Bendrick Rock, South Glamorgan

[ST 131 668]

Highlights

Bendrick Rock, Barry is the source of Britain's best dinosaur trackways. Hundreds of footprints have been recorded and collected there over the years, and the site is still extremely rich.

Introduction

Abundant dinosaur footprints have been found in Late Triassic sediments near Bendrick Rock (Figure 4.17). This is the best site in the British Isles for such early dinosaur trackways, and it may be the best in Europe. Its value is in providing clear evidence for dinosaur ichnofaunas in Europe for comparison with the well-known, and similar, ichnofaunas from the eastern United States (Newark Supergroup) and from southern Africa. Although many slabs have now been collected, natural marine erosion and excavation of the site continues to yield further material.

Three-toed dinosaur-like footprints were found by the artist T.H. Thomas in 1878 in a loose slab, possibly from a quarry at Scorlon, Newton Nottage, near Porthcawl (Thomas, 1879). These came from 'flaggy, calcareous beds with subangular pebbles of limestone' of the marginal Triassic. They were described by Sollas (1879), who named them *Brontozoum thomasi.*

The tracks at Bendrick Rock were found in 1974 on bedding surfaces. At least 450 individual prints were observed (Tucker and Burchette, 1977) and many are still *in situ* (the main slabs then exposed were removed to the NMW, and further specimens were excavated in 1990 for exhibition at the NMW).

	Thickness (m)
Marl	3.5+
Conglomerate (erosive base)	*c.* 1
Marl	1–1.5
Sandstone (bedded), containing footprints	*c.* 0.8
Conglomerate (channels)	0–2
Marl, with calcareous nodules	0.5–2
Sandstone, trough cross-bedded	*c.* 2
Marl	1
Sandstone, bedded and cross-bedded	1
Marl, with calcareous nodular horizon (Resting unconformably on Carboniferous Limestone)	1–4

Description

The sediments in the cliff and on the foreshore at Bendrick Rock form part of the marginal Triassic deposits of South Glamorgan (Marginal Triassic of Tucker, 1977), formerly called the Dolomitic Conglomerate or the Littoral Triassic (Ivimey-Cook, 1974). They include fluviatile sandstones and siltstones, and shore-zone lacustrine sediments (Tucker, 1977). The assemblage is laterally equivalent to playa-lake and aeolian deposits at Lavernock and other localities nearby.

These all form part of the Mercia Mudstone Group (Warrington *et al.,* 1980) which ranges in age from the Mid to the Late Triassic (pre-'Rhaetian'). There is no clear evidence of age, although the dinosaur footprints would strongly suggest Late Triassic and probably Norian.

Palaeogeographically, this was a low lying piedmont area, adjacent to islands or hilly upland of Carboniferous Limestone flanked by alluvial fans and talus slopes, and marginal to an inland (epicontinental) sea. The climate was warm and conditions were desert-like with only intermittent rainfall (evidence of evaporites, calcretes, sheet floods).

The sequence including footprints is logged as follows by Tucker and Burchette (1977): The footprints occur on several bedding planes, the best being an 0.08 m thick graded sandstone, overlain by a marl parting, and then another sandstone bed, 0.03 m thick (Figure 4.18). The footprint surface also bears ripple marks. Most of the prints are reasonably clear and many are perfect in their preservation, but others are somewhat deformed or reduced to vague squelch marks, which demonstrates that the muddy sand on which the animals were walking was originally soft and damp. However, the prints appear to have been preserved by a desiccation process caused by subsequent drying out of the surface into which they were impressed. Burial by sediments carried in by thin sheet floods of low turbulence then covered the top of the marked surface.

Fauna

Two types of print occur, a small three-toed variety (105 mm x 70 mm) and a larger four-toed variety, the latter having three toes directed forward and a fourth obliquely backwards (160 mm x 120 mm). Preservation is good, and trackways of many prints may be observed. Tucker and Burchette (1977) attributed the prints to the ichnogenus *Anchisauripus* (Lull) (synonym: *Brontozoum*), but they did not attempt an identification to specific level. Delair and Sarjeant (1985, p. 153) generally compared the smaller Bendrick Rock footprints with *A. thomasi* (Sollas, 1879) and then referred them to *A. tuberosus* (Hitchcock, 1836). They disputed referral of the larger prints to *Anchisaurus* 'since phalangeal pads are not visible' and because of their markedly smaller size, and instead attributed these prints to the ichnogenus *Gigandipus* (Hitchcock), characterizing them as *Gigandipus* sp. nov. The original specimen of *Brontozoum thomasi,* and others collected more recently, are in the NMW (Tucker and Burchette, 1977).

