

facing the odd tentacle, the large pair of tentacles round the mouth is quite prominent in this figure.

Fig. 5. Figure 3 seen from the broad side to show the mode of arrangement of the tentacles of the two sets of tentacles, the odd tentacle is on the left of the figure, the last formed pair on the right.

ART. XII.—*Prodromus of the History, Structure, and Physiology of the order Lucernariæ.* BY Prof. HENRY JAMES-CLARK, of *Harvard University, Cambridge, Mass.*

[Communicated January 7th, 1863.]

In the month of September, 1862, I discovered upon our coast a Lucernarian, *Halimocyathus platypus*, H. J. C., which differed in such a remarkable degree from the most commonly known form, *Haliclystus auricula*, H. J. C., that I deemed it to belong to a different family from the latter; but in order that there might be no lack of correlative confirmation, I obtained, by the help of friends, sufficient materials to warrant me in making a complete revision of the whole order. This I now present in the form of a prodromus, rather than an elaborate treatise, simply because I desire at the earliest possible time to incite naturalists to a closer investigation of the habits, structure, and relations of this remarkable order, and moreover that by their labors I may profit whilst working out the memoir which I have had in preparation for many months.

LUCERNARIÆ.* H. James-Clark.

An order of pedicellated Acalephæ.

The disc more or less octagonal or circular, and varying

* See my paper entitled "Lucernaria the Cœnotype of Acalephæ." Proceed-

from umbellæform to infundibuliform or urnæform; the aboral side at the centre extended into a monocamerous or tetracamerous pedicel, whose base constitutes the principal means of attachment and progression; the middle of the oral side extended into a cylindrical quadrate mouth, with plicate lips; the oral and aboral sides of the disc consist each of two walls, between which is included a gelatiniform layer of varying thickness, which in the aboral side, although compressible and resilient, is uncontractile, but in the oral side is contractile, and constitutes the *musculo-gelatiniform* layer, which is also continuous into the tentacles and marginal anchors, between their outer and inner walls, whilst the aboral gelatiniform layer is continuous into the pedicel between its outer and inner walls; the cavity of the disc divided into four quadrant cameræ by the junction of the oral and aboral sides along four equidistant lines, thus forming so many partitions which extend from the base of the four flanks of the quadrate mouth nearly to the intertentacular margin; the discal cameræ either simple (*Eleutherocarpidæ*), or each subdivided into two superposed spaces (*Cleistocarpidæ*) by a horizontal membrane or diaphragm, which extends from the base of each of the four angles of the mouth to the distal ends of the approximate halves of neighboring genitals; exteriorly the oral side of the disc is divided into four depressions, corresponding to the region about the four partitions, and four elevations alternating with the latter, and constituting the four buttress-like basilar extensions from the angles of the mouth: in the area of the four depressions are situated the four principal muscular layers; in the region of the four elevations are the four

ings Boston Soc. Nat. Hist., May 1862, p. 47, in which I have attempted to prove that the Lucernarians are a distinct order of Acalephæ. I take occasion here to correct a provoking error in the paper referred to: on the 53d page, line 8, *less* should be *more*.

weaker muscular layers; both of the above layers are immediately subjacent to the outer wall, and terminate, at the edge of the disc, in a marginal muscular band which, with varying degrees of breadth and thickness forms a complete ring passing outside the bases of the tentacles and anchors, and constitutes the terminus of the oral side of the disc: the tentacles are disposed in eight groups on the oral face just within the margin of the disc, and at eight points which alternate with the four partitions and the four corners of the mouth; in each group those of the outermost row are the oldest; they are hollow,* open into the general cavity of the body, cylindrical, slightly tapering, and terminate in a globular or spheroidal expansion which serves a tactile purpose or as an organ of prehension: † the intertentacular margin is either simple or at eight points, exactly opposite the four partitions and the four corners of the mouth, bears in youth a single tentacle, which with increasing age, by the development of adhesive vesicles in the outer wall, below the globose tip, becomes more or less modified in shape and proportions, according to the species, varying from pistilliform to broadly oval, fabæform or trumpet-shape, and serves as an organ of adherence and progression, of the same nature as the base of

* In Milne Edwards' description of the plates of Zoöphytes belonging to the third edition of Cuvier, Pl. 63, fig. 1, and in Edwards and Haimés' Hist. Nat. Coralliers, Vol. 3, p. 456, the tentacles are represented to have closed cavities, with an ampulla at the base, like the ambulacral tubes of Echinoderms; this I am convinced is a mistake, the ampullæ being merely the more or less thickened, lobulate projections between the bases of the tentacles, as I have fully proved for myself by examination not only of our common Lucernarian, *Halielystus auricula*, but also of the same species that Edwards had, viz.: *Calvadosia campanulata* (*Lucernaria campanulata* Lamx.)

† As I shall have occasion to speak of the radial and the transverse development of the groups of tentacles, I give here a brief description of their taxis and of the mode of its development. In a young *Halielystus auricula*, not quite $\frac{1}{10}$ of an inch in diameter, there are four tentacles in each tuft,— No. 1, the oldest and outermost; No. 2 the next oldest; No. 2a the next youngest; and No. 3 the youngest. In another bunch on the same individual there

1
2 2a
3

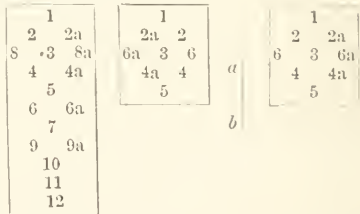
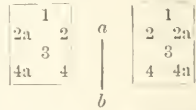
the pedicel: the motive power of the tentacles and the marginal anchors consists of a longitudinally fibrillated muscular layer situated just beneath their outer wall, and is directly continuous with the muscular layer in the oral side of the disc: in the pedicel the muscular system is either imbedded in the gelatiniform layer, or forms longitudinal ridges upon the inner face of it; in the former case it either consists of four longitudinal cords extending from the base of the pedicel, throughout its length, to the inner ends of the partitions, or it forms a continuous sheath subdividing the gelatiniform layer into two portions; in the latter case the four ridges* are purely muscular and like the imbedded cords extend from the base of the pedi-

are six tentacles, arranged as in the second diagram. No. 1 the oldest; and Nos. 2, 2a, 3, 4, 4a successively younger. Bunches on each side of any one partition develop in opposite spirals, as the third diagram illustrates; *a b* is the partition. In a specimen a little older than this, about $\frac{3}{8}$ of an inch in diameter, the tentacles are arranged as in the fourth diagram. No. 1, the oldest, and Nos. 2, 2a, 3, 4, 4a, 5, 6, 6a, successively younger, and as in the last case, in opposite spirals on each side of a partition. In this, the last, instance, it is clear that the radial

development, Nos. 1, 3, 5, is the same in rate as the transverse Nos. 6a, 2a, 1, 2, 6, so that the tuft is about as broad one way as the other. In a tuft of seventeen tentacles of *Halimocyathus platypus*, the succession is as in the fifth diagram; No. 1 the oldest, and Nos. 2, 2a, 3, 4, 4a, 5, 6, 6a, 7, 8, 8a, 9, 9a, 10, 11, 12, successively, the younger ones.

By this it is evident at a glance that the radial development, Nos. 1, 3, 5, 7, 10, 11, 12, is far in excess over the transverse Nos. 8, 2, 1, 2a, 8a. In *Carduella* the transverse development is far more rapid than the radial. Allman represents a young one with five or six tentacles in a group, and all in a transverse row. Sars figures a still older one having two transverse rows in each group, and four or five in each row.

* In this case the muscular pilasters of *Lucernaria quadricornis* are not to be confounded with the pilasters in the pedicel of *Calvadosia*, as in the latter they are totally devoid of muscle. — See the diagnosis and description of the latter further along.



cel to the partitions, where they become continuous with the muscular layer of the oral side of the disc: organs of generation diœcious; they occupy the same position in the male as in the female, and have the same general structure in both, which consists of saccules attached to the inner wall of the oral side of the disc, and arranged more or less closely together, so as to form variously shaped groups or bands; each individual has eight of these bands, every two of which constitute the halves of a single genital, and are either separate from each other, or united across the axial end of a partition, so as to form a U-shaped organ, the two limbs of which extend in a greater or less degree toward the groups of tentacles or the intertentacular margins; the convex edge of the U is bordered by one or more rows of ligulate, digitiform, or filamentary bodies, which extend from the inner or proximal end of the septal region, either one third, one half, or even along the whole length of the genitals; of each ligulate filament, at least in *Haliclystus auricula*, the side which faces toward the band which it borders, is covered, like the whole of the general cavity, with vibratile cilia, and on the opposite side there are no cilia, but a layer of closely set adhesive vesicles identical in structure with those on the anchors and in the base of the pedicle; lasso-cells are also numerous on the ciliated side, and all around the end of the filament.

