Marine Geoscience Report 020

The Blasket Islands

Overview

The Blasket Islands, located off the western tip of the Dingle Peninsula, form a striking archipelago shaped by glacial and marine processes on Ireland's south-west coast. Composed of steep, cliffed islands and sea stacks, the Blaskets are geologically continuous with the folded and faulted bedrock of the mainland and represent some of the most dramatic coastal landscapes in Ireland.

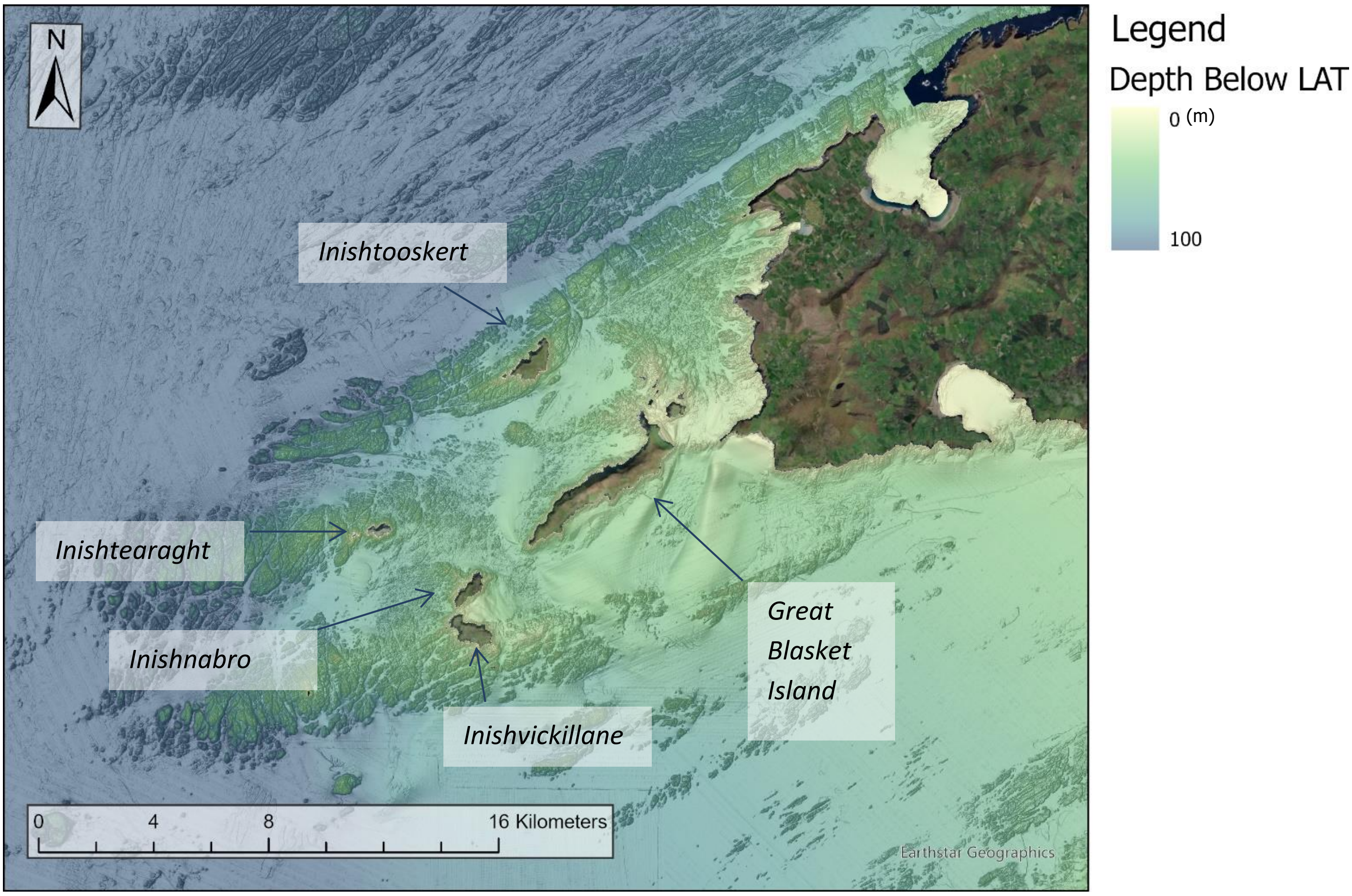

Figure 1: Overview of bathymetry around the Blaskets. Depths are referenced to Lowest Astronomical Tide (LAT).

The Blaskets record a long geological history, from Palaeozoic volcanism and marine sedimentation to later deformation during the Variscan Orogeny. The islands expose folded and faulted sequences of Silurian and Devonian rocks that continue beneath the seabed, making them a focal point for geological investigation.

In addition to their geological significance, the Blasket Islands support a diverse range of coastal and marine habitats. These include vegetated sea cliffs, rocky reefs, and rich offshore waters that sustain important seabird colonies and benthic communities. Today, the islands and their surrounding seabed continue to evolve under the influence of waves, currents, sediment transport and climate processes. Their geological and biological heritage makes the Blaskets an important area for scientific research and conservation.

Geology of the Blasket Islands

The geology of the Blasket Islands and the surrounding region records a continuous evolution from the Ordovician, around 510 million years ago (Ma), to the present. Many of the rocks of the peninsula have been affected by three major periods of deformation due to continental collision: the early Caledonian (~470 Ma), the late Caledonian or Acadian (~400 Ma), and the Variscan (~300 Ma), which together shaped much of the region's structural architecture (Williams, 2020).

The oldest rocks in the area belong to the Dunquin Group, which comprises Silurian and Ordovician marine fossiliferous sediments, including mudstones, siltstones and sandstones (Pracht, 1996). These deposits were laid down in deep ocean settings and later influenced by the closure of the Iapetus Ocean during the Caledonian Orogeny, which was marked by widespread volcanism and deformation. Remnants of ancient volcanoes from this period are preserved, particularly to the south-west near Inishvickillane, where volcanic rocks indicate the centre of Silurian volcanic activity (Pracht, 1996).