Interpretation

If all the prints are referrable to *Anchisauripus* sp., then it would once have been thought that they had been made by the prosauropod dinosaur *Anchisaurus,* a form known from the Early Jurassic of North America and southern Africa. However, the maker of *Anchisauripus* prints was a small theropod dinosaur (Haubold, 1971), and at least two. forms may be implied by the assignment of the prints to two ichnogenera, *A. tuberosus* and *Gigandipus* sp., the latter interpreted by Haubold (1971) as a large form of *Anchisauripus.* However, there are many taxonomic problems with these kinds of trackways: many ichnospecies hitherto assigned to *Anchisauripus* have been reassigned to *Atreipus* and *Grallator* (Olsen and Baird, 1986), and these authors interpret *Atreipus* at least as the footprint of an ornithischian. Hence, these kinds of three-toed footprints have been assigned to all major dinosaur groups: sauropodomorphs, theropods and ornithischians!

Comparison with other localities

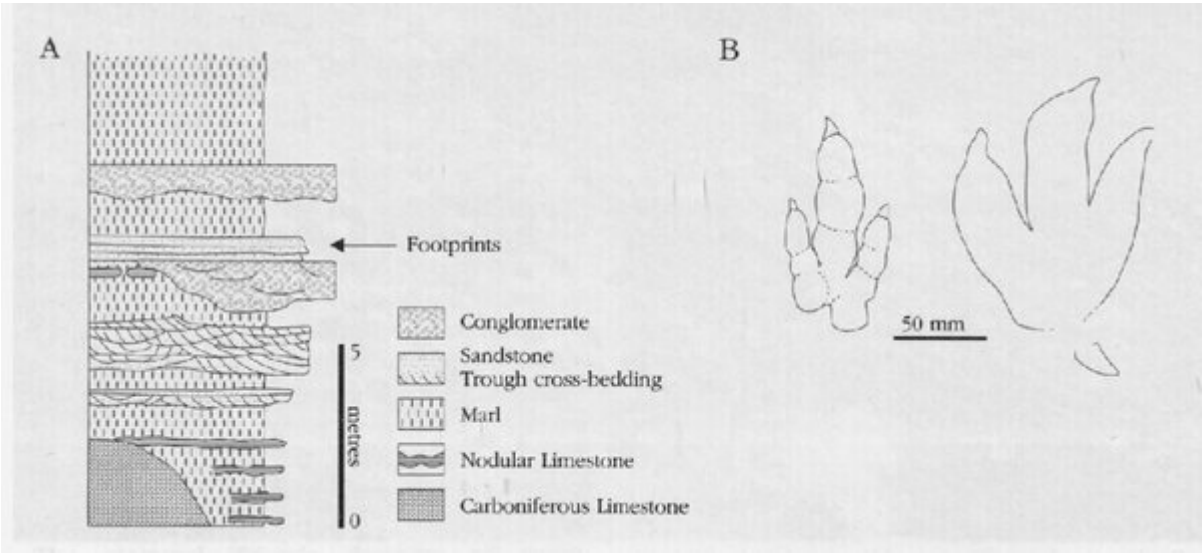
There are no other known occurrences of Late Triassic footprints in the British Isles, nor of those of a prosauropod dinosaur. *Anchisauripus* prints have been described from the Late Triassic to Early Jurassic Newark Supergroup of eastern North America (Connecticut, Massachusetts, New Jersey, Pennsylvania, New Mexico) and the Late Triassic of South America (Argentina), as well as possible *Anchisauripus* from the Mid Triassic of France (Haubold, 1971, 1986; Olsen and Baird, 1986). More detailed comparisons and interpretations of the palaeobiology and stratigraphic significance of the Bendrick Rock footprints must await a full review of the relevant ichnotaxa.

Conclusions

Constant erosion by the sea keeps this locality clear of debris, and new footprints are exposed from time to time. Recently excavated footprints from here are currently being studied and have provided material for museum exhibits, e.g. National Museum of Wales in Cardiff. This potential and the importance of the finds from here give the site its conservation value.

References

(Figure 4.17) Aerial view of a bedding plane on the foreshore at Bendrick, covered with three-toed dinosaur footprints, named Anchisauripus. Each small depression is a footprint. Width of field of view is about 5m. (Photo: M.J. Benton.)



(Figure 4.18) The Bendrick Rock footprints. (A) Sedimentary log showing the horizon at which footprints occur; (B) the two footprint types from the locality, each of which is ascribed to Anchisauripus. After Tucker and Burchette (1977).