Wilderness (Land Grove) Quarry, Gloucestershire

[SO 672 185]

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Introduction

This site near Mitcheldean, Gloucestershire is a working building stone quarry in the Early Devonian Brownstones Formation of the Lower Old Red Sandstone (Figure 5.44). The site is important in displaying a fine section of alluvial facies that represent deposition in an environment that was intermediate between the more distal environments of the underlying Dittonian St Maughans Formation and the more proximal, sand-dominated environments of the higher parts of the Brownstones. The vertical arrangement of the fades in the quarry were included in Allen's (1964a) detailed study of cycles in the Dittonian rocks of the Welsh Borderland, and thus instrumental in the modelling of Early Devonian Old Red Sandstone alluvial environments. The site is of national and international importance in being the only locality in the Brownstones Formation to have yielded remains of the late Dittonian index fish *Althaspis leachi.*

Description

The quarry exposes beds dipping steeply (*c.* 30°) westwards (Figure 5.45). They lie about 150 m above the base of the Brownstones Formation of the Forest of Dean (Welch and Trotter, 1961). Allen (1962, 1964a,b, 1971) and Allen *et al.* (1968) gave detailed descriptions of this quarry. Currently, about 23 m of beds are exposed, the section summarized as:

	Thicknesses (m)
Thinly bedded, red-brown sandstones and mudstones	*c.* 10 m
Red-brown sandstones in large channels, some sandstone beds up to 1 m thick; thin red-brown mudstone interbeds	*c.* 6 m
Mudstone, red-brown; prominent persistent bed	*c.* 1 m
Sandstone, red-brown, in beds of about 1 m average thickness	*c.* 4 m
Mudstone, red-brown, with pale green layers and thin sandstones	*c.* 2 m
Sandstone; top forms prominent bedding plane at eastern limit of workings	

The following account of the succession (Figure 5.46) is based largely on the descriptions of Allen (in Allen *et al.,* 1968; Allen, 1971). The sandstones are predominantly red-brown, but pale green reduced zones occur at the bases of beds and in local random patches. Some red/green colour layering is present locally. Fine- to medium-grained, red-brown sandstones predominate, with some very fine-grained sandstones. Minor lithologies include coarse-grained, red-brown siltstones, intraformational conglomerate and red-brown siltstones/mudstones with calcrete nodules. The sandstones are mainly parallel-laminated, but cross-bedding occurs at some levels. The finer-grained sandstones are commonly cross-laminated and have rippled bedding surfaces. The siltstones are poorly bedded, although some are cross-laminated and most are strongly bioturbated. The intraformational conglomerates consist of rounded to angular clasts of siltstone and mudstone, very fine-grained sandstone and calcrete set in a sandy matrix. Intraformational mudstone/ siltstone clasts are common, mainly occurring as concentrations at the bases of channel-fill sandstones, but they also occur sporadically throughout the sandstones.

The beds are arranged in fining-upward cycles. Each has a basal scoured surface overlain by sandstones, and locally conglomerates, in turn overlain by siltstones interbedded with thin sandstones. Fine-grained sandstone-filled desiccation cracks are present locally towards the tops of the siltstones. The scoured surfaces locally cut steeply down into the siltstones and thin sandstones of the underlying cycle. Broad, shallow channels are common in the siltstones, locally

extending down to the underlying thick sandstones.

Wilderness Quarry is noted also for yielding one of the highest ostracoderm faunas known from the Lower Old Red Sandstone of south Wales and the Welsh Borderland (Allen *et* al., 1968). The assorted, disarticulated remains of the ostracoderm *Althaspis leachi* (White) and, very rarely, the articulated remains of the thelodont *Turinia pagei* (Powrie) were collected from a distinctive bed of purplish to greenish white sandstone within siltstones 29 m above the base of the section recorded in 1968. This bed occurs high up on the western face of the quarry, but was formerly exposed by the entrance to the quarry 2 m above the quarry floor. In addition, the quarry yields several different types of trace fossil, which are particularly abundant in the siltstones. The traces include irregularly, randomly orientated, branching tubes with longitudinally crinkled walls and less common smooth, sinuous tubes on bedding planes. *Planolites* occurs in the fish-bearing sandstone.

