Roade Railway Cutting, Northamptonshire

[SP 750 525]

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Introduction

Roade Railway Cutting [SP 7534 5145]–[SP 7451 5327], some 20 km north of Bletchley on the main London (Euston) to Birmingham line in Northamptonshire, is 1700 m long and, on average, about 20 m deep (Figure 4.16). The cutting exposes an almost complete section through the Great Oolite Group (see (Figure 4.14)), which rests unconformably on the Northampton Sand Formation and Lias Group. The section comprises two parts: the lower is a steep face in the Blisworth Limestone Formation and older units, whilst the upper is a much less steep batter in the Blisworth Clay and Cornbrash formations. At the north end, the cutting divides into two where the Northampton branch line diverges. The section is particularly important because it shows the rhythmic depositional rock units that are typical of the Rutland Formation. Unfortunately, extensive portions of the cutting are faced with brick to prevent landslip.

A brief description of the section was given by Woodward (1894), but the most comprehensive account is that of Thompson (1924) who was able to examine the complete section made visible during remedial works at the north end of the cutting in the 1890s. Further observations were made by Torrens (1967) on the Blisworth Limestone Formation, and by Bradshaw (1978), in his unpublished thesis, on such parts of the Rutland Formation as were visible, enabling him to demonstrate and identify rhythmic units.

Description

The following description is a composite, abbreviated version of Thompson's (1924) detailed log, and includes observations by Bradshaw (1978) and Torrens (1967); bed numbers are those of Thompson.

	Thickness (m)
Glacial Drift	
Boulder Clay, chalky, with a little gravel or sand	0–6.1
Cornbrash Formation	
2: Limestone, whitish-weathering, hard, very shelly; fossils including the bivalves *Chlamys, Entolium, Meleagrinella, Pleuromya, Rollierella* and trigoniids, as well as *Obovothyris obovata* (J. Sowerby), *Anabacia complanata* Defrance; *Palaeohydatina undulata* (Bean) and serpulids; locally a bed of hard, brown shale (Bed 3) at base	0.74–0.91
Blisworth Clay Formation	
4a: Clay, variegated red and green; thin bed of hard shale *c.* 0.15 m below top; much selenite; *Placunopsis socialis* Morris and Lycett, *Praeexogyra hebridica* (Forbes); purple, oyster-rich clay layer at base (4b)	0.61
4c: Clay, green with shelly layers	0.86
5a: Clay, purple-mottled, with carbonaceous wood-fragments and selenite crystals; layer of red ironstone nodules about middle	2.44
5b: Clay, red, yellow and green variegated, with rootlets; irregular layer of ironstone at base	3.05
6a: Clay, bluish and ferruginous, with carbonaceous debris; 0.15 m oyster-shell debris bed (6b) at base	0.30–0.46

