# Doulting Railway Cutting, Somerset

[ST 645 424]–[ST 652 424]

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## Introduction

Doulting Railway Cutting, near Shepton Mallet, Somerset, exposes both Bajocian and Bathonian strata (Figure 2.45), and features in both the Aalenian–Bajocian and Bathonian GCR blocks. The strata comprise the Doulting Conglomerate, Garantiana Beds, Doulting Stone and Anabacia Limestone, overlain by the Fullonicus Limestone and Knorri Beds of the Fuller's Earth Formation (see (Figure 2.3) and (Figure 2.4)). The Bajocian-Bathonian stage boundary lies within the Anabacia Limestone. The cutting is the type section for the Fullonicus Limestone (named by Torrens (1980b) after a species of ammonite; (Figure 2.46)C) which is here the basal unit of the Lower Fuller's Earth Member, Fuller's Earth Formation and Great Oolite Group. The cutting also lies within the type area of the Doulting Conglomerate, Doulting Stone, Anabacia Limestone (named by Richardson (1907a) after a genus of button coral (now *Chomatoseris*); (Figure 2.46)A) and Knorri Beds (named by Richardson (1916a) after a species of small oyster; (Figure 2.46)B). The Anabacia Limestone and Fullonicus Limestone have yielded ammonite faunas indicative of the Lower Bathonian Zigzag Zone and its component subzones. The underlying part of the Inferior Oolite Formation has yielded Upper Bajocian ammonite faunas. As elsewhere in the Mendips area (see Vallis Vale GCR site report, this volume), the Aalenian and Lower Bajocian successions are missing; the Doulting Conglomerate unconformably overlies the Lower Jurassic (Toarcian) Lias Group.

## Description

The section was described by Richardson (1907a) and Torrens (in Donovan (1969)) on which the following details are largely based (Figure 2.45). The lithostratigraphical classification has been amended following Parsons (1975a, 1980a) and Bristow *et al.* (1999) such that the lower part of the Doulting Stone as recognized by Richardson (1907a) and Torrens in Donovan (1969) (Bed 1a herein) is reclassified as Garantiana Beds (= Ragstone of Parsons, 1975a; Ragstones of Parsons, 1980a). The strata dip gently eastwards such that the stratigraphically lowest are exposed in the western part of the cutting, which totals *c.* 730 m in length. Exposure is presently patchy owing to vegetation cover.

| | Thickness (m) |
|---|---|
| **Great Oolite Group** | |
| **Fuller's Earth Formation** | |
| ***Lower Fuller's Earth Member*** | |
| *Knorri Beds* | |
| 4: Clay, brown-yellow; brachiopods including *Acanthothiris doultingensis* Richardson and Walker and *Wattonithyris midfordensis* Muir-Wood; *Catinula knorri* (Voltz); gradational base | 0.60–0.75 |
| *Fullonicus Limestone* | |
| 3i: Cementstone, white, argillaceous; abundant *Procerites fullonicus* (S.S. Buckman) | |
| 3h: Marl, brown; common *Pholadomya lirata* (J. Sowerby) | |
| 3g: Cementstone, white, argillaceous; occasional *C. knorri* | |
| 3f: Marl, brown; occasional *C. knorri* | |
| 3e: Cementstone, white, argillaceous | |
| 3d: Marl, brown; occasional *C. knorri* | |
| 3c: Cementstone, white, argillaceous; *Procerites sp.* | |
| 3b: Marl, brown; *Pholadomya lirata* and *Procerites* sp. | total 0.90 |

