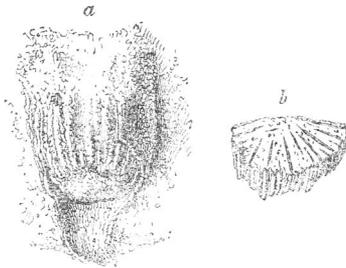


APPENDIX II.—*Account of SIX SPECIES OF POLYPARIA obtained from Timber Creek, New Jersey, and described by WILLIAM LONSDALE, Esq. F. G. S.*

THE following is a list of the species :—

1. *Montivaltia atlantica* *Lonsdale* (*Anthophyllum atlanticum* *Morton*).
2. *Idmonea contortilis* *Lonsdale*.
3. *Tubulipora Megæra* *Lonsdale*.
4. *Cellepora tubulata* *Lonsdale*.
5. *Escharina*? *sagena* *Lonsdale* (*Flustra sagena* *Morton*).
6. *Eschara digitata* *Morton*.

1. MONTIVALTIA ATLANTICA.



a. Nearly perfect specimen, exhibiting the lamelliferous or upper portion in its true position, and the inferior hollow cone.

b. Portion of the upper surface slightly worn down, to show the characters of the lamellæ.

Inversely conical; lower or non-lamelliferous portion nearly equal in length to the upper or lamelliferous; enveloping crust extending nearly to the superior termination of the cone; lamelliferous portion variable in form; lamellæ very numerous; centre, contorted plates terminating inferiorly in a distinct umbilicus or boss; superior termination of the cone nearly flat.

This coral is described by Dr. Morton under the name of ANTHOPHYLLUM ATLANTICUM. (*Silliman's Journ.* vol. xviii. pl. 1. f. 9, 10. *Essays on Org. Rem. &c.*, p. 61. 1829. *Journal Acad. Nat. Sc. Philadelphia*, vol. vi. pl. viii. f. 9, 10. pp. 123, 124. 1830. *Synopsis Org. Rem. &c.* pl. i. f. 9, 10. p. 80. 1834.)

Dr. Morton states (*Essays*, pp. 61, 62. *Synopsis*, p. 80.) that he derived his characters of the genus *Anthophyllum* from Goldfuss; and the lamelliferous portion of the coral under consideration, as represented in Dr. Morton's excellent figures, bears a strong general resemblance to some of Goldfuss's species (*Petref.* pl. xiii. f. 10, 11. pl. xxxvii. f. 15.). The fossil is probably generically identical with that represented in pl. xxxvii. f. 15. There is also a general

agreement in Dr. Morton's figure 10. (pl. i. Synopsis) with Schweigger's *Anthophyllum cyathus* (Beobachtungen, Tabular Arrangement, vi.), particularly as given in Esper (Pflanzenziethere, Madrep. tab. xxiv.); but the American fossil, when preserved in its true position, clearly differs from the generic characters proposed by Schweigger, and adopted with various modifications by succeeding authors, including Goldfuss. The *Anthophyllum cyathus*, as well as the corals typical of the four other divisions of Schweigger's comprehensive genus, are lamelliferous throughout, whereas the American fossil, as beautifully shown in one of the Timber Creek specimens (*a*), consists of an upper lamelliferous portion or nucleus, and an inferior non-lamelliferous portion or hollow inverted cone.

