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# Afon Llafar

[SH 7357 3644]–[SH 7329 3687]

## Introduction

The Afon Llafar site exposes the basal stratotype of the Clogau Formation and is the only section in which the three zones recognized in the Clogau Formation are proved in stratigraphical succession. An exposure of the lowest part of the overlying Maentwrog Formation is one of only two that have yielded Middle Cambrian fossils.

The Clogau Formation was originally taken as the basal part of the 'Lingula Flags' (Salter, 1864a, pl. 10, p. 4), but with the detection of *Paradoxides* and other fossils in the unit, Belt (1867b, p. 494) excluded it from the 'Maentwrog Group', the lowest division of the 'Lingula Flags' as restricted by him, and he employed the South Welsh term 'Menevian Group'. The name 'Clogau Shales' was introduced by Andrew (1910) as a local name for the lowest unit of dark-grey laminated mudstones in the Dolgellau district, and the unit was described fully and its outcrop mapped by Matley and Wilson (1946). Allen *et al.* (1981) formalized the term 'Clogau Formation' and defined a basal stratotype in the Afon Llafar. Subsequently Pratt *et al.* (1995) described a clearer and much larger (though less fossiliferous) exposure on the coast at Llwyngwriil [SH 602 114].

## Description

Allen *et al.* (1981, p. 301) described the transitional contact (at [SH 7357 3644]) between the sandstones of the Gamlan Formation and the dark-grey laminated mudstones of the Clogau Formation, marking the basal stratotype of the latter (Figure 3.7). The strata dip north at 12–15° and sparse faunas of the *fissus* Zone, including *Plutonides hicksii* (Salter), have been collected from both the transitional beds at the top of the Gamlan and the lower beds of the Clogau Formation. About 17 m stratigraphically above the base of the Clogau Formation are fossils, including *Hartshillina spinata* (tilling), referred to the *parvifrons* Zone.

A further 50 m upstream and about 15 m higher stratigraphically, sparse representatives of the *punctuosus* Zone appear (Figure 3.8), whilst richer and more representative faunas (listed in Allen *et al.*, 1981, p. 303) occur for the next 300 m upstream. These include the trilobites *Paradoxides davidis* Salter and *Meneviella venulosa* (Salter), plus solenopleurids and agnostids, and are identical with typical Menevian faunas from South Wales (see the Porth-y-rhaw site report).

Alluvium covers the contact between the Clogau and Maentwrog formations, but a mudstone bed estimated to occur about 25 m above the base of the Maentwrog [SH 7329 3687] has yielded poorly preserved agnostid trilobites that appear to represent a late Middle Cambrian horizon (Allen *et al.*, 1981, p. 307). Above this, a considerable thickness of the lower part of the Maentwrog Formation is unfossiliferous, but further upstream, north of Doldinas [SH 7376 3822], the middle part of the Maentwrog Formation contains a fauna of *Homagnostus obesus* (Belt) and *Olenus* sp., both typical of the *Olenus* Zone.

## Interpretation

The Afon Llafar includes the basal stratotype for the Clogau Formation and shows the faunal succession from *fissus* to *punctuosus* zones better than anywhere else in North Wales. The choice of a basal stratotype for the Clogau Formation is arbitrary on account of the generally transitional nature of the basal contact, but also because of regional variation in both the Gamlan and Clogau formations. At Afon Llafar the Gamlan includes a coarse sandstone, with the Cefn Coch Grit of Matley and Wilson (1946) as its topmost division, and the Clogau Formation is dominantly of dark-grey laminated mudstone. At the contact at Llwyngwriil, described in detail by Pratt *et al.* (1995), the Cefn Coch Grit is absent and the Clogau Formation, though marked by the appearance of laminated hemipelagite, contains a higher proportion of sandstone and siltstone. The Llafar section is much clearer biostratigraphically. At Llwyngwriil the only useful fossil is a

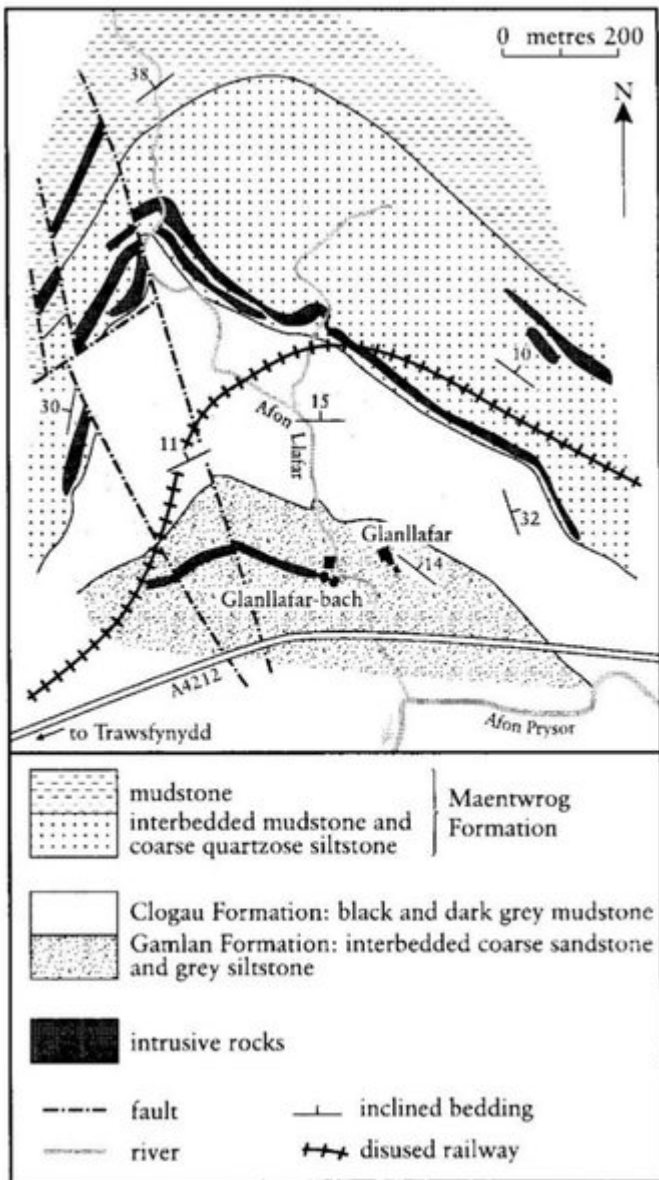
*Plutonides hicksii*, indicating the *fissus* Zone, found about 40 m above the base of the formation (Pratt *et al.*, 1995). In the Llafar section the *fissus* Zone is confined to the lowest 15 m of the section and is overlain by the *parvifrons* Zone, also about 15 m thick, followed by the *punctuosus* Zone, which appears to be more than 60 m thick (Allen *et al.*, 1981).

