No. 8. — *On the Acalephæ of the East Coast of New England.* By J. Walter Fewkes.

The observations recorded in the following pages are placed under two titles. The first subject, "Medusæ from Newport" relates to jelly-fishes taken at Newport, R. I., in the summer of 1881.* Under the second, "Acalephæ collected by the U. S. Fish Commission, &c.," will be found descriptions of jelly-fishes taken by them off the New England coast in 1880 and 1881.†

I. Medusæ from Newport.

CTENOPHORA.

Development of the Chymiferous Tubes in Mnemiopsis Leidyi, A. Ag.

Figs. 1-9.

In the development and union of the chymiferous tubes, the larval stages of *Mnemiopsis* differ radically from those of the closely related genus *Bolina*, whose embryology is described and figured by Mr. A. Agassiz.‡ In *Bolina*, according to the author last mentioned, those ambulacral tubes which are situated nearest the tentacles are the first to unite, "forming thus the first connected loop enclosing in the adult *Bolina* the complicated winding tubes of the short pair of chymiferous canals of the actinal lobes."

The first pair of these tubes to unite in the young *Mnemiopsis* are not the vessels which lie adjacent to the tentacles, but those placed in the body walls between the tentacular rows of combs. It therefore appears, in other words, that the chymiferous tubes which are the last to join in *Bolina*, are first to unite in the closely allied *Mnemiopsis*.

* I am indebted to Mr. Agassiz for facilities to carry on this portion of the work in his private laboratory at Newport, R. I.

† These medusæ have been placed in my hands for study through the kindness of Prof. Verrill. I take this opportunity to express my indebtedness to him for this and other favors.

‡ North American Acalephæ, p. 17; also Mem. Amer. Acad., Vol. X. No. III. Mr. Agassiz has pointed out that the sequence in the union of the ambulacral tubes of *Bolina* is exceptional.

The successive stages in the growth of the young *Mnemiopsis* are as follows.

In the youngest larva which was taken we recognize most of the organs of the adult. The lateral tubes (*l*), which originate as simple blind sacs, end in the neighborhood of the lips without bifurcation. The eight remaining vessels, situated meridionally just below the surface beneath the rows of "combs," resemble each other in size and have about the same length, each also ending blindly in the body walls.* Fig. 1 represents this larva, drawn in a plane passing through the tentacles and the otocyst. The two auricular vessels (*a t*) are seen to lie adjacent to the tentacles, one on either side, while the lobular tubes (*l t*) are situated in the segments between them.

A clearer conception of the relationship of the chymiferous tubes to each other may be obtained by a consultation of the following figure (1 *a*), taken from the actinal pole. In no other way can the origin of the chymiferous vessels from the funnel be shown to such advantage as by a drawing made in this way. The eight meridional tubes spring in pairs from a vessel (*c*) which arises from the base of the funnel (*f*). From the point of bifurcation also, there originates a tentacular tube (*t t*), which passes to the tentacular sac. This tube exists in the youngest larva studied, as a very broad vessel, and in subsequent growth it becomes more and more slender and tubelike, as shown in following figures. The lateral tubes (*l*) originate independently of all the others, as short diverticula from the base of the funnel.

Fig. 2 represents, in the same plane as the above, a larval *Mnemiopsis* somewhat older than the last. The most marked difference between the vessels of the two is produced by a growth of the lobular vessels, which have lengthened more than the auricular, and now extend about half-way down the length of the body. In other respects they are unchanged. The lateral tubes (*l*) have remained in about the same condition as in the previous stage, and have not yet bifurcated at their extremities.

In Fig. 3 the lobular vessels are represented as having extended still farther in their growth, and are rapidly approaching the oral pole of the medusa. Their extremities have even turned towards each other preparatory to a final union. The auricular tubes have also lengthened and pushed their way about two thirds the whole distance from the apical to the oral pole.

Fig. 4 represents a larva somewhat more developed than the last, in which

* In my descriptions the lobular vessels correspond with what Mr. Agassiz calls the "long ambulacral tubes (longitudinal ambulacra)," and the auricular vessels with his "short ambulacral tubes (lateral ambulacra)." The adjectives *lobular* and *auricular* seem to me preferable to "long" and "short," to avoid confusion in a comparative study of these structures in other Ctenophores (contrast the long and short ambulacra of *Cestus* and *Ocyroë*). I have abandoned the adjective "lateral," as applied to ambulacra, in order to avoid confusion with other vessels (*l*) designated by the same name, on each side of the stomach. Between the older term "longitudinal" and the new adjective *lobular*, I have chosen the latter, as more characteristic. The nomenclature adopted seems to me to call attention to characteristic features in all genera of *Ctenophora*, as well as of *Mnemiopsis*.

the growth preparatory to a fusion of the lobular tubes has gone still further, so that the extremities of the lobular vessels almost touch each other. By far the most important change has taken place in the lateral tubes, which are now bifurcated at their extremities.

The fusion of the lobular vessels appears in a larva (Fig. 5) following the last. A junction of these tubes has here been effected, forming one continuous vessel. In the same stage the auricular tubes have also pushed downward through the bell walls, but they still end blindly and without division. They also eventually fuse, and in a following stage (Fig. 6) they bend towards each other and approach in such a way as to enclose the loop of the lobular vessels, which has been already formed.

In the next figure (6 *a*) the junction of the two auricular vessels has occurred, so that a connecting loop is formed enclosing that already resulting from a fusion of the lobular vessels. It will also be noticed that the lower ends of the lateral tubes have bifurcated. Its terminal division (*l l*) is shown in the foreground of the figure. At about this stage in the growth of the Ctenophore, the lobes (*ol*), which later reach such a great size, begin to be differentiated from the body of the medusa. In Fig. 7 they have pushed themselves still more prominently into notice, and the network of lines upon their inner surface is even now well marked. Meanwhile a slight variation in the direct meridional course of the auricular tubes marks the situation of the future auricles (*a*). The two branches formed by the bifurcations at the extremity of each lateral tube have grown to such an extent that they join the auricular vessels one on each side at a point directly below the position where the lower edge of the auricles ends.

