

Sublittoral survey of habitats and species around the Summer Isles : Ross and Cromarty.

Underwater Conservation Society expedition with assistance from the Nature Conservancy Council. August 29th to September 12th 1981.

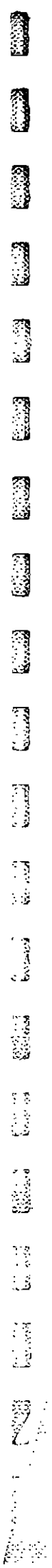
by

Frances Dipper

SURVEY TEAM

Team leaders: Dr Frances Dipper  
Dr Dave Moss

Other members: Mr Graham Ackers  
Mr John Aldred  
Ms Norma Brandt  
Mr Alan Brittain  
Mr George Brown  
Mr John Grummit  
Mr Martin Prout  
Mr Peter Schofield  
Mr Bryan Stark



Sublittoral survey of habitats and species around the Summer Isles : Ross and Cromarty.

Underwater Conservation Society expedition      August 29th to  
with assistance from the Nature Conservancy      September 12th  
Council.      1981.

by

Frances Dipper

SURVEY TEAM

Team leaders:      Dr Frances Dipper  
                         Dr Dave Moss

Other members:    Mr Graham Ackers  
                         Mr John Aldred  
                         Ms Norma Brandt  
                         Mr Alan Brittain  
                         Mr George Brown  
                         Mr John Grummit  
                         Mr Martin Prout  
                         Mr Peter Schofield  
                         Mr Bryan Stark



## CONTENTS

PAGE

1.	INTRODUCTION	
1.1	Aims of survey	1
1.2	Location and area	1
1.3	Previous marine studies	1
2.	ENVIRONMENTAL CONDITIONS	
2.1	Bathymetry and seabed characteristics	2
2.2	Exposure to wave action	2
2.3	Exposure to tidal streams	2
3.	METHODS	
4.	RESULTS	
4.1	Introduction	3
4.2	Descriptions of species groups	4
4.2.1	Sponges	4
4.2.2	Hydroids	5
4.2.3	Anthozoa and Scyphozoa	5
4.2.4	Crustacea	5
4.2.5	Opisthobranch molluscs	6
4.2.6	Molluscs other than opisthobranchs	6
4.2.7	Echinoderms	6
4.2.8	Bryozoa	7
4.2.9	Ascidians	7
4.2.10	Fish	7
4.2.11	Mammals	8
4.2.12	Algae	8
4.3	Description of plant and animal communities	9
4.3.1	Communities on hard substrata	9
4.3.1.1	Kelp forest	9
4.3.1.2	Vertical cliffs	10
4.3.1.3	Boulder slopes	10
4.3.1.4	Current exposed boulder areas	10
4.3.2	Communities on soft substrata	10
4.3.2.1	Coarse shell sand, shell gravel and maerl	10
4.3.2.2	Muddy sand	11
4.3.2.3	Mud	11
5.	DISCUSSION	
5.1	General	12
5.2	Species of particular interest	12
5.3	Conservation aspects	13
6.	ACKNOWLEDGEMENTS	13

7. REFERENCES

14

MAP 1.	Sites visited	Following 14
FIGURE 1.	Diagrammatic typical profiles	15
TABLE 1.	List of sites visited and grid references	17
TABLE 2.	Number of species recorded at each site	18
TABLE 3.	Descriptions of sites	20 - 30
APPENDIX I	List of all animals and algae observed	31 - 50
APPENDIX II	Habitat and species recording sheets	Following 50
APPENDIX III	(Separate cover). Raw data sheets	
APPENDIX IV	(Separate cover). Catalogue of colour slides held by NCC.	

## 1. INTRODUCTION

### 1.1 Aims of Survey

The two main aims of the survey were firstly to describe the range of sublittoral habitats and species present around the Summer Isles; and secondly to give interested members of the Underwater Conservation Society the opportunity of taking part in and learning the techniques of a marine biological survey. The area was chosen because the islands were reputed to provide good diving and the few records of the marine life available suggested an interesting fauna and particularly flora. In addition it is hoped that the information contained in this report will be of use to the Nature Conservancy Council (NCC) in the context of their marine nature conservation review of the Inner and Outer Hebrides, and the West Coast of Scotland in general.

### 1.2 Location and area

The area studied is shown in Map 1. The Summer Isles are a group of islands and Skerries spread over 30 square miles, lying north-west of Loch Broom off the Scottish west coast. Tanera Mhor is the largest and the only inhabited island nearly 2 miles long and  $1\frac{1}{2}$  broad. It is shaped like a horse-shoe with a well sheltered bay on the eastern side facing the mainland at Achiltibuie two miles away. The island ferry connects the island to the mainland. Tanera Mhor is privately owned and is run through the Summer Isles Estate.

### 1.3 Previous marine studies

The marine life of the area is not well documented, but some work has been done in the area. A series of visits were made to the islands by sub-aqua groups particularly by David Jones and these included a Herriott Watt University expedition in 1978. Algal surveys have been carried out by Dr W Farnham (Portsmouth Polytechnic) over several years. Some of David Jones work was supported by an NCC Section 3 grant and most of the available information including W Farnham's algal list is summarised in a report to the NCC (Jones, 1980). Visits are also regularly made to Tanera Mhor by Heriot Watt University who have been carrying out littoral surveys and have produced a fauna list for 34 stations around Tanera Mhor and 30 stations around the other main islands (Kingston, undated). A considerable amount of work has also been done on the geology of the area (including the sublittoral) by the Department of Geology, Royal School of Mines (London University) and this team led by Paul Grant were diving in the area at the time of our survey (Zhongying, Diver & Grant, 1980). Some records for the area have been received by the UCS Observation Scheme.

## 2. ENVIRONMENTAL CONDITIONS

### 2.1 Bathymetry and seabed characteristics

Deep water is present fairly close inshore around all the islands with rock slopes quickly giving way to sediment slopes. Boulder slopes characterise the majority of sites extending to between 20 to 30m off the west coasts of Tanera Beg, the small islands to the north and the outlying islands to the south. Elsewhere the sediment tends to extend closer inshore into shallower depths. In most cases the boulder slopes are compact and end abruptly at a rock/sediment boundary. However at more sheltered sites off the north coast off Tanera Mhor, boulders and sediment are intermingled. Bedrock is mostly confined to small cliffs close inshore but pinnacles and submerged rocks occur particularly around the outlying islands, and bedrock or boulders may occur in deeper water offshore (Admiralty Chart No. 2501). Large areas of coarse sand occur below the rock slopes and in channels between islands and may have maerl associated with it. Muddy sands and muds are confined to the anchorages of Tanera Mhor and Tanera Beg and to deep water offshore.

### 2.2 Exposure to wave action

The majority of the area is exposed to heavy wave action particularly south and west coasts. Sites in Dorney Sound are only moderately exposed and sites within the anchorages of Tanera Mhor and Tanera Beg are very sheltered.

### 2.3 Exposure to tidal streams

Tidal currents are weak throughout the area, and only really noticeable in Dorney Sound which has a maximum flow of about 2 knots or less. The maximum flow encountered whilst diving in this area was only about half a knot.

## 3. METHODS

The expedition was based in the 'Farmhouse' on Tanera Mhor run by Mr and Mrs Fowler of the Summer Isles Estate. The facilities were excellent and ideal for a group such as this. Diving equipment was kept in the boathouse adjacent to the water. Two boats (an inflatable and a Dory) were used working within sight of each other. Four sites were usually covered in a day, each person carrying out two dives if he wished. The flat calm weather of the first week allowed visits to be made to the outlying islands and rocks which would otherwise have been impossible with the boats available. The island ferry was chartered for one day to visit the distant Priest Island.

Sites were chosen by inspection of charts and maps to include locations exposed to as great a variety of environmental conditions as possible within the limitations of boat travel. Depths were determined prior to diving by use of an echo-sounder and all dives were restricted to 'no-stop' times. Each pair of divers were logged in and out of the water on special log sheets, (Appendix II).

The recording methods used were based on those used by the NCC and by previous UCS surveys. Field records were made on formica writing boards and transferred each evening to standard check lists, (Appendix II). Everyone was able to record habitats; species were recorded to the best of the individuals at a site and specimens were collected for further identification. Voucher collections of nudibranchs, sponges and algae were also made. Each person was given responsibility for a particular group of animals or algae and was asked to collate species records for their group from each site, and to identify specimens collected. For this purpose completed species check lists were hung each evening on a 'washing line' with site numbered pegs to allow easy access to the data. This collation of species records saves considerable time for the final report writer when he/she has to construct a species/site list.

A photographic record of species and habitats was made by Frances Dipper and Graham Ackers and the collection is held by NCC who provided the film.

Although the emphasis during the survey was necessarily on the collection of qualitative data, unqualified presence/absence records provide less useful information for the comparison of sites. Therefore subjective estimates of abundance were made whenever possible using the notations, dominant, abundant, common, frequent occasional and rare. A chart datum correction table was prepared prior to the survey and all depths are given relative to Chart Datum.

#### 4. RESULTS

##### 4.1 Introduction

Sites were numbered in the order in which they were visited and are shown in Map 1 and summarised with grid references in Table 1. A description of the main features of each site was prepared from habitat recording sheets and is given in Table 3. Typical site profiles are illustrated in Figure 1. The main results of the survey are summarised in Appendix I as an annotated species list showing species present at each site and the distribution and habitat preferences of each individual species. Each team member

prepared the species list for his/her particular group and these were collated and annotated by the author. In addition each member prepared a short paragraph about their group which is given below. Plant and animal populations and communities are also described below. The term 'community' is used here in the loose sense as defined in Hiscock & Mitchell (1980) to include any group of organisms present in a particular habitat. Raw data sheets are bound in a separate Appendix III, and a catalogue describing the colour slides is also bound as a separate Appendix IV.

#### 4.2 Descriptions of species groups

The number of species of each group recorded at each site is given in Table 2. From this it can be seen that at the majority of sites species diversity was quite low. The two caves at sites 7 and 28 were the richest sites in terms of encrusting attached species. Sites 23 and 31 were the richest in terms of hydroids and other current loving species. The most diverse algal populations were found on shallow sand and maerl areas.

##### 4.2.1 Sponges Graham Ackers

At sheltered sites at all depth ranges, sponges were absent or only occasionally present usually as small or poorly developed specimens. Habitats and substrata utilized at sheltered sites included small boulders, epiphytic on other fauna (Chalmys, Inachus) or flora; loose amongst flora, or completely unattached (eg Subrites carnosus at site 33).

At shallow wave exposed sites (7, 28, and 29 - two being caves) the sponge fauna was much more luxuriant. Certain species (Halichondria, Pachymatisma, Clathrina) were common or abundant at one or more of these sites. Here, the habitats available were vertical cliffs (favoured by Pachymatisma and Clathrina) or large boulders (favoured by Halichondria). In the caves, extreme wave surge was present and on the large boulders at site 7, sponges were abundant with few other encrusting organisms on the boulders. These wave exposed sites were favoured heavily by species thriving under conditions of high water movement, in stark contrast to the poorer sheltered sites. Grazing by Echinus was clearly responsible for the generally poor fauna in the area. Indeed, at sites in habitats where Echinus were present sponges were virtually absent. Owing to strong wave action, Echinus was absent from the wave exposed sites and in the sheltered sites the habitats colonised by the sponges were unavailable to Echinus.

#### 4.2.2 Hydroids Frances Dipper

The hydroid fauna was very poor throughout the area and only 21 species were recorded. Only three species, Nemertesia antennina, Nemertesia ramosa and Obelia geniculata were widespread. No really dense turfs of hydroids were found and the only sites at which any species were recorded as common were in Dorney Sound (21, 22, 31, 32) where a weak tidal current is present. A slightly greater variety of species than the average was found at exposed sites with extensive rocky slopes. The average number of species per site was 3.4 and the greatest numbers of species were found at sites 23 and 31 in Dorney Sound (11 and 9 species respectively).

#### 4.2.3 Anthozoa and Scyphozoa Bryan Stark

Anthozoan species were found at 38 out of 40 sites dived. The numbers and variety were however rather low, and only 13 species were recorded. The majority of these were found in small numbers at only a few sites. Alcyonium digitatum, Cerianthus lloydii, Caryophyllia smithi, Metridium senile and Virgularia mirabilis were the most widespread. The two best sites for anthozoa were sites 7 and 29 on the walls of sea caves in less than 5m of water. Here there was not only a variety of species (7 and 8 respectively) but also large numbers of several species particularly Sagartia elegans, Corynactis viridis and Metridium senile covering the walls. Site 23 in Dorney Sound also had 7 species but only one or two of each was present (Table 2).

Four species of scyphozoa were also found including two species of stalked jellyfish. Jellyfish were in general not very common.

#### 4.2.4 Crustacea Alan Brittain

The number of crustacean species recorded was very low (18) and few of them were present in any numbers at any particular site. The records do not distinguish between those living in different types of habitat (eg bedrock, boulders, gravel etc) and in general cannot be related to depth below chart datum. Visits were made to sites ranging from 40m below CD to landings on secluded islets and from very sheltered to very exposed locations. The records appear to indicate that crab populations were most diverse and possibly most dense in the more sheltered waters to the east and north of substantial islands. This suggestion may however be spurious and it is not possible to gauge accurately the amount and effort of search at each location. Cancer pagurus, Munida bamffica, Liocarcinus puber and Liocarcinus depurator account for about two thirds of all sightings. Hermit crabs, however, were probably under-recorded.

#### 4.2.5 Opisthobranch molluscs Peter B Schofield

A total of 27 species of nudibranchs with an additional two other opisthobranch molluscs were recorded from 29 out of 40 sites. It will be seen from the annotated list given in Appendix I that species which prey on sponges, compound ascidians and anthozoa were relatively scarce whilst those preying on hydroids and bryozoans (particularly encrusting species) were more numerous. It can also be seen from Table 2, that the sites with the greatest number of species correspond with the sites supporting high numbers of hydroids and other prey species (eg sites 7 and 23). Although Nemertesia antennina and N. ramosa were found at most sites, only two species of Doto were found - three individuals in all. Many species of Doto normally feed on Nemertesia. Other species which are usually quite common were either sparse or absent. For example Archidoris pseudoargus and Aeolidia papillosa were only found in small numbers and Tritonia lineata and Coryphella pedata were not recorded. In view of the fact that each dive site was investigated by 4 divers who each spent about half an hour on the site (ie a total of about 80 hours dive time) the number of nudibranchs found is surprisingly low.

#### 4.2.6 Molluscs other than opisthobranchs John Aldred

A total of 36 species were recorded of which 16 were only recorded once or twice. In sediment areas, many of the records were from dead shells. No dredging or sediment collection was done which would undoubtedly have increased the number of records of bivalves. The highest numbers of species was recorded at site 24 (16) where a variety of habitats including vertical cliff, boulders and sediment were present and where significantly, several dives were carried out as the site was near the landing beach and could be shore dived in rough weather. The commonest species recorded were Calliostoma ziziphinum (27 sites) Gibbula cineraria (23 sites), and Pecten maximus (28 sites) representing the two main mollusc habitats of kelp forest and sediment. The highest density of Pecten recorded was one per square metre at site 14. Buccinum undatum (18 sites) and Ensis spp. (17 sites) were also widespread. Other species recorded more than just once or twice were mainly bivalves or other sediment living species. Priest Island where there was little sediment in shallow water seemed particularly poor in numbers of species.

