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

19 Quivals Loch, Sanday

Location		
Position (centre)	59°15.78'N 02°34.6'W	HY 671 419
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

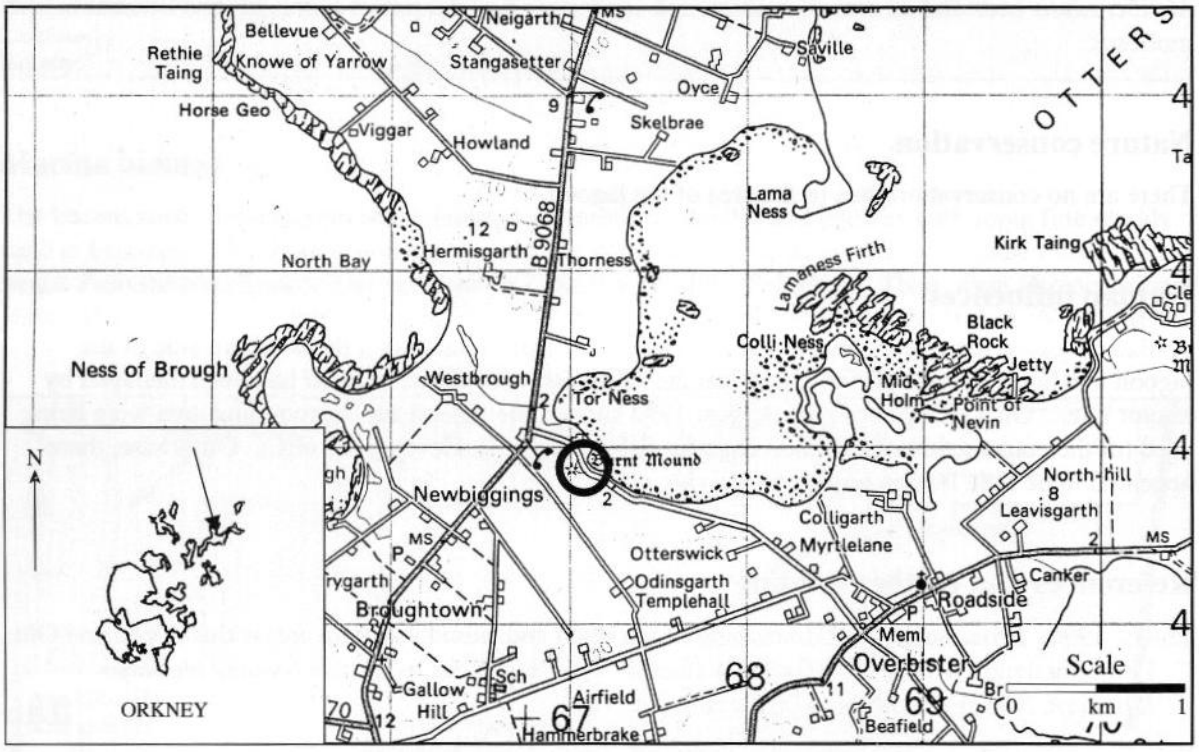

Figure 19.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

Quivals Loch is located in the north-west of Sanday. The loch is about 0.04 km long with a maximum depth of 0.4 m and a tidal range of about 0.2 m. It is connected to Lamaness Firth via a culvert, 0.5 m long by 0.5 m high, which passes under a road bridge and opens open out into the firth just below high tide level. There is little freshwater input into the lagoon and the salinity was measured at 35 ‰ at the time of the survey. There is very little disturbance from wave action and tidal currents are negligible, except in a small area around the culvert. The site is surrounded by grassland, with a road on the north-eastern side of the loch.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	0.35 ha
Maximum length of lagoon	0.04 km
Bathymetry	Maximum depth 0.4 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.2 m
Salinity	30-35 ‰; 35 ‰ at time of survey

Marine biology

The lagoon bottom consisted of muddy stones with a thick layer of silt, which were dominated by the green algae *Enteromorpha intestinalis* and *Chaetomorpha linum* (FiG). Where the surface layer of silt was thicker, there were areas of the tasselweed *Ruppia maritima* with the burrowing amphipod *Corophium volutator* (Rup). Three-spined stickleback *Gasterosteus aculeatus* and mysid shrimps swam amongst the weeds.

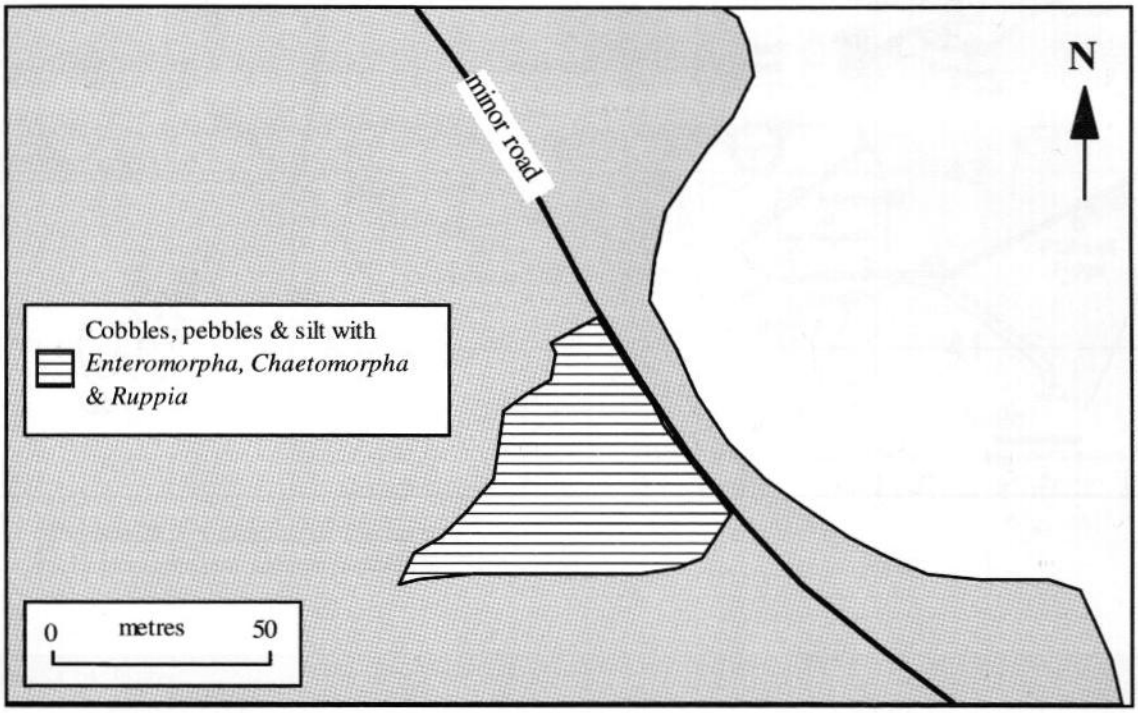

Figure 19.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

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

Human influences

The water exchange with the sea is restricted by a culvert under a road bridge. There appeared to be very little other human influence at the site.

References and further reading

None available.

Compiled by: Kath Thorpe

20 Point of Nevin lagoon, Sanday

Location		
Position (centre)	59°15.8'N 02°33.2'W	HY 695 423
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

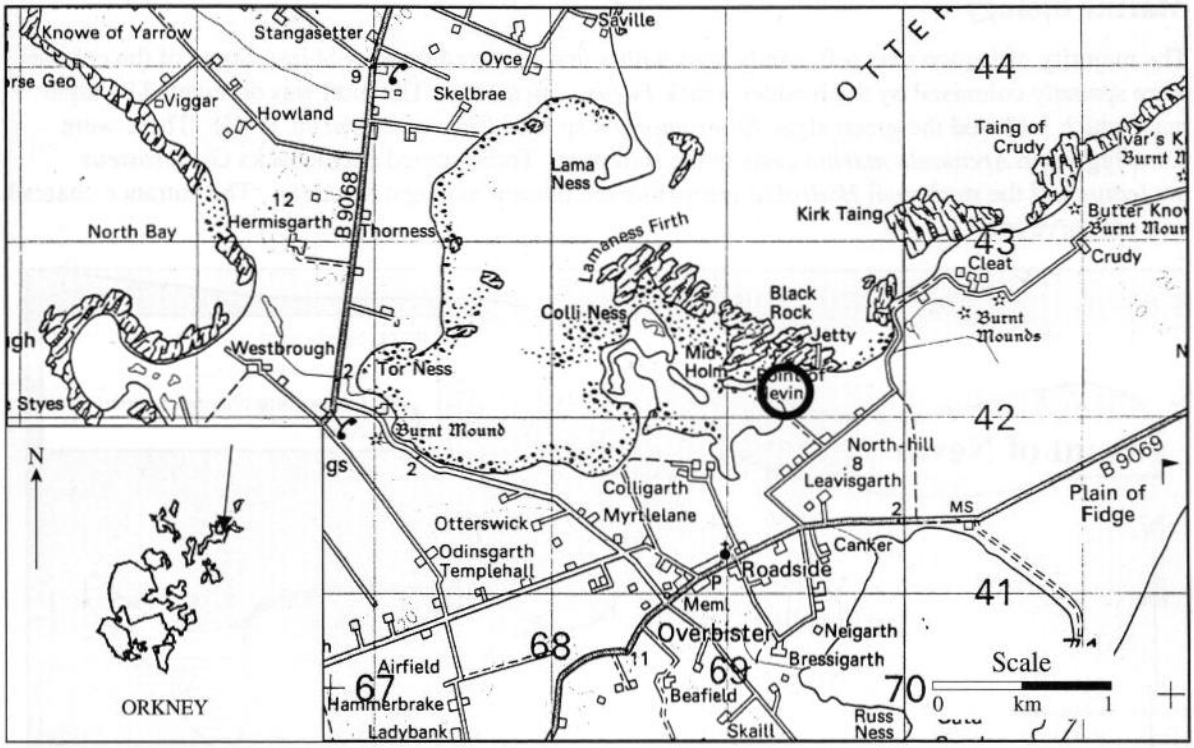

Figure 20.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477

Introduction

The Point of Nevin lagoon on Sanday is about 50 m long, with a maximum depth of 0.3 m and a negligible tidal range. It connects to the sea via a narrow channel, 100 m in length, which opens out above high water level into the eastern side of Lamaness Firth. The lagoon is not shown on the 1:50,000 Ordnance Survey map. The salinity at the time of survey was 34 ‰, which is maintained by seawater exchange on high spring tides and during storms. There is very little freshwater input and little disturbance from wave action or tidal currents, except for limited tidal currents around the channel on high spring tides. The lagoon is surrounded by saltmarsh vegetation.

Physical features	
Physiographic type	Silled saline lagoon (sill above mean high water)
Area of lagoon	1 ha
Maximum length of lagoon	0.05 km
Bathymetry	Maximum depth 0.3 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	34 ‰ (measured)

Marine biology

The majority of lagoon was soft, sandy mud with a few scattered small cobbles. Some of the cobbles were sparsely colonised by the bladder wrack *Fucus vesiculosus*. The mud was dominated by algal mats which included the green algae *Enteromorpha* sp. and *Chaetomorpha* sp. (FiG). There were some lugworm *Arenicola marina* casts in the sediment. Three-spined sticklebacks *Gasterosteus aculeatus* and the mud snail *Hydrobia ventrosa* were present amongst the algae. The entrance channel was not surveyed.

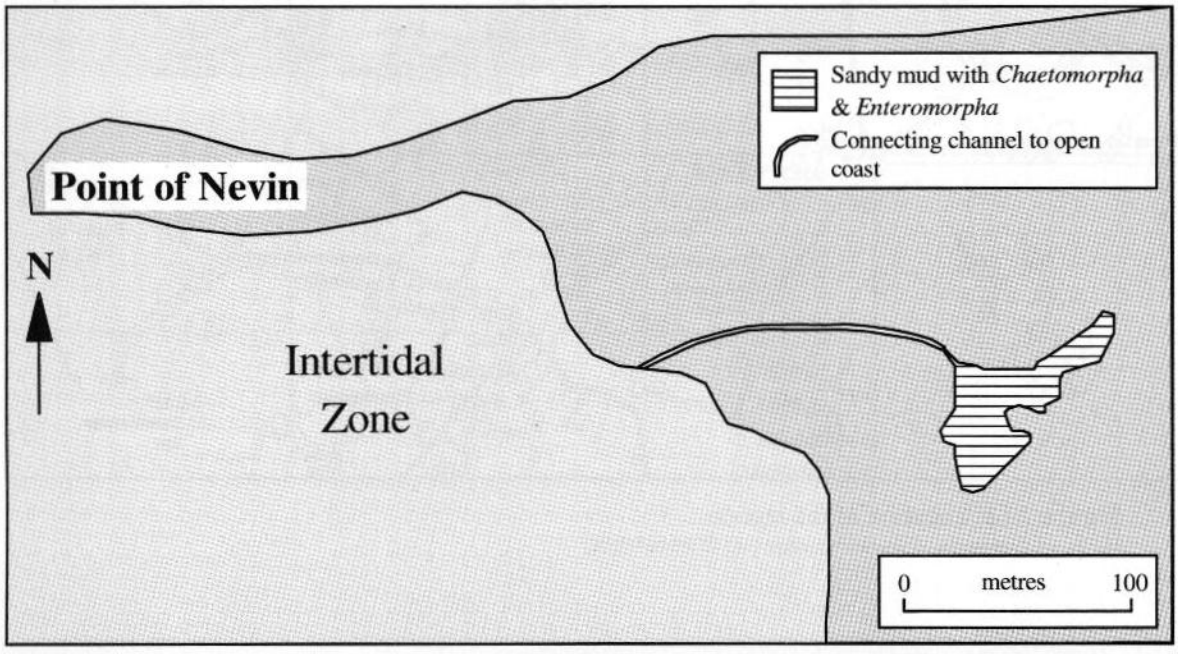

Figure 20.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

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

Human influences

There appeared to be very little human influence at the site.

References and further reading

None available.

Compiled by: Kath Thorpe

21 Little Sea lagoon, Sanday

Location		
Position (centre)	59°14.6'N 02°34.8'W	HY 669 398
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

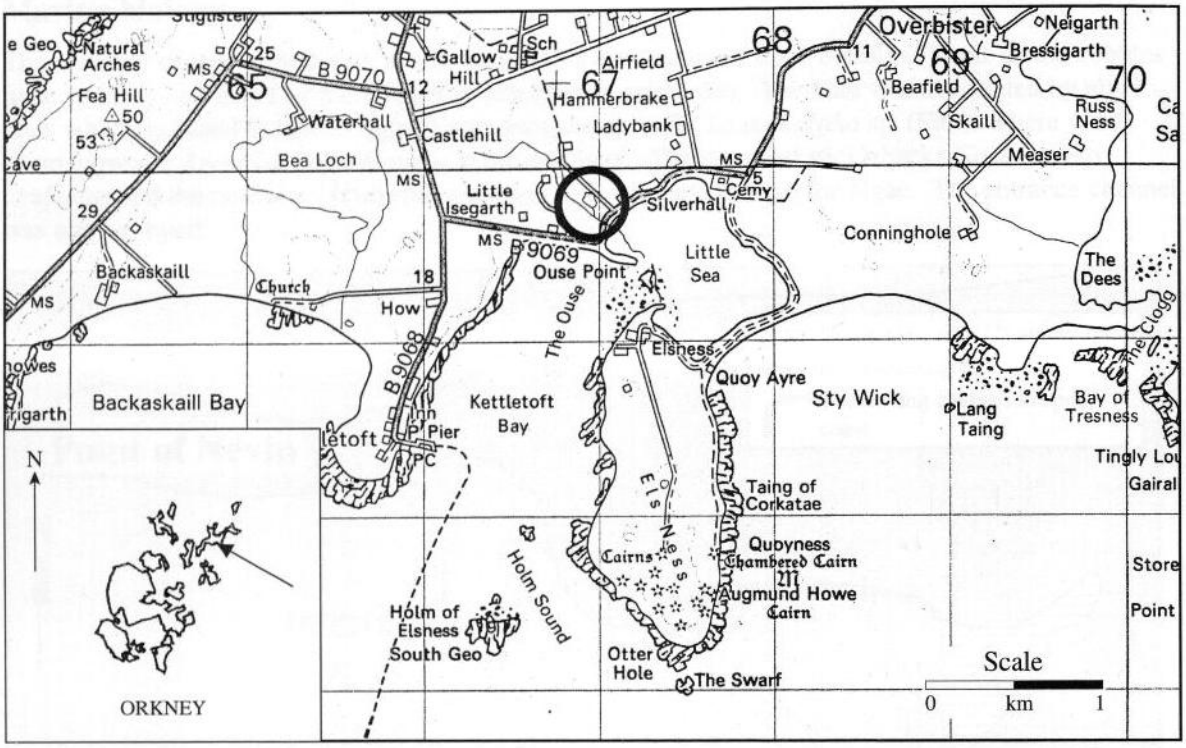

Figure 21.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	July 1994	MNCR survey 477
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

The lagoon is located to the east of Little Isegarth and to the north-west of the extensive intertidal sandflats known as the Little Sea in south Sanday. The main body of the lagoon is approximately 50 m in diameter, with a maximum depth of 0.3 m and a tidal range of about 0.2 m. The lagoon connects to the Little Sea via a channel, about 50 m long and 2 m wide, which connects to a pipe that passes under a road bridge to the south-east of the lagoon and out into the Little Sea close to high water level. The salinity at the time of survey was measured as 10 ‰ at the northern end of the lagoon and 25 ‰ in the channel. Seawater input is restricted by the culvert pipe, whilst freshwater input is limited to drainage from the surrounding marshy ground. There is very little disturbance from wave action or

tidal currents, except for the area around the channel. The lagoon is surrounded by saltmarsh and has saltmarsh islands within it. A minor road runs close to its north-eastern shore.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	1 ha
Maximum length of lagoon	0.05 km
Bathymetry	Maximum depth 0.3 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.2 m
Salinity	10-25 ‰ (measured)

Marine biology

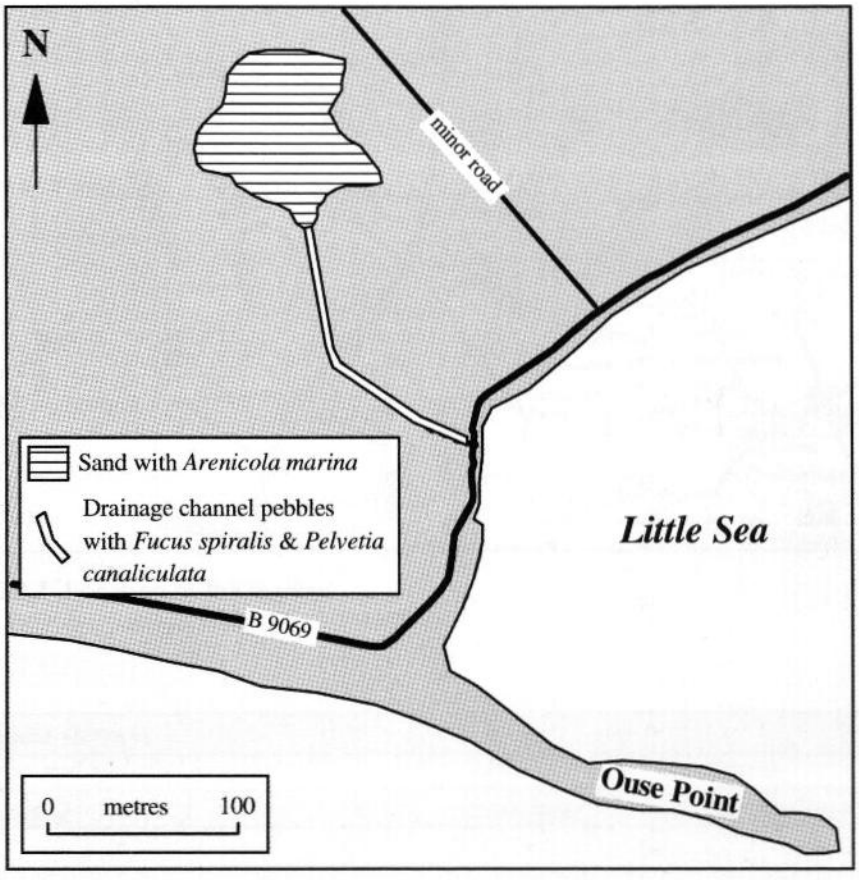

Figure 21.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The main body of the lagoon had a sandy mud bottom dominated by the green alga *Enteromorpha intestinalis* and filamentous green algae with some lugworms *Arenicola marina* and burrowing amphipods *Corophium volutator* (FiG). Mysid shrimps and three-spined sticklebacks *Gasterosteus aculeatus* swam amongst the algae.

The channel, between 0.2 m up the shore and 0.3 m depth, consisted of pebbles and gravel which were dominated by the green alga *E. intestinalis,* amongst which were clumps of spiral wrack *Fucus spiralis* and channelled wrack *Pelvetia canaliculata* (EphX).

Nature conservation

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

Human influences

Connection of the lagoon to the sea is restricted by a culvert pipe with a tidal flap valve at its seaward end. At the time of survey in 1994, this valve was jammed open. There was litter around the main part of the lagoon.

References and further reading

None available.

