

Forbes E. On the Estuary beds and the Oxford Clay at Loch Staffin, in Skye.// The quarterly journal of the Geological Society of London, 1851.- Vol. 7, p. 2, №26.- p. 104-113, 1 fig., pl. 5.

*Iolias*



2. *On the ESTUARY BEDS and the OXFORD CLAY at LOCH STAFFIN, in SKYE.* By PROFESSOR EDWARD FORBES, F.R.S., V.P.G.S. &c.

THE purpose of the following brief notice is to put on record some observations made in the island of Skye in August 1850, by which the true geological horizon of the so-called "Wealden" of Loch Staffin was determined, and the Oxford Clay added to the series of oolitic strata in the Hebrides.

Sir Roderick Murchison, in his "Supplementary Remarks on the Strata of the Oolitic Series and the Rocks associated with them in the Counties of Sutherland and Ross, and in the Hebrides," read before the Geological Society in November 1827, states that "in the low and ruinous cliff of blue shale, associated with zeolitic and amygdaloidal trap on the north-eastern shores of Loch Staffin, were found, during my late excursion with Professor Sedgwick, flattened masses of shelly limestone containing five species of *Cyclas*, one *Paludina*, one *Neritina*, one *Ostrea*, one *Mytilus*, and some undescribed bivalves," and remarks that "it adds materially to the interest of these remains, that two species of the *Cyclas*, the *Paludina*, and the *Ostrea* prove to be identical with the fossils of one of the upper beds of the Weald clay described by Dr. Fitton as occurring in Swanage Bay, Dorsetshire, and in the Isle of Wight." Of these fossils a list is appended to the paper, drawn up by Mr. Sowerby; and besides the references to Weald Clay species, one *Cyclas* is considered identical with a Barton Cliff shell, and the *Nerita* is compared with a Woolwich species.

When the Duke of Argyll announced his important discovery of tertiary strata, probably of freshwater origin, associated with traps in the island of Mull, it occurred to me that possibly the Loch Staffin beds might prove to be tertiaries also; the more likely since some of their fossils had been referred to tertiary species. At the same time I felt very anxious to ascertain whether on the other hand they might really be Wealden strata, or what was more probable, as Mr. Robertson had suggested in his interesting paper on Brora, equivalents of the estuary strata associated with the Brora oolitic coal. My recent researches among the Purbecks had led me to distrust all the older determinations and comparisons of freshwater fossils, and I felt that it was of great consequence to the special work in which I was officially engaged in my duties as a member of the Geological Survey, that before publishing the full account of the palæontology of the Purbecks now in course of preparation, I should examine the Loch Staffin fossils, and, if possible, personally inspect their locality. This I felt to be the more necessary, since I had been told by Sir Roderick Murchison that the fossils in question were taken from loose blocks of stone, the exact position of which *in situ* had not been seen.

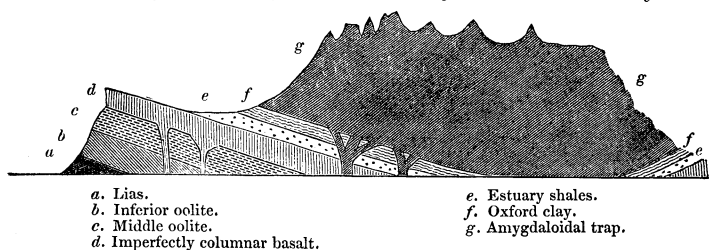
Many of the Hebridean localities are so out of the way of travelling that it is by no means easy to visit them. Loch Staffin and Loch Laigh (the latter in the neighbourhood of the Duke of Argyll's leaf-beds) were of this kind. But all difficulty was removed by a proposal from my excellent friend Mr. MacAndrew to accompany him

on a cruise in his yacht to Mull and Skye, and so examine at our leisure the desired places. Accompanied by Professor Goodsir of Edinburgh, accordingly we set sail, and in the course of three weeks' cruise had not only the good fortune to see the geological points in question, but also to add not a few fossils and nearly twenty species of living animals to the British fauna.

