

# **Sealochs in west Scotland**

## **Area summaries**

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with additional text by  
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Contents

Preface .....	5
Synopsis .....	7
Introduction .....	8
Background .....	8
Data collection and the classification of biotopes .....	9
<i>Area summaries</i> and their format .....	11
Acknowledgements .....	14
References .....	14
Area summaries	
1. Loch Indaal .....	19
2. Loch Gruinart .....	25
3. Loch Tarbert, Jura .....	29
4. West Loch Tarbert .....	39
5. Loch Caolisport .....	47
6. Loch Sween .....	53
7. Loch Crinan .....	79
8. Loch Craginish .....	85
9. Loch Melfort .....	93
10. Loch Feochan .....	99
11. Loch Etive .....	105
12. Loch Creran .....	119
13. Lower Loch Linnhe .....	129
14. Loch Leven .....	143
15. Upper Loch Linnhe and Loch Eil .....	153
16. Loch Aline .....	165
17. Loch Sunart and Loch Teacuis .....	171
18. Loch a'Chumhainn .....	193
19. Loch na Keal .....	199
20. Loch Scridain .....	205
21. Loch na Lathaich .....	213
22. Loch Buie .....	219
23. Loch Spelve .....	225
24. Loch Don .....	231
Appendix A. Biotopes classification .....	237
Appendix B. Biotopes recorded in each area .....	248
Appendix C. Species recorded .....	257

# 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.

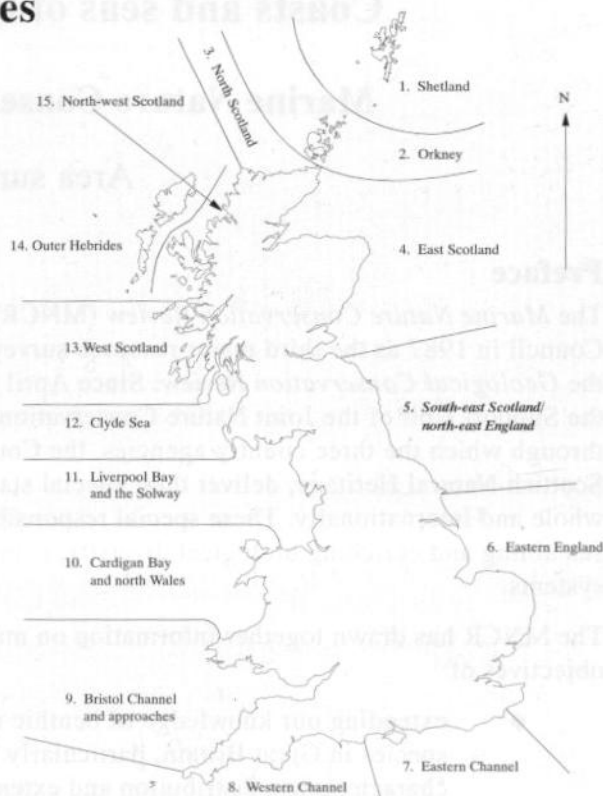
A full list of MNCR and other JNCC marine reports is available from the Marine Information Officer, JNCC, or at JNCC's website [www.jncc.gov.uk/marine](http://www.jncc.gov.uk/marine). JNCC publications can be purchased from NHBS Ltd, 2-3 Wills Road, Totnes, Devon, TQ9 5XN (tel. 01803 865913; fax. 01803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

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 and Steele	2007
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

\*These volumes have been updated and are now available on-line [www.jncc.gov.uk/MarineHabitatClassification](http://www.jncc.gov.uk/MarineHabitatClassification), authored by Connor *et al.* 2004

# Marine Nature Conservation Review

## Sector 13

### Sealochs in west Scotland

#### Area summaries

#### Synopsis

The sealochs of west Scotland (MNCR Sector 13) have been studied as part of the Marine Nature Conservation Review programme. The studies included field surveys of the shores and the sublittoral zone between 1988 and 1997 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 1,855 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 24 *area summaries*:

- |                       |                                    |
|-----------------------|------------------------------------|
| 1. Loch Indaal        | 13. Lower Loch Linnhe              |
| 2. Loch Gruinart      | 14. Loch Leven                     |
| 3. Loch Tarbert, Jura | 15. Upper Loch Linnhe and Loch Eil |
| 4. West Loch Tarbert  | 16. Loch Aline                     |
| 5. Loch Caolisport    | 17. Loch Sunart and Loch Teacuis   |
| 6. Loch Sween         | 18. Loch a'Chumhainn               |
| 7. Loch Crinan        | 19. Loch na Keal                   |
| 8. Loch Craignish     | 20. Loch Scridain                  |
| 9. Loch Melfort       | 21. Loch na Lathaich               |
| 10. Loch Feochan      | 22. Loch Buie                      |
| 11. Loch Etive        | 23. Loch Spelve                    |
| 12. Loch Creran       | 24. Loch Don                       |

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.

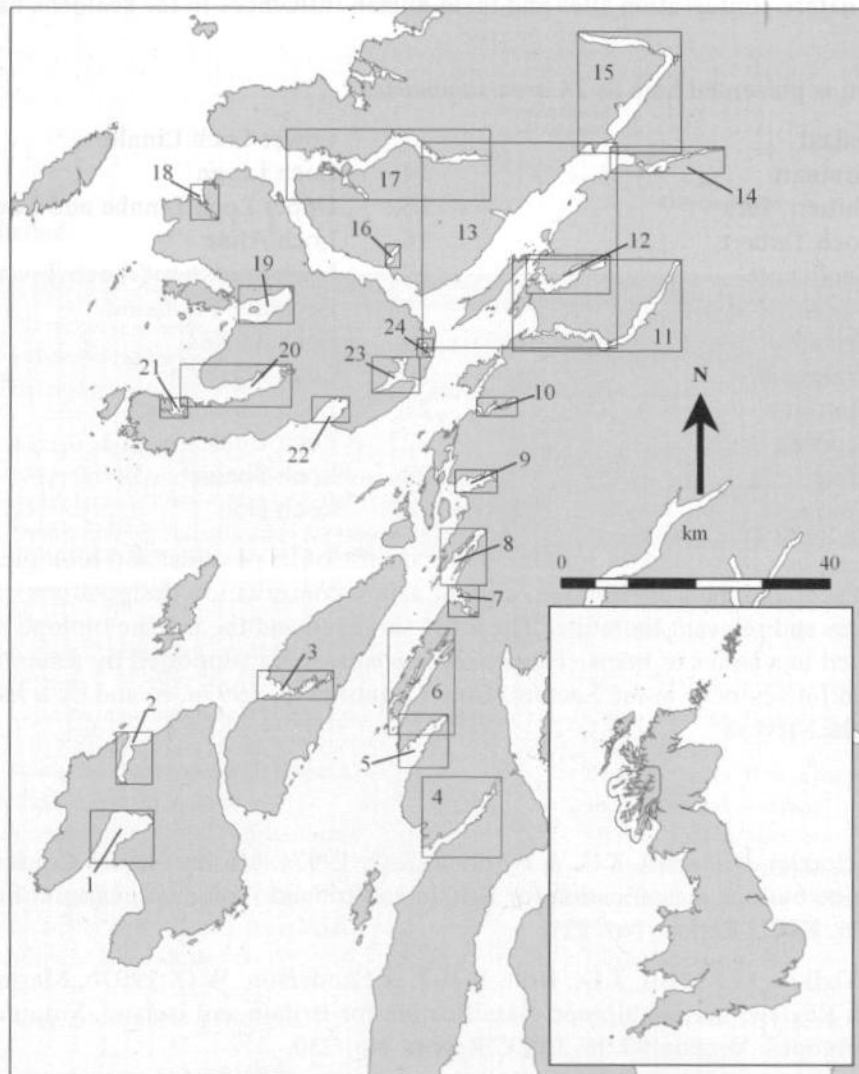
#### References

- 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.

## Introduction

### Background

The coast of west Scotland, from the Mull of Kintyre to the Point of Ardnamurchan (MNCR Sector 13) is highly indented and includes several large sealoch systems oriented primarily on a south-west/north-east axis. The southern Inner Hebridean islands, the largest of which are Islay, Jura and Mull, lie offshore (Figure 1) and strong tidal streams are generated in the sounds between the islands. The west-facing coasts of the outer islands are exposed to the force of the Atlantic Ocean, receiving only slight protection from the Outer Hebrides and from Ireland, and deep water extends close inshore. In contrast, the mainland sealochs are sheltered from the prevailing south-westerly winds by the Inner Hebrides. There are strong tidal streams around the entrances to many of the lochs, but generally only weak tidal streams in the inner basins. Several are isolated from the open sea by sills or narrows and there are tidal rapids across many of these sills. In the case of Loch Etive, a highly constricted entrance combined with an exceptionally high freshwater input produces brackish conditions. The majority of the sealochs have been classified as fjords, whilst those without an entrance sill are open sealochs.



**Figure 1** Location of the 24 sealoch areas in MNCR Sector 13 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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The sealochs of the west Scotland mainland are mostly easily accessible, and have a longer history of marine biological study than those further north or in the Hebrides. Many studies of the marine biology of these sealochs, particularly Lochs Linnhe, Eil, Creran and Etive, have been undertaken under the auspices of the Heriot-Watt University (with Loch Creran in particular being studied), Scottish Association for Marine Science (SAMS), Oban and the University Marine Biological Station, Millport. Other studies were initiated by the Nature Conservancy Council (Connor & Little 1998), with Loch Sween being particularly intensively studied (Connor 1990a; Nature Conservancy Council 1990). Together with surveys undertaken for the MNCR, this research has resulted in the biology of the sealochs generally being better known than that of the open coast. More recent studies for Scottish Natural Heritage have focused on candidate Special Areas of Conservation (cSACs). The deep fjordic sealochs typical of Sector 13 do not feature in the list of Annex I habitats for which SACs are selected. However, the Firth of Lorn has been designated an SAC based on its variety of reef types and associated communities and species, and Loch Creran has gained SAC status based on presence of the biogenic reefs of horse mussel (*Modiolus modiolus*) and polychaete reef (*Serpula vermicularis*). The present volume does not include lagoons which occur within some sealoch systems; these are described by Covey *et al.* (1998). Loch Sunart has also gained SAC status based on a recommendation to ensure appropriate recognition of its population of otters (Scottish Natural Heritage 1999) and for its reef habitats.

### 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, Connor & Holt 1994). The surveys aimed to describe the habitats and communities (together referred to as biotopes) present and to assess their natural heritage importance. A summary of these surveys<sup>1</sup> 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, 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 Littoral or Sublittoral Habitat Forms. 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 m<sup>2</sup> core samples were taken at each site sampled 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.

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<sup>1</sup> Please note: where more recent publications (including surveys) are available, these are referenced within the relevant chapters.



**Table 1** Sources of field survey information.

<i>MNCR database survey no.</i>	<i>Survey</i>	<i>Source</i>	<i>No. of sites</i>	<i>No. of habitats surveyed</i>
5	1990 MNCR Loch Leven (Lochaber) survey	Davies (1991)	37	114
6	1988–89 MNCR Loch Linnhe survey	Connor (1990)	82	221
9	1990 MNCR Loch Tarbert (Jura) survey	Connor (1991)	14	30
10	1979–82 NCC/RSM Jura and Islay littoral survey	Hiscock (1983); Smith (1982b)	46	44
11	1982 OPRU Jura and Islay sublittoral survey	Hiscock (1983); Smith (1982b)	50	146
15	1989 MNCR Loch Sunart survey	Allen (1954); Davies (1990)	29	82
17	1987 NCC/MCS Seasearch Loch Sunart sublittoral survey	MacKinnon & Lumb (1988)	24	43
25	1989 UMBSM south Argyll and west Kintyre sealochs survey	Howson (1990)	63	136
26	1989 UMBSM Mull sealochs survey	Davies (1990)	58	108
32	1990 UMBSM Loch Etive survey	Holt (1991)	43	104
46	1984 NCC/OPRU Loch Sween sublittoral survey	Lumb (1986)	14	54
47	1983 MCS Firth of Lorn sublittoral survey	Buehr (1984)	17	0
48	1983 UCS Mull sublittoral survey	Smith & Gault (1983); Bishop (1984)	39	38
50	1982 UCS Loch Sween sublittoral survey	Earl (1982); Earl (1984)	90	102
63	1970s Ridley north-west Scotland sublittoral photographic survey	Dipper (1981)	16	14
65	1987 UMBSM Loch Sween burrowing megafauna survey	Atkinson (1987)	15	15
81	1984 Smith Loch Sween mollusc and polychaete littoral survey	Smith (1982a); Smith (1985)	20	20
82	1982 Smith Loch Sween littoral molluscs survey	Smith (1982a)	1	0
83	1979–80 Smith west Inverness-shire & north Argyll littoral mollusc survey	Smith (1981)	27	26
84	1978 Smith west Inverness-shire & north Argyll littoral survey	Smith (1978)	22	22
85	1983 Smith Mull littoral survey	Smith & Gault (1983); Bishop (1984)	32	32
97	1982–85 NCC Loch Sween littoral habitats review	Hiscock & Smith (1986)	76	232
98	1984 OPRU Upper Loch Sween littoral survey	Rostron & Hiscock (1985)	15	42
99	1985 Smith Loch Sween littoral survey	Smith (1986)	24	25
175	1990 MNCR Loch Sunart sediment survey	Davies & Connor (1993)	34	84
265	1970–80 SMBA/MBA Great Britain littoral survey	Harvey et al. (1980)	434	323
267	1985 NCC Loch Sween sublittoral survey	Lumb & Hiscock (1990)	135	232
284	1990 Seasearch Loch Craignish survey	Gubbay & Loretto (1991)	46	96
296	1969 Gage Lochs Etive, Creran and Lochnell Bay sublittoral survey	Gage (1974a); Gage (1974b)	8	75
463	1994 MNCR Ardnamurchan peninsula sublittoral survey		43	88
469	1994 MNCR/SNH Ardnamurchan peninsula and north Mull ROV survey		6	14
497	1994 SNH Loch Sunart biotope survey	Fuller et al. (1996)	60	60
624	1995 MNCR Firth and Lynn of Lorn training survey		4	32
653	1996 SNH Argyll ROV survey		10	17
730	1995 SNH Loch Creran ROV survey		4	6
734	1995 SNH Loch Sunart sublittoral biotope survey	Howson (1996)	114	265
762	1997 JNCC/MCS Seasearch Loch Sunart survey		38	93
811	1995 Heriot-Watt University Loch Creran Serpulid reef survey	Moore (1996)	48	49
812	1996–98 SNH Firth of Lorn remote sublittoral survey		17	22
<b>Total</b>			<b>1855</b>	<b>3106</b>



MNCR database survey no.	Survey	Source	No. of sites	No. of habitats surveyed
<i>Other relevant surveys that have been undertaken include the following:</i>				
	1994 SNH Ardnamurchan AGDS survey for phase 2 site selection	Unpublished		
	1998 SNH broad-scale remote survey and mapping of sublittoral habitats and their associated biota in the Firth of Lorn	Davies 1999		
	1998–99 SNH broad-scale survey and mapping of seabed biota in Loch Creran	Black et al. 2000		
	2001 SNH broad-scale mapping of sublittoral habitats in Loch Sunart	Bates et al. 2004		
	2005 Highland Shellfish Management Organisation: seabed biotope map	Foster-Smith & Sotheran 2005		

Abbreviations: MCS = Marine Conservation Society; MNCR = Marine Nature Conservation Review (JNCC); NCC = Nature Conservancy Council; OPRU = Oil Pollution Research Unit; ROV = remotely-operated vehicle; RSM = Royal Scottish Museum (now Royal Museums of Scotland); SMBA/MBA = Scottish Marine Biological Association/Marine Biological Association Intertidal Survey Unit; SNH = Scottish Natural Heritage; UCS = Underwater Conservation Society (now Marine Conservation Society); UMBSM = University Marine Biological Station, Millport.

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 1,855 sites (different habitat or station records) from sealochs in MNCR Sector 13 were used in the analyses, resulting in the identification of 147 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 listed 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 Sector 13 (see Figure 1) are described in the standard MNCR *area summary* format. The 24 *area summaries* are:

- |                       |                                    |
|-----------------------|------------------------------------|
| 1. Loch Indaal        | 13. Lower Loch Linnhe              |
| 2. Loch Gruinart      | 14. Loch Leven                     |
| 3. Loch Tarbert, Jura | 15. Upper Loch Linnhe and Loch Eil |
| 4. West Loch Tarbert  | 16. Loch Aline                     |
| 5. Loch Caolisport    | 17. Loch Sunart and Loch Teacuis   |
| 6. Loch Sween         | 18. Loch a'Chumhainn               |
| 7. Loch Crinan        | 19. Loch na Keal                   |
| 8. Loch Craignish     | 20. Loch Scridain                  |
| 9. Loch Melfort       | 21. Loch na Lathaich               |
| 10. Loch Feochan      | 22. Loch Buie                      |
| 11. Loch Etive        | 23. Loch Spelve                    |
| 12. Loch Creran       | 24. Loch Don                       |

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 (Argyll & Bute; Highland) and nature conservation agency and area (Scottish Natural Heritage, West and 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 from the relevant 1:50,000 Ordnance Survey (Landranger series) map.
<i>Area and length of inlet</i>	Taken from Edwards & Sharples (1986). 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) and from Edwards & Sharples (1986) (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 recent MNCR surveys). 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 especially applies 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.* 1997a, b, where further information on the types of designation can be found, and Scottish Natural Heritage information).

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

ESA	Environmentally Sensitive Area
GCR	Geological Conservation Review site
MCA	Marine Consultation Area
NCR	Nature Conservation Review site
NNR	National Nature Reserve
NSA	National Scenic Area
NTS	National Trust for Scotland
Ramsar	Ramsar site
RSA	Regional Scenic Area (regional landscape designation)
RSC	Regional Scenic Coast (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, 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.* (1997a, b).

### 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.

### Acknowledgements

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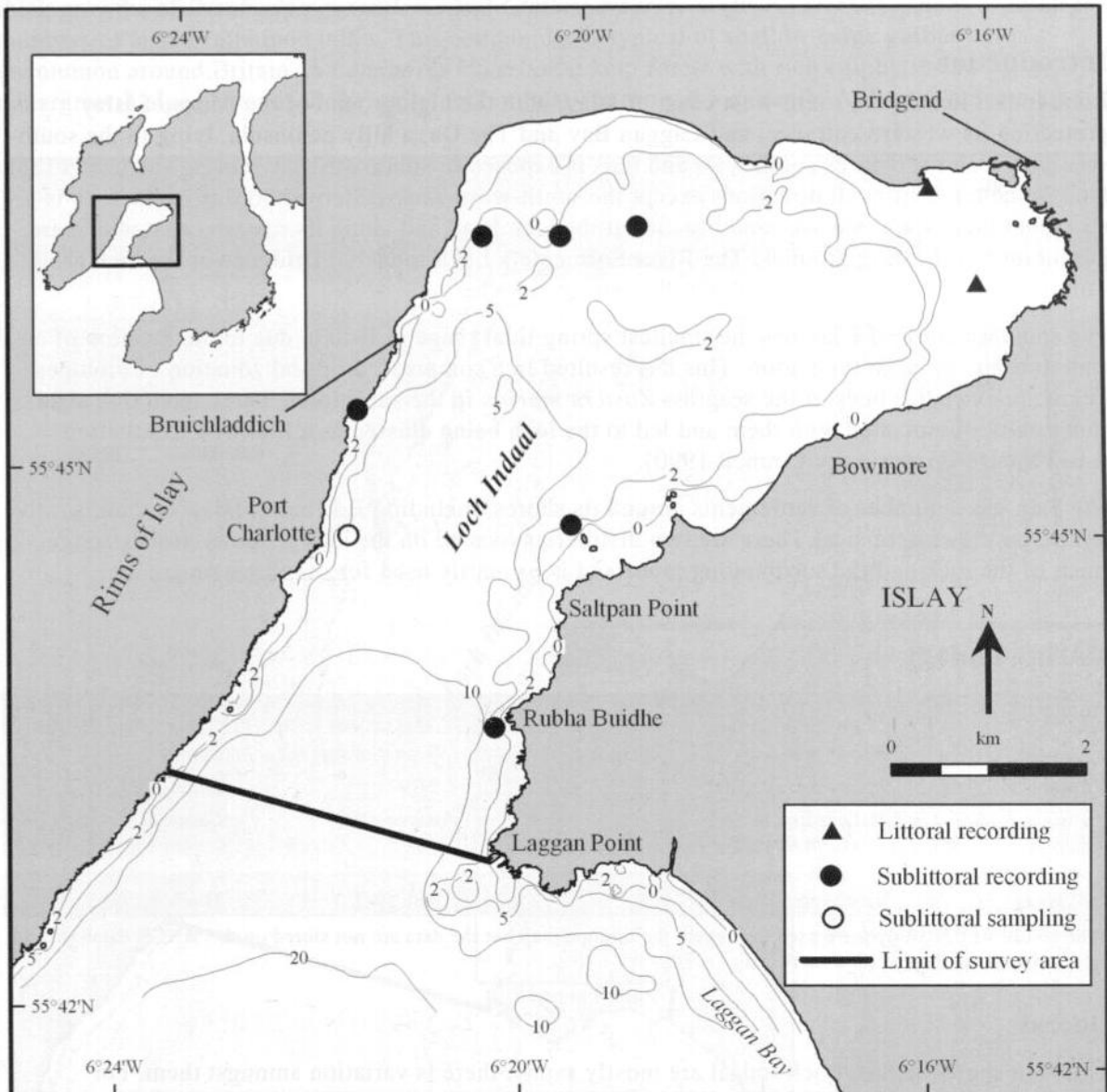
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1

## Loch Indaal

## Location

Position (centre)	NR 280 600	55°41.2'N 6°20'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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**Physical features**

<i>Physiographic type</i>	Fjord with one sill
<i>Length of coast</i>	36.61 km
<i>Length of inlet</i>	10.4 km
<i>Area of inlet</i>	30.7 km <sup>2</sup> (HW); 24.2 km <sup>2</sup> (LW)
<i>Bathymetry</i>	13.0 m (max)
<i>Wave exposure</i>	Very exposed to south-westerly winds
<i>Tidal streams</i>	Negligible
<i>Tidal range</i>	Springs – 1.4 m; neaps – 0.1 m (Bruichladdich)
<i>Salinity</i>	Fully marine

**Introduction**

Loch Indaal lies on the south-west coast of Islay, with the high ground of the Rinns of Islay protecting its western entrance, and Laggan Bay and The Oa, a hilly peninsula, lying to the south-east. The loch itself faces south-west and thus is exposed to south-westerly winds. The head of the loch is sheltered from all directions except the south-west. The western shoreline of the loch is rocky but there are extensive sand beaches at the loch head and along its eastern coast which are important bird feeding grounds. The River Sorn enters Loch Indaal at Bridgend at the loch head; salinity in this area is reduced but is fully marine elsewhere.

The southern coast of Islay has the smallest spring tidal range in Britain due to the location of an amphidromic point in the region. This has resulted in a compressed littoral zonation of biotopes. There are extensive beds of the seagrass *Zostera marina* in the sublittoral. These have rich algal communities associated with them and led to the loch being classed as a Marine Consultation Area (Nature Conservancy Council 1990).

The loch has a number of settlements around its shores, including Bowmore, Islay's administrative centre, on the eastern side. There are two distilleries located on the loch's shores. Roads fringe much of the loch and the surrounding moorland is primarily used for rough grazing.

**Marine biology****Marine biological surveys**

	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording (epibiota)	2	1979	Smith 1982
	*Infaunal sampling (cores along transects)	4	January 1984	Stroud <i>et al.</i> 1984
<i>Sublittoral</i>	Recording (epibiota)	7	June 1982	Hiscock 1983

\*The results of this study were used to prepare the biotope map but the data are not stored on the MNCR database and not shown on the map of sites surveyed.

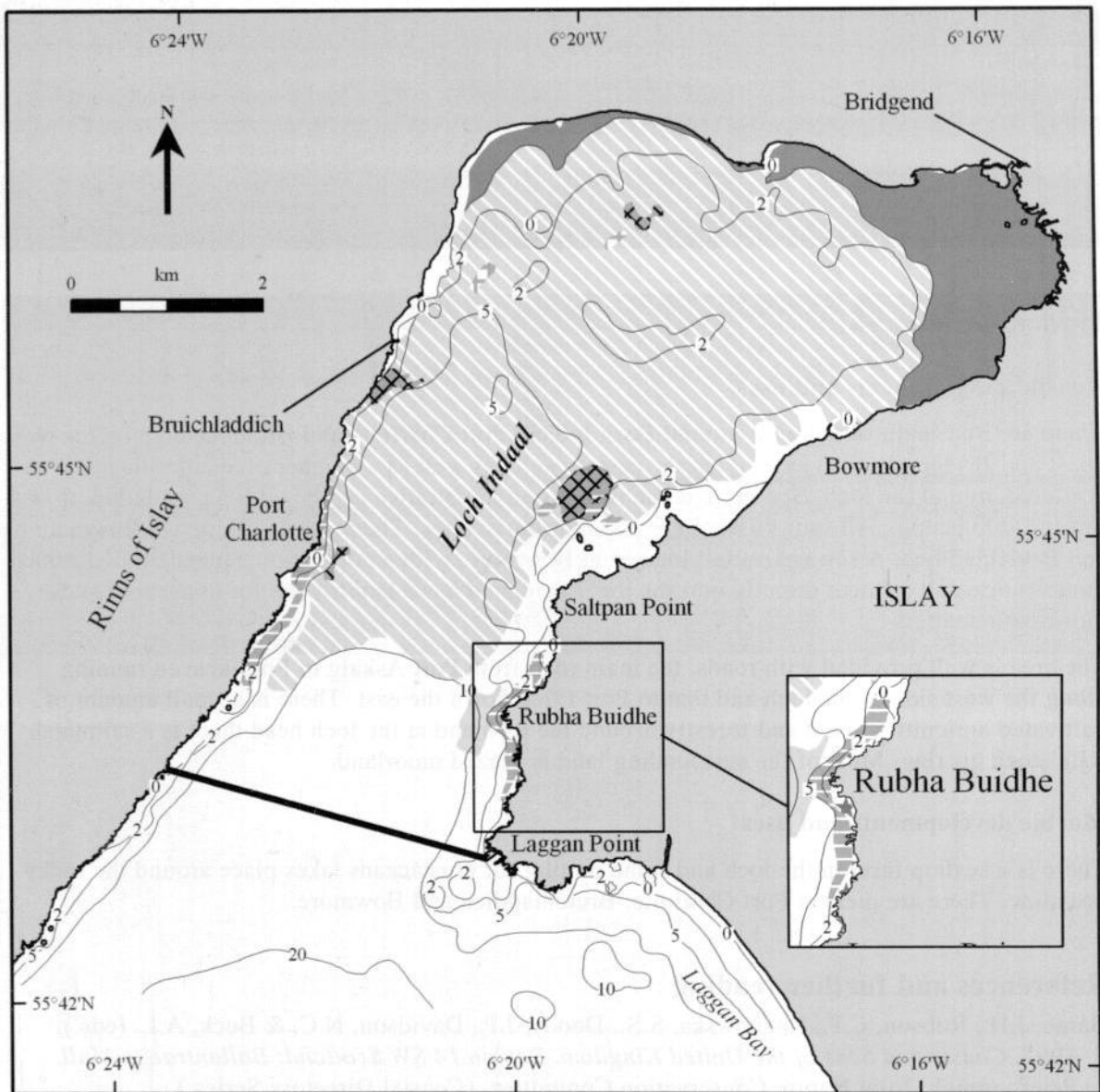
**Littoral**

Although shores within Loch Indaal are mostly sandy, there is variation amongst them. For example, sandy shores at the head of Bridgend are backed by saltmarsh, whereas sandy areas on the outer northern and southern edges of the bay are backed by areas of steep, storm shingle. In contrast, along the south-west side the shoreline is narrow and steep and composed of irregular rocks. Laggan Point, on the east side at the entrance to the loch, is also rocky. The fine sand sediment is dominated by molluscs. *Hydrobia ulvae* and small worms predominate in the upper shore, with *H. ulvae* and *Macoma balthica* in the mid-shore, whilst in the lower shore *Angulus tenuis* and *Cerastoderma edule* are prevalent. These molluscs support large winter populations of curlew *Numenius arquata* and oystercatcher *Haematopus ostralegus*. This information is based on surveys done in the early 1980s and it is not known whether any changes have occurred since.



## Sublittoral

The seabed within the loch consists mostly of fine sediments. Infralittoral bedrock, extending to around 6–8 m depth, occurs from the loch entrance inwards as far north as Port Charlotte and Saltpan Point, but there is no circalittoral rock. Further into the loch, rock is restricted to bedrock outcrops, boulders and pebbles surrounded by sediment. Rubha Buidhe, on the east side of the loch entrance, supports some interesting, shallow, wave-exposed communities. The infralittoral rock here is steep and rugged with many vertical faces and gullies. *Laminaria digitata* and *Alaria esculenta* predominate in the infralittoral fringe (Ala.Ldig) with an understorey of calcareous encrusting algae and foliose algae. Surge gullies cut through the rock and have walls lined with thick growths of *Dendrodoa grossularia* and *Clathrina coriacea* (SCAs.DenCla), along with large numbers of jassid amphipod tubes. This community is typical of shallow surge gullies but is uncommon around Britain. A *Laminaria hyperborea* kelp forest with rich epiphytic and undergrowth algae extends to the sediment boundary at around 5 m depth. At Port Charlotte, on



**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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the west side of the loch entrance, a similar, short dissected bedrock slope is dominated by *L. hyperborea* but extending to only around 3 m depth. Vertical surfaces here are dominated by jassid amphipod tubes and other turf-forming animals (FaSwV). Scattered patches and ridges of boulders in the north-west of the loch support *Halidrys siliquosa* and *L. hyperborea* (HalXK) and are grazed by *Psammechinus miliaris*.

Extensive beds of *Zostera marina* (Zmar) colonise the clean sands that predominate within the sheltered northern half of the loch. A wide variety of algae grows with, or is attached to, the *Zostera*, adding interest to these seagrass beds. The seabed throughout this area is shallow, mostly less than 5 m depth, reaching a maximum of 7 m. The extent of the *Zostera* beds has not yet been mapped. At the loch entrance, where wave exposure is greatest, the sandy seabed is coarser and rippled.

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Loch Indaal	MCA	NR 280 600	Marine Biological, Ornithological
Laggan Peninsula	SSSI, SPA	NR 297 555	Ornithological
Rhinn of Islay	SSSI, SPA, Ramsar	NR 235 620	Botanical, Ornithological, Geological
Bridgend Flats	SSSI, SPA, Ramsar	NR 330 620	Ornithological
Argyll islands	ESA		Includes Islay, Environmental
Eilean Na Muice Duibhe (Duich Moss)	SSSI, NNR, SPA, SAC	NR 323 558	Botanical, Ornithological

## Human influences

### Coastal developments and uses

There are four main settlements around Loch Indaal: Port Charlotte and Bruichladdich on the west coast and Bridgend and Bowmore on the eastern side, as well as a number of small villages scattered around the loch. Bowmore is the island's administrative capital with a population of just under 1,000 people. All four villages are popular tourist sites. There are distilleries at Bowmore and Bruichladdich. A sewage outfall located at Bowmore, with a population equivalent of 12,000, pumps untreated effluent directly into the loch. Bridgend has a landfill site for household and putrescible matter.

The area is well provided with roads, the main road from Port Askaig to Portnahaven running along the west side of the loch and that to Port Ellen down the east. There is a small amount of cultivated agricultural land and forestry around the loch and at the loch head there is a saltmarsh with stock grazing. Most of the surrounding land is grazed moorland.

### Marine developments and uses

There is a scallop farm in the loch and some potting for crustaceans takes place around the rocky coastline. There are piers at Port Charlotte, Bruichladdich and Bowmore.

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## Sites surveyed

Survey 10: 1979–82 NCC/RSM Jura and Islay littoral survey (Hiscock 1983; Smith 1982).

Survey 11: 1982 OPRU Jura and Islay sublittoral survey (Hiscock 1983; Smith 1982).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
10	36	Bridgend Bay, Islay	NR 320 625	55°46.8'N 06°16.4'W	LGS
10	37	Bridgend Bay, Islay	NR 325 615	55°46.3'N 06°15.9'W	LGS

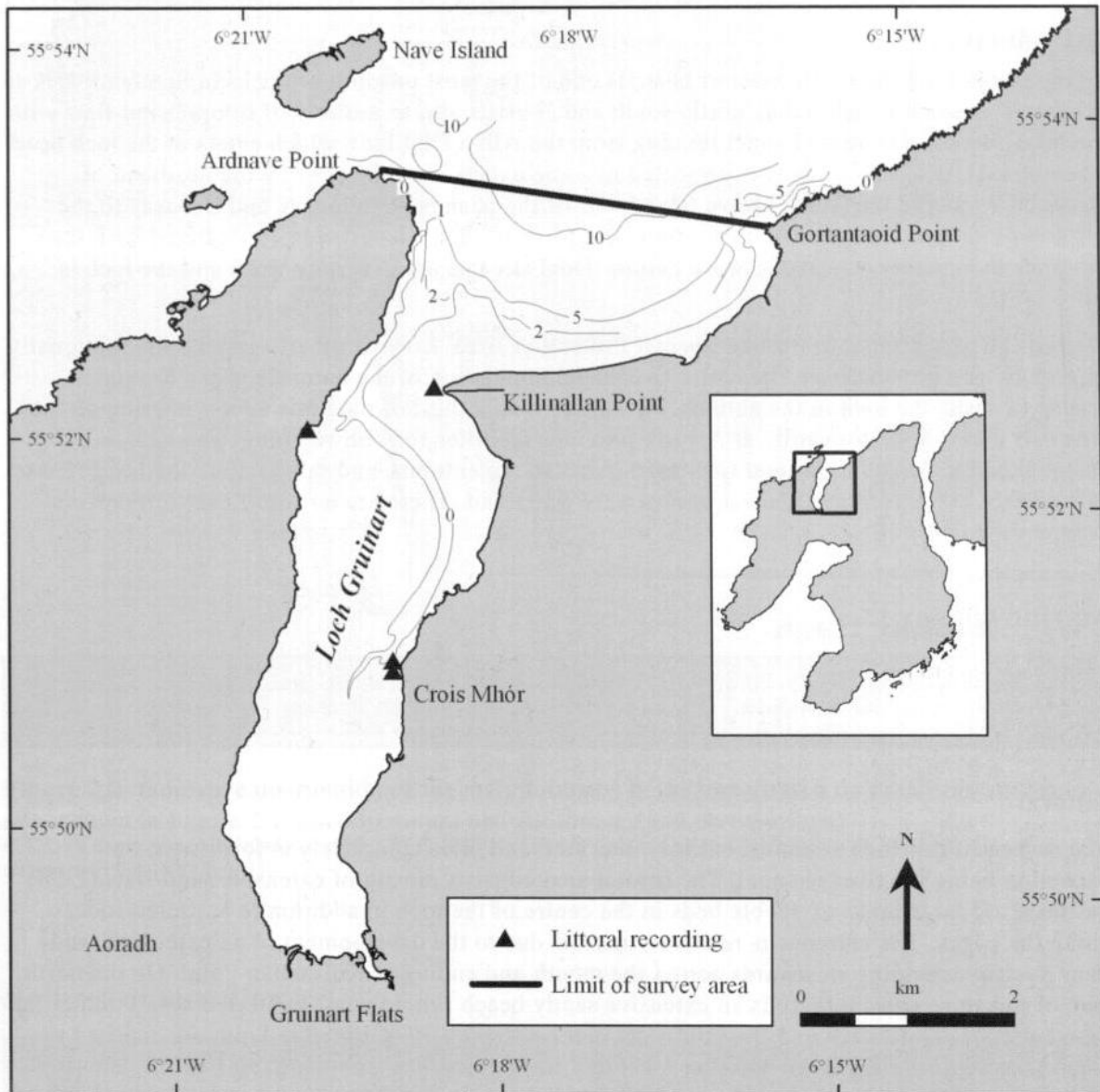
Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
11	13	Rubha Buidhe, Loch Indaal, Islay	NR 275 569	55°43.7'N 06°20.4'W	FaS, Ala.Ldig, KFaR, SCAs.DenCla, XKScrR
11	14	Ceann A Chlachain, Loch Indaal, Islay	NR 283 590	55°44.8'N 06°19.8'W	Zmar, Lhyp.Ft
11	15	Loch Indaal, north, Islay	NR 290 621	55°46.5'N 06°19.3'W	FaS, Zmar
11	16	Loch Indaal, north-west, Islay	NR 282 620	55°46.4'N 06°20.0'W	LhypLsac, IMX
11	17	Loch Indaal, west, Islay	NR 274 620	55°46.4'N 06°20.8'W	MIR
11	18	Loch Indaal, south of Bruichladdich, Islay	NR 261 602	55°45.4'N 06°21.9'W	Zmar
11	19	Port Charlotte Lighthouse, Rubh an Duin, Islay	NR 260 589	55°44.7'N 06°22.0'W	FaSvV, novo.LsacX1, Zmar, Lhyp.Ft, LsacX

## 2

## Loch Gruinart

## Location

<i>Position (centre)</i>	NR 295 710	55°52'N 6°18'W
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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Physical features	
<i>Physiographic type</i>	Fjord
<i>Length of coast</i>	18.79 km
<i>Length of inlet</i>	6.2 km
<i>Area of inlet</i>	8.4 km <sup>2</sup> (HW); 3.8 km <sup>2</sup> (LW)
<i>Bathymetry</i>	10 m (max)
<i>Wave exposure</i>	Mouth of loch moderately exposed to winds from north. Much (c 55%) of loch is intertidal sand-flats
<i>Tidal streams</i>	Negligible
<i>Tidal range</i>	3.0 m (springs)
<i>Salinity</i>	Fully marine

## Introduction

Loch Gruinart, on the north coast of Islay, is one of the most unspoilt sealochs in Scotland. It is an 'elongate' sealoch which trends north-south and consists almost entirely of littoral sand-flats with a narrow, winding central channel running from the Allt a Ghil burn which enters at the loch head. The entrance to Loch Gruinart is protected to some extent from the west by the headland of Ardnave Point and the (small) Nave Island, whilst the islands of Colonsay and Oronsay to the north provide some shelter from this direction. Most of the loch is therefore sheltered with the entrance moderately exposed to wave action. Tidal streams are generally weak and the loch is fully saline.

