



Seasearch Surveys around Carna Island, Loch Sunart

2018, 2019, 2021, 2022

Lin Baldock & Richard Yorke

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Butterfish (*Pholis gunnellus*). ©Lin Baldock

Introduction

This report summarises the findings of dive surveys undertaken by a small group of volunteer Seasearch divers lead by Richard Yorke around the island of Carna at the western end of Loch Sunart in the west of Scotland. Surveys were carried out during October in 2018, 2019, 2021 and 2022. Results of earlier Seasearch surveys are included to provide an over view of the tremendous diversity of the marine species and habitats in the area.

Carna Island is located at the western end of Loch Sunart on the southern side between Ardnamurchan and Morvern and is managed in close collaboration with the owners by the Carna Conservation Initiative¹ with the aim to improve and maintain the economic and ecological sustainability of the island and surrounding communities. The island comprises some 600 acres representing a variety of terrestrial habitats and has almost 8km of shore line ranging from steep, wooded cliffs on the west and northwest sides of the island to sheltered, muddy bays in the southeast. In the past Carna provided a link between Ardnamurchan and Morvern and this is reflected in the names given to the rocky points either side of the little bay at the northernmost tip of the island: Rubha an Aisig Mhòir to the west (Great Point of the Ferry) and Rubha an Aisig Bhig to the east (Little Point of the Ferry). Other names such as Rubha na h' Eaglaise (Point of the Church) north of the present jetty and Coal Achadh Lic the name given to the narrow, fast flowing strip of water between the southwest shore of the island and the mainland (Narrows of the Flagstone Field) indicate the existence of a much larger community of people living on the island in the past, most traces of which are now well hidden by natural regrowth of trees, heather and bog.

In recognition of the rich and diverse marine life Loch Sunart's marine habitats have been designated a Special Area of Conservation (SAC) including the rocky reefs. In 2014 the Scottish government gave the loch Marine Protected Area (MPA) status in order to protect the Flapper Skate (*Dipturus intermedius*). Parts of the loch are recognised as a Site of Special Scientific Interest (SSSI) covering intertidal habitats including rocky shores and very sheltered sites where the rare free-living variant of Egg Wrack (*Ascophyllum nodosum* f. *mackayi*) is found.

In 2015 CAOLAS² (Community Association of Lochs and Sounds) was established by local communities to protect and promote the recovery and sustainable use of marine habitat biodiversity in the Sound of Mull, Loch Sunart and the marine coastal waters surrounding the Ardnamurchan and Morvern peninsulas.

Seasearch³ is a project for volunteer divers and snorkelers collecting information about marine habitats around Britain and Ireland supported by the Marine Conservation Society working in Partnership with the Wildlife Trusts. Data are used to inform decisions about management or regulatory measures to protect marine environments and species. The marine surveys done around Carna by volunteer SCUBA divers using Seasearch techniques have shown that the waters around the island harbour a diverse variety of marine life and include a number of Scottish Priority Marine Features (PMFs). Citizen science and community initiatives such as Seasearch and CAOLAS are becoming increasingly important in recent years in delivering and disseminating accurate and up to date information on marine habitats at a time when few "professional" surveys are being carried out.



Norwegian Topknot (*Zeugopterus norvegicus*). ©Richard Yorke

¹ <https://www.isleofcarne.co.uk/what-is-cci/>

² <https://www.caolas.org/about/>

³ <https://www.seasearch.org.uk/>

Methods

Subtidal survey methods

Subtidal surveys were carried out around the island of Carna at the west end of Loch Sunart at 45 locations during a week in October in 2018, 2019, 2021 and 2022.

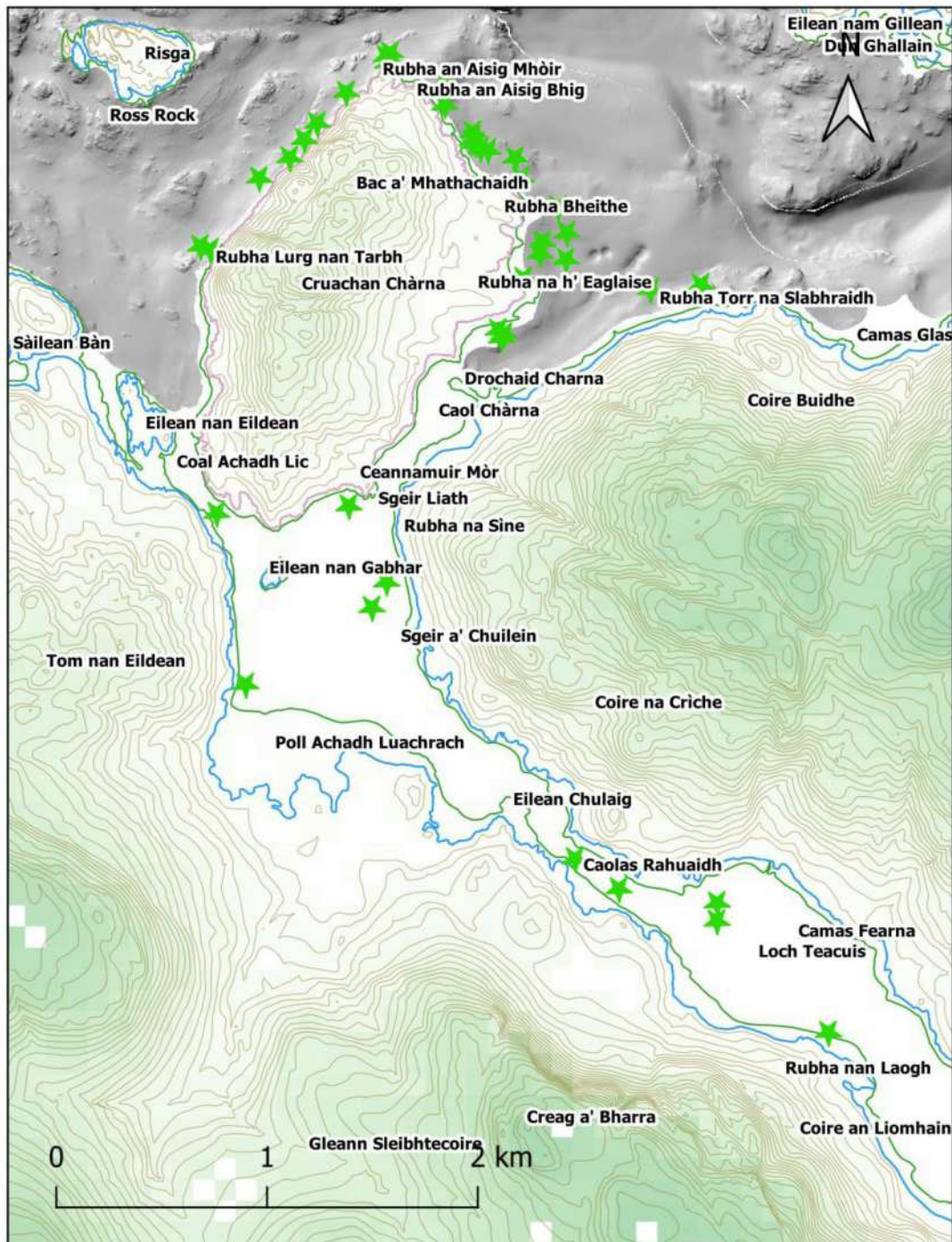


Figure 1 Locations of 45 survey dives October 2018, 2019, 2021, 2022.

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These four surveys were undertaken by volunteer scuba divers (three of whom are also very experienced professional divers) trained in Seasearch survey techniques (<https://www.seasearch.org.uk/record>). Seasearch surveyor forms were completed for most of the

sites visited and a large library of photographic images was reviewed to provide additional information on species distributions. Further information on the marine life of the area was examined from other Seasearch surveys especially information provided by Paisley (2018) as well as professional subtidal surveys commissioned by NatureScot⁴ notably the survey by Mercer *et al.* (2007) done in 2006. All data were entered to the Marine Recorder database⁵ and will in due course become freely available on the National Biodiversity Network Atlas⁶ a registered charity, which has supported sharing of biological data in the UK since 2000.

Intertidal survey of Sea Loch Egg Wrack (*Ascophyllum nodosum* f. *mackayi*)

In October 2022 an intertidal survey of the distribution of the Sea Loch Egg Wrack (also known as Crofter's Wig) was made. This internationally rare seaweed is a Scottish PMF and the Loch Sunart SSSI has been in part designated to protect it. The survey was conducted during low water on 9th October 2022. The extent of the area dominated by the seaweed was mapped by walking round the patches using a handheld GPS unit recording at 2s intervals. Tracks were uploaded to a GIS⁷ and polygons derived from the GPS tracks allowed area estimates to be made for each site. The mapping data were supplemented by photographic panoramas and sketches of each bay where the seaweed was recorded providing an estimate of the density distribution of the seaweed in the patches.



Surveyor walking the boundary of a patch of Sea Loch Egg Wrack (pale yellow in colour) in the sheltered bay just north of Rubha na h' Eaglaise, east shore of Carna.

©Richard Yorke.

Eyelash Worm Collection

In 2019 samples of the Eyelash Worm *Myxicola* (a sabellid polychaete) were collected from two sites with soft, muddy sediment for gene sequencing and morphological study. Samples were dissected from the tubes and material carefully preserved immediately after collection and before dispatch. This was in support of a review of two of the UK species of the Eyelash Worm by Teresa Darbyshire (Amgueddfa Cymru⁸, National Museum Wales). Permission to gather material from the Loch Sunart SAC had been obtained prior to collection.

⁴ <https://www.nature.scot/>

⁵ <https://jncc.gov.uk/our-work/marine-recorder/>

⁶ <https://nbnatlas.org/>

⁷ <https://www.qgis.org>

⁸ <https://museum.wales/>

Results

Dive survey results

The 45 sites surveyed produced a list of over 375 taxa from over 2,750 individual records. The records included a number of Scottish Priority Marine Features (PMFs), both habitats and species, and these are listed below together with the JNCC Marine Habitat Classification⁹ scheme code. The full list of taxa for all dive surveys conducted around Carna is 374 (Appendix 1) with a total of over 4,300 records, half of these accounted for by some 40 taxa. 143 species were represented by only one or two occurrences in the whole data set. The most frequently recorded species was the Common Starfish (*Asterias rubens*) with 126 reports with the next top ten species listed below, four of them echinoderms which are very much a feature of the fauna of Loch Sunart:

Species	Vernacular name	Count	Species	Vernacular name	Count
<i>Echinus esculentus</i>	Edible Sea Urchin	101	<i>Antedon bifida</i>	Feather Star	74
<i>Liocarcinus depurator</i>	Harbour Crab	88	<i>Crossaster papposus</i>	Common Sunstar	74
<i>Munida rugosa</i>	Long-clawed Squat Lobster	85	<i>Pagurus bernhardus</i>	Common Hermit Crab	69
<i>Ascidia aspersa</i>	A sea squirt	82	<i>Spirobranchus sp</i>	Keelworms	69
<i>Cerianthus lloydii</i>	Burrowing anemone	80	<i>Marthasterias glacialis</i>	Spiny Starfish	64

The ten most common species recorded by divers around Carna.

Around the island 69 different biotopes (habitats) were recognised giving an indication of the diversity of subtidal habitats present (Appendix 2). The six most commonly recorded ones were as follows:

Biotope description	Biotope code	Count
<i>Cerianthus lloydii</i> and other burrowing anemones in circalittoral muddy mixed sediment	SS.SMx.CMx.CIloMx	21
Seapens, including <i>Funiculina quadrangularis</i> , and burrowing megafauna in undisturbed circalittoral fine mud	SS.SMu.CFiMu.SpnMeg.Fun	18
<i>Virgularia mirabilis</i> and <i>Ophiura</i> spp. with <i>Pecten maximus</i> , hydroids and ascidians on circalittoral sandy or shelly mud with stones	SS.SMu.CSaMu.VirOphPmax.HAs	18
<i>Ophiothrix fragilis</i> and/or <i>Ophiocomina nigra</i> brittlestar beds on sublittoral mixed sediment	SS.SMx.CMx.OphMx	18
<i>Laminaria saccharina</i> and <i>Chorda filum</i> on sheltered upper infralittoral muddy sediment	SS.SMp.KSwSS.LsacCho	11
Seapens, including <i>Funiculina quadrangularis</i> , and burrowing megafauna in undisturbed circalittoral fine mud	SS.SMu.CFiMu.SpnMeg.Fun	18

The six most frequently recorded biotopes around Carna Island.

