



CAPE WRATH 2002 SEASEARCH

Report of a SEASEARCH survey around Cape Wrath, Sutherland

May 3rd - 7th 2002

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February 2003

A report to Scottish Natural Heritage

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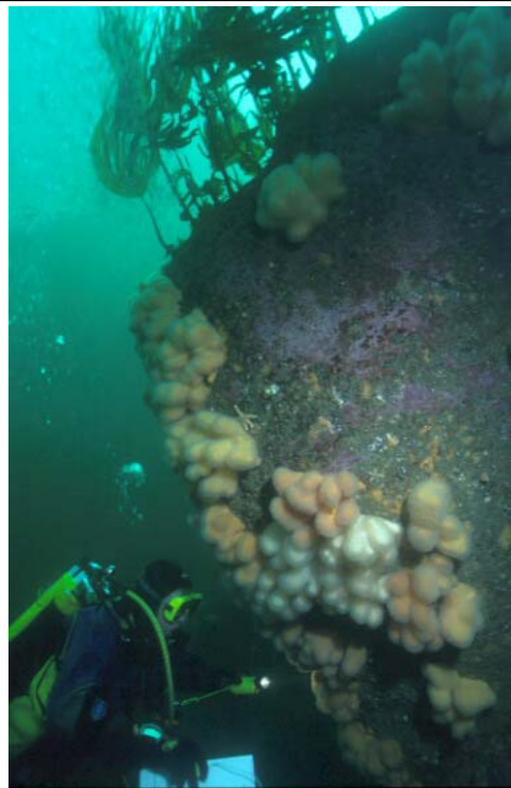
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CAPE WRATH 2002 SEASEARCH**Report of a SEASEARCH survey around Cape Wrath, Sutherland****May 3rd - 7th 2002****SYNOPSIS**

SEASEARCH is a programme of Phase 1 marine biological survey, developed by the Marine Conservation Society and the Joint Nature Conservation Committee to give sports divers an opportunity to participate in marine biological surveys, and to contribute to the information from an area by recording habitats and species. A SEASEARCH national steering group made up of conservation and diver training organisations and independent experts was established in 1999 to further develop the potential of the project. The Cape Wrath expedition was an excellent opportunity to test the SEASEARCH Surveyor and Observer forms being piloted throughout the UK in 2002.

The survey was carried out by 11 divers, mainly from Lothian Divers Sub-Aqua Club, with two from Menai SAC and two independent, between May 3rd-7th 2002. SEASEARCH recording forms were completed for 24 sites spread across a large area, and 30 of the biotopes listed in the MNCR biotope manual were recognised. Species lists and a catalogue of photographs have been compiled.

The range of biotopes recorded reflects the wave and current-exposed nature of much of this coast, with exposed rock being the main seabed type. The rugged topography of the coast made for spectacular diving, as well as providing living spaces for a variety of exposed biotopes. Dense kelp forest with abundant low-growing fauna was predominant in shallow water, with dense animal turfs on circalittoral rocks. Communities with abundant colonial ascidians were particularly common on the north coast. Vertical rock with colourful surge gully communities of anemones, sponges, ascidians, bryozoans and hydroids were found at many sites, while on less exposed vertical rock, soft corals were predominant. Circalittoral caves were explored at Cape Wrath, and had typical cave communities of gooseberry seasquirts and sponges at the entrance, with solitary ascidians and tubeworms on inner walls. Pitted limestone rock at sites outside the entrance to Loch Eriboll had a varied infauna, including abundant small banded brittlestars *Ophiactis balli*.

At the only very sheltered site, in Loch Inchar, typical extremely sheltered sealoch rock communities were seen on a sheer underwater cliff to beyond 40m, with abundant sealoch anemones *Protanthea simplex*, brachiopods and peacock fanworms.

Most sediments on this predominantly exposed coast were clean and mobile with little life, although the marbled crab *Liocarcinus marmoreus* and cuttlefish *Sepiola* sp were seen at Cape Wrath. More sheltered muddy sand in Loch Eriboll had a varied fauna, including the recently described giant naked foraminiferan *Toxisarcon alba*. Other interesting species recorded on the survey included the bright orange starfish *Stichastrella rosea*, and an unidentified 2m long shark!

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1. INTRODUCTION

1.1. Background to survey

The coastline around Cape Wrath is very exposed to both wave action and tidal currents, and prior to this survey there was little recorded marine biological information for the area outwith Loch Eriboll and Loch Inchar. This SEASEARCH survey was carried out to add to the knowledge of the underwater sites, habitats and species. The survey was planned to fill in gaps in previous surveys, and to provide a spread of sites over a large area, as well as to enjoy diving in a spectacular and remote part of the Scottish coast.



Cape Wrath, Sutherland. [Photo No: 02.50.03, S.Scott]

1.2. SEASEARCH

SEASEARCH is a project for volunteer sports divers and others to record useful and accurate observations of underwater habitats and the life they support, thus contributing to the knowledge and understanding of the marine ecology of Britain. The underwater life and scenery of Britain is still little known, even by 'experts', so divers who see the marine life at first hand can contribute invaluable information. SEASEARCH aims to capture this information by recording it on structured forms, which are designed to fit a level of expertise to suit the diver. The aim is both to

increase the knowledge and therefore the enjoyment of divers, and to contribute useful information to add to the pool of knowledge of an area.

SEASEARCH was established by the Marine Conservation Society and the Joint Nature Conservation Committee (JNCC) in the mid-80s. A SEASEARCH national steering group (NSSG) was established in 1999 to further develop the potential of the project. The NSSG members include statutory conservation bodies (Scottish Natural Heritage, English Nature, Countryside Council for Wales and JNCC), the Environment Agency, NGOs (Marine Conservation Society and the Wildlife Trusts), the Marine Biological Association (MarLIN), diver training organisations (BSAC, SSAC, PADI and SAA), the Nautical Archaeology Society and independent marine life experts. A starter pack is available giving more detail on SEASEARCH and how the surveys are planned and carried out (Scottish Natural Heritage 1995), although the forms in the original pack have been superseded by the SEASEARCH Observer and Surveyor forms developed by the NSSG. The Cape Wrath expedition was an excellent opportunity to test these forms, which were piloted throughout the UK in 2002.



Diving Am Buachaille, near Sandwood Bay, Sutherland (Site 17), from the LDSAC boat *Safina*. [Photo No: 02.51.01, S.Scott]

1.3. Previous diving surveys

Barnes et al (1996 & 1997) summarise the information sources for surveys along this coast, together with important locations and marine communities. The only major sublittoral survey in the area was an early MCS diving expedition to Loch Eriboll (Moss 1986), which found a wide range of habitats and some interesting species, particularly in bedrock habitats around the seaward entrance to the loch. These included rich animal communities on exposed and current-swept rock and on pitted limestone, and areas of cobbles and pebbles with particularly interesting algal floras. On the basis of information from this survey, Loch Eriboll was included in the list of Scottish Marine Consultation Areas (MCAs). MCA is a non-statutory designation which highlights the marine conservation interest of an area, particularly in regard to developments which might impact on this interest.

MNCR surveys in north west Scotland included a small lagoon at the head of Loch Eriboll, and a number of sites in Loch Inchar (Howson et al 1994). However prior to this SEASEARCH, there was no information from the sublittoral of most of the large stretch of open coast between Loch Inchar in the west and Loch Eriboll in the east.

2. METHODS

2.1. Survey facilities

The SEASEARCH survey was based in two large self-catering caravans at Laid, on the west side of Loch Eriboll, Sutherland. The survey team were mainly from Lothian Divers Sub-Aqua Club, based in Edinburgh, plus two from Menai Sub-Aqua Club in North Wales, and two independent. Most of the team had previous experience of SEASEARCH, and two were professional marine biologists.

Two rigid inflatable boats (RIBs) were used for diving; the Lothian club's *Safina*, and Paul and Chris Turkentine's *Osprey*. Diving cylinders were filled at Portnancon, Loch Eriboll.



Launching boats at Kyle of Durness. LDSAC boat *Safina* (left) and Paul and Chris Turkentine's boat *Osprey*, (right). [Photo No: 02.49.02, S.Scott]

2.2. Site selection

Sites were selected from Admiralty chart nos.1954, 2076 and 2503, and Ordnance Survey 1:25000 scale maps to fill in gaps between areas already surveyed, as indicated by printouts of sites from the MNCR database. In view of the exposed nature of the coast and long distances to some sites, surveying over the five days was inevitably modified by weather conditions (particularly fog), distance to sites from

launch points, potentially strong tidal streams at some sites, and the requirement for the two boats to stay within radio or visual contact for safety. However generally good weather without strong winds on some days enabled access to the most remote sites at Cape Wrath.

The offshore rock of An Garb Eilean is used as a target for the army firing range. As this was one of the planned dive sites, care was taken to establish that firing was not planned to take place during the survey!

2.3. Survey methods

Depending on weather conditions and distance to sites, boats were launched from the caravan site in Loch Eriboll, from Keoldale in the Kyle of Durness, or from the harbour at Kinlochbervie. Weather conditions during the survey were generally good, though there was a thick haar hanging off the north coast on the last day. The first day was planned as a 'shakedown' day in Loch Eriboll, to establish methods and diving practices for the rest of the survey.



Calum Duncan recording on plain of cobbles at 25m near Faraid Head (Site 10, E Clac Mhór na Faraid). [Photo No: 02.41.04, S.Scott]

On arrival at dive sites, divers worked in pairs, or occasionally as a threesome, generally working from the deepest depth upwards according to safe diving practices, and to allow maximum working time in shallow water. After descending to the deepest depth of the dive, divers began recording main habitat features and prominent species, using underwater writing boards. Ascending up the slope in a predetermined direction, usually directly towards the shore, they stopped to describe different habitats, noting the depth at which these changed. Species were recorded according to the diver's capabilities. The information was later transferred to SEASEARCH

recording forms (Appendices VI & VII). SEASEARCH surveys are now tiered into two levels. Observer level requires the completion of a simple form which focusses on seabed cover types, while Surveyor level records habitats and species in more detail on more structured forms.

