

NOTES ON THE POLYZOA AND MICROZOA OF THE RED CHALK OF  
YORKSHIRE AND NORFOLK. BY GEORGE ROBERT VINE.

I. INTRODUCTORY.

From the time when John Phillips, F.G.S. (1829), published his "Illustrations of the Geology of Yorkshire," up to the present, the origin and probable horizon of the Red Chalk, have been fairly discussed by authors. It is only within the last thirty years, however, that the stratum has been worked out with any degree of skill, or that any attempt has been made to co-relate the Red Chalk beds, by means of their fossil contents, of Norfolk, Lincolnshire and Yorkshire. Then again, the differences of opinion which have been expressed by authors who have studied the palæontological evidence, have helped to advance the importance and relative value of the fossil contents of this very peculiar band. It is not my intention, therefore, to comment on opinions raised by men who are far more competent to deal with the subject than I am, but a brief *résumé* of what has been done will serve as a necessary preface to what will follow.

In 1829, as regards Yorkshire, John Phillips gave a list of five fossils only, under the head line "Fossils of the Red Chalk," two of which were figured.\* As regards Hunstanton, Professor Sedgwick in 1826† remarked in a foot note "that the red beds of Hunstanton Cliff . . . . contain the peculiar fossils of the *galt* in great abundance."

In 1833, Mr. S. Woodward in "An outline of the Geology of Norfolk,"‡ gave a list of fossils of the Hunstanton Beds; and Mr. C. B. Rose (1835), in a series of papers in the Philosophical Magazine, followed with remarks on the probable horizon of the Red Beds. As the history and literature of this side of the subject have been given so admirably by Professor Seeley up to 1861,|| and up to

\* Geol. Yorkshire, p. 120, pl. 1, figs. 18-19.

† Annals of Philosophy, Ser. 2, vol. xi., p. 378. ‡ 8vo, pp. 29-54.

|| Ann. Mag. Nat. Hist. Ser. ii., vol. vii., pp. 233-244,

## 364 VINE: POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

1882 by Mr. W. Whitaker, F.G.S., of the Geological Survey of England, (\*) it will perhaps be as well to refer the student to these papers for special details, as I could only feebly repeat here remarks and expressions of opinion which these respected authors have said so well in the papers referred to.

In the year 1859† the Rev. T. Wiltshire read a paper before the Geologists' Association on the Red Chalk of England, and to him belongs the credit of bringing forward the subject in a systematic way. He describes the Red Chalk through Yorkshire, Lincolnshire, and Norfolk, "notices that whilst many of the fossils at Hunstanton are Gault species, others are Lower Chalk species, and concludes that probably it is better to regard it as an intermediate formation between the Lower Chalk and the Lower Greensand, which comes into being when the Gault and Upper Greensand have almost thinned out." In the list of fossils (pp. 275, 277) Mr. Wiltshire catalogues a very fine series derived from Speeton, Hunstanton, and Muswell Hill. A few species of *Foraminifera*, *Entomostraca*, and *Polyzoa* are given by the author, altogether 47 species are catalogued, which, aided by the clear and precise description of the Red Rocks in the text of the address, added considerably to our knowledge of the palæontology of these rocks up to that date. The "microzoa" were as follows:—

*Foraminifera*: *Cristellaria rotulata*, Lamk. Collection of Prof. T. R. Jones.

*Entomostraca*: *Cytherella ovata*, Rømer. Collection of Prof. T. R. Jones.

*Polyzoa*: *Idmonea dilatata*, d'Orb. Collection of Mr. Bean.  
 „ *Diastopora ramosa* (Dixon) Lonsd. Collected by Mr. Wiltshire.

„ *Ceriopora spongites*, Goldfuss. Collected by Mr. Wiltshire.

The other fossils were in different collections, named by Mr.

---

(\*) Proc. Norwich Geol. Soc., vol. i., pt. xvii., 1883.

† *Geologist* vol. ii., pp. 261-278. This paper was printed separately, pp. ii., 18, with 4 plates of Fossils, but I have not been successful in getting a copy; so I quote from the *Geologist*.

Wiltshire, but the whole of the examples catalogued were examined and compared with like fossils in other public and private collections.

Two years after Mr. Wiltshire's paper was published Professor H. G. Seeley gave the first of a series of four papers which were wholly devoted to the "Red Limestone of Hunstanton."\* In it "he reviews the literature of the subject, and notices the weak points of the various papers reviewed . . . and concludes that the Red rock is Upper Greensand, because it is linked to the Chalk, and yet differs from it in fossils." In an analytical table of fossils of the red bed Professor Seeley shows affinities with, and differences from, the fossils of the Upper and Lower Cretaceous Rocks.

In 1864 Professor Seeley wrote another paper† on the Hunstanton Red Rock, which was devoted rather more to the Geological than to the Palæontological aspect of the same. Unless this paper is very carefully gone through, and the chalky material of the Hunstanton Beds studied by its aid, it is impossible to understand the differences between the red beds of Norfolk and Yorkshire. In the one we have hard chalk containing pebbles and minute grains, in the other much softer chalk, with scarcely any perceptible mixture other than the colouring matter present. The *Foraminifera*, too, of the Yorkshire Red Chalk, are much larger than the Hunstanton species. Judging from these differences one can easily imagine that the finer *débris* in solution floated farther north in the Red Chalk Sea, whereas the coarser material was deposited farther south.

The Red Rock, says Professor Seeley, "is divisible into three parts, III. Lower, II. Middle, and I. Upper. "In the lower of these beds . . . as in the others, the little brown and black shining pebbles . . . in the Carstone pass up. . . . The lowest layer is sandy, and not more clearly separated from the Carstone below than from the concretionary layer above. The top layer is like the sponge bed above‡ in structure . . . but often there is a thin soapy seam of deep red matter. . . . parting them ; and at intervals this enlarges into nest-like burrows, which . . . extend for several inches up into

---

\* Quart. Journ. Geol. Soc , vol. xx., pp. 327-332.

† Ann. Mag. Nat. Hist, Ser. iii., vol. vii., pp. 233-244, 1861.

‡ These beds contain a very peculiar fossil in abundance called *Spongia paradoxica*, of authors.

the sponge rock, without affecting the level top of the Red Rock. These spaces are filled with soft red matter, or with sand."

By far the most important of Professor Seeley's papers from a palæontological standpoint is the one published in the *Annals* in 1864, on the Fossils of the Hunstanton Red Rock.\* As in a previous paper Prof. Seeley remarks that the rock at Hunstanton may be divided into three parts, or three well-marked layers of nearly equal thickness, and these may be numbered in descending order, 1, 2 and 3. Then follows a list of about eighty-seven named species, and nearly twenty more fossils indicated by generic names only, or varieties. The whole of these fossils were collected by the author, and are now deposited in the Woodwardian Museum at Cambridge. In this list Prof. Seeley introduces a new feature of great interest to the palæontologist, by locating the fossils, as far as he was able to do so, in the several layers. Certain species are peculiar to the lowest (No. 3). *Belemnites attenuatus* and *minimus*; *Plicatula sigillina*: *Terebratula capillata*, *biplicata*, and *Dutempliana*, range through the whole of the layers; a still less number of species range through layers 2 and 3, and by far the greater number are found in the top bed only. It was unfortunate for me that when writing my "Monograph of the Polyzoa of the Red Chalk of Hunstanton,"† this paper was overlooked, especially so, as an acquaintance with it would have prevented the error on p. 456, of the Monograph, and have saved me from after annoyance. In Prof. Seeley's list I find the following Polyzoa mentioned: the new species being described in the last of the series of Hunstanton papers in 1866.‡

1. *Diastopora (Berenicea) polystoma*, Rœm.
2. " ( " ) *contracta*, Seeley.
3. " ( " ) *clementina*, d'Orb.
4. *Proboscina dilatata*, d'Orb.
5. *Cellulipora sulcata*, Seeley. (*Diastopora* of this paper.)
6. *Reptomulticava* n-sp. (R. favus, Seeley of this paper.)
7. *Reptotubigera serpens*, d'Orb.

---

\* *Ann. Mag. Nat. Hist.*, Ser. 3, vol. xiv.

† *Quart. Jour. Geol. Soc.*, vol. xlvi., pp. 454-486 (1890).

‡ *Ann. Mag. Nat. Hist.*, Ser. 3, vol. xvii., pp. 173-183.

VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 367

In 1869, seemingly in answer to Prof. Seeley, who characterised his last paper as one on the fossils (new and rare) of the "Upper Greensand of Hunstanton," Mr. Wiltshire's second paper was published in the Journal of the Geological Society.\* In this paper will be found a rather full list of fossils, and a drawing of the cliff section. The Red Chalk beds or bands are marked A B and C, and Mr. Wiltshire assigns to each of these layers the fossils which are either peculiar or common. Four species of Polyzoa are named and located thus :

- |   |               |
|---|---------------|
| 1. Diastopora ( <i>Berencia</i> ) regularis, d'Orb. | Band B.       |
| 2. Proboscina dilatata, d'Orb. (rare)               | „ C.          |
| 3. Reptomulticava mamilla, Rss.                     | Bands B. & C. |
| 4. Stomatopora longiscata, d'Orb. (rare)            | „ C.          |

The last paper in which, so far as I am aware, Polyzoa are mentioned, is "On things in General and the Red Chalk of Norfolk in Particular"† by the then president, Mr. W. Whitaker, of the Norwich Geological Society.