FAMILIES OF THE ORDER LUCERNARIE. H. J. C.

1st. — Family. CLEISTOCARPIDÆ. H. James-Clark.

The neighboring halves of adjoining genitals approximate each other and unite at their distal ends opposite the corners of the quadrate mouth and extend to or toward the four intertentacular margins which alternate with the partitions; the approximate genital halves, from their axial

to the distal end, united by a transverse horizontal membrane, which divides each of the four quadrant cameræ of the disc into two superposed spaces, the oral one of which forms a *cul de sac*, or claustrum* opening at the axial end, and includes the genitalia. *Halimocyathus*, *Craterolophus*, *Manania*, *Carduella*, *Depastrum*.

2d. — Family. ELEUTHEROCARPIDÆ. H. James-Clark.

Each genital half, projecting freely† into the discal cameræ, extends in a direct line from the inner or axial end of a partition to or toward the end of an arm; the four quadrant cameræ of the disc simple. *Lucernaria*, *Calvadosia*, *Haliclystus*.

Family. CLEISTOCARPIDÆ. H. J. C.

HALIMOCYATHUS.‡ H. James-Clark.

Disc infundibuliform, octohedral; arms produced: pedicel tetracamerous: tentacles in groups at the end of the arms, outer row pistilliform like the marginal anchors, radial development of the group greater than the transverse: marginal anchors pistilliform: genital halves transversely folded bands, united at their proximal ends across the end of the intervening partition, their distal ends reach nearly to the marginal anchors; the digitate bodies do not extend across the proximal end of the partitions: muscles of the pedicel four filaments alternate with the four cameræ: principal muscles of the disc eight ligulate bands, arising from the proximate ends of the partitions, extend

* Hence the name of the family Κλείω, to confine; καρπός fruit.

† Ἐλεύθερος, free.

‡ ἄλιμος, marine; κύαθος, cup.

to the end of each arm : marginal muscle broad and thin, forming a sort of velum which projects beyond the margin of the aboral side ; at the end of the arms it merges into the ligulate muscles of the oral side of the disc : gelatiniform layer of the aboral side, and the pedicel, conspicuous.

HALIMOCYATHUS PLATYPUS. II. James-Clark.

The disc or bell deeply infundibuliform ; the arms nearly twice as long as broad, and one third as long as the height of the disc from the pedicel to the margin ; the marginal sinuses no broader than the arms : the pedicel short, half as high as the disc ; at the narrowest part, where it joins the body, its diameter is nearly one half its length, and from there it gradually broadens into a very large base, which has a width equal to the length of the pedicel ; round, or very slightly furrowed at four points opposite the muscles ; in the middle of the base a small round opening leading to a cylindrical cavity, lined by the outer wall, which projects into the gelatiniform axis considerably beyond the horizon at which the pedicel-cameræ terminate ; the four cameræ very large, closely approximated to each other and to the axis, so that they have very narrow strips of gelatiniform substance between each other, or between them and the axis ; transversely quadrant ; altogether they occupy the axial two thirds of the pedicel, and as the latter broadens toward its base the cameræ broaden also, so as to retain their proportionate size throughout ; they open widely into the cavity of the bell, neither at the base nor at any point have they any intercommunication : tentacles thick, about as long as the greatest breadth of the arms, seventeen to twenty in each tuft, the radial diameter of the tuft much greater than the transverse ; in a bunch containing seventeen there are seven tentacles in the middle radial row, four in each row on either side of the latter, and one in each outermost row, the last close to the distal side of the

tuft; the three in the distal transverse row pistilliform, *i. e.*, the distal side of the three tentacles is considerably thickened by the development of a layer of adhesive vesicles, but not to such an extent as to disguise their tentacular nature, united at their bases for one quarter of their length, as if a triple organ; the length of the largest tentacles is to their thickness as eight is to one, the length of the pistilliform ones is to their thickness as five is to one; the terminal knob globose, slightly depressed at the end, as broad as the base of the tentacle: marginal anchors reverted, very small, one third as long as the pistilliform tentacles, but proportionately thicker, their length being a little less than three times their radial diameter, *i. e.*, from the distal to the proximal side, and a little less than twice their lateral diameter; the layer of adhesive vesicles nearly of uniform thickness from the knob to the base where it rather abruptly thins out; in the pistilliform tentacles this layer is thickest midway between the base and the knob, and gradually thins out each way; in both anchor and pistilliform tentacles it occupies the distal two thirds of the circumference; the knob of the anchor is proportionately much smaller than that of the tentacles: genitals transversely fifteen to seventeen times folded, ligulate bands, which extend from their point of union, at the proximate end of the partitions, to the inner edge of the marginal muscle, the folds or lobes gradually enlarging toward the distal end; each of these lobes constitutes a single genital saccule; the digitiform bodies, in a single row, very far apart, extend from near the proximal end of each band a little more than half its length: the horizontal membrane which forms the claustrum in which the genital bands are confined is excessively thin and very extensible: pedicel muscles four very thin cords, not easily detected on account of their transparency, imbedded in the gelatiniform mass, between the distal corners of the camerae:

principal muscles of the disc broadly ligulate, gradually widening from their proximal ends to the termination of the arms where they are as broad as the tentacular tufts: marginal muscle very broad and very thin, doubled longitudinally, and, projecting considerably beyond the margin of the aboral side, completely hides from direct view the marginal anchors when the animal is looked at from the oral side; it suddenly thins out to a mere film at the bases of the tentacles: gelatiniform layer of the aboral side quite thick and uniform from the junction with the pedicel to the margin where it abruptly terminates; from its inner to its outer surface equal to the basal diameter of the largest tentacles; in the pedicel exterior to the cameræ it is one quarter thicker than in the bell, but no thicker than the latter in the base; between the four apertures of the pedicel cameræ, it projects considerably in the form of a boss, from which a thick ridge extends to the proximal end of each partition; the fibroid bodies arranged very much like those in *Haliclystus auricula*: lasso-cell groups or pockets scattered here and there over the oral side. Size; bell one quarter of an inch in diameter, and three eighths of an inch high including the pedicel. Geographical distribution; a single specimen was found in September, 1862, at Chelsea Beach, Mass., along with *Haliclystus auricula*, attached to *Zostera marina*, at half tide.

CRATEROLOPHUS.* H. James-Clark.†

Disc octohedral, campanuliform; arms produced; pedicel monocamerous, the camera possessed of ridges which form

* Κρατήρ, a cup; λόφος, a tuft.

† A species of *Lucernaria* from Heligoland described by Mettenheimer. Ueber den Bau und das leben einiger wirbel. Thiere, &c. Abhandl. Senkenberg. Naturf. Gesell. Frankfurt, 1854, p. 15, plate I. fig. 5-11, is generically unlike any other, except, perhaps, the *Lucernaria convolvulus*, Johnston, and therefore for the sake of uniformity, I am obliged to characterize a genus, without having seen the animal, and from the written description of Mettenheimer.

a cruciate figure at its base; tentacles in groups at the end of the arms; anchors none; genitals tubiform with blind-sacklike divisions; pedicel muscles correspond to the four ridges in the camera.

CRATEROLOPHUS TETHYS. H. James-Clark.

"*Lucernaria*. (n. sp. ?)" Mettenheimer loc. cit. ut sup. Disc deeply campanuliform, tapering into a long pedicel; the arms very prominent, equidistant; the marginal intervals or sinuses round: pedicel thick, more than one half as long as the bell, the base large and broad: tentacles slender: genitals extend from the pedicel to the margin of the bell, the approximated halves very close to each other: the margin of the bell is beset by a row of lasso-cell groups or pockets, which extend also in a double row from each of the four corners of the mouth to the marginal sinuses. Size, $1\frac{1}{2}$ inches long including the pedicel. Geographical distribution: Heligoland Is.; North Sea. Mettenheimer. Collected in August.

? CRATEROLOPHUS CONVOLVULUS. H. James-Clark.

- Lucernaria convolvulus* Johnston Mag. Nat. Hist. January, 1835, p. 59, fig. 3.
 " " Dujardin in Lamk. An. sans Vert. 2d ed. 1840, tom. 3, p. 59.
L. campanulata Johnst. Brit. Zoöph. 1838, p. 231, fig. 37, (excl. synonym. Lamx.)
 " " " " " 1847, 2d ed. p. 248, (excl. synonym. partim.)
 " " Greene Nat. Hist. Review; Proc. Soc. 1858, p. 132.

