Frogden Quarry, Dorset

[ST 649 183]

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Introduction

Frogden Quarry, near Oborne, Dorset, has been well known in the geological literature for over 100 years. The section is notable for the relatively complete zonal succession across the Lower–Upper Bajocian substage boundary (Humphriesianum–Subfurcatum zones). At other localities in the Sherborne area (see (Figure 2.29)), this interval is usually much condensed or absent (e.g., Bradford Abbas Railway Cutting, Louse Hill Quarry, Sandford Lane Quarry, see GCR site reports, this volume). The site has yielded abundant fossils including the type material of many ammonite species (Parsons, 1976a) and other molluscs.

Description

The section at Frogden Quarry was noted by Buckman (1881) and subsequently described, when the quarry was still worked, by Hudleston (in Hudleston and Woodward, 1886; Hudleston, 1887), Buckman (1893a, 1910b), Woodward (1894) and Richardson (1932). In more recent years, the disused quarry section was reported by Macfadyen (1970) and Parsons (1976a). A graphic section was included by Callomon and Chandler (1990) and the quarry also featured in the [British] Geological Survey memoir by Bristow *et al.* (1995). The fullest modern account is that of Callomon and Cope (1995) on which the following details are largely based (Figure 2.34). Bed numbers follow Parsons (1976a) as modified by Callomon and Cope (1995). Classification into members follows Bristow *et al.* (1995).

	Thickness (m)
Inferior Oolite Formation	
Sherborne Building Stone Member	
7: Limestone, shell-fragmental and somewhat sandy, slightly ooidal, weathering yellow-brown; in well-bedded courses separated by marly partings; few fossils; flat erosion surface at base	seen to 2.0
Miller's Hill Member	
Oborne Roadstone	
6: Limestone, marly, ferruginous, ooidal, variably indurated, strongly bioturbated, indistinctly divisible into four courses:	
6d: *Cadomense Bed:* Hard, somewhat concretionary; many fossils including ammonites (*Garantiana baculata* (Quenstedt), *Leptosphinctes davidsoni* (S.S. Buckman) and *Strenoceras subfurcatum* (Zieten)), and gastropods	0.15–0.20
6c: As 6d but softer, sandy and with fewer fossils; ammonites including *Caumontisphinctes polygyralis phaulus* S.S. Buckman	0.35–0.40
6b: *Sphaeroidothyris Bed: As* 6c but more strongly cemented and with nests of terebratulid brachiopods; ammonites including *Cadomites deslongchampsi* (d'Orbigny), *C. homalogaster S.S.* Buckman, *Caumontisphinctes phaulus* (S.S. Buckman), *Orthogarantiana haugi* Pavia and *Torrensia gibba* (Parona); highly undulating parting at base	0.10–0.20

6a: As 6b but softer with large ammonites including *Teloceras banksii* (J. Sowerby) resting on planed erosion surface at base	0.05–0.15
5: Limestone, more massive than above, densely 'iron-shot' ooidal; in two courses:	
5b: Yellowish-brown matrix, rich in belemnites; ammonites including *Caumontisphinctes aplous* S.S. Buckman, *Leptosphinctes* sp., *Teloceras banksii* and *T. coronatum* (Schlotheim-Zieten, *non* Bruguière); undulating erosion plane at base cutting through large ammonites in bed below	0.25–0.30
5a: 'Iron-shot' oolite as above; matrix grey-brown, sandy when decalcified, strongly burrowed; common *Teloceras blagdeni* J.Sowerby); undulating marl parting at base	0.30–0.40
4: Limestone, densely 'iron-shoe ooidal with brown ooids in hard, grey matrix, heavily burrowed; divisible into three parts:	
4c: Large well-preserved flat-lying ammonites at three levels, most abundant in lowest level, which comprises layer of *Stephanoceras*	0.20–0.30
4b: As above but harder with a more diverse fauna including ammonites, belemnites and nautiloids; ammonites (embedded at all angles) including *Chondroceras wrighti* (S.S. Buckman)–*gervillii* (J. Sowerby), *Dorsetensia edouardiana* (d'Orbigny)-pulchra S.S. Buckman–*tessoniana* (d'Orbigny), *Oppelia subradiata* (J. Sowerby), *Sonninites liostracus–subtectus* (S.S. Buckman), *Stephanoceras* aff. *humphriesianum* (J. Sowerby), *Teloceras labrum* S.S. Buckman and *Witchellia romani* (*Oppel*)–*complanata* (S.S. Buckman); indistinct parting at base	0.20–0.25
4a: As above but more marly in lower part where conglomerate of limonite-coated pebbles, corroded ammonites, occasional 'snuff-box' oncoids, and much shell debris; sharp lithological change at base	0.15–0.20
Corton Denham Member	
3: *Spissa Bed:* Marl, soft, non-ooidal, greenish-white, glauconitic; richly fossiliferous with ammonites, including *Bradfordia* (*Amblyoxyites*) *amblys* S.S. Buckman, *Emileia brocchi* (J. Sowerby), *Frogdenites spiniger* S.S. Buckman, *Mollistephanus, Otoites contractus* (J. de C. Sowerby), *Papilliceras arenatus* (Quenstedt), *Shirbuirnia superba* (S.S. Buckman), *Skirroceras* and common *Witchellia laeviuscula* (J. Sowerby) and variants, retaining purplish-grey calcitic shells; common pleurotomariid gastropods; passing down into	0.05–0.10
2: *Blue Bed:* Limestone, somewhat glauconitic, very hard, blue-hearted, extensively burrowed with narrow marl-filled vertical burrows from bed above; sparsely shelly with ammonites including *Emileia catainorpha* S.S. Buckman, '*E.*' *crater* S.S. Buckman and *Witchellia rubra* S.S. Buckman	0.40

