Rathlin Island Dive Expedition

May 2019

A condition assessment of the seabed habitats and biodiversity around Rathlin Island

CEDaR
Centre for Environmental Data and Recording

In partnership with:

Department of Agriculture, Environment and Rural Affairs

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A condition assessment of the seabed habitats and biodiversity around Rathlin Island

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Cover photo: *Arachnanthus sarsi* ©Bernard Picton

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Background

The marine data officer role at the Centre for Environmental Data and Recording (CEDaR) is funded and managed by the DAERA Marine and Fisheries Division. The primary objective for this role is to facilitate the collection, and collation, of marine biodiversity data from within the Northern Ireland Marine Area. Data is stored at CEDaR and made available for statutory monitoring and management, research, environmental impact assessments, planning, licencing and general interest.

In order to collect marine data from within the Rathlin Island MPA, in May 2019, the CEDaR marine data officer (Sally Stewart-Moore) joined a group of divers exploring the seabed around Rathlin. This week-long trip was organised by Bernard Picton and focused on recording and photographing nudibranch species. The collection of seabed images presented an opportunity to gather additional species and habitats data and the DAERA Marine and Fisheries Division were grateful to Bernard for allowing Sally Stewart-Moore to join the trip, and to the group as a whole for sharing their images and observations. This enabled the production of a species list and description for each site, which has been compared with previous dive surveys and was used to inform this condition assessment of the seabed habitats and faunal communities around Rathlin Island.

Overall this initiative was deemed to be a great success, highlighting the potential benefits from conducting targeted citizen science projects.

Prologue

RATHLIN ISLAND

Supporting Information

B.E. Picton and D.G. Erwin

Circa 1986

REASONS FOR PROTECTION OF RATHLIN ISLAND

Rathlin Island is a site of unique importance in marine biological terms. Its geographical position at the entrance to the North Channel suggests that it should be an important site from a zoogeographical standpoint. The frequency of species found to be at or near their northern limits of distribution in the British Isles around Rathlin Island confirm this suggestion. The presence of many rocky circalittoral habitats and rare sedimentary habitats make the island an important site in a Northern Ireland context as such habitats have been shown by the N.I.S.S. to be comparatively rare in this area. The underwater cliffs on the north side of the island are probably the largest vertical sublittoral rockfaces in the British Isles. The presence of deep water which is being turbulently mixed by the strong tidal streams may also account for the occurrence of some of the species found on the east coast, which are thought to be characteristically deep-water forms, and are not known elsewhere within diving range. This sort of habitat coincides with the open sea etage of Glemarec.

Sediment habitats around Rathlin are apparently in a natural state and do not appear to have been damaged by dredging or other fishing activities. The muddy grade 1 habitats in particular, which support small populations of scallops Pecten maximus, are mostly mixed with numbers of boulders and cobbles which support rich populations of hydroids and bryozoa and greatly increase the diversity of these sites. On the west coast of Scotland such sites have been extensively dredged, with consequent removal of most of the cobbles causing permanent damage to the habitat. While the presence of larger boulders and bedrock outcrops may inhibit dredging on the east coast of Rathlin urgent protection should be sought to protect against this threat, especially in view of current trends towards dredging of more marginal areas using sophisticated instrumentation such as side-scan sonar.

It is suggested therefore that full Marine Nature Reserve status should be given to Rathlin Island as soon as possible. Licensing of current fishing with lines and pots should not pose any threat to the environment if continued at present levels, and indeed protection of this fishery by exclusion of boats from elsewhere should be seen as beneficial by the islanders. Rathlin has considerable potential from a sport-diving tourism point of view, and if the reserve is established on a "look but don't take" principle then it could be developed along these lines as an educational and sports resource.

Introduction

The Northern Ireland Sublittoral Survey (NISS) conducted by Erwin et al. (1986, 1990) highlighted the rich diversity of marine life and supporting habitats that surround Rathlin Island, off the north coast of County Antrim. This has since been recognised in recent dive surveys conducted around Rathlin Island (Picton et al., 2007a; Goodwin et al., 2011 & 2011a), which is considered as a stronghold for many rare species that are included on the Northern Ireland Priority Species list (Goodwin et al., 2011a).

Environmental Designations with marine components

Today, the site is a designated Special Area of Conservation (SAC) for its rocky reefs, sea caves and sandbanks which are slightly covered by seawater all of the time, that support the diverse marine fauna communities and are listed as Annex I Habitats under the European Habitats Directive. It is also a Special Protection Area (SPA) and Area of Special Scientific Interest (ASSI) for breeding seabirds, and in 2017 it was designated as one of Northern Ireland's first Marine Conservation Zones (MCZ) (Fig. 1). The Rathlin MCZ is designated for the following features:

- Deep-sea bed
- Black guillemot
- Geological/Geomorphological features indicating past change in relative sea level (such as submerged paleo-lagoon, cliffs, gullies and sea arches).

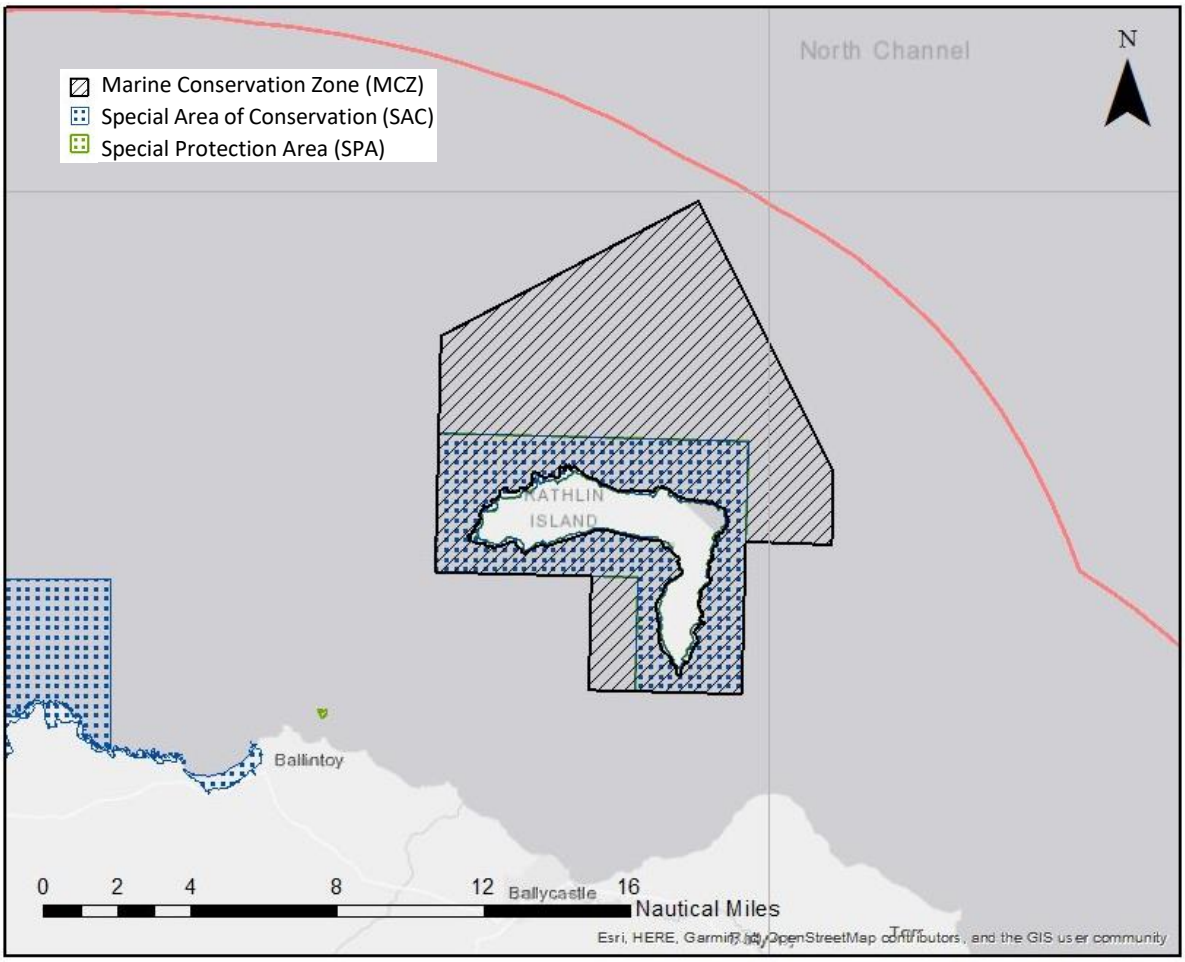

Figure 1 | Designated Marine Protected Areas surrounding Rathlin Island

Priority Marine Features (PMFs) are also present within the MCZ and underlying Marine Protected Area (herein referred to as the 'Rathlin Island MPA'). While these do not meet the criteria for consideration as an MCZ listed feature in their own right, they are afforded a level of protection based on vulnerability, sensitivity and risk assessments. The list of these features (Annex A, Table 1) includes a number of low mobility, benthic species, which are sensitive to seabed disturbance.

Dive Surveys

The first official underwater surveys around Rathlin Island were carried out by the Ulster Museum dive team in the 1980s (NISS). During this period, over 530 species were recorded, making up 60% of all marine species known from Northern Ireland. Many of these were species of conservation interest (Erwin et al., 1986). The final report described the seabed habitat and characterising species for 5 specific areas: Church Bay, SW coast, NNW coast, NNE coast and the East coast. No signs of habitat disturbance were reported at the time.

Rathlin is considered as one of the most important sites in Europe for sponges (van Soest et al., 1999) and in 2005 a six-week diving expedition was carried out by the Ulster Museum dive team to catalogue these. A total of 128 species were recorded in total, giving a total of 134 sponge species now known from Rathlin (Picton & Goodwin, 2007a).

In 2006, the Sublittoral Survey of Northern Ireland (SSNI) was launched by the Ulster Museum to build upon the data collected in the 1980s. Over 251 dive surveys, at 47 distinct sites, were conducted around Rathlin from 2005-2009. This was combined with data from other sites around Northern Ireland to inform the development of a network of Marine Protected Areas (MPAs) (Goodwin et al., 2011).

The area is also popular for recreational diving with amateur recorders contributing to the overall species list for Rathlin. This includes data provided by expert recreational recorders as well as divers from Seasearch Northern Ireland*. Data from this recreational diving community is also used to support the monitoring and management of MPAs.

Dredging Damage

The Sponge Biodiversity of Rathlin Island (Picton and Goodwin, 2007a) project reported significant change in the boulder habitat and associated sponge and hydroid communities, as described in the 1980s off the east coast of the island (Erwin et al., 1986) (Fig. 2). The disappearance of some boulders, and a harrowed appearance of what was left (Fig. 3) was reported originally in 1989 after dredging commenced in the area (Goodwin et al., 2011). This occurred shortly after Picton and Erwin (Prologue), suggested that a Marine Nature Reserve status should be given to Rathlin Island based on their findings and considering the damaging dredging activity occurring in Scotland at the time.

The impact of scallop dredging on the seabed was substantiated by evidence gathered from divers in June 2009 off the Lochgarry wreck (east of Rathlin) following observed dredging activity at the site. The seabed to the east of the wreck was previously described as a 'sand and gravel plain with cobbles, small boulders and larger boulders supporting dense communities of sponges and hydroids' (Goodwin et al., 2011) (Fig. 4). However, after the dredging was observed, trawl scars were reported along with apparent removal of the pebble and cobble habitat and dislodged sea pens (Fig. 5).

*Seasearch Northern Ireland is a citizen science project which engages with the recreational diving community, providing them with training in species identification, underwater photography and recording species and habitats.

