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# Church Hill Quarry

[SO 4120 7380]

## Introduction

At the present time this locality is manifest merely as a number of small, grassed-over scars in the field near the crest of the western slope of the spur called Church Hill, about 750 m east of the bridge over the River Teme at Leintwardine, Herefordshire (Figure 5.27). These are all that remain of several exposures that have been a famous source of Silurian fossils from the mid-19th century onwards (e.g. Salter, 1857, 1959; Wyville Thompson, 1861). For all practical purposes these outcrops, and in particular the horizons from which the more celebrated fossils were recovered, have been unavailable for collecting for several decades: 'the quarries... have been abandoned for more than half a century, and all but two are completely overgrown' (Hawkins and Hampton, 1927).

The Leintwardine area, which has Wenlock to Pridoli strata, lies at the extreme western end of the northern limb of the Ludlow Anticline, more or less along the axis of the complementary Downton Syncline. Its geology was first discussed by Murchison (1839) and was mapped in detail by Whitaker (1962; see also 1960). Accounts of the local middle Ludlow Series Aymestry Limestone and Leintwardine Group were made by Alexander (1936) and Cherns (1988) respectively. The field guide of Siveter *et al.* (1989) also includes Silurian localities in the vicinity of Leintwardine.

Church Hill consists of gently, easterly dipping Ludlow Series strata. Well-preserved, unusual Silurian invertebrates and vertebrates, including asteroids, crinoids, eurypterids and fish have been recorded by field parties and studied in detail by many authors (e.g. see Marston, 1865; Salter, 1857, 1859; Wyville Thompson, 1861; Woodward, 1866–78; Woodward and Dixon, 1904; Spencer 1914/1940, Hawkins and Hampton, 1927; Watson *et al.*, 1948; Ramsbottom, 1958; Blake, 1968). Alfred Marsdon of Ludlow is credited with the discovery of starfish from this and nearby localities (Lightbody, 1863). Several of these accounts, especially that of Hawkins and Hampton (1927), also provide information about the stratigraphy of the exposures and the main horizons that have yielded the well-known fossil finds. Church Hill is also the site of one of six submarine canyon-heads, of mid-Ludlow age, which are recognized locally (Whitaker, 1962; see (Figure 5.27), (Figure 5.29), (Figure 5.29), (Figure 5.30), (Figure 5.31), (Figure 5.32), (Figure 5.33).

## Description

The Middle Elton, Lower Leintwardine, Upper Leintwardine and Lower Whitcliffe formations succeed each other from west to east up the slope of Church Hill (Whitaker, 1962). The Lower Leintwardine Formation rests on the graptolite-rich Elton mudstones along a marked erosion surface. The Lower Leintwardine Formation (*Dayia* Beds of older literature) at Church Hill consists of calcareous siltstones, which at some horizons record slump structures and also contain rare boulders of the Upper Bringewood Formation (Aymestry Limestone of Alexander, 1936; (Figure 5.29)).

The Lower Leintwardine fauna at Church Hill occurs in hands. It includes the early Ludfordian biozonal graptolite *Saetograptus leintwardinensis* (Lapworth, 1880c), for which it is the type locality (see Wood, 1900, Elles and Wood, 1901–1918), and the brachiopod *Dayia navicula* (see Hawkins and Hampton, 1927; Alexander 1936). It is apparently also the source of the more spectacular fossil finds from the locality, such as starfish (e.g. *Echinocystus pomum*, *Furcaster leptosoma*, *Palaeodiscus ferox*, *Rhopalocoma pyrotechnica*, *Sturtzaster*

*marstoni*, *Sturtzaster colvini* and *Lapworthura miltoni*; see (Figure 5.30), eurypterids (e.g. *Salteropsis longilabium*; *Pterygotus arcuatus*), the small heterostracan fish *Archaeognaspis ludensis*, excellently preserved crinoids (e.g. *Eutaxocrinus maccoyanus*, *Gissocrinus ludensis*, *Mastigocrinus bravoniensis* and *Hapalocrinus quinquepennis*) and annelids (*Protoscolex*). The fish finds at Church Hill were mentioned in Roberts (1861) and many subsequent papers (e.g. Marston, 1870; Woodward, 1891; White, 1958; see Dineley and Metcalf, 1999 for details). The eurypterid taxa feature in Woodward (1866–1878) and Kjellesvig-Waering (1961); some of the starfish species were studied by Spencer (1914–1940), Hawkins and Hampton (1927) and Blake (1968); Ramsbottom (1958) described the crinoids.

