Lower Stanton St Quintin Quarry and Stanton St Quintin motorway cutting, Wiltshire

[SP 921 805], [SP 917 796]

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Introduction

The motorway cutting and disused quarry at Lower Stanton St Quintin, *c.* 7 km north of Chippenham, Wiltshire, together provide an excellent composite section ranging from the upper part of the Forest Marble Formation up to the basal part of the Kellaways Formation. The quarry is situated about 1 km north-east of the motorway cutting, on the south-eastern outskirts of the village; the conserved 100 m-long section occupies the south-eastern face of the quarry. The motorway cutting (at Junction 17 of the M4) comprises both sides of the central and eastern roundabout cutting, a total length of about 300 m (Figure 3.14); the western boundary is delimited by the western bridge.

The quarry at Lower Stanton St Quintin was first described by Blake (1905), and subsequently by Douglas and Arkell (1928) and Cave (1977). The more recent motorway section was briefly described by Barron (19721. The too of the Forest Marble Formation, which is seen in the quarry section, is also exposed locally in the Leigh Delamere Motorway Service Area (Barron, 1972). The section recorded by Woodward (1894) in another quarry north-west of Lower Stanton St Quintin is comparable to the upper part of the section in the motorway cutting.

Description

Lower Stanton St Quintin Quarry

The section in Lower Stanton St Quintin Quarry (Figure 3.15) exposes the uppermost 3.9 m of the Forest Marble Formation, the lower 3.0 m of which comprises hard, fine- to coarse-grained, slightly ooidal, shell-fragmental, sparry limestones, exhibiting large-scale cross-bedding structures. These limestones have yielded *Camptonectes, Placunopsis socialis* Morris and Lycett, *Praeexogyra hebridica* (Forbes), *Globularia?, Burmirhynchia?* and phosphatic vertebrate fragments. A dark-grey-weathering clay, 0.9 m thick, with layers of sand, caps the formation.

Only the lower part of the overlying Cornbrash Formation is exposed in the quarry. At its base, a 0.6 m-thick bed of pale-blue-weathering clay is overlain by 0.25 m of blue-weathering limestone with clay intercalations. Above this, there is 0.9 m of very fossiliferous, rubbly weathering, shell-fragmental, micritic limestone interbedded with clay. This limestone has yielded *Ornithella foxleyensis* Douglas and Arkell, a brachiopod known only from the Lower Cornbrash of this district, *O. obovata* (J. Sowerby), the bivalves '*Exogyra*', *Meleagrinella echinata* (Wm Smith), *Pleuromya, Protocardia, Pseudolimea* and *Rollierella minima* (J. Sowerby), the echinoids *Acrosalenia, Holectypus* and *Nucleolites,* and serpulids. However, there is now some doubt about the provenance of two specimens of *Clydoniceras discus* (J. Sowerby) housed in Devizes Museum (Geological Collection, Nos 1197, 1207), which Douglas and Arkell (1928) cited as coming from this unit (A. Tucker, pers. comm., 1996). A thin but prominent bed of harder, shell-fragmental, sparry limestone, 0.15–0.30 m thick, overhangs these more readily weathered beds and is, in turn, overlain by 1.6 m of strata comprising similar but softer limestone with *Pleuromya?, Clypeus?* and *Acrosalenia,* passing up into harder, well-cemented limestone containing common *M. echinata.*

Stanton St Quintin motorway cutting

At the base of the motorway cutting section (Figure 3.15), the uppermost 0.60 m of the Forest Marble Formation is seen to be a grey, silty limestone, its upper surface eroded and bored. Above it, there is a complete succession of the Cornbrash Formation, in which Lower and Upper Cornbrash can be recognized. The lowest 0.60 m of the Lower

Cornbrash is a grey, argillaceous limestone with well-preserved fossils, including 0. *obovata.* This is overlain by 1.50 m of argillaceous, shell-fragmental, micritic limestone, with some silty clay interbeds, which has yielded the bivalves '*Exogyra*', *Pseudolimea* and *Meleagrinella,* the echinoid *Acrosalenia,* and the brachiopod *Cererithyris.* As at Lower Stanton St Quintin Quarry, this unit is overlain by a prominent bed of hard, shell-fragmental, sparry limestone, which overhangs the less resistant beds below. This bed is the lowest of three, each 0.15–0.20 m thick, that contain *M. echinata, Modiolus,* oysters and terebelloid worm tubes. A thin, muddy parting above is succeeded by a 0.60 m-thick bed of similar limestone with *M. echinata* and sporadic inclusions of coarse shell-debris; then by a softer, slightly argillaceous limestone, 0.20 m thick, with *Anisocardia?.* The Lower Cornbrash is completed by a 0.75 m-thick bed of massive, well-cemented, fine- to medium-grained, shell-fragmental, sparry limestone, the top surface of which is a goethite-coated hardground, encrusted by large oysters (*Lopha marshii?* Arkell) which are in turn encrusted by small oysters ('*Exogyra*')*; M. echinata* is common in this limestone, and *Anisocardia, Modiolus* and *Obovothyris?* also occur.

