Burrington Combe, Somerset–Avon

[ST 477 590]–[ST 476 582]–[ST 485 582]

Introduction

The Burrington Combe GCR site provides the most complete section through the Carboniferous Limestone in the Mendips. The site extends from the entrance to the combe [ST 477 590], south to Goatchurch Cavern [ST 476 582], with an eastwards extension up the combe to [ST 485 582]. Although the base and top of the Lower Carboniferous sequence are not seen in the site, some 800 m of strata are exposed. The section is notably fossiliferous and, compared to the Avon Gorge succession, is more complete, being sited in a more distal position on the Dinantian carbonate ramp. Detailed accounts of the site geology are provided by Sibly (1905a), Reynolds and Vaughan (1911) and Mitchell and Green (1965).

Description

The Burrington Combe section is located on the northern limb of the Black Down Pericline. Beds dip northwards at between 50° and 65°, and the combe sides provide a section at right angles to strike through much of the succession. A summary lithological and stratigraphical log for the area is shown in (Figure 9.37). The Lower Limestone Shale Group is not exposed within the boundaries of the site, but is partially exposed on the hillside to the south. The Black Rock Limestone, however, is extensively exposed, in dip sections at the southern end of the combe and at the entrances to the tributary valleys known as the Eastern and Western Twin Streams, as well as in a strike-section along Great Scarp on the northern side of the east–west part of the combe. Mitchell and Green (1965) provide a measured section of the interval which, including the dolomite at the top, the Laminosa Dolomite of Reynolds and Vaughan (1911), totalled 943 feet (288 m). Much of the undolomitized part of the succession comprises fine-grained, dark-coloured limestone with variable amounts of coarse crinoidal debris. Notable chert developments occur at two levels, 30 m and 150 m above the base of the Black Rock Limestone. Both contain chert nodules and silicified fossils and the upper also shows well-defined bands of chert. These were designated the Lower Chert and Main Chert beds by Reynolds and Vaughan (1911). The Lower Chert forms a well-marked topographical feature on the hillside on the south side of the combe and the Main Chert is well seen in Great Scarp (Reynolds and Vaughan, 1911; Mitchell and Green, 1965).

The Black Rock Limestone is the most fossiliferous part of the Mendips succession, with a particularly diverse and abundant coral–brachiopod fauna. This is described in detail by Mitchell and Green (1965) who recognized three main faunal assemblages, which they referred to as the Lower, Middle and Upper faunas. Important elements of the faunal assemblages are summarized by Kellaway and Welch (1993). The Lower Fauna is characterized by zaphrentoid corals and includes *Fasciculophyllum omaliusi, Sychnoelasma clevedonensis* and *Zaphrentites delanouei.* Common brachiopods are *Cleiothyridina glabristria, Dictyoclostus multispiniferus, Pugilis vaughani, Rhipidomella michelini, Rugosochonetes vaughani* and *Syringothyris cuspidata cyrtorhyncha.* The Middle Fauna is characterized by the first appearance of a number of corals: *Caninophyllum patulum, Caninia cornucopiae, Cyathaxonia cornu, Cyathoclisia tabernaculum, Fasciculophyllum densum* and *Sychnoelasma konincki.* The appearance of the coral *Siphonophyllia cylindrica* marks the beginning of the Upper Fauna, which is also characterized by the brachiopods *Eomarginifera* aff. *derbiensis, Megachonetes magna, Pustula pustuliformis, P. pyxidiformis, Schuchertella* cf. *wexfordensis* and *Syringothyris* aff. *elongata.*

The lower part of the overlying Clifton Down Group is known as the 'Buffington Oolite', measured by Mitchell and Green (1965) as 680 feet (208 m) thick. It consists of grey, grainy, sometimes oolitic, and crinoidal limestones with some intercalations of fine-grained limestone. Parts of the succession, particularly near the base, are strongly dolomitized. Two dolomitic mudstone marker bands which have some stratigraphical significance have been named by George *et al.* (1976). These are the Ham Mudstone 6 m above the base, and the Rib Mudstone 38 m below the top (Figure 9.40). The most common corals in the Burrington Oolite are *Palaeosmilia murchisoni* in the lower part and *Siphonodendron martini*

in the upper part (Mitchell and Green, 1965). Amongst the brachiopods, *Megachonetes papilionaceus* and *Rhipidomella michelini* are common in the lower beds (Mitchell and Green, 1965). *Davidsonina carbonaria* has been found in the upper part of the Burrington Oolite (Mitchell and Green, 1965).

