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## Solfach, Pembrokeshire

[SM 802 241]

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### Introduction

The small ria at Solfach (Solva) and its infilled counterpart, the Gwada valley, are the westernmost such features on the south coast of Wales, lying some 5 km east of St David's (see (Figure 3.1) for general location). Rias (drowned river valleys) are common features of the coasts of the Bristol Channel, Devon and Cornwall. Many are large landforms such as Milford Haven, Pembrokeshire, and the Fowey River, Cornwall, but many more are small. Solfach is a good small-scale example of a ria. The site includes both the present ria of Solfach Harbour itself and the infilled ria called the 'Gwada Valley'. The proximity of the two features adds interest to the site, which has been little affected by human activity. Slope-over-wall cliff forms surround the present and former rias that have been cut into a near-horizontal surface at an altitude of about 60 m OD. There has been some infilling of the upper reaches of the present ria, whereas the Gwada Valley has been almost entirely infilled by alluvial sediments. Mentioned briefly by Steers (1946a), Solfach was described by Goudie and Gardner (1985).

### Description

Solfach Harbour and the Gwada Valley are very good examples of two phases of the development of submerged rocky coastlines. Solfach is a good example of a ria: a former glacial meltwater channel that subsequently became a river valley that was flooded by rising sea-level during Holocene times. The Gwada Valley is a comparable feature in origin, but sedimentation has filled almost all its length leaving a small bay with a sandy beach at its mouth. Solfach and the Gwada Valley are cut into a near-horizontal surface (commonly regarded as a former marine erosion surface) at about 60 m OD. From this surface, the land slopes at between 20° and 35° before dropping abruptly into the sea at the seaward end of the valleys. Both valleys are thought to be 'curved' segments of subglacial meltwater channel.

Solfach is flooded at high tide, but gravel, sand and mud are exposed at low tide. These sediments that have been dumped here in a narrowly confined delta will gradually fill in the whole ria just as has happened to the Gwada Valley. In the lower part of the ria, the intertidal forms are more related to marine action as waves penetrate the estuary. Shore platforms of rock occur, particularly on the eastern side.

The Gwada Valley has much the same general form but its valley floor infill is extended almost to its seaward end. Flat-floored with only a small stream across it, this valley has a much-reduced fluvial input compared to Solfach, and its beach is predominantly sandy.

### Interpretation

The present-day features combine vertical cliffs in hard Cambrian and Ordovician rocks with sedimentation in a small marine delta at the head of Solfach Harbour. Steers (1946a) passes little comment on the site other than to note that it is a good example of a ria. The stream, though capable of carrying fine-grained sediments into the estuary, would require a long time to bring about the substantial erosion that was necessary to carve the steep-sided meandering valley. Similarly, present day marine action does not appear to be especially effective in eroding the shoreline. Several separate phases of development have to be invoked to explain the present assemblage of forms.

The first phase (Figure 3.34) appears to have been predominantly fluvial and produced the gentler upper slopes of the valleys. A second phase (Figure 3.34) then produced the steep sides of the lower valley, which in parts of the estuary extend well below sea level. If this phase was fluvial, it required much larger discharges than occur at present. The development of the forms to below present sea level suggests that they developed during a period of lower sea level, i.e.

they derive from a glacial period. Much larger discharges at that time could help explain the incision. Alternatively, changed climatic conditions with higher rainfall and greater runoff during an interglacial could also generate the larger discharges needed. Goudie and Gardiner (1985) have suggested that an alternative explanation may be sought in the erosional vigour of sub-glacial streams that flowed beneath, or issued from, ice-sheets covering south-west Wales. If so, Solfach differs significantly in origin from the rias of southern Cornwall and Devon.

