Bradford Abbas Railway Cutting, Dorset

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B.M. Cox

Introduction

Bradford Abbas, Dorset was the childhood home of S.S. Buckman; his father James, one time Professor of Geology at the Royal Agricultural College in Cirencester, is buried in the grounds of the parish church there (Chandler and Sole, 1996). Soon after moving to Bradford Abbas, Buckman senior became aware of the 'richness of the oolitic strata of the district in fossil remains' and both father and son investigated the quarries and railway cuttings in the neighbourhood (J. Buckman, 1877). The GCR site comprises the railway cutting on the eastern side of Bradford Abbas, on the line between Salisbury and Yeovil. Access is restricted because of highspeed trains. The cutting extends for *c.* 340 m eastwards from the Back Lane overbridge, and both the north and south sides, exposing beds of the Inferior Oolite Formation, are included (Figure 2.26). The most famous stratum hereabouts is the Bradford Abbas Fossil Bed, up to *c.* 1 m thick, which yields a rich fauna, including ammonites, gastropods, bivalves and brachiopods, of the Aalenian Concavum and Lower Bajocian Discites zones.

Description

The only published description of the section is that of Woodward (1894), as later mentioned by Richardson (1932). Composite faunal lists were given by Wilson *et al.* (1958), and Parsons (1974a) described the ammonite fauna of the Bradford Abbas Fossil Bed. Most other authors, including the Buckmans, concentrated on the section exposed at East Hill Quarry (Buckman, 1893a), sited *c.* 600 m NNW of the railway cutting, where the succession is closely similar. This quarry was situated in the corner of a field farmed by James Buckman, who had it worked from time to time in order to obtain fossils (Richardson, 1932); it has recently been reinvestigated by Chandler and Sole (1996). The section in the railway cutting given below is based mainly on that in the unpublished thesis of Parsons (1980b), modified following Callomon and Chandler (1990) and Callomon and Cope (1995). Bed numbers follow Callomon and Chandler (1990); these agree with those of Parsons (1980b) except for the lowest beds. The informal lithostratigraphical terms mainly follow Parsons (1980a,b) who based them largely on terms used by Buckman (1893a). The ammonite names used by Parsons (1980b) have been rationalized following Callomon and Chandler (1990) and Chandler and Sole (1996).

	Thickness (m)
Inferior Oolite Formation	
Crackment Limestone Member	
10: Limestone, poorly bedded, rubbly, white, weakly ooidal; deeply weathered and relatively unfossiliferous; *Parkinsonia* in basal 0.10 m	seen to 2.0
Halfway House Fossil Bed	
9: Limestone, soft, cream-coloured with yellow-brown limonite ooids; fossiliferous with shells, notably the bivalve *Neocrassina,* replaced by limonite; numerous small 'snuff-boxes'; *Parkinsonia*	0.35–0.65
Marl Bed	
8: Limestone, limonite-rich, 'iron-shot'; planed top surface; in places reduced to limonitic clay parting; very fossiliferous with bivalves (*Neocrassina*) and terebratulid brachiopods (*Goniothyris*)*;* numerous 'snuff-boxes'	0–0.20
Irony Bed	

