NATURE CONSERVANCY COUNCIL

SEASEARCH

Marine Nature Conservation Review

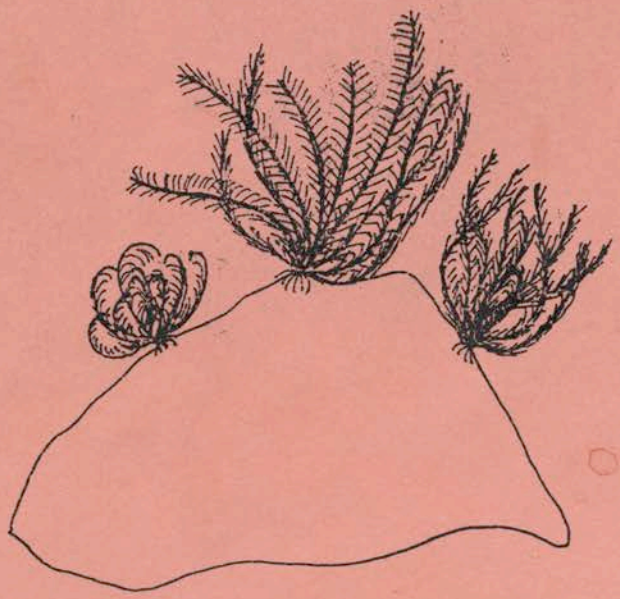
MARINE CONSERVATION SOCIETY

Seasearch is run by the Marine Conservation Society on behalf of
the Nature Conservancy Council as part of the Marine Nature Conservation Review of Great Britain.

SEASEARCH SURVEY OF GRUINARD BAY LOCH EWE AND LOCH GAIRLOCH

Susan Gubbay

1990



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A Report to the Nature Conservancy Council
from Marine Biological Consultants Ltd.,
9, Gloucester Road, Ross-on-Wye,
Herefordshire, HR9 5BU.

SEASEARCH SURVEY OF GRUINARD BAY, LOCH EWE AND LOCH GAIRLOCH

Susan Gubbay

1990

Survey Team

Susan Gubbay	-	Project Leader
Simon Haytor	-	Assistant Leader
Alan Davis	-	Diving Officer
Ruth Beaver	-	Recorder
Peter Cox	-	Recorder
Penny Glover	-	Recorder
Betty Green	-	Recorder
Joe Roberts	-	Recorder
Chris Spurrier	-	Recorder
Angela Williams	-	Recorder
Lin Baldock	-	Photographer
Ron Crosby	-	Photographer
Paul Glendell	-	Photographer
Gil Green	-	Photographer
Roger Sykes	-	Photographer
Bob Hook	-	Non-diving support

89/SS/4

ABSTRACT

SEASEARCH survey techniques were used to collect information on the main habitat and community types in Gruinard Bay, Loch Ewe and Loch Gairloch on the north west coast of Scotland. Forty-nine different habitat/community types were observed however there was little difference in diversity of the sites with 28 habitat types in Loch Ewe, 26 in Loch Gairloch and 24 in Gruinard Bay.

Gruinard Bay was the most open of the three survey areas and was predominantly sandy although fringed by kelp covered boulders. There was an extensive bed or living maerl around Gruinard Island and the deeper parts of the bay supported beds of *Virgularia mirabilis* and *Pennatula phosphorea*. Loch Ewe had some of the most sheltered habitats but was also exposed to wave action near the mouth of the loch and in the central channel. The margins of the loch graded from sand to muddy sand with the surface covered with mats of *'Trailliella'* in the sheltered areas. The two sills in this loch were distinctly different consisting of extremely smooth bedrock and areas of angular cobbles and boulders. Loch Gairloch was mostly sandy with very dense mats of *'Trailliella'* on the surface towards the head of the loch. Most of the circalittoral was medium sand with loose algal material scattered on the surface.

PREFACE

SEASEARCH is a survey of the sublittoral marine habitats of Great Britain. The project is run by the Marine Conservation Society (MCS) on behalf of the Nature Conservancy Council (NCC); the governments statutory advisors on nature conservation in Great Britain.

The aims of the SEASEARCH project are;

1. To gather information on sublittoral habitats and major community types at selected areas around the coast.

2. To note the presence of any human activities and man-made impacts in the areas surveyed.

3. To note areas which appear of particular interest because of their scenic value, habitat diversity and species richness.

4. To illustrate the habitats encountered with photographs.

5. To produce a report on each areas surveyed.

SEASEARCH surveys contribute to the Marine Nature Conservation Review (MNCR) of Great Britain which is being undertaken by the NCC. The MNCR will describe marine ecosystems around Great Britain from the lower limit of flowering plants, or normal tidal limits of estuaries, offshore to the 12 mile limit of territorial seas.

SEASEARCH is a 'Phase 1' survey aimed at describing the location and extent of habitts and major community types. This also provides necessary basic information to use in planning the more detailed 'Phase 2' surveys. At the same time as recording habitat types, the presence of human activities and impacts are noted, thus supplying information of value to NCC for use in assessing effects of human activities on the marine environment and in providing advice. The project SEASEARCH is designed to be undertaken by volunteer divers with an interest in natural history.

Further details of SEASEARCH can be obtained by writing to:

MARINE CONSERVATION SOCIETY, 9 Gloucester Road, Ross-on-Wye, Herefordshire, HR9 5BU.

ACKNOWLEDGEMENTS

I would like to thank all those who took part in the survey for their enthusiasm and commitment to the project despite having to cope with swarms of midges and force 11 gales during the two weeks. Because of their hard work we were able to survey 90 sites. My thanks also to those who gave us shore-based support; Peter Povall who allowed us to launch boats from his land and was very hospitable to us during our days at Gruinard Bay, Philip Maclachlan chief technician at the DAFS Firemore Bay laboratory who was always pleased to help, Sid Hinds for lending us his inflatable boat, Gil Green for endless hours of on-site photographic developing, and Mike Mills for the loan of an unmounted slide film projector which proved very useful in helping with habitat descriptions and improving the standard of photography during the expedition.

A number of organisations also supported the expedition. The Department of Agriculture and Fisheries for Scotland gave much practical help by allowing us to use the facilities at their Firemore Bay laboratory for which we were most grateful. The Nature Conservancy Council made the expedition possible by funding the survey and also loaned us equipment and the Ministry of Defence reassured us about diving around Gruinard Island.

Finally my thanks to Bob Earll for his advice and comments on this report and to Alan Davis who assisted in the planning and report writing stages of this project as well as taking on the responsibilities of Diving Officer during the survey.

CONTENTS

1. INTRODUCTION

The main aims of SEASEARCH are to identify and describe the major sublittoral habitat and community types at specific locations around the coast of Great Britain. The survey areas are selected by the Nature Conservancy Council (NCC) to fit in with their Marine Nature Conservation Review programme and the information is collected using volunteer divers. The results of these surveys need to be detailed enough to enable NCC staff to identify potential sites of marine nature conservation importance and sites in need of further investigation.

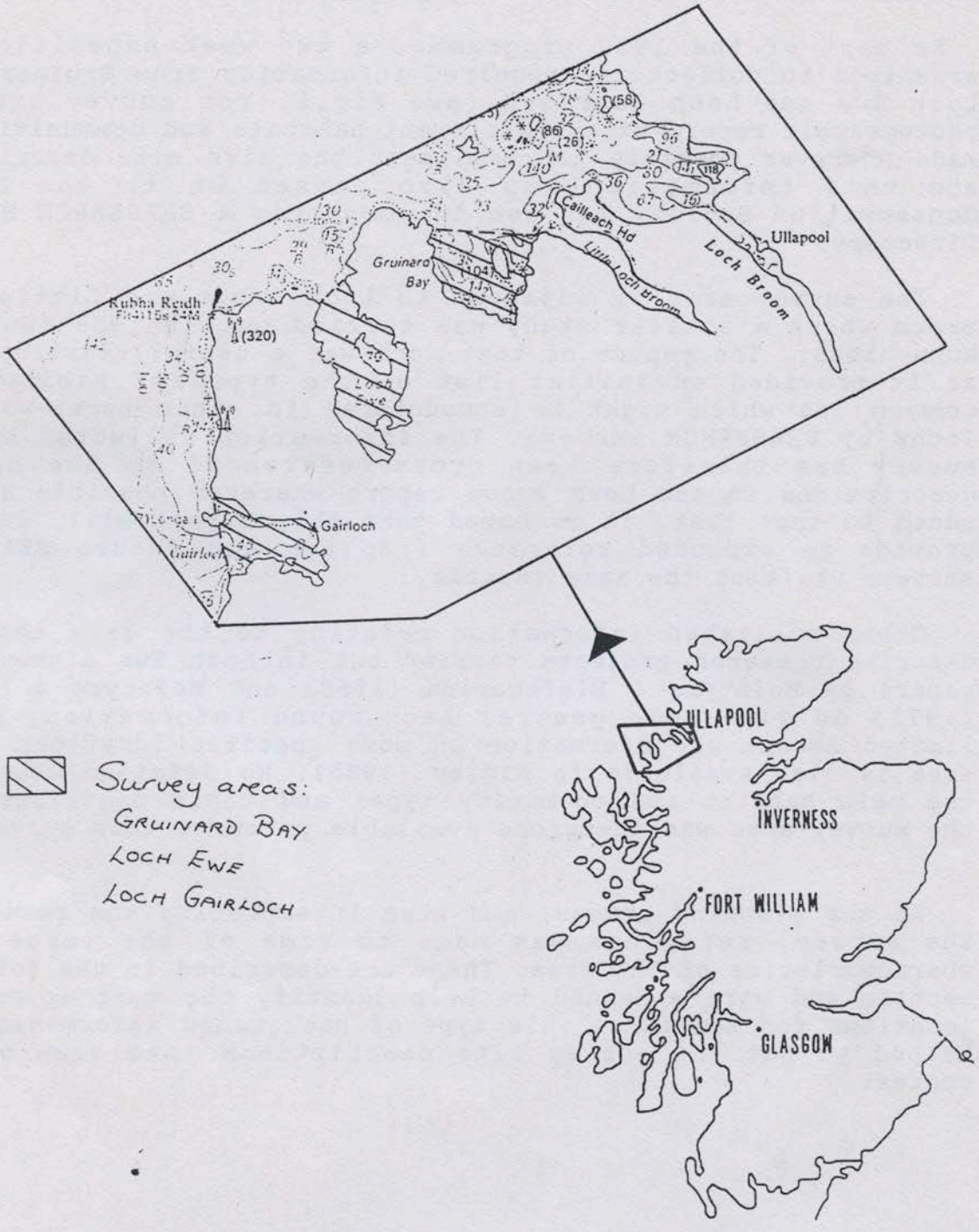
As part of the 1989 programme, a two week expedition was organised to collect the required information from Gruinard Bay, Loch Ewe and Loch Gairloch (see Fig.1. for survey area). A photographic record of the different habitats and communities was made wherever possible to compliment the dive site descriptions and this information was also passed on to the Marine Conservation Society for use in compiling a SEASEARCH Habitat Directory.

The survey area is adjacent to Loch Broom and Little Loch Broom where a similar study was carried out in 1988 (Gubbay & Nunn, 1988). The report of that work was a useful starting point as it provided an initial list of the types of habitats and communities which might be encountered in other north-west sea lochs by SEASEARCH surveys. The information collected by this survey has therefore been cross-referenced to the habitat descriptions in the Loch Broom report wherever possible and has added to that list. It is hoped that this report will, in turn, provide an expanded reference list for any future SEASEARCH surveys visiting the same locality.

Other published information relating to the area tends to describe research projects carried out in Loch Ewe although the papers by McIntyre & Eleftheriou (1968) and McIntyre & Murison (1973) do give some general background information. A very limited amount of information on some specific locations in the area is also available in Ridley (1985). No detailed account of the main habitat and community types and their distribution in the survey area was therefore available prior to this survey.

At the planning stages, and when interpreting the results of the survey, reference was made to some of the large scale characteristics of the area. These are described in the following section and were examined to help identify the most appropriate locations for sampling. This type of background information also helped to put the survey site descriptions into some overall context.

FIGURE 1 - SURVEY AREA



2. LARGE SCALE CHARACTERISTICS OF THE AREA

Many of the large scale coastal features on the west coast of Scotland show some signs of glacial activity. Typically these include the over-deepened basins, sills and narrows of fjord-like sea lochs or the highly indented drowned fjardic coastlines of lowland areas. Of the two sea lochs investigated during this survey Loch Ewe shows the clearest signs of glacial activity with two sills dividing the loch into basins. (There is a slightly shallower area near the head of Loch Gairloch which separates two deeper parts of the loch but this is not considered to be a sill) (Edwards, 1986). Particular emphasis was therefore given to investigating the habitats and communities associated with these large scale features and comparing them to adjacent areas of the loch. Their location is show in Figure 2. and the physical details are summarised in Table 1 (both from Edwards, 1986).

TABLE 1

PHYSICAL CHARACTERISTICS OF LOCH EWE AND LOCH GAIRLOCH

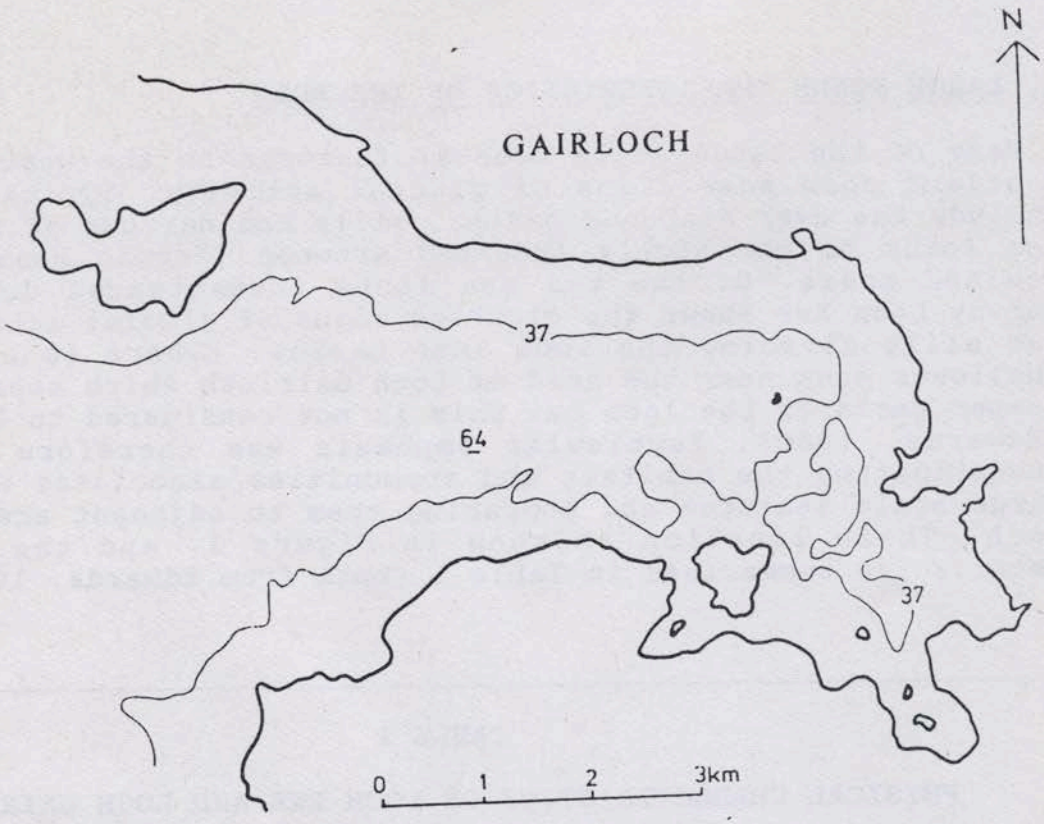
	LOCH EWE	LOCH GAIRLOCH
O.S. Grid Reference	NG 820920	NG 760750
Chart number	2509	2509
Loch length (km)	11.9	6.9
Tidal range (m)	4.4	4.6
Maximum depth (m)	73.0	64.0
High Water area (sq.km)	46.4	14.5
Low water area (sq.km)	44.4	13.8
LW vol. (million m^3	944.6	411
Watershed (sq.km)	570	158
Annual rainfall (mm)	1750	2250
Runoff (M m^3/yr)	855.6	315.2

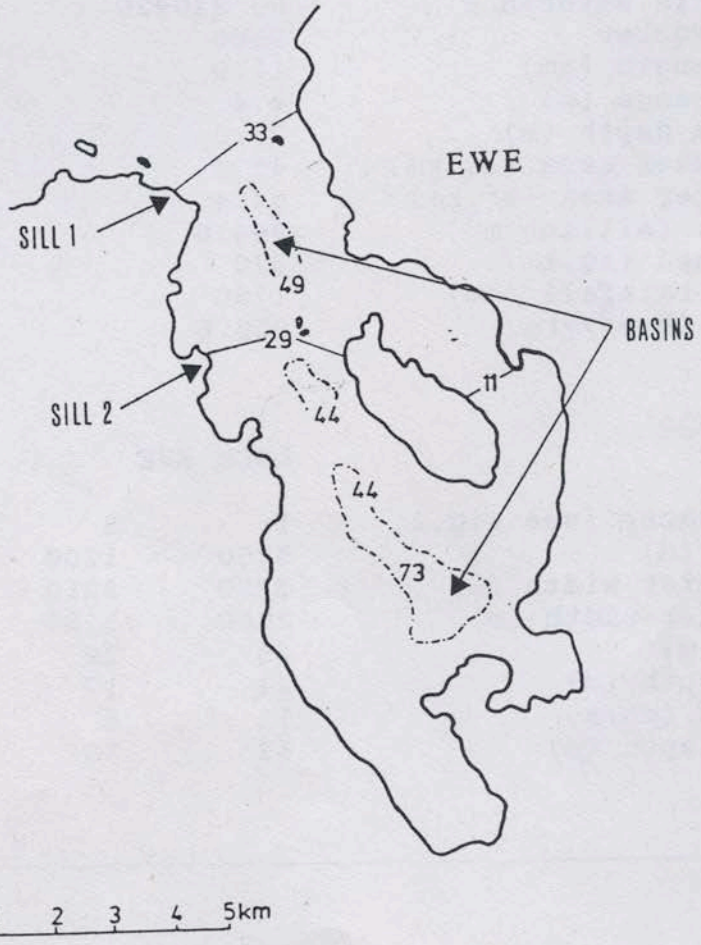
Sill Data

	LOCH EWE		LOCH GAIRLOCH
Sill number (see Fig.2)	1	2	No sills
Length (m)	5700	1200	
High water width (m)	2380	3210	
Low water width (m)	2360	3190	
Depth (m)	33	29	
Mean depth (m)	24	17	
Current (cm/s)	12	8	
Basin depth (m)	62	73	

(from Edwards, 1986)

FIGURE 2 – LARGE SCALE FEATURES OF LOCH GAIRLOCH & LOCH EWE



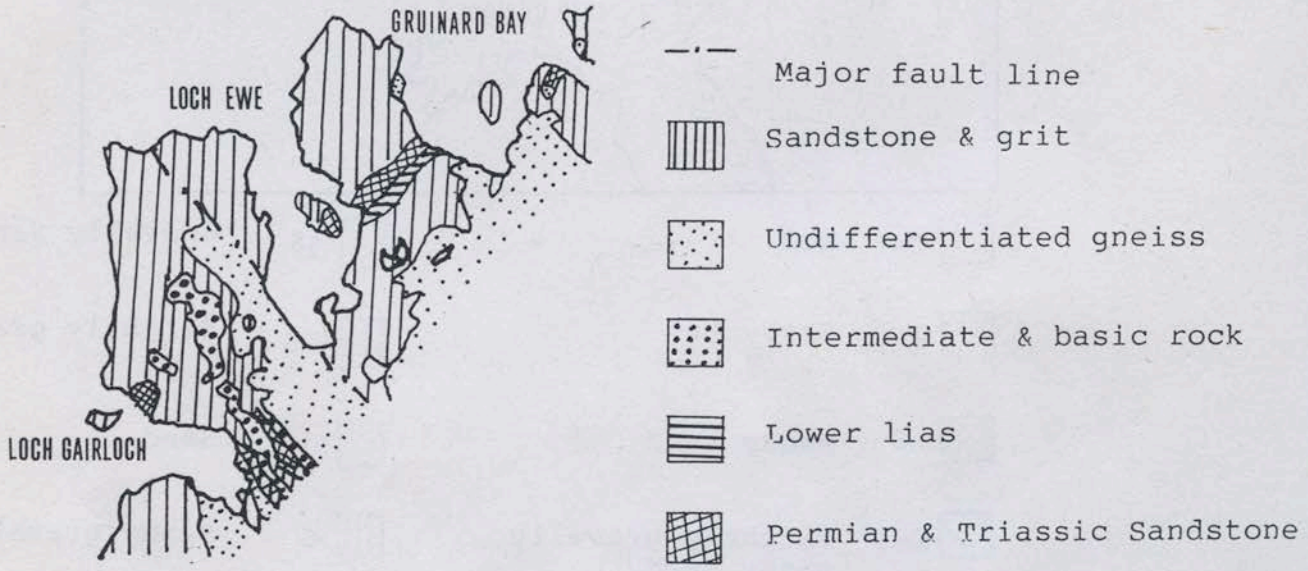


(from; Edwards, 1986)

The solid geology is another large scale characteristic of a region which can provide some clues to the distribution of the habitats and communities in the area. It is also relevant when trying to compare the results of this survey with those from other sea lochs by helping to interpret similarities and differences between sites.