The fish-bearing sandstone ranges between 14 cm and 25 cm thick and overlies a red siltstone that fills and extends beyond a shallow depression in the top of the underlying sandstone. At its thickest, the bed is a tough, green, fine-grained, parallel-laminated sandstone with scattered siltstone clasts at its base. Over most of its outcrop in the quarry, the bed is a distinctive, fine- to very fine-grained, pinkish to mauve-brown sandstone that is parallel laminated at its base and cross-laminated in its finer-grained upper part. Convolute bedding is widespread.

Interpretation

The succession is interpreted as one that accumulated on an alluvial floodplain (e.g. Allen, 1964a, 1971; Allen *et* al., 1968). The scoured surfaces at the bases of the cycles were cut by stream channels migrating laterally across the floodplain. The channel-fill sandstones were deposited in high-energy streams, with planar sandstone beds being more common than dune forms. The fine-grained, argillaceous lithologies are interpreted as overbank, extra-channel floodplain deposits, as indicated by their desiccation cracks and pedogenic carbonate (calcrete) nodules. The fish bed, occurring within fine-grade, floodplain facies, probably originated as a flash-flood deposit, either as a crevasse-splay sheet-flood or levee.

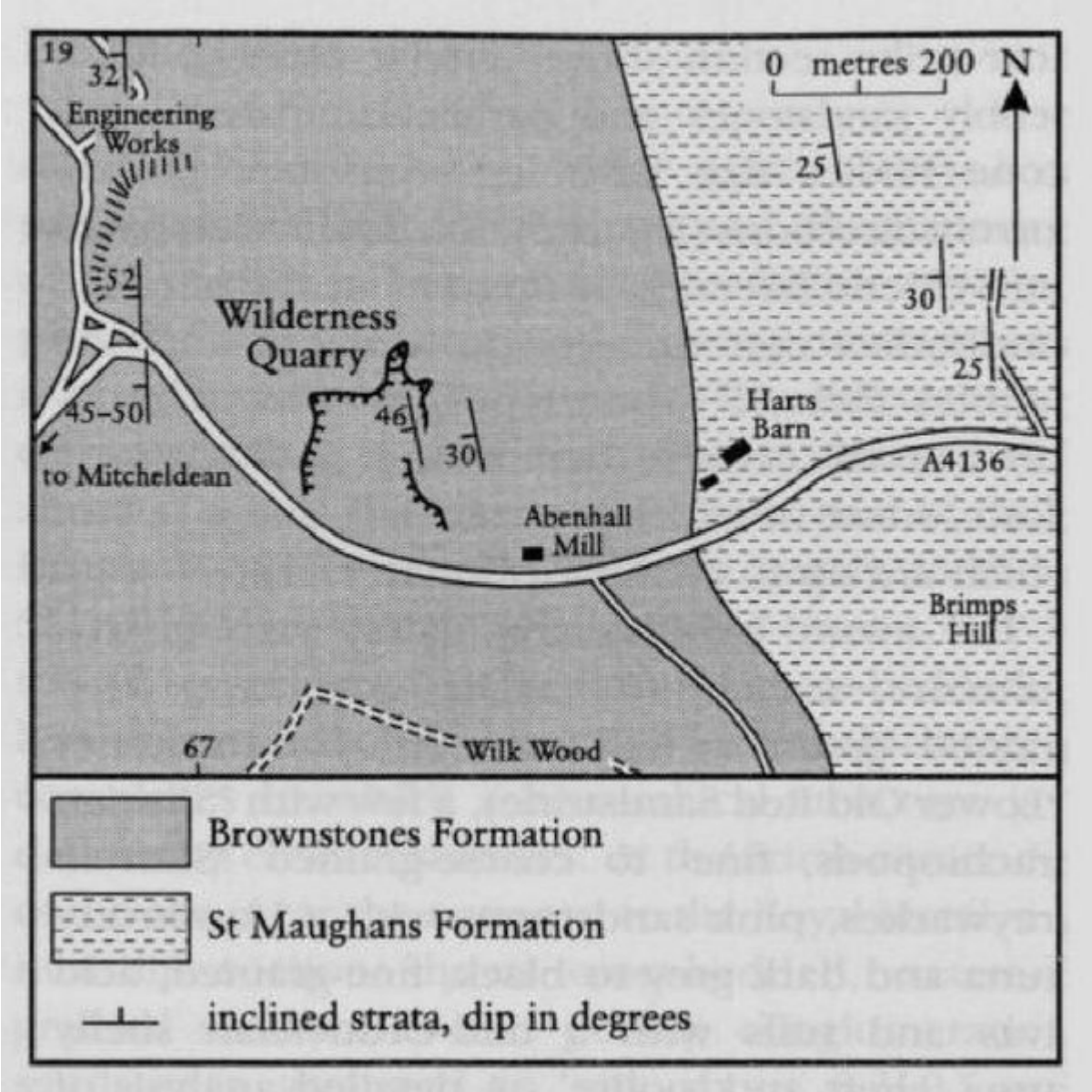
Fossil fish remains collected by Sibly in 1915 were first identified as *Pteraspis* cf *dunensis* (Trotter, 1942) and later as the Breconian index fossil *Rhinopteraspis dunensis* (Welch and Trotter, 1961). These, as well as a large collection of pteraspid fragments obtained in 1965 were assigned to *Altbaspis leachi* (Allen *et al.,* 1968). The presence of this late Dittonian index fossil in beds previously assumed to be Breconian in age emphasizes the need for more accurate definition of the local Anglo-Welsh stages, but may also demonstrate the diachronism of the Brownstones Formation.