The oldest larva of *Mnemiopsis*, which I have figured, shows nearly the same disposition of vessels as one finds in the adult. Subsequent modifications in the course of these vessels consist in their deviation from the direct meridional lines, and their increase in length; but no new junction of tubes takes place in intermediate stages between this larva and the adult *Mnemiopsis*.

DISCOPHORA.

Dactylometra quinquecirra, A. Ag.

Figs. 25-28, 38, 39.

A single specimen of this interesting Discophore was taken by me in the last summer, and from it a few new observations were made, which may add something to our imperfect knowledge of its anatomy.

The bell margin bears eight otocysts and a variable number of tentacles, which have the following arrangement. If we take the interval of bell rim between two otocysts we find appended to it a variable number of tentacles. A figure is given of such a portion in which there are eight tentacles. Of these the two tentacles adjacent the otocysts are larger than the remainder, and hang from the incisions between two marginal lappets. The remaining six tentacles are of smaller size, and are irregularly placed as regards the incisions between the marginal lobes. The tentacles have a brownish color above, and are white on the under side. The two marginal lobes adjacent the marginal sense bodies are larger and more prominent than the others. In the interval of bell margin between them there are five smaller lobes. Each lobe is leaf-shaped, pointed, and very flexible. In each lobe there ends blindly, without dendritic ramifications, a chymiferous vessel, which is a prolongation from a cavity, or system of vessels in the disk. There are four ovarian openings, each of which lies in a radius drawn from alternate marginal sense bodies. They resemble most closely similar openings in *Aurelia*. The ovaries themselves have a pink flesh-color. The ovarian filaments are well developed. The marginal sense bodies are highly characteristic. When looked at from the aboral side, in the region of the bell margin in which the otocyst lies, there is in its immediate vicinity a small pit or depression in the bell walls. This pit is identified as a "Riechgrübschen." It is commonly regarded in other medusæ as an organ of special sensation. The situation of this pit in *Dactylometra* is such that one cannot help being reminded that it may be simply the thinning out of the bell walls above the sense body in order to increase the sensitiveness of the otocyst below. The oral curtains, which are so prominent on each side of the otocyst of *Cyanea*, are wanting in *Dactylometra*. The two lappets found one on each side of the marginal sense body of *Aurelia* also fail. Two well-marked inner Riechgrübschen are found one on each side of the base of the style. The ocellus is inconspicuous or wanting. The otocysts do not differ from those of other Discophores, and are formed of a simple sac with enclosed otoliths. They have a whitish straw color, and are easily seen from the aboral side, showing through the bell walls at the bottom of the recess or pit called the outer Riechgrübschen.

HYDROIDA.

Calycidion formosum, Fewkes.

A further consideration of my former* identification of *Turritopsis nutricula*, McCrady, has convinced me that I was wrong in my determination of this medusa. The jelly-fish which was mistaken for *T. nutricula* resembles in some respects *Podocoryne*, and may perhaps be found to be a new genus and species, for which I suggest the name *Calycidion formosum*. The medusa which was referred in the same paper to *Modeeria* and described as *M. multitentacula*, sp. nov., is probably the same as *T. nutricula*, McCr. As the generic name *Modeeria* is older than *Turritopsis*, and as they seem to have been applied to similar jelly-fishes, McCrady's medusa may later be known as *M. nutricula*.

* Bull. Mus. Comp. Zoöl., VIII. 7.

New studies must be made to find out whether *M. multitentacula* and *M. nutricula* are the same species.

As my identification * of *T. nutricula* was wrong, my criticisms of McCrady's description of this medusa are unjust to him. The true affinities of the jelly-fish which Mr. Agassiz † and myself ‡ called *Turritopsis* are somewhat doubtful. The "pencil-like clusters of stalked thread-cells" upon the lips allies this medusa to that of *Podocoryne carnea*, Sars. In a figure ‡ of *P. carnea*, just escaped from the trophosome, there are eight tentacles, and no rows of lasso-cells extending from the tentacular bulbs to the apex of the bell. The oldest specimens of *C. formosum* have more than eight tentacles. It may, however, be simply a more developed planoblast of *P. carnea*, Sars.

Ectopleura ochracea, A. Ag.

Figs. 15, 16, 35, 36.

The bell of the medusa of *E. ochracea* is high, and has a pointed apex, where its walls are thicker than on the sides. There is no trace of a former tubular connection between the stomach cavity and the fixed hydroid through the apex. The outer surface of the bell walls is crossed by eight rows of lasso-cells, which arise in pairs from the tentacular bulbs and have a common junction at the apex of the bell. Near the bulbs the number of cells in each row is larger than towards the apex, where they become more scattered and smaller (?). The chymiferous tubes are four in number, narrow, and unbranched.

A manubrium hangs down in the bell cavity about two thirds its height. In normal specimens it is never protruded beyond the bell opening. It is divided into three regions, a basal, median, and terminal. The basal division, by which it arises from the bell walls, is more transparent than the others, and is colorless. It contains many large spherical cells. The remainder of the proboscis has a light rosy color, and is divided midway in its length by a slight constriction, which separates it into a median and a terminal region. Both of these portions are more opaque than the hyaline division with large cells already noticed. Near the region where the junction of the median division with the basal takes place there is a zone of ochraceous colored pigment. The constriction forming the division between the median and terminal divisions is marked by a zone of small dark brown pigment-dots. The lips are thickly pigmented with irregular patches of a yellow color. They bear also, according to Mr. Agassiz, small "bunches of lasso-cells."

* Bull. Mus. Comp. Zoöl., VIII. 7.

† *Op. cit.*, p. 167. Mr. Agassiz suspected that his medusa was not the same as *Turritopsis*, McCr., since he was unable to trace it to a medusa of the same form and color.

‡ Allman, *op. cit.*, Pl. XVI. figs. 3, 4.