The peninsula of Trotternish, which forms the north-western portion of the island of Skye, presents on its northern line of sea-coast a range of magnificent cliffs, extending from Portree to Loch Staffin. The crest of these cliffs is composed of a vast bed of imperfectly columnar trap, resting on oolitic sandstones, limestones, and shales, the uppermost of which were determined by Sir Roderick Murchison to be the equivalents of the cornbrash and forest marble. Beneath these we find unquestionable representatives of the middle and inferior oolitic strata, and at the base of all undoubted lias. They abound in fossils, and, whenever the palæontology of the secondary rocks of Scotland shall be scientifically explored, will afford a rich harvest of beautiful and probably undescribed forms of invertebrata to the naturalist who may have the good fortune to undertake the work.

Through the oolitic strata are seen rising dykes of greenstone in communication with the spread of trap above, and other trap dykes are seen which not only burst through the greenstone, but also through the sheet of trap forming the perpendicular wall on the summit of the cliffs.

*Diagram of the Geological Structure of Trotternish in Skye.*



The strata of the cliffs dip rapidly inland southwards at a considerable angle, and a little way behind them towards the east. Farther back towards the west rise lofty hills of amygdaloidal and zeolitic trap, which, broken up into fragments on these escarpments, form magnificent isolated blocks and pinnacles of rock of vast height and slenderness, resembling so many gigantic castles and towering spires of dimensions beyond the workmanship of human architecture. The truly wonderful scenery of the Storr and Quiraing, which far surpasses for irregularity any other rock landscapes in Britain, have been produced by the breaking up of this amygdaloidal escarpment.

The cause of this extraordinary range, extending over many miles, of cyclopean ruins, depends upon the fact which it is my object to announce in this communication. Between the mass of amygdaloidal trap and the columnar trap which crests the sea-cliffs and dips in-

wards with the underlying oolitic strata, intervene beds of soft shale and crumbly limestone, the wearing away of which causes the breaking up of the superincumbent mass, the retrocession of the main body of trap, and the isolation of the blocks and pinnacles, which probably become more numerous after every winter.

The open bay called Loch Staffin lies at the westernmost extremity of Trotternish. Its northern headland is composed of the oolitic beds and superincumbent columnar trap dipping southwards, and its southern by the same traps rising again to commence a new line of coast, forming the southern bound of the peninsula. The bay itself has been formed in consequence of the wearing away by the waves of the shales above the columnar trap, thus brought into contact with the force of the sea; and as the westernmost extremity of the range of amygdaloidal hills corresponds nearly to the centre of the bay, the ruin of the superincumbent trap is here very great indeed. It was on the shores of this bay that Sir Roderick Murchison and Professor Sedgwick found the blocks of freshwater or estuary limestone referred by them conditionally to the Wealden.

On landing, I found similar blocks with similar fossils, but could not see them *in situ* in the section along the coast. I found, however, very soon that the black shales included in and underlying the amygdaloidal trap were fossiliferous, and before long had the pleasure to find numerous specimens of *Ammonites cordatus* and *Belemnites Owenii* and *Beaumontianus*, indicating the age of these shales beyond a question to be that of the Oxford clay, to which stratum indeed mineralogically they have the most marked resemblance.

When the tide receded, the beds of shale were exposed in regular sequence along the shore, and *beneath* them in conformable succession I found *in situ* the strata of yellowish crumbly limestone and shale with estuary fossils from whence the blocks referred to had been derived.

The series of beds seen in the section in descending order is as follows:—

1. Immediately below the amygdaloidal trap, which is crumbly and wackaceous at the junction, there is a thin band of small rolled pebbles mingled with fragments of jet.
2. Crumbling blue shales with *Belemnites Owenii*, *Ammonites cordatus*, and *A. Eugenii*, about 5 feet in thickness.
3. A thin band of concretionary limestone.
4. Five feet of blue shale with *Ammonites* and large *Belemnites*.
5. Two bands of hard grey concretionary limestone, weathering yellow, in which I could find no fossils, 3 feet.
6. Dark blue shales with small *Belemnites*, 7 feet.
7. Concretionary reddish and yellowish limestone with large *Belemnites*, 1 foot.
8. Blue shales, 1 foot.
9. Ferruginous sands with fragments of wood, pyritized and in the state of jet, 1 foot.
10. Concretionary limestone with *Belemnites*, 1 foot.