| | |
|---|---|
| 3a: Limestone, yellow, iron-stained, rubbly, fine grained; occasional serpulid-encrusted pebbles of Anabacia Limestone (Bed 2 below); abundant fauna including macroconch and microconch *Procerites,* rare C. *knorri* and other bivalves (*Modiolus*)*, Acanthothiris doultingensis,* occasional nerineid gastropods; sharp basal erosion surface | 0.20–0.30 |
| **Inferior Oolite Formation** | |
| *Anabacia Limestone* | |
| 2d: Limestone, brown to white, rubbly, ooidal; top surface bored and heavily iron-stained; upper part stained and fissured with material from Fullonicus Limestone (Bed 3 above); *Chomatoseris* ['*Anabacia*'] *porpites* (*Wm* Smith) throughout; ammonites in top 0.30 m including *Morphoceras, Oxycerites* and *Zigzagiceras;* parkinsoniin ammonites below | 1.60 |
| 2c: Limestone, white or brown, ooidal; full of shell casts including *Chomatoseris porpites,* trigoniid bivalves and *Parkinsonia* | 0.15–0.30 |
| 2b: Limestone, brown to white, rubbly, densely ooidal; top surface deeply bored with long, thin, vertical borings | 0.60–0.70 |
| 2a: Limestone, brown-white, densely ooidal, vertically jointed; bored top surface; upper part very fossiliferous; *Chomatoseris porpites common* throughout | 0.90 |
| *Doulting Stone* | |
| 1b: Limestone, massive, false-bedded; top surface covered with oysters in growth position and extensive *Lithophaga* borings; ooidal in topmost few centimetres; shell-fragmental below with crinoids (sparry crinoidal limestone of Cain, 1968); bored horizons and shell beds rich in casts of trigoniid and other bivalves, and less common gastropods | 8.60 |
| *Garantiana Beds* | |
| 1a: Limestone, less massive than 1b, with marly partings; pectinid bivalves (*Entolium*) abundant in upper part; large nautiloid | 4.80 |
| *Doulting Conglomerate* | |
| Limestone, pale-grey, crystalline; pebbles of yellow-stained limestone with *Lithophaga* borings encrusted inside by serpulids; abundant terebratulid brachiopods (*Sphaeroidothyris*) especially in lower part | 0.40 |
| **Lias Group** | |
| Clay, bluish, micaceous, arenaceous, shaly | seen to 0.60 |

## Interpretation

When Richardson (1907a) first described the section, he referred to the conglomeratic bed at the base of the Inferior Oolite Formation as the 'Upper Trigonia Grit', believing that it was the same as the well-known bed of that name in the Cotswolds (see Chapter 3). Richardson (1916a) maintained this correlation but Parsons' (1975a) subsequent reassessment of the ammonite fauna, including specimens not seen by Richardson, concluded that it indicated the Upper Bajocian Subfurcatum Zone rather than the next youngest Garantiana Zone to which the Upper Trigonia Grit belongs; correlation of the Doulting Conglomerate with the Upper Trigonia Grit of the Cotswolds was therefore considered to be untenable. According to Parsons (1975a), the ammonite fauna of the Doulting Conglomerate comprised *Cadomites deslongchampsi* (d'Orbigny), *Leptosphinctes* aff. *davidsoni* (S.S. Buckman), *Orthogarantiana* sp., *Stephanoceras* sp., *Strenoceras* (*S.*) cf. *subfurcatum* (Zieten) and *Teloceras banksi* (J. Sowerby), and could be reconciled only with the

Banksi Subzone of the basal Subfurcatum Zone in which the co-occurrence of stephanoceratid and perisphinctid ammonites is typical. The Banksi Subzone is generally accepted as marking the base of the Upper Bajocian Substage (Callomon and Chandler, 1990; see (Figure 1.3), Chapter 1). In Richardson's defence, Parsons (1975a) reported that there was little reason to doubt Richardson's (1907a, 1916a) assessment of the ammonites as belonging to the Garantiana Zone on the basis of the specimens available to him at that time, if one assumed that a specimen of *Stephanoceras* was reworked. The fact that the ammonite fauna of the Upper Trigonia Grit in the Cotswolds indicates the upper part of the Garantiana Zone (Acris Subzone) implies that the Late Bajocian transgression north of the Mendips occurred at a slightly later date than south of the Mendips (Parsons, 1975a).

Above the Doulting Conglomerate and representing the Garantiana Zone, Parsons (1975a, 1980a) separated a unit of less massive limestones with marl partings (Bed la of section) from the base of the overlying Doulting Stone. Referred to as the 'Ragstone' or 'Rag Bed' by Parsons (1975a) and the 'Ragstones' by Parsons (1980a), this unit is herein called the 'Garantiana Beds' (Richardson, 1916a) following Bristow *et al.* (1999). Parsons (1975a) reported an ammonite fauna of *Prorsisphinctes* sp. and *Spiroceras* sp. in the Doulting area and deduced these to be forms of the upper part of the Garantiana Zone because of the close similarity of *P.* ('*Glyphosphinctes*')*glyphus* (S.S. Buckman), of which the Ragstone is the alleged type horizon (Buckman, 1925), and *P.* ('*Stomphosphinctes*') *stomphus* (S.S. Buckman), which is known to characterize the upper Garantiana Zone elsewhere (see Burton Cliff and Cliff Hill Road Section GCR site report, this volume). Much of the Subfurcatum and Garantiana zones (equal to six subzones) is thus missing beneath the Garantiana Beds (see (Figure 1.3), Chapter 1).