#### 4.2.7 Echinoderms John Grummit

Comments on this group were prepared by the author on an assessment of John Grummit's species/site list. Twenty four species were positively identified and many of these were

widespread. The group as a whole, particularly the starfish and Echinus were common throughout the area. Large species such as Asterias rubens, Astropecten irregularis, Crossaster papposus, Luidia ciliaris, Marthasterias glacialis and Porania pulvillus were present at most sites. Antedon bifida was recorded from all except four sites and the pentacrinoid stages were often abundant. Brittle stars, particularly Ophiothrix fragilis and Ophiocomina nigra were common but no brittle star beds were found. Echinus esculentus was recorded at all sites except site 39 which was a deep sediment area. It was abundant at most sites where rock was present and many of the rock surfaces were extensively grazed. The species diversity and richness of the area is obviously greatly reduced by the grazing action of large numbers of urchins, and other echinoderms.

#### 4.2.8 Bryozoa Dave Moss

The majority of bryozoa were encrusting species and were identified from collected specimens. Therefore many will have been undercollected. Bryozoa were only searched for systematically by Dave Moss. Bryozoan 'turfs' were rare and only small patches were present at sites 7, 28 and 34. Boulder slopes were often heavily encrusted by Paramittina trispinosa.

#### 4.2.9 Ascidians Frances Dipper

Ascidians were very poorly represented throughout the whole area. The only site at which they were at all common was in the cave at site 7 where a mixed turf of ascidians, bryozoa and sponges occurred. The most widespread species were Ascidia mentula which was found attached to the sides of boulders on most boulder slopes; Clavelina lepadiformis which was found only as small rather tatty clumps on bedrock and boulders and Botryllus schlosseri which was generally present in the kelp forest. These species are all three fairly resistant to grazing by Echinus.

#### 4.2.10 Fish John Grummit and Frances Dipper

Fish were recorded somewhat sporadically as the majority of team members did not feel confident enough to make positive identifications. The number of species recorded (28 positive identifications) is very near the average for most surveys of this type. The highest number of species (18) were recorded at site 24 where several dives were carried out and a variety of habitat was present. The extensive rock slopes and clear waters of the islets in the north west of the area (site 35) appears to support larger numbers of species.

4.2.11 Mammals John Grummit

Several sightings of seals were made but in only small numbers (4 - 6 at a time). No observations of seals "hauled-out" were made although local knowledge indicates that they can regularly be seen on the outlying islands and a small breeding colony is usually present in October. All those seen appeared to be grey seals (Halichoerus grypus). Dolphins and/or porpoises were often seen particularly in the waters between Tanera Mhor and the mainland and to the south of Tanera Mhor.

4.2.12 Algae Norma Brandt and Frances Dipper

The overall impression of the area was that apart from kelp algal populations were sparse, particularly on rocky substrata. However a total of 61 species were identified. In general rocky substrata were heavily grazed by Echinus and no thick swards of foliaceous algae were present, but rather a variety of small and encrusting species. The largest number of species were recorded at sites where shallow sediments were present such as site 20 (22 species) and site 31 (16 species); and associated with maerl beds. Although extensive collections were made, a number of species will undoubtedly have been missed because no algologist was present; and in very few cases was the shallow infralittoral fringe investigated.

A Laminaria hyperborea forest dominated at the majority of sites on boulders and bedrock to about 16m. At several sites, there was a very sharp cut off at this depth. Laminaria saccharina often extended for a few metres more especially if the substratum consisted of smaller unstable boulders. L. hyperborea stipes frequently had a heavy epiphytic load of red algae particularly Plocamium cartilagineum and Bonnemaisonia asparagoides. On boulders below the limit of the kelp forest, foliaceous algae were sparse, the commonest species being Dictyota dichotoma and less frequently Cutleria multifida. Boulders adjacent to sediment plains were often covered by a fine turf of Trailiella (see Appendix I for note on identity of this species). Deeper sediments at about 17 - 20m supported few algae attached to boulders or pebbles, but the shallow water sediments supported a surprising number of species. These included Scinaia turgida which was extremely common, Ulva lactuca, Bryopsis plumosa, Gracilaria verrucosa, Desmarestia spp. and, Ceramium rubrum agg. Many species were associated with maerl and this is described in more detail in section 4.3.2.1. In very sheltered areas of muddy sand (25, 26, 33, 34) species such as Asperococcus turneri, Audinella floridula (in dense tufts), and Phyllophora crispa covered large areas generally unattached. Chorda filum also occurred in shelter attached to

small stones and boulders. Some species appeared to prefer really open water exposed to wave action around isolated rocks or off headlands and these included Sacchariza polyschides, Callophyllis laciniata, Cryptopleura ramosa, Phycodrys rubens and Odonthalia dentata. The latter was only found at very wave exposed sites including the entrances of the two caves visited.

The majority of the algae recorded had previously been recorded by Dr W Farnham but the following species were not on his list:

Dictyosiphon chordaria  
Stichtyosiphon tortilis  
Acrosorium uncinatum  
Callithamnion tetragonum  
Cordylecladia erecta  
Compsothamnion thuyoides  
Dudresnaya verticillata  
Rhodophyllis sp. (a new entity being described by C Maggs)

#### 4.3 Description of plant and animal communities

The populations and communities of plants and animals present were related to the degree of water movement and the substratum and were also heavily influenced by the intensive grazing action of the very numerous sea urchins, Echinus esculentus. The majority of the area is exposed to strong wave action, there are no very strong tidal currents and the rocky substrata are fairly uniform consisting mainly of small bedrock cliffs and extensive boulder slopes. These factors result in a fairly low diversity of distinct communities.

##### 4.3.1 Communities on hard substrata

###### 4.3.1.1 Kelp forest

A well developed kelp forest of Laminaria hyperborea typical of wave exposed conditions was present on bedrock and stable boulder slopes to about 16m, with individual plants extending to at least 20m. At many of the more exposed sites such as off the south and west of Tanera Beg and around Priest Island, the L. hyperborea forest had a very sharp cut off point ending abruptly at 16m in spite of suitable rock slopes below this depth. The undergrowth of the infralittoral zone and the kelp forest in particular was in general very sparse and heavily grazed by Echinus and there were no areas with rich sponge and tunicate or algal undergrowths such as have been recorded at other similar wave exposed sites (eg Tiree) in the Hebrides (Dipper, 1981). At the very wave exposed site 28 (Priest Island) gullies in the bedrock supported some sponges and tunicates. The richest undergrowths of foliaceous algae were also found around Priest Island but were not very dense.

A Laminaria saccharina forest was present on boulder slopes at very sheltered sites in the anchorages of Tanera Beg and Tanera Mhor.

#### 4.3.1.2 Vertical cliffs

No extensive vertical cliffs were recorded but low bedrock cliffs in the infralittoral zone were present at several sites (3, 5, 9, 24, 34, 35). These were dominated by Metridium senile in particular (eg site 24) and also Alcyonium digitatum, Ascidia mentula, Clavelina lepadiformis, Caryophyllia smithi, Pomatoceros triqueter, lithothamnion, and Antedon bifida. At site 30, a pinnacle of rock supported dense growths of Corynactis viridis. Echinus was present even on these vertical cliffs.

#### 4.3.1.3 Boulder slopes

Boulder slopes were the major hard substrum present in the area, extending to at least 30m off the west coasts of the Tanera Beg area.

The boulders were heavily grazed by Echinus and in the circalittoral zone below the kelp forest they supported only those species resistant to grazing, and a crevice fauna in between the rocks. Characteristic species included the encrusting bryozoan Parasmittina trispinosa, lithothamnion and other encrusting algae, Pomatoceros triqueter and large numbers of Antedon bifida. Caryophyllia smithi and Nemertesia antennina were frequent additions and the squat lobster Munida bamffica was always common.

#### 4.3.1.4 Current exposed boulder areas

At sites in Dorney Sound (23, 31) some tidal current was present in areas of mixed boulders and coarse sand. The boulders here typically supported a hydroid community mainly of Campanularia verticillata, Abietinaria abietina, and Schizitricha frutescens with their associated nudibranch predators. Ophiocomina nigra was particularly common further out into the channel at these sites.

#### 4.3.2 Communities on soft substrata

##### 4.3.2.1 Coarse shell sand, shell gravel and maerl

The predominant soft substratum throughout the area was coarse shell sand. This predominates in the shallow channels between islands and below rock slopes to at least 30m. Below this depth, it becomes muddy sand. In some situations, maerl overlies the sand and the sand may be derived from it. In shallow areas above 10m or so (eg the channel between Tanera Mhor and Tanera Beg (21, 2, 20, 31 etc) the sand supports a varied community of bivalves

and algae. The commonest bivalves were Ensis sp., Mya sp., and Lutraria sp. Algae were generally attached to stones and shell fragments (or maerl when present) and L. saccharina, Scinaia turgida and Plocamium cartilagineum were particularly common. Other algae included Desmarestia aculeata, Bryopsis plumosa, Gracilaria verrucosa and other small species. Other animals included Chaetopterus variopedatus, Cancer pagurus, Liocarcinus spp., Pomatoschistus pictus and Neopentadactyla mixta in the very coarse sediments.

Coarse sand below boulder slopes in deeper water supported far less species but small Virgularia mirabilis and Pecten maximus were often frequent.

#### Maerl

Maerl was found off S.W. Tanera Mhor (1); in the channel between N.W. Tanera Mhor and adjacent islands (21); off north Tanera Beg (19); off north Sgeir Dubh (11) and small patches in sand amongst rocks off west Black Rock (36). A thick live maerl bed was present in the bay of Mol Mor (site 1) with the maerl lying mainly on the tops of sand ridges and extending to about 20m. Above 10m much of the maerl was dead. Species present were similar to the community found in coarse sand but additional attachment is provided by the maerl. At site 1, Plocamium cartilagineum formed an almost complete cover attached to the maerl. Live maerl was also present at site 19 but in the channel at site 21 and at site 11 the majority of the maerl was dead.

#### 4.3.2.2 Muddy Sand

Muddy sand was present at sheltered sites (10, 37, 38, 34 - anchorages) grading into mud, and offshore in deep water (39; 40m). No distinct community was identified and species present were similar to those of coarse sand in deep water with Pecten maximus, Virgularia mirabilis, Cerianthus lloydi, and various bivalves and crabs.

#### 4.3.2.3 Mud

Mud was only recorded at very sheltered sites well within the anchorages of Tanera Mhor and Tanera Beg (25, 26, 33). The mud supported few species but characteristic of these sites were algal mats of Asperococcus turneri; Auodinema floridula and Phyllophora crispa lying loose on the mud surface (similar populations were found in very sheltered sea lochs in South Skye; Dipper, 1981). Occasionally species such as Suberites carnosus, Cerianthus lloydi, Turritella communis and, Virgularia mirabilis were present.

## 5. DISCUSSION

### 5.1 General

The absence of strong tidal currents, the large degree of exposure to wave action, uniformity of substrata and especially the intensive grazing action of Echinus, all result in a relatively small diversity and low numbers of species throughout the area. The absence of rich growths of prey species such as sponges, hydroids and bryozoa results in correspondingly low numbers of predators such as nudibranchs. The richest habitats in terms of numbers of species and biomass were the sea caves (7, 29) and the shallow sand and maerl areas rich in bivalves and algae. No rich growths of annual algae on rocky substrata were recorded, which is almost certainly entirely due to grazing by Echinus since conditions appear otherwise favourable.

### 5.2 Species of particular interest

Anticpella hyalina : A single specimen of this nudibranch was collected by Peter Schofield from the cave at site 7. It is one of Britains rarest nudibranchs and has only been seen a few times in localities between the Isle of Man and Plymouth. As far as is known, there are no previous records from Scottish waters (Thompson and Brown, 1976).

Seirospora seriosperma: This small alga which was collected attached to another algal specimen is widespread but is not often recorded.

Liocarcinus corrugatus: As far as can be ascertained this is the most northerly record of this species (Paul Clarke pers. comm.)

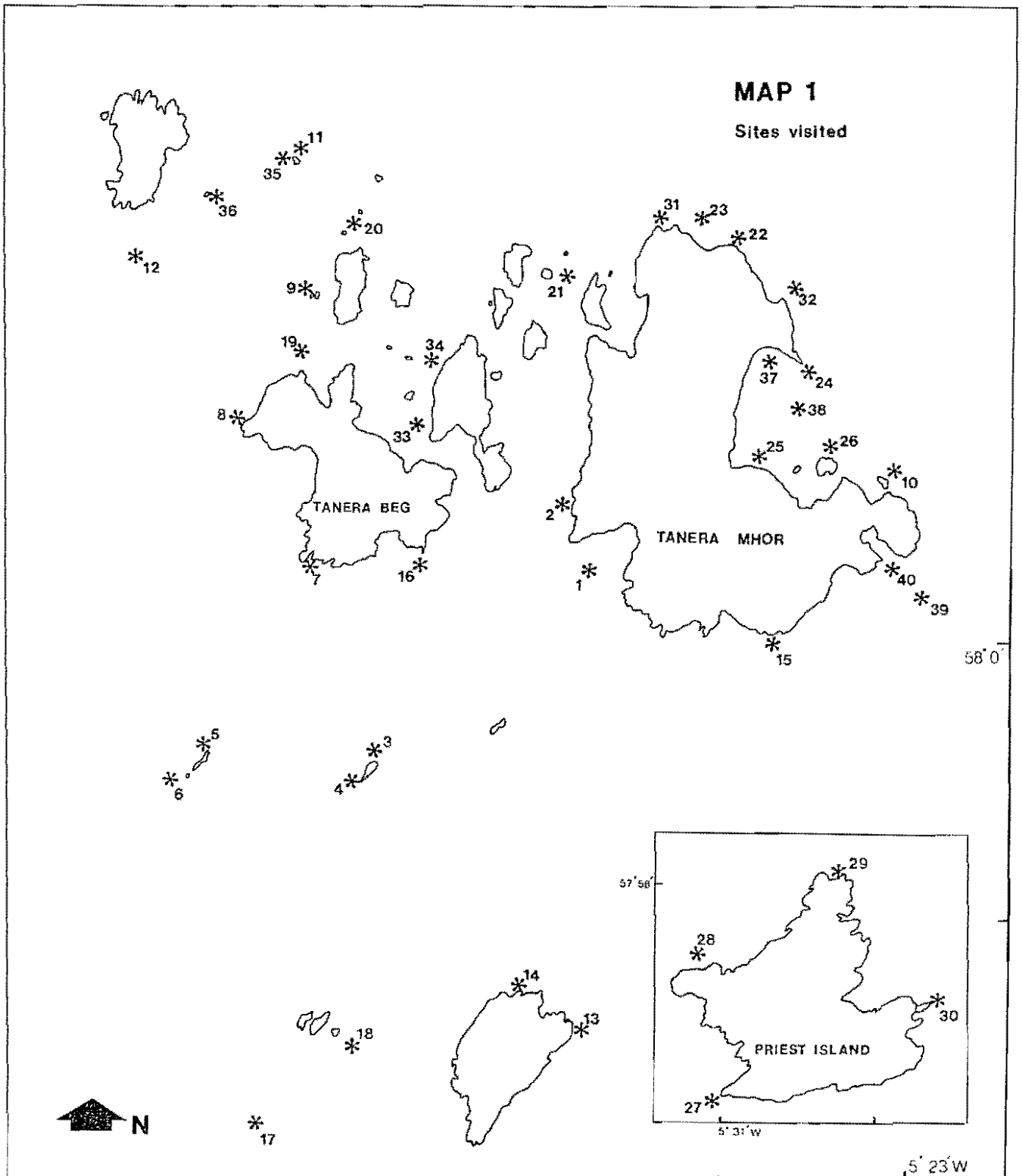
Luidia sarsi: In the authors experience this fairly widespread species is rarely recorded by divers unlike its very common relative L. ciliaris.

