Ham Hill, Somerset

[ST 481 165]

Introduction

The Ham Hill GCR site encompasses exposures in a large active quarry at the south-western corner of the Ham, or Hamdon, Hill plateau, and in a series of disused quarries extending for about 1 km northwards along the western edge of the hill (centred on [ST 481 165]). A natural exposure located in Hedgecock Hill Wood a little farther east [ST 485 168] is also designated as a subsidiary GCR site (Figure 2.27). The quarries afford excellent exposures through almost the full thickness of the Ham Hill Limestone Member at its maximum development. This geographically restricted facies represents a uniquely thick development of bioclastic limestones within the predominantly siliciclastic Bridport Sand Formation.

The unusual facies represented by the Ham Hill Limestone Member has long attracted researchers and aspects of it have been described by Moore (1867b), Buckman (1889), Woodward (1893), Richardson *et al.* (1911), Arkell (1933), Kellaway and Wilson (1941a,b), Wilson *et al.* (1958), Davies (1969), Hemingway *et al.* (1969), Knox *et al.* (1982), Jenkyns and Senior (1991) and Hart *et al.* (1992). None of these accounts has provided a detailed description of the succession. A popular guide book to the Ham Hill quarries has been produced by Prudden (1995). Ham Hill stone has been quarried since at least Roman times and was used widely in Dorset and Somerset as a prestige building stone from Norman times onward. The working quarry at the south end of the hill still produces stone for new buildings and for restoration.

Description

The quarries at Ham Hill, all within the Ham Hill Limestone Member, expose up to 27 m of bioclastic limestone within the upper part of the Bridport Sand Formation (Figure 2.28). This facies is peculiar to the Hamdon Hill outlier and others up to 10 km to the south, at Chiselborough Hill and Chinnock Hill (Figure 2.27), where it is significantly thinner.

Patchily cemented, yellow-brown, micaceous, silty sands of the Bridport Sand Formation (= 'Yeovil Sands' of earlier authors) crop out on the lower slopes of Hamdon Hill. These are not exposed within the quarry complex but the topmost few decimetres are visible beneath the base of the Ham Hill Limestone Member exposed in Hedgecock Hill Wood. Extensive, but discontinuous, exposures of sands with lines of sandstone doggers are exposed in the sunken lane that ascends the hill from Montacute [ST 494 164]. Winwood (in Richardson *et al.,* 1911) noted that the full thickness of the sandy part of the Bridport Sand Formation was formerly exposed in this lane. He estimated the thickness of the formation (excluding the Ham Hill Limestone Member) to be about 25 m (80 ft), while Buckman (1889) estimated it at 31 m (100 ft) and Kellaway and Wilson (1941a) at 38 m (125 ft).

The lowest unit of the Ham Hill Limestone Member, exposed in Hedgecock Hill Wood [ST 485 168] and occasionally in the floor of the working quarry, is a 0.5 m-thick conglomerate containing rather poorly rounded clasts, up to 0.2 m across, of hard, micaceous, silty sandstone derived from the underlying Bridport Sand Formation (Hart *et al.,* 1992). Most of these are ovoid but some are cylindrical and may represent reworked *Thalassinoides* burrows (Hugh Prudden, pers. comm.). The clasts are penetrated by numerous bivalve crypts and other borings, and some are encrusted with serpulid tubes. The matrix is richly fossiliferous with abundant, though often fragmentary, remains of bivalves, particularly oysters, belemnites, ammonites, crinolds, echinoids and asteroids. Prudden (in Torrens, 1969) recorded *Dumortieria moorei, D. pseudoradiosa* and *Plagiostoma* cf. *schimperi* from this bed, and Simms (1989) figured fragmentary *Isocrinus rollieri* from here.

