Fassfern to Lochailort Road Cuttings (A830)

[NN 047 784]–[NM 769 827]

R. A. Strachan

Introduction

The road cuttings between Fassfern and Lochailort on the Fort William to MaHaig road (A830) provide a comprehensive profile across the Neoproterozoic Moine Supergroup, its associated meta-igneous and igneous intrusions, and the Caledonian and earlier structures that typify this part of the orogenic belt. The 27 km-long section includes numerous localities that in their own right would merit GCR status; when put together as a coherent traverse they provide the definitive section across the Moine Supergroup (Figure 8.19). In the east, psammites and quartzites of the Loch Eil Group pass transitionally westwards into underlying pelitic and psammitic gneisses of the Glenfinnan Group (Dalziel, 1966; Brown *et al.,* 1970; Baird, 1982; Strachan, 1985; Powell *et al.,* 1988; Strachan *et al.*, 1988). Lithological layering in the Loch Eil Group is typically subhorizontal to gently inclined (the 'Flat Belt') in contrast to the Glenfinnan Group where it is typically steeply inclined to subvertical (the 'Steep Belt'). The junction between these two domains was initially termed the 'Loch Quoich Line' by Clifford (1957) (here abbreviated to the 'Quoich Line'). The structural contrast between the domains results from the varying intensity of upright folding during the Caledonian Orogeny (Roberts and Harris, 1983). A suite of deformed and metamorphosed granites, known collectively as the 'West Highland Granite Gneiss' (Johnstone, 1975), occurs approximately along the Glenfinnan Group–Loch Eil Group boundary. A cross-section through the southernmost member of the suite, the Ardgour Granite Gneiss, is exposed east of Glenfinnan. Recent U-Pb isotopic dating of zircons from the gneiss indicates that granite sheets were emplaced at *c.* 873 Ma (Friend *et al.,* 1997; Rogers *et al.,* 2001) (see 'Introduction', this chapter). The abundant segregation pegmatite veining in the granite gneiss possibly also formed at this time under middle amphibolite-facies metamorphic conditions. In the vicinity of Loch Eilt and Lochailort, the Glenfinnan Group is tightly inter-folded with psammites and semipelites of the underlying Morar Group. The junction between the two groups was for many years interpreted as a stratigraphical boundary (Powell, 1964, 1966), but is now generally thought to be a major ductile shear-zone, the Sgurr Beag Thrust (Powell *et al.,* 1981). Morar Group rocks at Loch Eilt are intruded by pegmatites (Figure 8.20), which have yielded isotopic ages of *c.* 740 Ma (van Breemen *et al.,* 1974). In addition, U-Pb isotopic dating of titanite from calc-silicate rocks by Loch Eilt implies that the main metamorphic event occurred at *c.* 735 Ma (Tanner and Evans, 2003). All three Moine groups were intruded by a variety of mafic and felsic igneous rocks during the Ordovician–Silurian Caledonian Orogeny (van Breemen *et al.,* 1974; Fettes and MacDonald, 1978; Smith, 1979; Talbot, 1983). They are also cross-cut by Permian–Carboniferous camptonite dykes and by Palaeogene dolerites and basalt dykes of the Skye swarm.

Description

The east to west traverse from Fassfern to Lochailort follows the A830 and includes road cuts and outcrops on the adjacent rocky hills (Figure 8.2). It crosses the Loch Ell, Glenfinnan and Morar groups of the Moine Supergroup (Figure 8.19) and it was in this region that this basic division of the Moine rocks was first defined (Johnstone *et al.,* 1969).

The easternmost road cuttings around Fassfern and west to Kinlocheil are dominated by generally subhorizontal to gently inclined psammites and quartzites of the Loch Eil Group (Strachan, 1985). Within the psammites, micaceous laminae locally define cross-lamination that indicates that the rocks are normally right-way-up and young eastwards. The psammites commonly contain abundant small lenses of calc-silicate rock, which formed during diagenesis. The grade of metamorphism is difficult to establish because of the lack of metamorphic indicator minerals such as staurolite, kyanite and sillimanite and the widespread retrogression of the rocks. The co-existence of hornblende and garnet within the calc-silicates is broadly indicative of at least lower amphibolite-facies metamorphism. The Loch Eil Group rocks are deformed by metre-scale, recumbent, tight to isoclinal folds. Good examples are exposed in road cuts at [NN 043 785], 2 km east of Fassfern. Here, a weak axial-planar fabric is developed in micaceous layers in the fold hinges and a poorly developed mineral and extension lineation parallel to the N–S-trending fold hinge lines is locally discernable. The axial-planar fabric can be seen in places to be a crenulation of a preexisting mica schistosity, S1, that is attributed to the first episode of deformation (D1), with the recumbent folds related to the second deformation (D2). Late upright, open to gentle folds with N–S-trending axes constitute evidence for a third (D3) period of deformation.

The road cuttings between the west end of Loch Eil and the east end of Loch Eilt (Figure 8.19) mainly expose metasedimentary rocks of the Glenfinnan Group. Unlike the Loch Eil Group they contain a high proportion of semipelites and pelites that are thinly interlayered with psammites and quartzites. Although metamorphic index minerals are not abundant, pelitic rocks locally contain sillimanite, kyanite and stau-rolite and in many places develop migmatitic quartz-feldspar segregations. These segregations formed in *situ,* possibly as a result of partial melting under middle- to upper-amphibolite-facies conditions. Sedimentary structures are generally absent in this section, in part due to widespread recrystallization and high tectonic strain of the dominantly pelitic lithologies.

