Salthill and Bellmanpark Quarries, Lancashire

[SD 751 424]–[SD 763 428]

Introduction

The quarries at Salthill (disused) and Bellmanpark (formerly disused but recently re-opened and extended) which constitute the Salthill and Bellmanpark Quarries GCR site extend from the north-eastern edge of Clitheroe ENE for more than a kilometre towards Worston ([SD 751 424] to [SD 763 428]). The site is split by the Pimlico Link Road, which connects to the A59 Clitheroe Bypass. The floor of Salthill Quarry has been developed as an industrial estate, but the quarry faces have been maintained and the site is now a Local Nature Reserve (managed by the Lancashire Wildlife Trust) featuring a geology trail. Bellmanpark Quarry is owned by Castle Cement and is to be re-opened to supply some high-purity limestone to the Ribblesdale Cement Works. However, although renewed quarrying will result in the loss of some geological features, development plans require the retention of some newly generated and potentially more interesting exposures, and ultimately better access to these new sections will be provided. These are classic localities of the British Dinantian sequence, providing the best exposures of the internal structure and composition of limestone knolls in the Clitheroe Limestone Formation (Figure 6.2) and both quarries are justly famous for their diverse and abundant faunas. The most important contribution on the facies relationships seen here is by Miller and Grayson (1972), and a modern account of the Salthill Geology Trail has been published by Bowden *et al.* (1997). Accounts of faunas from this locality include those of Parkinson (1926), Westhead (1967) and Donovan (1992).

Description

This site includes exposures of the upper part of the late Tournaisian Salthill Bank Beds of Miller and Grayson (1972), a unit now referred to as the Bellman Limestone Member of the Clitheroe Limestone Formation (Riley 1990a) (Figure 6.2). The Bellman Limestone Member is the upper of the two major developments of the Waulsortian facies in the Clitheroe area. The overlying beds, the Salthill Cap Beds of Miller and Grayson (1972), rest unconformably on eroded Waulsortian mudbanks and are also well exposed at the site (Figure 6.9). This unit is now included in the Limekiln Wood Limestone Member of the Hodder Mudstone Formation by Riley (1990a) and is of early Viséan age (Figure 6.2). The regional dip is about 25° to the southeast, but this is not always immediately apparent, because of the unbedded nature of Waulsortian bank facies and depositional dips in some of the subsequent beds.

Detailed plans of the Salthill Quarry faces have been provided by Miller and Grayson (1972) and sketches of the faces at localities on the geology trail are provided by Bowden *et al.* (1997). The eroded tops of the mud-banks which constitute the Bellman Limestone Member are seen in Salthill Quarry (Figure 6.9), but a thicker development of this unit is seen in Belhnanpark Quarry where it forms the high easternmost face. Typically, the Bellman Limestone Member consists of poorly bedded, fine-grained limestone with groups of stromatactoid cavities showing multiple fills of sediments and cements.

The erosion that followed the development of the main Waulsortian Complex is most marked along the southern faces of the quarries, where, at intervals, there are boulder beds. Some of the boulders are more than a metre across. The boulders are of different limestone types, including crinoidal limestones not normally associated with the Bellman Limestone Member, and some have their bedding or geopetal fabrics rotated or even inverted. Grey calcareous mudstone may form a matrix to the boulders. Draped over the erosion surface are more than 20 m of crinoidal packstones and grainstones. These are locally well sorted and free of matrix, but may retain partial carbonate mud-fills within the crinoidal lumen. These geopetal infills indicate that the crinoidal facies was deposited on slopes of up to at least 30°. The boulder beds and breccias can be followed north-east into those of the Crow Hill–Teviston area (see The Knolls GCR site report, this chapter) and are probably related to tectonic activity along the south-east edge of the Waulsortian Complex, producing submarine collapse and break up of the Waulsortian bank margin. Evidence for this is shown by the sudden increase in depositional dip from the crest of the Salthill-Bellman ridge towards its southern side.