Designated as a Ramsar site and a Special Protection Area, Loch Gruinart supports internationally important bird populations. The entire Greenland population of the barnacle geese *Branta leucopsis* visits the loch in the autumn, with more than a third of the birds over-wintering on the Gruinart Flats. A visitor centre at Aoradh provides facilities for birdwatching. The loch is surrounded by low-lying ground with sand-dunes at the entrance and saltmarsh at the head. These saltmarshes are grazed and show a transition to grassland. There are no significant settlements around 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>Littoral</i>	Recording (epibiota)	4	1979	Smith (1982)

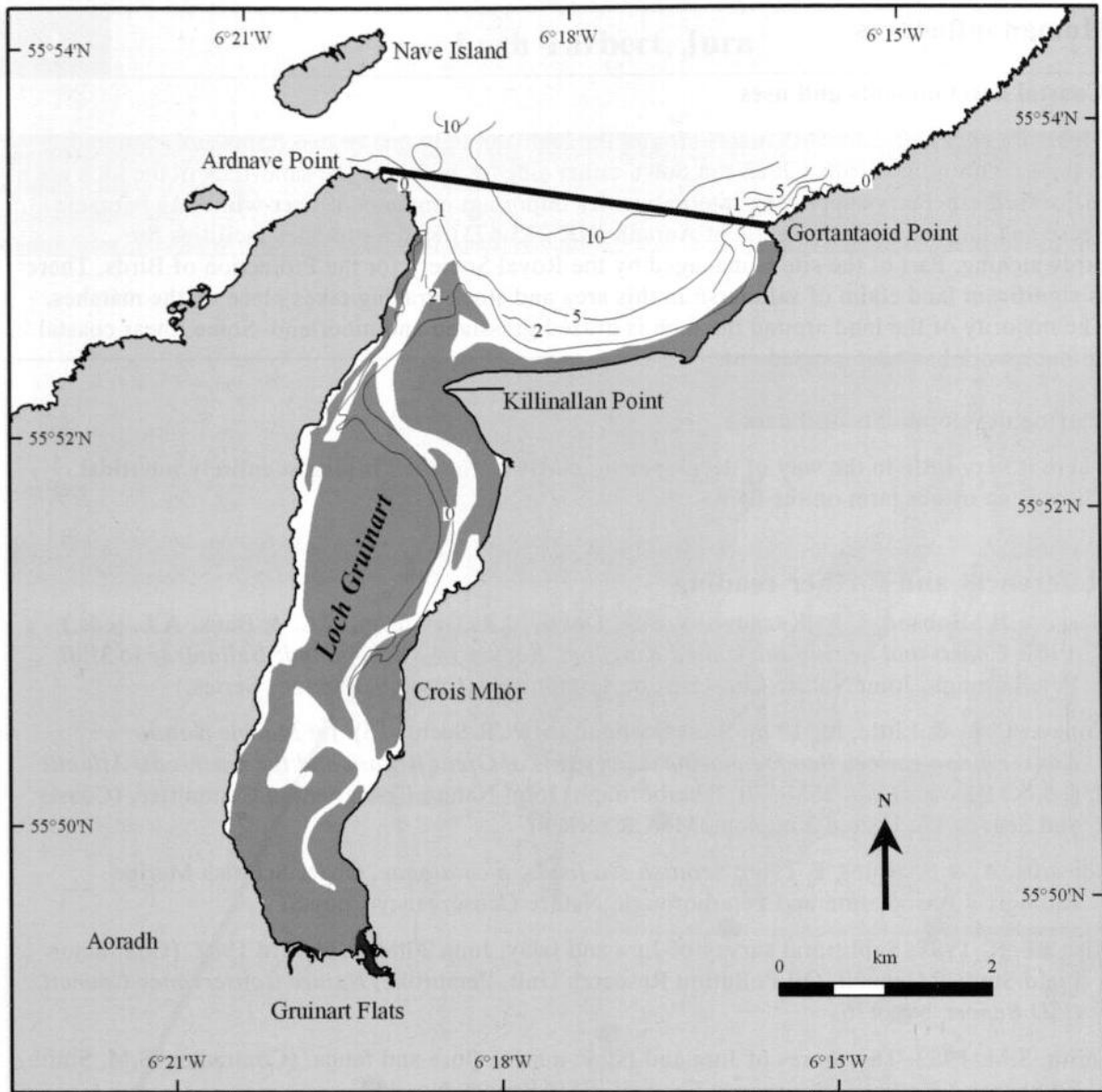
### Littoral

The seabed of this loch is almost entirely intertidal and dries completely at low water, the exception being the river channel. The littoral area consists mostly of extensive sand-flats (LGS) but there are large areas of pebble beds in the centre of the loch in addition to scattered rocks along the edges. The entrance is relatively narrow due to the development of an extensive sand-dune system extending westwards across the mouth and ending at Killinallan Point. On the north side of this dune system there is an extensive sandy beach running east to Gortantaoid Point at the loch entrance. This beach and the sand-flats in the entrance off Killinallan Point are exposed to wave action and are relatively mobile, with very little living in them. Sediments further into the loch at Crois Mhór are sheltered but, according to Smith (1982), are also relatively barren. However, no detailed information is available on the infauna of these sand-flats or of the pebble areas in the centre of the loch.

### Sublittoral

No information is available for the sublittoral parts of the loch, which are anyway very restricted in extent.





**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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## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Gruinart Flats	SSSI, SPA, Ramsar, RSPB reserve	NR 285 665	Botanical, Ornithological
Loch Gruinart	GCR	NR 295 710	Geological
Bun-an-uillt	GCR	NR 694 297	Geological
Argyll islands	ESA		Includes Islay

## Human influences

### Coastal developments and uses

There are no significant settlements around the loch and only one or two farms and scattered cottages with minor roads which run down either side of the loch. The sand-flats in the loch are a major bird sanctuary supporting internationally important numbers of over-wintering barnacle geese and there is a visitor centre at Aoradh (NR 275 673) which provides facilities for birdwatching. Part of the site is managed by the Royal Society for the Protection of Birds. There is significant land claim of saltmarsh in this area and stock grazing takes place on the marshes. The majority of the land around the loch is grazed grassland and moorland. Some linear coastal defence work has been carried out.

### Marine developments and uses

There is very little in the way of development, partly as the loch is almost entirely intertidal. There is an oyster farm on the loch.

## References and further reading

- Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C. & Buck, A.L. (eds.) 1997. *Coasts and Seas of the United Kingdom. Region 14 SW Scotland: Ballantrae to Mull*. Peterborough, Joint Nature Conservation Committee. (Coastal Directory Series.)
- Connor, D.W. & Little, M. 1998. West Scotland (MNCR Sector 13). In: *Marine Nature Conservation review. Benthic marine ecosystems of Great Britain and the north-east Atlantic* (ed. K. Hiscock), pp. 355–370. Peterborough, Joint Nature Conservation Committee. (Coasts and Seas of the United Kingdom. MNCR series.)
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- Smith, S.M. 1982. The shores of Jura and Islay: marine flora and fauna. (Contractor: S.M. Smith, Edinburgh.) *Nature Conservancy Council, CSD Report*, No. 432.

## Sites surveyed

Survey 10: 1979–82 NCC/RSM Jura and Islay littoral survey (Hiscock 1983; Smith 1982).

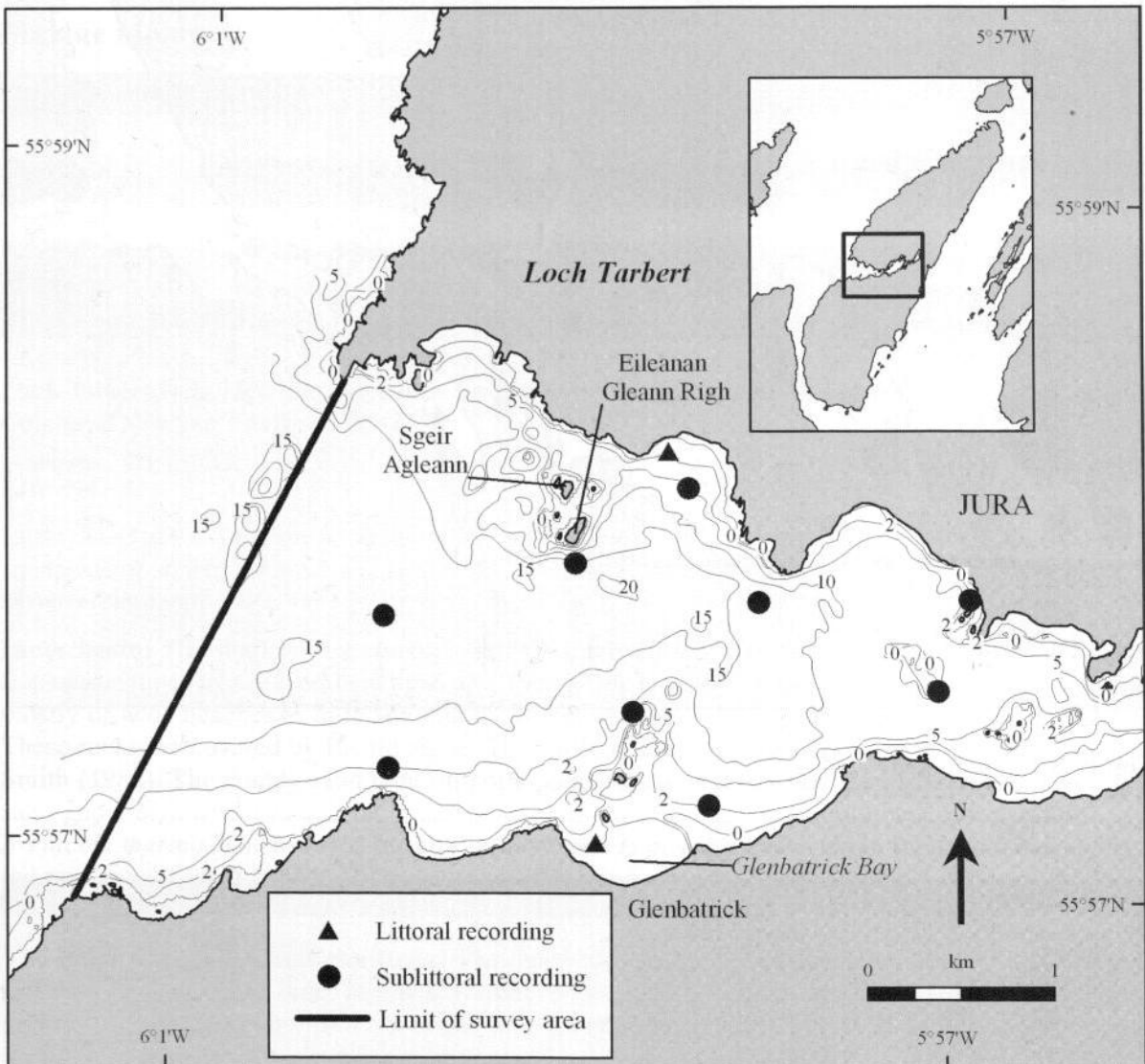
Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
10	18	Killinallan Point, Islay	NR 300 729	55°52.4'N 06°19.0'W	
10	19	Crois Mhór (rocks), Islay	NR 296 703	55°50.9'N 06°19.2'W	F
10	20	Crois Mhór (sediment), Islay	NR 296 702	55°50.9'N 06°19.2'W	LGS
10	21	Tayovullin, Islay	NR 288 725	55°52.1'N 06°20.1'W	LS

## 3

## Loch Tarbert, Jura

## Location

Position (centre)	NR 540 810	55°57'N 5°57'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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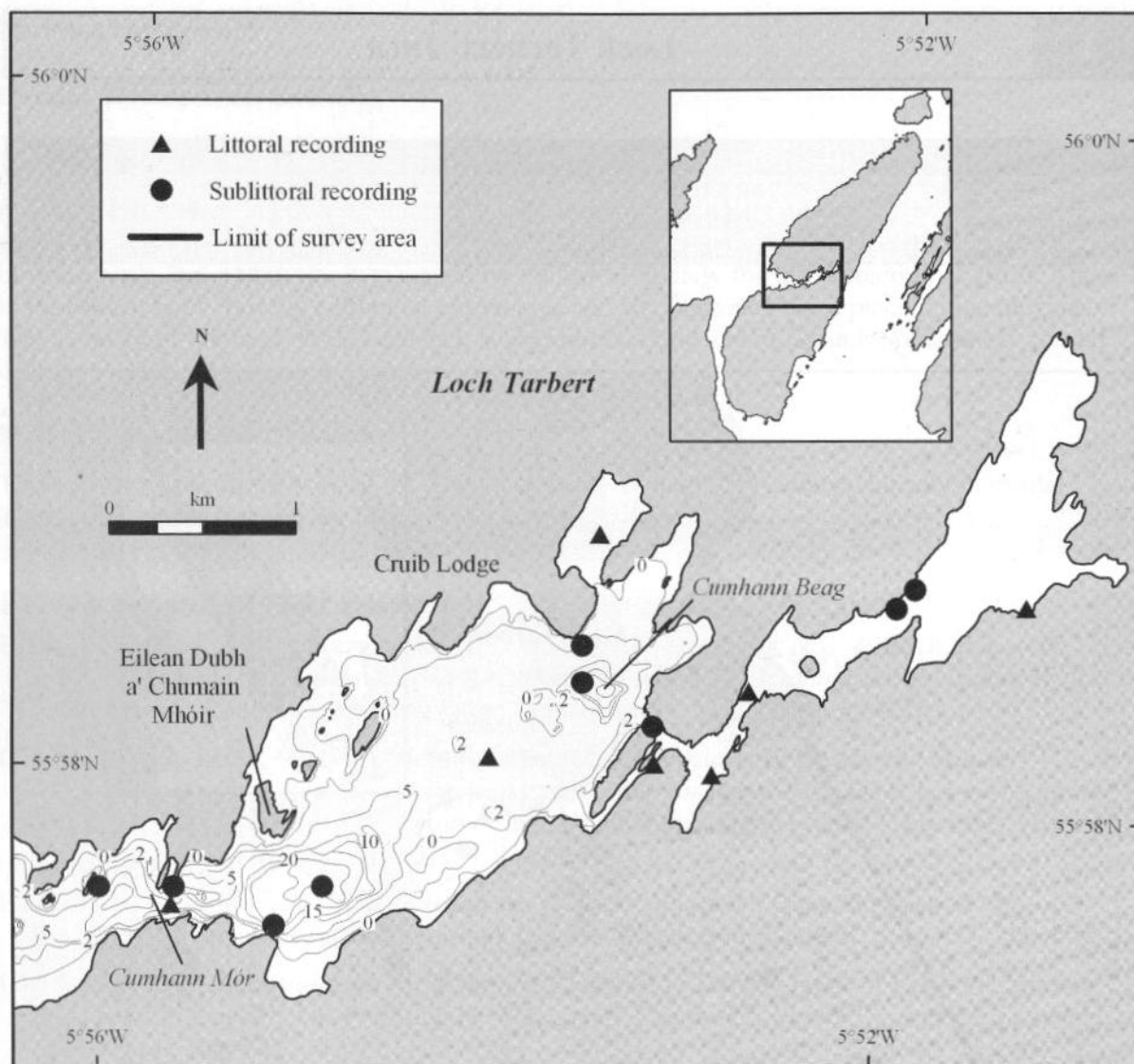


Figure 3.1 (continued)

Physical features	
<i>Physiographic type</i>	Fjord with two sills
<i>Length of coast</i>	46.26 km
<i>Length of inlet</i>	8.3 km
<i>Area of inlet</i>	11.9 km <sup>2</sup> (HW); 9.5 km <sup>2</sup> (LW)
<i>Bathymetry</i>	43.0 m (max)
<i>Wave exposure</i>	Outer basin subject to swells from the west; inner basin very sheltered
<i>Tidal streams</i>	Weak tidal currents throughout the loch, but strong in Cumhann Beag and Cumhann Mòr narrows
<i>Tidal range</i>	3.1 m (springs)
<i>Salinity</i>	Outer basin is marine; inner basin is brackish

### Introduction

The small, fjordic Loch Tarbert on the west coast of Jura lies in very sparsely populated, mountainous land. It is a shallow loch, reaching a depth of 43 m at its deepest point, and is divided into three basins by shallow sills at Cumhann Mòr and Cumhann Beag. The latter is a long



and tortuous narrow channel leading into a very secluded and shallow inner basin. The loch entrance faces due west and is exposed to wave action and Atlantic swells, while the inner basin is extremely sheltered and brackish. Tidal streams are negligible throughout most of the loch, although there is a stronger flow through each of the narrows.

Despite its proximity to mainland Scotland, and in contrast to most other Scottish sealochs, Loch Tarbert is almost completely undeveloped. The island of Jura itself only has a population of c.200. Only two houses lie beside the shores of Loch Tarbert, with a track leading to the loch head but no road access. The surrounding mountainous land is almost entirely given over to Jura's extensive population of deer (c.5000). There is no mariculture and little fishing activity within the loch.

## Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
<i>Littoral</i>	Recording (epibiota)	4	April 1990	Connor (1991)
	Recording (epibiota) and sampling by weed washing	5	June–July 1982	Smith (1982)
<i>Sublittoral</i>	Recording (epibiota)	9	April 1990	Connor (1991)
	Recording (epibiota)	9	June 1982	Hiscock (1983)

Loch Tarbert is divided into three distinct basins by the constricted and shallow narrows of Cumhann Mór and Cumhann Beag.

### Littoral

Little detailed information is available for most of the shoreline within the loch, with the exception of shores within the narrows of Cumhann Mór and Cumhann Beag. These have been surveyed in detail.

**Inner basin:** The shallow inner basin is largely intertidal and is influenced by a significant freshwater input from several small rivers. The shores have not been studied in detail but consist mostly of wide beaches of mud and muddy gravel with patches of bedrock and boulders (LMX). These rocks are covered by furoid algae. The shore in the south-east corner was described by Smith (1982). The muddy sand here supports populations of the cockle *Cerastoderma edule*, the sand-gaper *Mya arenaria* and the mud-snail *Hydrobia ulvae* and small numbers of lugworm *Arenicola marina*. The lowered salinity in this basin is possibly reflected in the fauna, namely by the presence of the brackish-water gastropod *Littorina saxatilis tenebrosa* and patches of the unattached form *mackaii* of *Ascophyllum nodosum* and eelgrass *Zostera noltii*.

**The inner narrows, Cumhann Beag:** The inner basin is connected to the middle basin via the tortuous channel of the inner narrows, Cumhann Beag. This is flanked by very steep and, in places, vertical rocky shores, with a number of overhanging rock faces on the mid and lower shore. There are also shores composed of angular boulders and pockets of muddy sediment within the narrows. Despite the steepness of the shores, the extreme shelter of the channel promotes dense growths of bands of furoid algae over all rocky surfaces and a particularly wide variety of lichens on the upper shore. The lower shore is dominated by *A. nodosum* and a rich community of sponges, hydroids and ascidians, particularly on the shady overhangs (Asc.T, SByAs). The lower shore gives way to a sublittoral fringe of kelp *Laminaria hyperborea*, which are subject to the very strong tidal streams which run through the narrows. In a nearby narrow cut, which runs off the main narrows channel between Eilean Dubh a' Cumhain Mhóir and the mainland, there is an extremely rich sublittoral fringe community. Here a mixture of kelp, *Laminaria digitata*, *Laminaria saccharina* and sea-oak *Halidrys siliquosa*, is present on cobbles and boulders. There is a very rich understory flora of red algae, especially *Corallina officinalis* and *Polysiphonia*

*nigrescens*. The breadcrumb sponge *Halichondria panicea* and the ascidian *Ascidiella scabra* are abundant, along with a wide variety of other current-loving species (Ldig.T).

**Middle basin:** Shores in the shallow middle basin remain largely unsurveyed. The eastern shores appear from maps and charts to be predominantly composed of either bedrock or boulders and cobbles. The west and north sides are flanked by a number of islands behind and between which there are extensive areas of sediment. The very sheltered rocky shores are densely covered by furoid algae, except where the shore is vertical, such as on the headland of Rubh' an Sglifein Eighne, which is dominated by barnacles. At the north-west end there is an almost enclosed embayment which was surveyed by Connor (1991). For the most part it is sediment-filled with a very dense lugworm *A. marina* population in mud and sandy mud, along with a variety of other worms and the cockle *C. edule* (PCer). In the extreme shelter of the bay the unattached *A. nodosum* ead *mackaii* is able to grow on the sediment surface, behind the lugworm mounds (AscX.mac). Nearby boulders are covered by attached *A. nodosum* plants, densely colonised by the hydroid *Laomedea flexuosa* and the bryozoan *Bowerbankia imbricata*. The latter species reflects the freshwater influence of a stream, Abhainn a' Ghleann Duirch, which drains across the shore in this bay.

**The outer narrows, Cumhann Mór:** The Cumhann Mór narrows are wider than the inner narrows of Cumhann Beag, but there are a number of rocks which significantly enhance tidal streams through the channel, particularly at its eastern end. The shores are mainly rocky and, being sheltered from wave action by a series of islets in the approaches to the channel, are covered by furoid algae (PeI, Fspi). At the most constricted point (Site 4 of Connor 1991) the strong tides supply rich mid and lower shore biotopes of furoid algae, red algae, sponges and ascidians (Asc.T, Fserr.T). In contrast to the shores in Cumhann Beag, there is a band of dense kelp *L. digitata* in the sublittoral fringe (Ldig.T). In terms of variety and abundance of species, the shores in these narrows are not quite as rich as those of the inner narrows.

**Outer basin:** The Cumhann Mór narrows open to a gradually widening and deepening outer basin. This basin is moderately exposed to wave action, with the outer parts of the loch more exposed and open to the west. The shores are predominantly rocky, but there are sediment bays behind the shelter of the rocky outcrops of Eileanan Gleann Righ and Sgeir Agleann and behind headlands. The rocky areas of these more sheltered shores support furoid-dominated communities. Extensive muddy sand-flats in Glenpatrick Bay on the south shore support a lugworm-cockle *A. marina-C. edule* community (PCer). None of the more exposed rocky shores near the entrance have been examined.

### Sublittoral

**Inner basin:** This basin has only a small sublittoral area, extending down to 25 m depth. Only one site just below chart datum has been investigated. This proved similar to the adjacent muddy shores, with many *A. marina* mounds and furoid algae attached to small rocks. There are also elements here of sublittoral biotopes found in the middle and outer basin, indicated by the presence of terebellid worms and the shrimp *Crangon crangon*. It is highly likely that the whole sublittoral area is composed of soft mud (IMU).

**The inner narrows, Cumhann Beag:** In the sublittoral of the main channel, bedrock ridges and boulder areas support a tide-swept *L. hyperborea* kelp forest (Lhyp.TFt), with dense growths of thick encrusting sponges, mainly *H. panicea* and *Amphilectus fucorum* and a variety of hydroids, bryozoans and foliose red algae. At the less tide-swept inner end of the narrows where they join the inner basin, the kelp is accompanied by stands of sea-oak *H. siliquosa* with an epiphytic growth of sponges and the hydroid *Aglaophenia pluma* (HalXK). Amongst the rocky areas in the channel there are large patches of gravel with scattered live maerl. The gravel in the outer part of the channel has a rich infauna including the burrowing anemones *Edwardsia timida* and *Halcampa chrysanthellum* and a wide variety of worms (HalEdw).

**Middle basin:** At the four sites investigated in this basin, the rocky shores give way in the shallow sublittoral to a dense forest of silty kelp *L. saccharina*, under which grows a turf of filamentous algae and many solitary ascidians (Lsac.Ft). It is likely that *L. saccharina* forest is present in the shallow sublittoral along most of the shoreline in this basin, especially on the east side. In places such as around the group of rocks at the north end called Sgeirean Druim an Loch, *L. saccharina* kelp forest continues onto the sediment, where it is accompanied by dense stands of bootlace weed *Chorda filum* (LsacX). Off the headland of Rubha an Sglifein Eighne, at the southern end of the basin, a steep, rocky shore continues into the sublittoral as a short vertical cliff. This is too steep for kelp to grow, and is covered by a variety of sponges, as well as red algae and ascidians. The rock/sediment interface in this basin is generally very shallow, at about 2–3 m, with a soft mud-plain extending over almost the entire basin at a depth of mainly less than 3 m. The mud at both the north and south ends of the basin is colonised by beds of sea-pens *Virgularia mirabilis*, along with large numbers of the opisthobranch *Philine aperta* (PhiVir) and by occasional anemones *Sagartiogeton laceratus* and *Cerianthus lloydii*. This biotope is likely to be predominant throughout the entire basin.

Only in the approaches to the two tidal narrows at each end of the basin does the depth increase significantly, because of the scouring effect of water pouring through the narrows. The scour pit from Cumhann Beag extends to around 23 m depth. Scattered cobbles and boulders here are only poorly colonised and the pit appears to act as a sink for drift algae. The scour pit from Cumhann Mór narrows extends to around 43 m depth and is the deepest spot in the loch. Here, boulders and cobbles in the base of the pit, at 20–34 m, support a sand-scoured community dominated by the barnacle *Balanus crenatus*. Hydroids, bryozoans and sponges are also quite common (AntAsH).

**The outer narrows, Cumhann Mór:** The most constricted section of these narrows is very similar to the main part of the Cumhann Beag narrows. A band of kelp *L. digitata* in the sublittoral fringe (not present in Cumhann Beag) gives way offshore to stands of sea-oak *H. siliquosa* and large *L. saccharina* and then to a tide-swept *L. hyperborea* forest (Lhyp.Tft) on bedrock ridges. The rocky areas are interspersed with patches of coarse sand and gravel with scattered maerl (Phy) and here the holothurian *Neopentadactyla mixta* is common. To the east of the main constriction, away from the strongest tidal streams, the sediments are somewhat finer with large numbers of the sand mason worm *Lanice conchilega*, a few scallops *Pecten maximus*, the peacock worm *Sabella pavonina* and occasional lugworm *A. marina* (Lcon).

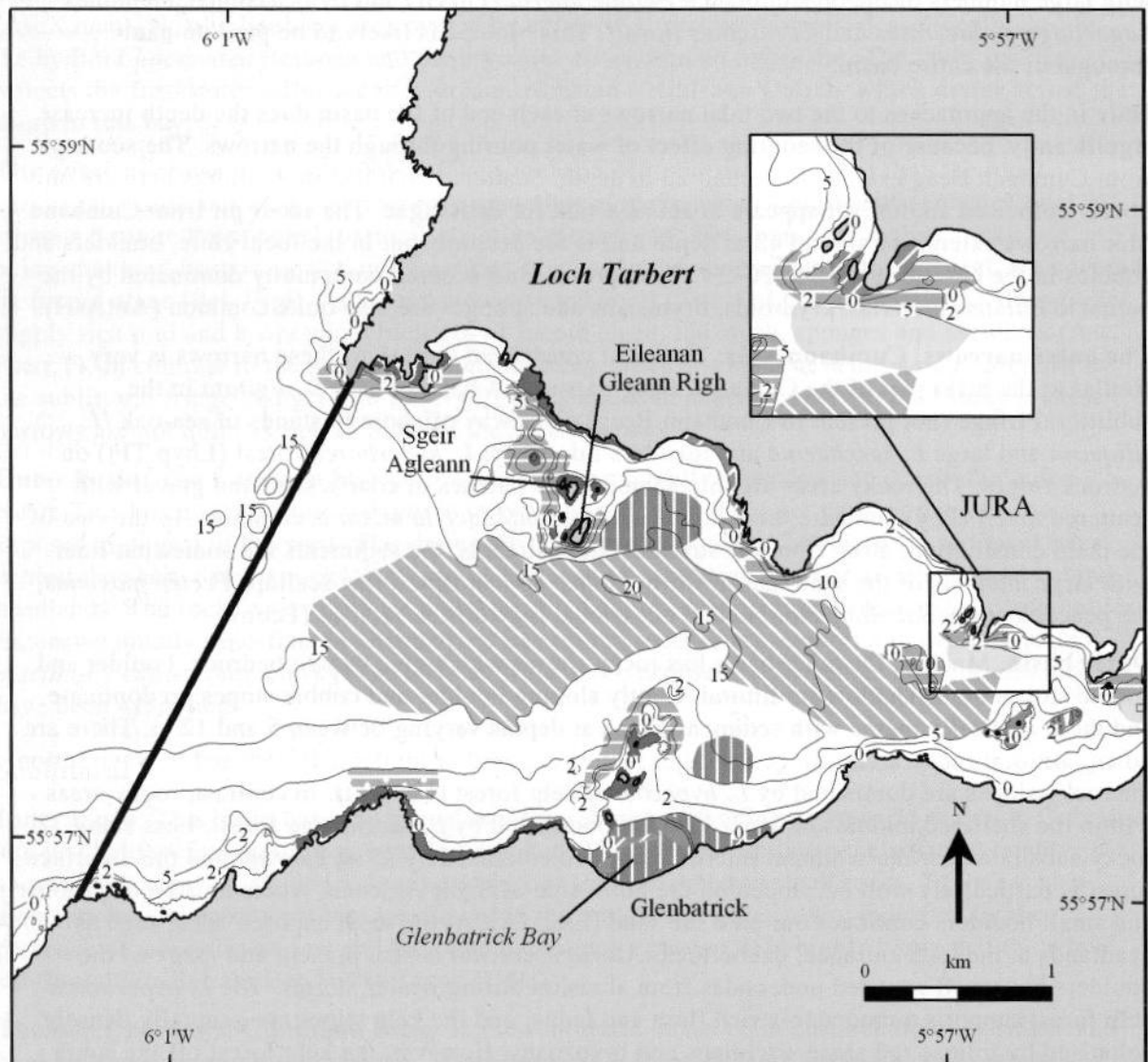
**Outer basin:** Much of the outer basin has rocky shores which give way to bedrock, boulder and cobble slopes in the shallow sublittoral. Gently sloping boulder and cobble slopes predominate and these gradually merge with sediment plains at depths varying between 5 and 12 m. There are no circalittoral rocky areas. Since the outer loch is exposed or moderately exposed to wave action, the rocky slopes are dominated by *L. hyperborea* kelp forest (Lhyp.Ft). In contrast, rocky areas within the sheltered middle and inner loch are dominated by *L. saccharina* forest. Less stable rocky substrata near the sediment interface are also colonised by *L. saccharina* and this interface forest is particularly well developed on the north side of Sgeir Agleann, where an area of pebbles and small boulders continues out onto the sand (Lsac.Pk). At the most exposed sites, such as headlands at the loch entrance, dabberlocks *Alaria esculenta* is also present and many of the boulders have well-rounded undersides from abrasion during winter storms. The *L. hyperborea* kelp forest supports a moderately rich flora and fauna, and the kelp stipes are generally densely colonised by foliose red algae, ascidians and bryozoans. However, the kelp forest off the south entrance headland is grazed and the understorey flora and fauna is poor in this area.

Sediments in the outer basin of the loch are considerably less muddy than those of the sheltered central and inner basins. The seabed in the mouth of the loch consists of an extensive plain of fine rippled sand at around 12–17 m depth. This has a rich infauna including the bivalves *Arctica islandica* and *Ensis arcuatus*, the brittlestar *Amphiura brachiata*, many polychaetes and low numbers of the burrowing sea urchin *Echinocardium cordatum* (EcorEns). Epifauna is sparse with the exception of the sea-pen *V. mirabilis* which is common. Similar fine sand sediment is also present to the east at the rocks called Boghachan Bàite, where the loch starts to narrow and is



probably continuous from the entrance to this point. Shallow sediments at the entrance headlands are coarse enough for the anemone *H. chrysanthellum* to live.

Two groups of islands, Eileanan Gleann Righ and Sgeir Agleann extend across the outer basin from the north and south and provide some shelter from wave action. The shallow sediment in the embayments to the east of these islands consists of firm mud colonised by dense beds of the sea-pen *V. mirabilis* together with the worms *A. marina*, *S. pavonina*, *L. conchilega* and *Myxicola infundibulum* (PhiVir). These sea-pen beds are similar to those in the shallow middle basin but the sediment is much firmer in the outer basin. The sediment in the shallower embayment of Glenpatrick Bay has an extensive cover of filamentous algae, mainly ectocarpoids and *Enteromorpha* sp.



**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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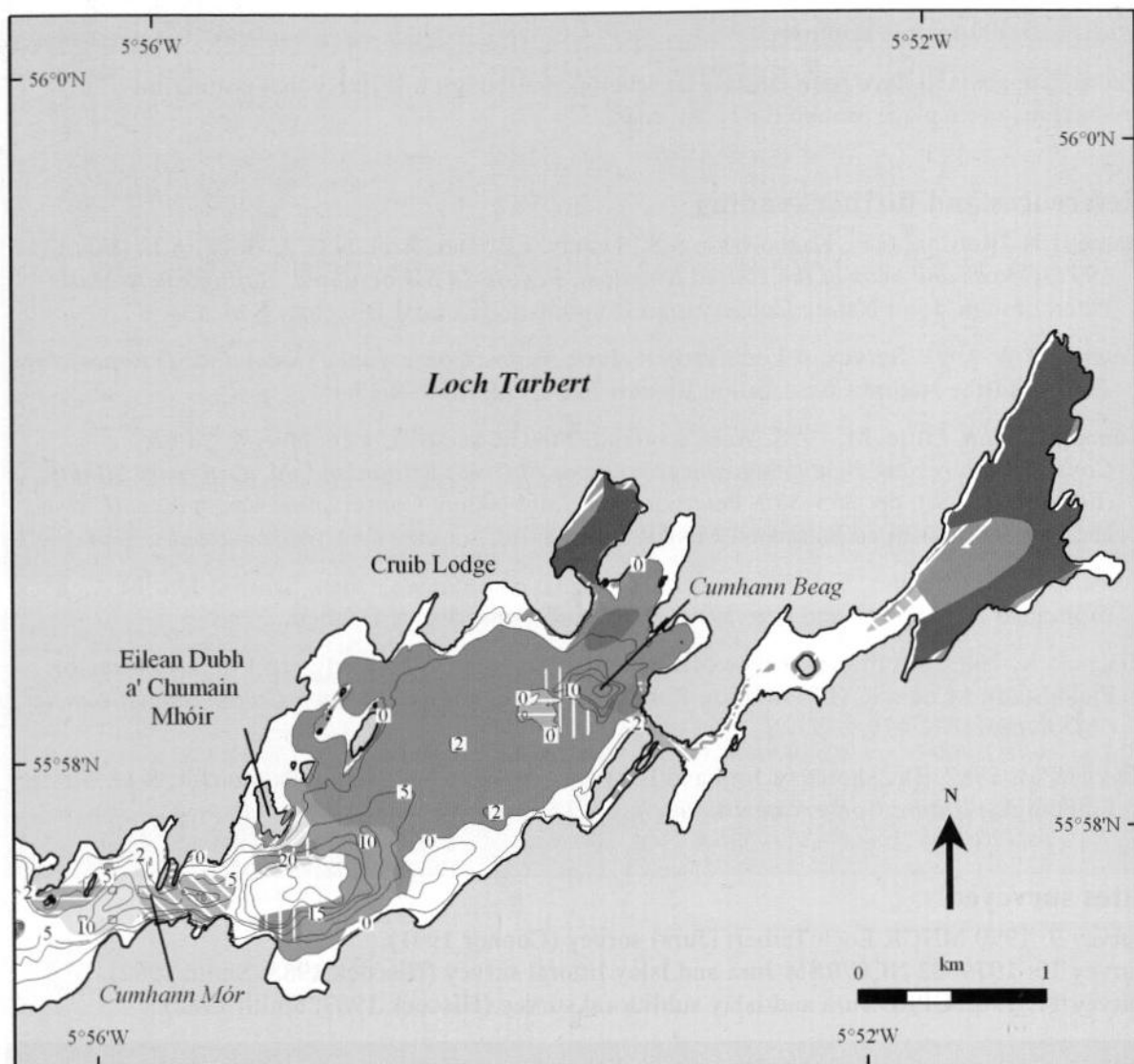


Figure 3.2 (continued)

## Nature conservation

### Conservation sites

Site name	Status	Location	Main features
Jura	NSA, RSA		Includes Loch Tarbert
West coast of Jura	GCR		Geological
Argyll Islands	ESA		Includes Jura

## Human influences

### Coastal developments and uses

The only signs of human habitation around the loch are Cruib Lodge (NR 567829) which has no track leading to it, and a house at the loch head at the end of a track from Tarbert. The loch is surrounded by mountainous land which supports a large number of red deer *Cervus elaphus*.

### Marine developments and uses

The area appears to have been entirely undeveloped although it is likely that potting for crustaceans takes place around the rocky coast.

### References and further reading

- Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C. & Buck, A.L. (Eds.). 1997. *Coasts and Seas of the United Kingdom. Region 14 SW Scotland: Ballantrae to Mull*. Peterborough, Joint Nature Conservation Committee. (Coastal Directory Series.)
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- Smith, S.M. 1982. The shores of Jura and Islay: marine flora and fauna. (Contractor: S.M. Smith, Edinburgh.) *Nature Conservancy Council, CSD Report*, No. 432.