Scottish Priority Habitats (seven recorded)

- Seapens and burrowing megafauna in circalittoral fine mud (**SS.SMu.CFiMu.SpnMeg**) component spp include Tall seapen – *Funiculina quadrangularis*, Fireworks Anemone - *Pachycerianthus multiplicatus* (18 records).
- Sea loch egg wrack beds: *Ascophyllum nodosum* ead *mackaii* beds on extremely sheltered mid-eulittoral mixed substrata – (**LR.LLR.FVS.Ascmac**). The distribution of this habitat around Carna has been described above.
- Northern sea fan and sponge communities' *Caryophyllia smithii* and *Swiftia pallida* on circalittoral rock (**CR.MCR.EcCr.CarSwi**) (six records)
- *Limaria hians* beds in tide-swept sublittoral muddy mixed sediment (**SS.SMx.IMx.Lim**) (seven records)
- Maerl beds (**SS.SMp.Mrl**) (two records)
- Various kelp and seaweed biotopes (not mapped) including *Laminaria hyperborea* on tide-swept infralittoral mixed substrata (**IR.MIR.KR.LhypTX**)

⁹ <https://mhc.jncc.gov.uk/>

- *Serpula vermicularis* reefs on very sheltered circalittoral muddy sand – (SS.SBR.PoR.Ser).

Scottish Priority Species (seven recorded)

Low or limited mobility priority species

- Northern Seafan – *Swiftia pallida* (eight records)
- Northern Feather Star *Leptometra celtica* (23 records)
- Heart Cockle – *Glossus humanus* (one record)
- Ocean Quahog/Islandic Cyprine – *Arctica islandica* (5 records)

Mobile Priority species

- Atlantic Cod – *Gadus morhua* (two records)
- Sand Goby – *Pomatoschistus minutus* (Scottish populations are considered globally important), probably two species including *P. lozanoi* (48 records)
- Flapper Skate - *Dipturus intermedius* (one juvenile fish)



Juvenile Flapper Skate (*Dipturus intermedius*) (wing span ~ 20cm) northeast Carna.

©Lin Baldock



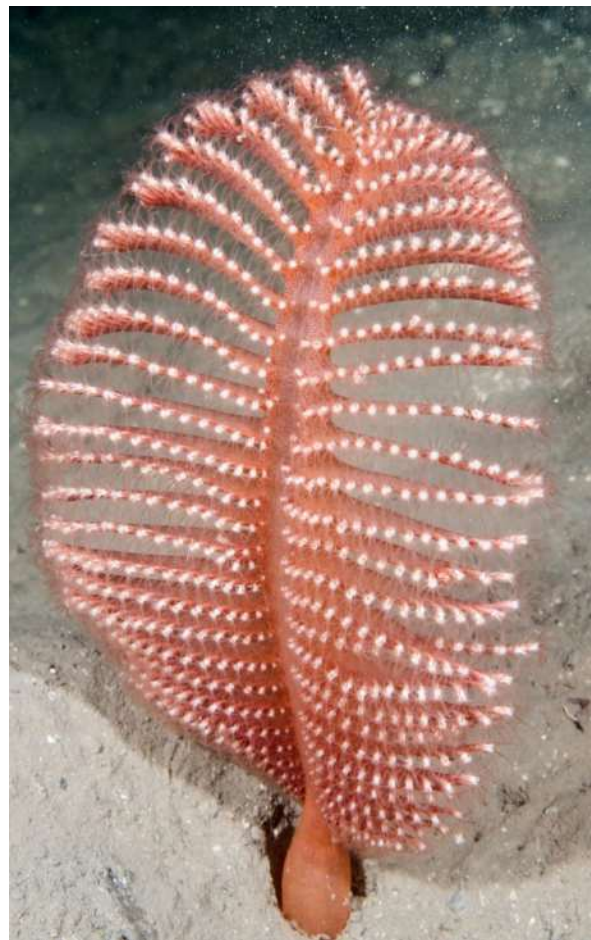
Painted Gobies (*Pomatoschistus pictus*). ©George Brown

Biotope: Seapens, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral fine mud **SS.SMu.CFiMu.SpnMeg.Fun.**

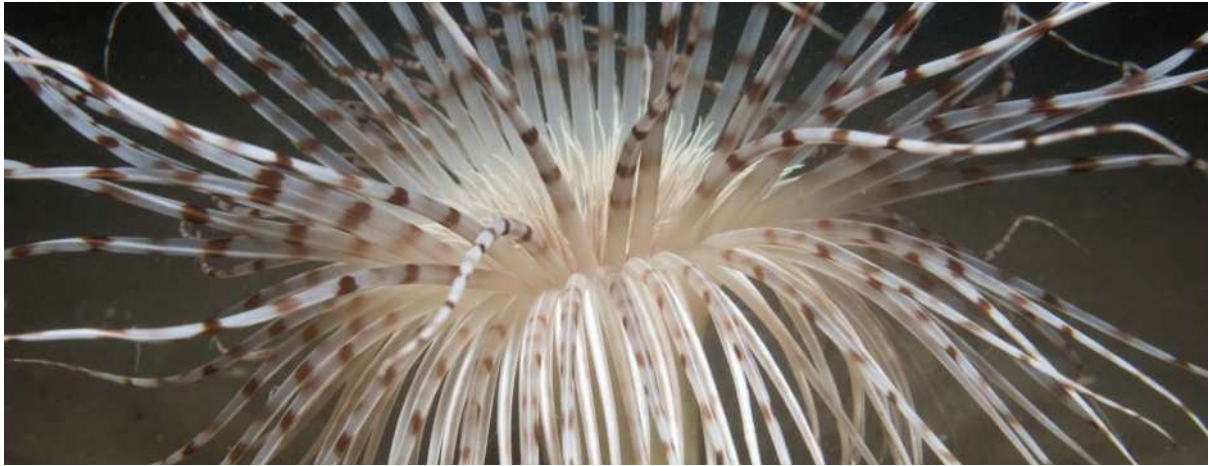


Tall Seapens (*Funiculina quadrangularis*) east Carna. ©Richard Yorke

This Scottish PMF habitat is widespread around Carna in very soft, muddy sediments in water depths greater than about 25m, especially on the northeast and east side of the island and around Bo Crithian in the southwest. The one record from inner Loch Teacuis is not a good example of this biotope. The habitat usually also includes scattered examples of the Fireworks Anemone (*Pachycerianthus multiplicatus*). A site dived in outer Loch Teacuis in search of the Tall Seapen had very silty coarse shell fragments and pebbles, sediment unsuitable for this species.



Phosphorescent Seapen (*Pennatula phosphorea*) Bo Crithian. ©Lin Baldock



Fireworks Anemone (*Pachycerinus mutiplicatus*) northeast Carna. ©Lin Baldock

Several records for the Spotted Dragonet (*Callionymus maculatus*) were made from this muddy habitat. This fish was thought to be a deep water, offshore species but recent Seasearch records in particular have shown that it occurs regularly in this habitat in Scottish sea lochs at depths of 25m or less where there is suitable soft sediment. All 50 records from Scottish sea lochs for this species have been made by Seasearch divers with over a third of these from the waters around Carna.



Immature male Spotted Dragonet (*Callionymus maculatus*) showing characteristic pinkish tinge and spangled speckles on the pectoral and pelvic fins. ©Lin Baldock



Female Spotted Dragonet (*Callionymus maculatus*) with unspeckled pectoral and pelvic fins
©Lin Baldock

The Norway Goby (*Pomatoschistus norvegicus*) also occurs in this habitat. This is another small fish which was previously thought to be confined to offshore, muddy sites until recently with Seasearchers recording the species regularly in Scottish sea lochs at relatively shallow water depths. There are two records from Loch Teacuis.



Norway Goby (*Pomatoschistus norvegicus*) – Inner Loch Teacuis. ©Lin Baldock

Another fish common in the burrowed mud habitat is Fries's Goby (*Lesueurigobius friesii*) which makes its own burrows in the mud and can be tricky to photograph as it skips out of site into a burrow in the gloom.



Fries's Goby (*Lesueurigobius friesii*) on muddy sediment, northeast Carna.

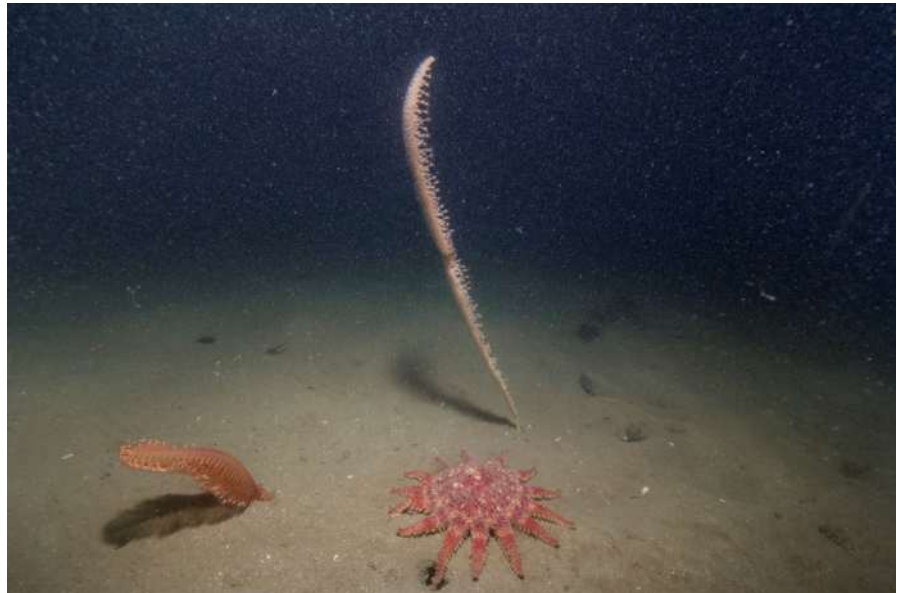
Left: an emaciated fish at the mouth of its burrow.

Right: a male fish in good condition. Both images ©Richard Yorke.

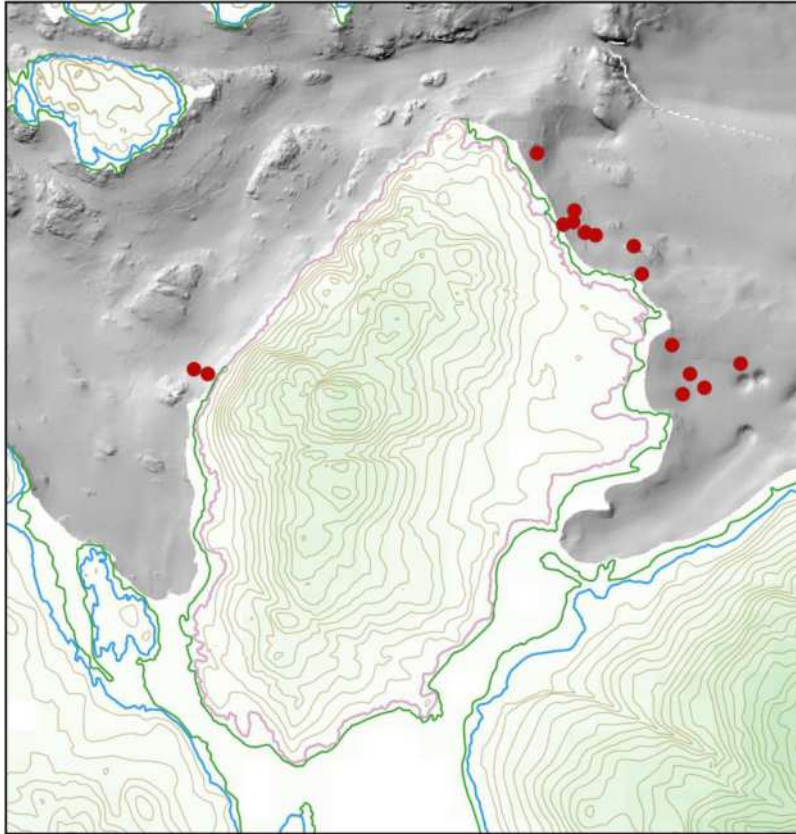


Phosphorescent
Seapens
(*Pennatula
phosphorea*) in
burrowed mud
northeast Carina
©Lucy Kay

Tall Seapen
(*Funiculina
angularis*) and
Phosphorescent
Seapen
(*Pennatula
phosphorea*) with
a Common
Sunstar
(*Crossaster
papposus*) in
burrowed mud
northeast Carina
©Lucy Kay



Angular Crab (*Goneplax rhomboides*) on burrowed mud. Northeast Carina. ©George Brown



Distribution of seapens and burrowing megafauna biotope around Carna.

