Kiln Cottage Quarry, Devon

[SS 950 222]

Introduction

The Kiln Cottage Quarry GCR site is a disused quarry [SS 950 222] near Bampton, east Devon. It reveals a Brigantian–?Pendleian section extending from the upper part of the Bampton Limestone succession into the lower part of the Dowhills Beds (Crackington Formation). It is the most informative of the few localities in Devon that record the cessation of limestone turbidite deposition within the sediment-starved Lower Carboniferous basin. Ammonoids confirm that this shift in depositional pattern occurred during Brigantian times in the Bampton area (Thomas, 1982). Although there is no comprehensive account of this site to date, it is mentioned in field guides (e.g. Webby and Thomas, 1965; Thomas, 1971) and unpublished theses (e.g. Jackson, 1985).

Description

Although much of the site has been ladled, some 30 m of section is still visible In the north-west face of the quarry. It records the transition from dark shales and impure limestones of the Bailey's Member (topmost beds of the Bampton Limestone) into weathered black shales of the overlying Dowhills Beds (lowermost part of the Crackington Formation) (Figure 10.2). A log of the partially exposed succession, indicates that the Bailey's Member is about 23 m thick whereas the Dowhills Beds are considerably thicker, although only the basal 5–6 m are currently exposed (Figure 10.9).

Near the base of the succession is a thick (0.75 m) deeply weathered limestone overlain by dark-grey, siliceous mudstones and thinner limestones. Above an interval obscured by talus, three prominent limestone beds 20–40 cm thick with pronounced honeycomb weathering occur, separated by beds of dark, locally cherry, mudstone. These limestones show no sign of internal structure or bioturbation although they are characteristically sharp-based and muddy. From 11–18 m, the limestones are thinner (Figure 10.10), more frequent and are interbedded with grey and black shales that are patchily siliceous and mottled. At 19 m, poorly preserved *Posidonia* occurs, above which the shales become darker and more mottled.

Matthews and Thomas (1974) defined the top of the Bailey's Member at the top of the last limestone bed. This may equate to the thin, weathered limestone or 'rottenstone' at 23 m (Figure 10.9). Above this, the Dowhills Beds consist of unfossiliferous, finely laminated shales and thin siltstones that are locally micaceous and rich in plant debris. The remainder of the section is hidden but elsewhere in the Bampton region the Dowhills Bcds rangc up into the Pendleian and Arnsbergian stages (Edmonds, 1974).

The section between 19 m and 25 m yields *Posidonia bechert, Neoglyphioceras spirale* and *Lusitanoceras granosus,* and is a classic example of the Posidonia Beds. These taxa characterize the P_{1b}–P_{2a} ammonoid zones (Figure 10.3), and, although they are imprecisely located, they adequately bracket the waning of limestone deposition in this area as a feature of early Brigantian times.

Interpretation

Matthews and Thomas (1974) interpreted the laterally persistent limestones within the Bailey's Member as distal turbidites that originated from extensions of the carbonate shelf to the north. They are broadly similar in age to the Upper Westleigh Limestone (Figure 10.2) but are generally finer grained. This might be readily anticipated since the composition of turbidites is easily influenced by subtle changes taking place in provenance areas and in sea-floor topography. It is also Interesting to note that, at a local level, the Posidonia Beds occur in a black shale facies around Bampton whereas at Westleigh, only 10 km to the south-east, the same horizon is interbedded amongst thick detrital limestones.