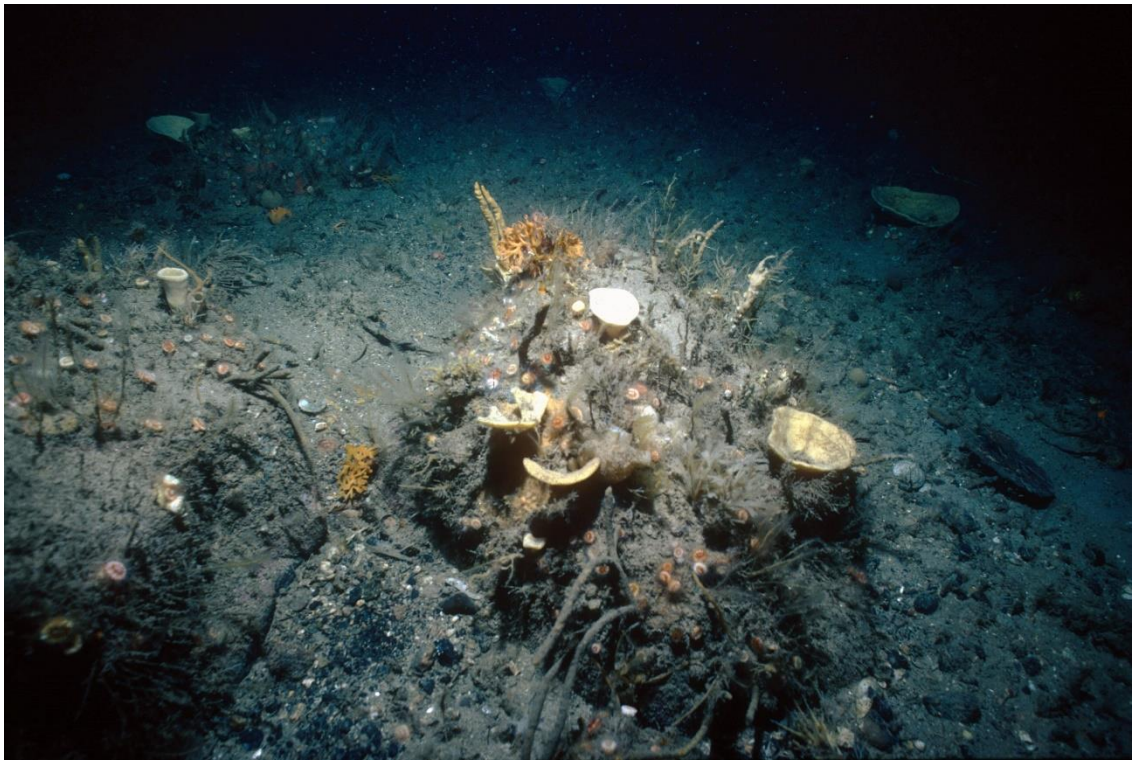

Figure 2 | Undisturbed boulder habitat to the east of Doon Point, Rathlin, 14th August 1984.

Figure 3 | Overturned boulder following dredging on east coast of Rathlin, 25th August 1989.

Figure 4 | Non-dredged area immediately adjacent to the boiler of the S.S. Lochgarry wreck, 10th June 2009.

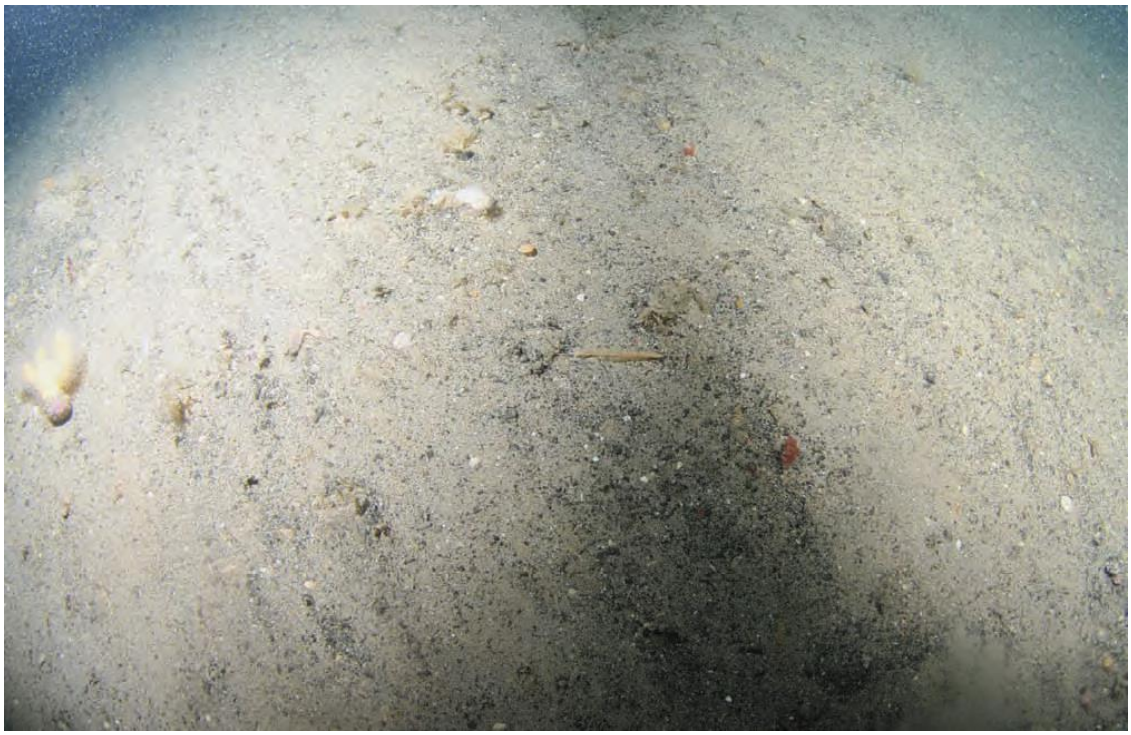

Figure 5 | Recently dredged area off the stern of the S.S. Lochgarry wreck, showing displaced slender sea pen *Virgularia mirabilis* and dead man's fingers *Alcyonium digitatum*.

As a result of these findings, in the last condition assessment reporting cycle (2008-2013), the reef habitat around Rathlin was considered to be in an unfavourable condition and a voluntary ban on bottom-towed fishing within the SAC was introduced. In 2016, the voluntary measures were replaced by the **Rathlin Island (Prohibited Methods of Fishing) Regulations** which banned the use of demersal mobile fishing gear within the SAC. This includes any fishing gear which is towed or moved, along, or close to, the seabed.

Data from Vessel Monitoring Systems (VMS) on-board commercial fishing vessels >12m in length indicates the key areas for scallop dredging within the Rathlin Island MPA prior to the 2016 ban. These are predominantly off Bull Point to the West, the South facing cliffs and adjacent area within Church Bay and the east coast (Fig. 6). There is also some evidence of bottom trawling occurring to the west, south and east of the island.

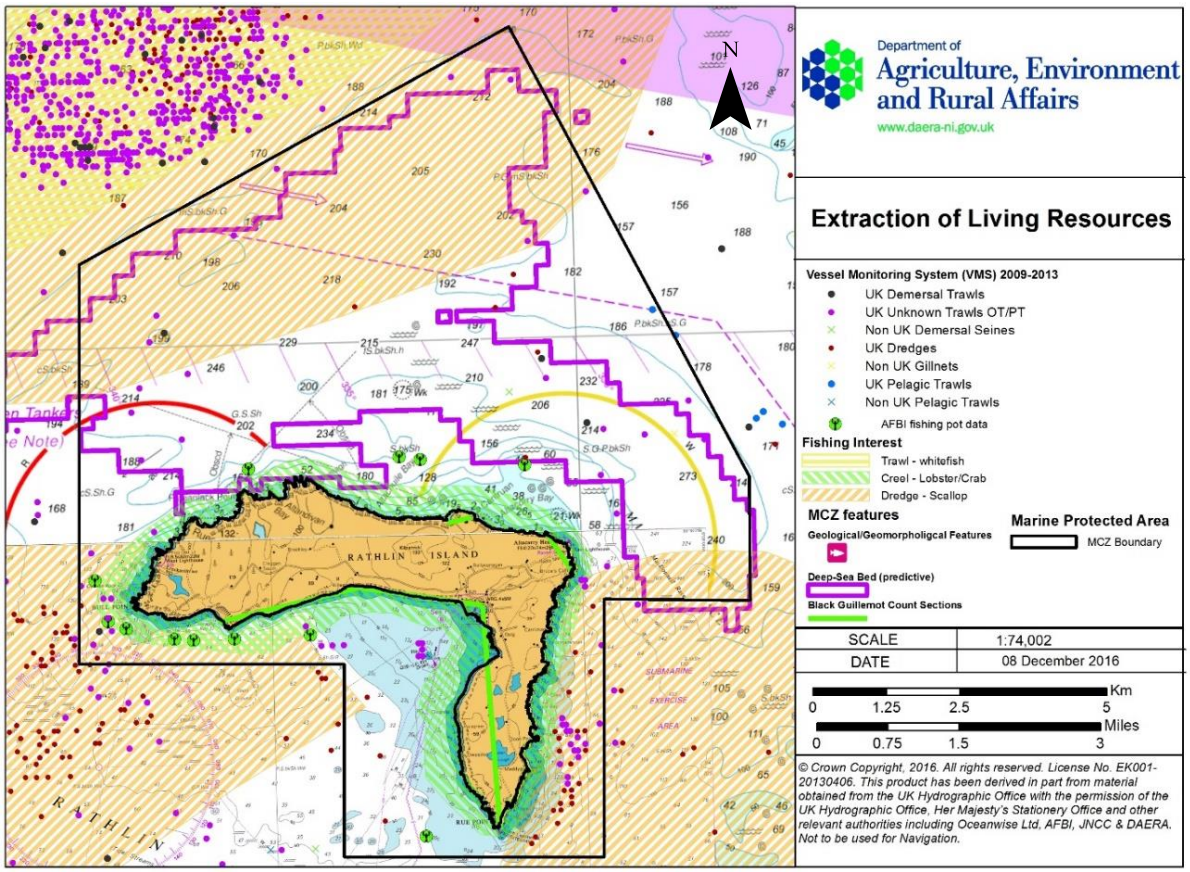

Figure 6| Commercial fishing activity surrounding Rathlin Island from Vessel Monitoring System (VMS) data for vessels >12m length from 2009-2013.

Recent Sublittoral Survey Effort

Since the disbandment of the Ulster Museum dive team, and DAERA's prioritising of survey efforts in other areas with potential for MCZ designation, within the Rathlin Island MPA, survey work has been mostly focused on the deep seabed habitat. As a result, between 2016 and 2018, sublittoral benthic data was collected purely through recreational diving initiatives.

In 2019, the DAERA Marine and Fisheries Division and the Agri-Food and Biosciences Institute (AFBI) carried out sublittoral benthic condition monitoring using benthic video tows and grab sampling on

board R.V. Corystes. Further risk based subtidal site integrity monitoring (i.e. seagrass, maerl etc.) and MPA officer patrols have also been conducted. As part of the MarPAMM (Marine Protected Area Management and Monitoring) project, side-scan sonar and additional monitoring was carried out around the wreck of the S.S. Lochgarry in 2019. This more recent survey work was not available to CEDaR at the time of publication of this report.

2019 Survey

In order to inform a condition assessment for the seabed around Rathlin, and evaluate the effects of the demersal mobile gear ban, the CEDaR marine data officer joined the week-long Rathlin Dive Expedition in May 2019, organised by Bernard Picton. In order to fill the deficit for recent species data and habitat information from around the island, images and information gathered by divers participating in the expedition were collected and analysed. The species and habitat data from each site was merged with additional data collected since the demersal mobile gear ban was imposed.

To assess the current condition of the seabed around Rathlin since implementation of the demersal mobile fishing ban in 2016, here, the species composition and site descriptions reported after the ban (2017-2019) are compared with data collected whilst demersal mobile fishing activity was occurring (1990-2016) and during the period before it began (1983-1989).

Method

Data collection

Eight recreational divers took part in a total of 14 boat dives from the 12th – 17th May 2019. All divers were equipped with their personal underwater cameras. Dive sites were selected based on divers' preferences, accounting for tide/weather conditions and the presence of suitable habitat for nudibranch species (the main taxa of interest to the group). As the divers were recreational and participating at their own cost, they were free to explore and photograph the seabed as they pleased. Following each dive, initial species and habitat information was provided voluntarily by the divers and Marine Nature Conservation Review (MNCR) forms were completed for each site by combining this information with additional metadata e.g. start/end times, co-ordinates and tidal phase. On return to the shore, all divers submitted their images, which were catalogued and stored at CEDaR.

The group included experienced field biologists and all had a good knowledge of *in situ* species identification. The expedition was organised and led by Bernard Picton (National Museums Northern Ireland) and the participants were Mats Larsson (Sweden), Iain Dixon (England), Jim Anderson (Scotland), George Brown (Scotland), Katrina Dick (Scotland), Mike Markey (England), Michael Lundin (Sweden), Donna Conroy, Ron Patterson and Richard Bloore (Seasearch Northern Ireland).

Data analysis

Light Room CC & Light Room Classic was used for image analysis and identification of species. All metadata, information collected on the MNCR forms and subsequent species lists were collated into a MEDIN compliant file and submitted to Marine Recorder.

