Clifton Down Group and Hotwells Group (excluding the arenaceous facies), Lower Carboniferous, Bristol and Gloucester region

From Earthwise
Jump to navigation Jump to search


Stratigraphy

Comparative vertical sections of the Carboniferous Limestone in the Avon Gorge area, Bristol and at Burrington Combe, Mendip Hills to illustrate the relationship between the lithostratigraphical and chronostratigraphical classifications of the rocks. (P948962)
In the following account the Dinantian rocks are described in ascending stratigraphical order for the whole region, except for those at Cannington Park, which are treated separately.

**Clifton Down Group (excluding the arenaceous facies)**

Between the relatively homogeneous Black Rock Limestone and the Hotwells Group, the Clifton Down Group comprises two to six formations of varied facies, apparently deposited under peritidal or lagoonal conditions, in shallow or extremely shallow water.

The local successions are shown in P948962 and P948963, and their relationships to the older and newer Dinantian classifications are shown in P948962. They may be grouped into three rather indistinctly defined facies units that form wide belts trending in a general east-west direction and grading into each other in a north–south direction. These belts are named for purposes of description, from north to south, as the Forest of Dean, the Bristol and the Mendip regions respectively. The Forest of Dean region and the northern part of the Bristol Coalfield are characterised by the strong development of arenaceous facies, the Bristol region by peritidal carbonate mud sequences and the Mendip region by an appreciable overall thickening of the sequences, which are dominated by oolitic and bioclastic grainstones and which formed as carbonate barrier shoals.

**Gully Oolite**

The Gully Oolite, known as the Crease Limestone west of the River Severn, is the lowest, most distinctive and widespread formation of the group. It is 20 to 30 m thick in the north-west and 35 to 40 m on Broadfield Down and in the Weston area in the south. Typically, it comprises pale grey, medium- to fine-grained, cross-bedded oolite, which is white-weathering and exceedingly massive, with strong vertical joints. Macrofossils are rare; Vaughan’s name of ‘Caninia Oolite’ refers to its zonal position in his scheme. The lowest part commonly consists of pale grey, well-sorted, crinoidal limestones, known in the Bristol area as the ‘Sub-Oolite Bed’, which may contain an abundant brachiopod fauna of mixed Tournaisian and Visean aspect, including chonetoids and large orthotetoids. The ‘Sub-Oolite Bed’ ranges from less than one metre to 7 m thick, but exceptionally, in the Tytherington area north of Bristol, it attains 21 m; the overlying oolite is up to 43 m thick. The diagnostic Chadian brachiopod Levitusia humerosa, common in northern England, has been found only near the base of the Gully Oolite, at Middle Hope, north of Weston-super-Mare, but conodont faunas recovered from the Gully Oolite are consistent with a Chadian age.

The dolomitisation that affects the underlying Black Rock Limestone commonly extends upwards into the Gully Oolite without affecting the massive nature of the beds. At the southern limit of its
outcrop, on Brean Down, it includes thick lenses of coarse crinoidal limestone with sparse coral faunas, but elsewhere in the Mendips it cannot be separately distinguished from the overlying massive oolitic and bioclastic limestones that comprise the Vallis Limestone and the Burrington Oolite.

**Clifton Down Mudstone**

The Clifton Down Mudstone, or the Whitehead Limestone as it is known in the Forest of Dean, consists of thinly bedded, pale grey calcite and dolomite mudstones, commonly called chinastones, with thin, interbedded, dark grey and brown shales. The calcite and dolomite mudstones weather whitish grey or buff. They are poorly fossiliferous except for some foraminifera, stromatolitic algae and occasional serpulid worms. The formation is not present in the Mendips, apart from Brean Down, where it comprises 1.5 m of dolomitic mudstone and shale. From Bristol northwards it ranges in thickness from about 30 to 60 m.

The beds abruptly overlie the Gully Oolite and the boundary, which has been referred to as 'the mid-Avonian break', is one of the most distinctive in this and adjacent regions. In the Forest of Dean, where the junction is locally very irregular, differences in thickness in the Gully Oolite are attributed to erosion at this level. Farther south, for example in the Weston area, there is evidence of karstification and micritisation of the underlying strata, indicating subaerial exposure of the Gully Oolite before deposition of the Clifton Down Mudstone. Current opinion, however, favours the view that no great interval of time is represented by the erosional break, and the implied changes of sea level need not have been very great.