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Coarse Sediment Biotopes

Biotope: *Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximus*, hydroids and ascidians on circalittoral sandy or shelly mud with stones **SS.SMu.CSaMu.VirOphPmax.Has**

This is a particularly diverse habitat round Carna occurring in water depths of less than about 20m above the seapens and burrowing megafauna biotope. This habitat often includes many Northern Feather Stars (*Leptometra celtica*) which is a Scottish PMF most often found at depths greater than 40m but occurring in sea lochs at much shallower depths, typically about 18-20m in Loch Sunart. The densest populations of this feather star occur in a narrow band at these depths along the northeast and northwest shore of Carna. Off Carna Jetty this habitat forms a mosaic with loose mats of the red seaweed *Phylophora crispa*, but in the absence of the Northern Feather Stars.



Left: Juvenile Grey Gurnard (*Eutrigla gurnardus*) ©George Brown

Right: Two-spotted Clingfish (*Diplecogaster bimaculata*). ©Richard Yorke



Northern Feather Star (*Leptometra celtica*)
©Lin Baldock

The Slender Seapen (*Virgularia mirabilis*) which characterises this habitat is only ever rare around Carna in these mixed sediments.



Slender
Seapen.
(*Virgularia
mirabilis*)
©Lin Baldock

The habitat also includes several other rarely recorded species such as Jeffreys's Goby (*Buenia jeffreysii*) another fish once thought to be confined to deep water habitats but 30 of 32 inshore records from Scottish sea lochs made by Seasearch divers show it widely distributed in this rather silty, mixed sediment habitat.



Juvenile Sunstar (*Crossaster papposus*), brittlestars (*Ophiura albida*) and Red Sea Fingers (*Alcyonium glomeratum*). ©Lin Baldock



Jeffreys's Goby (*Buenia jeffreysii*), west Carna.
©Richard Yorke

Both species of *Lebetus* goby have been recorded here. The Diminutive Goby (*Lebetus scorpioides*) with five records and Guillet's Goby (*Lebetus guilleti*), the smallest fish on the UK list, on one occasion off Carna Jetty.



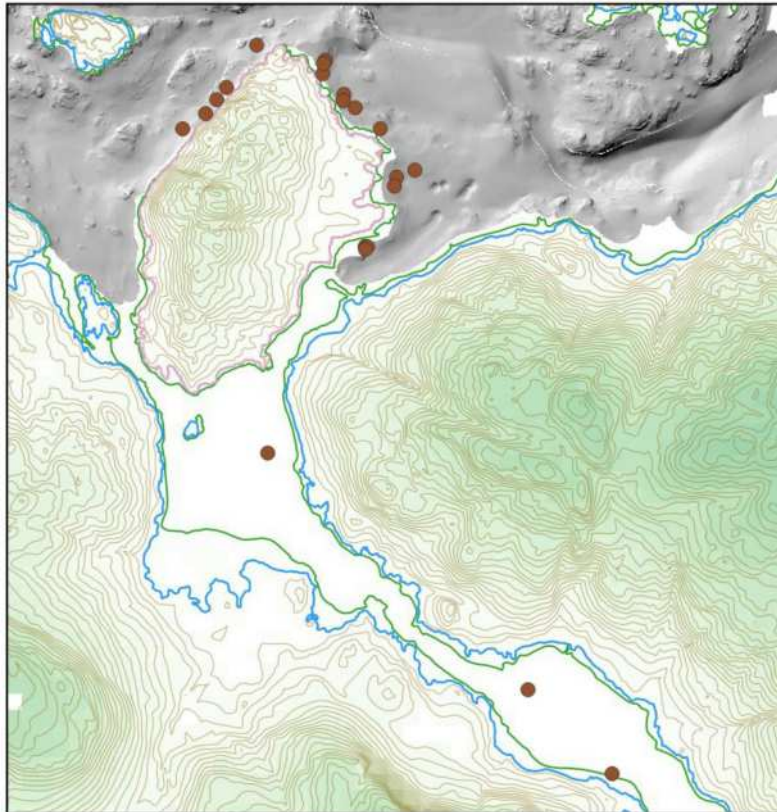
Left: Diminutive Goby (*Lebetus scorpioides*), northwest Carna. **Right** Guillet's Goby (*Lebetus guilleti*), under a small pebble, Carna Jetty. ©Lin Baldock



Northern Feather Stars (*Leptometra celtica*) on silty, bedrock reef, northwest Carna. ©Lin Baldock



Northern
Feather Stars
(*Leptometra
celtica*) on mixed
sediment with
stones,
northeast Carna.
©Lucy Kay



Hydroids and ascidians on circalittoral sandy or shelly mud with stones biotope

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A group of sea squirts on stones, northeast Carna. ©George Brown

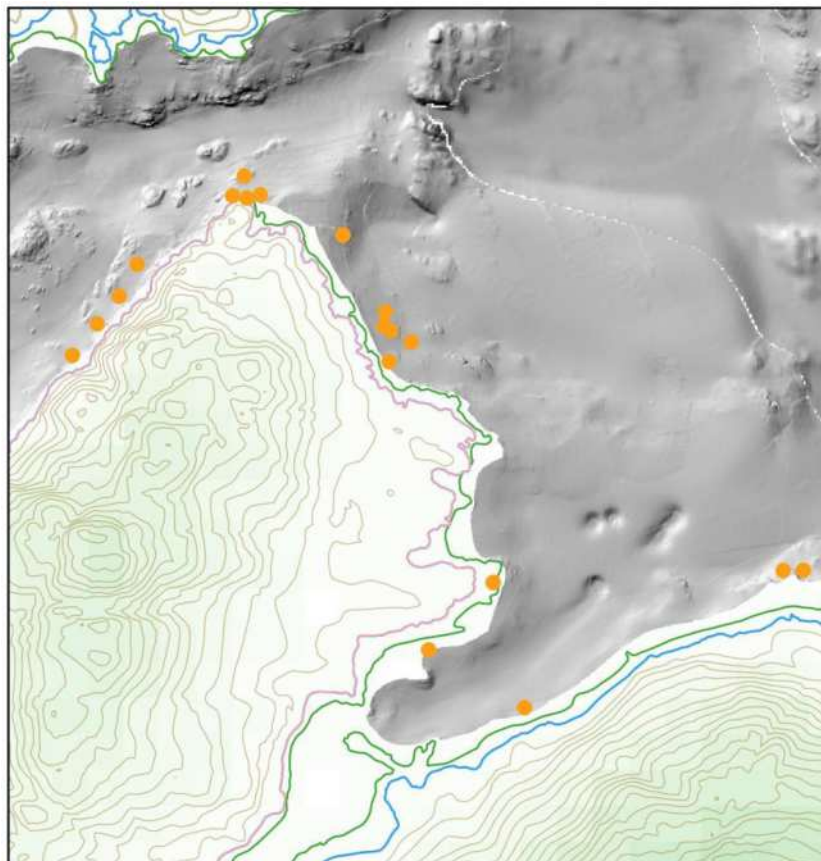
1: Fluted Sea Squirt (*Asciella aspersa*), 2: *Pyura microcosmus*, 3: Gas Mantle Sea Squirt (*Corella parallelogramma*), 4: *Asciella scabra*.

Biotope: *Cerianthus lloydii* and other burrowing anemones in circalittoral muddy mixed sediment
SS.SMx.CMx.CIloMx mosaic with above

This is a widely distributed habitat around Carna supporting quite a diverse fauna and occurring as a mosaic with other mixed sediment habitats from depths of about 15m.



Burrowing anemones in mixed muddy sediment – west Carna. ©Lin Baldock



Distribution of Burrowing anemones in mixed muddy sediment biotope around Carna

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Biotope: *Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock
CR.LCR.BrAs.AntAsH

This biotope again harbours a diversity of species and occurs in a mosaic of habitats with **SS.SMu.CSaMu.VirOphPmax.Has** and brittle star beds (**SS.SMx.CMx.OphMx**) especially off the northeast and northwest shores of Carna from water depths of less than about 18m. It is characterised by a selection of large, solitary tunicates (*Ascidia mentula*, *A. virginea*, *Ascidella aspersa* and *A. scabra*) which take advantage of the cobbles and small boulders. Crustacea are common especially the Long-clawed Squat Lobster (*Munida rugosa*), with the occasional the Angular Crab (*Goneplax rhomboides*) and lobster (*Homarus gammarus*). The feather star *Antedon petasus* occurs regularly as scattered individuals throughout this habitat with the smaller *A. bifida* more often on cobbles and boulders at shallower depths.



Tunicate dominated cobbles in mixed sediment west Carna. ©Lin Baldock



Displaying male Long-clawed Squat Lobsters (*Munida rugosa*). ©Lin Baldock

This behaviour was noted on several occasions in 2022. The females are known to carry eggs between November and May.



Left: Untidy looking group of *Antedon bifida*



Right: the neat appearance of *Antedon petasus*

©Lin Baldock

Biotope: *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment **SS.SMx.CMx.OphMx**

There are scattered patches of brittlestar beds on mixed sediment around northeast and northwest Carna and very dense populations on sediment among the boulders and cobbles in Caol Chàrna and Caolas Rahuaidh, the narrows at the entrance to Loch Teacuis. These animals tend to have a smothering effect on other fauna so the patches give the impression of being less diverse compared with some other sediment communities around the island.



Left: *Ophiocomina nigra* – Caol Chàrna

©Lin Baldock



Right: *Ophiothrix fragilis* – Caolas Rahuaidh

©George Brown



Short-spined Sea Scorpion (*Myoxocephalus scorpius*) in a brittle star bed (*Ophiothrix fragilis*), northeast Carna. ©Lin Baldock

Serpulid Aggregations

Reefs formed by the Organ Pipe Worm (*Serpula vermicularis*) were found in Loch Teacuis and reported to be well established in 2006 by Mercer et al. (2007). Since then the reefs have disappeared. Two dives were carried out in Loch Teacuis in October 2022 to fill in gaps in a survey for these aggregations done earlier in the year. Only very small clumps of worm tubes were found in the intertidal fringe. These all had fronds of Sugar Kelp attached and appeared to be rafted by the seaweed in the shallow water where wave action is most severe.



Small aggregations of Organ Pipe Worm attached to pebbles.