On their re-excavation of the site Hawkins and Hampton (1927) identified the southerly of the then two remaining quarries at Church Hill as the famous 'Starfish Quarry' of Marston. They also managed to trace two horizons that yielded excellently preserved specimens of starfish and crinoids.

## Interpretation

The sediments at Church Hill are fully marine. They accumulated at the western edge of the Midland Platform, a shelf area extending across central England during the mid-Silurian (see Siveter *et al.*, 1989, fig. 10; Bassett *et al.*, 1992, figs S4b, S5a; (Figure 5.47)).

The fossil-bearing Lower Leintwardine siltstones at Church Hill are interpreted as the fill deposits of a shelf edge canyon head, the so-called Church Hill Channel (Alexander, 1936; Whitaker, 1962, see also 1994). The slumped horizons within the Lower Leintwardine Formation and the concomitant boulders of the Upper Bringewood Group are thought to be down-channel and down-flank features of the channel (Whitaker, 1962; see (Figure 5.28)). Whitaker thought that the characteristic, unusual fauna of the Lower Leintwardine strata at Church Hill and similar, coeval assemblages documented from the other five submarine channels occurring locally were indigenous to such channel fill deposits (Figure 5.28). Hawkins and Hampton (1927) also considered that the fauna was indigenous, but in a very shallow lagoonal setting. Goldring and Stephenson (1972) maintained that the fauna was transported into the channels.

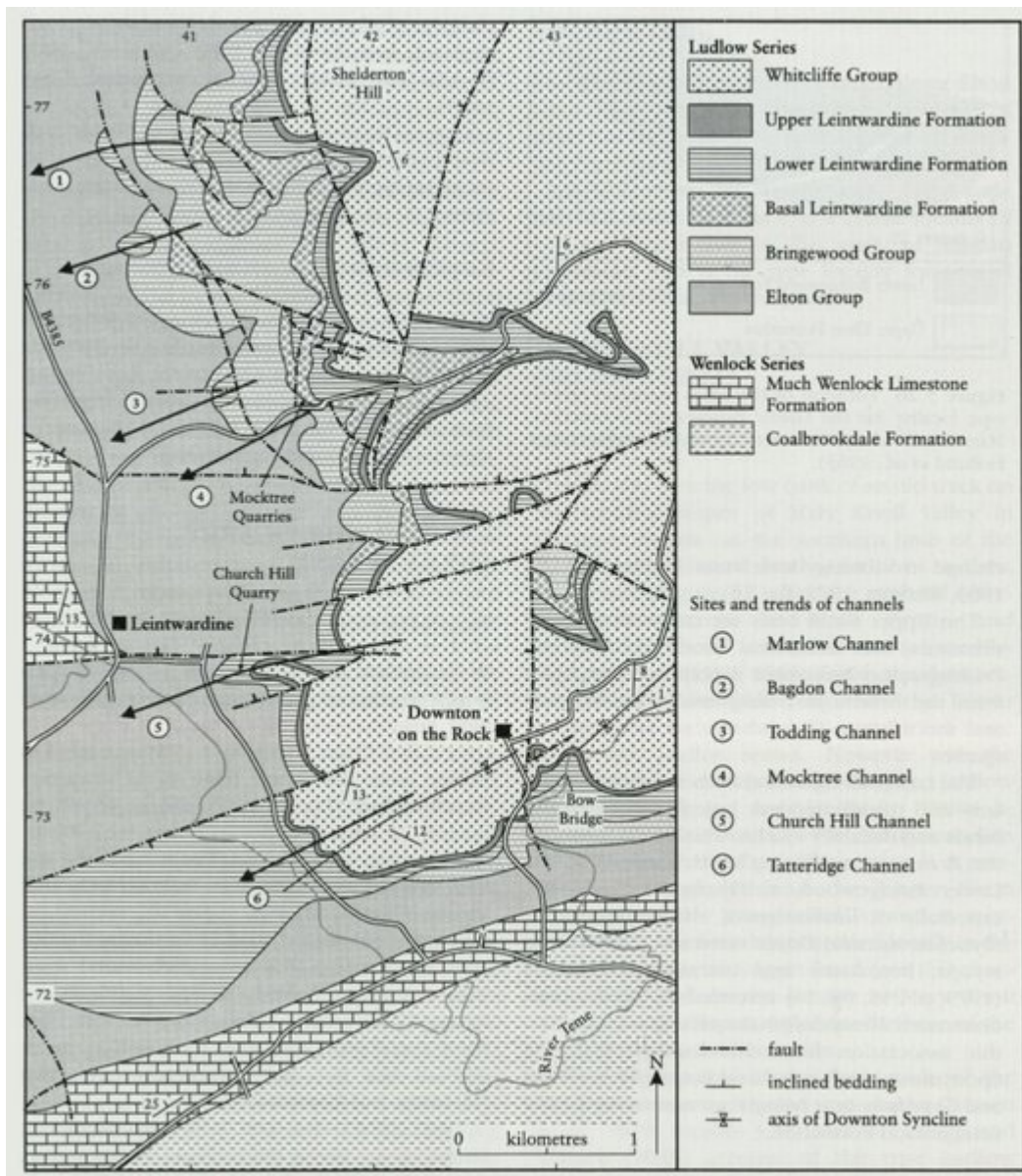
The margin of the Church Hill channel, with Lower Leintwardine resting unconformably on Middle Elton beds, is inferred at Church Hill itself (Alexander, 1936) and is seen at nearby Trippleton Farm Lane (Whitaker, 1962). The Church Hill Channel has a 10° gradient and has eroded out at least 180 m of Ludlow strata belonging to the Upper Elton, Lower and Upper Bringewood, and Basal Lower Leintwardine formations (Whitaker, 1962).