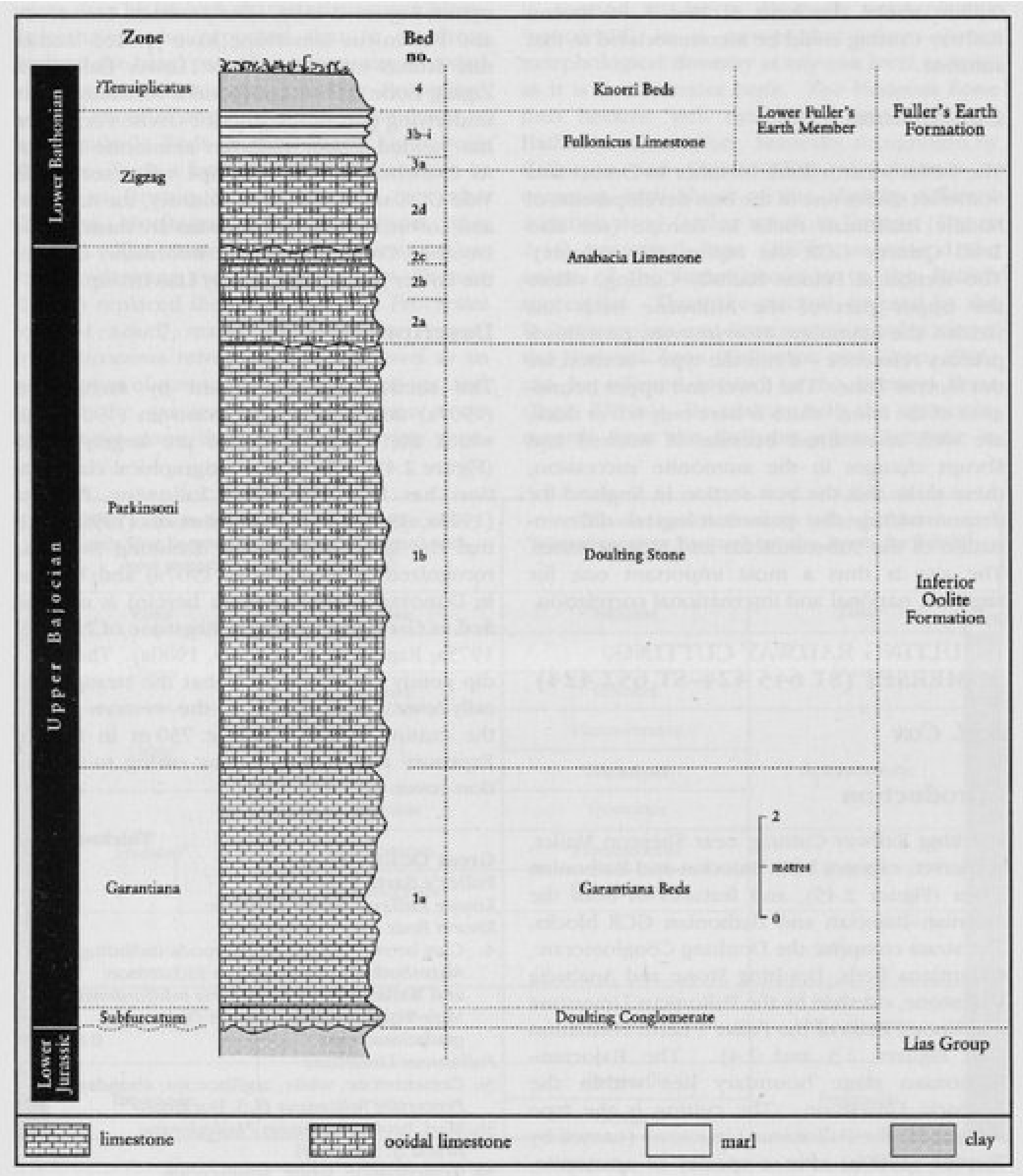
The overlying Doulting Stone has been quarried extensively hereabouts since at least the Middle Ages and was used in the building of Wells Cathedral, Glastonbury Cathedral and all of the older buildings of Doulting village (Savage, 1977). Parsons (1975a, 1980a) implied that both the Doulting Stone and overlying Anabacia Limestone had yielded ammonite faunas indicative of the Parkinsoni Zone but the only ammonites specifically mentioned were those that Torrens (in Donovan, 1969) reported from his beds 2c and 2d of the Anabacia Limestone where the macroconch/microconch pair *Parkinsonia convergens* (*S.S.* Buckman) and *P. pachypleura* (S.S. Buckman) in the lower part of Bed 2d indicate already the basal Lower Bathonian Zigzag Zone, Convergens Subzone (Torrens, 1974; Page, 1996a). The ammonite fauna in the highest part of Bed 2d, including *Bigotites* sp., *Morphoceras* sp. (including '*Ebrayiceras*'cf. *jactatum* S.S. Buckman), *Oxycerites yeovilensis* Rollier and *Zigzagiceras plenum* Arkell, indicates the next youngest Macrescens Subzone (Torrens in Donovan, 1969; Page, 1996a). The Bajocian-Bathonian stage boundary is arbitrarily taken at the base of Bed 2d. Richardson (1907a) had used the term Anabacia Limestone' in a more restricted sense than herein, preferring to recognize the upper part as a separate unit that he called the 'Rubbly Beds'. However, Torrens (1980b) proposed that this term should be abandoned because the beds were not lithologically distinct from Richardson's Anabacia Limestone and they also contained the latter's characteristic button coral.