Left: with juvenile Sugar Kelp fronds attached and tangled with Mermaid's Tresses. ©Richard Yorke

Right: tangled in the hold fast of a large Sugar Kelp frond. ©Lin Baldock



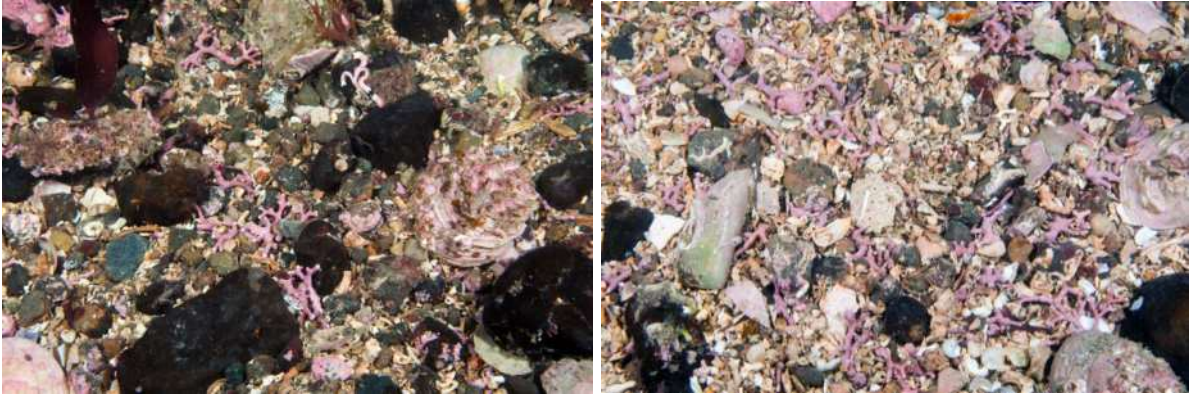
Entrance to Loch Teacuis. ©Richard Yorke

Biotope: Maerl **SS.SMp.Mrl**

Maerl bed habitat is a Scottish PMF which has been recorded in the narrows (Caol Achadh Lic) between southwest Carna and the mainland. The maerl growth is not a very well developed here but accumulations of up to 10% live maerl occur between the large boulders beneath the kelp.



Live maerl fragments among broken shell.
©Lin Baldock



Accumulations of live maerl mixed in gravel of dead maerl and shell – Caol Achadh Lic. ©Lin Baldock

Biotope: *Limaria hians* beds in tide-swept sublittoral muddy mixed sediment **SS.SMx.IMx.Lim**

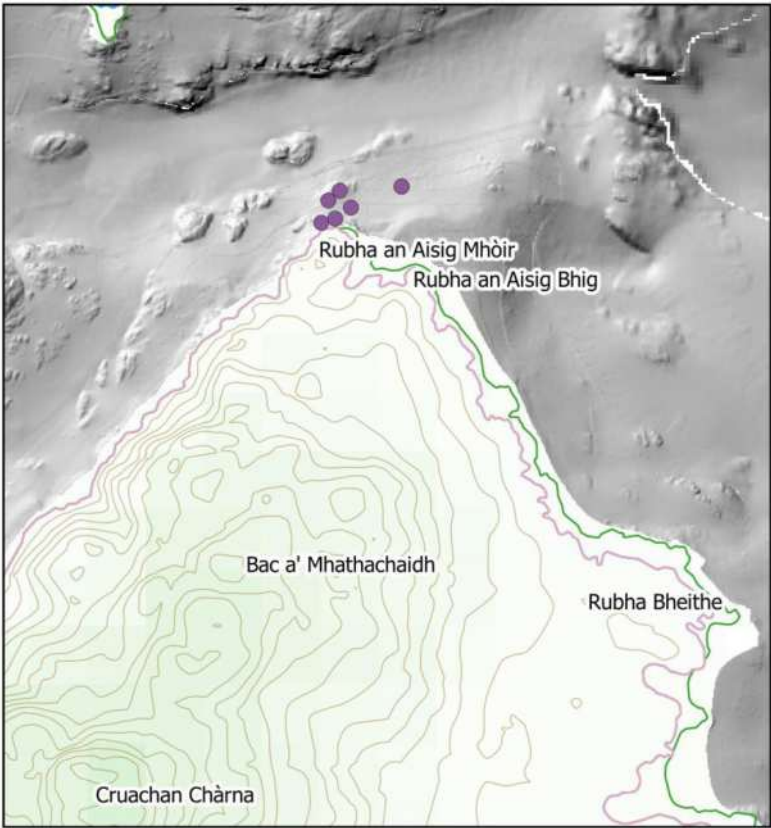
Flame Shell beds are another Scottish PMF and dense populations have been recorded at depths of 20-25m at high energy sites around the north end of Carna on clean gravel and coarse sediment of dead shell exposed to strong tidal streams.



A Flame Shell "nest" of dead shell and shell fragments bound together by byssus threads.
North Carna. ©Lin Baldock



A small Flame Shell (*Limaria hians*). Larger individuals are usually a rich orange colour. North Carna.
©George Brown.



Records for Flame Shell beds – north Carna.

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Infralittoral Seaweed Dominated Habitats

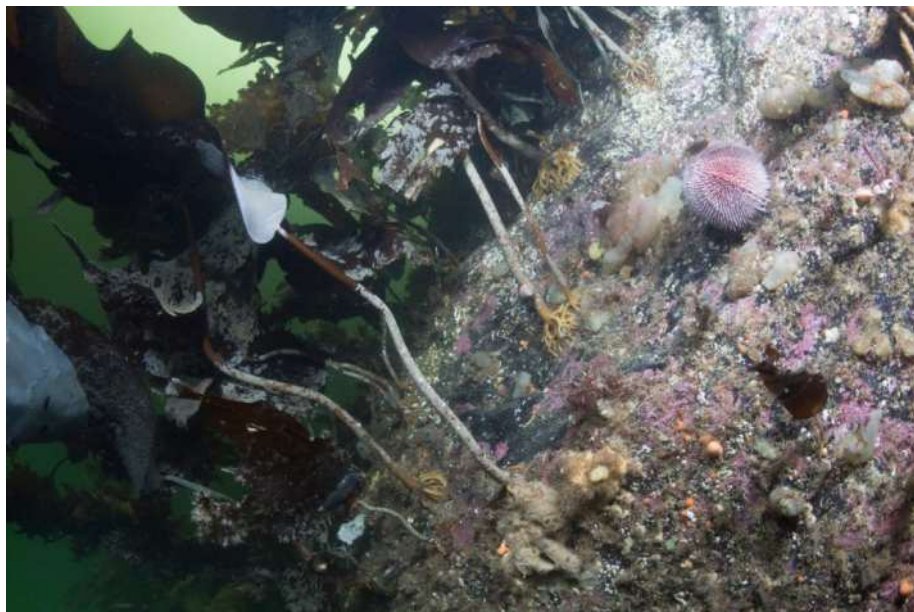
Very few algal records were made during any of the October surveys but there is a fringe of a variety of kelp habitats all around the island especially on bedrock and large boulders in shallow water (<5m). On the sheltered northeast and east sides of the island this habitat is dominated by Sugar Kelp (*Saccharina latissima*) with an understory of a few species of red algae and the sea squirts *Ascidia mentula* and *Ascidiella aspersa* (**Biotope: *Saccharina latissima* forest on very sheltered upper infralittoral rock IR.LIR.K.Slat.Ft**). It is noteworthy that the non-native filamentous red seaweed Siphoned Japan Weed (*Dasysiphonia japonica*) is very common in this habitat and on the muddy, stony sediments below the kelp where it occurs all around the island.



Left: Non-native Siphoned Japan Weed (*Dasysiphonia japonica*) ©Lin Baldock

Right: Sugar Kelp (*Saccharina latissima*) and Mermaid's Tresses (*Chorda filum*) died back in autumn.
©Richard Yorke

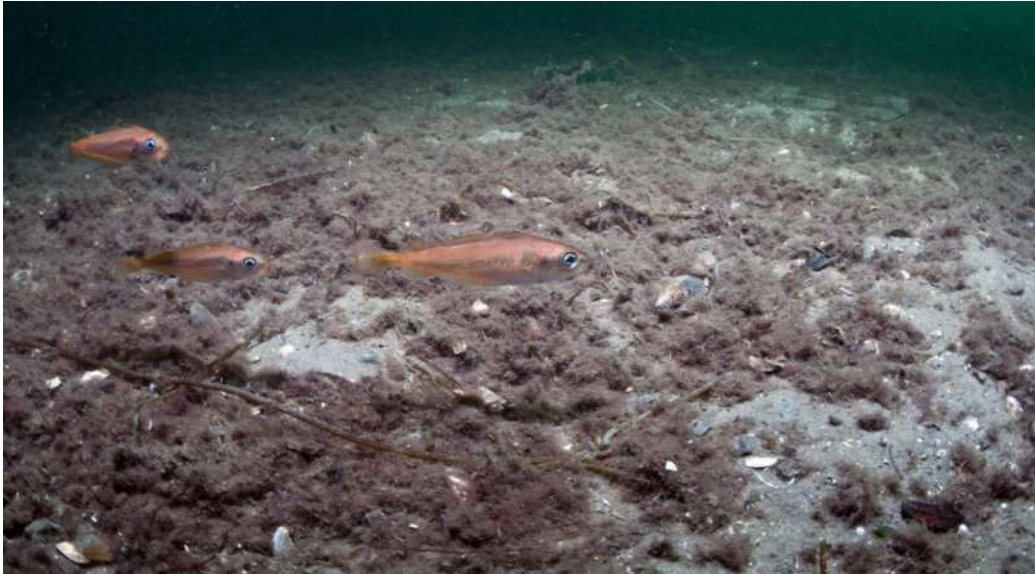
On the northeast side of Carna there is often a dense stand of Mermaid's Tresses (*Chorda filum*) which dies back in the early autumn, while the north point of the island supports dense stands of kelp with a sparse understory of red algae and urchin-grazed faunal turfs. A narrow fringe of sparser kelp forest occurs on the west side of the island on the bedrock and boulder slopes there. The tidal rapids of Caol Achdah Lic and Caolas Rahuaidh have stands of Forest Kelp park (*Laminaria hyperborea*) with Oar Weed (*Laminaria digitata*) on the shallowest bedrock and boulders.



Kelp park north Carna. In part *Laminaria hyperborea* on moderately exposed vertical rock.

IR.MIR.KR.LhypVt. ©Lin Baldock

Biotope: Loose-lying mats of *Phyllophora crispera* on infralittoral muddy sediment **S.SMp.KSwSS.Pcri**
The sediment seabed off Carna Jetty includes patches of loose lying red weed Sandy Leaf Bearer (*Phyllophora crispera*) interspersed with mats of the *Trilliella* phase of (*Bonnemaisonia hamifera*).



Mats of the *Trilliella* phase of Bonnemaisonia's Hook Weed with three Poor Cod (*Trisopterus minutus*).
Carna Jetty. ©Lin Baldock



Loose-lying fronds of the red seaweed Sandy Leaf Bearer (*Phyllophora crispera*) among pebbles and mixed sediment – Carna Jetty. ©Lin Baldock

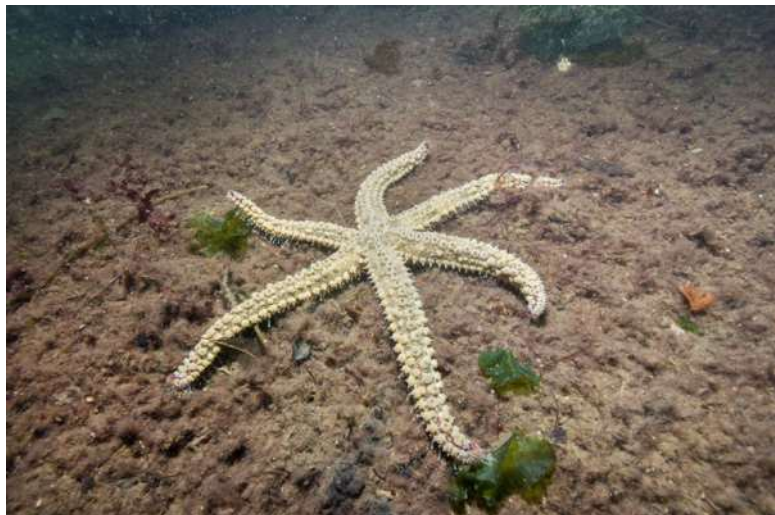
Biotope: Mats of *Trilliella* on infralittoral muddy gravel. **SS.SMp.KSwSS.Tra**

This biotope is widely distributed around northeast and eastern sheltered shores of Carna and Loch Teacuis in water depths of less than about 10m. The associated fauna does not seem to be at all diverse, probably because of the swamping effect of the seaweed mat.