11. Soft white sands with traces of bivalve shells, apparently *Cyrenæ*, 3 feet.

12. Hard sandstones with *Perna* and numerous *Ostreæ* and *Cyrenæ*, 2 feet.

13. Greyish sands with carbonaceous streaks and lenticular courses of comminuted shells; concretions in places; 5 feet.

14. Hard calcareous shales with bands of *Cyrenæ* and fossil wood, 3 feet.

15. About fourteen bands of loose calcareous slaty and shaly beds filled with *Cyrenæ*, occasional *Uniones*, and *Ostreæ*: these appear to constitute a thickness of about 12 feet, but the base of them resting on the basalt is concealed under water.

The dykes of trap in communication with the superincumbent amygdaloid bake the strata through which they pass and alter the mineral character of the fossils.

The position of these estuary beds, beneath the Oxford clay and above the mass of the middle oolites, at once removes them from identification with Wealden or tertiary strata of the South of England, and as readily suggests a comparison of them with the so-called "Wealden beds," discovered by Mr. Alexander Robertson, intercalated with the carboniferous portion of the oolitic strata of Brora in Sutherlandshire, and described by that gentleman in two most interesting papers communicated to the Geological Society in 1843 and 1846. The main seam of Brora coal lies immediately beneath a stratum containing Kelloways Rock fossils, and regarded by Sir Roderick Murchison as the representative of the pier stone of Scarborough. Below the coal beds are bituminous shales, clays, and a thin layer of whitish argillaceous limestone, containing numerous remains of Fish, and of shells of the genera *Cyclas* or *Cyrenæ*, *Unio*, *Perna*, *Tellina*, and *Paludina*. These shales are superior to the oolitic and liassic strata.

Mr. Robertson enumerates the many fossils found by him, but does not describe or figure the new species. Of the freshwater or estuary invertebrata found by him in the Brora strata, only two are mentioned as identical with known species, viz. *Cyclas angulata*, identified with a Wealden shell, and *Cypris granulosa*, considered the same as a Wealden crustacean. Mr. Robertson presented the best specimens of all his species to the Geological Society, where I have had an opportunity of inspecting them, and can speak to their distinctness from known forms, or from any of the many Purbeck fossils known to me and not published. Both the identifications above mentioned I consider to be insufficient. The *Cyclas*, called *angulata*, from Brora is not to me identical with Sowerby's shell, and the *Cypris* referred to *granulosa* is altogether distinct.

Through the kindness of Sir Roderick Murchison, I have had an opportunity of comparing his original Loch Staffin fossils with those collected by myself. He procured two with which I did not meet, and I found some additional to his. None of the identifications in the list appended to his paper will now hold. The comparison and determination of freshwater bivalves is a matter of great delicacy and

practice; the distinctions between the species of *Cycladidae* and *Unionidae* respectively being of so delicate a character that the examination of numerous specimens of each species is necessary, combined with a knowledge of the recent species of these excessively difficult tribes. I cannot satisfy myself that any one of the Loch Staffin shells is identical with a Purbeck or Wealden species. This in the present state of our knowledge was to be expected.

A more curious result is that, after a close comparison of both Sir Roderick's and my own specimens (now contained in the collection of the Museum of Practical Geology), I cannot satisfy myself that, with the exception of the *Paludina conulus* of Robertson, which is a little *Hydrobia* identical with the unfigured *Paludina* mentioned in Sir Roderick Murchison's Loch Staffin list, there is any one of the Loch Staffin estuary shells identical with a Brora species. The little *Hydrobia* above mentioned, however, appears to be undistinguishable.

