

Intertidal and sublittoral survey of islands within the Staffa Island group, Inner Hebrides.

September 16 - 20, 2016



A Porcupine Marine Natural History Society field trip

Compiled and edited by Dr Frances Dipper (with contributions from other team members);
set and designed by Fiona Crouch.

This report is dedicated to Michael Blakenham, our generous host who died in January of this year (2018). His kindness hospitality and enthusiasm for the conservation of the seas around his beloved Little Colonsay, led to PMNHS being invited to survey the enchanting Staffa archipelago.



SURVEY TEAM

Intertidal shore scramblers

Rayner Piper (RP) (convenor) (fish)

Juliet Brodie (JB), Natural History Museum (algae)

Jo Wilbraham (JW), Natural History Museum (algae)

Frances Dipper (FD)(fish)

Rosemary Hill (RH) (molluscs)

Phillip Cowie (PC), Field Studies Council (fauna)

Lisa Kamphausen (LH), Scottish Natural Heritage (biotopes)

Mia Scott (MS) (photography)

Diving dudes

Emily Priestley (EP) (dive team leader)

Ali Bessell (AB)(FUGRO)

George Brown (GB) Boat skipper

Fiona Crouch (FC) (Marine Biological Association)

Becky Hitchin (BH) (JNCC)

Nick Owen (NJO) (Marine Consultant)

Trudy Russell (TR) (Natural England)

Franki Perry (FP)



(Note: All participants took part in this survey on a voluntary basis as members of PMNHS and were not necessarily representing the organisations listed above)

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INTRODUCTION

The Porcupine Marine Natural History Society runs an annual field trip to various far-flung parts of the British Isles as part of its aim to “promote a wider understanding of the biology, ecology and distribution of marine organisms”. The field trips take various forms but are self-funding and generally concentrate on species and habitat recording in the intertidal of under-recorded areas. Sublittoral sampling employing remote techniques (usually scientific dredges and trawls) is also frequently undertaken. Where appropriate, local shore diving is sometimes possible using Seasearch recording techniques (see below). However major diving surveys are not usually part of the remit - the 2016 field trip was an exception to this rule.

The field trip to the Staffa Archipelago was at the invitation of the owners of Inch Kenneth, Little Colonsay, Ulva and Gometra, who are keen to know just what important marine habitats there are in the surrounding waters and the status of the marine life there.

Field trip reports and species lists are usually published in the Society’s Bulletin but for this more extensive and intensive Staffa Archipelago field trip, a more detailed report was deemed appropriate. However a general report on the diving (Hitchin and Crouch 2017) and the shore recording (Dipper 2017) was published in the spring 2017 Bulletin.

Aims of the Survey

The main aim of the survey was to collect and collate baseline information on the marine habitats, communities and species present around these small islands, as there have been few, if any, previous detailed surveys. All data collected on PMNHS field trips is added to Marine Recorder either directly by the Hon. Records Convenor (shore records) or via Seasearch for sublittoral data. Apart from just wanting to know and appreciate what is on your doorstep, such information

is vital to allow potential impacts and developments to be properly assessed. In this area (and the west coast of Scotland in general) the expanding fish farm industry is of particular concern. However, with only four days survey time, this could only ever be an initial look-and-see, but hopefully Porcupine will return for a future field trip. Information from the survey will also help inform conservation agencies including the MCS, JNCC and SNH and will broaden the data available on priority marine habitats and features in Scotland’s shallow seas.

Previous marine studies

There appear to have been no specific marine surveys undertaken around these islands. In the 1980s a series of early sublittoral surveys within the Inner Hebrides, were undertaken by the then Nature Conservancy Council’s Chief Scientist’s Team (CST) in collaboration with the Underwater Conservation Society (now the Marine Conservation Society). These are listed at the end of this report and covered the Small Isles (Rhum, Eigg, Muck and Canna); Skye; Coll and Tiree.

Seasearch, a ‘citizen science’ marine recording project for volunteer divers, (www.seasearch.org.uk) has undertaken a number of surveys within the Inner Hebrides, particularly around Coll (Scott 2003), Rhum (summary report only) and various seafan surveys in the Firth of Lorn. Other records can be found via the NBN Atlas Scotland (<https://scotland.nbnatlas.org>).

METHODS

General shore surveys

As only a single low tide occurred in (reasonable) daylight hours, one island was visited by the shore team each day. Depending on the terrain one to several sites on each island could then be reached. At each site, individuals or pairs recorded species and habitats

Table 1. Locations of shore survey sites

Site No.	Site Name	Grid Ref	Date	Surveyors
LU1	Lunga NW	279425	17.09.16	JB, JW, FD, RH, PC, LK
LU2	Lunga NE (Corran Lunga)	281426	17.09.16	JB, JW, FD, RH, PC, LK
LC1	Little Colonsay NE	377374	18.09.16	JB, JW, FD
LC2	Little Colonsay SE	379365	18.09.16	JB, JW
LC3	Little Colonsay SW ‘swimming pool’	375365	18.09.16	RP, PC
IC1	Inch Kenneth ‘house bay’	441356	18.09.16	LK, RH
IC2	Inch Kenneth ‘Cowrie bay’	434350	18.09.16	RH
UL1	Ulva islets nr Traigh Bhan	390386	19.09.16	JB, JW, FD, RH, PC, LK, RP
UL2	Ulva islets nr Traigh Bhan	389385	19.09.16	JB, JW, FD, RH, PC, LK, RP
UF1	Ulva Ferry	444397	20.09.16	JB, JW, FD, RH, PC, LK, RP
UF2	Ulva Ferry	444394	20.09.16	JB, JW, FD, RH, PC, LK, RP

according to their expertise. Specialist seaweed and micro-mollusc (see below) collections were made. A total of 11 sites were surveyed.

Micro-mollusc surveys (Rosemary Hill)

The UK marine mollusc fauna has a considerable number of micro-mollusc species which the non-specialist is largely unaware of because they are difficult to find. The diversity of these is greatest at low tide and in permanently submerged habitats. While some species may be found by diligent manual searching of seaweed or the underside of boulders at low tide, the time available in these places (and for those diving), is limited and the taking of samples is an important part of obtaining a full list of species.

Red weed samples. The usual practice is to collect a litre of mixed live, attached red weed, including a full range of species over a broad area at the lowest tide. Certain species are reputed to be more productive than others, but taking a wide range is the safer option. Particular care should be taken not to take all specimens of a species at a given point and to refrain from collecting weeds that are unfamiliar or where there is only one specimen. Weed encrusted with sponges or bryozoans or with an intricate structure is often the most useful for yielding molluscs. Large easily identified molluscs and other unwanted organisms can be returned to the habitat the time of collecting if they are visible. On returning to base it is worth soaking the sample in sea water to look for nudibranchs if time permits. The next step is to soak the weed, pulled apart if necessary, in fresh water so that the micro-molluscs close up and drop off the weed. The ideal is to do this overnight but three hours is often sufficient. At the end of the soaking period the weed is shaken out and discarded and the sample for study is left at the bottom of the bucket. This will consist of sand, weed fragments, dead organisms, molluscs etc. On a shore with a high population of molluscs or with a lot of debris, it is useful to wash the material through 4mm, 2mm and 0.5mm sieves in a stack. The fractions can then be examined under a binocular microscope. Where the samples are sparse, as proved to be the case on the volcanic rock types present in the Staffa archipelago, it can be preferable not to pass the fraction through the sieves, but to pick through the entire sample under a microscope so that molluscs do not get missed by being stuck on debris on the sieves.

Rock scrubblings. The procedure here is to turn boulders and use a wetted old toothbrush to scrub portions of the epifauna present on the boulder into a container. With larger boulders it is easiest to balance the boulder on a bucket and scrub into that. The surface should be inspected first and care should be taken not to scrub every part of the underside of the boulder, but to avoid larger organisms and only scrub part of an encrusting

or colonial species. The resulting material can then be placed in a container for subsequent searching under a microscope.

Grit or sand samples. These are selected from the lower shore where there is evidence that shelly material is accumulating, or collected by divers. Results from such samples can be very variable as the distribution of live animals is usually clustered and the sampler cannot see them. The samples are sieved in small quantities as above and the fractions examined. Grit or sandy areas of the lower foreshore can also be dug through to seek live specimens of bivalves in situ.

Combinations of these techniques were used depending on the characteristics of the sites studied.

General logistics and diving data collection methods (Emily Priestley)

For the 15 volunteer scientists and enthusiasts that made up the dive and shore parties, the Staffa expedition proved to be the most challenging location so far for a Porcupine field trip. For starters, the area of operations comprised over 80 square miles of sea off the storm swept west coast of Mull. Without a local dive boat, field centre or any nearby shops, for that matter, we relied on our own resources and especially on our island hosts. Getting to the bases on (privately owned) Inch Kenneth and Little Colonsay meant a ferry ride from Oban to Craignure on Mull, a drive south to the Ulva ferry slip and finally a bumpy inflatable boat ride to the two islands, some five to nine kilometres to the south and west respectively. Such transport would have been easy for a backpacker, but given the nature of the mission, a bewildering assortment of kit had to be hoisted into the two RIBs: microscopes, fuel, dive kit, herbarium paper, reference books, more fuel, chemicals, sample jars, a small air compressor to fill the dive cylinders... and even more fuel.

The divers were based on Inch Kenneth and the shore party (in the main) on Little Colonsay. Gear was carried on foot and by tractor. The divers set up shop with a shed for the 'wet operations' and the magnificent front room of Inch Kenneth house was turned into a 'lab' with ranks of microscopes, petri dishes, charts and books. It was one of the biggest spring tides of the year which favoured access to intertidal habitats for shore parties but did mean a long trudge for anyone landing at low water. The shore party wrote up their notes in the comfort of the front room in the Little Colonsay house but with no power in the evenings, data entry and analysis onto computers had to wait mostly until after the trip.

Communication was limited to VHF radio and the occasional phone call (for those who had Vodaphone). Little Colonsay was a completely 'off-grid' house (yes,

Table 2. Locations of dive sites

Dive No.	Site Name	Lat/Long	Date	Surveyors	Seasearch form
1	Treshnish Lunga East/West	N 56° 29.289; W 6° 25.146	17.09.16	EP, NJO, FC, TR	NJO, TR
2	Treshnish Fladda	N 56° 30.964; W 6° 22.973	17.09.16	FP, GB, FC, TR	FP, FC
3	Treshnish shore	N 56° 29.865; W 6° 25.135	17.09.16	AB, BH	BH
4	MacQuarrie's Rock	N 56° 27.786 W 6° 08.432	17.09.16	EP, GB, FP	See 7
5	Inch Kenneth shore dive	N 56° 26.437 W 6° 09.266	17.09.16	AB, BH	BH
6	Inch Kenneth shore dive	N 56° 26.471 W 6° 09.237	18.09.16	BH, FC	
7	MacQuarrie's Rock 2	N 56° 27.786 W 6° 08.432	18.09.16	AB, FP, NJO, TR, EP	NJO (for all)
8	Outer Gometra reef	N 56° 28.309 W 6° 17.822	19.09.16	EP, NJO	NJO
9	Inner Gometra reef	N 56° 28.364; W 6° 16.567	19.09.16	FC, FP, GB, AB	FP
10	Ulva islets dropoff, W of Eilean na Creche	N 56° 27.670; W 6° 14.652	19.09.16	BH, TR	BH
11	Ulva inlets maerl dropoff	N 56° 27.459; W 6° 13.682	19.09.16	GB, TR	TR
12	Ulva inlets shallow maerl beds	N 56° 27.569; W 6° 13.775	19.09.16	BH, NJO	BH
13	Staffa NE side	N 56° 26.258; W 6° 19.796	19.09.16	FC, AB, NJO, EP	NJO
14	Inch Kenneth SW 'Humpies A'	N 56° 26.201; W 6° 10.029	19.09.16	NJO, EP	NJO
15	Inch Kenneth SW 'Humps B'	N 56° 26.276; W 6° 10.066	19.09.16	GB, TR, FP	Species form only
16	Inch Kenneth snorkel	N/A	18.09.16	EP	
17	Inch Kenneth snorkel	N/A	20.09.16	EP (Claire, Jim)	

candle light); Inch Kenneth, on the other hand, knitted its own electricity using a mixture of sun, wind and diesel. Rayner Piper co-ordinated the shore party and Emily Priestley the divers, with the experienced hand of George Brown at the helm of his Rigid Inflatable Boat (RIB). To add to that sense of the unknown, George tied his RIB to a drying mooring overnight; fortunately his bedroom overlooked the sound and when the southerly wind blew, he was able to creep out in the wee hours as the tide dropped to cradle it carefully onto sand between the many rocks. Timing of dives was all important with strong tidal currents and exposed sites to reconnoitre.

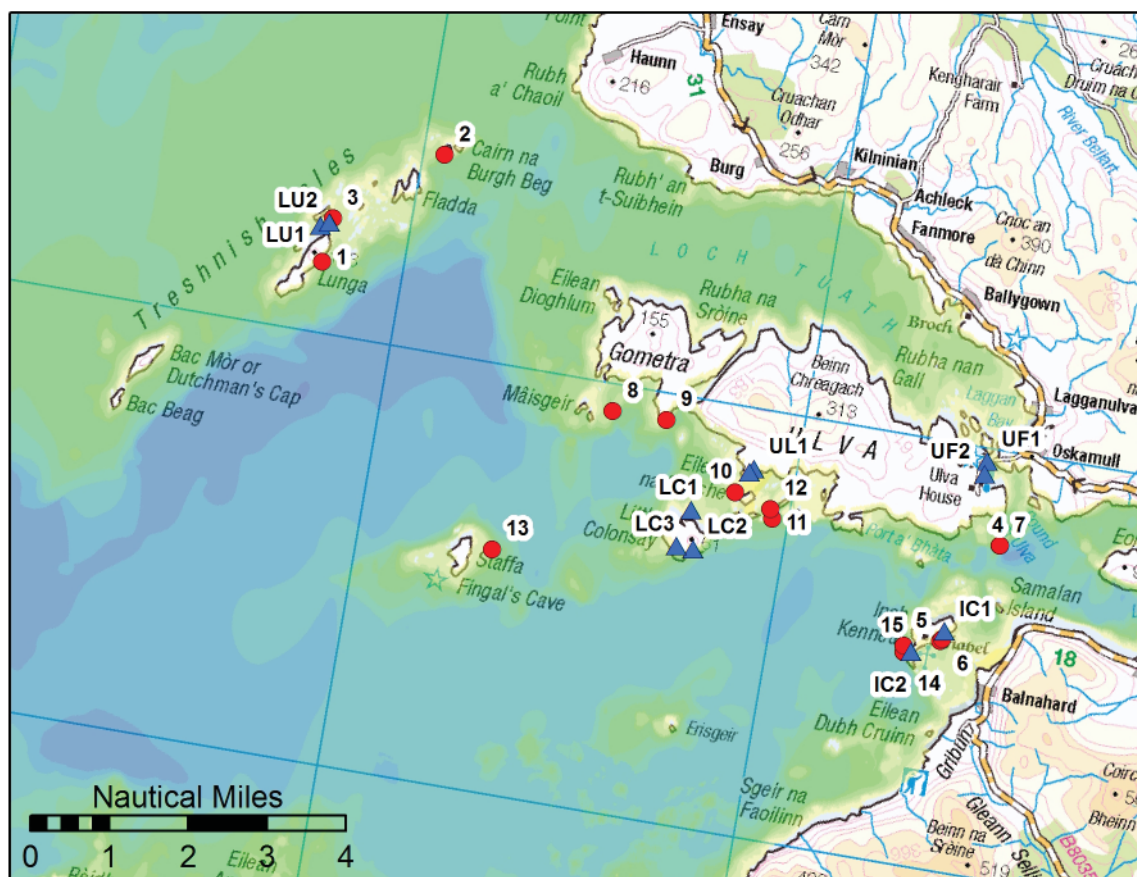
Diving survey plans sought to link with the shore party to capture underwater areas close to shore collecting areas, to allow for continuity of habitat survey work. It also meant that the experience of local host boatman (Ronnie) enabled us to navigate through shallow rocky areas, some rocks being uncharted. He also provided transport for shore parties, cover for shore divers and a safety back up to the diving boat.