Extensive mats of the *Trilliella* phase of *Bonnemaisonia hamifera*. Southeast Carna.
©Lucy Kay

Extensive mats of the *Trilliella* phase of *Bonnemaisonia hamifera* with a Spiny Starfish (*Marthasterias glacialis*). Northeast Carna.
©Lucy Kay



Extensive mats of the *Trilliella* phase of *Bonnemaisonia hamifera* with the Spoonworm *Amalosoma eddystonense* (the grey Y-shape centre image). Northeast Carna.
©Lucy Kay

Scottish Priority Marine Features

Heart Cockle (*Glossus humanus*). A single valve of this rare bivalve mollusc was found in outer Loch Teacuis on mixed, muddy, stony sediment in October 2022. There are a dozen likely records for this very rare species from around Scotland and the Isle of Man. Its relatively delicate, light weight shell and preferred habitat in soft, muddy sediments makes it highly vulnerable to fishing using bottom towed gear.



Left: Heart Cockle (*Glossus humanus*) - outer Loch Teacuis. ©Lin Baldock

Right: Ocean Quahog/Islandic Cyprine (*Arctica islandica*) – northeast Carna. ©George Brown

Ocean Quahog (Islandic Cyprine) (*Arctica islandica*). This is thought to be one of the longest living molluscs with one reported to be over 500 years old. There are seven records for this bivalve around Carna all on the muddy, sandy sediments on the east side with several off Carna Jetty and one from Loch Teacuis. No more than one or two live individuals are ever seen on any one dive.

Northern Sea Fan (*Swiftia pallida*) There are six records for this characterising species for the Scottish PMF broad habitat Northern Sea Fan and sponge communities along the west side of Carna.

Biotope: *Caryophyllia smithii*, *Swiftia pallida* and *Alcyonium glomeratum* on wave-sheltered circalittoral rock (**CR.MCR.EcCr.CarSwi.Aglo**).



Northern Sea Fan & Devonshire Cup Corals West Carna ©George Brown

Sand Goby *Pomatoschistus minutus*. This goby has been designated a PMF because the Scottish populations are considered globally important. It is a common species around Carna, particularly on the sandy sediments on the east side of the island in water depths of 10-20m especially off the jetty. It is very likely that the populations are a mix between this species and the very similar *P. lozanoi*. As yet no good distinguishing characters to separate these two species in the field have been found.



Sand Goby (*Pomatoschistus* sp) (left) south of Rubha na h' Eaglaise (right) off Carna Jetty
©Lin Baldock

Some Species Associations



Rhopalomenia aglaopheniae is an unusual worm-like mollusc in the class Solenogastres. It is almost exclusively found coiled around the stem of the rare hydroid *Lytocarpia myriophyllum* and has been recorded three times together with this hydroid from around Carna. ©George Brown



The stalked barnacle *Scalpellum scalpellum* on *Lytocarpia myriophyllum*, north Carna.
©Lin Baldock



The isopod *Astacilla longicornis* is often found associated with the Tall Seapen occurring in groups right at the tip of the seapen. ©George Brown



Left The isopod *Astacilla longicornis* at the tip of a Tall Seapen. ©George Brown
Right: Polyps of the Tall Seapen with orange oocytes. ©George Brown



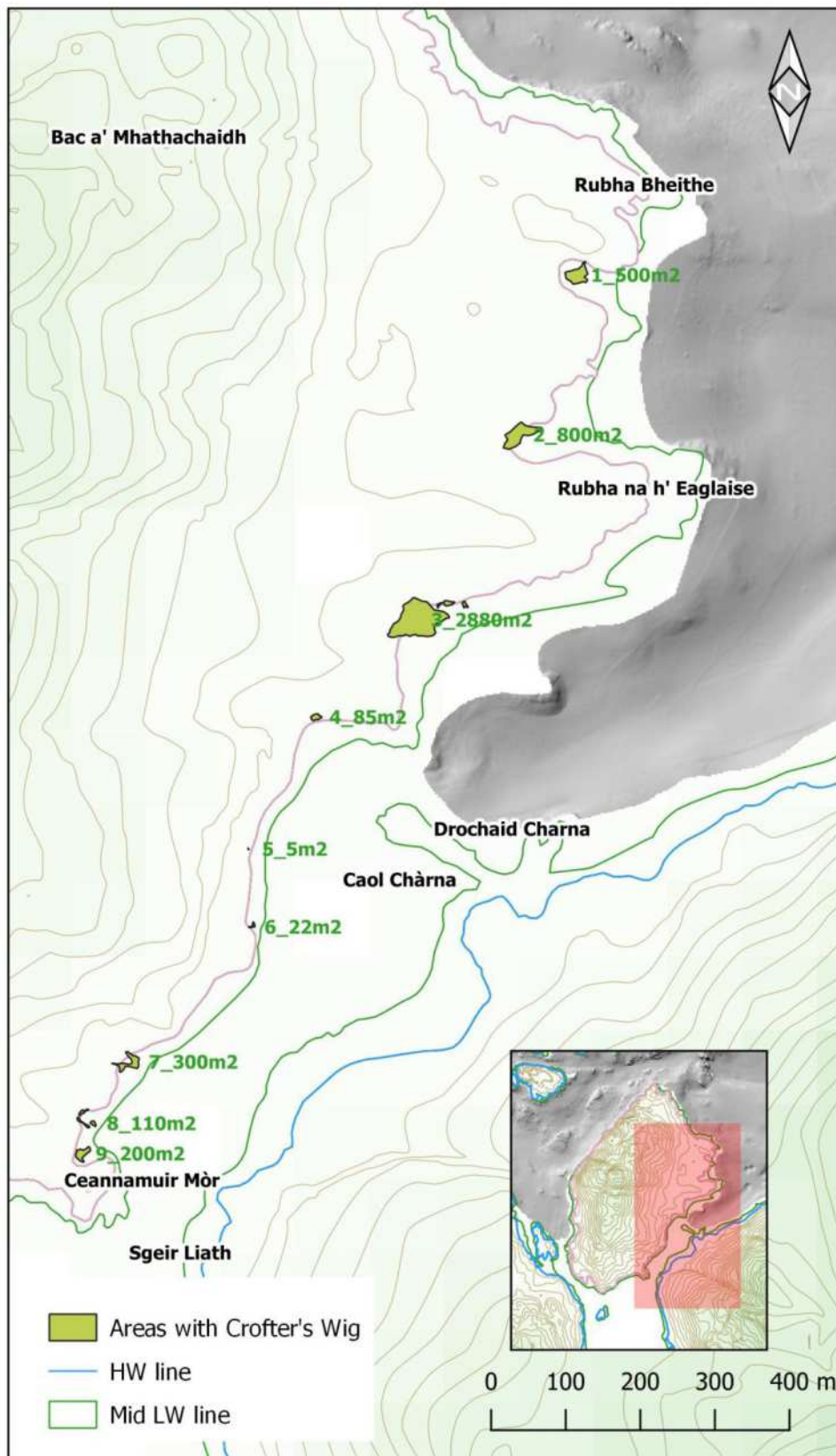
The pink speckled Cloak Anemone (*Adamsia palliata*) living commensally with its hermit crab *Pagurus prideauxi*. The right-hand image shows the anemone taking advantage of the water currents set up by the crab as it sifts through the sediment. **Left:** ©George Brown. **Right:** ©Richard Yorke.

Intertidal survey of Sea Loch Egg Wrack (*Ascophyllum nodosum* f. *mackayi*)

The rare Sea Loch Egg Wrack was found at eight locations in very sheltered muddy bays on the east side of Carna between the northeastern most point at Rhubha Bheithe (Point of the Birches) and Ceannamuir Mòr (Big Headland) at the entrance to Loch Teacuis to the southeast. The patches ranged in size from less than 10m² to over 2,500m² with a total area for Carna as a whole of 4,900m² - just under half a hectare (one acre). Patches were located on the upper shore and when plotted in the GIS using boundary line data available from the Ordnance Survey some appear above the high water line (mean high water springs in Scotland). This is because this line is only a rough approximation to the level of mean high water springs and in the absence of an accurate local reference point does not provide an exact representation of this level. All patches of the wrack were well above the Extent of the Realm (EOR) line which is defined as the level of mean low water springs. In Europe this seaweed is known only from Britain and Ireland, there are also records from the east coast of North America.



Both forms of Egg Wrack shown at high water next to Carna Jetty. ©Lin Baldock



Distribution and patch size of Crofter's Wig (*Ascophyllum nodosum f. mackayi*) around Carna. Contains OS data © Crown copyright and database right 2021. Contains public sector information, licensed under the Open Government Licence v3.0, from the Maritime and Coastguard Agency. Not to be used for navigation.

Site	Area (m ²)
1 Bay south of Rubha Bheithe	500
2 Bay north of Rubha na h-Eaglaise	800
3 Bay - Dailachreagain	2880
4 Bay south of Ceannamuir Beag	85
5 West shore of Caol Charna	5
6 West shore of Caol Charna	22
7 North of Ceannamuir Mòr	300
8 North of Ceannamuir Mòr	110
9 Bay north of Ceannamuir Mòr	200

Patch sizes of Crofter's Wig (*Ascophyllum nodosum f. mackayi*) around Carna.
Site numbers cross reference with the map above.



Crofter's Wig on the beach at high tide next to Carna Jetty. ©Lin Baldock



Detail of Crofter's Wig growth form with the associated red seaweed *Vertebrata lanosa*.

©Richard Yorke



Patch 4 (behind the boulder) Crofter's Wig survey. ©Richard Yorke



Patch 5 Crofter's Wig survey. ©Richard Yorke



Patch 8 Crofter's Wig survey. ©Richard Yorke



Patch 9 Crofter's Wig survey (Patch 8 in the background). ©Richard Yorke

Eyelash Worm Collection

Results of the analysis by Teresa Darbyshire of various collections of the Eyelash Worm *Myxicola* sp from around Britain have shown that the *Myxicola* species lacking black tips to the crown of tentacles is genetically and morphologically distinct from *Myxicola infundibuliformis* (which has black tips). Diver observations of the tube morphology in the field show that it too differs between the two species: that of the species without black tips remains as a gelatinous wobbly translucent tube extending about a centimetre above the sediment when the worm retracts when alarmed. By contrast the tube of *M. infundibuliformis* almost disappears into the sediment leaving virtually nothing above surface level when the worm disappears. A full morphological description of the species lacking black tips is currently in progress in part using material collected from around Carna. There are no confirmed records for *M. infundibuliformis* from sites around Carna while there are ten certain reports of the species lacking black tips to the tentacles from very soft muddy sediments, often with some small shell fragments.



Eyelash worm (*Myxicola* sp) in very soft, shell rich mud at 20m northeast point of Carna.
Right hand image shows the tube after worm has contracted. ©George Brown

Colour varies slightly ranging from individuals with reddish orange tones to very pale, greyish cream with iridescent blue-green hints.



From Bo Crithean ©George Brown

Gallery of Marine Life Around Carna

The following pages provide a gallery of marine life from sites around Carna.



