
Gripwood Quarry, Wiltshire

[ST 822 603]

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Introduction

Gripwood Quarry, on the south side of the Kennet and Avon Canal at Bradford-on-Avon, has been open for over a century although not worked for many years. Referred to by Cox (1941) as the 'Upper Westwood (or Woodside) Quarry', it originally exploited the oolite/freestone (Bradford Ground or Bethel Stone) of the Ancliff Oolite (Upper Rags Member, Forest Marble Formation) (see (Figure 2.2)). At the time of Cox's account, the underground galleries from which the beds had been worked were already being used for the cultivation of mushrooms, an industry that was apparently pursued in the disused quarry until recently. However, the site is most famous for the c. 3 m-thick Bradford Clay, which overlies the Upper Rags Member (Lonsdale, 1832; Cunnington, 1860). The Bradford Clay, of which Gripwood Quarry is considered to be the type locality (Cave, 1977), is renowned for its rich fossil content, particularly brachiopods and crinoids.

Description

The following section of Gripwood Quarry is based on that recorded by Woodward (1894) who described it as the best exposure of the Bradford Clay that he had seen. Bed numbers are those used by Woodward (1894), and his sketch of the section is shown in (Figure 2.51).

	Thickness (m)
Forest Marble Formation	
5: Clay and thin stone	
4: False-bedded ooidal limestone	1.8
<i>Bradford Clay</i>	
3: Clay, grey, marly; rare fossils	c. 2.4–2.7
2: Fossil bed: clay, marly, locally cemented; impersistent, 0.15–0.20 m shelly limestone at base; crinoids, terebratulid and rhynchonellid brachiopods, bivalves and serpulids	0.4–0.6
Upper Rags Member	
1: Oolite, shelly, and limestone, brown, hard, marly, ooidal	

Cox (1941) recorded the following brachiopod fauna from slipped masses of the Bradford Clay: *Avonothyris bradfordiensis* (Davidson), *Cryptorhynchia bradfordensis* S.S. Buckman, *Dictyothyris coarctata* (Parkinson), *Digonella digona* (J. Sowerby), *Kallirhynchia* sp., *Rhactorhynchia rostrata* (J. de C. Sowerby), *R. farcta* (Linneaus), *R. diducta* S.S. Buckman and *Rhynchonelloidella curviviarians* (S.S. Buckman). As well as brachiopods, Woodward's (1894) fossil list included the crinoid *Apiocrinus parkinsoni* (Schlotheim); bivalves including *Oxytoma costata* (Townsend), *Plagiostoma* sp.; oysters including *Lopha gregarea* Sowerby) and *Chlamys (Radulopecten) vagans* (J. de C. Sowerby); and serpulids. However, the descriptions and extensive faunal lists published by Cox (1941) and subsequent authors (Periam, 1956; Stinton and Torrens, 1968; Palmer and Fürsich, 1974; Insole and Wright, 1977) relate to the nearby quarry [ST 826 600], a little farther east on the opposite side of the canal.

According to Arkell (1933), the Bradford Clay at Gripwood Quarry passes laterally into flaggy, false-bedded limestone ('typical Forest Marble') but still with abundant shells, albeit largely broken, in the basal layers. Younger beds of the Forest Marble Formation form the high ground to the south of the quarry. A section in Grip Wood [ST 8202 6036], [ST 8209 6033], a little farther west of the quarry, exposing the Forest Marble and Great Oolite formations down to the Combe Down Oolite Member, was recorded by Green and Donovan (1969). There, as elsewhere in the area, the top of the Upper Rags Member is marked by the Bradford Coral Bed (Green and Donovan, 1969), the top of which is hardened

and bored.

The quarry is now concrete-floored and the faces heavily overgrown with fairly mature woodland. However, up to c. 5 m of massive, cross-bedded, cream-coloured, well-sorted, generally coarse- to medium-grained, shell-fragmental oolite (Upper Rags Member) are patchily exposed on the northern face, and entrances to the old underground galleries are visible on the southern face.

