Cranford St John, Northamptonshire

[SP 924 764]

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Introduction

The GCR site at Cranford St John, Northamptonshire, is a 1 km-long former ironstone quarry face, up to 10 m high and extending from [SP 9210 7677] in the north-west to [SP 9287 7607] in the south-east (Figure 4.20). It exposes a succession that includes the whole of the Rutland Formation and most of the overlying Buisworth Limestone Formation (Figure 4.21). The section exhibits the rhythmic depositional character of the freshwater and brackish-water Rutland Formation, in which each rhythm is capped by a rootlet bed; it is the type section of the Cranford Rhythm. Along the face, the uppermost Finedon Rhythm uniquely shows a facies change into the basal unit of the Blisworth Limestone Formation (Figure 4.22). The fauna of the latter is diverse and abundant. The section is important in interpreting the lateral facies changes in the Bathonian succession in the East Midlands. The section was first described in detail by Torrens (1967) and subsequently by Bradshaw (1978) and Cripps (1986) in unpublished theses.

Description

The following description is based mainly on Torrens (1967), Bradshaw (1978) and Cripps (1986). Bed numbers are those of Torrens (1967).

	Thickness (m)
Blisworth Limestone Formation	
22: Limestone, flaggy-weathering	0.15–0.30
21: Marl, brown, shelly; abundant *Praeexogyra hebridica* (Forbes)	0.61
19–20: Limestone, ooidal; upper part flaggy, rubbly, fossiliferous below; *Homomya, Pholadomya* and *Praeexogyra*	0.84–0.91
18: Marl, dark-brown, ooidal; *P. hebridica subrugulosa* Morris and Lycett	0.23
16–17: Limestone, creamy-white, sparsely ooidal, shell-detrital; ripple cross-lamination near top	0.30
15: Limestone, white, soft, micritic; upper part marly	0.30
14: Limestone, similar to 15 but rubbly and shelly; many bivalves (*Anisocarodia, Modiolus, Pholadomya, P. hebridica* (abundant), *P. hebridica subrugulosa, Pseudolimea* and *Rollierella*), *Digonella digonoides* S.S. Buckman, *Epithyris*	0.23
13: Marl, brown, with abundant oysters; distinctly pocketed base	0.15–0.23
12: *Digonoides Beds:* Limestone, whitish, micritic, ooidal, rubbly, fossiliferous; bivalves (*Anisocardia, Limatula, Modiolus, Pholadomya, P. hebridica* and *Trigonia*), *Digonella digonoides, Epithyris, Acrosalenia, Nucleolites, Holectypus*	0.30
8–11: Limestone, shell-fragmental, rubbly; two thin, persistent marl-beds; sharp, planar base	1.14–1.22
7: Mudstone, dark-grey, carbonaceous, shaly (0.15 m), overlying rubbly, shelly limestone; abundant *P. hebridica* throughout (2.21 m)	2.36

6: Limestone with *Clypeus*	0.20
5: Clay, dark-grey	0.20
1–4: *Sharpi Beds:* Interbedded argillaceous, micritic, shell-detrital limestone and marl; abundant *Kallirhynchia sharpi* Muir-Wood, *Anisocardia, Eocallista, Modiolus, Pholadomya, Praeexogyra, Rollierella;* erosional base	1.80
Rutland Formation	
Finedon Rhythm: Clay, silty, interlayered with sand in lower part; rootlets at top; erosional base	0.60
Cranford Rhythm: Clay, dark-grey, silty, carbonaceous; convoluted contact with underlying bed	0.70
Clay, pale-green-weathering, slightly silty; '*Corbula*' locally common	0.50
Clay and silt, interlaminated, varicoloured; erosional base	0.15
Wellingborough Rhythm: Clay, silty; rootlets	0.10
Sandstone, argillaceous, quartzose, fine grained, bioturbated	0.65
Clay, silty, and sand, irregularly interlaminated	0.50
Sandstone, as above	0.95
Clay, silty, and sand, irregularly interlaminated	0.25
Sand, cross-laminated and ripple-bedded; clay-draped foresets; erosional base, channelled into underlying bed	0.15–0.60
Stamford Member	
Clay, black, slightly silty, carbonaceous; abundant rootlets	up to 1.10
Sand, fawn, fine grained, clayey, trough cross-bedded in upper part; unevenly laminated and bioturbated in lower part	*c.* 2.5
Northampton Sand Formation	

Interpretation

A lengthy period of non-deposition and/or erosion occurred between deposition of the Northampton Sand and Rutland formations. Renewed sedimentation was initiated by a transgression that flooded the gently graded coastal plain of the London Landmass, producing a shallow-water, offshore shelf with restricted access to open marine waters, but subject to a high input of freshwater coastal run-off. The basal clayey sands of the Stamford Member, deposited in this regime, were regarded by Bradshaw (1978) as the distal sediments of a low-lying freshwater coastal swamp. The prograding backswamp deposits are represented by the overlying dark, organic, rootleted clays.

