23. *On* THREE NEW SPECIES *of* LAMELLIBRANCHIATA *from the* CARBONIFEROUS ROCKS *of* GREAT BRITAIN.

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[PLATE XXV.]

I. On a new species of *Anthracomya*, from the Upper Coal Measures of North Staffordshire.

Introduction.—In my monograph on *Carbonicola*, *Anthracomya*, and *Naiadites*[1] I pointed out that only one lamellibranch was then known to occur in the Upper Coal Measures of North Staffordshire, and indeed of Great Britain. The comparative sections illustrating the distribution of the Lamellibranchiata in the various coalfields showed that in a large number of them the highest known lamellibranch was *Anthracomya Phillipsii*, and that this species might well be considered characteristic of a certain zone. Since the date of that publication I have been able to accumulate material from a series of beds in the North Staffordshire and Lancashire coalfields much higher than the *A. Phillipsii*-zone, which contains a hitherto undescribed fossil shell, evidently referable to the genus *Anthracomya*. This species appears to characterize also a certain somewhat narrow zone of calcareous shales and freshwater limestones which occur towards the top of the Coal Measures in these localities. The shells from Fallowfield were collected by Mr. Rœder. They are free from the matrix, and, although often fragmentary, afford distinct details of the hinge. I am not sure whether there are not at least two distinct species from the Fallowfield beds, but hesitate to erect a new species on mere fragments.

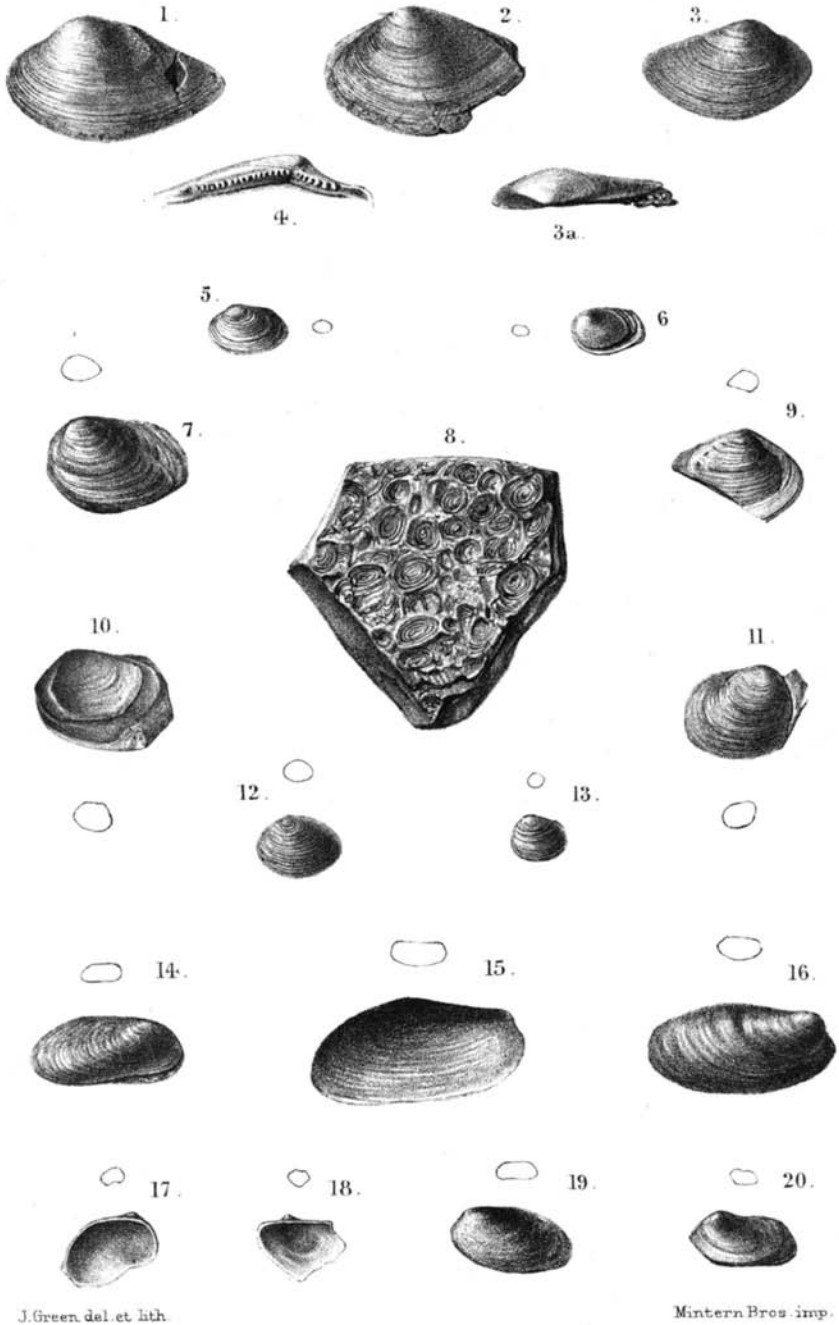
ANTHRACOMYA CALCIFERA, sp. nov. (Pl. XXV, figs. 14–20.)