The succession of events indicated by the section I have described is of no small interest, when considered in its bearing on the physical geography of our area during the oolitic epochs. From the lias up to the cornbrash, or beds probably equivalent to that stage in the series of oolites, we have in the Hebrides, as was indicated by Macculloch and proved by Murchison, a continuous sequence of marine conditions, which, if I might venture to judge from the as yet imperfect evidence of the contained fossils, prevailed in a sea by no means shallow. But at the termination of the deposition of the middle oolitic strata, we have indications of most important changes, and of the conversion of the bed of the Hebridean oolitic sea into an estuarine and terrestrial area, which after a considerable lapse of time became submerged under oceanic conditions and had a new series of marine strata deposited upon it.

If I read what I have seen aright, the plutonic phenomena which accompanied these changes were not less interesting. The great and thick sheet of imperfectly columnar basalt which has so wide an extension in the island of Skye, and plays so important a part in the formation of the magnificent scenery of its coasts, was the product of a submarine eruption, which, if we regard this basalt as an overflow, has its geological date marked to a nicety, having occurred at the close of the middle and at the commencement of the upper oolitic period. This vast cap of compact volcanic matter served to assist in the consolidation of the muddy and sandy marine accumulations over which it spread, and the Titanic throes of this region of eruptions elevated the whole probably above the level of the ocean, and converted a part at least of the sea-bed into dry land, the area of which and of its fresh and brackish waters became again submerged, to be again overwhelmed by the destructive outpourings of submarine volcanoes; their results we now see in the great and thick mass of trap forming the line of hills constituting the chain of the Storr. This trap has features distinct from those presented by the bed between the middle and upper oolites. It is in great part an amygdaloid, and its vesicular character may indicate the formation of it at

a different depth of water and under different circumstances; a conclusion consistent with the indications presented by the fossiliferous strata which it overlies and alters.

Another view may be taken, however, of the origin of the basaltic sheet intervening between the upper and middle oolites in Skye, one which would seriously affect the preceding estimate of its date. It may be regarded as intruded trap, insinuated between superior and inferior strata at an epoch long posterior to that of the deposition of the former. A minuter investigation of the geological phenomena of the north and west of Skye than has yet been made will probably determine which view is the right one beyond question. But in the present state of the evidence I incline to regard the basalt as contemporaneous with the oolites, and as of the definite date which its position in sequence of beds seems to indicate. The great spread and uniform thickness presented by this sheet of basalt, as far as it has been examined, the unaltered condition of the strata which lie upon it, and the baking of the rocks beneath it and of those which the jets connected with it pass through, are facts which determine me at present to regard it as a bed of the date previously suggested. At the same time, in the Loch Staffin section there are appearances at some of the points where the trap bursts through the superincumbent strata which I could not clearly make out, and which, from their connection with the faulting of the beds, at first sight seemed to indicate disturbances produced by the lower trap. My belief at present is, however, that the disturbances alluded to are results of the jets of amygdaloidal trap distinctly seen bursting through the lower and middle oolites and the basalt, and breaking up and baking the estuary beds and Oxford clay, on which the amygdaloid is over-spread in mass.

The area of the Hebrides appears to have been a scene of igneous eruptions and disturbances of level from a very early geological period down to the age of the newer tertiaries. These beautiful and singular islands present a rich field for geological explanation, much as has been done among them. Their palæontology, one of the freshest and fullest mines for discovery yet remaining in the British Islands, may be said to be unexamined. The working out of the exact relations in age of the igneous with the stratified rocks of the Hebrides, and of the physical and vital phenomena determined by the several eruptions within their area will sooner or later be one of the most delightful and best-rewarded tasks to which a competent observer can apply.

*List of FOSSILS collected at LOCH STAFFIN, with Descriptions and Figures of the New Species.*

#### *Oxford Clay.*

*Ammonites cordatus*, Sowerby.

*Ammonites Eugenii*, Raspail.