The easternmost outcrops of the Glenfinnan Group immediately west of Loch Eil display a well-developed gneissic S1 foliation, which dips gently eastwards and is deformed by recumbent, tight to isoclinal F2 folds. Westwards from Glenfinnan, the gneissosity is steep and commonly subvertical, typical of the 'Steep Belt'. The rocks are highly strained and display evidence of a more-complex structural history. The S1 foliation and F2 folds are deformed by at least one and possibly two subsequent phases of upright, close to isoclinal, NNE-trending folds (D3–D4; Baird, 1982; Powell *et al.,* 1988). These have curved hinges that plunge gently to steeply to the NNE and SSW. A strong lineation defined by quartz, feldspar and mica plunges very steeply down-dip. An inlier of Loch Eil Group psammites located within the 'Steep Belt' south of Glenfinnan (Figure 8.19) occupies the core of a kilometre-scale composite F3/F4 synform (Dalziel, 1966). The characteristic fold structures of the 'Steep Belt' are spectacularly well exposed on flat glaciated surfaces located above the road cuttings at The Muidhe [NM 857 815] (see (Figure 8.2)). Open to tight, F3 and F4 asymmetrical minor folds, whose axes mainly plunge to the north-east, dominate the outcrops. The folds are accompanied by tight crenulations that refold the migmatitic fabric in the pelitic and semipelitic horizons. There are numerous examples of coaxial, type-3 fold interference patterns (*sensu* Ramsay, 1967) where F3/F4 structures refold earlier F1 or F2 minor isoclinal folds.

Between the eastern end of Loch Eilt and Lochailort, two complementary regional large-scale F3 folds, the Loch Eilt Antiform and the Glenshian Synform, infold Morar Group and Glenfinnan Group rocks and fold the bounding Sgurr Beag Thrust (Powell *et al.,* 1981; Tanner and Evans, 2003) ((Figure 8.19), and see (Figure 8.21), Lochailort GCR site report, this chapter). The Morar Group rocks here consist mainly of interlayered psammites and micaceous psammites with thin semipelite layers and calc-silicate ribs and lenses. Sedimentary structures are generally absent. These rocks record all the deformation events apparent in the Glenfinnan Group. The presence of garnet and locally staurolite and sillimanite in pelitic rocks and both hornblende and pyroxene with bytownite/anorthite in calc-silicate rocks imply that metamorphic grade lies within the middle-amphibolite facies. However, mineralogical and textural features indicate that the Morar Group rocks have been metamorphosed at a slightly lower metamorphic grade than those of the overlying Glenfinnan Group (Barr *et al.,* 1986). Comparison of calc-silicate rocks from the two groups shows that those from the Glenfinnan Group have generally higher anorthite contents of plagioclase, and migmatitic textures are generally absent within Morar Group pelites (Powell *et al.,* 1981; Tanner and Evans, 2003).

The contact between the Morar and Glenfinnan groups has been interpreted as a regional-scale tectonic boundary, the Sgurr Beag Thrust (see Lochailort GCR site report, this chapter). The thrust is not exposed in the road cuttings, but on the hillsides near Lochailort, and above Loch Eilt it is seen as a sharp, concordant lithological contact between Glenfinnan Group migmatitic pelites and semipelites in the hangingwall and attenuated but bedded Morar Group psammites in the footwall. The Lewisianoid inliers, which are such a diagnostic feature of the thrust zone farther north (see Kinloch Hourn GCR site report this chapter, and Fannich GCR site report, Chapter 7) are absent and the case for the existence of a structural discontinuity rests on recognition of the difference in metamorphic grade between the Morar and Glenfinnan groups, and on the identification of high strains typical of major ductile shear-zones. Rathbone and Harris (1979) demonstrated a progressive increase in ductile strain in the Upper Morar Psammite near Lochailort as the thrust is approached from the west, and these features are described in the Lochailort GCR site report (this chapter). The present steep orientation of the ductile thrust is a result of subsequent upright, tight Caledonian F3 folding (Powell *et al.,* 1981).

All three Moine groups incorporate a range of mafic to felsic igneous intrusions, the oldest of which were emplaced in the Neoproterozoic. Pre-eminent amongst these is the Ardgour Granite Gneiss (Harry 1954; Dalziel, 1966; Gould, 1966; Barr *et al.,* 1985), which is well exposed in cuttings east of Glenfinnan between [NM 941 797] and [NM 914 803]. The gneiss is distinguished from its host metasedimentary Moine rocks by its generally homogeneous appearance, its quartz + K-feldspar + oligoclase mineralogy with lesser biotite and garnet, and its granitic geochemistry. A strong coarse foliation is defined by discontinuous biotite laminae and quartzofeldspathic segregations fringed by biotite selvedges. In the eastern part of the outcrop, the foliation is gently dipping and deformed and transposed by F2 recumbent, tight to isoclinal folds. These structures become progressively steeper towards the west as a result of the gradual development of F3/F4 upright folds.

Generally concordant sheets of hornblende schist up to 1 m thick are present within the Glenfinnan Group and Loch Ed Group metasedimentary rocks and in the granitic gneiss (e.g. at [NN 043 785]). In places their margins are slightly discordant to lithological layering in the host rocks and they apparently represent metamorphosed mafic intrusions. A strong planar S1 fabric, defined by aligned hornblende and plagioclase, is folded and crenulated by F2 folds. The dolerite precursors of these amphibolitic mafic rocks must have been intruded either prior to or during D1 .