In total, data was collated from 538 sublittoral surveys within the Rathlin Island MPA boundary from 1983-2019. The data included is taken from seven separate projects (Annex B, Table 1) carried out by the DAERA Marine Conservation and Reporting team, AFBI, Ulster Museum, Seasearch N.I. and recreational expert divers. For the purposes of this project, intertidal survey data and marine mammal / seabird data has been omitted.

The 2019 dive sites were mapped and overlain with all species records from within the Rathlin Island MPA boundary using ArcMap 10.5.1. All records within a 200m boundary of each site were extracted and split by date ranges to represent the periods before (1983-1989) and during (1990-2016) fishing activity and after implementation of the ban (2017-2019); herein referred to as 'pre-demersal mobile fishing', 'during demersal mobile fishing' and 'post-demersal mobile fishing'.

Comparisons between these time periods for the species composition and habitat descriptions have been made for each specific site. Comparisons have been made only for low or limited mobility epifaunal species i.e. those which are sensitive to demersal mobile fishing gear.

Results

Dive sites

Where the 200m boundary around separate sites overlapped, the species records and habitat descriptions have been combined and the sites have been treated as one e.g. White Cliffs West. Out of 12 dives carried out in May 2019 (Annex B, Table 2), ten discrete sites have been described (Fig. 7). These are split into 'non-targeted sites' for those on the steeply sloping north wall, which is not suitable for demersal mobile fishing and are therefore not directly impacted, and 'targeted sites' on the south west, south and east of the island which were previously subject to demersal mobile fishing.

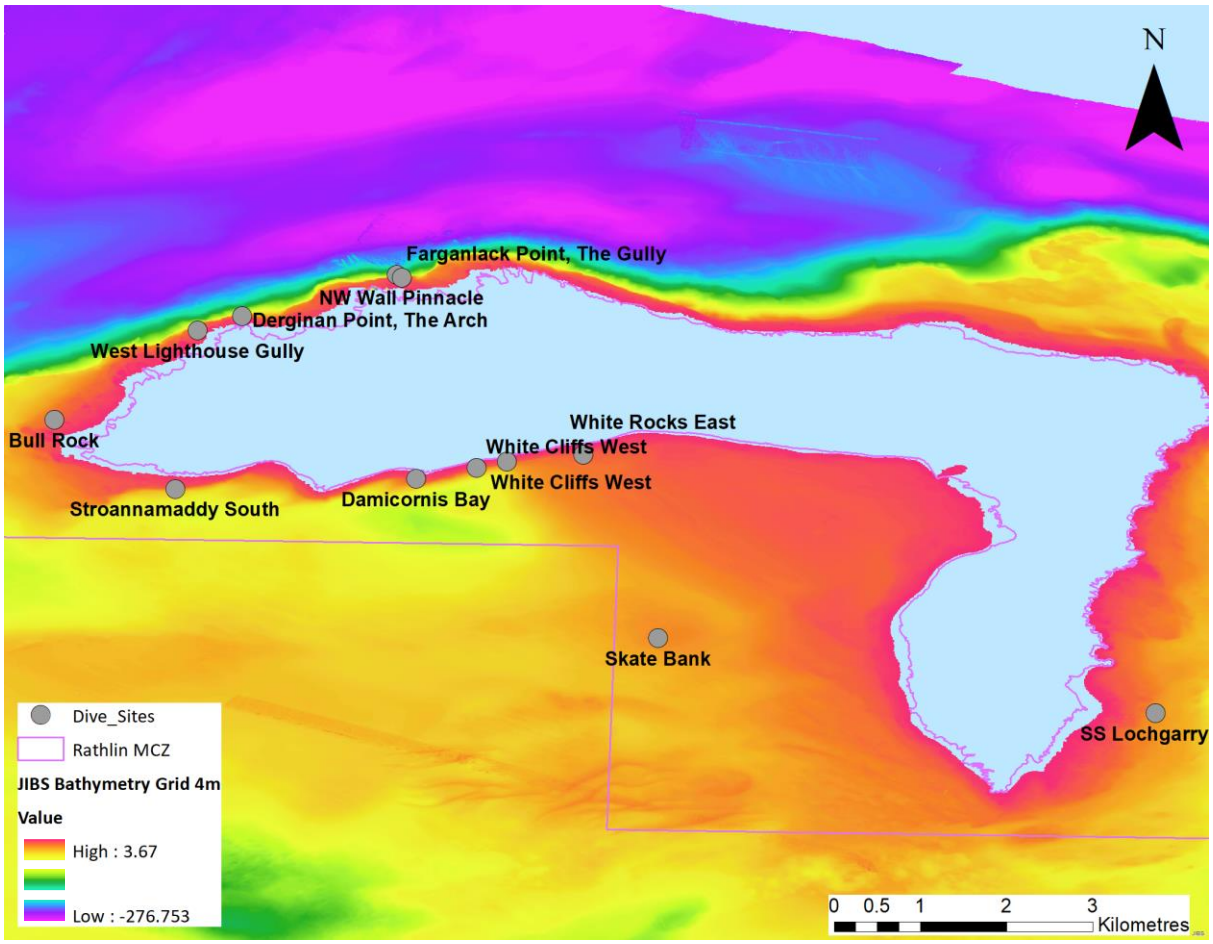

Figure 7| Location of dive sites visited in May 2019 overlaying a high resolution bathymetric map of the seabed from the Joint Irish Bathymetric Survey project.

Non-targeted sites

1. NW Wall Pinnacle and Farganlack Point Gully

Depth (metres)	7-30m
Total no. species	**48**

As the 200m boundary between these two sites visited in 2019 overlap, the species data and habitat descriptions have been combined.

The Pinnacle to the east of Farganlack Point, off the north-west wall of Rathlin is a vertical bedrock wall that supports a rich epifaunal community with the dominant species described as Crisiidae spp. (Bryozoa), the Devonshire cup coral *Caryophyllia (Caryophyllia) smithii*, dead man's fingers *Alcyonium digitatum*, oaten pipes hydroid *Tubularia indivisa* and the sea squirt *Aplidium punctum*. Species of particular interest included the sponge *Lissodendoryx (Ectyodoryx) jenjonesae,* a Northern Ireland Priority Species (NIPS), which was first described from Rathlin in 2005 (Picton et al., 2007a) and is only known from here and the Maiden Islands. Two species of the sea squirt *Pyura* were recorded; *P. microcosmus*, another NIPS species, and *P. squamulosa* (Fig. 8), which has only been recorded once previously off Rathlin in 1984.

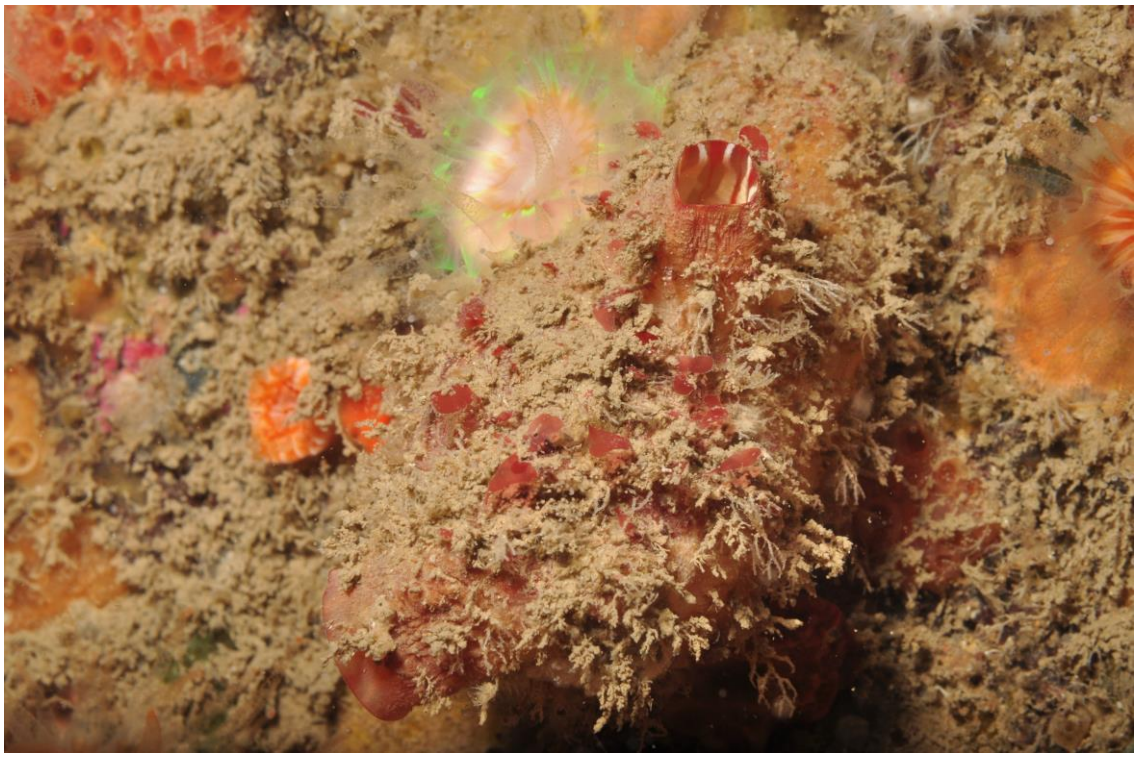

Figure 8 | *Pyura squamulosa,* Rathlin May 2019 ©George Brown

As the Gully off Farganlack Point was explored on Day 1, before the group were joined by CEDaR, little habitat information was collected, although nearby gullies are described to have steep basalt bedrock walls with a diversity of sponges and an abundance of *C. smithii* and *T. indivisa* (Goodwin et al., 2011). This description correlates with the species list from this survey, with 22 sponge species recorded including *Phorbas plumosus*, which has only been recorded off Rathlin once before. Other species of interest from 2019 include the nudibranch *Aeolidia filomenae*, which was first described in 2017. It is likely that this is a common species which was misidentified as *A. papillosa* previously.

Generally across both sites, the dominant species groups were sponges (Porifera), anemones, hydroids (Cnidaria) and nudibranchs (Mollusca), which correlates with the species composition described from previous surveys (Fig. 9a). No signs of seabed disturbance were reported at the site.

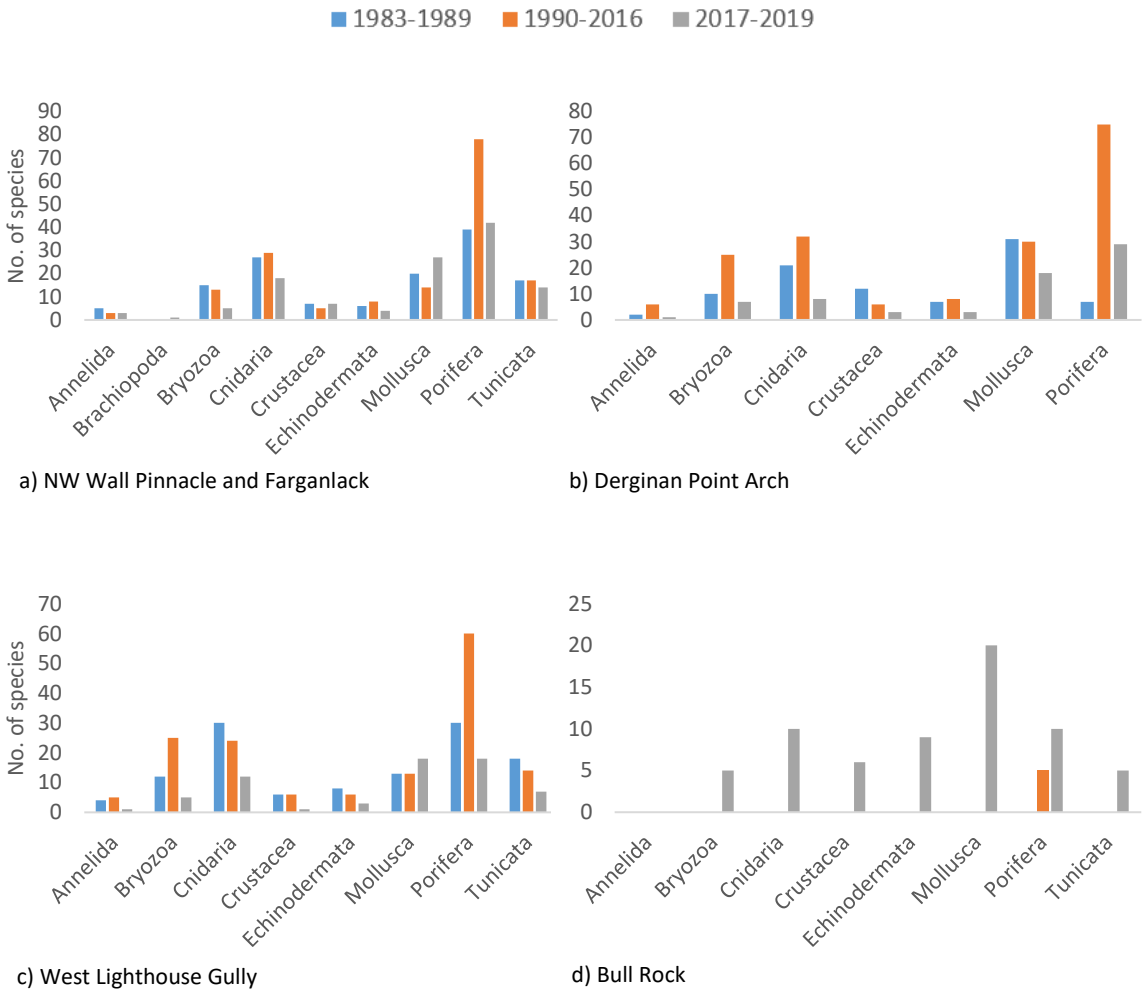

Figure 9| Total number of low/limited mobility species recorded pre- (1983-1989), during- (1990-2016) and post- (2017-2019) demersal mobile fishing activity around Rathlin Island from within a 200m boundary of the 'non-targeted' dive sites surveyed in May 2019. Species records grouped by taxon group.

