
Ogof Gynfor Coast

[SH 368 938]–[SH 374 946]

(GCR name: Llanbadrig area)

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Introduction

This locality has been described as including 'one of the finest exposures of Gwna mélange' (Barber *et al.*, 1981), and includes a well-exposed and critically important unconformable contact between this unit and overlying Arenig strata (Figure 7.16). The Gwna Group was the first mélange ever to be described in the world, indeed the term 'mélange' was coined by Greenly (1919) to describe this unit.

The relationship between the pre-Arenig basement of Anglesey and the overlying Ordovician cover was elucidated in the seminal publications of Matley (1899, 1900) and Greenly (1919). Later publications by Shackleton (1969) and Bates (1974) appeared to confirm the importance of the unconformity exposed at this site in terms of the likely huge age difference between an underlying Precambrian basement and overlying Ordovician cover. Barber and Max (1979) later challenged this generally accepted explanation, by putting forward the controversial view that the unconformity was of little significance. The south-western section of this site is of special interest because here the Gwna mélange contains abundant, very large limestone clasts. These limestones have yielded the only known examples of stromatolites in the Monian basement of North Wales. The stromatolites have been interpreted as being of late Precambrian (Wood and Nicholls, 1973) or late Precambrian to early Cambrian (Muir *et al.*, 1979) age, making them the oldest such fossils in Britain.

Description

The Gwna Group mélange, here exposed in between downfaulted blocks of Ordovician cover, has been described by Greenly (1919). It consists dominantly of grey and brown limestone and white quartzite clasts enclosed in a foliated but unbedded semi-pelitic matrix. The lithology is completely chaotic, although some sense of ghost stratigraphy can be detected in places, as trains of disrupted masses of limestone and quartzite are traced across the cliff line. The banded stromatolites (Figure 7.17) are seen on the coast west of Gadlys Quarry, and are preserved in some of the least recrystallized limestones seen anywhere in the Gwna Group mélange. Indeed, the mélange along the north coast of Anglesey has undergone the mildest degree of tectonism and metamorphic recrystallization in the entire Gwna Group outcrop of north-west Wales.

The famous unconformity between the Gwna mélange and the overlying Ordovician sedimentary rocks is exposed just above high water mark at the cliffbase at Ogof Gynfor (Figure 7.18). The bedded Ordovician cover, which consists mostly of coarse, pebbly sandstones, rests upon an irregular surface of steeply dipping quartzite-rich mélange. Prominent blocks of white quartzite project up into the overlying strata, which have draped over this irregular base. Clasts of the same white quartzite have become eroded and incorporated within the Ordovician succession. This is a classic locality for demonstrating the relationships that prove the unconformity between a sedimentary 'cover' sequence and its relatively older basement.

Interpretation

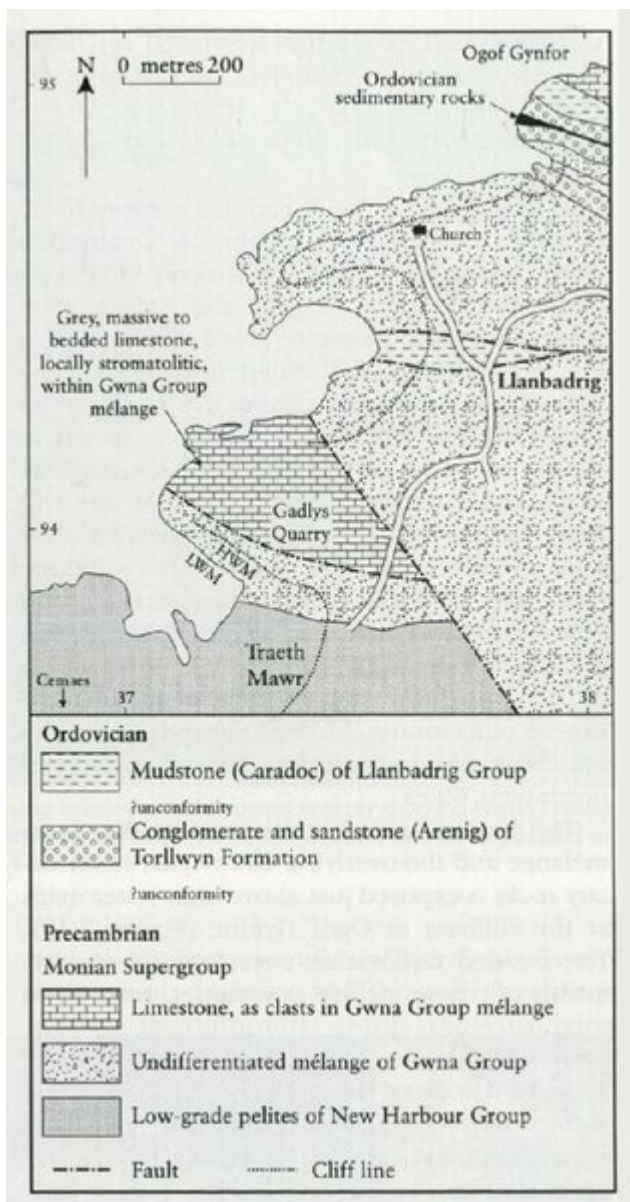
This site is key to the generally accepted view that Anglesey comprises an old basement (the 'Mona Complex' of Greenly, 1919) and a post-Cambrian cover. The exact length of time represented by the unconformity remains uncertain and somewhat controversial however. In Greenly's (1919) interpretation of the tectonic evolution of Anglesey, great emphasis was laid upon this unconformity. Greenly (1919) interpreted all of the Monian rocks, including the Gwna

