

Marine Nature Conservation Review

Sectors 15 and 3

Sealochs in north-west Scotland

Area summaries

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with additional text by

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Contents

Preface	5
Synopsis	7
Introduction	9
Background	9
Data collection and the classification of biotopes.....	11
Area summaries and their format.....	12
Acknowledgements.....	14
References.....	15
Area summaries	
1. Kentra Bay	19
2. Loch Moidart	25
3. Loch Ailort	33
4. Loch nan Uamh	41
5. Loch nan Ceall	47
6. Loch Nevis	53
7. Loch Hourn	59
8. Loch Alsh, Loch Duich and Loch Long	65
9. Lochs Eishort and Slapin	81
10. Loch Scavaig and Soay Sound	87
11. Loch Brittle	91
12. Loch Eynort	97
13. Lochs Bracadale and Harport	101
14. Loch Pooltiel	111
15. Lochs Dunvegan and Bay	115
16. Lochs Greshornish and Snizort Beag	123
17. Uig Bay	131
18. Loch Portree	135
19. Loch Sligachan	141
20. Loch Ainort	145
21. Lochs Carron and Kishorn	149
22. Lochs Torridon and Shildaig	159
23. Loch Gairloch	167
24. Loch Ewe	177
25. Little Loch Broom	189

26.	Loch Broom	197
27.	Loch Inver	205
28.	Lochs a' Chàirn Bhàin, Glendhu and Glencoul	209
29.	Lochs Laxford and Dùghaill	217
30.	Loch Inchard	227
31.	Loch Eriboll	233
Appendix A.	Biotopes classification	243
Appendix B.	Biotopes recorded in each area	256
Appendix C.	Species recorded	265

Coasts and seas of the United Kingdom

Marine Nature Conservation Review series

Area summaries

Preface

The *Marine Nature Conservation Review* (MNCR) was initiated by the Nature Conservancy Council in 1987 as the third major resource survey, following the *Nature Conservation Review* and the *Geological Conservation Review*. Since April 1991, the MNCR has been undertaken within the Support Unit of the Joint Nature Conservation Committee (JNCC). The JNCC is a forum through which the three country agencies, the Countryside Council for Wales, English Nature and Scottish Natural Heritage, deliver their special statutory responsibilities for Great Britain as a whole and internationally. These special responsibilities, known as special functions, contribute to sustaining and enriching biological diversity, enhancing geological features and sustaining natural systems.

The MNCR has drawn together information on marine ecosystems around Great Britain with the objectives of:

- extending our knowledge of benthic marine habitats, communities and species in Great Britain, particularly through description of their characteristics, distribution and extent; and
- identifying sites of nature conservation importance.

The data collected also provide information to support more general measures to minimise adverse effects of development and pollution, particularly on sites and species of nature conservation importance.

The area included in the MNCR is the coastline of England, Scotland and Wales (excluding the Isle of Man and the Channel Isles), extending on the shore from the lower limit of terrestrial flowering plants and within marine inlets from the limit of marine influence out to the limit of British territorial seas. Saline lagoons are also included. The MNCR included a major field survey programme of the shores and near-shore sublittoral zone, undertaken to standard methodology.

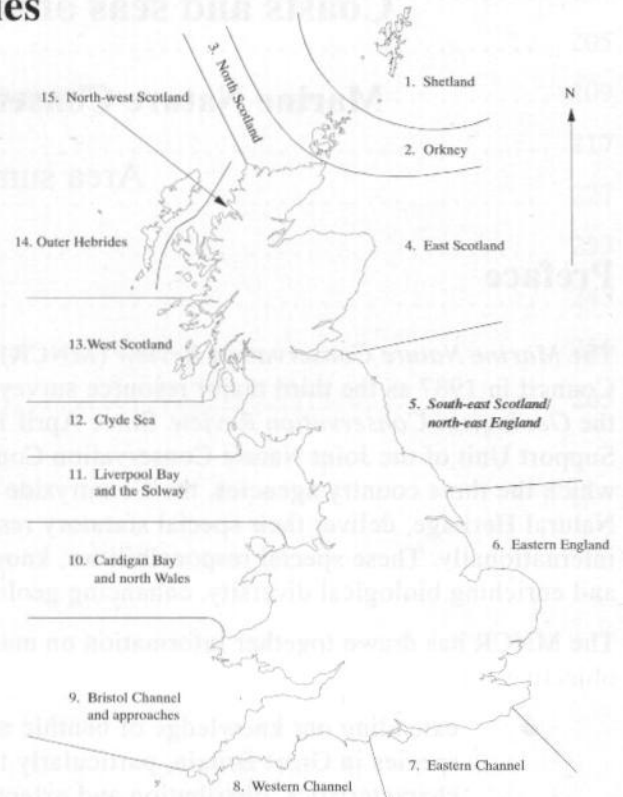
MNCR studies have been undertaken within particular coastal sectors around Britain (see map overleaf) or of major physiographic types, such as lagoons and sealochs. These studies are being presented, in the *Coasts and seas of the United Kingdom – MNCR series*, as *area summaries*, each of which provides an account of a discrete stretch of open coast, a marine inlet or a lagoon within the area of study. A list of *area summary* volumes and other major publications from the MNCR is given overleaf.

A full list of MNCR and other JNCC marine reports is available from the Marine Information Officer, JNCC, or at JNCC's website www.jncc.gov.uk/marine. JNCC publications can be purchased from NHBS Ltd, 2-3 Wills Road, Totnes, Devon, TQ9 5XN (tel. 01803 865913; fax. 01803 865280; e-mail nhbs@nhbs.co.uk). JNCC reports are available directly from JNCC (tel. 01733 562626; fax. 01733 555948).

David Connor
Joint Nature Conservation Committee

Publications in the MNCR series

MNCR coastal sectors, as used in the *Coasts and seas of the United Kingdom – MNCR series*.



Volumes published or near publication:

Sector	Title	Authors	Date
<i>Foundation volumes</i>			
1–15	Rationale and methods	Hiscock, ed.	1996
1–15	Benthic marine ecosystems of Great Britain and the north-east Atlantic	Hiscock, ed.	1998
<i>Biotope classification</i>			
1–15	Marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes (JNCC Report, No. 229)	Connor, Brazier, Hill & Northen	1997
1–15	Marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes (JNCC Report, No. 230)	Connor, Dalkin, Hill, Holt & Sanderson	1997
<i>Area summaries</i>			
1	Shetland	Howson	1999
1–2	Lagoons in Shetland and Orkney	Thorpe	1998
2	Orkney	Murray, Dalkin, Fortune & Begg	1999
3, 4, 12, 13, 15	Lagoons in mainland Scotland and the Inner Hebrides	Covey, Fortune, Nichols & Thorpe	1998
5	South-east Scotland and north-east England	Brazier, Davies, Holt & Murray	1998
6	Inlets in eastern England	Hill, Emblow & Northen	1996
8	Inlets in the western English Channel	Moore, Smith & Northen	1999
9	Inlets in the Bristol Channel and approaches	Moore, Smith, Northen & Little	1998
10	Cardigan Bay and north Wales	Brazier, Holt, Murray & Nichols	1999
11	Liverpool Bay and the Solway Firth	Covey	1998
12	Sealochs in the Clyde Sea	Dipper & Beaver	1999
13	Sealochs in west Scotland	Dipper, Howson & Steele	Duc 2006
14	Lagoons in the Outer Hebrides	Thorpe, Dalkin, Fortune & Nichols	1998
14	Sealochs in the Outer Hebrides	Beaver & Dipper	2002
15	Sealochs in north-west Scotland	Dipper & Johnston	2005

Marine Nature Conservation Review

Sectors 15 and 3

Sealochs in north-west Scotland

Area summaries

Synopsis

The sealochs of north-west Scotland (MNCR Sector 15), together with one sealoch in north Scotland (MNCR Sector 3), have been studied as part of the Marine Nature Conservation Review programme. Between 1988 and 1990, the studies included field surveys of the shores and the sublittoral zone to describe the habitats and communities (together referred to as biotopes) present and to assess their marine natural heritage importance. Comparable data from other organisations or previous studies have been added to provide information on 1,108 sites, and the data analysed to classify the biotopes present. Information on the designated nature conservation sites and main human influences in the sealochs has also been compiled.

The information is presented here as 31 *area summaries*:

- | | |
|--|---|
| 1. Kentra Bay | 17. Uig Bay |
| 2. Loch Moidart | 18. Loch Portree |
| 3. Loch Ailort | 19. Loch Sligachan |
| 4. Loch nan Uamh | 20. Loch Ainort |
| 5. Loch nan Ceall | 21. Lochs Carron and Kishorn |
| 6. Loch Nevis | 22. Lochs Torridon and Shieldaig |
| 7. Loch Hourn | 23. Loch Gairloch |
| 8. Loch Alsh, Loch Duich and Loch Long | 24. Loch Ewe |
| 9. Lochs Eishort and Slapin | 25. Little Loch Broom |
| 10. Loch Scavaig and Soay Sound | 26. Loch Broom |
| 11. Loch Brittle | 27. Loch Inver |
| 12. Loch Eynort | 28. Lochs a' Chàirn Bhàin, Glendhu and Glencoul |
| 13. Lochs Bracadale and Harport | 29. Lochs Laxford and Dùghaill |
| 14. Loch Pooltiel | 30. Loch Inchard |
| 15. Lochs Dunvegan and Bay | 31. Loch Eriboll |
| 16. Lochs Greshornish and Snizort Beag | |

Each area is described in a standard format, giving details of its physical and biological character, the biotopes present and their distribution, current nature conservation designations, the main human influences and relevant literature. The areas surveyed and the marine biotope information are also presented in a series of maps. These *area summaries* are supported by a summary of the biotopes defined for sealochs in the Sectors (from Connor *et al.* 1997a, b) and by a list of species recorded from the surveys.

References

- Connor, D.W., Brazier, D.P., Hill, T.O. & Northen, K.O. 1997a. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes. Version 97.06. *JNCC Report*, No. 229.

Connor, D.W., Dalkin, M.J., Hill, T.O., Holt, R.H.F. & Sanderson, W.G. 1997b. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes. Version 97.06. JNCC Report, No. 230.

Sealochs in north-west Scotland

Area summaries

Synopsis

The information presented here is a summary of the marine biotope classification for the sublittoral zone in north-west Scotland (MNCR Sector 3). It is based on the Marine Nature Conservation Review programme between 1988 and 1991. The biotopes listed in this summary are those identified in the field and laboratory studies. The biotope classification is based on the results of the field and laboratory studies. The biotope classification is based on the results of the field and laboratory studies. The biotope classification is based on the results of the field and laboratory studies.

Table with multiple columns and rows, containing detailed biotope classification information. The text is very faint and difficult to read, but appears to be a list of biotope types and their characteristics.

Introduction

Background

The coast of north-west Scotland, from the Point of Ardnamurchan to Cape Wrath (MNCR Sector 15) is remote, rugged, and highly dissected by a series of sealochs, with the Inner Hebridean islands of Skye, Raasay and the Small Isles (Canna, Rum, Eigg and Muck) lying offshore (Figure 1). Despite being sheltered from the full force of Atlantic swells by the Outer Hebrides, much of the open coast is fairly exposed to wave action, especially at the northern and southern ends of the Minch. In contrast, many of the sealochs are protected by sills or narrows and exhibit a typical exposure gradient from exposed at the mouth to very sheltered at the head, while the narrows and sounds can generate strong tidal streams, providing further diversity of habitats. The majority of the sealochs have been classified as fjordic, with some being open sealochs. There are few fjordic sealochs in Sector 15, but the Loch Laxford complex is an example of this type.

Most studies of the benthic marine biology of north-west Scotland were initiated under the auspices of the Nature Conservancy Council (Connor & Little 1998), and, mainly as a result of MNCR surveys, the sealochs have generally been better studied than the open coast. A single sealoch, Loch Eriboll, in north Scotland (MNCR Sector 3), is included in the present volume.

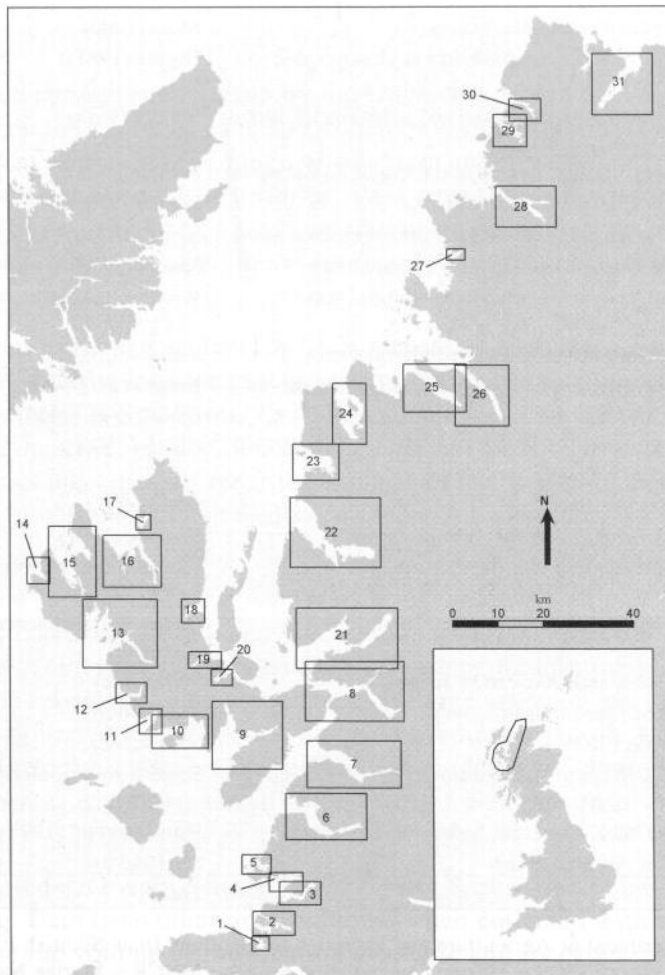


Figure 1 Location of the 31 sealoch areas in MNCR Sectors 15 and 3 described in *area summaries* in the present volume. Some systems covered by a single *area summary* include more than one sealoch.

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Table 1 Sources of field survey information

MNCR database survey no.	Survey	Source	No. of sites	No. of habitats surveyed
2	1988 MNCR Skye sealochs survey	Hiscock & Covey (1991)	65	119
3	1988 MNCR Lochs Duich, Long and Alsh survey	Connor (1989)	52	176
18	1988 MNCR Loch Nevis sublittoral survey	MNCR survey	8	20
24	1988 UMBSM Lochs a' Chàirn Bhàin, Glencoul & Glendhu survey	Davies (1989)	33	87
27	1989 UMBSM Arisaig and Moidart sealochs survey	Howson (1990)	69	166
30	1990 UMBSM Loch Gairloch and Loch Ewe survey	Howson (1991)	96	182
33	1991 MNCR Loch Bracadale (Skye) survey	MNCR survey	21	93
34	1991 MNCR Loch Laxford and Inchard littoral survey	Holt (1991)	13	81
35	1991 UMBSM Lochs Laxford, Inchard, Broom and Little Loch Broom survey	Holt (1991)	65	154
44	1985-87 Green north Skye sublittoral survey	Green & Green (1987)	5	5
45	1990 MNCR/UMBSM Loch Nevis survey	MNCR survey	5	8
51	1980 UCS south Skye sublittoral survey	Dipper (1981b)	16	16
52	1988 Seasearch: Skye sealochs sublittoral survey	Holt (1988)	82	94
53	1985 Smith Loch Torridon and Loch Carron survey	Smith & Hiscock (1985)	88	88
54	1988 Seasearch: Loch Broom and Little Loch Broom sublittoral survey	Gubbay & Nunn (1988)	47	47
55	1984 Smith west Sutherland survey	Smith (1985)	37	37
56	1986 MCS Loch Eriboll sublittoral survey	Moss (1986)	29	68
63	1970s Ridley north-west Scotland sublittoral photographic survey	Dipper (1981a)	3	3
83	1979-1980 Smith west Inverness-shire and north Argyll littoral survey	Smith (1981a)	11	11
84	1978 Smith west Inverness-shire and north Argyll littoral survey	Smith (1978a)	6	6
86	1978 Smith Wester Ross littoral survey	Smith (1978b)	19	19
88	1979 Smith west Sutherland and Coigach littoral mollusc survey	Smith (1981b)	5	5
89	1974 University of Dundee Loch Eriboll littoral survey	Jones (1975b)	12	12
95	1987 Heriot-Watt University Loch Moidart littoral survey	Wilkinson & Scanlan (1987)	4	4
96	1974 University of Dundee Loch Inchard littoral survey	Jones (1975a)	9	10
135	1984 Queen's University Loch Nevis and Loch Hourm survey	Breen <i>et al.</i> (1986)	35	35
265	1970-80 SMBA/MBA Great Britain intertidal survey	Powell <i>et al.</i> (1980)	41	41
283	1989 Seasearch: Gruinard Bay, Loch Ewe and Loch Gairloch survey	Gubbay (1990)	67	130
290	1991 Scott Skye bridge survey	Scott (1991)	6	6
294	1991 MNCR Loch Long (Lochalsh) littoral survey	Hiscock (1991)	5	5
326	1965-70 DAFS Scottish littoral sediment survey	Eleftheriou & McIntyre (1976)	7	67
637	1995 BioMar Arisaig maerl beds survey	Davies & Hall-Spencer (1996)	5	5
650	1995 SNH Lochs Alsh and Duich ROV survey	SNH survey	20	23
652	1996 SNH outer Loch Hourm ROV survey	SNH survey	4	7
654	1996 SNH Loch Ailort ROV survey	SNH survey	11	13
731	1997 SNH Kyle Rhea, Loch Alsh and Loch Duich ROV survey	Scottish Natural Heritage (1999)	18	28
761	1996 Entec Lochs Duich, Long and Aish mapping survey	Johnston <i>et al.</i> (1997)	85	216
765	1998 SNH Sound of Arisaig survey	SNH survey	3	3
Total			1,108	2,090

Abbreviations: DAFS = Department of Agriculture and Fisheries for Scotland (now Scottish Executive Fisheries Research Services); MCS = Marine Conservation Society; MNCR = Marine Nature Conservation Review (JNCC); ROV = remotely operated vehicle; SMBA/MBA = Scottish Marine Biological Association/Marine Biological Association Intertidal Survey Unit; SNH = Scottish Natural Heritage; UMBSM = University Marine Biological Station, Millport; UCS = Underwater Conservation Society (now Marine Conservation Society).

More recent studies for Scottish Natural Heritage have focused on candidate Special Areas of Conservation (cSACs), designed under the European Union (EU) Habitats Directive. The deep fjordic sealochs typical of north-west Scotland do not feature as stand-alone in the list of Annex I habitats for which SACs can be selected. However, Lochs Alsh, Duich and Long are a marine cSAC for their 'reefs' (Scottish Natural Heritage 1999), while Lochs Moidart, Ailort and nan Uamh adjoin the Sound of Arisaig (Loch Ailort to Loch Ceann Traigh) cSAC, selected to represent 'sandbanks which are slightly covered by seawater all the time' (Brown *et al.* 1997) and, more recently, Loch Laxford has been selected as a 'long shallow inlet and bay'. The present volume does not include lagoons which occur within some sealoch systems; these are described by Covey *et al.* (1998).

Data collection and the classification of biotopes

Field surveys of the shores and the sublittoral zone of the sealochs were undertaken between 1988 and 1990 by the University Marine Biological Station, Millport as part of a major study of sealochs in Scotland for the MNCR (Howson *et al.* 1994). The surveys aimed to describe the habitats and communities (together referred to as biotopes) present and to assess their natural heritage importance. These surveys complemented other studies carried out previously or by other organisations, including the Department of Agriculture and Fisheries for Scotland, the Marine Conservation Society, Dundee University and Scottish Natural Heritage. A summary of these surveys is given in Table 1. Further references to other studies are given in the individual *area summary* accounts.

During the MNCR field surveys, undertaken by the University Marine Biological Station, Millport, information on the nature of each site, together with its biotopes, was collected. Sites were selected in order to sample a wide range of substrata and different environmental conditions in a broad geographical spread, such as differing wave exposure and salinity regimes in both the littoral and sublittoral zones. Sublittoral hard substrata were particularly well represented. Photographs were taken of the sites, and their biotopes and species, to provide a permanent visual record of the areas surveyed.

The sites were surveyed following standard MNCR recording and infaunal-sampling techniques (Connor & Hiscock 1996). The location and physiographic characteristics of each site were recorded on a standard MNCR Site Form. The physical details of each habitat and the species present were recorded on standard MNCR Habitat Forms (Littoral or Sublittoral as appropriate). The conspicuous species present were recorded using the MNCR semi-quantitative abundance scales. Species which could not be identified *in situ* were collected for later identification in the laboratory.

Core samples of littoral sediment habitats were taken for infaunal species identification. Four 0.01 m² core samples were taken and sieved over a 0.5 mm mesh sieve. Material retained on the sieve from all four cores was combined and preserved in seawater-formalin for subsequent identification and enumeration of the species present. Abundances of large infaunal species were estimated after digging over areas of sediment with a spade. A separate sediment sample was taken for granulometric analysis. In the sublittoral most MNCR samples were obtained using an anchor dredge and subsequently washed out, sieved and preserved. Samples from external sources were obtained using a variety of grabs, such as the Day or van Veen.

Once fully processed, the data were entered into the MNCR database to facilitate subsequent analysis and reporting. Data from other organisations, when collected with compatible techniques, were added to increase the volume of information available and its geographical coverage.

The species data from the surveys were analysed, in conjunction with their associated habitat data, to identify which biotopes, as defined in the MNCR national biotope classification (Connor *et al.* 1997a, b), were present in the dataset. Multivariate analytical techniques, including TWINSpan and DECORANA, were employed to facilitate the identification of distinct assemblages of species within the dataset, using the procedures given in Mills (1994). Data from 1,108 sites (2,090

different habitat or station records) from sealochs in MNCR Sectors 3 and 15 were used in the analyses, resulting in the identification of 192 biotopes or sub-biotopes from the national classification (Appendix A). Full descriptions of each biotope and the general approach to biotope classification are given in Connor *et al.* (1997a, b). Appendix B shows the distribution of biotopes in each area. Species recorded from the surveys listed in Table 1 are given in Appendix C. Note that not all species recorded by some non-MNCR surveys may be included.

Area summaries and their format

The sealochs of MNCR Sectors 15 and 3 (see Figure 1) are described in the standard MNCR *area summary* format. The 31 *area summaries* are:

- | | |
|--|---|
| 1. Kentra Bay | 17. Uig Bay |
| 2. Loch Moidart | 18. Loch Portree |
| 3. Loch Ailort | 19. Loch Sligachan |
| 4. Loch nan Uamh | 20. Loch Ainort |
| 5. Loch nan Ceall | 21. Lochs Carron and Kishorn |
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| 14. Loch Pooltiel | 30. Loch Inchard |
| 15. Lochs Dunvegan and Bay | 31. Loch Eriboll |
| 16. Lochs Greshornish and Snizort Beag | |

Each *area summary* contains the following sections:

Location

The geographic location is given as the central Ordnance Survey grid reference and latitude/longitude, together with the local government administrative area (Highland) and nature conservation agency and area (Scottish Natural Heritage, North Areas). A location map shows the main features and bathymetry of the area, key place names and the limits of the area considered by the *area summary*. Place names are taken from the Ordnance Survey 1:50,000 scale second series Landranger maps. The sites surveyed are shown according to four main types of survey:

- ▲ recording on littoral rock/hard substrata
- recording on sublittoral rock/hard substrata
- △ sampling by cores in littoral sediment
- sampling by cores or grab in sublittoral sediment.

Physical features

A summary of the main physical features includes:

- | | |
|--------------------------------|--|
| <i>Physiographic type</i> | As defined in Connor & Hiscock (1996). |
| <i>Maximum length of coast</i> | Measured using GIS from a 1:25,000 Ordnance Survey coastline |

<i>Length and area of inlet</i>	Measured using GIS from a 1:25,000 Ordnance Survey coastline. Inlets are measured from the mouth of the inlet to the limit of tidal influence.
<i>Bathymetry</i>	The maximum depth below chart datum, taken from Edwards & Sharples (1986).
<i>Wave exposure</i>	Taken from field observations, as defined in Connor & Hiscock (1996) and from Admiralty charts.
<i>Tidal streams</i>	Taken from field observations and tidal streams atlas, as defined in Connor & Hiscock (1996) (1 knot @ 0.5 m/s).
<i>Tidal range</i>	Figures for mean spring and mean neap tidal range, quoted for the nearest secondary port, and based on Admiralty tide tables and charts.
<i>Salinity</i>	The salinity range, as categorised in Connor & Hiscock (1996), as estimated at the time of survey (based on the species present and their known salinity tolerances and the presence of freshwater sources) or as given in available literature.

All heights and depths given are corrected to chart datum.

Introduction

The overall physical characteristics of the area and significant human influences and activities are described.

Marine biology

A table lists marine biological surveys of the shores and sublittoral which have been used in compiling the *area summary*, including the survey type (littoral/sublittoral), survey method, date(s) of survey and reference source (MNCR database survey number in the case of unpublished MNCR data). The distribution of survey sites is shown on the location map, and sites are listed at the end of each *area summary*.

The marine biological nature of the area is described with reference to the biotopes present and their distribution within the area, based primarily on the findings of the most recent MNCR survey but with reference to previous studies where appropriate. Heights and depths noted in the text are corrected to lowest tide level (chart datum). The biotope codes given in parentheses are from the MNCR national classification, as listed in Appendix A; a summary of biotopes recorded within each area is presented in Appendix B. Marine species nomenclature follows Howson & Picton (1997); that for lichens follows Purvis *et al.* (1992); and that for higher plants follows Stace (1991).

A map assembled with the aid of a Geographical Information System illustrates the distribution of the main biotopes and biotope complexes within the area; some mapped areas represent more than one biotope. To aid interpretation of these maps, the reader is directed to a generic pull-out key inside the back cover.

NOTE: the biotope maps give an indication of the *likely* distribution and extent of biotopes, based on the data available, including sketch maps of biotope distribution made at the time of survey, cited literature and information on Admiralty charts. In some areas data are sparse and additional data or more comprehensive survey would enable more accurate maps to be drawn. This applies especially to the littoral zone in most of the lochs.

Nature conservation

A summary of statutory and non-statutory wildlife and landscape conservation designations for the marine and coastal parts of the area is given (from Barne *et al.* 1996, 1997, where further information on the types of designation can be found, and from Scottish Natural Heritage information).

Key to abbreviations used: (c = candidate; p = proposed):

AGLV	Area of Great Landscape Value (regional landscape designation)
GCR	Geological Conservation Review site
JMT	John Muir Trust
MCA	Marine Consultation Area
MoD	Ministry of Defence
NCR	Nature Conservation Review site
NNR	National Nature Reserve
NSA	National Scenic Area
NTS	National Trust for Scotland
RSA	Regional Scenic Area (regional landscape designation)
RSPB	Royal Society for the Protection of Birds nature reserve
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWT	Scottish Wildlife Trust nature reserve
WT	Woodland Trust

Human influences

This section describes some of the main uses and activities of the area, including urbanisation, and industrial or commercial activities that have (or potentially have) an impact on the area. These can include sewage discharges, industrial effluent, development, dredging, spoil-dumping, fishing, aquaculture, recreation and shipping. Although as accurate as possible at the time of writing, readers should be aware that further developments, particularly improvements to sewage treatment and disposal, and changes in the number and location of mariculture installations, are likely to have occurred since. Further details of human influences are given in Barne *et al.* (1996, 1997).

References and further reading

This lists cited references and other relevant literature and information sources.

Sites surveyed

This lists the sites surveyed within the area from the surveys shown in Table 1, with additional information on the location of each site (OS grid reference and latitude/longitude), and an inventory of biotopes known to be present at the time of survey.

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(UMBSM), Ken Cameron (UMBSM), Nikki Chapman, David Connor, Dominic Counsell, Roger Covey, Jon Davies, L. Mark Davies, Ian Dixon (UMBSM), Philip Dixon-Smith, David Donnan, Chris Emblow, Clare Eno, Sarah Fowler, Ian Fuller, Robert Hillier, Keith Hiscock, Sue Hiscock (Scott), Rohan Holt, Steve Howard (Independent surveyor), Christine Howson (UMBSM), Robert Irving (Independent surveyor), Charlotte Johnston, Dan Laffoley, Chris Lumb, Christine Maggs (Queens University, Belfast), Dave Mills, Jon Moore (Independent surveyor), Colin Munro (UMBSM), Thom Nickell (UMBSM), Bernard Picton (Ulster Museum), Jane Picton (Independent surveyor), Anna-Maria Rossolini (UMBSM), Dale Rostron (SubSea Survey), Barbara Smith, Philip Smith (University of Glasgow), Lucy Stone, Ian Strachan, Joy Sturtevant (UMBSM), Peter Taylor (Independent surveyor), Valerie Wilson.

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1

Kentra Bay

Location

Position (centre)	NM 640 692	56°45.2'N 05°51.6'W
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North Areas

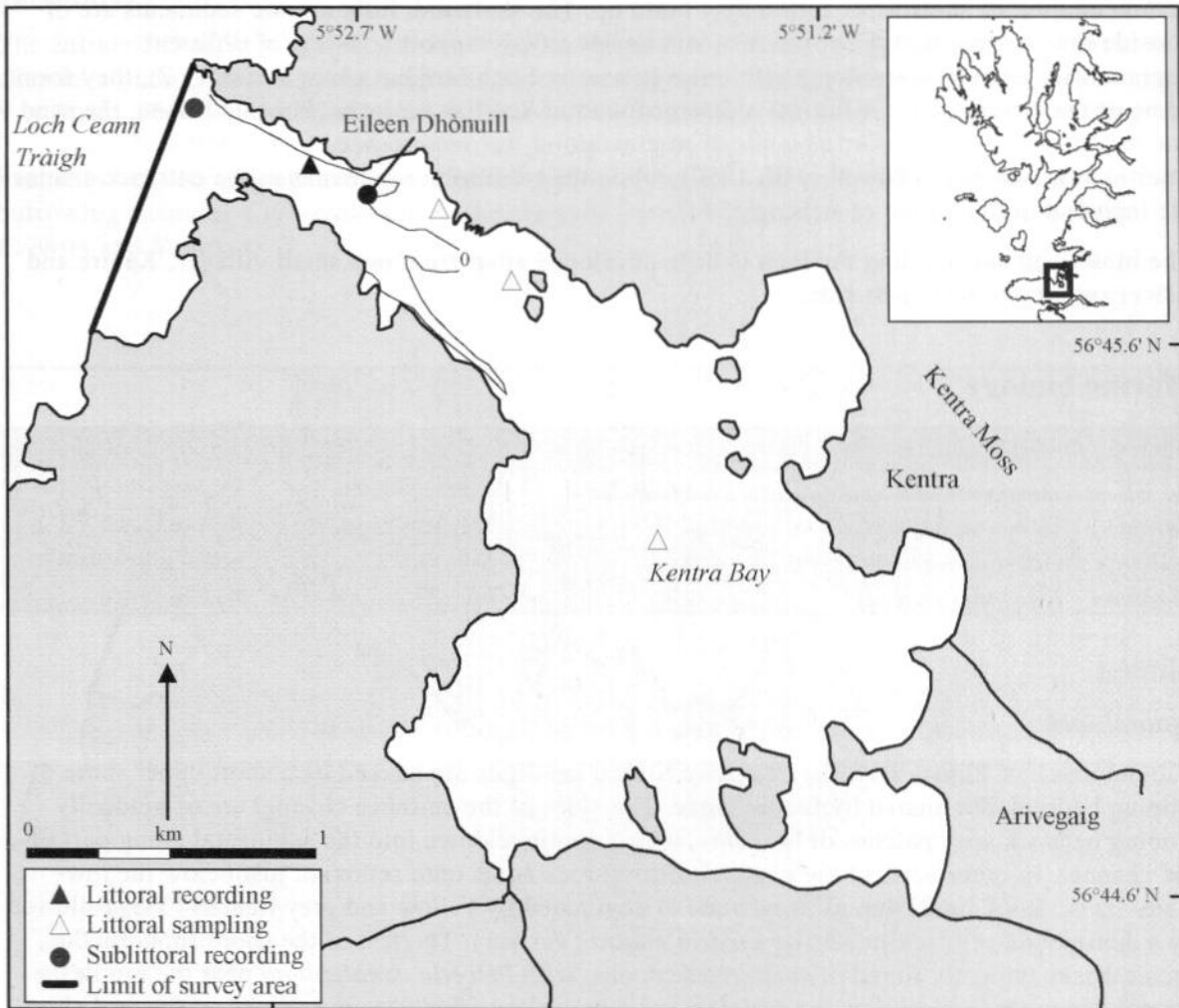


Figure 1.1 Main features of the area, showing sites surveyed.

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Physical features

Physiographic type	Embayment
Length of coast	15.2 km (18.4 km including islands)
Length of inlet	3.35 km
Area of inlet	3.4 km ² (3.3 km ² excluding islands)
Bathymetry	Predominantly intertidal; entrance channel maximum 3 m depth
Wave exposure	Very sheltered
Tidal streams	Moderately strong in entrance channel
Tidal range	4.3 m (mean springs); 1.9 m (mean neaps) (Loch Moidart)
Salinity	Fully marine; may be variable in channel at low tide

Introduction

Kentra Bay lies in the Moidart area to the north-east of the Ardnamurchan peninsula. It is an enclosed area of littoral sediments with a narrow channel, experiencing moderate tidal streams, connecting it to Loch Ceann Tràigh, an open bay off the Sound of Arisaig. Kentra Bay is wide and shallow with an indented and convoluted coastline; 82% of the loch, the highest percentage for any Scottish sealoch, is intertidal. The surrounding area is hilly apart from the east side which is flat and backed by Kentra Moss, a raised bog. Terrestrial vegetation fringes the high water mark, and fucoïd-covered low rocky areas are present around the edges. The enclosed nature of Kentra Bay means that it is almost entirely sheltered from wave action, although because of its size, a certain amount of short wave action may build up. The sheltered, fully marine sediments are of considerable marine biological interest both because they support a variety of different communities and because, along with those in nearby Loch Moidart (*Area summary 2*), they form some of the largest areas of littoral sediment found in Scottish sealochs. For this reason, the sand and mud flats were identified as a site of marine biological importance by the SMBA/MBA Intertidal Survey Unit (Powell *et al.* 1980), while the sublittoral sandbanks in the entrance channel are included in the Sound of Arisaig cSAC.

The hinterland surrounding the loch is little developed apart from two small villages, Kentra and Arivegaig, on the level east side.

Marine biology

Marine biological surveys

	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	1	May 1989	Howson (1990)
	Infaunal sampling (digging)	3	May 1979	Powell <i>et al.</i> (1980)
Sublittoral	Recording (epibiota)	2	May 1989	Howson (1990)

Littoral

Littoral rock

Around much of Kentra Bay, the extensive littoral sandflats are backed by a short upper shore of sloping bedrock dominated by fucoïd algae. The sides of the entrance channel are of gradually sloping bedrock with patches of boulders, which continue down into the sublittoral along part of the channel. In other parts of the channel, littoral rock leads onto sediment just below the low-water mark. Rock in the supralittoral zone is dominated by yellow and grey lichens (YG) followed by a dense band of black lichen *Verrucaria maura* (Ver.Ver). The rest of the shore supports the fucoïd zones typically found in sheltered sealochs, with *Pelvetia canaliculata* near the top in the littoral fringe (Pel) and *Fucus vesiculosus* and *Ascophyllum nodosum* over much of the mid-shore (Fves). *Fucus serratus* is abundant on the lower shore (Fser.Fser) and barnacles *Semibalanus balanoides* are common on vertical rock and beneath the fucoïds over much of the area. The tide-exposed sublittoral fringe supports quite a wide variety of species, including the kelp *Laminaria digitata*, small foliose red algae, encrusting sponges and the barnacle *Balanus crenatus* (Ldig.T).

Littoral sediment

The littoral sediment flats lie at a relatively high level and are largely sandy with moderately coarse sand predominant. The gradient is very slight except at the edges of the central basin and in the area of low-water spring channels. The sediment becomes slightly more muddy towards the inner, more sheltered parts. The infauna consists of a wide variety of sedentary polychaetes and a number of amphipods and bivalves. The composition of the communities present varies with subtle changes in the degree of coarseness and sorting of the sand. The Department of Agriculture and Fisheries for Scotland (1969) identified two main communities, an upper shore '*Arenicola*

community' and a '*Tellina* community'. Powell *et al.* (1980) recognised two further communities. The first, a '*Spatangus-Fasciata* community', occurred towards the mouth of the loch and supported many bivalves, including *Venus striatula*, *V. fasciata*, *Dosinia exoleta*, *Mya truncata* and *Cerastoderma edule*. The steeply sloping edges of low-water spring channels towards the mouth of the bay consist of medium sand with shell fragments, empty shells and dead maerl-gravel, supporting an '*Echinocardium-Siliqua* community' with the bivalves *V. striatula*, *D. exoleta*, *Venerupis decussata*, *Lucinoma borealis*, the fanworm *Sabella penicillus* and the burrowing sea cucumber *Leptosynapta inhaerens*.

Sublittoral

The entrance channel is the only area extending below the intertidal. At the seaward end of the channel a plain of maerl-gravel with some live maerl (Phy) extends out from the mouth to around 9 m depth. The shell-gravel supports species typical of coarse, tide-swept conditions, including the holothurian *Neopentadactyla mixta* and the razor clam *Ensis ensis*. The seabed in the channel itself lies at 3–10 m depth and also consists mainly of coarse sand and maerl-gravel with the burrowing anemone *Cerianthus lloydii* and the sand mason worm *Lanice conchilega* as well as *E. ensis* and *N. mixta*.