There are four rosy flesh-colored tentacles, which are generally carried closely coiled about the tentacular bulbs. Their length, when extended, is greater than the height of the bell. In older specimens they are sometimes extended at full length when the medusa is in motion. At rest they are carried at right angles to the bell walls, or closely coiled about the tentacular bulbs. At intervals along their outer surface the tentacles bear bundles of lasso-cells regularly placed, equally distant from each other. The tentacular bulbs are darkened by orange-colored pigment scattered through their walls, and in many specimens a single black pigment spot (ocellus) is found on the under side. The figures of the fully grown medusa which I have described are from a more advanced stage than those given by Mr. Agassiz.*

The above description of this species differs in some respects from the original account which we have of this medusa. The arrangement of lasso-cells on the tentacles is similar to that in *Sarsia turricula*, McCr.† Although in McCrady's description of *S. turricula* the lines of lasso-cells found on the external bell walls of *E. ochracea* were not observed, in other particulars the two medusæ are so much alike that they probably belong to the same genus. The rows of lasso-cells were probably overlooked in *S. turricula*. The reference of *S. turricula*, McCr. to *Syndictyon*, A. Ag., made by Haeckel, has little to recommend it ‡ except the arrangement of lasso-cells on the tentacles. We now know that the same or a very similar regularity exists in *E. ochracea*, and one more reason for separating the two species *E. turricula*, A. Ag. and *E. ochracea*, A. Ag. vanishes. The want of meridional lines of lasso-cells on the outer bell walls of *E. turricula*, A. Ag. is the main feature by which *E. ochracea* and *Sarsia turricula* are known to differ.§

* North American Acalephæ, pp. 191, 192.

† Gymnophthalmata of Charleston Harbor. Proc. Eliot Soc. Nat. Hist., 1857. Mr. Agassiz says (*loc. cit.*): "This species (*ochracea*) 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." According to my observations they are arranged in regular bundles in *E. ochracea*.

‡ For reference of *S. turricula*, McCr. to *Syndictyon*, A. Ag., see Haeckel, *op. cit.* The validity of the genus *Syndictyon* is denied by Allman. (A Monograph of the Gymnoblastic or Tubularian Hydroids. Ray Soc., 1871, p. 284.)

§ *E. turricula* does not seem to be the young of *E. ochracea*, since in the young of the latter of the same age, as judged by the form of the bell, the lasso-cells of the tentacles are "irregularly arranged" according to Mr. Agassiz, while in *S. turricula*, McCr. they are thrown into bundles.

E. ochracea is closely related to *E. Dumortieri*, Van Beneden.

Phialium duodecimale, Haeckel.

Figs. 17-21.

The youngest larval stage of the medusa of *P. duodecimale* * found by us has two long tentacles, which are situated opposite each other on the bell rim. Each tentacle is accompanied by two tentacular spurs or filaments, which arise from the bell margin near the tentacular bulb. The rudiments of two intermediate tentacles are visible as simple projections on the bell margin. A description of this larva, which resembles closely the planoblast, *Lovenella*, is given below.

The bell is tall, almost spherical, with thin walls. Its outer surface is smooth. At the apex there is a remnant of the tube by which the medusa was attached in an earlier stage to its hydroid. It has four simple narrow chymiferous tubes, which are destitute of sexual organs.† Proboscis short, small, with closed mouth. There are four otocysts, each containing a single otolith, and alternating on the bell margin with the radial tubes.

The two larger tentacles are long, coiled in the distal two-thirds of their length, and accompanied by flexible "spurs" or filaments,‡ which arise near their bases.

A still older medusa of *P. duodecimale* differs from the former in having four well-developed tentacles, each of which is accompanied by a pair of lateral filaments. The bell of this larva has a more pointed apex, which has thicker walls than that of the preceding. Sexual glands, four in number, have made an appearance upon the radial tubes near their junction with the circular vessel. There are four otocysts, each alternating with a tentacle. The height of the bell, when expanded, is about two thirds its diameter. When the bell walls are contracted the height and diameter are about equal.

In a medusa more advanced in growth than the last two, additional otocysts

* Mr. Agassiz's suggestion (*op. cit.*), that his *Eucheilota duodecimalis* belongs to a different genus from McCrady's *E. ventricularis*, is supported not only by the difference in number of otocysts on the bell margin of the adult, but also by the character of the development of the two. Without adding any new facts to our knowledge of these two forms, Haeckel has already suggested the name *Phialium* for *E. duodecimalis*, A. Ag. The difference in the form of figs. 106, 107[a] (North American Acalephæ), upon which Haeckel relies, together with the inflated or shrunken condition of the ovaries, for his two species of *Phialium*, does not seem to me to warrant the separation. I therefore retain the specific name *duodecimale* for both.

† The sexual organs are well developed in Prof. Clarke's figure of the medusa of *L. gracilis*, Clarke. They are wanting in Hincks's drawing of *L. clausa*. (Clarke, Mem. Bost. Soc. Nat. Hist., Vol. III. No. IV. Hincks, Ann. Mag. Nat. Hist., VIII., 1871, p. 79, Pl. V. figs. 2-2[b].)

‡ I have not followed a medusa of this age in its development into the following stage. Both stages are common at the same time, and they appear to be the same. Absolute proof is as yet wanting.

have formed between each pair of tentacles, so that we have a stage in which there are four tentacles and twelve otocysts. Between each pair of tentacles there are three marginal sense bodies, instead of a single otocyst as in the larva last described. The beginnings of other tentacles alternating with the otocysts are visible on the bell rim as simple protuberances from the margin.

The adult is derived from the medusa last mentioned by a change in form of the bell and a growth of the protuberances which form in the last-mentioned larva the beginnings of the new tentacles. In the most developed stage which was taken, the medusa has assumed a form like that figured (107^a) by Mr. Agassiz. The color of the bell of this medusa is light green, and that of the ovaries is white.

The likeness between the youngest *Phialium* which is here described and the planoblast *Lovenella* * is so great, that there is no doubt that these two genera are identical. The Lovenella stage of *Phialium* is remarkable, according to Haeckel, in the exceptional number of otocysts, which are generally eight in the young of other Leptomedusæ. The existence of otocysts shows that it has no affinities with the Anthomedusæ, and it is extremely doubtful whether it has any relationship with the Trachymedusæ.†

Epenthesis folleata, McCrady.