### Sites surveyed

- Survey 9: 1990 MNCR Loch Tarbert (Jura) survey (Connor 1991).  
 Survey 10: 1979–82 NCC/RSM Jura and Islay littoral survey (Hiscock 1983; Smith 1982).  
 Survey 11: 1982 OPRU Jura and Islay sublittoral survey (Hiscock 1983; Smith 1982).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
9	1	S side Cumhann Beag, Loch Tarbert, Jura	NR 566 819	55°58.1'N 05°54.0'W	SR, K, YG, Ver.Ver, Fves, Fspi, Asc.T, SByAs, Pel
9	2	Channel S of Cumhann Beag, Loch Tarbert, Jura	NR 574 818	55°58.1'N 05°53.2'W	Ldig.T
9	3	'Lagoon' E of Cruib Lodge, Loch Tarbert, Jura	NR 572 831	55°58.7'N 05°53.5'W	LMX, AscX.mac, Asc.VS
9	4	W of Rubh' a' Choire, Cumhann Mór, Loch Tarbert, Jura	NR 549 812	55°57.6'N 05°55.6'W	G, YG, Ver.Ver, Fspi, Asc.Asc, Fserr.T, Ldig.T, PelB
10	4	Bàgh Gleann Rìgh Mór, Loch Tarbert, Jura	NR 519 824	55°58.2'N 05°58.5'W	F, LGS, Ldig
10	5	Upper Loch Tarbert, Jura	NR 595 827	55°58.6'N 05°51.3'W	AscX.mac
10	6	Upper narrows, Loch Tarbert, Jura	NR 580 822	55°58.3'N 05°52.7'W	Asc.T, Fserr.T, LsacX
10	7	Creag Làthaich, Loch Tarbert, Jura	NR 578 818	55°58.0'N 05°52.9'W	AscX.mac
10	8	Glenpatrick, Loch Tarbert, Jura	NR 515 803	55°57.0'N 05°58.8'W	PCer, Fves, Fserr.VS

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
9	5	Inner basin, Loch Tarbert, Jura	NR 589 828	55°58.6'N 05°51.9'W	FaMS, AreSyn
9	6	NE end of Cumhann Beag, Loch Tarbert, Jura	NR 588 827	55°58.5'N 05°51.9'W	Lsac.T

## Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
9	7	W entrance to Cumhann Beag, Loch Tarbert, Jura	NR 574 820	55°58.2'N 05°53.2'W	HalEdw, ScupHyd, Lsac.T., FaMx, IMX
9	8	E of Sgeirean Druim an Loch, Loch Tarbert, Jura	NR 571 825	55°58.4'N 05°53.6'W	PhiVir
9	9	Rubh' an Sglifein Eighne, Loch Tarbert, Jura	NR 554 809	55°57.5'N 05°55.1'W	FaSwV, AmenCio, FaSwV, PhiVir
9	10	SE of Bogachan Baite, Loch Tarbert,	NR 533 811	55°57.5'N 05°57.1'W	EcorEns
9	12	Rubh' a' Chrois-aoinidh, Loch Tarbert, Jura	NR 504 807	55°57.2'N 05°59.9'W	Lhyp.Ft
9	13	Mid mouth of loch, Loch Tarbert, Jura	NR 503 815	55°57.7'N 06°00.0'W	EcorEns
11	38	Eileanan Gleann Righ, Loch Tarbert, Jura	NR 514 818	55°57.8'N 05°59.0'W	Lhyp.Ft, Lhyp.Pk
11	39	Rocks off Glenbatrick beach, Loch Tarbert, Jura	NR 517 810	55°57.4'N 05°58.7'W	Lhyp.Ft, Lsac.Pk
11	40	Raised beach bay, Loch Tarbert, Jura	NR 521 805	55°57.2'N 05°58.2'W	FaMS, PhiVir
11	41	Near Cumhann Mór, Loch Tarbert, Jura	NR 545 812	55°57.6'N 05°56.0'W	Lcon, Lsac.Pk
11	42	Rapids, Loch Tarbert, Jura	NR 549 812	55°57.6'N 05°55.6'W	Lsac.T, Lgla, Phy
11	43	Off Eilean Dubh a' Chumain Mhóir, Loch Tarbert, Jura	NR 557 812	55°57.6'N 05°54.8'W	AmenCio, K, VirOph.HAs, PhiVir, CMS, Flu.SerHyd
11	44	Off Rubh' a' Chumhainn Bhig, Loch Tarbert, Jura	NR 571 823	55°58.3'N 05°53.6'W	Lsac.Ft, PhiVir, LsacX
11	45	Rubha Liath, Loch Tarbert, Jura	NR 535 816	55°57.8'N 05°57.0'W	IGS, Lhyp.Ft
11	46	Anchorage Bâgh Gleann Righ Mór, Loch Tarbert, Jura	NR 520 822	55°58.1'N 05°58.4'W	FaMS, PhiVir

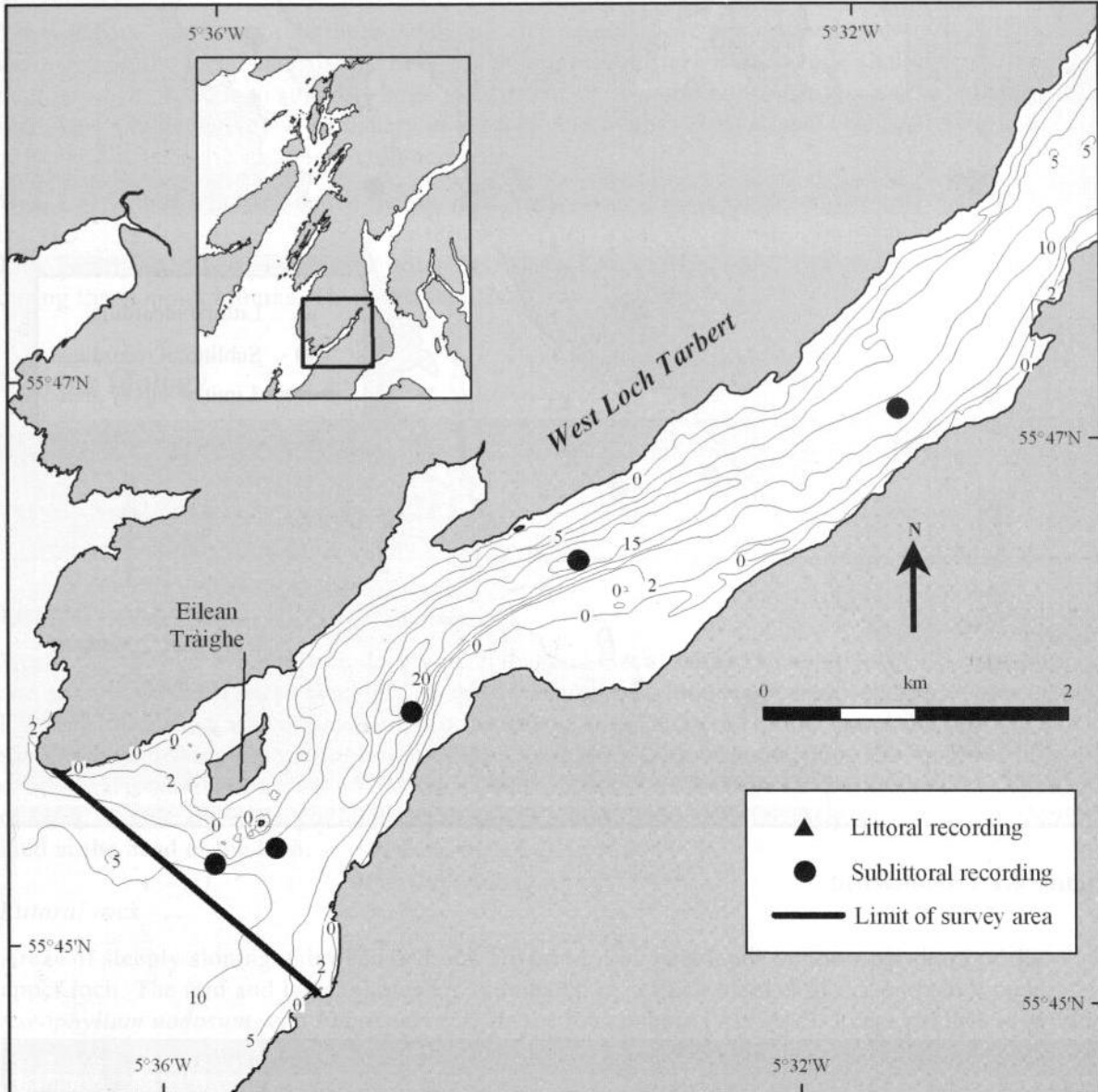


Figure 4.1 Main features of the 1992-2002 sublittoral sites survey of Loch Tarbert, Jura. Legend: (●) Littoral recording; (●) Sublittoral recording; (---) Line of survey sites.

## West Loch Tarbert

## Location

Position (centre)	NR 795 610	55°48'N 5°30.4'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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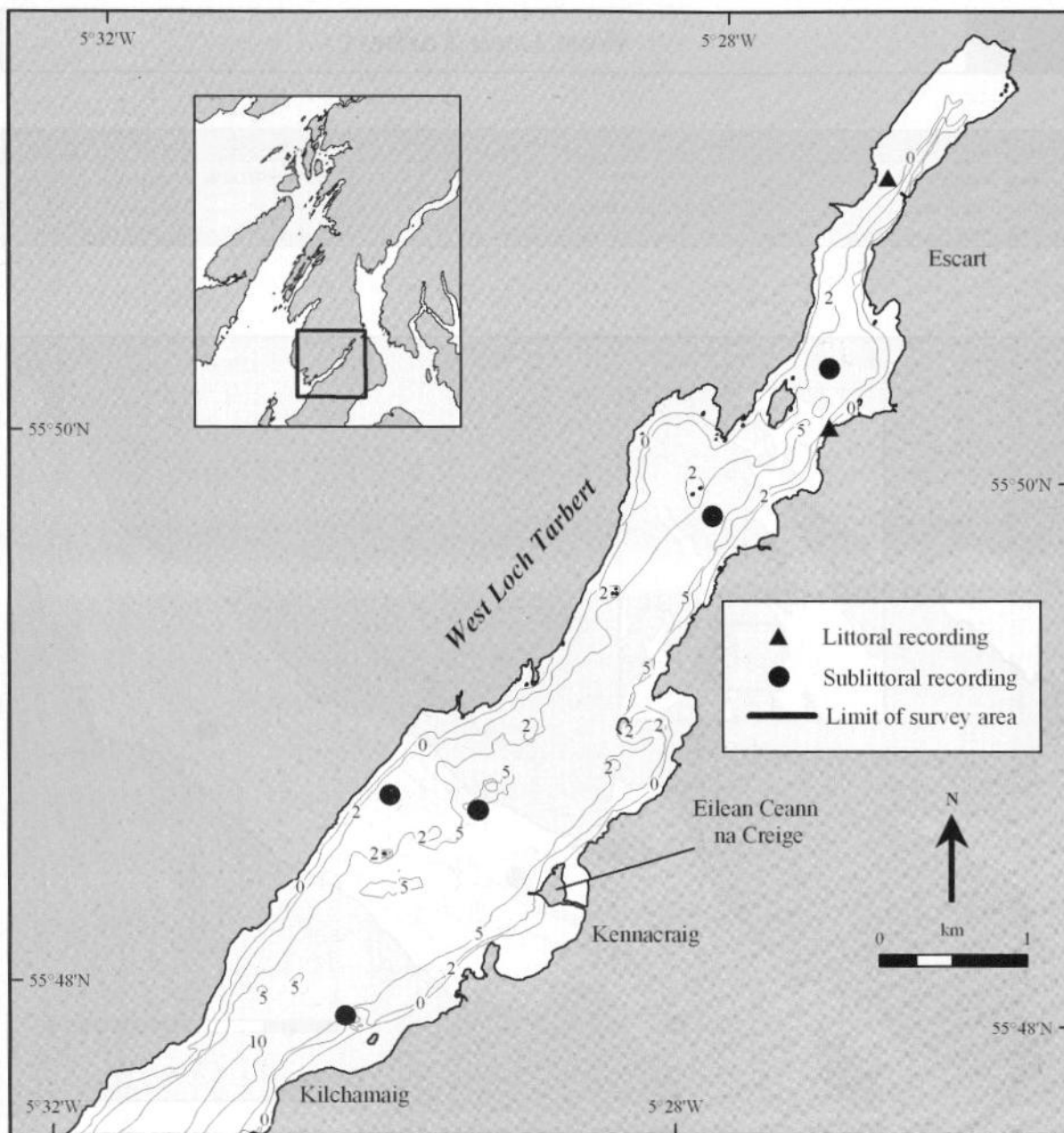


Figure 4.1 (continued)

**Physical features**

<i>Physiographic type</i>	Fjord with one sill
<i>Length of coast</i>	43.42 km
<i>Length of inlet</i>	16 km
<i>Area of inlet</i>	17.6 km <sup>2</sup> (HW); 13.5 km <sup>2</sup> (LW)
<i>Bathymetry</i>	32.0 m (max)
<i>Wave exposure</i>	Moderately exposed to very sheltered
<i>Tidal streams</i>	1–2 knots across entrance sill; negligible further into the loch
<i>Tidal range</i>	0.9 m (springs). Loch is close to an amphidromal point producing small tidal ranges.
<i>Salinity</i>	Fully marine with reduced salinities in surface layer at loch head

## Introduction

West Loch Tarbert on the west of the Kintyre Peninsula opens south of the Sound of Jura just north of the island of Gigha. Although the loch entrance faces south-west, Gigha provides some shelter from south-westerly winds and thus the loch is only moderately exposed to wave action. It is a narrow, fjordic sealoch with an entrance sill and is one of the longest of the Scottish sealochs. The majority of the loch is less than 10 m deep but a basin behind the sill reaches a depth of 32 m. Almost a quarter of the loch is intertidal, with large muddy sediment banks at the loch head and around the sill. These extensive shallows mean that during the summer months the loch becomes considerably warmer than the adjacent coastal waters. Consequently there is pronounced summer stratification in West Loch Tarbert and at the loch head the surface waters become brackish.

There is little sublittoral rock in the loch and the sediments are predominantly muddy. Littoral sediments at the loch head support beds of the seagrass *Zostera noltii*, while shallow sublittoral mud in much of the loch supports large numbers of the opisthobranch *Philine aperta*. Historically, there was a large native oyster fishery in the loch and oysters *Ostrea edulis* can still be found, although the beds are no longer commercially viable.

West Loch Tarbert is surrounded by low hills, and much of the coastal strip around the loch is forested. Kennacraig, on the south-eastern side of the loch, serves as the ferry port for Islay and Jura, and the loch is important for water-based leisure activities with frequent visiting yachts during the summer months. There are shellfish farms in the loch.

## Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	2	August 1989	Howson 1990
Sublittoral	Recording (epibiota)	10	August 1989	Howson 1990

### Littoral

West Loch Tarbert has not been deeply glaciated and is surrounded by relatively low-lying land, and so most of the shores slope only gradually. There are a number of rocky shores within the loch but little in the way of steep cliffs or extensive bedrock. Most of the shores are of mixed sand, mud and shingle, the proportion of mud increasing with distance along the loch, as wave exposure decreases. Shores south of Kennacraig, which is about half way along the loch, consist of sand, shingle and rock, gradually changing to muddy sand at Kennacraig and to mud or sandy mud at the head of the loch.

### Littoral rock

Areas of steeply sloping unbroken bedrock are present on headlands on the west shore of the upper loch. The mid and lower shores are dominated by a thick blanket of the knotted wrack *Ascophyllum nodosum* with *Fucus serratus* on the lower shore (Asc.Asc). Large patches of *Mytilus edulis* are also present, especially on the steeper rock faces. On the upper shore, a band of the channelled wrack *Pelvetia canaliculata* is present and there is a well-developed lichen zone. The zonation pattern of the algae is very clear on rocky shores throughout the loch but the zones are unusually compressed, spanning a height of only around 1 m from the low water mark to the top of the *P. canaliculata* zone. Another unusual feature in this loch is the presence of a distinct band of the barnacle *Chthamalus montagui* at the very top of the shore, with a sharply defined lower limit and an upper limit consistently higher than in other lochs. These two features probably result from the unusual tidal regime in the loch, which in turn partly results from the close proximity of the loch to a tidal amphidromic point south of Islay. Some of the smallest tidal ranges in Britain occur in West Loch Tarbert. The orientation of the loch and its constricted entrance, combined with this small tidal range, means that on neap tides the rise and fall can be barely perceptible.

North-easterly or south-westerly winds can depress or raise the sea level, sometimes for days on end. This unusual zonation is discussed in detail by Lewis and Powell (1960 a, b) but it should be borne in mind that *C. montagui* had, at that time, not been separated from *C. stellatus*, to which they always refer. Records of *C. stellatus* from West Loch Tarbert are now referred to as *C. montagui*. A similar zonation is present in Loch Sween but has not been found in any other sheltered localities in Britain.

#### *Littoral sediment*

At the head of the loch there are extensive intertidal flats of sheltered muddy sand. Broken shell debris and pebbles are mixed into the sediment and provide a foothold for *Fucus vesiculosus*, which covers much of the shore. At the south-west corner there is also a thin covering of the seagrass *Zostera noltii* across the entire width of the shore (Znol). The fauna appears to be rather sparse with some lugworms *Arenicola marina* and cockles *Cerastoderma edule*. This is probably due to the brackish conditions experienced at the head of the loch. Detailed but non site-specific studies of the sediments between the head of the loch and Kennacraig were made by McLusky (1986). He found that the upper loch, near the head, had finer sediments with lowered salinity, the communities of which were dominated by the amphipod *Corophium volutator*, with the worms *A. marina*, *Fabricia sabella*, *Manayunkia aesturina* and *Hediste diversicolor*. Sediments lower down the loch, closer to Kennacraig, were coarser and supported cockles *C. edule*, worms *Capitella capitata* and a large number of other species at lower densities. This is similar to the situation in the upper and lower parts of Loch Crinan.

#### **Sublittoral**

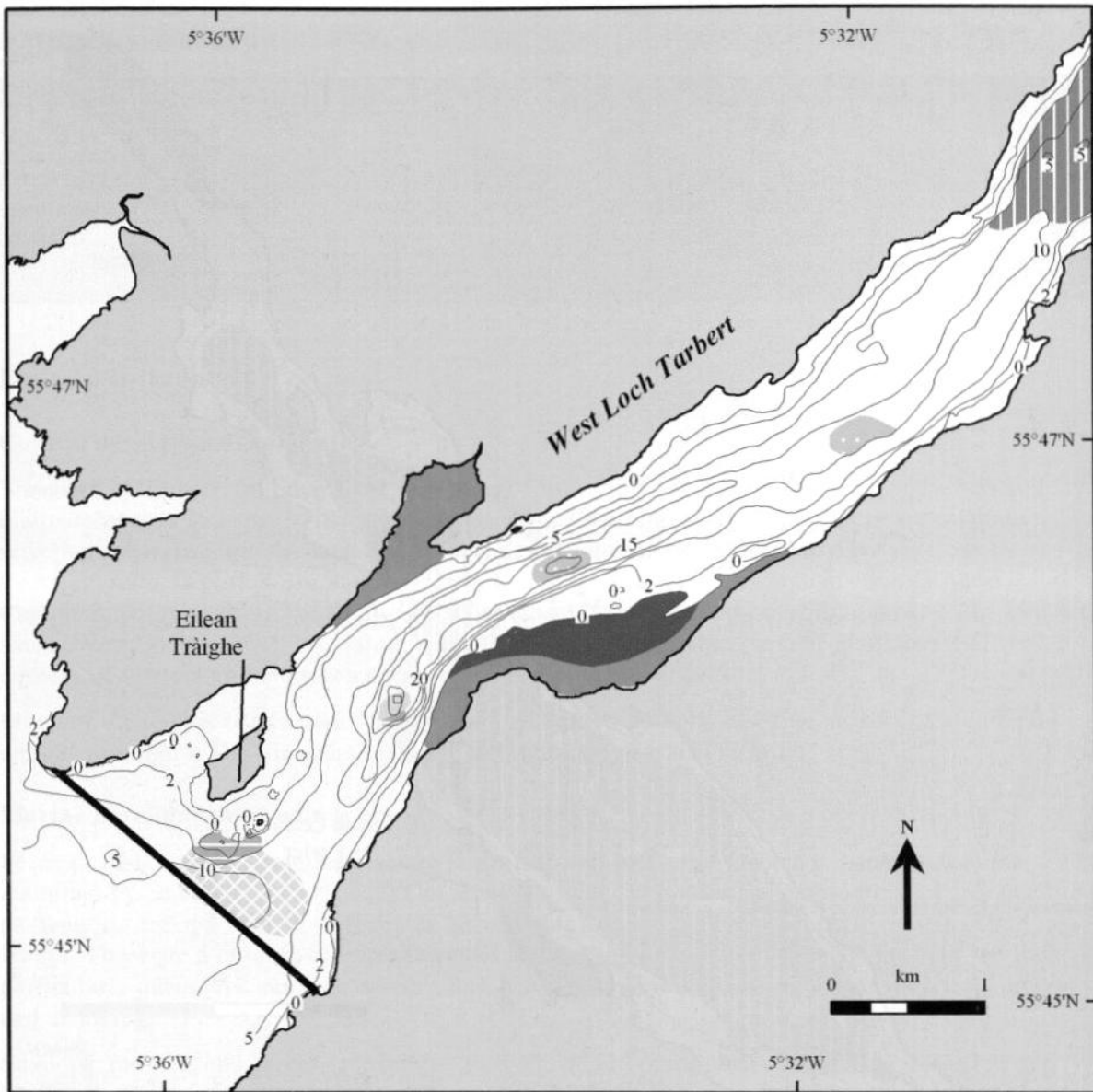
##### *Sublittoral rock*

Sublittoral bedrock in West Loch Tarbert is in very short supply and is mainly restricted to the few small islands and rocks scattered throughout the loch. Even in the entrance, bedrock extends to only 5 m depth around the islets south of Eilean Tràighe. Conditions here are moderately exposed and smooth, steep-sided bedrock is covered by a *Laminaria hyperborea* kelp forest typical of these conditions (Lhyp.Ft). Further into the shelter of the loch, at Black Rocks just north of Kilchamaig Point, sublittoral bedrock extends only to 3 m depth and is dominated by a mixed kelp forest of *L. hyperborea* and *Laminaria saccharina* (LhypLsac.Ft). This is unusual for such sheltered conditions where *L. saccharina* would normally predominate. Rock at this site also supports patches of the phoronid *Phoronis hippocrepia*. Phoronids are rarely recorded during diving surveys and other Scottish records are restricted to the Clyde, Loch na Keal on Mull, Loch Sween and Loch Melford. Small drying rocks in the middle of the loch opposite Kennacraig support *L. saccharina* (Lsac.Ft), with extensive patches of mussels *Mytilus edulis*, on steep rock faces. Extensive sublittoral mussel beds are relatively uncommon in this area.

##### *Sublittoral sediment*

The whole of the upper half of West Loch Tarbert, north of Kilchamaig Point, is shallow, less than 10 m in depth, and filled with soft, black mud. This sediment supports the opisthobranch mollusc *Philine aperta*, the anemone *Sagartiogeton undatus*, and occasional sea cucumbers *Leptopentacta elongata* (PhiVir). Brittlestars *Ophiura* spp. are abundant at some sites and the sea-pen *Virgularia mirabilis* has a patchy distribution throughout the loch. The burrowing anemone *Cereus pedunculatus* was found in moderate numbers by the 1989 MNCr survey, at two sites out from Kennacraig. Predominantly a southern species in Britain, its presence in this loch is probably attributable to the loch warming up considerably in summer, due to its shallow nature and restricted water circulation. This species is also known from a number of other locations in west Scotland, mostly in warm, shallow lagoons. Few algae are present on these muddy sediments, in spite of the shallow depth, but there is often a film of diatoms over the mud surface.





**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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A narrow band of slightly coarser sediments is present where the loch shelves up into shallow water around the edges. These mixed sediments support some brown algae, especially *Laminaria saccharina* and *Chorda filum*, attached to small stones and shells (LsacX). Large numbers of empty shells of the bivalves *Chlamys varia* and *Anomia ephippium* are particularly common in this habitat in this loch. In addition, scattered oysters *O. edulis* are present, the remnants of large natural oyster beds that once existed in the loch. Millar (1958, 1961) examined these sandier sediments around the edges of the loch to see if they would be suitable for oyster cultivation. The sandier grounds were dominated by polychaetes with *Scoloplos armiger*, *Euclymene oerstedii*, *Melinna palmata* and *Nephtys hombergii* numerically dominant. The muddier areas supported large numbers of bivalves especially tellinid species and *Thracia phaseolina*. The sill at the entrance to the loch holds the most interesting and richest sediments. Waves of coarse, shelly sand and plains of coarse sand with patches of shell-gravel and cobbles (Phy.HEc) are present across



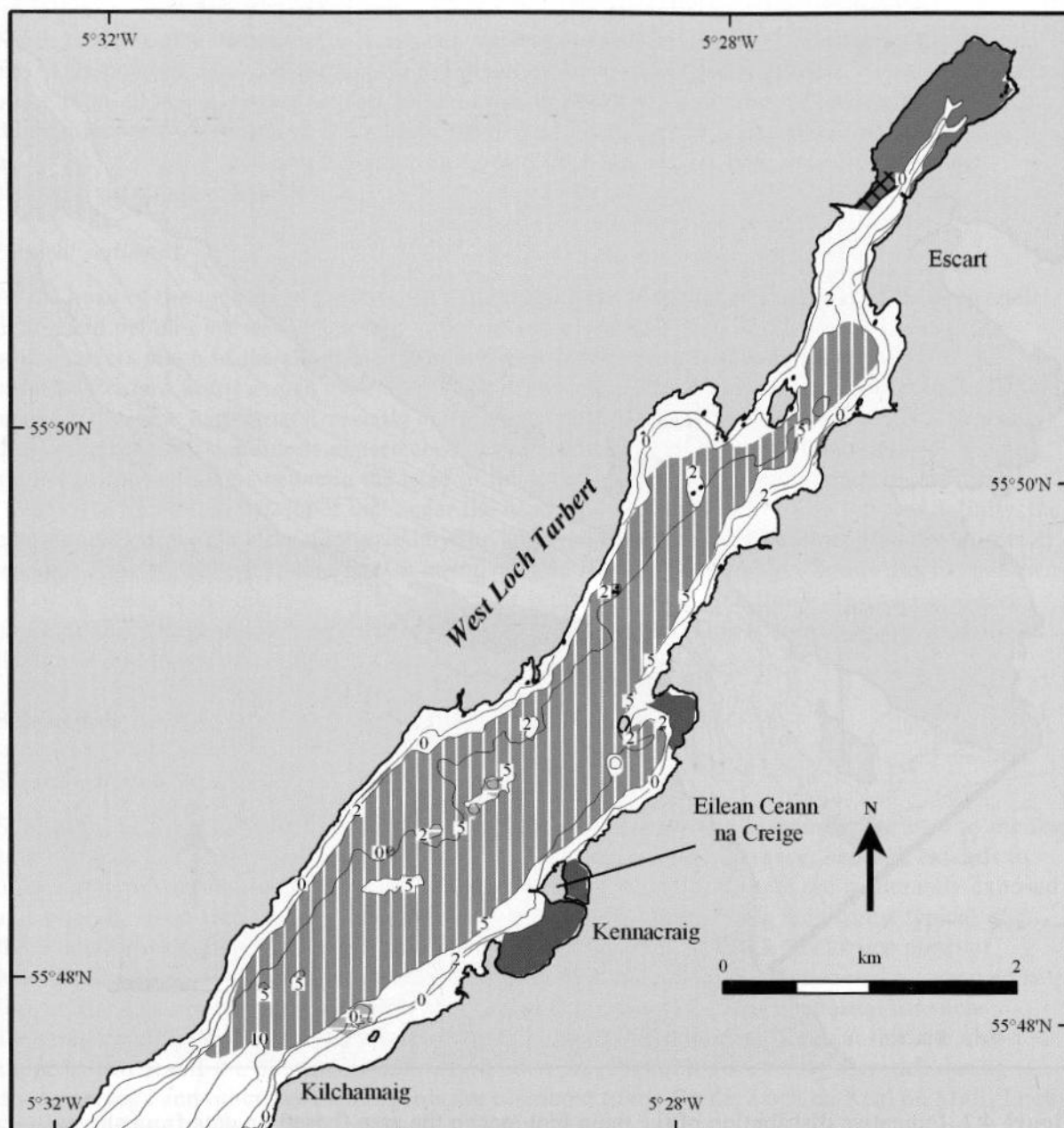


Figure 4.2 (continued)

the sill, where tidal streams reach one to two knots. A wide variety of foliose red algae are present, attached to shells, stones and occasional boulders. This habitat is also found through most of Loch Caliosport and at the entrances to Lochs Crinan and Melfort. However, the West Loch Tarbert sill has a higher proportion of boulders, cobble and gravel and is very diverse, with a range of coarse sediments and a high species diversity. The small, tide-exposed deep basin immediately behind the sill is, in contrast, rather dull and supports few species. The 1989 MNCR survey reported signs of dredging in this area. There are no extensive areas of deep, circalittoral, soft sediments in the loch, and the central areas of the outer loch, between about 12 to 20 m depth, are floored by rather bare mud-plains. Sea-pens *Virgularia mirabilis* and the burrows of the Norway lobster *Nephrops norvegicus* have been sighted (SpMeg).

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Ardpatrick & Dunmore Woods	SSSI	NR 765 610	Botanical, ornithological – woodland backing onto shore
Ardpatrick	SSSI	NR 762 597	Marine biological
Rhu Point	GCR	NR 824 637	Geological
Knapdale/Melfort	RSA		Regional Scenic Area includes area to north of West Loch Tarbert

## Human influences

### Coastal developments and uses

The town of Tarbert, on Loch Fyne, lies about 1 mile from the head of West Loch Tarbert and there are houses and small villages scattered around the edge of the loch. There are no main sewers discharging into the loch and all new developments are required to have septic tank treatment with an outfall discharging below low water mark. The main road from Oban to Campbeltown runs along the south-eastern shore and a minor road runs along most of the opposite shore. West Loch Tarbert is situated in one of the more accessible parts of Scotland; it attracts a number of visitors and there is a caravan and camping site at Escart.

Much of the loch is fringed with woods and is recorded by SNH as being an area of significant coastal woodland. The hinterland is used predominantly for hill farming.

### Marine developments and uses

Ferries to Islay depart from Kennacraig (Eilean Ceann na Creige) which is connected to the mainland by an artificial causeway. The ferries, which carry vehicles, commercial cargoes and foot passengers, are operated by Caledonian MacBrayne and the pier has two berths, each 180 m in length. There are a number of other small jetties and slipways in the loch. Yachts visit the loch, particularly during the summer months, and it is probable that the loch is used for wind-surfing and canoeing.

Scallops, mussels and oysters are farmed in the loch and potting for crustaceans is carried out around the rocky areas. During the 19th century there was a successful fishery for the native oyster *Ostrea edulis* in West Loch Tarbert. Overfishing of winkles *Littorina littorea* at the time made the fishery commercially unviable and it petered out. The status of the oyster stock was largely unclear during most of the 20th century; however, an illegal fishery developed in this area from around 1999, leading to concerns about its impact on the stock.

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### Sites surveyed

Survey 25: 1989 UMBSM south Argyll and west Kintyre sealochs survey (Howson 1990).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
25	50	Shore at the head of loch, West Loch Tarbert	NR 842 674	55°51.0'N 05°26.8'W	AscX, Pel, FvesX, Znol
25	52	Shore opposite Eilean da Ghallagain, West Loch Tarbert	NR 838 657	55°50.1'N 05°27.1'W	Asc, Asc, Pel

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
25	51	NE of Eilean da Ghallagain, West Loch Tarbert.	NR 838 661	55°50.3'N 05°27.2'W	PhiVir
25	53	SE of Sgeir Liath, West Loch Tarbert	NR 830 651	55°49.8'N 05°27.9'W	FaMS, PhiVir
25	54	N of Sgeir an t-Snidh, West Loch Tarbert	NR 808 632	55°48.7'N 05°29.9'W	FaMx, PhiVir, LsacX
25	55	NW Kennacraig, West Loch Tarbert	NR 814 631	55°48.6'N 05°29.3'W	Lsac.Ft, PhiVir, MytT
25	56	Black Rocks, West Loch Tarbert	NR 805 617	55°47.9'N 05°30.1'W	PhiVir, LhypLsac.Ft
25	57	E of Sgeir Mheim, West Loch Tarbert	NR 789 602	55°47.0'N 05°31.6'W	SpMeg
25	58	NW of Sgeir na Luib, West Loch Tarbert	NR 768 592	55°46.4'N 05°33.5'W	SpMeg
25	59	NW of Portachoillon, West Loch Tarbert	NR 757 582	55°45.9'N 05°34.5'W	FaMx, CMS, ModHo, Lcon
25	60	Sill at entrance, West Loch Tarbert	NR 748 573	55°45.3'N 05°35.3'W	Phy.HEc
25	61	S of Eilean Tràighe, West Loch Tarbert	NR 744 572	55°45.3'N 05°35.7'W	LsacX, Lhyp.Ft

Compiled by: F.A. Dipper, C.M. Howson & D. Steele

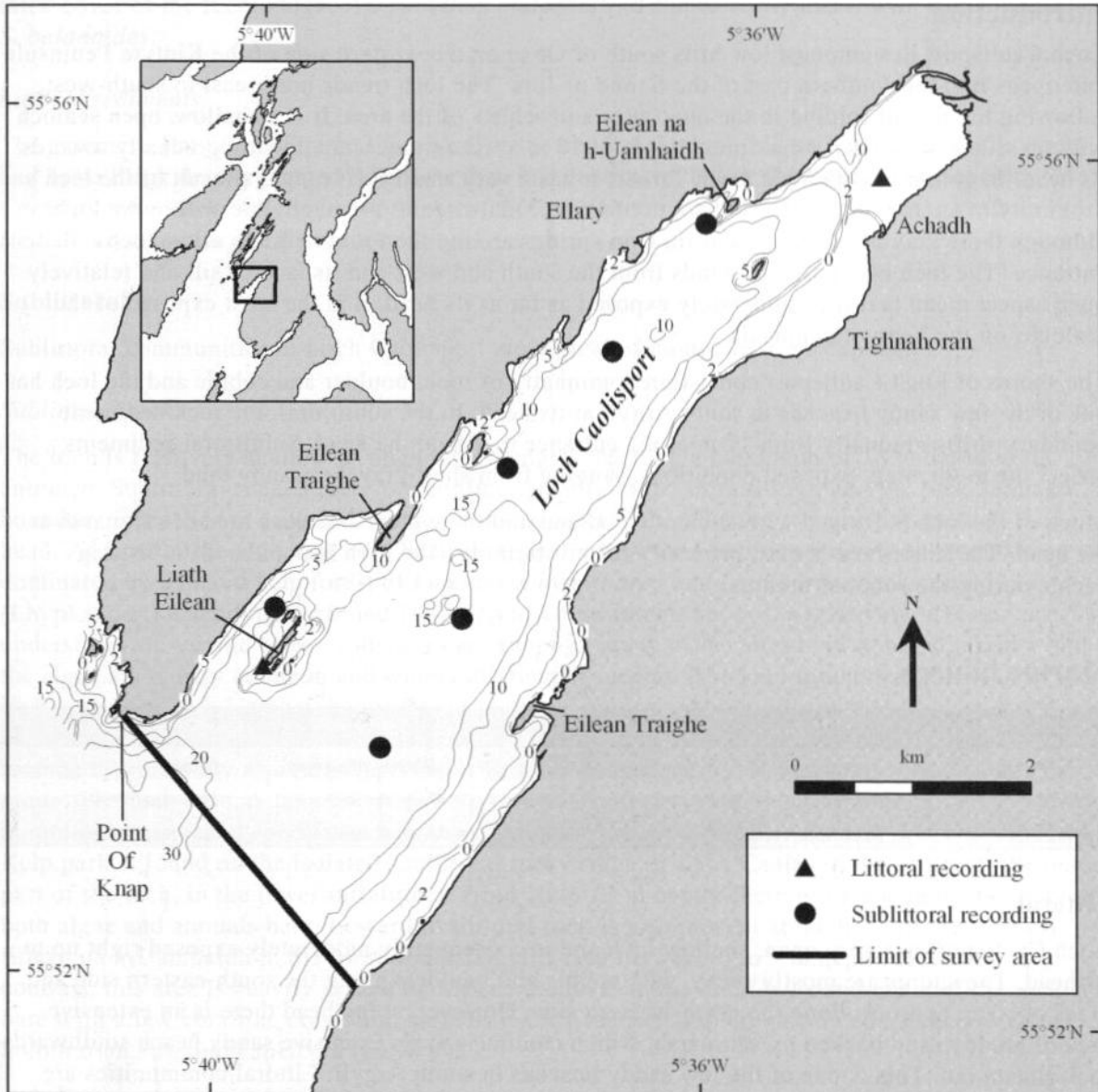


## 5

## Loch Caolisport

## Location

Position (centre)	NR 730 735	55°54'N 5°38'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



**Figure 5.1** 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>	28.37 km
<i>Length of inlet</i>	8.3 km
<i>Area of inlet</i>	14.5 km <sup>2</sup> (HW); 12.5 km <sup>2</sup> (LW)
<i>Bathymetry</i>	18.0 m (max)
<i>Wave exposure</i>	Exposed to winds from west and south-west
<i>Tidal streams</i>	Negligible inside the loch; moderately strong around Point of Knap on springs
<i>Tidal range</i>	0.9 m (springs). Loch is close to amphidromal point producing small tidal ranges
<i>Salinity</i>	Fully marine

**Introduction**

Loch Caolisport lies amongst low hills south of Oban on the western side of the Kintyre Peninsula and opens into the southern part of the Sound of Jura. The loch trends north-east to south-west, following the line of folding in the quartzites and schists of the area. It is a shallow, open sealoch with no sills and reaches a maximum depth of 18 m at its entrance, shallowing gradually towards its head. In common with West Loch Tarbert it has a very small tidal range, a result of the loch's proximity to an amphidromic point south of Islay. Tidal streams are negligible within the loch, although there may be a strong tidal flow on springs around the Point of Knap at the loch entrance. The loch is exposed to winds from the south and west and its lack of sill and relatively open aspect mean that it is moderately exposed as far as its head. It is the most exposed of the sealochs on the Kintyre peninsula.

The shores of Loch Caolisport consist predominantly of rock, boulder and cobble and the loch has one of the few sandy beaches in south Argyll at its head. In the sublittoral, the rock-sediment boundary shifts gradually from 17 m at the entrance to 9 m at the head. Sublittoral sediments reflect the moderately exposed conditions, ranging from shell-gravel to sandy mud.

Much of the loch is fringed with ancient woodland and there is an extensive area of saltmarsh at the head. The hinterland is used primarily for hill farming. The loch is popular with visiting yachts during the summer months.

**Marine biology****Marine biological surveys**

	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording (epibiota)	2	August 1989	Howson (1990)
<i>Sublittoral</i>	Recording (epibiota)	6	August 1989	Howson (1990)

**Littoral**

Loch Caolisport is a very open, shallow loch and is consequently moderately exposed right up to its head. The shores are mostly rocky, with cobble and boulders along the south-eastern side and areas of steep bedrock along the north-western side. However, at the head there is an extensive area of muddy sand backed by saltmarsh, which continues as an extensive sandy beach southwards to Tighnahoran. This is one of the few sandy beaches in south Argyll. Littoral communities are typical of moderately exposed conditions and, unlike West Loch Tarbert to the south, have no unusual features attributable to the tidal regime.

*Littoral rock*

Rocky shores at the mouth of Loch Caolisport are exposed to the prevailing south-westerly winds, but those just inside gain some protection and are moderately exposed. The shore at the south end of Liath Eilean consists of steep, broken bedrock. The upper shore is dominated by barnacles *Chthamalus montagui* and *Semibalanus balanoides* and lichens *Lichina pygmaea* and *Verrucaria*

*maura* (Ver.B, BPat.Lic). The mid-shore is again barnacle dominated; *S. balanoides* and limpets *Patella vulgata* are abundant, with some mussels *Mytilus edulis* (MytB, BPat). The lower shore is mainly covered by the low-growing red alga *Mastocarpus stellatus* and the sublittoral fringe is dominated by kelp with a mixture of *Laminaria digitata* and *Alaria esculenta* (Ala.Ldig). Steep bedrock on other headlands further into the loch is likely to support very similar communities.

Lewis and Powell (1960) describe the rocky shore on the Point of Knap as one of the most exposed sites in the area. The shore is dominated by barnacles, mainly *S. balanoides*, with a few mussels *M. edulis* or red algae also present.

Sheltered rock in the form of upper and mid-shore boulders lying on sediment is present at the head of the loch, backing the south-east corner of the sand-flats. The boulders are dominated by a thick cover of the furoid algae *Ascophyllum nodosum* and *Fucus vesiculosus*, with some barnacles *S. balanoides*.

#### *Littoral sediments*

The extensive flat of medium and fine sand at the head of the loch has no pebbles or shell debris and has a black de-oxygenated layer less than one centimetre below the surface. The cockle *Cerastoderma edule* and the lugworm *Arenicola marina* are abundant (PCer) and ragworms *Hediste diversicolor* are also present.