Specific Description.—Shell small transversely, modioliform, very inequilateral, gibbose, expanded and flattened posteriorly, oblique. The anterior end is very short, and narrower than the rest of the shell, and its border is elliptically curved. The inferior border is produced downward and backward, and is almost straight, subparallel with the superior border. The posterior border is comparatively lengthened obliquely, truncate from above downward and backward, and is straight for the greater part of its extent, but joins the inferior border at a somewhat rounded angle.

The hinge-line is straight, much shorter than the inferior border, and the posterior superior angle is well marked and obtuse. The umbones are small, pointed, incurved, and contiguous, placed in the anterior quarter of the shell.

Passing downward and backward from the umbo towards the posterior inferior angle is a well-marked, bluntly rounded fold, in front of which the valve is obliquely compressed, and posterior to

[1] Palæont. Soc. pt. ii, vol. xlix (1895) p. 156.



J. Green del. et lith.

Mintern Bros. imp.

ANTHRACOMYA, CARBONICOLA.
& CTENODONTA.

this fold the valve is rapidly compressed and expanded to form the dorsal slope.

Interior.—Hinge edentulous. Muscle-scars normal. Pallial line entire, remote from the margin.

Exterior.—The shell appears to be almost smooth, but under the microscope faint concentric lines of growth are to be observed. Periostracum wrinkled. Ligament external, small, lodged in a narrow groove.

Dimensions.—Antero-posteriorly, 6 mm.; dorso-ventrally, 3 mm.; elevation of valve, 1 mm.

Localities.—A bed of freshwater limestone at Highfield marl-pit, Etruria, and excavation for telegraph-posts, roadside, Bradwell; marl-pit east of Cocknage Hill; railway-cutting, Florence Colliery; road-cutting, from Trentham to Whitmore, close to Butterton New Farm; Newcastle-under-Lyme railway-cutting; Etruria, road-cutting; quarries near Longport Station; marl-pit, Richmond Hill, Stoke-on-Trent; Upper Coal Measures, Slade Lane, Fallowfield, Manchester coalfield.

Observations.—This species is much more elongate, less oblique, and attains a much smaller size than *Anthracomya Phillipsii*. The species which it most nearly resembles is *A. minima*, Ludwig, which is flatter, more triangular, and has a much shorter hinge-line.

I am of opinion that *A. calcifera* is of distinct value as indicating a special zone, and it appears to be the only molluscan form present in that zone. It has not yet been discovered in beds which contain *A. Phillipsii*. *A. calcifera* is present in very large numbers at certain horizons in its zone of occurrence, but it is very sparsely distributed through the rest of the rock of its zone.

The zone of *A. Phillipsii* is much more extensive, and altogether below that of *A. calcifera*. The zone of *A. calcifera* occurs 300 feet below the Penkhull Sandstone, mapped by the officers of the Geological Survey as Permian, and estimated to be about 900 feet above the Bassey Mine Ironstone, which itself is filled with crushed specimens of *A. Phillipsii*. The Penkhull Sandstone is underlain by a series of grey sandstones and grey marls with the zone of *A. calcifera* at their base: these were included by the officers of the Geological Survey in the Upper Coal Measures. They are underlain by a series of clays and marls, worked for brick- and tile-manufacture.