This great peculiarity of structure apparently agrees with Lamouroux's characters of his genus *Montivaltia*: "Polypier . . . presque pyriforme, composé de deux parties distinctes, l'inférieure ridée transversalement; la supérieure presque aussi longue que l'inférieure, . . . presque plane au sommet, légèrement ombiliquée et lamelleuse" (Exposition Méthodique, p. 78.); and in his observations on the Caen specimens of *Montivaltia* he says, "elles sont géodiques" (ibid.). This peculiar structure would agree perfectly with the hollow inverted cone of the American coral, and the characters of the "partie supérieure légèrement ombiliquée et lamelleuse" accord well with the structure of the lamelliferous portion. De Blainville (Man. d'Actinologie, p. 336.) says, Lamouroux's figures are "*forte inexacte*," but there is enough of resemblance in them, particularly in figure 9. (Plate 79.) to support a generic agreement with the Timber Creek fossil, the "partie inférieure, ridée transversalement," being represented in the American specimens by the cast of the hollow cone, and the higher extension of the envelope being considered only a specific difference. Lamouroux's coral figured by Guettard (Mém. iii. p. 466. pl. 26. f. 4, 5.), but named by De Blainville *Montivaltia Guettardi* (De Bl. Man. d'Actinol. p. 336.; see also *Anthophyllum Guettardi*, p. 340.), bears even a closer resemblance to the Timber Creek specimens. Guettard graphically compares it to a "cupule de gland de chêne."

Dr. Morton, in his careful researches for analogous cretaceous fossils, refers to Faujas St. Fonds's figures of Maestricht corals, particularly to Pl. xxxviii. f. 1. 5. (Hist. Nat. de la Mont. de St. Pierre de Maestricht). Between those figures and the American coral there is a great general similarity; but a rigid comparison will show that there are important differences in the structural details, particularly in the centre of the apparently lamelliferous portion. The Maestricht fossils, or casts, are moreover wholly siliceous; and therefore, as they do not exhibit any traces of the original lamellæ, they cannot lead to the inference that the original coral consisted of two distinct structures. It is most probable that those casts represent only the terminal cup of an ordinary lamelliferous polypidom. It was the preservation of the lamellæ in the

upper part, and the total want of any trace of them in the lower, which led to the belief that the Timber Creek specimens belong to the genus *Montivaltia*.

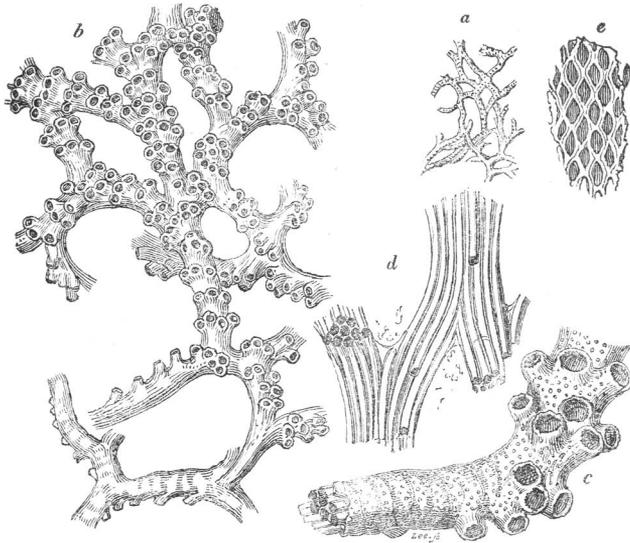
The total length of the finest specimen (*a*, see figure), is about $1\frac{1}{2}$ inches, and the greatest breadth nearly $\frac{3}{4}$ of an inch; the two portions, as before stated, are of about equal length. The whole form of the coral is an inverted cone, terminating downwards in a bent point. The lamelliferous portion is cylindrical, or slightly contracted towards the base, and there is often a tendency to bend to one side. The lamellæ are very numerous, amounting probably to eighty; and are represented in well-preserved specimens by layers of calcareous spar. They were apparently of unequal dimensions; and their lower terminations are distinctly rounded or semicircular without any signs of fracture, and, consequently, of having extended downwards into the existing hollow cone. The sides of the lamellæ were apparently hispid, rows of indentations occurring in the earthy matter, which filled the intervening spaces of the original coral. The superior terminations of the lamellæ were unequal, certain of them, probably twenty in all, protruding above the others; and these range inwards, uniting with the central contorted plates. The characters exhibited in a slightly worn-down specimen prove also that the upper termination of the coral was not cup-shaped, but flat, with possibly a slight central depression (*b*).

