REPORT

Edgehill Quarry, Warwickshire

The Lower Jurassic escarpment of Edge Hill, in southeastern Warwickshire is capped by the Marlstone Rock Formation. Here, this unit consists of about 8 m of unusually pure calcitic chamositic ironstone, weathering to limonite (Whitehead *et al*, 1952). It thins to the northeast and southwest, accompanied by increasing sand content. Rare ammonites collected from the Marlstone prove a late Pliensbachian to early Toarcian (*spinatum* up to *tenuicostatum* Zone) age (Howarth, 1980). It has been quarried around the scarp-top settlement of Edgehill since mediaeval times for building stone, ornamental stone and aggregate (Edmonds *et al*, 1965).

Hornton stone is now quarried at just one site, on the crest of Edgehill about 700 m north of the A422 road, at SP372468. This site has recently been deepened, and has an active face over 100 m long. Old quarries northwards along the escarpment are now backfilled, but other exposures survive nearby, notably within the former Banbury Ironstone Field to the southeast, and on the Burton Dassett ridge to the northeast. The active Edgehill quarry section has been selected as a RIGS (Regionally Important Geological Site) by the Warwickshire Geological Conservation Group. Permission to visit the site should be sought from Hornton Quarries Limited at their Edgehill works.

Lithologies and palaeontology

Excavations within the quarry floor have recently provided sections down to the uppermost part of the underlying Dyrham Formation (formerly Middle Lias Silts and Clays; Cox *et al*, 1999), seen to a thickness of approximately 0.5 m. Iron-stained clays were exposed, grading up into marl and richly fossiliferous bioclastic and oolitic ferruginous limestone. These beds are rich in pectinid bivalves and worn belemnite rostra. One particular clay-limestone interface preserves a 'belemnite battlefield' (Doyle & Macdonald, 1993). This comprises a dense accumulation of variably worn belemnite rostra interspersed with crushed bivalves (Fig. 1).

Overlying these beds, the widely distributed pebble bed at the base of the Marlstone Rock Formation (Edmonds *et al.*, 1965) is developed as a 10-15 cm hard shelly pebbly ironstone bed, containing numerous pebbles and flattened cobbles of claystone, siltstone and shelly ironstone, up to 20 cm in length. The pebble bed matrix yields a well preserved fauna of disarticulated pectinid bivalve shells (including large *Pseudopecten equivalvis*), oysters (including bilobate *Gryphaea sportella*), fully articulated deep-burrowing bivalves in life position (*Pholadomya ambigua*), abundant belemnite rostra (*Passaloteuthis* and *Parapassaloteuthis*) and 'nests' of fully articulated rhynchonellid and terebratulid brachiopods (*Tetrarhynchia tetrahedra* and *Lobothyris punctata*). Many oysters and belemnite rostra are serpulid-encrusted and extensively bored. Some bear grazing traces attributable to regular echinoids and gastropods (ichnofossils *Gnathichnus pentax* and *Radulichnus*).

Above the quarry floor, the Marlstone Rock Formation is seen in low faces up to 5 m in height, grading up into stony subsoil (Fig. 2). The lower part of the ironstone is intensely weathered and argillaceous, yielding scattered disarticulated bivalves and further accumulations of fully articulated, well preserved *Lobothyris punctata*. The main mass consists of the typical finely bioclastic, jointed, locally cross bedded oolitic ironstone, containing scattered wood fragments and a few other fossils including the body chambers of large nautiloids. Much of the rock is rusty and limonitic, with sporadically distributed blue-green, chamositic 'cores'. Cross sections through bundled, tube-like burrows are seen on loose blocks. The quarry workshops provide an opportunity to inspect sawn slabs of the ironstone from several sites in the Edgehill-Hornton area. These show that the rock is extensively bioturbated. Recognisable trace fossils including dumb-bell shaped cross sections through *Diplocraterion* and/or *Rhizocorallium*.