This is one of two GCR sites in the immediate vicinity of Leintwardine. The other site, that of Mocktree Quarries, also contains evidence for the existence of the same system of submarine channels. Both localities complement the many GCR sites that demonstrate the geology of the type Ludlow and contiguous areas of the Ludlow Anticline.

## Conclusions

Church Hill Quarry is very important for historical, palaeontological and palaeogeographical reasons. Its famous marine fauna, recognized in the mid-19th century, is virtually unique in the British Silurian; it includes rare and unusual elements such as starfish, eurypterid arthropods and early fish specimens, and it is the type locality for many of the taxa found there. Its sediments accumulated in a mid-Ludlow age submarine channel at the edge of the eastern shelf of the Welsh Basin. The site is currently overgrown; careful re-excavation would have to be undertaken before the locality could be restudied.

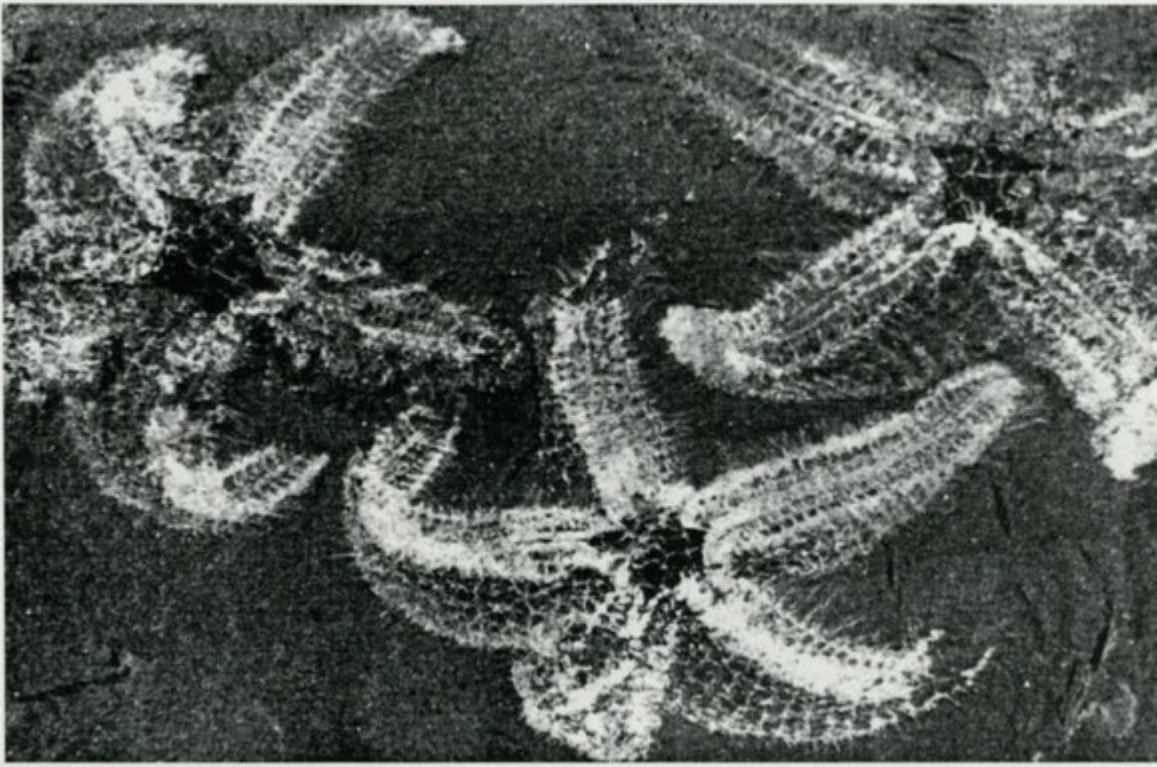
## [References](#)



