# A giant trilobite from the Lynton Formation, North Devon, indicates a Late Emsian age

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A large and unusually well-preserved trilobite pygidium collected *in situ* from the Lynton Formation at Lynton, north Devon, is identified as that of the homalonotid *Digonus gigas* (Roemer), and indicates a late Emsian age for the oldest Devonian strata on the North Devon coast.

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## Introduction

The Lynton Formation is displayed in well-exposed, but often inaccessible cliffs around the town in North Devon that gives the formation its name. These rocks comprise a folded sequence of clastic rocks estimated at between 300 and 400 metres thick (Edmonds *et al.*, 1985; Leveridge, 2011), with the lower part dominated by thick-bedded sandy and silty strata, but with argillaceous beds becoming more prominent higher in the sequence. Since Simpson (1964), the Lynton Formation has been accepted as the oldest marine Devonian exposed along the North Devon coast, lying at the centre of the Lynton Anticline, and surrounded by the prominent sandstones of the Hangman Grits. Despite strenuous attempts to retrieve fossils, the palaeontological evidence bearing on the age of the Lynton Formation has remained scrappy, and the long list of fossils in Edmonds *et al.* (1985, pp.7–8) includes predominantly tentative determinations. Marine fossils collected from the argillaceous beds are generally not well preserved, and are dominated by molluscs with long stratigraphic ranges. None of the standard Rhenish ammonoid zone fossils have been discovered. The best-preserved brachiopods were described by Evans (1983) who indicated a late Emsian assemblage, improving upon an Emsian-Eifelian age, close to the Lower to Middle Devonian boundary, previously tentatively suggested by House *et al.* (1977, table 1, column SW 3). Other than an unlocalised "*Phacops* sp." of little stratigraphical significance, trilobites had never been recorded. The discovery of a well-preserved pygidium of a very large trilobite was both unexpected and stratigraphically important. The specimen in question was excavated from bedrock, and was brought to The Natural History Museum, London, in 2016, coming in as an enquiry to the Angela Marmont Centre, from where Fiona Fernhead quickly brought it to the attention of the authors. The new trilobite discovery and its stratigraphical implications are the subject of this short paper.

## Trilobite occurrence and origin

The trilobite pygidium was recognised as a fossil and collected during construction work excavated into a fine sandstone bedrock towards the top of the hill at Lynton, high above the left bank of the West Lyn River (SS 73010 48975). The trilobite was brought into the Natural History Museum by its discoverer, Dr Frederika Holmes, and comprises part and counterpart of a very large pygidium, which was immediately recognisable as belonging to a homalonotid. Dr Holmes very kindly donated the specimen to the Museum for scientific study after consultation with her family. The comparatively fine preservation of this specimen contrasts with the indifferent condition of fossils from the argillaceous sediments known previously from the same formation. The coarser matrix evidently preserved the trilobite from the cleavage and tectonic distortion that affected the associated shalier rocks. Some further preparation of the hard sandstone was necessary to extract buried parts of the flanks of the specimen and the terminal pygidial spine. The preservation is sufficiently good to retain some details of the surface sculpture, and allows a determination, even without the discovery of corresponding cephalic sclerites.

Pound and Chapman (2004) have argued that some of the folding in the Lynton Formation was penecontemporaneous with its deposition, and recognised therein a submarine slide of considerable magnitude, using structural and cleavage criteria as evidence. The direction of movement of the slide was deduced by these authors to be "towards the SSW", that is, away from the Bristol Channel. This slumped structure includes sandstone beds similar to those that yielded the trilobite fossil. It seems plausible to us that the large homalonotid trilobite was entrained in a similar slide, accounting for its basin-ward emplacement from an originally shallower site. Large early Devonian homalonotids are typically found in shallow-water clastic deposits in the Rhenish 'magnafacies', and indeed over a

