Hinton Hill, Wellow, Somerset

[ST 757 582]

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Introduction

The roadside cutting on Hinton Hill between Hinton Charterhouse and Wellow, *c.* 6 km south of Bath, exposes the Combe Down Oolite and Twinhoe members of the Great Oolite Formation (see (Figure 2.4)). The Twinhoe Ironshot (Cox and Arkell, 1950; Green and Donovan, 1969), which constitutes the basal part of the Twinhoe Member, is the stratum of special interest. It is a distinctive 'iron-shot', pisoidal limestone, less than 2 m thick, which has yielded an abundant bivalve and brachiopod fauna, as well as zonally diagnostic Upper Bathonian ammonites. Restricted to the Bath area, the Twinhoe Ironshot is the only major source of ammonites from the Great Oolite Formation limestones of that region (Torrens, 1974, 1980b). The site is a replacement for Wellow (or Twinhoe) Quarry [ST 7400 5914] (Cox, 1941), which, as the type locality of the Twinhoe Ironshot, was originally selected as the representative GCR site but is now infilled and the land restored to agricultural use.

Description

At the time of its selection as a replacement for the GCR site at Wellow Quarry, the Hinton Hill road cutting (south side) was described as overgrown and wooded but with small exposures of the Combe Down Oolite Member overlain by at least 1.5 m of Twinhoe Ironshot (unpublished English Nature records, 1992). There was also some evidence of small-scale quarrying activity. It was anticipated that relatively little site clearance would also expose the overlying Freshford facies of the Twinhoe Member and therefore a complete Twinhoe Ironshot, the maximum known thickness of which is about 1.8 m. Arkell (1958b) had earlier figured an ammonite from the cutting, and Hawkins (1977) had reported that the Twinhoe Ironshot was possibly visible there in winter.

The Combe Down Oolite Member is predominantly a false-bedded, shell-fragmental oolite but it is very variable especially towards the base (Green and Donovan, 1969). When weathered, it is white. Bedding is often massive with individual beds up to *c.* 2.5 m thick. The total thickness in the Wellow area is *c.* 8 m (Green and Donovan, 1969). The Twinhoe Ironshot overlies it disconformably, and the upper surface is either planed and bored and/or oyster-covered, or irregular and hummocky with a ferruginous crust. By contrast, the Twinhoe Ironshot is rubbly with poorly defined bedding. According to Hawkins (1977), it is a biomicrite with ferruginized pisoids; these are rounded intraclasts of oomicrite and biomicrite with a layered, probably algal, coating. In hand specimen, the pisoids appear as shiny, dark-brown grains, 1–2 mm long, set in a cream-coloured matrix. Typical photomicrographs of thin sections of both the Twinhoe Ironshot and Combe Down Oolite Member were illustrated by Green and Donovan (1969).

The Twinhoe Ironshot is richly fossiliferous and the road cutting at Hinton Hill has yielded bivalves, brachiopods and ammonites (unpublished English Nature records, 1992). Green and Donovan (1969) did not think it necessary to distinguish between the different localities from which particular taxa in their extensive list of fossils from the Twinhoe Ironshot came, although they admitted some local variations in the abundance of different species. They reported species of corals (*Chomatoseris, Isastrea, Montlivaltia, Thamnasteria*), serpulids, brachiopods (*Acanthothiris, Avonothyris, Burmirhynchia, Kallirhynchia, Kutchirhynchia?, Kutchithyris, Obovothyris, Parvirhynchia, Ptyctothyris?, Rhynchonella, Rhynchonelloidella, Rugitela, Tubithyris?, Wattonithyris*), bivalves (*Camptonectes, Catinula, Chlamys, Cucullaea, Entolium, Gervillella, Gresslya, Homomya, Inoperna, Lithophaga, Lopha, Meleagrinella, Modiolus, Nanogyra, Osteomya, Pholadomya, Pinna, Pleuromya, Plagiostoma, Praeexogyra, Protocardia, Pseudolimea, Pseudotrapezium, Pteroperna, Rollierella, Thracia, Trigonia*), ammonites (oppeliids and perisphinctids — see 'Interpretation' below), belemnites (*Belemnopsis*) and echinoids (*Acrosalenia, Clypeus* or *Pygurus, Diplopodia, Holectypus, Nucleolites, Trochotiara*).