Compiled by: Kath Thorpe

22 Bay of Brough lagoons, Sanday

Location		
Position (centre)	59°15.8'N 02°35.8'W	HY 659 420
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

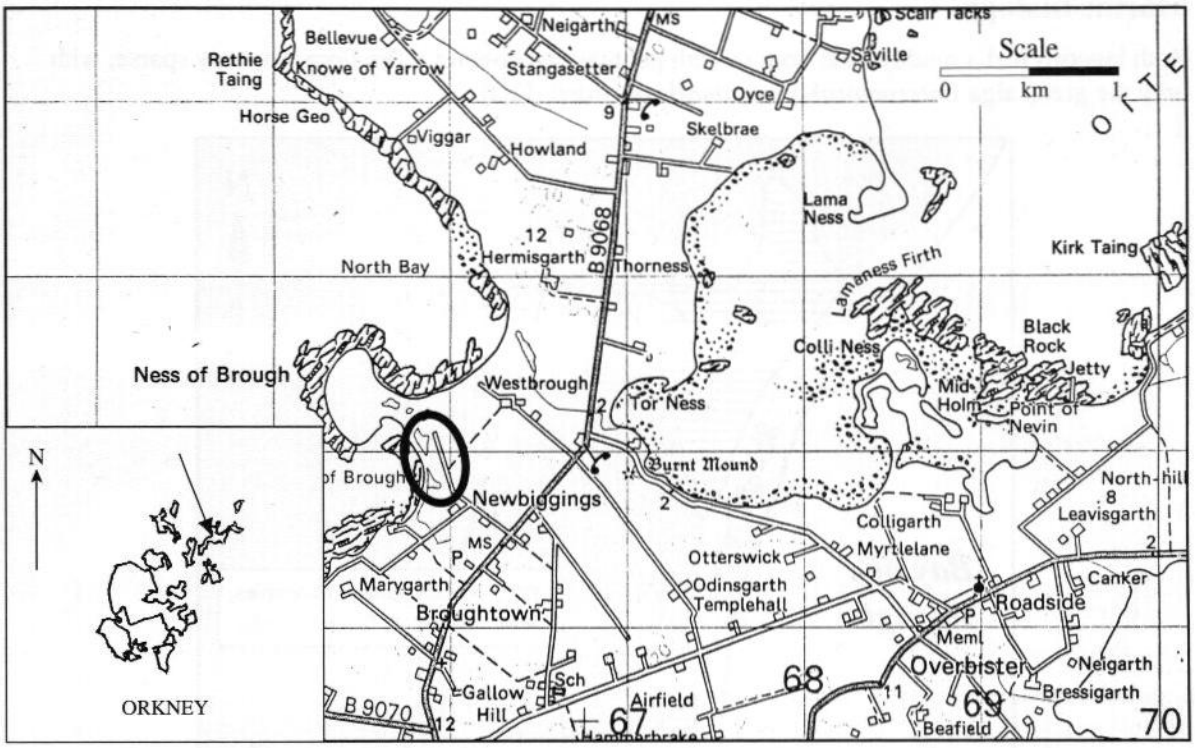

Figure 22.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

A shingle bar isolates two lagoons from the Bay of Brough in western Sanday. Each lagoon is about 100 m by 30 m in area, with a negligible tidal range. Both lagoons had a measured salinity of 9 ‰ to 33 ‰ at the time of survey. Water exchange with the sea is limited to percolation through the shingle barrier and over-topping of the barrier during storms. There is very little freshwater input into either lagoon. At the time of survey the water in both lagoons was stagnant and very green, limiting survey to the upper 30 cm. Both lagoons are backed by rough grazing land on the landward side and by the shingle ridge on the seaward side.

Physical features	
Physiographic type	Percolation saline lagoons
Area of lagoon	0.75 ha each
Maximum length of lagoon	Northern lagoon = 0.1 km; southern lagoon = 0.08 km
Bathymetry	Maximum depth > 0.3 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	9-33 ‰ (measured)

Marine biology

Both lagoons had a muddy sand bottom with pebbles and cobbles. The flora was very sparse, with only the green alga *Enteromorpha intestinalis* recorded (FiG).

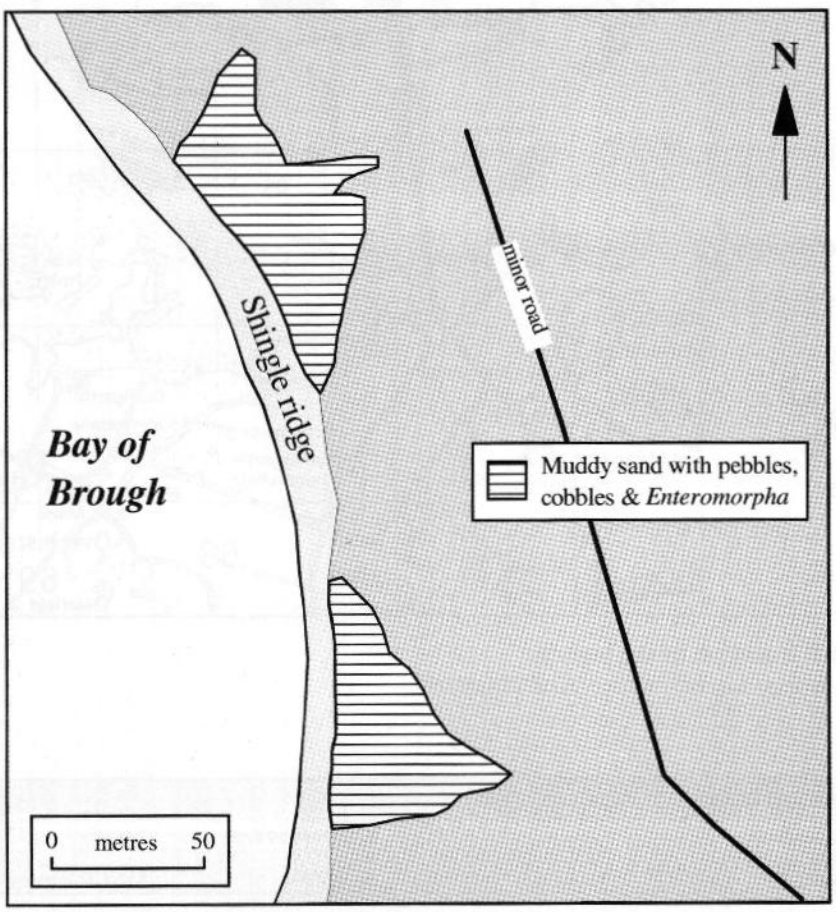

Figure 22.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

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

Human influences

At the time of survey in 1994 there may have been some organic enrichment of the lagoons from adjacent farmland, resulting in poor water quality. Otherwise the lagoons appeared to have little human influence.

References and further reading

None available.

Compiled by: Kath Thorpe

23 Bay of Ham lagoon, Rousay

Location		
Position (centre)	59°10.4'N 02°57.4'W	HY 453 323
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

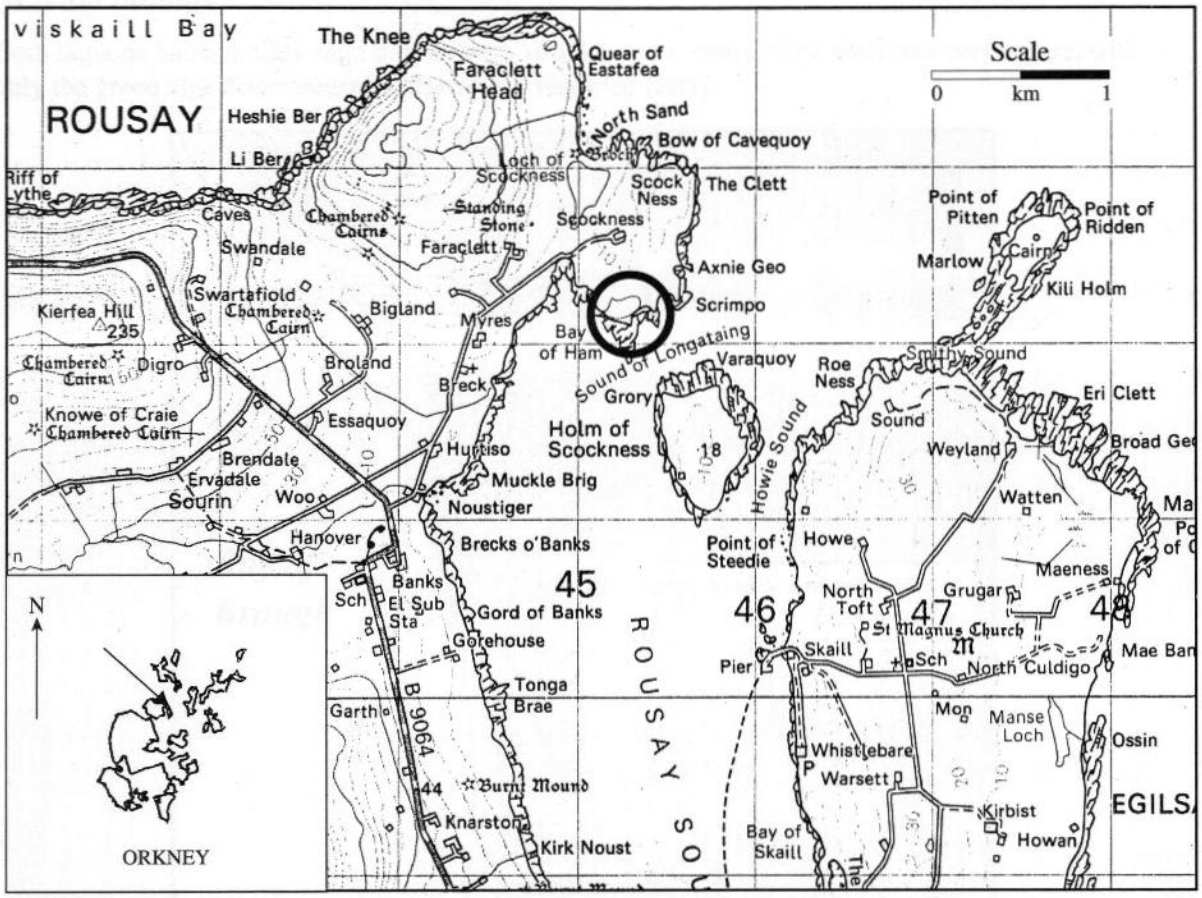

Figure 23.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	July 1994	MNCR survey 477
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477

Introduction

Bay of Ham lagoon is located in the north-east of the island of Rousay and is about 0.25 km long, has a maximum depth of 1 m and a negligible tidal range. The lagoon connects to the Bay of Ham at high tide over a 5 m-wide slate bar on its south-western side. The lagoon is little disturbed by tidal currents

or wave action and was fully marine at the time of survey. Freshwater input is limited to drainage from a small area surrounding the lagoon. The site is backed by grassland to the north and by a shingle bar on the south-eastern side, through which some seawater may percolate. Water quality at the time of survey was poor for there was a layer of gas-filled blue-green algae floating on the water surface and forming a blue stain around the shores of the lagoon.

Physical features	
Physiographic type	Silled saline lagoon (sill at high tide level)
Area of lagoon	2 ha
Maximum length of lagoon	0.25 km
Bathymetry	Maximum depth 1 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	35 ‰ (measured)

Marine biology

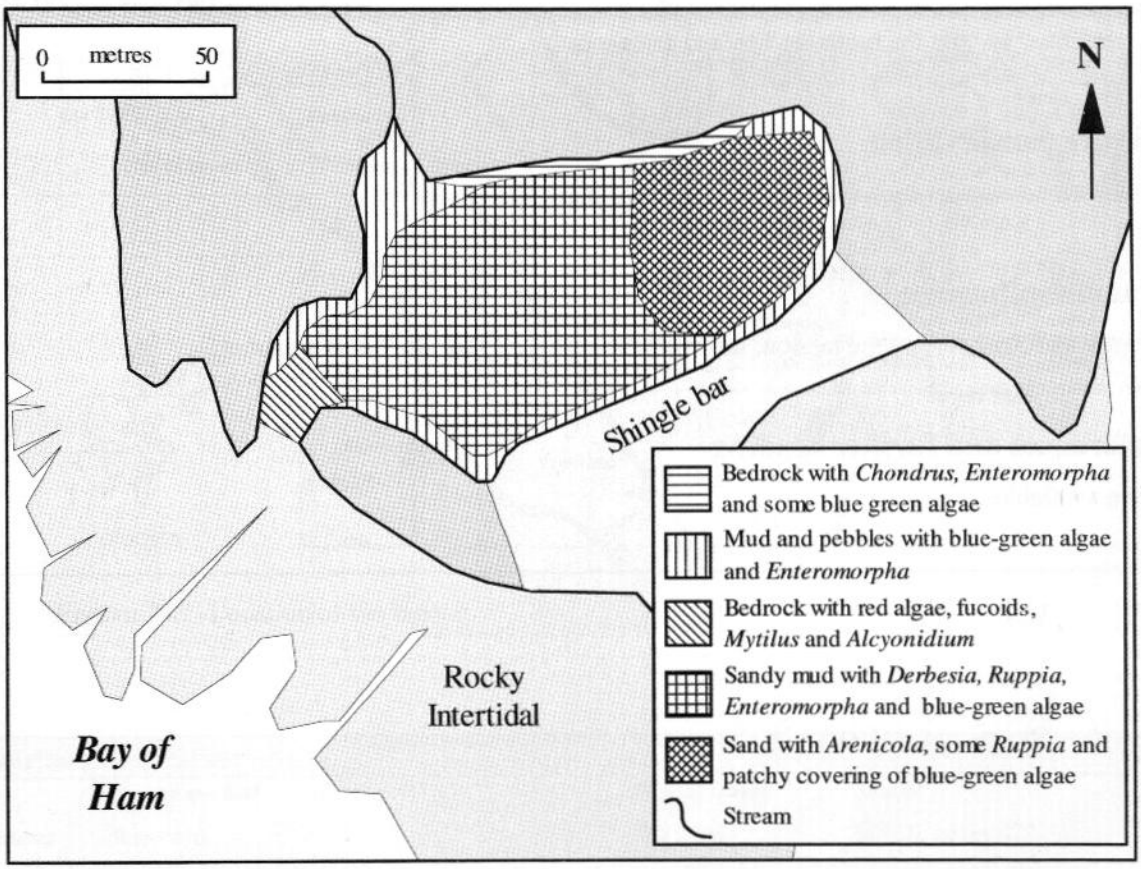

Figure 23.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The lagoon was fringed by a mud and pebble bank colonised by green algae. Stones below this were colonised by blue-green algae, which formed a thick layer on the water surface and extended below the water level. The green alga *Enteromorpha intestinalis* was attached to larger stones (EphX).

The short length of rocky shore on the northern edge of the lagoon was colonised by the green alga *E. intestinalis* with clumps of the red alga *Chondrus crispus*, the green alga *Vaucheria* sp. and blue-green algae (Ent). Mysid shrimps, gammarid amphipods and the opisthobranch mollusc *Alderia modesta* were present amongst the algae.

The eastern end of the lagoon, between 0.2 and 1 m depth, comprised medium-grained sand dominated by the lugworm *Arenicola marina* (FaMS) with some areas of the tasselweed *Ruppia* sp. and a patchy mat of green algae. Clumps of bladder wrack *Fucus vesiculosus* were also present. The green alga *E. intestinalis* grew attached to the *F. vesiculosus* and formed mats on the sediment amongst the tasselweed *Ruppia* sp. Mysid shrimps and the isopod *Idotea* sp. were present amongst the algae.

The western end of the lagoon was sandy mud with tasselweed *Ruppia* sp. (Rup). A mat of the green algae *Derbesia marina* and *E. intestinalis* grew on the surface of the sediment and amongst the stands of tasselweed *Ruppia* sp. Blue-green algae, attached to the green algae, formed floating, gas-filled masses which extended up towards the surface. Mysid shrimps were also present.

The bar at the entrance to the lagoon, between 0 and 0.2 m depth, comprised flat slate with some loose slate fragments. It was colonised by a dense covering of filamentous red algae, including *Ceramium* sp. and *Cystoclonium purpureum*. There was also the green alga *Enteromorpha* sp. and a few scattered plants of serrated wrack *Fucus serratus* (Ent). Mysid shrimps were present around the algae. The loose slates were colonised by spirorbid worms and the periwinkle *Littorina saxatilis*. A few mussels *Mytilus edulis* were aggregated under the slates, together with the encrusting bryozoan *Alcyonidium* sp. and the barnacle *Verruca stroemia*.

Nature conservation

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

Human influences

Litter was found around the lagoon; little human influence was otherwise apparent.

References and further reading

None available.

Compiled by: Kath Thorpe

24 Oyce of Huip, Stronsay

Location		
Position (centre)	59°9.2'N 02°37.5'W	HY 642 298
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

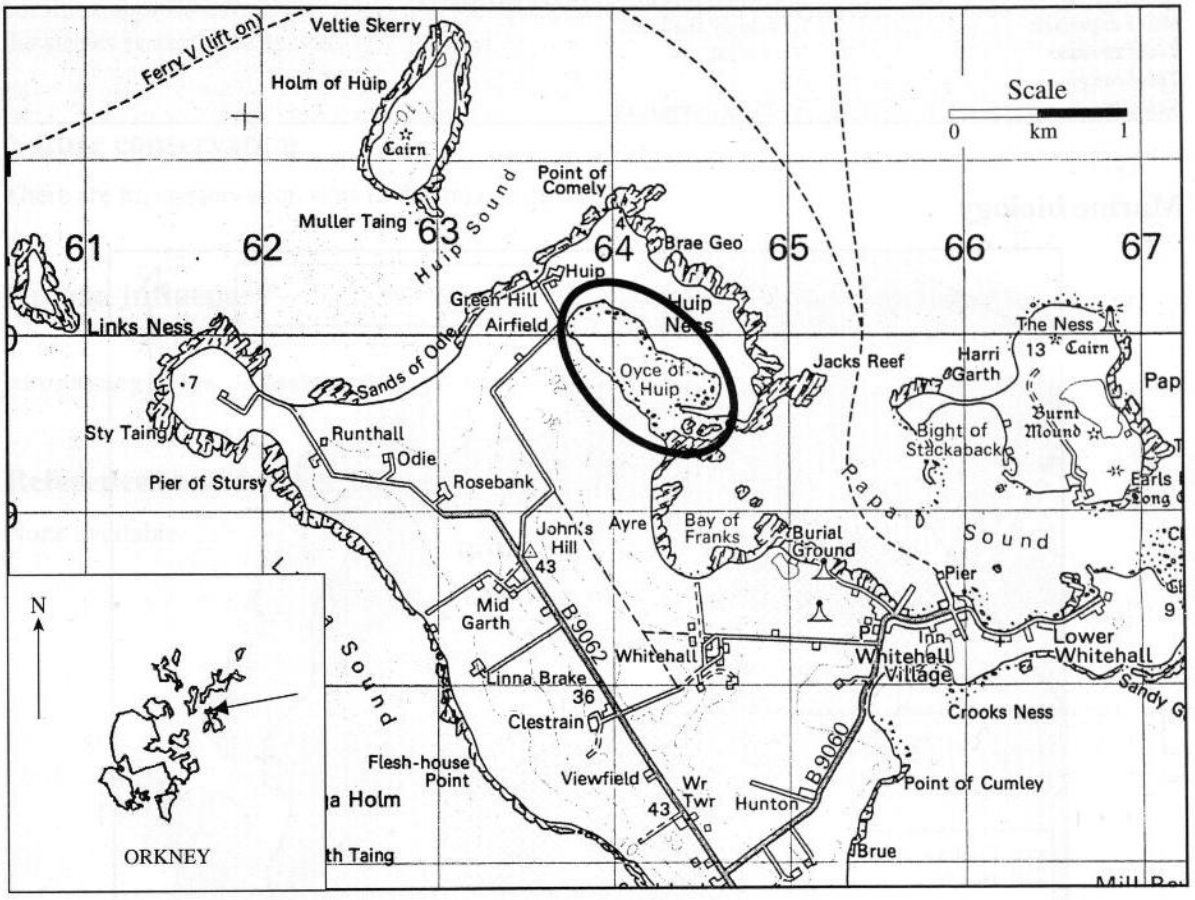

Figure 24.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	July 1994	MNCR survey 477
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477

Introduction

The Oyce of Huip is located in the north of Stronsay, connecting to Papa Sound through a shingle ridge via a subtidal channel about 150 m wide and 1.5 m deep. The lagoon is an inlet 1 km long with a maximum depth of 1.5 m and a tidal range of 0.5 m. Full salinity is maintained by daily exchange of

seawater through the channel. Freshwater input is limited to drainage from land run-off. The inlet is surrounded by a cobble shore and backed by grazing land. There is very little disturbance from wave action or tidal currents, except for the entrance channel which is subject to tidal currents of up to 1 knot.

