JOINT NATURE CONSERVATION COMMITTEE

Marine Nature Conservation Review

Sectors 1 & 2

Lagoons in Shetland and Orkney

Area summaries

Kath Thorpe

1998

Series editor: David Connor

Coasts and seas of the United Kingdom - MNCR series

Joint Nature Conservation Committee
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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.

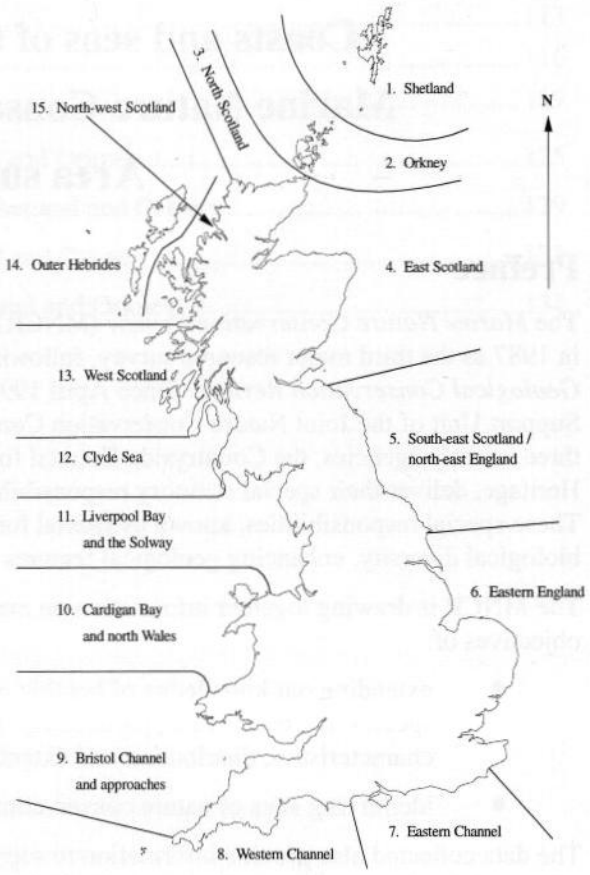
MNCR studies have been undertaken within particular coastal sectors around Britain (see map overleaf) or of major physiographic types, such as lagoons and sealochs. These studies are being presented, in the *Coasts and Seas of the United Kingdom - MNCR series*, as *area summaries*, each of which provides 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 below.

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, *ed.*	1996
1-15	Benthic marine ecosystems of Great Britain and the north-east Atlantic	Hiscock, *ed.*	1998
	Biotope classification		
1-15	Marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes (*JNCC Report*, No. 229)	Connor, Brazier, Hill & Northen	1997
1-15	Marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes (*JNCC Report*, No. 230)	Connor, Dalkin, Hill, Holt & Sanderson	1997
	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	Due 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 1 & 2. Lagoons in Shetland and Orkney
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. Eighteen lagoons in MNCR Sector 1, the Shetland Islands, were surveyed in August 1993, and sixteen lagoons were surveyed in July 1994 in MNCR Sector 2, the Orkney Islands.

The studies included field surveys of the shores (if tidal) and the subtidal zone of each lagoon to describe the marine habitats and communities (together referred to as biotopes) and to assess their marine 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 34 *area summaries*:

No.	*Shetland*	*No.*	*Orkney*
1	Easter Loch, Unst	19	Quivals Loch, Sanday
2	South Wick of Sound lagoons, Yell	20	Point of Nevin lagoon, Sanday
3	Mussel Loch, Yell	21	Little Sea lagoon, Sanday
4	Ness of Galtagarth lagoon, Yell	22	Bay of Brough lagoons, Sanday
5	Houb at Gutcher, Yell	23	Bay of Ham lagoon, Rousay
6	Wick of North Garth lagoon, Yell	24	Oyce of Huip, Stronsay
7	Loch of the North Haa, Mainland	25	The Ouse, Ling Holm, Shapinsay
8	Loch of Queyfirth, Mainland	26	Vasa Loch, Shapinsay
9	The Houb, Fora Ness, Mainland	27	Oyce of Isbister, Mainland
10	The Houb, Fugla Ness, Mainland	28	Point of Backaquoy lagoon, Mainland
11	Minn, Mainland	29	The Ouse, Finstown, Mainland
12	Loch of Hellister, Mainland	30	Kirkwall lagoon (Peedie Sea), Mainland
13	The Vadills, Mainland	31	Long Ayre lagoon, Mainland
14	Loch of Strom, Mainland	32	Loch of Ayre, Mainland
15	Houb of Haggrister, Mainland	33	Skaith, Mainland
16	Laxo Voe lagoon, Mainland	34	Loch of Stenness, Mainland
17	Vadill of Garth lagoon, Mainland		
18	Saltness lagoon, Mainland		

Each area is described in a standard format, giving details of its physical and biological character, the marine 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.

In the Shetland Islands the lagoons range from small percolation lagoons less than 0.5 ha in extent, e.g. at the South Wick of Sound, through simple lagoons with sills at varying tidal heights, e.g. the lagoon at the head of Laxo Voe, to the Vadills which is a complex fiardic lagoon some 61 ha in area with many sills and basins. Forty-three biotopes or sub-biotopes were found within the eighteen lagoons in Shetland. Their character ranges from stagnant water with only a single species-poor biotope at the

South Wick of Sound to The Vadills which has a rich complement of biotopes, many of which support a large number of species.

In the Orkney Islands the sites range from the Bay of Brough lagoons on Sanday, which are stagnant percolation lagoons about 1 ha in area and supporting very little life, to the Loch of Stenness which covers more than 860 ha (the largest lagoon in Britain) and has a wide variety of biotopes, including fucoids on the shore and extensive beds of pondweed *Potamogeton pectinatus*. Twenty three biotopes or sub-biotopes were found within the sixteen lagoons in Orkney.

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

MNCR Sectors 1 and 2 encompass the Shetland and Orkney Islands. Orkney lies about 10 km north of mainland Scotland across the Pentland Firth, whilst the Shetland Islands lie a further 60 km to the north-east. They both comprise a group of islands of various sizes, the largest in both cases being called Mainland, and are relatively unpopulated and rural in nature. Their coastlines are complex and subject to a wide range of wave exposures and tidal stream strengths. Lagoon habitats occur throughout the islands and vary considerably in character, from sediment-fringed lagoons to rock-bound lagoons. All such lagoon-like habitats in Shetland and Orkney have been surveyed by the MNCR as part of a wider study of lagoons in 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 of lagoons is more variable than in the adjacent sea as it fluctuates more closely with air temperature (Barnes 1980).

Most of the lagoon habitats in Shetland and Orkney receive their freshwater from rainfall and diffuse input from the land, rather than from any large streams or rivers. Seawater can enter lagoons by a variety of means, including over tidal sills, via over-topping in storms and through percolation of shingle barriers.

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

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 Shetland and Orkney 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 Figures 1 and 2.

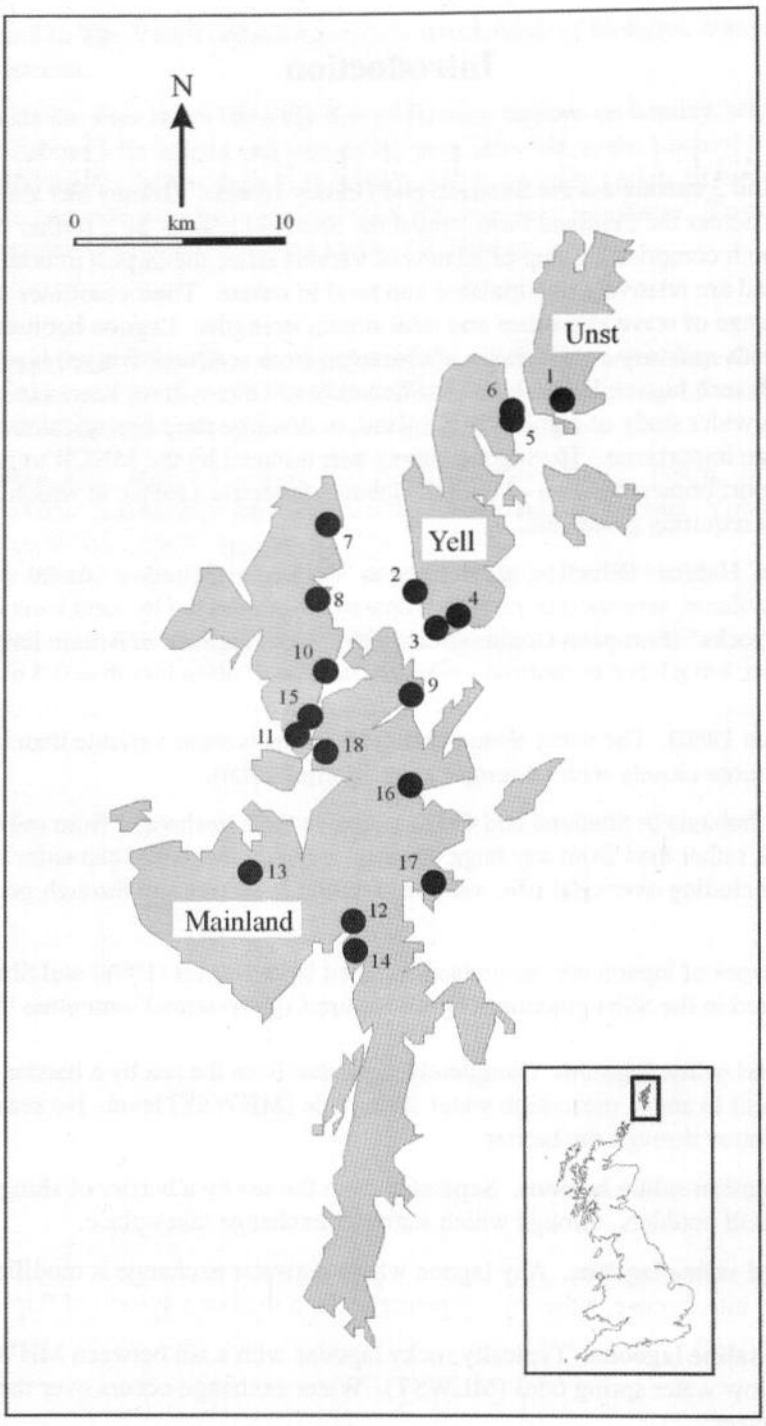

Figure 1 Location of lagoons in the Shetland Islands (MNCR Sector 1).

Field surveys of each lagoon were undertaken by the MNCR in 1993 and 1994, 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 are given in the individual *area summary* accounts.

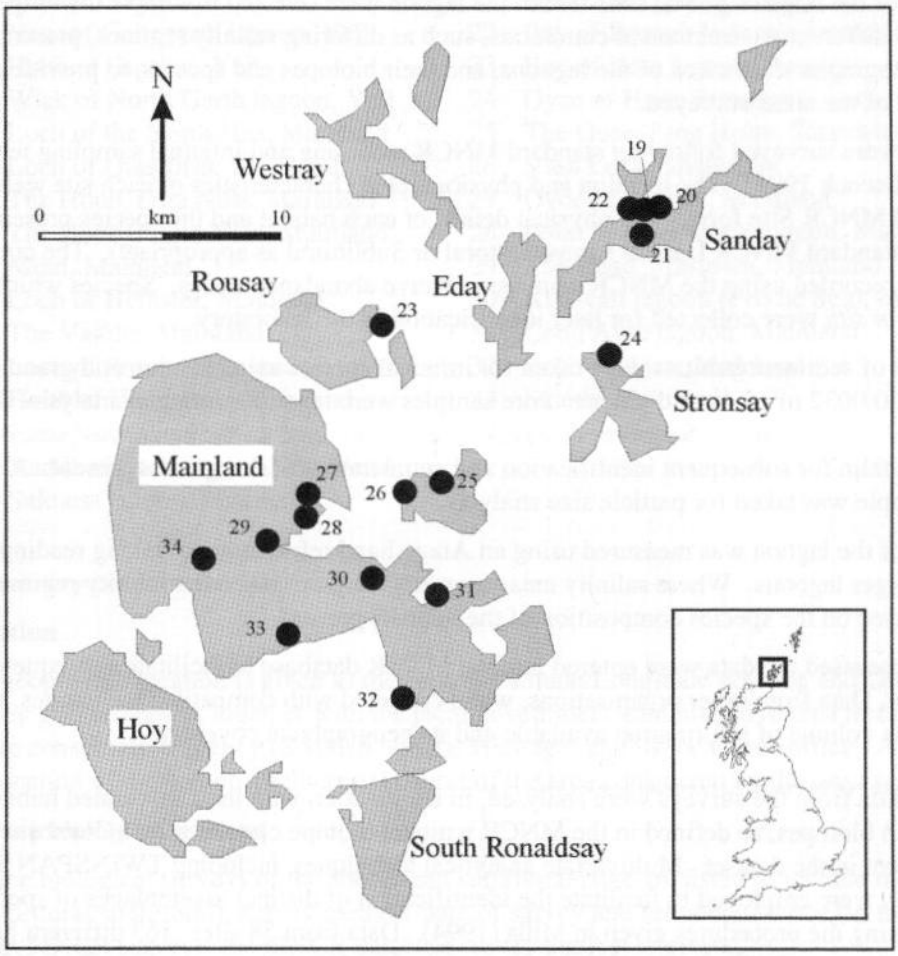

Figure 2 Location of lagoons in the Orkney Islands (MNCR Sector 2).

Table 1 Sources of field survey information

MNCR database survey no.	*Survey*	*Source*	*No. of sites*	*No. of habitats surveyed*
1	1988 MNCR Shetland survey	Hiscock (1988)	1	5
261	1986/87 OPRU/MNCR Shetland, Foula and Fair Isle survey	Hiscock (1986); Howson (1988)	11	22
443	1993 Marine Seen Brindister Voe and the Vadills habitat mapping survey	Bunker *et al.* (1994)	10	31
472	1993 MNCR Shetland lagoons survey	MNCR survey	19	48
477	1994 MNCR Orkney lagoons survey	MNCR survey	17	57
		Total	**58**	**163**

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

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 from the shallow sublittoral habitats present; for a few deeper lagoons, SCUBA diving methods were used to gain access to the lagoon bottom. 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 m^2 (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, was 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 58 sites (163 different habitat records) from lagoons in Shetland and Orkney were used in the analyses, resulting in the identification of 45 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 34 lagoons is described in a standard *area summary* format:

No.	*Shetland*	*No.*	*Orkney*
1	Easter Loch, Unst	19	Quivals Loch, Sanday
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17	Vadill of Garth lagoon, Mainland		
18	Saltness lagoon, Mainland		

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) and its 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, the MNCR database survey number is given).

Introduction

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

Physical features

Physiographic type	As defined in Joint Nature Conservation Committee (1996) (and outlined above).
Area of lagoon	Measured from the relevant 1:50, 000 Ordnance Survey (Landranger series) map.
Maximum length of lagoon	Measured from the relevant 1:50, 000 Ordnance Survey (Landranger series) map.
Bathymetry	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.

Wave exposure	Taken from field observations, as defined in Connor & Hiscock (1996).
Tidal streams	Taken from field observations, as defined in Connor & Hiscock (1996).
Tidal range	Maximum range, as measured or estimated during the survey.
Salinity	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 lagoon 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; a summary of 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.* 1997a, b, where further information on the types of designation can be found).

Key to site designations relevant to the lagoons in Orkney and Shetland:

MCA	Marine Consultation Area
RSPB	Royal Society for the Protection of Birds reserve
cSAC	candidate Special Area of Conservation
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 human activities such as sewage discharges, development, spoil dumping, artificial damming or culverting and recreation.

References and further reading

This lists cited references and other relevant literature.

Acknowledgements

Roger Covey lead the MNCR project team surveying the lagoons of Scotland, providing considerable guidance throughout this work. The MNCR field surveys relied heavily on the surveyors, who often walked miles to survey some of the sites. For the hours of hard work we would like to thank the following (JNCC unless otherwise stated):

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Tim Hill
Christine Howson (independent; Ormiston, East Lothian)

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Dora Nichols and Karen Begg assisted with report production. Keith Hiscock commented on drafts of the report.

Maps are reproduced from the Ordnance Survey 1:50,000 scale map with the permission of The Controller of Her Majesty's Stationery Office © Crown copyright. Licence number GD 27254x/02/98.

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1 Easter Loch, Unst

Location		
Position (centre)	60° 41.4′N 00° 54.2′W	HP 598 013
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

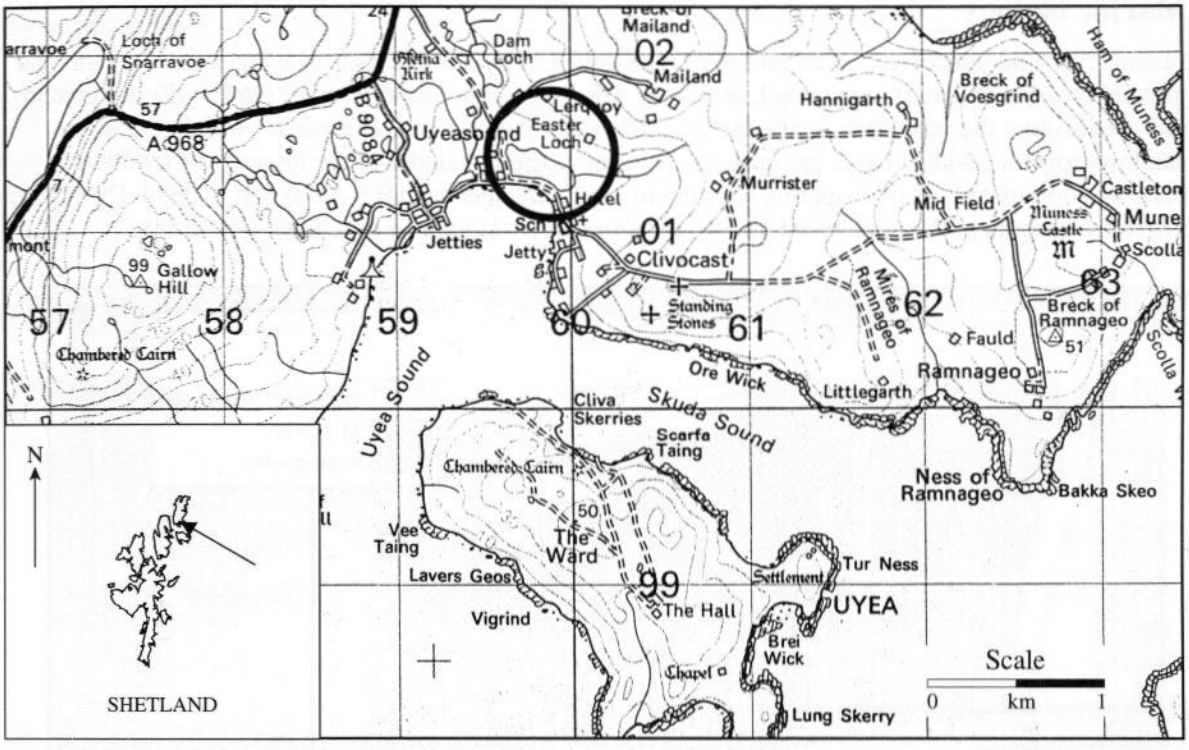

Figure 1.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

Easter Loch is situated in the south of Unst where it is separated from Uyea Sound by a road bridge. The lagoon consists of a single basin about 0.4 km in length, with a maximum depth of 0.6 m and a negligible tidal range. A culvert, comprising a single pipe, connects the lagoon to the sea at high water level. There is very little disturbance from wave action or from tidal currents, except in a small area around the inflow pipe. The salinity was estimated to be between 5 ‰ and 8 ‰ within about 4 m of the inflow pipe, with the remainder of the pool being freshwater. Freshwater input is from a stream on the eastern side of the lagoon. The site is surrounded by grassland, except for the southern side which is bordered by the road bridge.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	5 ha
Maximum length of lagoon	0.4 km
Bathymetry	Maximum depth 0.6 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	5-8 ‰ (estimated) near inlet culvert

Marine biology

In an arc around the culvert, in an area approximately 4 m by 5 m in extent, the lagoon had a sand and gravel bottom with a maximum depth of 0.4 m. The green alga *Enteromorpha intestinalis* dominated this area around the water line, while the brackish-water wrack *Fucus ceranoides* was found in the shallows together with some *E. intestinalis* (FcerEnt). The remainder of the lagoon, the freshwater part, was dominated by angiosperms growing in sandy mud between 0.3 and 0.6 m in depth (NVC S4). There are records of the tasselweed *Ruppia maritima* in the lagoon (John Uttley pers. comm.).

