TAXONOMY AND DISTRIBUTION OF THE UPPER CARBONIFEROUS NON-MARINE BIVALVE *CARBONICOLA ALDAMII*

by P. J. BRAND

ABSTRACT. Records of non-marine bivalves similar to *Carbonicola aldamii* (Brown) are listed and, where possible, specimens are figured. This species, originally described from Whitehaven, Cumbria has not so far been recorded again in collections from that district. Most known specimens referred to the species come from the Midlothian and Douglas coalfields of Scotland.

THE non-marine bivalve species described by Brown (1843) have been used over many years by workers on the Westphalian faunas of Britain, despite the fact that the type specimens must be presumed to be lost (Trueman and Weir 1947, p. 23). The interpretation of some of these described species, including *Carbonicola aldamii* (*aldamae*) (Trueman and Weir 1947; Weir 1968), was left in abeyance. Brown, in his original description, referred the species *aldamii* to the genus '*Pachyodon*', later transferring it to '*Unio*' (Brown 1849, p. 179). It was Trueman and Weir (1947, p. 56, pl. 9, figs 15–17) who placed the species in the genus *Carbonicola*. Despite the apparent loss of the type specimens it seems likely that Brown's figure (Pl. 1, fig. 2) is accurate, a conclusion reached by Eagar and Williamson (1970, p. 221) in their discussion on other material from Shedden, near Burnley, a locality from which Brown also described specimens in 1843. It has been suggested (J. D. D. Smith, pers. comm.) that the figure and description given by Brown is in itself sufficient to distinguish the species.

SYSTEMATIC PALAEONTOLOGY

Repositories. The specimens described and figured below are housed as follows: GSE, British Geological Survey, Edinburgh, E 7657, E 7664, E 7667, EU 8361, GSE 13706; GSM, British Geological Survey, Keyworth, FMT 550; HM, Hunterian Museum, Glasgow, S 6341, S 7103; NMW, National Museum and Gallery of Wales, 70. 17G. 29a.

Phylum MOLLUSCA
Class BIVALVIA Linné, 1758
Family ANTHRACOSIIDAE Amalitsky, 1892

Genus CARBONICOLA (*pars*) McCoy *in* Sedgwick and McCoy, 1855

Carbonicola aldamii (Brown) Trueman and Weir

Plate 1, figures 1–8

1843 *Pachyodon aldamii* Brown, p. 394, pl. 16*, fig. 3.
1849 *Unio aldamii* (Brown); Brown, p. 179, pl. 73, fig. 18.
1947 *Carbonicola aldamae* (Brown); Trueman and Weir, p. 56, pl. 9, fig. 17 [cop. Brown 1843, pl. 16*, fig. 3], *non* pl. 9, figs 15–16.

Holotype. Specimen figured by Brown (1843) and now believed lost.

Diagnosis. Subcompressed, flexuose and subtriangular; umbones subcentral, very obtuse, set 3 mm apart; hinge line slightly arcuated; anterior side descending abruptly from the umbones, beneath

[Palaeontology, Vol. 39, Part 2, 1996, pp. 407–411, 1 pl.]

which it is slightly rounded with a flexure below, somewhat produced on the margin immediately under the umbones; posterior side gently sloping and rounded, with a shallow furrow emanating from below the umbones, and rapidly widening, terminates on the base; basal line flexuose. Length is 41 mm; breadth 54 mm; thickness 25 mm. The greatest thickness of the shell is at the middle of the discs, from where it rapidly thins to the margins (adapted from Brown 1843, p. 394).

