Kersdown Quarry, Devon

[SS 964 222]

Introduction

The Kersdown Quarry GCR site is a deep disused quarry [SS 964 222], developed in a pronounced ridge overlooking the town of Bampton in east Devon. It is an important reference section for the Viséan Bampton Limestone succession in an area where many former exposures have been lost to quarrying or reclamation. Limestones at this locality have been interpreted as turbidity current deposits and they occur, with increasing frequency, within a thin sequence of fine-grained cherts. Despite its significance, little information has been published about the site apart from isolated references to its fossils (Thomas, 1962; Prentice and Thomas, 1965; Matthews and Thomas, 1974) and a more comprehensive stratigraphical synthesis by Jackson (1985).

Description

Following extensive field mapping, Thomas (1962, 1963b) determined the principal lithostratigraphical divisions of the Lower Carboniferous succession around Bampton and Westleigh. He recognized that basal black shales were succeeded by limestones and cherts, passing up into soft, black, silty shales and greywackes. That succession has subsequently been refined (Selwood and Thomas, 1987) and the broad age-equivalence between the Bampton Limestone and Westleigh Limestone is well established (Figure 10.2).

Successive levels in the quarry reveal about 60 m of the Bampton Limestone succession in a tightly folded anticline that plunges towards the south-west (Figure 10.8). The northern limb of the fold provides the most informative section and allows the three members that comprise the Bampton Limestone to be recognized.

About 40 m of uniform, thin-bedded (*c.* 10 cm) siliceous shales occupy the core of the fold. They form the upper part of the Hayne Beech Member and are interbedded with a few thin silicified limestones and ash bands that pass upwards into thin mottled and dolomitized limestones.

The overlying Kersdown Chert Member is 7 m thick and comprises cherts with interbedded shales and some fine-grained limestones (Webby and Thomas 1965; Matthews and Thomas, 1974). Weathered surfaces of the cherts are pale in colour, but fresh samples are dark grey or black, finely laminated and contain relict radiolarian tests. On average, the chert beds are 10–50 cm thick and they are usually well jointed and blocky. The cherts are interbedded with thinner shales that are slightly silicified and contain radiolarians and siliceous nodules. Some limestones up to 50 cm thick also occur, particularly towards the top of the member where they show evidence of grading, loading and bioturbation. They have a rottenstone appearance although their matrix is slightly siliceous.

Fossils from the Kersdown Chert Member include small corals, brachiopods, ammonoids and conodonts. The ammonoids are typically crushed and poorly preserved but siliceous nodules in the lower part of the member have yielded rare examples of *Merocanites* cf. *similis* and *Bollandites* (Thomas, 1962; Prentice and Thomas, 1965). Conodonts extracted from an overlying limestone bed include *Gnathodus texanus pseudosemiglaber, G. t. texanus* and *Mestognathus becknzanni* (Matthews and Thomas, 1974). Despite concerns that some of the conodonts may be reworked, an early- to mid-Viséan age is indicated.

The upper levels of the quarry show a gradation into the overlying Bailey's Member of the Bampton Limestone succession (Figure 10.2). Some 15 m thick here, the member comprises black, faintly laminated siliceous shales at the base with alternations of pale-weathering limestones and mudstones above. Individual limestone beds are laterally persistent with sharply defined bases, but mottling attributed to bioturbation obscures internal structures. Towards the top of the member, black shales become more abundant and at nearby localities both *Michiganites hesteri* and *Posidonia becheri* occur at a corresponding level. These fossils indicate an Asbian–Brigantian age.