Otter feeding among Egg Wrack. ©Richard Yorke



Angular Crab (*Goneplax rhomboides*) northeast Carna. ©George Brown

A window on underwater life in the narrows of Caol Chàrna



Caol Chàrna with Drochaid Chàrna (Carna Bridge) jutting part way across the narrows.
©Lin Baldock



Waiting for slack water in the
narrows of Caol Chàrna.
©Lucy Kay



Sunstar (*Crossaster papposus*) and Black Brittlestars (*Ophiocomina nigra*) Caol Chàrna ©Lin Baldock



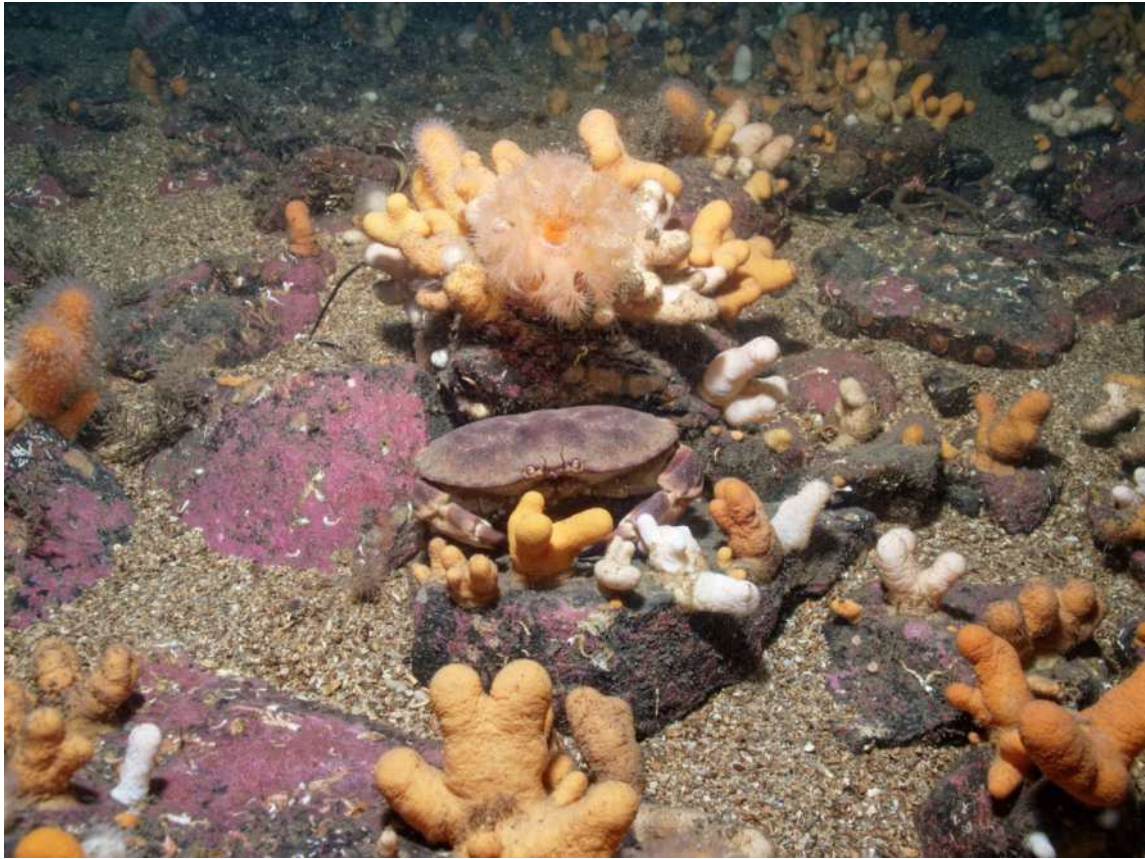
Black Brittlestars (*Ophiocomina nigra*) and Dead Mens' Fingers (*Alcyonium digitatum*) Caol Chàrna ©Lin Baldock



Leopard-spotted Goby (*Thorogobius ephippiatus*) peering from its lair under a boulder encrusted with pink coralline algae. Caol Chàrna. ©Lin Baldock



Lobster (*Homarus gammarus*). ©Lin Baldock



Dead Mens' fingers (*Alcyonium digitatum*), an Edible Crab (*Cancer pagurus*) and a Sunstar (*Crossaster papposus*) at 25m on the tide swept northern tip of Carna. ©Richard Yorke

Caolas Rahuaidh, the narrows leading into Loch Teacuis



A bed of Common Brittlestars (*Ophiothrix fragilis*) in Caolas Rahuaidh.
©Lucy Kay

Dead Mens' Fingers (*Alcyonium digitatum*) on smooth, water worn bedrock in Caolas Rahuaidh.
©Lucy Kay



Left: Edible Crab (*Cancer pagurus*). **Right:** A nudibranch *Cadlina laevis*
Caolas Rahuaidh. ©George Brown



Horse Mussel (*Modiolus* sp)
in Caolas Rahuaidh.
©George Brown



Sea Stickleback (*Spinachia spinachia*) ©George Brown



Left: Butterfish (*Pholis gunnellus*)

Below: Eckströms Topknot (*Zeugopterus regius*)

Both images ©George Brown



Carna House and Carna Cottage nestled in the shelter below Cruachan Chàrna

©Lin Baldock

Acknowledgements

We are extremely grateful to **Andy Jackson** and staff who welcomed us to the Isle of Carna and Carna Cottage. They did a huge amount to facilitate the logistics of getting to and from the island with all the equipment involved in a dive survey. Provision of boats and compressor (often at the end of a long working day) were an essential part of the smooth running of the surveys for which we are particularly appreciative.

Owen Paisley, coordinator for Seasearch West Scotland, was most helpful providing information for dive planning and pointing us towards potentially interesting survey sites.

Dawn Watson had the unenviable task of entering our data deciphered from hastily scribbled survey forms into the national Seasearch database. Thank you!

The Divers: Richard Yorke (group organiser), George Brown, Lucy Kay and Lin Baldock carried out the October dive surveys in 2018, 2019, 2021 and 2022. Jon Bass helped fetch and carry, and provided light beacons for late returns to the jetty at the end of the diving day.

Other divers who contributed to the Seasearch records of marine life around Carna.

Joanne	Beaton	Des	Kay*
John	Beaton	Flora	Kent
Caroline	Bishop*	Ellen	Last
Steve	Bishop*	Ian	Lowther*
Michael	Child	Jill	Mellink Davidson*
Trevor	Davies	John	Rees
Sean	Gallagher	Andrew	Shiple*
John	Harris*	Susan	Shiple*
Rebecca	Hills*	Kieran	Tulbure
Lisa	Kamphausen	Mike	Verner*

*Members of Bingham Sub Aqua Club

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Panorama east Carna looking up Loch Sunart: Rubha Bheithe to Rubha na h-Eaglaise at low tide.

©Richard Yorke

Appendix 1 List of taxa recorded from waters around Carna

Taxon	Common name	Taxon	Common name
Protozoa		<i>Virgularia mirabilis</i>	Slender Sepen
<i>Toxisarcon alba</i>	Foraminifera	<i>Abietinaria abietina</i>	A hydroid
Sponges		<i>Aglaophenia</i> sp	A hydroid
<i>Clathrina lacunosa</i>		<i>Aglaophenia tubulifera</i>	A hydroid
<i>Leucosolenia</i> sp	Organ Pipe Sponge	<i>Amphisbetia operculata</i>	A hydroid
<i>Amphilectus fucorum</i>	Carrot Sponge	<i>Antennella secundaria</i>	A hydroid
<i>Aplysilla sulfurea</i>		<i>Ectopleura larynx</i>	A hydroid
<i>Axinella infundibuliformis</i>	Prawn Cracker Sponge	<i>Eudendrium</i> sp	A hydroid
<i>Cliona celata</i>	Boring Sponge	<i>Halecium</i> sp	A hydroid
<i>Cliona celata</i> (boring form)		<i>Halecium beanii</i>	A hydroid
<i>Dysidea fragilis</i>	Goosebump Sponge	<i>Halecium halecinum</i>	A hydroid
<i>Halichondria</i> sp		<i>Halecium muricatum</i>	A hydroid
<i>Halichondria (Halichondria) panicea</i>	Breadcrumb Sponge	<i>Halopteris catharina</i>	A hydroid
<i>Haliclona</i> sp		<i>Hydractinia</i> sp	Hermit Crab Fur
<i>Haliclona (Haliclona) urceolus</i>		<i>Hydrallmania falcata</i>	Helter Skelter Hydroid
<i>Haliclona (Rhizoniera) viscosa</i>		Hydrozoa	
<i>Hymedesmia (Hymedesmia) paupertas</i>		<i>Kirchenpaueria</i> sp	A hydroid
<i>Myxilla (Myxilla) incrustans</i>		<i>Lytocarpia myriophyllum</i>	A hydroid
<i>Stelligera</i> sp		<i>Nemertesia antennina</i>	Antenna Hydroid
<i>Suberites</i>		<i>Nemertesia ramosa</i>	Branched Antenna Hydroid
<i>Suberites</i> (on hermit crab shell)		<i>Obelia geniculata</i>	Kelp Fur
<i>Suberites</i> (on Queen Scallop)		<i>Plumularia setacea</i>	A hydroid
<i>Suberites camosus</i>		Plumulariidae	A hydroid
<i>Suberites ficus</i>	Sea Orange	<i>Rhizocaulus verticillatus</i>	A hydroid
Porifera		<i>Schizotricha frutescens</i>	A hydroid
Porifera indet crusts		<i>Sertularella</i> sp	A hydroid
Cnidaria		<i>Sertularella gayi</i>	A hydroid
<i>Adamsia palliata</i>	Cloak Anemone	<i>Sertularia argentea</i>	A hydroid
<i>Alcyonium digitatum</i>	Dead Mens' Fingers	<i>Tubularia indivisa</i>	Oaten Pipe Hydroid
<i>Alcyonium glomeratum</i>	Red Fingers	<i>Aurelia aurita</i>	Moon Jellyfish
<i>Anemonia viridis</i>	Snakelocks Anemone	<i>Aurelia aurita</i> (Scyphistomae)	Moon Jellyfish
<i>Bolocera tuediae</i>	Deeplet Anemone	<i>Cyanea capillata</i>	Lion's Mane Jellyfish
<i>Capnea sanguinea</i>	Imperial Anemone	<i>Rhizostoma pulmo</i>	Barrel Jellyfish
<i>Caryophyllia (Caryophyllia) smithii</i>	Devonshire Cup Coral	Nemertea	
<i>Cerianthus lloydii</i>	Burrowing Anemone	<i>Tubulanus</i> sp	Football Jersey Worm
<i>Corynactis viridis</i>	Jewel Anemone	<i>Tubulanus annulatus</i>	Football Jersey Worm
<i>Cylista</i> sp		<i>Lineus</i> sp	Bootlace Worm
<i>Cylista elegans</i>	Elegant Anemone	<i>Lineus longissimus</i>	Bootlace Worm
<i>Cylista lacerata</i>		Echiura	
<i>Cylista troglodytes</i>		<i>Amalosoma eddystonense</i>	Spoon Worm
<i>Edwardsia claparedii</i>		Polychaetes	
<i>Epizoanthus couchii</i>	Sandy Creeplet	<i>Aphrodita aculeata</i>	Sea Mouse
<i>Funiculina quadrangularis</i>	Tall Sea Pen	<i>Arenicola</i> sp (casts)	Lugworm
<i>Gonactinia prolifera</i>		<i>Branchiomma bombyx</i>	
<i>Hormathia coronata</i>		<i>Chaetopterus</i> sp (tubes)	Parchment Worm
<i>Metridium dianthus</i>	Plumose Anemone	<i>Chone</i> sp	
<i>Pachycerianthus multiplicatus</i>	Fireworks Anemone	<i>Lanice conchilega</i>	Sandmason Worm
<i>Pennatula phosphorea</i>	Phosphorescent Seapen	<i>Myxicola cf sarsi</i>	Eyelash Worm
<i>Protaethea simplex</i>	Sea Loch Anemone	<i>Polychaeta</i>	
<i>Swiftia pallida</i>	Northern Seafan	<i>Protula tubularia</i>	Red Spotted Horseshoe Worm
<i>Urticina eques</i>	Horseman Anemone	<i>Sabella pavonina</i>	Peacock Worm
<i>Urticina felina</i>	Dahlia Anemone	<i>Sabellidae</i>	