The address is divided as follows :—

- a. Notes on Norfolk Geology, pp. 207, 212.
- b. The Red Chalk of Norfolk.
  1. Introductory, p. 212.
  2. History of the subject (Bibliography), 213, 222.
  3. Critical Remarks, pp. 222, 226.
  - 4-5. Personal experience and conclusion, 226, 234.
  6. List of fossils, compiled, I believe, by A. J. Jukes Browne from the Red Chalk of Hunstanton, showing their range, &c., in the Cretaceous series. This list might have been conveniently reproduced, but the student is advised to compare the lists of Whitaker, Wiltshire and Seeley, particularly when the later investigations of Messrs. A. J. Jukes Browne and W. Hill come under his consideration.

Polyzoa of the Red Chalk of Hunstanton (Whitaker, p. 234) :

1. Diastopora (*Berenicea*) contracta, Seeley.
2. „ ( „ ) regularis, d'Orb.

\* Quart. Journ. Geol. Soc., vol. xxv., pp. 185-192.

† Proc. Norwich Geol. Soc., vol. i., pt. vii., 1883, pp. 207-236.

368 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

3. Cellulipora sulcata, Seeley.
4. Proboscina dilatata, d'Orb.
5. Reptomulticava mamilla, Reuss.
6. Stomatopora longiscata, d'Orb.

Besides the above, Mr. Whitaker catalogues in the same paper two species of *Foranimifera*, but no *Entomostraca* :

1. Cristellaria rotulata, Lamx.
2. Globigerina cretacea, d'Orb.

A few expressions of opinion from competent authorities as to the probable horizon of the Red Chalk, may be given before closing this part of my paper.

In 1878, the Rev. E. Maule Cole read a paper before the Yorkshire Geological and Polytechnic Society, on "the Red Chalk,"\* in which rather full details are given of the various sections of the Red and Grey Chalk found in Yorkshire. These two terms "Red" and "Grey," Mr. Cole uses "indiscriminately, because I believe" he says "that many beds which present no traces of red colour belong to this formation. At the north end of Burdale tunnel there is a deposit of upwards of 20 feet, similar in texture to the Red Chalk of Speeton, with no trace of flint, of a greyish colour, and showing when broken, rich chocolate markings resembling the black spots indicating Manganese. It contains Terebratulæ, but of a much smaller kind than those found so abundantly at Speeton."

A similar formation, or rather the same, appears at another point nearer North Grimston, exposed for a length of several hundred yards on the same east side of the valley. On the west side it also appears at the base of the chalk, opposite Wharram Station (where there are springs at an elevation of 475 feet), with the same peculiar markings. It occurs at Dalglely and Nova. It is not White Chalk, it cannot be called Chalk Marl exactly, though at Nova and other places it is friable and clayish; but it must be the equivalent of the formations known in the south under the terms Chalk Marl, Upper Greensand, and Gault," pp. 5.

In a very elaborate paper† on the lower part of the Upper

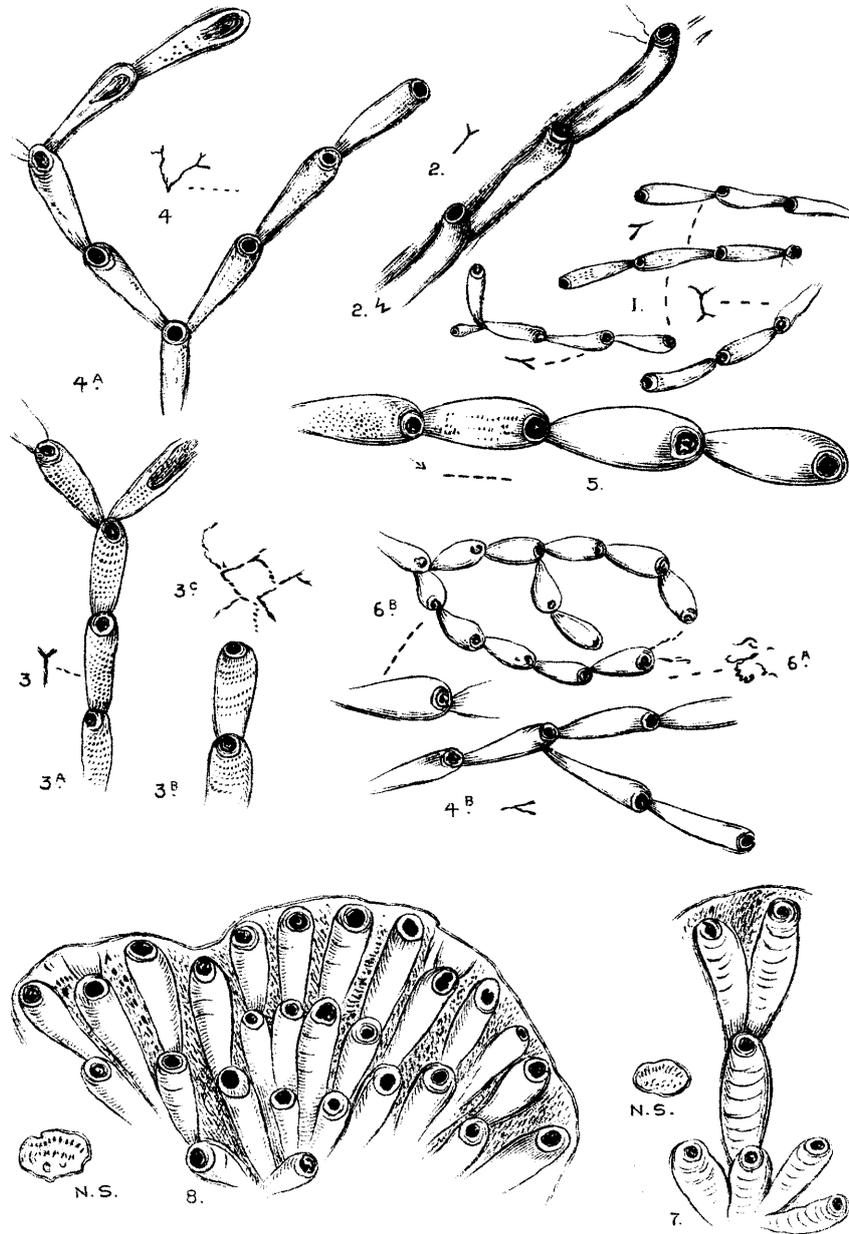
---

\* Proc. Yorksh. Geol. and Polyt. Soc., vol. vii., pp. 1-11.

† Quart. Journ. Geol. Soc., vol. xliii., pp. 592-593, 1887.

DESCRIPTION OF PLATE.

1. *Stomatopora gracilis*, Edw., var. *delicatula*, Vine.
2. „ *ramea*, Blainville.
3. „ *granulata*, Edw.
4. „ *longiscata*, d'Orb.
5. „ *linearis*, d'Orb.
6. „ *divaricata*, Rømer.
7. *Diastopora hunstantonensis*, Vine. The central cells of a small colony.
8. *Diastopora hunstantonensis*, Vine. Var. A. Probably the *D. contracta*, Seeley.



VINE: POLYZOA AND MICROZOA.

Cretaceous Series in West Suffolk, the authors, Messrs. A. J. Jukes-Browne and W. Hill, remark as follows :—

“ We are now in a position to indicate the bearing of our work on the debated question of the exact age of the Red Chalk. In the absence of anything like ordinary Gault, Upper Greensand, or Chalk Marl at Hunstanton, the remarkable stratum which there lies at the base of the Chalk has been referred by different observers to each of the formations which appeared to be missing, to the Gault by most of the early writers and by Mr. Wiltshire, to the Upper Greensand by Prof. Seeley (on the strength of its fossils being similar to those of the Cambridge Greensand), and lastly to the Chalk Marl by Mr. Whitaker. Every one, however, has discussed the question principally from a local point of view, founding their arguments mainly upon a consideration of the rock and its fossils as seen at Hunstanton.”

After stating their views rather more fully the authors seem to find a decisive answer to the question of age in the following premises :—

1. “ That the Norfolk Gault becomes increasingly calcareous towards the north, till at Dersingham it passes into 7 feet of marly and chalky material. the lower part of which is coloured red.
2. That the microscopical structure of the Hunstanton Rock bears the same relation to the red and yellow marls of Dersingham that the hard chalk marl of Norfolk does to the softer Chalk marl of Cambridge.
3. That the hard whitish limestone which overlies the representative of the Gaults from Grimstone to Dersingham is identical, in our opinion, with the so-called “ sponge-bed ” which overlies the Red Rock at Hunstanton.
4. That the fossils are chiefly Gault species, and are such as would constitute a deep-sea fauna contemporaneous with that of the shallower and muddier water in which the Gault of South England was formed.

From these premises we come to the uncontrovertible conclusion that the Red Rock of Hunstanton must be the equivalent of the Gault, and not of its upper divisions only but that it is a condensed

## 370 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

representative of both Lower and Upper Gault, formed outside of the limits of the area reached by mud-bearing currents."