Judging from Johnston's figures, as well as his description, in the first citation,* the most ostensible difference be-

* My determination of the character of this species is based purely upon Johnston's original description, published in 1835, in the Mag. Nat. Hist. In the

tween this species and the last, is that this has an exceedingly short pedicel, consisting merely of a very broad disciform base which is attached to the bell by a deep constriction; the tentacles are also said to be short, but this is rather a vague term, especially as the figures represent them as long as in some other species of *Lucernariæ* in which they can only be called long. The color is so variable among these animals that it cannot be used as a mark of distinction. Size, about an inch in height. Geographical distribution: Berwick Bay, east coast of Scotland, Johnston; Tor Bay, south coast of England. May, 1833, Coldstream.

MANANIA.* H. James-Clark.

Disc urnæform, octohedral; the arms produced: pedicel monocamerous; the camera simple: tentacles in groups at the end of the arms, but a little within the muscular margin of the bell; outer or distal row pistilliform; the radial diameter of the groups greater than the transverse: marginal anchors pistilliform, situated just within the muscular margin: genitals transversely folded, terminating at a greater or less distance from the margin of the bell; the digitiform bodies accompany the united bands across the proximal end of the partitions: muscles of the pedicel four, equidistant, imbedded in the gelatiniform layer: principal muscles of the disc ligulate; from each side of the proximal end of a partition one extends in a direct line to

British Zoöphytes the description is modified so as to correspond with the *L. campanulata*, Lamx, with which he mistakenly identifies the originals. Curiously enough too, *L. campanulata*, Lamx, belongs not only to a different genus, but also to a different family from the *L. convolvulus*.

* As in the case of *Calvadosia* and *Haliclystus salpinx*, I am indebted to Mr. Stimpson for specimens of this genus, which he collected near the island of Grand Manan, off Eastport, Maine. Unfortunately he made no written notes upon it while it was in a living state, but he tells me that he identified it at the time with the *Lucernaria auricula*, Fabricius, as described by that author in his *Fauna Grönlandica*; and this is the same conclusion I have come to independently.

the end of the nearest arm: marginal muscle ligulate, powerful, forming a ring of uniform breadth and thickness, uninterruptedly, all around the margin of the bell, just outside the anchors and the tufts of tentacles: gelatiniform layer variable in thickness in the bell, uniform in the pedicel.

MANANIA AURICULA. H. James-Clark.

- Lucernaria auricula* Fabr., Fauna Grönland, 1780, p. 341.
 “ “ Gmelin, Linn. Syst. Nat. 13th ed. 1788, p. 3151.
 “ “ Steenstrup, Videnskbs. Meddl. Nat. Hist. For. Kjöbnh. 1859, p. 108, (exclus. synonym. Sars.)
 “ “ Sars, Skandinav. naturforsch. möde i Kjöbenhavn, 1860, p. 693.
 “ “ “ Aftryk af Videnskab. Forhand. i Christiana, 1860, p. 6.*
 “ “ Leuck. Bericht Wieg. Archiv, 1861, 2d bd. p. 331.
 “ “ = *L. typica* Greene, Leuck. Wieg. Archiv, 1860, p. 205.
 “ “ Keferstein, Siebold und Kölliker, Zeitsch. June, 1862, (exclus. synonym. Sars Bidrag.)
L. typica Greene, Nat. Hist. Rev. Proc. Soc. 1858, p. 132.
L. sp. Sars, in note under *L. auricula*, J. Rathke, (non Fabr.) Reise i Lofoten. Nyt. Mag. 1860, p. 144.
Holothuria lagenam referens, &c. Müll. Prod. Zoöl. Dan. 1776, No. 2812.

* I quote this synonym here notwithstanding the apparent disagreement in Sars' diagnosis "organa generationis octo æquidistantia" which is intended doubtless merely as the opposite to the "radiis binis approximatis; organa generationis octo per paria approximata" of *L. quadricornis*.

The urn much deeper than broad, passes into the pedicel abruptly from a rounded base; the arms about as broad as long, recurved: pedicel much longer than the urn, slender, gradually tapering to the end, where it suddenly expands into a moderate disciform base; the camera four sided, it occupies the middle half of the diameter of the pedicel, opens broadly into the cavity of the disc, and gradually tapers, in the same proportion as the pedicel, until at the base it abruptly expands with the latter: tentacles thirty-six, (60 et ultra, Fabr.)* in each group, the taxis and the rate of radial and transverse development the same as in *Halimocyathus platypus*; the globose knob distinct from the moderately slender shaft; the thickening of the pistilliform tentacles near the base of the shaft, on the distal third of the circumference: the marginal anchors have the same form as the pistilliform tentacles, but they are a little smaller than the latter: genital bands † twelve or fourteen times transversely folded, broadly ligulate, gradually narrowed at the proximal end to one half the breadth of the distal and middle portion; the digitiform bodies in a single row extend across the proximal junction of the bands and along three quarters of their length; the membrane of the genital claustrum, thin but not filmy: the muscles of the pedicel close to the inner wall, trans-

* Fabricius' specimens, at least some of them, were larger than those to which I have access, but I have drawn up the description from the latter, and added one or two sentences from Fabricius in such cases as when his diagnosis differs from mine. [Since writing the above I have examined Greenland specimens, as large as Fabricius', which Mr. Stimpson received from Steenstrup, and I find them identical with the Grand Maan ones in every particular.]

† Rathke and those who have followed him in identifying this Lucernarian with his *Lucernaria auricula*, have overlooked the statement of Fabricius in regard to the genitals, (intestines he calls them,) which is, "De ventriculo in singulum par tuberculorum prodit intestinum nigrum 2--plicatum spirale, versus tubercula integrum, versus collum vero aperturis 2 terminatum," a feature which distinguishes this family from that to which Rathke's *L. auricula* belongs, in which the diagnosis should be, in singulum tuberculum prodit intestinum simplex. using the same terms as Fabricius.

versely semicircular, thin, minutely longitudinally folded, the concave side of each one facing one of the flanks of the quadrate camera; the edge of each limb of the semicircle two or three times deeply folded lengthwise; the breadth of each muscle rests against the middle of each flank of the camera; just above the base of the pedicel each muscle is nearly as broad as the corresponding flank of the camera, but at the base the muscle expands very little, whilst the camera suddenly widens to a far greater extent; and in the opposite direction, toward the urn, the muscle retaining the same breadth, the camera gradually broadens, until each flank is at least three times as broad as the muscle; and finally, when the muscle rather suddenly narrows, by one half, just before it enters the proximal end of a partition, the disproportion is still greater; radially the muscles occupy about one half the thickness of the gelatiniform layer: the principal muscles of the oral side of the urn narrow-ligulate, thin; each one extends to the base of a tentacular tuft, a little to one side of the middle line of an arm, and next the marginal sinus opposite a corner of the mouth; the marginal muscle very wide, nearly as broad as the radial diameter of a group of tentacles; it is imbedded in the middle of a considerable thickening of the musculo-gelatiniform layer, and is quite thick itself, but thins out on each edge, one of which borders close on the distal base of the pistilliform tentacles and the anchors, whilst the other terminates with the musculo-gelatiniform layer close to the edge of the aboral side: gelatiniform layer almost imperceptible in the aboral side, except at a short distance from its junction with the pedicel, where it gradually thickens and merges into that of the latter; in the pedicel it is very thick, being in this respect about twice the basal diameter of the largest tentacles; in the base of the pedicel it grows thinner, and at the under side of the disc it is less than one quarter of its greatest

thickness; the fibroid bodies diverge from the corners of the camera directly to the outer surface of the layer; some go to the nearest point in the surface, and others extend to the extreme distance opposite to, and even beyond the middle of a muscle, so that those from two adjoining corners cross each other between the muscle and the surface of the layer, but none of the fibroid bodies go from the muscles to the surface; on the concave side of the muscles the fibroids diverge at all points of the flank of the camera and, crossing each other at all angles, terminate against the proximal face of the muscles: depressions or pockets containing lasso-cells frequent upon the oral side, especially about the base of the arms. Size, three quarters of an inch high, including the pedicel. Geographical distribution: Greenland, Fabricius, Steenstrup, Sars; Lof-foden Is., Norway, Sars, in summer of 1849; Eastport Harbor, Maine, Stimpson, August.

