. 448, Nahant, 1864, A. Agassiz. Medusa.

Fig. 210. Spherical embryo.

Fig. 211. The same, somewhat more advanced.

Fig. 212. The same, immediately before becoming attached.

Fig. 213. Group of embryos attached, in different stages of development.

Fig. 214. Different stages of growth, beyond those of Fig. 213, till the sterile Hydra is fully developed.

Melicertum georgicum A. Agass.

Melicertum georgicum A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 349. 1862.

The Medusa (Fig. 215) is here figured to show the differences noticed between it and the New England representative of the genus. The pointed spherosome, the smaller number of the circular tentacles, the longer actinostome, and the termination of the genital organs, somewhat above the circular tube, are characters which readily distinguish the *M. georgicum* from its Eastern representative. The knowledge of its complete development will settle this point definitely. The close resemblance of the mode of attachment of the ovaries to that of the Æquoridæ, referred to in the preceding species, is readily seen

Fig. 215.

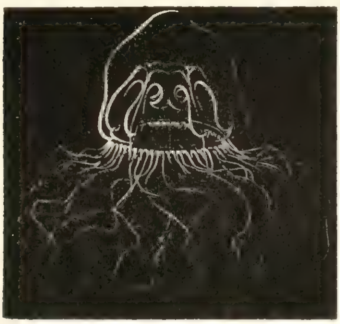


Fig. 216.

in Fig. 216. The genital folds are looped up on the upper side of the interior of the bell in an octagonal outline (Fig. 216), opening into the large cavity formed by the eight constrictions of the lips, *l*, of the actinostome. The difference is simply in the number of the chymiferous tubes, as well as in the mode of carrying the lips of the actinostome. A simple flattening of the spherosome, and an increase in the number of chymiferous tubes, would give us an Æquorea. This Medusa is found, in the summer, in the Gulf of Georgia, W. T.

Fig. 215. Profile of Melicertum georgicum, natural size.

Fig. 216. Digestive cavity and point of junction of the chymiferous tubes. *l*, lips of actinostome; *p*, abactinal point of attachment of genital organs; *c*, opening leading into chymiferous tubes. Magnified.

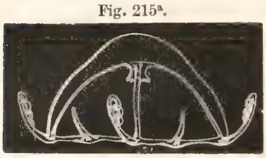
STAUROPHORA Brandt.

Staurophora Brandt (*non* Forbes) ; in Mém. Acad. St. Petersburg, II. p. 399. 1835.
Staurophora Agass. ; in Mem. Am. Acad., IV. p. 300.
Staurophora Agass. Cont. Nat. Hist. U. S., IV. p. 351. 1862.
Staurophora Less. Zooph. Acal., p. 297. 1843.

Staurophora laciniata Agass.

Staurophora laciniata Agass. ; in Mem. Am. Acad., IV. p. 300, Pl. 7. 1849.
Staurophora laciniata Agass. Cont. Nat. Hist. U. S., IV. p. 351. 1862.
Staurophora laciniata A. Agass. ; in Proc. Boston Soc. Nat. Hist., IX. Figs. 1, 2, 3.
Staurophora laciniata Stimps. Mar. Inv. Grand Manan, p. 11. 1853.

Fig. 215^{a}.



The youngest Medusa of Staurophora which has been observed (Fig. 215^{a}) resembles to such an extent the young Melicertum (Figs. 203, 205), as readily to have been taken for different stages of the same Jelly-fish, did not the absence of pigment eye-specks enable me to distinguish them sufficiently easily. The development of the tentacles of the young Medusa explains itself from the accompanying figures (Figs. 216^{a}, 217), as well as the changes of form of the digestive cavity, as it passes from a simple pendent pouch (Fig. 215^{a}) through the different stages (*a*, *b*, *c*, Fig. 218), where the digestive cavity loses little by little its individuality, the corners gradually extend along the chymiferous tubes, and in quite young specimens (*c*, Fig. 218) the actinostome can no longer be distinguished among the innumerable small folds of the genital pouches. In Fig. 219 the young Staurophora has all the characters of the adult, excepting the size of the different parts. The violet pigment-spots at the base of the tentacles are quite apparent, being perceptible in

Fig. 216^{a}.

Fig. 217.

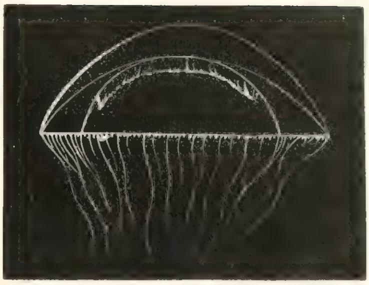
Fig. 218.

c b a

Fig. 215^{a}. Young Staurophora, with eight tentacles.
Fig. 216^{a}. Quarter of the disk of a young Staurophora, with sixteen large tentacles.
Fig. 217. Young Medusa, somewhat more advanced than Fig. 216^{a}.
Fig. 218. Different stages of the actinostome, intermediate between that of Figs. 215^{a} and 219. *a*, the youngest ; *b*, the next ; *c*, the oldest.

younger stages. (Figs. 215a, 216a, 217.) This Medusa grows to a large size, measuring often six to eight inches in diameter. It is one of the earliest Medusæ to make its appearance, attains its full size rapidly from May to June, and by the end of June the dead Medusæ are found in large numbers, floating about after storms; by the middle of July they have all disappeared. Found at Nahant.

Fig. 219.



Massachusetts Bay (Agassiz); Maine (Stimpson).

Cat. No. 275, Nahant, A. Agassiz. Young and old Medusæ.

Cat. No. 359, Boston Harbor, L. Agassiz. Medusa.

Staurophora Mertensii Br.

Staurophora Mertensii Br.; in Mém. Acad. St. Petersb., IV. p. 400, Pls. 24, 25. 1838.
Staurophora Mertensii Less. Zooph. Acal., p. 297. 1843.

Norfolk Sound (Mertens).

PTYCHOGENA A. Agass.

The Medusa for which this genus has been established shows the intimate structural connection between Staurophora, Melicertum, and Polyorchis. The structure of the genital organs is an intermediate state of development between organs where the folds of the actinostome are lost in the genital folds, as in Staurophora, and the other extreme, where we have pendent genital organs attached to one extremity of diverticulate chymiferous tubes, as in Polyorchis.

Ptychogena lactea A. Agass.

The bell of this Medusa is rather high (Fig. 220), and the spherosome of considerable thickness, giving this species an appearance of consistency, which is heightened by the striking contrast with the water of the milky genital organs and numerous marginal tentacles. The chymiferous tubes are broad; at an equal distance on the abactinal and actinal ends, the edges of the tube become hacked; the notches increase in size, and soon become long, sharp folds of the walls of the chymiferous tubes, projecting at right angles from the tubes (Fig. 221); the larger of these folds branch again. To these folds the genital organs are attached, forming as many connecting

Fig. 219. Young Staurophora, having the general aspect of the adult.

pouches as there are points to the projections of the chymiferous tubes; the folds become smaller and smaller (Fig. 222) towards the abactinal pole, and are connected by a loose fold with the actinostome. The opening of the actinostome is large; its folds are small, and do

Fig. 220.

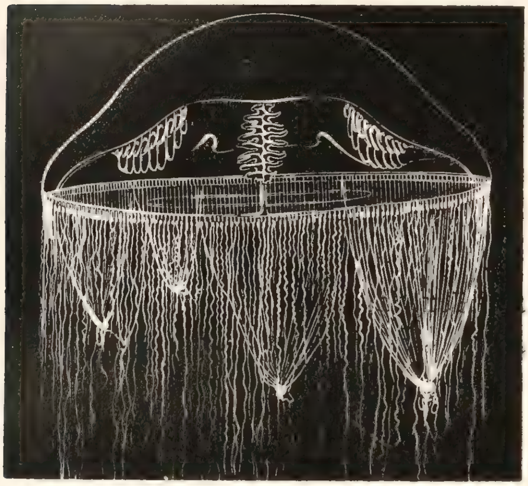


Fig 221.

not form regular lips, but merely an irregular quadrangular frill. (Fig. 223.) The tentacles are extremely numerous, opening into a large circular tube; they are very much flattened in one direction (*f*, Fig. 224); between every two tentacles is found a club-shaped appendage, made

Fig 222.

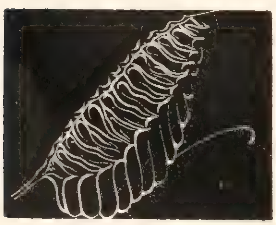


Fig. 223.

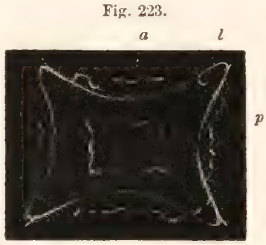
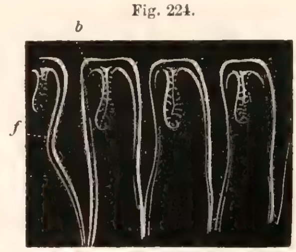


Fig. 224.



up of large cells somewhat like those of *Lafœa calcarata* (*b*, Fig. 224); the tentacles are capable of great expansion, and when contracted are usually curled up tightly, as is the case in Melicertum and Staurophora; they are very frequently tied up in festoons, as in Fig. 220. This

Fig. 220. Profile view of Ptychogena, somewhat reduced.

Fig. 221. Magnified view of the genital organs, seen from the abactinal pole.

Fig. 222. The same as Fig. 221, seen in profile, on a somewhat smaller scale.

Fig. 223. Actinostome. *a*, opening of actinostome; *p*, point of attachment of the digestive cavity; *l*, lips of the actinostome.

Fig. 224. Magnified base of tentacles and club-shaped appendages. *f*, swelling of tentacles; *b*, club-shaped appendages.

Medusa, like Tima, swims at a considerable depth below the surface. The action of the light and increase of temperature of the surface is sufficient to kill them in the course of half an hour; the moment they are brought to the surface, the spherosome loses its transparency, the genital organs become dull, and the Medusa is soon completely decomposed. This action is much more rapid than any thing of the kind which I have noticed even in Ctenophoræ, Mertensia being the only genus in which the decomposing effects of light and heat are at all equal to what is produced here. This Jelly-fish must be a deep-water species, as they have only been found during a single fall, and then only for a few days, when they seemed quite abundant.

Massachusetts Bay, Nahant (A. Agassiz).

Family PLUMULARIDÆ Agass.

Plumularidæ Agass. Cont. Nat. Hist. U. S., IV. p. 358. 1862.
Sertularidæ Johnst. (*p. p.*). Brit. Zooph., p. 89.

AGLAOPHENIA Lamx. (*restr.* McCr.).

Aglaophenia Lamx. (*pars*); in Bull. Soc. Phil. 1812.
Aglaophenia McCr. Gymnoph. Charleston Harbor, p. 98. 1857.
Aglaophenia Agass. Cont. Nat. Hist. U. S., IV. p. 358. 1862.
Plumularia Lamk. (*pars*). Anim. s. Vert., II. p. 159.

Aglaophenia pelasgica McCr.

Aglaophenia pelasgica McCr. Gymn. of Charleston Harbor, p. 99. 1857.
Sertularia pelasgica Bosc. Hist. Nat. Vers., III. p. 122.
Plumularia pelasgica Lamk. An. s. Vert., II. p. 167.
Dynamena pelasgica Blainv. Man. d'Actin., p. 484.

Cat. No. 253, Florida, 1858, L. Agassiz. Hydrarium.

Cat. No. 254, Tortugas, Fla, 1859, L. Agassiz. Hydrarium.

Cat. No. 255, Hayti, 1858, Dr. D. F. Weinland. Hydrarium.

Cat. No. 256, Gulf Weed, 1858, Dr. D. F. Weinland. Hydrarium.

Cat. No. 257, Gulf Weed, 1858, Dr. D. F. Weinland. Hydrarium.

Cat. No. 390, a hundred miles south of Cape Hatteras, A. S. Bickmore. Hydrarium.

Cat. No. 391, a hundred miles south of Cape Hatteras, A. S. Bickmore. Hydrarium.

Aglaophenia trifida Agass.

Aglaophenia trifida Agass. Cont. Nat. Hist. U. S., IV. p. 358. 1862.
Aglaophenia cristata McCr. (*non* Lamk.). Gymn. Charl. Harb., p. 100.

Charleston, S. C. (L. Agassiz).
Cat. No. 252, Charleston, S. C., Jan. 1852, L. Agassiz. Hydrarium.

Aglaophenia tricuspis McCr.

Aglaophenia tricuspis McCr. Gymn. Charleston Harbor, p. 101.

Charleston, S. C. (McCrady).

Aglaophenia franciscana A. Agass.

Plumularia franciscana Trask; in Proc. Cal. Acad., March, 1857, p. 101, Pl. 4, Fig. 3.
Plumularia struthionides Murr.; in Ann. & Mag. N. H., V. p. 251. 1860.

San Francisco (A. Agassiz).
Cat. No. 259, San Francisco, Cal., December, 1859, A. Agassiz. Hydromedusarium.
Cat. No. 260, San Francisco, Cal., December, 1859, A. Agassiz. Hydromedusarium.

PLUMULARIA Lamk. (*restr.* McCr.).

Plumularia Lamk. (*p. p.*) An. s. Vert., II. p. 159.
Plumularia McCr. Gymn. Charleston Harbor. 1857.
Plumularia Agass. Cont. Nat. Hist. U. S., IV. p. 358. 1862.

Plumularia quadridens McCr.

Plumularia quadridens McCr. Gymn. Charleston Harbor, p. 97.
Plumularia quadridens Agass. Cont. Nat. Hist. U. S., IV. p. 358. 1862.

Charleston, S. C. (McCrady); Florida (L. Agassiz).
Cat. No. 251, Ship Channel, Florida, January, 1856, L. Agassiz.

Plumularia arborea Des.

Plumularia arborea Des.; in Proc. Bost. Soc. Nat. Hist., III. p. 65. 1848.

Massachusetts Bay (Desor).

Family SERTULARIADÆ Johnst.

Sertulariadæ Johnst. British Zoophytes, p. 57.

DYNAMENA Lamx. (*restr.* Agass.).

Dynamena Lamx.; in Bull. Soc. Phil. 1812.
Dynamena Agass. Cont. Nat. Hist. U. S., IV. p. 355. 1862.

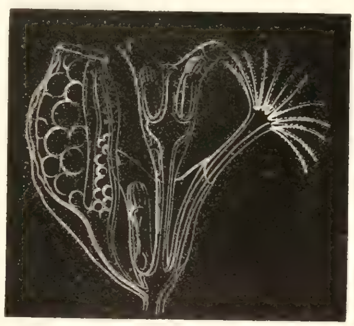
Dynamena pumila Lamx.

Dynamena pumila Lamx. Cor. Flex., p. 179.
Dynamena pumila Johnst. Brit. Zooph., p. 66.
Dynamena pumila Agass. Cont. Nat. Hist. U. S., IV. pp. 326, 355, Pl. 32. 1862.
Dynamena pumila Pack.; in Can. Nat. & Geol., Dec. 1863.
Sertularia pumila Mörch; in Beskriv. af Greenland, p. 97. 1857.
Sertularia thuja Fab. (*teste* Mörch). Fauna Groenl., No. 456.

This is one of the few of our Hydroids (Fig. 225) which have been compared in a living state with European specimens sent by Mr. Thos. J. Moore to the Museum, and brought across the Atlantic by Captain Anderson. Professor Agassiz, supposing it to be a distinct species, had previously given it the name of *Dynamena Fabricii;* and before he

Fig. 225.

Fig. 226.



had examined the development of the sessile Medusa (Fig. 226), supposed it to be the Hydroid of our *Melicertum campanula.* See, for the Hydroid of Melicertum, the description of that species.

European and American shores of Atlantic Ocean (Ellis, Agassiz).

Cat. No. 163, New Brighton, England, 1860, H. J. Clark. Hydrarium.
Cat. No. 164, Liverpool, October, 1861, Thos. J. Moore. Hydromed.
Cat. No. 165, Lynn, Mass., May, 1852, H. J. Clark. Hydromedusarium.
Cat. No. 166, Nahant, July, 1862, A. Agassiz. Hydromedusarium.
Cat. No. 167, Nahant, May, 1862, A. Agassiz. Hydromedusarium.
Cat. No. 168, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Fig. 225. Cluster of Dynamena pumila.
Fig. 226. Magnified portion of stem of Fig. 225.

Cat. No. 169, Nahant, June, 1855, H. J. Clark. Hydromedusarium.
Cat. No. 170, Nahant, September, 1854, H. J. Clark. Hydrarium.
Cat. No. 171, Chelsea Beach, L. Agassiz. Hydrarium.
Cat. No. 172, Cohasset, Mass., L. Agassiz. Hydrarium.
Cat. No. 173, Nantucket, Mass., August, 1857, L. Agassiz. Hydromedusarium.
Cat. No. 174, Grand Manan, August, 1857, J. E. Mills. Hydromedusarium.
Museum Diagram No. 18, after L. Agassiz.

Dynamena cornicina McCr.

Dynamena cornicina McCr. Gymn. Charl. Harb., p. 102.

Charleston, S. C. (L. Agassiz).
Cat. No. 175, Charleston, S. C., L. Agassiz. Hydrarium.
Cat. No. 176, Charleston, S. C., 1852, L. Agassiz. Hydrarium.

DIPHASIA Agass.

Diphasia Agass. Cont. Nat. Hist. U. S., IV. p. 355. 1862.

Diphasia fallax Agass.

Diphasia fallax Agass. Cont. Nat. Hist. U. S., IV. p. 355. 1862.
Sertularia fallax Johnst. Brit. Zooph., p. 73, Pl. 11, Figs. 2, 5, 6.
Sertularia fallax Stimps. Mar. Inv. Grand Manan, p. 9. 1853.

Grand Manan (W. Stimpson); Massachusetts Bay.
Cat. No. 183, Eastport, Me., 1851, L. Agassiz.
Cat. No. 184, Eastport, Me., 1852, W. Stimpson.
Cat. No. 185, Massachusetts Bay, L. Agassiz.
Cat. No. 427, Eastport, Me., 1861, Anticosti Expedition.
Cat. No. 428, Eastport, Me., 1863, A. E. Verrill.

Diphasia rosacea Agass.

Diphasia rosacea Agass. Cont. Nat. Hist. U. S., IV. p. 355. 1862.
Sertularia rosacea Linn. Syst. 1306.
Sertularia rosacea Johnst. Brit. Zooph., p. 64.
Sertularia rosacea Pack.; in Can. Nat. & Geol., Dec. 1863.
? *Sertularia plumea* Des.; in Proc. Bost. Soc. N. H., III. p. 66. 1848.

Nahant, Suisconset, Mass. (A. and L. Agassiz).
Cat. No. 180, New Brighton, England, Oct. 1860, H. J. Clark. Hydromedusarium.
Cat. No. 181, Nahant, Mass., July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 182, Suisconset, Mass., July, 1849, L. Agassiz. Hydromedusarium.

Diphasia corniculata A. Agass.

Sertularia corniculata Murray; in Ann. & Mag. N. H., X. Pl. XI. Fig. 3. 1860.

Bay of San Francisco (Murray).

SERTULARIA Linn. (*emend.* Agass.).

Sertularia Linn. Syst. Nat.
Sertularia Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.

Sertularia abietina Linn.

Sertularia abietina Linn. Syst. 1307.
Sertularia abietina Fab. Fauna Groenlandica. No. 453.
Sertularia abietina Johnst. Brit. Zooph., p. 75.
Sertularia abietina Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.

St. George's Bank, Newfoundland; Mingan Islands.
Cat. No. 195, New Brighton, Eng., Oct. 1860, H. J. Clark. Hydrarium.
Cat. No. 196, Liverpool, Eng., 1861, Thos. J. Moore.
Cat. No. 197, St. George's Bank, W. Stimpson.
Cat. No. 419, Mingan Islands, 1861, Anticosti Expedition.

Sertularia cupressina Linn.

Sertularia cupressina Linn. Syst. 1308.
Sertularia cupressina Johnst. Brit. Zooph., p. 80.
Sertularia cupressina Leidy. Inv. R. I. and N. J., p. 6.
Sertularia cupressina Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.

Absecom Beach (Leidy); Massachusetts Bay (Agassiz).
Cat. No. 202, New Brighton, Eng., October, 1860, H. J. Clark. Hydromedusarium.
Cat. No. 203, Beverly, July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 204, Nahant, May, 1862, A. Agassiz. Hydromedusarium.
Cat. No. 205, Chelsea, May, 1862, H. J. Clark. Hydromedusarium.
Cat. No. 206, Eastport, Me., 1851, W. Stimpson. Hydromedusarium.
Cat. No. 207, Mount Desert, Me., W. Stimpson. Hydromedusarium.
Cat. No. 208, Suisconset, July, 1849, L. Agassiz. Hydromedusarium.
Cat. No. 209, Suisconset, Mass., L. Agassiz. Hydrarium.
Cat. No. 211, Lynn, Mass., Jan. 1861, H. J. Clark. Hydrarium.
Cat. No. 212, Massachusetts Bay, L. Agassiz.

Sertularia argentea Ell. & Sol.

Sertularia argentea Ellis & Sol. Zooph., p. 38.
Sertularia argentea Johnst. Brit. Zooph., p. 79, Pl. 15, Fig. 3; Pl. 14, Fig. 3.
Sertularia argentea Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.
Sertularia argentea Stimps. Mar. Inv. Grand Manan, p. 8. 1853.
Sertularia argentea Mörch.; in Besk. af Grönland, p. 97.
Sertularia fastigiata Fab. (*teste* Mörch). Fauna Grönlandica, No. 458.

Grand Manan (W. Stimpson).
Cat. No. 213, New Brighton, Oct. 1860, H. J. Clark. Hydrarium.

Sertularia falcata Linn.

Sertularia falcata Linn. Syst. 1309.
Sertularia falcata Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.
Plumularia falcata Johnst. Brit. Zooph., p. 90, Pl. 21, Figs. 1, 2.
Plumularia falcata Pack.; in Can. Nat. & Zool. Dec. 1863.
Plumularia falcata Stimps. Mar. Inv. Grand Manan, p. 8. 1853.
Sertularia tenerissima Stimps. Mar. Inv. Grand Manan, p. 8. 1853.

Grand Manan (W. Stimpson); Eastport, Me. (W. Stimpson); Mingan Islands; Massachusetts Bay (Agassiz).
Cat. No. 218, New Brighton, Eng., 1860, H. J. Clark. Hydrarium.
Cat. No. 219, Grand Manan.
Cat. No. 220, Eastport, Me., 1853, W. Stimpson. Hydromedusarium.
Cat. No. 221, Grand Manan, W. Stimpson.
Cat. No. 222, Eastport, Me., 1851. Hydrarium.
Cat. No. 223, Suisconset, Mass., L. Agassiz. Hydrarium.
Cat. No. 224 (*P. tenerissima*), Grand Manan, W. Stimpson. Hydromedusarium.
Cat. No. 415, Mingan Islands, 1861, Anticosti Expedition. Hydrarium.
Cat. No. 416, Eastport, Me., 1861, A. E. Verrill. Hydrarium.
Cat. No. 417, Mingan Islands, 1861, Anticosti Expedition. Hydrarium.
Cat. No. 424, Eastport, Me., 1861, Anticosti Expedition.

Sertularia anguina Trask.

Sertularia anguina Trask; in Proc. Cal. Acad. N. S., p. 100, Pl. 5, Fig. 1. 1857.
Sertularia labrata Murray; in Ann. & Mag. N. H., V. p. 250, Pl. XI. Fig. 2. 1860.

Bay of San Francisco (Trask, Murray); Monterey, Punta de los Reyes, Tomales Point (Trask).

Sertularia gracilis A. Agass.

Plumularia gracilis Murray; in Ann. & Mag. N. H., V. p. 251, Pl. XII. Fig. 1. 1860.

Bay of San Francisco (Murray).

Sertularia myriophyllum Linn.

Sertularia myriophyllum Linn. Syst. 1309.
Plumularia myriophyllum Johnst. Brit. Zooph., p. 99.

Cat. No. 214, Massachusetts Bay, L. Agassiz.
Cat. No. 418, Mingan Islands, Anticosti Expedition.
Cat. No. 429, Eastport, Me., A. E. Verrill.
Cat. No. 430, Eastport, Me., A. E. Verrill.

Sertularia latiuscula Stimps.

Sertularia latiuscula Stimps. Mar. Inv. Grand Manan, p. 8. 1853.

Grand Manan (W. Stimpson).

Sertularia filicula Ell. & Sol.

Sertularia filicula Ellis & Sol. Zooph., p. 57, Pl. 6, Figs. c, C.
Sertularia filicula Stimps. Mar. Inv. Grand Manan, p. 8. 1853.
Sertularia filicula Johnst. Brit. Zooph., p. 76, Pl. 14, Fig. 1.

Grand Manan (W. Stimpson).

Sertularia furcata Trask.

Sertularia furcata Trask; in Proc. Cal. Acad., March, 1857, p. 101, Pl. V. Fig. 2.

San Francisco (Trask).

Sertularia turgida Trask.

Sertularia turgida Trask; in Proc. Cal. Acad., March, 1857, p. 101, Pl. IV. Fig. 1.

San Francisco (Trask).

Sertularia producta Stimps.

Sertularia producta Stimps. Mar. Inv. Grand Manan, p. 8. 1853.

Grand Manan (W. Stimpson).

AMPHITROCHA Agass.

Amphitrocha Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.

Amphitrocha rugosa Agass.

Amphitrocha rugosa Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.
Sertularia rugosa Linn. Syst. 1308.
Sertularia rugosa Fab. Fauna Grönlandica. No. 454.
Sertularia rugosa Johnst. Brit. Zooph., p. 63, Pl. X. Figs. 4–6.
Sertularia rugosa Stimps. Mar. Inv. Grand Manan, p. 9. 1853.
Sertularia rugosa Mörch; in Besk. af Grönland, p. 97.
Amphitrocha cincta Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.

Massachusetts Bay (L. Agassiz); Grand Manan (W. Stimpson).
Cat. No. 226, Nahant, April, 1855, H. J. Clark. Hydromedusarium.
Cat. No. 227, Nahant, May, 1855, H. J. Clark. Hydromedusarium.
Cat. No. 228, Nahant, August, 1854, H. J. Clark. Hydrarium.
Cat. No. 229, Nahant, July, 1861, A. Agassiz. Hydrarium.
Cat. No. 230, Nahant, September, 1854, H. J. Clark. Hydrarium.
Cat. No. 406, Nahant, July, 1862, A. Agassiz.

COTULINA Agass.

Cotulina Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.

Cotulina tricuspidata A. Agass.

Sertularia tricuspidata Alder (*non* Murray). Cat. Zooph. Northumb. and Durham, p. 21, Pl. II. Figs. 1, 2. 1857.
Sertularia tricuspidata Pack.; in Can. Nat. & Geol. Dec. 1863.

Massachusetts Bay (L. Agassiz).
Cat. No. 233, Massachusetts Bay, L. Agassiz.
Cat. No. 234, Massachusetts Bay, L. Agassiz.
Cat. No. 235, Eastport, Me., July, 1851, W. Stimpson.
Cat. No. 236, Eastport, Me., July, 1852, W. Stimpson.

Cotulina polyzonias Agass.

Cotulina polyzonias Agass. Cont. Nat. Hist. U. S., IV. p. 356. 1862.
Sertularia polyzonias Linn. Syst. 813.
Sertularia polyzonias Johnst. Brit. Zooph., p. 61, Pl. X. Figs. 1–3.
Sertularia polyzonias Mörch; in Besk. af Grönland, p 97. 1857.
Sertularia polyzonias Stimps. Mar. Inv. Grand Manan, p. 9. 1853.
Sertularia polyzonias Pack.; in Can. Nat. & Geol. Dec. 1863.
Sertularia pinnata Gould. Rep. Inv. Mass., p. 350.