The overlying Fullonicus Limestone, at the base of the Fuller's Earth Formation, is distinguished from the Anabacia Limestone by a total lack of ooids and a micritic matrix (Torrens, 1980b). The erosive nature of its basal boundary is indicated by pebbles of the Inferior Oolite Formation in its basal bed. Its perisphinctid ammonite fauna of macroconch and microconch variants of *Procerites fullonicus* (S.S. Buckman) (the latter referred to as '*Siemiradzkia*') is one of the two main ammonite faunas recognized in the Yeovilensis Subzone, the youngest of the three subzones of the Zigzag Zone in Britain (Torrens, 1974; Page, 1996a). This *fullonicus* fauna is associated with the small oyster *Catinula knorri,* which occurs in abundance in the overlying Knorri Beds. According to Torrens (1980b), the latter have yielded no ammonites, but they have been tentatively assigned to the Tenuiplicatus Zone on the basis of a specimen of *Asphinctites recinctus S.S.* Buckman that possibly came from the Knorri Beds of Midford, near Bath (Torrens, 1980b).

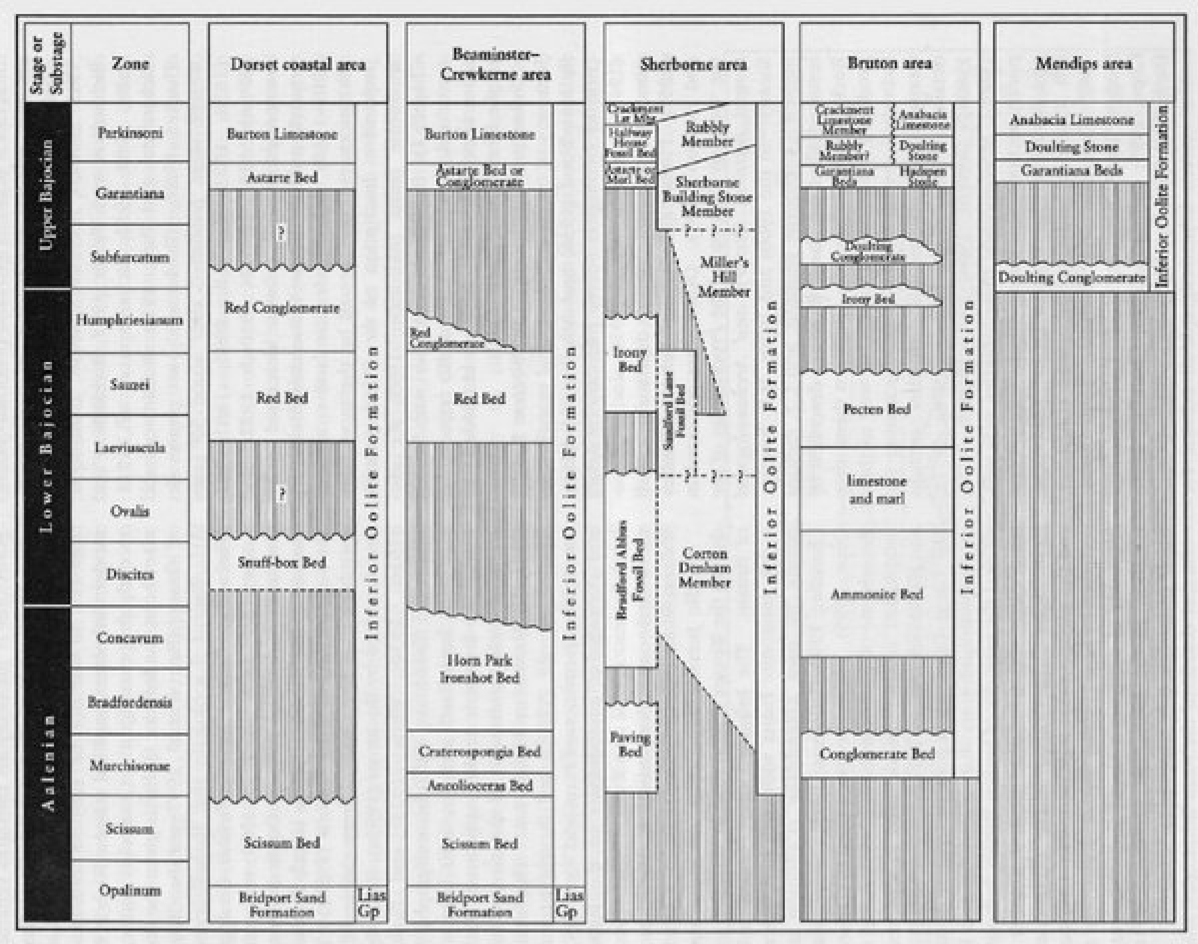
## Conclusions

The section at Doulting Railway Cutting exposes the Bajocian–Bathonian stage boundary in ammonitiferous limestone facies, and provides one of the most important Lower Bathonian exposures in southern England. At the top of the Anabacia Limestone, a hardground, which is probably correlatable over wide areas, marks the boundary between the Inferior Oolite Formation and the Great Oolite Group. The cutting is the type locality for the Fullonicus Limestone, at the base of the Great Oolite Group, and lies within the type area of several of the other exposed stratal units. It is thus an important section for local and regional lithostratigraphy. The fauna that it has yielded, including ammonites characteristic of the oldest documented British Bathonian ammonite assemblage (*Parkinsonia convergens* Biohorizon of the Convergens Subzone and Zigzag Zone; see (Figure 1.4), Chapter 1), enables correlation with areas further afield, and thus endows the site with national and international significance. The influence of the Mendip Axis on sedimentation in the Mid Jurassic Epoch is clearly demonstrated here not least by the absence of Aalenian and Lower Bajocian strata.