Interpretation

According to Arkell (1933), the Bradford Clay fossil assemblage, mainly comprising colonies of brachiopods, including, in addition to those listed above, *Avonothyris langtonensis* (Davidson), *Epithyris bathonica* S.S. Buckman, *Eudesia cardium* (Lamarck), *Kutchirhynchia morieri* (Davidson), *Rhactorhynchia obsoleta* Davidson, and numerous, small, undescribed rhynchonellids, as well as the echinoid '*Cidaris*' *bradfordensis* Wright, represents a fauna that lived in clear marine waters upon an eroded surface of the underlying Upper Rags Member. He envisaged that this fauna had been choked and killed by an influx of mud that laid the crinoids undisturbed full-length on the sea floor amongst the brachiopods. Cox (1941) noted that 'generations of collectors' had long exhausted the supply of good complete specimens of *Apiocrinus*. Where the fauna is well developed, it is easily recognized with the long-looped brachiopod *Digonella digona* (sometimes associated with the similar *D. digonoides* S.S. Buckman) abundant and well preserved, the short-looped species of *Avonothyris* and *Epithyris*, and the rhynchonellid *Rhactorhynchia obsoleta*. Less abundant are the highly distinctive brachiopods *Dictyothyris coarctata* and *Eudesia cardium*, pectinacean bivalves such as *Chlamys* (*Radulopecten*) and pteriods such as *Oxytoma*. The shells are commonly encrusted with serpulids and bryozoans (Penn and Wyatt, 1979).

Although the fauna of the Bradford Clay is found only intermittently above the Upper Rags Member (the latter, incidentally, included in the Great Oolite Formation by Green and Donovan (1969) and earlier authors), Arkell (1933) believed that it recurred repeatedly at the same horizon from close to the Mendips northeastwards into Oxfordshire, and was therefore of correlative value. However, as noted by Green and Donovan (1969), Cave (1977) and Penn and Wyatt (1979), the Bradford Clay fauna is not confined to the stratigraphical level of the type locality but recurs at different horizons within the Forest Marble Formation. Indeed, Arkell (1947b) reported it sporadically near the top of the Forest Marble Formation from Gloucestershire into Oxfordshire. In fact, the Bradford Clay of the type locality is merely one of a number of laterally impersistent clay beds within the lower part of the Forest Marble Formation, any one of which is likely to yield the fauna like that of the Bradford Clay (Cave, 1977). The latter can be mapped for about 1.6 km west of Bradford-on-Avon and then it abruptly wedges out. The 'Bradford Clay fauna' has been noted in limestones and clays in the lower part of the Forest Marble Formation (including the Upper Rags Member) throughout the Bath area (Green and Donovan, 1969; Penn and Wyatt, 1979) and farther afield in the Cotswolds (e.g. Elliott, 1973) but it is not invariably present, even where the beds above the Upper Rags Member are clay. Farther south, in Dorset, the Boueti Bed at the base of the Forest Marble Formation (see Shipmoor Point–Butterstreet Cove and Tidmoor Point–East Fleet Coast GCR site report, this volume) has faunal elements in common (Arkell, 1933; Callomon and Cope, 1995). According to Penn and Wyatt's (1979) study of the Bath-Frome area, of all of the Bradford Clay fossils already mentioned, only the species of *Digonella*, *Dictyothyris coarctata* and *Eudesia cardium* do not occur below the base of the Forest Marble Formation. Of these three diagnostic genera, the digonellids are by far the most abundant, whilst *Dictyothyris* and *Eudesia* are persistent but rare elements. One or two other characteristic species commonly occur in great abundance but unless they can be shown to be associated with the diagnostic brachiopods, Penn and Wyatt (1979) considered it unwise to assume that a Bradford Clay fauna is indicated.