The differential infilling of the two valleys has not been explained. The stream carrying sediment into the Gwada valley appears to have been more active and been able to overcome the sorting and transporting action of the sea. The subsurface sediments and the depth of the underlying bedrock surface are not known. However, Goudie and Gardner (1985) state that it has been infilled more than the Solfach valley. They consider that the valleys were drowned about 6000 years BP, but may also have been drowned previously by earlier higher interglacial sea levels. Their discussion of the formation of the rias and their subsequent infilling may need to be re-thought in the light of more recent work on sea-level change in south-west Wales reported by Campbell and Bowen (1989)

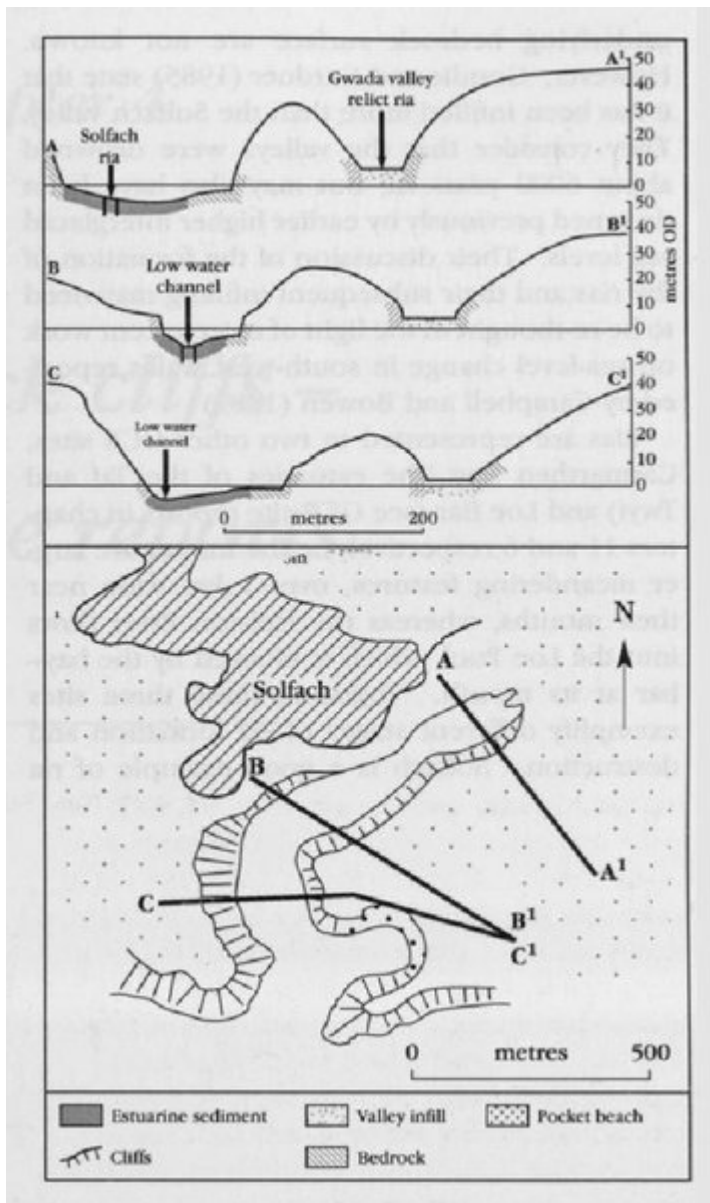
Rias are represented in two other GCR sites, Carmarthen Bay (the estuaries of the Taf and Twyi) and the Bar (see GCR site reports in chapters 11 and 6 respectively). The former are larger meandering features, over 1 km wide near their mouths, whereas the Helston River flows into the Pool, which is blocked by the bay-bar at its mouth. Together, these three sites exemplify different stages of ria formation and destruction. Solfach is a good example of ria development, but questions have been raised about its origins. The extent to which fluvial processes were associated with sub-glacial streams remains open to conjecture, nevertheless Solfach may represent a ria form that combines the effects of both glacial and fluvial environments. If so, it is a rare feature in Britain, and probably in Europe.

## **Conclusions**

A small ria and its infilled neighbour form the site. Solfach and the Gwada Valley provide a distinct contrast in the development of coastal land-forms, both being drowned water-worn valleys, but the Gwada Valley has been infilled in contrast to the tidal Solfach. Solfach is a distinctive example of a ria, not least because of the combined effects of glacial and fluvial processes in its formation.



(Figure 3.1) High-cliffed coast of Great Britain, showing the location of the sites selected for the GCR specifically for coastal geomorphology features of hard-rock cliffs. Other coastal geomorphology GCR sites that include hard-rock cliffs in the assemblage are also indicated.



(Figure 3.34) Cross profiles of Solfach and the Gwada Valley, showing the contrast between the ria of Solfach and the infilled former ria at Gwada.