Eastport, Me. (A. E. Verrill); Mingan Islands (Anticosti Expedition); Grand Manan (W. Stimpson).

Cat. No. 426, Eastport, Me., 1863, A. E. Verrill.
Cat. No. 434, Mingan Islands, 1861, Anticosti Expedition.

Cotulina tamarisca A. Agass.

Sertularia tamarisca Linn. Syst. 1307.
Sertularia tamarisca Johnst. Brit. Zooph., p. 74, Pl. XIII. Figs. 2–4.

Eastport, Me. (A. E. Verrill; Sea-Coal Bay, N. S. (Anticosti Expedition); Massachusetts Bay (Agassiz).

Cat. No. 231, Grand Manan, W. Stimpson. Hydrarium.
Cat. No. 232, Massachusetts Bay, W. Stimpson. Hydrarium.
Cat. No. 425, Eastport, Me., 1863, A. E. Verrill.
Cat. No. 431, Sea-Coal Bay, N. S., 1861, Anticosti Expedition.

Cotulina Greenei A. Agass.

Sertularia tricuspidata Murray (*non* Alder). Ann. & Mag., V. p. 200. 1860.
Sertularia Greenei Murray. Ann. & Mag., V. p. 504. 1860.

Growing in very thick clusters, resembling somewhat in their appearance fine brushes of *Dynamena pumila.* It is supported by a very slender stem, which branches near the base; the branches rise vertically, forming fan-shaped tufts, in which all the stems reach one level; there is no prominent main stem. It attains a height of from two to three inches. The secondary branches arise in a similar way, near the base of the primary branches. The sterile hydræ have two prominent exterior points to support the operculum, and two smaller ones near the stem. The reproductive calycles are conical and slightly corrugated, attached by the apex, and terminate in a bottle-shaped neck.

San Francisco, Cal.

Cat. No. 436, San Francisco, Cal., Normal School, Salem.

HALECIUM Oken.

Halecium Oken. Lehrb. der Naturg. 1815.
Thoa Lamx. Pol. Cor. Flex. 1816.
Halecium Agass. Cont. Nat. Hist. U. S., IV. p. 357. 1862.

Halecium muricatum Johnst.

Halecium muricatum Johnst. Brit. Zooph., p. 40, Pl. IX. Figs. 3, 4.
Sertularia muricata Ellis & Sol. Zooph., p. 59, Pl. VII. Figs. 3, 4.

Cat. No. 421, Eastport, Me., 1863, A. E. Verrill.

Halecium halecinum Johnst.

Halecium halecinum Johnst. Brit. Zooph., p. 38, Pl. VIII.
Halecium halecinum Agass. Cont. Nat. Hist. U. S., IV. p. 357. 1863.
Halecium halecinum Mörch; in Beskriv. af Grönland, p. 97. 1857.
Sertularia halecina Linn. Syst. 1308.
Sertularia halecina Fab. Fauna Grönlandica. No. 455.

Eastport, Maine; Massachusetts Bay.
Cat. No. 243, New Brighton, England, Oct. 1860, H. J. Clark.
Cat. No. 244, Suisconset, Mass., L. Agassiz.
? Cat. No. 245, Nahant, Mass., Sept. 1854, H. J. Clark.

GRAMMARIA Stimps.

Grammaria Stimps. Mar. Inv. Grand Manan, p. 9. 1853.
Grammaria Agass. Cont. Nat. Hist. U. S., IV. p. 357. 1862.

Grammaria gracilis Stimps.

Grammaria gracilis Stimps. Mar. Inv. Grand Manan, p. 9. 1853.

Grand Manan (W. Stimpson).

Grammaria robusta Stimps.

Grammaria robusta Stimps. Mar. Inv. Grand Manan, p. 9, Fig. 3. 1853.

Grand Manan (W. Stimpson).

THUIARIA Flem.

Thuiaria Flem. British Animals. 1828.

Thuiaria thuja Flem.

Thuiaria thuja Flem. British Animals, p. 545. 1828.
Sertularia thuja Linn. Syst. 1308.
Thuiaria thuja Johnst. Brit. Zooph., p. 83.

Mingan Islands, N. S.
Cat. No. 240, Norway, M. Sars.
Cat. No. 420, Mingan Islands, N. S., Anticosti Expedition, 1861. Hydrarium.

Suborder TUBULARIÆ Agass.

Tubulariæ Agass. Cont. Nat. Hist. U. S., IV. p. 338. 1862.
Tubularina Ehrenb. Corall. d. Rothen Meeres.
Tubularina and *Hydrina* Johnst. Brit. Zooph., p. 29.

Family NEMOPSIDÆ Agass.

Nemopsidæ Agass. Cont. Nat. Hist. U. S., IV. p. 345. 1862.

NEMOPSIS Agass.

Nemopsis Agass.; in Mem. Am. Acad., IV. p. 289. 1849.
Nemopsis McCr. Gymn. Charl. Harbor, p. 57.
Nemopsis Agass. Cont. Nat. Hist. U. S., IV. p. 345. 1862.

Nemopsis Bachei Agass.

Nemopsis Bachei Agass.; in Mem. Am. Acad., IV. p. 289, Fig. 1849.
Nemopsis Bachei Agass. Cont. Nat. Hist. U. S., IV. p. 345. 1862.
Nemopsis Gibbesi McCr. Gymn. Charl. Harb., p. 58, Pl. 10, Figs. 1–7.
Nemopsis Bachei A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 98, Figs. 26, 27.

Owing to the great changes through which Nemopsis passes before it reaches its adult form (compare Figs. 227–230), it is impossible to decide at present, before having seen the *Nemopsis Gibbesi* of McCrady, found at Charleston, whether he has not described again, under a new name, the *N. Bachei* found by Professor Agassiz in Vineyard Sound in 1848, and of which a wood-cut was published in the Memoirs of the American Academy for 1849. The circumstances under which the drawing was made precluded the possibility of great accuracy; it was a simple sketch; and as this Medusa has not been observed since, until the publication of McCrady's paper on the Medusæ of Charleston Harbor, it is not astonishing that he should have described it as a new species, having only for his guide that single wood-cut.

Fig. 227.

I have had, during the summer of 1861, the opportunity of observing this Medusa, at the time when it had only four tentacles to each marginal bulb (Fig. 227), no ovaries, and was not more than a sixteenth of an inch in diameter. The shape of the bell, and of the oral tentacles, the mode of branching of the digestive cavity and of the tentacles, agree so well with the drawings and descriptions of McCrady of similar stages in *N. Gibbesi*, that I am inclined to consider them as identical. The

Fig. 227. Youngest Nemopsis observed, having four tentacles at the base of each chymiferous tube.

only point which would throw some doubt upon this identification, is the time of the year at which it appears in Charleston and in Vineyard Sound; in the former place it is a winter species, found in December, while at Naushon it was very common in September. The marginal tentacles increase in the same way as in Bougainvillia; those which are nearest the middle of the bulb, at its apex, are developed first, and new tentacles are constantly growing near the base of the conical-shaped bulb. (Figs. 228, 229.) They are at first slender-pointed tentacles, but soon become rounded at the extremities, with sensitive eye-specks at the base, and change into contractile tentacles, having a slight swelling at the extremity; this swelling, however, depends very much upon the state of contraction of the tentacles. The adult frequently swim about with the marginal tentacles contracted to mere knobs, rising from the sensitive bulb (Fig. 229); during their movements, which are rapid and powerful, the oral tentacles (Fig. 230) are thrown up and down at each pulsation with great violence, and seem to be important appendages in directing the motions of the animal. With the exception that the tentacles, which are carried erect upon their base, are not contractile like the others, and have a more clavate appearance (Figs. 227–230), they differ in no way from the others. There are eye-specks at the base of the erect tentacles, as well as at the base of the contractile ones, and the supposition that in this genus the eyes were supported upon a peduncle, like the eyes of a lobster, was founded upon the dark club terminating this pair of tentacles; this color is due entirely to a thickening of the extremity by contraction. Male specimens have been found measuring more than half an inch in diameter. The proboscis projects well beyond the line of the genital organs (Fig. 231); at first, in young stages, the genital organs occupy but a very

Fig. 228.

Fig. 229.

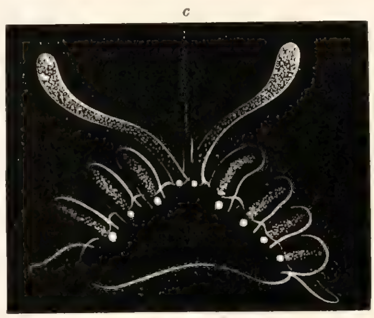


Fig. 230.

Fig. 228. Nemopsis somewhat more advanced than Fig. 227, having the second and third set of tentacles developed.

Fig. 229. Magnified view of the sensitive bulb at the base of one of the chymiferous tubes, *c*.

Fig. 230. Nemopsis in which the genital organs extend a considerable distance along the chymiferous tubes.

small portion of the upper part of the chymiferous tubes (Figs. 227, 228), but with advancing age extend farther down (Figs. 230, 231), and in the adult they reach the circular tube. The genital organs remind us, in their mode of growth, of what we find in Melicertum and Staurophora. The outline of the bell is but little changed from the earliest stages to the more advanced; it simply grows somewhat more globular. The sensitive bulb as well as the ovaries are slightly yellowish.

Fig. 231.

McCrady describes the Hydroid of this Medusa as a free floating community; I greatly incline to the opinion of Professor Allman, that we have in these free Hydroids nothing but the detached head of some Tubularian; certainly the figures given by McCrady of the Hydroid of Nemopsis, and by Stimpson of Acaulis, remind us very forcibly of detached heads of Tubularians. The heads of our Pennaria (*Globiceps tiarella* Ayres) frequently drop off, and nothing is more common than to see, at the time of breeding, several of these heads, covered with Medusæ, floating about in the jars where the Pennariæ are kept, and to have the Medusæ buds come to maturity while the head is thus detached, and would readily be mistaken for something like a free Hydroid. During four successive summers I have hunted in vain in the hope of finding one of these free Hydroids among the innumerable small Medusæ which must have just separated from the Hydrarium, which makes it probable that the Hydrarium is fixed, and not floating.

Vineyard Sound (L. Agassiz); Buzzard's Bay (A. Agassiz); Charleston Harbor (McCrady).

Cat. No. 44, Nantucket, Mass., June, 1849, L. Agassiz. Medusa.
Cat. No. 272, Naushon, Mass., Sept. 1861, A. Agassiz. Medusa.

ACAULIS Stimps.

Acaulis Stimps. Mar. Inv. Grand Manan, p. 10. 1853.
Acaulis Agass. Cont. Nat. Hist. U. S., IV. p. 345. 1862.

Acaulis primarius Stimps.

Acaulis primarius Stimps. Mar. Inv. Grand Manan, p. 10, Pl. 1, Fig. 1.
Acaulis primarius Agass. Cont. Nat. Hist. U. S., IV. p. 345. 1862.

Grand Manan (W. Stimpson).
Cat. No. 162, Grand Manan, W. Stimpson. Hydromedusarium.

Fig. 231. Magnified view of the genital organs, the actinostome, and the oral tentacles.

Family BOUGAINVILLEÆ Lütk.

Bougainvilleæ Lütk.; in Vidensk. Med., p. 29. 1849–50.
Bougainvillidæ Gegenb.; in Zeit. f. Wiss. Zool., p. 220. 1856.
Hippocrenidæ McCr. Gymn. Charl. Harbor, p. 56.
Bougainvillidæ Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.
Eudendroidæ Agass. Cont. Nat. Hist. U. S., IV. pp. 282, 342. 1862.

BOUGAINVILLIA Less.

Bougainvillia Less.; in Ann. des Sc. Nat., V. 1836.
Hippocrene Mert.; (Preocc. Moll.) in Mém. Acad. St. Petersburg, p. 229. 1835.
Hippocrene Agass.; in Mem. Am. Acad., p. 250. 1849.

Bougainvillia Mertensii Agass.

Bougainvillia Mertensii Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.
Hippocrene Bougainvillei Br. (*non* Less.); in Mém. Acad. St. Petersburg, p. 293, Pl. 20. 1838.

If the Hydrarium, collected at San Francisco, is the Hydrarium of *Bougainvillia Mertensii*, there can be no doubt of the specific difference between it and *Bougainvillia superciliaris* Agass. It grows quite luxuriously, attaining a height of nearly two and a half inches; the stems are very stout, particularly the main branch, which near the base is exceedingly robust; the branches are at least three times as stout as those of the Hydrarium of our Bougainvillia, which is slender, and always branches quite loosely. In the California species the branches succeed each other rapidly, and are crowded on the sides of the main stem. This would seem to prove that this species, like the *Coryne rosaria*, is the representative on the Pacific coast of its eastern congener, and that neither the *Coryne mirabilis* nor the *Bougainvillia superciliaris* are circumpolar species, like the *Toxopneustes drobachiensis*.

This species is undoubtedly the *Hippocrene Bougainvillei* Br. which Mertens found at Mathaei Island, in Behring's Strait, and which is figured in the Memoirs of the Academy of St. Petersburg for 1838, Vol. II. The ramifications of the tentacles surrounding the actinostome are very numerous, and the eye-specks at the base of the marginal tentacles small. The spherosome has a slight bluish tinge; the chymiferous tubes, the tentacles surrounding the mouth, and the marginal tentacles, are straw-colored; the base of the tentacles is yellowish-brown. This species is much larger than either *Bougainvillia superciliaris* or *B. macloviana;* it was quite common during the summer, in the harbor of Port Townsend, at the northwest boundary, in the

Gulf of Georgia, and was also found in the harbor of San Francisco during May and November.

Behring's Strait (Brandt); Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 33, San Francisco, Cal., March, 1859, A. Agassiz. Hydrarium.

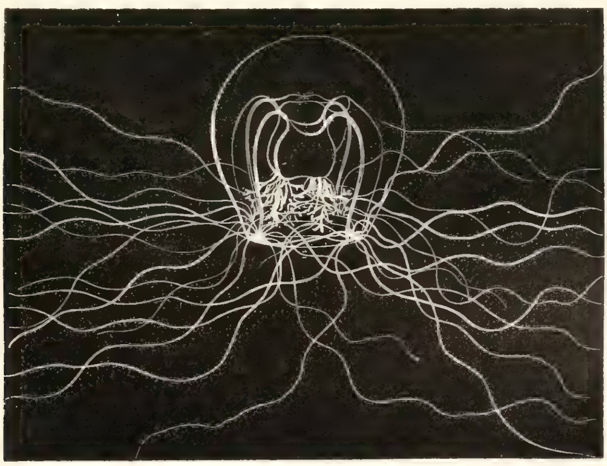
Cat. No. 49, Gulf of Georgia, W. T., May, 1859, A. Agassiz. Medusa.

Bougainvillia superciliaris Agass.

Bougainvillia superciliaris Agass. Cont. Nat. Hist. U. S., IV. pp. 289, 291, Figs. 37–39; p. 344, Pl. 27, Figs. 1–7. 1862.
Hippocrene superciliaris Agass.; in Mem. Am. Acad., IV. p. 250, Pls. 1–3.
Hippocrene superciliaris Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Bougainvillia superciliaris A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. Figs. 24, 25.
Hippocrene Bougainvillei Gould (*nec* Br., *nec* Less.). Rep. Inv. Mass., p. 348. 1841.
? *Tubularia ramosa* Gould. Rep. Inv. Mass., p. 350. 1841.
? *Eudendrium cingulatum* Stimps. Mar. Inv. Grand Manan, p. 9. 1853.

The development of the young Medusæ of the species, formerly referred to Bougainvillia, shows beyond doubt that the genera Bougainvillia and Margelis are founded upon structural differences; from the earliest stages we can trace the peculiar short and long digestive cavities so characteristic of these two genera, as well as the differences in the form of the bell. *Bougainvillia superciliaris* (Fig. 232), of which a

Fig. 232.



complete description has already been given by Professor Agassiz, in the Memoirs of the American Academy for 1849, is one of our most common Medusæ, but readily escapes notice on account of its small size. The Hydrarium (Fig. 233) has also been figured by Professor Agassiz in Vol. IV. of his Contributions, but the development has not been traced before. The Medusæ buds are found along the stem below the heads; Figs. 234, 235 are early stages, when the bell is elongated, and inca-

Fig. 232. Magnified profile view of adult Bougainvillia superciliaris.

pable of expansion and contraction. In Figs. 236, 237, which are somewhat older Medusæ in different attitudes, the digestive cavity is well

Fig. 233.

Fig. 234.

Fig. 235.

Fig. 236.

developed, and from the four corners of the actinostome bulge out four club-shaped appendages, the first traces of the oral tentacles. There

Fig. 237.

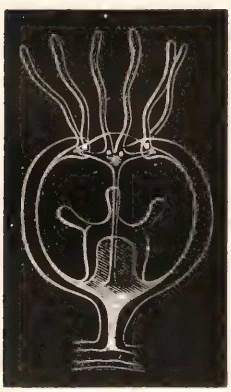
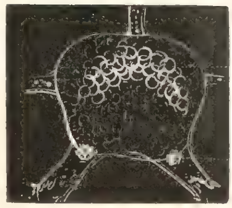


Fig. 238.

are two well-developed tentacles, which were at first a mere knob, with distinct eye-specks. (Fig. 234.) The bell is quite thin at this stage, and

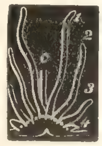
Fig. 233. Hydromedusarium of Bougainvillia superciliaris.
Fig. 234. Young elongated Medusa.
Fig. 235. Somewhat more advanced than Fig. 234.
Fig. 236. Appearance a short time before separating from the stem, in a contracted state.
Fig. 237. The same as Fig. 236, expanded.
Fig. 238. Young Bougainvillia, immediately after its liberation from the Hydromedusarium.

Fig. 239.



of uniform thickness, the veil large and powerful; the abactinal portion of the bell becomes somewhat more thickened, and when it has separated from the Hydrarium (Fig. 238), the tentacles far exceed in length the diameter of the bell, the sensitive bulb (Fig. 239) having become quite well defined in outline; it is somewhat quadrangular, filled with dark pigment cells, *p*, and at the base of each tentacle a bright eye-speck, *e*, is formed; the club-shaped oral appendages soon begin to branch, additional tentacles appear in pairs on each side of the original pair (Fig. 240), and the young Medusa soon assumes all the principal features of the adult, as in Fig. 232, with the exception of the simpler character of the tentacles of the actinostome.

Fig. 240.



Massachusetts Bay (Agassiz).
Cat. No. 27, Nahant, Mass., Sept. 1854, H. J. Clark. Hydrarium.
Cat. No. 28, Beverly, July, 1861, A. Agassiz. Hydromedusarium.
Cat. No. 29, Nahant, July, 1861, A. Agassiz. Hydrarium.
Cat. No. 30, Newport, R. I., Prof. J. Leidy. Hydromedusarium.
Cat. No. 31, Newport, R. I., S. Powell. Hydromedusarium.
Cat. No. 408, Nahant, July, 1862, A. Agassiz. Hydromedusarium.
Cat. No. 447, Nahant, July, 1864, A. Agassiz. Hydromedusarium.
Museum Diagrams, Nos. 20, 22, after A. Agassiz.

MARGELIS Steenst.

Margelis Steenst.; in Vidensk. Medel. for 1849 – 50, p. 43.
Margelis Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.
Bougainvillia Less.; in Ann. Sc. Nat., V. 1836.
Hippocrene McCr. (*nec* Mert. *nec* Agass.). Gymn. Charl. Harb., p. 61.

The structural differences observed in the European *Bougainvillia britannica* Forbes, and the *Hippocrene carolinensis* McCrady, seem sufficient to separate them from the genus Hippocrene, as has been proposed by McCrady. The digestive cavity, instead of being a short, rounded sac, attached at some distance below the highest point of the chymiferous tubes, is long and slender, swelling slightly towards its actinal end, and attached at the point of junction of the chymiferous tubes; the peduncle of the actinostome is long, the oral tentacles branch only two or three times; these are more than specific differences; they are structural differences, unlike the differences we find between species of the genus Bougainvillia, as between the

Fig. 239. Magnified view of sensitive bulb. *p*, pigment-cells; *e*, eye-speck.
Fig. 240. Tentacular bulb with the young tentacles. *c*, chymiferous tube; 1, 2, 3, 4, different sets of tentacles.

Hippocrene superciliaris of the northeast coast, and the *Hippocrene Mertensii* of the northwest coast, which are differences in the proportion of the digestive cavity, its position, the thickness of the bell, and the mode of branching of the oral tentacles.

Margelis carolinensis Agass.

Margelis carolinensis Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.
Hippocrene carolinensis McCr. Gymn. Charl. Harbor, p. 62, Pl. 10, Figs. 8–10.

Adult females, taken at Naushon in September, measured about one third of an inch (Fig. 241); the main stem of the four oral tentacles

Fig. 241.

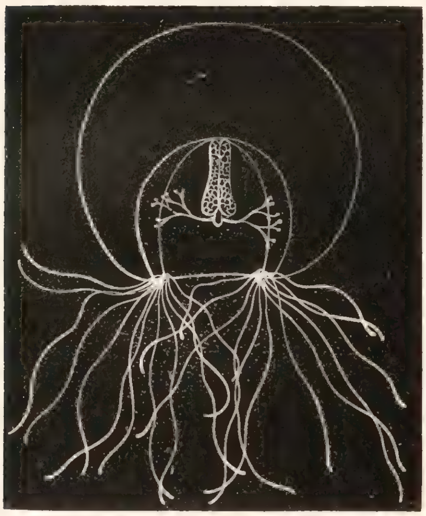
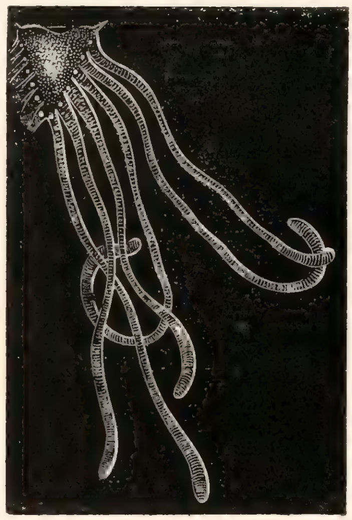
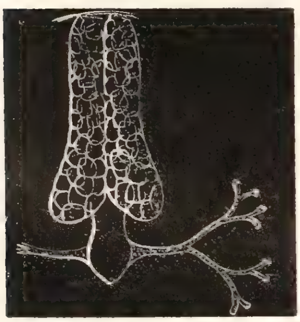


Fig. 243.



branches twice, and each of these branches twice (Fig. 242); the cavity of the bell is small and globular; the marginal bulbs are large and

Fig. 242.



conical, and give rise (Fig. 243) to ten or twelve tentacles, which are long, slender, and not usually carried curled up tightly near the bulb; the bulb is colored with brilliant red pigment-cells, surrounded by a green edge, bordered with bright yellow, and in the yellow border are placed the black eye-spots, giving to the base of the tentacles a very striking appearance; the digestive cavity is brick red, and when the folds of the genital glands are expanded by eggs, they hang down in four pouches, so as to hide the peduncle of the digestive cavity. (Fig. 242.) The outline of

Fig. 241. Adult Margelis, seen in profile; magnified.
Fig. 242. Digestive cavity, genital pouches, oral tentacles, and actinostome.
Fig. 243. Sensitive bulb at base of one of the chymiferous tubes.

the bell is almost spherical; the thickness of the disk is so great that the cavity of the bell only extends to half the height of the vertical axis. (See Fig. 241.)

In young specimens (one tenth of an inch in height) just liberated from the Hydromedusarium, the outline of the disk is bell-shaped (Fig. 244), the cavity of the bell is large in proportion, and the thickness of the upper part of the bell is not one third of the height of the actinal axis. The digestive cavity and the peduncle are one; it is bottle-shaped, cylindrical, and not yet divided by four longitudinal furrows into genital pouches. These small Medusæ have, like the young of Bougainvillia, when freed from the Hydromedusarium, but two tentacles at the base of each of the chymiferous tubes (Figs. 244, 245), the

Fig. 244.

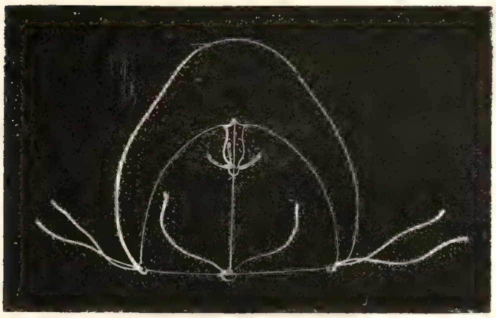
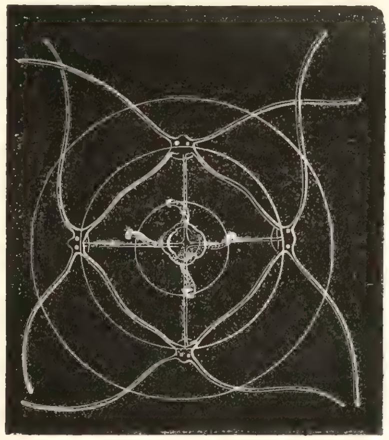


Fig. 245.



digestive cavity terminates likewise with perfectly simple, stiff oral tentacles, which begin to branch only in somewhat more advanced stages. The generic identity of *Bougainvillia britannica* with our *Margelis carolinensis* is perhaps not better shown than by the agreement of the young Medusæ in all their essential features, while the Hydrarium shows that the specific difference between the English and American representatives is not to be questioned. See the observations of Dalyell on the development of his *Tubularia ramosa*, Pl. XI. Vol. I., Animals of Scotland, and the figures of Hodge of *Podocoryne Alderi*, which I presume is only a young of one of the species of Bougainvillia (Margelis Steenst.) of Forbes. It seems therefore perfectly justifiable to reconstruct the genus Bougainvillia in such a way as to separate from it those species which have a long, slender digestive cavity, with but slightly branching tentacles, under the name of Margelis.

The oral tentacles are, in the youngest Medusæ (Fig. 244), small,

Fig. 244. Young Margelis, having only two marginal tentacles at the base of each chymiferous tube, and simple oral tentacles.

Fig. 245. Young Margelis, seen from the abactinal pole, in the condition of Fig. 244.

simple tentacles, terminating with a cluster of lasso-cells; in somewhat older Medusæ the oral tentacles have two branches, as in Fig. 246, when there are six tentacles to each marginal bulb, with a small bundle of lasso-cells at the extremity. As the young Medusa grows, the bell

Fig. 246.

loses its conical shape, and becomes more spherical. The marginal tentacles of the young are carried curved inwards towards the veil; as they increase in length they lose this tendency, and are stretched out in every direction. The additional tentacles are added at the base of the conical bulb, those which are near the apex being always the longest and oldest.

The Hydrarium (Fig. 247) grows to a very large size, from eight to twelve inches in height; it resembles in its general mode of branching *Eudendrium ramosum.* The main stem is stout, and tapers gradually; the main branches begin close to the root, and thus form clusters of stems, from which branch off irregularly secondary branches, which are quite slender, and ramify but little. The Hydræ are very large, and quite closely packed together, growing with equal profusion on the main stem and on the

Fig. 247.

Fig. 248.

branches. The Hydrarium is found growing attached to *Fucus vesiculosus* in great abundance. The general color of the main stem is somewhat grayish green, the Hydræ are of a delicate rosy tint. The Medusæ buds are developed, somewhat as in our *Bougainvillia superciliaris,* along the stem (Fig. 248), without, however, being limited to the proximity of the Hydra head, as the Medusæ make their appearance

Fig. 246. Proboscis of a Margelis, having already six tentacles at each sensitive bulb.
Fig. 247. Hydrarium of Margelis carolinensis, greatly reduced in size.
Fig. 248. Magnified heads and Medusæ buds of Margelis carolinensis.

all over the stem, resembling in this respect very strikingly the Perigonimus of Sars, to which the Hydrarium also bears a close affinity, from the size of its sterile Polypes.