Conclusions

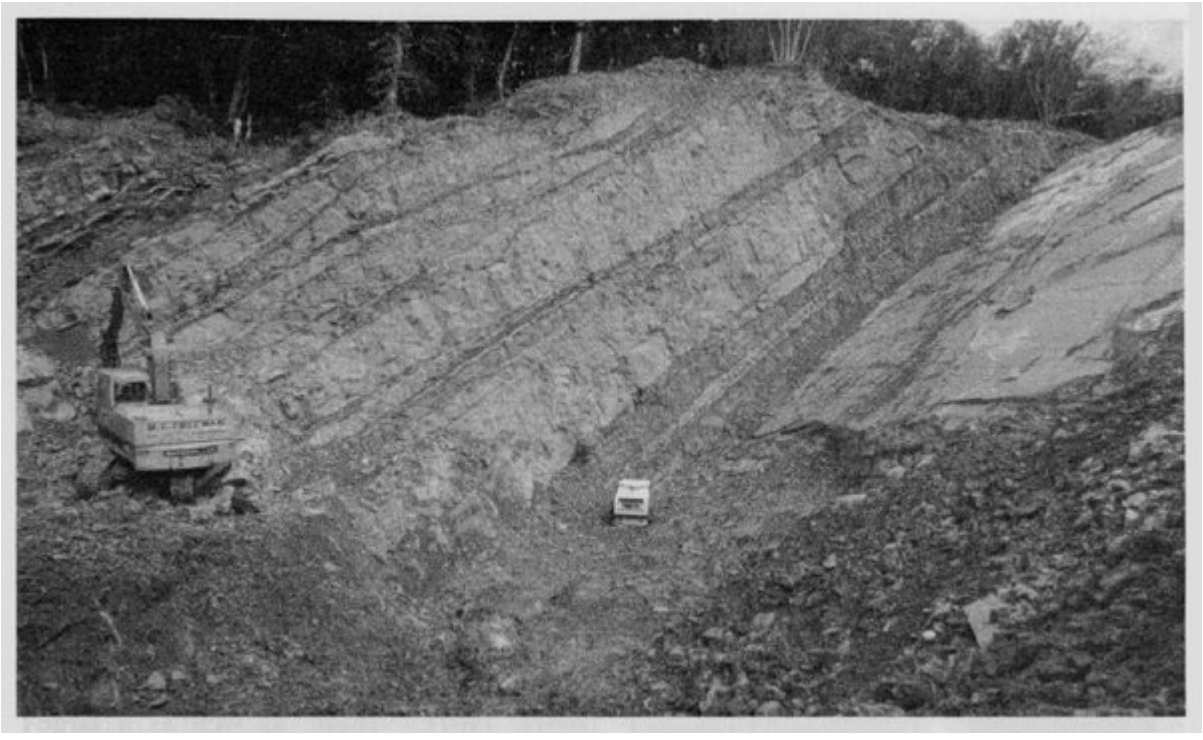
Wilderness Quarry provides the best exposure in the Welsh Borderland at which to examine a facies of the Brownstones Formation that is transitional between those of the underlying St Maughans Formation and the overlying, more typical, Brownstones. Although sandstones dominate, mudstone interbeds are common and divide the succession into typical cycles comprising alluvial meandering channel deposits and overbank floodplain facies.