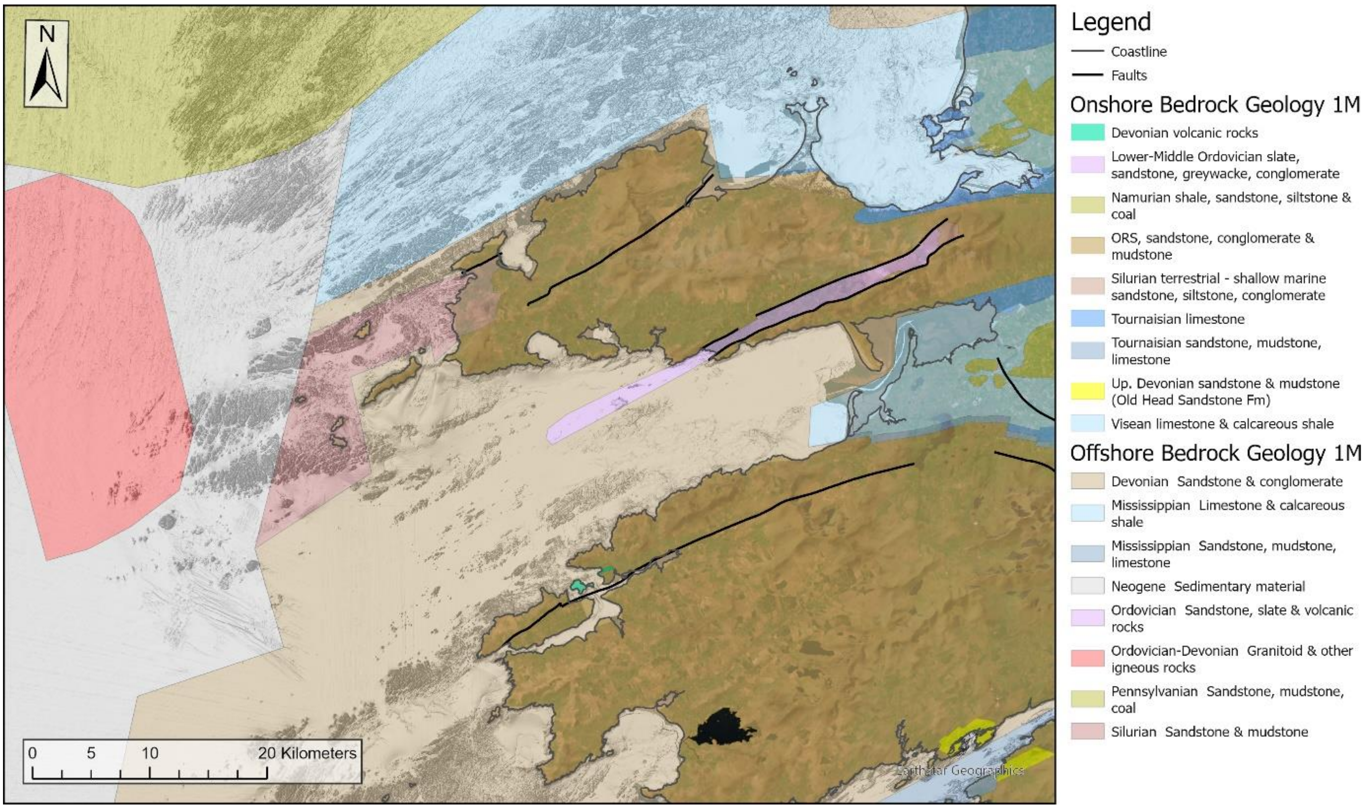

Figure 2: Regional Geology.

The remaining Blasket Islands consist largely of Dingle Group sediments, younger terrestrial sequences that reflect the progressive retreat of the sea and the formation of the Dingle Basin. In this basin, Old Red Sandstone (ORS) was deposited under semi-arid continental conditions during the Late Silurian to Devonian. These deposits include purple and green sandstones, siltstones, and mudstones, recording sedimentation in large desert basins and half-grabens (an asymmetrical fault-bounded basin). The ORS is subdivided into several groups separated by unconformities, indicating tectonic activity and periods of uplift (Pracht, 1996).

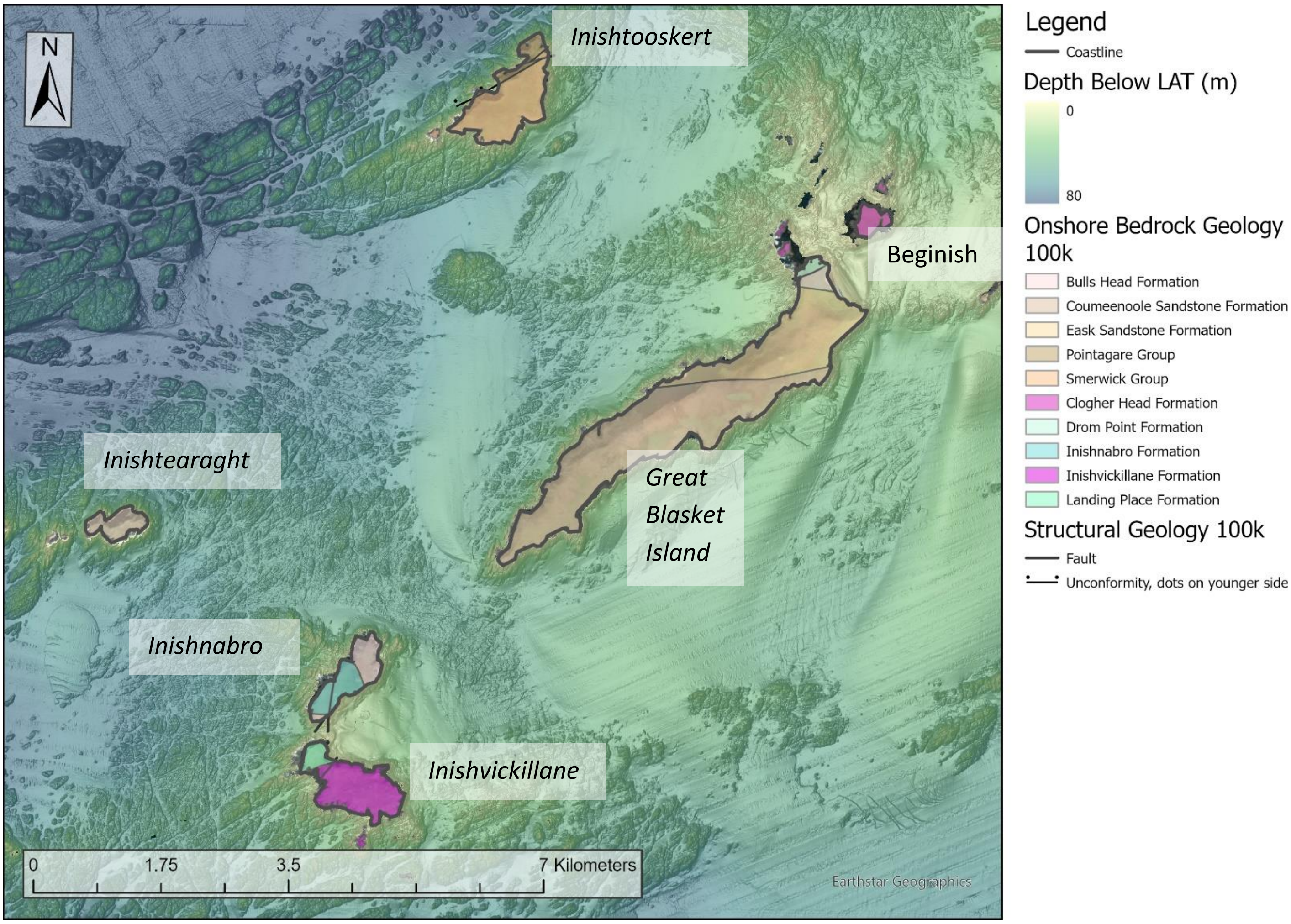

Figure 3: Geology of the Blasket Islands.