Charleston Harbor (McCrady); Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 43, Naushon, Mass., Sept. 1861, A. Agassiz. Hydrarium.

Cat. No. 437, Naushon, Mass., 1864, A. Agassiz. Medusa.

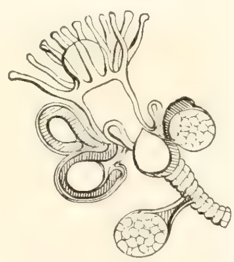
EUDENDRIUM EHRENB.

Eudendrium EHRENB. Corall. d. Roth. Meeres. 1834.
Eudendrium AGASS. Cont. Nat. Hist. U. S., IV. p. 342. 1862.
Calamella OKEN. Lehrb. der Naturg. Gesch. 1815.
Thoa LAMX. Pol. Cor. Flex. 1816.

Eudendrium dispar AGASS.

Eudendrium dispar AGASS. Cont. Nat. Hist. U. S., IV. pp. 285, 289, 342, Fig. 36; Pl. 27, Figs. 10–21. 1862.
Thoa dispar AGASS. Cont. Nat. Hist. U. S., IV. Pl. 27, Figs. 10–16. 1862.

Fig. 249.



This Hydroid (Fig. 249) is closely allied to the *Tubularia ramea* of Dalyell and the *Coryne pusilla* var. *muscoides* of Johnston. The male and female communities are readily recognized by the different color of the Medusæ buds; the male Medusæ buds are bright orange, while the females are of a dull pink.

Massachusetts Bay (Agassiz).

Cat. No. 34, Nahant, Mass., Sept. 1854, H. J. Clark. Hydrarium.

Cat. No. 35, Suisconset, Mass., July, 1849, L. Agassiz. Hydrarium.

Cat. No. 36, Nahant, July, 1861, A. Agassiz. Hydrarium.

Cat. No. 37, Nahant, July 11, 1861, A. Agassiz.

Cat. No. 38, Naushon, Mass., September, 1861, A. Agassiz.

Cat. No. 405, Nahant, June, 1862, A. Agassiz. Hydromedusarium.

Cat. No. 423, Eastport, Me., A. E. Verrill.

Museum Diagram No. 23.

Fig. 249. Female Medusæ buds in different stages of development.

Eudendrium tenue A. AGASS.

Fig. 250.

This species (Fig. 250) can at once be distinguished from the *E. dispar* Agass. (Fig. 249) by its large clusters of Medusæ, while in the *E. dispar* the Medusæ buds are always somewhat scattered, and never clustered together, as in *E. tenue.* This is quite a small species, the tallest specimens hardly rising more than an inch to an inch and a half, while the *E. dispar* is a large Hydroid, growing in tall stems, branching but little; the *E. tenue*, on the contrary, forms small colonies of densely crowded individuals, branching profusely. The color is light pinkish.

Massachusetts Bay, Nahant (A. Agassiz); Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 39, Naushon, Sept. 1861, A. Agassiz. Hydrarium.
Cat. No. 40, Suisconset, July, 1849, L. Agassiz. Hydrarium.
Cat. No. 41, Suisconset, July, 1849, L. Agassiz. Hydrarium.
Cat. No. 402, Nahant, June 17, 1862, A. Agassiz. Hydromedusarium.

Eudendrium ramosum McCR.

Eudendrium ramosum McCR. Gymn. Charleston Harbor, p. 64.
? *Eudendrium ramosum* JOHNST. Brit. Zooph., p. 46.

McCrady has identified this species with the English *E. ramosum* Johnst. Specimens collected at Charleston by Professor Clark certainly show a great similarity to the English species, but it still remains to be proved, as we do not know their development, that these species are identical.

Charleston, S. C. (McCrady).

Cat. No. 42 Charleston, S. C., December, 1861, H. J. Clark.

Fig. 250. A part of a male colony; magnified.

LIZZIA Forbes.

Lizzia Forbes. Brit. Naked-eyed Medusæ, p. 64. 1848.
Lizzia Agass. Cont. Nat. Hist. U. S., IV. p. 345. 1862.
Cytæis Sars (*non* Esch.). Beskriv., p. 28. 1835.

Lizzia grata A. Agass.

Lizzia grata A. Agass.; in Proc. Bost. Soc. Nat. Hist., p. 100, Figs. 28, 29. 1862.

The presence of a cluster of tentacles, intermediate between the chymiferous tubes gives to Lizzia a totally different aspect from that of Bougainvillia, which is the permanent embryonic type of Lizzia. In a young Lizzia this middle cluster is wanting; the character of the development of the tentacles is totally different from that of Bougainvillia; we have an odd tentacle at first (Fig. 252), and then pairs of

Fig. 252.

Fig. 251.

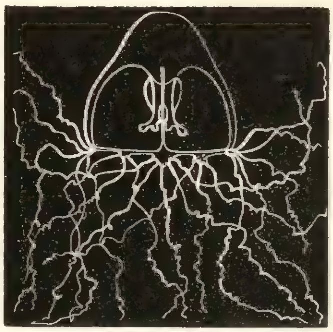
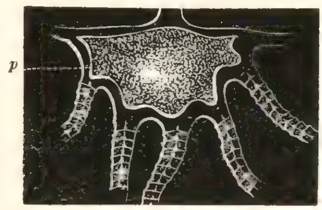


Fig. 253.



tentacles (Fig. 253), while in the Bougainvillia we have, for the first set, as well as for the subsequent cycles, a pair of tentacles; so that we may have, as members of the same family, forms in which these clusters are reduced to a minimum, as in Dysmorphosa (Fig. 259), where the odd tentacle alone is developed.

In an adult Lizzia (Fig. 251) the chymiferous cluster of tentacles consists of five, the intermediate cluster of three. The order of succession of the different tentacles in the young stages can easily be traced in Fig. 252; at first there are four long tentacles opposite the chymiferous tubes, flanked by two short tentacles; next the odd tentacle of the middle cluster makes its appearance, and then after some time the other pair of tentacles of the middle cluster. The sensitive bulb of the adult is elongated, polygonal, and thickly covered with pigment-cells (*p*, Fig. 253); the digestive cavity of the adult (Fig. 254) is nearly as long as the cavity of the bell, into which a short projection of the bell

Fig. 251. Adult male Lizzia grata, seen in profile; magnified.
Fig. 252. Quarter of the disk of a young Lizzia.
Fig. 253. Magnified view of the sensitive bulb. *p*, pigment-cells.

extends; the genital pouches are on the sides of the digestive cavity, extending nearly to its extremity. The actinostome terminates in four large lobes, edged with short oral tentacles, surmounted by a knob of

Fig. 254.

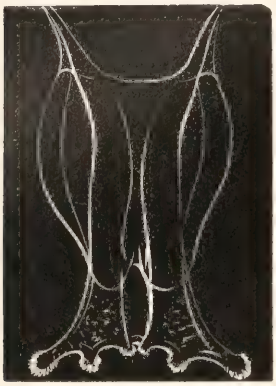
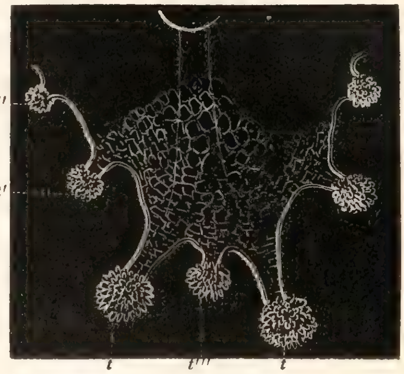


Fig. 255.



lasso-cells; these lips are quite expansive and contractile. (t, t', t'', t''', Fig. 255.) In the young Medusæ the digestive cavity terminates with only four club-shaped tentacles (t, Fig. 256); this soon branches in

Fig. 256.

Fig. 257.

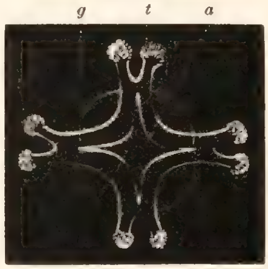


Fig. 258.

somewhat older stages, as that of Fig. 252, and assumes the shape of Figs. 257, 258, t, additional club-shaped oral tentacles being added in the order in which they are numbered in Fig. 255.

Massachusetts Bay (A. Agassiz).

Cat. No. 446, Nahant, A. Agassiz. Medusa.

Fig. 254. Proboscis of male Lizzia; magnified.

Fig. 255. One of the four lobes of the actinostome, seen from above. t, t, t', t'', t''', tentacles of actinostome.

Fig. 256. Actinal view of the proboscis of a young Lizzia. t, oral tentacle; d, digestive cavity.

Fig. 257. Actinal view of proboscis of an older specimen. a, actinostome; g, genital pouches; t, tentacles of actinostome.

Fig. 258. Abactinal view of Fig. 257, somewhat less magnified, with the oral tentacles in a different attitude; lettering as above.

DYSMORPHOSA PHIL.

Dysmorphosa PHIL.; in Archiv f. Nat., p. 37. 1842.
Podocoryne SARS. Fauna Lit., p. 4. 1846.

Sars has traced the development of a Medusa from *Podocoryne carnea* which is very closely allied to *Dysmorphosa fulgurans* here figured. It corresponds, in its younger stages, while still attached to the proboscis of its parent, to the different stages of our Medusa, in the number, arrangement, and order of appearance of the tentacles, so completely, that I have referred it to the genus Dysmorphosa of Philippi, considered by Sars as identical with the Hydroid from which his Medusa was developed. This identification is the more probable, as Krohn has given us a complement to the observations of Sars on the adult Medusæ, and traced the budding from the proboscis in exactly the same manner as it is here given. The Lizzia figured by Claparède in the tenth volume of Siebold u. Kölliker's Zeitschrift, in which he has also traced the budding from the proboscis, appears to be identical with the *Podocoryne carnea* of Sars.

Dysmorphosa fulgurans A. AGASS.

This Medusa (Fig. 259) is sometimes so abundant that the whole sea, when disturbed, is brilliantly lighted by the peculiar bluish phosphorescent color which they give out. Their great number is easily accounted for by their mode of reproduction and by its rapidity. Young Medusæ are formed by budding on the upper extremity of the proboscis (Figs. 259, 260), and their development takes place in the course of three or

Fig. 259.

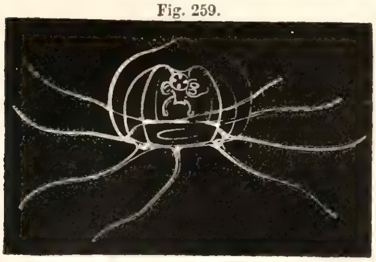
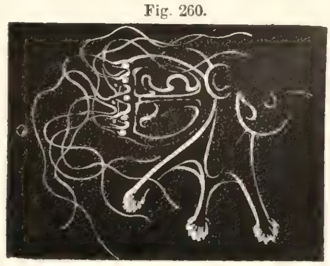


Fig. 260.



four days; from three to four Medusæ develop at the same time; the Medusæ buds of the third generation are already forming, while the second is still attached. (Fig. 260.) The young Dysmorphosa has at first four tentacles, the middle set developing later; there are only four oral tentacles, quite long and slender, and an accumulation of pigment-

Fig. 259. Adult Dysmorphosa; magnified.
Fig. 260. Magnified proboscis, showing young Medusæ of the second and third generations.

cells at the base of the tentacles; the abactinal part of the bell is quite conical (Fig. 259); the tentacles of the adult Medusa are usually carried rather stiffly (Fig. 260); but when the young Medusa is still attached, they are frequently expanded several times the diameter of the bell. (Fig. 260.) This Medusa resembles very much the young of *Turritopsis nutricula*, and could readily be mistaken for it. It would be most natural, therefore, to place this genus in the family of Nucleiferæ; but the presence of the peculiar oral tentacles of Lizzia, added to the fact that this is probably only a permanent embryonic stage of Lizzia, induces me to place it among the Bougainvillidæ.

Allman describes, in the fourth volume of the Ann. & Mag. of N. H. for 1859, page 368, a Medusa as developing from *Laomedea tenuis*, which resembles so strikingly Lizzia and Dysmorphosa that I suspect there must be some error in his observation. Does it not rather come from his *Dycoryne stricta*, which he found at the same time and at the same place, and which would thus bring this Medusa, intermediate in its characters between Lizzia and Dysmorphosa, to its proper place among the Bougainvillidæ?

Massachusetts Bay, Nahant (A. Agassiz); Buzzard's Bay, Naushon (A. Agassiz).

Family NUCLEIFERÆ Less.

Nucleiferæ Less. Prod. Mon. Méd. 1837.
Nucleiferæ Agass. Cont. Nat. Hist. U. S., IV. p. 346. 1862.
Oceanidæ Esch. (*p. p. non* Agass.). Syst. der Acal., p. 96. 1829
Oceanidæ Gegenb.; in Zeitschrift f. Wiss. Zool., p. 219. 1856.
Oceanidæ McCr. Gymn. Charleston Harbor, p. 21.
Clavidæ McCr. Gymn. Charleston Harbor, p. 37.
Clavidæ Agass. Cont. Nat. Hist. U. S., IV. p. 338. 1862.

TURRIS Less.

Turris Less. Prod. Mon. Méd. 1837.
Turris Agass. Cont. Nat. Hist. U. S., IV. p. 346. 1862.
Oceania Auct. (*p. p. non* Agass.). Medusa.
Clavula Wright. Hydra.

Turris vesicaria A. Agass.

Turris vesicaria A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 97.

This Medusa I formerly supposed to be the *Medusa digitalis* of Fabricius; it certainly is not that of Forbes. Since that time I have ascertained that the *Medusa digitalis* of Fabricius belongs to a different family, the Trachynemidæ. (See page 57.) It has been found but once at Nahant, in the early part of the spring, and probably having habits similar to those of Tima, it is only accidentally met with. It has very much the same kind of coloring as our Tima, but in Turris the color of the genital organs and the base of the tentacles is somewhat more yellowish. The bell of Turris is exceedingly

Fig. 261

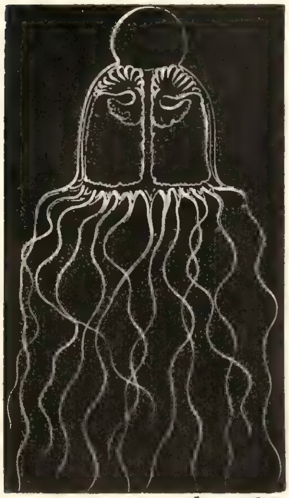


Fig. 262.

thin, except at the abactinal pole (Fig. 261), where it forms a sort of bladder, capable of more or less contraction at its base; when the Medusa is disturbed, the sides of the bell, below the bladder, contract, and give it a polygonal outline, as is seen in Fig. 262. The genital

Fig. 263.

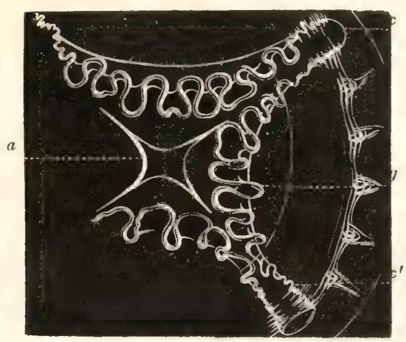
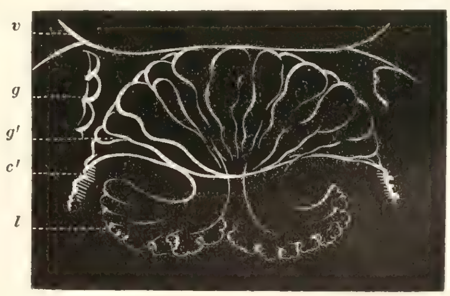


Fig. 264.



organs remind us somewhat of those of Ptychogena, only they are attached to the abactinal part of the interior of the bell; passing in

Fig. 261. Turris vesicaria, natural size; seen in profile.

Fig. 262. The same, with the bell contracted.

Fig. 263. A portion of the disk, seen from the abactinal pole. *a*, opening of actinostome; *g*, point of attachment of the convoluted genital organs to the inner surface of the bell; *c*, chymiferous tubes; *c'*, continuation of convolution of genital organs, forming the sides of the chymiferous tubes.

Fig. 264. Magnified profile view of genital organs and actinostome. *l*, lips of actinostome; *g'*, convoluted genital organs, extending from one side of the bell to the other; *g*, part of the genital organ on the other side of the chymiferous tube; *c'*, as in Fig. 263; *v*, base of bladder surmounting the bell.

deep festoons (Fig. 263) from one chymiferous tube to another; they form a compact mass, and fill the whole of the upper part of the bell; from this are suspended four movable, deeply-frilled lips (*l*, Fig. 264), leading into a short digestive cavity totally concealed by the genital organs. The chymiferous tubes are broad and very flat, the two edges of the tubes being irregularly cut (Fig. 265); transverse folds extend from one side to the other; the chymiferous tubes open into a broad circular tube (Fig. 266), having a similar hacked edge; with the circular tube communicate five tentacles placed between the chymiferous tubes, and one opposite each. The tentacles are broad at the base, and taper very rapidly into a long slender lash; at the base of

Fig. 266.

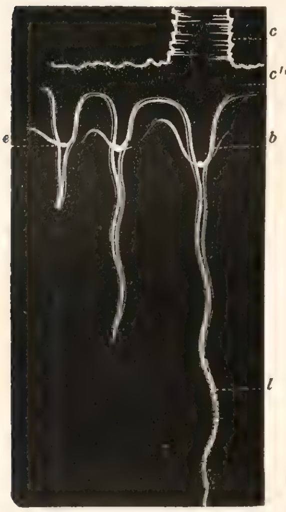


Fig. 267.

Fig. 265.

Fig. 268.

the bag of the tentacles is a large swelling, in the centre of which is placed a distinct eye-speck. (Figs. 266, *e*; 267, 268.) The size of the opening, leading from the circular tube to the tentacle, is readily seen when examined from the abactinal side. (Figs. 263; *o*, 268.) In the genera Turris, Ptychogena, Olindias of Müller, and Polyorchis, we have strongly developed characters, which show their close relation; in Turris and Ptychogena, the nature of the genital organs and the character of the chymiferous tubes; in Olindias and Polyorchis, the genital organs and branching tubes, being simply extreme cases of what we have first hinted at in Turris, more strongly marked in Ptychogena, in the mode of attachment of the genital organs, and

Fig. 265. Magnified view of a part of a chymiferous tube.

Fig. 266. Base of one of the chymiferous tubes, and part of the circular tube. *c*, chymiferous tube; *c''*, circular tube; *b*, sensitive bulb of tentacle; *e*, eye-speck; *l*, lash of the tentacles covered with lasso-cells.

Fig. 267. One of the tentacles in a semi-profile view.

Fig. 268. One of the tentacles, seen from the abactinal pole. *o*, opening leading from circular tube.

carried out in a very different direction in the genital pouches on the pendent proboscis of Stomotoca.

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 274, Nahant, Mass., May 12, 1862, A. Agassiz.

TURRITOPSIS McCr.

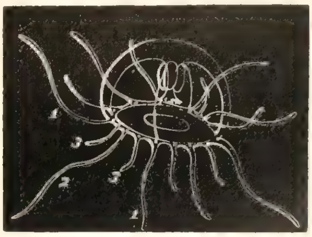
Turritopsis McCr. Gymnoph. Charleston Harbor, p. 24. 1857.
Turritopsis McCr. On Turritopsis, new species, ... p. 2. 1856.
Turritopsis Agass. Cont. Nat. Hist. U. S., IV. p. 347. 1862.

Turritopsis nutricula McCr.

Turritopsis nutricula McCr. Gymn. Charleston Harbor, p. 25, Pls. 4, 5, 8, Fig. 1.
Turritopsis nutricula Agass. Cont. Nat. Hist. U. S., IV. p. 347. 1862.
Turritopsis nutricula A. Agass.; in Proc. Boston Soc. Nat. Hist., IX. Figs. 22, 23.

Fig. 269.

Fig. 270.



The young Medusæ have only four stiff tentacles, with a long bottle-shaped digestive trunk (Fig. 269), fastened by its base to the lower part of a short prolongation of the bell, along which the chymiferous tubes run; the digestive cavity has four marked prolongations, surmounted by bunches of lasso-cells; along the upper part of the digestive cavity, the genital organs are developed in four bunches, placed along the prolongations of the actinostome. As the Medusæ increase in size, there are four more tentacles formed, one in the middle of the space between the chymiferous tubes; the genital organs increase in length, and by the time two additional tentacles (3, Fig. 270) have been formed, one on each side of the tentacles of the second cycle, the genital glands have become very much swollen, and occupy nearly the whole length of the digestive cavity and proboscis. With advancing size the gelatinous mass loses its bell shape, and becomes more globular, the tentacles (then sixteen in number) losing somewhat their stiffness; when it has only four tentacles, the young Medusa resembles so much Sarsia, in the shape of the bell and of the digestive cavity, that were it not that Sarsia carries its tentacles curled up close to the circular tube, while in Turritopsis they stand stiffly out from the rim of the bell, like the tentacles of Eudendrium, it would be difficult to distinguish them apart. Not having traced this Medusa beyond the stage when it had sixteen

Fig. 269. Young Turritopsis nutricula, with four marginal tentacles; greatly magnified.
Fig. 270. Somewhat more advanced Turritopsis, having sixteen tentacles.

tentacles, I am unable to determine whether it is a distinct species from the Turritopsis of Charleston; the color of the proboscis and of the sensitive bulb is different in the two; the ovaries are light brown, with darker lines in the furrows between them; the ocelli are dark-red brown. The shape of the tentacles and of the bell, however, are the same in both, as well as their habits, and the changes which this Medusa goes through with advancing age. From each side of the base of the four tentacles, at the junction of the circular and of the chymiferous tubes, runs a thread of bunches of lasso-cells, which reach nearly to the abactinal pole, as in the young Medusæ of many of the Tubularians.

There is found at Nahant the young of a species of Turritopsis which differs from the *Turritopsis nutricula* very essentially; the bell, which is remarkably thin, has a uniform thickness from the circular tube to the abactinal pole; the tentacles, even when there are only four, are quite long, slender, and usually carried curled up along the sides of the bell, giving these young Medusæ a totally different aspect from the young of the *T. nutricula.* I might mention here that the trace of its connection with a Hydroid stock was very distinct in young Medusæ; the adult Medusa was not observed.

Charleston, S. C. (McCrady); Naushon, Buzzard's Bay (A. Agassiz).
Cat. No. 273, Naushon, September, 1861, A. Agassiz. Medusa.
Cat. No. 440, Naushon, July, 1864, A. Agassiz. Medusa.

STOMOTOCA Agass.

Stomotoca Agass. Cont. Nat. Hist. U. S., IV. p. 347. 1862.
Saphenia Forbes (*non* Esch.). British Naked-eyed Medusæ, p. 25. 1848.

Stomotoca apicata Agass.

Stomotoca apicata Agass. Cont. Nat. Hist. U. S., IV. p. 347. 1862.
Saphenia apicata McCr. Gymn. Charleston Harbor, p. 27, Pl. 8, Figs. 2, 3.

Charleston, S. C. (McCrady); Newport (A. Agassiz).
Cat. No. 454, Newport, A. Agassiz. Medusa.

Stomotoca atra Agass.

Stomotoca atra A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 347. 1862.

This Medusa (Fig. 271) is much larger than the one Forbes has described as *S. dinema* (Naked-eyed Medusæ, Pl. II. Fig. 4), which measures only a quarter of an inch, while this species is from three quarters to an inch in size; it is much less elongated, the vertical and horizontal diameters being the same; it swells out to its greatest horizontal diameter almost immediately above the circular tube, where it curves in slightly, and then bends uniformly towards the abactinal pole; the upper part is almost hemispherical, being very blunt at the abactinal pole; the peduncle tapers gradually from the base to the ovaries; the ovaries are barrel-shaped, extending to the digestive cavity, which is small at the point where the chymiferous tubes empty into it, but gradually bulges out, and passes into the lobes of the actinostome, where it is three or four times as wide as at the base. Only two of the chymiferous tubes have long tentacles; between these larger tentacles there are a number of small tentacles (in the specimen described about eighty), hardly one sixteenth of an inch long. The ovaries are placed on the abactinal extremity of a long peduncle; they consist of a double series of folds, occupying the middle third of the peduncle (Fig. 272), and are of a dark-brown color; below them is placed the digestive cavity, which is very contractile, of a lighter color, and end-

Fig. 271.

Fig. 273.

Fig. 272.

ing with an actinostome divided into four lips. While swimming, these Medusæ move slowly, contracting alternately either one or the other of their long tentacles; when contracted, the tentacle has very much the appearance of the contracted tentacle of a Pleurobrachia; when floating about motionless, the chymiferous tubes often contract, and this gives to the Medusa the appearance of being deeply lobed (Fig. 273), the intermediate portions of the periphery not seeming to be so highly contractile as that which immediately adjoins the chymiferous tubes. This Medusa was quite common in the Straits of Rosario, W. T., in the beginning of June. I also found specimens of it during the summer, till September, in different parts of the Gulf of Georgia, and in the neighborhood of Port Townsend.

Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 50, Straits of Rosario, W. T., June, 1859, A. Agassiz. Medusa.

Fig. 271. Stomotoca atra, somewhat magnified; seen in profile.
Fig. 272. Magnified view of genital organs.
Fig. 273. Stomotoca atra, in a different attitude.

RHIZOGETON Agass.

Rhizogeton Agass. Cont. Nat. Hist. U. S., IV. p. 347. 1862.

Rhizogeton fusiformis Agass.

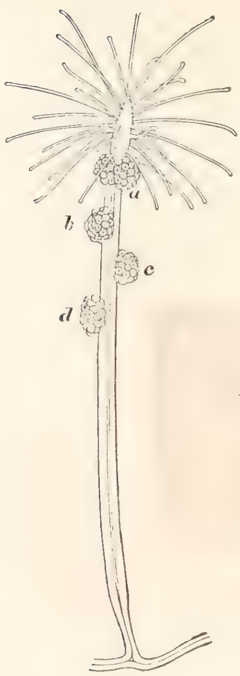
Rhizogeton fusiformis Agass. Cont. Nat. Hist. U. S., IV. pp. 224, 347, Pl. 20, Figs. 17–23. 1862.

Massachusetts Bay (Agassiz).
Cat. No. 52, Nahant, Mass., July, 1861, A. Agassiz. Hydrarium.

CLAVA Gmelin.

Clava Gmelin; in Beschäft. d. Berlin. Ges. Naturf. Freunde. 1775.

Fig. 274.



Clava leptostyla Agass.

Clava leptostyla Agass. Cont. Nat. Hist. U. S., IV. pp. 218, 222, Fig. 32; 338, Pl. 20, Figs. 11–16[a]; Pl. 21. 1862.
Clava multicornis Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Clava multicornis Leidy. Mar. Inv. Rhode Island and New Jersey, p. 3, Pl. XI. Figs. 33, 34. 1855.
Clava multicornis Pack.; in Can. Nat. & Geol. Dec. 1863.

The *Clava leptostyla* (Fig. 274) seems to differ from the *C. multicornis* by the greater number of its tentacles.

Point Judith (Leidy); Massachusetts Bay (Agassiz).

Cat. No. 51, Kingston, Mass., July, 1851, H. J. Clark.

Cat. No. 451, Nahant, Mass., A. Agassiz. Hydromedusarium.

Museum Diagram, No. 24, after L. Agassiz.

Fig. 274. Clava leptostyla; greatly magnified.

Family WILLIADÆ Forbes.

Williadæ FORBES. British Naked-eyed Medusæ, p. 19. 1848.
Berenicidæ AGASS. (*p. p. non* Esch.). Cont. Nat. Hist. U. S., IV. p. 345. 1862.

WILLIA FORBES.

Willsia FORBES. British Naked-eyed Medusæ, p. 19. 1848.
Willia AGASS. Cont. Nat. Hist. U. S., IV. p. 346. 1862.

