

Marine Nature Conservation Review

Sectors 3, 4, 12, 13 & 15

Lagoons in mainland Scotland and the Inner Hebrides

Area summaries

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1998

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Contents

Preface	5
Synopsis	7
Introduction	9
Background	9
Data collection and the classification of biotopes	9
Area summaries and their format	12
Acknowledgements	14
References	15
Area summaries - North Scotland	
1 Lochan Havurn, Loch Eriboll	17
Area summaries - East Scotland	
2 Loch Fleet lagoon	20
3 Fearn Lodge lagoon, Dornoch Firth	23
4 Alness Point lagoon, Cromarty Firth	26
5 Muirtown Basin lagoon, Inverness	29
6 South Kessock lagoon, Inverness	32
7 Barry Links lagoon, Firth of Tay	35
8 Pond Cottage lagoon, Firth of Forth	38
9 Island Farm lagoon (Skinflats), Firth of Forth	41
Area summaries - Clyde Sea	
10 Ballantrae lagoons	44
11 Dubh Loch, Loch Fyne	48
Area summaries - West Scotland	
12 Craiglin lagoon, Loch Sween	51
13 Easdale Island quarry no. 1	56
14 Easdale Island quarry no. 2	59
15 Easdale Island quarry no. 3	62
16 Easdale Island quarry no. 4	65
17 Easdale Island quarry no. 5	68
18 Easdale Island quarry no. 6	71
19 Easdale lagoon, Seil	74
20 Easdale quarry, Seil	77
21 Loch Caithlim, Seil	80
22 Leth-fhonn, Mull	83
23 Loch a' Chumhainn, Mull	86
Area summaries - North-west Scotland	
24 An t-ob, Skye	89
25 Loch na h-Airde, Skye	92
26 Pool Roag, Skye	95
27 Loch of Reiff, Enard Bay	99
28 Loch an Eisg-brachaidh lagoon, Enard Bay	102
29 Loch Roe lagoon, Lochinver	105
30 Loch Nedd lagoon, Eddrachillis Bay	108
31 Loch an Obain, Eddrachillis Bay	111
32 Loch an Roin, Loch Inchar	114
33 Loch Ceann na Saile, Loch Inchar	117

Appendix A	Biotope classification.....	120
Appendix B	Biotores present in each lagoon	124
Appendix C	Summary of physical features for each lagoon.....	129
Appendix D	Species recorded	133

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. 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 is drawing 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 includes a major field survey programme of the shores and near-shore subtidal 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.

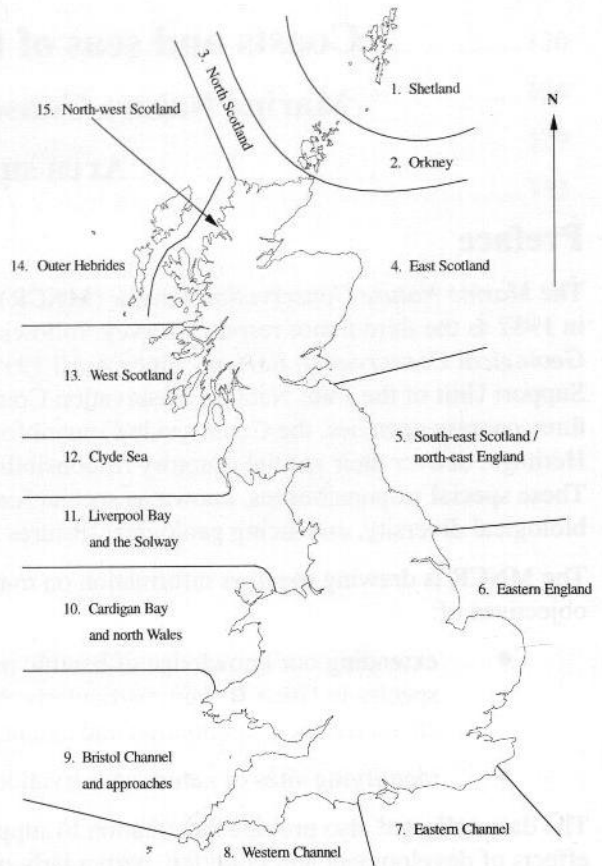
A full list of MNCR and other JNCC marine reports is available from the Marine Information Officer, JNCC. JNCC publications can be purchased from NHBS Ltd, 2-3 Wills Road, Totnes, Devon, TQ9 5XN (tel. 01803 865913; fax. 01803 865280; e-mail nhbs@nhbs.co.uk).

Dr Keith Hiscock

Joint Nature Conservation Committee

Publications in the MNCR series

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



Volumes published or near publication:

Sector	Title	Authors	Date
Foundation volumes			
1-15	Rationale and methods	Hiscock, <i>ed.</i>	1996
1-15	Benthic marine ecosystems of Great Britain and the north-east Atlantic	Hiscock, <i>ed.</i>	1998
Biotope classification			
1-15	Marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes (<i>JNCC Report, No. 229</i>)	Connor, Brazier, Hill & Northen	1997
1-15	Marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes (<i>JNCC Report, No. 230</i>)	Connor, Dalkin, Hill, Holt & Sanderson	1997
Area summaries			
1	Shetland	Howson	Due 1998
2	Orkney	Murray, Dalkin, Fortune & Begg	Due 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	Smith, Moore & Northen	Due 1998
9	Inlets in the Bristol Channel and approaches	Smith, Moore, Northen & Little	Due 1998
10	Cardigan Bay and north Wales	Brazier, Holt, Murray & Nichols	Due 1998
11	Liverpool Bay and the Solway Firth	Covey	Due 1998
1-2	Lagoons in Shetland and Orkney	Thorpe	1998
3, 4, 12, 13, 15	Lagoons in mainland Scotland and the Inner Hebrides	Covey, Fortune, Nichols & Thorpe	1998
14	Lagoons in the Outer Hebrides	Thorpe, Dalkin, Fortune & Nichols	Due 1998

Other volumes in the series are also in preparation.

Marine Nature Conservation Review

Sectors 3, 4, 12, 13 & 15

Lagoons in mainland Scotland and the Inner Hebrides

Area summaries

Synopsis

In 1993 the MNCR initiated a survey of lagoons (isolated saline water bodies) in Scotland, to provide information to support the implementation of the 1992 EC Habitats Directive and to contribute to the general MNCR survey programme. Thirty-three lagoons in mainland Scotland and the Inner Hebrides were studied as part of this programme, with field surveys undertaken in 1994 and 1995.

The studies included field surveys of the shores (if tidal) and the subtidal zone of each lagoon to describe their habitats and communities (together referred to as biotopes) and to assess their natural heritage importance. Comparable data from other organisations or previous studies have been added and the data analysed to classify the biotopes present. Information on the designated conservation sites and main human influences in the lagoons has also been compiled.

The information is presented here as 33 *area summaries*:

Sector 3 North Scotland

- 1 Lochan Havurn, Loch Eriboll

Sector 4 East Scotland

- 2 Loch Fleet lagoon
- 3 Fearn Lodge lagoon, Dornoch Firth
- 4 Alness Point lagoon, Cromarty Firth
- 5 Muirtown Basin lagoon, Inverness
- 6 South Kessock lagoon, Inverness
- 7 Barry Links lagoon, Firth of Tay
- 8 Pond Cottage lagoon, Firth of Forth
- 9 Island Farm lagoon (Skinflats), Firth of Forth

Sector 12 Clyde Sea

- 10 Ballantrae lagoons
- 11 Dubh Loch, Loch Fyne

Sector 13 West Scotland

- 12 Craiglin lagoon, Loch Sween
- 13 Easdale Island quarry no. 1
- 14 Easdale Island quarry no. 2
- 15 Easdale Island quarry no. 3

Sector 13 West Scotland (cont.)

- 16 Easdale Island quarry no. 4
- 17 Easdale Island quarry no. 5
- 18 Easdale Island quarry no. 6
- 19 Easdale lagoon, Seil
- 20 Easdale quarry, Seil
- 21 Loch Caithlim, Seil
- 22 Leth-fhonn, Mull
- 23 Loch a' Chumhainn, Mull

Sector 15 North-west Scotland

- 24 An t-ob, Skye
- 25 Loch na h-Airde, Skye
- 26 Pool Roag, Skye
- 27 Loch of Reiff, Enard Bay
- 28 Loch an Eisg-brachaidh lagoon, Enard Bay
- 29 Loch Roe lagoon, Lochinver
- 30 Loch Nedd lagoon, Eddrachillis Bay
- 31 Loch an Obain, Eddrachillis Bay
- 32 Loch an Roin, Loch Inchard
- 33 Loch Ceann na Saile, Loch Inchard

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 lagoons 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 the region (from Connor *et al.* 1997a, b) and by a list of species recorded from the surveys.

The lagoons in mainland Scotland and the Inner Hebrides vary greatly in both physical and biological character. They range from near-fully marine percolation lagoons, only 2 ha in extent, to lagoonal inlets, 54 ha in extent, with a restricted connection to the open sea and a widely varying salinity regime

(freshwater to fully marine). Although the majority of the lagoons are less than 5 m deep, the flooded quarry at Easdale is over 70 m deep. Within the 33 lagoons, a total of 47 biotopes or sub-biotopes were recorded. There were, however, relatively few biotopes present in any one lagoon. For example, only one biotope was recorded from several Easdale Island quarry lagoons but fifteen biotopes were recorded from Pool Roag, Skye. The lagoons ranged in species richness from 83 species recorded in Loch an Obain in north-west Scotland, to Easdale Island quarry no. 2 in west Scotland, where only one species was noted.

References

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- 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 coastline of mainland Scotland and the Inner Hebrides ranges widely in character, from the east coast with its large firths to the west coast which is highly dissected by a series of long, narrow sealochs. Lagoonal habitats occur throughout but vary considerably, from sediment-fringed lagoons, most common on the east coast, to the rock-bound lagoons or obs of western Scotland. All such lagoon-like habitats in mainland Scotland and the Inner Hebrides have been surveyed by the MNCR, as part of a wider study of lagoons throughout Scotland to describe their biological nature and to assess their natural heritage importance. The lagoon survey was initiated by the MNCR to provide information to support implementation of the EC Habitats Directive (1992), in which lagoons are listed as a priority habitat requiring protection.

Lagoons, for the EC Habitats Directive, are defined as "expanses of shallow coastal water, of varying salinity and water volume, separated or partially separated from the sea by sand banks or shingle, or, less frequently, by rocks" (European Commission 1996). Most lagoons in Britain have a maximum depth less than 10 m, but a large proportion are much shallower, often less than 0.5 m deep. Lagoons with basins greater than 2 or 3 m depth may have a halocline with fresher water on top and more saline water below (Barnes 1980). The water temperature in lagoons is more variable than in the adjacent sea, as it fluctuates more closely with air temperature (Barnes 1980).

Most of the lagoonal habitats in mainland Scotland and the Inner Hebrides receive their freshwater input from rainfall and run-off from the land, rather than from any large streams or rivers. The seawater enters the lagoons by a variety of means, including over tidal sills, via over-topping during storms and through percolation of shingle barriers.

In this study, five types of lagoon, adapted from Barnes (1988) and Sheader & Sheader (1989) and as defined in the SSSI guidelines (Joint Nature Conservation Committee 1996), are recognised:

- 1 Isolated saline lagoons.** Completely separated from the sea by a barrier of rock or sediment to above mean high water spring tide (MHWST) level. No seawater percolation through the barrier.
- 2 Percolation saline lagoons.** Separated from the sea by a barrier of shingle, pebbles and small boulders, through which seawater exchange takes place.
- 3 Sluiced saline lagoons.** Any lagoon where seawater exchange is modified by human interference, either by a pipeline under a road or a system of flaps or valves.
- 4 Silled saline lagoons.** Typically rocky lagoons with a sill between MHWST and mean low water spring tides (MLWST). Water exchange occurs over the sill at high water.
- 5 Saline lagoon inlets.** Lagoons with a restricted connection to the sea, where there is no sill or a sill below MLWST.

Data collection and the classification of biotopes

Lagoon sites in mainland Scotland and the Inner Hebrides were located by inspection of 1:50,000 Ordnance Survey maps, through discussion with Scottish Natural Heritage local staff and by studying existing literature and survey information. The location of the lagoons is shown in Figure 1.

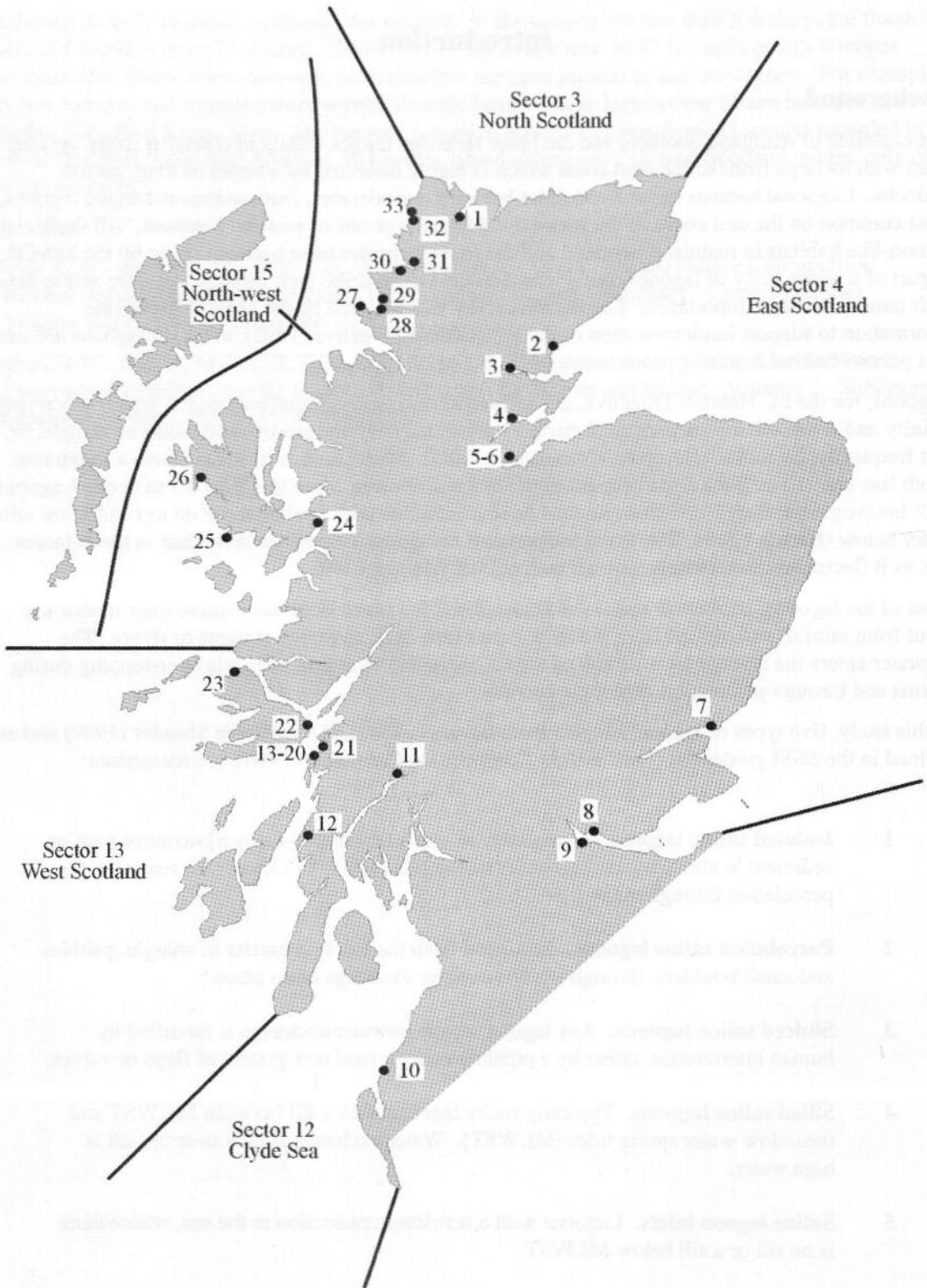


Figure 1 Location of lagoons in mainland Scotland and the Inner Hebrides.

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Field surveys of each lagoon were undertaken by the MNCR in 1994 and 1995, complementing surveys carried out previously or by other organisations. Together the data from these surveys provide a comprehensive dataset to describe the biology of lagoons in the region and to enable assessment of their natural heritage importance. A summary of these surveys is given in Table 1. Further references to other studies are given in the individual *area summary* accounts.

Table 1 Sources of field survey information

<i>MNCR database survey no.</i>	<i>Survey</i>	<i>Source</i>	<i>No. of sites surveyed</i>	<i>No. of habitats surveyed</i>
2	1988 MNCR Skye sealochs survey	Hiscock & Covey (1991)	2	4
33	1991 MNCR Loch Bracadale, Skye survey	MNCR survey	1	8
34	1991 MNCR Loch Laxford and Incharad littoral survey	Holt (1991)	6	22
50	1982 UCS Loch Sween sublittoral survey	Earl (1982)	2	2
98	1984 OPRU upper Loch Sween littoral survey	Rostron & Hiscock (1985)	1	1
447	1995 MNCR western Scotland lagoons survey	MNCR survey	10	34
450	1995 MNCR South Uist, Barra and the Inner Hebrides lagoon survey	MNCR survey	5	25
473	1994 MNCR west mainland Scotland lagoon survey	MNCR survey	7	38
474	1995 MNCR north and east mainland Scotland lagoon survey	MNCR survey	9	23
Total			43	157

Abbreviations: OPRU = Field Studies Council's Oil Pollution Research Centre; MNCR = JNCC's Marine Nature Conservation Review; UCS = Underwater Conservation Society.

During the MNCR field surveys information on the nature of each lagoon, together with its habitats and their associated communities (together referred to as biotopes) were collected. The majority of sites were surveyed by snorkelling to record the shallow sublittoral habitats present; for a few deeper lagoons, SCUBA diving methods were used to gain access to the bottom of the lagoon. Where the lagoon was tidal (usually only a very small tidal range - microtidal), the intertidal area was also examined. The full extent of the lagoon and its range of biotopes were normally surveyed, although this was not always possible. The extent of each biotope was recorded and its species composition was described. For the larger lagoons, sites within the lagoon were selected to sample the range of substrata and different environmental conditions, such as differing salinity regimes, present within the lagoon. Photographs were taken of the lagoons, and their biotopes and species, to provide a permanent visual record of the areas surveyed.

The lagoons were surveyed following standard MNCR recording and infaunal sampling techniques (Connor & Hiscock 1996). The location and physiographic characteristics of each site were recorded on a standard MNCR Site form. The physical details of each habitat and the species present were recorded on standard MNCR Habitat forms (Littoral or Sublittoral as appropriate). The conspicuous species 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 sediment habitats were taken for infaunal species identification and granulometric analysis. Six 0.0032 m² (6.4 cm diameter) core samples were taken for infaunal analysis. These were combined and sieved over a 0.5 mm mesh sieve. Material retained on the sieve was preserved in seawater-formalin for subsequent identification and enumeration of the species present. A separate sediment sample was taken for particle size analysis.

The salinity of the lagoon was measured using an Atago hand refractometer, taking readings at various sites in the larger lagoons. Where salinity measurements were not taken the salinity regime was estimated, based on the species composition of the habitats present.

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

The species data from the surveys were analysed, in conjunction with their associated habitat data, to identify which biotopes, as defined in the MNCR national biotope classification (Connor *et al.* 1997a, b), were present in the dataset. Multivariate analytical techniques, including TWINSpan and DECORANA, were employed to facilitate the identification of distinct assemblages of species within the dataset, using the procedures given in Mills (1994). Data from 43 sites (157 different habitat records) from lagoons in mainland Scotland and the Inner Hebrides were used in the analyses, resulting in the identification of 47 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 the lagoons.

Appendix C summarises the physical features of each of the lagoons. Species recorded from the surveys listed in Table 1 are given in Appendix D.

Area summaries and their format

Each of the 33 lagoons is described in a standard *area summary* format:

Sector 3 North Scotland

- 1 Lochan Havurn, Loch Eriboll

Sector 4 East Scotland

- 2 Loch Fleet lagoon
- 3 Fearn Lodge lagoon, Dornoch Firth
- 4 Alness Point lagoon, Cromarty Firth
- 5 Muirtown Basin lagoon, Inverness
- 6 South Kessock lagoon, Inverness
- 7 Barry Links lagoon, Firth of Tay
- 8 Pond Cottage lagoon, Firth of Forth
- 9 Island Farm lagoon (Skinflats), Firth of Forth

Sector 12 Clyde Sea

- 10 Ballantrae lagoons
- 11 Dubh Loch, Loch Fyne

Sector 13 West Scotland

- 12 Craiglin lagoon, Loch Sween
- 13 Easdale Island quarry no. 1
- 14 Easdale Island quarry no. 2
- 15 Easdale Island quarry no. 3

Sector 13 West Scotland (cont.)

- 16 Easdale Island quarry no. 4
- 17 Easdale Island quarry no. 5
- 18 Easdale Island quarry no. 6
- 19 Easdale lagoon, Seil
- 20 Easdale quarry, Seil
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- 23 Loch a' Chumhainn, Mull

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- 30 Loch Nedd lagoon, Eddrachillis Bay
- 31 Loch an Obain, Eddrachillis Bay
- 32 Loch an Roin, Loch Inchard
- 33 Loch Ceann na Saile, Loch Inchard

Each *area summary* contains the following sections:

Location

The geographic location is given as the central latitude/longitude position and Ordnance Survey grid reference, together with the local government administrative area and the relevant nature conservation agency (Scottish Natural Heritage), its region and local area office. A map shows the location of the lagoon, including the limit of the area considered by the *area summary*.

Marine biological surveys

Marine biological surveys of the shores and sublittoral zone are listed to include the survey type (littoral/sublittoral), survey method, date of survey and reference source (in the case of recent MNCR surveys, MNCR database survey number).

Introduction

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

Physical features

<i>Physiographic type</i>	As defined in Joint Nature Conservation Committee (1996) and outlined above.
<i>Area of lagoon</i>	Measured, to the nearest hectare, from the relevant 1:50,000 Ordnance Survey (Landranger series) map.
<i>Maximum length of lagoon</i>	Measured from the relevant 1:50,000 Ordnance Survey (Landranger series) map.
<i>Bathymetry</i>	The maximum depth below loch datum (the lowest water level in the lagoon at low tide), as measured or estimated during the survey. Admiralty charts and the literature added further information in some cases.
<i>Wave exposure</i>	Taken from field observations, as defined in Connor & Hiscock (1996).
<i>Tidal streams</i>	Taken from field observations, as defined in Connor & Hiscock (1996).
<i>Tidal range</i>	Maximum range, as measured or estimated during the survey.
<i>Salinity</i>	In parts per thousand, either as measured at the time of survey or in available literature or, where stated as estimated, based on species present and their known salinity tolerances; categories as in Connor & Hiscock (1996). It is likely that the salinity varies considerably both seasonally and annually at some sites; the readings taken on a single visit may not therefore fully reflect salinity conditions at the site.

Marine biology

The biological nature of the lagoon is described, based primarily on the findings of the most recent MNCR survey but with reference to previous studies where appropriate. The heights and depths noted in the text are corrected to lowest tide level (loch datum). As some lagoonal habitats may be subject to wide variation in their salinity regime, their biological nature may fluctuate markedly with time. Reference to the biotopes and species present, the substratum and other physical characteristics of the lagoon is therefore made in the past tense as findings at the time of survey. The biotope codes given in parentheses are from the MNCR national classification, as listed in Appendix A and a summary of the biotopes present within each lagoon is presented in Appendix B. Species nomenclature follows Howson & Picton (1997); that for lichens follows Purvis *et al.* (1992) and that for higher plants follows Stace (1991).

A map illustrates the distribution of the main biotopes within the lagoon; some mapped areas represent more than one biotope. **NOTE:** This map gives 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 and cited literature. In some areas data are sparse and additional data or more comprehensive survey would enable more accurate maps to be drawn.

Nature conservation

A summary of statutory and non-statutory wildlife and landscape conservation designations is given (from Barne *et al.* 1996, 1997a, b, c), where further information on the types of designation can be found).

Key to site designations relevant to the lagoons in this volume:

NNR	National Nature Reserve
MCA	Marine Consultation Area
NSA	National Scenic Area
Ramsar	Ramsar site
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

Human influences

This section describes the main uses and activities of the area, including urbanisation, industrial or commercial activities that have (or potentially have) an impact on the lagoon. These can include sewage discharges, development, spoil dumping, artificial damming or culverting and recreation.

References and further reading

This lists cited references and other relevant literature.

Acknowledgements

The MNCR field surveys relied heavily on the surveyors, who had to walk several miles to survey some of the sites. The following contributed to the MNCR surveys (JNCC unless otherwise stated):

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1

Lochan Havurn, Loch Eriboll

Location

<i>Position (centre)</i>	58° 26.9'N 04° 44.8'W	NC 397 544
<i>Administrative area</i>	Highland	
<i>Conservation agency/area</i>	Scottish Natural Heritage	North West (Caithness and Sutherland)

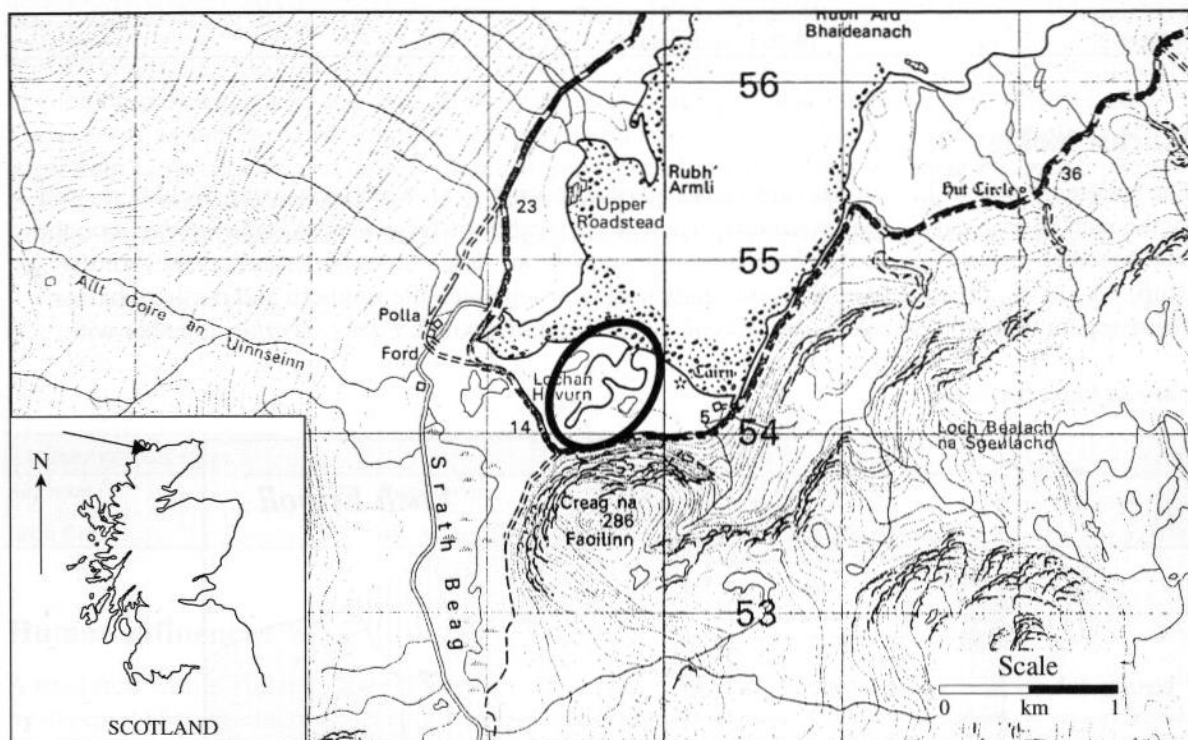


Figure 1.1 Location of the lagoon.

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Marine biological surveys

<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i> Recording	May 1994	MNCR survey 474

Introduction

Lochan Havurn lies at the head of Loch Eriboll, separated from the Loch at high tide level by a substantial shingle spit which is 150 m long. The lagoon comprises two brackish-water basins separated by a 50 m long cobble and pebble sill, through which water drains in response to changes in the water level of either basin.

The southern basin is small, being about 100 m in length with a maximum depth of about 0.2 m. The northern basin is larger and deeper than the southern basin, being about 250 m in length with a maximum depth of 3 m. The salinity was estimated to be between 18 and 30 ‰ at the time of survey, with water exchange between the lagoon and Loch Eriboll occurring during high tides. The salinity is also influenced by substantial freshwater input from a large stream to the west of the lagoon which

flows into the head of Loch Eriboll, and by land drainage from the adjacent moorland and peat bog. Both lagoons are ultra sheltered from wave action and are little influenced by tidal currents.

Physical features

Physiographic type	Silled saline lagoon
Area of lagoon	9 ha (including shingle spit)
Maximum length of lagoon	0.55 km (including shingle spit)
Bathymetry	Maximum depth 3 m (northern basin); 0.2 m (southern basin)
Wave exposure	Ultra sheltered
Tidal streams	Weak
Tidal range	Northern basin 1 m; southern basin 0.1 m
Salinity	18-30 ‰ (estimated)

Marine biology

The southern basin of Lochan Havurn consisted of soft peaty mud, which was extensively burrowed by the mud shrimp *Corophium volutator*. There were patches of tasselweed *Ruppia maritima* on the mud together with the green alga *Enteromorpha* sp., various filamentous algae and mysid shrimps (Rup). A sill of pebbles and cobbles on sandy sediment separated the southern and northern basins. This supported bladder wrack *Fucus vesiculosus* and serrated wrack *Fucus serratus*, together with isolated plants of sugar kelp *Laminaria saccharina*, sea oak *Halidrys siliquosa* and bootlace weed *Chorda filum* (FChoG).