Silurian volcanic centres to the south-west of Inishvickillane produced thick lava and pyroclastic successions (Inishvickillane Formation) together with fossiliferous siltstones (Landing Place Formation) (Pracht, 1996). As a result, several islets, notably Inishvickillane and Beginish, are volcanic in character. In contrast, Great Blasket is dominated by younger Devonian Old Red Sandstone (Dingle Group), and Inishnabro shows a transition from Silurian marine strata up into Old Red Sandstone. The differing make-up of the islands reflects structural relief from folding and faulting and subsequent erosion that exposes different stratigraphic levels across the archipelago.

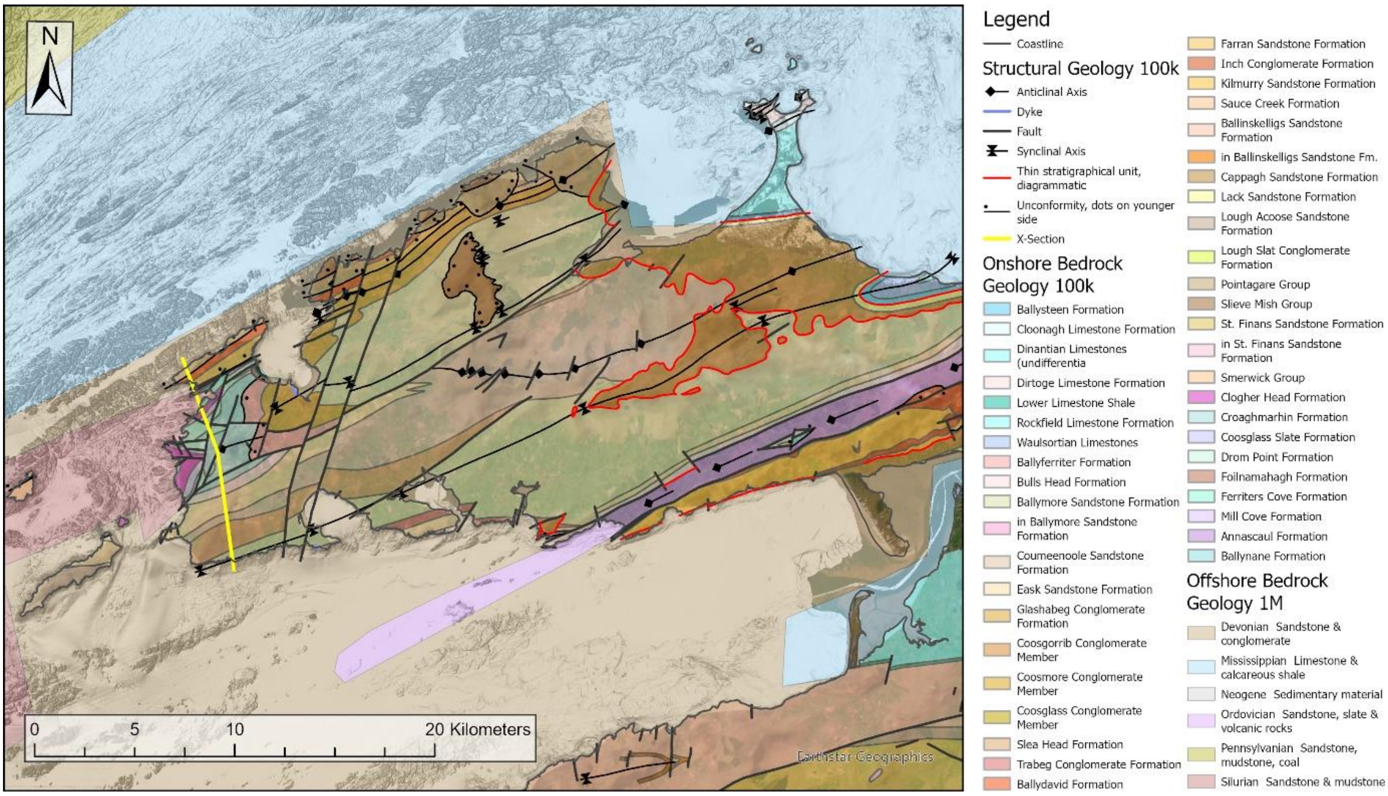

Figure 4: Detailed geology of the Dingle Peninsula.

The onset of a south-east-sourced marine transgression (a landward shift of shorelines as relative sea level rose) during the late Devonian (~355 Ma) led to deposition of shallow-marine mudstones and siltstones over the older terrestrial ORS succession. This Transition Series marks a shift from terrestrial to marine conditions, corroborated by marine spores that appear earlier in the succession at Glengarriff than at Killarney, consistent with a south-east to north-west transgression.

