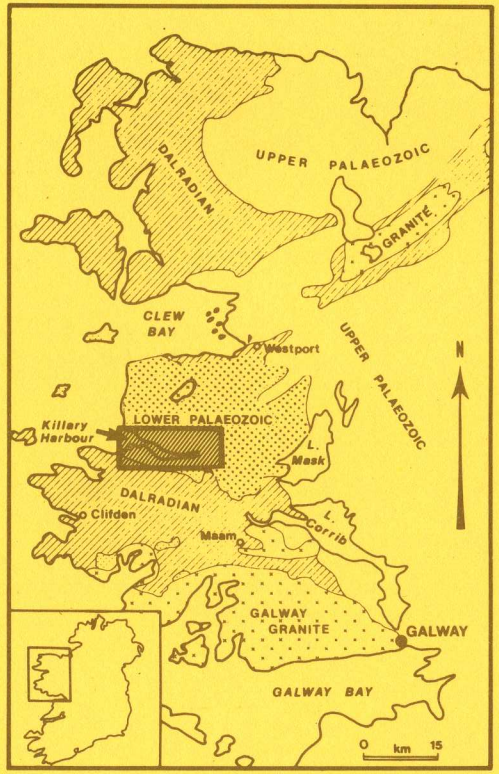
IRISH GEOLOGICAL ASSOCIATION

FIELD GUIDE SERIES
No. 3

THE GEOLOGY AROUND KILLARY HARBOUR CO. GALWAY

By D. M. Williams



START: Leenaun Grid Ref. L875618 on Ordnance Survey Half Inch to One Mile (1:126720) Map No. 10.

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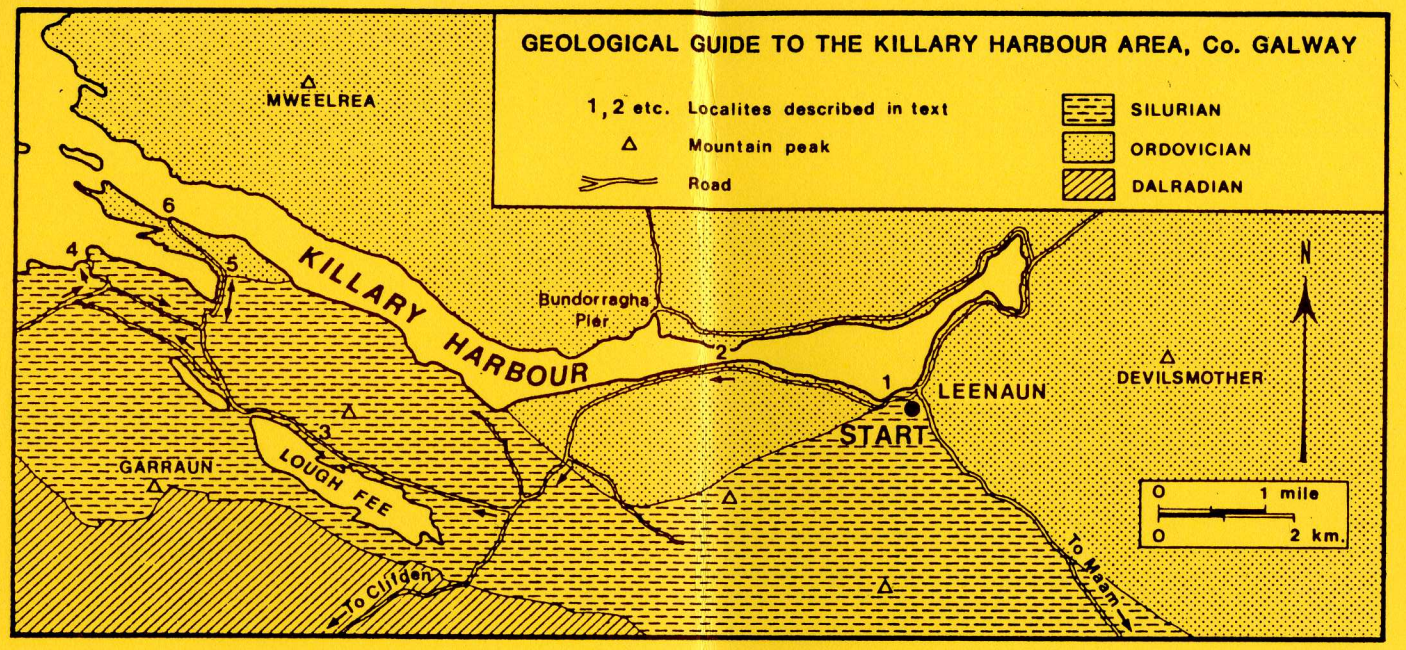


START

CENTRE OF LEENAUN VILLAGE. Travel west on road T71 signposted to Clifden.

TIME – Allow 2 to 3 hours.

