Horn Park Quarry, Dorset

[ST 457 021]

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Introduction

Horn Park Quarry, *c.* 1.5 km north-west of Beaminster in Dorset, is one of the most famous Aalenian–Bajocian localities in Britain. The highly fossiliferous Inferior Oolite Formation there has been quarried intermittently over many years, and has yielded many thousands of ammonites. Sections were recorded by Richardson (1928–1930), Bomford (1948), Torrens (1969b) and Senior *et al.* (1970), and the succession was summarized by Parsons (1980a). Since then the locality has featured prominently in the reassessment of the Aalenian–Bajocian ammonite faunas and stratigraphy of this region (Chandler, 1982, 1996; Callomon and Chandler, 1990; Morton and Chandler, 1994; Sandoval and Chandler, 2000). It is particularly important for the Aalenian Stage as nearly all of that stage's currently recognized ammonite biohorizons are present. According to Callomon and Cope (1995), the profusion of ammonites has also given the opportunity to record the rarer elements of the fauna.

Description

The following record of the section (also (Figure 2.18)) is largely based on that of Callomon (in Callomon and Cope, 1995); his bed numbers are modified from Senior *et al.* (1970). The faunal determinations are biased towards the ammonites, which occur in particular abundance.

	Thickness (m)
Great Oolite Group	
Fuller's Earth Formation	
Clay, grey	seen to 1–2
Inferior Oolite Formation	
Zigzag Bed	
11: Limestone, marly, rubbly, lenticular; indistinctly divisible into four courses (11a-11d) with limonite-encrusted parting between 11b and 11c; many ammonites including profuse *Parkinsonia convergens* (S.S. Buckman) (both macroconchs and microconchs) in layer at top of 11a and abundant *Oxycerites yeovilensis* Rollier (both macroconchs and microconchs) in 11d; undulating base	0.35
Burton Limestone	
10: Limestone, variably hard and marly, nodular, patchily ferruginous, bioturbated; *Parkinsonia;* serpulid-encrusted sponges; many echinoids	0.70
9: Limestone, pale-grey, crinoidal, locally ooidal to pisoidal and with marly patches; ammonites including *Cadomites, Parkinsonia parkinsoni* (J. Sowerby) and common *Polyplectites;* common belemnites; large bivalves; brachiopods including *Sphaeroidithyris,* echinoids; gastropods	0.50
Astarte Bed	

8: Limestone, ferruginous, 'iron-shot' ooidal in part; sparse but including typical bivalve and brachiopod fauna and the ammonite *Sphaeroceras tutthum* S.S. Buckman; conglomeratic pebbles at erosional base	0–0.10
Red Bed	
7a: Limestone, hard, shell-detrital packstone, crinoidal, sparsely ooidal, pale-grey, weathering pink with ferruginous patches and vertical burrows filled with reddish marly material; planed upper surface; very sparsely fossiliferous; *Stephanoceras* cf. *rhytum* (S.S. Buckman); thickening eastwards; erosional base	0.05–0.40
7b: Limestone, as 7a but finer grained, more evenly bedded; planed upper surface; very hard, white with limonitic marly wisps and pockets of sparse ooids; sparsely fossiliferous with ammonites including *Skirroceras leptogyrale* S.S. Buckman and *Sonninia* or *Papilliceras* sp.; thickening westwards; erosional base	0.15–0.45
6: Clay, brown, greasy	0–0.03
Horn Park Ironshot Bed	
5: Oolite, brown, Iron-shot' with grey marly limestone matrix; weathering into several indistinct and irregular courses; strongly bioturbated; planed upper surface cutting through ammonites, sometimes infilled with crystalline calcite; fossils, including abundant ammonites, clearly stratified (5a-5e)	
5e: Hard, sparsely fossiliferous, thinning eastwards; ammonites including *Euhoploceras acanthodes* (S.S. Buckman), *Fontannesia grammoceroides* (Haug), *Graphoceras formosum* (S.S. Buckman) and *Hyperlioceras*	0.10–0.20
5d: Slightly softer and more densely 'iron-shot' than 5e; ammonites including *Bradfordia costata* S.S. Buckman, *Eudmetoceras eudmetum* S.S. Buckman, *Graphoceras concavum* (J. Sowerby), *Haplopleuroceras subspinatum* (S.S. Buckman), *Pseudaptetoceras amplectens* (S.S. Buckman) and *Stephanoceras* aff. *perfectum* (S.S. Buckman); indistinct parting at base	0.10
5c: As above; *Graphoceras cavatum* (S.S. Buckman) in upper part, *Brasilia decipiens* (*S.S.* Buckman), *B. maggsi* (*S.S.* Buckman) in lower part; other ammonites including *Abbasites abbas* S.S. Buckman, *Eudmetoceras sieboldi* (Oppel), *Megalytoceras confusum* (S.S. Buckman), *Stephanoceras* aff. *perfectum* (S.S. Buckman) and *Tmetoceras* cf. *scissum* (Benecke); prominent layer of large bivalves (*Ctenostreon pectiniforme* (Schlotheim)) at base	0.15

