INFOMAR
Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
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Department of Climate, Energy and the Environment
Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann
Marine Institute
Foras na Mara

Marine Geoscience Report 016

Kenmare River

Overview

Kenmare River is a long, narrow bay in south-west Ireland, lying between the Iveragh Peninsula to the north and the Beara Peninsula to the south. Despite its name, it is not a freshwater river, but a saltwater ria, or drowned river valley. It was designated a "river" by the Lansdowne Lords to secure fishing rights across the bay (MacCarthy, 2024).

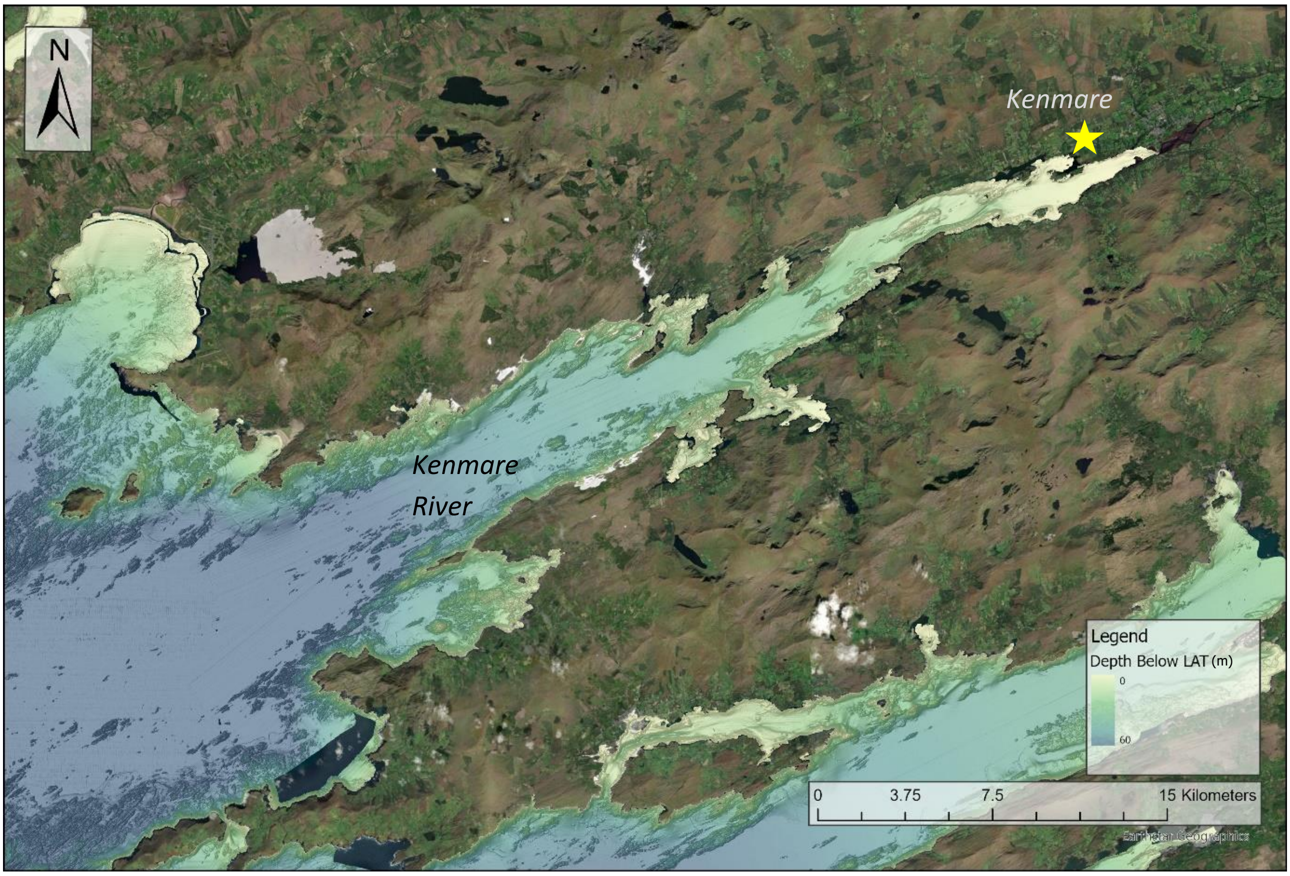

Figure 1: Bathymetry of Kenmare River. Depths are referenced to Lowest Astronomical Tide (LAT).

The bay is underlain by Devonian (419-359 Ma) and Carboniferous (359-299 Ma) bedrock. Its present form reflects a long geological history involving terrestrial and shallow-marine sedimentation, mountain building, repeated glaciation and modern marine processes. Together, these have shaped the bedrock framework, sediment distribution, current patterns and distinctive seabed features of the bay. Much of Kenmare River is designated as a Special Area of Conservation (SAC) for important marine habitats, including reefs, caves, and large shallow bays (National Parks & Wildlife Service, 2024).

Geology of Kenmare River

Kenmare River is situated within the South Munster Basin, an extensional basin that developed following the closure of the Iapetus Ocean, over 416 Ma. By the Early Devonian, Ireland was part of a large desert-like continent known as Laurussia. Rapid erosion of mountains to the north supplied gravel, sand and mud to river systems crossing an arid landscape. These deposits formed the red sandstones, siltstones and mudstones known collectively as the Old Red Sandstone (ORS), which accumulated within the Munster Basin (Sleeman & Pracht, 2002).