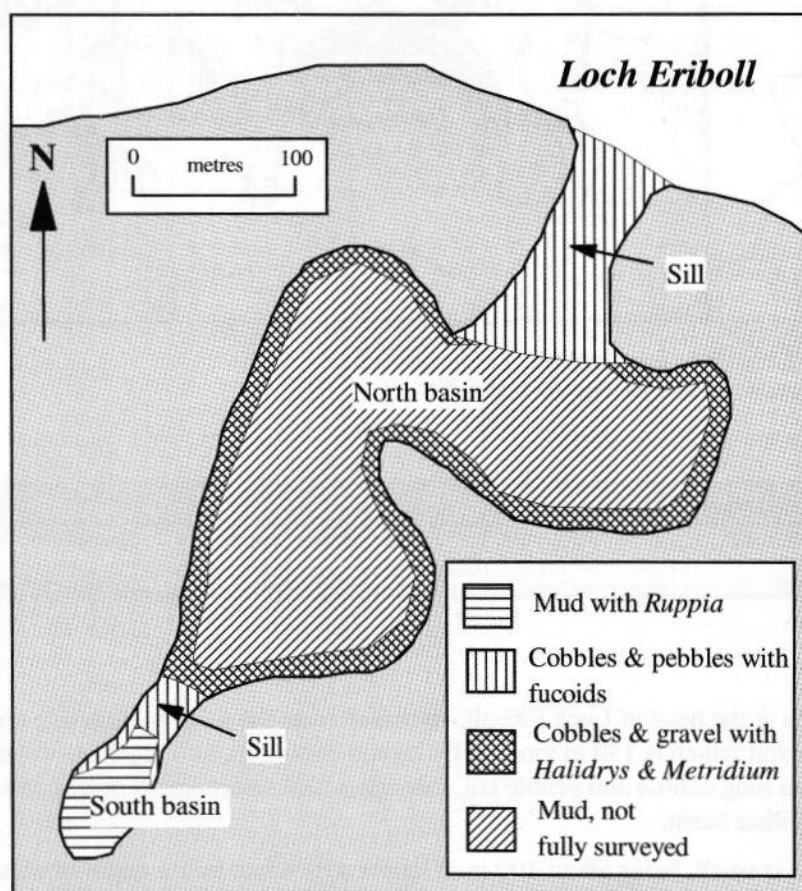


Figure 1.2 Distribution of the main biotopes.

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The northern basin, down to 1.5 m depth, comprised cobbles and muddy gravel. Sea oak *Halidrys siliquosa* plants were dominant on the cobbles, extending up into the water column, and sugar kelp *Laminaria saccharina* lay over the sediment (LsacX). Large plumose anemones *Metridium senile* grew on the rocks and larger algae; other animals present included the sand mason worm *Lanice conchilega*, the keel worm *Pomatoceros triqueter* and the lugworm *Arenicola marina*, mysid shrimps, the shore crab *Carcinus maenas*, the common tortoiseshell limpet *Tectura testudinalis*, the common periwinkle *Littorina littorea* and the common starfish *Asterias rubens*. Amongst the kelp there was a turf of red and green algae, including *Polyides rotundus*, *Enteromorpha intestinalis*, *Chaetomorpha linum* and *Cladophora liniformis*. Tufts of the green alga *Derbesia marina* grew on areas of bare sediment. The majority of the north basin consisted of mud but the central area, between 1.5 and 3 m depth, was not surveyed.

The sill connecting the northern basin to Loch Eriboll was about 0.2 m deep and consisted of a mixture of cobbles, pebbles, gravel and sand, through which seawater percolates at high water. The wracks *Fucus serratus* and *Fucus vesiculosus* were present on large stones (FChoG). Occasional plants of sugar kelp *L. saccharina*, sea oak *H. siliquosa*, sea lettuce *Ulva* sp., and green algae *Enteromorpha* sp. and *C. filum* were also present. Ectocarpoid brown filamentous algae grew on the furoid and kelp fronds. Mysid shrimps swam amongst the algae and the mud snail *Hydrobia* sp. was found on the fronds.

Nature conservation

Conservation sites

Site name	Designation	Centre grid ref.	Main features
Loch Eriboll	MCA	NC 440 600	Important marine site

Human influences

A road runs within 100 m of the southern shore of the lagoon and the surrounding grassland is grazed by sheep. Otherwise there appears to be very little human influence.

References and further reading

None available.

2

Loch Fleet lagoon

Location

Position (centre)	57° 57.4'N 04° 04.4'W	NH 772 983
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North West (Caithness and Sutherland)

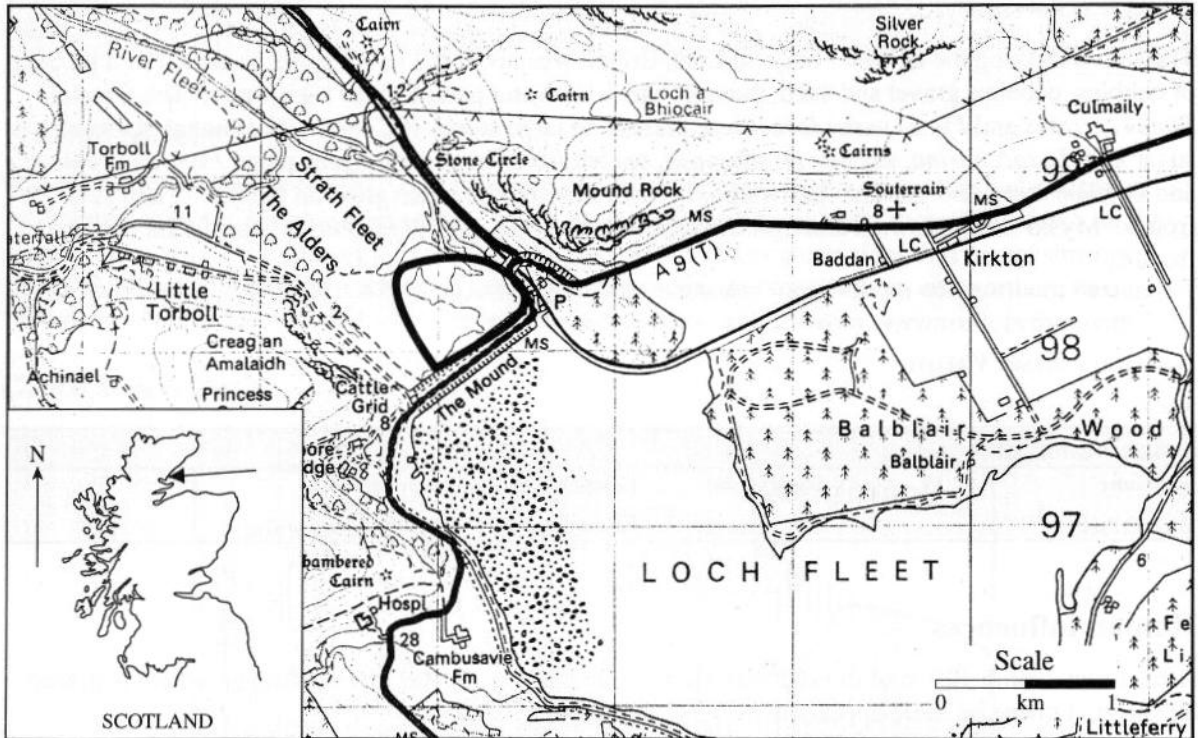


Figure 2.1 Location of the lagoon.

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Marine biological surveys

	Survey method	Date of survey	Source
Littoral	Recording	August 1994	MNCR survey 474
Sublittoral	Recording	August 1994	MNCR survey 474
	Infaunal (6 x 0.0032 m ² cores) and granulometry sampling	August 1994	MNCR survey 474

Introduction

The lagoon is located at the head of Loch Fleet, which lies to the north of the Dornoch Firth. The lagoon is about 0.7 km in length at its longest point and has a maximum depth of about 0.5 m. The River Fleet flows down the eastern side of the lagoon, connecting to the main body of the lagoon over a sand bank and through a channel at the south-eastern corner. The lagoon connects to Loch Fleet via tidal flap valves at its eastern corner.

There appeared to be a salinity gradient across the lagoon, for the salinity was measured at 13 ‰ in the northern basin and 35 ‰ by the outflow channel. The lagoon is surrounded by grassland with the exception of the south-eastern end where there is a rocky embankment built to support a road bridge over the river mouth. There is very little influence from wave action and tidal currents affect only a very small area around the culvert.

Physical features

<i>Physiographic type</i>	Sluiced saline lagoon
<i>Area of lagoon</i>	24 ha
<i>Maximum length of lagoon</i>	0.7 km (excluding channel)
<i>Bathymetry</i>	Maximum depth 0.5 m
<i>Wave exposure</i>	Extremely sheltered
<i>Tidal streams</i>	Weak
<i>Tidal range</i>	Not recorded (at least 0.3 m)
<i>Salinity</i>	13-35 ‰ (measured)

Marine biology

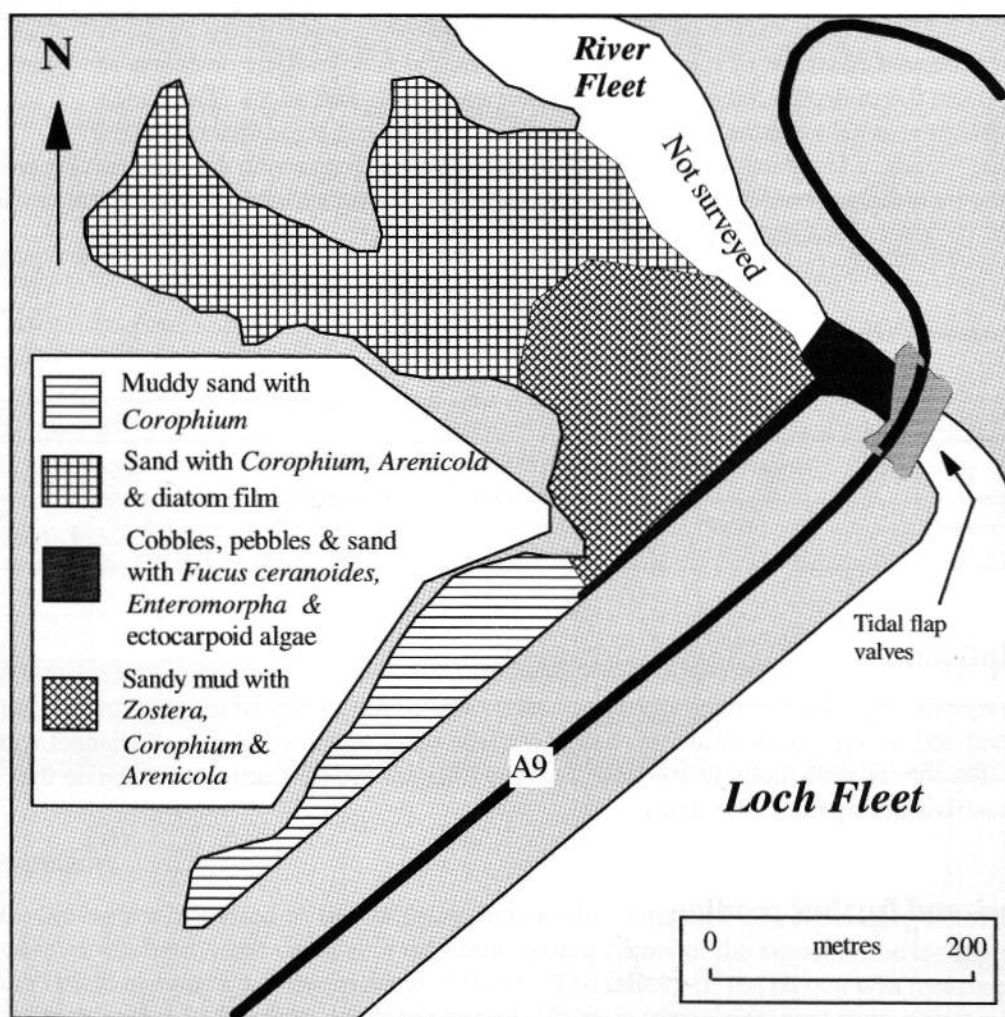


Figure 2.2 Distribution of the main biotopes.

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In the south-western arm of the lagoon the intertidal zone, between 0.2 m height and datum, consisted of muddy sand. The habitat was dominated by the mud shrimp *Corophium volutator* and the ragworm *Hediste diversicolor* (HedMac); the brackish-water furoid *Fucus ceranoides* was present on occasional scattered boulders. The habitat extended into the sublittoral zone but was not surveyed in detail below the water level. The salinity here was measured as 22 ‰.

Sand covered the northern part of the lagoon, where it extended only to about 5 cm maximum depth. Salinity here was 13 ‰ at the time of survey. The habitat was dominated by large numbers of mud shrimps *C. volutator*, with a few lugworm *Arenicola marina* casts and a diatom film on the sediment surface (FaS).

The south-eastern edge of the lagoon, at the edge of the road embankment, consisted of cobbles and pebbles. These rocks were dominated by the green algae *Enteromorpha* spp. and by the wrack *F. ceranoides* (FcerX). Mysid shrimps, gobies and an eel *Anguilla anguilla* were noted here in the shallow water. The salinity was measured at 25 ‰ at the time of survey.

The main basin consisted of sandy mud, extending to 0.5 m depth. Here there were large numbers of mud shrimps *C. volutator*, together with lugworms *A. marina* and patches of seagrass *Zostera* sp. and green algae *Enteromorpha* spp. (Zmar). Large numbers of mysid shrimps were present amongst the plants. At the time of survey a halocline was present at a depth of about 10 cm and the salinity was measured at 32 ‰.

The entrance channel consisted of small boulders, cobbles and pebbles lying on coarse sand, between 0.3 m height and 0.4 m depth. Salinity here varied between 27 ‰ and 35 ‰. The wrack *F. ceranoides* grew attached to the rocks, with epiphytic ectocarpoid algae attached to the *F. ceranoides* fronds; a few patches of green alga *Enteromorpha* sp. grew on the sediment (FcerEnt). Mobile fauna included gammarid amphipods, mysid shrimps, brown shrimps *Crangon crangon* and three-spined sticklebacks *Gasterosteus aculeatus*.

Nature conservation

Conservation sites			
Site name	Designation	Centre grid ref.	Main features
Mound Alderwoods	cSAC	NH 765 990	Residual alluvial forest
Mound Alderwoods	NNR	NH 765 990	Coastal habitats, ornithology
Mound Alderwoods	SSSI	NH 765 990	Alder swamp, ornithology

Human influences

There is a large rocky embankment on the south-eastern side of the lagoon which supports the main A9 trunk road and, as a result, the water exchange with the sea is restricted to a small channel with tidal flaps. The valves were faulty at the time of survey (August 1994). Cattle were seen on the intertidal sandflats during the 1994 survey.

References and further reading

None available.

Compiled by: Kath Thorpe

Fearn Lodge lagoon, Dornoch Firth

Location

Position (centre)	57° 51.2'N 04° 17.7'W	NH 638 873
Administrative area	Highland	
Conservation agency/area	Scottish Natural Heritage	North West (Ross & Cromarty and Inverness)

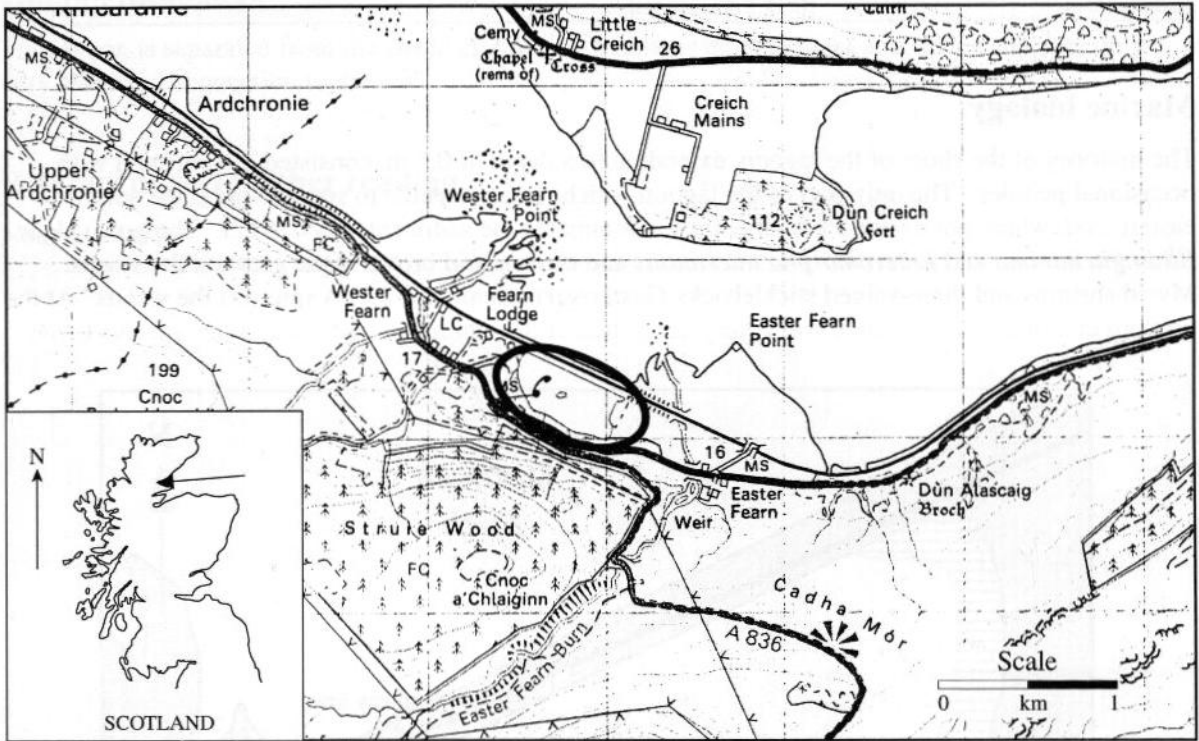


Figure 3.1 Location of the lagoon.

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Marine biological surveys

Survey method	Date of survey	Source
Sublittoral Recording	August 1994	MNCR survey 474

Introduction

Fearn Lodge lagoon is located on the southern shore of the Dornoch Firth, connecting to the Firth at high tide level via a culverted channel in the north-eastern corner of the lagoon. The lagoon is about 0.6 km in length and has a maximum depth of 0.5 m. The salinity of the lagoon was measured at 10 ‰ in the main basin and 12 ‰ in the entrance channel. There is freshwater input from a stream which enters the north-western corner of the lagoon and seawater input at each tide. Emergent reed vegetation at the north-western end of the lagoon suggests that the salinity is consistently very low. The lagoon is surrounded by marshy grassland, except for the north-eastern edge which is bordered by a railway embankment. The marshy ground made access to the western end of the lagoon impossible.

There is a very steep slope close to the south-western bank which is reinforced with concrete to provide support for the main A836 road.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	13 ha
Maximum length of lagoon	0.6 km (excluding channel)
Bathymetry	Maximum depth 0.5 m
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	10-12 ‰ (measured)

Marine biology

The majority of the shore of the lagoon, extending to a depth of 0.5 m, consisted of firm sand with occasional pebbles. The only part of the lagoon which it was possible to survey was at the south-eastern end, where pondweed *Potamogeton* sp. dominated the sediment (NVC A12). The green algae *Blidingia minima* and *Enteromorpha intestinalis* and ectocarpoid brown algae grew on the stones. Mysis shrimps and three-spined sticklebacks *Gasterosteus aculeatus* swam amongst the weeds. At the western end of the lagoon there was a very dense bed of the emergent reed *Phragmites* sp. (NVC S4).

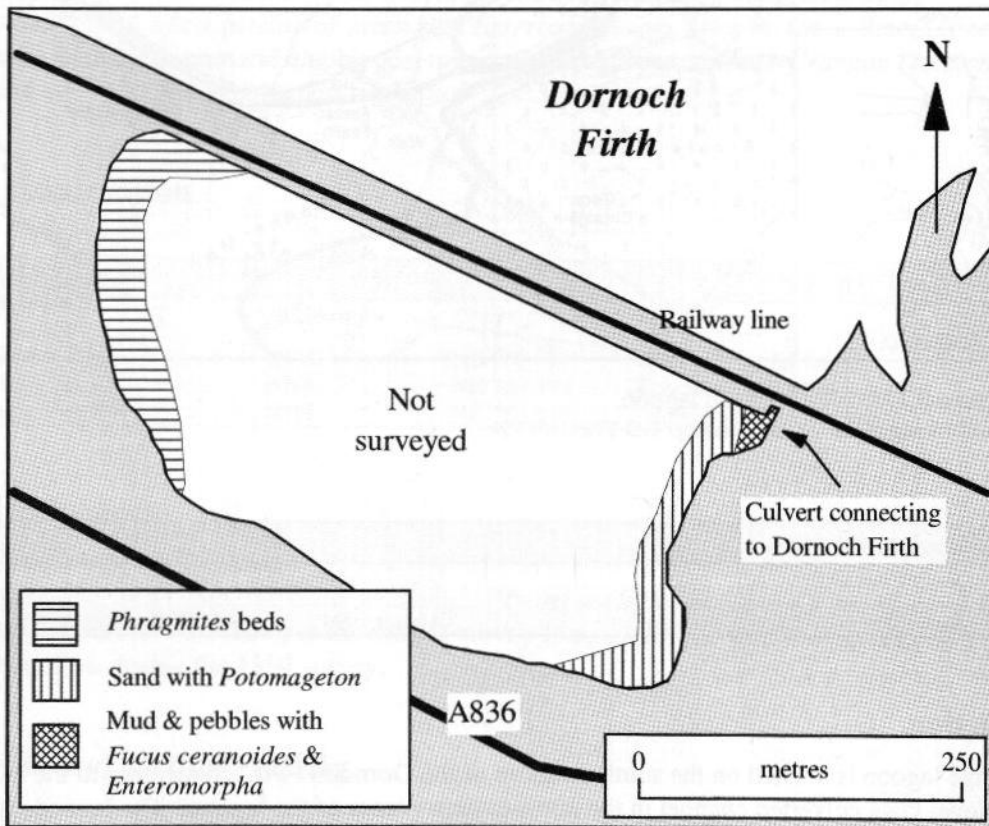


Figure 3.2 Distribution of the main biotopes.

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The 0.5 m deep entrance channel consisted of very soft mud with a few scattered pebbles. The brackish-water fucoid *Fucus ceranoides*, together with the green alga *E. intestinalis*, grew on the pebbles and the metal grid across the culvert (FcerEnt). The mud was covered with a diatom film and ectocarpoid brown algae (FiG).

Nature conservation

There are no conservation sites around the lagoon.

Human influences

The lagoon is separated from the Dornoch Firth by a railway embankment and, as a result, has only a very restricted connection to the sea.

References and further reading

None available.



Figure 4.2 Distribution of the main species...

The lagoon is separated from the Dornoch Firth by a railway embankment and, as a result, has only a very restricted connection to the sea. The mud was covered with a diatom film and ectocarpoid brown algae (FiG).

Compiled by: Kath Thorpe

4

Alness Point lagoon, Cromarty Firth

Location

<i>Position (centre)</i>	57° 40.7'N 04° 15.5'W	NH 653 677
<i>Administrative area</i>	Highland	
<i>Conservation agency/area</i>	Scottish Natural Heritage	North West (Ross & Cromarty and Inverness)

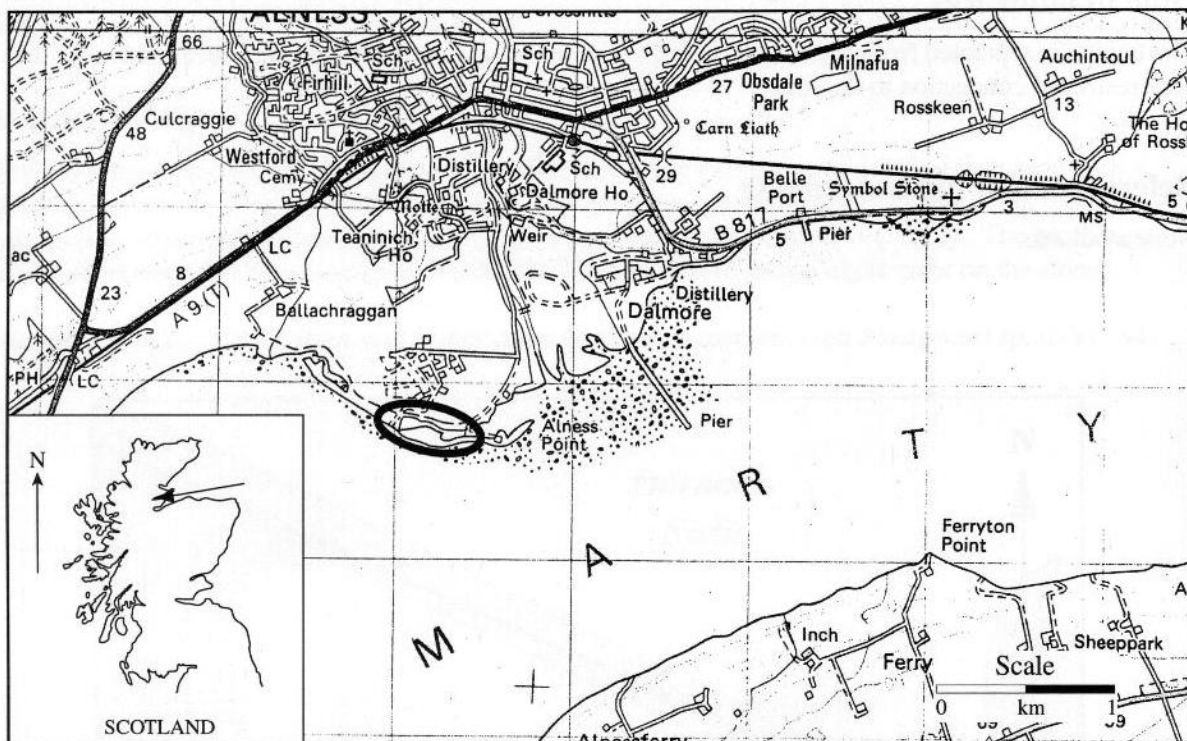


Figure 4.1 Location of the lagoon.

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Marine biological surveys

<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i> Recording	August 1994	MNCR survey 474

Introduction

The lagoon is located at Alness Point, near Alness on the northern shore of the Cromarty Firth. The lagoon is about 0.3 km in length, has a maximum depth of 0.4 m and a very restricted tidal range. The lagoon consists of two small saltmarsh basins which are separated by a shallow sill. The eastern basin connects to the sea via a boulder and cobble sill at high water level. This opens out into a bay formed by a shingle spit at the river mouth. There is seawater input at every high tide but very little freshwater input; salinity in the western basin was measured at 28 ‰ at the time of survey. The lagoon is extremely sheltered from the effects of wave action and tidal currents are very weak.

Physical features

<i>Physiographic type</i>	Silled saline lagoon (sill at mean high water)
<i>Area of lagoon</i>	2 ha
<i>Maximum length of lagoon</i>	0.3 km
<i>Bathymetry</i>	Maximum depth 0.4 m
<i>Wave exposure</i>	Extremely sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	0.1-0.2 m
<i>Salinity</i>	28 ‰ (measured)

Marine biology

The western basin consisted of a layer of soft mud, about 0.2 m thick, with a firm layer of pebbles and cobbles underneath. The sides of the basin were vertical steps in the surrounding saltmarsh. The sediment was extensively burrowed by lugworms *Arenicola marina* and there were dense patches of seagrass *Zostera marina* and tasselweed *Ruppia maritima*, with filamentous green algae amongst them (Rup).

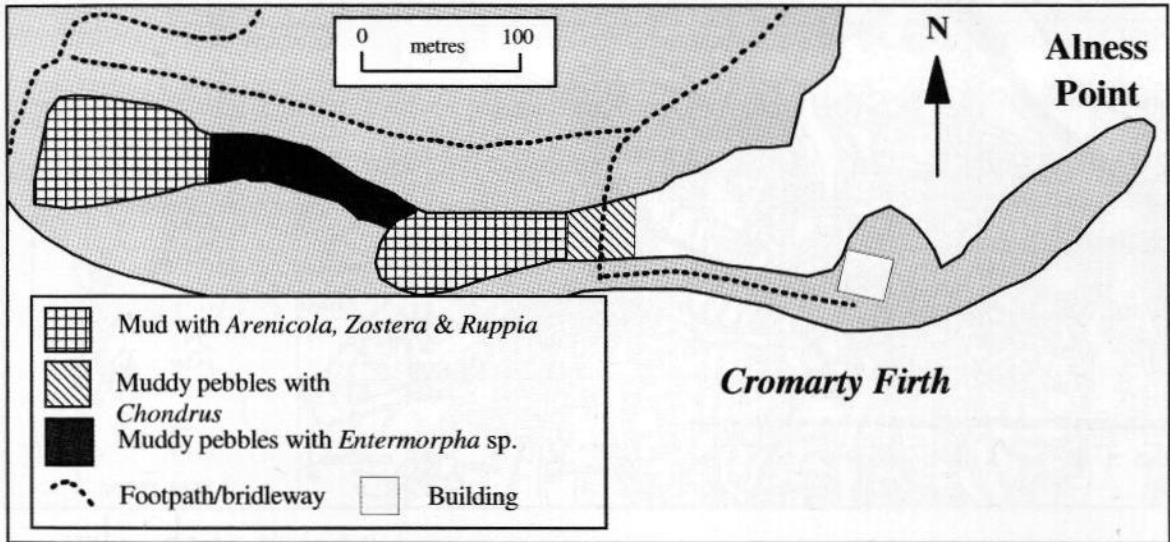


Figure 4.2 Distribution of the main biotopes.

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The connecting channel between the two basins had a maximum depth of 0.1 m and consisted of muddy pebbles with steep mud banks at the edges. The mud had no visible epifauna but the pebbles were colonised by filamentous green algae, the green alga *Enteromorpha* sp. and sparse tasselweed *R. maritima*.

The eastern basin had a very similar substratum to the western basin; it was colonised by dense beds of seagrass *Z. marina* with some tasselweed *R. maritima* growing amongst it (Zmar). Towards the sill at the eastern end of the lagoon the cobbles protruded through the sediment; here the red alga *Chondrus crispus* formed a dense covering on the cobbles, which were encrusted by the red alga *Hildenbrandia* sp.

Nature conservation

Conservation sites			
<i>Site name</i>	<i>Designation</i>	<i>Centre grid ref.</i>	<i>Main features</i>
Cromarty Firth	SSSI	NH 650 670	Coastal habitats, ornithology

Human influences

Litter was present around the lagoon and there appeared to be some small-scale dumping of waste. The surrounding marsh was used for motor bike scrambling and wildfowling.

References and further reading

None available.



Figure 4.1: Distribution of the main lagoon
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The lagoon is situated in the western basin of the Cromarty Firth, approximately 1.5 km from the town of Cromarty. It is a shallow, brackish water body, approximately 0.5 km long and 0.2 km wide. The lagoon is surrounded by a mix of coastal habitats, including salt marshes and mudflats. The water level is generally low, and the lagoon is a popular site for birdwatching and other recreational activities. The surrounding area is a mix of agricultural land and residential development. The lagoon is a designated Site of Special Scientific Interest (SSSI) due to its importance for birdlife and its coastal habitats.