5a,b: Oolite, fine, dense, as above, completely bioturbated, profusely fossiliferous notably with gigantic (up to 0.5 m diameter) graphoceratid ammonites and many large bivalves; ammonites including *Abbasites abbas* S.S. Buckman, *Brasilia gigantea* (S.S. Buckman), *B. platychora* (S.S. Buckman), *Megalytoceras confusum* (S.S. Buckman), *Parammatoceras grande* Elmi, *Praestrigites praenuntius* S.S. Buckman, *Stephanoceras* aff. *perfectum* (S.S. Buckman) and *Tmetoceras* sp.; bivalves including *Coelastarte, Ctenostreon, Plagiostoma, Pleuromya* and *Trigonopsis;* gastropods including *Bathrotomaria;* indistinct and undulating base	0.25
4: Limestone, hard, shell-detrital and shelly, densely ooidal; ooids fine and non-limonitic (buff iron-shoe); weathering cream; ammonites including *Abbasites, Brasilia baylii* (S.S. Buckman), *B. bradfordensis* (S.S. Buckman), *B. similis* (S.S. Buckman), *Erycites partschi* Prinz, *Megalytoceras, Pachylytoceras, Planammatoceras* cf. *planiforme* S.S. Buckman, *Pseudaptetoceras klimakomphalum* (Vacek) and *Tmetoceras;* well-preserved bivalves; sponges in lower part; undulating parting at base	0.55
3: Limestone, sandy, marly, variably ferruginous, weathering to pale olive-brown; divisible into three courses (3a-3c) separated by undulating clay partings	
3c: *Craterospongia Bed:* Fairly hard, heavily burrowed with marly pockets, slightly ooidal and with echinoderm debris; ammonites including *Erycites intermedius* Prinz, *Ludwigia murchisonae* J. Sowerby), large *Pachylytoceras, Parammatoceras rugatum* S.S. Buckman, *Planammatoceras planiforme* S.S. Buckman and *Tmetoceras regleyi* (Dumortier); well-preserved large bivalves; sponges (*Craterospongia concentrica* Thomas)	0.15
3b: Softer than 3c; many large shells decalcified; voids and burrows filled with ferruginous marl; ammonites including *Asthenoceras nannodes* S.S. Buckman, *Ludwigia obtusiformis* (S.S. Buckman), *Megalytoceras, Parammatoceras boyeri* Elmi, *Staufenia sebndensis* (Hoffman), *Tmetoceras* and *Vacekia stephensi* (S.S. Buckman); nautiloids; undulating clay parting at base	0.30
3a: Ancolioceras Bed: Harder than 3b, finely shell-detrital including echinoderm debris; finely ooidal; heavily bioturbated with prominent vertical burrows filled with limonitic marl; fauna including decalcified ammonite shells and large bivalves with voids replaced by ochreous marl; small solitary corals and occasional sponges (*Craterospongia*)*;* ammonites including *Ancolioceras opalinoides* (Mayer), A. *substriatum* S.S. Buckman, *Ludwigia crassa* (Horn), *Megalytoceras, Pachylytoceras* aff. *torulosum* (Zieten) and*Staufenia sinon* (Bayle); erosional base	0.25
Scissum Bed	
2: Limestone, fine grained, white, hard, massive with planed upper surface; forming floor of quarry	

2b: Bioturbated with ochreous burrows and pockets; highly fossiliferous with ammonites (*Leioceras bifidatum* (S.S. Buckman) and *L. capillare* (*S.S.* Buckman)); large bivalves including *Ceratomya* and *Plagiostoma;* small solitary corals (*Montlivaltia delabechei* Tomes)	0.15
2a: Massive, becoming sandy downwards; fewer fossils than 2b; ammonites including *Leioceras comptum* (Reinecke) and *L. lineatum* S.S. Buckman	0.40
Bridport Sand Formation	
1: Sand, fine grained, yellow, locally cemented into sandstone lenses (seen in access road cuttings)	

Additional records of the non-ammonite fauna can be found in Richardson (1928–1930) and, particularly, in Bomford (1948).

