DEAD MAID QUARRY

OS Grid Reference: ST804323

Introduction

The former Dead Maid Quarry is located on the north side of the B3095 behind an industrial estate opposite the turning to Gillingham (Figure 3.38), and on the north side of the re-entrant into the Chalk escarpment that is controlled by the Mere Fault. The beds dip at *c*. 5° to the east and are on the north side of the Mere Fault (Figure 3.39). This former quarry is famous for its condensed highly fossiliferous basal Cenomanian succession, comprising the so-called 'Popple Bed' and overlying Glauconitic Marl, which is intercalated between the Upper Greensand Chert Beds and the Lower Chalk of the traditional stratigraphy.

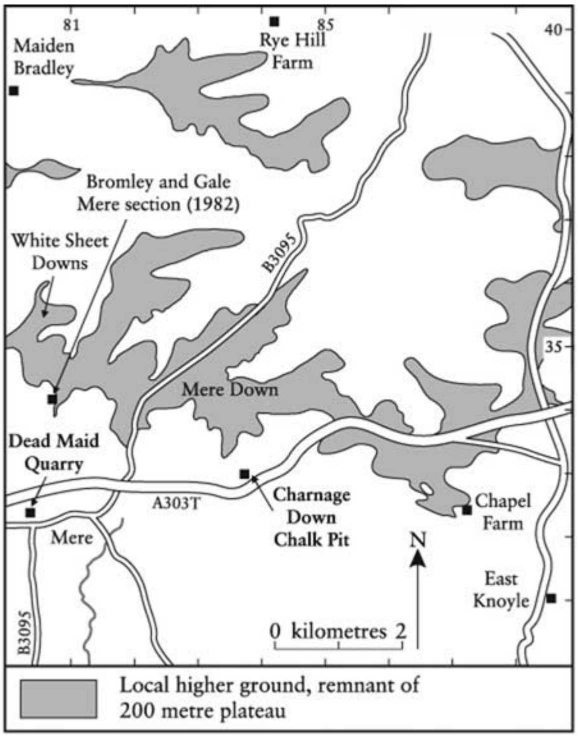

Figure 3.38: Position of Dead Maid Quarry and Charnage Down Chalk Pit, Mere, Wiltshire.

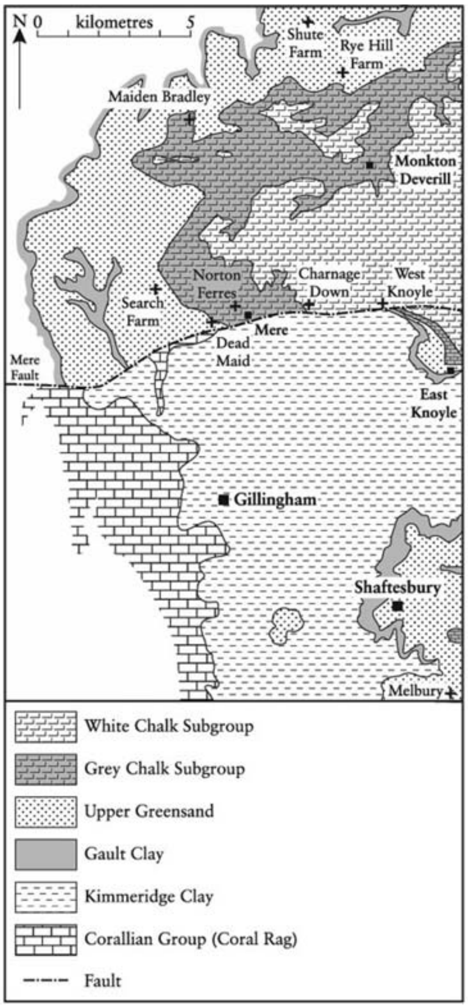

Figure 3.39: The position of Dead Maid Quarry and Charnage Down Chalk Pit in relation to the Mere Fault and other key localities in the area. (After Scanes, 1916.)