The overlying Freshford facies of the Twinhoe Member is a massive, cream-coloured, pisoidal, marly, shell-fragmental limestone but can vary both laterally and vertically from strongly pisoidal rock to marl (Green and Donovan, 1969). The pisoids are a pale-orange colour and are much paler than those of the Twinhoe Ironshot though of about the same size.

Interpretation

According to Green and Donovan (1969), deposition of the Combe Down Oolite Member took place on a flat or gently shelving area of Fuller's Earth Formation mud (Upper Fuller's Earth Member), and ended with a break in sedimentation and perhaps emergence, as indicated by its hardened and bored upper surface. The Great Oolite Formation, of which the Combe Down Oolite is the basal member, dies out suddenly a little farther to the south of Wellow, a fact that was first established by Lonsdale (1832) but the detail and implications of which have challenged geologists ever since. The Twinhoe Ironshot occurs only near this southern limit and is thus confined to the margin of an extensive area of carbonate shelf deposition. Green and Donovan (1969) concluded, on both lithological and faunal grounds, that the Twinhoe Member, of which the Twinhoe Ironshot is the basal part, was deposited in quieter and probably deeper waters than the Combe Down Oolite Member, and that the Twinhoe Ironshot was deposited in the deepest water. They compared the depositional environment of these members with those described by Kinsman (1964) for the Recent sediments of the Persian Gulf where oolite deltas, relating to a shallow marginal area rather than rivers, are flanked by tidal channels. The deltas lie between high-water mark and a depth of one fathom. Such an analogy compares closely with the views of Klein (1965) who concluded, on the basis of sedimentological studies, that the Combe Down Oolite Member was a limestone deposited by migrating channels on tidal flats. By contrast, the Twinhoe Ironshot closely resembles the character of beds deposited below three fathoms in the Persian Gulf (Kinsman, 1964). Penn and Wyatt (1979) similarly concluded that the ubiquitous occurrence of beds of Twinhoe Member facies between oolites to the north (Great Oolite Formation) and a clay–mudstone sequence (Frome Clay Formation) to the south is consistent with deposition in a zone where the seabed deepened from a very shallow shelf-sea subject to vigorous wave activity to an area of deeper, quieter water in which deposition of calcareous mud predominated. Using data from cored boreholes, Penn and Wyatt (1979) demonstrated the complexity of the interdigitation of facies as shown in (Figure 2.48). According to these authors, the Twinhoe Ironshot correlates southwards with the higher of two interbedded limestone–mudstone units, rich in the brachiopod *Rhynchonelloidella smithi* (Davidson), that occur in the lower part of the Frome Clay Formation (Upper Smithi Limestone herein; see (Figure 2.4)).