CARDUELLA.* Allman, (1859,) 1860. (Emendat. H. J. C.)

Disc urnæform, perfectly circular; arms none; pedicel tetracamerous; tentacles placed in eight distinct equidis-

* By exchange, for our common Lucernarian, *Haliclystus auricula*, H. J. C., I have obtained from Professor Allman a couple of specimens of this remarkable genus. Fortunately the specimens are much older than the ones from which he drew up his description, and more in accordance with Sars' representations, and the specimens which he has lately sent to me. It would seem that Allman was unaware that Sars says that the tentacles are in three rows. "Diese bilden in jedem Büschel etwa 3 unregelmässige Reihen; bei jungen Individuen, die auch eine geringere Anzahl Tentakeln haben, nur 2 Reihen;" probably he based his identification upon the Latin diagnosis as copied in Johnston's *Zöophytes*, 1847, p. 475, although even there the "tentaculis sæpissime in fasciculis fere continuis ad marginem corporis dispositis;" would hardly warrant him in identifying it with his diagnosis, which says "tentacles capitate, *not tufted*, springing from within the margin of a circular disc *in a single series*." The italics in both quotations are my own. Really Gosse's *Depastrum*, as he has described it, is more nearly related to Sars' *L. cyathiformis* than is Allman's *Carduella*, as the diagnosis now stands; and I myself am very much inclined to believe that *Depastrum* is an adult *L. cyathiformis*, whilst I have no doubt that *Carduella*, as it now is understood in books, is the young of the latter. See note under *Depastrum*.

tant groups within the margin of the urn, and arranged in rows parallel to the margin, those in one row alternating with those in the next, and successively diminishing in size from the central to the outermost ones; the radial development less than the transverse; between every radial row the oral and aboral sides of the urn are united by a thin septum, so that the interior of the tentacles communicates with the quadrant cameræ of the urn, through short radiating passages: the marginal anchors are single tentacles whose cavity opens between a pair of septa like those at the base of the tentacles; they are set up higher and nearer to the edge of the urn than are the tentacles: the approximated genital halves, with their respective claustra, extend half way or more toward the edge of the urn, transversely plicate; the digitiform bodies border the whole length of the bands: pedicel muscles four, alternate with the cameræ; principal muscles of the oral side of the urn pennate, the partitions forming the line of divergence; marginal muscle a single ligulate ring, forming a continuous, thickened projecting brim to the urn, outside the tentacles and anchors: gelatiniform layer conspicuous, varying in thickness in the urn and pedicel.

CARDUELLA CYATHIFORMIS, Allman.

- Carduella cyathiformis*, Allman, Rep. Brit. Assoc.
(Aberdeen 1859), 1860, p.
143.
- “ “ Allman, Mic. Jour. Trans.
1860, VIII. p. 125, Pl. V.
- “ “ Allman, An. Mag. Nat. Hist.,
July, 1860, VI. p. 40.
- Calicinaria cyathiformis*, Edw. et Haime, Hist. Corall.,
1860, tom. III. p. 460.
- Depastrum cyathiforme*, Gosse, An. Mag. Nat. Hist. 1860,
June, p. 481.

- Lucernaria cyathiformis*, Sars, Fauna Litt. Norveg. 1846,
p. 26, pl. 3, fig. 8-13.
- “ “ Sars,* Aftryk af Vidensk. For-
hand. i Christiana, 1860, p. 7.
- “ “ Sars, Skandinav. Naturforsch.
möde i Kjöbenhavn, 1860, p.
693.
- “ “ Greene, Nat. Hist. Rev. Proc.
Soc. 1858, p. 132.
- “ “ Keferstein, Siebold und Kölliker,
Zeitsch. June, 1862, (exclus.
synon. Gosse Synop. Actin.?)

The body † “where it joins the stem, is bellied, becomes farther above somewhat constricted, and at the uppermost end again widened, whilst the margin spreads itself outwardly round about;” as long as the pedicel: the pedicel “cylindrical, slender” abruptly expanded into a broad disciform base; the four cameræ very large, widened in the base of the pedicel, rather abruptly narrowed just before they open into the cavity of the urn, oblong ovate in a transverse section; they nearly meet at the centre of the pedicel, of the radius of which the greater diameter of each camera occupies about four fifths, the lesser diameter

* In the diagnosis which Sars gives in the above cited paper, he says, “*corpuscula marginalia nulla*;” but as he immediately afterwards remarks that “This remarkable form, which, perhaps, rightly forms a peculiar genus (*Carduella*, Allman”) separated from the other *Lucernarians*,” &c., &c., and prefaces his diagnosis by reference to the *Fauna Littoralis* and *Carduella cyathiformis*, Allman, *Quart. Journ. Mic. Soc.*, April, 1860, in both of which papers marginal *corpuseles* are certainly described, I can only believe that Sars has made a slip of the pen, or that he means to say these bodies being identical with the tentacles, cannot be considered in the light of marginal bodies or anchors. In the second paper quoted he also says, “*L. cyathiformis*, Sars, which lately has been offered as a new genus, under no less than three names: *Depastrum*, Gosse; *Carduella*, Allman; and *Calicinaria*, Milne Edwards.” Sars has lately sent me specimens of all ages, which certainly have the “*corpusecula marginalia*.”

† As my specimens are alcoholic preparations, I quote from Sars’ *Fauna Litt. Norveg.* in regard to such features as are observable only in a living state.

of the same being only one half the greater : tentacles 12-15 in each bunch, "filiform, of moderate length, and proportionately much thicker than in *Luc. quadricornis*,—and ending in a thicker globular knob," the groups very close together, separated by a short interval in which the marginal anchor is situated,—in at least four rows; four in each of the three outermost rows, those in the fourth inner row very young; in each tuft, those in the next to the outer row the largest, "those situated in the inner row are turned outwards, those in the outer one with their ends bent down around the tolerably thick margin of the body," the basal septa, between which their channels open, do not reach beyond the inner or proximal row of tentacles; their position is recognized from the aboral side of the urn by radiating furrows extending from the edge of the gelatiniform layer a short distance toward the pedicel; those on each side of the anchors extend much beyond their base, and opposite the four partitions of the urn nearly close up the passage between the cameræ: marginal anchor purely tentacular, much smaller than the tentacles, its base nearer to the margin than is that of the outer row of tentacles, and partially overlying the marginal muscle: genital bands extending about half way to the margin of the urn, ligulate, 6-8 uniserial saccules in each band; the digitiform bodies arranged in a single row from one end of the bands to the other, and across their proximal junction; the membrane of the claustrum comparatively thick, and at least twice as wide as the two enclosed genital halves together: *

* In Allman's transverse section of a young *Carduella*, (*Mic. Journ. &c., ut sup.*) the approximated halves of the neighboring genitals are represented as if they were one band, and there is no indication of a *claustrum*; this I can only account for by supposing that the section was made just at the point where the distal ends of the bands become confluent, as is the norm in this family, and where also the claustral membrane merges into the oral side of the urn. I am well aware that Allman calls them "four generative bands," but I cannot view them as such, and on the contrary I consider them as the closely approximated halves of adjoining genitals; each claustrum therefore encloses not a single genital, but the two halves

pedicel muscles very large, equally trihedral, with slightly convex sides ; at the base of the pedicel they extend from the axis to very near the surface, terminate truncately, and each occupies about one eighth the whole area, the camera, each respectively filling up the other four eighths ; passing toward the urn the muscles gradually diminish their radial diameter, and just before they enter the proximal ends of the partition of the urn they narrow rapidly to a much less diameter : principal muscles of the oral side of the urn uniformly pennate, the fibrillæ diverging symmetrically on each side of the partitions ; marginal muscle imbedded in the distal side of the greatly thickened musculo-gelatiniform layer, which forms the raised border ; the muscle is very broad, its breadth equal to the length of the tentacular anchors ; at its free margin it is very thick, and gradually thins away to a sharp edge at the junction with the termination of the aboral side : gelatiniform layer of the aboral side of the urn moderately thick, nearly uniform, being slightly thinned toward the pedicel, but thickening again farther along, and passing into the pedicel retaining about the same incassation exterior to the region occupied by the cameræ and muscles, until at the base it abruptly becomes thinner by two thirds ; at the axis of the pedicel it is thickest where the cameræ and muscles are thinnest, and projects a short distance between the cameræ, but the contact of the sides of the latter and the muscles prevents it from communication with its peripheral portion : two irregular rows of large lasso-cell pockets extend from the distal end of the genitals toward the margin of the urn. Size " $\frac{1}{2}$ seldom $\frac{2}{3}$ of an inch long ; of which the cylindrical thin stem forms the one, and the beaker-form body the other half." Geographical distribution : coast of Norway, Sars ; Orkney Is., Allman.

of different genitals, and this my prolonged investigations, for the past two years, have induced me to consider as the peculiarity of the type of this family.

