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## Cliff Hill Road Section, Dorset

[SY 486 892]

### Introduction

The cliffs at Burton Bradstock have always afforded magnificent exposures of the Bridport Sand Formation (Figure 2.13) but the upper beds are largely inaccessible there. In the early 1880s a lane cutting was excavated just to the north of Burton Cliff (Figure 2.14) giving easy access to this part of the succession for the first time (Woodward, 1885). This section, the Cliff Hill Road Section GCR site provides an excellent, accessible section through the boundary between the Lower and Middle Jurassic series, with the mainly Toarcian Bridport Sand Formation passing up into the Aalenian and Bajocian Inferior Oolite Group. It provides possibly the best exposure of the late Toarcian Aalensis Zone in Britain.

The richly fossiliferous Inferior Oolite Group in this section has always attracted attention, but the underlying Bridport Sand Formation has never been adequately recorded. An unannotated photograph of the section was published by Richardson and Butt (1912, pl. vi), and Richardson (1915) provided a brief account and annotated log of the section. Buckman (1910) published a composite log and annotated sketch section constructed from this site, the cliffs, two quarries and 'even from the walls'. Richardson (1928) mentioned the site again briefly and included an annotated version of the photograph first published by Richardson and Butt (1912), and Arkell (1933) published a simplified version of Richardson's (1915) section. Subsequent brief descriptions include those by Wilson *et al.* (1958), Hemingway *et al.* (1969), and House (1989). Hesselbo and Jenkyns (1995) incorporated data from here into their composite log and description of the Bridport Sand Formation and the section was also described by Callomon and Cope (1995).

### Description

More than 3 m of the Bridport Sand Formation is visible beneath about 2 m of the Inferior Oolite Group at the top of the section (Figure 2.15) and (Figure 2.16). The lowest part of the succession exposed here (beds 32–36 of Hesselbo and Jenkyns, 1995, fig. 15) comprises yellow, slightly micaceous sands with several layers of burrowed, concretionary, calcite-cemented sandstone. Richardson (1915, fig. 4) described these sandstone concretions as 'crowded with ammonites' that Buckman (1910) and Callomon and Cope (1995) identified as *Pleydellia aalensis*, indicative of the Aalensis Zone. This is overlain by a fairly continuous bed of cemented sandstone 0.2 m thick (Bed 37) with *P. aalensis*, which is overlain by 0.6 m of poorly cemented sand (Bed 38) from which no ammonites have been obtained. This latter unit is intensely burrowed, with the burrows infilled by more cemented sand from the overlying basal bed of the Inferior Oolite Group (Bed 4 of Callomon and Cope, 1995) (Richardson, 1915), with which it has an undulating contact (Callomon and Cope, 1995). Richardson (1915) noted that the overlying fine sandstone was in two distinct layers, although it was assigned a single bed number (Bed 39) by Hesselbo and Jenkyns (1995). Callomon and Cope (1995) divided it into a more weakly calcareous lower unit (Bed 4a) about 0.2 m thick, and a more strongly calcareous and burrowed upper unit (Bed 4b) 0.25 m thick with local accumulations of *Leioceras opalinum* near the top and rare *Tmetoceras scissum* and *Pachylytoceras torulosum*, together indicative of the Opalinum Zone at the base of the Aalenian Stage. Above this bipartite sandstone lies the most conspicuous unit, the Rusty (or Foxy) Bed (Bed 5 of Callomon and Cope, 1995; Bed 40 of Hesselbo and Jenkyns, 1995), a 0.05 m-thick brown, somewhat laminated, sandy marl that forms a useful marker horizon where it has weathered back to form a narrow slot (see Richardson, 1928, pl. vi). Immediately overlying the Rusty Bed is the Scissum Bed, a hard sandy limestone in two courses; the lower 0.3 m thick and poorly fossiliferous, and the upper 0.2 m thick and richly fossiliferous with an ammonite fauna indicating the (Aalenian) Scissum Zone. The Yellow Conglomerate above encompasses much of the remainder of the Aalenian Stage, with higher beds in the section lying within the Bajocian Stage of the Inferior Oolite Group.