It is very difficult to separate *A. calcifera* from the hard matrix of the limestone, and unless this be done its characters are often hidden. With its posterior angle hidden, the shell may be easily mistaken for a species of some other genus, especially *Carbonicola*. In specimens from the limestones, also, little evidence is shown of the wrinkled periostracum, so characteristic of the genus, but when preserved in a more shaly matrix undoubted evidence of this condition obtains. Occasionally, too, the shells are crushed and flattened, and then assume a shape very different from that which really belongs to them, becoming much more triangular; while the posterior end, on account of its natural convexity, appears much expanded from above downward.

II. *Carbonicola Vinti* (Kirkby). (Pl. XXV, figs. 5–13.)

(?) Ancylus Vinti, Kirkby, Trans. Tyneside Nat. Field Club, vol. vi (1864) p. 220.

Specific Characters.—Shell very small, inequilateral, ovate, compressed. The anterior end is broad, and its border is regularly rounded. The inferior border is regularly but gently convex. The posterior border is narrowed by the approximation of the upper and lower margins, obliquely truncate from above downward and backward, making a well-marked obtuse angle with the hinge-line above and an acute angle with the inferior margin below. The hinge-line is arched, extended, and depressed posteriorly. The umbones are small, tumid, slightly elevated, and situated in the anterior fourth of the shell.

The valves are regularly and gently convex for the anterior two-thirds, but gradually compressed in the posterior third.

Interior.—The muscle-scars appear to be normal. The hinge has not yet been isolated.

Exterior.—The surface is smooth and glistening, covered with fine concentric lines and folds. Periostracum much wrinkled. Shell thin.

Dimensions.—Antero-posteriorly, 5 mm.; dorso-ventrally, 3 mm.

Localities.—In a calcareous bed some yards above the Bassey Mine Ironstone, in an old marl-hole near Chatterley Station; in calcareous bands about 10 yards above the Bassey Mine Ironstone, the Hamil, Burslem, Upper Coal Measures, North Staffordshire; in a bed of ironstone in the northern bank of the Wear, opposite Claxheugh, Upper Coal Measures, Durham.

Observations.—A very full account of the history of the discovery of this fossil is given by Mr. J. W. Kirkby (*op. supra cit.*), who was disposed to admit the lamellibranchiate character of this little fossil, which was considered by some high authorities to be a gasteropod (*Ancylus*), by others to be a brachiopod allied to *Discina*, and was thought by yet others to be a crustacean.

I have referred my specimens to Mr. Kirkby, Prof. T. Rupert Jones, and Dr. G. J. Hinde, with the following result:—The latter two gentlemen consider that the shell is a lamellibranch, and Mr. Kirkby writes that it is identical with his *Ancylus Vinti*. The specimens that I have of '*Ancylus Vinti*' from the Durham beds, kindly sent by Mr. Kirkby, seem to me to be simply the closely compressed remains of the periostracum of a large number of shells, a circumstance which probably accounts for the difficulty in accurately determining the fossil.

Fortunately the North Staffordshire specimens are much better preserved, and, though generally somewhat crushed, show the general outline and character of the shell, and are therefore more easily referred to their real family and genus. After discussing the question of the true affinity of this shell at length, Mr. Kirkby finishes by saying:—'For the present, therefore, it will be as well, perhaps, to retain as a provisional name Prof. Phillips's term of

Ancylus. This I propose chiefly to get rid of the evil of having an unnamed fossil .... and not because I am of the opinion that it really belongs to *Ancylus*. For, whether it be an entomostracan or a mollusc, the evidence certainly would appear to go towards proving that it had a bivalvular rather than an univalvular carapace.'

Carbonicola Vinti would appear to be the last representative of this well-developed and frequently recurring Carboniferous fresh-water genus, and to occur at a higher horizon than any other species of the genus. As Mr. Kirkby points out is the case in the Durham beds, this fossil is associated in North Staffordshire also with a non-marine fauna. He estimates that *Carbonicola Vinti* occurs at an horizon not much over 50 or 60 feet from the top of the Coal Measures or the base of the Lower Red Sandstone, but in North Staffordshire there is a thickness of several hundred feet of red and purple beds of the Upper Coal Measures above the horizon of this fossil, *C. Vinti* occurring in this coalfield about the middle of the zone of *Anthracomya Phillipsii*.

