
Windsor Hill Quarry, Shepton Mallet, Somerset

[ST 615 452]

Introduction

Windsor Hill Quarry is the type site for the mammal-like reptiles *Oligokyphus major* and *Oligokyphus minor* (Kühne, 1956). Walter Milne, a German citizen, discovered the Windsor Hill Quarry site, which he termed 'Mendip 14', in August 1939. Over the next 10 years, he processed large quantities of sediment from the site and recovered more than 2000 specimens of *Oligokyphus*. Kühne and his wife had arrived in Britain in 1938 with the express purpose of sieving and sampling for small fossils in the fissure deposits, and in the midst of their work the war broke out and they were both interned for the duration in a prisoner-of-war camp on the Isle of Man. As he discretely says in his monograph (Kühne, 1956, p. 4), 'Apart from the war years, when field work was impossible, each summer saw the author and his wife at the locality, and every season yielded some specimens which improved the osteological material.' Nonetheless, Kühne was encouraged in his studies during his internment years and was enabled to finish the work after the war.

Description

Kühne (1956, pp. 5–6) noted that the *Oligokyphus* bones came from a single fissure that had a strike oriented East–West. 'The fissure is only one foot wide or less and is exposed for about 50 yards. It was fortunate that the outcrop of the fissure was so near the road that quarrying had to stop...'

The fissure was filled with light-brown, pebbly, iron-rich sandy limestone showing faint signs of lamination. The pebbles in the fissure were a mixture mainly of Carboniferous chert and limestone, with rarer silica and phosphatized Lias lasts. The *Oligokyphus* bones ranged in size up to 60 mm, and 'as many as 200 specimens per cubic foot' were recovered in some places. The bones showed signs of abrasion and had evidently been washed into the fissure from another site where the animals died.

The site preserved a mixture of reworked Penarth Group ('Rhaetic') taxa as well as in-situ Hettangian marine fishes (Dineley and Metcalf; 1999). For example, about half the brachiopods were reworked from 'Rhaeto-Liassic' sediments, and the others apparently were contemporaneous. The ammonites (*Arnioceras* sp., *Promicroceras* sp.) indicate a Sinemurian age.

Fauna

Taxa present at Windsor Hill Quarry include marine invertebrates, fishes and the tritylodonts. Marine invertebrates include some 15 taxa of brachiopods, as well as bivalves, small gastropods, belemnites and ammonites. The fishes are also marine forms: *Lissodus*, *Acrodus*, *Hybodius* and a chimaeroid (Kühne, 1956; Evans and Kermack, 1994; Dineley and Metcalf, 1999).

REPTILIA

'Therapsida'

Tritylodontidae

Oligokyphus major Kühne, 1956

Oligokyphus minor Kühne, 1956

Oligokyphus (Figure 2.4) is the most completely known tritylodontid, a member of a group represented by some 10 genera from the Early and Mid Jurassic epochs of Europe and North America (Sues, 1986). They were highly successful

herbivores with a skull length ranging from 80 to 220 mm.

Oligokyphus has the typical superficially rodent-like tritylodontid skull, with a deep lower jaw and a high sagittal crest, indicating powerful jaw muscles that plastered the outside of the lower jaw and the side of the skull to the crest. The dentition is highly specialized: elongate incisor teeth at the front and four to six massive cheek teeth in straight rows ((Figure 2.4)a, b). The upper cheek teeth all bear three longitudinal rows of crescent-shaped cusps, whereas the lower cheek teeth bear two rows. When the jaws close, the two lower rows cut into grooves between the three upper rows. The tight arrangement of ridges and grooves restricted the jaw movement of *Oligokyphus* to a longitudinal one. The orientations of the opposing crescents indicate a backward motion of the lower jaw, allowing tough plant food to be sheared along four parallel 'grating' surfaces.

Oligokyphus had a long, slender body like a weasel ((Figure 2.4)c). The forelimbs and hindlimbs are short, and the feet posed in a plantigrade (palm flat on the ground) posture. The limb girdles are very mammal-like. Indeed, Kühne (1956) noted that this animal was very nearly a mammal in all its characters.

Kühne (1956) identified two species of *Oligokyphus* from Windsor Hill Quarry, *O. major* and *O. minor*, differing by about one-third in body size, which equates, according to him, to a difference of 100% in body weight, i.e. *O. minor* weighed half as much as *O. major*. Kühne (1956, p. 98) noted that these genuinely might be two different species, or they simply might be males and females of a single species.