#### **Sublittoral**

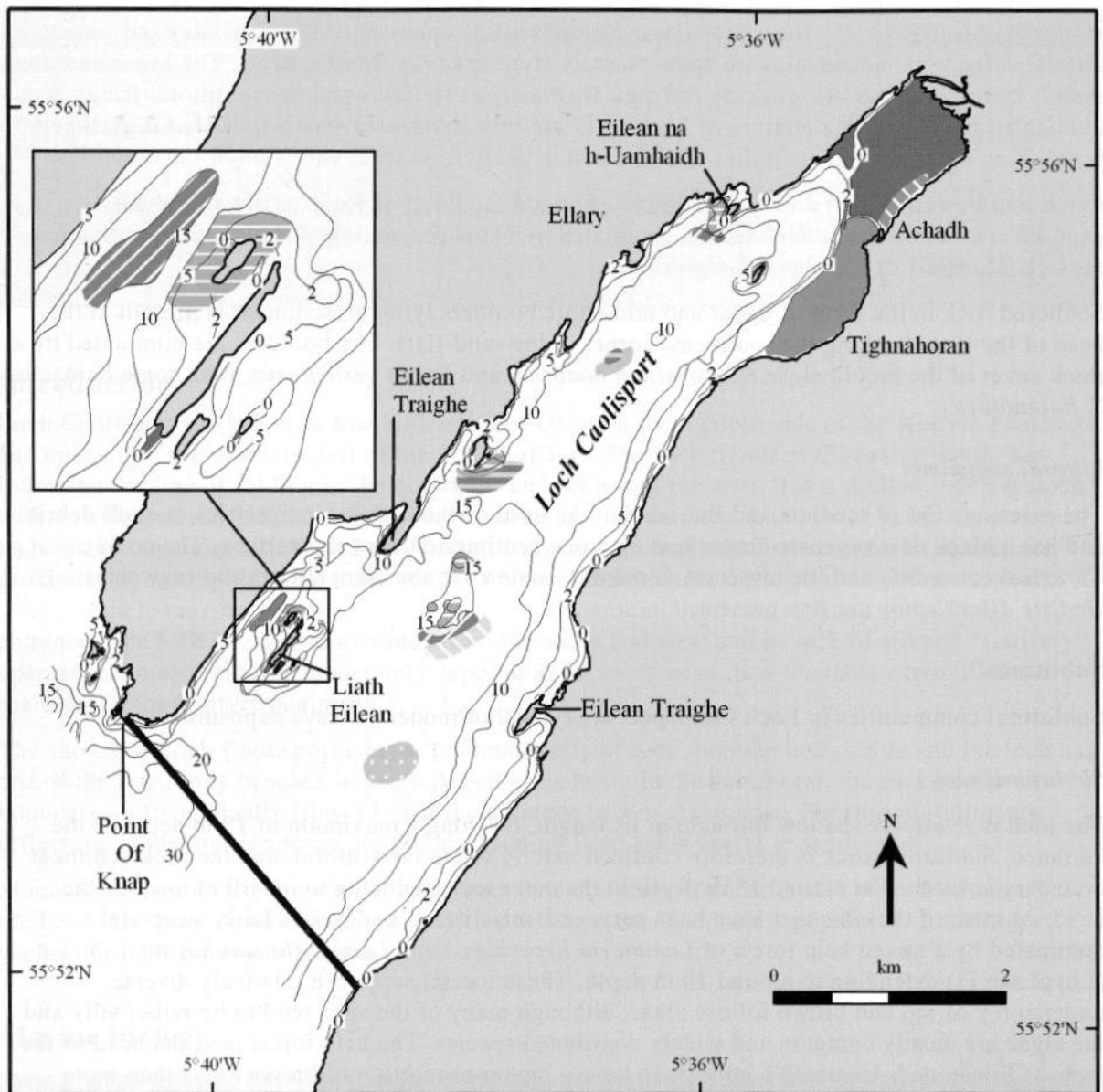
Sublittoral communities in Loch Caolisport are typical of moderate wave exposure.

#### *Sublittoral rock*

The loch is relatively shallow throughout its length, reaching a maximum of 18 m depth in the entrance. Sublittoral rock is therefore confined mainly to the infralittoral, and the rock-sediment boundary is reached at around 15 m depth in the outer loch, reducing to only 9 m towards the head. At most of the sites that have been surveyed, infralittoral bedrock is fairly steep and dominated by a mixed kelp forest of *Laminaria hyperborea* and *Laminaria saccharina* (LhypLsac.Ft) extending to around 10 m depth. These forests support a relatively diverse understory of red and brown foliose algae, although many of the sites tend to be rather silty and the algae are mostly common and widely distributed species. The kelp forest near the head of the loch, at Eilean na h-Uamhaidh, appears to have a higher proportion of brown algae than more exposed sites. During the 1989 MNCR survey, one plant of the brown alga *Taonia atomaria* was recorded; principally a southern species in Britain, this record significantly extended its known range. The fauna found amongst these kelp forests is rather sparse, consisting mainly of ubiquitous kelp forest species such as the gastropod mollusc *Gibbula cineraria* and other grazers. Kelp park is found on the isolated sublittoral rocky ridge of Lach Caolas in the centre of the outer part of the loch, in the lower infralittoral from 10 to 13 m depth; there is a reasonable diversity of both algae and animals here. Lower infralittoral rock is also present at the head of the loch off Eilean na h-Uamhaidh in the form of a small cliff face between 6 to 9 m depth. However, in contrast, this area is heavily grazed by the sea urchin *Echinus esculentus* and much of the rock is bare with a few coralline crusts and animals mainly restricted to crevice dwellers such as the holothurian *Pawsonia saxicola* (FaSwV).

#### *Sublittoral sediments*

The open, exposed nature of Loch Caolisport and the lack of a sill result in the presence of coarse sediments throughout the length of the loch. These sediments have variable proportions of shell debris and support a variety of biotopes and species. This is in contrast to the almost uniform soft mud found throughout the length of West Loch Tarbert, a short distance to the south. The distribution of the various sediment types throughout the loch cannot be accurately mapped without additional survey, especially as the sediments grade into one another, making it difficult to



**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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assign discrete biotopes to particular sites. Mixed shelly sediments in the upper part of the loch support sparse beds of the horse mussel *Modiolus modiolus*, often with clumps of red algae and ascidians (ModHo, ModHAs) at depths of around 12 to 15 m. In slightly deeper water in the outer part of the loch, firm muddy fine sand supports sea-pens *Virgularia mirabilis* and brittlestars *Amphiura* spp. as well as many tubes and burrows (VirOph). The coarsest sediment, consisting of wave-marked coarse shell-gravel, occurs at the base of Lach Caolas, an isolated sublittoral rocky ridge in the outer loch. This sediment is characterised by the burrowing sea cucumber *Neopentadactyla mixta* and razor shells *Ensis* spp. Infralittoral mixed sediments supporting various algae occur at the base of the rocky slopes around the edges of the loch (LsacX). Circalittoral soft mud supporting many sea-pens and burrowing crustaceans is not found in this loch. Mud in the deeper entrance area supports some sea-pens, mainly *V. mirabilis*, while *Pennatula phosphorea* occurs beyond the loch entrance (SpMeg).



## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Kilberry Coast	SSSI	NR 716 690	Botanical
Ellary Woods	SSSI	NR 730 750	Botanical – woodland backing onto shore
Knapdale	NSA, RSA		National and Regional Scenic Area includes entire coastline of loch

## Human influences

### Coastal developments and uses

There are scattered houses all around the edge of the loch, with a holiday chalet development at Orosay. There are no main sewers discharging into the loch and all new developments are required to have septic tank treatment with an outfall discharging below low water mark. A road runs along the whole of the east coast and part of the west coast, giving relatively easy access to the loch. Much of Loch Caolisport is fringed by woodland and Ellary Woods on the west coast is an SSSI; this site is one of the largest remaining areas of ancient woodland in Argyll. Stock graze an extensive area of saltmarsh at the head and there is significant land claim here. The low hills of the hinterland are used for rough grazing.

### Marine developments and uses

There are no major marine developments on the loch. Jetties are located on Eilean Tràighe (NR 732 721) and at Achadh (NR 763 764) and there is a pier at Ellary (NR 741 762). There have been both salmon *Salmo salar* and shellfish farms on the loch but there is none at the time of writing. Potting for crustaceans takes place around the rocky inshore areas. Winkles *Littorina littorea* are collected from the shores. Yachts visit the loch, particularly during the summer months, and it is probable that the loch is used for wind-surfing and canoeing.

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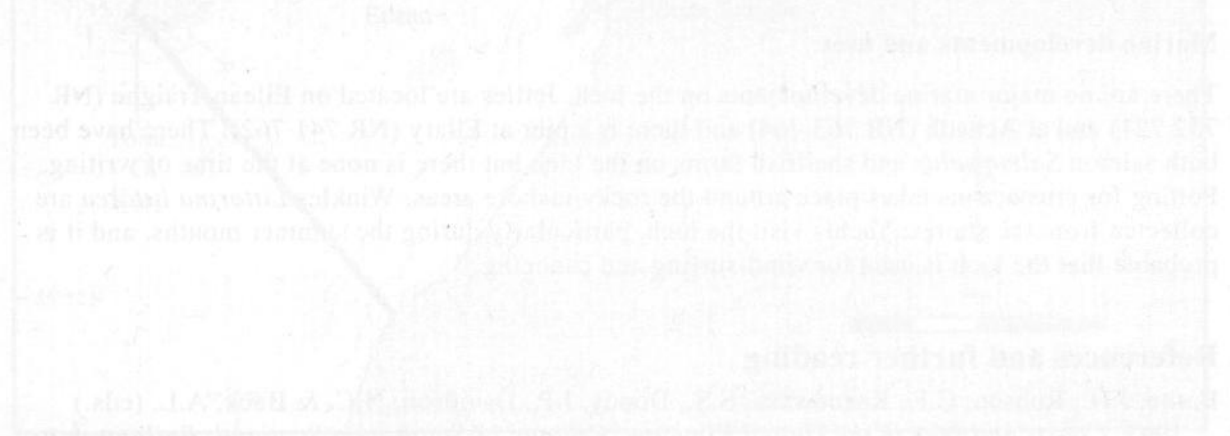


## Sites surveyed

Survey 25: 1989 UMBSM south Argyll and west Kintyre sealochs survey (Howson 1990).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
25	40	Head of loch, Loch Caolisport	NR 763 767	55°55.8'N 05°34.9'W	AscX, PCer
25	46	Shore of SW Liath Eilean, Loch Caolisport	NR 710 725	55°53.4'N 05°39.7'W	BPat.Lic, MytB, BPat, Ala.Ldig, Ver.B

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
25	41	S Eilean na h-Uamaidh, Loch Caolisport	NR 748 763	55°55.6'N 05°36.3'W	FaSwV, LhypLsac.Ft, LsacX
25	42	SW of Eilean na Bruachain, Loch Caolisport	NR 740 752	55°55.0'N 05°37.0'W	SpMeg, ModHo
25	43	E of Eilean nam Muc, Loch Caolisport	NR 731 742	55°54.4'N 05°37.8'W	CMS, ModHAs, LhypLsac.Ft
25	44	E side of Loch Caolas, Loch Caolisport	NR 727 729	55°53.7'N 05°38.1'W	VirOph, SedK, Ven.Neo, LsacX, LsacPk, Lsac.Pk, AfilEcor
25	45	NW of Liath Eilean, Loch Caolisport	NR 711 730	55°53.7'N 05°39.6'W	FaMx, Lsac.Ldig, Lsac.Ft
25	47	Central mouth, Loch Caolisport	NR 720 718	55°53.1'N 05°38.7'W	SpMeg



The map shows the location of the surveyed sites in Loch Caolisport, west Scotland. The sites are numbered 40 through 47. Site 40 is at the head of the loch, site 46 is on the shore of SW Liath Eilean, and sites 41-47 are distributed along the central and southern parts of the loch. The map is surrounded by a grid of latitude and longitude lines.

Compiled by:

F.A. Dipper, C.M. Howson & D. Steele

## 6

## Loch Sween

## Location

Position (centre)	NR 743 840	56°N 5°37'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)

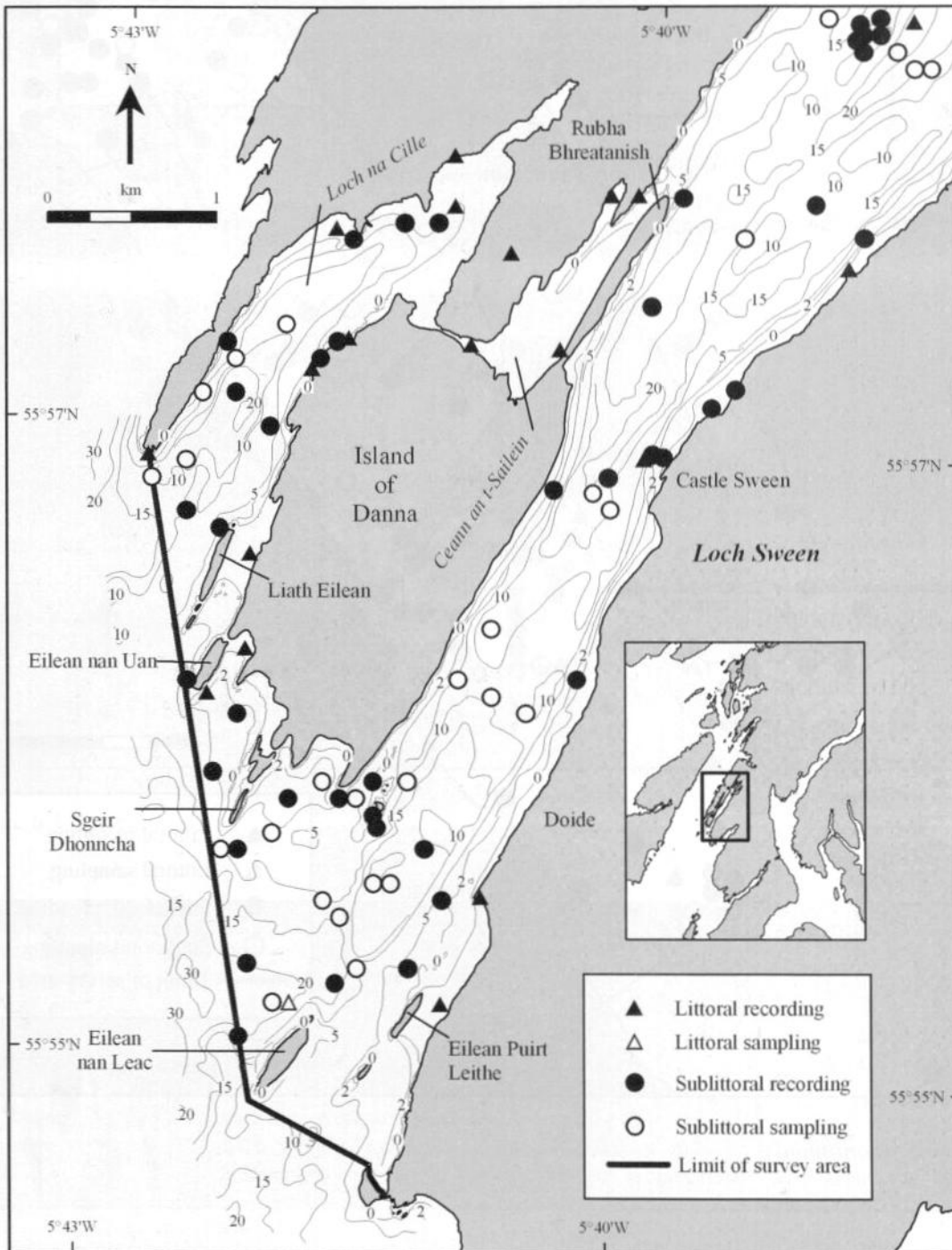


Figure 6.1 Main features of the area, showing sites surveyed.

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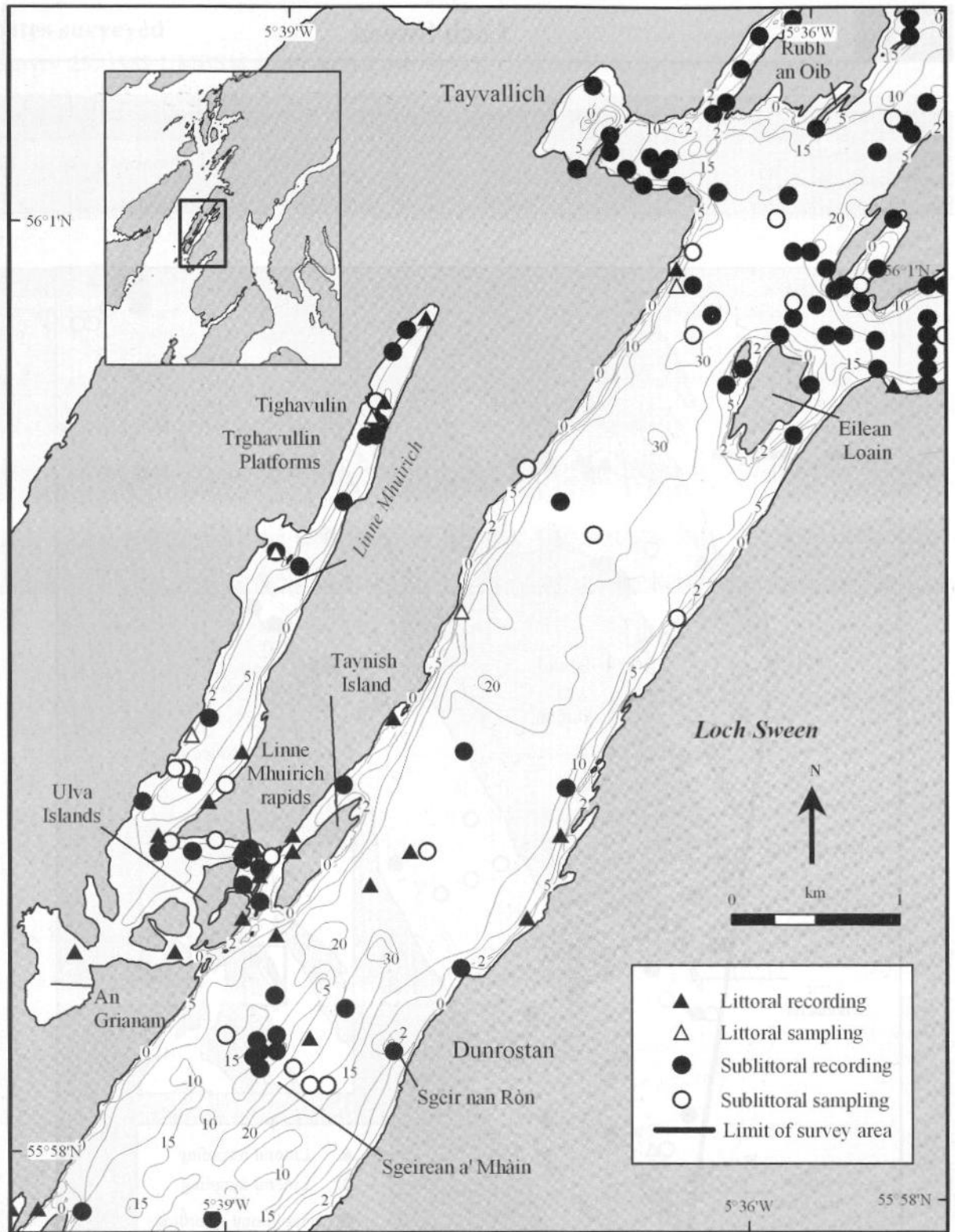


Figure 6.1 (continued)

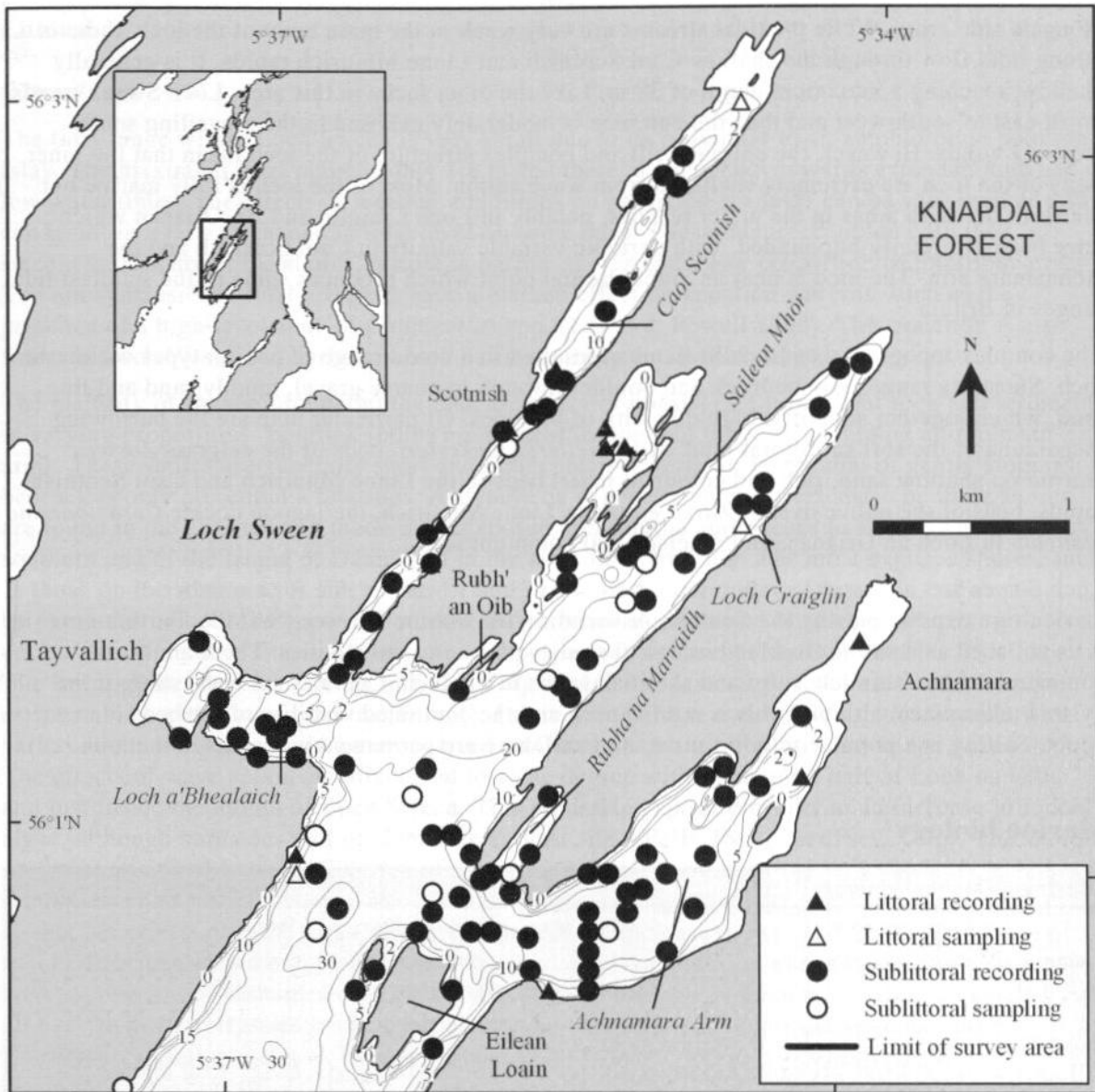


Figure 6.1 (continued)

### Physical features

<i>Physiographic type</i>	Fjord with six sills
<i>Length of coast</i>	94.95 km
<i>Length of inlet</i>	14.8 km
<i>Area of inlet</i>	20 km <sup>2</sup> (HW); 18.2 km <sup>2</sup> (LW)
<i>Bathymetry</i>	38.0 m (max)
<i>Wave exposure</i>	Range from moderately exposed to extremely sheltered
<i>Tidal streams</i>	Vary from strong to weak
<i>Tidal range</i>	1.6 m (springs). Loch is close to amphidromal point producing small tidal ranges
<i>Salinity</i>	Predominantly fully marine with brackish areas in upper reaches (Loch Craiglin and An Grianan)

### Introduction

Loch Sween is a complex fjordic sealoch lying on the west side of the Kintyre Peninsula and opening into the Sound of Jura. The loch has six sills which separate a number of basins and



elongate side arms. While the tidal streams are very weak in the main body of the loch, there is a strong tidal flow through the shallow Caol Scotnish and Linne Mhuirich rapids. It is generally shallow, reaching a maximum depth of 38 m. Like the other lochs in this area, Loch Sween trends north-east to south-west and thus the entrance is moderately exposed to the prevailing south-westerly winds. However, the entrance sill and complex structure of the loch mean that the inner parts of the loch are extremely sheltered from wave action. Most of the loch is fully marine but there are brackish areas in the upper reaches, notably in Loch Craigin and An Grianan which have been artificially impounded, with periodic variable salinity in Caol Scotnish and the Achnamara arm. The loch is near an amphidromal point which produces some of the smallest tidal ranges in Britain.

The complex topography of Loch Sween has resulted in a broad range of habitat types within the loch. Substrata range from bedrock and boulder through to coarse gravel, muddy sand and fine mud, which together support a high diversity of biotopes. Of particular note are the burrowing megafauna of the soft sublittoral mud, *Maxmuelleria lankesteri*, beds of the eelgrass *Zostera marina* on shallow sand, rich and colourful maerl beds in the Linne Mhuirich and Caol Scotnish rapids, beds of the native oyster *Ostrea edulis* in Linne Mhuirich, the lagoon cockle *Cerastoderma glaucum* in Loch an Grianan, and diverse algal communities.

Loch Sween has a long association with mariculture and it was the site for a number of mariculture experiments by the Scottish Association for Marine Science (SAMS). Furthermore, it is established as a site for marine biological studies of several universities. There are also commercial interests such as fin and shellfish farms in the loch. Commercial harvesting of the oysters takes place, although this is not licensed and the continued viability of the beds is in doubt. Sailing is a popular activity in the area and there are permanent moorings in the loch.

## Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	24	April–Aug 1985	Smith (1986, survey 99)
		5	May 1982	Earll (1984, survey 50)
	Recording (epibiota)	17	Aug–Sept 1984	Smith (1985, survey 81)
	Recording (epibiota)	14	August 1984	Rostron & Hiscock (1985, survey 98)
	Recording (epibiota)	1	May 1982	Smith (1982, survey 82)
	Recording (epibiota)	1	February 1976	Powell et al. (1977)
Sublittoral	Recording (epibiota)	82	Aug–Sept 1985	Lumb & Hiscock (1990, survey 267)
	Recording (epibiota –sledge diving)	10	Aug–Sept 1985	Lumb & Hiscock (1990, survey 267)
	Recording (epibiota)	14	Aug–Sept 1984	Lumb (1986, survey 46)
	Recording (epibiota)	72	May 1982	Earll (1982 & 1984, survey 50)
	Infaunal sampling (dredging)	26	Aug–Sept 1985	Lumb & Hiscock (1990, survey 267)
	Recording, Photography	4	Aug–Sept 1984	Rostron & Hiscock (1985, survey 98)
	Infaunal sampling (diving, burrow mapping)	6	Sept–Oct 1988	Atkinson (1989)
	Infaunal sampling (remote video tows)	13	August 1988	Atkinson (1989)
	Infaunal sampling (diving, hand-operated cores & resin casts)	15	August 1987	Atkinson (1987)

\*The results of these studies were used to prepare the biotope map but the data are not stored on the MNCR database and not shown on the map of sites surveyed.

## Littoral

### *Littoral rock*

The tidal range within Loch Sween is very small due to its proximity to an amphidromic point on Islay. The maximum tidal range is only 1.6 m and there is a tendency towards extended high and low water times. The effects of weather conditions on predicted sea level can be very marked and can result in a lack of change in tidal level on some days. These factors, coupled with the steepness of many of the shores, results in narrow shores and a low proportion of intertidal area. The idiosyncrasies in tidal level can have a marked effect on zonation patterns, such as the presence of a high-level zone of *Chthamalus* spp. (Lewis & Powell 1960). This zonation is also found in Loch West Loch Tarbert, which has a similarly small tidal range.

The majority of shores throughout the loch are rocky or consist of a mixture of rock and sediment in varying proportions. Bedrock shores are present throughout the loch, including all the main arms. These shores are generally short and either steep or vertical. Horizontal or gently sloping bedrock is only present at a few sites. As would be expected, the most extensive bedrock shores are found in the exposed and moderately exposed areas in the approaches to Loch Sween, off the southern end of the Island of Danna and in the open Loch na Cille. The most exposed shores, such as those on the west side of Eilean nan Leac, Eilean nan Uan and Sgeir Dhonncha, are dominated by barnacles on both the upper and middle shore. Small mussels and bladderless *Fucus vesiculosus* (*linearis*), littorinid snails and limpets are also present (MytB, BPat.Cht, BPat.Fvesl). The lower shore supports a dense turf of red algae such as *Mastocarpus stellatus* and *Chondrus crispus* along with *Fucus serratus* (Fser.R). *Laminaria digitata* and *Alaria esculenta* and a wide variety of animals, especially anemones and molluscs, occur in the sublittoral fringe (Ala.Ldig). The effects of wave action are attenuated to some degree within the outer half of Loch na Cille and just inside the mouth of Loch Sween. This moderate exposure results in an increase in fucoid algae, although barnacles still predominate at most sites (PelB, Fves, Fser.Fser, Ldig). The shores on the west side of Loch na Cille are of particular interest because they exhibit a clear gradation in exposure within a short distance into the loch. The rock slope here is very even for around 1 km, so that the effects of local variation are eliminated. An increase in the variety and abundance of fucoid algae, appearance of bladders on *F. vesiculosus*, compression of the supralittoral lichen zone and zoning of barnacles with *Chthamalus* spp. above and *Semibalanus balanoides* below can all be seen and are classic changes that occur when moving from exposure towards shelter.

Inside the main loch, steep, sheltered bedrock shores are common along the west coast, north of the Island of Danna, and also within the sheltered upper arms of the loch. This is the predominant shore type within the narrow channel that forms the southern end of Caol Scotnish and throughout much of Linne Mhuirich. The sheltered nature of these shores encourages the growth of fucoid algae, but the steepness of the rock means that barnacles often predominate, especially on the upper shore. Barnacles are more predominant at less sheltered sites, such as the tiny rocky islet of Sgeirean a' Mhàin in the centre of the main loch. At some sites the bedrock may continue into the sublittoral but at most sites the bedrock merges into boulders and sediments on the lower shore. Lichen zones in the supralittoral are generally very compressed since there is little in the way of wave splash. The barnacle *Chthamalus montagui* predominates on the upper shore (Ver.B, BPat), while *S. balanoides* is rarely found in the upper reaches of the loch system. Limpets are relatively rare, especially in very sheltered sites. The middle shore is characterised by short, dense bands of fucoid algae in varying proportions and includes *Fucus spiralis*, *F. vesiculosus*, *Ascophyllum nodosum* and *F. serratus* (Fspi, Fves, Asc, Fserr). In contrast to the relative lack of diversity on the steep upper and middle shores, the lower shore and especially the sublittoral fringe support a wide variety of algae and animals on rock terraces, boulders and in deep clefts. Fucoids generally extend to low water, with an understorey of encrusting calcareous algae, but are replaced at the low water mark by a distinctive turf of the filamentous alga *Trilliella* sp. This turf continues into the infralittoral at many sites. Other algae, such as *Dictyota dichotoma*, *Leathesia difformis*, *Corallina* sp. and *C. crispus*, are locally abundant. Sublittoral fringe rock on the east side of Caol Scotnish, opposite Scotnish village, has a particularly high variety of algae, probably due to

increased tidal currents in this area. It also has a wide variety of anemones, ascidians and brittlestars, usually found in slightly deeper water. In Linne Mhuirich, oysters *Ostrea edulis* are often present on bedrock at low water. These probably spread from the commercial oyster beds near the head of the loch. Linne Mhuirich also differs from the other inner arms of the loch in that *F. serratus* is replaced by *A. nodosum* and *F. vesiculosus* on the lower shore, so that *A. nodosum* often extends almost into the sublittoral fringe (Asc.Asc).

Extensive boulder shores are also common within Loch Sween. At some sites these form steep slopes that extend down into the sublittoral, but more commonly the slope is more gradual and boulders are often mixed in with sediment and pebbles on the middle and lower shore. Moderately exposed boulder shores predominate at the northern end of Loch na Cille and along the east side of Loch Sween from the entrance to Castle Sween. These shores slope gently and are, in general, wider than bedrock shores within the loch. The proportion of boulders to sediment and stones varies. There is usually a substantial cover of furoid algae on the boulders on the middle shore but barnacles are also common, with *Chthamalus* spp. at the top and *S. balanoides* lower down. At the level of the lower shore and the sublittoral fringe the boulders are usually scattered amongst sediment but still support a wide variety of algae (Fser.Fser.Bo). South of Castle Sween, boulders at this level form an interesting complex, with different algae co-dominant in dense patches over the rocks. These include *Mesophyllum lichenoides*, *L. difformis*, *Trailiella* sp., *D. dichotoma*, *Polyides rotundus*, *Furcellaria lumbricalis* and *Codium* spp. In Loch na Cille, *Ceramium rubrum*, *Cystoclonium purpureum* and *Corallina* spp. are locally abundant. *Laminaria digitata*, *Laminaria saccharina*, *Halidrys siliquosa* and *Chorda filum* all occur lower down in the sublittoral fringe (Ldig.Ldig.Bo, Lsac.Ldig). However, as shelter increases with distance into the loch, *L. digitata* disappears from sites on the east coast. These lower shore boulders also support a wide variety of animals under the rocks, on the sides and amongst the algae. The dogwhelk *Nucella lapillus*, the beadlet anemone *Actinia equina*, the grey topshell *Gibbula cineraria* and the barnacle *Verruca stroemia* are all common here, but are much less common on sheltered boulder shores further into the loch.

Sheltered boulder shores are common within the loch, especially within the upper arms where stretches of sheltered, steep bedrock tend to alternate with stretches of less steep, sheltered boulder and cobble shores, depending on the local topography and geology. For example, the west shore adjacent to Scotnish village in Caol Scotnish consists mainly of medium-sized boulders with a turf bank at the top of the shore. Immediately opposite on the east shore, there is a steep bedrock cliff extending down into the sublittoral. Insufficient sites have been examined to map bedrock and stable boulder shores separately, although some indication is given in Figure 6.2. Both types of shore support similar furoid-dominated communities, although the cover of furoids tends to be heavier on the boulder shores, since they slope less steeply. *A. nodosum* is often abundant to superabundant and grows as a thick blanket over the middle shore (Asc.Asc, Asc.VS). At many sites, boulders give way to increasing amounts of pebbles and smaller substrata on the lower shore and below. Furoids, mainly *F. serratus*, still predominate at this level (Fserr), with an understory of smaller algae such as *Cladophora rupestris* and *C. crispus*. Occasional larger boulders embedded in sediment at low water level support a turf of foliose algae including *Trailiella* sp. Kelp *L. saccharina* is generally present in the sublittoral fringe, along with *C. filum* and *Stilophora rhizoides* (Lsac.Ft, LsacX), the latter often growing as loose-lying flocculent masses.

#### Littoral sediment

There are a number of sites where reasonable-sized expanses of muddy sand or gravel are exposed at low tide. The largest of these is Ceann an t-Sailein, a rectangular bay over 1 km long and around 300 m wide. The bay lies between Rubha Bhreathanish (a northern extension of the Island of Danna) and the mainland on the west side of the loch. It was at one time connected to the northern part of Loch na Cille but the connection has been severed by a road running over a causeway. The sediment within the bay consists mainly of muddy sand overlying blue clay. There are also patches of pebbles and bedrock or boulders around the edges. The infauna is not especially rich and is characterised by the lugworm *Arenicola marina* and the cockle



*Cerastoderma edule* (PCer), along with large nemertean worms. Similar muddy sand together with areas of dead maerl sand and gravel are present at the head of Loch na Cille. This area also supports patches of the seagrass *Zostera noltii* (Znol) and there is a narrow fringe of saltmarsh around the edges. The innermost part forms an extremely sheltered, long narrow channel and here *C. edule* is replaced by *C. glaucum*, which is characteristic of brackish conditions. The head of Achnamara Arm also has a relatively extensive expanse of muddy sand.

On the west side of Sailean Mhòr there is a small side arm whose entrance is almost blocked by the Faery Isles. At the head of this arm, north of the islands, there is an expanse of soft mud with some gravel and boulders. The mud is characterised by the bivalve molluscs *Scrobicularia plana* and *Mya arenaria* (HedScr), both of which can tolerate low salinities. Polychaete worms are also common here.

Clean sand shores are restricted to the exposed approaches to Loch Sween. Areas of sand and shell-gravel with scattered boulders are present between Liath Eilean and the Island of Danna and in the equivalent position between Eilean Puirt Leithe and the east mainland. The sand supports only a limited fauna, including a few polychaetes, mainly lugworms *A. marina* and bivalves including *Dosinia exoleta* and *Macoma balthica* (LGS). Sand in the bay to the south of Doide Point, to the north of Eilean Puirt Leithe, is obviously mobile and therefore almost barren (BarSh).

Various grades and mixtures of sediment, mainly muddy gravel and gravel, are present under and between boulders and cobbles on many shores and in small inlets, bays and channels. The bivalves *Venerupis senegalensis* and *D. exoleta* are common in these gravel areas. The muddier gravels support a higher number of bivalves and polychaetes (Lan, HedMac, MacAre.Mare, LMX).

#### *Littoral areas in Linne Mhuirich rapids*

Linne Mhuirich, one of the inner arms of Loch Sween, is connected to the main body of the loch by a very shallow, narrow channel of only 0.5 to 3 m depth at low tide, which runs from east to west. This channel forms the Linne Mhuirich rapids, through which tidal streams run at up to 6 knots. The shores forming the edges of the rapids are generally gently sloping and include a variety of substrata. Bedrock occurs on the upper shore and at small headlands, while middle and lower shore areas consist of boulders, cobbles, gravel, sand and maerl. The whole area is very sheltered from wave action but subject to strong tidal streams. Upper and middle shore areas are not greatly influenced by the tidal currents and support furoid-dominated communities that are similar to those found on sheltered bedrock and boulder shores in the loch, often with luxuriant growths of *A. nodosum* (Asc.Asc). In contrast, the lower shore and sublittoral fringe are subject to very strong currents, and this, coupled with the wide range of substrata present, results in very rich and characteristic communities of plants and animals. The south end of the Tainish peninsula forms a relatively linear shore along the north side of the rapids. Boulders and cobbles predominate and on the lower shore these are covered by a rich turf of algae, with *F. serratus*, *Trailliella* sp. and *Codium* sp. especially common (Fserr.T). Prolific growths of *Codium fragile* subsp. *tomentosoides* also occur on the south-west shore of Linne Mhuirich above beds of seagrass *Zostera marina*. The sides of the boulders support a wide variety of sponges and there is also a rich under-boulder fauna. Large patches of maerl *Phymatolithon calcareum* and *Lithothamnion glaciale* extend up from the sublittoral (Mrl) in some places. Intertidal maerl is relatively common in rapids systems along the west coast of Scotland but at this site a loose-lying form of the calcareous alga *Corallina* sp. is present, overlying gravel. This is rarely recorded and adds to the interest of these relatively small rapids. The *Corallina* provides a habitat for a number of molluscs, including *Musculus discors*, *Crenella decussata* and small rissoid gastropods. The south shore of the rapids is formed by the Ulva Islands and is irregular with bedrock spurs dissected by small bays. The bedrock is fringed by *F. serratus* and *L. saccharina* at low water, with relatively few other species present. A mosaic of boulders, cobbles and sediment line the small bays and support a rich fauna of sponges. A rocky ridge, Sgeir an Fheòr, juts out into the channel at the eastern end, and at low water a bank of mobile-maerl gravel is exposed. This



supports few species, but the alga *Grateloupia filicina*, which reaches its northern limits in this area, has been recorded from this site and is characteristic of this type of habitat. An extensive area of gravel and boulders is also present at the west end of the rapids, forming a small sill. This supports relatively few infaunal animals but the boulders again support a wide variety of species. The sublittoral of these rapids is also of great interest, a mixture of boulders and cobbles supporting a rich kelp forest of *L. hyperborea* with a very extensive and diverse sponge fauna (see below) in an almost intertidal situation.