7c: Marl, limonitic, patchy; occasional 'snuff-boxes'; capped by flat hardground; locally thickened and hardened into lenses of crimson ironstone, patchily ooidal; fills depressions in bed below; *Sphaeroceras* sp.	
7b: Limestone, hard, somewhat fissile, crystalline, white to pale-grey with ferruginous patches; scattered large, coarse limonitic ooids and echinoderm debris	
7a: Marl, ochreous or limonitic crust; 'snuff-box' oncoids	0–0.15
Bradford Abbas Fossil Bed	
6: Limestone, 'iron-shot', very fossiliferous; divided into two or three courses (6a-6c) by one or two discontinuous and irregular clay partings	
6c: Oobiomicrite, densely 'iron-shot'; fine, brown limonite ooids set in pale blue-grey matrix; joint faces and fossils stained black; ammonites including *Euhoploceras, Hyperlioceras* and *731lobiticercts;* persistent marl parting at base	0.18–0.20
6b: Oobiomicrite, densely 'iron-shot'; ooids yellower and matrix browner than Bed 6c; ammonites including *Bradfordia, Eudmetoceras, Euhoploceras, Graphoceras, Haplopleuroceras, Trilobiticeras;* impersistent marl parting at base but where absent,	
Bed 6b not separable from 6a	0–0.25
6a: As Bed 6b; ammonites including *Graphoceras*	0.25–0.38
(Total thickness for Bed 6 is 0.50–0.70 m)	
5: Marl, brown, prominent	0–0.04
Paving Bed	
4a-b: Limestone, hard, rubbly, ooidal; small yellow ooids set in pale blue-grey fine spar matrix; joint faces and relatively rare fossils stained dark red-purple; *Ludwigia* 0.12 m below top; impersistent limonite-stained parting at base	0.25–0.38
3a-b: Limestone, hard, rubbly, ooidal; superficially similar to Bed 4 but, where fresh, matrix seen to be sandier and more yellow-grey; ammonites including *Brasilia* and *Ludwigia*	0.30–0.70
Dew Bed	
2: Biosparite, extremely hard, coarsely shelly, blue-hearted; prominent, bored, undulating upper surface in places thickly smeared with limonite; moderately shelly but fossils very difficult to extract; impersistent limonite layer at base, otherwise base transitional	0–0.28
Lias Group	
Bridport Sand Formation	
1: Sandstone, hard, nodular, very shelly, blue-hearted but weathering yellow	0.35–0.40
Sand, soft, yellow; occasional sandstone doggers	seen to 0.60

Woodward (1894) and Richardson (1932) reported two faults, the western one of which brought the Inferior Oolite and Bridport Sand formations against the Fuller's Earth Formation (Bathonian) (Figure 2.27).

Interpretation

According to Chandler and Sole (1996), identification and evaluation of the fossils from the Bradford Abbas area is ongoing and there continues to be associated, more-or-less provisional, changes to the ammonite taxonomy and recognition of Callomon and Chandler's (1990) Aalenian–Bajocian ammonite biohorizons.

In the lower part of the section, ammonite faunas enable recognition of the Aalenian Murchisonae, Bradfordensis and Concavum zones. Chandler and Sole (1996) recorded a typical *Ludwigia murchisonae* (J. de C. Sowerby), eponymous ammonite of the Murchisonae Zone, in the lower part of Bed 4. This occurrence may mean that the Murchisonae–Bradfordensis zonal boundary should be taken somewhat higher than the position shown in (Figure 2.26), which is at the base of Bed 4, between ammonite biohorizons Aa-5 (*Ludwigia obtusiformis*) and Aa-9 (*Brasilia bradfordensis* and *B. baylii*) of Callomon and Chandler (1990). The Murchisonae Zone rests unconformably on Lower Jurassic (Toarcian) strata (Figure 2.26).

There is some confusion in the literature regarding the limits of the so-called 'Paving Bed', which was first described as the 'Pavingstone' or *Murchisonae*-bed proper' by Hudleston and Woodward (1886). They used the term for the *c.* 0.3 m-thick bed between the Dew Bed and the 'great shell bed' (= Bradford Abbas Fossil Bed) at East Hill Quarry, describing it as a 'slabby iron-shot oolite' that was used for 'gutters etc'. There has been some subsequent confusion about whether the term should be applied to the combined beds 3 and 4 of the section recorded above or whether it should be restricted to Bed 4 alone, and there is disparity between Parsons (1980b) and Callomon and Chandler's (1990) bed numbers at this level. At East Hill Quarry, Buckman (1893a) certainly restricted the term to the equivalent of Bed 4 but Callomon and Cope (1995) implied that, at the railway cutting, the term covered Bed 3. For convenience, the term is applied herein to the combined beds 3 and 4.