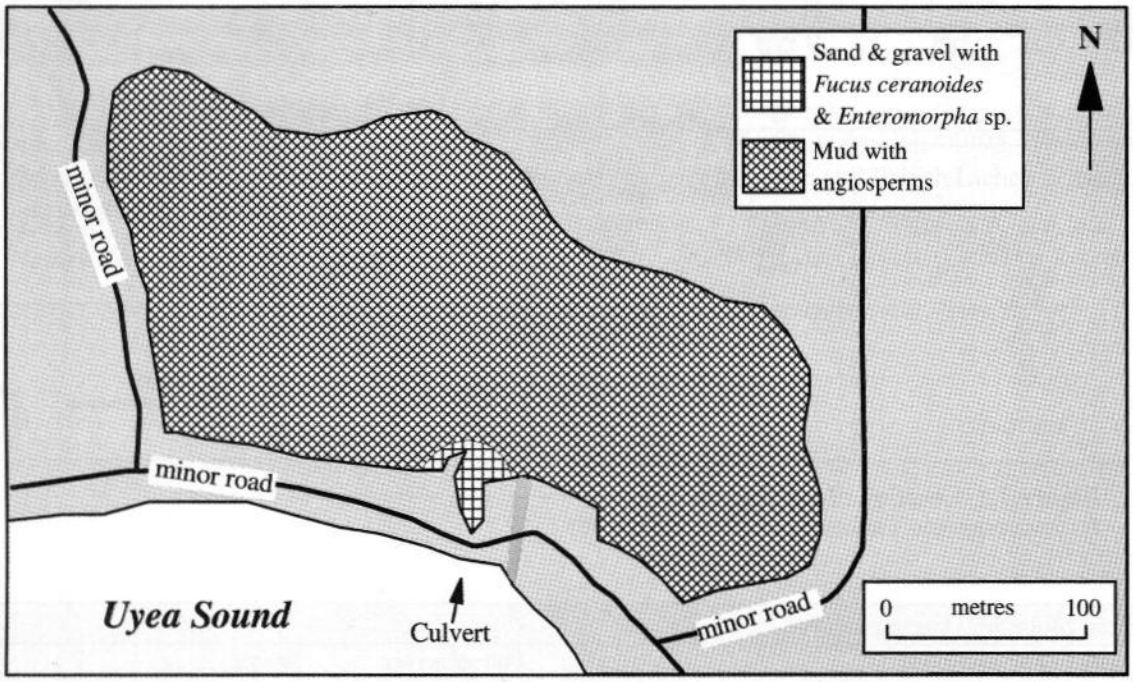

Figure 1.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

Conservation sites			
Site name	***Designation***	***Centre grid ref.***	***Main features***
Easter Loch	SSSI	HP 598 013	Ornithology

Human influences

The water flow between Easter Loch and the open sea is restricted to a single culvert under a road bridge on the southern side of the lagoon. There are minor roads to the south and west of the lagoon and a few houses and a small hotel close to the lagoon. The eastern shore has been modified by the construction of a track which branches off the Uyeasound to Muness road. The lagoon has occasionally been used as a storage area for unused cages from a salmon farm.

References and further reading

None available.

Compiled by: Kath Thorpe

2 South Wick of Sound lagoons, Yell

Location		
Position (centre)	60°31.4'N 01°10.5'W	HU 452 825
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

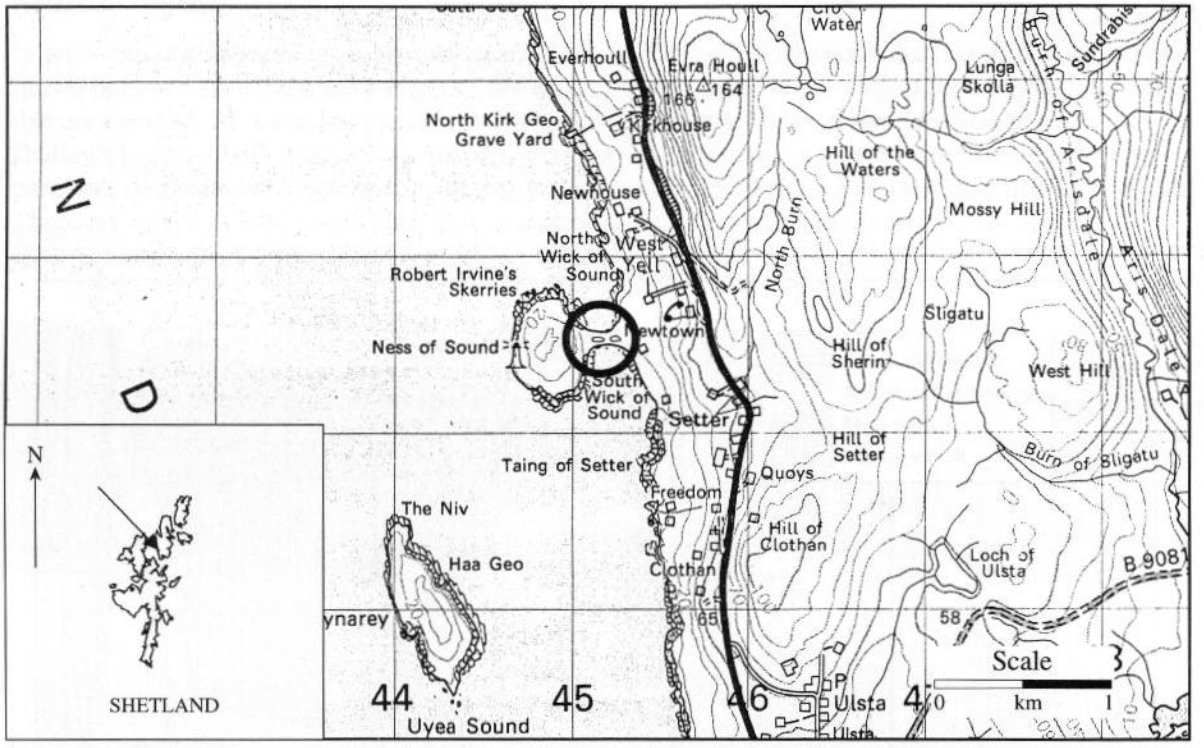

Figure 2.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

There are two lagoons at this site, on the vegetated tombolo between the west coast of Yell and the Ness of Sound. These percolation lagoons are both less than 100 m in length and have a maximum depth of 0.2 m. There is very little disturbance by wave action or tidal currents in either lagoon. Both lagoons are backed by salt-tolerant grass to the north and by an unvegetated shingle ridge to the south. The salinity of the lagoons was estimated to be between 30 ‰ and 35 ‰, being maintained by seawater over-topping the shingle ridge during storms and by percolation through the ridge during high spring tides. There is very little freshwater input to the lagoons and, at the time of survey, both appeared to be stagnant.

Physical features	
Physiographic type	Percolation saline lagoons
Area of lagoon	0.5 ha each
Maximum length of lagoon	0.1 km each
Bathymetry	Maximum depth 0.2 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	30-35 ‰ (estimated)

Marine biology

Both lagoons comprised sand, pebbles and cobbles covered by peat-stained saline water. There was very little life in either lagoon, with the exception of a unicellular green algal slime on the surfaces of the stones, gammarid amphipods beneath the larger pebbles and cobbles and occasional chironomid larvae (Lag).

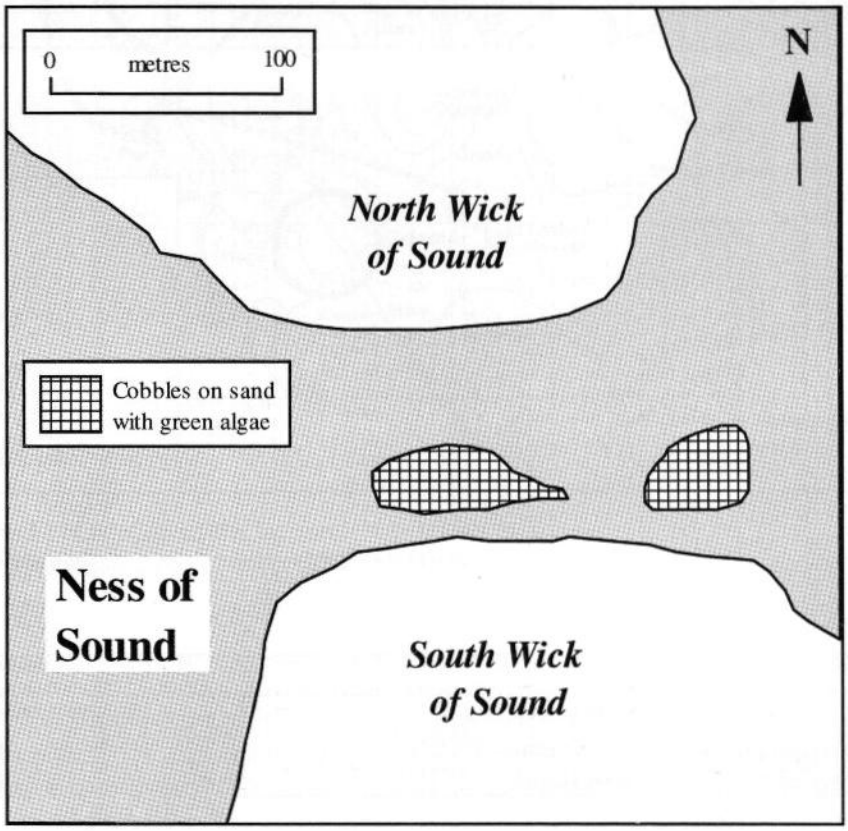

Figure 2.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

At the time of survey there was litter around both lagoons; otherwise there appeared to be little human influence.

References and further reading

None available.

Compiled by: Kath Thorpe

3 Mussel Loch, Yell

Location		
Position (centre)	60° 29.4′N 00° 08.3′W	HU 473 789
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

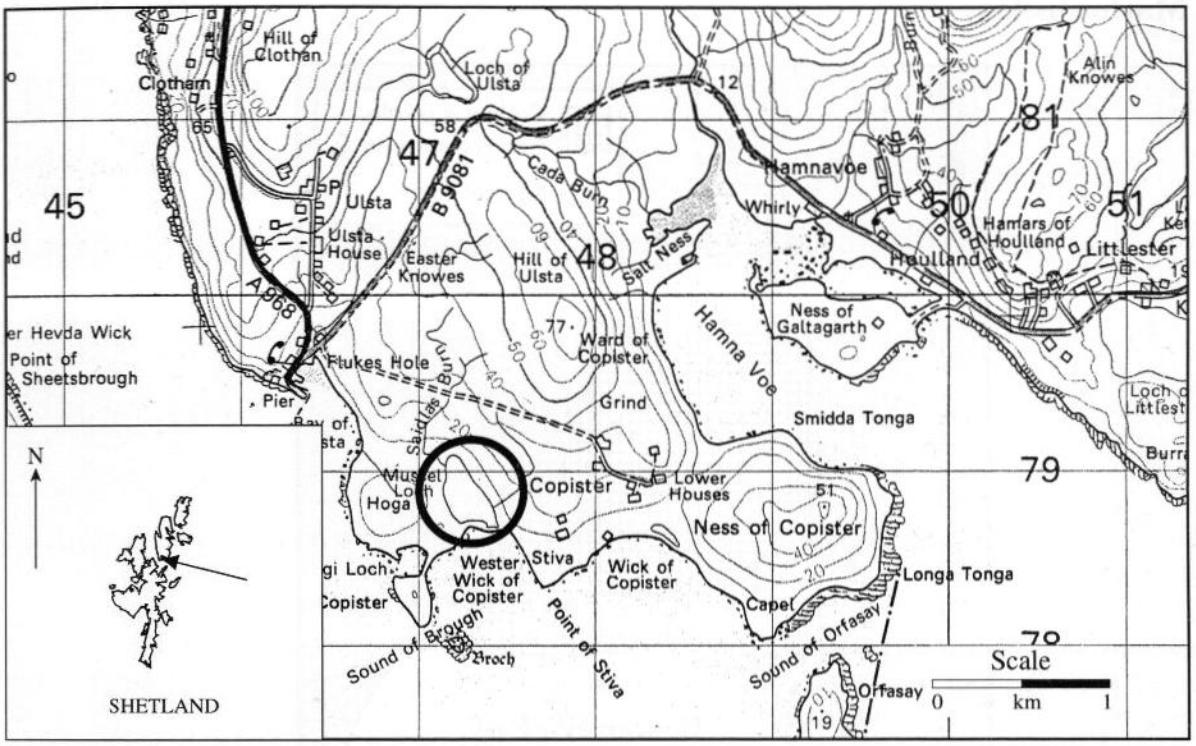

Figure 3.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	1974	Maitland (1995)
	Recording	August 1993	MNCR survey 472

Introduction

Mussel Loch is located on the south-west coast of Yell and is separated from the sea by a substantial shingle ridge, while its landward side is backed by a large area of moorland. The lagoon is about 0.4 km in length, has a maximum depth of 0.5 m and a negligible tidal range. Its salinity was estimated to be 0.5 ‰ to 5 ‰, this being maintained by over-topping of the shingle barrier during storms and high tides. The lagoon has a substantial catchment area which results in high freshwater run-off and a low overall salinity regime. There is very little disturbance to the lagoon from tidal currents or wave action.

Physical features	
Physiographic type	Isolated saline lagoon
Area of lagoon	9 ha
Maximum length of lagoon	0.4 km
Bathymetry	Maximum depth 0.5 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	0.5-5 ‰ (estimated)

Marine biology

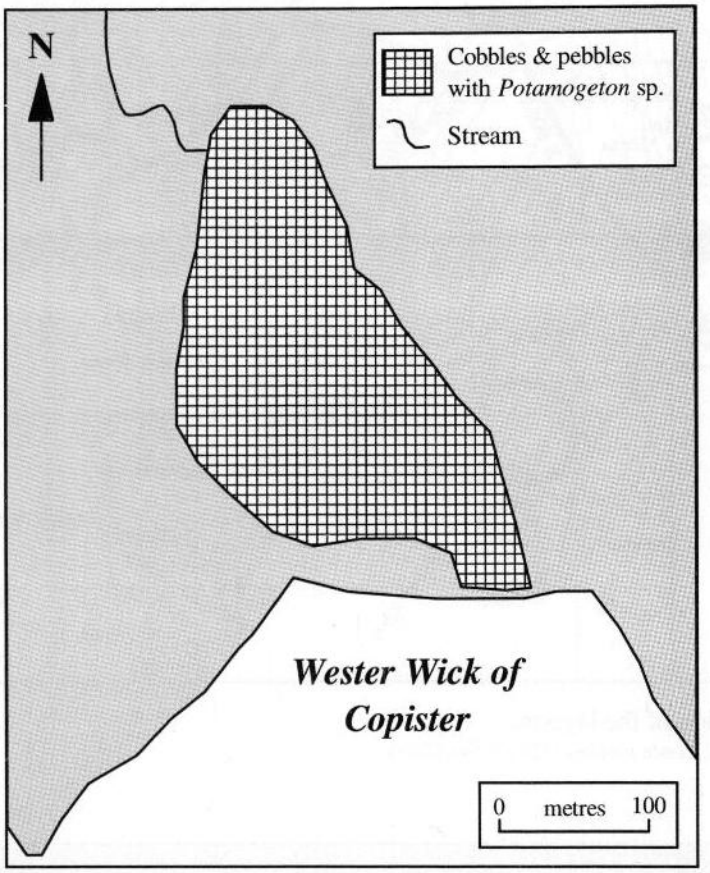

Figure 3.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

Mussel Loch consisted of peaty sand with small boulders, cobbles and pebbles. The species richness of the lagoon was low with pondweed *Potamogeton* sp. and a green algal cover of *Enteromorpha intestinalis* on the sand (NVC A12). A green algal film was present on the stones and gammarid amphipods and small gastropods were found underneath the stones. An extensive survey of Mussel Loch, undertaken in 1974 (Maitland 1995), found similar results to the 1993 survey and noted the presence of a number of rare algae.

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

There was some litter and debris around the edges of the lagoon. No other human influences were apparent.

References and further reading

Maitland, P.S. 1995. *The freshwaters of Shetland*. Unpublished report to Scottish Natural Heritage.

Compiled by: Kath Thorpe

4 Ness of Galtagarth lagoon, Yell

Location		
Position (centre)	60° 30.1′N 00° 05.9′W	HU 495 801
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

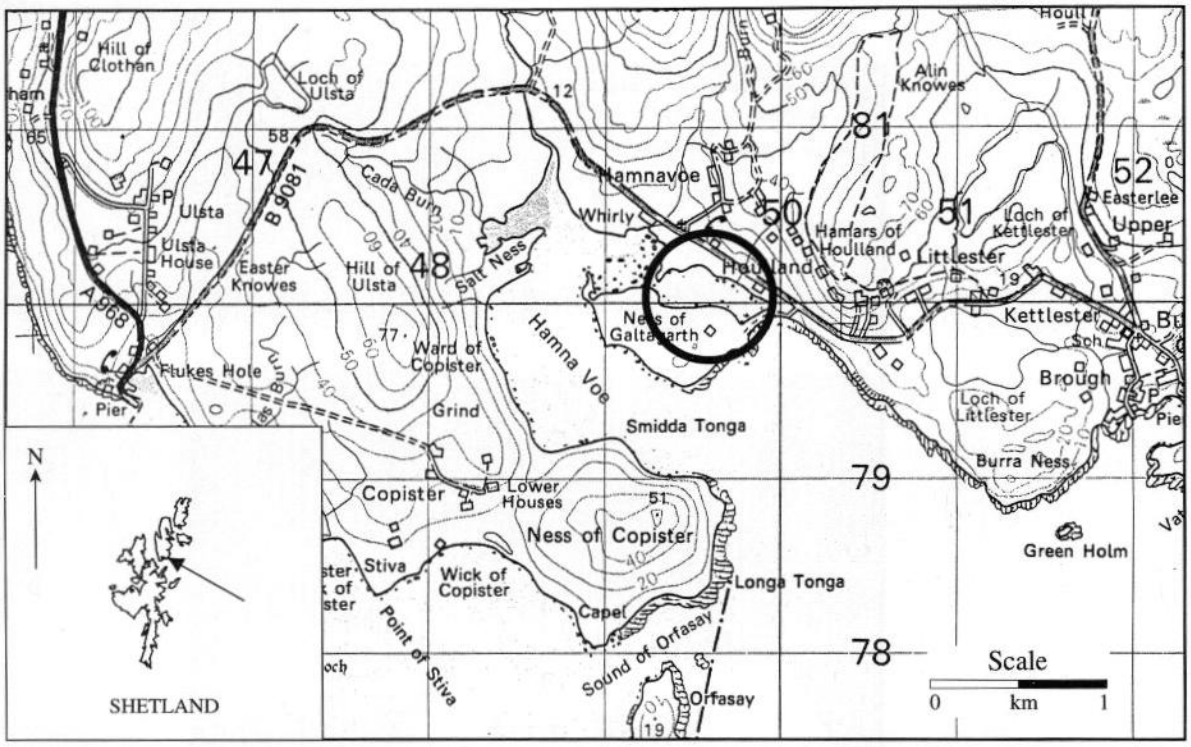

Figure 4.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	August 1987	Howson (1988)
	Recording	August 1993	MNCR survey 472
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The lagoon is located to the north of Ness of Galtagarth on the south-west coast of Yell and comprises a basin about 0.7 km in length, with a maximum depth of 2.5 m and a tidal range of about 3 m. A well-established vegetated shingle barrier separates the lagoon from Hamna Voe at its eastern end; the remainder of the lagoon is surrounded by grassland. The western end of the lagoon connects at low tide level to Hamna Voe via a series of tidal rapids. The lagoon is fully saline, the high salinity being maintained by seawater entering from Hamna Voe on each tide through the rapids. There is no substantial freshwater input. The site is extremely sheltered from wave action and has very little current, with the exception of the tidal rapids.

Physical features	
Physiographic type	Silled saline lagoon (sill at low water level)
Area of lagoon	11 ha
Maximum length of lagoon	0.7 km
Bathymetry	Maximum depth 2.5 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	3 m
Salinity	30-35 ‰ (estimated)

Marine biology

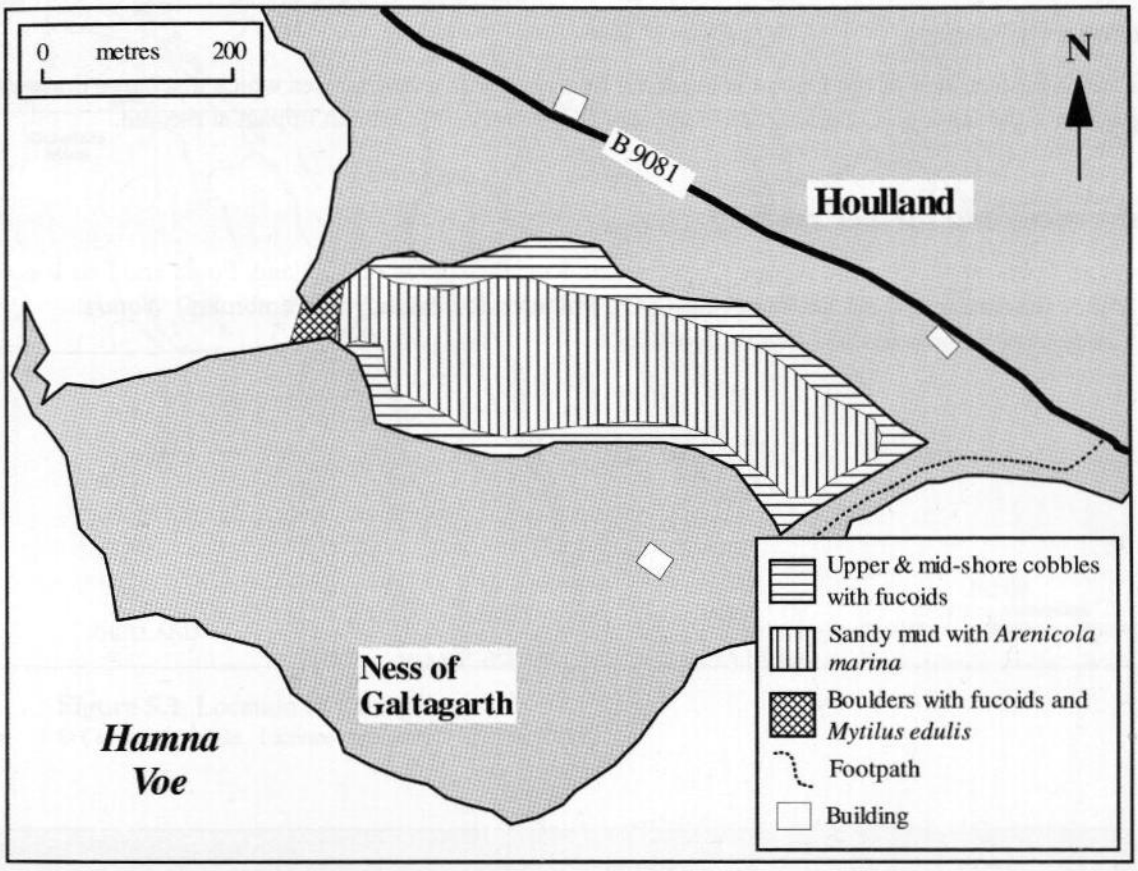

Figure 4.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

The littoral zone of the main basin consisted of small boulders, cobbles, pebbles and gravel dominated by the fucoid algae *Pelvetia canaliculata*, *Fucus spiralis*, *Fucus vesiculosus* and *Fucus serratus* (Pel; Fspi; FvesX; FserX). The green alga *Enteromorpha* sp. was common in places and winkles *Littorina littorea* and *Littorina saxatilis* were found on the cobbles. Occasional patches of coarse sand between the rocks were colonised by lugworms *Arenicola marina*.