Interpretation

The fissures from Windsor Hill Quarry are classified as Neptunian dykes: they were formed below sea level and have been infilled with a sediment containing a highly variable invertebrate and vertebrate fauna. The mode of formation of the Windsor Hill Quarry fissure, and indeed the other fissures to be seen elsewhere on the Mendip Hills, is debated (Simms, 1990). Many of them, and perhaps also the *Oligokyphus* fissure, were formed as solutional fissures — conduits for the passage of waters, almost certainly marine waters in this case. (Geographically, the Windsor Hill Quarry site lies at the southern end of the Mendip Hills, at what was then the margin of the island (Figure 2.1).) Other Mendip fissures may have formed as grikes on top of a limestone pavement.

Tritylodonts were clearly herbivores, and indeed their dentition indicates adaptation to feeding on remarkably tough vegetation (Sues, 1986). Perhaps the forelimb was used in digging, possibly for roots and rhizomes of waterside plants.

Kühne (1956, pp. 10–18) offers a detailed account of the biostratigraphy of the *Oligokyphus* remains. He summarizes his conclusions graphically, as follows:

'On a small island in the Mendip Archipelago, a restricted but very numerous terrestrial vertebrate fauna flourished, *Oligokyphus* being the only herbivorous component, an unknown mammal or mammal-like reptile being its predator. At a restricted spot only a few hundred metres from the coast, most likely a spring to which *Oligokyphus* flocked, the killing and eating of *Oligokyphus* took place. Fracturing of the bones by the predator was accidental and confined to those regions of the body most nourishing... With the onset of a wet season ... the area around was swept by sheet floods, and the skeletal debris became waterborne in a brook... Once in the brook, the skeletal elements were carried along its bed right into the sea. Into the open fissure in the sea floor there would fall mainly heavy skeletal elements, the majority of the small and light elements, as well as small debris of bone, traversed the fissure and passed out to sea to be dispersed by currents.'

Comparison with other localities

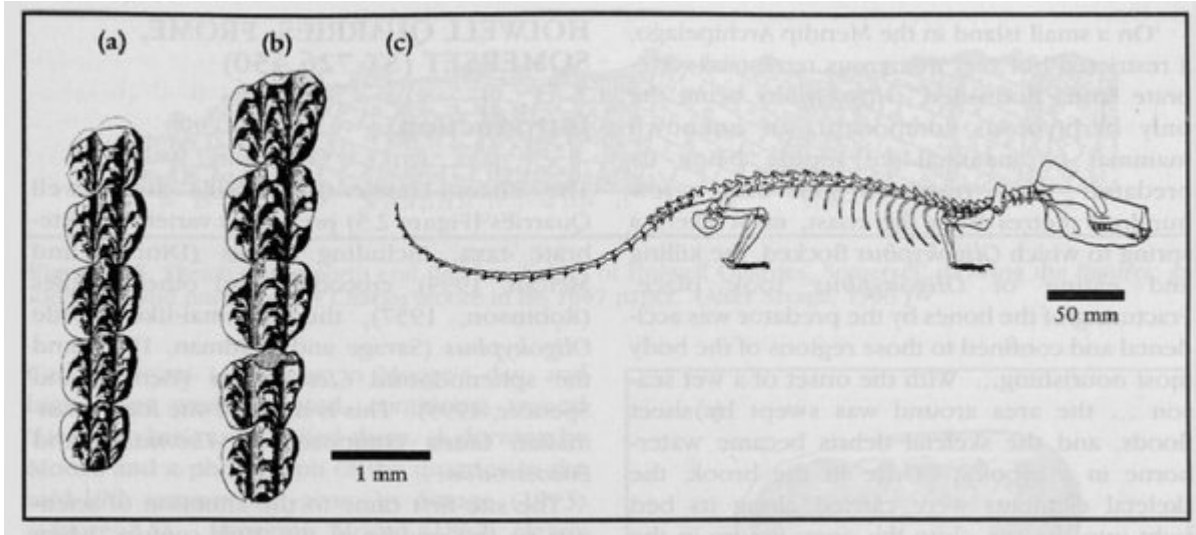
The Windsor Hill Quarry site is most comparable with the Holwell Quarries GCR site in terms of age and sedimentary setting. No other site in the region yields *Oligokyphus* in such quantities, however, and indeed no other site presents such a monospecific assemblage. *Oligokyphus* also has been reported from Pant Quarry in South Glamorgan [SS 896 760] (part of the Bridgend Quarries GCR site), in association with the mammals *Thomasia*, *Kuehneotherium* and *Morganucodon* (Benton and Spencer, 1995, p. 82). The genus *Oligokyphus* was not established for the Windsor Hill

Quarry material but for some teeth from a Rhaeto-Liassic bone bed in Baden-Württemberg, south-west Germany.