2. Derginan Point, the Arch

Depth (metres)	32
Total no. species	**34**

The 'Arch' at Derginan Point was also visited on Day 1 and so no habitat information was collected. However, it has been described by Goodwin et al. (2011) as rising up from a boulder shelf at approximately 33m, with the top at ~25m. It is around 4m wide and densely encrusted with animal turf. Species recorded in 2019 included dead man's fingers *Alcyonium digitatum*, Devonshire cup corals *Caryophyllia (Caryophyllia) smithii*, white-striped anemone *Actinothoe sphyrodeta* and a diversity of sponges (29 species). On the whole, this closely matches the species composition of the site recorded by Goodwin et al. in 2011, with the exception of the pink sea fingers *Alcyonium hibernicum*. A large patch of *A. hibernicum* was previously described under the arch, however, it was not recorded in 2019 and appears to have reduced in abundance at this site (Bernard Picton pers. comm.).

Species of particular interest includes the sponge *Spongosorites calcicola* (Fig. 10), for which Rathlin is deemed to be a stronghold. Goodwin et al. (2011) described the site as rich in hydroids, however, only 3 species were recorded in 2019.

As this site is very popular for recreational divers, the species data is skewed, making species richness appear higher in the 1990-2016 period (Fig. 9b). During this period the site was surveyed annually from 2005-2016. No signs of seabed disturbance were recorded at the site in 2019 and it continues to support a diversity of sponges.

Figure 10 | Yellow sponge *Spongosorites calcicola,* Rathlin May 2019 ©George Brown

3. West Lighthouse Gully

Depth (metres)	25-30m
Total no. species	**33**

This gully, lies to the north west of Rathlin between West Lighthouse and Ruecallan Point. This is an area of steep infralittoral basalt bedrock shelf, covered in jewel anemones *Corynactis viridis*. Other common species included the sea beard hydroid *Nemertesia antennina*, dead man's fingers *Alcyonium digitatum* and massive sponges including the yellow hedgehog sponge *Polymastia boletiformis* and elephant hide sponge *Pachymatisma johnstonii*. This matches the description of the species composition given by Goodwin et al. (2011), however, the southern cup coral *Caryophyllia (Caryophyllia) inornata*, a southern species recorded at the site in 2007 and 2009, was not observed. The NIPS species *Edwardsia timida*, the timid burrowing anemone, was also recorded (Fig. 11), having only been recorded here once previously in 1984.

Once again, while the overall species composition of the site in 2019 was similar to previous years, as this is a popular site for recreational diving, the number of species appears to be lower than in previous years (Fig. 9c). However, no disturbance to the seabed was recorded and the site still supports a high diversity of nudibranch (12) and sponge (18) species.

Figure 11 | *Edwardsia timida,* Rathlin May 2019 ©Mats Larsson

4. Bull Rock

Depth (metres)	20-24m
Total no. species	**70**

This site is relatively unexplored by divers, with only one survey carried out previously in 2005 as part of the Rathlin Island Sponge Survey (Picton et al., 2007a). It is described as an area of flat rock, either bare or with pink encrusting algae or kelp park, amidst patches of gravel. Common species included Crisiidae (bryozoan), the nudibranch *Diaphorodoris luteocincta*, which feeds on it, and the common urchin *Echinus esculentus*. The site was also rich in red algae such as *Delesseria sanguinea.*

Species of particular interest included the spiny lobster *Palinurus elephas* (Fig. 12), a NIPS species which is making an apparent comeback in the area (based on increasing records from divers and fishermen). The feather star *Antedon petasus* was also recorded (Fig. 13). This is a northerly species which hadn't been recorded around Rathlin since 1985.

Overall the species composition was dominated by nudibranchs (14 species), sponges (10 species), cnidarians (10 species) and echinoderms (9 species) (Fig. 9d), with more sponge species being recorded than previously in the 2005 Rathlin Island Sponge Survey. No seabed disturbance was reported.

Figure 12 | Spiny lobster*, Palinurus elephas,* Rathlin May 2019 ©Mats Larsson

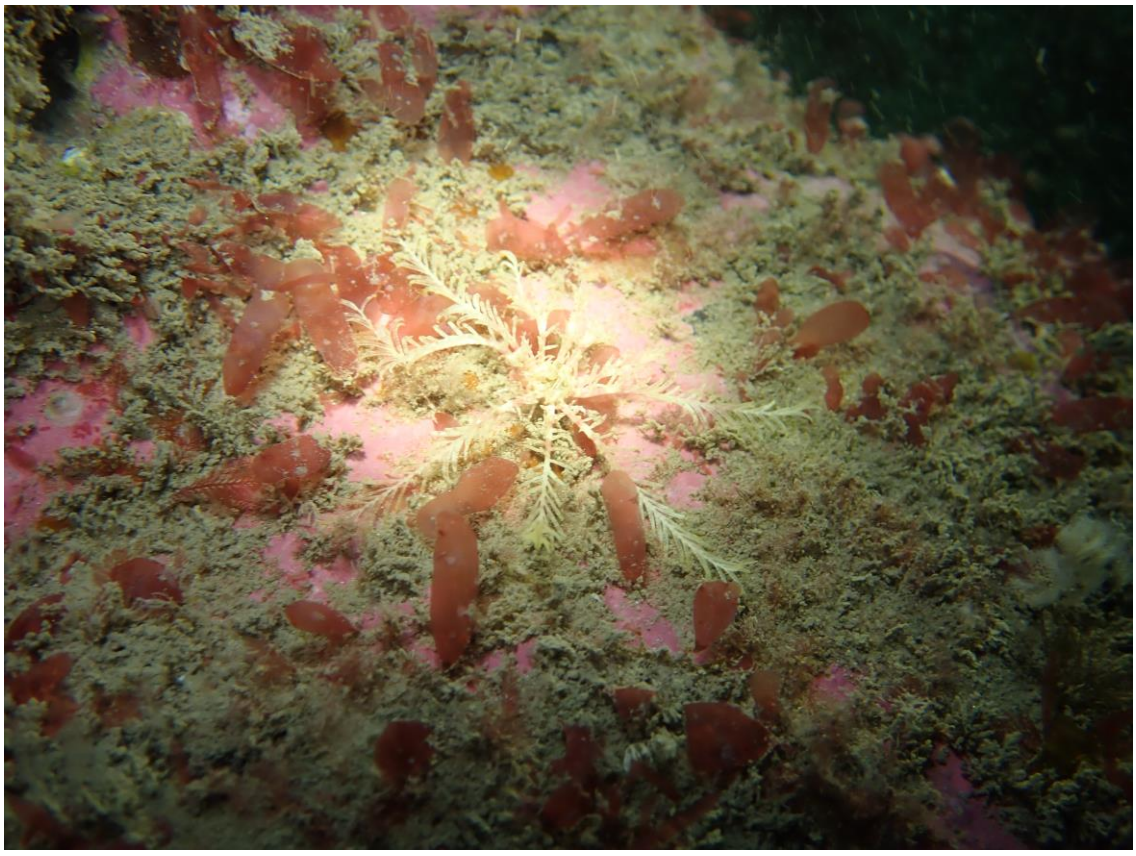

Figure 13 | Feather star*, Antedon petasus,* Rathlin May 2019 ©Katrina Dick

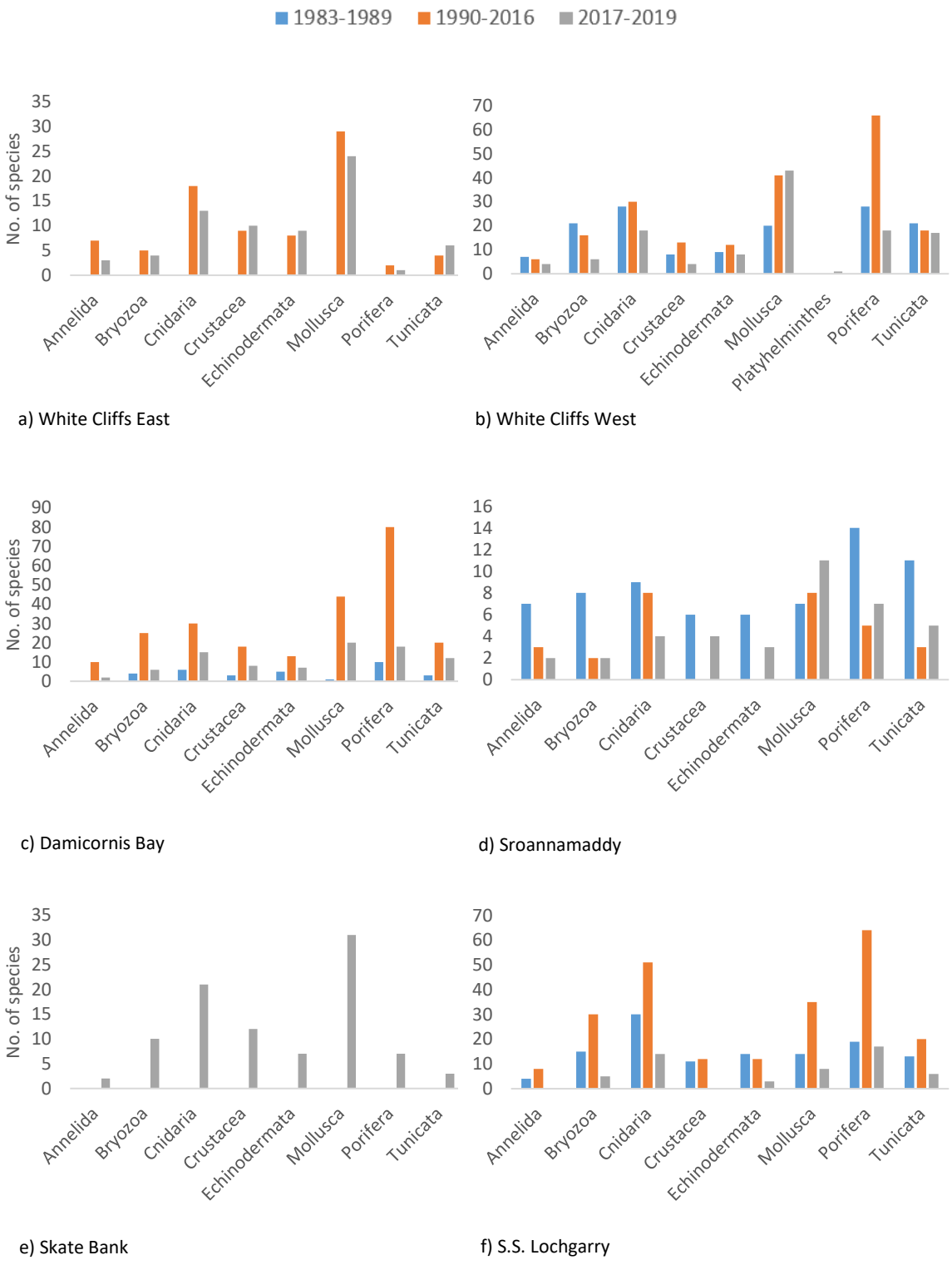

Figure 14| Total number of low/limited mobility species recorded pre- (1983-1989), during- (1990-2016) and post- (2017-2019) demersal mobile fishing activity around Rathlin Island from within a 200m boundary of the 'targeted' dive sites surveyed in May 2019. Species records grouped by taxon group.

