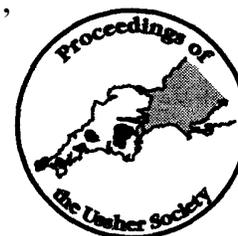


PLEISTOCENE INTERGLACIAL SEA-LEVELS ON THE ISLAND OF ALDERNEY, CHANNEL ISLANDS

H.C.L. JAMES

James, H.C.L. 1997. Pleistocene interglacial sea-levels on the island of Alderney, Channel Islands. *Proceedings of the Ussher Society*, 9, 173-176.



Brief references to raised beaches and associated phenomena on Alderney are reviewed in a historical context. More recent surveys by officers of the Institute of Geological Sciences demonstrated a series of raised beaches on Alderney within the context of the Channel Islands. This paper includes recently discovered sections which have been surveyed laterally and altitudinally. At least two distinct former sea-levels have been identified.

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BACKGROUND

The earliest reference to raised beaches in Alderney appears in a Geological report to the Guernsey Society in 1894 (De la Mare, 1895). This was followed by Mourant's classic descriptions of evidence for former sea-levels in the Channel Islands (1933) including Alderney. Elhai (1963), using numerous published reports from the main Channel Islands' Societies, incorporated further descriptions of the Quaternary deposits within a broader consideration of the adjoining Normandy coast. More comprehensive recent reports on Pleistocene deposits on the island of Alderney appeared in Keen (1978). James (1989, 1990) added further sites and descriptions of low level raised beaches and suggested geochronological links with those of south-west England.

RECENT WORK

Keen's report for the Institute of Geological Sciences (1978) largely contained brief accounts of the location of raised beaches on Alderney within the context of his proposed three groups according to their height range (Figure 1) based on earlier work by Mourant (1933) and Zeuner (1959). There are fundamental problems with the construction of height range diagrams for the Channel Islands but particularly with smaller islands such as Alderney. These problems include the absence of datum levels equivalent to Ordnance Datum (OD) in the United Kingdom and Nivellement General Francais (NGF) in France, or indeed a general absence of comparable datum levels on the island group. With reference to west Cornwall, James (1974) argued for precise levelling to the raised shore platform/palaeocliff or notch as an acceptable datum point for comparison work.

To an even greater extent than in west Cornwall, any accurate measurement of the heights of the raised beaches needs to consider the large tidal range of the island (10 m). Assuming that such tidal ranges also existed during the Late Pleistocene then the raised beach deposits would be spread over a substantial height range (see Austin, 1991 and Scourse and Austin, 1995). In addition, as noted in James (1968), the heights of the notches can vary by 1-2 m from individual headland to bayhead beach, thereby adding to the possibility of a number of intermediary heights. Thus the range in heights for the three specific raised beach groups proposed by Keen (based on Fig. 4, p.6, Keen, 1978) for Alderney are:

