
North Morar

[NM 668 933], [NM 682 922], [NM 703 927], [NM 718 936], [NM 731 924]–[NM 872 915]

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Introduction

The North Morar GCR site provides a cross-section through the Morar Group metasedimentary succession in its type area. It also documents the transition from low-grade, relatively undeformed rocks in the west, across the Morar Antiform, to high-grade, highly deformed rocks in the interior of the Caledonian Orogen.

The GCR site is large and extends from west of the Mallaig road (A830) eastwards as far as Kinlochmorar, encompassing the hills that separate Loch Morar from Loch Nevis. However, much of the north-western part of this North Morar area is excluded from the GCR site. The approximately N-S-trending, domal Morar Antiform, is the dominant structure of the western part of the area. The antiform exposes Lewisianoid inliers as sheets within the Moine succession and also repeats the Morar Group succession on its flanks (Figure 8.15). The lower contacts of the Lewisianoid rocks are ductile shear-zones. Farther east, other structurally higher shear-zones dominate the overall structural pattern, notably the Knoydart Thrust (Poole and Spring, 1974), the complex zone of ductile thrusting around Ardnamurach, and the Sgurr Beag Thrust (Johnstone and Mykura, 1989). These D2 shear-zones and related folds have been refolded by a later D3 phase; for instance the Sgurr Beag Thrust at Sgurr Breac is folded by the F3 Glenshian Synform (Powell, 1974). Metamorphic grade ranges from epidote- amphibolite facies in the west to middle- and locally upper-amphibolite facies in the east.

The Geological Survey mapped much of the North Morar area between 1935 and 1938, but gaps in the mapping meant that work continued into the 1960s, and Sheet 61 (Arisaig) was only published in 1971 (Institute of Geological Sciences, 1971). Richey and Kennedy (1939) summarized the overall stratigraphy, emphasizing the sedimentary features of the Lower Morar Psammite and Upper Morar Psammite formations. Subsequently Glendinning (1988) carried out detailed work on the sedimentological features of the Morar Group psammites, notably the Upper Morar Psammite. Other field studies in the adjacent areas of Knoydart (Ramsay and Spring, 1962), Mallaigmore (Lambert and Poole, 1964), and Lochailort (Powell, 1964, 1966) have been summarized by Poole and Spring (1974) and Powell (1974). These latter two papers both used the Sheet 61 geological map to re-interpret the major structures of Knoydart and Morar. The stratigraphical and structural terminology of Powell is preferred here. The regional structure of the area is summarized by Johnstone and Mykura (1989) and the overall Moine stratigraphy shown in (Figure 8.3) (after Holdsworth *et al.*, 1994).

Description

The North Morar GCR site extends from east to west for some 20 km and ranges in width from 6 km down to c. 2 km at Tarbet [NM 792 923]. It is bounded to the south by Loch Morar, the deepest freshwater loch in Europe, and to the north by Loch Nevis. It consists of rugged rocky and grassy hills with numerous clean rock exposures present in the area.

The oldest rocks in the area are the Lewisianoid gneisses that form lenticular sheets whose contacts are now approximately conformable with the overall bedding in the underlying and overlying Moine rocks. The gneisses consist of interlayered feldspathic acid gneiss with abundant amphibolitic mafic layers and lenses. In parts the hornblende is extensively retrograded to biotite or chlorite and secondary epidote. Even where highly deformed, the pyrite and epidote content of the felsic and mafic gneisses confirm their Lewisianoid origin. Excellent exposures of white and green-black, layered felsic and mafic gneiss with rare discordant basic sheets occur at Rubh' Àird na Murrach [NM 8261 9375] (Figure 8.16). The compositional layering in the Lewisianoid inliers ranges from less than 1 mm to over 1 m thick, dependent on the amount of later tectonic reworking. Where thickly layered, the lenticular and gneissose nature of the rock, and locally discordant nature of some of the mafic sheets and dykes is evident. A good section is seen near Brinacory between [NM 758 912] and [NM 762 910], where the sheared contact between hornblende-bearing Lewisianoid gneisses and Moine

psammites and minor semipelites (Lower Morar Psammite) is exposed. The sheared Lewisianoid rocks contain abundant epidote, biotite, pyrite and chlorite. Within 50 m of the contact they generally regain their coarser gneissose aspect, with some tonalitic gneiss units up to 1 m thick. Farther east the amphibolitic mafic sheets and lenses thicken to several metres and mafic sheets discordant to the overall layering are seen. The upper contact shows no evidence of attenuation and the immediately overlying semipelites and psammites of the Basal Pelite Formation still show recognizable sedimentary structures, suggesting this contact is a structurally modified unconformity.

