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# Nant y Gadwen

[SH 2122 2685]–[SH 2108 2661]

## Introduction

This site is important in exemplifying the biostratigraphy of the Arenig succession as developed in southern LISrn, and is the only place where Moridunian, Whitlandian and Fennian faunas are all present. It is also significant in that the graptolites afford correlation with the Lake District succession (Jackson, 1962; Cooper *et al.*, 1995) and the trilobites with that in South Wales (Fortey and Owens, 1987), thereby offering a significant link in the correlation between these two important areas.

Nant y Gadwen is a narrow valley occupied by an underfit stream that may have formed sub-glacially (Gibbons and McCarroll, 1993, p. 61), and which runs south-south-west for some 600 m from the hamlet of Llanfaelrhys to the sea at Porth Alwm. The valley is carved out of Ordovician siltstones that lie between more resistant dolerite intrusions. There are numerous old mine workings from which manganese was extracted before World War I and briefly during World War II. Matley (1932) first mapped Arenig strata here, and more recently Beckly (1988) collected new faunas that allowed him to identify representatives of the Moridunian, Whitlandian and Fennian stages, and he proposed new lithostratigraphical divisions. However, Gibbons and McCarroll (1993, p. 28), who were unable to use Beckly's units in their wider mapping, modified his scheme, and their divisions are employed here.

## Description

At the north end of the valley, faunas from all three Arenig stages have been found within approximately 100 m of rock, but they are not in simple succession. Grey mudstones there dip south to south-west at 28–50° (Figure 9.8). The trilobite *Merlinia selwynii* (Salter) (Figure 9.9)a, indicative of the Moridunian Stage in South Wales and in the Harlech Dome, occurs commonly in mudstones exposed on the east side of the valley [SH 2122 2685], above a dolerite sill.

Across a gap in the exposure, but with no change in dip, tuffaceous mudstones, siltstones and a prominent bedded tuff crop out [SH 2122 2684] and yield trilobites and graptolites, including *Didymograptus distinctus* Harris and Thomas, *Expansograptus cf. extensus linearis* Monsen and *Pseudisograptus cf. dumosus* (Harris), which are indicative of a Fennian age. To the south-west, also dipping south and apparently overlying the Fennian strata, are manganese-stained laminated siltstones that have yielded a Whitlandian fauna which includes the diagnostic trilobites *Bohemopyge scutatatrix* (Salter) and *Cyclopyge grandis grandis* (Salter). Clearly this succession is affected by local faulting, the details of which are unknown.

These SW-dipping beds are truncated by a NW-trending fault, and the beds that crop out on both sides of the valley to the south dip to the south-east at about 60–65° on the west side and about 30° on the east side according to Matley (1932, p. 244), though Beckly (1985, unpublished) gave higher values (Figure 9.8). All the strata are referred to the Wîg Bach Formation of the Aberdaron Bay Group, and comprise dark-grey laminated mudstone and siltstone. Beckly (1988) recorded Fennian faunas from the west side and Whitlandian ones from the east, indicating that there is not a simple succession here (Figure 9.8). From the west side of the valley [SH 2108 2661] he recorded abundant *Didymograptus uniformis lepidus* Ni, together with other graptolites (*Expansograptus hirundo* Salter, *Isograptus caduceus gibberulus* (Nicholson) (Figure 9.9)b, *Pseudisograptus angel Jenkins* and *P. dumosus* (Harris)) and trilobites (*Microparia (M.) broeggeri* (Holub) and *Pricyclopyge binodosa eurycephala* Fortey and Owens). In collections from the east side of the valley [SH 2119 2679] a trilobite fauna with *Cyclopyge grandis grandis* (Salter), *Furcalithus aff. sedgwickii* (Salter), *Shumardia gadwensis* Fortey and Owens (type locality) and *Bohemopyge scutatatrix* (Salter) is firmly indicative of the Whitlandian Stage.