The centre of the lamelliferous portion consists of plates more or less horizontally contorted in the body of the cylindrical mass, and vertically at the superior and inferior terminations, forming in the latter position either a marked central rugose depression as shown in Dr. Morton's figures (*loc. cit.*), or a subordinate projecting cone (*a*).

The interspaces between the original lamellæ are occupied by earthy casts, constituting a very conspicuous portion of the coral; and from their well-defined rounded edge, as well as their decided termination downwards, they might be considered as the true lamellæ. It is clear, however, from their bearing the impression of hispid surfaces, that they are mere casts, formed while the original lamellæ existed. The material of which they consist is more or less argillaceous, and includes numerous foraminiferæ.

Of the nature of the portion represented by the hollow cone, no opinion can be offered. That it possessed a certain amount of solidity, and had structural details which resisted, for a time, decomposition, is evident from the earthy matter which filled the spaces between the lamellæ not having penetrated downwards into the cone, and from the marked characters of these casts. It is clear, also, from the preserved vestiges of the crust which enveloped the lamelliferous portion, as well as from the surrounding cavities mentioned by Dr. Morton, that the external wall or integument must have been thin.

Locality. Timber Creek.

2. *IDMONEA CONTORTILIS* *Lonsdale*. Sp. n.

- a.* Branches natural size.
b. Portion of the same magnified, and exhibiting the contorted mode of growth.
c. Part of a branch more highly magnified, to show the pores in the surface.
d. Magnified portion of the reverse side (*e.* nat. size), exhibiting the range of the tubes, exposed by fracture.

Branches compressed, bifurcated, contorted and anastomosed; tubular openings projecting, variously grouped; no marked, continuous, central line between the groups; reverse surface slightly convex, furrowed transversely, and streaked faintly by the separating walls of the tubes.

In the absence of the central line or medial ridge, and of a regular bilateral arrangement of the tubular openings, this coral differs from the generic characters of *Idmonea* as given by Lamouroux (*Exp. Méthodique*, p. 80.), and repeated by Milne Edwards (*Ann. Sc. Nat.*, 2d series, vol. ix. *Zool.*); but it agrees in the general distribution of the openings with the latter author's enlarged figure of *Idmonea transversa* (*loc. cit.* Pl. ix. fig. 3.; likewise *Recherches sur les Polypes; Mémoire sur les Crisies, &c.*); De Blainville also, in his description of the genus, says, the openings are disposed "en demi-anneau ou en lignes brisées" (*Man. d'Actinol.*, p. 419.). There is a slight resemblance between the Timber Creek coral and the *Cellepora echinata* of Goldfuss (*Petref. xxxvi. f. 14.*), an Astrupp tertiary fossil, but which is said to be attached to a *Terebratula*.

The branches are slightly convex on both sides (see figures), and so greatly contorted that the reverse surface of some portions of a specimen are completely turned round. The tubular openings

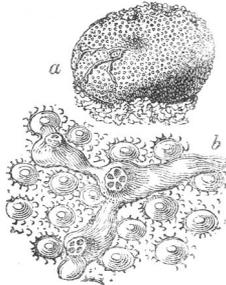
project more or less, and are variously grouped, but with a tendency to a transverse linear arrangement. The furrows between the openings are smooth, or but faintly traversed by longitudinal lines, marking the range of the tubes; they are, moreover, minutely porous (*c*). On the reverse side very small pores may also be detected, though not generally, in consequence, probably, of the thickening of the external layer by matter secreted through them. This remark applies likewise to those between the tubular openings. On the inner surface of the layer, forming the reverse side, the pores are very distinct and numerous.

The tubes are angular (*d*), and have a considerable range, bending conformably to the contortions of the branches. The substance of their walls is not often well preserved, but where it is retained microscopic foramina may be also detected.