The Moine rocks have a well-defined stratigraphy in North Morar, which is summarized in (Table 8.1) (see also (Figure 8.3); Richey and Kennedy, 1939; Holdsworth *et al.*, 1994).

The Basal Pelite Formation generally overlies the Lewisianoid gneisses, and although there is now little evidence of angular unconformity, east of Brinacory the contact appears to be sharp and show no evidence of subsequent shearing. The formation is variable both in lithology and thickness, and consists of interbedded semipelite, coarse pelite, and micaceous and feldspathic psammite, with minor gritty quartzose psammite units. The rocks are commonly epidotic. Graded units are seen, but cross-bedding is rare, and calc-silicate lenses are typically absent. In places the formation contains psammitic lenses at the base and the top (Ramsay and Spring, 1962). Quartz and subsidiary quartz-feldspar veins and lenses are locally abundant, especially where the unit is sheared. Richey and Kennedy (1939) interpreted these veined and sheared rocks as part of a 'Sub-Moine Series', as discussed below.

The Lower Morar Psammite Formation is exposed in the core of the Morar Antiform in North Morar, where typically it is a pale, blocky to massive, feldspathic to micaceous psammite with thin coarsely schistose pelite and semipelite interbeds. Calc-silicate lenses occur rarely and are concentrated in the upper, more-semipelitic part of the formation. Bedding is commonly lenticular, with channel features seen on Creag Mhòr Bhrinicoire [NM 743 919]. The formation also contains examples of cross-bedding, heavy-mineral bands, gritty lenses, loading structures and slump folds, testifying to its rapid deposition and relatively proximal nature. On the southern flank of Sgurr Mòr around [NM 831 919] feldspathic and quartzose psammites with subsidiary micaceous psammites and thin semipelite interbeds are tightly folded. The bedding is nebulous in the main F2 hinge zone, but elsewhere, early tight folds, confined to individual beds are seen. These are interpreted either as slump folds or D1 folds. Powell (1974) assigned these beds to the Lower Morar Psammite Formation. This formation is also mapped below and within the Ardnamurach Shear Zone, and farther east where it links northwards to the Arnisdale Psammite of Ramsay and Spring (1962). The unit becomes generally thinner to the east and contains a greater proportion of pelitic material, reflecting its more-distal nature.

The Morar Pelite Formation, formerly termed the 'Striped and Pelitic Group' (Richey and Kennedy, 1939), comprises three lithologically distinctive units. Interlayered semipelite and psammite units sandwich a central garnetiferous pelite and semipelite unit, as exposed around the estuary of the River Morar, east of Tarbet at [NM 804 931], and on Sgurr Mòr. To the north in Knoydart, Ramsay and Spring (1962) termed the equivalent unit the 'Ladhar Bheinn Pelitic Group'. The boundary with the underlying Lower Morar Psammite Formation is transitional, marked by mid-grey micaceous psammites and semipelites with feldspathic and siliceous psammite interbeds. Calc-silicate ribs are present but become more abundant in the higher parts of the pelite formation. The central pelitic schist is a dark-grey, garnetiferous, biotite-rich pelite and semipelite with a penetrative schistosity. The semipelitic and minor micaceous psammite interbeds define the bedding. The upper striped unit consists of thinly bedded, grey, micaceous and feldspathic psammites and garnetiferous, biotite + muscovite-bearing semipelites with abundant thick calc-silicate ribs and lenticular layers. Biotite-rich amphibolite pods are present and locally show discordant relationships with the bedding. Around Sgurr Breac the semipelitic units become gneissose in parts.