In his concluding remarks in the "address" already referred to, Mr. Whitaker says, "From the evidence before us it seems to me that our Red Chalk is probably one of two things; either it is a part of the Lower Chalk or else it is a representative of that and of the upper part of the Gault. It is certainly chalk to some extent. Consequently, were I obliged to confess my belief in any one formation, I should simply say that Red Chalk is—Red Chalk." (p. 234, *op. cit.*)

## II. DESCRIPTION OF THE POLYZOA.

In the two papers published in the Proceedings of this Society\* I have described as fully as was possible the Polyzoa of the Cambridge Greensand. In presenting another paper on the Polyzoa of the Red Chalk of Hunstanton, it is only fair to state that a Monograph of the Polyzoa of the Red Chalk has already been published in the Journal of the Geological Society.† As, however, so many of my papers on Polyzoa have been read before the members of this Society and published in their Proceedings, one perfectly distinct from the other on the Red Chalk may not be deemed out of place. In the Monograph referred to only the new species that are described are figured, but though I have adopted D'Orbigny's names for some of the uniserial Stomatopora, the figures of the British examples may be produced with advantage to illustrate the present paper, but there will not be any need to re-describe the species except when additions or alterations are made.

## Sub-Order CYCLOSTOMATA, BUSK.

## A. Parallelata, Waters.

*Zoaria* encrusting, dendroid or anastomosing. Surface of *Zoarium* to a large extent formed of the lateral walls of Zoecia.‡

## Genus STOMATOPORA, BRONN.

1821. *Alecto* Lamouroux (Blainville, Johnston, Edwards and Busk).

\* 1885. Polyzoa of the Cambridge Greensand.—*Proc. Yorksh. Geol. Soc.*, vol. ix  
1889. Further Notes on the Camb. Greensand Polyzoa.—*Ibid.* vol. xi., p. 250.

† *Quart. Journ. Geol. Soc.*, vol. xlv., pp. 454—486.

‡ A. W. Waters, *Quart. Journ. Geol. Soc.*, vol. xliii., p. 337.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 371

1825. *Stomatopora*, d'Orbigny, for uniserial species.

*Zoarium* repent, adnate, or free at the extremities, uniserial, branching, and occasionally anastomosing.

In working out the uniserial *Stomatopora* of the Red Chalk, I have, generally speaking, followed the leading of d'Orbigny, but it is not always safe to adopt his names for British examples without some qualification at least.

1. *Stomatopora gracilis*, M. Edw. (*Alecto*), *Ann. Sc. Nat.* (9) p. 207, pl. 46, f. 2.

Var. *delicatula* (new. var.), pl. xvii., fig. 1.

1890. *S. gracilis*, Edw. (var.), *Vine, Quart. Jour. Geol. Soc.*, vol. xlvi., p. 463.

*Zoarium* delicate, wholly adherent. *Branches* dichotomizing irregularly, and variable in breadth and length. *Zoecia* uniserial, originating from a disc-like base from which two cells are generally thrown off, and these form the nucleus of two branches; slightly lateral in their points of juncture; aperture circular turning alternately to the left and right on the branch, and sometimes raised upwards.

Habitat : The most typical examples on *Terebratula biplicata*.

Typical *S. gracilis*, vary very much both in the Neocomian and in the Upper Chalk, so much so that one hesitates to put the forms under one name. In the variety described above, the delicate character of the Hunstanton forms, which, by the way, are most abundant, and adherent also to a variety of fossils, appear to me to warrant their separation from the more robust species.

2. *Stomatopora ramea*, Blainville, pl. xvii., fig. 2-2a.

1834. *Alecto ramea*, Blainv. *Man. de Actinozoa*, p. 464, pl. 78, fig. 6.

1850. *Alecto ramea*, Lonsdale, *Geol. of Sussex*, p. 268, p. xviii., figs. 35-40.

1890. *Stomatopora ramea*, Vine. *Quart. Jour. Geol. Soc.*, vol. xlvi., p. 465.

Examples of this species are rare in the Red Chalk. The *Zoarium* is, as Lonsdale says, uniserial, and the branching "irregularly divergent and nearly uniform in breadth, but bordered by a narrow band. *Zoecia* nearly uniform in width, peristome inclined upwards, aperture circular; when worn slightly oval.

## 372 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

Habitat : On *Terebratula biplicata*, Sby.

3. *Stomatopora granulata*, M. Edw., pl. xvii. fig. 3, 3a.b.c.  
 1838. *Alecto granulata*, Ed., Sur les Cris., &c., pl. xvi., figs. 3, 3a.  
 1875. *Alecto granulata*, Busk, Brit. Mus. Cat., pt. iii., pl. 32, fig. 1.  
 1880. *Stomatopora granulata*, Hincks, Brit. Marine Polyz., p. 425.  
 1889. *Stomatopora granulata*, Waters, Quart. Journ. Geol. Soc.,  
 vol. xliii., p. 341.  
 1890. *Stomatopora granulata*, Vine, Ibid., vol. xlvi., p. 464.

*Zoarium* variable in shape, and in the general arrangement of its anastomosing branches, which are more or less linear. *Zoecia* uniserial, almost uniform in breadth, oral extremity occasionally erect and free; cells punctured in the younger, granular in the older colonies. *Gonæcium* (?) a cell rather more inflated about the aperture than ordinary *Zoecia*.

Habitat : On *Inoceramus* sp. and on *Terebratula biplicata*, Sby.

This species is not abundant in the Red Chalk, yet I have met with some fairish examples.

4. *Stomatopora granulata* (Edwards). Var. *incrassata* d'Orb.  
 1852. *Stomatopora incrassata* d'Orb., Terr. Cret., vol. v., p. 837,  
 pl. 628, figs. 9-11.  
 1890. *Stomatopora granulata*, var. A, Vine, Quart. Journ. Geol.  
 Soc., vol. xlvi., pl. 465.

The *Zoarium* of this variety is much more stunted, more compressed, and more anastomosing than the normal form. I follow Mr. Waters in identifying the *S. incrassata* d'Orb. as a variety of *S. granulata* Edwards, as, irrespective of size, the two have many features in common.

Habitat : On *Terebratula biplicata*.

5. *Stomatopora longiscata* d'Orb., pl. xvii., figs. 4a, b, c.  
 1852. Ibid d'Orb., Terr. Cret. v., p. 839, pl. 629, figs. 9-11.  
 1890. *Stomatopora longiscata*, Vine, Quart. Journ. Geol. Soc.,  
 vol. xlvi., p. 465.

Examples of this species are rare in the Red Chalk, but I have come across fragments that may be reasonably placed here. This is one of the species previously noticed by Mr. Wiltshire from the bottom layer (C) of the Red Chalk, and which he characterised as rare.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 373

Habitat : On *Terebratula biplicata*.

6. Stomatopora divaricata, Roemer, pl. xvii., fig. 6a-6b  
 1840. Aulopora divaricata, Roemer, vol. ii., p. 15., pl. 17., fig. 3.  
 1850 = ? *Alecto brevis*, d'Orb., Terr. Cret., v., p. 840, pl. 629.  
 1890. Stomatopora divaricata, Vine, Quart. Journ. Geol. Soc.,  
 vol. xlvi., p. 463.

Adherent to a large number of fossils, many of them species of Inoceramus or Terebratula, is a peculiarly blunt, or stunted Stomatopora, figures of which are given. The forms are not unlike the so-called *Hippothoa inflata*, Hall, a Silurian species first brought to our notice, with admirable descriptions and figures, by Professor H. A. Nicholson.\* In the Jurassic rocks there are similarly stunted forms, but as these have not been described I cannot refer to them more minutely. The Hunstanton examples of this species, if I am correct in my identification, are very characteristic; and the figures, though sketched by the eye, may be relied on as pretty correct in outline. Detail sketches are not easy to obtain owing to the species being adherent to most of the larger fossils.

Habitat : Type of fig. on *Terebratula biplicata*.

7. Stomatopora linearis, d'Orb., pl. xvii., fig. 5.  
 1852. Stomatopora linearis, d'Orb., Terr. Cret., v., p. 838,  
 pls. 629-658.  
 1890. Stomatopora linearis, Vine, Quart. Jour. Geol. Soc., vol. xlvi.,  
 p. 466.

I have met with only one unbranched specimen of this species in the Red Chalk of Hunstanton. The example differs from d'Orbigny's fig. in some respect, but only slightly. The *Zoecia* of the British form are rather less oval than the French species of d'Orb.

Habitat : On *Terebratula biplicata*.

It may be well for the student to compare the British uniserial Stomatopora, as figured on plate xvii., with foreign examples figured by d'Orbigny, Reuss, and other authors, because, to prevent the loading of our literature with new names, injustice is too often done to our British fauna in adopting foreign names for species without a proper caution being given.

---

\* *Annal. Mag. Nat. Hist.*, s. 4, vol. xv., Feb., 1875, pl. xi., figs. 1-2.

Genus *PROBOSCINA* (Audouin) d'Orbigny.