Black welly boot: Possibly the deepest record of a right footed size 10 specimen; found in 30m of water.

The following interesting records were included in the species list prepared by David Jones (Jones, 1980) but were not confirmed by the present survey. It is not known whether voucher specimens for these species exist: Epizoanthus incrustatus (no recent record and appearance in life is unknown); Aiptasia couchi (now A. mutabilis; an uncommon species restricted to the extreme south west of Britain), Eunicella verrucosa (only recorded from the south west of Britain); Strongylocentrotus droebachiensis (not generally recorded from west coast) Paracentrotus lividus (mainly a south west species but records have been confirmed from the

# MAP 1

Sites visited



11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

west coast of Scotland); Echinus acutus (normally in deep water off south-west and north coasts; Holothuria forskali (this species used to be considered a south western species but has now been recorded throughout the Hebrides).

The record of Eunicella is considered erroneous as the only specimens collected by Jones were later identified as Swiftea pallida.

### 5.3 Conservation aspects

The sea caves on Tanera Beg (7) and Priest Island (29) are very good examples of this type of habitat typical of heavy wave surge conditions. Although they cannot often be visited by divers because of severe wave action, they are very vulnerable to damage by collection of specimens, accidental trampling and divers bubbles. Alerting visiting diving groups to these facts might help to preserve them. Maerl beds support an interesting community of their own and are particularly susceptible to damage by trawling. Jones (1980) reports that a maerl bed off Eilean na Saille (north west Tanera Mhor) was severely damaged by a trawler in 1978 and that no live maerl was found in 1979. This site was revisited during the present survey (site 21) and the majority of the maerl present was dead although there were frequent pockets of live maerl, particularly towards the centre of the channel. It would be a useful and interesting exercise to map the extent and condition of the maerl beds in this area. This would allow advice to be given to trawlers of vulnerable sites and would also prevent wasted effort on this part in areas where no populations of scallops or other commercial species are present.

The Summer Isles as a whole do not exhibit a wide diversity of sublittoral habitats and communities when compared with other islands or island groups in the Hebrides similarly surveyed. They most closely resemble Rhum in the Small Isles (Dipper, 1981) which presented similarly impoverished rocky substrata. The maerl beds, and sea caves are however good examples of particular habitats. The area as a whole is beautiful and unspoilt and presents some good diving in clear waters and it is hoped this situation can be maintained.

## 6. ACKNOWLEDGEMENTS

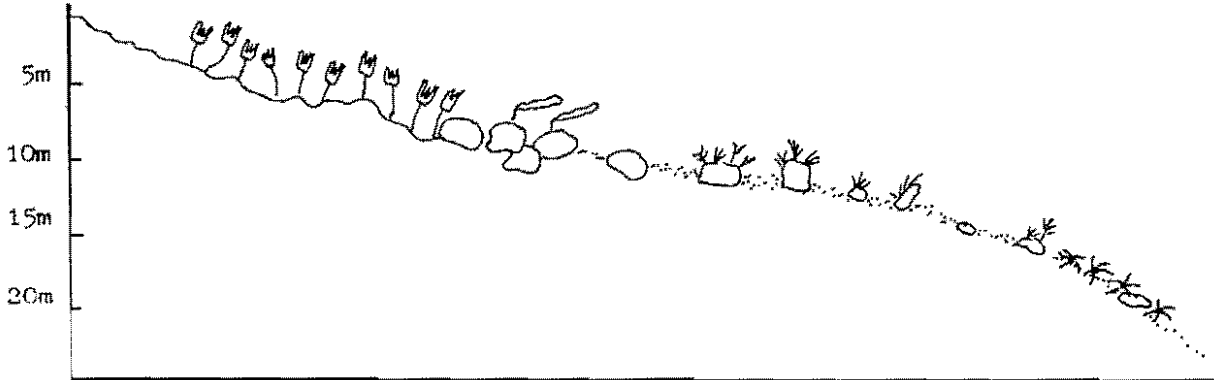
We would like to thank all those who made this expedition possible, in particular Mr and Mrs Fowler of the Summer Isles estate who made us so welcome and comfortable and moved our mountain of gear from the mainland to the island AND back again! We would also like to thank Stuart Angus (NCC ARO, Scotland N.W. Region) for arranging the loan of an NCC Dory boat and engine; and George Brown for fetching and returning the boat. We are grateful to the

following people for help in the identification of specimens: Mr Paul Clarke (crustacea); Miss Ailsa Clarke (echinoderms); Miss Christine Maggs (algae); Mr Bernard Picton and the Ulster Museum (for remaining groups: sponges, hydroids, nudibranchs, tunicates). The expedition was partly funded by the Nature Conservancy Council who contracted Frances Dipper to lead the expedition and write the report; and who provided much of the necessary equipment.

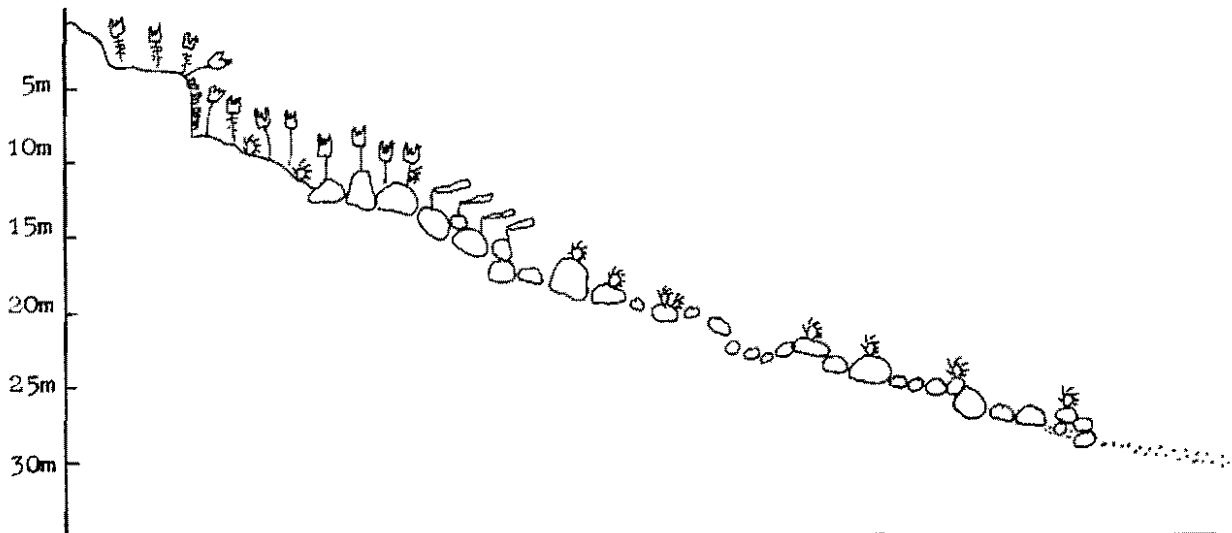
## 7. REFERENCES

- Dipper, F.A. (1981). A sublittoral survey of Coll and Tiree, Inner Hebrides. NCC CST report.
- Dipper, F.A. (1981). A sublittoral survey of habitats and species around South Skye: Inner Hebrides. UCS/NCC Report.
- Dipper, F.A. (1981). Sublittoral survey of the Small Isles, Inner Hebrides: Rhum, Canna, Eigg and Muck. NCC, CST Report.
- Hiscock, K. and Mitchell, R. (1980). The description and classification of sublittoral epibenthic ecosystems. Systematics Association Special Volume No 17(b), "The Shore Environment, Vol 2: Ecosystems". Ed. J. H. Price, D. E. G. Irvine, and W. F. Farnham; Academic Press, London.
- Jones, D. (1980). A marine survey of the Summer Isles. Report to the NCC.
- Marine Biological Association (1957). Plymouth Marine Fauna; 3rd Ed.
- Thompson, T.E. and Brown, G.H. (1976). British Opisthobranch Molluscs. Synopses of the British Fauna (New Series) No. 8. Academic Press.
- Zhongying, Z; Diver, W. L. and Grant, P. R. (1980). Microfossils from the Aulthen formation, Torrison group, of Tanera Beg, Summer Isles.
- Kingston, P. (undated). Lists of species of littoral animals recorded from sampling stations around the Summer Isles. Heriot Watt University.

FIGURE 1. Diagrammatic typical profiles.

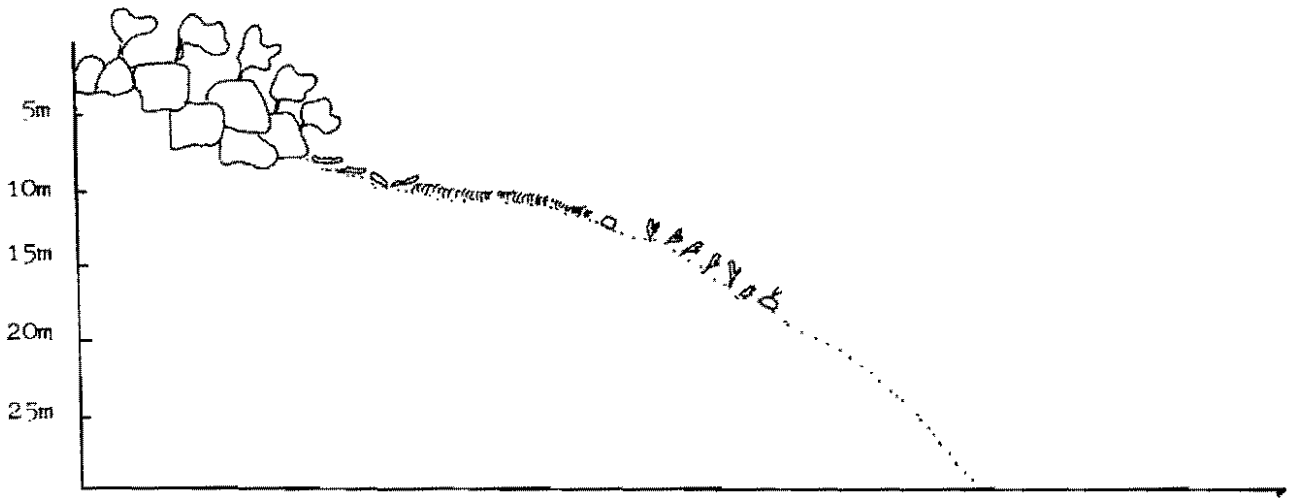


North coast of Tanera Mhor (eg site 23).

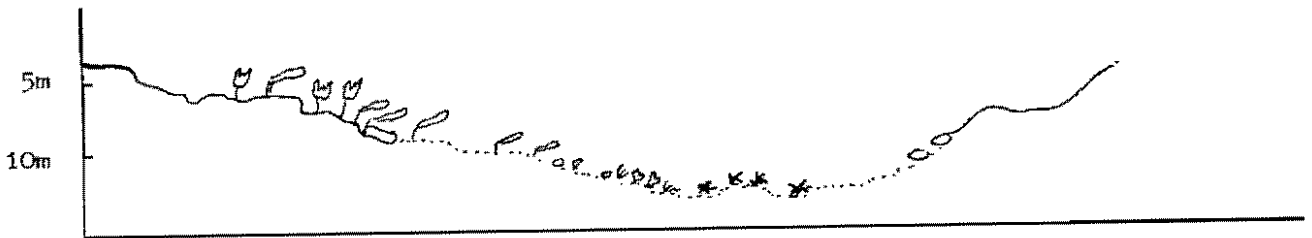


West coast of Tanera Beg and nearby islands; southern outlying islands.

FIGURE 1 continued



Sheltered anchorages of Tanera Mhor and Tanera Beg.



Channels between islands (eg. site 21).

TABLE 1. DIVING SITES

Site Number	Name	Date	Grid Ref.	Divers
1	Mol Mor, Tanera Mhor	30.8.81	NB 980067	FD,BS; JA,JG,GA,NB
2	N of Mol Mor, Tanera Mhor	30.8.81	NB 979072	DM,MP; AB,GB,PS
3	Sgeir Neo-ghluasadach N	30.8.81	NB 965056	GA,NB; JG,JA; FD, BS
4	Sgeir Neo-ghluasadach S	30.8.81	NB 964053	DM,MP; AB,GB,PS
5	Stac Mhic Aonghais N	31.8.81	NB 953055	FD,GB; BS,NB; JA, AB
6	Stac Mhic Aonghais S	31.8.81	NB 955057	GA,MP; DM,JG
7	Cave; Tanera Beg	31.8.81	NB 963069	FD,GA,DM,AB,NB,BS, JG,GB
8	Sron Slugain Uaine, Tanera Beg	1.9.81	NB 958079	DM,PS,NB,BS,JA,MP
9	Eilean a Char W	1.9.81	NB 963086	FD,GA,AB,JG
10	Rubha Dubh N, Tanera Mhor	1.9.81	NC 001073	DM,PS,NB,BS,MP,GA, AB,JG
11	Sgeir Dhubh	2.9.81	NB 963096	BS,JA,JG,NB,GA
12	S of Glas-leac Mor	2.9.81	NB 952089	DM,MP,AB,PS
13	Eilean Dubh E	2.9.81	NB 978038	NB,GA,JG,BS
14	Eilean Dubh N	2.9.81	NB 974041	DM,MP,AB,JA
15	Earbulla Dhuin, Tanera Mhor	3.9.81	NB 993063	PS,BS,JA,MP
16	Carn Sgoilte, Tanera Beg	3.9.81	NB 970068	DM,JG,GA,AB,NB
17	Twelve foot Rock	3.9.81	NB 955032	FD,BS; MP,NB
18	Sgeir nam Mult	3.9.81	NB 964038	DM,JG,PS,AB
19	N Tanera Beg	4.9.81	NB 963083	JG,BS,GA,AB
20	Rock N of Eilean a Char	4.9.81	NB 967091	FD,MP; DM,NB
21	Sgeir Loisgte	4.9.81	NB 980087	FD,GB; DM,NB
22	Doire na Sroine, Tanera Mhor	4.9.81	NB 992088	AB,GA,JG,BS
23	Sgeir a Chapuill, Tanera Mhor	5.9.81	NB 989090	FD,NB,JG,AB,PS,GB
24	Rubh Ard-na-goine, Tanera Mhor	5.9.81	NB 996080	GA,DM,BS,MP,JA
25	Pier, Tanera Mhor	5.9.81	NB 992075	DM,BS; MP,JA
26	Eilean Mor	5.9.81	NB 997075	FD,GA,AB,GB,PS
27	Priest Island S.W.	7.9.81	NB 918015	GA,PS,FD,GB,BS
28	Priest Island W	7.9.81	NB 917025	AB,JG,DM,JA,MP,NB
29	Priest Island N - Archway	7.9.81	NB 925030	GA,PS,FD,GB,BS
30	Priest Island, Ard Glas	7.9.81	NB 933023	AB,JG,DM,JA,MP,NB
31	Creag Ard, Tanera Mhor	8.9.81	NB 987090	FD,JA,PS,MP,AB,NB
32	Sron na Moil Baine, Tanera Mhor	8.9.81	NB 995085	BS,JG,DM,GA
33	Anchorage, Tanera Beg	8.9.81	NB 970077	FD,JA,AB,NB,PS,MP
34	NW Eilean Fada Mor	8.9.81	NB 971082	JG,BS,DM,GA
35	Sgeir Dubh W	9.9.81	NB 962095	FD,JG,AB,GA,JA,PS
36	Black Rock W	9.9.81	NB 957093	DM,MP,NB,BS
37	Tanera Mhor anchorage	9.9.81	NB 993081	GA
38	Anchorage Centre, Tanera	10.9.81	NB 995077	BS,DM,NB,JG
39	Off Rubha Dubh, Tanera Mhor	11.9.81	NC 003065	FD,GA,BS,DM
40	Rubha Dubh	11.9.81	NC 004068	AB,JG,MP,JA,NB,PS