1: Sand, calcareous and marl, sandy, somewhat glauconitic, indurated at several levels into hard stony bands; sparsely shelly with ammonites including *Emileia contrahes* S.S. Buckman, *Fissilobiceras* cf. *ovalis* (Quenstedt) and *Witchellia connata* (S.S. Buckman); poorly exposed	*c.* 4.0

According to Callomon and Cope (1995), a borehole sited 800 m to the south-east (Wilson *et al.,* 1958) proved a further 3 m of Sherborne Building Stone Member overlain by *c.* 13 m of Rubbly Member and *c.* 12 m of Crackment Limestone Member with Lower Fuller's Earth Member above and, at the base of the succession, a further 5 m of Inferior Oolite Formation with the Bridport Sand Formation below.

Interpretation

The informal stratal names used for parts of beds 2–6 originate with Hudleston (in Hudleston and Woodward, 1886), Buckman (1893a), Richardson (1915, 1916a), or Parsons (1980a). The 'Spissa Bed' (Bed 3) was so named by Parsons (1980a) based on Richardson's (1916a) term '*Astarte spissa* Bed' that Richardson equated with Buckman's (1893a) 'soft green-grained white marl' (Bed 9) at Frogden Quarry. Here and elsewhere in the area, this bed has yielded an extensive and superbly preserved ammonite fauna (Parsons, 1974a) including the type material of Buckman's (1921) early sphaeroceratid genus *Frogdenites* (Figure 2.35). The Cadomense Bed (Hudleston in Hudleston and Woodward, 1885 — who used the term for the whole of Bed 6 in the above section) takes its name from the small, lappetted strigoceratid ammonite *Cadomoceras cadomense* (Defrance). This bed has also yielded a notable gastropod fauna, which, together with other Frogden Quarry specimens, was described and figured by Hudleston (1887).