Description

Dead Maid Quarry was first described by Jukes-Browne and Scanes (1901) and by Jukes-Browne and Hill (1903). Additional details were given by Scanes (1916), Edmunds (1938) and Smith and Drummond (1962). Jukes-Browne and Scanes (1901), Scanes (1916), and Kennedy (1970) gave graphic logs differing in points of detail, and the first two papers included annotated photographs of the section. The description given here is a based on a combination of these sources and the authors own observations.

Lithostratigraphy

In modern British Geological Survey stratigraphical terminology (Woods and Bristow, 1995; Bristow *et al*., 1999), the 6 m section (Figure 3.40) comprises a complex and highly condensed succession, belonging to the Melbury Sandstone Member of the Upper Greensand Formation, which rests with marked erosive contact on the Boyne Hollow Cherts Member of that formation, and is overlain by the West Melbury Marly Chalk Formation of the Grey Chalk Subgroup. However, following the rationale of the new classification (Rawson *et al*., 2001), the Melbury Sandstone Member now becomes the basal member of the Grey Chalk Subgroup.

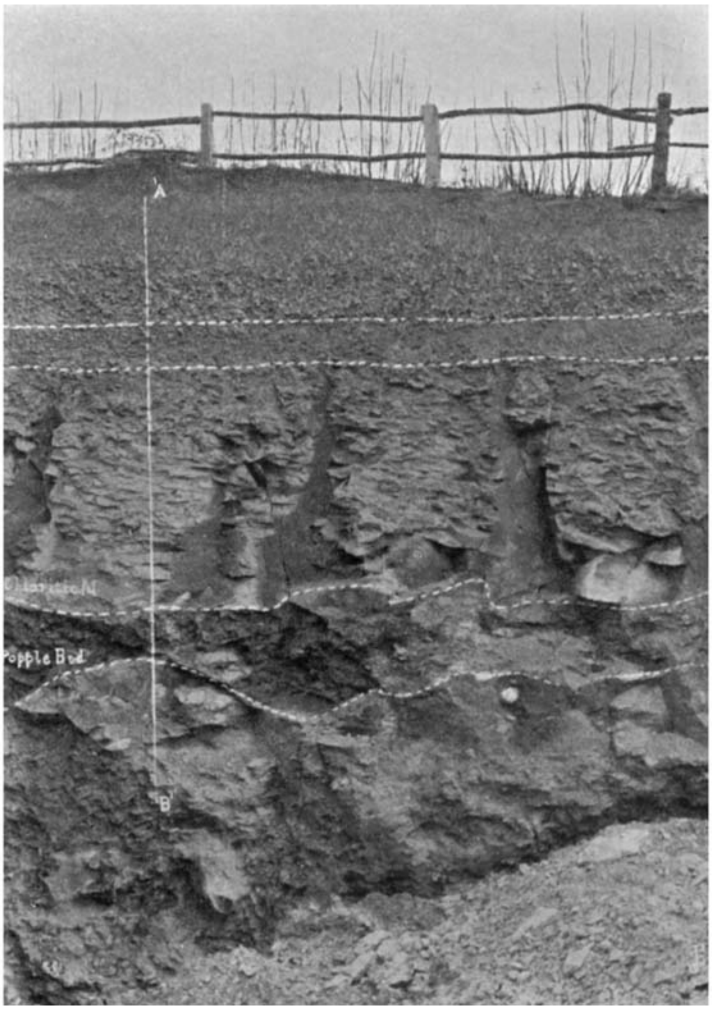

Figure 3.40: Dead Maid Quarry, Wiltshire. (Reproduced from Jukes-Browne and Scanes, 1901. The vertical line 'A–B' indicates where their section was taken.)

The Boyne Hollow Cherts Member consists of fine-grained, buff-green laminated silts with lenticular, black-brown cherts. A bed of fine-grained, grey calcareous glauconitic sandstone, containing very hard, grey concretions of calcite-cemented quartz-sand, which is also assigned by the British Geological Survey to the Boyne Hollow Cherts, rests with burrowed contact on the beds with cherts.