Few specimens were collected, as logistics on this survey, with long travel times, did not allow time for identification. However biologists on the survey were able to assist with identifying specimens in the field. Underwater photographs were taken by 4 survey members (Sue Scott, Keith Pritchard, Paul Turkentine and Paul Tyler).

2.4. Position fixing

Most positions were taken with GPS on the RIBs. Positions for Sites 1, 3, and 7 were taken from Admiralty charts. The position for Site 9 was taken from the 1:50,000 OS map (Sheet 9)

2.5. Data analysis

After the survey, depths on the recording forms were corrected relative to Chart Datum (to the nearest metre) using a Windows tidal programme with adjustments. Biotope codes according to the Marine Nature Conservation Review (MNCR) manual (Connor et al, 1997) were assigned to habitat descriptions where possible. Additional species identified from photographs were added to the species lists.



Rugged rock slope, typical of much of the survey area, exposed to waves and tidal streams with kelp forest and the starfish *Henricea sanguinolenta*. (Site 21, Stac Cló Kearvig). [Photo No: 02.44.17, S.Scott]

3. RESULTS

Recording forms were completed for 24 sites. Site locations are marked on Figure 1 and listed in Appendix I. 30 biotopes (Connor, et al. 1997) were assigned (see below) to habitats at the sites surveyed. These are listed in Appendix II, and in Appendix III by site. The species identified on the survey are listed in Appendix IV. A set of photographs from the survey has been mounted and catalogued (Appendix V).

Sites surveyed were predominantly exposed and rocky, with bedrock and large boulders. In places the topography made for spectacular diving, with vertical faces and surge gullies carrying a range of exposed surge communities. Natural arches and pitted limestone with a diverse infauna was a particular feature at the entrance to Loch Eriboll, and deep sublittoral caves were explored at Cape Wrath.



Pitted limestone with small banded brittlestars *Ophiactis balli*, common brittlestars *Ophiothrix fragilis*, mollusc siphons and encrusting brown and coralline seaweeds. (Site 2, Eilean Hoan Mid 1). [Photo No: 02.38.22, S.Scott]

More sheltered rock communities were found within Loch Eriboll, and typical extremely sheltered sealoch life at one site in Loch Inchar, where a vertical cliff continued down to below 40m.

At most sites rock slopes ended in sediments within diving depths, and sand-scoured or sand-covered bedrock was frequent. Sediments were generally coarse and clean on the open coast, and created scoured communities where wave action and strong tides

moved sand and shell gravel against adjacent rock. Sediments were more mixed and with more mud content in the innermost sites in Loch Eriboll.

4. DISCUSSION

4.1 Assignment of biotope codes

Attempts to assign biotope codes to habitats according to the descriptions in the MNCR biotope manual (Connor et al 1997), as usual proved difficult in many cases. 9 of the 30 biotopes could only be assigned at the primary or very general level (for example EIR – exposed infralittoral rock), while 9 were given a further secondary classification (for example EIR.SG – robust faunal cushions and crusts in surge gullies). Only 12 biotopes were assigned a detailed, tertiary biotope code (for example, EIR.SG SCAs.DenCla – *Dendrodoa grossularia* and *Clathrina coriacea* on wave-surfed vertical infralittoral rock) This was partly because SEASEARCH data is rarely adequate for this purpose, particularly when accurate species identifications are required (for example, for the species of kelp). Data recorded on the Observer level SEASEARCH forms in particular was generally not adequate for assigning codes beyond the first level. Many of the sediment biotopes could not be given a biotope code because the biotope descriptions rely on identification of infauna. Thus the biotope codes should be taken as an indication only.

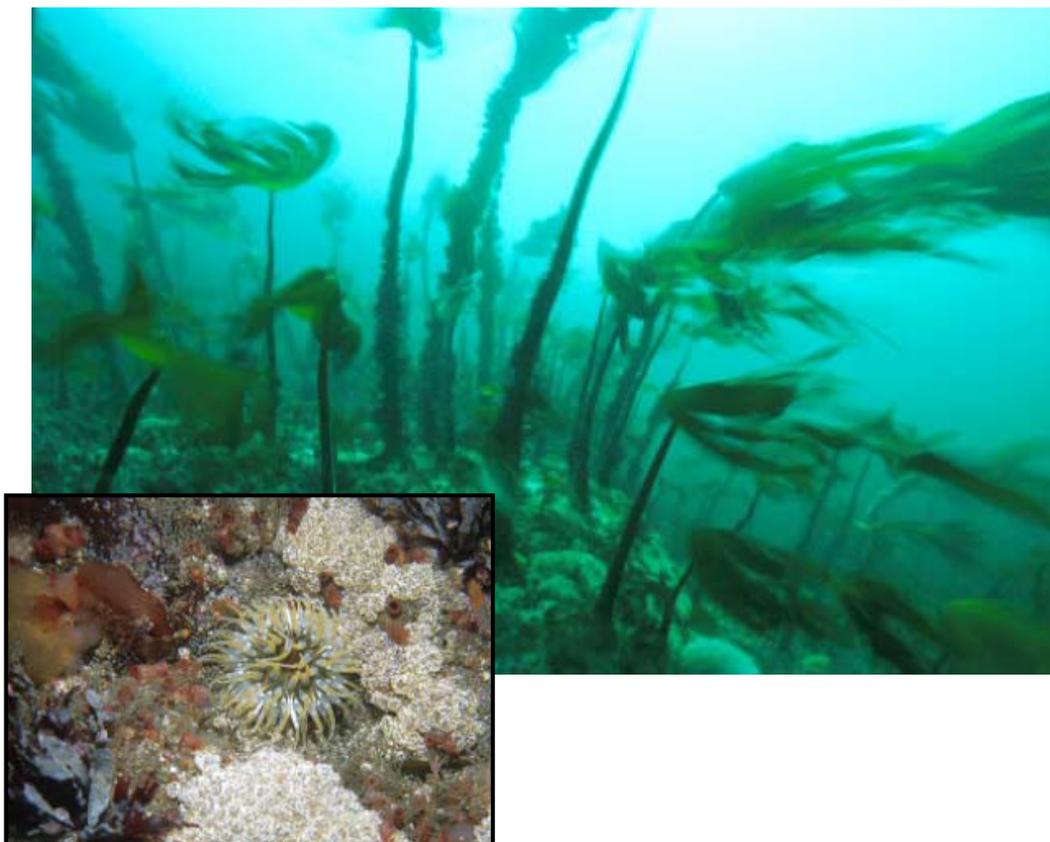


Dense gooseberry seasquirts *Dendrodoa grossularia* and white lacy sponge *Clathrina coriacea* form an easily recognised biotope (EIR.SG SCAs.DenCla) in surge gullies or cave entrances at exposed sites. (Site 15, S Stac an Dunain, Cape Wrath). [Photo No: 02.38.22, S.Scott]

4.2 Distribution of biotopes in the survey area.

4.2.1. Infralittoral rocky biotopes

Exposed infralittoral rock (EIR) was present at all the open coast sites, but not always surveyed because of swell or lack of dive time. In shallow water, bedrock slopes and large boulders were typically covered with dense kelp forest, with a rich understory of cushion fauna, red seaweeds and coralline crusts (EIR.KFaR). The faunal constituents varied from site to site, but sandy polyclinid ascidians were particularly abundant at the most exposed and tideswept sites on the north coast, and in the north Minch. Other animals commonly seen beneath the kelp included dahlia anemones *Urticina felina*, *Sagartia elegans* anemones, jewel anemones *Corynactis viridis*, encrusting sponges, small hydroids and encrusting orange bryozoans. The red seaweeds *Delesseria sanguinea*, *Odonthalia dentata* and *Plocamium cartilagineum* were particularly abundant in shallow water. At several sites, kelp stipes were enveloped in large breadcrumb sponges *Halichondria panicea*, and at Sites 19 & 22, clumps of mussels *Mytilus edulis* were attached to the upper part of kelp stipes.



Wave-exposed and tideswept *Laminaria hyperborea* kelp park at Stac Cló Kearvaig (Site 21). Inset: typical life on kelp forest/park floor at exposed sites, including dahlia anemone *Urticina felina*, sandy colonial ascidians, solitary ascidian *Polycarpa scuba*, encrusting orange and small bushy bryozoans, foliose and encrusting red seaweeds. (Site 15, S Stac an Dunain, Cape Wrath). [Photo Nos.02.44.13, 02.42.16, S Scott]

At these exposed sites, wave-surfed infralittoral communities were common in surge gullies (EIR.SG) or on vertical rock faces too steep for kelp (IR.FaSwV). Life in these high-energy habitats again varied from site to site, and communities were patchy. In very shallow water above 5m sponges and red algae were often dominant, while in the deeper infralittoral anemones (*Sagartia elegans* and jewel anemones *Corynactis viridis*), the oaten-pipe hydroid *Tubularia indivisa*, short hydroid/bryozoan turfs, sponges, colonial ascidians and coralline crusts were found in varying abundance.



Communities on exposed vertical rock. Top: Anemones *Sagartia elegans*, encrusting sponges and oaten-pipe hydroid *Tubularia indivisa* on infralittoral surged bedrock. (Site 15, S Stac an Dunain, Cape Wrath) Bottom: several species of colonial ascidians together with orange encrusting bryozoans and pink coralline seaweed crusts. (Site 17, W of Am Buachaille). [Photo Nos. 02.42.27, 02.43.11, S Scott]

At the moderately exposed sites inside Loch Eriboll (Sites 5,6,7,8), shallow vertical rock was often dominated by soft corals *Alcyonium digitatum*, while just above the upper limit of kelp, vertical rock on the lower shore and sublittoral fringe at Sites 6 and 8 was covered with dense mussels *Mytilus edulis*. At Site 12, on the west coast, tideswept vertical rock was covered with sponges, ascidians, hydroids and bryozoans as well as soft corals (IR.FaSwV AlcByH), grading lower down an overhanging cliff into circalittoral communities dominated by soft corals (ECR.Alc).



