

Rathlin Island 2009 — 2011

A Survey Report from the Nationally
Important Marine Features Project



In partnership with



explore / engage / enjoy

Research and Development Series 11/03
A report commissioned by the Northern Ireland Environment Agency

Rathlin Island

2009 — 2011

A Survey Report from the Nationally
Important Marine Features Project

Authors — Claire Goodwin, Hugh Edwards, Joe Breen & Bernard Picton

Contractor — National Museums Northern Ireland

NIEA contract number — CON 2/1 (260)

This report should be cited as follows —

Goodwin, C., Edwards H., Breen, J. and Picton, B. (2011) Rathlin Island - A Survey Report from the Nationally Important Marine Features Project 2009-2011. Northern Ireland Environment Agency Research and Development Series No. 11/03

For further information on this report please contact —

Joe Breen
Northern Ireland Environment Agency,
Conservation Science,
Klondyke Building,
Gasworks Business Park,
Lower Ormeau Rd,
Belfast,
BT7 2JA

The opinions expressed in this report do not necessarily reflect the current opinion or policy of the Northern Ireland Environment Agency.

Contents

	Page
Introduction	3
Methodology	3
Data	4
Abbreviations used in the report	4
Areas of particular conservation importance	6
1. Seagrass Bed Mill Bay	6
2. White Cliffs	6
3. Damicornis/O'Byrne Bay	8
4. Limestone Cliff soth of Bull Point	8
5. Spongisorites Gully	12
6. Cave Gully	13
7. Ruecallan Archway and Caves	15
8. Duncan's Bo and North Wall	17
9. Other Sea Caves	18
10. Farganlack Stack Channel	19
11. Steep Boulder/Bedrock Slope	19
12. East Coast Maerl Bed	19
13. Picton's Reef	21
14. East Coast Boulder Slope	23
15. Steep Boulder Slope over bedrock	25
16. Boulder Slope SE Lochgarry	25
17. Lochgarry Wreck	26
Discussion	27
Fishing Damage	27
Boulder Habitat on East Coast of Rathlin	27
Church Bay	30
Ecological effects of fishing	32
Acknowledgements	33
References	34
Appendix 1 - List of Survey Dives	36

Introduction

Rathlin Island lies six miles off the north coast of Northern Ireland. It was recognised during the Northern Ireland Sublittoral Survey (Erwin et al. 1986, 1990) as being of particular significance because of the wide range of habitats and the high species diversity (530 species, 60% of NI total recorded from here). Recent survey work (Goodwin et al. 2011a) has established that the island is a stronghold for many Northern Ireland Conservation Priority Species such as the anemone *Arachnanthus sarsi*. Several of the species recorded here are not found elsewhere in Northern Ireland and are rare in the rest of Britain and Ireland (Goodwin et al. 2011a).

The lower rock strata on which the Island stands are cretaceous limestone laid down in beds 1-2 metres thick. This weathers to form steps. Basalt was laid over this in a series of lava flows and forms much of the island currently above sea level. The basalt/limestone junction often forms a shelf in the sublittoral. The limestone is patchily exposed in the sublittoral; where it is exposed it tends to weather forming fissures and caves (Erwin et al. 1986,1990; Wilson and Robbie 1971).

Rathlin is designated a European Special Area of Conservation (SAC) because of its rocky reefs and submerged or partially submerged sea caves (both Annex I habitats). Reef habitats include the steep limestone and basalt cliffs on the north wall of the island and areas of boulders on the east and south coasts. Caves are found mainly on the north wall at depths from 0-60+ m. Some partially submerged caves are used for breeding by grey seals (*Halichoerus grypus*).

This survey was part of the National Museums Northern Ireland and Northern Ireland Environment Agency (NIEA) 'Nationally Important Marine Features' project. The project aims to build on the data collected during the Northern Ireland Sublittoral Survey (Erwin et al. 1986, 1990) and Sublittoral Survey Northern Ireland (SSNI) (Goodwin et al. 2011a) projects and provide NIEA with the information required to develop a Northern Ireland network of marine protected areas.

The recent Joint Irish Bathymetric Survey (JIBS) Project (<http://www.marine.ie/home/services/surveys/seabed/JIBS.htm>) has used multibeam sonar to produce high resolution bathymetric and seabed type maps of the 3 nautical mile coastal strip westward from Fair Head, around Rathlin Island and extending to Inishtrahull Island off Donegal, excluding the harbour sections of Lough Foyle. This gives information on seabed depth to 1 m accuracy. This sort of high resolution bathymetric data has not been previously available: the existing charts of most of the coastline of Northern Ireland are Victorian in vintage and compiled from leadline soundings with sextant positioning. One of the aims of the project was to use the new multibeam data to locate and survey features of potential national importance.

