

NEW NAMURIAN GONIATITES OF THE GENUS *EUMORPHOCERAS*

by PATRICIA J. YATES¹

ABSTRACT. Two new species of Carboniferous goniatites, *Eumorphoceras rota* and *E. medusa* and a variety, *E. medusa* var. *sinuosum*, are described from the *Cravenoceras leion* zone on Slieve Anierin, Co. Leitrim, Ireland.

THESE new forms were collected from the *Cravenoceras leion* Zone (E_{1a}) on Slieve Anierin, Co. Leitrim, Ireland, during an investigation of the Namurian faunas of the area. *Eumorphoceras rota* is the earlier of the new species and occurs with typical *Eumorphoceras pseudocoronula* Bisat. *Eumorphoceras medusa* and *E. medusa* var. *sinuosum* are both found in later deposits which are, however, still within the *Cravenoceras leion* Zone. They are considered to show the later stages in the evolution of *E. pseudocoronula*. An example of the latter (occurring on the same level as *E. rota*) is figured (Pl. 6, fig. 3) to illustrate the lines along which evolution has proceeded to result firstly in the species *E. medusa* and then in the probably slightly later variety, *E. medusa* var. *sinuosum*.

Eumorphoceras medusa sp. nov.

Plate 6, figs. 1, 2.

Synonymy. Poorly preserved specimens of this species may in the past have been referred to *Eumorphoceras pseudocoronula* Bisat (1950, p. 19, pl. 2, fig. 4).

Description. The adult individuals are platyconic, with the last whorl high. On the same slab as the holotype a young individual of 10 mm. diameter appears to be a less flattened form with less difference between whorl height and whorl thickness. There are strong constrictions which in the holotype number six in half a whorl. These constrictions show a forward bow close to the umbilical edge; over the flanks they are slightly concave before curving forward to end at the latero-ventral groove with a strongly defined termination. Between these constrictions the ornament consists of muted plications which persist across the flanks. The shoulder furrow is divided by a broad flattened ridge but the resulting ventro-lateral furrow is very faint. The latero-ventral furrow is shallow but still persistent at the largest diameter seen. The umbilicus is open but not large and has a raised rim around its edge.

The very early stages are not well seen. At about 10 mm. the constrictions leave the umbilicus radially and arch smoothly forward to a salient at the shoulder [St. Ri. 2. 23 (Pl. 6, fig. 2) and St. Ri. 2. 26]. A weak beading of the umbilical edge can be seen at these early diameters [see the early part of St. Ri. 2. 23 (Pl. 6, fig. 2)]. With increasing diameter all indications of the umbilical beading disappear and the constrictions begin to develop the forward bow close to the umbilical edge. At large diameters the con-

¹ Miss Yates died on 7 August 1960 while this paper was in the press.

strictions become less strongly incised over the flanks and the actual terminations are less distinct than the earlier definite end at the latero-ventral groove.

Holotype. Doh. 6B. 10 (part and counterpart, Pl. 6, fig. 1). *Paratypes*. Doh. 6B. 14, St. Ri. 2. 24 (part and counterpart). Doh. 6B. 7, St. Ri. 2. 25, St. Ri. 2. 23 (Pl. 6, fig. 2). *Dimensions*. Doh. 6B. 10: diameter c. 21 mm., umbilical diameter 3.5–4 mm. Doh. 6B. 14: diameter c. 23 mm. St. Ri. 2. 23: diameter c. 10 mm. The other paratypes are too incomplete to allow exact measurements but appear to approximate to the above figures. The specimens are in the author's collection in the Murchison Museum, Department of Geology, Imperial College, London. The form is reasonably common and the material examined includes many incomplete specimens.

Type locality. The material on which this new species is based was collected from the mountain of Slieve Anierin, Co. Leitrim, Ireland. Locality Doh. 6 is on Irish Ordnance Survey 6-inch sheet Leitrim 21 (14) and lies about 150 yards beyond the last field boundary on the east bank of the stream which flows to the east of the old coal-mine track. The section consists of about 30 feet of light-brown shales and the goniates were collected about 20 feet above the base.

Locality St. Ri. 2 is on 6-inch sheet Leitrim 20 (8) and lies on the south bank of the Stony River; the section consists of a sheer cliff about 40 feet high and the fossils were all collected within a few feet of the base of the section.