The main basin, between 0.5 and 2.5 m depth, was soft, sandy mud. This was dominated by lugworms *A. marina* and clumps of algae (FaMS). These algae consisted mainly of *F. serratus*, *F. vesiculosus* or the red alga *Polyides rotundus*, all of which had filamentous green algae attached to their fronds (FChoG).

In the tidal rapids the littoral zone consisted of boulders, cobbles and pebbles. Channelled wrack *P. canaliculata* grew on the upper surfaces of the boulders while the wracks *F. vesiculosus* and *F. spiralis* grew on the boulder sides (Pel; Fspi; FvesX). Barnacles *Semibalanus balanoides* and limpets *Patella vulgata* were present between the algal holdfasts. Mussels *Mytilus edulis* were found on the edges of boulders just below the water's surface. Serrated wrack *F. serratus* dominated the areas with flowing water (Fserr.VS).

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

The north-eastern side of the lagoon is bordered by a road with a few houses which discharge domestic sewage into the lagoon. Otherwise there appeared to be very little human impact at the site.

References and further reading

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987 . (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 816.

Compiled by: Kath Thorpe

5 Houb at Gutcher, Yell

Location		
Position (centre)	60° 40.4′N 00° 59.8′W	HU 548 994
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

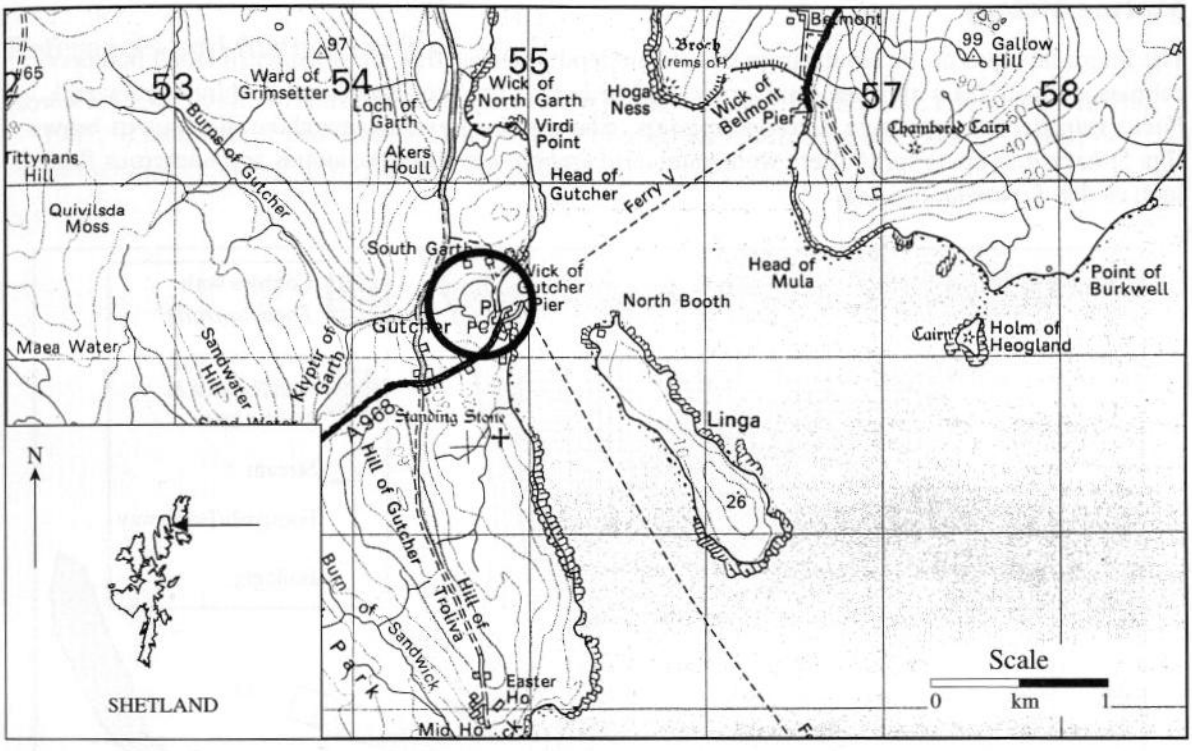

Figure 5.1 Location of the lagoon.

Marine biological surveys			
	Survey methods	*Date of survey*	*Source*
Littoral	Recording	August 1987	Howson (1988)
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The Houb at Gutcher is located on the east coast of Yell, separated from Bluemull Sound by a substantial vegetated shingle barrier which has a rough vehicle track running over the top. The remainder of the Houb is surrounded by peat bog. The Houb consists of a single basin about 0.3 km in length and has a maximum depth of 0.5 m. There are two culvert pipes, both about 0.3 m in diameter, which connect the Houb to Bluemull Sound at about high tide level, and the salinity in the lagoon (maintained by regular seawater inflow through the culvert pipes) was estimated to be between 30 ‰ and 35 ‰. There is some freshwater input from a stream entering the western side of the Houb, but this appears to have little influence on the salinity. The Houb is very sheltered from wave action and tidal currents are limited to the area around the culvert.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	4 ha
Maximum length of lagoon	0.3 km
Bathymetry	Maximum depth 0.5 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.3 m
Salinity	30-35 ‰ (estimated)

Marine biology

The intertidal areas of the Houb (from 0 to 0.2 m depth) consisted predominantly of small boulders, cobbles and pebbles with some sand, gravel and bedrock. The area was dominated by spiral wrack *Fucus spiralis*, the green alga *Enteromorpha* sp., filamentous green algae and the filamentous brown alga *Sphacelaria* sp. (Fspi). There were gammarid amphipods under the stones and numerous flatfish such as dab *Limanda limanda*.

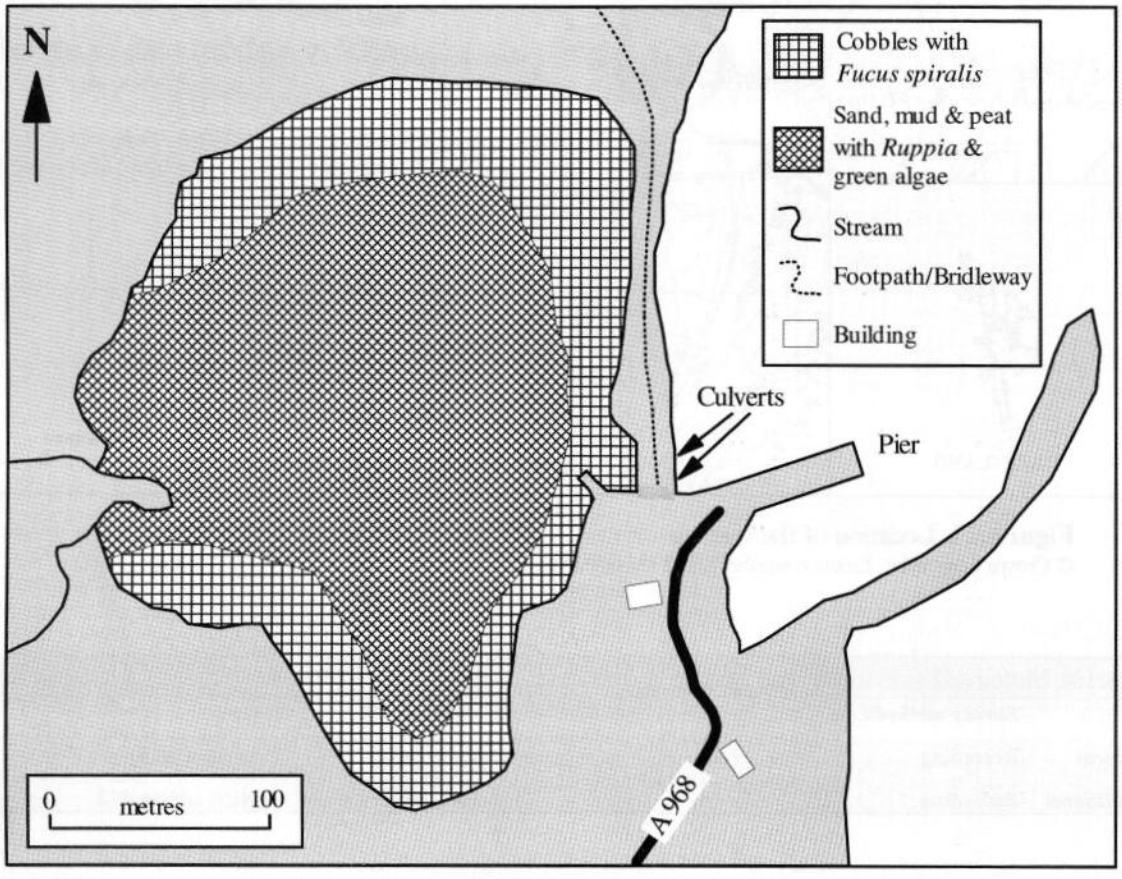

Figure 5.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

The central area of the Houb, between 0.2 and 0.5 m depth, is predominantly sandy mud with peat; it was dominated by a fine filamentous green alga with patches of tasselweed *Ruppia maritima* (FiG). Bladder wrack *Fucus vesiculosus* was present in small clumps. Gammarid amphipods, shore crabs *Carcinus maenas*, three-spined sticklebacks *Gasterosteus aculeatus*, dab *Limanda limanda* and the sand gaper *Mya arenaria* were sparsely distributed in this habitat.

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

Water exchange with the open sea is restricted to a culvert through the road bridge. There are a few houses by the road on the eastern side of the Houb. There is also a working quarry and cement works to the north of the Houb.

References and further reading

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 816.

Compiled by: Kath Thorpe

6 Wick of North Garth lagoon, Yell

Location		
Position (centre)	60° 40.9′N 00° 59.8′W	HP 548 003
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

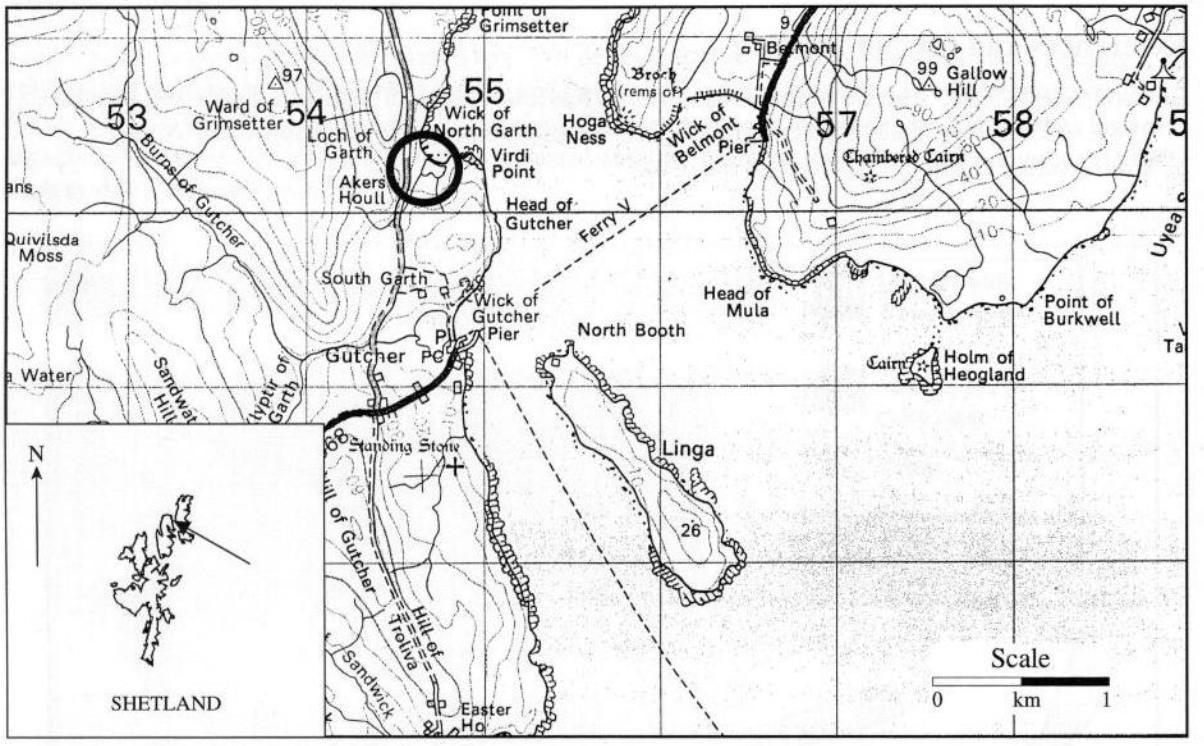

Figure 6.1 Location of the lagoon.

Marine biological surveys			
	Survey methods	***Date of survey***	***Source***
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The lagoon at the Wick of North Garth, on the north-east coast of Yell, is separated from Bluemull Sound by a shingle bar. The remainder of the lagoon is surrounded by peat bog. The lagoon is about 0.3 km in length, has a maximum depth of 0.3 m and a negligible tidal range. Seawater exchange is by percolation through the shingle barrier at high tide and the salinity was estimated to be between 30 ‰ and 35 ‰. However, the presence of a strandline of detached seaweed and rubbish at the head of lagoon suggests there is also some over-topping of the shingle barrier during high spring tides and storms. A small stream on the western side of the lagoon provides limited freshwater input.

Physical features	
Physiographic type	Percolation saline lagoon
Area of lagoon	1 ha
Maximum length of lagoon	0.1 km
Bathymetry	Maximum depth 0.3 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	30-35 ‰ (estimated)

Marine biology

The lagoon was fringed by a mixture of small boulders, cobbles and muddy sand with occasional peat exposures. Species richness was low, consisting of tasselweed *Ruppia maritima* growing in the sediment (Rup) and the brown filamentous alga *Sphacelaria* sp. growing attached to small boulders and large cobbles. Other species recorded included sparse filamentous green algae and knobbly crusts of a blue-green alga on some of the boulders.

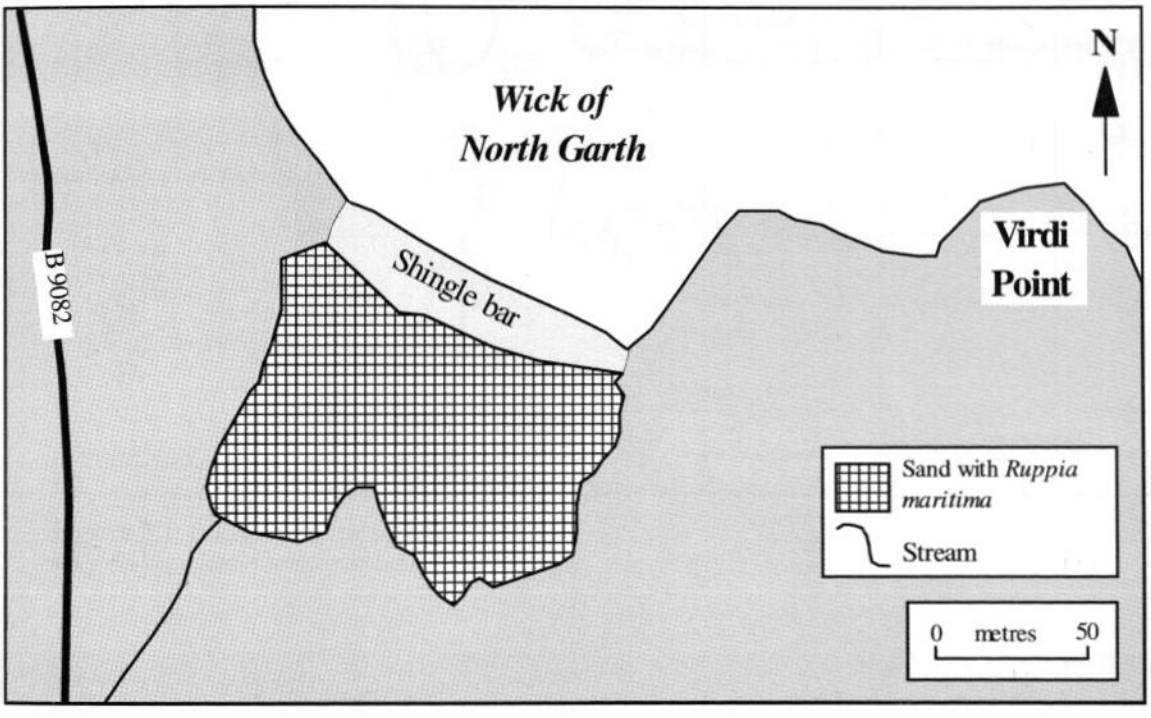

Figure 6.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

There is a road 100 m to the west of the lagoon. Some litter was present on the strandline. In 1993 there was a proposal for a salmon farm to be established in the lagoon.

References and further reading

None available.

Compiled by: Kath Thorpe

7 Loch of the North Haa, Mainland

Location		
Position (centre)	60° 35.1′N 01° 20.0′W	HU 365 892
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

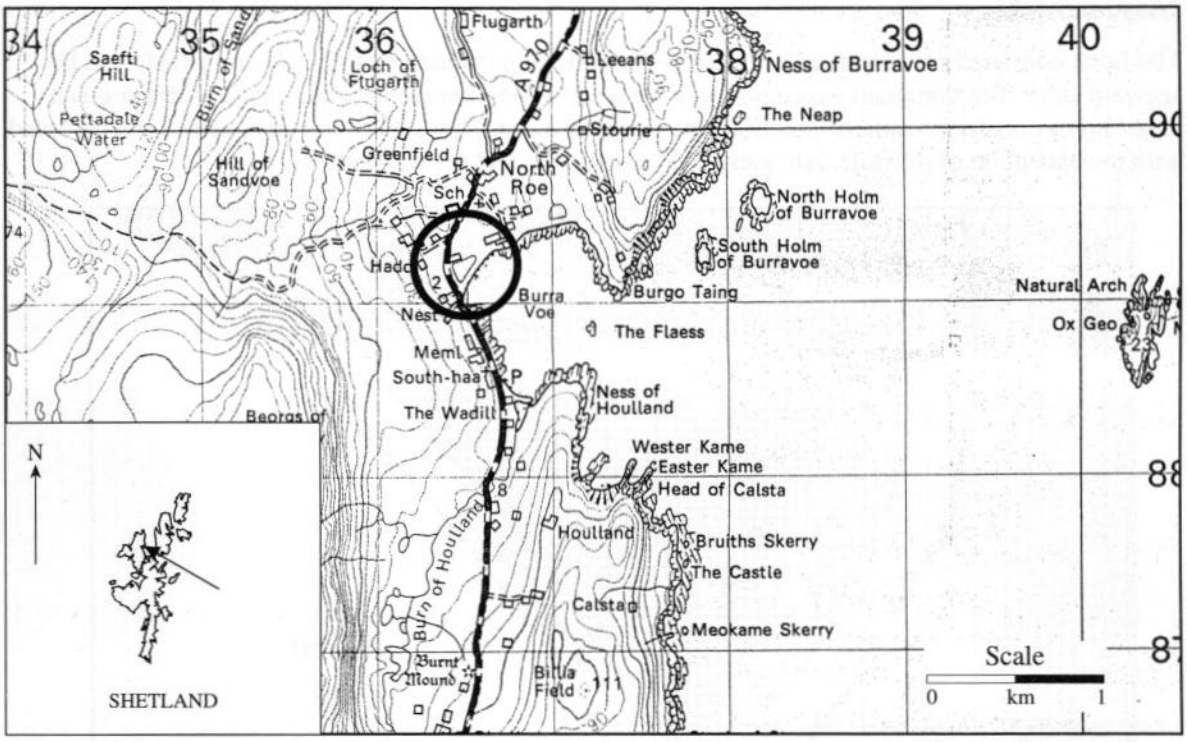

Figure 7.1 Location of the lagoon.

Marine biological surveys			
	Survey methods	*Date of survey*	*Source*
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The Loch of the North Haa is a small percolation lagoon, located between a shingle barrier and a road at Burra Voe on the north-east coast of Mainland Shetland. The lagoon was considered to be fully saline at the time of survey in 1993. Water exchange with the open sea occurs through the shingle barrier at the south-eastern side of the lagoon and also via a culvert at mean high water of spring tides. There is very little freshwater input. The loch is approximately 0.13 km in length, has a maximum depth of 1 m and a negligible tidal range. There is very little disturbance from wave action or tidal currents.