In the Bristol–Wick area intercalations of massive oolitic and crinoidal limestone, of which the Goblin Combe Oolite is the most important, are present in the higher parts of the formation. On Flat Holm, thick bioclastic limestones with some half dozen intercalations of the Clifton Down Mudstone facies have been given the name Flat Holm Limestone Member. There, the thickness of the beds containing the mudstone facies is about 35 m, including a basal calcite mudstone-mudstone sequence with stromatolites, which has been separately named the Caswell Bay Mudstone after its type locality in Gower (George et al., 1976[1]). Farther south, in the Weston area, the sequence above the Caswell Bay Mudstone comprises grey crinoidal limestones, to which the name Birnbeck Limestone has been applied. It is usually distinguished by a lower very massive, finely cross-bedded and sometimes oolitic facies, and an upper well-bedded, bioturbated facies. The lower facies is relatively poor in macrofossils apart from *Palaeosmilia murchisoni*, but the upper facies is fossiliferous and, in particular, is distinguished by the large keeled chonetoid *Delepinea carinata*, which is diagnostic of the Arundian Stage.

The Goblin Combe Oolite thickens southwards from the Bristol and Wick area at the expense of the mudstone facies. At its type locality at Broadfield Down, the oolite is 38 m thick, but its thickest development is on the coast at Weston-super-Mare where it attains 70 m. It is distinguished from the Gully Oolite by its darker colour and coarser texture, and by the abundance of crinoidal debris. Scattered fossils include *Palaeosmilia murchisoni* and bellerophonid gastropods, which are very abundant in the Failand-Clevedon area. In the Weston–Bleadon area, the basal part of the Goblin Combe Oolite is marked by a single bed of pale grey, well-sorted, crinoidal limestone, 18 m thick on Steep Holm, and strongly contrasting with the well-bedded Birnbeck Limestone below.

**Burrington Oolite**

In the Mendips, apart from the small area between Bleadon and the coast, the Gully Oolite, Birnbeck Limestone and Goblin Combe Oolite of the Bristol-Broadfield Down-Weston area come together to form the Burrington Oolite. The individual components of the formation remain generally
recognisable, but cannot readily be mapped out in the absence of any distinctive interbedded marker units such as the mudstone facies in the Clifton Down Mudstone. As the formation is traced southwards and eastwards towards the eastern Mendips, the non-oolitic facies become increasingly dominant and the term Vallis Limestone is used to describe the largely bioclastic sequence.

**Clifton Down Limestone**

Over the greater part of the district the uppermost formation of the Clifton Down Group is the Clifton Down Limestone, known as the Drybrook Limestone west of the Severn. Its type section is in the Avon Gorge (P948962), which illustrates both the general sequence and the variable nature of the rocks. The lowest part consists of well-bedded calcite and dolomite mudstones, with common stromatolites similar to those in the underlying Clifton Down Mudstone which, like them, indicate deposition in a very shallow-water, peritidal or lagoonal environment. Then follow rather poorly sorted, bioclastic limestones characterised by the cerioid species of the coral *Lithostrotion*. The first appearance of these characterises the base of the Holkerian Stage. This facies represents more open-sea conditions, though the recurrence of peritidal conditions from time to time is shown by the presence of the algal ‘Seminula Pisolite’ and beds of calcite mudstone with *Composita*. The Seminula Oolite occurs in the upper part of the sequence and may represent a channel or bar deposit. Finally, peritidal conditions returned with the upper thick calcite mudstone-algal sequence known as the ‘Concretionary Beds’. A similar sequence occurs in the Wick Inlier east of Bristol (Murray and Wright, 1971[2]).

This general succession can be traced southwards from Bristol where oolites become increasingly dominant in the lower part; silicified *Lithostrotion* masses and chert nodules and layers become prominent in the middle part, and algal growths become more conspicuous in the upper part. Thick lenticular masses of cross-bedded oolite, similar to the Seminula Oolite of the Avon Gorge, occur locally, but are not confined to any one horizon. Thus, the Cheddar Oolite occurs near the base of the sequence in the area after which it is named and the Brockley Oolite on Broadfield Down directly underlies the uppermost group of calcite mudstone beds.

