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# Nant Llech

## Highlights

This is the best exposure of the lower Langsettian in South Wales, showing the complete set of seven marine bands, three plant beds and two non-marine bivalve horizons.

## Introduction

The bed of Nant Llech, on the southern outskirts of Abercrave, Powys, Wales [SN 834 127]–[SN 843 120], is the classic exposure of the Namurian–Westphalian boundary in the South Wales Coalfield. It was noted in a number of early studies (De la Beche, 1846; Strahan *et al.*, 1904), and details of the plant fossils found here were given by Dix (1933, 1934). However, tectonic disruption associated with the Swansea Valley Disturbance (Owen, 1971a; Weaver, 1975) made it difficult to establish a continuous stratigraphical succession. This was not achieved until the publication of the now classic paper by Leitch *et al.* (1958). The sedimentology of the Farewell Rock here was described in Bluck's (1961) thesis but, other than a brief summary by Bluck and Kelling (1963), the data have not been published. Most recently, the site has been mentioned by Barclay *et al.* (1988).

## Description

### Lithostratigraphy

The exposed sequence here is summarized in (Figure 4.18)(b). The lowest strata seen are c. 3 m of dark grey mudstone belonging to the topmost Middle Shales Formation. They contain abundant marine fossils (see below) and are thought to represent the Subcrenatum Marine Band. It is not quite as thick as at other north crop exposures, such as Brynamman and the Vale of Neath (Bloxham and Thomas, 1969) and is dwarfed by the 16 m thick marine band reported on the south crop (Woodland *et al.*, 1957). However, it is significantly better developed than at sites such as Cwm Gwrelych, where it has been partially eroded away by fluvial activity associated with the overlying Farewell Rock (see discussion of previous site).

The Farewell Rock Formation here is some 30 m of massive sandstones and grits. Bluck (1961) reported extensive trough cross-bedding at this exposure, indicating a south-south-east palaeocurrent direction, which is consistent with observation made elsewhere in the middle part of the north crop. Bluck also noted the presence of a basal *mélange* with angular mud-clasts, rounded ironstone nodules and quartz pebbles, probably the result of reworking of channel deposits (see also Bluck and Kelling, 1963).

Overlying the Farewell Rock at Nant Llech is a 30 cm thick coal known as the Astell Seam, marking the base of the Productive Coal Formation. The coal is in turn overlain by c. 15 m of channel deposits, including a 3.5 m thick coarse, lenticular sandstone with an erosive base. At the top of this fluvial interval is a second emergent surface. Dix (1933) claims that there is a coal at this point in the sequence. It is no longer exposed, although its roof-shales containing abundant plant fossils (Plant Bed C) is still visible.

There then follows six cyclical intervals, each consisting in turn of marine mudstones, non-marine sandstones and coals. Leitch *et al.* recognized five marine bands which they designated M<sub>1</sub>–M<sub>5</sub>. Subsequently, W.A. Wimbledon (pers. comm.) has found a sixth marine band between M<sub>4</sub> and M<sub>5</sub>. This interval probably represents lower delta-plain, possibly intertidal conditions; marine influence can never have been far away, although there is evidence of an emergent surface between M<sub>1</sub> and M<sub>2</sub>.

The top part of the sequence sees a return to non-marine strata. Initially, this is in the form of dark-grey lacustrine shales, which include two discrete beds with non-marine bivalves (C<sub>1</sub> and C<sub>2</sub> of Leitch *et al.*, 1958). This is eventually capped by a coal, known locally as the Cnapiog Seam. It is the lowest of the South Wales coals to occur widely through the

coalfield, and is sometimes known elsewhere as the Garw or Rhasfach coal. The position of this coal at Nant Llech was established by Leitch *et al.* (1958), but is no longer exposed.

## Biostratigraphy

### Marine bands

The only fully developed marine band in this sequence is in the top of the Middle Shales Formation (Robertson, 1932; Ware, 1939; Leitch *et al.*, 1958). It yields abundant ammonoids, mainly of *Gastrioceras subcrenatum* (Frech), but with some *Anthracoeratites*. There are also inarticulate brachiopods (*Lingula*, *Orbiculoidea*), bivalves (*Edmondia*, *Dunbarella*, *Schizodus*, *Nuculopsis*) and gastropods (*Euphemusites*). Although there is no published description of the assemblage, the listed taxa appear to indicate the Subcrenatum Marine Band, probably in the pectinoid facies of Calver (1968).

Most of the six 'marine' bands above the Farewell Rock here contain essentially brackish-water assemblages of inarticulate brachiopods and fish fragments. The only exceptions are M<sub>1</sub>, which has yielded some indeterminable productid fragments, and M<sub>2</sub>, which has yielded *Schizodus*, and indeterminable gastropods and productids (Leitch *et al.*, 1958).

### Non-marine bivalves

Other than a band containing some crushed *Carbonicola* shells in the fluvial sequence above the Astell Coal (Leitch *et al.*, 1958), non-marine bivalves are restricted to two discrete bands towards the top of the sequence. They are known as C<sub>1</sub> and C<sub>2</sub>. The bivalves from Nant Llech have not been described in the literature, although Eagar (1962) has described the fossils from what is probably a correlative of the lower bed at Cwm Gwrelych.

### Plant fossils

Plant fossils occur at three horizons in the sequence, corresponding to the plant beds B–D of Dix (1933, 1934). Leitch *et al.* (1958) only recognized the lower two of these beds, which they termed P<sub>1</sub> and P<sub>2</sub>.