*Ammonites Vernoni*, Phillips?, possibly a variety of *A. biplex*.

Ammonites; fragment of a species nearly allied to *A. zignodensis* of Alcide D'Orbigny.

Belemnites Owenii, *Pratt*.

Belemnites Beaumontianus, *D'Orbigny*. This is the *B. sulcatus* of the Brora lists.

Turbo; a muricated species too imperfect for determination.

Nucula; remains of two species.

Pinna mitis, *Phillips*?

Arca concinna (Cucullæa, sp.), *Phillips*.

Avicula; species uncertain.

Gryphæa dilatata, *Sow*.

#### *Staffin Estuary Shales.*

RISSEO (HYDROBIA) CONULUS. *Paludina conulus* of Robertson.

PLATE V. fig. 12.

Shell very minute, conical; whorls five or six, rounded, smooth, the last very large and much broader than the others, occupying rather less than half the length of the shell. I have compared the specimens with those of "*Paludina conulus*" (Robertson MSS.) from Brora, in the Museum of the Geological Society, and can detect no difference. The *Hydrobiæ* are *Rissoæ*, for the most part inhabiting brackish water. The species can be distinguished from each other only with difficulty. This is the unfigured *Paludina* compared with a Weald Clay species in the list appended to Sir Roderick Murchison's paper in vol. ii. p. 366, Geol. Soc. Trans., Second Series.

NERITINA STAFFINENSIS. PLATE V. fig. 13 a, 13 b.

"*Nerita* or *Neritina*, not figured, resembling Woolwich shells."—*Geol. Trans. loc. cit.* p. 366.

A minute shell not exceeding three-twelfths of an inch in length, and unfortunately rare and in bad condition. It is smooth, with a body whorl widening and becoming ventricose towards the aperture; the spire is very short, obsolete, and of few and close volutions. Although so imperfect, it is evidently quite distinct from any described *Neritina*. I found only two specimens.

OSTREA HEBRIDICA. PLATE V. fig. 4 a, 4 b, 4 c.

*Ostrea* with the under valve spatulate, rarely short and subtriangular, rather smooth, gently tumid, sometimes highly convex; upper valve flat, or nearly flat. Length of a large example one inch and three-tenths, and breadth eight-twelfths of an inch.

This is the "flat species of *Ostrea*" mentioned in *Geol. Trans. loc. cit.* p. 366, and there identified with one found with *Cyclas media* in the Isle of Wight. Being very familiar with the oysters of the Wealden and Purbeck I cannot admit this identification, nor can I refer the Loch Staffin shell to any known fossil, although, as usual in this variable genus, it is difficult to express in words its marked distinctions. It is abundant, and from its association with *Cyrenæ* appears to have inhabited brackish water.

PERNA MURCHISONII. PLATE V. fig. 1 a, 1 b, 1 c.

Shell elongato-subtriangular, valves unequal but both tumid, anteally straight, very tumid and steep-sided, posteally angulated, rapidly declining to an acute margin, surface obsoletely wrinkled; dorsal portion not expanded, ovate. Hinge-line very oblique, straight, terminating at less than half the length of the shell, beaks acute; young shells dorsally carinated; pits of hinge distant, four or five in number. Length 1 inch  $\frac{3}{4}$ ths. Maximum breadth  $\frac{8}{12}$ ths of an inch. Thickness of shell with valves united  $\frac{9}{12}$ ths of an inch. This well-marked *Perna* differs from any of the species of which I have seen examples from Brora, and is equally distinct, or more so, from that which I have found in the Purbecks. It is the "*Mytilus*?" of Sir Roderick Murchison's list (*loc. cit.*). I have dedicated it to that distinguished geologist, as the discoverer of the Loch Staffin estuary strata.

TRIGONIA TRIPARTITA. PLATE V. fig. 11 a, 11 b.