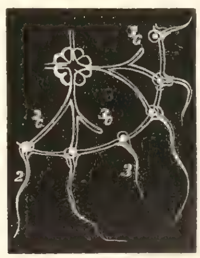
Willia ornata McCR.

Willia ornata McCR. Gymnoph. Charleston Harbor, p. 47, Pl. 9, Figs. 9–11.
Willia ornata AGASS. Cont. Nat. Hist. U. S., IV. p. 346. 1862.
Willia ornata A. AGASS.; in Proc. Bost. Soc. Nat. Hist., IX. Figs. 20, 21. 1862.

The development of Willia presents some striking differences from the mode in which tentacles are regularly developed in successive cycles among Polyps, and from what has been observed, in accordance with that mode of development, among some of our naked-eyed Medusæ (*Laomedea diaphana*, *Clytia bicophora*, etc.). In very young Williæ, having only four simple chymiferous tubes and four tentacles, — two much longer than the others, as we find them in Atractylis and Lafœa, — there are soon developed four additional tentacles; these

Fig. 274a.

Fig. 275.



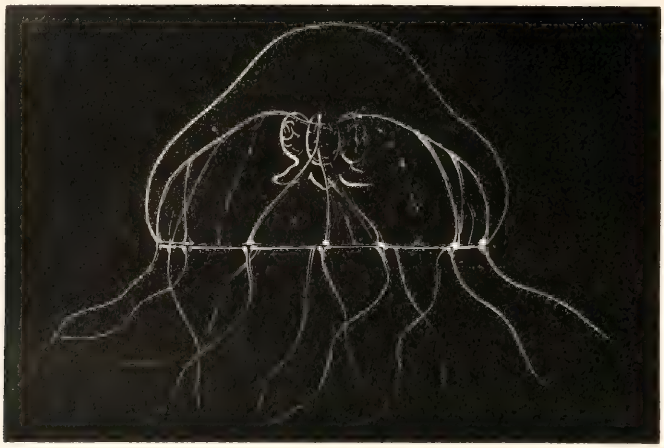
do not appear in the middle between the adjoining chymiferous tubes, but about one third of the distance. (Fig. 274a.) When this second cycle of tentacles can be readily distinguished as four well-marked knobs along the circular tube, an offset branches off from the simple chymiferous tube, which soon extends to the circular tube, opposite the rudimentary tentacle; this offset takes its origin at two thirds the length of the chymiferous tube from the circular tube; at the same time this branch is forming, the main tube is slightly bent in the opposite direction from that in which the branch diverges; the offset

Fig. 274a. Youngest Willia observed, having only the second set of tentacles developed. 2, second set of marginal tentacles; 2c, branch of chymiferous tubes leading to them.

Fig. 275. A young Willia, nearly in the stage of Fig. 276, seen from the abactinal pole. 3, third set of tentacles; 3_c, chymiferous tube leading to them.

also is slightly convex, the convexity being turned towards the circular tube. The next cycle, the third, consists only of four tentacles, which all make their appearance on the other side of the main chymiferous tube, just as far on the other side as the tentacles of the second cycle were on this side of the main radiating tube; the offsets of the tube which reach these tentacles start slightly below the first, and

Fig. 276.

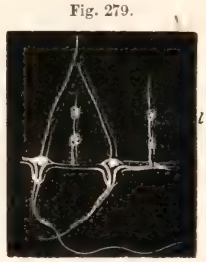


are likewise bent towards the circular tube. I was not able to observe the formation of the additional branches and tentacles. I refer this species at present to the *Willia ornata* of McCrady found at Charleston, the specimens which I found (Fig. 276) not being advanced enough to enable me to determine their difference or identity. The tubes which contain the clusters of lasso-cells (*l*, Fig. 279), running in the thickness

Fig. 277.

Fig. 278.

Fig. 279.



of the spherosome from the circular tube to the height of the base of the digestive cavity, were particularly well defined; the longer tubes, extending in the middle of the space between two chymiferous tubes, contain three clusters of lasso-cells, made up of from four to five large cells arranged in a circle. Even at this early stage the ovaries were well developed (Figs. 277, 278); they are elliptical bunches placed on

Fig. 276. Profile view of a young Willia; magnified.

Fig. 277. Part of the circular tube. *l*, tubes running into the thickness of the spherosome, containing large lasso-cells.

Fig. 278. View of ovary of Fig. 276.

Fig. 279. The same as Fig. 278, seen from the abactinal pole.

both sides of the cross-shaped edges of the digestive cavity, giving it a quadrangular appearance, when seen from above. (Fig. 279.) Found at Naushon the last part of September, one tenth to one eighth of an inch in diameter.

Charleston Harbor (McCrady); Buzzard's Bay, Naushon (A. Agassiz).

PROBOSCIDACTYLA Brandt.

Proboscidactyla Brandt; in Mém. Acad. St. Petersburg, II. p. 228. 1835.
Proboscidactyla Agass. Cont. Nat. Hist. U. S., IV. p. 346. 1862.

Proboscidactyla differs from Willia in the mode of branching of the chymiferous tubes; in the former genus each main chymiferous tube divides into two halves, branching symmetrically on both sides from the two main branches, which is not the case in Willia.

Proboscidactyla flavicirrata Br.

Proboscidactyla flavicirrata Br.; in Mém. Acad. St. Petersb., p. 390, Pl. 19. 1838.
Proboscidactyla flavicirrata Agass. Cont. Nat. Hist. U. S., IV. p. 346. 1864.

This small Medusa seems quite uncommon in the Gulf of Georgia. I only found a couple of specimens, in the latter part of June, near Galiano Island. They are so small and so transparent that it requires the utmost attention to discover them. It seems to be the species found by Brandt on the coast of Kamtschatka; he was unable to find any actinostome in the trunk-like prolongation (Fig. 280), which he represents as surrounded by a large number of small tentacles; the digestive cavity opens by an actinostome, surrounded by four large lobes, and these subdivide into a number of smaller lobes, subordinate to the larger ones. (Fig. 281.) The ovaries are attached to the abactinal extremity of the chymiferous tubes, and extend but a short distance towards the periphery along the four radiating tubes (Fig. 281); the chymiferous tube runs single for a short distance, before the principal division into two branches takes place (*b*, Fig. 282); at the point of meeting of each of the smaller branches with the circular branch, there is a very marked eye-speck; the tentacles are numerous, each

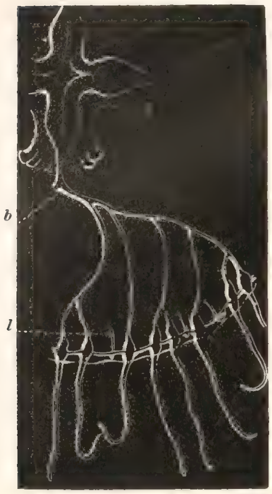
Fig. 280.

Fig. 281.

Fig. 280. Proboscidactyla flavicirrata; magnified.
Fig. 281. Actinostome and digestive cavity.

chymiferous tube dividing into two main branches, and each branch subdividing again into eight, making in all sixty-four branching tubes, and as many tentacles and eye-specks. Between each of the ocelli there extends from the circular tube a small tube penetrating into the thickness of the edge of the spherosome, which projects a considerable distance beyond the circular tube. The color of the digestive cavity is dirty yellow, the tentacles are of a brilliant straw color, and the ocelli dark blue. The whole exterior of the spherosome is densely granulated, the projections being probably something similar to what we find on the disk of *Aurelia flavidula*, made up of large lasso-cells, only much more densely crowded together. The shape of the bell is almost perfectly thimble-shaped, there being neither bulging nor striking indentations of the periphery. The motions of this Medusa are very rapid; the tentacles are capable of but little contraction.

Fig. 282.



Petropolawsky (Mertens); Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 62, Gulf of Georgia, W. T., June, 1859, A. Agassiz. Medusa.

Fig. 282. Portion of disk, to show the mode of branching. *b*, first fork; *l*, tubes containing lasso-cells, as in Willia.

Family SARSIADÆ Forbes.

Sarsiadæ Forbes (*restr.* Agass.). Brit. Naked-eyed Medusæ, p. 54. 1848.
Sarsiadæ Agass. Cont. Nat. Hist. U. S., IV. pp. 184, 217, 339. 1862.

CORYNE Gärt.

Coryne Gärt.; in Pall. Elen. Zooph. 1774. Hydra.
Syncoryna Ehrenb. (*p. p.*). Corall. des Rothen Meeres. 1834. Hydra.
Stipula Sars. Bidrag til Söedyr. Nat. 1829. Hydra.
Hermia Johnst. British Zoophytes, p. 111. 1838. Hydra.
Coryne Agass. Cont. Nat. Hist. U. S., IV. p. 339. 1862. Hydra.
Sarsia Less. Zooph. Acal., p. 333. 1843. Medusa.
Sthenio Duj.; in Ann. Sc. Nat. 1845. Medusa.
Sarsia Agass.; in Mem. Am. Acad., p. 224. 1849. Medusa.

Coryne mirabilis Agass.

Coryne mirabilis Agass. Cont. Nat. Hist. U. S., IV. pp. 185–217, Figs. 9–31; Pl. 20, Figs. 1–9; Pl. 23[a], Fig. 12; III. Pl. 11[c], Figs. 14, 15; Pls. 17–19. 1860–62.
Sarsia mirabilis Agass.; in Mem. Am. Acad., IV. p. 224, Pls. 4, 5.
Sarsia mirabilis Stimps. Mar. Inv. Grand Manan, p. 11. 1853.
Oceania tubulosa Gould (*non* Sars). Inv. of Mass., p. 348. 1841.
Sarsia glacialis Mörch; in Beskriv. af Groenland, p. 95. 1857.
Tubularia stellifera Couth.; in Bost. Journ. Nat. Hist., II. p. 56.
Tubularia stellifera Gould. Inv. Mass., p. 350. 1841.

This Medusa (Figs. 283, 284, 285) is one of the earliest visitants of our wharves. The ice has scarcely gone from the shores when numbers of young Medusæ, just freed from the Hydrarium, swarm near the surface on any sunny day. Captain Couthouy has described, under the name of *Tubularia stellifera*, a Hydroid which is probably the Hydroid of our *Sarsia mirabilis*; as the specimens from which his descriptions were made have not been pre-

Fig. 283.

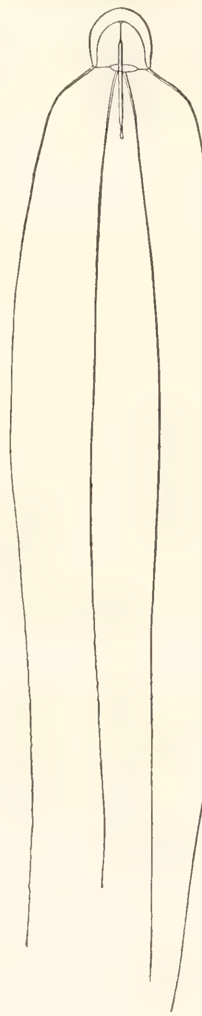


Fig. 284.

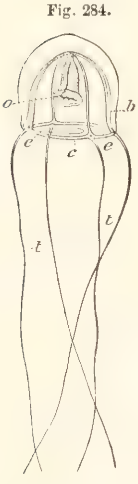


Fig. 285.

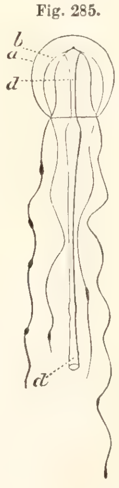


Fig. 283. Adult Coryne mirabilis, seen in profile; one half natural size.
Fig. 284. Coryne mirabilis, with proboscis contracted. *t*, tentacles; *e*, veil; *c*, circular tube; *o*, actinostome.
Fig. 285. Coryne mirabilis, with expanded proboscis. *d*, proboscis; *a*, *b*, thickness of the bell.

served, I am unable to state this positively. It seems to make but little difference to the Hydrarium (Figs. 286, 287, 288) or to the

Fig. 286.

Fig. 288.

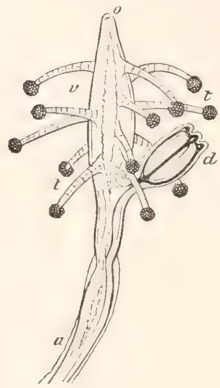
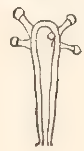


Fig. 287.



Medusa whether they live in pure sea water, such as they find at Nahant, or live in the more brackish waters of the inner harbor of Boston; they are equally abundant in both localities.

Massachusetts Bay (L. Agassiz).

Cat. No. 45, Nahant, Mass., May, 1862, A. Agassiz. Hydromedusarium.

Cat. No. 60, Nahant, May, 1862, H. J. Clark. Hydrarium.

Cat. No. 64, Nahant, March, 1862, H. J. Clark. Hydrarium.

Cat. No. 268, Boston, April, 1862, A. Agassiz. Young Medusæ.

Cat. No. 269, Boston, May, 1862, A. Agassiz. Young Medusæ.

Museum Diagrams, No. 20, 21, after L. Agassiz.

Coryne rosaria A. Agass.

Coryne rosaria A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 340. 1862.

I have but little doubt that the Hydroid here described is the larva of *Coryne rosaria;* this settles any doubt there may be concerning the specific differences between this Medusa, and the European or American representatives on the two sides of the Atlantic. The Hydrarium resembles somewhat *Coryne stipula* of Sars, but the proportions of the individuals of these two Hydraria are totally different; what is particularly characteristic of *Coryne stipula* is the stoutness and great size of the head and stem, compared to the size of the community; in *Coryne rosaria* the heads, which are quite slender, are supported by remarkably long and attenuated stems; they branch also very profusely, and it is not uncommon to find communities of this graceful Coryne reaching a height of three to three and a half inches. Medusæ buds were

Fig. 286. Cluster of Hydraria of Coryne mirabilis.
Fig. 287. Young Hydrarium.
Fig. 288. Magnified view of a head with Medusa bud, *d*, attached.

observed on the Hydrarium in March; no young Medusæ have been observed; the adults attain an enormous size, measuring more than an inch in polar diameter, as in Fig. 289, which is drawn the natural size.

Fig. 289.

The spherosome bulges very rapidly from the abactinal pole (Fig. 289) till it reaches the point of junction of the chymiferous tubes; from there it tapers very gradually towards the peripheric tube; the chymiferous tubes are exceedingly slender, the digestive cavity very long, projecting one half its length beyond the circular tube, swelling near the lower extremity, and then suddenly contracting, tapers gradually, in the form of a conical projection, beyond the ovaries; the sensitive bulbs are large, the eye-specks small. The proboscis and the tentacles are of a dirty-yellow color, the color of the swelling of the proboscis and of the sensitive bulbs being somewhat darker. It resembles *Sarsia tubulosa* of the English coast more than *Sarsia mirabilis* of New England. Found in the Straits of Rosario in May, and as late as the beginning of July in the Gulf of Georgia, W. T., and also in the harbor of San Francisco during November.

San Francisco, Cal. (A. Agassiz); Gulf of Georgia, W. T. (A. Agassiz).

Cat. No. 48, Gulf of Georgia, W. T., May, 1859, A. Agassiz. Medusa.

Cat. No. 49, San Francisco, Cal., March, 1860, A. Agassiz. Hydromedusarium.

SYNDICTYON A. AGASS.

Syndictyon A. AGASS.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 340. 1862.

Syndictyon reticulatum A. AGASS.

Syndictyon reticulatum A. AGASS.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 340. 1862.

The Hydrarium (Fig. 290) resembles that of *Coryne mirabilis;* it is much smaller, not being more than one tenth of an inch in height; it does not branch, or only occasionally once, near the base, in very old specimens. The stem is slender, the head large, club-shaped, the tentacles short, eight or ten in number. The Medusæ develop among the tentacles in the lower part of the head; this development is similar to that of Sarsia; when the Medusa is separated it is nearly as large as the whole Hydrarium, measuring about one sixteenth of an inch in

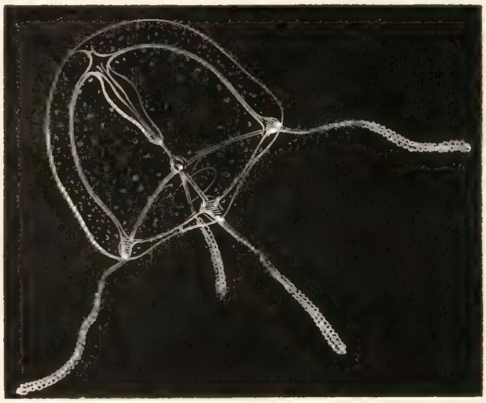
Fig. 289. Coryne rosaria, natural size.

diameter. The young Medusæ resemble somewhat Zanclea (Fig. 291), having the lasso-cells of the marginal tentacles arranged spirally in large clusters on the surface of the tentacles; the more advanced Medusæ lose this character. The bunches of lasso-cells increase in size towards the extremity, where the tentacle terminates in a club-shaped bunch (Fig. 292) larger than the others; the sensitive bulb is large, the

Fig. 292.

Fig. 290.

Fig. 291.



ocellus at the base of the tentacle (Fig. 293) is similar to that of Sarsia, the spherosome is of a uniform thickness, and the proboscis (Fig. 294) resembles somewhat that of Dipurena; the whole surface of the spherosome is covered with clusters of large lasso-cells (Fig. 296), giving it a granulated appearance; the ground-work consists of minute granulation, which appears under a low magnifying power to be arranged

Fig. 293.

Fig. 294.

Fig. 295.

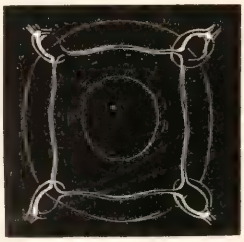


Fig. 290. Hydromedusarium of Syndictyon reticulatum, greatly magnified.

Fig. 291. Syndictyon reticulatum, immediately after it has become freed from the Hydromedusarium; in profile, magnified.

Fig. 292. One of the tentacles of Fig. 291, magnified.

Fig. 293. Sensitive bulb of Fig. 291.

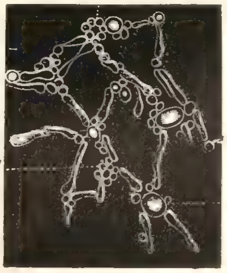
Fig. 294. Digestive cavity of Fig. 291.

Fig. 295. Fig. 291, from the actinal side.

in rows parallel to the circular tube, upon which are scattered large lasso-cells. The actinal and polar axes are of about the same length; the veil is well developed (Fig. 295); the central part of the spherosome is uniformly arched outside; the curve of the inner cavity is concentric with it; the proboscis extends somewhat more than half the length of the height of the cavity of the bell; the circular and chymiferous tubes are narrow (Fig. 296), of uniform diameter throughout; the sensitive bulb is ovoid, with a well-defined lenticular-shaped concentration of black pigment-cells (Fig. 293); the bulb itself is colored light-brown; the walls of the tentacles are thick, the tentacular tube tapering rapidly as it nears the extremity of the tentacle, where the walls increase in thickness in proportion as the tube diminishes in bore; the bunches of lasso-cells begin at some distance from the base of the tentacle (one fourth of the length of the tentacle), increase rapidly in size, being packed closer and closer towards the extremity of the tentacle, where they are large crescent-shaped masses, almost touching each other, and composed of very elongated lasso-cells. (See Fig. 292.) The tentacles are not very contractile; usually they are about as long as the vertical diameter of the bell, and I have seen them contracted to about half that length; the peduncle is not contractile. The large lasso-cells of the surface of the spherosome (Fig. 297) are round; they are usually scattered singly over the whole surface, while the fine granulation of the surface of the bell consists of long, narrow cells, dividing into smaller granules, which are small, undeveloped lasso-cells, forming a net-work over the surface of the spherosome; the lasso-cells are not as numerous near the abactinal pole as towards the margin of the bell, above the circular tube. The motions of the Medusa are similar to those of Sarsia, the bell, owing to its thinness, being, however, much more flexible. The bell has a very light metallic-blue tinge. The Hydroid was found growing on *Diphasia rosacea.* Young Medusæ, similar to those developed from the Hydroid, are found swimming freely about during June and July.

Fig. 296.

Fig. 297.



The young Medusa described above gradually loses the characters which distinguished it from Sarsia, and as it becomes more advanced, it resembles so closely Sarsia, that were it not for the invariable

Fig. 296. Fig. 291, from the abactinal pole.

Fig. 297. Part of net-work of the surface of the spherosome. *c*, large lasso-cells; *c′*, cluster of smaller ones.

presence of the light reddish-brown eye-specks, which become red in the adult, it would be difficult, without very close examination, to distinguish them apart. The tentacles of the adult (Fig. 298) are not as long as those of Sarsia; they are likewise capable of much greater contraction, being often carried in a club-shaped form, not longer than half the vertical axis of the bell. (Fig. 299.) The actinostome is also very different; the lips (four in number) are quite prominent (a', Fig. 300), though often carried in trumpet fashion, at

Fig. 299.

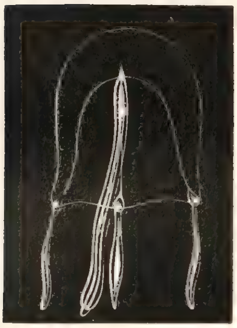


Fig 298.

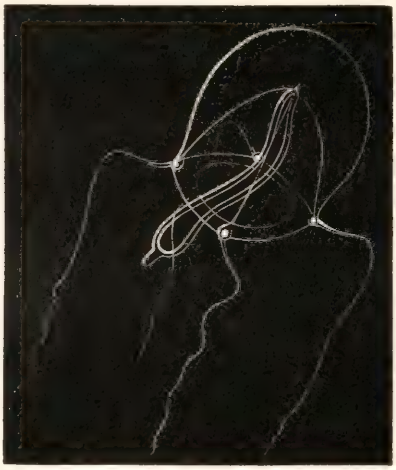
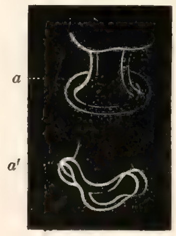


Fig. 300.



the extremity of the digestive cavity (a, Fig. 300), and the spherosome increases greatly in thickness at the abactinal pole.

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 160, Nahant, Mass., July, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 348, Boston Harbor, May, 1862, H. J. Clark. Medusa.

Cat. No. 378, Nahant, 1863, A. Agassiz. Medusa.

DIPURENA McCr.

Dipurena McCr. Gymn. Charleston Harbor, p. 33.
Dipurena Agass. Cont. Nat. Hist. U. S., IV. p. 341. 1862.

McCrady established this genus from an investigation of two species of Medusæ, which, though having all the characteristics of Slabberia of Forbes, yet differed from it in the position of the sexual organs, which are placed in Dipurena along the digestive trunk, as in Sarsia and the like, while in Slabberia Forbes has figured genital organs along the

Fig. 298. Adult Medusa, in a natural attitude.
Fig. 299. The same Medusa as Fig. 298, with the tentacles contracted.
Fig. 300. Actinostome of adult Medusa. a, when protruded, trumpet-shape; a', showing the lips of actinostome.

chymiferous tubes. This is so contrary to what we have thus far found to be uniformly the position of these organs among Tubularian Medusæ, that there is probably some mistake in Forbes's drawing.

Dipurena strangulata McCr.

Dipurena strangulata McCr. Gymnoph. of Charleston Harbor, p. 33, Pl. 9, Fig. 1.
Dipurena strangulata Agass. Cont. Nat. Hist. U. S., IV. p. 341. 1862.

Charleston, S. C. (McCrady).

Dipurena cervicata McCr.

Dipurena cervicata McCr. Gymn. Charleston Harbor, p. 34.
Dipurena cervicata Agass. Cont. Nat. Hist. U. S. IV. p. 341. 1862.

Charleston Harbor (McCrady).

Dipurena conica A. Agass.

Dipurena conica A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 341. 1862.

In the young Medusa the shape of the bell is nearly sugar-loaf (Fig. 301); the cavity of the bell is formed by a similar cone, with rounded apex; the disk diminishes rapidly in thickness towards the circular tube; the digestive cavity does not extend quite to the level of the veil; it is divided by a constriction into two unequal cavities, the upper one (*u*, Fig. 302) being about half the size of the lower one (*l*, Fig. 302); the walls of this cavity are thick, tapering gradually towards the actinostome, which is a simple opening, without labial appendages; the digestive cavity is scarcely contractile; the four marginal tentacles are short, the sensitive bulb is large, consisting of minute granular cells, the eye-speck being placed in a small button, standing out slightly from the base of the tentacle on the upper side (the abactinal side). (Fig. 303.) The walls of the tentacles are thick; they are made up of large elongated polygonal cells, giving the tentacles a striated appearance; the tube running through the tentacles is exceedingly fine, expanding slightly towards the extremity, where it joins the cavity of the terminal club; the large polygonal cells of the tentacle decrease in size towards the extremity, where there is a crescent-

Fig. 301.

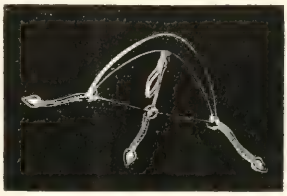
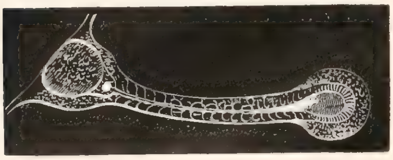


Fig. 302.

Fig. 301. Young Dipurena conica; magnified.
Fig. 302. Digestive cavity of a young Dipurena conica. *u*, the upper part; *l*, the lower.

shaped row of large elliptical cells surrounding the upper end of the terminal cavity, these cells being surmounted by a thick coating of small granular cells, extending along the surface of the tentacle until they gradually disappear; these granular cells are pigment-cells, giving the terminal club a reddish tinge; the sensitive swelling at the base of the tentacles is colored by similar cells, the eye-spot being black.

Fig. 303.



This species differs from the *Dipurena strangulata* in the form of the bell, the proportions of the digestive cavity and of the terminal clubs of the tentacles, as well as the shape of the sensitive bulbs; according to McCrady, they are exceedingly pointed in *D. strangulata*, while the sensitive bulb of *D. conica* widens as it approaches the circular tube. The largest specimens taken were one sixth of an inch in diameter; smaller specimens, not more than an eighth of an inch, differed greatly from the more advanced. The bell is almost globular, of uniform thickness; the digestive cavity is short and rectangular in shape. As the young advance in age, the spherosome becomes more and more bell-shaped, and then conical; as the digestive trunk increases in length, it contracts near the base, and becomes pear-shaped towards the extremity. When still quite young, the first appearance of the constriction becomes visible; larger and older specimens, measuring one fourth of an inch, have a digestive cavity divided into two cavities, separated by a constriction, as in Fig. 304, where this separation has become quite prominent; when the Medusa is in violent motion, the proboscis will assume a quadrangular shape, with a large four-sided opening; this flexibility of the actinostome is lost in older specimens. In the oldest specimens which have been found (Fig. 305), the separation between the upper and lower part of the digestive trunk has become such, that the

Fig. 304.

Fig. 305.

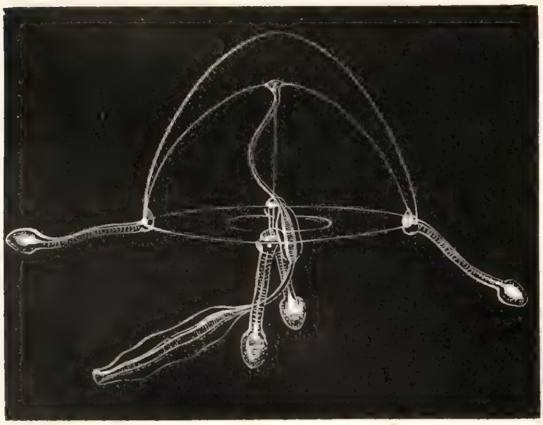


Fig. 303. Tentacle of Dipurena conica.