Figs. 10-14.

Several specimens of *E. folleata*, McCr. were found at Newport about the end of August.

The differences between this medusa and that of *Oceania languida*, A. Ag. seem to me great enough for a generic separation.

The bell of the adult is low, disk-shaped, and about one sixteenth of an inch in diameter. Walls transparent, thin, with smooth outer surface. There are four narrow, unbranched chymiferous tubes. The sexual organs are small spherical bodies, which hang in the bell cavity from a position on the tubes midway between the base of the proboscis and the bell margin. The proboscis is small, and has a light green color. Its lips are four-lobed and hang down a short distance into the bell cavity. There are sixteen tentacles, which alternate on the bell rim with the same number of otocysts. Each otocyst regularly contains a single otolith. The tentacular bulbs have a red or crimson color. Two clusters of pigment are found in the tentacular bulb. The smallest occupies the position of the ocellus.

* In what I have identified as a young *Phialium* (Lovenella stage) the small tentacles (spurs) do not arise so near the lithocysts as in Hincks's figures (Ann. Mag. Nat. Hist., VIII., 1871, p. 79, Pl. V. figs. 2^a, 2^b). It however agrees with his drawing in being destitute of ovaries, which are found in the figure of *L. gracilis* given by Prof. Clarke (*op. cit.*).

† Haeckel, *op. cit.*

E. folleata has a habit of swimming with the bell reversed and the proboscis protruded, as shown in Figure 14. This posture is rarely assumed by *O. languida*.

Two larval stages in the growth of *Epenthesis* were observed. The youngest of these has a taller bell than the adult, and seven tentacles with as many otocysts. The disposition of the tentacles and otocysts is as follows. Of the seven tentacles six are well developed, while a seventh is a simple enlargement in the marginal border. In each of three quadrants there are two otocysts, and in a fourth there is a single body of this kind. It is to be noticed that the quadrant which contains the beginning of a new tentacle is situated diametrically opposite that in which no tentacle is found, and in which there is a single otocyst. In the same way the two quadrants which bear the fully developed tentacles are opposite each other. This inequality in the number of tentacles and otocysts leads us at first sight to suppose that this form is a monstrosity. There is, however, a certain regularity in the arrangement of the tentacles and otocysts. We are perhaps hardly justified in supposing that in a stage earlier than the present that quadrant which now bears a rudimentary tentacle separating two otocysts had but a single otocyst, and that in larvæ still younger we have a medusa with four tentacles and a single otocyst in each quadrant. In this way we may interpret the existence in the present form of a quadrant with a solitary otocyst.

An older stage * of the medusa than that with seven tentacles is one with eight tentacles, alternating with as many marginal sense bodies. From this stage the adult is formed by the interposition of a new tentacle between each pair already formed, after the formation of an additional otocyst, either by fission from the last, or by a new growth from the bell margin between each pair of tentacles.

Willia ornata, McCrady.

Figs. 22-24.

The youngest larva of *W. ornata* which was found is very different from the adult. It has a deeper bell and only four tentacles. The bell walls are thin, transparent, and have a smooth surface. There are four narrow, unbranched chymiferous tubes, each of which passes directly from the proboscis to the bell margin. Several specimens of about the same age were taken. In all, the remnant of a communication between the stomach cavity and the hydroid is still visible. There are four short, smooth tentacles,† which are sometimes carried tightly coiled about the base as in *Ectopleura*. They are also sometimes extended.

The structures which identify this larva as the young of *Willia* are four rows

* Both of these stages were fished up in the open sea, and not raised one from the other.

† According to Mr. Agassiz (*op. cit.*, p. 171), two of these tentacles are longer than the remaining pair. In my specimens their length was about equal.

of lasso-cells, each situated on the outer surface of the bell in a position slightly removed from the bell rim, and midway between the tentacles. Each cluster is connected with the bell margin by a small body which bears some likeness to one of the peroniæ of *Cunina*.

This larva is the youngest *Willia* yet figured.* It has been raised into an adult, and there is therefore no doubt of its relationship.

In a *Willia* observed by Dr. Brooks at Beaufort, N. C., there are stolons attached to the outer walls of the manubrium, and upon them are found budding medusæ in all stages of growth.

The accompanying figure † of *Willia* shows a stage in which there are only eight tentacles, and each of the four chymiferous tubes has a single bifurcation. If this budding *Willia* represents a stage in the development of *W. ornata*, it is intermediate between the youngest medusa described above and that which is figured as the youngest *Willia* by Mr. Agassiz. At present, I cannot say from the facts which are known whether it is a new species, a stage in the development of *W. ornata*, or a dimorphous form of the latter. The difference in the chymiferous tubes in it and in *W. ornata* of the same age is very great, as will be seen by contrasting Fig. 24 with those of the young *Willia* by Mr. Agassiz. It may be a new species, *W. gemmifera*.

II. Acalephæ collected by the U. S. Fish Commission during the Summer of 1880 and 1881.

The collection ‡ of medusæ here described was taken by the members of the Commission off the New England coast in the summers of 1880 and 1881. The finds of the latter year were the most valuable, so far as the collection sent to me is concerned.

The collection contains two Ctenophores, which should probably be referred to the genus *Beroë*. The species could not be determined.

Among the Siphonophora there is a magnificent new Physophore, *Haliphyta*, gen. nov., *Agalma elegans*, Fewkes, *Apolemia*, sp., *Diphyes*, sp., and *Gleba hippopus*, Forsk.

* A medusa doubtfully referred to *Cytæis* by Will (Horæ Tergestinæ, Pl. II. fig. 7) is possibly the same.

† The figure of a *Willia*, with attached stolons, was contributed by the courtesy of Dr. Brooks. Consult his notice, "Budding in Free Medusæ," Amer. Naturalist, Sept., 1880. See also Huxley, Anatomy of the Invertebrated Animals, p. 132. In the *Willia* mentioned by Huxley the stolons arise from the bifurcations of four radial tubes.