The Genus *Proboscina* is a convenient, rather than an essential division of the *Stomatopora* group. As defined and accepted by d'Orbigny, the genus loses much of its individuality, for many of his species have been variously located by other authors. Mr. Hincks says (Brit. Marine Polyzoa, p. 432) "I do not venture to identify *Stomatopora expansa* with d'Orbigny's *Proboscina ramosa* (= *Idmonea cenomana* d'Orb.) though it bears a strong general resemblance to it," while *Tubulipora fimbria*, Lamk. (op. cit. p. 448) = *T. flabellaris* Busk (Cyclostomata, p. 25) is identified by both authors as ? *Proboscina latifolia* d'Orb. In working up their material, both Mr. Busk and Mr. Hincks disallow the genus for recent species; the latter author bracketing the *Stomatopora* whose zoaria are partially erect and free, as the Sub-genus *Proboscina* Smitt. *Stomatopora incrassata*, Hincks, thus absorbs *Tubulipora* (*Proboscina*) *incrassata* Smitt, *Alecto retiformis* Hincks, and ? *Filisarsa incrassata* D'Orb. From this it is manifest that unless the genus is more rigidly defined and limited, it would be impossible to accept it for the purposes of this memoir. By Reuss,\* and Novak,† and recently by Mr. Walford‡ *Proboscina* has been accepted as a kind of passage genus intervening between *Stomatopora* and *Diastopora*.

Jules Haime, in his admirable memoir on Jurassic Bryozoa, accepts *Proboscina* as a passage group, and he suggests that probably *Cellepora echinata*, Goldf. = *Tubulipora echinata*, Hag., and *Siphonotyphlus plumatus*, Lonsdale, are really *Proboscina* species; and *Diastopora ramosa*, Mich. Lonsd. is undoubtedly another. Haime, in his monograph, cites other species, and these are probably *Proboscina* Haime, = *Idmonea* (in part.) d'Orb.

Mr. E. O. Ulrich, in reviewing some of Prof. Nicholson's *Alecto* species,|| places two of them in the *Proboscina* group. Thus *Alecto confusa* Nich. and *Aulopora frondosa* James, become *Proboscina* respectively; and Mr. Ulrich remarks that the Silurian forms are

\* Bryozoen des Unteren Planers, in Geinitz's Ethalger, in Sachsen, vol. 1, and Ibid, vol. ii. † Bryoz der böhmischen Kreideformation.

‡ Quart. Journ. Geol. Soc., vol. xliii., and Ibid, vol, xlv.

|| Ann. Mag. Nat. Hist., Ser, iv., vol. xv., 1875.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 375

like Stomatopora "but with cells in two or more series."\* As yet I have not found multiserial-serial *Proboscina* in our own Silurian rocks, but the antiquity of the genus is sufficiently established by the citations already given.

From the above notes, all too brief, it will be gathered that there is a difficulty whenever we attempt to establish *Proboscina* as a natural division of the Stomatopora group; yet I find that in spite of these difficulties, that both in the Red Chalk and also in the Upper White Chalk the adoption of the genus is most convenient, but only in very rare cases are similarities even, much less identity, between British and foreign species noticeable.

The following species have been fully described in the paper already referred to, and as regards new species fully illustrated.

8. *Proboscina angustata*, d'Orb., Terr. Cret., p. 852, pl. 632, figs. 7, 9.

1890. Varieties (Vine) Quart. Jour. Geol. Soc., vol. xlvi., p. 467, pl. xix., 1, 1a.

1885. *Stomatopora gracillis* (?) Vine, Proc. Yorksh. Geol. Soc., vol. ix., p. 4, pl. ii., fig. 7.

Examples of this species are rare in the Red Chalk, and as they differ from the type species of d'Orb., I place them here temporarily.

Habitat : On *Terebratula biplicata*.

9. *Proboscina rugosa* (?) d'Orb.

1852. *Proboscina rugosa* d'Orb., Terr. Cret. p. 853, pl. 633, figs. 6, 7.

1890. ., ., (?) Vine, Quart. Journ. Geol. Soc., vol. xlvi., p. 468.

Habitat : On *Terebratula*, *Inoceramus* and *Ammonites*.

10. *Proboscina irregularis*, Vine.

1890. Ibid. Quart. Journ. Geol. Soc. *Ibid*, p. 468, pl. xix., figs. 2a, 2b.

Var. A. Figs. 2c, 2d.

Habitat : On *Terebratula* and *Belemnites*.

This species is only known to me by a few rather imperfect examples besides the type species.

---

\* Jour. Cincin. Soc. Nat. History, 1882, p. 149.

376 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

11. *Proboscina uberima*, Vine., Quart. Jour. Geol. Soc., vol. xlvi., p. 469, pl. xix., figs. 3a-3b.

Habitat : On *Inoceramus? sulcatus*.

The type species is the only example that I have met with in the Red Chalk.

12. *Proboscina gracilis*, Reuss, var. *Reussi*, Vine, Quart. Journ. Geol. Soc., vol. xlvi., p. 469, pl. xix., figs. 4-4b.

Habitat : On *Terebratula biplicata*.

This species is also rare in the Red Chalk.

13. *Proboscina subelegans*, d'Orb., Terr. Cret. v., p. 853, pl. 759, figs. 8-13.

1890. *Stomatopora subelegans*, Pergens Rev. Bryoz. Cret., p. 332, pl. xi., fig. 3.

1890. *Proboscina subelegans*, Vine, Quart. Jour. Geol. Soc., vol. xlvi., p. 470.

Of this species I noticed in the material placed in my hands for description about three fairish examples only.

Habitat : On *Inoceramus*.

14. *Proboscina hunstantonensis*, Vine, Quart. Journ. Geol. Soc., vol. xlvi., p. 470, pl. xix., fig. 5.

Habitat : On *Inoceramus* and *Terebratula biplicata*.

This is by far the most characteristic and abundant of the Red Chalk *Proboscinae*. The variety differs from the type species, but I find that it is impossible to separate them altogether except by a varietal term.

15. *Proboscina hunstantonensis*, Vine. Var. *ampliata*, Vine, Ibid, pl. xix, figs. 6-6a.

Habitat : On *Inoceramus*.

Not so abundant as the typical form.

16. *Proboscina Jessoii*, Vine. Ibid, p. 471, pl. xix., figs. 7a-7b.

Habitat : On *Terebratula biplicata*.

This beautiful and well-marked species is rare in the Red Chalk. It is not often that we meet with examples of *Proboscina* having the orifices of the cells closed, but in this species several of the middle cells of the colony have not only closed cells, but the "closures" are delicately perforated.

VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 377

17. *Proboscina gigantopora*, Vine. Ibid, p. 471, pl. xix., figs. 8-8b.  
Reference : *Entalophora gigantopora* (Proboscidian stage),  
Vine, Camb. Greensand Polyzoa, Proc. Yorksh. Geol. Polyt.  
Soc., vol. ix., 1885, p. 8, pl. i., fig. 3, and vol. xi., 1889,  
p. 262, footnote.  
Habitat : On *Terebratula biplicata*.
18. *Proboscina bohemica* (?), Novák. Var. (Vine) Op. cit., p. 472,  
pl. ix., figs. 9a-9b.
1877. *P. bohemica*, Novák, Bryoz., Böhm, Kreidef, p. 101, pl. v.,  
figs. 24-25.
- 1852 (?). *Idmonea radiolitorum* d'Orb., Terr. Cret. v., pl. 633,  
figs. 8-10.  
A beautiful little polyzoon, and closely resembling Novák's species.  
Habitat : On *Terebratula biplicata*.
19. *Proboscina Toucasiana* (?), d'Orb., Terr. Cret. v., p. 856, pl. 634,  
figs. 1-6.
1890. Vine, Quart. Journ. Geol. Soc., vol. xlvi., p. 472.  
Habitat : On *Terebratula biplicata*.
20. *Proboscina ramosa* (?) d'Orb., Terr. Cret. v., p. 851, pl. 632,  
figs. 1-3, pl. 633, figs. 1-3. Vine, Quart. Journ. Geol.  
Soc., xlvi., p. 473.  
Habitat : On *Inoceramus*.
21. *Proboscina dilitata*, d'Orb., Terr. Cret., v. p. 851, pl. 632,  
figs. 4, 6.  
Prof. Seeley remarks of this species that the fossil is about  
intermediate between d'Orbigny's figures of *Idmonea dilatata* and  
*Idmonea virgula*, being nearer to the former. It appears to differ  
a little too, in having the mouths more contracted. Ann. Mag. Nat.  
Hist. Ser. iii., vol. xvii., p. 181, 1866.
22. *Proboscina dilitata* var. *cantabrigiensis*, Vine, Quart. Jour. Geol.  
Soc., vol. xlvi., p. 473.
1889. *P. dilitata* var. *cantabrigiensis*, Vine.  
Further Notes on the Polyzoa of the Cambridge Green-  
sand. Proc. Yorksh. Geol. Soc., vol. xi.
1890. Ibid., Vine. Quart. Jour. Geol. Soc., vol. xlvi., p. 473.  
Habitat : Red Chalk. Cast only.

## 378 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

So far as I am concerned all that I have seen at all resembling the *P. dilutata*, d'Orb., is a cast of a species similar to the one referred to in my Greensand paper. Its existence, however, is recorded by Prof. Seeley in his 1864 paper, and by the Rev. T. Wiltshire, but marked rare (top layer Red Chalk). Therefore I retain d'Orb. name, so as to admit the identifications of Prof. Seeley and the Rev. T. Wiltshire.

---

Genus *DIASTOPORA* Lamx.

