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A Review of the Family Diastoporidae for the purpose of Classification

George Robert Vine

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26. *A REVIEW of the Family DIASTOPORIDÆ for the purpose of Classification.* By GEORGE ROBERT VINE, Esq. (Communicated by Prof. DUNCAN, M. B. Lond., F.R.S., F.G.S.) (Read May 12, 1880.)

[PLATE XIII.]

THE Diastoporidæ are a group of adherent Polyzoa belonging to the suborder Cyclostomata. Busk defines the generic characters thus:—"Zoarium crustaceous or foliaceous, discoid or indefinite in outline; adnate and sessile, or pedunculate and erect; *no cancelli*"*. This restricted definition limits the group to almost a single genus; for the *Mesenteripora* of Blainville is the only other genus classed by Smitt and Busk among Diastoporidæ, and the non-cancellated surface separates this small family from the Discoporellidæ.

In this review of the recent and fossil Diastoporidæ we must bear in mind the restriction formulated by Busk, because as we go backward in time the necessity of this caution will be apparent. The family was never prolific either generically or specifically; but in nearly all the seas, from the Lower-Silurian era to the present, representatives of the family are generally found in deep-sea deposits. Their geographical range now is chiefly northern; and their bathymetrical range in the past was as variable as now.

In his definition of the genus *Diastopora*, Busk says:—"Zoarium adnate, discoid or flabelliform, centric or excentric, margin entire or lobed; cells towards the centre wholly immersed, usually suberect, and partially free towards the margin; mouth elliptical or suborbicular, horizontal or oblique"†. As there is no typical species in which the whole of these characters are preserved, we are compelled to seek them in the five species catalogued as recent and fossil by Busk. But there are specific characters not embraced in the generic definition, to which I wish to direct attention. In *D. simplex* the surface is *coarsely* punctate, and there are no "adventitious tubules." In *D. obelia*, Johnst., the surface is finely punctate, and a small "adventitious tubule rises from the back of some of the cells." In *D. patina*, Lamk., the central cells are immersed and usually closed, whilst the marginal ones are erect and open; and in *D. congesta*, D'Orb., the cells are decumbent, the surface is spotted, and a secondary disk arises from the surface of the primary one. In pl. xxxiv. of the 'Cyclostomata,' Busk gives a figure of *D. sarriensis*, Norman, but no descriptive text. Norman, however, claims for this species a separate identity; but the most characteristic feature is its size, "and here and there among the open-mouthed cell-tubes there occurs a tube which, instead of being open, is closed above with a little cup, from one side of the centre of which rises an umbonal-like process, which is perforated at the apex. Probably these organs

* Mus. Cat., pt. iii. Cyclostomata, p. 27.

† Ibid. p. 28.

are connected with the reproduction of *Diastopora*, and are homologous with ovicells”*.

These are all the recent and fossil *Diastopora* given by Busk in the ‘Cyclostomata’ and in the ‘Crag Polyzoa.’ Mr. Waters, in his papers on the Naples “Bryozoa” † and in his paper on the “Bryozoa from the Pliocene of Sicily” ‡, revives one of the synonyms of Busk’s *D. obelia*, the *D. lato-marginata* of D’Orb., and adopts *D. flabellum*, Reuss, in the place of *D. simplex*, Busk, on the ground that D’Orbigny had already appropriated the term for a fossil species §.

In this review of the family I wish to direct the attention of the palæontologist more particularly to the Palæozoic forms; but it may be advantageous as a more accurate study if I give a stratigraphical list of the fossil Diastoporidæ, gleaned from works that are accessible to me; for the remarks made upon the species from Recent to the Chalk, and from the Carboniferous to the Upper Silurian, are the results of original investigation.

RECENT.	Species already given.
POST-TERTIARY.	<i>Diastopora obelia</i> , Flem. Garvel Park, Scotland.
PLIOCENE.	— <i>simplex</i> , Busk’s ‘Crag Polyzoa.’
	— <i>neandrina</i> , Wood, Mor. Cat.
	— <i>flabellum</i> , Reuss, Waters’s ‘Bryozoa of Naples.’
MIOCENE.	— —, Reuss, Manzoni’s ‘Bryozoi d’Aust.’
UPPER CHALK.	— <i>grandis</i> , D’Orb., “ <i>D. ramosa</i> very doubtful.”
	— <i>Sowerbii</i> , Lonsd., Mor. Cat.
	— <i>Wetherelli</i> , Morris, Mor. Cat.
	— <i>glomerata</i> and <i>congesta</i> , D’Orb., Busk’s Cat.
	— <i>lacula</i> , D’Orb., Mor. Cat.
GREENSAND.	— <i>tuberosa</i> , D’Orb., Mor. Cat.
	— <i>papyracea</i> , D’Orb., Mor. Cat.
	— <i>Berenicea foliacea</i> , Lamx., Mor. Cat.
OOLITE.	— <i>verrucosa</i> , Milne-Edw., Mor. Cat.
	— <i>diluviana</i> , Milne-Edw., Mor. Cat.
	— <i>Eudesiana</i> , Milne-Edw., Mor. Cat.
	— <i>striata</i> , J. Haime. Lias of Valica ¶.
LIAS.	— <i>antipodium</i> , Tate, African form **.
?	
CARBONIFEROUS.	— <i>megastomus</i> , M’Coy, ‘Irish Fossils.’

