A VERTEBRATE FOOTPRINT FROM THE STONESFIELD SLATE (MIDDLE JURASSIC) OF OXFORDSHIRE

by

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Summary

A vertebrate footprint *Pooleyichnus burfordensis* ichnogen. et sp. nov., discovered in the Stonesfield Slate (Jurassic; Bajocian) of the Burford district, Oxfordshire, in 1886 is described and illustrated for the first time. Reasons are advanced for considering this to be the footprint of a mammal or mammal-like reptile. The palaeogeographical implications of this find are discussed.

Introduction

In 1886, the natural cast of a footprint of a small vertebrate was collected by Mr. C. Pooley near Burford, Oxfordshire, from the Stonesfield Slate (Inferior Ooolite; Bajocian). The specimen was lodged in the British Museum, Natural History (R893BMNH). Though the discovery has been briefly mentioned (Sarjeant 1974) in an historical account of studies of vertebrate footprints in the British Isles, no illustration or description of the footprint has yet been published.

Although vertebrate footprints in profusion have been described from Permian and Triassic sediments, records of them from the Jurassic are relatively few. In Britain, they have been recorded in abundance only from Yorkshire (Sarjeant, 1974).

Moreover, if one examines footprint literature on a world scale, one finds that almost all vertebrate footprints recorded from the Jurassic are large, the footprints of dinosaurs are conspicuous and striking objects readily noticed by casual observers. Indeed Otto Kuhn, in his stratigraphical review (1958), recorded no small footprints whatsoever from the Jurassic. However, there is at least one other known occurrence of tracks of small Jurassic vertebrates, recorded from the Forest Marble north of Bath; the tracks were originally reported by George Poulett Scrope in 1831 and subsequently briefly mentioned by Thomas Barkas in 1873, but were not described or illustrated in either of these papers. Recently I was able to describe what I believe to be Scrope's specimens, two rather indistinct trackways with three digits on the pes (hindoot); surely the tracks of a small reptile. Apart from a single record of pterodactyl footprints (Stokes, 1957), these are the only small footprints yet described from world Jurassic rocks.

Pooley's discovery is thus of considerable interest still, not only because it is the only vertebrate footprint known from the Jurassic strata of the English Midlands, but also because it is one of the very few small footprints yet to be recorded from the Jurassic system of the world. A description and assessment of it is therefore presented here.