III. On a new species of *Ctenodonta* from Penton Linns (Dumfriesshire).

Introduction.—In pt. iii of my monograph of the British Carboniferous Lamellibranchiata[1] I described a single species, *Ctenodonta sinuosa* (de Ryckholt), as being the only known representative of that genus in the Carboniferous rocks of Great Britain. After the work was in print I obtained several specimens of another species which should undoubtedly be referred to this genus, as its hinge-plate possesses no cartilage-cavity between the anterior and posterior rows of hinge-teeth. These specimens occurred in a richly fossiliferous, marine, blue shale, overlain by a massive limestone forming a small gorge, through which the River Liddell rushes. Another thick bed of limestone also occurs below it. The bed of shale is on the Scottish side of the stream and forms a small scar, which is evidently covered by a kind of backwater when the river is high. This shale is slightly inclined; its surface is covered with fossils and contains a very rich fauna, one which indicates undoubtedly an estuarine condition. This fauna corresponds to a large extent with that of the shales which occur among the limestones of the Lower Limestone Series of the West of Scotland. The following lamellibranchs may be found in this bed:—*Nucula gibbosa*, Phill.; *N. lævistriata*, Portlock; *N. undulata*, Phill.; *Nuculana attenuata* (Phill.); *Ctenodonta*; *Protoschizodus axiniformis* (Portlock); *Pinna flabelliformis*, Martin; and *Edmondia*, sp. nov., to be described and figured in pt. iv of my monograph.

The exact place in the series is doubtful, but the beds are referred to the horizon of the Hurlet Limestone of Scotland by the officers of the Geological Survey. It is probable that these limestones are identical with those exposed in quarries at Harelaw Hill,

[1] Palæont. Soc. vol. lii (1898) p. 210.

1 mile north-west of this locality, and at Peter's Crook Quarry, about ½ mile to the east on the English side, in both of which are seen two thick limestones separated by a richly fossiliferous marine shale which has a fauna largely identical with that contained in the shale in the river-bank. This bed is rich in gasteropoda, the genera *Murchisonia*, *Macrocheilus*, *Pleurotomaria*, *Loxonema*, and *Euomphalus* being represented in it. *Bellerophon Urei* and *B. decussata* also occur, together with *Orthoceras*, *Fenestella*, brachiopods, crinoids, and *Archæocidaris*. *Productus giganteus* occurs in the limestones, and therefore affords strong evidence that the identification of the horizon with that of the Hurlet Limestone is correct.

CTENODONTA PENTONENSIS, sp. nov. (Pl. XXV, figs. 1–3, 3*a* & 4.)

Specific Characters.—Shell transversely and triangularly ovate-acute, moderately gibbose, very inequilateral.

The anterior portion of the shell is about one-third of the valve, and is moderately swollen, its border being elliptically curved. The inferior border is extended, and is very convex. The posterior border is exceedingly small and bluntly pointed, much narrowed by the approximation of the upper and lower borders. The hinge-line is arched, especially in front, but becomes straight, extended, and depressed posteriorly.

The umbones are moderately swollen, incurved, contiguous, elevated, forming the highest point of the shell, and excavated in front, but there is no real lunule. Above the hinge is a very narrow elongate groove, posterior to the umbo, for the insertion of the external ligament.

The valve is regularly convex from above downward and before backward, and most specimens show that an angular ridge parallel to, but at a higher level than, the hinge-line passes from the umbones backward to the posterior end, indicating a bending of the valve on itself.

Interior.—The muscle-scars are not exposed in any of the specimens yet obtained. The hinge-plate consists of two rows of small triangular teeth which meet at an obtuse angle beneath the umbo. The anterior set are fewer and larger than the posterior, about six in number, the teeth becoming smaller from before backward. The posterior row contains about eighteen to twenty teeth, which increase in size from before backward.

Exterior.—The surface is covered with well-marked concentric lines of growth, one of which occasionally becomes much accentuated. Shell of moderate thickness.

Dimensions.—Antero-posteriorly, 30 mm.; dorso-ventrally, 17 mm.; elevation of valve, 7 mm.