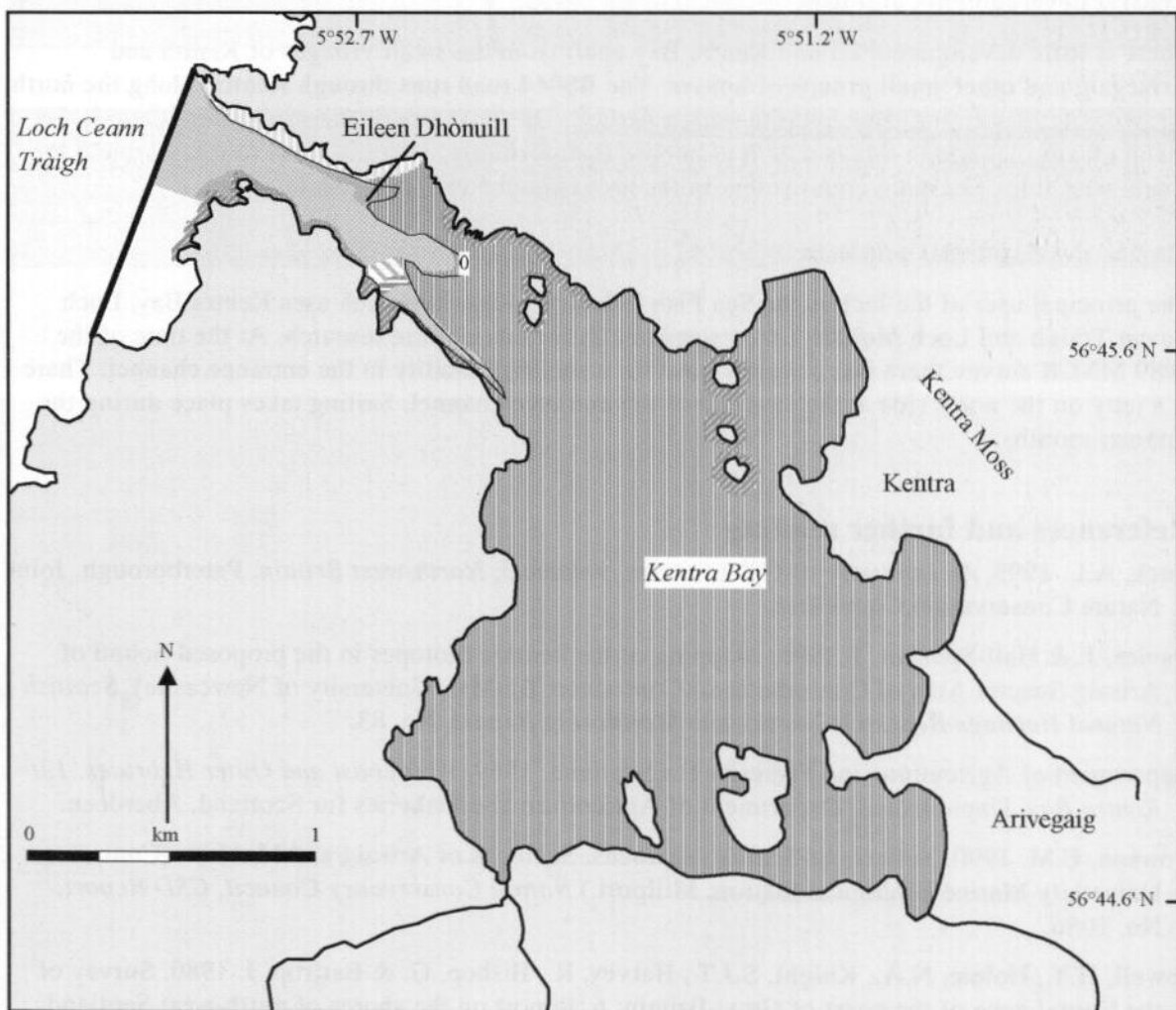


Figure 1.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 1.1, cited literature and additional field observations).

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There are also some rocky areas within the channel, particularly around the small islet of Eilean Dhònuill. Bedrock and boulders here are covered with kelp, mainly *Laminaria saccharina* at shallower depths and *L. hyperborea* nearer the bottom of the channel with a dense understorey of red algae including *Polyides rotundus* near the boundary with the sand (PolAhn). The *L. hyperborea* has abundant epiphytes, especially *Phycodrys rubens*. The plumose anemone *Metridium senile* and ascidians *Ascidiella* spp. are common on vertical surfaces here and along the edges of the channel.

Nature conservation

Conservation sites		
Site name	Status	Main features
Claish Moss and Kentra Moss	cSAC	Blanket bog
Kentra Moss	NCR	Blanket bog
Kentra Bay and Moss	SSSI	Raised mire, tidal mudflats and saltmarsh
Morar, Moidart and Ardnamurchan	NSA	Landscape

Human influences

Coastal developments and uses

There is little development around Kentra Bay apart from the small villages of Kentra and Arivegaig and other small groups of houses. The B8044 road runs through Kentra, along the north shore of the loch to the jetty, and then on to Ardtoe. The main use of the surrounding land is for sheep grazing, although this is now less intense than formerly. There is some forestry around the south-west side. The main employment in the area is connected with fish farming.

Marine developments and uses

The principal user of the loch is the Sea Fish Industry Authority which uses Kentra Bay, Loch Ceann Tràigh and Loch Moidart (*Area summary 2*) for mariculture research. At the time of the 1989 MNCR survey there was a single lease for a shellfish facility in the entrance channel. There is a jetty on the north side at the east end of the entrance channel. Sailing takes place during the summer months.

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Sites surveyed

- Survey 27: 1989 UMBSM Arisaig and Moidart sealochs survey (Howson 1990).
- Survey 265: 1970–80 SMBA/MBA Great Britain intertidal survey (Powell *et al.* 1980).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	44	Narrows, Kentra Bay	NM 628 703	56°45.8'N 05°52.9'W	YG; Ver.Ver; Fves; Fser.Fser; Ldig.T; SR; Pel
265	82	Kentra Bay	NM 640 690	56°45.1'N 05°51.6'W	Pol
265	S2	Kentra Bay jetty	NM 632 701	56°45.7'N 05°52.4'W	
265	S3	Kentra Bay islands	NM 635 699	56°45.6'N 05°52.1'W	

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	60	Entrance to Kentra Bay, Loch Ceann Tràigh	NM 624 705	56°45.9'N 05°53.3'W	Phy.R
27	62	S of Eilean Dhònuill, Kentra Bay	NM 630 702	56°45.7'N 05°52.7'W	Phy; PolAhn

2

Loch Moidart

Location

<i>Position (centre)</i>	NM 668 730	56°47.4'N 05°49.1'W
<i>Administrative area</i>	Highland	
<i>Conservation agency/area</i>	Scottish Natural Heritage	North Areas

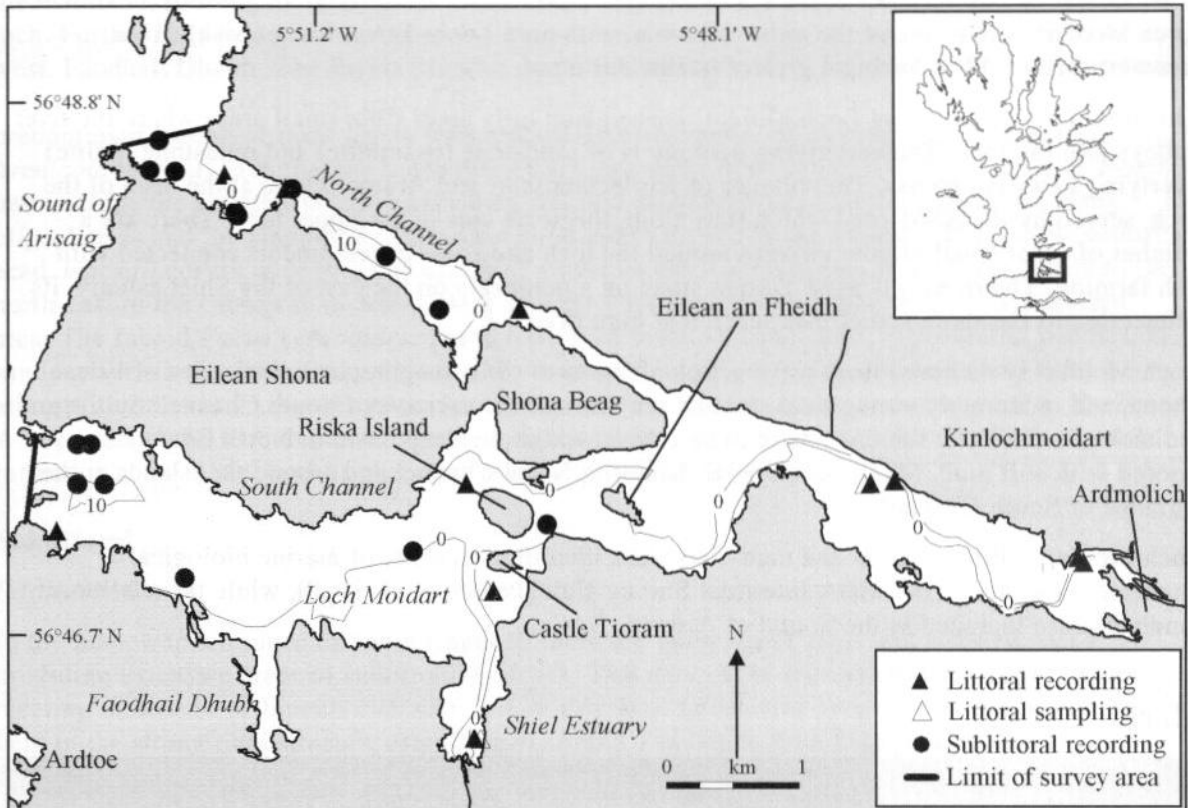


Figure 2.1 Main features of the area, showing sites surveyed.

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Physical features

<i>Physiographic type</i>	Fjordic sealoch with fiardic features
<i>Length of coast</i>	18.40 km (including islands)
<i>Length of inlet</i>	9 km
<i>Area of inlet</i>	9.1 km ² (8.8 km ² excluding islands)
<i>Bathymetry</i>	Maximum depth: North Channel 29 m; South Channel 23 m
<i>Wave exposure</i>	Sheltered to very sheltered; entrance moderately exposed
<i>Tidal streams</i>	Very weak in inner part; moderately strong through narrow channels
<i>Tidal range</i>	4.3 m (mean springs); 1.9 m (mean neaps)
<i>Salinity</i>	North Channel fully marine; South Channel and inner loch fully marine to variable

Introduction

Loch Moidart lies to the north-east of the Ardnamurchan peninsula. It has a complex structure with two distinct entrance arms, the North and South Channels, separated by the broad wedge of Eilean Shona. Both entrances are narrow and open onto the Sound of Arisaig. North Channel is

steep-sided and is separated from the open sea by a shallow sill at 2 m depth. There is a small group of shallow shoals and islands to the seaward side of the sill and a relatively deep basin (29 m) behind the sill. The channel then narrows and becomes intertidal prior to joining the upper loch; and the main water flow consequently follows the route via South Channel. The latter is wider and shallow with several small islands along its length. It has two shallow sills of 3 m and 1 m depth with medium-depth basins behind them. Much of the upper loch consists of intertidal mud- and sand-flats and the loch as a whole has an intertidal area of 75%. This is in contrast to the majority of Scottish west coast sealochs, which mostly have very small intertidal areas. The upper loch has considerable freshwater influence from the River Moidart, and the River Shiel entering South Channel provides further freshwater input.

Loch Moidart is thus one of the most estuarine, with only Lochs Etive, Long (Alsh) (Area summary 8) and Aline having a greater freshwater input.

The hinterland surrounding Loch Moidart is steep and hilly apart from small areas where the river valleys join the loch. The underlying geology is of sandstone (psammite) and mudstone (pelite) overlying Lewisian gneiss. The villages of Kinlochmoidart and Ardmolich lie at the head of the loch, served by the A861 road which runs along the north side of the upper loch. There are a number of other small remote villages around the loch and some developments connected with fish farming. The ruins of Castle Tioram stand on a peninsula on the east of the Shiel estuary, its connection to the shore sometimes severed at high tides.

Loch Moidart is sheltered from wave action along most of its length, particularly east of Eilean Shona, and moderately strong tidal streams run through the narrows of South Channel. Sublittoral sediments in the latter therefore tend to be coarse, whilst the deep basin in North Channel is floored with soft mud. Maerl occurs near the sill in North Channel and around the islands at the entrance of South Channel.

Loch Moidart's littoral sand- and mud-flats were identified as a site of marine biological importance by the SMBA/MBA Intertidal Survey Unit (Powell *et al.* 1980), while the sublittoral sandbanks are included in the Sound of Arisaig cSAC.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
<i>Littoral</i>	Recording (epibiota)	3	May 1989	Howson (1990)
	Recording (epibiota)	4	July 1987	Wilkinson & Scanlan (1987)
	Recording (epibiota)	3	September 1979	Powell <i>et al.</i> (1980)
	Recording (general)	Not known	1975	Smith (1978)
	Sampling (infauna)	3	1989	Howson (1990)
<i>Sublittoral</i>	Recording (epibiota)	12	May 1989	Howson (1990)
	Recording (cores, epibiota)	1	June 1995	Davies & Hall-Spencer (1996)
	Recording ROV	1	Aug 1998	SNH survey 765

Littoral

Littoral rock

Rocky shores are largely confined to the outer parts of North and South Channels and have not been surveyed in detail. The predominantly steep rock slopes in North Channel show clear zonation of lichens, barnacles and furoid algae. Bedrock and boulders on the lower shore are tide-exposed in the narrow parts of the channel and support dense growths of bryozoans such as *Alcyonidium* spp. as well as bread-crumble sponge *Halichondria panicea*. The sheltered 'cape' form of the kelp *Laminaria digitata* is common. Rocks just inside the entrance to South Channel slope

steeply and are dominated by furoid algae. In the upper loch the predominantly sedimentary littoral areas are backed in some places by rocky outcrops, and by boulders and gravel mixed in with the sand. These areas are dominated by knotted wrack *Ascophyllum nodosum*. Mussels *Mytilus edulis* are frequent, both attached to the rocks and on the sediment between.

Littoral sediment

Loch Moidart contains some of the largest areas of littoral sediments found in Scottish sealochs. Almost the whole of the inner loch from around Eilean an Fheidh eastwards consists of fine muddy sand-flats. These flats extend westwards into the narrow channel between Shona Beag and the mainland, forming an intertidal bar that effectively isolates North Channel from the rest of the loch. Further flats extend out into South Channel from the River Shiel estuary and the inlet to the west, Faodhail Dhubh. The Rivers Moidart and Shiel both provide considerable freshwater input, such that estuarine conditions prevail for some distance from the mouths of the rivers. The predominant feature of these sandy flats are numerous mounds and casts made by lugworm *Arenicola marina*, such that the sands resemble a miniature lunar landscape. Other species found here include the polychaetes *Spio filicornis*, *Nephtys hombergii* and *Capitella capitata*, many oligochaetes and the amphipod *Corophium volutator*. The free-living furoid *Ascophyllum nodosum* ecad. *mackaii* covers wide areas of sand and gravel on the bar in North Channel, especially to the north-east of the causeway to Shona Beag (AscX). Patches are also found in the Shiel estuary area. The furoid *Fucus ceranoides*, characteristic of brackish conditions, is present in patches on sandy gravel in the same area and in the river channels of the Moidart estuarine area (Fcer.), along with other brackish species including the amphipods *Gammarus oceanicus* and *G. duebeni*. At the head of the loch there is an extensive area of saltmarsh extending up to the limit of tidal influence at the A861 road bridge, with marshy grassland above.

Sublittoral

Infralittoral rock

In the tide-swept entrance to South Channel, there are many small islets and isolated rocks, providing extensive areas of sublittoral bedrock. This extends to around 10–16 m depth before meeting the coarse sediments characteristic of this area. *Laminaria hyperborea* kelp forest thrives here in the strong tidal streams, extending to around 7 m depth, with kelp park to around 10 m depth. The forest appears to be mostly ungrazed with an understorey of dense foliose algae mixed with abundant filter-feeding animals, mainly the anemone *Metridium senile*, barnacles *Balanus crenatus* and hydroids, especially *Nemertesia* spp. It is probable that tidal streams are too strong for the sea urchin *Echinus esculentus* to graze in the area. *M. senile* is most abundant in the areas of strongest water movement. Towards the edges of the channels, kelp forest is mixed, with both *L. hyperborea* and *L. saccharina*, and ascidians, mainly *Asciidiella scabra* (LhypLsac.Ft). At the upper end of South Channel, which is very sheltered from wave action, *L. saccharina* predominates on mixed bedrock and boulder slopes. Tidal streams are still noticeable, so filter-feeding animals are prominent amongst the foliose algae, but with less *M. senile* and more ascidians (XKScrR).

Infralittoral bedrock in the outer part of the entrance to North Channel extends to around 10 m depth and is also dominated by *L. hyperborea* kelp forest, but here there is more evidence of grazing by *E. esculentus* and the understorey of foliose algae is sparse. Along the edges of the deeper North Channel basin, bedrock and boulder slopes extend down to around 20 m depth. Kelp forest in the infralittoral is predominantly *L. saccharina*, extending to around 5 m depth, with a sparse understorey of foliose and filamentous algae and many ascidians (Lsac.Ft).

Circalittoral rock

The shallow nature of South Channel means that it has no deep circalittoral rock. Upper circalittoral rock in the entrance is dominated by dense growths of filter-feeding animals, mainly *Metridium senile*, hydroids, some sponges and *Balanus crenatus*, all of which extend up into the

infralittoral. However, in North Channel, boulder slopes extend to at least 20 m depth. Below the kelp forest, these very sheltered steep slopes support a biotope that is in many ways typical, with many ascidians, especially *Ascidia mentula*, *Pyura* spp. and *Boltenia echinata*. However, the particular combination of species found here is unusual, especially due to the presence of large numbers of the fanworm *Bispira volutacornis*, an uncommon species in Scotland. Their dramatic tentacle fans make a beautiful display emerging from between the boulders and cobbles. Encrusting sponges, especially *Aplysilla rosea* and *A. sulfurea*, a taxa not found at many other sites in Area 2, are also common.

Sublittoral sediments

The floor of the tide-swept South Channel consists of a mixture of cobbles, pebbles, shell debris and coarse sediment. Near the entrance, cobbles and pebbles have a dense cover of hydroids, particularly *Sertularia argentea*, *Obelia longissima* and *Hydrallmania falcata* (Flu). Similar habitats are present all along the channel and east of Riska Island. Off the south-east tip of Eilean Shona, tide-swept pebbles at shallower depth mainly support encrusting and filamentous algae. There are no extensive areas of maerl in the entrance to South Channel, in contrast to other sealochs in the Arisaig area, such as Loch Ailort (Area summary 3). This may be due to the considerable inflow of freshwater from the rivers. What maerl there is lies right at the entrance, mixed with coarse sand and gravel which supports the holothurian *Neopentadactyla mixta* and bivalves *Mya truncata* and *Ensis* spp. (Ven.Neo). Medium to coarse sands along the sides of the channel support species such as the burrowing sea urchin *Echinocardium cordatum* and the razor clam *Ensis ensis* (EcorEns), with hydroids and red algae attached to empty shells and stones.

The outer part of North Channel seaward of the sill is also tide-swept, and the floor consists mainly of coarse sediments and maerl. The maerl bed in the shallows has a dense cover of foliose

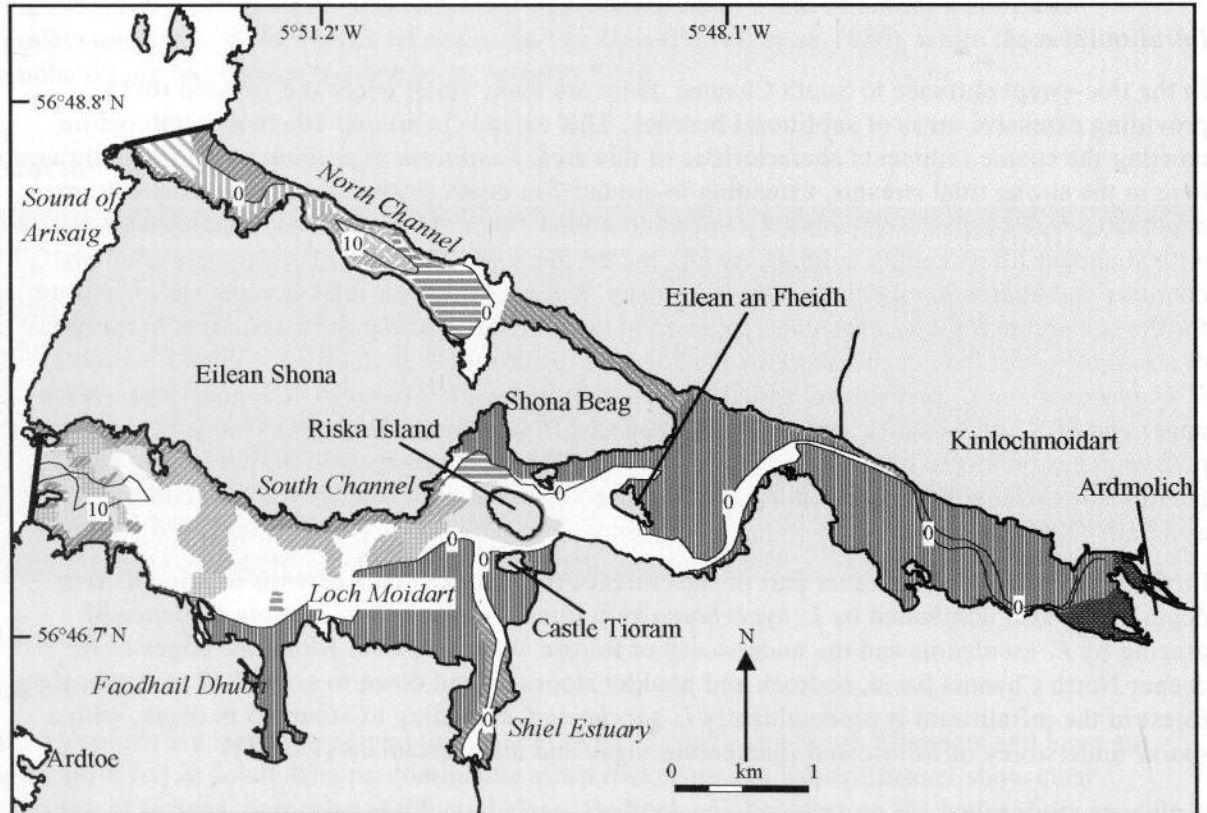


Figure 2.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 2.1, cited literature and additional field observations).

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red algae (Phy.R). A variety of burrowing fauna inhabits areas of dead maerl and shell-gravel, including the bivalves *M. truncata* and *Lutraria lutraria* and the holothurian *N. mixta*. The only areas of soft mud in the loch are found in the North Channel basin which is subject to limited tidal flow. The mud is not particularly species-rich, supporting scattered sea-pens *Virgularia mirabilis* and the burrowing brittlestar *Amphiura filiformis* (SpMeg). At the eastern end of this basin, firm glutinous mud extends into very shallow water grading into the littoral zone, and is typically well-worked with numerous lugworm *Arenicola marina* mounds (AreSyn). This is a common situation at the heads of sealochs and in very sheltered shallow areas.

Nature conservation

Conservation sites		
Site name	Status	Main features
Sound of Arisaig	cSAC	Sandbanks which are slightly covered by seawater all the time
Loch Moidart	SSSI; NCR; GCR	Biological; geological
Morar, Moidart and Ardnamurchan	NSA	Landscape
Dorlin/Castle of Eilean Tioram, Moidart	RSA	Landscape

Human influences

Coastal developments and uses

The coastline around Loch Moidart is largely remote and undeveloped. The A861 road follows the north shore of the inner loch, with minor roads ending at points on the south shore, but elsewhere there is no public road access. There are two small villages, Kinlochmoidart and Ardmolich at the head of the loch, and a number of other scattered dwellings along the east side of the Shiel estuary and elsewhere. There are a number of holiday cottages and dwellings on Eilean Shona and Shona Beag with access via an intertidal causeway across North Channel or by boat. The surrounding hinterland is used for sheep grazing and some cattle grazing, including on the saltmarsh at the loch head. There is a small forestry plantation on the south side at the head of the loch and deer forest between Loch Moidart and Loch Ailort to the north.

Marine developments and uses

The Sea Fish Industry Authority (SFIA) makes extensive use of Loch Moidart for mariculture research, working from its research laboratory at Ardtoe on Loch Ceann Tràigh immediately to the south. Studies by SFIA have included experimental cultivation of Manila clams *Tapes philippinarum* (Paul 1988; Lake 1992) and rearing of winkles *Littorina littorea* (Cashmore & Burton 1998). Admiralty Chart 2207 (1993) shows six shellfish farming sites in South Channel and one in North Channel. There is a salmon *Salmo salar* hatchery at Brunery, upstream on the River Moidart but at the time of the MNCR 1989 survey there were no salmon farms in the loch. The loch is generally not suitable for commercial fishing. Creeling for lobsters *Homarus gammarus* is a traditional crofting activity and takes place on a small scale throughout the Arisaig and Moidart areas. The natural stocks may have been enhanced by the Scottish lobster stock enhancement trials undertaken in the Ardtoe area by the SFIA, starting in 1984. Under a programme of lobster rearing and release, around 2,000 lobsters had been released by the end of the first phase in 1990, with further releases of smaller juveniles during the second phase, completed in 1997 (Burton 1992; SFIA 1998).

There are a number of piers, jetties and moorings, particularly on the north side of the upper loch, in the estuary of the River Shiel and on the south-east corner of Eilean Shona. Recreational activities include sailing, windsurfing, canoeing, birdwatching and angling (Buck 1993).

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- Survey 95: 1987 Heriot-Watt University Loch Moidart littoral survey (Wilkinson & Scanlan 1987).
- Survey 265: 1970-80 SMBA/MBA Great Britain intertidal survey (Powell *et al.* 1980).
- Survey 637: 1995 BioMar Arisaig maerl beds survey (Davies & Hall-Spencer 1996).
- Survey 765: 1998 Sound of Arisaig survey.(Scottish Natural Heritage).

Littoral sites					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
27	33	S end of Shiel estuary, Loch Moidart	NM 661 711	56°46.3'N 05°49.7'W	HedMac.Are; FcerX
27	34	N end of Shiel estuary, Loch Moidart	NM 662 722	56°46.9'N 05°49.6'W	Lan; HedMac
27	38	Upper loch, Loch Moidart	NM 690 730	56°47.4'N 05°46.9'W	MacAre; AscX.mac; Asc.VS; HedMac; FcerX
84	J	Loch Moidart, West Inverness-shire	NM 660 730	56°47.3'N 05°49.9'W	FX LGS
95	1	North Channel, Loch Moidart	NM 664 743	56°48.0'N 05°49.5'W	AscX; FvesX; Pel; AscX.mac; Fspi; HedMac
95	2	Mid loch (disused jetty), Loch Moidart	NM 692 731	56°47.5'N 05°46.7'W	Fves; Fspi; Fserr; Asc; Pel
95	3	Saltmarsh, Loch Moidart	NM 705 725	56°47.2'N 05°45.4'W	FcerX; NVC SM13
95	4	Estuary, Loch Moidart	NM 705 726	56°47.3'N 05°45.4'W	LMX
265	71	Eilean na-h-oitire, Loch Moidart	NM 642 753	56°48.5'N 05°51.8'W	Zmar SLR
265	76	Farquhar's Point, Loch Moidart	NM 629 726	56°47.1'N 05°52.8'W	F
265	91	North Channel, Loch Moidart	NM 646 752	56°48.5'N 05°51.3'W	SLR

Sublittoral sites					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
27	46	N of Eilean an Aonaich, South Channel, Loch Moidart	NM 631 733	56°47.4'N 05°52.7'W	XKScrR; LsacX
27	47	NW of Shona Beag, Loch Moidart	NM 658 743	56°48.0'N 05°50.1'W	AreSyn
27	48	NE Eilean Raonuill, South Channel, Loch Moidart	NM 631 730	56°47.2'N 05°52.7'W	Flu.HByS; Ven.Neo; Flu.SerHyd; XKScrR
27	49	S of Bad an Dobhain, North Channel, Loch Moidart	NM 654 747	56°48.2'N 05°50.6'W	SpMeg; Lsac.Ft; PhiVir; LsacX
27	50	N of Eilean Mhic Neill, South Channel, Loch Moidart	NM 639 723	56°46.9'N 05°51.9'W	EcorEns; EphR
27	52	South Channel, Loch Moidart	NM 656 725	56°47.1'N 05°50.2'W	Lsac.Pk; EcorEns; EphR
27	53	S of Eilean na h-Oitire, North Channel, Loch Moidart	NM 643 750	56°48.4'N 05°51.6'W	Phy.R; FaSwV; Lhyp.Ft
27	54	Opposite Rubhan Dubh Aonaich, North Channel, Loch Moidart	NM 647 752	56°48.5'N 05°51.3'W	AmenCio; Lsac.Ft
27	55	Sgeir Srath Luinga, South Channel, Loch Moidart	NM 666 727	56°47.2'N 05°49.3'W	Flu.SerHyd; MCR; Lsac.T
27	61	NE Sgeir an Durdain, South Channel, Loch Moidart	NM 633 730	56°47.3'N 05°52.5'W	Ven.Neo; Flu.SerHyd
27	63	N side of an Leacach, South Channel, Loch Moidart	NM 632 733	56°47.4'N 05°52.6'W	Phy.HEc; Ven.Neo; LhypLsac.Ft
637	11	Narrows, North Channel, Loch Moidart	NM 642 750	56°48.4'N 05°51.7'W	Phy.R
765	48	North channel (1), Loch Moidart, Sound of Arisaig	NM 636 753	56°48.5'N 05°52.3'W	LsacX
765	49	North Channel (2) Loch Moidart, Sound of Arisaig	NM 638 753	56°48.5'N 05°52.1'W	Phy
765	50	North Channel (3), Loch Moidart, Sound of Arisaig	NM 637 755	56°48.6'N 05°52.3'W	CMU

3

Loch Ailort

Location

Position (centre)	NM 730 790	56°50.8'N 05°43.3'W
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North Areas

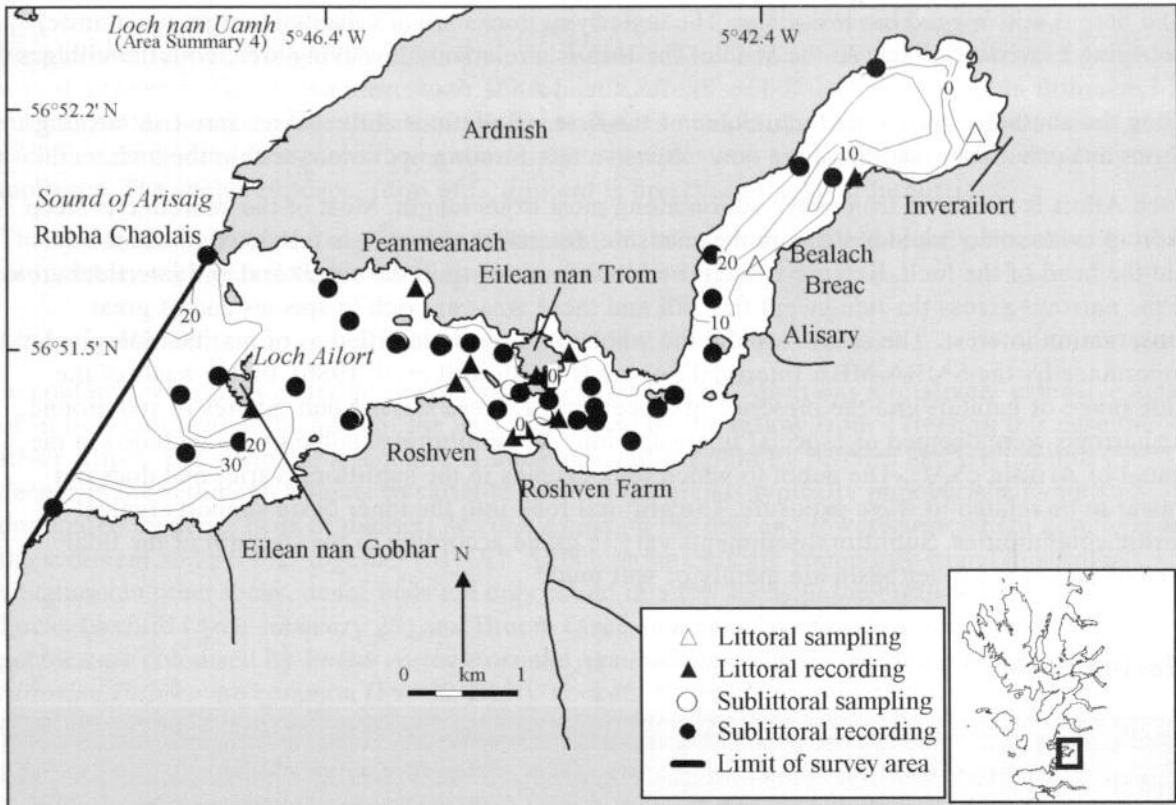


Figure 3.1 Main features of the area, showing sites surveyed.

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Physical features

Physiographic type	Fjordic sealoch
Length of coast	30.1 km (36.0 km including islands)
Length of inlet	8.8 km
Area of inlet	11.1 km ² (10.9 km ² excluding islands)
Bathymetry	Maximum depths in basins: inner 43 m; middle 23 m; outer 14 m
Wave exposure	Sheltered to very sheltered; entrance moderately exposed
Tidal streams	Very weak in inner loch; moderately strong over sills
Tidal range	4.3 m (mean springs); 1.9 m (mean neaps) (Loch Moidart)
Salinity	No data; probably fully marine but variable in inner loch

Introduction

Loch Ailort lies in the Arisaig area to the north-east of the Ardnamurchan peninsula. The mouth of the loch opens into the Sound of Arisaig adjacent to the mouth of Loch nan Uamh (*Area summary 4*) which lies to the north. It is separated from the latter by the Ardnish peninsula. Loch

Ailort bends in the middle, the outer half running from north-west to south-east and the inner half from south-west to north-east. The wide entrance to the loch is very shallow with depths of less than 10 m over most of its area and a number of small islands across the mouth. Where the loch narrows at Eilean nan Trom there is a sill at 4 m depth followed by two further sills at 5 m and 11 m. The three basins behind the sills range in depth from 14 to 43 m, with the deepest innermost. Moderately strong tidal streams run over the outer two sills where the loch narrows due to a number of islets and shoals.

The hinterland along the southern and eastern coasts of the loch is steep and mountainous. The northern and western coasts of the loch are bounded by the Ardnish peninsula and the surrounding land here is still rugged but less steep. The underlying rocks are of sandstone origin (psammite) overlying Lewisian gneiss. At the head of the loch is a relatively low-lying area, with the villages of Lochailort and Inverailort served by the A830 and A861 roads running across the head and along the southern side of the loch. Some of the first installations and research into fish farming began in Loch Ailort, and there are now extensive fish-farming operations within the loch.

Loch Ailort is sheltered from wave action along most of its length. Most of the shoreline is steep bedrock with some boulder areas on the east side. Intertidal sediment is restricted to small bays and the head of the loch. Extensive maerl beds are found both in the sublittoral and intertidal areas in the narrows across the tide-swept first sill and these areas are rich in species and of great conservation interest. The shores around the whole loch were identified as of marine biological importance by the SMBA/MBA Intertidal Survey Unit (Powell *et al.* 1980), on the basis of the wide range of habitats and the presence of an eelgrass *Zostera marina* bed. Shores in and around the narrows were deemed of especial interest, while the sublittoral sandbanks are included in the Sound of Arisaig cSAC. The depth to which rock extends in the sublittoral varies and does not appear to be related to wave exposure. Circalittoral rock into the inner basin supports typical fjordic communities. Sublittoral sediments vary in grade according to the strength of the tidal streams and in the inner basin are mainly of soft mud.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	6	May 1989	Howson (1990)
	Recording (epibiota)	3	May 1979	Smith (1981)
	Recording (epibiota)	2	September 1979	Powell <i>et al.</i> (1980)
	Infaunal sampling (digging & sieving)	2	May 1979	Powell <i>et al.</i> (1980)
Sublittoral	Recording (epibiota)	18	May 1989	Howson (1990)
	Recording & sampling (epibiota, cores)	5	June 1995	Davies & Hall-Spencer (1996)
	ROV survey	11	June 1996	SNH survey 654

Littoral

Littoral rock

The majority of the shoreline around Loch Ailort consists of steep bedrock, some of it very steep cliffs. The eastern shore of the inner loch consists of a series of steep rocky headlands connected by more gradually sloping boulder shores. Sheltered furoid-dominated biotopes are prevalent throughout the loch but are replaced on the steepest rock by mussels and barnacles. In the outer moderately exposed entrance area, the shores are mostly dominated by limpets and barnacles (BPat.Sem) with the extent of furoid cover related to the exposure and steepness of the rock. In the sublittoral fringe both the kelp *Laminaria digitata* and dabberlocks *Alaria esculenta* (Ala.Ldig), which is generally indicative of exposed conditions, are found together. In the sheltered inner loch, steep bedrock shores show a typical zonation, with colourful lichens on the

rocks at the very top of the shore (YG), bands of the black lichen *Verrucaria maura* and channelled wrack *Pelvetia canaliculata* below (Ver.Ver; Pel), and barnacles *Semibalanus balanoides*, limpets *Patella* spp. and mussels *Mytilus edulis* predominant on the mid-shore. Boulder slopes and gently-sloping bedrock show a similar zonation in the upper regions but the mid-shore is fucoid-dominated, mainly by *Fucus vesiculosus* and blankets of *Ascophyllum nodosum* (Asc.Asc).