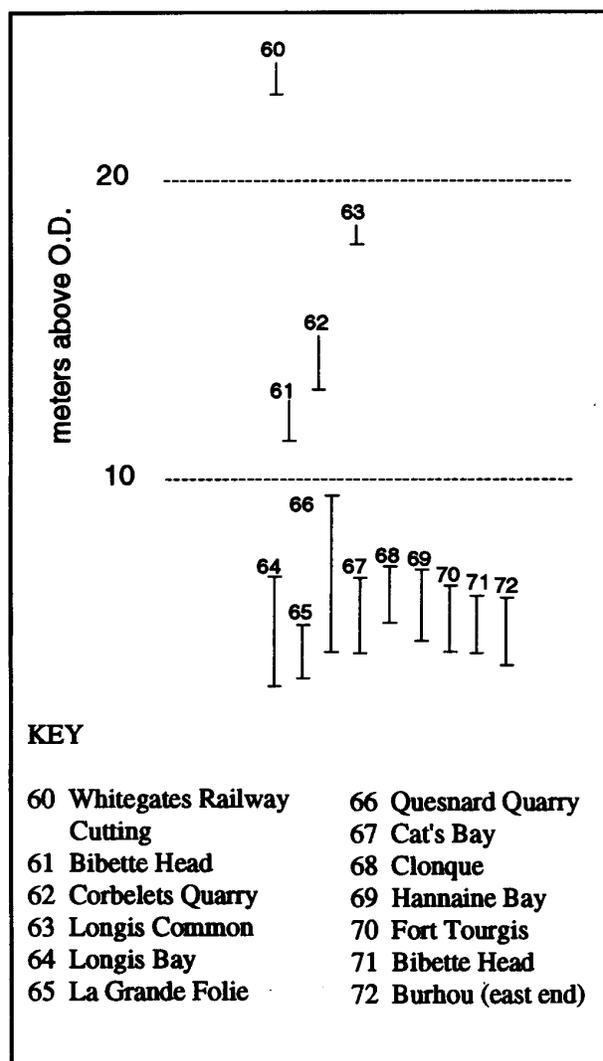


Figure 1. Height-range diagram for raised beaches, Alderney (after Keen, 1978).

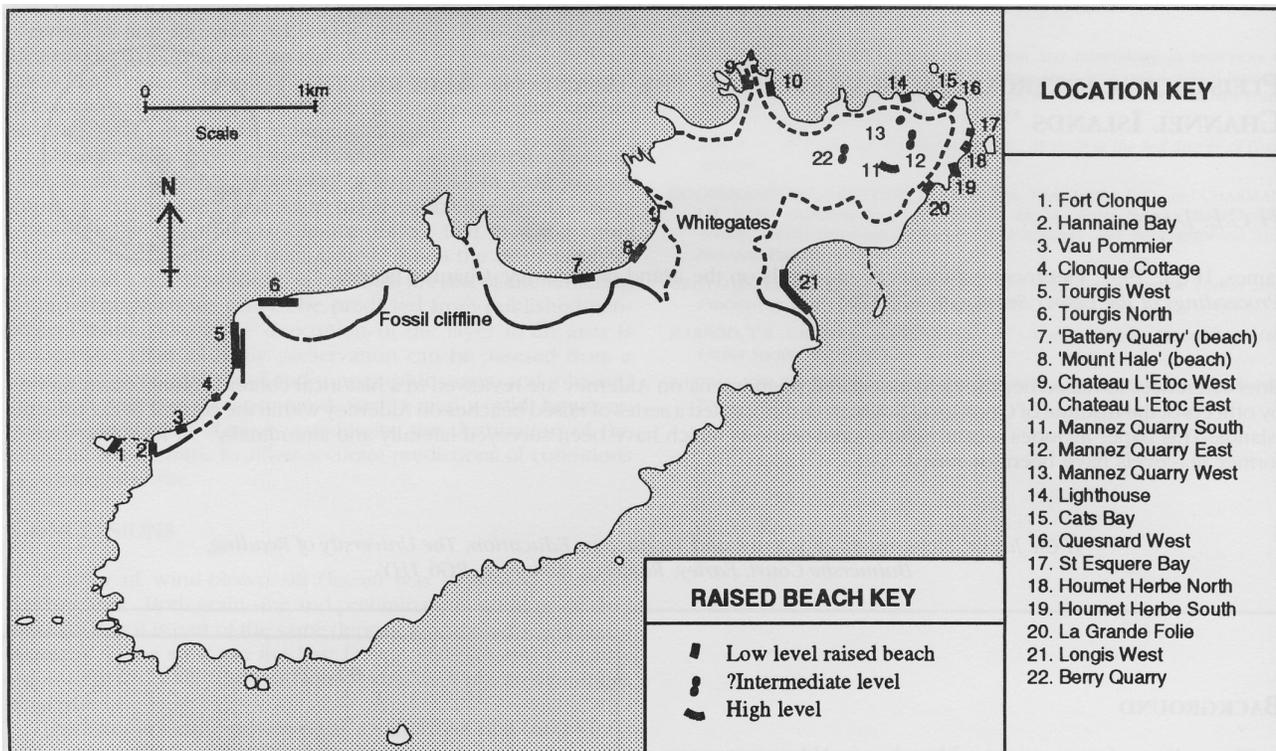


Figure 2. Raised beach and fossil cliffline locations, Alderney, Channel Islands.

