
Deganwy Quarries

[SH 786 791]–[SH 788 792]

Introduction

The Deganwy Quarries site is important for understanding the development of the uppermost Ordovician in North Wales. It is the type locality for the Deganwy Mudstone Formation of latest Rawtheyan or early Hirnantian age and provides the best exposures of the Hirnantian Conway Castle Grits. The latter reflects the late Ordovician glacio-eustatic fall in sea level, which gave rise to a large submarine fan that brought coarse sediment into a deep part of the Welsh Basin.

Both the Deganwy and Conway Castle Grit formations were named by Elles (1909) in her account of the geology of the Conwy district, which included a map of the area. Conway Castle, 1.5 km SSW of Deganwy, is built on the formation to which it gives its name. Elles (1909, p. 182) provided brief descriptions of the units in Deganwy Quarries and, listed faunas from both formations. She confirmed the correlation originally made by Jukes (1871) of the Conway Castle Grits with the Hirnant Limestone in the Bala area (see the Aber Hirnant site report), although, as she noted (1909, p. 170), Jukes subsequently suggested correlation with a lower horizon in the Bala sequence.

James and James (1969, p. 579) briefly outlined the sedimentology of the Conway Castle Grits in the Deganwy Quarries and recognized that its base represents a large-scale erosion surface. An account of the formation, including sedimentary logs, was given by Cullen (1986, unpublished), and the succession in the Conwy area was shown schematically by Brenchley and Cullen (1984), who discussed the significance of the faunas from Deganwy.

The Deganwy and Conway Castle formations and their equivalents have also been described in areas west of the River Conwy and south of Deganwy (Stevenson, 1971; Roberts, 1979; Warren *et al.*, 1984). The underlying Bodeidda Mudstone Formation (not exposed in Deganwy Quarries) contains a shelly fauna that indicates a Rawtheyan age (Brenchley and Cullen, 1984, p. 117, table 2; Price, 1984, p. 101), and there is thus a significant hiatus above the upper Caradoc (*Dicranograptus clingani* Zone) Cadnant Shale Formation (see the Cadnant Cutting site report).

Description

The Deganwy Quarries provide about 40 m of vertical exposure on the two main faces, which are orientated NW–SE, and over 300 m of lateral exposure in these and two faces at right angles to them. The succession dips south at about 65°. Some 5.5 m of bioturbated, cleaved mudstones of the Deganwy Mudstone Formation are exposed in the south-west face of the main quarry. Their colour varies upwards from light-grey to dark-grey immediately below the overlying Conway Castle Grits, and there is a band of small, highly fossiliferous phosphatic nodules 2 m below the top. The erosional base of the Conway Castle Grits is well seen in this section (Figure 9.24), and the coarse calcarenites at various levels in the formation contain lithoclasts of the underlying mudstone unit. At Llanros, to the north, the Deganwy Mudstones were completely removed prior to deposition of the Conway Castle Grits, which there lies on the underlying Bodeidda Mudstone Formation. About 38 m of the Conway Castle Grits are exposed in the south-west face of Deganwy Quarries, and Cullen's (1986) detailed sedimentary log of the section there is simplified here as (Figure 9.24). Cullen also produced a log of the north-east end of the quarry, where some 18 m of the formation is seen. The overlying Gyffin Shales (Llandovery) are not exposed.

The Conway Castle Grits contain three main facies, interpreted by Cullen (1986) as representing different parts of a submarine fan (Figure 9.24), much of the sediment having been transported by turbidity currents. Most of the section comprises channel deposits of coarse, generally thickly bedded calcarenites. Between 10 m and 14 m above the base of the formation in the south-west section, more thinly bedded, generally finer deposits represent the mid-fan, and at various levels above 19 m siltstones represent the deposition from suspension of inter-channel overbank fines.