On very steep and near-vertical rock faces of the islands in the tide-swept narrows at the entrance to the inner loch, there are rich communities of algae and filter-feeding animals such as sponges, ascidians, bryozoans and anemones near low water and in the sublittoral fringe. Predominant species include serrated wrack *Fucus serratus*, red algae, especially *Osmundea hybrida*, breadcrumb sponge *Halichondria panicea*, the ascidian *Asciidiella scabra* and, in areas of fastest water movement, the plumose anemone *Metridium senile* (Fserr.T). Boulder shores in this area, such as on the southern side of Eilean nan Trom, have a moderately rich under-boulder fauna with ascidians, including the scarce *Pyura microcosmus*, brittlestars, terebellid worms, crustaceans and molluscs. The sheltered 'cape' form of *L. digitata* is present in the sublittoral fringe.

The bay at Roshven on the south coast to the west of the narrows is filled mainly by coarse gravel and pebbles with gravel flats extending out as a shallow spit.

Littoral sediment

In common with many other north-west coast sealochs, Loch Ailort has a relatively extensive area of littoral sediment at the head of the loch influenced by the inflow from a river, in this case the River Ailort. The sediment is a coarse compacted sand overlain by pebbles and with cobbles deeper in the sediment. Subject to variable salinity, the area is typically impoverished and is dominated by dense beds of mussels *Mytilus edulis* on the mid and lower shore which help to bind the sediment and pebbles together (MytX). Although mussels are commonly found in similar situations in other lochs, dense beds are only found in a few lochs in the north-west, notably Lochs Laxford (*Area summary 29*) and Broom (*Area summary 26*). On the upper shore, the pebbles are colonised by *Fucus vesiculosus* and *Semibalanus balanoides*, and periwinkles *Littorina littorea* are common (FvesX, BLit). Pockets of muddy sediment on the lower shore are colonised by lugworms *Arenicola marina*.

Littoral sediment around the rest of Loch Ailort is restricted to pockets of fine sandy mud along the eastern shore, often with *A. marina*, and a clean fine sand beach at Peanmeanach on the northern shore of the outer part of the loch. The latter supports a 'Tellina community' with *Angulus tenuis* and the polychaete *Nephtys cirrosa*. One particularly sheltered small embayment west of Bealach Breac supports a thick bed of the free-living form of knotted wrack *Ascophyllum nodosum* ecad. *mackaii* (AscX.mac). Small quantities of this alga are also found at the head of the loch.

In addition, a number of small bays on the north and south side of the narrows at Eilean nan Trom support some of the richest sediment biotopes of the whole north-west coast. These bays are subject to moderate tidal streams and have a patchy mosaic of sediment types providing a wide variety of habitats. At Roshven Farm on the south side of the narrows, the retreating tide exposes a wide expanse of coarse sandy gravel over which pebbles, cobbles, shells and small boulders are scattered and within which are extensive areas of live and dead maerl. Pools of standing water add to the interest of the area, allowing a number of filamentous and foliose algae such as *Chondrus crispus*, *Scytosiphon lomentaria*, and *Osmundea pinnatifida*, to colonise the stones along with snakelocks anemones *Anemonia viridis*. Periwinkles *Littorina littorea* are present in sufficient numbers to be subject to regular collection. A wide variety of bivalves and worms inhabit the sediment, including the bivalves *Venerupis senegalensis* and *Ensis ensis*, the polychaetes *Sabella pavonina* and *Neoamphitrite figulus* and the sipunculan *Golfingia vulgaris*. On the north side of the narrows, the muddy gravel habitat in the sheltered areas to the east of Eilean nan Trom appears to be exceptionally rich in bivalves and was identified as a Site of Marine Biological Importance by the SMBA/MBA Intertidal Survey Unit (Powell *et al.* 1980). These species-rich sediment and

maerl habitats are also found on the skerries in nearby Loch nan Ceall (Area summary 5) but are uncommon elsewhere in the British Isles.

Sublittoral

Infralittoral rock

In the outer moderately exposed parts of Loch Ailort, bedrock and boulder slopes extend to around 15 m depth and are dominated by a kelp forest of *Laminaria hyperborea* with some *L. saccharina* (Lhyp.Ft) to around 10 m depth and kelp park to around 15 m depth. Bedrock sites support some dense foliose algae, while at boulder sites the holothurian *Pawsonia saxicola* is common between the rocks. Kelp in the narrows areas is restricted mainly to *L. digitata* and sparse *Saccorhiza polyschides*. In the very sheltered inner basin of the loch, steep bedrock with extensive silty ledges extends through the infralittoral and circalittoral to around 32 m depth along most of the northern shore. Along the southern shore, there are both bedrock and boulder slopes, the latter sometimes following the former. All the rock faces tend to be very silty and *L. saccharina* is the only kelp present. The kelp is fairly sparse, extending only to around 5 m depth. Coralline algae encrust most of the rock with a few foliose red algae, especially *Phycodrys rubens*, and a sparse fauna of ascidians *Ascidiella aspersa* and *Ascidia mentula*, brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, and various other species such as the anemone *Protanthea simplex*, extending up from adjacent circalittoral rock. The rock is probably grazed since the sea urchins *Echinus esculentus* and *Psammechinus miliaris* are also common (LsacRS.Psa).

Circalittoral rock

Steep to vertical circalittoral bedrock extends to around 32 m depth along the northern shore of the inner basin and supports a typical fjordic loch community, with the brachiopod *Neocrania anomala*, the tubeworm *Chaetopterus variopedatus* and large numbers of the anemone *Protanthea simplex* growing both on the rock and on the worm tubes (NeoPro). Other prominent species include solitary ascidians, scattered silt-tolerant sponges such as *Suberites* spp. and the brittlestars *Ophiocomina nigra* and *Ophiothrix fragilis* on silty ledges.

Sublittoral sediment

Sediments in the outermost, exposed entrance to Loch Ailort consist of burrowed mud in the deep areas below about 30 m depth, with Norway lobster *Nephrops norvegicus*, burrowing brittlestars *Amphiura* spp. and the sea-pen *Virgularia mirabilis* (SpMeg). Shallower sediments in the vicinity of Eilean nan Gobhar and along the north and south sides of the outer basin consist of clean to muddy sands and gravels, the species present depending on the coarseness of the sediment and depth. The finer shallow sands support the burrowing sea urchin *Echinocardium cordatum*, the bivalves *Arctica islandica* and *Ensis ensis* and numerous red algae attached to stones (AfilEcor; EcorEns), whilst the gravels have typical coarse sediment species such as the holothurian *Neopentadactyla mixta* and some maerl in wave troughs (Ven.Neo). Areas of rather sparse eelgrass *Zostera marina* occur along the north side to the west of Peanmeanach Bay (Zmar).

Extensive and fairly dense beds of maerl *Phymatolithon calcareum* lying on a sand or muddy base line the main channel of the narrows at Eilean nan Trom (Phy). The maerl extends seawards towards Eilean nan Gobhar for at least 2 km, following the tide-swept shallow channels. These beds support rich and diverse populations of foliose algae and are possibly the most extensive in west Scotland. Similar smaller beds are also found in the entrance channels to the nearby Loch Moidart North Channel (Area summary 2), Kentra Bay (Area summary 1) and Loch nan Ceall (Area summary 5). Other species characteristically found in the underlying sediment include *N. mixta*, the burrowing anemone *Cerianthus lloydii* and bivalves including *E. ensis*, *Mya truncata* and *Glycymeris glycymeris*. Maerl gravel and medium to fine sand also line much of the shallow channel east of the narrows, at least as far as the second sill at Alisary. Much of this consists of dead maerl gravel with patches of live maerl and little in the way of foliose algae or animal species. The mat-forming red alga *Trailiella* is abundant in patches (Tra).

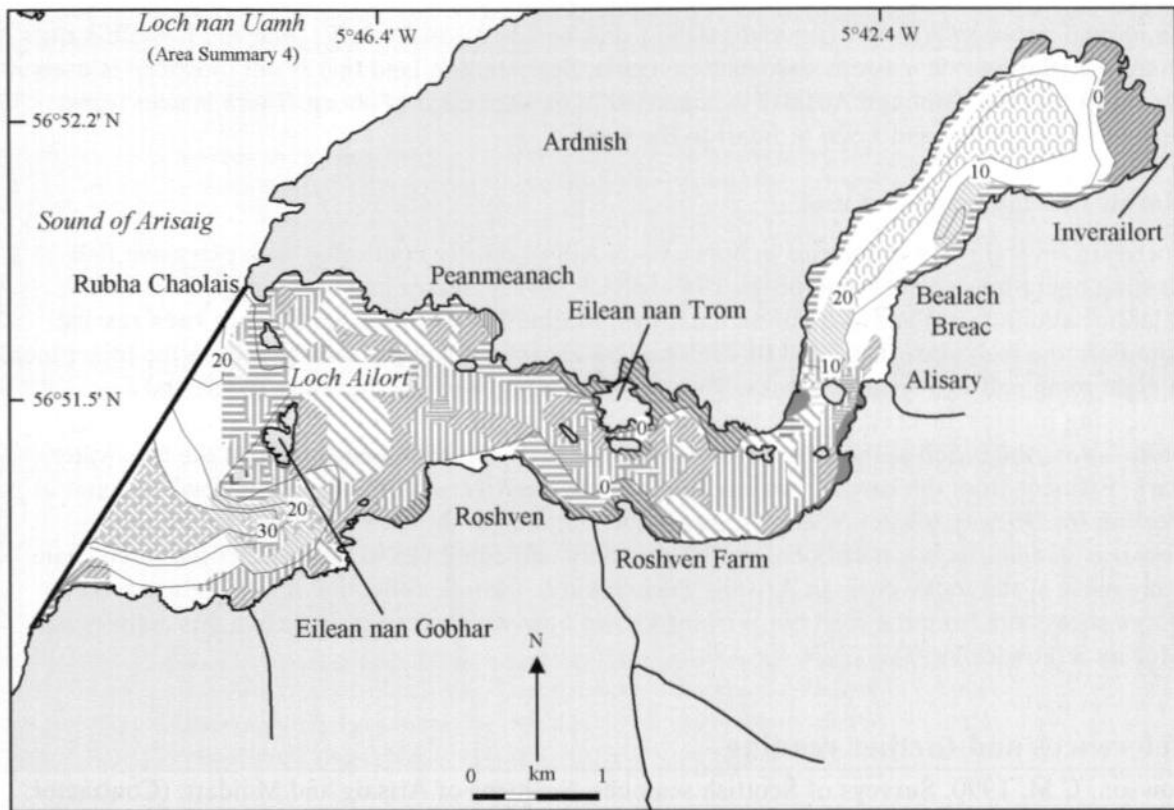


Figure 3.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 3.1, cited literature and additional field observations).

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The deeper parts of the small basin behind the second sill consist mainly of a rather featureless muddy sand plain with gravel and pebbles, common in many sealochs, with *C. lloydii* in the sediment and scattered hydroids on the pebbles (VirOph.HAs). Silty rock extends to at least 20 m depth in the innermost basin and below this the sediment is a rather barren mud with occasional anemones *Sagartiogeton laceratus* and patches of the white bacterium *Beggiatoa* (Beg). The species-poor nature of these sites may possibly be connected with fish farms in the vicinity, as the water exchange in this basin is poor. One small area, in the vicinity, supports an extremely sheltered muddy sand biotope with the echiuran worm *Amalosoma eddystonense*. Other common species include lugworms *Arenicola marina*, brittlestars and tubeworms (VirOph).

Nature conservation

Conservation sites

Site name	Status	Main features
Sound of Arisaig	cSAC	Sandbanks which are slightly covered by seawater all the time
Morar, Moidart and Ardnamurchan	NSA	Landscape

Human influences

Coastal developments and uses

There are no extensive developments around Loch Ailort. The villages of Lochailort and Inverailort are situated at the head of the loch, with a few scattered crofts elsewhere. There are holiday cottages near the beach at Roshven on the south side of the loch towards the entrance. The

A830 road between Fort William and Mallaig runs across the head of the loch and the A861 runs along the whole of the eastern and southern coast. Surrounding land that is not too steep is used for sheep grazing, although Ardnish is supposed to be kept clear of sheep. There is deer forest between Loch Ailort and Loch Moidart to the south.

Marine developments and uses

There are several piers and jetties in upper Loch Ailort, mostly connected with extensive fish farming operations. At the time of the 1989 MNCR survey, leases had been granted for four Atlantic salmon farms and two mussel facilities. Marine Harvest McConnell have been rearing salmon in the loch since 1967 and in 1989 had 60 cages in the upper loch and 40 in the lower loch in eight main and two smaller blocks. They also had a hatchery on the River Ailort and a processing plant at Inverailort. The latter was, at the time of the 1989 MNCR survey, discharging waste across the beach at the head of the loch through a pipe which ended above the low-water mark. Effluent from the hatchery enters the loch via the River Ailort. There is a small amount of creeling for Norway lobster *N. norvegicus* in the entrance to the loch. Creeling for lobsters *Homarus gammarus* is a traditional crofting activity and continues to take place on a small scale along most of the rocky coast in Arisaig. Periwinkle *L. littorea* collecting has been observed on shores accessible from the road but it is not known how widespread or intensive this activity is (McKay & Fowler 1997).

References and further reading

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Sites surveyed

- Survey 27: 1989 UMBSM Arisaig and Moidart sealochs survey (Howson 1990).
- Survey 83: 1979–1980 Smith west Inverness-shire and north Argyll littoral survey (Smith 1981).
- Survey 265: 1970–80 SMBA/MBA Great Britain intertidal survey (Powell *et al.* 1980).
- Survey 637: 1995 BioMar Arisaig maerl beds survey (Davies & Hall-Spencer 1996).
- Survey 654: 1996 SNH Loch Ailort ROV survey (SNH survey).

Littoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	35	S point Eilean nan Gobhar, Loch Ailort	NM 695 792	56°50.8'N 05°46.8'W	FvesB; Ala.Ldig
27	40	Inner bay shore, Loch Ailort	NM 761 817	56°52.3'N 05°40.4'W	FvesX; MytX
27	41	W of Bealach Breac, Loch Ailort	NM 741 805	56°51.6'N 05°42.3'W	HedMac.Are; F; AscX.mac; EphX; SwSed; Lsac.Ft; Pel
27	42	Shore N of Roshven Farm, Loch Ailort	NM 718 788	56°50.6'N 05°44.5'W	MacAre; FvesX; VsenMtru; YG; Ver.Ver; Fspi; Pel
27	43	Shore ESE of Eilean Dubh, Loch Ailort	NM 750 813	56°52.1'N 05°41.5'W	YG; Ver.Ver; Fspi; Asc.Asc; Pel; LsacRS.Psa; Fserr
27	45	Shore N side of Eilean nan Gualainn, Loch Ailort	NM 723 791	56°50.8'N 05°44.0'W	Asc.Asc; Fserr.T; Pel; Lsac.T; BPat.Sem
83	12	Eilean nan Trom, Loch Ailort, West Inverness-shire	NM 720 790	56°50.7'N 05°44.3'W	
83	13	Roshven Bank, Loch Ailort, West Inverness-shire	NM 715 796	56°51.1'N 05°44.8'W	CGS
83	14	Roshven Bay, Loch Ailort, West Inverness-shire	NM 713 794	56°51.0'N 05°45.0'W	
265	73	Eilean nan Trom E, Loch Ailort	NM 722 795	56°51.0'N 05°44.1'W	SLR
265	74	Eilean nan Trom W, Loch Ailort	NM 721 795	56°51.0'N 05°44.2'W	MLR
265	75	Eilean nan Trom, Loch Ailort	NM 724 797	56°51.1'N 05°44.0'W	LMX
265	99	Peanmeanach, Loch Ailort	NM 710 803	56°51.4'N 05°45.4'W	MLR

Sublittoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	13	W of Eilean nan Gobhar, Loch Ailort	NM 692 795	56°50.9'N 05°47.1'W	Phy.HEC
27	15	An Taor-geal, Loch Ailort	NM 737 797	56°51.2'N 05°42.7'W	Oph; LsacX; Tra
27	16	S of Eilean Buidhe, Loch Ailort	NM 732 792	56°50.9'N 05°43.1'W	IGS; Lcor
27	17	E of Eilean nan Bairneach, Loch Ailort	NM 726 794	56°51.0'N 05°43.7'W	EcorEns
27	18	E of Cruach an Aonaich, Loch Ailort	NM 737 802	56°51.4'N 05°42.7'W	VirOph.HAS
27	19	Sgeir Ghlas Sound, Loch Ailort	NM 694 789	56°50.6'N 05°46.9'W	AfilEcor; XKScrR
27	20	Glasnacardoch Bay, Loch Ailort	NM 704 800	56°51.2'N 05°45.9'W	Phy.HEC
27	21	NE of Cruach an Aonaich, Loch Ailort	NM 737 806	56°51.7'N 05°42.7'W	AmenCio; NeoPro; Lsac.Pk; Beg
27	22	Channel S of Eilean nan Bairneach, Loch Ailort	NM 722 791	56°50.8'N 05°44.1'W	Phy.R
27	23	N side, head of loch, Loch Ailort	NM 752 823	56°52.6'N 05°41.3'W	Beg
27	24	W side of Eilean nan Trom, Loch Ailort	NM 718 797	56°51.1'N 05°44.5'W	LsacX
27	72	Rocks W of Eilean nan Trom, Loch Ailort	NM 715 798	56°51.2'N 05°44.8'W	Phy.R; Lhyp.TFt
27	74	E of Eilean nan Gobhar, Loch Ailort	NM 699 794	56°50.9'N 05°46.4'W	EcorEns; LsacX
27	76	Opposite Eilean Dubh, Loch Ailort	NM 745 814	56°52.1'N 05°42.0'W	NeoPro; Lsac
27	77	Rubh a'Chairn Mhoir, Loch Ailort	NM 677 783	56°50.2'N 05°48.5'W	XKScrR; LsacX
27	78	E of Eilean Dubh, Loch Ailort	NM 748 813	56°52.1'N 05°41.7'W	VirOph; LsacRS.Psa
27	79	SW of Sgeir Ghlas, Loch Ailort	NM 689 788	56°50.5'N 05°47.3'W	SpMeg
27	9	SW of Glasnacardoch, Loch Ailort	NM 702 803	56°51.4'N 05°46.1'W	Zmar; Lhyp.Ft
637	5	Skerry S of Peanmeanach, Loch Ailort	NM 708 797	56°51.1'N 05°45.5'W	Phy.R
637	6	Skerries W of Eilean Troin, Loch Ailort	NM 712 797	56°51.1'N 05°45.1'W	Phy.R

Sublittoral sites					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
637	7	Channel S of Eilean nan Trom, Loch Ailort	NM 719 793	56°50.9'N 05°44.4'W	Phy.R
637	8	Roshven, Loch Ailort	NM 704 790	56°50.7'N 05°45.9'W	Phy.R
654	1	Near Eilean nan Trom (site 1), Loch Ailort	NM 722 794	56°51.0'N 05°44.1'W	LsacX
654	2	Near Eilean nan Trom (site 2), Loch Ailort	NM 722 794	56°51.0'N 05°44.1'W	K; LsacX; Phy
654	3	S of Eilean nan Trom, Loch Ailort	NM 722 792	56°50.9'N 05°44.1'W	Phy
654	4	SE of Eilean Buidhe, Loch Ailort	NM 733 793	56°51.0'N 05°43.0'W	LsacX
654	7	S of Eilean Buidhe, Loch Ailort	NM 688 793	56°50.8'N 05°47.4'W	LsacX
654	8	SW of Eilean Buidhe (site 1), Loch Ailort	NM 726 791	56°50.8'N 05°43.7'W	LsacX
654	9	SW of Eilean Buidhe (site 2), Loch Ailort	NM 726 792	56°50.9'N 05°43.7'W	LsacX
654	10	SW of Eilean Buidhe (site 3), Loch Ailort	NM 726 790	56°50.8'N 05°43.7'W	Lcor
654	11	S of Eilean Buidhe (S loch shore to W of fish farm), Loch Ailort	NM 729 789	56°50.7'N 05°43.4'W	Lcor
654	12	Main channel S of Eilean nan Trom, Loch Ailort	NM 724 790	56°50.8'N 05°43.9'W	Phy
654	13	W end of main channel, S of Eilean nan Trom, Loch Ailort	NM 717 791	56°50.8'N 05°44.6'W	EphR

Loch nan Uamh

Location

Position (centre)	NM 697 832	56°52.9'N 05°52.9'W
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North Areas

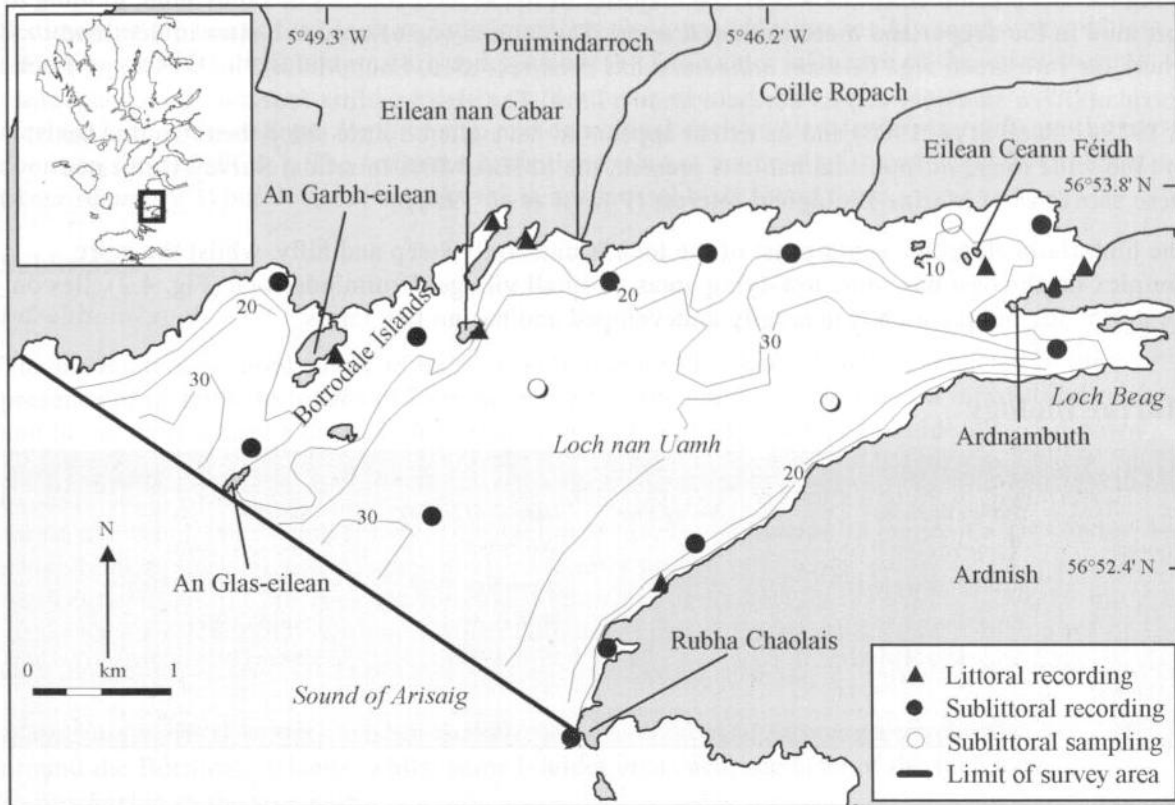


Figure 4.1 Main features of the area, showing sites surveyed.

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Physical features

Physiographic type	Open sealoch
Length of coast	25.3 km (29.5 km including islands)
Length of inlet	6.0 km
Area of inlet	14.7 km ² (14.6 km ² excluding islands)
Bathymetry	Maximum depth 52 m; Loch Beag 21 m
Wave exposure	Exposed to moderately exposed; sheltered at extreme head
Tidal streams	Very weak
Tidal range	4.3 m (mean springs); 1.9 m (mean neaps) (Loch Moidart)
Salinity	No data but probably fully marine

Introduction

Loch nan Uamh lies to the north-east of the Ardnamurchan peninsula. It is a wide inlet opening onto the Sound of Arisaig and separated from Loch Ailort (*Area summary* 3) to the south by the Ardnish peninsula. Loch nan Uamh runs north-east to south-west with its wide entrance to the south-west and has no protecting islands or bars. The loch therefore has few sheltered areas. The

head of the loch divides into two small arms, an un-named northern arm enclosed by a group of rocks, and Loch Beag, and here there is some shelter from the prevailing winds. Loch nan Uamh has no entrance sill but two parallel rocky ridges run north-east to south-west, seaward from the north-west side of the loch. One of these is partly emergent, appearing as a series of small islands, the Borrodale Islands.

The intertidal area in the loch is small and the shores consist mainly of steeply sloping bedrock, particularly along the south shore bordering the Ardnish peninsula. There are also areas of boulders in small embayments along the north coast. In the sublittoral, rock extends to 20 m depth along the steep south coast. However, the majority of the seabed consists of sandy mud, grading to soft mud in the deeper and more sheltered areas. The loch is one of only two sites in Scotland where the rare green alga *Codium adhaerens* has been recorded, Loch Melfort in Argyll and Loch Torridan (Area summary 22) its northern known limit. The alga was first found in Loch nan Uamh in 1928 (Powell *et al.* 1980) and its extent appears to have altered little since then. On this basis, and the wide range of intertidal habitats present, the SMBA/MBA Intertidal Survey Unit rated these shores as of Marine Biological Interest (Powell *et al.* 1980).

The hinterland along the south coast of the loch is uniformly steep and hilly, whilst the more complex north coast has some low-lying areas. A small village, Druimindarroch (Fig. 4.2), lies on the north side but the loch is generally undeveloped and has no fish farms.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
<i>Littoral</i>	Recording (epibiota)	2	May 1989	Howson (1990)
	Recording (epibiota)	2	September 1979	Powell <i>et al.</i> (1980)
	Recording (epibiota)	3	May 1979	Smith (1981)
	Recording (epibiota)	1	1970, 1972	Smith (1978)
<i>Sublittoral</i>	Recording (epibiota)	13	May 1989	Howson (1990)
	Infaunal sampling (dredge)	3	May 1989	Howson (1990)

Littoral

Littoral rock

The majority of the shores around Loch nan Uamh are steep bedrock with the steepest areas along the north-west shores of the Ardnish peninsula, where the shore drops straight into deep water. There are some interesting boulder areas around and between the Borrodale Islands. Sediment is restricted to small pockets along the north shore and areas at the loch head. The majority of the shores are exposed or moderately exposed due to the open nature of the loch and this, combined with the steepness of the rock, means that most of the shores are barnacle-dominated. Sheltered fucoid-dominated rock is, however, found on the lee side of some of the islands at the loch head. Steep bedrock along the Ardnish shoreline is dominated in the mid and upper zones by barnacles *Semibalanus balanoides* and *Chthamalus montagui* with some limpets *Patella vulgata* and mussels *Mytilus edulis*. The extreme lower shore supports mats of red algae such as *Plocamium cartilagineum* and *Membranoptera alata*, encrusting coralline algae, and on overhanging rock, the anemone *Metridium senile*, the sponge *Halichondria panicea* and small bryozoans (SByAs). Kelp *Laminaria digitata* and dabberlocks *Alaria esculenta* are found in the sublittoral fringe (Ala.Ldig).

The shores around the Borrodale Islands are a mixture of steep, exposed bedrock and boulders. On the south-east and east sides of the largest island, An Garbh-eilean, the boulders lie on gravel and a wide variety of mollusc species were found here and nearby by Smith (1981). Of particular interest is an area of boulders near the low-water mark on the north side of Eilean nan Cabar. Several boulders here are covered by the green alga *C. adhaerens*.

The small islands near the head of the loch are more sheltered; the lee side of Eilean Ceann Féidh has an extremely sheltered, gently sloping rocky shore dominated by furoids. A clear zonation can be seen with *Fucus spiralis* and *Pelvetia canaliculata* on the upper shore (Fspi; Pel), and *Fucus vesiculosus* on the mid-shore with *Ascophyllum nodosum* below (Asc.Asc). Much of the rock on the lower shore is covered by encrusting coralline algae and in some areas, foliose red algae, especially *Palmaria palmata*. This is similar to the lower shore at exposed, barnacle-dominated sites. Barnacles are also present at these sheltered sites, sometimes as a band at the top of the shore.

Littoral sediment

Sediment at the head of the loch at Ardnambuth is close-packed, fine, muddy sand with cobbles and stones, and its unyielding nature and possibly the freshwater influence of the small streams that enter the loch here result in a paucity of burrowing species. The polychaetes *Arenicola marina*, *Lanice conchilega*, *Nephtys* spp. and occasional cockles *Cerastoderma edule* are the most common species (PCer.). The sediment is similar to that at the head of the adjacent Loch Ailort (Area summary 3) but does not support the dense mussel beds found there.

Sublittoral

Infralittoral rock

The moderately exposed nature of most areas throughout Loch nan Uamh is reflected in the presence of mixed kelp forests of *Laminaria hyperborea* and *L. saccharina* on infralittoral rock, and in the more exposed areas, *L. hyperborea* only (Lhyp). Bedrock and boulders extend down from the shore all round the loch, to a sediment boundary at around 10–20 m depth. Along the exposed south coast, both bedrock and stable boulder slopes are dominated by *L. hyperborea* forest to around 14 m depth (Lhyp.Ft), sometimes with *L. saccharina* as the major kelp on the less stable boulder areas below. At some sites, especially on bedrock, there is a rich algal understorey and kelp epiflora but this is rather variable, some areas being heavily grazed and grading into the rather barren circalittoral, with no distinct boundary apart from the absence of kelp plants (LhypGz). Colour and variety are added to these forests by areas of vertical rock in shallow water covered by the jewel anemone *Corynactis viridis* and the anemones *Sagartia elegans* and dwarf *Metridium senile* (CorMetAlc). Similar infralittoral biotopes are found on the north coast and around the Borrodale Islands, whilst some boulder areas near the head of the loch have *L. saccharina* as the sole kelp.

Circalittoral rock

Circalittoral bedrock and boulder slopes are found all round Loch nan Uamh since hard substrata extend to at least 20 m depth along the south coast and along parts of the north coast. In Loch Beag, rocky outcrops extend up from the sediment plain at around the same depth. Most of the bedrock areas are of steeply sloping smooth rock with ledges. In the very sheltered Loch Beag, deep silt has accumulated on these ledges such that sediment-dwelling species, including the sea-pen *Virgularia mirabilis*, have become established. The rock itself has a very barren 'pink' appearance, the colour of the predominating crusts of coralline algae. Other robust species, such as the brachiopod *Neocrania anomala*, the keel worm *Pomatoceros triqueter* and the cup coral *Caryophyllia smithii*, are also common. The sea urchin *Echinus esculentus* is also common at some sites, and the bareness of the rock may be in part due to its grazing activities. Scattered hydroids and solitary ascidians and the featherstar *Antedon petasus* are also characteristic of this habitat (FaAlc). Deep circalittoral rock is present as low-lying bedrock and boulder outcrops in depths of 40 m and probably more in the offshore, outer parts of the loch. Similar outcrops are found in the adjoining Sound of Arisaig. The species present are similar to those of the upper circalittoral rock slopes but with no algae apart from the pink crusts and often a complete cover of brittlestars *Ophiothrix fragilis*. Where boulders are present, there is a greater variety of species living on the sides and under the rocks, including the tubeworm *Chaetopterus variopedatus*, the polychaete *Eupolytnia nebulosa* and larger numbers of *N. anomala*.

Sublittoral sediment

Throughout most of Loch nan Uamh, sediment slopes and plains of muddy sand and gravel occur where the rock slope ends at around 20 m depth. This type of sediment is one of the most widespread in Scottish sealochs and is characterised by burrowing species, particularly the sea-pen *Virgularia mirabilis*, the anemone *Cerianthus lloydii* and brittlestars *Amphiura* spp. (VirOph). Other typical species include the scallop *Pecten maximus* and the gastropods *Turritella communis* and *Aporrhais pespelecani*. Where the rock slope is short and sediment extends into shallow water, mainly along parts of the north coast and around the Borrodale Islands, these muddy circalittoral sediments grade into similar but often coarser sediments with foliose algae, which may be abundant in shallow water, growing attached to stones and shells (LsacX). Finer muddier sediment in embayments often has lugworms *Arenicola marina* and the burrowing sea urchin *Echinocardium cordatum* present in significant numbers, and sometimes also the topshell *Gibbula magus* and brittlestars *Ophiura* spp. (EcorEns). In the north-eastern part of the loch head, scattered eelgrass *Zostera marina* plants occur (Zmar).

Deep areas below about 30 m extend in a wide swathe along the whole of the southern side of the loch. Here the sediment is mainly soft mud and is extensively burrowed by megafauna such as Norway lobster *Nephrops norvegicus*, with abundant burrowing brittlestars *Amphiura* spp. and occasional *V. mirabilis* (SpMeg). This is a common biotope in deep areas of Scottish sealochs but in Loch nan Uamh large numbers of the burrowing sea urchin *Brissopsis lyrifera* are also present. Other similar deep pockets of mud are present along the central outer parts of the loch and in Loch Beag. The mud in the latter is however rather poor in species. Soft mud is also present at the head of the loch on the north side of the anchorage at around 16 m depth. The predominant species here is the tube-dwelling polychaete *Melinna* sp.

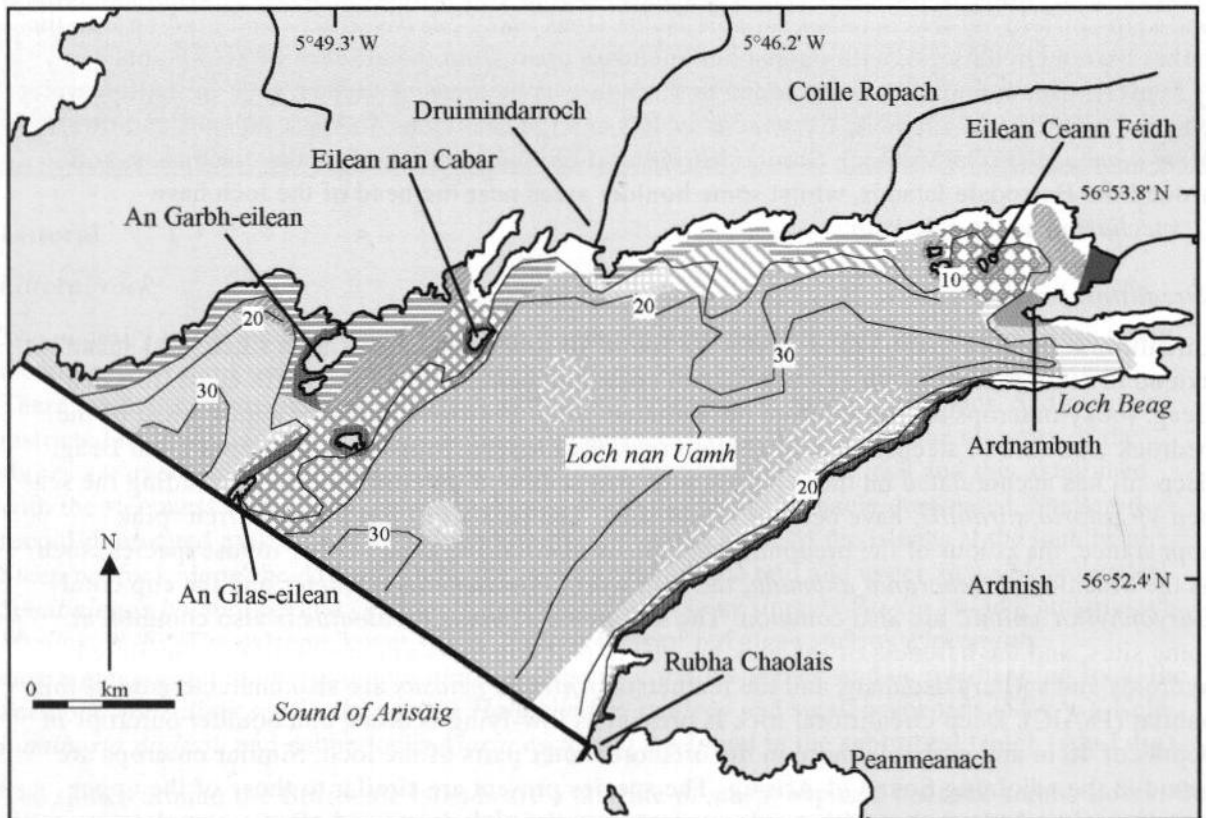


Figure 4.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 4.1, cited literature and additional field observations).

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At the entrance to the loch, open exposed sites such as the headland of Rubha Chaolais have coarse clean sands. These replace the muddy sands found further into the loch and support typical species such as the holothurian *Neopentadactyla mixta* (Ven.Neo).

Nature conservation

Conservation sites		
Site name	Designation	Main features
Glen Beasdale	SSSI	Botanical; geological
Druimindarroch	SSSI; GCR	Geological
Morar, Moidart and Ardnamurchan	NSA	Landscape

Human influences

Coastal developments and uses

The coastal area around Loch nan Uamh is little developed. The A830 Fort William-Mallaig road and railway run past the head of the loch. The small village of Druimdarroch and Coille Ropach railway station lie a little way inland on the north side. The loch attracts some tourists through its historical interest as the place where Bonnie Prince Charlie first landed on the Scottish mainland at the start of the 1745 rebellion, marked by the 'Prince's Cairn' on the shore at the head of the loch. Ardnish peninsula is supposed to be kept clear of grazing sheep but this policy does not always succeed. The north-west corner of the loch is bounded by an extensive oakwood of considerable nature conservation interest.

Marine developments and uses

There are a few small piers and slipways around Loch nan Uamh. At the time of the 1989 MNCR survey, there were no fish farms within the loch and the Crown Estate Commissioners have said that no sites will be leased because of the area's historical interest. There is a small amount of creeling for Norway lobster *Nephrops norvegicus* in the loch. Creeling for lobsters *Homarus gammarus* is a traditional crofting activity and continues to take place on a small scale along most of the rocky coast in Arisaig.