Interpretation

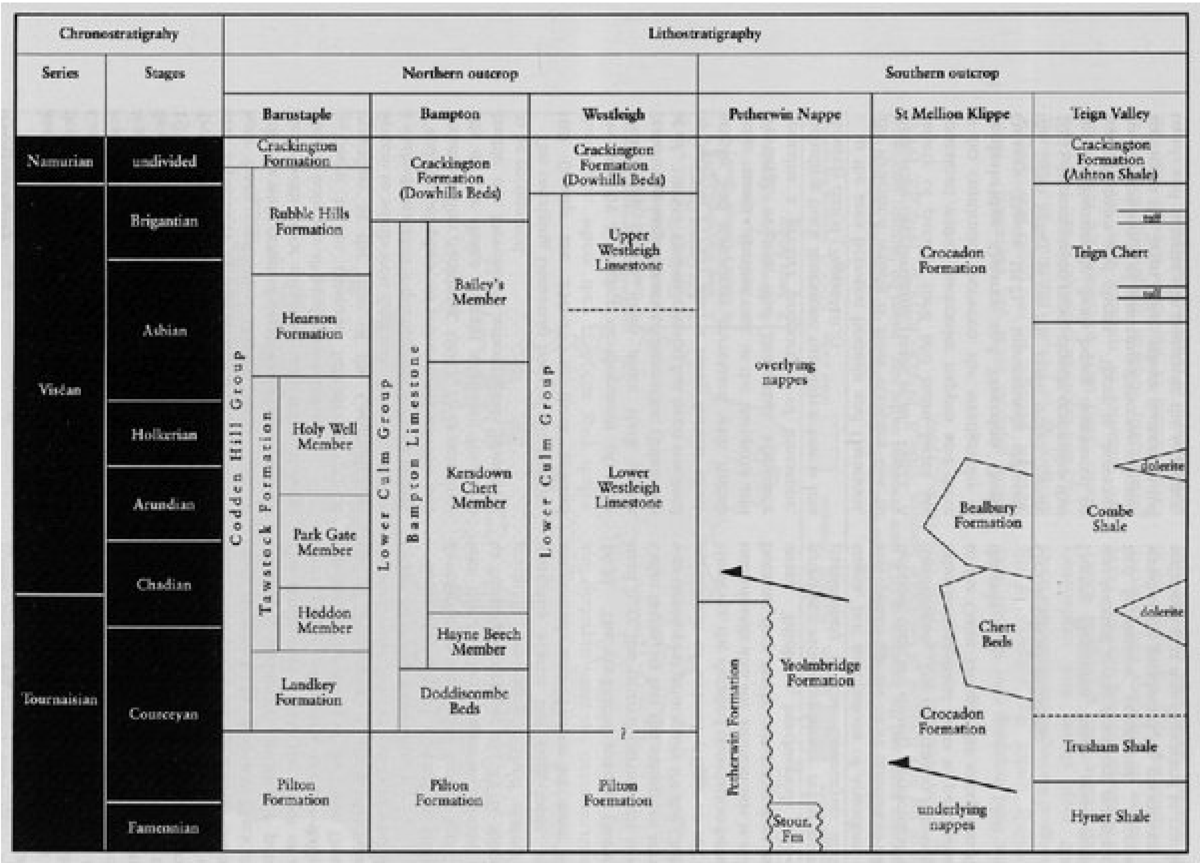
The Bampton Limestone succession is characterized by fine-grained limestones, mudstones and cherts. At Kersdown Quarry and other localities, the thin silicified limestones occasionally display graded bedding, sole markings, burrowing and ripple cross-lamination which suggest they form part of a distal turbidite influx (Thomas, 1962; Matthews and Thomas, 1974). The limestones are subordinate to the thicker and more extensive sequences of laminated cherts, shales and mudstones that are generally considered to have accumulated in a sediment-starved, deep-water basin (Prentice, 1958; Thomas, 1982). However, van Adrichem Boogaert (1967) described similar shales and cherts of upper Tournaisian age from the Vegamian Formation of Cantabria, which formed in shallow water, probably under anoxic sea-floor conditions caused by high plankton productivity and high oxygen depletion rates. In similar vein, Edmonds *et al.* (1985) favoured a comparatively shallow, perhaps lagoonal, origin for these 'background' sequences.

A palaeoenvironmental reconstruction for the Lower Carboniferous sequence (Figure 10.4) illustrates a carbonate shelf and ramp extending south of the Wales-Brabant Massif. Sediment from this area was transported basinward by turbidity currents, augmenting the rather thin, condensed sequences in the basin. The progressive upward increase of limestone turbidites at Kersdown Quarry is mirrored by an increase of other re-sedimented beds elsewhere in the northern part of the Culm Trough (Thomas, 1963b; Jackson, 1991). This suggests that submarine topography continued to influence depositional patterns during Dinantian times in the northern part of the Culm Trough, just as it did farther south (Isaac *et al.,* 1982).