STOP 1. (at 0.16 miles/0.25 km, pull of the road on the first big left hand bend after the village).

At the left hand side of the road is a small cliff section of sands and gravels. These sediments are of Quaternary age (younger than 2 million years) and have not been buried deeply enough by overlying sediment to become rock. These sediments were laid down during a time when much of Ireland was covered by vast ice sheets. The section shows alternating bands of sand and gravel. This suggests that the sediments were laid down by running water, probably the melt-waters of the Quaternary ice masses. The cobbles of rock in the sediment shows that it was derived from an area of Lower Palaeozoic and Dalradian rocks (metamorphosed sedimentary rocks of Late Precambrian to Cambrian age).

STOP 2. (at 2.9 miles/4.7 km, park on left hand side some 300m after sign indicating bends, just where road suddenly widens).

There is a section of exposed rock here some 60m long. These rocks are part of the Rosroe Formation of Ordovician age. The sediment from which these rocks were formed was probably deposited on large *submarine fans.* Walking from the eastern end of the section one of the first exposures shows sandstone with long scratches on its surface. These are glacial striae, formed by boulders within the Quaternary glaciers scraping along any rock surface with which they came into contact. About 10m further west and 2.5m above road level a thin mudstone bed (originally a mud layer) shows *ripple marks* on its surface. Further west in the section notice *conglomerates* consisting of large cobbles of granite set within a sandstone matrix.

STOP 3. (pass Killary Shop on left hand side after 3.38 miles/ 5.45 km. At 4.46 miles/7.2 km turn right onto small road signposted Tullycross 9 miles. At 6.32 miles/10.2 km pull off road).

The mountainside section on the right here consists of rocks of Silurian age. They are coarse sandstones and shales known as *turbidites* and were also probably deposited as sediment on submarine fans. The alternation between sandstone and shale is typical of turbidites. Examination of rocks exposed on this hillside will reveal some of the features typical to sediment deposited by turbidity currents. Each thick sandstone represents the results of deposition by one such current flow and may be capped by a mudstone bed representing mud deposited as the current finally waned. On the underside of some of the sandstone beds sole marks may be seen – longitudinal furrows caused by the erosion of a soft substrate by these high-energy flows. Some of the sandstone beds shows normal grading, a progressive upward decrease in grain size caused by a gradual reduction of the carrying power of the current. There are also thin beds showing examples of *slump folds.*

STOP 4. (at 9.18 miles/14.8 km turn sharp right signposted Glassillaun; at 9.42 miles/15.2 km turn left, signposted Glassillaun, drive on to car park adjacent to beach. Not suitable for coaches).

This is a fine beach with safe bathing. On clear days the islands of Inishbofin and Inishturk may be seen to the west. At the northern end of the beach are exposed the green, red, and yellow rocks of the Salrock Formation. These consist of red shales and green sandstones. They are thought to have been deposited as sediments in lagoons during the Silurian period. Note the gentle folding and the tension gashes (cracks infilled with white quartz) in these rocks. Some of the sandstones show *cross lamination* and *slump folds.* Walk southwards across the sand for about 150m to the next rock exposure. Here the sedimentary rocks of the Salrock Formation are cut by a dolerite sill (an igneous intrusion parallel to bedding). The dolerite is a green igneous rock which runs approximately E-W through the red and green sedimentary rocks. Fresh surfaces of this sill show large dark crystals of hornblende.

STOP 5. (return to last turn off, turn left, drive 1.12 miles/ 1.8 km to road junction, turn left, beware bends, after 0.65 miles/1.05 km pull off road at sharp left hand bend directly under high cliff).

The rocks exposed in the cliff are part of the Rosroe Formation. These Ordovician rocks have been faulted against the Silurian rocks of the Salrock Formation, the base of the cliff marks the approximate line of the fault plane. On the shore, below the road, the red rocks of the Salrock Formation can be seen to be folded and faulted much more intensely than at Glassillaun beach. It may be inferred that the deformation was caused by movement along this major fault, the Salrock Fault.

STOP 6. (drive on to Rosroe Pier, adjacent to Youth Hostel, 0.71 miles/1.15 km from Stop 5).

Mweelrea Mountain (2688 ft/815 m) can be seen directly across Killary Harbour. It consists of Ordovician sandstones, originally deposited on large *alluvial fans.* Interbedded with the sandstones are tuffs; ash deposits formed through the violent explosion of volcanoes which existed during the Ordovician. If desired these rocks may be examined near the pier at the mouth of the Bundorragha River on the north side of Killary Harbour.

Killary Harbour itself is a fjord. This type of valley is the result of considerable erosion by the Quaternary glaciers. After melting of the ice masses, sea level rose and this over-deepened valley became flooded by the sea. Ireland owes much of its present landforms to the action of these relatively recent ice sheets. As well as erosion, ice sheets are capable of deposition; well known examples of which are the drumlin islands in Clew Bay to the north of this area, which are composed of boulder clay. These again demonstrate the rise in sea level after the glacial phase.