The *Diastopora* of the Red Chalk are a very peculiar and a very characteristic group of fossils. Most of the species now to be referred to are altogether unlike any known British forms, but some are evidently allied to species described by d'Orbigny and other authors, derived from foreign Cenomanian or Senonian horizons; while others, such as *D. hunstantonensis* and its allies are quite distinct and new to science.

As already stated Prof. Seeley has catalogued (1864) three species, *Berenicea polystoma* Rœm; *B. contracta* Seeley; and *B. clementina* d'Orb;\* but in his 1866 paper only one species, *B. contracta* Seeley is described. It is quite possible that this form may be one of the varieties of *D. hunstantonensis* Vine, of which species there are several varieties, and as no figures are given by the author it may be well to retain it, below which Mr. Seeley's remarks will appear. The other species I have not been able to identify. The *Cellulipora sulcata* Seeley will be retained as *Diastopora*, but I am not aware that I have come across a similar species in the Hunstanton Red Chalk. As Prof. Seeley's fossils are preserved in the Woodwardian Museum, probably labelled with the specific term *sulcata*, I feel that I have no right to suppress it in this memoir.

23. *Diastopora hunstantonensis*, Vine. Fig. 7 (small example).

1890. *D. hunstantonensis*, Vine, Quart. Journ. Geol. Soc., vol. xlvii., p. 475, pl. xix., figs. 10a, 10b.

This is the most abundant and most characteristic of all the Red Chalk Polyzoa. I have found examples of it adherent to a large number and variety of fossils, especially the larger Ammonites. On

---

\* 1864 Ann. Mag. Nat. History.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 379

one Ammonite alone I counted more than a dozen colonies, but I was unable to study these forms under the microscope on account of the size of the Ammonite, and in examining them by the hand glass, which was by no means satisfactory, I might have overlooked several varieties, and the *D. contracta* Seeley, might be one of the forms that has not been previously recorded by me. It will be noticed in my list of *Proboscina* species that one bears the name *P. hunstantonensis*, Vine; evidently the Proboscina thus named is an ally of the present form.

Habitat : On Terebratula, Inoceramus, Ammonites, and almost on every class of fossils referred to.

24. *Diastopora hunstantonensis*, Vine. (Var. A.) fig. 8, Quart. Jour. Geol. Soc., p. 475, pl. xix., figs. 11a, 11b.

A well-marked variety of this beautiful species.

Habitat : On Inoceramus and Terebratula

25. *Diastopora hunstantonensis*, Vine.  
? Var. *contracta*, Seeley. Ann. Mag. Nat. Hist., Ser. iii., vol. xvii., p. 181, 1866.

Prof. Seeley remarks that the species which he has described as *Berenicea contracta*, "resembles *Diastopora clementina* d'Orb. (Terr. Cret. v., p. 865, pl. 636, figs. 1, 2), of which it is a good variety. It is attached, *orbicular*, and has the cells arranged like an extended fan; these are very distinct and narrow, being about twice as long in proportion to their width, as in *B. clementina*, and contract from the point where they first appear, to the aperture, which is very small. This tapering character of the cells suffice to distinguish it from all other forms."

26. *Diastopora fœcunda*, Vine.  
1885. *Diastopora fœcunda*, Vine, Proc. Yorksh. Geol. Polytech. Soc., vol. ix., p. 9.  
1889. *Diastopora fœcunda*, Vine, Ibid, vol. xi., p. 266.  
1890. *Diastopora fœcunda*, Vine, Quart. Jour. Geol. Soc., vol. xlvi., p. 476.

The Red Chalk form is rather larger than the one described in the Cambridge Greensand papers.

Habitat : On a Water-worn piece of Chalk.

380 VINE: POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

27. *Diastopora regularis*, d'Orb.

1850. *D. regularis* d'Orb., Terr. Cret. v., pl. 636 (fig. 10 only).

1851. *D. densata* d'Orb., ibid, pl. 637, figs. 1, 2.

1851. *D. orbicula* d'Orb., ibid, pl. 637, figs. 3, 4.

1852. *Berenicea regularis* d'Orb., p. 865, ibid, pl. 636, figs. 9, 10,  
pl. 637, figs. 3, 4.

1869. „ „ Wiltshire, Ann. Mag. Nat. Hist., vol.  
xxv., p. 187.

1890. *Diastopora regularis* Vine, Quart. Jour. Geol. Soc., vol. xlvi.,  
p. 476.

A well-marked and characteristic species as restricted above,  
and the only one that I have met with.

Habitat : On *Terebratula biplicata*.

28. *Diastopora radians* Novák, Variety ?

1877. *Berenicea radians* Novák, Bryoz. böhm. Kreidef., p. 98,  
pl. iv., figs. 15, 18.

1890. *Diastopora radians* ? Vine, Quart. Journ. Geol. Soc., vol.  
xlvi., p. 477.

The example which I place under Novák's name, as a variety of  
his species, is the only one that I have met with amongst the Red  
Chalk fossils.

Habitat : *Terebratula biplicata*.

29. *Diastopora papillosa* (?) Reuss.

1846. *Diastopora papillosa*, Reuss. Verst. böhm. Kr., p. 65, pl. xv.,  
figs. 44, 45.

1847. „ *papillosa*, d'Orb., Prodr. ii., p. 266.

1847. „ *oceanica*, d'Orb., ibid.

1851. „ *disciformis*, Hag. Bryoz. Maastr. Kreid., p. 16,  
pl. x., f. 7.

1852. *Berenicea papillosa*, d'Orb., Terr. Cret. v., p. 866, pl. 639,  
figs. 6, 7.

1890. *Diastopora papillosa*, Vine, Quart. Journ. Geol. Soc., vol. xlvi.,  
p. 477.

The Red Chalk form is disciform, one colony overlapping another,  
originating cells central.

Habitat : On *Terebratula biplicata*.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 381

30. *Diastopora Jessoni*, Vine.

1890. *Diastopora Jessoni*, Vine, Quart. Journ. Geol. Soc., vol. xlvi., p. 478, pl. xix., figs. 12a, 12b.

This beautiful little species is only known to me by a few examples, the most perfect of which is taken as the type.. My reasons for naming it after Mr. Jesson are given in the descriptive text in the Quart. Journ. Geol. Soc., p. 478.

Habitat : On *Terebratula biplicata* ; *Nautilus albensis*, d'Orb.

31. *Diastopora sulcata*, Seeley.

1866. *Cellulipora sulcata*, Seeley, Ann. Mag. Nat. Hist., vol. xvii, p. 181.

“The form of the colony in this species is similar to that of *Cellulipora spongiosa*, d'Orb. (*D. spongiosa*, d'Orb., 1850, Terr. Cret. v., p. 874, pl. 637, f. 5, 6), with which it is most closely related. . . *D. Sowerbyi*, Lonsdale, belongs to this genus (*Cellulipora*), and is nearly related, and may even be this species, but from the important characters being overlooked in the description and figure, I cannot determine the point.” Seeley.

32. *Unitubigera papyracea*, d'Orb.

1850. *Actinopora papyracea*, d'Orb.

1852. *Unitubigera papyracea*, d'Orb., Terr. Cret. v., pl. 643, figs. 12, 14.

1890. „ „ Vine, Quart. Journ. Geol. Soc., vol. xlvi., p. 479.

This species is rare in the Red Chalk, but the example that I place here, though almost unique, is very distinct. Only one other broken specimen has been found.

Habitat : On *Terebratula biplicata*.

---

Genus ENTALOPHORA, Lamx.

The following may be recorded but examples are very rare, and very ill preserved.

33. *Entalophora proboscidea*, Edw.

1890. *Entalophora* ? sp. Quart. Journ. Geol. Soc., xlvi., p. 479.

Habitat : On *Spondylus*. Red Chalk, Hunstanton.

382 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

It is useless to give any synonyms of the above species in this case, as I am somewhat doubtful about the identity of this ill-preserved example, but I believe that I am right.

§ B. RECTANGULATA, Waters.

In which the Zoœcia or cancelli open for the most part at right angles to the axis or surface of the Zoarium or sub-colony.

Genus CERIOPORA, Goldfuss.

1826. *Ceripora* (pars.) Goldf. : *Petrifacta*, &c.

In establishing the genus *Ceripora*, Goldfuss accepted for his type *Alveolites*, Lamarck ; altogether Goldfuss described about 37 species, but since his time the genus has been broken up considerably. d'Orbigny admits (*Terr. Cret. v.*, p. 1030) the following Cretaceous species :—

1830. *Ceripora tubiporacea*, Goldf., *Petrifacta*, pl. x., f. 13.

„ „ *milleporacea* „ „ pl. x., f. 10.

„ „ *micropora* „ „ pl. x., f. 4.

1845. *Ceripora truncata*, Mich. *Icon.*, pl. li., f. 7.

34. *Ceripora micropora* ? Goldf. (*Vine*), *Quart. Journ. Geol. Soc.*, vol. xlv., p. 480.

Two examples of this species were found among the fossils submitted to me for examination.

Habitat : Embedded in fragments of Red Chalk.

Horizon : Middle Bed, Hunstanton.

Genus REPTOMULTICAVA, d'Orb.

1826. *Ceripora* (pars.) Goldfuss ; Blainville.

1852. *Reptomulticava*, d'Orb., *Terr. Cret. v.*, p. 1032.

