

## Contents

<b>Preface</b>	vii		
<b>Acknowledgements</b>	viii		
<b>Chapter 1: Introduction</b>	<b>1</b>		
1.1 Background	1		
1.1.1 Wider significance of the Gairloch area	1		
1.1.2 Description of the study area	3		
1.1.3 Mapping history	3		
1.2 Summary of the Lewisian geology of the NW Scottish mainland	3		
1.2.1 Historical background to Lewisian chronology	3		
1.2.2 Subdivision of the mainland Lewisian outcrop	3		
1.2.3 The Scourian gneisses	4		
Origin of the gneisses	5		
1.2.4 Scourian deformation and metamorphism	6		
1.2.5 The Inverian event	6		
1.2.6 The Scourie dyke swarm	7		
1.2.7 The Loch Maree Group	7		
1.2.8 Laxfordian modifications and younger events	7		
The early Laxfordian	7		
The late Laxfordian	8		
1.3 Southern Region nomenclature	8		
<b>Chapter 2: The Early Stages - Scourian and Inverian</b>	<b>11</b>		
2.1 Petrography and distribution of the Archaean gneisses	11		
2.1.1 Quartzo-feldspathic biotite gneisses	11		
2.1.2 Hornblende gneisses	12		
2.1.3 Amphibolites of the 'early basic' suite	12		
2.2 Chemistry and origin	13		
2.2.1 Quartzo-feldspathic gneisses	13		
2.2.2 Amphibolites	14		
2.3 Structural chronology	14		
2.4 Scourian and Inverian structure	16		
2.4.1 Braigh Horrisdale	16		
2.4.2 Creag Mhor Thollaidh	17		
2.4.3 The Ialltaig block	18		
2.5 Metamorphism	18		
<b>Chapter 3: The Scourie Dyke Suite</b>	<b>21</b>		
3.1 Distribution and field relations	21		
3.1.1 SW of the LMG belt	21		
3.1.2 NE of the LMG belt	22		
3.2 Petrography	23		
3.3 Chemistry and origin	25		
<b>Chapter 4: The Loch Maree Group</b>	<b>29</b>		
4.1 Semipelites			
4.1.1 Distribution	29		
4.1.2 Petrography	29		
4.1.3 Geochemistry and origin	31		
4.1.4 Zircon age data	32		
4.2 Other metasediment types	32		
4.3 Carbonate (marble)	33		
4.3.1 Distribution and petrography	33		
4.3.2 Geochemistry	34		
4.4 Banded-iron-formation	34		
		4.4.1 Distribution and petrography	34
		4.4.2 Geochemistry	34
		4.4.3 Origin	35
		4.5 Graphitic pelite	35
		4.6 Quartz-chlorite schist	35
		4.6.1 Distribution and petrography	35
		4.6.2 Geochemistry and origin	36
		4.7 Garnet-biotite schist	36
		4.7.1 Distribution and petrography	36
		4.7.2 Geochemistry and origin	36
		4.8 Origin of the BIF-carbonate-graphitic pelite assemblage	38
		4.9 Amphibolites	38
		4.9.1 Distribution and petrography	38
		4.9.2 Geochemistry	40
		4.9.3 Origin	41
		4.10 Stratiform sulphide deposits within the Loch Maree Group	42
		4.11 Origin of the Loch Maree Group	44
		4.11.1 Semipelites	44
		4.11.2 Other metasediments	44
		4.11.3 Amphibolites	44
		<b>Chapter 5: Laxfordian Intrusive Rocks</b>	<b>45</b>
		5.1 The Ard-type gneisses	45
		5.1.1 Distribution and structural relationships	45
		5.1.2 Petrography	45
		5.1.3 Geochemistry	47
		5.1.4 Geochronology	47
		5.2 Granite sheets	47
		5.3 Granitoid pegmatites	47
		5.3.1 Distribution and petrography	47
		5.3.2 Geochemistry	48
		5.3.3 Geochronology	48
		<b>Chapter 6: Laxfordian Structure and Metamorphism</b>	<b>51</b>
		6.1 Introduction	51
		6.1.1 Structural overview	51
		6.1.2 Deformation phases and chronology	51
		6.1.3 Metamorphic conditions	51
		6.2 Early Laxfordian ( $D_1/D_2$ )	51
		6.2.1 Narrow marginal shear zones in Scourie dykes	51
		6.2.2 SW of the Loch Maree Group outcrop	52
		6.2.3 Supracrustal rocks of the Gairloch schist belt	52
		6.2.4 The NE limb of the Tollie antiform	54
		6.2.5 The western margin of the Creag Mhor Thollaidh block	55
		6.2.6 The Ard gneiss	56
		6.2.7 Relationship between $D_1$ and $D_2$	56
		6.2.8 Change in plunge of $L_2$ in the Ard gneiss outcrop	56
		6.3 Large-scale $D_2$ structure	56
		6.4 Late Laxfordian	57
		6.4.1 $D_3$ minor structures	57
		6.4.2 $D_3$ major structures	58
		The Tollie antiform and Gairloch shear zone	58
		The Mill na Claise fold	58
		6.4.3 $D_4$ structures	58
		6.5 Brittle-ductile shear zones	58
		6.5.1 Early ( $D_2$ ) mylonitic rocks	60
		6.5.2 $D_3$ mylonites associated with the Gairloch shear zone	60

6.5.3 Later movements in the zones	60	<b>Chapter 7: Tectonic Interpretation and Regional Significance</b>	<b>67</b>
6.6 Summary of Laxfordian tectonic history	61		
6.7 Faults	62		
6.7.1 Pre-Torridonian faults	65	7.1 The Archaean (Scourian)	67
The Flowerdale fault	65	7.2 The Inverian: earlier Palaeoproterozoic?	67
N–S thrusts.	65	7.3 The Scourie dyke swarm: events from <i>c.</i> 2.4 to <i>c.</i> 2.0 Ga?	67
N-trending strike-slip faults	65	7.4 The Laxfordian: later Palaeoproterozoic	68
NE-trending normal faults	65	7.4.1 The early Laxfordian: subduction–accretion–collision model	68
6.7.2 Post-Torridonian faults	65	7.4.2 Later Laxfordian structural history	70
The Loch Maree fault	65	7.4.3 Post-D <sub>3</sub> tectonic history	70
NE-trending normal faults	65	7.5 Palaeoproterozoic belts of the North Atlantic region	70
		<b>References</b>	<b>73</b>