Grinshill Quarries, Shropshire

[SJ 520 237]

Potential GCR site

Introduction

The quarries in the vicinity of Grinshill and Clive are historically important as a source of vertebrate fossils, footprints, and for exposures of the Helsby Sandstone Formation and the Tarporley Siltstone Formation.

At the time of writing, the site was being considered for addition to the GCR on account of the contribution that it makes in helping to understand Mid Triassic palaeoenvironments in central England. However, it is already a confirmed GCR palaeontological locality for its fossil reptiles (Benton and Spencer, 1995).

The old quarries show spectacular large-scale cross-bedding in the Helsby Sandstone Formation, and ripples, rain-pits, mud-cracks, and footprints in the Tarporley Siltstone Formation. Skeletal fossils of *Rhynchosaurus* have been found in the upper parts of the succession, and specimens still come to light. This site offers evidence of the environmental changes that occurred through the transition from the Sherwood Sandstone Group to the Mercia Mudstone Group. It is important as one of the best Triassic sites in the south of the Cheshire Basin, and is historically important for work there in the 1830s on sedimentology and palaeontology.

Many descriptions of these quarries have been published. Murchison (1839) provided one of the first records of the succession at Grinshill. Later accounts of the geology include Hull (1869, pp. 64, 73), Pocock and Wray (1925), Thompson (1970a,b, 1985, 1995), and Macchi and Meadows (1987). The footprints were described by Ward (1840) and Beasley (1902), and the reptile remains by Owen (1842), Walker (1969), Benton (1990), and Benton and Spencer (1995), among others.

Description

There are many quarries in the area [SJ 520 239], [SJ 523 238], [SJ 524 238], and [SJ 526 238], however, all but one at [SJ 526 238] have been abandoned (Figure 3.42). Quarrying began about 1000 AD, with the buff-coloured, fine-grained sandstones being a favoured building material for churches in the area, and activity increased in Victorian times with the expansion of Shrewsbury and the erection there of many new public buildings (Thompson, 1995).

The quarries were important also in the early history of geology (Benton, 1990; Thompson, 1995). About 1838, the Reverend Ogier Ward acquired four slabs of stone with footprints and rain-drop impressions on their surfaces. He forwarded these to his mentor at Oxford University, the Reverend William Buckland, who recognized the significance of the impressions, and enthused about the story they told of ancient Triassic environments (Buckland, 1844). These were not the first footprints to be recorded from Permo-Triassic rocks, but their association with ripples and rain pits attracted a great deal of attention and led to some of the first modern-style interpretations of ancient clastic sedimentary environments. Roderick Murchison also visited Grinshill quarries, and he included a section in his *Siluria* in 1839. At the same time, Ward found bones of a small reptile at Grinshill, which he sent to Richard Owen, who described them (Owen, 1842) as remains of an ancient lizard. So, around 1840, Grinshill had attracted the attention of three of the leading geologists of the day — Buckland, Murchison, and Owen — and the finds of sedimentary structures, footprints, and bones caused a sensation.

Sedimentology

The sedimentary sequences in the quarries at Grinshill (Figure 3.43) are dominated by sandstones of the Helsby Sandstone Formation, which are overlain by red marls of the Mercia Mudstone Group. The following sedimentary log is taken from Pocock and Wray (1925, pp. 39–40), with updated stratigraphical terminology:

	Thickness m
Mercia Mudstone Group; *Bollin Mudstone Formation:*	
Fee (quarrymen's term): red marl	0.6
Mercia Mudstone Group; *Tarporley Siltstone Formation:*	
Flag rock: grey and light yellow sandstone, evenly bedded, with thin, reddish seams; ripple marks	6.1
Esk bed: unconsolidated grey sandstone and sand, with harder patches; full of specks of manganese dioxide	0.22
Sherwood Sandstone Group; *Helsby Sandstone Formation:*	
Hard burr: hard, coarse-grained, yellowish-white sandstone	0.76
Hard, yellowish freestone	0.76
White and pale yellow freestone, with iron-stained patches towards the base	10.06
White freestone with iron-stained and speckled patches	1.68

The Helsby Sandstone Formation at Grinshill was formerly termed the 'Grinshill White Sandstones' (Pocock and Wray, 1925); it comprises some 30 m of pale yellow and buff-coloured, well-sorted, medium-grained sandstones. Large-scale trough cross-stratified sets are clearly preserved, often emphasised by mud laminae on the foresets (Figure 3.44)a. Manganese hydroxide is present in small spots and patches.