* Ann. & Mag. Nat. Hist., January 1864.

† Ann. & Mag. Nat. Hist., April 1879, p. 272.

‡ Manchester Geol. Soc. Trans., May 1878.

§ The Rev. T. Hincks, in his new work on British Polyzoa, does not admit the rendering of Mr. Waters, but gives a new name, *D. suborbicularis*, to *D. simplex* (Brit. Polyzoa, vol. i. pp. 464 to 466).

|| *Elea* and *Bidiastopora*, D’Orb., require reworking; and I shall be glad if palæontologists will help me in this matter.

¶ If *Berenicea striata*, J. Haime, of the Lias of Valica, may be taken as the type of our foreign Secondary rocks, it may be taken also as the type of our own Oolitic species. I have not seen Haime’s figure; but Manzoni, in his ‘Bryozoi del Pliocene antico di Castrocaro,’ gives good figures of *Diastopora (Berenicea) striata*, J. Haime (p. 44, tav. vi. fig. 74, and tav. vii. fig. 79), which very closely resemble our species from the Inferior and Great Oolite of Clevee and Kidlington.

** Quart. Journ. Geol. Soc. 1867, p. 162. “The only Polyzoon hitherto known in the Secondary rocks of South Africa.”

- DEVONIAN. *Ceramopora nuronensis*, Nicholson, Geol. Mag. 1875.
 SILURIAN, UPPER. — *incrustans*, Hall, Pal. of New York, vol. ii.
 — *ohioensis*, Nicholson, Ann. of Nat. Hist. 1875.
Berenicea irregularis, Lonsd., Sil. Syst. p. 679, pl. 15. fig. 20.
 SILURIAN, LOWER. — *heterogyra*, M'Coy, Pal. Foss. pl. 1. c. fig. 17.

It is impossible to look over this list without some sense of shame that this indiscriminate nomenclature should be allowed to influence the minds of those who undertake the task of introducing to the palæontologist new species of fossil Diastoporidæ. Between the *Berenicea* of Lamouroux, the *Ceramopora* of Hall, and the *Diastopora* of Smitt and Busk there is a wide difference—so much so that, though all the genera are incrusting, there are special features about the Palæozoic that are not found in the Secondary, Tertiary, or recent forms. For the present many of the species in this list may be conveniently left with the Diastoporidæ; but I would strongly advise those who are in possession of good characteristic specimens of Secondary forms to allow them to be examined by some competent authority, so that this review may be completed, because some few that are catalogued are not *Diastopora* or even Diastoporidæ.

The generic characters of Lamouroux's *Berenicea*, as given by M'Coy, are as follows:—"Parasitic: cells united in a spot-like crust, radiating from a centre; adhering throughout, not circumscribed; mouth at the distal extremity of each cell; substance *submembranaceous*"*. In the 'Brit. Pal. Fos.' p. 44, M'Coy very properly checked Lamouroux's wider characters; and his description of the genus suits more particularly some at least of the Palæozoic forms. The *B. heterogyra*, M'Coy, of the Lower Silurian rocks of Coniston, is a remarkable species. From his description it seems to me to be a true Diastoporid of a very peculiar type; but the size of the cells in the length (three to the space of one line), occupying the same space as the ten or eleven pores crosswise, is very unusual. M'Coy says nothing about the interspaces between the cells in his species. The *B. irregularis* of Lonsdale is very insufficiently described; but as the locality of his fossil is given (Dudley), identification is not so difficult. The species, however, requires reworking; and in doing this I find that the cells are very sparsely punctate; and when sections are made for microscopic examination, the interspaces between the cells of this species are plain, and the mode of bifurcation and the attachment of the cells are also of a peculiar type. The cell-pores, too, are not so fully developed as in the genus *Ceramopora*, nor are the cell-mouths so distinctly marked. It seems to me, however, to be a very unwise procedure to substitute another name for these Silurian species; I therefore propose that M'Coy's definition for the genus in 'Brit. Palæozoic Fossils' be adopted, and entirely restricted to the "very thin calcareous foliaceous" forms of the Silurian rocks of this country at least.