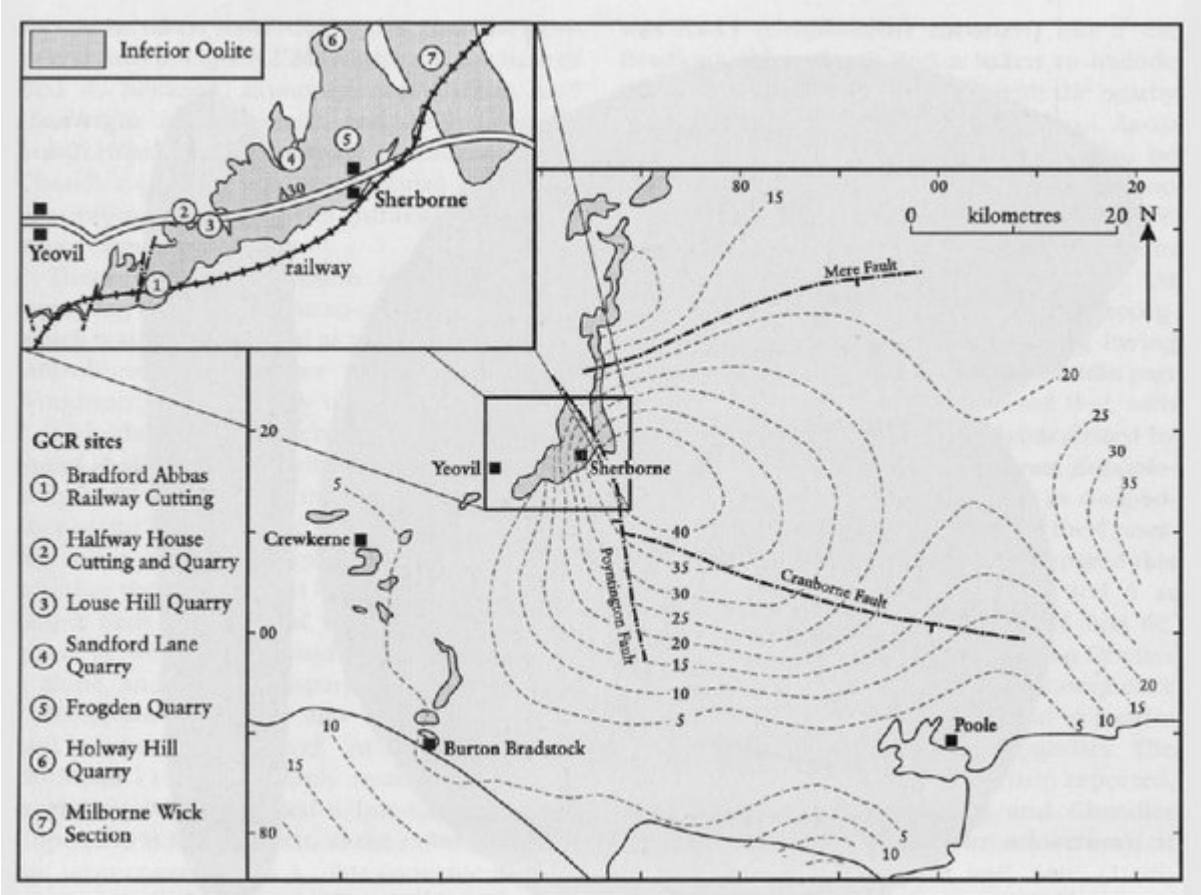
The ammonite faunas enable recognition of the Lower Bajocian Ovalis, Laeviuscula, Sauzei and Humphriesianum zones, and the Upper Bajocian Subfurcatum Zone (Figure 2.34). Those of the Sauzei Zone are found only as a reworked element in Bed 4a where they represent what Callomon and Cope (1995) described as a lag-relict. Older faunas of the Laeviuscula Zone are also reworked into this bed. The section at Frogden Quarry has played a definitive role in recognition of ammonite biohorizons in the Humphriesianum and Subfurcatum zones (Callomon and Chandler, 1990; Callomon and Cope, 1995) (Figure 2.34). All three subzones of the Humphriesianum Zone are recognized: the Romani Subzone (the oldest) in Bed 4b, although not fully developed compared with the Milborne Wick Section (see GCR site report, this volume); the Humphriesianum Subzone in Bed 4c; and the Blagdeni Subzone in Bed 5a. Ammonites in beds 5b-6 indicate the overlying Subfurcatum Zone. Parsons (1976a) designated Bed 5b as 'typical British horizon' for the Banksi Subzone, with the Sherborne area of Dorset as its type area, and beds 6b and 6d as 'typical British horizons' for the Polygyralis and Baculata subzones respectively. Bed 7 is assigned to the overlying Garantiana Zone by analogy with other local sections (e.g. Sandford Lane Quarry and Louse Hill Quarry, see GCR site reports, this volume) (Callomon and Cope, 1995).

The succession shows many of the characteristic features of the Inferior Oolite Formation in Dorset and Somerset, such as ammonites preserved at all angles to the bedding (Bed 4b) and erosion planes that cut through large body fossils (base Bed 5b) (see Seavington St Mary Quarry GCR site report, this volume, for discussion).

