Drewton Lane Pits, East Riding

[SE 918 333], [SE 920 329]

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Introduction

The GCR site known as 'Drewton Lane Pits' is located to the east of the A1034 road *c.* 2 km north of South Cave in the East Riding of Yorkshire (formerly Humberside) (Figure 4.49). It comprises two small quarries: Kettlethorpe Quarry [SE 918 333], which has long been disused; and the more famous South Cave Station Quarry [SE 920 329], which is larger and worked periodically (Figure 4.53) and (Figure 4.54). The section at Kettlethorpe Quarry has been noted by Walker (1972), Penny and Rawson (1969) and Page (1988), and that at South Cave Station Quarry by De Boer *et al.* (1958), Penny and Rawson (1969), Walker (1972), Brasier and Brasier (1978) and Page (1988). Quarrying at the latter site has now partly destroyed the old Drewton Railway Cutting that was referred to by Keeping and Middlemiss (1883), Dakyns *et al.* (1886) and Fox-Strangways (1892). South Cave Station Quarry is the type locality of the Cave Rock Member of the Kellaways Formation (Page, 1989). This member yields a rich molluscan fossil fauna, including ammonites, and the site is a designated reference section for the Enodatum Subzone of the Lower Callovian Calloviense Zone.

Description

The most detailed description of South Cave Station Quarry is that of Brasier and Brasier (1978). Records of Kettlethorpe Quarry vary in detail and the only full description is that of Page (1988). A composite succession for the two sites is given below; details of the Oxford Clay Formation are based on Drewton Railway Cutting (Keeping and Middlemiss, 1883) and bed notation in the Kellaways Sand Member follows Brasier and Brasier's (1978) record of South Cave Station Quarry shown in (Figure 4.54).

	Thickness (m)
Oxford Clay Formation	
Clay, dark bluish-grey, becoming sandy near base	*c.* 2.4–3
Kellaways Formation	
Cave Rock Member	
Sandstone, orange-brown to pale-yellowish, often decalcified but locally calcareous and flaggy with calcite-cemented, shelly concretions containing scattered white ooids; kosmoceratid (*Sigaloceras*), perisphinctid (*Anaplanulites*) and cardioceratid (*Cadoceras*) ammonites	*c.* 2.7
Kellaways Sand Member	
J: Sand with beds of ferruginous sandstone (S8 and S9) rich in *Gryphaea* (*Bilobissa*) *dilobotes* Duff	0.55
C-I: Sand, pale-greyish, cross-bedded and bioturbated with some ferruginous beds and occasional large calcareous concretions; shell beds (S3–S7) with *Gryphaea*	*c.* 6.4
B: Sand, grey to brown, bioturbated; belemnite conglomerate at top (S2), bivalve-rich layer below with *Pleuromya* and *Lopha marshii* (J. Sowerby)	*c.* 0.45
A/B: Sand, grey to orange-brown, muddy with belemnites and *Pleuromya;* abundant trace fossils; interburrowed junction at base	up to 0.5
Rutland Formation	
Thorncroft Sand Member	

A: Sand, pale-pink to whitish *c.* 2.6

Interpretation

The sands at the base of the section are assigned to the Thorncombe Sand Member, following Gaunt *et al.* (1992) who recorded the section proved in the BGS South Cave Borehole [SE 9366 3230] (Gaunt *et al.,* 1980). These beds are believed to represent the lower part of the Rutland Formation of mainly Bathonian age, and there is thus a pronounced non-sequence with the beds above.