A variety of habitats were chosen for diving, according to the conditions and to fit in with shore party survey

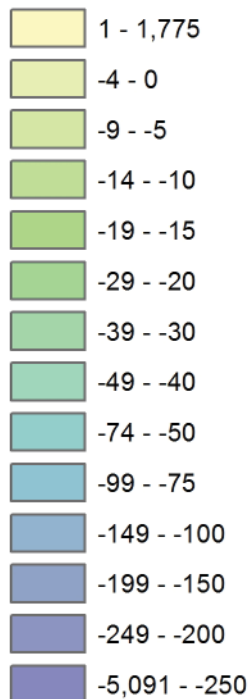
locations (see map p.4). Chosen habitats included:

- Exposed rocky reef with kelp forest (Staffa, Lunga and Gometra);
- Shallow sand and shingle with sea grass and maerl beds (Lunga, Little Colonsay, Inch Kenneth south);
- Tide swept channels (Fladda, Little Colonsay, Inch Kenneth south)
- Deep vertical and overhanging reef (providing more shelter) (MacQuarrie's reef near Ulva);
- Boulders, cobbles and pebbles (Inch Kenneth west, Gometra).

Favourable weather allowed a start out west on the Treshnish Islands, a SSSI and SPA designated bird reserve, where the shore party was landed. The plan was to capture snapshots of data from four dive sites, including an area of sea grass and maerl, looking to add data collected previously by Scottish Natural Heritage (SNH).

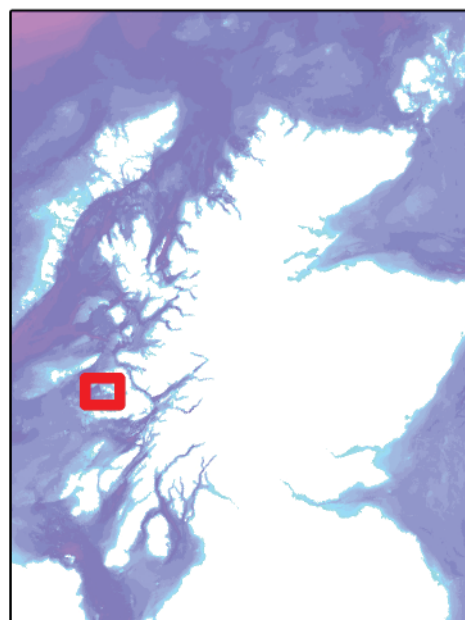


Bathymetry



▲ Shore survey positions

● Dive positions



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With only three full days for diving, one of the main challenges was time. Typically 8 - 10 hours a day were spent on the water whilst evenings ashore were filled with washing dive kit, filling cylinders, downloading photos, saving samples into chemicals and beginning data analysis. Thankfully, no cooking was needed as the island owners laid on a splendid meal every night, packed sandwiches for lunch and tempted everyone out of bed in the mornings with porridge and the aroma of bacon.

A lot was learned about tackling a relatively unknown and remote area in a short time and without incident. Although some exposed western coasts were inaccessible due to weather constraints, a wide variety of habitats (both intertidal and sublittoral) were sampled and baseline data established for future surveys to reference.

Seasearch diving. Sublittoral species and habitat records were collected on each dive site using a standardised survey tool, the Seasearch Surveyor Form. Forms were filled in after the dives and after the trip from notes made by the divers on waterproof dive slates. Fifteen Seasearch forms were completed covering most sites. Over 400 high resolution underwater photographs were stored into site folders within a shared Dropbox alongside the Seasearch forms. Experts and ecology professionals within the teams also analysed preserved samples to add to the records. Data from the Seasearch forms was validated by Seasearch and added to Marine Recorder and as such is accessible to all interested parties including MCS, JNCC and SNH.

RESULTS

General Intertidal Shore Surveys

Treshnish Isles (17.09.16)

Two areas were explored at the northern tip of Lunga where there is a small peninsula that is almost cut off into an island at high tide.

LU1 Lunga NW

An irregular, wave-exposed platform of bedrock slopes gradually down to the low water mark with a final short, steep drop into the sea. The platform is broken up by very steep-sided gullies through which the tide surges in and out. There are numerous crevices, steps and rock pools. An upper zone of lichens and black lichens was followed by a *Pelvetia* zone (ca. 9m width), grading into *Fucus spiralis* (ca. 30m width) and on the lower shore by *Fucus serratus* (ca. 17m width) ending with *Laminaria digitata* and *Himanthalia* in the lower gullies.

Extensive, very shallow rock pools lined with pink paint weeds (Corallinaceae) made an attractive display. These were dotted with limpets carrying bright green tufts of gut weed (*Ulva* spp.) and studded with red beadlet anemones (*Actinia equina*). Small juvenile shannies (*Lipohrys pholis*) were common. Deep rock pools on the lower shore were filled with *F. serratus*, *F. vesiculosus* and some kelp – too deep to record fish accurately.

Rocky gullies bisecting the bedrock platform and the large gulley south of the rock peninsular, were filled with fucoid-covered boulders with steep and vertical sides dominated by barnacles and limpets and were obviously exposed to wave surge. Littorinid snails, dog whelks (*Nucella lapillus*) and beadlet anemones were all abundant.

Seaweed survey shore description (JB & JW): Fairly exposed bedrock and large boulder shore indented with a few large channels. Fucoid cover patchy between barnacle covered rock. Well-developed kelp cover at the bottom of the lower shore.

LU2 Lunga NE (Corran Lunga)

The moderately exposed extensive eastern shore was made up almost entirely of small boulders (ca. 30-60cm diameter) and cobbles, with a moderate slope down to low water and beyond this a sandy seabed with seagrass. Maerl and shell gravel filled the spaces between the boulders and provided an under-boulder habitat for crustaceans and worms, with amphipods and juvenile edible crab (*Cancer pagurus*) especially common. The boulders in the middle shore were covered in a (slippery!) mass of *Fucus serratus*, with kelp (*L. digitata*) dominating the sublittoral fringe. Their sides and undersides supported extensive encrusting sponges and bryozoans. Upper shore boulders were covered by barnacles. An extensive area of littoral and sublittoral boulders extends north to join with rocky outcrops and small islets and was dominated by a thick cover of kelp (*L. digitata*).

Seaweed survey shore description (JB & JW): Boulder shore with shelly (maerl fragments) sand. Very little seaweed cover on the upper shore boulders. Fucoids and kelps on the lower shore and extensive kelp beds in shallow channel at north end.

Little Colonsay (18.09.16)

Three sites on the eastern and southern coasts were visited but without boats, (weather too windy) access to the exposed west and north coasts was too difficult within the low tide time frame.



Lunga NW (LU1): Top left - Gulley and rocky platform (FD); top right - lower shore (JB); bottom left - mid-shore rock pool (FD); bottom right - Gem Anemone in mid-shore rock pool (FD)



Lunga NE (LU2): Top left - Boulder shore (JB); top right - Foliose seaweed and maerl gravel (JB); bottom left - North end extensive boulders and kelp forest (JB); bottom right - underboulder fauna (FD).

LC1 Little Colonsay NE

This site on the sheltered side of the island, faces the southern side of Gometra and Ulva. The shore was composed mainly of gently sloping, fissured and dissected bedrock. Shallow gullies running down the shore were filled with small rocks, sand and dead seaweed, but were not obvious due to a thick cover of furoid seaweeds. Small boulders and rocks were also scattered around on the bedrock and on small areas of shell sand. There were very extensive but shallow rock pools on the mid to upper shore and smaller but deeper pools on the lower shore. A *Pelvetia* zone on the upper shore was followed by a barnacle and limpet zone with the middle and lower shore predominantly swamped with knotted wrack (*Ascophyllum nodosum*). Towards the low water mark, *F. serratus* formed a zone, followed by an extensive kelp forest of *L. digitata* in the sublittoral fringe.

Beneath the thick seaweed blanket, there was a relatively rich fauna especially within the damp rock gullies, under rocks and in crevices. Turning over such rocks revealed an abundance of porcelain crabs (*Porcellana platycheles*) and Risso's crab (*Xantho pilipes*) and a smaller number of juvenile edible crabs and shore crabs (*Carcinus maenas*) plus green sea urchins (*Psammechinus miliaris*), cushion stars (*Asterina gibbosa*) and



Xantho pilipes (FD)

butterfish (*Pholis gunnellus*). Undersides of rocks and boulders plus vertical and overhanging sides of bedrock ridges, had a good cover of encrusting sponges, juvenile tube worms (*Spirorbis*), encrusting sea squirts and small hydroids.

The upper and middle shore shallow rock pools were lined with thick pink paint weeds (Corallinaceae) which even covered the shells of limpets. The bottom was decorated with tufts of coral weed (*Corallina*) which provided some shelter for juvenile fish mainly sea scorpions (*Taurulus bubalis*), butterfish and adult shannies (*Blennius pholis*). The surrounding higher bedrock around many of the pools was dominated by



Little Colonsay NE: Mid-shore rock pool with non-native *Sargassum muticum*; upper and mid-shore extensive rock pool; lower shore *L. digitata* kelp forest exposed. (FD)

small barnacles with abundant dogwhelks (*Nucella lapillus*) and some limpets.

Seaweed survey shore description (JB & JW): Bedrock. Sheltered shore with small pools. Good furoid/*Ascophyllum* cover.

LC2 Little Colonsay SE

Bedrock and boulders interspersed with extensive, shallow pools, some with bedrock bottoms, others with shelly sand. Dense cover of furoid seaweeds especially *A. nodosum*. Only seaweed records were made from this shore.

LC3 Little Colonsay SW "the indoor swimming pool" (Rayner Piper)

The shoreline here is backed by towering cliffs of grand basaltic columns. Moving eastwards from the access point, the rocky shore widened and the cliff became progressively more undercut eventually providing a room-like shelter from the wind and sea-spray. Within the cavern were boulder filled pools, coloured pink with coralline algae, the limpets within them flying flags of green *Ulva intestinalis* from their summits. Beyond the pink pools, at the eastern end of the cavern, was a larger deeper pool of clear green water – "the indoor swimming pool". The upper metre of the pool was pink with coralline algae and around the edges of the pool were a few stunted kelps, mainly Dabberlocks (*Alaria esculenta*), which typically grows in wave-exposed conditions. Deeper down, the pool was mostly bare, most likely as a result of wave scour. Only a few large colourful Dahlia Anemones (*Urticina felina*) could be seen, alongside occasional limpets and barnacles and red foliose algae.

Outside the cavern the exposed upper shore was characterised by *Fucus spiralis* which extended in scrubby patches to mid shore. Corallinaceae crusts formed extensive cover in many pools, with *Corallina officinalis* present in most. The fauna was dominated by barnacles (*Semibalanus balanoides*), which extended down from the lower cliffs onto the upper shore, limpets (*Patella vulgata*), and dogwhelks (*Nucella lapillus*) in large numbers and humbug colours.



Little Colonsay SE (LC2): Above - Lower shore *A. nodosum* cover (JB), top right - Shore view from above (JB), bottom right - *Dilsea carnosa* (Red rags) in rockpool (JB)



Little Colonsay "indoor swimming pool" (LC3): Above - the 'swimming pool'; top right - pink pool in the upper cavern; bottom left - colourful *Sagartia elegans* in midshore rockpool; bottom right - unusual pink colour morph of *S. elegans*. (PC).

Extensive beds of juvenile mussels (*Mytilus edulis*) extended from the midshore down to the sublittoral, and the pools were bejewelled with anemones (*Sagartia elegans*) in colours from white, to orange and beetroot red. In a single tiny pool less than 30 cm diameter, nearly 40 years previously, the island owner's children had discovered some vivid pink specimens and the species has remained here ever since. Springtails or Collembola (*Anurida maritima*) were found on the surfaces of some small rockpools.

On the lower shore, the fauna and flora was more diverse. Breeding aggregations of the Green-leaf worm, possibly *Eulalia viridis*, were present in shallow pools. Blue-rayed Limpets (*Patella pellucida*) were found gripping to holdfasts of *Laminaria digitata*, and shannies (*Lipophrys pholis*) and prawns (*Palaemon serratus*) were visible in the deeper, lower shore pools. *Fucus serratus* sheltered *Spirorbis spirorbis* and the Snakelocks anemone (*Anemonia viridis*). In still deeper pools were the red alga *Dilsea carnosa*, brown *Halidrys siliquosa* and *Alaria esculenta* and green *Codium fragile*. Hermit crabs (*Pagurus bernhardus*) and Beadlet Anemones (*Actina equina*) were both present and it is highly likely that the species diversity at this site is far higher than the species recorded. The sublittoral fringe rockpools were especially difficult to sample due to the crashing waves and spray.

Inch Kenneth (18.09.16)

IC1 Inch Kenneth" House Bay"

This site, along the stretch near to Inch Kenneth house, was looked at by three of those based on Inch Kenneth, from the landward edge looking straight out across to Mull. The weather was too bad for boats and diving.