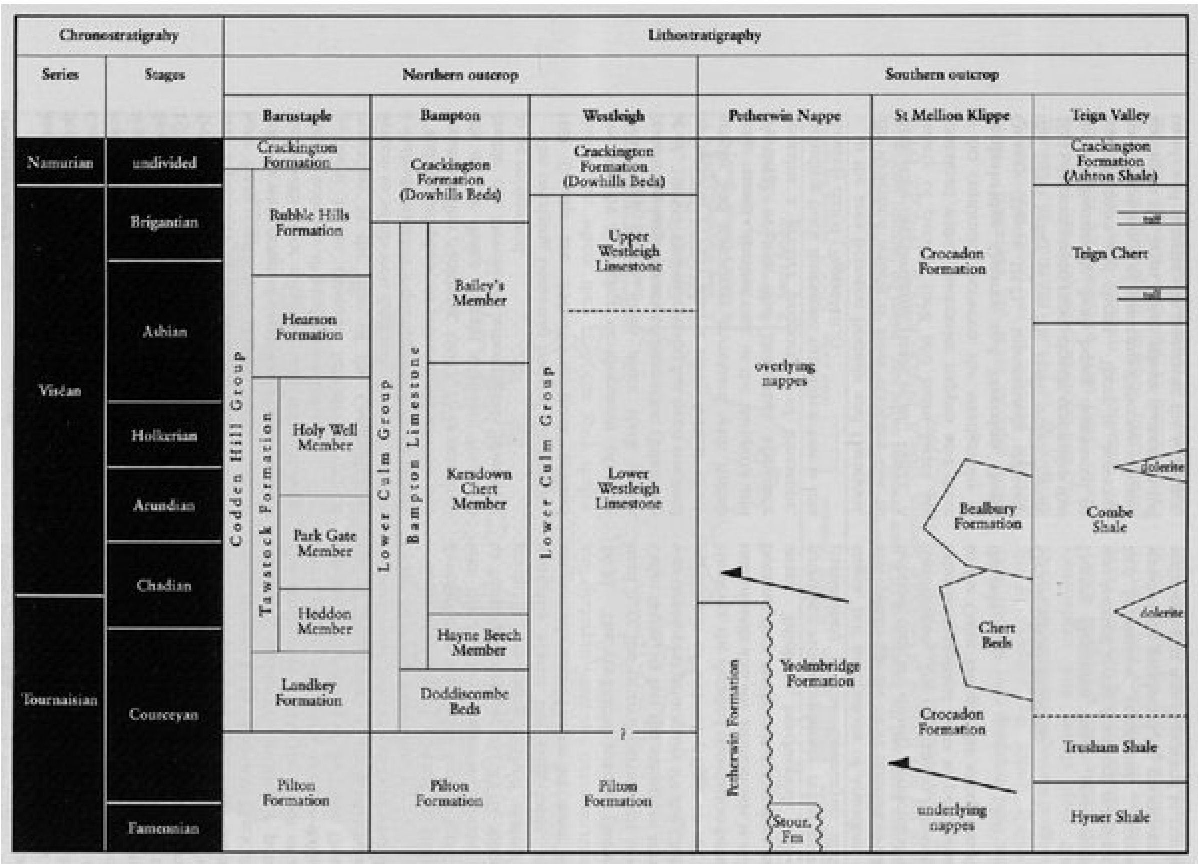
However, in a regional sense, Thomas (1982) has noted that limestone deposition in the Culm Trough is generally at its most widespread at about Posidonia Beds time. He suggested that the abundance of preserved bivalves and ammonoids reflected high organic productivity, reduced sedimentation rates and perhaps a better-ventilated water column. Certainly the causative factors have to be sought at a basin scale since the Posidonia Beds are uniformly developed throughout the present northern and southern outcrops, areas that were separated by more than 75 km at the time of deposition.

The Dowhills Beds are one of several euxinic black shale sequences (e.g. Ashton Shale, Limekiln Beds) that have been recognized below the thick turbiditic sandstones of the Crackington Formation (Edmonds, 1974). This has led to a proliferation of stratigraphical synonomy during the course of localized mapping projects. Edmonds (1974) sought to simplify the problem by proposing that all the black shale intervals should be considered part of the Crackington Formation, a view reflected in (Figure 10.2). This is logical since the euxinic shales provide background sedimentation throughout the Crackington Formation whereas the more conspicuous sandstone bodies provide variation in terms of bedform and origin.

Conclusions

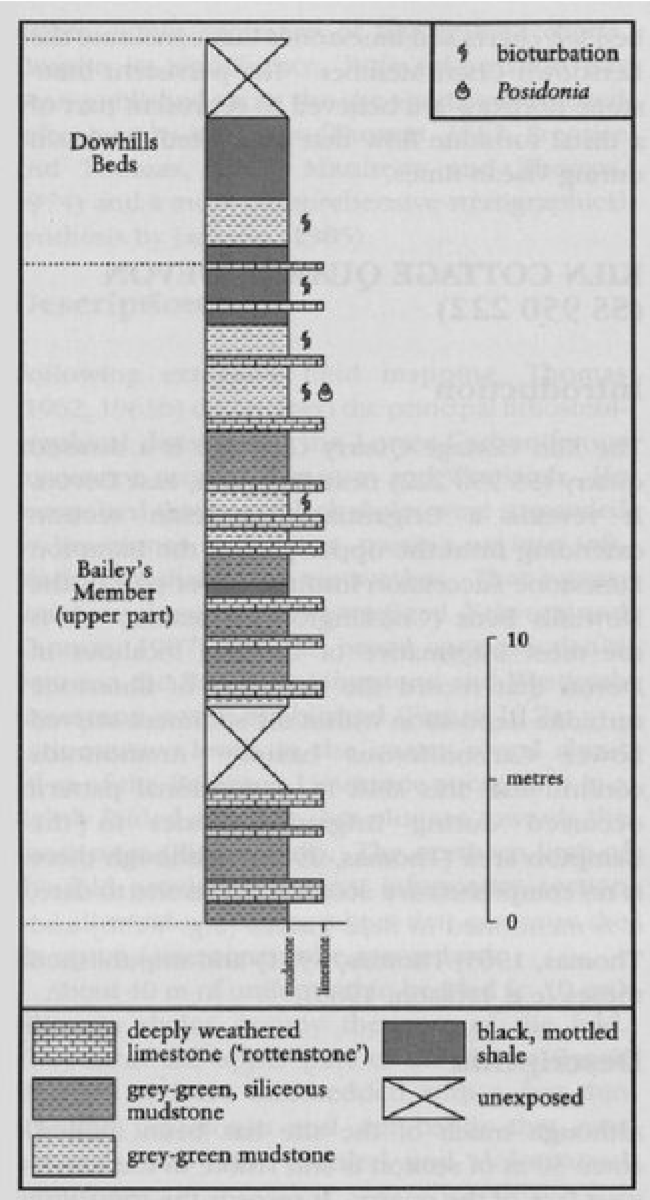
This important site records the conformable passage from sequences containing mudstones, cherts and limestone turbidites into younger beds characterized by black shales and coarse, sandy turbidites. The fine-grained deposits accumulated more-or-less unchanged in a long-lived, sediment-starved basin, but the obvious shift from limestone to clastic turbidites occurred from Brigantian times onward. A fundamental re-arrangement of the hinterland around the Culm Trough must account for the marked change in sediment type made accessible to the basin.

