

Having since obtained a careful drawing, I think it may be desirable to place the earlier figure of this specimen beside the later figure, in order to show how Mr. Scudder was misled by the former, and that in fact (as may be seen by comparing the woodcut Fig. 2 below, with the drawings of other examples given on Plate I.) there

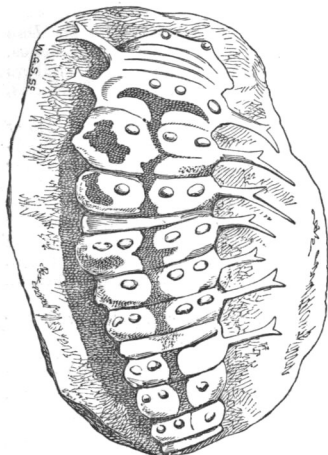


Fig. 1.

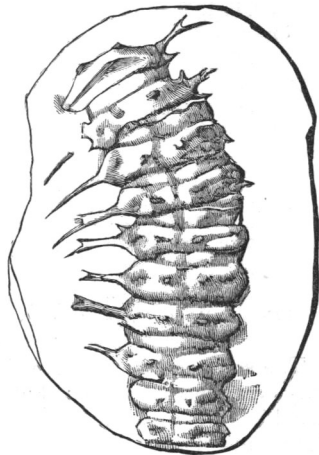


Fig. 2.

Euphoberia ferox, Salter, Coal-measures, Coalbrook-dale ("Hope Collection").

FIG. 1.—Rough copy of original figure in "Brodie's Fossil Insects" (1845, pl. i. fig. 11).

FIG. 2.—The same specimen re-drawn to show that there are only two pairs of spines to each segment.

can be no reason for separating this specimen from its congeners, with which it agrees in every particular.

The lateral spines are bifid, there are two submedian spines, broken off as usual; the supposed third pair of spines on each somite, one on either side above the pair of lateral branched spines, are (as already pointed out on p. 2 *op. cit.*) only *depressions* in the tergum near the base of these lateral spines. This led to the error of attributing the Oxford specimen to the genus *Acantherpestes*, to which it certainly does not belong.

NOTICES OF MEMOIRS.

I.—ON THE CLASSIFICATION OF THE CARONIFEROUS LIMESTONE SERIES; NORTHUMBRIAN TYPE. By HUGH MILLER, F.R.S.E., F.G.S.¹

IT is now twenty years since the late George Tate, of Alnwick, published a completed classification for the Carboniferous Limestone Series of North Northumberland. For more than half that period it has been set aside as of merely local value. It will be the endeavour of this paper to restore it to its true place.

¹ Read before British Association, Birmingham, in Section C (Geology).

Tate's classification may be summarized as in the following table:—

CARBONIFEROUS LIMESTONE SERIES OF NORTH NORTHUMBERLAND: TATE'S CLASSIFICATION, 1856-1868.

[References:—G. Tate, *History of Berwickshire*, Naturalists' Club, 1856, p. 219; *Ibid.* vol. v. 1866-7, pp. 283, 357; *Hist. of Alnwick*, 1866, p. 444; *Tyneside Transactions*, vol. ii. 1868, p. 6.]

Upper or Calcareous group:—From the base of the Millstone Grit to the Dun Limestone—"the lowest limestone of any value." Good workable limestones, interstratified among alternations of sandstone, shale, and coal; large numbers of marine organisms connected with the calcareous strata. Thickness, about 1700 feet.

Lower or Carbonaceous group:—From the base of the Dun Limestone to the top of the Tuedian group. Marked by the number, thickness, and quality of its coal-seams; limestones thin and generally impure; marine organisms in fewer numbers. Thickness, 900 feet.

Tuedian Groups:—Beds intermediate between the Productal and Encrinital limestones and the Upper Old Red Sandstone. Distinguished by coloured shales, by thin, argillaceous and cherty or magnesian limestone, and by the rarity of Encrinites and Brachiopoda; some Stigmarian layers, but no beds of coal. Thickness, about 1000 feet. In one of his papers Tate distinguishes an upper group of "Tuedian grits."

[*Upper Old Red Sandstone*. Local conglomerates, "more connected with the Carboniferous than with the Devonian." No *Stigmara*.]