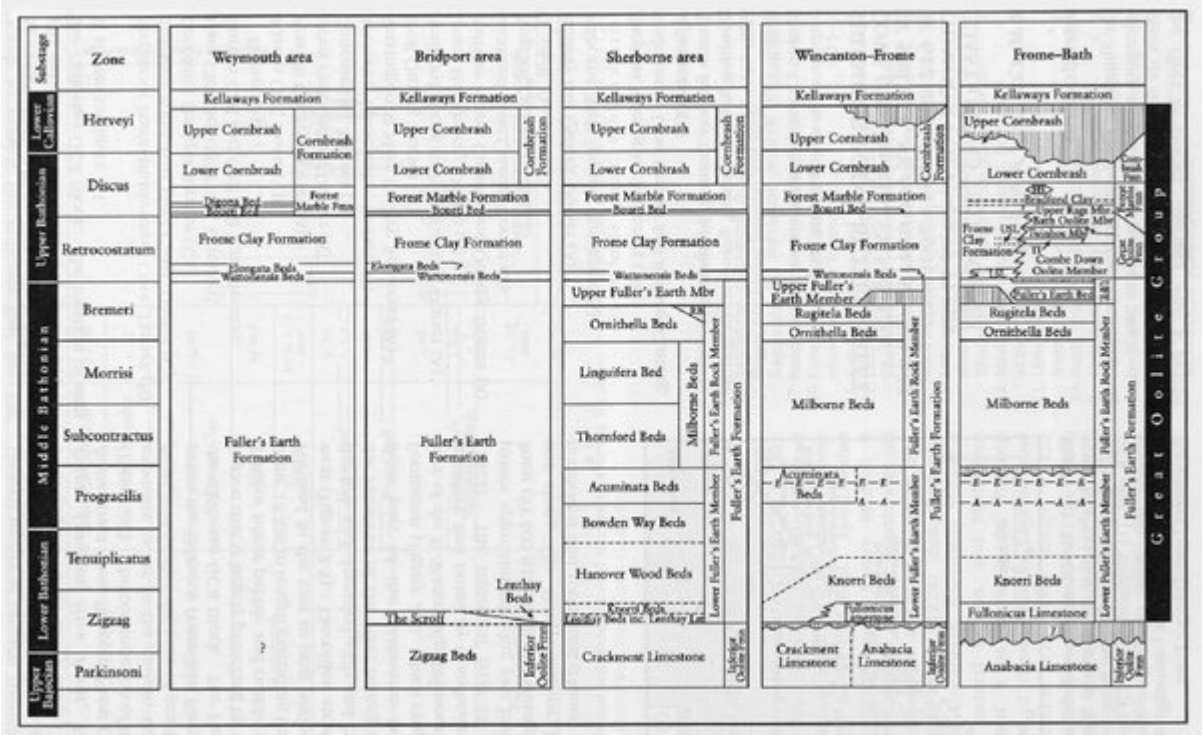
The ammonite fauna of the Twinhoe Ironshot comprises the oppeliids *Oxycerites orbis* (Giebel) (common) (Figure 2.49) and *Paroecotraustes maubeugei* Stephanov, and the perisphinctid genus *Procerites* including *P. twinhoensis* Arkell (Arkell, 1951a, 1958b; Torrens, 1974; Page, 1996a). The specimen from Hinton Hill figured by Arkell (1958b) as *Procerites imitator* (S.S. Buckman) has been re-identified as a possible *Homoeoplanulites* by Page (1996a) who also recorded '*Paroecotraustes*' cf. *variabilis* Elmi from here. This famous and well-documented fauna has for many years been considered to be a classic assemblage of the Upper Bathonian Aspidoides Zone (Arkell,1951b; Torrens, 1974, 1980b), which was renamed the 'Orbis Zone' by Dietl (1982) following the discovery that *Oxycerites aspidoides* (Oppel), which gave its name to the Aspidoides Zone, is an ammonite of the Bajocian–Bathonian boundary beds. Torrens (1980b) described the Twinhoe Ironshot assemblage as the only ammonite fauna of that zone known in Britain. It belongs to the Blanazense Subzone, the older of two subzones recognized within the Orbis Zone elsewhere in the Subboreal Province by Dietl and Callomon (1988). These subzones can equally well be referred to the Retrocostatum Zone of the Submediterranean zonation (see (Figure 2.44); Mangold and Rioult, 1997).