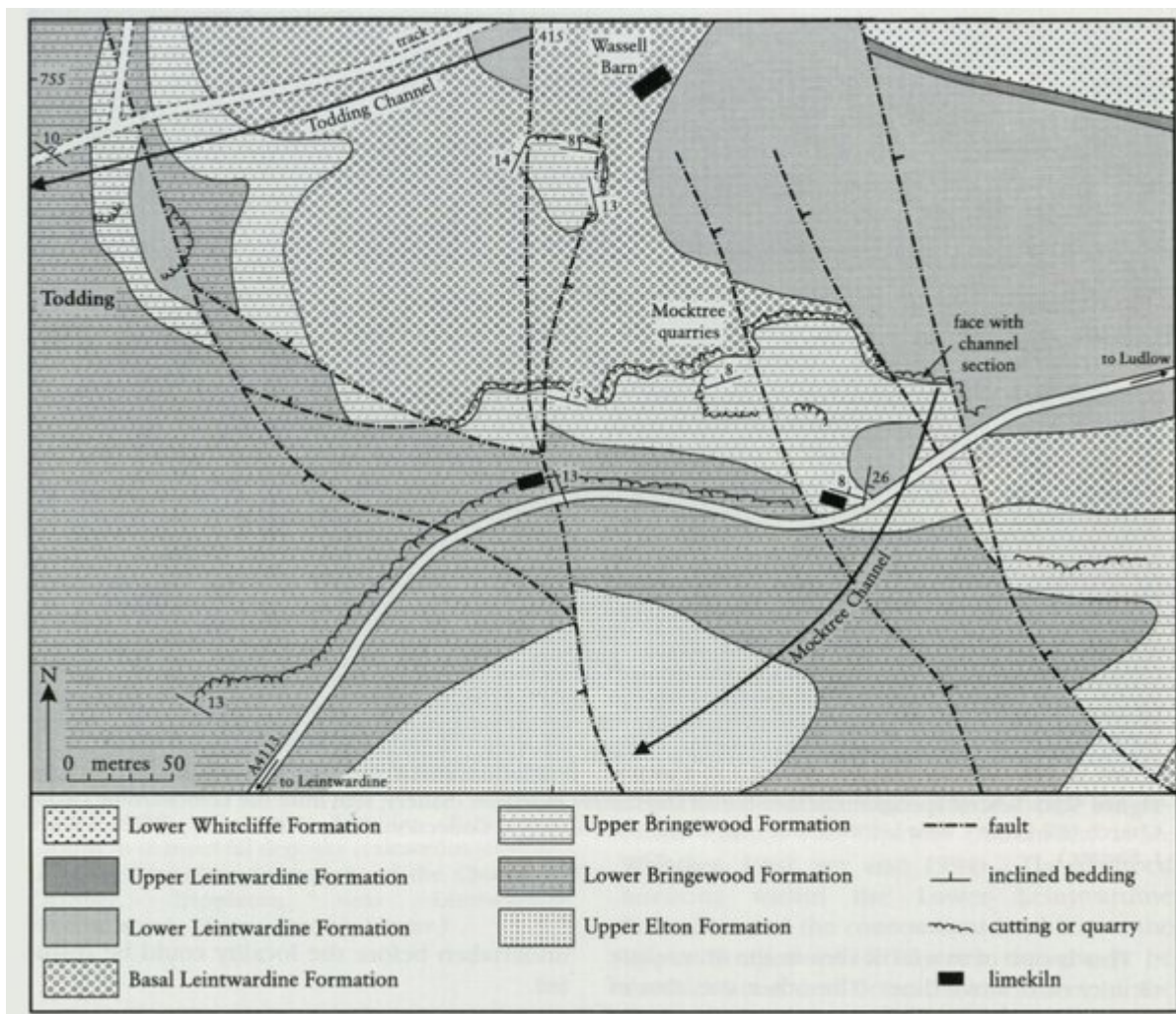
(Figure 5.27) The geology in the vicinity of GCR sites Church Hill Quarry and Mocktree Quarries, Leintwardine area, Herefordshire (after Whitaker, 1962).