### Interpretation

The accessibility of the highest part of the Bridport Sand Formation at this site has enabled the stratigraphy and facies of this critical part of the succession to be interpreted. The presence of the highest recorded *Pleydellia aalensis* at least 0.6 m below the lowest recorded *Leioceras opalinum* indicates the approximate position of the Toarcian–Aalenian boundary. Callomon and Cope (1995) and Hesselbo and Jenkyns (1995) included the highest unfossiliferous bed of the Bridport Sand Formation within the Aalenian Zone; this appears to represent a continuation of the facies beneath but is sharply demarcated from the bed above, with *Leioceras opalinum*, by an undulating, possibly erosional, contact. Arkell (1933) reported fragmentary and badly preserved '*Pleydellia aalensis* type' ammonites for about 25 feet (7.7 m) below the Scissum Bed, but this seems an over-estimate of the thickness of this zone. Hesselbo and Jenkyns (1995) assigned just over 2 m of strata (beds 35 to 38), Callomon and Cope (1995) about 1.5 m, to the Aalenian Zone with the lowest part of the succession visible here lying within the upper part of the Pseudoradiosa Subzone.

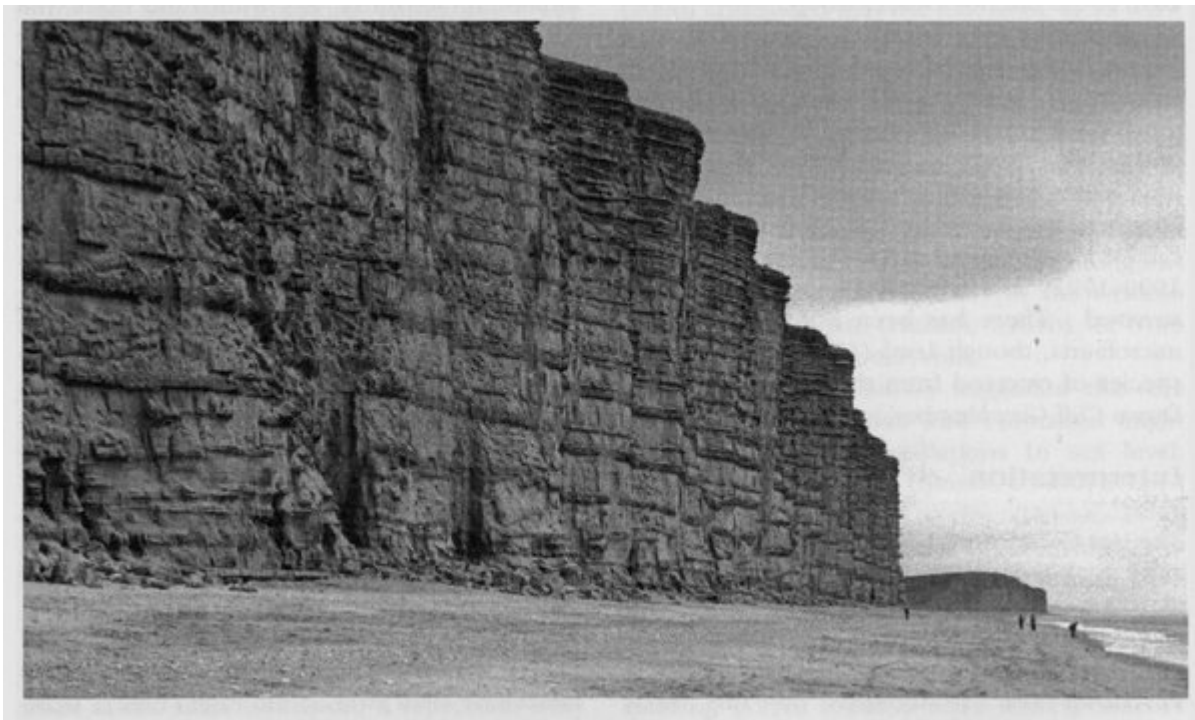
The boundary between the Bridport Sand Formation and the overlying Inferior Oolite Group was placed by Richardson (1915) at the top of the Scissum Bed (Bed 6), a view maintained by Arkell (1933). Parsons (in Cope *et al.*, 1980b) placed it at the base of the 'Scissum Beds' (?Bed 6), Hesselbo and Jenkyns (1995) placed it at the base of the Rusty Bed (Bed 5) while Callomon and Cope (1995) placed it at the base of Bed 4. The most recent revision of Lower Jurassic lithostratigraphy (Cox, *et al.*, 1999) followed Parsons (in Cope *et al.*, 1980b) and placed the top of the Bridport Sand Formation at the base of the Scissum Bed (Bed 6).

The highest part of the Bridport Sand Formation represents a transition between two contrasting depositional regimes. The bulk of the formation, which can be assigned to the Pseudoradiosa Subzone alone, indicates rapid sedimentation. In contrast the Inferior Oolite Group consists of a condensed sequence of limestones separated by hiatuses and siliciclastic units. Indeed the entire Aalenian and Bajocian interval within this group is contained in less than 6 m of rock. The Aalenian Zone at the top of the Toarcian succession, and accessible at this site, is represented by only 2 m of intensely burrowed sand that is significantly more fossiliferous than the lower part of the formation. The greatly reduced thickness by comparison with the Pseudoradiosa Subzone below indicates that deposition rates slowed abruptly in this transition between the Bridport Sand Formation and the succeeding Inferior Oolite Group, perhaps reflecting sediment starvation as the sand supply was cut off.