The specific aims of the Rathlin Survey were to:

- 1) Survey areas of boulder slope on the east coast of Rathlin. These areas were noted as being of high importance for Northern Ireland Conservation Priority (NICP) species such as the hydroids *Diphasia nigra* and *Polyplumaria flabellata*. However, their full extent was not known.
- 2) Survey the small reef area on the east coast termed 'Picton Reef', located in the SSNI project.
- 3) Survey additional reef features on the north and south coasts.
- 4) Assess the SAC for any indications of damage, particularly that caused by bottom trawling.

Methodology

The areas were surveyed by SCUBA diving. Sites were selected using a combination of previous survey data (SSNI and NISS) and multibeam habitat data from the Joint Irish Bathymetric Survey project. This report combines data collected on the Sponge Biodiversity of Rathlin Island Project 2005 (Picton and Goodwin 2007a,b), Sublittoral Survey Northern Ireland project 2006-2008 (Goodwin et al. 2011a), a survey targeting Northern Ireland Conservation Priority Species; and the results of two weeks fieldwork carried out in summer 2009. In total 251 dives were made around the Rathlin Coast (Appendix 2). Each dive is given a unique reference number to which all data are linked. This is the date backwards (to assist sorting in databases)

followed by the number of the dive on the day. For example the third dive on the 1st of June 2009 would be 090601/03.

On each dive approximately 30 minutes was spent recording, this depended on decompression constraints and consequently bottom time varied from 20 minutes at the deepest sites to up to an hour at the shallowest. Conspicuous flora and fauna was noted and specimens collected where *in situ* identification was not possible. A JNCC phase 2 sublittoral habitat form was also completed to give a record of species and habitats at the site and on most dives photos were also taken. A pair of divers was deployed on all dives (see Hiscock 1996 for methodology). Biotopes were subsequently designated as per Connor et al. (2004).

Divers were experienced field biologists with good knowledge of *in situ* identification. Surveyors were Claire Goodwin, Bernard Picton (National Museums Northern Ireland), Joe Breen, Hugh Edwards (Northern Ireland Environment Agency), Lin Baldock, George Brown, Fiona Crouch and Jennifer Jones (contractors).

Tidal range has not been corrected to chart datum as accurate information for Rathlin is not available. Tidal range for Ballycastle, the closest port, is unusually small, being approximately one metre, so in any case variation is likely to be less than that encountered in the course of the dive. This is due to the occurrence of an amphidromic point (around which tides oscillate) south of Islay, 14 miles north of Rathlin Island.

The JIBS data greatly assisted the survey team in understanding the habitat complexity of the sites and targeting sampling to suitable areas. The limited number of sites it was possible to survey can now be transposed onto the multibeam images of the area, enabling groundtruthing of this data and interpolation into broad scale habitat maps.

Data

In total 251 survey dives were carried out on Rathlin over 2005-2009. The recording protocol on these varied but on the majority of dives 2006-2009 a JNCC phase II recording form was completed giving details of habitats and species. Data is stored in both the Marine Recorder national database (records held by CEDaR at National Museums Northern Ireland) and the Sublittoral Survey Northern Ireland photographic database (copies held by National Museums Northern Ireland and Northern Ireland Environment Agency).

From the 251 survey dives 47 distinct sites were identified for which detailed habitat information was available. The dive numbers and link to Marine Recorder data are given in Appendix 1. These were further subdivided into fourteen areas of conservation significance (Figure 1, Appendix 1).

Abbreviations used in the report

BSL - Below Sea Level. Indicates depth not corrected to chart datum.

BCD - Below Chart Datum. Indicates depth corrected to chart datum.

CEDaR - Centre for Environmental Data and Recording, National Museums Northern Ireland.

JIBS - Joint Irish Bathymetric Survey

JNCC - Joint Nature Conservation Committee

NICP - Northern Ireland Conservation Priority Species (listed under Northern Ireland Biodiversity Strategy).

NIEA - Northern Ireland Environment Agency

SAC - European Special Area of Conservation

SOCC - Northern Ireland Species of Conservation Concern (listed under Northern Ireland Biodiversity Strategy).

UK BAP Species - Species listed as a UK Biodiversity Action Priority

Species abundances are listed according to the JNCC SACFOR scale (see Hiscock 1996):

S - Super abundant, A- abundant, C- Common, F-Frequent, O- Occasional, R- Rare.