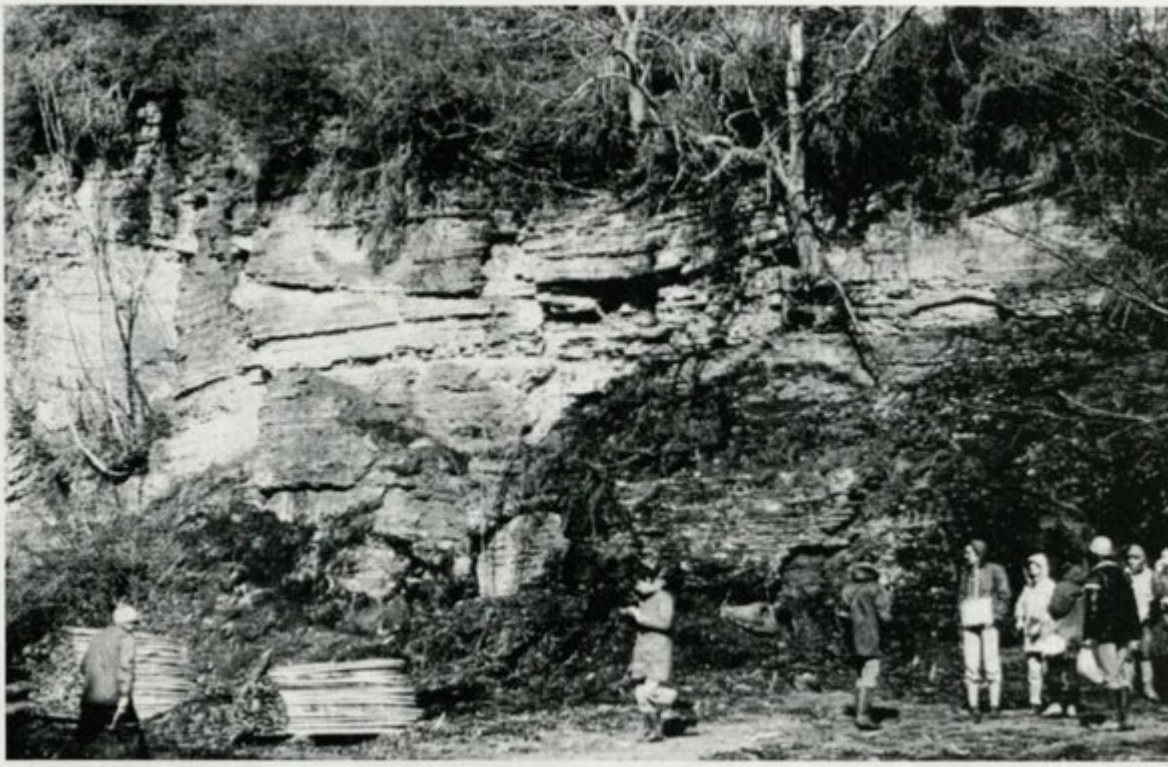
*(Figure 5.29) Carbonate boulder (Bringewood Group) in channel-fill deposits (calcareous siltstones, Lower Leintwardine Formation) of the Church Hill Channel, Trippleton, near Leintwardine, Herefordshire. (Photo: David J. Siveter.)*



