The West Coast of Jura, Argyll and Bute

[NR 659 985]–[NR 442 724]

J.D. Hansom

Introduction

The west coast of Jura (see (Figure 6.2) for general location) contains a remarkable assemblage of emerged coastal landforms including shore platforms and some of the most extensive areas of well-developed Lateglacial gravel ridges in Britain. The area is noted for small areas of machair-like dune surfaces and for the finest example of a medial moraine in Great Britain at Sgriob na Caillich [NR 475 765]. The emerged coastal landforms provide valuable information for understanding changes in Late Devensian and Holocene relative sea level.

Description

The 37 km-long stretch of the west coast of Jura, between Glengarrisdale Bay [NR 659 985] in the north, and Rubha Aoineadh an Reithe [NR 448 751] in the south, together with a small area (0.2 km^2) at Inver [NR 442 724], is one of the classic localities in Great Britain for emerged coastal landforms. Spectacular unvegetated spreads of Late Devensian and Holocene emerged beach gravel are juxtaposed with excellent examples of three emerged shore platforms, the High Rock Platform, Main Rock Platform and Low Rock Platform. The emerged gravel beaches were described by Ting (1936, 1937), however, the first major study of the emerged beaches was by McCann (1961, 1964), who sought to describe and explain the origin of the western Jura gravels by relating them to Lateglacial relative sea-level change. More recently, the emerged shorelines of western Jura have been investigated in detail by Dawson in several papers, most of which are reviewed by Dawson (1993) in the *Quaternary of Scotland* GCR volume.

The High Rock Platform and associated cliff that extend continuously between Shian Bay [NR 530 875] and Ruantallain [NR 505 833] are are discussed extensively by Dawson (1993) and so only a brief account is included here. The platform has an average width of 350 m but reaches 600 m and the backing cliffs are usually 5–15 m high. The inner edge of the platform lies at an altitude of 34.1–32.1 OD and its seaward slope is about 4°. The surface is covered in places by gravel spreads, which overlie not only rock platform but also patches of lodgement till. Elsewhere the surface is ice-moulded and a striated bedrock sea stack occurs immediately north of Loch a' Mhile [NR 514 850].

Between Shian Bay and Ruantallain the seaward edge of the High Rock Platform forms the cliff of a lower platform, the Main Rock Platform. The lower platform is 50–150 m wide and the inner edge occurs at 3–5 m OD. It is locally overlain by Holocene emerged beach sediments, and the crenulate cliffs of 10–15 m high are indented by numerous emerged sea caves. The platform has a serrated and uneven surface with no signs of glacial moulding. The platform is also continuous between Shian Bay and Glendebadel Bay.

The intertidal rock platform fragments of the Low Rock Platform are conspicuous along long stretches of the Jura coast. Typically 100 m wide, they are best developed on the foreshore between Rubh' Aird na Sgitheich and Allt Bun an Eas. The platform surfaces are locally ice-moulded and in most places pass inland beneath till. Between Rubh'Aird na Sgitheich and Glenbatrick the platform is overlain by up to 15 m of Late Devensian emerged beach gravels.

The coast of western Jura is dominated by conspicuous emerged beach terraces and 'staircases' of unvegetated beach ridges. Although discussed by Ting (1936, 1937), the most detailed studies of these emerged coastal features are by McCann (1964, 1968) and Dawson (1979, 1982). There are two main sets of gravels: a higher suite and a lower suite. The higher suite of emerged coastal terraces can be traced almost continuously southward from Shian Bay (Figure 6.37) to Inver but other areas occur at Corpach Bay, Glendebadel and in the Glenbatrick area (Figure 6.38). In most cases the emerged marine deposits are ridges of unvegetated quartzite gravels that decline in altitude from north-east to south-west, from 40 m OD at Corpach Bay to 24.5 m OD at Inver. The altitudes of the higher suite of beaches suggests

