Chad Girt, White Island, St Martin's

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Highlights

This site affords excellent exposures through a sequence of raised beach and overlying periglacial slope deposits containing reworked glacial sediments of Late Devensian age. The site is of historical importance because it was selected in the early twentieth century as the type-site for the Quaternary sequence of the Isles of Scilly.

Introduction

Barrow (1906) was the first worker to place the erratic pebbles found at a number of locations on the northern islands into a stratigraphic context. He used Chad Girt to exemplify and demonstrate this context, in addition to showing the stratigraphic relations between other Pleistocene deposits. The site was discussed by Mitchell and Orme (1967), who used it as the type-site for their 'Chad Girt' Raised Beach. The site was reinterpreted by Scourse (1991).

Description

Barrow (1906) defined four main stratigraphic units in the Isles of Scilly: raised beach, head, iron-cement and a glacial deposit. Barrow recognized the conglomerate of an old beach, now raised above the level of the present beach, resting on a shore platform. He regarded the beach as once much more extensive but having been largely eroded away leaving the old platform exposed in many places. He applied the term 'head' to the accumulation of angular or subangular fragments of granite in an advanced state of decomposition' (Barrow, 1906; p. 17). This head had reoccupied the position of the eroded beach and, resting on the old platform, had a terrace-like contour imparted to it. He was able to divide the head in certain localities into two parts, an 'Upper' and a 'Lower' or 'Main' Head separated by a 'curious glacial deposit' (Barrow, 1906; p. 18).

Barrow cited the section at Chad Girt [SV 926 174] on White Island, St Martin's, as fixing the stratigraphic position of these identified units. He described the Isles of Scilly as surrounding an 'interior-sea'; the northern coast of St Martin's, including White Island, forms part of this island rim. The north and east shore of White Island consists of a linking chain of granite tors forming a steeply cliffed coastline; the western slopes of these tors descend gradually to the beach–dune coastline on the sheltered western shore adjoining Porth Morran. The rugged cliffs of the east and north shore are bisected by some deep fissures in the solid granite and overlying Pleistocene sediments, trending north-west to south-east, typified Underland Girt and Chad Girt. The deep embayment of Chad Girt is separated by two parallel granite ridges.

The southern side of the Chad Girt fissure affords an excellent exposure of Pleistocene sediments resting on the solid granite. Here Barrow (1906; (Figure 8.11)) noted that the old beach rests on the bare granite and underlies the 'Main Head', ' … a glacial deposit in turn reposing on the latter' (Barrow, 1906; p. 16). Barrow's (1906) sequence is still clearly exposed, and is little disputed; there have, however, been differences of interpretation.

Interpretation

Mitchell and Orme (1967) provided an excellent interpretation of the geomorphological evolution of the site. They recognized that the Chad Girt embayment did not exist when the shore platform was cut, and that the east side of White Island then formed a continuous north-south rock ridge. Higher sea levels eroded a shore platform on both sides of this ridge, and beach deposits were laid down on the sheltered, western, Porth Morran side. Marine erosion in the 'post-glacial' then attacked the ridge from the east, cutting through the rock ridge and into the shore platform and overlying deposits on its west side.

Although Barrow (1906) was explicit in his interpretations of the basal cobble deposit at Chad Girt as a raised beach, and was able to recognize that the Main and Upper Heads were derived from weathered granite and showed evidence of having moved downslope, he was less sure about the 'glacial deposit'; 'The origin of this curious deposit is by no means clear … ' (Barrow, 1906; p. 21). He noted the high content of silica and iron oxide in the matrix, and the occurrence of lenticular patches of foreign stones within it. He argued that

… a considerable portion of them [the foreign stones] must have been derived from an older deposit, as many of them are too well rounded to leave any doubt that they were derived from some gravel and not directly from the parent rock' (Barrow, 1906; p. 23). Whatever their precise origin, Barrow was quite certain that they had been transported to the islands by ice; That these stones have been brought into their present position by ice admits of little doubt' (Barrow, 1906; p. 27). He believed their curious distribution to be unintelligible except by invoking some other means of transport than water. Further, 'It is quite clear that they [the foreign stones] must have been carried by floe-ice' (Barrow, 1906; p. 27).