The Morar Group psammites and semipelites at the western end of Loch Eilt [NM 806 827] contain several highly deformed pegmatites, which are concordant with lithological layering, locally tightly folded and boudinaged (Figure 8.20). They are composed of quartz, plagioclase, microcline, muscovite, garnet, and accessory apatite. Available evidence suggests that the pegmatites did not form *in situ:* they lack biotite selvedges and contain microcline and apatite, which are absent from the migmatitic segregations of the adjacent semipelites. The pegmatites were probably intruded into their Moine host rocks from deeper crustal levels. Muscovite books from one of the pegmatites have yielded a Rb-Sr age of 730 ± 20 Ma (van Breemen *et al.,* 1974), which is within error of a discordant upper intercept U-Pb zircon age of 740 ± 30 Ma that is assumed to date crystallization (van Breemen *et al.,* 1978). The Neoproterozoic Knoydartian age of the pegmatites is clear but it is difficult to establish the timing of intrusion relative to early deformation phases (D1, D2) as the pegmatites and Moine metasedimentary rocks have undergone high Caledonian tectonic strains and been subject to Caledonian metamorphism.

Most other igneous intrusive bodies were emplaced during the later stages of the Caledonian Orogeny. The Morar and Glenfinnan groups and the Ardgour Granite Gneiss are intruded by a suite of distinctive coarse-grained, discordant and steeply dipping pegmatitic granite veins and lenses. These pegmatites display evidence for variable amounts of foliation development, formed during regional upright D3/D4 folding and associated with the formation of the 'Steep Belt' (e.g. [NM 857 815]; [NM 806 827]). Individual pegmatite veins are pink to white, typically 1–4m thick, but locally they are abundant and form pegmatite-rich zones up to 300–400 m wide. They are composed of quartz, plagioclase, K-feldspar, muscovite, biotite and garnet. Muscovite books up to 4–5cm across are present and show a crude subvertical alignment. Muscovite from a pegmatite body near Glenfinnan yielded an Rb-Sr age of 450 ± 10 Ma (van Breemen *et al.,* 1974). The pegmatites probably formed during high-grade Caledonian metamorphism by melting of Moine rocks below the present exposure level.

The Moine rocks, granitic gneiss, and the pegmatites are cut discordantly by gently to moderately inclined Caledonian microdiorite sheets (Smith, 1979) generally about 1 m thick (e.g. at [NM 857 815], [NM 925 794]). The intrusions were probably intruded in Mid-Silurian times. The microdiorites pre-date the Strontian Pluton whose emplacement is dated at *c.* 425 Ma (Rogers and Dunning, 1991). Relict igneous textures are locally preserved in the central parts of the microdiorite intrusions, but in most cases they show mineralogies characteristic of the upper-greenschist- or epidote-amphibolite-facies. Although the margins of the intrusions are commonly strongly foliated, they appear to have been intruded after the regional upright D3/D4 folding associated with formation of the 'Steep Belt' (but see Talbot, 1983), but prior to uplift and exhumation of the orogen. At the western end of Loch Eil, numerous discordant sheets of undeformed granite, aplite and pegmatite form part of the late Caledonian Loch Eil Granite Vein-Complex ((Table 7.1), Chapter 7; see 'Introduction', this chapter, and (Figure 8.5)).

Interpretation

The significance of the Fassfern to Lochailort road section lies in the excellent and near-continuous roadside exposure of the three constituent groups of the Moine Supergroup effectively in their type areas. Despite the generally high levels of tectonic strain and the amphibolite-facies metamorphism, it is still possible to make reasoned inferences concerning their environment of deposition and to speculate on the likely geometry of the Moine basins (e.g. see Soper *et at,* 1998). The relatively competent psammites of the Loch Eil Group preserve numerous sedimentary structures; some of these, such as 'herring-bone' cross-bedding, are certainly consistent with deposition in a shallow-marine, tidal setting (Strachan, 1986). Palaeocurrent directions trend NNE–SSW probably parallel to their contemporary coastline. The westward thickening of the sequence is consistent with deposition in an extensional basin that was bounded to the west by a normal fault (Strachan *et al.,* 1988). The high tectonic strains characteristic of the underlying Glenfinnan Group make palaeogeographical analysis considerably more difficult. However, in the context of the marine setting deduced for the Loch Eil Group, the extensive belts of pelite and semipelite (metamorphosed mudstone or siltstone) and striped psammite-quartzite (thin-bedded sandstone) suggest a possible middle to outer shelf marine environment. The Glenfinnan Group and Loch Eil Group sequence overall constitute a coarsening-upward, regressive succession. The Morar Group rocks west of the site were also deposited as sands, silts and muds in a fluviatile and/or shallow-marine extensional basin (Glendinning, 1988; Bonsor and Prave, 2008). However, the relationship of this Morar Group basin to the Glenfinnan–Loch Eil basin is uncertain given the subsequent displacements on the Sgurr Beag Thrust. Farther north both Morar Group and Glenfinnan Group rocks were apparently deposited upon Lewisianoid basement, and hence it is possible that the Glenfinnan Group is a distal equivalent of the Morar Group.