Fig. 304. Digestive cavity of a specimen in which the constriction has already separated the upper and lower halves.

Fig. 305. Adult Dipurena conica, in which the two digestive cavities are widely separated; greatly magnified.

two parts are simply connected by a narrow tube as long as the digestive cavities themselves; the narrow tube leading to the first digestive cavity extends to the level of the veil; the radiating tubes and the circular tube are thin, but there is no difference in the shape of the bell and of the tentacles of the different stages observed.

Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 439, Naushon, July, 1864, A. Agassiz.

Museum Diagram, No. 20, after A. Agassiz.

Family ORTHOCORYNIDÆ A. Agass.

I have ventured to separate the genus Zanclea from the Pennaridæ, with which it had been associated by McCrady and Professor Agassiz, and to form a new family, on account of the observations of Allman on the development of Zanclea from its Hydroid, *Coryne impressa* Ald. The peculiar form of the Hydrarium, and the still more remarkable characters of the Medusæ, with their tentacles bearing pedunculated knobs of lasso-cells, separate them from the square Medusæ of the Pennaridæ, while they remind us somewhat of the embryonic stages of Syndictyon. From the resemblance of this Hydroid to Halocharis and to Candelabrum, as well as owing to the close affinities of Corynitis to Zanclea, I would propose to unite all these forms into one family, the Orthocorynidæ. Does not also the *Heterocordyle Conybearei* belong to this family? The great difference between the reproductive and the sterile individuals is another example of the polymorphism so remarkable in Hydractinia.

CORYNITIS McCr.

Corynitis McCr. Gymn. Charl. Harbor, p. 29. Medusa.
Corynitis Agass. Cont. Nat. Hist. U. S., IV. p. 340. 1862.
Halocharis Agass. Cont. Nat. Hist. U. S., IV. p. 239. 1862. Hydrarium.

Corynitis Agassizii McCr.

Corynitis Agassizii McCr. Gymn. Charl. Harbor, p. 30, Pl. 9, Figs. 3–8.
Corynitis Agassizii Agass. Cont. Nat. Hist. U. S., IV. p. 340. 1862.
Halocharis spiralis Agass. Cont. Nat. Hist. U. S., IV. p. 239, Pl. 20, Figs. 10, 10ᵃ. 1862.

Charleston, S. C. (McCrady).

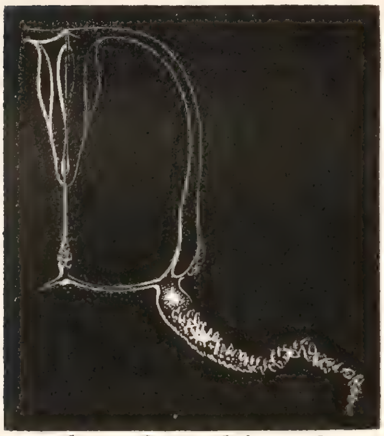
GEMMARIA McCr.

Gemmaria McCr. Gymn. Charl. Harbor, p. 49.
Zanclea McCr. (*non* Geg.). Gymn. Charl. Harbor, p. 48.
Zanclea Agass. (*p. p.*). Cont. Nat. Hist. U. S., IV. p. 344. 1862.
Acrochordium Mey.; in Nov. Ac. N. Aur XVI. 1834. Hydrarium ?

Gemmaria gemmosa McCr.

Gemmaria gemmosa McCr. Gymn. Charl. Harbor, p. 49, Pl. 8, Figs. 4, 5.
Zanclea gemmosa McCr. Gymn. Charl. Harbor, p. 49.
Zanclea gemmosa Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.

Fig. 306.



McCrady has distinguished with reason the genus Gemmaria from the Zanclea of Gegenbaur. The form of the bell of the digestive cavity and of the tentacles are totally different in the two genera. Very young specimens (Fig. 306) of this species, observed at Naushon, differed essentially from the *Gemmaria cladophora* of Massachusetts Bay, in the character of the tentacles and the shape of the clusters of lasso-cells; in the present species, the clusters of lasso-cells are attached by a short peduncle, and are arrow-shaped; the great tenuity of the bell in the specimen here figured is a characteristic of the younger stages, which disappears in older specimens. (See McCrady's figures.)

Charleston, S. C. (McCrady); Buzzard's Bay, Naushon (A. Agassiz).

Gemmaria cladophora A. Agass.

The shape of the inner bell of the adult Medusa of this species is peculiar; the outline does not follow that of the outer bell (Fig. 307),

Fig. 307.

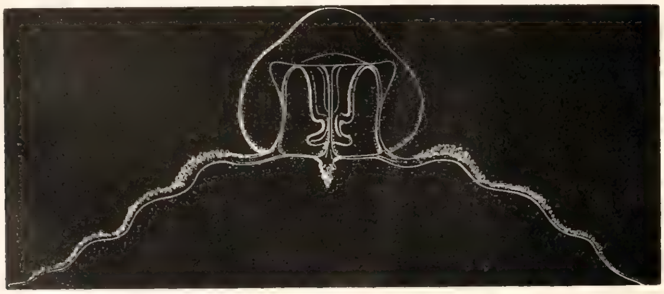


Fig. 306. Profile view of half of a young Gemmaria gemmosa; magnified.
Fig. 307. Profile view of Gemmaria cladophora; magnified.

but is curved in the opposite direction; near the upper bend of the chymiferous tubes, it runs up into a point, making a sharp and deep groove round the projection of the spherosome; the chymiferous tubes (c', Fig. 308), as well as the circular tube, are very broad (Fig. 308), opening into a conical digestive cavity, which at its base occupies nearly the whole width of the upper part of the inner bell; this cavity tapers gradually till it reaches the level of the veil, where the edges flare a little; the extremity of the proboscis has a tendency to be slightly drawn in, so that the opening of the cavity is flanked by the pouches formed by the partial contraction of a portion of the walls; the walls are thick, and open into a quadrangular mouth (Fig. 309), surrounded by a couple of concentric rows of large lasso-cells; similar large cells extend on the outside of the chymiferous tubes, more than half-way up the spherosome. (Fig. 308.)

Fig. 308.

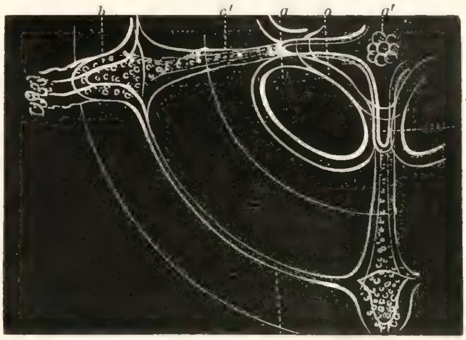


Fig. 309.

The tentacles are broad and thick, two of them being more developed than the others (Fig. 307); they are of a light-brown color, with orange pigment-cells at the base; the knobs of lasso-cells are attached to quite long stems (Fig. 310); the walls of the digestive cavity are thick; the ovaries are placed in the upper part of the proboscis. Found at Nahant in the beginning of August. When at rest, the tentacles are stretched out very obliquely from the bell, and they often remain perfectly motionless in this position; the Medusæ are quite rapid in their movements. (Fig. 307.)

Fig. 310.

Professor Clark discovered at Nahant a Hydroid closely resembling the *Coryne implexa* of Alder, and which I suspect will prove to be the nurse of our Gemmaria; this would be in accordance with the observations of Allman on the development of Zanclea from *Coryne implexa*.

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 363, Nahant, 1862, A. Agassiz. Medusa.

? Cat. No. 63, Nahant, May, 1862, H. J. Clark. Hydrarium.

Museum Diagram, No. 20, after A. Agassiz.

Fig. 308. Quarter of the disk of G. cladophora, seen from the abactinal pole. c, circular tube; c', chymiferous tube; b, sensitive bulb, having a great accumulation of pigment and lasso cells extending along the chymiferous tubes; c'', opening leading into the chymiferous tubes from the digestive cavity, o; g, g, genital organs; g', fatty globules at base of proboscis.

Fig. 309. Actinostome of Gemmaria, enlarged.

Fig. 310. Cluster of lasso-cells of the marginal tentacles.

CANDELABRUM Blainv.

Candelabrum Blainv. Man. d'Actin., p. 307. 1834.
Candelabrum Agass. Cont. Nat. Hist. U. S., IV. p. 340. 1862.
Myriothela Sars. Reise i Lof. og Fin., p. 14.
Spadix Gosse; in Ann. & Mag. N. H., p. 125. 1855.

Candelabrum phrygium Blainv.

Candelabrum phrygium Blainv. Man. d'Actin., p. 317. 1834.
Lucernaria phrygia Fab. Fauna Grönlandica. No. 333.
Lucernaria phrygia Agass. Cont. Nat. Hist. U. S., IV. p. 341. 1862.
Corymorpha phrygia Mörch.; in Besk. af Grönland, p. 96.

Greenland (Fabricius); Grand Manan (W. Stimpson).
Cat. No. 161, Grand Manan, W. Stimpson. Hydromedusarium.

Family PENNARIDÆ McCr.

Pennaridæ McCr. (*restr.* A. Agass.). Gymn. Charl. Harbor, p. 46.
Pennaridæ Agass. (*p. p.*). Cont. Nat. Hist. U. S., IV. pp. 278, 344. 1862.

This family is restricted here to the single genus Pennaria, Zanclea having been removed from this family since the discovery of its development from a Coryne-like Hydrarium by Allman.

PENNARIA Goldf.

Pennaria Goldf. (*non* Oken). Handb. der Zoologie, p. 89. 1820.
Pennaria McCr. Gymn. Charl. Harbor, p. 50.
Pennaria Agass. Cont. Nat. Hist. U. S., IV. pp. 278, 344. 1862.
Globiceps Ayres; in Proc. Bost. Soc. Nat. Hist., IV. p. 193. 1852.
Globiceps Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.
Eucoryne Leidy. Inv. N. J. and R. I., p. 4. 1855.

I have not given to the *Globiceps tiarella* of Ayres a new generic name, although it is probable that it does not belong to the same genus as the *Pennaria gibbosa* Agass., as the development of the latter species requires renewed examination to decide the question.

Pennaria gibbosa Agass.

Pennaria gibbosa Agass. Cont. Nat. Hist. U. S., IV. pp. 278, 344; III. Pl. 15, Figs. 1, 2.

Florida (L. Agassiz).
Cat. No. 19, Key West, Florida, March, 1853, L. Agassiz. Hydromedusarium.
Cat. No. 20, Jéremie, Hayti, Dr. Weinland.

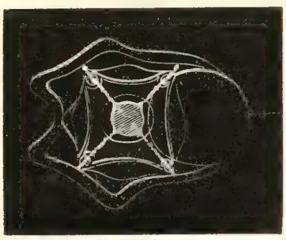
Pennaria tiarella McCr.

Pennaria tiarella McCr. Gymn. Charleston Harbor, p. 51.
Globiceps tiarella Ayres; in Proc. Bost. Soc. Nat. Hist., p. 193, Pl. X. Figs. 1–5. 1852.
Eucoryne elegans Leidy. Mar. Inv. N. J. and R. I., p. 4. 1855.
Globiceps tiarella Agass. Cont. Nat. Hist. U. S., IV. p. 344. 1862.

Fig. 311.

The Medusa of *Globiceps tiarella* is one of the most remarkable of our naked-eyed Medusæ. As in the Sarsiadæ, the Medusa bud is formed among the tentacles (Fig. 311), between the whirl of large and small tentacles; the mode of development of the bud is similar to that of Coryne and Bougainvillia; the chymiferous tubes, however, never have the extraordinary thickness which is noticed in Sarsia, and the cavity of the bell is hollowed out at an earlier period; the Medusa bud gradually becomes very elongated as it becomes more mature.

Fig. 312.



Large white eggs are developed from the proboscis, filling the whole cavity of the bell as they increase in size, and giving the Medusa an opaque milky appearance; the walls of the spherosome become thinner and thinner, and when the Medusa bud has attained its full development, and is ready to be separated, the walls have become so thin that the Medusæ are almost always distorted, either on one side or the other, by the eggs or bunches of spermaries which have reached such a great size that four or five of them completely fill the inner cavity, at the same time pressing the sides outward, wherever one of the large eggs happens to be placed (*e*, Fig. 312); two or three of the eggs generally escape before the Medusa bud is liberated, and when they are found detached, the cavity of the bells usually does not contain more than one or two large eggs; folds appear on the inner surface of the cavity of the bell after the eggs have escaped,

Fig. 313.

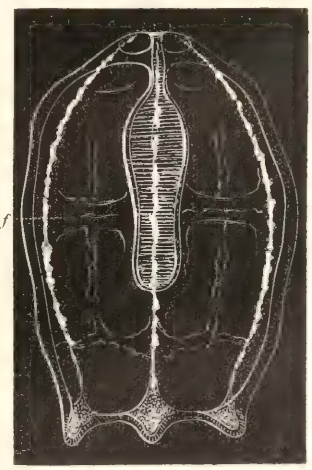


Fig. 311. A fertile Hydra of Pennaria tiarella, showing the mode of budding; magnified.
Fig. 312. A Medusa distended by an egg, *e*; magnified.
Fig. 313. Profile view of Medusa of Pennaria tiarella; magnified. *f*, folds produced by the distension of spherosome.

owing to their distension (*f*, Fig. 313); as soon as the eggs have all escaped, and the Medusæ have become detached, they move about with great activity, their motions resembling the quick, restless movements of Sarsia.

The size of the free Medusa is about one sixteenth of an inch; the walls of the spherosome are so thin that the Medusa will often assume a quadrangular or octagonal outline (Fig. 314), with deep indentations between the chymiferous tubes (Fig. 315); the digestive trunk is short, bottle-shaped, not extending more than half the length of the inner cavity of the bell; it is suspended by the narrow part (Fig. 313), the connection of the digestive cavity with the Hydrarium dividing the abactinal part of the bell in such a way that when seen in profile there are two circular masses above the chymiferous tubes. As the Medusa grows older, this open connection does not seem to diminish, as it does in the Sarsiadæ, Bougainvilleæ, and others. The chymiferous tubes,

Fig. 314.

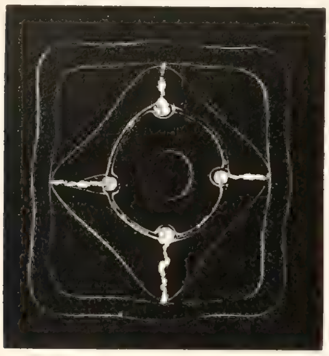
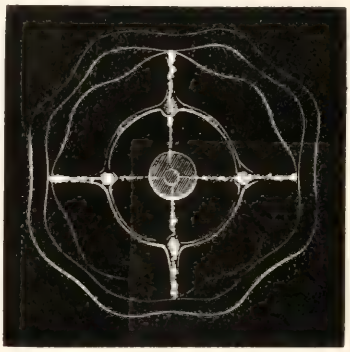


Fig. 315.



four in number, are broad, running almost perpendicularly, after making a sharp bend at the top, from the abactinal pole to the circular tube; there are also four well-developed sensitive bulbs; the tentacles on the contrary remain always in a rudimentary condition (Fig. 313), being simply four small knobs scarcely projecting beyond the general outline of the bell; the opening of the veil is small.

What becomes of the Medusa after the eggs have escaped, I am not able to say, though I am inclined to think that they do not undergo changes of any importance, as I have kept them in confinement for three weeks without noticing any striking differences. The color of the Medusa, when freed from its eggs, is of the most delicate rose color; the digestive trunk and the chymiferous tubes are a little darker, and a line of rich crimson pigment-cells, running almost their whole length, makes this Medusa one of the most brilliantly colored of our coast. Found at Naushon, during the month of September.

Buzzard's Bay (Ayres, A. Agassiz); Massachusetts Bay (A. Agassiz); New Jersey (Leidy); Charleston, S. C. (McCrady).

Fig. 314. A different attitude of the Medusa, seen from the actinal pole.
Fig. 315. Fig. 313, seen from the abactinal pole.

Cat. No. 21, Suisconset, Mass., July, 1849, L. Agassiz. Hydromedusarium.
Cat. No. 22, Naushon, Sept. 1861, A. Agassiz. Hydromedusarium.
Cat. No. 23, Newport, R. I., Prof. J. Leidy. Hydromedusarium.
Cat. No. 24, Newport, R. I., S. Powell. Hydromedusarium.
Cat. No. 25, Beverly, Mass., T. Lyman. Hydrarium.
Cat. No. 26, West Yarmouth, Mass., Aug. 1860, T. Lyman. Hydrarium.
Cat. No. 407, Nahant, September, 1862, A. Agassiz. Hydrarium.

Family TUBULARIADÆ Johnst.

Tubulariadæ JOHNST. (*restr.* Agass.); in Trans. Berwick Club, p. 107.
Tubulariadæ AGASS. Cont. Nat. Hist. U. S., IV. p. 342. 1862.

EUPHYSA FORBES.

Euphysa FORBES. British Naked-eyed Medusæ, p. 71. 1848.
Euphysa AGASS. Cont. Nat. Hist. U. S., IV. p. 343. 1862.

The outline of the bell of this genus is entirely different from that of Corymorpha or of Hybocodon. It can at once be recognized by its quadrangular shape, and the great thickness of the spherosome above the base of the digestive cavity, which is short and cylindrical. The tentacles also are always short and hollow, but are developed in the same proportion as in Corymorpha, — one stout triangular one, a pair somewhat less advanced, and an odd rudimentary one; the large tentacle never attains the size which it does in Hybocodon or in Corymorpha. The pigment bands at the base of the tentacles are quite short, and extend but little way along the chymiferous tubes. The ovaries are placed on the sides of the proboscis; the bell is symmetrical.

Euphysa virgulata A. AGASS.

This Medusa attains a size of about half an inch; the polar diameter is nearly one third greater than the actinal (Fig. 316); the proboscis (Fig. 317) is short, not more than half the length of the inner bell (Fig. 316); the veil is slightly indented (Fig. 318); the tentacles (*t*, *t'*, Fig. 318) are triangular, and covered with large granules of a milky color, with a band of intensely pink pigment-cells extending a short distance (*p*, Fig. 319) along the chymiferous tubes, from the base of the tentacles; the proboscis is cylindrical, of a light yellow color, with a perfectly smooth actinostome, and fatty globules generally accumulated at the base (*g*, Fig. 317), as in Corymorpha and Hybocodon.

The Medusa is exceedingly active, moving very rapidly and incessantly. Found at Nahant in the latter part of August.

Fig. 316.

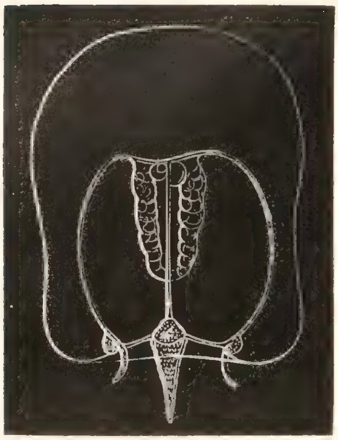


Fig. 317.

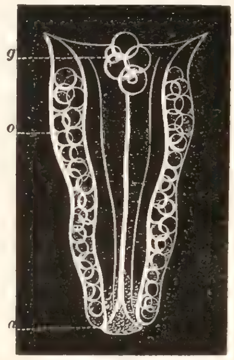
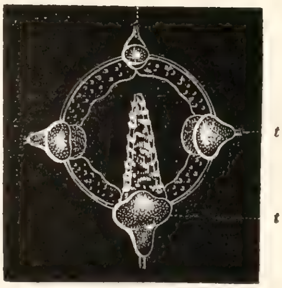


Fig. 319.

Fig. 318.



Euphysa is not, as Professor Agassiz has stated, the generation of Medusæ which become separated from the base of the reproducing tentacle in Hybocodon. That generation of Medusæ are identical with the parent Medusa, as well as the second generation which bud from the large tentacle of this first set of Medusæ.

Massachusetts Bay, Nahant (A. Agassiz).

Cat. No. 452, Nahant, A. Agassiz.

ECTOPLEURA Agass.

Ectopleura Agass. Cont. Nat. Hist. U. S., IV. p. 342. 1862.

In this genus I would include those species of the genus Sarsia (like *Oceania telostyla* Geg., *Sarsia turricula* McCrady, and *Sarsia gemmifera* Forbes) which have a short digestive trunk, and in which the pigment-cells are not concentrated in one mass in the sensitive bulb, but are scattered irregularly through the whole swelling at the base of the tentacles.

Fig. 316. Euphysa virgulata, seen in profile; magnified.

Fig. 317. Proboscis of Euphysa. *a*, actinostome; *o*, ovaries; *g*, fatty globules; magnified.

Fig. 318. Actinal view of Euphysa, to show the character of the veil. *t*, the odd long tentacle; *t'*, one of the pair of tentacles; *t''*, the odd small tentacle.

Fig. 319. One of the tentacles seen in profile, to show the character of the band of pigment-cells, *p*, extending along the base of the chymiferous tube from the origin of the tentacle, *t'*.

Ectopleura turricula Agass.

Ectopleura turricula Agass. Cont. Nat. Hist. U. S., IV. p. 343. 1862.
Sarsia turricula McCr. Gymn. Charleston Harbor, p. 36, Pl. 8, Figs. 6–8.

Charleston, S. C. (McCrady).

Ectopleura ochracea A. Agass.

Ectopleura ochracea A. Agass.; in Agassiz's Cont. Nat. Hist. U. S., IV. p. 343. 1862.

The bell is of uniform thickness from the circular tube as far as the base of the digestive cavity; here the outline tapers gradually towards the abactinal pole (Fig. 320), giving the upper part of the bell a much greater thickness, and a conical shape. Near the base of the digestive cavity there is a very marked constriction; it then bulges out towards the middle, contracting again towards the actinostome, which is simple; the opening is formed by the abrupt termination of the walls of the digestive cavity; there are no labial appendages of any sort, except small bunches of lasso-cells. The tentacles are short; when swimming about they are usually carried tightly curled up near the circular tube. This species differs from the *S. turricula* McCr. in having the surface of the tentacles covered irregularly with innumerable lasso-cells; they are not arranged in bundles, as in the Charleston species. From each side of the base of the four tentacles there runs to the abactinal pole (Figs. 321, 322) a thread of bunches of lasso-cells (*l*, Fig. 320), like that of Turritopsis. The bunches are large near the actinal extremity, and gradually diminish to the abactinal pole, where there is only one cell, while near the base of the tentacles the bundles are made up of aggregations of clusters of lasso-cells, consisting of two or three cells each. An accumulation of bright yellow pigment-cells forms a ring round the point of attachment of the digestive trunk; the digestive cavity itself is of a delicate rose color, with whitish bunches of lasso-cells at the actinostome, surmounted by a second light yellow ring immediately above it; the tentacles are of the color of the digestive trunk, but of a

Fig. 320.

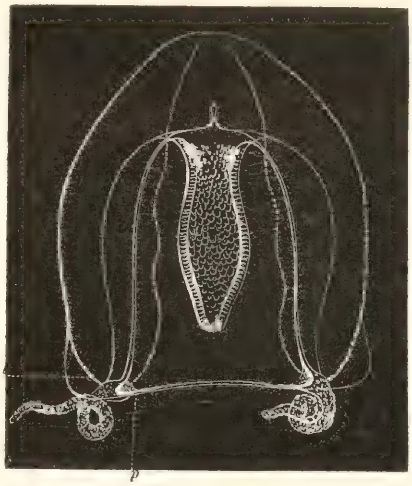


Fig. 320. Profile of Ectopleura ochracea, magnified. *l*, thread of lasso-cells extending to abactinal pole; *p*, pigment-cells at base of tentacles.

lighter tint; the pigment-cells in the sensitive bulb (*p*, Figs. 320, 323) are purplish-orange upon a light-yellow ground. When the Medusæ

Fig. 321.

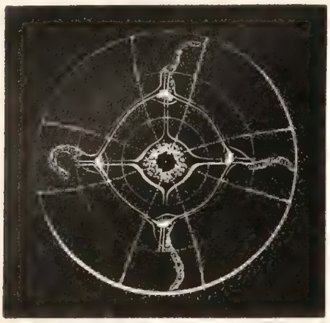


Fig. 322

move about, which they do with great rapidity, the tentacles are twisted in knots, as stated above, but when at rest expand at right angles to the disk, and then the Medusa will often remain, balancing itself upon its tentacles, perfectly motionless in the water, appearing like a rosy tube, with its yellow ring set in a rectangle of four brilliantly colored ocelli.

Fig. 323.

Found at Naushon in September, the largest specimen being one fourth of an inch in diameter; young specimens have a shorter digestive trunk, and the rows of lasso-cells extending along the outer surface of the bell are more marked than in older specimens. The Hydroid of this Medusa probably resembles the *Tubularia Dumortierii* Van Beneden, the Medusa of which is closely allied to the one found on our coast.

Buzzard's Bay, Naushon (A. Agassiz).

Cat. No. 441, Naushon, Mass., A. Agassiz. Medusa.

CORYMORPHA Sars.

Corymorpha Sars. Beskriv., p. 6. 1835.
Corymorpha Agass. Cont. Nat. Hist. U. S., IV. p. 343. 1862.

Corymorpha pendula Agass.

Corymorpha pendula Agass. Cont. Nat. Hist. U. S., IV. pp. 276, 343, Pl. 26, Figs. 7–17.
Corymorpha nutans Stimps. Mar. Inv. Grand Manan, p. 9. 1853.
Corymorpha pendula A. Agass.; in Proc. Bost. Soc. Nat. Hist., IX. p. 101, Fig. 31.

The Medusa of Corymorpha is, like Hybocodon, asymmetrical; the shape of the bell is more elongated (Fig. 324) and the tentacles more

Fig. 321. Fig. 320, seen from abactinal pole, to show the termination of the lasso threads.

Fig. 322. Fig. 320, seen from the actinal pole, showing the origin of the threads on each side of the base of the tentacles.

Fig. 323. The base of one of the tentacles, magnified. *p*, cluster of pigment-cells.

developed, the long tentacle (Fig. 324) attaining a size two or three times the length of the bell; the proboscis is long, and stretches beyond the aperture of the veil; the long tentacles (1, 2, Fig. 324) are capable of great contraction and expansion; the lasso-cells are arranged in groups upon them in such a manner as to appear like heavy rings surrounding the thinner thread; the outer wall of the proboscis is exceedingly thick, as in the Medusa of Euphysa, and of a light-yellow color; the pigment-cells at the base of the tentacles are light pink. This Medusa attains a size of a quarter of an inch, and is found at Nahant in the middle of May.

Fig. 324.

Although the separation of this Medusa from its Hydrarium has not been observed, yet their similarity to the most advanced Medusæ buds observed on our Corymorpha leave but little doubt on this point. Hodge has observed the development of an English species of Corymorpha, which resembles the Medusa here figured. (Fig. 324.)

Massachusetts Bay, Nahant (L. Agassiz).

Cat. No. 18, off Race Point, Cape Cod, Mass., March, 1862, A. S. Bickmore. Hydromedusarium.

Museum Diagram, No. 24, after L. Agassiz.

HYBOCODON Agass.

Hybocodon Agass. Cont. Nat. Hist. U. S., IV. p. 343. 1862.

Hybocodon prolifer Agass.

Hybocodon prolifer Agass. Cont. Nat. Hist. U. S., IV. pp. 243, 343, Pl. 23a, Figs. 10, 11; Pl. 25. 1862.

This is one of the few known Tubularians found growing singly. (Fig. 325.) The character of the Medusæ is particularly important in a morphological point of view, giving us, as it does, the clew to the probable character of the scales (Deckstück) of the Nanomia, described below. The asymmetrical character of the Medusa (Figs. 326, 327) is more marked than in the Medusa of Corymorpha. The budding of Medusæ (Fig. 328), similar to the parent

Fig. 325.

Fig. 324. Medusa of Corymorpha, seen in profile. 1, long odd tentacle; 2, pair of tentacles, 3, short odd tentacle.