- 8 m level (3-9 m)
- 18 m level (11-19 m)
- 30 m level (22-24 m)

Fragments of higher level raised beaches on Alderney were reported at the now overgrown Whitegates Railway Cutting site [WA 591 084] at about 23 m, at Bibette Head [WA 589 091], Corbelets Quarry [WA 596 089] and at the eastern end of Longis Common [WA 601 084] all at 18 m. The number of low-level exposures between 3 and 9 m are largely restricted to coastal locations with the exception of examples in Corbelets Quarry and the former Quesnard Quarry at the eastern end of the island. Further finds have been located at Chateau l'Etoc, Fort Clonque and Mannez and Berry quarries (James, 1991) (Figure 2).

In June 1996, an Ordnance Datum point was fixed at Braye Harbour by the Guernsey States Engineering Department from which a series of benchmarks were established on neighbouring piers. In July the writer was therefore able to precisely level significant exposures of raised beaches of Alderney from these established OD points. An Electronic Distance Measurer (EDM) (Geodimeter System 400/500) was used to survey sites at Mannez Quarry [WA 603 089], Berry Quarry [WA 598 088] and Clonque Bay [WA 557 072].

MANNEZ QUARRY

Figure 3 reveals a series of results for a number of raised beach exposures in the large disused quarry. A 60 m long exposure on the east facing side of a low spur at the eastern end of the quarry rises from 16.45 m OD in the north to 20.28 m OD at the southern end of the spur. A limited exposure on the western side of a low knoll in the centre of the former Alderney Sandstone quarry was precisely levelled to 22.38 m OD rising to 22.99 m OD on the east facing side of the same structure.

A series of measurements of raised beach fragments over a horizontal distance of 70 m at the southern extremity of Mannez

quarry ranged between 28.02 m OD in the east rising to 28.81 m OD further west. The morphological evidence (Figure 4) suggests that the junction or notch of an ancient shore platform and palaeocliff occurs in this section.

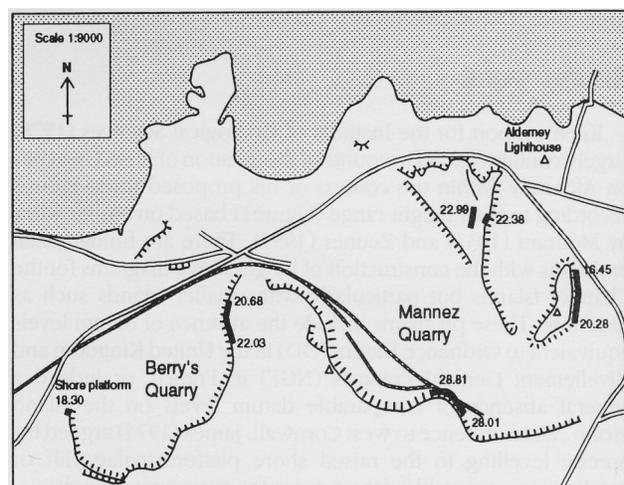


Figure 3. Surveyed heights (O.D.) of raised beaches, Berry and Mannez Quarries, Alderney.

BERRY QUARRY

In this disused Alderney Sandstone quarry, a 50 m section of raised beach on the eastern side was levelled from 20.68 m OD rising southwards to 22.03 m OD. while a raised shore platform overlain by a matrix supported diamict or head at the western end was levelled at 18.30 m OD. (Figure 5).