TABLE 2. NUMBER OF SPECIES RECORDED AT EACH SITE

	Sponges	Hydroids	Anthozoa	Crustacea	Nudibranchs	Other Molluscs	Echinoderms	Bryozoa	Tunicates	Fish	Algae
1	1	0	1	1	0	2	9		0	5	11
2	0	3	1	6	2	9	10		3	3	1
3	0	4	4	4	0	6	11		2	4	8
4	0	3	0	4	2	3	8		1	1	2
5	1	3	4	3	0	5	11		2	6	9
6	0	2	1	2	2	6	12		2	4	4
7	9	6	7	5	11	4	8		7	3	9
8	1	2	5	5	0	4	9		2	4	9
9	0	6	3	2	2	3	10		4	2	2
10	0	2	2	9	0	15	10		1	8	3
11	0	4	1	2	0	7	11		0	6	8
12	0	4	4	4	1	6	9		1	0	0
13	0	0	4	5	0	3	9		1	4	10
14	0	3	3	5	1	7	9		2	5	5
15	1	1	2	4	0	4	8		1	4	6
16	0	4	2	7	0	10	10		2	3	5
17	2	3	3	4	7	1	9		2	1	7
18	1	2	0	4	4	11	10		1	4	5
19	1	1	1	4	3	8	13		1	4	3
20	1	2	4	4	3	9	9		5	3	22
21	1	2	2	7	2	11	9		2	4	15

TABLE 2. Contd.

	Sponges	Hydroids	Anthozoa	Crustacea	Nudibranchs	Other Molluscs	Echinoderms	Bryozoa	Tunicates	Fish	Algae
22	2	4	2	7	4	5	6		2	7	3
23	0	11	7	4	7	8	11		5	10	7
24	4	3	5	10	3	16	12		6	18	7
25	1	3	4	7	0	7	9		2	6	3
26	2	8	4	8	4	7	10		3	9	4
27	1	4	5	2	2	2	10		4	2	7
28	11	6	4	4	1	4	2		6	5	7
29	7	2	8	0	4	2	7		1	4	5
30	3	4	4	5	2	7	12		3	5	3
31	2	9	5	9	2	13	10		3	3	16
32	1	5	3	6	1	4	10		0	7	2
33	5	0	4	9	1	10	6		3	5	12
34	2	0	5	8	0	6	8		3	7	5
35	0	5	4	4	2	6	11		5	10	7
36	0	4	5	4	6	10	13		3	6	9
37	3	4	3	6	0	3	6		0	3	0
38	2	2	2	5	2	7	7		1	3	2
39	0	3	3	3	0	4	2		0	0	0
40	1	3	2	6	3	9	12		5	9	0

TABLE 3. Descriptions of sites

1. Mol Mor, South Tanera More NB 980067

Moderately exposed, S.W. facing site in the mouth of a bay. Thick maerl bed overlying dead maerl sand thrown up into ridges which flattened out with increasing depth. Live maerl mainly on the tops of the ridges. Some pebbles and cobble present and many dead bivalve shells. Laminaria saccharina fairly thick at 12m but gone by 16m. Foliaceous red algae common attached to maerl, mainly Plocamium cartilagineum; and Scinaia turgida. Few animal species present but echinoderms and gobies common.

/11-20m/

2. N of Mol Mor, Tanera More NB 979072

Fairly sheltered site on west coast. Cliffs continue underwater as a stepped rock face dominated by Laminaria saccharina and giving way to a shell gravel and sand plain at about 9m. Offshore this plain slopes down fairly steeply with outcrops of boulders and bedrock. Echinus common on cliff face; undergrowth species poor. Sand with many bivalve siphons, Lanice conchilega, and Cancer pagurus. Munida bamffica common in boulder patches. Virgularia mirabilis common below 20m.

/5-29m/

21. Sgeir Loisgte NB 980087

Moderately exposed channel between two islands off N.W. Tanera More. Low bedrock ridges adjacent to the land with Laminaria hyperborea forest. Channel predominantly shell sand becoming maerl sand further out into the channel; only a small amount of live maerl unlike site 1. L. saccharina present attached to old shells and pebbles. Sand very well worked and obviously rich in bivalve species particularly Ensis sp., Mya sp., Lutraria sp. Foliaceous algae frequent attached to stones, shells and maerl especially Plocamium cartilagineum and Scinaia turgida. Very large individuals of Desmarestia aculeata present. Crabs (Cancer and Liocarcinus), Chaetopterus variopedatus and gobies common.

/5-9m/

15. Earbull Dhuin, Tanera More NB 9930063

Exposed site on south coast. Bedrock or boulder and rock slopes to about 10m, giving way to a coarse shell sand slope with scattered boulders. Rock dominated by L. hyperborea forest with Echinus common, undergrowth poor. Munida common amongst boulders.

/2-18m/

40. Rubha Dubh, Tanera Mhor NC 004068

Moderately exposed site on south coast. Bedrock and boulder slope to about 14m progressively giving way to a coarse shell sand slope with boulder outcrops. Boulders dominated by L. saccharina, and bedrock by L. hyperborea. Some foliaceous algae including Scinaia turgida, and some Nemertesia sp. present attached to pebbles and shells. Echinus only occasional.

/6-19m/

39. Off Rubha Dubh, Tanera Mhor NC 003065

An offshore site sheltered by virtue of depth. Gentle slope of uniform muddy sand with very occasional boulders and a few scattered pebbles. Fauna very sparse, small Munida bamffica under Arctica shells; larger ones out in the open. Very occasional hydroids on shells; Pomatoceros triqueter and other tube worms attached to pebbles.

/34-41m/

TANERA MORE ANCHORAGE

10. Rubha Dubh N. Tanera Mhor NC 001073

Moderately sheltered site at the south side of the mouth of the Anchorage. Gently sloping muddy sand plain with some shell gravel, and occasional cobbles, pebbles and boulders, with attached L. saccharina. Large numbers of crabs present (7 species) and echinoderms common. Crabs presumably feeding on the infauna. Pecten maximus very common; Ensis sp. frequent. Surface of sediment well worked. Virgularia mirabilis common at 20m. An algal turf was present in patches below 9m (Audoninella floridula).

/4-22m/

25. Pier, Tanera Mhor NB 992075

A sheltered site within the Anchorage. A short boulder and bedrock slope dominated by L. saccharina and Chorda filum giving way to a muddy sand slope at about 6m which became mud with increased depth; some isolated boulders. Mud covered by red algal turf (Audoninella) to about 10m with Asperococcus sp. also present. Fauna rather sparse including Suberites carnosus, Cerianthus lloydi and, Carcinus maenas.

/4-14m/

26. Eilean Mor NB 997075

A sheltered site within the Anchorage. A short boulder slope dominated by L. saccharina giving way to a muddy sand plain at about 8m. This was dominated by a loose lying turf of the red alga Audoninella sp. At 15m the slope increased considerably in steepness and became much more muddy with scattered small rocks and boulders. Loose lying Phyllophora crispa was present on the mud and Virgularia mirabilis in it. Very few epifaunal species apart from empty Turritella communis shells and occasional hydroids on rocks.

/8-27m/

38. Anchorage centre, Tanera More NB 995077

A very sheltered site within the Anchorage (deep). A gently sloping plain of fine muddy sand with scattered pebbles. Ascidia mentula, and Nemertesia ramosa attached to pebbles. Occasional Cerianthus lloydi, Virgularia mirabilis, Lanice conchilega, Pecten maximus, Chlamys sp., Turritella communis, Chaetopterus variopedatus and egg coils of Pleurobranchus membranaceus.

/22-30m/

37. Tanera More Anchorage NB 993081

Sheltered site adjacent to the landing bench. This part of the bay has a jumble of boulders inshore to only about 5m depth with L. hyperborea and L. saccharina adjacent to a sediment plain. The sediment is muddy sand close inshore with patches of Audoninella and Asperococcus sp. Arenicola marina is specific to this region. Further offshore, the sediment becomes mud with less algae, and Virgularia mirabilis present. Cerianthus lloydi, crabs, Pecten maximum and echinoderms were present throughout.

/0-12m/

24. Rubh Ard-na-goine, Tanera More NB 996080

Moderately sheltered site on the peninsula forming the north side of the anchorage entrance. A shallow cliff face about 5m high with crevices and overhangs extends some way round the headland. The cliff face is dominated by large Metridium senile with a variety of other species including Alcyonium digitatum, Ascidia mentula, Clavelina lepadiformis and, Pomatoceros triqueter. Below the cliff face a boulder slope is dominated by Laminaria saccharina and Echinus is very common. A sediment slope continues below about 7m.

/0-15m/

NORTH TANERA MORE (Lorney Sound)

31. Creag Ard, Tanera More NB 987090

Small bedrock cliff adjacent to land followed by a boulder slope quickly becoming a coarse sand slope with scattered boulders and rocks. Distribution of boulders patchy, but apparently ending at about 19m. L. saccharina present on boulders down to their maximum extent. Below about 15m, small boulders and pebbles with thick clumps of hydroids mainly Nemertesia spp., Halecium halecinum and Campanularia verticillata. Ophiocomina nigra becoming common below 18m and starting to form beds. Sediment with similar species to other sites - Ensis sp., Lutraria sp., Mya sp., Scinaia turgida, Plocamium cartilagineum etc.  
/10-24m/

23. Sgeir a Chapuill, Tanera More NB 989090

Moderately sheltered site adjacent to a group of offshore rocks, and exposed to some tidal current. Bedrock slopes present adjacent to the drying rocks. Moving offshore substratum predominantly a coarse shell sand slope with scattered boulders and cobbles. Boulders fairly dense in some areas and dominated by L. saccharina to about 10m. Below about 15m, rocks with thick clumps of hydroids as in site 31 and dense patches of O. nigra below 20m. Munida bamffica common amongst boulders. Mixture of bedrock, boulders and sediment gives a fairly high species diversity. Antedon bifida common below 10m.  
/6-20m/

22. Doire na Sroine, Tanera More NB 992088

Moderately sheltered site exposed to some tidal current. Steep (45°) slope of gravel with heavy siltation. Numerous small rocky outcrops and boulders giving a number of micro habitats. Somewhat different from other sites. L. saccharina present on the boulders. Some hydroids on the rocks; Antedon and Echinus common. Cancer pagurus frequent in the gravel and bivalve shells common.  
/10-22m/

32. Sron na Moil Baine, Tanera More NB 995085

Moderately sheltered site exposed to some tidal current. Gravel and cobble plain with thick L. saccharina to about 13m. Steep boulder slope from 13 to 20m and a muddy sand slope below this. Sediment had a mixed if fairly sparse community notably large Virgularia mirabilis, Pecten maximus, Chlamys sp. and large Ophiura texturata. Boulder slope supported Munida bamffica, Echinus, some hydroids and, Pomatoceros triqueter.  
/5-26m/

TANERA BEG AND ADJACENT ISLETS

16. Carn Sgoithe, Tanera Beg NB 970068

Moderately exposed site off the south coast. Bedrock, followed by boulder slope giving way at about 18m to a mainly coarse shell sand plain. Thick L. hyperborea forest to about 13m heavily grazed by Echinus and with impoverished undergrowth. Fairly typical boulder slope with L. saccharina, Echinus, Pomatoceros, Parasmittira trispinosa and many Munida bamffica. Sediment plain somewhat impoverished; Pecten maximus common. There was a thermocline at about 14m with reduced visibility in the upper warmer (14°C) water and good visibility in the lower cooler (10°C) water.

8. Sron Slugain Uaine, Tanera Beg NB 958079

Moderately exposed site off the west coast. Steep slope of large and small boulders extending to beyond 22m. Dominated by a thick L. hyperborea forest to 15.5m where it abruptly ended. Small kelp plants and some red algae present to 18m. Echinus very common especially just below kelp and rock surface heavily grazed. Cover on boulders mainly encrusting bryozoa (Parasmittina trispinosa), Caryophyllia smithi, Pomatoceros triqueter, Munida bamffica common.

/7-22m/

19. N Tanera Beg NB 963083

Moderately exposed site off the north coast. Low dissected bedrock slope giving way to a shell sand and maerl plain at about 13m with flat bedrock outcrops. Bedrock dominated by L. hyperborea forest with numerous Echinus. Fauna and flora fairly sparse. Juvenile Antedon bifida common. Neopentadactyla present in maerl.

9. Eilean a Char W NB 963086

Moderately exposed site off west side of small islet. Bedrock plateau and steep cliff ending at about 20m followed by a steep boulder slope. In some places, boulders extended up to 11m. Gravel and coarse sand plain at about 25m. Bedrock and boulders dominated by a L. hyperborea forest ending abruptly at 16m. Vertical bedrock dominated by Caryophyllia and Antedon. Pentacrinoid stages of Antedon common on small hydroids and bryozoa. Echinus common and boulders cover mainly encrusting bryozoa (Parasmittina trispinosa), and Pomatoceros triqueter, Munida bamffica and ophiuroids common.

/11-26m/

35. Sgeir Dubh W NB 962095

Exposed site off west side of small islet. Bedrock cliff continuing underwater from exposed rock to 4m and bedrock slope to about 11m. Steep extensive boulder slope with some bedrock cliffs and ledges (with a sand cover) extending down to about 32m. Shell gravel and muddy sand plain. L. hyperborea forest on bedrock and large boulders ending abruptly at 16m. L. saccharina 'park' to about 17m. Boulder slope similar to other sites (8, 9) but with a greater variety of species, and somewhat less Echinus. Parasmittina trispinosa, Pomatoceros and lithothamnion abundant on boulders. Foliaceous algae common at this site; Plocamium cartilagineum and Bonnemaisonia aspargoides common to 16m, and Myriogramme sp., and Audoninella / Trailiella common to 19m. Hydroids, mainly clumps of Nemertesia sp, common below 23m. Fish fauna diverse including 4 species of wrasse, sediment fairly poor in species.

