
Porth Oer

Highlights

This locality shows unique Pleistocene evidence of a high shore platform, interglacial raised beach deposits, and till from the last glacial period. It therefore records rare evidence in North Wales of temperate high sea-levels during the last, Ipswichian, interglacial.

Introduction

Porth Oer [SH 167 301] is a unique site in the Llŷn Peninsula recording critical evidence for the interpretation of Late Pleistocene events which affected North and north-west Wales. The site is notable for being one of only two sites in the region where pre-Holocene raised beach sediments (presumed interglacial) have been recorded. The site was first described by Jehu (1909) and has since featured in studies by Whittow (1957, 1960, 1965), Mitchell (1960), Syngé (1963, 1964, 1970), Saunders (1963, 1967, 1968a, 1968b, 1968c, 1968d, 1973), Whittow and Ball (1970), Bowen (1973a, 1973b, 1974, 1977b), and Peake *et al.* (1973). The most detailed accounts of the site were provided by Saunders (1963, 1968d, 1968d).

Description

The site comprises one of the finest examples of a raised shore platform in North Wales, cut across Precambrian rocks of complex structure at both the northern and southern headlands of the bay — see (Figure 30). The most important part of the sedimentary sequence at Porth Oer occurs on a fossil sea stack towards the northern end of the bay — see (Figure 30). Here, the platform at c. 7.5m OD (Whittow 1960; Bowen 1974) is overlain by up to 0.4m of locally derived head, and by raised beach gravel up to 1.2m thick. The raised beach is succeeded by up to 0.5m of current-bedded ferruginous cemented sand. The remainder of the succession at this location is, however, obscured by slumping and vegetation, although there is some suggestion that the cemented sand is succeeded by periglacial head and then glacial sediments. The latter crop out extensively between the north and south headlands of the bay where the steep cliffs are formed mostly in Irish Sea till up to 15m in thickness. The till is homogenous and relatively stoneless, but contains northern erratics and abundant marine shell fragments. Occasional lenses and layers of gravel and silt occur in the till, and towards the northern end of the bay the till becomes gravelly in character and merges downwards into head. The upper surface of the Irish Sea till is decalcified in places to depths of up to 4m.

Interpretation

The first description of the sections at Porth Oer was by Jehu (1909) who noted the beds of cemented sand and gravel which he regarded as a pre-glacial raised beach. He suggested that the underlying rock platform was succeeded in places by a rock rubble or head which was entirely local in origin and derived from adjacent Precambrian rocks. He suggested it had formed subaerially by freeze-thaw processes in pre-glacial (pre-Pleistocene) times. At the south-west end of the bay, this rock rubble formed a horizon about 0.3m thick on top of the shore platform and beneath thick blue-grey till. This till, which also formed most of the cliff at Porth Oer, belonged to his Lower Boulder Clay series and represented evidence of the earliest of the glacial advances in Llŷn (Jehu 1909). It contained irregular masses of marine sand, and occasionally some gravel in addition to numerous marine shell fragments from the floor of the Irish Sea (Jehu 1909).

Whittow (1957, 1960) originally doubted Jehu's evidence for the beach at Porth Oer, but later accepted it (Whittow 1965). He described the shore platform at Porth Oer, and suggested that the lack of raised beach deposits was not surprising since glacial striae on the platform indicated that it had been severely scoured by Irish Sea ice moving onshore from a northerly direction. He suggested that the age of the platform was uncertain but that it could be Hoxnian or even earlier. This was supported by Mitchell (1960) who correlated the raised beach at Porth Oer with the Fremington raised beach in

north Devon, which he believed was Hoxnian in age. Similarly, Synge (1963, 1964) considered Porth Oer to be important because it was the sole locality in LI■n where an interglacial raised beach deposit could be observed. He considered that a number of factors pointed towards the antiquity of the sequence at Porth Oer. First, the great age of the platform was attested by its highly weathered condition (Synge 1963). Second, the till at Porth Oer was weathered at its surface, a process that must have taken place under fully interglacial conditions. Therefore, a Saalian age was attributed to the till at Porth Oer, with the interglacial weathering of its surface attributed to the succeeding Ipswichian Stage (Synge 1964). The basal raised beach was Hoxnian in age and the underlying platform was ascribed to the Hoxnian or possibly earlier.