Blisworth Limestone Formation	
Plant Beds	
7a: Limestone, soft, argillaceous; branching, upright plant-stems and crushed fossils	0.30
7b: Limestone, harder and purer than bed above but with vertical plant-stems and similar fossils, though uncrushed	0.46
8a-c: Shaly limestone and hard limestone; three thin beds	0.30
Coral Bed	
9a: Limestone, hard with coral in patches and very extensively bored by *Lithophaga; Thamnasteria* probably dominant coral; passing down into a 0.23 m-thick basal marl bed (9b)	0.61
10: Limestone, hard, flaggy, ooidal, unfossiliferous	1.47
Upper Terebratula Bed	
11: Limestone, ooidal, fossiliferous, with common bivalves; also *Clypeus* and common ?epithyrid brachiopods identified by S.S. Buckman as *Kutchithyris* aff. *circumdata* Deslongchamps	0.30
12: Limestone, cross-bedded, shell-detrital; variable thickness	0.23
'*Nerinea*' *Bed*	
13: Limestone, ooidal, highly fossiliferous; gastropods, mainly in middle; large terebratulids, *Epithyris?* and *Burmirhynchia?;* also corals (*Chomatoseris*)	0.56
14: Limestone, darker, bluish, more argillaceous than bed above	0.15
Sharpi Beds	
15a-b: Limestone, hard, blue-hearted, with *Kallirhynchia sharpi* Muir-Wood and terebratulids, *Pholadomya* and other bivalves	0.53
15c: Limestone, argillaceous, with abundant *K. sharpi,* terebratulids and *Pholadomya;* nautiloid and *Acrosalenia* also recorded	1.98
Rutland Formation	
16a: Mudstone, blue, shaly, sandy, with abundant rootlets	0.46–0.91
16b-c: Clay, dark-green, with abundant rootlets; darker green in lower 0.61 m with *Corbulomima*	1.47
16d: Clay, pale-green, calcareous, very fossilferous; *Corbulomima, Eomiodon angulatus* (Morris and Lycett), *Modiolus imbricatus* J. Sowerby, *Cuspidaria ibbetsoni* (Morris), *Placunopsis socialis* Morris and Lycett	1.60
17e: Clay, dark-green, laminated, very fossiliferous; *P. socialis* dominant	0.15
18f: Clay, dark-blue, with rootlets, ferruginous near base; passing down into	0.91
19a: Marl, shelly, rich in oysters	0.53
19b-c: Limestone, blue-hearted, shelly; *Astarte, Protocardia, Pholadomya, P. socialis*	1.07
20d: Limestone, blue, very hard, poorly fossiliferous	0.46
20e: Limestone, argillaceous, ferruginous in part; becoming shelly mudstone towards base; layer of oysters at base	0.41
Stamford Member	

21: Clay, purple; rootlets and plant debris	0.15–1.04
22: Sand, white; rootlets; irregular base	0.30

Northampton Sand Formation below

Interpretation

The Rutland Formation, which unconformably overlies the uppermost sands ('Variable Beds') of the Northampton Sand Formation, is characterized by a succession of rhythmic depositional units, each of which is ideally capped by a rootlet bed (Bradshaw, 1978). They are regarded as shallowing-upwards, regressive units deposited in a shallow lagoon, marginal to the London Landmass, in which deposition of muddy sediment was dominant. The clays of each unit become increasingly organic and increasingly charged with carbonaceous plant-debris upwards; the final rootlet bed denotes exposure of the substrate as a nearshore saltmarsh environment became established. Bradshaw (1978) recognized the presence in Roade Railway Cutting of his Wellingborough and Cranford rhythms (beds 18f-20e and 16b-17e), which overlie the basal Stamford Member rhythm (beds 21–22). An upper 'Third Rhythm' may be regarded as his Finedon Rhythm (Bed 16a). The basal sands of the Stamford Member are the local representative of an extensive deposit, known as the 'White Sands' (now Horsehay Sand Formation; see Horsehay Quarry GCR site report, this volume), which extends westwards to near Banbury and, in the subcrop, perhaps as far south as Wallingford (Fenton *et al.,* 1994). The fauna of the Rutland Formation, dominated by bivalves, indicates largely brackish-water depositional conditions.

The general character of the Blisworth Limestone Formation in Roade Railway Cutting is comparable to that of the quarry at Blisworth Rectory Farm (see GCR site report, this volume), about 3 km to the west (see (Figure 4.14)). The lithology and fauna of the formation represent a change to mainly carbonate mud-sand sedimentation in a fully marine environment. A number of very fossiliferous beds reflect flourishing, mainly epifaunal associations in which brachiopods, bivalves and corals abound, suggesting a relatively stable substrate. The Sharpi Beds at the base of the formation, with their diagnostic brachiopod, constitute a regionally correlatable unit (Torrens, 1967).

The Digonoides Beds, present at Blisworth Rectory Farm (see GCR site report, this volume) are absent in Roade Railway Cutting; the occurrence of a 'Nerinea Bed' (cf. Blisworth Rectory Farm, Bed 10) close above the Sharpi Beds suggests an erosional interval between the two, accounting for the absence of the Digonoides Beds. Other stratigraphical breaks in the succession are indicated by the bored hard-ground at the top of the 'Coral Bed' and by the rootleted 'Plant Beds' that cap the formation.