The fauna of the Limekiln Wood Limestone Member is much richer than that of the Bellman Limestone Member and most of the fossils described from this site were obtained from these crinoidal beds. Parkinson (1926) was one of the first to describe the faunas in detail. Among the corals he described were *Clisiophyllum* and *Koninckophyllum clitheroense* (type locality at Salthill). Other corals present include *Michelinia* cf. *megastoma, Caninia cylindrica* and *Syringopora.* The only corals commonly found in the Bellman Limestone Member are *Amplexus coralloides* and hetero-corals. Parkinson (1926) also recorded many brachiopods, the most typical being athyrids such as '*Dielasma*', '*Girtyella*' and *Leptaena analoga,* productoids including *Pustula nodopustulosa* (type locality at Salthill), smooth brachythyrids, many species of *Spirifer,* and varieties of *Pugnax acuminatus* and *P. mesogonus.* Muir Wood added an appendix to Parkinson's paper, describing for the first time *Spirifer bollandensis* and *Reticularia lobata* with paratypes from this site. Other fossils listed include bryozoans, bivalves and echinoderms. Parkinson (1926) especially mentioned the abundance and diversity of the blastoids, which include the rare *Mesoblastus.* This site is also famous for its crinoids. Westhead (1967) and Donovan (1992) described crinoid faunas from Salthill and Bellmanpark and compared them with the faunas from the older Coplow Limestone Member at Coplow Quarry (see GCR site report, this chapter) and with other localities in Bowland and in Scotland. Westhead (1967) commented on the large number of grapnel-like crinoid roots. *Cyathocrinites* and *Potertocrinites* are the most common inadunate genera, with *Euryocrinus* representing the Flexibilia, and *Ampboracrinus, Actinocrinites, Platycrinites, Pleurocrinus* and *Gilbertsocrinus* the camerates. Further descriptions of crinoids from this locality can be found in Westhead (1979), Donovan and Sevastopulo (1985, 1988), Donovan (1986) and Donovan and Westhead (1987).

According to current directions Indicated by crinoid toppling orientations, the Limekiln Wood Limestone Member was deposited over the irregular eroded surface of the Bellman Limestone Member under the influence of north-south currents. Orientated crinoid stems are well seen in the relatively fresh exposures at the south-west end of the site where a footpath comes down to road level by means of a short set of steps [SD 752 424].

Other points of interest around Salthill are described in the trail guide by Bowden *et al.* (1997). Of particular note are the exposures either side of the road between the industrial developments, where the quarry faces are closest to the road [SD 756 426]. To the north of the road the quarry face features the dome-shaped geometry and irregular (eroded) top surface of a prominent mud-bank within the Bellman Limestone Member (Figure 6.9). Draped over this is a 'boulder bed' development, which here consists mostly of crinoid debris, followed by the dark-grey, bedded limestones of the Limekiln Wood Limestone Member, which thin over the dome and thicken Into the troughs on either side. On the south side of the road, on the corner where the quarry face turns southwards, an unparalleled example of sharp facies intertonguing between dark-grey well-bedded deposits and pale crinoidal limestones of the Limekiln Wood Limestone Member can be seen. At the top of the face is a small tabular development of pale fine-grained limestone with typical mud-bank features. This seems to be a minor development of Waulsortian bank facies of Viséan age within the Limekiln Wood Limestone Member.

Interpretation

Salthill and Bellmanpark lie along the same line of knolls as Crow Hill, Worsaw, Gerna and Tiviston, part of which constitute The Knolls GCR site (see previous site report, this chapter; and (Figure 6.7)), the original knolls of Bellmanpark and Salthill having largely been quarried away. Miller and Grayson (1972) provided borehole evidence that the drift-covered interval between Bellmanpark and Crow Hill is underlain by the Waulsortian Complex and thus that the mud-banks originally formed a continuous belt. Later work on the Waulsortian at Bellmanpark (Lees and Miller, 1985) indicated the presence of the component phases B, C and D of Lees *et al.* (1985), indicating original water depths for the accumulation ranging from approximately 280 m to around 150 m. Further discussion about the origin and development of the Waulsortian facies in the Clitheroe area can be found in The Knolls GCR site report (this chapter) and is not repeated here.