The overlying Upper Morar Psammite Formation is composed mainly of medium-bedded feldspathic psammite with abundant sedimentary structures, notably tabular and trough cross-bedding, ripple marks, and dewatering and loading structures. The formation is at least 5 km thick in its western outcrop, where it has been interpreted as a proximal marine sand sequence, derived from the west and south-west and dominated by N-flowing tidal currents (Glendinning, 1988). The sequence thins rapidly to c. 1.5 km thick on the east side of the Morar Antiform and the minor semipelite element found in the west becomes more significant. In North Morar, the formation is not well represented on the eastern side of the Morar Antiform. Only the lower parts of the formation occur in small fold outliers on the southern slopes of Sgurr Breac where they consist of thin- to medium-bedded, siliceous to micaceous psammites and minor semipelites with

abundant calc-silicate ribs.

The Lochailort Pelite Formation is the basal unit of the Glenfinnan Group, and is separated from the underlying Morar Group succession by the Sgurr Beag Thrust. The pelite crops out in the central part of the Glenshian Synform that crops out on the southern slopes of Sgurr Breac, where it consists of massive gneissose muscovite-biotite pelite, commonly garnetiferous, with subsidiary semipelite and minor thin micaceous and feldspathic psammite interbeds. The pelite contains abundant quartz and quartz-feldspar segregation veins and pods, in parts with prominent biotite selvages. Lenticular calc-silicate beds and small lenses are locally common and an excellent example displaying interference fold patterns is seen at [NM 839 907]. Garnetiferous biotite-hornblende metabasic pods and sheets, locally discordant to the lithological layering, are present in the Lochailort Pelite here.

Foliated garnet-muscovite-bearing pegmatites are found in the eastern, higher metamorphic grade areas, notably between Sgurr Mòr and Sgurr Breac, and on Sgurr Breac itself. They mainly intrude the Morar Pelite and Upper Morar Psammite formations. A particularly large pegmatite at [NM 836 924] is locally discordant to the lithological layering but is strongly foliated parallel to the S2 schistosity in the surrounding semipelite-psammite sequence. In the eastern margin of the area pegmatitic leucotonalite ('trondhjemite') forms large white masses and vein networks. This is coincident with the overall increase in metamorphic grade and migmatization eastwards. Such masses are of Caledonian age.

There are numerous minor intrusions in the North Morar area, including late Caledonian microdiorite and lamprophyre dykes, Permo-Carboniferous quartz-dolerite plugs and E-W-trending camptonite dykes, and Palaeogene basalt and dolerite dykes of the Skye swarm.

Structure

The Moine succession has been affected by two main penetrative deformation phases, termed 'D2' and 'D3' (Powell, 1974). Prior to their development, D1 is recognized as resulting in a bedding-parallel schistosity and minor tight to isoclinal folding. These are mainly slump folds and convolute bedding structures, largely resulting from sediment loading. Powell (1974), following the work of Ramsay and Spring (1962) in the Glenelg area to the north (see Rubha Camas na Cailinn GCR site report, Chapter 7), postulated that the Lewisianoid inliers in Morar formed the cores of early F1 isoclinal folds, termed the 'Morar and Ardnamurach Isoclines'. This hypothesis is rejected here as on the east flank of the Morar Antiform the sedimentary structures clearly show that the Moine succession youngs upwards on both sides of the Lewisianoid gneiss inlier, and the lower contact of the inlier is strongly sheared.

The D2 event resulted in the development of a pervasive S2 cleavage and large- and small-scale, generally tight F2 folds in both Moine and Lewisianoid rocks. F2 fold axes plunge gently north-east in the broad hinge zone of the Morar Antiform, but on its eastern flank they plunge steeply to the south and south-west, and on its western flank they plunge gently to steeply north. The relatively open hinge of the D2 Knoydart Antiform crops out immediately east of Tarbet, where it dips very steeply to the south (Poole and Spring, 1974). An F2 hinge zone is also exposed on Sgurr Mot- near [NM 832 918], where the bedding becomes nebulous, and prominent quartz rodding in low-strain psammites plunges steeply to the south-west. In this area later more-upright D3 folds re-fold large-scale tight F2 folds. Excellent examples of small-scale F2–F3 fold interference patterns occur in Moine rocks on the north shore of Loch Morar at [NM 839 907] and in Lewisianoid gneisses at Rubh' Àird na Murrach [NM 826 938].