The conglomerate is succeeded by the Main Building Stone, which here is about 12 m thick (Figure 2.28) and (Figure 2.29). Richardson *et al.* (1911) divided this part of the sequence into a lower series of 'Grey Beds' and an upper series of 'Yellow Beds', a division that is still evident in the quarries. The Main Building Stone succession is composed of coarsely bioclastic sparry limestones with conspicuous trough cross-bedding. Shell debris is abundant, commonly forming the dominant component, but intact bivalves, brachiopods and other fossils generally are scarce (Wilson *et al.,* 1958). Buckman (1887–1907), Winwood (in Richardson *et al.,* 1911), Kellaway and Wilson (1941b) and Torrens (1969) all reported *Dumortieria* from this part of the succession indicating the late Toarcian Pseudoradiosa Zone. Quartz sand grains are absent from the lower part of the Main Building Stone, appearing only in the top 3 m or so (Davies, 1969, fig. 11). The Main Building Stone is overlain, with an abrupt transition, by a 4.5 m-thick sequence of very fine-grained, cross-laminated sands indistinguishable from parts of the typical sandy facies of the Bridport Sand Formation. These are interbedded with thin beds of cross-bedded limestone and bioturbated sandstone. The sands are commonly bioturbated, sometimes with distinct burrows, though evidence of bioturbation is largely absent from the cross-bedded limestone units. This passes up into 3.9 m of thinly interbedded bioclastic limestone and cross-laminated fine-grained sands. A brachiopod bed, with *Homoeorhynchia cynocephala meridionalis,* forms a marker bed about 1.8 m below the top and was the source of material figured by Ager (1956–1967). It has also yielded a specimen of *Dumortieria* sp. (Torrens, 1969). Richardson (in Richardson *et al.,* 1911) also mentioned that this brachiopod (then *Rhynchonella cynica*) was abundant in several sandy layers between the beds of limestone.

These beds are overlain by a 0.25 m-thick conglomerate that is lithologically very similar to that at the base of the Ham Hill Limestone Member. Above this is about 6 m of coarsely bioclastic limestone that is more thinly bedded than those of the Main Building Stone in the lower part of the succession but, like them, they show trough cross-bedding and lack quartz sand grains in the lower part. The highest beds seen on Ham Hill are weathered limestones referable to this unit. At Chiselborough Hill, less than 2 km to the south, the Ham Hill Limestone Member is overlain by marly beds with *Leioceras* sp., indicating the Opalinum Zone of the basal Aalenian Stage of the Middle Jurassic Series (Kellaway and Wilson, 1941a; Wilson *et al.,* 1958).

