
Morfa-bychan

Highlights

Controversial periglacial and possible glacial sediments occur here in the finest sections of their kind in Wales. These sediments are important in interpreting the position of glacial and periglacial zones during the Late Devensian.

Introduction

The origin and age of the sediments at Morfa-bychan [SN 562 764] have been the subject of much debate. The site has a long history of research commencing with Keeping (1882) and Reade (1896). The sediments were interpreted by Watson and Watson (1967) and Watson (1977a, 1982) as slope deposits, accumulated under periglacial conditions during the Devensian Stage. Others, however, have suggested that at least part of the succession is glacial in origin (Wood 1959; Bowen 1974; Vincent 1976). Most workers agree that any glacial sediments do not rest *in situ*. The site is widely regarded as one of the best exposures of its kind in Wales.

Description

Pleistocene deposits exposed on the coast extend southwards from Morfa-bychan [SN 565 772] for over 1.5 km to beyond Ffos-Las [SN 558 757]. The best exposures are found between Cwm-ceirw [SN 563 766] and Ffos-Las where, in places, the sediments reach up to 45 m vertical section (Watson 1977a).

Watson (1977a) recognised a succession of:

5 Loess-like silts

4 Brown Head

3 Gravels

2 Blue Head

1 Yellow Head

The sequence is shown in (Figure 12).

Interpretation

Early workers regarded the sequence as glacial in origin (Keeping 1882; Reade 1896; Williams 1927). Keeping noted that the sediments were composed entirely of local rock debris, and suggested that they had accumulated during a single glaciation of the area by ice coming from the Welsh uplands.

Wood (1959) reported that the drift at Morfa-bychan mantled a fossil coastline comprising a compound platform made up of a number of wave-cut benches. He described the relationship between the drift and the buried coastline, and believed that the former comprised Welsh till of Saalian age, rearranged by solifluction towards the end of the Devensian Stage.

Watson and Watson (1967) provided a detailed account of the deposits and stratigraphy. They showed that the beds dipped consistently towards the sea, and in strike section they appeared horizontal or very gently dipping — see (Figure 12). Individual beds were concave while the dip of individual beds decreased downslope, and the dips of a series of beds decreased upwards vertically, at any single point — see (Figure 12). Detailed stone orientation analyses suggested that the beds, apart from the gravels and loess, had a fabric typical of solifluction deposits; in particular the azimuths of the

stones' long axes were grouped tightly around the dip values of the beds (Watson and Watson 1967). Rock fragments in the drift deposits consisted entirely of the Aberystwyth Grits, greywackes and shales of Silurian age, derived from the local hinterland. Thus, in contrast to previous interpretations, they proposed that the sequence was typical of a coastal head, consisting of scree and solifluction deposits with subordinate rainwash gravels and a thin loess, all laid down under periglacial conditions during the Devensian Stage.

The periglacial origin of the entire drift sequence at Morfa-bychan has been restated in a number of papers by Watson (1968, 1970, 1976, 1977a, 1982). The periglacial origin of the Yellow Head, for example, has never been questioned, but the origin of the Blue Head has been debated. Bowen (1977a) noted that many clasts in the Blue Head were striated. He concluded that the basal layers of the Blue Head, at least, might well include till, originally deposited upslope from its present position.

In an attempt to unravel the controversy concerning the origin of the deposits at Morfa-bychan, Vincent (1976) undertook an SEM study of quartz sand grain surface textures from the deposits. These surface textures indicated that the deposits could not be regarded solely as the products of periglacial slope activity (Watson and Watson 1967), and he showed that grains in the Blue Head had surface textures attributable to glacial abrasion.