/4-34m/

11. Sgeir Dubh NB 963096

Moderately exposed site off north side of small islet (as in site 35). Very different from nearby site 35 on other side of islet. Irregular gently sloping bedrock giving way to undulating shell sand/gravel and maerl plain between about 12-18m. L. hyperborea forest on bedrock to 13.5m with Antedon bifida common. Maerl contained more dead than living material. Pecten maximus, bivalve shells and pentacrinoid phase of Antedon common in the maerl.

/12-19m/

36. Black Rock W NB 957093

Exposed site off east side of islet. Bedrock cliff continuing underwater from exposed cliff to about 8m followed by a complex boulder slope with bedrock outcrops and plateaus often covered by sediment. Boulder slope finally giving way to muddy sand plain with scattered boulders at about 26m. Some maerl present on the sand at shallower depths (14m). L. hyperborea forest on rock to about 14m. L. saccharina and Scinaia turgida present on sandy patches above 20m. Echinus common and boulders mainly covered by Parasmittina trispinosa and some red algae. Virgularia mirabilis common in sediment.

/8-28m/

12. S of Glas-leac Mor NB 952089

Deep offshore site. Offshore bedrock present in the form of stepped bedrock slope with a few large boulders with coarse sand at 30m. Not known whether this was an outcrop of rock on part of an extensive area of rock off south Glas-leac Mor. Kelp present above 20m. Echinus and Antedon common. Pecten present in sediment.

/25-31m/

20. Rock N of Eilean a Char NB 967091

Shallow channel between two islets. Bedrock slope from the islet dominated by thick L. hyperborea forest with little undergrowth. Coarse shell sand plain adjacent to the rock with many foliaceous algae attached to empty shells; Scinaia turgida, Ceramium rubrum and Ulva sp. common. Sediment well worked and rich in bivalve species especially Ensis sp. Sediment finer further into channel and with less species.

/5m/

West side of the islet much more extensive rock slope with bedrock to about 14m and a boulder slope to beyond 21m. L. hyperborea forest to about 14m; red algae, lithothamnion Caryophyllia, Pomatoceros and Echinus on rock.

/2-21m/

33. Anchorage, Tanera Beg

Very sheltered shallow site. Soft very muddy sand plain with occasional small outcrops of rock. Sediment cover of Asperococcus sp. and Ceramium sp. No Scinaia; L. Saccharina attached to rock and shells. At edge of bay, large boulder blocks covered by lithothamnion and tatty L. saccharina. Vertical surfaces including bedrock cliff leading above water supported Alcyonium digitatum, Pomatoceros, small hydroids and bryozoa, Clavelina lepadiformis and Myxilla incrustans.

/+1.5-8m/

34. NW Eilean Fada Mor NB 971082

Sheltered site just within the anchorage. Vertical bedrock cliff adjacent to shore to about 5m dominated by L. hyperborea with an understory of Alcyonium digitatum, Metridium senile, Caryophyllia, Ascidia mentula, Botryllus schlosseri; occasional Clavelina and many Echinus. Below the cliff was gravel and muddy sand with Asperococcus sp., bedrock outcrops covered by L. saccharina and heavily silted; and finally muddy sand at about 11.5m.

/5-12m/

7. Cave; Tanera Beg NB 963069

A cave on the south coast of Tanera Beg exposed to considerable wave surge; about 100m in length with vertical sides and bedrock bottom sloping upwards towards the back. Several very large boulders near the entrance. Algae present only near the entrance. Walls dominated by patchy animal turfs of ascidians (Dendrodoa grossularia and others), bryozoa and Corynactis viridis, Metridium senile (small) and Sagartia elegans. Sponges dominated horizontal

and sloping surfaces especially Myxilla incrustans and Halichondria panicea on the tops of the large boulders. Fierce competition for space on all vertical walls and overhangs. Nudibranch predators common. Typical of fauna associated with 'surge gulleys' including some patches of Dendrodoa grossularia with Clathrina coriacea.

5-9m

#### SOUTHERN ISLANDS AND ROCKS

##### 3. Sgeir Neo-ghluasadach N NB 976056

Moderately exposed site with some tidal current (ca 0.2m). Stepped bedrock slope with thick kelp forest to 8m thinning out and stopping by 13m. Small cliff between 2 and 8m at one part of site covered in Metridium senile. Long boulder slope below about 13m continuing beyond 22m. Boulders heavily grazed by Echinus with only sparse growths of algae mainly Trailiella/Audoninella and extensive patches of Parasmittina trispinosa and Pomatoceros triqueter. Large numbers of Antedon bifida present.

2-22m

##### 4. Sgeir Neo-ghluasadach S NB 964053

Exposed site at south end of small islet. Steep slope of rounded boulders with some plateau areas with sandy patches extending to beyond 25m. L. hyperborea forest to 14m. Boulders heavily grazed by Echinus; Parasmittina trispinosa, Pomatoceros triqueter and Antedon bifida common.

12-22m

##### 5. Stac Mhic Aonghais N NB 953055

Moderately exposed site in equivalent position to site 3. Very similar to site 3. Stepped bedrock slope with some small vertical cliffs close inshore giving way to extensive moderate boulder slope at about 12m. Small cliffs dominated by Alcyonium digitatum. L. hyperborea forest to 14m mainly on bedrock. Dense L. saccharina on boulders ending abruptly at 17.5m in some areas where boulder slope increased in steepness. Boulders heavily grazed by Echinus but few on bedrock and dense epiphytic algal growths on kelp stipes in shallower water. Other algae sparse apart from a turf of Trailiella/Audoninella to 20m. Small red algae present to 25m. Extensive patches of Parasmittina trispinosa and Pomatoceros triqueter. Antedon bifida abundant.

5-30m

6. Stac Mhic Aonghais S NB 955057

Exposed site in equivalent position to site 4. Steep boulder slope to about 19m flattening out to a gentle cobble and coarse sand slope. L. hyperborea forest to 17m with a 'park' to 19m, Echinus abundant and rock below kelp well grazed. Parasmittina trispinosa, Pomatoceros triqueter, and Antedon bifida common on boulder slope. Brittle stars abundant on the cobble, mostly Ophiocomina nigra with some Ophiothrix fragilis near the boulder/cobble boundary.

/9-25m/

18. Sgeir nam Mult NB 964048

Moderately exposed site. Gentle slope of smooth bedrock becoming boulders at about 14m and shell gravel at 17m. L. hyperborea forest to edge of sediment plain but thinning by 14m. L. saccharina on boulders on plain. Animal species clearly sparse. Echinus and Antedon bifida frequent.

/8-18m/

14. Eilean Dubh N NB 974041

Moderately exposed site on north coast of Eilean Dubh. Low bedrock cliffs with gullies lined by coarse shell sand and gravel, giving way to boulder fields at about 8-11m and finally to coarse shell sand at about 20m. Dense L. hyperborea forest on bedrock to about 9m but with kelp park and L. saccharina to 19m. Gulley walls in kelp forest with numerous Caryophyllia smithi. Boulders covered by lithothamnion, Pomatoceros and encrusting bryozoa. Very dense bed of Pecten maximus on sediment plain.

/3-19m/

13. Eilean Dubh E NB 978038

Moderately exposed site on east coast of Eilean Dubh. Bedrock cliff descending from shore to about 7.5m dominated by L. hyperborea and Sacchoriza polyschides. Bedrock outcrops, boulders and cobble finally giving way to a coarse shell sand plain at about 14m. L. saccharina on bedrock outcrops and on quite small pebbles, Antedon abundant. Sediment well worked by crabs with numerous excavations. Pecten maximum common.

/0-15m/

17. Twelve foot rock NB 935032

Extensive submerged rock rising to within a few metres of the surface. Only the west and south faces were dived. The top of the rock is covered by typical L. hyperborea forest with a sparse undergrowth. The rock drops off gently at first but then descends in a

series of bedrock cliffs and steps. The south face exhibits smooth steep gouged surfaces (ice action?). Boulder slopes continue from the base of the rock starting at between 22 and 30m and sand patches are present at the bottom of the west face. Below the kelp forest (18m) the rock is surprisingly bare without even a cover of lithothamnion. Boulders are typically dominated by Parasmittina trispinosa, lithothamnion and Pomatoceros with numerous Echinus and few foliaceous algae.

6-28m

27. Priest Island SW NB 918015

Very exposed site on south west corner. Smooth steep bedrock slope leading sharply down to a gradual boulder slope at about 19m. Boulders mixed in with coarse shell gravel and sand patches to beyond 28m. Mature L. hyperborea forest on the bedrock ending abruptly at 17m. Echinus very abundant. Some foliaceous algae under kelp but not very rich; mainly Dictyota dichotoma and Bonnemaisonia asparagoides with others as kelp stipe, epiphytes. Boulders with very large numbers of Antedon bifida, and Pomatoceros triqueter, but little encrusting bryozoa and lithothamnion.

12-28m

28. Priest Island West NB 917025

Exposed site especially near to shore cliffs. Steep bedrock cliff continuing down from shore to about 10m, leading onto bedrock dissected by deep gullies. Flat boulder plain present at 16m. L. hyperborea forest present on bedrock with sparse plants on boulders at 16m. Sides of gullies exposed to wave surge supported a variety of sponges, Alcyonium digitatum, crisiidae and some tunicates. Boulders with sparse cover and Echinus and Antedon common.

5-20m

29. Priest Island N - Archway NB 925030

Very exposed site with a natural tunnel leading right through the rock and exposed to considerable wave surge. Outside the tunnel, the substratum is bedrock dominated by a very thick mature kelp forest. Moderate cover of foliaceous algae including Plocamium cartilagineum, Odanthalia dentata, Callophyllis laciniata and Cryptopleura ramosa; epiphytes rich. Small cliffs and gully sides dominated by Alcyonium digitatum.

3-14m

Within the tunnel only Halichondria panicea and Pachymatisma johnstonia abundant. Halichondria formed extensive thin sheets over boulders and the vertical sides of the tunnel. Vertical surfaces near the entrance to the tunnel supported fairly rich animal growths particularly Clathrina coriacea, Alcyonium digitatum, Corynactis viridis, Pomatoceros, Crissiidae and Botryllus schlosseri.

[-1 to 6m]

30. Priest Island, Ard Glas NB 933023

Moderately exposed site. Steep bedrock and boulder slope giving way to boulders on coarse sand at about 18m. L. hyperborea forest to about 16m. Some foliaceous red algae. Carophyllia smithi common on bedrock and Ophiocomina nigra frequent. At one part of site slightly offshore, a steep pinnacle of rock extending from deeper than 16m to within 5m of the surface. Dense L. hyperborea over the top of the pinnacle and abundant Corynactis viridis, Caryophyllia smithi and Cliona celata.

APPENDIX III

List of all animals and algae observed, photographed and collected.

Nomenclature in general follows the Plymouth Marine Fauna (MBA, 1957) but where more recent taxonomic information is available for a particular group, some names have been changed. Numbers in parentheses indicate the sites at which the species was found and reference should be made to Table 3 for habitat information on these sites.

Further notes on the availability of voucher specimens is given within the list.

The species lists were prepared by those indicated and annotated by the author.



ALGAE

Collections made by Norma Brandt and Frances Dipper. Species marked with an asterisk are represented in the dried herbarium material held by NCC and were identified by Christine Maggs (Galway). List prepared by Norma Brandt and FD.

CHLOROPHYTA

- \*Bryopsis plumosa: (1,20,21). Shallow sites attached to stones, shell or maerl on sand.
- \*Cladophora rupestris: (33,34). On shore and in shallow water.
- \*Enteromorpha intestinalis: (11,13,33).
- \*Enteromorpha sp.: (11,31,32,33,34).
- \*Ulva (lactuca): (1,13,15,16,20,21,23,31).

PHAEOPHYTA

- \*Asperococcus turneri: (25,26,33,34). Very sheltered shallow sites lying loose on muddy sand and mud; typically just below a kelp covered boulder slope.
- Chorda filum: (24,25,33). Sheltered sites.
- \*Cutleria multifida: (20,31,33). Usually on boulders just below the main kelp zone, or on bedrock within the kelp zone.
- \*Desmarestia aculeata: (1,5,21,13,16,31). On stones amongst L. saccharina on maerl and boulders.
- \*Desmarestia viridis: (11,21,23,31).
- Desmarestia ligulata: (21,33). Large pieces attached to stones etc on sediment plains.
- Dictyota dichotoma: (3,7,8,10,11,13,17,20,27,28,30,31,36). One of the commonest undergrowth algae beneath and just below the kelp forest on bedrock and boulders.
- \*Dictyosiphon chordaria: (1,34).
- \*Dictyosiphon foeniculaceus: (11).
- Laminaria hyperborea: (3,5,6,9,11,13-22,24,27-31,35,36). Well developed kelp forest on bedrock and stable boulder slopes to 16m with plants to at least 20m. Probably present at all inshore sites with rock present except for very sheltered areas but not always recorded consistently.

Laminaria saccharina: (1-5,10,11,13-28,30-36,38). Present at almost all sites, often forming a forest on boulder slopes and cobble below the L. hyperborea forest. Also present on sediment and maerl plains attached to stones and shells.

Sacchoriza polyschides: (13,14,15,20,22,24,28,31). Especially at 'open' sites such as headlands and off-shore reefs.

\*Spermatochnus paradoxus: (13,33).

\*Sporochnus pedunculatus: (16,21,31).

\*Stichtyosiphon tortilis?: (6).

\*Stilophora sp.?: (26)

#### RHODOPHYTA

\*Acrosorium uncinatum: (5)

\*Antithamnion plumula: (20,21,24,31,35). Mainly attached to stones, shells or other algae on sediment.

\*Audoninella (Rhodochorton) floridula: (10,26,33). Thick growths on mud and muddy sand in sheltered sites from below boulder zone to about 15m.

\*Bonnemaisonia asparagoides: (3,5,6,8,11,13,20,27,30,35,36). Common as a kelp epiphyte and on rock beneath kelp canopy.

\*Brongniartella byssoides: (20).

\*Callophyllis laciniata: (1,3,5,20,29).

\*Callithamnion tetragonum:

\*Ceramium rubrum agg: (16,20,31,33).

\*Ceramium (strictum?): (20).

\*Chylocladia verticillata: (3).

\*Cryptopleura ramosa: (1,7,20,29,30). Exposed, clear water sites.

\*Cordylecladia erecta: (1). On maerl.

\*Compsothamnion thuyoides: (5,3).

\*Cystolonium purpureum: (34).