Of particular interest is the so-called 'Popple Bed', which rests on a highly irregular erosion surface with an amplitude of at least 0.3 m at the base of the Grey Chalk Subgroup, cut into the underlying sandstone with concretions (Jukes-Browne and Scanes, 1901, pl. 5). The 'popples' are pebbles, flat cobbles and boulders 0.2–0.25 m in length, which Kennedy (1970) and previous observers considered were actually reworked concretions from the underlying bed. The long-axes of the popples rest parallel to the underlying erosion surface and the surfaces of the popples are commonly coated with a veneer of chocolate-brown phosphate. An encrusting epifauna of serpulids, bryozoans and bivalves is also usually phosphatized. Kennedy (1970) sliced the popples to show a marginal zone of glauconitization and phosphatization, and he recognized boring traces including lithodomous bivalve crypts. The popples are incorporated in a brownish calcareous sand, which also contains phosphatized fossils and patches of sandy material that is different from the sandy matrix of the bed.

The Popple Bed is overlain by a 'bed of hard glauconitic marl, with many fossils and phosphatic nodules at the base' (Jukes-Browne and Scanes, 1901, fig. 3). Scanes (1916) noted that this stone, which he took to be the equivalent of the Chloritic (i.e. Glauconitic) Marl that elsewhere is developed at the base of the Lower Chalk, 'rang to the hammer' and that it was quarried for building stone. However, in lithological terms, it is actually a glauconitic sandstone, and it was consequently classified by the British Geological Survey (Woods and Bristow, 1995; Bristow *et* *al*., 1999) as part of the Melbury Sandstone Member of the Upper Greensand, with the thin overlying sandy, glauconitic marl containing a few phosphatic nodules (their Glauconitic Marl *sensu stricto*) being assigned to the basal bed of the Chalk Group (West Melbury Marly Chalk Formation). In this account, we treat the Popple Bed as the basal member of the West Melbury Marly Chalk Formation (Figure 3.40).

Biostratigraphy

The Boyne Hollow Cherts here are undated, but by analogy with sections in the Shaftesbury district, can be inferred to belong to the Upper Albian *Stoliczkaia dispar* Zone. The bed of glauconitic sandstones with concretions that is developed here, and in the localities around Maiden Bradley, is reported to contain rare macrofossils at Dead Maid Quarry, but there are no fossil names in the literature and the bed is, therefore, of uncertain age. Arenaceous foraminifera cited by Carter and Hart (1977a, fig. 23) from this bed were assigned to the Lower Cenomanian Substage; however, most of the taxa indicate a latest Albian rather than an Early Cenomanian age (cf. their fig. 9).

The sediment in between the popples of the Popple Bed, the overlying top bed of the Melbury Sandstone Member, and the thin bed of sandy glauconitic marl all contain phosphatized fossils, including bivalves, gastropods and ammonites. Extensive fossil collections (now at the British Geological Survey, Keyworth), were made here at the beginning of the 20th century by the local amateur geologist, Dr Pope Bartlett. It must be emphasized that, although he assigned his fossils to the various beds, inspection of this material suggests that the stratigraphical information is not necessarily reliable. Phosphatized material from this collection believed to be from the Popple Bed contains 14 species of bivalves and 4 of echinoids (notably *Catopygus columbarius* (Lamarck)), as well as species of the ammonites *Mariella* and *Mantelliceras*, including *Mantelliceras dixoni* Spath (Woods and Bristow, 1995). Kennedy (1970) observed that there was locally a phosphatic crust at the top of the Popple Bed, while in other places the sediment of the ‘Glauconitic Marl' infilled the interstices between the popples. He noted that the Popple Bed itself contained some fossils, stating that most of the ammonites that he collected came from the top of the bed, in the complex zone of contact between it and the ‘Glauconitic Marl', and that it was therefore impossible to separate the faunas from the two beds. The mixed ammonite assemblage (Kennedy, 1970, p. 620) is dominated by *Mantelliceras* spp. and *Schloenbachia varians* (J. Sowerby) with subordinate *Hyphoplites*, *Hypoturrilites* and *Mariella*. Kennedy (1970) assigned the assemblage to the *mantelli* Zone, later than the *carcitanense* assemblage and earlier than the *saxbii* assemblage. Subsequently, Wright *et al*. (1984) stated that the *Mantelliceras* suggested derivation from the *couloni* Horizon (i.e. the upper part of the basal Cenomanian *Neostlingoceras carcitanense* Subzone) and the *Mantelliceras saxbii* Subzone (i.e. the *Sharpeiceras schlueteri* and *Mantelliceras saxbii* subzones of the current zonal scheme). The ammonite evidence from here is equivocal, but the records of *Mantelliceras dixoni* (Wright and Kennedy, 1984, pl. 37, fig. 5) from the ‘Glauconitic Marl' above the Popple Bed and *Mesoturrilites boerssumensis* (Schlüter) from the mixed Popple Bed/‘Glauconitic Marl' assemblage (Kennedy, 1970; Wright and Kennedy, 1996) clearly indicate the presence of the *dixoni* Zone. The assignment of the top bed of the Melbury Sandstone (i.e. the Glauconitic Marl of earlier literature) to the *dixoni* Zone is supported by a recent find (Woods and Bristow, 1995) of *Inoceramus virgatus* Schlüter.