Above: vertical rock in the infralittoral fringe with dense mussels *Mytilus edulis*.

Left: soft corals *Alcyonium digitatum* and kelp *Laminaria hyperborea* on vertical rock. (Both photos Site 6, White Head, Loch Eriboll).

[Photo Nos. 02.39.28, 02.39.18, S Scott]

The limestone bedrock on the south side of Eilean Hoan (Sites 1,2,3 & 4), a moderately exposed location outside the entrance to Loch Eriboll, was highly pitted in places, providing refuge for a wide variety of small animals, including large numbers of the small banded brittlestar *Ophiactis balli*, smaller numbers of the crevice brittlestar *Ophiopholis aculeata*, pea crabs and the siphons of molluscs and ascidians (see photo in section 3). Other animals of note at Site 2 were the hairy hermit crab *Pagurus cuanensis*, in the shells of the large gastropod *Colus gracilis*, and the round crab *Atelecyclus rotundatus*.

At Site 7, inside Loch Eriboll, infralittoral bedrock and large boulders also supported kelp, but the rock surfaces in increased shelter here were grazed by urchins, leaving coralline crusts as the predominant cover (MIRGzK LhypGz). Coralline crusts were also common where rock was scoured by sand in the infralittoral at exposed sites. At Site 17, characteristic red seaweeds tolerant of sand cover and scour grew on upward-facing bedrock covered with coarse clean sand and shell gravel (MIR.SedK PolAhn), including *Phyllophora truncata*, *Phyllophora crispa*, *Ahnfeltia plicata* and *Polyides rotundus*.



Disturbed and urchin-grazed bedrock and boulders, with sparse kelp, and rock surfaces covered with encrusting pink coralline and brown seaweeds, encrusting orange bryozoans, and keelworms. A common sunstar *Crossaster papposus* is in the foreground. (Site 10, E Clac Mhór na Faraid). [Photo No. 02.41.23, S Scott]

At the only very sheltered site surveyed (Site 24, in Loch Inchard), dense sugar kelp *Laminaria saccharina* covered steep bedrock and boulders in the infralittoral (SIR.K Lsac.Ft), typically for a sheltered sealoch situation.

4.2.2. Circalittoral rocky biotopes

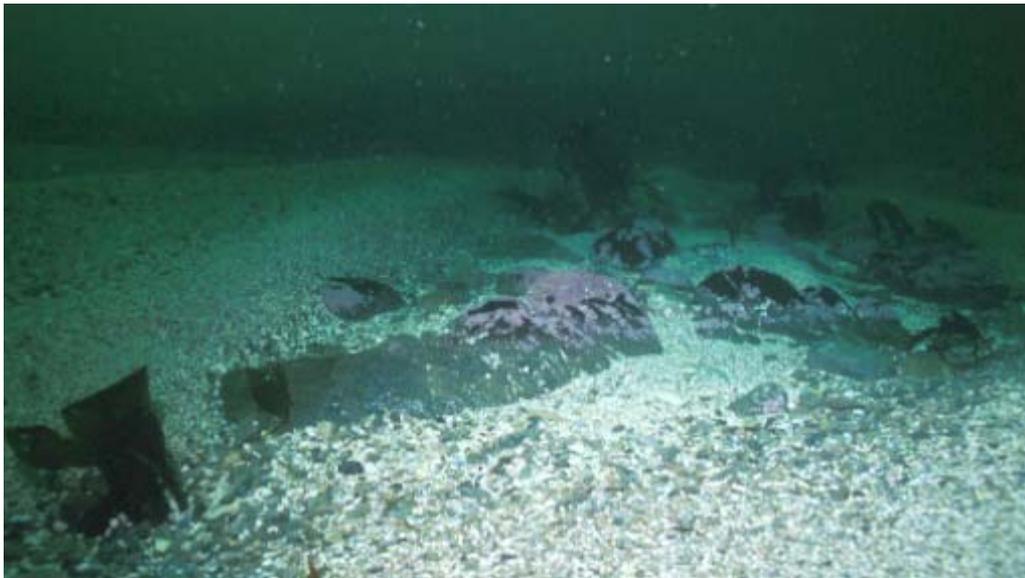
In deeper water on the north coast, similar high-energy-type communities of short mixed animal turfs similar to those found on infralittoral vertical rock were often continued onto circalittoral rock slopes, maintained off the north coast by strong tidal currents. Ascidians and hydroid/bryozoan turfs were often dominant. At An Garbh Eilean (Site 9), which sticks out into the Pentland Firth, the oaten-pipe hydroid vertical faces (ECR.BS BalTub), while in deeper water and at other sites on the north coast, rock surfaces often had large amounts of sandy polyclinid ascidians, hydroids and bryozoans, with featherstars on vertical rock. The bushy bryozoans *Securiflustra securifrons* and hornwrack *Flustra foliacea* were also common along the north coast, particularly where the rocks were subject to some sand influence, and dahlia anemones *Urticina felina* were common in hollows and crevices.



Dense stands of the oaten pipe hydroid *Tubularia indivisa* with red algae on very tideswept upper circalittoral rock at An Garbh Eilean (Site 9). [Photo No.02.40.07, S Scott]

A number of sites on the west coast were in the lee of small rocks and islands, as well as being in a slightly more sheltered and less tideswept position in the north Minch, and circalittoral communities reflected the less extreme water movement. Circalittoral rock slopes from Am Balg southward became progressively less dominated by colonial ascidians, and rock slopes became more grazed, with featherstars and less dense turfs of small hydroids becoming more frequent particularly on steep rock (CR.FaV Ant). Abundant soft corals *Alcyonium digitatum* grew on vertical rock (ECR.Alc).

Cobbles and pebbles embedded in sediments were found at the base of the rock slope at 21.5m at Site 10, with scour-tolerant fauna and flora. Nearby bedrock outcrops were scoured and probably periodically covered with sand, and rock surfaces covered with encrusting brown and coralline algae. There were patches of black brittlestars *Ophiocomina nigra*, with dahlia anemones *Urticina felina* in crevices.



Bedrock outcrops in sand and other mobile materials were often severely scoured at current-swept sites, as at E Clac Mhór na Faraid (Site 10 above) [Photo No. 02.41.20]. Typically, only encrusting organisms such as coralline seaweeds and keelworms *Pomatoceros* sp survive (centre, Site 17, W of Am Buachaille) [Photo No. 02.43.17]. A few dahlia anemones *Urticina felina* and black brittlestars *Ophiocomina nigra* were also often found (left, Site 10) [Photo No.02.41.10]. Some red seaweeds typically grow on sand-covered rocks, including *Phyllophora truncata* (Site 17, right) [Photo No. 02.41.20, all photos S Scott]

At Cape Wrath (Site 15), two caves (CR.Cv) at the base of the rock slope were explored. One was only 2-3m high but extended at least 20m deep into the cliff. Its walls were encrusted with keelworms *Pomatoceros* sp, spirorbid tubeworms, the solitary ascidian *Ascidia mentula*, and possibly brachiopods *Neocrania anomala* (identified from photographs). Abundant burrowing anemones *Cerianthus lloydii* inhabited the sand floor in the inner part of the cave, which had a blind end and was not affected by surge. A small unidentified eel-like fish was seen in the back of this cave. The second cave was quite different in character, being more open and cathedral-like, more than 8m high and around 15m deep. This cave was not surveyed in detail. At the entrances to the caves, there were dense patches of the gooseberry seasquirt *Dendrodoa grossularia* on vertical rock, together with the white sponge *Clathrina coriacea*, typical of surged cave entrances (EIR.SG SCAs.DenCla) (see photo Section 4.1).



The solitary ascidian *Ascidia mentula*, spirorbid tubeworms, keelworms *Pomatoceros* sp and thin encrusting sponges on cave walls (Site 15, S Stac an Dúnain, Cape Wrath). [Photo No. 02.42.25, S Scott]

At many of the sites surveyed there were well-developed crevices and fissures, with interesting fauna including lobsters *Homarus gammarus*, squat lobsters *Galathea* spp, and sea cucumbers *Pawsonia saxicola*. A variety of fish were seen inhabiting fissures & crevices, including three-bearded rockling *Gaidropsaurus vulgaris*, northern rockling *Ciliata septentrionalis*, ling *Molva molva*, lemon sole *Microstomus kitt*, Yarrell's blenny *Chirolophis ascanii*, leopard spotted goby *Thorogobius ephippiatus*, and possibly the red blenny *Parablennius ruber* (see below).

The very sheltered bedrock cliff inside Loch Incharh plunged sheer from sea level to over 40m, and was completely different in character from the other sites. Here there was classic sheltered rock sealoch life on vertical and overhanging rock, with the sealoch anemone *Protanthea simplex* very abundant, together with brachiopods *Neocrania anomala* and *Terebratulina retusa*, peacock fanworms *Sabellina pavonia*, tubeworms *Serpula vermicularis*, parchment worms *Chaetopterus variopedatus*, and solitary ascidians *Ascidia mentula* (SCR.BrAs NeoPro). Above 21m, featherstars were common (SCR.BrAs AntAsH).



Sealoch anemones *Protanthea simplex* and red cushion star *Porania pulvillus* on extremely sheltered deep vertical rock in Loch Incharh (Site 24, E Craig Mhor). [Photo No. 02.46.04, S Scott]

4.2.3. Sediment biotopes

Sediments in much of the survey area were clean and mobile, at the base of rock slopes or filling the base of gullies. In many places sand and shell gravel was formed into ripples and waves, and these mobile sediments typically had little visible life. Sand eels *Ammodytes* sp emerged from the sand at two sites, and at Cape Wrath (Site 15) the marbled swimming crab *Liocarcinus marmoreus* (see section 4.3) and small cuttlefish *Sepiolo* sp were seen. Burrowing brittlestars *Amphiura* sp were reported in sand at two more sheltered sites in the lee of Eilean Hoan (Sites 3 and 4).