The site is internationally important in yielding the only fossil vertebrate remains from the Brownstones Formation. The occurrence of abundant disarticulated fragments of the late Dittonian index fossil *Althaspis leachi* in a flood-plain deposit is one of a few such occurrences in the Anglo-Welsh Basin, and provides an insight into the contemporaneous habitats and sedimentary environments of the Anglo-Welsh Basin during Early Devonian times.

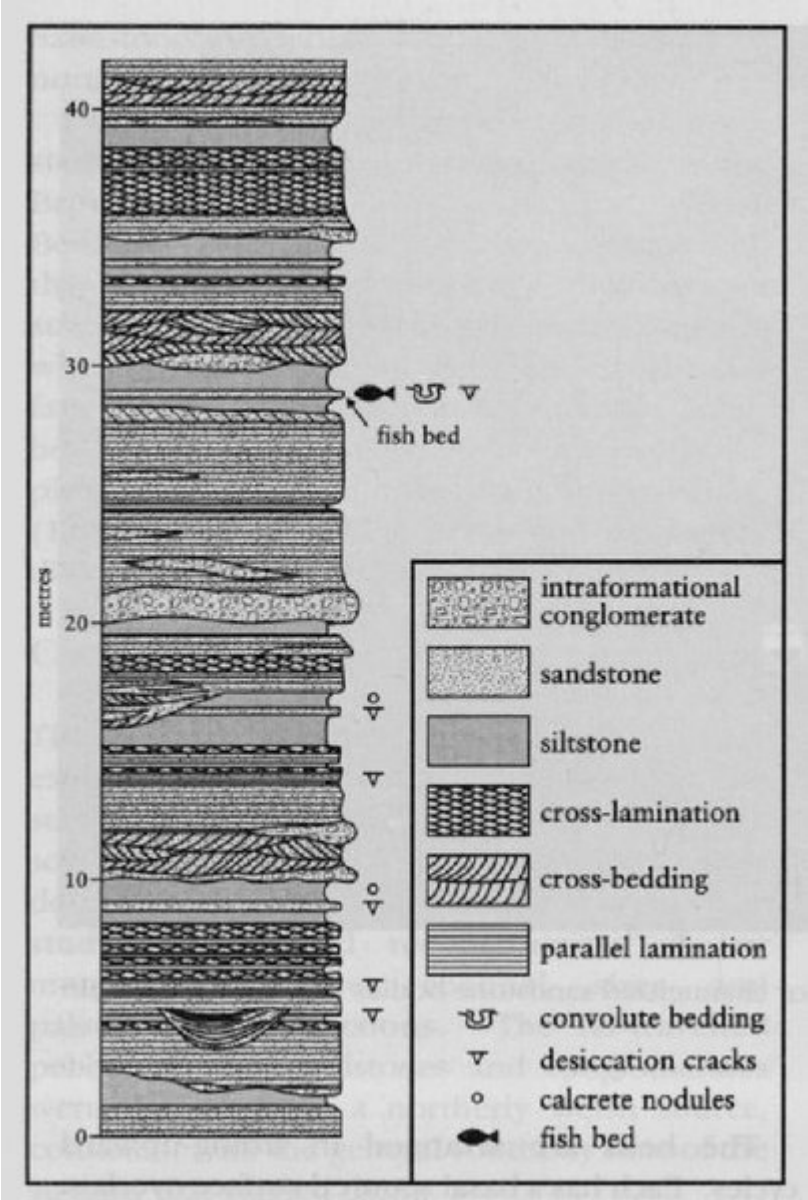
References



(Figure 5.44) Geological map of the area around Wilderness Quarry. After British Geological Survey 1:10 560 manuscript map Gloucs. 23SE (1956).



(Figure 5.45) Wilderness Quarry. Main face showing major channelized sandstone bodies and intervening thin mudstones: (Photo: R.T. Mogridge.)



(Figure 5.46) Generalized section of the Brownstones Formation at Wilderness Quarry. After Allen (1971).