References and further reading

- Howson, C.M. 1990. Surveys of Scottish sealochs. Sealochs of Arisaig and Moidart. (Contractor: University Marine Biological Station, Millport.) *Nature Conservancy Council, CSD Report*, No. 1086.
- Powell, H.T., Holme, N.A., Knight, S.J.T., Harvey, R., Bishop, G. & Bartrop, J. 1980. Survey of the littoral zone of the coast of Great Britain: 6. Report on the shores of north-west Scotland. (Contractor: Scottish Marine Biological Association/Marine Biological Association, Oban/Plymouth.) *Nature Conservancy Council, CSD Report*, No. 289.
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- Smith, S.M. 1981. Littoral Mollusca of west Inverness-shire and north Argyll (II). (Contractor: S.M. Smith, Edinburgh.) *Nature Conservancy Council, CSD Report*, No. 358.

Sites surveyed

- Survey 27: 1989 UMBSM Arisaig and Moidart sealochs survey (Howson 1990).
- Survey 83: 1979–1980 Smith west Inverness-shire and north Argyll littoral survey (Smith 1981).

Survey 84: 1978 Smith west Inverness-shire and north Argyll littoral survey (Smith 1978).

Survey 265: 1970–80 SMBA/MBA Great Britain intertidal survey (Powell *et al.* 1980).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	36	N shore of Eiridh Gharbh, Ardnish peninsula, Loch nan Uamh	NM 698 817	56°52.1'N 05°46.6'W	R; Ala.Ldig; SByAs; BPat.Cht
27	37	E side of Eilean Ceann Féidh, Loch nan Uamh	NM 721 840	56°53.4'N 05°44.5'W	YG; Ver.Ver; Fves; Fspi; Asc.Asc; Pel
83	10	Druimindarroch, Loch nan Uamh, West Inverness-shire	NM 688 842	56°53.4'N 05°47.7'W	
83	11	Ardnambuth, Loch nan Uamh, West Inverness-shire	NM 726 838	56°53.3'N 05°44.0'W	
83	19	Ardnamurchan Point, West Inverness-shire	NM 416 675	56°43.6'N 06°13.4'W	
84	G	Loch nan Uamh, Loch Ailort	NM 685 843	56°53.5'N 05°48.0'W	LMX
265	51	Ardnambuth House, Loch nan Uamh	NM 726 838	56°53.3'N 05°44.0'W	Lan EcorEns
265	52	Ardnambuth viaduct, Loch nan Uamh	NM 728 840	56°53.5'N 05°43.8'W	Pccr
265	69	Eilean Ceann Feidh, Loch nan Uamh	NM 721 840	56°53.4'N 05°44.5'W	MLR
265	72	Eilean nan Cabar, Loch nan Uamh	NM 684 835	56°53.1'N 05°48.0'W	MLR

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	2	Rubha Chaolais, Loch nan Uamh	NM 691 806	56°51.5'N 05°47.2'W	Ven.Neo; LsacSac; LhypGz.Pk
27	5	NW side of Ardnish peninsula, Loch nan Uamh	NM 700 820	56°52.3'N 05°46.4'W	FaAIC; VirOph.HAs; SedK; CorMetAlc; Lhyp
27	6	N of An Glas-eilean, Loch nan Uamh.	NM 668 827	56°52.6'N 05°49.6'W	VirOph.HAs; FaAIC
27	7	Camas Ghaoidheil, Loch nan Uamh	NM 670 839	56°53.2'N 05°49.5'W	VirOph; LsacSac; EphR; LsacX
27	8	Cuildarrach, Loch nan Uamh	NM 725 843	56°53.6'N 05°44.1'W	Zmar; LsacX
27	10	Rubh' Aird Ghamhsgail, Loch nan Uamh	NM 694 839	56°53.3'N 05°47.1'W	SpMeg; FaAIC; Lhyp.Pk
27	12	S side of skerry in Loch Beag, Loch nan Uamh	NM 726 834	56°53.1'N 05°44.0'W	SpMeg; VirOph; AntAsH
27	14	W of Eilean nan Cabar, Loch nan Uamh	NM 680 835	56°53.0'N 05°48.5'W	VirOph; LhypGz.Ft
27	64	E of Borrodale Islands, Loch nan Uamh	NM 689 831	56°52.9'N 05°47.6'W	SpMeg
27	65	NW of Cruach an Fhearainn Duibh, Loch nan Uamh	NM 710 830	56°52.9'N 05°45.5'W	SpMeg
27	66	Anchorage, Loch nan Uamh	NM 698 844	56°53.6'N 05°46.8'W	SpMeg
27	73	Mid loch, Loch nan Uamh	NM 681 822	56°52.3'N 05°48.3'W	VirOph; FaAIC
27	75	SW of Ardnambuth, Loch nan Uamh	NM 721 836	56°53.2'N 05°44.5'W	AntAsH; VirOph.HAs; Lhyp.Ft; Lsac.Pk
27	81	N of Rubha Chaolais, Loch nan Uamh	NM 694 812	56°51.8'N 05°47.0'W	FaAIC; CorMetAlc; Lhyp.TFt
27	83	NW Sgeir nan Eilid, Loch nan Uamh	NM 701 841	56°53.4'N 05°46.5'W	Lhyp.Ft; LsacX
27	84	500 m E of Sgeir nan Eilid, Loch nan Uamh	NM 707 841	56°53.4'N 05°45.9'W	EcorEns; Lsac.Ft

5

Loch nan Ceall

Location

Position (centre)	NM 637 866	56°54.6'N 05°52.9'W
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North Areas

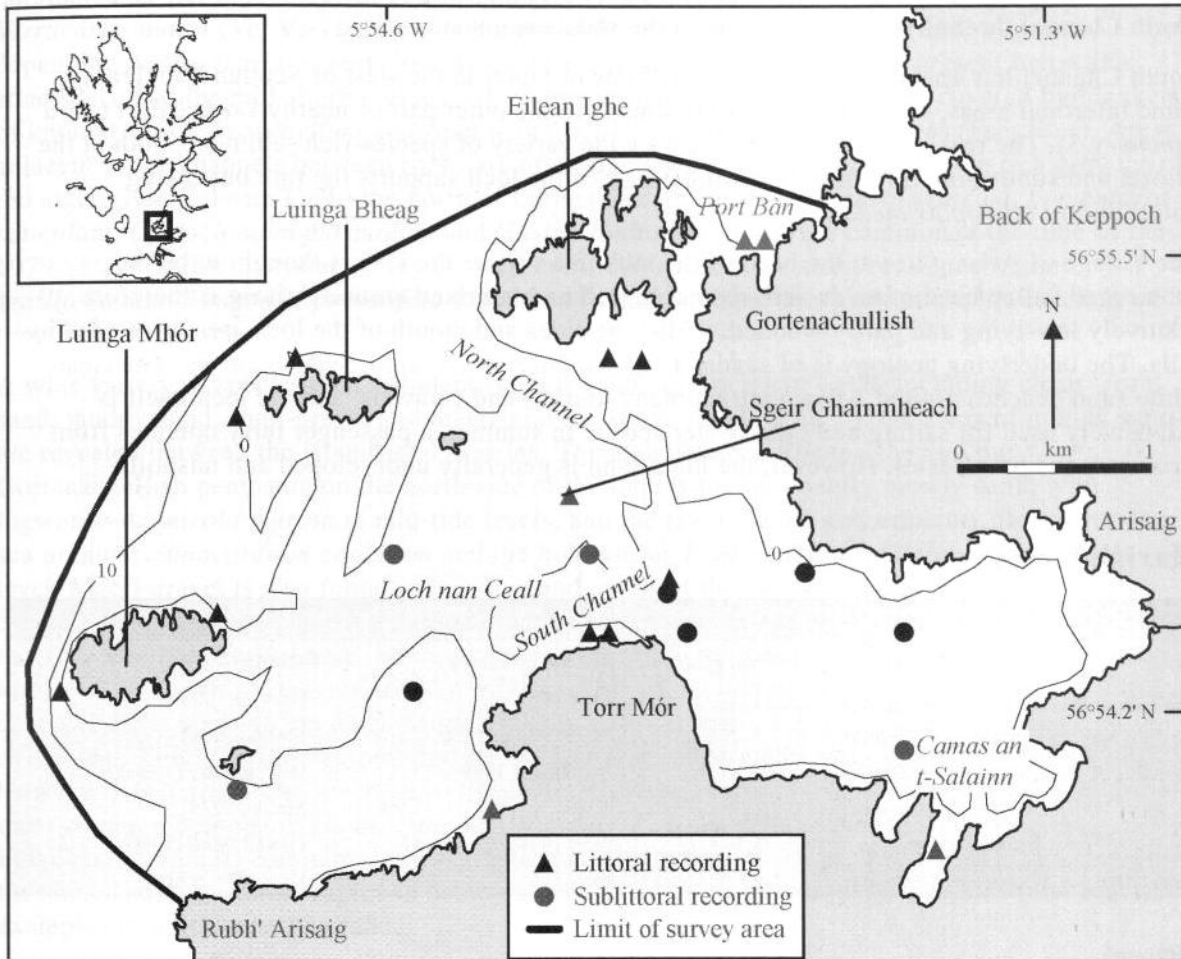


Figure 5.1 Main features of the area, showing sites surveyed.

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Physical features

Physiographic type	Fiardic sealoch
Length of coast	29.1 km (36.7 km including islands)
Length of inlet	4.4 km
Area of inlet	12.1 km ² (11.6 km ² excluding islands)
Bathymetry	Max depth 19 m off north-east Torr Mór (MNCR survey)
Wave exposure	Entrance exposed to moderately exposed; otherwise sheltered
Tidal streams	Moderately strong through entrance channel
Tidal range	4.3 m (mean springs); 1.9 m (mean neaps) (Loch Moidart)
Salinity	No data but appears fully marine

Introduction

Loch nan Ceall is a small, very shallow loch lying in the Arisaig area to the north-east of the Ardnamurchan peninsula. One of the shortest as well as one of the shallowest sealochs, it is separated from the adjacent Sound of Arisaig and Loch nan Uamh (*Area summary 4*) by part of the Arisaig peninsula. Across the entrance to the loch lies a mass of rocky islets, reefs and sandbanks which form a protective guard and provide considerable shelter at low water. At high water many of these are submerged and the loch becomes more exposed. These flat-topped islets are the remains of a raised platform. The narrow and tortuous South Channel entrance winds through the islets and shoals adjacent to the Arisaig promontory. This channel has a maximum depth of only 6 m and a sill at only 2 m near the end of the channel off Torr Mór. The smaller North Channel through the northern side of the shoals is unnavigable.

South Channel has one of the most extensive beds of maerl in the west of Scotland, including some intertidal areas, and in this respect is similar to the outer part of nearby Loch Ailort (*Area summary 3*). The rest of Loch nan Ceall has a wide variety of species-rich sediments both in the littoral and sublittoral. Soft mud in the inner part of the loch supports the rare burrowing holothurian *Labidoplax media*.

The village of Arisaig lies at the head of the loch in a valley; the loch is thought to be the submerged valley head of an ancient river course. The hinterland around Arisaig is therefore relatively low-lying and partly wooded, whilst the sides and mouth of the loch are surrounded by hills. The underlying geology is of sandstone (psammite) overlying Lewisian gneiss. The clean, white sand beaches around Arisaig attract many tourists and caravans, and the loch itself is extensively used for sailing and other water sports. In summer, a passenger ferry operates from Arisaig to the Small Isles. However, the hinterland is generally undeveloped and unspoilt.

Marine biology

Marine biological surveys

	Survey methods	No. of sites	Date(s) of survey	Source
<i>Littoral</i>	Recording (epibiota)	1	May 1989	Howson (1990)
	Recording (epibiota)	5	May 1979 & 1980	Smith (1981)
	Recording (epibiota)	4	September 1979	Powell <i>et al.</i> (1980)
	Recording (epibiota)	1	1970s	Smith (1978)
	Infaunal recording	3	May 1979	Powell <i>et al.</i> (1980)
<i>Sublittoral</i>	Recording (epibiota)	9	May 1989	Howson (1990)

Littoral

Loch nan Ceall has a wide range of interesting littoral habitats and its shores have been identified as of great marine biological interest (e.g. Powell *et al.* 1980 and Smith 1978, 1981). The loch presents a very different appearance at low tide compared to high tide. As the tide recedes a large expanse of seaweed-covered littoral rock is exposed around and between the numerous small islands across the entrance to the loch. Separating these rocky reefs are tortuous channels, 'coral' sand-flats and banks of sand and maerl-gravel, many of which dry out on low spring tides. Rocky shores are mostly found around the skerries and along the outer part of the south shore to the west of Torr Mór. Sand and maerl-gravel fill the areas between the skerries and sandy shores predominate around Arisaig and the whole of the inner part of the loch, interspersed with small rocky headlands and skerries.

The seaward-facing rocky coasts of the islands and skerries are fairly steep and exposed and support communities typical of Scottish west coast exposed sites. The rocks are dominated by barnacles *Semibalanus balanoides* with some *Fucus vesiculosus* f. *linearis* and limpets *Patella vulgata*. Dabberlocks *Alaria esculenta* occurs in the sublittoral fringe along with the kelp

Laminaria digitata and encrusting coralline algae. Around the south side of Luinga Bheag extensive forests of the kelp *Laminaria hyperborea* occur around extreme low-water mark and have rich epiphytic growths of red algae, especially *Palmaria palmata* and *Ptilota plumosa*. Similar exposed shores make up the coastline along the south of the loch along the Arisaig promontory as far east as the pier below Torr Mór.

Sheltered fucoid-dominated rocky shores occur over most of the rest of the skerries coastline and on the lee shores of the larger outer islands such as Eilean Ighe. These show a typical sheltered rocky-shore zonation, while the lower shore is often of sand or maerl-gravel, the highest zones are absent on those skerries that are totally submerged at high tide. Steep rock at the highest levels is dominated by lichens, colourful yellow and green species (YG) with a band of black lichen *Verrucaria maura* (Ver.Ver) below, sometimes with other species such as *Lichina pygmaea* depending on the aspect. Channelled wrack *Pelvetia canaliculata* is usually present below this zone (Pel), and the mid-shore regions, which mostly have a gentler slope, are covered by blankets of knotted wrack *Ascophyllum nodosum* with *Fucus serratus* in the lower areas (Fser.Fser). Areas adjacent to the channels between rocks are often tide-swept and here there may be rich growths of red algae (Asc.T; Fserr.T). To the north of Luinga Bheag, *Plocamium cartilagineum*, *Lomentaria articulata*, *Cystoclonium purpureum* and *Gastroclonium ovatum* were common at the time of the 1979 SMBA/MBA intertidal survey (Powell *et al.* 1980). At other sites, rocks covered by *Trilliella* and *Osmundea pinnatifida* have been found. Sponges also grow at the lower levels of these tide-swept sites.

A wide variety of species-rich sediment types is found in Loch nan Ceall, including clean 'coral' sand, muddy sand, shell-gravel and maerl-gravel. At extreme low tide, large areas of muddy sand are revealed between the islands and skerries. The area between Eilean Ighe and the Gortnachullish peninsula on the north side of the loch is predominantly muddy sand, with lugworms *Arenicola marina* at mid-tide levels, and the razor clam *Ensis arcuatus*, the burrowing sea urchin *Echinocardium cordatum* and the holothurian *Leptosynapta inhaerens* at low-water level. Maerl-gravel is also found in this area and amongst the skerries and is rich in burrowing bivalves, but the most extensive area of intertidal maerl-gravel is found along the north shore of the Torr Mór peninsula where it borders the tide-swept South Channel. A sandy beach runs for a kilometre or so with extensive areas of mixed sediment, including maerl-gravel heaped up into bars and drifts up to 40 cm deep. Much of the maerl near low water is live *Phymatolithon calcareum*. This forms the littoral part of an extensive bed stretching across South Channel and between the skerries. The maerl-gravel has a rich infauna, particularly of bivalve molluscs, the most common being *Dosinia exoleta*, *Mya truncata*, *E. arcuatus* and several *Venerupis* spp. Polychaetes are also common. Intertidal maerl is uncommon, and these beds, along with those on the shores adjacent to the rapids in nearby Loch Ailort (*Area summary* 3), are two of the best examples in north-west Scotland.

Eelgrass *Zostera marina* is found in sheltered sandy inlets amongst the skerries, for example on the north coast of Luinga Mhór where there is also a rich flora in pools among the surrounding rocks. The free-living *A. nodosum* ecad. *mackaii* is found in similarly sheltered areas, such as around Sgeir Ghainmheach.

Within the shelter of the inner part of the loch most of the shoreline is sedimentary. Camas an t-Salainn and adjacent inlets to the west are backed by rocks covered with *A. nodosum* and mainly comprise gravel and mud. These sediments are not as rich as those in the north around the skerries. There are extensive sandy beaches around Arisaig and along the north side of the loch which are used for recreation. The small pocket beach at Gortnachullish to the north of Arisaig is sandy, much of it shell-sand, with a rather sparse infauna of the tellin *Angulus tenuis*, amphipods, and the polychaetes *Nephtys hombergii* and *A. marina* near low-water mark. Larger numbers of *A. marina* along with the bivalves *Macoma balthica* and *Cerastoderma edule* occupy the muddier upper shore.

Sublittoral

Infralittoral rock

The sublittoral seabed consists mainly of shallow sediments and there is little sublittoral rock. Tide-swept bedrock and small boulders occur on the south sides of the skerries abutting South Channel and are dominated at the channel entrance by *Laminaria hyperborea* kelp forest with an understory of red algae (XKScrR). The anemones *Urticina felina* and *Sagartia elegans* also occur frequently. Boulders and shallow areas further along the channel tend to have little kelp but dense growths of foliose red algae, especially *Delesseria sanguinea* and *Phycodrys rubens*, and some sponges, mainly *Amphilectus fucorum*, *Myxilla incrustans* and *Halichondria panicea*, add a splash of colour. Sea-oak *Halidrys siliquosa* occurs with *Laminaria* spp. at around 2–3 m depth (HalXX).

Sublittoral sediments

The whole of the inner part of Loch nan Ceall comprises a flat plain of soft mud with a flocculent surface at between 3 and 4 m depth. The mud is mounded up by lugworms *Arenicola marina* and many burrows are present. The opisthobranch mollusc *Philine aperta* is common ploughing through the mud surface, and the holothurian *Leptosynapta inhaerens* is also present (PhiVir; AreSyn). Another holothurian *Labidoplax media* was found in one area by the 1989 MNCR survey, one of very few records of this species in the British Isles. Epibiota include patches of green algal turf *Derbesia* sp. and the shore crab *Carcinus maenas*. South Channel, running between the skerries and the Arisaig promontory shore, is tide-swept and floored by an extensive bed of maerl, and maerl-gravel and sand. The bed extends from the entrance to the channel at Rubh' Arisaig to the north-east side of Torr Mór where the loch widens. In the outer part of the channel maerl lies at about 9 m depth and consists of around 30% live *Phymatolithon calcareum* (Phy.R). Shells and cobbles support a range of foliose algae but algae on the maerl itself is more restricted, with *Plocamium cartilagineum* the most abundant species. Infauna includes the holothurian *Neopentadactyla mixta*, large bivalves, the burrowing anemone *Cerianthus lloydii* and the squat lobster *Galathea intermedia*. Maerl further along the channel in shallow water is overgrown by mats of the filamentous alga *Trilliella* as well as *P. cartilagineum* and the occasional *Laminaria saccharina* kelp plant. Off the north-east of Torr Mór, maerl is piled up into a steep bank along the edge of the channel. On the seaward side of the skerries at around 6 m depth in the channel north of Luinga Mhór there is a plain of clean, coarse, rather bare sand with, at the time of the 1989 MNCR survey, much drift-blown algae.

Nature conservation

There are no designated conservation sites in the area at present.

Human influences

Coastal developments and uses

The village of Arisaig is situated at the head of Loch nan Ceall and is served by the A830 Fort William–Mallaig road. A minor road follows the coastline along the south side. The village has a septic tank with an overflow at low-water mark south-west of the harbour. There are a few small groups of houses and crofts around the rest of the loch. The area is very popular for caravans, putting increasing pressure on sandy beaches near Arisaig and at the village of Back of Keppoch to the north.

Marine developments and uses

There is a small harbour at Arisaig which is used for the summer ferry service to the Small Isles and by a few creeling boats. There is a pier in the bay to the west of Torr Mór. In the summer the loch is extensively and increasingly used for recreational boating, especially sailing.

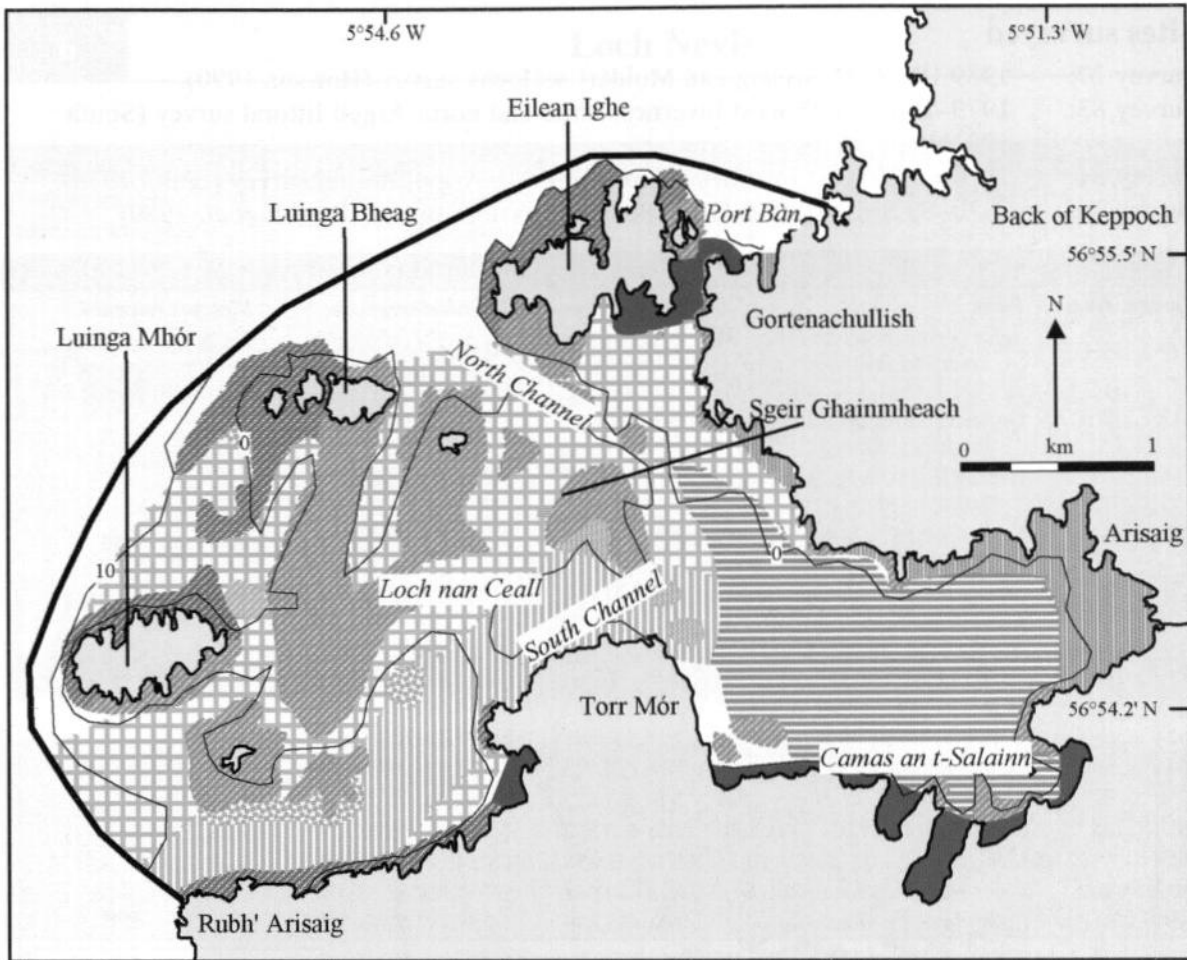


Figure 5.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 5.1, cited literature and additional field observations).

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The shallow nature of Loch nan Ceall makes it unsuitable for fin-fish farming and there are no installations in the loch. Fishing within the loch is mainly by crofters creeling for lobsters *Homarus gammarus*.

References and further reading

- Howson, C.M. 1990. Surveys of Scottish sealochs. Sealochs of Arisaig and Moidart. (Contractor: University Marine Biological Station, Millport.) *Nature Conservancy Council, CSD Report*, No. 1086.
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Sites surveyed

- Survey 27: 1989 UMBSM Arisaig and Moidart sealochs survey (Howson 1990).
 Survey 83: 1979–1980 Smith west Inverness-shire and north Argyll littoral survey (Smith 1981).
 Survey 84: 1978 Smith west Inverness-shire and north Argyll littoral survey (Smith 1978).
 Survey 265: 1970–80 SMBA/MBA Great Britain intertidal survey (Powell *et al.* 1980).

Littoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	32	Sgeir Ghainmheach to Eilean Bàn, Loch nan Ceall	NM 631 868	56°54.7'N 05°53.5'W	Sh; AscX.mac; YG; Ver.Ver; Fspi; Asc.T; Fserr.T; R; FserX; Pel
83	4	Gortnachullish, Arisaig, West Inverness-shire	NM 640 881	56°55.4'N 05°52.7'W	
83	5	Eilean Ighe, Arisaig, West Inverness-shire	NM 634 874	56°55.1'N 05°53.2'W	
83	6	Saideal Torr a' Bheithe, Arisaig, West Inverness-shire	NM 649 849	56°53.8'N 05°51.6'W	
83	7	Traigh Torr Mór, Arisaig, West Inverness-shire	NM 633 861	56°54.3'N 05°53.2'W	
83	8	Arisaig Pier, Arisaig, West Inverness-shire	NM 627 852	56°53.8'N 05°53.8'W	
84	F	Loch nan Ceall, Sound of Sleat	NM 636 863	56°54.5'N 05°53.0'W	LR
265	80	Gortnachullish, Loch nan Ceall	NM 641 881	56°55.4'N 05°52.6'W	Lan
265	86	Luinga Bheag N, Loch nan Ceall	NM 617 875	56°55.0'N 05°54.9'W	MLR
265	87	Luinga Bheag S, Loch nan Ceall	NM 614 872	56°54.8'N 05°55.2'W	MLR
265	88	Luinga Mhór N, Loch nan Ceall	NM 613 862	56°54.3'N 05°55.2'W	SLR
265	89	Luinga Mhór, Loch nan Ceall	NM 605 858	56°54.1'N 05°56.0'W	ELR
265	119	Torr Mór, Loch nan Ceall	NM 632 861	56°54.3'N 05°53.3'W	LMX
265	S10	Eilean Ighe, Loch nan Ceall	NM 633 875	56°55.1'N 05°53.3'W	

Sublittoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
27	25	S of Sgeir Ghainmheach, Loch nan Ceall	NM 636 863	56°54.4'N 05°53.0'W	Phy.R; Lsac.T
27	26	Urchair Fhada, Loch nan Ceall	NM 643 864	56°54.5'N 05°52.3'W	PhiVir
27	27	W of Torr Mór, South Channel, Loch nan Ceall	NM 623 858	56°54.1'N 05°54.2'W	Phy.R; XKScrR
27	28	NE of Rubh' Arisaig, South Channel, Loch nan Ceall	NM 614 853	56°53.8'N 05°55.1'W	Phy.R; Lhyp.Ft
27	29	NE of Torr Mór, Loch nan Ceall	NM 637 861	56°54.3'N 05°52.9'W	Phy
27	30	Channel N of Luinga Mhór, Loch nan Ceall	NM 622 865	56°54.5'N 05°54.3'W	FaS
27	31	SE of Sgeir Ghainmheach, Loch nan Ceall	NM 632 865	56°54.5'N 05°53.4'W	Phy.R; HalXX
27	69	W of Morroch Point, Loch nan Ceall	NM 648 855	56°54.0'N 05°51.7'W	AreSyn
27	71	S of Urchair Fhada, Loch nan Ceall	NM 648 861	56°54.3'N 05°51.8'W	PhiVir

6

Loch Nevis

Location

Position (centre)	NM 784 941	56°59.1'N 05°38.9'W
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North Areas

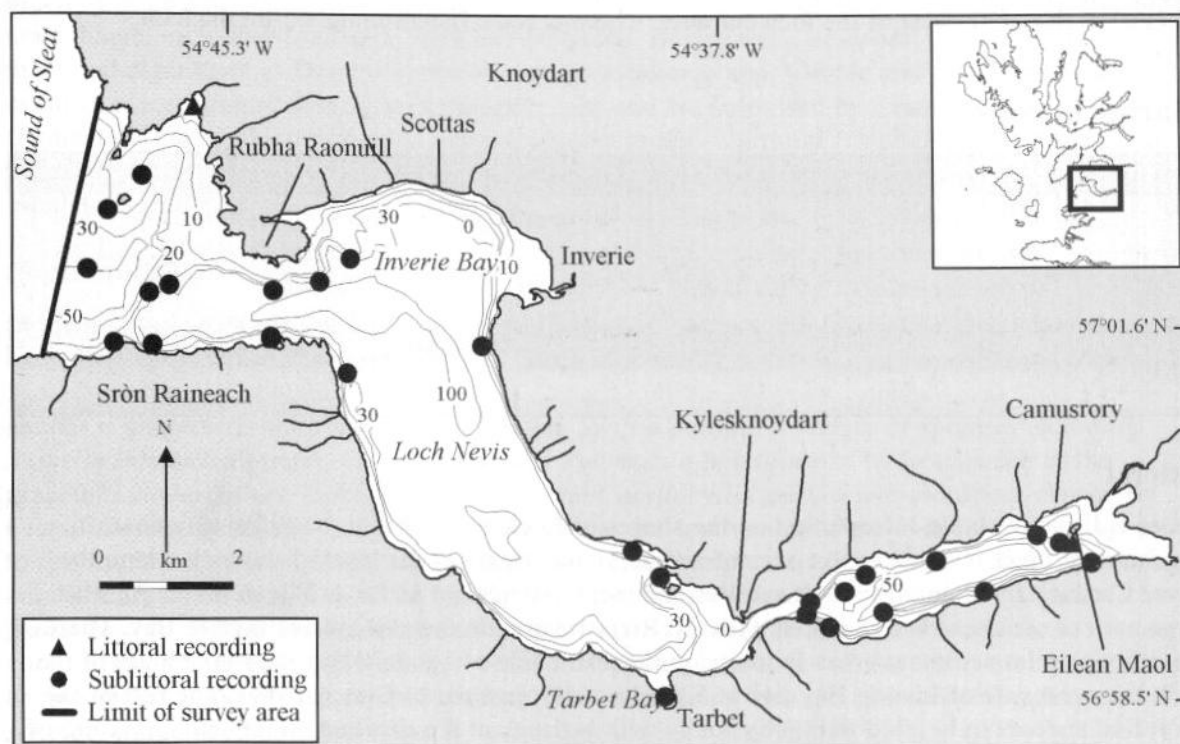


Figure 6.1 Main features of the area, showing sites surveyed.

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Physical features

Physiographic type	Fjordic sealoch
Length of coast	67.9 km (70.7 km including islands)
Length of inlet	20.3 km
Area of inlet	41.7 km ²
Bathymetry	Maximum depth: outer basin 133 m; inner basin 101 m
Wave exposure	Moderately exposed to sheltered
Tidal streams	Generally weak; moderately strong over entrance sill and in central narrows
Tidal range	4.3 m (mean springs); 1.8 m (mean neaps) (Inverie Bay)
Salinity	Fully marine; possibly variable at times near head of loch

Introduction

Loch Nevis is situated in Inverness-shire to the south of Knoydart, and has a wide mouth opening onto the Sound of Sleat. The loch is sheltered from the prevailing winds by the Isle of Skye to the west, and high hills surrounding the loch provide further shelter. Consequently the majority of the loch experiences little wave action and even the mouth is only moderately exposed. The loch is divided into two basins separated by the narrows at Kylesknoydart where there is a sill at about

4 m depth. An entrance sill lies across the mouth of the outer loch at a depth of 10–20 m. Both basins are deep, exceeding 100 m in places. The main body of the loch lies north-west to south-east but the inner basin and the entrance lie almost west-east. Moderately strong tidal streams run through the narrows between the two basins. There is no extensive freshwater input but the small Inverie River enters the loch near the mouth at Inverie and the River Carnach enters at the head of the loch.

The hinterland surrounding the loch is steep. Only on the north shore near the mouth of Loch Nevis is there a minor road (with no land connection to the wider road system) and it is here, in Inverie Bay, that there is some habitation in the form of small villages. The fishing and ferry port of Mallaig lies just to the south-west of the loch entrance. There is some fish farming within the loch.

Marine biology

Marine biological surveys

	Survey methods	No. of sites	Date(s) of survey	Source
<i>Littoral</i>	Recording (epibiota)	1	May 1988	MNCR Survey 18
	Recording (general)	Not known	1970, 1972	Smith (1978)
<i>Sublittoral</i>	Recording (epibiota)	5	August 1990	MNCR Survey 45
	Recording (epibiota)	8	May 1988	MNCR Survey 18
	Recording (epibiota)	16	July 1984	Breen, Connor & McKenzie (1986)

Littoral

There is little available information on the shores of Loch Nevis. From the Admiralty chart it appears that there is an extensive area of sediment and stones at the head of the loch where the River Carnach flows into the loch and this sediment extends out as far as Eilean Maol. Another large area of sediment is associated with the River Inverie on the east side of Inverie Bay. There are other smaller sediment areas in inlets on the north side of Sandaig Bay near the mouth of the loch, the west side of Inverie Bay and at Kylesknoydart just west of the narrows. The rest of the shoreline appears to be predominantly rocky with bedrock at the exposed mouth and a mixture of bedrock, boulders and stones in the sheltered inner basins of the loch.

Sublittoral

Sublittoral rock

The deep, sheltered nature of Loch Nevis and lack of strong tidal streams throughout most of its length result in a predominance of muddy sediments in the sublittoral, with only a restricted amount of silted rock. Steep, predominantly bedrock slopes are found around the edge of the loch and there are also many areas where boulders and cobbles lie scattered over and mixed into sediment slopes. The depth of the rock/sediment boundary varies, is not always distinct and has not been systematically charted. It lies as deep as 30 m in some places, even in the inner loch. Bedrock also occurs around the relatively few islands throughout the loch and also around outcrops in sediment plains, especially in the vicinity of the sill near the loch mouth, on the north side of the outer loch where it narrows before opening out into Inverie Bay, and near the head of the loch.

Infralittoral rock

Laminaria saccharina is the predominant kelp on infralittoral rock, extending to a variable depth depending on the amount of silt in the water. Bedrock and boulder slopes on both the east and west sides of the main south-east running basin support *L. saccharina* forest to around 8 m depth, along with a very sparse underflora and fauna. Where there is a slight increase in tidal streams, such as over the outer sill between Sròn Raineach on the south side and Rubha Raonuill on the north, the rock under the kelp is often dominated by brittlestars *Ophiothrix fragilis* and

Ophiocomina nigra. Dense *L. saccharina* occurs to a similar depth on bedrock and boulder slopes near the head of the loch, with an understorey of brown and red algae. Dense forests of *Laminaria hyperborea* only occur in the exposed entrance to the loch.

The rock surfaces beneath the kelp are, in general, heavily grazed by the urchin *Echinus esculentus* and are dominated mainly by encrusting red algae. *L. hyperborea* also occurs along with *L. saccharina* on bedrock ridges and scattered boulders in the tide-swept narrows at Kylesknoydart.

Areas of infralittoral cobbles and pebbles and maerl overlying clean gravel and shell-sand floor much of these narrows. The stones and large shell fragments provide anchorage for a diverse algal assemblage, including *Ulva* spp., *Halidrys siliquosa*, *Desmarestia aculeata*, *Chorda filum* and many red algae such as *Porphyra miniata* and *Polysiphonia* spp. Cobble and pebble areas also occur in places around the edges of the inner loch and are colonised by *L. saccharina* and filamentous algae which may form a dense blanket in the sublittoral fringe. Below around 10 m depth, these cobble and pebble slopes are relatively bare but may support some hydroids and ascidians (ModHAs).

Circalittoral rock

In the mouth of Loch Nevis there are outcrops of deep, steeply sloping circalittoral bedrock, extending up from the sediment at around 30 m to about 16 m depth. The rock here supports a much wider variety of animals than similar outcrops within the shelter of the inner loch. The habitat is characterised by the northern sea-fan *Swiftia pallida*, a variety of sponges including *Axinella infundibuliformis*, *Cliona celata* and *Polymastia boletiformis*, hydroids such as the graceful *Lytocarpia myriophyllum*, the cup coral *Caryophyllia smithii* and ascidians, especially *Ciona intestinalis* (ErSSwi). On both the north and the south sides of the loch just before it turns to run south-east, outcrops at a similar depth are rather barren and silty with extensive encrusting coralline algae, the brachiopod *Neocrania anomala*, scattered hydroids such as *Polyplumaria frutescens*, *C. smithii* and dense patches of brittlestars *O. fragilis*, especially where there is some current flow. Circalittoral bedrock and boulder slopes on both sides of the main south-east running basin support similar impoverished communities, sometimes with the anemone *Protanthea simplex*. In the inner loch, outcrops at the head of the loch near Eilean Maol are heavily silted with *N. anomala*, the ascidians *Clavelina lepadiformis* and *Ascidia mentula*, the keel worm *Pomatoceros triqueter* and some foliose algae above about 15 m depth (NeoPro).

Cobble and pebble plains overlying gravel and muddy sand are present in the outer reaches of Loch Nevis around Glas Eilean between around 15–20 m depth. The stones are predominantly covered with barnacles *Balanus crenatus* and *Balanus balanus* and *O. nigra* is common. This type of habitat often supports large numbers of hydroids and their scarcity here may be due to scallop-dredging activities since tracks were clearly seen in this area by MNCR teams. At the time of the 1990 MNCR survey, thousands of sea-slugs *Onchidoris bilamellata* were present. Cobble and pebble areas at the eastern end of the Kylesknoydart narrows are covered by dense beds of the brittlestar *O. nigra* (Oph) from 12–20 m depth, with quite a sharp cut-off above and below this depth.