Bedrock reef and crevices: The area was dominated by a bedrock reef protruding roughly 2m upwards from the base. This reef had a single deep crevice running parallel with the shore. At points the crevice was up to 1.5m deep. The lip of the crevice was overhung with strands of *Ascophyllum nodosum* and *Fucus serratus*. The resulting habitat remained dark and damp at low tide. It is likely that the nature of the crevice meant that temperatures could remain more stable. In addition to this main crevice there were numerous smaller crevices and fissures running through the bedrock. At the base of the crevice there were occasional and small rockpools present. At the base of the bedrock reef wall the sediment was comprised of dead maerl gravel with occasional live maerl. Subtidal surveys carried out in the preceding days to this intertidal survey, reported healthy live maerl beds in the channel between the 'house bay' and Mull. The day prior to the survey there had been strong winds. It

is possible that these winds created waves strong enough to move some live maerl onto the intertidal. There was a series of bedrock reefs running SSE out of the bay. Not all of these reefs were surveyed, however there were no visible differences in the habitats from the location of our survey.

General habitat and dominant species: a rough survey down the shore recorded the following (approximate distances down the shore from the land):

Grass edge to 10m: boulders and shell gravel, black and yellow lichens;

10-15m: *Pelvetia* on boulders and bedrock;

15-22m: *F. serratus* and *F. vesiculosus* about 50:50, on cobbles and boulders;

22-32m: *F. serratus*, *A. nodosum*, *F. spiralis*, *F. vesiculosus* in about even proportions on cobbles;

32-98m: *Ascophyllum* (90%) and *F. vesiculosus* (10%) on slightly raised bedrock hump (about 1m high);

98-116m: *Ascophyllum* and *F. vesiculosus* (about 50:50) on pebbles and sand;

116-141m: almost bare pebbles with some *F. serratus*;

141-241m: *Ascophyllum* and *F. vesiculosus* (about 50:50) on bedrock;

241-244: Channel with maerl gravel;

244-274m: *Ascophyllum* and *F. vesiculosus* (about 50:50) on bedrock.

Ulva

Two sites were visited on Ulva; Ulva islets on the south coast and the shore by the Ulva ferry on the east coast, surveyed as we were leaving to catch the ferry back to Mull. The weather was perfect for the Ulva islets and the tide one of the lowest of the year allowing the shore team access far out into the bay.

UL1 and UL2 Ulva islets near Tràigh Bhàn ("maerl beach" (19/09/16)

A sandy bay backed by low grass-covered land (excellent picnic spot!). The bay was flanked by low, rocky headlands either side and there was a small islet just offshore. The tide flows between the shore and around the islet and the bay (see photographs). The wider area on this southern side of Ulva is dotted with small islands and islets providing relative shelter to the



Inch Kenneth 'House Bay' (IC1): Top left - View towards Gribun on Mull (EP); top right - Bedrock reef (FP); middle left - Chorda filum (EP); middle right - Intertidal maerl, bottom left - Crevice fauna Pachymatisma johnstonia (Elephant's ear sponge (AMB); bottom right - Crevice fauna (AMB)



Ulva islets (UL1 & UL2): Top left - Maerl bed at low tide (FD); top right - Shore from the bottom at low spring tide (FD); bottom left - Zostera bed at low tide (FD); bottom right - Seagrass and maerl in shallow channel (FD).

shoreline. Records were made from several different areas, following the tide down.

The rocky basalt headlands showed a typical sheltered shore fucoid zonation from *Pelvetia* and black lichens on the upper shore, through *F. spiralis* followed by mid and lower shore *F. vesiculosus* and especially *A. nodosum*. The usual variety of gastropod molluscs, barnacles, limpets etc. were present as would be expected from a short (about 8-10m extent) and fairly sheltered shore. As the tide retreated, extensive ridges of maerl gravel and seagrass beds mixed in with sand patches was revealed. Much of the maerl was dead but still supported a rich benthic fauna and infauna. Just on and below the low tide level (welly boot and over depth), scallops (*Pecten maximus*) were (still) common within the maerl gravel along with many painted gobies (*Pomatoschistus pictus*), burrowing starfish (*Astropecten irregularis*) and a variety of decapod crabs including *Liocarcinus corrugatus* and *L. depurator*. Native oyster (*Ostrea edulis*) were present in small numbers as well as other bivalves such as large gapers (*Mya truncata*) and rayed artemis (*Dosinia exoleta*). The swathes of seagrass (*Zostera marina*) were healthy and provided a platform for snakelocks anemone (*Anemonis viridis*), hydroids and epiphytic algae. An interesting find was a lesser spotted catshark/“dogfish” (*Scyliorhinus canicula*) amongst the seagrass, trapped in the shallow water between sandy ridges.

Wading with a net just below the rocky headlands before the tide went further out, revealed many common shrimp (*Crangon crangon*), prawns, mysids, amphipods, juvenile flatfish, fifteen-spined sticklebacks and a variety of gobies. The maerl beyond wading depth was mainly live, as seen by Philip who snorkelled along the width of the bay.

Seaweed survey shore description (JB & JW): Extensive flats of shelly sand and dead maerl with well-developed areas of eel grass beds. Occasional bedrock and boulder regions.

UF1 and UF 2 Ulva ferry (20.09.16)



UF1 & UF2 shore looking SE to Ulva Sound (FD)

This site was to the south of the ferry slip on Ulva and was a very sheltered rocky shore flanking the channel between Ulva and Mull (Sound of Ulva). It was a mixture of low, flat but dissected bedrock, boulders and stony areas, dominated by knotted wrack (*A. nodosum*). It was not a rich shore with the exception of the lowest areas, lying just at and beyond the low tide level, where a jumble of boulders sloped away fairly steeply into the sublittoral. The base of these boulders supported a variety and quantity of sea squirts including bright red *Ascidiella scabra* and much duller *A. aspersa*. The non-native sea squirt *Corella eumyota* was common in this lowest region. Sponges were common including various crusts, massive orange and yellow sponges, as well as the ball-shaped sponges *Tethya* and *Suberites*. Other prominent species included the white crevice sea cucumber (*Pawsonia saxicola*), the Devonshire cup coral (*Caryophyllia smithii*), cowries (*Trivia arctica*) and oysters (*Ostrea edulis*). It would be interesting to dive this area as the glimpses of animals seen in the fringing boulders suggest a rich and varied sublittoral fauna. This might be expected since currents run fast through the sound.

Seaweed survey shore description (JB & JW): Very sheltered shore with bedrock and boulders, and saltmarsh vegetation at the sheltered end.



UF1 & UF2 Ulva ferry Porcupiners in action (BH)



UF1 & UF2 Ulva ferry shore looking NW towards jetty & Boat-house Cafe (JB)



Ulva ferry (UF1 & UF2): Top left - lower shore boulders (FD); top right - *Fucus vesiculosus* and *Ascophyllum nodosum* (JB); bottom left - Crevice sea cucumber (*Pawsonia saxicola*) (EP); bottom middle - Sea squirts (*Ascidia mentula*) attached to lower shore boulders (EP); bottom right - *Pholis gunnellus* (butterfish) (EP).

Intertidal Seaweed Survey (Juliet Brodie & Jo Wilbraham)

Six sites were surveyed for red (Rhodophyta), green (Chlorophyta) and brown (Phaeophyceae, Ochrophyta) seaweeds over four days on a representative range of exposed and sheltered shores with a variety of habitats on the Treshnish Islands (Lunga), Little Colonsay and Ulva Island. At each site, seaweeds were listed and collections were made for microscopic identification and to press as herbarium specimens. For shore descriptions, see above.

Numbers of species recorded

In total, approximately 126 seaweed species were recorded of which 73 were reds, 19 greens and 31 browns. Of those species, about 48 are not recorded for one or more of the islands in Hardy & Guiry (2006). The largest number of species was recorded from sites UL 1 and UL 2 Ulva islets (60), although numbers were similar for LU1 Lunga NW (59) and LC1 Little Colonsay NE ('north harbour') (55). The lowest number of species (27) was recorded for the shore at UF1 Ulva ferry (boathouse).

Taxa requiring further taxonomic assessment

The number of species recorded is approximate, because there are some seaweed groups which require further taxonomic study, including the use of molecular techniques. The following groups are particularly noteworthy in this regard:

- *Plocamium* species: these were until recently all under one name *P. cartilagineum*. There are now at least three species (possibly four) in Britain. Species are difficult to identify based on morphology alone. Two species, *P. cartilagineum* and *P. lyngbyanum* were recorded during this survey but they require confirmation.
- *Corallina* species: most of the *Corallina* species recorded during this survey were *C. officinalis*. However, some of the turf coralline algae, particularly from more exposed sites, have different

morphological characters and may represent one or more species.

- **Maerl:** maerl beds are habitats of conservation importance and the presence of large areas of dead maerl at Ulva Bay requires investigation. The main maerl-forming species in north-west Britain are *Lithothamnion glaciale* and *Phymatolithon calcareum*, but there is evidence that there are other species present. *L. corallioides*, a warm temperate species, has recently been confirmed from Scotland. In addition, Melbourne et al. (2017) described a new species of maerl, *L. erinaceum*, from Scotland. Species recorded from this survey include *Lithothamnion glaciale* and *Phymatolithon calcareum*, but there is some material that morphologically resembles *L. erinaceum* although this would need molecular confirmation.
- *Gelidium* species: a number of specimens were hard to assign to species level during this survey and would benefit from a molecular taxonomic study.
- *Ulva* species: species can be very hard to distinguish in this genus and there are undescribed species in the British flora.

A permanent reference collection of seaweeds

A representative collection of seaweeds collected and identified during this survey, were preserved as permanent reference vouchers. Approximately 120 specimens were prepared and these have been incorporated into the Algal Herbarium at the Natural History Museum, London, one of the largest herbaria of its kind in the world, holding in the region of a quarter of a million specimens. These will be available to the international research community and just some of the potential future uses for these specimens include: providing evidence of a particular species' presence at a specific time and place; contributing to larger biodiversity data modelling; providing a source of referenced biological material available for DNA analysis.

Table 3. Numbers of seaweeds recorded at each site surveyed.

Site	Treshnish: LU1 Lunga NW	Treshnish: LU2 Lunga NE	LC1 Little Colonsay NE ('north harbour')	LC2 Little Colonsay SE	UL1 & UL2 Ulva islets	UF1 Ulva ferry (boathouse)
Date	17.09.16	17.09.16	18.09.16	18.09.16	19.09.16	20.09.16
Red	28	24	35	27	31	15
Green	14	5	5	6	8	4
Brown	17	7	15	14	21	8
TOTAL	59	36	55	47	60	27

General comments

This survey yielded a diverse seaweed flora for the Hebrides and evidence of a wide range of habitats. The total number of species recorded represents c. 20% of the British seaweed flora (644 taxa; Brodie *et al.* 2016). The numbers of species recorded for each site largely reflects the nature of each shore, i.e. there are more species with greater exposure and range of habitats. However, with the exception of the shore at Ulva ferry, where the species and numbers recorded reflect the classic sheltered nature of the shore, with greater effort it is probable that more species would have been found on the other shores. Two shores were worked on one tide each for both Lunga and Little Colonsay and this may account for the lower numbers recorded for NE Lunga and the SE side of Little Colonsay, as there was less time at the second shore.

The discovery that almost 40% of the 126 species of seaweeds found during this survey, have not been recorded for one or more of the islands in the Hebrides, is probably due to a lack of recording from these areas. However, it would be valuable to make more comparisons with other areas in the region in order to consider whether some of these species are genuinely new to the area or reflect the relatively inaccessible nature of some of the Hebridean islands. Many of these species have been recorded in the more accessible Outer Hebrides, for example. It would also be valuable to have more monitoring on some of these remoter islands, such as Little Colonsay, in view of changes in the seaweed flora of Britain and related areas due to climate change.



Shore team at the top of the shore, Ulva Islets (FD)



LH exploring the shore, close-up

Fish Surveys

A total of 13 species of shore fish was recorded during the survey. The highest number of species (7) was recorded from Ulva islets (UL 1 & UL 2). This undoubtedly reflects both the varied nature of the site in terms of different habitats and the larger number of people recording (e.g. PC snorkelling, divers wandering along after their dive). Species diversity and abundance of shore fish is usually greater on shores with varied habitats especially those with deep rock pools, a good cover of seaweeds and moderate wave exposure. The most notable species was the Lesser Spotted Catshark, better known to most people as a dogfish (*Scyliorhinus canicula*). An individual had become trapped at extreme low tide amongst the seagrass at the Ulva islets site. Otherwise, the fish recorded were the 'usual culprits'. At each of the shores surveyed, a specific search (FD) was made for intertidal fish using a hand net in pools and by turning rocks and seaweeds. However, it is likely that more species would have been found given more time and people searching and by setting simple bottle traps and other devices.

The Seasearch divers recorded a total of 19 fish species, again the usual ones that might be expected within each type of habitat. A single Sunfish (*Mola mola*) was seen on Dive 14 (Inch Kenneth "Humpies A"). Divers were recording all species and no-one was concentrating exclusively on fish.



Fish species recorded by divers: Top - *Pleuronectes platessa* (Plaice) (FC), bottom - *Taurulus bubalis* (Long-spinned scorpion fish) (TR).

Sublittoral Surveys

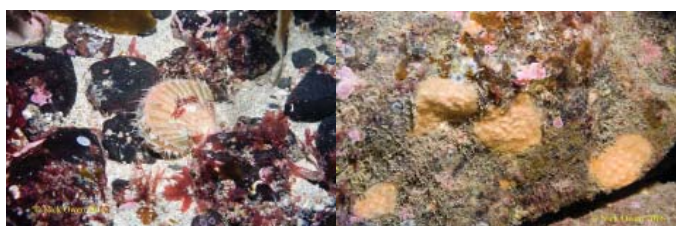
A total of 15 dives over three full days covering 11 different sites, resulted in 15 completed Seasearch forms, with site profiles, habitat descriptions and species. General descriptions of the habitats and species are given below. A full species list can be found at the end of this report and details of the sites dived (in chronological order) can be found in Table 2.

Treshnish Isles

Three sets of divers were dropped into the clean, oceanic waters along the sheltered eastern sides of Lunga and Fladda. None of these sites proved easy to survey due to the amount of swell and surge amongst often thick kelp. One pair of divers (site 3) were dropped from a boat and swam inshore to exit on the beach.

Dive Site 1: Treshnish, Lunga West.

South facing boulder slope with occasional bedrock outcrops and patches of cobbles/pebbles scoured by shell gravel. Boulder size and shape was varied, with smaller boulders quite rounded and larger boulders more angular. Clean, mobile shell gravel was present around the cobbles and pebbles.