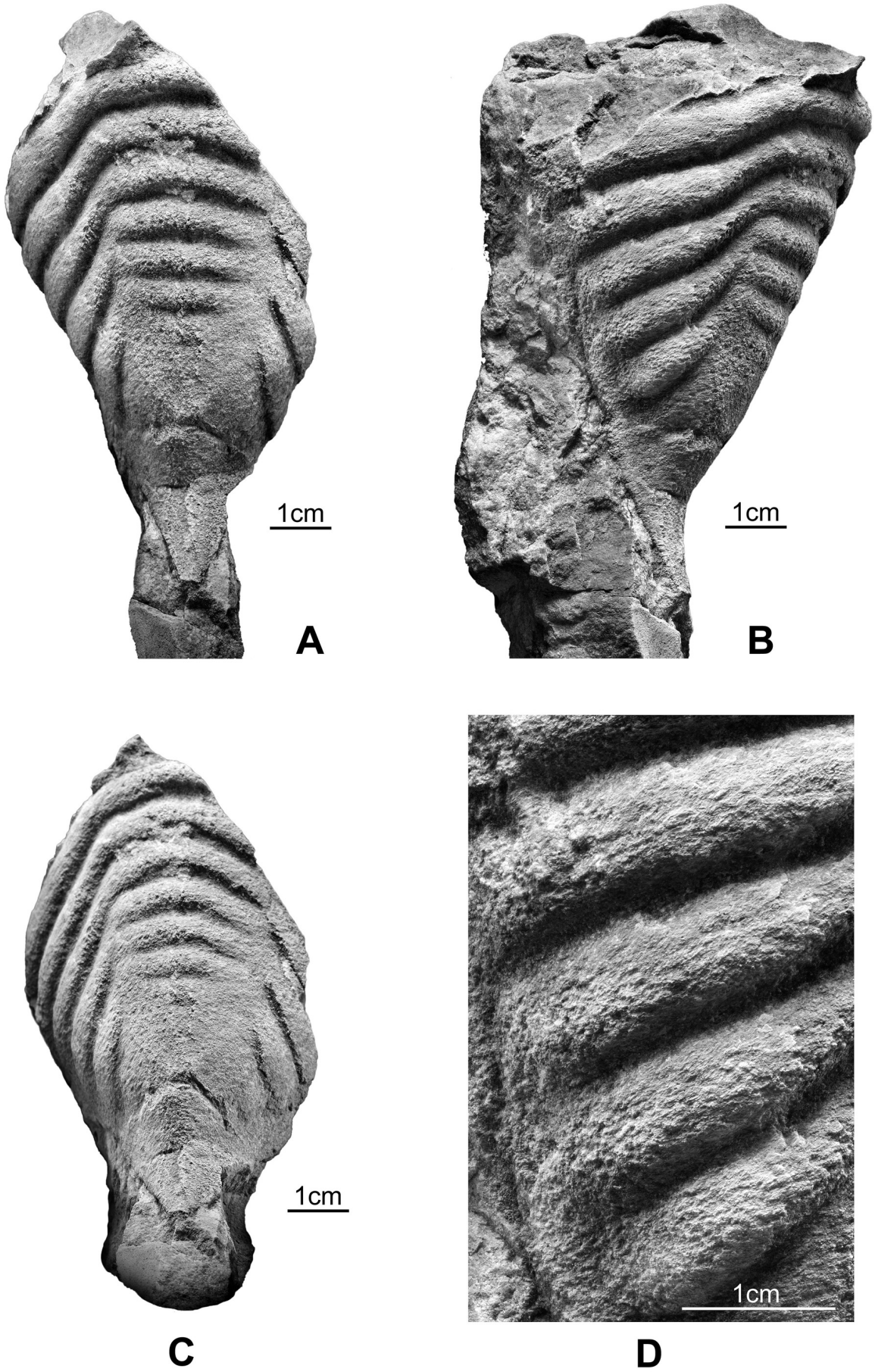


***Figure 1.*** Digonus gigas *(Roemer), pygidium. Natural History Museum, NHMUK PI It 29219.* ***1(A)****, dorsal view, x1;* ***1(B)****, left lateral view, x1;* ***1(C)****, posterior view, x1, showing the terminal spine slightly displaced by a crack;* ***1(D)****, enlargement of part of Fig. 1B to show the surface sculpture on the lateral parts of the pleural region, x 2.5.*