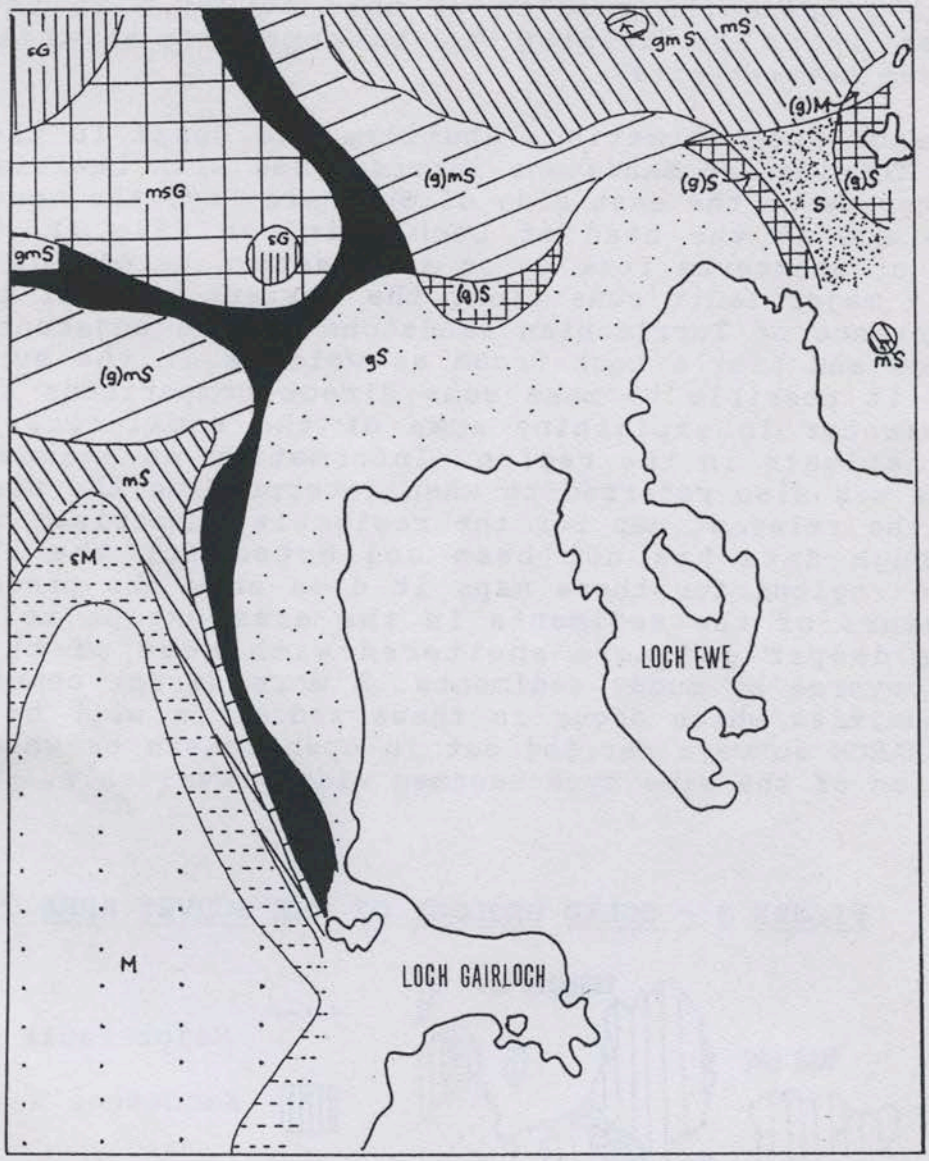
The major rock formations abutting the coast in the survey area are Torridonian sandstone interspersed with Lewisian gneiss which outcrops on the east side of Gruinard Bay, the west side of Loch Ewe and at the head of Loch Gairloch (Fig.3). There is evidence of shattered rock eg.on the western margin of Gruinard Bay and a major fault runs along the western edge of Loch Ewe. The occurrence of Torridonian sandstone in the adjacent area of Loch Broom and Little Loch Broom as well as in the survey area has made it possible to make some direct comparisons and was a helpful factor in explaining some of the similarities in the bedrock habitats in the region. Information on seabed surface sediments was also referred to when interpreting the results and part of the relevant map for the region is summarised in Figure 4. Although data has not been collected for the immediate nearshore regions for these maps it does show the predominantly sandy nature of the sediments in the area except to the west which is deeper and more sheltered with most of the seabed surface covered by muddy sediments. A more direct comparison of the communities which occur in these sediments will be possible for SEASEARCH surveys carried out in open coasts or when inshore information of the same type becomes widely available.

FIGURE 3 - SOLID GEOLOGY OF THE SURVEY AREA



(From;Institute of Geological Sciences Map. Geological Survey 1:625,000. North Sheet,Solid Geology, 1979.)

FIGURE 4 - SEABED SURFACE SEDIMENTS IN THE SURVEY AREA



M	Mud	gS	Gravelly Sand
sM	Sandy Mud	(g)S	Slightly gravelly sand
mS	Muddy sand	S	Sand
(g)mS	Slightly gravelly muddy sand	sG	Sandy gravel
gmS	Gravelly muddy sand	msG	Muddy sandy gravel

(From;British Geological Survey Map 1:250,000 Series. Little Minch including part of Great Glen. Seabed Sediments and Quaternary Geology. 1988.)

3. METHODS

The survey of Gruinard Bay, Loch Ewe and Loch Gairloch was carried out between the 9th -23rd September, 1989. Sixteen people were involved over the two week period with a change over of personnel half-way through. Although this meant that two groups of divers had to be instructed in the aims and methods of SEASEARCH it was considered worthwhile as more people were able to get involved with the project. The survey methods were identical to those used in a previous SEASEARCH expedition to the adjacent area of Loch Broom & Little Loch Broom (see Gubbay & Nunn, 1988 for full details).

Team members were instructed to act as Recorders or Photographers and dived at sites identified by the Project Leader. Recorders made notes of the different habitats and visually dominant communities encountered during the dive. This information was subsequently transcribed onto standard SEASEARCH forms (see Appendix 1 for sample) whilst referring to the SEASEARCH manual and the Loch Broom survey report. A list of key words was also provided to act as a prompt to recording during the second week of the survey (Appendix 2.).

Photographers were asked to take slides of each of the habitat and community types encountered during the dive. The recommended area to be covered by each photograph was approximately $1m^2$ but it became clear that a greater area had to be covered to give a good impression of larger scale habitats such as bedrock and boulders. Natural light photographs were also helpful in this context and considered to be a valuable addition to the photographic library. Relatively good underwater visibility meant that these gave a much better general impression of the dive site complimenting the more limited, but better illuminated, views available using flash light. This type of photography is therefore recommended for future surveys of this type if conditions are suitable.

The records made whilst diving were supplemented by information collected using a glass-bottomed viewer. This was suitable for scanning areas of seabed in shallow water from the inflatable boats and was used successfully in depths of up to 6m. Parts of Loch Gairloch and Loch Ewe were investigated in this way when sea conditions were favourable. This increased the number of sites which could be visited during the survey without affecting diving time and it is recommended for future surveys.

3.1. Sampling Strategy

Diving sites were selected with a view to getting an overall impression of the habitats and communities in the survey area and to try and ensure that the major habitat and community in the area were located. To achieve this dives were carried out at regular intervals around the lochs as well as in positions which were likely to reveal a different habitat or community to those already located during the survey. Sites were also selected with the aim of finding the boundaries between different habitat types so that many of the dives were transects into the shore crossing the infralittoral/circalittoral boundary. The thirteen different site selection criteria used for the SEASEARCH survey of Loch Broom and Little Loch Broom in 1988 were used to identify appropriate dive sites. Apart from the criteria relating to the presence of sills and basins these criteria were also applicable to site selection in Gruinard Bay as the aim was essential the same in trying to dive sites where differences in water movement, wave exposure and sediment type occurred as these were the most likely factors which would lead to differences.

SITE SELECTION CRITERIA FOR SEA LOCHS
USED IN THIS SURVEY

1. Edges of basins in sea lochs - transects into shore
2. Bottom of different basins
3. Areas of freshwater influence
4. Areas of sills or narrows
5. Either side of an area of narrows as current falls
6. Areas where currents were noted
7. Very sheltered areas at the head of lochs
8. Steep and more gently sloping edges
9. Obviously different features eg.pinnacles and reefs
10. Bays and bluffs along the margins
11. Areas of different geology
12. Different substrate types marked on the chart
13. Different aspects of islands.

3.2. Access to sites

Diving was carried out from inflatable boats making access to most sites good. Road access to the shore was also reasonable in some places making it possible to dive in Loch Thurnaig, at the head of Loch Ewe, from the shore when weather conditions deteriorated during the second week of the survey. The central and outer parts of Loch Ewe were not surveyed but this was due to weather conditions and safety considerations rather than problems of access. The area around fish farms, the large number of moorings in parts of Loch Gairloch and Loch Ewe, and the vicinity of the NATO jetty in Loch Ewe were not investigated nor were any parts of the survey area which were deeper than 50m.

SITE	LAUNCH POINTS	UNSURVEYED AREAS
Loch Gairloch	Public slip at the head of the Loch	DAFS experimental area. Area >50m
Gruinard Bay	Laide Caravan Park (NB private property - permission required) The public jetty north of Laide could be used	Close inshore to Gruinard Island - Ministry of Defence
Loch Ewe	Firemore Bay - DAFS lab (NB. private property - permission required)	NATO jetty Fish Farms Central & outer area due to depth and bad weather.
	Loch Thurnaig (NB. DAFS private slip)	

4. RESULTS

The information on completed SEASEARCH forms has been used to build up a general picture of the habitats and communities in the survey areas and has been supplemented by referring to Admirality Charts and other relevant publications. It has also been used to provide detailed descriptions of the various habitats and communities which were encountered in Loch Gairloch, Gruinard Bay and Loch Ewe. In this section the following information is provided for each of these areas in turn;

(1) Dive site details (summary table)

(2) Dive site locations (map)

(3) Habitat/community types recorded at each dive site (table)

(The detailed habitat information collected during the survey is presented in section 4.4. under the sixteen major headings used in the SEASEARCH Habitat Directory (being developed to assist recorders on SEASEARCH surveys). This is accompanied by an explanation of the coding system and photographs of the habitat types wherever possible. These provide the background information for the summary habitat/community type tables in this section.)

(4) A general description of the distribution of habitats and communities recorded in the survey area

(5) Approximate distribution of habitats and communities recorded in the survey area (map).

(The summary maps are intended to provide an **approximate first view** of the distribution of habitats and communities in the area (Figs 6,8,10). As such they are only intended to act as a guide to Phase 2 work in the area which will add to and refine this general picture.)

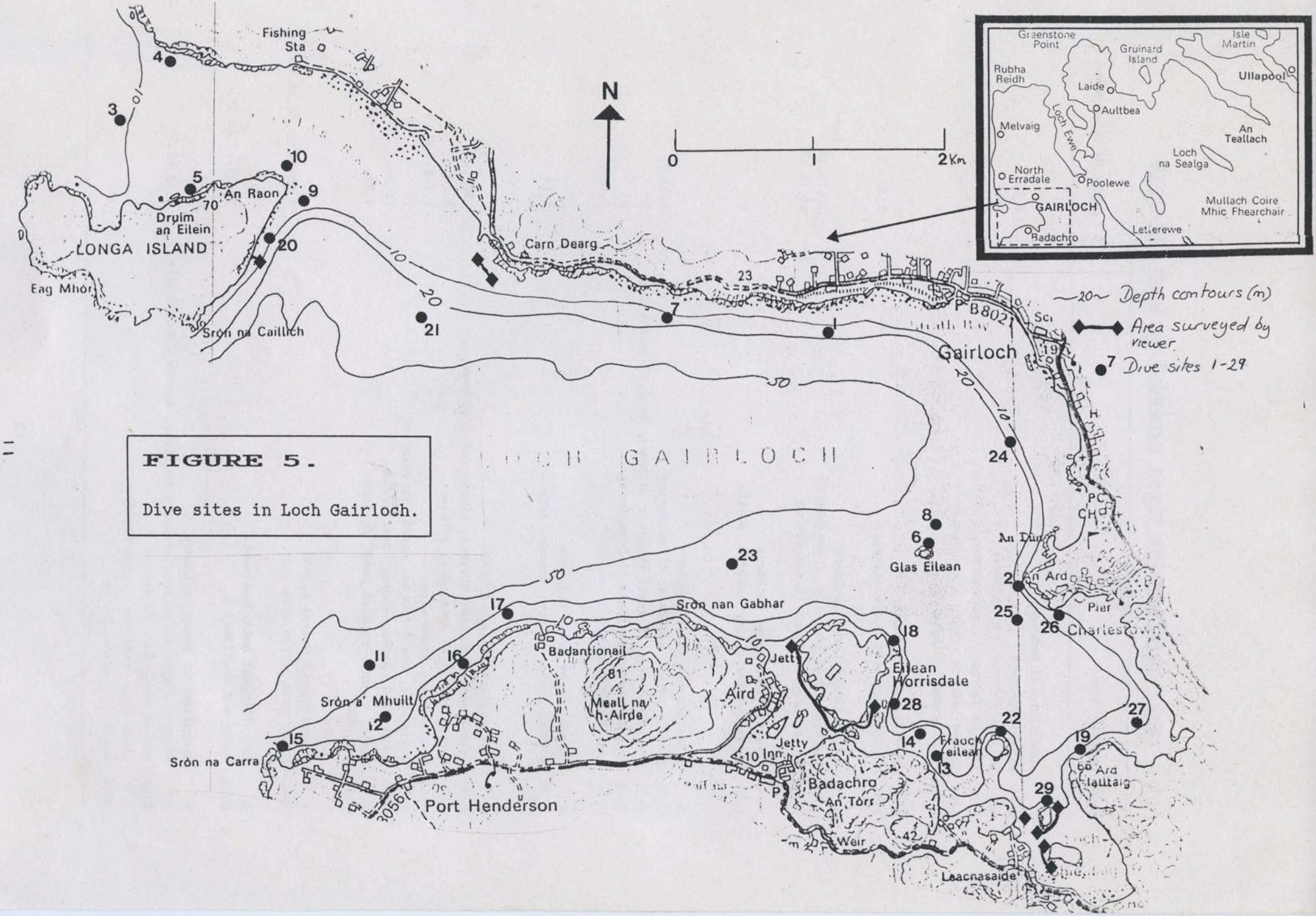
4.1. LOCH GAIRLOCH

4.1.1. Details of dive sites in Loch Gairloch

The details of each dive site in Loch Gairloch have been summarised below. All depths have been corrected to chart datum. The locations are shown in Figure 5.

DETAILS OF SURVEY SITES IN LOCH GAIRLOCH

SITE No.	SITE NAME	GRID REF.	DATE	MAX DEPTH (m)	RECORDER
1	Lonemore	NG 787767	10.9.89	17.5	SG/RS
2	Sron nah Airde	NG 800750	10.9.89	22.4	BG/SH
3	South of Rubah Ban	NG 732788	10.9.89	8.2	GG/AW
4	North Caolas Beag	NG 736792	10.9.89	2.6	SG/RS
5	N.E. Longa Island	NG 738782	10.9.89	8.4	BG/SH
6	Glas Eilean	NG 794753	10.9.89	18.9	RB/RC
7	An Oirthir	NG 774771	10.9.89	9.7	GG/AW
8	North of Glas Eilean	NG 794756	10.9.89	10.9	PC/AD
9	East of Longa Island	NG 759781	10.9.89	5.2	RB/RC
10	Caolas Beag Narrows	NG 743787	10.9.89	5.6	PC/AD
11	N. of Port Henderson	NG 749746	11.9.89	28.2	AD/RS
12	Nares Rock	NG 751744	11.9.89	9.7	SG/RB
13	Rubha mhic Chonnuill	NG 795737	11.9.89	22.6	AD/RS
14	Well Rock	NG 792739	11.9.89	7.9	SG/RB
15	Sron na Carra	NG 744739	11.9.89	7.5	RC/PC
16	N. of Sron a Mhuillt	NG 757746	11.9.89	9.8	GG/BG
17	Leac Bad an Tionail	NG 763750	11.9.89	18.5	SH/AW
18	N.E.Eileann Horrisdale	NG 793745	11.9.89	16.4	RC/PC
19	Ard Lalltaig	NG 803738	11.9.89	16.5	SH/AW
20	East coast Longa Is.	NG 744777	12.9.89	17.7	BG/RS
21	Carn Dearg	NG 762769	12.9.89	33.1	AW/AD
22	Fraoch Eilean	NG 798740	12.9.89	21.4	BG/RS
23	Reef W. of Glas Eilean	NG 781755	12.9.89	31.0	AW/AD
24	West of Gairloch Hotel	NG 799767	12.9.89	26.9	SG/RC
25	Sron na H-Airde	NG 799752	12.9.89	27.1	SH/PC
26	Flowerdale Bay	NG 804747	12.9.89	23.2	RB/GG
27	Loch Kerry	NG 808742	12.9.89	14.5	SG/RC
28	N.E. Sgeir dubh Bheag	NG 790743	12.9.89	15.9	SH/PC
29	Eilean an t-Sabhail	NG 802734	12.9.89	14.8	RB/GG


Fishing Sta
LONGA ISLAND
Eag Mhor
Drum an Eilein
An Raon
Sròn na Caillich
Carn Dearg
N
0
1
2 Km
Graenstone Point
Gruinard Island
Isle Martin
Rubha Reidh
Laide
Ullapool
Aultbea
Melvaig
Loch Ewe
An Teallach
Loch na Sealga
North Erradale
Poolewe
GAIRLOCH
Mullach Coire Mhic Fhearchair
Badachro
Letterewe
~20~ Depth contours (m)
Area surveyed by viewer
Dive sites 1-29
B802
Gairloch
LOCH GAIRLOCH
Glas Eilean
An Ard
Pier
Charles
Sròn nan Gabhar
Badantionail
Jetty
Eilean Horrisdale
Aird
Meall na h-Airde
Sròn a' Mhuilt
Sròn na Carra
Jetty
Inn
Fraoch eilean
Badachro
An Torr
Ard Iailtaig
Port Henderson
Weir
Leacnasaide
FIGURE 5.
Dive sites in Loch Gairloch.