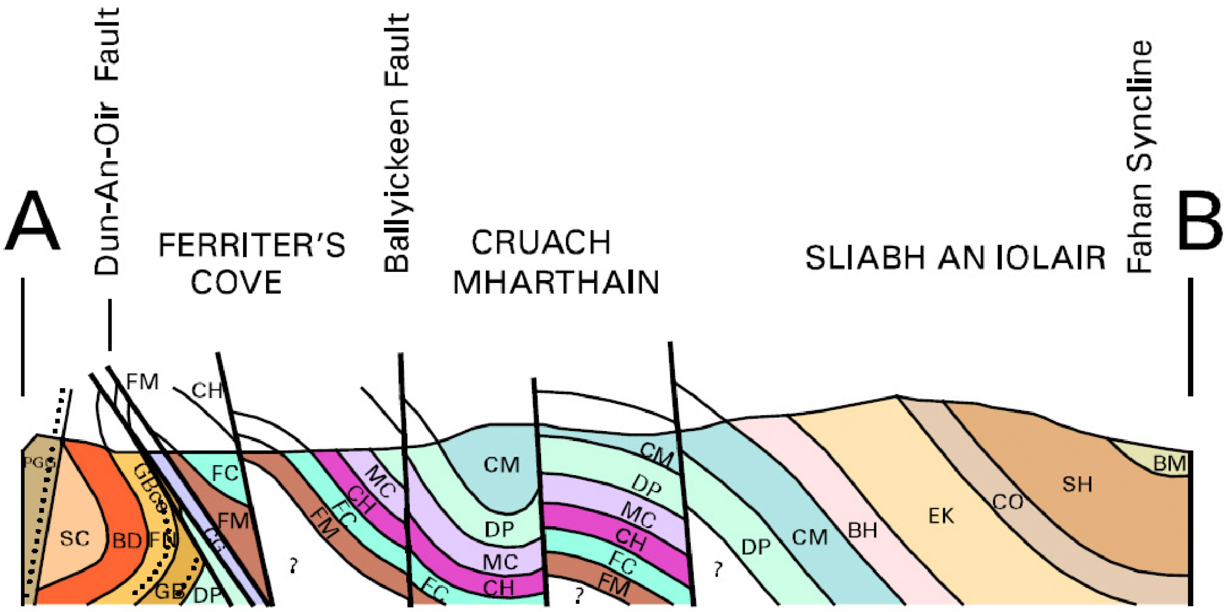

Figure 5: Cross-section of the end of the Dingle Peninsula from (Pracht, 1996). Position of cross-section marked in yellow in Figure 4.

With the full establishment of marine conditions in the early Carboniferous, beginning 355 Ma, limestones were deposited in tropical shallow seas, followed by a thick sequence of marine shales, siltstones, and sandstones. Volcanic rocks, both intrusive and extrusive, are present throughout this sequence. Tectonic deformation during the Variscan Orogeny (~300 Ma) produced large-scale folding, faulting, and uplift, initiating basin inversion (or uplift) and shaping the present-day structural framework.

Joints observed in rocks often form parallel to compressive stress axes and can reveal multiple phases of deformation across the peninsula. However, the geological complexity of the region, combined with overlapping structural features and variable bedrock expression, makes it challenging to clearly distinguish individual folds, faults, and joints in bathymetry data.

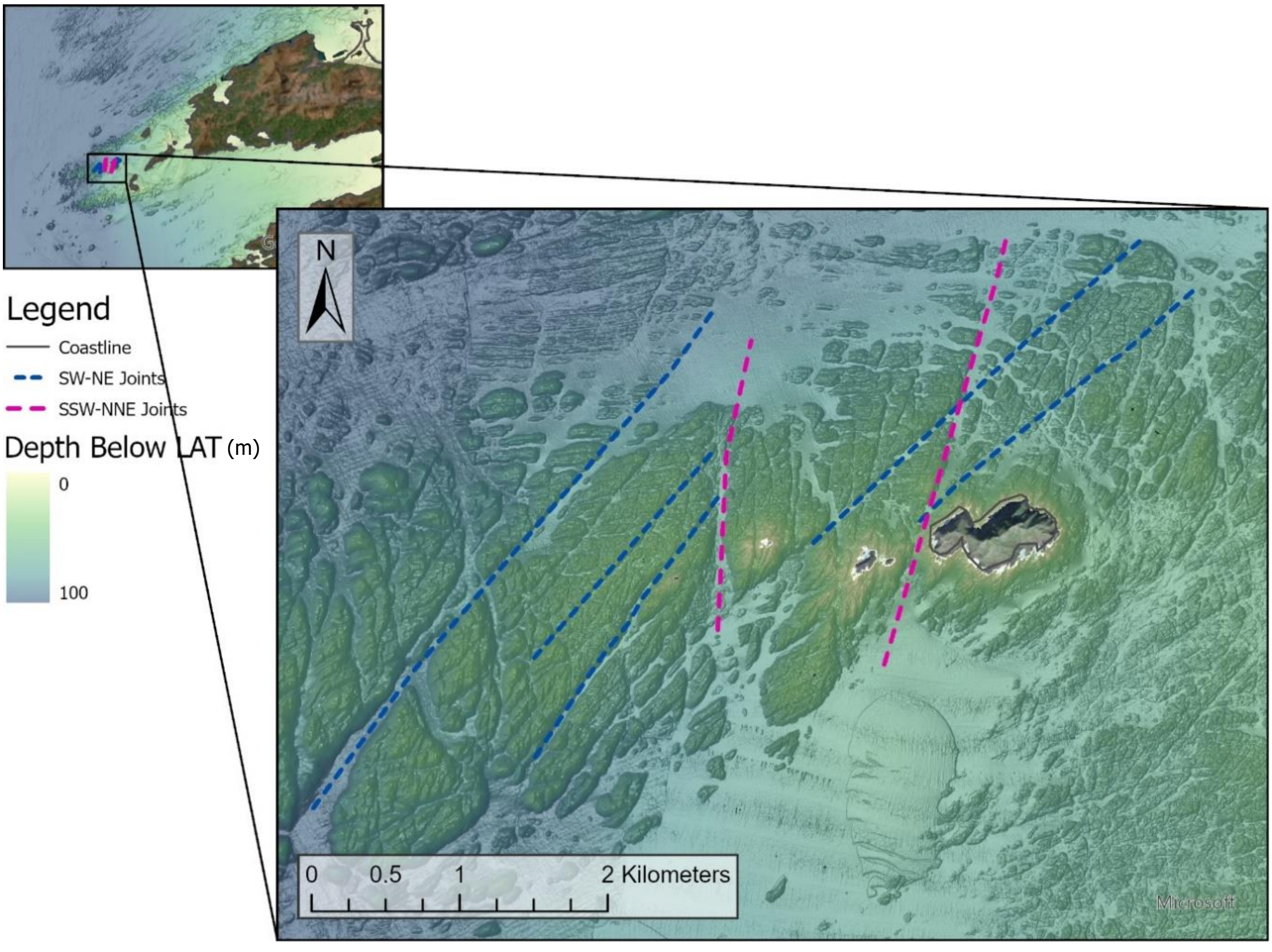

Figure 6: Structural interpretation of the seabed surrounding Inishtearaght showing differing orientation of joints.

Following the Variscan deformation, there is little geological record in the region until the Quaternary period, around 2.58 Ma. This gap in the geological record is largely due to prolonged uplift and erosion (Hennessy, et al., 2023). In the Quaternary, repeated glaciations covered the Dingle Bay area with ice sheets. The alternating cold and warm interglacial stages resulted in the deposition of glacial till, the formation of meltwater channels, and the development of raised beaches, while vegetation colonised the land during warmer intervals. Peat deposits and raised beaches along the coast also reflect the effects of postglacial sea-level rise and landscape adjustment following glacial retreat.