Cobbles & sand (NJO)

Boulders (NJO)

Dive Site 2: Treshnish, Fladda South

A low-lying bedrock reef approximately 6m high was followed by boulders, cobbles and a flat sandy gully. Kelp park was present on top of the bedrock reef, with tide-swept hydroids and bryozoans. The divers saw a pot line as they descended, and a line of shellfish pots along the cliff face.



Hydroid/bryozoan turf (TR)

Urticina felina (FC)

A tall, open kelp park (*Laminaria saccharina*, *Laminaria hyperborea*, *Saccorhiza polyschides*) on bedrock reef was present with an understorey dominated by red algae grazed by *Echinus esculentus*. Coralline algae were common on rock surfaces, mixed in with barnacles and bryozoan crusts on the vertical surfaces of larger boulders. Some larger sponges (e.g. *Pachymatisma johnstonia*) and hydroids were also noted. Below the reef was a boulder slope leading down to a flat sandy gully. Divers descended down a pot line.

Dive Site 3: Lunga East (Lunga 1)

Shelly gravelly seabed with small boulders and cobbles rocking back and forth in the considerable swell. Areas of either *Zostera marina* or dead maerl were mixed in with the shelly substratum. The boulders and cobbles had kelp and red seaweeds growing on them.



Boulder and cobbles with kelp (AB)



Zostera marina (AB)

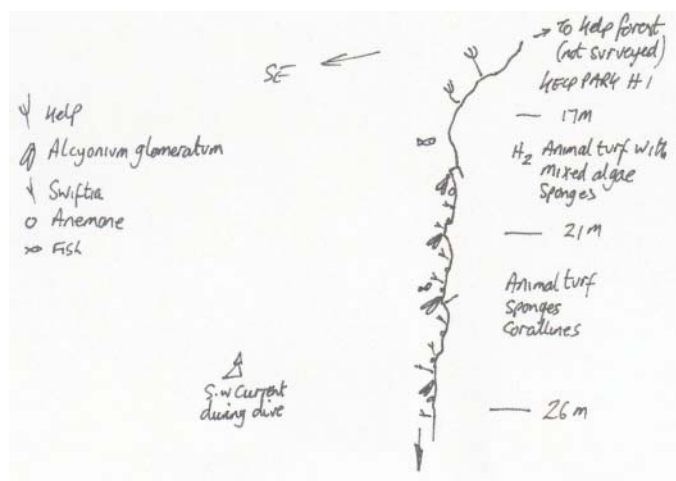
Loch na Keal

Two sets of dives were undertaken on the submerged feature known as MacQuarrie's Rock.

Dive sites 4 and 7: MacQuarrie's Rock

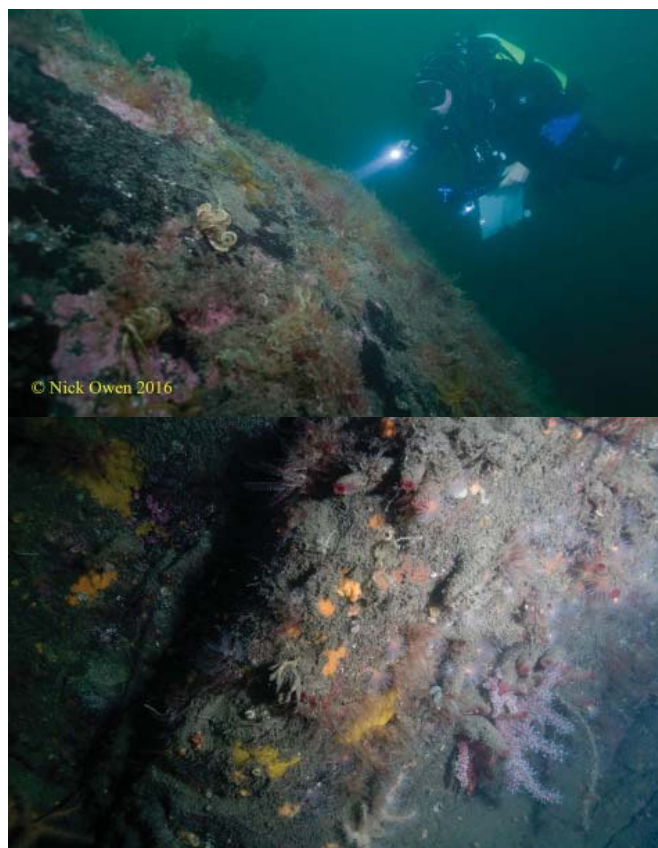
Submerged feature in Loch na Keal, with top at 6m below chart datum composed of a silty, southeast-facing steep, rugged slope leading to vertical / near vertical rock wall with overhangs, ledges, fissures and perched boulders. Some areas of bare rock were noted.

Kelp forest was noted on top of the feature, but not surveyed, and this graded into kelp park by 14m below chart datum. An urchin-grazed understory was present dominated by coralline crusts, *Antedon bifida* and mixed algae, as well as occasional sponges, anemones, bryozoan crusts, starfish and crevice cucumbers.



Profile of MacQuaries Rock

Below the kelp park was animal turf dominated by *A. bifida* and *Echinus esculentus*, grading into a more diverse animal turf with sponge crusts, *Alcyonium glomeratum*, *Caryophyllia smithii*, *Swiftia pallida*, occasional anemones (*Metridium dianthus*, *Urticina eques*, *Protanthea simplex*, *Hormathia coronata*), arborescent sponges, hydroids, echinoderms and



Above - Diver exploring MacQuaries Rock, below - encrusted rocky reef (NJO).

tunicates. Coralline crusts were seen below 25m.

The diversity of the sponge crusts was noteworthy, as was the size of the *A. glomeratum* and the large numbers of freely reproducing *S. pallida* at comparatively shallow depths.

Inch Kenneth

One set of dives was undertaken to the southwest of Inch Kenneth, and two sets of dives was undertaken from the shore ("House Bay"). Information for House Bay dives was supplemented with information from snorkelling in the same area.

Dive sites 5 and 6: Inch Kenneth shore dives

Several shore dives were undertaken from the main jetty outwards (at high tide, the surveys could continue almost to the shore; at low tide, the surveys halted at the low tide jetty). As such, the area surveyed overlaps the area surveyed by the shore team. Seven habitats were surveyed (see p. 17).

1 – Sandy sediment, leading offshore in a channel close to the rocky headland. Some shell and pebbles, often encrusted with dark red algae. Only scarce life, restricted to hermit crabs, crustose algae and a few *Lanice conchilega*.

2 – Bands of *Fucus serratus* and *Ascophyllum nodosum* leading outwards from the shore.

3 – Beds of dead maerl, with occasional pieces of live maerl. Some small red seaweeds and stones often encrusted with dark red algae. Epifauna was scarce, but including *Anemonia viridis*, *Pagarus bernhardus*, *Carcinus maenas*, *Urticina felina* and littorinids.

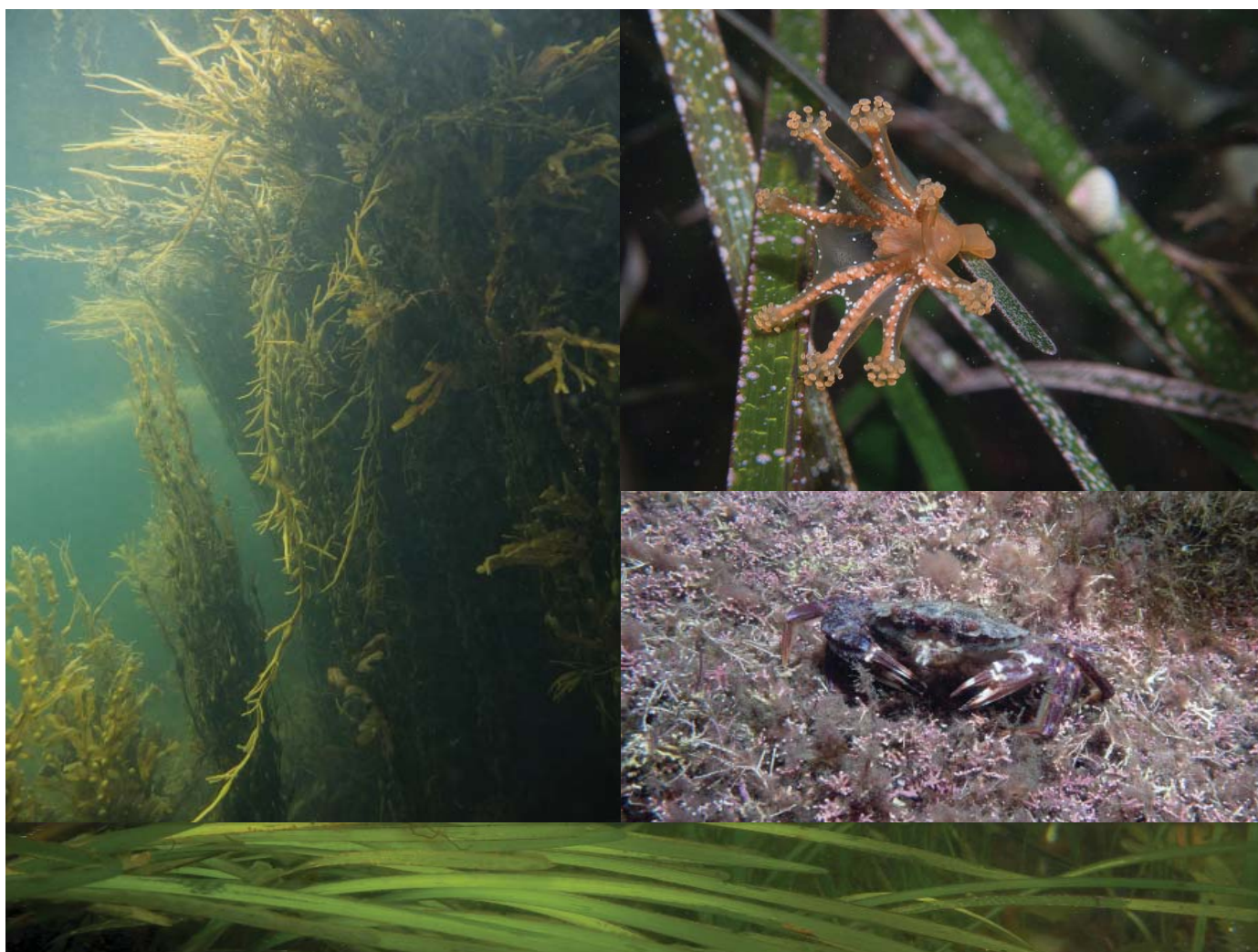
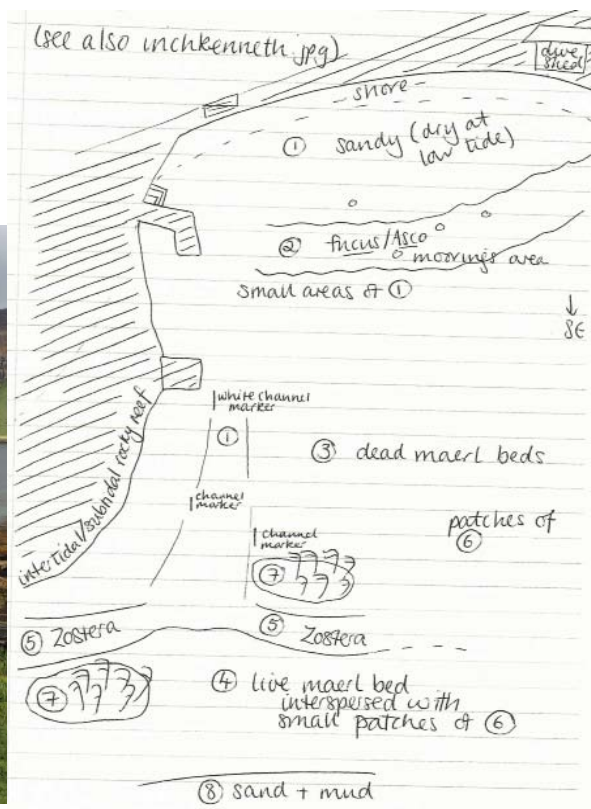
4 – Beds of live maerl (around 95% live). Several forms of crustose pink algae seen – thin twiglets with complex branching patterns, thicker twiglets, twiggy growth forms of *Corallina officinalis* and crusts on pebbles. Epifauna included numerous *Anemonia viridis*, *Pagarus bernhardus* and *Carcinus maenas*.

5 – *Zostera* bed with numerous *Calvadosia campanulata* and fewer *Calvadosia cruxmellitensis*. The substrate was a mix of live maerl, dead maerl and muddy sands. This habitat was often seen grading into beds of live maerl.

6 – Deeper sandy seabed with *Laminaria saccharina*.

7 – Rocky reef with kelp forest (*Laminaria hyperborea*, *Saccarhiza polyschides*) covering the tops and sides. The understory was diverse and abundant with sponges (especially *Amphilectus fucorum*), *Asterina gibbosa*, tunicates, barnacles and bryozoans.

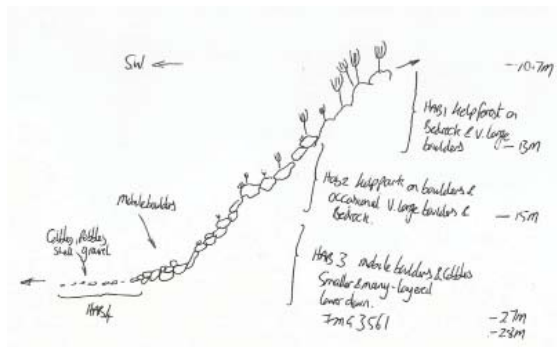
8 – Sandy seabed with some areas of muddier sediment leading out into the main channel. Drift red and brown algae (whole or in fragments) covered much of the substrate.



*Inch Kenneth shore dives: Top left - Aerial view of shore (FC); top right - Sketch of habitats (BH); middle left - *A. nodosum* near shore (FC); middle right - *Calvdosia campanulata* on seagrass and *Carcinus maenus* in maerl (FC); bottom - seagrass (FC).*

Dive sites 14 and 15: Inch Kenneth SW 'Humpies A' and 'Humpies B'

Steep, southwest facing craggy bedrock slope overlain with large boulders deeper down. The slope bottomed out in a fringe of smaller boulders at the base, grading into a more gently-sloping sea bed of pebbles and clean, mobile shell fragments below 28m. Bedrock and boulders were fissured, and were composed of large-clast conglomerate with a calcareous sandstone matrix and massive igneous or metamorphic rock, providing a considerable amount of three dimensional structure for attachment and refuge from sea urchin *Echinus* grazing pressure.