Interpretation

The unique facies of the Ham Hill Limestone Member, at least in the context of the British Toarcian Stage, led to considerable discussion in the 19th and early 20th centuries concerning its age and correlation with other bioclastic limestones around the Lower–Middle Jurassic boundary. Moore (1867b) included the Ham Hill Limestone Member and the underlying Bridport Sand Formation in the 'Oolitic Series' (Middle Jurassic), but noted that the ammonites indicated that these strata were the correlative of part of the Upper Lias. James Buckman (1874) held the same view and erroneously correlated the lower, greyer, beds of the Ham Hill Limestone Member with the Pea Grit of the Cotswolds and the upper, yellow and ochreous, beds at Ham Hill with the Freestones of the Cotswolds. He correctly correlated the Ham Hill Limestone Member with the sands at Babylon Hill. Woodward (1887) concluded that the Ham Hill Limestone Member should be correlated with the 'upper part of the Midford or Inferior Oolite Sands', the Bridport Sand Formation of modern terminology. S.S. Buckman (Buckman, 1887–1907) initially considered that the Ham Hill Limestone Member lay within the lower part of his Opalinum Zone, now considered to be equivalent to the upper part of the Pseudoradiosa Zone. Subsequently Buckman (1889) correlated the Ham Hill Limestone Member with the Bridport Sand Formation at Babylon Hill but, in the same paper, he also correlated the member with the lower beds of the Inferior Oolite Group in Gloucestershire. Richardson and Winwood, within the same paper (Richardson *et al.,* 1911), disagreed as to whether the Ham Hill Limestone Member should be assigned to the Upper Lias (Richardson's view) or the basal Inferior Oolite (Winwood's opinion), largely based on the identity and stratigraphical significance of the common rhynchonellid (*Homoeorhynchia cynocephala meridionalis,* then *Rhynchonella cynica*) found in the Ham Hill Limestone Member. Arkell (1933) recognized a late Toarcian Moorei Subzone age (= Pseudoradiosa Zone of the scheme used here) for the Ham Hill Limestone Member, following Winwood's (in Richardson *et al.,* 1911) record of *Dumortieria moorei,* and so correlated the member with the Dew Bed' of the Yeovil–Sherborne area, a hard, sandy, bioclastic limestone less than 1 m thick that caps the local Toarcian succession (Wilson *et al.,* 1958). Howarth (in Prudden, 1966) considered that the coarse-ribbed, stout-whorled species of *Dumortieria* in the basal conglomerate also indicated the Pseudoradiosa Subzone while higher parts of the Ham Hill Limestone Member also appear to lie within the Pseudoradiosa Zone. Evidence from the Babylon Hill GCR site indicates that the upper part of the Bridport Sand Formation, below the Dew Bed, is of Aalensis Zone age (Torrens, 1969) while more recent work places the Dew Bed within the Scissum Zone at the base of the Aalenian Stage (Chandler and Sole, 1996). Hence the Ham Hill Limestone Member and the Dew Bed cannot be considered correlatives.

There have been several interpretations of the environment of deposition of the Ham Hill Limestone Member. James Buckman (1874) noted the similarity in facies between the Ham Hill Limestone Member and richly bioclastic units within the Bridport Sand Formation at Babylon Hill, implying that depositional environments represented by these thin shelly bands at Babylon Hill might have been similar to those that produced the bioclastic limestones at Ham Hill. Davies (1969) interpreted the conglomerates as channel lags and the sand-dominated sequence between the two main limestone units as a tidal flat sequence. He found fairly consistent north to north-easterly current orientations for the trough cross-beds throughout the Ham Hill Limestone Member that, combined with the minor 'channel lag conglomerate' towards the top of the sequence, and the dramatic east–west thickness changes, he interpreted as evidence for deposition in a flood-tide channel. The current directions contrast with the predominantly south-west current orientations observed in the Bridport Sand Formation in areas to north and south, and more obviously tidal bimodal orientations in the sands to east and west. Davies (1969) considered that the Bridport Sand Formation was deposited as a sand-bar, breached by tidal channels that migrated more than 100 km southwards from the Cheltenham area to the Dorset coast during the course of the Toarcian Stage. In Davies' (1969) interpretation the exposures at the Ham Hill GCR site, and the adjacent outliers of the Ham Hill Limestone Member, represent the only remaining example of the tidal-channel facies within the Bridport Sand Formation.