The age of the lowest beds of the overlying Kellaways Sand Member is uncertain owing to the absence of age-diagnostic fossils. The presence of belemnites in Bed A/B suggests the Lower Callovian Koenigi, or younger, Zone; the more muddy lithology may indicate a level close to the top of the Kellaways Clay Member (which apparently has been recorded below the Kellaways Sand Member in a well section at nearby Drewton [SE 925 334] (Fox-Strangways, 1892; Page, 1988). The absence of *Gryphaea* in these lowest beds supports a pre-Calloviense Zone age by analogy with sections in eastern and southern England; a corollary of this is that the incoming of *Gryphaea* (with abundant belem-nites) in Bed S2 may indicate that the beds above belong to the Calloviense Subzone with the base of the Enodatum Subzone lying at around the level of beds S8-S9. At South Cave Station Quarry, the only ammonites that the latter beds appear to have yielded are a *Homoeoplanulites* (specimen figured by Cox, 1988 (as *Choffatia cardoti* (Petitclerc)) and Page, 1991) and a fragment of a giant *Macrocephalites* ex gr. *tumidus* (Reinecke) O.K. Wright collection; Page, 1988). At Kettlethorpe Quarry (Figure 4.54), beds equivalent to S8-S9 yield, from Bed 6b, *Sigaloceras* (*Catasigaloceras*) *enodatum* transient *a* Callomon and Page (in Callomon *et al.,* 1989) and *?Anaplanulites* sp., indicating the basal Enodatum Subzone (*Sigaloceras enodatum* α Biohorizon) and, from Bed 8, *Sigaloceras enodatum* aff. transient β Callomon and Page (in Callomon *et al.* 1989), *Anaplanulites difficilis* S.S. Buckman and *Cadoceras* cf. *durum* (S.S. Buckman), indicating the Enodatum Subzone (*Sigaloceras enodatum* β Biohorizon). Abundant bivalves (including '*Astarte*', *Chlamys, Gryphaea* and *Myophorella*) and rhynchonellid brachiopods are also present. The zonal evidence from the Kellaways Sand Member therefore suggests that the erosive phase and non-sequence below Bed A/B at South Cave Station Quarry represents at least the entire Lower Callovian Herveyi Zone and part of the Koenigi Zone (and probably a significant part of the Bathonian Stage also). This erosion is related to uplift on the Market Weighton High.

Brasier and Brasier (1978) provided a detailed palaeoenvironmental analysis of these beds and concluded that Bed A/B represented a submerged marsh with a typical trace-fossil assemblage (*Ophiomorpha, Arenicolites* and *Skolithos*) suggesting intertidal to nearshore subtidal conditions and indicating that, in earliest Callovian times, the Market Weighton High formed a shoal and may even have been emergent. The bulk of the overlying Kellaways Sand Member, a sequence of shell beds alternating with cross-bedded often muddy sands, was interpreted as the point-bar deposits of laterally migrating tidal channels, with the shell beds representing basal lag deposits. The trace-fossil assemblage, with abundant *Arenicolites, Skolithos* and *Ophiomorpha,* is also consistent with an intertidal to shallow subtidal environment, as is the presence of 'tidal bedding', mud-cracks, a coarse sediment grain-size and frequent plant-debris and mica. According to Brasier and Brasier (1978), deepening and establishment of subtidal conditions is reflected by the increase in abundance of *Gryphaea* towards the top of the Kellaways Sand Member and the high diversity of epifaunal and infaunal bivalves in beds S8-S9 (and their equivalents at Kettlethorpe Quarry) and the overlying Cave Rock Member.

The Cave Rock Member is the 'Upper Kellaways Rock' of Keeping and Middlemiss (1883), which was renamed by Page (1988, 1989) to avoid confusion with the separate but similarly named development of calcareous sandstone at a lower stratigraphical level in Wiltshire (see Kellaways–West Tytherton GCR site report, this volume). The member has yielded a very rich and well-preserved fauna with many ammonites, including macroconch and microconch *Sigaloceras* (*Catasigaloceras*)*enodatum* β (Nikitin) (including the types of *S. planicerclus* S.S. Buckman, *S. curvicerclus* S.S. Buckman and *S. crispatum* S.S. Buckman; specimens figured by Buckman, 1923a,b; Tintant, 1963; Page, 1989, 1991) with macroconch and microconch *Anaplanulites difficilis* Buckman (including the lost holotype; specimens figured by Cox, 1988; Page, 1991) and macroconch and microconch *Cadoceras* (*C.*) *durum* Buckman (including the holotype; specimens figured by Buckman, 1922b; Page, 1991). This fauna was used by Callomon (1955) to establish the Enodatum Subzone (originally as Planicerclus Subzone), with the South Cave Station Quarry as its type locality. Page (1989) subsequently proposed an alternative section at South Newbald, *c.* 2.5 km north of South Cave Station Quarry, because the fauna of