Profile sketch of Humpies A

Kelp forest was found to 13m below sea level. This had an urchin-grazed understorey of mixed algae (with red filamentous algae dominant). A further layer was dominated by coralline crusts and barnacles, with *Alcyonium digitatum*, sponge crusts, tunicates and bryozoans in pockets and crevices in the rock. The kelp was ragged and often broken-topped.

The kelp forest graded into urchin-grazed kelp park coincident with where the bedrock became obscured by large and small boulders. This was covered with abundant coralline crusts, barnacles, red and brown algal crusts, bryozoan crusts and *Spirobranchus* spp. Sponge crusts, holothurians and tunicates were also present between boulders.



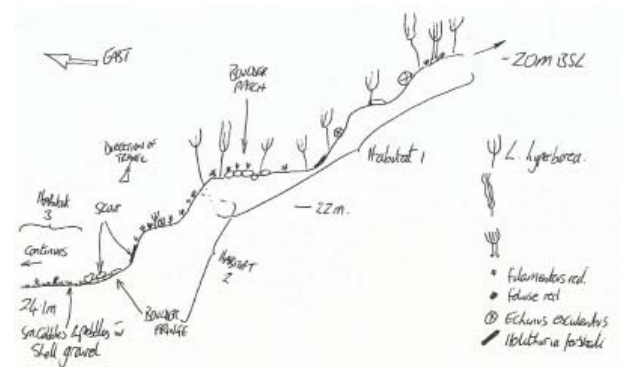
Mundia rugosa (long-clawed squat lobster) amongst coralline encrusted bedrock (TR)

Gometra

Two sets of dives were undertaken around the south-east of Gometra, in worsening weather conditions.

Dive site 8, Outer Gometra reef (Maisgeir)

Steeply-sloping east-facing fissured and eroded bedrock with areas of boulders on horizontal surfaces. A fringe of coralline-dominated rock was present at the bottom of the slope, and boulders below the fringe led onto a seabed of pebbles and small cobbles with clean, mobile, large-fragment shell gravel.



Profile sketch of Outer Gometra

A tall, mixed kelp park was present (dominated by *Laminaria hyperborea*) with an *Echinus esculentus* and *Holothuria forskali*-grazed understorey dominated by red algae. A ground layer was dominated by coralline crusts, but also with some other rarer crusts, such as brown algae, sponges and bryozoa. Occasional tunicates, *Antedon bifida*, *Pawsonia saxicola* and a few anemones were present in crevices and pockets in the rock. Below the kelp park, there was rocky reef down to 22m below sea level. A narrow upper band was dominated by red algae, and a wider, lower part included a narrow fringe of boulders and was scoured by shell gravel. This was heavily dominated by coralline crusts.

The sea bed at the base of the rock slope was composed of rounded pebbles and small cobbles with drifts of



Kelp Park (NJO)

coarse shell fragments. Coralline crusts, barnacles, brown algal crusts and foliose red algae were present on pebbles, but much of the surface of each pebble was bare, with the black rock being a striking contrast with the bright, white shell gravel.



Sediment and cobbles (NJO)

Dive site 9: Inner Gometra Reef (Channel between the west side of Ulva and the east side of Gometra)

Both of the two sets of divers noted considerably different underwater topography and life. In one area there was rocky reef, composed mainly of bedrock but with some boulders, down to 17m. This was followed by a boulder slope with occasional areas of bedrock exposed. The boulders formed a rugged, highly complex environment with numerous crevices and crannies. Coralline crusts were highly dominant, with some orange bryozoan crusts, *Caryophyllia smithii*, *Echinus esculentus*, encrusting sponges and crevice cucumbers. Frequent fish (especially small wrasses) darted among the three dimensional structure produced by the boulders. *Alcyonium digitatum* was seen on corners of larger boulders that stuck out into the current.

Around 15-20m, there was mixed cobbles/sand with occasional boulders. Coralline algae, red algae and tunicates, with holothurians in the spaces between larger cobbles and boulders.



Crevice sea cucumber (Pawsonia saxicola) (AB)

Ulva Small Islands

Three sets of dives were undertaken around the cluster of small islands on the SW coast of Ulva on maerl beds and a drop-off.

Dive site 10: Ulva islets drop off (W of Eilean na Creiche)

Shelly gravel seabed with some boulders and cobbles leading to a small wall of silted, dark-coloured rock. Some small patches of shelly sediment were present in wall crevices or on ledges. The shell gravel seabed contained both drift and attached algae, especially *Desmerestia aculeata* and *Halidrys siliquosa*. Boulders and cobbles had red algae cover (especially *Delesseria sanguinea*) and kelp cover (especially *Laminaria saccharina* and *Saccarhiza polyschides*). Numerous stalked jellyfish *Calvadosia campanulata* and some *Calvadosia cruxmellitensis* were present on the red algae (this genus was previously *Lucernariopsis*). Frequent *Urticina* sp. were found in the sediment.

The small wall was covered with considerable quantities of pink crustose algae, covering both rock and sessile biota. Some limited life was present on the wall, especially tunicates (*Ascidiaella aspersa*) which totally covered some sections of the wall. Crevices contained sea cucumbers, and *Antedon bifida* was present on edges of the wall facing into the water column.



Top left - Tunicates covering wall plus Luidia, top right - Stalked jellyfish on red algae, bottom left - Alcyonium on wall, bottom right - Cancer pagarus (edible crab) (TR)

Dive site 11: Ulva islets maerl / drop-off (west of En na H-Uamha)

Bed of 40-50% cover of live maerl, with dead maerl gravel and sand in about 5m depth, followed by a gentle slope of sand and gravel to about 7m. This was followed by a very steeply sloping rocky reef dominated by kelp forest to about 17m.



Left - Kelp holdfast community, top right - Maerl bed, bottom right - Steep rocky reef (TR).

Dive site 12: *Ulva* islets shallow maerl beds

This dive site was within a cluster of small islets and reefs off the southern shore of Ulva, completely sheltered from the north and east by the bulk of Mull and Ulva, sheltered from the west by the bulks of Little Colonsay (and Staffa) and with a limited fetch to the SSW past the tip of Iona. To the south there is a short fetch (12km) from the bulk of the southernmost peninsula of Mull. Further shelter is provided by shallow water and reefs immediately to the south of the site. There is considerable shelter from currents, provided by shallow water and reefs all around the edges of the site, but beyond these the water becomes deep very quickly.

The dive was over a bed of mainly live maerl (ca. 60-80% live in some parts), with low associated diversity. This was overlain in places by free-floating filamentous brown seaweed in tangled mats (possibly *Desmarestia aculeata*). The brown algal mats moved over the surface with movements of the tide and contained pieces of maerl caught up with the movement. There was also considerable quantities of fluffy red algal balls within the mats including the *Trailliella* phase of *Bonnemaïsonia hamifera*. See the section on habitats and species of particular interest, for more details.

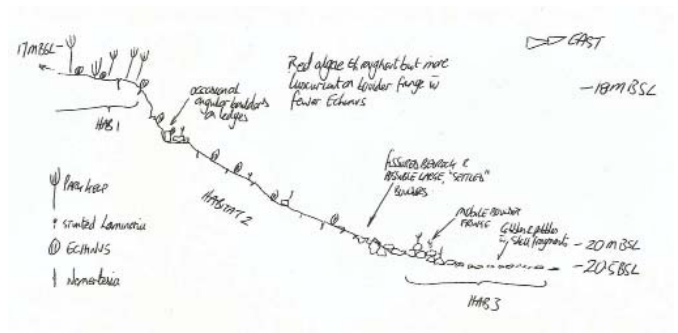


Shallow maerl with free seaweed (NJO)

Staffa

Dive site 13: Staffa, NE side

East-facing hard, fissured bedrock that sloped gently, then steeply away, increasingly masked by boulders until it bottomed out. The boulders became smaller until the boulder fringe gave way to a gentle slope covered in cobbles and pebbles with drifts of mobile, large-size, shell fragments. There were large areas of bare rock, and these, along with the copious barnacles, indicate that in storm events the smaller, rounded boulders at the base of the slope and the cobbles and pebbles at the base of the slope undergo considerable movement.



Profile of Staffa reef

Kelp park was seen on the gently-sloping bedrock, ceasing abruptly as the slope became steeper. The kelp park had an urchin-grazed understorey dominated by red algae, large areas of barnacles and considerable bare rock, with coralline crusts outlining fissures and crevices. On the steeper slope, urchin-grazed, filamentous red algae dominated, bedrock and large boulders were noted, along with cobbles, pebbles, extensive areas of barnacles, and coralline, sponge and bryozoan crusts. Red algae were more luxuriant on the deeper, more horizontal surfaces away from the urchins.

At the bottom of the slope, hard surfaces were covered in barnacles with filamentous red algae, occasional foliose red algae, occasional brown algae and occasional bivalves.



Staffa NE diver and kelp forest (NJO)

HABITATS AND SPECIES OF INTEREST AND IMPORTANCE: INTERTIDAL AND SUBLITTORAL

Maerl

Maerl beds are important and relatively rare habitats. In conservation terms they are considered a 'Priority Marine Feature'. Previous to the PMNHS survey, maerl (principally *Phymalithon calcareum*) beds had been recorded from the Staffa archipelago only from the Treshnish Islands (for details of this and other earlier records of maerl within the Inner Hebrides, see Conservation Designations below). The PMNHS survey recorded maerl from the east side of Lunga in the Treshnish Isles, plus additional localities on Inch Kenneth and Ulva, including high quality live, as well as dead maerl beds in each of these two places. The live maerl bed in the bay at Inch Kenneth (Dive sites 5 and 6) was in excellent condition with up to 95% live maerl in SW part of the bay.

The maerl recorded at Dive Site 12, Ulva Islets maerl bed, was unusual in that the live maerl was overlain and mixed in with an abundant brown seaweed, provisionally identified as a free-living form of *Desmarestia aculeata*. This appears to "interact" with the maerl by "picking it up" when the masses of *D. aculeata* are tumbled by wave action. This "picking", combined with occasional direct wave disturbance, seems to mix the top layers of the maerl bed so scattering live maerl amongst dead – an unusual occurrence. Maerl is known to favour current-swept sites. On this site water movement by currents seems to be replaced by occasional wave action and in westerly and south westerly storms there may be water flow by waves overtopping the beaches around Eilean na Creiche to the west, with water flowing into the deep water to the south, keeping the site low in accumulated particulate organic matter. The percentage of live maerl lying on the surface varied from about 60% to a patchy 20-30% over the 100m or so from the drop in point to the start of the rocky slope up towards the shore.

Seagrass

Seagrass beds are also considered a 'Priority Marine Feature'. While there are previously known seagrass records from Inch Kenneth and the Treshnish Islands (for details see Conservation Designations below), this survey has increased the known distribution of *Zostera marina* to the east side of Lunga, has increased the number of records in the east bay of Inch Kenneth and has documented extensive beds amongst the islets on the south side of Ulva.

Sublittoral sponge crusts (NJO)

Two walls are known in Loch na Keal that are vertical, very sheltered from wave action, little exposure to current and with considerable depth close by. This survey dived three times on Macquarrie's Rock in the mouth of the loch. Both that and the similar wall on Eorsa have numerous *Swiftia pallida* and numerous, large colonies of *Alcyonium glomeratum*. While the silt on Macquarrie's Rock in particular obscures the richness of the epifauna, especially the sponge crusts, wafting suggested considerable richness that would be worth continued examination of the sponge fauna in both locations, especially from the deeper vertical walls and overhangs.

The two adjacent dive sites at the Inch Kenneth Humpies (14 & 15) were partly on an unusual large-clast conglomerate with a calcareous sandstone matrix. This conglomerate contained many small –scale pockets due to the removal of the rounded "pebbles" in the conglomerate which afforded protection from *Echinus* grazing and scour for species including sponges on what would otherwise be an exposed, urchin-grazed (and relatively epifauna-poor) site. Sponge richness on this site would repay further examination and sampling.

Non-native species

Non-native marine species are nowadays regularly and increasingly recorded during marine surveys. The following were recorded during this survey:

- Non-native seaweed species (JB): Five species of non-native seaweeds were recorded from the intertidal in this survey. The most significant of these is *Sargassum muticum*, which has almost certainly arrived in the Hebrides within the last decade. The other non-native species are well-established in the area. The gametophyte phase of *Asparagopsis armata* has not been reported from this area although the 'Falkenbergia' (sporophyte) phase is common. The other three were *Bonnemaisonia hamifera* gametophyte and 'Trailliella' phase (sporophyte), *Codium fragile* subsp. *fragile*, and *Colpomenia peregrina*. In addition the divers recorded *Dasysiphonia japonica* (previously *Heterosiphonia japonica*) from Staffa, Ulva and Gometra (first recorded from the Fal estuary in 2001).
- Seaweed considerable range increase (JB): *Champia parvula* was recorded from the intertidal maerl bed at the Ulva islets site (UL) (previously known from southern UK).
- The seasquirt *Corella eumyota* was recorded from the sublittoral at Fladda in the Treshnish Isles (dive site 2).



Top - *Sargassum muticum* in pool (FD), bottom - *Falkenbergia* (NJO)

CONSERVATION DESIGNATIONS (Becky Hitchin)

Treshnish Isles Special Area of Conservation

The Treshnish Isles were designated in 2005 as a Special Area of Conservation (SAC). The SAC occupies 1,962ha and encompasses 6 of the 8 principal islands. The southernmost islands of Bac Mòr (the ‘Dutchman’s Cap’) and Bac Beag fall outside the boundary of the SAC.

The site was selected primarily for the breeding colony of *Halichoerus grypus* (contributing just under 3% of annual UK pup production), but reefs (bedrock and stony) are also a qualifying feature.

SNH have undertaken 2 surveys of the SAC - broadscale mapping work in 2003 (CR345) and baseline monitoring of reef habitats in 2007 (CR302). There is little other published littoral or sublittoral habitat information available for the site. The reefs support species rich floral and faunal communities characteristic of a range of exposures to wave action.

Conservation objectives have been published for the site. To avoid deterioration of the reefs habitat, “it is advised that” (in the SAC objectives) the following should be maintained in the long term:

- Extent of the habitat on site
- Distribution of the habitat within site
- Structure and function of the habitat
- Processes supporting the habitat
- Distribution of typical species of the habitat
- Viability of typical species as components of the habitat
- No significant disturbance of typical species of the habitat

Beam trawl, dredge, set nets, demersal seine nets and demersal trawl were all prohibited throughout the SAC from 8 February 2016, following Marine Scotland consultation in 2014 – 2015. The SNH surveys underpinned advice to Marine Scotland on the management requirements for the SAC. It was noted during the consultation process for these management measures that they would also protect the maerl beds and seagrass beds of the SAC that do not form part of the qualifying features.

