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# Cawdor Quarry, Derbyshire

[SK 286 606]

## Introduction

The Cawdor Quarry GCR site is a disused quarry [SK 286 606] extending for over 1 km due west of the station at Matlock Bridge. It exposes the upper part of the Monsal Dale (Matlock) Limestones and the lower part of the overlying Eyam (Cawdor) Limestones (for which it is the type locality as defined by Shirley, 1959). Cawdor Quarry was a key locality in determining the Brigantian lithostratigraphy and biostratigraphy of the southern part of the Dinantian outcrop in Derbyshire. The Eyam Limestones are particularly well known for their diverse conodont (Higgins, 1975), ostracode (Robinson, 1959) and zaphrentid coral (Hudson, 1943) faunas. The most comprehensive accounts of the geology at this site are by Shirley (1959) and Smith *et al.* (1967).

## Description

Most of the main face (Figure 7.19) is made up of the topmost 21.3 m of the Monsal Dale Limestones (Cox and Harrison, 1980). These comprise uniform, massively bedded, grey bioclastic wackestones and packstones with some beds of disarticulated gigantoproductids. Bedding planes are formed by palaeokarst surfaces with poorly developed clay wayboards. Smith *et al.* (1967) recorded a coral–brachiopod fauna from these beds that included *Dibunophyllum*, *Lithostrotion portlocki* and *Siphonodendron pauciradiale* and productoids.

The Monsal Dale Limestones–Eyam Limestones boundary is marked by a grey clay (30 cm thick), which overlies a surface developed on the underlying Monsal Dale Limestones topped by some palaeokarstic pits up to 0.5 m deep.

Above this, the Eyam Limestones comprise approximately 23 m of dark fossiliferous limestones and shales. The formation can be divided into three units. The lower unit (*c.* 6.5 m) consists of thinly bedded dark cherty biomicrites with minor shale partings and a relatively sparse fauna. It is capped by an angular discordance that represents an intra-Brigantian unconformity. This in turn is overlain by a middle unit (*c.* 7.5 m) composed mainly of shales with minor developments of limestone in its middle and top sections. This unit has proved to be particularly fossiliferous, yielding ostracodes in abundance (Robinson, 1959) and rich zaphrentid coral assemblages (Hudson, 1943; Smith *et al.*, 1967), together with trilobites (*Paladin*), brachiopods (including *Lingula*, *Orbiculoidea* and *Productus concinnus*), gastropods and scattered bivalves. The upper unit (*c.* 9 m) comprises dark fossiliferous shales with a prominent muddy limestone bed (1 m) near its top. Trilobite–brachiopod assemblages recorded from this unit resemble those of the underlying middle unit; however, the upper unit does contain some distinctive P<sub>2</sub> bivalve–goniatite taxa including *Posidonia membranacea*, *Sudeticeras stolbergi* (P<sub>2b</sub>) and *Lyrogoniatites aff. georgiensis* (P<sub>2c</sub>) (Smith *et al.*, 1967; Riley, 1993).

Regrettably, although Shirley (1959) recorded the P<sub>2a</sub> subzonal indicator *Lusitanoceras 'Goniatites' granosus* from this sequence, there remains uncertainty as to whether this record was from beds below or above the unconformity. However, it is assumed to have originated from either the lower or middle unit of the Eyam Limestones as described in this account (see Smith *et al.*, 1967).