No changes, incident upon age, have been noticed, except the probable thickening of the outer layers on both surfaces: no cases of young tubes have been observed.

Locality. Timber Creek, New Jersey.

3. TUBULIPORA MEGÆRA *Lonsdale*. Sp. n.



a. The coral of the natural size, to exhibit the general resemblance to the smaller species of *Alecto*.

b. Portion magnified, showing the characters of the attached fasciculi and the tubercular openings.

Dichotomous, fasciculi of tubes slightly conical; mouths of the tubes united in a round, slightly projecting tubercle.

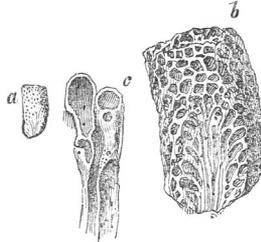
To the unassisted eye this coral presents a perfect agreement with Lamouroux's genus *Alecto*, consisting apparently of simple tubes, and not of fasciculi of 2 to 5 tubuli.

The fasciculi or branches gradually increase in breadth between the points of bifurcation, the broadest part being adjacent to the mouths. Externally they are round, but the outline of the surface is apparently modified by the papillæ of the Echinite to which they are attached. The tubuli, where they have been accidentally exposed, are arranged laterally. The tubercle, composed of the mouths, or probably the abraded base of the vertical portion of the tubuli, is reflected vertically upwards, or is inclined at a consider-

able angle: it is cylindrical, and much less in diameter than the adjacent portion of the fasciculus. The mouths themselves are not arranged in a line, or in the same manner as the tubuli, but grouped so as to occupy the least possible breadth; they are small, rounded on the exterior side, but flattened or angular at the points of contact.

Locality. Timber Creek.

4. CELLEPORA TUBULATA *Lonsdale*. Sp. n.



a. Portion of a branch of the natural size.

b. The same magnified, to show the elongated characters of the central cells.

c. Magnified, elongated cells from the interior of the branch, with a perfect mouth and foramen under the proximal lip. The microscopic pores in the walls of the cells are likewise given.

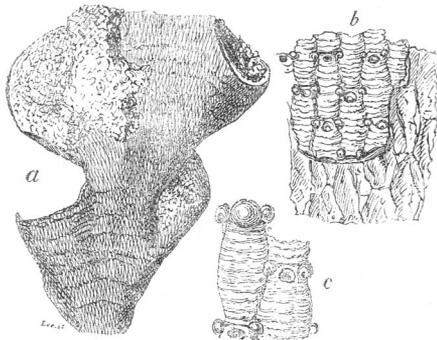
Branched; branches round, dichotomous; cells irregularly aggregated, ovoid elongated or tubular; mouth semicircular, large; proximal lip straight with a minute foramen in the centre.

The external surface of the branches rarely presents cases of perfect cells. Where they occur, they exhibit the usual ovoid form, and the mouth is well defined, being bounded completely by the distal arched covering of the cell; there is also a foramen under the proximal lip. More generally the surface presents a confused congeries of circular or angular openings, leading into ovoid cells. Internally, the branches exhibit, when fractured transversely or longitudinally, a perfectly tubular character in the cells comprising the axis of the branch (*b*), the cells being of great length and angular from lateral interference or compression; but towards the distal termination, as displayed in one instance, the ovoid form of the ordinary condition is assumed, by a swelling outwards, and the mouth is bounded by a regularly curved surface, the proximal lip being also supplied with a minute foramen (*c*). The prevailing form of the cells composing the mass of the branches is, however, ovoid, but variable in outline as well as in size and position. The cells are also much more numerous than is represented in fig. *b*.

The minute foramen on the proximal lip was probably connected with the base of the spinous process, so frequently exhibited in recent and fossil species of *Cellepora*. On the surface of the sides of the tubular cells, and also on those of the ovoid, minute connecting foramina may be detected, well defined, and occasionally bounded by an opaque, or thickened, circular line.