Compiled by: Kath Thorpe

5

Muirtown Basin lagoon, Inverness

Location

<i>Position (centre)</i>	57° 29.3'N 04° 15.1'W	NH 650 466
<i>Administrative area</i>	Highland	
<i>Conservation agency/area</i>	Scottish Natural Heritage	North West (Ross & Cromarty and Inverness)

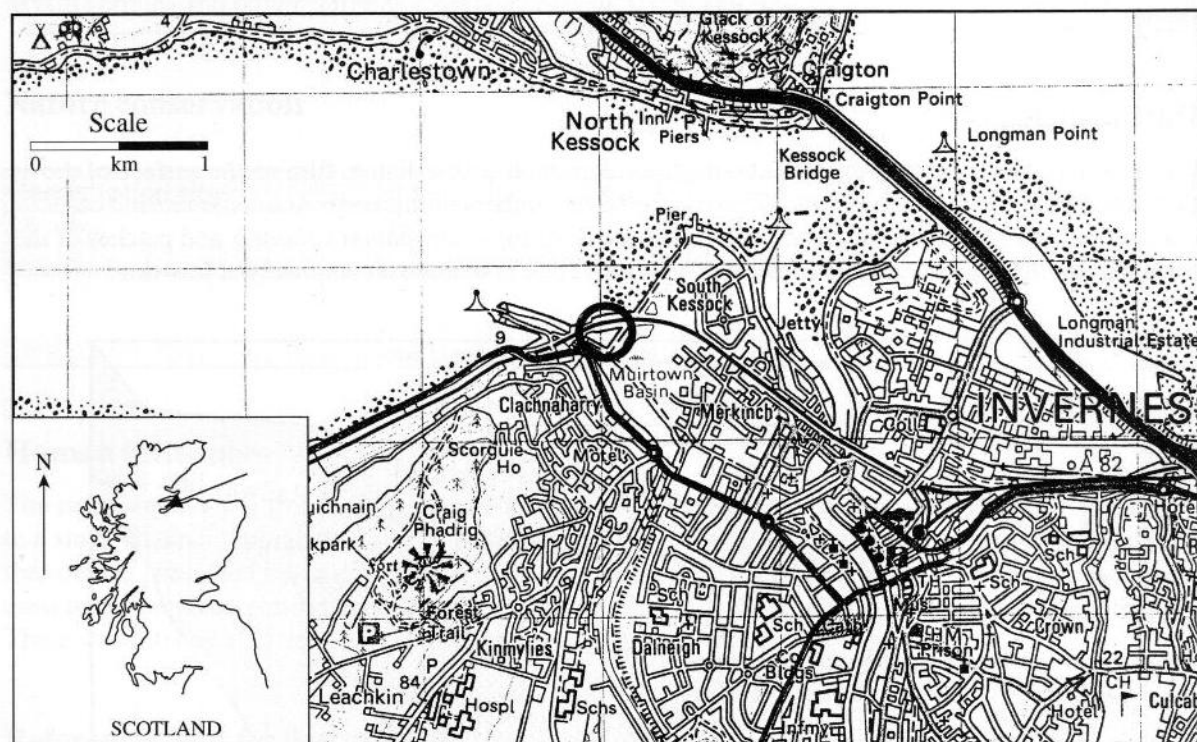


Figure 5.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording	August 1994	MNCR survey 474
<i>Sublittoral</i>	Recording	August 1994	MNCR survey 474

Introduction

The lagoon is located in the Muirtown Basin area to the west of Inverness; the lagoon connects to the south-eastern corner of the Beaulieu Firth via a narrow channel. At low tide most of the lagoon empties through the channel; there appears to be very little freshwater input, limited to drainage from the immediate surrounding area. The salinity was measured at 28 ‰ at the time of survey. The lagoon is surrounded by raised embankments on all sides; to the north there is a railway embankment (the entrance channel flows under the western end of the embankment) while to the south the shores are backed by smaller embankments with footpaths running along the top of them. The Caledonian Canal

is located behind the south-western embankment. There is very little disturbance from wave action but the immediate area around the entrance channel is affected by moderately strong tidal currents.

Physical features	
<i>Physiographic type</i>	Saline lagoon inlet
<i>Area of lagoon</i>	1 ha
<i>Maximum length of lagoon</i>	0.2 km (excluding channel)
<i>Bathymetry</i>	Maximum depth 1 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak to moderately strong
<i>Tidal range</i>	0.5 m
<i>Salinity</i>	28 ‰ (measured)

Marine biology

The majority of the lagoon consisted of soft, flocculent mud with a diatom film on the surface of the mud around the edges of the lagoon. There were large numbers of lugworm *Arenicola marina* casts and the mud snail *Hydrobia neglecta*, along with mud shrimps *Corophium volutator* and patches of the green alga *Enteromorpha prolifera* (Mu). This habitat dries out almost completely at low tide.

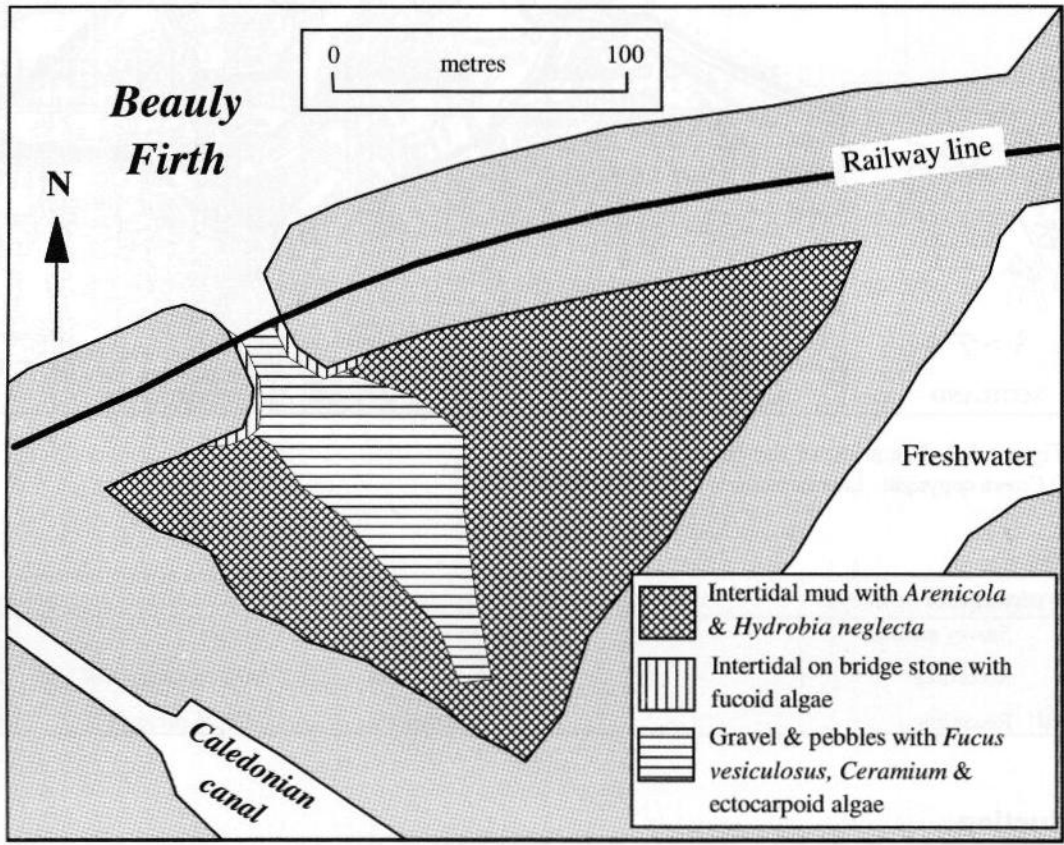


Figure 5.2 Distribution of the main biotopes.
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On the stone of the railway bridge close to the entrance channel, the upper shore level was colonised by a mixture of sea plantain *Plantago maritima* and the channelled wrack *Pelvetia canaliculata* (Pel).

In the upper mid-shore there was a zone of the spiral wrack *Fucus spiralis* (Fspi). Below this, in the lower mid-shore to the shallow sublittoral (0.1 m depth), the substratum was gravel and pebbles which was dominated by the bladder wrack *Fucus vesiculosus* and the knotted wrack *Ascophyllum nodosum* with brown ectocarpoid algae growing on the fronds (AscX). There were also a few scattered plants of the green alga *Enteromorpha intestinalis*. Mysid shrimps and three-spined sticklebacks *Gasterosteus aculeatus* swam amongst the weeds.

On the western side of the lagoon and into the entrance channel, where tidal flow is accelerated over most of the area, the substratum was gravel and pebbles. The sides of the entrance channel shelved steeply to a depth of 1 m. The stones were colonised by bladder wrack *F. vesiculosus*, the red filamentous alga *Ceramium* sp., the green alga *Blidingia* sp. and ectocarpoid brown algae (FChoG). Mysid shrimps and brown shrimps *Crangon crangon* swam amongst the stones.

Nature conservation

Conservation sites			
Site name	Designation	Centre grid ref.	Main features
Muirtown Pools and Canal Basin	Local Nature Conservation Area in Inverness, Culloden and Ardersier local plan	NH 650 466	Unique features to Inverness district; amenity and educational potential

Human influences

The entire lagoon is surrounded by man-made embankments. Water exchange with the sea is limited to a small channel through the railway embankment; any water exchange with the freshwater pool to the south is prevented by an embankment with a footpath running across the top. The area is heavily used for informal recreation, mainly walking and also cycling, horse-riding, motor-cycling and fishing. There was litter around the edges of the lagoon during the 1994 survey.

References and further reading

- Gallagher, P. 1993. *Inverness urban area habitat survey*. (Contractor: Scottish Wildlife Trust.)
 Unpublished report to Scottish Natural Heritage.

6

South Kessock lagoon, Inverness

Location

<i>Position (centre)</i>	57° 29.4'N 04° 14.7'W	NH 654 467
<i>Administrative area</i>	Highland	
<i>Conservation agency/area</i>	Scottish Natural Heritage	North West (Ross & Cromarty and Inverness)

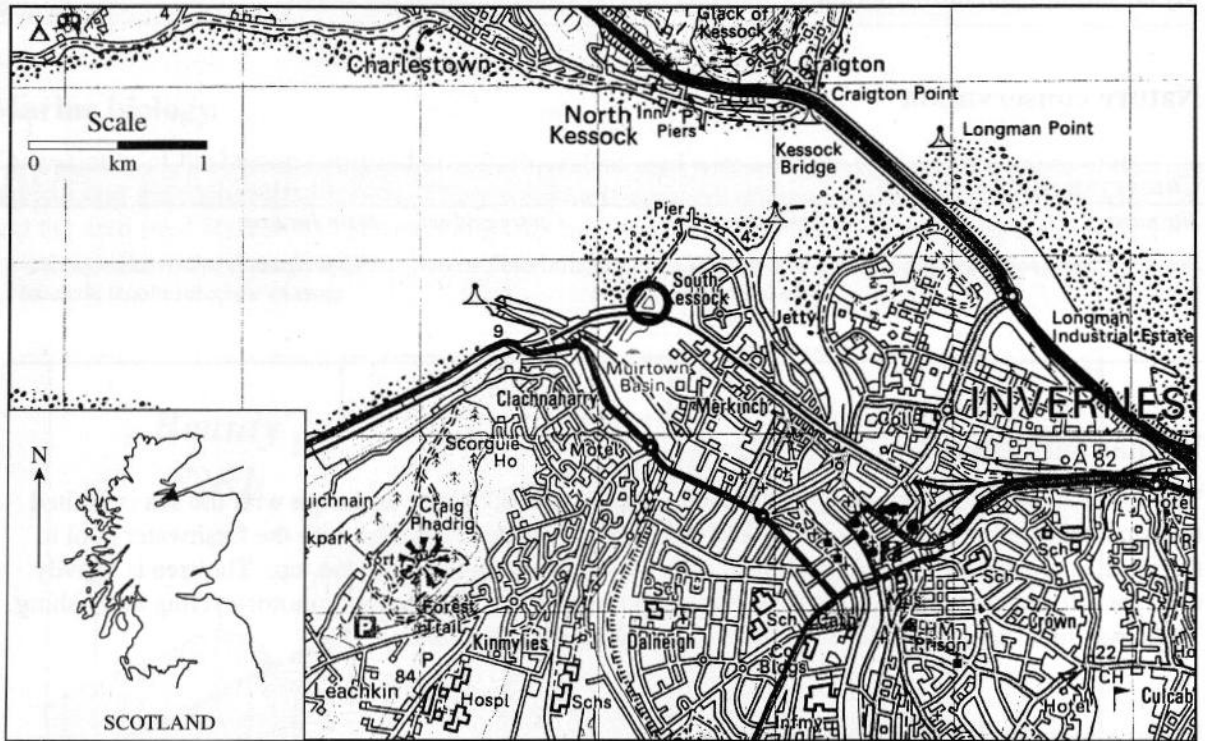


Figure 6.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i>	Recording	August 1994	MNCR survey 474
	Infauunal (6 x 0.0032 m ² cores) and granulometry sampling	August 1994	MNCR survey 474

Introduction

This lagoon is located west of South Kessock in Inverness, close to the mouth of the River Ness. The lagoon is about 0.05 km in length and has a maximum depth of 0.4 m. It connects to the Beaully Firth via a small pipe at high water level which passes through a sea wall. The salinity of the lagoon was measured at between 5 and 10 ‰ at the time of survey. The only freshwater input is drainage from a small area of surrounding marshy land, and as water exchange with the Beaully Firth is limited and the lagoon is located close to the river mouth, this results in a low overall salinity regime. The site is bordered by grass and reed beds and backed by marshy ground on the western side, a sea wall on the

north-west side and a railway embankment on the southern side. There is very little influence from either wave action or tidal currents.

Physical features

<i>Physiographic type</i>	Sluiced saline lagoon
<i>Area of lagoon</i>	<1 ha
<i>Maximum length of lagoon</i>	0.05 km
<i>Bathymetry</i>	Maximum depth 0.4 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Negligible
<i>Salinity</i>	5-10 ‰ (measured)

Marine biology

The edges of the lagoon were colonised by reeds and grass, with the brackish-water fucoid *Fucus ceranoides*, the green alga *Enteromorpha* sp. and the tasselweed *Ruppia maritima* present in the sediment (FcerEnt). Blue-green algae colonised the *F. ceranoides* fronds. The remainder of the lagoon consisted of a 20-30 cm thick layer of mud overlying cobbles which was colonised by the lugworm *Arenicola marina*, the mud shrimp *Corophium volutator* and the mud snail *Ventrosia ventrosa* (LagMu).

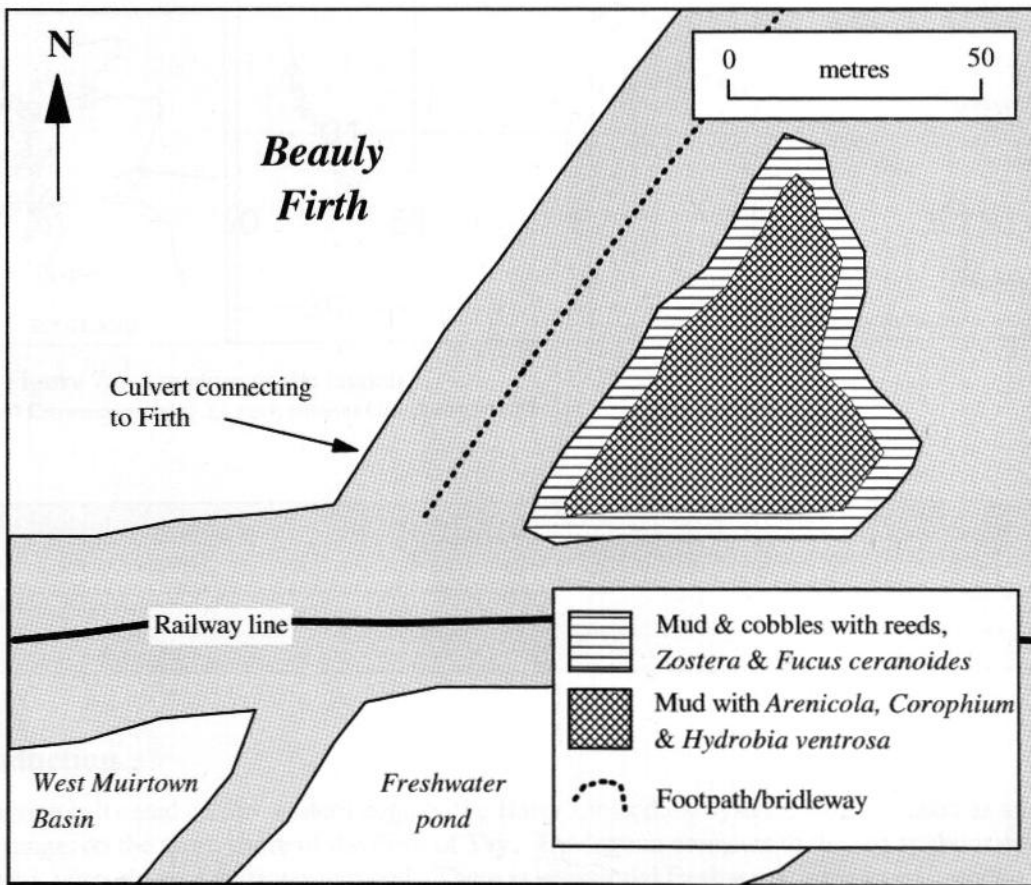


Figure 6.2 Distribution of the main biotopes.

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Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The lagoon has a restricted connection with the sea through the sea wall, and there is a railway embankment on the southern side. At the time of survey, the local council were building a set of wooden steps and a walkway over the south-western corner of the lagoon, as part of a nature trail.

References and further reading

None available.

Compiled by: Kath Thorpe

Barry Links lagoon, Firth of Tay

Location

Position (centre)	56° 28.7'N 02° 47.1'W	NO 516 322
Administrative area	Angus	
Conservation agency/area	Scottish Natural Heritage	South East (Tayside)

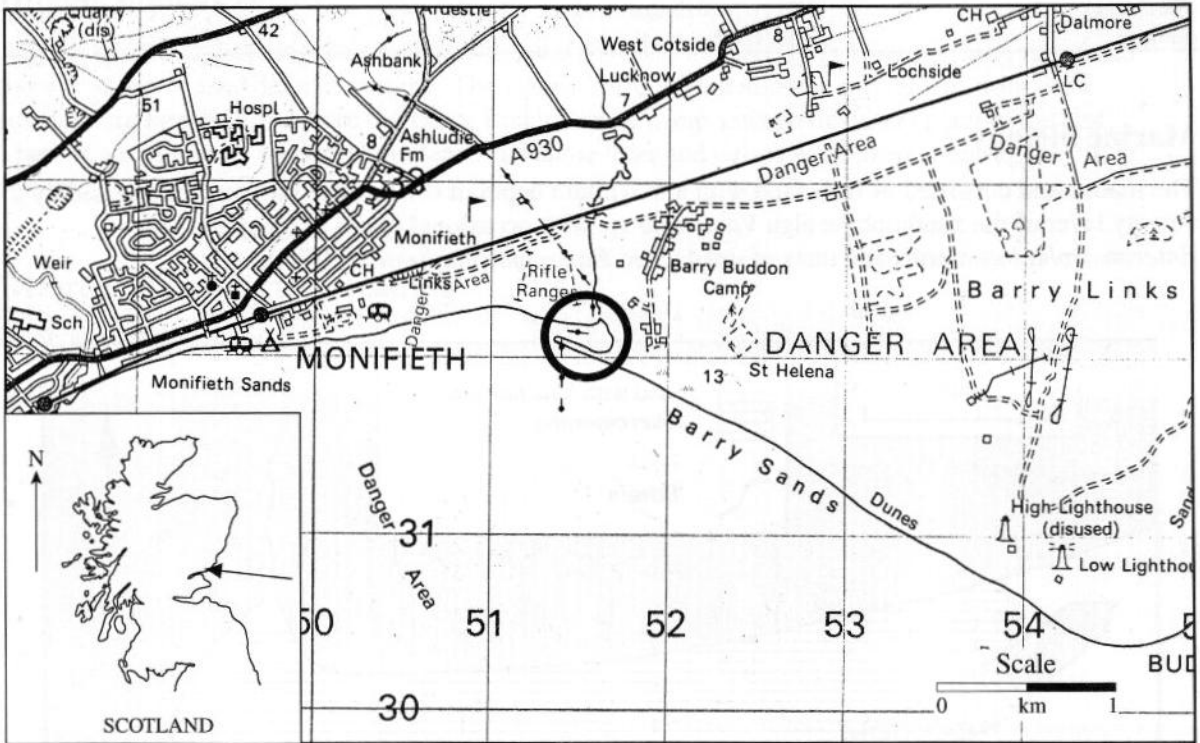


Figure 7.1 Location of the lagoon.

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Marine biological surveys

	Survey method	Date of survey	Source
Sublittoral	Recording	August 1994	MNCR survey 474
	Infaunal (6 x 0.0032 m ² cores) and granulometry sampling	August 1994	MNCR survey 474

Introduction

The lagoon is located on the western edge of the Barry Links dune system, which is used as an army firing range, on the north shore of the Firth of Tay. The lagoon connects to the sea at about upper mid-tide level, via a channel at its western end. There is substantial freshwater input from a stream which enters the north-eastern corner of the lagoon and produces a salinity gradient along the length of the lagoon. At the time of survey, the northern end of the lagoon was freshwater (0‰) whilst the salinity in the centre of the lagoon was 30‰. There is very little influence from wave action and tidal current effects are limited to the entrance channel. The site is surrounded by grassland, except for the southern

side where there is a sand bar. The lagoon was formed after 1947 and has constantly changed in shape since its formation; it is likely to be breached by the sea in the next decade.

Physical features

<i>Physiographic type</i>	Silled saline lagoon (sill at upper mid-tide level)
<i>Area of lagoon</i>	3 ha
<i>Maximum length of lagoon</i>	0.3 km
<i>Bathymetry</i>	Maximum depth 0.7 m
<i>Wave exposure</i>	Extremely sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	0.5 m (approximately)
<i>Salinity</i>	0-30 ‰ (measured)

Marine biology

The main basin consisted of firm sand with a maximum depth of 0.7 m. The sand was dominated by a velvety layer of the xanthophyte alga *Vaucheria* sp. with occasional plants of the green alga *Enteromorpha intestinalis* and mats of unattached *Enteromorpha flexuosa* (FiG).

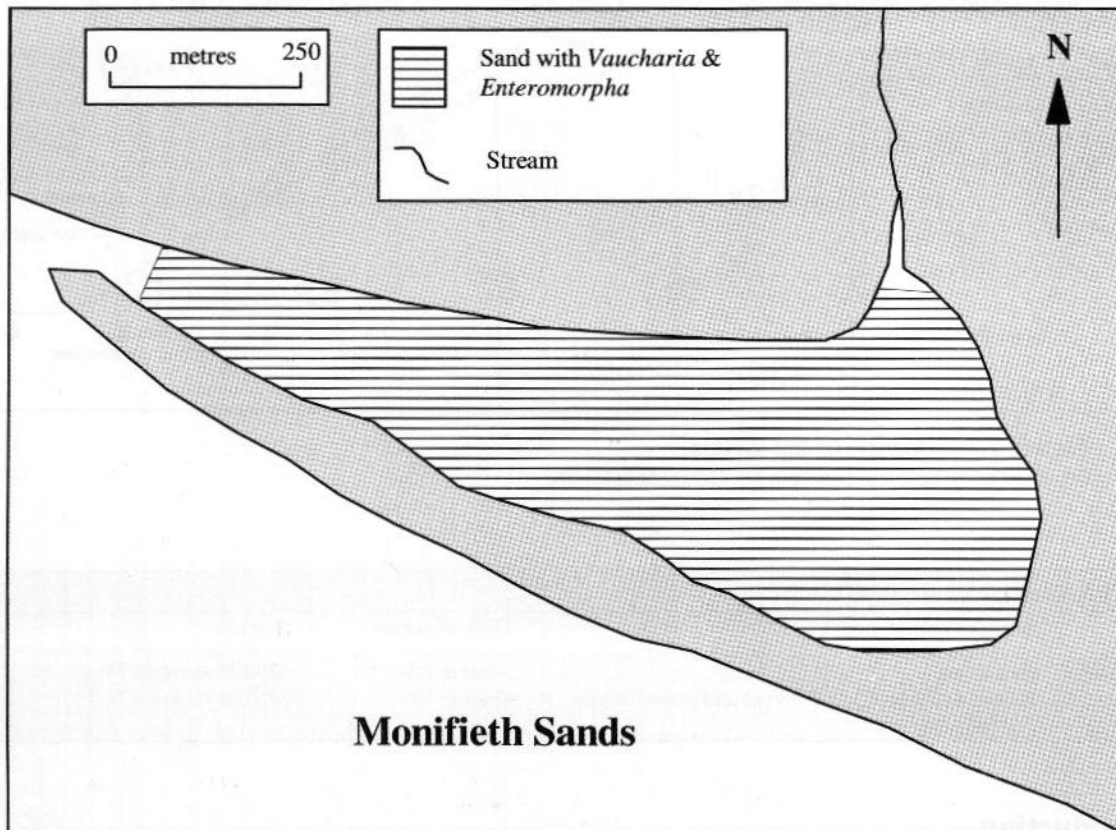


Figure 7.2 Distribution of the main biotopes.
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Nature conservation

Conservation sites

<i>Site name</i>	<i>Designation</i>	<i>Centre grid ref.</i>	<i>Main features</i>
Barry Links	cSAC	NO 532 319	Various dune habitats
Barry Links	SSSI	NO 532 319	Geomorphology, dune habitats, flora, ornithology, entomology

Human influences

A large area around the lagoon (mainly to the west) is used intensively as an army firing range and there is an old coastal defence system. The lagoon suffers from nutrient enrichment from the surrounding farmland and from the Barry Buddon army camp sewage treatment plant to the east. There is a footpath on adjacent grasslands and some litter and debris were present during the 1994 survey.

References and further reading

None available.

8

Pond Cottage lagoon, Firth of Forth

Location

Position (centre)	56° 03.3'N 03° 36.9'W	NS 994 860
Administrative area	Fife	
Conservation agency/area	Scottish Natural Heritage	South East (Central and Fife)

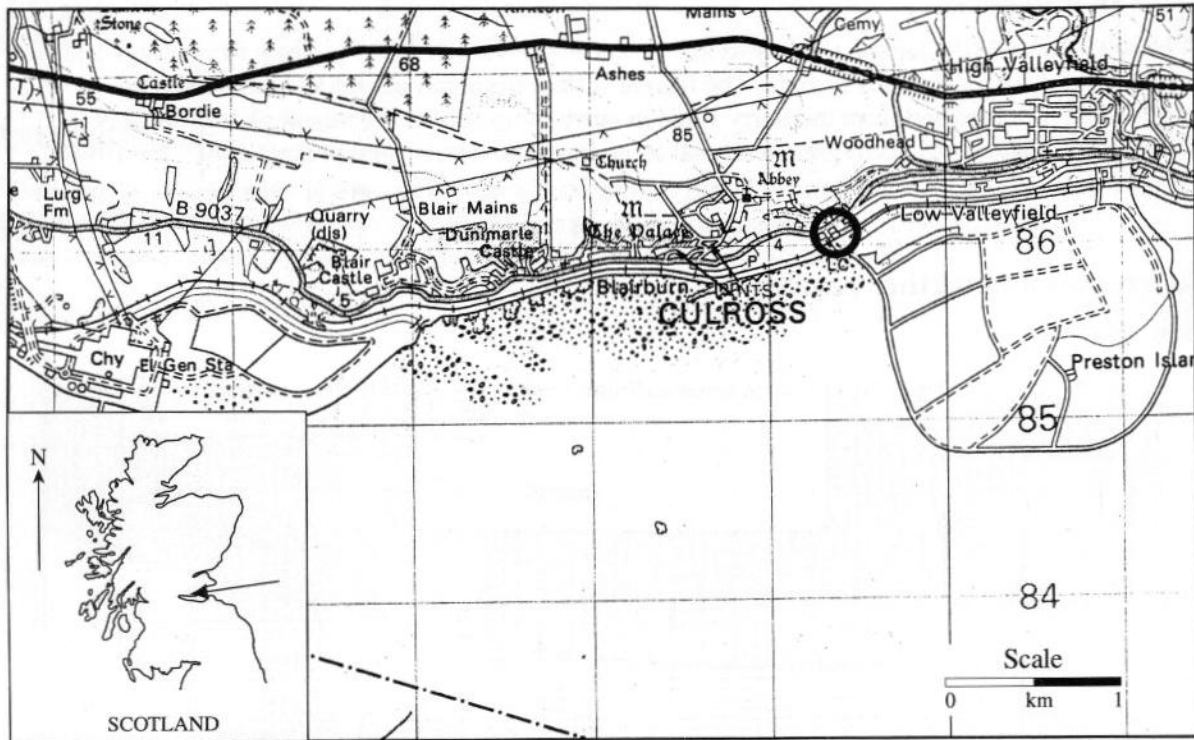


Figure 8.1 Location of the lagoon.

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Marine biological surveys

	Survey method	Date of survey	Source
Sublittoral	Recording	August 1994	MNCR survey 474
	Infaunal (6 x 0.0032 m ² cores) and granulometry sampling	August 1994	MNCR survey 474

Introduction

Pond Cottage lagoon lies to the east of Culross, on the north shore of the Firth of Forth. The lagoon connects to the Firth only on high spring tides, via a pipe on the southern side of the lagoon. It was built by monks from the nearby abbey several hundred years ago as a salt pan/fish pool. The lagoon is small, measuring only 0.06 km by 0.05 km, and has a maximum depth of 1.5 m. It has a base of solid flagstones which are now covered with silt. The lagoon is surrounded by a garden apart from the southern side which is backed by a wall and a railway bridge. Freshwater input from the garden and surrounding land is limited, and salinity was measured at 30 ‰ at the time of survey. There is no disturbance from wave action or tidal currents.

Physical features

<i>Physiographic type</i>	Sluiced saline lagoon
<i>Area of lagoon</i>	<1 ha
<i>Maximum length of lagoon</i>	0.06 km (excluding channel)
<i>Bathymetry</i>	Maximum depth 1.5 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Negligible
<i>Salinity</i>	30 ‰ (measured)

Marine biology

The vertical stone walls of the sides of the lagoon were colonised by a dense growth of blue-green algae and the mussel *Mytilus edulis* (MytT). Most of the mussels were covered by blue-green algae; any remaining bare surfaces on the walls and mussels were colonised by the scyphistomae larvae of the moon jellyfish *Aurelia aurita*.