During the Last Glacial Maximum (~24,000 years ago), sea levels were significantly lower than today, exposing large areas of the continental shelf (Ó Cofaigh, et al., 2012). The palaeocoastline at that time extended far beyond the present shoreline of Dingle Bay and the Blasket Islands. This earlier coastline can be visualised in the figure below, which shows a reconstructed map of the palaeocoastline at 18 ka.

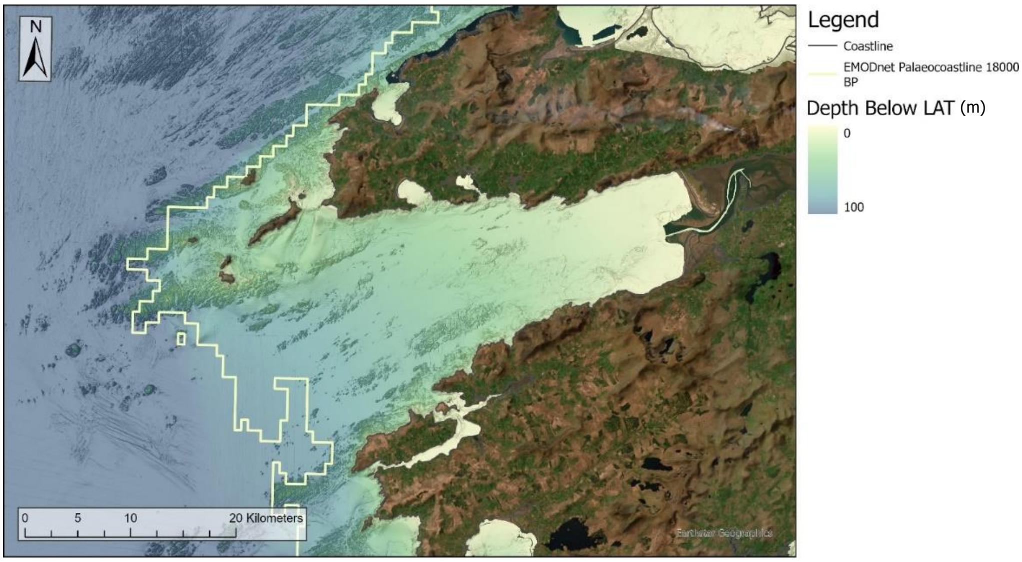

Figure 7: Modelled palaeocoastline of Ireland approximately 18 ka. Palaeocoastline data from (Brooks, et al., 2011).

Seabed Features

The seabed surrounding the Blasket Islands displays a range of structural and sedimentary features that reflect both its geological foundation and the influence of recent marine processes. Bathymetric and geophysical data reveal folded strata and linear fault-controlled valleys consistent with onshore structures.

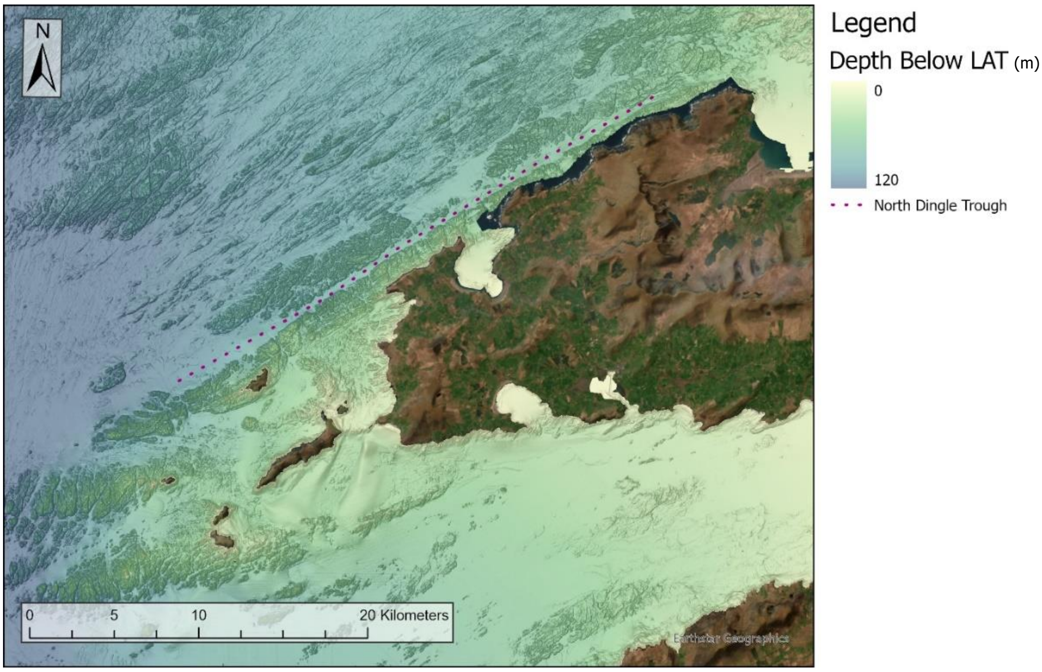

Figure 8: Bathymetry of the North Dingle Trough.

A continuous coastal ridge of steeply north-dipping sandstones defines much of the peninsula's north coast. Just offshore, a narrow seabed trough, about 40 km long, 400 m wide, and 30 m deep, marks the northern limit of these rocks. This trough is the possible bathymetric expression of the North Kerry Lineament, a crustal structure recognised in geophysics that influenced development of the Dingle Basin (INFOMAR, 2023).