Physical features	
Physiographic type	Saline lagoon inlet
Area of lagoon	31 ha
Maximum length of lagoon	1 km
Bathymetry	Maximum depth 1.5 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	0.5
Salinity	30-35 ‰ (estimated)

Marine biology

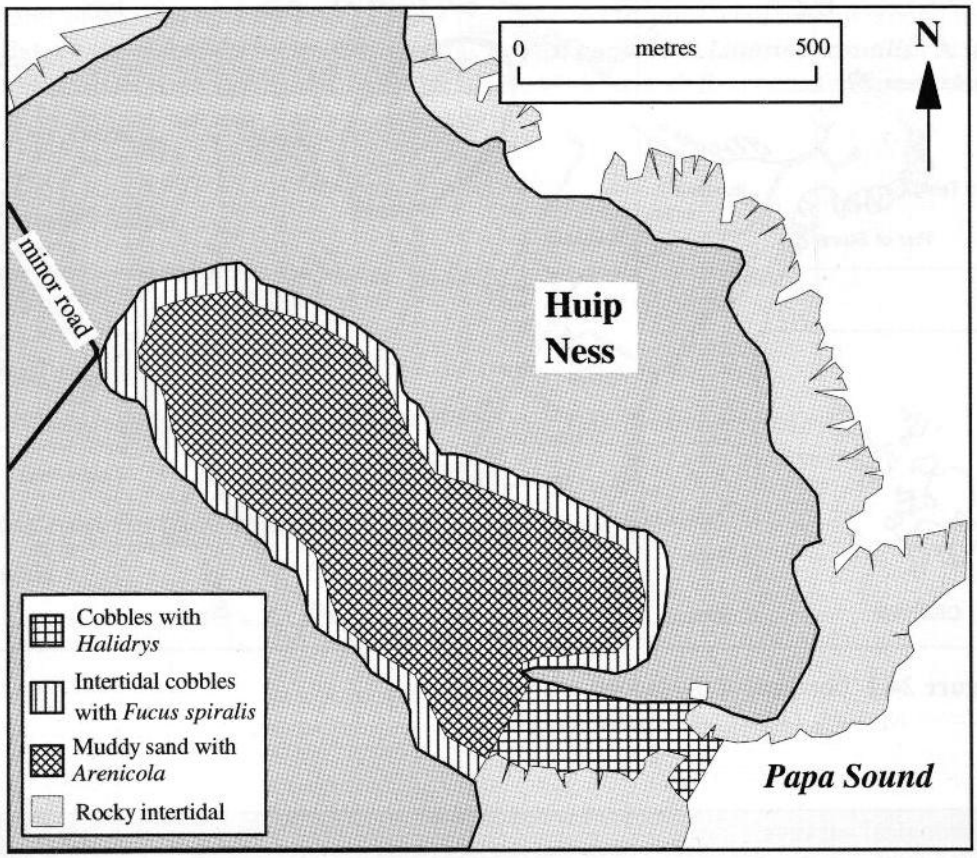

Figure 24.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The cobble ridge around the edge of the inlet was colonised by spiral wrack *Fucus spiralis*; this habitat was not surveyed in detail.

The main basin of the inlet, between low water and 1.5 m depth, consisted of muddy fine sand which had lugworm *Arenicola marina* mounds and bootlace weed *Chorda filum* on the surface. Some areas were colonised by dense patches of seagrass *Zostera marina* with green algae, whereas other areas of the sediment were covered by an algal mat, including the green algae *Blidingia* sp., *Enteromorpha*

prolifera and *Rhizoclonium riparium* (Zmar; FiG). The animals present included the isopod *Idotea balthica*, mysid shrimps and shore crabs *Carcinus maenas*.

Throughout the main basin, between the depths of 0 and 1.5 m, there were isolated small boulders lying on the sediment. The boulders were dominated by large plants of the green alga *Codium* sp. (about 1 m high), the light-bulb sea squirt *Clavelina lepadiformis* and the sponges *Halichondria panicea* and *Leucosolenia botryoides* (Lsac.Cod).

The mouth of the inlet and the channel connecting it to the sea consisted of tide-swept cobbles. The sea oak *Halidrys siliquosa* dominated this area (HalXK). There were epiphytes, including the ascidian *Aplidium pallidum* and the sponge *Leucosolenia botryoides*, growing on the sea oak *H. siliquosa*. The coralline alga *Corallina officinalis* and the sponges *Halichondria panicea* and *Haliclona* sp. grew on the stones beneath the sea oak *H. siliquosa*.

Nature conservation

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

Human influences

There is a farm track at the northern end of the inlet and farm vehicles use the upper shore to reach surrounding fields. Otherwise there appeared to be little human influence.

References and further reading

None available.

Compiled by: Kath Thorpe

25 The Ouse, Ling Holm, Shapinsay

Location

Position (centre)	59°03.4'N 02°51.9'W	HY 503 192
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

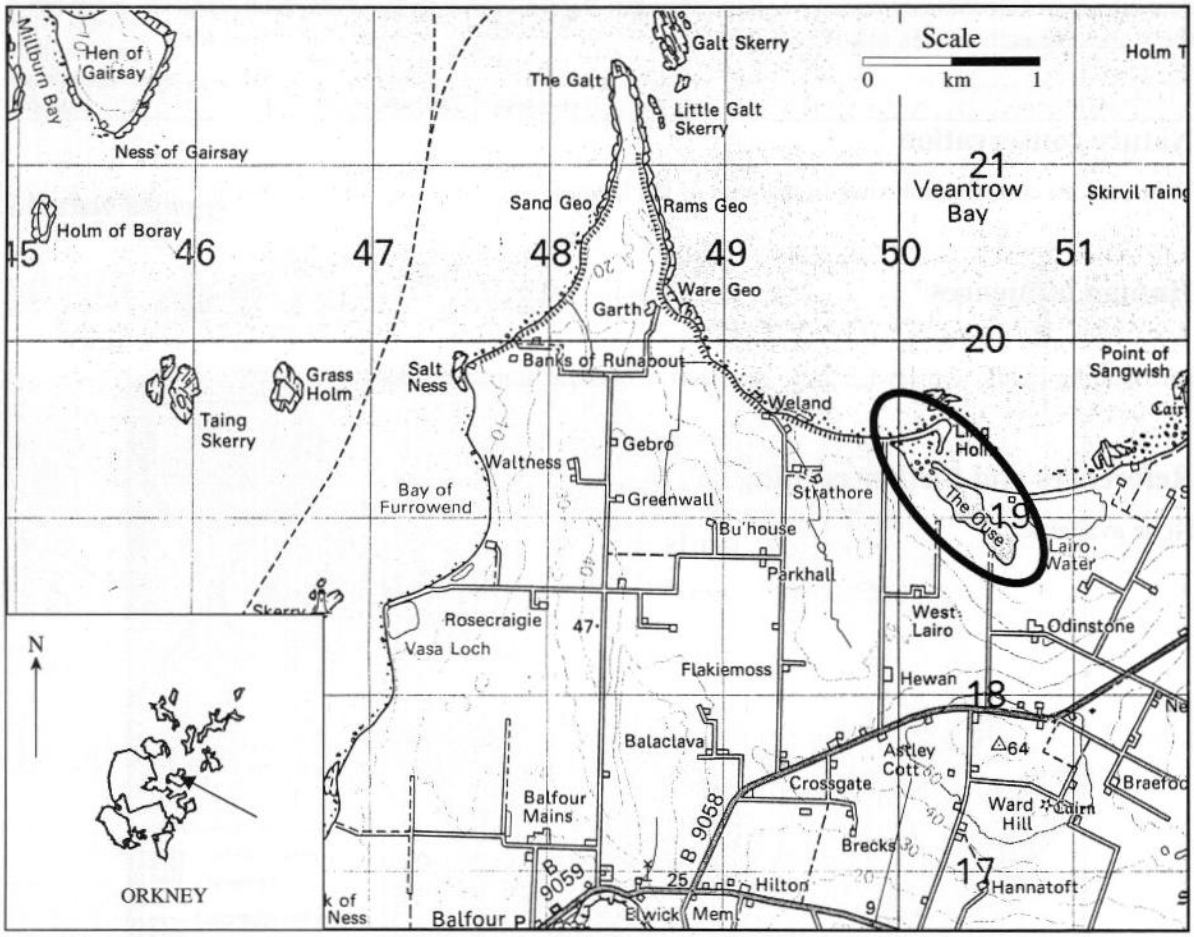

Figure 25.1 Location of the lagoon.

Marine biological surveys

	Survey method	*Date of survey*	*Source*
Littoral	Recording	July 1994	MNCR survey 477
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477

Introduction

The Ouse is an inlet on the north coast of Shapinsay, and connects to the sea at Ling Holm via a 10 m-wide channel through a shingle ridge. The inlet is 1 km long, has a maximum depth of 3 m and a tidal range of about 1 m. The head of the inlet is a sandflat which dries out, but the extent of drying is unknown. The inlet has two basins separated by a shingle bar with a connecting channel on its eastern side. The southern basin itself is almost split into two basins by a stone ridge which extends halfway across the inlet. The tide is accelerated, both in the entrance channel and between the two main basins; otherwise there is little disturbance from tidal currents or wave action. The salinity was estimated to be 30 to 35 ‰ throughout the inlet, maintained by seawater exchange through the entrance channel on each tide. Freshwater input, from drainage off the surrounding land, is minimal. The north-eastern end of the inlet is backed by shingle ridges that shape the entrance channel. The remainder of the inlet is surrounded by grassland, with a small track to the south-west.

Physical features	
Physiographic type	Saline lagoon inlet
Area of lagoon	15 ha
Maximum length of lagoon	1 km
Bathymetry	Maximum depth 3 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Weak
Tidal range	1 m
Salinity	30-35 ‰ (estimated)

Marine biology

The shore of the southern basin, between 0.3 and 0.2 m height, consisted of pebbles with a zone of channelled wrack *Pelvetia canaliculata* (Pel). Other species present included the sea slater *Ligia oceanica*, halacarid mites, periwinkles *Littorina saxatilis*, barnacles and the black lichen *Verrucaria maura*. Between 0 and 0.2 m height, there was a zone of spiral wrack *Fucus spiralis* and the lichen *V. maura* growing on shingle and small cobbles embedded in fine sand (Fspi). There were numerous red nematodes under the stones. Fine polychaete tubes and the anemone *Haliplanella lineata* were attached to the sides of stones (part embedded in the surrounding sediment). A few rocks were colonised by the barnacle *Semibalanus balanoides*. The periwinkles *Littorina obtusata/mariae* and *L. saxatilis* were also present.

The sublittoral zone of the southern basin consists of fine sand and was dominated by lugworm *Arenicola marina* casts and numerous fine polychaete tubes (FaMS).

The ridge between the two basins comprised small boulders and pebbles with sand in between. The ridge was dominated by bladder wrack *Fucus vesiculosus* with smaller quantities of serrated wrack *Fucus serratus* and knotted wrack *Ascophyllum nodosum* (FvesX). The green algae *Enteromorpha intestinalis* and *Rhizoclonium riparium* were also present.

The channel connecting the two basins of the inlet had a sand and shingle bottom which was colonised by the algae *F. vesiculosus*, *E. intestinalis* and *R. riparium*, together with some serrated wrack *F. serratus* and the red alga *Porphyra* sp. (FChoG).

The shore of the northern basin consisted of small boulders, cobbles and pebbles, which extended from sea level to about 0.3 m height. This habitat was colonised by a mixture of channelled wrack *P. canaliculata* and spiral wrack *F. spiralis*, neither of which formed a very dense cover (Fspi). Other species present included the periwinkle *Littorina saxatilis*, the springtail *Anurida maritima* and the sea slater *L. oceanica*.

The northern basin consisted of fine sand which had numerous lugworm *A. marina* casts. Occasional cobbles on the surface of the sediment were colonised by the wracks *F. vesiculosus*, *F. serratus*, *A. nodosum* and green alga *Enteromorpha* sp. (FaMS; FChoG).

The channel connecting the inlet to the open sea had a shingle bottom from 0 to 3 m depth; this was colonised by wracks *F. serratus* and *A. nodosum* and bootlace weed *Chorda filum* (FChoG). The fucoids supported filamentous green algae, the sea mats *Alcyonidium gelatinosum* and *Flustrellidra hispida* and the sponge *Leucosolenia botryoides*.

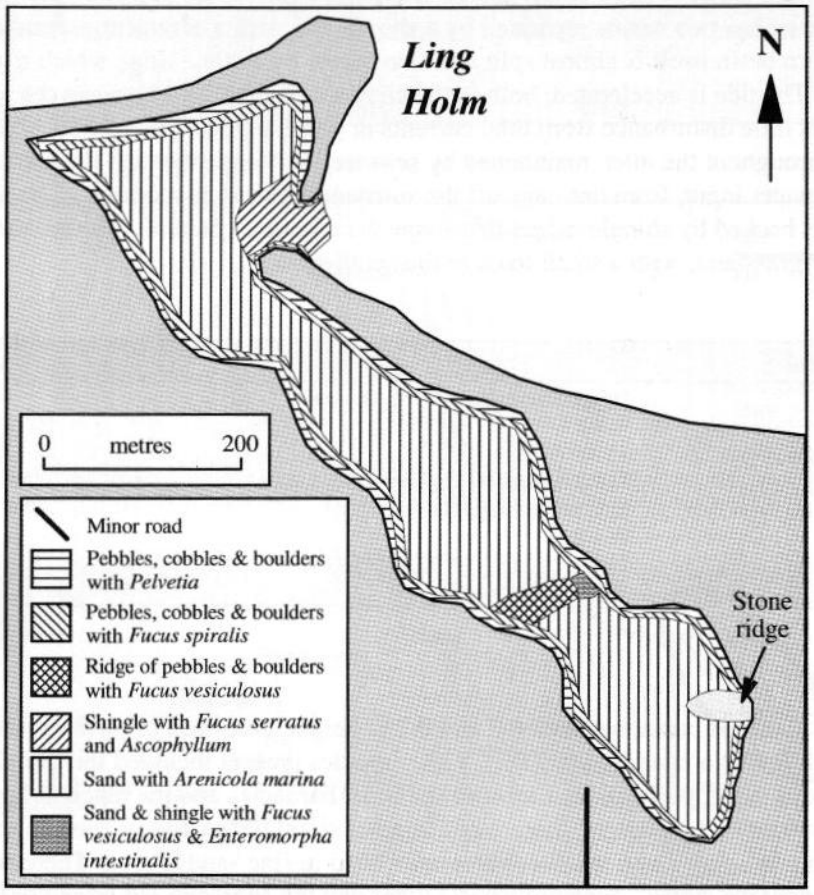

Figure 25.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

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

Human influences

The stone ridge which restricted water movement around the southern basin appeared to be man-made. There was a small track in the southern corner of the inlet. Otherwise, there appeared to be very little human impact at the site.

References and further reading

None available.

Compiled by: Kath Thorpe

26 Vasa Loch, Shapinsay

Location		
Position (centre)	59°02.9'N 02°55.2'W	HY 472 184
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

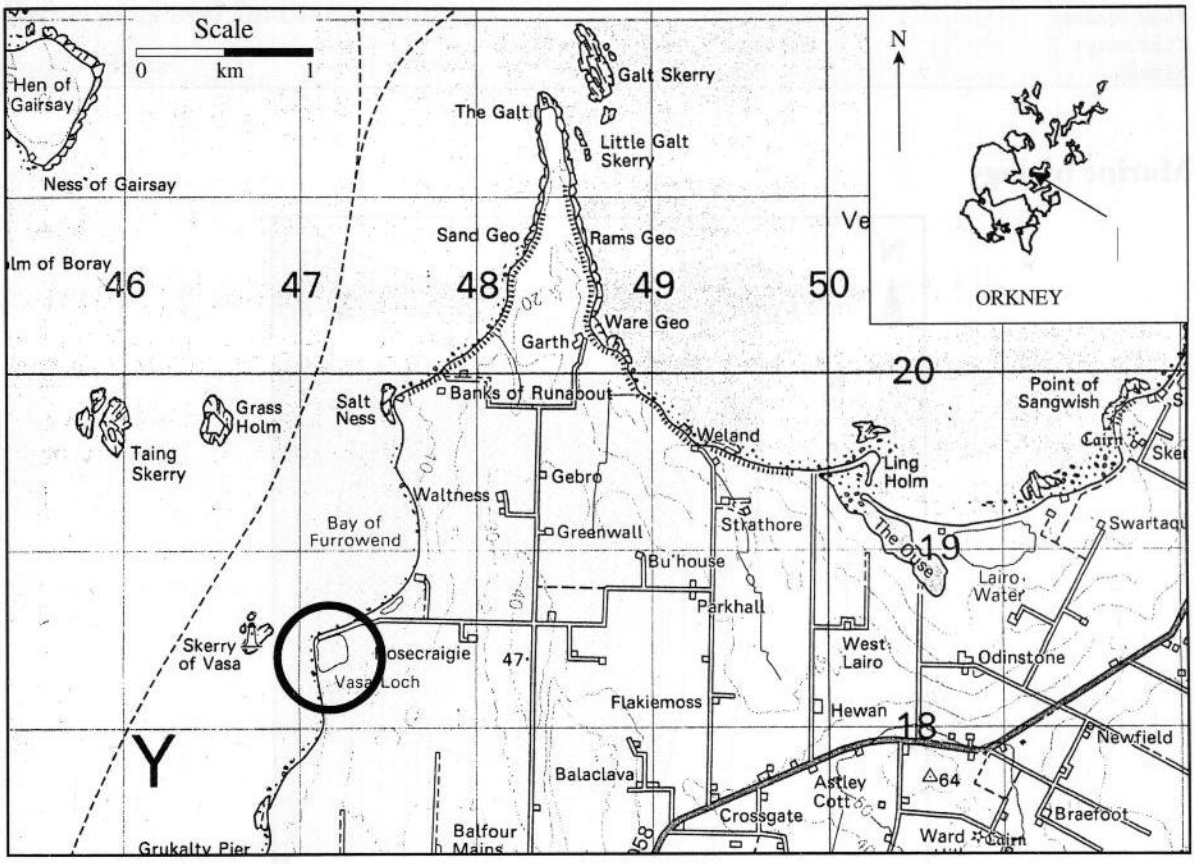

Figure 26.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032 m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477

Introduction

Vasa Loch is a small lagoon on the west coast of Shapinsay; it is 0.25 km long, has a maximum depth of 0.4 m and a negligible tidal range. The lagoon is separated from the sea by a shingle ridge on its western side. The salinity was measured at 5 ‰ at the time of survey. Seawater input is limited to percolation through, and over-topping of, the shingle barrier at high spring tides and during storms.

Freshwater input is by drainage from a small area surrounding the lagoon. There is very little disturbance from tidal currents or wave action. The lagoon is backed by shingle banks to the north and west and by pasture land to the south and east sides.

Physical features	
Physiographic type	Percolation saline lagoon
Area of lagoon	3 ha
Maximum length of lagoon	0.25 km
Bathymetry	Maximum depth 0.4 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	5 ‰ (measured)

Marine biology

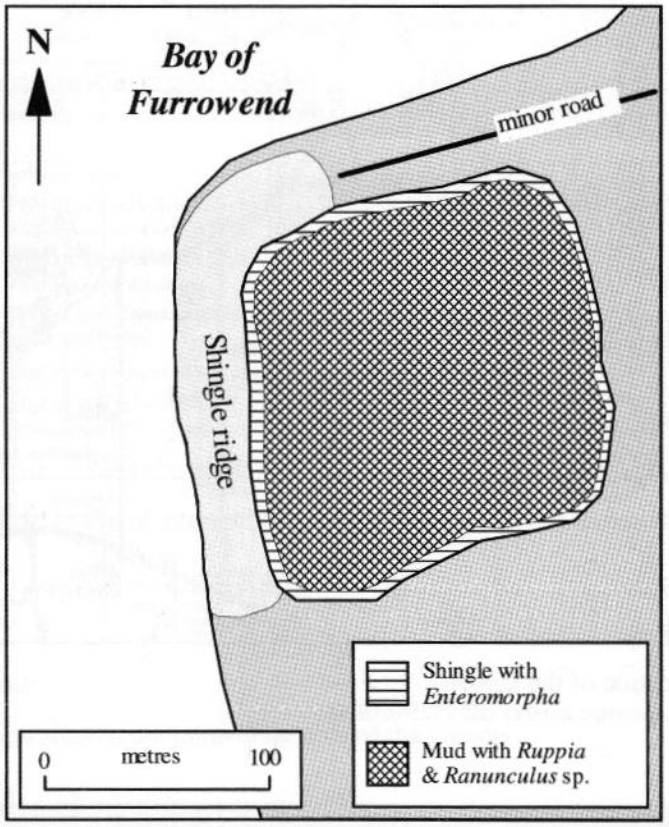

Figure 26.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The fringe of the lagoon, between 0 and 0.2 m depth, was a shingle bank colonised by the green algae *Enteromorpha intestinalis*, *Enteromorpha prolifera* and *Derbesia marina* (FiG). There were mysid shrimps and amphipods amongst the algae.

The main body of the lagoon had a fine mud bottom which was colonised by the tasselweed *Ruppia maritima* and the freshwater angiosperm *Ranunculus* sp. (Rup). Mysid shrimps, amphipods and chironomid larvae were also present.

Swans and terns were observed on the eastern side of the lagoon.

Nature conservation

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

Human influences

There is a minor road on the northern shore of the loch. Otherwise there appeared to be very little human influence.

References and further reading

None available.