Shell moderately tumid, ovato-subtriangular, obliquely carinated, the carina nodulose; the space between the carina and the postéal margin is occupied by about three longitudinal radiating ribs, not very elevated; the central portion of the shell is ornamented with eight or nine very oblique strong rounded ridges proceeding from the nodulations of the keel towards the margin in an antéal direction, but all stopping short except the two lowest, and forming acute angles with a third and more numerous (about twelve) set of acute and slender ribs which run very obliquely in the contrary direction, *i. e.* from the antéal margin towards the centre of the shell. The teeth of the hinge are strong and well marked. The largest valve found measured  $\frac{1}{12}$ ths of an inch from beak to frontal margin, by  $\frac{9}{12}$ ths of an inch maximum breadth. The height of a single valve was rather more than  $\frac{2}{3}$ ths of an inch. I found only single valves of this curious and very distinct *Trigonia*, an ally of *T. undulata*, and characteristically an oolitic form.

UNIO? STAFFINENSIS. PLATE V. fig. 5 a, 5 b.

I have given this name provisionally to impressions of a bivalve having the form and aspect of a small *Unio*. It is transversely oblong, inequilateral, depressed, truncated anteally, rounded and narrowed posteally, and transversely sulcated. Its breadth is  $\frac{5}{12}$ ths of an inch. Adult specimens will probably be found hereafter.

CYRENA JAMESONII. PLATE V. fig. 7a, 7b, and variety, fig. 8a, 8b.

Shell moderately tumid, ovate, inequilateral, anteally declining, antéal extremity subcentral, postéal rounded but not abbreviated, surface obsoletely furrowed by lines of growth, sometimes nearly smooth, beaks subacute. Length of a fairly grown example (not the largest found)  $\frac{8}{12}$ ths, breadth 1 inch, and thickness  $\frac{5}{12}$ ths of an inch. This is an abundant shell. I cannot distinguish specifically between the two forms, the one rather more tumid and narrowed posteally, and the

other rather compressed and wider postally. The latter is the *Cyclas media* of Sir Roderick Murchison's list. After a careful comparison of this *Cyrena* with Mr. Robertson's Brora specimens, and the large series from the Purbeck, Hastings sands, and Wealden, in the Museum of Practical Geology, I feel bound to consider it distinct. It is a characteristic shell of the Staffin beds, and is found in large masses. I have dedicated it to Professor Jameson, a memorial of his many and valuable researches in the Hebrides, and as a token of respect from one, who esteems as a high honour the good fortune of having been a pupil of that eminent geologist.

CYRENA ARATA. PLATE V. fig. 6 *a*, 6 *b*.

Shell much depressed, very inequilateral, postally abbreviated, ovate-subquadrate, surface regularly sulcated concentrically, ridges acute, numerous, narrower than the interspaces. Breadth  $\frac{4}{12}$ ths, length  $\frac{3}{12}$ ths of an inch. This very distinct species is comparatively scarce, and not gregarious.

CYRENA CUNNINGHAMII. PLATE V. fig. 9 *a*, 9 *b*.

Shell depressed, subinequilateral, subquadrate, wide and subtruncated anteally, rounded postally, antea extremity just above the frontal margin; surface obsoletely wrinkled by layers of growth; beaks not prominent, rather obtuse.

Length of a large specimen  $\frac{9}{12}$ ths of an inch, breadth 1 inch; thickness half an inch.

This appears to be distinct from *C. Jamesonii*, and is easily recognised by its small and depressed beaks. I have dedicated it to the memory of my late friend and fellow-student, Mr. Hay Cunningham, whose Memoirs on the Geology of Scotland held out hopes of future discoveries, too soon destroyed by his premature death.

CYRENA MACCULLOCHII. PLATE V. fig. 10 *a*, 10 *b*.

Shell tumid, strong, more or less subtriangular, abbreviated postally, obliquely subangulated anteally, surface with frequent and close lines of growth, beaks very prominent. Length  $\frac{9}{12}$ ths, breadth  $\frac{1}{12}$ ths, thickness  $\frac{6}{12}$ ths of an inch. This *Cyrena* is constantly associated with the *Perna*. It varies considerably in characters and outline, but appears to be distinct from its congeners, and to occupy a special horizon in this series of estuary beds. I have named it in honour of the eminent investigator of the geology of Scotland, who called attention to the series of oolitic beds in Skye.