The Clifton Down Limestone is about 150 m thick, but the basal 40 m is poorly exposed in Burrington Combe. The lowest exposed beds comprise oolites interbedded with fine-grained limestones. These are overlain by darker cherty beds, often containing silicified corals. The topmost part consists of dark fine-grained limestones (Mitchell and Green, 1965; Kellaway and Welch, 1993). The most common coral in the Clifton Down Limestone *is Siphonodendron martini, with Axophyllum* '*Carcinophyllum*' *vaughani* also widely distributed (Mitchell and Green, 1965). *S. martini* is particularly common in the middle part of the unit and this part of the succession has been used as a mappable marker known as the '*Lithostrotion* Beds' (Green and Welch, 1965). *Megachonetes papilionaceus, Composita ficoidea* and productoids characterize the brachiopod fauna of the Clifton Down Limestone (Mitchell and Green, 1965).

Only about 30 m of the Hotwells Limestone can be seen at the north end of Burrington Combe. It consists mostly of massive crinoidal limestone, but contains a fauna distinct from the Clifton Down Limestone below This includes the first appearance of the coral *Dibunophyllum bourtonense* and the brachiopods *Gigantoproductus maximus* and *Linoprotonia hemispherica.*

Interpretation

Mitchell and Green (1965) discuss the relationships of the faunas, the mapped formations and the application of the Avonian zones to the Burrington section as described by Reynolds and Vaughan (1911). Much of this data is incorporated in (Figure 9.37). The Burrington Combe section offers a thicker section with fewer non-sequences than the Avon Gorge (Figure 9.37).

This is exemplified by the Black Rock Limestone with its Lower, Middle and Upper faunas, of which the Upper Fauna and part of the Middle Fauna are missing in the Avon Gorge. Ramsbottom and Mitchell (1980) replaced these three faunas with assemblage biozones. Thus the Lower Fauna became the *Zaphrentites delanouei* assemblage biozone, the Middle Fauna became the *Caninophyllum patulum* assemblage biozone and the Upper Fauna became the *Siphonophyllia cylindrica* assemblage biozone. The two lower biozones were equated with the later part of the Courceyan Stage and the *Siphonophyllia cylindrica* assemblage biozone with the early part of the Chadian Stage.

In Burrington Combe the base of the Chadian Stage lies in an unexposed interval some 20–25 m thick between the limestones bearing the Middle and Upper faunas, and the top of the stage has been taken at the top of the Ham Mudstone which lies just above the base of the Burrington Oolite as defined by Green and Welch (1965) (George *et al.,* 1976). That part of the Burrington Oolite beneath the Ham Mudstone was attributed to the Gully Oolite by George *et al.* (1976). Basal Arundian beds may be missing in Burrington Combe even if there is less of a non-sequence at this level than there is in the Bristol area (George *et al.,* 1976). The top of the Arundian Stage at this site was taken at the top of the Rib Mudstone 38 m below the top of the Burrington Oolite of Green and Welch (1965) (see (Figure 9.40)). That part of the Burrington Oolite between the Ham Mudstone and the Rib Mudstone was called the Aveline's Hole Limestone', and the part above the Rib Mudstone was called the 'Quarry Two Limestone' by George *et al.* (1976). The appearance of *Davidsonina carbonaria* above the Rib Mudstone indicates that the upper part of the Burrington Oolite (i.e. the Quarry Two Limestone) is Holkerian in age (George *et al.,* 1976). The remainder of the Holkerian Stage is represented by the Clifton Down Limestone. The Hotwells Limestone contains an Asbian fauna, although, as in the Avon Gorge, *Daviesiella llangollensis* is not present, suggesting that the early part of the stage is not represented (George *et al.,* 1976).