Localities. Lewis's Creek (South Washington, North Carolina), and Timber Creek.

5. ESCHARINA*? SAGENA.



a, General mode of growth, the exposed surface being the reverse side of a layer of cells.

b, Cells composing portion of an inner layer; also reverse side of the opposite layer.

c, Cells forming part of an outer layer; one of them with a gemmiferous vesicle.

Foliaceous, cells in two or more opposite layers, successively encrusting, but separable; cells oblong or hexagonal, defined by a slightly depressed line, arranged in alternate rows, but not conformably in succeeding layers; outer surface of cell nearly flat, ribbed; mouth at the distal extremity, small, round; gemmiferous vesicle large, hemispherical; accessory foraminated vesicles two, over the mouth.

In the notice of this coral (Synopsis, &c. p. 79., pl. xiii. f. 7.), Dr. Morton describes it under the name of *Flustra sagena*, but adds, "perhaps it is an Eschara."

This polypidom differs from described species of *Escharina* in its free, foliaceous mode of growth, in being composed of several opposite, enveloping layers, and in the facility with which the dorsal surfaces may be detached; but it has been thought advisable not to propose a new generic name for this and analogous fossil corals, the characters of *Escharinae* being considered to be not fully ascertained. The *Cellepora nobilis* of Esper (Pflanzen-thiere, Cellep. tab. vii.) exhibits similar consecutive layers of cells, but arranged around a cylindrical nucleus and not in free plates.

The foliations are of considerable dimensions, and are variously contorted (*a*), and sometimes anastomosed. The layers are thin, but when numerous the foliations exhibit considerable thickness. Specimens presenting the opposite layers in their original position are not common, in consequence of the facility with which they separate along the medial plane. Portions only of successive layers are also to be detected, and not very frequently. The perfect outer layer was noticed in only one instance. (*c*)

* *Escharina* Milne Edwards; *Lepralia* Johnston.

Of the earliest state of the cells no positive information has been obtained* ; but it is inferred from the ribs, more or less distinctly traceable on the outer covering, that they were in the young stage entirely open, and that the outer surface was produced by a uniform development of rib-like processes from the side-walls of the cells, in the same manner as in certain species of recent *Escharina*.

In the only observed case of a perfect outer layer (*c*), the cells were oblong and slightly hexagonal, and separated by a faint, depressed line. The external surface was, to a small extent, convex ; and ribs, though they were not prominent, could be detected, converging from the proximal and lateral walls towards the centre ; and the medial line of junction might also be discovered. The perfect mouth, placed in the middle of the distal extremity, was small and round, and in the same plane with the outer surface, but the lips projected slightly. The hemispherical gemmuliferous vesicles were relatively large, and comparatively numerous. They were situated immediately over the mouth, and they altered the position of that orifice from a horizontal to an inclined position. The accessory foraminated vesicles were variable in outline but constant in occurrence and situation, springing from the sides of the mouth, and increasing in size as they ranged upwards and outwards. The foramen was often well defined. From the position of these vesicles, the breadth of the distal extremity was apparently much increased.

In subjacent or older layers (*b*) the substance of the coral was not often preserved, having been detached with the overlying series, and leaving only calcareous casts of the interior of the cells ; but where it is retained, there were no marked differences of characters, as far as observation extended, except in the absence of gemmuliferous vesicles. The mouths did not appear to have been filled up by the animal, and the foramina of the accessory vesicles were occasionally open : the depressed lines between the cells were also preserved.

In fragments which exhibited only casts of the cells, the indications of the ribs were sometimes as strong as on the outer surface, and the form of the mouth was well shown ; but there were only very slight indications of the accessory vesicles.