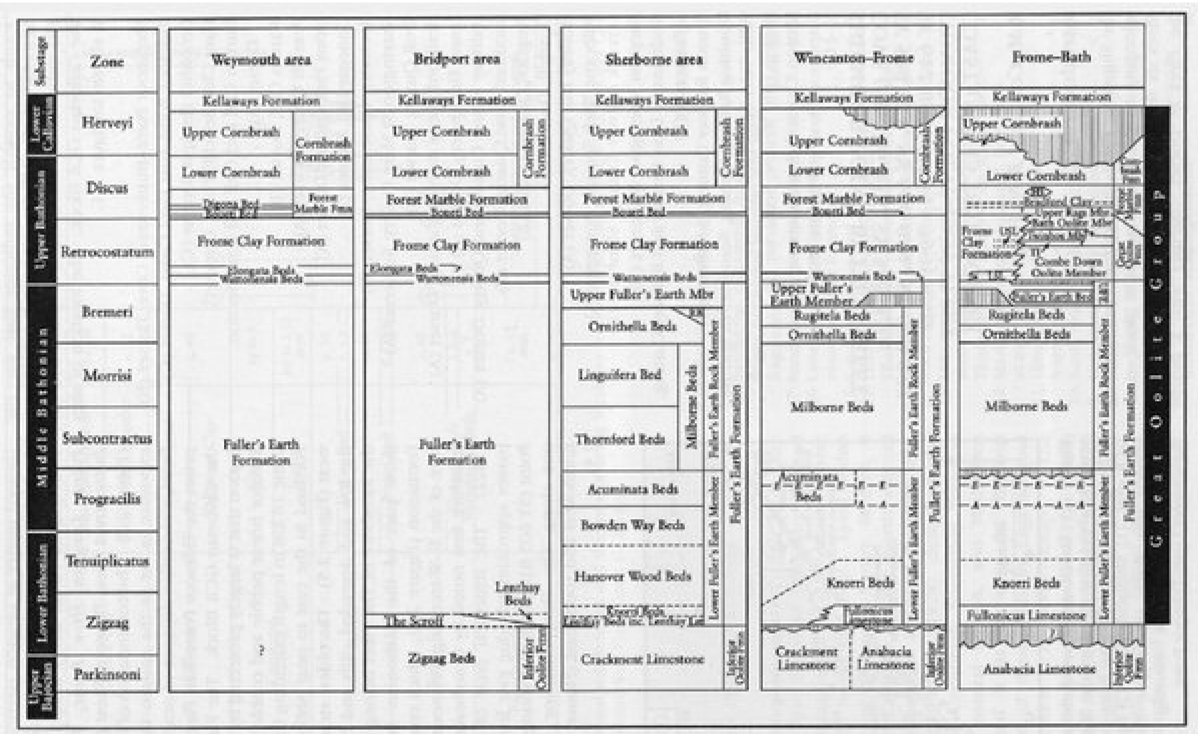
**References**




*(Figure 2.45) Graphic section of the Middle Jurassic succession at Doulting Railway Cutting. For lithologies, see text. Not all non-sequences shown.)*