The sequence at Porth Oer described by Saunders (1963, 1967, 1968a, 1968b, 1968c, 1968d, 1973) was, essentially similar to that of Jehu. He believed Porth Oer was the most westerly drift-filled hollow in Inn, and considered that the pre-drift surface at the site provided conclusive evidence for a former high sea-level between 7.6 and 9.1m OD (25 ft and 30 ft) before deposition of the till. He argued that the shore platform represented a multi-cyclical feature of probable Ipswichian and pre-Ipswichian ages, while the raised beach gravels themselves belonged to the Ipswichian Stage. Saunders and other workers (for example, Whittow and Ball 1970; Peake *et al.* 1973; Bowen 1974) recognised foreign erratics in the raised beach at Porth Oer and alluded to the possibility that they had been derived by marine reworking of glacial deposits from an earlier glaciation. An Ipswichian age for the raised beach at Porth Oer was also proposed by Bowen (1973a, 1973b, 1974, 1977b).

On the basis of radiocarbon dates from till sites elsewhere in LI■n, Saunders argued that the till at Porth Oer was deposited during the principal invasion of the Late Devensian Irish Sea ice-sheet. He correlated this till with the lower or Trevor Till (Simpkins 1968) of the north LI■n coast and suggested that it could also be correlated with the lower or Criccieth Till exposed in southern LI■n (at Criccieth and Glanllynau), and was supported by Bowen (1973a, 1973b, 1974, 1977b). Deposits from the proposed later readvance of Late Devensian ice (the Clynnog Till of north LI■n) found, for example, at Dinas Dinlle and Gwydir Bay, have not been recorded at Porth Oer. The weathered surface of the Trevor Till at Porth Oer was correlated with a comparable horizon at Gwydir Bay which affected both the Trevor Till and the sands and gravels of the Aberafon Formation, and pre-dated deposition of the Clynnog Till. Saunders suggested that the weathering at both sites therefore occurred during interstadial conditions in the Late Devensian.

Detailed pebble lithology and till fabric measurements have been undertaken at Porth Oer (Saunders 1963, 1968b, 1968d). Fabric properties have established that the Trevor Till was deposited by Irish Sea ice moving onshore from between the north and ENE, and a generally northern source was confirmed by high percentages of fine- and coarse-grained acid igneous rock types.

The broad sequence of Late Pleistocene events reconstructed from lithostratigraphic evidence at Porth Oer by Saunders, was also upheld by Whittow and Ball (1970) who suggested that the site was glaciated by Irish Sea ice of the first recorded (Devensian) advance in L19'n, but not during the subsequent advance of the Irish Sea ice-sheet.

Porth Oer provides an important lithostratigraphic record of Late Pleistocene events in north-west Wales and in particular, evidence for a cycle of interglacial and glacial events. It displays the finest example of raised marine deposits anywhere in North or north-west Wales. It is the only such site in LI■n, and together with Red Wharf Bay on Anglesey, provides rare evidence for former high relative sea-levels and probably interglacial conditions in the region. The presence of raised beach deposits at Porth Oer has resulted in the site having featured prominently in studies of Pleistocene correlations (for example, Mitchell 1960; Synge 1963, 1964; Bowen 1973a, 1973b, 1974, 1977b; Peake *et al.* 1973). In particular, the raised beach deposits formerly allowed correlation of the Pleistocene succession in LI■n with that in the Gower Peninsula (for example, Bowen 1973a, 1973b, 1974, 1977b) where the raised beach fragments were regarded as Ipswichian in age and were used as a lithostratigraphic marker horizon. Although the age of the raised beach at Porth Oer has not been determined, the site provides rare evidence in North Wales, and the only sedimentary evidence in LI■n, for former high sea-level, interglacial conditions.

The unusually fine development of a raised shore platform beneath the raised beach sediments at Porth Oer gives a rare opportunity to study earlier elements of the Late Pleistocene sequence. Although the age of this platform is unknown and probably composite, it is representative of the most widespread geomorphological feature pre-dating Late Pleistocene glaciation in LI■n (Whittow and Ball 1970), and it provides evidence for former high sea-levels before the raised beach

event.

The site is also important for establishing details of the glacial history of Llŷn. The till exposure has provided lithological and fabric evidence which indicates deposition by ice moving onshore from the Irish Sea Basin. Porth Oer therefore helps to establish regional patterns of ice movement. Saunders' studies have provided a firm foundation for correlating this till with the lower or Trevor Till found widely elsewhere along the north coast of

The occurrence of this till here, on the western tip of Llŷn, helps to establish that virtually the whole northern coast was inundated by Irish Sea ice during this probably Late Devensian glacial episode. The upper or Clynnog Till which occurs in north Llŷn, for example at Dinas Dinlle and Gwydir Bay, is not present at Porth Oer. It follows that the sequences at these sites help to constrain the extent to which north Llŷn was affected by ice during the second recorded advance of Late Devensian ice — the proposed Late Devensian readvance. The site, therefore, helps to establish that parts of western Llŷn were not glaciated by the possibly confluent Irish sea and Welsh ice that affected the Menai Straits region and other parts of the north Llŷn coast.

