
Nant Aberderfel

[SH 850 395]

Introduction

This is the type locality for the Derfel Limestone and for several brachiopod species contained within it. They and adjacent graptolite faunas make this a locality important for the correlation of early Caradoc stratigraphy and volcanism in North Wales.

The gorge at Nant Aberderfel, 8.5 km northwest of Bala (Figure 9.1), is the type locality for the so-called 'Derfel Limestone', a calcareous member locally developed near the base of the Nant Hir Mudstones, and thus near the base of the lower Bala Group (column W5 in Williams *et al.*, 1972). The limestone was reported by Ramsay (1866) and was named and mapped by Fearnside (1905). Its rich brachiopod and trilobite fauna was described by Whittington and Williams (1955) and further discussed by Bassett *et al.* (1966). The fauna is the earliest development of an ecological association known as the *Nicolella* palaeocommunity, which subsequently thrived at various times in parts of Wales but was only poorly developed in the type Caradoc of Shropshire. This has hindered direct correlation of the Derfel Limestone with the Shropshire shelly zonation but has an important role in the analysis of the changing environmental patterns of the basin. Zalasiewicz (1992) described graptolites of the *multidens* Zone from strata just above and just below the Derfel Limestone.

Description

As described by Bassett *et al.* (1966, p. 229), the type Derfel Limestone at Nant Aberderfel comprises 1–2 m of blue-black, pyritous, slightly calcareous mudstones in the west wall of the gorge.

Lockley (1980a, p. 25) noted that the gorge was subsequently partly flooded by Llyn Celyn, and when the water level is low it is seen that the 'limestone' (something of a lithological misnomer) is separated from the underlying Aran Volcanic Group by 15 m of mudstones with ashy intercalations. Lynas (1973), however, noted lenses of beds similar to the Derfel Limestone within the topmost division of the Aran Volcanic Group, the Llyn Conwy Formation. Bassett *et al.* (1966, p. 229) considered correlatives of the Derfel Limestone in the Bala area to include fossiliferous silty mudstones in Afon Serw, and blocky mudstones at Pistyll Gwyn in Nant Hir. The Nant Hir Mudstones, of which the Derfel Limestone forms an impersistent basal member, may be in excess of 1000 m thick.

The Derfel Limestone is richly fossiliferous; a 10 kg bulk sample analysed by Lockley (1980b, p. 173) yielded 173 specimens belonging to at least 28 taxa, in a fauna dominated by brachiopods and bryozoans but also including trilobites and a few echinoderms, ostracods and machaeridians. A total of 19 species of brachiopod and 9 of trilobite are known from the member (Whittington and Williams, 1955; Williams, 1963; Lockley, 1980b), with 10 of the brachiopod species or subspecies having this as their type horizon.

Interpretation

The faunal association in the Derfel Limestone was originally termed the '*Kullervo–Palaeostrophomena–Nicolella* association' by Williams (in Whittington and Williams, 1955) but was subsequently renamed the '*Nicolella* association' (Williams, 1963, 1973). Williams noted similarities to some of the faunas of the Gelli-grŷn Formation (see site report for Gelli-grŷn) and the significant component of stocks of Baltic origin. Lockley (1980b), who made a quantitative assessment of the faunas of the Bala area and subsequently the Arenig to Caradoc of the Welsh Basin as a whole (Lockley, 1983), considered that what he termed the '*Nicolella* palaeocommunity' was derived from the earlier 'mixed *Dalmanella* palaeocommunity' and that it typified fine-grained calcareous siliciclastic rocks and limestone. In addition to the Derfel Limestone in the Bala area, Lockley recognized the palaeocommunity in much of the Gelli-grŷn Formation of

Longvillian–Woolstonian age and, in the intervening succession, in part of the Glyn Gower Siltstone. It is also developed in the Longvillian of the Berwyns, the lower Caradoc of Anglesey and the Soudleyan of the Shelve area, but not to any significant extent in the type Caradoc of Shropshire.