The succeeding brackish-water deposits of the Rutland Formation form three regressive, rhythmic, depositional units, each initiated by a marine transgression and terminated by coastal progradation, which led to the formation of nearshore saltmarsh deposits penetrated by rootlets; these cap the units. The dark-grey clay with convoluted base at the top of the Cranford Rhythm is believed to represent a laterally extensive storm deposit. The three rhythms that, to the north-east, at Ketton Quarry (see GCR site report, this volume), form the base of the rhythmic sequence below the Wellingborough Rhythm, are absent at Cranford St John, having been overstepped by the latter (see (Figure 4.33), see Ketton Quarry GCR site report). The upper part of the Finedon Rhythm, which caps the Rutland Formation, exhibits a unique facies change along the quarry face from a silty clay with interlayered sand at the southeastern end of the section into a facies comparable to much of the overlying Blisworth Limestone Formation; a transition back into clay occurs at the north-western extremity of the face. The restricted fauna of the Rutland Formation is dominated by brackish-water bivalves; in contrast to Irchester Old Lodge Pit (see GCR report, this volume), there are no beds yielding fully marine fossils, indicating that Cranford St John lay beyond the limit of marine incursions during Wellingborough Rhythm times.

A further marine transgression introduced a period of fully marine, carbonate deposition in a shallow-water, protected lagoon, to produce the Blisworth Limestone Formation. The occurrence in it of less pure limestones than those typical of

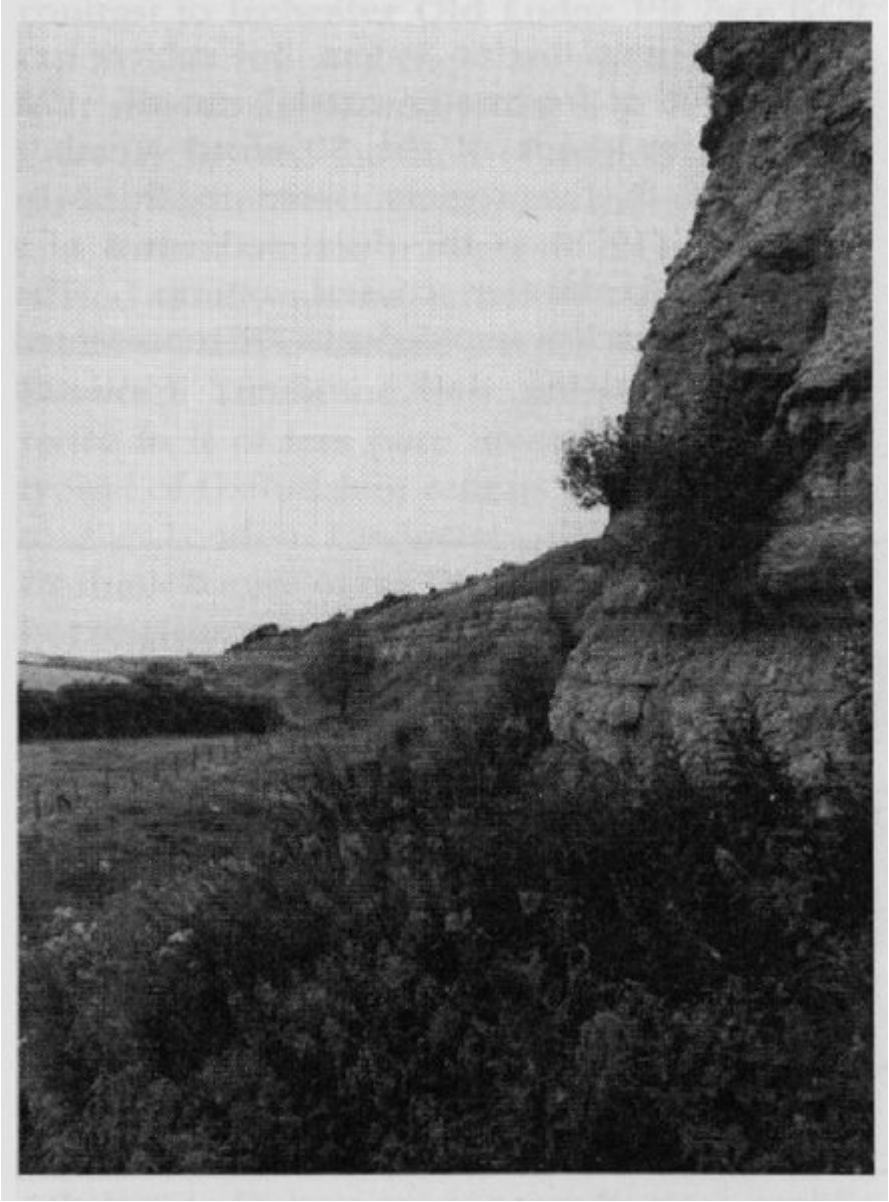
Oxfordshire reflects greater proximity to the London Landmass. The well-defined rhythmic nature of the Oxfordshire succession is not so clearly recognizable in the more marginal district hereabouts where, locally, only partly preserved or missing rhythmic units are characteristic. Nevertheless, erosional surfaces at the top of the Sharpi Beds (beds 1–4) and the Digonoides Beds (Bed 12), and a carbonaceous, shaly mudstone (at the top of Bed 7), probably represent the tops of rhythmic units, of which the Sharpi Beds, at least, are regionally persistent. Much of the succession yields a prolific fauna, suggesting the predominance of only moderate current activity and relatively stable substrates. Oysters are apparently more prolific than in localities to the south-west, presaging their dominance in districts farther north, where the term 'Longthorpe Member' has been used for beds above the Sharpi Beds (Cripps, 1986).

