Barnhill Quarry, Chipping Sodbury, Avon

[ST 725 826]

Introduction

Barnhill Quarry exposes an excellent section of Carboniferous Limestone overlain unconformably by the Penarth Group. The site is especially important in showing the nature of this unconformity, and how the Late Triassic sediments filled fissures and faulted steps on the landscape formed on the Carboniferous Limestone. The Penarth Group includes the Westbury Formation with a basal bone bed and interbedded dark grey shales and muddy limestones, and pale limestones of the succeeding Cotham Member (Lilstock Formation).

Much of the geological and palaeontological research at Barnhill Quarry has concentrated on the Carboniferous strata (e.g. Coysh, 1927; Murray and Wright, 1971). The first description of the site was by Reynolds (1938), and Sykes (1977) included a brief analysis of the bone bed and a short description of the Rhaetian sediments.

Description

Barnhill Quarry provides a 2-km-long section of faulted and steeply dipping Carboniferous Limestone with small sections of overlying Upper Triassic sediments. The south-east part of the quarry forms the GCR site, and is situated within the Severn Valley Natural Area (Reynolds, 1938). Most of the quarry is now disused, although the northern area remains in use. The site is also known as 'Chipping Sodbury Quarry' (Reynolds, 1938).

Sedimentology

The Upper Triassic deposits rest on eroded Carboniferous Limestone surfaces (Figure 4.18) that have been cut by three major thrust faults. The thrusts were propagated along bedding planes within the Carboniferous Limestones, and slickensides are common (Reynolds, 1938). In places, the Carboniferous strata are covered by Westbury Formation clays, and beneath these, the limestone is smooth. The exposed upper surface of the Carboniferous Limestone forms four platforms, two of which display well-developed clints and grykes, deep solution channels characteristic of karst landscapes produced by subaerial chemical weathering of limestone (Reynolds, 1938); the remaining limestone surfaces are generally smooth and planar, and are probably a result of intensive erosion.

The following section is adapted from Reynolds (1938, pp. 100–1) and Sykes (1977):

	Thickness (m)
Lias Group:	
seen as blocks of grey limestone in the soil	
Penarth Group	
Lilstock Formation, Cotham Member:	
Pale shale	0.61
Euestheria Bed: compact pale argillaceous limestone; variable thickness up to	0.3
Grey shale	0.76
Westbury Formation:	
Irregular beds of greyish argillaceous limestone, sometimes sandy	0.15
Dark shale, sometimes very fissile.	
Selenite common, especially in the lower parts of the section. Towards the base of the bed is an impersistent ferruginous layer rich in vertebrate fossils	1.1

Pecten Bed: argillaceous limestone, sometimes very hard and crystalline; well-defined layers of 'beef' towards the base of the bed up to	0.3
Dark grey shale:	
(a) dark grey shale with several fossil-rich bands	1.37
(b) compact black shale, common pyrite, very fossiliferous	0.91
(c) black papery shale, no fossils	0.38
Bone bed: very irregular and patchy; variable thickness; containing bones of fishes and reptiles, and quartz pebbles	0.3 or less
Carboniferous Limestone	

A bone bed occurs at the base of the Triassic succession, resting directly on the eroded Carboniferous Limestone. Two bone-bearing lithologies have been described (Reynolds, 1938), the first being a dark-coloured crystalline limestone containing phosphatic nodules, coprolites, and bone fragments, and the second characterized by large (up to 1.2 m long), rounded blocks, which may be partially coated with pyrite. In many cases these blocks are isolated, but when they occur in groups, bone-bearing and quartz pebble-rich sediment often infills the spaces, producing a very coarse-grained conglomerate. The distribution of this coarse conglomerate is somewhat patchy and corresponds to the occurrence of a grit bed within the Carboniferous Limestone (Reynolds, 1938).

The overlying sediments are typical Westbury Formation lithologies and comprise dark grey, often fissile shales with thin interbedded limestones and sandstones (Reynolds, 1938; Sykes, 1977).

The top of the section exposes the Cotham Member of the Lilstock Formation. This comprises pale buff-coloured shales and thinly bedded limestones (Reynolds, 1938). The Cotham Marble facies has not been recorded at this locality.