35. *Reptomulticava simplex*, d'Orb., *Terr. Cret. v.*, p. 1041, pl. 793, fig. 5.

Habitat : On *Terebratula biplicata*.

36. *Reptomulticava collis*, d'Orb., *Terr. Cret. v.*, p. 1036, pl. 792, , figs. 1, 3.

1890. *R. simplex* and *R. collis*, Vine, *Quart. Jour. Geol. Soc.*, vol. xlv., p. 481.

37. *Reptomulticava mamilla*, Rss. (Wiltshire).  
 1869. Quart. Jour. Geol. Soc., vol. xxxv., p. 187.  
 Horizon : Middle and Lowest layers. Red Chalk, Hunstanton.  
 (Common, Wiltshire).
38. *Reptomulticava favus*, Seeley.  
 1866. Ann. Mag. Nat. Hist., Ser. iii., vol. xvii., p. 181.  
 A form, says Prof. Seeley, nearly related to *R. collis* and *R. mamilla*, but irregular in growth, more resembling d'Orb's *Ceriodora digitata*. It is a common fossil and may be marked *R. favus*.  
 Although I only admitted two species of *Reptomulticava* (Nos. 35 and 36) in my paper, the other two may be advantageously adopted. I have retained Prof. Seeley's name, however, as most appropriate for one of the undescribed examples in my cabinet.  
 Habitat : On Fragments of Water-worn Red Chalk.  
 Horizon : Top layer (A.) *Hunstanton*.

Genus ZONOPORA.

D'Orbigny in his 5th Family Caveidæ (Terr. Cret. v., p. 922) has brought together no fewer than twenty-seven genera, all of which are peculiar, or characteristic. The author includes in this family, Zonopora, Ditaxia, Lichenopora, Domopora and Radiopora. In his "Revision des Bryozoaires du Crétacé figures par d'Orbigny," Dr. Pergens,\* these genera are separated, and Zonopora and Multicrescis are designated Heteropora. For the convenience of reference, and to prevent any misinterpretation in the present paper of the Monograph of Red Chalk Polyzoa (Q. J. G. Soc., vol. xlvi), I quote the names given in the latter paper, with the additional references furnished by Dr. Pergens in his Revision.

39. *Zonopora irregularis*, d'Orb.  
 1840. *Zonopora irregularis*, d'Orb., Prodr. ii., p. 87.  
 1852. " " " d'Orb., Terr. Cret. v., p. 390, pl. 771,  
 figs. 4, 6.  
 1890. *Heteropora arborea* Koch. et Dunker. (Pergens.) Revis. des  
 Bryoz., p. 373.

---

\* Bulletin de la Soc. Belge de Geol. de Palæontologie, 1889, Tome iii., pp. 305, 400.

384 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

1890. *Zonopora irregularis* (?) Vine, Quart. Journ. Geol. Soc., vol. xlvii, p. 482.

Habitat : Embedded in Red Chalk.

Horizon : Top layer (A.) Hunstanton.

40. *Zonopora variabilis* (?), d'Orb.

1852. *Zonopora variabilis*, d'Orb., Terr. Cret., v., p. 931, pl. 771, figs. 9-13.

1890. *Heteropora variabilis*, Perg., Rev. des. Bryoz., p. 374.

1890. *Zonopora variabilis* (?), Vine, Quart. Journ. Geol. Soc., vol. xlvii, p. 482.

Two minute fragments are placed here doubtfully.

Horizon : Top layer (A.) Red Chalk, Hunstanton.

41. *Multicrescis variabilis*, d'Orb., Terr. Cret. v., p. 1077, pl. 800, figs. 3-7.

1890. *Multicrescis variabilis*, Vine, Quart. Journ. Geol. Soc., vol. xlvii, p. 483.

Horizon : Top layer (A) Red Chalk, Hunstanton.

42. *Heteropora tenera*. Hagenow, var.

1890. *Heteropora* (?) sp., Vine, Quart. Journ. Geol. Soc., vol. xlvii, p. 480.

I am rather doubtful about this species, as the fragments were very soft and did not yield good results when rubbed down for minute examination. Yet I have had fragments of Faringdon *H. tenera* just as doubtful to deal with, but being of a harder texture better results were obtained by rubbing.

Habitat : Decumbent on Water-worn Hunstanton Red Chalk.

43. *Lichenopora collis*, d'Orb.

1850. *Actinopora collis*, d'Orb., Terr. Cret. v., pl. 643, fig. 1-4.

1852. *Unicavea collis*, d'Orb., Ibid. p. 973, pl. 778, fig. 1-2.

1890. *Unicavea collis*, Vine, Quar. Journ. Geol. Soc., vol. xlvii, p. 483.

This species must not be confounded with *Reptomulticavea collis*, d'Orb., already described.

Habitat : On *Terebratula*, *Inoceramus*, and *Bourguetierinus*.

I have found two varieties of this species among my Red Chalk material.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 385

## § II. Sub-Order CHEILOSTOMATA, Busk.

Species belonging to this sub-order are very rare in the Red Chalk. The five well-marked species given below, are all that I have met with, and these are very fragmentary. Excepting the first, which is new, I have identified the other species to the best of my ability, but I think they ought to find a place here in the hope that better examples will be found in the future.

44. *Membranipora gaultina*, Vine, Quart. Jour. Geol. Soc., v. xlvi., p. 484, pl. xix., figs. 13a-13b.

Habitat : On *Inoceramus*, *Terebratula biplicata*, and *T. capillata*.  
Horizon : Gault, Cambridge ; Red Chalk, Hunstanton.

45. *Membranipora fragilis*, d'Orb.

1852. *Flustrellaria fragilis*, d'Orb., Terr. Cret. v., p. 545, pl. 723, figs. 5-9.

1890. *M. fragilis*, Vine, Quar. Journ. Geol. Soc., p. 485.

Habitat : On *Terebratula biplicata*, Red Chalk, Hunstanton.

46. *Membranipora? obliqua*, d'Orb.

1852. *Filiflustraria obliqua*, d'Orb., Terr. Cret., v., p. 513, pl. 723, figs. 1-4.

1890. *M. obliqua?* Vine, Q. J. Geol. Soc., vol. xlvi., p. 485.

The fragment, adherent to *Belemnites minimus*, is the only example of this species known to me from the Red Chalk of Hunstanton.

47. *Membranipora elliptica?* Hagenow.

*Cellepora elliptica*, Hag. *Marginaria elliptica*, Rœm.

*Membranipora elliptica* d'Orb.

1877. *M. elliptica*, Novák, Bryoz. böhm, Kreide, p. 89, pl. 2, fig. 16.

Hesitating, as I do, to identify this species with von Hagenow's *C. elliptica*, I refer the student, with pleasure, to the long list of synonyms and references given by Novák. I have only one example, and as Novák's fig. 16, pl. ii., closely resembles its general features, his identification is adopted.

Habitat : On *Pentacrinus Fittoni*, Red Chalk, Hunstanton.

48. *Hippothoa? simplex*, d'Orb.

1851. *Hippothoa simplex*, d'Orb. Terr. Cret., v., p. 385, pl. 711, figs. 5-8.

386 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

1890. *Hippothoa simplex*, Vine, Q. J. Geol. Soc., vol. xlvi, p. 486,  
very rare in the Red Chalk.

Habitat : On *Inoceramus*, Red Chalk, Hunstanton.

In my Monograph of the Polyzoa of the Red Chalk\* of Hunstanton I have only catalogued 43 species and varieties, the additional 5 species or varieties in this paper are made up chiefly from the identifications of other authors, which, I consider it would be unwise to suppress.

---

III. ENTOMOSTRACA.

When examining the material sent to me by Mr. Jesson, every now and again I came across fragments of broken chalk, or broken shell, on which were examples of either Ostracoda or Foraminifera. At least four or five species were found in this way, but as I did not intend to work out these two groups when I had the polyzoa paper in hand, I returned the attached forms to Mr. Jesson with the other unused fossils. Most of the Entomostraca, so far as I remember, belonged to the *Cytherella* and probably *Bairdia* groups, and the Foraminifera were *Lituola* and *Cristellaria* species. Among the rest of the material sent to me was a small box of powdered fragments of Red Chalk from the top layer of the Hunstanton bed. This I reserved for the purpose of manipulation, and after washing and sifting I was able to pick out the Microzoa, which will be described in this part of my paper. Neither Foraminifera nor Entomostraca were in any abundance, in many cases the examples that will be referred to are unique. Occasionally I came across a small fish tooth or a minute fragment of Echinodermata, spines chiefly, which I am not able to describe, but their presence may receive a passing notice. Thin sections of the Red Chalk of Speeton and Hunstanton, together with sections of White Chalk from the layers which overlay the Red Chalk of Speeton and Hunstanton have been carefully prepared and examined for the purpose of studying the difference between the red layers of Norfolk and Yorkshire. Examples of the Lincolnshire Red Chalk I was not able to get.