DEPASTRUM.* Gosse, 1858.

According to Gosse's diagnosis and figures, this genus is distinguished from *Carduella*, as I have characterized it,

* Since I have had an opportunity to examine specimens of *Carduella*, I have compared it with the descriptions of *Depastrum* as given by Gosse in "*The Aquarium*" and in his reclamation in the *An. Mag. Nat. Hist.* 1860, V., for June, and with Allman's answer to the latter, from which I gather but one fact, or at most two, which can now separate the two genera, and these are, in *Depastrum* there are no marginal anchors, and the tentacles arise at the margin of the disc or without it. I offer the following suggestions and facts which have occurred to me to be explanatory of what seem to be only such differences as may be exhibited by any one individual. In the first place, in Sars' *Fauna Litt. Norvegica*, Pl. 3, fig. 13, there is a distinctly octagonal area with a sharply defined boundary, the corners of which correspond to the intertentacular spaces, and the sides to the groups of tentacles which are without their margin; the marginal anchors are reverted and inconspicuous, so that the prominent features are the octagonal area, and the groups of tentacles outside the so-called margin are almost perfect counterparts of Gosse's figure in the *Annals and Magazine* 1860, V. p. 481, fig. 3. Now in *Carduella*, as I find and have described above, the margin of this octagonal area corresponds to the inner or proximal ends of the short septa at the bases of the tentacles and the marginal anchors, and which unite the oral and aboral sides of the disc; but within this margin the two sides are free from each other, and very naturally form a distinct fold along the line of separation, which fold constitutes an octahedral figure with prominent angles. It is very easy to see now that if the marginal muscle contracts in such a way as to revert the edge, as often I have seen done in other *Lucernarians*, and at the same time constricts the urn below, the octagonal area will inevitably become prominent; and this I suspect strongly is the condition of the animal figured in profile by Gosse. (*An. Mag.* 1860, V. p. 481, fig. 2.) I would say also that it seems to me there must be a marginal muscle *outside* the tentacles in Gosse's animal, else how could the neck of the urn become so deeply constricted? My dissections have taught me that the marginal muscle of *Lucernarians* is the extreme border of the oral side, without which the tentacles do not originate, although they may arise close to its distal edge as obtains in *Halimocyathus*. When, therefore, Gosse speaks of the tentacles springing from the margin or without it, I take it that the margin is that of the octagonal area, and not the true margin. The only serious objection to identifying the two genera is that *Depastrum* has no marginal anchors, according to Gosse. Now it is notable, that Gosse's figure represents the animal in a contracted state, the peduncle is strongly corrugated, the urn is deeply constricted, and the tentacles are very short and thick set, as if, (and very probably), contracted. All this might arise from an unhealthy state of the animal; and Gosse remarks, that his specimen, after being detached, did not reflex itself, but laid at length on the bottom of the vessel in which it was placed. In an unhealthy state the thick layer of lasso-cells of the knob of the tentacles falls away very readily, and next sloughs off the outer wall of the shaft, thus leaving the thick musculo-gelatiniform layer exposed. Now if this were to happen to the short marginal anchors of *Carduella* there would

by the following features: "disc octagonal; the tentacles spring from the margin or without it;" no anchors.

DEPASTRUM CYATHIFORME. Gosse.*

- Depastrum cyathiforme*, Gosse, An. Mag. Nat. Hist. 1858,
Vol. I. June, p. 419.
" " Allman, An. Mag. Nat. Hist. 1860,
Vol. VI. July, p. 41.
" *stellifrons*, Gosse, An. Mag. Nat. Hist. 1860,
Vol. V. June, p. 481, figs. 1,
2, 3.
Lucernaria cyathiformis, Gosse, [non Sars,] The Aquarium,
(2d ed.) 1856, p. 85.
" " Johnston, Brit. Zoöph. (2d ed.)
1847, p. 475, fig. 86.
" *stellifrons*, Keferstein, Siebold und Kölliker,
Zeitseh. June, 1862, p. 25.

Geographical distribution: Weymouth, Southern England, Gosse.

Family. ELEUTHEROCARPIDÆ. H. J. C.

LUCERNARIA. Müll. Prod. Zoöl. Danica, 1776, p. XXIX.†

Type, *L. quadricornis*, Müll. Prod. Zoöl. Danica, 1776, p. 227. Disc broad funnel-form; the eight arms elongate,

be left this transparent musculo-gelatiniform layer projecting in a point from every corner of the octagonal area, and simulating completely the sharply-pointed disc of Gosse's figures of *Depastrum*.

* If this is truly different from Sars' *Lucernaria cyathiformis* the synonymy will be as I have given it, and the name *stellifrons* must be suppressed, for the former has priority in the genus; and if, on the contrary, it should prove to belong to the same genus as the *L. cyathiformis*, it can only be so by really possessing marginal anchors; and this I suspect is all that is needed to make it *specifically* the same as *L. cyathiformis*; so that in the latter case it would also remain as *D. cyathiforme*, and *Carduella* become a synonym from sequence in date.

† It appears that Edwards and Haime, (Hist. Corall. III. 1860, p. 457,) who credit the genus *Lucernaria* to Fabricius, have overlooked the fact that Müller, in the introduction of his Prodomus, under the head of "CHARACTERES VERMIUM," p. XXVII. in the 3d div. "MOLLUSCA," * * * "Ore infero," p. XXIX. has charac-

in closely approximated pairs,* so that the oral side of the disc appears quadrate: pedicel monocamerous: tentacles in groups on the end of each arm; radial and transverse development of each group equal: marginal anchors none: genitals transversely folded bands which extend to the end of the arms: muscles of the pedicel four, equidistant, projecting like ridges or pilasters † from the surface of the camera: the principal muscles of the disc ligulate, each one extending from the proximal end of a partition to the end of an arm: marginal muscle ligulate, very thin at the base of the tufts of tentacles: gelatiniform layer thin in the disc, moderately thick in the pedicel.

LUCERNARIA QUADRICORNIS. Müller.

- Lucernaria quadricornis*, Müll. Prod. Zoöl. Dan. 1776, p. 227, No. 2754.
- “ “ Müll. Tegninger til Zoöl. Dan. Förste Hæfte, Kiöbenh. 1777, tab. XXXIX. Fide Fabr. Faun. Grönld. 1780, p. XVI. and 342.
- “ “ Müll. Zoöl. Dan. 1788, Vol. I. p. 51, Pl. 39, fig. 1-6.
- “ “ Gmelin Linn. Syst. Nat. 1788, tom. 1, pars. VI. p. 3151.

terized his genus, “Gelatinosum, rugosum, brachiatum,” and refers to page 227 for the description of the species. *L. quadricornis* was the first and only species ever described by Müller, and therefore was the type, and must be retained as the type of the herewith restricted genus *Lucernaria*.

* In all *Lucernariae* the arms are more or less approximated toward the partitions, probably because thereabouts are situated the more powerful muscles; but in this genus the approximation is not only close, but also evidently permanent, and moreover the intertentacular sinuses opposite the partitions are only half as deep as those which alternate with them.

† These are altogether different from those in the pedicellar camera of *Calvadosia*, in which the pilasters are totally devoid of muscular structure, and are composed entirely of gelatiniform substance.