Compiled by: Kath Thorpe

27 Oyce of Isbister, Mainland

Location		
Position (centre)	59°02.8'N 03°03.5'W	HY 392 182
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

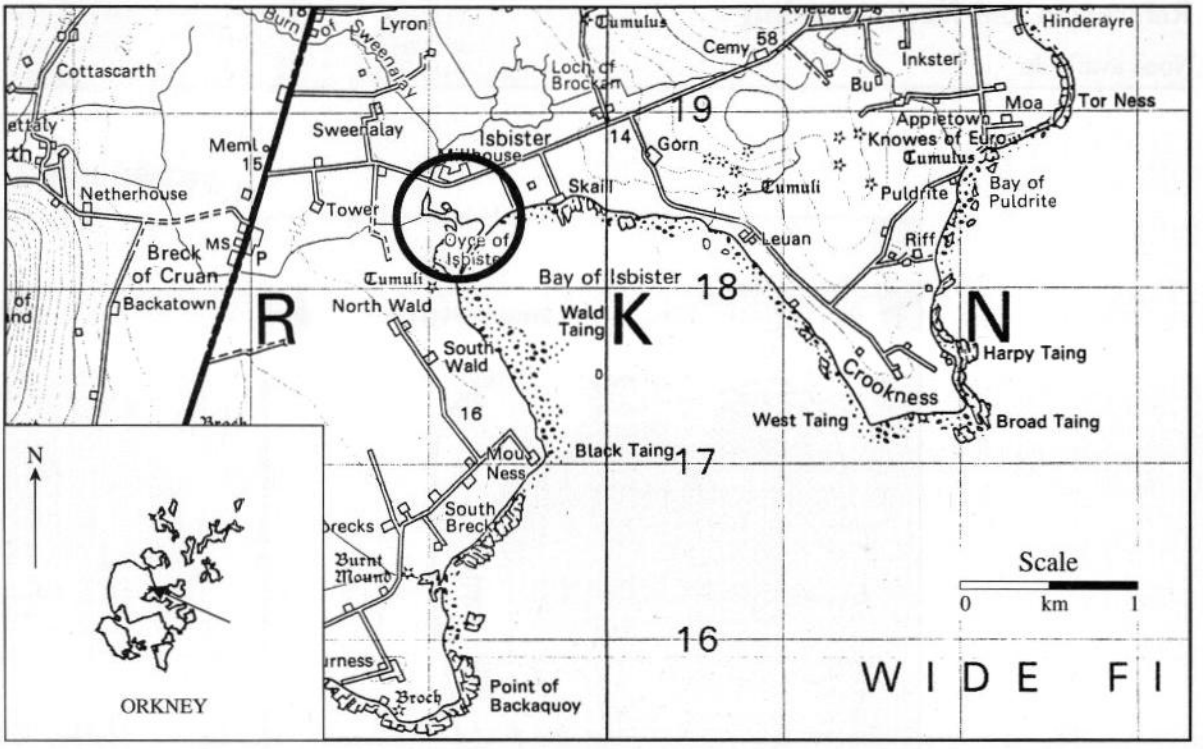

Figure 27.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

The Oyce of Isbister is a silled lagoon at the head of the Bay of Isbister on the north-east coast of Mainland Orkney. The lagoon is 0.4 km long, has a maximum depth of 0.4 m and a tidal range of about 0.5 m and connects to the Bay of Isbister via a narrow channel through a shingle spit. The channel opens out into the bay at mid-tide level. The salinity at the head of the lagoon was 2 ‰ at the time of survey and was estimated to be between 5 and 18 ‰ in the remainder of the lagoon. There is substantial freshwater input from a stream which enters at the north-western corner. There is very little disturbance from tidal currents or wave action. The lagoon is surrounded by saltmarsh and backed by pasture land.

Physical features	
Physiographic type	Silled saline lagoon (sill at mid-tide level)
Area of lagoon	8 ha
Maximum length of lagoon	0.4 km
Bathymetry	Maximum depth 0.4 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.5 m
Salinity	2-18 ‰ (estimated)

Marine biology

The main body of the lagoon, between 0 and 0.4 m depth, consisted of sandy gravel overlain by a layer of fine sand. The sediment was dominated by the green alga *Enteromorpha intestinalis* with a few small areas of the tasselweed *Ruppia* sp. and the brackish-water fucoid alga *Fucus ceranoides* (EphX; Rup; FcerX). There were burrows of the amphipod *Corophium volutator* in the sediment and the mud snail *Hydrobia ulvae* was present on the surface of the mud.

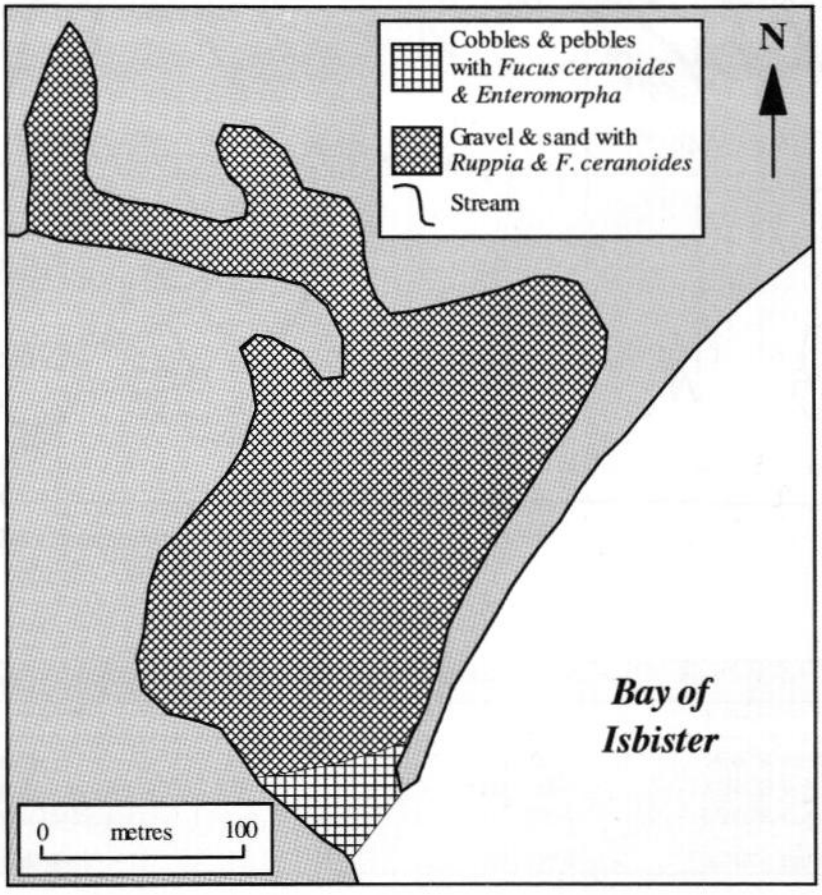

Figure 27.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The tidal channel which connects the lagoon to the sea consisted of cobbles and pebbles between 0 and 0.2 m depth and was dominated by the wrack *F. ceranoides* and green alga *E. intestinalis* (FcerEnt). Brown algae grew epiphytically on wrack *F. ceranoides*. Gammarid amphipods were present amongst the algae.

Nature conservation

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

Human influences

There was a large number of rusting old cars on the fringes of the saltmarsh on the eastern side of the lagoon in 1994.

References and further reading

None available.

Compiled by: Kath Thorpe

28 Point of Backaquoy lagoon, Mainland

Location		
Position (centre)	59°01.7'N 03°03.7'W	HY 390 164
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

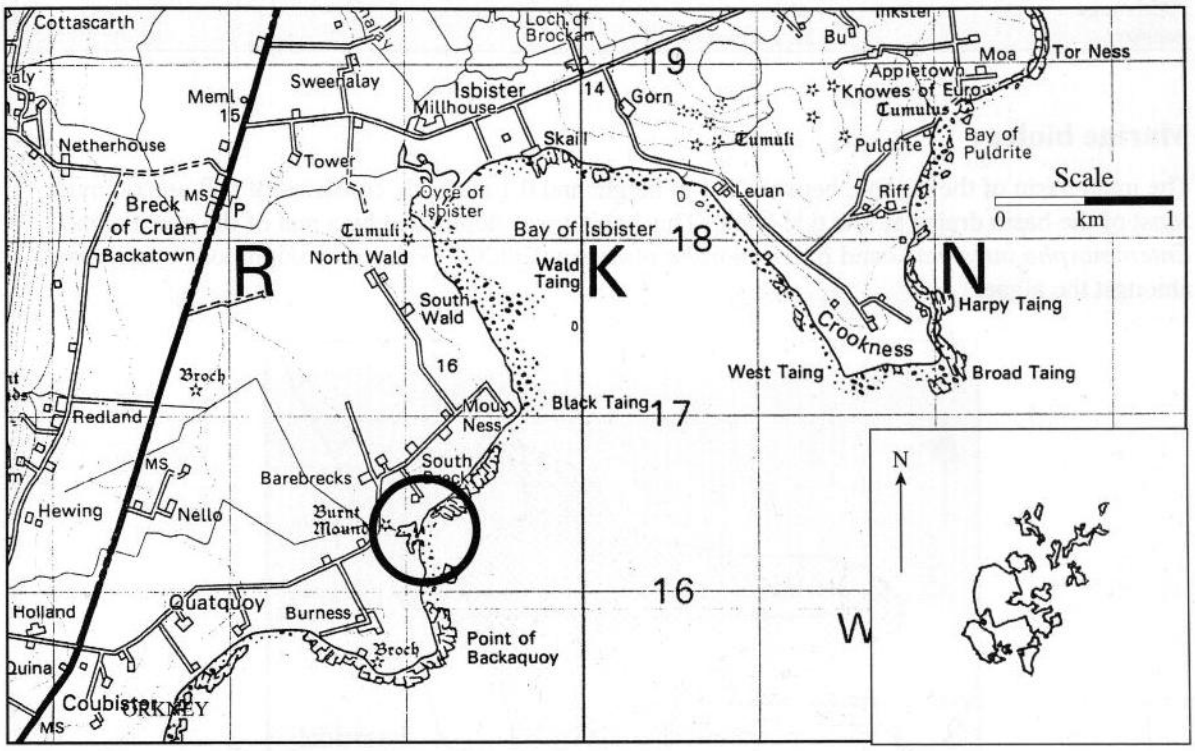

Figure 28.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032 m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

This lagoon is located north of the Point of Backaquoy on north-east Mainland. The lagoon is about 0.3 km in length and about 100 m wide, with a maximum depth of 0.4 m in the entrance channel. The tidal range is less than 0.3 m but the majority of the lagoon drains at low water to expose mudflats. The lagoon connects to Wide Firth through a shingle bar at mid-tide level, via a narrow channel about 3 m wide and 10 m long. The salinity was 28 ‰ at the time of survey (on the flood tide) and freshwater input is limited to drainage from the immediate surrounding land. There is very little

disturbance from wave action or tidal currents, except for the immediate area around the entrance channel. The lagoon is surrounded by grassland.

Physical features	
Physiographic type	Silled saline lagoon (sill at mid-tide level)
Area of lagoon	1.5 ha
Maximum length of lagoon	0.3 km
Bathymetry	Maximum depth 0.4 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Weak
Tidal range	<0.3 m
Salinity	28 ‰ (measured)

Marine biology

The main basin of the lagoon, between 0.1 m height and 0.1 m depth, consisted of soft anoxic mud. Most of the basin drains at low tide level. This habitat was dominated by a mat of the green algae *Enteromorpha intestinalis* and *Enteromorpha prolifera* (EphX). Gammarid amphipods were present amongst the algae.

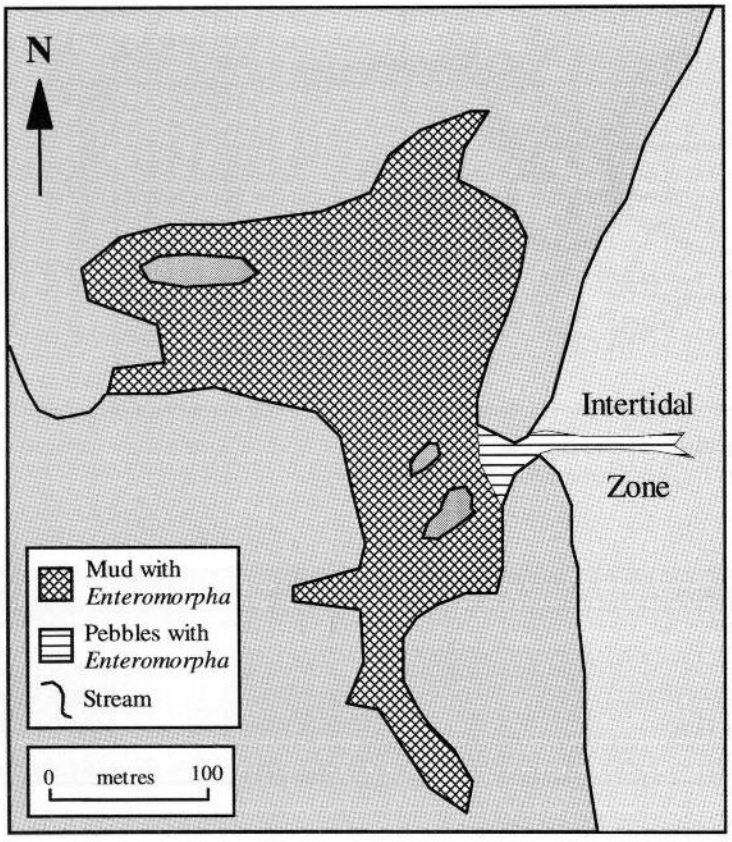

Figure 28.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The entrance channel consisted of pebbles and cobbles which lie between 0 and 0.4 m depth. The stones were covered by a thick growth of green algae *E. intestinalis* and *E. prolifera* with a few bladder wrack *Fucus vesiculosus* plants (FiG). Flatworms were present under stones and a few gammarid amphipods were found.

Nature conservation

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

Human influences

There appeared to be very little human influence at this site.

References and further reading

None available.

Compiled by: Kath Thorpe

29 The Ouse, Finstown, Mainland

Location		
Position (centre)	59°00.6'N 03°07.7'W	HY 358 143
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

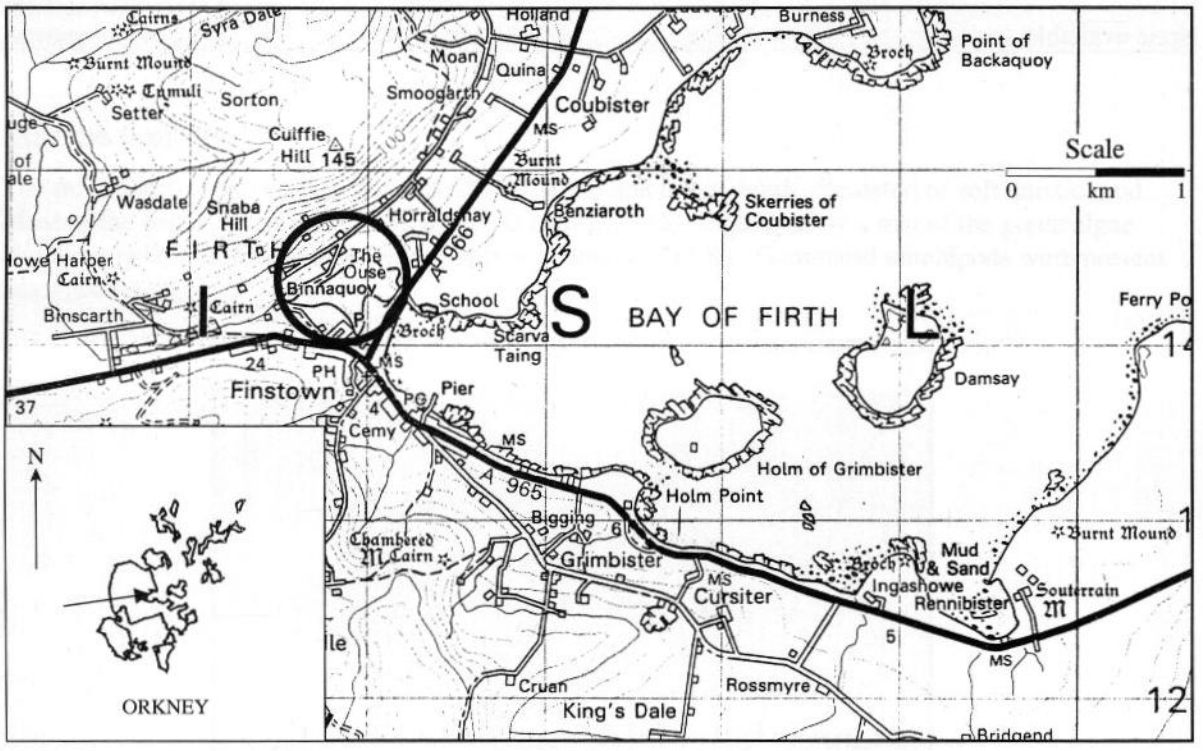

Figure 29.1 Location of the lagoon.

Marine biological surveys			
	Survey method	***Date of survey***	***Source***
Littoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032 m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

The Ouse is located north of Finstown in north-east Mainland, and it connects to the Bay of Firth via a subtidal channel under a road bridge. The lagoon is 0.7 km long, has a maximum depth of 1.5 m and a tidal range of about 1.5 m. At the time of survey in 1994, the salinity at the western end of the lagoon was 5 ‰; in the middle of the basin it was 28 ‰, whilst in the rapids it was considered to be fully marine. The western end of the lagoon receives substantial freshwater input from a stream. There is very little influence of wave action and tidal currents are limited to the entrance channel where they run very strongly. The western end of the lagoon has a minor road with a few houses around the shore

and the entrance channel on the eastern side is crossed by a road bridge. The remainder of the lagoon is backed by grassland.

Physical features	
Physiographic type	Saline lagoon inlet
Area of lagoon	11 ha
Maximum length of lagoon	0.7 km
Bathymetry	Maximum depth 1.5 m below loch datum
Wave exposure	Extremely sheltered
Tidal streams	Very weak
Tidal range	1.5 m
Salinity	5-35 ‰ (measured)

Marine biology

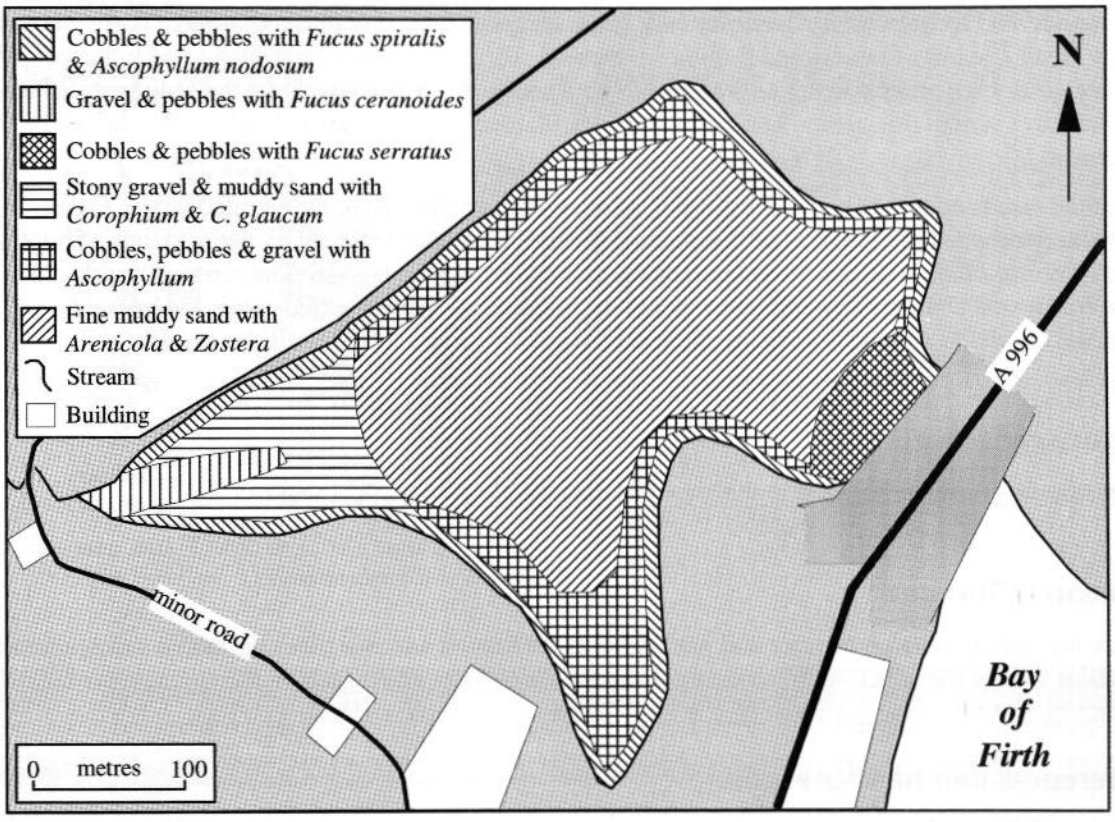

Figure 29.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Where the stream enters the western end of the lagoon, the upper shore was muddy gravel with pebbles. The area was dominated by the green alga *Enteromorpha intestinalis* and the brackish-water wrack *Fucus ceranoides* (EphX). The animals in this habitat included the burrowing amphipod *Corophium volutator*, the periwinkle *Littorina saxatilis* and mysid shrimps.

The upper to mid-shore zone at the western end of the lagoon is stony gravel with a slight covering of muddy sand. This area was dominated by amphipods *C. volutator* and the estuary cockle

Cerastoderma glaucum. There were also lugworm *Arenicola marina* burrows and a few sand gapers *Mya arenaria* present in the sediment (Mare). In a few areas of this habitat there was a thin sheet of the green alga *Monostroma oxyspermum*, with numerous periwinkles *Littorina saxatilis tenebrosa* and mud snails *Hydrobia ulvae*. Occasional pebbles were colonised by the brown alga *Ralfsia* sp.

The upper shore in the remainder of the main basin consisted of cobbles, pebbles and gravel with some mud and fine sand in between. There was a narrow band of spiral wrack *Fucus spiralis* with occasional stumpy plants of knotted wrack *Ascophyllum nodosum,* barnacles and the black lichen *Verrucaria maura* on small stones (Fspi). Large numbers of amphipods were present amongst the stones. Towards the western end of the lagoon, spiral wrack *F. spiralis* grew amongst the grasses at the edge.

The mid-shore zone in the remainder of the loch consisted of muddy cobbles, pebbles and gravel. Knotted wrack *A. nodosum* formed dense patches on the stones with some coralline algal crusts and the red filamentous alga *Audouinella* sp. also present (Asc.VS). Amphipods and littorinid molluscs were present among the algae. There were also scattered areas of muddy sediment which were colonised by tasselweed *Ruppia* sp. and seagrass *Zostera marina*.

The sublittoral zone of the main basin, between 0.1 and 0.4 m depth, consisted of fine muddy sand. It was dominated by lugworms *A. marina* with some seagrass *Z. marina* plants (FaMS). There were also a few small patches of tasselweed *Ruppia* sp. present. Estuary cockle *C. glaucum* and sand gaper *M. arenaria* were present in the sediment with mud snails *H. ulvae* frequent on the sediment surface. A small area within this habitat had a dense mat of filamentous green algae lying on the surface of the sediment.