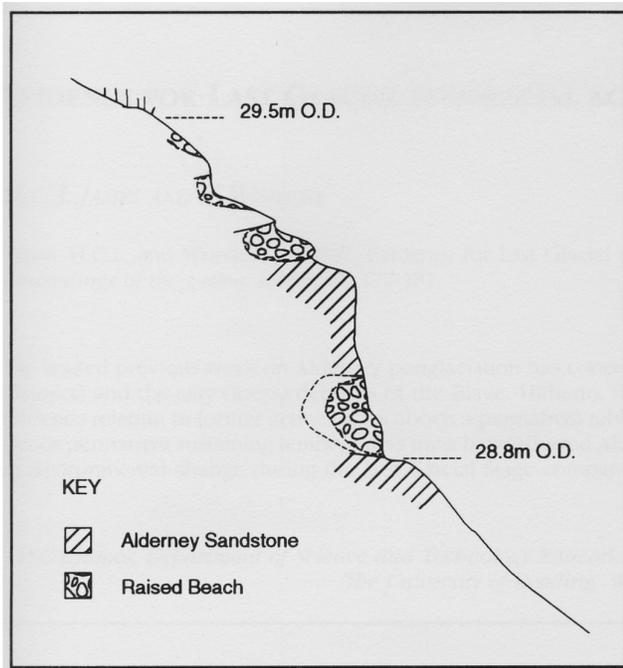


Figure 4. High level raised beach/notch, Mannez Quarry, Alderney.

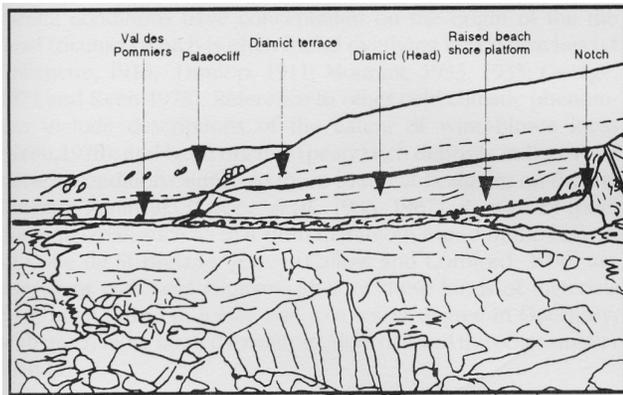


Figure 5. Notch and shore platform, 10m raised beach, Hannaine Point.

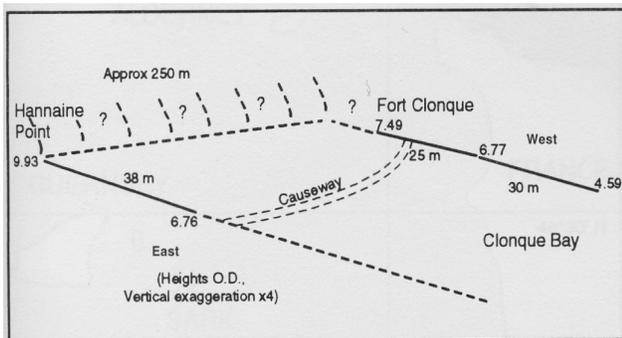


Figure 6. Former coastline at Fort Clonque.

CLONQUE BAY

Extensive sections of lower level raised beach and associated platform(s) were levelled just above the contemporary shoreline at Fort Clonque [WA 555 073], at Hannaine Point [WA 557 072], at the mouth of the stream at Val des Pommiers [WA 559 074] and the west

and north facing shoreline around Fort Tourgis [WA 562 079]. A prominent notch is revealed at Hannaine Point (Figure 5) and was levelled to 9.93 m OD whilst the raised beach/platform contact on the island of Fort Clonque, circa 250 m to the west, descended from from 7.50 m OD to 4.60 m OD over a distance of approximately 60 m from south-west to north-east.