the subzone's oldest (*Sigaloceras enodatum* α) biohorizon is exposed there in Cave Rock Member facies and consequently faunal preservation is much better than in areas farther south. The ammonite *Anaplanulites* appears to be a Subboreal genus that is almost unknown where *Homoeplanulites is* common, such as in parts of France (Cariou, 1984; Mangold, 1970a,b). Its morphology and distribution are reminiscent of the Subboreal genus *Proplanulites* from which it may well descend. The remaining fauna of the Cave Rock Member includes the bivalves *Anisocardia, Chlamys, Entolium, Goniomya, Grammatodon, Gresslya, Gryphaea, Isodonta, Myoconcha, Oxytoma, Pinna, Pleuromya, Protocardia, Thracia* and *Trautscholdia,* the belemnite *Cylindroteuthis* and the brachiopod *Rhynchonelloidea;* full listings are given by Walker (1972) and Brasier and Brasier (1978).

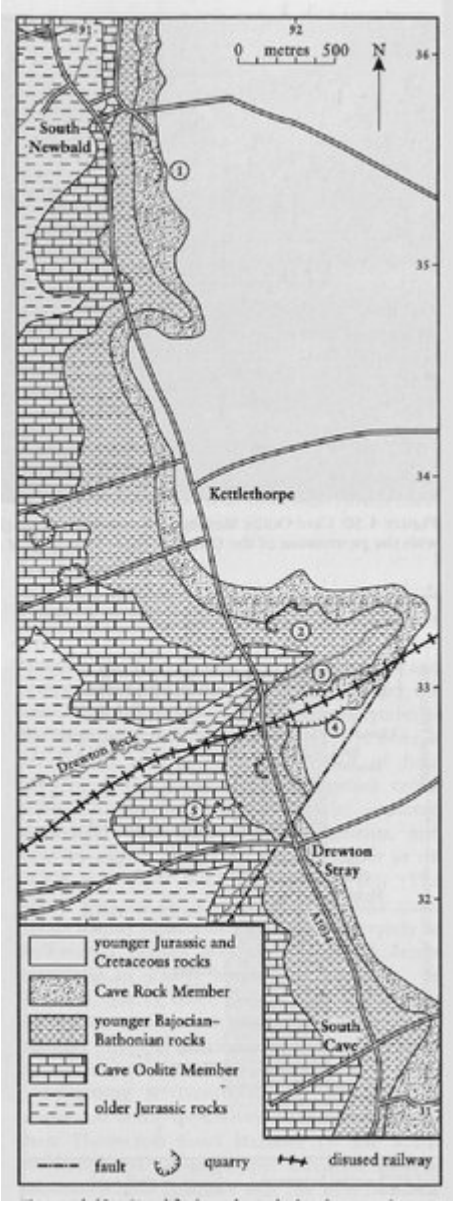
The Cave Rock Member appears to increase in stratigraphical range northwards, and at South Newbald includes levels equivalent to the top of the Kellaways Sand Member at South Cave Station and Kettlethorpe quarries. This phenomenon is certainly related to the proximity of the Market Weighton High, the unit perhaps representing a shoal of shelly sands fringing the southern side of a then largely submerged positive area. The presence of presumably allochthonous, ooids may indicate a shallow-water, subtidal lagoonal or platform environment over the High.