Fig. 325. Single Hydra of Hybocodon. *o*, mouth surrounded with tentacles; *t*, *t*, marginal tentacles; *d*, *d*, advanced Medusæ buds; *a*, stem.

Medusa, from the base of the single largely-developed tentacle, is a feature it has in common with other Medusæ which have been referred by various writers to the genera Sarsia and Steenstrupia, and which very probably are all derived from a Tubularian nurse similar to Hy-

Fig. 326.

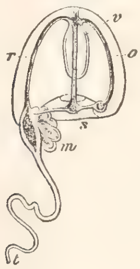


Fig. 327.

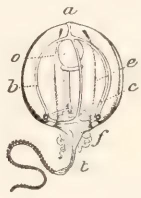
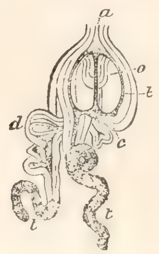


Fig. 328.



bocodon. Should the Diplonema of Greene prove to be one of these asymmetrical Medusæ, the name Hybocodon must give way to that of Diplonema.

Massachusetts Bay (L. Agassiz).

Cat. No. 61, Nahant, Mass., May, 1862, H. J. Clark. Hydrarium.

Museum Diagram, No. 23, after L. Agassiz.

PARYPHA Agass.

Parypha Agass. Cont. Nat. Hist. U. S., IV. p. 342. 1862.
Pyxidium Leuck.; in Archiv f. Nat., I. p. 31. 1856.

Parypha cristata Agass.

Parypha cristata Agass. Cont. Nat. Hist. U. S., IV. p. 342. 1862.
Tubularia cristata McCr. Gymn. Charleston Harbor, p. 54.

Charleston, S. C. (McCrady).

Cat. No. 14, Sullivan's Islands, S. C., December, 1851, L. Agassiz.

? Cat. No. 16, Florida, 1850, L. Agassiz.

Fig. 326. Hybocodon prolifer Agass., seen from the broad side. *v*, proboscis; *r*, *o*, radiating tubes; *s*, circular tube; *m*, buds of Medusæ at base of long tentacle, *t*.

Fig. 327. Hybocodon prolifer, seen facing the long tentacle. *a*, point of attachment to Hydrarium; *b*, *c*, radiating tubes; *e*, rows of lasso-cells extending from base of tentacle to abactinal pole; *o*, proboscis; *f*, Medusæ budding from base of long tentacle, *t*.

Fig. 328. Medusa bud of Hybocodon. *a*, base of attachment; *o*, proboscis; *b*, *c*, chymiferous tubes; *d* and near *c*, Medusæ buds at base of tentacle, *t*.

Parypha crocea Agass.

Parypha crocea Agass. Cont. Nat. Hist. U. S., IV. pp. 249, 342, Pls. 23, 23ª, Figs. 1–7. 1862.

Boston Bay (L. Agassiz).

Cat. No. 13, Warren Bridge, Boston, June, 1858, H. J. Clark. Hydromedusarium.

Parypha microcephala A. Agass.

Resembles in its general aspect the *Parypha cristata* Agass.; the stem is more slender than that of *P. crocea*, found in Boston Harbor; the head is much smaller than in either of the above-mentioned species, though the stem grows to a size fully as great as in our Eastern Parypha, giving it a very characteristic aspect. Found attached to floating logs round the wharves of San Francisco.

San Francisco, Cal. (A. Agassiz).

Cat. No. 15, San Francisco, Cal., October, 1859, A. Agassiz. Hydromedusarium.

Cat. No. 17, San Francisco, Cal., December, 1859, A. Agassiz. Hydromedusarium.

THAMNOCNIDIA Agass.

Thamnocnidia Agass. Cont. Nat. Hist. U. S., IV p. 342. 1862.

Thamnocnidia spectabilis Agass.

Thamnocnidia spectabilis Agass. Cont. Nat. Hist. U. S., IV. pp. 271, 342, Pl. 22, Figs. 1–20. 1862.

Massachusetts Bay, Boston (L. Agassiz).

Cat. No. 6, Boston, August, 1851, H. J. Clark. Hydromedusarium.

Thamnocnidia tenella Agass.

Thamnocnidia tenella Agass. Cont. Nat. Hist. U. S., IV. pp. 275, 342, Pl. 22, Figs. 21–30. 1862.

Massachusetts Bay, Nahant (L. Agassiz).

Cat. No. 7, Nahant, Mass., September, 1854, H. J. Clark. Hydromedusarium.

Cat. No. 8, Nahant, July, 1861, A. Agassiz. Hydromedusarium.

Cat. No. 410, Eastport, Me., 1861, Anticosti Expedition.

Cat. No. 411, Eastport, Me., 1863, A. E. Verrill.

Cat. No. 412, Eastport, Me., 1863, A. E. Verrill.

Thamnocnidia tubularoides A. Agass.

This species grows in clusters, which at first sight would readily be mistaken for a species of true Tubularia, on account of the great diameter of the stem, and the large size of the head. The structure of the proboscis, however, shows plainly that it is a genuine Thamnocnidia, which can at once be distinguished from its Eastern congeners by the stoutness of the stem and size of the head, surrounded by as many as from thirty and even forty tentacles in large specimens. Found growing profusely on the bottom of the coal-barges which bring coal from Benicia to the Pacific Mail Steamship Company's steamers at San Francisco.

San Francisco, Cal. (A. Agassiz).

Cat. No. 11, San Francisco, Cal., December, 1859, A. Agassiz. Hydromedusarium.

TUBULARIA Linn.

Tubularia Linn. (*restr.* Agass.). Syst. Nat. 1756.
Tubularia Agass. Cont. Nat. Hist. U. S., IV. p. 342. 1862.

Tubularia larynx Linn.

Tubularia larynx Ellis. Cor., Pl. 16, Fig. 6.
Tubularia larynx Johnst. Brit. Zooph., p. 50, Pl. 3, Fig. 3; Pl. 5, Figs. 3, 4.
Tubularia larynx Stimps. Mar. Inv. Grand Manan, p. 9. 1853.

Grand Manan (W. Stimpson).

Tubularia Couthouyi Agass.

Tubularia Couthouyi Agass. Cont. Nat. Hist. U. S., IV. pp. 266, 342, Pl. 23[a], Figs. 8, 9; Pls. 24, 26, Figs. 1–6. 1862.
Tubularia indivisa Stimps. Mar. Inv. Grand Manan, p. 9. 1853.
Tubularia indivisa Gould. Rep. Inv. Mass., p. 350. 1841.
Tubularia indivisa Mörch; in Besk. af Grönland, p. 96. 1857.

Massachusetts Bay (L. Agassiz).

Cat. No. 4, Boston, August, 1851, H. J. Clark. Hydromedusarium.

Cat. No. 5, Grand Manan, 1857, J. E. Mills. Hydromedusarium.

Museum Diagram, No. 24, after L. Agassiz.

Family HYDRAIDÆ Gray.

Hydraidæ GRAY. Syn. Brit. Mus., p. 76. 1840.
Hydrina EHRENB. (*p. p.*). Corall. d. Roth. Meeres, p. 67.
Hydraidæ JOHNST. Brit. Zooph., p. 120, Second Edition.

HYDRA LINN.

Hydra LINN. Syst. Nat. 1756.

Hydra gracilis AGASS.

Hydra gracilis AGASS.; in Proc. Bost. Soc. Nat. Hist., III. p. 354.
Hydra gracilis AYRES; in Proc. Bost. Soc. Nat. Hist., V. p. 103.

Our fresh-water Hydra has as yet been studied so insufficiently, that I am unable to add anything respecting the development of the Medusæ, or concerning its identity with the European *Hydra viridis*. Agassiz has described two Eastern species under the name of *Hydra gracilis* and *H. carnea*, and Ayres a California species. From the character of the Medusæ of the Hydra, it seems to me that it finds its natural place among the true Hydroids, and not among the Discophoræ, with which it has usually been associated, on account of its close resemblance to the Scyphistoma (*Hydra tuba*).

Cambridge (L. Agassiz).

Cat. No. 370, Cambridge, 1862, W. Glen.

Hydra carnea AGASS.

Hydra carnea AGASS.; in Proc. Bost. Soc. Nat. Hist., III. p. 354.
Hydra carnea AYRES; in Proc. Bost. Soc. Nat. Hist., V. p. 104.

Massachusetts and Connecticut (Agassiz; Ayres).

Hydra tenuis AYRES.

Hydra tenuis AYRES; in Proc. Bost. Soc. Nat. Hist., V. p. 104.

San Francisco, California (Ayres).

Family HYDRACTINIDÆ Agass.

Hydractinidæ AGASS. Cont. Nat. Hist. U. S., IV. p. 339. 1862.

HYDRACTINIA VAN BENEDEN.

Hydractinia VAN BENEDEN; in Bull. Acad. Bel., VIII. 1841.
Hydractinia AGASS. Cont. Nat. Hist. U. S., IV. p. 339. 1862.
Synhydra QUAT.; in Ann. des Scien. Nat., XX. p. 230. 1843.

Hydractinia polyclina AGASS.

Hydractinia polyclina AGASS. Cont. Nat. Hist. U. S., III. Pl. 16; IV. pp. 227–239, 339, Figs. 33–35; Pl. 26, Fig. 18. 1862.
Hydra squamata FAB. Fauna Grönlandica. No. 338.
Alcyonium echinatum GOULD. Rep. Inv. Mass., p. 351.
Hydractinia echinata LEIDY. Mar. Inv. New Jersey and Rhode Island, p. 3, Pl. X. Fig. 35. 1855.
Hydractinia echinata STIMPS. Mar. Inv. Grand Manan, p. 11. 1853.
Hydractinia echinata MCCR. Gymn. Charleston Harbor, p. 66.
Clava squamata MÖRCH; in Beskriv. af Grönland, p. 96.
Hydractinia polyclina PACK.; in Can. Nat. & Geol. Dec. 1863.

As such constant reference is made to Hydractinia in the comparison of the free colonies of Nanomia to the fixed Hydroids, figures of male

Fig. 329.

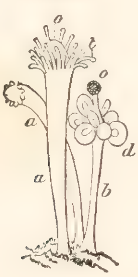


Fig. 330.

(Fig. 329) and female (Fig. 330) colonies of this species are here introduced to facilitate the comparison.

Point Judith (Leidy); Atlantic coast of North America (L. Agassiz).
Cat. No. 55, Grand Manan, 1859, A. E. Verrill.
Cat. No. 56, Grand Manan, October, 1857, J. E. Mills.
Cat. No. 57, Chelsea Beach, L. Agassiz.
Cat. No. 58, Swampscott, Mass., March, 1859, S. Tufts.
Cat. No. 59, Nantucket Shoals, July, 1849, L. Agassiz.
Cat. No. 403, Nahant, Mass., July, 1862, A. Agassiz.
Museum Diagram, No. 25, after L. Agassiz.

Fig. 329. Part of male community of Hydractinia. *a*, *a*, sterile individuals; *b*, fertile individual; *d*, male Medusæ; *o*, *o*, proboscis; *t*, elongated tentacle of sterile individuals.

Fig. 330. Part of female community. *a*, sterile individual; *b*, fertile individual, producing female Medusæ, *d*, *e*, *f*, *g*, *h*, *i*; *o*, peduncle of mouth; *c*, individual with globular tentacles.

Suborder DIPHYÆ Cuv.

Diphyæ Cuv. Règne Animal, IV. 1817.
Calycophoridæ Leuck. (*p. p.*); in Archiv f. Nat., I. p. 256. 1854.
Diphyæ Agass. Cont. Nat. Hist. U. S., IV. p. 370. 1862.

For the reasons which have led me to adopt the old divisions of Eschscholtz, and not the divisions of Leuckart, which have found such universal approval, I would refer to the description of Nanomia given below.

Family DIPHYIDÆ Esch.

Diphyidæ Esch. (*restr.* Agass.). Syst. der Acal., p. 122. 1829.
Diphyidæ Agass. Cont. Nat. Hist. U. S., IV. p. 371. 1862.

EUDOXIA Esch.

Eudoxia Esch. Syst. der Acal., p. 125. 1829.
Eudoxia Less. Zooph. Acal., p. 460. 1843.

Eudoxia alata McCr.

Eudoxia alata McCr. Gymnoph. Charleston Harbor, p. 70, Pl. 8, Figs. 9, 10.

Charleston Harbor (McCrady).

DIPHYES Cuv.

Diphyes Cuv. Règne Animal, IV. 1817.
Ersæa Esch. Syst. der Acal., p. 127. 1829.
Cucullus Q. & G.; in Ann. des Sc. Nat., X. 1829.
Diphyes Less. Zooph. Acal., p. 438. 1843.

Diphyes pusilla McCr.

Diphyes pusilla McCr. Gymn. Charleston Harbor, p. 72.

Charleston, S. C. (McCrady).

SUBORDER PHYSOPHORÆ GOLDF.

Physophoræ GOLDF. Handb. d. Zool. 1820.
Physophoræ AGASS. Cont. Nat. Hist. U. S., IV. p. 367. 1862.

Family AGALMIDÆ Brandt.

Agalmidæ BRANDT; in Mém. Acad. St. Petersburg, p. 234. 1838.
Agalmæ LESS. Zooph. Acal., p. 509. 1843.
Stephanomiæ LESS. Zooph. Acal., p. 475. 1843.
Stephanomidæ LEUCK.; in Archiv f. Nat., I. p. 312. 1854.
Stephanomidæ HUXL. Ocean. Hyd., p. 72. 1858.
Agalmidæ AGASS. Cont. Nat. Hist. U. S., IV. p. 368. 1862.

NANOMIA A. AGASS.

Nanomia A. AGASS.; in Proc. Boston Soc. Nat. Hist., IX. p. 181. 1863.

Nanomia cara A. AGASS.

Nanomia cara A. AGASS.; in Proc. Bost. Soc. Nat. Hist., IX. p. 181. 1863.

This Siphonophore is closely allied to the genus Agalmopsis of Sars, but the nature of the tentacles of the feeding polyps, and the mode of arrangement of the swimming-bells, show undoubtedly that it cannot be placed in the same genus as Agalmopsis, though closely related to it, as also to Halistemma of Huxley. The small size of this species has been of great advantage in enabling us to seize readily, at one glance, the connection between the different parts of this community, while the great size of many of the species hitherto observed has always been more or less of a drawback in analyzing the relations of the individuals of the community.

Fig. 331.

The float, or swimming-bladder, (I shall use at present the nomenclature usually adopted, and afterwards show to what parts these organs correspond in an ordinary Hydroid,) is a large elliptical cavity (Fig. 331), entirely shut off from the main cavity, which runs from the base of the float, through the whole of the axis of the community. It contains in this genus a bubble of oily substance; the nature of the contents of the float varies in different families of Siphonophoræ, and this cavity may or may not be closed. In this genus it is closed, and there is no access to the oil-bubble from without; the oil-bubble by no means fills the whole of the cavity of the float. The float is of a brilliant garnet color; from it hangs the rosy-

Fig. 331. Oil-float of Nanomia; magnified.

colored axis, with its pale swimming-bells, and farther down, the scales, protecting the different kinds of feeding polyps, with their various kinds of tentacles projecting in all sorts of angles and curves from the main axis of the body, like the festoons of a chandelier; the darker-colored polyps, tipped and mottled with scarlet, being visible underneath the protecting scales. (Fig. 332.)

The swimming-bells are arranged in two vertical rows, consisting of four to six large bells each; they are placed obliquely, in such a way

Fig. 332.

that the wing-like projections of the spherosome encroach upon those of the opposite row, and thus fit closely and compactly together, by a sort of oblique dovetail arrangement; these bells are only symmetrical when seen from one of the sides (Fig. 333), when they appear somewhat heart-shaped, having a large cavity which opens externally by means of an aperture (see Fig. 334) in a veil, similar to that of genuine naked-eyed Medusæ, and capable, like it, of beating up and

Fig. 332. Nanomia cara; natural size.

down, and forcing the water in or out of the cavity of the bell. From the abactinal pole of this cavity diverge four chymiferous tubes, which lead into a circular tube, connecting them all (*c*, Fig. 334) ; two of these tubes, *t'*, *t'*, are straight, and run directly from the point of junction of

Fig. 333.

the four tubes (*j*, Fig. 334) to the circular tube, while the other tubes, *t*, *t*, wind round before joining the circular tube. The connection of these chymiferous tubes with the tube into which they run, and which connects them all with the main cavity of the axis of the community, can readily be traced by combining the different views of the swimming-bell here given. (Figs. 333–336.) In Fig. 333 the straight chymiferous tubes run perpendicularly to the circular tube, in continuation of the tube passing through the abactinal pole of the spherosome ; while in Fig. 336, which is a view at right angles to that of Fig. 333, we see the connection of the winding tubes with the connecting tube ; the opening (*j'*, Fig. 335) of the connecting tube (*t''*, Fig. 335) is somewhat to one side of the point of junction of the chymiferous tubes

Fig. 334.

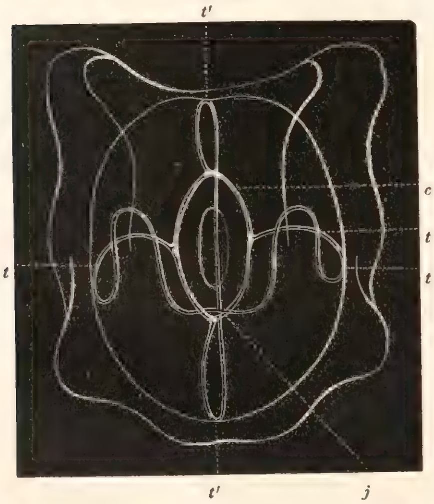
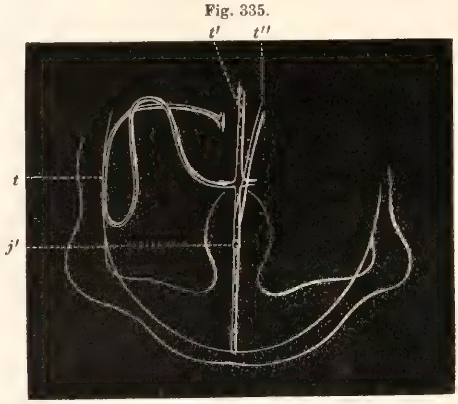


Fig. 335.



(*j*, Fig. 334), as is readily seen on examining Figs. 335, 336. Fig. 336 shows the wing-like expansions of the spherosome which clasp the axis, giving the Medusa a conical appearance, when seen from that side ; while when seen from the actinal or abactinal pole, as Figs. 334, 335,

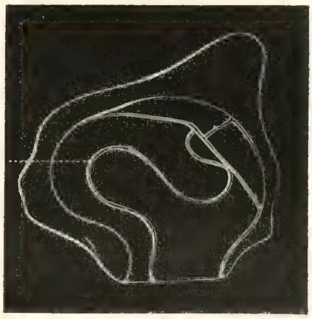
Fig. 333. Swimming bell of Nanomia, seen facing the side of the straight chymiferous tubes.

Fig. 334. The same bell, seen from the actinal pole, somewhat more magnified. *t*, *t*, bent chymiferous tubes ; *t'*, *t'*, straight chymiferous tubes ; *c*, circular tube round veil ; *j*, point of junction of the four chymiferous tubes.

Fig. 335. A portion of the same bell, seen from the abactinal pole ; lettering as in Fig. 334. *j'*, opening of tube, *t''*, leading into the main axis connecting with one of the straight chymiferous tubes.

the shape of the swimming-bell is rectangular. There can be but little doubt that these swimming-bells, as I have called them, are genuine Medusæ; they have all the characters of Medusæ, and when they become detached, move like them, the only difference being the absence of a proboscis to admit food. This, however, they do not need as long as they remain connected with the main axis, the cavity of which opens directly into the chymiferous tubes, and thus circulates in them whatever food is taken in at the feeding mouths, and from them passed into the cavity of the main axis. I have not been able to detect any opening leading directly into the system of chymiferous tubes. These Medusæ are the locomotive organs of the community; they force the water in and out of their cavity, and thus propel the whole community by a sort of alternating motion, resembling that of sculling a boat; the bells on one side of the axis are filling with water, while those of the other side are forcing the water out violently; the motion begins at the bottom bell, passes on to the top one of the same side, then begins at the bottom of the other row, and so on, throwing the whole of the upper part of the community violently from one side to the other, while the remainder is dragging lazily after it. I have not found any specimens with more than eight swimming-bells fully developed; the younger bells are added between the first-formed pair and the float, where we find a cluster of swimming bells in different stages of development. These young bells are formed, as the Medusæ buds of the Tubularians, by folds of the outer wall, which gradually grow larger and larger, and circumscribe parts of the main cavity to form chymiferous tubes.

Fig. 336.



In their younger stages, the swimming-bells resemble still more the Medusæ of Hydroids, when they have not yet assumed an irregular outline, and while their chymiferous tubes are still straight. In the cluster of young bells here given (Fig. 337), we find a few of the different stages through which one of these bells passes, from the time it appears as a mere bud, till it has gone through

Fig. 337.

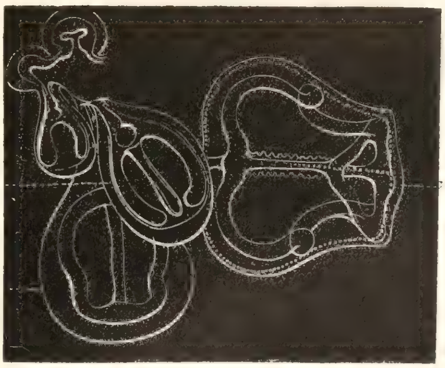


Fig. 336. The same bell as Fig. 333, seen from the other side, to show the course of the bent tubes, and the mode of connection of the tubes leading into the main axis; *t*, bent tube.

Fig. 337. Group of swimming bells, in different stages of development. *a*, the chymiferous tubes are simple sacs; *b*, the tubes, having united, make a circuit; *c*, first signs of bending of the tubes, *t*, of the preceding figures.

the different phases in which the chymiferous tubes are mere pouches (*a*, Fig. 337), then large tubes connected by a circular tube (*b*, Fig. 337), till finally the bell becomes somewhat expanded at one pole, and the tubes have a tendency to bend, as in *c*, Fig. 337, when the difference between the two kinds of chymiferous tubes is quite marked, although the mode of attachment of the Medusa and the shape of the bell remind us strongly of Tubularian Medusæ buds, and we find no trace as yet of the wing-shaped appendages, and of the difference of outline of older Medusæ, when seen from different sides.

As there is a portion of the axis, immediately beneath the float, which is free from swimming-bells, we find also under the swimming-bells a small part of the axis bare; we soon, however, come upon a cluster of small buds entirely different in character from those found under the float; these are polyps, or feeding-mouths, in different stages of development. The polyps (Medusæ) to which this set of buds give rise are of very different characters; they are of three kinds, and nearly equally distributed along the remainder of the axis, no part of the axis being reserved for any special kind of polyps; the most prominent kind, and the largest, are the Hydra-mouths (Fig. 338), which are the most active, and in which we find, at the point of junction with the axis, a cluster of long tentacles, along the thread of which are fastened, by a short handle, a knob-like appendage; these are the tentacles which are so prominent, and assume such manifold attitudes when the community is at rest or in motion. The polyps are open at the distal extremity, the opening being frequently expanded like the disk of a leech, or simply flaring trumpet-shaped; they are exceedingly contractile, and sometimes expand far beyond the axis in search of food; they communicate by means of a somewhat narrow neck with the main axis, so that the food which is taken in by any one of these mouths helps to feed the whole community, and circulates freely in the main axis, and in every polyp and swimming-bell. The clusters of tentacles are protected by a shield-like scale (Deckstück), to the nature of which I shall refer hereafter; this scale is triangular, with rounded extremities, and through the middle of it passes a thin tube, which connects with the main axis, making a kind of knee immediately above the point of junction; the upper shield of Fig. 338 shows plainly the mode of connection. The knobs of

Fig. 338.

Fig. 338. Cluster of Medusæ (feeding polyps) of the first kind formed, in the younger stages, with tentacular knob and scale. In the upper part of the figure a closed bud, with an oil-bubble, is seen; this bud is ready to be liberated and become an embryonic community, like Fig. 346.

this kind of tentacles are sole-shaped bodies, paved with a beautifully arranged setting of large lasso-cells, edged in by a large set running round the edge (Fig. 339); these knobs are partly hollow, a portion of the tube of the tentacle extending into it a short distance.

The second kind of feeding polyps (Medusæ) (Fig. 340) resemble the first in every respect except the tentacles; they are, like them, attached to the main axis, and protected by a scale, omitted in the figure; at the proximal end of the polyp we find, however, a cluster of tentacles of a totally different nature from the club-bearing lashes of the first kind; they take their origin as diverticula of the wall of the polyp, as those of the first kind; they never grow long, scarcely extending the length of the polyp, but are twisted closely when fully developed, though in their earlier stages they are more corkscrew-shaped, and coiled quite loosely. The whole surface of these tentacles

Fig. 340.

Fig. 339.

Fig. 341.

is covered by a regular pavement of lasso-cells of the same size; the lasso-cells in the young tentacles are only found on the edge; as they increase in length, the tentacles become more thickly covered, until, when closely coiled, they have the pavement described above. There are generally from five to six (Fig. 340) of these large tentacles, and about as many more, in different stages of development, at the base of each of these polyps; while of the first kind of tentacles we rarely find more than three long threads, though there is a thick cluster of embryonic ones adjoining them ready to develop and take their place if any accident should happen to the longer meshes.

The third kind of polyp (Medusæ), which is found along the axis, are polyps with closed extremities (Fig. 341), differing besides from the others in having only one long, slender tentacle at the proximal ex-

Fig. 339. Enlarged view of the knob of a tentacle of the first kind of Medusæ.

Fig. 340. The second kind of Medusæ, having cork-shaped tentacles. The scales in this and following figure are omitted; they differ in no respect from those of Fig. 338.

Fig. 341. Third kind of Medusa, having only a single thread-like tentacle, and a closed proboscis.

tremity, and being perfectly colorless; this tentacle is three or four times the length of the polyp, and is covered with patches of small lasso-cells scattered irregularly over its surface; the walls of this polyp are thick, and are not capable of extensive expansion or contraction, or of any remarkable alteration of shape, as the former kinds. There is still a fourth kind of appendage formed here and there along the stem, one of which is figured on the top of Fig. 338, which resembles this last kind of polyp, being closed, like it, at the extremity, but having neither scale nor tentacles of any kind, and in the proximal end of which we notice an accumulation of oily matter; these I simply mention here, and shall return to them hereafter.

The new polyps which are added to the community take their origin from the cluster of buds situated beneath the swimming-bells; like the swimming-bells, they are formed by the bulging of the wall of the main axis (Fig. 342); they very soon assume the general aspect of feeding polyps, though they remain closed at their distal extremity after they have attained a considerable size (p, p', p'', Fig. 342); the scarlet pigment-cells make their appearance at a very early period, so that we are able, in very young buds, to recognize the nature of the future polyps; as soon as the polyp buds are slightly more advanced than they are in the figure here given (Fig. 342), the nature of the tentacular buds at the base, and the total absence of pigment-cells in some of the larger closed buds, enables us readily to decide to which kind of polyps (Medusæ) these different buds will give rise; the peculiar sole-shaped knobs of one of the kinds of tentacles are nothing but an expansion of the original diverticulum at the base of the polyp; the different phases through which the knobs pass are very easily followed by examining the various stages of growth found in a cluster of tentacles, such as is represented in Fig. 338 (somewhat enlarged in Figs. 343, 344), until they attain the shape represented in Fig. 339. They are at first a narrow bag, with a few scattered lasso-cells (a, Fig. 343), then the thickness of the wall at the extremity increases, the lasso-cells at the same time becoming large (b, Fig. 343). In the next stage, when seen in profile, the sac has assumed a hook-shaped form (c, Fig. 343), the bend becomes still more marked, and the lasso-cells are now arranged in a row along the extremity (d, Fig. 343); the walls become thicker as the lasso-cells

Fig. 342.