Description. The shell outline is more an irregular trapezium than subtriangular and the shells are tumid but not strongly so. They become flattened towards the posterior margins. The umbones are subcentral or nearer the anterior third of the shell length. The shell material is thick in the umbonal region and thins towards the margins of the shell. The ventral margin shows a flexuosity towards the posterior which Trueman and Weir (1947, p. 57) suggested may be due to crushing. However, in all the specimens seen from Scottish locations this feature is present and is as marked as it is in Brown's original figure, serving to distinguish this form from other elements of the associated fauna. The shallow furrow emanating from below the umbones mentioned by Brown arises posterior to the umbones and widens towards the venter (Pl. 1, figs 1–2, 5, 7). It is, however, less obvious on internal moulds (Pl. 1, figs 4, 6, 8). Internal moulds of this species, as with some other species of *Carbonicola*, are unreliable guides to the external morphology, in part because of the varying thickness of the shell material, particularly in the umbonal region. Neither Brown nor Trueman and Weir were able to figure any examples of the interior or the hinge. That figured here (Pl. 1, fig. 3) shows that the hinge is typical of species of *Carbonicola* as illustrated by Maclennan (1944, pl. 1), and Eagar (1946, pl. 1). Thus there is a striated pit in the right valve anterior to a low striated tooth or ridge which is succeeded to the posterior by a shallow hollow. The narrow external ligament notch extends over this area on the upper surface of the commisure and leads into a broad area on the hinge face which continues and narrows to the posterior. So far, no left valve has been recovered in which the hinge structure is present, and even the right valve figured is incomplete to the posterior so that the posterior musculature is not seen. A deep pit at the extreme anterior marks the position of a major adductor scar whilst minor pedal scars lie posterior to it just below the hinge and anterior to the umbo.

Remarks. Brown (1843), in his original description, described the location for the type specimen of *Carbonicola aldamii* as 'from Coal Shale at Whitehaven'. This is insufficient to indicate what horizon is involved. Examination of the mining records for the Whitehaven area now held by the British Geological Survey at Edinburgh shows that the seam principally worked in the area was the Bannock Band. This seam lies near the base of the lower Similis-Pulchra Chronozone (Calver *in* Taylor 1961, p. 22). Wood (1988, p. 116) recorded that, at the time of Brown's paper, workings had begun in the Six Quarters Coal near the top of the Communis Chronozone (Calver *in* Taylor 1961, p. 20). Abandonment plans for various collieries suggest that this was the lowest seam commonly

---

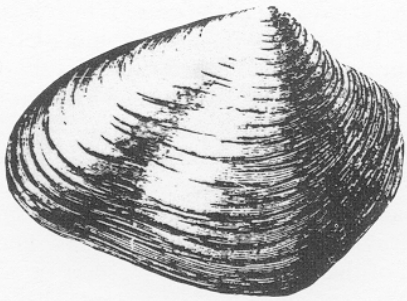
EXPLANATION OF PLATE 1

Figs 1–8. *Carbonicola aldamii* (Brown, 1843); Midlothian Fifteen Foot Coal; Langsettian. 1, GSE E7664; Newcraighall Colliery, Midlothian; right valve, composite mould. 2, reproduction of Brown (1843, pl 16*, fig. 3). 3, GSE EU 8361; Musselburgh Briarthorn Bore 5 at 405 m; interior of incomplete right valve showing part of hinge plate. 4, HM S7103; 274 m east-south-east of pit bottom, Newcraighall Colliery, Midlothian; internal mould of right valve. 5, GSE E 7667; as fig. 1, composite mould of right valve. 6, HM S 6341; as fig. 4, internal mould of right valve, figured Leitch (1936, pl. 1, fig. c). 7, GSE 13706; Pinkieburn Bore 74 at *c.* 24 m; incomplete composite mould of right valve. 8, GSE E 7657; as fig. 1, composite mould of right valve.

Figs 9–11. *Carbonicola* sp. intermediate between *C. robusta* (J. de C. Sowerby, 1840) and *C. rhomboidalis* Hind, 1894. 9, GSM FMT 550; basal *Communis* Zone; stream on right bank of River Giedd, 613 m south-east of Pen-cae-moel, near Cwm Giedd, Breconshire; right valve, figured Trueman and Weir (1947, pl. 9, fig. 16) as *Carbonicola* cf. *aldamae*. 10, reproduction of Pastiels (1960, pl. 14, fig. 14). 11, NMW 70.17G.29a (formerly University College Swansea L 2093); *Lenisulcata* Zone; shales below Farewell Rock; Twrch Valley near Ystradgynlais, Breconshire; composite mould of crushed right valve, figured Trueman and Ware (1932, text-fig. 3c) as *Carbonicola* sp., and Trueman and Weir (1947, pl. 9, fig. 15) as *Carbonicola* cf. *aldamae*.

All × 1.