The Blisworth Clay Formation represents a return to dominantly mud deposition in the low-energy, protected waters of a nearshore lagoon. The occurrence of carbonaceous plant-debris suggests proximity to the London Landmass. The bright, variegated colours of the clays result from varying states of oxidation of iron compounds; ferruginous layers and bands of ironstone nodules indicate a considerable input of iron-rich compounds. Rootlet beds in the lower part of the formation indicate the establishment of saltmarsh conditions. Fossils are uncommon and are generally confined to sporadic oyster-rich bands, perhaps representing occasional marine incursions into a region of dominantly brackish-water deposition.

Only the basal 1 m or so of the Cornbrash Formation is preserved beneath glacial boulder clay; it was deposited in an extensive shallow, carbonate shelf-sea, probably subject to only gentle currents.

Although the Rutland Formation of the East Midlands yields no diagnostic fossils, correlation with corresponding strata of the carbonate shelf succession farther west in Oxfordshire indicates that it ranges in age from the Lower Bathonian Zigzag Zone to the Middle Bathonian Subcontractus Zone (Wyatt, 1996a,b). However, the absence of the Ketton, Clipsham and Casterton rhythms (see Ketton Quarry GCR site report, this volume) means that the Tenuicostatum Zone is unrepresented. The Sharpi Beds at the base of the Blisworth Limestone Formation in Northamptonshire are considered to be the lateral equivalent of the Excavata Bed, which caps the Shipton Member of the White Limestone Formation in Oxfordshire and which belongs to the Morrisi Zone. Cripps' (1986) record of the gastropod *?Aphanoptyxis excavata* Barker near the top of the Sharpi Beds in the cutting supports this correlation. Since, at Roade Railway Cutting, the Sharpi Beds rest directly on beds of the Rutland Formation, which are assigned to the Finedon Rhythm, there must be a non-sequence between the two.

The occurrence of the ammonite *Procerites quercinus* (Terquem and Jourdy) in beds close above the Sharpi Beds in the Northampton–Blisworth area (see Blisworth Rectory Farm GCR site report, this volume) indicates the lowest part of the Retrocostatum Zone but, as noted above, the equivalent beds, as well as the Digonoides Beds, are absent in Roade Railway Cutting (Figure 4.14).