The rocks you have examined today, with the exception of the Quaternary deposits, began as sediments deposited near the southern margin of a major continent which existed in Lower Palaeozoic times. This continent was separated by an ocean from another continent which lay to the south.

If you have enjoyed this excursion further information on the geology of the west of Ireland may be obtained from the local contact address, Geology Department, University College, Galway.

SUBMARINE FANS

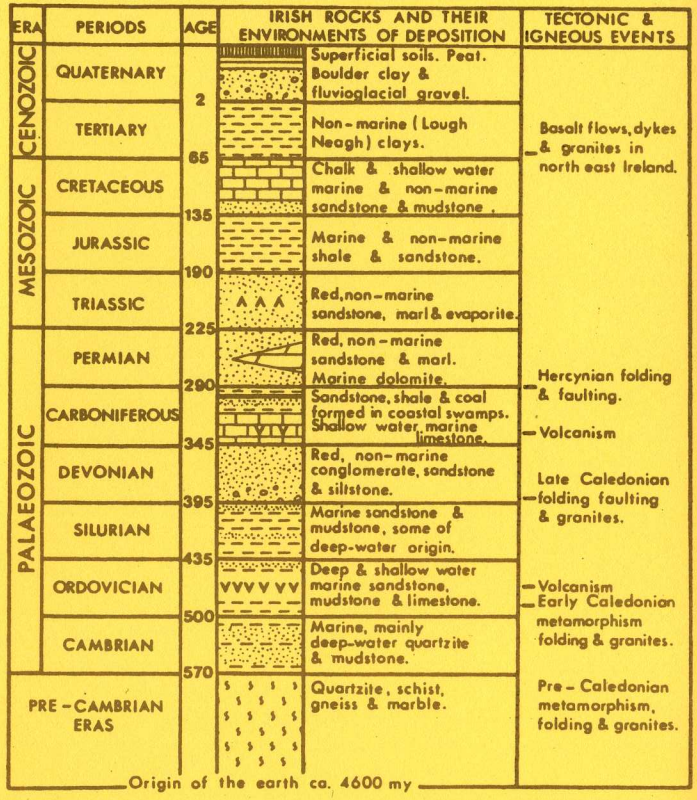
Submarine fans are lobes of sediment found most often in a deep marine environment. They exist in various sizes but may be tens of kilometres across. Many such fans exist at present, for example, off the continental shelf of North America and seaward of the Ganges River delta in India. Large quantities of sediment may be funnelled off the continental shelf via submarine canyons incised in the continental slope. Upon reaching the downstream end of such a canyon the sediment is distributed across the fan often by means of density or *turbidity currents.* The deposits formed by such means are called *turbidites.* The current velocities in the canyon may be high enough to erode and transport boulders of rock which, when they come to rest, may become buried by later sediment. If buried sufficiently deeply for millions of years this mixture of boulders and sand eventually becomes rock known as *conglomerate.*

As the transporting currents leave the end of the canyon to traverse the fan they become progressively weaker, first depositing their load of sand, then silt, and finally barely affecting the outer fringes of the fan at all. Here the main deposition is by settling mudstone or shale. Currents affecting the sediment may generate *ripple marks.* You can see examples of these on many present day sandy beaches. In cross-section these ripple marks have angled laminations, *cross-lamination.* In any sedimentary environment the sediment may become unstable for various reasons. If these layers of wet sediment begin to move they will deform and fold to give *slump folds.* The deposits from ancient submarine fans may form rock sequences several kilometres thick and are often important petroleum reservoirs. They are found in rocks of most ages in the geological record.

Alluvial fans are often similar in shape to submarine fans and may have a main feeder canyon funnelling sediment onto the fans surface. However, unlike submarine fans they are always formed on land. Typically they represent the rapid erosion of a mountain belt with the consequent transport and deposition of vast amounts of sediment down the canyons. There are many present-day examples in the Rocky Mountains of North America.

GEOLOGICAL HISTORY OF IRELAND

Ages are quoted in millions of years (my). Permian to Tertiary rocks are restricted to northeast Ireland, but also occur widely offshore.



A RESPONSIBILITY

The user of this guide is strongly urged to take every care of the countryside and particularly areas described in this guide. Specimens should be collected with great care and only if they are going to have some continuing interest. Use a camera or a sketch-pad instead of a hammer and please leave all gates fastened, leave no litter and avoid damage to fences and hedges.

AN INVITATION

If you have enjoyed using this guide you may be interested to know that the Irish Geological Association organises many field excursions and lectures for its members every year. Many of these prove of interest to amateur geologists. Information about these events can be had by writing to the Association care of any University Geology Department or to the Geological Survey of Ireland, 14 Hume Street, Dublin 2.