A similar fall in the ancient shore platform at Hannaine Point was recorded. Measurement of the direction and dip of the long axes of clasts within the overlying rubbly head deposits together with location of the fossil cliff indicates that the former ancient platform dipped in the same direction as that recorded for the raised platforms 200 m westwards on the island of Fort Clonque. Indeed the levelling survey together with the sedimentological and morphological evidence suggests that the ancient cliff on the main island of Alderney formerly extended westwards to include Fort Clonque island (Figure 6) with a west to east shoreline dipping north-east towards the centre of Clonque Bay. Hannaine Bay appears to have been formed during the final phases of the Flandrian Transgression (circa 6,000 years ago) when the rising sea-level, aided by the prevailing southwest winds, sought out the lines of weakness adopted by the prevalent south-west—north-east trending dykes in the locality.

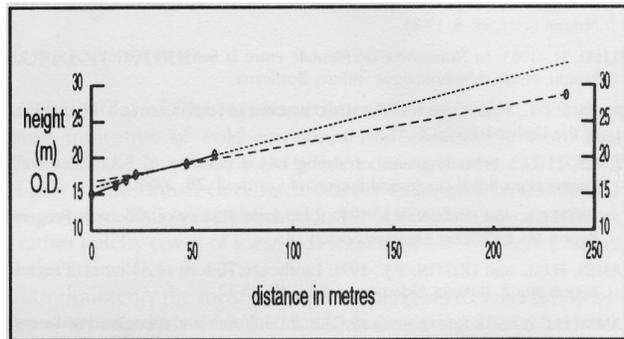


Figure 7. Heights of raised beach(es), Mannez Quarry.

DISCUSSION

Results of levelling of the remaining fragments of raised beaches around Alderney suggest that evidence of at least two distinct sea-levels has been preserved on the island. The altitude of the notch at Hannaine Point at about 10 m O.D. matches heights for similar low-level raised beaches elsewhere in the Channel Islands (Keen, 1978) while the height of the notch at the back of Mannez Quarry at about 29 m O.D. records the first accurately levelled high level ancient beach in Alderney and the Channel Islands. The latter altitude appears to accord with suggested heights of approximately 30 m ascribed by Keen to similar beach levels on Guernsey and Jersey, (see Figure 1). However, the intermediate heights for other higher level raised beach exposures range from 16.4 m O.D. to just above 22 m O.D. and with the lack of a clearly identified notch within these levels, suggestions for a specific intervening sea-level must remain problematic.

Keen (1978) proposed an intermediate sea-level at approximately 18 m following his survey of the Channel Islands although there does not appear to be any record of a clearly identified notch at this height on any of the islands. It could be argued on altitudinal grounds that the intermediate heights represent the regression from the 29 m beach (Figure 8.) The structure and dip of the raised beach sediments with coarse well-rounded clasts in a sandy matrix extending over a seaward distance of more than 60 m suggest partial derivation from already abandoned beach material.

With the exception of the well documented Oxygen Isotope Substage 5e date for the low level (8 m) raised beaches in the Channel Islands based on the work by Keen *et al*, (1981) at Belle Hougue in

Jersey, geochronometric methods have not yet been applied to the remaining higher level non-fossiliferous ancient beach deposits. Thus on altitudinal grounds only, the 29 m beach may be ascribed to CH Stage 9 and while the ?intermediate 16-22 m beach, if it can be clearly differentiated, might be tentatively related to OI Stage 7 and equivalent to the 20 m raised beaches in west Cornwall, for example, Penlee raised beach near Penzance (James, 1994), (Table 1). It is to be hoped that recently devised geochronometric techniques, for example, Infra-Red Stimulated Luminescence (IRSL) (see James, 1995) might be applied to the Alderney raised beaches in the near future.

ACKNOWLEDGEMENTS

The author would like to thank members of the Alderney Society and Dr J. Renouf (Jersey) for their help in the field surveying, and also Mrs Meriel Thorpe, Cartographic Technician, Department of Science and Technology Education, in the production of the illustrations.

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