---

\* Quart. Journ. Geol. Soc., vol. xlvi., 1890.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 387

It must not be imagined, therefore, that this part of my paper is in any way exhaustive; indeed our knowledge of the Microzoa of the Red Chalk is only in its infancy, but every little addition to that knowledge will help in a good work, and others may benefit by even a single record. As regards the Entomostraca my chief references will be to Prof. T. Rupert Jones' Monograph of Cretaceous Entomostraca,\* and to the Supplementary Monograph recently published by Messrs. T. R. Jones and G. H. Hinde.† In the 1849 Monograph only one species, *Cytherella ovata*, is recorded as derived from the Red Chalk of Flamborough; in the second Monograph none are recorded, not even the *C. ovata* as above. I am, glad therefore, to be able to add to the Red Chalk list five additional species.

## Genus BAIRDIA, M'Coy.

1. Bairdia sub-deltaidea, Münster.  
1849. Bairdia sub-deltaidea, Jones, Monog. Entom. Cret. p. 23,  
pl. v., fig. 15.  
1856. Bairdia sub-deltaidea, Jones, Monog. Entom. Tert., p. 52.  
1890. „ „ „ Jones and Hinde, Monog. Entom. Cret.  
p. 5, pl. ii., figs. 31-34.

A long list of synonyms and references is given by the authors in the last (1890) citation above, p. 5, to which the student is referred. The unique example which I place here is more like the fig. 34 (right valve), pl. ii., (Monog. Entom. Cret., J. and H.), than any of the others in this, or in the earlier Monograph.

## Localities (Jones and Hinde).

*Chalk* : Norwich, Horstead, Colchester, and South East England ;  
Cave Hill (Antrim), and Keady Hill (Londonderry).

*Chalk-rock* : Dunstable and Luton (Bedfordshire) ; West Wycombe  
(Buckinghamshire) ; Chinnor (Oxfordshire).

*Chalk-Marl* : Didcot (Berkshire) ; *Detritus* : Charring (Kent).  
Red Chalk Hunstanton, Vine.

*Gault* : Godstone (Surrey) ; *Greensand* : Cambridge and War-  
minster.

2. Bairdia Harrisiana, Jones.

\* Palæontographical Soc., 1849.

† Palæontographical Soc., 1890.

388 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

1849. *Bairdia Harrisiana*, Jones. Monog. Entom. Cret., p. 25.

1890. „ „ J. and H., Monog. Entom. Cret., p. 8,  
pl. ii., figs. 52-55.

The examples which I place here are like the Cambridge Greensand forms in my possession, "elongate, convex, and narrow," which were at first identified by Prof. T. R. Jones as "*Argillæcia? Harrisiana*."

Localities : *Chalk* : Keady Hill (Derry) ; Gravesend and Charlton (Kent) ; *Chalk Rock* : Dunstable ; *Detritus* : (Charing) ; *Red Chalk Hunstanton* (Vine) ; *Greensand* : Cambridge ; *Gault* : Folkestone and Leacon Hill.

---

Genus CYTHEREIS, Jones, 1849.

3. *Cythereis auriculata* (Cornuel) (fig. 53, more particularly J. and H., pl. i.)

*Cythere auriculata* Corn. (part) Mem. Soc. Geol. France.

1890. *Cythereis auriculata* J. and H., Monog. Entom. Cret., p. 19,  
pl. i., figs. 56-61.

"Specimens of this particular form have been obtained by Mr. F. Chapman, from the Gaults of Folkestone (Kent), and Godstone (Surrey). Figs. 53 and 64 are typically sub-oblong, broadly rimmed and denticulate in front, and bear the two longitudinal swellings characteristic of this species." p. 20, op. cit). The unique Red Chalk form bears the longitudinal swellings, and speaking generally all the other features depicted in fig. 53 on pl. i.

Localities : *Chalk Rock* : Dunstable ; Red Chalk Hunstanton ; *Gault* : Godstone and Folkestone ; *Neocomian* : Haute-Marne, France.

4. *Cythereis Lonsdaleana* Jones. Monograph, Cret. Entomos.  
Jones and Hinde, 1890, pl. i., p. 27 for description.

I have found a single valve of this species which corresponds with fig. 64, pl. i., of the above monograph.

Horizon : Red Chalk, Hunstanton (Top bed).

---

Genus CYTHERELLA, Jones, 1849.

5. *Cytherella ovata*, Römer (Monog. Cret. Entom. Jones, 1849).

VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 389

1890. See Monog. Entom. Cret. J. and H., pp. 44-45, pls. iii., iv.  
Horizon : Red Chalk Hunstanton (Vine) ; Flamborough (Jones).  
6. *Cytherella Muensteri* (Römer) 1849. Monog. Entom. Cret.  
1890. Monog. Entom. Cret. J. and H., p. 46 for references, &c.  
Horizon : Red Chalk Hunstanton.

IV. FORAMINIFERA.

It will not be necessary to give elaborate details of the Foraminifera of the Red Chalk. Some of the examples are unique, but nearly all of them belong to the ordinary chalk forms, and with the exception of three are similar to the species already catalogued from the Cambridge Greensand.

1. *Placopsilina cenomana* d'Orb.

Examples of this genus, which are, according to Prof. T. R. Jones (Fossil Foraminifera Brit. Mus., p. 87, fixed *Lituola*), are abundant in the Red Chalk, adherent to a variety of fossils.

Horizon, &c. : Red Chalk Hunstanton : On *Terebratula buplicata*.

2. *Nodosaria obscura*, Reuss.

Unique example.

Horizon : Red Chalk Hunstanton,\* Middle layer B.

3. *Cristellaria rotulata*, Lam.

This species is very small and rather rare in the Red Chalk. In the Cambridge Greensand (Phosphate Beds) it literally swarms in the *débris*, and examples may be picked out by thousands.

Horizon : Red Chalk Hunstanton. Top layer A. and sections in the Middle layer B in chalk ; Red Chalk Speeton (Yorkshire).

4. *Bulimina presli*, Reuss.

Examples rather rare.

Horizon : Red Chalk Hunstanton. Mid. layer B, and top layer A.

5. *Verneuilina triquetra* Münster. (*V. tricarinata*, d'Orb.)

Horizon : Red Chalk Hunstanton, Top layer A, rare. Camb. Greensand : abundant.

6. *Globigerina bulloides*, d'Orb.

This form is very abundant in sections of Red Chalk from both

---

\* I could quote a variety of horizons for the species indicated, but I have kept to my own labours chiefly.

390 VINE: POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

Hunstanton and Speeton. The Speeton forms, however, are considerably larger in the chambers than in the Hunstanton Red Chalk, and I find examples of the species in sections from the whole of the layers A, B, C. In the finely sifted *débris* of the middle and top bands, mounted as transparencies of course, I also met with small examples. At Speeton, in sections of the chalk which overlie the Red Bed, and also at Hunstanton, the *G. bulloides*, as well as the next species, are common.

Horizons: Red Chalk, Hunstanton and Speeton; White (or grey) Chalk over Red Chalk, Hunstanton and Speeton; Cambridge Greensand (Phosphate Beds).

7. *Globigerina cretacea*, d'Orb.

Found under similar circumstances as No. 6.

Horizons: Same as No. 6.

8. *Planorbulina ammonoides*, Rss.

Rare otherwise than in sections of Red Chalk.

Horizons: Red Chalk, Speeton and Hunstanton; Camb. Greensand.

9. *Rotalia Beccarii*, Linn.

I believe that this species has only once before been found in the Chalk, by Mr. Joseph Wright. Mr. Sherborn says "The *Rotalia Beccarii* is most important, and as far as I can see unassailable."\*

Horizon: Red Chalk Hunstanton, Top Band A.

---

Only on the day before the presentation of my paper to the Yorkshire Geological Society (Nov. 4th, 1890), I received from Mr. C. D. Sherborn, a copy of his elaborate paper on the Foraminifera of the Red Chalk of Yorkshire, Norfolk, and Lincolnshire.† This is a valuable contribution to the literature of the Foraminifera, especially so on account of the four plates of illustrations of the species described. My own work, however, as given above, was prepared altogether independently of the knowledge that other authors

---

\* The slide containing nearly all the species of Foraminifera and Entomostraca described or referred to above has been given to the Brit. Museum (S. Kensington), and many of the Foraminifera described by Mr. Sherborn are, I believe, also placed in the Museum.

† By H. W. Burrows, C. Davies Sherborn, and the Rev. George Bailey.  
Journal of the Royal Microscopic Soc. (1890), pp. 549-566.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 391

were working on the group. After the publication of the paper referred to below, I sent the dry mounted slides to Mr. Sherborn for examination, so as to prevent misinterpretation of species on my part, consequently I have altered two names in deference to his authority. I have also obtained Mr. Sherborn's sanction to publish the very full list of Red Chalk Foraminifera found in Yorkshire, Lincolnshire, and Norfolk, which is the result of several years labour on the group by the author's whose names are associated with his on the title page of the paper. For special details the student is referred to the paper itself. I believe a second paper is in hand.

Full lists, up to date Nov. 10th, 1890, of the Foraminifera, Entomostraca and Polyzoa of the Red Chalk of Norfolk, Lincolnshire, and Yorkshire (Speeton).