The granitic gneiss was formerly thought to have formed *in situ* as a result of melting of Moine metasediments (Harry, 1954; Dalziel, 1966), but the current consensus is that it represents a syn-tectonic granite which was intruded during D1 accompanied by high-grade metamorphism (Barr *et al.,* 1985; see also Quoich Spillway GCR site report, this chapter). An Rb-Sr whole-rock isochron of 1028 ± 43 Ma obtained from the granitic gneiss by Brook *et al.* (1976) was interpreted to date formation of the gneiss during high-grade metamorphism. However, more-recent U-Pb SHRIMP and TIMS dating of zircons from the granitic gneiss and its migmatitic segregations indicates a younger age of 873 ± 7 Ma (Friend *et al.,* 1997); this is considered a more-reliable estimate of the granite emplacement and metamorphism. The *c.* 740 Ma pegmatite within the Morar Group at Loch Eilt is one of a suite of 'Morarian' pegmatites that has yielded U-Pb isotopic ages of *c.* 780–740 Ma in the region (van Breemen *et al.,* 1974, 1978). Detailed studies of several of these pegmatites suggest that they formed as a result of segregation during deformation and amphibolite-facies metamorphism (Hyslop, 1992), although for the Loch Eilt pegmatite it is difficult to see back through the superimposed pervasive high Caledonian strain. The significance of these Neoproterozoic events is still the subject of discussion (see Strachan *et al.,* 2002a; Tanner and Evans, 2003). Isotopic ages of between *c.* 1000 Ma and 750 Ma that have been obtained from the Moine Supergroup have traditionally been attributed to orogenesis (e.g. Bowes, 1968; Lambert, 1969; Powell, 1974; Brook *et al.,* 1976, 1977; Piasecki and van Breemen, 1979a; Powell *et al.,* 1981, 1983; Barr *et al.,* 1986; Harris and Johnson, 1991). An alternative model has been proposed by Soper (1994) and Ryan and Soper (2001) who speculated that high heat flow during continental rifting – perhaps enhanced by emplacement of the igneous protoliths of the widespread amphibolitic metabasic sheets and dykes — may account for melting and formation of granitic gneisses and pegmatites at mid-crustal levels, contemporaneous with sedimentation at the surface. Distinction between these two models on structural criteria alone is not possible. Ductile extension at depth could produce flat-lying foliations and folds (perhaps equivalent to the D1 structures in the Glenfinnan and Loch Eil groups), which could not be distinguished from similarly orientated compressional structures.

Critical to this discussion is the pressure (i.e. crustal depth) at which the high-temperature metamorphism occurred. Metamorphic and isotope studies of Zeh and Millar (2001) and Tanner and Evans (2003) suggest that the Knoydartian tectonothermal event occurred under relatively high pressures, implying contractional orogenesis, rather than at low pressures, which would favour an extensional origin.

The Sgurr Beag Thrust was identified initially as a synmetamorphic discontinuity (ductile shear-zone) within the Moine rocks and Lewisianoid gneiss basement inliers of the Kinloch Houm area (Tanner, 1971; see also Kinloch Hourn GCR site report, this chapter). It was termed the 'Sgurr Beag Slide' because at that time its geometric significance was uncertain and it appeared to place younger rocks over older rocks. However, later work demonstrated that it is best interpreted as a ductile thrust that emplaced high-grade Glenfinnan Group rocks (with locally underlying Lewisianoid basement) westwards onto lower-grade Morar Group rocks (Rathbone and Harris, 1979; Powell *et al.,* 1981; Rathbone *et al.,* 1983).

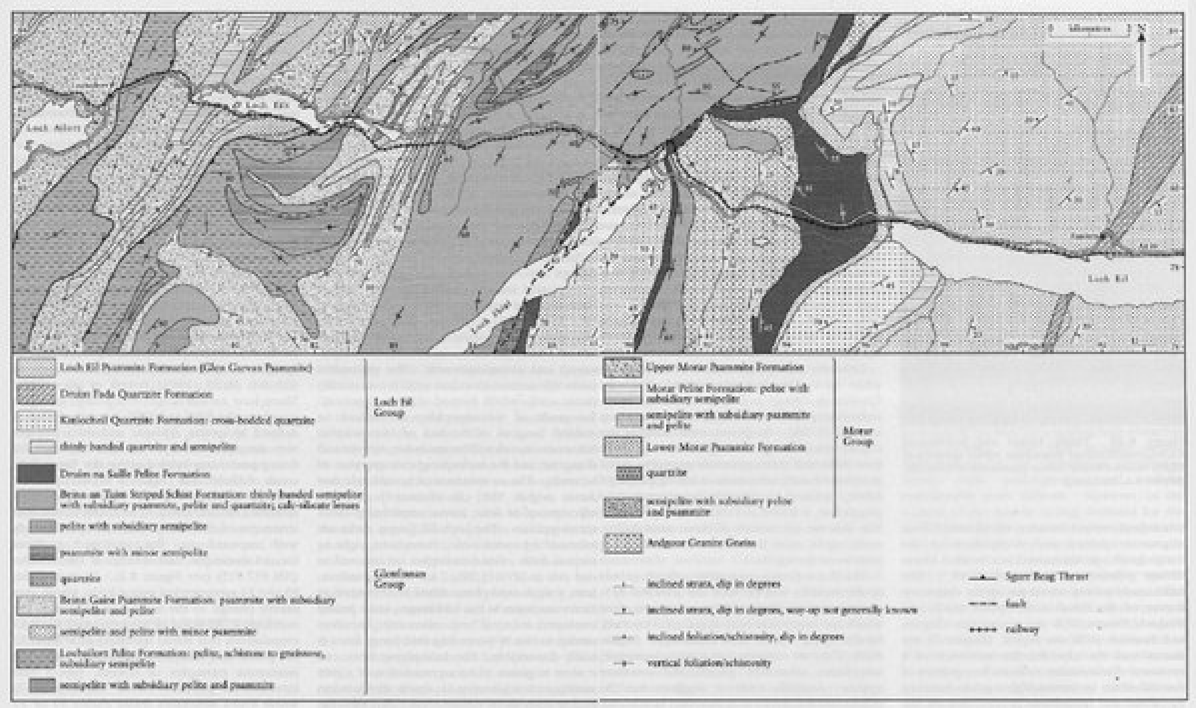
The age of the Sgurr Beag Thrust and its full history remain unclear. In northern Ross-shire, the Carn Chuinneag Granite Complex, whose intrusion is dated at *c.* 610–560 Ma (Strachan *et al.,* 2002a), contains a fabric assigned to D2 that appears also to be associated with displacement along the Sgurr Beag Thrust, suggesting the thrust is Caledonian in age (Wilson and Shepherd, 1979). The Sgurr Beag Thrust has thus been interpreted as a W-directed ductile thrust, which formed at an early stage (Early Ordovician?) of the Caledonian Orogeny (Powell *et al.,* 1981; Barr *et al.,* 1986). However, U-Pb TIMS titanite ages of 737 ± 5 Ma from 'syn-D2' amphibolite-facies assemblages near Lochailort imply that the Sgurr Beag Thrust is mainly a Knoydartian structure (Tanner and Evans, 2003).