mélange, to have undergone intense structural deformation, including isoclinal folding and regional overturning of the succession. This view was later modified by Shackleton (1954, 1969), who recognized that Greenly's idea of wholesale regional overturning of the Monian sediments was in fact incorrect. Thus, there was no necessity to invoke massive regional deformation, and, furthermore, this placed the Gwna Group at the top of the Monian Supergroup succession rather than at the base, thus requiring less erosion to reveal it. The subsequent discovery, albeit controversial, of supposedly Cambrian fossils in the Monian Supergroup (Muir *et al.*, 1979), added to the recognition by Bates (1968) that the overlying cover was of Arenig age (early to mid-Ordovician), rather than Caradoc (late Ordovician) as believed by Greenly; it also further reduced the necessity for a huge time gap at this unconformity (Barber *et al.*, 1981). The latter authors went further in this line of argument, and claimed that the Gwna mélange at this locality has undergone no more complex or pervasive deformation than the overlying Arenig cover strata. This final interpretation proved highly controversial because it implies that all of the deformation was Palaeozoic, probably Acadian (see discussion in Barber and Max, 1979), and this remains a matter of debate.

Conclusions

This site has been chosen because it preserves one of the best examples of the Gwna Group mélange on Anglesey, and the only clear place where unconformity with the overlying Ordovician cover sequence can be observed directly. The term 'mélange' was first defined on Anglesey, making this site of historical interest worldwide. Furthermore, the site includes the only place where macrofossils have been found in the pre-Arenig basement to north-west Wales. The exposure of an unconformity here is critical in proving the Gwna Group to be pre-Arenig, an observation fundamental to the interpretation of Welsh basement geology. However, the exact amount of time represented by the unconformity has been, and remains, the subject of great controversy.

[References](#)

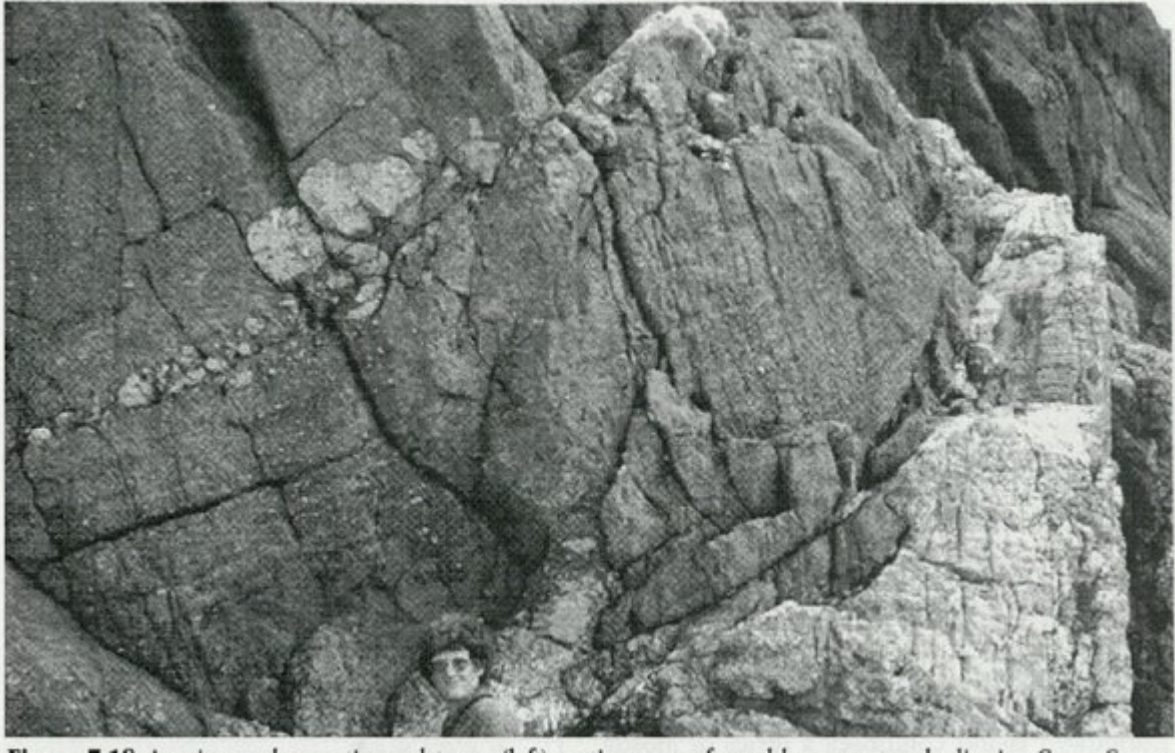


(Figure 7.16) Locality map for the Ogof Gynfor Coast site.



Figure 7.17 Bedded stromatolitic limestone within the Gwna Group from the coastal exposure west of Gadlys

(Figure 7.17) Banded stromatolitic limestone within the Gwna Group from the coastal exposures west of Gadlys Quarry (Photo: W Gibbons.)



(Figure 7.18) Arenig conglomeratic sandstones (left) resting unconformably upon steeply dipping Gwna Group mélange (lower right). The white quartzite in the underlying mélange has been eroded and incorporated as clasts within the Arenig sediment (top left). (Photo: W. Gibbons.)