- Lucernaria quadricornis*, Lamarek, Syst. An. sans Vert.
1801, p. 354.
- “ “ Lamarek, Anim. sans Vert.
1816, tom. 2^{me}. p. 474, (excl.
syn. Fabr.)
- “ “ Lamarek, Anim. sans Vert.
1840, 2d ed. tom. 3^{me}. p. 58,
(excl. synonym. Fabr.)
- “ “ Lamx. Mem. Mus. Hist. Nat.
Paris, 1815, tom. 2^{me}. p. 471.
- “ “ Cuvier, Regne Animal, Vol.
IV. 1817, p. 53.
- “ “ Cuvier, Regne Animal, Vol.
III. 1830, 2d ed. p. 294.
- “ “ Deslongchamps, Encyclop. Me-
thod. Zoöph. tom. 2, 1824,
p. 499. Pl. 89, fig. 13-16.
- “ “ Sars, Bidrag til Södyrenes
Natur. Bergen, 1829, p. 43,
Tab. 4. Translated in Oken's
Isis, 1833, p. 229.
- “ “ Sars, Fauna Litt. Norvegica
1846, p. 20. Pl. 3, fig. 1-7.
(Excl. syn. Fabr. *L. auricula*.)
- “ “ Sars, Aftryk af Videnskabs-
selskabets Forhandling i
Christiana, 1860, p. 6.
- “ “ Sars, in Leuck. Bericht, Wieg-
Archiv, 1861, 2d bd. p. 332.
- “ “ Blainville, Manuel d'Actinolog.
1834-36, p. 317.
- “ “ Johnston, Brit. Zoöph., 2d ed.
1847, p. 252.
- “ “ Stimpson, Marine Invertebrata

- of Grand Manan. Smithson. Contrib. 1853. Apart. p. 8.
- Lucernaria quadricornis*, Carus, Icones Zoöt. 1857. Taf. IV. figs. 1, 2.
- “ “ Gosse, An. Mag. Nat. Hist. June, 1858, p. 419.
- “ “ Edw. et Haime, Hist. Corall. 1860, tom. 3, p. 459.
- “ “ L. Agassiz, Contrib. Nat. Hist. N. Am. 1862. IV. p. 175.
- “ “ Keferstein, Siebold und Kölliker Zeitschrift, June, 1862, p. 20.
- L. fascicularis*, Fleming, Mem. Wern. Soc. II. 1814, p. 248. Pl. 18, figs. 1, 2, translated in Oken's Isis, 1832, p. 764. Taf. XIV. figs. 1, 2.
- “ “ Fleming, Hist. British Animals, 1828, p. 499.
- “ “ Lamx. Mem. Museum Hist. Nat. Paris, 1815. II. p. 470.
- “ “ Ehrenb. Corallenthiere. Abhand. Berlin Akad. 1834, p. 267.
- “ “ Johnston, Brit. Zoöph. 1838, p. 228.
- “ “ “ “ “ 1847, 2d ed., p. 244. Pl. XLV., figs. 3-6.
- “ “ Frey und Leuck. Beiträge Wirbellosen Thiere, 1847, p. 9. Pl. 1, fig. 3.
- “ “ Green, Nat. Hist. Rev. 1858. Proc. Dublin Univ. Assoc., Zoöl. & Bot. p. 132.

The disc very pliable and flaccid, owing to the very slight development of the gelatiniform layer in the aboral side; the apex being prolonged, a pseudo-pedicle is produced which gradually tapers into the pedicle: the eight tentaculiferous arms about twice as long as their basal breadth; the intertentacular marginal sinuses opposite the

corners of the mouth, twice as deep as those alternate with them: the pedicel slender, tapering toward the base, about as long as the semidiameter of the disc; the pedicellar camera circular, and subdivided into four lateral spaces by the four large muscular pilasters, opens broadly into the cavity of the disc: tentacles 100–120 on each arm in adult, in half-grown individuals as many as fifty, very slender: genital bands linear lanceolate; the proximal ends come close down to the top of the pilaster-like muscles of the pedicel, but do not approximate each other; their distal ends terminate between the middle and the edge of the arm, next the greater marginal sinus, and close up to the base of the tentacles; the genital saccules are very numerous, about as large as those of *Haliclystus auricula*; they are largest at the proximal end, and gradually diminish toward the distal end; digitiform bodies larger than the tentacles, at the proximal end of the double rows, but gradually diminish until at the distal end of the rows they are only one fifth as long; they extend only one third the length of the genital bands from the proximal end of the latter, distally: the four pilaster-like pedicel muscles about one fifth the diameter of the pedicel, circular, attached by a narrow strip along the face of the camera: the muscles of the disc narrow ligulate, each one terminating at the middle of the end of an arm; marginal muscle thick and narrow ligulate: gelatiniform layer hardly perceptible in the disc, but in the pedicel about one third as thick as the diameter of a muscular pilaster. Size, 2" broad, 2" – 2 $\frac{1}{3}$ " long, Sars; "nearly three inches in length," Stimpson. Geographical distribution: Denmark, O. F. Müller, Steenstrup; Coast of Norway, 2 ft.–20 fthms, Sars; * Zetland,

* While the above was in press, I received a full-grown Norwegian specimen from Sars, by means of which I am enabled to add somewhat to the proofs. I find it is identical with one which Mr. Stimpson received from Greenland, through Steenstrup, and also the same as one, three inches high, which the former found at Grand Manan.

4-7 fthms, Forbes, Fleming; Faröe Is., Steenstrup; Greenland, Ehrenberg, Steenstrup; Grand Manan Is., Bay of Fundy, and Owls Head, Maine, Stimpson; * "Mass. Bay, Agassiz and Gould."

CALVADOSIA.† H. James-Clark.

Disc infundibuliform; the eight arms nearly equidistant, prominent: pedicel monocamerous with four equidistant rounded pilasters: tentacles in groups on the end of the arms close to the aboral edge; outer row pistilliform, and having the same function as the anchors in other genera; radial and transverse diameter of the group equal: anchors none: genitals, transversely folded bands extending to the end of the arms; the digitiform bodies alone extend across the proximal end of the partition: muscle of the pedicel a continuous thin layer of transversely disposed fibrillæ, forming a cylinder between the outer and inner walls, and imbedded in the gelatiniform layer: the principal muscles of the disc ligulate, each one extending from the proximal end of a partition to the end of an arm; marginal muscle ligulate, moderately thick, but at the outer base of the tufts of tentacles very thin: gelatiniform layer thickest at the edge of the disc, but thins out almost entirely half way toward the pedicel, and then in the latter grows thick again where it is divided into two layers or concentric cylinders by the intervening muscular cylinder; the four pilasters are also gelatiniform, and not muscular, as are the pilasters in the pedicel of *Lucernaria quadricornis*.

* I am indebted to Mr. Stimpson for the permission to dissect a small specimen of this species, about an inch high, which he obtained at Owls Head, Maine.

† I am indebted to my friend William Stimpson, Esq., for the privilege of making the anatomy of this genus; the specimen, *Lucernaria campanulata* Lamx. (non Johnston,) was collected by him at Milford Haven, South Wales, in September, 1862, during an extensive dredging excursion, along the western coast of Great Britain. [Whilst this was in press, I also received a specimen from Keferstein, which he collected at St. Vaast la Hougue, France;—it agrees in all particulars with the Milford Haven specimen.]

CALVADOSIA CAMPANULATA. H. James-Clark.

- Lucernaria campanulata*, Lamx. (non Johnst.) Mem. Museum, 1815. II. p. 460, Pl. 16, fig. 1-7.
- “ “ Gosse, An. Mag. Nat. Hist. 1855. XVI. p. 313.
- “ “ Edw. et Haime, Hist. Corall, tom. 3^{me}. 1860, p. 458, (excl. syn. Johnstoni), Atlas. Pl. A, 6.
- “ “ Leuck. Bericht, Wieg. Archiv, 1861, 2d bd. p. 332.
- “ “ Keferstein, Zeitsch. Wissensch. Zoöl., Siebold und Kölliker. June, 1862, p. 23, taf. 1, fig. 4, etc., (excl. syn. Montagu, Lamk. Johnston).
- L. auricula*, Milne Edw. Cuvier, Regue Animal, 3d ed. Atlas. Pl. 63.
- “ “ ? Templeton, Mag. Nat. Hist. 1836. IX. p. 304.
- L. inauriculata*, Owen, Rep. Brit. Assoc. (Birmingham, 1849,) 1850. 2d pt. p. 78.
- “ “ Greene, Nat. Hist. Rev. Vol. V. 1858, Proc. Soc. p. 132.