## Interpretation

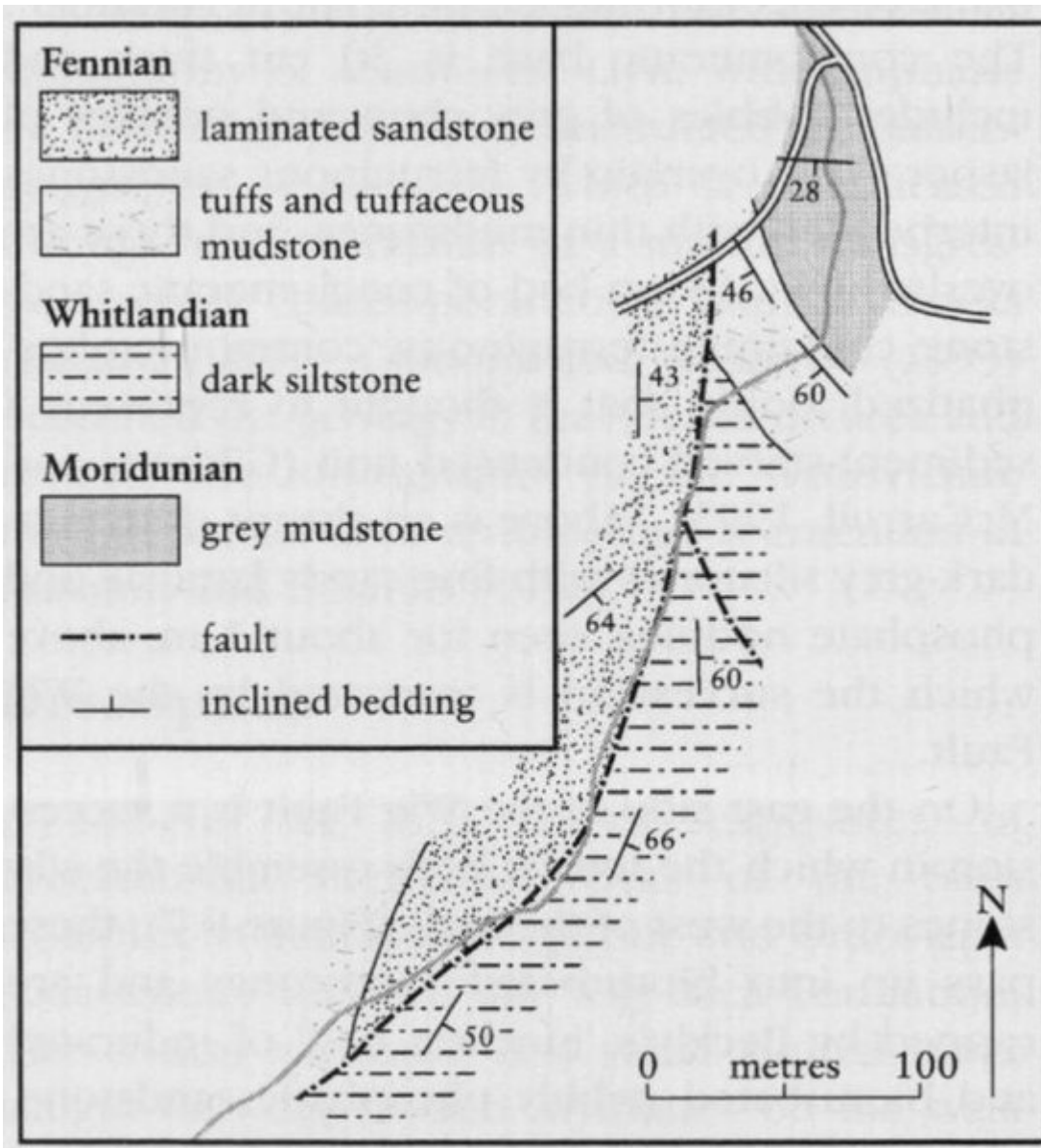
Nant y Gadwen is one of the few inland exposures of Arenig strata in south-western Llŷn. The laminated siltstones and mudstones of the Aberdaron Bay Group seem to, have been deposited in relatively quiet, deep water over a period of about 10 million years, during much of the Arenig epoch. It is probable that deposition of this kind took place continuously, although because of local faulting and lack of exposure only parts of the succession can be seen at Nant y Gadwen and elsewhere.