Palaeontology

Many fossils have been recorded from the Penarth Group sediments at Barnhill Quarry, principally from the Westbury Formation that contains abundant remains, including the bivalves *Eotrapezium, Protocardia,* and *Lyriomyophoria.* Vertebrates are especially common in the basal bone bed, but also occur scattered throughout the overlying Westbury Formation shales. Fish teeth, for example *Acrodus, Saurichthys, Sargodon,* and *Gyrolepis,* are abundant (Dineley and Metcalfe, 1999), while plesiosaur remains are rare (Reynolds, 1938). In contrast, the Cotham Member contains few, if any, fossils.

Interpretation

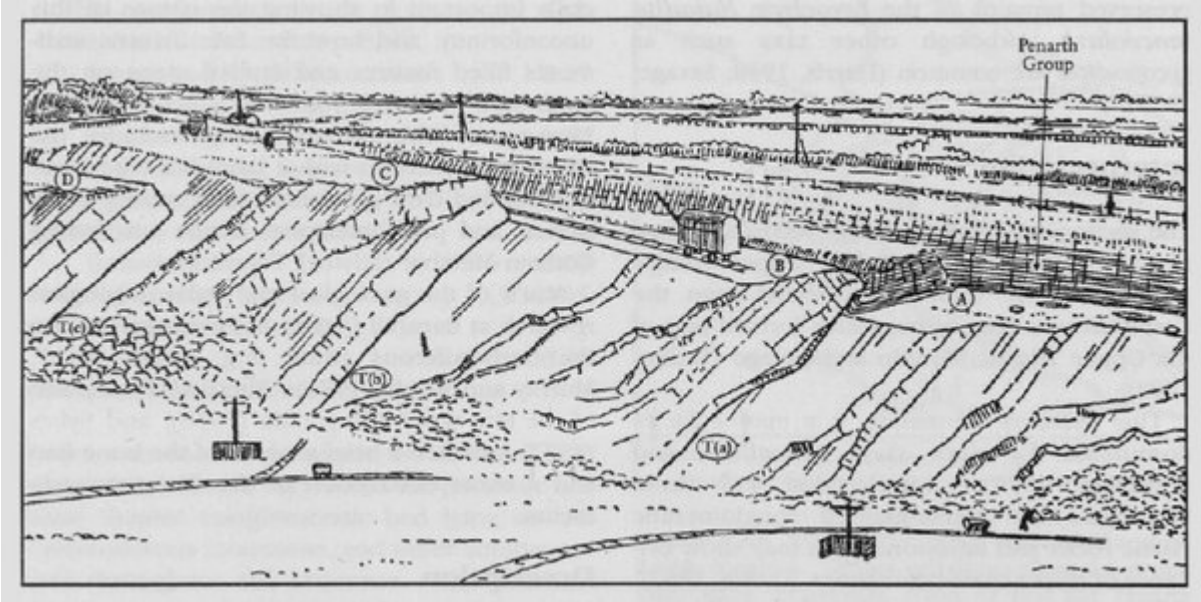
The Penarth Group sediments at Barnhill Quarry reflect the changing palaeoenvironmental conditions experienced by south-west England during the Late Triassic Epoch. The planar surface of the Carboniferous Limestone was produced, at least in part, during the Late Triassic transgression (Reynolds, 1938). The basal beds of the Westbury Formation are typical in that they contain a bone bed. Reworking of sediments and vertebrate material in the basal bone bed is important (Storrs, 1994): at Barnhill Quarry; coarse-grained grits have been reworked into the bone bed from the Carboniferous Limestone. The rest of the Westbury Formation shows typical marine sediments, as elsewhere.

The overlying pale-coloured limestones and shales of the Cotham Member were deposited in marine lagoons (Mayall, 1979).

Conclusions

Barnhill Quarry is one of the few inland sites where Penarth Group sediments are easily accessible. It is especially important for the extensive exposures of the irregular, eroded, karst-like surface of the Carboniferous Limestone and overlying Penarth Group sediments that rest on this Late Triassic land surface. This is a critically important site for the understanding of the Late Triassic transgression and palaeogeography of the region.

References



(Figure 4.18) Perspective view of Barnhill Quarry, at the height of its operations in the 1930s, looking NNE. A, B, C, and D are Carboniferous Limestone platforms, and T(a), T(b), and T(c) are overthrusts. Penarth Group sediments rest unconformably on top of this stepped landscape. (After Reynolds, 1938.)