## Interpretation

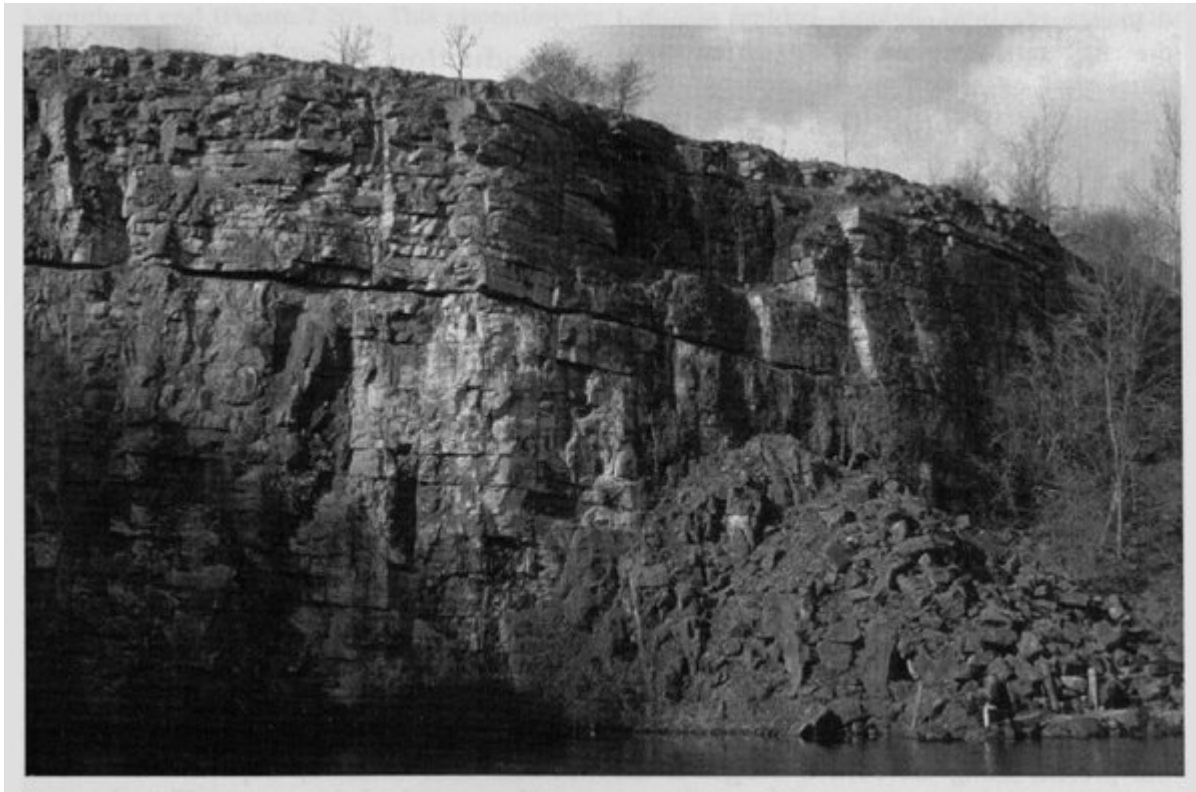
The Monsal Dale Limestones were deposited on a shallow carbonate shelf prone to occasional periods of emergence. The palaeokarst that defines the Monsal Dale Limestones–Eyam Limestones boundary most probably developed during a period of exposure when the whole of the Derbyshire Platform became emergent (Gutteridge, 1989a). This was followed by the establishment of a sheltered, low-energy depositional setting in which the Eyam Limestones accumulated. The intra-Brigantian unconformity is one of several local unconformities present along the eastern margin of the Derbyshire Platform that may have formed during an episode of intra-Brigantian inversion (Gutteridge, 1989a). The progressive

upward change to a shale-dominated succession reflects the progressive shut-down of carbonate production on the platform. Fossils indicate a Brigantian and late Brigantian age for the Monsal Dale Limestones and Eyam Limestones respectively.

## Conclusions

Cawdor Quarry demonstrates the sedimentological and faunal evolution of the south-eastern part of the Derbyshire Platform during Brigantian times. The Monsal Dale Limestones were formed on a shallow carbonate shelf subject to periods of subaerial exposure, while the Eyam Limestones, represented by the 'dark facies' (traditionally regarded as 'quasi-basinal' deposits and formed at an uncertain water depth) most probably developed on the margins of an intra-platform basin or sheltered shelf setting (Walkden, 1970; Gutteridge, 1987, 1989a).

## References



*(Figure 7.19) General view of the Monsal Dale Limestones and Eyam Limestones at the Cawdor Quarry GCR site, Matlock. The Monsal Dale Limestones comprise pale, thickly bedded limestones that form the lower two-thirds of the face. The top of the formation is marked by a palaeokarstic surface overlain disconformably by thinly bedded and darker units of the Eyam Limestones. The height of the face is approximately 15 m. (Photo: P. Gutteridge.)*