Interpretation

The ammonite fauna enables recognition of the Aalenian Scissum, Murchisonae, Bradfordensis and Concavum zones, with most of their component subzones, the Lower Bajocian Discites and Sauzei zones, the Upper Bajocian Parkinsoni Zone and, probably, the Garantiana Zone, and the Lower Bathonian Zigzag Zone, with two of its subzones, as shown in (Figure 2.18). The Scissum Zone rests non-sequentially on the Bridport Sand Formation (?Lower Jurassic, Upper Toarcian). Non-sequences higher in the succession cut out the Ovalis, Laeviuscula, Humphriesianum and Subfurcatum zones.

Although the Aalenian Stage totals only 2.4 m in thickness at Horn Park Quarry, 14 of its 16 known ammonite biohorizons can be recognized; only Aa-1 (*Leioceras opalinum*) and Aa-6 (*Ludwigia patellaria*) are missing (Figure 2.18). Details of the diagnostic ammonite taxa of the Aalenian and Lower Bajocian biohorizons were given by Callomon and Chandler (1990) who also figured several specimens from Horn Park Quarry. The Aalenian ammonite biohorizons are all based on the single family Graphoceratidae (see (Figure 1.4), Chapter 1), representatives of which from Horn Park Quarry have been discussed and figured by Chandler (1996). The oldest Aalenian stratum is the Scissum Bed, a name first introduced to the Dorset succession by Richardson (1928–1930) (see also Burton Cliff and Cliff Hill Road Section GCR site report, this volume). Richardson (1928–1930) was also responsible for naming the Ancolioceras Bed (Bed 3a) after a graphoceratid ammonite genus that was considered to be a junior synonym of *Leioceras* by Donovan *et al.* (1981) and taken as one of that genus' macroconch subgenera by Chandler (1996). Bed 3b provided the first British record of the grapho-ceratid genus *Staufenia,* allowing a useful correlation with sequences in continental Europe (Chandler, 1982). The Craterospongia Bed (Bed 3c) was first named by Parsons (1980a) after a sponge genus for which Horn Park Quarry is the type locality (Dighton Thomas, 1948).

The richly fossiliferous Horn Park Ironshot Bed (Bed 5) (Figure 2.19) is the lateral equivalent of the Bradford Abbas Fossil Bed (see Bradford Abbas Railway Cutting GCR site report, this volume) but the Gigantea Subzone of the Aalenian Bradfordensis Zone (represented by the lower part of the Horn Park Ironshot Bed) is missing at Bradford Abbas Railway Cutting, and the younger part of the Bajocian Discites Zone (represented by the upper part of the Bradford Abbas Fossil Bed) is missing at Horn Park Quarry (Callomon and Cope, 1995); indeed, the latter zone is present only at the western end of the quarry where Bed 5e is thickest. Nevertheless, Callomon and Chandler (1990) considered that the section at Horn Park Quarry would do well as an English reference section for the Aalenian–Bajocian stage boundary (see also Seavington St Mary Quarry GCR site report, this volume). This local 'coming and going' of individual beds, which is characteristic of the Aalenian–Bajocian succession in this region, as well as the other sedimentological features (see Seavington St Mary Quarry GCR site report, this volume), are almost certainly the result of tectonic activity. According to Callomon and Cope (1995), the seven successive ammonite faunas (biohorizons Aa-11-Aa-16 and Bj-1) recognized within the Horn Park Ironshot Bed have been resolved only because of the abundance of ammonite material collected; otherwise the morphological overlap between the successive assemblages of the dominant graphoceratids (Chandler, 1996) would be too great for them to be distinguished. Bed 5a is known locally as the 'Dinner Plate Bed' because of the concentration therein of perfectly preserved and gigantic (up to 0.5 m diameter) *Brasilia gigantea* macroconchs. Specimens of the sonniniid ammonite *Euhoploceras* from the top part of the Horn Park Ironshot Bed are featured in Sandoval and Chandler (2000).

The Lower Bajocian Substage is represented exclusively by the Red Bed (Bed 7) and the clay parting at its base (Bed 6). The name (often used in the plural) originates with Buckman (1910a) who described it on the coast at Burton Bradstock (see Burton Cliff and Cliff Hill Road Section GCR site report, this volume).