The occurrence of Middle Cambrian fossils near the base of the Maentwrog Formation and the *Olenus* Zone higher up shows that the base of the Upper Cambrian lies within the formation. Allen *et al.* (1981, p. 306) suggest that a non-sequence corresponding to the *brachymetopa* Zone separates the Maentwrog and Clogau formations and that the *pisiformis* Zone may be represented by strata that have not yet yielded diagnostic fossils. A comparable situation is inferred at Porth Ceiriad (see site description), where the basal non-sequence is more pronounced, but the Middle Cambrian fossils may be largely derived, and the strata representing the *pisiformis* Zone are not proved (Young *et al.*, 1994). In contrast, Pratt *et al.* (1995) described the contact between the Clogau and Maentwrog formations at Llwyngwril as conformable; however, there is insufficient biostratigraphical control (none for the Maentwrog) from which to infer this, and from the evidence elsewhere a non-sequence may be suspected.

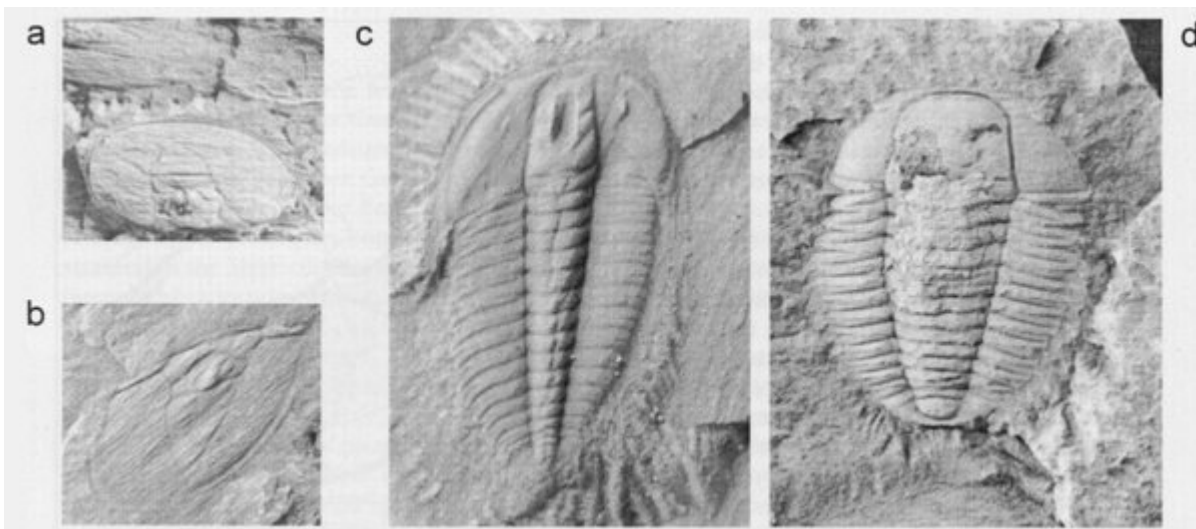
## Conclusions

Afon Llafar is the only place in North Wales to show the full succession of trilobite faunas, from the *fissus* to *punctuosus* zones, that inhabited the Welsh Basin during mid-Middle Cambrian times. These faunas allow correlation with the lithologically similar Menevian Beds of South Wales. It is one of only two places where one can identify the time in the late Middle Cambrian at which the pyritic mid-Middle Cambrian deposits were replaced by influxes of the sandy Maentwrog Formation.

## [References](#)



(Figure 3.7) Geological map of Afon Llafar, after Allen et al. (1981, fig. 3).



(Figure 3.8) Cambrian trilobites from North Wales. (a, b) *Ptychagnostus punctuosus*, cephalon and pygidium, x4, from the Clogau Formation (St David's Series) in Afon Llafar. (c) *Olenus micrurus* Salter, x4, from Maentwrog Formation (Merioneth) of Nant Ganol. (d) *Peltura scarabaeoides* (Wahlenberg), x 3, from Dolgellau Formation of Rhobell-y-big.