The tidal rapids consisted predominantly of cobbles and pebbles. Here the serrated wrack *Fucus serratus* dominated the majority of the channel (Fserr.T), but was replaced by dense stands of bootlace weed *Chorda filum* in the narrowest part of the channel below the bridge. The serrated wrack *F. serratus* was colonised by epiphytes including filamentous green and red algae, the hydroid *Dynamena pumila* and the bryozoans *Alcyonidium gelatinosum* and *Flustrellidra hispida*.

Nature conservation

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

Human influences

There are minor roads on the east and west sides of the lagoon and two pipes discharge sewage into the southern side of the inlet. At the time of survey there were discarded glass bottles in the tidal rapids.

References and further reading

None available.

Compiled by: Kath Thorpe

30 Kirkwall lagoon (Peedie Sea), Mainland

Location		
Position (centre)	58°59.0'N 02°57.9'W	HY 445 112
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

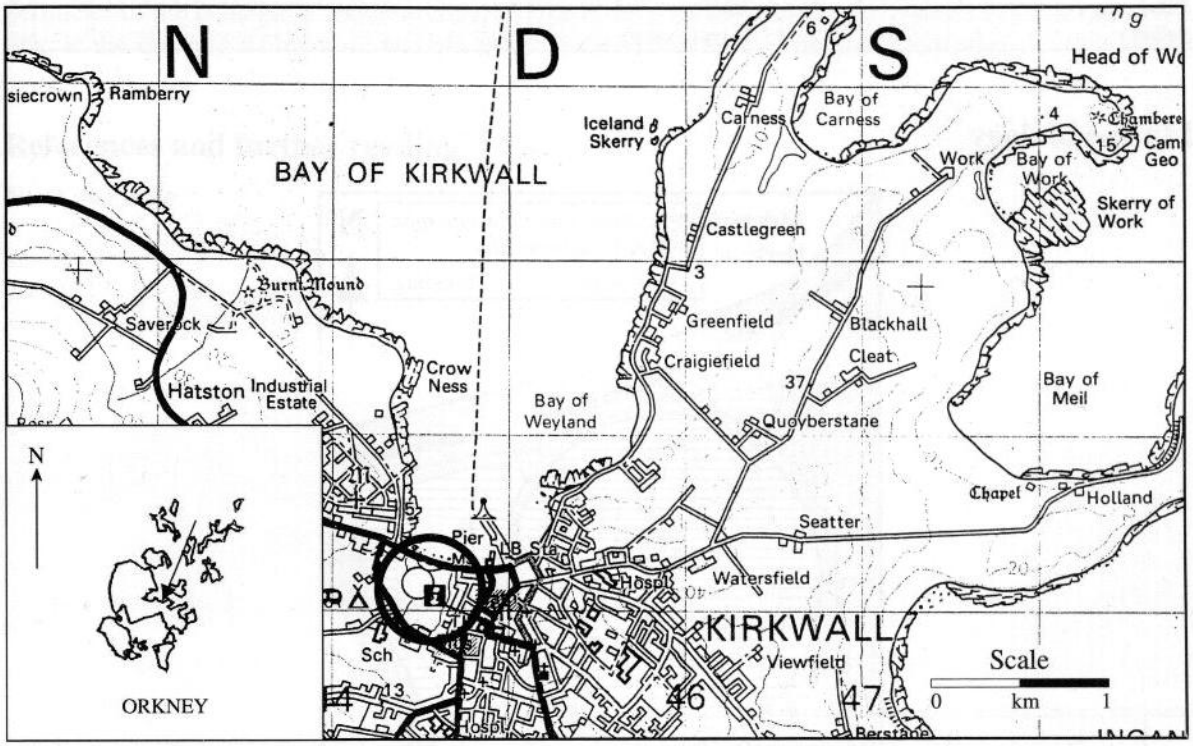

Figure 30.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

Kirkwall lagoon is connected to Kirkwall harbour in the north-east of Mainland via two sluice gates at its north-eastern and north-western corners. The western side of the lagoon is isolated from the rest of the lagoon by a concrete walkway which forms the boundary of a boating pond. The boating pond connects to the lagoon via a series of pipes and is connected to the harbour by a sluice gate. At the time of survey in 1994 the salinity was measured at 22 ‰ in the eastern part of the lagoon, 29 ‰ in the boating pond and 35 ‰ just inside the western sluice gates. The sluices are at high water level, allowing some seawater to enter the lagoon at high water. Freshwater input is from direct run-off from surrounding land, from drainage water which is discharged into the southern and eastern sides of the lagoon and cooling water from the power station which is discharged into the eastern part of the

lagoon. There is very little disturbance from wave action and tidal currents are only significant in the area of the sluices. The lagoon is surrounded by Kirkwall town, the power station and a shopping area.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	10 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	Negligible
Salinity	22-35 ‰ (measured)

Marine biology

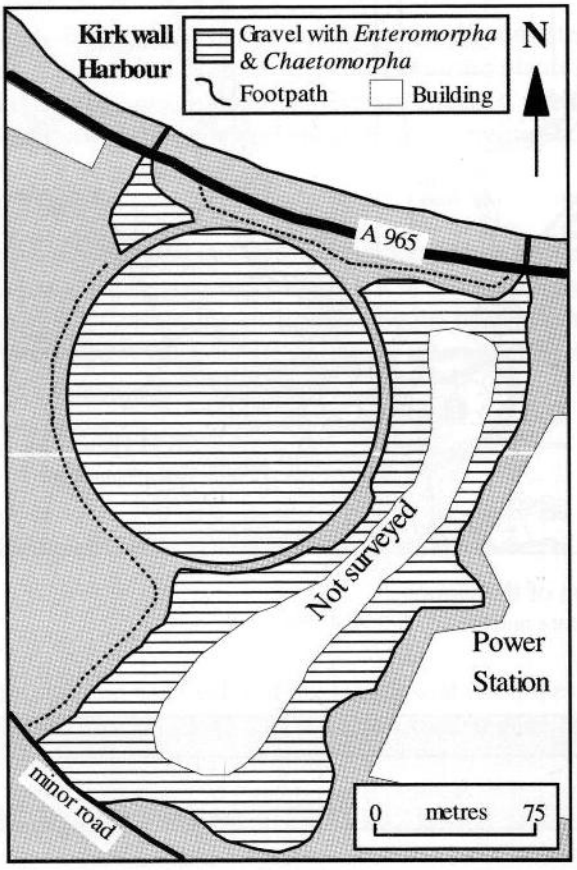

Figure 30.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The edge of the lagoon, between 0 and 0.4 m depth, had vertical concrete walls in places whilst in other areas there was a more natural cobble and grassy bank. Gravel, sediment and small cobbles covered the rest of the pond, between 0.4 and 0.5 m depth. The whole fringing area of the lagoon was dominated by the green algae *Enteromorpha intestinalis* and *Chaetomorpha linum* with some *Blidingia minima*, *Ulothrix* sp. and the chain diatom *Melosira nummuloides* (FiG). Among the plants there were numerous mysid shrimps and amphipods. The main body of the lagoon was not surveyed due to possible health risks from the discharges made into the lagoon.

Nature conservation

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

Human influences

A power station discharges cooling water into the eastern side of the lagoon. Drainage water from the immediate surrounding area (including roads and car parks) discharges into the southern and eastern sides of the lagoon. Water exchange with Kirkwall Harbour is restricted by two sluice gates at high water level. The boating pond is used for the sailing of model boats and a significant proportion of the perimeter of the pond has a concrete edge. At the time of survey in 1994 there was a large amount of litter at the site, and a film of oil was observed on the surface of the water in many places.

References and further reading

None available.

Compiled by: Kath Thorpe

31 Long Ayre lagoon, Mainland

Location		
Position (centre)	58°58.3'N 02°52.2'W	HY 499 098
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

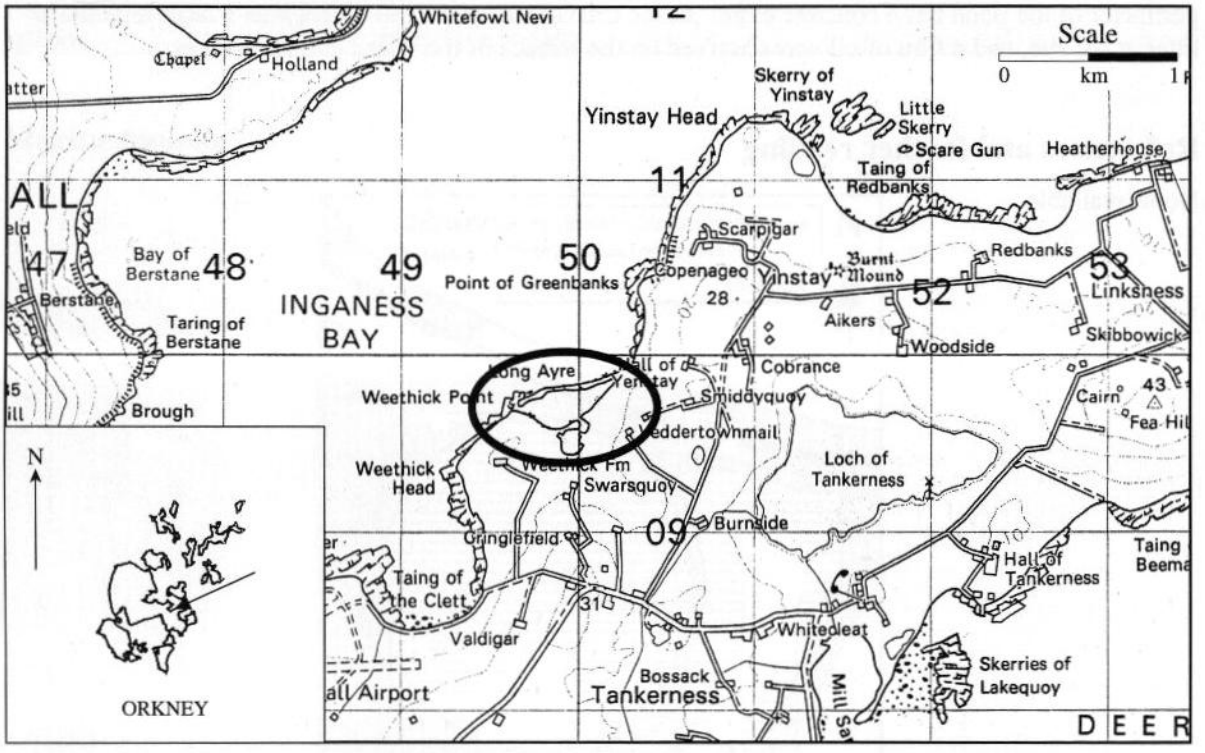

Figure 31.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032 m²)	July 1994	MNCR survey 477
	Granulometric samples	July 1994	MNCR survey 477

Introduction

Long Ayre is a small lagoon located on the north-east coast of Mainland, to the east of Kirkwall. It connects to the south-eastern side of Inganess Bay at mid-tide level via a channel through a shingle barrier. The lagoon is separated into two basins by the remains of a wall which restricts water flow into the smaller southern basin. The lagoon is about 0.7 km in length with a maximum depth of 2.5 m and a tidal range of about 0.5 m. The water was considered to be fully saline at the time of survey. Freshwater input is limited to drainage from a very small area around the lagoon. There is very little disturbance from wave action and tidal currents affect only the small area around the entrance channel.

The lagoon is surrounded by grassland, except for the northern side which is separated from the sea by a shingle bank.

Physical features	
Physiographic type	Silled saline lagoon (sill at mid-tide level)
Area of lagoon	10 ha
Maximum length of lagoon	0.7 km
Bathymetry	Maximum depth 2.5 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.5 m
Salinity	30-35 ‰ (estimated)

Marine biology

The smaller, southern basin consisted of muddy sand which was colonised by the lugworm *Arenicola marina* and the burrowing amphipod *Corophium volutator* (FaMS). There was a mat of the green algae *Enteromorpha intestinalis* and *Cladophora liniformis* (FiG). On the sediment surface there was also a patchy covering of blue-green algae which had become gas-filled and was floating close to the surface in the centre of the basin.

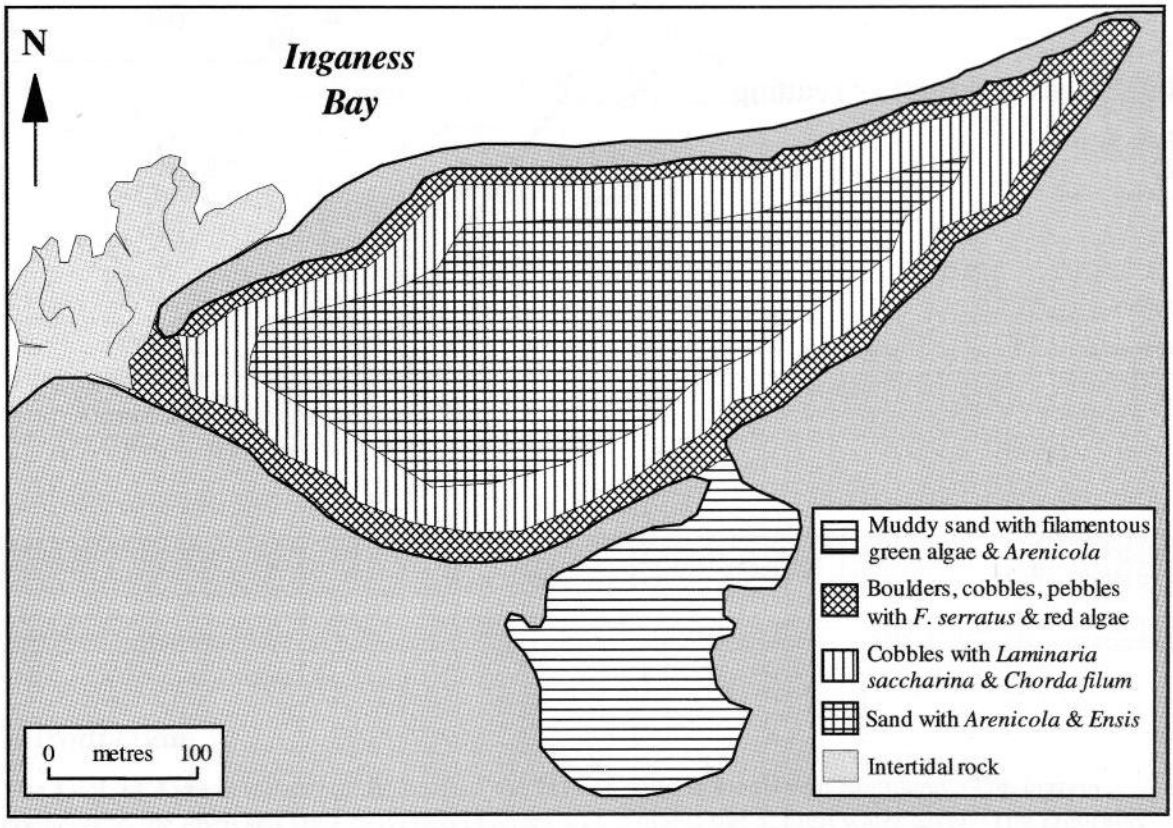

Figure 31.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The sublittoral fringe between 0 and 0.3 m depth of the larger, northern basin had a mixture of cobbles, pebbles, gravel and fine sand. This habitat was dominated by serrated wrack *Fucus serratus* with the red algae *Polyides rotundus*, *Mastocarpus stellatus* and filamentous red algae including *Polysiphonia*

fucoides (FserX). The animals present included mysid shrimps, spirorbid worms and periwinkles *Littorina littorea*.

The upper infralittoral zone, between 0.3 and 2 m depth, consisted of stable cobbles which supported a dense forest of sugar kelp *Laminaria saccharina* together with bootlace weed *Chorda filum* (Lsac.Ft). Some kelp fronds had ascidians attached to them. Mysid shrimps and shore crabs *Carcinus maenas* were present in the habitat.

The remainder of the basin, between 2 and 2.5 m depth, was fine sand which was colonised by lugworms *Arenicola marina* (FaMS). In some areas of the sediment there were mats of filamentous green algae and a diatom film. The razor shell *Ensis ensis* and amphipods *C. volutator* were also present.

Nature conservation

There are no conservation sites around the lagoon.

Human influences

There was very little human influence at this site, with the exception of the damaged wall which restricts water exchange between the northern and southern basins.

References and further reading

None available.

Compiled by: Kath Thorpe

32 Loch of Ayre, Mainland

Location		
Position (centre)	58°53.7'N 02°55.1'W	HY 470 012
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

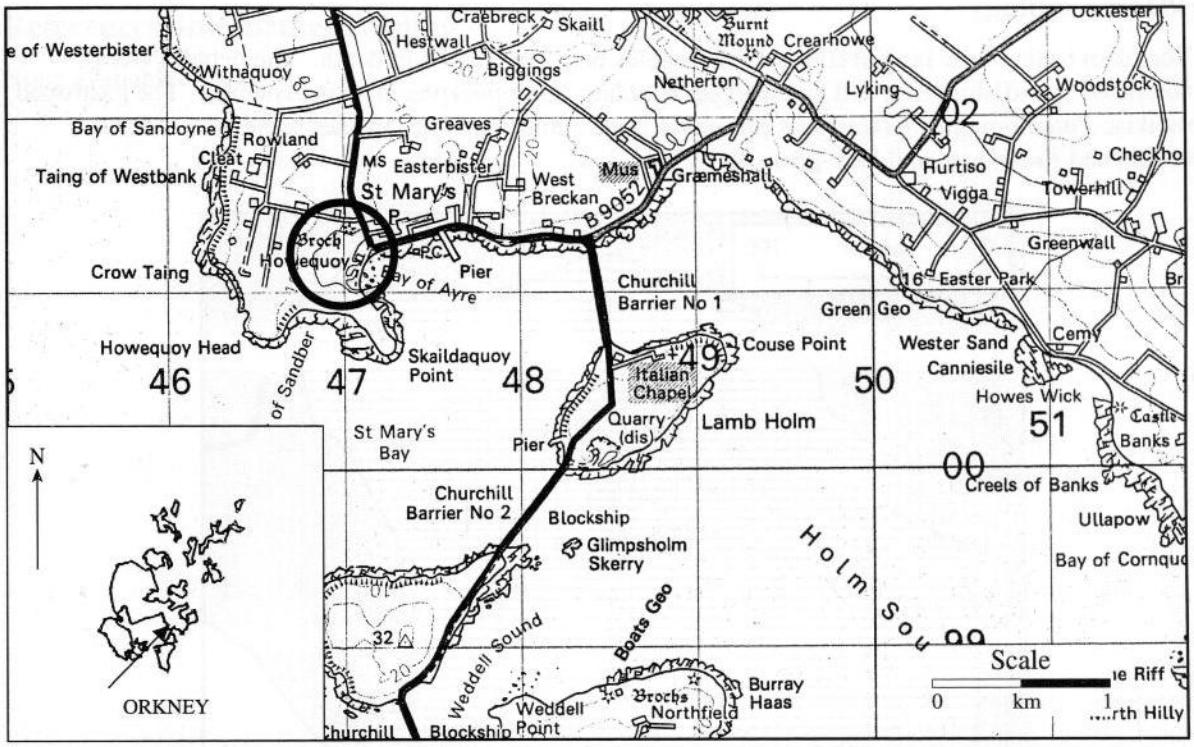

Figure 32.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

The Loch of Ayre is located at the head of the Bay of Ayre in south-east Mainland. The lagoon connects to the open sea via a culverted channel which opens out at high water level. The lagoon is 0.3 km in length and has a maximum depth of 1 m and was fully saline (34 ‰) at the time of survey. Freshwater input is from a small stream which enters the lagoon on the western side. It is possible that, as a result of the limited water exchange, the freshwater input and the large surface area relative to its depth, the lagoon may occasionally become hypersaline. The lagoon is surrounded by grassland, except for the north-eastern corner where it is bordered by a road.

Physical features	
Physiographic type	Sluiced saline lagoon
Area of lagoon	7 ha
Maximum length of lagoon	0.3 km
Bathymetry	Maximum depth 1 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	Negligible
Salinity	34 ‰ (measured)

Marine biology

The main basin of the lagoon consisted of pebbles between 0 and 1 m depth. The pebbles were colonised by a diatom film and green algae including *Enteromorpha intestinalis* (FiG). The gastropod mollusc *Potamopyrgus jenkinsi* was present in large numbers. Other species present included the tasselweed *Ruppia* sp. and blue-green algae.