In the increased shelter of Loch Eriboll, there was much more life in slopes of muddy sediment, extending from 7m to beyond 29m. Epifauna included a variety of typical species including hermit crabs, brown crabs *Cancer pagurus*, burrowing anemones

Cerianthus lloydii, and razor shells *Ensis* sp preyed upon by common starfish *Asterias rubens*. The recently described giant foraminiferan *Toxisarcon alba* was found at two adjacent sites in Loch Eriboll (Sites 6 and 7) (see below), and the uncommon pelican's foot shell *Aphorrais pes-pellicani* at Site 5.



Brown crab *Cancer pagurus* on steep slope of muddy sand with shell fragments and diatom film in Loch Eriboll (Site 6, Whitehead SE 2) [Photo No: 02.39.05, S Scott]

4.3. Interesting species

A number of animals worthy of further note were recorded on the survey.

Unidentified shark: A rare underwater sighting of a large shark by divers caused much speculation as to species, as well as stimulating the release of a considerable amount of adrenalin! The shark, which is still not positively identified, was around 2m long, and described as classic shark-shaped, resembling a great white. The shark species seen most often by divers in Scotland is the porbeagle, but this shark was apparently not noticeably deep bodied, a characteristic feature of the porbeagle. Mako is another possibility; whatever the species, the sighting added considerably to the excitement of diving Cape Wrath! (Site 20a).

Basking shark: Seen near site 18.

Red blenny: The red blenny *Parablennius ruber* has been identified recently from British waters by Paul Kay, with records from St Kilda, Islay and Eire. The red blenny closely resembles the tompot blenny *Parablennius gattorugine*, with a similar tuft of tentacles over the head, but the red blenny is a brighter red colour, and the male fish has a distinctive blue spot on the dorsal fin when in breeding condition. However the two species may be difficult to distinguish when seen in their usual habitat, in a crevice. The occurrence of the red blenny on the west coast of Scotland probably

explains some recent sightings of slightly odd and brightly coloured 'tompots', including at Site 17.

Stichastrella rosea: This bright orange starfish is uncommon, and apparently a northern species in Britain (Site 22).



Starfish *Stichastrella rosea* (left) and marbled swimming crab *Liocarcinus marmoreus* (right).
[Photo Nos. 02.45.17, 02.42.10. S. Scott]

Squid eggs: Typically attached to kelp stipes on rocks scoured by sand. (Sites 1, 10, 14 and 17).

Liocarcinus marmoreus: The marbled swimming crab is rarely recorded, but appears to be typical of clean shell sand at exposed sites. Found at Cape Wrath (Site 15).

Phellia gausapata: An uncommon anemone, typically found in very exposed vertical rock surge communities (Site 20a).

Thuiaria thuja: The bottlebrush hydroid is a northern hydroid common on the north and east coasts of Scotland, on this survey it was found extending into the north Minch to sites around Am Balg (Sites 13, 16 and 17)

Toxisarcon alba: This giant naked foraminiferan was found in muddy sediments in Loch Eriboll. This strange organism resembles a small white fungus-like branched mass up to 5cm across with an outer organised network or 'pepperpot' of sand grains. These fragile organisms are more typical of sediments in deep water, where there is little disturbance, but survive in relatively shallow water in the shelter of sealochs. Noted from other sealochs by the MNCR and SEASEARCH surveys, *Toxisarcon alba* has only recently been recognised and described (Wilding 2002). Its specific name *alba* refers both to its colour (white) and its distribution – so far it has only been found in Scottish sealochs. (Sites 6 and 7).

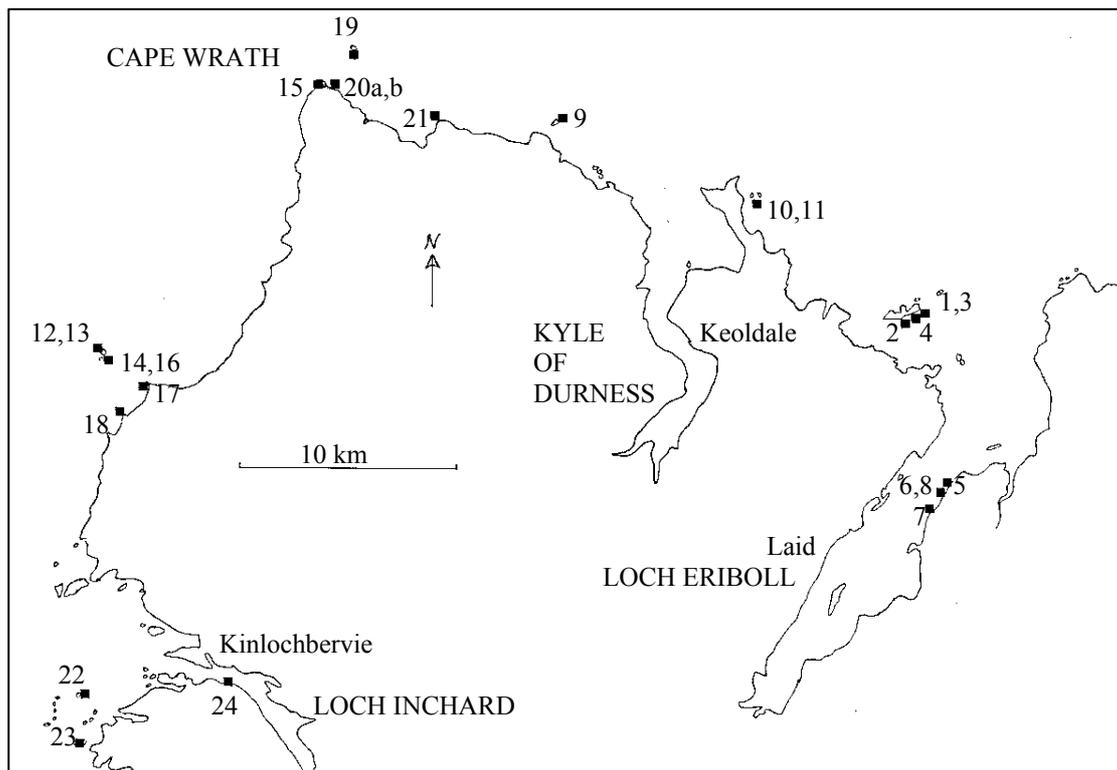
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7. ACKNOWLEDGEMENTS

The hard work of the survey organisers Neil Cowie and Calum Duncan made the survey run smoothly, and we are grateful for the use of Paul & Chris Turkentine's boat which was invaluable in reaching the more remote sites in safety. Most of all thanks to the dive team for cheerfully filling in SEASEARCH forms, compiling much useful data.

Figure 1. Location of sites surveyed around Cape Wrath, Sutherland. Names and positions of sites are listed in Appendix I.



APPENDIX I

List of sites surveyed

Most site positions are taken from GPS; positions for Sites 1, 3 and 7 were taken from Admiralty charts; position for Site 9 taken from OS map. Depths are corrected to below Chart Datum (BCD)

Site No	Site name	Position Lat/Long (source – chart, GPS)	Date	Divers	Dive time (mins)	Depths (m) BCD
1	Eilean Hoan SE 1	58°34.110'N, 4°39.820'W	03.05.02	NC, KP	46	3 - 18
2	Eilean Hoan Mid 1	58°33.970'N, 4°40.057'W	03.05.02	SS, DJ, CD	50	2 - 19
3	Eilean Hoan SE 2	58°34.100'N, 4°39.880'W	03.05.02	AF, MH	31	0 - 18
4	Eilean Hoan Mid 2	58°33.908'N, 4°40.241'W	03.05.02	CT, PTu	45	9 - 18
5	Whitehead SE 1	58°30.950'N, 4°39.000'W	03.05.02	MH, PTy		6 - 22
6	Whitehead SE 2	58°30.810'N, 4°39.124'W	03.05.02	SS, DJ, CD	45	+3 - 29
7	Tor Mor Cliff	58°30.600'N, 4°39.320'W	03.05.02	NC, KP	40	1 - 22
8	Whitehead SE 3	58°30.807'N, 4°39.114'W	03.05.02	CT, PTu	40	0 - 10
9	NE An Garbh Eilean	58°37.2'N, 5°52.2'W	04.05.02	CD, SS, FF, NC, DJ, PTu, CT	38	8 - 32
10	E Clac Mhór na Faraid 1	58°35.822'N, 4°45.432'W	04.05.02	CD, SS	48	12 - 23
11	E Clac Mhór na Faraid 2	58°35.861'N, 4°45.395'W	04.05.02	FF, PTy	30	16 - 23
12	NW Am-Balg 1	58°32.264'N, 5°07.221'W	05.05.02	FF, DJ	36	0 - 23
13	NW Am-Balg 2	58°32.742'N, 5°07.210'W	05.05.02	CD, PTy	31	29 - 23
14	SE Am-Balg 1	58°32.665'N, 5°07.013'W	05.05.02	KP, AF	34	4 - 19
15	S Stac an Dúnain	58°37.575'N, 5°00.285'W	05.05.02	NC, MH, SS, PTu, CT	54	6 - 24
16a 16b	SE Am-Balg 2 SE Am-Balg 3	58°32.600'N, 5°07.142'W to 58°32.665'N, 5°07.013'W	05.05.02	DJ, CD, PTy KP AF	38	?2 - 23
17	W of Am Buachaille	58°32.189'N, 5°07.737'W to 58°32.209'N, 5°05.882'W	05.05.02	NC, MH, SS	60	5 - 13
18	Rubha nan Cúl Gheodhachan	58°31.801'N, 5°06.247'W to 58°31.913'N, 5°06.407'W	05.05.02	CT, PTu	45	10 - 18
19	Duslic Rock	58°38.122'N, 4°59.227'W	06.05.02	NC, CD, PTy	36	10 - 29
20a	N Geodha'an Fhvarain 1	58°37.628'N, 4°59.795'W	06.05.02	MH, AF, NC	60	7 - 25
20b	N Geodha'an Fhvarain 2	58°37.662'N, 4°59.791'W	06.05.02	CT, PTu	20	22 - 31
21	Stac Cló Kearvaig	58°37.082'N, 4°56.384'W	06.05.02	SS, DJ	30	15 - 25
22	Sgeir Daimh East	58°26.547'N, 5°07.244'W	07.05.02	SS, MH, NC	50	5 - 32
23	Eilean na Sumald	58°25.827'N, 5°07.505'W	07.05.02	Ptu, CT	45	4 - 32
24	E Craig Mhor, Loch Inchar	58°26.966'N, 5°02.040'W	07.05.02	SS, MH, NC	55	0 - 37

APPENDIX II

Biotores recorded by the survey

Biotope codes follow those in Connor et al (1997). Depths are in metres below Chart Datum.