‡ An assorted collection from which Prof. Verrill had excluded many previously known medusæ collected by the commission at the same time. For an account of the explorations in the summer of 1881, see Prof. Verrill's paper, Am. Jour. Arts and Sci., XXII., Oct. 1881.

The only Discophores sent me are *Periphyllia hyacinthina*, Steen., and an unknown genus of the Pelagidæ. Three new hydroids represented by several specimens were found. The whole material upon which my observations were made is as follows.*

	Station.		No. Spec.
Ctenophora.			
Beroë, sp.	920		1
Discophora.			
Periphyllia hyacinthina, Steen.	936	Surface.	2
" " "	936		3
" " "	954		2
" " "	952		3
" " "	995		7
Fam. Pelagidæ. Genus could not be identified.	936		3
Siphonophora.			
Apolemia.	Off Block Island, 1880.	Surface, No. 6538.	1
Agalma elegans.	Gulf Stream.		
Gleba (*Hippopodius*) *hippopus.*	925		1
Haliphyta magnifica, gen. et sp. nov.	953		1
Diphyes.			
Hydroida.			
Trachynema digitale, A. Ag.	985	Trawl wing.	2
" " "	1026	"	3
Calycopsis typa, gen. et sp. nov.	924		3
" " " "	870		1
" " " "	952	Trawl wing.	1
" " " "	945		1
Chromatonema rubrum, gen. et sp. nov.	936		3
" " " "	954		2
" " " "	936		1
" " " "	936		1
Halicreas minimum, gen. et sp. nov.	1029		1
" " " "	954		1

DISCOPHORA.

Periphyllia hyacinthina, Steen.†

Many specimens of the young of this medusa were taken.

* For locations and depths corresponding to the stations, see Prof. Verrill's lists, *op. cit.*, XX. p. 391, and *loc. cit.*, pp. 292, 294.

† Peron designated two very different medusæ under the name *Carybdea periphylla.* One of these was undoubtedly the above mentioned, while the other was

SIPHONOPHORA.

PHYSOPHORIDÆ.

Apolemia, sp. (Provisional.)

A fragment of an *Apolemia** stem from which covering-scales and nectocalyces have been broken off was taken by the commission.

Agalma elegans, Fewkes.

A mutilated specimen of a Physophore which is identified as belonging to this species is found in the collection made in 1880. The locality given is "Gulf Stream, surface."

Haliphyta magnifica, gen. et sp. nov.

Figs. 39, 40.

The most interesting, and at the same time tantalizing find, was a magnificent new Physophore, which was destitute of both nectocalyces and tentacular knobs. These structures, so important in generic determinations of Siphonophores, had evidently been detached from the stem in the capture of the animal, and we must wait for future observations to determine their form. The structures, however, which remain, especially the covering-scales, polypites, and stem, show that the genus to which they belong is different from any which have yet been described.

The genera with which *Haliphyta* is liable to be confounded are *Stephanomia* M. E., *Halistemma*, Huxley, *Agalma*, Esch., and *Agalmopsis* (restricted sense). Although in the broken specimen before me the nectocalyces and tentacular knobs, the structure of which has generally been relied upon for generic differences, are gone, from what is left there can be no doubt that the animal to be described is a type of a new genus.

The polypites of *Stephanomia* differ from those of *Agalma*, *Agalmopsis*, and *Halistemma* in possessing long peduncles. *Haliphyta* seems to have the same long peduncles as *Stephanomia*. Unlike *Stephanomia* (*Forskalia*) the margin of the few covering-scales which remain in the bottle with our new genus and attached to its axis is not indented or notched. When placed in alcohol the

the same with or very similar to *Carybdea marsupialis* of later authors. Steenstrup's name *Periphylla* is followed to designate the first of these forms, since the generic name *Carybdea* is commonly given to the latter. (Cf. Haeckel, *loc. cit.*, I. 2, pp. 416 and 439.) The Discophore which I have identified as *Dodecabostrycha dubia*, Brandt, is probably the same. (Cf. Bull. Mus. Comp. Zoöl., VIII. 7.)

* The stem of this specimen is twisted in the same direction as that of alcoholic *Apolemia uvaria* brought from Naples. No identification of species could be made.

stem of *Stephanomia* is generally contracted into a closely coiled spiral. The alcoholic stem of *Haliphyta* is uncoiled.

A description * of what remains of the single specimen of *Haliphyta* is as follows. The parts remaining which could be identified were the float, stem (nectostem and polyp-stem), a few covering-scales, polypites, a broken tentacle, and clusters of sexual bells. Although no nectocalyces are found, their former existence is indicated by a well-marked nectostem and a cluster of immature swimming-bells (always the most adherent of these bodies) just below the float. Nectocalyces, with the exception of the cluster just mentioned, are more readily detached from the stem than any other structures, and they were probably broken from their connections with the axis at the time of capture.

The float is a small, pear-shaped, colorless body, slightly inclined to one side in its attachment to the stem. The nectostem is larger in diameter than that of any other genus, not excluding gigantic specimens of *Apolemia*. The contracted axis is about a quarter of an inch in diameter. It is not twisted in contraction. The nectostem has a smooth surface with the exception of one side, on which is placed a row of small tubercles, which I have considered former points of attachment of the absent nectocalyces.

The polyp-stem is a little more in diameter than the nectostem, and is jointed. Many detached joints from the distal end are found in the bottle, while several of the joints, although partially severed, hang adherent to the remainder of the axis.

The appendages to the polyp-stem all arise from one side of the stem, which by its contraction in spirit has thrown them in such confusion that their normal arrangement cannot be satisfactorily determined. The walls of the stem are very thick, and its terminal end opposite the float is not enlarged into a sac, as occurs in *Physophora*.

Several detached covering-scales are found in the bottle, and a few still hang from the stem. They have a spatulate outline, continuous margin, and resemble the bracts of *Agalma*. A small orange-colored tube † (somatocyst) passes through the middle of each covering-scale, and opening into the stem cavity.