more extended area fringing the Gondwana core (e.g., South Africa; Cooper, 1982). They are not typical of more offshore facies. Pound and Chapman (2004) surmised that major slides were set off by movements along faults located within the present day Bristol Channel, presumably in connection with an active phase in the tectonic history of the Rheic Ocean. A landmass in the same general area has been proposed for some time (Bluck *et al.*, 1992) and this area might well have been fringed with shallow seas providing suitable habitats for large benthic trilobites like homalonotids; these were periodically caught up in foundering events. However, recent interpretations (summarised by Leveridge, in Whittaker and Leveridge, 2011) postulate that during the Devonian to Early Carboniferous, the location of the north Devon area lay some 200 km to the south-east along the Bristol Channel/Bray fault. The source of both slumps and trilobite might thus be associated with a different landmass, far removed from the present-day shelf configurations. Regardless of the tectonic setting, if we are correct in identifying the specimen from North Devon with *Digonus gigas* (Roemer, 1843) it adds to the evidence that there was ready marine contact between this part of western England and what is now the Rhenish region of western Germany. This distinctive species was widespread there in latest Emsian times.

## The Trilobite from Lynton

We identify the pygidium from the Lynton Formation as a species of the genus *Digonus* Gürich, 1909, which was discussed by Sandford (2005, p. 21). We do not have the cephalon, but the pygidium corresponds closely to Sandford's diagnosis. Species of *Digonus* are recorded throughout the Lower Devonian in many parts of the world (Sandford, 2005).

The type species of *Digonus* is *Homalonotus gigas* Roemer, 1843; this species was revised by Wenndorf (1990, p. 64) and we accept the synonymy he presented.

### *Description of the specimen from Lynton*

The specimen is registered in the NHM collections with the number NHM PI It 29219.

The length, as preserved, is 92 mm, but the anterior part of the pygidium is broken off. The maximum width is estimated to be 60 mm (doubled half-width) and the maximum height as preserved is about 52 mm. The incomplete pygidial axis is 67 mm long and at its anterior end the width is estimated to be 33 mm.

The pygidial outline is approximately triangular, elongate, with a terminal pygidial spine that extends back about 26 mm from the end of the axis (Fig. 1A). In end view the pygidium is evenly vaulted and nearly as high as wide. The axis lacks independent convexity in transverse section (Fig. 1C), and the axial furrow is indistinct, though its course is inferred from the angles that the pleurae make with the axial rings. Six axial rings are well seen and a seventh is weakly delimited. The first four axial rings pass directly into pleural ribs that bend strongly down and backwards, becoming a little broader distally; interpleural grooves are not seen; the pleural furrows are deep and extend almost to the margin of the pygidium, where they end abruptly, leaving a narrow border that is visible in side view (Fig. 1B). The fifth pleural rib is directed more nearly posteriorly and is less clearly connected to any particular axial ring. In dorsal view the pleural regions are about half as wide as the axis. In lateral view the profile of the axis is almost straight, sloping down posteriorly to the tip of the axis; the axial rings are evenly rounded, and not cuesta-style or "step-like", as in some species of *Digonus* – the '*ornatus* Group' of Wenndorf, 1990 (see Kennedy 1994, p. 31, pl. 3, fig 10). The edges of the terminal spine converge backwards at nearly 40°; the tip of the spine is broken off, but the counterpart shows that only about 1-2 mm are missing and that the tip of the spine appears to have been blunt. In places the surface of the pleural regions show a rough scabrous sculpture that includes a scattering of irregularly spaced larger granules (Fig. 1D).