The Aalenian–Bajocian stage boundary lies within the Bradford Abbas Fossil Bed, which Parsons (1980b) described as 'world famous' for its rich fossil content. Although Buckman (1893a) divided this bed into only two, which he assigned to his *concavum* and *discites* hemerae, Parsons (1974a) used two marl partings to establish a three-fold division from which he collected three successive ammonite faunas. He assigned the lowest part (Bed 6a), with an ammonite fauna dominated by species of *Graphoceras,* to the Concavum Zone and Subzone and drew comparisons with the fauna of Bed 2 at Seavington St Mary Quarry and Bed 5 at Horn Park Quarry (see GCR site reports, this volume). The environs of Bradford Abbas are one of the most important areas for the Concavum Zone (Parsons, 1974a). Chandler and Sole (1996) noted an abundance of the eponymous ammonite *Graphoceras concavum* (J. Sowerby) (Figure 2.28) in the top part of Bed 6a. The oldest ammonite biohorizon reported in Bed 6 by Callomon and Chandler (1990) was Aa-13 (*Graphoceras cavatum*) but if the Bradford Abbas Fossil Bed is taken to include also Bed 5 then, by comparison with the nearby East Hill Quarry, ammonite biohorizon Aa-10 (*Brasilia bradfordensis similis*) might also be represented at about this level (Chandler and Sole, 1996). This would require an upward adjustment to the Bradfordensis–Concavum zonal boundary as shown in (Figure 2.26). At present, Aa-10 is at least questionably recognized in the top part of the underlying Paving Bed (Bed 4) at both localities. The middle part (Bed 6b) of the Bradford Abbas Fossil Bed, with a more varied ammonite fauna characterized by the genera *Bradfordia, Eudmetoceras, Euhoploceras* and *Haplopleuroceras* as well as *Graphoceras,* is assigned to younger levels of the Concavum Zone; Parsons (1974a) again compared this ammonite assemblage with that of Bed 5 at Horn Park Quarry. At the base of Bed 6c, which is assigned to the Lower Bajocian Discites Zone, there is almost certainly a non-sequence (Callomon and Chandler, 1990) that coincides with the Aalenian–Bajocian stage boundary. The oldest Bajocian ammonite biohorizon reported, albeit tentatively, by Callomon and Chandler (1990) was Bj-3 (*Hyperlioceras subsectum*)*;* at East Hill Quarry, Chandler and Sole (1996) reported older biohorizons including Bj-1 (*Hyperlioceras politum*)*.*

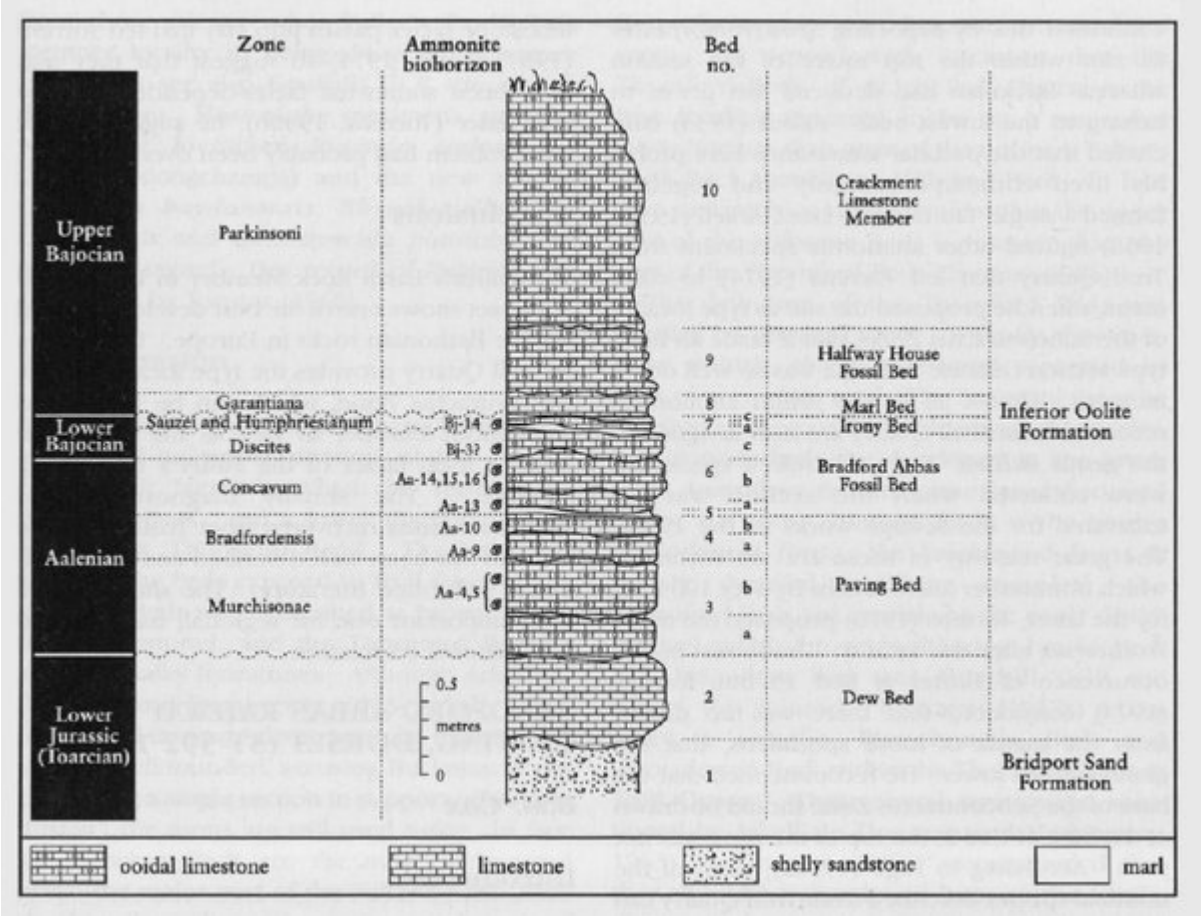
According to Callomon and Chandler (1990), there is a non-sequence at the base of Bed 7 that cuts out the Ovalis and Laeviuscula zones, although there is possibly some evidence of these at East Hill Quarry (Chandler and Sole, 1996). The Humphriesianum Zone is thinly represented by Bed 7c in which Callomon and Chandler (1990) reported their ammonite biohorizon Bj-14 (*Poecilomorphus cycloides*)(since replaced by Bj-14a and Bj-14b; Callomon and Cope, 1995; see Seavington St Mary Quarry GCR site report, this volume). Callomon and Cope (1995) likened this bed to the Red Conglomerate at Burton Bradstock (see Burton Cliff and Cliff Hill Road Section GCR site report, this volume). These authors also deduced the presence of the Sauzei Zone in Bed 7b at Bradford Abbas Railway Cutting because of the similarity of its lithology and general appearance to the Red Bed at Burton Bradstock.