Systematic Description

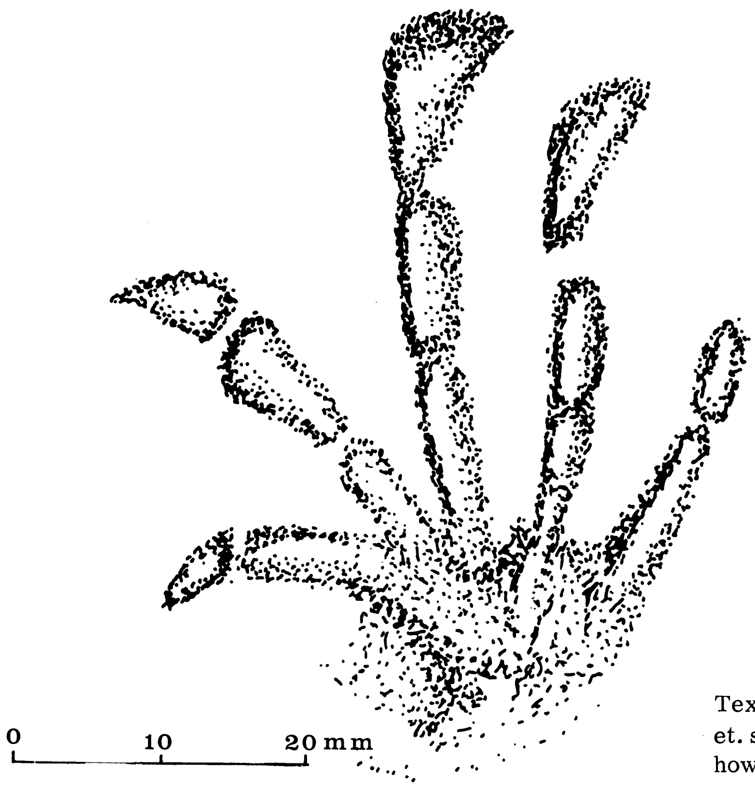
Kingdom Animalia

Class ? Mammalia

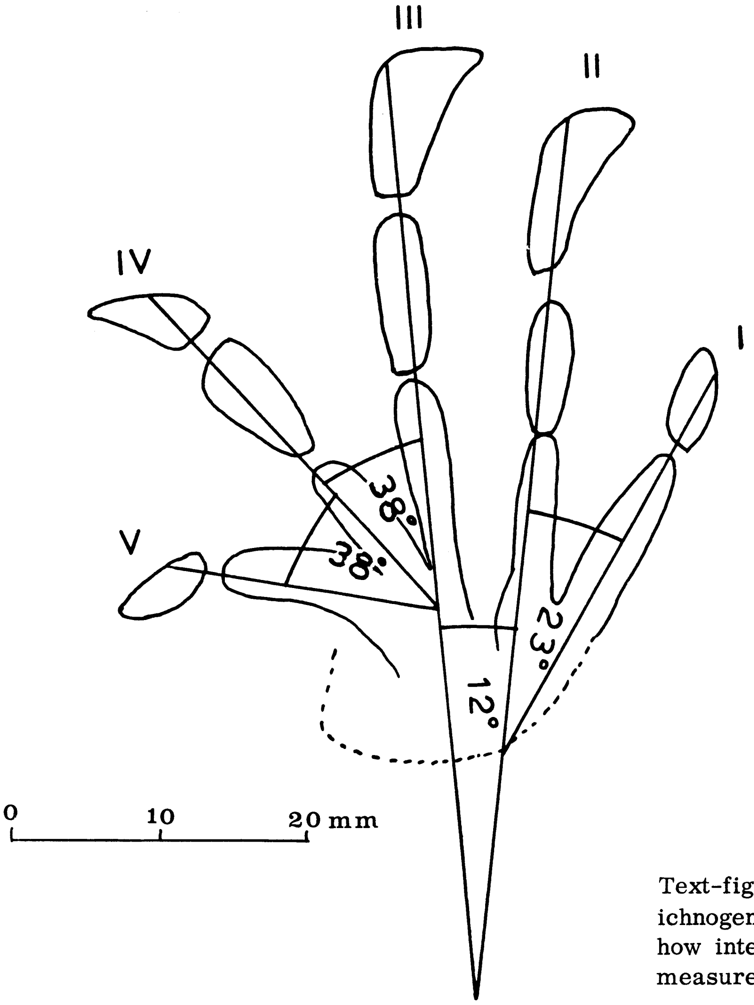
Pooleyichnus burfordensis ichnogen. et ichnosp. nov.

(Plate 14. : Text-figs. 1-2)

Mercian Geol. Vol. 5, No. 4, 1975.
pp. 273-277, 1 text-fig., Plate 14.



Text-fig. 1. *Pooleyichnus burfordensis* et. sp. nov. Sketch to illustrate how the morphology is interpreted; approximately the same scale as Plate 14.



Text-fig. 2. *Pooleyichnus burfordensis* ichnogen. et sp. nov., showing how interdigital angles were measured.

Pooleyichnus burfordensis ichnogen. et sp. nov. The holotype, specimen R893 BMNH. Photo. by Courtesy of the Trustees of the British Museum (Natural History).

Derivation of Name After the discoverer and the type locality.

Description Single cast of a right foot (manus or pes?). Pentadactyl, digitigrade; digits slim and radially arranged. Digit III is longest, digits I and V are relatively short. Digits II to IV show clear indications of short claws, those of digits II and III being directed inwards and those of digits IV and V outwards. The presence of claws on digit I is doubtful. Phalangeal formula is apparently 2, 3, 3, 3, 3,

Figured Specimen. Specimen R 853 BMNH, British Museum (Natural History), London.

Horizon and Locality. Stonesfield Slate (Inferior Oolite, Bajocian) near Burford, Oxfordshire, England.

Dimensions. Overall length 35 mm; overall breadth 33 mm. Length of digit I, 15 mm; digit II, 25 mm; digit III, 28 mm; digit IV, 22 mm; digit V, 13 mm. (Note: Because of the nature of preservation and the subjectivity of deciding where the cast ends, all measurements are necessarily imprecise).

Divarication of digits. (text-fig. 2). I-II, 23°; II-III, 12°; III-IV, 38°; IV-V, 38°. (For a discussion on divarication of digits consult Sarjeant, 1971, p.346).

Systematic Discussion

Footprints of small reptiles - rhynchocephalians, pseudosuchians, early lizards - are well known from the Permian and Triassic and have recently been comprehensively reviewed by Haubold (1971). Characteristic features of them are (a) the fact that digit IV is almost uniformly the longest digit; (b) where the digits are clawed, the claws of digits I-IV are all directed inwards, towards the centre of the trackway; (c) the fact that digit V is almost always reduced and may be opposed - it is, indeed, frequently not imprinted; and (d) the presence of four phalanges in two (III-IV) or more digits.