Targeted sites

5. White Cliffs East

Depth (metres)	10-18m
Total no. species	**90**

Two separate habitats were described from this site in 2019: 'muddy sand with burrowing megafauna' and 'medium sized boulders on coarse sediment with abundant *Saccharina latissima* and encrusting red algae'. The area was previously described by Goodwin et al. (2011) as a 'gently sloping sediment plain of sand, pebbles and small boulders'. In addition to *S. latissima* and *Laminaria* sp., the common starfish *Asterias rubens,* was also common at the site. The dominant taxon groups were nudibranchs (14 species), echinoderms (9 species), hydroids (8 species) and decapod crustaceans (Fig. 14a).

Particular species of interest included the scarce tube-dwelling anemone *Arachnanthus sarsi* (Fig. 15), an NIPS for which Rathlin is considered to be a stronghold. Other interesting anemone species recorded included *Edwardsia claparedii*, *Cerianthus lloydii* and *Adamsia palliata* (Fig. 16, which grows on the shell of the hermit crab *Pagurus prideaux*.

Sessile species highlighted by Goodwin et al. (2011) from this site were the starfish *Astropecten irregularis*, the slender sea pen *Virgularia mirabilis* and the nudibranch *Cumanotus beaumonti* (Annex D). While *A. irregularis* has not been recorded around Rathlin since 2009, both *V. mirabilis* and *C. beaumonti*, were observed in 2019. Another rare nudibranch species recorded in 2019, for which Rathlin appears to be a stronghold, was *Lomanotus genei* (last recorded from Rathlin in 2009) (Annex D).

Also recorded here was the burrowing worm *Myxicola infundibulum*, four brittlestar species including *Acrocnida brachiata*, the sea cucumber *Oestergrenia digitata*, the Bryer's nut crab *Ebalia tumefacta* and both king *Pecten maximus* and queen *Aequipecten opercularis* scallops.

Overall the species composition from this site matched that of previous surveys conducted from 1990 to 2016 (Fig. 14a) and no disruption to the seabed was recorded.

Figure 15 | Scarce tube-dwelling anemone*, Arachnanthus sarsi,* Rathlin May 2019 ©Bernard Picton

Figure 16 | Cloak anemone *Adamsia palliata*, on the abandoned shell of a hermit crab*,* Rathlin May 2019 ©Bernard Picton

6. White Cliffs West

Depth (metres)	12-30m
Total no. species	**142**

This area was visited twice in 2019 with divers entering at different points and covering a large area of the site. The seabed here is described as a 'gently sloping sediment plain of sand, pebbles and small boulders'. This is another popular site and has been surveyed previously in 1985, 2005, 2006, 2007, 2009, 2011 and 2016, initially as part of the NISS project and subsequently by Ulster Museum and Seasearch N.I.

Common species at the site included the sea beard hydroid *Nemertesia antennina* and Didemnidae sea squirts. The site was rich in nudibranch diversity with 33 species recorded. This included *Carronella pellucida* (Annex D), which has only been recorded here once before in 2006. 13 species of hydroid were recorded and other dominant taxon groups included sponges (18 species) and sea squirts (17 species) (Fig. 14b). Both the queen scallop *Aequipecten opercularis* and king scallop *Pecten maximus* were common at the site, and Ross coral was also recorded (Fig. 17). Other species of note recorded in 2019 included a tusk shell (Scaphopoda) and the slender sea pen *Virgularia mirabilis*. However, some species known from this site from previous surveys, e.g. the goosefoot starfish *Anseropoda placenta* and the hermit crab *Cestopagurus timidus* (Goodwin et al., 2011), were not observed in 2019.

Figure 17 | Ross coral *Pentapora foliacea,* Rathlin May 2019 ©Mats Larsson

The overall species composition, dominated by nudibranchs, sponges, tunicates and hydroids matched that from previous surveys (Fig. 14b). No disturbance to the seabed was observed.

The second dive at this site was a drift dive from the drop point to the east with a moderate tidal stream of 1-2 knots. This dive could be calibrated as it crossed the mooring chain of the kelp farm and this was photographed, therefore date-stamping that position in the photo metadata. The seabed was flat at 17m depth and 8 individuals of *Arachnanthus sarsi* were seen and photographed. Assuming a 5m wide field of vision this suggests that there was one *Arachnanthus* per 100 square metres or a little less dense. Previous searches for this species have rarely recorded more than 3 and often none. They have mostly been in deeper water, 25–30m. Broad-scale searches in outer Church Bay would be valuable to try and get a better estimate of the population of *Arachnanthus* in this area, the only known site in Northern Ireland, and a stronghold for a species which is probably adversely affected by trawling (Bernard Picton pers. comm.).

7. Damicornis Bay

Depth (metres)	10-30m
Total no. species	**97**

This small bay lies between Sroanderrig Point and Sroanlea Point to the South West of Rathlin. The site is narrow and steep sided, bounded by steep boulder slopes that rapidly drop down to about 70 metres. It is considered to be a site of particularly high conservation importance due to the presence of a large number of rare species and in particular, a diversity of sponges (Goodwin et al., 2011). It is another popular site for diving, with previous survey data from 1985 and annually from 2005-2011 and 2015-2016.

A total of 97 species were recorded from a single dive at the site in 2019. The large boulder slope was dominated by hydoids (13 species) and the Devonshire cup coral *Caryophyllia (Caryophyllia) smithii*. The rugose squat lobster *Munida rugosa* was also common at the site. Other dominant taxa included nudibranchs (12 species), including the rare *Doto sarsiae* and *Facelina annulicornis* (Annex D), and sponges (18 species), including the NIPS *Hymedesmia (Hymedesmia) rathlinia* (Fig. 18) and *Tethya hibernica*, for both of which, Rathlin is a stronghold. Ross coral *Pentapora foliacea* was also recorded at the site.

The overall species composition was similar to previous surveys (Fig. 14c) and no signs of seabed disturbance were observed.

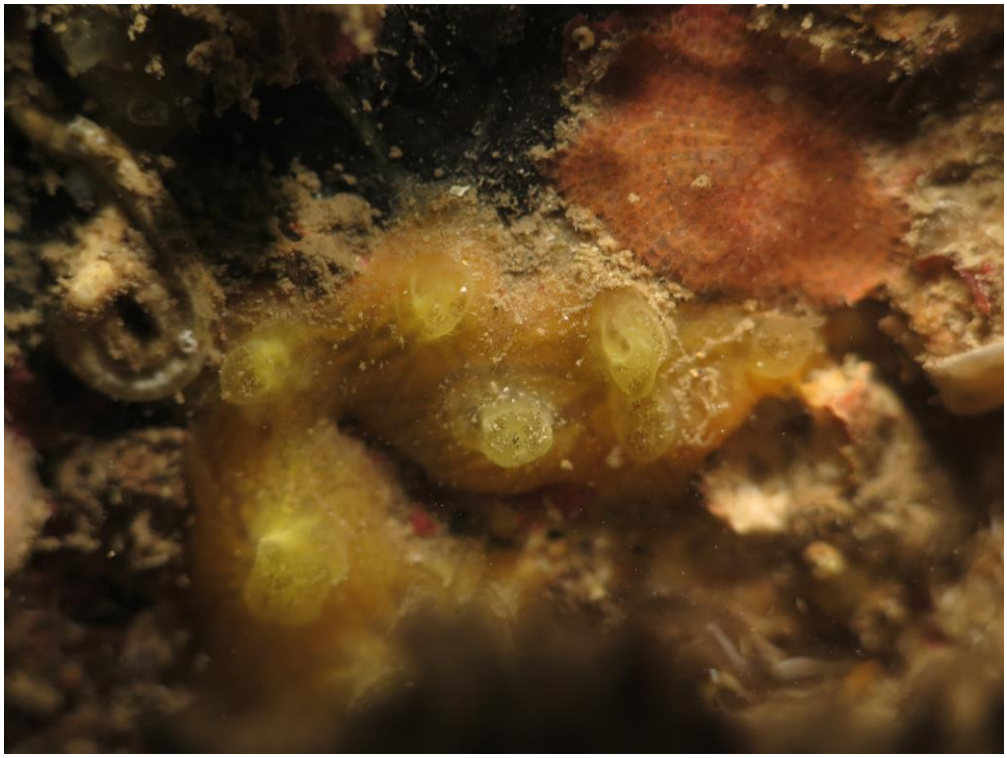

Figure 18 | Sponge *Hymedesmia (Hymedesmia) rathlinia,* Rathlin May 2019 ©Mats Larsson

8. Sroannamaddy

Depth (metres)	20-32m
Total no. species	**48**

This site lies to the south east of Bull Light. The seabed is comprised of tide-swept bare boulders dominated by pink encrusting algae and a dense coverage of *Tubularia indivisa* (Fig. 19). The boulder area lies immediately to the west of a small limestone cliff, previously surveyed by Ulster Museum in 1984 and more recently in 2012. Other dominant species described here in 2019 include the Devonshire cup coral *Caryophyllia (Caryophyllia) smithii,* dead man's fingers *Alcyonium digitatum,* the sponge *Hymeniacidon simplicima* and the sea cucumber *Holothuria (Panningothuria) forskali*. Areas of kelp *Laminaria hyperborea* forest were also noted.

The overall species composition was dominated by nudibranchs (7 species) and sponges (7 species) but generally the taxon composition was more spread than observed at other sites (Fig. 14d). No disturbance to the seabed was reported.

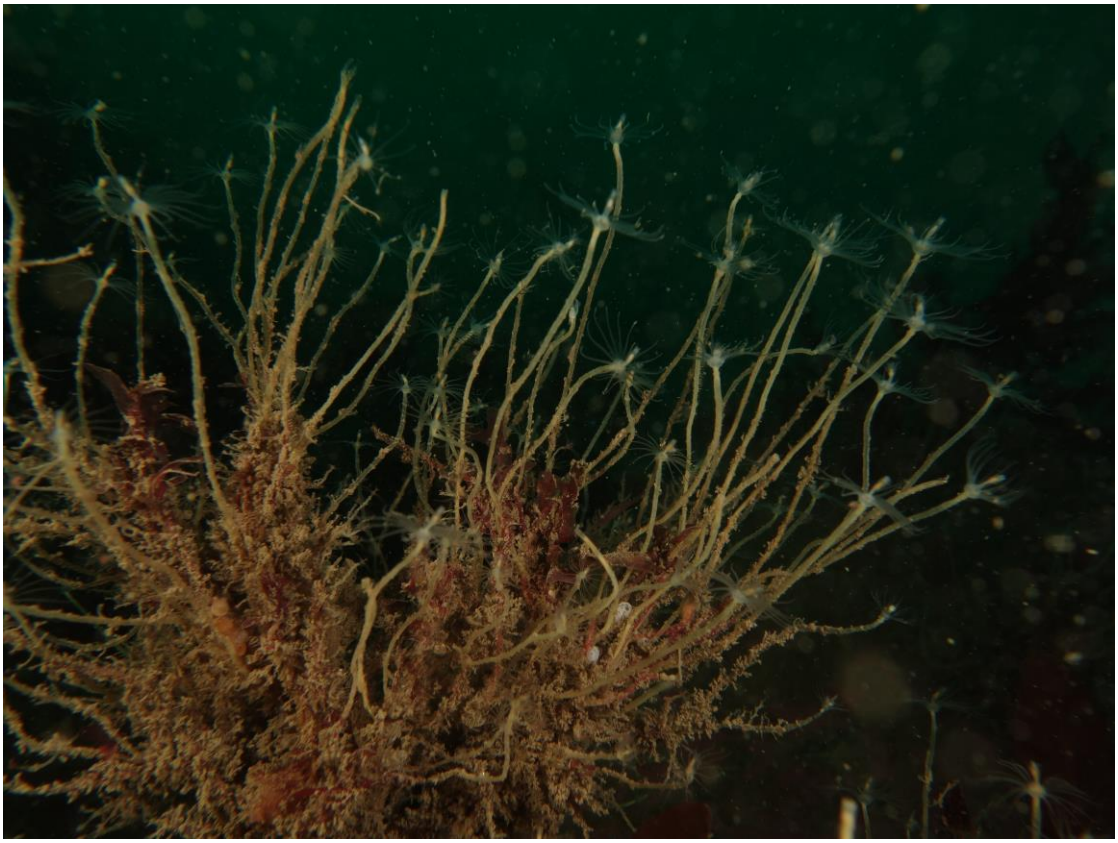

Figure 19 | *Tubularia indivisa,* Rathlin May 2019 ©Iain Dixon

9. Skate Bank

Depth (metres)	28m
Total no. species	**96**

This site, in the middle of outer Church Bay, was explored by divers for the first time in 2019, although similar sites in the area had been surveyed as part of the NISS project in the 1980s (closest site 260m away). The area is known historically as 'Skate Bank' amongst the local fishing community.