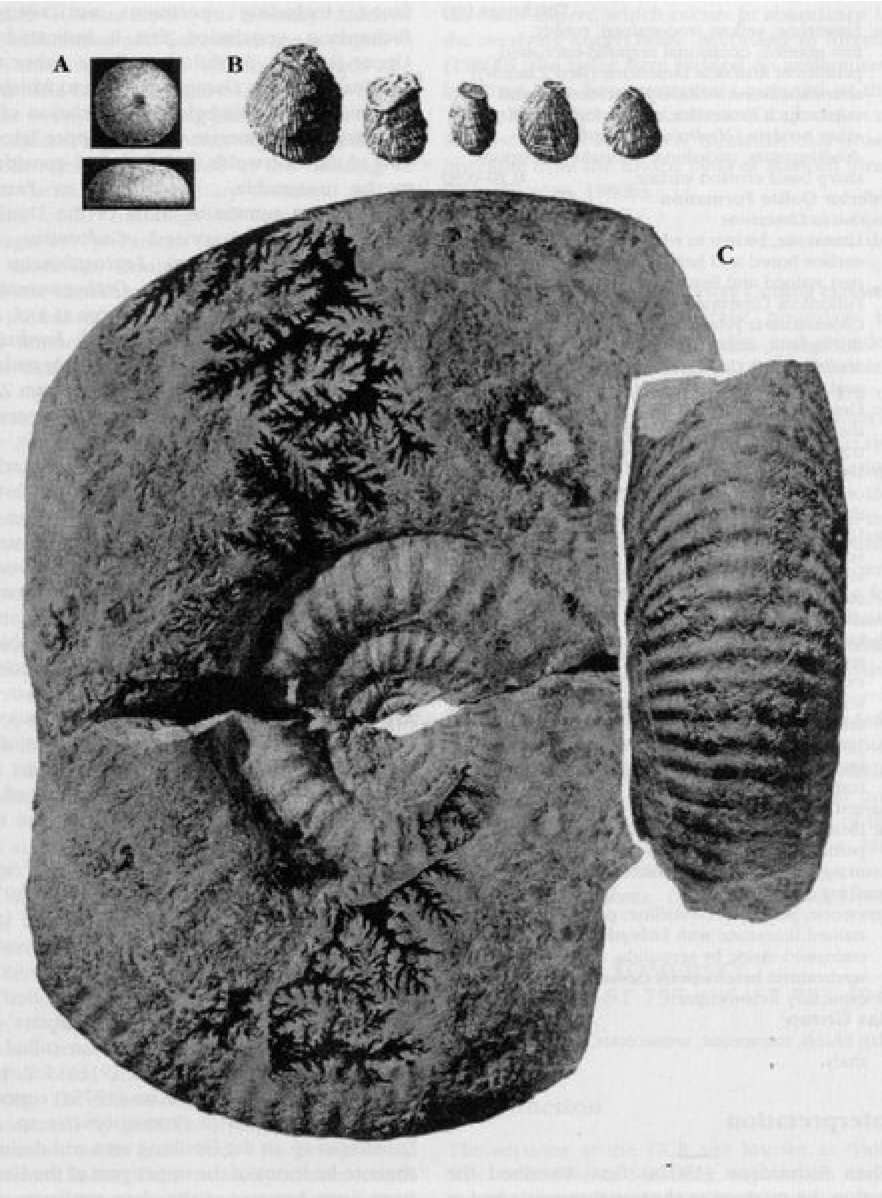



(Figure 2.3) Simplified stratal subdivision of the Aalenian–Bajocian succession of the Wessex region. Vertical ruled lines indicate major non-sequences. Not to scale. (Based on data in Bristow et al., 1995, 1999; Callomon and Cope, 1995; and Parsons, 1980a.))




(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 2.46) (A) Chomatoseris ['Anabacia'] porpites (Wm Smith) (reproduced from Milne Edwards and Haime, 1851, pl. 25, figs 3, 3a; courtesy of the Palaeontographical Society); (B) Catinula knorri (Voltz) from quarries at Doulting (reproduced from Arkell, 1934, pl. 2, figs 8–12; courtesy of the Cotteswold Naturalists' Field Club); (C) holotype of Procerites fullonicus (S.S. Buckman) from Combe Hay near Bath (reproduced from Arkell, 1958a, pl. 24, figs la,b; courtesy of the Palaeontographical Society). All specimens are shown at c. 90% of natural size.)

| Stage | Zone | Subzone |
|---|---|---|
| Aalenian | Concavum | Formosum |
| | | Concavum |
| | Bradfordensis | Gigantea |
| | | Bradfordensis |
| | Murchisonae | Murchisonae |
| | | Obtusiformis |
| | | Haugi |
| | Scissum | |
| | Opalinum | |

| Stage | Substage | Zone | Subzone |
|---|---|---|---|
| Bajocian | Upper | Parkinsoni | Bomfordi |
| | | | Truellei |
| | | Garantiana | Acris |
| | | | Tetragona |
| | | | Dichotoma |
| | | Subfurcatum | Baculata |
| | | | Polygyralis |
| | | | Banksi |
| | Lower | Humphriesianum | Blagdeni |
| | | | Humphriesianum |
| | | | Romani |