Physical features	
Physiographic type	Percolation saline lagoon
Area of lagoon	0.75 ha
Maximum length of lagoon	0.13 km
Bathymetry	Maximum depth 1 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	30-35 ‰ (estimated)

Marine biology

The Loch consisted predominantly of mud, with increasing quantities of shingle and pebbles on its seaward side. The dominant vegetation was the tasselweed *Ruppia maritima* mixed with the green alga *Enteromorpha intestinalis* and filamentous green algae (Rup). Few animal species were recorded, with the exception of juvenile fish, gammarid amphipods and mysid shrimps.

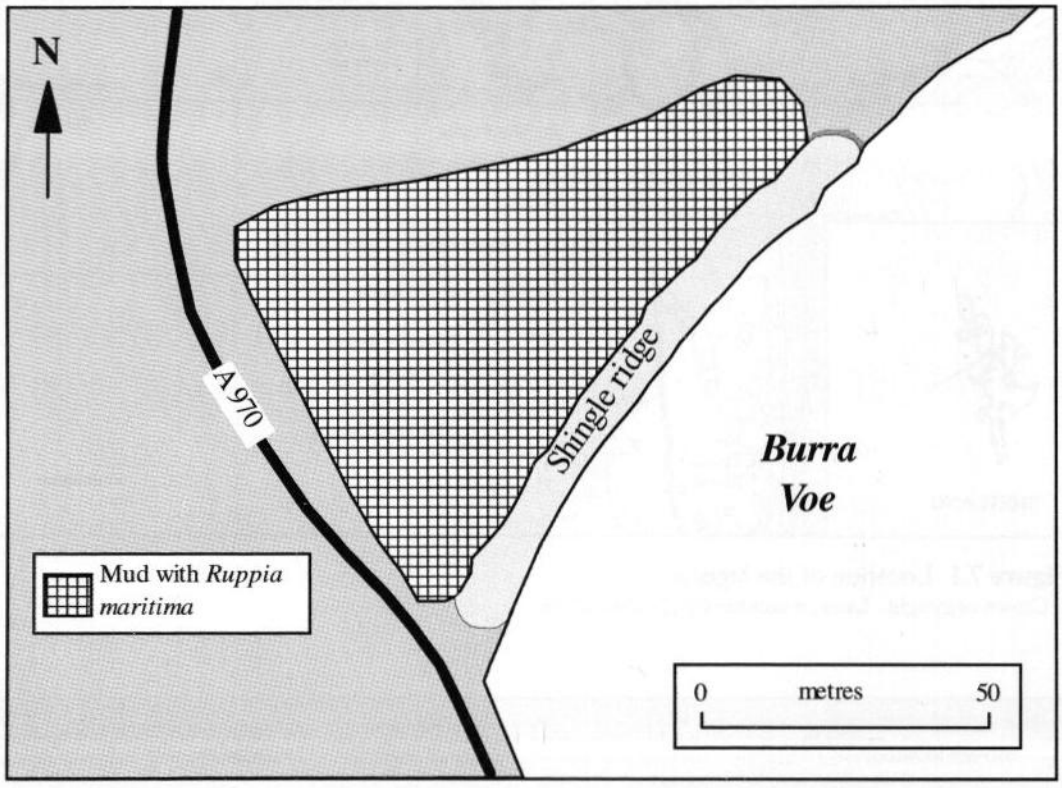

Figure 7.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

Until 1993 there was a septic tank outflow from the nearby public hall. There is a road on the western side of the lagoon and a few houses close by. Otherwise there appears to be very little human influence at this site.

References and further reading

None available.

Compiled by: Kath Thorpe

8 Loch of Queyfirth, Mainland

Location		
Position (centre)	60° 31.1′N 01° 21.2′W	HU 355 818
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

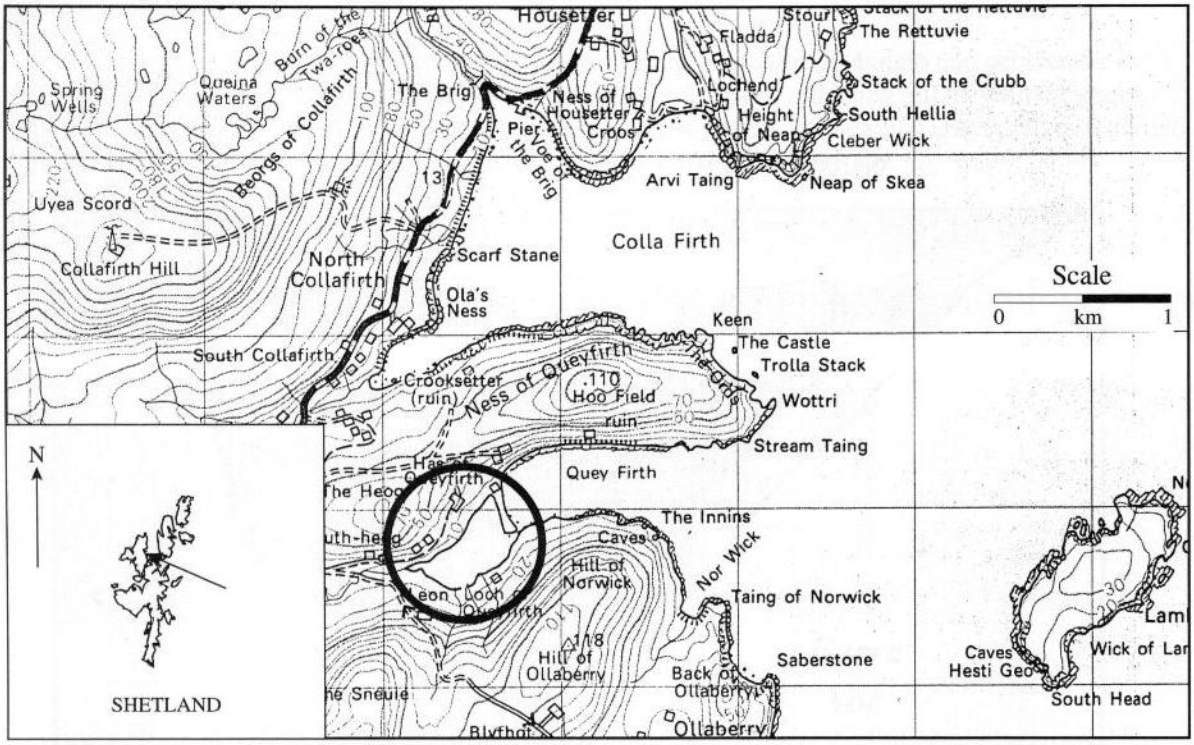

Figure 8.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The Loch of Queyfirth is located on the north-east coast of Mainland Shetland. The lagoon is connected to Quey Firth via a channel of tidal rapids, about 50 m in length and 7 m wide, which forms a sill at about mid-tide level. Seawater flows into the eastern end of the lagoon on each tide through the channel, and there is freshwater input from several streams on the south-eastern side and from one on the south-western side. The salinity of the lagoon was estimated to be between 18 ‰ and 30 ‰ at the time of survey in 1993, with the freshwater input resulting in the presence of a halocline at the lagoon's western end. The Loch is about 0.7 km in length, has a maximum depth of 2 m and a tidal range of 1 m. There is very little disturbance by wave action and very little current flow, except in the rapids. The site is surrounded by grassland and saltmarsh.

Physical features	
Physiographic type	Silled saline lagoon (sill at mid-tide level)
Area of lagoon	16 ha
Maximum length of lagoon	0.7 km
Bathymetry	Maximum depth 2 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	1 m
Salinity	18-30 ‰ (estimated)

Marine biology

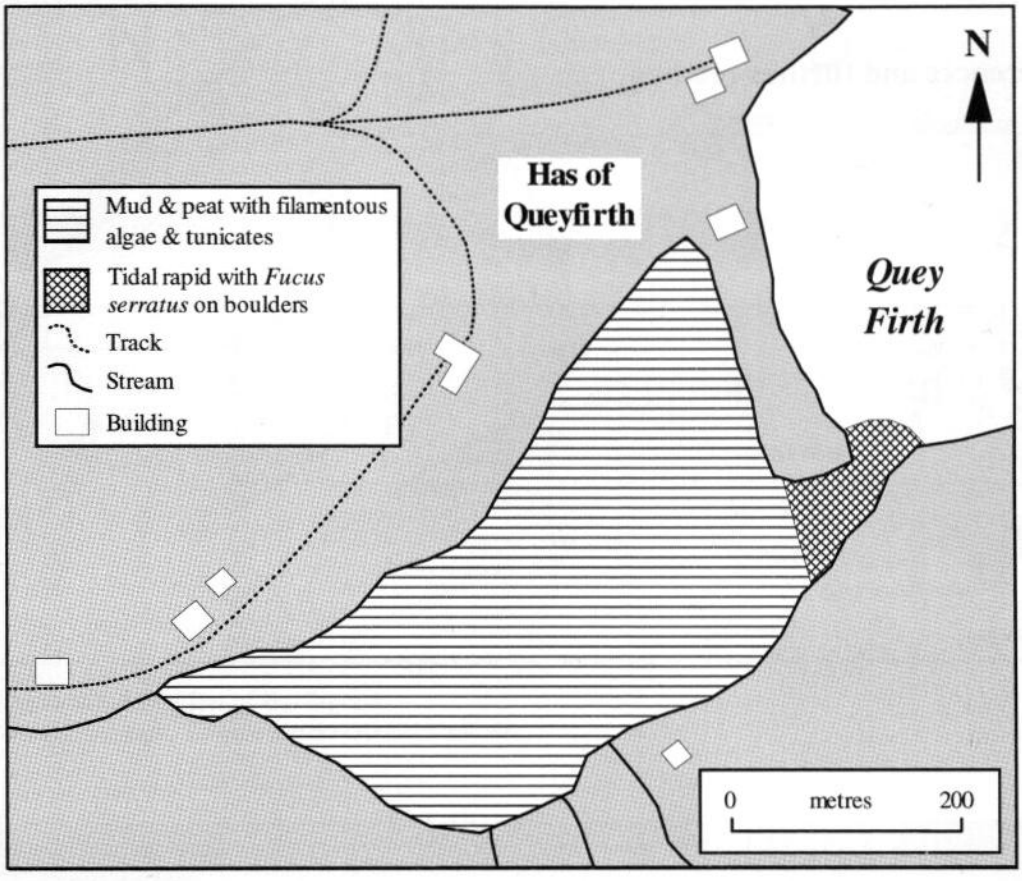

Figure 8.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The main basin of the lagoon consisted of soft, muddy sediment with peat. The mud was overlain by a dense mat of filamentous algae, with areas of sugar kelp *Laminaria saccharina* and bootlace weed *Chorda filum* and isolated patches of the wracks *Fucus vesiculosus* and *Fucus serratus* (FiG). The solitary ascidians *Ascidiella aspera* and *Ascidia mentula* grew attached to the algae. Hermit crabs *Pagurus bernhardus* and shore crabs *Carcinus maenas* were present on the sediment.

The tide-swept inlet channel, lying between 0.2 and 1 m depth, had gravel with boulders in the deeper calmer areas, giving way to boulders in the more tide-swept areas. The dominant species in the deeper, calmer areas were kelps *L. saccharina*, *Laminaria hyperborea* and bootlace weed *C. filum* (Lhyp.TFt). Serrated wrack *F. serratus* and barnacles *Semibalanus balanoides* were dominant in the shallower, more tide-swept areas (Fserr.T). The algae supported a substantial growth of the bryozoan

Alcyonidium sp. Hermit crabs *P. bernhardus* were present and the clear surfaces of the rocks were colonised by limpets *Patella vulgata*.

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

There is a track with a few houses on the north-western side of the lagoon, whose septic tanks discharge into the lagoon. Otherwise, there appeared to be very little human influence at this site.

References and further reading

None available.

Compiled by: Kath Thorpe

9 The Houb, Fora Ness, Mainland

Location		
Position (centre)	60° 25.9′N 01° 11.1′W	HU 448 723
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

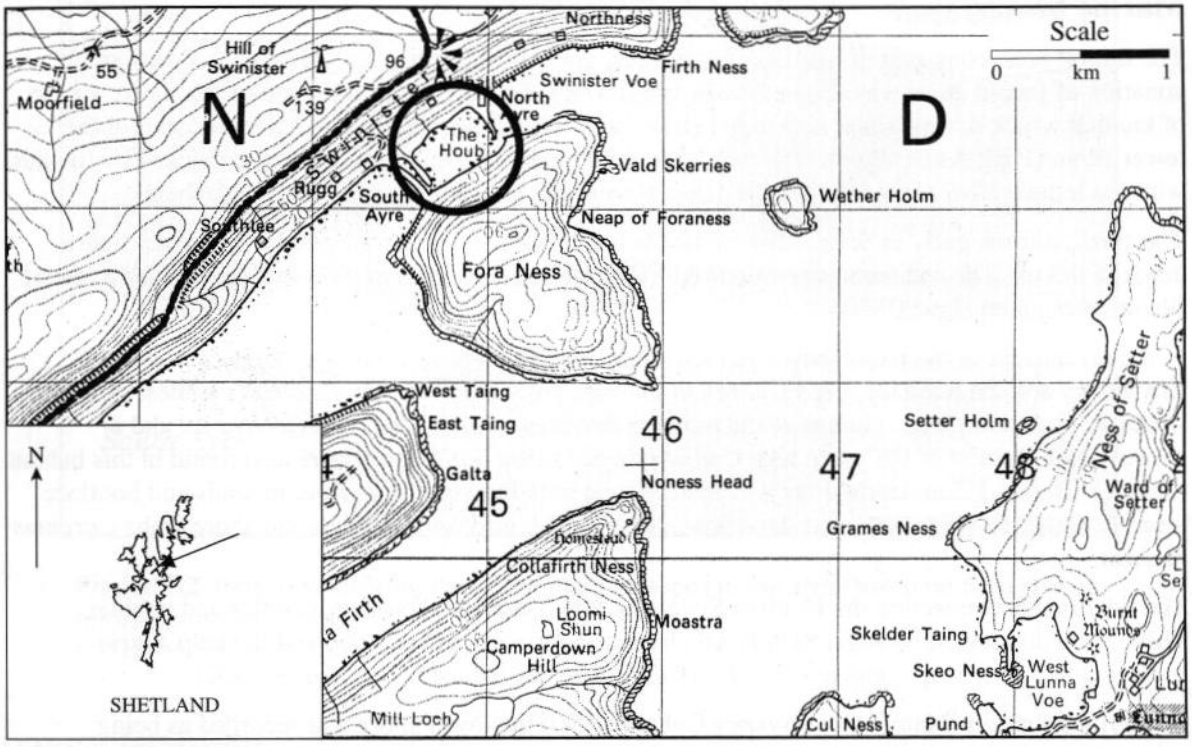

Figure 9.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	August 1993	MNCR survey 472
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The Houb of Fora Ness is located between Dales Voe and Swinister Voe, on the north-east coast of Mainland Shetland. The main basin is about 0.4 km in length, has a maximum depth of 3 m and a tidal range of 3 m. The lagoon is bounded by a shingle bar and shingle spit at its south-western end; between these there is a gully that connects to the main basin via a small channel. The lagoon is surrounded by grassland. At its north-eastern end the Houb connects to Swinister Voe at low water level via tidal rapids, and regular seawater inflow through these rapids maintains full salinity within the lagoon. Two small streams enter the Houb on its north-western side, but these do not appear to have a significant effect on the salinity.

Physical features	
Physiographic type	Silled saline lagoon (sill at low water level)
Area of lagoon	17 ha
Maximum length of lagoon	0.4 km
Bathymetry	Maximum depth 3 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	3 m
Salinity	30-35 ‰ (estimated)

Marine biology

The littoral zone consisted of cobbles and pebbles, gradually shelving towards sand. A distinct zonation of fucoid algae was apparent with spiral wrack *Fucus spiralis* at the top of the shore, a zone of knotted wrack *Ascophyllum nodosum* below and a zone of serrated wrack *Fucus serratus* at the lower shore (Fspi; AscX; FserX). Towards the tidal rapids, the shingle ridge was colonised by fucoids, with sea lettuce *Ulva lactuca* and the red alga *Porphyra umbilicalis* growing amongst them.

The small, narrow gully in the south-west of the Houb had a muddy sand bottom, and a maximum depth of 0.3 m. The sediment was colonised by lugworms *Arenicola marina* and covered by a mat of filamentous green algae (FiG).

In the main basin of the Houb, between loch datum and 1.5 m depth, the sugar kelp *Laminaria saccharina* and the bootlace weed *Chorda filum* were growing on muddy sand and cobbles. Knotted wrack *A. nodosum* plants, clumps of the red alga *Polyides rotundus*, sea lettuce *Ulva* sp. and a considerable amount of the green alga *Codium fragile* subsp. *atlanticum* were also found in this habitat (LsacX). Below 1.5 m depth, there was muddy sand with lugworm *A. marina* mounds and bootlace weed *C. filum* (FaMS). Amongst these were sugar kelp *L. saccharina* plants and shore crabs *Carcinus maenas*.

The tidal rapids connecting the Houb to Swinister Voe comprised boulders, cobbles and pebbles. These were dominated by sugar kelp *L. saccharina*, bootlace weed *C. filum* and the kelp *Alaria esculenta*, together with some red alga *P. rotundus* and sea lettuce *U. lactuca* (HalXK).

In previous surveys (Nature Conservancy Council 1990) the lower shore was recorded as being colonised by the '*Trailliella*' phase of the red alga *Bonnemaisonia asparagoides*, while the fauna was noted as being species rich and included sponges, echinoderms and ascidians. The gully between the two spits at the south-western end of the Houb had a restricted flora and fauna, dominated by the sea mat *Bowerbankia imbricata* with several ascidian species also present. The sediment was colonised by a rich infauna of amphipods, polychaetes and nematodes which lived amongst lugworms *A. marina*. A rich flora and fauna were recorded in the littoral zone, including a rich molluscan fauna.

Common seals, grey seals and otters were found within the region of the Houb and Swinister Voe. A variety of wading birds and ducks, including oystercatcher, ringed plover, golden plover, turnstone, curlew, redshank, wigeon, shoveler and teal, use the sediments and waters of the Houb (Nature Conservancy Council, 1990). Arctic terns were nesting on the South Ayre, to the south-west of the Houb.

Nature conservation

Conservation sites			
Site name	***Designation***	***Centre grid ref.***	***Main features***
The Ayres of Swinister	SSSI	HU 449 723	Coastal geomorphology
Swinister Voe and the Houb of Fora Ness	MCA	HU 449 723	Marine ecology of the rapids and the Houb

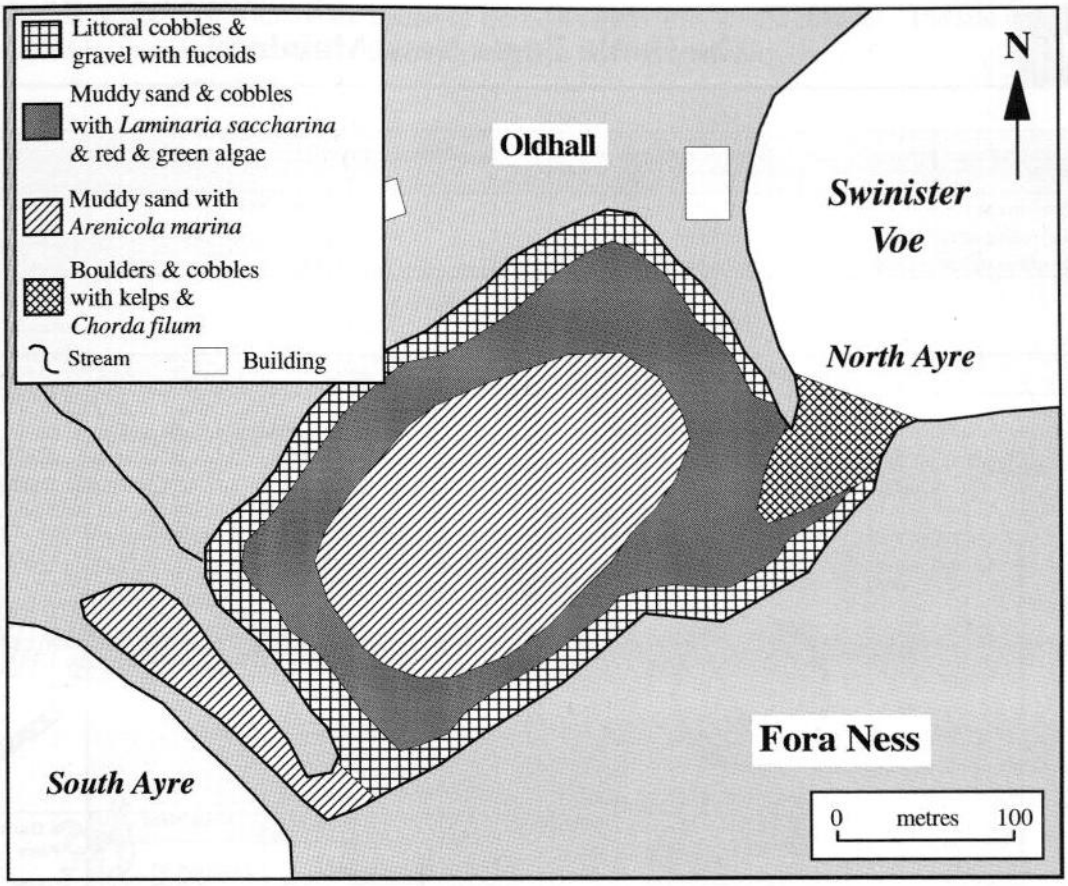

Figure 9.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

Human influences

In 1993 there was construction of fish cages on the shingle spit between the Houb and Swinister Voe and boats were beached on the shores of the Houb. Otherwise, there appeared to be little human influence at the site.