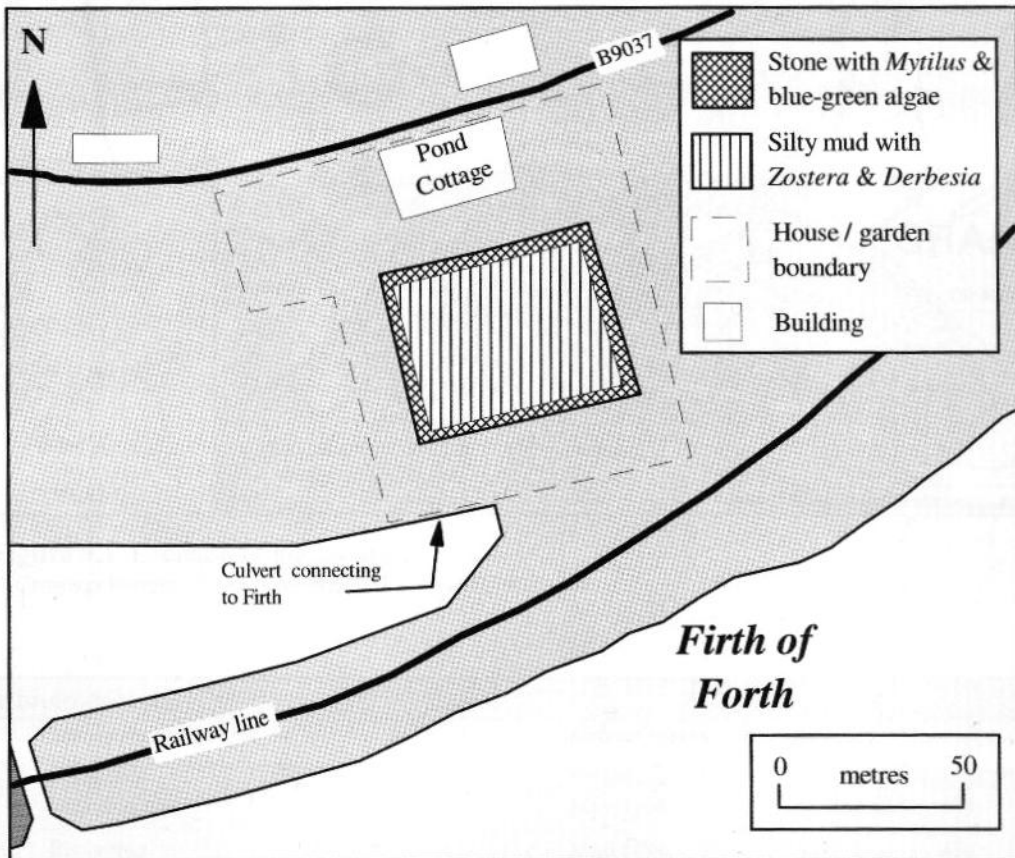


Figure 8.2 Distribution of the main biotopes.

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The base of the lagoon had a layer of silt at least 30 cm deep over the stone base. It was colonised by dense stands of the seagrass *Zostera marina* and filamentous green algae including *Derbesia marina* (Zmar). There were also large numbers of the estuary cockle *Cerastoderma glaucum* amongst the plants. Quite a large fish population was present within the lagoon, including the three-spined stickleback *Gasterosteus aculeatus*, a few plaice *Pleuronectes platessa*, flounder *Platichthys flesus* and large eels *Anguilla anguilla*. A variety of fly larvae, including chironomids, were also present.

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The lagoon is artificial and is now contained within a private garden.

References and further reading

None available.



Introduction

[Faint, illegible text in the introduction section]

Compiled by: Kath Thorpe

Island Farm lagoon (Skinflats), Firth of Forth

Location

Position (centre)	56° 06.5'N 03 °52.6'W	NS 923 833
Administrative area	Falkirk	
Conservation agency/area	Scottish Natural Heritage	South East (Central and Fife)

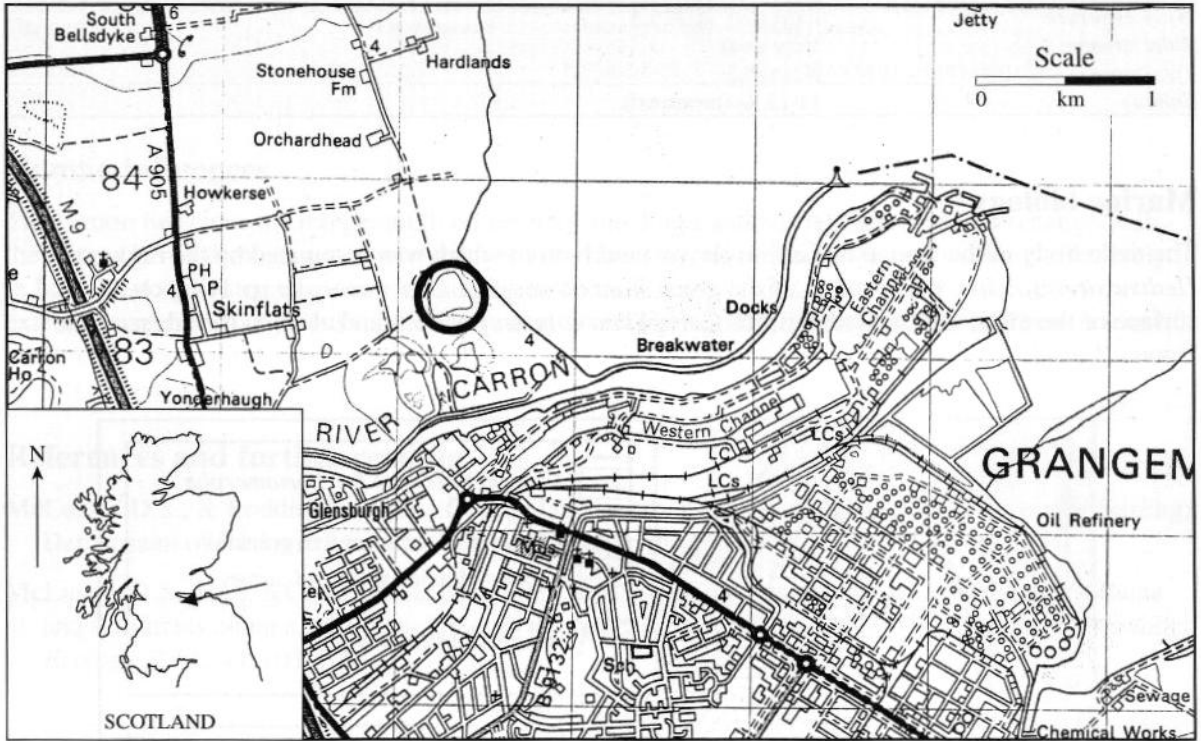


Figure 9.1 Location of the lagoon.

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Marine biological surveys

	Survey method	Date of survey	Source
<i>Littoral</i>	Recording	September 1984	McLusky & Roddie (1984)
	Recording	May 1994	MNCR survey 474
<i>Sublittoral</i>	Recording	May 1994	MNCR survey 474
	Infauanal (6 x 0.0032 m ² cores) and granulometry sampling	May 1994	MNCR survey 474

Introduction

The lagoon is located to the north of the mouth of the River Carron and the Grangemouth oil refinery, on the southern shore of the Firth of Forth. The lagoon is small and shallow, being about 0.2 km in length and 0.2 m deep, and connects to the River Carron via an open ditch with a failed tidal flap valve. Limited amounts of seawater from the Firth of Forth enter the lagoon via this open ditch on each high tide, where the salinity of the Firth of Forth in this area is about 22 ‰ owing to freshwater input from the River Carron (McLusky *et al.* 1993). The salinity of the lagoon was measured at 11 to

12 ‰ at the time of survey. Direct freshwater input is restricted to drainage from the surrounding grassland and from a track which runs along the western side of the lagoon. There is very little effect of current or wave action within the lagoon and there is a negligible tidal range. A second lagoon to the south, which was the subject of previous studies, was drained at the time of survey in 1994.

Physical features

<i>Physiographic type</i>	Sluiced saline lagoon
<i>Area of lagoon</i>	8 ha
<i>Maximum length of lagoon</i>	0.2 km
<i>Bathymetry</i>	Maximum depth 0.2 m
<i>Wave exposure</i>	Extremely sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Negligible
<i>Salinity</i>	11-12 ‰ (measured)

Marine biology

The main body of the lagoon had a fine clayey mud bottom which was dominated by the ragworm *Hediste diversicolor*, with patches of the green filamentous alga *Chaetomorpha* sp. lying on the surface of the mud. A few mud shrimps *Corophium volutator* were found close to the edges of the lagoon (LagMu).

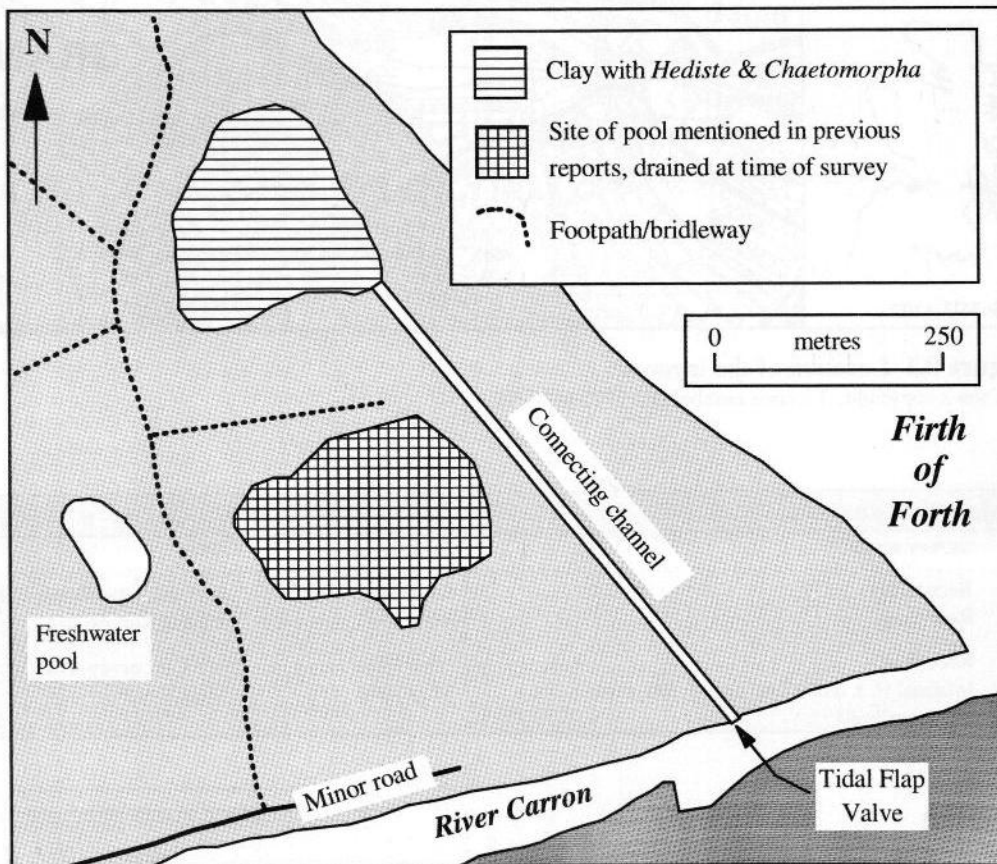


Figure 9.2 Distribution of the main biotopes.
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The bare sides of the concrete culvert pipe were covered, in the higher sections, by the barnacle *Balanus improvisus*, with bladder wrack *Fucus vesiculosus* and the green algae *Blidingia marginata*, *Chaetomorpha linum* and *Ulothrix* sp. in the lower sections (Fves). The bottom of the channel had cobbles and pebbles which were colonised by the mussel *Mytilus edulis* with some barnacles *B. improvisus* among them.

Nature conservation

Conservation sites			
Site name	Designation	Centre grid ref.	Main features
Skinflats	SSSI	NS 932 845	Coastal habitats, ornithology

Human influences

The lagoon lies close to Grangemouth oil refinery and docks and has restricted water exchange with the River Carron through a concrete channel via a tidal flap valve which was not working effectively in May 1994. Maintenance work is undertaken on these valves from time to time which alters the extent of water exchange and consequently may affect the lagoon's salinity and biota. There is a small track to the west of the site.

References and further reading

- McLusky, D.S., & Roddie, K. 1984. Coastal lagoon survey 1984. (Contractor: University of Stirling, Department of Biological Science.) *Nature Conservancy Council, CSD Report*, No. 554.
- McLusky, D.S., Hull, S.C., & Elliott, M. 1993. Variations in the intertidal and subtidal macrofauna and sediments along a salinity gradient in the upper Forth estuary. *Netherlands Journal of Aquatic Ecology*, 27 (2-4): 101-109.

10

Ballantrae lagoons

Location

<i>Position (centre)</i>	55° 05' N 05° 00' W	NX 081 818
<i>Administrative area</i>	South Ayrshire	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Mid and South Strathclyde)

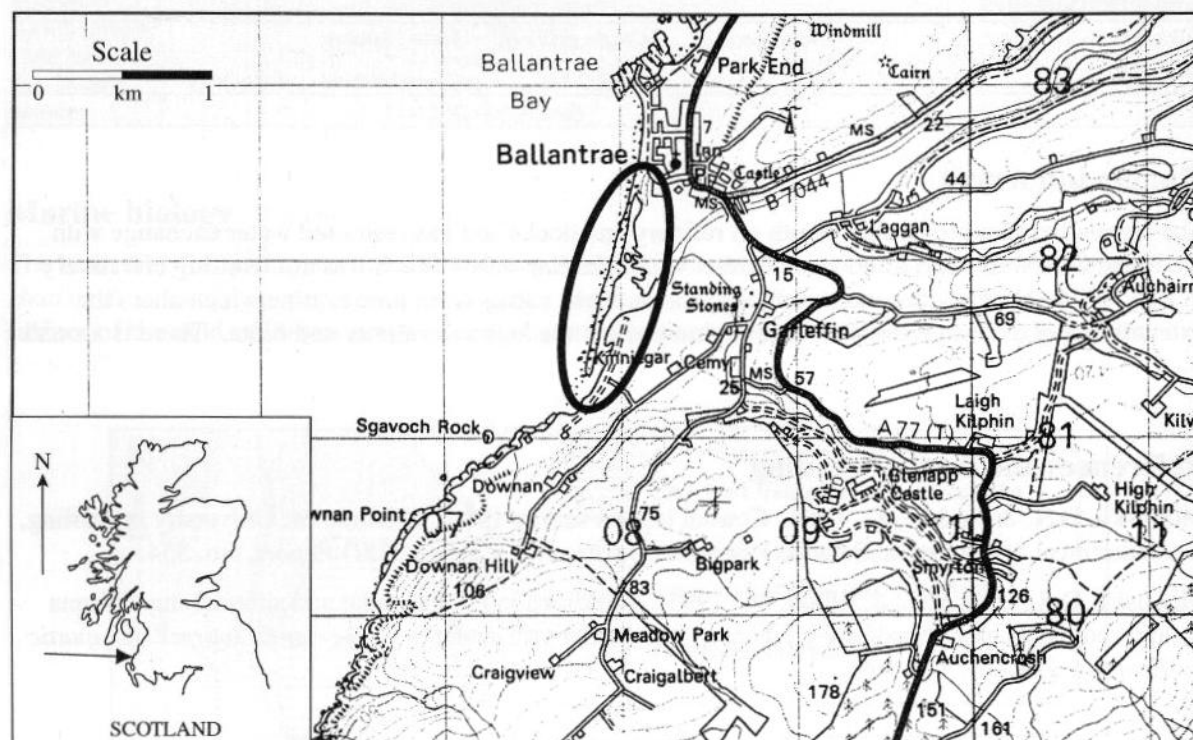


Figure 10.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i>	Recording	August 1988	Moore (1988)
	Recording	May 1995	MNCR survey 447

Introduction

There are two lagoons at Ballantrae, situated to the south of Girvan on the shores of the Clyde Sea. The lagoons have formed within a dynamic shingle beach system where the River Stinchar enters Ballantrae Bay. Moore (1988) describes the historical changes to the lagoons' structure.

The southern lagoon is a percolation lagoon which is separated from the sea and the mouth of the River Stinchar by a shingle barrier. The lagoon consists of a single basin which is approximately 300 m long and 100 m wide with a maximum depth of 0.7 m. Water percolates into the lagoon from the sea through the shingle barrier, while freshwater enters the lagoon as run-off from the surrounding land. At the time of survey the salinity was measured at 20 ‰, a similar salinity to that measured by

Moore (1988; 21-25 ‰). The lagoon is bordered on the eastern side by arable land with a shingle ridge forming the other sides of the system.

To the north of the river mouth two basins form the northern lagoon. The basins are connected by a narrow channel approximately 100 m long and 1 m wide, while connection to the river mouth is via an intertidal sediment flat. The northernmost basin measures approximately 100 m by 50 m, has a maximum depth of 0.6 m and a measured salinity of 14 ‰. The southernmost basin measures approximately 150 m by 50 m with a maximum depth of 0.3 m. At time of survey in May 1995 the salinity was measured at 8 ‰; Moore (1988) found the highest salinity in this basin to be 4 ‰. There is a mixture of farmland, housing and saltmarsh vegetation bordering these basins on the eastern side, with shingle ridges to the north and west.

Physical features

<i>Physiographic type</i>	Percolation saline lagoon and silled saline lagoon (sill at high water)
<i>Area of lagoon</i>	10 ha
<i>Maximum length of lagoon</i>	Southern lagoon: 0.8 km. Northern lagoon (excluding joining channel & intertidal area): 0.25 km
<i>Bathymetry</i>	Maximum depth 0.7 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Negligible (less than 0.2 m)
<i>Salinity</i>	8-20 ‰ (measured)

Marine biology

The lagoon to the south of the River Stinchar was fringed by pebbles with some patches of mud and sand. The pebbles had the green algae *Enteromorpha intestinalis* and *Ulva lactuca* attached to them, and these in turn supported ectocarpoid brown algae (FiG). At a depth of 0.3 m, the pebbles gave way to a soft bottom of muddy sand, with dense clumps of the green alga *Derbesia marina* and the lugworm *Arenicola marina* present (FiG; LagMu). The surface of the sediment, and of some of the fringing pebbles, supported large numbers of tubicolous amphipods.

The lagoon to the north of the River Stinchar was connected to the mouth of the river via an intertidal sediment flat. The sediment flat was at high water level and had no evident biota present. The basin of the lagoon was floored by a mixture of small cobbles and pebbles with patches of muddy sand and the sand became predominant towards the centre of the basin. Near to the sediment flat, cobbles and pebbles supported sparse clumps of the brackish-water furoid *Fucus ceranoides*, while throughout the rest of the lagoon the tasselweed *Ruppia* sp., with filamentous green algae and the gastropod mollusc *Potamopyrgus antipodarum*, were found (Rup). This basin was fringed to the east by saltmarsh vegetation and to the north and west by shingle ridges.

The two basins of the northern lagoon were connected by a series of channels that joined to form a larger channel. This connecting channel had a maximum water depth of 0.3 m and was floored by pebbles with attached green alga *E. intestinalis*. The eastern side of this channel was bordered by a series of farm buildings and there was litter and large amounts of debris present in the channel. The western side of the channel was bordered by saltmarsh which gave way further west to shingle ridges. The channel passed through a cast-iron gate to enter the northern basin of the lagoon.

The northern basin was floored, to a depth of 0.6 m, by pebbles and cobbles with muddy fine sand. Dense tasselweed *Ruppia* sp. and some pondweed *Potamogeton* sp. grew in the sediment, and the gastropod mollusc *Potamopyrgus antipodarum* was present in large numbers on the cobbles and pebbles (Rup). The larger cobbles and pebbles supported filamentous green algae, including *E. intestinalis*, *Blidingia* sp., *Cladophora* sp. and *Derbesia marina* (FiG).

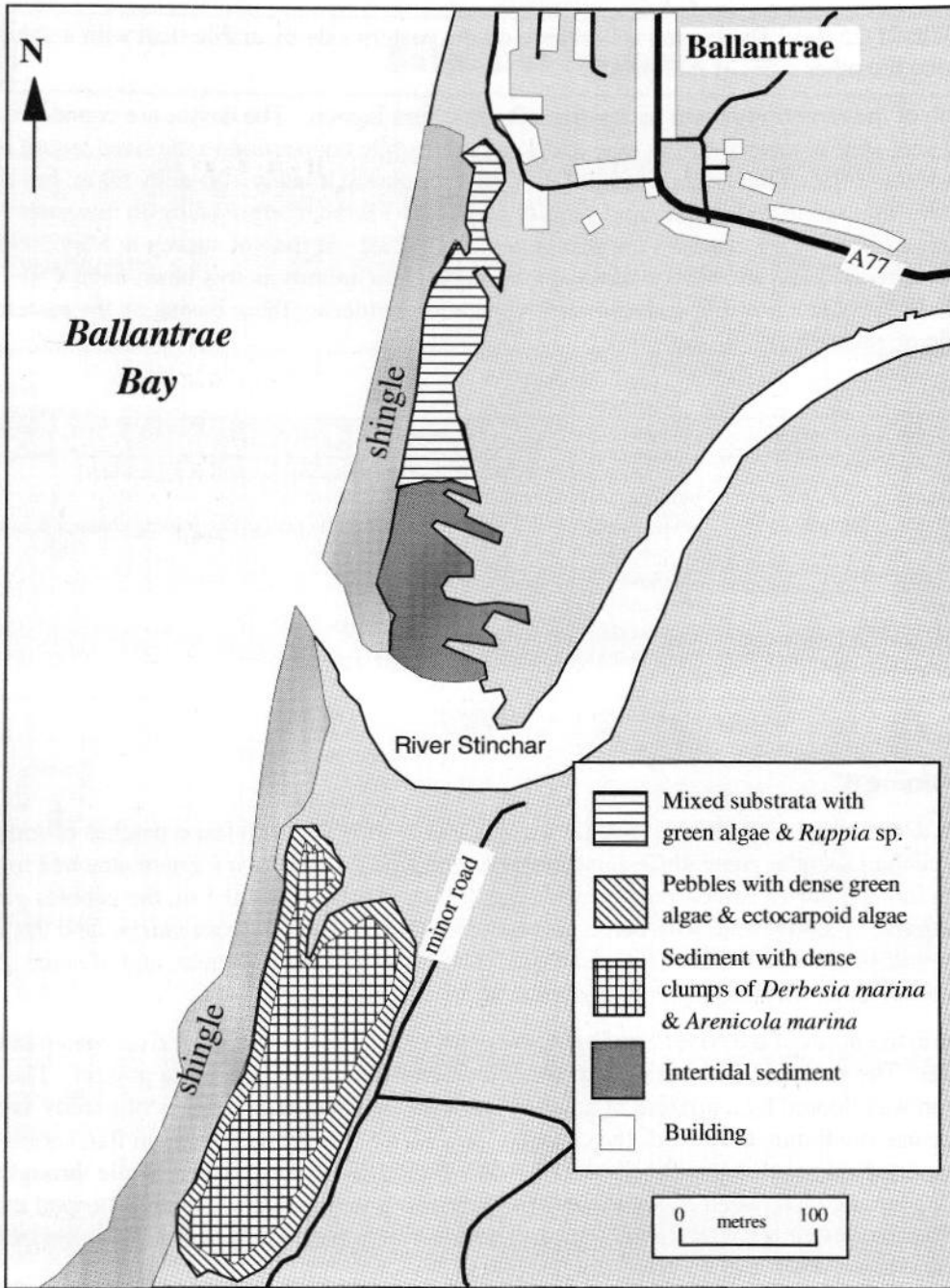


Figure 10.2 Distribution of the main biotopes.
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Nature conservation

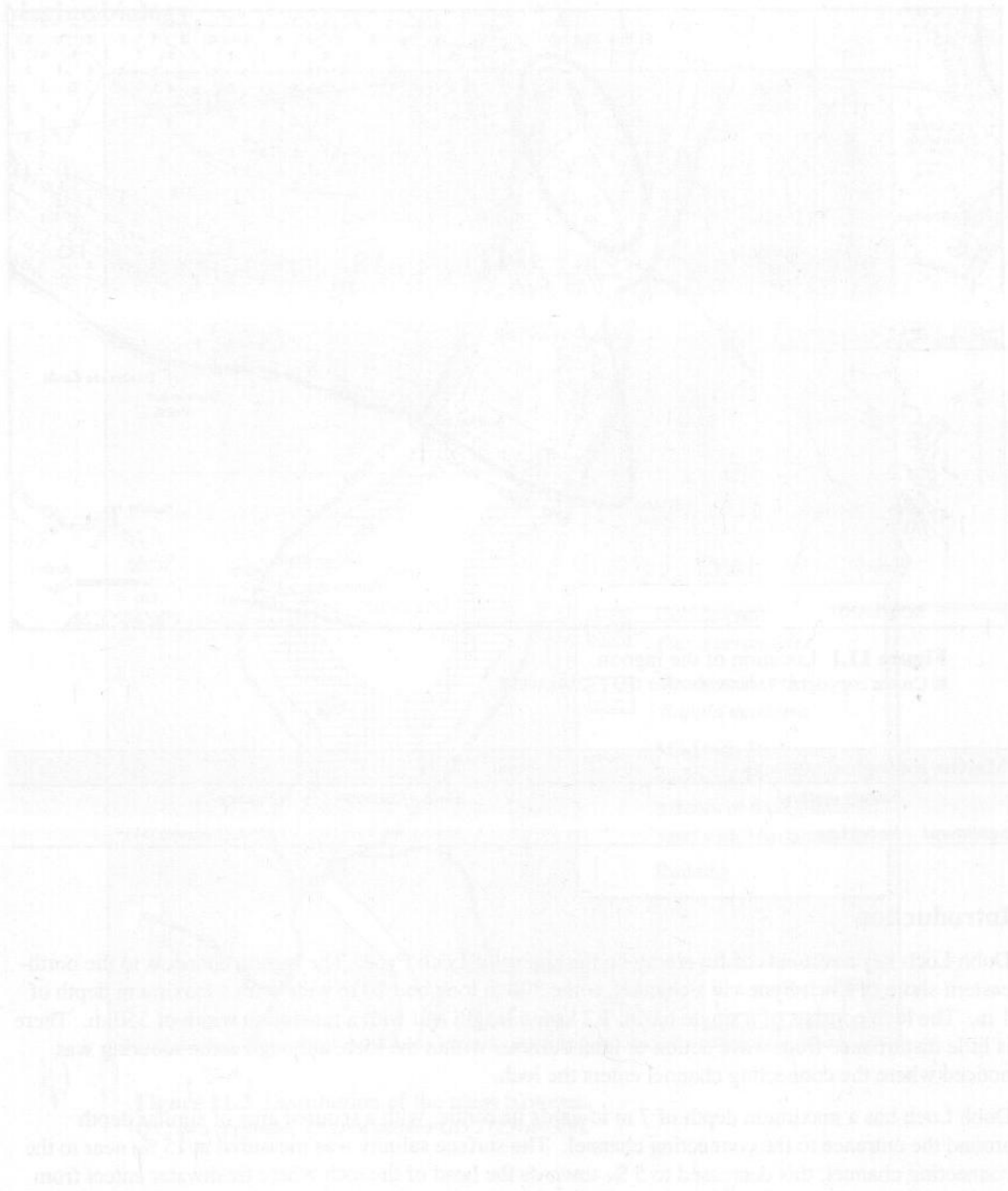
Conservation sites			
Site name	Designation	Centre grid ref.	Main features
Ballantrae shingle beach	SSSI	NX 080 818	Coastal habitats, ornithology

Human influences

The lagoon north of the River Stinchar is prone to the accumulation of large amounts of litter. Large amounts of litter, debris and household items were observed at the time of survey in May 1995.

References and further reading

Moore, P.G. 1988. Brackish-water systems in the Clyde Sea area. (Contractor: University Marine Biological Station, Millport.) *Nature Conservancy Council, CSD Report, No. 884.*



Compiled by: Frank Fortune

11

Dubh Loch, Loch Fyne

Location

<i>Position (centre)</i>	55° 15.10' N 05 ° 03.00' W	NN 115 110
<i>Administrative area</i>	Argyll & Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

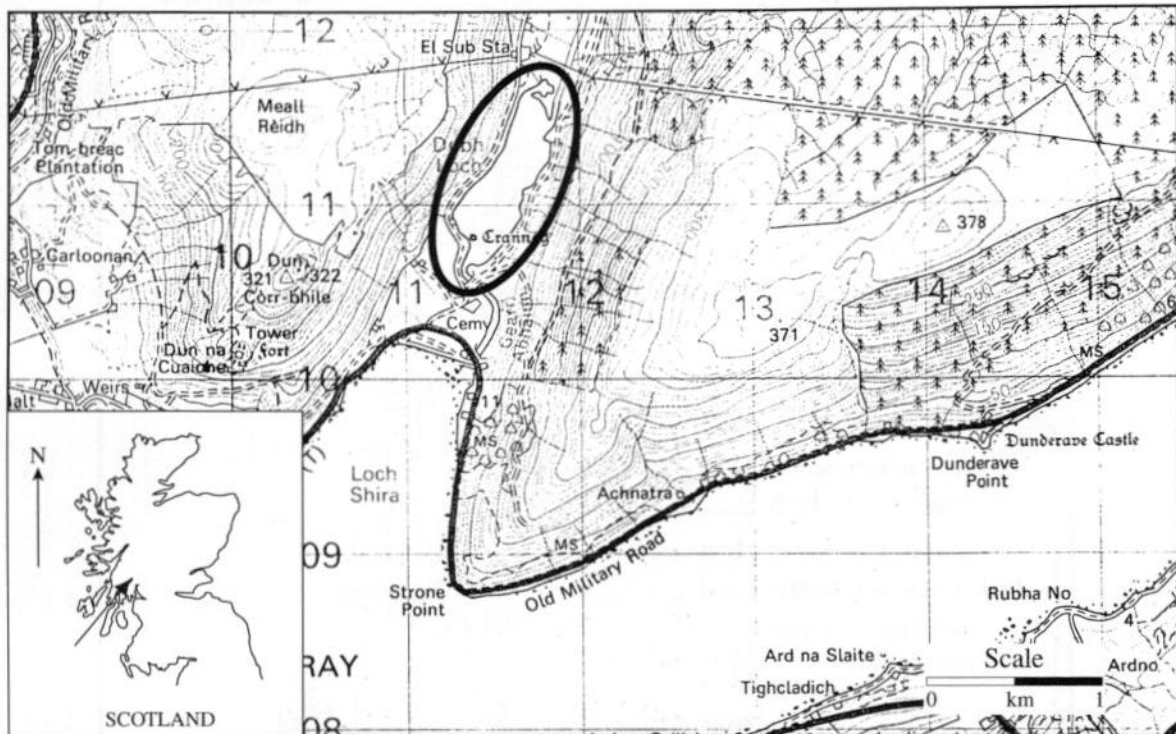


Figure 11.1 Location of the lagoon.

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Marine biological surveys

<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
Sublittoral Recording	May 1995	MNCr survey 447

Introduction

Dubh Loch lies north-east of Inveraray on the shores of Loch Fyne. The lagoon connects to the north-eastern shore of Loch Fyne via a channel, some 300 m long and 20 m wide with a maximum depth of 1 m. The loch consists of a single basin, 1.2 km in length and with a maximum width of 350 m. There is little disturbance from wave action or tidal currents within the loch, although some scouring was noticed where the connecting channel enters the loch.