D2 shear-zones occur as narrow planar zones of highly attenuated rock, typically < 50 m wide. Their overall geometry and orientation suggests that they stack up the sequence towards the WNW On Creag Mhòr Bhrinicoire at [NM 745 920] lenses of indurated and partly silicified, millimetre-striped, Lewisianoid gneisses are included in and interfolded with highly sheared psammites over some 10 m in a shear zone. This Lewisianoid-Moine boundary is folded by minor, close to tight F3 folds. The underlying footwall Lower Morar Psammite Formation consists of feldspathic psammites, and thin, coarsely schistose semipelite layers with quartz-feldspar segregations and quartz veins. Immediately below the contact zone they contain a strong penetrative fabric (S2), generally sub-parallel to bedding, with related close to tight F2 folds. In parts attenuated cross-bedding structures can be seen and these become less deformed in psammites some 50 m below the contact. Both at Brinacory and farther west on Creag Mhòr Bhrinicoire at [NM 743 919], where cross-bedding, load structures, channel forms and slump folds are present, the sedimentary structures show that the Moine psammites young

upwards towards the Lewisianoid rocks. Hence, a D2 ductile thrust has emplaced Lewisianoid gneisses and the unconformably overlying Morar Group cover sequence towards the WNW over the Lower Morar Psammite.

A 650 m-wide zone of interleaved, sheared and tightly folded Morar Group metasediments and Lewisianoid gneisses, the Ardnamurach Thrust Zone, occurs on the south shore of Loch Nevis east of Creag Cruachain at [NM 817 936]. To the west are subvertical, highly strained, interbedded micaceous psammites and semipelites with quartz and quartz-feldspar veins, assigned to the Basal Pelite Formation. The beds are attenuated and boudinaged and contain tight to isoclinal folds with sheared and disrupted limbs. Within the thrust zone are highly strained feldspathic and siliceous psammites, cut by discordant thick quartz veins. At the eastern edge of the zone, by the ruins of Ardnamurach [NM 828 936] are highly sheared micaceous psammites, which have also been assigned to the Basal Pelite Formation (Powell, 1974). The rocks possess a pervasive S2 schistosity sub-parallel to bedding, and strongly boudinaged quartz pods. Tight F2 minor folds occur in low-strain zones.

A further zone of strongly attenuated platy psammite marks the boundary of the Lochailort Pelite Formation with bedding, veining and internal structures all strongly aligned parallel to the compositional layering giving the rocks a so-called 'tramline' appearance (Rathbone and Harris, 1979). This is the Sgurr Beag Thrust that here juxtaposes the Glenfinnan Group Lochailort Pelite against various units of the Morar Group succession (see also Lochailort and Kinloch Hourn GCR site reports, this chapter). The thrust and related D2 fabrics and minor structures are refolded by the F3 Glenshian Synform (Powell *et al.*, 1981) (Figure 8.15).

The D3 deformation resulted in kilometre-scale upright to W- or WNW-verging folds. Associated cleavage development is variable, dependent on lithology and metamorphic grade; it is more strongly developed in the pelitic lithologies. The general effect of D3 structures in North Morar is to steepen and locally refold the earlier D2 structures. The F3 Morar Antiform dominates the structure in the western part of North Morar. This forms a large domal or periclinal antiform whose hinge zone is subhorizontal in North Morar, but whose axial plunge steepens considerably to the north and south. In the Mallaig-Morar area, its western limb is vertical and the antiform refolds the D2 ductile thrust at the base of the Lewisianoid gneiss inliers. Tight F3 folds in the thrust zone suggest localized reactivation of thrusting during D3. Farther east in Knoydart the F2 Knoydart Antiform is refolded by the F3 Ladhar Bheinn Synform and also folded over the Meall Bhasiter dome (Powell, 1974).

South of Sgurr Breac at around [NM 847 925] the steeply S-plunging F3 Glenshian Synform refolds the Sgurr Beag Thrust. Small-scale examples of F2–F3 re-fold patterns are common in mixed lithologies on the limbs of this structure. In the fold core the prominent S3 mica fabric varies from a crenulation cleavage to a coarse penetrative schistosity and is axial planar to open to tight F3 minor folds. An intersection lineation, L3, plunges steeply south. In the gneissose pelites and semipelites, D3 deformation, folding and cleavages attenuate and refold the already segregated and veined, foliated rocks giving rise to very complex structural patterns. D3 strain increases towards the boundary of the Lochailort Pelite showing that the Sgurr Beag Thrust was reactivated during D3. Farther east F3 folds become tighter, and metamorphic grade increases giving rise to a coarse S3 schistosity and complex medium-scale F2–F3 fold interference patterns.