4.1.2. Habitat/community types recorded in Loch Gairloch

CODE	HABITAT TYPE	LOCATION (site Nos.)
A	**Infralittoral Bedrock**	
A/01	Stepped Bedrock	4,5,6
A/02	Gullied Bedrock, *L.hyperborea*	15
A/03	Stepped Bedrock, *L.saccharina, C.filum*	14,18,19,28
A/04	Broked bedrock slope, *L.saccharina*	2
A/06	Sloping bedrock face	6
B	**Circalittoral Bedrock**	
B/01	Stepped bedrock, *C.intestinalis*	2,22,23
E	**Infralittoral Large Boulders**	
E/01	Frequent large boulders, *L.hyperborea*	12,15,16
E/02	Dense large boulders, *L.hyperborea*	15,16,18
F	**Circalittoral Large Boulders**	
F/01	Large boulder slope, *Antedon, Munida*	8
G	**Infralittoral Small Boulders**	
G/01	Densely packed boulders, *L.saccharina*	5,19,22
G/02	Occasional angular small boulders on coarse sand, *L.saccharina*	5
G/05	Densely packed boulders, *L.hyperborea*	6
G/06	Occasional boulders on sand	2,5,16
H	**Circalittoral Small Boulders**	
H/01	Rounded boulder slope, *Munida, Antedon*	8,19
N	**Infralittoral Gravel & Sand**	
N/02	Coarse sand with intermittent, living and dead maerl	17
N/05	Coarse sand with occasional pebbles	5
N/10	Medium sand, loose algae	1,3,5,7,9,10
N/11	Muddy sand, shell debris, maerl, *Virgularia*	20
N/12	Muddy sand, *Aspherococcus, Trailliela*	14,28
N/13	Clean, coarse, rippled sand, *Zostera*	4,10,
P	**Circalittoral Gravel & Sand**	
P/04	Muddy sand, *Virgularia* beds	2,20,21,22,24,25,28
Q	**Infralittoral Muddy Sediments**	
Q/01	Sandy mud *Trailliella*	13,22,27,28,29
R	**Circalittoral Muddy Sediments**	
R/02	Silty mud with occasional stones & boulders, *Munida* & *Ascidiella*	6,14,18,19
R/08	Worked sandy mud, *Pennatula*	24
R/09	Sandy mud, occasional large boulder	8,11
R/10	Silty mud, algal debris	26

4.1.3. General description of Loch Gairloch

Loch Gairloch is one of the more open sea lochs on the west coast of Scotland. It is approximately 8km from Loch Shieldaig, the most sheltered part at the head of the loch, to the entrance. The mouth of the loch is approximately 6km wide and is interrupted by Longa Island. A shallow channel, Caolas Beag, separates this island from the northern shore of the loch. A number of other islands are also present towards the head of the loch the largest of which is Eilean Horrisdale. The habitats and communities of the Loch are described in three sections - the northern shore, the southern shore and the head of the loch including the areas of Loch Shieldaig and Loch Kerry. Fig.6. gives an approximate summary of the distribution and therefore compliments the following descriptions. The central part of the loch was not investigated because it was below 50m but reference to the Admiralty Chart suggests that it is likely to be a predominantly muddy area making it a good possibility that a *Pennatula phosphorea*, *Funiculina quadralinearis* and *Nephrops norvegicus* dominated community occurs in this area.

The Northern Shore

The northern shore of Loch Gairloch slopes moderately steeply from the shore down to 20m and then very gradually to 50m and beyond. It is a predominantly sandy area with a scattering of loose and some attached algae (*Chorda filum*) and a visible diatom mat on the surface. Living *Ensis* sp. and dead shells of this species were noted in this habitat, along with *Echinocardium cordatum*. These probably make up the main community in this habitat but this needs to be confirmed by further investigation and sampling. This habitat was also observed in the shallow channel between Longa Island and the mainland and patches of *Zostera marina* were noted near the entrance to the loch and at the eastern tip of Longa Island in areas of coarser, clean sand.

The infralittoral sandy habitats graded into an area of muddy sand at around 15m where the visually dominant species were *Virgularia mirabilis* and *Ascidiella aspersa*. The surface of the sand was extensively worked into mounds, burrows and tracks and apart from shell debris scattered on the surface there were occasional clumps of living *Modiolus modiolus* partially buried in the sediment. This was generally considered to be a habitat which was fairly rich in species.

The Southern Shore

The southern shore of Loch Gairloch was investigated between Badantionail and the mouth of the loch. Gullied bedrock immediately adjacent to the shore gave way to a slope of large angular boulders and blocks supporting *Laminaria hyperborea* kelp forest, and then to an area of coarse sand scattered with pebbles. Beyond 20m the habitat was predominantly a sandy mud although occasional large boulders lay partially buried in the sediment providing shelter for *Munida rugosa*.

Head of the Loch (including Loch Kerry & Loch Shieldaig)

The most sheltered parts of the Loch are in the bays of Loch Kerry and Loch Shieldaig and behind the island of Eilean Horrisdale. Much of the area was a sandy mud covered by extensive and often dense mats of *'Trailliella'*. This formed the dominant community although clumps of *Ascidiella aspersa* and *Modiolus modiolus* were observed in some areas. The channel between Eilean Horrisdale and the mainland was sandier but was again characterised by mats of *'Trailliella'*, although some *Aspherococcus turneri* was present. A number of rocky islets occurred in the channel and consisted of kelp covered boulder slopes leading down to the sand. These islets were used as haul-out sites by seals.

Below 20m much of the head of the loch appeared to be muddy sand with *Virgularia mirabilis* beds as described for the northern shore. The extent of this habitat needs to be clarified by further survey as few dives were carried out in this vicinity.

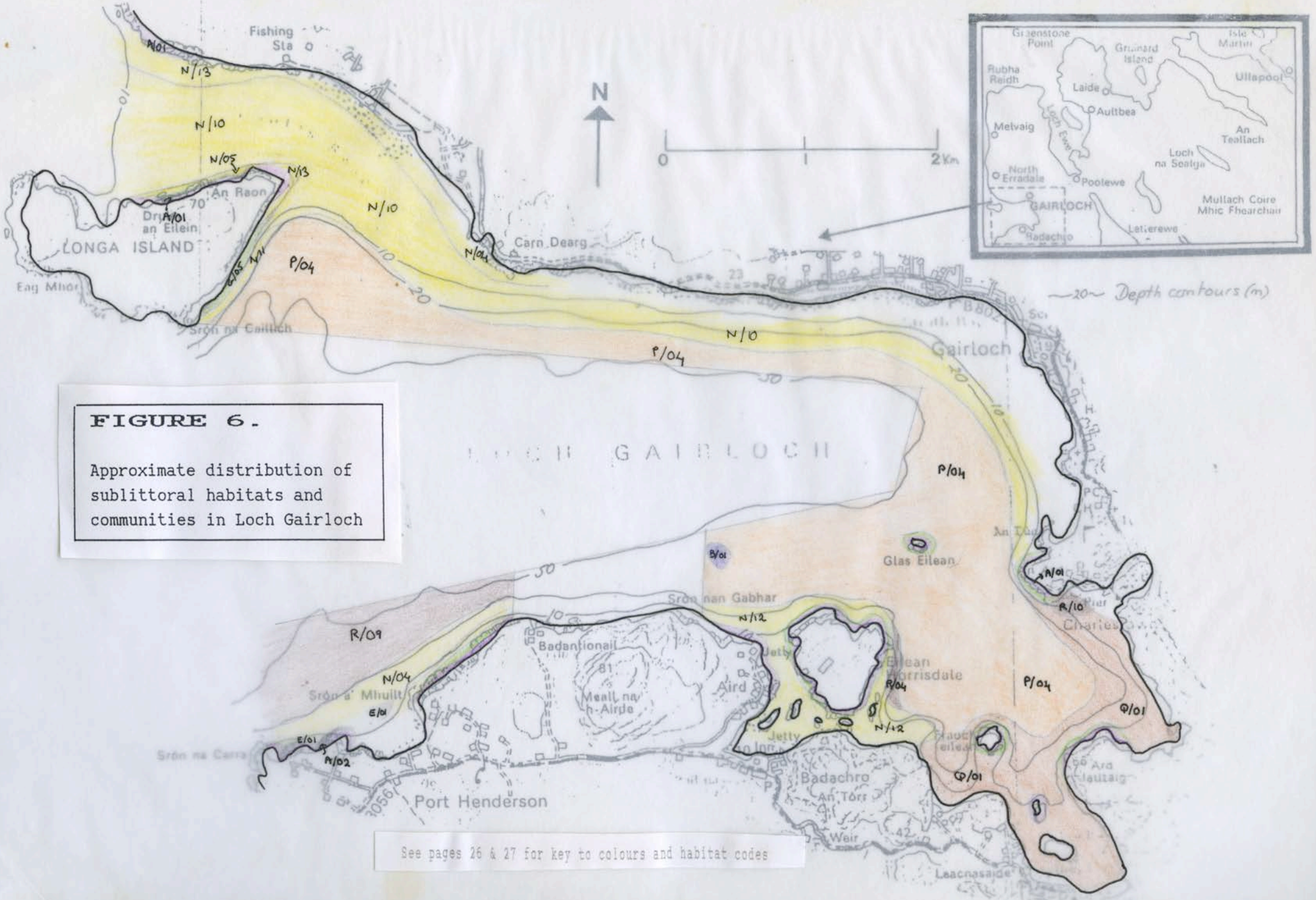


FIGURE 6.

Approximate distribution of sublittoral habitats and communities in Loch Gairloch

See pages 26 & 27 for key to colours and habitat codes

4.2. GRUINARD BAY

4.2.1. Details of dive sites in Gruinard Bay

The details of each dive site in Gruinard Bay are summarised below. All depths have been corrected to chart datum. The locations are shown in Figure 7.

DETAILS OF SURVEY SITES IN GRUINARD BAY

SITE No.	SITE NAME	GRID REF.	DATE	MAX DEPTH (m)	RECORDER
30	N.W.Gruinard Island	NG 933955	13.9.89	24.6	RB/RS
31	Sron Geodh an Tairbh	NG 967956	13.9.89	21.5	BG/RC
32	An T-Saothair	NG 917923	13.9.89	6.6	RS/SH
33	Laide Bay	NG 911922	13.9.89	7.7	BG/RC
34	N.Gruinard Island	NG 943957	13.9.89	28.3	AD/GG
35	N.Gruinard Island	NG 943955	13.9.89	19.5	SH/PC
36	N.E.Gruinard Island	NG 958956	13.9.89	18.6	AW/SG
37	Pollan Eoin Mor	NG 899946	13.9.89	10.1	AD/GG
38	Am Fiacl ach an	NG 904932	13.9.89	9.2	AW/SG
39	Miotag	NG 956932	14.9.89	23.0	SG/RS
40	Sron a Mhoil	NG 949928	14.9.89	21.6	RC/SH
41	Camas a Chrythach	NG 949918	14.9.89	10.7	RC/SH
42	First Coast	NG 927916	14.9.89	12.1	SG/RS
43	S.E.Gruinard Island	NG 955934	14.9.89	27.1	BG/AD
44	S.E.Gruinard Island	NG 953934	14.9.89	19.7	PC/BG
45	Seana Chreag	NG 956942	14.9.89	40.8	AW/RB
46	Fraoch Eilean Mor	NG 947908	14.9.89	18.0	BG/AD
47	Mill Bay	NG 933908	14.9.89	3.3	AW/RB
48	W.Gruinard Island	NG 935937	15.9.89	17.1	RB/RS
49	Camas a Charraig	NG 898958	15.9.89	16.8	SH/RC
50	S.W.Gruinard Island	NG 932933	15.9.89	28.5	PC/GG
51	S.W.Gruinard Island	NG 924933	15.9.89	19.3	AW/BG
52	Mid Gruinard Bay	NG 913941	15.9.89	44.9	SG/AD

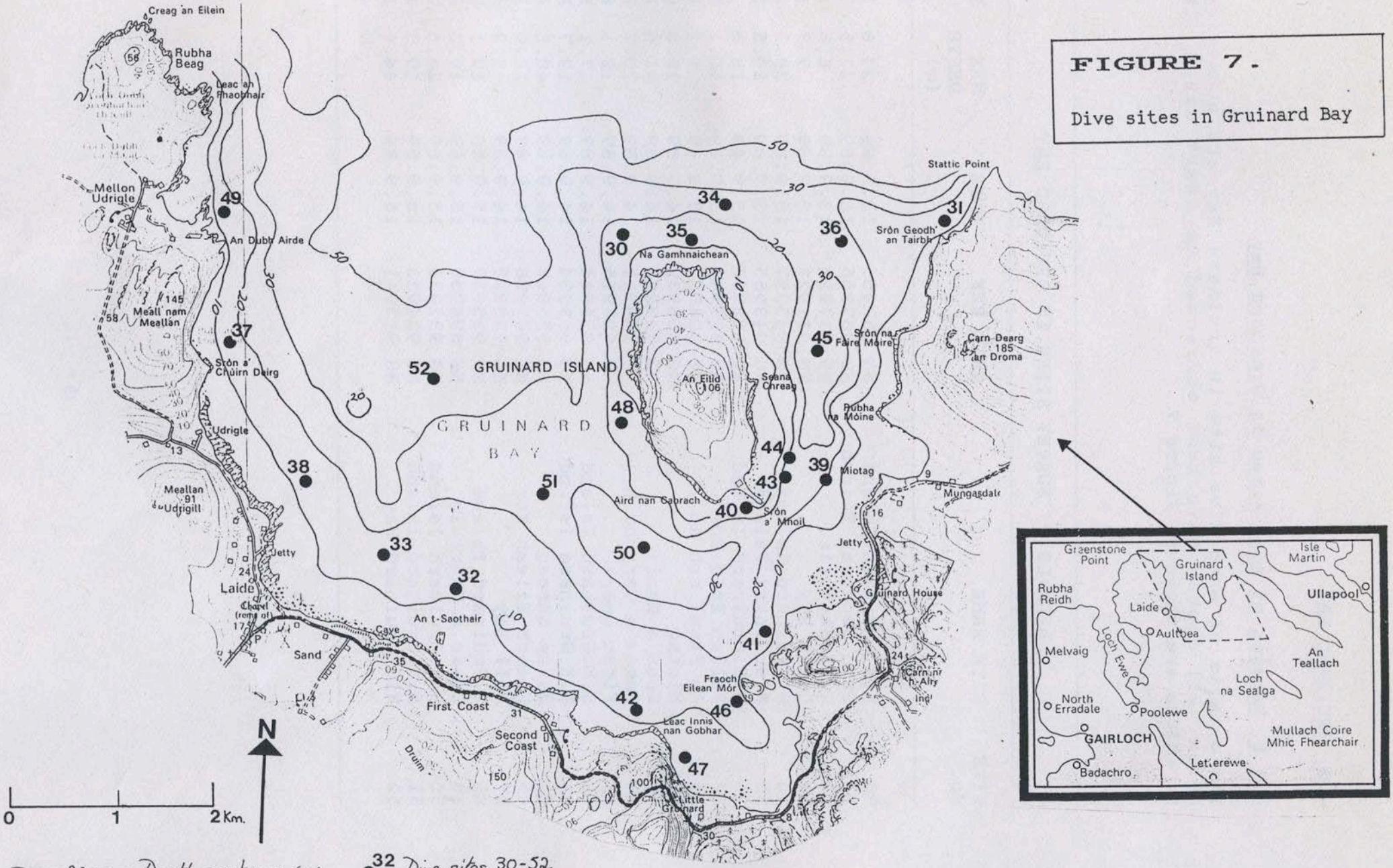


FIGURE 7.

Dive sites in Gruinard Bay

4.2.2 Habitat/community types recorded in Gruinard Bay

CODE	HABITAT TYPE	GRUINARD BAY
A	**Infralittoral Bedrock**	
A/02	Gullied Bedrock, *L.hyperborea*	48,49,
E	**Infralittoral Large Boulders**	
E/01	Frequent large boulders, *L.hyperborea*	49
E/02	Dense large boulders, *L.hyperborea*	49
G	**Infralittoral Small Boulders**	
G/02	Occasional angular small boulders on coarse sand, *L.saccharina*	31
G/04	Rounded boulders on coarse sand and maerl	30,34,35,51
G/05	Densely packed boulders, *L.hyperborea*	32,33,49
G/06	Occasional boulders on sand	47
G/07	Rounded boulders on coarse sand/maerl	51
J	**Infralittoral Stones - Cobbles/Pebbles/Slates**	
J/03	Pebble/cobble bank with occasional boulder, *S.polyschides*	40
J/05	Pebbles on shell sand	40,48
L	**Infralittoral Very Mixed Substrata**	
L/01	Boulders, pebbles & sand	32,42,48
N	**Infralittoral Gravel & Sand**	
N/01	Coarse sand covered by continuous bed of maerl	34,35,36
N/02	Coarse sand with intermittent, living and dead maerl	36,
N/07	Sand with occ.boulders & exposed bedrock.	33,38
N/08	Coarse sand with occ.boulder, maerl	50
N/09	Clean sand, frequent cobbles, algal tufts	40,42,43
N/10	Medium sand, loose algae	33,37,38,47
N/11	Muddy sand, shell debris, maerl, *Virgularia*	39
N/12	Muddy sand, *Aspherococcus, Trailliela*	41,51
P	**Circalittoral Gravel & Sand**	
P/01	Clean shell sand	31
P/04	Muddy sand, *Virgularia* beds	43,44
Q	**Infralittoral Muddy Sediments**	
Q/01	Sandy mud *Trailliella*	46
R	**Circalittoral Muddy Sediments**	
R/07	Fine mud, *Pennatula* beds, *Nephrops*	43
R/08	Worked sandy mud, *Pennatula*	43,45,46,52

4.2.3. General description of habitats in Gruinard Bay

In contrast to Loch Ewe and Loch Gairloch, Gruinard Bay is an open bay rather than a sea loch. The bay is approximately 6km wide and is therefore similar in size to Loch Gairloch. It faces north and thus does not get the full force of prevailing westerlies and south-westerlies. Gruinard Island dominates the eastern part of the bay creating a channel, about 1km wide, at its narrowest point, between the island and the mainland. The main freshwater input to the bay is also in this locality coming from Gruinard River, Inverianvie River and Little Gruinard River although there are also a number of streams which feed into the bay. The distribution of the sublittoral habitats and communities in the bay is summarised in Figure 8 and needs to be referred to in conjunction with the following description which covers the bay in three sections - the western side of the bay, the area around Gruinard Island, and the sheltered channel between Gruinard island and the eastern margin of the bay.

Western side of Gruinard Bay

In the western part of the bay the sublittoral habitats showed a gradual transition from an area dominated by boulders to a predominantly sandy seabed. The boulder surfaces were colonised by *Laminaria hyperborea* which thinned out with depth and as the boulders became scarce this gave an impression of a seabed supporting "islands of kelp". Much of the bay below 12m was a gently sloping sandy plain. A diatom mat was visible on the surface at some sites and there was also scattered loose algal debris and shells on the sand. The deepest part of the bay was an area of worked sandy mud with beds of *Pennatula phosphorea*.

The southern margin of the bay was also fringed by boulders supporting *L.hyperborea* but in this area it graded into very mixed substrates. Boulders, pebbles and cobbles were scattered on a bed of coarse shelly sand and supported foliaceous red algae although there were also some species of red algae anchored into the shell sand. Further east, where the Little Gruinard and Inverianvie rivers enter the most sheltered part of the bay, the sediments were mostly sandy mud with *'Trailliella'* scattered on the surface in the infralittoral zone, and a worked surface with *P.phosphorea* beds in the circalittoral zone.