Biostratigraphically the faunas from Nant y Gadwen are important in affording correlation within the British Isles and internationally. The *Isograptus* and *Pseudisograptus* from the west side of the valley indicate the development of the widespread deep-water Isograptid Biofacies of Cooper *et al.* (1991). Fortey *et al.* (1990) pointed out that of the graptolites from this locality *Pseudisograptus dumosus* (Harris) (which they identified as 'Form A' *sensu* Cooper) and *Didymograptus distinctus* Harris and Thomas, are widespread species that afford evidence for correlation with the Australian late Castlemainian Stage (Ca3). Mitchell and Maletz (1995, p. 324) and Mitchell and Chen (1995, p. 83) claimed that two graptolites from Nant y Gadwen (*P. dumosus* 'Form A' and *Pseudisograptus angel* Jenkins) are identical with *Arienigraptus zhejiangensis* Yu and Fang, which is an indicator of the earlier part of the *Undulograptus austrodentatus* Zone, a horizon that they recognize worldwide. The occurrence at Nant y Gadwen, therefore, pins part of the British succession into their scheme. Correlation with the *U. austrodentatus* Zone indicates a Darriwilian, not Castlemainian age, and Mitchell and Maletz (1995, p. 325) suggested that *D. distinctus* may have a longer range here, since elsewhere it does not range above the Castlemainian.

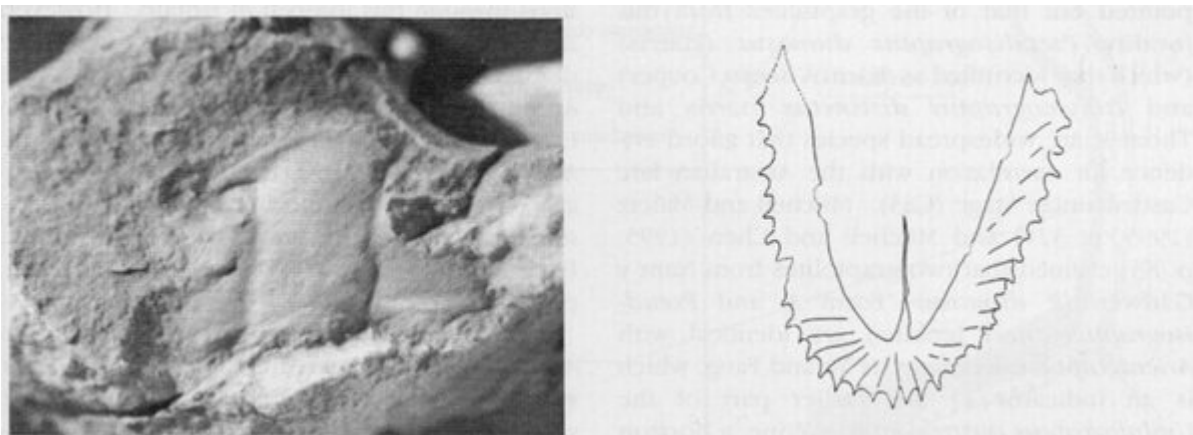
## Conclusions

Nant y Gadwen is a site of national importance. It contains trilobite and graptolite faunas from all three stages of the Arenig Series, and these contribute to the correlation of the trilobite-bearing sequence in South Wales with the sequence in the Lake District, which serves as a graptolitic standard (see Chapter 11).

## [References](#)



(Figure 9.8) Distribution of rocks of the three stages of the Arenig Series in Nant y Gadwen, after Beckly (1985, unpublished).



(Figure 9.9) Fossils from Nant y Gadwen. (a) Cranium of the Moridunian trilobite *Merlinia selwynii* (Salter), x 2.5. (b) The Fennian graptolite *Isograptus caduceus gibberulus* (Nicholson), x 4.