Biotope code		Biotope title	Sites & depth	Substratum & features	Depth range
EIR		Exposed infralittoral rock (and other hard substrata)	1(3-18), 6(+3-+1), 11(17-20), 14(9-19), 16(16-19)	Bedrock slopes & boulders; vertical faces; pitted limestone; arches	+3-20
EIR.KFaR		Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)	12(+2-6), 13(4-7), 15(17-22), 17(5-11), 18(3-9), 20a(5-12.5), 21(10-18), 22(5-16), 23(4-13)	Bedrock & boulders, vertical faces, some sites tideswept	+2-22
EIR.KFaR	LhypFa	<i>Laminaria hyperborea</i> forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock	19(10-22)	Tideswept bedrock	10-22
EIR.SG		Robust faunal cushions and crusts (surge gullies and caves)	15(18-24), ?22(5-9)	Steep and vertical rock	18-24
EIR.SG	SCAs.DenCla	<i>Dendrodoa grossularia</i> and <i>Clathrina coriacea</i> on wave-surged vertical infralittoral rock	15(20-23)	Vertical rock at cave entrance	20-23
EIR.SG	SCAnTub	Sponge crusts, anemones and <i>Tubularia indivisa</i> in shallow infralittoral surge gullies	9(8-16), ?20a(15-20),	Vertical cliff; vertical surge gully walls	5-20
MIR		Moderately exposed inralittoral rock	2(13-14), 3(0-17), 4(9-?)	Bedrock; pitted limestone	0-17
MIR.KR	Lhyp	<i>Laminaria hyperborea</i> and foliose red seaweeds on moderately exposed infralittoral rock	16(0-6)	Angular bedrock	0-6
MIR.GzK	LhypGz	Grazed <i>Laminaria hyperborea</i> with coralline crusts on infralittoral rock	7(7-13)	Bedrock & large boulders	7-13
MIR.SedK	PolAhn	<i>Polyides rotundus</i> , <i>Ahnfeltia plicata</i> and <i>Chondrus crispus</i> on sand-covered infralittoral rock	17(10-14)	Sand-scoured rock	10-14
SIR.K	Lsac.Ft	<i>Laminaria saccharina</i> forest on very sheltered upper infralittoral rock	24(0-8)	Boulders & steep bedrock	0-8

Biotope code		Biotope title	Sites & depth	Substratum & features	Depth range
IR.FaSwV		Fauna and seaweeds (shallow vertical rock)	2(8-13), 5(0-7), 6(+1-6), 7(+3-7), 8(0-10), 9(8-16), 10(12-19), 14(4-9), 17(6-13), 18(9-18), 22(5-9)	Vertical bedrock; vertical sides of large boulders; pitted limestone; crevices & ledges	+3-19
IR.FaSwV	AlcByH	<i>Alcyonium digitatum</i> and a bryozoan, hydroid and ascidian turf on moderately exposed vertical infralittoral rock	?12(6-23)	Vertical & overhanging bedrock	6-23
ECR		Exposed circalittoral rock	9(16-26), 10(20-22), 11(20-23), 12(23), 22(15-24),	Bedrock & boulders; gullies; scoured rock	15-26
ECR.EFa		Faunal crusts or short turfs (wave-exposed rock)	13(23-29), 15(18-24), 19(14-29),	Bedrock, large boulders & cobbles; tideswept	14-29
ERC.Alc		<i>Alcyonium</i> -dominated communities (tideswept/vertical)	16(5-23)	Bedrock & large boulders	5-23
ECR.BS		Barnacle, cushion sponge and <i>Tubularia</i> communities (very tide-swept/wave-sheltered)	?20a(22-25)	Bedrock, boulders & cobbles; tideswept	
ECR.BS	BalTub	<i>Balanus crenatus</i> and <i>Tubularia indivisa</i> on extremely tideswept circalittoral rock	?9(16-26),	Sloping bedrock	16-26
MCR		Moderately exposed circalittoral rock	22(15-24)	Bedrock slopes	15-24
MCR.ByH		Bryozoan/hydroid turfs (sand influenced)	20b(22-31), 22(23-32)	Bedrock cliff; bedrock & boulders	22-32
MCR.As		Ascidian communities (silt-influenced)	?9(16-26), 21(15-25)	Sloping bedrock; tideswept	15-26
SCR.BrAs	AntAsH	<i>Antedon</i> spp, solitary ascidians and fine hydroids on sheltered circalittoral rock	24(8-21)	Vertical bedrock; overhangs & fissures	8-21
SCR.BrAs	NeoPro	<i>Neocrania anomala</i> and <i>Protanthea simplex</i> on very sheltered circalittoral rock	24(21-37)	Vertical bedrock; overhangs & fissures	21-37
CR.FaV	Ant	<i>Antedon bifida</i> and a bryozon/hydroid turf on steep or vertical circalittoral rock	13(23-29), 23(13-32)	Steep bedrock & boulders; vertical faces	13-32
CR.Cv		Caves and overhangs (deep)	15(22-24)	Caves in bedrock	22-24
IGS		Infralittoral gravel and sand	8(10), 17(6-14), 18(18),	Clean shell sand between rock outcrops	6-18
CGS		Circalittoral gravel and sand	3(16-18), 4(?-18), 10(18-22),	Coarse clean sediment; ripples	16-29

Biotope code		Biotope title	Sites & depth	Substratum & features	Depth range
			11(23), 13(28-29), 14(19), 15(24), 19(25-29)	&waves	
CMS		Circalittoral muddy sand	5(7-17), 6(6-29), ?7(13-22)	Sand, shell gravel	6-29
IMX		Infralittoral mixed sediments	2(14-18)	Sand, shell gravel & pebbles	14-18
CMX		Circalittoral mixed sediments	10(22)	Cobbles & pebbles in sediment	22

APPENDIX III

Biotores recorded at each site

Biotope codes follow those in Connor et al (1997). Depths are in metres below Chart Datum.

Site No	Biotope		Depth	Substratum & features
1	EIR		3-18	Rugged limestone bedrock with arches & gullies
2	IR.FaSwV		8-13	Steeply sloping pitted limestone with deep crevices
2	MIR		13-14	Irregular pitted limestone
2	IMX		14-18	Sand, shell gravel & pebbles, with scoured boulders
3	MIR		0-17	Bedrock
3	CGS		16-18	Sand & shell gravel with <i>Amphiura</i> sp
4	MIR		9-?	Limestone
4	CGS		?-18	Sand with <i>Amphiura</i> sp
5	IR.FaSwV		0-7	Vertical limestone with <i>Alcyonium digitatum</i>
5	CMS		7-17	Sandy mud with varied fauna
6	EIR		+3-+1	Vertical bedrock with mussels & barnacles
6	IR.FaSwV		+1 to 6	Vertical rock with crevices
6	CMS		6-29	Muddy slope with shell gravel & dead shells
7	IR.FaSwV		+3-7	Vertical bedrock with overhangs & ledges
7	MIR.GzK	LhypGz	7-13	Slope of bedrock & large angular boulders
7	CMS		13-22	Mud slope with foraminiferans <i>Toxisarcon alba</i>
8	IR.FaSwV		0-10	Vertical pitted rock with crevices & <i>Alcyonium</i>
8	IGS		10	Sand & crushed shell
9	?IR.FaSwV ?EIR.SG	SCAn.Tub	8-16	Vertical cliff covered with sponges, ascidians & anemones. Ledges with kelp
9	?ECR.BS ?MCR.As	?BalTub	16-26	Sloping bedrock with dense <i>Tubularia</i> , bryozoans & ascidians
9	ECR		16-26	Gullies with angular cobbles & pebbles (bombed)
10	IR.FaSwV		12-19	Steep bedrock & huge boulders with vertical faces
10	ECR		20-22	Scoured bedrock outcrops in shell gravel & sand
10	CGS		18-22	Waves of coarse clean shell gravel & sand
10	CMX		22	Level plain of cobbles & pebbles in sediment
11	EIR		17-20	Bedrock & boulders
11	ECR		20-23	Bedrock & boulders
11	CGS		23	Sand & shell gravel
12	EIR.KFaR		+2-6	Vertical & overhanging rock with kelp
12	IR.FaSwV	?AlcByH	6-23	Vertical & overhanging rock with abundant fauna
12	ECR		23	Scoured boulders & cobbles at base of cliff
13	ECR.EFa		23-29	Exposed & tideswept bedrock & large boulders
13	CR.FaV	Ant	23-29	Vertical faces of tideswept bedrock & boulders
13	CGS		28-29	Pockets of rippled coarse shell gravel & sand
13	EIR.KFaR		4-7	Rugged bedrock with kelp forest
14	IR.FaSwV		4-9	Vertical rock with <i>Alcyonium</i>
14	EIR		9-19	Bedrock slope with encrusting coralline algae
14	CGS		19	Sand
15	EIR.KFaR		17-22	Steep bedrock slope with kelp & short animal turf
15	EIR.SG		18-24	Steep & vertical rock with patchy surge communities
15	EIR.SG	SCAs.DenCla	20-23	Vertical rock at cave entrance with dense <i>Dendrodoa</i>
15	ECR.EFa		18-24	Steep bedrock slope with abundant short animal turf
15	CR.Cv		22-24	Caves at base of bedrock
15	CGS		24	Clean rippled sand & shell gravel