## I.—FORAMINIFERA.

1826. *Spiroloculina*, d'Orbigny.  
 „ *papyracea* sp. nov. (B. S. and Bailey).  
 „ *tenuis*, Crjzek (and Brady).
1858. *Miliolina*, Williamson.  
 „ sp. (Young forms of *S. tenuis*? Sherb., op. cit., p. 552).
1840. *Placopsilina*, d'Orb. (fixed *Lituola*).  
 „ *cenomana*, d'Orb.
1854. *Cornuspira*, Schultze.  
 „ *cretacea*, Reuss.
1861. *Ammodiscus*, Reuss.  
 „ *gordialis*, Jones and Parker (= *Trochamini id.*).  
 „ *incertus*, d'Orb. (= *Operculina*).  
 „ *tenuis*, Brady.
1824. *Textularia*, DeFrance.  
 „ *attenuata*, Reuss.  
 „ *pygmœa*, Reuss.  
 „ *agglutinans*, d'Orb.  
 „ *gramen*, d'Orb.  
 „ *trochus*, d'Orb.  
 „ *turris*, d'Orb.  
 „ *complanata*, Reuss (= *Proroporus id.*).

392 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

1840. Verneuilina, d'Orbigny.  
    ,, propinqua, Brady.  
    ,, triquetra (Münst).
1844. Spiroplecta, Ehrenberg.  
    ,, biformis, Parker and Jones.
1840. Gaudryina, d'Orbigny.  
    ,, pupoides, d'Orb.
1826. Bulimina, d'Orbigny.  
    ,, affinis, d'Orb.  
    ,, Presli, Reuss.
1839. Bolivina, d'Orbigny.  
    ,, textularioides, Reuss.  
    ,, Beyrichi, Reuss.  
    ,, sp. (near *B. punctata*, d'Orb.)
1859. Pleurostomella, Reuss.  
    ,, subnodosa, Reuss.  
    ,, alternans, Schwager.
1784. Lagena, Walker and Boys.  
    ,, globosa (Mont).  
    ,, lævis (Mont).  
    ,, apiculata, Reuss.  
    ,, ,, var. emaciata, Reuss.  
    ,, cincta Seguenza.
1816. Nodosaria Lamarek. = (1826) Glandulina, d'Orb.  
    ,, lævigata, d'Orb.  
    ,, obtusissima, Reuss.  
    ,, cylindracea, Reuss.  
    ,, candela, Egger.  
    ,, simplex, Silvestri.  
    ,, longiscata, d'Orb.  
    ,, calamorpha, Reuss.  
    ,, limbata, d'Orb.  
    ,, obscura, Reuss.  
    ,, prismatica, Reuss.
1826. Dentalina, d'Orb. (Nodosaria continued, Sherborn)  
    ,, soluta, Reuss.

VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 393

1826. *Dentalina communis*, d'Orb.  
 „ *brevis*, d'Orb.  
 „ *filiformis*, d'Orb.  
 „ *marginuloides*, Reuss.  
 „ *mucronata*, Neugeboren.  
 „ *abnormis*, Reuss.
1826. *Marginulina*, d'Orbigny.  
 „ *glabra*, d'Orb.  
 „ *inequalis*, Reuss.  
 „ *variabilis*, Neugeb.
1826. *Lingulina*, d'Orbigny.  
 „ *carinata*, d'Orb.
1824. *Fronicularia*, DeFrance.  
 „ *biformis*, Marsson  
 „ *gaultina*, Reuss.  
 „ *Archiaciana*, d'Orb.
- 1860 *Rhabdogoniam*, Reuss.  
 „ *tricarinatum* (d'Orb).
1826. *Vaginulina*, d'Orbigny.  
 „ *eurynota*, Reuss.  
 „ *recta*, Reuss.  
 „ *arguta*, Rss.  
 „ *legumen*, Rss.
1816. *Cristellaria*, Lamarek.  
 „ *rotulata*, Lam.  
 „ *cultrata*, Montf.  
 „ *gibba*, d'Orb.  
 „ *italica*, Defr.  
 „ *lata*, Rss.  
 „ *variabilis*, Rss.  
 „ *multiseptata*, Rss.  
 „ *crepidula* (F. and M).  
 „ *Marekii*, Rss  
 „ *cymboides*, d'Orb.
1826. *Polymorphina*, d'Orbigny.  
 „ *lactea* (Walker and Jacob).

394 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

1826. *Polymorphina communis*, d'Orb.  
    ,, *amygdaloides*, Rss.  
    ,, *gibba*, d'Orb.  
    ,, *horrida*, Rss.  
1875. *Ramulina*, Rupert Jones.  
    ,, *aculeata*, d'Orb.  
1826. *Globigerina*, d'Orbigny.  
    ,, *bulloides*, d'Orb.  
    ,, *cretacea*, d'Orb.  
1816. *Rotalia*, Lamarck. (*Rotalina*, Linne, 1767).  
    ,, *Beccarii* (Linne).  
1839. *Orbulina*, d'Orbigny.  
    ,, *universa*, d'Orb.  
1826. *Sphæroidina*, d'Orbigny.  
    ,, *bulloides*, d'Orb.  
1826. *Truncatulina*, d'Orbigny.  
    ,, *variabilis*, d'Orb.  
1826. *Planorbulina*, d'Orbigny.  
    ,, *ammonoides*, Rss.  
1862. *Pulvinulina*, Parker and Jones.  
    ,, *menardii*, d'Orb.  
1826. *Anomalina*, d'Orbigny.  
    ,, *grosse-rugosa*, Gûmbel.  
1822. *Polystomella*, Lamarck.  
    ,, *macella* (F. and M).

II. ENTOMOSTRACA.

1844. *Bairdia*, M'Coy.  
    ,, *subdeltoidea*, Münster.  
    ,, *Harrisiana* Jones.  
1849. *Cythereis*, Jones.  
    ,, *auriculata*, Cornuel.  
    ,, *Lonsdaleiana*, Jones,  
1849. *Cytherella*, Jones.  
    ,, *ovata*, Rœmer.  
    ,, *Muensteri*, Rœmer.

## VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK. 395

III. POLYZOA, (= *Bryozoa*.)

## § CYCLOSTOMATA, Busk.

- Stomatopora gracilis*, Edw. var. *delicatula*, Vine.  
 „ *divaricata*, Roemer.  
 „ *granulata*, Edwards.  
 „ var. *incrassata*, d'Orb.  
 „ *ramea*, Blainville.  
 „ *longiscata*, d'Orb.  
 „ *linearis*, d'Orb.
- Proboscina angustata*, d'Orb.  
 „ *rugosa* (?) d'Orb.  
 „ *irregularis*, Vine.  
 „ var. *A.*, Vine.  
 „ *uberrima*, Vine.  
 „ *gracilis*, Reuss. var. *Reussii*, Vine.  
 „ *subelegans* (d'Orb.) Pergens.  
 „ *hunstantonensis*, Vine.  
 „ var. *ampliata*, Vine.  
 „ *Jessoni*, Vine.  
 „ *bohemica*, Novák. var.  
 „ *Toucasiana*, d'Orb.  
 „ *ramosa*, d'Orb., Hunst. & Yorksh.  
 „ *dilatata*, d'Orb. „  
 „ var. *cantabrigiensis*, Vine.
- Diastopora hunstantonensis*. Vine.  
 „ var. *A.*  
 „ var. *contracta*, Seeley.  
 „ *regularis*, d'Orb.  
 „ *fœcunda*, Vine.  
 „ *radians*, Novák. var.  
 „ *papillosa* ? Reuss.  
 „ *Jessoni*, Vine.  
 „ *sulcata*, Seeley.
- Unitubigera papyracea*, d'Orb.  
*Entalophora proboscidea* ? Edw.

## 396 VINE : POLYZOA AND MICROZOA OF YORKSHIRE AND NORFOLK.

*Ceriodora micropora*, Goldf.  
*Reptomulticava collis*, d'Orb.  
 „ *simplex*, d'Orb.  
 „ *mamilla*, Reuss.  
 „ *favus*, Seeley.  
*Zonopora irregularis*, d'Orb.  
 „ *variabilis*, d'Orb.  
*Multicrescis variabilis*, d'Orb.  
*Heteropora tenera*, Hag.  
*Lichenopora collis*, d'Orb.

## §§ CHEILOSTOMATA, Busk.

*Membranipora gaultina*, Viue.  
 „ *fragilis*, d'Orb.  
 „ *elliptica*, Hag.  
 „ *obliqua*, d'Orb.  
*Hippothoa? simplex*, d'Orb.

CORRIGENDA.—Further Notes on the Polyzoa of the Cambridge Greensand. Proc. Yorksh. Geol. and Polyt. Soc., vol. xi., pt. ii., pp. 250-275.

Page.	Line.	Please correct as follows:—
251	Note.	Ciply
252	24	<i>Delete</i> "I believe."
253	Note.	‡After 1881 insert "Geol. of Neighbourhood of Cambridge. G. W. H. Penning and A. J. Jukes-Browne: Mem. of Geol. Survey, 1881, pp. 149-154.
255	8	Etheridge.
253	}	read, A. J. Jukes-Browne.
&		
260		
262	11	<i>neocomiensis</i> .
"	17	Sollas.
263	17-18	<i>Stomatopora</i> ,
265	6	<i>gracilis</i> . 9 lines from top read <i>Radiolites</i> .
268	13	<i>fiabelliform</i> .
269	2	<i>Ostrea</i> .
"	4-5-10	<i>congesta</i> .
259	20	<i>Dumerilii</i> Aud. also p. 271, line 7.
274		8 lines from bottom read <i>debris</i> .