According to Callomon and Cope (1995), the Astarte Bed (Bed 8), at the base of the Upper Bajocian Substage, is one of the few tolerably constant beds of the Inferior Oolite Formation in this region — others being the Red Bed (see above) and the Scissum Bed (Bed 2). Named after an astartid bivalve, now referred to the genus *Neocrassina,* it has elsewhere locally yielded ammonites diagnostic of the Garantiana Zone (see Seavington St Mary Quarry, Bradford Abbas Railway Cutting, Louse Hill Quarry and Halfway House Cutting and Quarry GCR site reports, this volume). Its characteristic fauna includes belemnites, bivalves, brachiopods, echinoids and gastropods (e.g. Wilson *et al.,* 1958; Senior *et al.,* 1970).

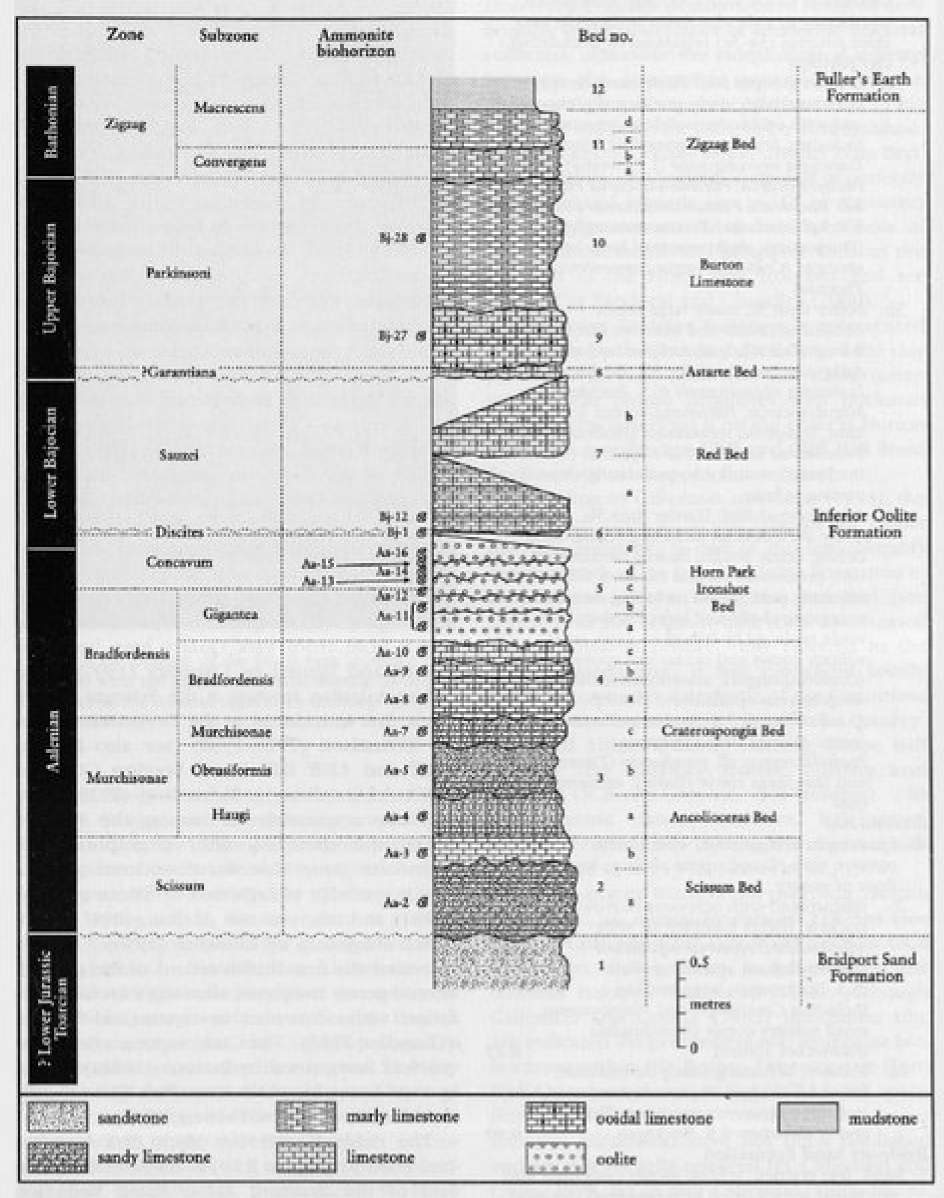
The ammonite fauna of the overlying 'Burton Limestone', so named by Parsons (1975b) (see Burton Cliff and Cliff Hill Road Section GCR site report, this volume), is indicative of the terminal Bajocian Parkinsoni Zone. Although Callomon and Cope's (1995) illustration (fig. 10) indicated the presence of two ammonite bio-horizons within the Burton Limestone at Horn Park Quarry, as shown in (Figure 2.18), full specifications for these and others in the Upper Bajocian succession have not been published and are not yet fully resolved (cf. Callomon and Cope, 1995, fig. 7; and Callomon, 1995, fig. 3). Indeed, Callomon (1995) commented that the faunal succession of the Garantiana and Parkinsoni zones in general had so far received little more than cursory attention.