The Glendessarry Syenite, which outcrops *c.* 10 km north of Glenfinnan, is dated by the U-Pb bulk zircon method at 456 ± 5 Ma (van Breemen *et al.,* 1979b). The syenite is deformed by F3 upright 'Steep Belt' folds (Roberts *et al.,* 1984), and thus the regional upright F3 and F4 folding of the Sgurr Beag Thrust must have occurred between *c.* 456 Ma and *c.* 440 Ma (the youngest ages obtained from the late pegmatite suite). Some models portray the deformation as generally propagating westwards, ultimately resulting in the formation of the Moine Thrust during the Early Silurian (Barr *et al.,* 1986). Crustal thickening was accompanied by amphibolite-facies metamorphism and melting of Moine metasediments at a slightly deeper structural level, resulting in formation of pegmatites. This was followed by the emplacement of the regional Microdiorite Sub-suite which partly overlapped intrusion of the Silurian-age Caledonian 'Newer Granite' suite (Smith, 1979).

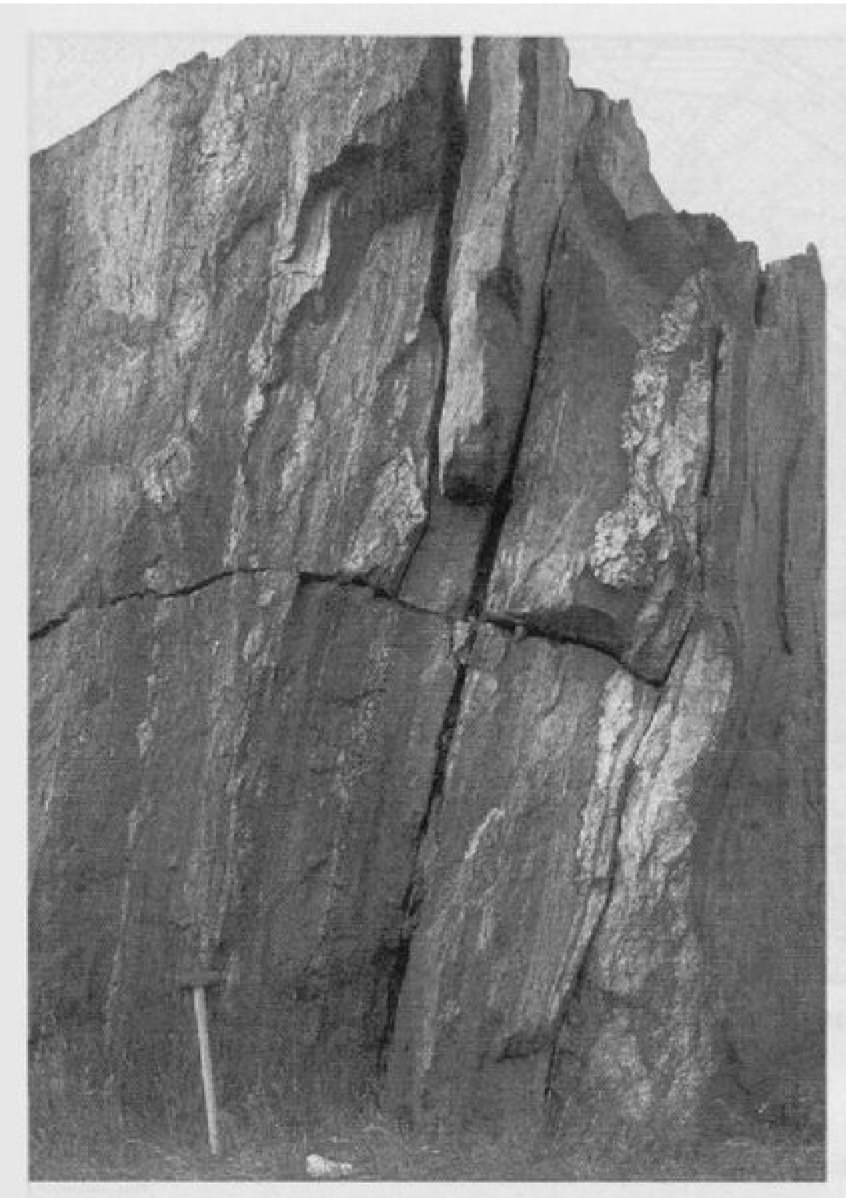
Conclusions

The Fassfern to Lochailort road cuttings are of national importance because they provide the most easily accessible and informative section across the Loch Eil, Glenfinnan and Morar groups of the Moine Supergroup. They include critical localities that have yielded invaluable isotopic data constraining the tectonometamorphic evolution of the Moine Supergroup, notably specimens of the Ardgour Granite Gneiss and members of the 'Morarian/ Knoydartian' pegmatite suite. These intrusive elements confirm that significant Neoproterozoic tectonothermal events occurred in the Moine succession between *c.* 870 Ma and *c.* 740 Ma. At Glenfinnan it seems that the *c.* 870 Ma age was associated with granite emplacement, deformation (D1 fabrics), metamorphism and migmatization. The tectonic setting of the events, in particular whether they represent orogenic activity or are the result of extension during sedimentary basin development, remains the subject of discussion. The D2 Sgurr Beag Thrust emplaced the Glenfinnan Group and the Loch Eil Group westwards onto the Morar Group. The age of the main movements on the thrust remains unclear; some evidence suggests it was mainly active during the Knoydartian at *c.* 740 Ma, whereas other evidence suggests it is a mainly Caledonian structure. Thrusting was followed by widespread upright, tight D3–D4 folding and formation of the 'Steep Belt' between *c.* 456 Ma and *c.* 440 Ma. Amphibolite-facies metamorphism and the generation of pegmatites accompanied this deformation. The rocks were subsequently intruded at a late stage in the Caledonian Orogeny (Mid-Silurian) by the regional Microdiorite Sub-suite and granite vein-complexes.