Conclusions

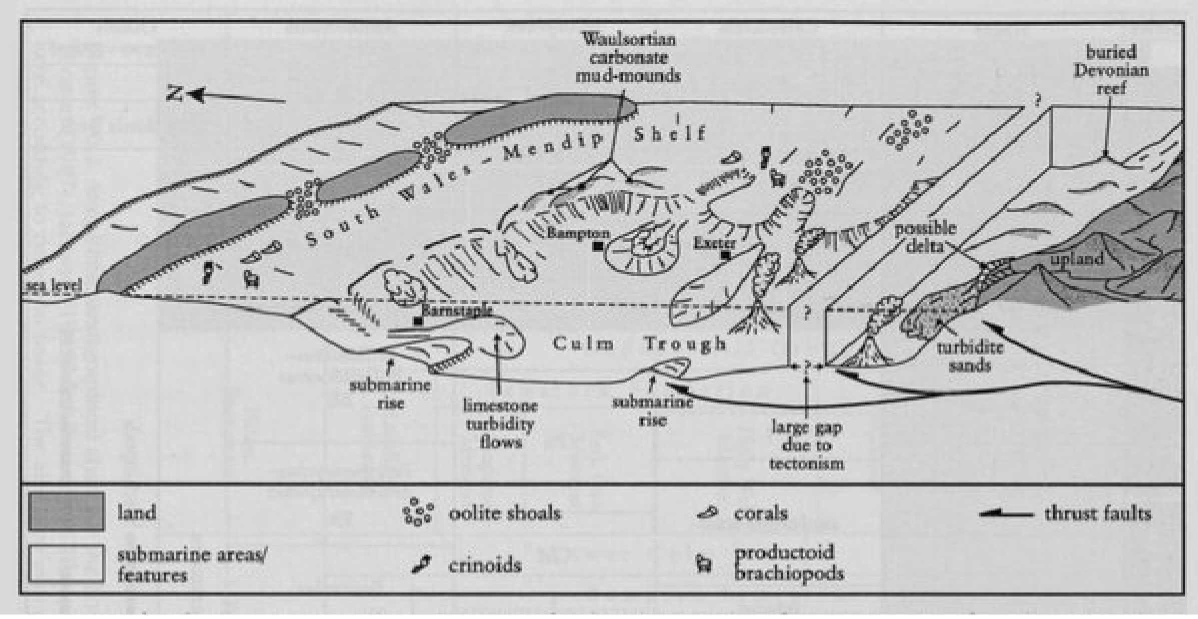
This is the best site in the Culm Trough for illustrating the stratigraphy of the Bampton Limestone succession. More specifically, it is the type locality for the thin sequence of inter bedded cherts and limestones that constitute the Kersdown Chert Member. The persistent limestone horizons are believed to represent part of a distal turbidite flow that inundated the basin during Viséan times.

References



(Figure 10.2) Simplified stratigraphical chart for the Lower Carboniferous strata of the Culm Trough. Compilation based on information from Seiwood and Thomas (1987), Jackson (1991) and Owens and Tilsley (1995). Much of the stratigraphical nomenclature in the CuIm Trough is informal and is reproduced here according to common usage. The aim is to summarize a range of differing successions rather than imply that the rock units are well dated and have isochronous boundaries. Note that the Chert Beds and the Bealbury Formation in the Crocadon Formation of the St Mellion Klippe may be olistoliths or isolated thrust-bound units; see Viverdon Down Quarry GCR site report (this chapter) for further details. Half-arrows represent thrust faults. Stour. Fm — Stourscombe Formation. Not to scale.

(Figure 10.8) Tight, asymmetric anticline developed in beds of the Bampton Limestone succession, Kersdown Quarry, east Devon. (Photo: J. Jones.)



(Figure 10.4) Palaeoenvironmental reconstruction for the Lower Carboniferous sequence of south-west England (after Thomas, 1982). Note the association of oolite shoals, productoids, corals and crinoids on the South Wales–Mendip Shelf and its possible southward extension. Subtle changes of basin-floor topography may influence the direction of turbidite flows or dictate sedimentation patterns, forming isolated rise-related successions. The southern margin of the Culm Trough was a mobile orogenic front associated with coarse clastic and volcanic rocks. Half-arrows represent northward-propagating Variscan thrust faults.