Horizon. At both localities *E. medusa* is associated with *Pseudamussium* cf. *praetenuis* (von Koenen), *Kazakhoceras* sp. with a beaded venter, and *Posidonia trapezoedra* Ruprecht. The horizon is about 25 feet above an horizon rich in *Cravenoceras leion* Bisat and *Eumorphoceras pseudocoronula* Bisat.

Discussion. *E. medusa* is closely related to *E. pseudocoronula* Bisat, but differs markedly in the absence of the intermediate ribs between the constrictions. These intermediate ribs were observed to occur in examples of Bisat's species from the horizon 25 feet below the type horizon. An example of *E. pseudocoronula* is figured here (Pl. 6, fig. 3) from the lower faunal band on Slieve Anierin. Both sides of the constrictions are usually raised into sharp rib-like edges and there are in addition two intermediate short ribs between the constrictions. These ribs fade some distance before the ventro-lateral groove. The umbilical edge is raised and beaded by the ribs. There is a groove on both sides of the shoulder ridge but the more ventral groove is less strong.

The stratigraphically higher *E. medusa* therefore differs from the lower *E. pseudocoronula* Bisat in that the short ribs beading the umbilical edge have been lost. The edge of the umbilicus is raised into a rim but is never beaded in the adult stage in *E. medusa* and the ornament between the constrictions consists of gentle plications which apparently persist across the flanks. The umbilicus is smaller in *E. medusa* than in *E. pseudocoronula*, and the ventral furrow has become almost non-existent in the former. The forward bowing of the constrictions near the umbilical edge and fine plications in the region of the umbilicus in *E. medusa* are likewise distinguishing features which are absent in *E. pseudocoronula*.

Miller and Furnish (1940, pp. 364–6, pl. 47, figs. 6–12) describe and figure *Girtyoceras limatum* (Miller and Faber), which, judging from the plates, resembles *E. medusa*. The specimens are all internal moulds, the external form has not been seen, and the zonal position is too imprecise for exact correlation. The evidence is not sufficiently strong to prove identity with *E. medusa*.

The Geological Survey specimen Ca. 4782 (from a stream in Bowland Shales 40 feet above the lowest *Cravenoceras leion* beds in Bateson Wood, 550 yards north-east of Crag House, Yorkshire) is here assigned to *E. medusa*. Bisat had previously identified

this specimen as *E. aff. hudsoni* Gill but had commented on the label about the umbilical bowing and considered that it might be a new form.

Eumorphoceras medusa var. *sinuosum* var. nov.

Plate 6, figs. 4, 5

Description. The adult individuals are platyconic with the last whorl high. The young individuals are less flattened. In the adult form there are several sinuous constrictions which have a strong forward bowing close to the umbilicus. They are more strongly incised in this region than over the rest of the flank, where they become less strong as they curve forward to the latero-ventral groove. Between the constrictions there are frequent fine ribs or plications which pass over the flanks and can be seen on the shoulder ridge and on the venter. The latero-ventral groove persists but the ventro-lateral groove is scarcely visible. The umbilicus is relatively small, the edge slightly raised. Several specimens show rather strong spiral striae on the latero-ventral ridge.

Holotype. Agh. 8. 1 (Pl. 6, fig. 4). *Paratypes.* Agh. 8. 2 (Pl. 6, fig. 5), Agh. 8. 4, Agh. 8. 10. Since no complete specimen has been observed it is not possible to give precise dimensions; they do not appear, however, to differ particularly in this respect from *E. medusa* sp. nov. All these specimens and several others are in the author's collection in the Murchison Museum, Department of Geology, Imperial College, London.

Type locality. Locality Agh. 8, Slieve Anierin, County Leitrim, Ireland, is on Irish Ordnance Survey 6-inch Series Leitrim 23 (4). It is the last accessible exposure of shale along the east side of the stream before the bridge, and is about 20 feet high. The bridge is not marked on the map but the road along which it lies appears to begin near B.M. 272. 1 on Leitrim 23 (8). This variety has also been seen, very rarely, at locality St. Ri. 2, associated with *E. medusa* (St. Ri. 2. 22a).

Horizon. The material occurs about 25–30 feet above an horizon rich in *Cravenoceras leion* Bisat and *Eumorphoceras pseudocoronula* Bisat. The horizon is probably slightly higher than that in which *E. medusa* occurs.