Mitchell and Orme (1967) interpreted the head deposits as the products of solifluction under periglacial conditions, and the glacial deposit as of glaciofluvial (meltwater) rather than strictly glacial origin. Whereas Barrow only identified a single raised beach on the islands, Mitchell and Orme recognized what they believed to be two stratigraphically distinct raised beach deposits, the lower being erratic-free, the upper erratic-rich. They identified the raised beach at Chad Girt as the stratotype for the lower, erratic-free, beach. Mitchell and Orme placed the meltwater sediments in the Gipping (= Wolstonian) glacial stage, the raised beach in the Hoxnian, thus assigning the Lower Head to the Wolstonian and the Upper Head to the 'Last Cold Period' (= Devensian).

Scourse (1991) concurred broadly with previous sedimentological interpretations of the raised beach and solifluction deposits, assigning these units to the Watermill Sands and Gravel (raised beach), Porthloo Breccia (Lower or Main Head) and Bread and Cheese Breccia (Upper Head). However, he differed from Mitchell and Orme (1967) on the age of the various units, and from Barrow (1906) and Mitchell and Orme on the interpretation of the glacial deposit.

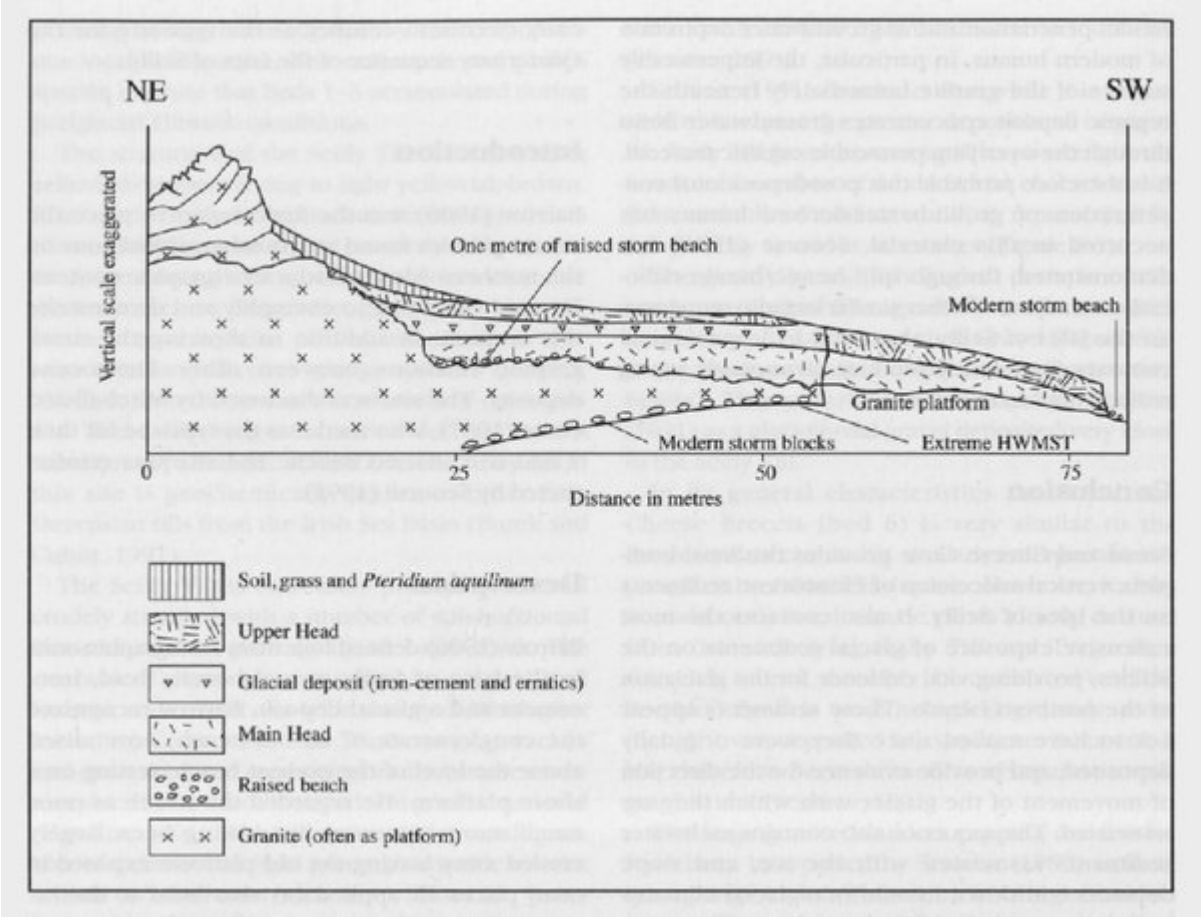
The grain-size, lithology and mineralogy of the 'glacial deposit' at Chad Girt is identical to the Hell Bay Gravel (Figure 8.3). This is a solifluction deposit derived from the Old Man Sandloess, the Scilly Till and the Tregarthen Gravel, in which all these sediments were mixed and redistributed downslope. The very distinctive silt matrix of this deposit is derived largely from the Old Man Sandloess, an aeolian sandy silt deposited penecontemporaneously with the glacial event. This material is not therefore an *in situ* glacial or glaciofluvial sediment, but rather a periglacial slope deposit derived from sediments associated with the glaciation.