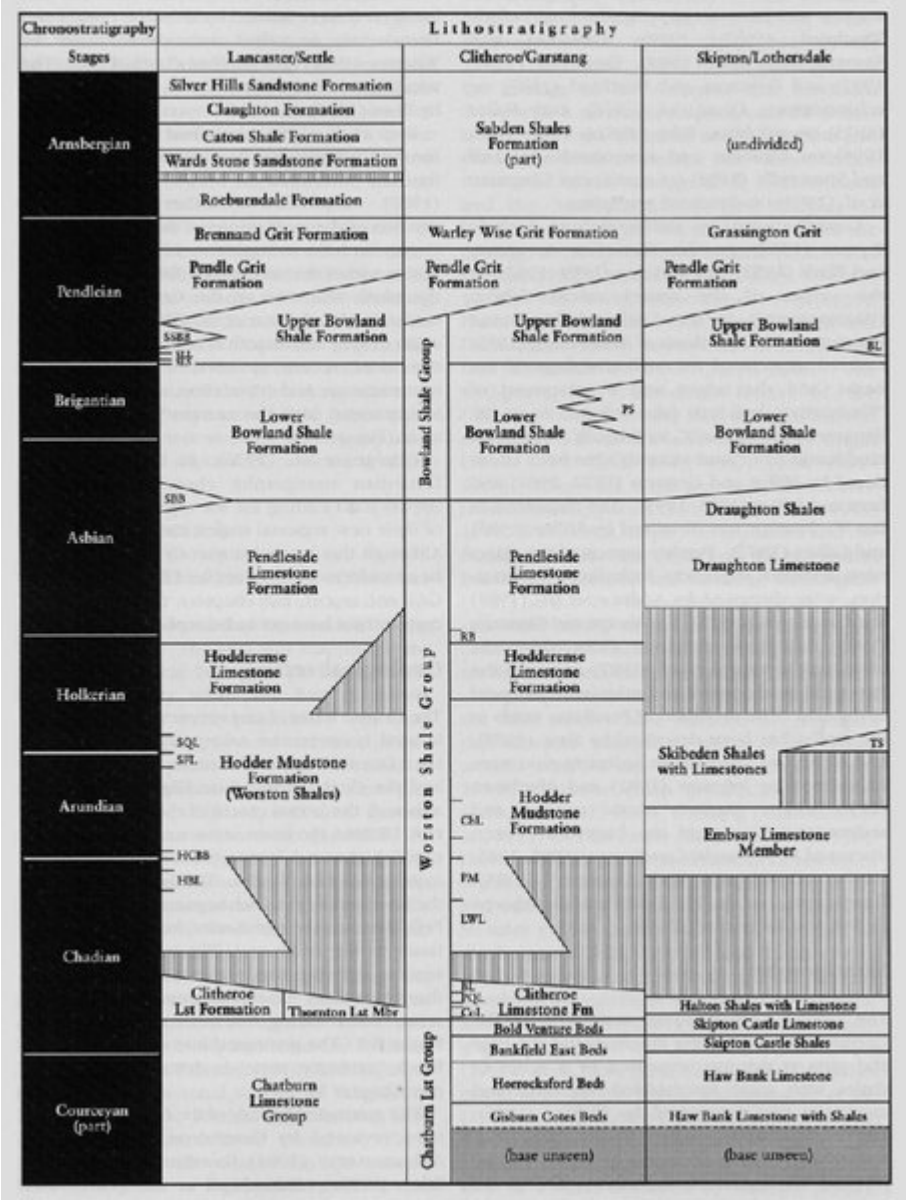
Miller and Grayson (1972) stressed that there is no evidence at this site for any original outward-dipping slopes in the Bellman Limestone Member. Although there may have been some depositional topography, they regard the whole Waulsortian Complex as essentially a tabular body that was strongly eroded after deposition to form the domes and troughs which are seen today. It is worth contrasting these structures with the younger Dinantian buildups that occur

along and to the south of the Craven Faults at the northern margin of the Craven Basin and which are described in Chapter 5. There, interpretations determined the existence of a marginal reef complex dissected by erosion to produce a knoll topography, but to the south of this marginal belt are isolated structures, such as that of Stebden Hill (see Cracoe Knolls and Swinden Quarry GCR site report, Chapter 5) which are apparently surrounded by shale and which are thought to have stood up as significant topographical features above the sea floor during growth (Mundy, 1980a).