The Popple Bed is noted for the find in 1899 of a petrified coniferous tree lying almost horizontally within the bed, and orientated NNE–SSW. The trunk was nearly 20 ft (6 m) long and 1 ft 6 in (0.45 m) in diameter at the thickest end, while the branches occupied an area of about 9 ft^2 (2.7 m^2) (Jukes-Browne and Scanes, 1901).

Interpretation

This locality gave rise to considerable controversy in the early years of the 20th century, because it appeared to show transition beds, which lithologically belonged to the highest beds of the Upper Greensand, but contained fossils of Lower Chalk (i.e. Cenomanian) age. It was difficult to know whether these transition beds should be placed in the Upper Greensand or in the Lower Chalk, and opinion on this question swung backwards and forwards between the two interpretations. Eventually Scanes, (1916, p. 115), following some preliminary hints given earlier (Jukes-Browne and Scanes, 1901), decided that the fossil evidence was paramount, and placed the beds in question in the Lower Chalk, despite the obvious difference in lithology. Jukes-Browne and Scanes (1901) introduced a new subzone (*Catopygus columbarius* Subzone) of the existing *Ammonites* (i.e. *Schloenbachia*) *varians* Zone for the transition beds, and assigned the overlying Chloritic (Glauconitic) Marl to the existing subzone of the sponge *Stauronema carteri* Sollas. In the Wincanton Memoir (Bristow *et al*., 1999) the British Geological Survey has now placed all of the transition beds, including the 'Glauconitic Marl' of earlier workers, once again in the Upper Greensand Formation, while recognizing their Cenomanian age. Following the recent revision of the lithostratigraphical classification (Rawson *et al*., 2001), all these transition beds once again revert to classification in the Grey Chalk Subgroup.

Dead Maid Quarry is a key locality in the interpretation of two other former sections near Mere, Norton Ferris (ST 810 331) and Search Farm (ST 790 334), as well as a group of sections around Maiden Bradley, some 6 km to the north (Figures 3.38 and 3.39), which exposed the so-called 'Warminster Greensand'. The most important of these latter sections were at Maiden Bradley Quarry (ST 797 310), Rye Hill Farm (ST 848 403) and Shute Farm (ST 843 410).

In all of these localities, the chert-bearing beds are overlain by a bed of conspicuously glauconitic sandstone containing concretions of calcite-cemented quartz sand, with inconspicuous sparse, very small glauconite grains. This bed at Maiden Bradley Quarry yielded a diverse fauna including ammonites, identified by Jukes-Browne, which are clearly Lower Cenomanian *Hyphoplites*, *Mantelliceras* and *Schloenbachia* (Jukes-Browne and Hill, 1900, p. 238). However, it must be emphasized that the ammonites actually came from the top of the bed, immediately beneath the Cornstones (see below), and that it is possible that their true provenance was in the overlying bed. None of these Cenomanian ammonites has been found in museum collections. The only ammonite (British Geological Survey Zb 1213) known to have come from this bed is an indigenous, poorly preserved Upper Albian *Callihoplites vraconensis* (Pictet and Campiche).