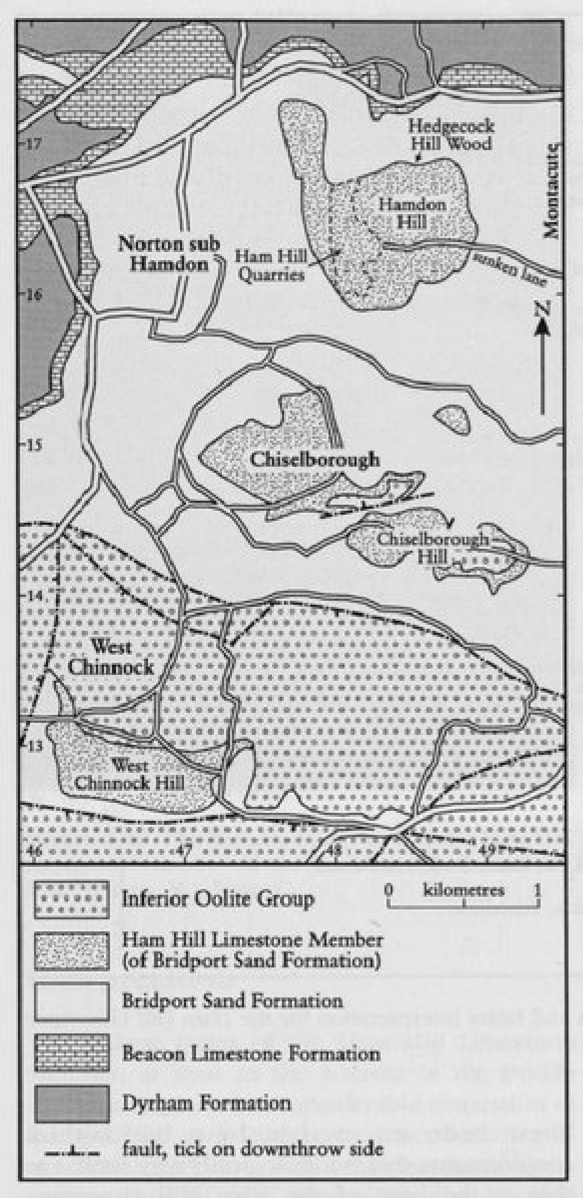
Knox *et al.* (1982) suggested that the Ham Hill Limestone Member might have formed as a shell-rich sand wave sweeping across the area after a brief period of non-deposition and erosion represented by the basal conglomerate. Jenkyns and Senior (1991) commented on the prevailing east–west orientation of the clastic sedimentary environments postulated by Davies (1969) and suggested that this was consistent with fault control of the submarine topography. In particular they noted the marked thinning of the Ham Hill Limestone Member southwards across the east–west Coker Fault and suggested that the limestones may have been deposited on fault-controlled topographic highs on which there was little siliciclastic deposition. The absence of the Ham Hill Limestone Member facies to the west of the River Parrett, where the Inferior Oolite Group rests directly on typical Bridport Sand Formation facies (Wilson *et al.,* 1958), also suggests that fault control influenced deposition and/or preservation from pre-Aalenian erosion of the Ham Hill Limestone Member. Further support for a tectonic control on deposition in this area during the Toarcian Age may also be indicated by marked thinning of the Barrington Limestone Member, to 1.2 m at Montacute, and of the Inferior Oolite Group, to 2.4 in at Stoford, 2 km south-east of Yeovil (Hugh Prudden, pers. comm.), both adjacent to the Coker Fault.

The limited evidence appears to favour deposition on a local fault-controlled high causing clastic sediment starvation and the accumulation of a thick bioclastic sequence. The succession at Ham Hill shows two cycles, each with a siliciclastic-dominated sequence abruptly succeeded by siliciclastic-free, cross-bedded, bioclastic limestones with a marked erosion surface at the base (Figure 2.28). It is suggested here that these erosion surfaces reflect discrete episodes of localized uplift, following which siliciclastic material initially was excluded from the local highs that were created thereby allowing bioclastic limestones to accumulate from the comminuted debris derived from adjacent live shell beds. With time the differential relief of these highs was reduced by regional subsidence and there was a progressive increase in the influx of siliciclastic material from the surrounding areas to form the sand-dominated part of the succession lying between the two main bioclastic units. A second episode of uplift, erosion and carbonate deposition is represented by the upper conglomerate and the succeeding cross-bedded bioclastic limestones.