The Rutland Formation contains no age-diagnostic fossils and dating relies on long-range correlation with coeval strata in the Cotswolds, using persistent, rhythmic, depositional units (Wyatt, 1996a,b). Thus, the formation is inferred to range from the Lower Bathonian Zigzag Zone to the Middle Bathonian Morrisi Zone. The absence of the Ketton, Clipsham and Casterton rhythms suggests that the Tenuiplicatus Zone is unrepresented. The basal Sharpi Beds of the Blisworth Limestone Formation are assigned to the Morrisi Zone by comparison with other sections to the west (see particularly Stratton Audley GCR site report, this volume). By the same means, the remainder of the formation is inferred to belong to the Upper Bathonian Retrocostatum Zone.

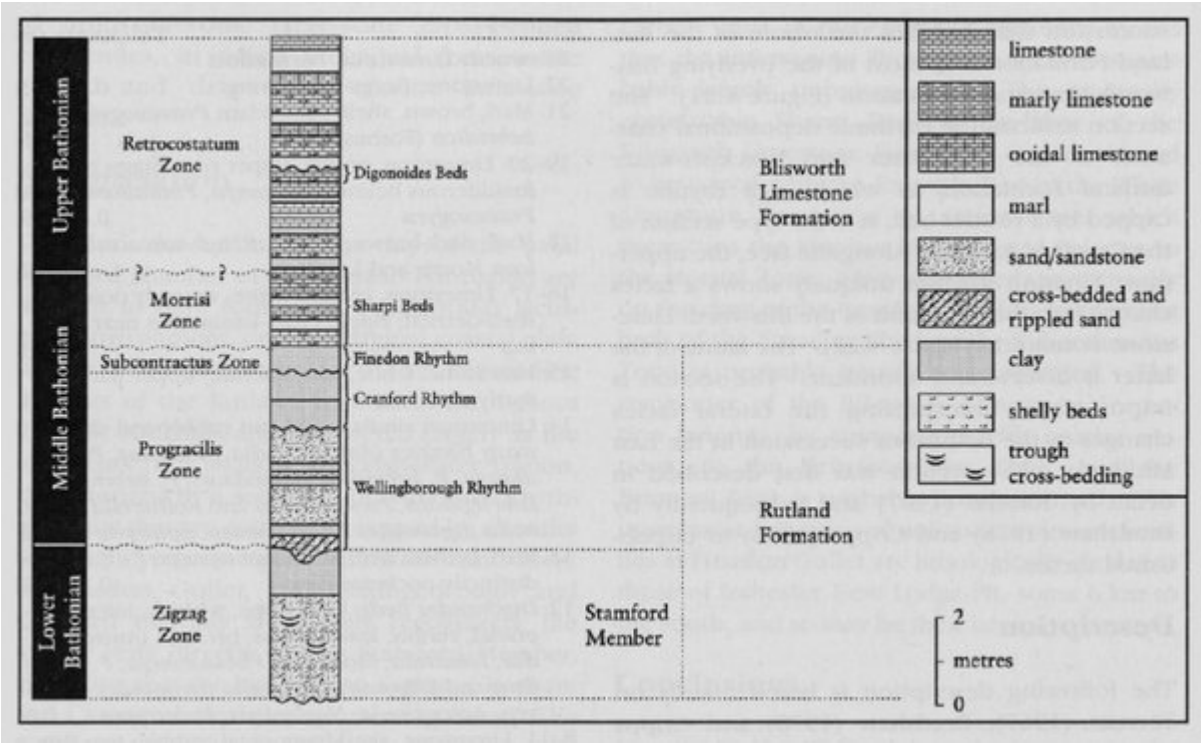
Conclusions

The Bathonian section at Cranford St John includes the whole of the Rutland Formation and most of the Blisworth Limestone Formation, and ranges from the Zigzag Zone to the ?Retrocostatum Zone. It is of particular value for showing a stratigraphical succession that is transitional between that to the north (e.g. Ketton Quarry, see GCR site report, this volume) and that to the south-west (e.g. Irchester Old Lodge Pit, see GCR site report, this volume). It provides an interesting contrast with Ketton Quarry in that the lowest three units of the Rutland Formation rhythmic sequence there are cut out by the Wellingborough Rhythm, which, at Cranford St John, locally has a strikingly channelled base. The section is also significant for exposing the Wellingborough Rhythm immediately beyond the limit of marine limestone interbeds (Wellingborough Member) that are typical farther south (see Finedon Gullet and Irchester Old Lodge Pit GCR site reports, this volume). A dark, freshwater clay at the top of the Cranford Rhythm (for which this is the type section) is believed to represent a laterally extensive storm deposit. The overlying Finedon Rhythm exhibits a unique facies change into the base of the Blisworth Limestone Formation. The Sharpi Beds and the Digonoides Beds, both of correlative value, are present in this section.