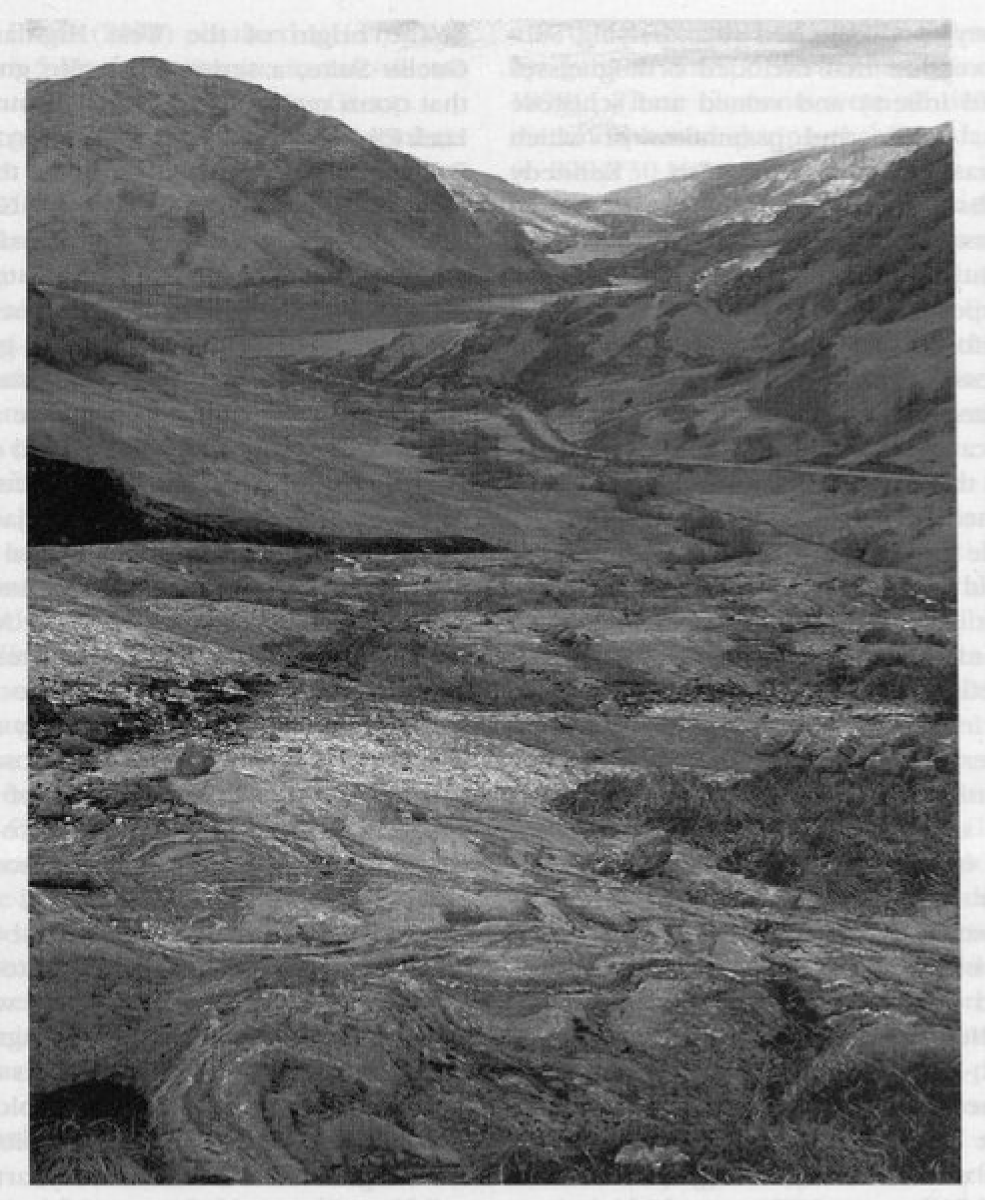
References



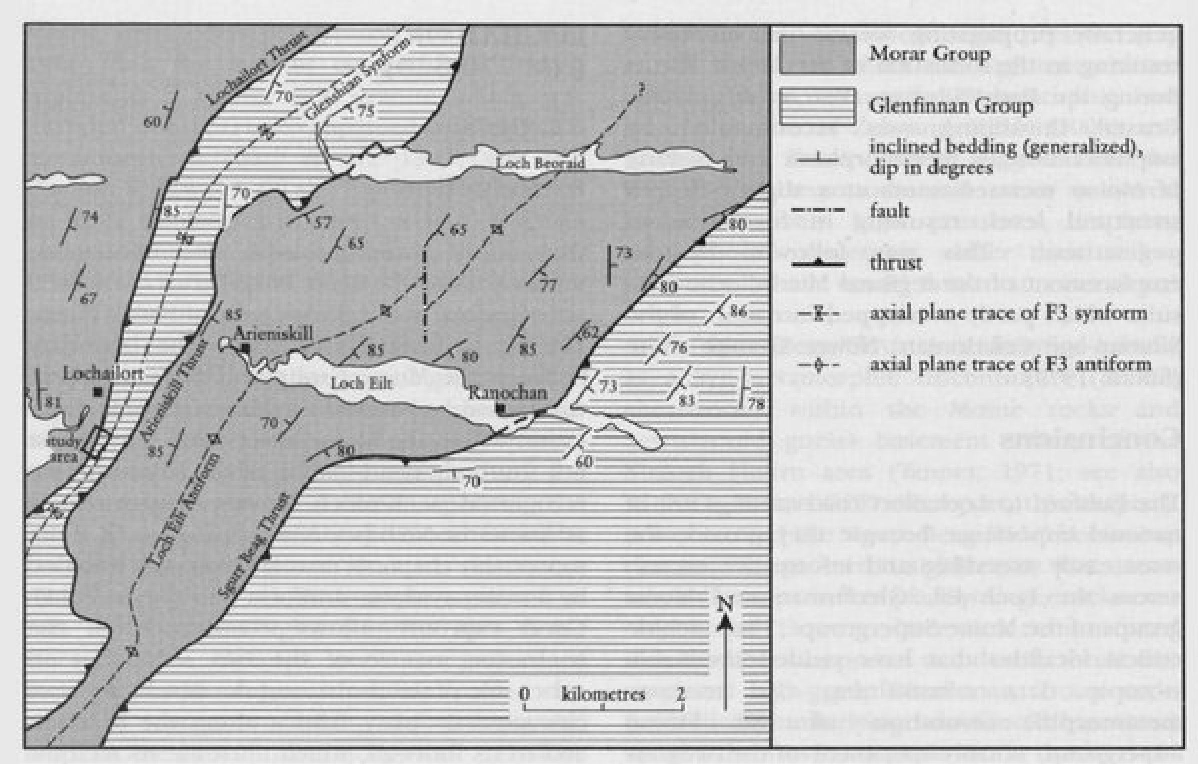
(Figure 8.19) Geology of the Fassfern to Lochailort region.



(Figure 8.20) Tightly folded and boudinaged Knoydartian/Morarian pegmatites within subvertical, highly strained Morar Group psammites at Loch Eilt. (Photo: R.A. Strachan.)



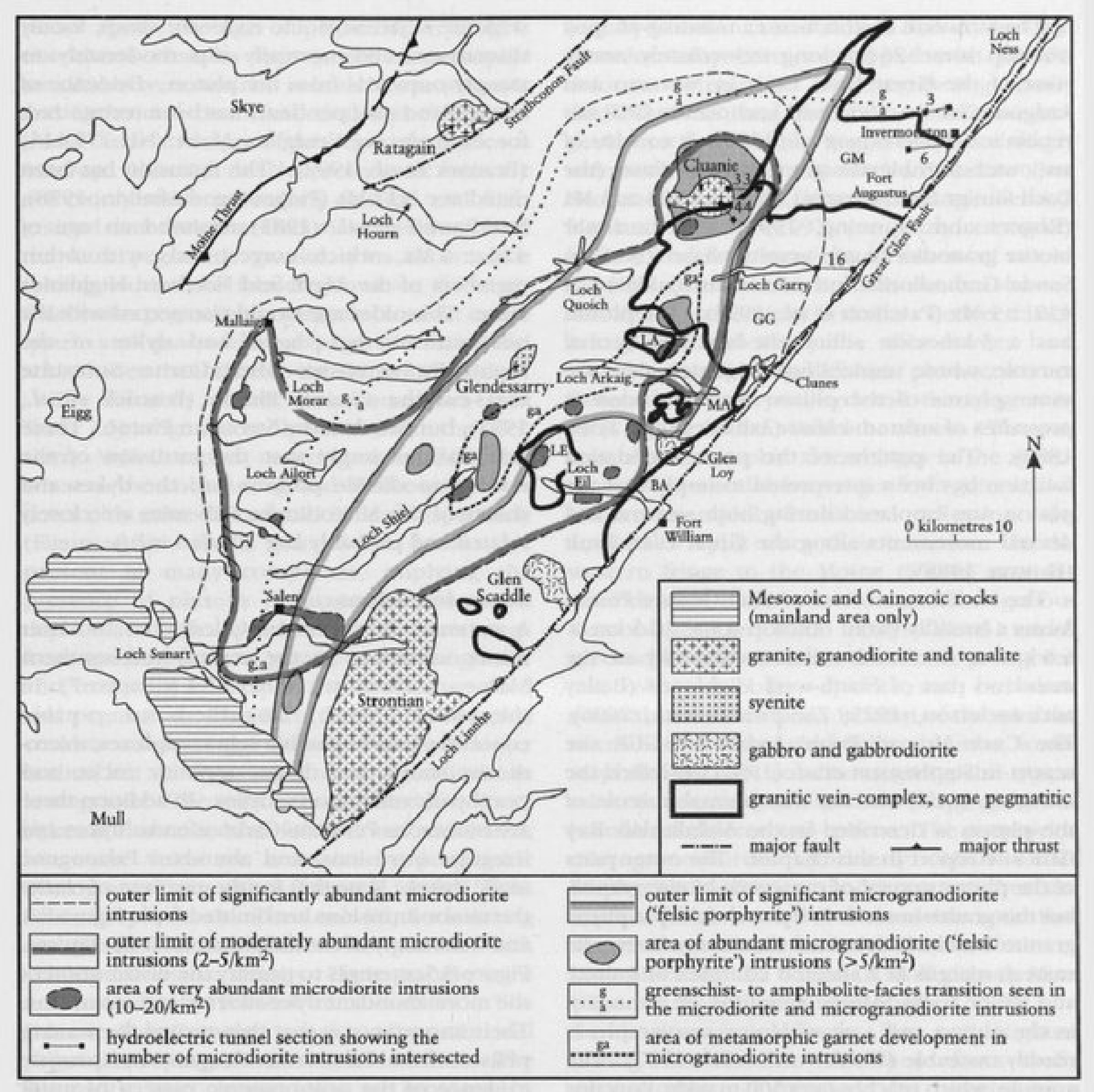
(Figure 8.2) View westwards to Loch Eilt from The Muidhe [NM 857 815]. In the foreground glaciated slabs show complex folded Glenfinnan Group pelitic and psammitic rocks cross-cut by thick pegmatitic veins that are themselves folded. The craggy and mainly grassy hills are typical of the 'Steep Belt'. (Photo: J.R. Mendum, British Geological Survey, reproduced with the permission of the director, British Geological Survey, © NERC.)