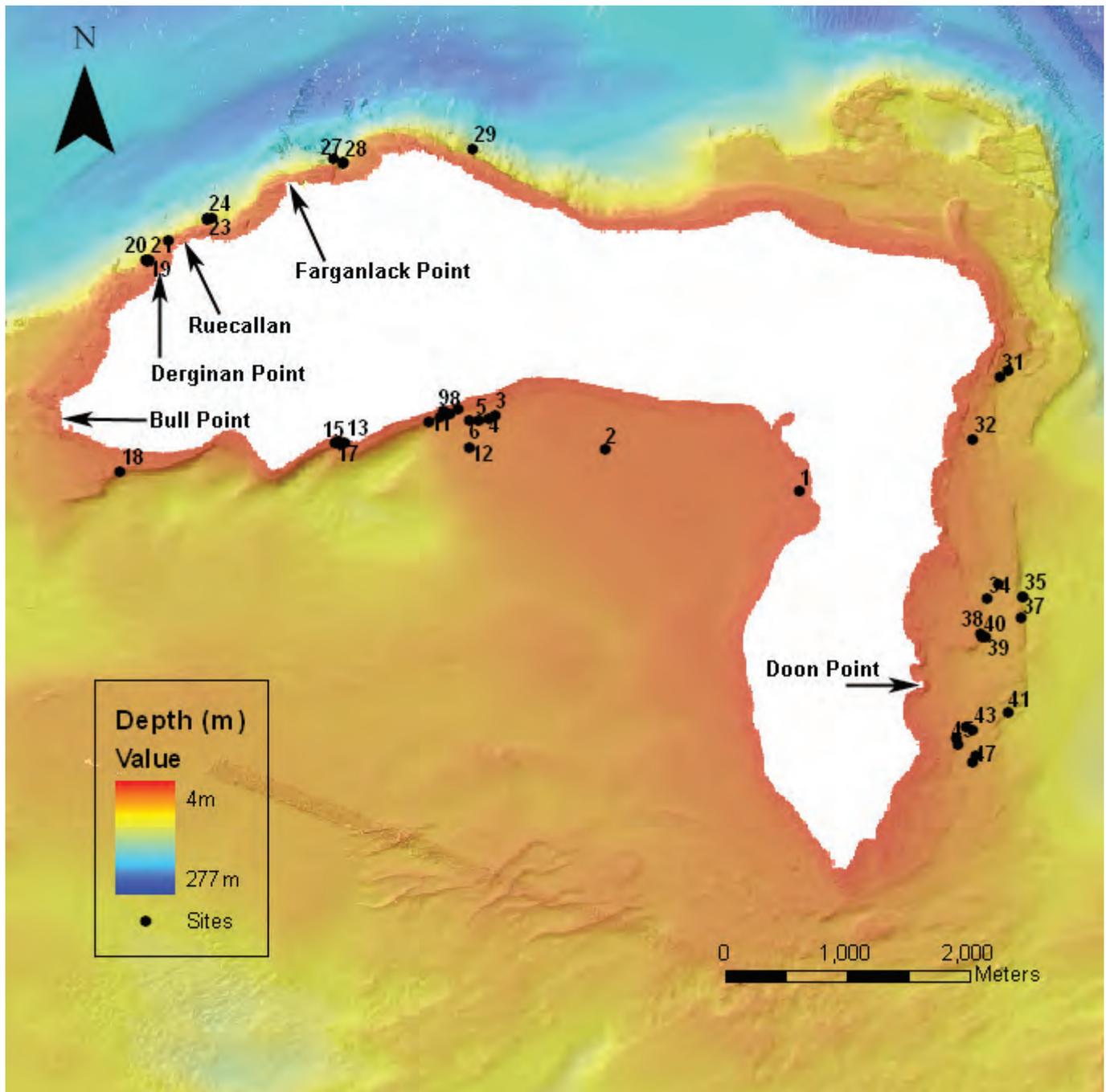


Figure 1. Sites surveyed around Rathlin Island. Numbering from 1 (Church Bay) around north wall and down east coast. For site details see Table 1 and more detailed figures on the following pages.