References and further reading

Hiscock, K. 1986. Marine biological surveys in Shetland. August 1986. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 678.

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 816.

Nature Conservancy Council. 1990. *Marine Consultation Areas: Scotland.* Edinburgh, Nature Conservancy Council.

Compiled by: Kath Thorpe

10 The Houb, Fugla Ness, Mainland

Location		
Position (centre)	60° 27.3´N 01° 20.4´W	HU 363 747
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

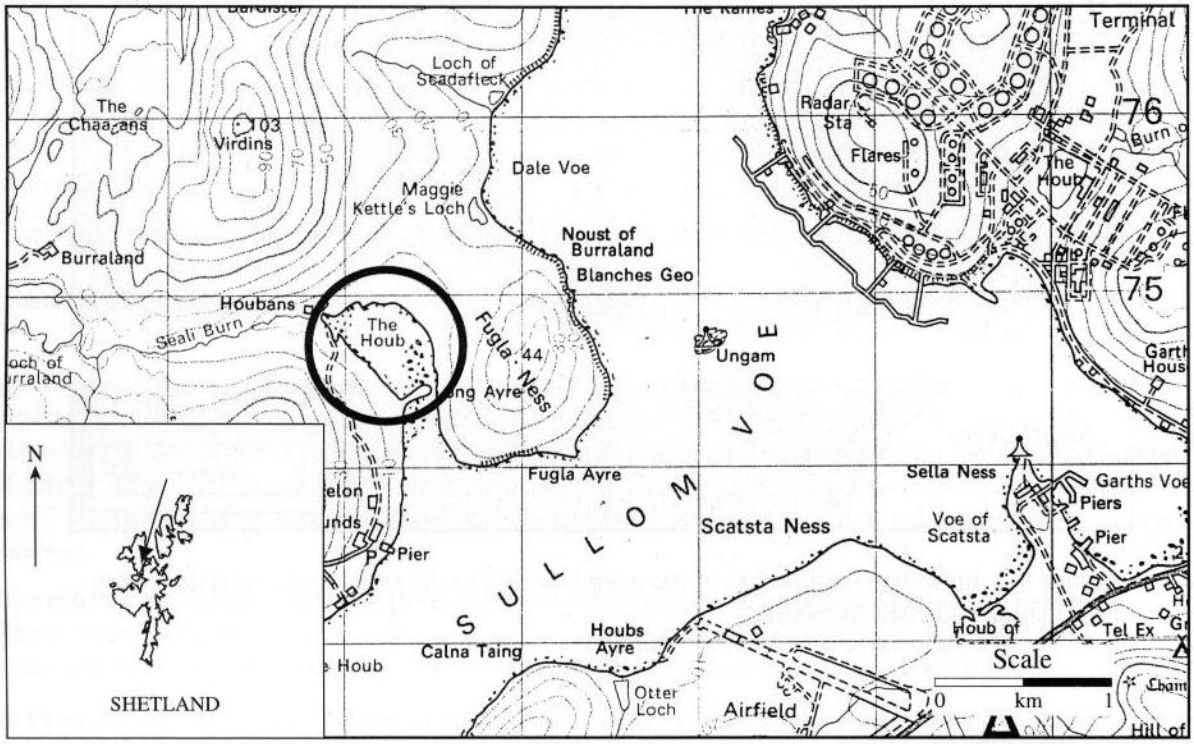

Figure 10.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Littoral	Recording	August 1993	MNCR survey 472
Sublittoral	Recording	August 1987	Howson (1988)
	Recording	August 1993	MNCR survey 472
	Core samples (6 x 0.0032 m²)	August 1993	MNCR survey 472
	Granulometric sample	August 1993	MNCR survey 472

Introduction

The Houb of Fugla Ness is located on the western shore of Sullom Voe. The Houb consists of a single basin about 0.6 km in length, has a maximum depth of 0.4 m and a tidal range of about 3 m. The lagoon is sheltered from the sea by a shingle barrier at its south-eastern corner, where a channel (approximately 10 m wide) allows an exchange of water with Sullom Voe at about mean low water level. The salinity of the main basin was approximately 30 ‰ to 35 ‰, with an area of more variable salinity where a stream enters the Houb from the north-west. There is very little disturbance by either

wave action or currents, with the exception of the tidal rapids through the channel. The site is surrounded by moorland, except for the shingle bar on the southern side.

Physical features	
Physiographic type	Silled saline lagoon (sill at mean low water)
Area of lagoon	23 ha
Maximum length of lagoon	0.6 km
Bathymetry	Maximum depth 0.4 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Weak
Tidal range	3 m
Salinity	30-35 ‰ (estimated)

Marine biology

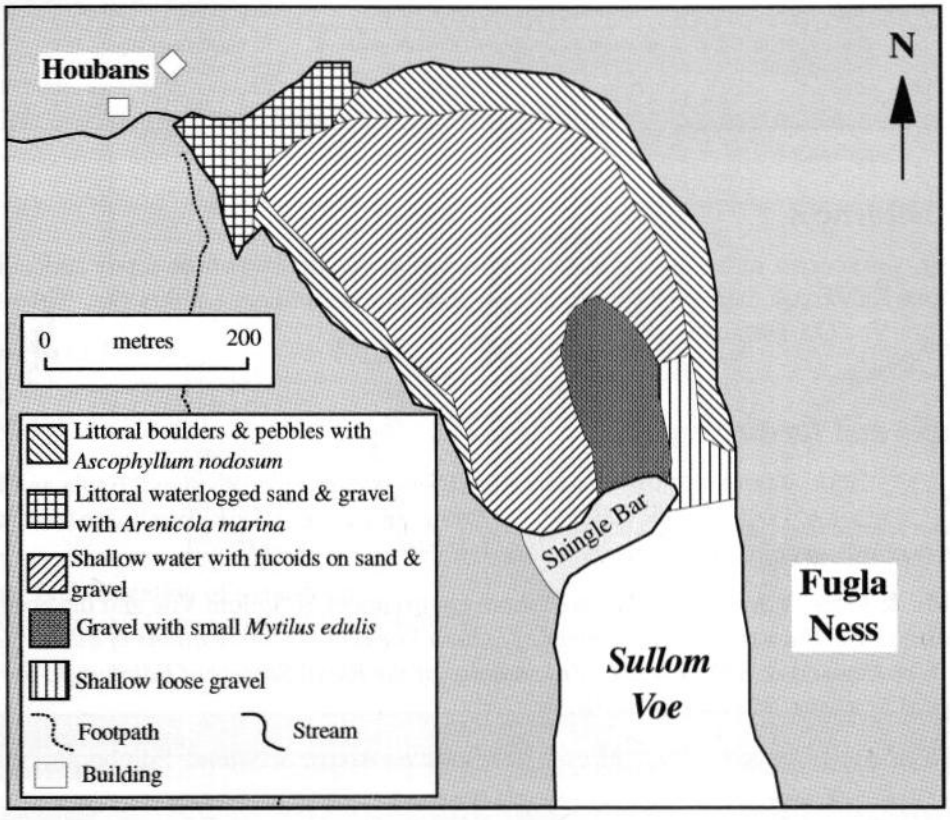

Figure 10.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

The shores around the main basin of the Houb were 10 to 50 m wide and consisted of boulders. The shores were dominated by a zone of knotted wrack *Ascophyllum nodosum*, with the wracks *Fucus spiralis* and *Pelvetia canaliculata* lying above (Pel; Fspi; Asc.Asc). The intertidal zone around the freshwater inflow in the north-west of the Houb consisted of coarse sand and gravel and was dominated by the lugworm *Arenicola marina* and the brackish-water wrack *Fucus ceranoides* (FcerX). Spiral wrack *F. spiralis* was also present here and some specimens appeared to be blistered.

The shingle barrier was consolidated by juvenile mussels *Mytilus edulis* (MytX). Other species present included cockles *Cerastoderma edule*, wracks *F. spiralis* and *Fucus vesiculosus* and bootlace weed

Chorda filum. Howson (1988) described the mussel *M. edulis* bed as having a rich fauna and flora, and Jones & Jones (1981) reported that the cockle *C. edule* populations lived, unusually, only partially embedded in the coarse gravel.

The sublittoral zone of the main basin had a maximum depth of 0.4 m and consisted of pebbles and gravel on coarse sand. This area was characterised by lugworms *A. marina*, bootlace weed *C. filum*, and wracks *F. vesiculosus* and *Fucus serratus* (FChoG). Many of the fucoid algae were unattached, and the larger plants were heavily epiphytised. The brown shrimp *Crangon crangon* and the burrowing anemone *Edwardsia claparedii* were recorded in this part of the Houb by Howson (1988).

The sublittoral zone of the tidal rapids consisted of loose sand and gravel. Although it was not surveyed in detail, occasional plants of bootlace weed *C. filum* were noted.

Nature conservation

Conservation sites			
Site name	***Designation***	***Centre grid ref.***	***Main features***
The Houb, Fugla Ness	MCA	HU 365 745	Geomorphology, ornithology and marine biology

Human influences

At the north-west corner of the lagoon there is a track with two houses whose septic tanks discharge into the Houb; otherwise there appeared to be very little human influence at this site. The site is close to the Sullom Voe Oil Terminal.

References and further reading

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 816.

Jones, A.M., & Jones, Y.M. 1981. The soft shore environment of Sullom Voe and the north mainland of Shetland. *In*: *The marine environment of Sullom Voe and the implications of oil developments*, ed. by T.H. Pearson & S.O. Stanley. *Proceedings of the Royal Society of Edinburgh. Series B: Biological Sciences*, *80* (1/4): 203-218.

Nature Conservancy Council. 1990. *Marine Consultation Areas: Scotland.* Edinburgh, Nature Conservancy Council.

Compiled by: Kath Thorpe

11 Minn, Mainland

Location		
Position (centre)	60° 23.9′N 01° 23.5′W	HU 335 684
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

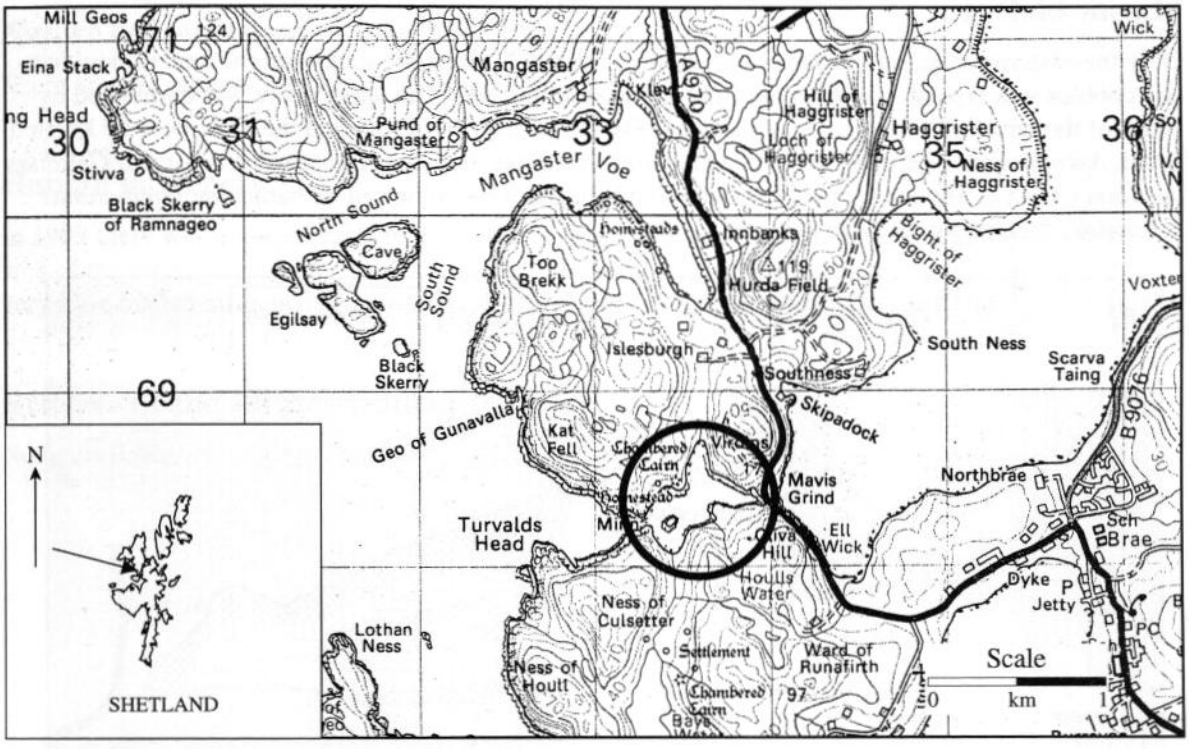

Figure 11.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	August 1993	MNCR survey 472
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

Minn is a small lagoon located close to the head of Sullom Voe on the western side of Mainland Shetland. Minn consists of a single basin about 0.7 km in length, with a maximum depth of 6 m and a tidal range of about 2 m. A wide channel with a sill below mean low water connects the lagoon to the open sea via St. Magnus Bay. Full salinity is maintained within the lagoon by regular seawater exchange through the channel and three small streams enter the inlet, two on the south side and one on the north side. The site is surrounded by grassland, except for the south-eastern corner which is bordered by a road bridge.

Physical features	
Physiographic type	Saline lagoon inlet (sill below mean low water)
Area of lagoon	18 ha
Maximum length of lagoon	0.7 km
Bathymetry	Maximum depth 6 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	2 m
Salinity	30-35 ‰ (estimated)

Marine biology

Only the eastern section of the Minn was surveyed in 1993. Here, the rocky littoral zone of boulders and cobbles was typical of a sheltered fully saline environment. The upper shore was dominated by zones of the wracks *Pelvetia canaliculata* and *Fucus spiralis* (Pel; Fspi), and the mid-shore by knotted wrack *Ascophyllum nodosum*, beneath which were red algae including *Chondrus crispus* and *Gelidium pusillum* (AscX). The areas of rock not covered by algae were colonised by barnacles *Semibalanus balanoides* and limpets *Patella vulgata*.

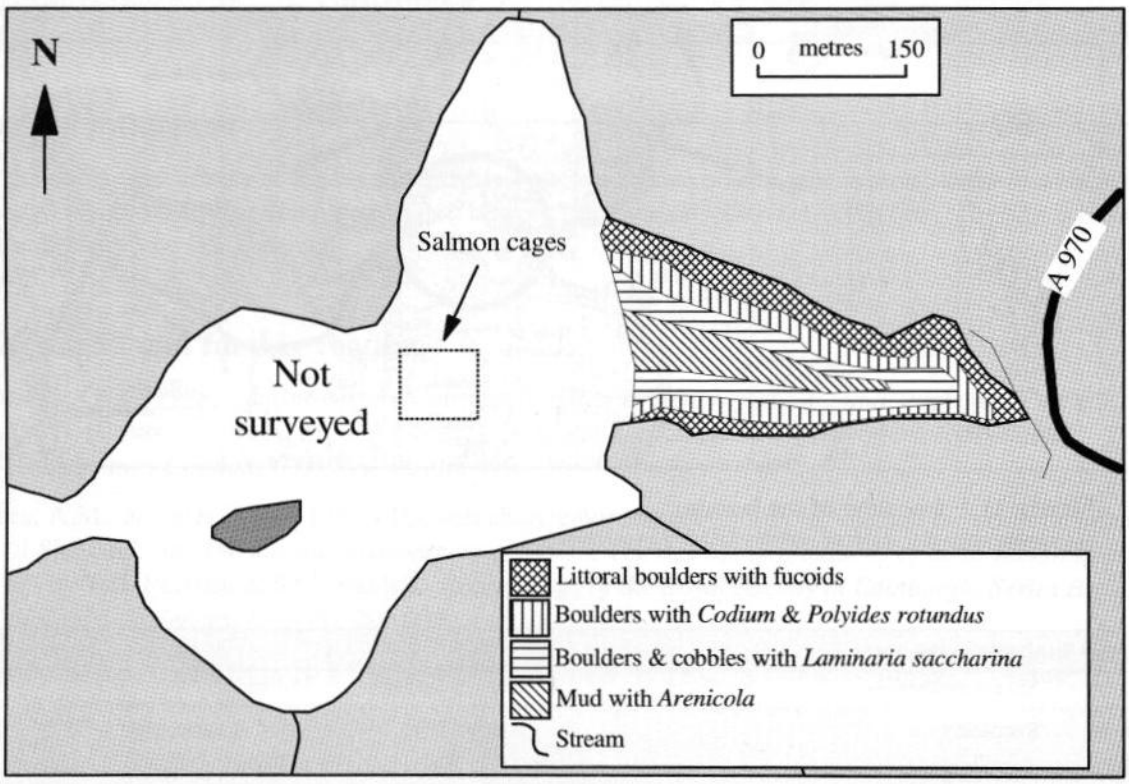

Figure 11.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The sublittoral fringe (between 2 and 3 m depth at the time of survey) consisted of boulders lying on cobbles, pebbles and mud. The larger boulders were dominated by the green alga *Codium fragile atlanticum*, with the red alga *Polyides rotundus* colonising the smaller cobbles. The sea oak *Halidrys siliquosa* and occasional stands of knotted wrack *A. nodosum,* with solitary ascidians *Ascidia mentula* attached, were also present (AscSAs).

Between 3 and 5 m depth (at the time of survey) boulders and cobbles were colonised by a dense forest of sugar kelp *Laminaria saccharina* with sea oak *H. siliquosa* and bootlace weed *Chorda filum* (Lsac.Ft). The kelp plants were large and, in places, rotting. Occasional patches of sand between the boulders had lugworm *Arenicola marina* casts and shore crabs *Carcinus maenas* (FaMS). Hermit crabs *Pagurus bernhardus* were common throughout the habitat.

The zone between 5 and 6 m depth consisted of a soft, flocculent mud with very few obvious organisms. There were a few lugworm *A. marina* casts, shore crabs *C. maenas* and hermit crabs *P. bernhardus* and isolated large pebbles had the red alga *P. rotundus* attached to them (MarMu).

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

In 1993 there was a salmon farm in the centre of Minn; it appeared to have very little impact on the area of the lagoon surveyed. A road runs along the eastern corner. Otherwise, there appeared to be very little human influence at the site.

References and further reading

None available.

Compiled by: Kath Thorpe

12 Loch of Hellister, Mainland

Location		
Position (centre)	60° 13.9′N 01° 17.7′W	HU 390 500
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

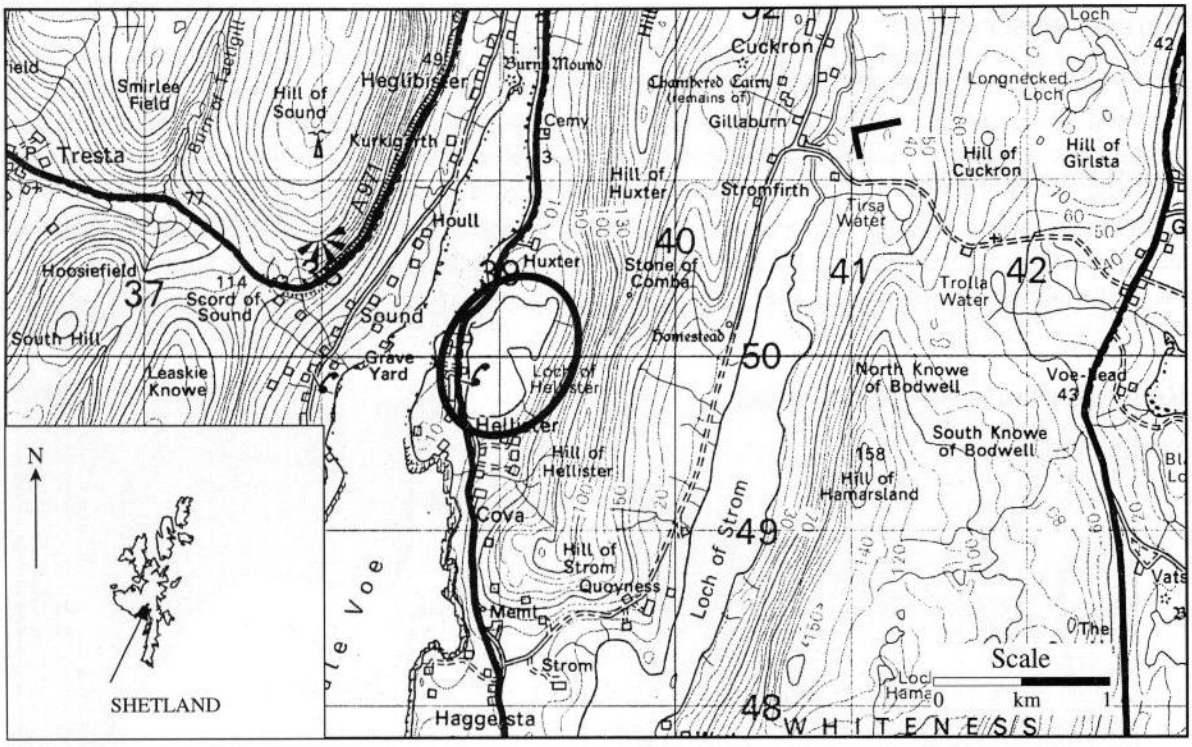

Figure 12.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The Loch of Hellister is a large lagoon on the west coast of Mainland Shetland. It connects to the sea via four culverts (each about 0.75 m in diameter) which pass under a road bridge and enter the eastern side of Weisdale Voe at mid-tide level. The lagoon consists of a single basin about 0.8 km in length, with a maximum depth of 7 m and a tidal range of 0.5 m. There is very little disturbance from wave action or tidal currents, except for the area close to the culverts which has an increased tidal current flow. The salinity was estimated to be between 30 ‰ and 35 ‰ and is maintained by seawater exchange with Weisdale Voe during each tide. There is freshwater input from two streams which causes a localised decrease in salinity in the north-east corner of the loch. The site is surrounded by grassland, except for the western side which is bordered by a road and a few houses. Between 1993 (the date of survey) and 1996 sluices were added to the culverts. It is not known how often these are

opened and closed or their effect on the tidal range, seawater exchange and overall salinity of the lagoon.