In the genus *Ceramopora*, Hall, we have an altogether different type of the family Diastoporidæ. In this genus we have an incrusting polyzoön with pores separated by interspaces as well as the

* Carb. Foss. of Ireland, 1844.

cell-walls, the interspaces being occupied by fine tubuli. In size and shape the American species do not differ very materially from the Dudley *Berenicea*; but in Nicholson's *C. ohioensis** we obtain an altogether new feature. The cell-arrangements of figs. 7 and 7 *a* are similar in character, when favourably selected, to those of Carboniferous species. The true type is seen in figs. 7 *c* and 7 *d*. In these figures "the cells appear in the form of rounded oval apertures, arranged in diagonal rows, but separated by a vast number of small rounded foramina, which appear to be the mouths of interstitial tubuli. In this condition the fossil presents much the appearance of certain species of *Chatetes* (*Monticulipora*)" †. This is a Silurian form from the Cincinnati group. The *C. incrustans* of Hall has a nodulose or tuberculated surface; and in the *C. huronensis*, Nicholson, the surfaces between the cells are smooth, but the cells are distinctly separated, and the generic character of the species is well marked in the pores.

All these species are comparatively small in the apertures when compared with the *Berenicea megastoma* of M'Coy, of the Carboniferous formation (Pl. XIII.). This species is more closely allied to *Ceramopora* than to *Berenicea*. The patches vary in size from one quarter up to nearly three quarters of an inch in diameter. The patches radiate from a centric or excentric point. The cells toward the centre are depressed, the cell-mouths are raised, having a circular form when worn, triangular when pretty perfect. The cells have a pyriform appearance, best seen in worn specimens; but when thin sections are made for microscopic study, the pyriform character is seen better still, and the interspaces are filled with what Nicholson calls "interstitial tubuli." In addition to these observations I cannot do better than conclude this description with a few remarks by Mr. John Young on this species:—"Our specimens show the characters of M'Coy clearly; but I have been fortunate in finding in the shales of Capelrig, East Kilbride, examples of the species showing, besides, that the perfect cells were closed by a thin calcareous cover, pierced by a narrow slit or opening, just under the raised lip of the cell, and, further, that amongst the cells there is a minute cellular structure, best seen in slightly worn specimens" ‡. In this, as well as in other respects, the Capelrig species differs from the well-preserved specimens from Hairmyres; and in one of my specimens a secondary disk rises, or, rather, covers a portion of the primary one. The arrangement of the cells and the thin calcareous surface-covering are also different. It appears, therefore, that we have in our Carboniferous Limestone series two distinct species instead of one.

The Secondary forms of the Diastoporidæ approach nearer to the Recent than to the Palæozoic; but on these I have already expressed my opinion.

It is clear, then, from all that has been said, that the Palæozoic representatives of the family Diastoporidæ differ very materially from

* Ann. & Mag. Nat. Hist. 1875, vol. xv. pl. xiv. figs. 7-7 *d*.

† Ibid. p. 183.

‡ Newspaper report. Address to the Geol. Soc. of Glasgow, Oct. 1879.

the more recent members. If the whole are to be classified under one family name, a course highly advantageous to the study of Polyzoa, it will be necessary to take into consideration the more prominent characters, and place the species of the different formations under suitable genera. I have already suggested this course to Prof Nicholson; and he writes me as follows:—"The Palæozoic Polyzoa of the types *Ceramopora*, *Berenicea*, and *Diastopora* are at present in a totally chaotic condition, and must all be reworked out by modern methods." In accordance with this suggestion I now propose, either for acceptance or discussion, the following grouping of the family, premising at the same time that the whole of the Palæozoic Polyzoa are being reworked out by myself for the purpose of classification, and, if permissible, will be submitted, from time to time, to the Society for consideration.

Class POLYZOA, J. V. Thomson.

Subclass HOLOBRANCHIA, E. Ray Lankester.

Order GYMNOLEMATA, Allman.

Suborder II. CYCLOSTOMATA, Busk.

Family IV. DIASTOPORIDÆ, Busk*.

Recent and Tertiary ..	Genus	I. <i>Diastopora</i> , Johnston.
Secondary	„	II. To be reworked.
Palæozoic (in part) ..	„	III. <i>Ceramopora</i> , Hall †.
Palæozoic (in part) ..	„	IV. <i>Berenicea</i> , M'Coy's description restricted.