Conclusions

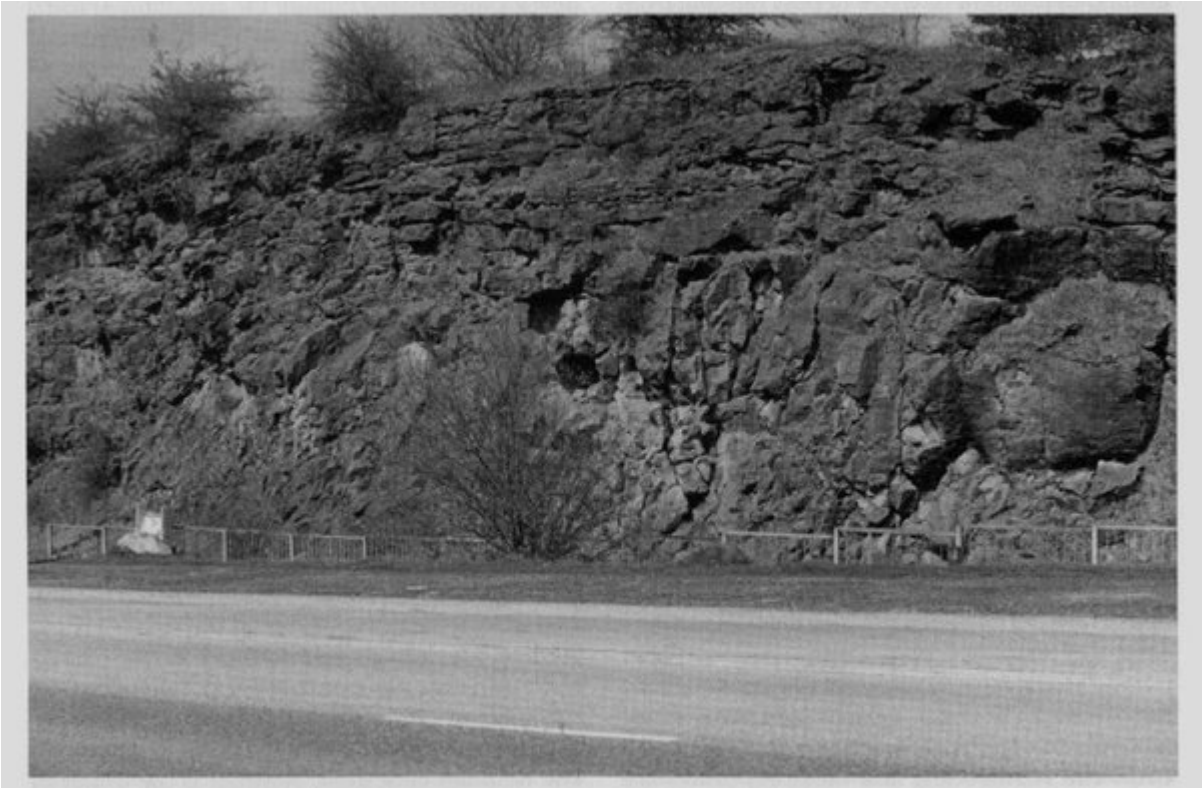
The quarries of Salthill and Bellmanpark have become a classic British Lower Carboniferous locality. The striking clarity with which the complex early to late Chadian sedimentation history of the Craven Basin is revealed here, has made this an invaluable site for teaching, as well as for research. The prolific faunas, including several species for which this is the type locality, make Salthill and Bellmanpark one of the most valuable palaeontological sites in northern England.