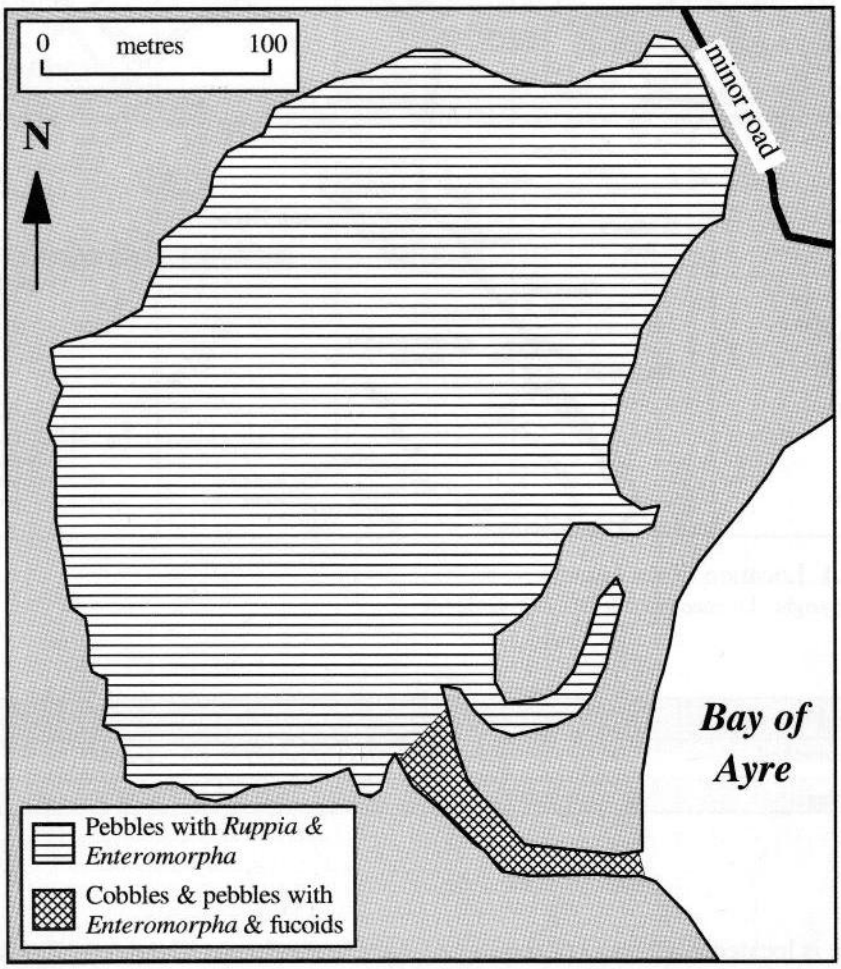

Figure 32.2 Indicative distribution of the main biotopes in the area (based on field survey information).

The channel connecting the lagoon to the sea had cobbles, pebbles and gravel between 0 and 0.2 m depth. The green alga *E. intestinalis* covered most of the stones with occasional bladder wrack *Fucus vesiculosus* plants in between (FChoG). Some of the fucoid plants had ectocarpoid brown algae growing epiphytically on the fronds.

Nature conservation

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

Human influences

A road runs around the north-western shore of the lagoon. At the time of survey in 1994 there was litter and evidence of waste dumping around the edges of the lagoon.

References and further reading

None available.

Compiled by: Kath Thorpe

33 Skaith, Mainland

Location		
Position (centre)	58°56.4'N 03°05.1'W	HY 375 065
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

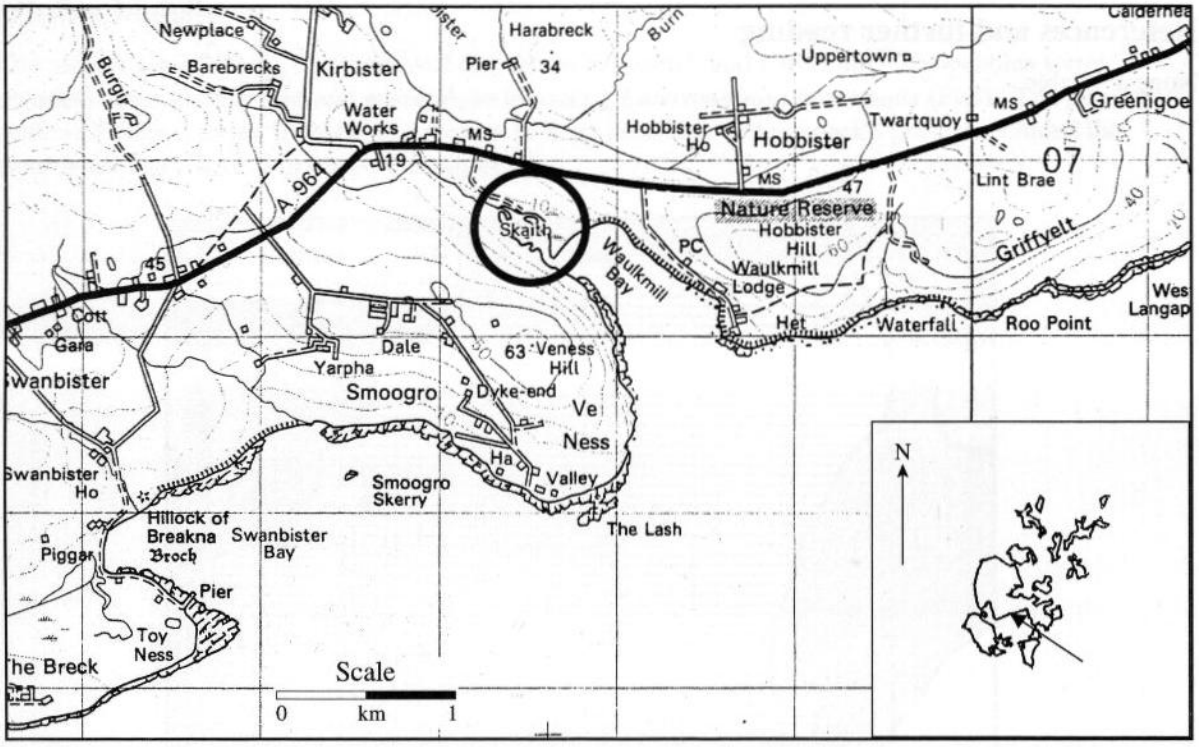

Figure 33.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Sublittoral	Recording	July 1994	MNCR survey 477

Introduction

Skaith is a large lagoon located at the head of Waulkmill Bay on the south coast of Mainland. The lagoon is connected to the sea via a channel with a sill at high tide level. The lagoon is 0.3 km in length, has a maximum depth of 0.3 m and a tidal range of about 0.2 m. Seawater enters the lagoon on most high tides, but the freshwater input from a stream at the western end of Skaith is high enough to keep the salinity as low as 2 ‰ at low tide. The salinity range was estimated to be between 2 ‰ and 18 ‰. There is very little effect from wave action and tidal currents affect only the small area around the entrance channel. The lagoon has a small track running along its northern edge; the remainder is surrounded by saltmarsh.

Physical features	
Physiographic type	Silled saline lagoon (sill at high tide level)
Area of lagoon	5 ha
Maximum length of lagoon	0.3 km
Bathymetry	Maximum depth 0.3 m below loch datum
Wave exposure	Ultra sheltered
Tidal streams	Very weak
Tidal range	0.2 m
Salinity	2-18 ‰ (estimated)

Marine biology

The lagoon, between 0 and 0.3 m depth, was a mixture of sand and gravel, covered by a thin layer of fine sand. The sediment was dominated by the green alga *Enteromorpha intestinalis* (FiG). Occasional clumps of the brackish-water wrack *Fucus ceranoides* were present and colonised by epiphytic growths of ectocarpoid brown algae. The sediment had a very sparse infauna and only the burrowing amphipod *Corophium volutator* was recorded.

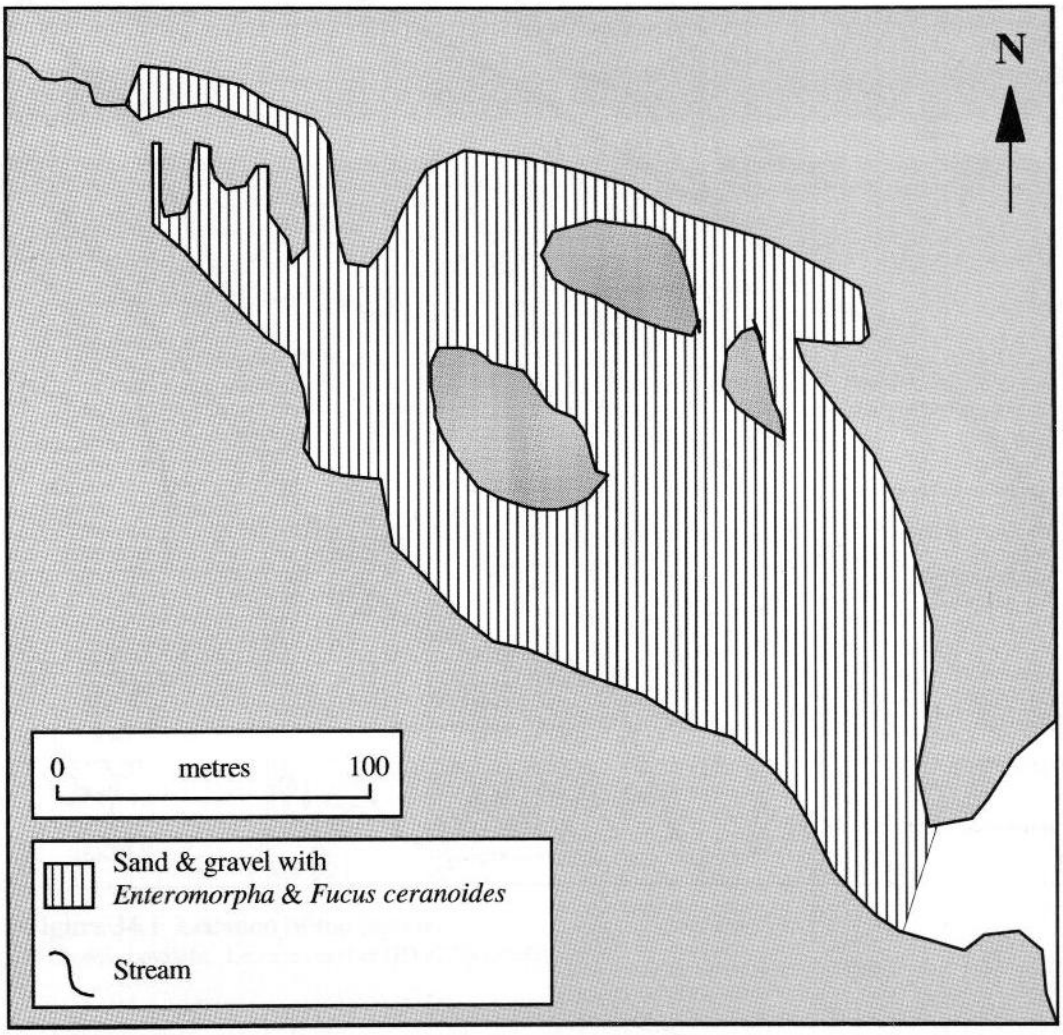

Figure 33.2 Indicative distribution of the main biotopes in the area (based on field survey information).

Nature conservation

Conservation sites			
Site name	*Designation*	*Centre grid ref.*	*Main features*
Waulkmill	SSSI	HY 377 065	Flora, entomology
Hobbister	RSPB reserve	HY 390 067	Ornithology

Human influences

There is a track along the northern shore of the lagoon. The lagoon is used for sea trout fishing; otherwise there appears to be very little human influence at the site.

References and further reading

None available.

Compiled by: Kath Thorpe

34 Loch of Stenness, Mainland

Location		
Position (centre)	58°59.9'N 03°12.5'W	HY 280 130
Administrative area	Orkney Islands	
Conservation agency/area	Scottish Natural Heritage	North

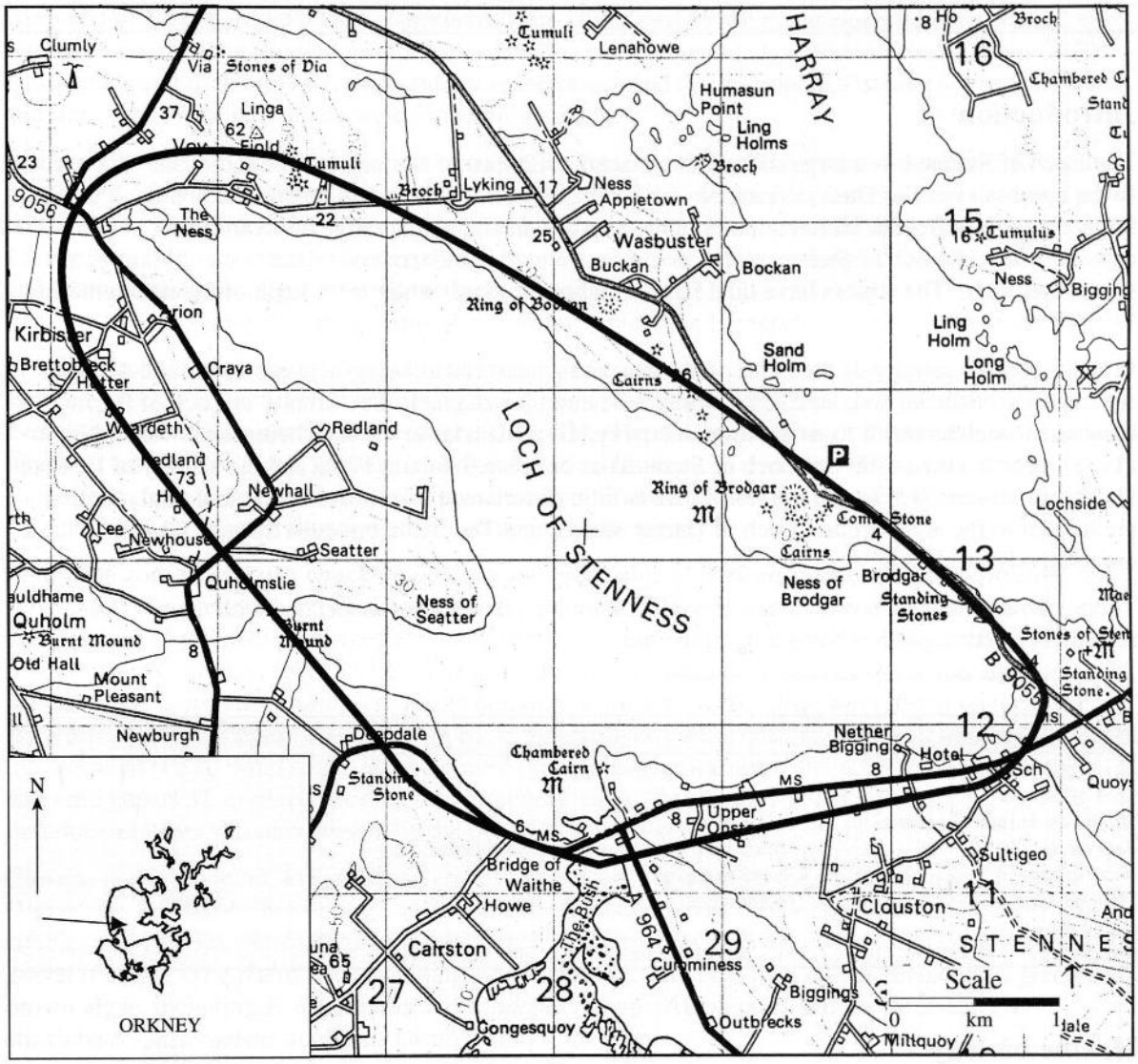

Figure 34.1 Location of the lagoon.

Marine biological surveys			
	Survey method	*Date of survey*	*Source*
Littoral	Recording	July 1938	Nicol (1938)
	Recording	April & August 1979	Palmer (1980)
	Recording	August 1987	Robson (1987)
	Recording	September 1993	Birkinshaw (1994)
	Recording	July 1994	MNCR survey 477
	Recording (stoneworts)	October 1994	Stewart (1995)
Sublittoral	Recording	July 1994	MNCR survey 477
	Core samples (6 x 0.0032 m²)	July 1994	MNCR survey 477
	Granulometric sample	July 1994	MNCR survey 477
	Recording (stoneworts)	October 1994	Stewart (1995)

Introduction

The Loch of Stenness is a large saline inlet located north-east of Stromness, Mainland, and it connects to the open sea via The Bush, a channel with a subtidal sill. At 6.2 km in length and 860 ha, it is the largest lagoon in Britain. It has a maximum depth of 5 m and a tidal range of about 0.3 m. At the eastern corner of Loch of Stenness, sluices connect it to the southern end of the Loch of Harray, a freshwater loch. The sluices have tidal flaps which prevent salt water from Loch of Stenness entering Loch of Harray, but allow a substantial amount of freshwater to enter Loch of Stenness.

In July 1994 the salinity of the Loch of Stenness was measured as being between 15 ‰ and 17 ‰ in the majority of the lagoon, and 22 ‰ close to the entrance channel. The salinity in Loch of Harray, close to the sluices was 1 ‰ at the time of survey, the remainder of the loch being freshwater. Nicol (1938) recorded the salinity of Loch of Stenness as between 9 ‰ and 17 ‰ and the salinity of Loch of Harray as between 0.5 ‰ and 2.8 ‰. There is little disturbance from wave action and tidal currents are limited to the areas around Loch of Harray sluices and The Bush, but even through The Bush these are relatively weak.

There are roads around some shores of the lagoon with a few houses associated with them. The remainder of the lagoon is backed by grassland.

Physical features	
Physiographic type	Saline lagoon inlet
Area of lagoon	860 ha
Maximum length of lagoon	6.2 km
Bathymetry	Maximum depth 5 m below loch datum
Wave exposure	Very sheltered
Tidal streams	Very weak
Tidal range	0.3 m
Salinity	15-22 ‰ (measured)

Marine biology

In the two western arms of Loch of Stenness, the sublittoral zone between 0 and 0.5 m depth was muddy. The habitat was dominated by large plants of the pondweed *Potamogeton* sp., coated by a mat of filamentous green algae including *Enteromorpha* spp. and *Cladophora liniformis* and filamentous brown algae (NVC A12). The burrowing amphipod *Corophium volutator* was present in large numbers in the sediment, mud snails *Hydrobia* sp. were present on the filamentous algae and mysid shrimps and gobies *Pomatoschistus* sp. swam amongst the plants. Between 1.5 and 3.5 m depth, the soft mud was dominated by a dense blanket of the filamentous green alga *Cladophora liniformis* covering pondweed *Potamogeton* sp. plants (FiG). Small sand gapers *Mya arenaria* were found in the sediment and numerous mud snails *Hydrobia* sp. and mussels *Mytilus edulis* were present amongst the algae.

At the western extremity of the north-western basin and extending along the northern edge of the lagoon, the sublittoral fringe zone, between 0 and 1 m depth, consisted of pebbles and cobbles on mud. This habitat was dominated by the serrated wrack *Fucus serratus* with the red algae *Mastocarpus stellatus* and *Polyides rotundus* growing on the stones (FChoG). In the sediment between the cobbles and pebbles, there were large numbers of sand gapers *M. arenaria* and a few lugworms *Arenicola marina*. Between 1.5 m and 3.5 m depth on the northern edge of the loch, this graded into boulders and large cobbles. Dense clumps of mussels *M. edulis* were present with red algae, including *Phyllophora pseudoceranoides*, *P. rotundus* and *M. stellatus* (PolFur). Stewart (1995) noted extensive beds of tasselweed *Ruppia cirrhosa* in this part of the loch at Voy and Mill of Voy.

In the south-western corner of the loch, the sublittoral fringe between 0.1 m height and 0.1 m depth consisted of cobbles and pebbles. The stones were dominated by the green algae *Enteromorpha intestinalis* with some *Cladophora liniformis* and the encrusting red alga *Hildenbrandia rubra* (FiG). Amphipods and flatworms were present under the stones and the gastropods *Potamopyrgus jenkinsi* and mud snails *Hydrobia ulvae* were found on the algae.

At the south-western corner of the loch two streams enter the loch, and between 0.1 and 0.3 m depth the bottom comprised cobbles and pebbles. The wracks *Fucus ceranoides* and *Fucus vesiculosus* grew on the stones here (FcerEnt). The red alga *Phyllophora pseudoceranoides* and the green alga *Cladophora rupestris* were present among the wracks. The encrusting red alga *Hildenbrandia rubra* and filamentous green algae covered the fucoid fronds.

Along the southern margins of the loch, between 0.1 and 2 m depth, there was a mixture of small boulders, cobbles, pebbles, gravel and fine sand. This habitat was dominated by a dense band of serrated wrack *F. serratus* with increasing quantities of the green alga *Cladophora sericea* coating everything in the deeper areas of the habitat (FChoG). The shallower areas of the habitat had bladder wrack *F. vesiculosus* plants growing amongst the serrated wrack *F. serratus*. The wrack fronds supported epiphytic brown algae including ectocarpoids and *Eudesme* sp. Numerous small mussels *M. edulis* and littorinid molluscs were found amongst the algae.

Below the zone of serrated wrack *F. serratus* and green alga *C. sericea*, between 2 and 4 m depth, the substratum was predominantly boulders among sediment. The sediment, between 2 and 3 m depth, was colonised by fennel pondweed *Potamogeton pectinatus* which was smothered by a dense growth of green alga *C. sericea* (NVC A12). The boulders were colonised by patches of the red algae *P. rotundus* and *P. pseudoceranoides*. Large numbers of mud snails *H. ulvae* were found on the algae. Between 3 and 4 m depth, the green alga *C. sericea* formed a thick coating over both the boulders and the sediment (FiG). Mud snails *H. ulvae* were present in large numbers and a few mussels *M. edulis* and sand gapers *M. arenaria* were also present attached to the algae. The red alga *P. pseudoceranoides* was also present on the boulders at this depth.

Close to the sluice gates, at the eastern end of Loch of Stenness and at the southern end of Loch of Harray, the substratum between 0.1 m height and 0.1 m depth was cobbles, pebbles and gravel. The cobbles and pebbles were colonised by the wrack *F. ceranoides* with tasselweed *Ruppia* sp. in the gravel (FcerX). The plants and remaining substratum were covered by a mat of filamentous green and brown algae, including *E. intestinalis* and *Cladophora* spp. Amphipods and the three-spined stickleback *Gasterosteus aculeatus* swam amongst the plants.

The southern end of Loch of Harray, in the immediate area of the sluices, consisted of muddy gravel between 0 and 0.3 m depth. It was sparsely colonised by pondweed *Potamogeton* sp. with a dense covering of brown alga *Cladophora* sp. and large numbers of the mollusc *P. jenkinsi* (NVC A12). Nicol (1938) also recorded tasselweed *Ruppia maritima*, water-milfoil *Myriophyllum alterniflorum* and shoreweed *Littorella lacustris* in this area. Palmer (1980) recorded periwinkles *Littorina saxatilis* near the sluices and the gastropod mollusc *P. jenkinsi* throughout Loch of Harray. The majority of Loch of Harray was colonised by freshwater vegetation (Palmer & Reynolds 1980; Robson 1987; Birkinshaw 1994).