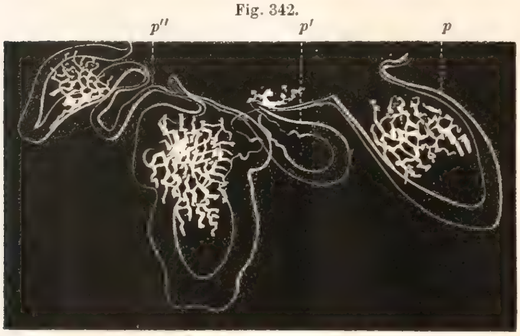


Fig. 342. Cluster of Medusæ (feeding polyps) in different stages of development, before the appearance of the scale or of the tentacles. p, oldest; p', somewhat younger; p'', still younger.

become more numerous and larger, the knob assuming more a ladle-shape (*e*, Fig. 344); there is then formed a still larger row of lasso-cells, extending along the edge, and concealing the others (*f*, Fig. 344), making a kind of binding when seen from above (*g*, Fig. 344), where we find all the peculiar characteristics of the sole-shaped, lasso-paved knob of Fig. 339, the only difference in the older knobs being the greater size of the outer row of lasso-cells, and their closer packing, which conceals entirely the cavity running into the knob, while it is plainly visible in younger tentacles.

The perfectly free and open communication we find between all the parts of the community, except the float, is one of their most striking characteristics; there is not an appendage into which the food taken in by any one of these feeding polyps (Medusæ) cannot circulate into its very extremity; even the scales, which seem in their full-grown state

Fig. 343.

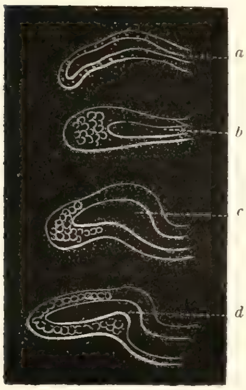


Fig. 344.

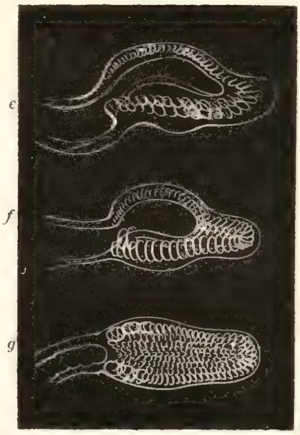
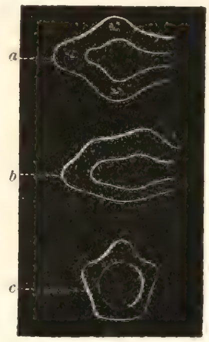


Fig. 345.



to consist of nothing but a gelatinous shield, with a very narrow tube passing through the middle, are, when developing, open pouches leading at once into the main cavity of the axis, and even after the buds can distinctly be recognized as undeveloped scales (Fig. 345), the cavity occupies a much greater part of the scale than in the adult, as is readily seen in the different views of one of the scales (*a*, *b*, *c*, Fig. 345). In the view from above, *a*, the triangular shape is already apparent; a profile view, *b*, shows its greater thickness than in a fully-developed scale, while in an end view, *c*, it is still quite pentagonal.

Besides these different kinds of appendages, we find the sexual individuals scattered in small clusters of abortive Medusæ near the lower extremity of the axis, generally in the third nearest the terminal

Fig. 343. *a*, *b*, *c*, *d*, tentacular knobs like those of Fig. 339, in different stages of development.

Fig. 344. *e*, *f*, *g*, the same tentacular knobs, still further developed.

In Figs. 343 and 344 all the figures are seen in profile, except *b* of Fig. 343, and *g* of Fig. 344, which are seen from the flat side, to show the arrangement of the lasso-cells.

Fig. 345. Young scale; seen from above, *a*; in profile, *b*; and endways, *c*.

polyp; as has already been shown by Sars in Agalmopsis, the sexes are distinct, so that we have whole communities, the sexual Medusæ of which are either males or females. There is no great difference between the appearance of the male and female Medusæ; they do not (as is the case in Agalmopsis, according to Sars) separate from the community, and lead an independent existence; they wither on the stem, after having discharged their contents. The Medusæ form bunches, the single Medusæ of which are directly attached to the main axis; they are somewhat pointed in outline, with four tolerably well defined chymiferous tubes, resembling quite closely the sessile Medusæ of such Tubularians as *Tubularia Couthouyi*.

Fig. 346.

From the observations of Gegenbaur, there can be no doubt that many of the Siphonophores are, like Nanomia, developed directly from the egg, and that the embryo which comes from the egg is one which is identical with those found floating about in such immense numbers during the early part of June, and which are figured in Fig. 346, consisting of a single closed polyp and of an oil-float, separated by a partition, as in the adult (Fig. 331); this simple polyp is to be the axis of the future community. But these young Nanomiæ (Fig. 346) do not all arise from eggs, and pass directly into an embryo like Fig. 346; we have a second kind of development, that of budding. In Fig. 338 there is represented on the top an appendage resembling somewhat a polyp without an opening, having neither tentacle nor protecting scale. A bubble of oil is collecting at the proximal extremity; as this bubble increases in size, the neck which connects the polyp with the main axis gradually becomes narrower and narrower, until the connection is finally cut, and we have a bud resembling in every respect Fig. 346, which has separated from the main community. By keeping in confinement, entirely isolated, an adult Nanomia having many of these buds along the main axis, I have found after a few days a large number of these buds liberated, which had assumed the shape and structure of Fig. 346, and had grown to be similar in every respect to the embryos I was fishing from the sea at the same time. From this I should infer that we have two broods of adults, those which are found in the fall, and which lay eggs in October and November, and those which are probably formed by budding from the older ones during the summer and winter; the embryos found in early summer may have come from the eggs of either of these.

Fig. 347.

The young embryos (Fig. 346) readily keep alive in confinement, and it is a comparatively easy thing to trace the successive stages of a

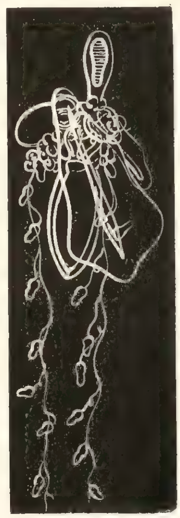
Fig. 346. Youngest Nanomia found swimming on surface.
Fig. 347. Somewhat more advanced.

further development; the terminal Hydra of Fig. 346 increases greatly in size; a number of buds make their appearance on both sides of the axis, immediately at the base of the float; these buds are nothing but the rudimentary swimming-bells, the so-called polyps and the tentacles. (Fig. 347.) As the young Nanomia grows larger, these buds increase in size, and we can soon trace in some of them undoubted polyps, with an open mouth, and the rudimentary tentacular knobs accompanying them; immediately at the base of these polyps there is a small transparent protuberance, the first appearance of the protecting scale. The terminal polyp of this diminutive community increases greatly in size, becomes open at the extremity, and covered irregularly with large

Fig. 348.

Fig. 349.

Fig. 350.



patches of scarlet pigment-cells; the tentacles become longer, and when they equal in length that of the community, from six to eight knobs hang from the main threads. (Fig. 348.) In somewhat more advanced specimens, we find protecting scales already quite well developed (Fig. 349), and besides many additional polyps in different stages of development, such as are figured in Fig. 342; the buds immediately under the float, the nature of which seemed still doubtful in the last stage (Fig. 348), are now seen to be rudimentary swimming-bells, some of them nearly as advanced as those represented in Fig. 337; these rudimentary parts grow now with great rapidity, the clusters of the

Fig. 348. The terminal Hydra is open, tentacles are developed, as well as clusters of small swimming-bells, like those of Fig. 337, and of Medusæ (feeding polyps), like those of Fig. 342.

Fig. 349. Still more advanced Nanomia.

Fig. 350. Young Nanomia, where we find several Medusæ (feeding polyps) of the first kind, having all the characters of those found in the adult (Fig. 332), and embryonic swimming-bells.

different kinds of individuals taking the place we find them occupying in the adult; the swimming-bells are placed immediately under the float, and the polyps between them and the primitive polyp. The protecting scales increase rapidly, and in Fig. 350 we have a young Nanomia having two well-developed polyps, as many scales, and as many tentacles, one of the polyps being the first terminal one, and the other a lateral polyp, at the base of which are found the rudimentary tentacles, while immediately under the float we find a cluster of rudimentary swimming-bells, as far developed as those of Fig. 337.

From this point there is no doubt that we have before us a young Nanomia, and the future phases of the development are only changes of quantity. The various members of the community have, however, a very different degree of development. What is particularly characteristic of the young Nanomia is that it is entirely composed of the polyp element, and of the polyps with knobbed appendages; it is only somewhat later that the scales make their appearance, and we then have a sufficient number of these polyps added to make quite an extensive community before any other kind is formed, and before the swimming-bells are developed. We generally find a couple of large swimming-bells preceding the appearance of the second kind of polyp (Fig. 339); it is not till still later that the Hydrocysts (Fig. 341), as Huxley has called the closed polyps, make their appearance. The remaining swimming-bells are slow in their development; we do not usually find more than two in quite large specimens, and it is only in the adult, where we find the buds which are to separate as young floats and where the sexual individuals have begun to make their appearance, that there are from four to six swimming-bells. (Fig. 332.)

From this slight sketch of the order of succession of the different individuals, we have the means of dividing all the Siphonophores into three great suborders, according to the degree of development of the three principal elements. Lowest are those in which the float has the greatest predominance, and in which the different individuals of the community appear as secondary appendages, such as Porpita, Velella, and Physalia; in the second suborder we have the various stages of combinations of the hydrarium and the swimming-bell elements, in the following forms, — Rhisophyza, Apolemia, Agalma, Nanomia, Halistemma, Stephanomia, and Forskalia; while in the third and highest suborder we find the greatest development of the swimming-bells, accompanied by a reduction in the number of individuals forming a single community, and a further specialization of parts not found in the preceding orders. The different appendages which are found along the axis of these floating Hydroids have been considered by most English investigators as simple organs, while the greater number of German writers believe them to be different kinds of individuals, forming together a community, and not a single animal, as maintained by the former. The solution of this question has been considered in various ways by Agassiz, Kölliker, Vogt, Leuckart, Gegenbaur, and Huxley. Professor Agassiz, who was the first to show the homology existing between one of these floating communities and a fixed community of Hydroids such as Hydractinia, has, it seems to me, given the correct account of these animals. According to him, and the principal points of this view have afterwards been proved independently by Vogt, and also developed further, from Professor Agassiz's lectures, by McCrady, a Siphonophore is neither a single animal, and its different appendages simply organs, nor, according to the opposite and more extreme view of Leuckart, does he push the polymorphism to such an extent as to consider all the appendages, such as the tentacles and scales, as independent individuals; he compares one of these communities to the different kinds of individuals found in a Hydractinia community, and thus shows beyond doubt that the Siphonophores are not a natural order of the Acalephs, but simply different suborders of the order of Hydroids; the fact that they move about as free communities does not separate them from the fixed Hydroids; it would be as unnatural to remove into different orders the free swimming Halcyonoids, such as Renilla, Veretillum, and the fixed Gorgonia or Halcyonium. It has already been fully shown by Vogt that the swimming-bells of Agalma and the like are only Medusæ differing from the Hydroid Medusæ in the absence of a free proboscis and of an opening communicating directly with the surrounding medium. The swimming-bells of Nanomia are nothing but Medusæ having complicated chymiferous tubes, remaining almost always attached to the community, and performing their part of the work. They are the locomotive individuals of the community; to them is intrusted the carrying about the whole of this fraternity, while different functions belong to the other individuals, some of them feeding the community, others serving to reproduce it by budding, while others again reproduce it by laying eggs.

The nature of the different kinds of polyps found along the axis does not seem to have been correctly understood; we can compare them, in a general way, to the different kinds of individuals found in a Hydractinia community; it seems to me that the only parts which can be homologized to one of these fixed Hydroids are the float, the original polyp, and the buds (top of Fig. 338) which drop off. These are in reality the floating Hydroid, and the other individuals, developed as the axis or original Hydroid becomes larger, are not Polyps like the original one, but Medusæ in various stages of development, having a different appearance from those we are accustomed to consider as such. We have, in the suborders of Siphonophoræ, communities of different kinds of Medusæ, instead of having communities of different kinds of

Hydroids, as in Hydractinia, only these Medusæ never separate from the original parent-stock from which they are produced. The float corresponds to the part of the stem of the fixed Hydroids by which they are attached, and the different individuals arising from this single Polyp are Medusæ. To show the Medusa character of these individuals, I must preface by saying that the tentacles, the Polyp, and the scale are not so many independent individuals, but that these three together form one individual, the Medusa. It is true this will appear, at first sight, rather doubtful; we are accustomed to associate with our notion of Medusa a regularly-shaped bell, chymiferous tubes, and a proboscis. But this is not the universal character of Medusæ; the abortive sessile Medusæ of Sertularians, Campanularians, and Tubularians are as much Medusæ, though they have no proboscis and nothing but rudimentary chymiferous tubes, as a free-swimming Sarsia or Bougainvillia. The moment this is understood, a new light is thrown on the nature of the individuals of our community. We find among the Hydroids all the stages intermediate between a rudimentary Medusa, as that of Laomedea or of Dynamena, and that of a symmetrical Medusa like Sarsia. We have those in which the proboscis is quite well developed, others in which the chymiferous tubes are always rudimentary, others which are asymmetrical, as Hybocodon, and the different spheromeres of which have not an equal degree of development. This gives us the clew to the true understanding of the relation between the clusters of tentacles, the scale, and the Polyp; let us take one of these Hybocodon Medusæ, cut away the two lateral spheromeres of the bell, and at the same time reduce the spheromere which bears the long tentacle to its minimum, that is, bring the tentacle to the point of junction of the proboscis and of the chymiferous tubes, cut the remaining spheromere in any shape we please, triangular or pentagonal, and we have a Medusa identical in every respect to those of our community. The cluster of tentacles corresponds to the single tentacle, the scale with its tube corresponds to the remaining spheromere and its chymiferous tube, while the proboscis and the Polyp are identical, and perform one and the same function. The fact that there is or is not a chymiferous tube extending through the scale, as in Fig. 338, does not invalidate this homology; for the chymiferous tubes in many Hydroid Medusæ are exceedingly rudimentary, and in that case it would only be carrying out for free Hydroids what has become perfectly familiar to us among the fixed Hydroids.

By reducing this proposition to a mathematical form, I may perhaps give the reader a better idea of the process I am endeavoring to explain, by supposing an equation of the *n*th degree to represent the formula of a Hydroid Medusa, the roots of which are represented by the different spheromeres; they all become imaginary in our Nanomia, with the exception of one root, which is positive, and this would represent the only remaining spheromere, that of the Deckstück.

If this view is correct, it is evident that the opinion of Huxley, who considers the scale as homologous to the urn of Campanularians, cannot be sustained. I have already hinted at the similarity of the embryonic Nanomia, in the stage of Fig. 347, when it consists of only the large Polyp and the float, with the early stages of the fixed Hydrarium of Melicertum, where we have at first a single Polyp, from which are developed, by budding, the branches and the other kinds of individuals of the community; supposing this community, instead of fixing itself, as it does, to remain movable, the base of the stem to expand into a float and become separated from the main cavity, we should have a Siphonophore. The discovery by McCrady and Stimpson of the floating Hydrarium of Nemopsis and Acaulis, where the Medusæ are closely related to genera the Hydrarium of which is always fixed, reduces still further the distinction which has been made of Polypi Nechali. And when we find that there are genuine Medusæ (Dysmorphosa) which for four generations reproduce themselves by budding from the proboscis, exactly in the same way in which we find additional individuals arising along the walls of the original Polyp among Physophoridæ, we are at a loss to find any distinctions to separate the Siphonophores from the true Hydroids, and we cannot consider them as anything but floating Hydroid communities.

Massachusetts Bay, Nahant, and Newport, R. I. (A. Agassiz).

Cat. No. 365, Nahant, Mass., September, 1862, A. Agassiz.

Museum Diagram, No. 27, after A. Agassiz.

Suborder PORPITÆ Goldf.

Porpitæ Goldf. Handb. der Zool. 1820.
Porpitæ and *Physaliæ* Agass. Cont. Nat. Hist. U. S., IV. p. 366. 1862.
Chondrophoræ Cham. et Eys. Acta Nova, X.

From a comparison of the young stages of Nanomia with the known Siphonophoræ, I have been induced to extend the limits of this suborder so as to include Physalia, forming thus three suborders among Hydroids of the old order of Siphonophoræ, the Diphyæ, the Physophoræ, and the Porpitæ.

Family PHYSALIDÆ Brandt.

Physalidæ Br.; in Mém. Acad. St. Petersb., p. 236. 1835.
Physalidæ Agass. Cont. Nat. Hist. U. S., IV. p. 366. 1862.

PHYSALIA Lamk.

Physalia Lamk. An. s. Vert., III. p. 89. Second Edition.
Arethusa Brown. Nat. Hist. Jam.
Arethusa Less. Zooph. Acal., p. 530. 1843.
Physalia Agass. Cont. Nat. Hist. U. S., IV. pp. 335, 366. 1862.

Fig. 351.

Physalia Arethusa Til.

Physalia Arethusa Til.; in Krusenst. Reise, Pl. 23, Figs. 1 – 6. 1813.
Physalia Arethusa Olf.; in Mem. Berl. Acad., Pl. 1. 1832.
Physalia Arethusa Agass. Cont. Nat. Hist. U. S., IV. pp. 335, 367, Pl. 35. 1862.
Physalia pelasgica Bosc. Hist. Nat. d. Vers, II. p. 168.
Physalia aurigera McCr. Gymn. Charleston Harbor, p. 74.

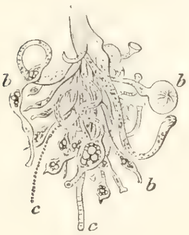
Physalia Arethusa (Fig. 351) is probably carried by the Gulf Stream as far as the Azores. A species has been described by Lesson as *Physalia azoricum*, which may be only the young of *Physalia Arethusa*. (See Voyage de la Coquille, Plate 5, Fig. 4.) To facilitate the comparison of the different kinds of individuals found in communities of this family with those of Nanomia, groups

Fig. 351. Physalia Arethusa Til. Figs. 351 – 354 are copied from Professor Agassiz's Contributions. *a*, blunt end of air-sac supporting the community; *b*, open end of air-sac; *c*, crest of air-sac; *m*, bunches of single individuals; *n*, tentacle contracted; *t*, *t*, tentacles of the largest kind expanded.

of Hydræ and of Medusæ (Figs. 352, 353, 354) are introduced here.

Fig. 352.

Fig. 353.



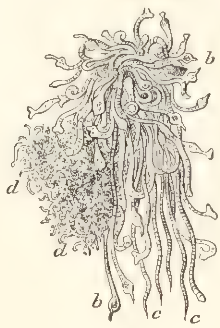
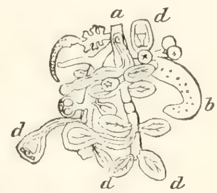


Fig. 354.



Charleston (McCrady); Gulf of Mexico (Brown, Sloane); Florida (L. Agassiz); Cape Cod (A. Agassiz); Martha's Vineyard (W. H. Forbes).

Cat. No. 305, Florida, 1850, L. Agassiz.
Cat. No. 306, Florida, 1850, L. Agassiz.
Cat. No. 307, Florida, 1850, L. Agassiz.
Cat. No. 308, Key West, Fla., February, 1858, L. Agassiz.
Cat. No. 309, Key West, Fla., March, 1858, L. Agassiz.
Cat. No. 310, Tortugas, Fla., February, 1858, L. Agassiz.
Cat. No. 311, New Providence, Bahamas, April, 1861, F. G. Shaw.
Cat. No. 312, Mobile, Alabama, L. Agassiz.
Cat. No. 313, 40° N. Lat., 60° W. Long., Captain W. H. A. Putnam.
Cat. No. 314, Naushon, Mass., 1861, W. H. Forbes.
Cat. No. 325, Tortugas, Fla., March, 1858, L. Agassiz.
Cat. No. 385, Beaufort, N. C., May, 1863, A. S. Bickmore.
Cat. No. 386, Bermudas, A. S. Bickmore.
Museum Diagram, No. 28, after L. Agassiz.

Fig. 352. Bunch of single Hydræ, and clusters of Medusæ, of Physalia Arethusa Til. *b*, *b*, Hydræ, with their tentacles, *c*, *c*; *d*, *d*, bunches of tentacles.

Fig. 353. Bunch of Hydræ. *a*, hollow base of attachment communicating with air-sac; *b*, *b*, *b*, single Hydræ; *c*, *c*, tentacles.

Fig. 354. Bunch of Medusæ in various stages of development. *a*, hollow base of attachment; *b*, Hydra; *d*, *d*, Medusæ buds.

Family VELELLIDÆ Esch.

Velellidæ Esch. (*restr.* Agass.). Syst. d. Acal., p. 165. 1829.
Velellæ Less. Zooph. Acal., p. 560. 1843.
Velellidæ Agass. Cont. Nat. Hist. U. S., IV. p. 366. 1862.

VELELLA Lamk.

Velella Lamk. Anim. s. Vert., II. 1819.
Velella Less. Zooph. Acal., p. 562. 1843.
Velella Agass. Cont. Nat. Hist. U. S., IV. p. 366. 1862.
Rataria Esch. Syst der Acal., p. 166. 1829.
Chrysomitra Gegenb.; in Zeit. f. Wiss. Zool., p. 231. 1856. Medusa.
Linuche Esch. Syst. der Acal., p. 91. 1829. Medusa.
? *Rataria* Pagenst.; in Zeit. f. Wiss. Zool., XII. p. 496. 1863.

Velella mutica Bosc.

Velella mutica Bosc. Hist. Nat. d. Vers, II. p. 158.
Velella mutica Less. Voyage de la Coquille, Pl. 6. 1829.
Velella mutica Less. Zooph. Acal., p. 571. 1843.
Velella mutica Agass. Cont. Nat. Hist. U. S., IV. p. 366. 1862.

The free Medusa of Velella resembles so exactly that produced by some of the Tubularians — Euphysa and Globiceps, for example — that it would seem the most natural thing to place these Medusæ among Tubularians, as McCrady has done; but the polymorphism of the

Fig. 356.

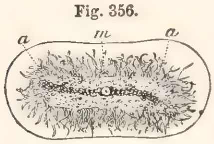
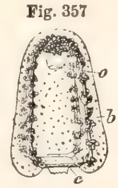


Fig. 355.

Fig. 357



Hydræ (Fig. 355) and the presence of the float (Fig. 356) associate the Hydrarium with the Porpitæ. The free Medusa is but another link showing how close is the relation between the floating and fixed Hydroids. The Medusa figured here (Fig. 357) is one which has just freed itself. The chymiferous tubes, as well as the proboscis, are of a

Fig. 355. An enlarged view of one of the fertile Hydræ of Velella. *a*, base of attachment of Hydra; *b*, end of Hydra; *d*, *d*, clusters of Medusæ. All these figures are copied from Professor Agassiz's Contributions, Vol. III.

Fig. 356. Velella, seen from below, to show the Hydræ. *m*, opening, so-called mouth; *a*, fertile Hydræ situated between the mouth and the outer tentacles, the sterile Hydræ.

Fig. 357. Magnified view of a free Medusa of Velella mutica Bosc. *o*, proboscis; *b*, chymiferous tube; *c*, circular tube.

brilliant ochre color. Professor Agassiz has observed this Medusa four days after it became free, when the Medusa had become quite globular, having lost entirely its elongated shape.

Long Island Sound (A. Agassiz); Gulf of Mexico (Bosc); Coast of Florida (L. Agassiz).

Cat. No. 296, Florida, 1850, L. Agassiz.
Cat. No. 297, Fort Jefferson, Fla., April, 1859, Dr. D. W. Whitehurst.
Cat. No. 298, Key West, Fla., March, 1858, J. E. Mills.
Cat. No. 299, Cape Florida, April, 1858, G. Wurdeman.
Cat. No. 300, Cape Florida, G. Wurdeman.
Cat. No. 301, Tortugas, Fla., April 2, 1858, L. Agassiz.
Cat. No. 302, Tortugas, Fla., April, 1858, J. E. Mills.
Museum Diagram, No. 27, after L. Agassiz.

Velella septentrionalis Esch.

Velella septentrionalis Esch. Syst. der Acal., p. 171, Pl. 15, Fig. 1. 1829.

Numerous specimens were collected at the entrance of the Straits of Fuca. The proportions of this species are quite different from those of our West Indian *V. mutica.* The figure given by Eschscholtz gives a good idea of the almost square outline of the float.

In company with *V. septentrionalis* was always found a Physalia, which I have been unable to refer to any of the described species. As the specimens of both were lost, they are mentioned here for the sake of the geographical distribution of these animals.

Northwest coast of America (Eschscholtz); Straits of Fuca (A. Agassiz, October, 1859); San Francisco Bar (A. Agassiz, October, 1859).

Family PORPITIDÆ Guild.

Porpitidæ GUILD.; in Zool. Journ., XI. p. 403.
Velellidæ ESCH. (*p. p.*). Syst. der Acal., p. 165. 1829.
Porpitidæ AGASS. Cont. Nat. Hist. U. S., IV. p. 366. 1862.
Porpitæ LESS. Voyage de la Coquille, II. p. 55. 1829.

PORPITA LAMK.

Porpita LAMK. Anim. s. Vert., II. 1819.
Porpita LESS. Zooph. Acal., p. 583. 1843.
Porpita AGASS. Cont. Nat. Hist. U. S., IV. p. 366. 1862.
Polybrachiona GUILD.; in Zool. Journ., XI.
Ratis LESS. Zool. de la Coquille. 1829.
Acies LESS. Zool. de la Coquille. 1829.
? *Armenistarium* COSTA. Faune de Naples.

Porpita linnæana LESS.

Porpita linnæana LESS. Zooph. Acal., p. 588. 1843.
Polybrachionia linnæana GUILD.; in Zool. Journ., XI. Fig.
Porpita linnæana McCR. Gymn. Charleston Harbor, p. 42.
Porpita linnæana AGASS. Cont. Nat. Hist. U. S., IV. p. 366. 1862.
? *Porpita atlantica* LESS. Voy. de la Coquille, Pl. 7, Fig. 2.

West Indies (Guilding); Florida (L. Agassiz); Charleston, S. C. (McCrady).

Cat. No. 289, Fort Jefferson, Fla., April, 1859, Dr. Whitehurst.

Cat. No. 290, Pensacola, Fla.

Cat. No. 291, Key West, Fla., L. Agassiz.

Museum Diagram, No. 27, after L. Agassiz.

Suborder TABULATÆ Agassiz.

Tabulatæ Agass. Sill. Journ., XXVI. p. 140. 1858.
Corallaria Tabulata Edw. & Haime. Archiv du Mus., V.
Madreporaria Tabulata Edw. & Haime. Hist. Corall., III. p. 223. 1860.
Tabulatæ Agass. Cont. Nat. Hist. U. S., IV. p. 292. 1862.

Family MILLEPORIDÆ Agass.

MILLEPORA Linn.

Millepora Linn. Syst. Nat.

Millepora alcicornis Lin.

Millepora alcicornis Lin. Syst. Nat., X. 1758.
Millepora alcicornis Dana. U. S. Ex. Exp. Zoophytes, p. 543.
Millepora alcicornis Edw. & Haime. Hist. Corall., III. p. 228.
Millepora alcicornis Agass. Cont. Nat. Hist. U. S., III. p. 292, Pl. 15, Figs. 3–13. 1860.
Millepora alcicornis Verrill; in Bull. Mus. Comp. Zoöl., p. 59, No. 3. 1864.