Priority Marine Features

Priority Marine Features are habitats or species considered to be of conservation importance in Scottish seas. They were used as search priorities during the process of designation of Nature Conservation MPAs (NCMPAs), and protection for the PMFs occurs through their designated status in other conservation designations such as NCMPAs or SACs.

PMFs within the Staffa Archipelago include:

PMF	Biotores represented	
Maerl beds	Maerl beds	SS.SMp.Mrl
Maerl or coarse shell gravel with burrowing sea cucumbers	<i>Neopentadactyla mixta</i> in circalittoral shell gravel or coarse sand	SS.SCS.CCS.Nmix
Seagrass beds	<i>Zostera noltii</i> beds in littoral muddy sand	LS.LMp.LSgr.Znol
	<i>Zostera marina/ angustifolia</i> beds on lower shore or infralittoral clean or muddy sand	SS.SMp.SSgr.Zmar

Maerl beds - SS.SMp.Mrl

*“Beds of maerl in coarse clean sediments of gravels and clean sands, which occur either on the open coast or in tide-swept channels of marine inlets (the latter often stony). In fully marine conditions the dominant maerl is typically *Phymatolithon calcareum* (SMP.Pcal), whilst under variable salinity conditions in some sealochs beds of *Lithothamnion glaciale* (SMP.Lgla) may develop.”*

Almost two-thirds of the known maerl bed records in Scottish territorial waters are found within eight SACs. Four of these SACs are considered to afford protection to the habitat through maerl being one of the qualifying features of their designations. Protection outside SACs is suggested to occur in areas where there are fisheries management measures in place that include annual restrictions on either mobile and active gear or all fishing. SNH currently considers that the overall range and distribution of existing maerl bed records is relatively representative of the expected range and distribution for the habitat.

To improve understanding of the state of maerl beds, OSPAR considers it important to establish suitable long-term monitoring of the distribution, extent and quality of these habitats and to assess the effectiveness of any management measures put in place. To meet OSPAR commitments, seabed habitat surveys and monitoring of the distribution, quality and extent of maerl beds are undertaken in Scottish waters to improve the knowledge base and provide indicators for the state and recovery of the habitat. This monitoring includes:

- extent of bed
- percentage of live maerl
- a measure of biodiversity
- physical data (e.g. water temperature, turbidity)
- chemical data (e.g. N, P values to determine possible eutrophication)

Maerl in the Treshnish Isles

Extensive *Phymatolithon calcareum* maerl beds were found during surveys of the Treshnish islands in 2009 (ERT, 2009; Moore *et al* 2009), both in the channels among the area of reefs and shallows between Lunga and Fladda, and in the slightly deeper main channel running along the northeast coast of Lunga. Some of the maerl beds were noted as being densely overgrown with algae. There was also an area of mega-ripples in the channel immediately to the north of Lunga, recorded as ‘*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand (SS.SMPMrl.Pcal)’, and

a bed supporting an epiflora of ephemeral and fast-growing species to the east of Sgeir Eirionnaich, recorded as ‘*Phymatolithon calcareum* maerl beds with red seaweeds in shallow infralittoral clean gravel or coarse sand (SS.SMPMrl.Pcal.R)’.

Within the wider Inner Hebrides area, there are records of maerl beds off the south-west and east coasts of Tiree and the south-east coast of Coll (Dipper 1981, and Mitchell, Earl and Dipper 1983). A dense live maerl bed (of *Lithothamnion corallinoides*) was recorded in sheltered Loch Ainort in Skye and extensive, thick dead maerl gravel around the Elgol and Sleat peninsulas (Dipper, 1981).

Seagrass beds - SS.SMp.SSgr

*“Beds of seagrass (*Zostera marina* or *Ruppia* spp.) in shallow sublittoral sediments. These communities are generally found in extremely sheltered embayments, marine inlets, estuaries and lagoons, with very weak tidal currents. They may inhabit low, variable and full salinity marine habitats. Whilst generally found on muds and muddy sands they may also occur in coarser sediments, particularly marine examples of *Zostera* communities.”*

To qualify as a *Zostera* ‘bed’, plant densities should provide at least 5% cover (OSPAR, 2008), although more typically, *Zostera* densities provide greater than 30% cover.

Seagrass beds are present in 14 SACs, 11 of which are considered to provide protection for the habitat through seagrass being one of the qualifying features of their designation. Seagrass beds are also present in 22 SSSIs, four of which are considered to provide protection to the feature. Protection outside SACs is suggested to occur in areas where there are fisheries management measures in place that include annual restrictions on either mobile and active gear or all fishing.

Overall, the known range and geographic variation of seagrass beds in the seas around Scotland is considered to be relatively well reflected by the existing range of protection for this habitat, including the full range of component biotopes.

Seagrass in the Treshnish Isles

Moore *et al.* (2009) noted dense beds of *Zostera marina* in the channels between Lunga and Fladda and the unexpected discovery of a small dense bed of *Z. marina* in the anchorage on the northeast side of Lunga. Within the wider Inner Hebrides area, there is a record of a small (and insignificant) seagrass bed off South Tiree (Dipper 1981), and sparse beds off the east coast of Rhum and in Eigg Harbour (Dipper 1981).

OSPAR list of threatened and declining species and/or habitats

Maerl beds and seagrass beds are included in the OSPAR list of threatened and/or declining habitats or species, nominated for the entire OSPAR area based on decline, sensitivity, ecological significance and threat.

DISCUSSION

When interpreting the results of this survey, please bear in mind that the number of different species recorded from each site is partially dependant on the ability of the observers. It was also not practical in the time and with the facilities available, to collect, preserve and identify all tiny animals such as amphipods, worms, and bryozoans. The most complete lists are liable to be intertidal seaweeds (Professor Juliet Brodie) and intertidal molluscs (Rosemary Hill). The sublittoral species were recorded using a checklist which adds to completeness. The numbers of fish species is undoubtedly lower than reality and more time plus the use of intertidal fish traps would significantly increase this list.

ADDENDUM (Rayner Piper)

For many, probably all of us, this was not just another Porcupine field trip but a very special adventure.

Here is one individual highlight:

Little Colonsay: an island of wonder. Day 3 and the weather was a “wee bit plowtery” – messy seas, windy, wet and wild. Plans to survey the western shore of Gometra and her islets had to be abandoned as the wind built and the seas churned. However, being marooned on Little Colonsay was no hardship and after a fine breakfast, the intrepid Porcupines set off in all directions to further explore this enchanted island.

I set off with Phillip Cowie, guided by the owner Michael Blakenham, for a site on the south-eastern coast known as the “indoor swimming pool”. Our adventure started with a brisk and invigorating hike through the island’s small woodland, then up and over steep ground crossing the island’s rocky summit, before descending towards the coast. Captivated by the view, we tripped over tussocks of heather and fell into ancient plough furrows, startling red deer and ravens as we headed closer to the rugged vertical cliffs of the coast.

Michael led us down a narrow lichen encrusted gully to a shoreline backed by towering cliffs of grand basaltic columns. Moving eastwards the rocky shore widened and the cliff became progressively more undercut, eventually providing a room-like shelter from the wind and sea-spray. Within the cavern were colourful boulder filled pools, coloured pink with coralline algae, including

a gorgeous deep pool, which, had the weather been warmer, might have made for a tempting dip. Leaving the shelter of the cavern to sample the exposed upper shore, Phillip and I were engaged running transects with the Go-pro, crawling on our hands and knees looking in nooks and crannies and turning over large cobbles trapped within rockpools. As the tide began to rise and our thoughts turned to leaving, we were joined by a small pod of bottlenose dolphins playing in the breakers and hunting amongst the kelp. We watched them for ten minutes or so as they leaped and played before they headed to deeper water and we scrambled up the cliff in search of the other Porcupines. On the cliff tops, on the landward side of the basalt pinnacles, slacks of freshwater had formed. These were a favourite bathing spot for the island otters. Their scat, nutriment-rich, enhanced the lush growth of longer greener grass surrounding the otter pools. And so our days exploration on “the island of wonder” ended - a truly memorable adventure filled with encounters of extraordinary interest.

ACKNOWLEDGEMENTS

The success of this field trip was due to the hard work and generosity of many people: all team members, who worked so hard especially the divers; special thanks to our generous hosts Michael Blakenham, Claire Barlow and Jim Woodhouse who made the trip to the islands so worthwhile; our boatmen Ronnie Campbell and George Brown (also a member of the dive team); additional help from Jamie and Tessa McGregor and Roc Sandford. Dawn Watson and Charlotte Bolton input the Seasearch data into Marine Recorder.

Acknowledgment from Rayner: thanks also to Frances Dipper for her considerable work both writing this report and ensuring that I contributed my findings to this study.

SPECIES TABLES

Table 4. Faunal species list compiled from shore recorders and their photographs, from all intertidal sites visited during the Staffa Archipelaga field trip.

	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay SE	LC3 Little Colonsay SW	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva ferry	IC 1 Inch Kenneth 'house bay'	IC 2 Inch Kenneth 'cowrie bay'
	17.09.16	17.09.16	18.09.16	18.09.16	18.09.16	19.09.16	20.09.16	18.09.16	18.09.16
SPONGES									
<i>Halichondria panicea</i>	P	C	O					P	
<i>Hymeniacidon perleve</i>	P	F	F			P	P	P	
<i>Pachymatisma johnstonia</i>								P	
<i>Suberites sp.</i>							R		
<i>Tethya citrina</i>							R		
Smooth yellow indet.			O						
Blue sponge crust indet.							P		
White sponge crust indet.							P		
CNIDARIA									
<i>Actinia equina</i>	C	C	F		P	P	O	P	
<i>Anemonia viridis</i>			R juv		P	C, on seagrass	P		
<i>Aiptasia?</i>			R						
<i>Aulactinia verrucosa</i>	R								
<i>Burrowing anemone (spec)</i>		P							
<i>Caryophyllia smithii</i>							R		
<i>Dynamena</i>		F	P						
<i>Obelia</i>		P							
<i>Sagartia elegans</i>					F				
Unidentified anemone	P								
<i>Urticina felina</i>			R		P			P	
ANNELIDA									
<i>Arenicola sp.</i>						P			
<i>Eulalia viridis?</i>					P				
<i>Euploymnia nebulosa</i>		P					P		
<i>nereid polychaete</i>		P							
<i>Spirobranchus (triqueter)</i>		C	F			P	O		
<i>Spirorbis spirorbis</i>		C			p				
<i>Spirorbidae.</i>	P	C	A				C	P	
<i>Scale worm indet.</i>		P	P				P		
CRUSTACEA									
<i>Amphipoda</i>						P			
<i>Cancer pagurus</i>		C, juvs						P	
<i>Carcinus maenas</i>		P	R			P	P	P	
<i>Crangon crangon</i>						C			

	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay SE	LC3 Little Colonsay SW	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva ferry	IC 1 Inch Kenneth 'house bay'	IC 2 Inch Kenneth 'cowrie bay'
<i>Chthamalus montagui</i>			C						
<i>Idotea baltica</i>		R (large)							
<i>Idotea sp</i>	P	P							
<i>Isopoda</i>						P			
<i>Liocarcinus corrugatus</i>						P			
<i>Liocarcinus depurator</i>						P			
<i>Macropodia sp.</i>						P			
<i>Mysida</i>						O			
<i>Necora puber</i>		P				P			
<i>Pagurus bernhardus</i>					P				
<i>Pagurus prideaux</i>		P							
<i>Palaeomon serratus</i>			C						
<i>Palaemon sp.</i>						C	C		
<i>Pilumnus hirtellus</i>		P	C						
<i>Pisidia longicornis</i>		P	F						
<i>Pocellana platycheles</i>		P							
<i>Semibalanus balanoides</i>	A	A	C		A		C	P	
<i>Xantho pilipes</i>			F						
<i>Xantho sp?</i>		P							
Hairy crab?									
Hermit crabs			F			P			
<i>Elminius?</i>			P						
Unidentified barnacles						C			
MOLLUSCA									
<i>Aequipecten opercularis</i>						P			
<i>Barleeia unifasciata</i>							O		
<i>Bitium reticulatum</i>							O		O
Chiton			R						
<i>Calliostoma ziziphinum</i>			O					P	R
<i>Chamelea gallina</i>						R			
<i>Dikoleps nitens</i>						R			
<i>Dosinia exoleta</i>						R			
<i>Eatonina fulgida</i>						O			
<i>Ensis sp.</i>						P			
<i>Gari tellinella</i>		Rmaerl/grit							
<i>Gibbula cineraria</i>	O	O	C			P	O	P	O
<i>Gibbula magus</i>						P			
<i>Gibbula tumida</i>		R maerl grit							
<i>Gibbula umbilicalis</i>	O	O	C			P	O		R
<i>Helcion pellucidum</i>	P				P				
<i>Hiatella artica</i>							R		
<i>Kurtiella bidentata</i>						O			
<i>Lacuna crassior</i>		R							
<i>Lacuna pallidula</i>	R	Rmaerl/grit					R		
<i>Lacuna parva</i>						O			
<i>Lacuna vincta</i>	O	C				O			

	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay SE	LC3 Little Colonsay SW	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva ferry	IC 1 Inch Kenneth 'house bay'	IC 2 Inch Kenneth 'cowrie bay'
<i>Lepidochitona cinereus</i>			R				R		
<i>Littorina fabalis</i>									O
<i>Littorina littorea</i>	O	O	C			P	O	P	
<i>Littorina obtusata</i>	O	O				P	O	P	O
<i>Littorina saxatilis</i>	O						F		
<i>Melarhaphe neritoides</i>						P			
<i>Mya truncata</i>						R			
<i>Mytilus edulis</i>		O			C		O	P	
<i>Nassarius incrassatus</i>		O							
<i>Nucella lapillus</i>	C	O	A		C	P	O	P	
<i>Ocenebra erinaceus</i>								P	
<i>Onoba semicostata</i>	O	Omaerl/grit				O			
<i>Ostrea edulis</i>						R	O		
<i>Striped littorinid</i>			F						
<i>Patella pellucida</i>	F	F							
<i>Patella vulgata</i>	F	O	C		F	P	O	P	O
<i>Patella ulyssiponensis</i>		O							R
<i>Pecten maximus</i>						F			
<i>Rissoa interrupta</i>	R	Rmaerl/grit					O		
<i>Rissoa membranacea</i>						R			
<i>Rissoa parva</i>		Omaerl/grit				O	O		
<i>Skeneopsis planorbis</i>	O								O
<i>Spirorbidae</i>						P			
<i>Tellina donacina</i>		Omaerl/grit							
<i>Tonicella rubra</i>							R		
<i>Tricholia pullus</i>	O								
<i>Trivia arctica</i>							R		
<i>Turtonia minuta</i>						O			
<i>Venerupis corrugata</i>							R		
BRYOZOA									
<i>Crisiidae</i>							P		
<i>Electra pilosa</i>		F							
<i>Membranipora membranacea</i>		P	P			P			
<i>Orange encrusting</i>		C					P		
ECHINODERMATA									
<i>Asterias rubens</i>		P	O			P	P	P	
<i>Asterina gibbosa</i>	P		R			P		P	
<i>Astropecten irregularis</i>						P	R	P	
<i>Echinus esculentus</i>							R		
<i>Luidia ciliaris</i>						P			
<i>Marthasterias glacialis</i>						R			
<i>Ophiothrix fragilis</i>		P					P		