Figure 1. A belemnite rostral accumulation (known as a 'belemnite battlefield') at the top of the Middle Lias Dyrham Formation.

Palaeo-environments

The onshore, British, mid to late Pliensbachian is represented by a shallowing-upward marine succession in both basin and shelf settings (Sellwood & Jenkyns, 1975; Hesselbo & Jenkyns, 1998). Situated at the south-western end of the East Midlands Shelf (Cox *et al.*, 1999), southern Warwickshire clearly demonstrates this regional pattern. The higher slopes of the Edge Hill escarpment are formed by the silty clays, silts, sands, and impure limestones of the Dyrham Formation, 'coarsening up' from the Lower Lias clay lowlands of the Warwickshire Feldon. This episode of shallowing has been attributed to regional hinterland and/or sea-bed uplift (Hallam & Sellwood, 1976; Hallam, 1988). The fauna of the uppermost Dyrham Formation at this site points to a well oxygenated marine environment. The worn belemnite rostra (Fig. 1) accumulated during a phase of low sedimentation.

Capping the Dyrham Formation, the pebble bed at the base of the Marlstone is taken to represent the culmination of the shallowing episode. Its generation appears to have involved wave and/or current erosion of bedrock, followed by and perhaps concurrent with, concentration of worn lithoclasts, shells and belemnite rostra in an intermittently high-energy environment. The hard substrate grazing traces are significant in this respect, suggesting widespread growth of algae and cyanobacteria in a shallow-water, photic setting (Bromley, 1994).

Thereafter, the Marlstone apparently signifies slight deepening, allowing net accumulation of bioturbated chamositic oolitic sediment. Localised cross-bedding indicates wave and/or current activity above storm wave base. The brachiopod accumulations are comparable to the life assemblages documented from the Marlstone of Leicestershire by Hallam (1961). These may have been preserved by rapid burial beneath ooid bedforms. Historically, the Marlstone has been central to a debate concerning the origin of oolitic ironstones. It is now generally thought that the abundant iron was derived from terrestrial laterite soils, indicating a warm, humid Pliensbachian climate (Hallam & Bradshaw, 1979). The fossil driftwood confirms the influence of nearby land, probably the western margin of the London Platform (Cox *et al.*, 1999). The unusually pure, relatively thick ironstone development at Edgehill suggests deposition in a semi-isolated basin, broadly coincident with A.H. Cox and Trueman's (1920) Edgehill syncline.

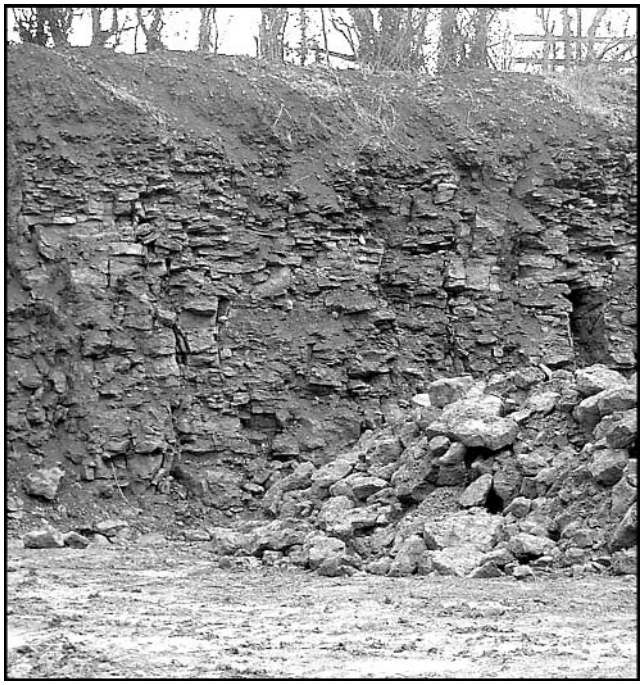

Figure 2. Exposure of the Marlstone Rock Formation in the Edgehill quarry.

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