Sublittoral sediment

The majority of sediments throughout the loch are muddy with mixtures of muddy sands and gravels grading into softer mud with increasing depth. Where muddy sands extend into shallow water, for example near the head of the loch, fairly dense algae including *Desmarestia viridis* and foliose red and brown algae are found attached to stones and shells down to around 7 m depth (Lsac.X). Similar muddy shell-gravel slopes are found along the south side of the outer loch and support a varied flora, including *Scinaia* spp., *Cutleria multifida*, *Sporochnus pedunculatus* and *Arthrocladia villosa*, where tidal stream strengths increase over the outer bar (Lsac.X). These mixed and slightly coarser sediments, in the outer loch and around the edges of the middle and inner loch, support a variety of widely dispersed species including the scallop *Pecten maximus*, the burrowing anemone *Cerianthus lloydii*, brittlestars *Amphiura* spp., the tubeworm *Chaetopterus*

variopedatus, the turret shell *Turritella communis* and the sea-pen *Virgularia mirabilis* (VirOph.HAs). This type of sediment is very widespread at moderate depths in Scottish sealochs. Below around 30 m, the sediment becomes increasingly fine and muddy, the sea-pens *Pennatula phosphorea* and *Funiculina quadrangularis* increase in numbers and burrows of Norway lobsters *Nephrops norvegicus* occur (SpMegFun).

The extensive deep areas of the loch have not been surveyed in detail but are likely to consist of soft mud with similar communities. Shallow fine mud near the head of the loch and in small inlets supports the opisthobranch *Philine aperta*, the brittlestar *Amphiura filiformis*, diatom films and occasional ascidians and algae on shells (PhiVir).

Nature conservation

Conservation sites

Site name	Status	Main features
Knoydart	NSA	Landscape

Human influences

Coastal developments and uses

The main habitation around Loch Nevis is at Inverie Bay where several small villages including Scottas and Inverie are spread out along a minor road which does not connect with any other road. The rest of the loch has no road access and only a few remote crofts, many of which are now abandoned. Transport is by boat or ferry from Mallaig. Small passenger ferries run from Mallaig to Inverie and along the length of the loch to Tarbet Bay and Camusrorry at the head of the loch. The Knoydart peninsula between Loch Nevis and Loch Hourn (*Area summary 7*) to the north is a remote wilderness area. Since 1999, much of the south-western part of the peninsula has been owned by the Knoydart Foundation, a charitable partnership which aims to revitalise the community and manage Knoydart Estate for the benefit of the public and conservation. The Foundation's business plan includes infrastructure improvements, support for new businesses, forestry proposals and conservation work (Knoydart Foundation 1999).

Marine developments and uses

There is a pier at Inverie and possibly other small landing slips serving fish farms and the small passenger ferries which link the remote settlements around the loch with Mallaig. Admiralty Chart 2451 (1993) shows six salmon *Salmo salar* cage sites and one other farm site along the west coast of the main basin, one in Inverie bay and three in the inner loch. At the time of the 1990 MNCR survey, tracks made by scallop-dredges were apparent on the seabed in the outer loch. The Knoydart Foundation has overseen improvements to the sewerage infrastructure serving the settlements on Knoydart Estate.

References and further reading

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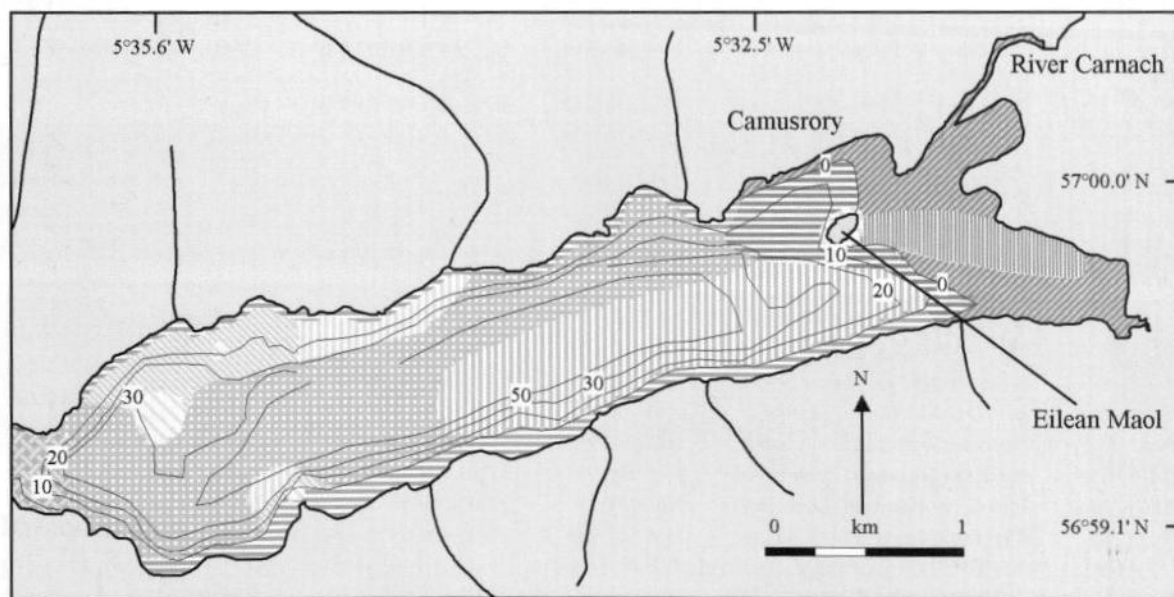
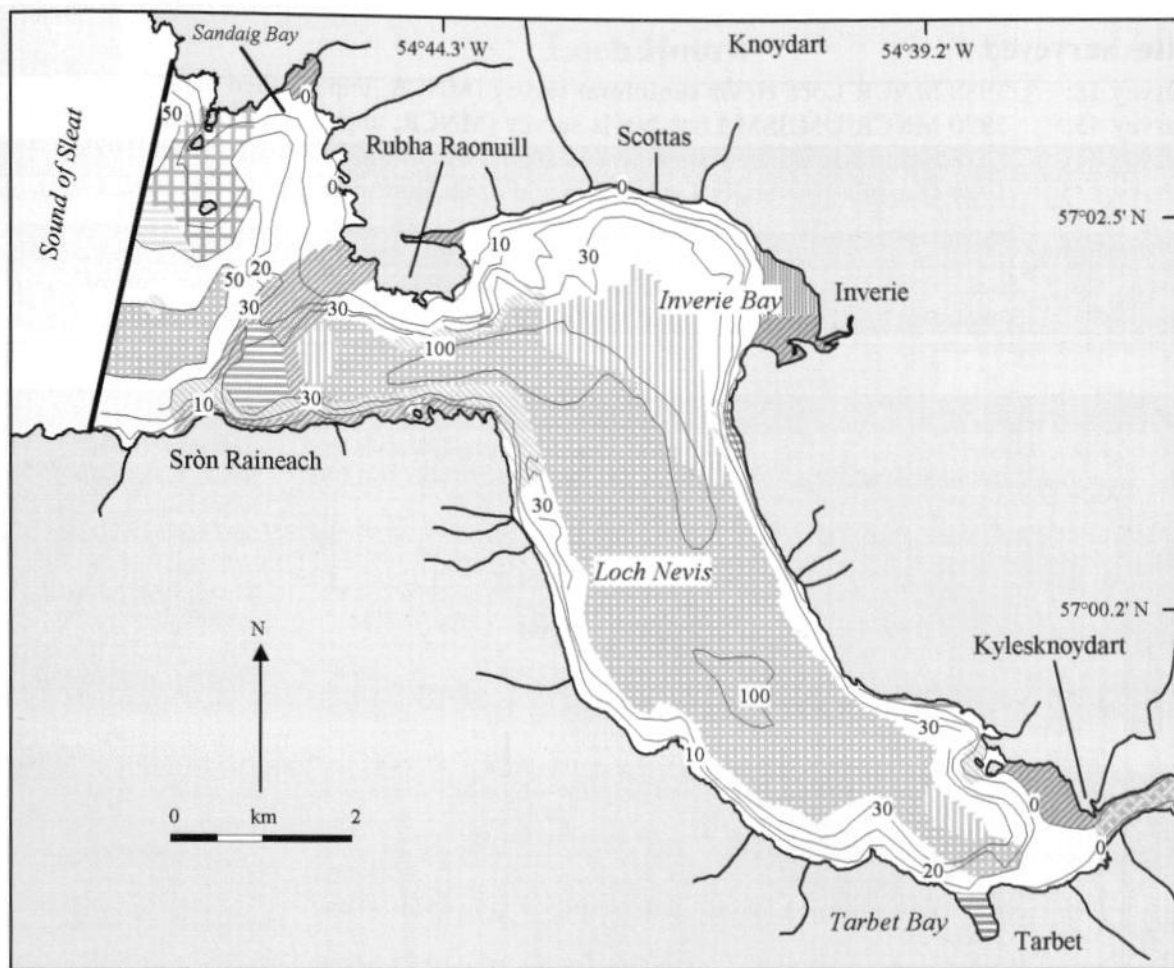


Figure 6.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 6.1, cited literature and additional field observations).
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Sites surveyed

- Survey 18: 1988 MNCR Loch Nevis sublittoral survey (MNCR, unpublished data).
 Survey 45: 1990 MNCR/UMBSM Loch Nevis survey (MNCR, unpublished data).
 Survey 84: 1978 Smith west Inverness-shire and north Argyll littoral survey (Smith 1978).
 Survey 135: 1984 Queen's University Loch Nevis and Loch Hourn survey (Breen *et al.* 1986).

Littoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
84	B	Sandaig Bay, Loch Nevis	NG 718 017	57°02.9'N 05°45.7'W	FX

Sublittoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
18	1	SSE of Eilean Maol, Loch Nevis	NM 856 946	56°59.6'N 05°31.7'W	SpMeg.Fun; PhiVir; LhypLsac
18	2	E of Sgeir Alasdair Mór, Loch Nevis	NM 840 942	56°59.3'N 05°33.3'W	SpMeg.Fun; AntAsH
18	3	NE of Rubh' Aird na Murrach, Loch Nevis	NM 824 938	56°59.1'N 05°34.8'W	VirOph.HAS; AntAsH
18	4	Ru Torr na Cartach, Loch Nevis	NM 813 940	56°59.1'N 05°35.9'W	Oph; CMX; LhypLsac.Ft; EphR
18	5	W of Eilean Maol, Loch Nevis	NM 853 949	56°59.7'N 05°32.0'W	F; PhiVir; LsacX
18	6	Pinnacle SW of Eilean Maol, Loch Nevis	NM 851 949	56°59.7'N 05°32.2'W	NeoPro; Lsac.Pk
18	7	N side opposite Sgeir Alasdair Mór, Loch Nevis	NM 832 946	56°59.5'N 05°34.0'W	AntAsH; ModHAS; LsacX
18	8	Off mainland ENE of Bogha an Tachard, Loch Nevis	NM 821 944	56°59.4'N 05°35.1'W	AmenCio; VirOph
45	1	NW of Eilean Guibhais, Loch Nevis	NM 730 981	57°01.1'N 05°44.4'W	AmenCio; VirOph.HAS
45	2	Sròn Raineach, Loch Nevis	NM 705 980	57°01.0'N 05°46.7'W	LsacX
45	3	Sill in mouth, Loch Nevis	NM 714 989	57°01.5'N 05°45.9'W	EphR
45	4	W Glas Eilean, Loch Nevis	NG 704 001	57°02.1'N 05°46.9'W	AntAsH; LhypGz.Pk
45	5	NE of Sgeir nan Eun, Loch Nevis	NG 710 006	57°02.4'N 05°46.5'W	LsacX; LsacSac; LhypGz.Ft
135	1	Headland W Eilean Maol, Loch Nevis	NM 848 950	56°59.8'N 05°32.6'W	CMU; Lsac.Ft; PhiVir
135	2	Bogha an Tachard, Loch Nevis	NM 818 942	56°59.2'N 05°35.4'W	Oph
135	3	Bay S of Bogha an Tachard, Loch Nevis	NM 816 936	56°58.9'N 05°35.6'W	BrAs; CMU
135	4	Narrows, Loch Nevis	NM 812 938	56°59.0'N 05°36.0'W	EcorEns
135	5	Tarbet Bay, Loch Nevis	NM 791 925	56°58.3'N 05°38.0'W	PhiVir
135	6	NW Eilean Beithe, Loch Nevis	NM 790 944	56°59.3'N 05°38.2'W	SpMeg.Fun
135	7	Braomisaig, Loch Nevis	NM 786 948	56°59.5'N 05°38.7'W	K; NeoPro
135	8	Creag an Eilean, Loch Nevis	NM 762 980	57°01.1'N 05°41.1'W	SpMeg.Fun; BrAs; Lsac
135	9	Sgeir a'Ghaill, Loch Nevis	NM 741 975	57°00.8'N 05°43.2'W	BrAs; Lsac
135	10	S Sgeirean Glasa, Loch Nevis	NM 742 993	57°01.8'N 05°43.2'W	SpMeg.Fun; K
135	11	SE Bogha Don, Loch Nevis	NM 737 990	57°01.6'N 05°43.7'W	VirOph; LsacX
135	12	S Rubha Raonuill, Loch Nevis	NM 730 988	57°01.5'N 05°44.4'W	BrAs; CMX
135	13	N Eilean Giubhais, Loch Nevis	NM 730 981	57°01.1'N 05°44.4'W	Oph; LsacX
135	14	E of Sròn Raineach, Loch Nevis	NM 711 980	57°01.0'N 05°46.2'W	SpMeg.Fun; LsacX
135	15	Threshold bar at mouth, Loch Nevis	NM 711 988	57°01.4'N 05°46.2'W	Oph; Lsac.Pk
135	16	Submerged rock at mouth, Loch Nevis	NM 701 992	57°01.6'N 05°47.2'W	ErSSwi

Location

Position (centre)	NG 840 085	57°07'N 05°28.5'W
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North Areas

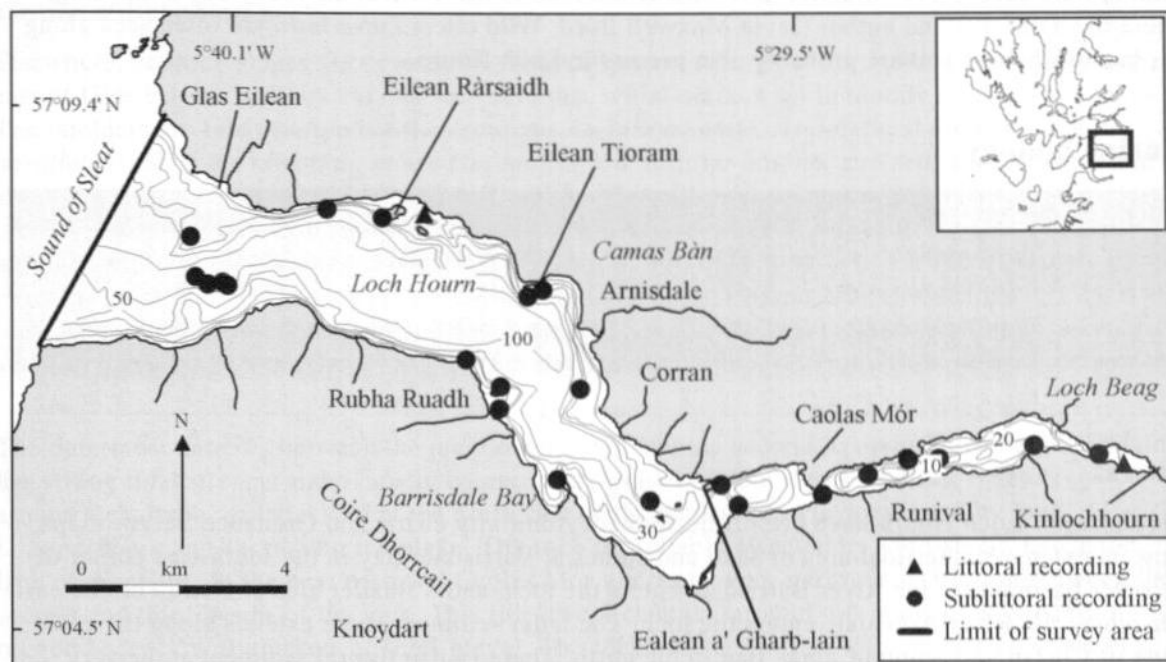


Figure 7.1 Main features of the area, showing sites surveyed.

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Physical features

Physiographic type	Fjordic sealoch
Length of coast	57.2 km (62.4 km including islands)
Length of inlet	21.3 km
Area of inlet	37.2 km ² (37.0 km ² excluding islands)
Bathymetry	Maximum depth: outer basin 185 m; middle basins 40–50 m; inner basin 18 m
Wave exposure	Moderately exposed to sheltered
Tidal streams	Generally weak; moderately strong through narrows over sills
Tidal range	4.2 m (mean springs); 1.8 m (mean neaps)
Salinity	Mostly marine; probably variable in innermost basin at times

Introduction

Loch Hourn, situated in west Inverness-shire, has a wide entrance opening onto the Sound of Sleat. The loch is sheltered from the prevailing winds by the Isle of Skye to the west, and high hills surrounding the loch provide further shelter. Consequently the majority of the loch experiences little wave action and even the mouth is only moderately exposed. Loch Hourn is typically fjordic in character and is divided into five basins by a series of sills. The wide outer basin comprises the majority of Loch Hourn and initially runs west to east before turning to run south-east. It is very deep with much of its area at over 100 m depth. At the eastern end of the

outer basin the loch narrows considerably and turns to run again almost directly west-east. The four inner basins are each separated by constrictions in the loch, with sills of less than 10 m depth, and are all less than 50 m deep. Tidal streams of up to 3 knots run through the narrows between the basins.

Loch Hourn is in a remote area with no major developments around its coastline and only two small villages on the north coast, served by minor roads. The loch is flanked by high, barren mountains giving it a rather dark and claustrophobic character and earning it the nickname 'Loch of Hell'. The Knoydart peninsula separating Loch Hourn from Loch Nevis is a remote wilderness without road access. An attraction just outside the loch to the north is the rocky bay at Sandaig, where the naturalist and author Gavin Maxwell lived. Wild otters *Lutra lutra* are often seen along this beautiful shore and are probably also present in Loch Hourn.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	1	August 1978	Smith (1978a)
	Recording (epibiota)	1	August 1978	Smith (1978b)
Sublittoral	Recording (epibiota)	19	July 1984	Breen <i>et al.</i> (1986)
	Recording (ROV survey)	4	May 1996	SNH survey

Littoral

The shores of Loch Hourn have been little studied. Admiralty charts and Ordnance Survey maps show an extensive intertidal area of sand and stones at Barrisdale Bay in the south-east corner of the outer basin where the River Barrisdale enters the loch, and a smaller area at Corran on the east side where the River Arnisdale enters the loch. The latter sediment shore extends along the coast south of Corran and around Camas Bàn to the north. There is also littoral sediment at the very head of the loch in Loch Beag where the Loch Hourn river enters.

There is some information available for the shore adjacent to Eilean Ràrsaigh on the north side of the outer basin (Smith 1978a,b). Here the intertidal area is a mixture of bedrock and boulders and shows a distinct zonation of furoid algae with *Fucus vesiculosus* passing down into a dense cover of *Ascophyllum nodosum* and some *Fucus serratus*, and finally the kelp *Laminaria digitata* in the sublittoral fringe. The sheltered nature of the loch makes it likely that most of the rocky shores will be similar to this.

Sublittoral

Sublittoral rock

The information given here is based on a survey carried out in 1984 by the Biological Society of Queen's University, Belfast (Breen *et al.* 1986). Extensive rocky sublittoral slopes are not characteristic of Loch Hourn. Below most of the shoreline, the seabed drops away as predominantly sediment slopes of muddy shell-gravel and sand, often with outcrops of bedrock or with overlying boulders and stones. Steep and extensive bedrock is confined to rock pinnacles in the mouth and headlands within the loch. Throughout the loch *Laminaria saccharina* is the predominant kelp; *L. hyperborea* only occurs in the mouth of the loch and in areas of high tidal streams in the narrows between each of the inner basins. In the middle of the loch entrance there is a barely submerged group of rocks, Sgeir Ulibhe. Rugged fissured bedrock extends down to around 22 m depth before giving way to muddy sand. Kelps *L. hyperborea* and *L. saccharina* are present, featherstars *Antedon* spp. are common and the northern featherstar *Leptometra celtica* has also been recorded at this site. Admiralty Chart 2451 shows areas of hard ground and rock in water over 100 m deep to the south of Sgeir Ulibhe.

Deep, steep bedrock is found off some headlands along the south coast of outer Loch Hourn, such as at Rubha Ruadh. Here vertical and steep bedrock extends to more than 37 m depth, interspersed with patches of shell-gravel, presumably on ledges. Circalittoral rock is characterised by the sponge *Axinella* sp. and the ascidian *Diazona violacea*. Further south, the headland off the north tip of Eilean a'Mhuineil consists of similar, heavily silted steep bedrock extending to around 12 m depth and fairly rich in sponges, including *Pachymatisma johnstonia*, *Cliona celata*, *Stelligera rigida* and *Raspailia hispida*. On the east side, isolated bedrock pinnacles support a diverse community of ascidians, *Antedon* spp. and squat lobsters *Munida rugosa*. Limited steep silted bedrock is also found in the inner basins and extends to around 35 m off Island Rock in the third narrows at Runival.

Elsewhere, bedrock slopes are generally of limited extent. Along the north side of the outer loch east of Glas Eilean, bedrock extends to 6 m depth, with boulders set in muddy shell-gravel below. The boulders are fairly barren but the ascidians *Ascidia mentula*, *Ascidiella scabra* and *Corella parallelogramma* are common, as are *Munida rugosa*. Similar boulder and sediment slopes occur along the south coast east of Rubha Ruadh and are probably a common habitat throughout the loch. At the entrance to the innermost basin, Loch Beag, steeply sloping rock dominated by the mussel *Mytilus edulis* extends to 6 m before giving way to mud. Bedrock also occurs widely as outcrops from sediment slopes at various depths. Off Eilean Tioram, near Arnisdale in the outer loch, such outcrops occur to at least 40 m depth and support the brachiopods *Neocrania anomala* and *Terebratulina retusa* (BrAs). Similar outcrops occur in the inner basins where the urchin *Psammechinus miliaris* may be common.

The outermost narrows between the main outer basin and the second basin at Eilean a'Gharb-làin has strong tidal streams and a mostly coarse sandy-gravel bottom. Steep bedrock extends to around 8 m depth off the island at the north side of the narrows and is dominated by kelp *L. hyperborea* and encrusting red algae. The rock is probably affected by sand-scour, hence the lack of diversity. At the next narrows, Caolas Mór, there is a very narrow constriction between the second and third basins of the loch. This tide-swept channel, around 6-8 m deep, is lined by rugged bedrock with pockets of shell-gravel. The rock surfaces have a rich and varied cover of filter-feeding animals including the anemones *Metridium senile*, *Sagartia elegans* and *Urticina felina*, hydroids such as *Sertularella* spp. and *Amphisbetia operculata*, dead-man's fingers *Alcyonium digitatum* and bryozoans such as *Bugula* sp. and *Scrupocellaria scruposa*. Kelp *L. hyperborea* is also present along with a variety of red algae species, mostly confined to the kelp stipes. The third narrows near Runival is separated into two channels by Eilean Mhogh Sgeir. Island Rock, off the east end of the island, drops sharply with steep, rugged silty bedrock to at least 35 m depth. Brittlestars *Ophiothrix fragilis* and *Ophiocoma nigrum* are abundant, as they often are in areas of increased tidal streams.

Sublittoral sediment

Sediments in Loch Hourn have not been studied in detail. Most of the loch apart from the edges lies below normal diving limits and there are no extensive or recent dredging records. Steep sediment slopes from the shore or shallow sublittoral downwards are common around the loch, the type of sediment depending on the degree of shelter and water movement. Apart from these areas of strong tidal streams, the sediments tend to be muddy. The softest muds are found in the extreme shelter of the innermost basins. Loch Beag consists mainly of soft mud and the other small basins mainly of sandy mud to soft mud with brittlestars *Amphiura* spp. and the opisthobranch mollusc *Philina aperta* in the softer sediments. Most of the outer main basin lies between 50 m and nearly 200 m deep and is likely to be soft mud. The sea-pen *Funiculina quadrangularis* and Norway lobster *Nephrops norvegicus*, both characteristic of deep soft muds, have been recorded from Loch Hourn. The deep-sea brittlestar *Asteronyx* has been sighted on the *Funiculina* at depths of 175 m (SNH ROV survey). Sediment at intermediate depths down to around 40 m consists of muddy sands with seapens *Virgularia mirabilis* and a variety of other widespread species. To the east of the first narrows at Eilean a' Gharb-làin, there is an area of small islands, rocks and shoals.

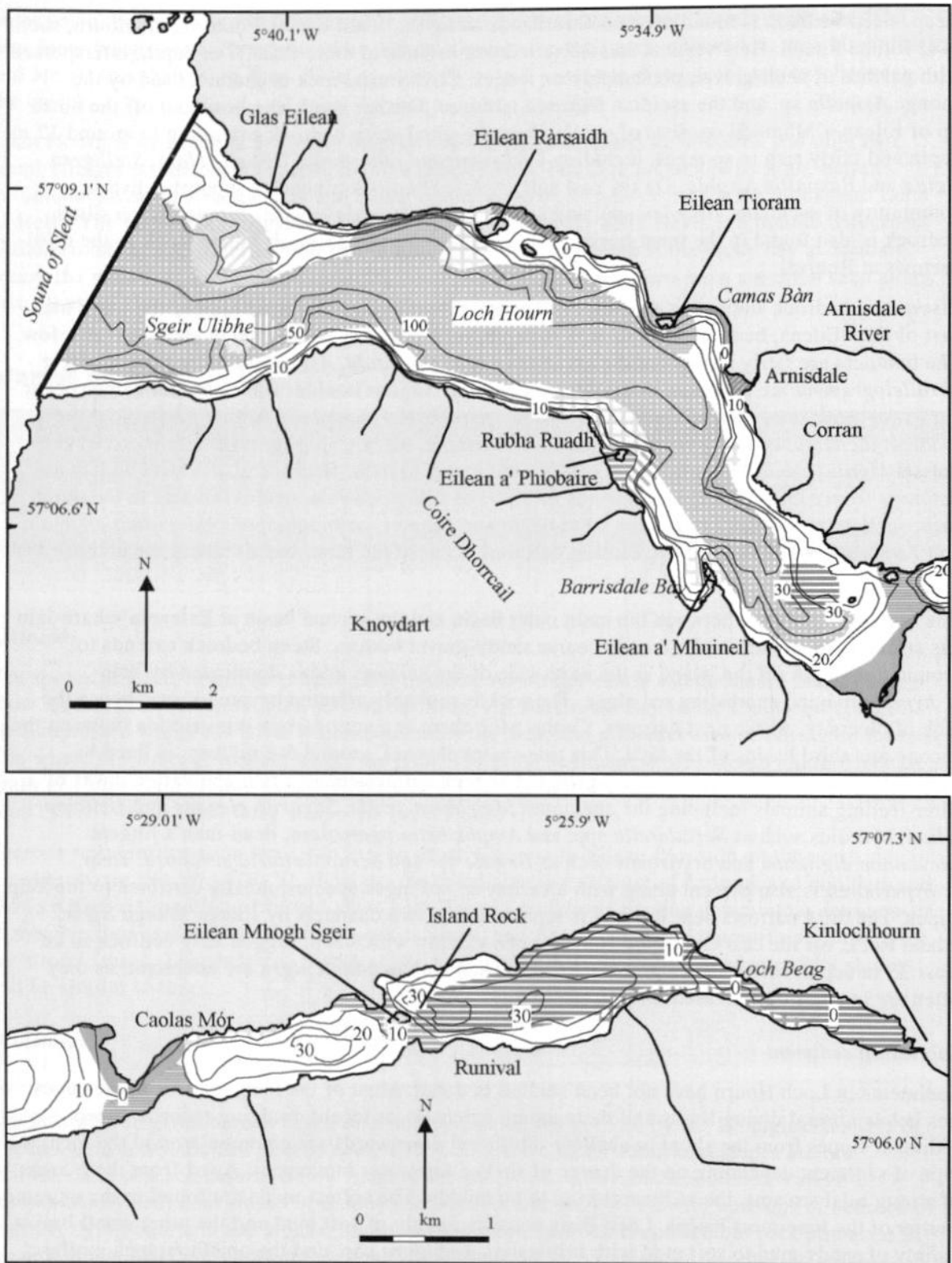


Figure 7.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 7.1, cited literature and additional field observations).

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Between these lies a shallow muddy plain at around 15 m depth with occasional cobbles, characterised by the turret shell *Turritella communis* and the ascidian *Ascidiella aspersa*.

In sheltered small bays in the outer loch, such as at Camas Bàn (Arnisdale) and inshore of Eilean a'Phìobaire on the south-west side, sediment extends up into the infralittoral and littoral mostly as shelly, muddy sand. Ascidians, especially *Ascidia mentula*, are common attached to stones and shell debris, and algae such as *Enteromorpha* spp. may also be common.

Nature conservation

Conservation sites

Site name	Designation	Main features
Rubha Camas na Cailinn	SSSI; GCR	Geological
Eilean Chlamail-Camas nan Ceann	SSSI; GCR	Geological
Coille Mhialairidh	SSSI	
Kinloch Hourn	GCR	Geological
Li and Coire Dhorrcail	JMT	Mountains and coast
Knoydart	NSA	Landscape

Human influences

Coastal developments and uses

Loch Hourn is remote and undeveloped and for the most part has no road access. The village of Arnisdale on the north side of the outer basin is served by a minor road from Glenelg, to the north of the loch, and this runs along the north-west side of the loch. Another hamlet, Kinlochourn, lies at the head of the loch and is served by a twisting narrow road which runs through deer forest from Glen Garry 48 km to the east. There are forestry plantations along part of the north shore of the outer basin, and the John Muir Trust is attempting to regenerate woodland on its Li and Coire Dhorrcail estate on the north coast of Knoydart.

Marine developments and uses

There are fish-farm sites in all the basins of Loch Hourn except the innermost, Loch Beag. Admiralty Chart 2541 (1993) shows six salmon *Salmo salar* farm sites in the inner basins and eight in the outer loch, plus a number of mussel farm sites. There are jetties at Arnisdale in the outer loch and in Loch Beag at the head of the loch and probably other small slipways associated with mariculture.

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- Smith, S.M. 1978b. Shores of Wester Ross, with emphasis on the Mollusca of rocky shores. (Contractor: S.M. Smith, Edinburgh.) *Nature Conservancy Council, CSD Report*, No. 227.

Sites surveyed

- Survey 84: 1978 Smith west Inverness-shire and north Argyll littoral survey (Smith 1978a).
 Survey 86: 1978 Smith Wester Ross littoral survey (Smith 1978b).
 Survey 135: 1984 Queen's University Loch Nevis and Loch Hourn survey (Breen *et al.* 1986).
 Survey 652: 1996 SNH outer Loch Hourn ROV survey (SNH survey).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
84	A	Kinlochhourn, Loch Hourn	NG 945 070	57°06.4'N 05°23.6'W	MytX
86	20	Caolas Eilean Ràrsaidh, Loch Hourn, Wester Ross	NG 818 116	57°08.6'N 05°36.4'W	F

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
135	17	Loch Beag, Loch Hourn	NG 940 071	57°06.5'N 05°24.1'W	EcorEns; LsacRS.Psa
135	18	E upper Loch Hourn Beg	NG 928 073	57°06.6'N 05°25.2'W	MarMu; LsacRS.Psa
135	19	N Island Rock, upper Loch Hourn Beg	NG 911 071	57°06.4'N 05°26.9'W	Oph; Lsac.Pk
135	20	NE middle Loch Hourn Beg	NG 905 070	57°06.4'N 05°27.5'W	K; CMU
135	21	N side middle Loch Hourn Beg	NG 898 068	57°06.2'N 05°28.2'W	SCR; CMS
135	22	Narrows Caolas Mór, Loch Hourn Beg	NG 890 064	57°06.0'N 05°29.0'W	Lhyp.TPk
135	23	SW lower Loch Hourn Beg	NG 875 062	57°05.9'N 05°30.5'W	CMX; LsacX
135	24	E of Eilean a'Gharb-Làin, Loch Hourn Beg	NG 871 066	57°06.1'N 05°30.8'W	Lhyp
135	25	Near Ellice Shoal, Loch Hourn	NG 859 063	57°05.9'N 05°32.1'W	PhiVir
135	26	W Sgeir Leathan, Loch Hourn	NG 846 084	57°06.9'N 05°33.4'W	BrAs
135	27	W Eilean a'Mhuineil, Loch Hourn	NG 842 067	57°06.0'N 05°33.7'W	K; CMU
135	28	S Eilean a'Phìobaire, Loch Hourn	NG 831 080	57°06.7'N 05°34.8'W	FaMS
135	29	N Eilean a'Phìobaire, Loch Hourn	NG 831 084	57°06.9'N 05°34.8'W	FaSwV; BrAs; CMU; Lsac
135	30	Rubha Ruadh, Loch Hourn	NG 825 089	57°07.2'N 05°35.5'W	BrAs; CMX; Lsac
135	31	W side Camas Bàn, Loch Hourn	NG 839 102	57°07.9'N 05°34.2'W	IMX
135	32	S Eilean Tioram, Loch Hourn	NG 836 100	57°07.8'N 05°34.5'W	BrAs; CMX
135	33	SW Eilean Ràrsaidh, Loch Hourn	NG 810 115	57°08.5'N 05°37.1'W	BrAs; Lsac
135	34	W of Eilean Ràrsaidh, Loch Hourn	NG 800 116	57°08.6'N 05°38.2'W	K; IMX; CMX
135	35	W Sgeir Ulibhe, Loch Hourn	NG 775 111	57°08.2'N 05°40.6'W	VirOph; AntAsH; Lsac
652	1	Site 1, Loch Hourn	NG 778 103	57°07.8'N 05°40.2'W	SpMeg.Fun; VirOph.HAs; ErSSwi
652	2	Site 2, Loch Hourn	NG 781 102	57°07.8'N 05°39.9'W	SpMeg.Fun
652	3	Site 3, Loch Hourn	NG 781 103	57°07.8'N 05°40.0'W	SpMeg; BrAs
652	4	Site 4, Loch Hourn	NG 776 104	57°07.8'N 05°40.5'W	SpMeg.Fun

8

Loch Alsh, Loch Duich and Loch Long

Location

Position (centre)	NG 848 251	57°16'N 05°34'W
Administrative area	Highland	Skye & Loch Alsh
Conservation agency/area	Scottish Natural Heritage	North Areas

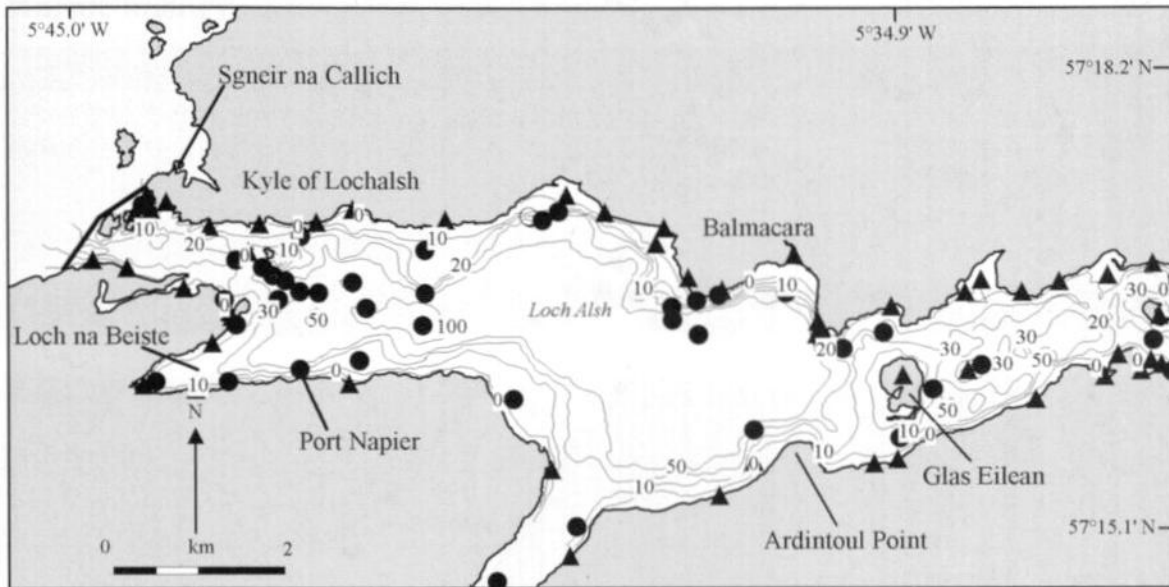


Figure 8.1 Location of area showing sites surveyed and main bathymetric features of Loch Alsh.
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Physical features

<i>Physiographic type</i>	Fjordic sealoch
<i>Length of coast</i>	99.3 km (106.9 km including islands)
<i>Length of inlet</i>	13.1 km (Alsh); 8.3 km (Duich); 7.3 km (Long)
<i>Area of inlet</i>	28.2 km ² (Alsh); 12 km ² (Duich); 3.1 km ² (Long)
<i>Bathymetry</i>	Maximum depth: Alsh: inner basin 30 m; outer basin 114 m. Duich: 115 m. Long: narrows 2–3 m; inner basin 48 m; outer basin 30 m
<i>Wave exposure</i>	Sheltered to extremely sheltered
<i>Tidal streams</i>	Generally weak to very weak, however in some places >6 knots e.g. Kyle Rhea and in others is 3–4 knots e.g. Loch Long narrows
<i>Tidal range</i>	5.7 m (springs); 1.1 m (neaps)
<i>Salinity</i>	Marine to reduced/variable

Introduction

Lochs Alsh, Duich and Long lie on the Scottish west coast, to the east of Skye. Loch Duich is a long narrow loch with very steep sides forming a single basin over 100 m deep. Loch Long comprises two basins over 30 m deep, separated by a shallow, narrow channel. Lochs Duich and Long open together into the narrow and relatively shallow eastern end of Loch Alsh. The eastern basin of Loch Alsh is separated from the main deep western basin, 114 m at its deepest point, by Glas Eilean and its associated shallows. The western end of Loch Alsh opens east of Skye into the

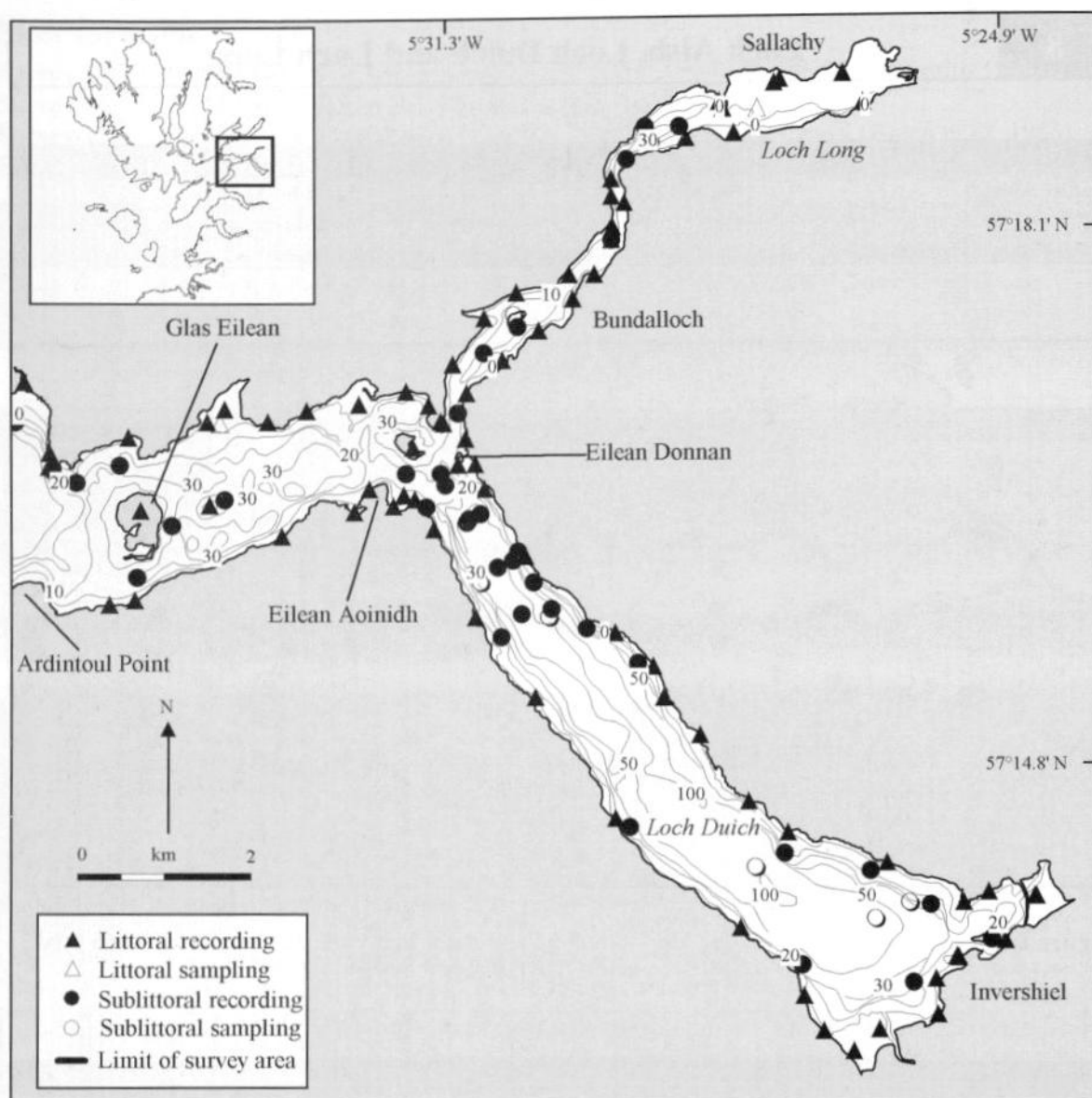


Figure 8.2 Location of area showing sites surveyed and main bathymetric features of Loch Alsh (eastern part), Loch Duich and Loch Long.

