
Porth Ceiriad

Highlights

This locality with its periglacial sediments above and below glacial till may show that this part of Llŷn was glaciated by confluent Irish Sea and Welsh ice during the Late Devensian, but lay in a periglacial area beyond the western limit of a later advance of Welsh ice.

Introduction

Porth Ceiriad is an important coastal exposure which shows that the St Tudwal's Peninsula may have been a zone of transition between Irish Sea and Welsh ice masses during the Late Pleistocene. The sections were first noted by Ramsay (1881) and have since featured in studies by Jehu (1909), Saunders (1967, 1968a, 1968b, 1968c, 1973) and Whittow and Ball (1970).

Description

The sections at Porth Ceiriad extend laterally for about 700m, and they reach a maximum height of 30m. Whittow and Ball (1970) recorded the following generalised sequence, shown in (Figure 32):

6 Hillwash

5 False-bedded shale head (cryoturbated)

4 Solifluction deposits

3 Grey-brown non-calcareous Welsh till

2 Fine shale head

1 Blocky head

Bed 4 contains a large lens of calcareous Irish Sea till, reworked Welsh till from bed 3 and beds of laminated clays and sands with gravel lenses.

Interpretation

Although Ramsay (1881) described the head deposits at Porth Ceiriad as an angular breccia of post-Tertiary age resting on slaty strata, Jehu (1909) was the first to describe the sections in detail. He noted that many of the boulders and pebbles in the till were of Welsh origin although other farther-travelled, probably Irish Sea, erratics were also recorded. He regarded the till at Porth Ceiriad as representing the Upper Boulder Clay of his tripartite succession, representing the most recent of two glacial advances in Llŷn.

The sections at Porth Ceiriad were next studied by Saunders (1967, 1968a, 1968b, 1968c, 1973). Using pebble lithology and till fabric measurements, he ascertained that the till at Porth Ceiriad (bed 3) had been deposited by Welsh ice moving from northeast to south-west. This suggested that when the Welsh till was deposited at Porth Ceiriad, the area to the west was probably free from Irish Sea ice, which otherwise would have caused a major southward deflection of the Welsh ice-sheet. The Welsh till was therefore considered younger than the main Irish Sea till (Trevor Till) at nearby Porth Neigwl, which Saunders ascribed to the main invasion of the Late Devensian ice-sheet in Llŷn. He correlated the Welsh till at Porth Ceiriad with the younger of the two Welsh tills exposed elsewhere along the south coast of Llŷn, (the Llanystumdwy Till of Simpkins (1968)), for example at Glanllynau and Morannedd. Saunders suggested that the till at

Porth Ceiriad had been deposited during the second glacial advance on Llŷn of proposed Late Devensian readvance age. The till at Porth Ceiriad was consequently seen to be equivalent in age to the gravelly Welsh till at Porth Neigwl.

These correlations were not, however, accepted by Whittow and Ball (1970) who suggested that the Welsh till at Porth Ceiriad belonged to the first of the recognised glacial advances in Llŷn and could therefore be correlated with the lower of the Welsh tills on the south Llŷn coast, at Criccieth (Morannedd) and Glanllynau (the Criccieth Till of Simpkins (1968)). A lens of calcareous Irish Sea till (in bed 4) was noted by Whittow and Ball but was not considered to be *in situ*. It appeared to have been soliflucted from a nearby deposit of the Irish Sea till, and it was used as evidence to suggest that St Tudwal's Peninsula had been a zone of transition between the Welsh and Irish Sea ice masses during this first glacial episode. The till and soliflucted till at Porth Ceiriad (beds 3 and 4) were succeeded by cryoturbated head deposits. The implication was that the head deposits and the structures were formed during a later glacial episode, when periglacial conditions were experienced at Porth Ceiriad and an upper till was deposited elsewhere in Llŷn. Saunders (1973) later accepted this interpretation.

Porth Ceiriad is particularly important for showing evidence for the interactions and movements of the Irish Sea and Welsh ice-sheets in south-west Llŷn during the Late Devensian.

Saunders originally presented lithological and fabric data to correlate the Welsh till at Porth Ceiriad with the upper of two tills found farther east along the south Llŷn coast, the Llanystumdwy Till —broadly equivalent to the Clynog Till of north Llŷn and of postulated Late Devensian readvance age. This evidence was used to suggest that western Llŷn was free from Irish Sea ice during a later advance of the Late Devensian ice-sheet. However, most subsequent authors, including Saunders (1973), have correlated the Welsh till at Porth Ceiriad with the Irish Sea till at Porth Neigwl and the lower of the two tills found commonly elsewhere in Llŷn (the Trevor and Criccieth Tills of Irish Sea and Welsh provenance, respectively). Such a correlation together with the close association of soliflucted Irish Sea and Welsh glacial sediments at Porth Ceiriad has led to the proposal of an entirely different sequence of Late Pleistocene events in south-west Llŷn. In particular, this evidence has been used to suggest that St Tudwal's Peninsula was a zone of transition between the Irish Sea and Welsh ice masses during the principal invasion of the Late Devensian ice-sheet. With lithological evidence from Porth Neigwl to the west and Glanllynau and Criccieth to the east, the evidence from Porth Ceiriad suggests that southwest Llŷn was glaciated by a Late Devensian Irish Sea ice-sheet moving southwards, while southern Llŷn was invaded contemporaneously by an ice-stream moving north-east to south-west from Snowdonia. From the evidence at Porth Ceiriad it appears that both ice-streams were confluent in the St Tudwal's area.