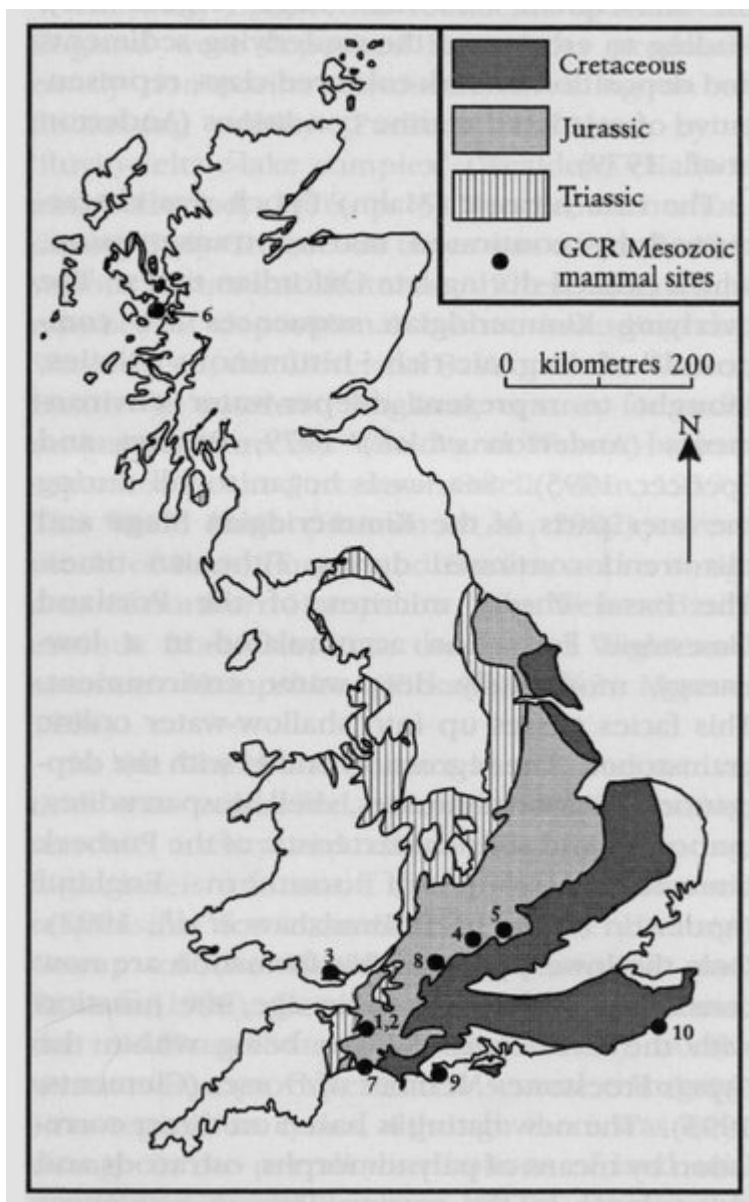
Conclusions

Windsor Hill Quarry has produced some of the best tritylodontid specimens in the world. The abundant specimens of *Oligokyphus* described by Walter Kühne in 1956 provided the first detailed knowledge of this extraordinary group of mammal-like reptiles. The tritylodontids are probably the closest reptilian relatives of the mammals, and yet specimens are rare and usually fragmentary. Understanding of *Oligokyphus* gave a key to understanding the origin of mammals.

References



(Figure 2.4) Specimens of the tritylodont *Oligokyphus* from the Early Jurassic deposits of Windsor Hill Quarry, Somerset: (a) and (b) upper cheek dentitions of *Oligokyphus minor* and *O. major* respectively (anterior is to the bottom of the diagram); (c) skeletal reconstruction of *Oligokyphus*. (Based on Kühne, 1956.)



(Figure 2.1) Map showing the distribution of Mesozoic rocks in Great Britain. GCR Mesozoic mammal sites: 1 — Windsor Hill Quarry; 2 — Holwell Quarries; 3 — Bridgend Quarries; 4 — Stonesfield Slate Mines; 5 — Kirtlington Old Cement Works; 6 — Loch Scavaig; 7 — Watton Cliff; 8 — Upper Chicksgrove Quarry; 9 — Durlston Bay; 10 — Cliff End.