Later folding is also present but generally no related cleavages are developed. Powell (1974) showed that later open folding along NNW-trending axes is common south of Loch Morar and these fold axes swing to trend WNW in North Morar to the west of Tarbet. They are well seen on Creag Mhòr Bhrinicoire [NM 743 923] and adjacent cliffs where they locally control the dip of the bedding and the trace of the D2 shear-zone. Within the Lochailort Pelite and the Morar Pelite formations, later, open to close, kink-folds with axial planes at a high angle to S2 and S3 are seen. These structures and the more-open folds may be assigned to D4 (Powell, 1974) but as they are local in extent and variable in trend, correlation with fold sequences elsewhere is problematical.

Metamorphism

The rocks range in grade from epidote-amphibolite facies in the west to middle-amphibolite facies in the east. Concomitant with this eastward increase in grade is the incoming of abundant quartz and quartz-feldspar segregations in semipelitic and pelitic lithologies, as seen just east of Sgurr Mor, and followed farther eastwards by the incoming of abundant large transgressive pegmatite veins. The large leucotonalite body at the eastern end of Loch Morar on An Stac

and Sron a' Choin, represents the acme of this pegmatitic activity. There are two distinct stages of pegmatite generation, coeval with the D2 and D3 deformation events.

The pelitic rocks in the western part of North Morar contain abundant garnets that show evidence of two distinct phases of growth; the earlier phase pre-dating D2 deformation, and the later phase overlapping with D2 (MacQueen and Powell, 1977). Farther east staurolite, kyanite and sillimanite (fibrolite) occur progressively in the pelitic lithologies. In the extreme east, sillimanite + potash feldspar is recorded in pelitic rocks, and plagioclase compositions in calc-silicate rocks lie in the range An_{60} to An_{90} . The peak of metamorphism appears to have been synchronous with, or at least overlapped, the D2 deformation. The later D3 event was associated with a greenschist- to lower-amphibolite-grade metamorphism that again increased in grade eastwards. Work on the mineralogy of calc-silicate lenses from the Lochailort area to the south (Powell *et al.*, 1981) showed that the Sgurr Beag Thrust is coincident with a sharp break in the overall metamorphic profile, implying westward thrusting post-dating the metamorphic peak.

Interpretation

The North Morar GCR site shows a profile from low-grade, moderately deformed Moine metasedimentary rocks in the west, to higher-grade, partly gneissose, pegmatite-veined, complex thrust and folded Moine rocks in the east.

Richey and Kennedy (1939) originally interpreted the metasedimentary rocks in the core of the Morar Antiform as an older more-deformed sequence, the 'Sub-Moine Series', lying unconformably beneath the Morar Group succession. Following work by MacGregor (1948), Kennedy (1955) re-interpreted the 'Sub-Moine Series' as more-deformed relatives of the lower part of the Morar Group, namely the Basal Pelite and Lower Morar Psammite formations. Kennedy's revised interpretation postulated that the Lewisianoid gneiss inliers were thrust into the succession, and that the bulk of the overlying structural sequence lay within a Morar Nappe. The base of the nappe was drawn below the outcrop of the Lower Morar Psammite, overlying all the Basal Pelite Formation and Lewisianoid inliers in the Morar Antiform. The antiform was envisaged as a structural window into a lower, more-deformed sequence with lesser-deformed Morar Group rocks occurring higher in the structural succession. There was much discussion of Kennedy's presentation, with many geologists doubting the identification of the gneissose inliers as Lewisianoid, preferring them to be part of the Moine succession. Subsequent work has shown the concept of the Morar Nappe to be incorrect, but Ramsay's (1957b) studies on the Moine–Lewisianoid relationships at Glenelg (see Chapter 7) dispelled the doubts about Kennedy's interpretation of the Lewisianoid gneiss inliers.