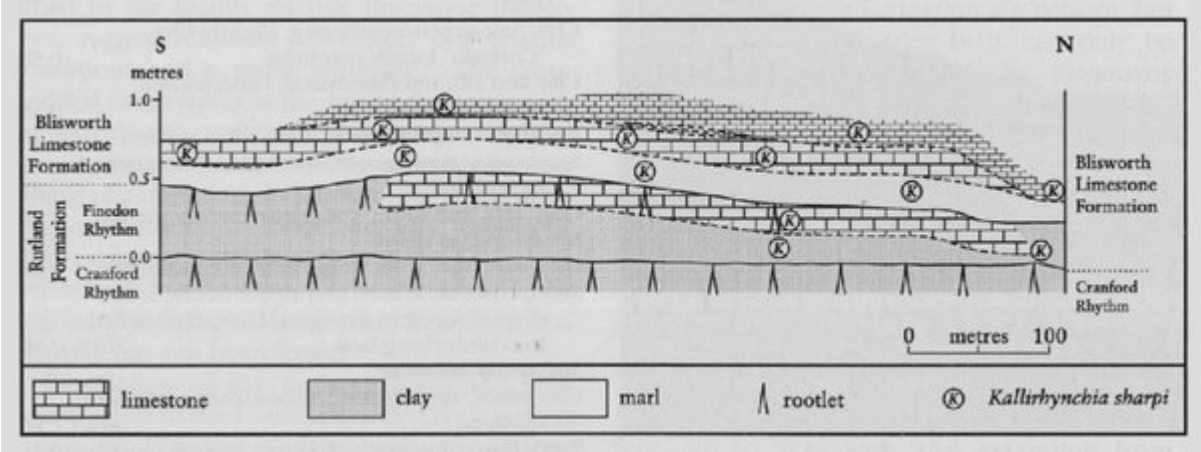
References



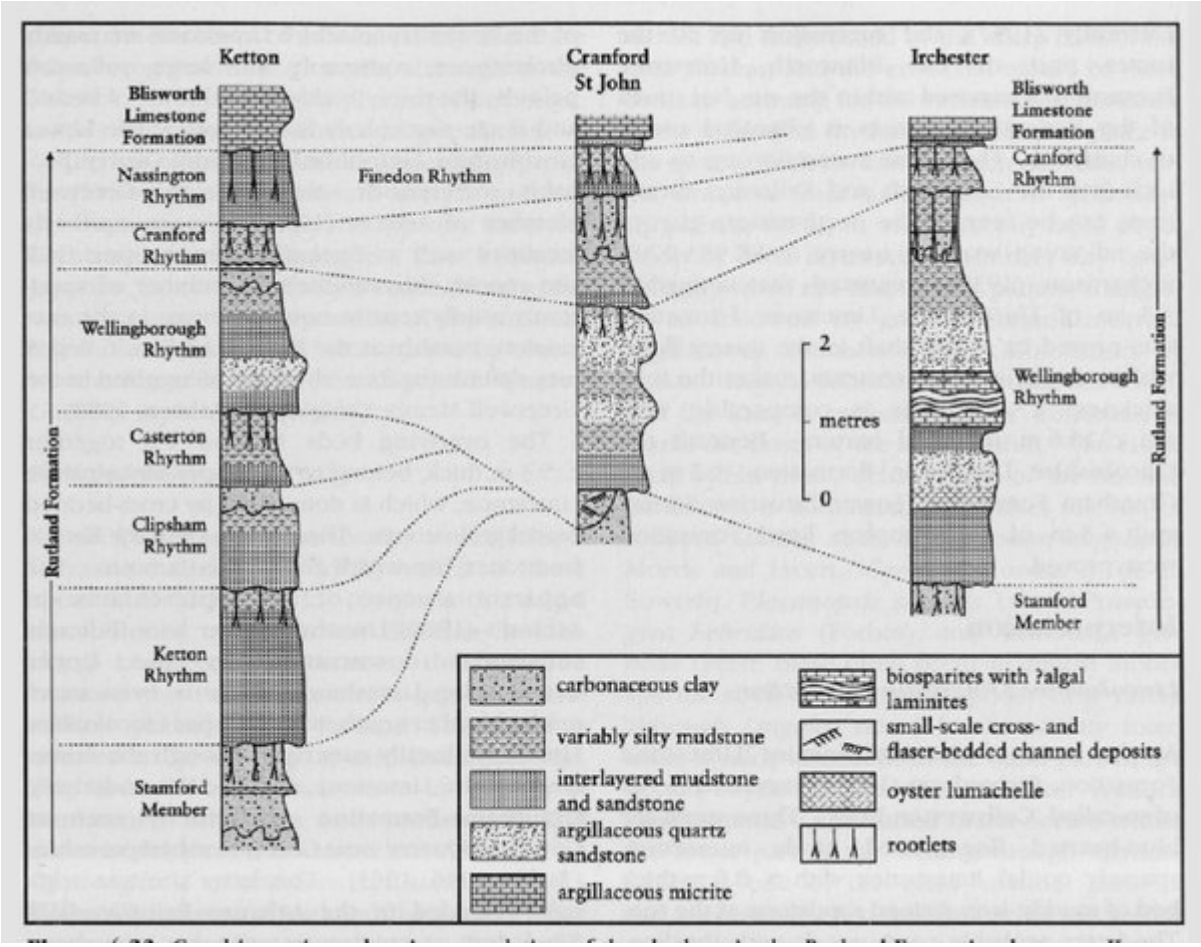
(Figure 4.20) Looking south at the Cranford St John GCR site; the Blisworth Limestone Formation overlies the Rutland Formation. (Photo: M.G. Sumbler.))



(Figure 4.21) Graphic section of the Bathonian succession at Cranford St John.)



(Figure 4.22) Facies changes at Cranford St John where the Finedon Rhythm of the Rutland Formation passes into the Blisworth Limestone Formation. (After Bradshaw and Cripps, 1983, fig. 11.))



(Figure 4.33) Graphic sections showing correlation of the rhythms in the Rutland Formation between Ketton, Cranford St John and Irchester. (After Bradshaw and Cripps, 1983, fig. 9.))