Gruinard Island

Gullied bedrock was the main habitat type fringing the northern and western sides of Gruinard Island and was also visible in the intertidal zone. On the western side this sloped down onto a predominantly sandy seabed with the occasional boulder whereas to the north it led to an extensive bed of maerl. The maerl formed a thick layer on the sandy surface in

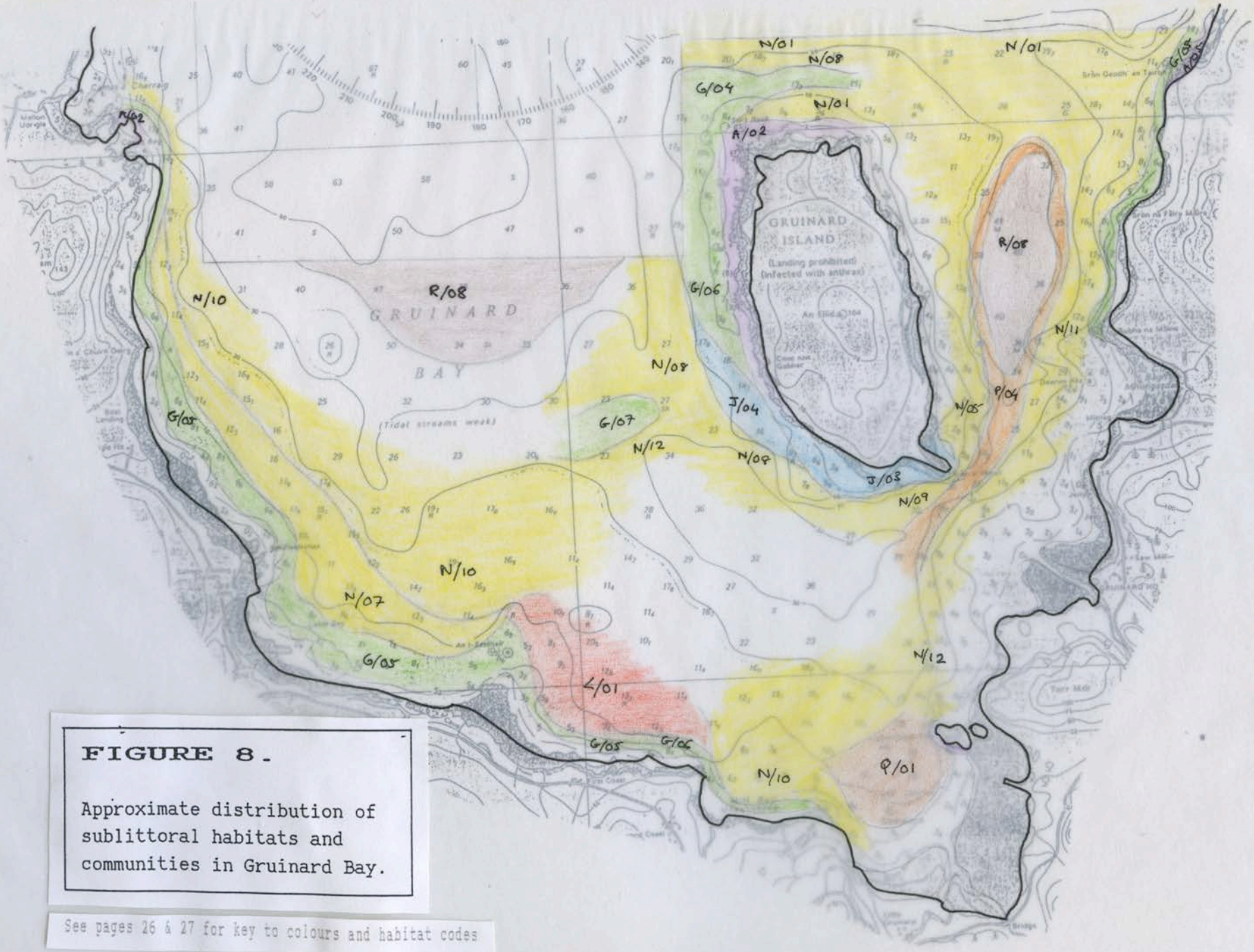


FIGURE 8.

Approximate distribution of sublittoral habitats and communities in Gruinard Bay.

See pages 26 & 27 for key to colours and habitat codes

many places and appeared to extend over a considerable area to the north and east of the island. Patches of living maerl were also located south-east of the island and may or may not be continuous with the maerl at the other sites. The extent of the bed needs to be examined further and could form part of the phase 2 survey to the area.

The habitats recorded to the south of Gruinard Island were very mixed. This was an area of cobbles, pebbles and boulders on sand with the proportion of each changing with depth. The shingle spit in the intertidal zone gave way first to an area of boulders covered by *Sacchoriza polyschides*, and then to a predominantly sandy seabed scattered with cobbles and pebbles. Filamentous algae were abundant on the hard substrata giving the latter habitat a very patchy appearance.

Channel between Gruinard Island and the eastern side of the bay

The narrowest part of the channel is at the south eastern margin of the island and was characterised by a sandy habitat with cobbles in the shallows grading through sand to muddy sand with *Virgularia mirabilis* beds below 20m. The deepest part of the channel (below 30m) which occurred at its widest point, was an area of worked sandy mud with *Pennatula phosphorea* beds. Moving eastwards the channel became shallow again with seapens less frequent and the muddy sand interspersed with patches of maerl.

4.3. LOCH EWE

4.3.1. Details of dive sites in Loch Ewe

The details of each dive site in Loch Ewe are summarised below. All depths have been corrected to chart datum. The locations are shown in Figure 9.

DETAILS OF SURVEY SITES IN LOCH EWE

SITE No.	SITE NAME	GRID REF.	DATE	MAX DEPTH (m)	RECORDER
53	West by Boor Rocks	NG 840823	17.9.89	4.9	GG/JR
54	Boor Rocks	NG 844822	17.9.89	6.0	AD/PJG
55	Off Naast Jetty	NG 839822	17.9.89	11.1	BG/LB
56	Off Sron Nan Oban	NG 816906	17.9.89	10.8	GG/JR
57	Sron Nan Oban Reef	NG 817815	17.9.89	11.6	AD/PJG
58	Sron Meallan a Shamhna	NG 818897	17.9.89	10.8	BG/LB
59	Off Midtown School	NG 826875	17.9.89	15.8	CS/SH
60	Channel an Squiteach	NG 833835	17.9.89	26.7	PG/SG
61	An Squiteach Point	NG 825885	17.9.89	15.3	CS/SH
62	Camas na Muil Bay	NG 822892	17.9.89	14.0	PG/SG
63	Sitheauan Dubha Bay	NG 846898	18.9.89	10.8	LB/PG
64	Gob na Lice	NG 844902	18.9.89	11.7	PG/CS
65	Sgeir an Araig	NG 834899	18.9.89	14.7	SG/JR
66	Loch Thurnaig Jetty S.	NG 874837	18.9.89	7.0	CS/LB
67	N. of Leach Bhudhe	NG 872841	18.9.89	17.4	AD/PJG
68	W. side Loch Thurnaig	NG 863839	18.9.89	18.5	BG/GG
69	Ob na ba Rudidhe	NG 862834	18.9.89	15.9	PG/CS
70	Loch Thurnaig narrows	NG 864843	18.9.89	24.3	JR/PJG
71	North of Site 68	NG 862842	18.9.89	19.8	SH/LB
72	Rubha ard na Ba	NG 859844	18.9.89	25.7	SG/AD
73	Jetty Nato Oil Depo	NG 871873	21.9.89	19.4	PG/BG
74	N. Rubha Thurnaig	NG 864853	21.9.89	24.7	PJG/LB
75	Off An Sagart Point	NG 846837	21.9.89	11.8	CS/GG
76	Resolution Rock	NG 483443	21.9.89	10.0	SG/JR
77	N. Rubha Ard na ba	NG 855848	21.9.89	38.0	AD/SH
78	S. Point Isle of Ewe	NG 862868	21.9.89	14.9	PG/BG
79	W. coast Isle of Ewe	NG 843878	21.9.89	13.5	PJG/LB
80	S. of Sgeir a Bhuic	NG 836890	21.9.89	20.7	CS/GG
81	S. of Aird Point	NG 867883	21.9.89	14.3	SG/JR
82	Ault Bea Slip	NG 865890	21.9.89	4.1	AD/SH
83	Gob na Lice/Rubh a Choin	NG 843905	22.9.89	20.1	PG/CS
84	East of Fairway Buoy	NG 832928	22.9.89	26.3	LB/JR
85	Bloc Leacon Donna	NG 837921	22.9.89	17.1	AD/PJG
86	Rebh a Choin	NG 909838	22.9.89	9.2	SG/BG
87	W. of Sgeir an Draig	NG 827895	22.9.89	25.4	GG/SH
88	S.E.of Sitheanan Dubha	NG 850894	22.9.89	12.1	PG/CS
89	A1 Buoy	NG 900853	22.9.89	11.2	LB/JR
90	Stithean Dubha/Culconich	NG 855896	22.9.89	14.1	AD/PJG

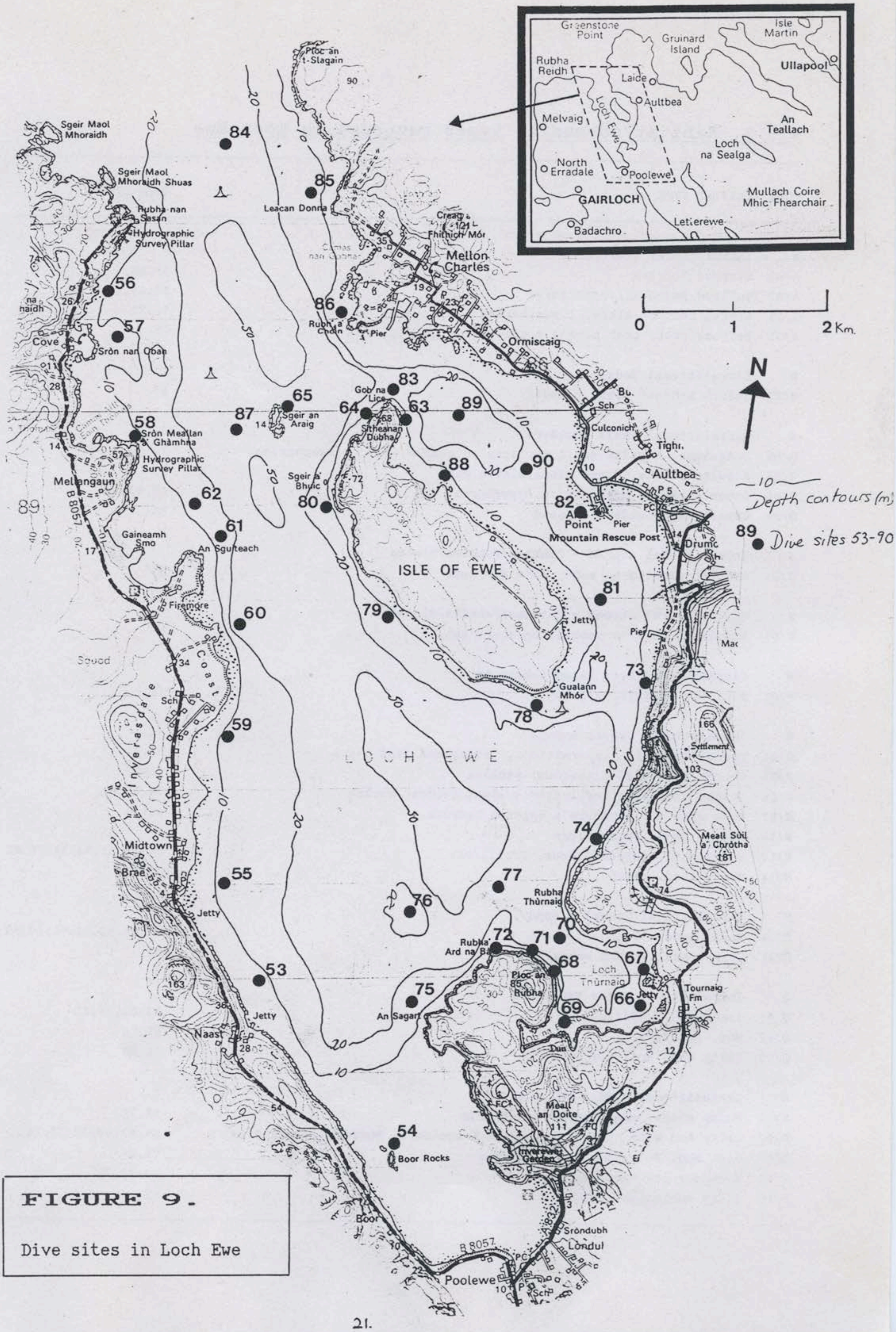


FIGURE 9.

Dive sites in Loch Ewe

4.3.2. Habitat/community types recorded in Loch Ewe

CODE	HABITAT TYPE	LOCH EWE
A	**Infralittoral Bedrock**	
A/01	Stepped Bedrock	56,58,
A/02	Gullied Bedrock, *L.hyperborea*	57,64,65
A/04	Broked bedrock slope, *L.saccharina*	71,72
A/05	Bedrock reef, pock marked surface	76
B	**Circalittoral Bedrock**	
B/02	Smooth bedrock reef, *C.smithi*	87
G	**Infralittoral Small Boulders**	
G/02	Occasional angular small boulders on coarse sand, *L.saccharina*	72
G/03	Angular blocks, scree slope, diatom mat.	65
G/05	Densely packed boulders, *L.hyperborea*	58,63,64
G/06	Occasional boulders on sand	65
J	**Infralittoral Stones - Cobbles/Pebbles/Slates**	
J/04	Angular pebbles on muddy sand *P.crispa*	81
K	**Circalittoral Stones - Cobbles/Pebbles/Slates**	
K/02	Angular cobbles & pebbles on shell sand	87
M	**Circalittoral Very Mixed Substrata**	
M/01	Boulders, pebbles & sand	84
N	**Infralittoral Gravel & Sand**	
N/02	Coarse sand with intermittent, living and dead maerl	57,61,62
N/05	Coarse sand with occasional pebbles	56,58
N/06	Coarse sand with shell debris algal debris, worked	56,83,86
N/07	Sand with occ.boulders & exposed bedrock.	63,64
N/10	Medium sand, loose algae	75
N/12	Muddy sand, *Aspherococcus, Trailliela*	54,55,61,73,74,76,82
N/14	Muddy sand, maerl	54,79
P	**Circalittoral Gravel & Sand**	
P/04	Muddy sand, *Virgularia* beds	59,60,63,71,75,80,83
P/05	Coarse shelly sand waves	85
Q	**Infralittoral Muddy Sediments**	
Q/01	Sandy mud *Trailliella*	53,55,79,88
Q/02	Mud, *P.crispa*	69,78
Q/03	Silty mud, *Modiolus, Antedon*	88,90
R	**Circalittoral Muddy Sediments**	
R/01	Muddy slope, small boulders, *Munida*	72,74
R/02	Silty mud with occasional stones & boulders, *Munida* & *Ascidiella*	66,67,68,72,73,74
R/07	Fine mud, *Pennatula* beds, *Nephrops*	71,89
R/08	Worked sandy mud, *Pennatula*	70,72,77
R/10	Silty mud, algal debris	69

4.3.3. General description of Loch Ewe

Loch Ewe was the larger of the two sea lochs investigated during the expedition. It is approximately 13km from the sheltered head of the loch at Poolewe to the loch mouth and approximately 5km across at its widest point. A major feature is the Isle of Ewe which lies in the north east part of the loch and there is also a particularly sheltered area known as Loch Thurnaig at the head of the loch. The loch is divided into two basins with a sill at the entrance and approximately two-thirds of the way up the loch (see Fig 2). The following description of the habitats and communities considers the loch in four parts - Loch Thurnaig, the inner basin and sill, the channel between the Isle of Ewe and the eastern shore, and the outer basin and sill. It should be read with reference to Figure 10. which summarises the information.

Loch Thurnaig

Loch Thurnaig is a sheltered area at the head of Loch Ewe. Apart from the pebble/muddy area on the southern margin, the intertidal is characterised by tilted, stepped bedrock which grades into a predominantly muddy area. The extremely sheltered arm at the western end of the inlet (Ob ba Ba Ruaidhe) was typically a muddy habitat with occasional small angular boulders buried in the sediment but extensively covered by *Phyllophora crispa*. At either side of the channel connecting the inlet to Loch Ewe, bedrock graded into a steep boulder slope (supporting *Laminaria saccharina*) and then became predominantly muddy with the occasional boulder. Below 20m the seabed consisted of worked sandy mud and areas of fine mud, both colonised by *Pennatula phosphorea*.

The inner basin and sill of Loch Ewe

The infralittoral area of the inner basin was predominantly muddy sand with mats of *'Trailliella'* covering parts of the surface. This graded into a slightly different habitat around Boor rocks where a maerl bed was located and supported large numbers of *Psammechinus miliaris*. The extent of this maerl bed was not determined and may therefore merit further investigation.

The circalittoral zone in this part of the loch was predominantly muddy sand supporting *Virgularia mirabilis* beds and extensively worked in places. This graded into a fine mud habitat supporting *P.phosphorea* and *Nephrops norvigecus* in the deeper parts of the loch. The area below 50m was not investigated however the Admiralty Chart notes that it is generally an area of mud therefore the same habitat and community type may occur here. The eastern edge of the basin abuts onto the Isle of Ewe and was mainly an area of muddy sediments in contrast to the sandy western side of the loch

presumably because of the shelter provided by the island. *'Trailliella'* and *P.crispa* were present on the mud surface although hydroids, ascidians and the occasional clump of *Modiolus modiolus* was also recorded in these habitats.

A small reef (Resolution Rock - site 76) was an anomaly in the area and when investigated had a distinctly different appearance to the bedrock around the edges of Loch Thurnaig and at the entrance to Loch Ewe. This may be an example of the Lewisian gneiss which occurs along the south western margin of the loch.

Edwards (1986) notes the presence of a sill running from the area of Sgeir a Bhuic on the western side of the Isle of Ewe to Sron Meallan Ghamhna (Fig.2). Investigation of the habitats in this area showed them to be distinctly different from the adjacent areas. The most conspicuous feature was a bedrock outcrop with an extremely smooth surface colonised by *Caryophyllia smithi* and little else. The area around the outcrop consisted of cobbles, pebbles and small boulders on coarse sand and supported large numbers of crinoids in places. In the shallower water, on the western margin of the sill, sand with patches of maerl were recorded. A more detailed investigation of this area is recommended to locate the boundaries of these different habitats as only the approximate locations are shown in Figure 10.

The channel between the Isle of Ewe and the eastern shore

The two main features of this sheltered channel were the continuation of the sill from the other side of the island and a deeper basin. In the vicinity of the sill the predominant habitat was angular stones on a sandy mud surface. Silt covered *P.crispa* was abundant and was the visually dominant species in many places. As the channel deepened silty mud was the main habitat and in the deeper basin fine mud with *Pennatula phosphorea* beds. The margins of the channel were predominantly sand but were not investigate in any details as these areas were used as boat moorings.

The outer basin and sill

Most of the outer basin was not investigated due to weather conditions and the depth of the central portion. The Admiralty Chart indicates that much of this is likely to be muddy. The western side of this basin graded from muddy sand with *Virgularia mirabilis* beds to coarse clean sand which was mixed with bedrock reefs and patchy maerl on sand, possibly relating to the presence of the inner sill. The outer sill was an area of mixed substrates. Coarse shell sand was overlain by pebbles, cobbles and boulders which were extensively colonised by keel worms. The extent of this habitat could not be confirmed as poor weather conditions restricted diving in this area.

FIGURE 10.