Site No	Biotope		Depth	Substratum & features
16	MIR.KR	Lhyp	0-6	Angular bedrock with kelp forest
16	EIR		16-19	Angular boulders with gravel & scattered kelp
16	ECR.Alc		5-23	Bedrock & large boulders with <i>Alcyonium</i>
17	EIR.KFaR		5-11	Upward facing bedrock with kelp
17	IR.FaSwV		6-13	Vertical rock with fissures and crevices
17	MIR.Sed.K	Pol.Ahn	10-14	Sand-scoured rock with red algae
17	IGS		6-14	Waves & ripples of clean shell sand
18	EIR.KFaR		3-9	Large boulders & bedrock with kelp & short fauna
18	IR.FaSwV		9-18	Vertical walls of gullies with <i>Alcyonium</i>
18	IGS		18	Shell sand in bottom of gullies
19	EIR.KFaR	LhypFa	10-22	Very exposed & tideswept bedrock with kelp park
19	ECR.EFa ?MCXR.AS		14-29	Bedrock slopes with dense short animal turf, & occasional rock mills
19	CGS		25-29	Floor of gullies with shell sand & mussel shells
20a	EIR.KFaR		5-12.5	Bedrock with kelp forest & red algae
20a	EIR.SG	?SCAnTub	?15-20	Surge gully with vertical walls
20a	?ECR.BS		?22-25	Scoured & tideswept bedrock, boulders & cobbles
20b	?MCR.ByH		22-31	Bedrock cliff with short animal turf
21	EIR.KFaR		10-18	Tideswept bedrock with kelp forest/park
21	MCR.As		15-25	Tideswept bedrock with ascidian-dominated fauna
22	EIR.KFaR		5-16	Rugged bedrock with kelp forest
22	?EIR.SG		5-9	Vertical rock faces with surge communities
22	IR.FaSwV		5-9	Vertical rock faces with <i>Alcyonium</i>
22	ECR/MCR		15-24	Bedrock slopes with variety of animals and algae
22	MCR.ByH		23-32	Bedrock & boulders with hydroids, bryozoans & featherstars
23	EIR.KFaR		4-13	Bedrock with kelp, sponges & anthozoans
23	CR.FaV	Ant	13-32	Bedrock & boulders with dense featherstars
24	SIR.K	Lsac.Ft	0-8	Boulders & steep bedrock with <i>L. saccharina</i> forest
24	SCR.BrAs	AntAsH	8-21	Vertical bedrock with overhangs, fissures & crevices
24	SCR.BrAs	NeoPro	21-37	Vertical bedrock with overhangs, fissures & crevices

APPENDIX IV

Species recorded by the survey

Nomenclature follows that in Howson & Picton (1997); sites are located on Figure 1.
(e) = eggs only

SPECIES	
RHODOPHYCOTA	
<i>Porphyra</i> sp	6
<i>Bonnemaisonia hamifera</i> (<i>Traillella</i>)	?22
<i>Callophyllis laciniata</i>	17, 22
Encrusting corallines	2,3,5,6,7,8,10,11,12,13,14,15,16,17,18,19,20a, 21,22,23,24
<i>Ahnfeltia plicata</i>	17
<i>Phyllophora crispa</i>	17,21
<i>Phyllophora truncata</i>	17
<i>Phyllophora traillii</i>	24
<i>Polyides rotundus</i>	17
<i>Plocamium cartilagineum</i>	2,6,7,9,15,17,19,22,24
<i>Lomentaria clavellosa</i>	24
<i>Lomentaria orcadensis</i>	24
<i>Ptilota gunneri</i>	15,17,21
<i>Delesseria sanguinea</i>	2,9,12,13,15,16,17,19,20a,21,22,24
<i>Hypoglossum hypoglossoides</i>	24
<i>Membranoptera alata</i>	17
<i>Nitophyllum punctatum</i>	24
<i>Phycodrys rubens</i>	2,6,7,9,13,15,17,21,22,24
<i>Brongniartella byssoides</i>	2,24
<i>Odonthalia dentata</i>	9,12,15,17,19,20a,21
<i>Polysiphonia</i> sp	6,17,22
<i>Pterosiphonia parasitica</i>	2
Encrusting dark red	17
CHROMOPHYCOTA	
Ectocarpaceae indet	24
<i>Tilopteris mertensii</i>	17
<i>Dictyota dichotoma</i>	2,22,24
<i>Desmarestia aculeata</i>	10,17
<i>Desmarestia viridis</i>	7
<i>Laminaria digitata</i>	6
<i>Laminaria hyperborea</i>	1,2,5,6,7,9,10,12,15,16,17,18,19,20a,21,22,23
<i>Laminaria saccharina</i>	5,6,24
<i>Saccorhiza polyschides</i>	24
<i>Alaria esculenta</i>	2
Kelp	3,4,8,11,14
Encrusting brown	2,10,17,24
Chromophycota indet	1

SPECIES	
CHLOROPHYCOTA	
<i>Ulva</i> sp	6
CHRYSOPHYCOTA	
Diatom film	15
FORAMINIFERA	
<i>Toxisarcon alba</i>	6,7
PORIFERA	
<i>Clathrina coriacea</i>	2,12,15
<i>Leucosolenia botryoides</i>	24
<i>Scypha ciliata</i>	2,9
<i>Tethya aurantium</i>	?24
<i>Pachymatisma johnstonii</i>	1,3,8,9,12,17,18,19,20a,24
<i>Polymastia boletiformis</i>	22
<i>Polymastia mamillaris</i>	18, 21
<i>Polymastia</i> sp	12
<i>Cliona celata</i>	2,3,9,15,17,19,20a,22
Axinellidae indet	24
<i>Halichondria panicea</i>	1,2,12,15,17,19,22
<i>Hymedesmia paupertas</i>	24
<i>Haliclona urceolus</i>	24
<i>Haliclona viscosa</i>	2,22
Porifera indet	5,15,17,19,22,24
CNIDARIA	
<i>Aurelia aurita</i>	5,6,22,24
<i>Tubularia indivisa</i>	9,13,15,17,18,19,20a,20b,21,22
<i>Halecium</i> sp	24
<i>Nemertesia antennina</i>	5,11,24
<i>Nemertesia ramosa</i>	21
<i>Nemertesia</i> sp	3,13,16
<i>Abietinaria abietina</i>	?22
<i>Thuiaria thuja</i>	13,16,17,21
<i>Sertularia argentea</i>	9,11,17,20a,21
<i>Obelia geniculata</i>	10,16
Hydroidea indet	7,9,10,11,13,15,16,17,20b,22
<i>Alcyonium digitatum</i>	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20a,20b,21,22,23,24
<i>Cerianthus lloydii</i>	4,5,6,15
<i>Protanthea simplex</i>	24
<i>Urticina felina</i>	1,2,5,6,9,10,11,12,13,15,17,18,19,20a,20b,21,22
<i>Urticina eques</i>	?4,?8,?24
<i>Metridium senile</i>	1,4,5,7,8,11,15,19,20a,24
<i>Sagartia elegans</i>	2,5,7,9,12,13,15,16,17,18,22,23
<i>Cereus pedunculatus</i>	2,?8
<i>Phellia gausapata</i>	20a
<i>Corynactis viridis</i>	9,12,13,15,16,19,20a,20b,21,22,23,24
<i>Caryophyllia smithii</i>	1,3,5,6,8,10,16,22

SPECIES	
CTENOPHORA	
<i>Ctenophora</i> indet	22
ANNELIDA	
<i>Chaetopterus variopedatus</i>	24
<i>Arenicola marina</i>	5,6
Terebellidae indet	2
Strawberry worm	7
<i>Lanice conchilega</i>	7,10
<i>Sabella pavonina</i>	5,24
<i>Pomatoceros</i> sp	2,5,10,11,12,15,16,17,18,20b,21,22
<i>Serpula vermicularis</i>	24
Spirorbidae indet	15
CRUSTACEA	
Cirripedia indet	5,6,10,11,12,15,16,17,18,20b,21,22
Mysidae indet	2
Caridea indet	2,21
<i>Homarus gammarus</i>	2,12,14,16,17,18,20b,21,22,24
<i>Pagurus bernhardus</i>	2,3,4,6,
<i>Pagurus cuanensis</i>	2
Paguridae indet	1,7,10,17,22
<i>Galathea strigosa</i>	3,4,8,15,17,18,23
<i>Galathea</i> sp	2,8,12,17,18
<i>Munida rugosa</i>	23,24
Pea crabs indet	2
<i>Hyas araneus</i>	4,5,6,17,20a
<i>Inachus</i> sp	4,17,24
<i>Macropodia rostrata</i>	3
<i>Macropodia</i> sp	4
Spider crab indet	2
<i>Corystes cassivelaunus</i>	4
<i>Atelecyclus rotundatus</i>	2,4
<i>Cancer pagurus</i>	1,4,5,6,7,9,10,11,12,15,17,18,19,20b,21,22,23,24
<i>Liocarcinus depurator</i>	4
<i>Liocarcinus marmoreus</i>	15
<i>Necora puber</i>	1,2,3,4,5,6,7,8,9,11,12,13,14,15,16,17,18,19,20a,20b,21,22,23,24
<i>Carcinus maenas</i>	5
MOLLUSCA	
<i>Emarginula fissura</i>	?24
<i>Tectura virginea</i>	2
<i>Helcion pellucidum</i>	17
<i>Gibbula cineraria</i>	2,10,17,24
<i>Gibbula</i> sp	6
<i>Calliostoma ziziphinum</i>	2,5,6,7,9,10,12,16,17,18,19,20b,22,24
Topshells indet	1
<i>Aporrhais pes-pelecani</i>	5
<i>Trivia arctica</i>	12
<i>Trivia monacha</i>	2,18,20a