the existence of two shorelines, the higher of which declines in altitude from 40 m OD at Corpach in the north to 34 m OD near Ruantallain in the south-west, a regional gradient of 0.56 m km^{-1}. A separate and lower set of ridges occurs in the south-west, from 31 m OD at Glenbatrick to 24 m OD at Inver, a regional gradient of 0.53 in km^{-1}. Along most of the west coast of Jura the higher suite of emerged ridges terminate at the cliff of the Main Rock Platform and so it is unusual to find them below 20 m OD. However, at South Shian Bay (Figure 6.37), emerged beach gravels descend to 11 m southwest of Loch Maol, probably on account of the unusually low altitude of the rock platform on which they sit (Dawson, 1993). The detailed pattern of ridge crests on both sets of gravel beaches bears a close relationship to the intricacies of the rock platforms on which they sit and of the rock headlands that separate individual beach units.

The lower suite of beach gravels is widespread throughout the west coast of Jura and falls in altitude from between 10 and 12.3 m OD to merge with the gravel ridges of the modern beach. Only a few distinct coastal terraces exist, but emerged gravel banks and beach accumulations everywhere mantle the rock surfaces of the Main and Low Rock Platforms. Spectacular staircases of emerged gravel ridges commonly occur, the best example of which is present north of Inver where 31 individual unvegetated ridges descend from 12.3 m OD to the present-day beach.

Small areas of windblown sand occur in several of the small pocket beaches. Of these, Corpach is of most geomorphological interest in that it contains a small area of rare cliff-foot dunes that resemble a machair surface. These dunes mantle the Main Rock Platform and are locally banked in great ramps of bare sand against the emerged cliff landwards. Although showing active deflation in places, the dunes are mostly vegetated and contain buried palaeosols together with several features of archaeological interest including grave burials in the emerged gravels. The dunes at Corpach, together with dune areas at Shian, Bagh Gleann nam Muc and Glengarrisdale show some of the geomorphological attributes of machair, with a dose sward of grasses and an absence of the normal dune grasses such as marram *Ammophila.*

Interpretation

The High Rock Platform of the southern Inner Hebrides, best seen in western Jura and northern Islay, was considered by Wright (1911) to be 'pre-glacial' in age on account of the emerged beach gravels that rest between its surface and a superficial cover of till. McCann (1968) suggested instead that it was 'interglacial'. Dawson (1979) accepted an interglacial origin but considered that the shoreline had been warped by neotectonic activity. Sissons (1982) proposed that the platforms that comprise the High Rock Platform were produced by cold-climate shore erosional processes and that the various platform fragments are part of a series of glacio-isostatic tilted shorelines. However, the altitudes from the West Coast of Jura (and northern Islay) do not demonstrate any platform tilt and so it is probably a single feature. At present there exists no general agreement on platform origin or age. Dawson (1983) argues that formation of the western Jura platform by cold-climate shore erosion would have taken a minimum of 8000 years and that such a lengthy period of relative sea-level stability during a single period of cold climate was unlikely. It would therefore appear that the western Jura High Rock Platform may represent the product of several periods of Pleistocene coastal erosion (Dawson, 1993).

The inner edge of the platform, which abuts the lower cliff of the High Rock Platform, occurs at 3–5 m OD and constitutes part of a glacio-isostatically tilted shoreline that declines in altitude to the south-west, from 6 m OD in northern Jura to sea level in northern Islay at a regional gradient of 0.13 m km^{-1}(Dawson, 1993). Together with its altitude, jagged nature and freshness of form, this gradient suggests that the platform conforms to the Main Rock Platform identified elsewhere in the Inner Hebrides (Gray, 1978). Dawson (1980a) reports the platform to be unglaciated although where the regionally tilted Main Rock Platform merges with and crosses the regionally horizontal intertidal Low Rock Platform the distinction becomes blurred (Dawson, 1979, 1980a; see below). The intertidal ice-moulded rock platforms that occur in north-west Jura and northern Islay are referred to by Dawson (1980a) as the 'Low Rock Platform', its regional horizontality explained as having been produced by marine processes during interglacial periods.