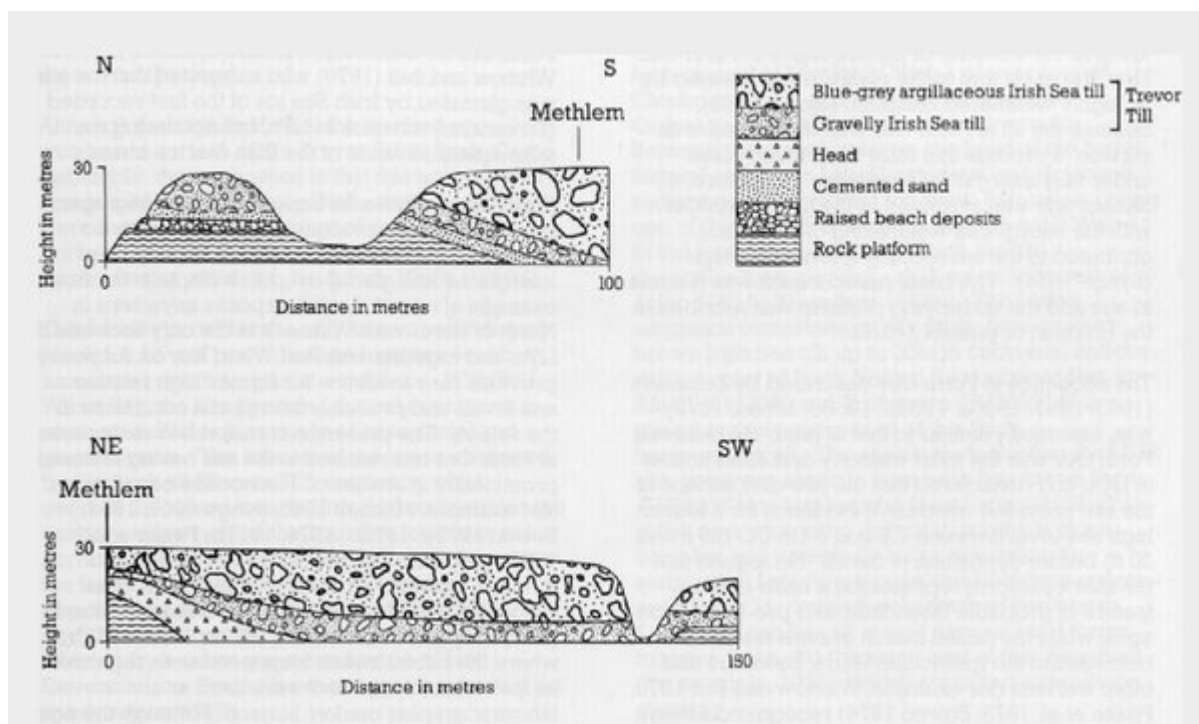
Although the significance of the leached and weathered surface of the Trevor Till at Porth Oer is debatable, the implication is that this horizon, and comparable ones at Dinas Dinlle and Gwydir Bay, were formed during a period of weathering between the two recorded Late Devensian ice advances (for example, Saunders 1968a, 1968d).

This locality provides the only known sedimentary record in Llŷn of pre-Holocene high sea-levels associated with interglacial conditions. With Red Wharf Bay, the site provides the only evidence in north-west Wales for a cycle of interglacial and glacial events. The interest of the site is enhanced by the thick till (Trevor Till) sequence which overlies the raised beach. This till demonstrates the onshore movement of the Irish Sea ice-sheet onto north and west Llŷn during the principal invasion of the Late Devensian ice-sheet. Whereas depositional evidence from Dinas Dinlle and Gwydir Bay show that parts of northern Llŷn were affected by a subsequent readvance of Late Devensian ice, Porth Oer shows that this ice did not reach western Ulm.

Conclusions

The raised beach at Porth Oer together with that at Red Wharf Bay in Anglesey, are the only known examples of their kind in North Wales. The overlying deposits show the events of the last glacial cycle, which followed the previous interglacial period when the raised beaches were formed.

References



(Figure 30) Pleistocene sequence at Porth Oer (from Saunders 1968d)