Dubh Loch has a maximum depth of 7 m towards its centre, with a scoured area of similar depth around the entrance to the connecting channel. The surface salinity was measured at 15 ‰ near to the connecting channel, this decreased to 5 ‰ towards the head of the loch where freshwater enters from the River Shira. The loch is bordered on its eastern side by grassland and to the west by deciduous forest.

Physical features

<i>Physiographic type</i>	Silled saline lagoon (sill above mean high water)
<i>Area of lagoon</i>	26 ha
<i>Maximum length of lagoon</i>	1.2 km
<i>Bathymetry</i>	Maximum depth 7 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Negligible (less than 0.1 m)
<i>Salinity</i>	5 ‰ near head of lagoon; 15 ‰ near connecting channel (measured)

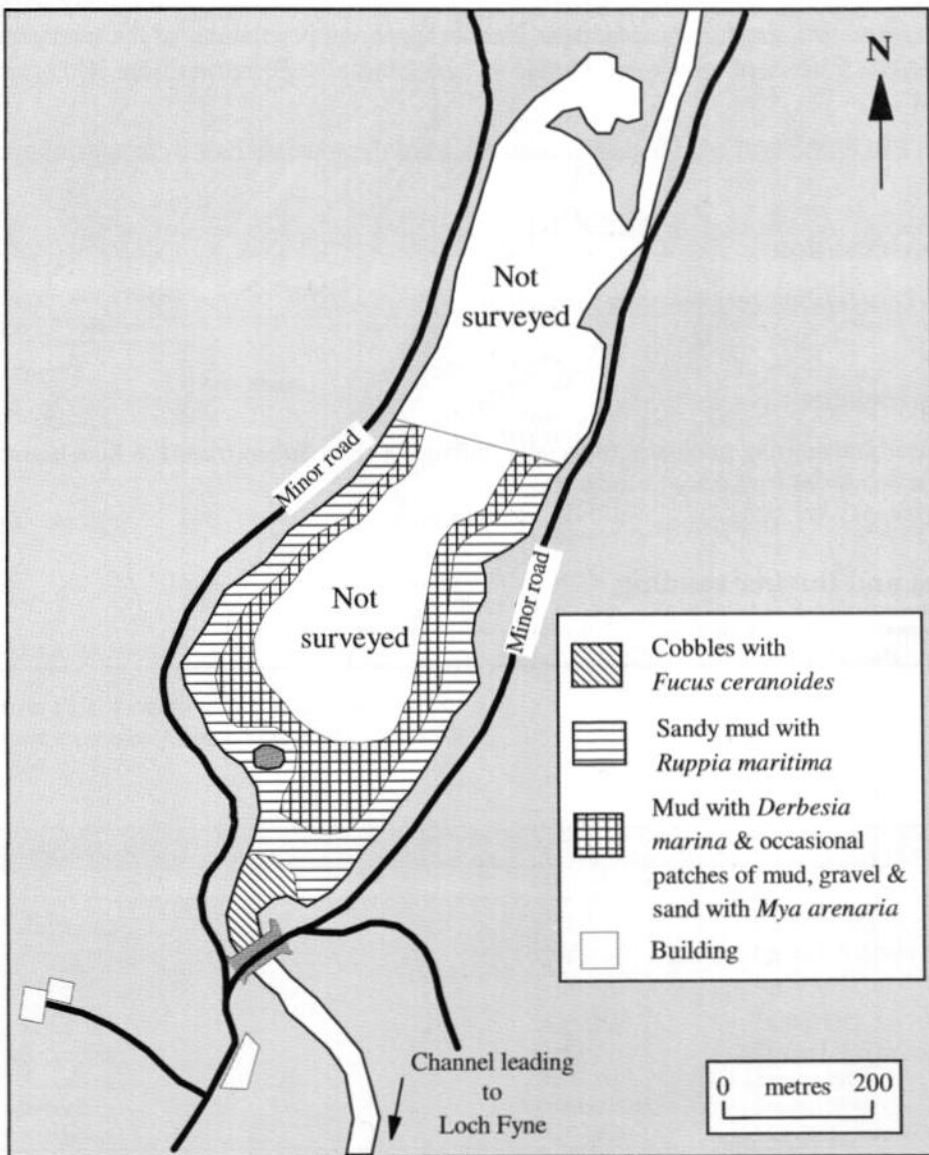
Marine biology

Figure 11.2 Distribution of the main biotopes.

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The northern section of the channel connecting Dubh Loch to Loch Fyne was floored, at a depth of 1 m, by a mixture of cobbles and pebbles which had the brackish-water furoid *Fucus ceranoides* and the green alga *Enteromorpha intestinalis* attached to them (FcerEnt). Towards the edge of the channel there were patches of sand and gravel, which supported sparse clumps of the tasselweed *Ruppia* sp.

The southern half of the loch was fringed by cobbles and pebbles overlain with sandy mud. The sediment, to a depth of about 1 m, supported dense stands of tasselweed *Ruppia* sp., with attached filamentous brown algae (Rup). Occasional patches of the green alga *Derbesia marina* were found amongst the *Ruppia* sp., whilst hydrobiid gastropods were found on the sediment surface and upon the *Ruppia* blades. The hydrobiids became more common toward the head of the loch.

At about 1 m depth the sandy mud gave way to soft, flocculent mud which extended to at least 4 m depth. The mud was covered by dense green alga *D. marina* (FiG). Below the halocline, the starfish *Asterias rubens* was common among the *Derbesia*. Occasional patches of coarser sandy sediment were present between 1 and 1.5 m depth, these patches supported populations of the sand gaper *Mya arenaria* (FaMx). Patches of tasselweed *Ruppia* sp. and green alga *D. marina* were also present on this sediment.

The northern half of the loch and the deeper central area of the southern half were not surveyed.

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The loch is used for sporting purposes, especially fishing for trout *Salmo trutta*. A boat house is present on the south-western shore of the loch.

References and further reading

None available.

12

Craiglin lagoon, Loch Sween

Location

<i>Position (centre)</i>	56° 01.8'N 05° 34.3'W	NR 775 878
<i>Administrative area</i>	Argyll & Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

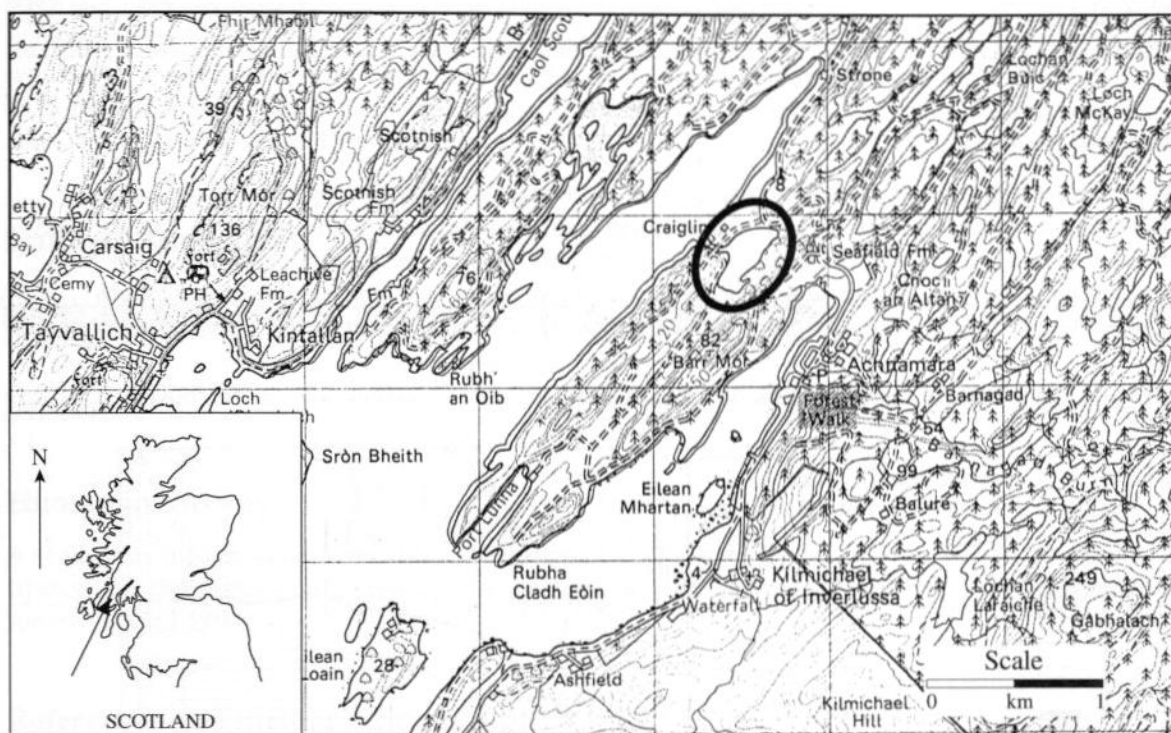


Figure 12.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording	1985	Smith (1985)
	Recording	1986	Hiscock & Smith (1986)
	Recording	August 1993	Smith (1994)
<i>Sublittoral</i>	Recording	May 1982	Earl (1982)
	Recording	August 1984	Rostron & Hiscock (1985)
	Recording	1985	Smith (1985)
	Recording	August 1993	Smith (1994)
	Recording	May 1994	MNCR survey 473

Introduction

Craiglin lagoon is connected to the eastern shore of Loch Sween via a narrow channel at mid-tide level. The lagoon consists of a single basin, 0.25 km by 0.5 km, and has a maximum depth of 5 m. There is little disturbance from wave action and only a little current action in and near the connecting channel. Freshwater input is limited to run-off from the surrounding land with no obvious streams. A

halocline was, however, observed at 1 m depth; salinity was measured at 20 ‰ above this and was fully marine below. The lagoon is largely surrounded by woodland, with some grassland.

Physical features

<i>Physiographic type</i>	Silled saline lagoon (sill at mid-tide level)
<i>Area of lagoon</i>	8 ha
<i>Maximum length of lagoon</i>	0.5 km
<i>Bathymetry</i>	Maximum depth 5 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Approximately 0.1 m
<i>Salinity</i>	20 ‰ to fully marine (measured)

Marine biology

The channel connecting Craigin lagoon to Loch Sween had a maximum depth of 0.5 m and was floored by a mixture of bedrock and boulders, with some cobbles and mud in-between. The serrated wrack *Fucus serratus* and the red alga *Polyides rotundus* were the most prominent biota on the rock, but the knotted wrack *Ascophyllum nodosum*, the sea oak *Halidrys siliquosa* and the sugar kelp *Laminaria saccharina* were also present. The mussel *Mytilus edulis* grew in the gaps between boulders with some mysid shrimps and eels *Anguilla anguilla* present. All rocky surfaces had a covering of encrusting coralline algae and the crustose red alga *Hildenbrandia* sp. (FChoG).

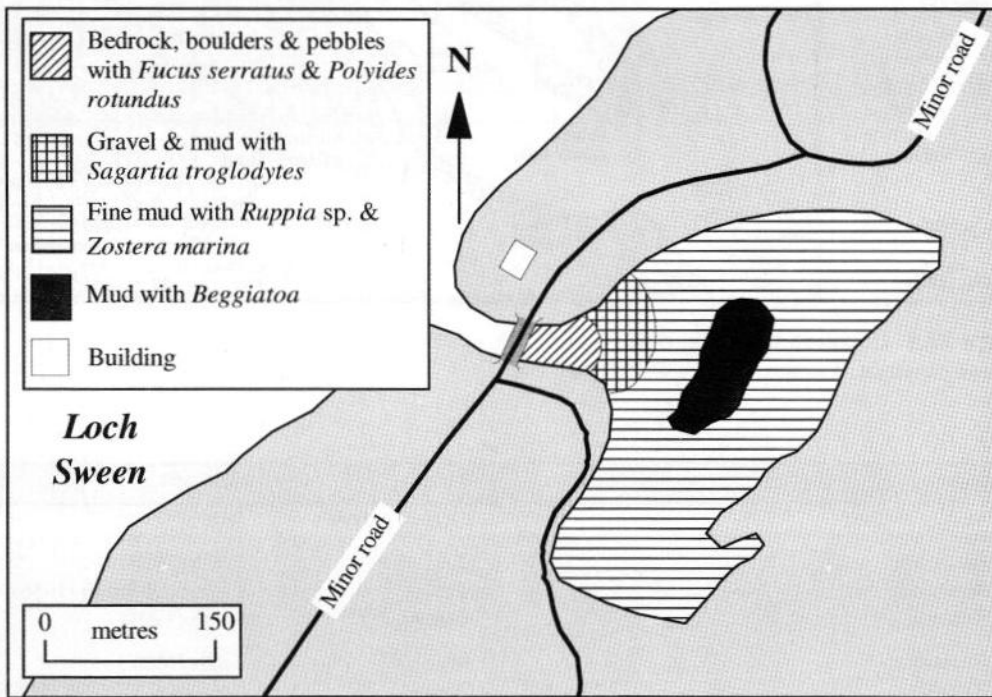


Figure 12.2 Location of the lagoon.
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Near to the lagoon entrance channel, from 0.5 m to 1.5 m depth, the lagoon bottom was stone gravel with mixed and overlaying mud. In the mud and gravel the burrowing anemone *Sagartia troglodytes* was present, along with the estuary cockle *Cerastoderma glaucum*, while attached to some of the

larger pieces of gravel was the large ascidian *Ciona intestinalis*. Patches of the tasselweed *Ruppia* sp. were present in the mud, and gobies *Pomatoschistus* sp. were on the mud surface.

The remainder of the lagoon, from the shore to a depth of 5 m, had a bottom of fine mud. Here tasselweed *Ruppia* sp. grew to about 1 m depth (Rup), giving way to the seagrass *Zostera marina* in deeper water (Zmar). This in turn gave way to bare mud with patches of the bacterial mat *Beggiatoa* at about 3.5 m depth (Beg). The green alga *Enteromorpha intestinalis* grew on the seagrass and mysid shrimps and gobies swam amongst the seagrass *Zostera* plants. Within the mud there were estuary cockles *C. glaucum* and shore crabs *Carcinus maenas* were observed burrowing in the sediment.

According to Smith (1985) the communities in the main section of Craiglin lagoon changed between 1982 and 1985. In 1982 there was healthy seagrass *Z. marina* and the opisthobranch mollusc *Akera bullata* was abundant; however by 1984 the seagrass *Z. marina* adjacent to the shore had died and was replaced by green algae. In the spring of 1985 there were fewer molluscs present on the *Z. marina* and no *A. bullata* were found. In June 1993 no seagrass *Z. marina* was seen (Smith 1994), but it was abundant at the time of the May 1994 survey.

Nature conservation

Conservation sites			
Site name	Designation	Centre grid ref.	Main features
Loch Sween	MCA	NR 730 820	Rich and diverse marine communities

Human influences

A soak-away pipe from the septic tank of a nearby cottage discharges into the lagoon. In the past, aquaculture experiments have been undertaken in the lagoon, although there were none at the time of survey in April 1994.

References and further reading

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Compiled by: Frank Fortune

The island of Easdale

Introduction

The island of Easdale lies on the west coast of Scotland, approximately 15 km to the south of Oban. The island, approximately 600 m long by 400 m wide, is separated from the mainland by Easdale Sound, which is 100 m wide at its narrowest point.

Easdale was the centre of slate quarrying from the 16th Century. Early operations were conducted above seawater level but as technology improved the quarries were deepened and worked regardless of the tides. A total of six quarries were established (see Figure 13.0) with peak production of 9 M slates achieved in 1869. In November 1881, the quarries were flooded by a great storm with production finally halting in 1914. The quarries now act as artificial lagoons; they have recently been considered for cod fish-farming.

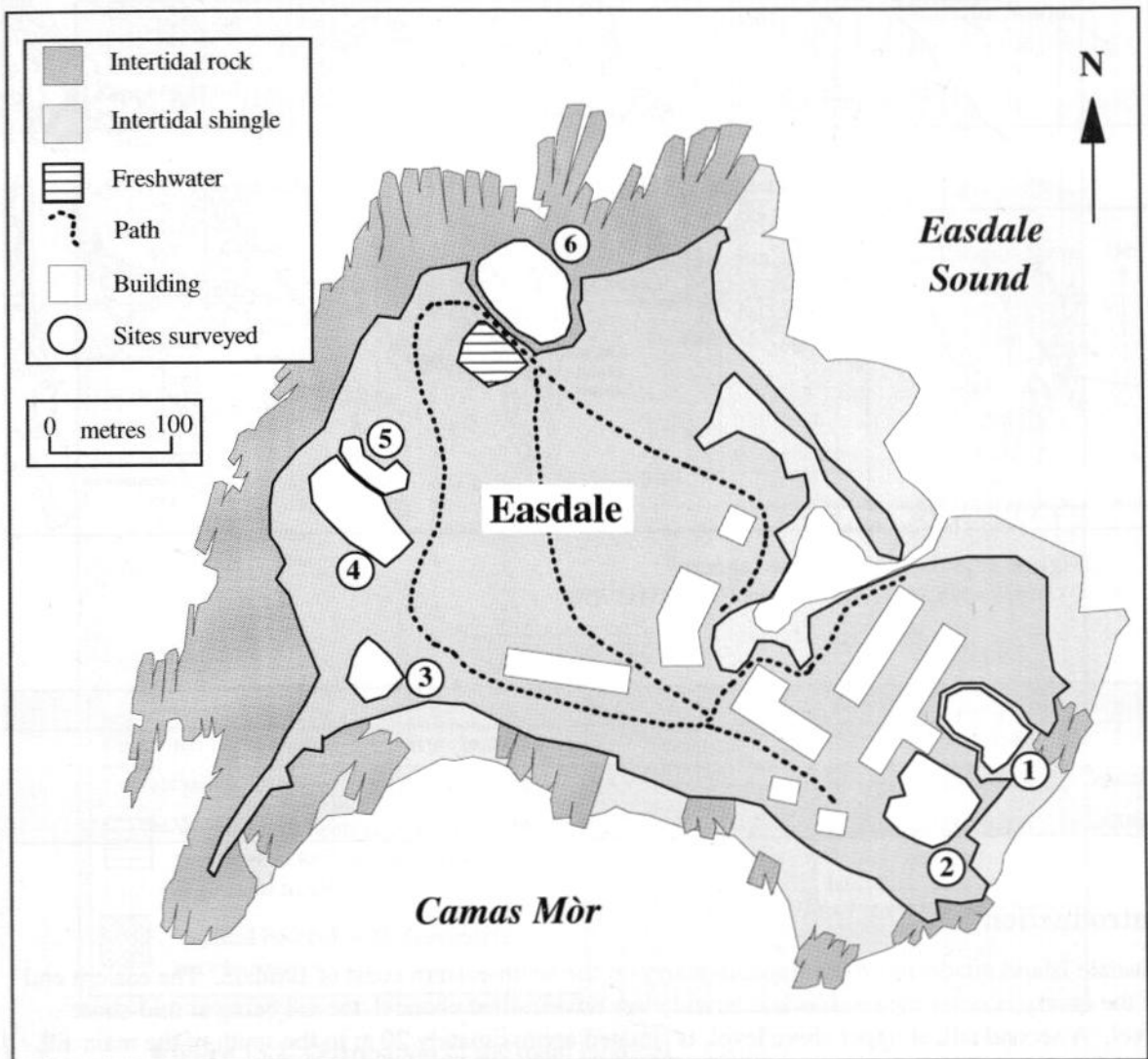


Figure 13.0 Map of Easdale showing the location of the quarries.

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13

Easdale Island quarry no. 1

Location

<i>Position (centre)</i>	56° 17.2' N 05° 39.4' W	NM 740 170
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

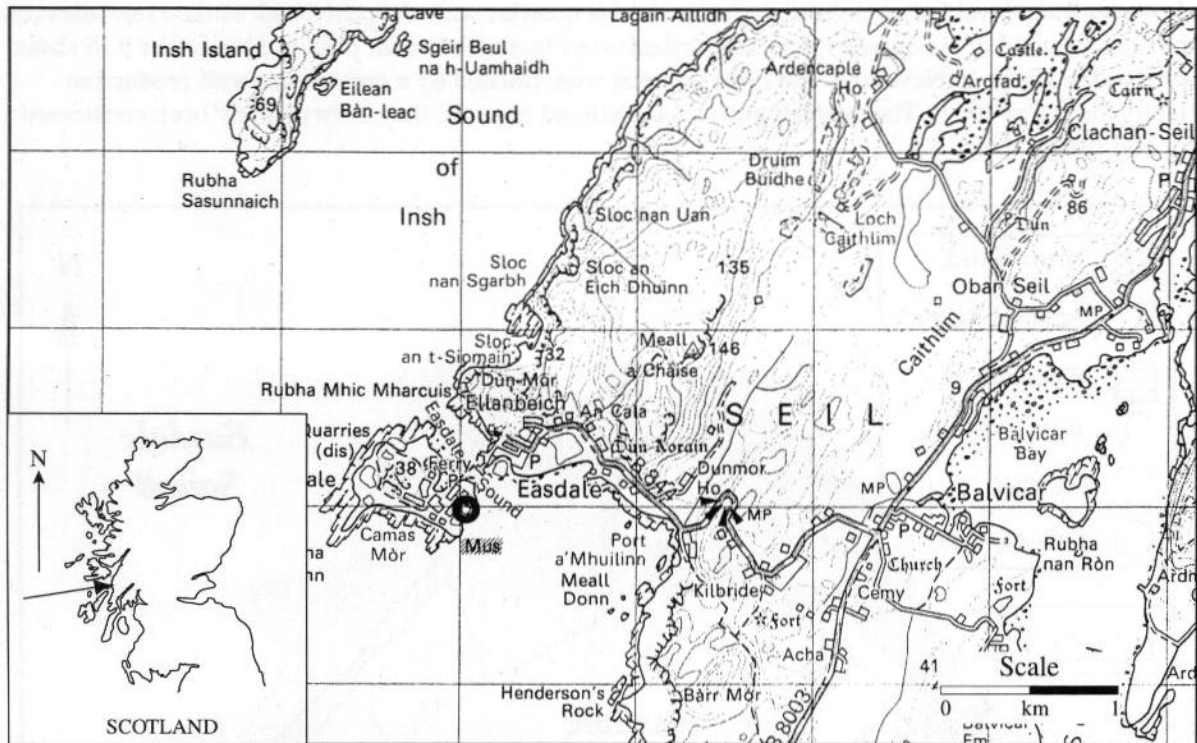


Figure 13.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording	May 1995	MNCR survey 447
<i>Sublittoral</i>	Recording	May 1995	MNCR survey 447

Introduction

Easdale Island quarry no. 1 is a flooded quarry on the south-eastern coast of Easdale. The eastern end of the quarry is connected to Easdale Sound via a broad, silled channel, the sill being at mid-shore level. A second sill, at upper shore level, is situated approximately 20 m to the south of the main sill. Seawater enters the lagoon across the sills on each high tide. Freshwater input to the quarry, consisting of run-off from surrounding land and some input from two septic tank 'soak-aways' at the north-western end, is minimal. The quarry was fully marine at time of survey.

The quarry consists of a single basin, 50 m by 50 m, with a maximum depth in excess of 20 m. Steep bedrock walls bound the quarry on most sides, with boulder slopes at the northern and southern

corners. The quarry is bordered on most sides by vertical bedrock outcrops, with a number of bungalows situated on its north-western shore.

Physical features

<i>Physiographic type</i>	Silled saline lagoon (sill at mid-tide level)
<i>Area of lagoon</i>	0.25 ha
<i>Maximum length of lagoon</i>	0.05 km
<i>Bathymetry</i>	Maximum depth >20 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	2.5 m
<i>Salinity</i>	Fully marine (measured)

Marine biology

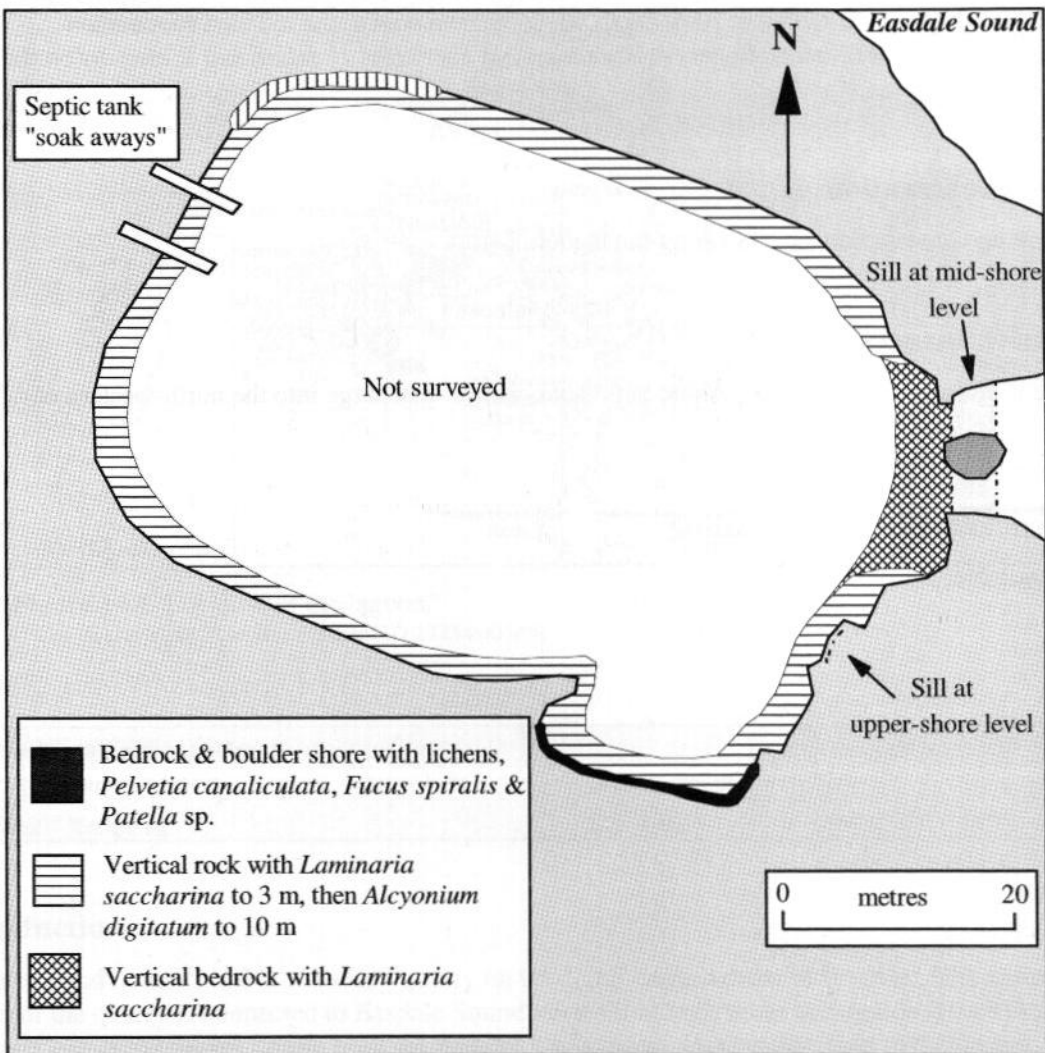


Figure 13.2 Distribution of the main biotopes.

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The main entrance sill to the quarry consisted of a break in the bedrock walls, with bladder wrack *Fucus vesiculosus* at its lowest point. Slightly to the south, a second break formed a sill with the channelled wrack *Pelvetia canaliculata* growing at its lowest point.

The quarry was surrounded on most sides by vertical rock faces, which restricted access to the intertidal area near the boulder slope at the south-eastern end of the quarry. Here the vertical rock supported a yellow lichen community (YG) and a black lichen *Verrucaria maura* zone (Ver.Ver) between 2.5 m and 2.0 m above low water level. These lichens gave way to a mixture of channelled wrack *Pelvetia canaliculata* (Pel) and spiral wrack *Fucus spiralis* (Fspi), on boulders between 2.0 m and 1.0 m above low water. A zone characterised by barnacles and limpets *Patella* sp. (BPat.Sem) extended from below the channelled wrack *P. canaliculata* down to low water level.

In the sublittoral, the boulder slope and vertical bedrock surfaces supported a dense forest of sugar kelp *Laminaria saccharina* to a depth of 3 m, with sparse dabberlocks *Alaria esculenta* present adjacent to both of the sills connecting to the sea (Lsac.Ft). As well as kelp, the rock surfaces supported populations of the anemones *Urticina felina* and *Sagartia elegans*, with dead-man's fingers *Alcyonium digitatum* and a number of red and other brown algae also present. Below 3 m depth and extending to the limit of survey at 10 m depth, the kelp gave way to the red alga *Plocamium cartilagineum* with dead-man's fingers *A. digitatum* and anemones *U. felina* and *S. elegans* on the bedrock (FaSwV).

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

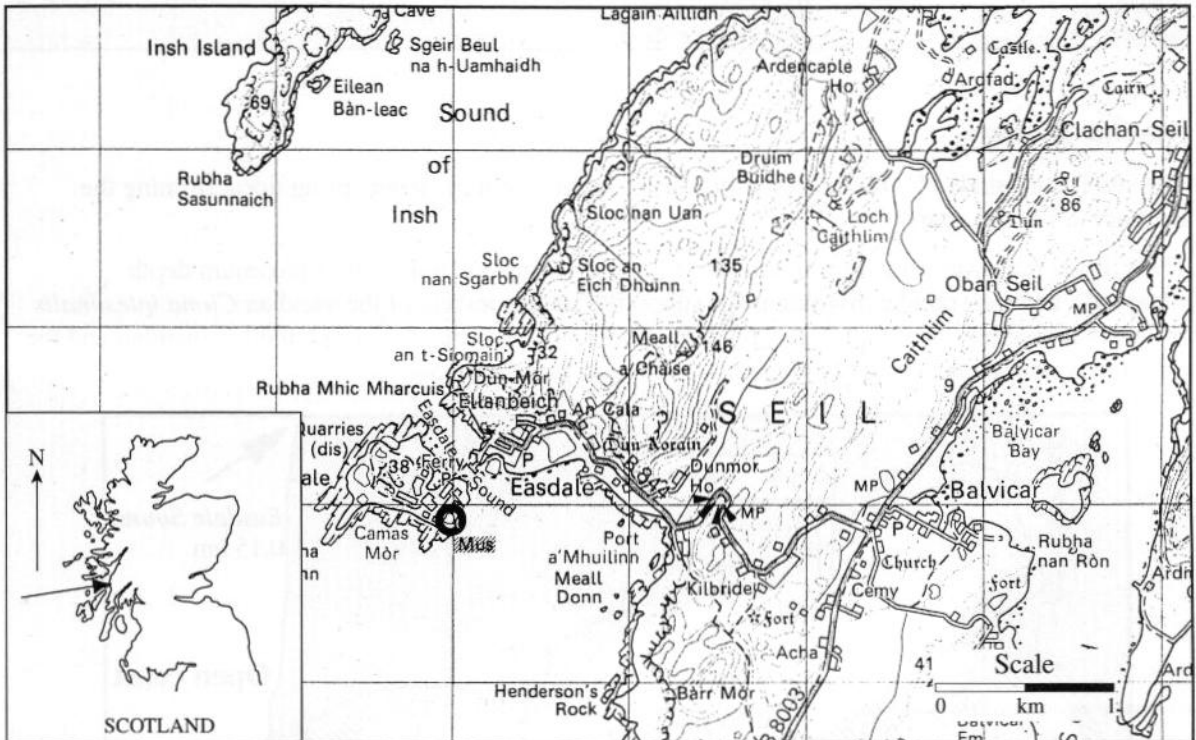
The site is entirely artificial. Two septic tank 'soak-aways' discharge into the north-western end of the quarry.