- Delesseria sanguinea: (20).
- \*Dilsea carnosus:
- \*Dudresnaya verticillata: (3).
- \*Gracilaria verrucosa: (20,21). On shallow sediment plains attached to small stones and shells; with tetrasporangia at 20.
- \*Griffithsia flosculosa: (17,18).
- \*Heterosiphonia plumosa: (1). On maerl.
- \*Halarachnion ligulatum: (1,11). Small pieces on maerl at 1.
- \*Hypoglossum woodwardi: (3,5,20).
- \*Kallymenia reniformis: (3,11,17,30).
- 'lithothamnion': (3,7,8,13,14,15,27,28,30,36). Very widespread and often extensive; probably at most sites but under-recorded.
- \*Lomentaria clavellosa: (20,21).
- \*Nitophyllum punctatum: (7,21).
- \*Odonthalia dentata: (1,7,29). At very wave exposed sites.
- \*Palmaria palmata: (16). Kelp epiphyte.
- \*Phycodrys rubens: (1,8,24,28,31,36).
- \*Phyllophora crispa: (21,26,31,33). Loose carpet on mud at very sheltered site 26. Attached to pebbles on sediment at other sites.
- \*Phymatolithon calcareum (Maerl): (1,11,19,21,36). Several extensive beds especially at 1 and 19. Mainly dead at 21.
- \*Plocamium cartilagineum: (1,3,5,6,10,13,17,18,20,21,23,24,28-31,33,35,36). The commonest and most widespread red alga, both on rock and on stones on sediment. Very common covered by silt and attached to maerl at 1. Kelp epiphyte.
- \*Polysiphonia urceolata: (21).
- \*Polysiphonia sp.: (11).
- \*Polyides rotundus: (20). Attached to stones in sediment.
- \*Pterosiphonia parasitica: (1). On maerl.
- \*Rhodomela confervoides: (31).

\*Rhodophyllis divaricata: (1). On maerl.

\*Rhodophyllis sp.: (3,5,6; 8,9,17,20,21,23,27,35,36). This entity cannot at present be identified with any particular species of Rhodophyllis. It was identified from specimens at 3, 5 and 6 (by C Maggs) but not at the other sites. Widespread and frequent especially on boulder slopes below the majority of other algae.

\*Scinaia turgida: (1,11,14-16,18,20,21,23,31). Widespread and common attached to stones and shells on sediment.

Sei rospora seirosperma: (26) Epiphyte on other red algae.

Trailliella?: (1,3,5,10,17,27,35,36,38). Tetrasporangial phase of Bonnemisonia hamifera. As no specimens were collected, this entity may have been confused with A. floridula which it closely resembles. Frequent on boulders below the kelp forest particularly adjacent to sediment plains.

ANIMALS

PORIFERA

List prepared by Graham Ackers. Specimens of the majority of sponges were taken and are held by the Ulster Museum. Many of the sponges still require identification and an accession list will be available. Specimen reference numbers are given in brackets. Photographs of most are available.

Amphilectus fucorum: (7) Occasional in cave amongst Halichondria.

Cliona celata (07/369): (18,20,24,28,30). Rare to occasional on bedrock.

Clathrina coriacea: (7,28,29). Common on walls of caves; at 7 in association with Dendrodoa grossularia.

Dysidea fragilis: (7). Occasional in cave.

Halichondria panicea (07/370): (7,19,22,26,28,29,34). Abundant covering tops of very large boulders and on walls of caves at 7 and 29; occasional on kelp stipes and other substrata at other sites.

Haliclona sp. (purple, 07/365): (5,17,28,29). Occasional especially on sides of boulders, but also on bedrock.

Leucosolenia botryoides: (1,15,21,26,28,33). Small pieces occasionally found usually attached to algae including maerl.

Microciona sp. (7). Encrusting walls of cave.

Myxilla incrustans (07/638,07/377); (7,17,24,27,29,29,30,31,33,37). Fairly widespread but only common in cave at 7.

Myxilla rosacea ("pink myxilla", 07/359): (7). On walls of cave at 7.

?Oscarella lobularis: ("yellow knobbly crust", 07/367, 07/372) : (7, 29,28,34). On walls of caves at 7 and 29; on vertical bedrock at 28, 34.

Pachymatisma johnstonia (07/364) : (8,28,29,33). Abundant in cave at 28; small pieces at other wave exposed sites. One small piece on roof of small 'cave' formed by boulders at very sheltered site 33.

Scypha compressa: (7). On walls of cave.

Scypha ciliata: (22,24).

Stelligera sp. (07/363) : (30). One specimen attached to small boulder on gentle boulder-sand slope.

Suberites carnosus (07/361,07/375) : (25,33). Fairly common at sheltered site 33 attached to rocks on soft sediment; one unattached.

Suberites sp? (07/374) : (33). Encrusting base of small rock half buried in sediment. May be S. carnosus.

'Encrusting suberitid' (07/360, 07/378) : (40,38,24). On Chlamys opercularis.

'Encrusting Inachus' (07/362, 07/381) : (37,40). Encrusting the chelipeds and carapace of Inachus.

'Red knobbly crust' (07/364) : (28,29). Encrusting rock.

'Red Chlamys crust' (07/373, 07/379) : (32,38) : On Chlamys opercularis.

'Algae sponge' (07/376, 07/380) : (37). Attached to flocculent algae and a pebble on sediment in shelter.

'Yellow Haliclona' (07/366) : (28).

'Halichondria?' (07/371) : (31) Attached to algae.

#### HYDROZOA

List prepared by Frances Dipper, Specimens are held by the Ulster Museum.

Abietinaria abietina; (22,23,28,29,30,31,32). Occasional pieces found at sites in Dorney Sound and around Priest Island; common on boulders at 23.

Abietinaria filicula: (7). Found in the cave at site 7 only, growing through Halichondria on top of large flat boulder.

Campanularia verticillata: (9,23,31,32). Frequent to common on small boulders and rocks at sites in Dorney Sound.

Clava multicornis: (37). Present on brown wrack seaweeds on shore in Tanera More anchorage.

Eudendrium sp.: (7,28). Very occasional small pieces.

?Filellum serpens: (26,28). Found growing on collected hydroid material.

Halecium halecinum: (11,16,21,23,26,31). Occasional clumps found at a variety of sites.

Hydrallmania falcata: (26). Recorded at one very sheltered site in Tanera More anchorage on boulders on mud.

Hydractinia echinata: (24).

Kirchenpaueria pinnata: (3,5,9?,23,31,35,39). Occasional to frequent on boulder slopes; present on old shells at deep sediment site 39.

Nemertesia ramosa: (2,3,4,9,11,12,14,16,17,22,23,25,26,27,30,31,32,35,36,37,38,39,40). Widespread on boulders, bedrock and pebbles but only as small scattered clumps. Present at both sheltered and exposed sites.

Nemertesia antennina: (2,3,4,5,6,8,9,10,11,12,14,16,17,18,20,22,23,25,26,27,28,30,31,32,35,36,37,38,39,40). Very widespread; present at most sites as for N. ramosa.

Obelia geniculata: (2,3,4,5,6,7-12,14-16,18-21,24,27-31,35,36,40). Widespread and common on fronds of the kelp L. hyperborea and L. saccharina.

Obelia dichotoma: (25,26). Only recorded in Tanera More anchorage.

Plumularia setacea: (7,23,27). On Nemertesia sp., and Eudendrium sp.

Grammaria abietina:(23,26).

Schizotricha frutescens: (9,12,23,24,31,32). Occasional clumps recorded from sites in Dorney Sound and the exposed area west of Tanera Beg.

Sertularia argentea: (7,23,28). Occasional small pieces.

Sertularella polyzonias: (22,23,26,31,36). Occasional pieces.

Tubularia indivisa: (7,17,35). Small scraggy clumps found only at wave exposed sites on the walls of the cave at 7 and on tops of boulders.

#### ANTHOZOA

List prepared by Bryan Stark. Few specimens were collected but photographs of most of the species are held in the NCC collection (see Appendix IV).

Actinothoe sphyrodeta: (5,24?). On boulders of exposed site.

Alcyonium digitatum: (1,5,7,8,9,11,12,13,14,17,19,20,21,23-31, 33-35). Widespread and common but no areas in which it dominated. Commonly found on small vertical bedrock cliffs in the kelp forest near to shore; also on boulders and on kelp stipes.

Actinia equina: (7,29,37). Present in both cave sites on the walls near the surface; and on the shore at 37.

Adamsia palliata: (12,22,23). On hermit crab shells.

Caryophyllia Smithi: (3,5-9,12-14,17,20,21,23-31,33-36,39). Widespread and common but usually present in small numbers on vertical faces such as the sides of boulders and on cliffs. Single specimen present on inside of Arctica shell on sediment at 40m (site 39).

Corynactis viridis: (3,7,8,29,30). Abundant on vertical sides of caves at 7 and 29; common on sides of rock pinnacle at 30; few individuals present at other sites.

Cerianthus lloydi: (10,13,15,20,22-26,31-34,36-38,40). Frequent in soft muddy sediments below about 20m.

Metridium senile: (3,7,8,12,13,14,16,17,23,24,27,29,31,33-36,40). Widespread and frequent on vertical and overhanging rock faces especially on headlands and isolated rocks exposed to wave action. Most abundant on shallow vertical cliff at site 24. In the caves at sites 7 and 29 numerous small individuals covered the rock surface.

Sagartia troglodytes: (29,30?).

Sagartia elegans var venusta: (7,27,28,29,). Occasional individuals in the kelp forest. Abundant on the walls in the cave at site 7.

Sagartia elegans var miniata: (5,7,8,20,28,29,34). As for venusta.

Sagartia elegans var nivea: (7,16,29,34). As for venusta.

Sarcodictyon roseum: (39). Small retracted colony on dead Arctica shell at 40m on sediment.

Urticina (Tealia) felina: (3,7,23,24,27,38,29,36). Occasional.

Virgularia mirabilis: (2,9,10,15,23,25,26,30,32,35-39). Widespread and frequent in sand and especially muddy sediments below about 20m. Often rather small but larger at sites in Dorney Sound (eg 32).

## POLYCHAETA

List prepared by Frances Dipper and Norma Brandt. A collection of worms was made and is currently being identified.

Arenicola sp. (casts) : (2,10,20,21,23,24,25,26,31,33,34,37,38,40). Present at most sites with sand present.

Chaetopterus variopedatus : (1,6,9,10,15,16,21,24,25,30,33,34,35,38). Widespread and fairly common in sediment and between boulders.

Filograna implexa : (7,14,28,29). Occasional patches on cliffs and holdfasts.

Halosydna gelatinosa : (13). One collected.

Hydroides norvegica : (39). One collected.

Lanice conchilega : (2,10,11,12,13,14,15,16,20,21,23,24,25,26,30,31,32,33,34,38,39,40). Widespread, at most sites with sand.

Myxicola infundibulum : (1,38). In maerl and muddy sand.

Pomatoceros triqueter : (Recorded at all sites except 7). Very widespread and common at most sites especially on boulder slopes.

Sabella pavonina : (13).

Serpula vermicularis : (32,39). Occasional on sides of boulders.

Spirorbis sp. : (4,14,15,16,17,20,24,34,37). Common on kelp fronds.

Terebellidae : (4,6,8,10,13,17,20,21,24,25,27,28,30,33,34,35,38). In sediment beneath boulders.

## NEMERTINI

Lineus ruber : (11).

Tubulanus annulatus : (31,38).



SCYPHOZOA

List prepared by Bryan Stark.

Aurelia aurita: (2,7,34,37).

Cyanea capillata: (5,21,32,37,39).

Haliclystus auricula: (15).

Lucernariopsis campanulata: (20).

CRUSTACEA

List prepared by Alan Brittain. Preserved specimens of some species are held by the British Museum (Natural History); these are indicated by an asterisk (\*).

Cancer pagurus: (Recorded at all sites except sites 1 and 29). Most commonly found in excavations in the sediment but also on rock. Usually one to several seen at each site and only common on a few sites (eg 22).

Carcinus maenas: (2,10,21,24,25,31,32,33,34,37). Frequent at shallow sheltered sites mainly on sediment, particularly in the anchorages of Tanera More and Tanera Beg.

Galathea sp.: (4,8,16,22,26,33). Small individuals sometimes present under boulders.

Galathea strigosa: (7,15,17,28). Occasional individuals in crevices in bedrock and between large boulders.

Homarus vulgaris: (8,24,25,30).

Hyas araneus: (2,7,10,19,21,34). Occasional individuals on kelp.

\*Hyas coarctatus: (17). One juvenile collected.

Inachus sp.: (2,10,13,16,21,22,24,25,26,32,33,35,38,40). Fairly widespread, often in kelp forest. Frequently found disguised by pieces of sponge, hydroid and algae.

Inachus phalangium: (31). Identified from specimen.

Liocarcinus puber: (3,4,5,7,8,10,11,12,13,14,15,17,18,19,21,22,24,25,26,28,30,31,33-37). Widespread; usually one or two recorded at each site.

\*Liocarcinus depurator: (1,2,3,10,13,16,19-23,25,26,31-34,36-38,40). Occasional to common particularly in sediment areas.

\*Liocarcinus corrugatus: (24,33). One collected.

Liocarcinus sp.: (10,14,16).

Macropodia sp: (10,13,21,24,25,26,31,33,34,37,40). In kelp forest on shallow sand amongst algae. Often 'decorated' with bits of algae.

\*Macropodia rostrata: (13). Identified from specimen.

Munida bamffica: (Recorded at all sites except 1,6,10,11,13,19, 21,25,29,33,37). Very widespread and common. Typically found in crevices between boulders on boulder slopes; and under stones on sediment plains. In deep water at Site 39, large individuals were present out on the open sediment.

Pagurus spp. (6,10,12,14,16,20,23,24,26,31-34,37-40). Widespread but not particularly common.

'Prawns': (34,30,31).

\*Pisidia (Porcellana) longicornis: (10,24,38). Specimens collected.

#### MOLLUSCA

List prepared by John Aldred.

Acmaea: (24,39). Probably under-recorded.

Anomiidae: (24,7).

Aporrhais pespelecani: (26,33). Shells only.

Arctica islandica: (2,38,39). Shells common at 38,39 - deep water sediment.

Buccinum undatum: (3,8,10,12,15,18,19,20,21,22,26,28,31,33,36,37,38, 40). Widespread but not in large numbers.

Chitons: (1,6,16,19,20,23,24,26,31,39).

Chlamys sp: (2,10,12,23,31,40).

Chlamys distorta: (25). Attached to stone; identified in laboratory.

Chlamys opercularis: (18,24,25,31,38). Generally only one or two present; fairly common in muddy sand at 38.

Calliostoma ziziphinum: (3-11,14,16-20,23-25,27-31,34-36,40). Widespread; recorded at most sites where kelp present.

Dosinia exoleta: (20,23,24,31,33,35,36,40). Shells only.

Ensis sp.: (10,14,15,18-21,31,34,36). Ensis sp. was very common at shallow sandy sites such as 20,21 identified by the 'puffs' made when withdrawing into the sand.

Ensis arcuatus: (2,10,16,22,24,31,33,35,40). Identified from shells.

?Ensis siliqua: (2,10). Not identified from shells; may be E. arcuatus.

Gibbula cineraria: (1-3,5,6,10,11,13-15,18-21,24,25,27,28,30,32,34,37,38). Widespread on kelp fronds. Probably present at all sites with kelp.

Gibbula magus: (10,13,16,18,20,21,33,40).

Glycymeris glycymeris: (21) Shells.

Hiatella arctica: (30,31,38,39).

Lacuna vineta: (18).

Laevicardium crassum: (11,14,24,31,32,33). Shells only.

Lutraria angustior: (11,16,19,23,26,31,36,40). Shells only; confirmed by Shelagh Smith (Royal Scottish Museum).

Musculus marmoratus: (4,12).

Mya arenaria: (21,24). Shells only.

Mya truncata: (21,24,31,33). Shells only.