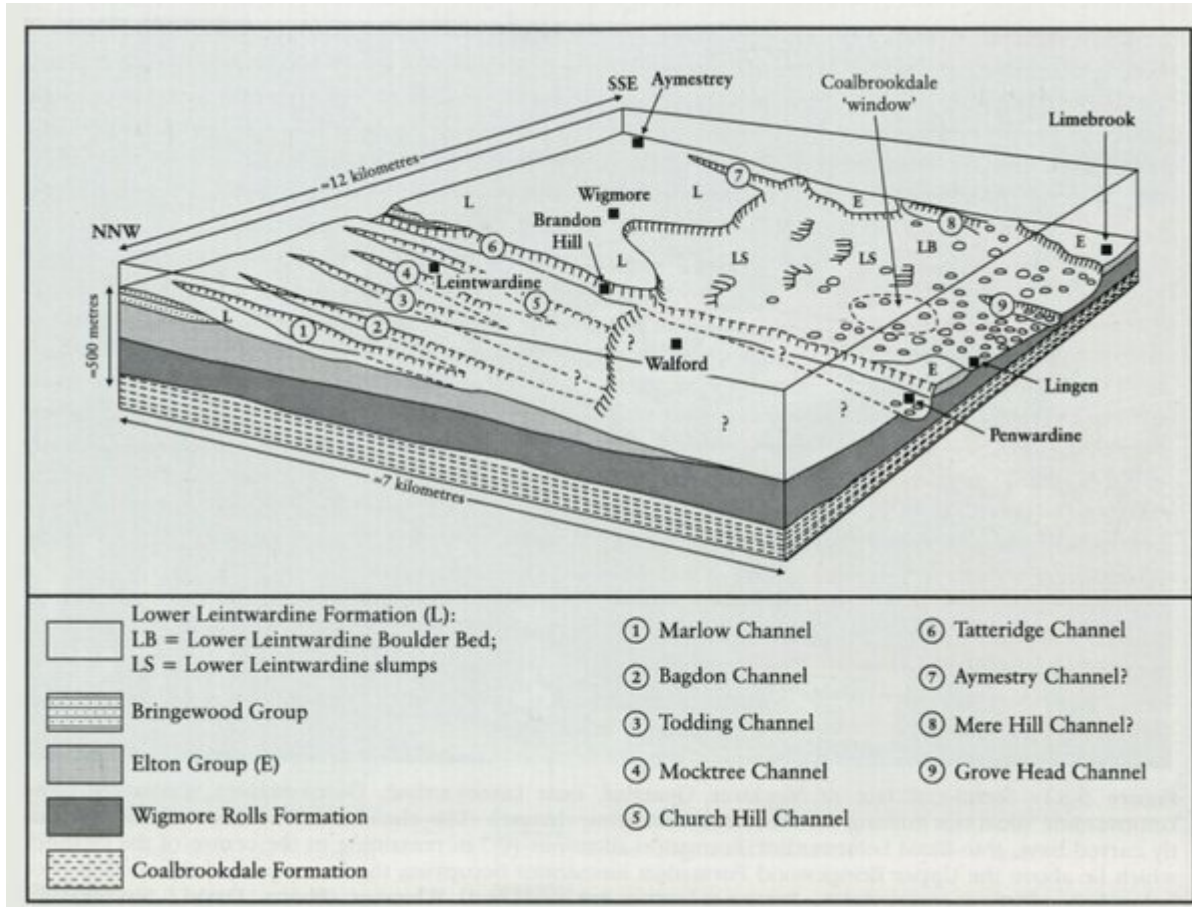
(Figure 5.30) Several specimens of the starfish *Sturtzaster marstoni* (Salter); slab from the Leintwardine Group, Church Hill Quarry, near Leintwardine, Herefordshire (Grindrod Collection, Oxford University). (Photo: Derek J. Siveter.)



(Figure 5.31) The geology of the vicinity of Mocktree Quarries near Leintwardine, Herefordshire (after Whitaker, 1962).