The Zigzag Bed, the youngest bed of the Inferior Oolite Formation at Horn Park Quarry, belongs to the Lower Bathonian Zigzag Zone (see also Burton Cliff and Cliff Hill Road Section GCR site report, this volume). The many ammonites in Bed 11 include almost the entire known fauna of the Zigzag Zone (Arkell, 1951a, 1958a; Torrens, 1974) and enable recognition of the Convergens Subzone in beds 11a and 11b, and the Macrescens Subzone in beds 11c and 11d (Callomon and Cope, 1995).

Conclusions

The succession at Horn Park Quarry possibly represents the most complete record of the Aalenian and lowest Lower Bajocian successions in southern England. The richness of the ammonite fauna, much of which is perfectly preserved, has made it a world famous and key locality for Middle Jurassic stratigraphy. It has played a major role in the elucidation of the regional stratigraphy, particularly of the Aalenian Stage, and has enabled the type material of many of the ammonite species first described by S.S. Buckman to be accurately pinpointed. It includes the richest development of the upper Aalenian Stage in Dorset. Horn Park Quarry is thus a locality of both national and international importance for Aalenian–Bajocian stratigraphy as well as being a prime palaeontological site.

References



(Figure 2.18) Graphic section of the Inferior Oolite Formation at Horn Park Quarry (After Callomon and Cope, 1995, fig. 10.) For lithologies, see text.)

Stage/Substage	Zone	Subzone		Ammonite biohorizon
Lower Bajocian	Humphriesianum	Blagdeni	Bj-19	*Teloceras coronatum*
			Bj-18	*Teloceras blagdeni*
		Humphriesianum	Bj-17	*Stephanoceras blagdeniforme*
			Bj-16	*Stephanoceras gibbosum*
			Bj-15	*Stephanoceras humphriesianum*
		Romani	Bj-14b	*Chondroceras wrighti*
			Bj-14a	*Chondroceras delphinum*
			Bj-13	*Stephanoceras umbilicum*
	Sauzei		Bj-12	*Stephanoceras rhytum*
			Bj-11b	*Nannina evoluta*
			Bj-11a	*Otoites sauzei*
	Laeviuscula	Laeviuscula	Bj-10	*Witchellia laeviuscula*
			Bj-9	*Witchellia ruber*
		Trigonalis	Bj-8b	*Shirbuirnia trigonalis*
			Bj-8a	*Witchellia nodatipinguis*
		Sayni	Bj-7b	*Witchellia connata*
			Bj-7a	*Witchellia gelasina*
	Ovalis		Bj-6c	*Witchellia* 'pseudoromani' MS
			Bj-6b	*Fissilobiceras gingense*
			Bj-6a	*Euhoploceras zugophorum*
			Bj-5	*Witchellia romanoides*
			Bj-4	*Bradfordia inclusa*
	Discites		Bj-3	*Hyperlioceras subsectum*
			Bj-2b	*Hyperlioceras rudidiscites*
			Bj-2a	*Hyperlioceras walkeri*
			Bj-1	*Hyperlioceras politum*
Aalenian	Concavum	Formosum	Aa-16	*Euhoploceras acanthodes*
			Aa-15	*Graphoceras formosum*
		Concavum	Aa-14	*Graphoceras concavum*
			Aa-13	*Graphoceras cavatum*
	Bradfordensis	Gigantea	Aa-12	*Brasilia decipiens*
			Aa-11	*Brasilia gigantea*
		Bradfordensis	Aa-10	*Brasilia bradfordensis, similis*
			Aa-9	*Brasilia bradfordensis, baylii*
			Aa-8	*Brasilia bradfordensis, subcornuta*
	Murchisonae	Murchisonae	Aa-7	*Ludwigia murchisonae*
			Aa-6	*Ludwigia patellaria*
		Obtusiformis	Aa-5	*Ludwigia obtusiformis*
		Haugi	Aa-4	*Ancolioceras opalinoides*
	Scissum		Aa-3	*Leioceras bifidatum*
			Aa-2	*Leioceras lineatum*
	Opalinum		Aa-1	*Leioceras opalinum*