POTAMOMYA? SOWERBII. PLATE V. fig. 2 *a*, 2 *b*.

Shell transversely ovate, subequilateral, inequivalve (?), rather tumid, somewhat expanded anteally, frontal margin rounded, surface striated by lines of growth, beaks prominent. Breadth 1 inch and  $\frac{3}{12}$ ths, length  $\frac{9}{12}$ ths of an inch, thickness half an inch.

This is the "bivalve referable to *Unio* or *Anodon*" of Sir Roderick

Murchison's list, and I have figured and described it from his specimen, the only one found. The true generic position of it and the next are very doubtful. I have dedicated it to Mr. J. De Carle Sowerby, who drew up the catalogue quoted of the oolitic fossils of the Hebrides.

POTAMOMYA? SEDGWICKII. PLATE V. fig. 3 *a*, 3 *b*.

Shell transversely elongated, inequivalve?, subcompressed, tumid near the beaks, rounded at both ends, most produced and dilated anteally, marked by concentric furrows of growth. This evidently distinct, yet, in the absence of better specimens, obscure shell, is the "transversely elongated bivalve not yet named or figured," compared with a Wealden shell, in Sir Roderick Murchison's list. I have dedicated it to Professor Sedgwick, who jointly with Sir Roderick Murchison examined the geology of Loch Staffin.

JANUARY 22, 1851.

Thomas Webster Rammell, Esq., and Robert Rawlinson, Esq., were elected Fellows.

The following communications were read:—

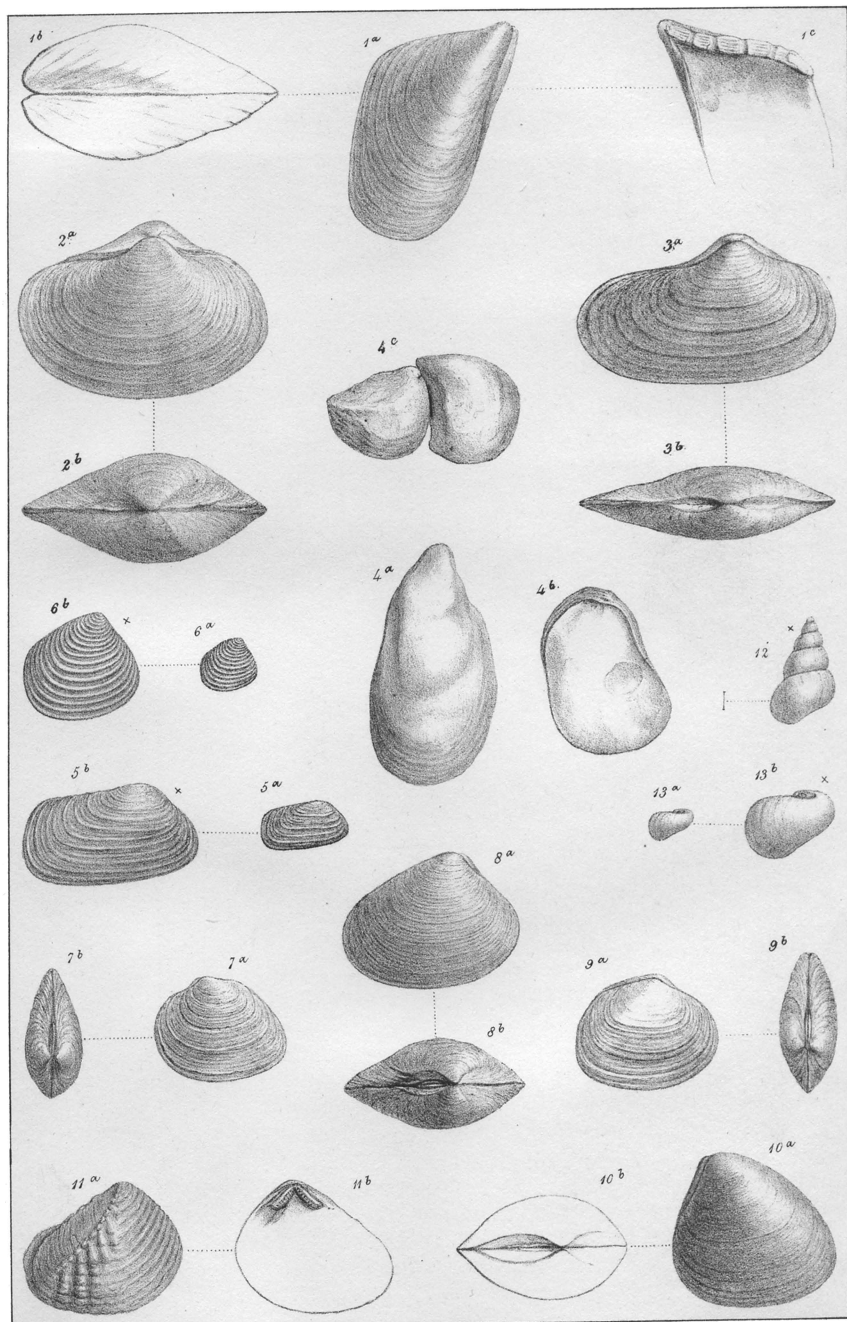
1. *Memorandum respecting* CHORISTOPETALUM IMPAR and CYATHOPHORA? ELEGANS. By WILLIAM LONSDALE, Esq., F.G.S.

