

EXCURSION TO ROSNEATH PENINSULA

Saturday 4th July 2015

Leader Dr. Iain Allison

Participants 15

Report by Robin Painter

For the duration of the excursion there was heavy cloud throughout and periods of heavy rain.

Except for the southern tip of the peninsula, the rocks of the Rosneath Peninsula, which lies between the Gare Loch and Loch Long, are Dalradian of the Southern Highland Group. The Rosneath Peninsula is cut by the northern branch of the Highland Boundary Fault, running NE/SW across the southern tip of the peninsula. The rocks to the south of the Highland Boundary Fault are Upper Old Red Sandstone.

The main focus of the excursion was on the lithologies and structures of the Dalradian rocks in the vicinity of the Highland Boundary Fault but also to observe features of the Upper Old Red Sandstone.

The Southern Highland Group is a range of metamorphic rock types which are thought to have been deposited largely as marine turbidites in the late Precambrian and then subject to low grade metamorphism during tectonic movements in the early Ordovician.

Observation at the minor centimeter scale of metamorphic structures in the Rosneath Peninsula rocks, the main theme of the excursion, was made with reference to the overall regional structure. Interpretation of these minor scale structures are part of the evidence used to support the explanation of the regional structure.

The regional structure is thought to have developed from a sequence of folding and deformations in response to the rising pressure, temperature and shearing stresses caused by tectonic movement. It is thought that there were a series of phases of deformation over geological time that were progressively superimposed, with succeeding phases overprinting the structures that formed in the previous phases.

On a regional scale, during the rise of the Caledonian Mountain Belt, the earliest fold phase (D1) consisted of a series of upright folds. During second phase of deformation (D2), a major D1 fold was tilted SE and squeezed out as a flattened sheet, referred to as the Tay Nappe, imposing a second set of folds on the earlier ones. As a result of relative tectonic movement from the NW, the Tay Nappe buckled downwards at the Highland Boundary Fault against resistant crustal rock beneath the Midland Valley to form the overturned Aberfoyle Anticline (D3 and

D4). Starting, therefore, from the northern side of the Highland Boundary Fault and moving roughly NNW up from the southern end of the Rosneath Peninsula, makes a traverse from D1 type folding through to D4. This general traverse northwards up the peninsula was the main itinerary of this field excursion. All the localities visited are situated on or close to the shore lines.

Location 1 Camsail Bay

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The incoming tide at the headland of the bay limited the extent to which it was possible to stand back on the shingle and look back up onto the rock face. It was also raining heavily and many of the rock exposures are seaweed covered. Suffice it to say here the rocks are the Bullrock Greywacke. They are thick (>1metre) beds of meta-greywacke and thin layers



of slate and coarser foliated rock. The foliated rock exhibits closely spaced strain slip cleavage, showing its derivation from a fine-grained original sediment. This contrasts with the adjacent folded beds of greywacke derived from much coarser grained rock and showing much less evidence of cleavage. Viewed in profile this section is seen as a series of plunging folds. These folds have axial planes with steep to vertical dips and are representative of D1 folds.

A calcareous nodule within the mudrocks, which is flattened parallel to the cleavage trace, can be seen at the SE end of the section. Given its probable near spherical initial shape, this distortion is a measure of the vertical strain to which it was subjected during D1 folding.

Location 1(a) Portkil Cliff

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This is the only location visited not in the Dalradian rocks of the peninsula. It is to the south of the line of the Highland Boundary Fault and is an exposed ca. 20 metres tall conglomerate rock sequence in the Upper

Old Red Sandstone. The sequence is somewhat inshore from the coastline on a raised beach. The cliff was cut by wave action when sea level stood higher than the present day in early post glacial times. The beds dip at about 25 degrees to the NW.

There are alternating beds of conglomerate and thinner sandstone beds. The conglomerate includes clasts of vein quartz and quartzite, some of which are quite large (2-10 cm.), types consistent with derivation from the Dalradian. Depositional environment is suggested to be a fast flowing river.

Location 2 was on the beach about 140 m north of the Cove Burgh Hall car park. The rocks here are interbedded metagreywackes and phyllite close to the junction between the Bullrock Greywacke and the Dunoon Phyllite. Examination of the rocks shows the strain slip cleavages. Some of the coarser layers show the presence of thin layers between the strain slip cleavages where an earlier foliation has been preserved, indication that the rocks have been deformed during both the D1 and D2 deformations.

Location 3, Barons Point, is close to and slightly to the north of Location 2. Here the rocks are black phyllites (originally mudstones and siltstones) with quartz veins, all belonging to the Dunoon Phyllite. There is visible crenulation cleavage in the Dunoon Phyllite. Asymmetrical folds in the phyllite deform a penetrative, slatey looking cleavage, which has been characterised as D2, though this conclusion cannot be verified by onsite observation alone.



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An effort was made here to determine the vergence of the observed folding (the direction in which the next primary fold is located) when looking down the plunge of minor folds. Such a determination is an aid to structural mapping.

At location 4, Knockderry Castle, the rocks are greywackes and phyllites belonging to the Beinn Bheula Schists. They show numerous examples of minor folds with a Z-profile (indicating northerly vergence). Examination of the hinge zones of these minor folds shows that they fold both the lithological layering and an early (D1) spaced cleavage. These features are characterised to be D2 deformations.

At the final location, Location 5, Letter Layo, Coulport, the rocks show alteration of the original bedding and the D1 cleavage, during the D2 deformation. There are numerous deformed quartz-carbonate-chlorite veins in these rocks. The green phyllite bands have penetrative D2 micro-scale crenulation cleavage.

Time available and weather terminated the excursion at Location 5.

Further north from Letter Layo at Portincaple the steep south limb of the Tay Nappe Downbend Antiform can be visited. This location is adjacent to the hinge zone where development of D3 and D4 minor folds and fabrics are observable.