Taxon	Common name	Taxon	Common name
<i>Serpula vermicularis</i>	Organ Pipe Worm	Anomiidae	Saddle Oyster
Serpulidae		<i>Arctica islandica</i>	Ocean Quahog, Islandic Cyprine
<i>Spirobranchus</i> sp	Keel worm	Bivalvia (siphons)	
Spirorbinae	Spiral worm	<i>Chlamys</i> sp	A scallop
Terebellidae		<i>Dosinia</i> sp	
		<i>Glossus humanus</i>	Heart Cockle
Crustacea		<i>Limaria hians</i>	Flame Shell
<i>Adna anglica</i>	Cup Coral Barnacle	<i>Mimachlamys varia nivea</i>	A scallop
Cirripedia	Barnacle	<i>Modiolus modiolus</i>	Horse Mussel
<i>Sacculina carcini</i>	Parasitic Barnacle	<i>Mytilus edulis</i>	Edible Mussel
<i>Scalpellum scalpellum</i>	Stalked Barnacle	<i>Ostrea edulis</i>	European Oyster
Amphipoda (tubes)		<i>Pecten maximus</i>	King Scallop
<i>Anapagurus</i> sp	Hermit crab	<i>Venus casina</i>	
<i>Astacilla longicornis</i>	An isopod		
<i>Cancer pagurus</i>	Edible Crab	Cephalopoda	
Caprellidae	Skeleton Shrimp	<i>Eledone cirrhosa</i>	Curled Octopus
<i>Carcinus maenas</i>	Shore Crab	<i>Sepioloa</i> sp	
<i>Crangon</i> sp	Brown Shrimp	<i>Sepioloa atlantica</i>	Little Cuttle
<i>Crangon crangon</i>	Brown Shrimp	<i>Rossia</i> sp	Bob-tailed squid
<i>Diogenes pugilator</i>	Roux's Hermit Crab		
<i>Ebalia</i> sp	Nut Crab	Gastropods	
<i>Eualus</i> sp	Shrimp	<i>Acanthodoris</i> sp	A nudibranch
<i>Galathea</i> sp	Squat Lobster	<i>Adalaria loveni</i>	A nudibranch
<i>Galathea intermedia</i>	Squat Lobster	<i>Adalaria proxima</i>	A nudibranch
<i>Galathea squamifera</i>	Squat Lobster	<i>Aeolidia</i> sp	A nudibranch
<i>Galathea strigosa</i>	Squat Lobster	<i>Amphorina farrani</i>	A nudibranch
<i>Goneplax rhomboides</i>	Angular Crab	<i>Aplysia punctata</i>	Sea Hare
<i>Hippolyte varians</i>	Chameleon Prawn	<i>Buccinum undatum</i>	Common Whelk
<i>Homarus gammarus</i>	Lobster	<i>Calliostoma zizyphinum</i>	Painted Top Shell
<i>Hyas</i> sp	A spider crab	<i>Elysia viridis</i>	Solar-powered Sea Slug
<i>Hyas araneus</i>	A spider crab	<i>Cadlina laevis</i>	A nudibranch
<i>Inachus</i> sp	A spider crab	<i>Cuthona nana</i>	A nudibranch
<i>Inachus dorsettensis</i>	Scorpion Spider Crab	<i>Doris pseudoargus</i>	A nudibranch
<i>Inachus phalangium</i>	Leach's Spider Crab	<i>Doto hystrix</i>	A nudibranch
<i>Iphimedia obesa</i>	An isopod	<i>Doto</i> sp	A nudibranch
<i>Liocarcinus depurator</i>	Harbour crab	<i>Duvaucelia plebeia</i>	A nudibranch
<i>Liocarcinus pusillus</i>		<i>Eubranchus farrani</i>	A nudibranch
<i>Macropodia</i> sp	Long-legged Spider Crab	<i>Eubranchus</i> sp	A nudibranch
<i>Munida rugosa</i>	Long-clawed Squat Lobster	<i>Eubranchus tricolor</i>	A nudibranch
<i>Necora puber</i>	Velvet Swimmong Crab	<i>Facelina bostoniensis</i>	A nudibranch
<i>Nephrops norvegicus</i>	Norway Lobster	<i>Fjordia chriskaugei</i>	A nudibranch
Paguridae	Hermit crab	<i>Fjordia</i> sp	A nudibranch
<i>Pagurus</i> sp	Hermit crab	<i>Flabellina browni</i>	A nudibranch
<i>Pagurus bernhardus</i>	Common Hermit Crab	<i>Flabellina pedata</i>	A nudibranch
<i>Pagurus cuanensis</i>	Hermit crab	<i>Flabellina pellucida</i>	A nudibranch
<i>Pagurus prideaux</i>	Anemone hermit crab	<i>Flabellina</i> sp	A nudibranch
<i>Palaemon serratus</i>	Common Prawn	<i>Jorunna tomentosa</i>	A nudibranch
<i>Pandalus montagui</i>	Pink Shrimp	<i>Limacia clavigera</i>	A nudibranch
<i>Pisidia longicornis</i>	Long-clawed Porcelain Crab	<i>Onchidoris bilamellata</i>	A nudibranch
<i>Portumnus latipes</i>	A crab	<i>Polycera faeroensis</i>	A nudibranch
		<i>Gibbula</i> sp	Top Shell
Molluscs Bivalves		<i>Gibbula magus</i>	Turban Top Shell
<i>Aequipecten opercularis</i>	Queen Scallop	<i>Littorina</i> sp	Winkle

Taxon	Common name	Taxon	Common name
<i>Littorina littorea</i>	Common Winkle	<i>Leptometra celtica</i>	Celtic Featherstar
<i>Nucella lapillus</i>	Dog Whelk		
<i>Patella pellucida</i>	Blue-rayed Limpet	Sea Urchins	
<i>Patella vulgata</i>	Limpet	<i>Echinus esculentus</i>	Common Sea Urchin
<i>Philine quadripartita</i>	Lobe Shell	<i>Psammechinus miliaris</i>	Green Sea Urchin
<i>Pleurobranchus membranaceus</i>			
<i>Polycera quadrilineata</i>		Holothurians	Sea cucumbers
<i>Steromphala cineraria</i>	Grey Top Shell	<i>Aslia lefevrei</i>	Crevice Sea Cucumber
<i>Tectura virginea</i>	White Tortoiseshell Limpet	<i>Neopentadactyla mixta</i>	Gravel Sea Cucumber
<i>Tricolia pullus</i>	Pheasant Shell	<i>Ocnus</i> sp	
<i>Tritia</i> sp	Netted Dog Whelk	<i>Ocnus planci</i>	
<i>Trivia</i> sp	Cowrie	<i>Pawsonia saxicola</i>	Crevice Sea Cucumber
<i>Trivia arctica</i>	Arctic Cowrie		
<i>Trivia monacha</i>	European Cowrie	Brittle stars	
<i>Turritellinella tricarinata</i>	Tower Shell	<i>Amphipholis squamata</i>	
<i>Leptochiton asellus</i>	A chiton	Amphiuridae (burrowing)	
Polyplacophora	A chiton	<i>Ophiocomina nigra</i>	Black Brittlestar
<i>Tonicella marmorea</i>	Mottled Red Mail Shell	<i>Ophiopholis aculeata</i>	Crevice Brittlestar
<i>Rhopalomenia aglaopheniae</i>	Solenogastres	<i>Ophiothrix fragilis</i>	Common Brittlestar
		<i>Ophiura</i> sp	Sand Brittlestar
Brachiopods		<i>Ophiura albida</i>	Sand Brittlestar
<i>Novocrania anomala</i>	Lamp Shell	<i>Ophiura ophiura</i>	Sand Brittlestar
Bryozoa		Tunicates	Sea squirts
<i>Bicellariella ciliata</i>		<i>Ascidia conchilega</i>	
Bryozoa indet crusts		<i>Ascidia mentula</i>	
<i>Bugula</i> sp	Spiral Bryozoan	<i>Ascidia virginea</i>	
Candidae		<i>Ascidiella</i> sp	
<i>Cellaria</i> sp		<i>Ascidiella aspersa</i>	Fluted Sea Squirt
<i>Cradoscrupocellaria</i> sp		<i>Ascidiella scabra</i>	
<i>Electra pilosa</i>	Frosty Sea Mat	<i>Boltenia echinata</i>	Cactus Sea Squirt
<i>Membranipora membranacea</i>	Sea Mat	<i>Botryllus schlosseri</i>	Star Sea Squirt
<i>Omalosecosa ramulosa</i>	Branching bryozoan	<i>Ciona intestinalis</i>	Yellow-ringed Sea Squirt
<i>Parasmittina trispinosa</i>	Encrusting bryozoan	<i>Clavelina lepadiformis</i>	Light Bulb Sea Squirt
<i>Securiflustra securifrons</i>	Hornwrack	<i>Corella parallelogramma</i>	Gas Mantle Sea Squirt
<i>Crisia</i> sp	White clawed Sea Moss	<i>Dendrodoa</i> sp	
<i>Crisia eburnea</i>	White Clawed Sea Moss	<i>Dendrodoa grossularia</i>	
Crisiidae	White Clawed Sea Moss	<i>Diazona violacea</i>	Football Sea Squirt
<i>Exidmonea atlantica</i>	White Palm Bryozoan	Didemnidae	
		<i>Didemnum maculosum</i>	
Starfish		<i>Diplosoma</i> sp	
<i>Anseropoda placenta</i>	Goosefoot Starfish	<i>Diplosoma spongiforme</i>	
<i>Asterias rubens</i>	Common starfish	<i>Lissoclinum perforatum</i>	
<i>Astropecten irregularis</i>	Sand Star	<i>Microcosmus claudicans</i>	
<i>Crossaster papposus</i>	Common Sunstar	<i>Molgula oculata</i>	
<i>Henricia</i> sp	Bloody Henry	<i>Polycarpa</i> sp	
<i>Luidia ciliaris</i>	Seven-armed Starfish	<i>Polycarpa errans</i>	
<i>Marthasterias glacialis</i>	Spiny Starfish	<i>Polycarpa pomaria</i>	
<i>Porania (Porania) pulvillus</i>	Red Cushion Star	<i>Polycarpa scuba</i>	
<i>Solaster endeca</i>	Purple Sunstar	<i>Pyura microcosmus</i>	
<i>Antedon</i> sp	Featherstar	<i>Pyura squamulosa</i>	
<i>Antedon bifida</i>	Common Featherstar		
<i>Antedon petasus</i>	Featherstar		