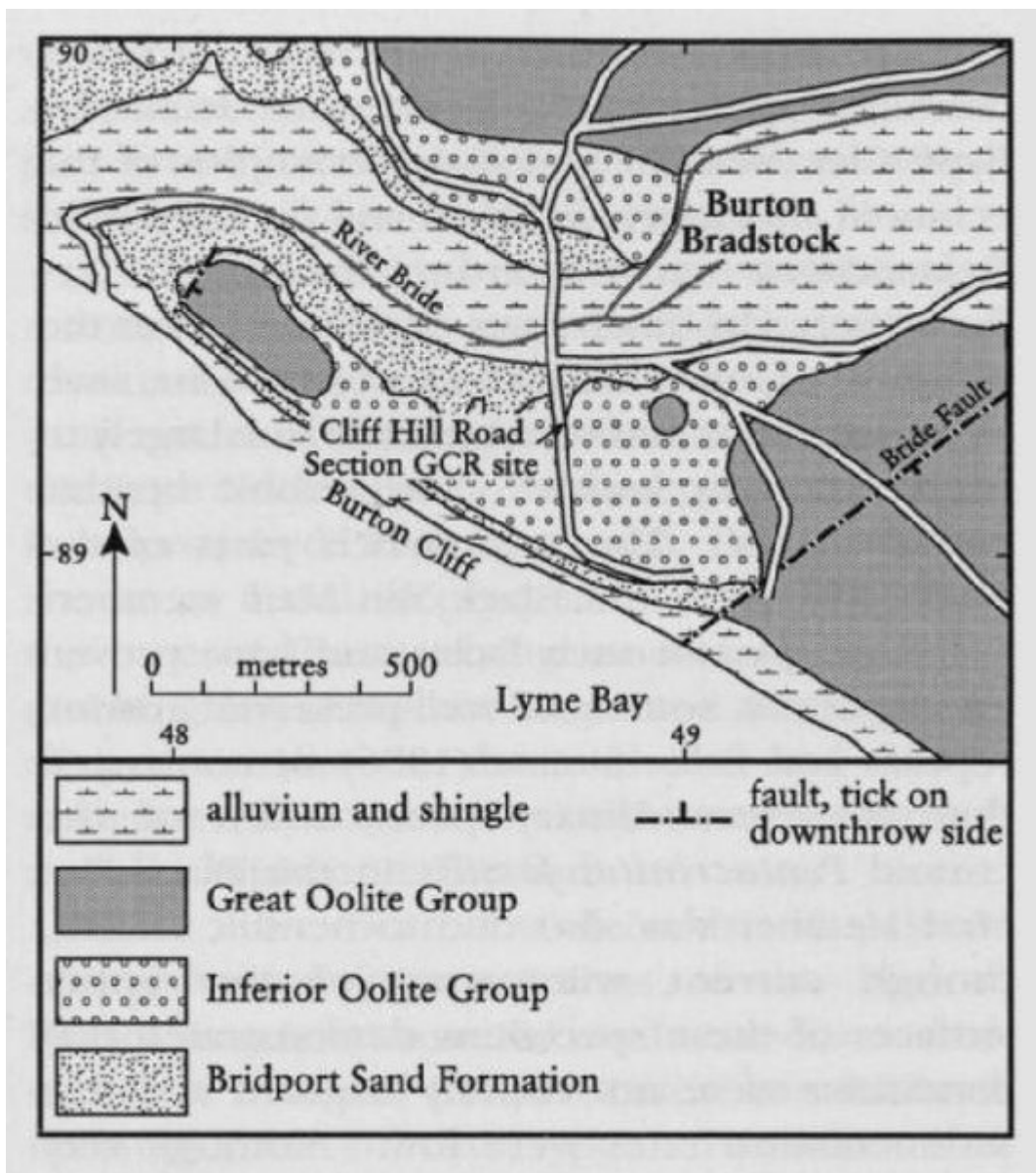
## Conclusions

The Cliff Hill Road Section GCR site exposes an easily accessible section that spans both the Toarcian–Aalenian stage boundary and the lithostratigraphical boundary between the Bridport Sand Formation and the Inferior Oolite Group. The precise positions of both boundaries has been the subject of debate, which is still not fully resolved. The succession displays a transition from the relatively rapidly deposited sands of the Bridport Sand Formation to the highly condensed limestones of the Inferior Oolite Group. The relatively condensed uppermost beds of the Bridport Sand Formation are one of the richest sources of Aalenian Zone ammonites in Britain. Despite its stratigraphical importance, the site remains little investigated.