Since the lower set of platform fragments has been ice-moulded, they were produced prior to the last glaciation. This platform, first noted by Wright (1911) as a preglacial plain of marine denudation...', termed the 'Low Rock Platform' by Dawson (1979). Dawson noted that its presence as an ice-moulded intertidal feature, unaffected by glacio-isostatic tilting along many parts of the Scottish coastline, implied interglacial origins. Sissons (1981) argued that the glaciated intertidal

features represented a set of platform fragments of different ages that had been subject to glacio-isostatic deformation and then exhumed in the intertidal zone as a result of present-day marine activity. According to this hypothesis, the rock platform features were initially produced by cold-climate, shore-erosion processes. The higher platform fragments were considered part of the glacio-isostatically tilted Main Rock Platform that was regarded as having been produced during the cold climate of the Loch Lomond Stadial (Dawson, 1993). This shoreline is generally considered to pass below sea level on Islay, owing to its glacio-isostatic deformation (Dawson, 1993).

The regional variations in altitude of the highest emerged beach terraces on the west coast of Jura suggest the existence of two shorelines. The older emerged shoreline at 34–40 m OD is also thought to occur in northern Islay and has a regional gradient of 0.56 m km^{-1} (Dawson, 1993). A separate and slightly younger shoreline is present in south-west Jura declining in altitude to the south-west from 31 m to 24 m OD at a regional gradient of 0.53 m km^{-1}. Dawson (1982) inferred from these that both south-west and north-west Jura remained ice-covered while the higher shoreline formed between Corpach Bay and Shian Bay. Deglaciation of south-west Jura took place at a slightly later date and was accompanied by the formation of the lower shoreline and its gravel ridges. The regularly declining ridge-crest altitudes of the western Jura gravel 'staircases' indicates that, although stillstands may have occurred during the fall in the sea level from 35 m to 20 m OD, no major sea-level oscillations occurred. Most of the west Jura gravel spreads below this altitude terminate at the cliff of the Main Rock Platform and so patterns of sea-level change below 20 m OD cannot be established except at South Shian Bay where McCann (1964) proposed that a prominent gravel spit at 19 m OD called the 'Colonsay Ridge' (Figure 6.37) represented a pause in the overall fall in sea level.

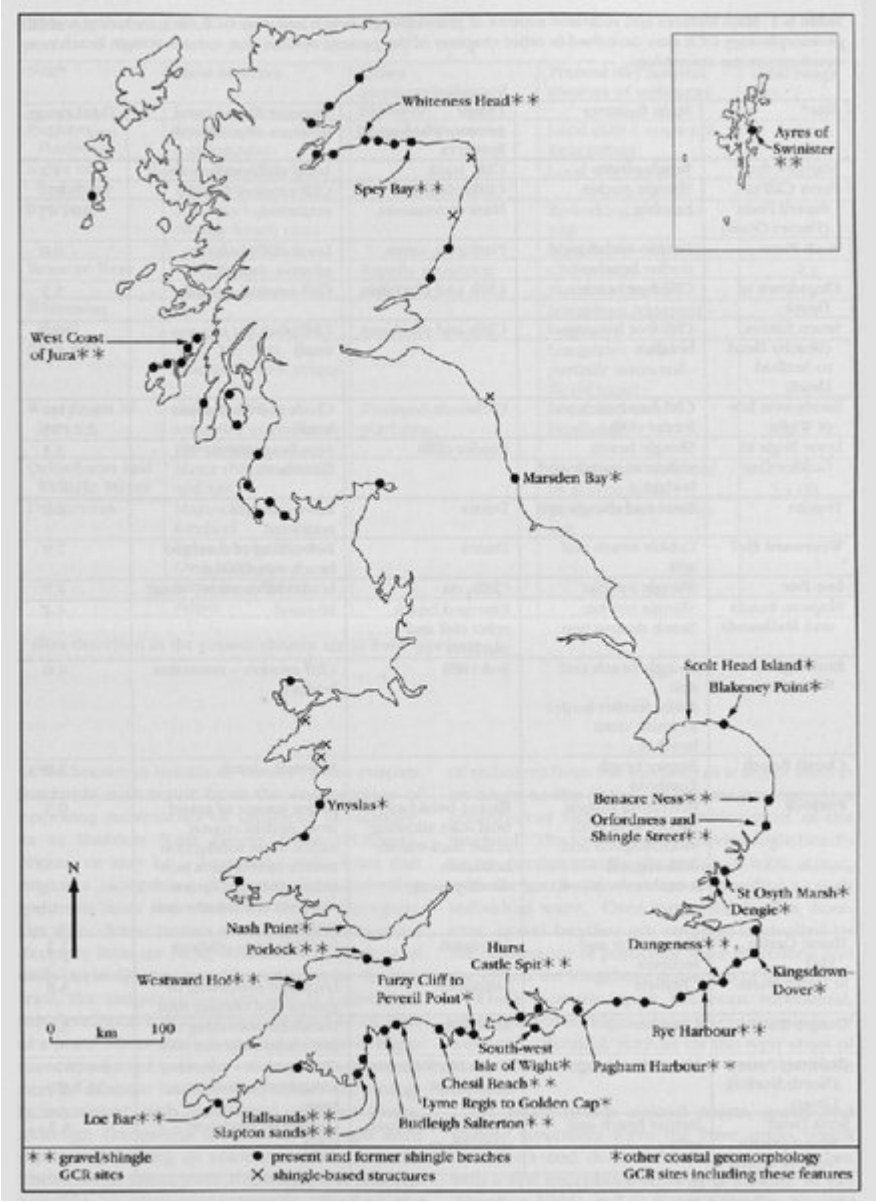
The presence on the west coast of Jura of extensive spreads of emerged gravel is primarily due to the glaclo-isostatic uplift of the higher shoreline and its altitudinal relationship with the till-covered High Rock Platform. These relationships indicate that both high and low gravels are of Late Devensian age. On deglaciation, the maximum sea level along this coast (34–40 m OD) stood several metres higher than the inner edge of the High Rock Platform. Wave erosion of the till cover resulted in extensive gravel deposition, a process enhanced by the gentle sloping nature of the underlying platform surface and its open exposure to westerly waves.