Keeping and Middlemiss' (1883) record of '*Ammonites* [*Binatisphinctes*] *comptoni*' and '*Ammonites* [*Kosmoceras*] *elizabethae*' from the Oxford Clay Formation at Drewton Railway Cutting is compatible with Gaunt *et al.*'s (1980) account of the nearby BGS South Cave Borehole where the Upper Callovian Athleta Zone is identified in the basal Oxford Clay Formation. A significant non-sequence is thereby indicated between the Kellaways and Oxford Clay formations.

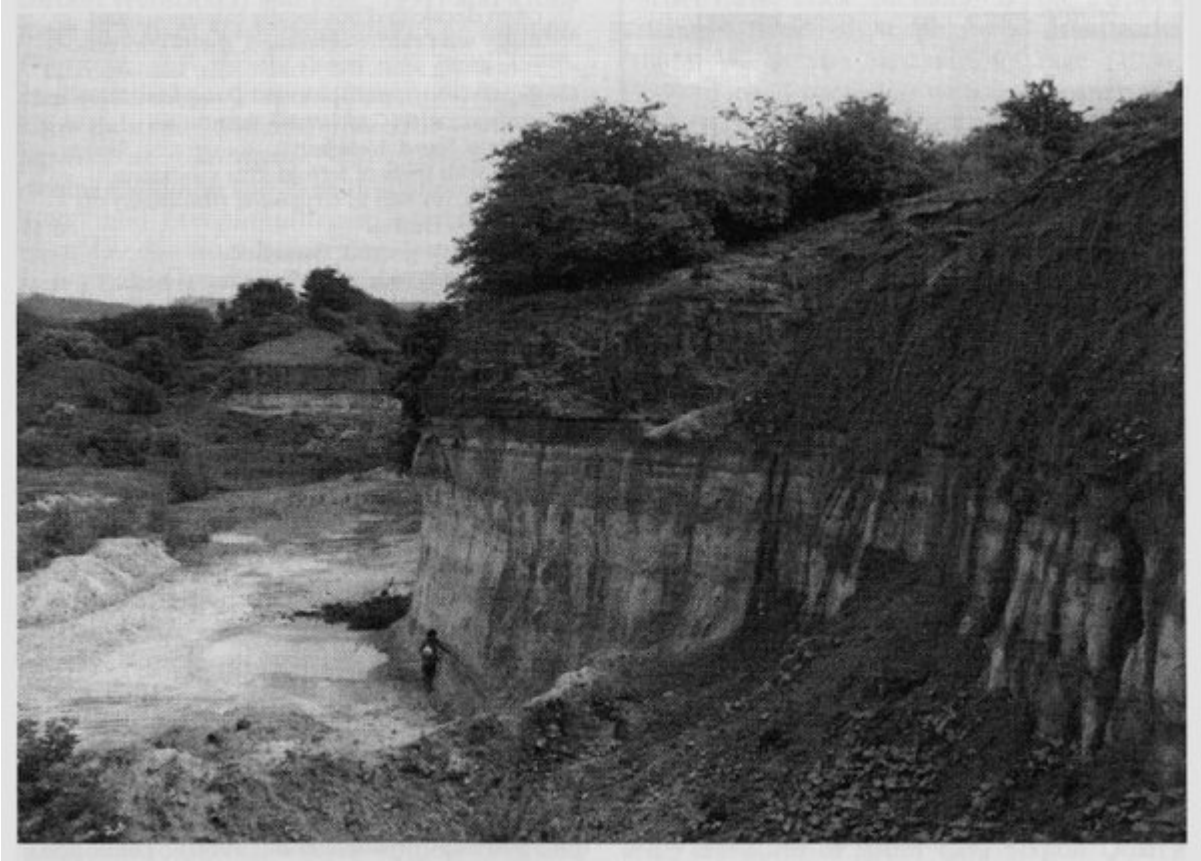
Conclusions

South Cave Station Quarry and Kettlethorpe Quarry, which together comprise the GCR site known as 'Drewton Lane Pits', include the type section of the Cave Rock Member of the Kellaways Formation. Sedimentary and palaeontological features in the exposed strata allow detailed palaeoecological analysis. The Cave Rock Member yields ammonite faunas of international importance that have facilitated recognition of the Enodatum Subzone of the Lower Callovian Calloviense Zone across Britain and Europe to Russia and beyond. The member here is the stratotype of this subzone that has yielded many specimens of the ammonite *Anaplanulites,* a genus restricted to Subboreal regions, and a single specimen of the