References and further reading

None available.

Location

<i>Position (centre)</i>	56° 17.1'N 05° 39.4'W	NM 739 169
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency / area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

**Figure 14.1** Location of the lagoon.

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Marine biological surveys

<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i> Recording	May 1995	MNCR survey 447

Introduction

Easdale Island quarry no. 2 is a flooded quarry on the south-eastern coast of Easdale. The eastern corner of the quarry is connected to Easdale Sound via a sill at high water spring tide (HWST) level. Seawater enters the quarry during high spring tides and storms. Freshwater input to the quarry, from run-off from surrounding land and some input from a septic tank 'soak-away' at the north-eastern corner of the quarry, is minimal. The site was fully marine at the time of survey.

The quarry consists of a single basin, approximately 50 m by 50 m, which is divided by a subtidal rock ridge into two sections of equal size. The quarry is surrounded on all sides by vertical rock faces which extend to a depth greater than 20 m. The site is surrounded by vertical bedrock outcrops, with

housing overlooking its north-western corner and an area of boulders at its western corner, forming a sill.

Physical features	
<i>Physiographic type</i>	Silled saline lagoon (sill at high water spring tide level)
<i>Area of lagoon</i>	0.25 ha
<i>Maximum length of lagoon</i>	0.05 km
<i>Bathymetry</i>	Maximum depth >20 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	Negligible
<i>Salinity</i>	33 ‰ (measured)

Marine biology

The site is surrounded by rock faces with a lower section, at high water spring tides, forming the entrance sill to the quarry.

The vertical rock wall surrounding the site, from the surface to 10 m depth (maximum depth surveyed), and the subtidal dividing ridge supported large numbers of the ascidian *Ciona intestinalis* and ectocarpoid brown algae. The sponge *Suberites* sp., the peacock worm *Sabella pavonina* and the calcareous tubeworm *Serpula vermicularis* were also present (FaSwV).

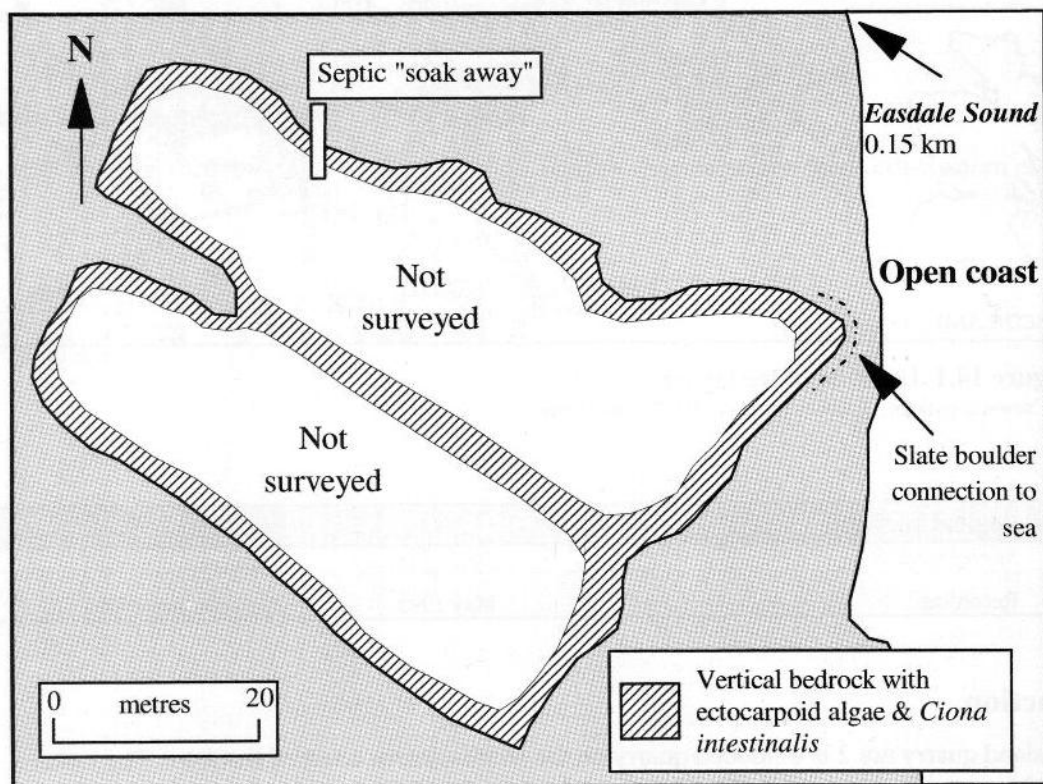


Figure 14.2 Distribution of the main biotopes.

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Nature conservation

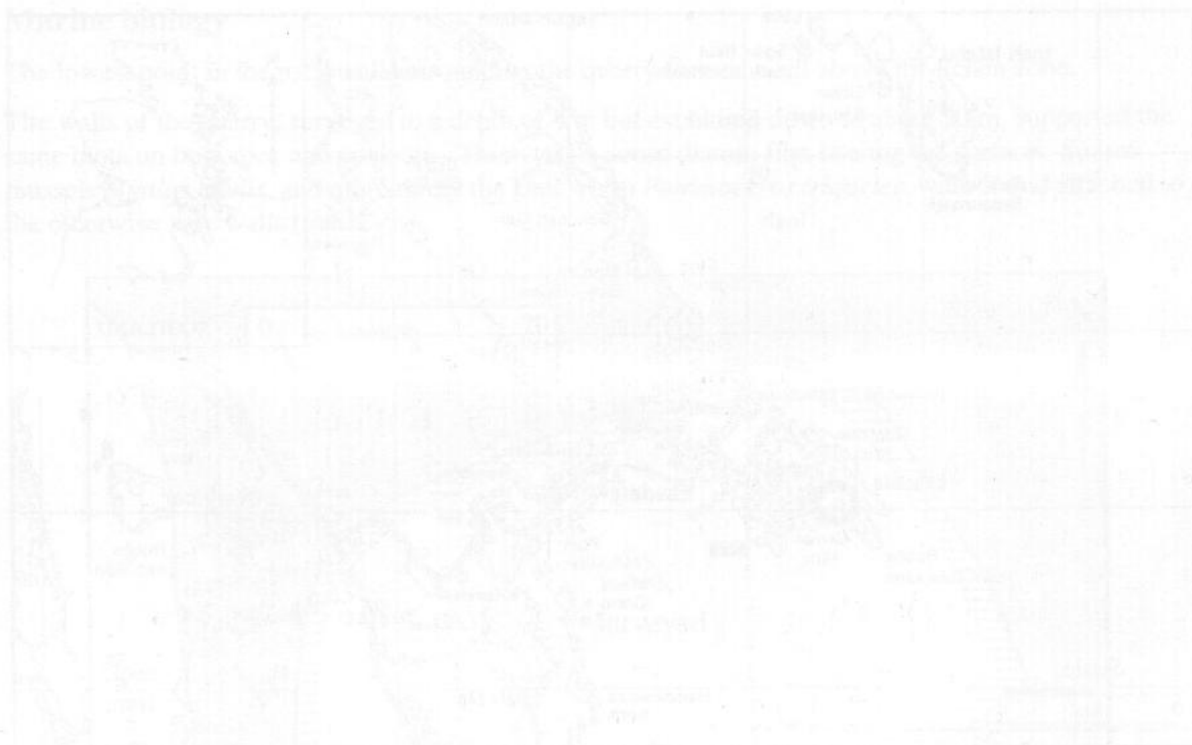
There are no conservation sites covering the lagoon.

Human influences

The site is entirely artificial. The 'soak-away' from a septic tank, discharges into the northern part of the quarry.

References and further reading

None available.



The quarry is situated on a small island in the Firth of Clyde, west of Glasgow. It is a large, rectangular area, approximately 1.5 km long and 0.5 km wide. The quarry is surrounded by a low wall, and the ground is mostly flat. The quarry is used for the extraction of sand and gravel. The quarry is situated on a small island in the Firth of Clyde, west of Glasgow. It is a large, rectangular area, approximately 1.5 km long and 0.5 km wide. The quarry is surrounded by a low wall, and the ground is mostly flat. The quarry is used for the extraction of sand and gravel.

Compiled by: Frank Fortune

15

Easdale Island quarry no. 3

Location		
Position (centre)	56° 17.2'N 05° 39.8'W	NM 735 170
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	South West (Argyll & Bute)

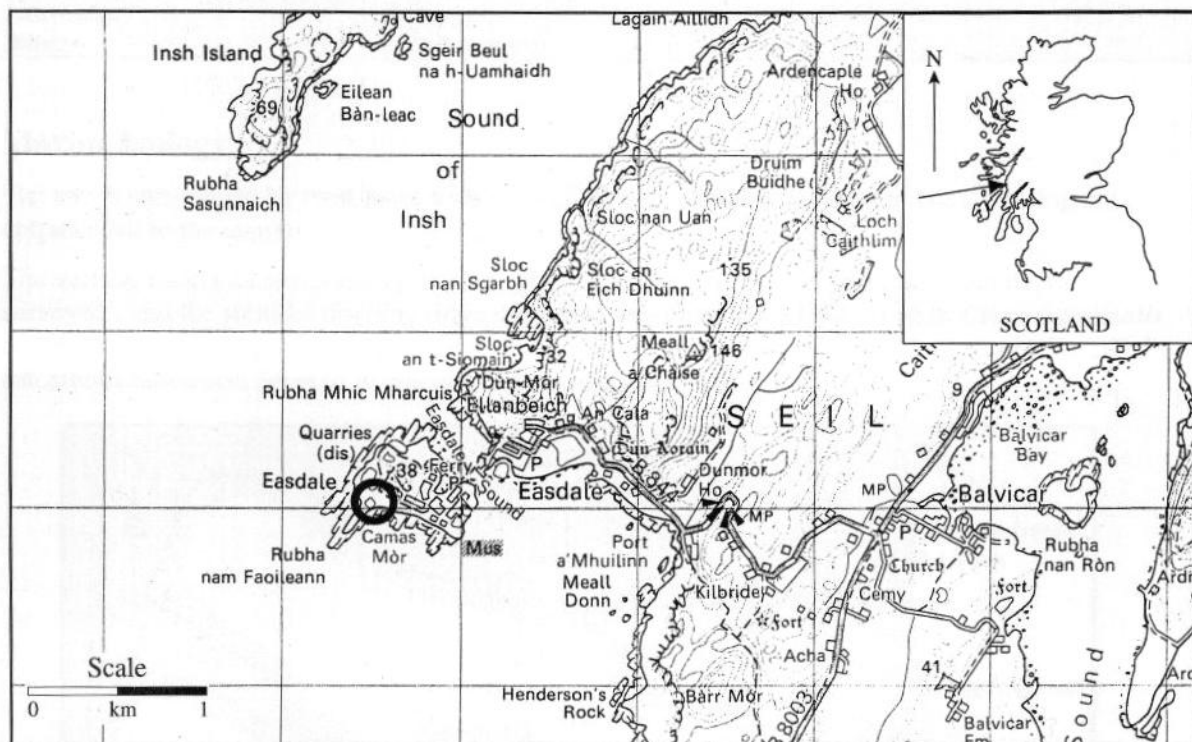


Figure 15.1 Location of the lagoon.
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Marine biological surveys		
Survey method	Date of survey	Source
Sublittoral Recording	May 1995	MNCR survey 447

Introduction

Easdale Island quarry no. 3 is a flooded quarry on the south-western coast of Easdale. The quarry has a sill at its western end, which lies above high water spring tide level and allows seawater to enter the quarry only during storms.

The quarry consists of a single basin bounded by vertical rock walls on all sides, with the southern side bounded by a concrete wall, from a depth of 2 m to a height of 2 m above water level. The rock walls extend to an estimated depth of 20 m (the limit of visibility during snorkel dives).

The site receives freshwater only as run-off from surrounding land; at the time of survey the salinity was measured at 26 ‰.

Physical features

<i>Physiographic type</i>	Isolated saline lagoon
<i>Area of lagoon</i>	0.25 ha
<i>Maximum length of lagoon</i>	0.05 km
<i>Bathymetry</i>	Maximum depth >20 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Negligible
<i>Tidal range</i>	None
<i>Salinity</i>	26 ‰ (measured)

Marine biology

The lowest point in the rock wall surrounding the quarry formed a sill above the lichen zone.

The walls of the quarry, surveyed to a depth of 4 m but extending down to about 20 m, supported the same biota on both rock and concrete. There was a dense diatom film coating the surface. Sparse mussels *Mytilus edulis*, and more rarely the keel worm *Pomatoceros triqueter*, were found attached to the otherwise bare walls (FaSwV).

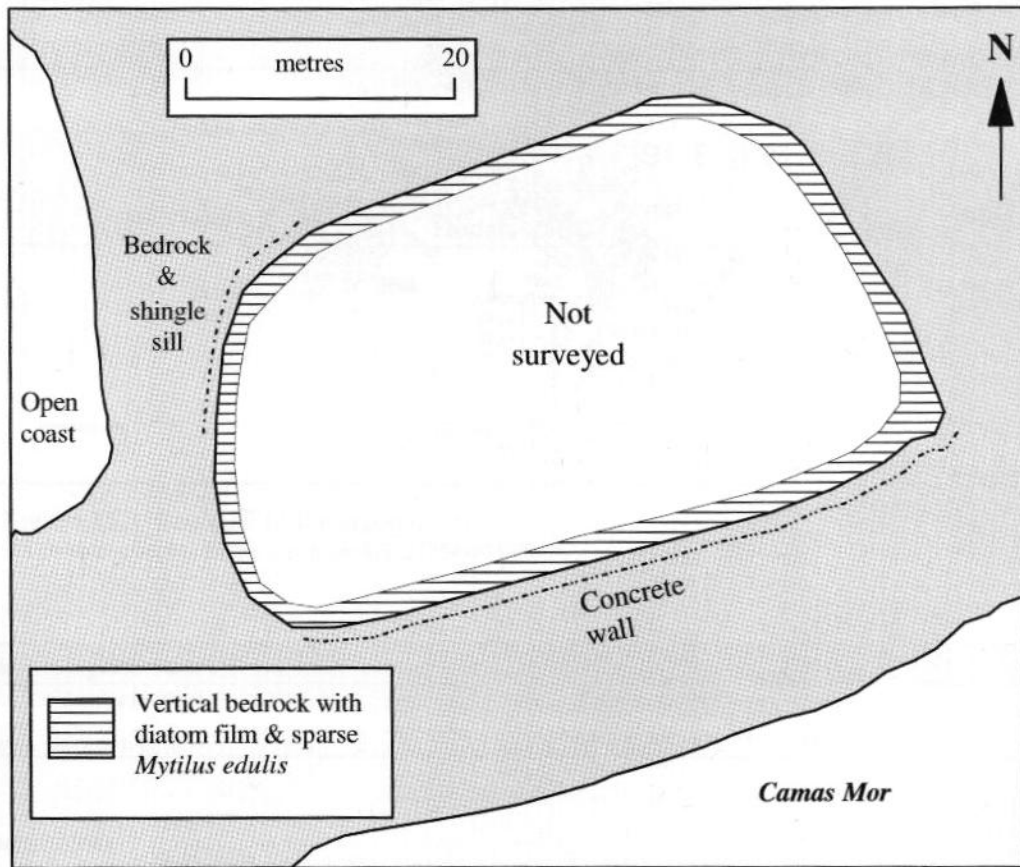


Figure 15.2 Distribution of the main biotopes.

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Nature conservation

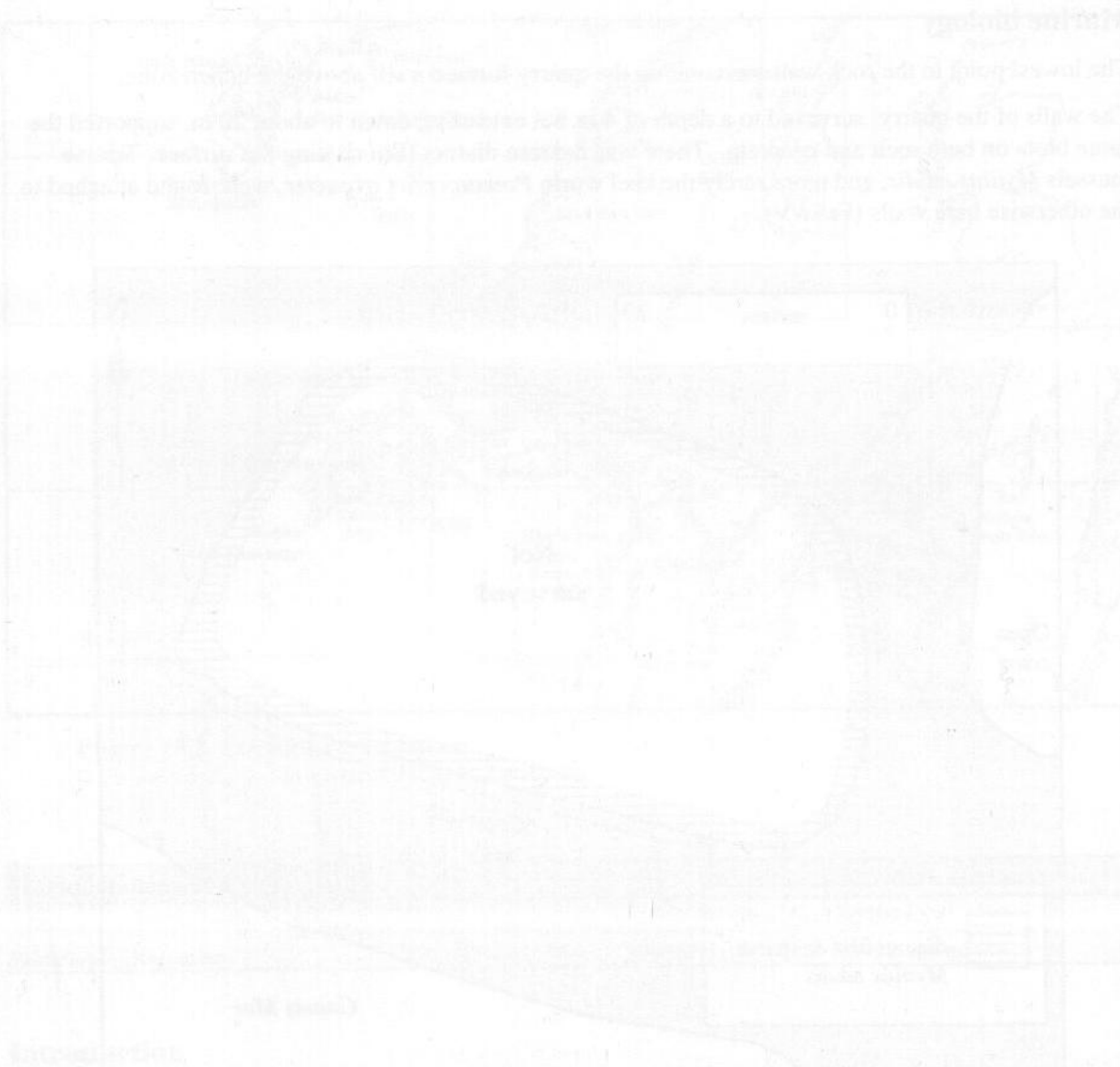
There are no conservation sites covering the lagoon.

Human influences

The site is entirely artificial and is bounded on its southern side by a concrete wall.

References and further reading

None available.



Compiled by: Frank Fortune

16

Easdale Island quarry no. 4

Location

<i>Position (centre)</i>	56° 17.2'N 05° 39.8'W	NM 735 171
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

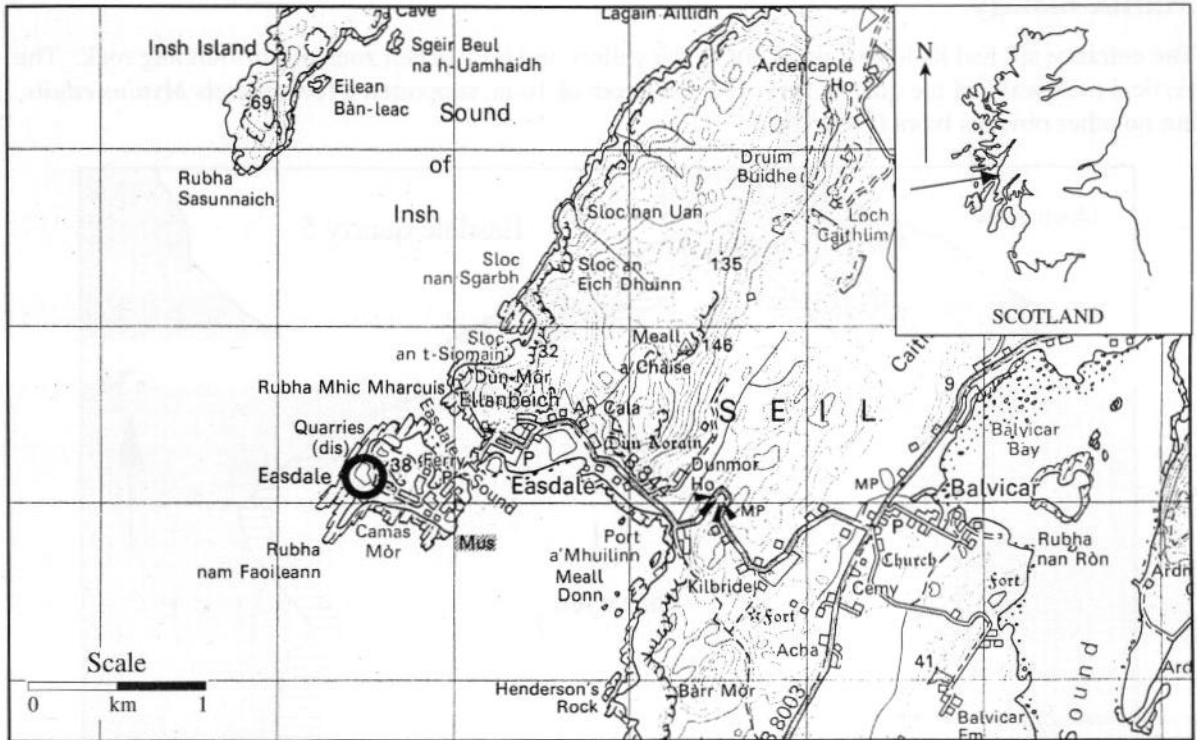


Figure 16.1 Location of the lagoon.

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Marine biological surveys

<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i> Recording	May 1995	MNCR survey 447

Introduction

Easdale Island quarry no. 4 is a flooded quarry on the western coast of Easdale, with a sill at its north-western end. The sill is formed by a slate bar, the top of which is above high water spring tide level. The sill is over-topped during storms but some percolation through the bar may also occur.

The quarry consists of a single basin with vertical bedrock walls on all sides. The walls extend to a depth greater than 20 m. The site may receive some freshwater run-off from surrounding land; at the time of survey the salinity was measured at 20 ‰.

Physical features	
Physiographic type	Isolated saline lagoon; some percolation may occur
Area of lagoon	0.25 ha
Maximum length of lagoon	0.075 km
Bathymetry	Maximum depth >20 m
Wave exposure	Ultra sheltered
Tidal streams	Negligible
Tidal range	None
Salinity	20 ‰ (measured)

Marine biology

The entrance sill had its lowest point above the yellow and grey lichen zone on surrounding rock. The vertical rock walls of the quarry, surveyed to a depth of 10 m, supported a few mussels *Mytilus edulis*, but no other obvious biota (FaSwV).

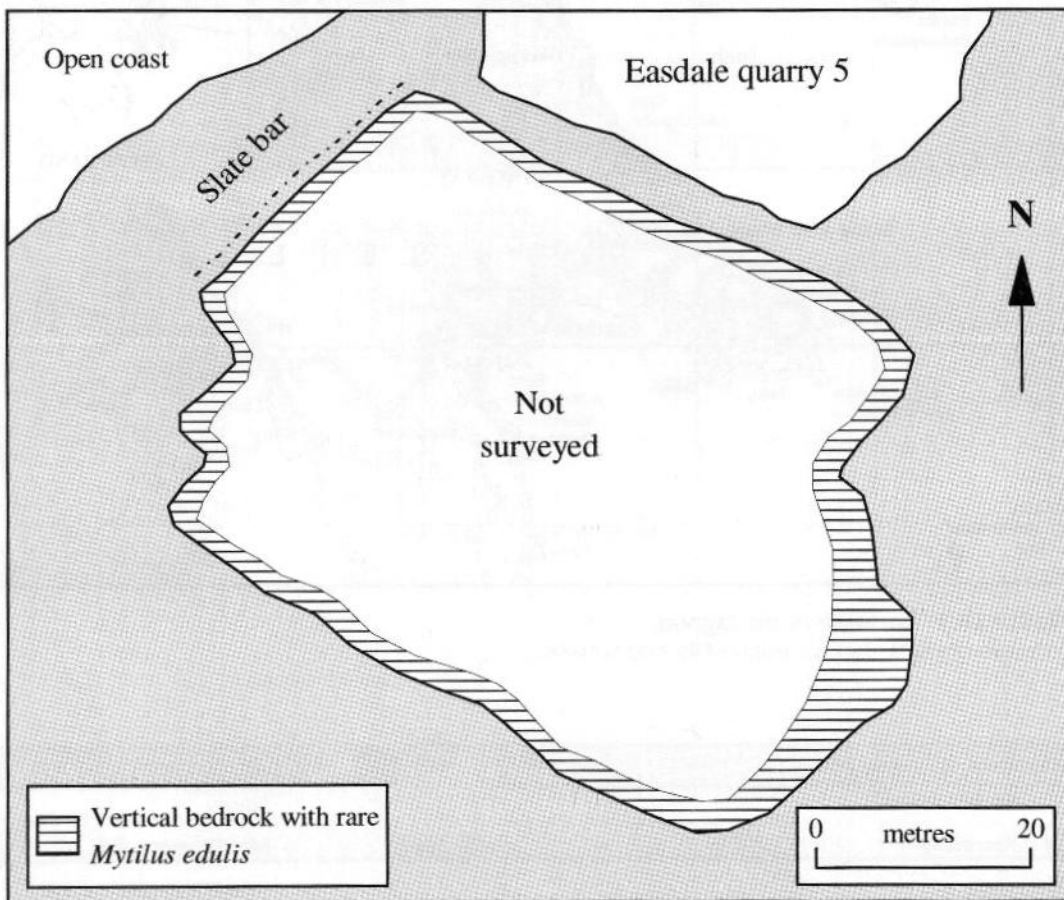


Figure 16.2 Distribution of the main biotopes.
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Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The site is entirely artificial.

References and further reading

None available.