Conclusions

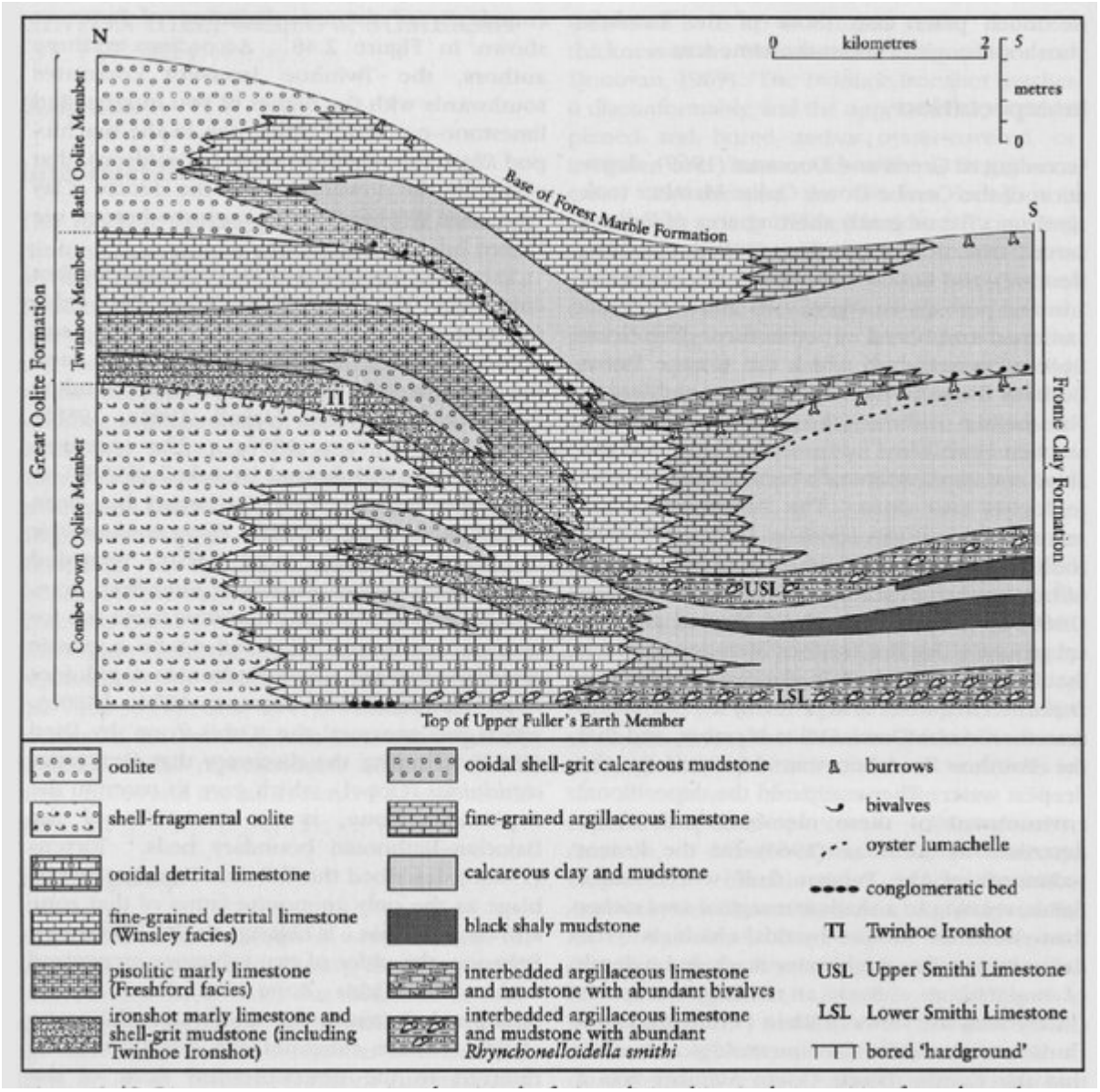
The roadside cutting at Hinton Hill exposes the Twinhoe Ironshot in its type area, which occupies a narrow belt at the southern limit of the carbonate sediments of the Great Oolite Formation. A little farther south, these sediments are replaced by a clay–mudstone succession (Frome Clay Formation). This southward disappearance of the famous oolites of the Bath area has fascinated and challenged geologists for many years. Not only is the Twinhoe Ironshot, with its ferruginized pisoids, of sedimentological and palaeogeographical interest but it has also yielded a zonally diagnostic Upper Bathonian ammonite fauna, which is well documented in the literature. The type locality of the Twinhoe Ironshot at Wellow (or Twinhoe) Quarry is no longer visible and the cutting at Hinton Hill now provides the best extant exposure of a

stratum that is of outstanding importance and significance in the local, regional, national and international classification and correlation of the Upper Bathonian Substage.