Approximate distribution of sublittoral habitats and communities in Loch Ewe

See pages 26 & 27 for key to colours and habitat codes

4.4CATALOGUE OF HABITATS RECORDED DURING THE SURVEY

Forty-seven different habitat types were encountered during the surveys of Loch Gairloch, Gruinard Bay and Loch Ewe. They are categorised under the sixteen major headings used in the SEASEARCH Habitat Directory (under preparation). These headings are not intended to be a comprehensive habitat classification system but a convenient means of collating and cross-referencing the habitat descriptions from SEASEARCH surveys. To distinguish between them each heading has been given a code letter (I and O have been omitted intentionally) (see Table 2).

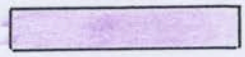
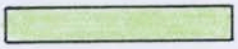
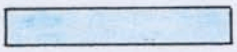
TABLE 2.

Broad habitat headings used for SEASEARCH recording

CODE	GENERAL HEADING
A	Infralittoral Bedrock
B	Circalittoral Bedrock
C	Infralittoral Artificial Substrata
D	Circalittoral Artificial Substrata
E	Infralittoral Large Boulders (>1m)
F	Circalittoral Large Boulders (>1m)
G	Infralittoral Small Boulders (<1m)
H	Circalittoral Small Boulders (<1m)
J	Infralittoral Stones - Cobbles/Pebbles/Slates
K	Circalittoral Stones - Cobbles/Pebbles/Slates
L	Infralittoral Very Mixed Substrata - hard and soft
M	Circalittoral Very Mixed Substrata - hard and soft
N	Infralittoral Gravel and Sand
P	Circalittoral Gravel and Sand
Q	Infralittoral Muddy Sediments
R	Circalittoral Muddy Sediments

More detailed habitat descriptions have the appropriate code letter followed by a number. Numbers are assigned in chronological order and are therefore not intended to show any relationship between the different habitats. For example the first SEASEARCH habitat description which falls under the general category "Infralittoral Bedrock" has been given the reference number A/01, and the second A/02; the first description of "Circalittoral Muddy Sediments" is R/01 and the second R/02 and so on. The habitats and associated communities which have been described in more detail in SEASEARCH surveys to sealochs in the north west of Scotland are listed in Table 3. Those which occurred in the area of the present survey have been highlighted with the symbol ◆ and those that occurred in the present survey and in the survey of Loch Broom and Little Loch are indicated with the symbol ◇. The colours used to represent each main habitat type in figures 6,8 & 10 are also indicated in the table.

HABITAT/COMMUNITY TYPES DESCRIBED BY SEASEARCH SURVEYS OF SEALOCHS IN NORTH-WEST SCOTLAND

COLOURS USED IN FIGS.	CODE	HABITAT TYPE
		
		A Infralittoral Bedrock
	◇ A/01	Stepped Sandstone Bedrock
	◆ A/02	Gullied Bedrock
	◆ A/03	Stepped Bedrock, *L.saccharina*, *C.filum*
	◆ A/04	Gullied Bedrock *L.saccharina*
	◆ A/05	Gullied Bedrock, pock marked
		
		B Infralittoral Bedrock
	◆ B/01	Stepped bedrock, *C.intestinalis*
		
		E Infralittoral Large Boulders
	◆ E/01	Occasional large boulders, *L.hyperborea*
	◆ E/02	Dense large boulders, *L.hyperborea*
		
		F Circalittoral Large Boulders
	◆ F/01	Large boulder slope, *Antedon*, *Munida*
		
		G Infralittoral Small Boulders
	◇ G/01	Densely packed boulders, *L.saccharina*
	◇ G/02	Occasional angular small boulders on coarse sand, kelp forest
	◇ G/03	Angular blocks, scree slope,diatom mat.
	◇ G/04	Rounded boulders on coarse sand and maerl
	◆ G/05	Densely packed boulders, *L.hyperborea*
	◆ G/06	Occasional boulders on sand
	◆ G/07	Rounded boulders on coarse sand/maerl
		
		H Circalittoral Small Boulders
	◆ H/01	Rounded boulder slope, *Munida*, *Antedon*
		
		J Infralittoral Stones - Cobbles/Pebbles/Slates
	J/01	Clean cobbles,on sand, *Modiolus* clumps.
	J/02	Pebble/cobble bank with occasional boulder, *L.saccharina*
	◆ J/03	Pebble/cobble bank with occasional boulder, *S.polyschides*
	◆ J/04	Angular pebbles on muddy sand *P.crispa*
	◆ J/05	Pebbles on shell sand
		
		K Circalittoral Stones - Cobbles/Pebbles/Slates
	K/01	Pebble clumps on muddy sand, *Limaria hians* bed.
	◆ K/02	Cobbles & pebbles on shell sand
		
		L Infralittoral Very Mixed Substrata
	◆ L/01	Boulders, pebbles & sand

◇ - Habitats/community types which occurred in this survey and the Loch Broom/Little Loch Broom SEASEARCH survey

◆ - Habitat/community types which occurred in this survey only

COLOUR USED IN FIGURES	CODE	HABITAT TYPE
		M Circalittoral Very Mixed Substrata
	◆ M/01	Boulders, pebbles & sand
		N Infralittoral Gravel & Sand
	◇ N/01	Coarse sand covered by continuous bed of maerl
	◇ N/02	Coarse sand with intermittent, living and dead maerl
	N/03	Sandy shell gravel with some pebbles
	N/04	Clean, rippled coarse sand, diatom mat
	◇ N/05	Coarse sand with occasional pebbles
	◇ N/06	Coarse sand with shell debris algal debris, well worked.
	◆ N/07	Sand with occ.boulders & exposed bedrock.
	◆ N/08	Coarse sand with occ.boulder, maerl
	◆ N/09	Clean sand, frequent cobbles, algal tufts
	◆ N/10	Medium sand, loose algae
	◆ N/11	Muddy sand, shell debris, maerl, *Virgularia*
	◆ N/12	Muddy sand, loose algal debris
	◆ N/13	Clean, coarse, rippled sand, *Zostera*
	◆ N/14	Muddy sand, maerl
		P Circalittoral Gravel & Sand
	◇ P/01	Clean shell sand
	P/02	Clean coarse sand, shell debris
	P/03	Shell sand with scattered pebbles and cobbles
	◇ P/04	Muddy sand, *Virgularia* beds
	◆ P/05	Coarse shelly sand waves
		Q Infralittoral Muddy Sediments
	◆ Q/01	Sandy mud with algal mat
	◆ Q/02	Mud, *P.crispa*
	◆ Q/03	Silty mud, *Modiolus, Antedon*
		R Circalittoral Muddy Sediments
	◇ R/01	Muddy slope, with small boulders, *Munida* dominated.
	◇ R/02	Silty mud with occasional stones and boulders, *Munidia* and *Ascidiella*
	R/03	Muddy slope with extremely abundant shell debris
	R/04	Sandy mud with shell debris and pebbles, *Ascidiella* dominated
	R/05	Silty mud with shell debris, *Aequipecten*
	R/06	Fine mud slope with occasional shell debris
	◇ R/07	Fine sticky mud, worked surface, *Pennatula* beds.
	◆ R/08	Slightly worked sandy mud
	◆ R/09	Sandy mud, occasional large boulder
	◆ R/10	Silty mud, algal debris

◇- Habitats/community types which occurred in this survey and the Loch Broom/Little Loch Broom SEASEARCH survey

◆- Habitat/community types which occurred in this survey only

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: A/01

HABITAT TYPE: A: Infralittoral Bedrock

SITE TYPE: Stepped bedrock, *Laminaria hyperborea*

LOCATION (site Nos.): 4,5,6,56,58 **DEPTH:**0-15m

DOMINANT COMMUNITY: *Laminaria hyperborea* kelp forest

SITE DETAILS

Situation: Sea loch entrance
Salinity: Fully marine
Wave exposure: Mod.exposed
Tidal streams: None noted
Geology: Torridonian sandstone

HABITAT DETAILS

Zone: Infralittoral
Substratum: Bedrock
Modifiers:
Features: Ledges

PHOTOGRAPH;

This habitat has been described by a previous SEASEARCH survey (see H25 in Gubbay & Nunn, 1988). It consisted of stepped bedock with ledges, vertical and horizontal faces. The dominant community type was *L.hyperborea* which formed a dense kelp forest in places and was covered by *Antedon bifida* which also occurred in patches on the rock surface. *Echinus esculentus* was also common and both *Caryophyllia smithi* and *Alcyonium digitatum* had colonised the vertical surfaces.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: A/02

HABITAT TYPE: A: Infralittoral Bedrock

SITE TYPE: Gullied bedrock, *Laminaria hyperborea*

LOCATION (site Nos.): 15,48,49,57,64,65 **DEPTH:**0-15m

DOMINANT COMMUNITY: *Laminaria hyperborea* kelp forest

SITE DETAILS

Situation: Open coast,loch mouth
Salinity: Fully marine
Wave exposure: Mod.exposed
Tidal streams: None noted
Geology: Torridonian sandstone

HABITAT DETAILS

Zone: Infralittoral
Substratum: Bedrock
Modifiers:
Features: Gullies

PHOTOGRAPH; Ron Crosby, Loch Gairloch

This habitat was predominantly bedrock with vertical and horizontal faces sloping up to the surface at approximately 30°. Conspicuous gullies (large enough to swim through in places) were a feature of the habitat and the rock surface was fissured. Coarse sand patches as well as pebbles and stones were present at the bottom of the gullies. *L.hyperborea* dominated the habitat but it was also extensively grazed by *Echinus esculentus* and *Caryophyllia smithi* were common. Although recorded to a depth of 15m this habitat was also visible in the intertidal areas particularly around the northern and western shores of Gruinard Island.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: A/03

HABITAT TYPE: B: Infralittoral bedrock

SITE TYPE: Stepped bedrock, *Laminaria saccharina, Chorda filum*

LOCATION (site Nos.): 14,18,19,28 **DEPTH:** 0-11m

DOMINANT COMMUNITY: *L.saccharina, C.filum*

SITE DETAILS

Situation: Sea loch
Salinity: Possibly some f.w.
Wave exposure: Sheltered
Tidal streams: None noted
Geology: Torridonian sandstone

HABITAT DETAILS

Zone: Infralittoral
Substratum: Bedrock
Modifiers: *Echinus*
Features: fissures

PHOTOGRAPH: Ron Crosby, Loch Gairloch

This habitat was stepped, fissured, bedrock dominanted by *L.saccharina* and *C.filum*. It was similar to A/01 but was recorded in more sheltered areas leading to the difference in the main community which was *L.hyperborea* in A/01. The habitat was recorded between the surface and 11m and was grazed by *Echinus*. The surfaces of the *L.saccharina* supported large numbers of crinoids.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: A/04

HABITAT TYPE: A: Infralittoral Bedrock

SITE TYPE: Broken bedrock slope.

LOCATION (site Nos.): 2,71,72 **DEPTH:** 0-14m

DOMINANT COMMUNITY: *Laminaria saccharina*

SITE DETAILS

Situation: Sea loch
Salinity: Marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology: Torridonian sandstone

HABITAT DETAILS

Zone: Infralittoral
Substratum: Bedrock
Modifiers: *Echinus*
Features: Gullies

PHOTOGRAPH: Lin Baldock, Loch Ewe

This habitat consisted of gullied and broken bedrock which formed an irregular slope upto the surface. It consisted of vertical and horizontal surfaces and was recorded in sheltered locations. The occasional *L.saccharina* made up the visually dominant community however they were generally very tatty and silt covered specimens. The rock surfaces were grazed by *E.esculentus* and a diatom mat was clearly visible on the surfaces.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: A/05

HABITAT TYPE: A: Infralittoral Bedrock

SITE TYPE: Gullied bedrock.

LOCATION (site Nos.): 76 **DEPTH:** 10-14m

DOMINANT COMMUNITY: *Laminaria saccharina*

SITE DETAILS

Situation: Sea loch
Salinity: Marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Bedrock
Modifiers: *Echinus*
Features: Gullies, pock marked

PHOTOGRAPH: Sue Gubbay, Loch Ewe

The bedrock which made up this habitat formed a reef in a sheltered part of Loch Ewe. Ledges, overhangs and crevices were features of the reef which was at an angle of approximately 20°. The rock type was distinctly different from that noted at other sites during this surface as it was extensively pock marked. Rather tatty specimens of *L.saccharina* formed the visually dominant community on the reef top but were generally sparse. *E.esculentus* and *.Antedon bifida* were common and shoals of juvenile fish were swimming around the reef. *Carophyllia smithi* and *Ascidiella aspersa* were noted on the reef surface.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: A/06

HABITAT TYPE: A: Infralittoral Bedrock

SITE TYPE: Sloping bedrock

LOCATION (site Nos.): 6

DEPTH: 5m

DOMINANT COMMUNITY: *Laminaria hyperborea*

SITE DETAILS

Situation: Sea loch entrance
Salinity: Fully marine
Wave exposure: Mod. exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Bedrock
Modifiers:
Features:

PHOTOGRAPH; Ron Crosby, Loch Gairloch

A gradually sloping bedrock surface was the main feature of this habitat. It was colonised by *L.hyperborea* which formed a patchy kelp forest. *Antedon bifida* was common at the site. There was also a patchy covering of filamentous algae on the rock surface. *Echinus esculentus* was common.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: B/01

HABITAT TYPE: B: Circalittoral bedrock

SITE TYPE: Vertical bedrock, *Ciona intestinalis*

LOCATION (site Nos.): 2,22,23 **DEPTH:** 18-28m

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Sea loch
Salinity: Possibly some f.w.
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Bedrock
Modifiers: *Echinus*
Features: fissures

PHOTOGRAPH: Roger Sykes, Loch Gairloch

This habitat was a nearly vertical, fissured, bedrock face although some ledges were present at site 22. The rock surface was encrusted by *Lithothamnion* however the most visually dominant species was *C.intestinalis* which covered between 50-100% of the habitat although interspersed with the occasional *Antedon bifida* at site 23.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: B/02

HABITAT TYPE: B: Circalittoral bedrock

SITE TYPE: Smooth bedrock reef, *Caryophyllia smithi*

LOCATION (site Nos.): 87 **DEPTH:** 27-29m

DOMINANT COMMUNITY:

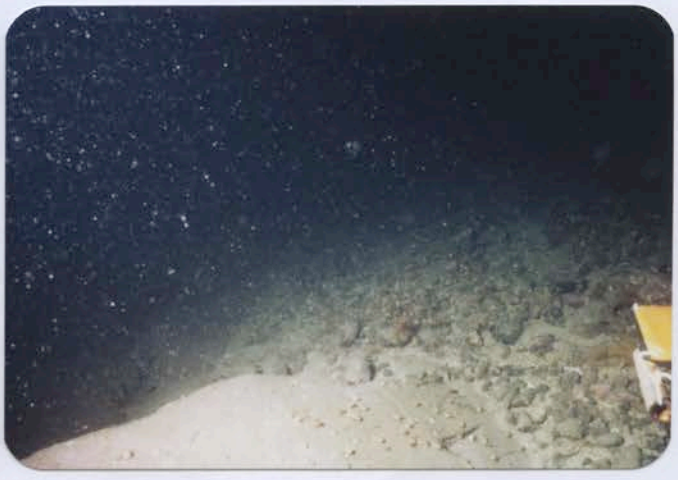
SITE DETAILS

Situation: Sea loch sill
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Bedrock
Modifiers: *Echinus esculentus*
Features:

PHOTOGRAPH: Gil Green, Loch Ewe



This habitat was a gently sloping bedrock reef recorded in the vicinity of a sill at the entrance to Loch Ewe. The rock surface was very smooth with the only conspicuous attached life being *C.smithii* which were common. Some *E.esculentus* were also observed on the reef. It graded into habitat K/02 (see photograph on right).

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: E/01

HABITAT TYPE: E: Infralittoral Large Boulders

SITE TYPE: Frequent large boulders, *Laminaria hyperborea*

LOCATION (site Nos.): 12,15,16,49 **DEPTH:** 5-13m

DOMINANT COMMUNITY: *Laminaria hyperborea*

SITE DETAILS

Situation: Loch entrance, bay
Salinity: Fully marine
Wave exposure: Mod.exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Boulders
Modifiers: *Echinus*
Features:

PHOTOGRAPH: Gil Green, Loch Gairloch

This habitat was recorded in the more exposed parts of Loch Gairloch and Gruinard Bay. It consisted of large boulders and blocks (>1m across) on a bed of coarse sand which also formed a microhabitat between the boulders. The surfaces were grazed by *Echinus* and the visually dominant community was *L.hyperborea* on the surfaces of the blocks and on the smaller boulders in the sandy gullies. The habitat was recorded between 5-13m on a very gradually sloping seabed.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: E/02

HABITAT TYPE: E: Infralittoral Large Boulders

SITE TYPE: Dense large boulders, *L.hyperborea*

LOCATION (site Nos.): 15,16,18,49 **DEPTH:** 9-15m

DOMINANT COMMUNITY: *Laminaria hyperborea*

SITE DETAILS

Situation: Open coast
Salinity: Fully marine
Wave exposure: Exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Boulders
Modifiers: *Echinus*
Features:

PHOTOGRAPH: Ron Crosby, Loch Gairloch

This habitat was made up of densely packed, large (>1m across), angular blocks which were often piled up on each other. They occurred between 9-15m on a very gradually sloping seabed and were colonised by the occasional *L.hyperborea* and grazed by *E.esculentus*.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: F/01

HABITAT TYPE: F: Circalittoral large boulders

SITE TYPE: Large boulder slope, *Antedon bifida, Munida rugosa*

LOCATION (site Nos.): 8 **DEPTH:** 22-27m

DOMINANT COMMUNITY: *A.bifida*

SITE DETAILS

Situation: Sea loch
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Boulders
Modifiers:
Features:

PHOTOGRAPH:

A scree slope of large (>1m) angular boulders made up this habitat. It was recorded between 22-27m and was extensively covered by *Antedon*. The occasional *Munida* and seasquirts were also common amongst the boulders.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/01

HABITAT TYPE: G: Infralittoral Small boulders

SITE TYPE: Densely packed boulders, *Laminaria saccharina*

LOCATION (site Nos.): 5,19,22, V1-19,V21,V25-6,V30 **DEPTH:**4-14

DOMINANT COMMUNITY: *L.saccharina*

SITE DETAILS

Situation:Sea loch
Salinity: Freshwater layer noted
Wave exposure: Sheltered
Tidal streams:None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Medium boulders
Modifiers: *Echinus*
Features: Sandy patches

PHOTOGRAPH:

This habitat has been described by a previous SEASEARCH survey (see H25 in Gubbay & Nunn, 1988). It was recorded in the survey area between 14-4m and consisted of a dense boulder slope interspersed with the occasional sandy patch. *L.saccharina* formed the main community and a particular feature was the abundance of *Antedon bifida* on the fronds. Occasional *Laminaria hyperborea* and *Chorda filum* were also recorded on this habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/02

HABITAT TYPE: G: Infralittoral Small boulders

SITE TYPE: Occasional angular small boulders on coarse sand, *Laminaria saccharina*

LOCATION (site Nos.): 5,31,72 **DEPTH:** 10-14m

DOMINANT COMMUNITY: *L.saccharina*

SITE DETAILS

Situation: Sea loch, bay
Salinity: Freshwater layer noted
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Medium boulders
Modifiers: *Echinus esculentus*
Features: Sandy patches

PHOTOGRAPH:

This habitat has been described by a previous SEASEARCH survey (see H23 in Gubbay & Nunn, 1988). It was recorded in the survey area between 10-14m and consisted of a occasional boulders on sand. The boulders were small (<1m) and generally rounded and the surfaces were grazed by *E.esculentus*. *L.saccharina* formed the main community type but was not particularly dense. The habitat was generally recorded on a gently slope.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/03

HABITAT TYPE: G: Infralittoral Small boulders

SITE TYPE: Angular boulders, scree slope.