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Sound of Sleat. Strong tidal currents occur in Loch Alsh either side of Glas Eilean, in the narrows in Loch Long, and at the confluence of Lochs Long and Duich.

The shores are predominantly composed of stable rock, cobbles and boulders, mostly of metamorphic gneisses and schists. Sediment shores occur at the heads of Lochs Long and Duich, and in embayments in Loch Alsh. The main deep basins of all the lochs consist of large areas of fine muddy sands and mud. The sublittoral margins of the lochs consist mainly of steep boulder and rock slopes with muddy sediment between. Sublittoral cliffs to greater than 50 m depth occur on the east side of Loch Duich, whilst the narrows in all three lochs consist of boulders, cobbles and bedrock outcrops.

Salinity varies considerably throughout the loch system: Loch Long has the largest input of freshwater and is the second most brackish sealoch in Scotland (Edwards & Sharples 1986). Loch Duich also receives a significant input of freshwater. These high inputs of freshwater, combined with low mixing of the water column because of shelter from wave action, results in distinct

haloclines in these two lochs, running to 3–6 m deep through the winter and sometimes in summer. Loch Alsh is more wave exposed and has greater water exchange between the loch and coastal waters, and therefore has a much less pronounced and more short-lived halocline. The high input of fresh peaty water into Lochs Long and Duich reduces the depth to which light penetrates, and this has an effect on the growth of algae in the sublittoral zones. Foliose algae were recorded to about 9 m depth in the inner basin of Loch Long and to 10–12 m at the head of Loch Duich. In the clearer waters of Loch Alsh, foliose red algae were recorded to a maximum depth of 20–22 m (Howson *et al.* 1994).

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Mapping (epibiota)	87	August 1996	Johnston <i>et al.</i> (1997)
	Recording (epibiota)	5	August 1991	Scott (1991)
	Recording (epibiota)	5	March 1991	Hiscock (1991)
	Recording (epibiota)	10	August–September 1988	Connor (1989)
	Infaunal sampling (cores)	2	August–September 1988	Connor (1989)
	Recording (epibiota)	1	September 1979	Powell <i>et al.</i> (1980)
	Recording (epibiota)	2	August 1978	Smith (1978)
Sublittoral	Acoustic mapping	–	September 1996	Johnston <i>et al.</i> (1997)
	Infaunal sampling (grabs)	19	September 1996	Johnston <i>et al.</i> (1997)
	Remote video recording	43	September 1996	Johnston <i>et al.</i> (1997)
	Remote video recording	20	August, 1995	Scottish Natural Heritage
	Recording (epibiota)	2	July 1991	Scott (1991)
	Recording (epibiota)	2	June 1988	Hiscock & Covey 1991
	Recording (epibiota)	37	August–September 1988	Connor 1989
	Infaunal sampling (biological dredge)	6	August–September 1988	Connor 1989
Recording (epibiota)	3	August 1980	Dipper 1981	

Littoral

In Loch Alsh the vast majority of the shores are composed of a mixture of bedrock outcrops and stable boulder slopes. The biological communities are characterised by yellow and grey lichens in the supralittoral fringe; black lichen *Verrucaria maura* and *V. mucosa*, channelled wrack *Pelvetia canaliculata* and *Fucus spiralis* on the upper shore; fucoid algae *F. vesiculosus* and *Ascophyllum nodosum* on the mid-shore; and *F. serratus* and kelps *Laminaria digitata* and *L. saccharina* on the lower shores and sublittoral fringe. In general, few other species occur on rock beneath the brown algal canopy. The lugworm *Arenicola marina* occurs in the patches of muddy and sandy sediment between boulders and rock outcrops.

Diverse tide-swept lower shore communities are found along the Skye shores of Kyle Rhea, the middle of Loch Alsh and at the point where Lochs Long and Duich enter Loch Alsh. At these sites the rock and boulders under the dense canopies of fucoid algae are colonised by a rich flora and fauna of red algae, sponges, bryozoans, anemones and ascidians, along with a relatively rich fauna of crabs, molluscs and littorinids (Asc.T, Fserr.T). Slightly tide-swept communities occur on the mainland shores of Kyle Rhea, the Skye shores of Kyle Akin, around Glas Eilean, and on the western side of Eilean Tioram. These shores have a rich red algal flora under the fucoid algal canopy and a more diverse fauna than other sites, but lack the dense bryozoans, sponges and ascidians found on the more tide-swept shores mentioned above.

There are no extensive sediment shores in Loch Alsh. Balmacara Bay on the north shore are characterised by gently sloping plains of mixed coarse sediment, backed by fringing saltmarsh,

and with appreciable freshwater input from rivers. The mixed sediments below the saltmarsh are colonised by sparse furoid algae on cobbles and pebbles (*Pelvetia canaliculata*, *Fucus spiralis* and *F. vesiculosus* upper and mid-shores; *F. serratus* on lower shores). The lugworm *Arenicola marina* is found in underlying fine sediment, with sand mason worm *Lanice conchilega* and cockles *Cerastoderma edule* in more sandy areas. Dense mussel beds *Mytilus edulis* (MytX) occur in areas where water pools at low tide and where the rivers flow across the sediment flats. *Fucus ceranoides* is also found in freshwater channels (FcerX). Bays with mixed sediments but lesser freshwater influence occur at Balmacara, and on the north side of the loch. Communities in these areas are similar to those described above, but without the mussel beds and *F. ceranoides*. The free-living form of bladder wrack *Ascophyllum nodosum* ecad. *mackaii* is found in small areas in Loch Alsh where natural or man-made enclosure of small areas of shore has created extreme shelter from wave action where mud can accumulate: in the small inlet on the Skye shore of Kyle Akin near Rubha ard Treisnis; on the northern shore of Loch Alsh and at the north end of Skye Bridge.

Loch Duich

Shores in Loch Duich are mostly narrow and composed of steeply sloping rock and boulders. These are colonised by distinct zones of lichens on the upper shore, and dense furoid algae on the mid and lower shore. A layer of freshwater of several metres depth is present in Loch Duich throughout most of the year, due to the high freshwater input and lack of mixing of the water column because of the wave-sheltered nature of the loch. This influences the flora and fauna of all the shores, generally reducing the variety of species present, and allowing a few species such as the furoid *Fucus ceranoides* and mussel *Mytilus edulis* to thrive and large beds of *A. nodosum* ecad. *mackaii* to develop.

Rock in the supralittoral zone of Loch Duich is colonised by yellow and grey lichens *Xanthoria parietina*, *Ramalina* sp. and *Caloplaca* spp., with the black lichen *Verrucaria maura*. A distinct band of *V. maura* is present above the furoid algal zone, mixed with a narrow but usually distinct band of channelled wrack *Pelvetia canaliculata* below this. The mid-shore zones are colonised by dense stands of furoid algae, composed of a narrow band of *Fucus spiralis* above a wide band of mostly *Ascophyllum nodosum*. *Fucus vesiculosus* occurs either in a distinct zone above the *Ascophyllum*, or in patches on steeper rock surfaces. Very steep and vertical rock surfaces, where furoid algae are absent, are dominated by dense mussels with barnacles. *Fucus serratus* is the dominant alga on the lower shore. Littorinids, the dogwhelk *Nucella lapillus* and the limpet *Patella vulgata* are the main species occurring beneath the algal canopy, with the red alga *Chondrus crispus* and green algae occurring on the lower shore amongst the wracks. On the eastern shore of Loch Duich, road construction has left a steep shore composed of very large (>1 m diameter) angular boulders. Here, the shaded overhanging surfaces under the furoid algal canopy are densely covered by sheets of the bryozoans *Flustrellidra hispida* and *Bowerbankia imbricata*, the sponge *Halichondria panicea* and spirorbid tubeworms.

Small freshwater streams flow into Loch Duich along the entire western shore, and in a few places on the eastern shore. In these areas *F. ceranoides* is present on cobbles and boulders, accompanied by populations of winkles, mussels and the barnacle *Semibalanus balanoides* (FcerX).

Extensive sediment flats occur at the head of Loch Duich. Relatively extensive areas of saltmarsh are present in these areas above the lichen zone, with the alga *Fucus cottonii* (*muscooides*) noted in the saltmarsh in both areas. Below the saltmarsh are extensive areas of mixed sediment with pebbles and cobbles colonised by sparse furoid algae (*P. canaliculata*, *F. spiralis*, *F. vesiculosus*, *F. serratus*), and mud with lugworm *Arenicola marina*, the polychaete *Pygospio elegans* and cockles *Cerastoderma edule*. Both areas are extremely sheltered from wave action and subject to considerable freshwater influence from the Rivers Croe and Shiel. Extensive beds of the free-living furoid alga *A. nodosum* ecad. *mackaii* occur in both areas (AscX.mac). Large numbers of juvenile eels *Anguilla anguilla*, gammarids and winkles were recorded from these algal beds during the 1989 MNCR survey (Connor 1989). Dense beds of mussels *M. edulis* (MytX) occur

around the causeway in the eastern embayment where the River Croe flows into the loch. Barnacles, winkles and either *Mastocarpus stellatus* or *C. crispus* are the main accompanying species.

Loch Long

Shores in Loch Long are mostly narrow, composed of steeply sloping rock and boulders, colonised by distinct zones of lichens on the upper shore, and dense furoid algae on the mid and lower shore. A layer of fresh or brackish water several metres deep is present in Loch Long throughout most of the year, due to the high freshwater input and lack of mixing of the water column owing to the wave-sheltered nature of the loch. This influences the flora and fauna of all the shores, generally reducing the variety of species present, and allowing a few species tolerant of low salinity, such as the furoid alga *Fucus ceranoides* and mussel *Mytilus edulis*, to thrive.

Communities on rock in Loch Long are similar to those in Loch Duich, with upper shore splash zone of rock colonised by yellow and grey lichens *Xanthoria parietina*, *Ramalina* sp. and *Caloplaca* spp. with the black lichen *Verrucaria maura*. A distinct band of *V. maura* is present above the furoid algae, mixed with a narrow but usually distinct band of channelled wrack *Pelvetia canaliculata* below this. The mid-shore zones are colonised by dense stands of furoid algae, composed of a narrow band of *Fucus spiralis* above a wide band of mostly *Ascophyllum nodosum*. *Fucus vesiculosus* occurs either in a distinct zone above the *Ascophyllum*, or in patches on steeper rock surfaces. Very steep and vertical rock surfaces, where furoid algae are absent, are dominated by dense mussels with barnacles. *Fucus serratus* is the dominant alga on the lower shore. Littorinids, the dogwhelk *Nucella lapillus* and the limpet *Patella vulgata* are the main species occurring beneath the algal canopy, with the red alga *Chondrus crispus* and green algae occurring on the lower shore amongst the wracks, and the barnacle *Balanus crenatus* present in the sublittoral fringe. On very sheltered shores between Dornie and the inner narrows of Loch Long, the free-living form of bladder wrack *A. nodosum* ecad. *mackaii* is found in small patches.

Where freshwater streams discharge into the loch, *F. ceranoides* is present on cobbles and boulders, accompanied by winkles, mussels, barnacles and *F. vesiculosus*.

In the narrows in the middle of Loch Long, the rocky shores on the east side are very steep or vertical, and subject to strong freshwater influence. Here a narrow band of mussels *M. edulis* occurs between the *F. serratus* and *A. nodosum* zones, with occasional plants of either species present amongst the mussels. The increased tidal flow also encourages epifaunal growth of the small polychaete *Spirorbis spirorbis*, and the bryozoans *Flustrellidra hispida*, *Bowerbankia imbricata* and *Alcyonidium gelatinosum* on the *F. serratus*.

In the narrows on the west side is a spit of muddy sand and cobbles covered at high water, which supports a dense bed of the mussel *M. edulis* colonised extensively by the red alga *Mastocarpus stellatus* (MytX).

In the very sheltered area at the head of Loch Long, there is a large area of saltmarsh with dense patches of *Fucus cottonii* (*muscooides*). The deeper channels between the saltmarsh vegetation are colonised by *F. ceranoides*, whilst boulders and cobbles in the mid-shore support sparse furoid algae. Extensive sediment flats subject to considerable freshwater influence contain an unusual community of dense populations of the gaper *Mya truncata*, with the lugworm *Arenicola marina*, the cockle *Cerastoderma edule* and the polychaete *Pygospio elegans*.

Sublittoral rock

Loch Alsh

The mixed cobbles and gravels on the sediment slopes of the sheltered bays of Loch na Beiste support the sugar kelp *Laminaria saccharina* and sparse *Chorda filum*. At the more exposed site, Aird a Mhill, *Laminaria digitata* and *L. saccharina* occur together on boulder and cobble slopes. Tide-swept *Laminaria hyperborea* communities with a lush understory of foliose red algae are

present along the mainland (east) coast of Kyle Rhea. Bedrock ridges exposed to the strong tidal streams and extreme shelter of Kyle Rhea, support a *L. hyperborea* park (Lhyp.Pk), with fairly dense foliose algae beneath. Scott (1991) also described *Alaria esculenta* as being sparse at this level, but found in greater abundance on scoured bedrock below. In the lower infralittoral at Kyle Rhea, a community of foliose red algae and the hydroid *Tubularia indivisa* occurs on cobbles in strong tidal streams. Very strong tidal streams sweep through Kyle Rhea, creating a high-energy environment. The seabed comprises a series of bedrock ridges with patches of coarse gravel in between; the gravel is often swept into large waves up to 1 m high by the tide. These conditions generate a highly characteristic community rich in dead man's fingers *Alcyonium digitatum*, the hydroids *T. indivisa* and *Sertularia argentea*, the barnacle *Balanus crenatus*, anemones and sponges such as the elephant's ear sponge *Pachymatisma johnstonia* (TubS). The complex seabed topography creates considerable local differences in the strength of the water flow that is reflected in a complex spatial arrangement of biotopes. Bedrock and boulders adjacent to sediment are often scoured and support barnacles and keel worms *Pomatoceros triqueter*. The edges of bedrock reefs exposed to the strongest water flow support dense populations of hydroids. Mixed substrata of cobbles, gravel and sand support populations of the anemone *Urticina felina*.

North-west of Kyle Rhea, at the western entrance to Loch Alsh (Kyle Akin), patchy beds of maerl (Phy) are present amongst a mixture of gravel and dead maerl with pebbles and shells. Maerl beds are also found at a few very sheltered sites subject to moderately strong tidal streams, namely north of String Rock, Kyle Akin, and also in the eastern basin, north of Glas Eilean. The maerl supports a variety of foliose algae, which are richest north of Glas Eilean, and include *Trilliella* sp., *Pterosiphonia parasitica*, *Halarachnion ligulatum*, *Porphyropsis coccinea* and the stalked green alga *Derbesia marina* (Halicystis). A fairly sparse fauna includes a number of scavengers, whilst in the sediment are the tubes of *Chaetopterus variopedatus* and *Lanice conchilega*, terebellid worms and the anemone *Cerianthus lloydii*. In areas where maerl is absent, north of Glas Eilean, the anemones *Aureliania heterocera* and *Halcompa chrysanthellum* are found in patches of clean coarse gravel.

Clumps of the horse mussel *Modiolus modiolus* (ModHAs) occur on a mixture of substrata, mostly where cobbles and pebbles overlay a coarse muddy seabed, in the lower infralittoral and circalittoral. Such a tide-swept community occurs north of String Rock, at the western end of Loch Alsh. The *Modiolus* supports isolated foliose red algae and kelp plants in the shallower depths, and a wide range of animals. The clumps provide shelter for brittlestars, hermit crabs, the squat lobster *Munida rugosa*, the whelk *Buccinum undatum*, and less frequently the gastropods *Gibbula tumida* and *Jujubinus clelandi*. North-east of Eileanan Dubha the mussel clumps also house the nests of the flame shell *Limaria hians* (Lim), the only known occurrence of this bivalve in the loch. Dense brittlestar beds of *Ophiothrix fragilis* and *Ophiocomina nigra* are recorded in the circalittoral zone throughout the main basin of Loch Alsh, including a site at 87 m in the deep central basin (Oph). These beds are present on a wide range of substrata from bedrock to mixed stones and sediment. The brittlestar *Ophiopholis aculeata* is the dominant species at a site in the narrow eastern section of loch between Glas Eilean and Eilean Tioram, and south-east of Eileanan Dubha, Kyle Akin (Oph.Oacu).

A shallow plateau less than 20 m deep extends south to the centre of the loch from Donald Murchison's Monument on the north shore of Loch Alsh, before the seabed drops sharply to attain a depth of over 100 m. A sediment plain with algal mats with small sea-pens *Virgularia mirabilis* and hydroids occurs in the upper infralittoral. A steep bedrock and boulder slope extends down to 48 m, supporting dense populations of the featherstars *Antedon bifida*, *A. petasus* and *Leptometra celtica*, the peacock worm *Sabella pavonina* and the solitary ascidian *Ciona intestinalis*. A sediment slope extends into the deep basin with muddy gravel, sand and shells grading to mud in the centre of the basin.

The wreck of *Port Napier*, in Loch na Béist, supports a rich fauna and flora, in an otherwise sheltered sediment bay. The wreck is exposed at low water, and Dipper (1981) described a community of *L. hyperborea* and red algae at shallow depths. The vertical sides of the wreck,

extending down to 20 m, had been colonised by the soft coral *A. digitatum*, the ascidians *C. intestinalis* and *Ascidia mentula*, and a number of sponges including *Suberites* sp. Along the north coast of Loch Alsh there are a series of rocky headlands separated by shallow bays. These headlands provide an interesting illustration of how a change in aspect results in a change in wave exposure, which in turn leads to a marked change in the marine community present. Some parts of the headland (where the western shore faces the prevailing wind and swell) infralittoral rock supports a dense forest of the kelps *L. hyperborea* and *L. saccharina*. The eastern side of the headland is sheltered from the prevailing wind and swell and the infralittoral zone is characterised by a *L. saccharina* forest.

Loch Alsh becomes much narrower at its eastern end where the small eastern basin is separated from the main loch by a shallow sill either side of Glas Eilean. Strong tidal currents sweep through this basin into Lochs Duich and Long. The seabed is mostly a mixture of bedrock and boulders interspersed with patches of coarse sediment. Brittlestar beds are common throughout this area.

Loch Duich

The sublittoral fringe is dominated by a dense canopy of the kelp *Laminaria digitata* (Ldig) in its broad-fronded cape form. This is mixed with varying quantities of *L. saccharina*, especially at the more sheltered sites. Rock beneath the kelp is often intensely grazed by the urchin *Psammechinus miliaris* and limpets *Tectura* spp., and is predominantly covered by the brown encrusting alga *Pseudolithoderma extensum*, and by coralline and red algal crusts (LsacRS.Psa). Foliose algae, particularly *Chondrus crispus* and *Dilsea carnosa*, survive the grazing pressure.

Below the fringe, hard substrata extend into the shallow sublittoral throughout much of the loch, replaced by sediments in the bays only where the seabed shelves less steeply. In the eastern half of Loch Duich, *L. saccharina* is the dominant kelp throughout the infralittoral zone, whereas in the western half of the loch, a *L. saccharina* forest gives way to a *L. hyperborea* park. Due to grazing pressures, the rock is rather devoid of erect living species, with the saddle oyster *Pododesmus patelliformis*, the keelworm *Pomatoceros triqueter* and the barnacle *Balanus crenatus* best able to survive under these conditions. Boulder slopes provide the necessary shelter for the strawberry worm *Eupolymnia nebulosa*, and sites with increased water movement encourage the presence of featherstars *Antedon bifida* and brittlestars *Ophiothrix fragilis*.

The lower infralittoral kelp park is restricted to shallower depths over much of Loch Duich, presumably as a result of restricted light penetration in the turbid peaty surface waters. A slightly greater range of species is recorded from this zone compared to the kelp forests. The solitary ascidians *Ciona intestinalis*, *Ascidia mentula* and *Corella parallelogramma* and the tubeworm *Protula tubularia* are typically present, together with the anemone *Protanthea simplex* which occurs occasionally at more sheltered sites. Foliose algae are very poorly represented, although increased tidal currents near the entrance to Loch Duich improve diversity. Here the algae *Bonnemaisonia asparagoides*, *Heterosiphonia plumosa* and *Desmarestia viridis* join the more widely distributed *Phycodrys rubens*.

Due to the steeply sloping nature of much of the loch, hard substrata extend well into deep water. This often occurs as bedrock that extends down from the shore or, as frequently occurs, outcropping in deeper water below sediment plains. Surveys have shown that even bedrock extending to a depth of 110m is capable of supporting populations of the brachiopod *Neocrania anomala*, the tubeworm *Sabella pavonina* and the keelworm *P. triqueter* (NeoPro). Elsewhere the bedrock in shallow water leads to a mixture of boulders, cobbles and pebbles with patches of muddy sediment with increasing depth. Away from strong currents these rocks are invariably embedded in muddy sediment.

In the strongest tidal streams, north-east of Totaig and the channel south of Eilean Tioram, the bedrock is covered by a dense stand of the soft coral *Alcyonium digitatum* (AlcC). The hydroid

Sertularia argentea thrives in these conditions and large numbers of the ascidian *C. intestinalis* grow on any vertical surfaces. Brittlestar beds are also very common.

Much of the circalittoral bedrock encountered in the remainder of Loch Duich is subject to weak or negligible currents and is very sheltered from wave action. Here the rock supports large populations of the brachiopod *N. anomala* and the anemone *P. simplex* (NeoPro). *Neocrania* tends to be replaced by another brachiopod *Terebratulina retusa* below about 25 m, and the football ascidian *Diazona violacea* is also often present at these depths. The brown encrusting alga *Pseudolithoderma extensum*, dominant on the shallower rock, also begins to be replaced by a more patchy cover of coralline crusts in deeper water. Encrusting algae therefore still account for a large proportion of the rock cover, although animals are generally more conspicuous than in the infralittoral zone. Solitary ascidians, the tubeworm *Serpula vermicularis* and, on vertical walls, the fanworm *S. pavonina* are conspicuous members of the community.

Where bedrock gives way to boulder and cobble slopes overlying muddy sediments, the combination of hard and soft substrata significantly increases species richness. These slopes are characterised by the squat lobster *Munida rugosa* which gains shelter under suitable boulders. At the most sheltered sites *Neocrania* and *Protanthea* are usually present, though in lower densities than on nearby bedrock. These sites also typically support the urchin *P. miliaris*, the hydroid *Nemertesia antennina*, the featherstar *Antedon petasus* and small clumps of *Modiolus modiolus* (ModHAs). The increased currents in the mouth of Loch Duich produce unusually dense beds of the brittlestar *Ophiopholis aculeata*, normally a crevice-dwelling species, with fewer numbers of *O. fragilis* and *Ophiocomina nigra* (Oph.Oacu).

Loch Long

Sheltered boulder and cobble slopes support *Laminaria saccharina*, the dominant kelp throughout Loch Long. There are no records of *L. digitata* in this loch, which contrasts markedly with Loch Duich where cape-form *L. digitata* is abundant. West of Sheep Island, in the sublittoral fringe, *L. saccharina* occurs with foliose red algae, *Ulva* sp., and the sponge *Halichondria panicea*, with scattered *Laminaria hyperborea* in deeper habitats. Rock beneath the kelp is intensely grazed by the urchin *Psammechinus miliaris*, and densely encrusted by the brown alga *Pseudolithoderma extensum* (LsacRS.Psa).

Dense kelp forests are present throughout the narrow entrance to Loch Long at Dornie. *L. saccharina* dominates the seabed to the south of Ardelve Point, with *L. hyperborea* dominating under Dornie Bridge. Tide-swept *L. hyperborea* is restricted to the shallow narrows (outer and inner) of Loch Long where the hard substrata are subject to strong tidal currents and an appreciable influence from freshwater runoff into the loch. A patchy canopy of *L. hyperborea* with a few *L. saccharina* is present in the sublittoral fringe on a mixed seabed of boulders and cobbles (intertidal). Beneath the kelp, the boulders are covered by large expanses of encrusting coralline algae and massive sheets of *H. panicea*. Foliose algae, predominantly *Phyllophora crispa*, *Furcellaria lumbricalis*, *Phycodrys rubens*, *Odonthalia dentata*, *Dictyota dichotoma* and *Ulva* sp., form dense masses. At the inner narrows, dense clusters of the periwinkle *Littorina littorea* are present well below their normal zone of occurrence on the shore, accompanied by scattered *Modiolus modiolus* on patches of gravel.

At the more sheltered sites, a slightly greater range of species is recorded from the lower infralittoral compared to the kelp forest, where grazing pressure, most notably by *P. miliaris*, restricts the foliose algae. The lower infralittoral kelp park is restricted to a depth of between 8 and 10 m over much of Loch Long, probably as a direct consequence of the decreased light levels arising from the high input of fresh peaty water.

At the northern end of the inner narrows, very steep circalittoral bedrock, exposed to moderately strong tidal streams, supports a rich and unusual fauna, considerably altered by the brackish influence. A variety of thin encrusting sponges is most common on the vertical faces. The large solitary ascidian *Ascidia virginea* is particularly common, whilst the smaller ascidians *Boltenia*

echinata and *Pyura squamulosa* are present in unusually high numbers; the anemone *Protanthea simplex* is also present.

Where bedrock gives way to boulder and cobble slopes on muddy sediments, the squat lobster *Munida rugosa*, *P. miliaris*, the hydroid *Nemertesia antennina* and the starfish *Crossaster papposus* are commonly found (west of Sheep Island). Boulder slopes also provide the necessary shelter for the strawberry worm *Eupolyornia nebulosa*. The increased currents at the mouth of Loch Long and west of Sheep Island produce dense beds of brittlestars on plains of cobbles and pebbles. In contrast to most brittlestar beds, this area is dominated by *Ophiopholis aculeata*, a species normally confined to the shelter of crevices and boulders (Oph.Oacu), while *Ophiothrix fragilis* and *Ophiocomina nigra* are less abundant.

Sublittoral sediment

Loch Alsh

At shallow depths, extensive plains of muddy fine sand mixed with a little shell-gravel are covered by dense mats of the fine filamentous red alga *Trailiella*, often covering 60% or more of the sediment surface (Tra). Aird a Mhill Bay is poorly colonised by other species, including the cord weed *Chorda filum*. However, at a site near Sgeir na Caillich a rich community of foliose algae and epifauna is found, with occasional plants of *L. saccharina*. In the spaces between the *Trailiella* mats, the nationally scarce echiuran worm *Amalosoma eddystonense* is present in high densities along with low numbers of the sea-pen *V. mirabilis*. The algae provide shelter for a number of mobile species, particularly crabs, and grazing for the topshell *Gibbula magus*. The muddy sand supports a large number of polychaetes, including *Prionospio cirrifera*, the sea cucumber *Labidoplax buskii*, and bivalves, of which *Nucula hanleyi* is most common. To the west of Glas Eilean, shallow infralittoral sediments support mixed kelp communities, including *Sacchoriza polyschides* and patches of seagrass *Zostera marina*.

Plains of fine sandy mud, shells and pebbles scattered on the surface support a varied but fairly sparse epifauna. The scallop *Pecten maximus* is infrequent and the worms *Chaetopterus variopedatus*, *Lanice conchilega* and *Myxicola infundibulum* are occasional or rare when present. The burrowing brittlestars *Amphiura* spp., the sea-pen *Virgularia mirabilis* and the anemone *Cerianthus lloydii* occur in low numbers. The large anemone *Pachycerianthus multiplicatus* has been found sporadically within this area. Scattered pebbles and shells on the sediment surface support a characteristic range of animals, found on both north-west headlands, including the hydroid *Nemertesia antennina*, the ascidians *A. mentula* and *C. intestinalis* and the featherstar *A. petasus*. Hermit crabs, squat lobsters, crabs and starfish are found in low numbers.

The deep central basin is predominantly soft mud with some areas of muddy sand with shell material. Video recordings of these sediments revealed many holes created by burrowing crustaceans. Grab samples from this area recorded dense populations of the burrowing brittlestars *Amphiura filiformis* and *A. chiajei*. The sea cucumber *Thyone raphanus* and the uncommon polychaete *Ancistrosyllis groenlandica* were recorded from 65 m at the eastern end of the central basin. Further to the east, bivalve molluscs characterised the infaunal community in a small basin filled with sandy mud to the south-east of Glas Eilean. Eilean Tioram creates a very sheltered bay at the easternmost end of Loch Alsh. The centre of the bay comprised stable circalittoral mud that supports a dense population of the sea-pen *V. mirabilis* but few other epibiota. The naturally scarce fan mussel *Atrina fragilis* has been recorded from Loch Alsh (S. Scott, pers. com.).

Loch Duich

Infralittoral habitats along the southern shore comprise a mixture of stones and muddy sediment. Occasional plants of *Laminaria saccharina* grow attached to small stones in shallow-water sandy bays, with the cord weed *Chorda filum* invariably also present (LsacX). Few other algae are found in this habitat, where a few scavenging animals and occasional species more typical of deeper water communities also occur. Horse mussel beds of *Modiolus modiolus* bed which support small

populations of echiuran worms are sparsely distributed along the muddy sand seabed. Further along the coast the circalittoral sediment comprises mud and fine sand that supports dense populations of bivalve molluscs, polychaete worms and cumacean and amphipod crustaceans.

In deeper water, sediments are characterised by animal-dominated communities. The sea-pen *Virgularia mirabilis*, the anemone *Cerianthus lloydii* and the burrowing brittlestars *Amphiura* spp. are present throughout the loch on muddy or muddy sand plains (VirOph). The proportion of each species varies considerably depending on local physical conditions and hence sediment type. The fine muds of the extremely sheltered basins at the head of Loch Duich have further variations on this community. In the shallow water large numbers of the opisthobranch *Philine aperta* and a few large brittlestars *Ophiura ophiura* are present (PhiVir), whilst the deepest parts of this basin, at about 25 m, support an unusually large population of the spectacular fireworks anemone *Pachycerianthus multiplicatus*.

The sediment plains below about 20 m in Loch Duich typically support a forest of the giant sea-pen *Funiculina quadrangularis* with *Asteronyx loveni*, and here low numbers of *Pennatula phosphorea* are also present (SpMeg.Fun). In the eastern half of Loch Duich these sediments are extensively excavated by Norway lobster *Nephrops norvegicus* and the burrowing shrimp *Callinassa subterranea*, the bivalve *Thyasira flexuosa* and the goby *Lesueurigobius friesii*. The deepest parts of Loch Duich support fewer sea-pens, but have a few megafaunal burrowers (*Calocaris macandreae*) amidst large numbers of the brittlestar *Amphiura chiajei* and the bivalves *Abra nitida*, *Myrtea spinifera* and *Corbula gibba*.

Loch Long

In deeper water, sediment habitats consist predominantly of fine muds, characterised by sparsely populated animal communities. A rather impoverished community of the sea-pen *Virgularia mirabilis* is present in the inner basin of Loch Long, with few other conspicuous species, except small gobies *Pomatoschistus* sp. The shallower mud to the west of the basin has extensive mats of the bacterium *Beggiatoa* sp., indicative of reduced oxygen conditions, and low numbers of shrimps *Crangon crangon*. A dredge sample taken in the inner basin to depths of nearly 50 m revealed anoxic black mud, with the brittlestars *Ophiopholis aculeata*, *Amphiura chiajei* and polychaetes. Mixed circalittoral stones and muddy sand support a sparse community of polychaete worms. Similarly, the gently sloping muds, at 20–30 m in the deep outer basin, have an impoverished fauna,

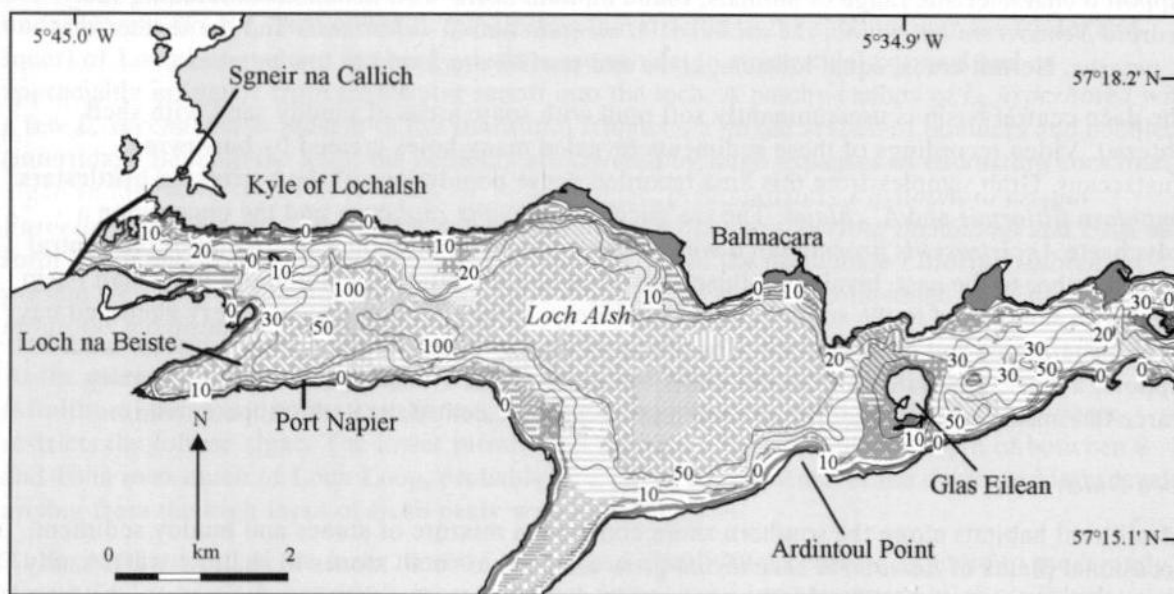


Figure 8.3 Indicative distribution of biological communities of Loch Alsh.