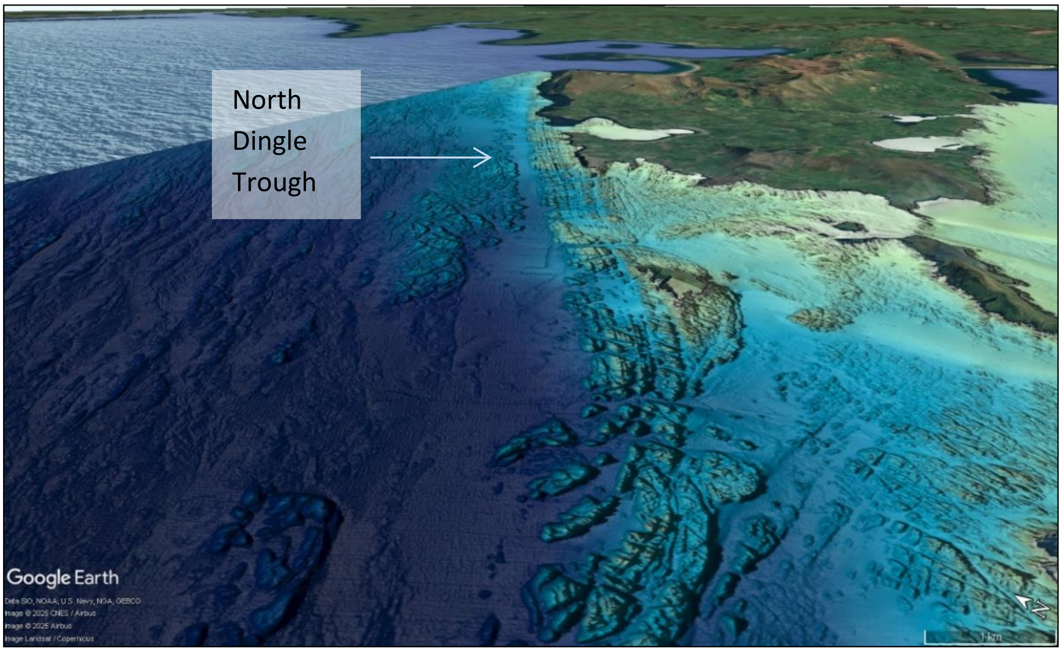

Figure 9: 3D Google Earth image showing the bathymetry of the North Dingle Trough and surrounding seabed.

In contrast, the Dingle Bay Lineament to the south does not appear in the bathymetry because it is blanketed by recent sediment.

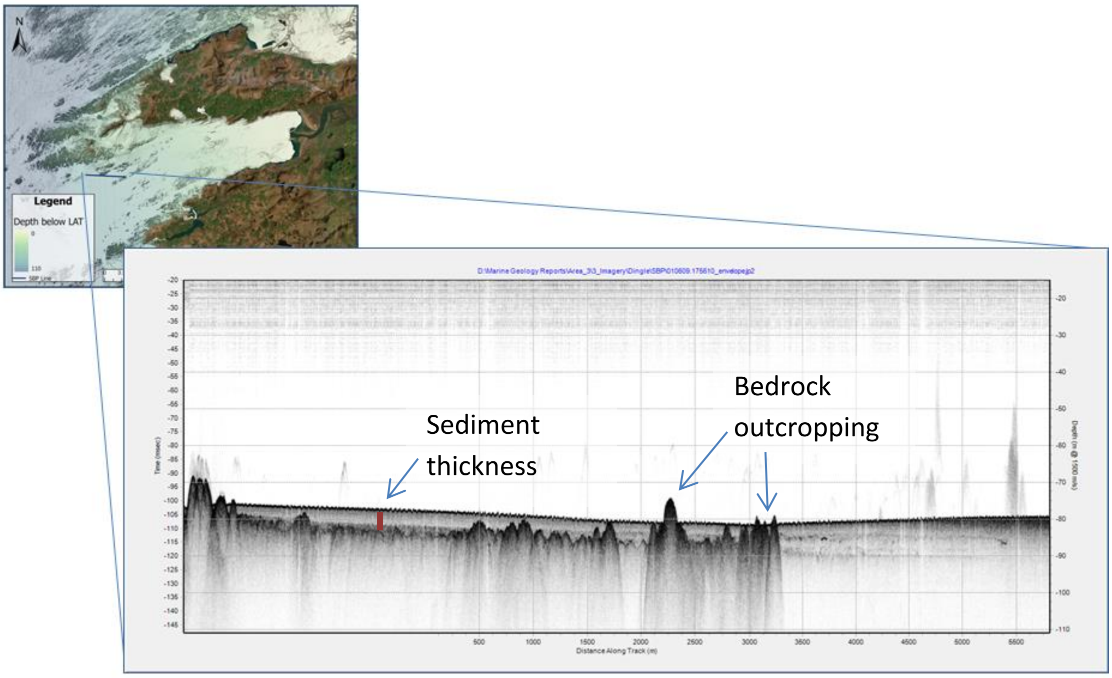

Figure 10: Sub-bottom profile in Dingle Bay showing over 5 m of sediment overlying the bedrock.

Silurian and Devonian bedrock is widely exposed around the Blasket Islands. Between the mainland and the Blaskets, INFOMAR bathymetry reveals folding and faulting expressed as lineated bedrock ridges and sediment-filled troughs aligned with regional structural trends. Volcaniclastic and sedimentary formations here show tight folding and steep dips, continuing offshore where seismic data reveal similar deformation in the subsurface (Pracht, 1996).

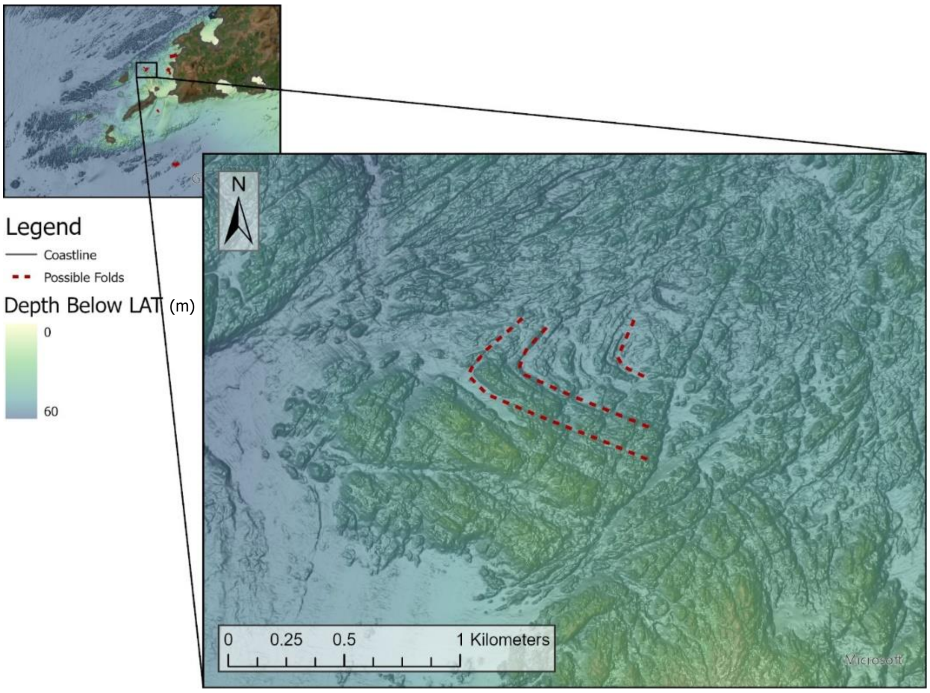

Figure 11: Apparent folded bedrock visible in the bathymetry.