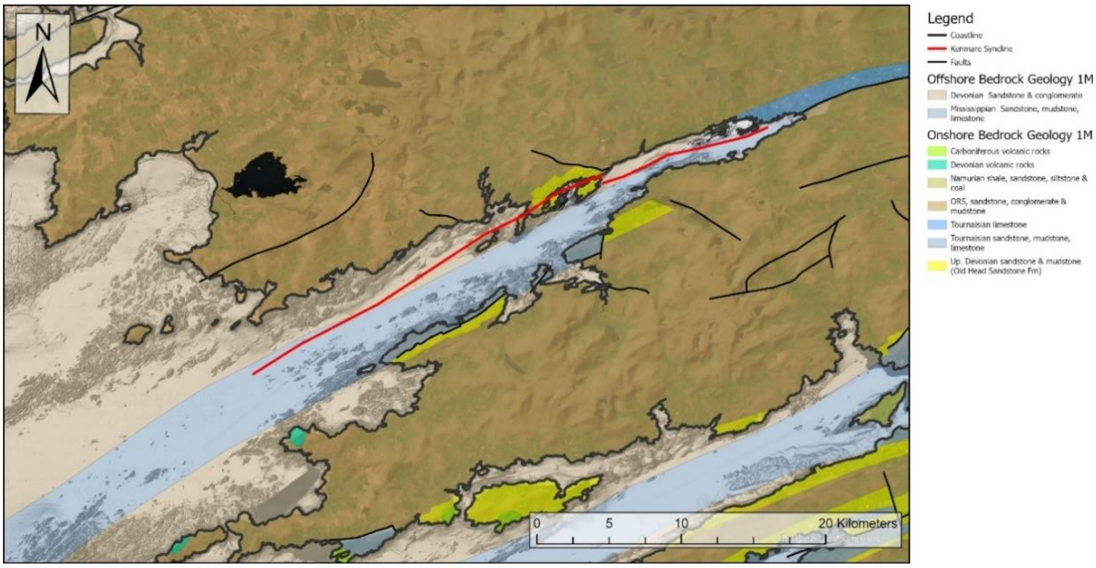

Figure 2: Geology of Kenmare River, with the Kenmare syncline axis inferred from (MacCarthy & Meere, 2007).

During the Late Devonian, a major marine transgression occurred, resulting in the inundation of the continent by shallow tropical seas. This transition marked the onset of marine sedimentation, which continued into the Carboniferous period as the South Munster Basin deepened. By the end of the Carboniferous, the Variscan Orogeny, a continental collision and mountain building event around 300 Ma, caused intense north-south compression. This produced east-west-trending folds and an extensive fault network across the region (Sleeman & Pracht, 2002).

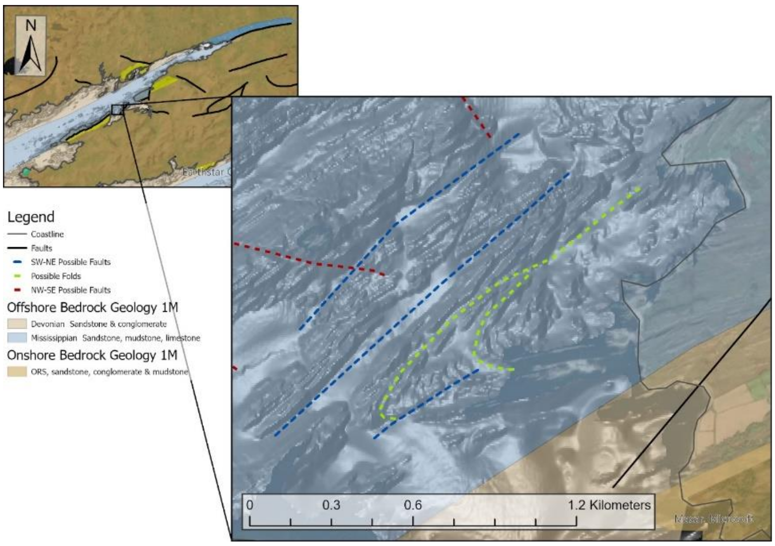

Figure 3: Folds and possible faults evident in the exposed Carboniferous bedrock on the seabed at the entrance to Ardgroom Harbour.

The bay is structurally controlled by complex asymmetric folding and faulting, including the Kenmare syncline, which dominates the region (MacCarthy & Meere, 2007). The fold axis trends south-west to north-east, with a strong south-west to north-east structural grain evident in both the geological units and the surrounding peninsulas. The dominant faults in the area are strike-slip faults trending north to south or north-west to south-east. Many of the south-west to north-east trending faults represent older Caledonian structures that were reactivated during later tectonic events (West Cork Palaeoecology, 2020). Caledonian structures are folds and faults formed during the Caledonian orogeny, which ended in the early Devonian, linked to the closure of the Iapetus Ocean, and they commonly provided weakness zones that were reused in subsequent deformation.