The southern part of Northumberland Tate seems to have visited only very occasionally; but from his small map of the county, in which he uses three colours for his three divisions throughout (*Tyneside Transactions*, vol. ii.), and from his treatise upon the geology of the Roman Wall (Bruce's Roman Wall, 4th edition), it is evident that his careful eye detected nothing to conflict with his classification. Mr. Tate died in 1873.

In 1875, Tate's classification of the upper divisions of the series was set aside by Professor Lebour in favour of an arrangement more "natural and convenient." Professor Lebour abolished the distinction between the *Calcareous* and *Carbonaceous* groups, and threw them together—along with some of the Tuedian grits—into a single large series, to which he applied the term *Bernician*. It is based on the assumption that Tate's two divisions either do not exist in nature or do not persist throughout the county.

CARBONIFEROUS LIMESTONE SERIES IN NORTHUMBERLAND: LEBOUR'S CLASSIFICATION, 1875-1886.

[References:—G. A. Lebour, "On the Larger Divisions of the Carboniferous Rocks in Northumberland," *Trans. N. of England Min. Inst.* 1876; "On the terms Bernician and Tuedian," *GEOL. MAG.* 1877, p. 19; "Outlines of the Geology of Northumberland," Newcastle, 1878; "Sketch of the Geology of Northumberland," Geologists' Association, 1886.]

Bernician A large group—which "cannot be divided in any natural manner"—of limestones, grits and sandstones, shales, and coals; lower limit, "a variable one," not keeping to any one horizon; thickness, in North Northumberland, 2600 feet (after Tate); in Mid Northumberland, a maximum of "at least 8000 feet"; in South Northumberland, 2500 feet (after Westgarth Foster).

Tuedian As in Tate's classification, but without definition at its upper limit.

Basement Conglomerates Local.

It has never been contended, the author believes, that Tate's prior classification is not applicable to North Northumberland. It is now, as the result of the labours of the Geological Survey shows, found to

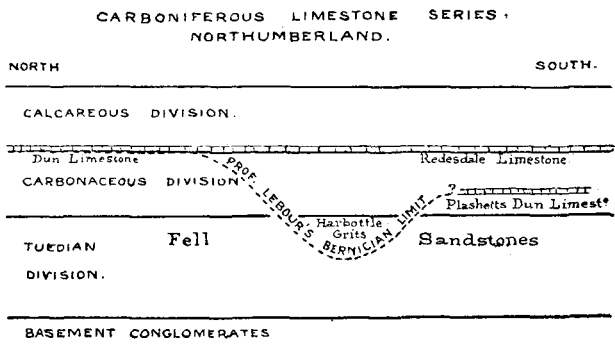
be equally applicable to South Northumberland, and to the whole of what deserves to be distinguished as the *Northumbrian Type* of the Carboniferous Limestone series, in contrast with the Yorkshire type and Scottish type. It is amplified in some not very important details, as set forth in the following table:—

CARBONIFEROUS LIMESTONE SERIES—NORTHUMBRIAN TYPE (Northumberland, East Cumberland, and Liddisdale).

[Reference:—H. Miller, Article "Northumberland," Encyclopædia Britannica, 9th edition.]

Upper Limestone Series.	<p><i>Felltop or Upper Calcareous Division:—From the Millstone Grit to the zone of the Great Limestone.</i> Sandstones and shales; one or more beds of marine limestone, including the Felltop Limestone; some coals</p> <p><i>Calcareous Division:—From the Great Limestone to the bottom of the Dun or Redesdale Limestone.</i> Many beds of good marine limestone; sandstones and shales; coals</p>	Feet
		350—1200
Lower Limestone Series.	<p><i>Carbonaceous Division (Scremerston Beds of North Northumberland):—From the Dun or Redesdale Limestone to Tate's "Tuedian Grits."</i> Strata prevalently carbonaceous; limestones chiefly thin, many of them containing vegetable matter; coals</p>	1300—2500
	<p><i>Tuedian Division or Tweed Beds:—Upper Tuedian or Fell Sandstone Group, the "Tuedian Grits" of Tate:—From the Carbonaceous Group to the Cement-Limestones.</i> Great belt of massive grits (Tweedmouth, Chillingham, the Simonside and Harbottle Hills, the Peel and Bewcastle Fells). Shales greenish and reddish as well as carbonaceous-grey; coals rare, thin, or absent . . .</p>	800—2500
	<p><i>Lower Tuedian or Cement-Limestone Group:—From the base of the Grits downwards.</i> Cement-stone bands passing (Rothbury, Bewcastle) into limestones; coals very rare; generally some coloration of the shales and sandstones</p>	500—1600
	<i>Basement Conglomerates (Upper Old Red Sandstone); local .</i>	530—1500 0—500