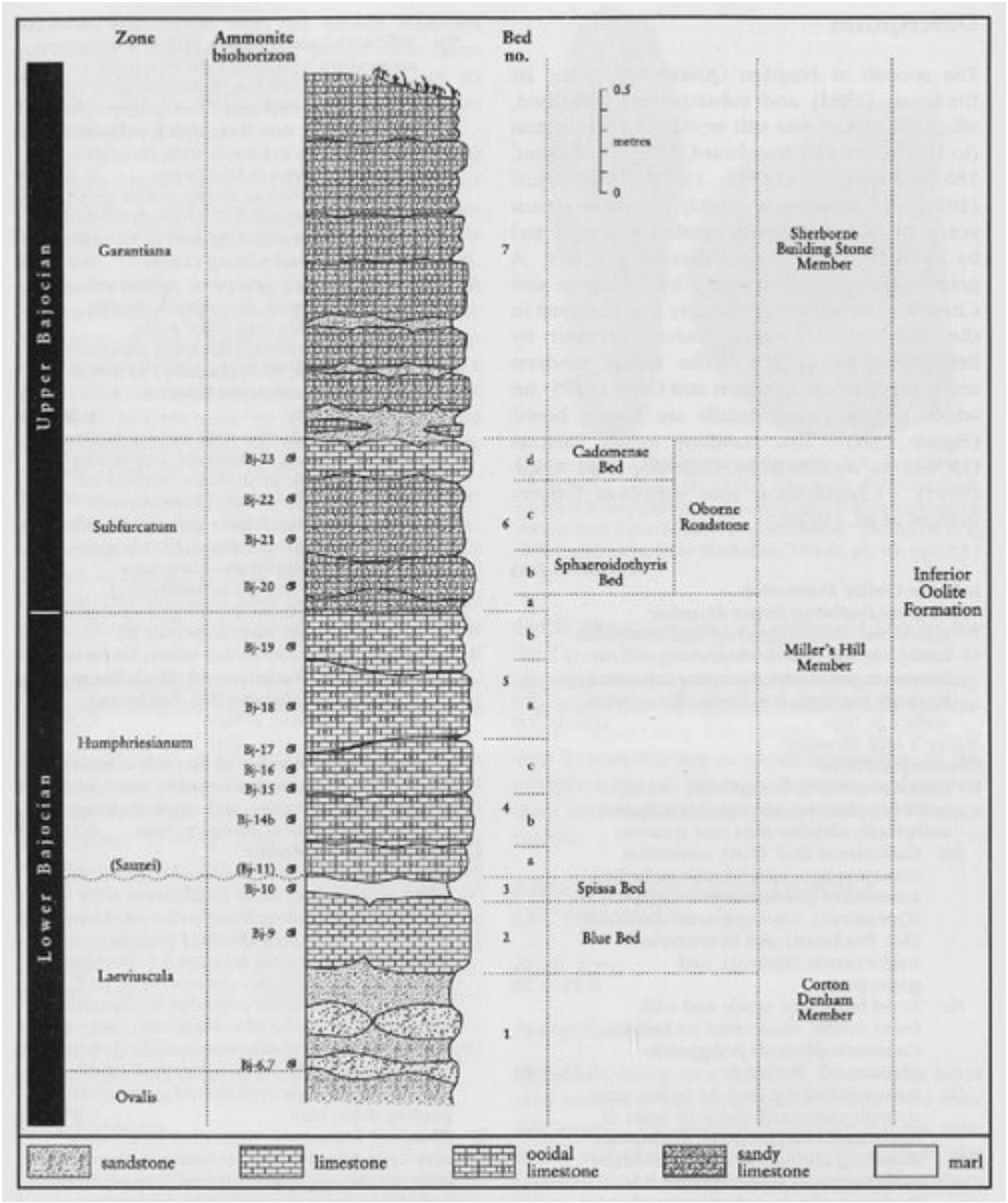
Conclusions

Frogden Quarry is regarded as an internationally important geological locality that has yielded a prolific ammonite fauna, largely described by S.S. Buckman and including the type specimens of many taxa. It is particularly important for the Humphriesianum and Subfurcatum zones that straddle the Lower–Upper Bajocian substage boundary and are not well represented elsewhere. Frogden Quarry is the source of much of the known ammonite fauna of these two zones. The site is thus of considerable national and international importance as a primary site for classification and correlation of the middle part of the Bajocian Stage.

