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# Afon Dyfi between Dinas Mawddwy and Mallwyd, Caernarfonshire and Merionethshire

[SN 860 139]–[SH 862 116]

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## Highlights

The upper Dyfi valley floor has a well-preserved terrace sequence cut into Devensian glacial materials. The present river is actively migrating, and the site is a representation of the recent sequence of Welsh valley floor development.

## Introduction

The section of the Dyfi between Dinas Mawddwy and Mallwyd is unusual in Wales in that rejuvenation of the river (which in some cases leads to the formation of rocky gorges) has preserved well-developed terrace sequences. Three main terraces were identified by Thomas *et al.* (1982) (see (Figure 3.22)). Underlying them are sequences of glacial, glaciofluvial and glacio-lacustrine sediments identified in river bank sections. These deposits in turn overlie glacial till (as revealed in a seismic profile at Cemmaes [SH 839 062]). The till was deposited by ice which subsequently retreated, producing these glacial sequences of Devensian age (Thomas *et al.*, 1982). The glacial material was then reworked by the Afon Dyfi to form terraces at progressively lower levels. These are especially well-preserved in this section of the Dyfi.

The Dyfi upstream of Dinas Mawddwy [SH 958 149] is deeply entrenched with a narrow floodplain, and the present channel shows little evidence of lateral mobility. However, downstream reaches of the river (e.g. at Llanwrin, [SH 785 030]) exhibit rapid rates of movement (Lewin and Hughes, 1976; Lewin, 1983). Thus a meander loop was seen to have developed in this location within 90 years. The lateral movement has involved the reworking of an estimated  $10.78 \times 10^4$  m<sup>2</sup> of agricultural land, and led to the creation of such features as abandoned channels and gravel deposits on the floodplain of the lower and middle Dyfi. Present-day channel deposits in the Dyfi catchment, such as point bars, have been studied in greater detail by Blacknell (1982) at Penegoes [SH 765 008] on the Afon Crewi. Lateral movement of the channel and rejuvenation of the Dyfi have resulted in terrace remnants being preserved at a higher level than the present channel. Such flood-plain morphology has been analysed in more detail downstream of Machynlleth [SH 745 007] in order to map flood extent at various stages during inundation (Lewin and Hughes, 1980).

## Description

In places, river bank sections reveal the relationship between terrace gravels and glaciofluvial and glacial deposits. Five such sections have been analysed for the middle Dyfi by Thomas *et al.* (1982), including two between Dinas Mawddwy and Mallwyd. Evidence for the rejuvenation of the Dyfi at this point occurs in the form of a rocky gorge immediately upstream and downstream of Pont Mallwyd [SH 857 122]. The channel is rock lined and has a steeper gradient than that of upstream reaches, culminating in a series of rapids. Upstream of Pont Mallwyd, a number of distinct terraces are evident (Figure 3.21). Thomas *et al.* (1982) suggest that three main terrace levels exist but that '... a considerable number of minor forms intervene and up to five terraces occur in some areas'. Such terraces are well-preserved on the left bank of the Dyfi, but appear to have been largely removed on the right bank. Exceptions to this occur opposite Maes-y-camlan [SH 859 133] on the inside of a meander loop, where the lowermost of the terraces (Thomas *et al.* 'Flood Plain Terrace') is approximately 2 m above the present channel level. Two sections of the Dyfi between Dinas Mawddwy and Mallwyd have especially well-preserved terraces due, it is suggested, to 'the confining of the river to its rock channel and its consequent inability to meander across the valley floor' (Thomas *et al.*, 1982). Individual terrace levels cannot be traced downstream as a continuous feature, but tend to grade into lower terraces. Three such levels can be identified at Mallwyd [SH 863 124], with two immediately upstream of the confluence of the Dyfi with the Dugoed [SH 856 125]. The

form of these terraces is clearly outlined by the 70 m and 80 m contours on the 1 : 10 000 map (Sheet SH 81 SE) and they have dissected a low-angle alluvial fan deposited by the Afon Dugod which grades into the uppermost level.