The polypites are very large, and in alcohol are contracted into an almost globular shape. They have a bright vermilion color, which must have imparted to this Physophore, when alive, a very beautiful appearance. The polypites seem to have been mounted upon a long peduncle, which is also contracted into a spherical shape. Upon the basal part of the polypite we find two kinds of appendages arranged in clusters.

* A few sketches of this Physophore made by Mr. Emerton shortly after the specimen was placed in alcohol have been of assistance in my studies. I have also made use of a few of his notes as regards the color of the tastern and covering-scales.

† This tube was colorless when the specimen came into my hands. Mr. Emerton, who observed it shortly after the medusa was placed in spirit, has indicated its color as bright orange. The central tube of the bract of known species of *Agalma*, *Agalmopsis*, *Halistemma*, and *Stephanomia* is colorless.

The first cluster is composed of a bundle of simple filaments. They are probably undeveloped tentacular knobs. The second cluster has a botryoidal shape, and is composed of small spheres closely packed together. They are regarded as the female sexual bells. From the base of a single polypite hangs the stump of a large tentacle, which is destitute of appendages.

The tastern are very characteristic in *Haliphyta*. They are long, flask-shaped structures, and are mounted on a slender peduncle. There is no filament in the tastern of the specimen studied. Their color is bright orange.*

HIPPOPODIDÆ.

Gleba hippopus, Forsk.

Figs. 31-33.

This beautiful medusa, somewhat mutilated, was taken off Martha's Vineyard, Station 925. The nectocalyces are sufficiently well preserved to show that it is identical with the Mediterranean species which is so well known. †

In the cruise of the "Blake" in the summer of 1880, Mr. Agassiz collected a second specimen of this Siphonophore in the Gulf Stream.

DIPHYIDÆ.

Diphyes, sp.

A specimen of *Diphyes* too imperfect for specific determination is found in the collection.

HYDROIDA.

Calycopsis typa, gen. et sp. nov.

Fig. 34.

Several specimens of a medusa which closely resembles *Turris neglecta*, Haeck. were collected. The structure of this jelly-fish is so exceptional that it is given a new generic name. Bell high, without apical protuberance. Bell walls thin, with external surface smooth. The inner surface of the bell is crossed by sixteen radial tubes, each of which passes without bifurcation directly from the proboscis to the bell margin. These vessels are narrow, and in alcoholic specimens resemble white lines on the surface of the bell walls. Four of them arise from the point of union of the ovaries to the proboscis, while three are found intermediate between each pair. The size of all is uniform.

* Mr. Emerton's notes mark what is here identified as a taster as bright orange. Even in the alcoholic specimens which were studied there were traces of this color.

† A direct comparison between this and specimens of *G. hippopus* brought from Villa Franca show that they are the same.

From the termination of each radial tube on the bell margin hangs a long flexible tentacle, which is unbranched, and in alcoholic specimens appears to be enlarged at the distal end. There are sixteen tentacles in most specimens. Several had less, but none more than this number.

No otocysts were found on the bell rim.

The ovaries are four in number, and in all the specimens are very well developed. They cover the outer walls of the proboscis, and seem to fill almost the whole of the upper part of the bell cavity. Each gland consists of many small leaflets arranged in parallel rows side by side, and opening into a tube which is a continuation along the surface of the proboscis of one of four radial vessels. By the method of attachment of the ovaries to the proboscis and the inner walls of the bell, the upper part of the bell cavity is separated into four recesses, which are divided from each other by partitions. These recesses are bounded above by the apex of the bell, on one side by the bell walls, and on the other sides by the partitions mentioned above and the walls of the proboscis. Upon the lower edge of the partitions which separate the recesses pass the chymiferous tubes, from the ovaries to the inner surface of the bell.

The lips about the mouth are so poorly preserved that their structure could not be satisfactorily made out. The color of the ovaries in alcohol is dark brown ; the bell walls and tentacles are white, with a tinge of bluish color.

The relationship of this medusa to forms like *Turris* is very great, so far as the general character and place of attachment of the ovaries is concerned. The existence in *Calycopsis* of sixteen radial tubes instead of four, is a feature which it shares with none of the Anthomedusæ. On the other hand, my failure to find otocysts on the bell rim seems to support the reference of it to Tubularian-like jelly-fishes. The otocysts could not be found after a persistent search, and are probably wanting. If sense bodies of this kind are present in *Calycopsis*, the place of attachment of its ovaries has such a strong likeness to those of *Turris* that the medusa would combine extraordinary features and be a most abnormal form, the number of radial tubes is so great.

Chromatonema rubrum, gen. et sp. nov.

Fig. 40.

Several specimens of a large hydroid medusa in a distorted condition, and apparently allied to *Staurophora* in the position of the sexual organs, were found.

The form of the bell is shown in the figures. There are four red-colored chymiferous tubes, near the origin of which from the proboscis are situated the ovaries. The sexual glands are confined to the upper part of the bell, hanging from the chymiferous tubes for about one third their course. Their color is bright red. No otocysts were found. The number of tentacles varies from twelve to sixteen. In alcohol their color is red. The affinities of this medusa are somewhat difficult to make out, and it is provisionally named *C. rubrum* until future observations can complete this imperfect sketch.

Halicreas minimum, gen. et sp. nov.

Two specimens * of a new and highly interesting jelly-fish closely related to the Narcomedusæ were found by the members of the Commission.

Halicreas, gen. nov.

The genus *Halicreas* differs from other medusæ in possessing eight prominent rounded projections covered with tubercles on the bell margin at the extremity of eight radially arranged ribs passing from centre to circumference of the bell. No proboscis. No tentacles. It has eight sausage-shaped ovaries hanging into the bell cavity from its upper surface.