LOCATION (site Nos.): 65 **DEPTH:** 17-20m

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Sea loch
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Angular boulders
Modifiers: *Echinus esculentus*
Features:

PHOTOGRAPH: Sue Gubbay, Loch Ewe

This habitat has been described by a previous SEASEARCH survey (see H22 in Gubbay & Nunn, 1988). It was a scree slope of medium sized angular boulders (upto 2m in diameter). *E.esculentus* was common and only a fine diatom mat and *Lithothamnion* was visible on what appeared to be an otherwise bare surface. The boulders were resting on a shelly sand.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/04

HABITAT TYPE: G: Infralittoral Small Boulders

SITE TYPE: Rounded boulders on coarse sand & maerl

LOCATION (site Nos.): 30,34,35,51 **DEPTH:** 20-22m

DOMINANT COMMUNITY: Urchin grazed

SITE DETAILS

Situation: Open coast
Salinity: Fully marine
Wave exposure: Exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Boulders
Modifiers: *Echinus esculentus*
Features: sand/gravel patches

PHOTOGRAPH: Roger Sykes, Gruinard Bay

This habitat has been described by previous SEASEARCH survey (see H21 in Gubbay & Nunn, 1988). It was recorded in the survey area between 22m and 20m and consisted of rounded boulders, less than 1.5m across on a bed of coarse sand. Patches of maerl were noted between the boulders and the occasional *Munida rugosa* was observed sheltering amongst the boulders at site 30. *Echinus esculentus* was also common at this site.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/05

HABITAT TYPE: G: Infralittoral Small Boulders

SITE TYPE: Densely packed boulders, *Laminaria hyperborea*

LOCATION (site Nos.): 5,6,32,33,49,58,63,64 **DEPTH:** 0-15m

DOMINANT COMMUNITY: *Laminaria hyperborea*

SITE DETAILS

Situation: Open coast, loch mouth
Salinity: Fully marine
Wave exposure: Mod. exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Boulders
Modifiers: *Echinus esculentus*
Features: sandy patches

PHOTOGRAPH: Ron Crosby, Loch Gairloch

This habitat was very similar to G/01 but is described as a different habitat type as it occurred in more exposed situations and was dominated by *L.hyperborea* rather than *L.saccharina*. It consisted of angular and rounded boulders, generally less than 1m across, covering about 90% of the seabed. Patches of coarse sand were observed where there were gaps between the boulders. It was recorded between 15m and the surface and was extensively grazed by *Echinus*. Crinoids were very abundant on the rock surfaces at some of the sites.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/06

HABITAT TYPE: G: Infralittoral Small Boulders

SITE TYPE: Occasional boulders on sand

LOCATION (site Nos.): 2,5,16,47,65 **DEPTH:** 0-10m

DOMINANT COMMUNITY: *Laminaria hyperborea*

SITE DETAILS

Situation: Loch entrance, bay
Salinity: Possible fresh water
Wave exposure: Mod.exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Boulders
Modifiers: *Echinus esculentus*
Features: sandy patches

PHOTOGRAPH: Sue Gubbay, Loch Ewe

This habitat is very similar to G/02 however it is noted here as a separate habitat type as it was recorded in a more exposed situation and supported mostly *L.hyperborea* although some *L.saccharina* was present. The habitat consisted of mostly angular boulders on a flat or gently sloping bed or coarse sand. It was recorded between 10m and the surface. The boulders were mostly between 1-1.5m across and were grazed by urchins. Apart from the kelp plants these were covered by encrusting red algae and crinoids were particularly common.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: G/07

HABITAT TYPE: G:Infralittoral Small Boulders

SITE TYPE: Rounded boulders on coarse sand/maerl

LOCATION (site Nos.):51 **DEPTH:**20-22m

DOMINANT COMMUNITY: Maerl/Brittlestars

SITE DETAILS

Situation: Open coast
Salinity: Fully marine
Wave exposure: Mod.Exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Boulders
Modifiers:*Echinus esculentus*
Features: sand/gravel/shell

PHOTOGRAPH: Betty Green, Gruinard Bay

This habitat consisted of medium sized boulders lying on a bed of coarse shell sand. The boulders which were mostly rounded and covered with encrusting red and brown algae, made up most of the habitat. Living maerl covered about 50% of the sand between the boulders.This habitat was recorded between 20m and 22m. Although similar to G/04 the most conspicuous difference of this habitat was the extensive cover of the brittle star *Ophiocomina nigra* over the boulders, maerl and sand. Maerl was also more abundant in this habitat. Occasional *L.hyperborea* and *E.esculentus* were observed in this habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: H/01

HABITAT TYPE: H: Circalittoral small boulders

SITE TYPE: Rounded boulder slope, *Munida rugosa*, *Ascidiella aspersa*

LOCATION (site Nos.): 8,19 **DEPTH:** 13-22m

DOMINANT COMMUNITY: *Munida rugosa*

SITE DETAILS

Situation: Sea loch
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Small boulders
Modifiers: *Echinus esculentus*
Features: Sandy patches

PHOTOGRAPH: Ron Crosby, Loch Gairloch

A sloping habitat of small (<1m) mostly rounded boulders scattered on muddy sand. This habitat was similar to G/02 but occurred in the circalittoral zone. *E.esculentus* was present and the occasional *M.rugosa*, *Antedon bifida* and *Ciona intestinalis* were noted in this habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: J/03

HABITAT TYPE: J:Infralittoral Stones - Cobbles/Pebbles/Slates

SITE TYPE: Pebble/cobble bank with occasional boulder, *Sacchoriza polyschides*

LOCATION (site Nos.): 40 **DEPTH:** 0-12m

DOMINANT COMMUNITY: *S.polyschides*

SITE DETAILS

Situation: Bay
Salinity: Fully marine
Wave exposure: Mod.Exposed
Tidal streams: Slight
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Pebbles/Cobbles
Modifiers: *Echinus esculentus*
Features:

PHOTOGRAPH: Ron Crosby, Gruinard Bay

This habitat was very similar to J/02 described by a previous SEASEARCH survey (see H19 in Gubbay & Nunn, 1988). It consisted of a gradually sloping bank of pebbles and cobbles on sand with the occasional boulder. However it is described separately here because the dominant community was *S.polyschides* kelp forest grazed by *E.esculentus* rather than *L.saccharina* which dominated J/02. The habitat occurred between 13m and the surface and included pockets of clean sand. Apart from the predominance of *S.polyschides*, the kelps *L.hyperborea*, and *L.saccharina* were present and foliose red algae had colonised the pebble and cobble surfaces.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: J/04

HABITAT TYPE: J:Infralittoral Stones - Cobbles/Pebbles/Slates

SITE TYPE: Angular pebbles on muddy sand, *Phyllophora crispa*

LOCATION (site Nos.): 81 **DEPTH:** 13-15m

DOMINANT COMMUNITY: *P.crispa*

SITE DETAILS

Situation: Sheltered
Salinity: Possible f.w.
Wave exposure: Sheltered
Tidal streams: Slight
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Pebbles
Modifiers:
Features: Muddy sand clearings

PHOTOGRAPH:

This habitat consisted of very angular pebbles 2-3cm across lying on muddy sand which was visible in the occasional clearings. Many of the pebbles were black in appearance (encrusting algae?). *P.crispa* was abundant and mostly covered by a thin layer of silt. Occasional *Modiolus modiolus*, *Nemertesia ramosa* and *Antedon bifida* were noted in this habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: J/05

HABITAT TYPE: J:Infralittoral Stones - Cobbles/Pebbles/Slates

SITE TYPE: Pebbles on shell sand

LOCATION (site Nos.): 40,48 **DEPTH:** 9-13m

DOMINANT COMMUNITY:

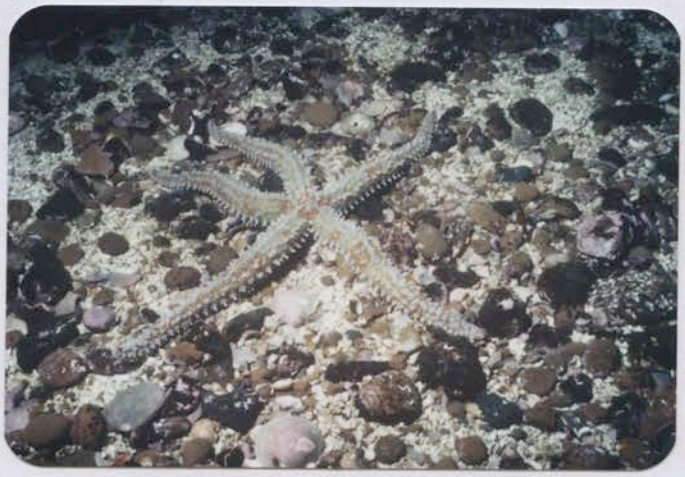
SITE DETAILS

Situation:Bay
Salinity: Marine
Wave exposure:Mod.exposed
Tidal streams:Slight
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum:Pebbles,cobbles, sand
Modifiers:
Features:

PHOTOGRAPH: Roger Sykes, Gruinard Bay



This habitat consisted of a mixture of pebbles and sand. The small rounded pebbles (2-3cm) made up between 30-60% of the habitat and lay on a virtually flat bed of shelly sand. The pebbles provided anchorage for small foliaceous red algae and hydroids. There was a very 'clean' appearance to this habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: K/02

HABITAT TYPE: K:Circalittoral stones - cobbles/pebbles/slates

SITE TYPE: Cobbles & pebbles on shell sand

LOCATION (site Nos.): 87 **DEPTH:** 28m

DOMINANT COMMUNITY: *Antedon bifida*

SITE DETAILS

Situation: Sea loch sill
Salinity: Fully marine
Wave exposure: Mod.Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Cobbles, sand
Modifiers:
Features:

PHOTOGRAPH: Gil Green, Loch Ewe

A flat or gently sloping habitat type recorded at 28m. The surface was a mixture of cobbles, pebbles and small boulders on a coarse sand. *Munida* and *Antedon* were frequent and there were patches of brittlestar beds overlying the sediment.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: L/01

HABITAT TYPE: L: Infralittoral Very Mixed Substrata

SITE TYPE: Boulders, pebbles, & sand

LOCATION (site Nos.): 32, 42, 48 **DEPTH:** 10-15m

DOMINANT COMMUNITY: *Laminaria hyperborea*, foliaceous red algae

SITE DETAILS

Situation: Bay
Salinity: Fully marine
Wave exposure: Mod. Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Very mixed
Modifiers:
Features:

PHOTOGRAPH: Roger Sykes, Gruinard Bay

A flat or gently sloping habitat type recorded between 16-8m and consisting of a mixture of substrates. The surface of a coarse shelly sand was covered by abundant and sparse patches of pebbles, cobbles, and stones as well as small and medium sized boulders. . *L.hyperborea* was present on some of the boulders, foliaceous red algae were common on the pebbles and cobbles as well as being anchored into the shell sand (eg. *Scinia turgida*).

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: M/01

HABITAT TYPE: M:Circalittoral Very Mixed Substrata

SITE TYPE: Boulders, pebbles, & sand

LOCATION (site Nos.): 84 **DEPTH:** 29

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Sill
Salinity: Fully marine
Wave exposure: Mod.exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Very mixed
Modifiers:
Features:

PHOTOGRAPHS: Lin Baldock, Loch Ewe

A flat or gently sloping habitat type recorded around 29m consisting of a mixture of substrates. The surface of a coarse shelly sand was covered by abundant and sparse patches of pebbles, cobbles, and stones as well as small and medium sized boulders. The boulders were extensively colonised by keel worms and *Echinus esculentus* was present. Brittlestars were also v.common in this habitat. There were many similarities between this habitat and L/01 but the main difference was its occurrence in the circalittoral and the great abundance of keel worms on the boulders.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/01

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Coarse sand covered with continuous bed of maerl

LOCATION (site Nos.): 34, 35, 36 **DEPTH:** 19-30m

DOMINANT COMMUNITY: Maerl

SITE DETAILS

Situation: Open coast
Salinity: Fully marine
Wave exposure: Mod.Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Coarse sand
Modifiers:
Features: Sand waves

PHOTOGRAPH: Gil Green, Gruinard Bay

This habitat has been described by a previous SEASEARCH survey (see H18 in Gubbay & Nunn, 1988). In the survey area it occurred between 19-30m on a flat or gently sloping seabed. The maerl was a delicate branching variety (*Phymatolithon calcareum*?) covering between 80-90% of the seabed and forming a layer upto 6cm deep. The surface layer was mostly living maerl and where the sand had been worked into waves the maerl was concentrated in the troughs. Pebbles, stones and fragments of shell were scattered amongst the maerl.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/02

HABITAT TYPE: N: Infralittoral gravel & and sand

SITE TYPE: Coarse sand with intermittent living and dead maerl

LOCATION (site Nos.): 17,36,57,61, **DEPTH:** 15-22m

DOMINANT COMMUNITY: Occasional maerl

SITE DETAILS	HABITAT DETAILS
Situation: Open coast, loch mouth	**Zone:** Infralittoral
Salinity: Fully marine	**Substratum:** coarse sand
Wave exposure: Exposed	**Modifiers:**
Tidal streams: None noted	**Features:** Ripples & burrows
Geology:	

PHOTOGRAPH: Paul Glendell, Loch Ewe

This habitat has been described by a previous SEASEARCH survey (see H17 in Gubbay & Nunn, 1988). It consisted of coarse sand overlain with patches of maerl worked into waves at some sites with the maerl lying in the troughs. An estimated 10-30% of the maerl was living. It occurred in the survey area between 15-22m. Some burrows were evident and dead shells were scattered on the surface. *Ascidiella aspersa* was present in the troughs of sand at sites 17, 57 and 61, and *Antedon bifida* was common at site 62.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/05

HABITAT TYPE: N: Infralittoral gravel & and sand

SITE TYPE: Coarse sand with occasional pebbles

LOCATION (site Nos.): 5,56,58 **DEPTH:** 11-13

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Loch mouth
Salinity: Fully marine
Wave exposure: Mod.Exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: coarse sand/pebbles
Modifiers:
Features:

PHOTOGRAPH: Lin Baldock, Loch Ewe

A predominantly coarse sand habitat with a scattering of pebbles and shell fragments on the surface. Small foliose and filamentous red algae were attached to the pebbles in small clumps. Unattached algae were also scattered on the surface. This habitat was recorded between 11-13m on a virtually flat seabed.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/06

HABITAT TYPE: N: Infralittoral gravel & and sand

SITE TYPE: Coarse sand with shell and algal debris, worked

LOCATION (site Nos.): 83,86 **DEPTH:** 12-14m

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Loch mouth
Salinity: Fully marine
Wave exposure: Mod.Exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: coarse sand
Modifiers:
Features: Ripples & burrows

PHOTOGRAPH: Betty Green, Loch Ewe

A coarse sand habitat with some loose algal debris and shells (particularly Tellins) scattered on the surface. A fine diatom mat was also visible covering the sand. This habitat showed more signs of working than N/10. Hermit crabs, *Asterias rubens* and *Buccinium undatum* were common.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/07

HABITAT TYPE: N:Infralittoral Gravel & Sand

SITE TYPE: Sand with occasional boulder and exposed bedrock

LOCATION (site Nos.): 33,38,63,64 **DEPTH:** 10-16m

DOMINANT COMMUNITY: *Laminaria hyperborea*

SITE DETAILS

Situation:Bay
Salinity: Fully marine
Wave exposure:Mod.Exposed
Tidal streams:None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Coarse sand
Modifiers:
Features: Bedrock/boulders

PHOTOGRAPH: Paul Glendell, Loch Ewe

This habitat was predominantly a coarse sand containing abundant shell fragments. An occasional outcrop of bedrock gave variety to the habitat along with boulders which lay on the surface. These were usually less than 1m across and supported clumps of *L.hyperborea*. An almost flat or gently sloping habitat type recorded between 10-16m. It was described as very "open" with "islands of kelp". *Astropecten irregularis* was common.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/08

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Coarse sand with occasional boulder, maerl

LOCATION (site Nos.): 50 **DEPTH:** 30-32m

DOMINANT COMMUNITY: Maerl

SITE DETAILS

Situation: Bay
Salinity: Fully marine
Wave exposure: Mod.Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Coarse sand, maerl
Modifiers:
Features: Occ.boulder/stones

PHOTOGRAPH: Gil Green, Gruinard Bay

This habitat was similar to N/01 but is included here as a different habitat due to the presence of the occasional boulder and a scattering of angular stones amongst the maerl adding to the diversity of the habitat. Hydroids, encrusting red algae and tube worms colonised the boulder surfaces. It was recorded between 30-32m on a virtually flat seabed.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/09

HABITAT TYPE: N:Infralittoral Stones - Cobbles/Pebbles/Slates

SITE TYPE: Clean sand, frequent cobbles, algal tufts.

LOCATION (site Nos.): 40,42,43 **DEPTH:** 12-16m

DOMINANT COMMUNITY: Algal tufts

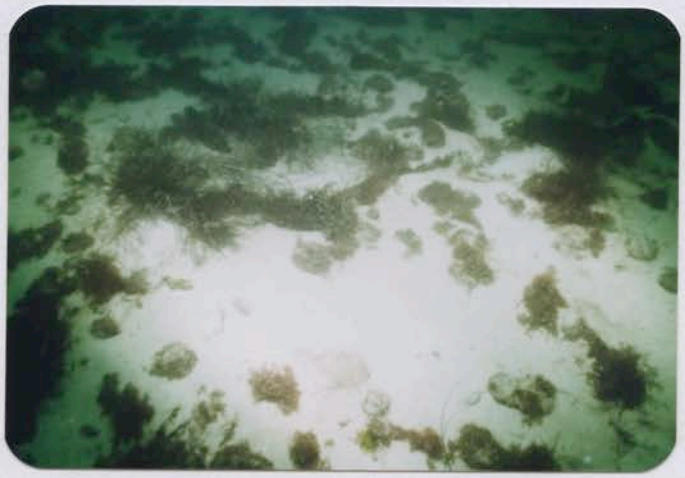
SITE DETAILS

Situation: Bay
Salinity: Possible f.w
Wave exposure: Mod.Exposed
Tidal streams: Slight
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Clean sand/cobbles
Modifiers:
Features:

PHOTOGRAPH: Ron Crosby, Gruinard Bay



A predominantly clean sand habitat with cobbles covering between 10-30% of the surface. This habitat was recorded on a flat or gently sloping seabed between 12-16m. The cobbles supported clumps of red and brown algae as well as hydroids which gave the habitat a very "patchy" appearance. Occasional crab excavations had modified the habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/10

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Medium sand, loose algae

LOCATION (site Nos.): 1,3,5,7,9,10,33,37,38,47 **DEPTH:** 8-15

DOMINANT COMMUNITY: *Ensis* sp.