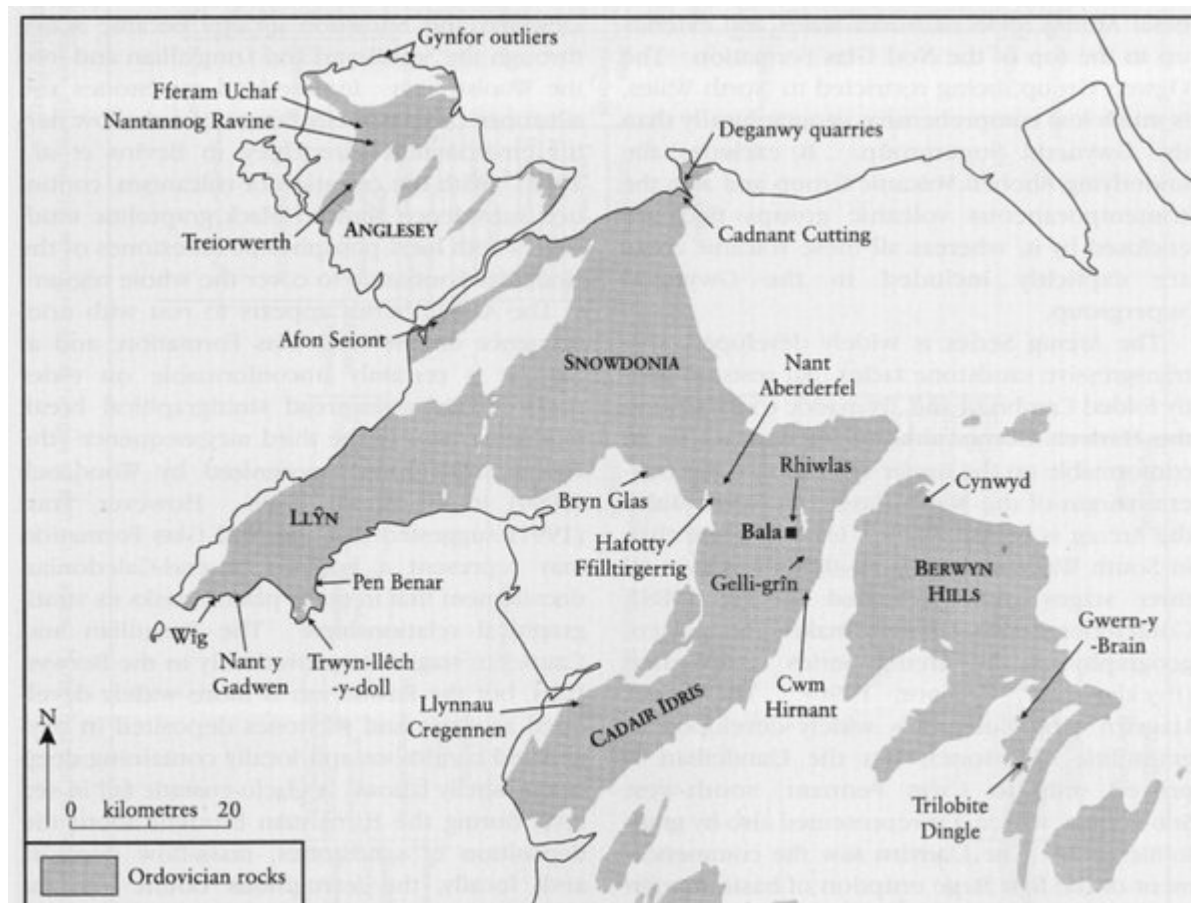
The development of the *Nicolella* palaeocommunity in the Derfel Limestone marks its earliest occurrence, but its precise age there is uncertain because of palaeoecological problems of direct correlation with the type Caradoc. Elles (1922) assigned to the *Nemagraptus gracilis* Zone a graptolite fauna that she considered to be from a level between the Derfel Limestone and the underlying volcanic formation. However, Zalasiewicz (1992) extracted graptolite faunas from above the Derfel Limestone at Nant Aberderfel (his Locality 3) and from immediately above the base of the Nant Hir Formation at his Locality 4 near Castell Carndochan [SH 8357 3033] and assigned both to the *multidens* Zone (renamed '*foliaceus* Zone' in Fortey *et al.*, 1995). These faunas date the cessation of Aran Volcanic Group activity to within the *multidens* Zone.

Williams (1963) and Bassett *et al.* (1966) drew attention to similarities between the Derfel Limestone brachiopod fauna and faunas from Anglesey that include *N. gracilis* Zone graptolites (Bates, 1968b), suggesting correlation with the Costonian of Shropshire, whilst Rushton and Howells (1998) and Howells and Smith (1997) placed the Derfel Limestone near the Costonian–Harnagian boundary. Of the trilobites known from the Derfel Limestone, only one, *Broeggerolithus* cf. *harnagensis* (Bancroft) of Whittington (in Whittington and Williams, 1955; Whittington, 1968) allows any direct correlation with south Shropshire. Though Dean (1960, p. 105) considered it similar, but not identical, to Bancroft's species from the type Harnagian, its occurrence is consistent with the revised graptolite zonation.

Conclusions

This is the type locality for the Derfel Limestone, which contains a rich, shelly fauna dominated by brachiopods, some ten taxa having their type locality there. This fauna, taken with the graptolites, provides a regionally important horizon for dating the end of the Man Volcanic Group volcanism. The shelly fauna is the earliest development of an ecological assemblage, the *Nicolella* palaeocommunity, that thrived at various times during the Caradoc history of the Welsh Basin.

References



(Figure 9.1) Distribution of Ordovician (Arenig to Ashgill) rocks in North Wales, after British Geological Survey (1994c), showing the location of GCR sites. For the Tremadoc site at Pen Benar, see Chapter 7.