## Discussion

The pygidium described here matches well the descriptions by both Wenndorf (1990) and Gürich (1909, p. 157, fig. 42, pl. 48, fig. 3b), though the terminal spine does not curve downwards as inferred by Gürich, but extends directly backwards, as illustrated by Wenndorf (1990, fig. 28). Comparison with illustrations of German specimens suggests that the three anterior segments of the Lynton specimen are not preserved (see Fig. 2); if this is correct, the pygidium would, when complete, have had about 11 axial rings and 8 pairs of pleural ribs, numbers that are typical for *Digonus*. The Lynton pygidium does not show the downwardly curved lateral profile of the axis, as in several other species (e.g., *Digonus intermedius* in Wenndorf, 1990, pl. 13; D. *antarcticus* Saul 1965), and has simple axial rings rather than the "step-like" rings seen in *Digonus* of the *ornatus* group (Kennedy, 1994). Preservation is good enough to see the coarse, irregular surface sculpture typical of the species (Wenndorf, 1990, p. 68), and there are no grounds to suppose that the Lynton specimen belongs to any species other than *D. gigas*, although cephalic information is obviously lacking.

If it is accepted that three pygidial segments, each 8 or 9 mm long, have been broken off (Fig. 2), we estimate that the original length of the pygidium was originally nearly 120 mm; following Wenndorf's (1990, figs 28, 29) reconstruction, this would correspond to a trilobite over 400 mm long, which is commensurate with some German records (Koch 1883), but is substantially larger than the British Devonian homalonotids described in Kennedy's (1994) monograph (with the possible exception of a thoracic fragment shown in Kennedy's plate 4, figure 1). The only other British homalonotid that we know of that may approach the Lynton specimen in size is the Ordovician form *Brongniartella*? *rudis* from North Wales, though the deformed condition of Salter's (1865, pl. 10, fig. 5) giant specimen prevents accurate comparison.

Kennedy (1994, pls 3–5) monographed the Devonian homalonotids of south Devon, nearly all of which were collected from the Meadfoot Group and Staddon Grits, and are considered to be of Emsian age. The specimens that he assigned to *Digonus ornatus disornatus* and *D. goniopygaeus* have pygidial axes with step-like rings that characterise the *D. ornatus* Group, rather than the simple rings of the *D. gigas* Group. The pygidia assigned to *Burmeisteria* tend to have

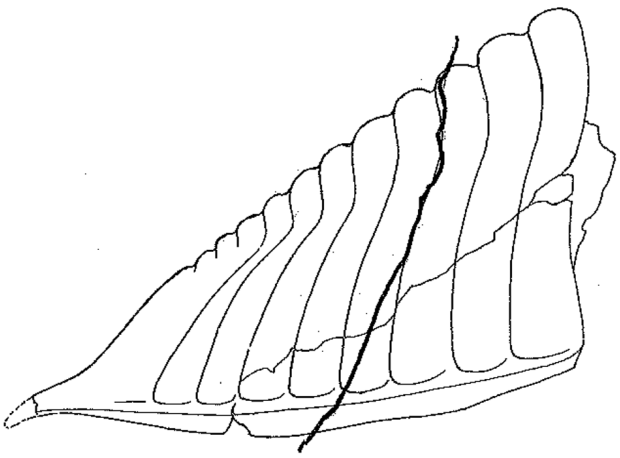

***Figure 2.*** Digonus gigas*, side view of a pygidium, approx. x 1, from Niederlahnstein, Germany, as figured by Gürich (1909, fig. 42). The part of the pygidium to the left of the thicker line shows the part that is represented by the fossil from Lynton.*

paired spines or tubercles on the axis and pleural fields, and they also differ from the pygidium from Lynton because the axis is more elevated above the pleural fields, and is longer, extending to the posterior margin (e.g., Kennedy 1994, pl. 4, figs 3, 9; pl. 5, figs 11, 12).

## Stratigraphical Significance

The genus *Digonus* ranges up through the whole Lower Devonian from the Lochkovian and Pragian stages to the top of the Emsian. In the Devonian succession of the Rhineland, the species of the *D. ornatus* Group are older than *D. gigas*, which occurs only in the upper Emsian. A descendant form, the subspecies *D. gigas posterior* Wenndorf, 1990, occurs in the highest part of the Emsian, and seems to be the youngest *Digonus* known. The discovery of *D. gigas* in the Lynton Formation adds to the evidence that that formation ranges down at least as far as the upper part of the Emsian Stage.

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