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## Ard Thurinish–Port na Long

[NG 587 001]–[NM 595 999]

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### Introduction

Senior members of long established families in the township of Aird of Sleat maintain that Ordnance Survey names are incorrectly assigned. According to local usage, 'Port na Long' (Bay of the Boat) refers to the haven to the east of Ard Thurinish; the bay to the west is known as Port a' Chuil (Bay of the Nook or Cranny). However, to avoid confusion with the published topographical and geological maps, the Ordnance Survey names are retained here. The situation is further complicated by the use of the term 'Port a' Chuil folds' by Cheeney and Matthews (1965) with reference to the westerly bay; here they are renamed the 'Port na Long folds'.

At Port na Long at the south-west end of the Sleat peninsula of Skye, the most southerly outcrop of the Moine Thrust is clearly exposed. The gentle ESE-dipping thrust plane separates the Moine Thrust Sheet above from the Caradal Nappe, the uppermost of the Tarskavaig nappes, beneath (Figure 5.63).

In this part of Sleat, the rocks of the Moine Thrust Sheet are dominantly schistose and partly mylonitic Lewisianoid felsic and mafic gneisses, interleaved with minor mylonitic Moine metasedimentary rocks. During the Caledonian Orogeny these rocks were metamorphosed to epidote-amphibolite facies followed by greenschist-facies retrogression. The underlying Caradal Nappe is composed mainly of semipelites, pelites and psammites of the Tarskavaig Group, metamorphosed to greenschist facies, but it also contains lenses of deformed Lewisian or Lewisianoid gneisses. Inland from Ard Thurinish, mylonitic Lewisianoid rocks of the Moine Thrust Sheet have been thrust over 'Lewisian' gneisses of the Caradal Nappe, and consequently the trace of the Moine Thrust is unclear in these areas. Several episodes of Caledonian minor folding are recognized within the area of the GCR site and these represent late-stage deformation and movements focused on the Moine Thrust. Numerous NNW-trending basalt dykes of the Palaeogene Skye swarm crosscut the earlier Caledonian features.

C.T. Clough mapped the area for the Geological Survey in 1896 and recognized the main structural elements (Clough in Peach *et al.*, 1907). He noted that the Moine Thrust Sheet contains both Lewisianoid and Moine rocks, despite their strong Caledonian overprint. Bailey (1939, 1955) subsequently revised the structural interpretation of the area. This account is mainly based upon Cheeney and Matthews (1965) who remapped the area. Powell and MacQueen (1976) later studied the link between garnet growth and deformation in the Moine rocks to the east.

### Description

Around Ard Thurinish, south of the hamlet of Aird of Sleat, a coherent cross-section is exposed along the coast, both in the intertidal zone and in low cliffs. Inland, exposure is generally poor in the low hilly terrain, especially in the Moine Thrust Sheet. The Moine Thrust itself is exposed on the coast section about 70 m south-west of the old schoolhouse [NG 5916 0048], close to some Palaeogene basaltic dykes. It is defined by the sharp contact between pink and green, mylonitized rocks above, and attenuated psammitic rocks beneath. It can be traced as an ill-defined topographical feature across the slopes to the north, above the hamlet (Figure 5.63).

### Moine Thrust Sheet

The Lewisianoid rocks in this sheet now occur as alternating pink and dark-green, finely laminated mylonites and phyllonites. The quartzofeldspathic and chloritic layers that range from less than 1 mm to over 50 mm thick, represent the original felsic and mafic gneiss protoliths (Clough in Peach *et al.*, 1907). The fine-grained rocks contain porphyroblasts of biotite, chlorite and green amphibole, all of which contain epidote trails. Larger lenses of coarser-grained schistose

amphibolites are present within the mylonites (Matthews and Cheeney, 1968). The subsidiary Moine rocks are mylonitic and schistose, interlaminated psammities and semipelites, with rare garnets. The compositional layering and mylonitic foliation in the Lewisianoid and Moine rocks are parallel to each other and to the Moine Thrust plane.

## Caradal Nappe

The Tarskavaig Group rocks in the Ard Thurnish–Port na Long GCR site consist of alternating beds of psammities and semipelites with local pelite. In the west, gritty psammities with well-developed cross-bedding are present. Close to the Moine Thrust, some coarser-grained psam-mite units also occur. Psammite–pelite contacts range from sharp to gradational. These rocks belong to the Capistal Psammite Formation and pass upwards to the west into the Laidhe na Greine Formation (Figure 5.61) As the Moine Thrust is approached, cross-bedding is modified by deformation such that younging direction can rarely be recognized. Within 300 m of the thrust plane, porphyroblasts of biotite become prominent; most notably in the psammitic layers. In associated pelitic layers Clough (in Peach *et al.*, 1907) reported small garnets.