The trend of falling sea levels in the Lateglacial was reversed later in the Holocene with the highest ridges of the extensive suites of lower beach gravels probably representing the culmination of this rise. The culmination of the sea-level rise at about 6500 years BP in the west coast of Jura produced ridges that now lie at 12 m OD. Subsequently a fall of sea level to its present-day level, the result of ongoing isostatic uplift, deposited a staircase of 31 individual gravel ridges and indicates that about 12 m of uplift has occurred in the area over the last 6500 years (MacTaggart, 1998a).

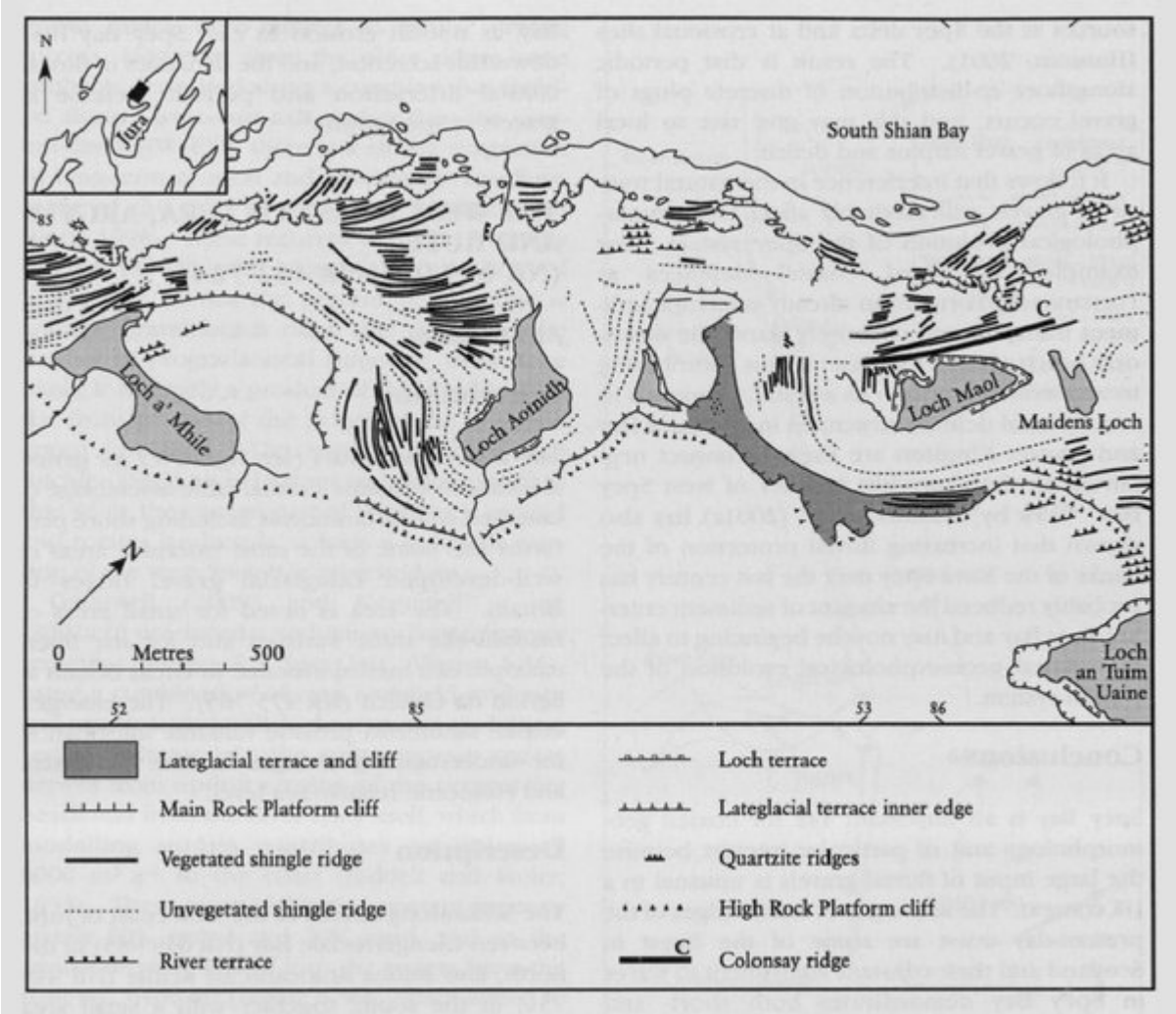
The cliff-foot dunes at Corpach are of interest in that they, along with similar features in other bays along the west coast of Jura, have been interpreted as machair (Ritchie and Crofts, 1974). The dunes mantling the Main Rock Platform are mostly stable and vegetated but bare sand has been blown into highly dynamic climbing dunes up the emerged cliff behind. The dunes at Corpach, together with dune areas at Shian, Bagh Gleann nam Muc and Glengarrisdale, all show some of the geomorphological attributes of machair, with a close sward of grasses and an absence of dune grasses (e.g. marram *Ammophila*). However, their status as machair has been questioned from a botanical perspective because few of the dune areas have even moderate amounts of carbonate sand and do not support classic machair vegetation communities (Dargie, 2000; Angus, 2001). Without this supporting evidence, It seems more appropriate to regard the blown sand deposits of the west coast of Jura as dune systems rather than machair.

Conclusions

The west coast of Jura is outstanding for its assemblage of emerged coastal landforms and gravel beach deposits. Both the range of features and their extent and degree of development are exceptional and include not only fine examples of the three major rock platforms recognized in western Scotland, the High, Main and Low Rock Platforms, but also extensive spreads of unvegetated Lateglacial and Holocene gravel beach ridges unparalleled elsewhere in Britain for the length of their morphological record of sea-level changes.



(Figure 6.2) Coastal shingle and gravel structures around Britain, showing the location of the sites selected for the GCR specifically for gravel/shingle coast features, and some of the other larger gravel structures.



(Figure 6.37) Geomorphology of western Jura in the area of South Shian Bay, showing the 'staircase' of emerged gravel ridges. (After Dawson, 1993.)

(Figure 6.38) An unbroken 'staircase' of unvegetated emerged gravel beaches falls from c. 30 m OD to sea level on the West Coast of Jura. Looking eastwards towards Glenbatrick. (Photo: J.D. Hansom.)