An apparent exception is furnished by *Gwyneddichnium* Bock 1952, from the Upper Triassic of the U.S.A., which is defined as having five radial digits with digit III longest. However, as Haubold has pointed out (1971, pp. 47-48), an examination of Bock's figures shows that the longest digit is not digit III, but digit IV. This is the only reptilian footprint yet described similar enough to merit comparison with the footprint here figured; the most similar species, *G. minor* Bock 1952, differs in that the digits are less radial, more forwardly directed, and do not exhibit comparable claws.

There are, indeed, no known footprints from the Jurassic that show any close comparability with the one here described. Whilst the basing of a new taxon on a single imprint is in general undesirable because of uncertainty concerning the form of the other foot and the pattern of the whole trackway, it is considered that the unique nature of this imprint fully justifies an exceptional procedure.

The remains of early mammals have long been known from the Stonesfield Slate (see Arkell, 1933. pp. 296-297); and fossil teeth and bones of mammals and mammal-like reptiles have, indeed, now been recorded as early as the late Triassic, in Britain and elsewhere. However, to my knowledge, there are as yet no records of mammal footprints from the Jurassic.

Can this footprint be that of a mammal? It resembles typical mammalian imprints in that digit III is longest, in the radial nature of the digits and the variable direction of the claws (compare, for example, the illustrations by Murie, 1954 Fig. 106, of meadow-vole sign [footprint track] and by Leutscher, 1960 p. 144, of shrew sign). The Stonesfield Slate mammals are mostly of small size, quite compatible with the size of these prints; knowledge of them is based primarily on fossil jaws and teeth, information on the character of the rest of the skeleton being meagre. In contrast, the only small reptiles known from these beds, according to Arkell (*op. cit.*), are pterodactyls, whose footprints, insofar as they are known, are entirely dissimilar from that here described (Stokes, 1957).

It thus appears highly probable that this footprint is that of an early mammal of small size; but it is recognised that the information available is insufficient to establish this beyond doubt and, indeed, that distinction between the tracks of mammals and those of mammal-like reptiles may well be impossible.

Palaeogeographical Discussion

The type area of the Stonesfield Slate is a small area of outcrop surrounding the village of Stonesfield, Oxfordshire, some 9 miles east-north-east of Burford. It is described by Rayner (1967, p.292) as "a fissile, sandy, oolitic limestone" - certainly not a slate in the normal geological sense. The name is derived from local usage since the limestone splits readily into thin flags, and was mined for a long time as a roofing material. By 1830, working had ceased (Arkell, 1933, p.296) and the Stonesfield Slate is no longer to be seen at outcrop in its type area.

Similar rocks crop out on the western side of the Cotswolds, where they have been worked until comparatively recently, for example in the area between Naunton and Condicote. It seems virtually certain that Pooley's specimen came from somewhere in this western outcrop rather than from Stonesfield itself, since a village 9 miles away would scarcely be referred to as "*near* Burford" in a countryside so crowded with villages as is Oxfordshire!

Both at its type locality and in its western outcrop, the Stonesfield Slate is rich in the remains of terrestrial organisms, notably plants (cycads, conifers and dicotyledonous plants), reptiles (pterodactyls and the carnivorous dinosaur *Megalosaurus*) and small mammals (multituberculates, triconodonts and pantotheres). In addition, marine reptiles (chelonians, marine crocodiles, and plesiosaurs) and a host of marine invertebrates are present. Arkell commented that the terrestrial remains were evidently "drifted into a shallow sea from neighbouring land" (1933, p. 297).

Such an explanation needs to be modified in this instance. The presence of a vertebrate footprint necessitates a phase during which the sediment surface was exposed, so that the footprint could be implanted, a phase of desiccation, so that it could be preserved, and a phase of rapid sedimentary accumulation, so that it could be infilled and cast before the underlying sediments were saturated and rendered potentially mobile. These processes could only have occurred on a shoreline.

Eastward from the western Cotswolds towards the Vale of Bourton, the Stonesfield Slate thins and is overlapped by the Taynton Stone, which comes ultimately to rest on the Fullers Earth beneath. An approach to a shoreline of some Jurassic island in the vicinity of Burford is perfectly possible; unfortunately, Pooley did not furnish sufficiently precise information to allow us to determine exactly where that shoreline was located. New information must be awaited before this can be established.

Acknowledgements

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