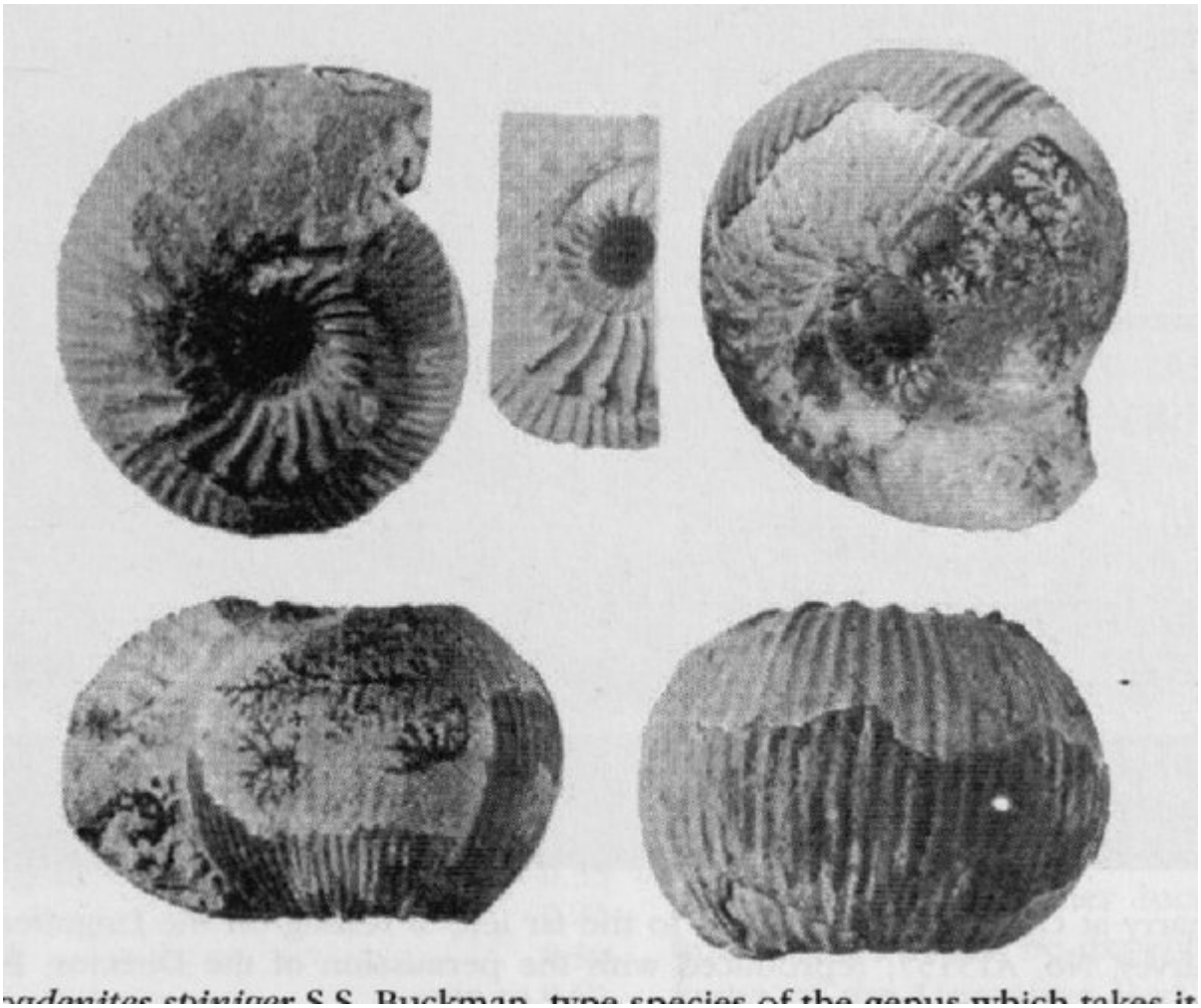
References



(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.))



(Figure 2.34) Graphic section of the Inferior Oolite Formation at Frogden Quarry (After Callomon and Cope, 1995, fig. 12.) For lithologies, see text.)



(Figure 2.35) Frogdenites spiniger S.S. Buckman, type species of the genus which takes its name from Frogden Quarry, as illustrated by Buckman (1921, pl. 215). The specimen is shown at natural size.)