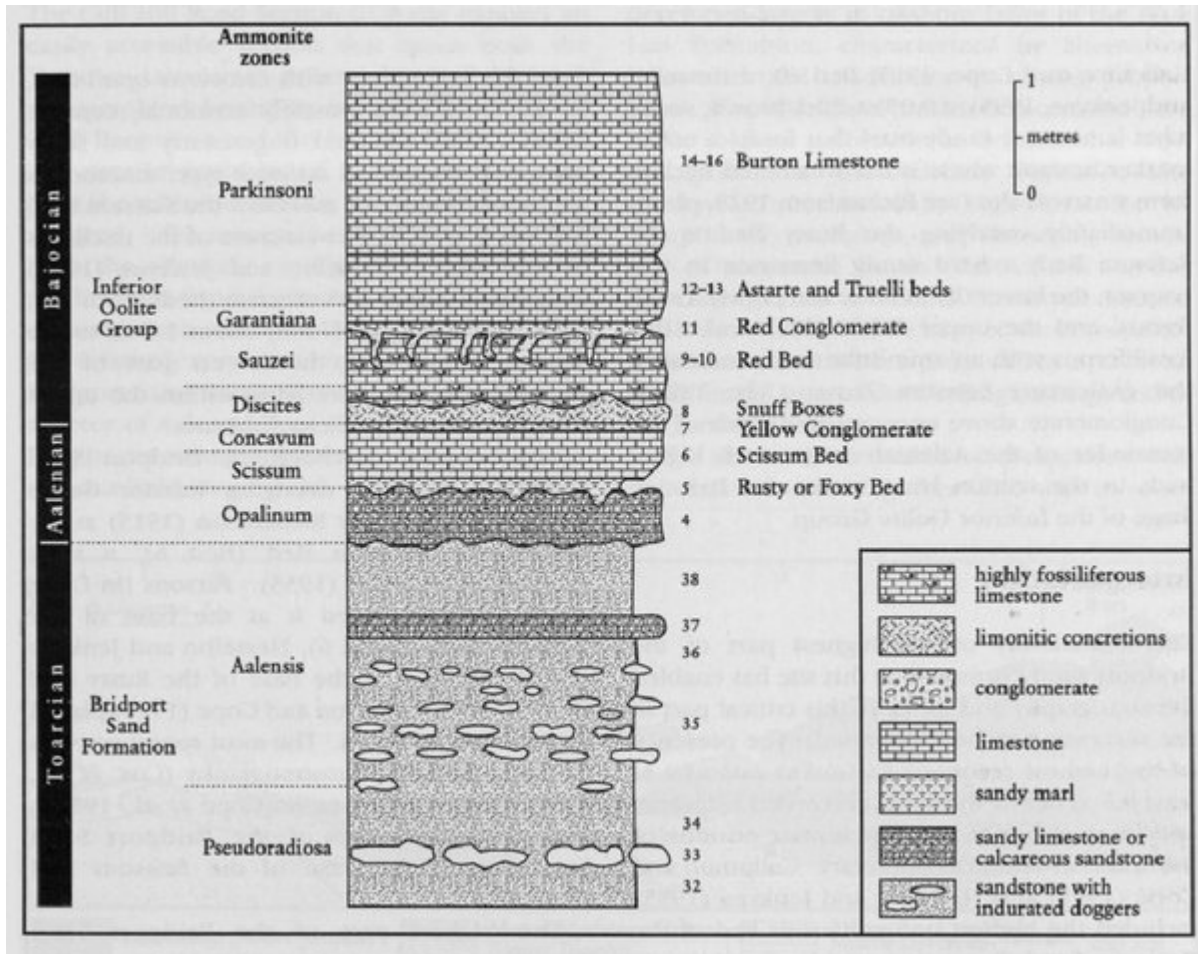
## [References](#)



(Figure 2.13) The Bridport Sand Formation at East Chit west of Burton Bradstock. (Photo: M.J. Simms.)



(Figure 2.14) Geological map of the Burton Bradstock area showing the location of the Cliff Hill Road Section. After House (1989).



(Figure 2.15) The section through the Lower–Middle Jurassic boundary exposed at the northern end of Cliff Hill Road Section, Burton Bradstock. After Hesselbo and Jenkyns (1995); with bed numbers for the Inferior Oolite Group from Callomon and Cope (1995).



(Figure 2.16) The eastern side of Cliff Hill Road, looking north. The continuous hard band just below the vegetation is Bed 37. (Photo: M.J. Simms.)