Bank sections at Carlyle Terrace and Camlan Uchaf (sections 1 and 2 on (Figure 3.22)) reveal the relationships of terrace gravels to the glaciofluvial deposits which underlie them. Three main facies have been identified between the two sections: terrace deposits consisting largely of coarse and medium gravels (facies A in (Figure 3.22)); sandur deposits (facies C) which represent a braided out-wash environment and consist of fine gravel and sand underlying the terrace gravels at Carlyle Terrace; and facies B, which Thomas *et al.* (1982) suggested was of deltaic origin and consists largely of 'repeated tabular bed sets of fine to medium gravel dipping steeply down-valley' (Thomas *et al.*, 1982). These last deposits were present at the 7 m bank section opposite Camlan Uchaf [SH 859 119] downstream of Pont Mallwyd on the left bank of the Dyfi, where a distinct 'break' occurs between the terrace gravels, representing a meandering channel environment (2 m of coarse gravel deposits) and sediments of deltaic origin which consist of a 5–6 m deposit of finer gravel and coarse sand (facies B). This has been complicated in the area of Pont Mallwyd [SH 857 123] by ancient alluvial fan deposits originating from the Dugod Valley. The deltaic deposits of facies B have fining upwards sets and represent deposition in a meltwater environment controlled largely by seasonal variations in flow.

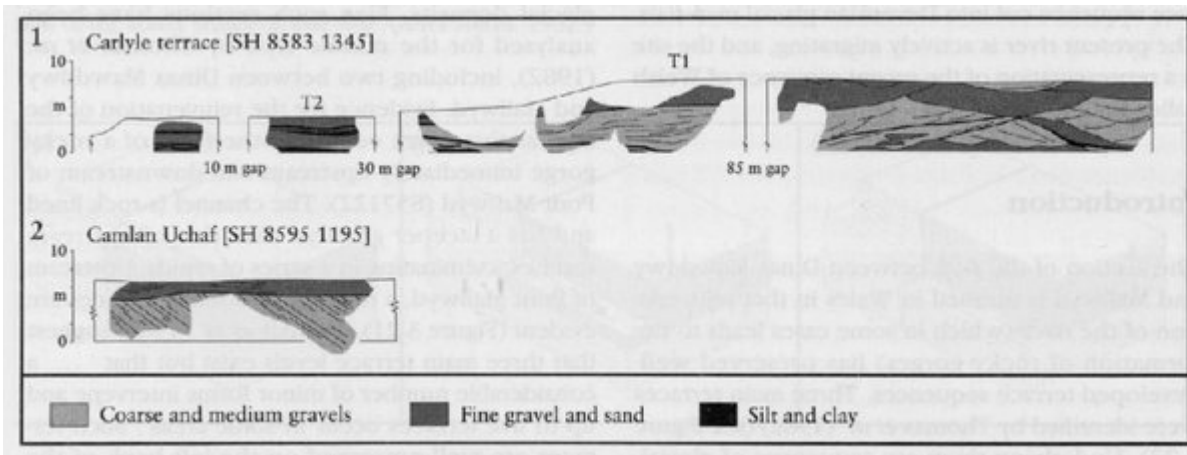
## Interpretation

Thomas *et al.* (1982) used these sections, together with three more at Cwm Llinau [SH 844 082] and Cemmaes Road [SH 821 050] and [SH 819 049] and a seismic profile at Cemmaes ([SH 839 062] — section A in (Figure 3.21)), to suggest a sequence of glacial deposits concealed by terrace deposits of coarse gravels similar to those that characterize the present Dyfi, and showing many of the features common to the present rivers of Mid-Wales; that is, gravel beds, composite banks and high rates of lateral mobility. The seismic profile revealed deposits of till up to 50 m thick in places that accumulated during a period of glacial advance, which in turn are overlain by glaciofluvial and glacio-lacustrine deposits that ... probably represent a late stage in the waste of this ice' (Thomas *et al.*, 1982). Such a retreat was not continuous (as indicated by moraines at Mallwyd and Minllyn—(Figure 3.21)) so that a range of proglacial deposits are seen in bank sections in the reach. Alluvial fans were also formed during this stage of retreat from deposits brought down tributary valleys. These glacial sequences, it was suggested, were of Devensian age (as indicated by the freshness of the moraine deposits) and subsequent river development has served only to cut through this valley infill of glacial deposits. These deposits have in turn been reworked and redeposited as river terraces at progressively lower levels. As these terraces have been eroded in the Holocene, only in a few locations are many terrace levels preserved. Confinement of the river in the reach between Dinas Mawddwy and Mallwyd has led to such features being especially well-preserved in this area.