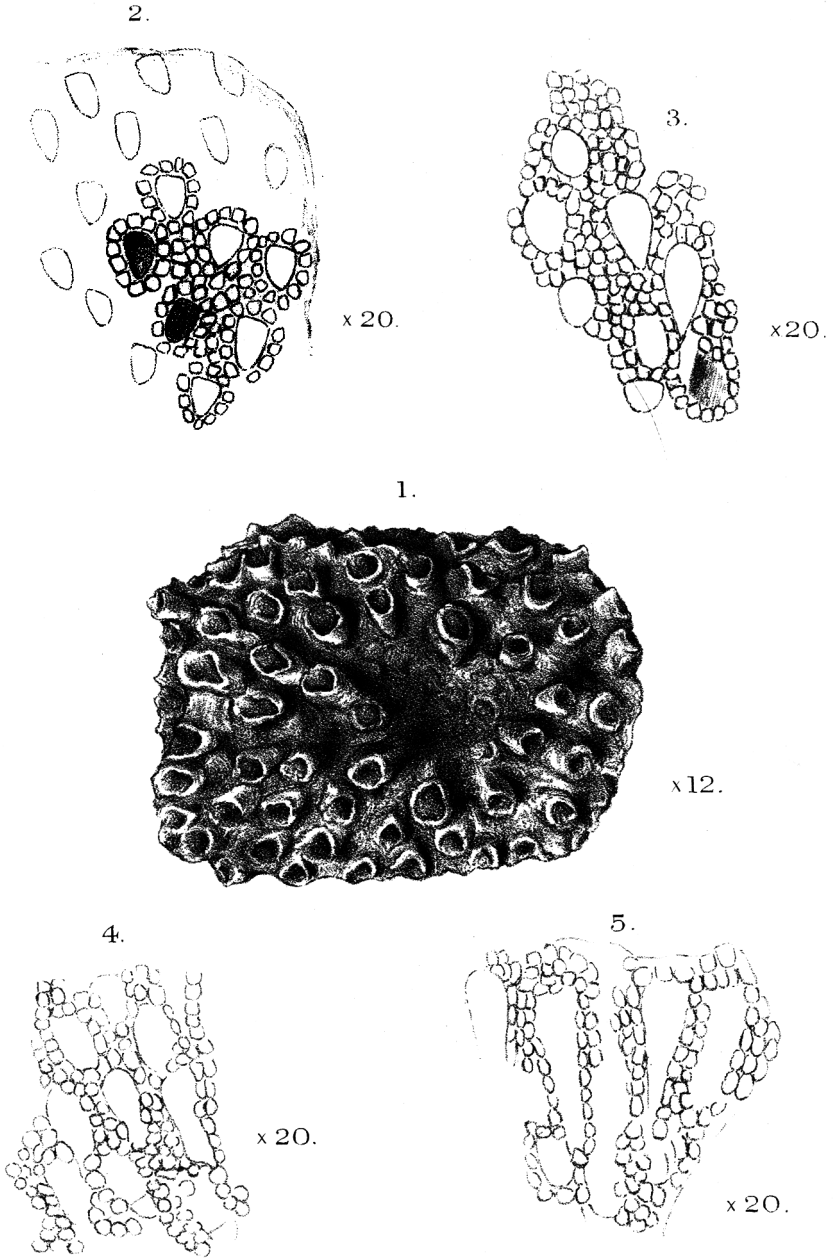
EXPLANATION OF PLATE XIII.

- Fig. 1. *Ceramopora megastoma* (*Berenicea*, M'Coy), Lower Carboniferous Limestone shales, Hairmyres, Scotland. The common adherent form. In some specimens the "ectocyst" is well preserved, in fragments; when this is so, a delicately punctured structure envelops the cells.
2. Slightly rubbed polyzoary, showing the "interstitial tubuli" of Nicholson ("Polyzoa from Silurian Rocks of North America," Ann. & Mag. Nat. Hist., March 1875).
3. Specimen, more transparent, showing a greater abundance of the "tubuli."
- Figs. 4, 5. Slightly oblique cells and interstitial tubuli. In many of the tubuli there are the remains of fluids (chylaqueous?), in the form of iron-pyrites.

(From drawings by the aid of camera lucida by my son, G. R. Vine, jun.)

* Fam. IV. *Diastoporidæ*, Busk, 'Marine Polyzoa,' pt. 3.

† *Ceramopora*, Hall, Pal. of New York, vol. ii. 1852.



A. S. Foord. lith.

Mintern. Bros. imp.

CERAMOPORA MEGASTOMA.

DISCUSSION.

Prof. DUNCAN expressed his sense of the value of the paper, which was the work of a most industrious student. His remark on the distinction between the modern and ancient forms of Diastoporidæ showed that he had grasped the most important principle. The specimens were common ; but still the distinctions were difficult to ascertain.