Over most of the Mendips, calcite and dolomite mudstones form no more than 20 to 30 per cent of the succession below the *Lithostrotion*-bearing beds. The base of the Clifton Down Limestone is somewhat arbitrarily taken at the base of the lowest mappable calcite mudstone occurrence. In the Wells area, the lower calcite mudstones are apparently not present and the associated, mainly oolitic rocks are indistinguishable from and grouped with the underlying Burrington Oolite. At Burrington Combe, isolated calcite-mudstone beds, such as the Rib Mudstone (George et al., 1976[1]), occur in the Burrington Oolite, but are too thin to map; here, the base of the Clifton Down Limestone is drawn at the base of the lowest thick unit of calcite mudstones above. At Holwell, in the eastern Mendips, the predominantly oolitic rocks in the lowest part of the Clifton Down Limestone are replaced by crinoidal bioclastic limestones, a change which indicates more open-sea conditions in that direction.

Northwards from Bristol the local facies variations in the Clifton Down Limestone are less well known. At Chipping Sodbury, about 11 m of stromatolite-bearing rocks are seen at the bottom of the sequence; they are overlain by c.103 m of thick *Lithostrotion*-bearing beds (Murray and Wright, 1971[2]) and then by c.16 m of calcite mudstone with stromatolites. The most striking difference in the succession here is the presence of wedges of arenaceous facies that thicken northwards at the expense of the intervening limestone (see below). West of the River Severn, a wholly arenaceous sequence north of Cinderford in the Forest of Dean is represented by the Drybrook Sandstone; farther south, it includes a high proportion of oolites.

The Clifton Down Limestone approximates to the Holkerian Stage, and is characterised by an
assemblage which includes the brachiopods *Davidsonina carbonaria*, *Composita ficoidea*, *Linoprotonia corrugato-hemispherica* and the corals *Axophyllum vaughani* and *Lithostrotion aranea*. Holkerian foraminifera, including *Holkeria avonensis* and *Pujarkovella nibelis*, have been recorded from the Clifton Down Limestone in the Bristol area.

**Hotwells Group (excluding the arenaceous facies)**

**Hotwells Limestone**

The calcareous facies of this group is known as the Hotwells Limestone and, although the type locality is in the Avon Gorge, it reaches its maximum development on Broadfield Down and the Mendips. Typically, the formation comprises massive, grey, oolitic and crinoidal limestones with an abundant fauna of corals and thick-shelled brachiopods. It marks an abrupt change in depositional environment from the predominantly low energy peritidal conditions of the upper part of the Clifton Down Limestone to an open-shelf marine environment characterised by turbulent, high-energy conditions. On faunal grounds, it appears that in contrast to northern England there is a nonsequence at the base of the Hotwells Limestone in this region. The thickest dominantly calcareous sequences are present at Winford (225 m) in the south-eastern part of Broadfield Down and along the northern margin of the Mendips between Ubley and Mells (180 to 225 m). In these areas, above a relatively uniform sequence in the lower third of the formation, the beds display evidence of the cyclical sedimentation that is so marked in the areas farther north. The cycles are characterised by thick massive limestones alternating with thin black, commonly carbonaceous shales. Beneath the shales there may be calcareous rubbly beds of pedogenic aspect. On the south side of the Mendips, the full thickness of the Hotwells Limestone, reduced to 125 m, is seen only at Ebbor, north-west of Wells. Details of the succession are unknown and it is possible there is attenuation due to pre-Namurian erosion. Northwards from the Mendips, the limestone facies increasingly pass into rhythmic, predominantly arenaceous sequences of sandy limestone, sandstone and shale, which include seatearth and very thin coals. At Bristol, the top half of the Hotwells Limestone has been similarly replaced, and along the northern rim of the coalfield the Hotwells Limestone is largely unrecognisable. The formation is not known anywhere west of the River Severn.

Chronostratigraphically, the Hotwells Limestone spans the Asbian and the Brigantian stages. The Asbian is characterised by a rich fauna which includes the corals *Lithostrotion pauciradiale*, *L. junceum* and *Palaeosmilia murchisoni*, and the productoids *Gigantoproductus* spp. and *Linoprotonia hemispherica*. The contact with the Brigantian is poorly defined, partly because of the presence of unfossiliferous arenaceous intercalations at about this level and partly because the characteristic Brigantian corals appear to be confined to discrete horizons (cf. Rownham Hill Coral Bed; George et al., 1976[^1^], p.17). The corals include *Lonsdaleia floriformis*, *Nemistium edmondsi*, *Orionastraea* spp. and *Palaeosmilia regia*. These occurrences have been recognised over a wide area extending from north of the Bristol Coalfield, eastwards to Wick and southwards to Wrington and Compton Martin.

**References**


Retrieved from