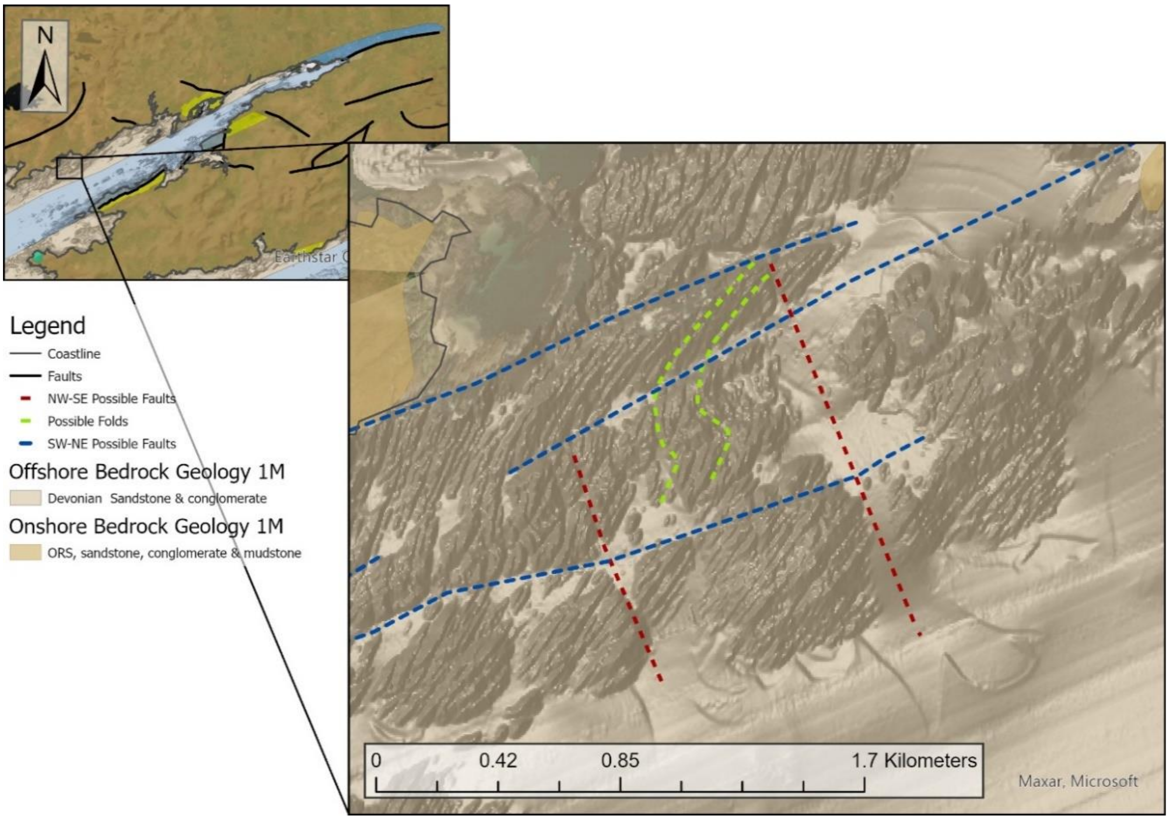

Figure 4: Possible faults and folds in the exposed Devonian bedrock on the northern shores of Kenmare River.

The geological contrast between Devonian and Carboniferous bedrock has influenced the erosion and weathering patterns across the bay. Devonian sandstones are generally harder and more resistant to erosion, forming prominent reefs along the bay's central axis. In contrast, the softer Carboniferous rocks are more susceptible to dissolution, with faulting and folding allowing for increased water penetration, leading to localised karstification.

Following the Carboniferous period, uplift and erosion dominated, leaving little geological record until the Quaternary glaciation, beginning 2.58 Ma. The last Ice Age shaped Kenmare River's modern landscape, leaving behind glacial deposits, submerged valleys, and extensive seabed sedimentary structures. Most of the sediment on the seabed consists of mud to muddy sand, with local patches of sands and coarse sediment, as well as exposed bedrock.

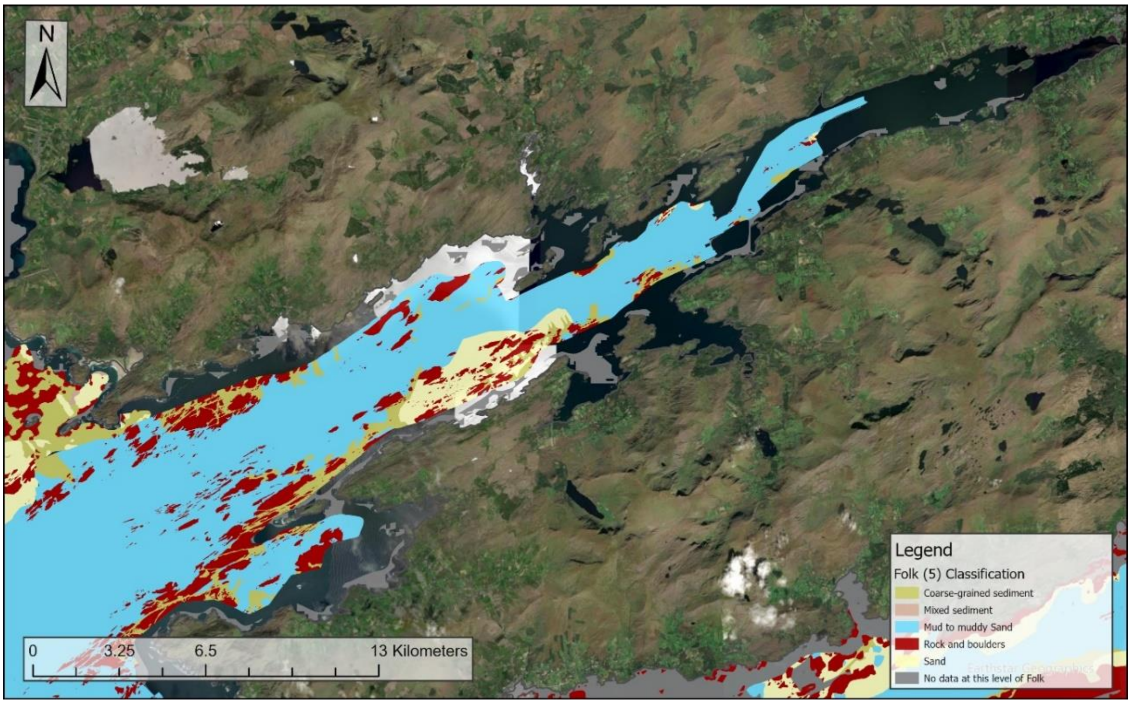

Figure 5: Sediment classification map of Kenmare River.

Seabed Features

The seabed of Kenmare River is shaped by tidal currents, geological structure and past glacial activity. The bay contains numerous small islands, which significantly influence seabed morphology by altering currents and sediment transport patterns.