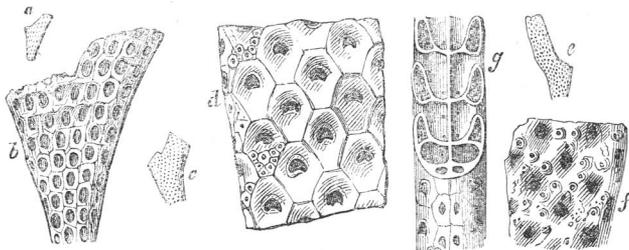
Of the lateral connecting foramina nothing decided was observed in consequence of the perishable state of the layers ; but if the imperfect cells mentioned in the note* belonged to *Escharina* (?) *sagena*, the foramina were numerous.

The dorsal surface along the medial plane of separation (*a*) very much resembled that of *Flustra foliacea*, when artificially exposed.

Locality.—Timber Creek.

* On the surface of one specimen, some immature cells, consisting of only the dorsal and side walls, were observed, occupying the exact position of an ordinary layer of *Escharina sagena*, but there were no proofs that they belonged to that species ; and all attempts to connect their structural details with those of the coral under consideration failed.

6. *ESCHARA DIGITATA* Morton.



a. b. Bifurcated branch, natural size and magnified, consisting of immature cells with the outer surface almost wholly open, and with no indications of a distinct mouth.

c. d. Portion of a bifurcated branch, with mature cells. To the right of figure d is a cell with an uniformly depressed surface, and conjectured to have performed the office of a gemmuliferous vesicle: to the left are irregularly foraminated cells.

e. f. Portion of an aged branch, with the characters of the mature cells obliterated by external additions and the production of irregular tubercles.

g. Magnified side view of a branch, to show the position of the lateral connecting foramina within the cells; and of the small or defective cells exhibited also in the edge of figure d.

Branched, branches compressed, dichotomosed; cells hexagonally pyriform, separated by a fine lineal groove; surface sloped inwards from the periphery; mouth semicircular or semi-oval; no accessory or gemmuliferous vesicles observed; lateral connecting foramina two, terminal one.

See Dr. Morton's Synopsis Org. Rem., Cretaceous Group, United States, p. 79. pl. xiii. f. 8. 1834.

Dr. Morton states that this fossil strongly resembles *Eschara dichotoma* of Goldfuss (Petref. tab. viii. f. 15.), a Maestricht coral, and there is a perfect agreement in the mode of growth, as well as a general resemblance in the form of the cell; but a considerable difference, in structural details, is visible when the two fossils are compared. The cells in both cases are hexagonal, but the sides of those composing the Maestricht *Eschara*, as given by Goldfuss, are very nearly, if not quite equal, and they are slightly but uniformly curved; whereas, in the Timber Creek specimens, the sides are almost invariably unequal, the proximal and distal being considerably smaller than the lateral, and the curvature is variable in amount and direction, giving the cell a pyriform aspect. The relatively broad grooves between the cells in *Eschara dichotoma* are represented in the American species by a fine line: the mouth of both fossils is semi-circular, but more completely so in the Maestricht than the Timber Creek coral; in Goldfuss's species,

moreover, it is bounded, at the distal extremity, by a broad flat band which is extended around the whole periphery of the cell ; while in Dr. Morton's coral the surface slopes inwards from the very edge of the cell.

These differences are not pointed out under the supposition that Dr. Morton conceived the two corals might be identical, for he was clearly aware of their distinction, but because both the Maestricht and Timber Creek deposits are members of the Cretaceous series, and the perfect agreement in generic outline with Goldfuss's figure (14 *a*), might lead a less careful observer than Dr. Morton to the inference, that the fossils are specifically the same.

The branches preserve a considerable uniformity of breadth, expanding only towards their bifurcation, and there very slightly, in consequence of the addition of one or more lateral rows. They diminish in thickness towards the edges, where they are rounded.

The cells on the opposite side of the medial line agree generally in position, and those forming the surface of the branches have a great regularity in size and relative proportions ; but, at the point of bifurcation, and along the edges of the branches, small and imperfect cells may very frequently be observed, the latter exhibiting sometimes irregular pores in the external covering.