SPECIES	
<i>Trivia</i> sp	16
<i>Polinices catena</i>	4
<i>Buccinum undatum</i>	2,4
<i>Colus gracilis</i>	4
<i>Dendronotus frondosus</i>	19
<i>Limacia clavigera</i>	17
<i>Cadlina laevis</i>	2
<i>Archidoris pseudoargus</i>	17(e), 18
<i>Janolus cristatus</i>	24
<i>Coryphella lineata</i>	20b
<i>Coryphella</i> sp	19
Opisthobranchia indet	15, 16(e)
<i>Mytilus edulis</i>	6,8,19,22
<i>Aequipecten opercularis</i>	6
<i>Pecten maximus</i>	5,7,8
<i>Ensis</i> sp	4,5,6
<i>Sepiola</i> sp	15
<i>Eledone cirrhosa</i>	4
Squid eggs	1,10,14,17
BRACHIOPODA	
<i>Neocrania anomala</i>	15, 24
<i>Terebratulina retusa</i>	24
BRYOZOA	
<i>Alcyonidium</i> sp	12,21
<i>Flustrellidra hispida</i>	9
<i>Porella compressa</i>	23
<i>Membranipora membranacea</i>	16
<i>Flustra foliacea</i>	9,11,12,13,17,18,19,20b,21
<i>Securiflustra securifrons</i>	12,13,19,20a,21,22
<i>Bugula</i> sp	12,22
Orange encrusting	2,9,10,11,12,13,15,17,19,21,22
Encrusting indet	6
ECHINODERMATA	
<i>Antedon bifida</i>	1,2,3,4,5,6,11,12,13,15,17,18,19,20a,20b,21,22,23,24
<i>Astropecten irregularis</i>	5,7
<i>Luidea ciliaris</i>	2,4,10,13,22,23
<i>Porania pulvillus</i>	10,16,22,23,24
<i>Solaster endeca</i>	1,22
<i>Crossaster papposus</i>	1,2,3,5,9,10,11,12,13,14,16,18,20a,20b,21,22,23,24
<i>Henricea</i> sp	1,2,3,4,7,8,9,10,12,13,14,15,17,20b,21,22,24
<i>Stichastrella rosea</i>	22
<i>Asterias rubens</i>	1,2,4,5,6,7,9,10,11,13,14,15,16,17,19,20a,20b,21,22,23,24
<i>Leptasterias muelleri</i>	19
<i>Marthasterias glacialis</i>	1,2,3,4,5,8,10,12,13,17,21,22,23,24
<i>Ophiothrix fragilis</i>	2,3,10,24
<i>Ophiocomina nigra</i>	2,9,10,11,13,22
<i>Ophiactis balli</i>	2

SPECIES	
<i>Ophiopholis aculeata</i>	2
<i>Amphiura</i> sp	3,4
<i>Ophiura albida</i>	5,6,10
<i>Ophiura</i> sp	1
Brittlestars indet	5,8
<i>Psammechinus miliaris</i>	2
<i>Echinus esculentus</i>	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20a,20b,21,22,23,24
<i>Pawsonia saxicola</i>	1,2,6,18, 24
<i>Neopentadactyla mixta</i>	4
TUNICATA	
<i>Clavelina lepadiformis</i>	1,3,5,6,7,10,12,16,17,22,23,24
<i>Aplidium punctum</i>	11, 15
<i>Aplidium</i> sp	9,12,20a,24
Didemnidae indet	9
<i>Ciona intestinalis</i>	2,24
<i>Diazona violacea</i>	?12
<i>Corella parallelogramma</i>	24
<i>Asciidiella scabra</i>	15
<i>Ascidia mentula</i>	15, 24
<i>Polycarpa pomaria</i>	24
<i>Polycarpa scuba</i>	15
<i>Dendrodoa grossularia</i>	2,15
<i>Botryllus schlosseri</i>	6,13,17,19,22
<i>Botrylloides leachii</i>	15,17
Sandy colonial ascidians	2,9,12,15,17,18,19,20a,21
Colonial ascidians indet	3,13,17,19,21,22
PISCES	
<i>Cetorhinus maximus</i>	18
Shark indet	20a
<i>Clupea harengus</i>	?24
<i>Gadus morhua</i>	17,24
<i>Molva molva</i>	11,17,23
<i>Pollachius virens</i>	18,20b
<i>Pollachius</i> sp	10,17
<i>Trisopterus minutus</i>	3
<i>Gaidropsaurus vulgaris</i>	17
<i>Ciliata septentrionalis</i>	24
Rockling indet	24
<i>Ctenolabrus rupestris</i>	24
<i>Labrus bergylta</i>	7,11,17,18,20a,20b,22,23
<i>Labrus mixtus</i>	11,13
<i>Parablennius gattorugine</i> / <i>Parablennius ruber</i>	17
<i>Chirolophis ascanii</i>	12,16,17
<i>Pholis gunnellus</i>	2,5,18,23
<i>Ammodytes</i> sp	11,17
<i>Gobiusculus flavescens</i>	24
<i>Pomatoschistus</i> sp	16

SPECIES	
<i>Thorogobius ephippiatus</i>	16,24
<i>Taurulus bubalis</i>	15, 20b
Sea scorpions indet	3,18,24
<i>Microstomus kitt</i>	17
<i>Platichthys flesus</i>	5
Pleuronectidae indet	10
<i>Cyclopterus lumpus</i>	16
Small eel-like fish in cave	15
Fish fry	21

APPENDIX V

Catalogue of photographs taken on SEASEARCH survey

All photographs taken by Sue Scott.

SCENIC AND PEOPLE

- 02.44.26. Survey base at Laid, Loch Eriboll.
- 02.44.29. Survey base at Laid, Loch Eriboll.
- 02.49.12. Launching at Keoldale.
- 02.49.14. Launching at Keoldale.
- 02.49.19. Launching at Keoldale. Calum Duncan, Frank Fortune, Anne Frankland.
- 02.49.21. Launching at Keoldale. Calum Duncan, Anne Frankland & Paul Tyler, & LDSAC RIB *Safina*.
- 02.49.23. Launching at Keoldale. From L: Paul Tyler, Calum Duncan, Anne Frankland, Keith Pritchard, Chris Turkentine, Paul Turkentine.
- 02.49.24. Launching at Keoldale.
- 02.49.31. Coast E of Cape Wrath.
- 02.50.03. Approaching Cape Wrath & arches.
- 02.50.04. Approaching Cape Wrath. From L: Mary Harvey, Paul Turkentine, Neil Cowie, Chris Turkentine.
- 02.50.08. Approaching Cape Wrath.
- 02.50.11. Approaching Cape Wrath.
- 02.50.18. Approaching Cape Wrath & arch
- 02.50.21. Cape Wrath (Site 20, N Geodha 'an Fhvarain)
- 02.50.23. Cape Wrath (Site 15, S Stac an Dunain)
- 02.50.26. Cape Wrath (Site 15, S Stac an Dunain)
- 02.50.32. Cape Wrath (Site 15, S Stac an Dunain)
- 02.51.02. Am Buachaille (Site 17)
- 02.51.03. Am Buachaille (Site 17)
- 02.51.04. Am Buachaille (Site 17)
- 02.51.13. Diving Am Buachaille (Site 17). LDSAC RIB *Safina*
- 02.51.14. Am Buachaille (Site 17)
- 02.51.16. Diving Am Buachaille (Site 17). LDSAC RIB *Safina*
- 02.51.17. Diving Am Buachaille (Site 17). LDSAC RIB *Safina*. Anne Frankland, Neil Cowie, Paul Tyler, Calum Duncan, Mary Harvey
- 02.51.19. Am Buachaille (Site 17)
- 02.51.30. Am Buachaille (Site 17)
- 02.51.34. Diving Am Buachalle (Site 17)
- 02.52.02. Am Buachaille (Site 17)
- 02.52.07. Ideal weather for sailing (& surveying)
- 02.52.13. Cruising past Sandwood Bay
- 02.52.18. Boat under arch, Cape Wrath
- 02.52.30. Stac Cló Kearvaig (Site 21)
- 02.52.31. E of Stac Cló Kearvaig (Site 21)

UNDERWATER**Eilean Hoan Mid 1 (Site 2)**

- 02.38.05. Circular crab *Atelecyclus rotundatus*
 02.38.06. Circular crab *Atelecyclus rotundatus*
 02.38.11. Hairy hermit crab *Pagurus cuanensis*
 02.38.12. Brittlestars *Ophiopholis aculeata* & *Ophiactis balli*, & encrusting algae on pitted limestone.
 02.38.14. Brittlestars *Ophiopholis aculeata* & *Ophiactis balli*, & sea cucumber *Pawsonia saxicola* on pitted limestone.
 02.38.21. Black brittlestars *Ophiocomina nigra*.
 02.38.26. Elephant's ear sponge, coralline algae, brittlestars & keelworms on pitted limestone.
 02.38.27. Daisy anemone *Cereus pedunculatus* on limestone.
 02.38.31. Lacy sponge *Clathrina coriacea*, ascidians *Polycarpa scuba* and sandy polyclinids, featherstars, sponge, gastropods & keelworms on pitted limestone.