The relation borne to the lines of this extended classification by Prof. Lebour's Bernician limit, so far as he has hesitatingly defined it by horizons,¹ is shown in the following diagram:—



¹ "To the north of Berwick, the lowest accepted Bernician limestone is the Dun limestone, well known throughout the northern part of Northumberland, but only with great reserve to be correlated with a bed of the same name in the Upper North Tyne district (the Plashetts Dun Limestone of the diagram). This is the limestone

Tate's admirable classification presents us with well-defined types, generally recognizable almost at a glance by the practised eye, and bounded by lines as good probably as from the complications of the structure (faults, obscurities, etc.) could be expected. His names, if not high-sounding, are at least sufficiently expressive.

II.—THE CARBONIFEROUS LIMESTONE OF NORTH FLINTSHIRE. By G. H. MORTON, F.G.S.

(Abstract of Paper read before the British Association, Birmingham, September, 1886.)

IN the year 1870 I described before the Association the subdivisions into which the Carboniferous Limestone of North Wales is naturally divided by clear lithological characters, and in 1877 more fully described the subdivisions of the formation as they occur in the Eglwyseg ridge, near Llangollen. Since then the whole of Flintshire has been examined, and the original classification found to extend to the sea-coast at the north of the county. Although the subdivisions are not piled up, one over the other, in a precipitous outcrop, the succession is as clearly shown between Prestatyn and Meliden as at Llanymynech and Llangollen, and the uniform character of each subdivision along the intervening 44 miles of country is remarkable.

The following four subdivisions of the Carboniferous Limestone are all well exposed in a fine mural section $3\frac{1}{2}$ miles in length, from Castell Prestatyn on the north to the end of Moel Hiraddug on the south, and occur in the following descending order:—

Upper Black Limestone—a black, fine-grained, thin-bedded limestone, containing very few fossils, but including *Posidonomya Becheri* and the remains of many plants. Thickness, 200 feet.

Upper Grey Limestone—a dark grey, thin-bedded limestone, with thin seams of interstratified shale, containing numerous fossils, including *Productus giganteus* and Corals. Thickness, 500 feet.

Middle White Limestone—a white or light grey, thick-bedded limestone, containing very few fossils. Thickness, 600 feet.

Lower Brown Limestone—a brown or dark grey, irregularly-bedded limestone, containing few fossils, but with interstratified shales at the base of the subdivision, which contain the remains of Plants. Thickness, 400 feet.

The total thickness of these four subdivisions, forming the Carboniferous Limestone of the North of Flintshire, is 1700 feet, which is much greater than anywhere else in North Wales.

Although the line of the section is nearly N. and S., the average dip of the strata is about 14° to the E.N.E. at Coed-yr-Esgob, N.W. at

which crops out for some miles along the coast at Lamberton . . . But in the Upper Coquet district (Mid-Northumberland), where the Tuedians are extremely well developed, no such limestone can (could) be traced, and the Harbottle Grits are so thoroughly Beruician in facies, and so well divided stratigraphically from the Tuedians, that *there* the base of this great sandstone series forms quite the most convenient boundary-line. Now there is little doubt that the horizon of the Lamberton or Dun Limestone is *above* the Harbottle Grits, so that the merely expedient and artificial character of the boundaries thus arrived at is shown at once. The truth is that no line should be drawn at all except as the merest matter of convenience."—Lebour, *Outlines of the Geology of Northumberland*, p. 44. In the diagram it is of course a matter of convenience that this confessedly artificial limit should be represented by a dotted line.