The sediments of the Tarporley Siltstone Formation, formerly the 'Grinshill Flagstones' (Pocock and Wray, 1925), consist of approximately 6 m of pale green, reddish or white, fine-grained, micaceous sandstones and marls. The lowest unit is a thin bed of unconsolidated sandstone that contains many barite nodules and is often speckled with black manganese hydroxides (Macchi and Meadows, 1987), termed the 'Esk Bed' by Pocock and Wray (1925, pp. 39–40). The overlying sediments are thinly bedded and display well-defined structures such as ripples (Figure 3.44)b, rain prints, desiccated mudstone drapes, and reptile footprints. The great abundance of ripples, best seen in the southwestern side of the Grinshill Stone Quarry [SJ 526 238], gives the sandstones a wavy appearance. The ripples take many forms, including isolate and transverse types, and are occasionally seen superimposed on larger-scale ripples (Macchi and Meadows, 1987).

At the top of the quarry sections at Grinshill about 1 m of the reddish siltstones and mudstones of the Mercia Mudstone Group is recorded (Macchi and Meadows, 1987). This unit is the basal part of the Bollin Mudstone Formation of Wilson (1993; see also Thompson, 1995). It was formerly termed the 'Fee' (pronounced 'fay').

In the north-western part of the Grinshill Stone Quarry [SJ 526 238] a few porphyritic dolerite dykes are exposed (Macchi and Meadows, 1987), which are thought to form a part of a larger, regionally important Tertiary dyke swarm (Thompson, 1985, 1995).

Palaeontology

The Grinshill Quarries are famous for the well-preserved remains of reptiles, although no other body fossils have been discovered here (Walker, 1969). Specimens have been collected since the 19th century and comprise remains of at least 17 individuals of *Rhynchosaurus articeps,* a rhynchosaur (Benton, 1990). These remains are thought to have been recovered from both the fine-grained sediments of the Tarporley Siltstone Formation, and possibly the top of the coarser-grained Grinshill Sandstone (Walker, 1969; Benton and Spencer, 1995).

Trace fossils are also present in the Tarporley Siltstone Formation — small reptilian footprints with clearly defined claw marks. These have been assigned to *Rhynchosauroides* and *Chirotherium* and are commonly associated with current and wave ripples (Benton and Spencer, 1995).

Interpretation

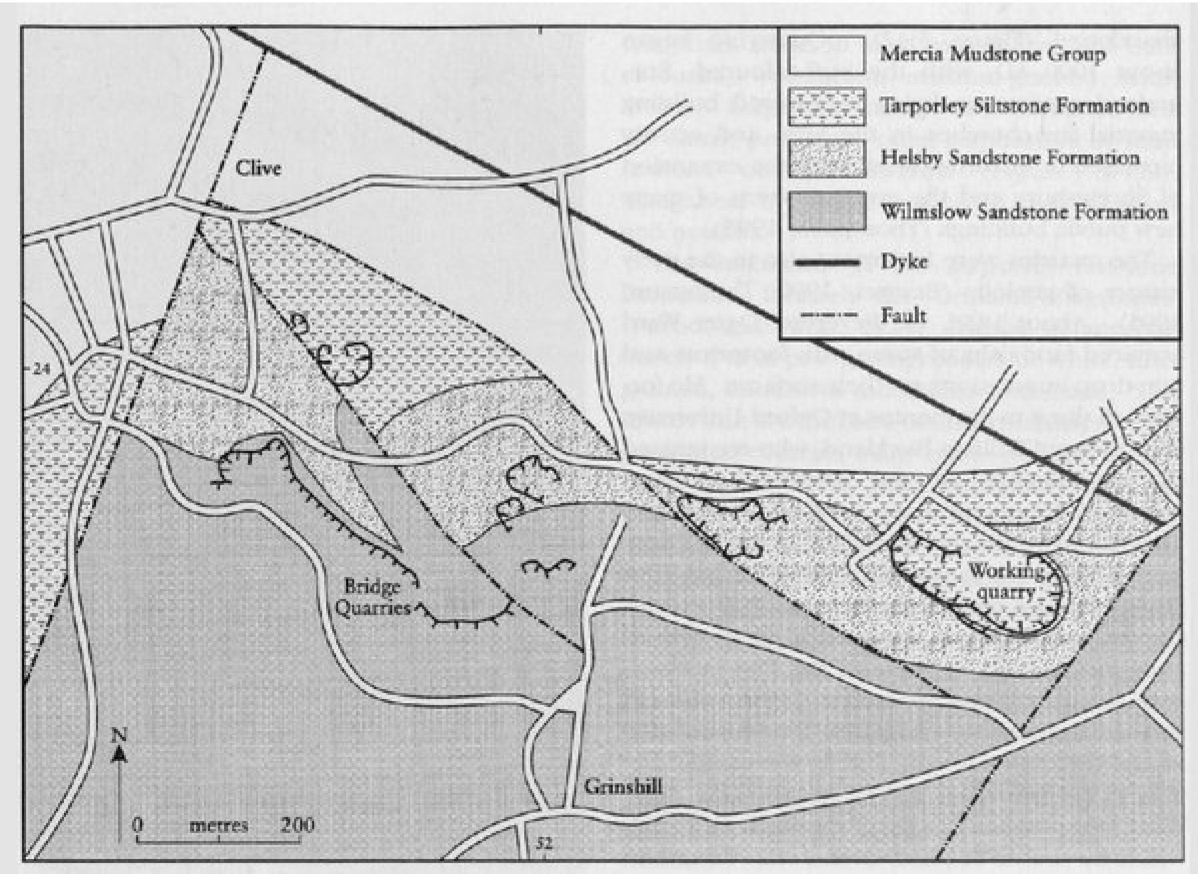
The sediments at Grinshill reflect a marked change in palaeoenvironment between the deposition of the Helsby Sandstone Formation and of the Tarporley Siltstone Formation. The large-scale cross-beds of the Helsby Sandstone Formation have been interpreted as evidence for aeolian deposition, possibly by large, transverse barchan dunes (Thompson, 1985; Macchi and Meadows, 1987), with the prevailing wind blowing from the east.