## Structure

Numerous minor folds occur within the Ard Thurnish–Port na Long GCR site. In the basal part of the Moine Thrust Sheet, the observed fold phases post-date the formation of mylonites. Powell and MacQueen (1976) attempted to correlate these fold episodes more widely, but correlations are uncertain (see also 'Introduction', this chapter). Consequently, the fold phases are referred to here in terms of type localities, following Cheeney and Matthews (1965).

On Ard Thurnish, a distinctive phase of minor folds is recognized in the schistose and mylonitic rocks of the Moine Thrust Sheet. The axial surfaces and congruent cleavages dip at 30°–50° towards the south-east or ESE. These 'Ard Thurnish phase' folds are generally tight with curvilinear hinges and widely dispersed axial orientations. They are typically asymmetrical, but do not show a consistent vergence. In quartzofeldspathic layers, the folds deform an earlier lineation. Some quartz veins in the Lewisianoid rocks of the Moine Thrust Sheet cut across 'Ard Thurnish phase' folds; these veins also contain chlorite, biotite and amphibole.

Chlorite- and biotite-bearing quartz veins also occur in the south-east corner of the Caradal Nappe. These carry a persistent ENE-trending lineation that lies parallel to the hinges of the 'Port na Long' folds (note that Cheeney and Matthews, 1965 termed these folds the 'Port a' Chuil phase' — see 'Introduction'). The Port na Long folds are only found within about 300 m of the Moine Thrust. In the Moine Thrust Sheet, they are small-scale structures with tight to isoclinal profiles and a coaxial ENE- or WSW-plunging lineation. In the Tarskavaig Group rocks, the Port na Long folds have been recognized for some 200 m west of the Moine Thrust, where they are delimited by a subsidiary thrust surface. Strong lineations are developed coaxial with the folds, particularly in psammities, and in places constitute fold mullions.

A later phase of kink folds, commonly conjugate, is widely developed in the schists and mylonites of both the Moine Thrust Sheet and the Caradal Nappe. Near the Moine Thrust, these folds deform structures belonging to the 'Port na Long' fold phase. Within about 20 m of the Moine Thrust, the rocks are notably fissile and mylonitic and, as Clough noted (in Peach *et al.*, 1907), 'occasional lines of crush break up the earlier structures in the rock', including the late-stage conjugate folds.

## Interpretation

The nature of the Moine Thrust and the overlying Moine Thrust Sheet at its southernmost outcrop at Ard Thurnish is different to their occurrences farther north. The Lewisianoid gneisses that form part of the Glenelg–Attadale Inlier (see 'Introduction', Chapter 7), are extensively mylonitized and retrograded, and possibly reflect several deformational events.

The interleaved Moine psammities in the mylonites above the thrust presumably belong to the Morar Group. In contrast, the rocks below the Moine Thrust belong to the distinctive but separate Tarskavaig Group. Their present juxtaposition is due to movements on the Moine Thrust and the associated mylonites. The trace of the thrust surface cuts discordantly across the folds, nappes and thrusts of Tarskavaig. This suggests that the Moine Thrust seen here is an

out-of-sequence, possibly late-stage structure, or the thrust stacking sequence is different in Sleat with the youngest thrust at the structurally highest level (see Tarskavaig GCR site report, this chapter). The interleaving of mylonitic Moine rocks and Lewisianoid rocks within the Moine Thrust Sheet may relate to Knoydartian, Grampian (early Ordovician) or Scandian (late Silurian) tectonic and metamorphic events. Certainly, evidence for all these events occurs in the Glenelg-Kintail region a short distance along strike to the north-east.