Interpretation

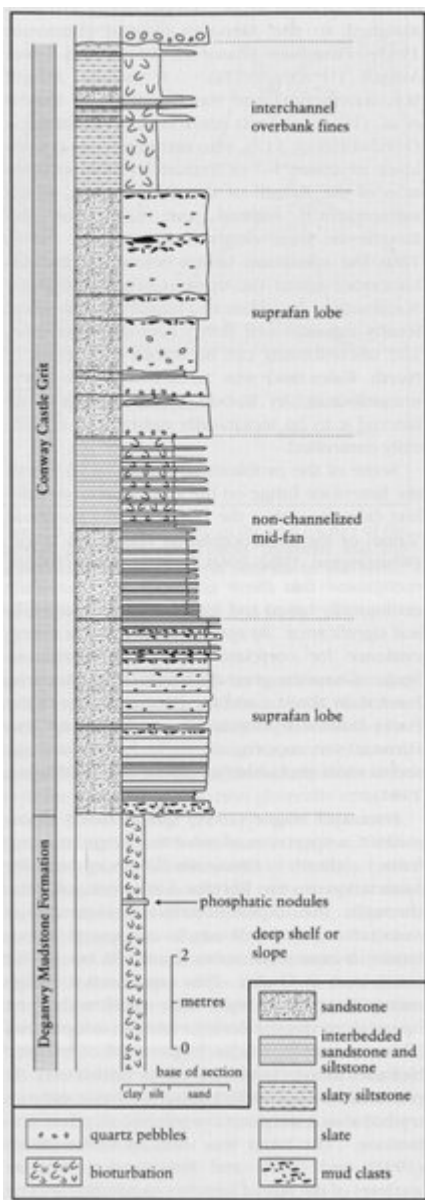
Elles (1909, p. 183) recorded *Orthograptus truncatus abbreviatus* from the lowest exposed part of the Deganwy Mudstones in the Deganwy Quarries, and Williams *et al.* (1972, p. 22) took this to indicate the *D. anceps* Zone. Elles also recorded the trilobite *Mucronaspis mucronata* (as *Phacops (Dalmanites) mucronatus*) in the uppermost 1.5 m or so of the mudstones, together with brachiopods, orthocones, bivalves and other shelly fossils. This has been confirmed by more recent collecting (BGS unpublished internal report; Brenchley and Cullen, 1984; Cullen, 1986). Williams *et al.* (1972, p. 22) considered the presence of *M. mucronata* to indicate that the Deganwy Formation extends up into the Hirnantian. However, the appearance of the species in the latest Rawtheyan of northern England (see the Ashgill Quarry site report) makes such a correlation somewhat doubtful.

The Conway Castle Grits is interpreted as a slope-base channel-fill (Cullen, 1986). The age of the formation has been the subject of some controversy (see Williams *et al.*, 1972, p. 22), but a correlation with the Hirnantian now seems well established on the basis of elements of the *Hirnantia* fauna at various levels in the unit at Deganwy and elsewhere (Elles, 1909, p. 183; Brenchley and Cullen, 1984, p. 118; Cullen, 1986). The faunas are locally diverse (unpublished BGS internal reports) but are clearly allochthonous; together with abundant bioclasts at some levels (Cullen, 1986), they indicate a carbonate source-area in addition to the source of the siliciclastic sediment. Locally, solitary rugose corals form a significant proportion of the bioclasts. The presence of lithoclasts derived from the underlying Deganwy Mudstones leaves open the possibility that some of the faunal elements may be reworked from that formation. Brenchley and Cullen (1984, p. 118, fig. 3) suggested that the *Mucronaspis* (formerly *Dalmanitina*) fauna of the Deganwy Mudstones represented the indigenous deep-shelf fauna, the shallower-water *Hirnantia* faunas being introduced from the west within a submarine fan. The development of the latter resulted from the Hirnantian glacio-eustatic fall in sea-level.

Conclusions

This site is important in providing the best exposures of the Conway Castle Grits, the deposition of which reflects the late Ordovician global fall in sea level; this fall resulted in the development of a large submarine fan bringing coarse sediment into a part of the Welsh Basin that had previously been the site of deep-water muds.

[References](#)



(Figure 9.24) Simplified sedimentary log of the uppermost part of the Deganwy Mudstone Formation and the lower half of the Conway Castle Grits at the southwest end of Deganwy Quarries, after Cullen (1986, unpublished).