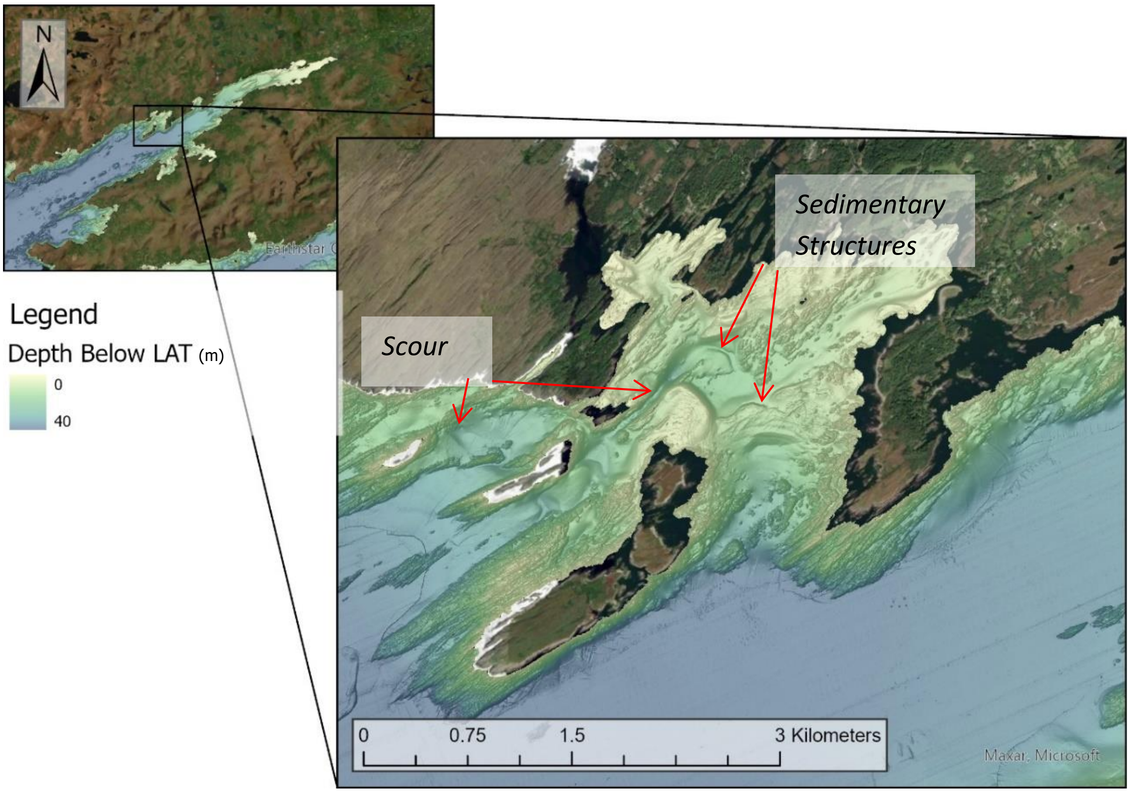

Figure 6: Sedimentary structures and scour around Sherky and Rossdohan Island.

Constrictions between bedrock outcrops create areas of accelerated tidal currents, as water is forced through narrow passages. These strong tidal flows, reaching speeds of 1.5 knots (Admiralty Chart 2495), contribute to localised seabed scouring and sediment redistribution. Deep channels, scour and erosional features are visible in these areas, particularly where currents interact with bedrock ridges.

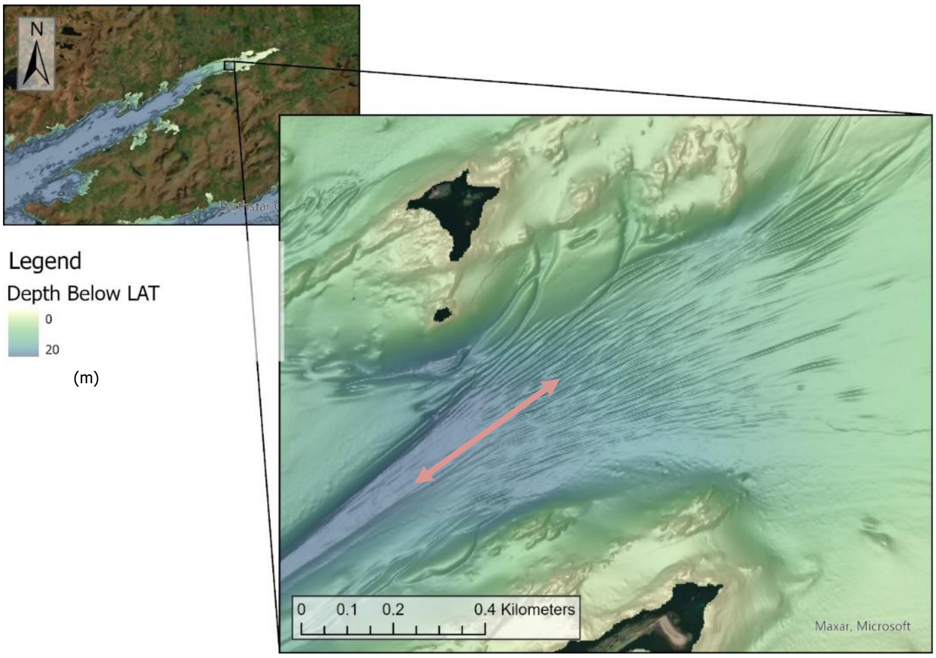

Figure 7: Scour features at an inter-island constriction; the double-headed arrow indicates the directions of ebb and flood currents.

The seabed composition varies significantly throughout Kenmare River, with exposed bedrock ridges aligning with the underlying structural grain, particularly along the central axis of the bay where sandstone reefs protrude.

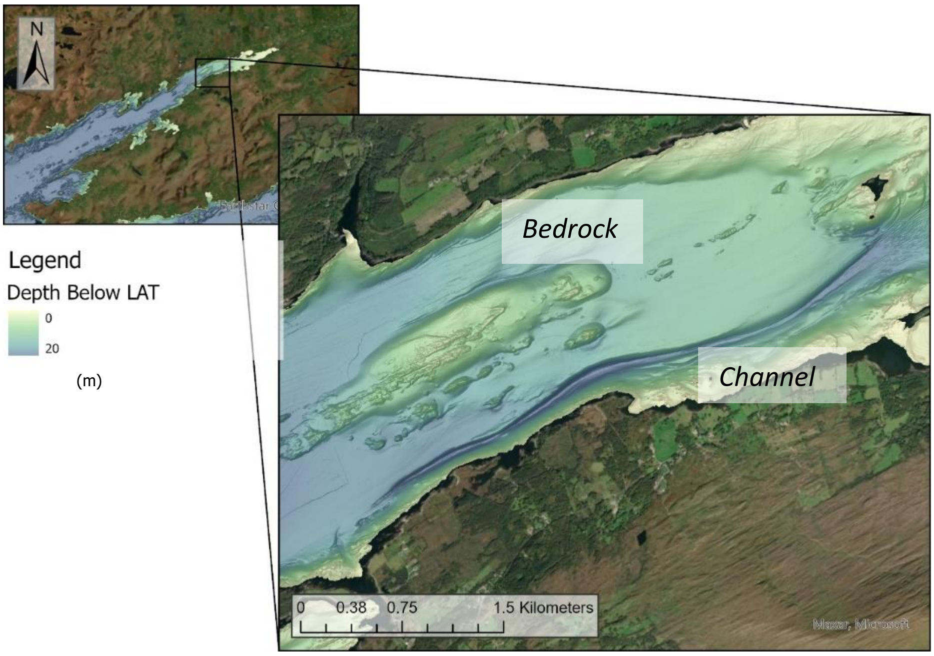

Figure 8: Bedrock reefs in the centre and a channel to the south. The channel reaches depths of 10 m below the surrounding seabed.