At Rye Hill Farm and Shute Farm, the sandstone with concretions at the top of the Boyne Hollow Cherts is overlain by a boulder bed made of similar concretions, which are known as 'Cornstones'. The Cornstones are succeeded by friable glauconitic calcareous quartz sands with very few phosphates, the Rye Hill Sands. Note that Kennedy (1970, fig. 4) incorrectly identified the bed *below* the Cornstones as the Rye Hill Sands. These sands are richly fossiliferous and are the source of the non-phosphatized, calcitic (and hence, inferred indigenous or quasi-indigeneous) fossils attributed to the so-called 'Warminster Greensand' (Jukes-Browne, 1896). Small fossil brachiopods and echinoids occur in profusion, together with well-preserved shells of the inoceramid bivalve *Inoceramus* ex gr. *crippsi* Mantell and poorly preserved calcareous internal moulds of ammonites. The association of the thin-shelled bivalve *Aucellina gryphaeoides* (J. de C. Sowerby *non* Sedgwick), the belemnite *Neohibolites ultimus* (d'Orbigny) and the heteromorph ammonite *Neostlingoceras carcitanense* (Matheron) enables the Rye Hill Sands to be assigned, at least in part, to the basal Cenomanian *carcitanense* Subzone. The two latter taxa identify the presence of the *ultimus/Aucellina* Event (Ernst *et al*., 1983) of European event stratigraphy. The Rye Hill Sands are succeeded by glauconitic sandstone with phosphates, the Glauconitic Marl of the literature, which provided the superbly preserved, irridescent, phosphatized components (mainly ammonites) of the 'Warminster Greensand' faunas in museum collections.

The relationship between this succession and that developed at Dead Maid Quarry is tantalizingly unclear. Although the popples of the Popple Bed can perhaps be equated with the Cornstones of Rye Hill Farm, there is no sign of the unequivocal, albeit non-phosphatized *carcitanense* subzonal fauna of the Rye Hill Sands, the phosphatized ammonites of the Popple Bed/'Glauconitic Marl' assemblage indicating, if anything, a *dixoni* Zone provenance, this being supported by the occurrence of *Inoceramus virgatus* in the terminal 'Glauconitic Marl' (i.e. terminal Melbury Sandstone). A possible explanation is that the high-amplitude erosion surface at the base of the Popple Bed, below the popples/Cornstones themselves, marks a significant hiatus and that no basal Cenomanian sediments are preserved. On the other hand, there appears to be evidence of westward thinning from Rye Hill to Maiden Bradley Quarry, and thence south to Norton Ferris, involving a coalescing of the phosphates above the Rye Hill Sands with the Cornstones at the base (cf. Kennedy, 1970, fig. 4; Bristow *et al*., 1999, fig. 27). In this case, the Rye Hill sands are perhaps represented at Maiden Bradley by the poorly fossiliferous sands surrounding the Cornstones (cf.Jukes-Browne and Scanes, 1901) and, at Dead Maid Quarry, by the sandy patches reported within the Popple Bed. At present, there is no clear understanding why the basal Cenomanian Rye Hill Sands are only locally developed, and the possible influence of local structures controlling the deposition and preservation of sediments must be seriously considered.

The biostratigraphical evidence from Dead Maid Quarry leads to the unexpected conclusion that the Melbury Sandstone and basal West Melbury Marly Chalk belong to the *dixoni* Zone, whereas the top of the Melbury Sandstone in its type area, near Shaftesbury, clearly falls in the basal Cenomanian *carcitanense* Subzone (Woods and Bristow, 1995; Bristow *et al*., 1999).

Conclusions

The sequence of superbly preserved phosphatized Lower Cenomanian ammonite faunas from Dead Maid Quarry, is critical to the interpretation of sections around Maiden Bradley that were formerly attributed to the loosely defined 'Warminster Greensand', including those in which the highly fossiliferous basal Cenomanian 'Rye Hill Sands' are developed. The section provides an important link with the new Albian–Cenomanian stratigraphy recently established in the Shaftesbury district, on the southern side of the Mere Fault, by the British Geological Survey.

This historically important section through the Albian–Cenomanian junction beds with its rich ammonite faunas is vital, on the one hand, for the resolution of the stratigraphical problem of the 'Warminster Greensand' and, on the other, for the interpretation of structural control of sedimentation across the Mere Fault, and in the area to the north.

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