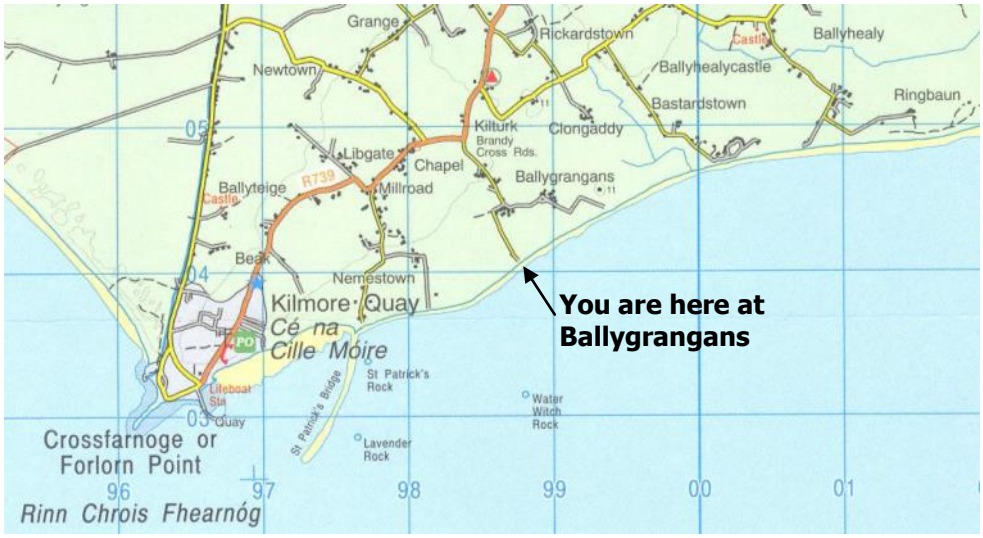
Coastal Erosion at Ballygrangans

An information sheet compiled, produced and distributed by Jim Hurley, SWC Promotions. E-mail: swc@eircom.net Updated June 2006



The shoreline at Ballygrangans is composed of mixed sediments. All sediment types, ranging from boulders to mud, are represented. The very large boulders are glacial erratics of Carnsore Granite. The bigger erratics have individual names: the two farthest out at sea beyond the Madjeen Reef are Spethaun (left/east) and Water Witch (right).

The shoreline is part of the 'Ballyhealy embayment', a sediment compartment that extends from Kilmore Quay to Carnsore Point (distance=17km) . That sediment compartment is characterised by an on-going deficit in its sediment budget. The deficit arises because material from the compartment is being carried both along the shore and off the shore.

Four key words

- A **BUDGET** is a measurement of inputs and losses.
- A **DEFICIT** is a shortage.
- **SEDIMENT** is eroded particles of rock. The particles are named after their diameter size range.

Particle name	Size range
Boulder	>256mm
Cobble	64-256mm
Pebble	16-64mm
Gravel	4-16mm
Coarse sand	1-4mm
Medium sand	0.25-1mm
Fine sand	0.063-0.25mm
Mud = silt + clay	<0.063mm

Mixtures of rounded beach cobbles and pebbles are known as 'shingle'.

- A **COMPARTMENT** is a division.

What is coastal erosion?

Coastal erosion is the process by which the land is worn away by the sea. Coastal erosion happens at Ballygrangans because, in an attempt to meet the deficit in the sediment budget of the compartment, the sea withdraws material from the sediment reserves held in the land bank. Since the deficit is on -going in the Ballyhealy embayment, the need to meet the deficit is also on-going. Coastal erosion is, therefore, an on-going process. Erosion has been happening since the end of the last Ice Age some 10 000 years ago. Coastal erosion is an entirely natural process; it only becomes a 'problem' when there is a threat to property or valuable coastal lands. The solution to the 'problem' in much of the Ballyhealy embayment is a combination of point protection coupled with managed retreat from the eroding shoreline.

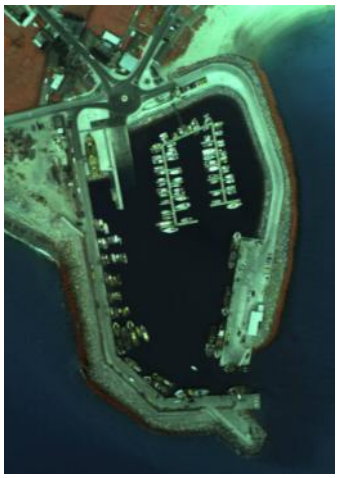

Coastal erosion at Blackwater

Factors that drive coastal erosion in the Ballyhealy embayment

1. The on-going deficit in the compartment's sediment budget resulting in coastal instability.
2. The very extensive soft, low-lying shoreline of glacial drift and sand hills perched on the coarse sediment barriers that impound Tacumshin Lake and Lady's Island Lake.
3. Exposure to southerly, south-easterly and the prevailing south-westerly winds.
4. Relatively high wave energy climate.
5. Exposure to swells and storm surges from the North Atlantic Ocean forcing barrier and beach retreat.
6. An apparent increase in the severity of storms.
7. The prevalence of short-period wave regimes (T<8) during storms in winter that comb down the beach thereby steepening the profile and allowing bigger waves to break closer inshore.
8. The south-facing aspect, the high level of sunshine, the flatness of the beach, and the direction of the prevailing wind that combine to cause fine shore sediment to dry when the tide ebbs and be blown to the east.
9. Long-term rising sea level due to global warming (mean rate = 1mm/year).
10. Long-term falling land level as the island of Ireland readjusts itself as it continues to be relived of the tremendous volume of ice that weighed the land down during the last glaciation.
11. The general longshore drift direction of sediment is to the east implying a progressively increasing demand for sediment via coastal erosion at the western end of the compartment.
12. The presence of reefs at St Patrick's Bridge and the Madjeen acting as impediments to longshore drift suggest that Ballygrangans is the main sediment source zone for the Ballyhealy compartment.
13. The loss of the ebb-delta complex at the tidal inlet/outlet of Tacumshin Lake since the 1970s removed a significant soft groyne, lengthened the sediment transport corridor and contributed to accelerating both erosion to the west and deposition to the east to the sediment sink zone.