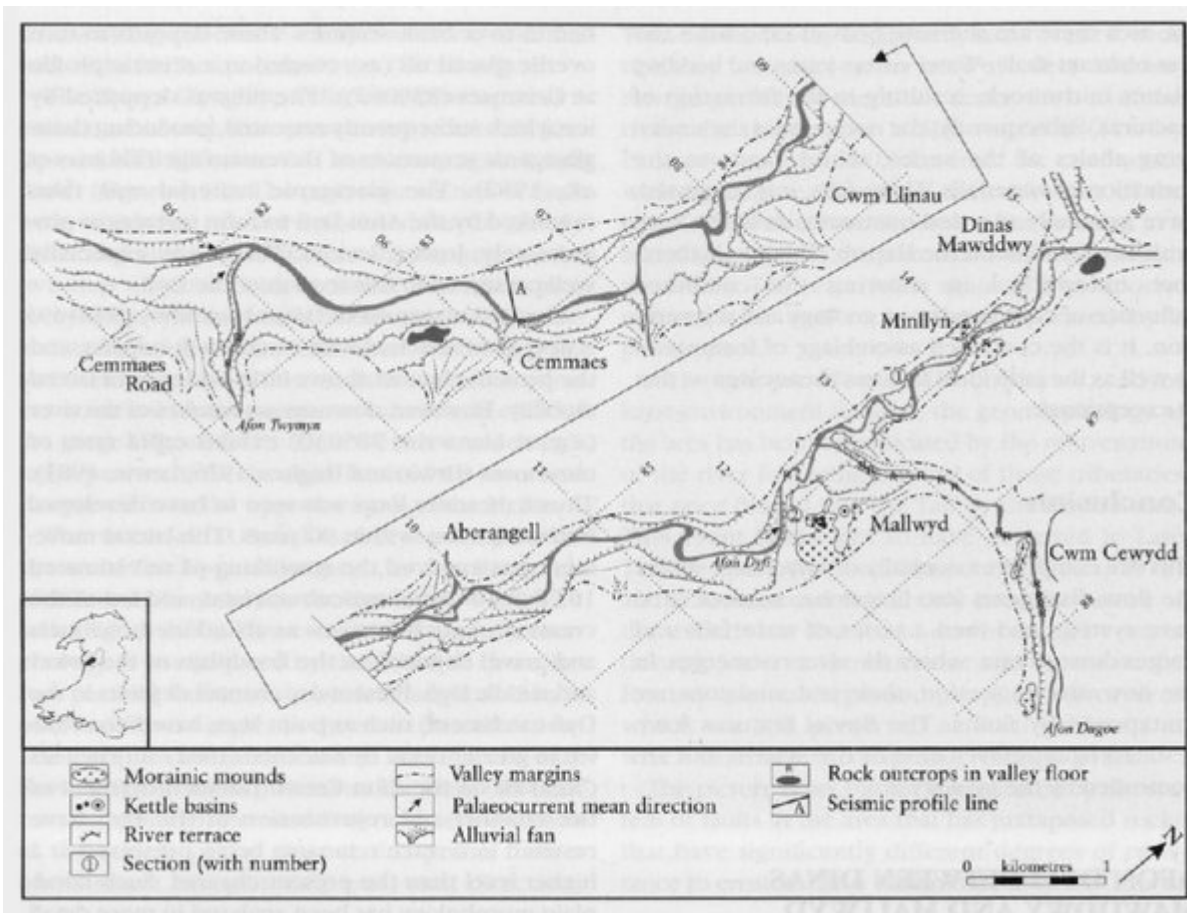
## Conclusion

The floodplain of the Afon Dyfi downstream of Dinas Mawddwy is notable for a range of terraces up to 20 m above present level. These are seen to consist of medium to coarse gravels, and overlie glacial sequences which can be identified in several sections of the middle Dyfi but which are especially well-preserved in the reach between Dinas Mawddwy and Mallwyd. Two of these bank sections were studied in more detail by Thomas *et al.* (1982) and these show deposits characteristic of a wandering gravel river environment. Although no study has yet concentrated on the relationship of such terraces to each other, it was suggested that three main terrace levels are present (the so-called Upper, Mid and Flood Plain terraces) and that these were formed by the reworking of the glacial deposits and their subsequent re-deposition.

## [References](#)



(Figure 3.22) The Afon Dyfi: cross-sections through the terrace. (After Thomas et al., 1982.)



(Figure 3.21) A geomorphological map of the Afon Dyfi: see (Figure 3.22) for sections. (After Thomas et al., 1982.)