### Sublittoral

For the sake of clarity, the sublittoral area of the loch is described below under geographical sub-headings. Areas of particular interest include the seagrass *Zostera marina* beds within Linne Mhuirich, Caol Scotnish and off Castle Sween; the Linne Mhuirich rapids; the maerl beds and other communities in the tide-exposed channel forming the southern end of Caol Scotnish; beds of native oysters *Ostrea edulis* at the head of Linne Mhuirich; and the brackish lagoons Loch Crinan and an Grianan.

#### *Loch Sween main body*

The main channel and body of Loch Sween runs NNE to SSW for about 8 km until it splits into three arms: the narrow Caol Scotnish, the wider Sailean Mhòr and the Achnamara Arm. The majority of the loch is less than 30 m deep, with a maximum depth of 39 m. Tainish Island, across the entrance to Linne Mhuirich, and Eilean Loain, forming part of the entrance to Achnamara Arm, are the only islands of any size. Sediments predominate throughout the loch, with rocky communities restricted to a narrow zone around the edges of the loch and around a few small islets. Exposure to wave action decreases with distance into the loch, and rock and sediment communities change correspondingly in a relatively linear fashion.

**Sublittoral rock:** Extensive, clearly defined areas of sublittoral rock are not a feature of Loch Sween. The majority of sublittoral rock consists of boulder slopes or patches of boulders interspersed with sediment. The sediment often extends right up to the intertidal, merging into a sublittoral fringe of pebbles, sediment and scattered boulders or bedrock patches. Boulders extend at least two-thirds of the way across the shallow sill just north of the loch entrance. Silty bedrock ridges and slopes are present around the small islet of Sgeirean a' Mhàin in the centre of the loch. Short but steep bedrock cliffs are present along some parts of the west coast, which is in general steeper than the east. The predominant infralittoral community is a kelp forest of *L. saccharina* down to around 7 m depth with an understorey turf of *Trilliella* sp., *Lithothamnion* sp., *Chorda filum* and rather sparse foliose red algae (Lsac.Ft, Lsac). This turf of *Trilliella* is very characteristic of Loch Sween and is found on stable infralittoral rock throughout the loch. At some sites, such as Sgeir nan Ròn off Dunrostan on the east coast, the green algae *Codium* spp. are particularly common in the upper infralittoral and sublittoral fringe (Lsac.Cod). *L. hyperborea* kelp forest is restricted to the more wave-exposed conditions found near the loch entrance. However, *L. hyperborea* is present in small amounts in the upper infralittoral as far into the loch as Sgeirean a' Mhàin; situated in the middle of the loch, this site is less sheltered than equivalent sites along the edges of the loch.

Circalittoral rock is only present at a few sites within Loch Sween, as the relatively shallow depth of the rock/sediment interface precludes a widespread distribution of this habitat. Animal communities are characteristically species-poor and rock surfaces appear rather bare and silty. The species present are those able to tolerate silt and to resist grazing pressures. There are no rich communities of brachiopods found on steep rock. This is unusual since such communities are found on steep rock in other fjordic lochs in this area. Examples of circalittoral bedrock cliffs, extending to around 20 m depth, are found on the rock pinnacles off the west side of Rubha na Marraidh at the entrance to Achnamara Arm, and just north of the islet Sgeirean a' Mhàin. Rock faces support encrusting sponges, encrusting bryozoans, encrusting algae, the tubeworm *Pomatoceros triqueter*, sparse hydroids, the barnacle *Balanus crenatus* and occasional brachiopods

*Pododesmus patelliformis* (FaAIC, AmenCio, FaSwV). At some sites, such as the Sgeirean a' Mhàin pinnacle, brittlestars *Ophiothrix fragilis* predominate (Oph).

**Sublittoral sediments:** The upper part of the main body of Loch Sween, from around Taynish Island to just north of Eilean Loain, has a fairly flat and uniform seabed, floored by soft, cohesive circalittoral mud. The mud supports very similar communities of burrowing megafauna and sea-pens to those found in Sailean Mhòr and Achnamara Arm, with large burrows and mounds formed by the Norway lobster *Nephrops norvegicus*, shrimps and gobies, plus the sea-pen *Virgularia mirabilis*. Particularly dense populations of burrowing brittlestars *Amphiura* spp. are present at many sites (SpMeg). This habitat extends relatively close inshore and is generally found below about 20 m depth. In Loch a' Bhealaich, a small side arm from which Caol Scotnish extends, this habitat extends up to around 10 m depth and supports relatively dense populations of *N. norvegicus*.

South of Taynish Island, the bathymetry is more complex and there are a number of sills running across the loch so that the seabed undulates and there are pockets and troughs of deeper water. At the entrance to the loch and as far north as Castle Sween, sediments at similar depths to the mud found further north are much firmer and consist mainly of muddy sand with few or no burrows and mounds. The coarser sediment results from greater exposure to wave action. These muddy sands contain a lot of shell debris and, in particular, numerous tower shells *Turritella communis*, both live and dead. They also support beds of sea-pens *V. mirabilis* which may be either quite dense or entirely absent, and hydroids that are frequently found attached to shells and stones (VirOph, VirOph.HAs, CMX). Between Castle Sween and Taynish Island the bathymetry is at its most complex, with infralittoral mud, circalittoral mud and muddy sands occurring adjacent to one another.

Sandier infralittoral sediments also occur around the edges of the main body of Loch Sween. This contrasts with the situation at the head of the loch where mud is encountered immediately adjacent to the shore or starts below any infralittoral rock that may be present. For example, muddy fine sand is present below a sublittoral fringe of small boulders at around 1 m depth, just north of Castle Sween. This supports a clean and healthy bed of seagrass *Z. marina* (Zmar). This grades into a cohesive infralittoral mud by 4 m depth (PhiVir) and into circalittoral soft mud with *N. norvegicus* by 10 m depth (SpMeg). At Castle Sween there is a plain of coarse sand with small outcrops of bedrock, extending down to 5 m depth. The sand is dominated by the burrowing urchin *Echinocardium cordatum* but also supports a variety of other burrowing species, including bivalve molluscs *Ensis* sp. and *Dosinia* sp. and the masked crab *Corystes cassivelaunus* (EcorEns). Where sufficient hard substrata are present, such as pebbles, cobbles and shells, these infralittoral muddy sands also support kelp *L. saccharina* and foliose algae (LsacX).

#### *Sailean Mhòr and Achnamara Arm*

Sailean Mhòr forms the head of Loch Sween, with Achnamara Arm branching off the east side and running parallel to it. Both these arms are very sheltered but remain relatively deep, extending to around 20 m depth. Sublittoral rock is limited to short slopes of steep, silt-covered bedrock and boulders around the headlands in the north entrance to Achnamara Arm, and in patches along both shores of Sailean Mhòr, extending to a maximum depth of around 15 m. Towards the base of the rocky areas the boulders become spread out and interspersed with muddy sediment. The rocks support an impoverished kelp forest of *L. saccharina* (Lsac.Ft) down to about 6 m depth, with an understory consisting mainly of the filamentous alga *Trilliella* sp., which becomes predominant in the lower infralittoral, and encrusting algae, especially *Lithothamnion* sp. Sea squirts such as *Corella parallelogramma* and the tubeworm *Chaetopterus variopedatus* are common in the undergrowth. Towards the entrance of Caol Scotnish around Rubh' an Oib, the kelp forest shows signs of sand scour and of grazing by brittlestars *Ophiocoma nigra* and *Ophiothrix fragilis* (XKScrR). The south shore of Achnamara Arm has no steep rock areas but cobbles and pebbles close inshore support some kelp *L. saccharina* and foliose algae (LsacX).

There is little in the way of circalittoral rock in these sheltered inner areas. Boulders supporting silt-tolerant sponges such as *Suberites carnosus* and ascidians (SubSoAs) occur below the infralittoral boulder slopes at the entrance to Achnamara Arm.

As in the main body of Loch Sween, circalittoral, soft mud is the predominant sediment throughout these two inner arms (SpMeg). The extent to which the mud is worked by megafauna, such as the Norway lobster *N. norvegicus*, and how many other species such as sea-pens *V. mirabilis* and burrowing brittlestars *Amphiura* spp. are present varies, but this circalittoral mud extends right to the head of Sailean Mhòr. The top part of Achnamara Arm is shallow and floored by infralittoral mud (IMU).

#### Caol Scotnish

Communities and biotopes in Caol Scotnish are heavily influenced by the strong tidal streams which run through this narrow arm of the loch. The lower part forms a shallow, narrow, steep-sided channel floored by an extensive maerl bed consisting of free-living and encrusting rhodoliths of *Lithothamnion glaciale*, overlying muddy sediment (Lgla, Mrl, MrlMx). The maerl is colonised by a variety of algae including *D. dichotoma*, *Phyllophora crispa*, *C. filum* and *Scinaia turgida*. Dense populations of brittlestars, mainly *O. nigra*, are present. Where the channel starts to broaden out to form the upper part of Caol Scotnish, and the current decreases, the maerl is replaced by a dense bed of seagrass *Z. marina* (Zmar). Brittlestars *O. nigra* remain abundant here and form a bed over areas of mud where there is no *Zostera*. The majority of the upper basin is floored by soft, anaerobic mud with a patchy cover of diatoms in the shallower areas. The shallow mud right at the head supports the opisthobranch *Philine aperta* (PhiVir). Deeper mud between the head and the long narrow entrance channel is mounded mainly by the lugworm *A. marina* and terebellid worms, but there is no extensive working by burrowers such as *N. norvegicus*, possibly in part because of the soft and unconsolidated nature of the sediment. However, numerous conspicuous vertical burrows were identified by Atkinson (1987) as belonging to the shrimp-like crustaceans *Callianassa subterranea* and *Jaxea nocturna* (SpMeg).

The tide-exposed sides of the lower channel consist of steep and vertical bedrock and boulder slopes dominated by large kelp plants *L. saccharina*, heavily encrusted with epiphytes and encrusting coralline algae *Lithothamnion*, overgrown by filamentous algae, especially *Trailiella*. The strong current encourages the growth of a varied fauna of filter-feeders on the vertical rocks and the kelp. These are mainly ascidians such as *Ascidella* spp. and *C. parallelogramma* and sponges, especially *Halichondria bowerbanki*, a very branched form of *Amphilectus fucorum* and *Hymeniacion perleve* (FaSwV, Lsac.T). Rocky areas in the upper basin, such as the promontory on the eastern side, also support forests of silty *L. saccharina*, with vertical surfaces dominated by a turf of *Trailiella* or *Lithothamnion* and extensive colonies of the phoronid *Phoronis hippocrepia* and small silt-tolerant sponges, especially towards the rock-sediment interface (Lsac.Ft, FaSwV).

#### Linne Mhuirich and rapids

**Rapids:** The Linne Mhuirich rapids exhibit considerable heterogeneity of sublittoral habitats and biotopes and support rich populations of kelp, foliose algae, maerl and sponges (Lsac.T, Lhyp.TFt, Phy.R, Mrl, Oph). Bedrock and large boulders predominate along the edges and throughout the central parts of the channel. Kelp *L. hyperborea* and *L. saccharina*, as well as large plants of *H. siliquosa*, form the dominant cover on upward-facing surfaces, along with the encrusting algae *Lithothamnion* spp. Massive growths of sponges, mainly *Halichondria panicea* and *A. fucorum*, cover the boulders and also spread up the kelp stipes, especially in the deeper central parts of the channel. Further colour is added by anemones such as *Sagartia elegans* in its various forms and *Metridium senile*, along with some dead man's fingers *Alcyonium digitatum*. Areas of cobbles and pebbles are colonised by encrusting algae, the keel worm *Pomatoceros triqueter*, encrusting bryozoans and, in some areas, relatively large foliose algal populations, especially *D. dichotoma*. Sand and shell-gravel between the rocky areas are overlain by sometimes quite extensive patches of live maerl, both *P. calcareum* and *L. glaciale* (Phy.R). Patches of maerl-gravel are also present



but support few species apart from the brittlestar *Ophiocomina nigra* (Mrl, Oph). Muddy sand areas are colonised by large numbers of tube-dwelling amphipods, mainly *Corophium bonnellii*.

**Seagrass beds:** Linne Mhuirich is also of interest for the extensive and well-developed beds of seagrass *Z. marina* (Zmar) which occur throughout its length, in shallow water of 3 m depth or less. The largest beds occur at the southern end, in the shallow water to the south of the rapids and a short distance to the north of them. Dense *Zostera* beds also occur at the head of Linne Mhuirich, continuing southward on the western shore to below Tighavullin. Further beds occur just beyond the main basin where it narrows to form the inner basin. A wide variety of algae and animals are associated with the *Zostera*, growing both as an understory and as epiphytes. These include the brown algae *Asperococcus turneri* and *S. rhizoides*, the anemone *Anemonia viridis*, which attaches to the seagrass blades, and the sea squirt *Asciidiella aspersa* that grows attached to shells, pebbles and the *Zostera* blades. Comparisons are available of the species occurring within the various *Zostera* beds throughout Loch Sween.

The main basin of Linne Mhuirich is floored predominantly by soft mud, with patches of coarser material along the edges. The mud is colonised by a limited variety of animals, especially the opisthobranch *P. aperta* (PhiVir) and the lugworm *A. marina* (AreSyn). The mud at the deepest point near the southern end is anoxic and the mud surface is covered by the white threads of the bacterium *Beggiatoa* (Beg). Sediment in the inner basin, where depths hardly exceed 2 m, also consists of soft mud, but pebbles and cobbles are present around the edges. These hard substrata used to support reefs of the tubeworm *Serpula vermicularis* towards their lower limits (Ser) but now probably only support the solitary form. Encrusting coralline algae, keel worms *P. triqueter* and kelp *L. saccharina* are also common. Dense beds of oysters *O. edulis* are present on the east side near the head of the loch (Ost), the remnants of an oyster culture area.

#### *Loch Craiglin and Loch An Grianan*

Loch Craiglin is a small, shallow loch connected by a narrow culvert to the eastern side of Sailean Mhòr at the head of Loch Sween. The culvert restricts tidal flow and the loch is brackish, particularly at its southern end. Seagrass *Z. marina* is abundant in the northern half down to around 2 to 2.5 m depth. The angiosperm *Ruppia* sp., commonly found in brackish lagoons, is also common. The deeper central section extends down to around 5 m depth and is floored by very soft, anoxic mud. It acts as a sink and collects considerable debris that is broken down by a white, marine bacterium *Beggiatoa* (Beg). The southern end supports less *Zostera* and *Ruppia* and extensive areas of mud are covered by filamentous algae (FiG). There are good historical records of the flora in this small loch, which adds to its interest. The culvert was probably constructed in the 1890s in connection with early attempts to cultivate oysters.

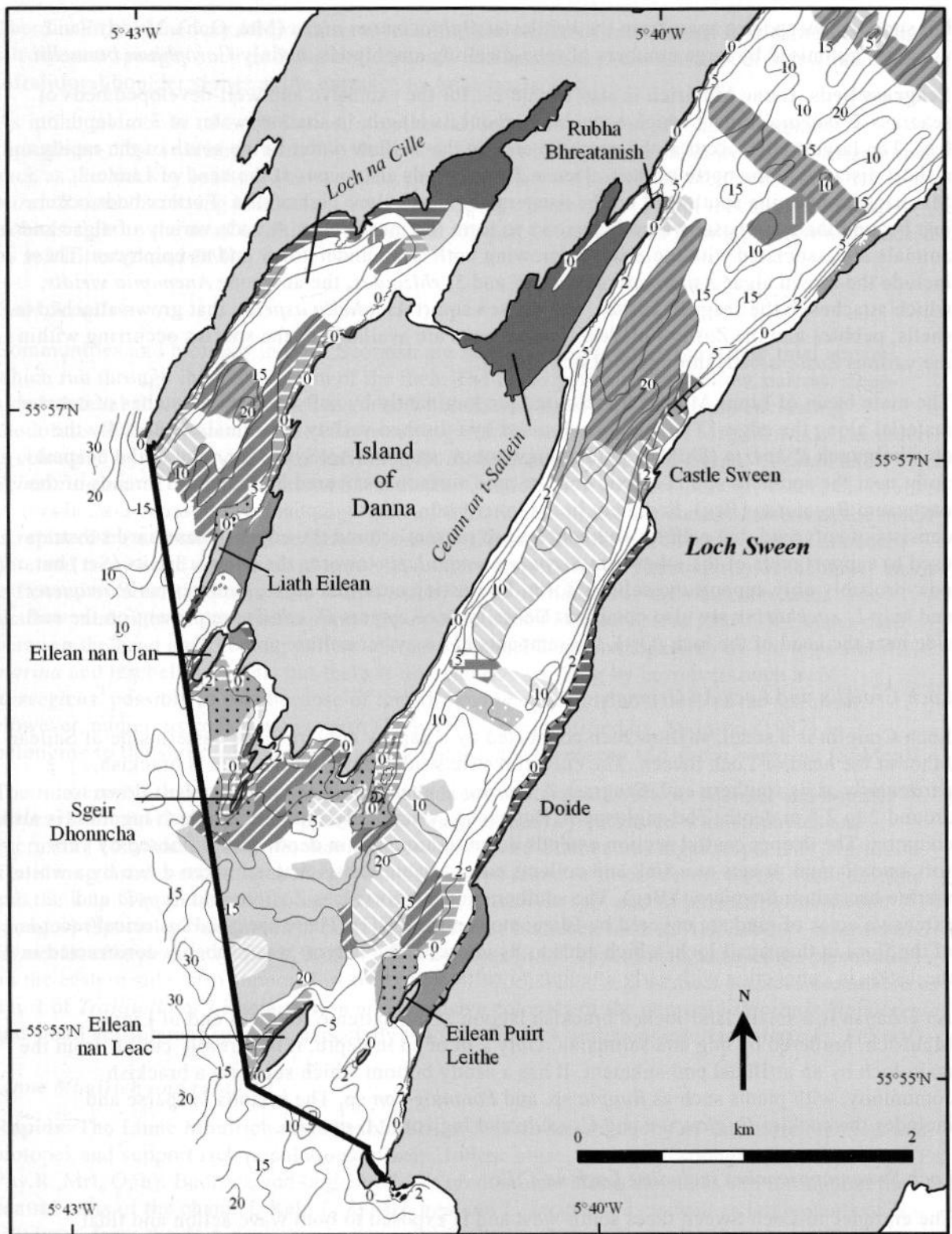
An Grianan is a small, land-locked brackish lagoon at the extreme southern end of Linne Mhuirich, bordered by bog and saltmarsh. Only 2 m or so in depth, it is partially cut off from the main loch by an artificial embankment. It has a sandy bottom which supports a brackish community, with plants such as *Ruppia* sp. and *Potamogeton* sp. The infauna is sparse and includes the cockles *C. glaucum* and *C. edule* and lugworm *A. marina*.

#### *Loch Sween approaches including Loch na Cille*

The entrance to Loch Sween faces south-west and is exposed to both wave action and tidal currents. However, the MacCormaig Islands, which fall just outside the scope of this area summary, provide some shelter from the waves. Loch na Cille is a small open-mouthed loch just to the north of the mouth of Loch Sween and separated from the latter by the Island of Danna. The upper intertidal areas of Loch na Cille were originally connected to the intertidal Ceann an t-Sailein, part of Loch Sween, at the northern end of the Island of Danna. The two lochs are now artificially separated by a causeway.

The bathymetry around the southern end of the Island of Danna is shallow and the coastline irregular. The infralittoral consists mainly of large boulders with smaller cobbles and pebbles in





**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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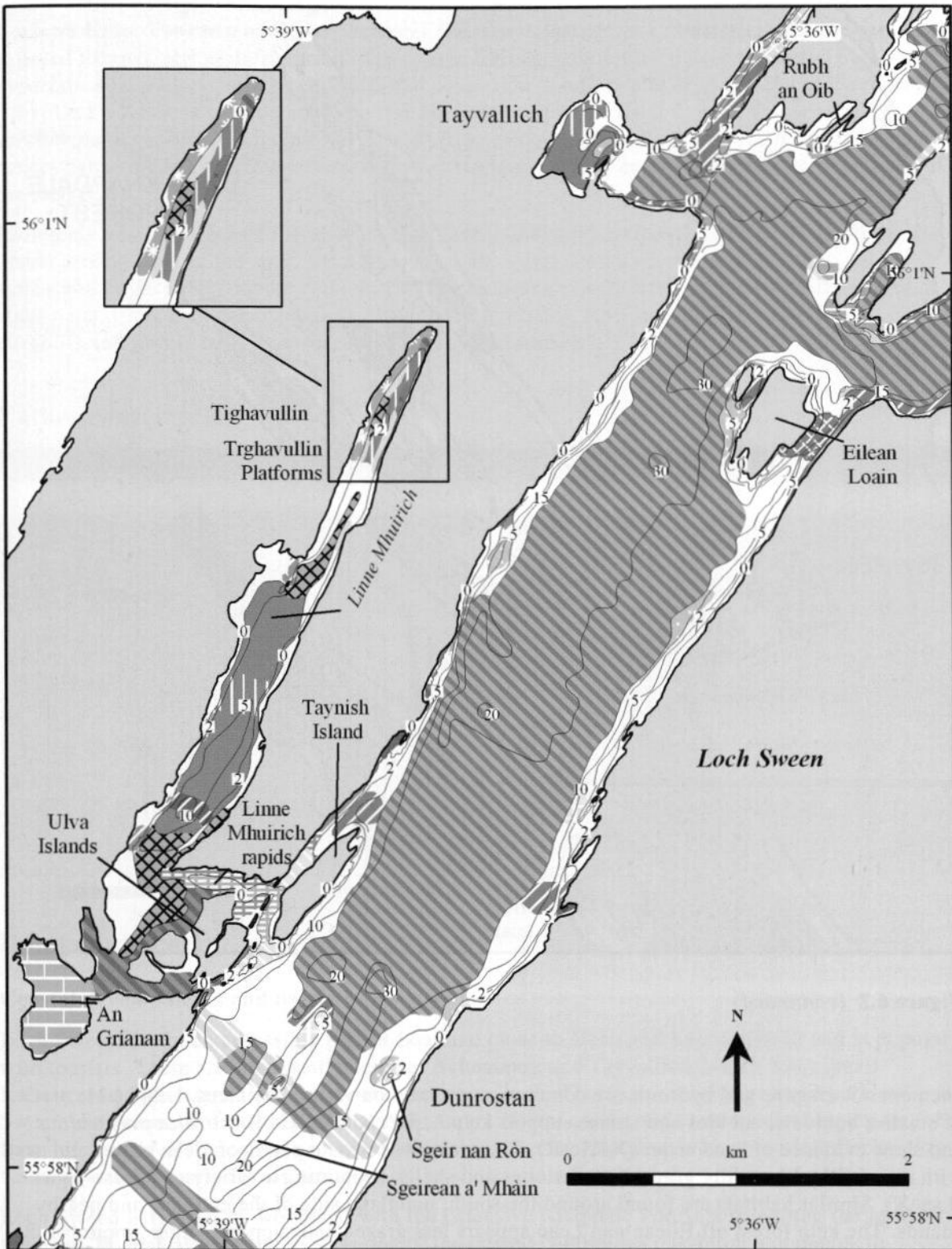


Figure 6.2 (continued)

between and some areas of flat or gently sloping bedrock. The stable boulders and bedrock areas are dominated by a *L. hyperborea* kelp forest with very large plants on the larger boulders. The boulder surfaces and the kelp stipes show considerable evidence of grazing (LhypGz.Ft). The undergrowth consists mainly of encrusting algae, especially *Lithothamnion*, and while there is a reasonable variety of foliose algae, their density is low. Filter-feeders such as encrusting sponges,

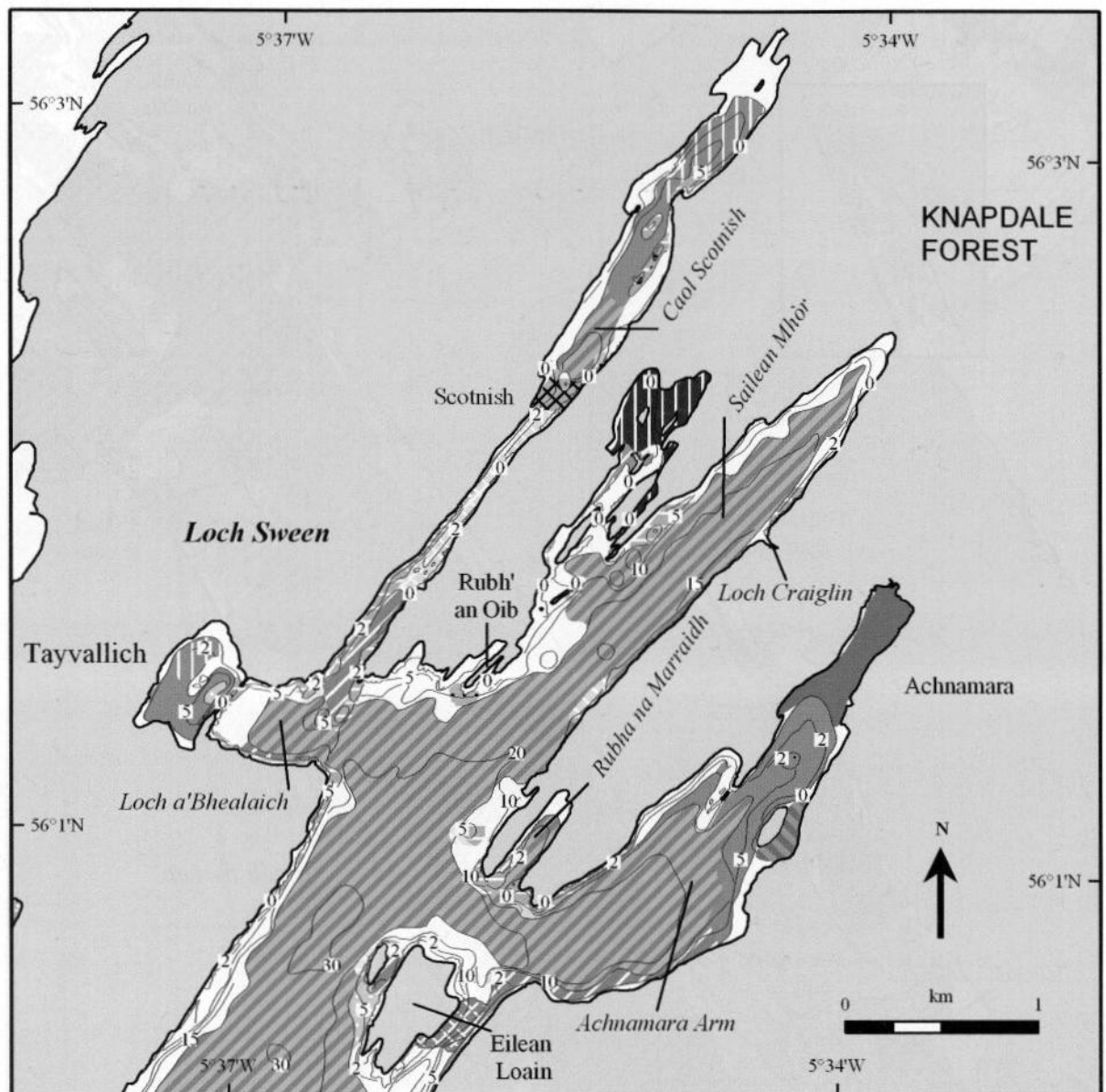


Figure 6.2 (continued)

anemones *S. elegans* and hydroids are common, especially on vertical surfaces. Less stable areas of smaller boulders, cobbles and stones support kelp *L. saccharina* and *Saccorhiza polyschides* and show evidence of sand scour (XKScrR). The rock gives way to plains of clean gravel and sand with maerl (Phy.R) or silty gravel, small stones and shells, supporting a variety of foliose algae (LsacX). Similar habitats are found around the south, mainland side of the entrance and nearby islands. The kelp forest off Eilean nan Leac appears less grazed and supports larger amounts of foliose algae (LhypR.Ft).

Offshore areas south of the Island of Danna and in the entrance channel are subject to strong tidal currents. The seabed here consists mainly of a mixture of gravel, pebbles and cobbles. In deeper circalittoral areas these support communities of hydroids and bryozoans which vary from rich and diverse to rather sparse (Flu.SerHyd, ByH, CMX). In shallower infralittoral areas, algae may also be present (Lsac.TX). Sediment, in the form of muddy sand, is present in the central deeper areas of the entrance channel at around 20 m depth. This supports populations of sea-pens *V. mirabilis* and various bivalve molluscs (VirOph).



**Loch na Cille:** The open nature of Loch na Cille means that the outer part is exposed or semi-exposed to wave action. Infralittoral rock around the edges therefore supports scoured *L. hyperborea* kelp forest, similar to that found around the southern end of the Island of Danna (LhypGz.Ft, XKScrR). In the upper part of the loch, mixed forests of *L. hyperborea* and *L. saccharina* occur with the large cape form of *L. hyperborea* (LhypLsac.Ft). *L. saccharina* also occurs below a band of *L. hyperborea* kelp forest along the east coast and at the sheltered head of the loch (Lsac.Ft).

Sediments within Loch na Cille also reflect its moderately exposed nature. Firm sand and shell-gravel predominate in the shallow water around the edges, with a variety of algae attached to stones and larger shell fragments (LsacX). The remaining circalittoral sediments in the deeper, outer parts of the loch consist mainly of mixtures of muddy sand and shell with sea-pens *V. mirabilis* and tower shells *T. communis* (CMX, VirOph).

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Loch Sween	MCA	NR 743 840	Marine Consultation Area
Taynish	Biosphere Reserve	NR 735 850	Significant example of a biome – terrestrial and coastal environment
Taynish Woods	SAC, SSSI	NR 735 843	Botanical – marsh fritillary butterfly <i>Eurodryas aurinia</i> ; old oak woods with holly <i>Ilex europaeus</i> and hard fern <i>Blechnum spicant</i>
Linne Mhuirich	SSSI	NR 726 847	Botanical, marine botanical, marine biological
West Tayvallich Peninsula	SSSI, GCR	NR 706 834	Geological
Tayvallich Juniper and Fen	SSSI	NR 725 828	Botanical
Knapdale	NSA		National Scenic Area includes area surrounding Loch Sween
Knapdale Forest	Significant Area of Coastal Woodland	NR 750 900	>5,000 ha coniferous
Faery Isles	SWT Reserve	NR 766 884	Wildlife Trust Site (21 ha)

## Human influences

### Coastal developments and uses

Loch Sween lies in an accessible part of Scotland close to Oban and Lochgilphead and is popular with tourists. There are small settlements at Achnamara and Tayvallich, which has a small harbour, and houses are scattered around the whole loch. There is a sizeable caravan park at Castle Sween and an outward bound centre at Achnamara. There are no main sewers discharging into the loch; all new developments are required to have septic tank treatment with an outfall discharging below low water mark. Roads run close to the shore around most of the loch.

Loch Sween is fringed by woodland with the extensive Knapdale Forest surrounding the head of the loch. Taynish Woods, an SSSI, is one of the largest continuous oak-birch woodlands in Scotland. The entire loch lies within a National Scenic Area. The low hills of the hinterland are used for rough grazing.

### Marine developments and uses

Loch Sween has a long association with mariculture and a number of major experiments were conducted by the Scottish Association for Marine Science (SAMS) in the loch during the first half of the 20th century. Salmon and oyster farming were both practised, the latter 'petering out' in the 1950s. Currently a bed of native oysters *O. edulis* persists in Linne Mhuirich and the oysters have

been commercially harvested. There are no current licences for harvesting the oysters but it is known that some illegal collecting takes place and the continued viability of the beds is in doubt.

Dredging for Norway lobster *N. norvegicus* takes place in the main body of the loch from Castle Sween to Eilean Loain and there is dredging for the king scallop *Pecten maximus* in the loch mouth and approaches. Divers also collect from these scallop beds on occasion. Salmon *Salmo salar* and sea trout *Salmo trutta* are both caught by netting and angling and the Crown Estate Commissioners lease the salmon netting rights in the loch on a nine-year cycle. Creeling for *Nephrops* and other crustacea takes place in the loch. Winkles *Littorina littorea* are collected from the shores and seaweed has been harvested from Danna Island since the 19th century for use as a fertiliser.

The loch is well-established as a site for marine biological studies, with staff and students from the SAMS and the University Marine Biological Station at Millport visiting on a regular basis. Several long-term research studies have been carried out in the loch and a number of other universities also use it for undergraduate field courses.

This area is important for water-based leisure, including sailing, canoeing, water-skiing, wind-surfing, diving and fishing. Yachts and sea-going canoeists often use Loch Sween for overnight stops. There are both permanent and seasonal moorings, mostly centred around Tayvallich and the Castle Sween campsite.

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- Survey 65: 1987 UMBSM Loch Sween burrowing megafauna survey (Atkinson 1987).
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- Survey 82: 1982 Smith Loch Sween littoral molluscs survey (Smith 1982).
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- Survey 99: 1985 Smith Loch Sween littoral survey (Smith 1986).
- Survey 265: 1975–80 SMBA/MBA Great Britain littoral survey (Harvey *et al.* 1980).
- Survey 267: 1985 NCC Loch Sween sublittoral survey (Lumb & Hiscock 1990).

### Littoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
50	10.1	Eilean nan Leac, Loch Sween	NR 690 758	55°55.1'N 5°41.8'W	CGS, EcorEns, FaAIC, Ala, Lhyp.Ft, LhypGz.Pk
50	10.2	Taynish, Loch Sween	NR 736 841	55°59.8'N 05°37.8'W	SpMeg, SCR, SLR, EchBriCC, Lsac
50	10.3	Taynish, north, Loch Sween	NR 749 861	56°00.8'N 05°36.7'W	SCR, CMX, EchBriCC, Lsac.Ft, SLR, LsacX
50	10.4	Sailean Mhòr, near Craiglin, Loch Sween	NR 772 879	56°01.9'N 05°34.5'W	SpMeg, SCR, LR, Lsac.Ft, Lsac
50	12.1n	Caol Scotnish, head, Loch Sween	NR 772 900	56°03.1'N 05°34.7'W	PhiVir, SLR
81	1	Castle Sween, Loch Sween	NR 711 790	55°56.9'N 05°40.0'W	VsenMtru, Zmar, Fser.Fser.Bo, BLit
81	2	Rubh' an Tacair, Loch Sween	NR 740 823	55°58.8'N 05°37.3'W	SLR



<b>Littoral sites – continued</b>					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotores recorded</i>
81	3	Daltot Point, Loch Sween	NR 742 828	55°59.1'N 05°37.2'W	PCer, BPat, Ldig, Fser
81	4	Ashfield, Loch Sween	NR 762 855	56°00.6'N 05°35.4'W	MytX
81	5	Inverlussa Jetty, Loch Sween	NR 775 866	56°01.2'N 05°34.2'W	Fserr.VS
81	7	Faery Isles, Loch Sween	NR 765 884	56°02.1'N 05°35.2'W	Lan, HedScr, Lsac.Ft, Asc.VS
81	8	Caol Scotnish, south, Loch Sween	NR 756 877	56°01.7'N 05°36.1'W	F, LMX, Lsac
81	9	Caol Scotnish, north, Loch Sween	NR 760 884	56°02.1'N 05°35.7'W	F, LMX, Lsac
81	10	Taynish East, north, Loch Sween	NR 733 827	55°59.0'N 05°38.0'W	F, Lan, HedMac
81	11	Taynish East, south, Loch Sween	NR 732 835	55°59.4'N 05°38.2'W	AscX.mac, Zmar, PCer
81	12	Taynish Island Channel, Loch Sween	NR 726 827	55°59.0'N 05°38.7'W	F, Fserr.T
81	13	Linne Mhuirich rapids N, Loch Sween	NR 723 823	55°58.7'N 05°39.0'W	LMX, SLR
81	14	Linne Mhuirich rapids S, Loch Sween	NR 724 826	55°58.9'N 05°38.9'W	SLR
81	15	Taynish shore, Loch Sween	NR 721 830	55°59.1'N 05°39.2'W	Zmar, PCer, LMX, Lan, SLR
81	16	Tighavullin, Loch Sween	NR 731 853	56°00.4'N 05°38.4'W	Zmar, MacAre.Mare, MytX, Lsac
81	17	An Grianan, Loch Sween	NR 713 821	55°58.6'N 05°39.9'W	A12, IMU, Zmol
81	18	Port Linne Mhuirich, Loch Sween	NR 719 821	55°58.6'N 05°39.3'W	F, LMS, Ldig
82	1	Taynish, near Taynish Island, Loch Sween	NR 730 825	55°58.9'N 05°38.3'W	
98	1	N shore Linne Mhuirich rapids, Loch Sween	NR 723 827	55°58.9'N 05°39.0'W	FserX.T, YG, Fserr, Ver.Ver, Fves, Asc.Asc, Lsac.Ft, Pel
98	2	S shore Linne Mhuirich rapids, Loch Sween	NR 723 825	55°58.8'N 05°39.0'W	Fserr.VS, Cod
98	3	Taynish channel, Loch Sween	NR 726 828	55°59.0'N 05°38.7'W	AscX.mac, Ver.Ver, Pel, Fspi, Asc.Asc, Lsac.Ft
98	4	W Taynish shore, Loch Sween	NR 723 833	55°59.3'N 05°39.0'W	FvesX, Zmar, Pel
98	5	Taynish Point, Loch Sween	NR 718 828	55°59.0'N 05°39.5'W	Mrl, Lsac.T, Zmar
98	7	E Caol Scotnish narrows, Loch Sween	NR 762 887	56°02.3'N 05°35.5'W	Mrl, MrlMx, Lsac.T, LsacX
98	8	W Caol Scotnish rapids, Loch Sween	NR 756 879	56°01.8'N 05°36.0'W	Lsac.T, YG, Pel, Ver.Ver, Fves, Fspi, Asc.VS, NVC SM13
98	10	W Faery Isles, Loch Sween	NR 765 883	56°02.1'N 05°35.2'W	Ver.Ver, Fspi, Pel, Asc.Asc, Lsac.Ft, FserX
98	11	E Faery Isles, Loch Sween	NR 766 883	56°02.1'N 05°35.1'W	YG, Ver.Ver, Pel, Fves, Fspi, Asc.Asc, Lsac.Ft
98	12	Head of Linne Mhuirich, Loch Sween	NR 734 859	56°00.7'N 05°38.1'W	FX, FvesX, Zmar, Ver.Ver, Fves, Fspi, SM13, Pel
98	13	Opposite Tighavullin, Loch Sween	NR 731 853	56°00.4'N 05°38.4'W	G, YG, Pel, Ver.Ver, Fves, Fspi, Asc.Asc, Lsac.Ft
98	14	Island off Dun Mhuirich, Loch Sween	NR 725 845	55°59.9'N 05°38.9'W	YG, Ver.Ver, Pel, Fspi, Asc.Asc, Lsac.Ft
98	15	S of Kilmory, Loch Sween	NR 720 834	55°59.3'N 05°39.3'W	YG, Ver.Ver, Lsac.Ft, Fspi, Asc.Asc
98	40	S of Sròn Bheith, Loch Sween	NR 749 862	56°00.9'N 05°36.7'W	L, Asc.Asc, Lsac.Ldig, Ver.B, Fserr
99	1	Ceann an t-Sailein, Loch Sween	NR 700 796	55°57.3'N 05°41.0'W	Zmar, LMU, Oph, PCer, Asc.Asc, Fserr.VS
99	2	Rubha Bhreatanish, Loch Sween	NR 706 796	55°57.3'N 05°40.5'W	F
99	3	S Linne Mhuirich rapids, Loch Sween	NR 727 815	55°58.4'N 05°38.5'W	FX
99	4	N Linne Mhuirich rapids, Loch Sween	NR 723 827	55°59.0'N 05°39.0'W	FX

**Littoral sites – continued**

<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
99	5	Sill, Linne Mhuirich Rapids, Loch Sween	NR 725 822	55°58.7'N 05°38.8'W	MrlMx, Lsac.Ft
99	6	Taynish Shore, Linne Mhuirich, Loch Sween	NR 721 830	55°59.1'N 05°39.2'W	AscX, Lsac.Ldig, Pel, FserX
99	7	Tighavullin, Loch Sween	NR 731 854	56°00.4'N 05°38.3'W	Zmar, Fspi, Fserr, Asc.Asc, Pel
99	A	Rubha na Cille (south), Loch Sween	NR 681 790	55°56.9'N 05°42.8'W	Cor, MytB, Ala.Ldig
99	B	Rubha na Cille North, Loch Sween	NR 681 790	55°56.9'N 05°42.8'W	ELR
99	C	Loch na Cille (chapel), Loch Sween	NR 693 803	55°57.6'N 05°41.7'W	Fspi, Ldig.Ldig.Bo, Pel
99	D	Rubha na Garbhaird, Loch Sween	NR 700 805	55°57.7'N 05°41.1'W	Fves, Lsac.Ldig, Fserr, Asc, Pel
99	E	Loch na Cille (Head), Loch Sween	NR 700 808	55°57.9'N 05°41.1'W	PCer, Znol, FserX
99	F	Loch na Cille (Lagoon), Loch Sween	NR 703 802	55°57.6'N 05°40.8'W	LMS, Fserr
99	G	Port nan Gallan, Loch Sween	NR 693 797	55°57.3'N 05°41.6'W	
99	H	Limekiln, Loch Sween	NR 691 795	55°57.2'N 05°41.9'W	Asc.Asc, Fser.Fser.Bo, Pel
99	I	Liath Eilean Channel, Loch Sween	NR 687 784	55°56.6'N 05°42.1'W	F, Ldig, Lsac
99	J	Eilean nan Uan, Loch Sween	NR 685 776	55°56.1'N 05°42.4'W	F, MytB, Ala.Ldig
99	K	Eilean nan Uan Bay, Loch Sween	NR 687 778	55°56.3'N 05°42.1'W	PCer, Asc.Asc, Pel
99	L	Ceann an t-Sailein (mouth), Loch Sween	NR 710 805	55°57.8'N 05°40.1'W	F, L, Ldig
99	M	Ceann an t-Sailein (North Bay), Loch Sween	NR 709 805	55°57.8'N 05°40.2'W	F, PCer, LMX
99	N	Port Liath, Loch Sween	NR 698 757	55°55.2'N 05°40.9'W	Zmar, Asc, Fser
99	O	Doide Point, Loch Sween	NR 701 764	55°55.5'N 05°40.8'W	F, L, Ala.Ldig
99	Q	Kilbride, Loch Sween	NR 723 801	55°57.6'N 05°38.8'W	Fves, Fspi, Fserr, Asc, Pel
99	S	Inverlussa Sands, Loch Sween	NR 778 873		
265	34	Linne Mhuirich rapids, Loch Sween	NR 724 824	55°58.8'N 05°38.9'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>
46	17	Narrows, Linne Mhuirich Rapids, Loch Sween	NR 723 826	55°58.9'N 05°39.0'W	Phy.R, Mrl, Lsac.T, Lsac.T
46	18	Third wall, Linne Mhuirich Rapids, Loch Sween	NR 721 827	55°59.0'N 05°39.1'W	Phy.R, Mrl, Lsac.T, Lsac.T
46	19	W spit, Linne Mhuirich rapids, Loch Sween	NR 718 827	55°59.0'N 05°39.4'W	Phy.R, Mrl, Oph, Lsac.T, Lsac.TX, Zmar
46	20	Linne Mhuirich Rapids, Loch Sween	NR 720 827	55°58.9'N 05°39.3'W	Phy.R, Mrl, Lsac.T, Lsac.T, Lhyp.TPt
46	21	E end, Linne Mhuirich rapids, Loch Sween	NR 724 826	55°58.9'N 05°38.8'W	Phy.R, Lsac.T, Oph, Lsac.TX
46	25	N of quarry, Linne Mhuirich, Loch Sween	NR 732 857	56°00.6'N 05°38.3'W	Zmar, PhiVir, Ser, Ost
46	26	Quarry, Linne Mhuirich, Loch Sween	NR 731 854	56°00.4'N 05°38.4'W	Zmar, PhiVir, Ser
46	27	S of Tighavullin, Linne Mhuirich, Loch Sween	NR 729 848	56°00.1'N 05°38.5'W	Zmar, Ser
46	28	Deep hole, Linne Mhuirich, Loch Sween	NR 719 832	55°59.2'N 05°39.4'W	Beg
46	29	W of deep hole, Linne Mhuirich, Loch Sween	NR 719 832	55°59.2'N 05°39.4'W	Zmar, IMU, Beg
46	30	E of deep hole, Linne Mhuirich, Loch Sween	NR 722 831	55°59.2'N 05°39.1'W	AreSyn, PhiVir
46	32	Caol Scottish Narrows, Loch Sween	NR 760 883	56°02.1'N 05°35.7'W	FaSwV, Lsac.T, Zmar, Lgla

<b>Sublittoral sites – continued</b>					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotores recorded</i>
46	33	North basin cliff, Caol Scotnish, Loch Sween	NR 768 897	56°02.8'N 05°35.0'W	FaSwV, K, PhiVir
46	39	S of Sròn Bheith, Loch Sween	NR 750 863	56°01.0'N 05°36.6'W	AmenCio, SpMeg, K, Lsac.Ldig, Lsac, EchBriCC
50	1.1	Achnamara Arm, Loch Sween	NR 757 859	56°00.8'N 05°35.9'W	SpMeg
50	1.2	Achnamara Arm, Loch Sween	NR 758 860	56°00.9'N 05°35.8'W	Lsac.Pk
50	1.3	Achnamara Arm, Loch Sween	NR 766 860	56°00.9'N 05°35.0'W	SpMeg
50	1.4	Achnamara Arm, Loch Sween	NR 761 856	56°00.6'N 05°35.5'W	SpMeg
50	1.5	Achnamara Arm, Loch Sween	NR 766 860	56°00.8'N 05°35.0'W	LsacX, LsacX
50	1.6	Achnamara Arm, Loch Sween	NR 760 857	56°00.7'N 05°35.5'W	SpMeg
50	1.7	Achnamara Arm, Loch Sween	NR 770 861	56°01.0'N 05°34.7'W	SpMeg, SCR
50	1.8	Achnamara Arm, Loch Sween	NR 760 860	56°00.8'N 05°35.6'W	SpMeg
50	1.9	Achnamara Arm, Loch Sween	NR 765 861	56°00.9'N 05°35.1'W	IMU, Lsac.Ft
50	1.10	Achnamara Arm, Loch Sween	NR 772 865	56°01.2'N 05°34.4'W	FaMS, IMU
50	1.11	Achnamara Arm, Loch Sween	NR 775 869	56°01.4'N 05°34.2'W	IMU
50	1.12	Achnamara Arm, Loch Sween	NR 769 859	56°00.8'N 05°34.7'W	SpMeg, IMU
50	1.13	Achnamara Arm, Loch Sween	NR 771 866	56°01.2'N 05°34.6'W	SpMeg, IMU
50	2.1	Sailean Mhòr, Loch Sween	NR 762 870	56°01.4'N 05°35.4'W	SpMeg, VirOph
50	2.2	Sailean Mhòr, Loch Sween	NR 763 870	56°01.4'N 05°35.4'W	Lsac.Ft, Lsac
50	2.3	Sailean Mhòr, Loch Sween	NR 766 877	56°01.8'N 05°35.0'W	LMS
50	2.4	Sailean Mhòr, Loch Sween	NR 766 877	56°01.8'N 05°35.1'W	SpMeg
50	2.5	Sailean Mhòr, Loch Sween	NR 773 881	56°02.0'N 05°34.5'W	SpMeg
50	2.6	Sailean Mhòr, Loch Sween	NR 772 880	56°01.9'N 05°34.6'W	Lsac.Ft
50	2.7	Sailean Mhòr, Loch Sween	NR 767 875	56°01.7'N 05°35.0'W	SpMeg, PhiVir
50	2.8	Sailean Mhòr, Loch Sween	NR 778 887	56°02.3'N 05°34.0'W	SpMeg
50	2.9	Sailean Mhòr, Loch Sween	NR 755 866	56°01.2'N 05°36.0'W	SpMeg
50	3.1	Sailean Mhòr, Loch Sween	NR 757 870	56°01.4'N 05°35.9'W	XKScrR
50	3.2	Loch Craiglin, Loch Sween	NR 770 878	56°01.8'N 05°34.7'W	Zmar, Beg
50	3.3	Caol Scotnish, Loch Sween	NR 754 876	56°01.7'N 05°36.3'W	Oph, Cod, Phy
50	3.4	Caol Scotnish, Loch Sween	NR 765 891	56°02.5'N 05°35.2'W	SpMeg, FaMS
50	3.5	Loch Craiglin, Loch Sween	NR 773 880	56°01.9'N 05°34.5'W	Zmar, FiG, Beg
50	4.1	Outer Loch Sween	NR 687 760	55°55.3'N 05°42.1'W	Flu.SerHyd
50	4.2	Outer Loch Sween/MacCormaig Isles	NR 685 771	55°55.9'N 05°42.3'W	Lhyp.Ft
50	5.1	Upper Loch Sween	NR 748 868	56°01.3'N 05°36.8'W	SpMeg
50	5.2	Upper Loch Sween	NR 751 866	56°01.2'N 05°36.5'W	FaSwV, IMS, Lsac.Ft, Ldig, SLR
50	5.3	Middle, Loch Sween	NR 751 859	56°00.8'N 05°36.5'W	SpMeg
50	5.4	Middle, Loch Sween	NR 755 858	56°00.7'N 05°36.1'W	Oph
50	5.5	Middle, Loch Sween	NR 736 833	55°59.3'N 05°37.8'W	SpMeg
50	5.6	Middle, Loch Sween	NR 742 830	55°59.2'N 05°37.2'W	AmenCio, Oph
50	5.7	Middle, Loch Sween	NR 711 799	55°57.4'N 05°40.0'W	SpMeg, PhiVir
50	5.8	Middle, Loch Sween	NR 721 805	55°57.8'N 05°39.1'W	PhiVir
50	5.9	Middle, Loch Sween	NR 729 817	55°58.5'N 05°38.4'W	SpMeg
50	5.10	Middle, Loch Sween	NR 725 817	55°58.5'N 05°38.8'W	Lsac.Ft
50	5.11	Middle, Loch Sween	NR 713 805	55°57.8'N 05°39.8'W	CMS, FaAIC
50	6.1	Outer Loch Sween	NR 701 719	55°53.1'N 05°40.6'W	XKScrR
50	6.3	Outer Loch Sween	NR 700 717	55°53.0'N 05°40.6'W	VirOph, VirOph.HAS
50	6.6	Outer Loch Sween	NR 695 768	55°55.7'N 05°41.4'W	XKScrR
50	6.7	Middle Loch Sween, opposite Castle Sween	NR 708 788	55°56.9'N 05°40.1'W	VirOph, VirOph.HAS
50	6.8	Middle Loch Sween, opposite Castle Sween	NR 705 788	55°56.8'N 05°40.5'W	IMS
50	6.10	The outer sill, Loch Sween	NR 692 759	55°55.2'N 05°41.5'W	FaMX, LsacX
50	8.1	Head of Linne Mhuirich, Loch Sween	NR 732 858	56°00.7'N 05°38.2'W	Zmar, LMX



## Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
50	8.2	Linne Mhuirich, N of oyster farm, Loch Sween	NR 731 853	56°00.4'N 05°38.4'W	IR/CR
50	8.3	Linne Mhuirich, Loch Sween	NR 730 851	56°00.3'N 05°38.4'W	Ser
50	8.4	Linne Mhuirich, Loch Sween	NR 726 844	55°59.9'N 05°38.8'W	Zmar
50	8.5	Linne Mhuirich, Loch Sween	NR 720 831	55°59.2'N 05°39.3'W	IMU, Lsac.Ft, PhiVir
50	8.6	Linne Mhuirich, Loch Sween	NR 721 835	55°59.4'N 05°39.2'W	SIR, LsacX, Zmar
50	8.7	Linne Mhuirich, Loch Sween	NR 723 827	55°59.0'N 05°39.0'W	PhiVir, LsacX
50	8.8	Linne Mhuirich, between 8/2 and 8/3, E side, Loch Sween	NR 731 852	56°00.3'N 05°38.3'W	Ser
50	9.1	Linne Mhuirich Rapids, Loch Sween	NR 723 826	55°58.9'N 05°39.0'W	Mrl, Lsac.Tx, Zmar
50	10.1	Eilean nan Leac, Loch Sween	NR 690 758	55°55.1'N 05°41.8'W	CGS, EcorEns, FaAIC, Lhyp.Ft, LhypGz.Pk, Ala
50	10.2	Taynish, Loch Sween	NR 736 841	55°59.8'N 05°37.8'W	SpMeg, LR, SCR, SLR, EchBriCC, Lsac
50	10.3	Taynish, north, Loch Sween	NR 749 861	56°00.8'N 05°36.7'W	SCR, CMX, EchBriCC, Lsac.Ft, SLR, LsacX
50	12.1	Caol Scotnish, head, Loch Sween	NR 772 900	56°03.1'N 05°34.7'W	PhiVir, SLR
50	12.2	Caol Scotnish, opposite Gallchoille in middle, Loch Sween	NR 769 898	56°02.9'N 05°34.9'W	PhiVir
50	12.3	Caol Scotnish, little cliff, Loch Sween	NR 768 896	56°02.8'N 05°34.9'W	Lsac.Ft
50	12.4	Caol Scotnish, salmon cage, Loch Sween	NR 762 886	56°02.3'N 05°35.5'W	SCR, Beg
50	12.5	Caol Scotnish, top of narrow part, Loch Sween	NR 761 884	56°02.2'N 05°35.6'W	MrlMx
50	12.6	Caol Scotnish, top of narrow part, Loch Sween	NR 762 886	56°02.3'N 05°35.5'W	Zmar
50	12.7	Caol Scotnish, opposite Scotnish House, Loch Sween	NR 759 883	56°02.1'N 05°35.8'W	MrlMx
50	12.8	Caol Scotnish, between boat house and rocks, Loch Sween	NR 755 878	56°01.8'N 05°36.1'W	Phy.R, MrlMx
50	12.9	Caol Scotnish, near mouth, Loch Sween	NR 752 874	56°01.6'N 05°36.4'W	LsacX
50	12.10	Caol Scotnish, mouth, Loch Sween	NR 751 871	56°01.4'N 05°36.5'W	LMU, LR
50	12.11	Caol Scotnish, Loch Sween	NR 747 868	56°01.3'N 05°36.9'W	SS
50	13.1	Castle Sween, Loch Sween	NR 711 790	55°56.9'N 05°39.9'W	Ldig, XKScrR, EcorEns
50	13.2	Castle Sween, end of caravan park, Loch Sween	NR 716 794	55°57.2'N 05°39.5'W	Zmar, EcorEns
65	1	N basin, Caol Scotnish, Loch Sween	NR 767 896	56°02.8'N 05°35.1'W	Beg
65	2	S basin, Caol Scotnish, Loch Sween	NR 765 890	56°02.5'N 05°35.3'W	SpMeg
65	3	S shore, Loch A' Bhealaich, Loch Sween	NR 746 868	56°01.2'N 05°37.0'W	SpMeg
65	4	E of Rubha Cladh Eoin, Achnamara Arm, Loch Sween	NR 765 861	56°00.9'N 05°35.1'W	SpMeg
65	5	Bay NW of Eilean Mhartan, Achnamara Arm, Loch Sween	NR 770 866	56°01.2'N 05°34.7'W	SpMeg
65	6	Opposite Eilean Mhartan, Achnamara Arm, Loch Sween	NR 771 865	56°01.1'N 05°34.6'W	SpMeg, FaMS
65	7	NE of Ashfield, Achnamara Arm, Loch Sween	NR 768 857	56°00.7'N 05°34.8'W	SpMeg
65	8	Mouth of Achnamara Arm, opposite Rubha Cladh Eoin, Loch Sween	NR 759 858	56°00.7'N 05°35.7'W	SpMeg
65	9	Around pinnacle W of Rubha na Marraidh, Sailean Mhòr, Loch Sween	NR 756 863	56°01.0'N 05°36.0'W	SpMeg
65	10	E side of Sailean Mhòr, S of Faery Isles, Loch Sween	NR 764 872	56°01.5'N 05°35.3'W	SpMeg

Sublittoral sites – continued					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
65	11	Head of Sailean Mhòr, Loch Sween	NR 776 885	56°02.2'N 05°34.2'W	SpMeg
65	12	Faery (Fairy) Isle approaches, Sailean Mhòr, Loch Sween	NR 763 877	56°01.7'N 05°35.4'W	SpMeg
65	13	Mouth of Sailean Mhòr, Loch Sween	NR 761 869	56°01.3'N 05°35.6'W	SpMeg
65	14	Centre of outer half of Achnamara Arm, Loch Sween	NR 766 859	56°00.8'N 05°35.0'W	SpMeg
65	15	E Sailean Mhòr, opposite Faery Isles, Loch Sween	NR 769 877	56°01.8'N 05°34.8'W	SpMeg
98	7	E Caol Scotnish narrows, Loch Sween	NR 762 887	56°02.3'N 05°35.5'W	Mrl, MrlMx, Lsac.T, LsacX
98	13	Opposite Tighavullin, Loch Sween	NR 731 853	56°00.4'N 05°38.4'W	G, YG, Pel, Ver.Ver, Fves, Fspi, Asc.Asc, Lsac.Ft
98	14	Island off Dun Mhuirich, Loch Sween	NR 725 845	55°59.9'N 05°38.9'W	YG, Ver.Ver, Pel, Fspi, Asc.Asc, Lsac.Ft
98	15	S of Kilmory, Loch Sween	NR 720 834	55°59.3'N 05°39.3'W	YG, Ver.Ver, Fspi, Lsac.Ft, Asc.Asc
267	1	E end, Linne Mhuirich rapids, Loch Sween	NR 724 826	55°58.9'N 05°38.9'W	Tra
267	2	W spit, Linne Mhuirich rapids, Loch Sween	NR 718 827	55°58.9'N 05°39.5'W	
267	3	W of Sgeir an Fheoir, Loch Sween	NR 723 825	55°58.8'N 05°39.0'W	Lhyp.Ft
267	4	S Linne Mhuirich, Loch Sween	NR 717 830	55°59.1'N 05°39.6'W	Zmar, IMU, Lsac.Ft, LsacX
267	5	N Linne Mhuirich, Loch Sween	NR 725 845	55°59.9'N 05°38.9'W	
267	6	NE of Castle Sween, Loch Sween	NR 715 793	55°57.1'N 05°39.6'W	SpMeg, Zmar, IMU, PhiVir, PolFur
267	7	N basin cliff, Caol Scotnish, Loch Sween	NR 768 897	56°02.8'N 05°35.0'W	IMU, Lsac.Ft, Oph
267	8	S basin, Caol Scotnish, Loch Sween	NR 765 890	56°02.5'N 05°35.3'W	SpMeg
267	9	Rock N of narrows, Caol Scotnish, Loch Sween	NR 762 885	56°02.2'N 05°35.5'W	Cod
267	11	S of Oib Rocks, Loch a' Bhealaich, Loch Sween	NR 749 867	56°01.2'N 05°36.7'W	Aasp, SpMeg, FaSwV, SCR, IMU, Lsac.Ft
267	12	W of Oib Rocks, Loch a' Bhealaich, Loch Sween	NR 748 868	56°01.2'N 05°36.8'W	SpMeg, KR, Lsac.Ft, SubSoAs
267	13	Entrance to Caol Scotnish, Loch Sween	NR 752 872	56°01.4'N 05°36.4'W	CR, IMU, Lsac.Ft, IR, LsacX
267	14	S end, Caol Scotnish narrows, Loch Sween	NR 756 877	56°01.7'N 05°36.1'W	Mrl, MrlMx, Lsac.Ft
267	15	Sgeir Bun an Locha, Loch Sween approaches	NR 695 771	55°55.9'N 05°41.4'W	Lhyp.Ft
267	16	W of Rubha na Marraidh, Loch Sween	NR 758 862	56°00.9'N 05°35.8'W	SpMeg, Lsac.Ft, Lsac.Pk, EchBriCC, Lsac
267	17	Pinnacle, Rubha na Marraidh, Loch Sween	NR 757 863	56°01.0'N 05°35.9'W	AmenCio, Lsac.Ft, Pcri, Lsac.Pk
267	18	E entrance, Port Lunna, Achnamara Arm, Loch Sween	NR 760 861	56°00.9'N 05°35.6'W	Lsac.Ft, Lsac
267	20	NE Port Lunna, Achnamara Arm, Loch Sween	NR 762 865	56°01.1'N 05°35.4'W	SIR, SpMeg
267	21	SW Port Lunna, Achnamara Arm, Loch Sween	NR 761 862	56°00.9'N 05°35.5'W	IMX, Lsac.Ft
267	22	Entrance to Port Lunna, Achnamara arm, Loch Sween	NR 759 861	56°00.9'N 05°35.7'W	Lsac.Pk
267	24	Entrance, Loch na Cille, Loch Sween approaches	NR 684 787	55°56.7'N 05°42.5'W	FaMx, LsacX
267	25	E of entrance, Loch na Cille, Loch Sween approaches	NR 686 786	55°56.6'N 05°42.3'W	FaSwV, IMX, XKScrR, Lsac

## Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
267	28	W of deep hole, Loch na Cille, Loch Sween	NR 685 794	55°57.1'N 05°42.5'W	LsacX, Tra
267	29	Deep hole, Loch na Cille, Loch Sween	NR 687 794	55°57.1'N 05°42.3'W	SpMeg
267	30	E of deep hole, Loch na Cille, Loch Sween	NR 689 792	55°57.0'N 05°42.1'W	LsacX, Lsac.Ft, LhypGz.Ft
267	31	S Limekiln, Loch na Cille, Loch Sween	NR 692 796	55°57.2'N 05°41.8'W	Lhyp.Ft, LsacX
267	32	Opposite S Limekiln, Loch Sween	NR 686 797	55°57.2'N 05°42.3'W	LhypLsac.Ft
267	33	Limekiln jetty, Loch na Cille, Loch Sween	NR 693 797	55°57.2'N 05°41.7'W	LsacX
267	35	Keillbeg jetty, Loch na Cille, Loch Sween	NR 694 803	55°57.6'N 05°41.6'W	PhiVir
267	36	E of Keillbeg jetty, Loch na Cille, Loch Sween	NR 697 804	55°57.6'N 05°41.4'W	SS, Lsac.Ft
267	37	Top of Loch na Cille, Loch Sween	NR 699 804	55°57.6'N 05°41.2'W	IGS
267	38	SW of Rubha na Marraidh, Achnamara Arm, Loch Sween	NR 756 859	56°00.8'N 05°36.0'W	SpMeg
267	39	S of Rubha na Marraidh, Achnamara Arm, Loch Sween	NR 758 858	56°00.7'N 05°35.8'W	SpMeg
267	40	S entrance to Achnamara Arm, Loch Sween	NR 760 860	56°00.8'N 05°35.6'W	CMX, SubSoAs, LsacX, Tra
267	41	N entrance to Achnamara Arm, Loch Sween	NR 760 860	56°00.8'N 05°35.6'W	CMX, SubSoAs, Lsac.Pk
267	42	N of Ashfield, Achnamara Arm, Loch Sween	NR 764 855	56°00.6'N 05°35.2'W	IMX, CMX, PolFur, LsacX
267	43	N of Ashfield, Achnamara Arm, Loch Sween	NR 764 856	56°00.6'N 05°35.2'W	CMX
267	44	N of Ashfield, Achnamara Arm, Loch Sween	NR 764 857	56°00.7'N 05°35.2'W	SpMeg
267	45	N of Ashfield, Achnamara Arm, Loch Sween	NR 764 858	56°00.7'N 05°35.2'W	SpMeg
267	46	N of Ashfield, Achnamara Arm, Loch Sween	NR 764 859	56°00.8'N 05°35.2'W	SpMeg
267	47	N of Ashfield, Achnamara Arm, Loch Sween	NR 764 861	56°00.9'N 05°35.2'W	VirOph.HAs, FaSwV, Lsac.Ft, Lsac
267	48	Head of basin, Achnamara Arm, Loch Sween	NR 768 861	56°00.9'N 05°34.8'W	SpMeg
267	49	Head of basin, Achnamara Arm, Loch Sween	NR 767 862	56°01.0'N 05°34.9'W	SpMeg
267	50	SE Sgeirean a' Mhàin, Loch Sween	NR 725 815	55°58.3'N 05°38.7'W	CMX, Lsac.Ft, Lsac
267	51	NW Sgeirean a' Mhàin, Loch Sween	NR 724 815	55°58.3'N 05°38.8'W	VirOph.HAs, IMX, Lsac.Ft
267	52	SW Sgeirean a' Mhàin, Loch Sween	NR 724 814	55°58.2'N 05°38.8'W	Lhyp
267	53	Pinnacle, Sgeirean a' Mhàin, Loch Sween	NR 725 816	55°58.4'N 05°38.7'W	SpMeg, FaSwV, Oph, KswMx, Verticals ??
267	54	Sgeir nan Ron, Loch Sween	NR 732 815	55°58.3'N 05°38.1'W	FaMx, CMX, Oph, Cod, Tra
267	55	Rubh' an Tacair, Loch Sween	NR 736 820	55°58.6'N 05°37.7'W	SpMeg, IMS, Cod, Lsac.Pk
267	56	Cala, Eilean Loain, Loch Sween	NR 752 855	56°00.5'N 05°36.3'W	FaSwV, FaAIC, Lsac.Ft
267	57	N Eilean Loain Channel, Loch Sween	NR 757 855	56°00.5'N 05°35.9'W	CMX, Tra
267	58	Eilean Loain Channel, Loch Sween	NR 756 852	56°00.4'N 05°35.9'W	Tra
267	59	Tayvallich entrance, Loch a' Bhealaich, Loch Sween	NR 745 870	56°01.3'N 05°37.1'W	SpMeg, Lsac.Ft, LsacX
267	60	Loch a' Bhealaich, Loch Sween	NR 747 867	56°01.2'N 05°36.9'W	SpMeg, Lsac.Ft, LsacX
267	61	SW Tayvallich entrance, Loch a' Bhealaich, Loch Sween	NR 743 868	56°01.2'N 05°37.3'W	IMU



Sublittoral sites – continued					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
267	62	S of quay, Tayvallich, Loch a' Bhealaich, Loch Sween	NR 745 869	56°01.3'N 05°37.1'W	IMU
267	63	Off Tayvallich Quay, Loch a' Bhealaich, Loch Sween	NR 744 873	56°01.5'N 05°37.2'W	PhiVir
267	64	Loch na Cille, Loch Sween	NR 690 798	55°57.3'N 05°42.0'W	IMX
267	65	Loch na Cille, Loch Sween	NR 687 796	55°57.2'N 05°42.3'W	SpMeg
267	66	Loch na Cille, Loch Sween *	NR 684 790	55°56.8'N 05°42.5'W	CMX
267	67	Loch na Cille, Loch Sween	NR 684 790	55°56.8'N 05°42.5'W	IMS
267	68	S Rubha na Cille (inshore), Loch Sween approaches	NR 682 789	55°56.8'N 05°42.7'W	CR
267	75	Castle Sween to Boulder, Loch Sween	NR 712 790	55°56.9'N 05°39.9'W	VirOph, Lsac.Pk
267	76	Sill E of Danna na Cloiche, Loch Sween	NR 707 777	55°56.2'N 05°40.3'W	FaMx, VsenMtru, ModHo, LsacSac
267	77	Sill at Sgeir an Duin, Loch Sween	NR 724 803	55°57.7'N 05°38.8'W	SpMeg
267	78	Channel at Sgeir Bun an Locha, Loch Sween	NR 698 767	55°55.6'N 05°41.1'W	VirOph
267	80	W Eilean nan Uan, Loch Sween approaches	NR 684 777	55°56.1'N 05°42.5'W	Phy.R, Lhyp.Ft, LhypGz.Ft, XKScrR
267	81	E of Eilean nan Uan, Loch Sween approaches	NR 687 775	55°56.0'N 05°42.2'W	XKScrR
267	82	SW of Rubha na Maraich, Loch Sween approaches	NR 690 770	55°55.8'N 05°41.9'W	XKScrR
267	83	S of Rubha na Maraich, Loch Sween approaches	NR 693 770	55°55.8'N 05°41.6'W	Phy.R, XKScrR
267	84	SE of Sgeir Dhonncha, Loch Sween approaches	NR 689 768	55°55.7'N 05°41.9'W	LsacX
267	85	SE of Sgeir Dhonncha, Loch Sween approaches	NR 689 768	55°55.7'N 05°41.9'W	CMX
267	86	Entrance to loch, Loch Sween approaches	NR 692 764	55°55.5'N 05°41.6'W	CR
267	87	Entrance to loch, Loch Sween approaches	NR 695 765	55°55.5'N 05°41.4'W	CMX
267	88	Entrance to loch, Loch Sween approaches	NR 694 760	55°55.3'N 05°41.4'W	VirOph
267	89	W of Rubha na Maraich, Loch Sween approaches	NR 692 771	55°55.8'N 05°41.7'W	FaMx, LsacX
267	90	S of Rubha na Maraich (inshore), Loch Sween approaches	NR 694 770	55°55.8'N 05°41.5'W	IMX
267	91	Entrance to loch, Loch Sween approaches	NR 696 765	55°55.5'N 05°41.3'W	VirOph
267	92	Sill at Danna Island, Loch Sween	NR 704 775	55°56.1'N 05°40.5'W	IMX
267	93	Sill at Danna Island, Loch Sween	NR 700 777	55°56.2'N 05°40.9'W	CMS
267	94	Sill at Danna Island, Loch Sween	NR 702 776	55°56.1'N 05°40.7'W	FaMx, IMX
267	95	Castle Sween, Loch Sween	NR 708 788	55°56.8'N 05°40.2'W	FaMx, CMX
267	96	Castle Sween, Loch Sween.	NR 709 787	55°56.8'N 05°40.1'W	VirOph.HAs
267	97	SE of Sgeir Dhonncha, Loch Sween approaches	NR 687 767	55°55.6'N 05°42.1'W	XKScrR, LhypGz.Ft, LsacX
267	98	NW of Eilean nan Leac, Loch Sween approaches	NR 687 756	55°55.0'N 05°42.1'W	LhypR.Ft, LsacSac, Lsac.T, LsacX
267	99	E of entrance, Loch Sween approaches	NR 699 764	55°55.5'N 05°41.0'W	VirOph, VirOph.HAs, LsacX
267	100	SE of Sgeir Bun an Locha, Loch Sween approaches	NR 695 769	55°55.7'N 05°41.4'W	LsacX, Tra, FaMx, XKScrR, LhypGz.Ft, LsacX
267	101	Entrance to loch, Loch Sween approaches	NR 697 760	55°55.3'N 05°41.1'W	Phy.R, Lsac.T, XKScrR, ScupHyd
267	102	Channel, SE Sgeirean a' Mhàin, Loch Sween	NR 724 815	55°58.3'N 05°38.8'W	SpMeg, CMS
267	103	Channel, NW Sgeirean a' Mhàin, Loch Sween	NR 724 815	55°58.3'N 05°38.8'W	SpMeg, VirOph

## Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
267	104	S Channel, Taynish Island, Loch Sween	NR 724 824	55°58.8'N 05°38.9'W	Phy.R, Lsac
267	110	Inshore Sgeir Dhonncha, Loch Sween approaches	NR 686 767	55°55.6'N 05°42.2'W	ByH
267	113	Offshore Eilean nan Leac, Loch Sween approaches	NR 689 758	55°55.1'N 05°41.9'W	CMX
267	114	Entrance sill, Loch Sween approaches	NR 693 763	55°55.4'N 05°41.5'W	ByH
267	115	Off Sgeir Bun an Locha, Loch Sween	NR 697 771	55°55.9'N 05°41.2'W	FaMx, CMX
267	116	Danna Island, Loch Sween	NR 702 780	55°56.4'N 05°40.8'W	FaMx, CMX, ScupHyd
267	117	N channel & Taynish Island, Loch Sween	NR 729 831	55°59.2'N 05°38.4'W	SpMeg, LsacX, Tra
267	118	Channel, Daltot, Loch Sween	NR 742 848	56°00.1'N 05°37.3'W	SpMeg, CMX
267	119	Channel, Sròn Bheith, Loch Sween	NR 750 861	56°00.8'N 05°36.6'W	SpMeg
267	120	Sailean Mhòr, Loch Sween	NR 767 877	56°01.8'N 05°35.0'W	FaMS, CMU
267	121	Sailean Mhòr, Loch Sween	NR 766 875	56°01.6'N 05°35.1'W	SpMeg, FaMS
267	122	E of Rubha' an Oib, Loch Sween	NR 762 871	56°01.4'N 05°35.5'W	FaMS, CMU
267	123	E of Sròn Bheith, Loch Sween	NR 755 865	56°01.1'N 05°36.1'W	SpMeg
267	124	Achnamara Arm, Loch Sween	NR 765 858	56°00.7'N 05°35.1'W	SpMeg
267	125	N Eilean Loain, Loch Sween	NR 756 860	56°00.8'N 05°36.0'W	SpMeg
267	126	Deephole, Cala, Loch Sween	NR 750 858	56°00.7'N 05°36.6'W	SpMeg
267	127	E Daltot, Loch Sween	NR 749 841	55°59.8'N 05°36.6'W	FaMS, IMS
267	128	Central Daltot, Loch Sween	NR 744 846	56°00.0'N 05°37.1'W	FaMS, CMU
267	129	W Daltot, Loch Sween	NR 740 850	56°00.2'N 05°37.5'W	IMX
267	130	SE Sgeirean a' Mhàin, Loch Sween	NR 727 813	55°58.2'N 05°38.5'W	FaMS, CMU
267	131	SE Sgeirean a' Mhàin, Loch Sween	NR 728 813	55°58.2'N 05°38.4'W	VirOph, CMU
267	132	NW Sgeirean a' Mhàin, Loch Sween	NR 722 816	55°58.3'N 05°39.0'W	FaMS, CMU
267	133	SE Sgeirean a' Mhàin, Loch Sween	NR 726 814	55°58.3'N 05°38.6'W	CMU
267	134	E of Taynish Island, Loch Sween	NR 734 827	55°59.0'N 05°37.9'W	FaMS, CMU
267	135	E of Rubha Bhreatanish, Loch Sween	NR 717 803	55°57.6'N 05°39.4'W	IMU
267	136	Fairy Isles, Sailean Mhòr, Loch Sween	NR 763 876	56°01.7'N 05°35.4'W	SpMeg, FaSwV, SCR, CMX, Lsac.Pk
267	137	Head of Sailean Mhòr, Loch Sween	NR 777 887	56°02.3'N 05°34.1'W	SpMeg, LsacX, Cod
267	138	Cala Channel, Loch Sween	NR 753 856	56°00.6'N 05°36.3'W	

Compiled by:

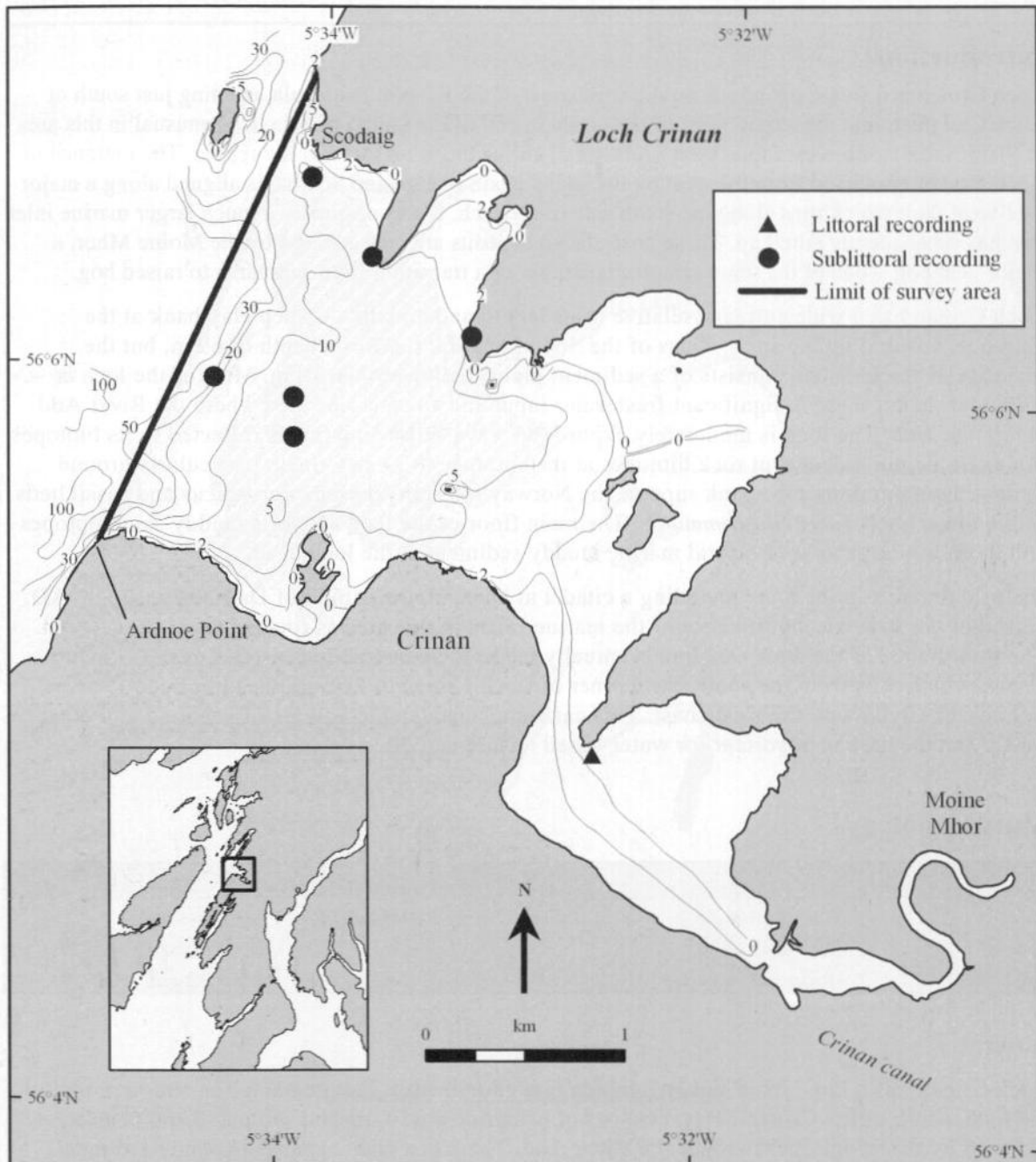
F.A. Dipper, C.M. Howson &amp; D. Steele

## 7

## Loch Crinan

## Location

<i>Position (centre)</i>	NR 785 955	56°06'N 5°33'W
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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**Physical features**

Physiographic type	Open sealoch
Length of coast	27.59 km
Length of inlet	7.1 km
Area of inlet	6.2 km <sup>2</sup> (HW)
Bathymetry	Mostly less than 10 m; 69 m at entrance
Wave exposure	Moderately exposed
Tidal streams	Negligible
Tidal range	2.1 m (springs)
Salinity	Fully marine; small estuarine area at river entrance

**Introduction**

Loch Crinan is a small, open loch on the west coast of the Kintyre Peninsula, opening just south of Loch Craignish into the strong tides of the northern end of the Sound of Jura. It is unusual in this area in that it faces north-west rather than south-west, unlike the other lochs in the region. The entrance to Loch Crinan, protected from the west by the island chain of Jura and Scarba, is aligned along a major east-west fault which runs along the south side of the loch. It was originally a much larger marine inlet that has subsequently silted up. These post-glacial deposits are now covered by the Moine Mhor, a major peat bog – one of the few examples in Britain of a transition from saltmarsh to raised bog.