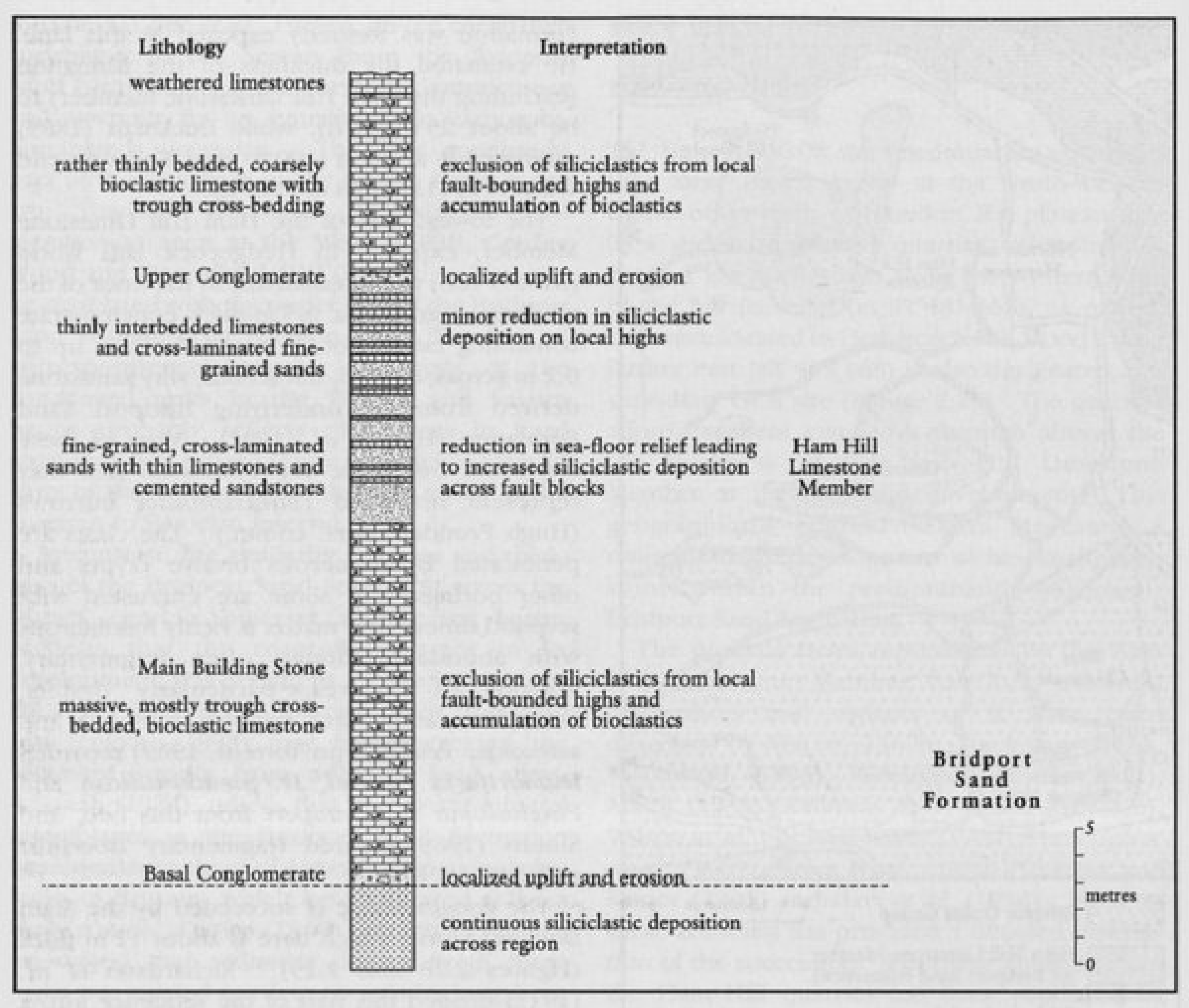
Conclusions

The importance of the quarries on Ham Hill lies in their excellent exposures of the Ham Hill Limestone Member, a thick local development of bioclastic limestone unique within the Lias Group of Britain. The member is restricted to a few outliers west and south-west of Yeovil. The Ham Hill GCR site represents the thickest development of the member and affords the best exposures. The evidence suggests the influence of syn-sedimentary fault movement during deposition. The site has been quarried for its building stone, and since roman times is one of the most famous and widely used in southern England; a working quarry still exists.