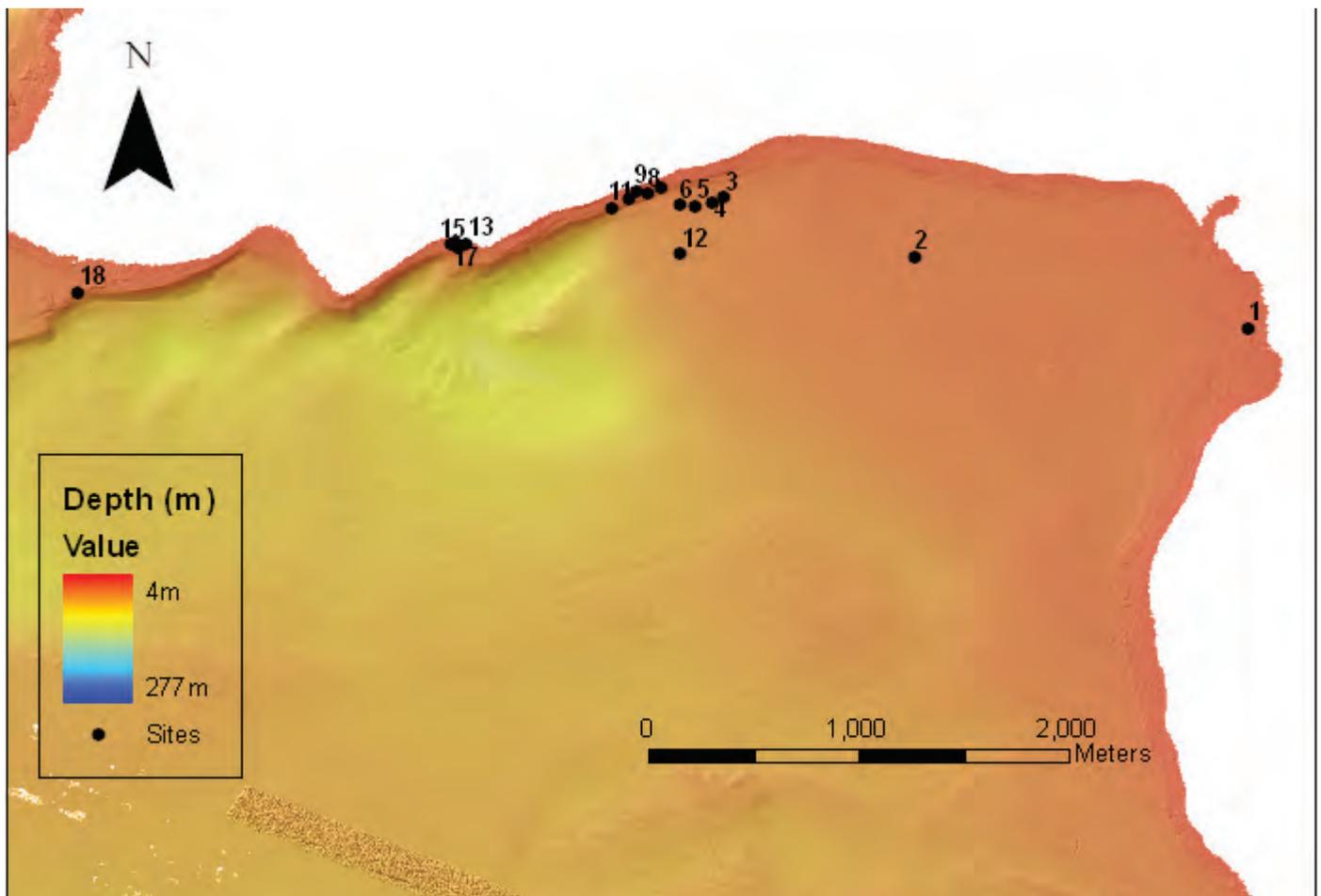


Figure 2. Sites in Church Bay.

Areas of Particular Conservation Importance

Survey site numbers are given in brackets. For site details see Table 1. Species abundance follow the SACFOR scale.

1. Seagrass Bed Mill Bay (1), 55° 17.161'N, 006° 11.679'W

There is a bed of *Zostera marina* seagrass in Church Bay. It had originally been indicated that Seagrass might be present in the area when some was obtained in a grab sample by NIEA Water Management Unit. The bed was subsequently located on a Seasearch dive in 2006, and has since been surveyed in several spot dives by NIEA/National Museums divers. The extent of this bed is not currently known and it would merit further survey work. However, surveys suggest that the seagrass is sparse and fairly patchy. The bed lies in around 6m on medium coarse sand. An unusual, possibly nocturnal, anemone was recorded from the bed on dive 060608/04 which was a night dive. A sample was taken but the species has not yet been identified.

2. White Cliffs - Sediment in Church Bay with *Arachnanthus sarsi* anemones (3-12)

The area adjacent to the white cliff in Church Bay is a gently sloping sediment plain of sand, pebbles and small boulders. This area is of note primarily because it is the only location in Northern Ireland in which the spotted burrowing anemone *Arachnanthus sarsi* occurs. This species is a NICP and UK Biodiversity Action Priority species. There seems to be a stable population of these anemones in this area with up to three individuals having been recorded on a single dive; this indicates that populations on Rathlin may be comparable with the most abundant populations known within the UK, making it a UK stronghold for this species. In addition to *A. sarsi* records of two other anemones were made this area. An anemone believed to be *Halcampoides abyssorum* was recorded during 2006 (dive 060608/05). This species is known only from the UK from Lundy (MarLIN record, Keith Hiscock) Havelet Bay, Guernsey (1987 Bernard Picton pers. comm.), and the West coast of Scotland (George Brown per. comm.). Several specimens of an as yet unidentified *Halcampoides*



Figure 3. *Arachnanthus sarsi* anemone on sand and pebble sediment at the White Cliffs.

