
Marros Sands

Highlights

This site shows deposits spanning the Ipswichian-Holocene interval, and including Ipswichian raised shoreline deposits, Devensian periglacial sediments which indicate that the area lay south of the Devensian ice limit, and Holocene submerged forest.

Introduction

Marros Sands (Marros) [SN 210 073] is important for its Late Pleistocene sequence of raised beach and head deposits which represents a succession from interglacial marine to periglacial conditions. Palaeobotanical and stratigraphical evidence indicates that the marine sequence was probably formed during the Ipswichian Stage, and the site records possible evidence for a number of high sea-level stands during this time. Head deposits at the site probably accumulated during the subsequent Devensian Stage when it lay in the periglacial zone. The geomorphological interest of the site is enhanced by extensively developed submerged forest and associated beds which occur along Marros Sands (Leach 1918a). The site was first described by Strahan *et al.* (1909) and was also mentioned by Leach (1910). More recently it has been described by John (1968a, 1971a, 1973), Bowen (1970a, 1973a, 1973b, 1974, 1977b) and Peake *et al.* (1973).

Description

The Pleistocene sequence is well exposed in coastal cliffs between Marros [SN 201 071] and Ragwen Point [SN 219 072]. Cemented and stratified head deposits are also well exposed near Gilman Point [SN 227 075]. Holocene submerged forest and associated beds occur along much of the shore at Marros Sands, and they are particularly well developed between [SN 200 074] and [SN 214 072].

The sequence is laterally variable, but along much of the coastal cliff comprises:

- 4 Hillwash sediments
- 3 Head
- 2 Raised beach shingle and sand (often mixed with head)
- 1 Rock shore platform

At Ragwen Point the sequence is (Bowen 1970a):

- 8 Hillwash sediments
- 7 Head
- 6 Colluvial silts
- 5 Cemented sand
- 4 Raised beach sediments
- 3 Cemented sand
- 2 Raised beach sediments
- 1 Rock shore platform

Beds 2 to 6 and the lower part of bed 7, at Ragwen Point, are partly cemented by iron and manganese oxides (John 1971a). The head, of angular shale and quartzite blocks, reaches about 12m maximum thickness. It was sub-divided into at least four facies by John, but only two by Bowen (1974) — a lower blue shale head and an overlying brown sandstone head. Cryoturbation structures occur in the head deposits (John 1973), and well developed fossil ice-wedge casts penetrate the brown head (Bowen 1974). Polygonal fossil ice-cracks are also exposed in periglacial deposits near Marros Mill (Bowen 1974).

Interpretation

The raised beach deposit at Ragwen Point was first described by A Strahan (*in Strahan et al.* 1909) as a concreted sand with small pebbles, just above HWM, and beneath a small cliff of 'boulder clay'. No shells were observed in the raised beach deposit, which was correlated with the raised beaches in Gower, of believed 'pre-glacial' or 'inter-glacial' age (Tiddeman *in Strahan* 1907a). Leach noted the drift deposits in the coastal cliffs at Marros, and described a sequence of glacial drift and local talus deposits farther west along the coast, near Amroth.

Subsequently, in 1965, Bowen discovered the raised beach at Marros Sands (Bowen 1966) and gave an account of the sediments and stratigraphy in the coastal cliffs between Marros and Gilman Point (Bowen 1970a).