Whitehead SE 2 (Site 6)

- 02.39.05. Brown crab *Cancer pagurus* on steep slope of muddy sand with diatom film in Loch Eriboll.
 02.39.09. Common starfish *Asterias rubens* eating razorfish *Ensis* sp on muddy sand in Loch Eriboll.
 02.39.10. *Laminaria hyperborea* kelp forest on vertical rock in Loch Eriboll.
 02.39.15. *Laminaria hyperborea* kelp forest on vertical rock in Loch Eriboll.
 02.39.18. *Laminaria hyperborea* kelp forest and soft corals *Alcyonium digitatum* on vertical rock in Loch Eriboll.
 02.39.21. *Laminaria hyperborea* kelp forest and soft corals *Alcyonium digitatum* on vertical rock in Loch Eriboll.
 02.39.23. *Laminaria hyperborea* kelp forest and soft corals *Alcyonium digitatum* on vertical rock in Loch Eriboll.
 02.39.27. Dense mussels *Mytilus edulis* on vertical rock in sublittoral fringe, Loch Eriboll.

NE An Garbh Eilean (Site 9)

- 02.40.04. Dense oaten pipe hydroid *Tubularia indivisa* on wave exposed, current-swept rock.
 02.40.07. Dense oaten pipe hydroid *Tubularia indivisa* & red seaweeds on wave exposed, current-swept bedrock.
 02.40.09. Red seaweeds *Odonthalia dentata* & colonial ascidians on wave exposed, current-swept rock.
 02.40.10. Oatenpipe hydroids *Tubularia indivisa*, bryozoans, soft corals & jewel anemones on exposed & current-swept bedrock.
 02.40.12. Hydroids, bryozoans, soft corals, sunstar & black brittlestars on sandy, current-swept bedrock.
 02.40.14. Oatenpipe hydroids *Tubularia indivisa*, soft corals & jewel anemones on exposed & current-swept bedrock.
 02.40.15. Dense oaten pipe hydroid *Tubularia indivisa* & red seaweeds on wave exposed, current-swept bedrock.

- 02.40.19. Dense oatenpipe hydroids *Tubularia indivisa* & jewel anemones on exposed & current-swept bedrock.
- 02.40.23. Dense oatenpipe hydroids *Tubularia indivisa* & jewel anemones on exposed & current-swept bedrock.
- 02.40.25. Dense oatenpipe hydroids *Tubularia indivisa* & anemones *Sagartia elegans* on exposed & current-swept bedrock.

E Clac Mhór na Faraid 1 (Site 10)

- 02.41.01. Diver ascending.
- 02.41.02. Calum Duncan recording on seabed of scoured cobbles & pebbles.
- 02.41.04. Calum Duncan recording on seabed of scoured cobbles & pebbles.
- 02.41.08. Mobile gravel and pebbles.
- 02.41.10. Dahlia anemones *Urticina felina* in mobile gravel & pebbles with scoured bedrock.
- 02.41.12. Seven-armed starfish *Luidea ciliaris* in mobile gravel & pebbles with scoured bedrock.
- 02.41.13. Squid eggs on kelp stipe, & black brittlestars *Ophiocomina nigra* on scoured bedrock.
- 02.41.14. Black brittlestars *Ophiocomina nigra* on scoured bedrock with encrusting algae.
- 02.41.17. Black brittlestars *Ophiocomina nigra* on scoured bedrock with keelworms *Pomatoceros* sp.
- 02.41.24. Grazed kelp *Laminaria hyperborea* park & bedrock with encrusting algae & sunstar *Crossaster papposus*.
- 02.41.27. Diver Calum Duncan recording from overhanging bedrock with soft corals *Alcyonium digitatum*.
- 02.41.30. Grazed kelp *Laminaria hyperborea* park.

S Stac an Dúnain (Site 15)

- 02.42.05. Spiny squat lobster *Galathea strigosa*, dahlia anemone *Urticina felina*, red seaweeds & colonial ascidians on exposed vertical rock.
- 02.42.09. Velvet swimming crab *Necora puber*, dahlia anemone *Urticina felina*, featherstars & colonial ascidians on exposed vertical rock.
- 02.42.10. Marbled swimming crab *Liocarcinus marmoreus* in clean sand.
- 02.42.13. Solitary & colonial ascidians, encrusting bryozoans & coralline algae on exposed vertical rock.
- 02.42.16. Solitary & colonial ascidians, dahlia anemone & red seaweeds on exposed vertical rock.
- 02.42.20. Plumose anemone *Medridium senile* & gooseberry seasquirts *Dendrodoa grossularia* at cave entrance.
- 02.42.21. Gooseberry seasquirts *Dendrodoa grossularia* & lacy sponge *Clathrina coriacea* at cave entrance.
- 02.42.25. Solitary ascidians *Ascidia mentula* spirorbid tubeworms, keelworms, ?brachiopods *Neocrania anomala* on cave wall.
- 02.42.27. Anemones *Sagartia elegans*, encrusting sponges & oatenpipe hydroid *Tubularia indivisa* on wave-surged vertical rock.

W of Am Buachaille (Site 17)

- 02.43.01. Breadcrumb sponge *Halichondria panicea* & spider crab *Hyas araneus* on kelp stipe at exposed site.

- 02.43.03. Breadcrumb sponge *Halichondria panicea* & red seaweeds on kelp stipe at exposed site.
- 02.43.06. Sandy colonial ascidians, orange encrusting bryozoans, dahlia anemone & red algae in kelp forest.
- 02.43.09. Red algae *Phyllophora truncata*, *Ahnfeltia plicata* & encrusting coralline alga on sand-covered rock.
- 02.43.13. Sandy colonial ascidians, orange encrusting bryozoans, & hornwrack *Flustra foliacea* on sand-scoured rock.
- 02.43.18. Keelworms *Pomatoceros* sp on sand-scoured bedrock.
- 02.43.21. Sandy colonial ascidians, orange encrusting bryozoans, hydroids & starfish *Henricea* sp on sand-scoured vertical rock.
- 02.43.23. Red algae *Phyllophora truncata* on sand-covered rock.
- 02.43.26. Red algae *Phyllophora crista* on sand-covered rock.
- 02.43.27. Sunstar *Crossaster papposus* & soft corals *Alcyonium digitatum* with colonial ascidians on vertical rock.
- 02.43.30. Colonial ascidian *Botrylloides leachii* & soft coral *Alcyonium digitatum* on vertical rock.
- 02.43.33. Boring sponge *Cliona celata* on vertical rock.

Stac Cló Kearvaig (Site 21)

- 02.44.02. Dense bryozoan *Securiflustra securifrons*, featherstars & soft corals on current-swept boulder side.
- 02.44.05. Bryozoans *Securiflustra securifrons* & *Flustra foliacea*, featherstars, velvet crab & sunstar on current-swept boulder.
- 02.44.07. Jewel anemones *Corynactis viridis*, spiny starfish *Marthasterias glacialis*, & common starfish *Asteria rubens* on current-swept bedrock.
- 02.44.09. Tideswept, sand-covered rock with hydroids, bryozoans & red algae.
- 02.44.10. Jewel anemones *Corynactis viridis*, & featherstars *Antedon bifida* on tideswept bedrock.
- 02.44.19. Lobster *Homarus gammarus* in crevice in exposed & tideswept bedrock.
- 02.44.13. Exposed & tideswept *Laminaria hyperborea* kelp forest.
- 02.44.21. Exposed & tideswept *Laminaria hyperborea* kelp forest understorey of ascidians, bryozoans & red seaweeds.
- 02.44.17. Exposed & tideswept *Laminaria hyperborea* kelp forest with ascidians, bryozoans & bloody henry starfish *Henricea* sp.
- 02.44.22. Diver Digger Jackson ascending, with guillemot *Uria aalga*.

Sgeir Daimh East (Site 22)

- 02.45.04. Circalittoral grazed bedrock with encrusting life, featherstars & hydroids.
- 02.45.07. Circalittoral bedrock with encrusting life & featherstars.
- 02.45.16. Bedrock slope with encrusting life & featherstars.
- 02.45.34. Shallow wave-surged rock with red alga *Delesseria sanguinea*, hydroids, sponges & ascidians.
- 02.45.32. Shallow wave-surged kelp *Laminaria hyperborea*, with breadcrumb sponge *Halichondria panicea* & mussels *Mytilus edulis* on stipe.
- 02.45.20. Sponge *Haliclona viscosa* on bedrock.
- 02.45.24. Sunstar *Crossaster papposus* & black brittlestars *Ophiocolina nigra* on circalittoral rock.
- 02.45.27. Seven-armed starfish *Luidea ciliaris*, black brittlestars *Ophiocolina nigra* & northern sunstar *Solaster endeca* on bedrock with coralline algae.

02.45.10. Bryozoans *Securiflustra securifrons*, featherstars *Andedon bifida* & hydroids on circalittoral rock.

02.45.17. Starfish *Stichastrella rosea*.

02.45.31. Colonial ascidians, jewel anemones, dahlia anemones, soft coral, red seaweeds & starfish on vertical rock.

E Craig Mhor, Loch Inchard (Site 24)

02.46.03. Sealoch anemones *Protanthea simplex* & tubeworm *Serpula vermicularis* on extremely sheltered rock in sealoch.

02.46.09. Sealoch anemones *Protanthea simplex* & brachiopods *Neocrania anomala* on extremely sheltered rock in sealoch.

02.46.05. Sealoch anemones *Protanthea simplex* & tubeworms *Serpula vermicularis* on extremely sheltered rock in sealoch.

02.46.11. Sealoch anemones *Protanthea simplex* on solitary ascidian *Ascidia mentula* on extremely sheltered rock in sealoch.

02.46.15. Brown crab *Cancer pagurus* with sealoch anemones *Protanthea simplex* on extremely sheltered rock in sealoch.

02.46.26. Sealoch anemone *Protanthea simplex* on extremely sheltered rock in sealoch.

02.46.27. Seaslug *Janolus cristatus* on bryozoan on extremely sheltered rock in sealoch.

02.46.04. Sealoch anemone *Protanthea simplex* and red cushion star *Porania pulvillus* on extremely sheltered rock in sealoch.

02.46.06. Peacock fan worm *Sabella pavonia* on extremely sheltered rock in sealoch.