	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay SE	LC3 Little Colonsay SW	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva ferry	IC 1 Inch Kenneth 'house bay'	IC 2 Inch Kenneth 'cowrie bay'
									IC 2 Inch Kenneth 'cowrie bay'
<i>Psammechinus miliaris</i>		P	F						
<i>Pawsonia saxicola</i>							P		
TUNICATA									
<i>Ascidia mentula</i>							F		
<i>Ascidella aspersa</i>							O		
Grey smooth			O						
FISH									
<i>Entelurus aequoreus</i>		P							
<i>Gobiusculus flavescens</i>						P			
<i>Gobius paganellus</i>							R		
<i>Lipophrys pholis</i>	F juv		P + juvs		P		R		
<i>Nerophis lumbriciformis</i>		P							
<i>Pholis gunnellus</i>		P juv					P		
<i>Pleuronectes platessa</i>						juvs.			
<i>Pomatoschistus pictus</i>						F			
<i>Pomatoschistus</i> 'sand series'						F			
Rockling sp		P							
<i>Scyliorhinus canicula</i>						R			
<i>Spinachia spinachia</i>						P			
<i>Sprattus sprattus</i>								R	
<i>Taurulus bubalis</i>			P			P			
MISCELLANEOUS									
<i>Collembola</i>					P		P		

Table 5. Algal species list compiled by Juliet Brodie and Jo Wilbraham. Inch Kenneth records from Lisa Kamphausen, Little Colonsay ‘swimming pool’ (LC3) records from Rayner Piper and Philip Cowie.

(A = abundant; P = present)	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay, SE	LC3 Little Colonsay SE “swimming pool”	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva Ferry	IC 1 Inch Kenneth House Bay
	17.09.16	17.09.16	18.09.16	18.09.16	18.09.16	19.09.16	20.09.16	18.09.16
RED ALGAE								
<i>Acrochaetium endozoicum</i>					P			
<i>Acrochaetium secundatum</i>	A							
<i>Acrosorium venulosum</i>		P						
<i>Agalothamnion hookeri</i>			P					
<i>Ahnfeltia plicata</i>	P	P	P	P				
<i>Asparagopsis armata</i> “Falkenbergia”			P			P		
<i>Bonnemaisonia hamifera</i>		P						
<i>Bonnemaisonia hamifera</i> “Trailliella”			P					
<i>Bostrychia scorpioides</i>							P	
<i>Catanella caespitosa</i>							P	
<i>Ceramium botryocarpum</i>	P		P	P				
<i>Ceramium ciliatum</i>	P		P					
<i>Ceramium diaphanum</i>						P		
<i>Ceramium echinotum</i>				P				
<i>Ceramium pallidum</i>	P			P		P		
<i>Ceramium shuttleworthianum</i>					P			
<i>Ceramium virgatum</i>	P	P	P	P		P		
<i>Champia parvula</i>						P		
<i>Chondrus crispus</i>	P	P	P			P	P	P
<i>Chylocladia verticillata</i>						P		
<i>Corallina officinalis</i>	P		P	P		P	P	P
<i>Corallina</i> ‘turf’ broad apex (3)4-5 fingers	P				P			
<i>Corallina</i> ‘tiny’ ? <i>caespitosa</i> (might be same as ‘turf’)				P				
<i>Cryptopleura ramosa</i>		P	P	P		P		
<i>Cystoclonium purpureum</i>			P	P		P		
<i>Dilsea carnosa</i>	P		P	P	P			
<i>Ellisolandia elongata</i>	P		P					
<i>Erythrodermis trailii</i>						?		
<i>Erythroglossum laciniatum</i>		P						
<i>Furcellaria lumbricalis</i>		P		P				
<i>Gastroclonium ovatum</i>				P				
<i>Gelidium</i> sp. (spiky)	P							
<i>Gelidium pulchellum</i>	P		P				P	
<i>Gelidium pusillum</i>						P	P	
<i>Gelidium</i> sp.			P	P				
<i>Gracilaria gracilis</i>						P		
<i>Hildenbrandia crouanii</i>		P						

(A = abundant; P = present)	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay, SE	LC3 Little Colonsay SE “swimming pool”	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva Ferry	IC 1 Inch Kenneth House Bay
<i>Hildenbrandia spp.</i>	P			P		P	P	
<i>Jania rubens</i>						P		
<i>Laurencia obtusa</i>				P				
<i>Lithothamnion glaciale</i>	P	P					P	
<i>Lithophyllum incrustans</i>	P		P					
<i>Lomentaria articulata</i>	P	P	P			P		P
<i>Lomentaria clavellosa</i>				P				
<i>Mastocarpus stellatus</i>	P	P	P			P		P
<i>Mastocarpus stellatus</i> Petrocelis phase			P					
<i>Melanothamnus harveyi</i> (was <i>Polysiphonia</i>)				? (or stricta)				
<i>Melanothamnus stricta</i> (was <i>Polysiphonia</i>)							P?	
<i>Melobesia membranacea</i>		P	P			P		
<i>Membranoptera alata</i>	P		P	P		P	P	
<i>Mesophyllum lichenoides</i>				P				
<i>Odonthalia dentata</i>	P (some drift)							
<i>Osmundea osmunda</i>	P	P	P	P				
<i>Osmundea pinnatifida</i>	P	P	P	P		P		P
<i>Palmaria palmata</i>	P	P	P					
<i>Phycodryas rubens</i>	P							
<i>Phyllophora crispa</i>						P		
<i>Phyllophora pseudoceranoides</i>			P					
<i>Phymatolithon lenormandii</i>	P		P	P		P	P	?
<i>Phymatolithon maerl</i>						P		
<i>Phymatolithon purpureum</i>	P	P	P				P	
<i>Plocamium cartilagineum</i>				P		P		
<i>Plocamium lyngbyanum</i>		P	P	P		P		
<i>Plumaria plumosa</i>			P	P		P		
<i>Pneophyllum confervicola</i>		P				P on Zostera & old Chordaria		
<i>Polyides rotundus</i>		P	P	P			P	
<i>Polysiphonia brodiei</i>			P					
<i>Porphyra purpurea</i>		P						
<i>Porphyra umbilicalis</i>	P							
<i>Rhodochorton purpureum</i>			P			P		
<i>Rhodomela confervoides</i>		P	P	P		? Young		
<i>Rhodothamniella purpurea</i>		P						
<i>Rhodothamniella floridula</i>								P
<i>Schmitziella endophloea</i>						P in Cladophora pellucida		

(A = abundant; P = present)	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay, SE	LC3 Little Colonsay SE “swimming pool”	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva Ferry	IC 1 Inch Kenneth House Bay
<i>Titanoderma pustulata</i>		P	P esp. on <i>Mastocarpus</i>			P on <i>Sargassum</i> , <i>Chordaria</i> (old) + <i>Mastocarpus</i> <i>stellatus</i>		
<i>Vertebrata fucoides</i>							P	
<i>Vertebrata lanosa</i>	C/A		P			P not on lower shore but plenty higher	P	P
GREEN ALGAE								
<i>Blidingia minima</i>	P	P						
<i>Chaetomorpha ligusticum</i>			P	P				
<i>Chaetomorpha linum</i>	P							
<i>Chaetomorpha melagonium</i>	P				P			
<i>Cladophora albida</i>	P							
<i>Cladophora pellucida</i>		P	P	P				
<i>Cladophora rupestris</i>	P	P	P	P		P	P	P
<i>Cladophora sp.</i>						P		
<i>Codium fragile subsp. atlanticum</i>	P		P	P				P
<i>Codium fragile subsp. fragile</i>					P			
<i>Rhizoclonium riparium</i>	P							
<i>Ulva clathrata</i>	P			P		P	P	
<i>Ulva compressa</i>	P					?		
<i>Ulva intestinalis</i>	P				P		P	
<i>Ulva lactuca</i>	P	?	?	P		?	P	
<i>Ulva linza</i>	P							
<i>Ulva prolifera</i>	P					P?		
<i>Ulva pseudocurvata</i>						P		
<i>Ulva rigida</i>	P	P				P		
<i>Ulva sp.</i>								P
BROWN ALGAE								
<i>Alaria esculenta</i>	A	P	A		P			
<i>Ascophyllum nodosum</i>	F		A			A	P	A
<i>Chorda filum</i>						P		
<i>Chordaria flagelliformis</i>			P			P		
<i>Cladostephus spongiosus</i>		P	P	P		P	P	
<i>Colpomenia peregrina</i>				P				
<i>Dictyota dichotoma</i>								
<i>Dictyota dichotoma</i>	P	P	P	P		P		
<i>Ectocarpus fasciculatus</i>						P		
<i>Ectocarpus siliculosus</i>	P			P esp. on <i>Himanthalia</i>				

(A = abundant; P = present)	LU1 Treshnish, Lunga NW	LU2 Treshnish, Lunga NE	LC1 Little Colonsay NE	LC2 Little Colonsay, SE	LC3 Little Colonsay SE “swimming pool”	UL1 & UL2 Ulva islets	UF1 & UF2 Ulva Ferry	IC 1 Inch Kenneth House Bay
<i>Elachista fucicola</i>	P on F. serratus and F. vesiculosus		P	P		P on F. vesiculosus		
<i>Elachista scutulata</i>	P							
<i>Fucus serratus</i>	P	A	A		P	P	P	C
<i>Fucus spiralis</i> (not much rim)	A		P		P	A	P	P
<i>Fucus spiralis</i> (no rim)	P							
<i>Fucus vesiculosus</i>	C		F/C	P		A	P curly	A
<i>Halidrys siliquosa</i>				P	P	P		
<i>Himanthalia elongata</i>	P			P		P		
<i>Laminaria digitata</i>	P	A	P		P			
<i>Laminaria hyperborea</i>	P	P	P			P		
<i>Leathesia marina</i>	P			P		P		P
Little brown tufty on <i>Himanthalia</i>				P				
<i>Mesogloia vermiculata</i>				P		P Mesogloia		
<i>Pelvetia canaliculata</i>	A		P			A	A	P
<i>Pelvetia canaliculata</i> in saltmarsh							P	
<i>Pylaiella littoralis</i>						P		
<i>Ralfsia verrucosa</i>	P		P				P	
<i>Saccharina latissima</i>		P		P		P		
<i>Saccorhiza polyschides</i>	P					P		
<i>Sargassum muticum</i>			P	P		P		
<i>Scytosiphon lomentaria</i>			P			P		
<i>Sphacelaria cirrosa</i>				P				

Table 6. Species list extracted from Marine Recorder from Seasearch forms for all sublittoral sites visited during the Staffa Archipelago field trip. This information should be used in conjunction with the sublittoral site descriptions above.

Abundance follows SACFOR (Superabundant, Abundant, Common, Frequent, Occasional, Rare, P = Present. Note: combined records for dives 5 and 6 (Inch Kenneth shore dives) also include a small number of intertidal records.

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
PORIFERA													
<i>Porifera</i>			R		R								
<i>Porifera indet crusts</i>	R-O			R-A		R					R	O-F	F
<i>Grantia compressa</i>	R												
<i>Pachymatisma johnstonia</i>	R	O			P	O					R	R-O	C
<i>Dysidea fragilis</i>	O	R									R	O	
<i>Cliona celata</i>	R	R		R		R			O			R	O
<i>Polymastia boletiformis</i>				R								R	
<i>Polymastia penicillus</i>				R									
<i>Stelligera</i>				R									
<i>Stelligera rigida</i>		R											
<i>Stelligera stuposa</i>		R											
<i>Suberites carnosus</i>				R-O									
<i>Axinella</i>				O									
<i>Axinella infundibuliformis</i>				R									
<i>Phakellia ventilabrum</i>				R									
<i>Halichondria</i>	R		R										
<i>Halichondria (Halichondria) panicea</i>					P								
<i>Haliclona (Rhizoniera) viscosa</i>				R		R			O			R	
<i>Amphilectus fucorum</i>					F			R	O				
<i>Hymedesmia</i>					P								
<i>Hymedesmia (Hymedesmia) pansa</i>												R	
<i>Hymedesmia (Hymedesmia) paupertas</i>	R			O		O					R	R-O	
<i>Mycale</i>	R												
<i>Myxilla</i>		R											
<i>Raspailia (Clathriodendron) hispida</i>				R									
<i>Raspailia (Raspailia) ramosa</i>		R		O									
CNIDARIA													
<i>Anemonia viridis</i>					R-O				R	O			
<i>Urticina</i>							R						

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
<i>Urticina eques</i>				R-O									
<i>Urticina felina</i>	R	R		R	P			O	R			R	O
<i>Prostanthera simplex</i>				R-F									
<i>Metridium senile</i>		O		O									
<i>Sagartia</i>						R							
<i>Sagartia elegans</i>		R		R					O			R	
<i>Alcyonium digitatum</i>	R	O-F		R				R	R			R-O	O
<i>Alcyonium glomeratum</i>				R-C									
<i>Swiftia pallida</i>				F-C									
<i>Cerianthus lloydii</i>			R						O-F				
<i>Corynactis viridis</i>		R		R									
<i>Caryophyllia (Caryophyllia) smithii</i>	R	R-F		A-C		R	F	O	F			R	F
<i>Epizoanthus couchii</i>				R									
<i>Isozoanthus sulcatus</i>								R					
<i>Parazoanthus anguicomus</i>				O									
<i>Hydrozoa</i>		O		R								O	
<i>Eudendrium</i>		O											
<i>Hydractinia echinata</i>					R								
<i>Ectopleura larynx</i>		R											
<i>Aglaophenia</i>				R					R				O
<i>Aglaophenia pluma</i>		O											
<i>Aglaophenia tubiformis</i>												R	
<i>Aglaophenia tubulifera</i>	R	F		R		R					R	R	
<i>Gymnangium montagui</i>		R											
<i>Obelia</i>	F			O		O		R					
<i>Obelia geniculata</i>	F	A	R		R						O	F	F
<i>Halecium</i>		R											
<i>Halecium halecinum</i>				R								O	O
<i>Schizotracha frutescens</i>		R		R-O									
<i>Lafoea dumosa</i>		R											
<i>Nemertesia</i>				R									
<i>Nemertesia antennina</i>		F		R				R	R		R		O
<i>Nemertesia ramosa</i>		R-O									R		
<i>Plumularia setacea</i>		O											
<i>Abietinaria abietina</i>		O											
<i>Diphasia rosacea</i>		O											
<i>Dynamena pumila</i>				R					F				
<i>Sertularella</i>				R									
<i>Sertularella gayi</i>		F											
<i>Cyanea capillata</i>												R	
<i>Lucernariopsis campanulata</i>	O		R	O	C			F	O-F	O		R	