The seabed here is mixed ground, made up of mud, broken shell, unsorted sand, cobbles and some small boulders. The dominant species recorded were the sea beard hydroid *Nemertesia antennina* and Ross coral *Pentapora foliacea*. 18 species of nudibranch were recorded here, including the rare *Knoutsodonta oblonga*, recorded from Rathlin just once before in 2007 (Annex D). The site was also rich in hydroids and bryozoans, with 17 and 10 species recorded respectively (Fig. 14e).

Particular species of interest recorded at Skate Bank included the imperial anemone *Capnea sanguinea*, the Bryer's nut crab *Ebalia tumefacta* (third record from Rathlin Island) (Fig. 20), the curled octopus *Eledone cirrhosa*, and the sea squirt *Pyura squamulosa* which has only been recorded once previously from Rathlin in 1984. Both the queen scallop *Aequipecten opercularis* and king scallop *Pecten maximus* (Fig. 21) were also present.

No signs of disturbance to the seabed were reported.

Figure 20 | Bryer's nut crab *Ebalia tumefacta,* Rathlin May 2019 ©George Brown

Figure 21 | King scallop *Pecten maximus,* Rathlin May 2019 ©George Brown

10. S.S. Lochgarry

Depth (metres)	33m
Total no. species	**59**

This wreck, lies on the seabed to the south east off Doon Bay at approximately 34 metres. The wreck is surrounded by an area of coarse gravel consisting of small stones reaching up to boulder size. The wreck and the surrounding gravel/boulder habitat are dominated by the oaten pipes hydroid *Tubularia indivisa*, the Devonshire cup coral *Caryophyllia (Caryophyllia) smithii,* dead man's fingers *Alcyonium digitatum*, the jewel anemone *Corynactis viridis* and the hydroid *Nemertesia ramosa* (Fig. 22).

In 2007, the fan mussel *Atrina fragilis* was recorded in the boulder area to the south east of the wreck, however, it was not found in any of four dives undertaken in 2009 and has since been subject to dredging activity at the site. This species has not been recorded since and wasn't observed in 2019.

The overall species composition at the site in 2019, dominated by sponges, hydroids and nudibranchs, matches that described in previous surveys (Fig. 14f). However, this is another popular site for diving and has been surveyed previously in 2005, 2006, 2007, 2009, 2011, 2012 and 2016. Therefore, the overall number of species recorded in the 1990-2016 period are significantly higher than recorded from the single dive in 2019.

No signs of disturbance to the seabed around the Lochgarry wreck were reported.

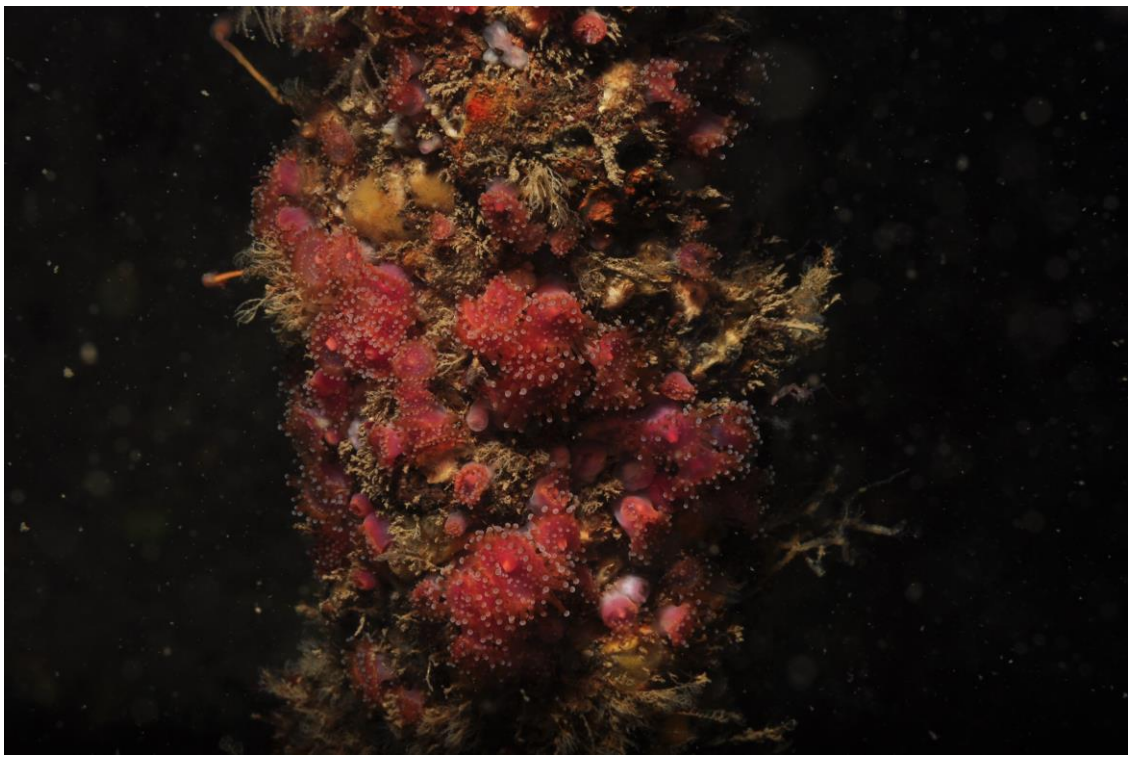

Figure 22 | *Tubularia indivisa* and jewel anemone *Corynactis viridis* on the Lochgarry wreck*,* Rathlin May 2019 ©George Brown

Summary

Overall, the site descriptions and species compositions from each site explored in May 2019 correlated with the findings of previous dive surveys conducted around Rathlin. A total of **989** species occurrence records were collected, covering **371** species, of which, 17 are included on the Northern Ireland Priority Species list (Annex C, Table 1).

No signs of seabed disturbance from fishing activity were observed at any of the 10 sites visited. This is in contrast to surveys carried out around the south and east areas of the island in the 1980s and again in the early 2000s when damage from demersal mobile fishing was apparent.

Sensitive species

The boulder habitats that support a diverse sponge community (Picton et al., 2007a), but which have been damaged by dredging activity (Goodwin et al., 2011), were revisited in May 2019 and a total of 56 species were recorded, accounting for 42% of the total number of species known to occur around the island (Picton et al., 2007a). Of these, 14 were erect, branching or globular sponges, which are considered to be particularly sensitive to demersal mobile fishing activity (Munro et al., 2012). The recovery of these sponge assemblages after the cessation of disturbance is generally considered to be slow, with one survey reporting no/little improvement after four years (Hiscock, 1994). Therefore, more time is required before the longer lasting effects of the fishing ban can be reviewed. Nevertheless, the presence of the erect branching species e.g. *Axinella damicornis*, *A. dissimilis, Stelligera rigida, S. stuposa, Raspailia ramosa* and *R. hispida* (Figs. 23&24), at most sites surveyed in 2019 is encouraging.

Figure 23 | *Axinella damicornis* and *S. stuposa* amongst Devonshire cup corals *Caryophyllia (Caryophyllia) smithii* and various hydroid species at Damicornis Bay, Rathlin May 2019 ©Mike Markey

Figure 24 | *Raspailia hispida* and *Axinella dissimilis* amongst various hydroid species at Damicornis Bay, Rathlin May 2019 ©Mike Markey

Figure 25 | Ross coral *Pentapora foliacea* with the rugose squat lobster *Munida rugosa* amongst various hydroid species at Skate Bank, Rathlin May 2019 ©Michael Lundin

Other commonly observed species which are also sensitive to demersal mobile fishing included Ross coral *Pentapora foliacea* and dead man's fingers *Alcyonium digitatum. Pentapora foliacea* is known to be highly susceptible to physical disturbance but is also known to rapidly colonise disturbed ground (Munro et al., 2012). *P. foliacea* was recorded from five sites visited in 2019, where it was generally described as common (Fig. 25). Rathlin is considered to be a stronghold for this species in a Northern Ireland context, accounting for 54% of all N.I. records (NBN Atlas Northern Ireland, 2019).

Dead man's fingers *Alcyonium digitatum* was common at almost all sites surveyed in 2019. This is a long-lived and slow growing species (Matthews, 1917), with recovery from disturbance thought to take several years (Munro et al., 2012). When the Lochgarry wreck was surveyed following dredging activity in 2010, dislodged dead man's fingers were observed on the seabed. However, this species was reported as 'common' on the gravel area surrounding the wreck in 2019.

The impacts of demersal mobile fishing on the slender sea pen *Virgularia mirabilis* are not yet fully understood. This species is able to withdraw into the sediment when disturbed, however it is not fast enough to avoid damage by fishing gear, and dislodged specimens have been observed near the Lochgarry in 2010 post-dredging. This species was not recorded when the site was re-visited in 2019, but it was recorded at the base of the White Cliffs, where it may have been afforded some protection from dredging activity.

Scattered individuals of the scarce tube-dwelling anemone *Arachnanthus sarsi* were recorded at White Cliffs East in 2019, with the species appearing to be frequent at the site (Bernard Picton pers. comm.). No records were made from White Cliffs West, a site which was previously considered to be a stronghold for this species at a UK/Ireland level, however, this may be due to the divers focusing on the boulder habitat beneath the cliffs when *A. sarsi* is typically found further off the shore, burrowed in the sand. This species is known to be particularly sensitive to demersal mobile fishing activity and therefore its presence here is a positive indication of recovery since the ban was implemented.

Henry and Kenchington (2004) demonstrated that dredging activity can also have a significant effect on hydroid assemblages through reducing the number of species and altering the assemblage to one characterised by small unbranched colonies. A rich diversity, (32 species) of branching hydroids were recorded in 2019, which in turn supported the variety of nudibranch species (53) listed.

Sensitive habitats

The habitats on the east coast of Rathlin Island and within Church Bay are known to be particularly vulnerable to damage by demersal mobile fishing (Goodwin et al,. 2011). Bottom towed fishing has been shown to remove 19% of boulders from a single trawl (Freese et al., 1999) while studies in Lyme Bay have demonstrated reductions in boulders and cobbles following a single dredge pass, and complete removal following just six passes (Munro et al., 2012). Furthermore, the destruction of the seabed, and the flame shell beds in particular, from scallop dredging in Loch Carron have been widely publicised and the site has since been designated as a Marine Protected Area with a bottom towed gear ban in place.

The images included in this report, and others collected from around Rathlin in May 2019, indicate the importance of these habitats for supporting diverse benthic communities. Overall, no sign of disturbance, as observed in 2009/2010 from demersal mobile fishing was observed in this survey and the sensitive boulder, cobble and gravel habitats were seen to support a rich benthic community.

Figure 26 | Large colonies of the hydroid *Nemertesia antennina* at White Cliffs East, Rathlin May 2019 ©Mike Markey

Condition Assessment

Overall, the images and observations provided by divers from around Rathlin Island in May 2019 indicated a good condition of all the observed features, with no signs of disturbance from dredging or other demersal mobile fishing activity. Neither were any invasive non-native species or additional human activities, which would impact the observed features, recorded during this survey. Sensitive taxa e.g. erect and branching sponges, bryozoans and anemones, which have previously been damaged from dredging activity around Rathlin, were observed at all sites and a diverse species composition was recorded. However, some sensitive species, which were disturbed by dredging, may have either a reduced distribution around the island e.g. *Virgularia mirabilis,* or are no longer present e.g. the fan mussel *Atrina fragilis*. The state of the habitat around the island and the composition and diversity of the benthic faunal communities which it supports indicates good compliance with the mobile fishing ban since it was introduced in 2016. However, for these slower growing, less resilient species with slower recovery rates, more time is required before true recovery can be assessed. Furthermore, it is likely that the boulder habitat, previously observed on the seabed to the east of the island, that supported a rich diversity of large, branching sponges (Figs 2 & 27), was dislodged and permanently displaced by dredging activity in the area (Bernard Picton pers. comm.).Therefore, based on the results of this survey, and considering the relatively short period of time since the introduction of the demersal mobile fishing ban, the overall condition of the seabed within the Rathlin Island MPA is considered to be '**Unfavourable Recovering**'. More time is required for the benthic community to return to its previous state but the management which is now in place, will, and is proving to, support this recovery.