Ramsay and Spring (1962) concluded that in the Glenelg–Arnisdale and Knoydart areas the Lewisianoid gneisses were disposed in isoclinal fold closures, (see Rubha Camas na Cailinn GCR site report, Chapter 7). Most subsequent workers followed this interpretation in North Morar (e.g. the Morar and Ardnamurach Isoclines of Powell, 1974). However, the North Morar folds cannot be convincingly substantiated in the field, and as D2 strain and deformation are notably high around several of the Lewisianoid–Moine contacts, the smaller Lewisianoid inliers are interpreted here as being underlain by D2 shear-zones. Lewisianoid gneisses also occur in synformal inliers in North Morar (Lambert and Poole, 1964), for example near Mallaigmore and immediately NNE of Creag Nth & Bhrinicoire [NM 745 920], but these folds are D3 in the regional context.

Isotopic age data for the rocks of Morar have been critical in discussions of the structural and metamorphic history for over 20 years. The pegmatites of Knoydart (see Knoydart Mica Mine GCR site report, this chapter) and Loch Eilt give Rb-Sr, U-Pb and K-Ar ages in the range 680–745 Ma (Long and Lambert, 1963; Fitch *et al.*, 1969; van Breemen *et al.*, 1974). Latterly, Hyslop (1992) showed on the basis of field and geochemical studies that the pegmatites at Knoydart, Sgurr Breac and Ardnish formed under amphibolite-facies conditions essentially *in situ*, related to zones of high D2 strain. Rogers *et al.* (1998) obtained U-Pb TIMS ages of 784 ± 1 Ma and 827 ± 2 Ma from single monazites from the Sgurr Breac and Ardnish pegmatites respectively and a discordant (upper intercept) zircon age of 815 ± 30 Ma from the Sgurr Breac pegmatite. Vance *et al.* (1998) put forward evidence of an earlier metamorphic event, based on Sm-Nd ages of 813–822 Ma from garnet cores from the Morar Pelite at Polish in western Morar. The rims on the garnet gave a Sm-Nd age of 788 ± 4 Ma. Vance *et al.* (1998) showed that the mineral compositions were compatible with a prograde P–T path that implied nappe-scale folding. Peak pressures of 12.5–14.5 kbar and temperatures of c. 650°–700° C were inferred

from the mineralogy. Hence, the isotopic data and correlation with the metamorphic and structural history of these rocks suggest that a Neoproterozoic Knoydartian orogenic event or series of events affected the Moine succession in the period 840–750 Ma.