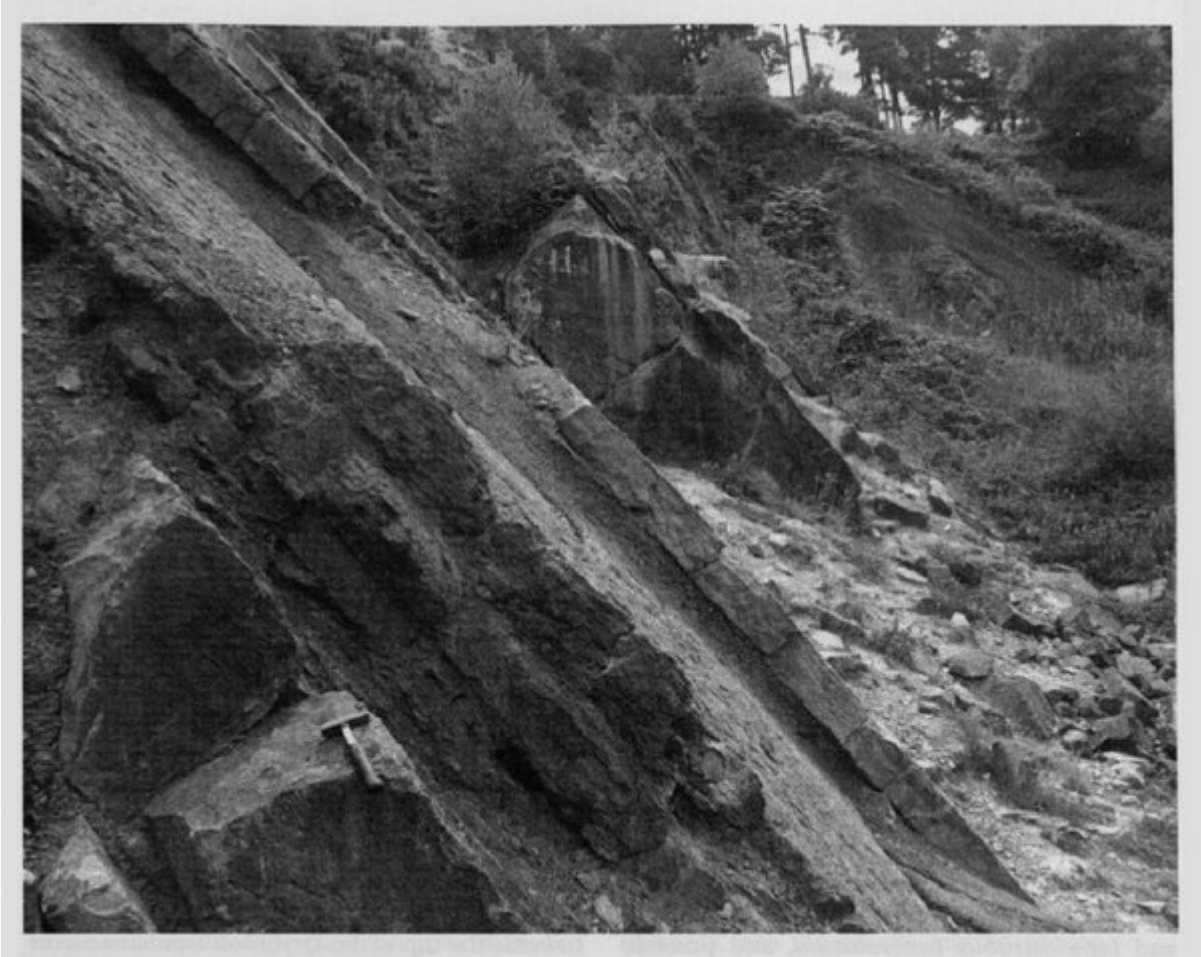
Despite little modern sedimentological work on the section in Burrington Combe having been published, the environments represented here appear to be broadly similar to those inferred for the Avon Gorge succession.

However, the more distal situation of Burrington on the Dinantian ramp means that the succession has fewer non-sequences and that open marine environments are better represented than restricted lagoonal environments. In particular, the Arundian and Holkerian successions are dominated by 'grainy', sometimes oolitic, limestones at Burrington Combe, which are less significant in the Avon Gorge.

Conclusions

Burrington Combe is now arguably the best section through the Carboniferous Limestone in the Mendips and Bristol area, even though the lowest and highest parts of the succession are not included in the site. The section is especially valuable for the rich coral–brachiopod faunas of the Black Rock Limestone, the study of corals, in particular, leading to notable refinements in the stratigraphy of the area. Although little of the sedimentology has been studied in detail, the site offers great opportunities for future research.

References



(Figure 9.37) Comparative sections of Dinantian strata exposed at the Avon Gorge and Burrington Combe GCR sites. After Kellaway and Welch (1993) and including non-sequence information from Ramsbottom (1973) and George et al. (1976). Biostratigraphical information is from Vaughan (1905, 1906), Reynolds and Vaughan (1911) and Reynolds (1921). Horizons a, $_{R}$ and y are based on Vaughan (1905).

(Figure 9.40) General view of the upper part of the Burrington Oolite at Burrington Combe. A thin band crossing the centre of the figure (top right to bottom left) marks the position of the dolomitic 'Rib Mudstone' and the Arundian–Holkerian boundary (see text for further details). (Photo: P.J. Cossey.)