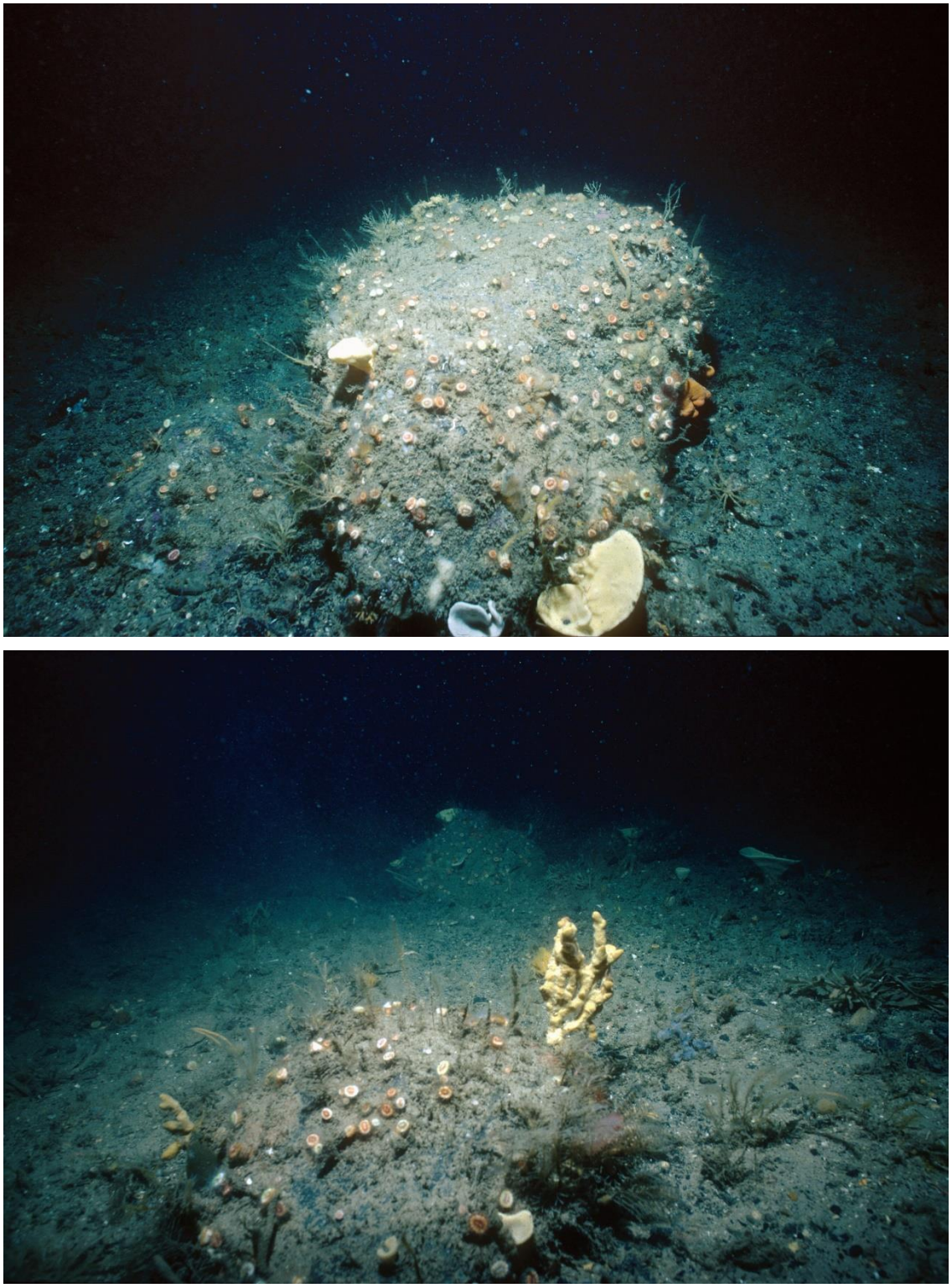

Figure 27 | Undisturbed boulder habitat to the east of Doon Point, Rathlin, 14th August 1984.

Statement from Bernard Picton

December 2019

Rathlin Island is a unique place. It is situated at the northern entrance to the Irish Sea and subjected to strong tidal streams as the Irish Sea rises and falls with the tide. It has water depths of over 200 m close to the northern shore, resulting in strong mixing of deep and shallow water which stabilises the temperature throughout the year. This water movement also results in a stable nutrient supply for plankton and therefore a steady food supply for benthic animals, especially those which feed directly on plankton such as sponges, hydroids, bivalve molluscs, bryozoans and sea squirts. In turn these animals have their predators and parasites, which include nudibranch sea slugs. Almost every NE Atlantic sea slug which can carry out its life cycle in water of 13°C can be found in the seas around Rathlin, but they are never abundant enough to impact their food sources. Most nudibranchs have a 'boom and bust' life strategy, depositing thousands of eggs which hatch into planktonic larvae which may be swept many miles in the plankton before settling. This makes them unlikely candidates for monitoring of a protected area but in fact they have been used successfully for such monitoring by the Skomer MNR team over a long period of time (Lock et al., 2019).

In 1985 the coast of Rathlin Island East off Doon Point had not been dredged extensively. In water of 37m depth the seabed was characterised by the sponge *Axinella infundibuliformis* which was the first thing a diver saw as they approached the bottom, appearing as pale discs the size of dinner plates. These sponges and many less conspicuous animals including abundant cup corals were attached to stones and partially embedded boulders which had probably been undisturbed on that seabed since the last ice age. As a result of the Northern Ireland Sublittoral Survey (Erwin et al., 1986), Marine Nature Reserve status was recommended for Rathlin. In 1989 the East coast was heavily dredged by scallop fishing vessels. Tommy Cecil, the lobster fisherman on the island, reported suddenly catching large numbers of lobsters with damaged claws and bodies and asked for the dredging to be stopped. A dive carried out in 1989 by Bernard Picton with Queen's University Sub-Aqua Club discovered a raked seabed with large boulders overturned and most of the sponges gone. Now that dredging is no longer occurring, consideration should be given to restoring the boulders in that area as the species are still present nearby and could be expected to recolonise if suitable substrate was present.

In the late 1980s one trawler was based on Rathlin and extensively trawled Church Bay for flatfish. The rare nudibranch *Cumanotus beaumonti*, frequent in this area in 1985, was not seen again until 2016. The sand habitat in that area has now been unfished for many years and the priority species of burrowing sea anemone *Arachnanthus sarsi* and the nudibranch *Cumanotus beaumonti*, which feeds on a solitary hydroid found in this habitat, were both found during the 2019 survey. Numbers of *Arachnanthus* were good but individuals were widely scattered. This suggests that the ban on bottom fishing is allowing recovery of these sensitive species.

The site known as Damicornis Bay has an abundance of sponges including *Axinella damicornis* which is close to the northern limit of its distribution in this area. It is still abundant and the area is undisturbed in appearance, but *Axinella damicornis* is very rare elsewhere around Rathlin and Northern Ireland in general. This site and the Maidens, off Larne, are the only known sites for the recently described *Tethya hibernica* Heim, Nickel, Picton & Brümmer, 2007, which was recorded again by this survey. Many other rare sponges are present at this site, which seems to have some unusual hydrographic conditions. It might be appropriate to protect this small site from the effects of pot fishing, where ropes are known to dislodge long-lived species such as these sponges. Another species which was found to be adversely affected by pot fishing is the bryozoan *Pentapora foliacea*.

The Skate Bank site was found to have numerous *Pentapora* during the 1980s surveys and these were confirmed to be still present in 2019. *Pentapora* is close to its northern distributional limit in Northern Ireland.

This report is largely based on the still photographs taken by a group of divers who were searching for nudibranchs. A protocol for divers should be developed for use in an initial briefing and to encourage them to take photographs of non-target species and covering a wider range of magnifications in order to capture more habitat information. This would also include things such as how to synchronise the dates and times on the cameras and possibly how to account for start and finish positions of dives. In the future it may be possible to track diver positions underwater. Some divers could also carry a small video camera such as a Paralenz and shoot a few seconds of wide angle video for different habitats encountered.

This exercise has shown that a group of highly experienced amateur diver-photographers can produce results which are very valuable to marine conservation agencies. Such targeted and specialised expeditions are a valuable addition to the work of government agencies and should be supported.

Recommendations

This project has demonstrated how data collected from recreational dive surveys is a great asset to statutory monitoring and could provide a long term indication of change in the condition of benthic biodiversity if continued over time. A number of recommendations have been made on the back of this report for future dive surveys of this nature, these include:

- provision of a standard protocol for amateur dive surveys;
- gathering of wide angle habitat footage by divers using mounted cameras e.g. Paralenz, which will enable habitat classification;
- synchronising date and times, setting a filename prefix and setting copyright declarations on all divers' cameras;
- conducting high resolution surveys e.g. video sledge, multibeam, side-scan, **prior to** dive surveys, that will provide broad-scale site information and identify new sentinel sites and seabed damage for future monitoring;
- executing comparative site specific surveys e.g. inside and outside the Rathlin Island MPA boundary across a gradient of anthropogenic pressure in order to monitor impact;
- using new available and affordable technologies to gather quantitative data e.g. GoPros with sequential stills along the dive transects;
- further investigations into new classification systems based on morphology, rather than taxonomy e.g. CATAMI, which could potentially be beneficial for citizen science dive projects;
- focused surveys on hydroid assemblages;
- focused surveys on sea squirt assemblages;
- focused surveys on *Arachnanthus sarsi* within the Church Bay area.

Acknowledgements

A huge thanks goes to Bernard Picton for inviting CEDaR to join the Rathlin Dive Expedition and enabling this report to be written. An extended thank you goes to all divers who voluntarily provided their images and information over the course of the week: Bernard Picton, Mats Larsson, Iain Dixon, Jim Anderson, George Brown, Katrina Dick, Mike Markey, Michael Lundin, Donna Conroy, Ron Patterson and Richard Bloore. Thanks also to Richard Lafferty from Aquaholics for allowing an extra person on board and for facilitating what was a great week.

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Annex A: Priority Marine Features (PMFs)

Table 1 | List of Priority Marine Features within the Rathlin MCZ

Habitats	
Deep Seabed	
Fragile sponge and anthozoan communities on subtidal rocky habitats	
Littoral Chalk Communities	
Maerl Beds	
Subtidal Chalk	
Intertidal Under-boulder Communities	
Littoral Chalk communities	
Low mobility species	
Common Name	**Latin name**
Tassel weed	*Carpomitra costata*
Brown seaweed	*Desmarestia dresnayi*
Spindle weed	*Atractophora hypenoides*
Red seaweed	*Cruoria cruoriiformis*
Red seaweed	*Schmitzia hiscockiana*
Red seaweed	*Stenogramme interrupta*
An erect bryozoan	*Bugula turbinata*
Ross coral	*Pentapora foliacea*
Soft coral	*Alcyonium hibernicum*
Burrowing anemone	*Arachnanthus sarsi*
Cup coral	*Caryophyllia inornata*
Cup coral	*Caryophyllia smithii*
Hydroid	*Diphasia alata*
Hydroid	*Diphasia nigra*
Burrowing anemone	*Edwardsia timida*
Hydroid	*Halecium plumosum*
Stalked jellyfish	*Haliclystus auricular*
Hydroid	*Lytocarpia myriophyllum*
Anemone	*Parazoanthus anguicomus*
Yellow trumpet anemone	*Parazoanthus axinellae*
Hydroid	*Polyplumaria flabellata*
Anemone	*Stomphia coccinea*
Hydroid	*Tamarisca tamarisca*
Circular crab	*Atelecyclus rotundatus*
Hermit crab	*Cestopagurus timidus*
Masked crab	*Corystes cassivelaunus*
European lobster	*Homarus gammarus*
Spider crab	*Inachus leptochirus*
Squat lobster	*Munida rugosa*
Spiny lobster/Crawfish	*Palinurus elephas*
Goosefoot starfish	*Anseropoda placenta*
Feather star	*Antedon petasus*
Starfish	*Astropecten irregularis*