The Upper Cornbrash is only 0.9 m thick and consists of silty limestone with abundant *Pleuromya?* in life-position. Other fossils include '*Exogyra*', *Lopha marshii, Rhynchonelloidea cerealis* S.S. Buckman and *Tetraserpula.* The motorway section is completed by the basal 3.0 m of the Kellaways Formation, which consist of dark-grey, silty clay, with sporadic calcareous concretions, becoming more sandy towards the base. *Macrocephalites* has been collected from this clay.

Interpretation

Only up to 3.6 m of the Forest Marble Formation are exposed in these sections, but they are sufficient to hint at the diversity of lithology associated with the formation. In this district, it is known that much of the upper part of the formation is composed of clay, commonly with lenticles or partings of calcareous siltstone or fine-grained sandstone. Additionally, there are sporadic, thick, lenticular inclusions of varied limestones, commonly cross-bedded, and sandstone. The clays imply prevailing low-energy conditions of deposition, but the limestones and sandstones, which represent periodic influxes of coarser sediment, suggest intermittent increased wave or current activity, perhaps associated with storms. This sediment was probably deposited in the form of isolated sand waves or banks. These characteristics imply a sedimentary environment comparable to modern intertidal or subtidal flat deposits. The eroded and bored upper surface of the formation in the motorway section indicates a distinct pause in sedimentation before deposition of the Cornbrash Formation; the borings imply concomitant lithification of the substrate.

The Lower Cornbrash is clearly divisible into two distinct units, the lower of which is characterized mainly by marly, shell-fragmental micritic limestone with clay interbeds. These lithologies imply relatively low-energy depositional conditions, although the commonly abraded nature of the shell debris, characteristic of the Cornbrash Formation, suggests repeated winnowing by gentle currents. The clay interbeds are witness to the periodic input of terrigenous mud into a carbonate shelf-sea, perhaps derived from the London Landmass. A further break in sedimentation at the top of the Lower Cornbrash is indicated by its goethite-coated and oyster-encrusted upper surface. The upper part of the Lower Cornbrash, comprising massive, coarser-grained, less argillaceous, sparry limestones, indicates higher-energy conditions, which inhibited deposition of fine-grained sediment. This facies is comparable to that a little farther south, nearer Chippenham, where it is known as the 'Corston Beds'.

The basal clays of the Kellaways Formation probably indicate deposition in relatively quiet, deeper waters in a shelf sea, the bottom of which was now beginning to subside gradually. The sandy content at the base is associated with the early stage of transgression that initiated this new regime.