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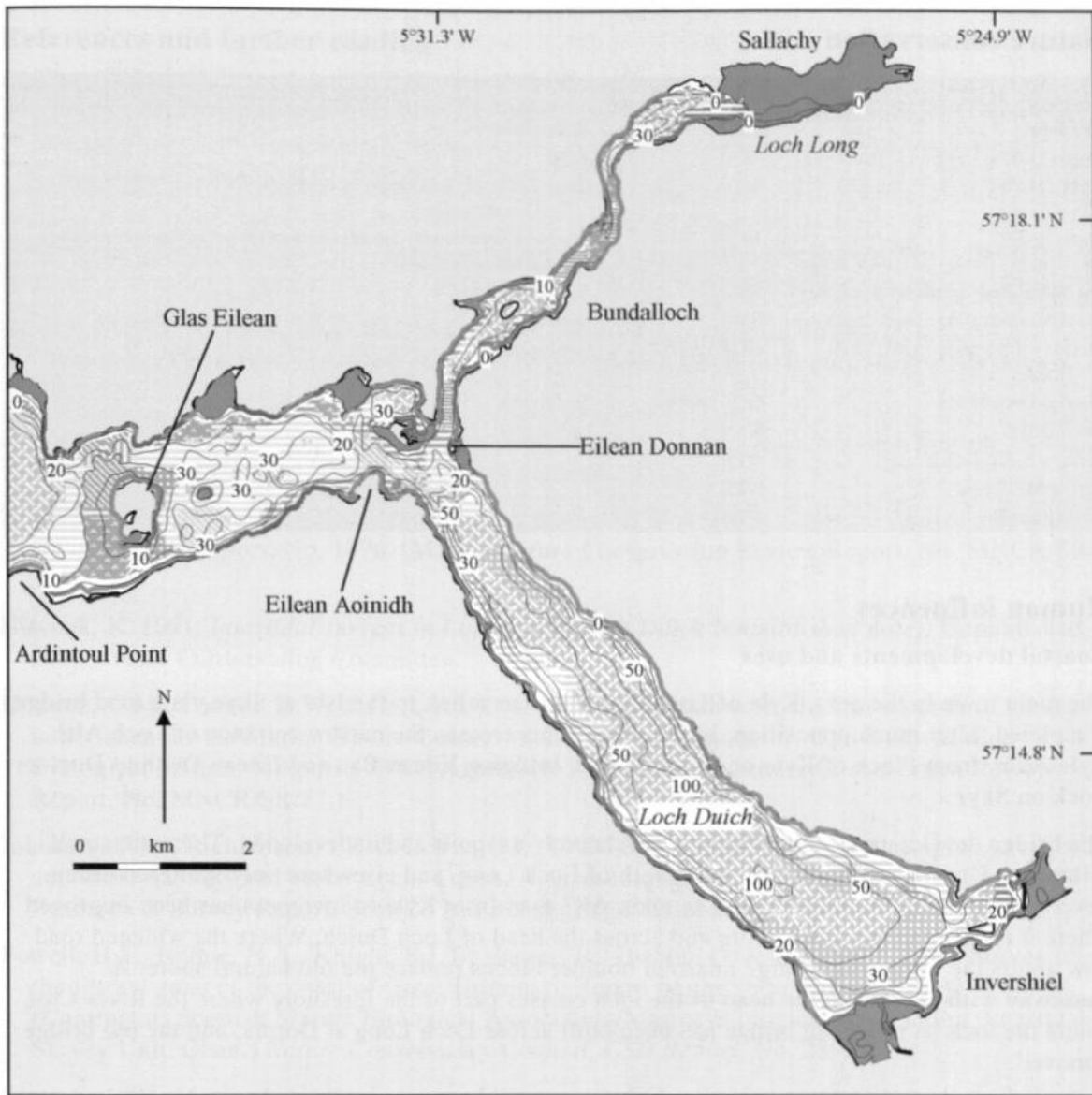


Figure 8.4 Indicative distribution of biological communities of Loch Duich and Loch Long.

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including the anemone *Sagartiogeton undatus*. A grab sample in the same area revealed serpulid and sabellid polychaetes, chitons, cockles *Cerastoderma edule* and the gaper *Mya truncata*. At the head of the loch, there is a plain of infralittoral sand with many mounds, possibly from the lugworm *Arenicola marina*. A grab sample indicated a rather impoverished community with only two species of polychaete worm – *Spio martinensis* and *Phyllodoce mucosa*.

Nature conservation

Conservation sites		
Site name	Status	Main features
Lochs Duich, Long and Alsh reefs	cSAC	Reefs
Loch Duich	MCA	Good examples of a range of communities typical of a deep, very sheltered sealoch
Loch Long	MCA	A number of unusual communities in the second most brackish sealoch in Scotland
Ru Sgarabhaig headland, Loch Alsh	SSSI	Geological
Ru Aird a Mhill headland, Loch Alsh	SSSI	Geological
Dornie – Inverinate coast, Loch Duich	GCR; pSSSI	Geological
Totaig, Loch Duich	GCR; pSSSI	Geological
Loch Duich	NSA	Landscape
Head of Loch Duich	NTS	
Aird a Mhill Bay	NTS	
Balmacara Bay	NTS	

Human influences

Coastal developments and uses

The main town in the area, Kyle of Lochalsh, serves as a link to the Isle of Skye via a road bridge, completed, after much opposition, in late 1995. This crosses the narrow entrance of Loch Alsh, Kyle Akin, from Plock of Kyle on the mainland, bridging Eilean Ban and Eilean Dubh to Doctors Rock on Skye.

The bridge development aside, the area is relatively unspoilt and undeveloped. There are small villages at Dornie and Ardelve at the mouth of Loch Long, and elsewhere only scattered urban development along the loch sides. The main A87 road from Kyle to Inverness has been improved where it runs along the north shore and across the head of Loch Duich. Where the widened road now abutts the north shore, large quarried boulder blocks replace the old natural shore. A causeway with culverts at the head of the loch crosses part of the foreshore where the River Croe enters the loch. A new road bridge has been built across Loch Long at Dornie, and the old bridge removed.

The area supports a significant population of otters *Lutra lutra*, mainly in Loch na Béiste on Skye. Eider ducks *Somateria mollissima* overwinter in Loch Alsh and breed on the islands near Kyle. Common seals *Poca vitulina* breed on the Kyle islands.

Marine developments and uses

Forestry, crofting and tourism are the main activities within the area. There is as yet very little development of the lochs for the production of finfish or shellfish. At the time of the MNCR survey in 1988 one salmon farm was in operation, near Nostie Bay in Loch Alsh, although a number of leases for both salmon and shellfish farming in Loch Alsh and Loch Duich have been granted. There has been a more recent proposal to stock the inner basin of Loch Long with mussel lines. Potting for Norway lobster *Nephrops norvegicus* takes place on a small scale.

Most shipping activity within the area is between Kyle Rhea and Kyle Akin, with Loch Duich and Loch Long mainly used by small fishing boats and pleasure craft. There is a naval base and harbour facility at Kyle of Lochalsh. An anchorage near Totaig provides shelter for a few yachts, and local boats are moored at a number of locations around the lochs. The *Port Napier* wreck in Loch na Beiste is a popular dive site.

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- Survey 3: 1988 MNCR Lochs Duich, Long and Alsh survey (Connor 1989).
- Survey 51: 1980 UCS south Skye sublittoral survey Dipper (1981).
- Survey 290: 1991 Scott Skye bridge survey (Scott 1991).
- Survey 294: 1991 MNCR Loch Long (Lochalsh) littoral survey (Hiscock 1991).
- Survey 650: 1995 SNH Lochs Alsh and Duich ROV survey.
- Survey 731: 1997 SNH Kyle Rhea, Loch Alsh and Loch Duich (SNH 1999).

Littoral sites					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes present</i>
3	1	E of causeway, Ault a chruinn, Loch Duich	NG 948 208	57°13.9'N 05°24.0'W	FvesX; AscX.mac; PCer; Fspi; Asc.VS; FcerX; MytX
3	2	N Am Fraoch-Eilean, Loch Beg, Loch Duich	NG 939 201	57°13.5'N 05°24.8'W	YG; Ver.Ver; Fves; Fspi; Asc.VS; Fserr.VS; Pel
3	3	W of A Leth-Allt, Loch Duich	NG 905 231	57°15.0'N 05°28.3'W	Fves; Fspi; Fserr.T; SByAs; Pel
3	4	S Eilean Donnan, Loch Duich	NG 881 258	57°16.4'N 05°30.9'W	YG; Ver.Ver; Fves; Fspi; Fserr.VS; Lsac.Ldig; Pel
3	23	S of Sallachy, Loch Long (Lochalsh)	NG 916 299	57°18.7'N 05°27.6'W	MacAre; FvesX
3	24	NW narrows, Loch Long (Lochalsh)	NG 899 289	57°18.1'N 05°29.2'W	YG; Ver.Ver; Fspi; Asc.VS; Fserr.VS; Pel
3	25	Spit in narrows, Loch Long (Lochalsh)	NG 899 284	57°17.8'N 05°29.2'W	Fserr.VS; MytX
3	35	Nostie Bay, Loch Alsh	NG 852 263	57°16.6'N 05°33.8'W	PCer
3	36	Ru Sgarabhaig, Loch Alsh	NG 834 258	57°16.2'N 05°35.5'W	Cor; FK; YG; Ver.Ver; FvesB; Fser.Fser; Ldig.Ldig; PelB; BPat.Sem
3	37	NW of Cnoc Cuil na Mine, Loch Alsh	NG 826 242	57°15.4'N 05°36.2'W	FvesX; Lsac.Ldig; FserX; Pel
3	38	Rubha na Caillich, Loch Alsh	NG 801 241	57°15.2'N 05°38.7'W	YG; Ver.Ver; Fves; Fspi; Asc.T; Fserr.T; Ldig.T; Pel
290	L1	Shore W of Lochalsh Hotel, Loch Alsh	NG 758 272	57°16.8'N 05°43.1'W	AscX.mac
290	L2	Inlet E of SW point of Plock of Kyle, Loch Alsh	NG 753 274	57°16.9'N 05°43.6'W	AscX
290	L3	SW point of Plock of Kyle, Loch Alsh	NG 751 273	57°16.8'N 05°43.8'W	Rkp; Ver.Ver; Fves; Fspi; Lsac.Ldig; Pel; BPat.Sem; Fserr
290	L4	NW point of Plock of Kyle, Loch Alsh	NG 752 275	57°16.9'N 05°43.8'W	Rkp; Ldig
290	L5	Doctors Rock, Loch Alsh	NG 744 267	57°16.5'N 05°44.5'W	MLR
294	1	W of Ceann-an-oba, Loch Long (Lochalsh)	NG 926 303	57°18.9'N 05°26.6'W	FvesX; Ver.Ver; FcerX
294	2	Sallachy, Loch Long (Lochalsh)	NG 918 302	57°18.9'N 05°27.4'W	Asc.VS
294	3	Sallachy Island, Loch Long (Lochalsh)	NG 912 300	57°18.7'N 05°28.0'W	Ver.Ver; Fves; Fspi; Asc.Asc; Fser.Fser; Pel
294	4	N narrows, Loch Long (Lochalsh)	NG 899 291	57°18.2'N 05°29.3'W	Ver.Ver; Fspi; Asc.VS; Fserr.VS; Pel

Sublittoral sites					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes present</i>
2	92	N end, Kyle Rhea, Skye	NG 804 234	57°14.9'N 05°38.4'W	Lhyp.TPk
2	93	S end, Kyle Rhea, Skye	NG 792 213	57°13.7'N 05°39.5'W	TubS; Urt; Lhyp.TPk
3	5	NE of Eilean Nan Gall, Loch Beg, Loch Duich	NG 943 203	57°13.6'N 05°24.4'W	SpMeg; NeoPro; PhiVir
3	6	Bay of Invershiel, Loch Duich	NG 934 198	57°13.3'N 05°25.3'W	SpMeg.Fun; ModHo; NeoPro
3	7	NE of Ratagan, Loch Duich	NG 921 200	57°13.4'N 05°26.6'W	SpMeg.Fun; NeoPro; LsacX
3	8	SW of Tigh-Geal, Loch Duich	NG 936 207	57°13.8'N 05°25.2'W	SpMeg.Fun
3	9	SW of church, Torchuillin, Loch Duich	NG 929 211	57°14.0'N 05°25.9'W	SpMeg; LsacRS.Psa
3	10	S of Gertrude Rock, Loch Duich	NG 919 213	57°14.1'N 05°26.9'W	SpMeg.Fun; NeoPro; LsacRS.Psa
3	11	NE of church, Ard-an-Eoin, Loch Duich	NG 901 216	57°14.2'N 05°28.7'W	SpMeg.Fun; ModHAs; VirOph.HAs; NeoPro

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes present
3	12	SW of Sgurr Aoide, Loch Duich	NG 902 235	57°15.2'N 05°28.7'W	SpMeg.Fun; ModHAS; NeoPro; LsacRS.Psa
3	13	SW of Easter Keppoch, Loch Duich	NG 896 239	57°15.4'N 05°29.3'W	NeoPro; LsacRS.Psa
3	14	E of Letterfearn, Loch Duich	NG 886 238	57°15.3'N 05°30.3'W	ModHAS; Lsac.Ldig; Lsac.Ft; NeoPro; Lhyp.Ft; LsacRS.Psa
3	15	SW of Torr a'Char, Loch Duich	NG 888 248	57°15.9'N 05°30.1'W	NeoPro; LhypGz; LsacRS.Psa
3	16	NE of Totaig, Loch Duich	NG 877 253	57°16.1'N 05°31.2'W	Oph.Oacu; AlcC; LhypGz.Ft; Lhyp.Pk
3	17	SW of Eilean Donnan, Loch Duich	NG 879 257	57°16.3'N 05°31.1'W	Oph.Oacu; Lhyp.TPk
3	18	Channel S of Eilean Tioram, Loch Duich	NG 875 257	57°16.3'N 05°31.5'W	AmenCio; Oph.Oacu; AlcC
3	19	S of Torchuillin, Loch Duich	NG 930 205	57°13.7'N 05°25.7'W	SpMeg
3	20	SW of Inverinate, Loch Duich	NG 916 211	57°13.9'N 05°27.2'W	SpMeg
3	21	SW of Wester Keppoch, Loch Duich	NG 892 240	57°15.4'N 05°29.7'W	SpMeg
3	22	E of Druidaig Lodge, Loch Duich	NG 884 244	57°15.6'N 05°30.5'W	SpMeg
3	26	Ru an Fhodar, Loch Long (Lochalsh)	NG 907 297	57°18.6'N 05°28.5'W	SpMeg
3	27	Allt-nan-Sùgh, Loch Long (Lochalsh)	NG 903 297	57°18.5'N 05°28.9'W	Beg
3	28	Cliff NE of narrows, Loch Long (Lochalsh)	NG 901 293	57°18.3'N 05°29.1'W	NeoPro
3	29	Narrows, Loch Long (Lochalsh)	NG 899 284	57°17.8'N 05°29.2'W	Lhyp.TPk; LsacRS.Psa
3	30	W of Sgeir Dhu, Loch Long (Lochalsh)	NG 888 274	57°17.3'N 05°30.3'W	CMU
3	31	W of Sheep Island, Loch Long (Lochalsh)	NG 884 271	57°17.1'N 05°30.6'W	Oph.Oacu; SedK; LsacX; LsacRS.Psa
3	32	Dornie Bridge narrows, Loch Long (Lochalsh)	NG 881 264	57°16.7'N 05°30.9'W	SCAs; LsacX; MytT
3	33	E of Allt-nan-Sùgh, Loch Long (Lochalsh)	NG 904 295	57°18.4'N 05°28.8'W	SpMeg
3	34	NW of Sgeir Dhu, Loch Long (Lochalsh)	NG 888 275	57°17.3'N 05°30.3'W	SpMeg
3	39	E of Làrach Tigh Mhic Dhomhnuill, Loch Alsh	NG 854 254	57°16.1'N 05°33.5'W	Oph.Oacu; VirOph.HAS; LhypLsac.Ft
3	40	E of Glas Eilean, Loch Alsh	NG 848 251	57°15.9'N 05°34.1'W	Oph.Oacu; LsacRS.Psa
3	41	S of Glas Eilean, Loch Alsh	NG 844 245	57°15.6'N 05°34.5'W	Oph.Oacu; EphR
3	42	N of Glas Eilean, Loch Alsh	NG 842 258	57°16.3'N 05°34.7'W	Phy.HEC; HalEdw; LhypGz.Pk
3	43	NW of Ragoon Rock, Loch Alsh	NG 837 256	57°16.2'N 05°35.2'W	Phy.HEC
3	44	W of Ru Sgarabhaig, Loch Alsh	NG 834 258	57°16.2'N 05°35.5'W	AmenCio; VirOph.HAS; Lsac.Ft; AntAsH; Lhyp.Ft
3	45	Aird a Mhill Bay, Loch Alsh	NG 830 263	57°16.5'N 05°36.0'W	VirOph.HAS; LsacX; Tra
3	46	Ru Aird A Mhill, Loch Alsh	NG 819 262	57°16.4'N 05°37.0'W	AmenCio; Lsac.Ldig; AntAsH; LhypLsac.Ft; Lhyp.Pk; LhypLsac.Pk
3	47	W of Ardintoul Point, Loch Alsh	NG 826 246	57°15.6'N 05°36.3'W	AntAsH; LsacX; LhypLsac.Pk
3	48	N of Sgeir Na Caillich, Loch Alsh	NG 800 272	57°16.9'N 05°39.0'W	VirOph.HAS; Tra
3	49	Balmacara Bay, Loch Alsh	NG 802 273	57°17.0'N 05°38.8'W	VirOph.HAS; LsacX
3	50	NE of Corran na Mudlaich, Loch na Beiste, Loch Alsh	NG 761 252	57°15.7'N 05°42.8'W	VirOph.HAS; ModHAS; LsacX
3	51	NE of Eileanan Dubha, Loch Alsh	NG 770 270	57°16.7'N 05°42.0'W	Lim; ModT
3	52	N of String Rock, Loch Alsh	NG 762 267	57°16.5'N 05°42.7'W	Phy.R; ModHAS
51	9	Outer Loch na Beiste, Loch Alsh	NG 762 259	57°16.1'N 05°42.7'W	Lsac.Ft; Pcri; LsacX; Tra
51	10	Inner Loch na Beiste, Loch Alsh	NG 752 252	57°15.7'N 05°43.6'W	SpMeg; Lsac.Ft; Tra

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes present
290	S1	Between Plock of Kyle and Eilean Ban (secondary channel), Loch Alsh	NG 750 273	57°16.9'N 05°43.9'W	Sac; EphR; Phy; LsacX
650	1	NE of Totaig, Loch Duich	NG 879 255	57°16.3'N 05°31.0'W	Oph.Oacu
650	2	SE of Totaig (2), Loch Duich	NG 882 251	57°16.0'N 05°30.7'W	Oph.Oacu
650	3	SE of Totaig, Loch Duich	NG 882 251	57°16.0'N 05°30.7'W	Oph.Oacu
650	4	E of Druidaig Lodge, Loch Duich	NG 885 246	57°15.8'N 05°30.4'W	SpMeg.Fun
650	5	NE of Letterfearn (2), Loch Duich	NG 888 240	57°15.5'N 05°30.0'W	SpMeg
650	6	NE of Letterfearn (1), Loch Duich	NG 888 240	57°15.5'N 05°30.0'W	SpMeg
650	7	W of Carr Brae, Loch Duich	NG 889 244	57°15.7'N 05°29.9'W	CMU; AntAsH; NeoPro
650	8	W of Rubha Ard, Loch Alsh	NG 760 262	57°16.3'N 05°42.8'W	ModT
650	9	SW of Eileanan Dubha, Loch Alsh	NG 765 266	57°16.5'N 05°42.4'W	ModT
650	10	S of Eileanan Dubha, Loch Alsh	NG 766 265	57°16.4'N 05°42.3'W	ModT
650	11	E of Rubha Ard Treisnis, Loch Alsh	NG 767 262	57°16.3'N 05°42.2'W	Oph
650	12	SE of Eileanan Dubha, Loch Alsh	NG 768 264	57°16.4'N 05°42.1'W	Oph.Oacu
650	13	SE of Eileanan Dubha (2), Loch Alsh	NG 769 263	57°16.3'N 05°41.9'W	Oph.Oacu
650	14	SW of Scalpaidh, Loch Alsh	NG 772 263	57°16.3'N 05°41.7'W	Oph.Oacu
650	15	S of Scalpaidh, Loch Alsh	NG 776 264	57°16.4'N 05°41.3'W	SpMeg
650	16	S of Donald Murchison's Monument, Loch Alsh	NG 785 268	57°16.7'N 05°40.4'W	Tra
650	17	Loch centre S of Donald Murchison's Monument, Loch Alsh	NG 785 262	57°16.4'N 05°40.4'W	VirOph; AntAsH
650	18	N of Sron an Tairbh, Loch Alsh	NG 785 258	57°16.2'N 05°40.4'W	SpMeg
650	19	Port Napier (Wreck), Loch Alsh	NG 778 261	57°16.3'N 05°41.1'W	LsacX
650	20	Mouth of Loch na Beiste, South, Loch Alsh	NG 769 253	57°15.8'N 05°41.9'W	AntAsH
731	1	W of Carr Brae, Loch Duich	NG 891 241	57°15.5'N 05°29.7'W	SpMeg.Fun; BrAs
731	2	N of Letterfearn, Loch Duich	NG 887 246	57°15.8'N 05°30.2'W	BrAs; AntAsH
731	3	Mouth of Loch Duich	NG 883 252	57°16.1'N 05°30.6'W	Oph.Oacu
731	4	SE Ard Hill (close to shore), Loch Alsh	NG 821 262	57°16.5'N 05°36.8'W	AmenCio; Ldig.Ldig; Lsac.Ft; Fserr
731	5	S of Ard Hill (1), Loch Alsh	NG 819 257	57°16.2'N 05°37.0'W	CMX
731	6	S of Ard Hill (2), Loch Alsh	NG 816 259	57°16.3'N 05°37.3'W	CMX
731	7	S of Ard Hill (3), Loch Alsh	NG 815 261	57°16.4'N 05°37.4'W	AntAsH
731	8	W of Sgeir na Caillich, NW of Kyle Rhea, Loch Alsh	NG 796 249	57°15.7'N 05°39.2'W	FaMS
731	9	Central Kyle Rhea (1), Loch Alsh	NG 794 227	57°14.5'N 05°39.3'W	AlcTub
731	10	E shore (W of electricity pylons), Kyle Rhea	NG 796 225	57°14.4'N 05°39.1'W	Lhyp.TFt
731	11	W of East Ferry House, Kyle Rhea	NG 794 215	57°13.8'N 05°39.3'W	SedK
731	12	S end Kyle Rhea (1)	NG 791 212	57°13.7'N 05°39.5'W	AlcMaS
731	13	S to middle, Kyle Rhea	NG 791 213	57°13.7'N 05°39.5'W	Urt; CGS; AlcTub
731	14	Mid-channel, W of East Ferry House, Kyle Rhea	NG 790 214	57°13.8'N 05°39.6'W	AlcMaS
731	15	N of West Ferry House (close to shore), Kyle Rhea	NG 790 211	57°13.6'N 05°39.6'W	Lhyp.TFt
731	16	Mid-channel (S end), Kyle Rhea	NG 791 214	57°13.8'N 05°39.5'W	AlcMaS; PomByC
731	17	SE of East Ferry House (close to shore), Kyle Rhea	NG 793 211	57°13.6'N 05°39.3'W	Lhyp.TFt
731	18	Mid-channel E of West Ferry House, Kyle Rhea	NG 792 211	57°13.6'N 05°39.4'W	SedK; Lhyp.TFt

9

Lochs Eishort and Slapin

Location

Position (centre)	NG 575 145	57°09.4'N 05°58.2'W
Administrative area	Highland	Skye and Lochalsh
Conservation agency/area	Scottish Natural Heritage	North Areas

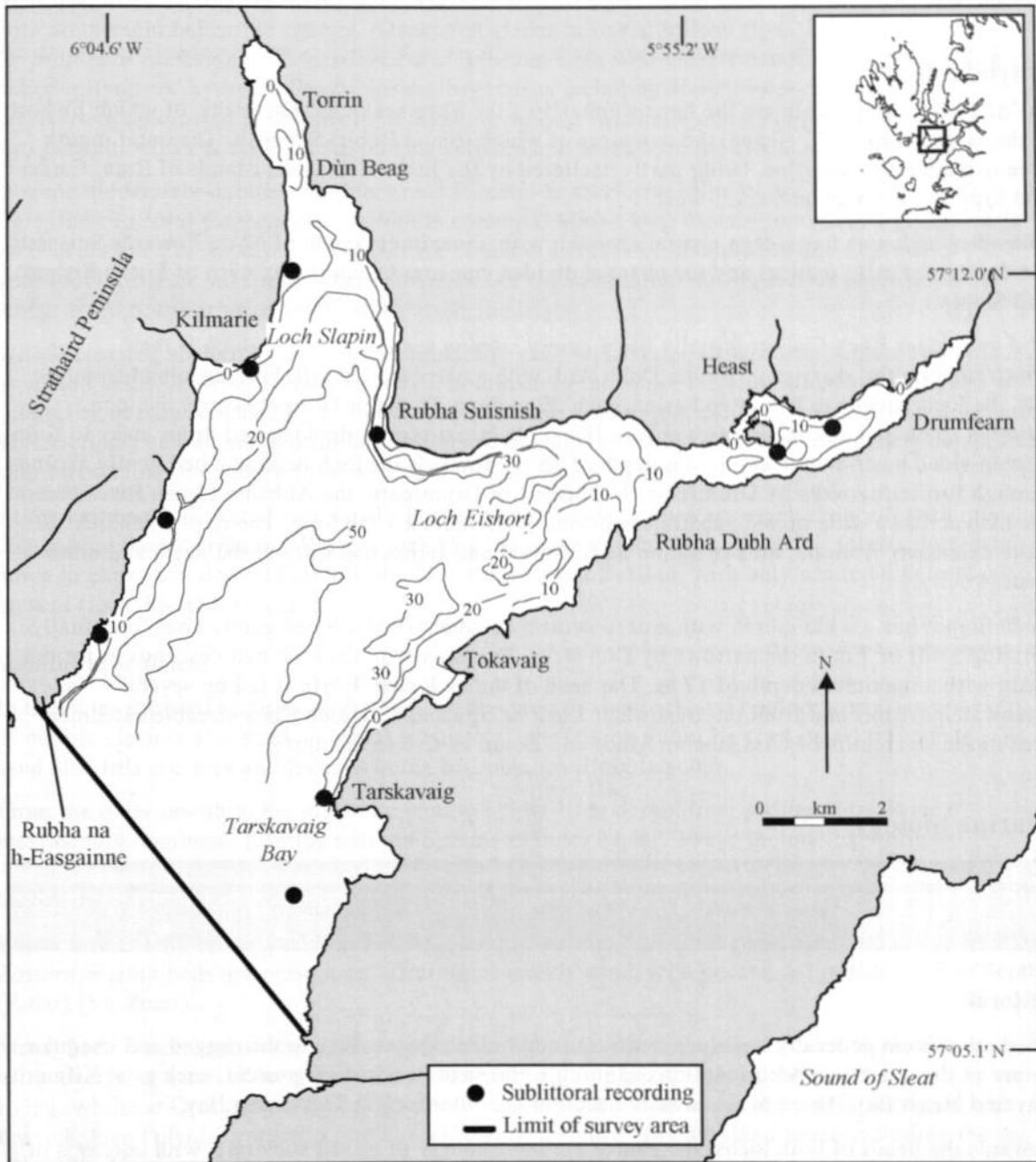


Figure 9.1 Main features of the area, showing sites surveyed.

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Physical features	
<i>Physiographic type</i>	Outer open sealoch, with two inner fjordic sealochs
<i>Length of coast</i>	62.9 km (65.2 km including islands)
<i>Length of inlet</i>	16.9 km
<i>Area of inlet</i>	63.4 km ² (63.2 km ² excluding islands)
<i>Bathymetry</i>	Deep central channel, rising from 62 m, splitting into two silled lochs
<i>Wave exposure</i>	Moderately exposed at mouth, reducing to very sheltered at the loch heads
<i>Tidal streams</i>	Generally very weak; moderate through narrows and over sills
<i>Tidal range</i>	3.3 m (mean springs); 1.5 m (mean neaps) (Mallaig)
<i>Salinity</i>	Fully marine at the loch mouth; reduced towards the loch heads

Introduction

Lochs Eishort and Slapin are the most southerly of the Skye sealochs. The lochs, of which Eishort is the larger, form a 'Y'-shape, the two arms of which join at Rubha Suisnish. The outer mouth area is moderately exposed, being partly sheltered by the Inner Hebridean islands of Rum, Canna and Eigg to the south and south-west.

The outer loch area has a deep central channel, with a maximum depth of 62 m. Towards Suisnish the depth gradually reduces and the channel divides, one arm extending up each of Lochs Eishort and Slapin.

Mid and upper Loch Eishort initially has a gently sloping seabed; the inner loch is then constricted by the skerries of Rubha Dubh Ard, with a narrow 10 m sill. Further inland from the sill, the loch widens to form two basins, each 22 m deep. By Sgeir Gormul skerry, the loch narrows again and continues eastwards to Heast. At Heast skerry, the loch bed drops away to form a steep-sided basin with a maximum depth of 35 m. Towards the loch head, the bed gently ascends through further narrows by Drumfearn. North-east of Drumfearn, the Abhainn Ceann River enters the loch across a wide mixed-substratum littoral plain almost 1 km long. The river catchment is quite extensive, from the hills of Beinn na Seamraig and Beinn nan Càrn to the north and north-east.

Loch Slapin has a wide mouth with a deep central channel. The loch bed gently rises, eventually forming a sill of 7 m in the narrows by Dùn Beag. Further north, the loch bed descends to form a basin with a maximum depth of 17 m. The head of the loch near Torrìn is fed by several freshwater streams and from the freshwater Loch na Sguabaidh, which has a sizeable catchment area in the steep hills of Glas Bheinn Mhór and Beinn na Crò to the north.

Marine biology

Marine biological surveys				
	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Sublittoral</i>	Recording (epibiota)	9	August 1980	Dipper (1981)

Littoral

The loch system generally has steep bedrock and boulder shores. Due to the rugged and irregular nature of the coastline, occasional mixed shingle and sand beaches are present, such as at Kilmarie Bay and Heast Bay. There is also a sand beach in the outer loch at Tarskavaig Bay.

Towards the heads of both lochs, the shores are increasingly of mixed substrata, with outcrops of emergent bedrock. At the loch heads, extensive mixed substrata shores are present. These are highly sheltered and influenced by freshwater.

There have been no specific surveys to describe the littoral biotopes of the area. Sublittoral surveys recorded steep bedrock shores supporting mussel *Mytilus edulis* aggregations, giving way to kelp *Laminaria* spp. in the sublittoral fringe.

Sublittoral

Sublittoral rock

Sites in the outer loch system, such as at Tarskavaig and Rubha na h-Easgainne, are moderately exposed. Bedrock and boulder shores descend into the sublittoral, supporting kelp forests of *Laminaria* sp. in the upper infralittoral. These slopes vary in steepness, with larger numbers of boulders on the bedrock as the depth increases. The rock is highly fissured, with numerous sand-filled gullies and crevices, and supports encrusting epifauna. The outer limits of the loch up to the mid-reaches are dominated by *Laminaria hyperborea* kelp forest (Lhyp.Ft) (SL.Lhyp.Ft). In some areas, the forest is very thick and well-established, with some plants over 3 m tall; here little other flora are present below the canopy. Associated glades have red foliose algae, including *Cryptopleura ramosa* and *Plocamium cartilagineum*. Less well-established forests have a much richer epifauna of hydroids *Obelia* sp. and bryozoans including *Membranipora membranacea*. A species-rich associated undergrowth of algae, including *Trailiella* and *Callophyllis laciniata*, is also present. Areas of rock not supporting kelp are encrusted by algal crusts and bryozoans.

In some moderately-exposed boulder areas *Laminaria saccharina* forests are found (Lsac.Ft). Here, the cup coral *Caryophyllia smithii* is common. Mixed kelp forests dominated by *Laminaria saccharina* and *Saccorhiza polyschides* are common in areas of disturbance due to scour or seasonally unstable substrata, where movement of the substratum during storms prevents the longer-lived *L. hyperborea* establishing itself (SedK).

With increasing shelter, by the inner entrances to each loch, the *L. hyperborea* forests are replaced by mixed kelps. *L. hyperborea* forests still dominate in the upper infralittoral down to about 5 m (Lhyp.Ft), but are replaced by *L. saccharina* (Lsac.Ft), and in places *S. polyschides*, (SL.Lsac and SL.LsacSpol) below this. *Trailiella* is common as an understorey alga. With increasing depth, the kelp forests thin out and by 11 m only sporadic plants are present (Lsac.Pk).

At the extremely sheltered loch heads, bedrock and boulder slopes are much reduced, with mud dominating the substratum. Where a rock slope is present, dense *L. saccharina* forests dominate down to about 5 m depth (Lsac.Ft); the forest thins from 5–10 m, with only scattered kelp plants present (Lsac.Pk) (SL.Lsac.Ft).

Sublittoral sediment

In the outer exposed sections of the loch, steep emergent bedrock and boulder areas have pockets of mobile clean coarse sand and shell fragments, overlain by a thin layer of maerl fragments. The sand also fills crevices and fissures in the bedrock, resulting in scour.

From the outer mouth to the mid-loch section below 10 m depth, finer sediment fractions increasingly dominate, forming soft mud-plains in inner basins. Fauna include lugworms *Arenicola marina*, brittlestars including *Ophiura* sp., the sand star *Astropecten irregularis* and the burrowing anemone *Cerianthus lloydii*.

Below a relatively barren bedrock slope in the mid-section of Loch Slapin, sporadic eelgrass *Zostera marina* beds are present on infralittoral muddy sand, with occasional pebbles at 5 m depth (Zmar) (SL.Zmar).

Maerl beds are present in the shallow infralittoral throughout the mid-section of the loch system, often overlying areas of level bedrock platform (Phy). In places, little of the maerl appears to be living, whilst at Ord, there are healthy maerl beds. Kelp *Laminaria saccharina* is common, with the red algae *Polyides rotundus* and *Furcellaria lumbricalis* (SL.Phy) and fauna including the sea cucumber *Neopentadactyla mixta* and burrowing anemone *C. lloydii*.

In upper Loch Eishort, the substratum is generally soft mud. Red algal mats of *Trailiella* and *Audouinella* sp. are extensive on the mud surface (Tra), with the sponge *Suberites carnosus* and ascidians *Asciella aspersa* and *Ascidia mentula* common, attached to debris on the mats. Other fauna include hermit crabs, spider crabs *Hyas* sp. and *C. lloydii*.

There is no biological information for upper Loch Slapin.

Nature conservation

Conservation sites		
Site name	Status	Main features
The Cuillin Hills	NSA	Landscape (Loch Slapin)
Strathaird, Torrin & Sconser	JMT	Mountains, moorland, croftland, coast

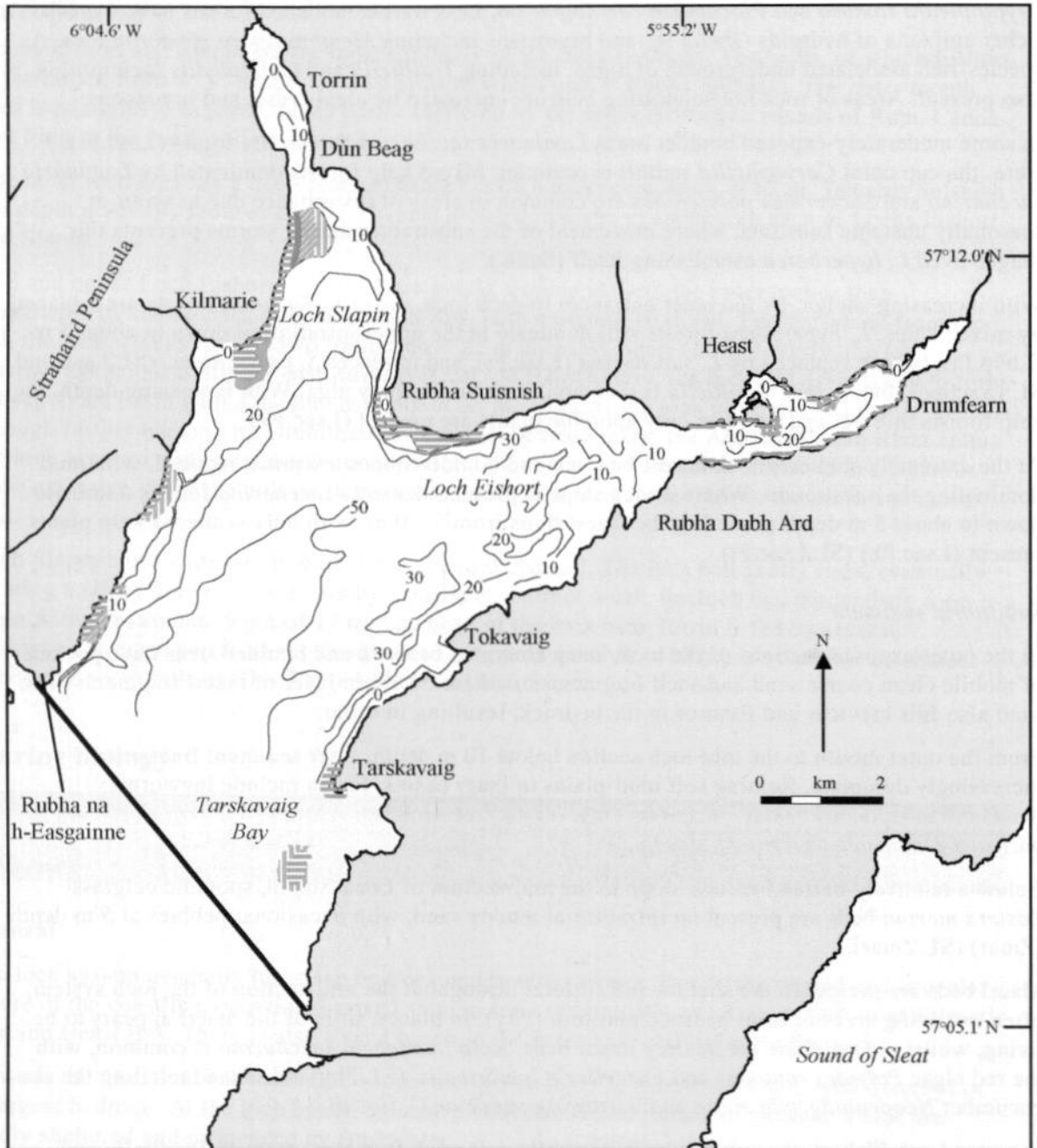


Figure 9.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 9.1, cited literature and additional field observations).
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Human influences

Coastal developments and uses

The Loch Eishort and Slapin system is relatively remote, with no major roads. The B8083 runs around the head of Loch Slapin but most of the coastline has no road access at all. Hence there is limited development, the main settlements being the villages of Torrin and Kilmarie on Loch Slapin. Loch Eishort is particularly unspoilt, with the crofting hamlets of Heast, Drumfearn, Tokavaig and Tarskavaig making up the majority of the development in the area. Although no information is available on water quality, it is likely that sewage disposal is a mixture of septic tanks and local drains into the lochs.