(Figure 8.21) Map of Lochailort-Loch Eilt area showing the regional structure. Note that the Lochailort, Arieniskill and Sgurr Beag thrusts are one and the same dislocation. After Baird (1982).

Ramsay, 1960, 1963		Barber and May, 1976		May *et al.*, 1993		Tobisch *et al.*, 1970	
Moine & Lewisianoid rocks: Glenelg–Arnisdale area		**Western unit of Glenelg–Attadale Lewisianoid inlier**		**Moine rocks of Killilan Forest (Sheet 72W, Kintail)**		**Moine rocks:– Glen Affric to Strathconon**	
		$D6_L$	Monoclinal folding.			Affric	Open to close, minor and medium-scale folding. Axial planes swing in strike from east in Glen Strathfarrar to NNE in Glen Affric and are subvertical or dip steeply south.
D4	Conjugate minor folds adjacent to Moine Thrust.	$D5_L$	Minor folding in Thrust Belt and Moine succession.				
		$D4_L$	Mylonitization and ESE-plunging lineation.				
D3	Open to tight major and minor folding. N-trending axial planes. Low plunge. Coaxial crenulations.			$D3_M$	Major folding with SE-plunging axes.	Monar	Open to tight major and minor folding on NE-trending axial planes. Related schistosity and crenulation cleavage. Axial plunge commonly to the south-west but locally variable.
						Orrin	Open to tight, rarely isoclinal, major and minor folding. Local axial-plane schistosity and segregations. Gently to steeply W- and SW-plunging axes and lineation. Confined to upper parts of Glens Cannich, Strathfarrar and Orrin.
			Growth of hornblende porphyroblasts.			Strathfarrar	Tight to isoclinal major folds. Axial planes strike north to north-west and axes dip steeply north and south. Confined to middle part of Glen Strathfarrar.
D2	Tight major and minor folding and penetrative axial-plane schistosity.	$D3_L$	SE-plunging folds and rodding.	$D2_M$	Reclined folding with ESE- to SE-trending mineral lineation and rodding. Major sliding and stacking of thrust sheets. Development of flaggy zones and mylonites in the west. Migmatization of the Boc Mor Psammite and formation of the quartz-biotite rock in some slide zones. Amphibolite-facies metamorphism.	Cannich	Tight to isoclinal major and minor folding. Penetrative axial-planar schistosity trends north-east and dips south-east. Axial plunges tend to be steep but are rather variable in orientation. Moderate south-west plunge is common. Amphibolite-facies metamorphism.
D1	Tight to isoclinal, major and minor folds. Interleaving of Lewisianoid and Moine rocks.	$D2_L$	NE-plunging minor folds and rodding abundant. Moderately SE-dipping axial-plane foliation.				
		$D1_L$	Interbanding of Moine and Lewisian.	$D1_M$	Minor isoclinal folding with axial-plane schistosity and rodding lineation. Amphibolite-facies metamorphism.	Pre-Cannich	Tight to isoclinal minor folding. Bedding-parallel schistosity. Intersection lineation. Amphibolite-facies metamorphism.

Deformation sequences in the Moine (Central) area. Note that the structural events do not correlate simply across different areas.



(Figure 8.5) Map showing the Caledonian major and minor intrusions. Granitic vein-complexes: Ba — Banavie; GG — Glen Garry; GM — Glen Moriston; LA — Loch Arkaig; LE — Loch Eil; MA — Maine.