ammonite *Macrocephalites,* only one other specimen of which is known from the Enodatum Subzone in Britain. Although the South Cave Station and Kettlethorpe quarries do not yield the well-preserved *Sigaloceras enodatum* α Biohorizon faunas of the now lost South Newbald site, a little farther north, they do provide an important reference section for the next youngest *Sigaloceras enodatum* β Biohorizon, the internationally most widespread and typical development of the Enodatum Subzone in Europe.

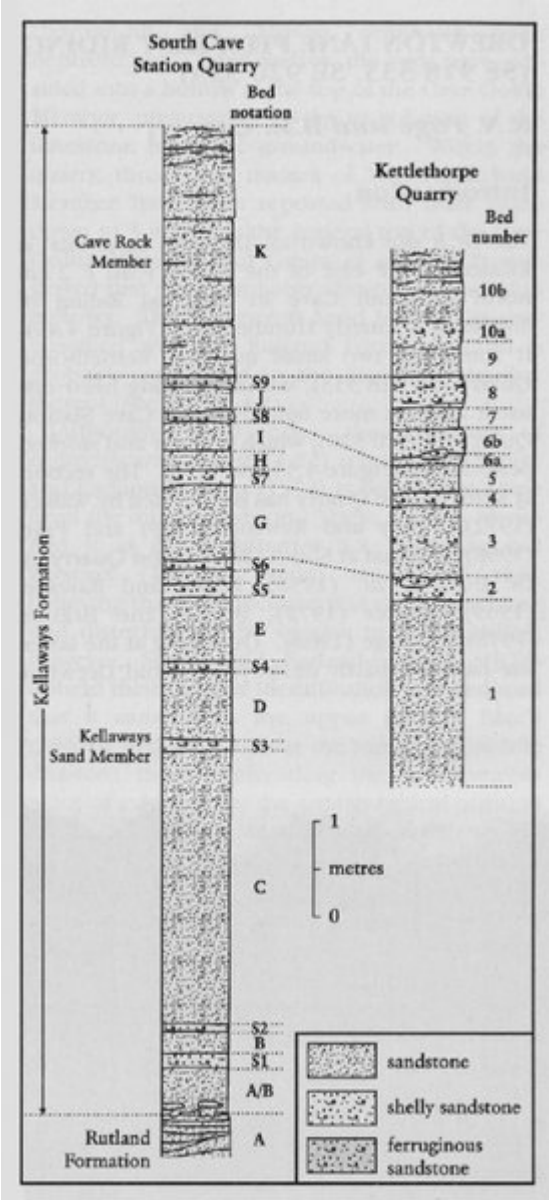
References



(Figure 4.49) Simplified geological sketch map showing Drewton Lane Pits and Eastfield Quarry GCR sites. (1) South Newbald Quarry; (2) Kettlethorpe Quarry; (3) South Cave Station Quarry; (4) Drewton Railway Cutting; (5) East-field (Everthorpe) Quarry (After Walker, 1972, fig. 1.))



(Figure 4.53) South Cave Station Quarry (part of the Drewton Lane Pits GCR site), showing the pale Kellaways Sand Member overlain by the darker Cave Rock Member. (Photo: M.G. Sumbler.))



(Figure 4.54) Graphic sections showing the correlation between South Cave Station Quarry and Kettlethorpe Quarry. Bed notation follows Brasier and Brasier (1978) and Page (1988) respectively.)