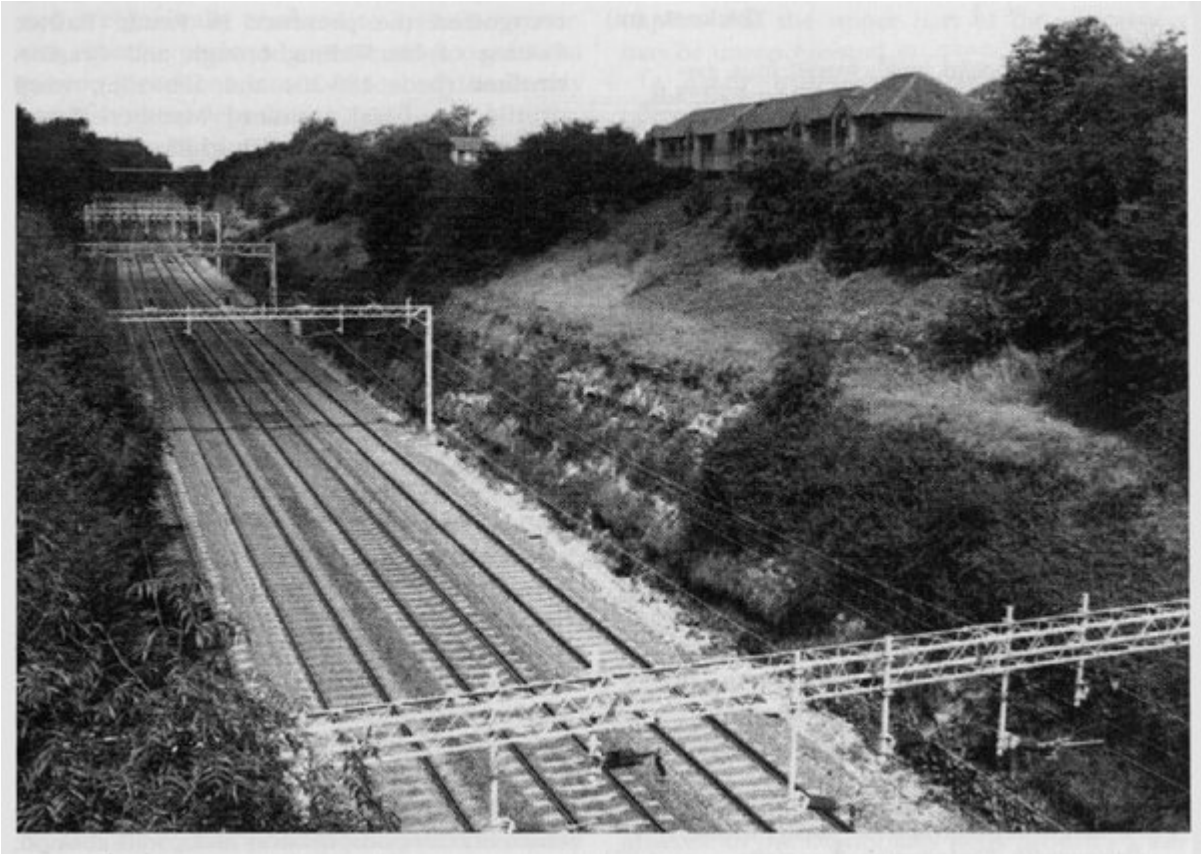
In the absence of an age-diagnostic fauna, correlation of the Blisworth Clay Formation is debatable. It has traditionally been equated with the Forest Marble Formation of Oxfordshire (Hollandi Subzone), but Cripps (1986) and Wyatt (1996a,b) have suggested its equivalence to the Bladon Member of the White Limestone Formation in Oxfordshire (Retrocostatum Zone); recent work suggests that both these units may be represented (Sumbler, in press) but a considerable non-sequence between the Blisworth Clay and the Cornbrash formations implies that the upper part of the succession may be unrepresented.

A major, widespread, marine transgression preceded deposition of the Cornbrash Formation. The occurrence of *Obovothyris obovata* in Bed 2 identifies it as the Lower Cornbrash.