A small pockmark field has been identified in Kenmare River, expressed as shallow depressions in fine-grained seabed sediment. Pockmarks are typically linked to localised gas escape or fluid movement through unconsolidated strata. They are most visible where near-surface seabed sediments are muddy rather than sandy, so similar escape features may not be evident everywhere gas or fluids are present. Similar pockmark fields have also been mapped in nearby Dunmanus Bay and Bantry Bay.

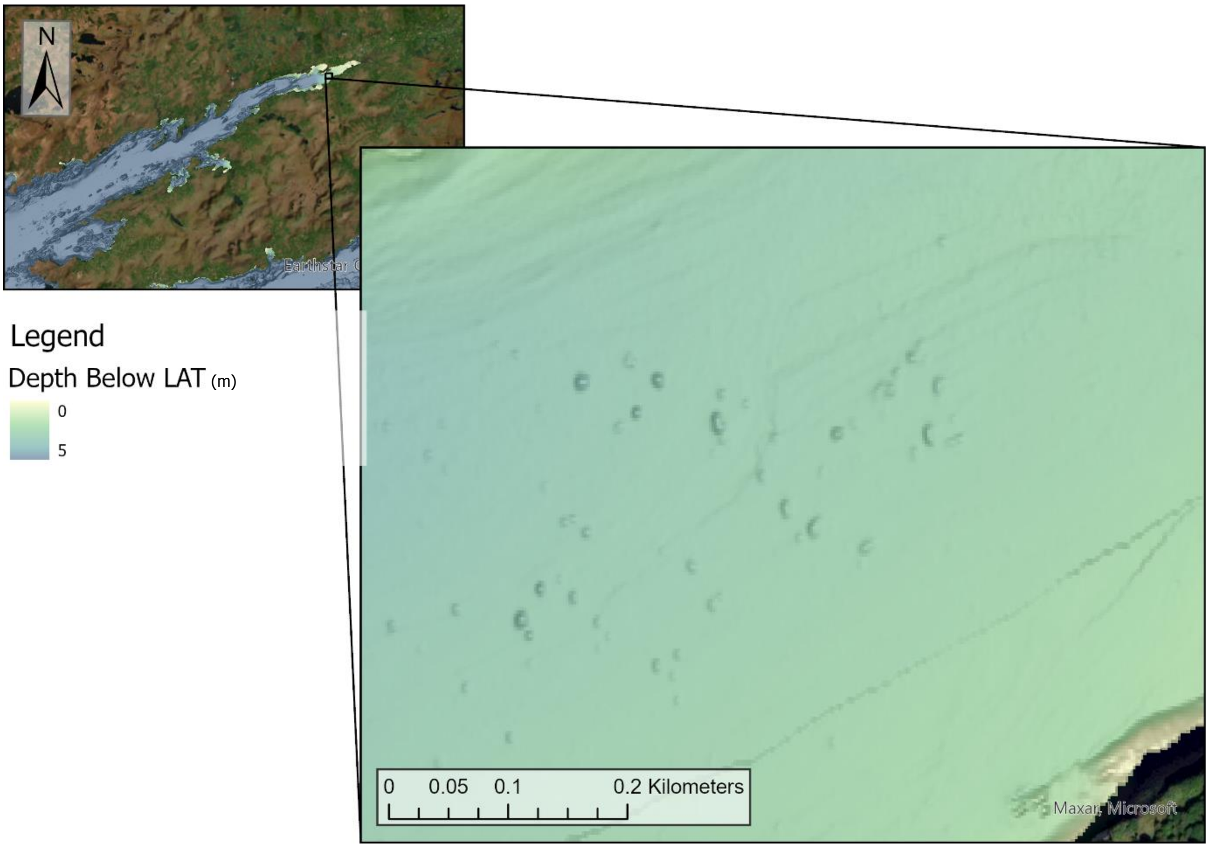

Figure 9: Pockmark field in the inner Kenmare River.

Habitats

Kenmare River's marine habitats are influenced by its bedrock structure, bathymetry, tidal currents, and seabed composition, which create a diverse range of environments. The seabed varies significantly, with areas of rocky outcrops, reefs, and soft-sediment substrates supporting a wide variety of marine life.

Using bathymetric data, backscatter surveys, sediment sampling, and underwater video footage, INFOMAR has mapped the seabed habitats of Kenmare River, producing a detailed classification of the bay's marine environment. The resultant habitat map comprises three reef habitats and seven distinct soft-sediment habitats, reflecting the complex interactions between geological, hydrodynamic, and biological processes. This map is a valuable tool for sustainable marine management, aiding in the monitoring of species distribution, habitat extent, and potential environmental changes over time.