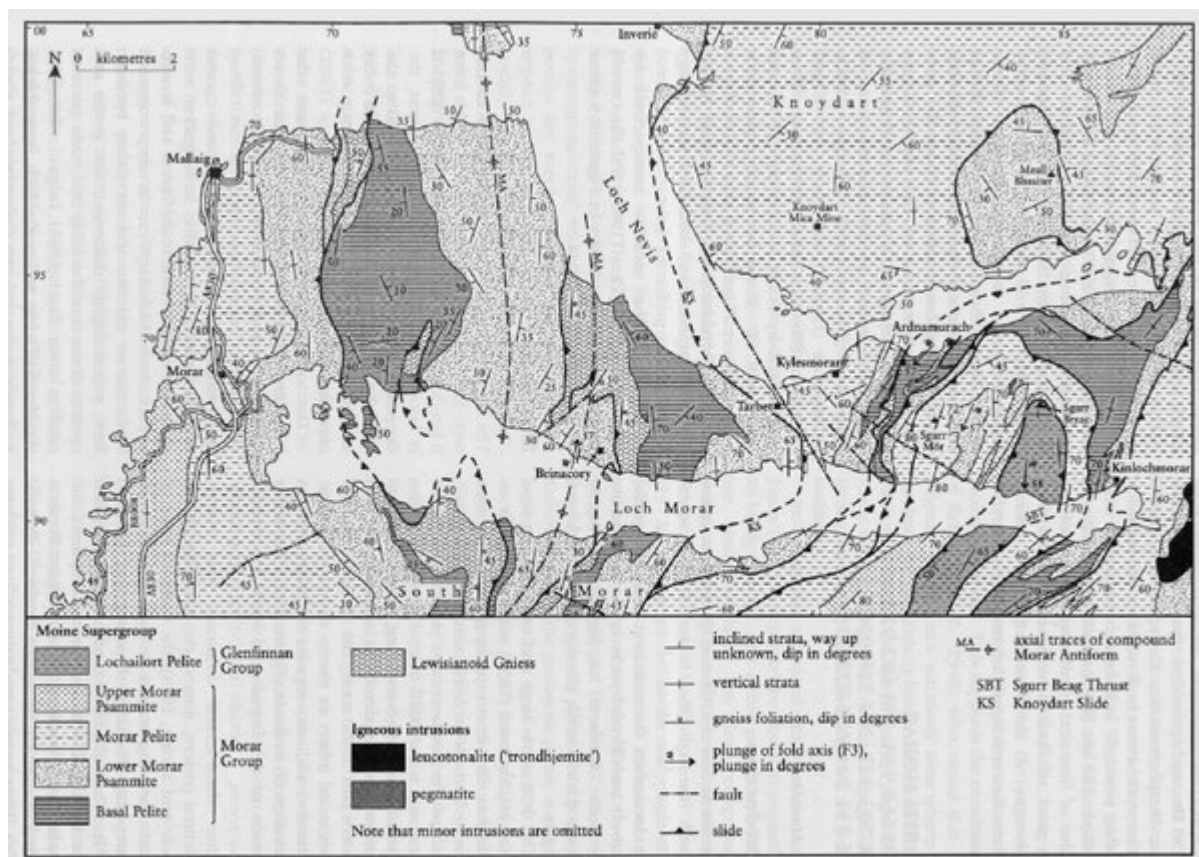
Conclusions

The North Morar GCR site provides a traverse from the western Moine Morar Group rocks, which show evidence of only moderate deformation and metamorphism at lowermost amphibolite facies, through Archaean-age Lewisianoid inliers to highly deformed and middle amphibolite-facies Moine rocks in the interior of the orogenic belt. Relationships between mineral growth and deformation episodes have been defined in the epidote-amphibolite-facies rocks in the west; these can then be traced eastwards to higher-grade areas where relationships are more complex. The Lewisianoid inliers represent parts of the gneissose basement to the Moine metasedimentary succession and their lower contacts with the Moine rocks are ductile thrust zones, which formed during the main D2 deformation and metamorphic event. Glenfinnan Group rocks occur in the hangingwall of the D2 Sgurr Beag Thrust in the eastern part of the site. D2 is currently thought to be Neoproterozoic in age in the Morar area.