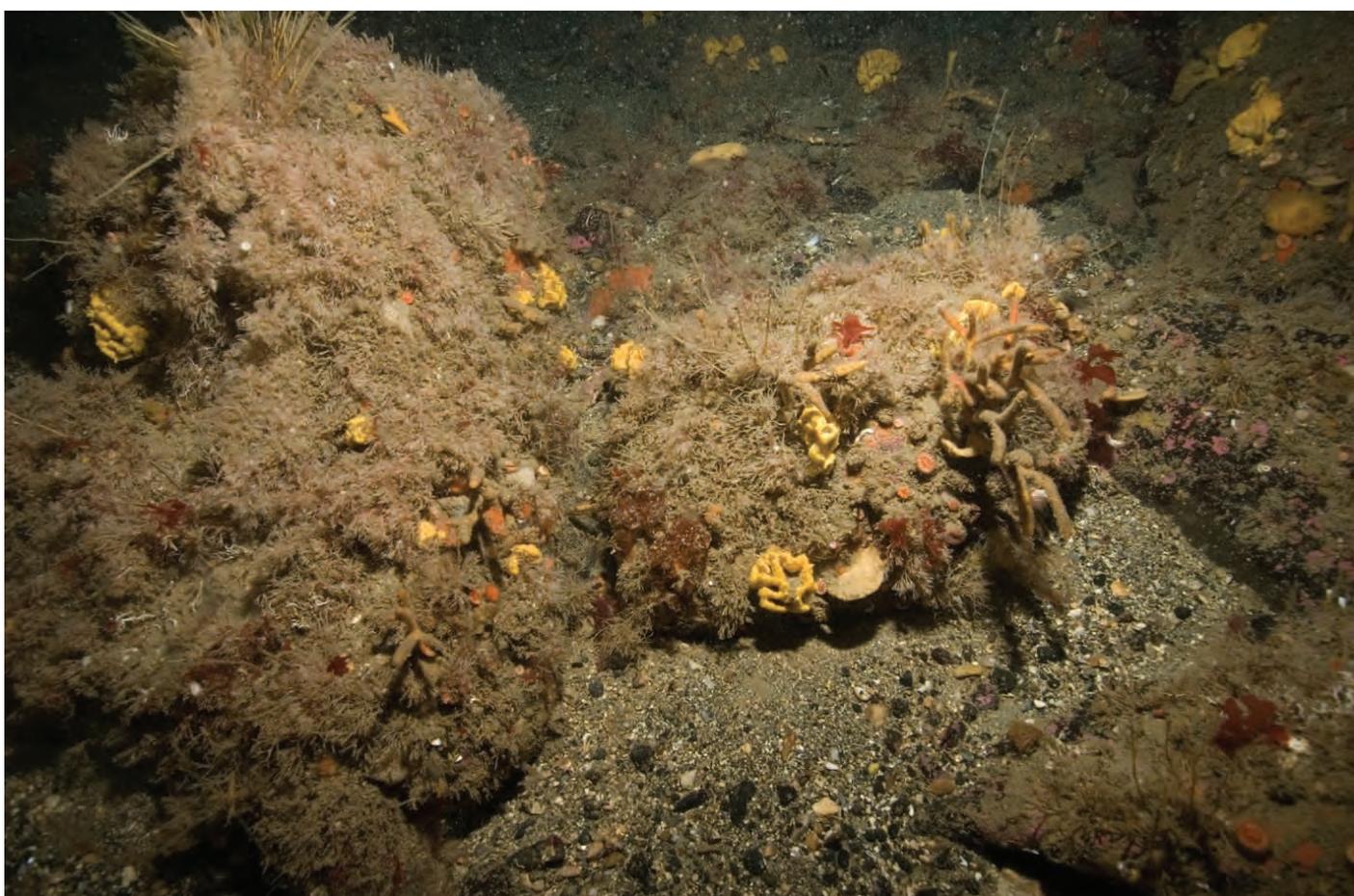


Figure 4. Boulder habitat with abundant *Axinella damicornis* sponges in Damicornis/O'Byrne Bay.

anemone species were also recorded; these were frequent with up to 20 being recorded on one dive.

The area is also important for other NICP species: the starfish *Anseropoda placenta* and *Astropecten irregularis*, the hermit crab *Cestopagarus timidus*, the slender sea pen *Virgularia mirabilis*, and the nudibranch *Cumanotus beaumonti* have all been recorded here. At present this area is very vulnerable to damage by scallop dredging; currently Church Bay is regularly fished by scallop dredgers, particularly when poor weather prevents fishing elsewhere (see discussion).

3. Damicornis Bay/ O'Byrne Bay (13-17)

This small bay is of very high conservation importance. It is very narrow and steep sided, bounded by steep boulder slopes which rapidly drop down to 70+ metres. The unusual hydrogeographic conditions created by the bathymetry seem to provide a favourable environment for many rare species, many of which are southern species rare in the rest of Northern Ireland. The site is unique in biodiversity terms and as such this is a site of high nature conservation importance.