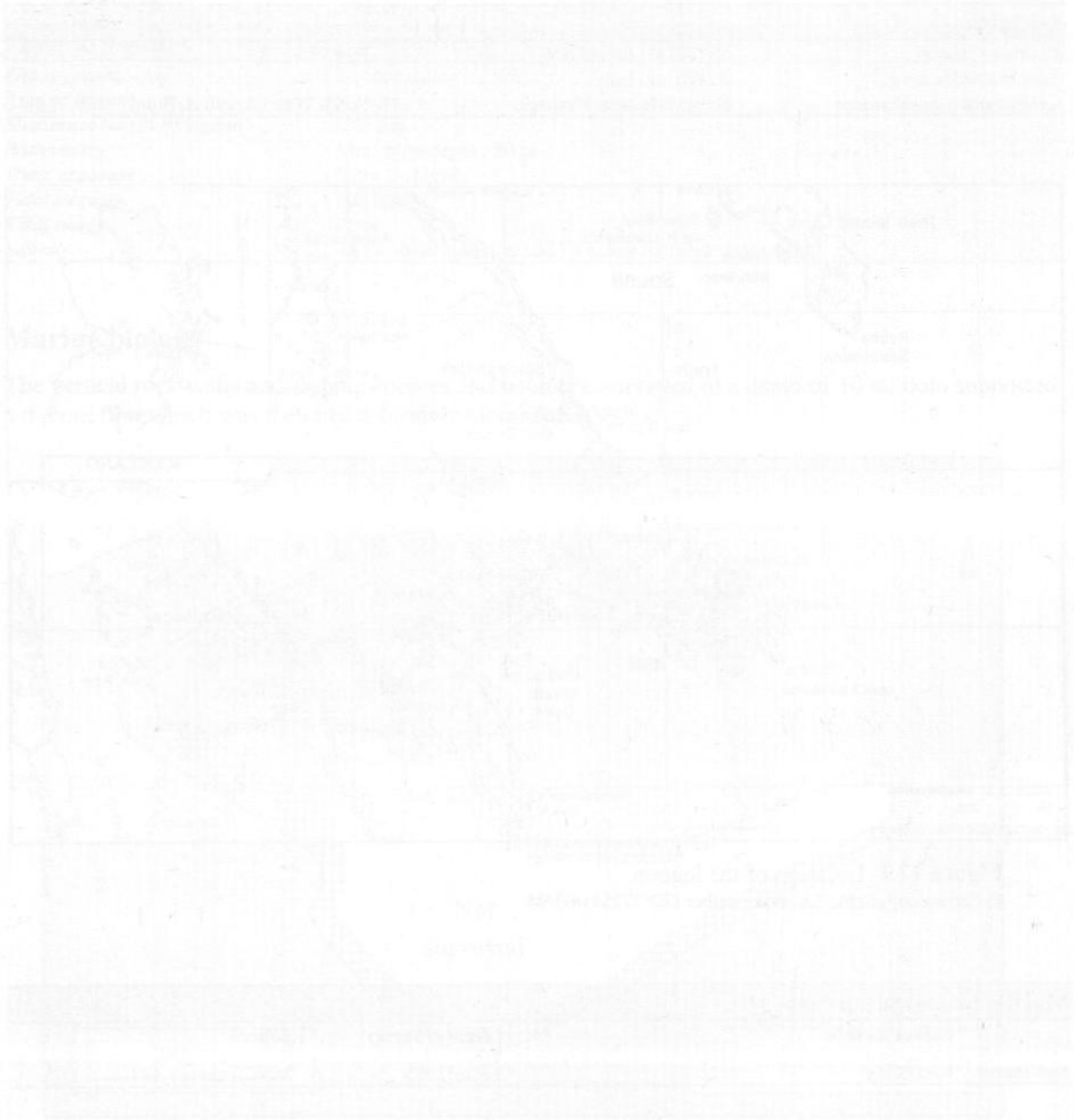


Figure 1.2 Distribution of the main features

Nature conservation

Human influences

Compiled by: Frank Fortune

17 **Easdale Island quarry no. 5**

Location		
Position (centre)	56° 17.3'N 05° 40.8'W	NM 735 173
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	South West (Argyll & Bute)

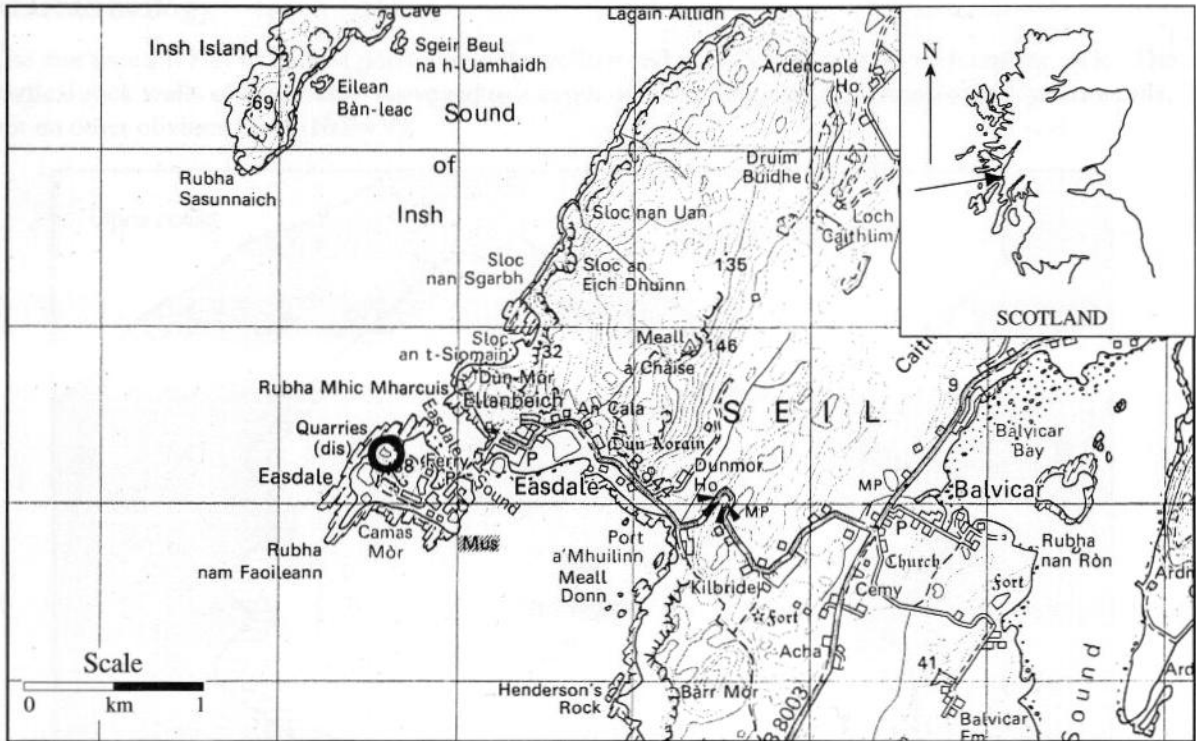


Figure 17.1 Location of the lagoon.
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Marine biological surveys		
Survey method	Date of survey	Source
Sublittoral Recording	May 1995	MNCR survey 447

Introduction

Easdale Island quarry no. 5 is a flooded quarry on the western coast of Easdale. The quarry has no obvious connection to the sea, although over-topping of a slate bar to the north-west may occur during storms and some percolation through the bar may also occur.

The quarry has one basin, floored at its north-western end by a gentle slope of cobbles and small boulders. These cobbles and boulders give way at about 5 m depth, to steeply-sloping bedrock. The remaining quarry sides have vertical bedrock walls. At the eastern end of the quarry the walls extend to depths greater than 20 m.

The quarry may receive freshwater run-off from surrounding land. At the time of survey in May 1995 a halocline and thermocline were present; salinity above and below were measured at 18 ‰ and 30 ‰ respectively.

Physical features

<i>Physiographic type</i>	Isolated saline lagoon
<i>Area of lagoon</i>	0.25 ha
<i>Maximum length of lagoon</i>	0.05 km
<i>Bathymetry</i>	Maximum depth >20 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Negligible
<i>Tidal range</i>	None
<i>Salinity</i>	18 ‰ above halocline, 30 ‰ below halocline (measured)

Marine biology

The vertical rock walls and sloping cobbles and boulders, surveyed to a depth of 10 m, both supported a diatom film which was the only noticeable biota (FaSwV).

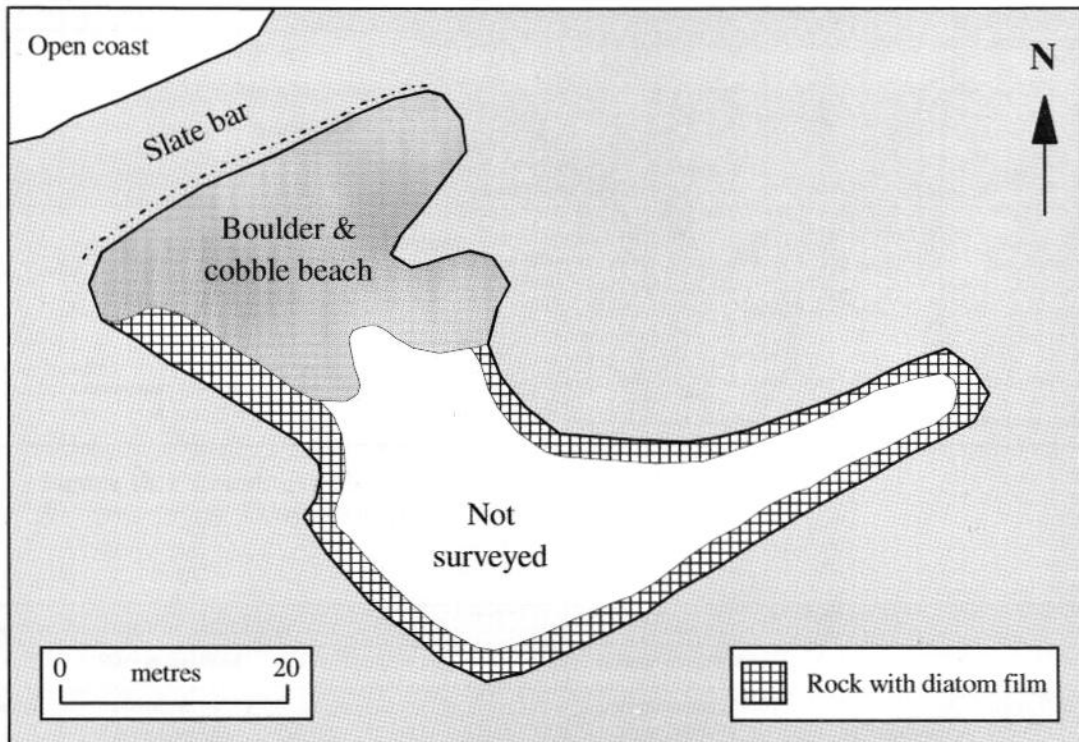


Figure 17.2 Distribution of the main biotopes.
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Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The site is entirely artificial.

References and further reading

None available.



Introduction
The study area is situated in the Inner Hebrides, specifically in the Shetland Islands. It is a coastal lagoon system that has developed over time due to a combination of natural and human factors. The lagoon is characterized by its shallow waters and extensive mudflats, which are important for wildlife and fisheries. The surrounding land is primarily agricultural, and the lagoon system plays a crucial role in the local economy and environment. The study aims to provide a detailed description of the lagoon system and its significance to the local community.

Compiled by: Frank Fortune

Easdale Island quarry no. 6

Location

<i>Position (centre)</i>	56° 17.4'N 05° 39.6'N	NM 736 174
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

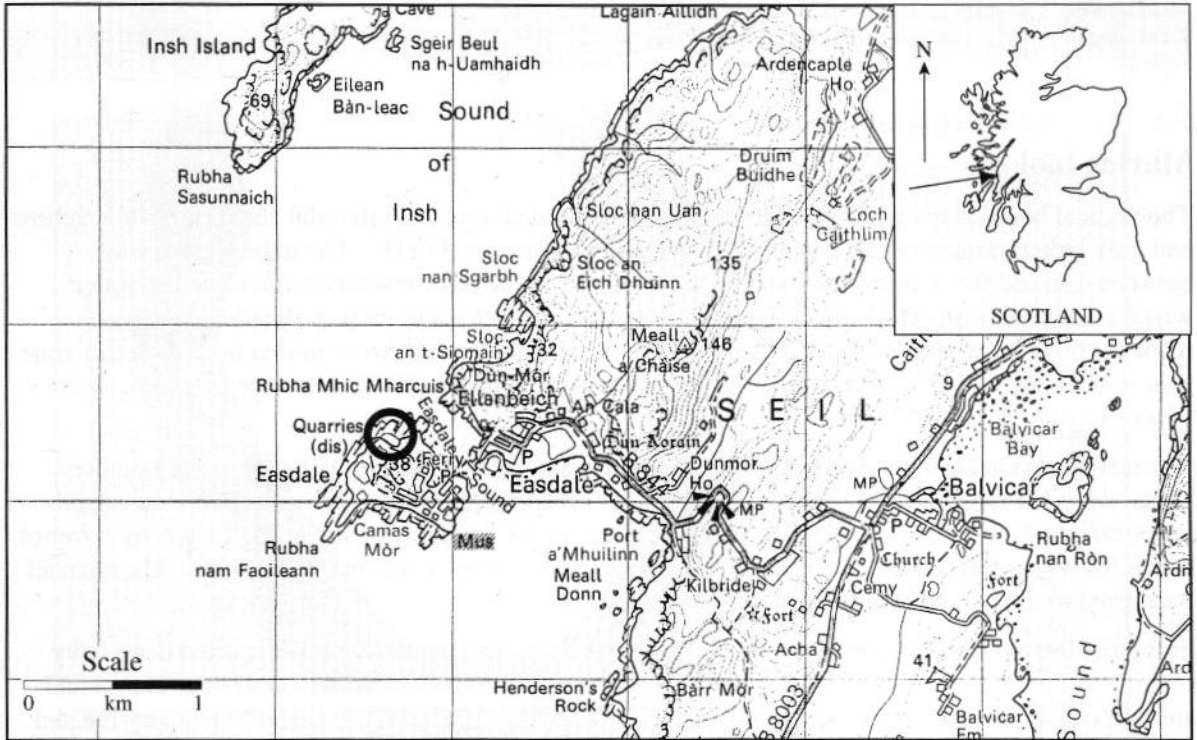


Figure 18.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording	September 1966	Norton & Milburn (1972)
	Recording	May 1995	MNCR survey 447
<i>Sublittoral</i>	Recording	September 1966	Norton & Milburn (1972)
	Recording	May 1995	MNCR survey 447

Introduction

Easdale Island quarry no. 6 is a flooded quarry on the northern coast of Easdale, the sea having inundated the quarry during a storm in 1881 (Norton & Milburn 1972). The quarry is connected to the sea via three sills on its north-west and north sides. The two sills to the north-west are at upper shore level and the lowest sill, to the north, is at sublittoral fringe level. This sublittoral fringe sill leads to a tide-swept bedrock and boulder entrance channel, some 20 m in length, at the north end of the quarry. The quarry has water exchange with the sea during the whole tidal cycle and, with only limited freshwater input, is consequently fully marine.

The quarry has only one basin and the walls on all sides consist of vertical bedrock which extends to depths greater than 60 m. The quarry is bordered to the south and west by large areas of abandoned slate workings and mounds of loose broken slate.

Physical features

<i>Physiographic type</i>	Saline lagoon inlet
<i>Area of lagoon</i>	0.5 ha
<i>Maximum length of lagoon</i>	0.15 km
<i>Bathymetry</i>	Maximum depth >60 m (Norton & Milburn 1972)
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak, but strong in entrance channel
<i>Tidal range</i>	2 m
<i>Salinity</i>	35‰ (measured)

Marine biology

The vertical bedrock walls surrounding the quarry exhibited a typical intertidal zonation, with a yellow and grey lichen zone between 1 m and 2 m above low water level (YG). The lichens gave way, between 1 m and 0.5 m above low water, to the channelled wrack *Pelvetia canaliculata* and spiral wrack *Fucus spiralis* (Pel; Fspi). Below this a zone of barnacles and limpets *Patella vulgata* was recorded down to the lowest water level, with the beadlet anemone *Actinia equina* present in this zone near to the main entrance channel (BPat.Sem). Norton & Milburn (1972) noted the complete absence of a serrated wrack *Fucus serratus* zone.

The main tidal channel connecting the quarry to the open sea was floored by bedrock and boulders which were encrusted by coralline red algae and the breadcrumb sponge *Halichondria panicea* and supported the kelp *Laminaria digitata* (Ldig.T). The littoral zone in the channel had a patchy cover of barnacles with scattered red algae, limpets and beadlet anemones *A. equina* (BPat.Sem). The channel connected to the quarry in the sublittoral fringe.

In the shallow sublittoral zone of the quarry itself the walls, to a depth of 3 m, supported dense silty sugar kelp *Laminaria saccharina*, together with some ascidians and red algae (Lsac.Ft). Occasional areas of overhanging bedrock between 0.2 and 3.0 m depth on the northern side of the quarry created shallow, silt-free habitats. The community here contained the peacock worm *Sabella pavonina*, the tubeworm *Serpula vermicularis*, dead-man's fingers *Alcyonium digitatum*, and a number of ascidians and sponges (FaSwV). Below 3 m the kelp gave way to a community similar to that found on the overhangs in shallower water, but with foliose red algae, such as *Phycodrys rubens* and *Delesseria sanguinea*, also present. This community was recorded to a depth of 6 m, but may have extended deeper. Norton & Milburn (1972) noted that sugar kelp *L. saccharina* was dominant down to 6 m with scattered kelp plants extending down to 12 m and that below 12 m the red algae *P. rubens* and *D. sanguinea* became dominant; these became sparser with depth until 24 m where only the red alga *Plocamium cartilagineum* and coralline algal crusts were found. They reported the presence of anoxic conditions below 24 m in September 1966 and recorded a total of 75 species of algae from the quarry.

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The site is entirely artificial.

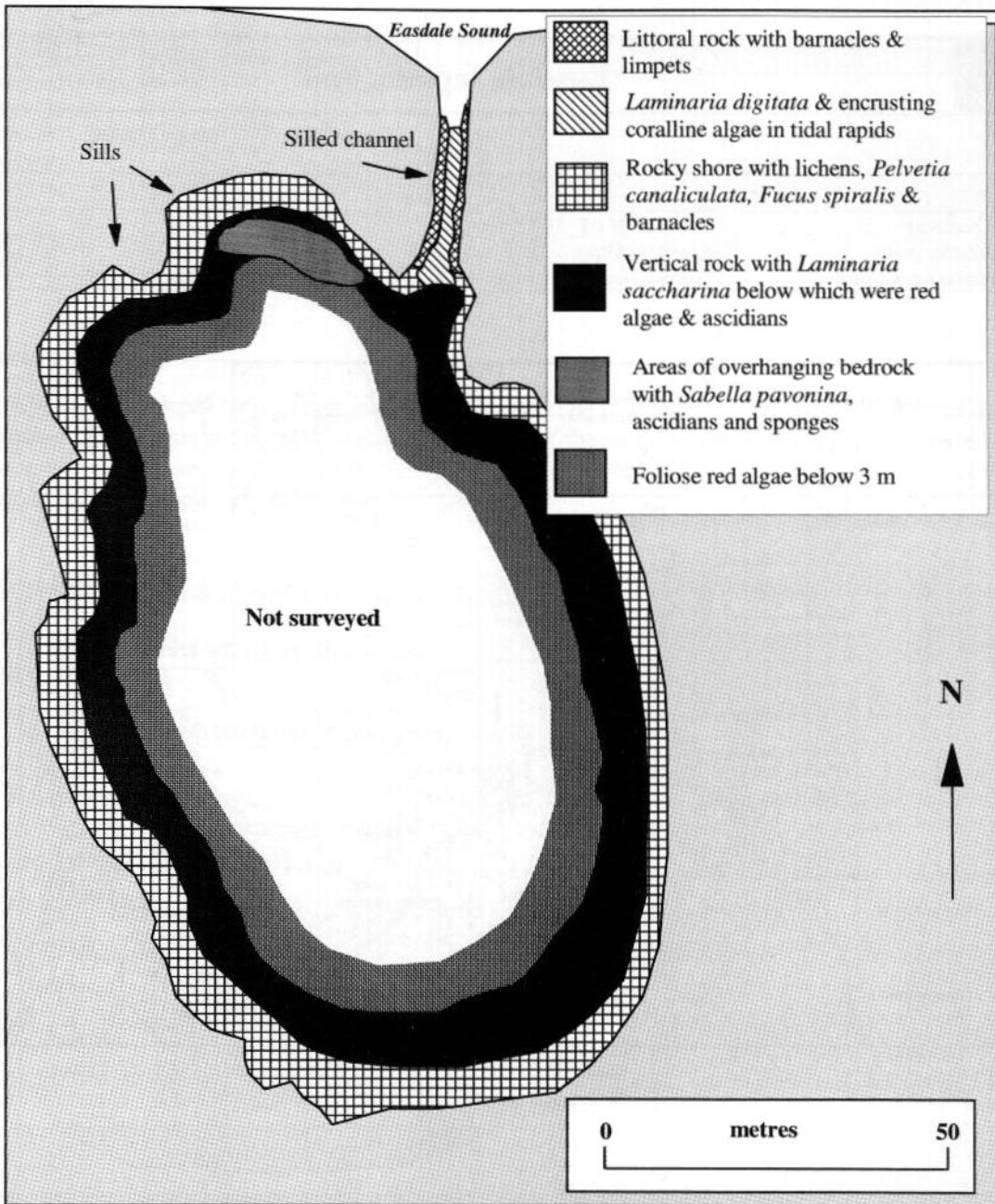


Figure 18.2 Distribution of the main biotopes.
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References and further reading

Norton, T.A., & Milburn, J.A. 1972. Direct observations on the sublittoral marine algae of Argyll, Scotland. *Hydrobiologia*, 40 (1): 55-68.

Compiled by: Frank Fortune

19

Easdale lagoon, Seil

Location

Position (centre)	56° 17.20'N 05° 38.7'W	NM 746 173
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	South West (Argyll & Bute)



Figure 19.1 Location of the lagoon.

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Marine biological surveys

	Survey method	Date of survey	Source
<i>Littoral</i>	Recording	May 1995	MNCR survey 447
<i>Sublittoral</i>	Recording	May 1995	MNCR survey 447

Introduction

Easdale lagoon lies on the west coast of the island of Seil, western Scotland. The lagoon is separated from the open sea by a ridge of slate shingle which allows seawater to percolate in and out of the lagoon with the tide, allowing approximately a 1 m tidal rise and fall. The lagoon is about 150 m in diameter and has a maximum depth of 5 m towards the centre. The only freshwater input to the lagoon is run-off from surrounding land and at the time of survey the salinity was measured at 31 ‰. The lagoon is bordered by a shingle ridge to the south and a car park to the west, while to the north there are a number of houses and a road.

Physical features

<i>Physiographic type</i>	Percolation saline lagoon
<i>Area of lagoon</i>	2 ha
<i>Maximum length of lagoon</i>	0.18 km
<i>Bathymetry</i>	Maximum depth 5 m
<i>Wave exposure</i>	Very sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	1 m
<i>Salinity</i>	31 ‰ (measured)

Marine biology

The lagoon was fringed by a steeply-sloping intertidal zone of boulders and cobbles with occasional bedrock outcrops; this supported a mixed community of the spiral wrack *Fucus spiralis*, knotted wrack *Ascophyllum nodosum* and the bladder wrack *Fucus vesiculosus*, which extended up to 1 m above loch datum (Fspi; Asc.Asc).

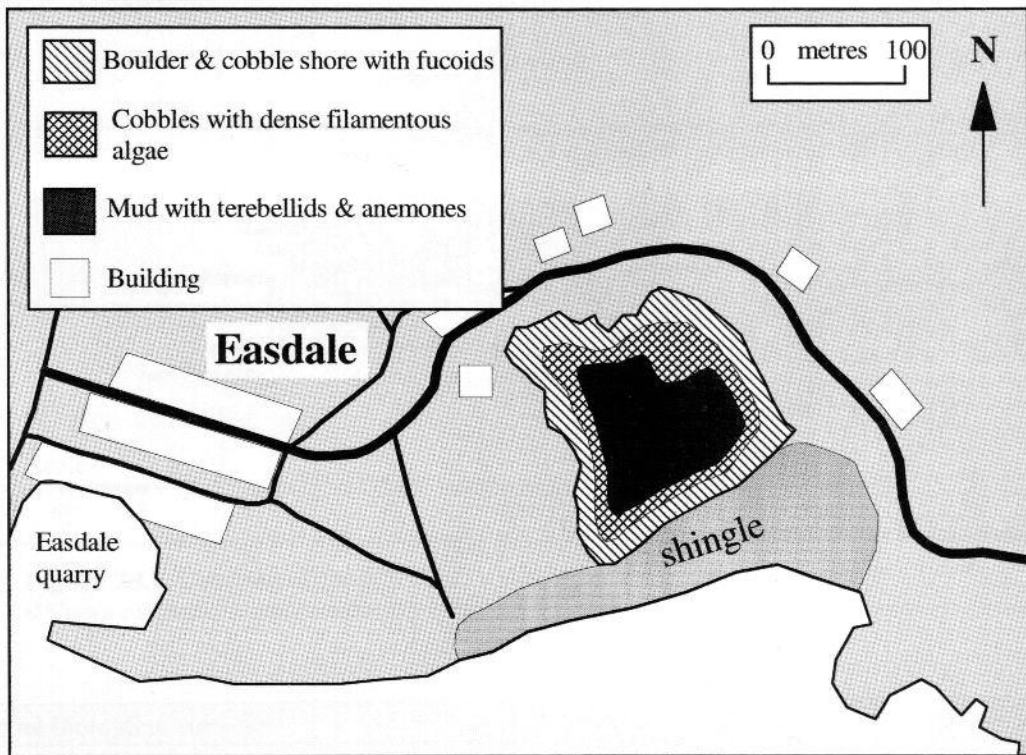


Figure 19.2 Distribution of the main biotopes.

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In the sublittoral the intertidal fucoids gave way to filamentous green algae and bootlace weed *Chorda filum*, which grew on cobbles and pebbles with occasional patches of mud (FiG). The soft sediment supported terebellid worms and patches of the red filamentous alga *Trilliella intricata*. The cobbles, pebbles and their associated biota were found down to a depth of 5 m, the amount of mud increasing with depth and giving way to a habitat of gently sloping soft, flocculent mud overlying slate cobbles which covered the centre of the lagoon. The mud supported terebellid worms and anemones *Diadumene cincta*, with some anemones also attached to the underlying cobbles (LagMu).

At the southern end of the lagoon, a number of coralline algal rhodoliths were found at 2 to 3 m depth. The presence of rhodoliths indicates that there is a degree of water movement, caused by the percolation of water between the lagoon and the sea.

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The lagoon is entirely artificial. In May 1995 it contained a number of household items and litter which appeared to have been dumped.

References and further reading

None available.



Compiled by: Frank Fortune

20

Easdale quarry, Seil

Location

<i>Position (centre)</i>	56° 17.17'N 05° 39.5'W	NM 742 172
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

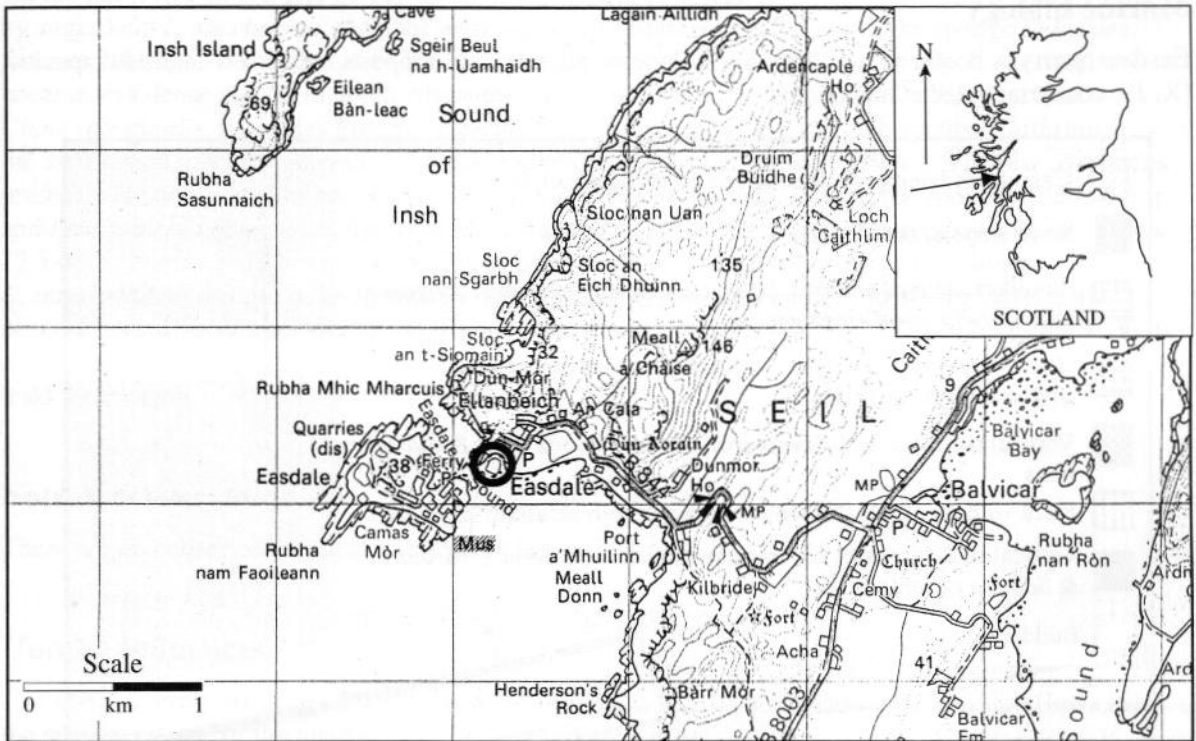


Figure 20.1 Location of the lagoon.

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Marine biological surveys

<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Sublittoral</i> Recording	1984	K. Hiscock (unpublished data)

Introduction

Easdale quarry lies on the west coast of the island of Seil, in western Scotland. The quarry has a sill at about chart datum level, where the seaward wall was breached, allowing seawater to flow in and out with each tide. The quarry is approximately 150 m by 120 m with a recorded depth of over 70 m (local information) and is fully marine. The only freshwater input is drainage from the surrounding land. To the north of the quarry lies the village of Easdale, to the east is grassland and to the south and west there is a narrow strip of land which separates the quarry from the open sea.

Physical features	
Physiographic type	Silled saline lagoon (sill below mean low water)
Area of lagoon	1.5 ha
Maximum length of lagoon	0.15 km
Bathymetry	>70 m depth
Wave exposure	Extremely sheltered
Tidal streams	Negligible
Tidal range	Approximately 2 - 3 m
Salinity	Fully marine (estimated)

Marine biology

Easdale quarry is bordered by a scree/rock slope on all sides and supports only a few intertidal species (K. Hiscock, unpublished data).

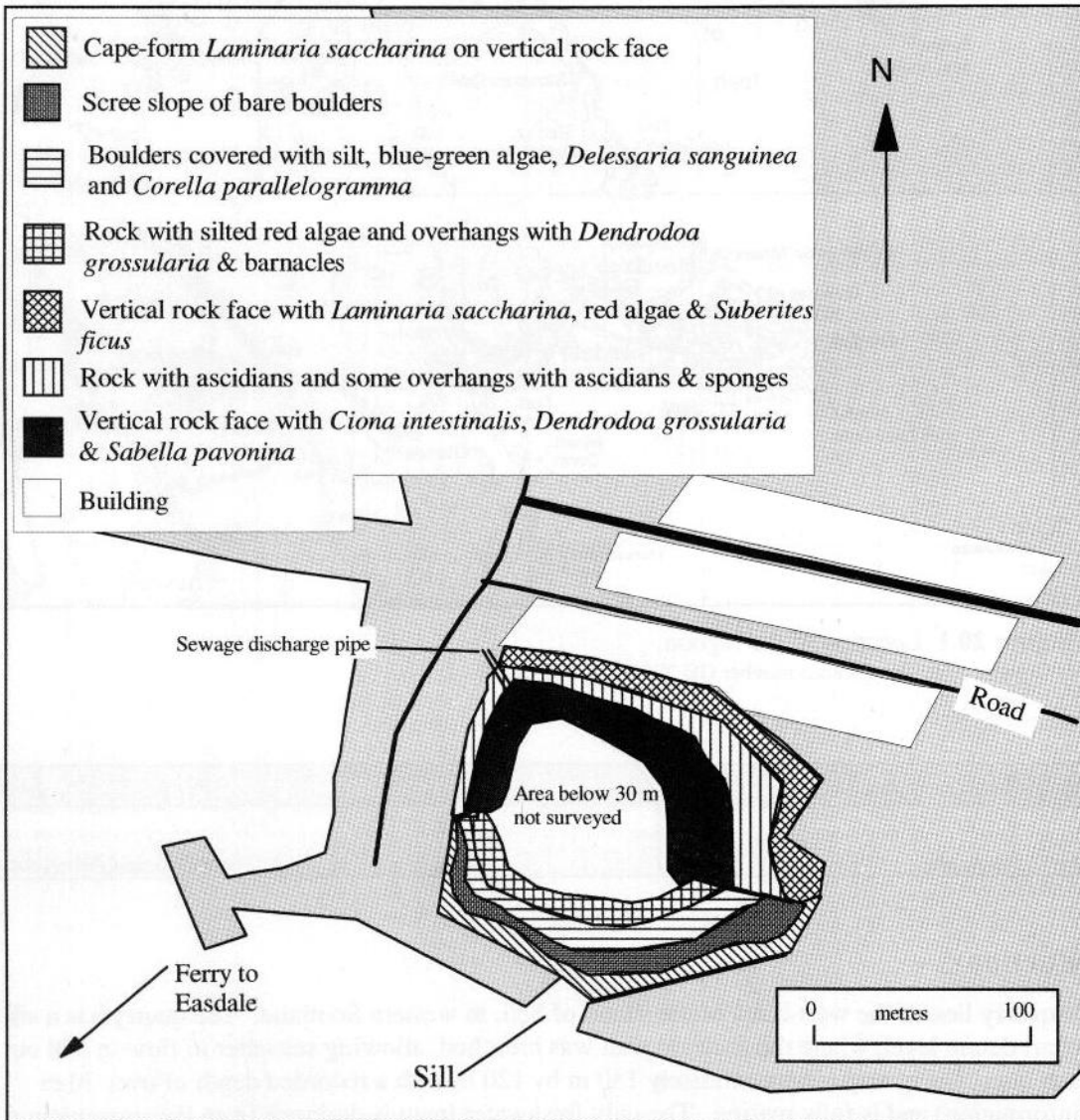


Figure 20.2 Distribution of the main biotopes.
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On the south side of the quarry, to a depth of 3.5 m, cape-form sugar kelp *Laminaria saccharina* covered the vertical rock (Lsac.Ft). Below this there was a scree slope of small, bare boulders. At 14 m depth there were very large boulders which were covered with silt, blue-green algae and the tube-dwelling worm *Polydora* sp. The red alga *Delesseria sanguinea* was common here, along with frequent gas mantle ascidians *Corella parallelogramma* and gobies *Pomatoschistus* sp. There were also patches of bacterial mat *Beggiatoa* sp. Below these large boulders, at 17 m depth, there was silt-covered, upward-facing bedrock with a few overhangs. The upward-facing rock supported a sparse biota of silted foliose red algae and tubeworms, while the overhangs had frequent gooseberry sea squirts *Dendrodoa grossularia* and barnacles *Balanus crenatus* together with a turf of white hydroids.