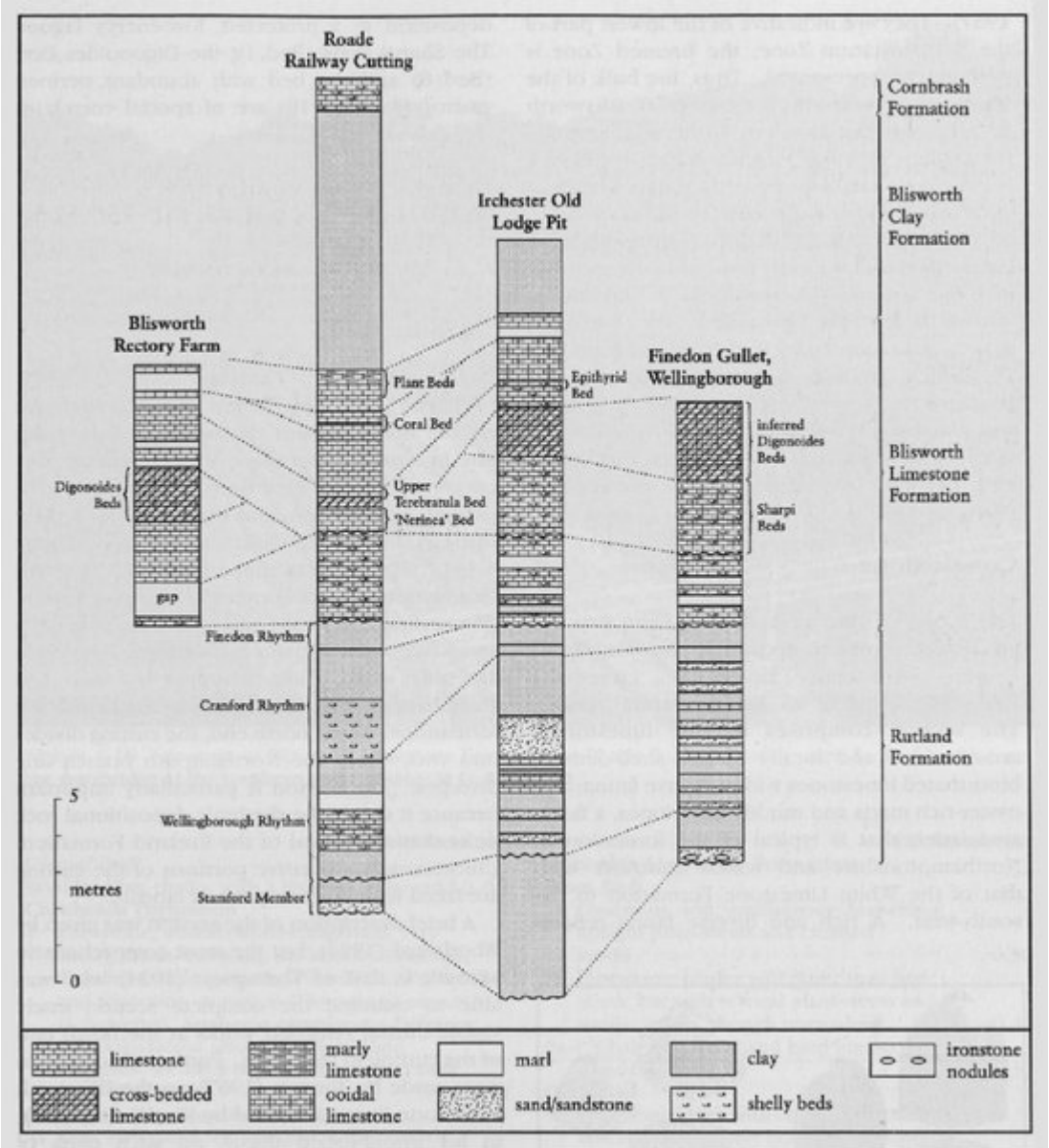
Conclusions

Roade Railway Cutting exhibits one of the most complete Bathonian sections in the region, potentially displaying sections in the Rutland, Blisworth Limestone, Blisworth Clay and Cornbrash formations, together ranging from the basal Lower Bathonian Zigzag Zone to the Upper Bathonian Discus Zone. The rhythmic depositional units of the Rutland Formation, capped by distinctive rootlet beds, are of considerable importance for regional correlation. The Blisworth Limestone Formation in the cutting is representative of the East Midlands generally and, together with that of the nearby quarry at Blisworth Rectory Farm (see GCR site report, this volume), provides an essential basis for correlation with the corresponding Middle to Upper Bathonian succession of Oxfordshire. The absence of the Digonoides Beds provides a key to a probable local non-sequence above the Sharpi Beds in the Northampton area. Other stratigraphical breaks in the Blisworth Limestone Formation provide the potential for recognition and extrapolation of the rhythmic units established in the White Limestone Formation of Oxfordshire. The range of lithologies and faunas in the section provides a basis for reconstruction of a variety of Bathonian depositional environments.

References



(Figure 4.16) Exposure of Blisworth Limestone Formation at Roade Railway Cutting; view looking north from the overbridge at the southern end. (Photo: M.G. Sumbler.))



(Figure 4.14) Correlation of GCR sites between Blisworth and Wellingborough (Blisworth Rectory Farm, Roade Railway Cutting, Irchester Old Lodge Pit and Finedon Gullet).)