A trough, oriented south-west to north-east, is present on the approaches to Blasket Sound, flanked by sediment banks.

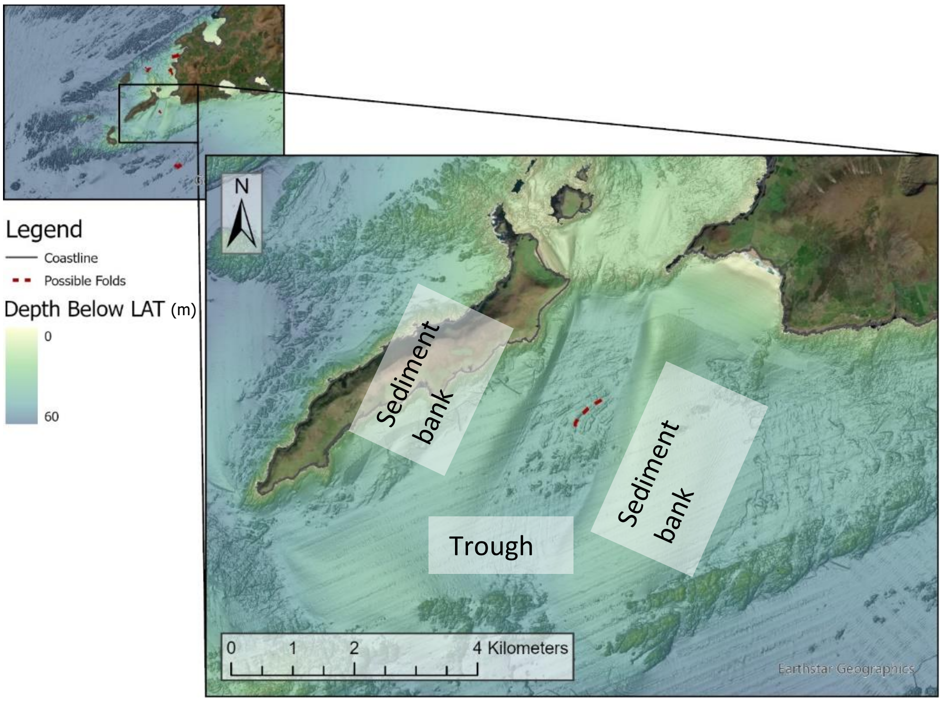

Figure 12: Trough on the approaches to the Blasket Sound.

This trough lies approximately 6 m below the adjacent sediment banks. Strong tidal currents, reaching up to 2 knots and funnelled through Blasket Sound, are likely to contribute to the formation and maintenance of this seabed morphology by influencing sediment deposition and erosion around the trough margins (Admiralty Chart 2790).

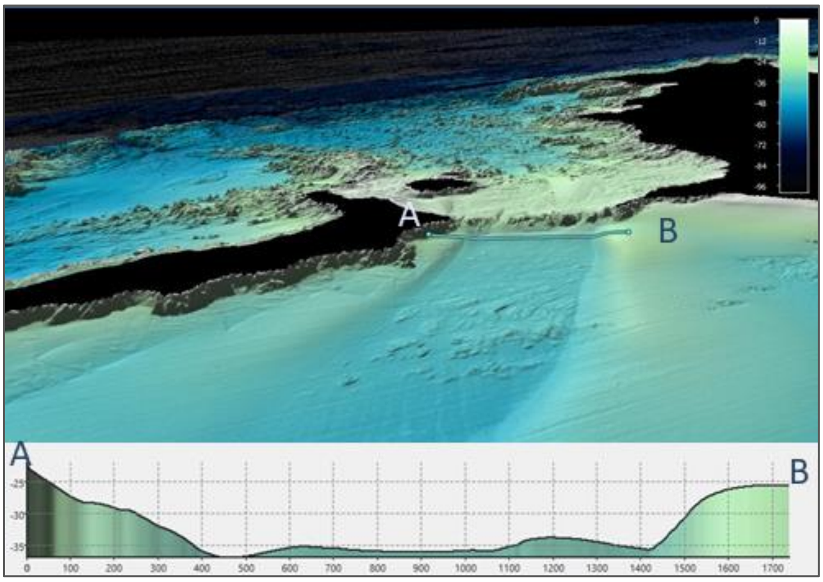

Figure 13: Elevation profile of the sediment trough.

Further offshore, at ~120 m water depth, a field of north-west to south-east oriented sediment ribbons is evident. These elongate bedforms likely reflect strong bottom currents interacting with subtle seabed relief, sorting coarser sand into linear ridges separated by finer-grained troughs. Their morphology suggests tidal and storm-driven transport, and may record a relict or locally active sediment pathway across the shelf.

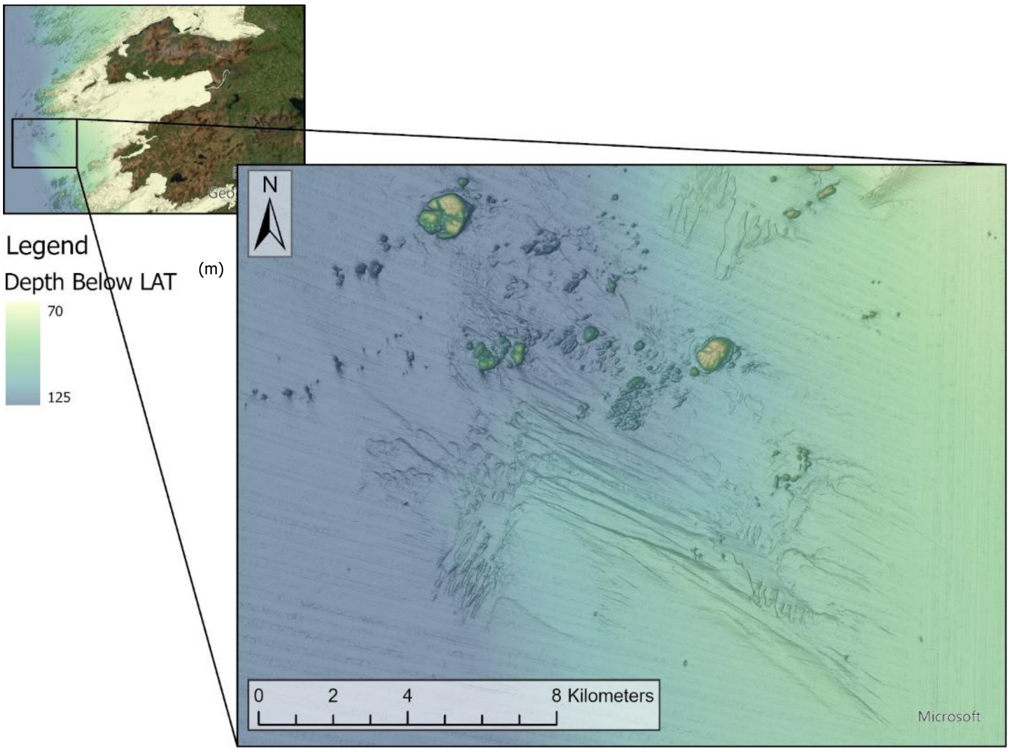

Figure 14: Sediment ribbons and rock outcrop.