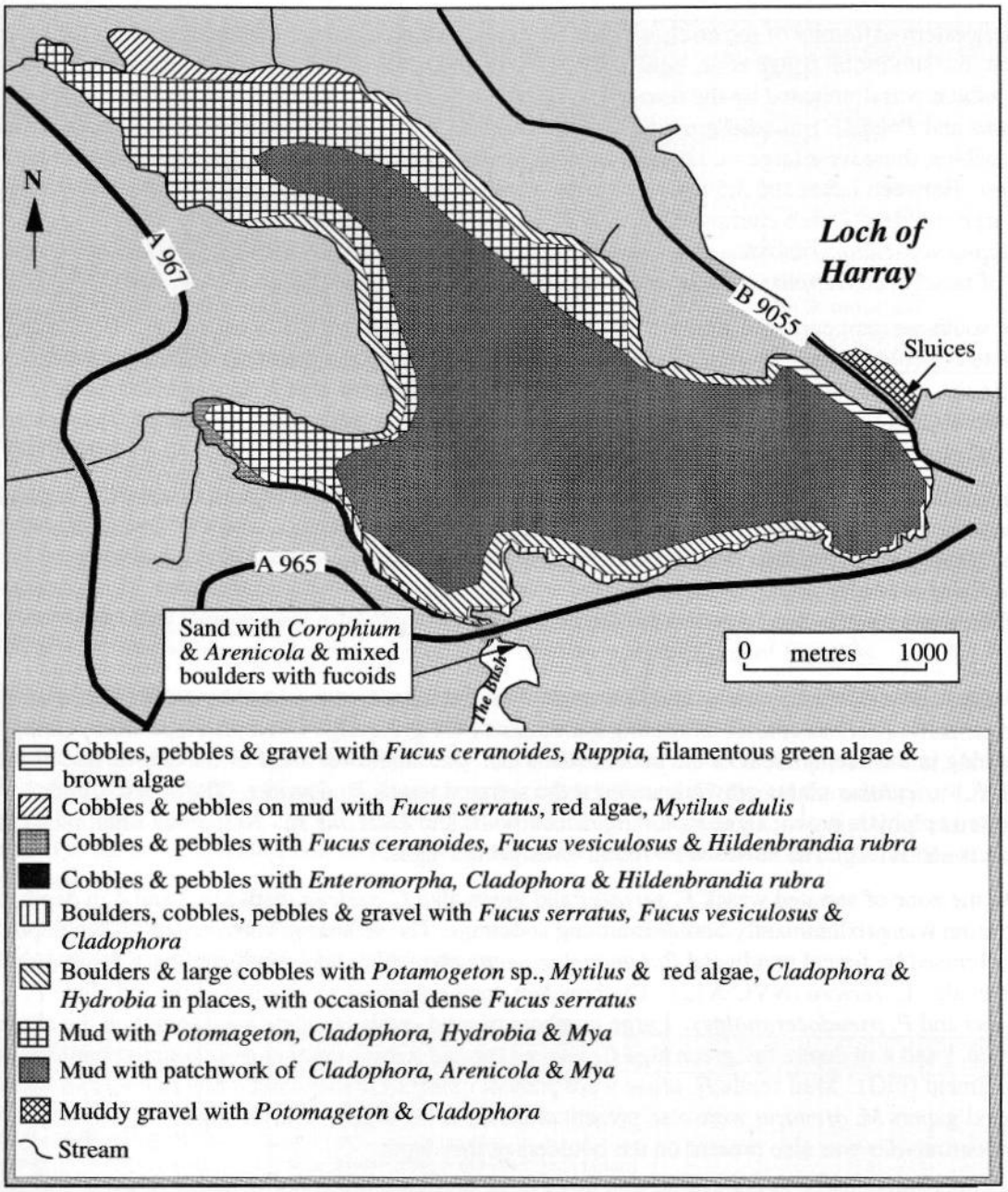

Figure 34.2 Indicative distribution of the main biotopes in the area (based on field survey information and cited literature).

The majority of the bottom of Loch of Stenness consisted of soft, flocculent mud which lies between 3 and 4 m depth. This habitat made up the majority of the southern end of the loch and extended about two-thirds of the way up the north-western arm where the sediment was deeper than 3 m. The mud was dominated by small sand gapers *M. arenaria* with numerous mud snails *H. ulvae* on the sediment surface. Dense algal mats, predominantly of *C. sericea*, covered the sediment surface (FiG). Large numbers of lugworms *A. marina* were also present. The salinity range of this habitat in July 1994 was between 15 ‰ and 17 ‰.

Just inside the loch, close to the entrance channel at a depth of 4 m, there were boulders on mud. The boulders were smothered by a covering of green alga *C. liniformis* (FiG). Small sand gapers *M. arenaria* and mud snails *H. ulvae* were present among the algae and a few shore crabs *Carcinus maenas* were present. The sides of some of the rocks were colonised by the red alga

P. pseudoceranoides. In some areas of the habitat there were rotting algae and drifting patches of serrated wrack *F. serratus*.

In the channel connecting Loch of Stenness to the Bay of Ireland, called The Bush, there was an intertidal zone of fine, well-sorted sand. The characterising species here were the amphipods *C. volutator* and lugworms *A. marina* with numerous mysid shrimps (HedMac.Are). Boulders lying on the sediment had a patchy cover of fucoids, predominantly serrated wrack *F. serratus*, but with some bladder wrack *F. vesiculosus* and knotted wrack *Ascophyllum nodosum* (FserX; FvesX). The boulders graded into cobbles and pebbles towards the lower shore. The fucoids were colonised by the epiphytic brown algae *Elachista* sp. and ectocarpoids. The green alga *Enteromorpha* sp. and filamentous algae formed dense patches of growth in places. There were very few animals associated with the rocks but mysid shrimps and gammarid amphipods were present.

In The Bush, for about 100 m on either side of the road bridge, serrated wrack *F. serratus* dominated boulders between 0 and 2 m depth. The fronds of the alga were colonised by epiphytes including the hydroids *Clava multicornis* and *Laomedea flexuosa* and encrusting bryozoans (FChoG). The vertical faces of the bridge pilings were densely covered by the red algae *P. pseudoceranoides* and *M. stellatus*. Large numbers of three-spined sticklebacks *G. aculeatus* were present.

Nature conservation

Conservation sites

Site name	*Designation*	*Centre grid ref.*	*Main features*
Lochs of Harray and Stenness	SSSI	HY 283 130	Flora, invertebrates, ornithology
Loch of Stenness	cSAC	HY 283 130	Lagoon habitat

Four Red Data Book species of stonewort, *Chara baltica*, *Chara canescens*, *Tolypella nidifica* and *Chara curta*, have been recorded in the loch, the last of which was washed in from Loch of Harray. Of these only *T. nidifica* was recorded during a recent survey of stoneworts in the loch by Stewart (1995).

Human influences

The Loch of Stenness is separated from the Loch of Harray by sluice gates. The original gates were put in place in 1968 to reduce the salinity in Loch of Harray and prevent blooms of the blue-green alga *Prymnesium parvum* which had resulted in fish deaths in 1963 and 1967. The original gates were replaced in 1994 and now operate automatically, instead of being operated manually at spring tides (Birkinshaw 1994).

Some nutrient enrichment of Loch of Harray has been reported. The nutrient input is from the feeder burns, sewage outfall from Dounby village to the north of the loch, silage effluent, nitrate and other agricultural run-off from the area around the loch. This has been associated with an explosion in the growth of Canadian pondweed *Elodea canadensis* (Sinclair *et al.* 1992).

Loch of Stenness and Loch of Harray are used for recreational fishing, predominantly for sea trout *Salmo trutta*. Loch of Harray is particularly renowned for its brown trout fishing.

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Compiled by: Kath Thorpe

Appendix A Biotopes present in lagoons in Shetland and Orkney

A hierarchical classification of the biotopes recorded in the lagoons in Shetland and Orkney, together with their higher types, is given below. The biotopes listed are derived from the MNCR national biotope classification (Connor *et al.* 1997a, b), except for IMU.LagMu for which a description is given below.

Higher code	*Biotope code*	*Biotope*
LR		**LITTORAL ROCK**
LR.L	YG	Yellow and grey lichens on supralittoral rock
MLR.Eph		**Ephemeral green or red seaweeds (freshwater or sand-influenced)**
MLR.Eph	Ent	*Enteromorpha* spp. on freshwater-influenced or unstable upper eulittoral rock
SLR.F		**Dense fucoids (stable rock)**
SLR.F	Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock
SLR.F	Fspi	*Fucus spiralis* on moderately exposed to very sheltered upper eulittoral rock
SLR.F	Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock
SLR.F	Asc.Asc	*Ascophyllum nodosum* on full salinity mid eulittoral rock
SLR.F	Asc.VS	*Ascophyllum nodosum* and *Fucus vesiculosus* on variable salinity mid eulittoral rock
SLR.F	Fserr	*Fucus serratus* on sheltered lower eulittoral rock
SLR.F	Fserr.T	*Fucus serratus*, sponges and ascidians on tide-swept lower eulittoral rock
SLR.F	Fserr.VS	*Fucus serratus* and large *Mytilus edulis* on variable salinity lower eulittoral rock
SLR.FX		**Fucoids, barnacles or ephemeral seaweeds (mixed substrata)**
SLR.FX	FvesX	*Fucus vesiculosus* on mid eulittoral mixed substrata
SLR.FX	AscX	*Ascophyllum nodosum* on mid eulittoral mixed substrata
SLR.FX	AscX.mac	*Ascophyllum nodosum* ecad. *mackaii* beds on extremely sheltered mid eulittoral mixed substrata
SLR.FX	FserX	*Fucus serratus* on lower eulittoral mixed substrata
SLR.FX	EphX	Ephemeral green and red seaweeds on variable salinity or disturbed eulittoral mixed substrata
SLR.FX	FcerX	*Fucus ceranoides* on reduced salinity eulittoral mixed substrata
SLR.MX		***Mytilus* (mussel) beds (mixed substrata)**
SLR.MX	MytX	*Mytilus edulis* beds on eulittoral mixed substrata

Higher code	*Biotope code*	*Biotope*
LS		**LITTORAL SEDIMENTS**
LMS.Zos		**Littoral *Zostera* (seagrass) beds**
LMS.Zos	Znol	*Zostera noltii* beds in upper to mid shore muddy sand
LMU.Sm		**Saltmarsh**
LMU.Sm	NVC SM13	*Puccinellia maritima*
LMU.Sm	NVC SM13	Sub-communities of *Puccinellia maritima* saltmarsh with *Limonium vulgare* and *Armeria maritima; Puccinellia maritima* with *Glaux maritima* co-dominant in species-poor vegetation; *Puccinellia maritima* with *Plantago maritima* and/or *Armeria maritima*
LMU.SMu		**Sandy mud shores**
LMU.SMu	HedMac	*Hediste diversicolor* and *Macoma balthica* in sandy mud shores
LMU.SMu	HedMac.Are	*Hediste diversicolor*, *Macoma balthica* and *Arenicola marina* in muddy sand or sandy mud shores
LMX		**Littoral mixed sediments**
LMX	Mare	*Mya arenaria* and polychaetes in muddy gravel shores
IR		**INFRALITTORAL ROCK**
MIR.SedK		**Sand or gravel-affected or disturbed kelp and seaweed communities**
MIR.SedK	HalXK	*Halidrys siliquosa* and mixed kelps on tide-swept infralittoral rock with coarse sediment
SIR		**SHELTERED INFRALITTORAL ROCK**
SIR.K		**Silted kelp (sheltered stable rock)**
SIR.K	Lsac	*Laminaria saccharina* on very sheltered infralittoral rock
SIR.K	Lsac.Ft	*Laminaria saccharina* forest on very sheltered upper infralittoral rock
SIR.K	Lsac.T	*Laminaria saccharina,* foliose red seaweeds, sponges & ascidians on tide-swept infralittoral rock
SIR.K	Lsac.Cod	Sparse *Laminaria saccharina* with *Codium* spp. and sparse red seaweeds on heavily silted very sheltered infralittoral rock
SIR.EstFa		**Estuarine faunal communities (shallow rock/mixed substrata)**
SIR.EstFa	MytT	*Mytilus edulis* beds on reduced salinity tide-swept infralittoral rock
SIR.Lag		**Submerged fucoids, green and red seaweeds (lagoonal rock)**
SIR.Lag	FChoG	Mixed fucoids, *Chorda filum* and green seaweeds on reduced salinity infralittoral rock
SIR.Lag	AscSAs	*Ascophyllum nodosum* with epiphytic sponges and ascidians on variable salinity infralittoral rock

Higher code	*Biotope code*	*Biotope*
SIR.Lag	PolFur	*Polyides rotundus* and/or *Furcellaria lumbricalis* on reduced salinity infralittoral rock
SIR.Lag	FcerEnt	*Fucus ceranoides* and *Enteromorpha* spp. on low salinity infralittoral rock
SS		**SUBLITTORAL SEDIMENTS**
IGS.Mrl		**Maerl beds (open coast/clean sediments)**
IGS.Mrl	Lgla	*Lithothamnion glaciale* maerl beds in tide-swept variable salinity infralittoral gravel
IGS.FaS		**Shallow sand faunal communities**
IMS.Sgr		**Seagrass beds (sublittoral/lower shore)**
IMS.Sgr	Zmar	*Zostera marina/angustifolia* beds in lower shore or infralittoral clean or muddy sand
IMS.Sgr	Rup	*Ruppia maritima* in reduced salinity infralittoral muddy sand
IMS.FaMS		**Shallow muddy sand faunal communities**
IMU.Ang		**Angiosperm communities (lagoons)**
IMU.Ang	NVC A12	*Potamogeton pectinatus* community
IMU.Ang	NVC S4	*Phragmites australis* swamp and reed beds
IMU.MarMu		**Shallow marine mud communities**
IMU.MarMu	AreSyn	*Arenicola marina* and synaptid holothurians in extremely shallow soft mud
IMU.LagMu		**Sublittoral lagoonal mud communities**
		Not currently described in national classification.
		Shallow, typically anoxic muddy sediments in areas of reduced, although stable, salinity (the salinity may vary annually). The sediment supports largely ephemeral faunal communities characterised by lugworm *Arenicola marina* and blue-green algae, together with other species, including shore crabs *Carcinus maenas*, mysid shrimps and tubificid oligochaetes, which occur commonly in lagoons.
CMU		**CIRCALITTORAL MUDS**
CMU	Beg	*Beggiatoa* spp. on anoxic sublittoral mud
IMX.KSwMx		***Laminaria saccharina* (sugar kelp) and filamentous seaweeds (mixed sediment)**
IMX.KSwMx	LsacX	*Laminaria saccharina, Chorda filum* and filamentous red seaweeds on sheltered infralittoral sediment
IMX.KSwMx	FiG	Filamentous green seaweeds on low salinity infralittoral mixed sediment or rock
IMX.FaMx		**Shallow mixed sediment faunal communities**

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Appendix B

Biotopes present in each lagoon in Shetland and Orkney

The biotopes recorded in each lagoon, using the data listed in Table 1, are summarised below. Biotope codes are given according to MNCR classification version 97.06 (Connor *et al.* 1997a, b), except for LagMu (see Appendix A).

Shetland lagoons

Lagoon	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
Littoral rock																		
LR					•													
YG													•					
Pel				•						•	•		•					•
Fspi				•	•				•	•	•		•			•		•
Asc.Asc										•								
Asc.VS													•					
Fserr													•					
Fserr.T								•					•					
Fserr.VS				•														
FvesX				•														•
AscX									•		•							
AscX.mac													•					
FserX				•					•									•
FcerX					•					•								
MytX										•								
Littoral sediment																		
Znol												•						
NVC SM13																		•
HedMac.Are										•								
Sublittoral rock																		
Lhyp.TFt								•										
SIR													•					
HalXK									•				•	•				
Lsac.Ft											•		•					
Lsac.T									•									
MytT														•				
Lag		•																
FChoG				•						•		•	•	•				•
AscSAs											•							
PolFur													•	•				
FcerEnt	•																	
Sublittoral sediment																		
Lgla													•					
FaS																•		
Zmar												•	•					
Rup					•	•	•						•		•		•	•
FaMS				•					•	•	•		•					•
NVC A12			•															
NVC S4	•																	

Shetland lagoons - continued

Lagoon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
MarMu											•							
AreSyn									•				•					
LagMu													•					
Beg													•					
LsacX									•			•	•					
FiG					•	•		•	•			•	•	•	•			
FaMx											•		•					

Orkney lagoons

Lagoon	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Littoral rock																
Ent					•											
Pel							•									
Fspi					•		•				•					
Asc.VS											•					
Fserr.T											•					
Fserr.VS							•									
FvesX							•									•
FserX													•			•
EphX			•		•				•	•	•					
FcerX									•							•
Littoral sediment																
HedMac.Are																•
Mare											•					
Sublittoral rock																
HalXK						•										
Lsac.Ft													•			
Lsac.Cod						•										
FChoG							•							•		•
PolFur																•
FcerEnt									•							•
Sublittoral sediment																
Zmar						•					•					
Rup	•				•			•	•							
FaMS					•		•				•		•			
NVC A12																•
FiG	•	•	•	•	•	•		•		•		•	•	•	•	•

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Appendix C — Summary of physical features of lagoons in Shetland and Orkney

Key: Extent of freshwater/seawater input: *Very limited **Limited ***Large ****Very large

Seawater levels: (M)HW = (mean) high water (M)LW = (mean) low water

Lagoon no.	*Site name*	*Physiographic type*	*Area (ha)*	*Max. depth (m)*	*Tidal range (m)*	*Seawater input*	*Extent of seawater input*	*Freshwater input*	*Extent of freshwater input*	*Salinity range (‰) (est. = estimate)*	*Salinity regime*
1	Easter Loch, Unst	Sluiced	5	0.6	Negligible	Culvert at HW	**	Stream	*** (*)	5-8 est. within 4 m of inflow pipe. Rest freshwater	Stable
2	South Wick of Sound lagoons, Yell	Percolation	0.5 each	0.2	Negligible	Over-topping & percolation	*	Land drainage	*	30-35 est.	Stable
3	Mussel Loch, Yell	Isolated	9	0.5	Negligible	Over-topping	*	Land drainage	***	0.5-5 est.	Stable
4	Ness of Galtagarth lagoon, Yell	Silled	11	2.5	3	Through tidal rapids at LW	***(*)	Land drainage	*	30-35 est.	Highly stable
5	Houb at Gutcher, Yell	Sluiced	4	0.5	0.3	2 culvert pipes at HW	***	Stream	*	30-35 est.	Highly stable
6	Wick of North Garth lagoon, Yell	Percolation	1	0.3	0.3	Percolation & some over-topping	**	Stream	**	30-35 est.	Stable
7	Loch of the North Haa, Mainland	Percolation	0.75	1	0.3	Percolation	***	Land drainage	*	30-35 est.	Stable
8	Loch of Queyfirth, Mainland	Silled	16	2	1	Silled channel at mid tide level	***	Streams	***	18-30 est.	Variable. Halocline in west in 1993
9	The Houb, Fora Ness, Mainland	Silled	17	3	3	Tidal rapids at LW	***(*)	Streams	**	30-35 est.	Stable

Lagoon no.	*Site name*	*Physiographic type*	*Area (ha)*	*Max. depth (m)*	*Tidal range (m)*	*Seawater input*	*Extent of seawater input*	*Freshwater input*	*Extent of freshwater input*	*Salinity range (‰) (est. = estimated)*	*Salinity regime*
10	The Houb, Fugla Ness, Mainland	Silled	23	0.4	3	Channel at MLW	***	Stream	**	30-35 est.	Stable. Variable near stream entrance
11	Minn, Mainland	Inlet	18	6	2	Silled channel below MLW	***	Streams	**	30-35 est.	Stable
12	Loch of Hellister, Mainland	Sluiced	26	7	0.5	Four culverts at mid-tide level	***	Streams	**	30-35 est.	Stable. Variable near stream entrance
13	The Vadills, Mainland	Inlet	61	6	2.5	Subtidal channel	****	Streams	***	18-35 est.	Variable
14	Loch of Strom, Mainland	Inlet	127	4.5	0.5	Tide-swept narrows with subtidal sill	****	Streams	****	18-35 est.	Salinity gradient along loch
15	Houb of Haggrister, Mainland	Percolation	2	0.5	Negligible	Percolation & over-topping	**	Stream	**	18-30 est.	Variable
16	Laxo Voe lagoon, Mainland	Silled	4	0.3	1.5	Channel at MLW	***	Streams	****	18-30 est.	Variable
17	Vadill of Garth lagoon, Mainland	Silled	9	0.3	0.2	Via constricted channel at MHW, some over-topping	**	Stream	***	18-30 est.	Salinity gradient across lagoon
18	Saltness lagoon, Mainland	Silled	1	0.3	1	Channel at MHW	**	Stream	***	18-30 est.	Variable
19	Quivals Loch, Sanday	Sluiced	0.35	0.4	0.2	Culvert below HW	***	Land drainage	*	30-35	Stable
20	Point of Nevin lagoon, Sanday	Silled	1	0.3	Negligible	Channel at HW	*	Land drainage	*	34	Highly stable
21	Little Sea lagoon, Sanday	Sluiced	1	0.3	0.2	Channel with culvert at HW	*	Land drainage	*	10-25	Highly stable
22	Bay of Brough lagoons, Sanday	Percolation	1.5	0.75 each	Negligible	Percolation & over-topping	**	Land drainage	*	9-33	Highly stable
23	Bay of Ham lagoon, Rousay	Silled	2	1	Negligible	Sill at HW; some percolation	***	Land drainage	*	35	Highly stable

Lagoon no.	*Site name*	*Physiographic type*	*Area (ha)*	*Max. depth (m)*	*Tidal range (m)*	*Seawater input*	*Extent of seawater input*	*Freshwater input*	*Extent of freshwater input*	*Salinity range (‰) (est. = estimated)*	*Salinity regime*
24	Oyce of Huip, Stronsay	Inlet	31	1.5	0.5	Subtidal channel	*****	Land drainage	*	30-35 est.	Highly stable
25	The Ouse, Ling Holm, Shapinsay	Inlet	15	3	1	Subtidal channel	***	Land drainage	*	30-35 est.	Stable
26	Vasa Loch, Shapinsay	Percolation	3	0.4	Negligible	Percolation & over-topping	**	Land drainage	**	5	Stable
27	Oyce of Isbister, Mainland	Silled	8	0.4	0.5	Channel at mid-tide level	**	Stream	***	2-18 est.	Salinity gradient across lagoon
28	Point of Backaquoy lagoon, Mainland	Silled	1.5	0.4	<0.3	Channel at mid-tide level	****	Land drainage	*	28	Highly stable
29	The Ouse, Finstown, Mainland	Inlet	11	1.5	1.5	Subtidal channel	***	Stream	***	5-35	Salinity gradient across lagoon
30	Kirkwall lagoon (Peedie Sea), Mainland	Sluiced	10	0.5	Negligible	Sluice gates at HW and pipes	**	Land drainage and cooling water from power station	***	22-35	Salinity gradient across lagoon
31	Long Ayre lagoon, Mainland	Silled	10	2.5	0.5	Channel at mid-tide level	**	Land drainage	*	30-35 est.	(Highly) stable
32	Loch of Ayre, Mainland	Sluiced	7	1	Negligible	Culvert at HW	**	Stream	**	34	Variable. May become hyper-saline occasionally
33	Skaith, Mainland	Silled	5	0.3	0.2	Channel with sill at HW	***	Stream	**	2-18 est.	Variable
34	Loch of Stenness, Mainland	Inlet	860	5	0.3	Subtidal channel	****	Via sluices from Loch of Harray; land drainage	***	15-22	Salinity gradient across loch

Appendix D Species recorded from lagoons in Shetland and Orkney

All taxa recorded during the surveys given in Table 1 are listed below; records of species noted in the text but not shown here come from additional published sources noted in the individual area summaries. Species nomenclature follows Howson & Picton (1997); that for higher plants follows Stace (1991) and that for lichens follows Purvis *et al.* (1992).