The absence of an upper till at Porth Ceiriad that could be correlated with the Welsh Llanystumdwy Till, found eastwards along much of the south Llŷn coast, places an important constraint on the maximum westward limit of the subsequent expansion of the Late Devensian ice-sheet which deposited that till. It has been shown that a gravelly Welsh till of limited extent occurs to the west, at Porth Neigwl. This implies that only a tongue of Welsh ice impinged on the coast of south-west Llŷn in this area, leaving Porth Ceiriad in the glacier-free zone during the inferred Late Devensian readvance. The presence of head, solifluction deposits and cryoturbation structures in the sequence above the Welsh till, lends some support to the proposal that the site and its immediate environs were situated in the periglacial zone during the later expansion of the Late Devensian ice.

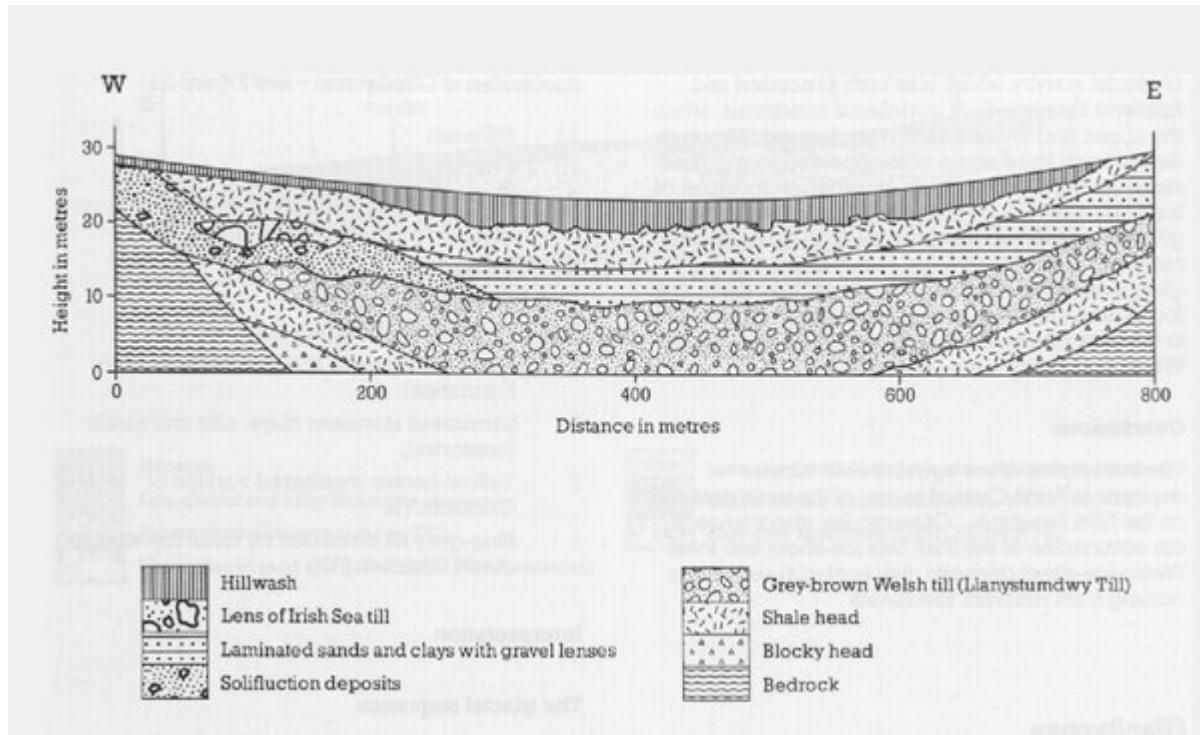
The stratigraphic record at Porth Ceiriad is difficult to interpret although it would appear that the sequence contains evidence for at least one phase of glacial activity which was both preceded and followed by periods of periglacial conditions, when the upper and lower heads were formed. Although the sections show some of the finest stratigraphical detail on the Llŷn Peninsula, it is the juxtaposition of Irish Sea and local Welsh glacial sediments which gives the site special significance. Such evidence contrasts with Porth Neigwl to the west where glacial deposits mainly from the Irish Sea Basin are found, and Glanllynau and Morannedd (Criccieth) in the east where glacial deposits of exclusively Welsh provenance are recorded.

Conclusions

The succession of ice age and cold climate deposits at Porth Ceiriad is one of the most detailed on the Llŷn Peninsula. Of particular importance is the occurrence of the Irish Sea ice-sheet and local Welsh ice-sheet deposits, that is glacial

sediments coming from different ice-sheets.

[References](#)



(Figure 32) Quaternary sequence at Porth Ceiriad (from Whittow and Ball 1970)