The Tarporley Siltstone Formation, characterized by fine-grained wavy-bedded sandstones, represents intertidal conditions associated with a marine transgression at the onset of Mercia Mudstone Group deposition (Macchi and Meadows, 1987). The basal 'Esk Bed' represents a phase of environmental transition (Benton and Spencer, 1995). The ripples in overlying units display characteristic features of intertidal and estuarine environments. Large-scale linguoid ripples formed during the ebb flow of the tide, and smaller ripples formed on the large-scale features as the sand flats were exposed (Macchi and Meadows, 1987).

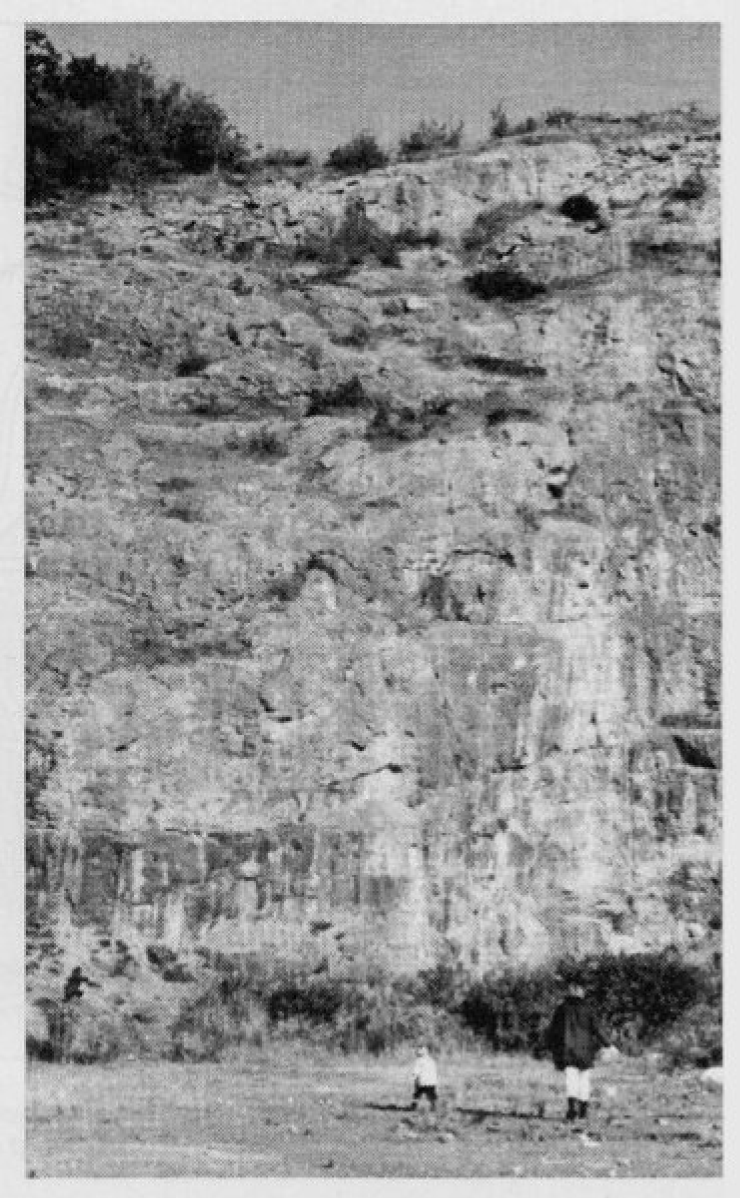
Conclusions

The sedimentary sequence in the quarries at Grinshill provides an excellent illustration of the change from the Sherwood Sandstone Group to the overlying Mercia Mudstone Group, and from aeolian to intertidal or estuarine environments. The Grinshill quarries have been an important source of Mid Triassic reptile remains, and have provided some well-preserved partial skeletons and trackways. This is a key site for the understanding of Mid Triassic palaeoenvironments in central England, and is especially significant for the sedimentary structures, the fossil tracks, and the skeletal remains of reptiles.