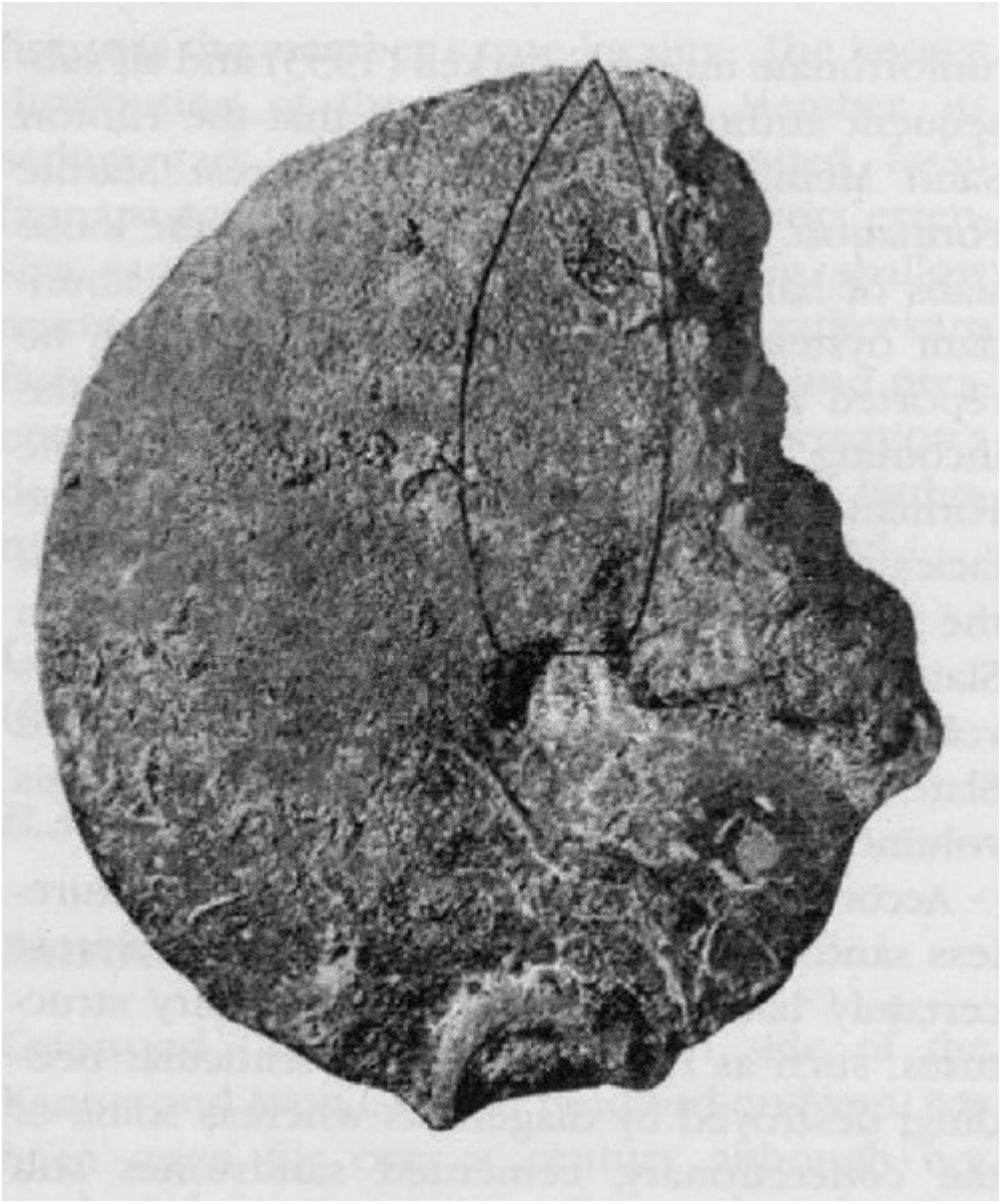
References



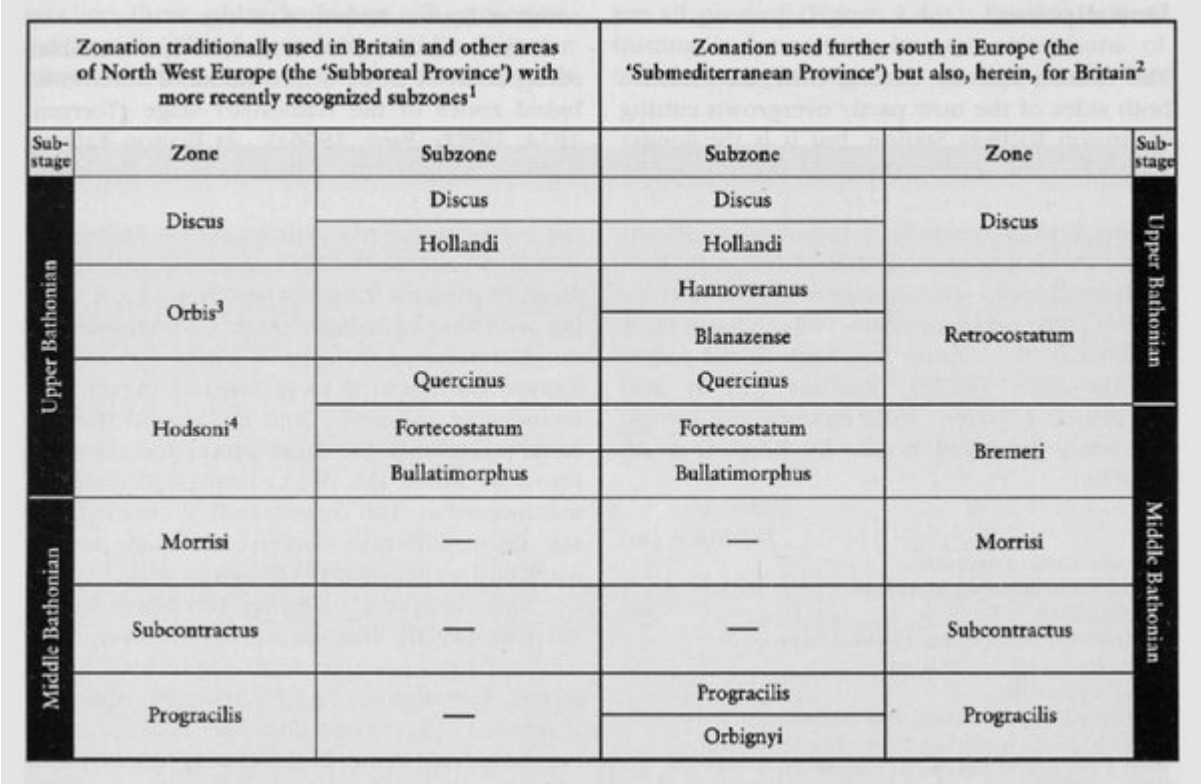
(Figure 2.4) Lithostratigraphical classification of the Great Oolite Group in the Wessex region. Vertical ruled lines indicate non-sequence. (Based on data in Penn and Wyatt, 1979; Torrens, 1980b; Page, 1989, 1996a; Bristow et al., 1995, 1999; and Wyatt, 1998.) (-E-E-E-E- = Echinata Bed; -A-A-A-A- = Acuminata Bed of Penn and Wyatt (1979); HS = Hinton Sand Member; LSL = Lower Smithi Limestone; RB = Rugitela Beds; TI = Twinhoe lronshot; UFE = Upper Fuller's Earth Member; USL = Upper Smithi Limestone.))



(Figure 2.48) Diagrammatic cross-section showing the facies relationships in the transition from the carbonate sediments of the Great Oolite Formation to the argillaceous sediments of the Frome Clay Formation south of Bath. (After Penn and Wyatt, 1979, fig. 17.))



(Figure 2.49) Oxycerites orbis (Giebel) from the Twinhoe Ironshot of Wellow (or Twinhoe) Quarry as figured by Arkell (1951b, text-fig. 17), but shown at c. 60% natural size. (Courtesy of the Palaeontographical Society))



Zonation traditionally used in Britain and other areas of North West Europe (the 'Subboreal Province') with more recently recognized subzones[1]			Zonation used further south in Europe (the 'Submediterranean Province') but also, herein, for Britain[2]		