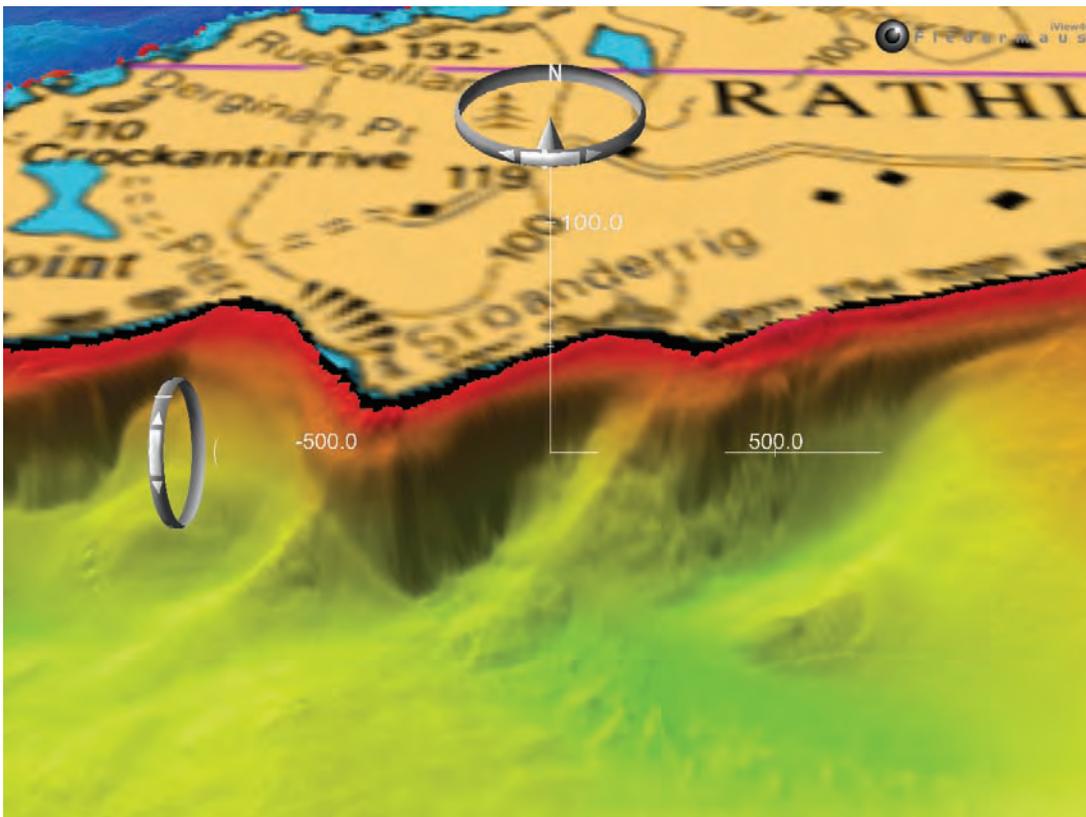


Figure 5. Damicornis/O'Byrne Bay (centre of image)

This boulder habitat has been shown to be of particular importance for sponge species (Erwin et al. 1990, Picton and Goodwin 2007a,b) and is a stronghold for NICP sponge species including *Microciona elliptichela*.

4. Limestone Cliff South of Bull Point (18), 55° 17.370'N 006° 16.918'W

This small cliff was identified from the JIBS data and had not been previously surveyed. It is a bedrock outcrop of heavily pitted limestone. There are many fissures in the limestone, some possibly large enough to be considered sea caves. The top of the cliff is at 20m and is covered in *Laminaria hyperborea* kelp forest and foliose red algae. The base of the cliff is in 33m and the dominant species on these lower, circalittoral, faces are the soft coral *Alcyonium digitatum* (C), the ascidian *Polycarpa scuba* (C) and the sponge *Spongosorites calcicola* (F). This last species was only recently described from Rathlin Island (Picton & Goodwin 2007a). It seems to be associated with calcareous substrates and elsewhere has only been recorded from cold water coral