Numbers refer to the area summaries as follows:

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		

	Shetland	*Orkney*
Porifera		
Porifera indet.		24
Leucosolenia sp.	13	
Leucosolenia botryoides	9, 11, 13, 14	24, 29
Scypha ciliata	9	24
Grantia compressa		24
Halichondria sp.	12	
Halichondria bowerbanki	13	
Halichondria panicea	10, 11, 12, 13, 14	24, 29
Esperiopsis fucorum	13	29
Haliclona sp.		24
Cnidaria		
Aurelia aurita	13, 14	
Hydractinia echinata	8, 9, 11, 13	
Clava multicornis	13	34
Dynamena pumila	11	29
Laomedea flexuosa	13	25, 31, 34
Obelia geniculata	9, 11, 13	
Actinia equina		24
Anemonia viridis		24
Urticina felina	9	
Haliplanella lineata		25, 29
Metridium senile	13, 14	
Edwardsia sp.	13	
Edwardsia claparedii	10, 13	
Platyhelminthes		
Platyhelminthes indet.		26, 28, 34

	Shetland	*Orkney*
Nemertea		
Nemertea indet.	14	
Lineus sp.	18	23, 24, 25, 29
Nematoda		
Nematoda indet.	9	25
Annelida		
Polychaeta indet.		25
Aphroditoidea indet.	13	
Harmothoe sp.	12, 13	
Harmothoe imbricata	14	
Phyllodoce sp.	13	
Syllidae sp.	9	
Exogone naidina	14	
Hediste diversicolor	10	20, 34
Nephtys hombergii	14	
Scoloplos armiger	9, 14	24
Malacoceros fuliginosus	10, 18	25
Pseudopolydora pulchra		24
Pygospio elegans	10, 15, 18	23, 24, 25, 29, 31, 34
Chaetozone setosa	14	
Capitella capitata	10, 18	23, 24, 25, 29, 34
Mediomastus fragilis	14	24, 34
Arenicola marina	4, 8, 9, 10, 11, 12, 13, 14, 15, 18	20, 21, 23, 25, 29, 31, 34
Maldanidae indet.	9	
Ampharete baltica	14	
Terebellidae indet.	9, 13	29
Lanice conchilega	11	
Polycirrus medusa	14	
Branchiomma bombyx	13	
Fabricia sabella	10	24, 25, 29
Pomatoceros sp.	9, 13	
Pomatoceros triqueter	8, 9, 11, 13, 14	29
Filograna implexa	13	
Spirorbidae indet.	8, 9, 10, 11, 12, 13	23, 24, 29, 31
Spirorbis spirorbis	10	
Oligochaeta indet.	18	
Paranais litoralis		23, 25, 28, 31
Tubificidae indet.	10	
Heterochaeta costata	10, 15	20, 24, 25, 29, 31, 34
Tubificoides benedii	18	23, 24, 25, 26, 29, 31, 34
Tubificoides pseudogaster		34
Enchytraeidae indet.	10, 15	24, 25, 28, 29, 31
Chelicerata		
Halacaridae indet.		25
Crustacea		
Verruca stroemia	9	23
Semibalanus balanoides	4, 8, 9, 10, 11, 14, 16, 18	25, 29
Balanus balanus	13	
Balanus crenatus	9, 11, 13, 14	31, 34
Mysidae indet.	7, 8, 10, 11, 12, 13, 14	19, 21, 23, 24, 26, 27, 29, 30, 31, 34
Amphipoda indet.	2, 4, 5, 9, 10, 12, 13, 14, 17, 18	26, 34
Harpinia antennaria	9	
Lysianassidae indet.	9	
Acanthonotozomatidae indet.	13	
Iphimedia sp.	9	
Ampelisca sp.	9	
Ampelisca brevicornis		24
Bathyporeia pilosa		25
Gammaridae indet.	3, 5, 7, 15, 16, 18	23, 25, 27, 28, 29, 30, 34

	Shetland	*Orkney*
Gammarus duebeni	14	26
Gammarus zaddachi	15	28, 31
Corophium sp.	9, 13	34
Corophium crassicorne	14	
Corophium volutator		19, 20, 21, 27, 29, 31, 33, 34
Caprellidae indet.	9, 13	
Caprella acanthifera		24
Jaera sp.	16	
Idotea sp.	13	23
Idotea baltica	8	23, 24, 29
Ligia oceanica		25
Tanais dulongii		25
Pandalus montagui	13, 14	
Crangon crangon	10, 13, 14	
Pagurus bernhardus	4, 8, 9, 10, 11, 13, 14	24
Hyas araneus	13	
Hyas coarctatus	13	
Macropodia rostrata	13, 14	
Cancer pagurus	10, 13	
Liocarcinus depurator	9, 11, 13	
Carcinus maenas	4, 5, 8, 9, 10, 11, 12, 13, 14, 16, 18	24, 25, 29, 31, 34
Insecta		
Chironomida indet.	2, 10, 13, 15, 18	23, 25, 26, 28, 29, 30, 31, 34
Anurida maritima	11	25
Mollusca		
Polyplacophora indet.	10, 13	
Leptochiton asellus	13	
Lepidochitona cinerea	8, 10, 11	23, 31
Acanthochitona crinita	13	
Gastropoda indet.	3, 12, 13, 14	
Tectura testudinalis	10, 12	29
Tectura virginea	13	
Patella vulgata	4, 8, 10, 11, 18	25
Helcion pellucidum	13	
Gibbula cineraria	8, 9, 13	24
Littorininae indet.	13	
Littorina sp.		20
Littorina littorea	4, 8, 9, 10, 11, 12, 13, 14, 18	30, 31, 34
Littorina mariae	4, 18	
Littorina saxatilis	4, 9, 10, 11, 12, 13, 18	23, 25, 29, 34
Littorina obtusata/mariae	9, 10, 11, 12, 13	23, 24, 25, 29
Littorina saxatilis tenebrosa	12, 13	23, 29, 34
Skeneopsis planorbis	13	
Hydrobia sp.		34
Hydrobia neglecta	12	
Hydrobia ulvae	13	27, 29, 34
Ventrosia ventrosa	12	20
Potamopyrgus jenkinsi		32, 34
Rissoidae indet.	8, 12	
Pusillina sarsi	12, 14	
Nucella lapillus	11, 13	
Buccinum undatum	9, 10, 13, 14	24, 29
Neptunea antiqua	13	
Hinia incrassata	13	
Opisthobranchia indet.	13	
Retusa sp.		23, 25
Elysia viridis	8, 9, 13, 14	
Alderia modesta		23
Akera bullata	13, 14	24, 29
Onchidoridae indet.	13	
Acanthodoris pilosa	9	29

	Shetland	*Orkney*
Onchidoris sp.		31
Onchidoris muricata	13	
Limacia clavigera	13	
Cadlina laevis	8, 13	
Archidoris pseudoargus	13	
Cuthona amoena	13	
Facelina sp.	13	
Favorinus branchialis	8	
Mytilus edulis	4, 8, 10, 12, 13, 14, 15, 16, 18	23, 29, 31, 34
Musculus sp.	13	
Musculus discors	14	
Modiolus sp.	13	
Modiolus modiolus	12, 13, 14	
Chlamys varia	13	
Aequipecten opercularis	13	
Pecten maximus	11, 13	
Anomia ephippium	9	
Pododesmus patelliformis	13	
Mysella bidentata	9	
Parvicardium ovale	14	
Cerastoderma edule	4, 8, 9, 10, 11, 18	24, 25
Cerastoderma glaucum		29, 34
Ensis sp.	13	
Ensis ensis		31
Abra nitida	14	
Venerupis senegalensis	13	
Mya arenaria	5, 8, 9, 13, 14, 16	29, 34
Mya truncata	13	
Hiatella arctica	14	
Bryozoa		
Bryozoa indet.	13	34
Alcyonidium sp.		23
Alcyonidium gelatinosum	13	25, 29
Alcyonidium hirsutum	8, 12, 13, 14	24
Alcyonidium mytili	13	
Alcyonidium parasiticum	9	
Flustrellidra hispida	13	25, 29
Umbonula littoralis	9, 13	
Parasmittina trispinosa	13	
Cellepora pumicosa	13	
Scruparia sp.	13	
Scruparia chelata	13	
Membranipora membranacea	10, 13	34
Conopeum seurati		30, 34
Electra crustulenta		34
Electra pilosa	10, 13, 14	
Membraniporella nitida	13	
Scrupocellaria sp.	13	
Scrupocellaria reptans	13	
Scrupocellaria scruposa	13	
Bryozoa indet. (crusts)		34
Phoronida		
Phoronis sp.	13	
Echinodermata		
Antedon bifida	13	
Luidia ciliaris	8	
Solaster endeca	13	
Crossaster papposus	13, 14	
Henricia sp.	13, 14	
Asterias rubens	4, 8, 9, 10, 11, 12, 13, 14	29, 31

	Shetland	*Orkney*
Ophiothrix fragilis	11, 13	
Ophiopholis aculeata	13	
Amphipholis squamata	13	
Ophiura affinis	13, 14	
Ophiura albida	13	
Psammechinus miliaris	13	
Echinus esculentus	13	
Leptopentacta elongata	13	
Leptosynapta inhaerens	13	24
Leptosynapta minuta	13	
Tunicata		
Clavelina lepadiformis	9, 13	24, 31
Aplidium pallidum		24
Aplidium punctum	13	
Diplosoma listerianum	9, 13	
Diplosoma spongiforme	13	
Lissoclinum perforatum	13	
Ciona intestinalis	13, 14	31
Corella parallelogramma	8, 10, 13, 14	
Ascidiella aspersa	8, 9, 12, 13, 14	29
Ascidiella scabra	9, 10, 13, 14	31
Ascidia mentula	8, 9, 11, 13, 14	
Dendrodoa grossularia	13	29
Botryllus schlosseri	13	
Botrylloides leachi	11, 13	
Pisces		
Osteichthyes indet.	7	
Anguilla anguilla	8, 13	29, 34
Salmo salar	8, 9	
Salmo trutta	13	29, 34
Gadidae indet.	13	
Gaidropsarus vulgaris		34
Pollachius virens	13	
Gasterosteus aculeatus	9, 10, 13	19, 21, 24, 27, 31, 34
Spinachia spinachia	5, 6, 13, 15	
Syngnathidae indet.	13	
Syngnathus sp.	13	
Syngnathus acus	11, 13	
Syngnathus rostellatus	14	
Myxocephalus scorpius	13	
Taurulus bubalis	9	
Cyclopterus lumpus	13	
Ctenolabrus rupestris	9	
Pholis gunnellus	13, 14	
Gobius niger	13	
Gobiusculus flavescens	9, 13, 14	
Pomatoschistus sp.		34
Pomatoschistus minutus	9, 10, 13, 14	
Pomatoschistus pictus	13	
Pleuronectiformes indet.	17	
Pleuronectidae indet.	1, 4, 5, 16	
Limanda limanda	5, 10, 13	
Platichthys flesus	9, 13	
Pleuronectes platessa	4, 9	25, 29, 34
Cyanophycota		
Cyanophycota indet.	6, 7	31, 32
Beggiatoa sp.	4, 8, 9, 11, 13, 14	29
Blue-green algae indet.		20, 23

	Shetland	*Orkney*
Rhodophycota		
Rhodophycota indet.		34
Erythrotrichia sp.	9	
Porphyra sp.	9, 10, 16	
Porphyra amethystea		29
Porphyra miniata		25, 29
Porphyra umbilicalis	9	
Audouinella sp.		29
Rhodothamniella floridula	9	
Bonnemaisonia hamifera	9, 13	
Trailliella intricata	13	24
Gelidium pusillum	11	
Palmaria palmata	13	29
Dilsea carnosa	13	
Dumontia contorta	9, 12	24, 29
Peyssonnelia sp.	13	
Hildenbrandia sp.		25, 34
Hildenbrandia rubra	4, 5, 10, 11, 15	34
Corallinaceae indet.	10, 11, 12, 13	24, 29, 31, 34
Corallina officinalis	9, 13	24
Lithothamnion glaciale	13	24, 29
Gracilaria gracilis	13	
Ahnfeltia plicata	12	34
Phyllophora crispa	13	
Phyllophora pseudoceranoides	13	34
Coccotylus truncata	13	
Mastocarpus stellatus	4, 8, 9, 10, 11, 12, 13, 14, 15, 18	24, 31, 34
Chondrus crispus	9, 11, 12, 13, 14	23, 29, 34
Polyides rotundus	4, 8, 9, 10, 11, 12, 13, 14	24, 31, 34
Plocamium cartilagineum	13	
Furcellaria lumbricalis	9, 12, 13, 14	29
Cystoclonium purpureum	13	23, 29
Rhodophyllis divaricata	13	
Chylocladia verticillata	13	
Lomentaria articulata	11	
Lomentaria clavellosa	13	
Bornetia secundiflora	13	
Callithamnion sp.	9, 13	
Ceramium sp.	4, 8, 9, 10, 11, 13, 14	24, 29, 34
Ceramium nodulosum	9, 13	
Ceramium strictum	13	
Ceramium botryocarpum		23
Compsothamnion thuyoides	13	
Griffithsia corallinoides	13	
Halurus flosculosus	13	
Ptilota gunneri	13	
Cryptopleura ramosa	13, 14	
Delesseria sanguinea	14	
Membranoptera alata	11, 13	
Nitophyllum punctatum	13	
Phycodrys rubens	13	
Heterosiphonia plumosa	13	
Polysiphonia sp.	13	31, 34, 24
Polysiphonia elongata	9, 11, 13	
Polysiphonia fibrata		34
Polysiphonia lanosa	10, 11, 18	25, 29, 34
Polysiphonia nigra	12	
Polysiphonia fucoides	8	
Polysiphonia opaca	13	
Rhodomela confervoides	14	24

	Shetland	*Orkney*
Chrysophycota		
Diatoms - colonial	5, 13, 18	30, 34
Diatoms - film	13	31
Chromophycota		
Chromophycota indet.	12	
Ectocarpaceae indet.	4, 5, 9, 10, 12, 13, 14	25, 27, 29, 31, 32, 33, 34
Spongonema tomentosum	12	
Ralfsia sp.		29
Elachista sp.		25, 29, 34
Leathesia difformis	9	24
Stilophora tenella	9, 13, 14	34
Stilopsis lejolisii		23, 29
Chordaria flagelliformis	13	
Eudesme virescens	9, 12, 13	34
Liebmannia sp.	10	
Mesogloia vermiculata	10, 13	
Sphacelaria sp.	4, 5, 6, 7, 12, 13, 15	31, 34
Sphacelaria plumosa	13	
Cladostephus spongiosus		24
Dictyota dichotoma	13	23
Desmarestia aculeata	8, 9, 13, 14	
Desmarestia ligulata		34
Desmarestia viridis	9, 12, 13, 16	29
Stictyosiphon sp.	14	
Stictyosiphon tortilis		34
Striaria attenuata		23, 25, 29, 31, 34
Asperococcus sp.	9, 13, 15	
Asperococcus fistulosus	13	24, 25
Asperococcus bullosus	7, 13, 14	
Dictyosiphon sp.	5, 10, 11, 13, 18	34
Dictyosiphon chordaria	14	
Dictyosiphon foeniculaceus	9, 13	
Colpomenia peregrina	9, 13	
Scytosiphon lomentaria	12, 18	
Chorda filum	4, 8, 9, 10, 11, 12, 13, 14, 18	24, 25, 29, 31, 34
Laminaria sp.	13	24
Laminaria digitata	8, 10, 13, 14	
Laminaria hyperborea	8, 9, 13, 14	
Laminaria saccharina	8, 9, 11, 13, 14	24, 31
Saccorhiza polyschides	13	
Alaria esculenta	8, 9	
Ascophyllum nodosum	4, 9, 10, 11, 12, 13, 14, 15, 18	25, 29, 34
Ascophyllum nodosum ecad *mackaii*	13	
Fucus sp.	5, 9	34
Fucus ceranoides	1, 5, 10, 13, 16, 17	27, 33, 34
Fucus cottonii	18	
Fucus serratus	4, 8, 9, 10, 12, 13, 14, 18	23, 25, 29, 31, 34
Fucus spiralis	4, 5, 9, 10, 11, 13, 16, 17, 18	21, 25, 29
Fucus vesiculosus	4, 5, 8, 10, 11, 13, 18	20, 23, 25, 28, 29, 32, 34
Pelvetia canaliculata	4, 11, 13, 18	21, 25
Halidrys siliquosa	11, 13, 14	24
Filamentous brown algae indet.		25, 34
Chlorophycota		
Chlorophycota indet.	2, 4, 5, 6, 12, 13, 14, 16, 18	34
Ulothrix sp.		20, 25, 30
Ulothrix flacca	13	
Ulothrix speciosa	9	
Percursaria percursa	4, 12, 18	20, 23, 27, 28, 29
Enteromorpha sp.	3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18	23, 29, 34
Enteromorpha clathrata	12, 13	25

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Enteromorpha compressa	4	
Enteromorpha flexuosa	13	
Enteromorpha intestinalis	1, 5, 7, 9, 13, 15, 17, 18	19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34
Enteromorpha muscoides	9	
Enteromorpha prolifera	12, 18	24, 25, 26, 27, 28, 29
Enteromorpha ralfsii		34
Ulva sp.	5, 8, 9, 10, 11, 12, 13, 16	24, 25
Ulva lactuca	9	
Blidingia sp.	12	25
Blidingia minima	5	24, 30
Monostroma sp.	5	
Monostroma oxyspermum	18	29
Rosenvingiella polyrhiza	8, 13, 14	
Spongomorpha aeruginosa	12, 13, 14, 17	
Spongomorpha arcta		23, 27
Chaetomorpha sp.	5, 6	
Chaetomorpha capillaris	9	
Chaetomorpha linum	5, 8, 15	19, 20, 21, 23, 30, 24
Cladophora sp.	5, 9, 13, 14	21
Cladophora battersii	13	
Cladophora flexuosa		34
Cladophora liniformis		23, 24, 29, 31, 34
Cladophora pellucida	13	
Cladophora rupestris	5, 9, 12, 13	24, 25, 29, 34
Cladophora sericea		34
Cladophora vagabunda	6	
Rhizoclonium sp.	8	
Rhizoclonium riparium	4, 8, 9, 12, 13, 14, 15, 18	19, 20, 21, 23, 24, 25, 29, 33, 34
Derbesia sp.	9	19, 21
Derbesia marina		23, 25, 26, 34
Codium sp.	8, 11	24
Codium fragile subsp. Atlanticum	9, 11, 13, 14	
Codium tomentosum		24
Encrusting green algae indet.	6	
Filamentous green algae indet.	10, 12, 13, 14, 17, 18	31
Xanthophyta		
Vaucheria sp.		23
Angiospermae		
Zostera marina	12, 13	24, 29
Zostera noltii	12	
Ruppia sp.	5, 9, 13, 18	19, 23, 26, 27, 29, 32, 34
Ruppia maritima	5, 6, 7, 13, 15, 17, 18	
Potamogeton sp.	3	32, 34
Potamogeton pectinatus		34
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