Loch Crinan has a wide entrance relative to its length and no sills. A steep clay bank at the entrance, scoured by the strong tides of the Sound of Jura, reaches a depth of 69 m, but the majority of the loch bed consists of a sediment plain shallower than 10 m. Most of the loch is fully marine but there is significant freshwater input and an estuarine area where the River Add enters the loch. The loch is moderately exposed to wave action and this is reflected in its biotopes. For example, the tide-swept rock biotopes at the entrance to Loch Crinan, particularly around Ardnoe Point, and the clay bank support the Norway lobster *Nephrops norvegicus* and fossil beds of the tower shell *Turritella communis*. The main floor of the loch supports muddy sand biotopes and there is a large area of littoral marine muddy sediment at the loch head.

Historic remains in the area, including a citadel at Dunadd, the capital of Dalriada until 900 AD, highlight the strategic significance of the marine inlets in this area as routes into central Argyll. The importance of the west-east link eventually led to the construction in 1801 of the Crinan Canal, which runs from the south-east corner of Loch Crinan to Lochgilphead in Loch Fyne, linking the Clyde with the west coast. This carries a considerable volume of yachting and other traffic and the area is important for water-based leisure activities.

**Marine biology****Marine biological surveys**

	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	1	April 1976	Harvey <i>et al.</i> 1980
Sublittoral	Recording (epibiota)	6	August 1989	Howson 1990

**Littoral**

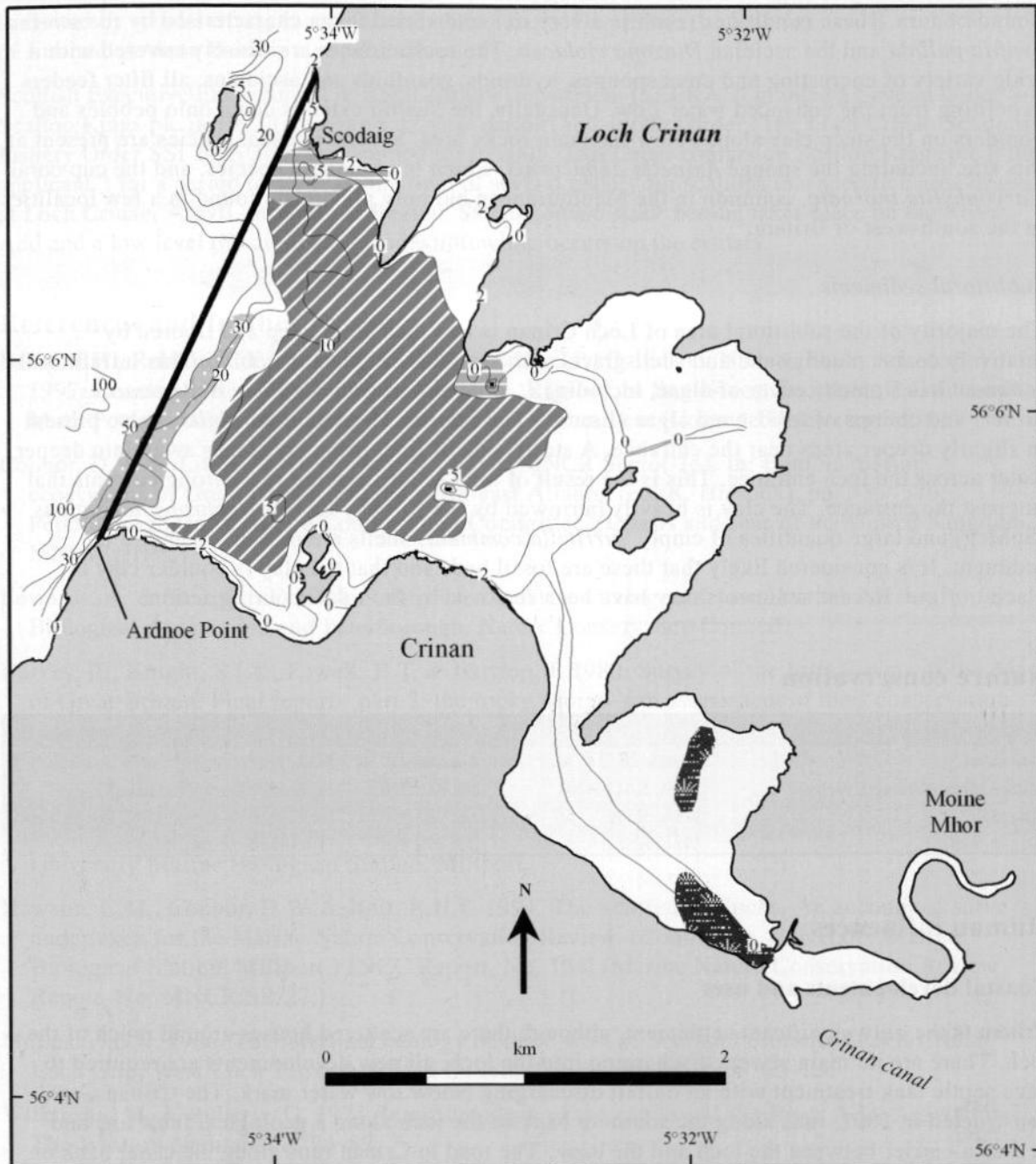
Loch Crinan has a large intertidal area which is predominantly sedimentary. The southern part of the loch, south of the Crinan Ferry, consists of estuarine mud-flats and saltmarsh and is also bisected by the winding channel of the River Add. There is a wide expanse of sandy sediment backing the eastern end of the open area of the loch. General information is available from McLusky (1986) concerning these sediments but insufficient data are available to assign biotopes. The upper estuary has fine sediments and lowered salinity and is dominated by the ragworm *Hediste diversicolor*, the amphipod *Corophium volutator*, the sabellid worm *Fabricia sabella* and oligochaete worms. The more exposed sediments of the lower estuary are predominantly sandy,

fully saline and support populations of the cockle *Cerastoderma edule*, with the lugworm *Arenicola marina*, other polychaetes and amphipods. There is an extensive area of saltmarsh at the head of the loch. Rocky shores on the headlands flanking the entrance have not been surveyed.

### Sublittoral

#### Sublittoral rock

With the exception of Ardnoe Point at the southern entrance of the loch, there are no extensive rocky slopes within this loch. The rock/sediment boundary lies at only 10 m depth at Scodaig on



**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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the north side of the entrance and is reduced to 4 to 5 m depth further into the loch. The rocky slopes are composed of a mixture of bedrock and boulders, the latter predominating near the sediment interface. A mixed kelp forest of *Laminaria hyperborea* and *Laminaria saccharina* covers the rocky areas, reflecting the moderately exposed nature of the loch (LhypLsac.Ft). The kelp is silty and there is a well-developed understorey of red algae and a sparse fauna. At Scodaig the kelp forest shows evidence of grazing, with encrusting algae predominant in the undergrowth (LhypLsac.Ft).

Steep, vertical and overhanging circalittoral rock extends from around 4 to 20 m depth at Ardnoe Point. The circalittoral communities in this area are moderately exposed to wave action, but are also influenced by strong tidal streams running past the loch entrance from the northern part of the Sound of Jura. These conditions result in a very rich and varied fauna characterised by the sea-fan *Swiftia pallida* and the ascidian *Diazona violacea*. The rock surfaces are densely covered with a wide variety of encrusting and erect sponges, hydroids, zoanthids and ascidians, all filter feeders benefiting from the enhanced water flow. Unusually, the *Swiftia* extends down onto pebbles and boulders on the steep clay slope below the main rocky area. Several unusual species are present at this site, including the sponge *Axinella damicornis*, which is a southern species, and the cup coral *Caryophyllia inornata*, common in the Mediterranean but only previously found in a few localities in the south-west of Britain.

#### Sublittoral sediments

The majority of the sublittoral area of Loch Crinan is less than 10 m deep and floored by relatively coarse muddy sand and shell-gravel with scattered pebble and cobble. This infralittoral sediment has a patchy cover of algae, including *L. saccharina*, *Chorda filum*, *Asperococcus turneri* and clumps of foliose red algae (LsacX). The sea-pen *Virgularia mirabilis* is also present in slightly deeper areas near the entrance. A steep bank of fine, firm clay slopes away into deeper water across the loch entrance. This is the result of tidal scour from the very strong currents that run past the entrance. The clay is heavily burrowed by the Norway lobster *Nephrops norvegicus* (SpMeg) and large quantities of empty *Turritella communis* shells are present on and in the sediment. It is considered likely that these are fossil beds and that the clay is boulder clay of glacial origin. Recent sediments may have been removed by the tidal scouring action.

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Moine Mhor (Crinan Estuary)	SSSI, SAC, NNR	NR 815 925	Botanical, marine botanical
Knapdale	NSA, RSA	NR 780 940	Includes area surrounding Loch Crinan
Crinan Wood	Woodland Trust site	NR 790 940	Woodland backing onto shore

## Human influences

### Coastal developments and uses

Crinan is the only significant settlement, although there are scattered houses around much of the loch. There are no main sewers discharging into the loch; all new developments are required to have septic tank treatment with an outfall discharging below low water mark. The Crinan Canal, constructed in 1801, runs along the southern bank of the loch along a geological fault line and acts as a barrier between the loch and the bank. The road to Crinan runs along the canal bank on the southern shore and there are minor roads around the head of the loch. Tourism is important here, with many visitors taking the Oban-Crinan-Lochgilphead route, and there is a harbour-side hotel at Crinan.



The southern shore of the loch is bordered by the extensive Knapdale Forest and it also lies within a National Scenic Area. Moine Mhor at the loch head is a large area of low-lying peat and wetland vegetation and is one of the few examples in Britain of a transition from saltmarsh to raised bog. The low hills of the hinterland are used for rough grazing.

### Marine developments and uses

The Crinan Canal runs along the south-eastern shore of the loch with its entrance at the village of Crinan. There is a small harbour here with a small fishing fleet, boat building and repair facilities, moorings and yacht berths. British Waterways sometimes pump seawater into the canal during the summer months when water levels are low. In addition to yachts and land-based tourists, the area is visited by wind-surfers, canoeists and scuba-divers. Divers use the loch for access to the Sound of Jura and Ardnoe Point is a popular dive site.

Scottish Executive Environment & Rural Affairs Department (SEERAD) granted a Several Order to Scallop Kings plc in 1993 (covering a 12-year period) and another order (The Loch Crinan Scallops Fishery Order SSI 2005/304) was applied for in 2005. This Order confers on Scallop Kings plc ("the applicant") for a period of 12 years the right of several fishery for scallops in a specified area of sea at Loch Crinan, Argyll, Strathclyde Region. Salmon *Salmo salar* netting takes place on the River Add and a low level of bait digging and wildfowling occurs on the estuary.

### References and further reading

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### Sites surveyed

- Survey 25: 1989 UMBSM south Argyll and west Kintyre sealochs survey (Howson 1990).  
 Survey 265: 1970–80 SMBA/MBA Great Britain littoral survey (Harvey *et al.* 1980).

<b>Littoral sites</b>					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
265	23	Crinan Ferry, Loch Crinan	NR 796 935	56°05.0'N 05°32.5'W	LS, SLR

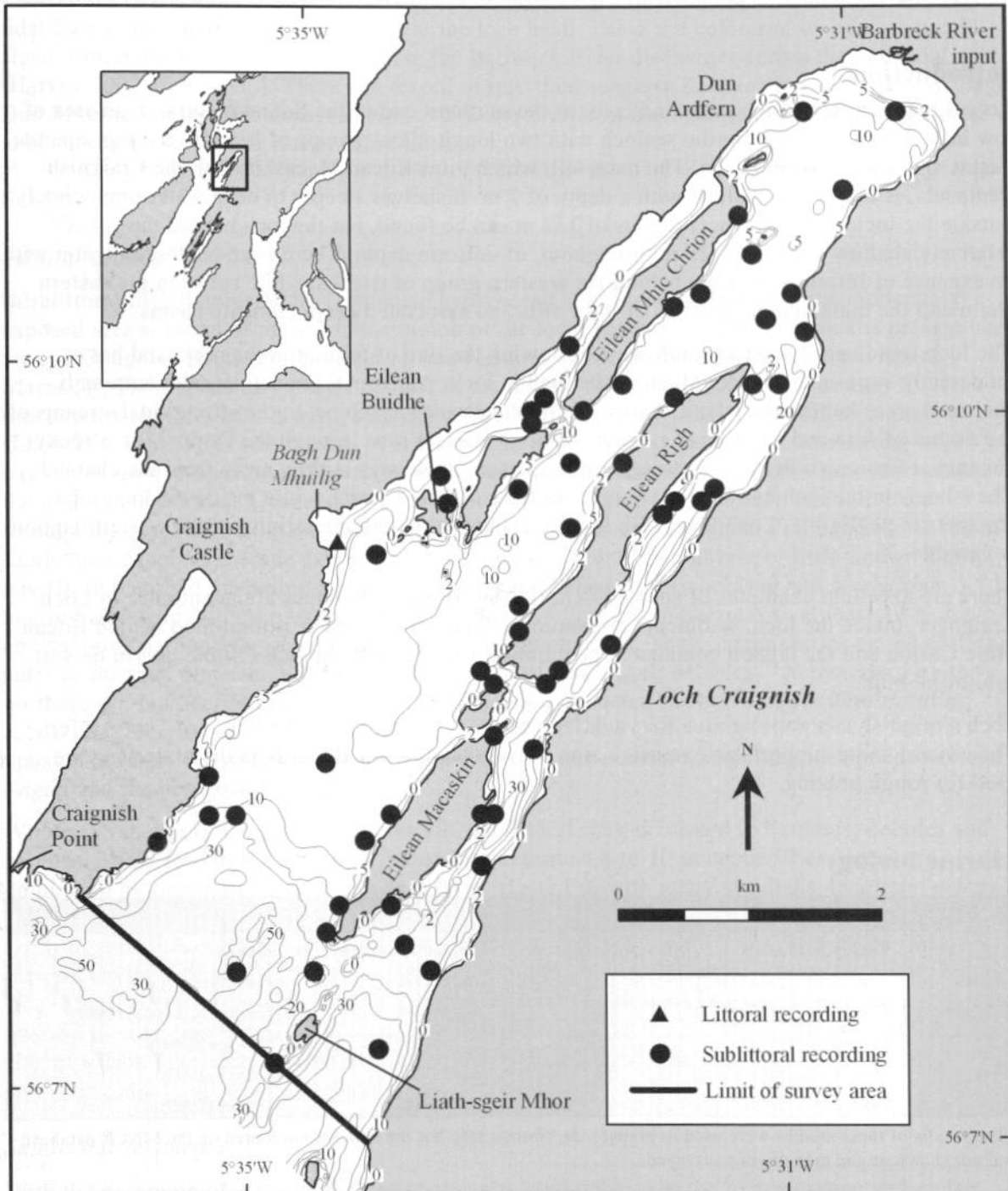
<b>Sublittoral sites</b>					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
25	34	S of Scodaig, Loch Crinan	NR 782 964	56°06.5'N 05°34.0'W	Lhyp, Lsac, LsacX, LhypLsac.Ft
25	35	S of Rubha Garbh-ard, Loch Crinan	NR 785 960	56°06.3'N 05°33.7'W	LsacX
25	36	Rubh na Moine, Loch Crinan	NR 790 956	56°06.1'N 05°33.2'W	LhypLsac.Ft, LsacX
25	37	Centre, Loch Crinan	NR 781 951	56°05.8'N 05°34.0'W	LsacX
25	38	Mouth of Loch Crinan	NR 777 954	56°05.9'N 05°34.4'W	SpMeg
25	39	Ardnoe Point, Loch Crinan	NR 781 953	56°05.9'N 05°34.0'W	SpMeg, ErSSwi

## 8

## Loch Craignish

## Location

Position (centre)	NM 790 010	56°10'N 5°33'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



**Figure 8.1** Main features of the area, showing sites surveyed.

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**Physical features**

<i>Physiographic type</i>	Fjord
<i>Length of coast</i>	48.14 km
<i>Length of inlet</i>	8.8 km
<i>Area of inlet</i>	19.5 km <sup>2</sup> (HW); 18 km <sup>2</sup> (LW)
<i>Bathymetry</i>	59.0 m (max)
<i>Wave exposure</i>	Moderately exposed to extremely sheltered
<i>Tidal streams</i>	Strong at entrance (up to 8 knots in Dorus Mor); negligible in main body of loch
<i>Tidal range</i>	2.1 m (springs)
<i>Salinity</i>	Most of loch is fully marine; variable salinity in western arm

**Introduction**

Loch Craignish lies on the mainland coast at the northern end of the Sound of Jura, in an area of low hills. It is a complex fjordic sealoch with two longitudinal groups of islands creating separate basins and a series of five sills. The main sill, which joins Eilean Macaskin with the Craignish Peninsula, is broad and shallow with a depth of 7 m. It shelves steeply to deep water immediately outside the loch entrance where depths of 112 m can be found, but the loch behind the sill is relatively shallow and, at 10–20 m throughout, of uniform depth. There is an enclosed lagoon with an expanse of littoral sediments behind the western group of islands, while between the eastern chain and the mainland are a series of three sills and associated deep, elongate basins.

The loch trends north-east to south-west, following the line of folding in the rock, and has a moderately exposed entrance. Much of the loch is sheltered from wave action, with extremely sheltered areas behind the island chains. The loch entrance is subject to the strong tidal streams of the Sound of Jura and on springs a stream of up to 8 knots runs through the Dorus Mor, a rocky channel at Craignish Point; the strength of the stream attenuates rapidly away from the channel. The islands in the loch entrance are subject to tides of 2 to 4 knots, while inside the loch tidal streams are negligible. Loch Craignish is fully marine, although the salinity in the western lagoon is variable.

There are excellent examples of species-rich, tide-swept rocky biotopes at the entrance to Loch Craignish. Inside the loch, sediments predominate. There is an area of littoral mud behind Eilean Mhic Chrion and the lagoon contains large numbers of the opisthobranch *Philine aperta* on soft sublittoral mud.

Loch Craignish is a popular area for yachting and there is a marina and harbour at Dun Ardfern. The eastern shore supports an extensive area of woodland, while the hills in the hinterland are used for rough grazing.

**Marine biology****Marine biological surveys**

	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording (epibiota)	1	April 1976	Harvey <i>et al.</i> (1980)
<i>Sublittoral</i>	Recording (epibiota)	46	September 1990	Gubbay & Loretto (1991)
	Recording (epibiota)	12	August 1989	Howson (1990)
	*Recording (drop video)	n/a	June 1998	Davies (1999)
	*Infaunal sampling (grab)	4	June 1998	Davies (1999)

\*The results of these studies were used to prepare the biotope map but the data are not stored on the MNCR database and not shown on the map of sites surveyed.

**Littoral**

Steep rocky shores are present on the headlands and islands in the loch entrance, and rocky shores occur at various other sites throughout the loch. However, there is little site-specific information

available on any of the shores within Loch Craignish. Early work on the shores of south Argyll, by Lewis and Powell (1960), indicates that rocky shores within the loch are largely fucoid-dominated. There is also a distinct gap between the upper boundary of the mid-shore fucoids and the lower limit of *Fucus spiralis*, corresponding with the top of the mid-shore *Semibalanus balanoides*. They considered this the normal situation in this and other sheltered lochs in this area. These workers also describe several sites within the loch where mid-shore populations of mussels *Mytilus edulis* occur in association with hanging curtains of the knotted wrack *Ascophyllum nodosum*.

There is an extensive area of intertidal mud between Eilean Mhic Chrion and the mainland, and tidal flats of mixed sediment and stones at the loch head. These are colonised by beds of fucoid algae, especially *Fucus ceranoides* where the Barbreck River discharges across the intertidal area (Harvey 2002, pers. com.). There is a record of intertidal seagrass *Zostera* sp. in a small bay, Bagh Dun Mhuilig, on the west coast (Davies 1999). *Zostera noltii* has been recorded on the mainland mud shores to the west of Eilean Mhic Chrion.

## Sublittoral

### *Sublittoral rock*

Infralittoral rock dominated by *Laminaria hyperborea* kelp forest is limited to the moderately exposed area seaward of the sill in the mouth of the loch. Extensive sublittoral rock is present here around Craignish Point and the chain of small islands and rocks that runs south from Eilean Macaskin. There is also a pinnacle of rock in the middle of the entrance area. The kelp forest in this outer part of the loch is particularly luxuriant with dense growths of red foliose algae (Lhyp.TFt, Lhyp.TPk) and extends to at least 20 m depth. This is the result of the strong tidal streams of up to 8 knots that flow through the narrow constriction of the Dorus Mor just outside the loch to the south of Craignish Point. Although these currents diminish in strength once through the gap, they still have some effect on the area between Craignish Point and the island of Liath-sgeir Mhor. In the tide exposed area at Craignish Point, several rare or little-known algae have been recorded, including *Desmarestia dresnayi*, *Schmitzia hiscockiana* and *Meredithia microphylla*. Circalittoral rock extends below the kelp forest in these areas to at least 40 m depth and supports particularly rich animal-dominated communities. These communities on the eastern sides of the rock pinnacle in the loch entrance and of Liath-sgeir Mhor are characterised by the northern sea-fan *Swiftia pallida*, the tunicate *Diazona violacea*, the brachiopods *Terebratulina retusa* and *Neocrania anomala* and a variety of hydroids and erect sponges (ErSSwi). Several unusual or rarely recorded species are present on the rock pinnacle, including the sponge *Mycale lingua* and the bryozoan *Caberea ellisii*.

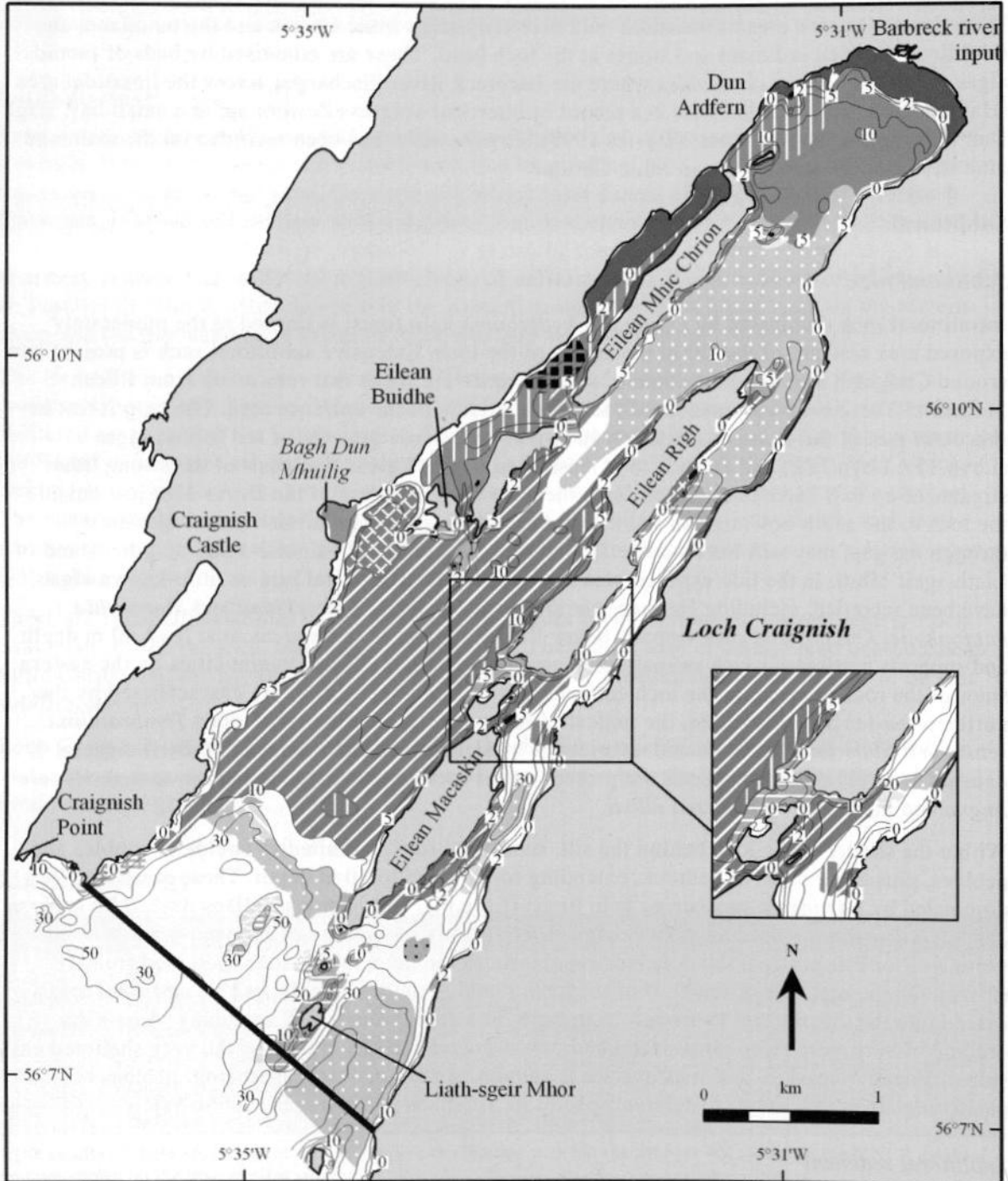
Within the shelter of the loch behind the sill, sublittoral rock is limited to boulders, cobbles and pebbles, plus a few areas of bedrock, extending to around 5 to 10 m depth. These areas are dominated by *Laminaria saccharina* kelp forest (Lsac.Ft), with many ascidians *Ascidella aspersa* and *Ascidia mentula* under the kelp canopy. There is only one record of *L. hyperborea*, off the north west of Eilean Righ; this was the 'cape' form of the kelp, with wide, undivided fronds (Lhyp). On the east side of the head of the loch, muddy boulder, cobble, pebble and shell areas extend into the circalittoral to around 15 m depth and are dominated by ascidians (Aasp). An outcrop of silty, very steep circalittoral bedrock is present off the middle of the very sheltered east side of Eilean Macaskin. The rock surface is smooth and almost bare, apart from patches of encrusting algae and a few silt-tolerant species of ascidians and sponges (SubSoAs).

### *Sublittoral sediment*

With the exception of areas of shallow coarse sand and pebbles at the loch entrance and on the sill, sediments within Loch Craignish are muddy. Very soft, black and sometimes anoxic muds fill the basin at the head of the loch and the lagoon-like channel between Eilean Mhic Chrion and the mainland. Despite the shallow depth, there are almost no algae present and the epifauna is also

rather sparse. At the head of the loch these muds support the burrowing anemone *Sagartiogeton undatus*, sparse holothurians, mainly *Leptopentacta elongata*, the opisthobranch *Philine aperta* and occasional sea-pens *Virgularia mirabilis* (PhiVir). The soft, wobbly mud behind Eilean Mhic Chrion is very similar but also supports some patchy but dense aggregations of the small burrowing holothurian *Ocnus planci* which can completely cover the mud surface (Ocn, PhiVir).

Slightly coarser muddy sands with pebbles and shell debris fill the main basin of the loch behind the sill. This extensive area is shallow, being mostly less than 10 m in depth and, in contrast to the



**Figure 8.2** Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 8.1, cited literature and additional field observations).

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shallow sediments at the loch head, supports thick growths of silt-covered algae, covering up to 70% of the sediment surface. Sugar kelp *L. saccharina* and bootlace weed *Chorda filum* are widespread, attached to pebbles and shells, along with a variety of filamentous brown and green algae and some foliose algae (LsacX). At some sites, notably along the west side of Eilean Rìgh, the predominant algae were filamentous green species forming extremely dense blankets (FiG). This is probably a seasonal phenomenon and these blankets may disappear in winter. However, they are obviously a regular phenomenon since they have been observed by different diving teams in different years. At one site near the sill a particularly dense blanket of algae was observed and this held large numbers of the small gastropod *Lacuna vincta*, the opisthobranch *Akera bullata*, a bivalve *Parvicardium* sp. and a holothurian *Leptosynapta inhaerens*. Similar mixed infralittoral sediments are also present along the eastern edge of the loch and along the edges of the main islands. In the very sheltered area between the muddy Bagh Dun Mhuilig and Eilean Buidhe, a dense bed of the red filamentous alga *Trilliella* sp. covers the mud (Tra).

Deeper circalittoral muddy sands are present in the main channel between Eilean Mhic Chrìon and the north end of Eilean Rìgh, and also in deep pockets in the channel that separates Eilean Rìgh and Eilean Macaskin from the east side of the loch. These sediments do not support a very distinctive community but at most sites the sea-pen *V. mirabilis* is present in varying numbers. The Norway lobster *Nephrops norvegicus* only occurs at some sites in small numbers, but burrows and tubes of other animals are frequent (SpMeg). Although mapped here as the biotope SpMeg (sea-pens and burrowing megafauna in circalittoral mud), these sediments appear to be somewhat intermediate between this and the shallower, sandier biotope VirOph (*V. mirabilis* and *Ophiura* spp. on circalittoral sandy or shelly mud). Deep burrowed mud with the sea-pen *Pennatula phosphorea*, as well as abundant *V. mirabilis* and *N. norvegicus*, is present in the deep water of the loch entrance on the seaward side of the sill (SpMeg).

A stable mud-plain with a high proportion of shell-gravel and empty shells covers the seabed in the narrowest northern section of the channel between Eilean Rìgh and the eastern mainland, between 10 to 20 m depth. The horse mussel *Modiolus modiolus* occurs as scattered clumps, along with numerous clumps of *Ascidiella aspersa* and *Sabella pavonina* (ModHo). The burrowing holothurians *Thyone fusus* and *Thyonidium commune* were recorded from this area in the spring of 1988. However, when the rest of the loch was surveyed in summer, these species were not recorded and it may be that these holothurians are seasonal, disappearing later in the summer.

Areas of coarse infralittoral sand with shell fragments and pebbles are present on the eastern sill between the south end of Eilean Macaskin and the mainland. The area is subject to moderate tidal currents and moderate wave exposure. Pebbles and shell fragments are colonised by a variety of small filamentous and foliose red algae, including large clumps of *Scinaia turgida*, which is characteristic of this type of habitat (EphR). Boulders are also scattered throughout this habitat and provide a foothold for *L. hyperborea* and the soft coral *Alcyonium digitatum*. Sediments on the main western sill are very mixed and there is a transition between the deep circalittoral muddy sediments outside the sill and the shallow infralittoral, algal-covered sediments inside the sill.

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Craignish Point	GCR	NR 755 990	Geological
Knapdale/Melfort	RSA	???	Includes area surrounding loch

## Human influences

### Coastal developments and uses

There is a small settlement, including a holiday chalet development, and harbour on the north-west bank at Ardfern and a road with occasional houses runs close along this shore to Craignish Castle. There is no road access to the eastern shore, which is forested. SNH records this as being an area of significant coastal woodland with over 500 ha of mixed forest on the lower slopes and coniferous forest inland. There is a saltmarsh at the upper end of the loch where grazing takes place. The Barbreck River enters the loch here.

### Marine developments and uses

There is a small harbour and marina at Ardfern and there are a number of jetties, including one on Eilean Rìgh. Loch Craignish is popular with visiting yachts and there are moorings and anchorages. It is also important for a number of other water-based activities, including wind-surfing and canoeing.

There is some scallop dredging in the loch and potting for crustaceans takes place. Winkles *Littorina littorea* are collected from the shores. The loch contains a mussel farm and salmon farming also once occurred in the loch.

## References and further reading

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## Sites surveyed

Survey 25: 1989 UMBSM south Argyll and west Kintyre sealochs survey (Howson 1990).