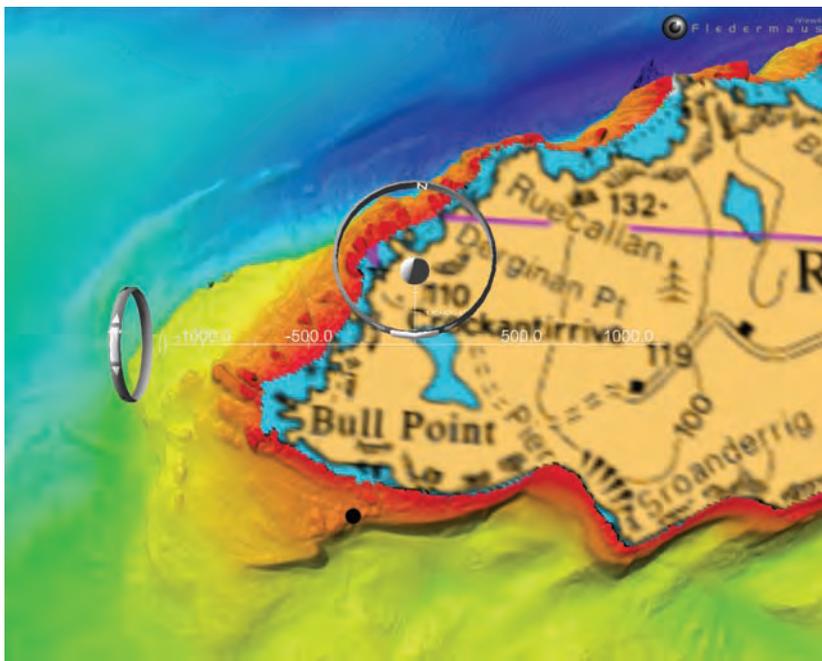


Figure 6. Location of Limestone Cliff (Site 4). Site indicated by black dot.

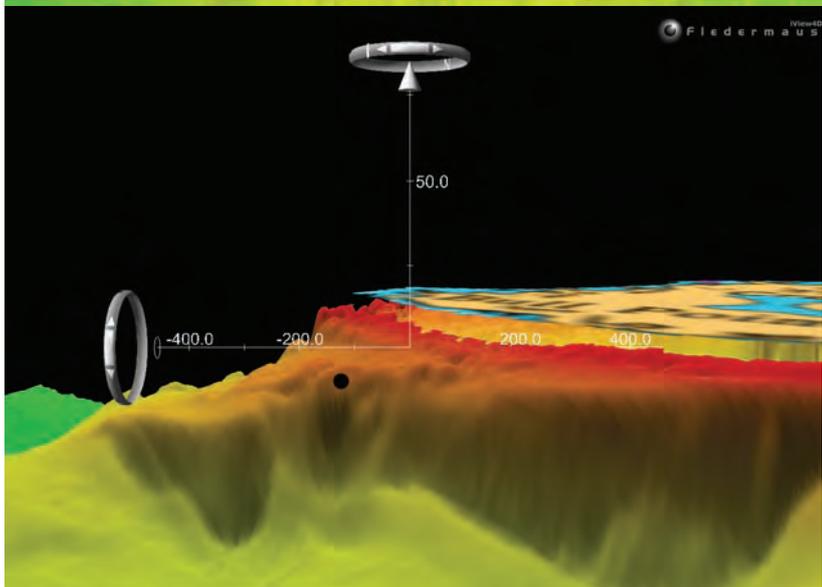


Figure 7. Location of Limestone Cliff (Site 4) from side. Site indicated by black dot.