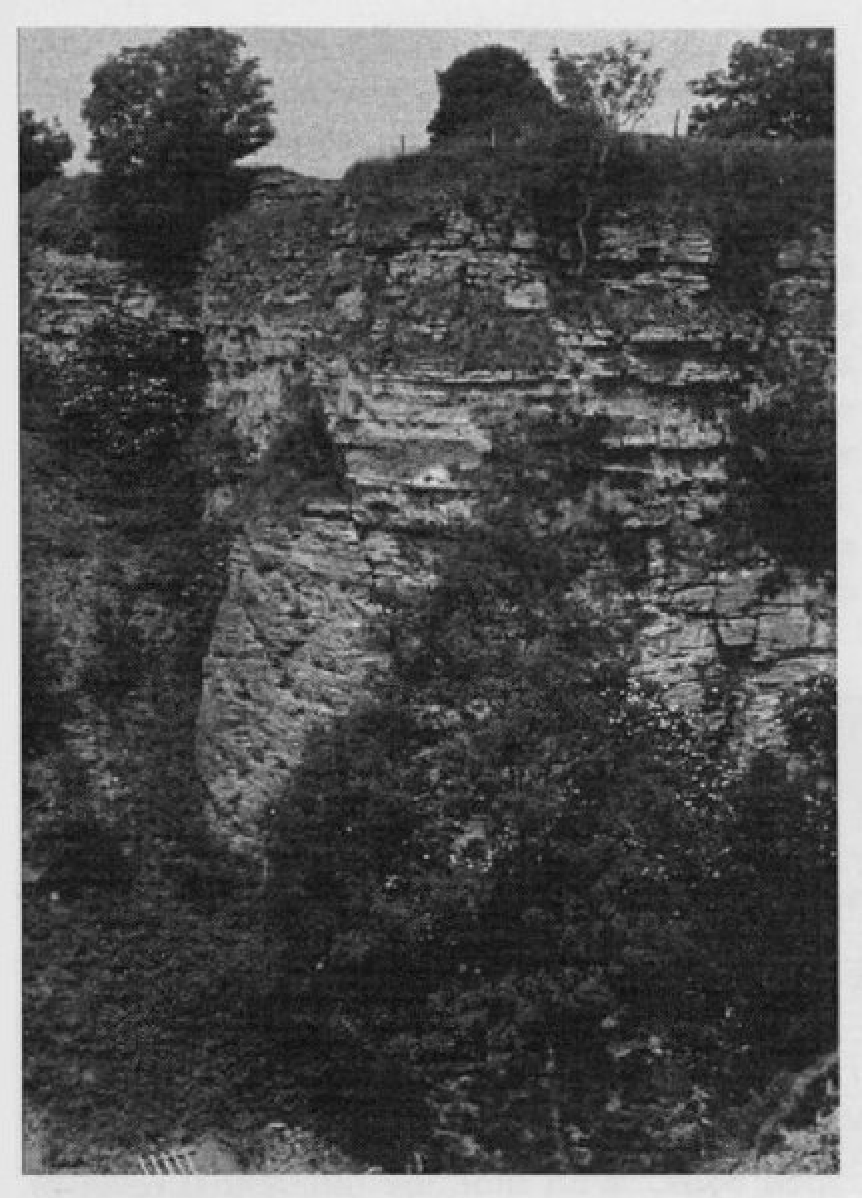
References



(Figure 2.27) Geological map of the known outcrop area of the Ham Hill Limestone Member of the Bridport Sand Formation. After Wilson et al. (1958).



(Figure 2.28) Generalized lithostratigraphical succession and facies interpretation for the Ham Hill Limestone Member of the Bridport Sand Formation.



(Figure 2.29) The Main Building Stone of the Ham Hill Limestone Member in the working quarry on Ham Hill. (Photo: M.J. Simms.)