The Old Man Sandloess has been dated by TL on the southern islands to 18 600 ± 3700 BP (Wintle, 1981; Scourse, 1991), and the Porthloo Breccia, which underlies the Hell Bay Gravel, contains organic beds at other sites on Scilly which have been dated by radiocarbon methods to the late Middle and early Late Devensian. The age of the raised beach remains uncertain. Scourse (1991) therefore interprets most of the sediments at Chad Girt as considerably younger than the ages envisaged by Mitchell and Orme (1967).

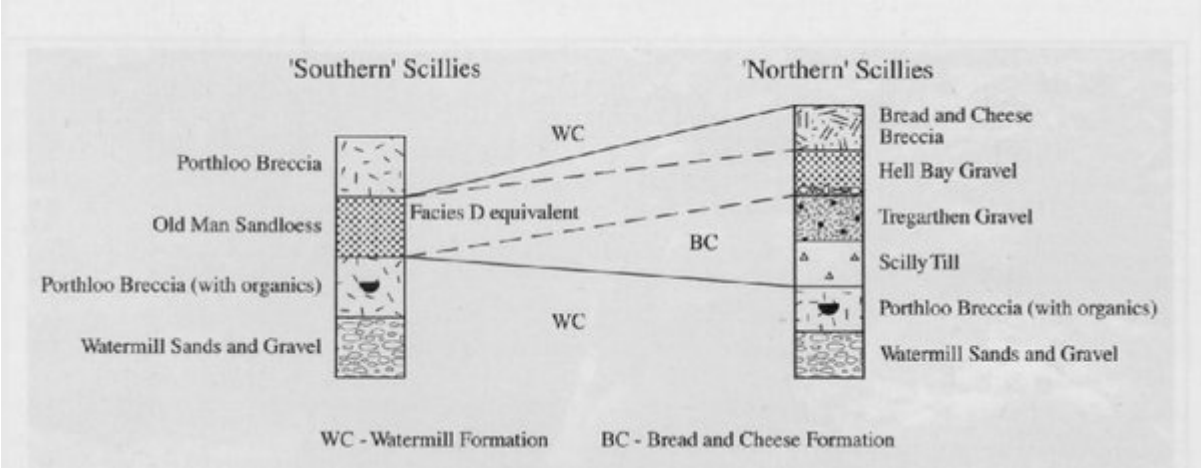
Conclusion

The fine exposures of Pleistocene sediments at Chad Girt have been used as a reference section by a number of workers, and are therefore of historical significance. The site demonstrates evidence for a high sea-level event pre-dating periglacial conditions in the Devensian in which Late Devensian glacial deposits were moved downslope.

References



(Figure 8.11) The Quaternary sequence at Chad Girt according to Barrow (1906). (Adapted from Scourse, 1986.)



(Figure 8.3) A lithostratigraphic model for the Isles of Scilly. (Adapted from Scourse, 1991.)