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

Survey 284: 1990 Seasearch Loch Craignish survey (Gubbay & Loretto 1991).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
265	12	Bagh Dun Mhuilig, Loch Craignish	NM 780 016	56°09.3'N 05°34.5'W	LGS

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
25	20	S of Eilean Traighte, Loch Craignish	NM 816 049	56°11.1'N 05°31.2'W	PhiVir
25	21	E of Gleann Mhic Chrion, Loch Craignish	NM 808 035	56°10.4'N 05°31.9'W	SpMeg
25	22	SW tip of Eilean Mhic Chrion, Loch Craignish	NM 796 027	56°09.9'N 05°33.0'W	LsacX, Lsac.Ft
25	23	SW Eilean Righ, Loch Craignish	NM 791 006	56°08.8'N 05°33.3'W	Lsac.Ldig, Lsac.Ft., FiG, Beg
25	24	W of Eilean Macaskin, Loch Craignish	NR 779 999	56°08.4'N 05°34.5'W	FiG
25	25	E of Eilean Macaskin, Loch Craignish	NR 791 995	56°08.2'N 05°33.3'W	SpMeg, LsacX, SubSoAs, PhiVir, LsacX
25	26	E of Rubh an Lionaidh, Loch Craignish	NR 784 988	56°07.8'N 05°33.9'W	Lsac.T
25	28	Pinnacle in mouth of Loch Craignish	NR 772 983	56°07.5'N 05°35.1'W	ErSSwi, Lhyp.TPk
25	29	W of Liath Sgeir Bheag, Loch Craignish	NR 778 983	56°07.5'N 05°34.5'W	ErSSwi, Lhyp.TFt, Lhyp.TPk
25	30	E of Liath-sgeir Mhor, Loch Craignish	NR 783 977	56°07.2'N 05°34.0'W	SpMeg
25	31	SW of Liath-sgeir Mhor, Loch Craignish	NR 775 976	56°07.1'N 05°34.7'W	AntAsH, Oph
25	62	E of Eilean Righ, Loch Craignish	NM 805 018	56°09.5'N 05°32.1'W	ModHo
284	1	SE of Eilean Righ, Loch Craignish	NM 797 006	56°08.8'N 05°32.8'W	Aasp, Lsac.Ft, LsacX
284	2	S of Port Na Moire, Loch Craignish	NM 801 008	56°08.9'N 05°32.4'W	SpMeg, LsacX
284	3	S of Eilean Macaskin, Loch Craignish	NR 782 993	56°08.0'N 05°34.2'W	LsacX
284	4	Off Benan Ardifuir, Loch Craignish	NR 787 983	56°07.5'N 05°33.6'W	MCR, XKScrR, Lhyp
284	5	E of Eilean Dubh, Loch Craignish	NM 794 020	56°09.5'N 05°33.1'W	FiG
284	6	SE of Eilean Mhic Chrion, Loch Craignish	NM 802 028	56°10.0'N 05°32.4'W	SpMeg, Lsac
284	7	Bagh Dun Mhuilig, Loch Craignish	NM 783 015	56°09.2'N 05°34.2'W	Tra
284	8	Sgeir Dubh, Loch Craignish	NM 788 021	56°09.6'N 05°33.7'W	XKScrR, FiG, Lsac
284	9	NE of Eilean Righ, Loch Craignish	NM 812 028	56°10.0'N 05°31.4'W	SpMeg, K, LsacX
284	10	S of Port a' Bheachan, Loch Craignish	NM 808 019	56°09.5'N 05°31.8'W	CMU, ModHAs, LsacX
284	11	E of Eilean Righ, Loch Craignish	NM 806 019	56°09.5'N 05°32.0'W	VirOph
284	12	S of Eas Mor River, Loch Craignish	NM 814 028	56°10.0'N 05°31.2'W	SpMeg, CMU
284	13	Channel E of Eilean Righ, Loch Craignish	NM 809 020	56°09.6'N 05°31.7'W	K
284	14	NE of Eilean Mhic Chrion, Loch Craignish	NM 811 041	56°10.7'N 05°31.6'W	SIR, K, IMU, CMU
284	15	Rubha Dubh nan Cuilean, Loch Craignish	NM 815 035	56°10.4'N 05°31.2'W	Aasp, LsacX
284	16	NW of Dun Arnai, Loch Craignish	NM 819 043	56°10.8'N 05°30.8'W	SIR, CMU



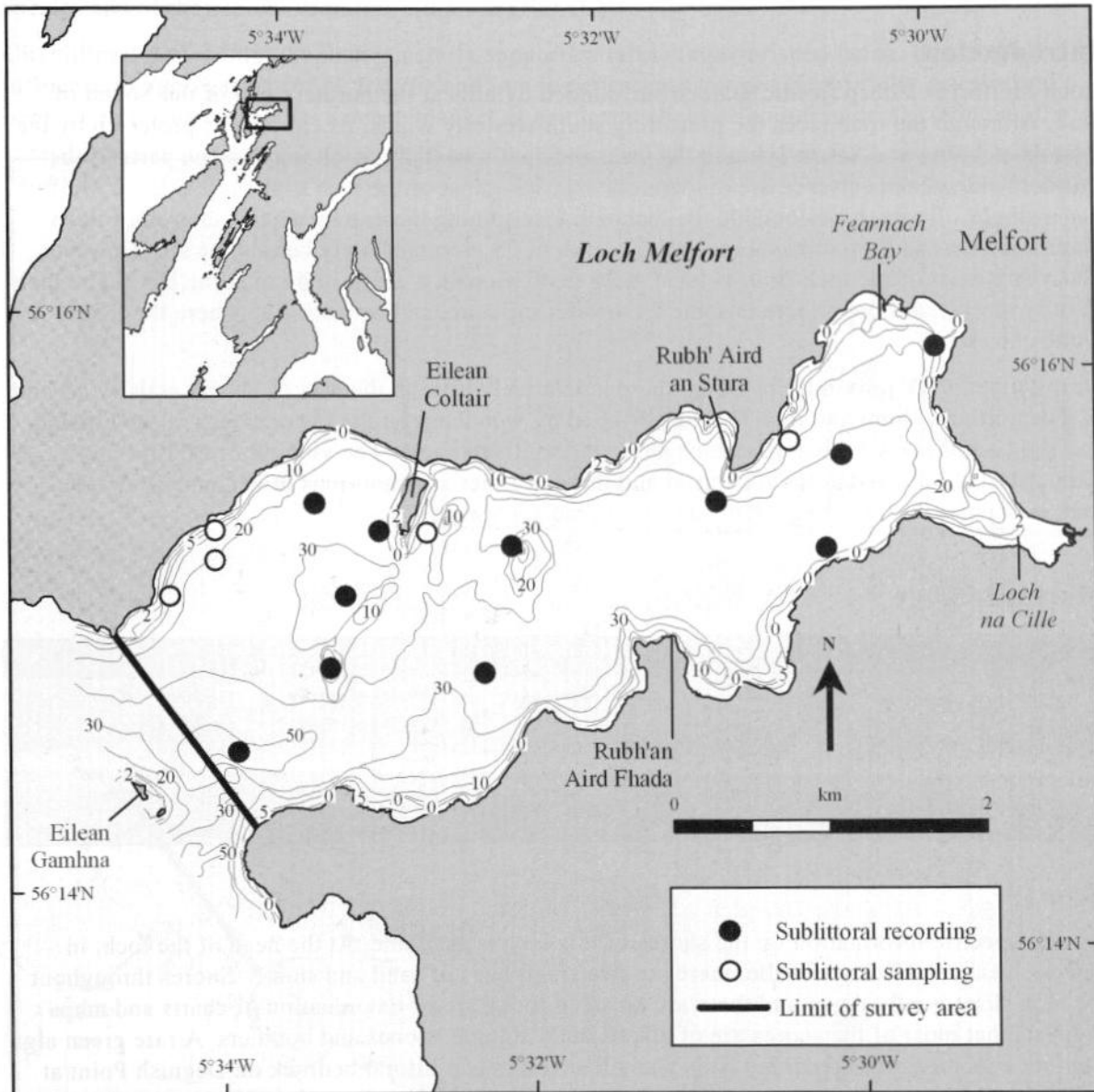
<b>Sublittoral sites – continued</b>					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
284	17	S of Barbeck River, Loch Craignish	NM 823 049	56°11.2'N 05°30.5'W	IMX, CMU
284	18	E of Druim Beithe, Loch Craignish	NR 772 995	56°08.1'N 05°35.1'W	VirOph, IGS, Lsac
284	19	Port-an-Llionaidh, Loch Craignish	NR 766 993	56°08.0'N 05°35.7'W	VirOph, LsacX
284	20	E of Druim Beithe, Loch Craignish	NR 770 995	56°08.1'N 05°35.3'W	SpMeg, IMX
284	21	S tip of Eilean Mackaski, Loch Craignish	NR 779 986	56°07.7'N 05°34.4'W	LhypLsac.Ft, LhypLsac.Pk
284	22	SW tip of Eilean Macaskin, Loch Craignish	NR 780 988	56°07.8'N 05°34.3'W	SpMeg
284	23	W of Eilean Righ, Loch Craignish	NM 802 022	56°09.7'N 05°32.4'W	LsacX
284	24	W of Eilean Macaskin, Loch Craignish	NR 784 995	56°08.2'N 05°34.0'W	IR, Ldig, LsacX
284	25	Off Am Priosan, Loch Craignish	NR 770 998	56°08.3'N 05°35.3'W	LsacX
284	26	N of Eilean nan Gabhar, Loch Craignish	NM 792 005	56°08.7'N 05°33.2'W	LsacX
284	27	S of Eilean Macaskin, Loch Craignish	NR 785 985	56°07.6'N 05°33.8'W	EphR
284	28	E of Eilean Macaskin, Loch Craignish	NR 791 991	56°08.0'N 05°33.3'W	VirOph, LsacX
284	29	E of Eilean Macaskin, Loch Craignish	NR 792 995	56°08.2'N 05°33.2'W	IMU, PhiVir, LsacX
284	30	SE of Eilean nan Gabhar, Loch Craignish	NM 795 000	56°08.5'N 05°32.9'W	PhiVir, LsacX
284	31	E of Eilean nan Gabhar, Loch Craignish	NM 794 009	56°08.9'N 05°33.1'W	IMU
284	32	SW of Eilean Righ, Loch Craignish	NM 794 011	56°09.0'N 05°33.1'W	FiG
284	33	S tip of Eilean Mhic Chrion, Loch Craignish	NM 788 018	56°09.5'N 05°33.7'W	IMX, Ocn, LsacX
284	34	N of Eilean Dubh, Loch Craignish	NM 795 025	56°09.8'N 05°33.1'W	SIR, PhiVir
284	35	Off Carranmore, Loch Craignish	NM 798 031	56°10.1'N 05°32.8'W	Ocn
284	36	Middle of lagoon, off Carranmore, Loch Craignish	NM 795 026	56°09.9'N 05°33.1'W	PhiVir, Ocn
284	37	S Rubha Dubh nan Cuilean, Loch Craignish	NM 816 032	56°10.2'N 05°31.1'W	IMU, LsacX
284	38	N of Eilean Righ, Loch Craignish	NM 813 033	56°10.3'N 05°31.4'W	SpMeg
284	39	NW Eilean Righ, Loch Craignish	NM 806 027	56°09.9'N 05°32.0'W	K, LsacX
284	40	W of Eilean Righ, Loch Craignish	NM 798 017	56°09.4'N 05°32.7'W	LsacX, FiG
284	41	Central channel, Loch Craignish	NM 798 022	56°09.6'N 05°32.8'W	SpMeg
284	42	E of Eilean Mhic Chrion, Loch Craignish	NM 806 034	56°10.3'N 05°32.0'W	K, IMU
284	43	M channel to lagoon, Loch Craignish	NM 799 026	56°09.9'N 05°32.7'W	IMU, Lsac
284	44	Sgeir Dubh, Loch Craignish	NM 812 038	56°10.5'N 05°31.5'W	SIR, Aasp, Lsac
284	45	S of Eilean Righ, Loch Craignish	NM 796 005	56°08.7'N 05°32.9'W	IGS, LsacX
284	46	N of Eilean Macaskin, Loch Craignish	NM 792 001	56°08.5'N 05°33.2'W	Zmar, IMU, LsacX

## 9

## Loch Melfort

## Location

Position (centre)	NM 810 123	56°15'N 5°33'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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**Physical features**

<i>Physiographic type</i>	Fjord with one sill
<i>Length of coast</i>	22.45 km
<i>Length of inlet</i>	6 km
<i>Area of inlet</i>	9.7 km <sup>2</sup> (HW); 9.3 km <sup>2</sup> (LW)
<i>Bathymetry</i>	73.0 m (max)
<i>Wave exposure</i>	Moderately exposed to extremely sheltered
<i>Tidal streams</i>	Negligible
<i>Tidal range</i>	Springs: 2.2 m; neaps: 0.8 m
<i>Salinity</i>	Fully marine; some freshwater influence in Fearnach Bay

**Introduction**

Loch Melfort is a deep fjordic sealoch surrounded by hills at the northern end of the Sound of Jura. Although the loch faces the prevailing south-westerly winds, its entrance is protected by the islands of Luing and Shuna lying to the west and south-west. Thus, although some parts of the northern side of the entrance are moderately exposed, most of the loch is sheltered. Loch Melfort has a single sill which lies outside the loch entrance joining the entrance headlands and Eilean Gamhna. There is a small basin reaching a depth of 73 m immediately behind the sill. However, elsewhere most of the loch floor is level at 30 to 40 m, with a depth of 46 m at the head. The loch is fully marine, although there is some freshwater influence in Fearnach Bay where the River Oude enters.

Despite the loch's proximity to Oban, there is relatively little in the way of human activity around it. The northern shore and loch head are fringed by woodland on the lower slopes of the hillside and the Campbeltown-Oban road runs along the southern shore. The villages of Melfort and Kilmelford are located at the loch head and there is a pier and moorings in Fearnach Bay. The loch is popular with visiting yachts as a sheltered anchorage.

**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)	5	September 1998	Davies (1999)
	Recording (epibiota)	2	April 1996	Survey 653
	Recording (epibiota)	8	August 1989	Howson (1990)
	Recording (epibiota)	1	September 1983	Buehr (1984)

**Littoral**

No site-specific information on the shores of this loch is available. At the head of the loch, in Fearnach Bay and Loch na Cille, there are two small bays of sand and stones. Shores throughout the loch slope gently down and there are no steep rocky areas. Examination of charts and maps suggests that most of the shores are of mixed sand, shingle, stones and boulders. A rare green alga *Codium adhaerens* was recorded from a small area of steep littoral bedrock on Degnish Point at the loch entrance in the 1960s and late 1970s (Powell 1966; Powell *et al.* 1977).

**Sublittoral***Sublittoral rock*

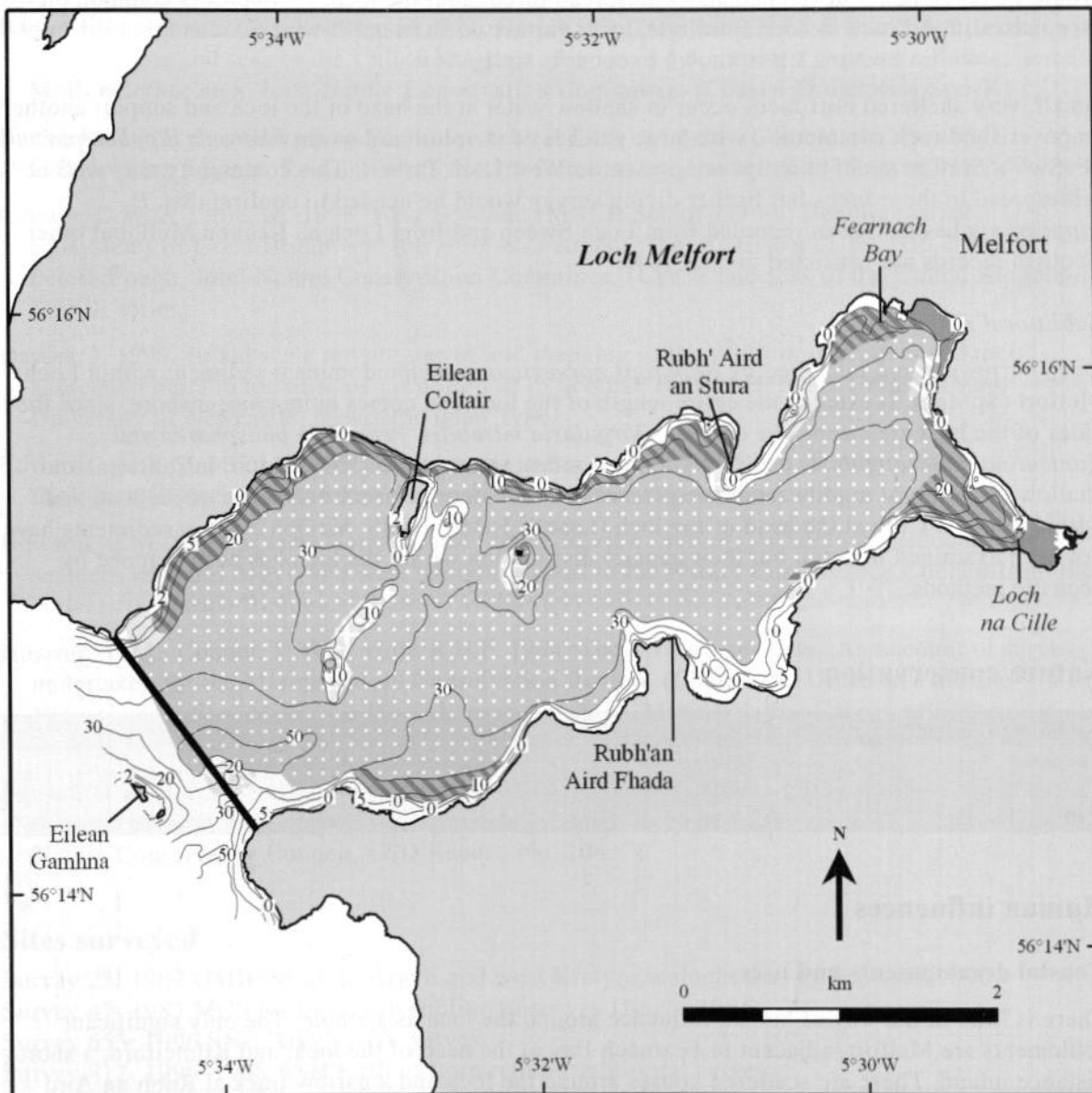
Sublittoral rock is well represented in Loch Melfort, which has steep sides and a number of isolated islands, rocks and shoals. Steep or vertical rock slopes reach depths of 30 m in the entrance, 25 m in the centre and 12 to 18 m at the head, with small outcrops frequently occurring



at greater depths. Thus, there is deep rock at the head of this loch and also in Loch Feochan, the next loch to the north. This is in contrast to Lochs Craignish, Crinan and others to the south.

Infralittoral bedrock and boulders in Loch Melfort support a kelp forest that is predominantly *Laminaria saccharina* along with the bootlace weed *Chorda filum* (Lsac.Ft), reflecting the sheltered nature of the loch. At the few sites examined, the kelp forest extends only to between 1 to 6 m depth as a result of grazing and smothering by brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, beds of which extend up from the circalittoral. The floral diversity beneath the kelp is generally quite low due to the shading effect of the canopy. However, at the head of the loch (site 9 of Howson 1990), the canopy was open, allowing the growth of other laminarian species and of the sea-oak *Halidrys siliquosa* (HalXK).

Circalittoral rock within the loch generally supports a rather impoverished fauna, due to the influence of aggregations of *O. fragilis* and to a lesser extent *O. nigra* (Oph). Silty circalittoral bedrock in the loch supports a dense blanket of brittlestars below about 5 m depth, reducing the



**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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extent of the infralittoral zone. The brittlestars effectively smother other attached organisms and greatly reduce the diversity of species when compared to similar rock in other lochs. Only encrusting algae and a few tough hydroids and tubeworms survive beneath the brittlestars. The presence of these brittlestars also gives an indication of the local water regime. As filter feeders, they normally only occur in such large numbers where there is some water movement. There are dense aggregations at Campbell Rock near the mouth and at the headland of Rubh' Aird an Stura in the inner third of the loch, where there is likely to be some water movement. Although few sites around the edges of the loch have been examined, it is possible that most of the circalittoral rock throughout the loch is dominated by this biotope. The anemone *Protanthea simplex* is found in large numbers on circalittoral bedrock and areas of mixed sediment and rock at the head of the loch, along with the tubeworm *Chaetopterus variopedatus* (NeoPro). These two species, along with the brachiopod *Neocrania anomala*, are present on circalittoral rock and areas of mixed rock and sediment at several other sites throughout the loch, often in areas where brittlestars are predominant. It is likely that without the presence of the brittlestars (Oph), this biotope (NeoPro) would be much better developed and widespread throughout the loch. *P. simplex* is common on steep circalittoral rock in deep fjordic sealochs further north in north-west Scotland, but the only other area within Sector 13 it is known to occur is Craig Aoil.

Small, very sheltered cliff faces occur in shallow water at the head of the loch and support another impoverished rock community, with large patches of the phoronid worm *Phoronis hippocrepia* (FaSwV). Similar small outcrops are present in West Loch Tarbert. This community may well be widespread in these lochs but further diving survey would be needed to confirm this. *P. hippocrepia* has also been recorded from Loch Sween and from Loch na Keal on Mull, but other Scottish records are restricted to the Clyde.

#### Sublittoral sediments

Deep burrowed mud inhabited by *Nephrops norvegicus* is the predominant sediment within Loch Melfort (SpMeg). It extends the entire length of the loch and comes quite close inshore, since the sides of the loch are steep. The sea-pens *Virgularia mirabilis*, *Pennatula phosphorea* and *Funiculina quadrangularis* occur in varying concentrations within this habitat. Infralittoral and shallow circalittoral muddy sands are present in a narrow zone around the edge of the loch and within Loch na Cille at the head of the loch (LsacX, FaMx, FaMS, VirOph). These sediments have not been examined in detail but their general distribution within the loch has been mapped by acoustic methods.

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Fearnach Bay	GCR	NM 830 140	Geological
Knapdale / Melfort	RSA		Includes area surrounding loch

## Human influences

### Coastal developments and uses

There is little in the way of human influence around the loch as a whole. The only significant settlements are Melfort, adjacent to Fearnach Bay at the head of the loch, and Kilmelford, a short distance inland. There are scattered houses around the loch and a narrow track at Rubh'an Aird Fhada leads to a series of residences. No main sewers discharge into the loch and all new developments are required to have septic tank treatment with an outfall discharging below low water mark. Kilmelford has a hydroelectric power station (2MW).

The northern shore and the head of the loch are fringed with woodland and the Campbeltown-Oban road runs along the southern shore, providing easy access to the loch. The hilly hinterland is used for rough grazing.

### Marine developments and uses

The area is popular for yachting, with a pier, moorings and Kilmelford Yacht Haven in Fearnach Bay. The loch is also used for a number of other water-based activities, including wind-surfing, canoeing and scuba-diving.

Salmon farming and mussel farming take place in the loch and there is creeling for Norway lobster *N. norvegicus* and other crustaceans. Winkles *Littorina littorea* are collected from the shores.

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### Sites surveyed

- Survey 25: 1989 UMBSM south Argyll and west Kintyre sealochs survey (Howson 1990).
- Survey 47: 1983 MCS Firth of Lorn sublittoral survey (Buehr 1984).
- Survey 653: 1996 SNH Argyll ROV survey.
- Survey 812: 1996–1998 SNH Firth of Lorn remote sublittoral survey.



<b>Sublittoral sites</b>					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
25	9	SE Fearnach Bay, Loch Melfort	NM 835 138	56°16.0'N 05°29.8'W	SpMeg, NeoPro, VirOph, FaSwV, Lsac.T, AfilEcor, Lsac.Ft, Lhyp.Ft
25	10	S of Fearnach Bay, Loch Melfort	NM 829 131	56°15.6'N 05°30.3'W	SpMeg
25	11	N of Rubh' an Tighe Loisgte Loch Melfort	NM 828 125	56°15.3'N 05°30.4'W	Aasp, LhypLsac, ModHo
25	12	SW of Rubh' Aird an Stura, Loch Melfort	NM 821 128	56°15.4'N 05°31.1'W	VirOph, NeoPro, Oph
25	13	S of Sgeir na Caillich, Loch Melfort	NM 806 117	56°14.8'N 05°32.5'W	SpMeg
25	14	Kilchoan Bay, Loch Melfort	NM 795 128	56°15.3'N 05°33.6'W	SpMeg
25	15	NE of Campbell Rock, Loch Melfort	NM 797 122	56°15.0'N 05°33.3'W	SpMeg, Oph
25	16	Shoal NE of Eilean Gamhna, Loch Melfort	NM 790 112	56°14.5'N 05°34.0'W	NeoPro, CMU, FaAIC, Oph
47	2	Eilean Coltair/Campbell Rock, Firth of Lorn	NM 799 126	56°15.3'N 05°33.2'W	
653	1	Sgeir na Cailliach, Loch Melfort, Firth of Lorn	NM 807 125	56°15.2'N 05°32.3'W	Oph, LhypLsac
653	2	Campbell Rock, Loch Melfort, Firth of Lorn	NM 796 117	56°14.8'N 05°33.4'W	Oph
812	364	Loch Melfort, Firth of Lorn	NM 785 122	56°15.0'N 05°34.5'W	FaMx
812	365	Loch Melfort, Firth of Lorn	NM 788 124	56°15.1'N 05°34.2'W	SpMeg
812	366	Loch Melfort, Firth of Lorn	NM 788 126	56°15.2'N 05°34.2'W	LsacX
812	367	Loch Melfort, Firth of Lorn	NM 802 126	56°15.3'N 05°32.9'W	SpMeg
812	368	Loch Melfort, Firth of Lorn	NM 825 131	56°15.6'N 05°30.6'W	SpMeg

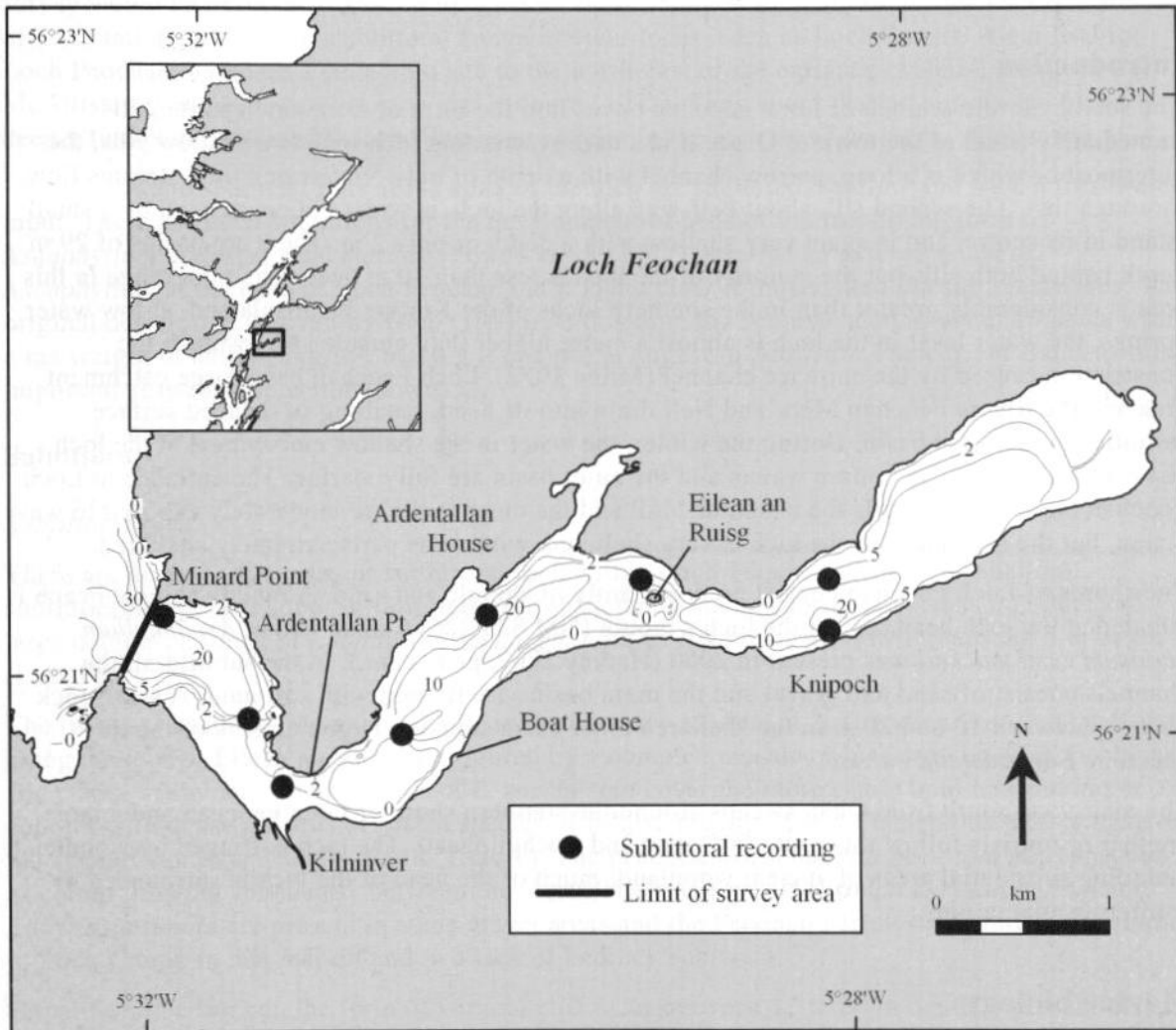
Compiled by: F.A. Dipper, C.M. Howson & D. Steele

10

## Loch Feochan

## Location

Position (centre)	NM 845 236	56°21.2'N 5°30'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)



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

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Physical features	
<i>Physiographic type</i>	Fjord with two sills
<i>Length of coast</i>	18.68 km
<i>Length of inlet</i>	6.7 km
<i>Area of inlet</i>	3.9 km <sup>2</sup> (HW); 2.7 km <sup>2</sup> (LW)
<i>Bathymetry</i>	29.0 m (max)
<i>Wave exposure</i>	Outer entrance moderately exposed; remainder of loch sheltered/extremely sheltered
<i>Tidal streams</i>	5 knots through entrance channel; 2–3 knots through inner channels
<i>Tidal range</i>	3.3 m (springs)
<i>Salinity</i>	Outer basin and bottom waters of inner basin fully marine; freshwater influence in surface waters of inner basin results in variable salinity

## Introduction

The small, fjordic sealoch of Loch Feochan opens into the Firth of Lorn amongst the hills immediately south of the town of Oban. It is a narrow, winding loch with two shallow sills, the outermost of which is a long, narrow channel with a depth of only 5 m; strong tidal streams flow thorough this. The second sill, about half-way along the loch, is wider but constricted by a small island in its centre, and is again very shallow with a depth of only 2 m. There are basins of 29 m depth behind both sills but the majority of the loch is less than 10 m deep. The tidal range in this area is considerably greater than in the southern lochs of the Kintyre Peninsula and, at low water springs, the water level in the loch is almost a metre higher than outside as a result of the constriction caused by the entrance channel (Milne 1972). Loch Feochan has a large catchment area and the Rivers Feochan Mhor and Nell drain into its head, resulting in reduced surface salinities in the inner basin. During the winter, the water in the shallow embayment at the loch head often freezes. The bottom waters and the outer basin are fully marine. The entrance to Loch Feochan faces west towards the island of Mull and the outer rocks are moderately exposed to wave action, but the remainder of the loch is very sheltered, with some parts extremely sheltered.

The shores of Loch Feochan consist predominantly of shingle and sand. A muddy shingle beach is situated at the loch head, and at the loch's mouth (NM 833 225) a small bed of *Ascophyllum nodosum* ead *mackaii* was present in 2000 (Harvey 2002, pers. com.). In the sublittoral, the channels consist of sand and gravel and the main basins are floored with soft mud. A small rock outcrop between 10 and 20 m in the sheltered inner basin supports large numbers of the tiny anemone *Edwardsiella carnea*.

The main road south from Oban sweeps around the southern shore of Loch Feochan and a large number of tourists follow this route to Crinan and Lochgilphead. The loch is fringed by woodland, including substantial areas of ancient woodland; much of the head of the loch is surrounded by coniferous plantations.

## Marine biology

Marine biological surveys				
	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Littoral</i>	*Recording (epibiota)	1	1976	Powell <i>et al.</i> (1977)
<i>Sublittoral</i>	Recording (epibiota)	8	June 1989	Howson (1990)

\*The results of this study were used to prepare the biotope map but the data are not stored on the MNCR database and not shown on the map of sites surveyed.

### Littoral

The shores in Loch Feochan have not been surveyed recently in any detail. Rocky shores are mainly confined to the north side of the entrance. There is an extensive area of shingle and mud on the south side of Ardentallan Point, which constricts the entrance channel, forming a tide-exposed narrows. There is another extensive area of sheltered muddy sediment and shingle at the



head of the loch. The remainder of the shores are low-lying boulders, cobbles, pebbles, shingle and sediment. Lewis (1957) and Lewis and Powell (1960) describe two types of shore from this loch, the first being shingle and gravel and the second, more stable boulders and rock. However, they do not provide any site-specific data. They described a typical zonation, where *Ascophyllum nodosum* on mid-shore rock changed abruptly to *Fucus serratus* on lower shore stones and then to *Laminaria saccharina* at low water level, with *Chorda filum* and large plants of *Halidrys siliquosa* in deeper water, where *Codium fragile* was found in considerable quantities. The 1989 MNCR survey did not record either *C. fragile* or *H. siliquosa* even though suitable habitats were visited. McAllister *et al.* (1967) also recorded *C. fragile*. The abundance of *C. fragile* is known to fluctuate greatly in other areas and so it may now be rare or absent in Loch Feochan. Further survey would be necessary to ascertain whether these changes are real. These three species are often found together in the sublittoral fringe in other lochs, such as Loch Sunart. Algal lists for Loch Feochan, based on a collection site to the north-east of the entrance channel, are given by McAllister *et al.* (1967) and Norton and Milburn (1972). They noted that no algae were found deeper than 9 m depth and that the dominant species in the loch was *Laminaria saccharina*.

The shingle and sediment flats at the head of the loch are sheltered, shallow and have a freshwater input. These are ideal conditions for the development of beds of the free-living form of *Ascophyllum nodosum* ead *mackaii*. Powell *et al.* (1977) describe an extensive bed of *Ascophyllum* at the head of Loch Feochan but it is not clear if they visited the site themselves. The original description is given by Gibb (1957). At this time the bed extended to about 10 acres with a net weight of about 11kg/m<sup>2</sup>, making it one of the largest in Scotland. The current status of this important seaweed bed is not known.

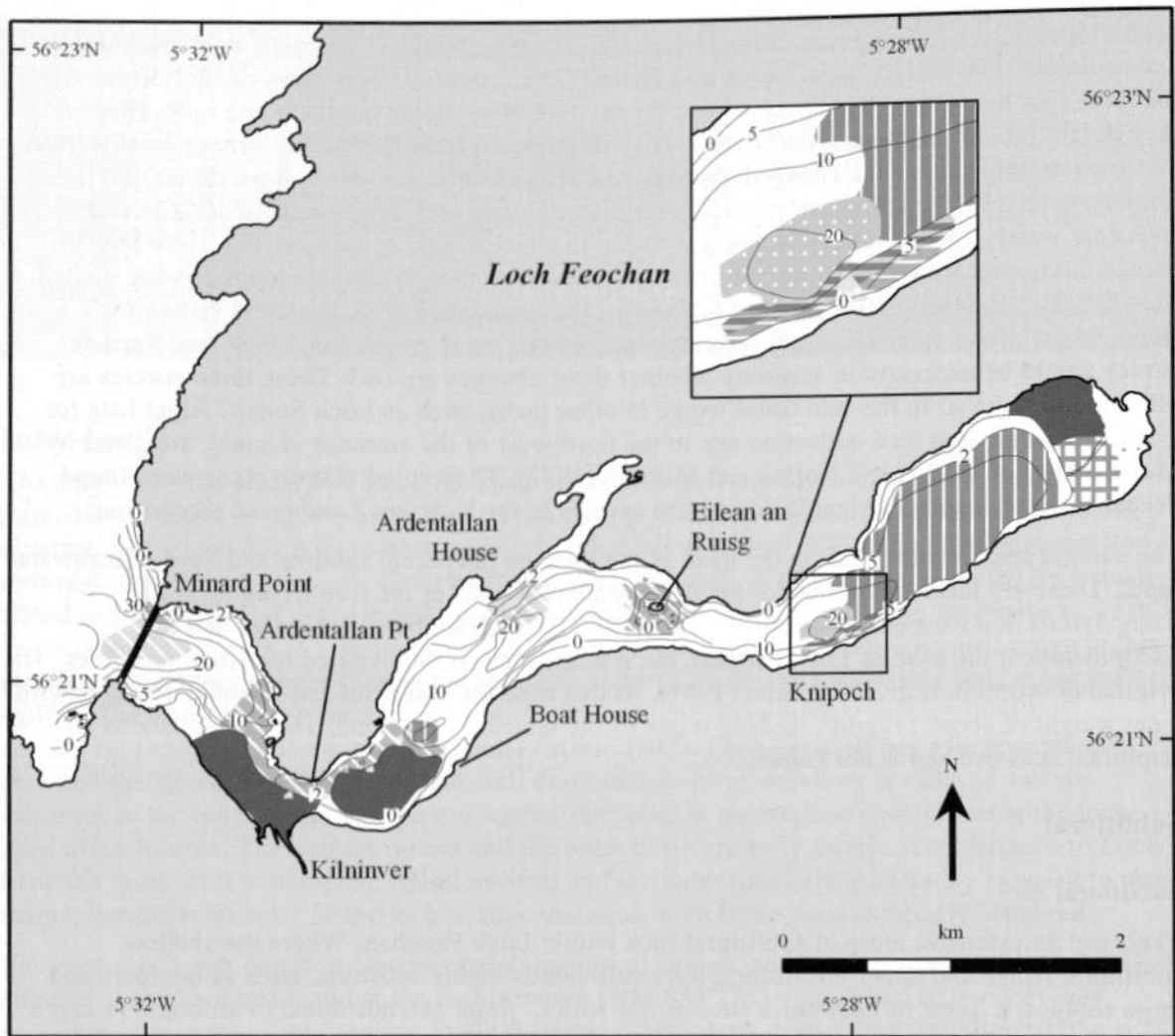
## Sublittoral

### Sublittoral rock

There are no extensive areas of sublittoral rock within Loch Feochan. Where the shallow sublittoral fringe and upper infralittoral have sufficiently stable substrata, such as boulders and large cobbles, a forest of *Laminaria saccharina* with *C. filum* extends down to around 5 m depth (Lsac.Ft).

The two very shallow, tide-exposed sills in the entrance channel at Ardentallen Point and half-way along the loch at Eilean an Ruisg are floored by a complex mosaic of boulders, cobbles, pebbles and coarse sediments. Dense stands of *L. saccharina* cover the more stable boulders and larger cobbles with dense growths of robust species of foliose red algae, and filamentous brown algae on the smaller stones and shells (SedK, Lsac.T). The peacock worm *Sabella pavonina* adds splashes of colour growing abundantly between the algae. The anemones *Halcompa chrysanthellum* and *Edwardsia timida* are present in some gravel areas and the Feochan narrows resemble those found in Loch Creran in this respect and in a lack of bedrock substrata.

Circalittoral bedrock in the form of vertical cliff faces between 12 to 20 m depth is present off Minard Point in the loch entrance. The rock is silty, heavily grazed and supports numerous ascidians *Corella parallelogramma* and *Ciona intestinalis*. The brachiopod *Neocrania anomala* is present in small crevices (AntAsH). Relatively deep circalittoral rock is also present in the inner basin of the loch just north of Knipoch. Here a small, extremely sheltered cliff face extends from 15 to 19 m depth. Crusts of barnacles, especially *Balanus crenatus*, and sponges *Polymastia mamillaris* cover extensive areas (SubSoAs). The pitted rock surface also supports a large population of the rarely recorded, tiny anemone *Edwardsiella carnea* and the anthozoan *Epizoanthus couchii* on rock overhangs, and mats of tiny sabellid worms. *E. carnea* is now known from Loch Sween, Loch Long and Loch Etive but has not been recorded with this particular association of species.



**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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#### *Sublittoral sediment*

The sheltered inner basin of the loch is filled with soft mud typical of such situations and characterised by the sea-pen *Virgularia mirabilis*, the opisthobranch mollusc *Philine aperta* and the anemone *Sagartiogeton laceratus* (PhiVir). A steep mud slope with numerous cobbles and pebbles on the surface leads down to the deepest part of this upper basin, on the south side. The horse mussel *Modiolus modiolus* is present here and live and empty shells provide a foothold for hydroids and ascidians (ModHAs). The middle basin of the loch, behind the entrance narrows, is floored by sandier sediment, with the razor shell *Ensis ensis* and the clam *Arctica islandica* (VirOph). The sand mason worm *Lanice conchilega* forms dense beds in the shallows on the north side (Lcon). An area of very soft mud opposite the Boat House, just inside this basin, has a carpet of rotting algae and the mat-like bacterium *Beggiatoa* (Beg). Sediment in the tide-exposed entrance area of the loch is muddy sand with sea-pens *V. mirabilis*, the large solitary hydroid *Corymorpha nutans* and brittlestars *Amphiura* spp. (VirOph). The mud content of the sediment in this area increases with depth.

## Nature conservation

Conservation sites			
Site name	Status	Location	Main features
North West Argyll	RSC		Regional Scenic Coast includes north side of loch entrance
Knapdale/Melfort	RSA		Includes part of south side of loch
Firth of Lorn	SAC		Includes whole of Loch Feochan

## Human influences

### Coastal developments and uses

This area is readily accessible from Oban and is well-provided with roads; thus there are houses scattered around the entire loch, with villages at Ardentallen on the north shore and Kilninver on the south. The small village of Kilmore lies about a kilometre inland from the head of the loch. There is a hotel on the southern shore and a chalet development at Cologin on the north. No main sewers discharge into the loch and all new developments are required to have septic tank treatment with an outfall discharging below low water mark.

The loch is fringed by woodland, with strips of ancient woodland along most of the loch side and coniferous plantation inland; the latter is concentrated around the head of the loch. The hilly hinterland and the saltmarsh at the head of the headloch are used for rough grazing and grazing respectively.

### Marine developments and uses

The area centred on Oban is one of the most popular in Scotland for water-based activities, particularly sailing, and yachts frequently visit Loch Feochan. There is a small marina with moorings and repair facilities at Ardentallen. As the loch is readily accessible from the road, it is commonly used for scuba-diving and other water sports including wind-surfing and canoeing.

There are salmon *Salmo salar* farms on the loch and potting for crustaceans takes place around the rocky areas of the outer loch. Winkles *Littorina littorea* are collected from the shores. The entire loch lies within the Firth of Lorn Marine Consultation Area.

## References and further reading

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### Sites surveyed

Survey 25: 1989 UMBSM south Argyll and west Kintyre sealochs survey (Howson 1990).

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
25	1	Upper loch, Loch Feochan	NM 856 237	56°21.4'N 05°28.2'W	PhiVir
25	2	NE of Knipoch, Loch Feochan	NM 856 234	56°21.2'N 05°28.2'W	SpMeg, SubSoAs, ModHAs, Lsac.Ft
25	3	N of Eilean an Ruisg, Loch Feochan	NM 845 237	56°21.3'N 05°29.3'W	Lsac.T
25	4	S of Ardentallen House, Loch Feochan	NM 836 235	56°21.2'N 05°30.1'W	VirOph, Lcon
25	5	W of boathouse, Loch Feochan	NM 831 228	56°20.8'N 05°30.6'W	Beg, LhypLsac.Pk
25	6	Ardentallen Point, Loch Feochan	NM 824 225	56°20.6'N 05°31.2'W	Lsac.T
25	7	NW of Ardentallen Point, Loch Feochan	NM 822 229	56°20.9'N 05°31.5'W	Lsac.T, LsacX

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