The greater part of the overlying Upper Bajocian succession belongs to the Parkinsoni Zone although the Marl Bed (Bed 8), at the base, was referred to the Garantiana Zone by Parsons (1980a). This bed is equivalent to the 'Astarte Bed' of other localities in the region (e.g. Seavington St Mary Quarry, see GCR site report, this volume) but the name 'Marl Bed' has been used where the latter is locally deeply weathered (Parsons, 1980a). The ammonite faunas of these youngest beds have not yet been studied in detail.

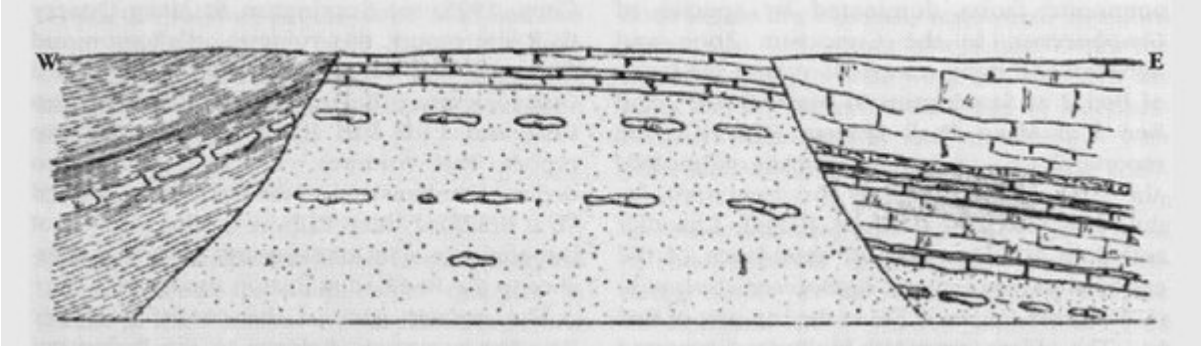
Conclusions

Although somewhat neglected in the geological literature compared with other quarries in the area, the Bradford Abbas Railway Cutting offers a permanent section through highly fossiliferous beds of the Inferior Oolite Formation. In particular, the Bradford Abbas Fossil Bed yields ammonite faunas from the Aalenian–Bajocian stage boundary interval (Concavum–Discites zones); the Concavum Zone faunas are especially renowned. Bradford Abbas also has strong associations with the Buckman family whose work has provided the basis for our present knowledge of Aalenian–Bajocian palaeontology and stratigraphy. With other sites in the Sherborne area (Figure 2.29), Bradford Abbas Railway Cutting is a key site for understanding the complex pattern of Aalenian–Bajocian sedimentation and depositional history in the Wessex region and the development of a refined ammonite-based chronology of national and international importance.