The infundibuliform disc gradually tapers into the pedicel; the arms much longer than broad: pedicel camera circular between the pilasters, opens widely into the cavity of the disc; the pilasters nearly circular, attached by a broad portion of their circumference along the whole length of the camera, and tapering away to a point at the base of the mouth; in the centre of the base, on the exterior, a small round pit, of variable depth and proportions: the tentacles rather stout; the spheroidal tips much depressed at the end, very large in comparison with those of

other genera; the outer pistilliform tentacles smaller than those in the next two or three inner rows, thickened and lumped on the exterior side, the proximal side as in the others: genital bands elongate lanceolate, the proximal ends of each pair almost touching each other across the axial end of the intervening partition, from which point they diverge and extend close up to the base of the tufts of tentacles; the base of the pedicel very broad; the muscular cylinder of the pedicel near the inner wall of the camera, at about one sixth the distance between the latter and the outer wall: principal muscles of the oral side of the disc narrow ligulate; one ligule accompanies each genital band, running close along its border between it and the partition from which it diverges; marginal muscle ligulate, thick in the middle, but thins out at both edges: gelatiniform layer at the margin of the disc about as thick as the base of a full grown tentacle, but it thins out to a mere film about two thirds of the way to the centre of the body, and then thickens again gradually toward the pedicel; in the latter its thickness is about one fifth the diameter of the camera; in the pilasters it comprises the whole of their substance, and is continuous with the inner division of the same substance in the main part of the pedicel, and in the thickest part of the pilaster has a diameter a little less than one quarter of that of the camera; the fibroid bodies of the inner division of the gelatiniform layer pass obliquely into the pilasters to their periphery, crossing each other promiscuously just within the paries of the same; the digitiform bodies extend a short distance along the tapering end of each pilaster: lasso-cell pockets scattered over the oral side. Size; the disc 1" across, and 1" deep; the pedicel $\frac{5}{8}$ " long; $\frac{1}{8}$ " diameter. Geographical distribution: Calvados, France, Lamouroux, Milne Edwards, Keferstein; Dover, England, Aug. 1849, Owen; Milford Haven, Wales, Sept. 1862, Stimpson in expd. collegit.

HALICLYSTUS.* H. James-Clark.

Disc umbellæform; arms more or less prolonged: pedicel tetracamerous: tentacles all alike, in groups at the end of the arms, the radial and transverse diameter of the groups equal: marginal anchors pistilliform, or fabæform: genitals double; the halves of each genital distinct from each other, the space between their proximal ends occupied by the digitiform bodies; each band extends to the base of the tentacles; the saccules distinct and prominent: pedicel muscles four distinct, equidistant cords, alternating with the four cameræ: principal muscles of the disc pennate, diverging on each side of the partitions; marginal muscle a band of varying breadth, very thin at the base of the tentacles and anchors: gelatiniform layer of varying thickness in the disc; very thick in the pedicel, occupying all the space not appropriated for the four cameræ and the four muscular cords.

HALICLYSTUS AURICULA. H. James-Clark.

- Lucernaria auricula*, Rathke, (non. Fabr.) Müll. Zoöl. Dan. Vol. IV. 1806, p. 35, (exclus. synonym.). Pl. CLII.
- “ “ Montagu, Trans. Linn. Soc. 1808, p. 113 (exclus. Pl. VII. fig. 5.)
- “ “ Lamx. Mem. Mus., 1815, tom. 2d, p. 471 (exclus. synonym.), partim.
- “ “ Fleming, Hist. British Animals, 1828, p. 499 (excl. syn. Fabr.)
- “ “ Cuvier, Regne An. IV. 1817, p. 53.
- “ “ Cuvier, Regne An. III. 1830, 2d ed. p. 294.
- “ “ Johnston, Mag. Nat. Hist., Jan. 1832. V. p. 43, fig. 29.

* Haliclystus; ἅλς, the sea, κλίζω, to dash upon.

- Lucernaria auricula*, Johnston, Brit. Zoöph. 1838, p. 229, fig. 35 (exclus. synonym. pars).
- “ “ Johnston, Brit. Zoöph. 1847, 2d ed. p. 246, fig. 54 (exclus. synonym. pars).
- “ “ Milne Edw. et Haime, Hist. Corall., tom. 3^{me}, 1860, p. 458 (exclus. synonym. Müll., Prod.; Fabr. Sars.)
- “ “ Auct. Anglicorum, H. J. C., Proc. Bost. Soc. Nat. Hist., March, 1862, p. 47.
- Lucernaria octoradiata*, Lamarek, Anim. sans Vert. 1816, tom. 2d, p. 474.
- “ “ Duj. in Lamk. An. sans Vert. 2d ed. 1840, tom. 3d, p. 59, (exclus. synonym., “Blainv., Man. Atlas, Pl. 50, fig. 4,” and Lamx. Mem. MSS.)
- “ “ Sars,* Aftryk af Videnskabs Forhand. i Christiana, 1860, p. 6, (exclus. synonym. *L. auricula*, Bidrag. et Faun. Litt. Norveg.)
- “ “ * Sars, in Leuck. Bericht, Wieg. Archiv, 2d bd. 1861, p. 332.
- “ “ Steenstrup,† Videns. Med. Natur. Foren. Kjöbenh, 1859, p. 108.
- “ “ Steenstrup in Leuck. Bericht, Wieg. Archiv. 1861, p. 331.

The disc shallow umbellæform, strongly octangular; the arms as broad as long: pedicel rather thick, cylindrical, expanded moderately at the base, furrowed longitudinally at four equidistant places, corresponding to the four

* Sars, to whom I had sent specimens of this species from our coast, in a recent letter, says it “is *L. octoradiata*. Lamk. (*L. auricula* Johnst. Sars olim, non Fabr.)”

† Steenstrup has sent, to Mr. Stimpson, Greenland specimens, which, upon direct comparison, I find to be identical with ours.

muscular cords, no pit in the base; the four camerae transversely ovate, connected with each other at the base by anastomosing channels, and slightly constricted above, just before opening into the cavity of the umbella; their greater diameter, trending radially, a little less than one third that of the pedicel; the space between them, at the axis of the pedicel, nearly one third the diameter of the latter; the space between every two, about double the breadth of a camera, and the distance of each from the paries of the pedicel one third its distance from the axis: tentacles from one hundred to one hundred and twenty, slender, their length equal to one fourth the diameter of the umbella; the globular tip slightly depressed at the end, its diameter from two to two and a half times greater than that of the cylindrical part of the tentacle: anchors reverted toward the pedicel; very large, oval or fabæform; each one attached to the margin by a short, broad stem, half as long and half as broad as itself; furrowed longitudinally on the proximal side like a coffee grain, which it resembles; length nearly equal to the diameter of the pedicel, those opposite the partitions usually longer than the others, breadth half as great; the original tentacular nature almost totally obscured by the enormous development of the adhesive cells in the outer wall, the head of the tentacle represented by a small group of lasso-cells near the distal end in a clear space, which has the deceptive appearance of being an opening; the internal cavity large, equalling from one third to one half the diameter of the whole organ; in unusually large individuals they are deeply wrinkled in every direction: the genitals consist each of two distinct bands, in the shape of broadly obtuse triangles, whose base, trending in a direct line to the arms, is twice as long as its height, and the apical obtuse angle projects into the area opposite the corner of the mouth; about one hundred and twenty-five saccules in each band,

which is at least three or four times as many as in the next two species, closely set together, reminding one of the pavement teeth of certain fishes; the youngest saccules always on the border next the partitions, from which side they gradually increase in size until they attain their maximum at the opposite edge; the distal end of each band nearly touches the end of the arm which it enters, but the proximal end terminates a short distance exterior to the proximal end of the partition; the digitiform bodies linear lanceolate, extend in three or four rows across the proximal end of the partitions, and a very short distance along the older border of each band: pedicel muscles transversely triangular, deeply and profusely furrowed longitudinally; on the proximal side three of the furrows are so deep as to divide the muscle into four great folds, which unite at the distal side, corresponding to the apex of the triangle; each cord arises from the pedicel base, where it stretches out to the centre, and gradually lessens in size as it approaches the disc; at the basal two thirds of the pedicel it is very near the outer surface of the gelatiniform layer, but in the remaining third it gradually approximates the axis of the pedicel, until, just within the entrance to the main cavity, it reaches the inner surface of the same layer, and then, in this relation, passing along a short distance, it enters the oral side of the disc at the proximal end of the corresponding partition; the diameter of a cord about one half the major diameter of a pedicel camera: the principal muscles of the disc are uniformly disposed layers, extending on each side of a partition to the margin of the genital bands, along the margin of the genitals so strongly developed as to appear like ligulate bands, as in *H. octoradiata*; the fibrillæ diverge at very acute angles from each side of the partitions, and, trending parallelwise with the edge of the genital band, extend to the marginal muscle; the minor muscles uniformly diffuse, the fibrillæ radiate

from the angles of the mouth to the marginal muscle; the marginal muscle ligulate, very thin at the distal side of the anchors and the tentacular tufts: gelatiniform layer of the disc about one quarter as thick as the diameter of the pedicel, rigid, a little thinner at the edge of the disc than toward its centre; at the end of the arms it suddenly becomes much thinner; in the base of the pedicel it is not more than one third as thick as in the disc; in all parts of the body, both disc and pedicel, the fibroid bodies of this layer stretch in a direct course from the outer to the inner surface; between the cameræ of the pedicel they cross each other at a wide angle, and also cross the axis at right angles to each other as they extend from diagonally opposite cameræ: the musculo-gelatiniform layer in the marginal anchors at least two thirds as thick as the gelatiniform layer of the disc; at the margin of the disc it is as thick as the gelatiniform layer at the same place, but it gradually lessens to one third this amount toward the mouth. Size, one inch across the disc, and one inch and a half including the tentacles; the pedicel half an inch long, one twelfth of an inch average diameter, and a little more than one eighth of an inch across the base. Geographical distribution: Vardöe Is., Norway, Rathke; Faröe Is., Steenstrup; English coast, Montagu, Fleming, Johnston, &c.; South coast of Greenland, Steenstrup; Anticosti Is., Gulf St. Lawrence, colleg. in exped. ex Mus. Comp. Zoöl., Camb., Mass., August, 1861, Messrs. Hyatt, Shaler, and Verrill; Mass. Bay, H. J. C.