Locality.—A bed of marine shale below the highest limestone, Penton Linns (Dumfriesshire).

Observations.—*Ctenodonta pentonensis* differs widely from *Ct. sinuosa* (de Ryckholt), and the two species are not likely to be

mistaken one for the other. The figure of *Ct. Halli*[1] has a much greater resemblance, and, indeed, it is possible that the species may be identical, but in the absence of any specimens of the Spanish shell I have hesitated to refer the Penton shells to that species. They seem to me to be more transverse, more pointed posteriorly, narrower from above downward, and neither in the figure nor in the description of Barrois's shell is any mention made of the angular ridge parallel to the hinge-line which is present in *Ct. pentonensis*.

The dimensions of *Ct. Halli*, Barrois, are here given for comparison:—Antero-posteriorly, 32 mm.; dorso-ventrally, 19 mm.

EXPLANATION OF PLATE XXV.

Fig. 1. *Ctenodonta pentonensis*. Left valve. Penton Linns; p. 369. Nat. size.
2. " " Left valve, full-grown size; same locality. Nat. size.
3. " " Right valve, medium-sized specimen; same locality. Nat. size.
3*a*. " " Fig. 3 viewed from above, showing the lunule and angular dorsal edge. Nat. size.
4. " " The hinge of a left valve, × 2; same locality.
5. *Carbonicola Vinti*. A left valve, × 3, from Chatterley; p. 367.
6. " " A left valve, ×3, crushed, giving rise to an appearance resembling that of *Discina* or *Ancylus*; same locality.
7. " " A left valve, ×3, somewhat crushed, with perfect contour; same locality.
8. " " A slab covered by the periostraca of the shells, ×3, from Claxheugh, County Durham.
9. " " Portion of a right valve, ×3; same locality.
10. " " The impression of a right valve, ×3; same locality.
11. " " An uncrushed right valve, ×3; same locality.

Figs. 12 & 13. *Carbonicola Vinti*. Small specimens from the Hamil marl-pit, Burslem; p. 367.

Fig. 14. *Anthracomya calcifera*. A right valve, ×3, from roadside, Bradwell, in limestone; p. 365.

Figs. 15 & 19. *Anthracomya calcifera*. The casts of left valves, ×3, from the same locality.

Fig. 16. *Anthracomya calcifera*. A right valve, × 3, from the same locality.

Figs. 17 & 18. *Anthracomya calcifera*. A left and right valve, ×3, showing the hinge-plate and interior, from Slade Lane, Fallowfield, near Manchester.

Fig. 20. *Anthracomya calcifera*. The left valve of a medium-sized specimen, ×3, from Bradwell.

[In the above plate the outlines of figs. 5–20 show the actual size of the specimens. With the exception of those reproduced in figs. 15, 17, 18, & 19, the specimens are all in my collection. The specimens figured as 15 & 19 are in the possession of Mr. Walcot Gibson, F.G.S., and those figured as 17 & 18 belong to Mr. C. Rœder of Manchester.]

[1] Barrois, 'Recherches sur les Terrains anciens des Asturies & de la Galice,' Mém. Soc. Géol. Nord, vol. ii (1882) No. 1, p. 339 & pl. xvii, fig. 3.

DISCUSSION.

The PRESIDENT said that he had been asked by Mr. W. GIBSON (who was unable to be present) to state his opinion as follows:—

He (Mr. GIBSON) was very pleased to find that the Author had discovered a distinctive fossil, other than fragmentary fish-remains, or smooth-valved entomostraca, in the great thickness of Upper Coal-Measure strata of North Staffordshire. The occurrence and, so far as yet known, the restriction of *Anthracomya calcifera* to the limestone at the base of the grey measures conformably underlying the Red Series (Permian of the Geological Survey) is an important fact, as bearing upon the age of the Red rocks. The correct relegation of the curious little shell found at Burslem and elsewhere in the Coal Measures of North Staffordshire to *Carbonicola Vinti* removes all doubt concerning a very curious fossil. The exact value of the zone of *C. Vinti* has yet to be determined. He wished to congratulate the Author on his careful working out of the material.

Mr. GARWOOD also spoke.