References

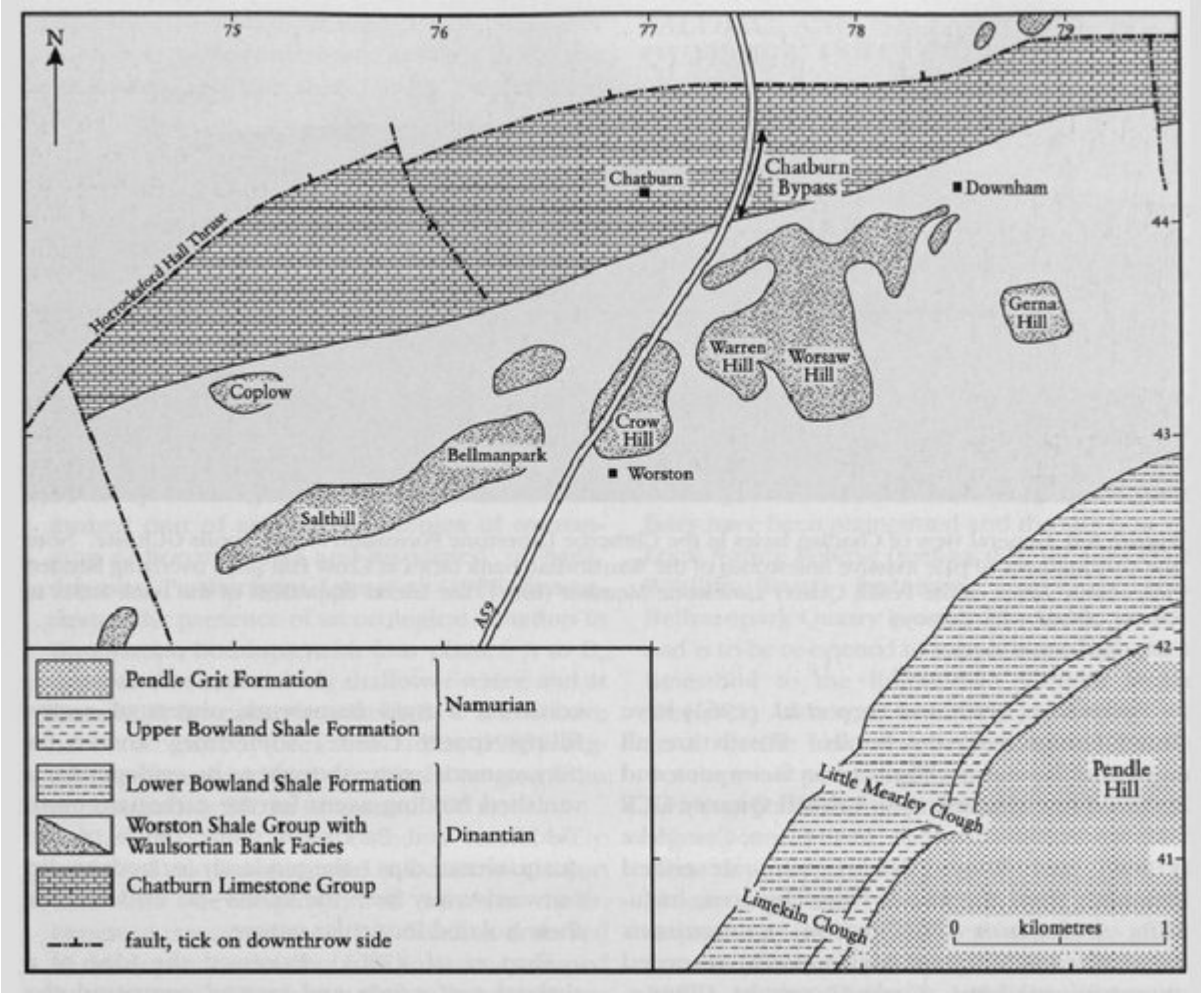


(Figure 6.2) Simplified stratigraphical chart for the Lower Carboniferous succession of the Craven Basin. (HBL — Hetton Beck Limestone Member; HCBB Haw Crag Boulder Bed; SFL — Scaleber Force Limestone Member; SQL — Scaleber Quarry Limestone Member; SBB — Scaleber Boulder Bed; SLS — Sugar Loaf Shales; SLL — Sugar Loaf Limestone; SSBB School Share Boulder Bed; CoL — Coplow Limestone Member; PQL — Peach Quarry Limestone Member; BL — Bellman Limestone Member; LWL — Limekiln Wood Limestone Member; PM — Phynis Mudstone Member; ChL — Chaigley Limestone Member; FIB — Rad Brook Mudstone Member; PS — Pendleside Sandstones Member; TS —

Twiston Sandstone Member; BL — Berwick Limestone.) Areas of vertical ruling indicate non-sequences. Not to scale. Compilation based on Hudson and Mitchell (1937), Metcalfe (1981), Arthurton et al. (1988), British Geological Survey (1989), Riley (1990a, 1995), Aitkenhead et al. (1992), Brandon et al. (1995, 1998).



(Figure 6.9) Development of the Waulsortian bank facies (Bellman Limestone Member of the Clitheroe Limestone Formation (Chadian) at Salthill Quarry, Clitheroe. An erosion surface above the bank facies is draped by a crinoid debris layer ('boulder bed') of variable thickness and this is in turn unconformably overlain by dark-grey bedded limestones of the Limekiln Wood Limestone Member. (Photo: A.E. Adams.)



(Figure 6.7) Geological map of the area to the east of Clitheroe showing the location of the exposed eroded remnants of the Waulsortian bank facies at The Knolls GCR site (Crow Hill to Gerna Hill) based on a [British] Geological Survey map of the area (Institute of Geological Sciences, 1970). The locations of several other GCR sites in the region (Chatburn Bypass, Salthill and Bellmanpark Quarries, Coplow Quarry, Pendle Hill) are also shown.