I. In the volume of the Palæontographical Society for 1850, M. Milne-Edwards and M. Jules Haime state that *Choristopetalum impar* does not appear to them to belong to the class *Zoantharia*, but is in their opinion a Bryozoon\*—the grounds of dissent not being however mentioned. When the description of the fossil, published in the Quarterly Journal of the Geological Society†, was under preparation, the author's attention was necessarily called to the class *Bryozoa*, in consequence of the generic name *Heteropora* having been assigned to some of the specimens previously to their coming into his possession; and it was not until all the detected structures had been carefully considered, that the fossil was referred to *Zoantharia* or *Anthozoa*. In the description, the visceral receptacles are stated to be tubular, and the tubes to be crossed at irregular levels in adjacent receptacles, by transverse laminae or diaphragms‡—"tabulae" of M. M.-Edwards and M. J. Haime; and these structures are carefully delineated by Mr. J. de Carle Sowerby in plate 4. fig. 6+, particularly as respects

\* *Op. cit.*, Memoir on British Fossil Corals, p. 70.

† Vol. v. p. 66-77.

‡ *Loco citato*, p. 66, l. 22, 24; p. 68, l. 12 from bottom *et seq.*; p. 69, l. 10 *et seq.* and 23; p. 70, l. 17, also last line with continuation in p. 71; p. 71, l. 32 *et seq.*



W.H. Bailey.

- |                                 |         |
|---------------------------------|---------|
| 1. <i>Perna Murchisonii</i> .   | Forbes. |
| 2. <i>Potomomya? Sowerbii</i> . | "       |
| 3. <i>P. ? Sedgwickii</i> .     | "       |
| 4. <i>Ostrea Hebridica</i> .    | "       |
| 5. <i>Unio? Staffinensis</i> .  | "       |
| 6. <i>Cyrena arata</i> .        | "       |

- |  |         |
|--|---------|
| 7. 8. <i>Cyrena Jamesonii</i> .        | Forbes. |
| 9. <i>C. " Cunninghamii</i> .          | "       |
| 10. <i>C. " Maccullochii</i> .         | "       |
| 11. <i>Trigonia tripartita</i> .       | "       |
| 12. <i>Rissoa (Hydrobia) conulus</i> . | "       |
| 13. <i>Neritina Staffinensis</i> .     | "       |

Printed by Hullmandel & Walter.