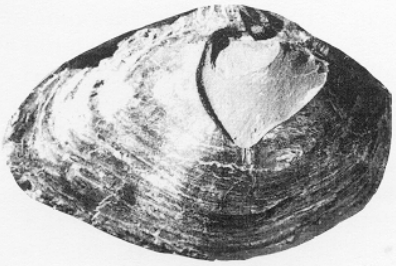
1



2

3

4

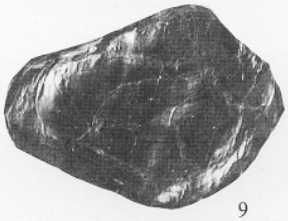


5

6

7

8



9

10

11

BRAND, *Carbonicola*

worked at that date in the area. Whilst it is eminently possible that the form described as *Pachyodon lateralis* (Brown 1843) from the same 'Coal Shale at Whitehaven' could have come from a horizon at about the Bannock Band it is unlikely that the form described as *P. aldamii* came from the same horizon, a conclusion also drawn by Weir (1968, p. 432). Calver (*in* Taylor 1961) examined the bulk of the material from the Cumberland Coalfield in the British Geological Survey collections and did not recognize the species. Further examination of these specimens and new material from the same area by the author has also failed to reveal any topotypic material. The Natural History Museum in London, the Hancock Museum in Newcastle and the Manchester Museum do not have any comparable shells in their collections. The museums at Carlisle, Kendal and Whitehaven are also devoid of these forms. Thus it seems possible that the original description concerning the location of the type specimen may be wrong. There are discrepancies in the listing of locations and specimen donors in the 1843 paper which Brown altered in the 1849 work, and it is possible that the type specimen did not originate from Whitehaven. Specimens similar to the original are to be found in collections from the Musselburgh Fifteen Foot Coal fauna from Dalkeith, and also at Newcraighall from a similar stratigraphical horizon. The location at Dalkeith was familiar to Brown who described *Pachyodon gerardi* from his own collection from there (1843, p. 390). The Musselburgh Fifteen Foot Coal lies near the base of the Communis Chronozone in the Midlothian Coalfield.

Leitch (1936) described the fauna of the Musselburgh Fifteen Foot Coal, with variation diagrams for the forms present. This material has been examined and in the opinion of the author the form labelled Norm β (C) in the diagram (Leitch 1936, pl. 1) represents *C. aldamii*. The specimen is figured here (Pl. 1, fig. 6), and is, in part, an internal mould with traces of external growth lines. It does, however, show the flexuosity of the margin which Trueman and Weir (1947, p. 57) noted as being rare in the genus *Carbonicola* and which appears to have been one of the features of the original specimen. As Leitch (1936, pl. 1) showed, the figured associated fauna consists of forms which may be termed *C.* aff. *browni* (Q–R); *C. polmontensis* (A, S); *C. rhindi* (B); with a few rare shells approaching *C. centralis* (M) together with others which exhibit features placing them between *C. robusta* and *C. rhomboidalis* (J–K). Other specimens shown in the variation diagram which approach *C. aldamii* are those lettered D–F. This paper by Leitch illustrates some of the principles which were used by Trueman and Weir (1946, p. xv) in their discussion of using morphological species of non-marine bivalves (see also Weir 1968, p. xxxviii).

Trueman and Weir (1947, p. 56, pl. 9, figs 15–16) figured shells from Wales which they referred with some doubt to *C. aldamae*. These have been examined and whilst they are similar to each other, neither specimen shows the ventral marginal features of *C. aldamii*. Both may be referred to a form intermediate between *C. robusta* and *C. rhomboidalis* similar to the forms found in the roof of the Fifteen Foot Coal. These are here re-figured (Pl. 1, figs 9, 11) in order to emphasize the differences in shell outline. Pastiels (1960, pl. 14, figs 12–14) also refers a specimen doubtfully to *C. aldamae*. It, too, may be referred to an intermediate form between *C. robusta* and *C. rhomboidalis*. A copy of Pastiels' original figure is added for comparison (Pl. 1, fig. 10). This form appears to have a wider distribution than *C. aldamii* both in geographical and stratigraphical terms and is known from horizons near the top of the Lenisculcata Chronozone to the middle part of the Communis Chronozone throughout the coalfields of Britain and also in Europe.

Occurrence. It appears that Brown's species *aldamii* may be recognized amongst Scottish material and so far has not been recorded again in collections from Cumbria. The species has an unusually restricted distribution in Scotland at the base of the Communis Chronozone, and has been only recorded from the Lothian Coalfield in the roof of the Musselburgh Fifteen Foot Coal and in the Douglas basin in the roof of the Castle Coal; both coalfields are on the southern margins of the Midland Valley of Scotland. Corresponding stratigraphical horizons in the remaining coalfields of Scotland appear devoid of the species.