Starfish	*Leptasterias (Leptasterias) muelleri*
Cushion Star	*Porania pulvillus*
Sunstar	*Solaster endeca*
Queen Scallop	*Aequipecten opercularis*
Nudibranch	*Cumanotus beaumonti*
Nudibranch	*Cuthona concinna*
Egg cowrie	*Erato voluta*
King scallop	*Pecten maximus*
Sponge	*Antho (Acarnia) brattegardi*
Sponge	*Axinella damicornis*
Sponge	*Axinella dissimilis*
Sponge	*Clathria (Clathria) barleei*
Sponge	*Hymedesmia (Hymedesmia) cohesibacilla*
Sponge	*Hymedesmia (Hymedesmia) rathlinia*
Sponge	*Hymerhabdia typica*
Sponge	*Iophon hyndmani*
Sponge	*Lissodendoryx (Ectyodoryx) jenjonesae*
Sponge	*Myxilla (Myxilla) rosacea*
Sponge	*Plocamiancora arndti*
Sponge	*Pyura microcosmus*
Sponge	*Spanioplon armaturum*
Sponge	*Spongionella pulchella*
Sponge	*Stelletta grubii*
Sponge	*Stryphnus ponderosus*
Sponge	*Tethya hibernica*
Sea squirt	*Archidistoma aggregatum*
Sea squirt	*Boltenia echinata*
Football sea squirt	*Diazona violacea*
Pinhead sea squirt	*Pycnoclavella stolonialis*
Sea squirt	*Synoicum incrustatum*
Highly mobile species	
Common Name	*Latin name*
Harbour Porpoise	*Phocoena phocoena*
Bottle-nosed dolphin	*Tursiops truncatus*
Basking Shark	*Cetorhinus maximus*
Lesser spotted dogfish	*Scyliorhinus canicula*
Nursehound	*Scyliorhinus stellaris*
Spurdog	*Squalus acanthias*
Cod	*Gadus morhua*
Angler fish	*Lophius piscatorius*
Ling	*Molva*
Plaice	*Pleuronectes platessa*
Sole	*Solea solea*
Grey seal	*Halichoerus grypus*
Common seal	*Phoca vitulina*
European Shag	*Phalacrocorax aristotelis*

Annex B: Survey Datasets

Table 1 | Sublittoral surveys carried out around Rathlin from 1983-2019 from which data has been used for this report.

Sublittoral Survey Name	Organised By	Year	Survey type
Northern Ireland Sublittoral Survey	Ulster Museum	**1983**	Statutory
Northern Ireland Sublittoral Survey	Ulster Museum	**1984**	Statutory
Northern Ireland Sublittoral Survey	Ulster Museum	**1985**	Statutory
iNaturalist Marine Records - Rathlin	Bernard Picton	**2005**	Recreational
Rathlin Island Sponge Survey	Ulster Museum		Statutory
Seasearch Rathlin Island	Seasearch N.I.		Recreational
iNaturalist Marine Records - Rathlin	Bernard Picton	**2006**	Recreational
Seasearch Rathlin Island	Seasearch N.I.		Recreational
Sublittoral Survey Northern Ireland	Ulster Museum		Statutory
iNaturalist Marine Records - Rathlin	Bernard Picton	**2007**	Recreational
Seasearch Rathlin Island	Seasearch N.I.		Recreational
Sublittoral Survey Northern Ireland	Ulster Museum		Statutory
Sublittoral Survey Northern Ireland	Ulster Museum	**2008**	Statutory
Seasearch Rathlin Island	Seasearch N.I.	**2009**	Recreational
Sublittoral Survey Northern Ireland	Ulster Museum		Statutory
Seasearch Rathlin Island	Seasearch N.I.	**2010**	Recreational
Seasearch Rathlin Island	Seasearch N.I.	**2011**	Recreational
Sublittoral Survey Northern Ireland	Ulster Museum		Statutory
Seasearch Rathlin Island	Seasearch N.I.	**2012**	Recreational
Sublittoral Survey Northern Ireland	Ulster Museum		Statutory
Rathlin pMCZ Support Survey	AFBI	**2013**	Statutory
Seasearch Rathlin Island	Seasearch N.I.		Recreational
Rathlin pMCZ Support Survey	AFBI	**2014**	Statutory
Seasearch Rathlin Island	Seasearch N.I.		Recreational
Rathlin pMCZ Support Survey	AFBI	**2015**	Statutory
Seasearch Rathlin Island	Seasearch N.I.		Recreational
iNaturalist Marine Records - Rathlin	Bernard Picton	**2016**	Recreational
Irish Nudibranch Festival	Bernard Picton		Recreational
Seasearch Rathlin Island	Seasearch N.I.		Recreational
iNaturalist Marine Records - Rathlin	Bernard Picton	**2017**	Recreational
Seasearch Rathlin Island	Seasearch N.I.	**2018**	Recreational
Rathlin Dive Expedition	Bernard Picton / CEDaR	**2019**	Recreational

Table 2 | Metadata from dive surveys carried out in May 2019.

Event Name	Date	Location	Latitude (WGS84)	Longitude (WGS84)	Depth (approx.)	Surveyors
120519_S1	2019-05-12	Derginan Point Arch	55.3079	-6.269317	32m	Bernard Picton; Mats Larsson; Iain Dixon; Jim Anderson; George Brown; Katrina Dick; Mike Markey; Michael Lundin; Donna Conroy; Ron Patterson; Richard Bloore; Sally Stewart-Moore
120519_S2	2019-05-12	Farganlack Point Gully	55.312183	-6.25325	6-14m	
130519_S1	2019-05-13	White Cliffs East	55.2935	-6.233783	10-18m	
130519_S2	2019-05-13	Damicornis Bay	55.291017	-6.251217	10-30m	
140519_S1	2019-05-14	White Cliffs West	55.292817	-6.241733	25-30m	
140519_S2	2019-05-14	Bull Rock	55.297133	-6.288933	20-24m	
150519_S1	2019-05-15	NW Wall Pinnacle	55.311917	-6.252667	7-30m	
150519_S2	2019-05-15	S.S.Lochgarry	55.2667	-6.174117	33m	
160519_S1	2019-05-16	Sroanamaddy	55.289967	-6.276317	20-32m	
160519_S2	2019-05-16	West Lighthouse Gully	55.306433	-6.273967	25-30m	
170519_S1	2019-05-17	Skate Bank	55.274483	-6.225983	28m	
170519_S2	2019-05-17	White Cliffs West	55.29215	-6.244883	12-29m	

Annex C: Northern Ireland Priority Species records

Table 1 | Northern Ireland Priority Species recorded from Rathlin Island in May 2019

Taxon Group	Scientific Name	Common Name
Bryozoa	*Pentapora foliacea*	Ross coral
Cnidaria	*Arachnanthus sarsi*	Scarce tube dwelling anemone
	Diphasia alata	Hydroid
	Edwardsia timida	Timid burrowing anemone
	Parazoanthus axinellae	Yellow cluster anemone
	Polyplumaria flabellata	Hydroid
	Virgularia mirabilis	Slender sea pen
Crustacea	*Munida rugosa*	Rugose squat lobster
	Palinurus elephas	Spiny lobster
Echinodermata	*Astropecten irregularis*	Sand star
Mollusca	*Cumanotus beaumonti*	Nudibranch
Pisces	*Lophius piscatorius*	Monkfish
Porifera	*Hymedesmia (Hymedesmia) rathlinia*	Sponge
	Lissodendoryx (Ectyodoryx) jenjonesae	Sponge
	Tethya hibernica	Sponge
Tunicata	*Pycnoclavella stolonialis*	Pin head sea squirt
	Pyura microcosmus	Sea squirt

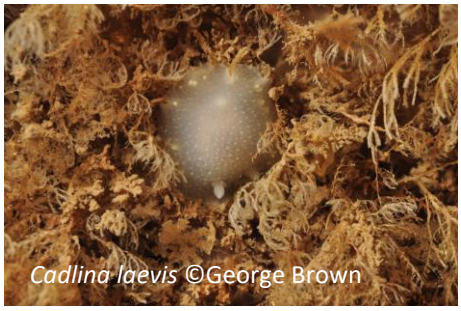
Annex D: Nudibranch Species Images


Acanthodoris pilosa ©Mike Markey


Aeolidiella filomenae ©Iain Dixon


Antiopella cristata ©Mats Larsson


Aplysia punctata ©George Brown


Cadlina laevis ©George Brown


Carronella pellucida ©Iain Dixon


Colpodaspis pusilla ©Michael Lundin

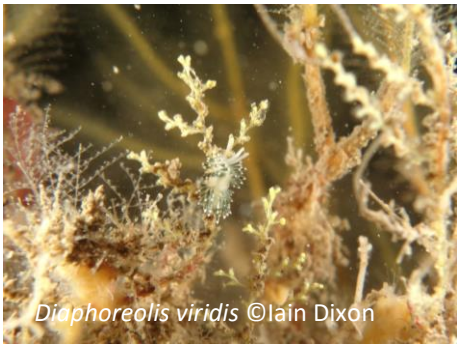

Coryphella verrucosa ©Iain Dixon


Crimora papillata ©Michael Lundin

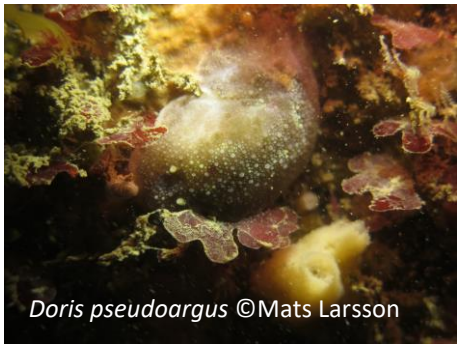

Cumanotus beaumonti ©Michael Lundin


Dendronotus europaeus ©Bernard Picton


Dendronotus frondosus ©Michael Lundin


Diaphoreolis viridis ©Iain Dixon


Diaphorodoris luteocincta ©George Brown


Doris pseudoargus ©Mats Larsson


Doto coronata ©Michael Lundin


Doto dunnei ©Michael Lundin


Doto fragilis ©Mats Larsson


Doto hystrix ©Bernard Picton


Doto lemchei ©Mats Larsson


Doto maculata ©Mats Larsson


Doto pinnatifida ©Mats Larsson


Doto sarsiae ©Michael Lundin

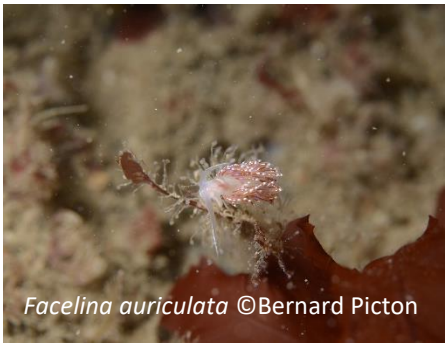

Edmundsella pedata ©Iain Dixon


Eubranchus exiguus ©Mats Larsson


Eubranchus tricolor ©Michael Lundin


Eubranchus vittatus ©Michael Lundin


Facelina annulicornis ©Bernard Picton


Facelina auriculata ©Bernard Picton


Fjordia browni ©Bernard Picton


Fjordia chriskaugei ©Mike Markey


Fjordia lineata ©George Brown


Goniodoris nodosa ©Mats Larsson


Joruna tomentosa ©George Brown


Knoutsodonta oblonga ©Mats Larsson


Limacia clavigera ©Mike Markey


Lomanotus genei ©Katrina Dick


Microchlamylla gracilis ©Michael Lundin


Okenia elegans ©George Brown


Polycera faeroensis ©George Brown


Polycera quadrilineata ©Bernard Picton


Rostanga rubra ©Mats Larsson


Rubramoena amoena ©Michael Lundin


Rubramoena rubescens ©Michael Lundin

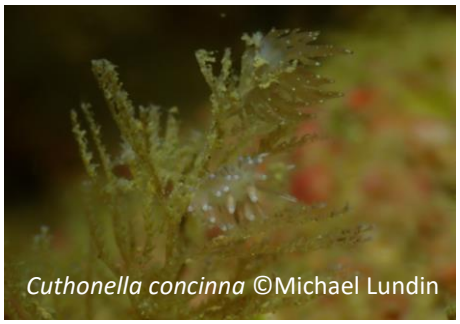

Tergipes tergipes ©Mats Larsson


Trapania pallida ©Michael Lundin


Tritonia hombergii ©Bernard Picton


Tritonia lineata ©Mike Markey


Tritonia plebeia ©Mike Markey


Cuthonella concinna ©Michael Lundin

The following nudibranch species were recorded during the 2019 Rathlin Dive Expedition but no images were taken:

Aeolidia glauca
Aeolidia papillosa (possibly mistaken *A. filomenae*)
Catriona aurantia
Doto tuberculata
Lomanotus marmoratus