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# Trwyn y Penrhyn (Cemaes) RIGS

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## RIGS Statement of Interest

Trwyn y Penrhyn till RIGS is a reference site for the limestone-rich variety of Irish Sea Till found on Anglesey. It provides one of the most accessible exposures of glacial deposits on the island, and one of the best places to study striated boulders. The cliff section cuts through a low-amplitude mound and extends along the coast in a single continuous exposure for about 350m. It reaches a maximum height of about 5m in the central part of the section, declining in height towards both ends. The cliff section exposes boulder clay or till deposited by the Irish Sea glacier, which moved north-east to south-west across Anglesey. The till overlies cemented sands and gravels which are exposed patchily on the foreshore. The till is a very poorly sorted, matrix-supported diamicton composed of all grades from clay to large boulders, some of which exceed 3m in diameter. Carboniferous limestone makes up most of the pebbles and boulders in the section, and the foreshore is densely littered with limestone rubble washed out of the till. Although a few sandstone and conglomerate clasts are also probably derived from the Carboniferous outcrop of eastern Anglesey, several much smaller and more rounded granite clasts indicate a more distant source from elsewhere in the Irish Sea Basin. Where the section thins at either end, the till passes upwards into increasingly stoneless brown sediment of unknown origin. This material may be slopewash or soliflucted debris or even, locally, post-glacial alluvial sediment. Many of the limestone clasts in the till and on the foreshore are superbly striated. Elongated boulders bear parallel striae, while more equidimensional blocks show a characteristic random pattern. This is one of the most accessible sites on Anglesey where text-book examples of glacial phenomena, such as boulder clay and striations, can be demonstrated.

**Geological setting/context:** About 2.4 million years ago there was a general cooling of the Earth's climate, heralding the onset of the Quaternary 'Ice Age', a period of geological time extending to the present day. In reality, the period has seen a number of cold 'glacial' periods interspersed with warmer 'interglacial' periods such as the one in which we now live. Since about 450,000 years ago there have been at least four intensely cold periods during which large parts of upland Britain were covered by ice sheets for long periods. Although Anglesey was probably overrun by ice on these occasions, only evidence from the last major glacial phase — the Late Devensian — is known. Possible evidence from the warm interglacial period before the Late Devensian may locally have escaped the destructive erosional and depositional effects of the last glaciation. During the Late Devensian, around 20,000 years ago, Anglesey was completely submerged by ice. Two ice sheets from different sources were involved. The Snowdonian mountains were the source of ice streams that moved broadly northwards towards Anglesey, while a massive Irish Sea ice sheet, fed by glaciers from Scotland, Ireland and Cumbria, moved onto the island from the north. The Irish Sea ice stream was dominant, and travelled north-east to south-west across the island, broadly in keeping with its NE–SW-trending, structurally controlled rock ridges. The Welsh and Irish Sea ice streams met in the region of the present-day Menai Strait and produced a confluent south-westward flow.

Deposits from the Irish Sea ice tend to contain a wide range of rock types from its diverse source areas and from the varied geology of the seafloor traversed. A red colouration is common, being derived partly from Permian-Triassic rocks offshore. The Irish Sea sediments commonly contain unconsolidated seafloor debris, including sand and shell fragments, dredged from the seafloor by the ice. Tertiary lignite, coal fragments and flint are also a characteristic component of the Irish Sea deposits. Alternatively, deposits from the Welsh ice sheet reflect the geology of its source areas, with a high proportion of Cambrian slates and mudstones, varied Ordovician igneous materials and a blue-grey colouration. Although the broad pattern of the island's glaciation has been understood for nearly 100 years, the exact timing of the arrival and retreat of the different ice masses is poorly understood, as is the relative extent of both ice masses during the Late Devensian. Anglesey contains an exceptional range of Quaternary evidence, in the form of coastal sediment exposures, glacial landforms and erratic boulders, which can be used to reconstruct the glacial history of the island, and elucidate regional variations in ice movement and sedimentary processes.

Three separate networks of RIGS have been selected to demonstrate the glacial history of the island. These are: 1) sedimentary sequences; 2) erratic boulders and; 3) glacial/glaciofluvial landforms. Selected sites may belong to more than one of these networks.

**Network context of the site** Trwyn y Penrhyn belongs to Network 1, 'Sedimentary sequences'. Significant areas of Anglesey are covered by Quaternary deposits, and the island's coastline provides an unusually high degree of exposure. Key sections have been selected as RIGS to demonstrate the most important lithological and sedimentological characteristics of the island's glacial and glaciofluvial deposits. The sites therefore provide important evidence for understanding the origins and patterns of movement of the ice masses that affected the island during the Late Devensian.

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**Site geometry:** Site boundary