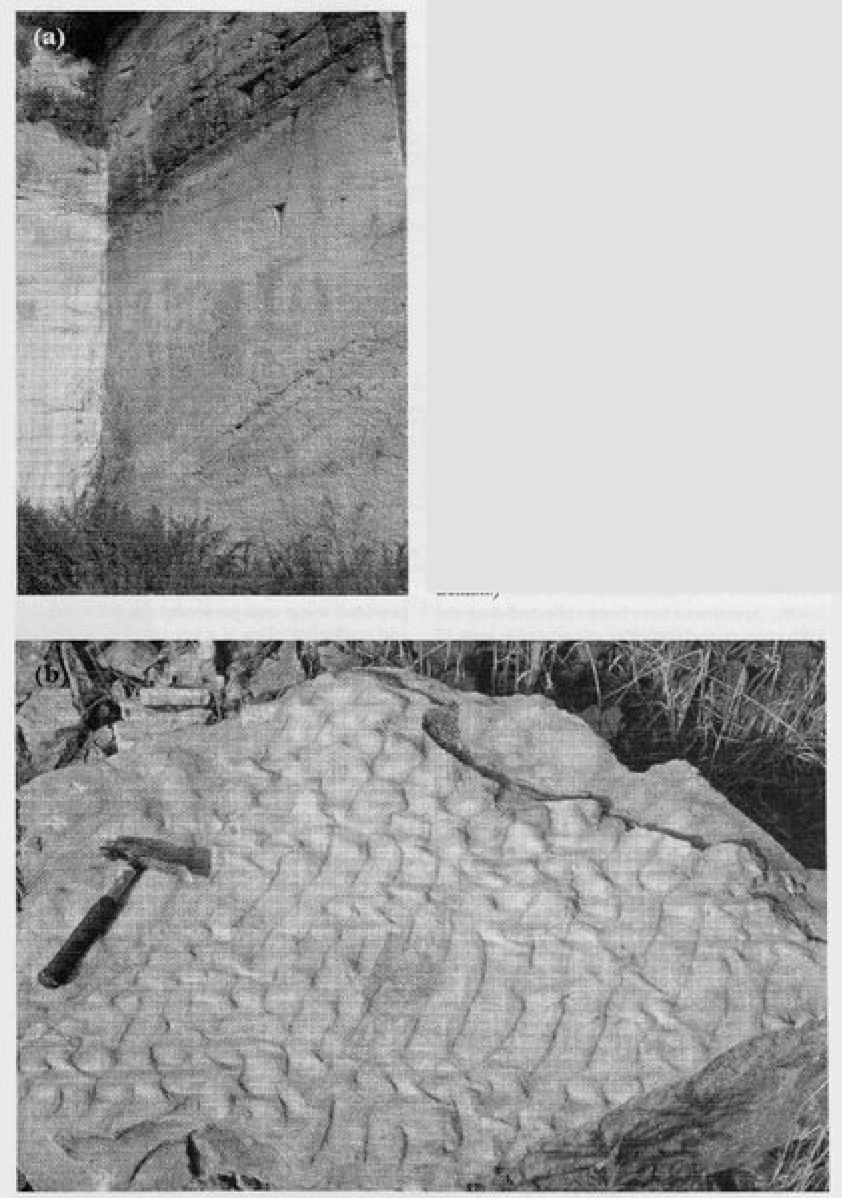
[References](#)



(Figure 3.42) The Grinshill localities. The map is based on published maps of the British Geological Survey (BGS 1:63 360 scale Geological Sheet 138, Wem), and on field observations by M.J.B.



(Figure 3.43) The operational quarry at Grinshill: view of the north face, showing the massive cross-bedded Helsby Sandstone Formation at the base, and the softer, more thinly bedded Tarporley Siltstone Formation above. (Photo: M. J. Benton.)



(Figure 3.44) Sedimentary structures in the Grinshill quarries. (a) Lower portions of large-scale aeolian cross-beds in the Helsby Sandstone Formation. The section is about 10 m high. (b) Ripple marks on the surface of a fine-grained sandstone unit in the Tarporley Siltstone Formation. (Photos: M. J. Benton.)