At Marros, the raised beach is succeeded by a sandy, silty mud which lies below the head deposits (Bowen 1970a). This bed yielded various seeds and fruits, moss stems and beetle fragments, together with pollen (Mitchell *et al.* *in* Bowen 1970a). The palaeobotanical data indicated that trees and bushes were rare at the time of deposition, but that there was a rich herbaceous flora with a strong calcicole element. Bowen (1970a) considered that this environment was probably very similar to the Allerød phase of the Devensian late-glacial, with open countryside, young soils and rich meadows. From the stratigraphic and palaeobotanical evidence, he interpreted the following sequence of Late Pleistocene events at Marros. During high interglacial sea-levels, in the Ipswichian Stage, raised beach sediments were deposited. The fossiliferous, sandy silty mud probably accumulated in a dune slack during temperate conditions towards the end of this interglacial phase, and it marks a transition between fully interglacial and periglacial conditions. The upper beds of raised beach shingle and sand at Ragwen Point (beds 4 and 5) may represent a further high sea-level stand during an Ipswichian Stage interglacial, and this Bowen tentatively correlated with the *Neritoides* sand at the key interglacial site of Minchin Hole, Gower (Bowen 1970a). He otherwise considered all deposits overlying the raised beach and dune slack sediments at Marros to be unquestionable periglacial slope deposits derived from the interglacial cliff line behind the sections; concluding that the absence of even a single erratic proved the non-glacial origin of the sediments. He argued that the head deposits had accumulated during the Devensian Stage when Marros lay in the periglacial zone, an interpretation followed by John (1971a, 1973). John also suggested that huge quartzite blocks weighing several tons, in the head, showed a high degree of instability on the coastal cliffs during these periglacial conditions. Occasional catastrophic collapses of huge blocks had interrupted the otherwise slower, but dominant, process of solifluction. The evidence was used by Bowen (1970a) to demonstrate that the area was south of the Late Devensian (Welsh) ice-sheet which did not reach this part of south Dyfed and the Carmarthen Bay area. The head deposits contained no trace of erratic material, but Bowen (1977b) noted that the plateaux adjacent to the coastline bore unmistakable boulder trains and outliers of till and fluvio-glacial sediments: these deposits, he suggested, demonstrated a pre-Devensian glaciation of the area by an Irish Sea ice-sheet moving NNW to SSE. Similar interpretations of the sequence were followed by Bowen (1973a, 1973b, 1974) and Peake *et al.* (1973).

A fine example of a cemented and stratified scree occurs at Gilman Point. Bowen (1977b) noted that a considerable thickness of limestone head mantles the former cliff here. The deposit consists of colluvium with boulders. This is overlain by a blocky, calcite-cemented head that fines upwards into scree beds which dip off the limestone outcrop. Cementation of similar screes elsewhere in Britain is thought to have occurred during discontinuous permafrost conditions in the Late Devensian (Prentice and Morris 1959).

The geomorphological interest at Marros is enhanced by well developed submerged forest and peat beds which crop out along the modern beach. Leach (1918a) noted that the beds extended from near HWM to the lowest levels of the shore uncovered by Spring tides, and stretched almost continuously for a mile along Marros Sands. Leach described a

sequence of:

4 Peat and submerged forest

3 Peaty soil with roots and leaves of aquatic plants

2 Blue 'slime'

1 Unstratified rubble (head)

Leach noted that the peat and submerged forest bed contained abundant leaves, twigs, branches and trunks of trees; stems, leaves and roots of marsh plants; mosses; hazel nuts, oak cupules, alder catkins; seeds and seed capsules of small plants and a large quantity of other disintegrated plant tissues. A Holocene age for the beds was suggested by Leach (1918a).

The sequence of deposits at Marros provides an important record of Late Pleistocene and Holocene environmental conditions and changes. The site demonstrates evidence for periods of high sea-level, probably during the Ipswichian, when raised beach sediments accumulated. Several facies of raised beach shingle separated by cemented sand are present at Ragwen Point, and the sequence may therefore provide rare evidence for marked climatic and sea-level fluctuations during this stage. These horizons have been correlated tentatively with raised beach deposits at Minchin Hole Cave, Gower (Bowen 1970a). The period of raised beach sedimentation came to an end with deteriorating climatic conditions, revealed by palaeobotanical evidence. Thick head deposits and colluvial sediments accumulated at Marros, probably during the Devensian Stage, and the site therefore sets a limit for the maximum extent of Late Devensian ice of Welsh provenance in the west Carmarthen Bay area. Marros is also notable for the fine development of infilled crack and polygonal structures that occur in the head deposits. These have not been dated, although similar cracks were noted in Late Devensian glacial sediments in west Gower: these features were considered to be either frost or desiccation cracks of Late Devensian late-glacial age (Campbell 1984). The submerged forest beds at Marros extend the stratigraphic record into the Holocene. These deposits have not been studied in detail and the site therefore has potential for Holocene sea-level studies.

Marros provides a rock record containing marine and terrestrial evidence. It demonstrates rare evidence for fluctuating sea-levels, probably in the Ipswichian Stage. Pollen evidence records the transition from these temperate interglacial conditions to periglacial conditions in the Devensian Stage, when substantial colluvial and head deposits accumulated. The association of marine deposits overlain by periglacial sediments establishes that Marros lay in the extra-glacial zone during the Late Devensian.

Conclusions

Marros Sands shows extensive exposures of marine and periglacial (cold climate) deposits. This is an important site, because it shows that ice-sheets did not cross this area after 125,000 years ago. It, therefore, provides important evidence for the reconstruction of the last Welsh ice-sheet; and proves that although it covered most of Wales and crossed west Gower, it did not cover this area.

References