References



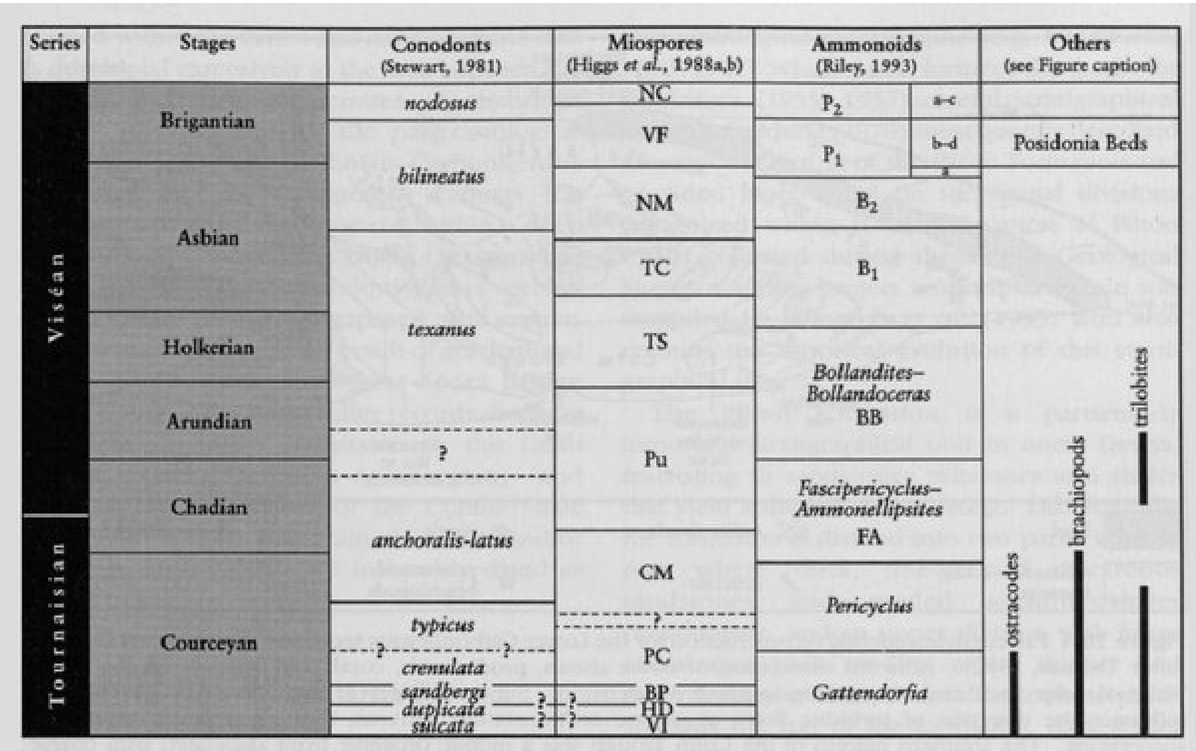
(Figure 10.2) Simplified stratigraphical chart for the Lower Carboniferous strata of the Culm Trough. Compilation based on information from Seiwood and Thomas (1987), Jackson (1991) and Owens and Tilsley (1995). Much of the stratigraphical nomenclature in the Culm Trough is informal and is reproduced 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 10.9) Simplified log of the upper part of the Bailey's Member (Bampton Limestone succession) and the transition into the Dowhills Beds (Crackington Formation), Kiln Cottage Quarry, east Devon. After Jackson (1985).

(Figure 10.10) Deeply weathered limestone bed within dark siliceous mudstones of the Bailey's Member (Bampton Limestone succession), Kiln Cottage Quarry, east Devon. Note coin for scale. (Photo: J. Jones.)



(Figure 10.3) Biostratigraphical schemes for the Lower Carboniferous strata in the Culm Trough based on conodonts, miospores and ammonoids. The distribution of other useful fossil groups is also shown; entomozoid ostracodes are locally abundant in the Courceyan Stage (Selwood et al., 1982; Gooday, 1983), as are diverse trilobite and brachiopod faunas (Goldring, 1955, 1970). Trilobites are more sporadic in the Chadian (Owens and Tilsley, 1995) and younger stages (Prentice, 1967) but the concurrence of Posidonia becheri and Neoglyphioceras spirale is a common feature within the early Brigantian Posidonia Beds (Thomas, 1982; Riley, 1993).