The principal land use is rough grazing, with semi-improved grassland and crofting in places, and forestry plantations on the west side of Loch Slapin. Tourism is increasingly important to the economy of the area.

Marine developments and uses

Small fishing boats operate from several locations around the lochs, with potting for crustaceans occurring within the loch system itself. There are licences for a mussel farm site in Loch Eishort, and for salmon *Salmo salar* farms in Loch Eishort, Loch Slapin and Tarskavaig Bay.

References and further reading

Dipper, F. 1981. Report of a sublittoral survey of south Skye, Inner Hebrides. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council, CSD Report*, No. 342.

Sites surveyed

Survey 51: 1981 UCS south Skye sublittoral survey (Dipper 1981).

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
51	14	Elgol, Spar Cave, Loch Slapin, Skye	NG 538 126	57°08.3'N 06°04.1'W	IMS; Lsac.Ft
51	15	S of Rubha Cruaidhlinn, Loch Slapin, Skye	NG 570 186	57°11.6'N 06°01.3'W	Zmar; Lhyp.Ft; LsacX; Phy
51	16	Dùn Ringill, Loch Slapin, Skye	NG 563 170	57°10.7'N 06°01.9'W	Lsac.Ft;
51	17	Dùn Liath, Loch Slapin, Skye	NG 549 145	57°09.3'N 06°03.2'W	Phy; Lhyp.Ft
51	18	Calaman Cave, Loch Slapin, Skye	NG 584 159	57°10.2'N 05°59.8'W	Lsac.Pk;
51	21	Eilean Heast, Loch Eishort, Skye	NG 650 156	57°10.2'N 05°53.2'W	Lsac.Ft; Tra
51	22	Mid loch, Loch Eishort, Skye	NG 659 160	57°10.5'N 05°52.4'W	Pcri
51	30	Tarskavaig Point, Loch Eishort, Skye	NG 575 099	57°06.9'N 06°00.3'W	SedK
51	31	Tarskavaig, Sgeir Bodaig, Loch Eishort, Skye	NG 570 083	57°06.0'N 06°00.7'W	Phy; Lhyp.Ft

10

Loch Scavaig and Soay Sound

Location

<i>Position (centre)</i>	NG 482 156	57°09.6'N 06°11.4'W
<i>Administrative area</i>	Highland	Skye and Lochalsh
<i>Conservation agency/area</i>	Scottish Natural Heritage	North Areas

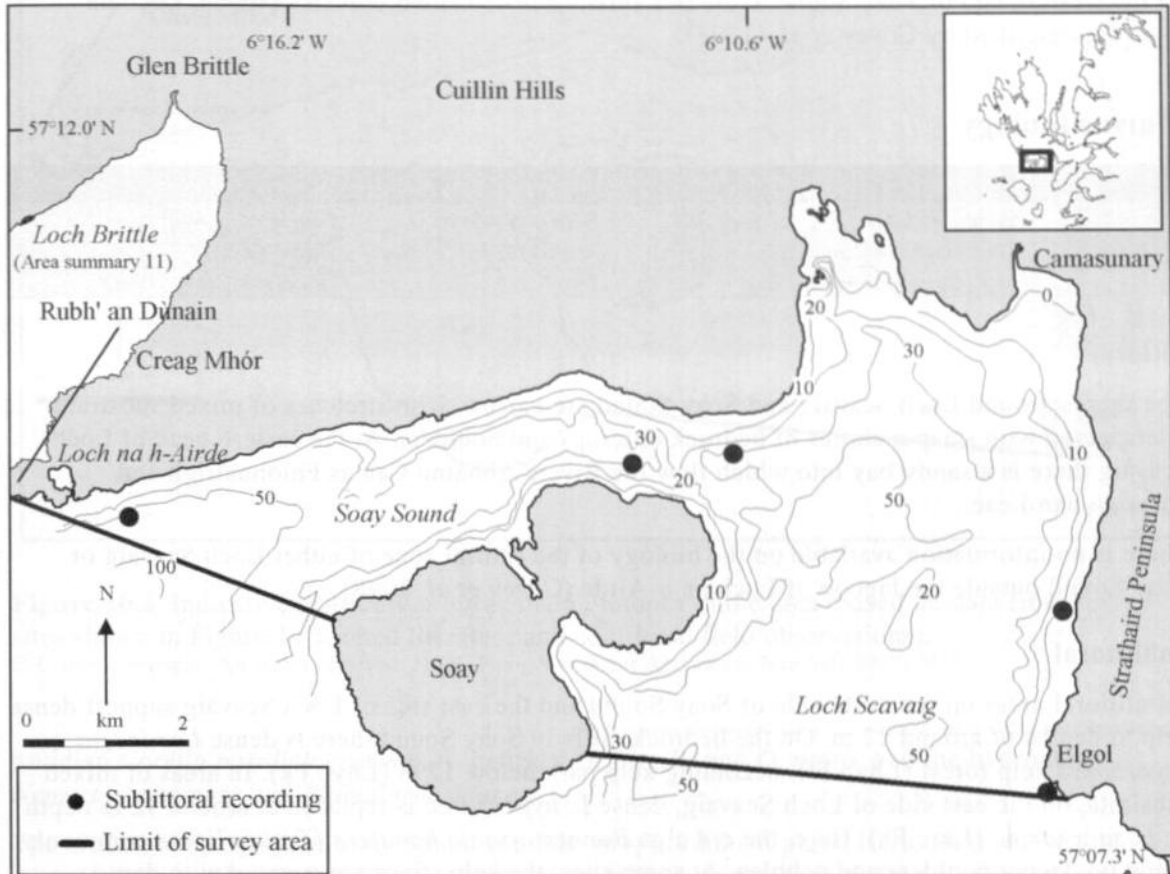


Figure 10.1 Main features of the area, showing sites surveyed.

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Physical features

<i>Physiographic type</i>	Open sealoch
<i>Length of coast</i>	30.1 km (39.4 km including islands)
<i>Area of inlet</i>	37.9 km ² (33.4 km ² excluding islands)
<i>Bathymetry</i>	Maximum depth in Loch Scavaig 71 m in trough within the main basin, the entrance to which is around 50 m deep; maximum depth in Soay Sound 90 m at entrance. Soay Sound separated from Loch Scavaig by a sill at around 17 m depth
<i>Wave exposure</i>	Sheltered at head of loch; becoming very exposed on the outer east side of Loch Scavaig
<i>Tidal streams</i>	Moderate in narrows between Skye and Soay and on outer east side of Loch Scavaig; weak at mouth of Soay Sound
<i>Tidal range</i>	3.3 m (mean springs); 1.5 m (mean neaps) (Mallaig)
<i>Salinity</i>	Fully marine; may be reduced at head of Loch Scavaig due to freshwater input

Introduction

Loch Scavaig and Soay Sound are situated on the south-west coast of Skye. The surrounding land is mountainous. Soay Sound is the arm of water stretching west from Loch Scavaig between Skye and the island of Soay. Loch Scavaig has a very wide south-facing entrance, delimited by the island of Soay on the western side and Strathaird peninsula to the east. The western entrance to Soay Sound faces into the Sea of the Hebrides, while to the south there is limited shelter from the Inner Hebridean islands of Rum, Canna and Eigg. A sill at a depth of around 17 m separates the deeper basins within Loch Scavaig from Soay Sound at the north end of the island of Soay.

At the western end of Soay Sound, there is a small enclosed silled brackish lagoon, Loch na h-Airde, described by Covey *et al.* (1998).

Marine biology

Marine surveys

	Survey methods	No. of sites	Date(s) of survey	Source
Sublittoral	Recording (epibiota)	2	August 1980	Dipper (1981)
	Recording (epibiota)	3	1988	Hiscock & Covey (1991)

Littoral

The shores around Loch Scavaig and Soay Sound are narrow, with stretches of mixed substrata interspersed with steeper shores of bedrock outcrops and boulders. At the eastern head of Loch Scavaig there is a sandy bay into which flow the Rivers Abhainn Camas Fhionnairigh and Abhainn nan Leac.

There is no information available on the biology of the littoral zone of either Loch Scavaig or Soay Sound outside the lagoon of Loch na h-Airde (Covey *et al.* 1998).

Sublittoral

Infralittoral areas on the north side of Soay Sound and the east side of Loch Scavaig support dense kelp to depths of around 12 m. On the bedrock cliffs in Soay Sound there is dense *Laminaria hyperborea* kelp forest (Lhyp.Ft), becoming kelp park below 12 m (Lhyp.Pk). In areas of mixed substrata, on the east side of Loch Scavaig, dense *L. hyperborea* is replaced at around 12 m depth by *L. saccharina* (Lsac.Pk). Here, the red alga *Bonnemaisonia hamifera* (*Trailiella*) is commonly found on deeper boulders and pebbles. At some sites, the kelp stipes are covered with dense foliose algae, with *Palmaria palmata* and *Ptilota gunneri* in shallow water, and predominantly *Phycodrys rubens* in deeper water.

Vertical and overhanging bedrock in the lower infralittoral supports a diverse fauna, including the featherstars *Antedon bifida* and *A. petasus*, the cup coral *Caryophyllia smithii*, anemones *Corynactis viridis*, *Metridium senile* and *Sagartia elegans*, and the sea urchin *Echinus esculentus* (CorMetAlc).

Dense patches of dead maerl-gravel are found along the east side of Loch Scavaig at depths of around 6–16 m (Lcor). Within the maerl there are a variety of faunal species, including sea cucumbers, the anemone *Cerianthus lloydii* and the polychaete *Chaetopterus variopedatus*.

Circalittoral biotopes within Soay Sound are rich and diverse, reflecting the fact that the area is somewhat tide-swept. Bedrock outcrops have a species-rich associated epifauna, with the northern sea-fan *Swiftia pallida*, axinellid sponges, the ascidian *Ascidia mentula* and featherstars *Antedon* spp. dominant (ErSSwi). Brittlestars *Ophiocoma nigra* and *Ophiothrix fragilis*, together with *A. bifida*, dead man's fingers *Alcyonium digitatum* and non-calcareous red algal crusts, are found on bedrock outcrops, boulders and cobbles (FaAlc). Patches of sand between the bedrock and boulders contain *C. variopedatus*, the starfish *Luidia sarsi* and the hermit crab *Pagurus bernhardus*. Areas of cobbles, pebbles and sand support a variety of species, including the

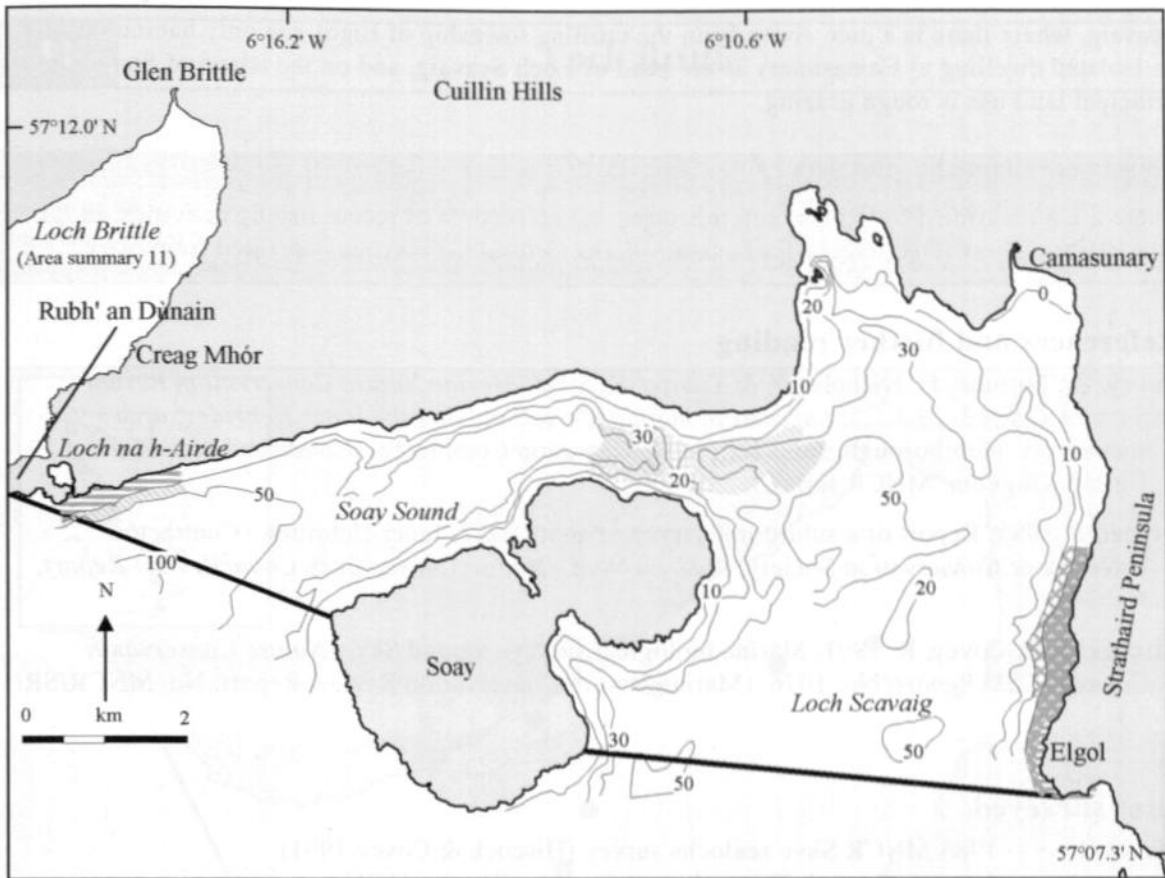


Figure 10.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 10.1, cited literature and additional field observations).
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ascidian *Corella parallelogramma*, *A. petasus*, *O. fragilis* and *O. nigra*, and the hydroids *Nemertesia ramosa* and *Plumularia setacea*.

The seabed of the basin of Soay Sound is a tide-swept sediment plain. Here, there are sea-pens *Virgularia mirabilis*, scallops *Pecten maximus*, ascidians, hydroids including *Nemertesia antennina*, and large burrowing bivalves. The seabed in the centre of Loch Scavaig is a mud-plain with *P. maximus*, *O. nigra* and *O. fragilis* (VirOph.HAs).

Nature conservation

Conservation sites		
Site name	Status	Main features
Cuillins	SSSI	Lagoons, habitats and associated communities
The Cuillin Hills	NSA	Landscape
Strathaird, Torrin & Sconser	JMT	Mountains, moorland, croftland, coast

Human influences

Coastal developments and uses

Loch Scavaig and Soay Sound are remote and largely surrounded by mountainous terrain. The only road access is at Elgol near the end of Strathaird promontory on the east side of outer Loch

Scavaig, where there is a pier. Away from the crofting township of Elgol, the only habitations are an isolated dwelling at Camasunary at the head of Loch Scavaig, and on the island of Soay. The principal land use is rough grazing.

Marine developments and uses

There are no marine developments in this area, and no records of recent fishing activities. In the late 1940s, a short-lived fishery for basking sharks *Cetorhinus maximus* operated from Soay.

References and further reading

- Covey, R., Fortune, F., Nichols, D. & Thorpe, K. 1998. *Marine Nature Conservation Review Sectors 3, 4, 12, 13 & 15. Lagoons in mainland Scotland and the Inner Hebrides: area summaries*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)
- Dipper, F. 1981. Report of a sublittoral survey of south Skye, Inner Hebrides. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council, CSD Report*, No. 342.
- Hiscock, S. & Covey, R. 1991. Marine biological surveys around Skye. *Nature Conservancy Council, CSD Report*, No. 1076. (Marine Nature Conservation Review Report, No. MNCR/SR/3.)

Sites surveyed

- Survey 2: 1988 MNCR Skye sealochs survey (Hiscock & Covey 1991).
Survey 51: 1981 UCS south Skye sublittoral survey (Dipper 1981).

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
2	1	E end of sound, Soay Sound, Skye	NG 475 165	57°10.2'N 06°10.6'W	VirOph.HAS; ErSSwi
2	2	SW of Ulfhart Point, Soay Sound, Skye	NG 463 164	57°10.1'N 06°11.8'W	FaAlc; VirOph.HAS; Ven.Neo
2	3	E of Sgeir Mhór, Soay Sound, Skye	NG 402 157	57°09.5'N 06°17.8'W	FaSwV; VirOph.HAS; LSac.Pk; Lhyp.Ft; CorMetAlc;
51	12	S of Suidhe Biorach, Elgol, Loch Scavaig, Skye	NG 513 124	57°08.1'N 06°06.6'W	XXScrR
51	13	N Elgol, Loch Scavaig, Skye	NG 515 146	57°09.3'N 06°06.5'W	Lcor

11

Loch Brittle

Location

Position (centre)	NG 400 190	57°11.1'N 06°18.6'W
Administrative area	Highland	Skye and Lochalsh
Conservation agency/area	Scottish Natural Heritage	North Areas

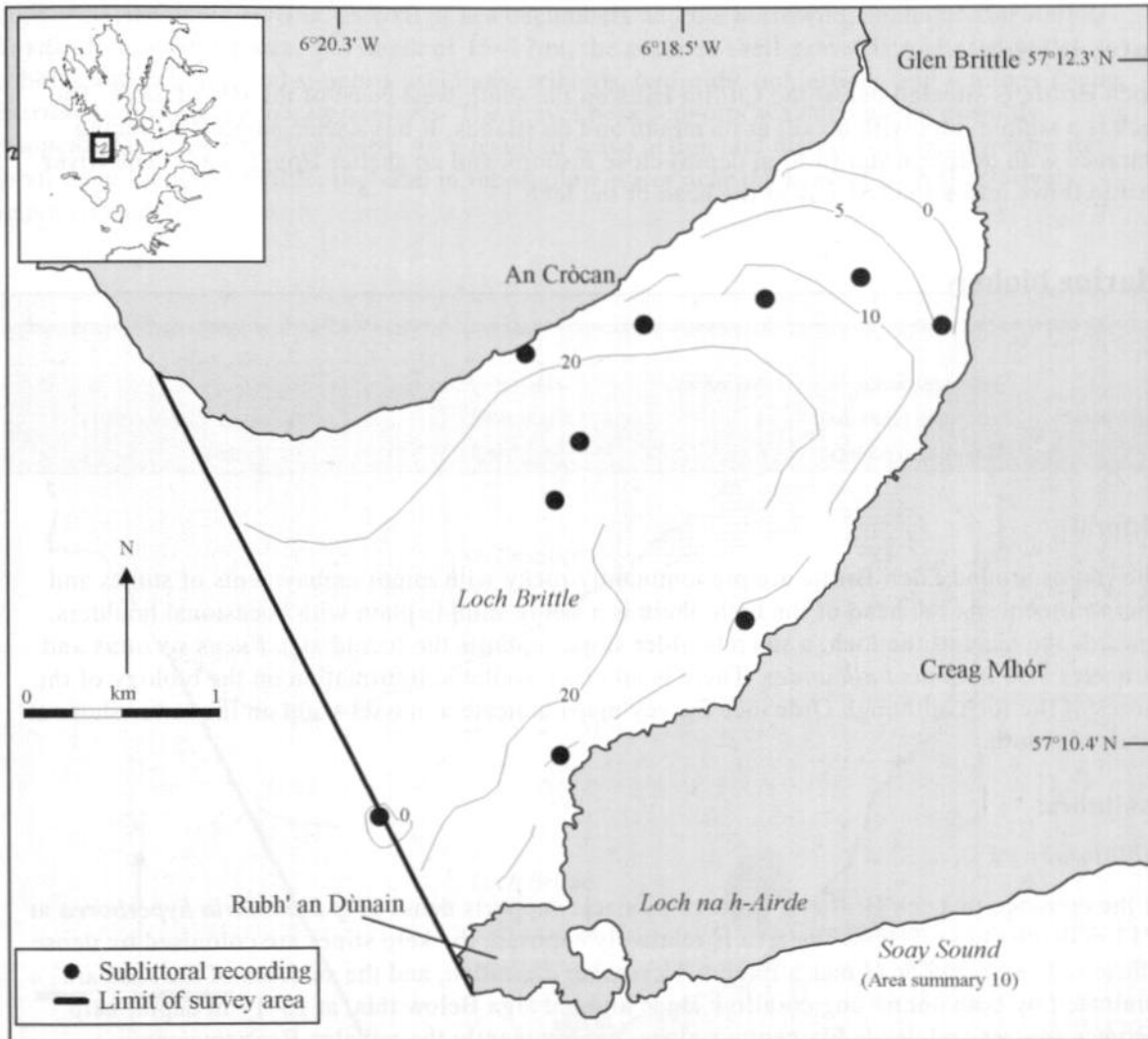


Figure 11.1 Main features of the area, showing sites surveyed.

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Physical features	
<i>Physiographic type</i>	Open sealoch
<i>Length of coast</i>	12.1 km
<i>Length of inlet</i>	4.3 km
<i>Area of inlet</i>	7.7 km ²
<i>Bathymetry</i>	Maximum depth 30 m at entrance
<i>Wave exposure</i>	Moderately exposed throughout but with more sheltered areas towards head of loch
<i>Tidal streams</i>	Moderate; becoming weaker towards head of loch
<i>Tidal range</i>	3.3 m (mean springs); 1.5 m (mean neaps) (Mallaig)
<i>Salinity</i>	Fully marine; reduced at head of loch due to freshwater input

Introduction

Loch Brittle is situated below the Cuillin Hills on the south-west coast of the Isle of Skye. The loch is a simple inlet with no sill at its mouth and no islands. It has a wide south-west facing entrance with deeper water (>40 m depth) close inshore, and no shelter from islands. The River Brittle flows into a shallow bay at the head of the loch.

Marine biology

Marine biological surveys				
	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Sublittoral</i>	Recording (epibiota)	4	June 1988	Hiscock & Covey (1991)
	Recording (epibiota)	6	May 1988	Holt (1988)

Littoral

The shores around Loch Brittle are predominantly rocky with minor embayments of stones and finer sediment. At the head of the loch, there is a sandy shingle plain with occasional boulders. Towards the head of the loch, a steep boulder slope supports the fucoid alga *Fucus serratus* and barnacles *Semibalanus balanoides*. There is no other available information on the biology of the shores of the loch, although Ordnance Survey maps indicate a mussel scalp on the lower shore at the river mouth.

Sublittoral

Sublittoral rock

At the entrance to Loch Brittle, a bedrock pinnacle supports dense kelp *Laminaria hyperborea* at 8–13 m depth (Lhyp.Ft). As the area is relatively exposed, the kelp stipes are colonised by dense foliose red algae and dead man's fingers *Alcyonium digitatum*, and the surfaces of the rock are dominated by both encrusting coralline algae and red alga. Below this, at 13–17 m depth, kelp becomes sparser and dense filamentous algae, predominantly the red alga *Bonnemaisonia asparagoides*, cover smooth sloping bedrock (Lhyp.Pk). This is one of the few areas around Skye where dense red algae are found on infralittoral bedrock.

Within the loch itself, in greater shelter, boulders and bedrock in the infralittoral support both *L. hyperborea* and *L. saccharina* below a sublittoral fringe of *L. digitata*. Occasional plants of sea-oak *Halidrys siliquosa* occur on the south side of the loch, below Creag Mhór (HalXK). Kelp generally becomes sparse at around 15 m depth.

Areas of dense kelp have a rich associated understory flora and fauna, including the red alga *Delesseria sanguinea*, the featherstar *Antedon bifida*, *A. digitatum*, the sea urchin *Echinus esculentus* and ascidians including *Clavelina lepadiformis* (XKScrR).

Sublittoral sediment

Below the kelp, down to depths of around 22 m, there is coarse sand and gravel with patches of mud and areas with scattered boulders, cobbles and pebbles. At the entrance to the loch, where substratum is more exposed, mobile cobbles cover shell-sand and gravel in the infralittoral. The gravel supports the polychaetes *Chaetopterus variopedatus* and *Lanice conchilega*, and the starfish *Luidia sarsi*. Where large boulders occur on gravel and sand in the lower infralittoral, the boulders are encrusted in corallines and brown algae with occasional featherstars *Antedon bifida*, *Echinus esculentus* and keel worms *Pomatoceros* sp.

To the north-east of An Cròcan, a plain of coarse sand lies over mud. Here, there are casts of lugworms *Arenicola marina*, as well as sea cucumbers and the burrowing anemone *Cerianthus lloydii*. Below An Cròcan, at a depth of 15–17 m, the plain of shell-gravel is scattered with cobbles and pebbles, and supports ascidians, crinoids, hydroids, ophiuroids, and scallops *Pecten maximus* and *Aequipecten opercularis*. The gravel here supports sea cucumbers, possibly *Neopentadactyla mixta* (Ven.Neo). As a result of wave action and disturbance from freshwater input from the River Brittle, the sand in the shallow water near the head of loch is relatively impoverished.

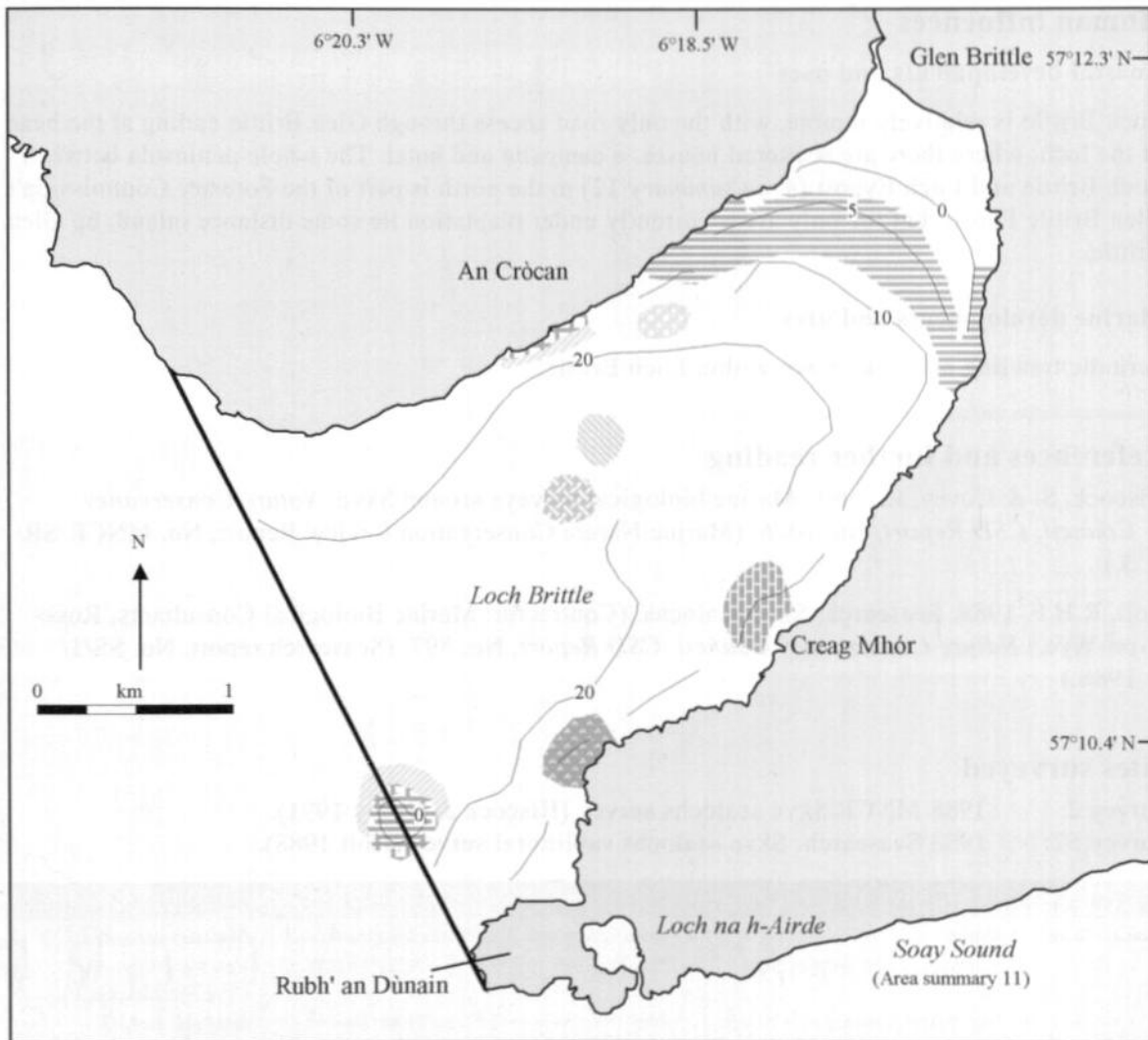


Figure 11.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 11.1, cited literature and additional field observations).

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In deeper water at the centre of the loch, at a depth of around 28 m, the seabed is a level plain of muddy sand with patches of silt. This area is characterised by animal-dominated communities, with the sea-pen *Virgularia mirabilis*, Norway lobster *Nephrops norvegicus*, *A. marina* casts, and burrows of the crustacean *Callianassa subterranea* (SpMeg). Holt (1988) also noted large numbers of the masked crab *Corystes cassivelaunus*. Holt (1988) recorded an area of eelgrass *Zostera marina* on the north-west side of the loch (Zmar).

A number of relatively scarce species have been found within Loch Brittle. These include the leech *Pontobdella muricata*, the echinoderms *Luidia sarsi* and *Asterina gibbosa*, and *Schmitzia hiscockiana*, a red alga characteristic of tide-swept pebbles and boulders.

Nature conservation

Conservation sites		
Site name	Status	Main features
Cuillins	SSSI	Lagoons, habitats and associated communities
The Cuillin Hills	NSA	Landscape (south & east shore)

Human influences

Coastal developments and uses

Loch Brittle is relatively remote, with the only road access through Glen Brittle ending at the head of the loch, where there are scattered houses, a campsite and hotel. The whole peninsula between Loch Brittle and Loch Eynort (*Area summary 12*) to the north is part of the Forestry Commission's Glen Brittle Forest, but the only areas currently under plantation lie some distance inland, up Glen Brittle.

Marine developments and uses

Periodic trawling may take place within Loch Brittle.

References and further reading

- Hiscock, S. & Covey, R. 1991. Marine biological surveys around Skye. *Nature Conservancy Council, CSD Report*, No. 1076. (Marine Nature Conservation Review Report, No. MNCR/SR/3.)
- Holt, R.H.F. 1988. Seasearch: Skye sealochs. (Contractor: Marine Biological Consultants, Ross-on-Wye.) *Nature Conservancy Council, CSD Report*, No. 897. (Seasearch report, No. SS/1/1988.)

Sites surveyed

- Survey 2: 1988 MNCR Skye sealochs survey (Hiscock & Covey 1991).
 Survey 52: 1988 Seasearch: Skye sealochs sublittoral survey (Holt 1988).

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
2	5	Entrance, Loch Brittle, Skye	NG 382 169	57°10.1'N 06°19.8'W	Ven.Neo; Lhyp.Ft; Lhyp.Pk; LhypGz.Pk
2	6	SE of An Cròcan, Loch Brittle, Skye	NG 393 188	57°11.1'N 06°18.8'W	AntAsH; FaAIC
2	7	Middle of loch, NW of Creag Mhór, Loch Brittle, Skye	NG 396 194	57°11.5'N 06°18.6'W	VirOph
2	8	NE of loch, Loch Brittle, Skye	NG 407 196	57°11.6'N 06°17.5'W	EcorEns

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
52	1	Mid loch, Loch Brittle, Skye	NG 391 185	57°11.0'N 06°19.0'W	SpMeg
52	2	Under Creag Mhór, Loch Brittle, Skye	NG 401 179	57°10.7'N 06°18.0'W	HalXK
52	3	SW corner at mouth, Loch Brittle, Skye	NG 392 172	57°10.3'N 06°18.9'W	XKScrR
52	4	NW side of head, Loch Brittle, Skye	NG 402 195	57°11.5'N 06°17.9'W	Ldig.Ldig; EcorEns; Lhyp.Ft; ZMar
52	5	Under An Cròcan, outer N coast, Loch Brittle, Skye	NG 390 192	57°11.4'N 06°19.1'W	Ven.Neo; LhypGz
52	6	E side of head, Loch Brittle, Skye	NG 411 194	57°11.5'N 06°17.0'W	Fser.Fser; Ldig.Ldig; EcorEns

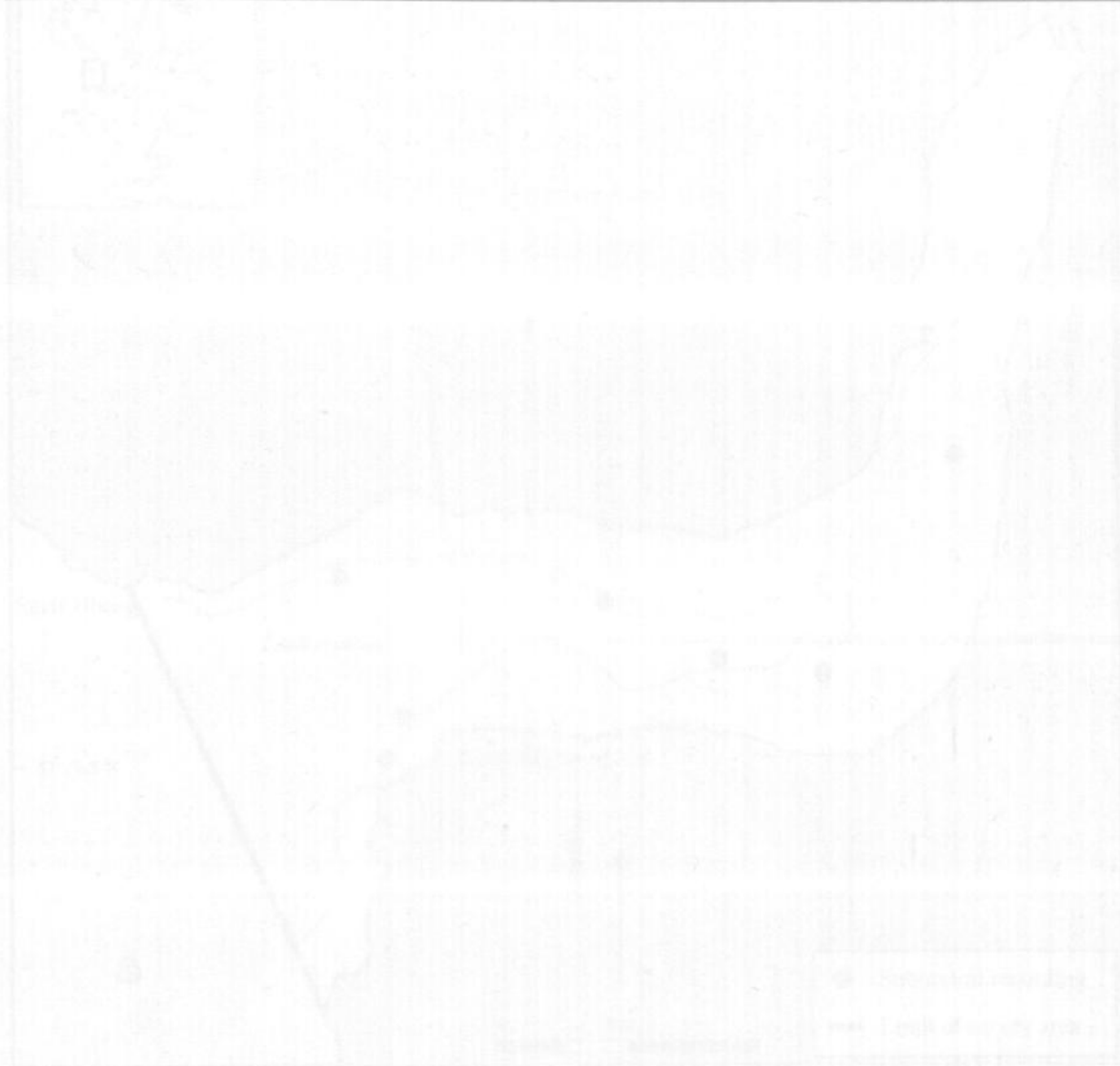


Figure 12.1 Map showing the sublittoral sites in Loch Brittle, Skye.