The hardground at the base of the Bradford Clay at Bradford-on-Avon has been investigated by Palmer and Fürsich (1974). They envisaged that the limestone beneath the Bradford Clay had been deposited in current-swept, fully marine conditions. They deduced that selective syndepositionary calcium carbonate cementation of the lime-sand produced a rocky sea-floor. As lithification continued, the uncemented sediment beneath the lithified layers was partly removed to form crevices, and the exposed hard surfaces were colonized by boring and encrusting animals. Periods of shell accumulation on the hardground alternated with periods of bioerosion; the soft floors of crevices started to lithify and the crevices themselves started to fill with shell material. Eventually, clay deposition buried the hardground and its associated fauna. Palmer and Fürsich (1974) described the upper surface fauna as an *Apiocrinus*/oyster-dominated community and

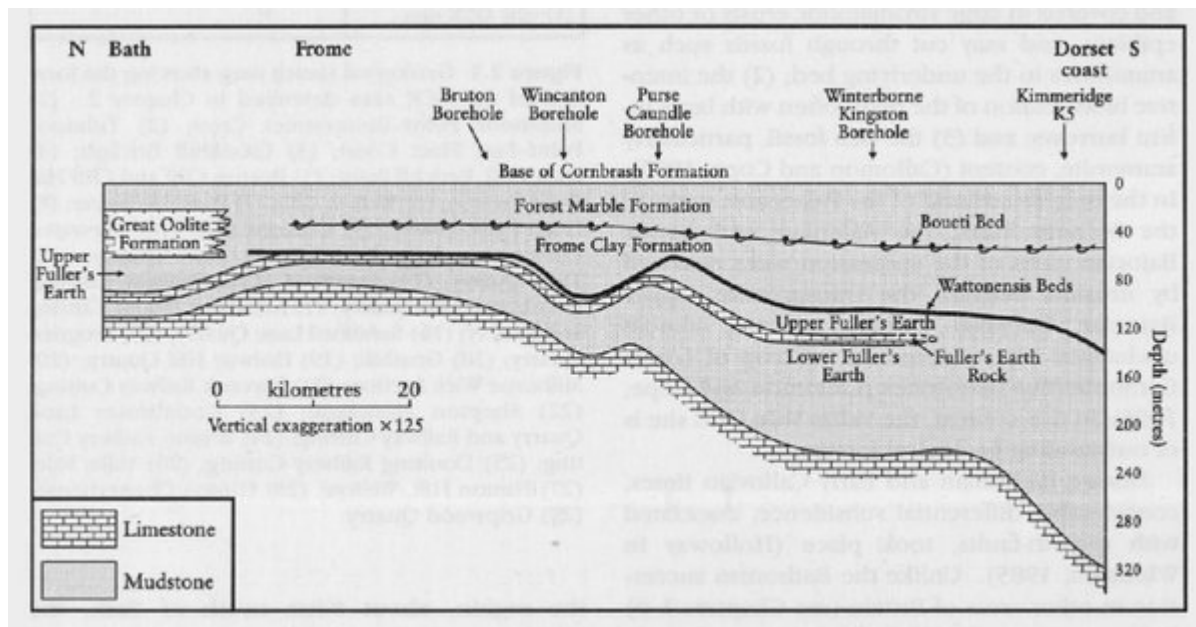
the crevice community as dominated by serpulids and encrusting bryozoans, accompanied by the brachiopod *Moorellina*, the bivalve *Plicatula* and encrusting calcisponges. They attributed the development of these two separate communities to a combination of crevice/cavity size, light intensity, degree of water turbulence, and competition for food and space.

The Bradford Clay of Bradford-on-Avon has yielded rare ammonites of the genus *Clydoniceras* and is thereby attributed to the Hollandi Subzone of the Upper Bathonian Discus Zone (Arkell, 1951a; Stinton and Torrens, 1968; Torrens, 1980b).