Sub-stage	Zone	Subzone	Subzone	Zone	Sub-stage
Upper Bathonian	Discus	Discus	Discus	Discus	Upper Bathonian
		Hollandi	Hollandi		
	Orbis[3]		Hannoveranus	Retrocostatum	
			Blanazense		
	Hodsoni[4]	Quercinus	Quercinus		
		Fortecostatum	Fortecostatum	Bremeri	Middle Bathonian
		Bullatimorphus	Bullatimorphus		
Middle Bathonian	Morrisi	—	—	Morrisi	
	Subcontractus	—	—	Subcontractus	
	Progracilis	—	Progracilis	Progracilis	
			Orbignyi		

(Figure 2.44) Comparison of the zonation of the Middle-Upper Bathonian used herein with that previously used in Britain. (Modified from Page, 1996a.) ([1] = Follows Torrens (1980b) emend.; Dietl and Callomon (1988); and Callomon and Cope (1995); Dietl and Callomon (1988) also divided the Orbis Zone into Blanazense and Hannoveranus subzones in the Subboreal Province of Germany; [2] = Follows Mangold (1991); and Mangold and Rioult (1997) but, following Page (1996a), the Procerites quercinus Biohorizon, at the base of the Blazanense Subzone, is elevated to a full Subzone; [3] = Aspidoides Zone of Torrens (1965, 1974, 1980b); [4] = 'Retrocostatum' Zone of Torrens (1974).))