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
<i>Lucernariopsis cruxmelitensis</i>					O			R					
<i>Lucernaria quadricornis</i>	R												
NEMATODA													
<i>Nematoda</i>			R										
PLATYHELMINTHES													
<i>Prostheceraeus vittatus</i>				R								R	
NEMERTEA													
<i>Lineus longissimus</i>													R
ANNELIDA													
<i>Nereis</i>			R										
<i>Sabella pavonina</i>				R	R								
<i>Protula tubularia</i>												R	
<i>Serpula</i>	R												
<i>Spirobranchus</i>	O	F	O	O		O	P	R-F	F		O	R-F	O
<i>Spirorbis</i>	O				O-F		P						
<i>Chaetopterus variopedatus</i>		R						R					
<i>Lanice conchilega</i>	R	F										R	R
PHORONIDA													
<i>Phoronida</i>													O
ARTHROPODA													
<i>Caprellidae</i>			R										
<i>Jassa</i>			R										
<i>Cancer pagurus</i>	R	R	R	R-O	R	R	P	R	O		R	R	
<i>Galathea strigosa</i>	R	R				R					R	O	O
<i>Inachus</i>	R					R					R	O	
<i>Macropodia</i>	R					R			R		R	O	
<i>Munida rugosa</i>	R					O	O				R	O	
<i>Homarus gammarus</i>		R		R				R					
<i>Hyas</i>			R										
<i>Hyas araneus</i>									R				
<i>Pagurus bernhardus</i>	R		O		O								
<i>Palaemon</i>					R					R	R		
<i>Palaemon serratus</i>	R					R							R
<i>Pandalus montagui</i>												R	

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
<i>Pilumnus hirtellus</i>	R												
<i>Liocarcinus corrugatus</i>										R			
<i>Liocarcinus depurator</i>									O				
<i>Necora puber</i>	R	O	R	R		R	O		O		R	R	
<i>Carcinus maenas</i>					R-O								
<i>Isopoda</i>	R					R						O	
<i>Balanus crenatus</i>			R										
<i>Verruca stroemia</i>			R										
<i>Cirripedia</i>	O-F	F		R	O-F	O	P				O	C-A	
<i>Pycnogonida</i>	R												
MOLLUSCA													
<i>Pecten maximus</i>	R	O										R	
<i>Calliostoma zizyphinum</i>	O	O		R	P		P	R				O	
<i>Tectura virginea</i>			R				R	R					
<i>Patella</i>						O						R-O	
<i>Patella pellucida</i>			R					R	F				
<i>Patella vulgata</i>					R-O								
<i>Tricolia pullus</i>		R											
<i>Gibbula cineraria</i>	R						O	O		R		O	
<i>Gibbula umbilicalis</i>					R-O								
<i>Lacuna vineta</i>			O							R			
<i>Littorina littorea</i>					R-O								
<i>Littorina obtusata</i>					P								
<i>Rissoa</i>										S			
<i>Rissoa membranacea</i>					O			R					
<i>Trivia arctica</i>	R												R
<i>Trivia monacha</i>	R						R						
<i>Buccinum undatum</i>					R							R	
<i>Nucella lapillus</i>					P								
<i>Ocenebra erinaceus</i>					P								
<i>Nassarius reticulatus</i>		R											
<i>Cadlina laevis</i>								R					
<i>Flabellina</i>		F											
<i>Onchidoris bilamellata</i>		R-C											
<i>Crimora papillata</i>	R												
<i>Limacia clavigera</i>	R								R				
<i>Polyplacophora</i>		R											
BRYOZOA													
<i>Bryozoa</i>												O-F	
<i>Bryozoa indet crusts</i>	O-F	R-O	R	R-O		F	P		F		O-F	O-C	

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
<i>Aetea anguina</i>	R											R	
<i>Cradoscrupocellaria reptans</i>	O												
<i>Scrupocellaria</i>			R		R			R			R		
<i>Tricellaria</i>	O												
<i>Cellaria</i>	R								F				
<i>Cellaria fistulosa</i>	F												
<i>Electra pilosa</i>	O-F		O	O	O	O							
<i>Securiflustra securifrons</i>		F											
<i>Membranipora membranacea</i>	F	C	R			O		O	R				
<i>Parasmittina trispinosa</i>								R					
<i>Alcyonidium diaphanum</i>		R									R	R	
<i>Alcyonidium hirsutum</i>			R										
<i>Bowerbankia</i>									R				
<i>Cyclostomatida</i>					R								
<i>Crisia</i>	O	F		R		R			O			O	
<i>Crisia eburnea</i>		C	R		O			R					
<i>Crisidia cornuta</i>		O											
ECHINODERMATA													
<i>Asterias rubens</i>	R	O		O	R	R		R	O	R	R	R-O	O
<i>Marthasterias glacialis</i>	R	O	R	R-F	R	O	P			R	R	R-O	O
<i>Astropecten irregularis</i>					R				R-0	R			
<i>Luidia ciliaris</i>	R	R		R		O		R	R		R	R	R
<i>Henricia</i>	R	R		R		R					R	R	O
<i>Asterina gibbosa</i>					O								
<i>Antedon bifida</i>		R		F-A		F	P	R-O			R		O
<i>Leptometra celtica</i>				R									
<i>Echinus esculentus</i>	C	O-F	R	F-C		F	O	R-O	F		F	F-C	F
<i>Holothuriidae</i>								O					
<i>Holothuria (Panningothuria) forskali</i>	R	R				O					R	R	
<i>Aslia lefevrii</i>	R						P		O				R
<i>Pawsonia saxicola</i>	O			R		O	P		O			R-O	O
<i>Ophiurida</i>		R											
<i>Ophiothrix</i>	R												
<i>Ophiura</i>	O							R					
<i>Ophiura albida</i>												R	R
TUNICATA													
<i>Clavelina lepadiformis</i>		R		R				R	R				
<i>Diplosoma</i>			R		R-O								
<i>Diplosoma listerianum</i>		R			R			R	R				

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
<i>Diplosoma spongiforme</i>		R			R								
<i>Lissoclinum perforatum</i>	O	R			R		R		R				
<i>Aplidium</i>								R					
<i>Aplidium punctum</i>									R				
<i>Morchellium argus</i>		R											
<i>Pycnoclavella stolonialis</i>								R	O				
<i>Ascidia mentula</i>	R			O-C			P	R			R-O	R	
<i>Ascidiella</i>											R		
<i>Ascidiella aspersa</i>	R			R-O	R		P	R-O	C	O		R-O	F
<i>Ascidiella scabra</i>					R-O			F	O	F			
<i>Ciona intestinalis</i>	R	R		R-O									
<i>Corella eumyota</i>		R											
<i>Corella parallelogramma</i>	O			R			O	P	O		R	R	O
<i>Pyura</i>								R					
<i>Botrylloides</i>		R											
<i>Botrylloides leachii</i>									O				
<i>Botryllus schlosseri</i>	R	R	R		R				O	R	R	O	
<i>Dendrodoa grossularia</i>					R								
<i>Polycarpa</i>												R	
<i>Polycarpa scuba</i>	O												O
PISCES													
<i>Gadus morhua</i>					R								
<i>Pollachius pollachius</i>				O								C	
<i>Trisopterus minutus</i>	R										R		
<i>Molva molva</i>												R	
<i>Spinachia spinachia</i>			R		R								
<i>Ammodytes</i>	R												
<i>Callionymus</i>	R											R	
<i>Callionymus lyra</i>	R			R									
<i>Callionymus reticulatus</i>			R								R		
<i>Gobiusculus flavescens</i>	O			R	F						R	R	O
<i>Pomatoschistus pictus</i>	R		R					R					
<i>Thorogobius ephippiatus</i>	O-R	R		O				R			R	O-R	
<i>Ctenolabrus rupestris</i>	O			O				R			O	O	
<i>Labrus bergylta</i>	R			R							R	O	
<i>Labrus mixtus</i>	O			O	R						R	O-R	
<i>Pholis gunnellus</i>												R	
<i>Limanda limanda</i>			R										
<i>Pleuronectes platessa</i>		R											
<i>Zeugopterus regius</i>	R			R									
<i>Taurulus bubalis</i>		R			R			R			R	R	O

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
OCHROPHYTA													
<i>Phaeophyceae</i>										A			
<i>Cutleria multifida</i>								R				R	
<i>Desmarestia aculeata</i>	R		O	R				C			R	R	
<i>Dictyota dichotoma</i>	R		O	O	R	O		R	O	O	R-O		O
<i>Leathesia marina</i>					P								
<i>Ascophyllum nodosum</i>					C								
<i>Fucus serratus</i>					C								
<i>Fucus spiralis</i>					O								
<i>Halidrys siliquosa</i>					R			F	R				
<i>Laminariales</i>					R-O	F				R			
<i>Chorda filum</i>					R-O								
<i>Laminaria hyperborea</i>	C	C		C		F	P		A		F	O-F	O
<i>Saccharina latissima</i>	F	F	F	C	F-C			F	O	O	R		
<i>Cladostephus spongiosus</i>					R				O				
<i>Halopteris filicina</i>	R												
<i>Saccorhiza polyschides</i>	F				R-O			C	F				
RHODOPHYTA													
<i>Rhodophyta</i>			R-O	R-O	O-F	R-F	P			F		R-O	
<i>Ahnfeltia plicata</i>	R		R										
<i>Asparagopsis armata</i>										A			
<i>Bonnemaisonia asparagoides</i>	O		R					R			O	R	
<i>Ceramium</i>			R		O								
<i>Heterosiphonia japonica</i>						R-O		R			F-C		
<i>Heterosiphonia plumosa</i>	O				R	R-F		R	O		F-C	O	
<i>Acrosorium</i>	F												
<i>Acrosorium ciliolatum</i>	O					R-O		R					
<i>Cryptopleura ramosa</i>	O					R-F		R				O	O
<i>Delesseria sanguinea</i>	O	O			O	O		O-F	F		R-O	O	F
<i>Erythroglossum laciniatum</i>	R												
<i>Haraldiophyllum bonnemaisonii</i>	O												
<i>Hypoglossum hypoglossoides</i>	R		R										
<i>Membranoptera alata</i>	R							O				F	
<i>Nitophyllum punctatum</i>			R										
<i>Phycodrys rubens</i>	O					O-F					O-F	O-F	O
<i>Brongniartella byssoides</i>										O			
<i>Odonthalia dentata</i>	O						P	R	O		R		
<i>Osmundea</i>					O								

SpeciesName	1. Lunga East	2. Fladda South	3. Lunga East shore dive	4 & 7. MacQuarrie's Rock	5 & 6. inch Kenneth shore dives	8. Outer Gometra reef	9. Inner Gometra reef	10. Ulva islets dropoff	11. Ulva island maerl dropoff	12. Ulva islets shallow maerl beds	13. Staffa NE side	14. Inch Kenneth SW Humpies A	15. Inch Kenneth SW Humpies B
<i>Osmundea pinnatifida</i>					P								
<i>Pterosiphonia parasitica</i>	R												
<i>Vertebrata lanosa</i>					P								
<i>Halurus flosculosus</i>	R												
<i>Corallina</i>			R		R-O								
<i>Maerl indet</i>									R-C	S			
<i>Phymatolithon calcareum</i>					A-S								
<i>Rhodophyllis</i>				R		R						O-F	
<i>Rhodophyllis divaricata</i>												R	
<i>Dilsea carnosa</i>		R	R		R			O	O				
<i>Furcellaria lumbricalis</i>										R			
<i>Chondrus crispus</i>			O		P			O					
<i>Callophyllis laciniata</i>	F					O					R-O	R-F	
<i>Kallymenia reniformis</i>						R			O				
<i>Meredithia microphylla</i>											R		
<i>Mastocarpus stellatus</i>					P								
<i>Phyllophora</i>													
<i>Phyllophora crispa</i>	R					O							
<i>Phyllophora sicula</i>											R		
<i>Polyides rotunda</i>			R		R-O				O	R			
<i>Sphaerococcus coronopifolius</i>	O												
<i>Gracilaria gracilis</i>									O				
<i>Scinaia</i>									O				
<i>Palmaria palmata</i>	R	A							F				
<i>Rhodothamniella floridula</i>					P								
<i>Plocamium</i>					O				F				F
<i>Plocamium cartilagineum</i>		O				O-F	P				O	R-F	
<i>Plocamium lyngbyanum</i>	F	O	O	R				O		O		O	
<i>Champia parvula</i>										R			
<i>Chylocladia verticillata</i>									R				
<i>Lomentaria articulata</i>					P								
<i>Lomentaria clavellosa</i>										R			
<i>Rhodymenia</i>				R								R	
CHLOROPHYTA													
<i>Codium</i>					R								
<i>Ulva</i>			R		P			O					
TRACHEOPHYTA													
<i>Zostera (Zostera) marina</i>	C				S								

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Websites for island information

www.gometra.org

www.isleofulva.com

www.southernhebrides.com

www.thehebrideantrust.org

Porcupine Marine Natural History Society

We are an informal society interested in marine natural history and recording, particularly in the North East Atlantic region and the Mediterranean Sea. Members receive 2 bulletins a year and proceedings from scientific meetings. Porcupine MNHS welcomes anyone interested in marine biology and ecology. The Aims of Porcupine are:

- To promote a wider understanding of the biology, ecology and distribution of marine organisms.
- To stimulate interest in marine biodiversity, especially in young people.
- To encourage interaction and exchange of information between those with interests in different aspects of marine biology, amateur and professional alike.

The name “Porcupine” is taken from the naval survey vessel HMS Porcupine which was engaged on scientific expeditions in the N.E. Atlantic and Mediterranean in 1869 and 1870. She made the first ever deep ocean dredge for living creatures in 1869 resulting in the naming of the Porcupine Bank off the west coast of Ireland.

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