HALICLYSTUS SALPINX. II. James-Clark.

This hitherto undescribed species is at once distinguishable from any other known Lucernarian by its remarkable trumpet-shaped marginal anchors. Mr. Stimpson, to whom I am indebted for the loan of specimens, and some sketches of the animal taken from life, says in his notes, that, "from

Lucernaria octoradiata, Sars, Videnskabs Forhand. i Christ., 1860, it differs by a stalk longer and not fading into body, suckers [anchors] longer and with more distinct tops, ovaries separate; color dark brown." The alcoholic specimens are singularly transparent, and, thanks to my friend's skill and experience, in a remarkably good state of preservation.

Disc octahedral, umbellæform, rather abruptly passing into the pedicel; the arms as broad as the intervals, broadly rounded at the end, their length less than their breadth: pedicel more slender and proportionately longer than in *H. auricula*, base slightly expanded, a small pit in the middle of the latter; the four camerae broadly ovate in transverse section, radial diameter to the transverse as $1\frac{1}{2}$ to 1, and one fifth the diameter of the pedicel, from the surface of which they are situated at a distance that is a little more than their greater diameter: tentacles from sixty to seventy in specimens less than an inch in diameter, very slender; the globose tip comparatively smaller than in *H. auricula*, not depressed; taxis as in *H. auricula*, but the radial development of the rows apparently less than the transverse, so that the groups are broader than in that species: marginal anchors very prominent, as long as the arms, not reverted, slender, and obliquely trumpet-shaped; the edge of the trumpet considerably thickened, except at a narrow space on the proximal side, by the development of the adhesive cells; the centre of the terminal expansion occupied by a single tentacular remnant, about as long as half the breadth of the trumpet, and the globose tip half as thick as that of the tentacles: genital halves not as widely separate as in *H. auricula*, oblong obovate; the broader end projecting half-way into the arms; from forty to forty-five saecules in each band, and uniformly of the same size in all parts of the organ, in four longitudinal rows, the marginal rows shorter than the middle rows, which

extend farther at each end;* the digitiform bodies are arranged as in *H. auricula*: pedicel muscles oval in a transverse section, situated as in *H. auricula*: muscles of the disc as in *H. auricula*; marginal muscle broad ligulate, narrowest at the anchors, but gradually widens toward the arms, at the end of which it is very thin: gelatiniform layer very thin at the edge of the disc, but gradually thickens toward the pedicel, in which it has the same relations to the muscles and the cameræ as in *H. auricula*, but with different proportions, as may be judged from measurements of the cameræ given above: groups of lasso-cells in little depressions or saccules scattered here and there, on the oral side of the disc. Size, nearly one inch across the disc; pedicel half an inch long. Geographical distribution: "Dredged in 3 fthms on *Laminaria*, Mt. Desert Is., Maine, August, 1858," Stimpson.

HALICLYSTUS OCTORADIATUS.† H. James-Clark.

Lucernaria octoradiata, Sars, (non Lamck.) Skandinav.
Naturforsch. möde i Kjöbnh.,
1860, p. 693.
" " = *L. auricula*, Bidrag til Södyr.
fide Sars, Aftryk af Videnskabs.
Forhand. i Christiana,
1860.

* In individuals of the same size belonging to *H. auricula* there are as many as one hundred saccules in each band; and in *H. octoradiatus* (*Lucernaria octoradiata*, Sars, (non Lamck.) Bidrag til Södyr., 1829, transl. in Oken's *Isis*, 1833, p. 228, taf. X. fig. 6) larger individuals have only "20-30" saccules, in two rows, in each band. By this feature alone the three species may be promptly recognized.

† As I do not possess living specimens of this species, I quote from the descriptions of Sars, as translated in the *Isis*, and Keferstein, and in order that the comparison with the two foregoing species may be as complete as possible, I deem it necessary to give a very full transcript from these authors, supplying from one what the other does not mention. In order that there may be no misapprehension as to the character of Sars's animal, I quote Keferstein in (), and any suggestions of my own in [].

Lucernaria octoradiata, Keferstein, Zeitschrift. Wissenschaft. Zoöl., Siebold und Kölliker, June, 1862, taf. 1, fig. 1, 2, 3, etc., and p. 22 (exclus. synonym., except Sars).

Lucernaria auricula, Sars, [non Rathke,] Bidrag til Södyrenes, 1829, translated in Oken's Isis, 1833, p. 228. Taf. X. fig. 6.

“ “ Sars, Fauna Litt. Norveg., 1846, p. 25 (exclus. synonym. Rathke, Montagu, and Lamarek.)

“ The bell is 1" broad, $\frac{1}{2}$ " high, divided into eight rays; pedicel nearly cylindric, or somewhat rounded four-cornered, $\frac{1}{2}$ " long, $\frac{1}{8}$ " thick, ends in a flat disc, in the middle of which is a small round opening," ("basal pore projects into the gelatinous substance as a blind sac"); "four brown red thick stripes in the stem, which prove themselves to be muscles by the movements of the animal," [Keferstein shows that these are the cameræ, and that the true muscles are alternate with them; the cameræ situated as in *H. salpinx*, and similar in shape and proportions]: "tentacles 40-60, short, thin," ("25-27 tentacles, the knob strictly globular");* "marginal bodies small, reverted, oblong cylindric, open at both ends, from the outer opening a filiform point can be stretched," [the opening at the outer end is no doubt illusory, as I have pointed out in *H. auricula*, and Keferstein does not speak of it]: "the genital organs extend from the stomach to the end of each ray; 20-30 tolerably large, round or oval, flattened grains" [sacculæ, and, according to his and Keferstein's figures, and specimens sent to me by the latter, in two rows in each band] "fastened to a very thin filiform tube," [this

* Keferstein's specimens were evidently young, as the number of tentacles shows. The specimens which he sent me are all young.

tube is the narrow muscle which Keferstein describes, along which the saccules are attached]: (“four cylindric or flat bundles of muscular fibres, free in the gelatinous mass,”) [according to Keferstein’s figure the muscular cords are situated half-way between the centre and surface of the pedicel]: (“the radial muscles of the swimming sac” [oral side of the disc] “occupy the middle line of each arm,”) [running from the proximal end of the partitions; as in *H. auricula*, this is, doubtless, merely a more strongly developed margin of the principal muscles which occupy the whole area about the partitions, between the genitals]; (“gelatinous mass” [gelatiniform layer of the aboral side] “a massive layer; it fails in the swimming sac,”) [oral side]; “in the stem solid between the four tubes,”) [as in the two foregoing species]: (“on the surface of the swimming sac [the oral side] heaps of nettling capsules lie in little pockets”).* Geographical distribution: Norway, Sars; St. Vaast la Hogue, north coast of France, Keferstein.†

Art. XIII. — *Monograph of the Genus Callinectes.* — By
ALBERT ORDWAY.

[Communicated Jan. 7th, 1863.]

[The following paper consists of selections from notes made by Lieut. Ordway during his study of the *Portunidæ* with the view of monographing that group of Crus-

* While the above was in press, I received specimens of this species from Keferstein, and am able, therefore, to confirm what I have quoted from this author.

† I would be glad to receive from the European coast specimens of any of the Lucernarians, and most especially of the following: *Craterolophus Thetys*, *C. convolvulus*, *Depastrum cyathiforme*, *Halielystus octoradiata*, for which I will send in exchange abundant specimens of our common *Halielystus auricula*. I will state that I have already sent specimens to Europe *by mail*, in little bottles about an inch and a quarter long, inclosed between two pieces of cork hollowed out. *Henry James-Clark, Harvard University, Cambridge, Massachusetts.*