On the north side of Easdale quarry there was a vertical rock face to 7.5 m depth which was covered by sugar kelp *L. saccharina*, together with foliose and filamentous red algae, the sponge *Suberites ficus* and the light-bulb sea squirt *Clavelina lepadiformis* (Lsac.Ft). The sugar kelp *L. saccharina* became less dense at 12.5 m depth where the rock was covered with abundant solitary ascidians *Ciona intestinalis*, barnacles *Balanus crenatus*, the bryozoan *Bugula* spp., the sponge *Clathrina* sp., the ascidians *Asciidiella aspersa* and *Ascidia mentula* and foliose algae (FaSwV). The few overhangs present were dominated by ascidians *C. intestinalis*, bryozoans *Bugula* spp., the sponges *Clathrina* sp. and *Leucosolenia botryoides*, the hydroid *Eudendrium* sp. and the red alga *Phycodrys rubens*. Below 12.5 m the quarry wall dropped vertically to 30 m depth and supported abundant ascidians *C. intestinalis* to a depth of 25 m with the red algae *D. grossularia* and *C. parallelogramma*, the peacock worm *Sabella pavonina* and the calcareous tubeworm *Protula tubularia* being found at 30 m depth. Below this vertical rock there was a boulder and scree slope which was thought to extend to at least 70 m depth.

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The site is entirely artificial; there is a sewage discharge pipe from nearby housing which flows into the north-west end of the quarry.

References and further reading

None available.

Compiled by: Dora Nichols

21 **Loch Caithlim, Seil**

Location		
Position (centre)	56° 17.4'N 05° 39.6'W	NM 765 185
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	South West (Argyll & Bute)

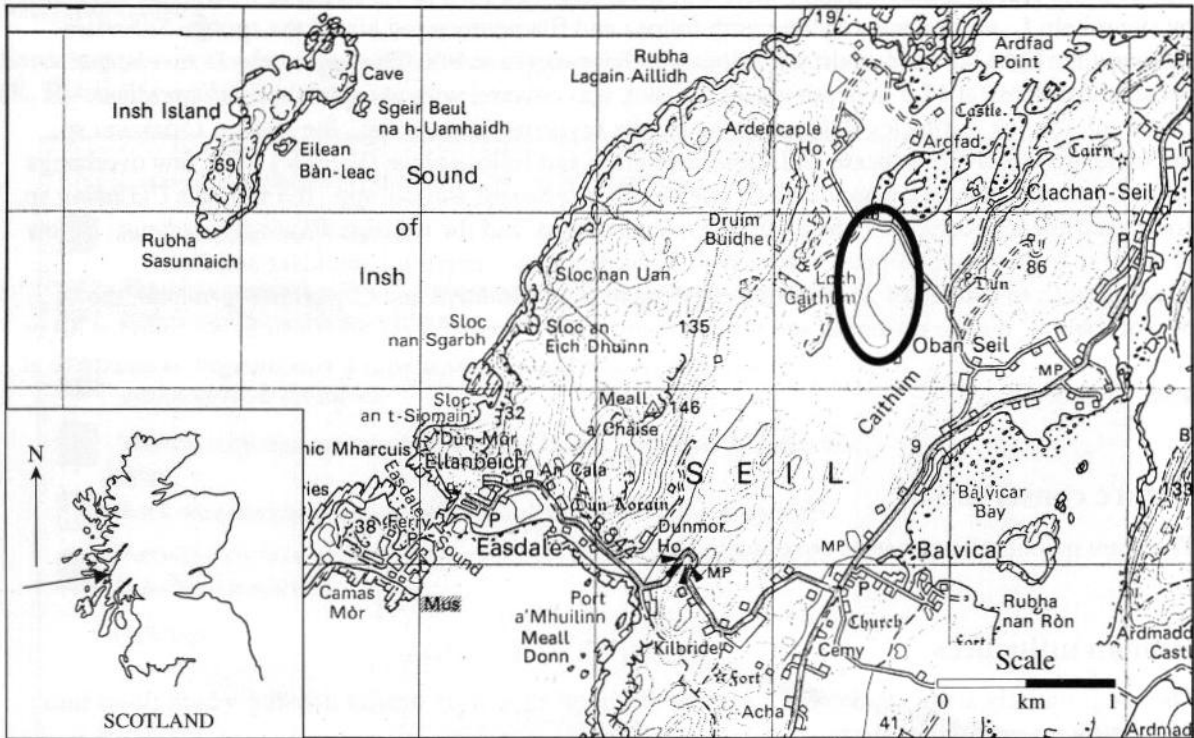


Figure 21.1 Location of the lagoon.
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Marine biological surveys			
	Survey method	Date of survey	Source
Littoral	Recording	May 1995	MNCR survey 447
Sublittoral	Recording	May 1995	MNCR survey 447

Introduction

Situated on the northern coast of the island of Seil, western Scotland, this lagoon is connected to the open sea by a culvert which passes underneath a road that runs along the northern shore of the lagoon. The inlet is bordered to the south, east and west by arable land.

The lagoon consists of a single basin, approximately 0.7 km long and 0.15 km wide at its broadest point, with a maximum depth of 0.5 m. There is little tidal movement within the basin, although some localised acceleration of currents may occur near to the culvert. Freshwater enters the lagoon as run-off from surrounding land and from two streams, one at the head of the basin and a smaller stream to

the east of the culvert. Salinity within the lagoon was measured at 29 ‰ near the head of the lagoon and 30 ‰ near to the culvert.

Physical features

<i>Physiographic type</i>	Sluiced saline lagoon
<i>Area of lagoon</i>	10 ha
<i>Maximum length of lagoon</i>	0.7 km
<i>Bathymetry</i>	Maximum depth 0.5 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	0.2 m
<i>Salinity</i>	29 ‰ at head of lagoon; 30 ‰ near culvert (measured)

Marine biology

The southern, eastern and western shores of the lagoon were fringed with soft mud, which had a scattering of small slate fragments on its surface. The mud formed a band from 0.2 m height to 0.5 m depth and supported large numbers of the mud shrimp *Corophium volutator* and polychaete worms. The centre of the basin, at 0.5 m depth, was extremely soft mud that supported little biota apart from a few polychaetes, with numerous mysid shrimps in the water column (LagMu).

Near to the culvert at the northern end of the lagoon, there were areas of bedrock, boulders and cobbles. There was no biota on the rock in the littoral zone here, but in the sublittoral the serrated wrack *Fucus serratus* and other fucoids were recorded to a depth of 0.3 m (FChoG). All of the fucoids observed supported large amounts of the hydroid *Obelia* sp. In the immediate vicinity of the culvert, there was a channel among the bedrock and boulders that experienced enhanced tidal movement. This channel supported a dense bed of mussels *Mytilus edulis*, which themselves supported the barnacle *Balanus crenatus* and red algae (MytT).

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

The entrance to the lagoon is artificially restricted by a culvert.

References and further reading

None available.

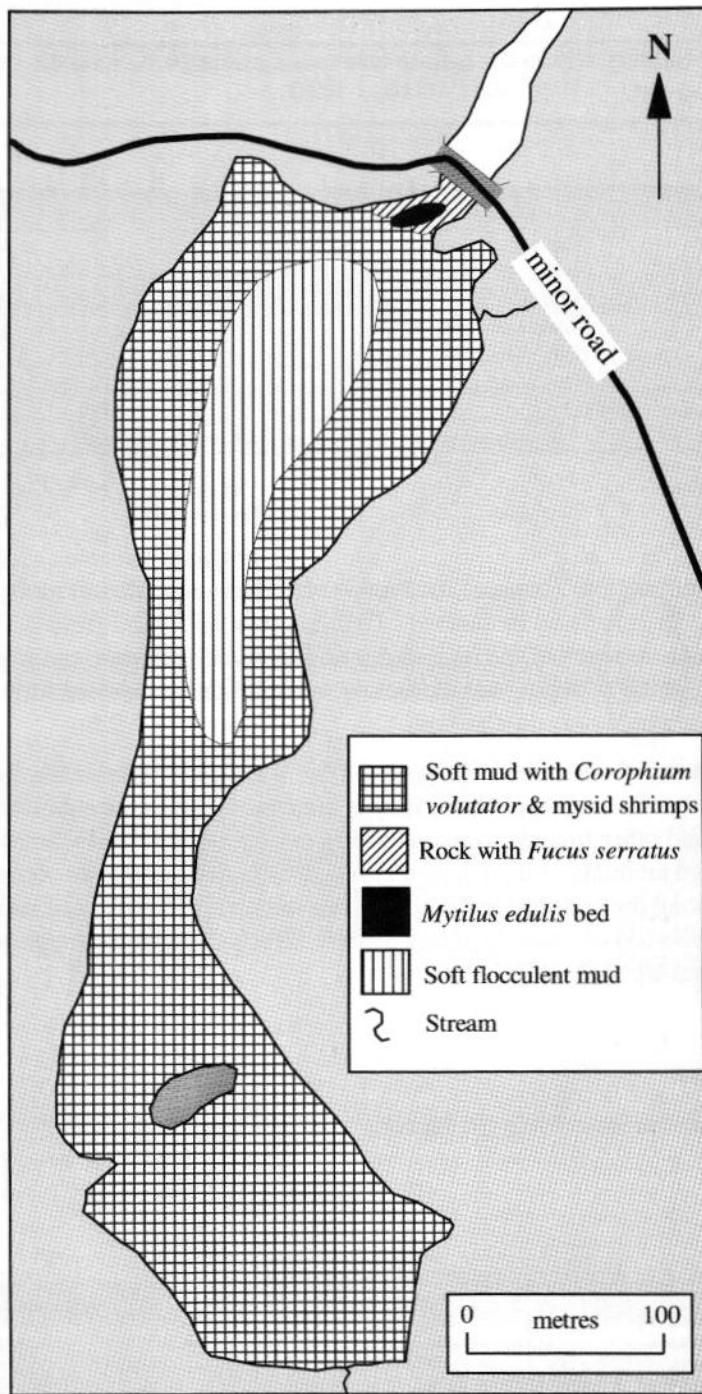
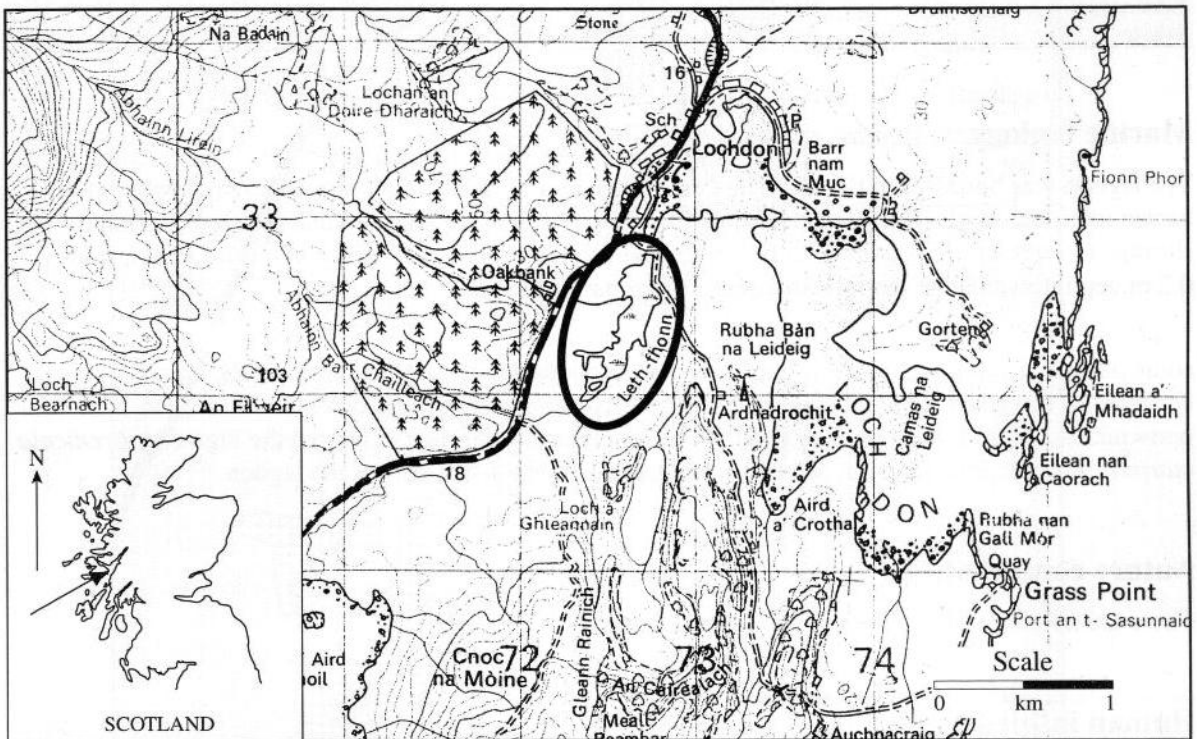


Figure 21.2 Distribution of the main biotopes.
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Compiled by: Frank Fortune

Location

<i>Position (centre)</i>	56° 25.5'N 05° 41.8'W	NM 725 325
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

**Figure 22.1** Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording	August 1995	MNCR survey 450
<i>Sublittoral</i>	Recording	August 1995	MNCR survey 450

Introduction

Leth-fhonn lies at the head of Loch Don on the south-eastern coast of the island of Mull. At its northern end the lagoon is connected to Loch Don by an unsilled channel, approximately 10 m wide, 50 m long and 1 m deep, that passes below a bridge. The lagoon consists of a single basin approximately 0.2 km wide and 0.9 km long. It is about 1 m deep at its northern end but rapidly shallows with a series of 0.2 m-deep channels, giving way to intertidal areas in the southern part of the lagoon. Salinity near the entrance channel was 30 ‰ at the time of survey, decreasing to fully freshwater conditions at a point 0.3 km south of the entrance, where a freshwater stream enters on the western shore. Further freshwater input comes from streams on the eastern shore and at the head of the lagoon, and as run-off from the surrounding land.

The inlet is surrounded by saltmarsh and moorland, with a minor road to the north and east and the A849 road to the west.

Physical features

<i>Physiographic type</i>	Saline lagoon inlet
<i>Area of lagoon</i>	12 ha
<i>Maximum length of lagoon</i>	0.9 km
<i>Bathymetry</i>	Maximum depth 1 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak
<i>Tidal range</i>	0.5 m
<i>Salinity</i>	Freshwater to 30 ‰ (measured)

Marine biology

The lagoon was bordered to the south and east by an approximately 150 m-wide area of apparently barren intertidal sand. The intertidal sand gave way to sublittoral muddy sand, burrowed by mud shrimps *Corophium volutator*, with occasional tasselweed *Ruppia* sp. and some mysid shrimps, at 0.2 m depth towards the western shore of the lagoon (FaMS).

Near the entrance channel, the muddy sand gave way to cobbles, pebbles and boulders mixed with some mud, at a depth of 1 m. The hard substrata supported the brackish-water wrack *Fucus ceranoides*, the green algae *Cladophora* sp. and *Enteromorpha* sp., and occasional common periwinkles *Littorina littorea* (FcerEnt). Occasional patches of mud supported the lugworm *Arenicola marina*. A number of sea trout *Salmo trutta* were also seen in this part of the lagoon.

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

None were noted at the time of survey.

References and further reading

None available.

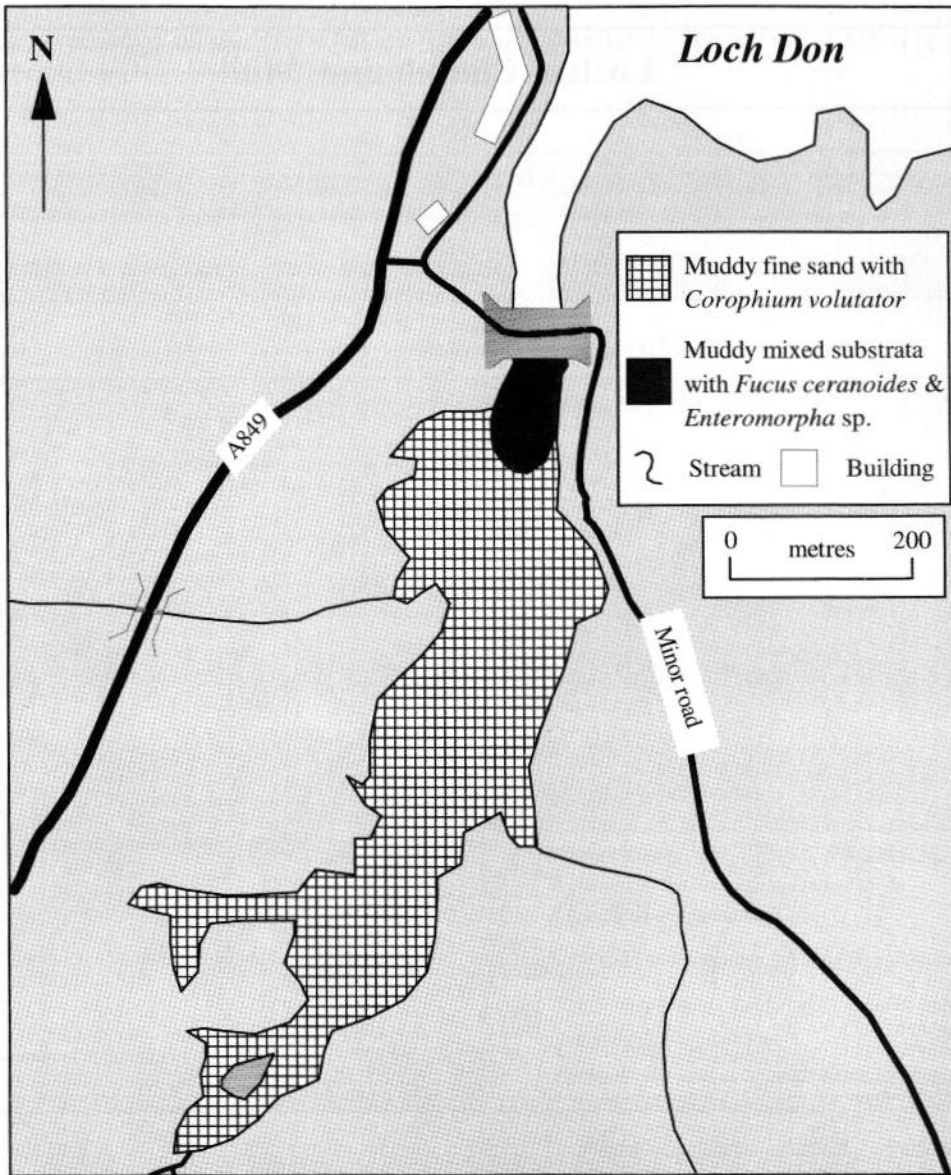


Figure 22.2 Distribution of the main biotopes.
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23

Loch a' Chumhainn, Mull

Location

<i>Position (centre)</i>	56° 35.5'N 06° 11.7'W	NM 424 523
<i>Administrative area</i>	Argyll and Bute	
<i>Conservation agency/area</i>	Scottish Natural Heritage	South West (Argyll & Bute)

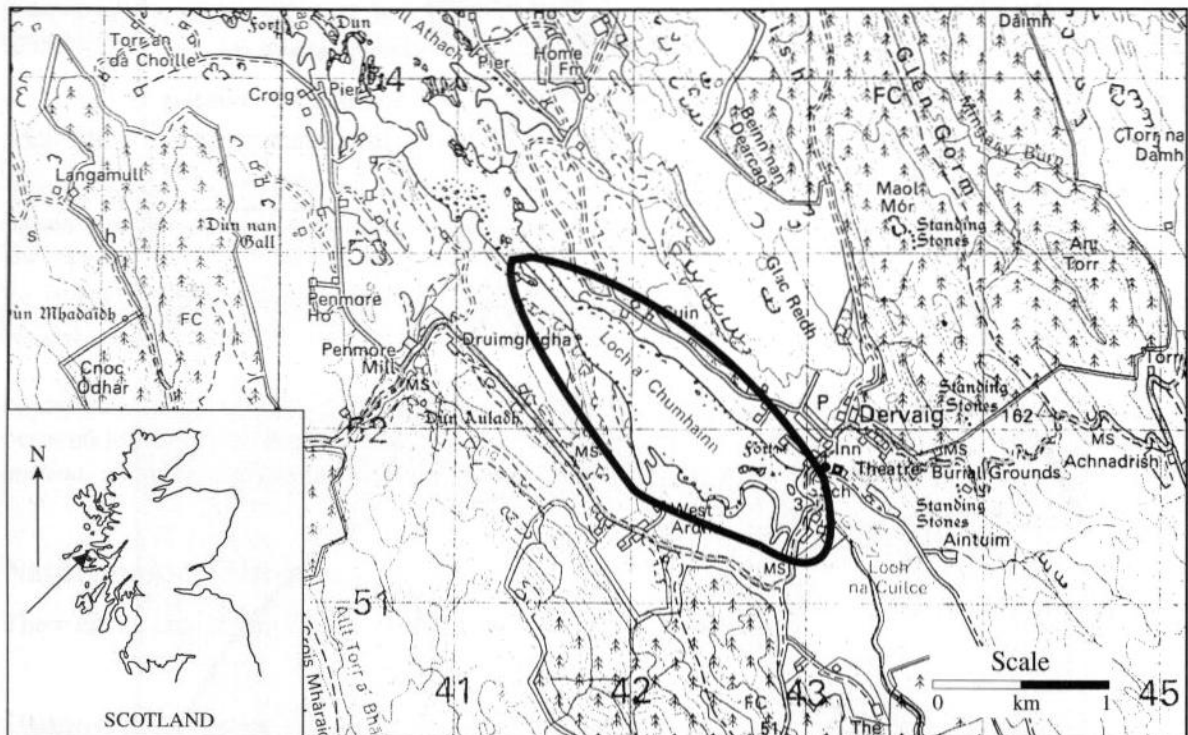


Figure 23.1 Location of the lagoon.

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Marine biological surveys

	<i>Survey method</i>	<i>Date of survey</i>	<i>Source</i>
<i>Littoral</i>	Recording	August 1995	MNCR survey 450
<i>Sublittoral</i>	Recording	August 1995	MNCR survey 450

Introduction

Loch a' Chumhainn is a lagoonal inlet on the north-west coast of Mull, and is connected to the sea by a channel approximately 0.08 km wide and 0.4 km long, with a maximum depth of 0.5 m at low water. The loch comprises a single basin measuring 1.6 km by 0.4 km, with a maximum depth of 5 m at its north-eastern end; however, most of the basin is approximately 0.5 m deep. There is little tidal movement in the main basin although some tidal acceleration occurs in the connecting channel where seawater enters on each tide. Freshwater enters the loch as run-off from surrounding land and more significantly from a stream at the head of the loch. At high tide a distinct halocline forms near the stream, with fully marine water below the halocline and freshwater above.

The loch is bordered on all sides by a mix of arable and woodland. The village of Dervaig is situated at the head of the loch.

Physical features

<i>Physiographic type</i>	Saline lagoon inlet
<i>Area of lagoon</i>	54 ha
<i>Maximum length of lagoon</i>	1.6 km (excluding entrance channel)
<i>Bathymetry</i>	Maximum depth 5 m
<i>Wave exposure</i>	Ultra sheltered
<i>Tidal streams</i>	Very weak, moderately strong through channel
<i>Tidal range</i>	1 m
<i>Salinity</i>	Freshwater to fully marine (measured)

Marine biology

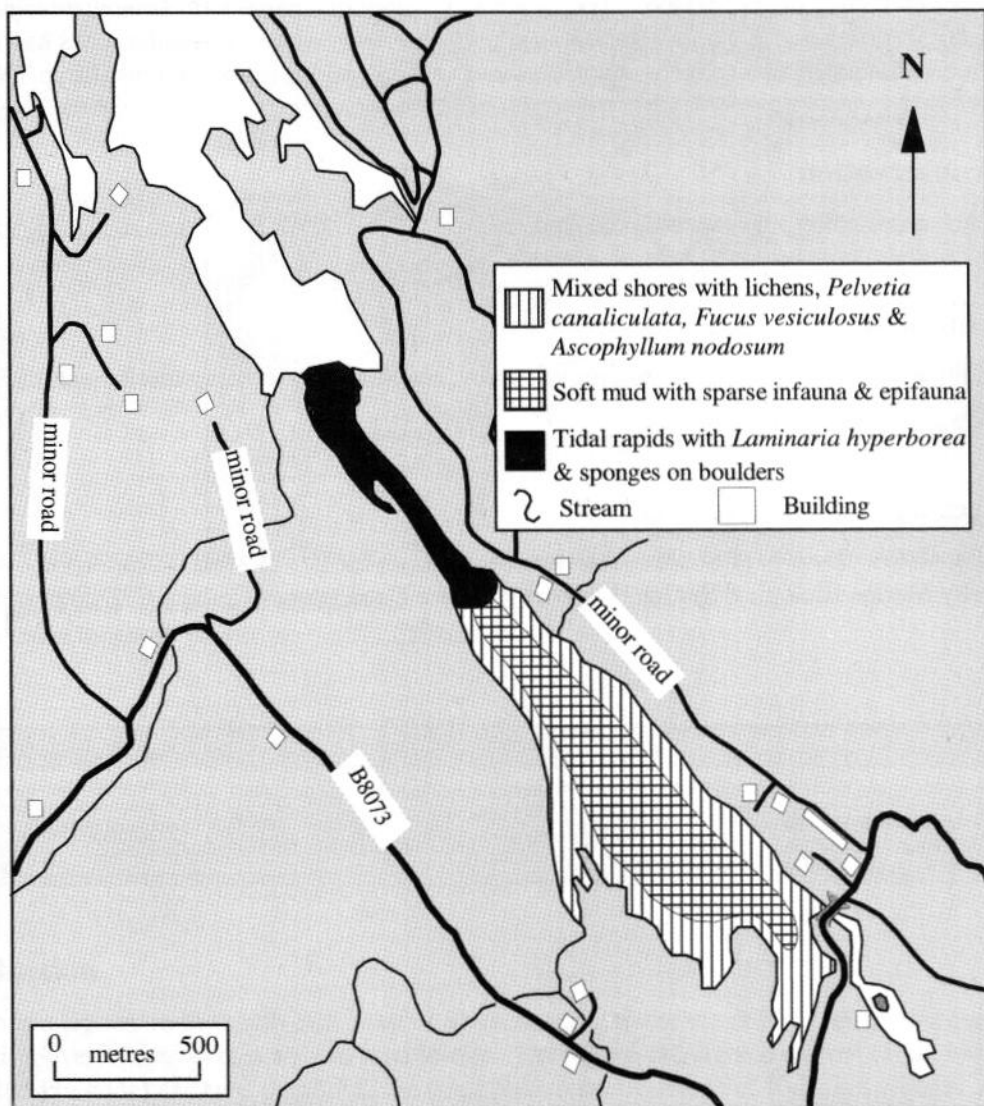


Figure 23.2 Distribution of the main biotopes.
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The loch was fringed by a mixture of bedrock, boulders and cobbles which supported a typical sheltered intertidal rocky shore zonation. A yellow and grey lichen zone was present at the strandline (YG); this gave way to the channelled wrack *Pelvetia canaliculata* and the black lichen *Verrucaria maura* on the upper shore (Ver.Ver; Pel). The channelled wrack *P. canaliculata* gave way in the mid-shore to a mixture of bladder wrack *Fucus vesiculosus* and knotted wrack *Ascophyllum nodosum*, the latter in both attached and unattached ecad *mackaii* forms, and occasional patches of mud supported the sand gaper *Mya arenaria* (AscX; AscX.mac). At the head of the loch the influence of the freshwater stream was indicated by the presence of the wrack *Fucus ceranoides* in the mid-shore (FcerX).

In the sublittoral, down to 5 m, rocky substrata gave way to mud, with some sand, pebbles and boulders also present. The sediment supported a sparse infauna and epifauna with the estuary cockle *Cerastoderma glaucum*, sand gaper *M. arenaria* and the mud shrimp *Corophium volutator* all present in the sediment (LagMu). The mud was extensively excavated by the burrowing activities of the shore crab *Carcinus maenas*; occasional hard substrata supported the plumose anemone *Metridium senile*.

Within the connecting channel soft substrata gave way to mixed boulders, cobbles, pebbles and gravel and attained a maximum depth of 0.5 m. The larger rocks supported dense kelp *Laminaria hyperborea* and the sponges *Halichondria panicea* and *Hymeniacidon perleve*, while the smaller rocks had a covering of coralline algal crusts, the barnacle *Balanus crenatus* and spirorbid worms (Lhyp.TFt).

Nature conservation

There are no conservation sites covering the lagoon.

Human influences

There was litter and debris present at the time of survey; and sewage was being discharged into the loch.

References and further reading

Davies, L.M. 1990. Surveys of Scottish sealochs: sealochs on the Isle of Mull. (Contractor: University Marine Biological Station, Millport.) *Nature Conservancy Council CSD Report*, No. 1,085.

Compiled by: Frank Fortune & Dora Nichols