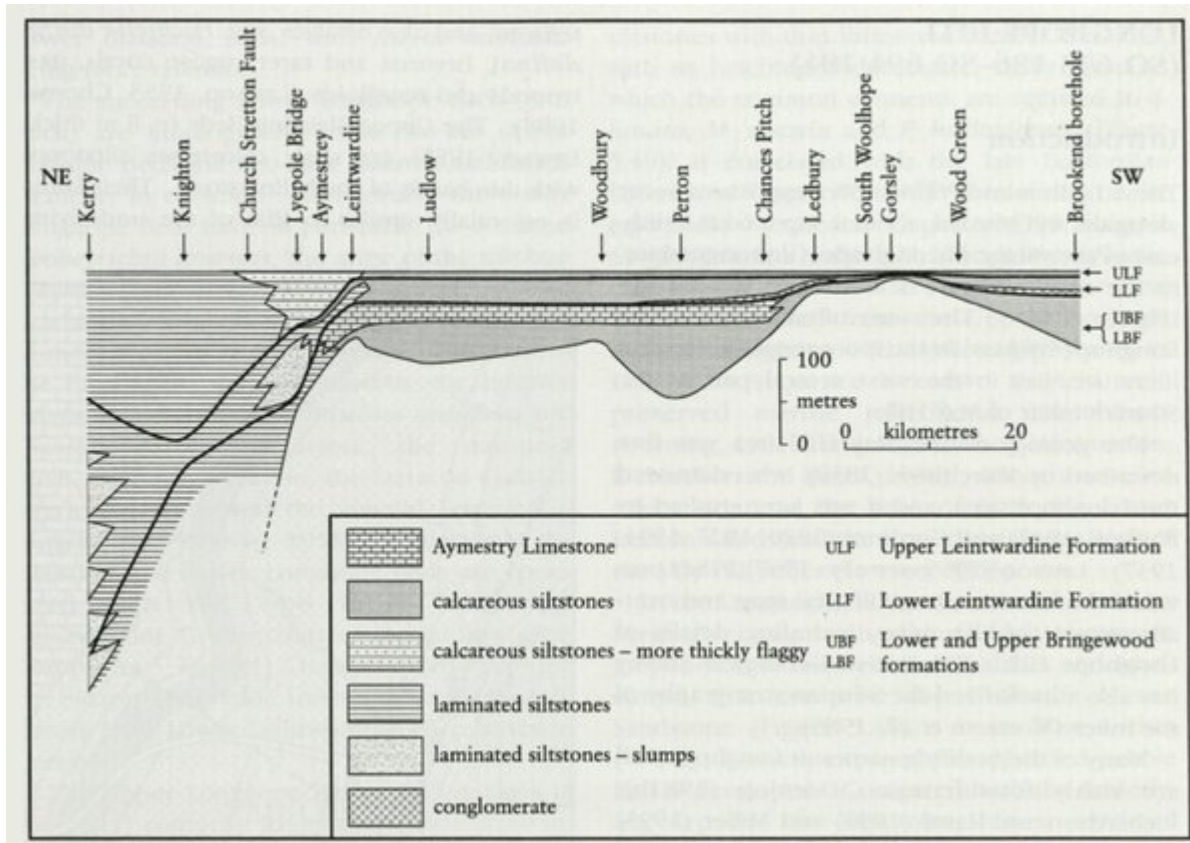


(Figure 5.32) South-east face of Mocktree Quarries, near Leintwardine, Herefordshire, displaying Lower Leintwardine siltstones infilling the Mocktree submarine channel. This channel down-cuts, with a broad, gently curved base, into Basal Leintwardine Formation siltstones (0.7 m remaining in the centre of the channel), which lie above the Upper Bringewood Formation limestones occupying the lower part of the section (from below base of tree at centre right). Person at bottom left is J.H.McD. Whitaker. (Photo: David J. Siveter.)