Taxon	Common name	Taxon	Common name
Cartilaginous fish		<i>Ascophyllum nodosum</i> f. <i>mackayi</i>	Crofter's Wig
<i>Dipturus intermedius</i> (juvenile)	Flapper Skate	<i>Asperococcus bullosus</i>	Fat Sausage Weed
<i>Raja clavata</i>	Thornback Skate	<i>Chorda filum</i>	Mermaid's Tresses
<i>Raja clavata</i> (egg)		<i>Desmarestia viridis</i>	Desmarest's Green Weed
<i>Scyliorhinus canicula</i>	Lesser Spotted Catshark	<i>Fucus serratus</i>	Serrated Wrack
<i>Scyliorhinus stellaris</i>	Nursehound	<i>Fucus spiralis</i>	Spiral Wrack
Bony fish		<i>Fucus vesiculosus</i>	Bladder Wrack
Ammodytidae	Sand Eel	<i>Halidrys siliquosa</i>	Sea Oak
<i>Aphia minuta</i>	Transparent Goby	<i>Himantalia elongata</i>	Thong Weed
<i>Buenia jeffreysii</i>	Jeffreys's Goby	<i>Laminaria</i> sp	Kelp
<i>Callionymus</i> sp	Dragonet	<i>Laminaria digitata</i>	Oar Weed
<i>Callionymus lyra</i>	Common Dragonet	<i>Laminaria hyperborea</i>	Forest Kelp
<i>Callionymus maculatus</i>	Spotted Dragonet	Laminariales	
<i>Callionymus reticulatus</i>	Reticulated Dragonet	<i>Pelvetia canaliculata</i>	Channel Wrack
<i>Centrolabrus exoletus</i>	Rock Cook	<i>Saccharina latissima</i>	Sugar Kelp
<i>Chirolophis ascanii</i>	Yarrell's Blenny	<i>Saccorhiza polyschides</i>	Furbellows
<i>Ctenolabrus rupestris</i>	Goldsinny	Chlorophyceae	
<i>Cyclopterus lumpus</i>	Lumpsucker	<i>Bryopsis</i> sp	
<i>Diplecogaster bimaculata</i>	Two-spotted Clingfish	<i>Chaetomorpha</i>	
<i>Eutrigla gurnardus</i>	Grey Gurnard	<i>Ulva</i> sp	Mossy Feather Weed
Gadidae		<i>Ulva lactuca</i>	Sea Lettuce
<i>Gadus morhua</i>	Cod	Red algae	
<i>Gobius niger</i>	Black Goby	<i>Bonnemaisonia</i>	
<i>Labrus bergylta</i>	Ballan Wrasse	<i>Bonnemaisonia hamifera</i> (<i>Trailiella</i> phase)	Bonnemaisonia's Hook Weed
<i>Labrus mixtus</i>	Cuckoo Wrasse	<i>Metacallophyllis laciniata</i>	Beautiful Fan Weed
<i>Lebetus guilleti</i>	Guillet's Goby	<i>Corallina officinalis</i>	Common Coral Weed
<i>Lebetus scorpioides</i>	Diminutive Goby	Corallinaceae (crust)	
<i>Lesueurigobius friesii</i>	Fries's Goby	<i>Cryptopleura ramosa</i>	Fine-veined Crinkle Weed
<i>Limanda limanda</i>	Dab	<i>Dasyisiphonia japonica</i>	Siphoned Japan Weed
<i>Myoxocephalus scorpius</i>	Short-spined Sea Scorpion	<i>Delesseria sanguinea</i>	Sea Beech
<i>Pholis gunnellus</i>	Butterfish	<i>Dilsea carnosa</i>	Red Rags
<i>Pleuronectes platessa</i>	Plaice	<i>Gracilariopsis longissima</i>	A Wart Weed
<i>Pleuronectidae</i>		<i>Heterosiphonia plumosa</i>	Siphoned Feather Weed
<i>Pollachius pollachius</i>	Pollack	<i>Hypoglossum hypoglossoides</i>	Under Tongue Weed
<i>Pollachius virens</i>	Saithe	Maerl indet	
<i>Pomatoschistus flavescens</i>	Two-spotted Goby	<i>Odonthalia dentata</i>	Northern Tooth Weed
<i>Pomatoschistus</i> sp	Sand Goby	<i>Palmaria palmata</i>	Dulse
<i>Pomatoschistus norvegicus</i>	Norway Goby	<i>Phycodrys rubens</i>	Sea Oak
<i>Pomatoschistus pictus</i>	Panted Goby	<i>Phyllophora crispa</i>	Sandy Leaf Barer
<i>Spinachia spinachia</i>	Sea Stickleback	<i>Plocamium aggregate</i>	Comb Weed
<i>Symphodus melops</i>	Corkwing Wrasse	<i>Pterothamnion plumula</i>	Bushy Feather Weed
<i>Syngnathus acus</i>	Greater Pipefish	<i>Ptilota gunneri</i>	Feathered Wing Weed
<i>Taurulus bubalis</i>	Long-spined Sea Scorpion	<i>Rhodomenia pseudopalmata</i>	Rosy Fan Weed
<i>Thorogobius ephippiatus</i>	Leopard Spotted Goby	<i>Scinaia furcellata</i>	Scinà's Weed
<i>Trisopterus luscus</i>	Bib	<i>Symphocladia parasitica</i>	Parasitic Winged Weed
<i>Trisopterus minutus</i>	Poor Cod	<i>Vertebrata lanosa</i>	Wrack Siphon Weed
<i>Zeugopterus regius</i>	Ecktröm's Topknot		
<i>Zeugopterus norvegicus</i>	Norwegian Topknot		
Brown algae			
Aglaozonia (asexual <i>Cutleria</i>)			
<i>Ascophyllum nodosum</i>	Egg Wrack		

Appendix 2 List of biotopes recorded from around Carna

Full details of each of these habitats (biotopes) can be found here <https://mhc.jncc.gov.uk/>

Biotope Code	Biotope Description	Count
IR.FIR.IFou	Infralittoral fouling seaweed communities	3
IR.LIR.K	Silted kelp communities (sheltered infralittoral rock)	4
IR.LIR.K.LhypLsac.Ft	Mixed <i>Laminaria hyperborea</i> and <i>Laminaria saccharina</i> forest on sheltered upper infralittoral rock	5
IR.LIR.K.Lsac	<i>Laminaria saccharina</i> on very sheltered infralittoral rock	2
IR.LIR.K.Lsac.Ft	<i>Laminaria saccharina</i> forest on very sheltered upper infralittoral rock	5
IR.LIR.K.Lsac.Pk	<i>Laminaria saccharina</i> park on very sheltered lower infralittoral rock	2
IR.LIR.Lag.FChoG	Mixed fucoids, <i>Chorda filum</i> and green seaweeds on reduced salinity infralittoral rock	2
IR.MIR.KR	Kelp and red seaweeds (moderate energy infralittoral rock)	4
IR.MIR.KR.Ldig	<i>Laminaria digitata</i> on moderately exposed sublittoral fringe rock	1
IR.MIR.KR.Lhyp.Ft	<i>Laminaria hyperborea</i> forest and foliose red seaweeds on moderately exposed upper infralittoral rock	3
IR.MIR.KR.Lhyp.GzFt	Grazed <i>Laminaria hyperborea</i> forest with coralline crusts on upper infralittoral rock	4
IR.MIR.KR.Lhyp.GzPk	Grazed <i>Laminaria hyperborea</i> park with coralline crusts on lower infralittoral rock	3
IR.MIR.KR.LhypT	<i>Laminaria hyperborea</i> on tide-swept, infralittoral rock	3
IR.MIR.KR.LhypT.Ft	<i>Laminaria hyperborea</i> forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock	1
IR.MIR.KR.LhypTX	<i>Laminaria hyperborea</i> on tide-swept infralittoral mixed substrata	2
IR.MIR.KR.LhypTX.Ft	<i>Laminaria hyperborea</i> forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata	1
IR.MIR.KR.LhypTX.Pk	<i>Laminaria hyperborea</i> park and foliose red seaweeds on tide-swept lower infralittoral mixed substrata	1
IR.MIR.KR.LhypVt	<i>Laminaria hyperborea</i> on moderately exposed vertical rock.	2
IR.MIR.KT.XKTX	Mixed kelp and red seaweeds on infralittoral boulders, cobbles and gravel in tidal rapids	4
CR.LCR.BrAs	Brachiopod and ascidian communities	1
CR.LCR.BrAs.AmenCio	Solitary ascidians, including <i>Ascidia mentula</i> and <i>Ciona intestinalis</i> , on wave-sheltered circalittoral rock	8
CR.LCR.BrAs.AmenCio.Ant	Solitary ascidians, including <i>Ascidia mentula</i> and <i>Ciona intestinalis</i> , with <i>Antedon</i> spp. on wave-sheltered circalittoral rock	8

Biotope Code	Biotope Description	Count
CR.LCR.BrAs.AmenCio.Bri	Dense brittlestars with sparse <i>Ascidia mentula</i> and <i>Ciona intestinalis</i> on sheltered circalittoral mixed substrata	1
CR.LCR.BrAs.AntAsH	<i>Antedon</i> spp., solitary ascidians and fine hydroids on sheltered circalittoral rock	3
CR.LCR.BrAs.NeoPro	<i>Neocrania anomala</i> and <i>Protanthea simplex</i> on sheltered circalittoral rock	3
CR.LCR.BrAs.NeoPro.FS	<i>Neocrania anomala</i> and <i>Protanthea simplex</i> on very wave-sheltered circalittoral rock	2
CR.MCR	Moderate energy circalittoral rock	1
CR.MCR.EcCr	Echinoderms and crustose communities	3
CR.MCR.EcCr.AdigVt	<i>Alcyonium digitatum</i> and faunal crust communities on vertical circalittoral bedrock	7
CR.MCR.EcCr.CarSwi.Aglo	<i>Caryophyllia smithii</i> , <i>Swiftia pallida</i> and <i>Alcyonium glomeratum</i> on wave-sheltered circalittoral rock	6
CR.MCR.EcCr.FaAlCr.Adig	<i>Alcyonium digitatum</i> , <i>Pomatoceros triqueter</i> , algal and bryozoan crusts on wave-exposed circalittoral rock	1
CR.MCR.EcCr.FaAlCr.Bri	Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed circalittoral rock	1
CR.MCR.EcCr.FaAlCr.Car	<i>Caryophyllia smithii</i> with faunal and algal crusts on moderately wave-exposed circalittoral rock	2
CR.MCR.EcCr.FaAlCr.Pom	Faunal and algal crusts with <i>Pomatoceros triqueter</i> and sparse <i>Alcyonium digitatum</i> on exposed to moderately wave-exposed circalittoral rock	1
CR.MCR.EcCr.FaAlCr.Sec	<i>Alcyonium digitatum</i> with <i>Securiflustra securifrons</i> on tide-swept moderately wave-exposed circalittoral rock	2
CR.FCR.Cv.SpCup	Sponges, cup corals and anthozoans on shaded or overhanging circalittoral rock	1
CR.FCR.FouFa	Circalittoral fouling faunal communities	3
CR.FCR.FouFa.Aasp	<i>Ascidella aspersa</i> on circalittoral artificial substrata	1
CR.HCR.XFa	Mixed faunal turf communities	1
LR.LLR.F	Fucoids on sheltered marine shores	1
LR.LLR.FVS.AscVS	<i>Ascophyllum nodosum</i> and <i>Fucus vesiculosus</i> on variable salinity mid eulittoral rock	1
LR.LLR.FVS.Ascmac	<i>Ascophyllum nodosum</i> ecad <i>mackaii</i> beds on extremely sheltered mid eulittoral mixed substrata	9
SS	Sublittoral sediment	1
SS.SBR.SMus	Sublittoral mussel beds (on sublittoral sediment)	2
SS.SCS.CCS	Circalittoral coarse sediment	6
SS.SMp	Sublittoral macrophyte-dominated communities on sediments	2
SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral sediment	5
SS.SMp.KSwSS.LsacCho	<i>Laminaria saccharina</i> and <i>Chorda filum</i> on sheltered upper infralittoral muddy sediment	11

Biotope Code	Biotope Description	Count
SS.SMp.KSwSS.Pcri	Loose-lying mats of <i>Phyllophora crispera</i> on infralittoral muddy sediment	2
SS.SMp.KSwSS.Tra	Mats of <i>Trilliella</i> on infralittoral muddy gravel	7
SS.SMp.Mrl	Maerl beds	2
SS.SMu	Sublittoral cohesive mud and sandy mud communities	1
SS.SMu.CFiMu	Circalittoral fine mud	7
SS.SMu.CFiMu.SpnMeg	Seapens and burrowing megafauna in circalittoral fine mud	3
SS.SMu.CFiMu.SpnMeg.Fun	Seapens, including <i>Funiculina quadrangularis</i> , and burrowing megafauna in undisturbed circalittoral fine mud	15
SS.SMu.CSaMu	Circalittoral sandy mud	3
SS.SMu.CSaMu.VirOphPmax	<i>Virgularia mirabilis</i> and <i>Ophiura</i> spp. with <i>Pecten maximus</i> on circalittoral sandy or shelly mud	3
SS.SMu.CSaMu.VirOphPmax.HAs	<i>Virgularia mirabilis</i> and <i>Ophiura</i> spp. with <i>Pecten maximus</i> , hydroids and ascidians on circalittoral sandy or shelly mud with stones	18
SS.SMu.IFiMu	Infralittoral fine mud	1
SS.SMu.IFiMu.PhiVir	<i>Philine aperta</i> and <i>Virgularia mirabilis</i> in soft stable infralittoral mud	2
SS.SMu.ISaMu	Infralittoral sandy mud	1
SS.SMx	Sublittoral mixed sediment	1
SS.SMx.CMx	Circalittoral mixed sediment	14
SS.SMx.CMx.CloMx	<i>Cerianthus lloydii</i> and other burrowing anemones in circalittoral muddy mixed sediment	11
SS.SMx.CMx.CloMx.Nem	<i>Cerianthus lloydii</i> with <i>Nemertesia</i> spp. and other hydroids in circalittoral muddy mixed sediment	10
SS.SMx.CMx.OphMx	<i>Ophiothrix fragilis</i> and/or <i>Ophiocomina nigra</i> brittlestar beds on sublittoral mixed sediment	18
SS.SMx.IMx	Infralittoral mixed sediment	3
SS.SMx.IMx.Lim	<i>Limaria hians</i> beds in tide-swept sublittoral muddy mixed sediment	7
SS.SSa.CMuSa	Circalittoral muddy sand	1
SS.SSa.IMuSa	Infralittoral muddy sand	1