The sequence of fold structures outlined above (the Ard Thurinish, Port na Long, and late-stage conjugate kink-fold phases) that post-date the mylonites, indicate clearly that the zone of active deformation became increasingly constrained with time, culminating in brecciation adjacent to the fault surface itself. Kinematic interpretation of the Ard Thurinish structures suggests that the eastward direction of net slip in this deformation zone was oblique to the general ESE dip of the Moine Thrust surface. Cheeney and Matthews (1965) showed that the Ard Thurinish and Port na Long fold phases and lineations were later than the fold phases developed more widely in the Skye-Glenelg region. In the rocks of the Caradal Nappe, a similar convergence of zones of deformation towards the Moine Thrust is seen. However, the distinctive biotite and garnet porphyroblasts in these rocks suggests prograde metamorphism, in contrast to the rocks in the Moine Thrust Sheet that show retrograde metamorphism.

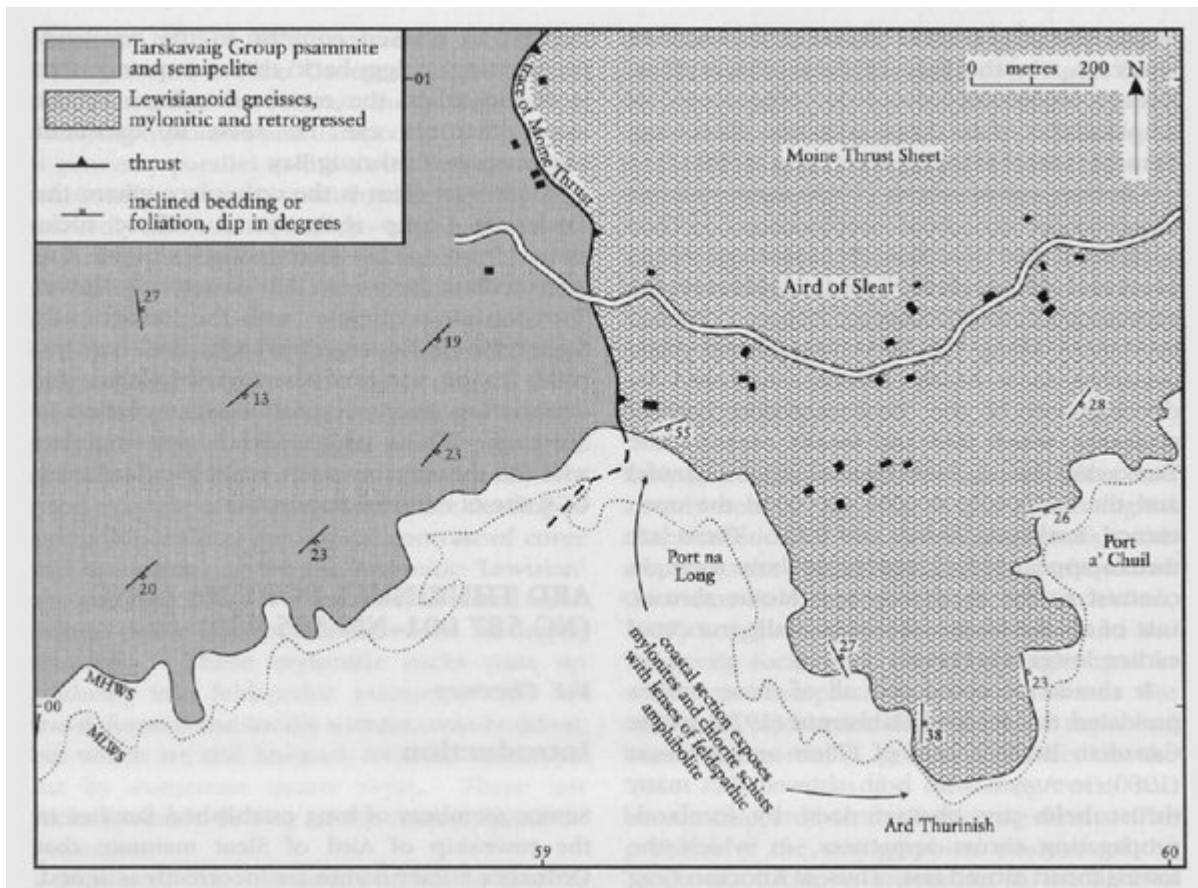
## **Conclusions**

The Ard Thurinish-Port na Long GCR site contains the southernmost exposure of the Moine Thrust. It separates dominantly Lewisianoid rocks of the Moine Thrust Sheet above, from the thrust and folded Tarskavaig Group metasedimentary rocks of the Caradal Nappe below.