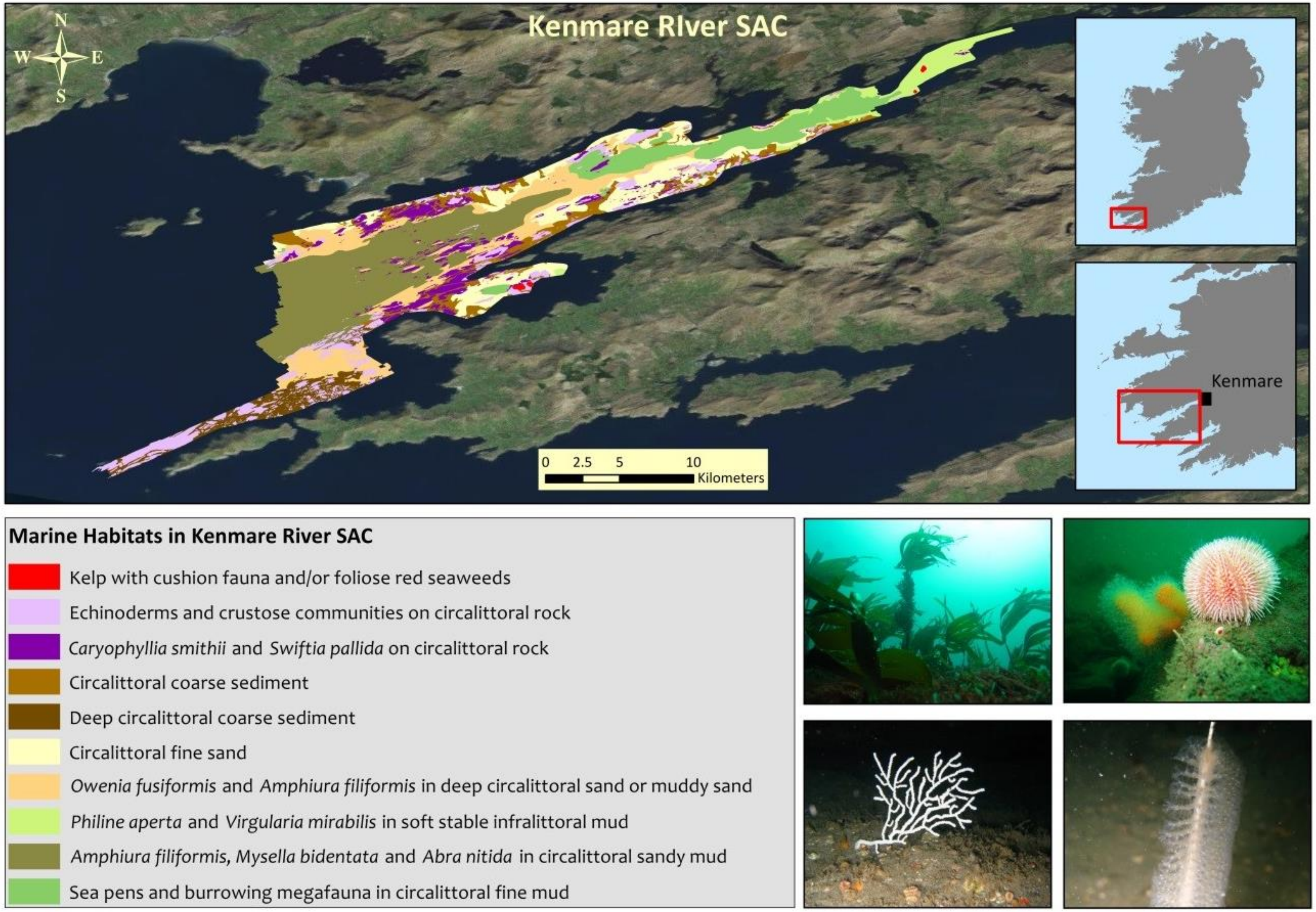

Figure 10: Habitat Map from (INFOMAR, n.d.).

Kenmare River is home to a range of rare and ecologically significant marine species. The reefs within the bay support a diverse assemblage of corals, sponges, and invertebrates, with both the northern sea fan (Swiftia pallida) and the southern sea fan (Eunicella verrucosa) occurring together in Kenmare River, a rare overlap of species that are usually associated with different biogeographic zones (National Parks & Wildlife Service, 2024). Their presence highlights the unusual ecological conditions of the bay and its importance as a conservation area.

Kilmackillogue Harbour

Kilmackillogue Harbour, a narrow, sheltered inlet along the southern shores of Kenmare River, is notable for its bedrock-dominated seabed and aquaculture activity. The seabed here consists primarily of exposed bedrock, channel features and soft sediment accumulation.