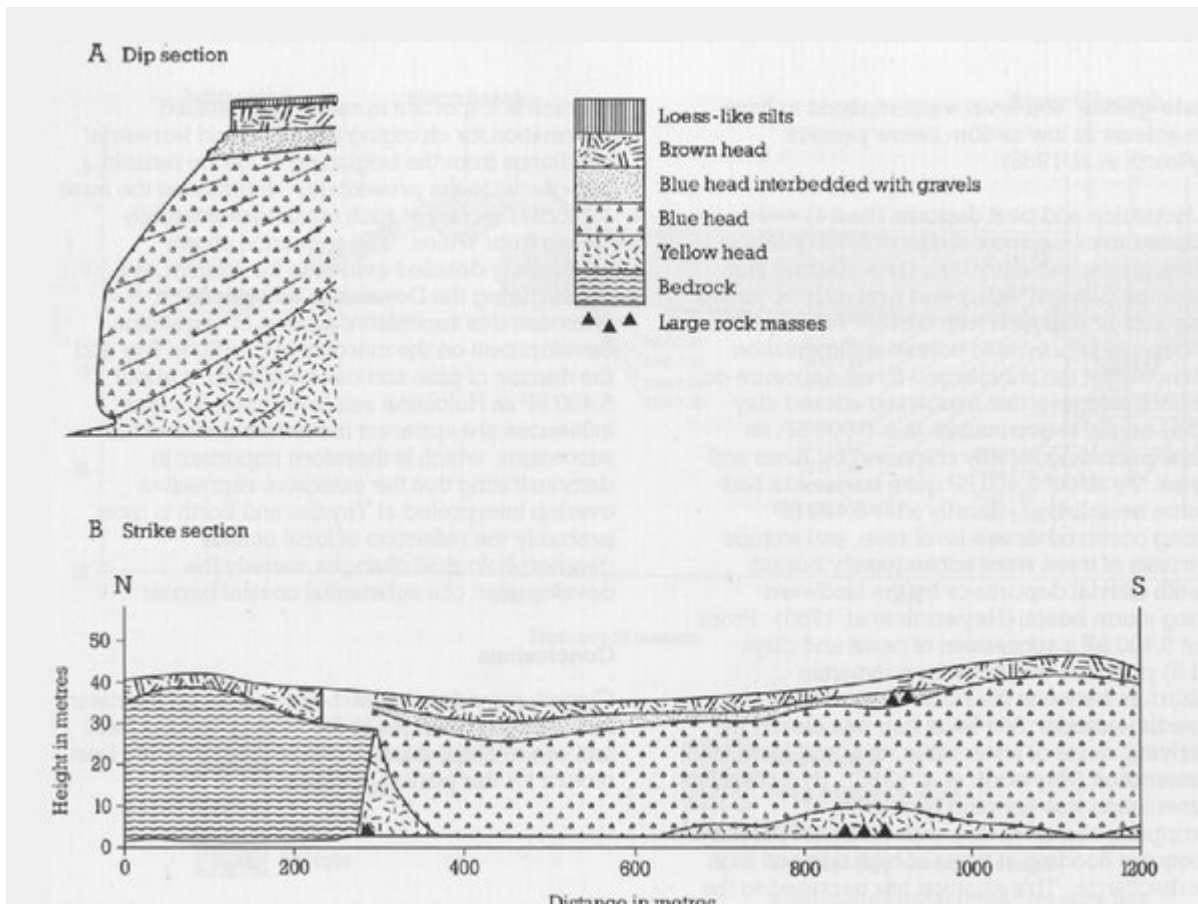
The interpretation of these beds assumes considerable importance in establishing a sequence of Late Pleistocene events in west Wales. Much controversy has persisted concerning the nature, particularly, of the Blue Head. In arguing that it was periglacial in origin, although perhaps containing some material reworked from an earlier (Saalian?) glaciation, Watson and Watson envisaged that the local area would have been ice-free during the Late Devensian. They used the evidence from this site, and elsewhere in Wales, to propose an extremely restricted glaciation during the Late Devensian. Wood (1959) and Bowen (1973a, 1973b, 1974, 1977a, 1977b) argued that the Blue Head included glacial deposits of Welsh provenance redeposited downslope by solifluction. Wood, like the Watsons, considered that the periglacial conditions responsible for redeposition of the Morfa-bychan sequence had occurred during the Devensian Stage. Indeed, the Watsons suggested that the sequence at Morfa-bychan could be sub-divided to represent the whole of the Devensian Stage. In contrast, Bowen (1973a, 1973b, 1974, 1977a, 1977b) argued that the Morfa-bychan area had been glaciated by westward-moving Welsh ice during the Late Devensian. He cited Garrard and Dobson's (1974) evidence that Welsh till of a similar lithofacies, and up to 12m thick, extended offshore for some 8 km. Bowen (1977a) pointed out that the Morfa-bychan sequence was, therefore, somewhat anomalous in terms of regional stratigraphy, in that the clay-rich sediments had lent themselves to rearrangement by solifluction down the steep coastal slope, both during and after deglaciation of the Late Devensian ice-sheet. The latter view of an extensive Late Devensian glaciation in west Wales was also upheld by Peake *et al.* (1973). Bowen's view that at least part of the sequence at Morfa-bychan was formed of Late Devensian glacial deposits rearranged by periglacial processes is also supported by the work of Potts (1968, 1971) in central Wales, who showed that the majority of periglacial landforms and landscape features had probably formed during the Late Devensian and particularly during the Late Devensian late-glacial.

Morfa-bychan has an important stratigraphical record of environmental and geomorphological changes in west Wales. The interpretation of the sequence is important for understanding Late Pleistocene events and the extent of ice in west Wales. The stratigraphical detail and the extent of the exposures makes this an exceptional site for periglacial scree and solifluction deposits in Wales. The sections show clearly the importance and relationship of localised topographic and lithological controls on the accumulation of solifluction deposits.

Conclusions

Morfa-bychan has an internationally important sequence of ice age deposits. Their interpretation has proved controversial. One view is that they are glacial deposits, whereas another is that they are slope deposits which have sludged downwards from the high coastal slope at their rear. The details and internal structure of the deposits are exceptionally well exposed.

References



(Figure 12) Pleistocene sequence at Morfa-bychan (after Watson and Watson 1967)