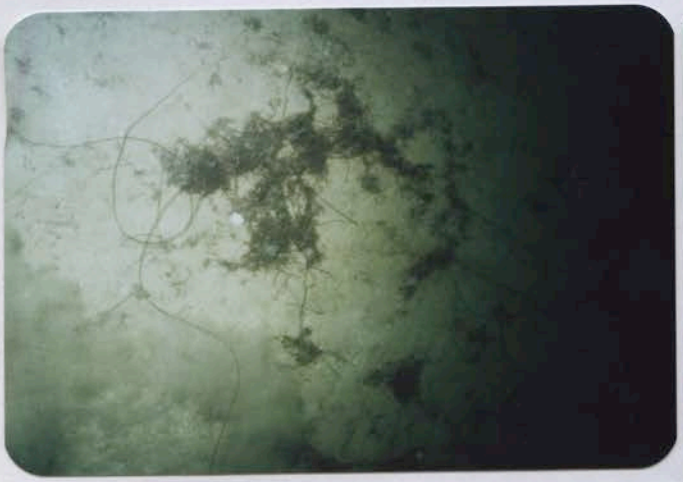
SITE DETAILS

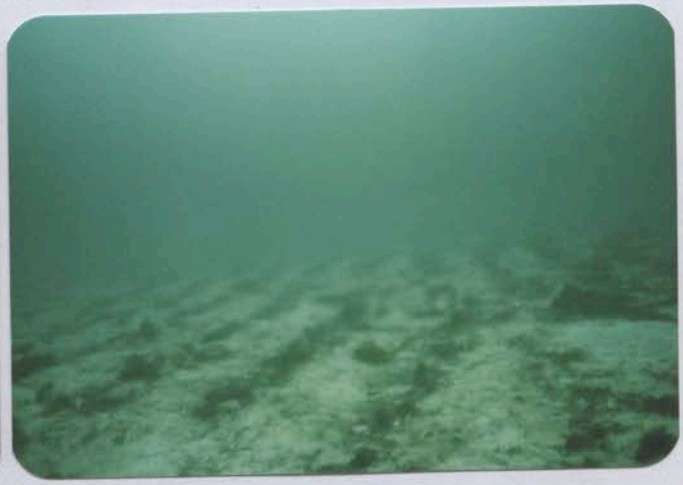
Situation: Bay, Sea loch
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: Slight
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Medium sand
Modifiers: Some excavations
Features: Sand waves

PHOTOGRAPH: Gil Green, Loch Gairloch & Gruinard Bay





A flat or very gently sloping medium sand habitat whose predominant feature was a scattering of both loose and attached algae (*Ulva, Chorda* and foliose reds). A diatom mat was also present on the sand surface and shell debris (particularly *Ensis*). *Echinocardium cordatum* was also noted in this habitat. There was very little working of the sand into burrows or mounds. This habitat was recorded between 8-15m and covered large sections of the survey area. At site 37 the sand was worked into waves with the algae concentrated in the troughs giving it quite a distinctive appearance and the latter situation may be considered a different habitat type.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/11

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Muddy sand, shell debris & maerl, *Virgularia mirabilis*

LOCATION (site Nos.): 20, 39 **DEPTH:** 15-23m

DOMINANT COMMUNITY: *V.mirabilis, 'Trailliella'*

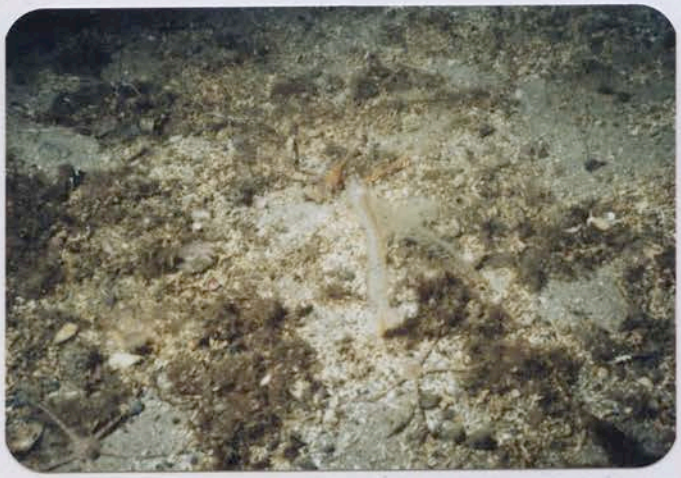
SITE DETAILS

Situation: Sheltered
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: Possibly slight
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Muddy sand
Modifiers: Worms
Features: Burrows & mounds

PHOTOGRAPH: Roger Sykes, Gruinard Bay



A gently sloping habitat of muddy sand scattered with shell debris (particularly *Turritella*) and, at site 39, patches of predominantly dead maerl. The surface was extensively worked and *Cerianthus*, *Virgularia*, and brittle stars were common. This habitat was recorded between 15-23m and was covered by a mat of filamentous "fluffy" algae (*'Trailliella'* and other species?) when it occurred above 16m.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/12

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Muddy sand, loose algal debris

LOCATION (site Nos.): 14,28,41,51,54,55, 61,73,74,76,82,V1-5,V20,V24-5 **DEPTH:** 8-15m

DOMINANT COMMUNITY: *Aspherococcus turneri, 'Trailliella'*

SITE DETAILS

Situation: Sheltered
Salinity: Possible f.w.
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Muddy sand
Modifiers:
Features:

PHOTOGRAPH: Ron Crosby, Gruinard Bay

A virtually flat plain of firm muddy sand recorded between 8-15m. The surface was scattered with loose algae debris, notably *Chorda*, *Aspherococcus turneri* and *Trailliella* the latter covering between 5-20% of the surface. Occasional shell debris and dead maerl was noted amongst this habitat at some sites as well as a diatom mat on the sand surface. *Cerianthus lloydi*, *Sabella pavonina* were present in the sand with the occasional *Cancer pagurus* excavating the surface. This habitat was distinguished from N/10 by the presence of *A.turneri* and *'Trailliella'* and its muddy consistency.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/13

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Clean, coarse, rippled sand, *Zostera marina*

LOCATION (site Nos.): 4,10,29 **DEPTH:** 9m

DOMINANT COMMUNITY: *Z.marina*

SITE DETAILS

Situation: Sea loch entrance
Salinity: Fully marine
Wave exposure: Mod.Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Coarse sand
Modifiers:
Features: Sand ripples

PHOTOGRAPH: Roger Sykes, Loch Gairloch

A coarse sand habitat with a very clean appearance (almost white), worked into waves and ripples (frequency approx. 20cm) and recorded in depths upto 9m. *Z.marina* was the visually dominant community in this habitat occurring in patches which were dense in places and containing flowering individuals at the time of the survey. Some shell debris (mainly *Ensis* sp.) was also observed on the surface with attached foliose red algae.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: N/14

HABITAT TYPE: N: Infralittoral Gravel & Sand

SITE TYPE: Muddy sand, maerl,

LOCATION (site Nos.): 54,79 **DEPTH:** 9-13m

DOMINANT COMMUNITY: maerl, *'Trailliella'*, filamentous algae.

SITE DETAILS

Situation: Sea loch
Salinity: Possible f.w.
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: muddy sand
Modifiers:
Features:

PHOTOGRAPH: Alan Davis, Loch Ewe

A muddy sand habitat overlain by maerl and other algae. *Psammechinus miliaris* was common in this 'matrix' at site 54 where the maerl was in large (5cm) chunky pieces. At site 79 the maerl was overlain by a mat of *'Trailliella'*. This habitat was recorded between 9-13m.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: P/01

HABITAT TYPE: P: Circalittoral Gravel & Sand

SITE TYPE: Clean shell sand

LOCATION (site Nos.): 31 **DEPTH:**

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Exposed
Salinity: Fully marine
Wave exposure: Exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Shell sand
Modifiers:
Features: Pebbles

PHOTOGRAPH: Ron Crosby, Gruinard Bay

This habitat has been described by a previous SEASEARCH survey (see H15 in Gubbay & Nunn, 1988). It consisted of flat or gently sloping plain of very clean shell sand. Small rounded pebbles were scattered on the surface and shell fragements were clearly visible mixed in with the sand.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: P/04

HABITAT TYPE: P: Circalittoral Gravel & Sand

SITE TYPE: Worked muddy sand, *Virgularia mirabilis*, *Ascidiella aspersa*

LOCATION (site Nos.): 2,20,21,22,24,25,28,43, 44,59,60,63,71,75,80,83 **DEPTH:** 16-34m

DOMINANT COMMUNITY: *V.mirabilis*

SITE DETAILS

Situation: Sheltered
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Muddy sand
Modifiers: Worms
Features: Burrows & mounds

PHOTOGRAPH: Gil Green, Loch Ewe

This habitat has been described by a previous SEASEARCH survey (see H4 in Gubbay & Nunn, 1988). It consisted of flat or gently sloping muddy sand which was extensively worked and covered by tracks. Shell debris, small stones and pebbles which were scattered on the surface supported hydroids. *V.mirabilis*, *Pennatula phosphorea* and *A.aspersa* were common along with brittle stars and starfish. Occasional *Modiolus modiolus* was also observed in this habitat. In places it graded into habitat N/11 which was similar but in the infralittoral zone.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: P/05

HABITAT TYPE: P: Circalittoral Gravel & Sand

SITE TYPE: Coarse shelly sand waves

LOCATION (site Nos.): 85 **DEPTH:** 17m

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Loch mouth
Salinity: Fully marine
Wave exposure: Mod.exposed
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Coarse sand
Modifiers:
Features: Boulders, waves

PHOTOGRAPH: Alan Davis, Loch Ewe

This habitat was predominantly of coarse shelly sand but the surface was scattered with the occasional boulder. The sand was worked into waves upto 15cm deep and 1-1.5m from crest to crest and shell debris and small pebbles had collected in the troughs. Mounds were visible on the sand surface and *Metridium senile*, *Alcyonium digitatum* and *Echinus esculentus* occurred on the boulders.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: Q/01

HABITAT TYPE: Q: Infralittoral mud

SITE TYPE: Sandy mud, *'Trailliella'*

LOCATION (site Nos.): 13,22,27,28,29, 46,53,55,79,88

DEPTH: 12-19m

DOMINANT COMMUNITY: *'Trailliella'*

SITE DETAILS

Situation: Sea loch
Salinity: surface f.w in places
Wave exposure: V.Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Sandy mud
Modifiers:
Features: Some burrows

PHOTOGRAPH: Gil Green, Loch Gairloch

A virtually flat plain of sandy mud recorded between 12-19m. The dominant community was *'Trailliella'* which covered between 20-100% of the seabed. Amongst this clumps of *Ascidiella aspersa* were frequent, there was shell debris (especially *Turritella*), brittlestars, starfish and hermit crabs on the surface (Juvenile starfish were extremely abundant amongst the algal mat at site 55). The occasional stone or boulder was colonised by *Nemertesia ramosa*. *Pecten maximus* and *Aequipecten opercularis* occurred amongst the algal fluff and clumps of *Modiolus modiolus* were a significant feature at one site (88).No *Cerianthus lloydi* were noted in this habitat.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: Q/02

HABITAT TYPE: Q: Infralittoral muddy sediments

SITE TYPE: Mud, *Phyllophora crispa*

LOCATION (site Nos.): 69,78 **DEPTH:** 13-17m

DOMINANT COMMUNITY: *P.crispa*

SITE DETAILS

Situation: Sea loch
Salinity: Possible f.w. effect
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Mud, small boulders
Modifiers:
Features:

PHOTOGRAPH: Paul Glendell, Loch Ewe

This habitat was recorded between on a fairly flat seabed between 13-17m. Silt covered *P.crispa* formed the dominant community but the occasional ascidian was also present on the muddy surface. Some small angular boulders were partially buried in the sediment.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: Q/03

HABITAT TYPE: Q: Infralittoral muddy sediments

SITE TYPE: Silty mud, *Modiolus modiolus*, *Antedon bifida*

LOCATION (site Nos.): 88,90 **DEPTH:** 12-15m

DOMINANT COMMUNITY: *M.modiolus*

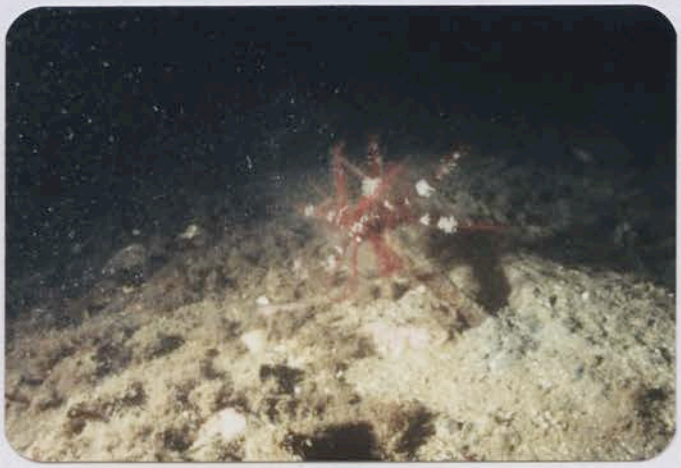
SITE DETAILS

Situation: Sea loch
Salinity: Freshwater layer noted
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Infralittoral
Substratum: Mud, pebbles, shells
Modifiers: *Modiolus*
Features:

PHOTOGRAPH: Paul Glendell, Loch Ewe



This habitat was recorded between 12-15m and consisted of fine mud scattered with shell debris and occasional pebbles. Clumps of *M.modiolus* were frequent and supported *Ascidiella aspersa*, and *Antedon bifida*. Patches of the surface were also covered by *'Trailliella'*. Brittlestars and crabs were frequent and both *Pecten maximus* and *Aequipecten opercularis* were present. The overall impression was of a habitat supporting a good diversity of species.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: R/01

HABITAT TYPE: R: Circalittoral muddy sediments

SITE TYPE: Muddy slope, small boulders, *Munida rugosa*

LOCATION (site Nos.): 72,74 **DEPTH:** 15-28m

DOMINANT COMMUNITY: *M.rugosa*

SITE DETAILS

Situation: Sea loch
Salinity: Marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Mud, stones, boulders
Modifiers:
Features:

PHOTOGRAPH:

This habitat has been described by a previous SEASEARCH survey (see H8 in Gubbay & Nunn, 1988). It consisted of muddy slope with the occasional boulder partially buried in the sediment *M.rugosa* was common sheltering by the boulders. It was recorded from 15-28m

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: R/02

HABITAT TYPE: R: Circalittoral muddy sediments

SITE TYPE: Silty mud, occasional stones/boulders, *Munida rugosa*, *Ascidiella aspersa*

LOCATION (site Nos.): 14,18,19,66,67,68,73,74 **DEPTH:** 16-27m

DOMINANT COMMUNITY: *M.rugosa, A.aspersa*

SITE DETAILS	HABITAT DETAILS
Situation: Sea loch	**Zone:** Circalittoral
Salinity: Freshwater layer noted	**Substratum:** Mud, stones, boulders
Wave exposure: Sheltered	**Modifiers:**
Tidal streams: None noted	**Features:**
Geology:	

PHOTOGRAPH: Ron Crosby, Loch Gairloch

This habitat has been described by a previous SEASEARCH survey (see H7 in Gubbay & Nunn, 1988). It consisted of silty mud with the occasional partially buried small boulder and was recorded as a gently sloping habitat between 16-27m. *M.rugosa*, and *A.aspersa*, were common and some *Cerianthus lloydi* and *Antedon bifida* were recorded.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: R/07

HABITAT TYPE: R:Circalittoral Muddy Sediments

SITE TYPE: Fine mud *Pennatula phosphorea, Nephrops norvegicus*

LOCATION (site Nos.): 43,71,89 **DEPTH:**23,29m

DOMINANT COMMUNITY: *P.phosphorea*

SITE DETAILS

Situation:Bay, Sea loch
Salinity: Fully marine
Wave exposure:Sheltered
Tidal streams:None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Fine mud
Modifiers:*N.norvegicus*
Features: Mounds & tracks

PHOTOGRAPH: Lin Baldock, Loch Ewe

This habitat has been described by a previous SEASEARCH survey (see H1 in Gubbay & Nunn, 1988). It consisted of *P.phosphorea* beds on a virtually flat seabed of fine mud. *N.norvegicus* burrows were present in this habitat and *Liocarcinus depurator* was also observed. Small sandy tubes approximately 1cm high were very common on the surface.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: R/08

HABITAT TYPE: R:Circalittoral Muddy Sediments

SITE TYPE: Worked sandy mud, *Pennatula phosphorea*

LOCATION (site Nos.): 24,43,45,46,52,70,72 **DEPTH:**25-40m

DOMINANT COMMUNITY: *P.phosphorea*

SITE DETAILS

Situation: Bay, Sea loch
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Sandy mud
Modifiers:
Features: Mounds & tracks

PHOTOGRAPH: Alan Davis, Gruinard Bay

A virtually flat habitat type of sandy mud recorded below 40m in Gruinard Bay and in shallower water in the sheltered parts of Loch Gairloch and Loch Ewe (25-30m). The surface was worked into occasional mounds and covered by tracks however *Nephrops* burrows were not observed in this habitat. *P.phosphorea* and *Virgularia mirabilis* were present and a conspicuous feature was the number of small sandy tubes which stood upto 1cm proud of the surface and which were extremely abundant (amphipod tubes?). A honeycomb-like cast of unknown origin was also common on the surface at some of the sites.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: R/09

HABITAT TYPE: R: Circalittoral muddy sediments

SITE TYPE: Sandy mud, occasional large boulder

LOCATION (site Nos.): 8,11 **DEPTH:** 25-30m

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Entrance to sea loch
Salinity: Fully marine
Wave exposure: Sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: sandy mud
Modifiers:
Features: Boulders, mounds

PHOTOGRAPH: Roger Sykes, Loch Gairloch

A gently sloping muddy sand habitat recorded between 25-30m. The surface had signs of occasional working into mounds, patches of shell debris and occasional large (>1m) angular boulders. *Munida* sheltered under the boulders whose surfaces were covered with keel worms. Occasional *Echinus esculentus* were noted in this habitat and *Antedon bifida* was common at site 8.

NORTH WEST SCOTLAND

SURVEY SITES: GRUINARD BAY, LOCH GAIRLOCH, LOCH EWE

HABITAT CODE NUMBER: R/10

HABITAT TYPE: R: Circalittoral Muddy sediments

SITE TYPE: Silty mud, algal debris

LOCATION (site Nos.): 26,69 **DEPTH:** 17-25m

DOMINANT COMMUNITY:

SITE DETAILS

Situation: Sea loch
Salinity: Poss.f.w. influence
Wave exposure: Very sheltered
Tidal streams: None noted
Geology:

HABITAT DETAILS

Zone: Circalittoral
Substratum: Silty mud
Modifiers:
Features: algal & human debris

PHOTOGRAPH: Gil Green, Loch Gairloch

This habitat consisted of a gradual slope of silty mud recorded between 17-25m. The surface was covered with decaying algal debris, bacterial mats and rubbish probably discarded from vessels entering and leaving the harbour at site 26

4.5. HUMAN IMPACTS IN THE SURVEY AREA

The main settlements in the area are the towns of Poolewe and Aultbea (around Loch Ewe), Laide (on the south-western edge of Gruinard Bay), and Gairloch (on the north-western shore of Loch Gairloch. Apart from these a number of smaller settlements were located along the shores of both lochs and Gruinard Bay but the area does not appear to be very densely populated. The lochs provide a natural harbour for boats and Gruinard Bay has also, on occasion, provided shelter for the Russian factory ships which lie off this part of the coast during the winter. Areas of permanent mooring were located off Aultbea, the eastern side of the Isle of Ewe, at Charlestown, off Badachro and in Loch Shieldaig at the head of Loch Gairloch. There is also a NATO fuel depot and pier in Loch Ewe which was in frequent use at the time of the survey.

Gruinard Bay

There was little evidence of human impact at the dive sites in Gruinard Bay. Gruinard Island however was the site of experimental work by the Ministry of Defence who contaminated part of the island with anthrax during World War II. The island was decontaminated in 1987 by spraying the cleared soil with formaldehyde dissolved in seawater. Heavy rain not long after the application caused some formaldehyde to be carried to the shore in runoff which, at one point, sterilized an estimated 0.07ha of the littoral zone (Miles *et al.* 1988). Signs of recovery were apparent within 10 weeks and more substantially when the site was investigated again the following year. No reports are available on the possible effects of the research and its clean up on the adjacent sublittoral zone and the island is now considered by the MoD to be fit for habitation.