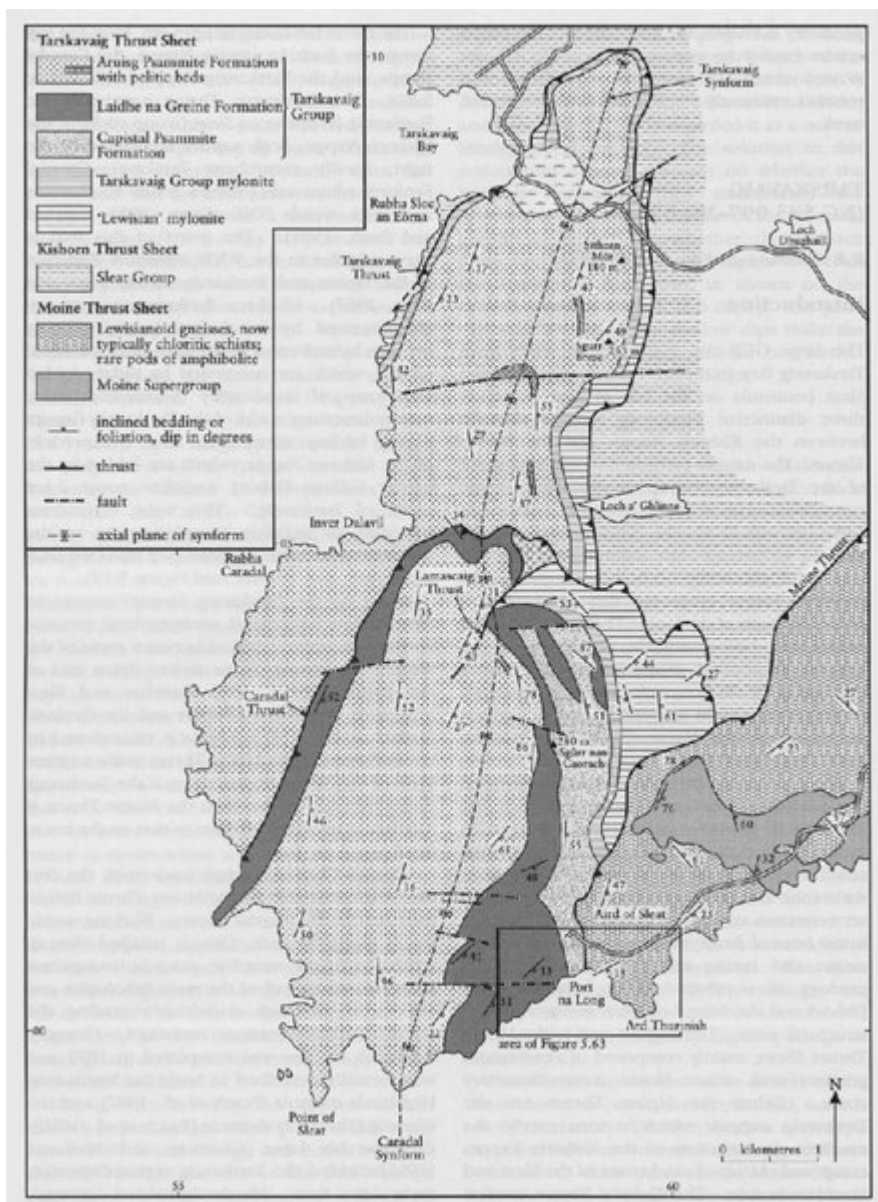
The overlying Lewisianoid gneisses, together with some Moine rocks, are strongly mylonitic, and have been pervasively retrograded to green-schist metamorphic facies. The Tarskavaig Group rocks are mainly psammites and semipelites that show increased deformation as the thrust is approached. Localized deformation post-dates the mylonitization and three discrete phases of minor folding have been recognized. The first two phases, named the 'Ard Thurinish' and 'Port na Long' phases, result in close to tight and isoclinal folds with related cleavages and axial lineations. The last phase results in a more-brittle style of chevron folding.

The national importance of this GCR site stems from its location at the southern end of the outcrop of the Moine Thrust Belt. The site also provides evidence of periodic movement on the Moine Thrust itself. The marked differences between the structural and metamorphic features seen here and farther north provide a clear demonstration of the along-strike complexity and variability of the thrust belt.

## **[References](#)**



(Figure 5.63) Map of area around the Ard Thurinish GCR site.



(Figure 5.61) Geological map of the Tarskavaig nappes in south-east Skye. After Cheeny and Mathews (1965).