Physical features	
Physiographic type	Sluiced saline lagoon (at mid-tide level)
Area of lagoon	26 ha
Maximum length of lagoon	0.8 km
Bathymetry	Maximum depth 7 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.5 m (prior to installation of sluices)
Salinity	30-35 ‰ (estimated)

Marine biology

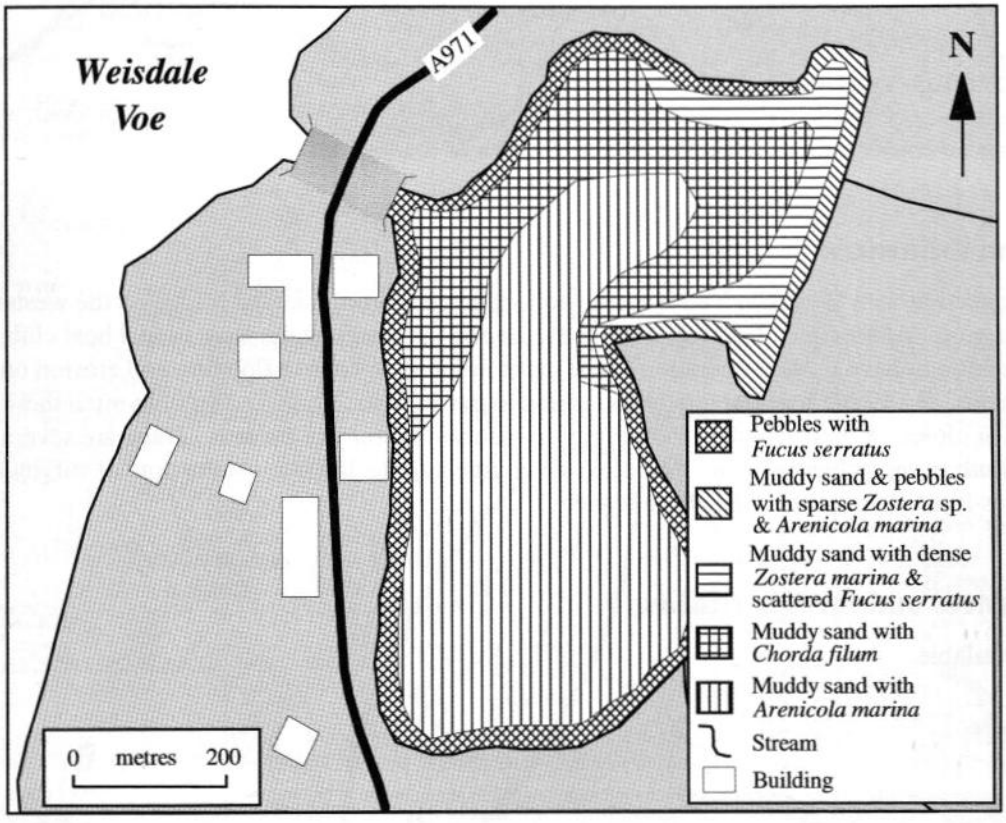

Figure 12.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The description below refers to conditions in the Loch prior to installation of sluices on the culverts.

In the north-east of the Loch, the shallow areas between sea level and 0.5 m depth were influenced by freshwater input from two streams entering the lagoon. Here muddy sand with scattered cobbles, pebbles and gravel was colonised by sparse stands of seagrass *Zostera noltii*, some serrated wrack *Fucus serratus* and lugworms *Arenicola marina* (Znol). Below this, between 0.5 and 2 m depth, close to the streams, muddy sand was colonised by extensive areas of dense seagrass *Zostera marina,* with occasional patches of serrated wrack *F. serratus* (Zmar). Shore crabs *Carcinus maenas* were frequent amongst the plants.

In the remainder of the Loch, the shallow sublittoral zone between sea level and 0.5 m consisted of cobbles and pebbles with some sand and boulders. Serrated wrack *F. serratus* colonised the rocks in dense stands, with bootlace weed *Chorda filum* and a few lugworm *A. marina* casts growing in the sand between the rocks (FChoG). The common tortoiseshell limpet *Tectura testudinalis* was found on the cobbles and periwinkles *Littorina littorea* and *Littorina mariae/obtusata* were present in large numbers.

Between 0.5 and 4 m depth in the main part of the lagoon (where salinity was higher) muddy sand was dominated by bootlace weed *C. filum* (LsacX) which provided attachment for small gastropods, juvenile mussels, amphipods and filamentous green and brown algae. Numerous casts of lugworms *A. marina* were present on the sediment. This community also occurred between 2 and 4 m depth below the dense seagrass *Z. marina* to the north-east, presumably where the freshwater influence in this part of the lagoon was reduced.

The remainder of the basin, between 4 and 7 m depth (shallower in the southern part of the basin), consisted of muddy sand which was dominated by lugworms *A. marina*. Filamentous green algae formed a mat on the surface of the sediment (FiG).

Nature conservation

There are no conservation sites in the immediate area of the lagoon.

Human influences

The connection with Weisdale Voe is restricted to a culvert through a road bridge on the western side of the lagoon. At the time of survey in 1993 the lagoon was used by the local model boat club, who were seeking to have limited-operation sluice gates installed to control flooding and erosion on high spring tides. By 1996 the sluices had been added to the culverts; is not known how often these are opened or closed or their effect on the salinity regime and biology of the site. There are several houses to the south of the culvert whose septic tanks discharge into the lagoon. At the time of survey (1993) there was litter around the edges of the lagoon.

References and further reading

None available.

Compiled by: Kath Thorpe

13 The Vadills, Mainland

Location		
Position (centre)	60° 16.6′N 01° 28.6′W	HU 288 548
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

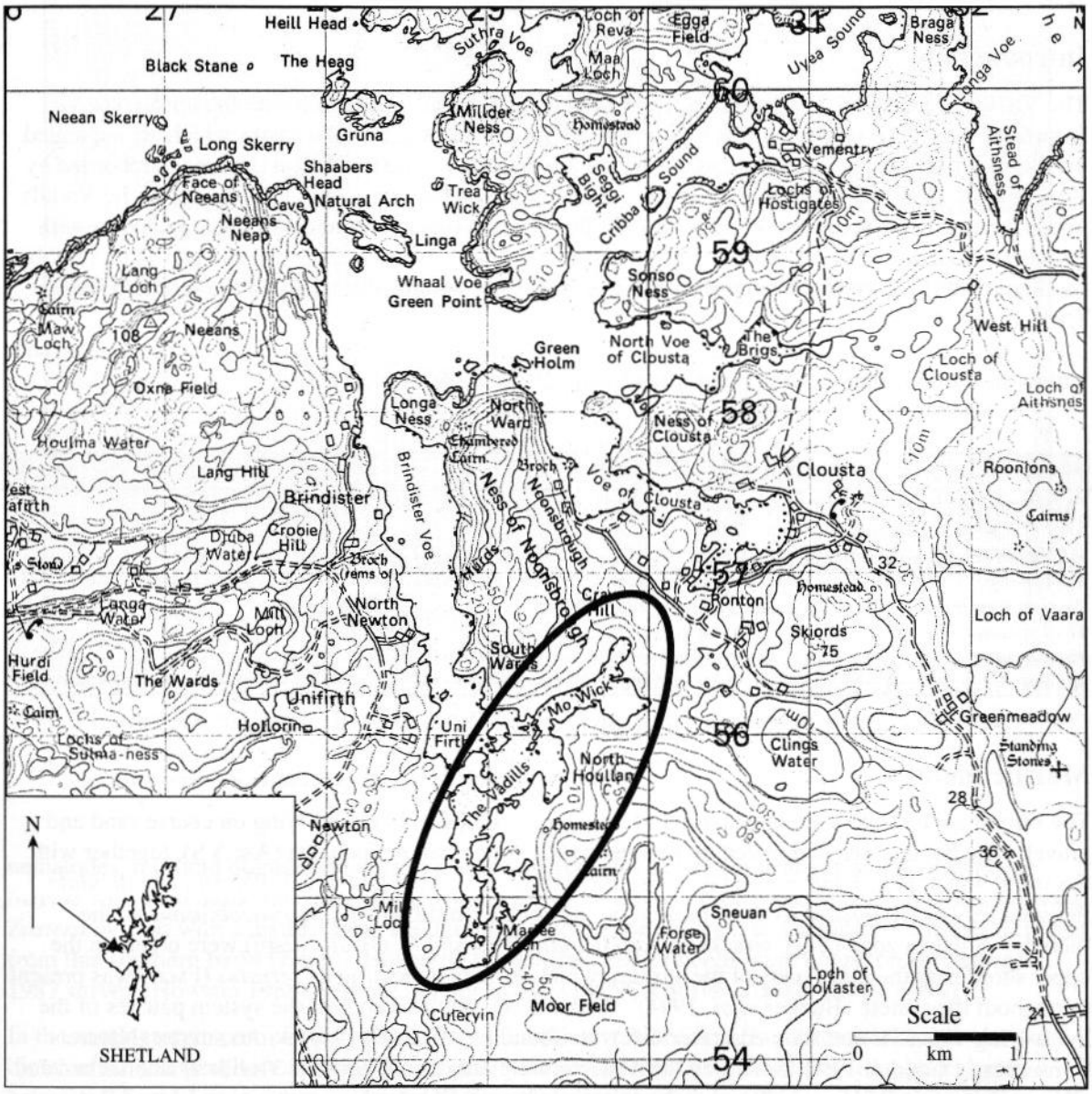

Figure 13.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	August 1993	MNCR survey 472
	Recording	August 1993	Bunker *et al.* (1994)
Sublittoral	Recording	August 1986	Hiscock (1986)
	Recording	August 1987	Howson (1988)
	Recording	May 1988	Hiscock (1988)
	Core samples (6 x 0.0032 m²)	August 1987	Howson (1988)
	Recording	August 1993	MNCR survey 472
	Recording	August 1993	Bunker *et al.* (1994)

Introduction

The Vadills are situated on the west coast of Mainland Shetland, connected with the open coast via Brindister Voe. The lagoon, with a total length of 1.6 km, consists of five basins which are separated by sills and tide-swept channels, some of which are intertidal. The maximum tidal range recorded by Bunker *et al.* (1994) was 2.5 m. The maximum depth in the basins is 6 m. The salinity of the Vadills was estimated to be between 18 and 35 ‰ and this is maintained by regular seawater exchange with Brindister Voe through an entrance channel about 20 m wide and 6 m deep. Freshwater input into the southern part of the system from three streams reduces the salinity, especially in the southern basin. There is very little disturbance from wave action, but the strength of the tidal current varies substantially between the basins and the tide-swept channels, resulting in a wide range of tidal currents within the system. The Vadills are surrounded by grassland and moorland.

Physical features	
Physiographic type	Saline lagoon inlet (complex fjardic inlet containing numerous sills)
Area of lagoon	61 ha
Maximum length of lagoon	1.6 km
Bathymetry	Maximum depth 6 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Weak to moderately strong
Tidal range	2.5 m maximum range (Bunker *et al.* 1994)
Salinity	18-35 ‰ (estimated)

Marine biology

The littoral zone of the Vadills consisted of boulders, cobbles and pebbles lying on coarse sand and gravel. The habitat was dominated by knotted wrack *Ascophyllum nodosum* (Asc.VS), together with the spiral wrack *Fucus spiralis* and occasional plants of the channelled wrack *Pelvetia canaliculata*. Periwinkles *Littorina saxatilis* were present on the cobbles and *Littorina mariae/obtusata* on the fucoids. A lichen zone (YG), wracks *P. canaliculata* (Pel) and *F. spiralis* (Fspi) were noted on the upper shore near the outer parts of the system, while serrated wrack *Fucus serratus* (Fserr) was present throughout the system (Bunker *et al.* 1994). At the head (southern end) of the system patches of the loose-lying wrack *A. nodosum* ecad *mackaii* were found (AscX.mac). A previous survey (Nature Conservancy Council 1990) described the *A. nodosum* plants throughout the Vadills as unattached and close to the *mackaii* form which was unknown elsewhere in Shetland.

In the southern basin, the sublittoral zone down to 1 m depth consisted of fine, muddy sand with some peat and cobbles scattered on the surface. The basin, especially in the centre, was dominated by beds of tasselweed *Ruppia* sp. (Rup). Knotted wrack *A. nodosum*, bladder wrack *Fucus vesiculosus* and the brackish-water wrack *Fucus ceranoides* were also present here, growing together in large clumps which appeared to be permanently submerged (FChoG). Very few animals were noted. The sea cucumber *Leptopentacta elongata* and various colour forms of phoronid worms were recorded in this basin by Hiscock (1986). The infauna was dominated by the bivalve mollusc *Mysella bidentata*;

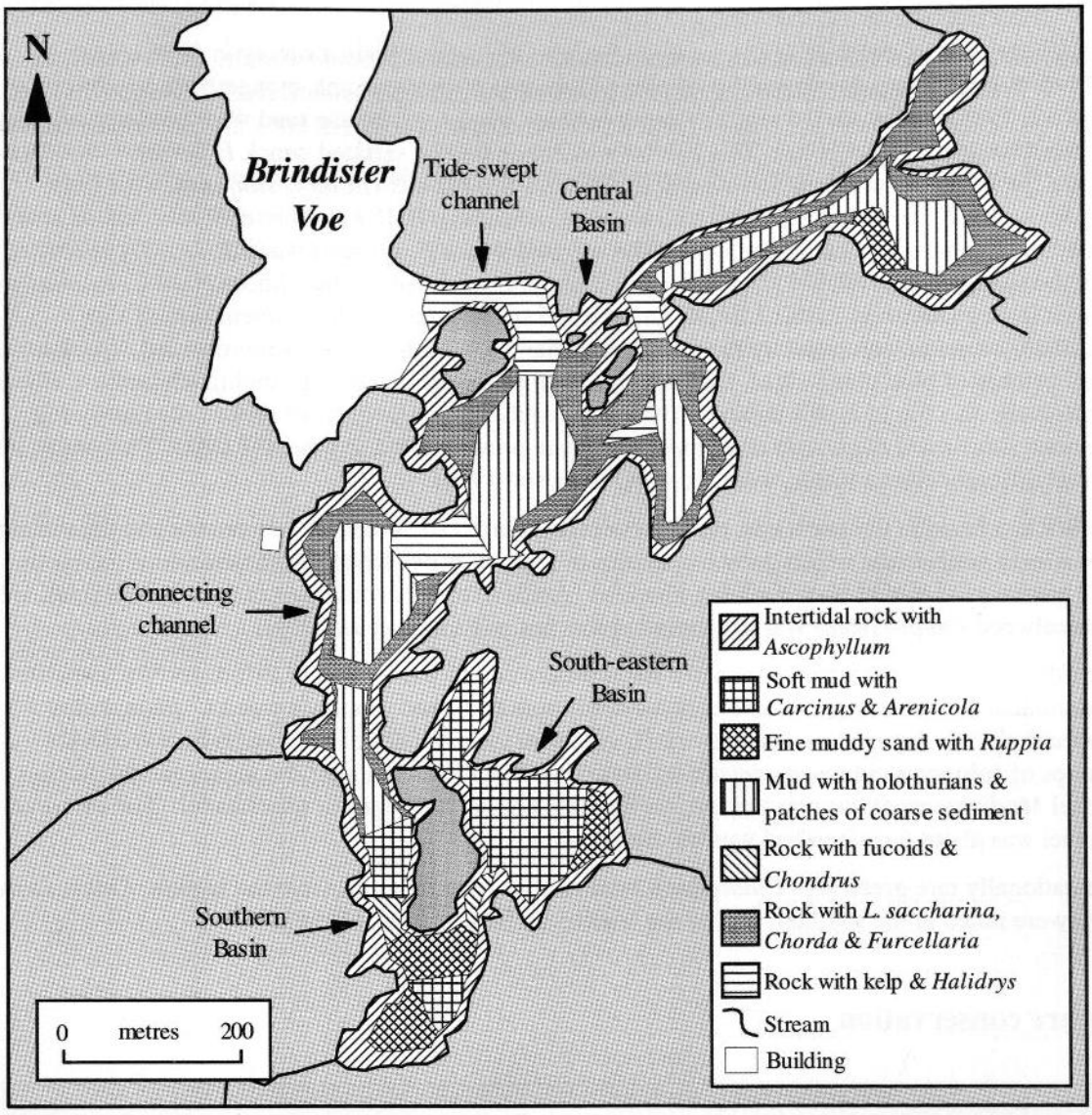

Figure 13.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

nematodes, tubificid oligochaete worms and the polychaetes *Scoloplos armiger* and *Mediomastus fragilis* were also numerous (LagMu) (Howson 1988). Hiscock (1986) described beds of the seagrass *Zostera marina* with a distinct flora and fauna (including species such as the pipefish *Syngnathus acus*) from this southern basin (Zmar). However, the eelgrass *Zostera* beds were not recorded during the 1987 survey (Howson 1988) or those in August 1993 (MNCR survey; Bunker *et al.* 1994).

In the south-eastern part of the system (Marlee Loch), a small basin off to the north had no obvious biota on the soft peat bottom (LagMu). In the main part of this basin the shallow sublittoral zone, between 0.5 and 1 m in depth, consisted of fine mud overlain with boulders, cobbles and pebbles. The mud was dominated by bootlace weed *Chorda filum* with flocculent green and filamentous brown algae. The cobbles, boulders and pebbles were colonised by the serrated wrack *Fucus serratus* and the red algae *Polyides rotundus* and *Mastocarpus stellatus* (FChoG). Lugworms *Arenicola marina* were found in the sediment; shore crabs *Carcinus maenas,* periwinkles *Littorina* spp., ascidians and mysid shrimps were present amongst the algae. Between 1 and 3 m depth, a surface film of diatoms covered the very soft flocculent mud. The fauna here was very sparse, consisting of lugworms *A. marina*, shore crabs *C. maenas*, mysids and a few common starfish *Asterias rubens* (LagMu). This biotope was also found below 2 m depth in other sheltered areas of the southern basin.

In the wide channel connecting the southern basin to the central basin a survey in 1986 revealed bedrock at loch datum dominated by coralline algae and the breadcrumb sponge *Halichondria panicea* (Howson 1988). Between 0.5 and 2 m depth pebbles, gravel and coarse sand were predominant, with scattered boulders and cobbles. This habitat was dominated by serrated wrack *F. serratus*, bootlace weed *C. filum*, cape form kelp *Laminaria saccharina* and sea oak *Halidrys siliquosa*, with some bladder wrack *F. vesiculosus* and knotted wrack *A. nodosum* (HalXK). Mussel *Mytilus edulis* spat had settled in large numbers on all the algae. The serrated wrack *F. serratus* was also heavily encrusted with the sponge *Leucosolenia botryoides*, ascidians and spirorbid worms. Shore crabs *C. maenas* were present in large numbers in this habitat. In the 1986 survey, mats of the filamentous red alga *Trailliella intricata*, colonised by the solitary ascidian *Ciona intestinalis*, were recorded. Occasional small patches of blue-green algae, the bacterium *Beggiatoa* sp. and the opisthobranch mollusc *Elysia viridis* were also found in this habitat. The sea cucumber *Leptosynapta inhaerens*, the burrowing anemone *Edwardsia claparedii* and amphipods were present in the sediment (FaMx). Phoronids, in several different colour forms, were recorded (Howson 1988).

Mo Wick, a basin in the north-east of the system, supported sugar kelp *L. saccharina* and the red alga *Furcellaria lumbricalis* which grew on pebbles in shallow water around the perimeter of the basin. This gave way to a mud plain with holothurians (AreSyn) in the central part of the basin; a small area of tasselweed *Ruppia* (Rup) was also noted in this basin (Bunker *et al.* 1994).

The tide-swept channel which connected the northern end of the Vadills to Brindister Voe consisted predominantly of coarse gravel and cobbles with some boulders. Bootlace weed *C. filum*, kelps *L. saccharina*, *L. hyperborea* and sea oak *H. siliquosa* were the dominant species here (HalXK). Clumps of solitary ascidians *Ascidiella* sp. were found scattered amongst the algae, and the horse mussel *Modiolus modiolus* was present, particularly around the edges of the channel. The centre of the channel was about 6 m deep and was not surveyed in detail.

The nationally rare green alga *Cladophora battersii* has been recorded from the lagoon. Otters *Lutra lutra* were noted in the southern part of the Vadills by Bunker *et al.* (1994).

Nature conservation

Conservation sites

Site name	*Designation*	*Centre grid ref.*	*Main features*
Brindister Voe and Vadills	MCA	HU 285 565	High diversity of brackish-water habitats
The Vadills	cSAC	HU 295 555	Lagoon

Human influences

None were noted.