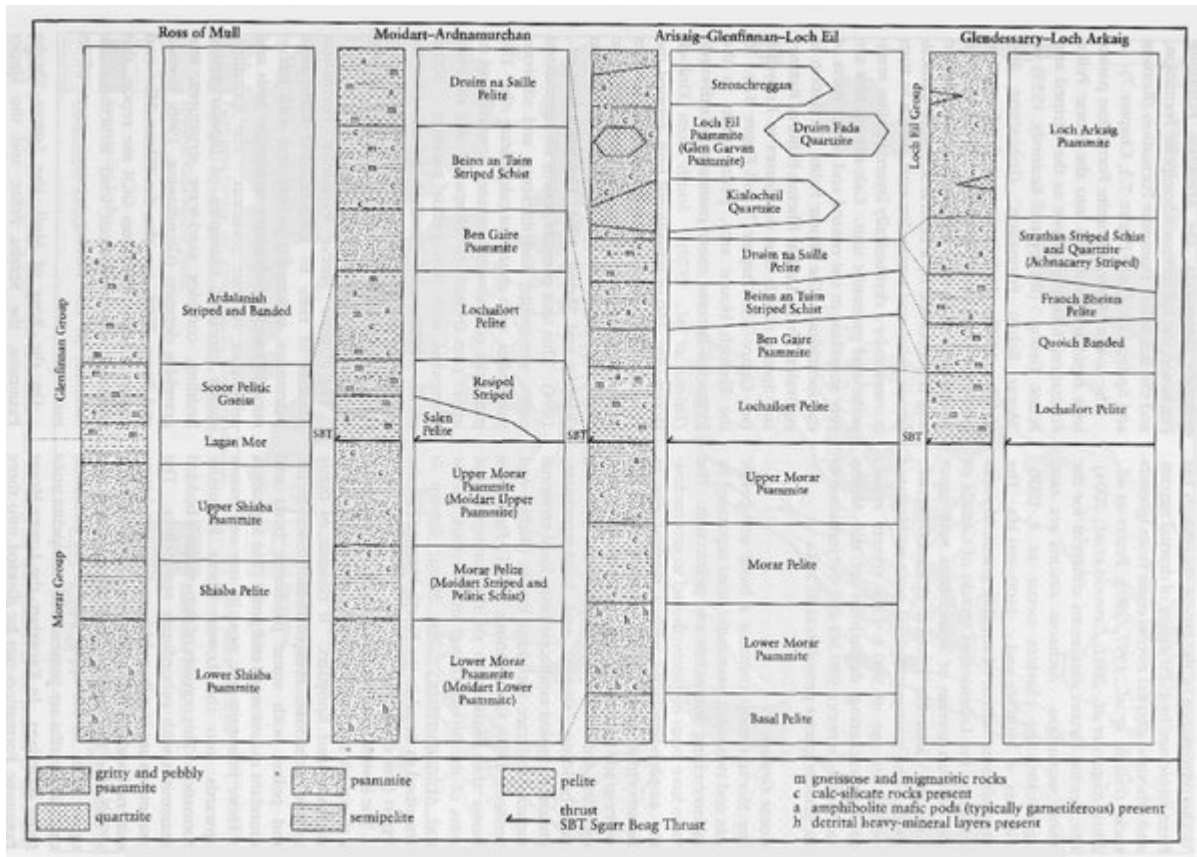
Early-formed garnets have been isotopically dated at c. 820–790 Ma. Later pegmatitic granite bodies were intruded into the strongly deformed and higher metamorphic grade parts of the section at c. 780 Ma. Caledonian folding (F3) is responsible for the formation of the domal Morar Antiform that dominates the structure of western Morar. In the eastern part of the area, more-pervasive Caledonian folding and metamorphism, dated at around 470–455 Ma, is widely recognized. The F3 folds refold the earlier F2 structures and the D2 shear-zones, including the Sgurr Beag Thrust.

The North Morar site is of international significance as it provides a well-exposed cross-section across c. 20 km of the western part of the Caledonian Orogen, and contains many of the elements that can be found in the Moine rocks of north-west Scotland. It was the first area in which sedimentary structures were used to elucidate the succession in such high-grade rocks, and has formed a natural 'laboratory' for the testing of numerous ideas about the nature and timing of the Caledonian and putative Knoydartian orogenies. It remains an area of significant importance for future studies.

References



(Figure 8.15) Geology of the North Morar GCR site and surrounding area. Compiled from 1:63 360-scale Sheet 61(Arisaig) (Institute of Geological Sciences, 1971), and Powell (1974).



(Figure 8.3) Tectonostratigraphy of the Moine succession within the Moine (South) area, showing the main formations.



(Figure 8.16) Attenuated and folded Lewisianoid felsic and mafic gneisses at Rubh' Àird na Murrach [NM 8661 9374], Loch Nevis. The prominent open to close folds are F3 and in parts refold earlier very tight F2 folds: an example can be seen to the top right. The hammer is 28 cm long. (Photo: G.S. Johnstone, BGS No. P254880, reproduced with the

Glenfinnan Group	
Lochailort Pelite Formation	Gneissose pelite and semipelite with subordinate psammite and quartzite beds. Amphibolite sheets and calc-silicate lenses.
Morar Group	
Upper Morar Psammite Formation	Feldspathic and siliceous psammite and subsidiary semipelite. Excellent cross-bedding and loading structures. Calc-silicate layers and lenses.
Morar Striped and Pelitic Schist Formation	Dark-grey fine-grained semipelite and striped pelite–psammite units with abundant calc-silicate layers and lenses.
Lower Morar Psammite Formation	Siliceous to micaceous psammite, commonly arkosic, with pebbly and gritty beds. Heavy-mineral bands common. Interbedded pelitic units.
Basal Pelite Formation	Mixed, thinly bedded, schistose pelite, semipelite, and micaceous to feldspathic psammite.

(Table 8.1) Moine stratigraphy in North Morar.