Coastal Protection

A pile of large boulders of quartzite rock quarried on Forth Mountain (right) was placed on the beach to protect the point where an Esat submarine fibre optic cable was brought ashore in May 2000 from Whitesand's Bay, Cornwall. Note how the shoreline has retreated to the left and right of the rocks as the soft cliffs are eroded by the sea. When the slipways were built in March 2004, the cliffline was 1m behind the seaward point of intersection of the two slipways.

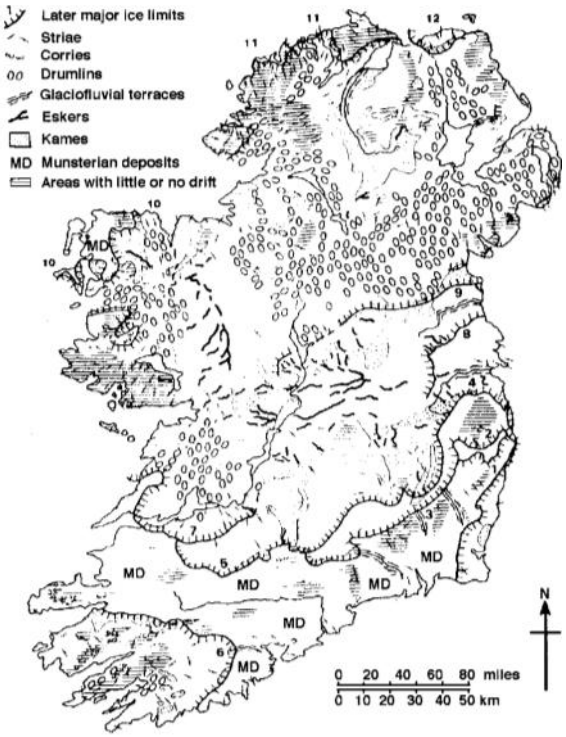


Some people believe that developments and coast protection works at the commercial fishing harbour and marina at Kilmore Quay (above) are having an impact on the accelerated rate of coastal erosion at Ballygrangans. However, no evidence has been produced to support that view.

Nature Conservation

The seashore at Ballygrangans is part of the 15 809ha Saltee Islands EU Site of Community Importance (SCI) and candidate Special Area of Conservation (cSAC). The shore is a protected area to conserve the marine life that lives on the reefs and rocks.

The Glacial Legacy



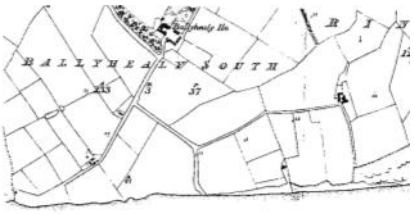
Quaternary geology of Ireland

Coastal erosion by the sea has formed cliffs at Ballygrangans (above). The cliffs are composed of the sediment left behind when the glaciers melted some 10 000 years ago at the end of the last Ice Age. The material is mainly mud loaded with coarser rock particles. Such unsorted glacial material is variously known as till, drift and boulder clay. In places, meltwater flowing from the glacier sorted the parent material into layers of purer sediments. Coastal erosion extracts the unsorted material from the cliff, wave action sorts it, and longshore drift carries the lighter fraction out to sea or away to the east leaving the boulders and cobbles behind on the beach.

At what rate is the coast eroding?

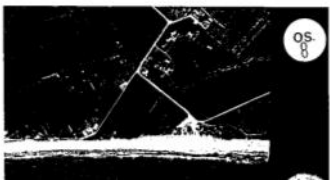
In 1993, the rate of shoreline recession due to coastal erosion was calculated for Ballyhealy by overlaying the position of the shoreline on the 1841 Ordnance Survey sheet, the 1922 Ordnance Survey sheet, and an aerial photograph taken in July 1992.

1840

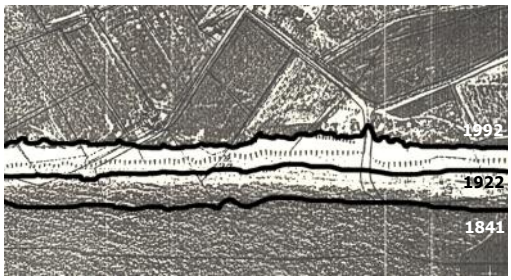


1922

1992



The results showed that the shoreline had retreated 95m in the 151-year survey period giving a mean rate of erosion of 0.625m/year. The shoreline retreated 42m in the 81-year period 1841-1922 (0.5m/year) and 53m in the 70-year period 1922-1992 (0.8m/year). It is important to note that coastal erosion does not happen at a steady rate; it proceeds in irregular and erratic jumps driven by storm events in the air, in the sea, and a combination of both.



In addition to the shoreline receding, the beach profile sweep zone also changes. In a weekly survey conducted from November 1993 to November 1994, the beach profile changed vertically by 1.1m [mean wave period (T)= 8.4 (n=22, range 3.4—13.5). The datum for measurements was the top of The Big Rock at Ballyhealy (level = 4.075m O.D. Poolbeg, equivalent to 1.485m O.D. Malin)].