Of the earliest state of the cells no evidence was obtained ; and of the condition after the formation of the side-walls only one case was noticed. It consisted (*a*, *b*) of a portion of a main branch, with part of another springing from a bifurcation. The surface of the greater number of the cells was wholly open, indicating considerable rapidity of development, or slowness in the formation of the exterior ; and in only a few instances was there a commencement at the proximal extremity of the outer surface. The walls of the latest produced cells, or those at the superior extremity of the bifurcated branches, had a sharp edge without any line of separation ; but in the cells of the undivided branch, and where the development of the external covering had commenced, fine grooves were perfectly visible. This great production of immature cells is analogous to many well-known recent examples.

In what was believed to be another step towards maturity, the surface of the cells was considerably developed, but the mouth was not regularly defined, the open part being large and circular. The structure of the mature cells is given in figure *d*, and in the specific characters.

The passages from maturity to what may be termed a state of decrepitude afforded some interesting structural details. In the first steps, the fine separating grooves between the cells were partially or completely obliterated, and a general thickening of the parietes was noticed ; but these changes were not always most decidedly shown in the oldest cells of the branch, depending, apparently, in part upon the individual polype. In a specimen in which the above alterations were not so complete as in other cases, there appeared upon the surface of the cells several minute prominences, and one or two fractured vesicles. Some of the

intermediate stages were not noticed; but in specimens believed to be far advanced towards extreme age (*e, f*) the surface of the cells was convex, instead of being concave; all traces of lines of separation were obliterated, the mouth was irregularly shaped, sometimes with a tooth-like projection on the proximal lip, and the whole surface of the branch was beset with perforated or abraded vesicles.* No instance of a perfect filling up of the mouth, which would characterise perhaps the oldest condition of the coral, was noticed. A due preservation of the specimens, which exhibited these stages, forbade any attempt to trace a connection between the vesicles and the polype cells; but a transverse section of a mature branch exposed clearly capillary tubes, passing through the substance of the thick external covering of the cell.

The lateral and terminal foramina in the walls of the cells were well exhibited. The former, two in number (see figure *g*), were relatively large, situated near the extremities of the cell, and close to the dorsal wall. In one beautifully exposed specimen, the presumed use of these foramina in the formation of cells was instructively shown. The specimen (figure *g*) displayed the sections of a series of cells with thickened parietes, and the lateral foramina, also the rounded edge of the branch composed of a regular double row of small cells, divided longitudinally by the usual middle or dorsal layer of separation. The mouths of these cells were small and round, and might be mistaken for lateral foramina; but the boundaries of the diminutive cells, to which they were the regular openings, were clearly to be traced. The length of these imperfectly developed cells was about half that of the full-grown; and the mouths accorded in position with the situation of the lateral foramina. It is, therefore, inferred, that each minor cell was produced by means of one lateral foramen, the perfect development not having taken place, owing to the absence, in the same longitudinal row, of a full-grown anterior cell. In consequence of the quincuncial arrangement of the perfect cells, each polype had, by means of the lateral and terminal foramina, immediate connection with six other cells.

Cases of monstrosity or deviation from the normal form occur, as before mentioned, near the edges and at the bifurcation of the branches; but it is believed that some entire branches were composed of irregularly-shaped cells, and might, without care, have been assigned to a distinct species.

No traces of accessory vesicles were observed, nor any satisfactory signs of a gemmuliferous vesicle. In one case the whole surface of a cell was deeply depressed (fig. *d*), and might have formed a receptacle for the development of gemmules.

Locality. Timber Creek, New Jersey.

* These vesicles or bladders must not lead to the inference that there is any resemblance between *Eschara digitata* and the recent coral *Cellepora cervicornis*. In the former case the bladder has no regular cellular structures, while in the latter there is always a perfectly developed mouth, with accessory vesicles.