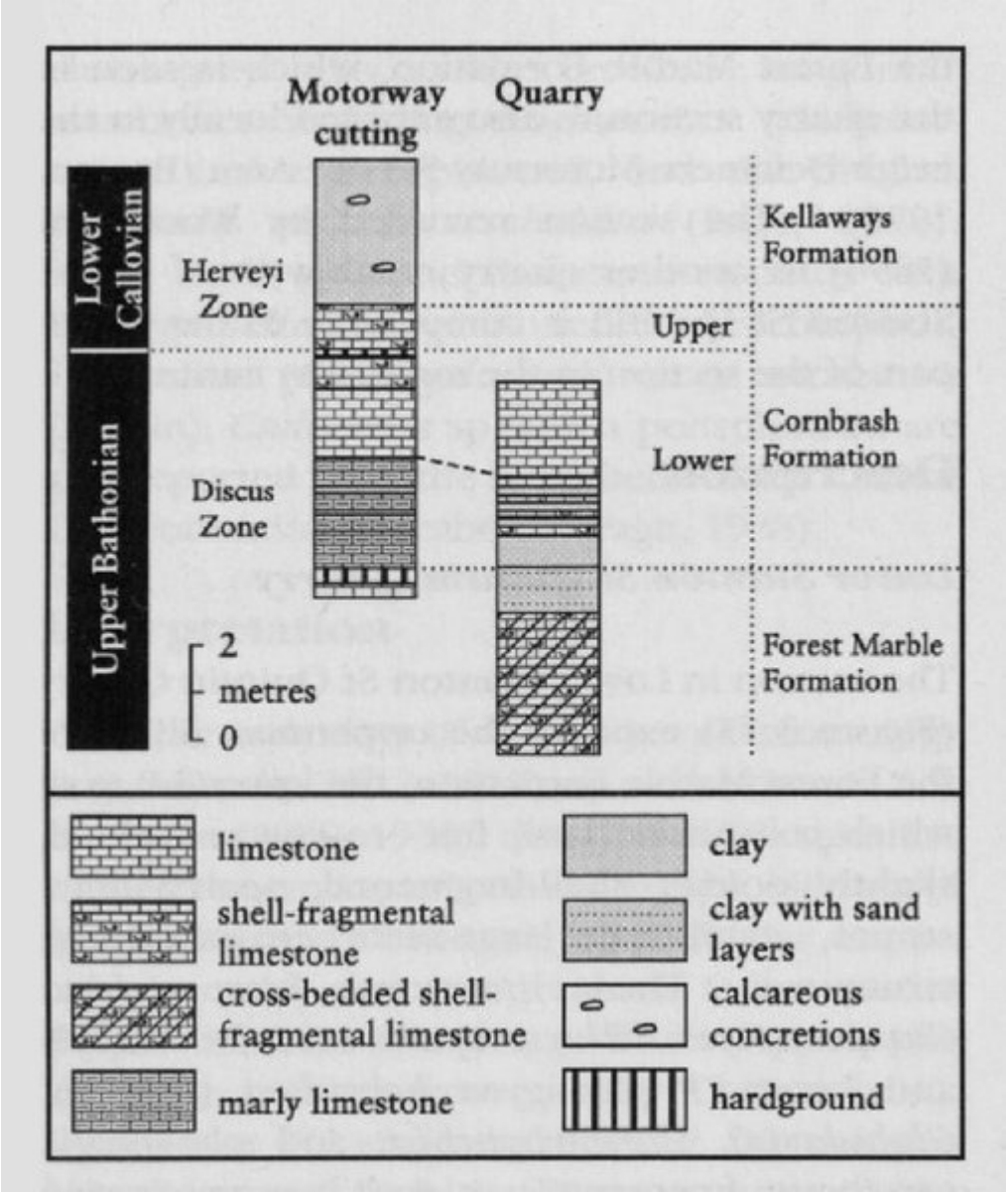
Callovian ammonites have been collected from the upper part of the motorway section (Barron, 1972), and Bathonian ammonites are believed to have come from the Lower Cornbrash of the Lower Stanton St Quintin Quarry nearby (Douglas and Arkell, 1928). These are consistent with assignment of the Upper Cornbrash and basal Kellaways Formation to the Lower Callovian Herveyi Zone, and the Lower Cornbrash to the Discus Subzone of the Discus Zone. It is notable that the Bathonian–Callovian boundary coincides with the oyster-encrusted hardground that separates the Lower from the Upper Cornbrash. In contrast, there is no significant stratigraphical break between the Upper Cornbrash and the Kellaways Formation. No ammonites have been collected from the Forest Marble Formation in these sections; however, the formation is believed to belong to the Hollandi Subzone of the Discus Zone.

Conclusions

The exposures at Lower Stanton St Quintin Quarry and the Stanton St Quintin Motorway Cutting (Junction 17 of the M4) together provide an important reference section through the complete local Combrash Formation. They exhibit the abrupt contact with, and the nature of, the underlying Forest Marble Formation, as well as the boundary of the Cornbrash Formation with the overlying Kellaways Formation. They also show the characteristic development of the Cornbrash Formation in the south Cotswolds, including the presence of the local Corston Beds facies in the Lower Cornbrash and the distinct stratigraphical break that caps this unit. The exposed rocks at both sites are fossiliferous and yield a well preserved and widely characteristic Cornbrash Formation fauna, together with more localized species such as the brachiopod *Ornithella foxleyensis.* Ammonites collected from the sections have confirmed the Bathonian and Callovian ages of the Lower and Upper Cornbrash, respectively.

References

(Figure 3.14) Exposure of Cornbrash on the south side of the M4 motorway cutting (part of the Lower Stanton St Quintin Quarry and Stanton St Quintin Motorway Cutting GCR site). (Photo: M.G. Sumbler.))



(Figure 3.15) Graphic section of the Bathonian–Callovian succession from the two locations that comprise the Lower Stanton St Quintin Quarry and Stanton St Quintin Motorway Cutting GCR site.)