References and further reading

Bunker, F.St.P.D., Bunker, A.R., & Perrins, J.M. 1994. *Survey of Brindister Voe and the Vadills (Shetland) Marine Consultation Area.* (Contractor: Marine Seen, Hundleton, Dyfed.) Lerwick, Scottish Natural Heritage. (SNH Research, Survey and Monitoring report, No. NE/93/210).

Hiscock, K. 1986. Marine biological surveys in Shetland. August 1986. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 678.

Hiscock, K. 1988. *Marine Nature Conservation Review. Marine biological surveys in Shetland 28th May - 5th June 1998. Field report.* Unpublished, Nature Conservancy Council.

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 816.

Nature Conservancy Council. 1990. *Marine Consultation Areas: Scotland.* Edinburgh, Nature Conservancy Council.

Compiled by: Kath Thorpe

14 Loch of Strom, Mainland

Location		
Position (centre)	60° 12.8′N 01° 16.9′W	HU 397 479
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

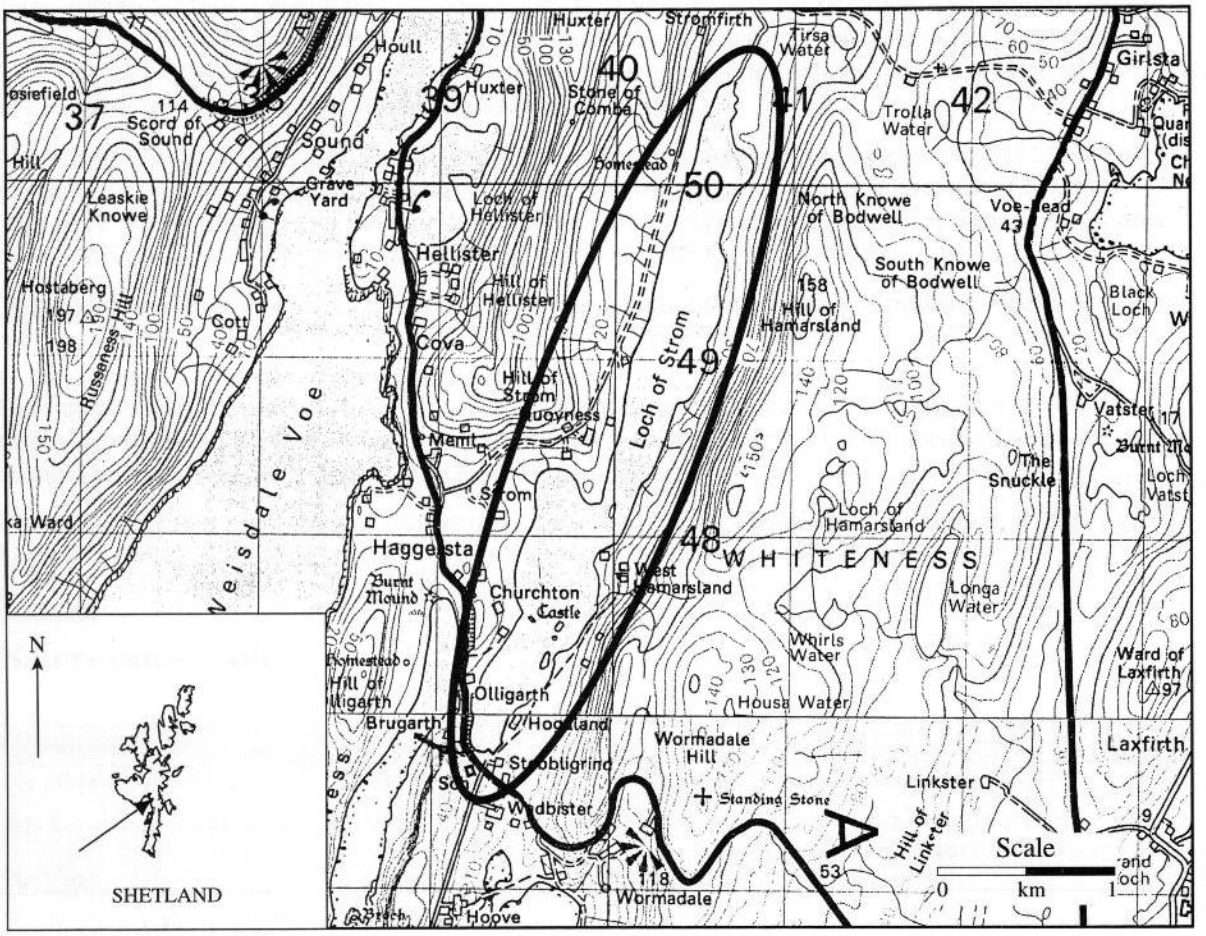

Figure 14.1 Location of the lagoon.

Marine biological surveys

	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	August 1986	Hiscock (1986); Howson (1988)
	Recording	August 1993	MNCR survey 472
	Core samples (6 x 0.0032 m²)	August 1993	MNCR survey 472
	Granulometric sample	August 1993	MNCR survey 472

Introduction

Loch of Strom forms the inner arm of Stromness Voe on the west coast of Mainland Shetland. Water exchange with the Voe is through a tide-swept narrows, about 5 m long and 3 m wide, with a subtidal sill. Stromness Voe connects to the open sea about 4 km south of the Loch of Strom, through a narrow entrance channel. The tidal range within the Loch of Strom is reduced to about 0.5 m.

The maximum depth in both the basin and the narrows is about 4.5 m, although the average depth in the basin is 3 m and the shallowest part of the narrows only about 1 m deep. The salinity was estimated to be between 18 ‰ and 35 ‰ and is maintained by seawater exchange through the narrows on each tide. There is freshwater input from a substantial stream at the northern end of the Loch and several smaller streams at the north-western side, resulting in a salinity gradient along the length of the Loch. Within the Loch there is very little disturbance from wave action or tidal currents, but the tidal currents in the narrows are strong (estimated at 3 to 6 knots). The Loch is surrounded by grassland, with a track on the western side and a road bridge over the narrows.

Physical features	
Physiographic type	Saline lagoon inlet (sill below mean low water)
Area of lagoon	127 ha
Maximum length of lagoon	4 km
Bathymetry	Maximum depth 4.5 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak to strong in entrance channel
Tidal range	0.5 m
Salinity	18-35 ‰ (estimated)

Marine biology

The northern tip of Loch of Strom comprised small boulders and pebbles on muddy sediment grading to soft mud at 2 m depth. The rocks were colonised by filamentous green algae including *Cladophora* sp. (FiG). Shells of dead mussels *Mytilus edulis*, from nearby fish farm nets and poles, and opisthobranch mollusc *Akera bullata* shells were found on the surface of the sediment. Large numbers of common starfish *Asterias rubens* were also present.

In the central section of the Loch, between 0.2 and 0.8 m depth, soft flocculent mud was characterised by lugworm *Arenicola marina* casts. The surface of the sediment was covered in patches of filamentous green algae, with patches of the serrated wrack *Fucus serratus* and the red alga *Furcellaria lumbricalis* (FiG). Occasional plants of bootlace weed *Chorda filum* were observed, with the pipefish *Syngnathus rostellatus* associated with them. Common starfish *A. rubens*, shore crabs *Carcinus maenas* and the opisthobranch mollusc *A. bullata* were also found in this habitat.

At the very southern end of the lagoon, between loch datum and 2.5 m depth, there was a plain of sandy mud which had a 100% covering of filamentous algae (FiG). The brown alga *Asperococcus bullosus*, small mussels, gastropods, amphipods and cockles *Parvicardium ovale* grew on this algal mat. Lugworms *A. marina* and the opisthobranch mollusc *A. bullata* were also present, but in smaller numbers than further up the lagoon.

The narrows connecting Loch of Strom to Stromness Voe were a tide-swept area, about 100 m long and between 1 and 4.5 m depth, and extended into the loch. The narrow channel was a mixture of bedrock outcrops and boulders, with some cobbles and pebbles, which graded into empty shells and sand at the inner end of the narrows. The bedrock and boulders were dominated by the kelps *Laminaria hyperborea*, *L. digitata* and *L. saccharina* (HalXK). The breadcrumb sponge *Halichondria panicea*, mussels *M. edulis* and barnacles *Semibalanus balanoides* were dominant in the narrower, more tide-swept part of the channel. In the slower moving areas around the edges of the channel, bootlace weed *C. filum* and plumose anemones *Metridium senile* were present.

A survey of Loch of Strom in 1974 (Maitland 1995) had similar findings, noting that it had a strong marine influence which was reflected in the flora and fauna present. Fish recorded in 1974 included salmon *Salmo salar,* sea trout *Salmo trutta,* eel *Anguilla anguilla* and stickleback *Gasterosteus aculeatus.*

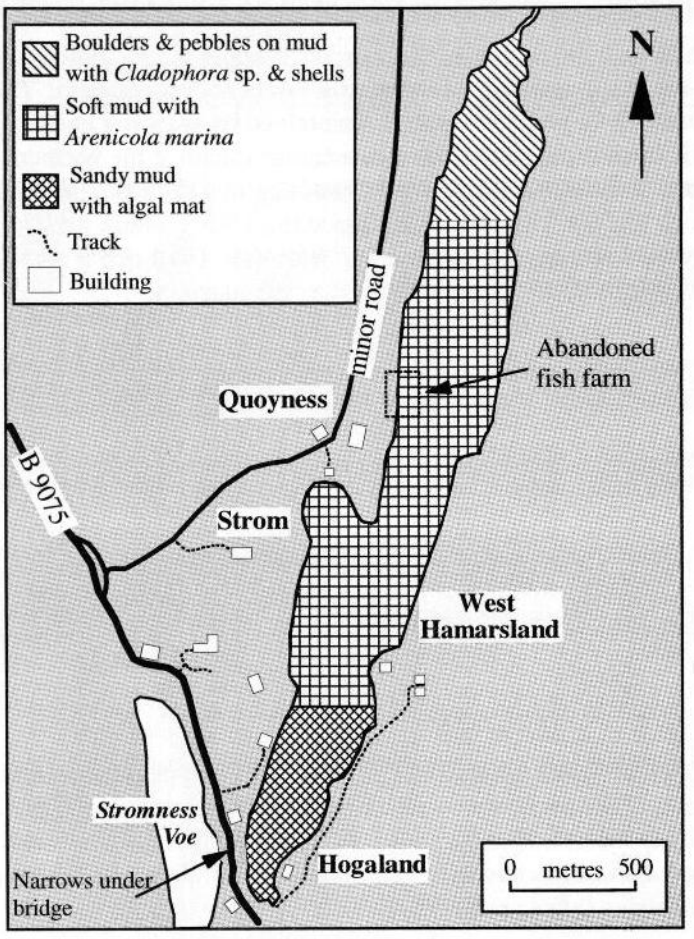

Figure 14.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

Nature conservation

There are no conservation sites in the area of the loch.

Human influences

The narrows are restricted by the concrete pilings of a road bridge. A small number of houses border the southern end of the loch and discharge septic tank waste into it. At the time of the most recent survey in 1993 there was an abandoned fish farm close to the middle of the loch and a proposal for a sea trout farm site within the loch.

References and further reading

Hiscock, K. 1986. Marine biological surveys in Shetland. August 1986. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 678.

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report,* No. 816.

Maitland, P.S. 1995. *The freshwaters of Shetland.* Unpublished report to Scottish Natural Heritage.

Compiled by: Kath Thorpe

15 Houb of Haggrister, Mainland

Location		
Position (centre)	60° 24.8′N 01° 22.0′W	HU 348 702
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

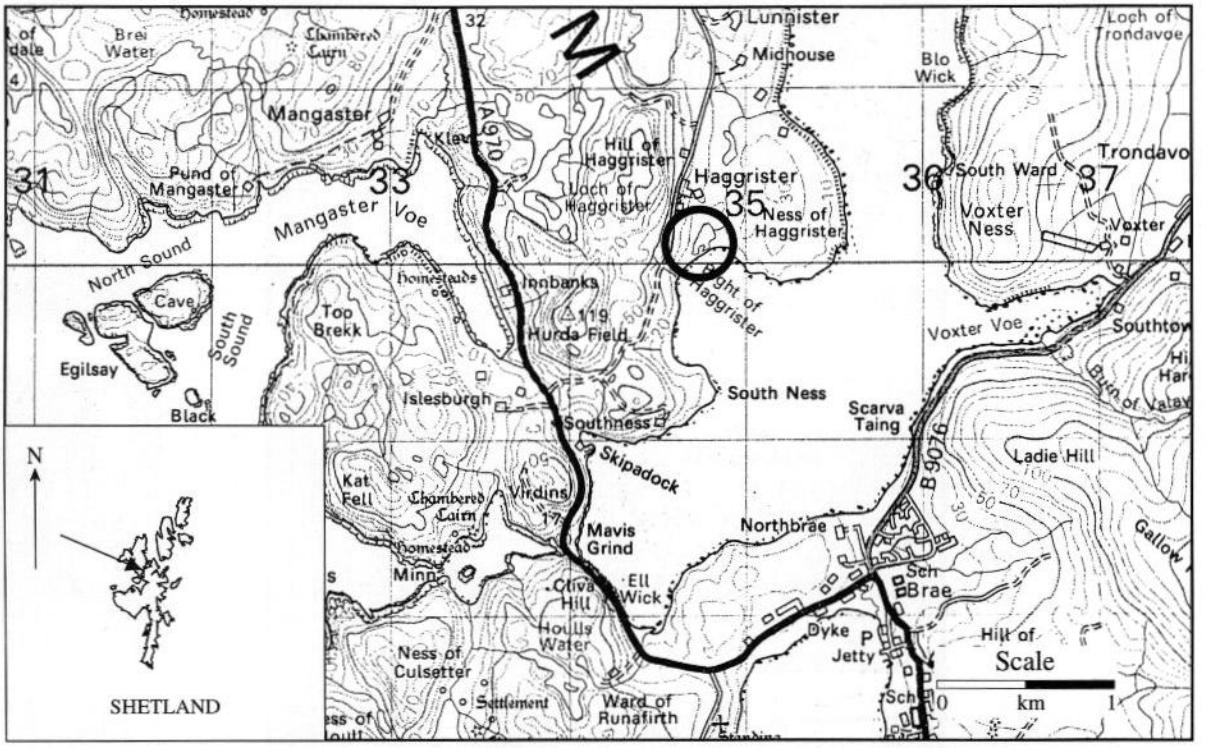

Figure 15.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The Houb of Haggrister is a pool located on the western shore of Sullom Voe. The lagoon is situated behind a shingle barrier, formed during a single storm in 1993, which appears to be encroaching slowly into the Houb as a result of further wave action. The Houb consists of a single basin about 0.25 km in length with a number of vegetated islands, and it has a maximum depth of 0.5 m and a negligible tidal range. The salinity was estimated to be between 18 ‰ and 30 ‰; seawater percolates through the shingle barrier from Sullom Voe and also over-tops the barrier on high tides and during storms. There is some freshwater input from a stream in the north-eastern part of the Houb. There is negligible disturbance from tidal currents or wave action. The Houb is surrounded by peaty sediments with a saltmarsh-type vegetation.

Physical features	
Physiographic type	Percolation saline lagoon
Area of lagoon	2 ha
Maximum length of lagoon	0.25 km
Bathymetry	Maximum depth 0.5 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	18-30 ‰ (estimated)

Marine biology

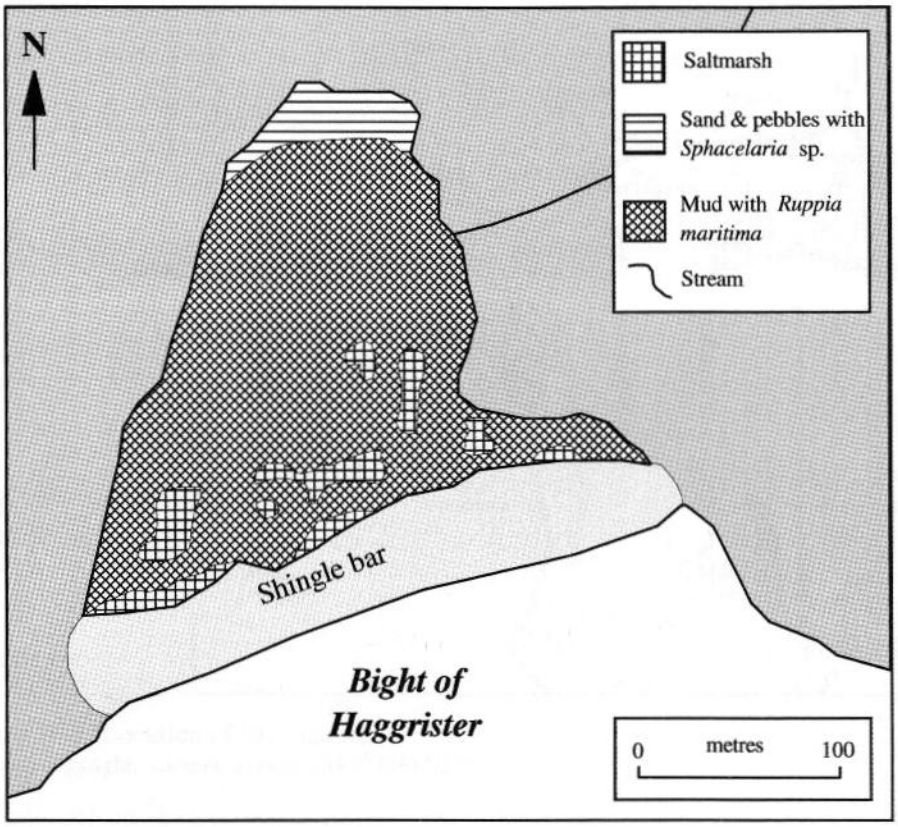

Figure 15.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The northern side of the Houb, at 0.1 to 0.2 m depth, consisted of firm sand with pebbles and boulders. The boulders at the edge of the Houb were colonised by the green alga *Enteromorpha intestinalis* and the red encrusting alga *Hildenbrandia rubra*. The pebbles were colonised by tufts of the filamentous brown alga *Sphacelaria* sp., and the sediment supported scattered tasselweed *Ruppia maritima*, with floating mats of filamentous green algae amongst the *Ruppia* (FiG).

The remainder of the Houb was soft muddy sediment with a maximum depth of 0.5 m. In this habitat there was a dense bed of tasselweed *R. maritima*, floating mats of filamentous green algae, including *Rhizoclonium tortuosum*, *Chaetomorpha linum* and *Enteromorpha* sp. and a few knotted wrack *Ascophyllum nodosum* plants (Rup). Very few animals were seen, except for a few small fish and amphipod tubes in the sediment.

In winter the Houb supports 20-30 wigeon. At the time of survey three otters were seen entering the Houb over the shingle barrier and there was a colony of about twenty terns on the barrier.

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

There appeared to be little or no human influences on the Houb.

References and further reading

None available.

Compiled by: Kath Thorpe

16 Laxo Voe lagoon, Mainland

Location		
Position (centre)	60° 21.1′N 01° 11.3′W	HU 447 634
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

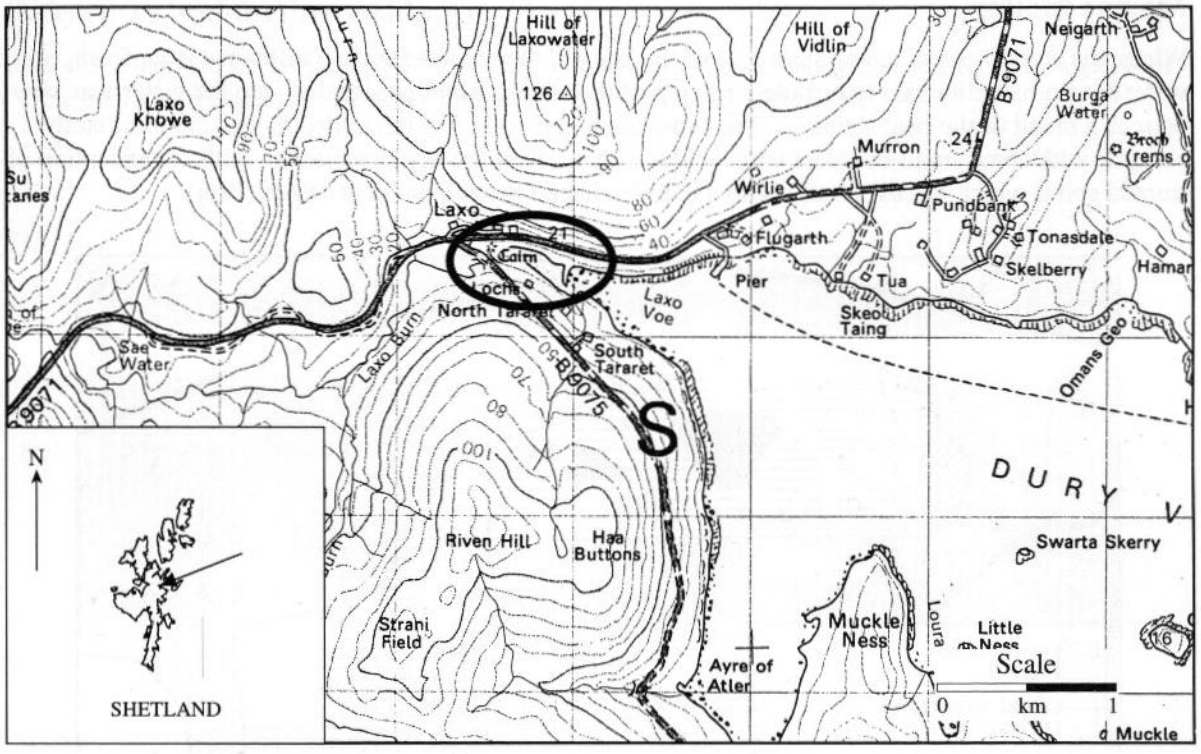

Figure 16.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	August 1974	Institute of Terrestrial Ecology (1975)
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The lagoon is located at the head of Laxo Voe, which lies at the eastern end of Dury Voe on the east coast of Mainland Shetland. The lagoon consists of a shallow basin which drains into Laxo Voe through a channel, about 10 m wide and 3 m deep, in a vegetated spit. The salinity was estimated to be 18 ‰ to 30‰; it is maintained by seawater exchange with Laxo Voe. There is substantial freshwater input from a stream at the western end of the lagoon. There is very little disturbance from wave action, but tidal currents vary, being stronger at each end where water enters and leaves. A number of islands of saltmarsh vegetation lie within the lagoon and the site is surrounded by grassland, with roads close to its northern and southern shores.

