Porth Padrig RIGS

NRW RIGS no. 195 [SH 37507 94468]

GeoMôn Global Geopark original webpage

RIGS Statement of Interest:

Porth Padrig RIGS is one of four RIGS selected to demonstrate the long-term geomorphological evolution of the island.Coastal, foreshore and quarry sections provide a traverse through a diversity of Precambrian and Ordovician strata. The former consist principally of Gwna mélange, part of the Gwna Group, with its inclusions of quartzite, limestone, ironstone, spilite and jasper. A faulted wedge of Ordovician rocks consists principally of shales (graptolitic) and ironstone. The Precambrian strata in the north-east part of the bay are deeply rotted and extremely friable, exhibiting a rich variety of grey, orange, black and ochre hues, strikingly similar to the zoned weathered residues seen in a series of palaeokarstic 'pipes' only half a kilometre to the south-west at Trwyn y Parc (see Trwyn y Parc RIGS). These highly friable materials are juxtaposed with solid bedrock masses akin to the corestones found in sections of weathered and altered granite on Dartmoor (e.g. Two Bridges Quarry) and sporadically elsewhere in Britain. Such features give the impression of deep in situ rotting and alteration of the bedrock, a process fundamental to Linton's (1955) famous theory of tor development. In the south-east section of the bay, an impressive white quartzitic stack ('White Lady') is juxtaposed with bright-red ironstone and other iron-stained rocks. It is speculated that the rocks in this vicinity may have been hydrothermally altered, possibly pyritised, by hydrothermal processes associated with the igneous activity responsible for the nearby Parys Mountain ore-body. Subsequent protracted supergene weathering (of postulated Tertiary age) may have oxidised the pyritic constituents causing much of the iron staining and also the deep rotting of the Precambrian strata elsewhere in the bay and at other notable locations on the island – such as Porth Swtan, Porth Wen and Trwyn y Parc. There is currently no detailed analysis to support this conclusion. Several authorities, however, hold that these sites hold the key to resolving many important questions about the pre-glacial geomorphological evolution of the Welsh landscape.

Geological setting/context: Long-term, pre-Pleistocene landscape development There is significant evidence that Permo-Triassic erosion effected the primary shaping of the present relief of the Palaeozoic rocks of western Britain. The broad outline and form of Anglesey's coastline and landscape thus appear to have been fashioned by that time. Although the landforms and deposits which adorn the present landscape are the result of processes (especially those of glacial and cold climates) operating in the Pleistocene, the landscapes of western Britain were in fact fashioned over the many millions of years between the Permo-Triassic and the Pleistocene, by a wide range of non-glacial processes operating under diverse, including tropical and sub-tropical, climatic regimes. Depositional evidence for the intervening Jurassic, Cretaceous and Tertiary is, of course, well represented elsewhere in south and eastern Britain, but deposits of these ages were either not deposited or have since been removed from substantial parts of Wales and south-west England. At the very best they have been selectively preserved on-land in narrow fault-controlled basins (e.g. the Eocene and Oligocene deposits found in the Bovey-Tracey and Petrockstow basins) and offshore (e.g. the Jurassic and Tertiary deposits found in the Cardigan Bay, Central Irish Sea and St George's Channel basins). The weathering and shaping of the landmass we see today has therefore been a protracted process. Much of the evidence for the geomorphological processes that operated and shaped the landscape during these times was modified or removed by the Pleistocene glaciations and periglacial processes, particularly in Wales, and the vast bulk of the evidence for these pre-Pleistocene events is erosional in nature and lends little precision to the interpretation of events. The denudation chronology of the British landscape has been detailed in a wide range of publications (see Campbell et al., 1998 for a review). Traditionally, geomorphologists have viewed the early to mid-Tertiary as a time when the landmass of Wales and south-west England was subjected to alternating phases of marine inundation and planation and subaerial exposure and weathering: these conditions were used to account for a multiplicity of perceived erosion surfaces – 'staircases' of these surfaces were widely invoked throughout Wales (e.g. Brown, 1960) and south-west England (e.g. Balchin, 1937). Recent evidence, particularly from St Agnes Beacon in west Cornwall and Trwyn y Parc in Anglesey, shows Miocene and mid-Oligocene deposits overlying a prominent erosion surface at between c. 75–131m OD. This suggests that surfaces above this

general level can be no younger than Miocene and lends much support to the view that large areas of the south-west Peninsula and Wales have existed, more or less, in their present forms since perhaps as early as the Eocene. Landscape evolution subsequent to this is likely to have been slow, the sole depositional evidence for a marine incursion onto these ancient landmasses being a minor transgression of late Pliocene age at St Erth, Cornwall. In recent years, there has been an increasing tendency to invoke only one complex polygenetic erosion surface (e.g. Coque-Delhuille, 1982; Battiau-Queney, 1984), the constituent landforms having been shaped in tropical and sub-tropical environments (Upper Cretaceous and Palaeocene) and uplifted since the late Miocene (Green, 1985). In Wales, this inherited landform has been deeply dissected by Pleistocene glacial activity; in south-west England, periglacial processes appear to have been the chief Pleistocene land-shaping agents. In view of the above, sites where depositional evidence for pre-Pleistocene land-shaping events is preserved take on a disproportionate importance.

In Wales and the Borderlands, evidence for long-term, pre-Pleistocene landscape evolution is represented by a network of RIGS where evidence of Tertiary weathering, the formation of weathered regoliths, saprolites and palaeosols is preserved and has a bearing on the development of specific landforms (e.g. tors) or major landscape features (e.g. erosion surfaces). At some of the sites, evidence for supergene weathering may be superimposed on bedrock previously altered by hydrothermal or pneumatolytic processes associated with intrusive igneous activity. These structurally compromised materials have been susceptible to subsequent exploitation by erosional processes and given rise to distinctive landscape features such as bays and inlets and specific landforms such as tors. The selective preservation of these weak rotten rock masses is something of a miracle, and they provide important clues for interpretations of landscape evolution.

Network context of the site: Porth Padrig RIGS is one of four sites on Anglesey selected to demonstrate key evidence and concepts concerning the long-term geomorphological evolution of the island. Together with Porth Wen RIGS and Porth Swtan RIGS the site is geomorphologically significant in providing an important example of highly altered bedrock possibly partially related to non-supergene processes (e.g. hydrothermal activity). Trwyn y Parc RIGS demonstrates a fossil flora of Miocene age with major implications for understanding the age of Anglesey’s land surface (see also Rhes-y-cae RIGS, north-east Wales). Collectively, the sites have major importance for understanding the long-term geomorphological evolution of Anglesey’s, and indeed Wales’, landscape.

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