Substage	Zone	Subzone		Ammonite biohorizon
Lower Callovian	Calloviense	Enodatum	XVIII	*Sigaloceras anterior*
			XVIIb	*Sigaloceras enodatum* β
			XVIIa	*Homoeoplanulites difficilis*
			XVI	*Sigaloceras enodatum* α
		Calloviense	XV	*Sigaloceras micans*
			XIV	*Sigaloceras calloviense*
	Koenigi	Galilaeii	XIII	*Kepplerites galilaeii*
		Curtilobus	XII	*Kepplerites trichophorus*
			XIb	*Kepplerites indigestus*
			XIa	*Cadoceras* 'gregarium' MS
			X	*Kepplerites curtilobus*
		Gowerianus	IX	*Kepplerites gowerianus*
			VIII	*Kepplerites metorchus*
	Herveyi	Kamptus	VII	*Macrocephalites polyptychus*
			VI	*Macrocephalites kamptus* β
			V	*Macrocephalites kamptus* α
		Terebratus	IVb	*Macrocephalites terebratus* γ
			IVa	*Macrocephalites terebratus* β
			III	*Macrocephalites terebratus* α
		Keppleri	II	*Macrocephalites verus*
			I	*Kepplerites keppleri*
Upper Bathonian	Discus	Discus	Bt-20	*Clydoniceras hochstetteri*
			Bt-19	*Clydoniceras discus*
		Hollandi	Bt-18	*Clydoniceras hollandi*
	Retrocostatum	Hannoveranus	Bt-17	*Clydoniceras* cf. *schlippei*
			Bt-16	?*Homoeoplanulites* sp.
		Blanazense	Bt-15	*Procerites twinhoensis*
		Quercinus	Bt-14	*Procerites hodsoni*
			Bt-13	*Procerites quercinus*
Middle Bathonian	Bremeri	Fortecostatum	Bt-12	*Wagnericeras bathonicum*
		Bullatimorphus	Bt-11	*Bullatimorphites bullatimorphus*
	Morrisi		Bt-10	*Morrisiceras morrisi*
	Subcontractus		Bt-9	*Tulites modiolaris*
			Bt-8	*Bullatimorphites* ex gr. *ruppelensis*
	Progracilis	Progracilis	Bt-7	*Procerites imitator*
			Bt-6	*Procerites progracilis*
		Orbignyi	Bt-5	*Procerites/Prohecticoceras*
Lower Bathonian	Tenuiplicatus		Bt-4	*Asphinctites tenuiplicatus*
	Zigzag	Yeovilensis	Bt-3b	*Procerites fullonicus*
			Bt-3a	*Procerites fowleri*
		Macrescens	Bt-2	*Morphoceras macrescens*
		Convergens	Bt-1	*Parkinsonia convergens*
Upper Bajocian	Parkinsoni	Bomfordi	Bj-28	*Parkinsonia bomfordi*
		Truellei	Bj-27c	*Parkinsonia pseudoferruginea*
			Bj-27b	*Strigoceras truellei*
			Bj-27a	*Parkinsonia parkinsoni* α
	Garantiana	Acris	Bj-26b	*Parkinsonia rarecostata*
		Tetragona	Bj-25	*Garantiana tetragona*
		Dichotoma	Bj-24	*Garantiana dichotoma*
	Subfurcatum	Baculata	Bj-23	*Leptosphinctes davidsoni*
		Polygyralis	Bj-22	*Caumontisphinctes polygyralis*
		Banksi	Bj-21	*Caumontisphinctes aplous*
			Bj-20	*Teloceras banksi*

(Figure 1.4) Ammonite biohorizons recognized in the British Middle Jurassic Series (for sources, see text).)

(Figure 2.19) Surface of the Horn Park Ironshot Bed (Bed 5a) with the graphoceratid ammonite Brasilia. The ruler at the bottom right is 15 cm long. (Photo: R.B. Chandler.))