Discussion. This is a variant of *E. medusa* which can be distinguished by the larger number of constrictions, which are strongly incised close to the umbilicus but more subdued over the rest of their course to the latero-ventral groove. As a result of the more strongly developed forward bow at the umbilical edge the constrictions have a more sinuous appearance than in *E. medusa*. The spiral ornament on the latero-ventral ridge is particularly strong in this variety.

EXPLANATION OF PLATE 6

- Figs. 1, 2. *Eumorphoceras medusa* sp. nov., Slieve Anierin, Co. Leitrim, Ireland. 1, Holotype (Doh. 6B. 10), external impression, $\times 4$. 2, Paratype (St. Ri. 2. 23), external impression of an adolescent stage, $\times 7.3$.
- Fig. 3. *Eumorphoceras pseudocoronula* Bisat, Slieve Anierin, Co. Leitrim, Ireland. Agh. 21. 3 is shown here as a typical example of the earlier *E. pseudocoronula* to compare with the later species and variety. One fragment is seen as an impression, the other as a mould, $\times 3$.
- Figs. 4, 5. *Eumorphoceras medusa* var. *sinuosum* var. nov. Slieve Anierin, Co. Leitrim, Ireland. 4, Holotype (Agh. 8. 1), external mould, $\times 4\frac{1}{2}$. 5, Paratype (Agh. 8. 2), external mould, $\times 4\frac{1}{2}$.
- Figs. 6, 7. *Eumorphoceras rota* sp. nov., Slieve Anierin, Co. Leitrim, Ireland. 6, Holotype (Agh. 21. 3), external impression, $\times 4\frac{1}{2}$. 7, Paratype (Doh. 50. 1), external mould, $\times 4\frac{1}{2}$.

Elias (1956, pp. 132–3) erected a new subgenus of *Eumorphoceras* which he named *Edmooroceras* in honour of E. W. J. Moore, and included *E. pseudocoronula* in this group. This subgenus is distinguished by 'a sub-angular and nodose umbilical edge; a more discoidal conch; a greater flattening of the venter in youthful and subadult stages; and a very narrow and low ventral carina, sharply rising upon the flattened venter at these same stages'. At least in the young forms *E. medusa* has a nodose umbilical edge and is closely related to *E. pseudocoronula*. The type species of *Edmooroceras* is *E. plummeri* Miller and Youngquist which, however, judging from the description and plates given by these authors (1948, pp. 665–7, pl. 100, figs. 1–4, 20, 21) does not resemble *E. pseudocoronula*, *E. medusa*, or *E. medusa* var. *sinuosum*. I prefer to retain these species as *Eumorphoceras* and not to place them in *Edmooroceras* as the type species of the latter is similar to *E. bisulcatum* Girty and is a strongly ribbed form and apparently without constrictions. Miller and Youngquist (1948, p. 666) comment that the type specimens of *E. plummeri* appear to resemble closely the form figured by Moore (1946, pl. 22, fig. 3). This specimen is in fact *E. bisulcatum* Girty, s.l., from Sabden Shales, near Samlesbury Bottoms, River Darwen, Lancashire, and is from the *Nuculoceras nuculum* subzone of E_2 age. It seems questionable, therefore, whether *E. pseudocoronula* should be placed in the subgenus *Edmooroceras*.

Eumorphoceras rota sp. nov.

Plate 6, figs. 6, 7

Description. Adult individuals platyconic. The umbilicus is minute. The shoulder groove is divided into two furrows of equal strength by a strong, rounded ridge. The ornament consists of extremely subdued sickle-shaped striae with a well developed ventro-lateral salient. Periodically there appears to be a stronger plication of the surface, a feature seen faintly on the external impression Agh. 21. 3, where there are about five or six of these per quarter whorl. This feature is also seen on the external mould Doh. 50. 1.

Holotype. Agh. 21. 3; diameter 12 mm. (Pl. 6, fig. 6). *Paratypes.* Doh. 50. 1; diameter 12 mm. (Pl. 6, fig. 7). Agh. 21. 4; diameter 11 mm. The material, which consists of about twelve specimens, is in the author's collection in the Murchison Museum, Department of Geology, Imperial College, London. All the specimens are external impressions and show no sutures.