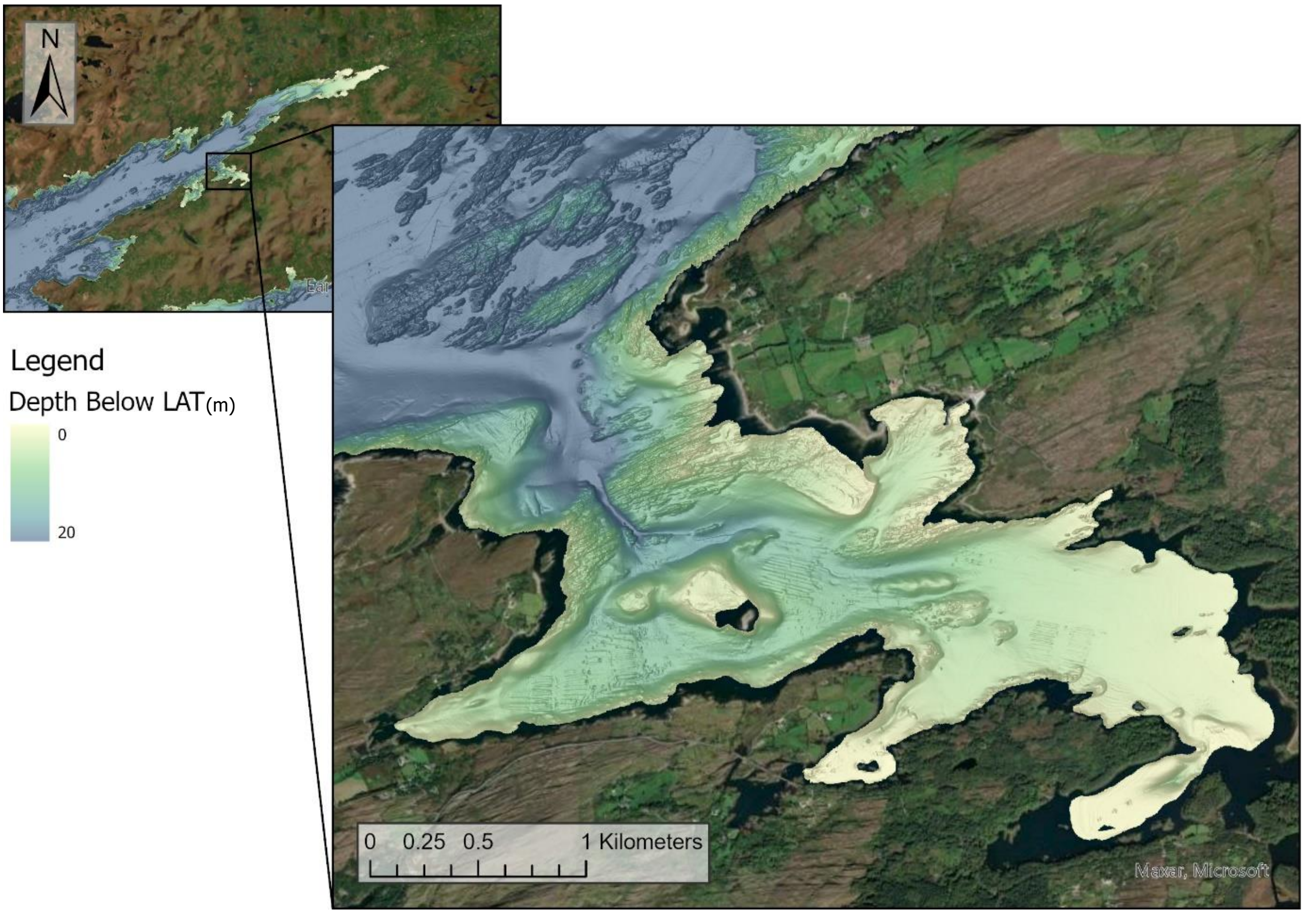

Figure 11: Bathymetry of Kilmackillogue Harbour.

At the entrance to the inlet, a distinctive north-west to south-east orientated channel cuts through the bedrock, forming a deep, narrow passage that influences local tidal flows. This feature is likely to be structurally controlled, shaped by faulting and erosion along pre-existing bedrock weaknesses.

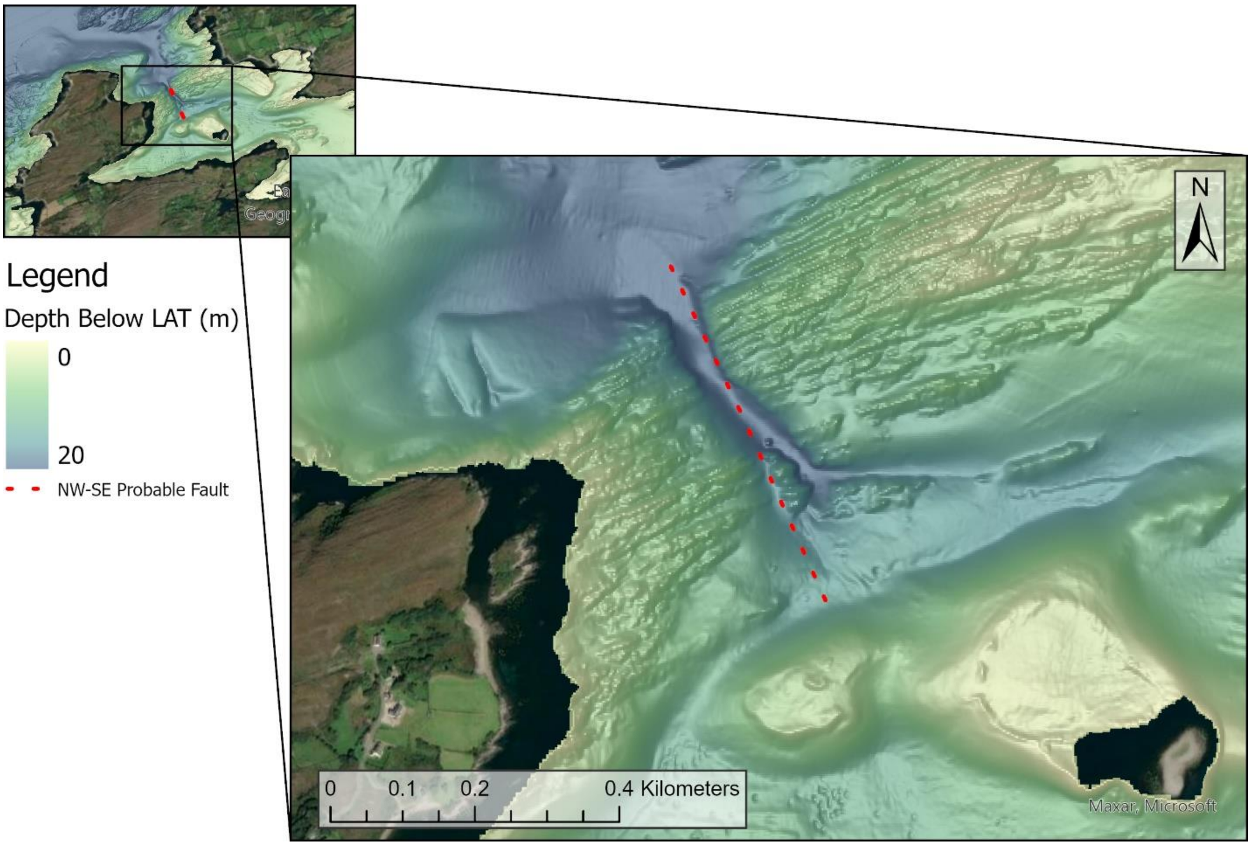

Figure 12: North-west to south-east orientated channel at the entrance to Kilmackillogue Harbour.