Plant Bed B (or P<sub>1</sub>) immediately overlies the Astell Coal. It has yielded a number of biostratigraphically sensitive taxa, including *Neuralethopteris rectinervis* (Kidston) Laveine, *Alethopteris decurrens* (Artis) Zeiller, *Karinopteris acuta* (Brongniart) Boersma, *Lyginopteris hoeninghausii* (Brongniart) Gothan, *L. baumleri* (Andrä) Gothan and *Renaultia cf. crepinii* (Stur) Gothan. The assemblage clearly belongs to the *Neuralethopteris jongmansii* Subzone (lower *L. hoeninghausii* Zone), indicative of the lower Langsettian.

Plant Bed C (or P<sub>2</sub>) is c.15 m higher, at the top of the fluvial interval between the Farewell Rock and the M<sub>1</sub> Marine Band. It differs from the Bed B assemblage, in not including *A. decurrens*, *L. hoeninghausii* or *R. cf. crepinii*. Also, *N. rectinervis* is rare, and is partially replaced by *Neuralethopteris jongmansii* Laveine. Nevertheless, the assemblage is also clearly from the *N. jongmansii* Subzone.

Plant Bed D occurs between the M<sub>1</sub> and M<sub>2</sub> marine bands. Again, the assemblage appears to belong to the lower *L. hoeninghausii* Zone, although there are no *Lyginopteris* species present. A number of distinctive lower Westphalian species occur here, but not in beds B and C, include *Pecopteris volkmannii* Sauveur and *Eusphenopteris hollandica* (Gothan and Jongmans) Novik. Dix (1934) also records *Neuropteris cf. heterophylla* Brongniart from Bed D, but this would be stratigraphically rather low for this species and it is more likely to refer to the very similar *Neuropteris obliqua* (Brongniart) Zeiller.

## Interpretation

This is the most complete development of lower Langsettian strata in the South Wales Coalfield. There are exposures of similar strata, such as along the Tenby–Saundersfoot Coast in Pembrokeshire, and at Cwm Gwrelych on the north crop. However, nowhere other than at Nant Llech is there the full development of seven marine bands, three plant beds and two non-marine bivalve beds. It is also the best exposure on the north crop of the Farewell Rock Formation, and of the

immediately overlying Astell Coal. For these reasons, Nant Llech has traditionally been regarded as the 'type' for the lower Langsettian of South Wales.

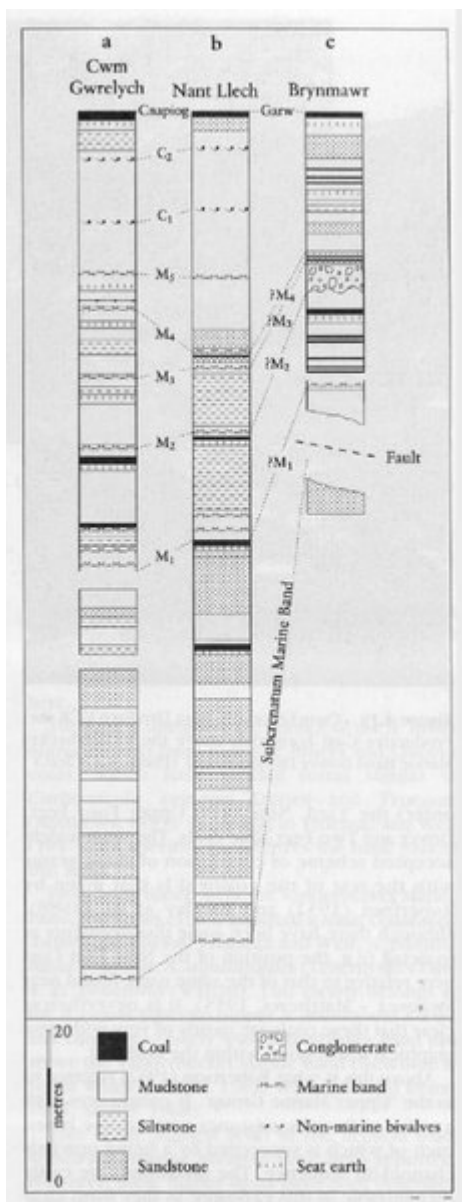
The most significant of the marker horizons are the marine bands, since they allow the sequence to be correlated in detail with coeval strata over much of northern Europe. The position of the Subcrenatum Marine Band, which marks the junction between the Namurian and Westphalian series, is readily identified at Nant Llech because of its diverse assemblage of marine fossils. The others are less easy to correlate, as they do not contain biostratigraphically sensitive fossils. Based on the assumption that they represent discrete eustatic events identifiable over wide geographical areas, Ramsbottom *et al* (1978) and Ramsbottom (1979a) proposed a correlation between these bands and the standard sequence of marine bands established in the Pennines coalfields. This correlation now needs to be modified slightly, to take into account the discovery of the new marine band between M<sub>4</sub> and M<sub>5</sub>, as follows:

Pennines	Nant Llech
Amaliae M.B.	M <sub>5</sub>
Meadowfarm M.B.	Unnamed
Parkhouse M.B.	M <sub>4</sub>
Listeri M.B.	M <sub>1</sub>
Honley M.B.	M <sub>2</sub>
Springwood M.B.	M <sub>1</sub>
Holbrook M.B.	(Unknown)

## Conclusions

This is the best exposure of rocks of early Langsettian age (315 million years old) in South Wales. No other locality in the coalfield has the complete set of fossil-bearing beds, which are important for establishing detailed correlations of these rocks.

## [References](#)



(Figure 4.18) Lower Westphalian successions in South Wales. (a) Cwm Gwrelych; (b) Nant Llech; (c) Brynmawr. Based on Leitch et al. (1958).