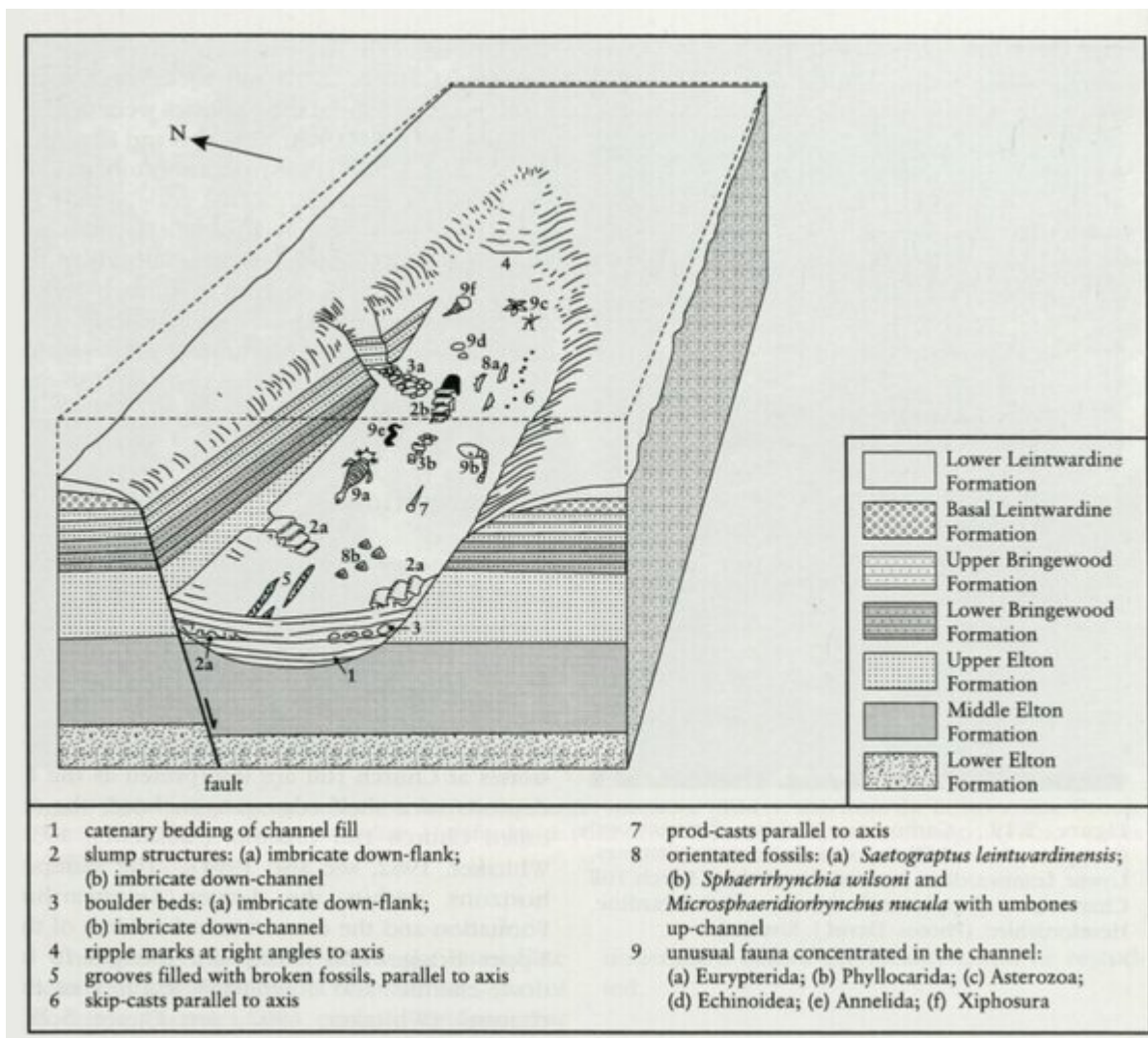


(Figure 5.33) Block diagram, not to scale, illustrating the possible shelf edge and Welsh Basin slope in the Leintwardine-Lingen area at the beginning of Ludfordian time (after Whitaker, 1994). In the south-west, where the boulder

bed is developed as a debris flow downslope from the postulated slide scar, places where Elton beds are not fully stripped off are not necessarily in their correct positions, nor is the Coalbrookdale 'window' where Lower Leintwardine erosion has cut right through the Wigmore Rolls Formation into the top of the Coalbrookdale Formation.



(Figure 5.47) The concept of the 'Gorsley topographical high' of the Welsh Basin, as illustrated in the facies and thickness variations of the Leintwardine Group (early Ludfordian Stage) in a general south-west to north-east transect from the region of the Brookend Borehole, Gloucestershire, to Kerry, Powys (after Cherns, 1988).



(Figure 5.28) Schematic reconstruction (not to scale) of an idealized submarine channel-head of basal Ludfordian times (after Whitaker, 1962). Data from several channels. Note that down-cutting is more severe down-channel.