Loch Ewe

Boat traffic is a feature of the relatively sheltered waters of Loch Ewe which has permanent moorings sited in the loch (eg. the eastern side of the Isle of Ewe). Apart from civilian craft the waters have been, and are still, used by the military. During World War II the loch was an assembly point for shipping convoys and the siting of a NATO fuel depot in the loch serves current day military traffic. The relatively sheltered nature of the loch in all but the entrance and central part also makes it a potentially useful site for aquaculture and operations of this type were noted at four locations; the north eastern and north western sides of the Isle of Ewe, between the NATO facility and Rubha Thurnaig, and off the village of Naast. The Highland Regional Council have prepared a Fish Farming Framework Plan for the loch which gives details of the leases. There is also a map in the report (reproduced as Figure 11) which shows sites where

leases have been refused and areas where there is a presumption against fish farming as well as indicating areas of the loch where fishing for prawns, lobster and crab is carried out (Highland Regional Council, 1988). Othere uses of the area include marine research which is carried out from the DAFS laboratory based at Firemore Bay. The area is also popular with tourists visting the National Trust property at Inverewe Gardens and following the scenic coastal road. The loch supports a large population of wintering seabirds including the largest populatin of Black Throated and Great Northern Divers in north west Scotland (Highland Regional Council, 1988)

Loch Gairloch

The more exposed waters of Loch Gairloch do not appear to have been developed for fish farming however potting for lobsters and crabs is carried out in parts of the loch. The sheltered area around the island of Eilean Horrisdale and Loch Shieldaig are used as moorings and a well used jetty in the area appears to be the one at Charlestown were a small natural harbour has formed at the point where a freshwater stream enters the loch. Most evidence of human impact was seen just outside this area where litter was evident on the seabed. The nature conservation interest of the area is unknown however grey seals used the small rocky islets towards the head of the loch as haul-out sites.

5. SUMMARY

The main sublittoral habitat and community types in Loch Gairloch, Loch Ewe and Gruinard Bay were identified and described as part of the 1989 SEASEARCH programme of work. Dives were carried out at ninety different sites and 49 different habitat/community types were observed. Most variety was seen in Loch Ewe where 28 different habitat types were observed however with 26 habitats recorded for Loch Gairloch and 24 in Gruinard Bay there was not a great deal of difference in the diversity of the three areas at this Phase 1 level of survey.

Gruinard Bay was the most open of the three survey areas. Much of the bay was sandy but was fringed by boulders supporting *Laminaria hyperborea*. Around the north and west of Gruinard Island the sand was overlain by an extensive bed of living maerl. In contrast, the seabed south of the island was largely an area of boulders, cobbles, and pebbles, grading into sand. The sandy mud between Gruinard Island and the mainland supported beds of *Virgularia mirabilis* and, in the deeper parts of the bay, *Pennatula phosphorea* was common on areas of worked muddy sand.

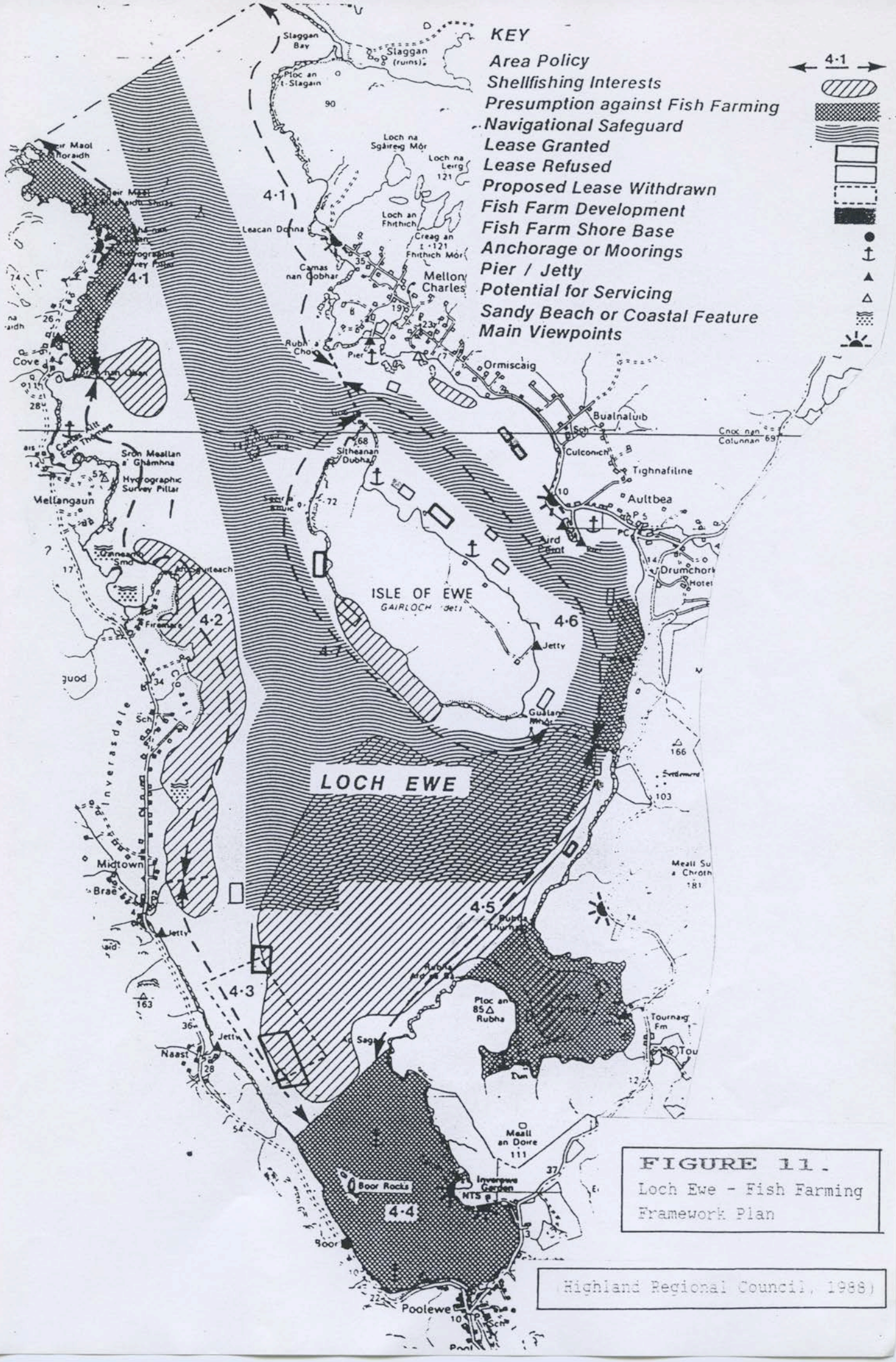


FIGURE 11.
Loch Ewe - Fish Farming Framework Plan

Loch Ewe contained some of the most sheltered habitats recorded during this survey but it was also exposed to wave action near the entrance and in the central part of the loch which may account for some of the variety. The margins of the loch were generally sandy grading into muddy sand where *Virgularia mirabilis* was quite common. In the shallower areas there were also patches of maerl or mats of *'Trailliella'* on the surface of the sand. In the most sheltered region of Loch Thurnaig a slope of boulders lying on mud led down to a predominantly muddy habitat with *P.phosphorea* and *Nephrops norvegicus*. This same habitat was also observed in the deeper parts of the main loch basin. The two sills in the loch supported distinctly different habitats. The innermost, between the western shores and the islands of Sgeir an Araig, was an area of smooth bedrock continuing as a bed of angular pebbles covered with patches of *Phyllophora crispa* in the more sheltered area between the Isle of Ewe and the eastern shore. The outer sill was an area of small boulders and cobbles on coarse shelly sand.

Loch Gairloch was a generally sandy area covered with dense mats of *'Trailliella* towards the head of the loch. Much of the infralittoral zone consisted of medium sand with loose algal debris and a diatom mat scattered on the surface. Patches of *Zostera marina* occurred on clean coarse sand near the entrance to the loch in the vicnitiy of Longa Island. The circalittoral zone of the loch was mostly muddy sand with beds of *Virgularia*

Table 6 indicates which habitats were recorded in each of the three survey areas allowing a comparison to be made between the sites.

TABLE 6

HABITATS RECORDED IN THE DIFFERENT SURVEY AREAS

CODE	HABITAT TYPE	LOCH GAIRLOCH	GRUINARD BAY	LOCH EWE
A	**Infralittoral Bedrock**			
A/01	Stepped Bedrock	4,5,6	-	56,58,
A/02	Gullied Bedrock, *L.hyperborea*	15	48,49,	57,64,65
A/03	Stepped Bedrock, *L.saccharina, C.filum*	14,18,19,28	-	-
A/04	Broked bedrock slope, *L.saccharina*	2	-	71,72
A/05	Bedrock reef, pock marked surface	-	-	76
A/06	Sloping bedrock face	6	-	-
B	**Circalittoral Bedrock**			
B/01	Stepped bedrock, *C.intestinalis*	2,22,23	-	-
B/02	Smooth bedrock reef, *C.smithi*	-	-	87
E	**Infralittoral Large Boulders**			
E/01	Frequent large boulders, *L.hyperborea*	12,15,16	49	-
E/02	Dense large boulders, *L.hyperborea*	15,16,18	49	-
F	**Circalittoral Large Boulders**			
F/01	Large boulder slope, *Antedon, Munida*	8	-	-
G	**Infralittoral Small Boulders**			
G/01	Densely packed boulders, L.saccharina	5,19,22	-	-
G/02	Occasional angular small boulders on coarse sand, *L.saccharina*	5	31	72
G/03	Angular blocks, scree slope,diatom mat.	-	-	65
G/04	Rounded boulders on coarse sand and maerl	-	30,34,35.51	-
G/05	Densely packed boulders, L.hyperborea	5,6	32,33,49	58,63,64
G/06	Occasional boulders on sand	2,5,16	47	65
G/07	Rounded boulders on coarse sand/maerl	-	51	-
H	**Circalittoral Small Boulders**			
H/01	Rounded boulder slope, *Munida, Antedon*	8,19	-	-
J	**Infralittoral Stones - Cobbles/Pebbles/Slates**			
J/03	Pebble/cobble bank with occasional boulder, S.polyschides	-	40	-
J/04	Angular pebbles on muddy sand *P.crispa*	-	-	81
J/05	Pebbles on shell sand	-	40,48	-
K	**Circalittoral Stones - Cobbles/Pebbles/Slates**			
K/02	Angular cobbles & pebbles on shell sand	-	-	87
L	**Infralittoral Very Mixed Substrata**			
L/01	Boulders, pebbles & sand	-	32,42,48	-

TABLE 6 (Contd.)

CODE	HABITAT TYPE	LOCH GAIRLOCH	GRUINARD BAY	LOCH EWE
M	**Circalittoral Very Mixed Substrata**			
M/01	Boulders, pebbles & sand	-	-	84
N	**Infralittoral Gravel & Sand**			
N/01	Coarse sand covered by continuous bed of maerl	-	34,35,36	-
N/02	Coarse sand with intermittent, living and dead maerl	17	36,	57,61,62
N/05	Coarse sand with occasional pebbles	5	-	56,58
N/06	Coarse sand with shell debris algal debris, worked	-	-	56,83,86
N/07	Sand with occ.boulders & exposed bedrock.	-	33,38	63,64
N/08	Coarse sand with occ.boulder, maerl	-	50	-
N/09	Clean sand, frequent cobbles, algal tufts	-	40,42,43	-
N/10	Medium sand, loose algae	1,3,5,7,9,10	33,37,38,47	-
N/11	Muddy sand, shell debris, maerl, *Virgularia*	20	39	-
N/12	Muddy sand, *Aspherococcus*, *Trailliela*	14,28	41,51	54,55,61 73,74,76 82
N/13	Clean, coarse, rippled sand, *Zostera*	4,10,V	-	-
N/14	Muddy sand, maerl	-	-	54,79
P	**Circalittoral Gravel & Sand**			
P/01	Clean shell sand	-	31	-
P/04	Muddy sand, Virgularia beds	2,20,21,22/4/5/8	43,44	59,60,63 71,75,80 83
P/05	Coarse shelly sand waves	-	-	85
Q	**Infralittoral Muddy Sediments**			
Q/01	Sandy mud *Trailliella*	13,22,27,28,29	46	53,55,79 88
Q/02	Mud, *P.crispa*	-	-	69,78
Q/03	Silty mud, *Modiolus*, *Antedon*	-	-	88,90
R	**Circalittoral Muddy Sediments**			
R/01	Muddy slope, small boulders, *Munida*	-	-	72,74
R/02	Silty mud with occasional stones & boulders, Munida & Ascidiella	6,14,18,19	-	66,67,68 72,73,74
R/07	Fine mud, Pennatula beds, *Nephrops*	-	43	71,89
R/08	Worked sandy mud, *Pennatula*	24	43,45,46,52	70,72
R/09	Sandy mud, occasional large boulder	8,11	-	-
R/10	Silty mud, algal debris	26	-	69

6. REFERENCES

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NATURE CONSERVANCY COUNCIL

SEASEARCH

Marine Nature Conservation Review

MARINE CONSERVATION SOCIETY

Side 1: To be completed by the Project Leader if necessary.

SITE NAME: _____ SITE NO: _____

DATE OF SURVEY: _____ * Delete where not applicable

TIME OF DIVE: Start: _____ End: _____ Duration: _____

DEPTH RANGE: _____ m below sea level/chart datum*

OS GRID REFERENCE [| | | | | |] to [| | | | | |]

OR LATITUDE/LONGITUDE [° 'N ° 'W/E*] [° 'N ° 'W/E*]

NAME OF RECORDER: _____

RECORDERS ADDRESS: _____

AND/OR NAME OF EXPEDITION: _____

WHY WAS THIS SITE SELECTED? _____

_____

DESCRIBE THE OBJECTIVES OF THE DIVE _____

_____

WERE THESE OBJECTIVES MET? _____

SITE LOCATION MAP(S) (Photocopy of OS map or chart and/or sketch of site marking dive location. Sketch any transit lines used for location.)

_____

Project Leader comments

Please tick if other information was collected at this site and note from where this information can be retrived. Please attach copies of information.

Species lists ☐ _____ Specimens (identified) ☐ _____

Samples (not identified ☐ _____ Photographs ☐ _____

Tick here if the form is complete and has been checked by the PL ☐

Side 2: To be completed by the recorder.

SEASEARCH
Marine Nature Conservation Review

Expedition _____

Site Name _____ Grid Ref. or Lat/Long _____ Site Number _____

Site Description Describe the main seabed features encountered on your dive. Use the key words and checklists provided. Refer to the diagrams and pictures in the habitat manual for cross reference, and also to the Sketch Sheet. First describe the topography (dive profile) then the main habitats, (rock, sediment, plants), and then the main community types in that order. Note the visually dominant species/ community types. Use extra sheets if necessary.

YOUR ASSESSMENT OF THE SITE: Please give your assessment of the site. Were any of the features of the site especially interesting. Was the underwater scenery uninteresting, typical, or spectacular? Was there a variety of habitats or was it dominated by one habitat. Were the marine life diverse and interesting or nothing unusual? Were there any marked features of human impact at the site?

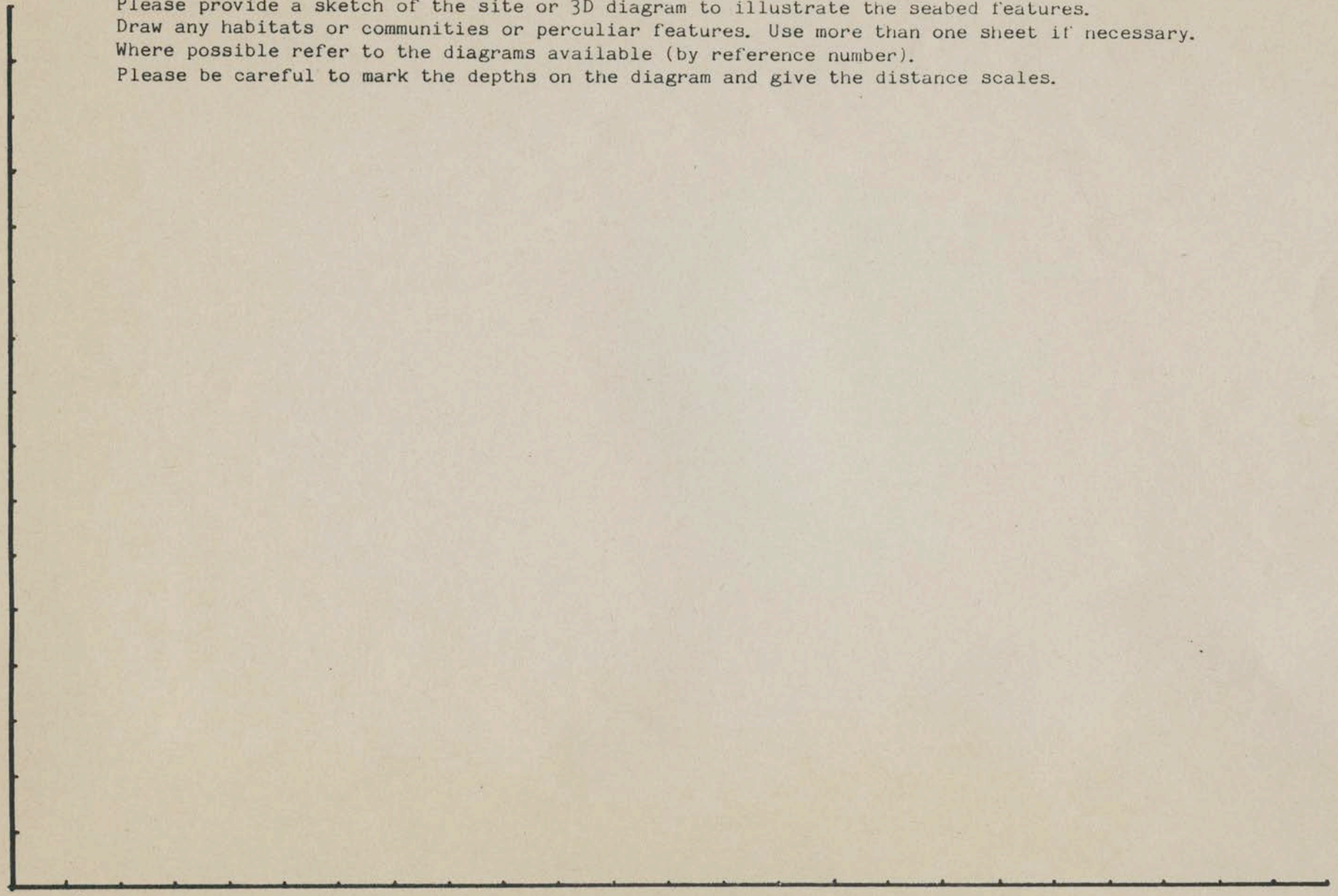
Please try and answer all the questions and add any other comments.

SEASEARCH

SKETCH SHEET

Site Number_____

Please provide a sketch of the site or 3D diagram to illustrate the seabed features.
Draw any habitats or communities or perculiar features. Use more than one sheet if necessary.
Where possible refer to the diagrams available (by reference number).
Please be careful to mark the depths on the diagram and give the distance scales.



SKETCH SHEET

APPENDIX TWO

KEY WORDS PROVIDED TO HELP COMPLETE DESCRIPTIONS FOR SEASEARCH FORMS

BEDROCK

Slope, gullies, overhangs, cliffs, caves, stepped, smooth
Algae - red, brown, green
Foliose/Encrusting
Kelp depth
Urchin grazing
Dominants - sedentary/mobile

PEBBLES, COBBLES, BOULDERS
Size
Angular/Rounded/Smooth
Slope - steep/shallow/x degrees
Other sediments between - sand/mud etc.
Encrusting/foliose algae
Algal turf
Kelp - depth
Urchin grazing
Dominants - sedentary/mobile

SAND
Fine/medium/coarse/muddy/silty/shelly
Slope/angle
Ripples/waves/troughs/crests/orientation/wavelength/amplitude
Shell debris/algal fluff/algal debris/diatom mats
Dominants - urchins, worms, starfish, seagrass

MUD
Firm/soft/wobbly
Silty/sandy/shelly/maerl/maerl debris/shell debris
Workings - mounds, depressions, hollows, burrows, holes, tubes, tracks, impressions, volcanoes
Slope/angle