Nassarius sp.: (23). Shell

Nassarius incrassatus: (3).

Neptunea antiqua: (10).

Octopus species: (5,6).

Patella sp.: (24,36).

Patina pellucida: (2,7,8,10,14,16,19-21,29). Probably under-recorded.

Pecten maximum: (1,2,3,9,10,11,12-16,18,21-26,28,31-38,40). Common at a few sites but no dense beds.

Tellina crassa: (36).

Trivia monacha: (10,24,31,33).

Turitella communis: (2,8,10,21,22,25,26,32,33,34,38). Mostly dead shells.

Venerupis pullastra: (12,16,18,21,22,30,35).

Venus sp.: (5,9,10,24,33).

Venus casina: (6,12,14,16,18-20,26,30,35,36).

Venus fasciata: (11,24).

Venus verrucosa: (4)

MOLLUSCA : OPISTHOBRANCHIA

List prepared by P Schofield, preserved specimens of all species are held by the Ulster Museum.

Aeolidia papillosa: (?). Feeds mainly on anemones and was only found in the cave at site 7 where these abound.

Antiopella cristata: (12,22,26,32). Feeds mainly on erect bryozoans.

Antiopella hyalina: (?). This rare species was found in the cave at site 7. It probably feeds on bryozoa such as Bugula sp. The latter was not recorded from this site but other bryozoa were.

Acanthodoris pilosa: (6,9,35). Feeds on encrusting bryozoa which were common throughout the area.

Archidoris pseudoargus: (7,29,38). Feeds on sponges which were only really common at the two cave sites 7 and 29.

Cadlina laevis: (?). Feeds mainly on sponges which were common at site 7.

Coryphella lineata: (36). Feeds mainly on hydroids.

Coryphella verrucosa: (7,19,20,22,23,24,26,36). The most commonly recorded species. It feeds mainly on hydroids.

Cuthona caerulea: (2,22,23,26). Feeds mainly on hydroids which were common at these sites.

Cuthona rubescens: (21). Feeds mainly on hydroids.

Dendronotus frondosus: (23,29,31,36,40). Feeds mainly on hydroids.

Doto coronata: (23). Feeds mainly on hydroids which were common at site 23.

Doto millbayana: (27,36). Feeds mainly on hydroids.

Eubranthus farrani: (4,6,14,17,18,20). Feeds mainly on hydroids.

Eubranthus pallidus: (36). Feeds mainly on hydroids.

Eubranthus sp.: (17,35).

Elysia viridis: (21).

Facelina bostoniensis: (7,17,36). Feeds mainly on hydroids.

Favorinus branchialis: (18,40). Feeds mainly on hydroids.

Limacia clavigera: (7,13,22,23,24,33,40). Feeds on encrusting bryozoa which were common throughout the area.

Lomanotus genei: (4). Feeds mainly on hydroids.

Lomanotus marmoratus: (31). Feeds mainly on hydroids.

Goniodoris nodosa: (5,6,7,9,17,19). Feeds mainly on compound ascidians.

Onchidoris muricata: (17,20,21,24). Feeds mainly on encrusting bryozoans which were common throughout the area.

Onchidoris luteocincta: (17,23,26,30). Feeds mainly on encrusting bryozoans.

Philine aperta: (26).

Polycera quadrilineata: (17,18,19,23,27,29,30). Feeds mainly on encrusting bryozoans.

Tritonia hombergi: (5,7,28,29). Feeds mainly on soft corals.  
Alcyonium digitatum was present on small vertical cliffs at sites where this species was found.

Tritonia plebeia: (7). Feeds mainly on soft corals.

#### BRYOZOA

List prepared by Dave Moss. All specimens were identified by Peter Hayward and are held by Dave Moss.

#### ASCOPHORA

Cribrilina punctata: (21).

Cribrilina annulata: (2,4).

Escharoides coccinea: (14,24,28,31).

Smittoidea reticulata: (2,6,20,24).

Parasmittina trispinosa: (2-6,8,9,11-18,20-24,26,28,30-32,34-36,38,39).  
Very widespread; present at the majority of sites and common on rocks and boulders below the kelp forest; abundant at site 4 with 20-30% cover.

Porella compressa: (4,5,8,17,28,35). Occasional pieces.

Porella concinna: (4,32,36).

Palmicellaria skenei: (2).

Escharella immersa: (2,4,30,32,36).

Escharella ventricosa: (2,4,30,32).

Schizomavella auriculata: (2,32,36).

Schizomavella linearis: (2,4,7,14,18,20,30,39).

Microporella ciliata: (2,4,10,12,14,20,21,24,25,30,31,36). Quite common on kelp fronds; probably under-recorded.

Fenestrulina malusii: (2,3,14,21,32).

Chorizopora brongniartii: (2,36).

Hippothoa flagellum: (2,4,12,20,36).

Celleporella hyalina: (10,17,25,30,34).

Cellepora pumicosa: (4,7,14,16,20,30,36).

Celleporina hassallii: (14,28).

Celleporina decipiens: (34).

Turbicellepora avicularis: (12,14,24,26-29,36). Common at 29.

Omalosecosa ramulosa: (3,4,6,7,14,27,36). Often found at the bases of the hydroids (Nemertesia spp).

Buskea dichotoma: (5).

Phylactellipora collaris: (32).

#### ANASCA

Aetea truncata: (32)

Membranipora membranacea: (3,5-8,10-12,14,16,18,20,21,23-30,33-37).  
Very widespread mainly on kelp fronds.

Electra pilosa: (2,6-8,10-14,16,18,21,27-30,32,34-36,39,40). Very widespread on kelp and other algae especially epiphytic

Securiflustra securifrons: (12,35,36).

Flustra foliacea:

Callopora lineata: (34).

Callopora dumerilii: (2,14,32).

Callopora aurita: (24).

Alderina imbellis: (2,18,32).

Tegella unicornis: (32).

Amphiblestrum flemingii: (2,18,20).

Amphiblestrum minax: (32,36).

Membraniporella nitida: (7,4,7,12,20,24,30).

Cellaria fistulosa: (39).

Scrupocellaria reptans: (7,10,14,17,19,24,28,33,37). Common at 19.

Scrupocellaria scruposa: (7,28,34).

Bugula flabellata: (9,12,24,32,35,36). Frequent as epizooite on  
S. securifrons and A. gelatinosum.

Dendrobeania murrayana: (5,12).

#### CYCLOSTOMATA

Disporella hispida: (2,30,32).

Hippoporina pertusa: (2,32).

Diposolen obelium: (4,12,30,36).

Berenicea patina: (12,20,30).

Nolella ciliata: (12).

Canloramphus spiniferum(24).

Crisia gaculeata: (6).

Crisia eburnea: (12).

Crisidia cornuta: (7,28).

CTENOSTOMATA

Alcyonidium gelatinosum: (4,9,12,14,16,18,23,26,27,30,32,35,36).

ECHINODERMATA

List prepared by John Grummit. Specimens held by BM(NH) are indicated by an asterisk (\*), and were confirmed by Ailsa Clark.

Asterias rubens: (Present at all sites) often common.

Antedon bifida: (Recorded at all sites except 13 and 37-39). Widespread and common. Pentacrinoid stages common at some sites.

Astropecten irregularis: (1,2,10-13,16,18,20-26,31-34,36,37,40). Widespread; present at most sites with sand.

Crossaster papposus: (1-6,8-13,15-19,2,23-34,36,40). Widespread.

\*Cucumaria saxicola: (11,13,19,30,35,36). Under boulders but small ones on rock surfaces in kelp forest. Probably widespread but under-recorded (now Pawsonia saxicola).

Cucumaria sp.: (5,24). Seen as tentacles extending from crevices in rock.

Echinus esculentus: (present at all sites except 39 which was deep sediment). Very abundant at almost all sites where rock was present, apart from the very wave exposed caves at 7 and 29. Most rock very heavily grazed.

Echinocardium cordatum: (14). Probably widespread but lives buried in sediment.

\*Henricia oculata: (37). Identified in the laboratory.

Henricia sp.: (4-7,10,14,17-19,24,26-30,35,40). Fairly widespread wherever rock present.

Luidia ciliaris: (1-3,5,6,9-16,19,21,23,25,27,29,32,38,39,40). Widespread.

\*Luidia sarsi: (36). One collected.

\*Labidoplax digitata: (37). One collected from fine sand close in-shore in Tanera Mhor anchorage.

Marthasterias glacialis: (Recorded from all sites except 4,13,39). Widespread; some found on sediment.

Neopentadactyla mixta: (1,3,11,13,19-21,36). Present in maerl and coarse sand and shell gravel.

Ophiothrix fragilis: (2-4,6-9,11,15-20,23,24,27,30-32,34,36,38). Often common under boulders and in crevices but no large beds recorded.

Ophiocomina nigra: (6,23,26,30,31,40). Present in large numbers at a few sites mainly on cobbles and small boulders below the main boulder slope. particularly where some current present (23).

Ophiura albida: (2-6,8,9,12-14,16-21,23-27,31,32,34-37,40). Small individuals common on sediment and on rock near sediment.

\*Ophiura texturata: (19,32). Common and large on muddy sand at 32 below boulder slope.

Ophiopholis aculeata: (35).

Ophiopholis sp.: (3,5-10,18,20,28,30). In crevices and under boulders.

Porania pulvillus: (1-17,19,22-27,30-32,35,36,38,40). Widespread on rock and sediment.

Psammechinus miliaris: (24,36).

Solaster endeca: (5,35,40).

\*Stichastrella rosea: (3,4,35).

#### ASCIDIACEA

List prepared by Frances Dipper. Specimens held by Ulster Museum.

Ascidia mentula: (2,3,4,5,8,9,12,14,15,16,20,21,22,23,24,25,26,27,28,30,31,33,34,35,36,38,40). Widespread; usually one or two recorded attached to sides of boulders. Also large specimens on small shaded cliffs (24).

Ascidia virginea: (8,9,17,19,27,30,35,36,40). Occasional individuals on bedrock and boulders.

Ascidiella aspersa: (10,40). Small 'prickly' form as found in Skye.

Ascidiella? sp.: (7). Abundant covering walls of cave amongst bryozoa.

Aplidium proliferum: (7). Frequent on walls of cave.

Botryllus schlosseri: (5,7,9,14,17,20,23,24,27,28,29,30,33,34,40).  
Usually small patches on kelp holdfasts or boulders.

Ciona intestinalis: (6,7,23,26,36). Occasional individuals.

Clavelina lepadiformis: (2,3,8,9,13,16,20,21,22,23,24,26,28,31,  
33,34,35,40). Fairly widespread; usually small, rather tatty patches  
on boulders. Common on cliff at 24.

Corella parallelogramma: (2,24,25). Solitary individuals.

Dendrodoa grossularia: (7,24). Abundant in patches on wall of  
cave at site 7 with the sponge Clathrina coriacea. Few at site  
24.

Diazona violacea: (2,35). One large colony present at each site.

?Didemnum maculosum: (7,28). "White lace didemnid" - frequent on  
cave walls at 7.

Diplosoma listerianum: (6,18,20,30). Thin film encrusting kelp  
fronds.

Didemnidae: (23,24,27,31,35,40).

Polyclinum aurantium: (7,28). Present only at wave exposed sites.

#### PISCES

List prepared by John Grummit.

Cyclopterus lumpus: (13). One very small.

Chirolophis ascanii: (7,28).

Callionymus lyra: (1,3,5,9,10,16,18,20-27,29,31-36,38,40). One of  
commonest fish encountered. Recorded at most sites where sediment  
present.

Conger conger: (24). One in crevice at base of cliff.

Centrolabrus exoletus: (24). Several amongst algae covered boulders.

Ctenolabrus rupestris: (8,22,24,26,35). Mainly on boulder slopes.

?Crenilabrus melops: (35).

Entelurus aequoreus: (1,19,24).

Gadus morhua: (1,3,4,8-11,14,15,17,18,22,24,25,34,35,37,40). Mainly  
juveniles.

Gobiusculus flavescens: (9,10,24,26,28,32-35,37,40).

Labrus mixtus: (9,11,15,19,24,35,36). Male and female colour phases recorded.

Labrus bergylta: (5,6,8,14,15,24,35). Mainly in the kelp forest.

Lophius piscatorius: (2,3,5,6,9,24).

Melanogrammus aeglefinus: (25,38).

Molva molva: (6,23,35).

Myoxocephalus scorpius: (18,40).

Pollachius pollachius: (2,3,5-8,20,22,23,28-30,35,36,40).

Pollachinus virens: (5,11,14,22-25,28-30,32,34,38,40).

Pholis gunnellus: (1,10,11,13,23,28,34).

?Pomatoschistus minutus: (23,26,33,36).

Pomatoschistus pictus: (1,2,10,11,13,14,16,18-24,26,27,31-34,40).

Very common on sandy sediments. Came in to feed on particles disturbed by divers turning stones over.

Pleuronectes platessa: (9,10,13,14,21-23,25,32,33).

Raja naevus: (16). One on sandy plain.

Scyliorhinus canicula: (5,10,22-24,30,32,40). Single ones frequently found in the kelp forest.

Scyliorhinus stellaris: (29,30).

Spinachia spinachia: (21,24). In shallow water ( 10m).

Trisopterus minutus: (9,11,24,35,37).

Syngnathus acus: (25,31).

Taurulus bubalis: (7,10,15,23,24,32,36).