| | | Sauzei | |
| | | Laeviuscula | Laeviuscula |
| | | | Trigonalis |
| | | | Sayni |
| | | Ovalis | |
| | | Discites | |

| Stage | Substage | Zone | Subzone |
|---|---|---|---|
| Bathonian | Upper | Discus | Discus |
| | | | Hollandi |
| | | Retrocostatum | Hannoveranus |
| | | | Blanazense |
| | | | Quercinus |
| | Middle | Bremeri | Fortecostatum |
| | | | Bullatimorphus |
| | | Morrisi | |
| | | Subcontractus | |
| | | Progracilis | Progracilis |
| | | | Orbignyi |
| | Lower | Tenuiplicatus | |
| | | Zigzag | Yeovilensis |
| | | | Macrescens |
| | | | Convergens |

| Stage | Substage | Zone | Subzone |
|---|---|---|---|
| Callovian | Upper | Lamberti | Lamberti |
| | | | Henrici |
| | | Athleta | Spinosum |
| | | | Proniae |
| | | | Phaeinum |
| | Middle | Coronatum | Grossouvrei |
| | | | Obductum |
| | | Jason | Jason |
| | | | Medea |
| | Lower | Calloviense | Enodatum |
| | | | Calloviense |
| | | Koenigi | Galilaeii |
| | | | Curtilobus |
| | | | Gowerianus |
| | | Herveyi | Kamptus |
| | | | Terebratus |
| | | | Keppleri |

*(Figure 1.3) Chronostratigraphical subdivisions of the Middle Jurassic Series (for sources, 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. *ruglfer* |
| | Progracilis | Progracilis | Bt-7 | *Procerites imitator* |
| | | | Bt-6 | *Procerites progracilis* |
| | | Orbignyi | Bt-5 | *Procerites/Prohecticoceras* |
| Lower Bathonian | Tenuiplicatus | | Bt-4 | *Asphinctes 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).)*