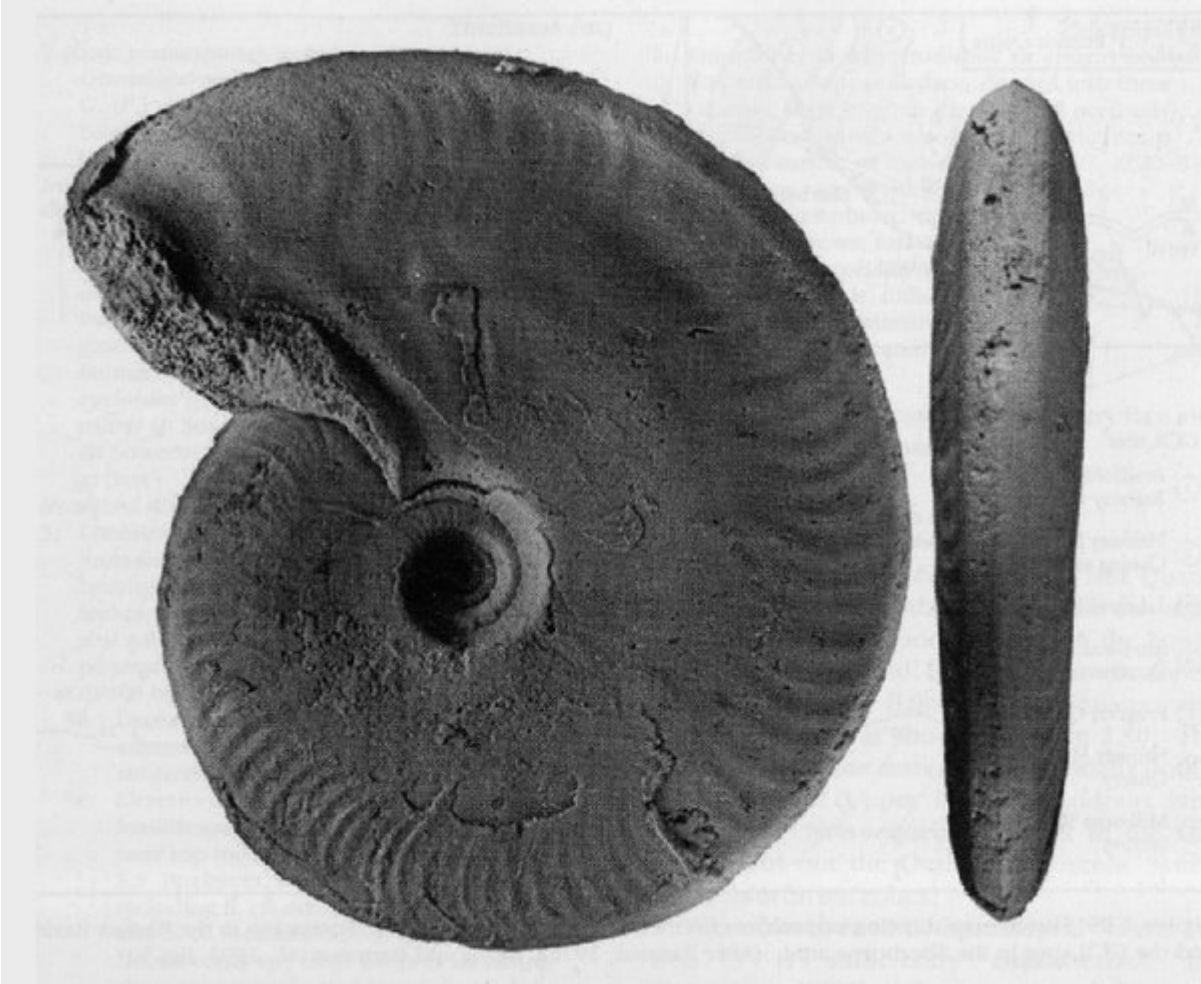
References



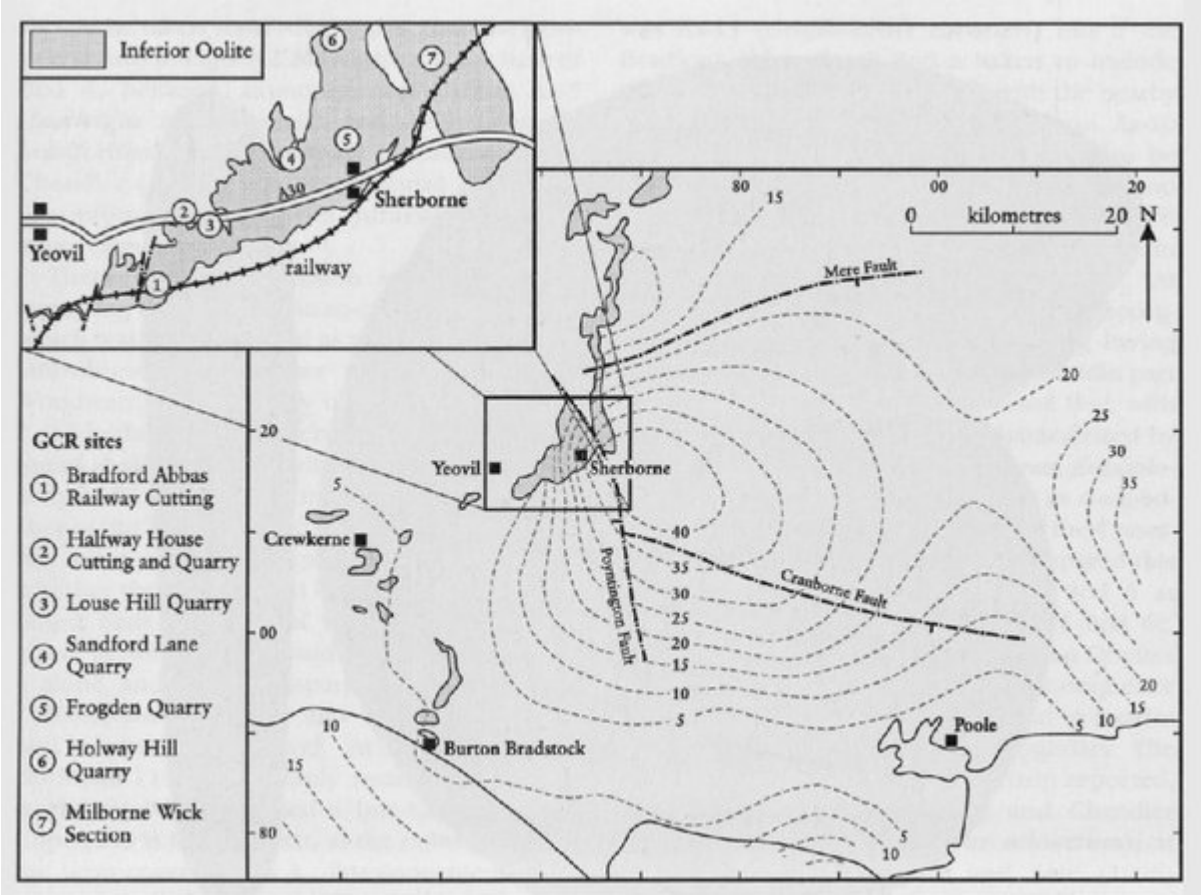
(Figure 2.26) Graphic section of the Inferior Oolite Formation at Bradford Abbas Railway Cutting. (After Callomon and Chandler, 1990, fig. 3.) For lithologies, see text.)



(Figure 2.27) Geological sketch section of the Bradford Abbas Railway Cutting as illustrated by Woodward (1894) showing the Inferior Oolite Formation in the east faulted against the Bridport Sand Formation which, to the west, is faulted against the Fuller's Earth Formation.)



(Figure 2.28) Graphoceras concavum O. Sowerby) (Sedgwick Museum, Cambridge, X27846) — eponymous ammonite of the Aalenian Concavum Zone — from Bed 6a of the Bradford Abbas Railway Cutting GCR site as illustrated by Chandler and Sole (1996, p1. 2, figs 1a,b). The specimen is shown at natural size. (Photo: R.B. Chandler.))



(Figure 2.29) Sketch map showing isopachytes (in metres) for the Inferior Oolite Formation in the Wessex Basin and the GCR sites in the Sherborne area. (After Parsons, 1976a, fig. 1; and Barton et al., 1993, fig. 5.))