Biodiversity

Dingle Bay and its offshore islands, including the Blaskets, are of high ecological importance, forming part of the Blasket Islands Special Area of Conservation (SAC) (National Parks & Wildlife Service, 2013) and Special Protection Area (SPA) (National Parks & Wildlife Service, 2015). These designations reflect the area's significance for both terrestrial and marine biodiversity. The region hosts a range of coastal habitats such as vegetated sea cliffs, maritime grasslands, and maritime heath, which support a rich flora (Barron, et al., 2011).

The cliffs of the Blasket Islands provide critical nesting grounds for seabirds, including internationally significant colonies of Manx Shearwater and Storm Petrel as well as puffins and kittiwakes (National Parks & Wildlife Service, 2015). These seabird populations benefit from relatively undisturbed habitats and nutrient-rich surrounding waters. The distribution and productivity of their prey are closely tied to seabed substrate and morphology. The sediment classification map used here was generated by integrating multibeam bathymetry, backscatter intensity, and ground-truth observations, and then applying a modified Folk sediment classification with five substrate classes (the Folk-5 scheme). This approach categorises seabed texture from mud through gravel and, when combined with seabed morphology, supports interpretation of benthic habitats and biodiversity patterns for marine spatial planning, conservation, and assessment (Guinan, et al., 2021).

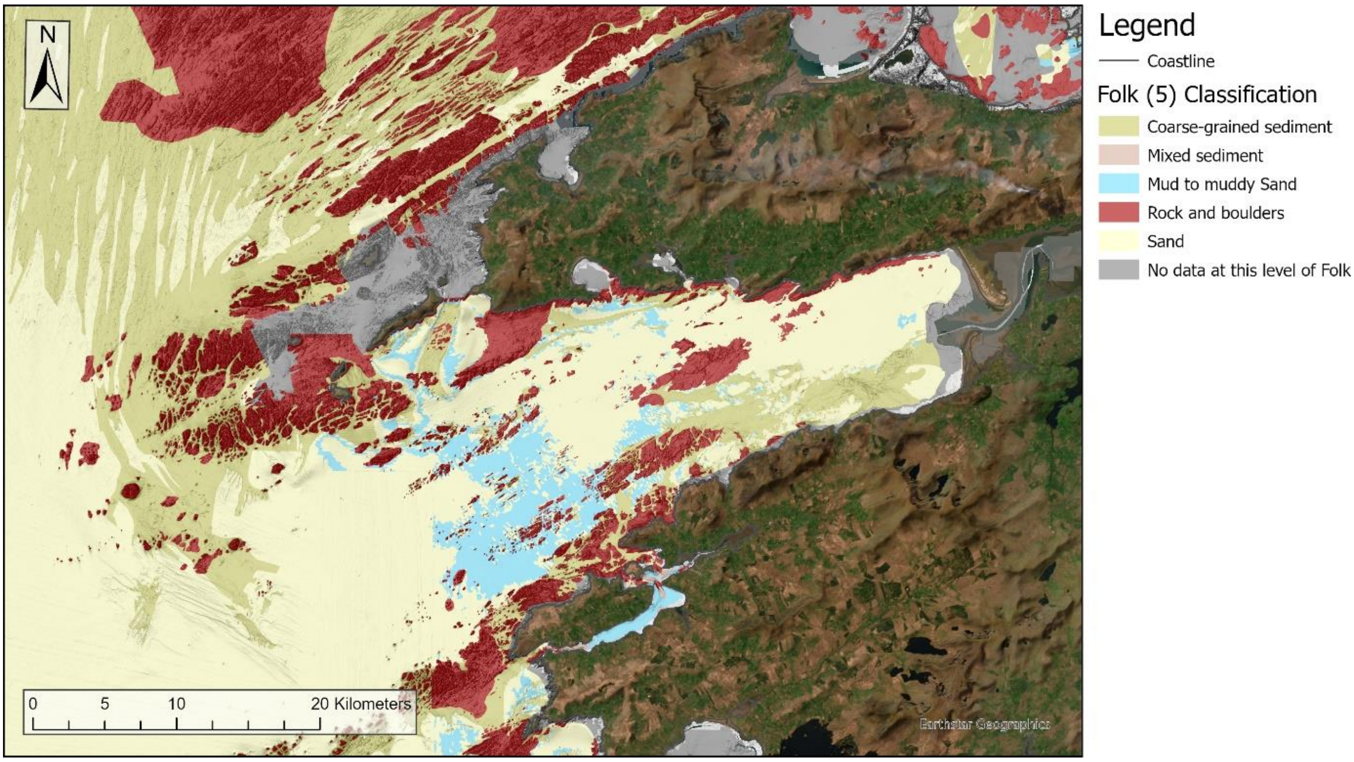

Figure 15: Sediment classification map of the Dingle Peninsula.

The rich biodiversity of the Blasket Islands region is also supported by its benthic communities, which vary across substrate types: from rocky reefs and boulder fields to muddy inlets and sandbanks. These habitats support a wide range of marine life that forms part of the food web for larger fish, marine mammals, and birds (National Parks & Wildlife Service, 2013).

Conclusion

Dingle Bay and the Blasket Islands record a long and varied geological history shaped by tectonic, depositional, glacial and marine processes. The rock record within and around the bay reflects the northward drift of Ireland's ancient landmass, from deep oceanic basins and volcanic arcs to tropical shallow seas, recording major shifts in palaeogeography and environmental conditions. From Silurian volcanism and Devonian terrestrial sedimentation to Carboniferous marine incursions and Quaternary glaciation, the region records the interaction between ancient geological processes and modern marine conditions.

Across the Blasket archipelago, this history is reflected in contrasting bedrock, with Silurian volcanic successions on some islets, Devonian ORS on Great Blasket and transitional sections on others. Structural features such as folds, faults, and intrusions continue to shape the seabed, while sedimentary environments reflect both geological controls and ongoing oceanographic processes. These relationships provide important context for marine mapping, ecological studies and coastal management.

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