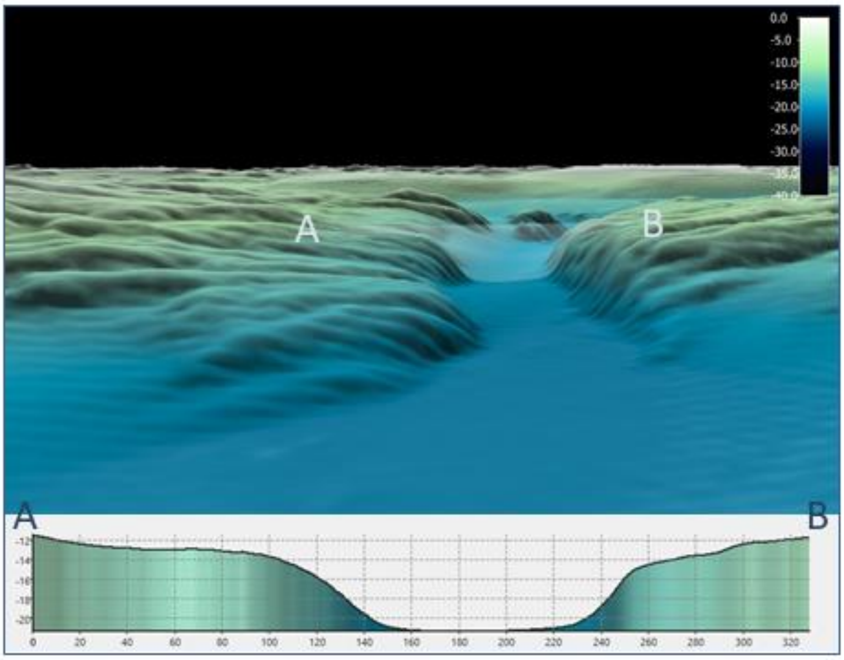

Figure 13: Profile of channel in bedrock, with depths reaching 10 m below the surrounding seabed.

The seabed around the inlet displays numerous folds and faults, which are part of the regional structural grain of the South Munster Basin. These geological features, visible in seabed mapping data, reflect the Variscan deformation that shaped the region, with bedrock structures continuing offshore.

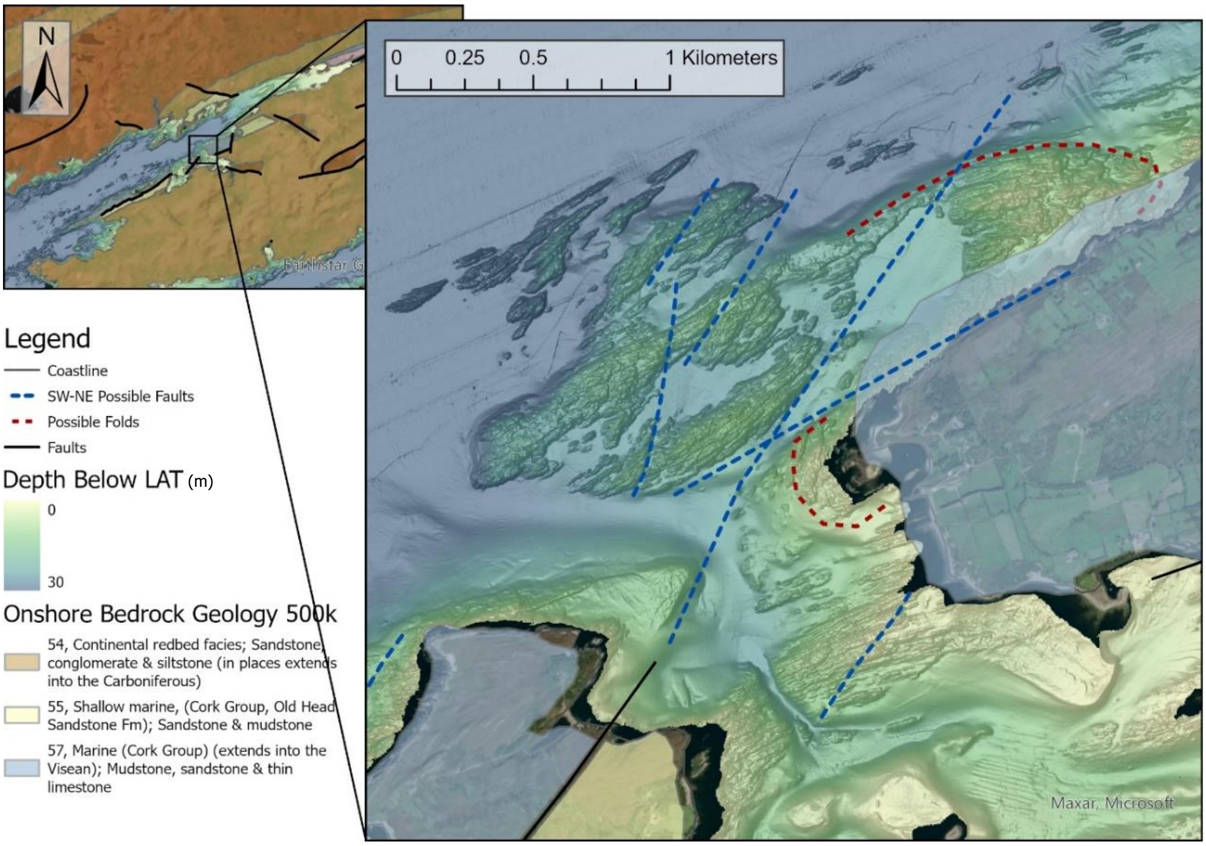

Figure 14: Possible folds and faults in the exposed bedrock outside of Kilmackillogue Harbour.

Mussel farms are present within the inlet, utilising the sheltered waters for suspended aquaculture.

Figure 15: Seabed footprint of aquaculture in Kilmackillogue Harbour.

Conclusion

Kenmare River has been shaped by a long history of Devonian and Carboniferous sedimentation, Variscan folding and faulting, Quaternary glaciation and modern marine processes. Its bedrock geology is characterised by east-west-trending folds, south-west to north-east structural grain and a dense fault network, all of which influence both the onshore landscape and the seabed.

INFOMAR bathymetry data shows a varied seabed, with tidally influenced channels, areas of seabed scour, exposed bedrock reefs and structurally controlled features. The small pockmark field, together with evidence for sediment redistribution by tidal currents, shows that the seabed continues to be shaped by active geological and hydrodynamic processes.

Kenmare River's SAC designation reflects its ecological importance, particularly its reefs, caves and shallow bay habitats. These environments support a wide range of marine life, including rare sea fan communities. Continued seabed mapping, sediment analysis and habitat monitoring would help improve understanding of the bay's sedimentary processes and support its long-term management.

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