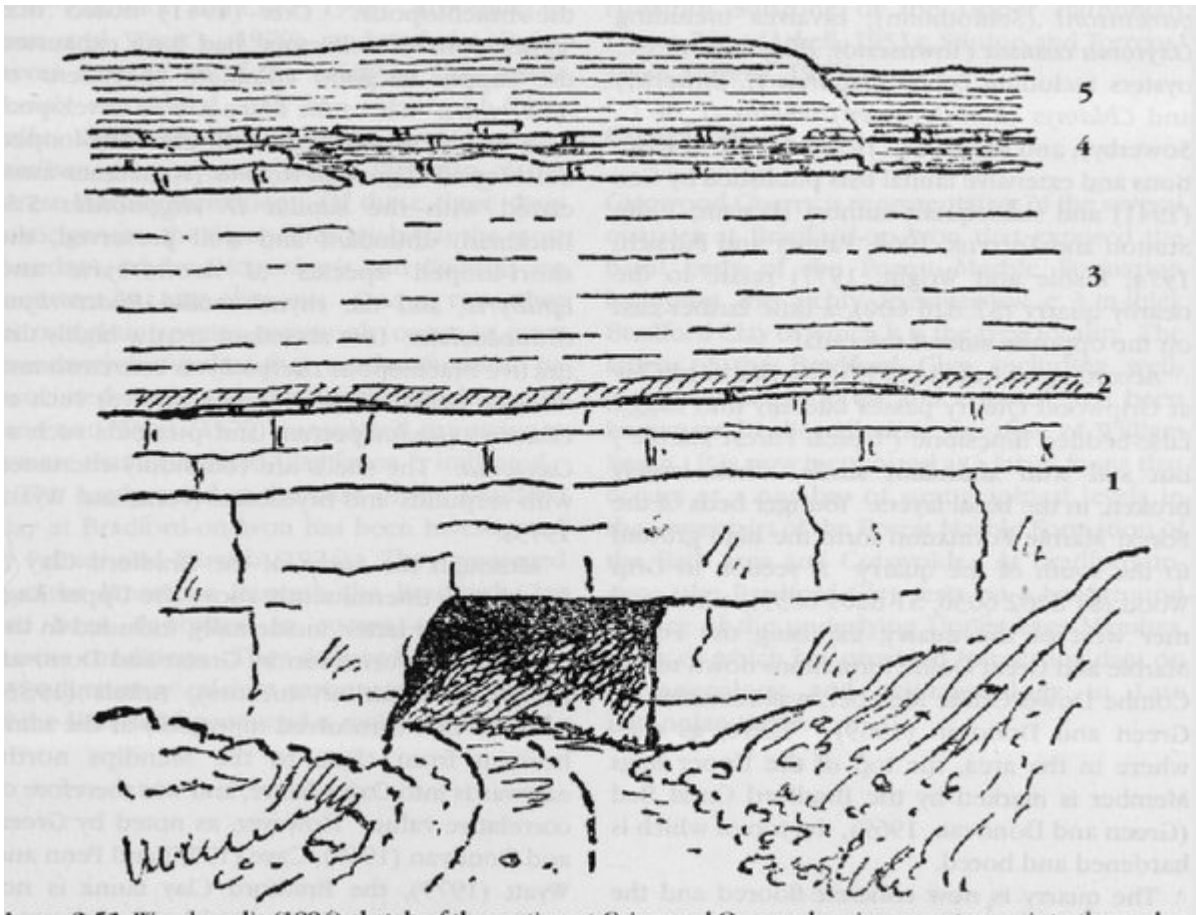
Conclusions

Gripwood Quarry is representative of the several quarries at Bradford-on-Avon that exposed the basal beds of the Forest Marble Formation including the richly fossiliferous c. 3 m-thick Bradford Clay of which it is the type locality. The fauna of the Bradford Clay, including well-preserved brachiopods and crinoids, has been known and collected since the time of William Smith. It is now recognized as a facies fauna that occurs at a number of stratigraphical levels in the lower part of the Forest Marble Formation of the Bath area and Cotswolds. At Bradford-on-Avon, the Bradford Clay rests on a hardground surface of the underlying Upper Rags Member, study of which has provided interesting data on palaeoecology and sedimentology in Late Bathonian times.

References



(Figure 2.2) Simplified diagrammatic cross-section through the Bathonian strata of Wessex. (After Bristow et al., 1995, fig. 23.)



(Figure 2.51) Woodward's (1894) sketch of the section at Gripwood Quarry showing an entrance into the underground galleries where the Ancliff Oolite of the Upper Rags Member (Forest Marble Formation) was worked.)