H. minimum, sp. nov.

The bell of the alcoholic specimen is flat, disk-shaped, translucent, white. In its walls are eight radial stripes, which were at first mistaken for radial tubes. They are, however, simple thickenings of the bell walls, and in general character are not unlike the radial stripes of *Cassiopea*. No opening was traced from them into the stomach, and they seemed to be solid throughout. Each of these radial stripes terminates on the bell margin near a prominence which is very marked in both specimens. This protuberance bears many small rounded papillæ. No remnant of tentacles was observed hanging from these tubercles or from the papillæ. Tentacles are also absent on the bell margin between the prominences. The margin of the bell between two marginal prominences is smooth and destitute of otocysts. A narrow "velum" (?), which probably forms the sides and lower floor of a stomach, hangs down in both specimens from the bell rim.† In the specimen preserved in chromic acid this structure is very much convoluted on account of the contracted condition of the bell walls. No otocysts were observed on its lower rim. Chymiferous tubes are wanting in the bell walls of both specimens. No circumferential vessel. There is no proboscis, and the stomach seems to resemble that of *Cunina discoides*. Its upper wall is the wall of the bell, and its floor the surface of the "velum."

Eight ovaries hang into this gastral cavity. They are sausage-shaped, and arise near the centre of the disk in the intervals between the radial stripes

* One of these had the disk expanded, and was preserved in spirit. The other was contracted, globular, and less translucent. It resembles a jelly-fish preserved in chromic acid. The second specimen had eight ovaries hanging down in the bell cavity. These organs were wanting in the former specimens, but the scars where they formerly were attached still existed.

† Circumference of the disk connecting the prominences.

mentioned above. In them individual eggs can be easily distinguished in the chromic acid specimen. The diameter of the larger specimen is about three fourths of an inch.

The combination of structures which could be made out with any certainty in these two specimens of *Halicreas* certainly stamp it as a most peculiar jelly-fish. Little stress, however, can be placed on the failure to find certain essential organs, as the tentacles, otocysts, and the like. Tentacles may have existed and have been broken off in the capture of the medusa, leaving the bases as stumps. Such a condition almost invariably results in alcoholic Trachymedusæ. If I am not wrong in my interpretation of the systematic position of *Halicreas*, the otocysts, if any exist, should be searched for on the inner or lower rim of that body which has been called the velum. In both the specimens before me that structure is so contorted that, even if sense organs existed, they could not be found or counted. There are certainly no marginal sense bodies on the interval between each marginal tubercle.

The knowledge which we have of the structure of this medusa is so fragmentary that it is at present impossible to determine its affinities. It seems to me most closely allied to the Narcomedusæ, Haeckel, but differs from them all in the eight radial stripes in the bell and the eight marginal tubercles. On the other hand, there are no marginal lappets as in Discophora, and the "velum" indicates a true hydroid medusa. The prominent marginal tubercles at their extremities are wanting in all other medusæ with which I am acquainted. The genus is the type of a new family related to the Discophora more intimately than are the Narcomedusæ, among which it will probably be placed.

EXPLANATION OF THE PLATE.

LETTERS.

A. *a.* Auricles.
a t. Auricular vessels.
B. *b o.* Bell opening.
b w. Central part of the nectocalyx.
C. *c.* Bifurcation of tubes from the funnel.
ca. Cavity.
c c. Primary divisions of *c.*
c l. Connection between the otocyst and the rows of combs.
c i. Wings of bell.
c t. Termination of the chymiferous tubes in marginal lappets.
D. *d.* Tentacular cavity (basal).
E. *e e.* Clusters of lasso-cells.
F. *f.* Funnel.
G. *g.* Remnant of former tubular connection with hydroid or medusa.
g m. Lasso-cells.
H. *h.* Lasso-cells.
h d. Hood.
I. *i.* Chymiferous tubes.
i r. Inner recesses (Riechgrübschen).
J. *j.* Peduncle.
K. *k.* Budding stolon.
L. *l.* Lateral tubes.
l m. Muscular layer on under floor (color white).
l d. Gelatinous tissue.
l l. Bifurcation of lateral tubes.
l t. Lobular vessels.
M. *m.* Mouth.
m f. Muscular fibres.
m l. Marginal lappets.
m p. Pigment.
O. *oc.* Ocellus.
o l. Oral lappets.
ov. Ovaries.
o i. Enlargement of a chymiferous tube.
ot. Otocyst.
otc. Cavity between the marginal lobes into which the marginal sense body projects.