Acknowledgements. The author thanks Drs P. Jeffery, The Natural History Museum, J. Nudds, The Manchester Museum, N. Clark, Hunterian Museum, Glasgow, R. M. Owens, National Museum and Gallery of Wales, J. D. D. Smith, International Commission for Zoological Nomenclature, London, L. Fade, Kendal Museum, Messrs S. McLean, Hancock Museum, Newcastle, H. Fancy, Whitehaven Museum, and S. Hewitt, Carlisle

Museum for their assistance with collections in their care. I thank also all those who have made helpful comments on earlier drafts. The paper is published by permission of the Director, British Geological Survey (N.E.R.C).

REFERENCES

AMALITSKY, W. P. 1892. Über die Anthracosien der Permformation Russlands. *Palaeontographica*, **39**, 125–214, pls 1–2.

BROWN, T. 1843. Description of some new species of the genus *Pachyodon*. *Annals and Magazine of Natural History*, **12**, 390–396, pls 15, 16*, 16.

—— 1849. *Fossil conchology of Britain and Ireland*. Smith, Elder, and Co., London, 275 pp., 114 pls.

EAGAR, R. M. C. 1946. The hinge of certain non-marine lamellibranchs from the Lenisculcata Zone of the Coal Measures. *Geological Magazine*, **83**, 1–19, pls 1–2.

—— and WILLIAMSON, I. A. 1970. A rediscovered fossil locality at Shedden, near Burnley, Lancashire. *Geological Journal*, **7**, 221–223, pl. 26.

HIND, W. 1894. A monograph on *Carbonicola*, *Anthracomya* and *Naiadites*. Part 1. *Palaeontographical Society Monograph*, **48** (227), 1–80, pls 1–11.

LEITCH, D. 1936. The Carbonicola fauna of the Midlothian Fifteen Foot Coal: a study in variation. *Transactions of the Geological Society of Glasgow*, **19**, 390–403.

LINNÉ, K. 1758. *Systema naturae per tria regna naturae*... Edit. decima, 1, Laurentii Salvii, Stockholm, 824 pp.

MACLENNAN, R. M. 1944. Hinge structure in *Carbonicola pseudorobusta* Trueman and related species. *Geological Magazine*, **81**, 1–14, pl. 1.

PASTIELS, A. 1960. Les lamellibranchs non-marins de la zone à *Lenisulcata* de la Belgique (Namurien et Westphalien A). *Publications, Centre National de Géologie Houillère*, 1–206, 23 pls.

SEDGWICK, A. and MCCOY, F. 1855. *Synopsis of the classification of British Palaeozoic rocks*. Part 3. John Parker and Son, London, xcviii + 255 pp.

SOWERBY, J. de C. 1822–1846. *The mineral conchology of Great Britain*. London, 4 vols of 236, 239, 186 and 104 pp., 327 pls.

TAYLOR, B. J. 1961. The stratigraphy of exploratory boreholes in the West Cumberland Coalfield. *Bulletin of the Geological Survey of Great Britain*, **17**, 1–74, pls 1–2.

TRUEMAN, A. E. and WARE, W. D. 1932. Additions to the fauna of the Coal Measures of South Wales. *Proceedings of the South Wales Institute of Engineering*, **48**, 67–91.

—— and WEIR, J. 1946. The Carboniferous non-marine Lamellibranchia. *Palaeontographical Society Monograph*, **99** (434), i–xxxii, 1–18, pls 1–4.

—— —— 1947. The Carboniferous non-marine Lamellibranchia. *Palaeontographical Society Monograph*, **101** (440), 45–74, pls 8–12.

WEIR, J. 1968. The Carboniferous non-marine Lamellibranchia. *Palaeontographical Society Monograph*, **122** (523), xxxv–xxxix, 415–449, pl. 48.

WOOD, O. 1988. West Cumberland Coal 1600–1982/3. *Cumberland and Westmorland Antiquarian and Archaeological Society*, Extra Series, **24**, 377 pp.

P. J. BRAND
British Geological Survey
Murchison House, West Mains Road
Edinburgh EH9 3LA, UK

Typescript received 27 January 1995
Revised typescript received 17 May 1995