Physical features	
Physiographic type	Silled saline lagoon (sill at mean low water)
Area of lagoon	4 ha
Maximum length of lagoon	0.5 km
Bathymetry	Maximum depth 0.3 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	1.5 m
Salinity	18-30 ‰ (estimated)

Marine biology

Where the stream enters the western side of the lagoon, there was extensive influence from fresh, peaty water but no halocline due to turbulent mixing of the water. Light penetration into the water was very poor as a result of the peat staining. The substratum here, down to 0.5 m depth, was predominantly bedrock with some small boulders and cobbles. There were few species present, with the exception of stunted spiral wrack *Fucus spiralis* with a bobble-shaped green alga on its stipes (Fspi).

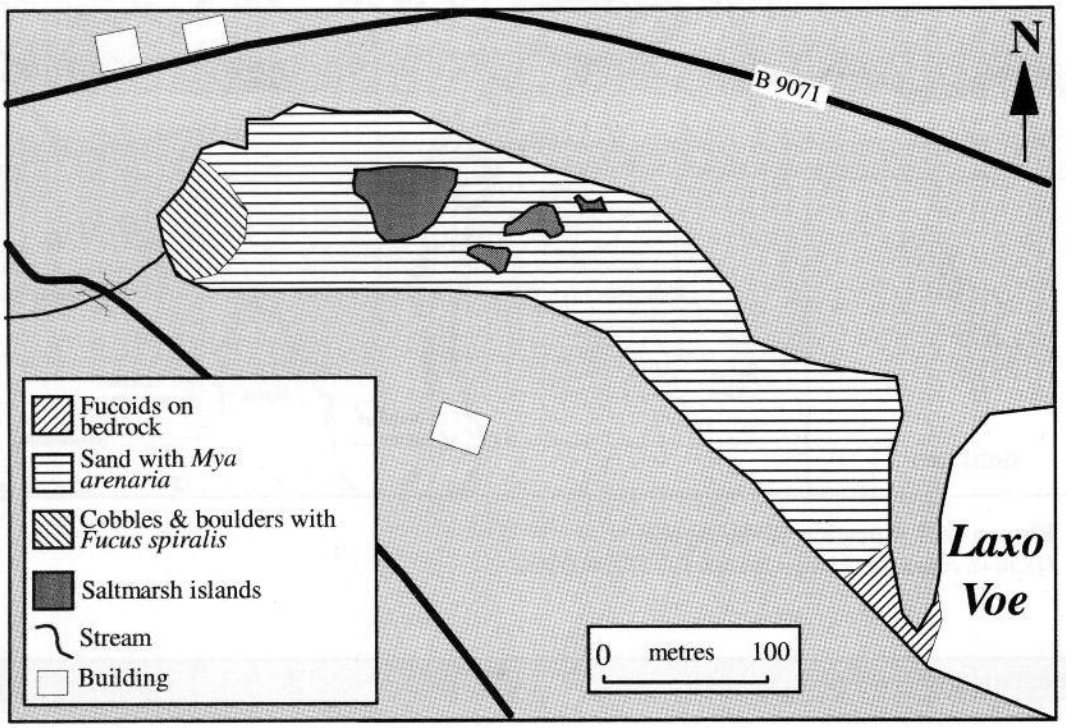

Figure 16.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

The majority of the lagoon, extending to 0.4 m depth, was medium to fine sand with scattered gravel, pebbles and cobbles. The fauna and flora in this habitat was sparse, with occasional clumps of spiral wrack *F. spiralis* and a few scattered sand gapers *Mya arenaria* (FaS). Shore crabs *Carcinus maenas*, amphipods and juvenile flat fish were also found.

The tide-swept channel connecting the lagoon to Laxo Voe was 2 m deep and consisted of small boulders and cobbles with some pebbles, gravel and sand. The biota here was sparse, dominated by spiral wrack *F. spiralis* and the brown alga *Desmarestia viridis*, with very small quantities of the green alga *Enteromorpha* sp. and the red alga *Porphyra* sp. (Fspi).

Nature conservation

There are no conservation sites within the area of the lagoon.

Human influences

There are roads and houses on the north-western side of the lagoon. Otherwise, there appeared to be very little human influence.

References and further reading

Institute of Terrestrial Ecology. 1975. Report to the Nature Conservancy Council on some aspects of the ecology of Shetland. *Nature Conservancy Council, CSD Report,* No. 14.

Compiled by: Kath Thorpe

17 Vadill of Garth lagoon, Mainland

Location		
Position (centre)	60° 15.9′N 01° 09.0′W	HU 470 538
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

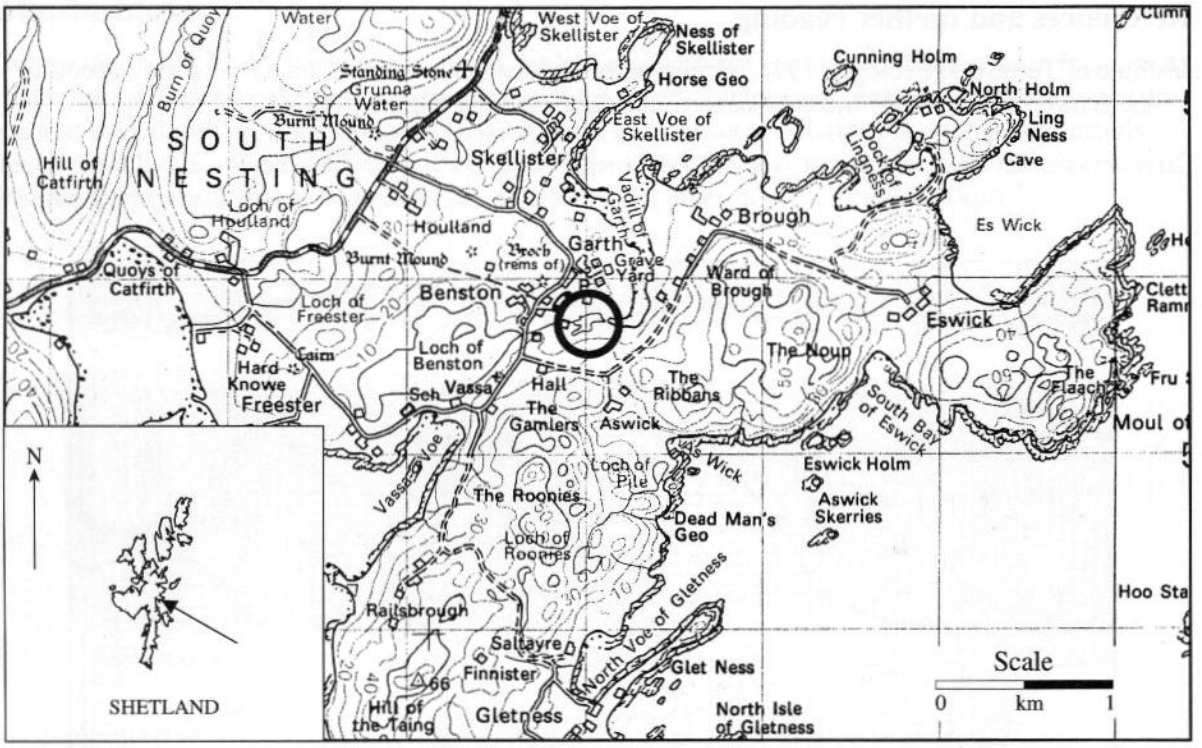

Figure 17.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	August 1993	MNCR survey 472

Introduction

The site is a small lagoon at the head of the Vadill of Garth, to which it is connected via a constricted channel, about 5 m wide, at high water level (it is only over-topped by spring tides). The lagoon consists of a single basin about 0.7 km long and has a maximum depth of 0.3 m and a tidal range of 0.2 m. The salinity was estimated to be between 18 ‰ and 30 ‰, maintained by seawater exchange with the Vadill of Garth to the east. There is significant freshwater input from a stream on the western side and as a result there is a gradient of salinity across the lagoon. The lagoon is surrounded by peat banks with saltmarsh-type vegetation.

Physical features	
Physiographic type	Silled saline lagoon (sill above mean high water)
Area of lagoon	9 ha
Maximum length of lagoon	0.7 km
Bathymetry	Maximum depth 0.3 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.2 m
Salinity	18-30 ‰ (estimated)

Marine biology

The whole basin of the lagoon was soft mud with some bedrock and boulders forming the sill which separates the lagoon from the Vadill of Garth. The mud was dominated by the tasselweed *Ruppia maritima* with some spiral wrack *Fucus spiralis* (Rup). *Enteromorpha intestinalis* and *Spongomorpha aeruginosa* formed a mat of green algae. The bedrock and boulders which formed the sill were colonised by the brackish-water brown alga *Fucus ceranoides*.

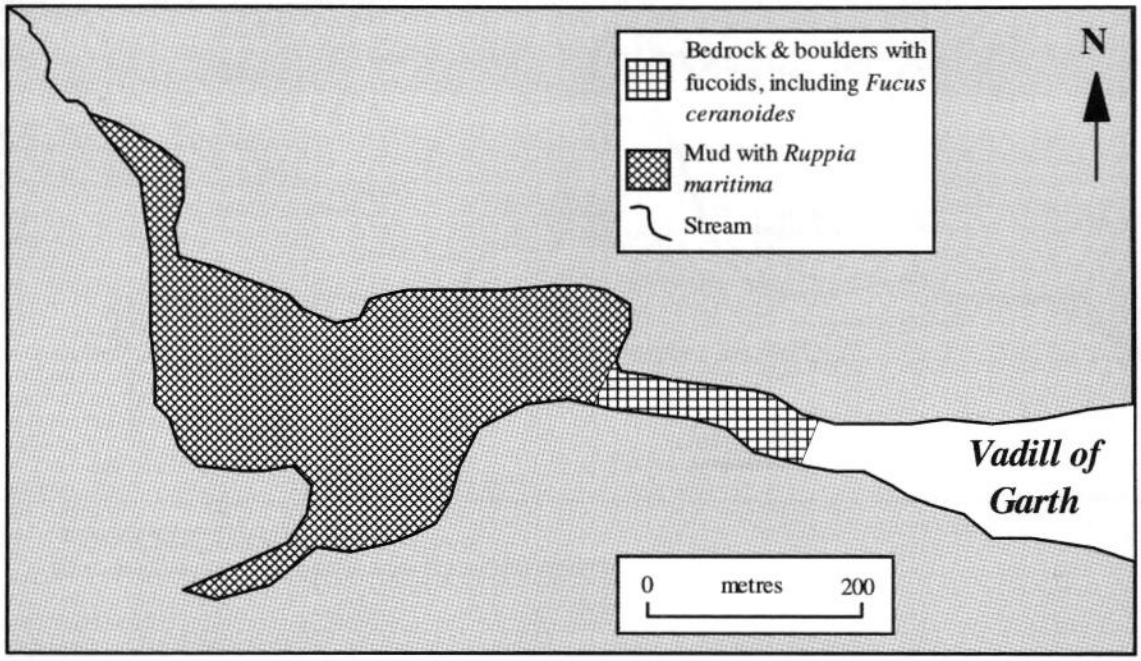

Figure 17.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

There are houses scattered around the north of the lagoon, but these appears to have very little influence on the lagoon.

References and further reading

None available.

Compiled by: Kath Thorpe

18 Saltness lagoon, Mainland

Location		
Position (centre)	60° 22.9′N 01° 00.4′W	HU 363 667
Administrative area	Shetland Islands	
Conservation agency/area	Scottish Natural Heritage	North

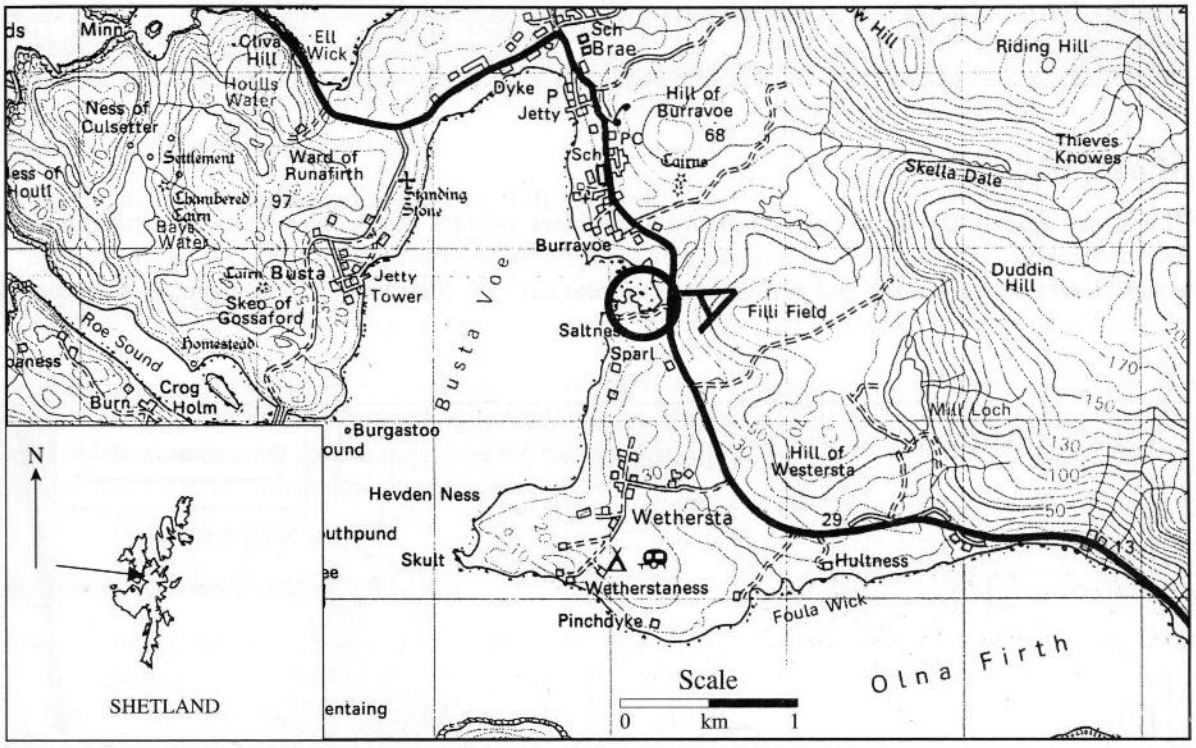

Figure 18.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Littoral	Recording	August 1993	MNCR survey 472
	Recording (habitat mapping)	August 1995	Entec (1996)
Sublittoral	Recording	August 1993	MNCR survey 472
	Core samples (6 x 0.0032 m²)	August 1993	MNCR survey 472
	Granulometric sample	August 1993	MNCR survey 472

Introduction

The site is a small lagoon located on the eastern shore of Busta Voe in Mainland Shetland. The lagoon, separated from the voe by a shingle spit, is about 0.1 km in length, has a maximum depth of 0.3 m at low tide and a tidal range of around 1 m. The littoral width varies from 1 m around most of the lagoon to 10 m on the shingle spit. The salinity was estimated to be 18 ‰ to 30 ‰ and is influenced by seawater exchange with Busta Voe, at high water level, via an entrance channel approximately 10 m wide. The channel is artificially raised by the addition of stepping stones. The

lagoon has significant freshwater input from a stream at its southern end. There is very little disturbance from either current or wave action, except close to the entrance channel. The site is surrounded by saltmarsh, except for the shingle spit at the northern end.

Physical features	
Physiographic type	Silled saline lagoon (sill at mean high water)
Area of lagoon	1 ha
Maximum length of lagoon	0.1 km
Bathymetry	Maximum depth 0.3 m (at low tide)
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	1 m
Salinity	18-30 ‰ (estimated)

Marine biology

The littoral zone of the lagoon was a mixture of boulders, cobbles and pebbles with some fine muddy sand in between. The shore was dominated by the spiral wrack *Fucus spiralis* with some channelled wrack *Pelvetia canaliculata* and periwinkles *Littorina saxatilis* (Pel; Fspi). There were also occasional plants of wrack *Fucus cottonii* at the edge of the saltmarsh which surrounded the lagoon (NVC SM13).

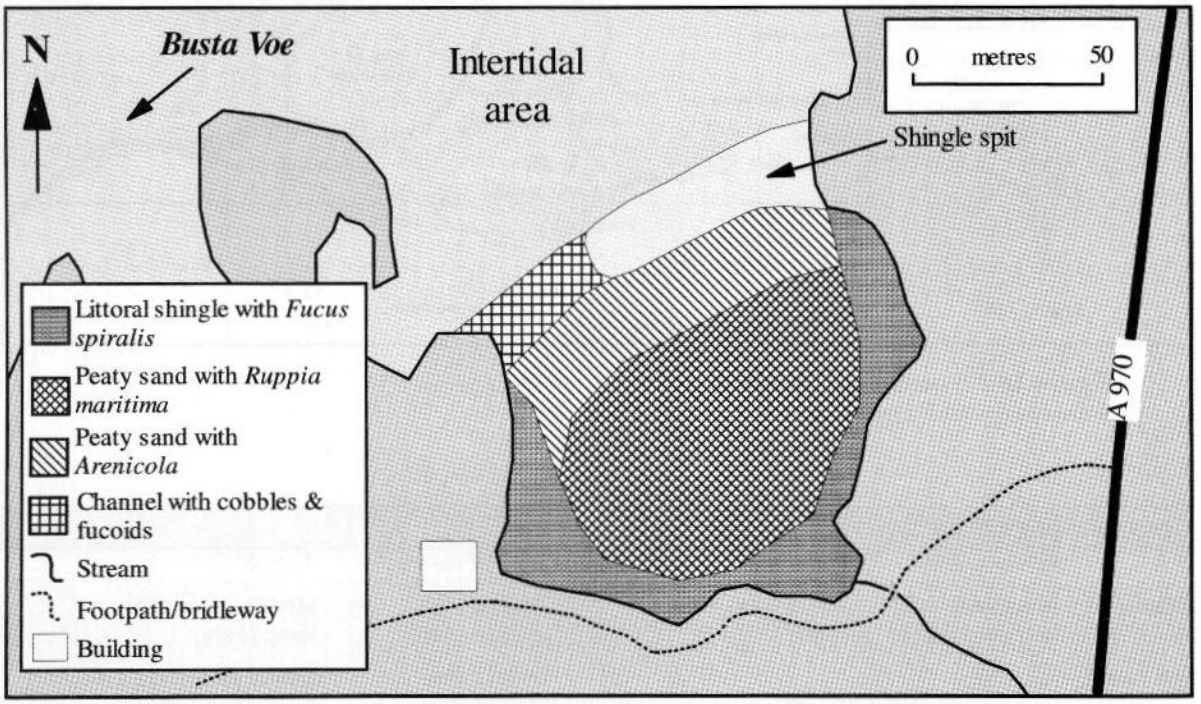

Figure 18.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

The southern end of the lagoon was influenced by freshwater input from the stream. The peaty, fine sand here was dominated by the tasselweed *Ruppia maritima* (Rup). Associated species included lugworms *Arenicola marina*, amphipods, the green alga *Enteromorpha* sp. and filamentous green algae.

In the northern part of the lagoon, there was peaty sand dominated by lugworms *A. marina* (FaMS). There were clumps of unattached and attached plants including the green algae *Enteromorpha* spp., spiral wrack *F. spiralis*, knotted wrack *Ascophyllum nodosum* and tasselweed *R. maritima* (FChoG). Entec (1996) noted seagrass *Zostera* sp. beds in this area.

The shallow sill at the entrance to the basin consisted predominantly of cobbles and pebbles with some larger boulders. The rocks were dominated by the wracks *Fucus vesiculosus*, *F. spiralis* and *Fucus serratus*, with some *A. nodosum* and many small clumps of the red alga *Mastocarpus stellatus* (FvesX; Fspi; FserX).

In the intertidal area on the seaward side of the shingle spit Entec (1996) recorded dense mussel *Mytilus edulis* beds and an area of muddy sand supporting populations of barnacles and littorinid molluscs.

Nature conservation

There are no conservation sites in the area of the lagoon.

Human influences

A road ran down the eastern side of the lagoon; a track from it ran along the southern side of the lagoon to a house. Entec (1996) noted that the saltmarsh with *Fucus cottonii* had been damaged by tractor tyres. On a visit prior to the August 1993 survey, the lagoon and surrounding area were being used for the construction of a salmon cage for fish farming (R. Covey pers. obs.). Otherwise, there appeared to be little human impact on the site.

References and further reading

Entec. 1996. Broad scale habitat mapping of intertidal and subtidal coastal areas: Busta Voe and Olna Firth, Shetland. (Contractor: Entec, Wallsend, Tyne and Wear.) *Scottish Natural Heritage Research, Survey and Monitoring Report*, No. 75.

Compiled by: Kath Thorpe