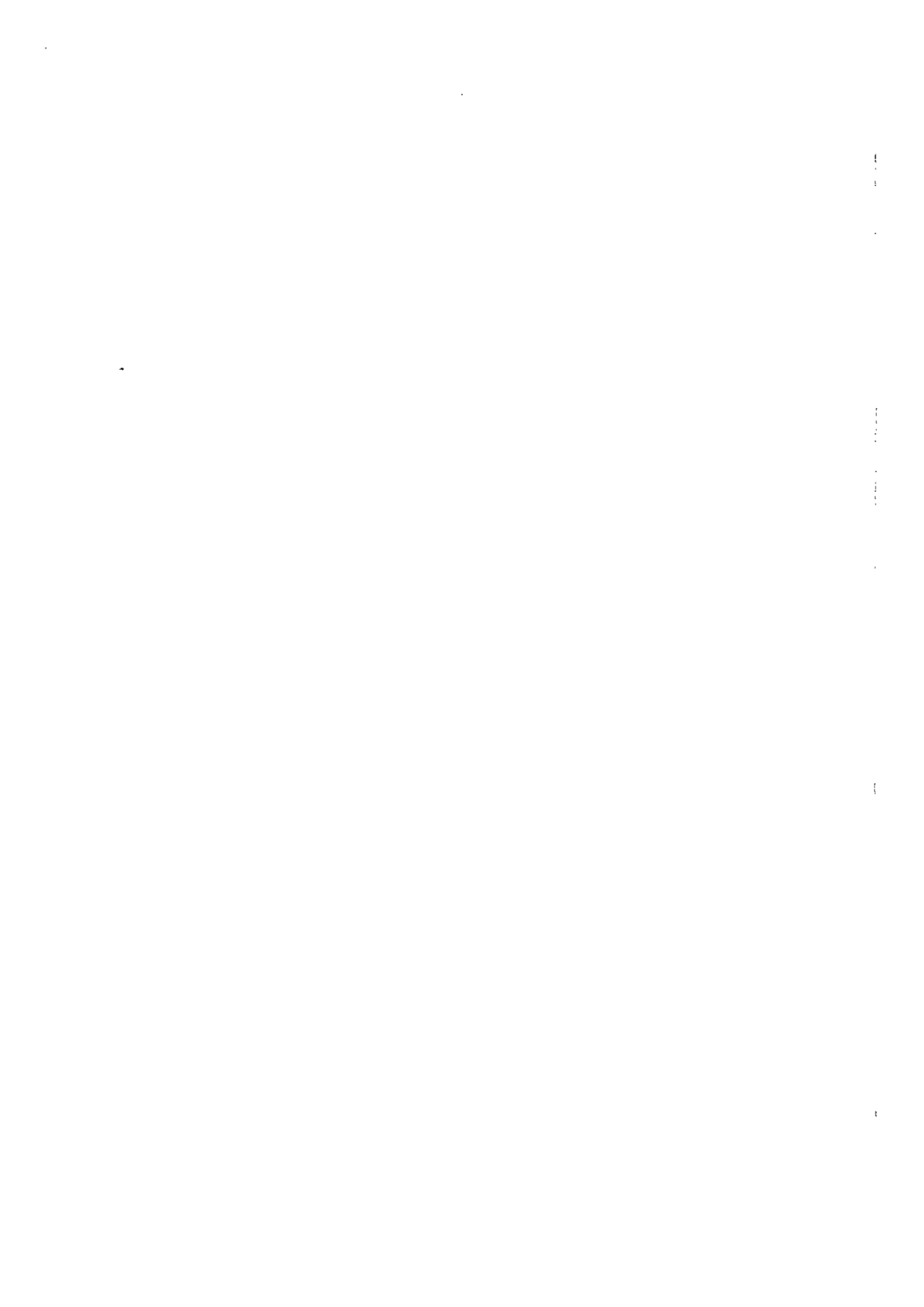
Thorogobbius ephippiatus: (24,30,34,40).

Immature gurnard: (19,36).



APPENDIX II

Recording Sheets



The Underwater Conservation Society

SUBLITTORAL HABITAT RECORDING SCHEME.

Return to: Dr Bob Earll, UCS, c/o Zoology Dept.  
University of Manchester, Oxford Rd. Manchester 1.

Recorders Name	Site Name
Address	Area/nearest town
	Country
Phone	OS Grid Ref. .... Sheet number ....
Date of observation	Lat/Long
	Duration of study

INSTRUCTIONS: Tick and score as appropriate using the following notations; 1 = <10%  
2 = 10% to 30%, 3 = 30%+

DEPTHS STUDIED corrected to Chart Datum:

0-5m	5-10m	10-15m	15-20m	20-30m	30+m
------	-------	--------	--------	--------	------

AREA OF SURVEY	COMMENTS	FEATURES - ROCK	COMMENTS
Extensive(site)		Gullies (size)	
Small(station)		Cliffs (size)	
Shore dive		Caves (size)	
Boat dive		Crevices (size)	
EXPOSURE TO WAVE ACTION		Wreck	
Very sheltered		Other	
Sheltered		Rock type (eg calcareous)	
Mod. exposed		FEATURES - SOFT SEDIMENT	
Exposed		Of one uniform type	
Very exposed		A mixture (eg sand & mud)	
EXPOSURE TO TIDAL CURRENTS		Burrows	
None		Mounds or worm casts	
Some, noticeable		Crab excavations	
Strong		Shell remains	
VISIBILITY(in metres)		'Worked' surface with obvious species	
SEA BED TYPE (score as indicated above)		Other comments	
Bedrock		Describe the site briefly. What features stand out in your mind about the site?	
Boulder (50 cm+)			
Boulder (15-50 cm)			
Cobble (5-15 cm)			
Pebble (2.5-5 cm)			
Gravel			
Coarse sand			
Medium fine sand			
Muddy sand			
Mud			
COVER - PLANT (score as indicated above)			
Kelp			
Foliaceous red			
Foliaceous green			
Foliaceous brown			
Calcareous encrusting reds			
Diatom 'planktonic origin'			
COVER - ANIMAL (score as indicated above)			
Dominant species			
Hydroid 'turf'			
Bryozoan 'turf'			
Ascidian 'turf'			
Other			
Echinus - numbers seen in 10 minutes			
COVER - INANIMATE			
Mud on rock: None			
Some			
100%			
'Bare' rock			
'Bare' sediment plain			
Shell remains			
Human debris			

Draw an aerial view - map of the site. Give distances in metres & the direction of North



Draw a cross section (transect) of the site. Give distances in metres and depth in metres corrected to Chart Datum.

Indicate on the profile:

Main study depth .....

Max. depth kelp forest .....

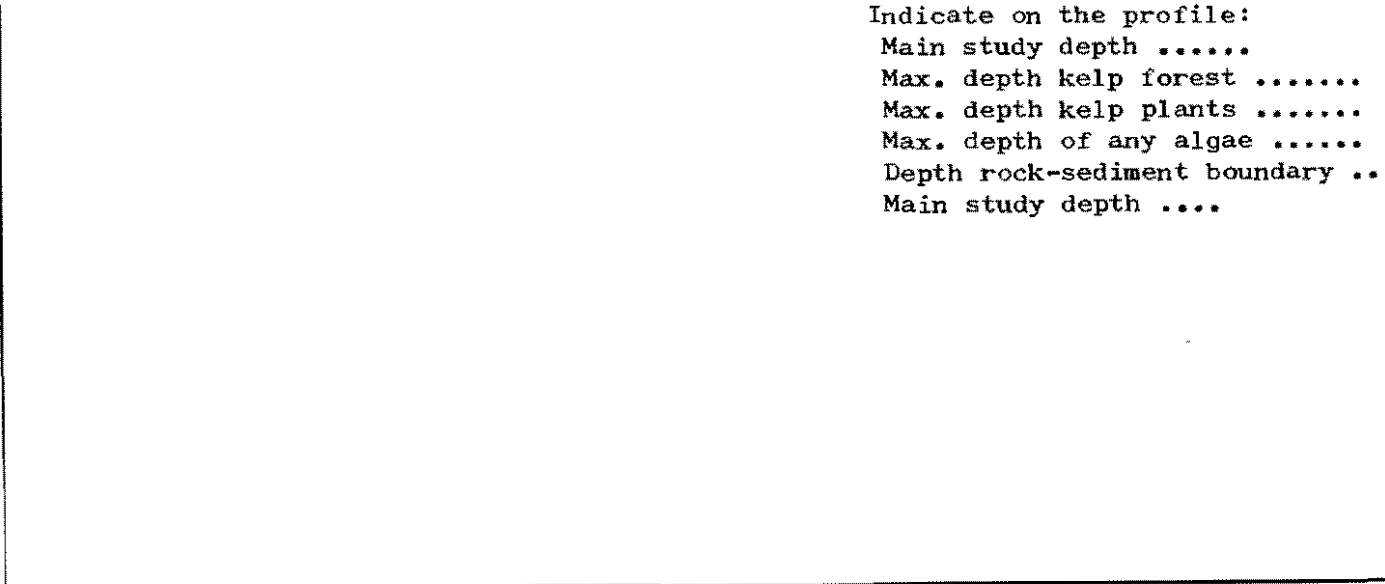
Max. depth kelp plants .....

Max. depth of any algae .....

Depth rock-sediment boundary ..

Main study depth ....

Depth (Metres)



Distance (metres)

Other comments (on species, facilities etc.)

Does anything make this site like or unlike other sites you have visited in this or other areas?

Fauna' check list:

For each site record approx. abundance of each species and notes on habitat and depth. Add additional species to appropriate groups or attach a separate note.

SITE NAME:.....DEPTH:.....m. below CD

DATE:.....RECORDERS NAME:.....

<u>Species</u>	<u>Notes</u>	<u>Species</u>	<u>Notes</u>
<u>PORIFERA</u>		<u>Sagartia elegans var venusta</u>	
<u>Axinella infundibuliformis</u>		<u>S. elegans miniata</u>	
<u>Axinella sp</u>		<u>S. elegans nivea</u>	
<u>Amphilectus fucorum</u>		<u>S. elegans rosea</u>	
<u>Cliona celata</u>		<u>Sagartia troglodytes</u>	
<u>Dysidea fragilis</u>		<u>Sagartiogeton lacerata</u>	
<u>Halichondria panicea</u>		<u>Swiftea pallida</u>	
<u>Hemimycale columella</u>		<u>Tealia felina</u>	
<u>Hymeniacidon perleve</u>		<u>T. eques</u>	
<u>Haliclona sp</u>		<u>Virgularia mirabilis</u>	
<u>Clathrina coriacea</u>			
<u>Leucosolenia botryoides</u>			
<u>Myxilla incrustans</u>			
<u>Pachymatisma johnstonia</u>		<u>ANNELIDA</u>	
<u>Polymastia mammillaris</u>		<u>Arenicola marina</u>	
<u>Polymastia boletiformis</u>		<u>Bispara volutacornis</u>	
<u>Scypha ciliatum</u>		<u>Chaetopterus variopedatus</u>	
<u>Scypha compressa</u>		<u>Eulalia viridis</u>	
<u>Suberites carnosus</u>		<u>Filograna implexa</u>	
<u>Suberites domuncula</u>		<u>Hydroides norvegicus</u>	
<u>Stelligera stuposa</u>		<u>Lanice conchilega</u>	
<u>Raspailia hispida</u>		<u>Myxicola infundibulum</u>	
		<u>Pomatoceros triqueter</u>	
		<u>Sabella pavonina</u>	
		<u>Spirorbis sp</u>	
		<u>Serpula vermicularis</u>	
		<u>Terebellidae</u>	
<u>HYDROZOA</u>			
<u>Aglaeophenia sp</u>		<u>CRUSTACEA - CIRRIPIEDIA</u>	
<u>Abietinaria abietina</u>		<u>Balanus balanus</u>	
<u>A. filiculina</u>		<u>B. crenatus</u>	
<u>Amphisbetia operculata</u>		<u>Elminius modestus</u>	
<u>Halecium halecinum</u>		<u>Verruca stroemia</u>	
<u>H. beanii</u>		<u>CRUSTACEA - DECAPODA</u>	
<u>Hydrallmania falcata</u>		<u>Cancer pagurus</u>	
<u>Hydractinia echinata</u>		<u>Carcinus maenas</u>	
<u>Kirchenpaueria pinnata</u>		<u>Caprellidae</u>	
<u>Nemertesia ramosa</u>		<u>Galathea strigosa</u>	
<u>N. antennina</u>		<u>Galathea sp</u>	
<u>Obelia geniculata</u>		<u>Goneplax rhomboides</u>	
<u>Plumularia setacea</u>		<u>Homarus vulgaris</u>	
<u>Sertularia argentea</u>		<u>Hyas araneus</u>	
<u>Sertularella polyzonias</u>		<u>H. coarctatus</u>	
<u>Tubularia indivisa</u>		<u>Inachus dorsettensis</u>	
<u>T. larynx</u>		<u>Inachus phalangium(dorynchus)</u>	
		<u>Jassidae(tubes)</u>	
<u>ANTHOZOA</u>		<u>Liocarcinus puber</u>	
<u>Alcyonium digitatum</u>		<u>L. depurator</u>	
<u>Anemonia sulcata</u>		<u>Liocarcinus sp</u>	
<u>Actinothoe sphyrodeta</u>		<u>Macropodia sp</u>	
<u>Aurelia aurita</u>		<u>Munida bamffica</u>	
<u>Cereus pedunculatus</u>		<u>Nephrops norvegicus</u>	
<u>Cerianthus lloydi</u>		<u>Palinurus elephas</u>	
<u>Caryophyllia smithi</u>			
<u>Corynactis viridis</u>			
<u>Hormathia coronata</u>		<u>MOLLUSCA</u>	
<u>Metridium senile</u>		<u>Acmaea: -p</u>	
<u>Peachia hastata</u>		<u>Anomiidae</u>	
<u>Pennatula phosphorea</u>			

<u>Species</u>	<u>Notes</u>
<u>MOLLUSCA CONT.</u>	
<u>Buccinum undatum</u>	
<u>Chlamys sp</u>	
<u>Calliostoma ziziphinum</u>	
<u>Gibbula cineraria</u>	
<u>G. umbilicalis</u>	
<u>G. magus</u>	
<u>Hiatella arctica</u>	
<u>Lacuna vineta</u>	
<u>Mutilus edulis</u>	
<u>Modiolus modiolus</u>	
<u>Mya arenaria</u>	
<u>M. truncata</u>	
<u>Musculus marmoratus</u>	
<u>Nassarius sp</u>	
<u>Patella sp</u>	
<u>Patina pellucida</u>	
<u>Pecten maximus</u>	
<u>Trivia arctica</u>	
<u>T. monacha</u>	
<u>Turritella communis</u>	

BRYOZOA

<u>Alcyonidium gelatinosum</u>	
<u>Bugula sp</u>	
<u>Cellaria sp</u>	
<u>'Crisiidae'</u>	
<u>Electra pilosa</u>	
<u>Flustra foliacea</u>	
<u>Parasmittina trispinosa</u>	
<u>Porocella compressa</u>	
<u>Membranipora membranacea</u>	
<u>Scrupocellaria reptans</u>	
<u>S. scruposa</u>	
<u>Securiflustra securifrons</u>	
<u>Encrusting bryozoa</u>	

<u>Species</u>	<u>Notes</u>
<u>ECHINODERMATA CONT.</u>	
<u>Solaster endeca</u>	
<u>Psammechinus miliaris</u>	
<u>ASCIDIACEA</u>	
<u>Asciidiella aspersa</u>	
<u>A. scabra</u>	
<u>Ascidia mentula</u>	
<u>A. virginea</u>	
<u>Botryllus schlosseri</u>	
<u>Botrylloides leachi</u>	
<u>Ciona intestinalis</u>	
<u>Clavelina lepadiformis</u>	
<u>Dendrodoa grossularia</u>	
<u>Diazona violacea</u>	
<u>Diplosoma listerianum</u>	
<u>Didemnidae</u>	
<u>Molgula manhattensis</u>	
<u>Polyclinum aurantium</u>	
<u>'Polyclinidae'</u>	
<u>Polycarpa pomaria</u>	

PISCES

ECHINODERMATA

<u>Asterina gibbosa</u>	
<u>Asterias rubens</u>	
<u>Antedon bifida</u>	
<u>Astropecten irregularis</u>	
<u>Crossaster papposus</u>	
<u>Cucumaria saxicola</u>	
<u>Cucumaria sp</u>	
<u>Echinus esculentus</u>	
<u>Echinocardium cordatum</u>	
<u>Henricia sp</u>	
<u>Holothuria forskali</u>	
<u>Luidia ciliaris</u>	
<u>Marthasterias glacialis</u>	
<u>Neopentadactyla mixta</u>	
<u>Ophiothrix fragilis</u>	
<u>Ophiocomina nigra</u>	
<u>Ophiura albida</u>	
<u>Ophiura sp</u>	
<u>Ophiopholis sp</u>	
<u>Porania pulvillus</u>	
<u>Parastichopus tremulus</u>	

ADDITIONAL SPECIES AND NOTES