Type locality. The material was collected from two localities on Slieve Anierin, Co. Leitrim, Ireland. Locality Agh. 21 is on Irish Ordnance Survey 6-inch sheet Leitrim 24 (1) on the west side of the stream running to the west of B.M. 801. 1 at the point where the 800-foot contour crosses the stream.

Locality Doh. 50 is on 6-inch sheet Leitrim 21 (14) on the west of the stream which flows to the east of the old coal-mine track, and is almost due east of B.M. 1249. 8 on this same track.

Horizon. Both localities are considered to be low in E_1 . *E. rota* is associated with *E. pseudocoronula* Bisat and *Cravenoceras leion* Bisat.

Discussion. *E. rota* is easily distinguished by its minute umbilicus, the marked prominence of the shoulder ridge and the subdued nature of the ornament. The sinuous nature of the ornament is reminiscent of that in *Eumorphoceras* sp. form A. (Moore 1946, pp. 418–19, pl. 25, fig. 2), but the latter has a much larger umbilicus, stronger ornament, and a less prominent shoulder ridge. *Eumorphoceras tornquisti* (Wolterstorff) is considered by Bisat (1950, pp. 20–21, pl. 2, fig. 2) to be very similar and possibly identical with *E.* sp. form A. Moore and like the latter is therefore easily distinguished

from *E. rota*. *Girtyoceras? costatum* (Ruprecht), figured by Bisat (1950, pl. 1, fig. 6) and also by Ruprecht (1937, pp. 271–2, pl. 10, figs. 5, 6) as *Sagittoceras costatum*, is similar in having a minute umbilicus. However, Ruprecht's description mentions only a deep furrow at the shoulder and the form has a much sharper ornament. It is also usually associated with *Lyrogoniatites georgiensis* Miller and Furnish and therefore occurs on a lower horizon than *E. rota*.

Rayner (1953, p. 286) refers to *Girtyoceras? costatum* Ruprecht (G.S.M. 85050) from a boring at Mount Pleasant, one mile south-west of Barnard Castle, Yorkshire. This specimen has been examined and although rather indistinct in the region of the groove there is definitely no strong ridge and the ornament is much stronger than that of *E. rota*. This specimen is very similar to the better specimen from the Alport Boring ZI 4707 (figured by Bisat 1950, pl. 1, fig. 6) and is distinct from *E. rota*.

There is, however, at the Geological Survey a specimen (84690) collected from Little Mearley Clough, Pendle, by E. W. J. Moore which has been identified as *E. pseudo-coronula* Bisat. Associated with this species there is an unidentified form which is now believed to be *E. rota*. I am indebted to Mr. Bisat who had previously noted this form and informed me of its existence on seeing examples of *E. rota*.

Acknowledgements. I am indebted particularly to Mr. W. S. Bisat who has given me much advice and assistance in preparing this paper; also to Dr. Gwyn Thomas for advice during its preparation, and to Mr. M. Mitchell who provided me with easy access to Geological Survey material.

REFERENCES

- BISAT, W. S. 1950. The junction faunas of the Viséan and the Namurian. *Trans. Leeds Geol. Ass.* **6**, 10–26, pl. 1, 2.
- ELIAS, M. K. 1956. Upper Mississippian and Lower Pennsylvanian formations of south-central Oklahoma. In *Petroleum Geology of Southern Oklahoma*, *Amer. Ass. Petrol. Geol.* 56–134.
- MILLER, A. K. and FURNISH, W. M. 1940. Studies of Carboniferous ammonoids. *J. Paleont.* **14**, 356–77, pl. 45–49.
- MILLER, A. K. and YOUNGQUIST, W. 1948. The cephalopod fauna of the Mississippian Barnett Formation of central Texas. *Ibid.* **22**, 649–71, pl. 94–100.
- MOORE, E. W. J. 1946. The Carboniferous goniatite genera *Girtyoceras* and *Eumorphoceras*. *Proc. Yorks. Geol. Soc.* **25**, 387–445, pl. 22–27.
- RAYNER, D. 1953. The Lower Carboniferous rocks in the north of England: a review. *Proc. Yorks. Geol. Soc.* **28**, 231–315, pl. 19.
- RUPRECHT, L. 1937. Die Biostratigraphie des obersten Kulm in Sauerlande. *Jahrb. preuss. geol. Landesanst.* **57**, 238–83, pl. 9–10.



1



2



3



4



6



5



7

YATES, *Eumorphoceras*