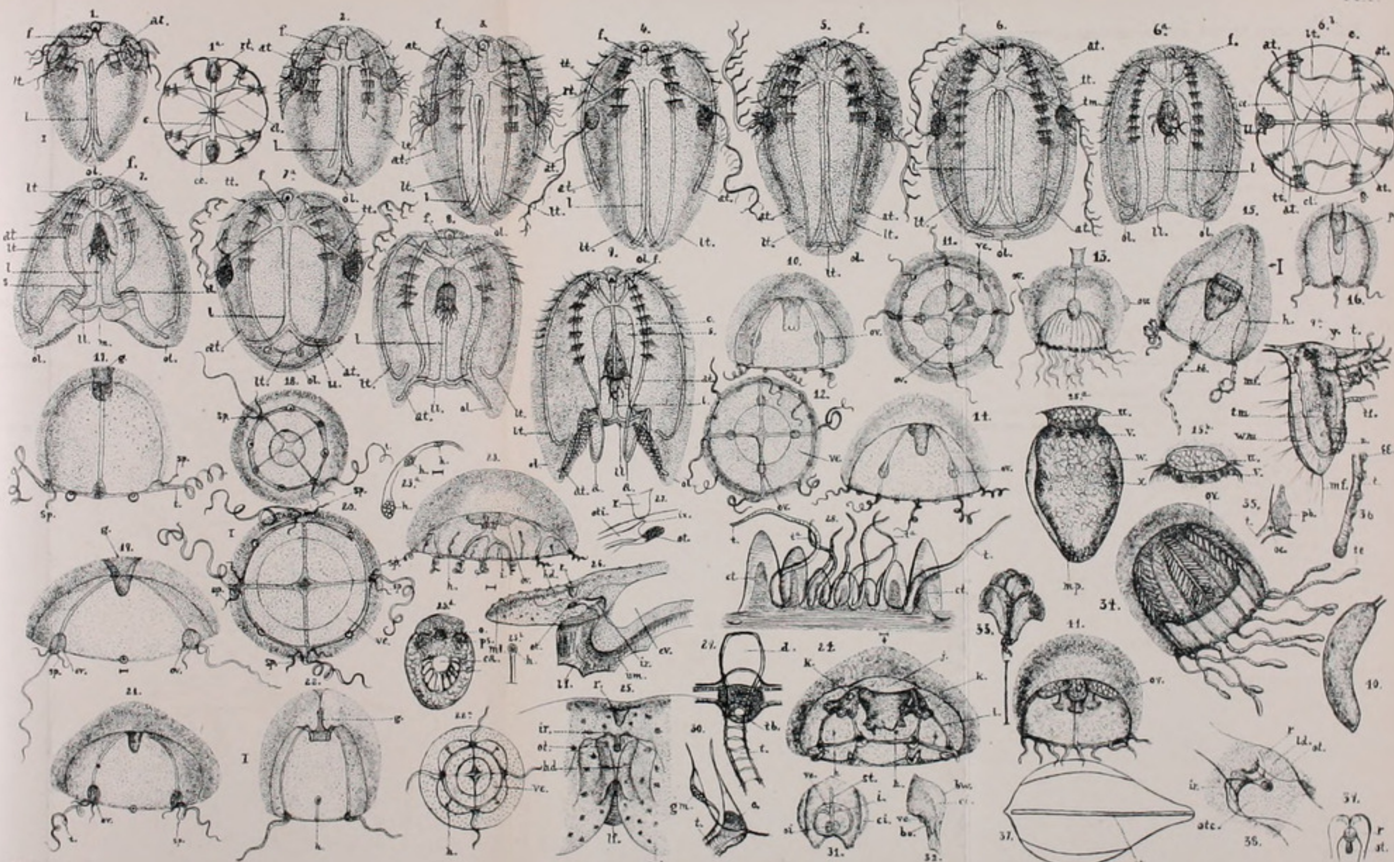
oti. Chymiferous tube passing to the otocyst.
P. *p.* Proboscis.
p b. Mass of pigment.
p s. Pigment spots.
R. *r.* Outer pit (Riechgrübschen).
r t. Tentacular base.
S. *s.* Stomach.
sp. "Spurs" (small filaments or tentacles).
st. Somatocyst.
T. *t.* Tentacle.
t^a. Small intermediate tentacles.
tf. Tentacular appendages.
t m. Basal portion of the tentacle into which it is absorbed.
t e. Distal enlargement of the tentacle.
t t. Tentacular tubes.
U. *u.* Basal portion of proboscis.
u m. Gelatinous part of the lower floor (color pink).
V. *v.* Pigment in median portion.
ve. Velum.
W. *w.* Constriction which separates median and distal portions.
w m. Long cells (?).
X. *x.* Pigment dots near constriction.
Y. *y.* Scattered pigment.
Z. *z.* Half-absorbed tentacular appendage.

FIGURES.

1–9. Larval stages illustrative of the development of the chymiferous tubes of *Mnemiopsis Leidyi*, A. Ag.
1. Youngest larva just escaped from the shell (egg sac). The view is taken in a plane passing through the tentacles and the otocyst.
1 *a.* A larval *Mnemiopsis* seen from the actinal pole.
2–4. Stages in growth illustrating the elongation of the chymiferous vessels previous to their union.
5. Young *Mnemiopsis* in which the lobular tubes (*l t*) have united.
6. The same, still older than the last.
6 *a.* View of fig. 6 in a plane at right angles.
7. A stage more advanced than the last, in which the auricles have begun to form.
7 *a.* View of fig. 7 at right angles to the plane of the last.
8. A larva in which the lateral and auricular tubes have united.
9. Young *Mnemiopsis* with well-developed auricles and oral lobes.
9 *a.* Base of the tentacle of young *Mnemiopsis*.
10–14. Larval stages of *Epenthesis folleata*, McCr.
10. Side view of the young, with six tentacles and beginnings of a seventh.
11. The same (oral view).
12. Young *E. folleata* with eight tentacles (oral view).

13. *E. folleata* with bell reversed.
14. Side view of the young *Epenthesis* with eight tentacles.
15. Adult *Ectopleura ochracea*, A. Ag.
15 *a*. Magnified proboscis of the same.
15 *b*. Magnified basal part of the proboscis when retracted.
16. Youngest larva observed of *E. ochracea.*
17. Youngest medusa of *Phialium duodecimale*, Haeck.
18. The same (oral view).
19. An older stage of *P. duodecimale* (bell expanded).
20. The same (oral view).
21. The same (bell contracted).
22. Youngest larva of *Willia ornata*, McCr.
22 *a*. The same (oral view).
23. Older larva of *W. ornata.*
23 *a*. A row of three clusters of lasso-cells found on the external walls of *W. ornata.*
23 *b*. A single cluster of lasso-cells from the external wall of the youngest *Willia* (fig. 22).
23 *d*. Tentacular bulb of *W. ornata* (optical section).
24. *Willia*, sp., with budding stola.
25. Marginal sense body of *Dactylometra quinquecirra*, A. Ag. (The marginal lobes are infolded.)
26. The same (side view with marginal lobes extended).
27. The relative position of the outer pit and the otocyst of the same.
28. Portion of the bell margin of *D. quinquecirra* between two marginal sense bodies.
29. Tentacular bulb of *Eucope.*
30. Tentacular bulb of *Gemmaria gemmosa*, McCr.
31. Nectocalyx of *Gleba hippopus*, Forsk.
32. The same (side view).
33. *G. hippopus* with retracted stem.
34. *Calycopsis typa*, gen. et sp. nov.
35. Tentacular bulb of *Ectopleura ochracea.*
36. Portion (terminal) of the tentacle of the last.
37. Covering scale of *Haliphyta magnifica*, gen. et sp. nov.
38. Inner pits, "Riechgrübschen," of the marginal sense body of *D. quinquecirra.*
39. The inner pits from above.
40. Taster of *Haliphyta magnifica.*
41. *Chromatonema rubrum*, gen. et sp. nov.

Cambridge, April 1, 1882.



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