The absence of radiating partitions in the Tabulatæ seems to show, without much doubt, that their true place is among the Hydroids. It is true that Professor Agassiz has not observed the Medusæ buds on the specimens he has figured (Fig. 358), yet the Hydroid character of the animal, and their similarity to Halocharis-like Hydroids, is very

Fig. 358.

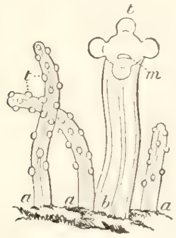


Fig. 359.

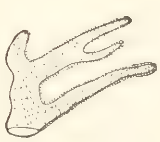
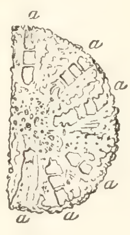


Fig. 360.



striking. It certainly is not more wonderful to have among Acalephs Hydroids which should deposit hard limestone parts (Figs. 359, 360), as Millepora and the like, than it is to find among the Polyps animals in which we find partitions of every stage of hardness, from a gelatinous or a horny nature, to the most solid deposits of limestone. We have already something of the same diversity in the formation of the

Fig. 358. Magnified view of extended Hydroids of Millepora. *a, a,* small Hydroids; *b,* larger ones; *m,* mouth; *t,* tentacles.

Fig. 359. Branch of Millepora alcicornis; natural size.

Fig. 360. Transverse section of branch. *a, a,* pits of Hydroids.

different kinds of sheaths of the Sertularians and of the Campanularians, and especially in the great development of the horn-like network forming the base of a Hydractinia colony, and the limestone floors deposited by the base of the animal of Millepora is only an extreme case for Acalephs, similar to the solid radiating partitions of the Madrepores among Polyps.

Tortugas, Fla. (L. Agassiz).

Cat. No. 382, Tortugas, Fla., March, 1858, L. Agassiz.

GEOGRAPHICAL DISTRIBUTION.

For the sake of showing more strikingly the character of the different Acalephian Faunæ of our coasts, lists have been prepared embracing several species not enumerated in the Catalogue, to give a better idea of the peculiar stamp of the regions into which our coast has been divided. No names are here given to these faunal divisions, as in a forthcoming number of the Museum Catalogue the limits and nomenclature of our Marine Faunæ will be fully discussed. For the present I shall simply point out in a general manner some of the more interesting points of the distribution of our Acalephs. Several species have a very extensive range; on the Atlantic side, from Greenland to Long Island Sound, and from Grand Manan to Charleston, South Carolina. In the Pacific Ocean we find species which range from Kamtschatka to the northern part of California. Within these extensive belts there are other species more limited in range, extending only from Massachusetts Bay to Eastport, from Charleston to Cape Cod, from San Francisco to the Gulf of Georgia, or from the Gulf of Georgia to Behring's Straits; while a third series of species is still more limited, extending only along such portions of the shores as Nova Scotia, Massachusetts Bay, Long Island Sound, the coast of Southern California, the Gulf of Georgia, and the like.

The areas of distribution of the different species overlap and enclose one another so as to give us for the character of the Fauna of any particular locality three different elements of distribution; first, the cosmopolitan species, spreading over wide areas; next, the species which range over more limited areas; and finally, the local species scattered in the areas of the limited species. It is the peculiar combination of these three elements which gives to a special locality what has been called its faunal character, but owing to the intricate crossing, overlapping, and enclosing of these areas, we find it nearly impossible to draw lines along our coast which should embrace homogeneous elements. Such areas are found on our coast, extending approximately from Greenland to the northern part of Nova Scotia, from Nova Scotia to the northern part of Maine, and from Massachusetts Bay to Cape Cod; the coast of Long Island Sound and New Jersey, as far as Cape Hatteras, presents features of its own; the coast of the Carolinas and Georgia has likewise distinct faunal features, while Florida and the West Indies have each their peculiar Acalephs, though the boundaries of the distribution of many of the species, found in each of those divisions, extend far beyond the limits we have here assigned to the regions. On the Pacific side of North America, we find the great belt of the Northern Pacific extending from the shores of Kamtschatka to British North America; the inland sea behind Vancouver's Island and the mainland has a characteristic fauna, and along the coast of California itself still different Medusæ are found. The association of the three elements mentioned above being so different at certain localities, we naturally come to look upon them as centres from which the species of a fauna are derived, while in reality it is only the peculiar combinations of the geographical extension of each species which give the distinguishing features to each locality.

NORTH PACIFIC.

SITKA, ALEUTIAN ISLANDS, BEHRING'S STRAITS, KAMTSCHATKA.

Bolina septentrionalis Mert.	Behring's Straits.	Mertens.
Janira cucumis Less.	Sitka.	Mertens.
Dryodora glandiformis Ag.	Behring's Straits.	Mertens.
Phacellophora camtschatica Br.	Kamtschatka.	Mertens.
Cyanea Postelsii Br.	Sitka.	Mertens.
Cyanea ferruginea Esch.	Aleutian Islands; Kamtschatka.	Eschscholtz.
Pelagia Brandtii Ag.	Aleutian Islands.	Mertens.
Polybostricha helvola Br.	Aleutian Islands.	Mertens.
Melanaster Mertensii Ag.	Kamtschatka.	Mertens.
Æginopsis Laurentii Br.	Behring's Straits.	Mertens.
Trachynema camtschaticum A. Ag.	Kamtschatka.	Mertens.
Staurophora Mertensii Br.	Aleutian Islands.	Mertens.
Diphasia (*nigra*-like)	Behring's Straits.	W. Stimpson.
Sertularia (*abietina*-like)	Behring's Straits.	W. Stimpson.
Cotulina Greenei A. Ag.	Behring's Straits.	W. Stimpson.
Thuiaria (*thuja*-like)	Behring's Straits.	W. Stimpson.
Bougainvillia Mertensii Ag.	Behring's Straits	Mertens.
Proboscidactyla flavicirrata Br.	Kamtschatka.	Mertens.

GULF OF GEORGIA, W. T.

Bolina microptera A. Ag.	A. Agassiz.	*Polyorchis penicillata* A. Ag.	A. Agassiz.
Pleurobrachia Bachei A. Ag.	A. Agassiz.	*Laodicea cellularia* A. Ag.	A. Agassiz.
Idyia cyathina A. Ag.	A. Agassiz.	*Gonionemus vertens* A. Ag.	A. Agassiz.
Heccædecomma ambiguum Br.	A. Agassiz.	*Melicertum georgicum* A. Ag.	A. Agassiz.
Cyanea Postelsii Br.	A. Agassiz.	*Bougainvillia Mertensii* Ag.	A. Agassiz.
Trachynema camtschaticum A. Ag.	A. Agassiz.	*Stomotoca atra* A. Ag.	A. Agassiz.
Oceania gregaria A. Ag.	A. Agassiz.	*Proboscidactyla flavicirrata* Br.	A. Agassiz.
Crematostoma flava A. Ag.	A. Agassiz.	*Coryne rosaria* A. Ag.	A. Agassiz.
Zygodactyla cærulescens Br.	A. Agassiz.	*Physalia sp.*	A. Agassiz.
Æquorea ciliata Esch.	A. Agassiz.	*Velella septentrionalis* Esch.	A. Agassiz.
Laomedea pacifica A. Ag.	A. Agassiz.	*Porpita sp.*	A. Agassiz.

SAN FRANCISCO, CALIFORNIA.

Aurelia labiata Cham. & Eys.	A. Agassiz.	*Sertularia gracilis* A. Ag.	Trask.
Phacellophora camtschatica Br.	A. Agassiz.	*Sertularia furcata* Trask.	Trask.
Polybostricha helvola Br.	A. Agassiz.	*Sertularia turgida* Trask.	Trask.
Melanaster Mertensii Ag.	A. Agassiz.	*Cotulina Greenei* A. Ag.	Murray.
Laomedea rigida A. Ag.	A. Agassiz.	*Bougainvillia Mertensii* Ag.	A. Agassiz.
Laomedea pacifica A. Ag.	A. Agassiz.	*Coryne rosaria* A. Ag.	A. Agassiz.
Polyorchis penicillata A. Ag.	A. Agassiz.	*Paripha microcephala* A. Ag.	A. Agassiz.
Aglaophenia franciscana A. Ag.	A. Agassiz.	*Thamnocnidia tubularoides* A. Ag.	A. Agassiz.
Diphasia corniculata A. Ag.	Murray.	*Hydra tenuis* Ayres.	Ayres.
Sertularia anguina Trask.	Trask.	*Physalia sp.*	A. Agassiz.

WEST INDIES.

Ocyroe maculata Rang.	Rang.	*Dynamena ostrearum* Duch.	Duchassaing.
Idyia ovata Less.	Brown.	*Dynamena* (*disticha*-like).	Duchassaing.
Polyclonia frondosa Ag.	Poey.	*Zelleria simplex* Duch.	Duchassaing.
Pelagia cyanella Pér. et Les.	Swartz.	*Tubularia Ehrenbergii* Duch.	Duchassaing.
Clytia (*volubilis*-like).	Duchassaing.	*Tubularia Lamourouxii* Duch.	Duchassaing.
Laomedea (*antipathes*-like).	Duchassaing.	*Tubularia glandulosa* Duch.	Duchassaing.
Laomedea (*gracilis*-like).	Weinland.	*Tubularia pinnata* Duch.	Duchassaing.
Aglaophenia pelasgica McCr.	Weinland.	*Physalia Arethusa* Til.	Brown.
Aglaophenia trifida Ag.	Weinland.	*Velella mutica* Bosc.	Brown.
Aglaophenia acinaria Duch.	Duchassaing.	*Porpita linnæana* Less.	Guilding.
Aglaophenia atlantica Duch.	Duchassaing.	*Millepora alcicornis* Lin.	Linnæus.

FLORIDA REEF.

Bolina vitrea Ag.	L. Agassiz.	*Eutima pyramidalis* Ag.	L. Agassiz.
Idyopsis affinis Ag.	L. Agassiz.	*Dynamena sp.*	L. Agassiz.
Polyclonia frondosa Ag.	L. Agassiz.	*Pasithea sp.*	L. Agassiz.
Aurelia marginalis Ag.	L. Agassiz.	*Aglaophenia pelasgica* McCr.	L. Agassiz.
Pelagia cyanella Pér. et Les.	L. Agassiz.	*Aglaophenia trifida* Ag.	L. Agassiz.
Liriope tenuirostris Ag.	L. Agassiz.	*Plumularia quadridens* McCr.	L. Agassiz.
Clytia (*intermedia*-like).	L. Agassiz.	*Plumularia sp.*	L. Agassiz.
Clytia (*volubilis*-like).	L. Agassiz.	*Nigelastrum sp.*	L. Agassiz.
Orthopyxis (*poterium*-like).	L. Agassiz.	*Pennaria gibbosa* Ag.	L. Agassiz.
Laomedea (*amphora*-like).	L. Agassiz.	*Paripha cristata* Ag.	L. Agassiz.
Laomedea (*dichotoma*-like).	L. Agassiz.	*Physalia Arethusa* Til.	L. Agassiz.
Rhegmatodes floridanus Ag.	L. Agassiz.	*Velella mutica* Bosc.	L. Agassiz.
Zygodactyla cyanea Ag.	L. Agassiz.	*Porpita linnæana* Less.	L. Agassiz.
Eirene cærulea Ag.	L. Agassiz.	*Millepora alcicornis* Linn.	L. Agassiz.

CHARLESTON, SOUTH CAROLINA.

Bolina littoralis McCr.	McCrady.	*Oceania folleata* Ag.	McCrady.
Mnemiopsis Gardeni Ag.	L. Agassiz.	*Eucheilota ventricularis* McCr.	McCrady.
Beroe punctata Esch.	McCrady.	*Clytia bicophora* Ag.	McCrady.
Idyopsis Clarkii Ag.	L. Agassiz.	*Platypyxis cylindrica* Ag.	L. Agassiz.
Stomolophus meleagris Ag.	L. Agassiz.	*Eucope divaricata* A. Ag.	L. Agassiz.
Cyanea versicolor Ag.	L. Agassiz.	*Obelia commissuralis* McCr.	McCrady.
Foveolia octonaria A. Ag.	McCrady.	*Eirene gibbosa* Ag.	McCrady.
Persa incolorata McCr.	McCrady.	*Eutima mira* McCr.	McCrady.
Liriope scutigera McCr.	McCrady.	*Eutima variabilis* McCr.	McCrady.

Aglaophenia pelasgica McCr.	McCrady.	*Dipurena strangulata* McCr.	McCrady.
Aglaophenia trifida Ag.	L. Agassiz.	*Dipurena cervicata* McCr.	McCrady.
Aglaophenia tricuspis McCr.	McCrady.	*Corynitis Agassizii* McCr.	McCrady.
Plumularia quadridens McCr.	McCrady.	*Gemmaria gemmosa* McCr.	McCrady.
Plumularia (*Catharina*-like).	L. Agassiz.	*Pennaria tiarella* McCr.	McCrady.
Dynamena cornicina McCr.	L. Agassiz.	*Ectopleura turricula* Ag.	McCrady.
Diphasia (*nigra*-like).	L. Agassiz.	*Paripha cristata* Ag.	L. Agassiz.
Nemopsis Bachei Ag.	McCrady.	*Hydractinia polyclina* Ag.	McCrady.
Margelis carolinensis Ag.	McCrady.	*Eudoxia alata* McCr.	McCrady.
Eudendrium ramosum McCr.	McCrady.	*Diphyes pusilla* McCr.	McCrady.
Turritopsis nutricula McCr.	McCrady.	*Physalia Arethusa* Til.	McCrady.
Stomotoca apicata Ag.	McCrady.	*Velella mutica* Bosc.	McCrady.
Willia ornata McCr.	McCrady.	*Porpita linnæana* Less.	McCrady.

BUZZARD'S BAY AND LONG ISLAND SOUND.

Mnemiopsis Leidyi A. Ag.	A. Agassiz.	*Sertularia cupressina* Lin.	Leidy.
Lesueuria hyboptera A. Ag.	A. Agassiz.	*Nemopsis Bachei* Ag.	L. Agassiz.
Pleurobrachia rhododactyla Ag.	A. Agassiz.	*Bougainvillia superciliaris* Ag.	Leidy.
Cyanea arctica Pér. et Les.	A. Agassiz.	*Margelis carolinensis* Ag.	A. Agassiz.
Cyanea fulva Ag.	A. Agassiz.	*Eudendrium dispar* Ag.	A. Agassiz.
Dactylometra quinquecirra Ag.	A. Agassiz.	*Eudendrium tenue* A. Ag.	A. Agassiz.
Trachynema digitale A. Ag.	A. Agassiz.	*Dysmorphosa fulgurans* A. Ag.	A. Agassiz.
Oceania languida A. Ag.	A. Agassiz.	*Modeeria sp.*	A. Agassiz.
Eucheilota ventricularis McCr.	A. Agassiz.	*Turritopsis nutricula* McCr.	A. Agassiz.
Eucheilota duodecimalis A. Ag.	A. Agassiz.	*Stomotoca apicata* Ag.	A. Agassiz.
Clytia volubilis A. Ag.	A. Agassiz.	*Clava leptostyla* Ag.	Leidy.
Clytia bicophora Ag.	A. Agassiz.	*Willia ornata* McCr.	A. Agassiz.
Platypyxis cylindrica Ag.	A. Agassiz.	*Dipurena conica* A. Ag.	A. Agassiz.
Eucope diaphana Ag.	A. Agassiz.	*Gemmaria gemmosa* McCr.	A. Agassiz.
Obelia commissuralis McCr.	A. Agassiz.	*Pennaria tiarella* McCr.	Ayres.
Laomedea amphora Ag.	A. Agassiz.	*Cordylophora sp.*	Leidy.
Rhegmatodes tenuis A. Ag.	A. Agassiz.	*Ectopleura ochracea* A. Ag.	A. Agassiz.
Zygodactyla groenlandica Ag.	A. Agassiz.	*Hybocodon prolifer* Ag.	A. Agassiz.
Æquorea albida A. Ag.	A. Agassiz.	*Hydra carnea* Ag. (Conn.)	L. Agassiz.
Eutima limpida A. Ag.	A. Agassiz.	*Hydractinia polyclina* Ag.	A. Agassiz.
Lafœa calcarata A. Ag.	A. Agassiz.	*Nanomia cara* A. Ag.	A. Agassiz.
Dynamena pumila Lamx.	A. Agassiz.	*Physalia Arethusa* Til.	A. Agassiz.

MASSACHUSETTS BAY.

Bolina alata Ag.	L. Agassiz.	*Oceania languida* A. Ag.	A. Agassiz.
Lesueuria hyboptera A. Ag.	A. Agassiz.	*Wrightia sp.*	L. Agassiz.
Mertensia ovum Mörch.	A. Agassiz.	*Clytia intermedia* Ag.	L. Agassiz.
Pleurobrachia rhododactyla Ag.	L. Agassiz.	*Clytia bicophora* Ag.	L. Agassiz.
Idyia roseola Ag.	L. Agassiz.	*Clytia volubilis* A. Ag.	L. Agassiz.
Aurelia flavidula Pér. et Les.	L. Agassiz.	*Platypyxis cylindrica* Ag.	L. Agassiz.
Cyanea arctica Pér. et Les.	L. Agassiz.	*Orthopyxis poterium* Ag.	L. Agassiz.
Campanella pachyderma A. Ag.	A. Agassiz.	*Eucope diaphana* Ag.	L. Agassiz.
Trachynema digitale A. Ag.	A. Agassiz.	*Eucope alternata* A. Ag.	A. Agassiz.
Halimocyathus platypus H. J. C.	H. J. Clark.	*Eucope parasitica* A. Ag.	A. Agassiz.
Manania auricula H. J. C.	H. J. Clark.	*Eucope polygena* A. Ag.	A. Agassiz.
Lucernaria quadricornis Müll.	L. Agassiz.	*Eucope pyriformis* A. Ag.	A. Agassiz.
Haliclystus auricula H. J. C.	L. Agassiz.	*Eucope articulata* A. Ag.	A. Agassiz.
Tiaropsis diademata Ag.	L. Agassiz.	*Eucope fusiformis* A. Ag.	A. Agassiz.

Obelia commissuralis McCr.	L. Agassiz.
Laomedea amphora Ag.	L. Agassiz.
Laomedea gigantea A. Ag.	H. J. Clark.
Laomedea reptans Lamx.	L. Agassiz.
Laomedea sp.	L. Agassiz.
Stomobrachium tentaculatum Ag.	L. Agassiz.
Halopsis ocellata A. Ag.	A. Agassiz.
Halopsis cruciata A. Ag.	A. Agassiz.
Zygodactyla groenlandica Ag.	L. Agassiz.
Zygodactyla crassa A. Ag.	A. Agassiz.
Tima formosa Ag.	L. Agassiz.
Lafœa cornuta Lamx.	A. Agassiz.
Lafœa dumosa Sars.	A. Agassiz.
Melicertum campanula Pér. et Les.	L. Agassiz.
Staurophora laciniata Ag.	L. Agassiz.
Ptychogena lactea A. Ag.	A. Agassiz.
Plumularia arborea Des.	Desor.
Dynamena pumila Lamx.	L. Agassiz.
Dyphasia fallax Ag.	L. Agassiz.
Dyphasia rosacea Ag.	L. Agassiz.
Sertularia cupressina L.	L. Agassiz.
Sertularia argentea Ell. & Sol.	L. Agassiz.
Sertularia falcata L.	L. Agassiz.
Sertularia myriophyllum L.	L. Agassiz.
Amphitrocha rugosa Ag.	L. Agassiz.
Cotulina tricuspidata A. Ag.	L. Agassiz.
Cotulina tamarisca A. Ag.	L. Agassiz.
Halecium halecinum Johnst.	L. Agassiz.
Bougainvillia superciliaris Ag.	L. Agassiz.
Eudendrium dispar Ag.	L. Agassiz.
Eudendrium tenue A. Ag	A. Agassiz.
Eudendrium sp.	A. Agassiz.
Lizzia grata A. Ag.	A. Agassiz.
Dysmorphosa fulgurans A. Ag.	A. Agassiz.
Turris vesicaria A. Ag.	A. Agassiz.
Turritopsis sp.	A. Agassiz.
Rhizogeton fusiformis Ag.	L. Agassiz.
Clava leptostyla Ag.	L. Agassiz.
Coryne mirabilis Ag.	L. Agassiz.
Syndictyon reticulatum A. Ag.	A. Agassiz.
Gemmaria cladophora A. Ag.	A. Agassiz.
Pennaria tiarella McCr.	A. Agassiz.
Euphysa virgulata A. Ag.	A. Agassiz.
Hybocodon prolifer Ag.	L. Agassiz.
Corymorpha pendula Ag.	L. Agassiz.
Paripha crocea Ag.	L. Agassiz.
Thamnocnidia spectabilis Ag.	L. Agassiz.
Thamnocnidia tenella Ag.	L. Agassiz.
Tubularia Couthouyi Ag.	L. Agassiz.
Hydra gracilis Ag. (Mass.)	L. Agassiz.
Hydractinia polyclina Ag.	L. Agassiz.
Nanomia cara A. Ag.	A. Agassiz.

NORTHERN COAST OF MAINE, GRAND MANAN, AND EASTPORT.

Bolina alata Ag.	W. Stimpson.
Mertensia ovum Mörch.	A. Agassiz.
Pleurobrachia rhododactyla Ag.	W. Stimpson.
Idyia roseola Ag.	W. Stimpson.
Aurelia flavidula Pér. et Les.	W. Stimpson.
Cyanea arctica Pér. et Les.	W. Stimpson.
Manania auricula H. J. C.	W. Stimpson.
Lucernaria quadricornis Müll.	W. Stimpson.
Haliclystus auricula H. J. C.	W. Stimpson.
Haliclystus salpinx H. J. C.	W. Stimpson.
Oceania languida A. Ag.	L. Agassiz.
Clytia volubilis A. Ag.	A. E. Verrill.
Clytia bicophora Ag.	W. Stimpson.
Orthopyxis poterium Ag.	A. E. Verrill.
Eucope diaphana Ag.	A. Agassiz
Eucope pyriformis A. Ag.	J. E. Mills.
Obelia commissuralis McCr.	J. E. Mills.
Laomedea amphora Ag.	J. E. Mills.
Melicertum campanula P. et Les.	L. Agassiz.
Staurophora laciniata Ag.	W. Stimpson.
Dynamena pumila Lamx.	A. Agassiz.
Diphasia fallax Ag.	W. Stimpson.
Sertularia abietina L.	J. E. Mills.
Sertularia cupressina L.	W. Stimpson.
Sertularia argentea L.	J. E. Mills.
Sertularia falcata Ag.	W. Stimpson.
Sertularia latiuscula Stimps.	W. Stimpson.
Sertularia myriophyllum L.	A. E. Verrill.
Sertularia filicula Ell. & Sol.	W. Stimpson.
Sertularia producta Stimps.	W. Stimpson.
Amphitrocha rugosa Ag.	W. Stimpson.
Cotulina tricuspidata A. Ag.	W. Stimpson.
Cotulina polyzonias Ag.	A. E. Verrill.
Cotulina tamarisca A. Ag.	W. Stimpson.
Halecium halecinum Johnst.	A. E. Verrill.
Halecium muricatum Johnst.	A. E. Verrill.
Grammaria gracilis Stimps.	W. Stimpson.
Grammaria robusta Stimps.	W. Stimpson.
Acaulis primarius Stimps.	W. Stimpson.
Eudendrium dispar Ag.	A. E. Verrill.
Coryne mirabilis Ag.	W. Stimpson.
Clava leptostyla Ag.	W. Stimpson.
Candelabrum phrygium Bl.	W. Stimpson.
Corymorpha pendula Ag.	W. Stimpson.
Thamnocnidia tenella Ag.	A. E. Verrill.
Tubularia larynx Ellis.	W. Stimpson.
Tubularia Couthouyi Ag.	W. Stimpson.
Hydractinia polyclina Ag.	A. E. Verrill.

NOVA SCOTIA.

Bolina alata Ag.	Anticosti Exp.	*Dynamena pumila* Lamx.	Dawson.
Pleurobrachia rhododactyla Ag.	Anticosti Exp.	*Sertularia abietina* L.	Anticosti Exp.
Idyia roseola Ag.	Anticosti Exp.	*Sertularia argentea* L.	Dawson.
Aurelia flavidula Pér. et Les.	Anticosti Exp.	*Sertularia plumea* Dawson.	Dawson.
Cyanea arctica Pér. et Les.	Anticosti Exp.	*Sertularia falcata* L.	Anticosti Exp.
Haliclystus auricula H. J. C.	Anticosti Exp.	*Sertularia myriophyllum* L.	Anticosti Exp.
Clytia volubilis A. Ag.	Anticosti Exp.	*Sertularia latiuscula* Stimps.	Dawson.
Clytia bicophora Ag.	Anticosti Exp.	*Cotulina tricuspidata* A. Ag.	Anticosti Exp.
Orthopyxis poterium Ag.	Anticosti Exp.	*Cotulina polyzonias* Ag.	Anticosti Exp.
Laomedea (*dichotoma*-like).	Dawson.	*Cotulina tamarisca* A. Ag.	Anticosti Exp.
Laomedea (*gelatinosa*-like).	Dawson.	*Halecium muricatum* Johnst.	Anticosti Exp.
Laomedea (*geniculata*-like).	Dawson.	*Thuiaria thuja* Flem.	Anticosti Exp.
Lafœa cornuta Lamx.	Anticosti Exp.	*Eudendrium* (*ramosum*-like).	Dawson.
Lafœa dumosa Sars.	Anticosti Exp.	*Tubularia larynx* Ellis.	Dawson.
Cosmetira sp.	Anticosti Exp.	*Tubularia Couthouyi* Ag.	Dawson.

GREENLAND.

Mertensia ovum Mörch.	Fabricius.	*Zygodactyla groenlandica* P. et Les.	Fabricius.
Pleurobrachia rhododactyla Ag.	Fabricius.	*Melicertum campanula* Pér. et Les.	Fabricius.
Idyia cucumis Less.	Fabricius.	*Dynamena pumila* Lamx.	Fabricius.
Idyia borealis Less.	Scoresby.	*Sertularia abietina* L.	Fabricius.
Aurelia flavidula Pér. et Les.	Fabricius.	*Sertularia argentea* L.	Fabricius.
Cyanea arctica Pér. et Les.	Fabricius.	*Amphitrocha rugosa* Ag.	Fabricius.
Chrysaora heptæna Pér. et Les.	Martens.	*Cotulina polyzonias* Ag.	Fabricius.
Trachynema digitale A. Ag.	Fabricius.	*Halecium halecinum* Johnst.	Fabricius.
Manania auricula H. J. C.	Fabricius.	*Bougainvillia superciliaris* Ag.	Mörch.
Lucernaria quadricornis Müll.	Fabricius.	*Coryne mirabilis* Ag.	Sabine.
Haliclystus auricula H. J. C.	Steenstrup.	*Coryne pusilla* Gärt.	Mörch.
Medusa bimorpha Fab.	Fabricius.	*Coryne muscoides* Johnst.	Mörch.
Tiaropsis diademata Ag.	Mörch.	*Candelabrum phrygium* Bl.	Fabricius.
Campanularia volubilis Mörch.	Mörch.	*Tubularia indivisa* Linn.	Mörch.
Campanularia olivacea Lamx.	Mörch.	*Hydractinia polyclina* Ag.	Fabricius.
Eucope diaphana Ag.	Mörch.		

SYSTEMATIC TABLE

OF THE ORDERS AND FAMILIES OF NORTH AMERICAN ACALEPHÆ DESCRIBED IN THIS VOLUME.

INDEX OF GENERA AND SPECIES.

[Synonymes are in Italics.]

THE END.

Cambridge : Electrotyped and Printed by Welch, Bigelow, & Co.