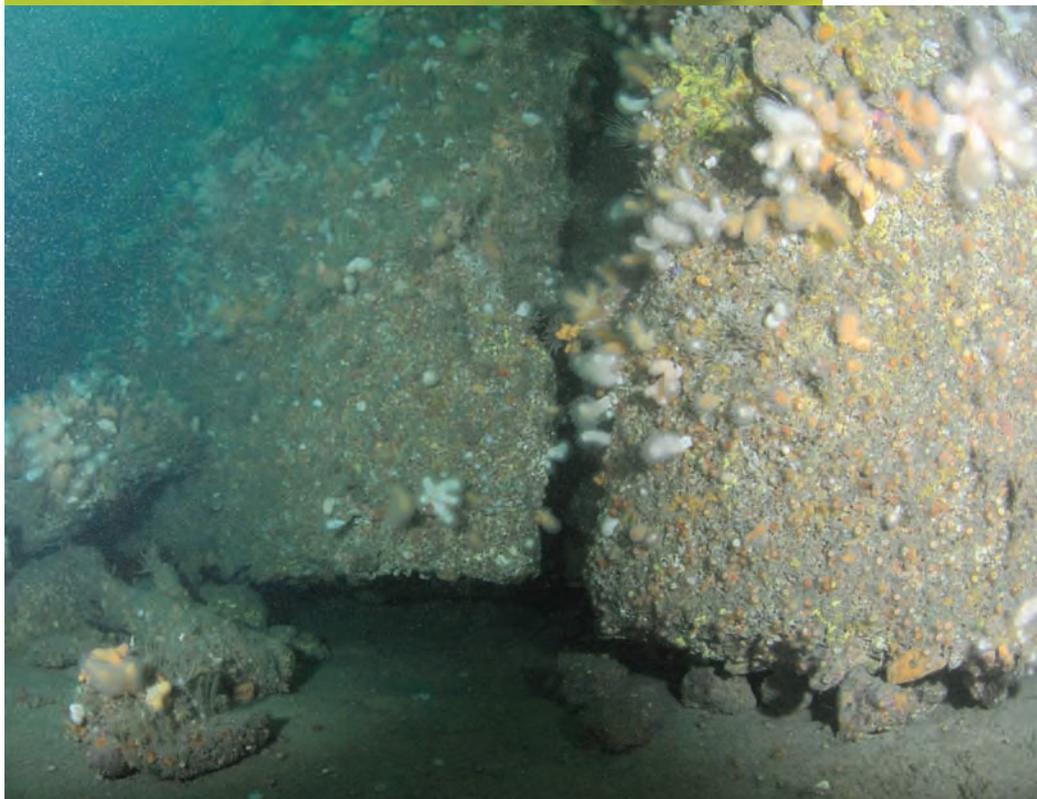


Figure 8. Large crevice/small cave at base of Limestone cliff. Cliff covered in *Spongosorites calcicola* (bright yellow), *Alcyonium digitatum* and *Caryophyllia smithii*.

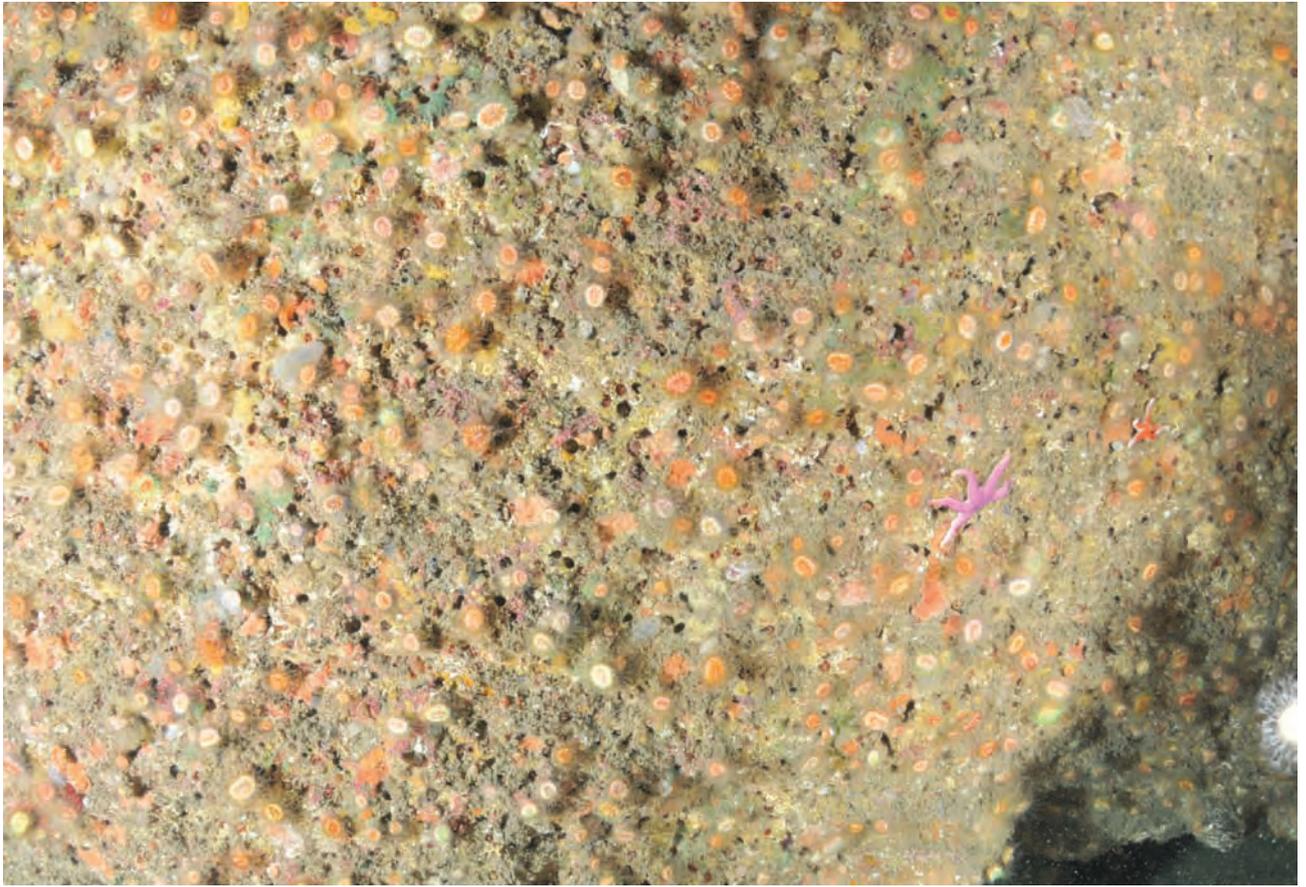


Figure 9. Surface of Limestone Cliff. Heavily pitted limestone with abundant *Caryophyllia smithii* and encrusting sponges.



Figure 10. Surface of Limestone Cliff. Rugged limestone with *Tubularia indivisa*, *Alcyonium digitatum* and *Spongosorites calcicola* (bright yellow sponge bottom right).

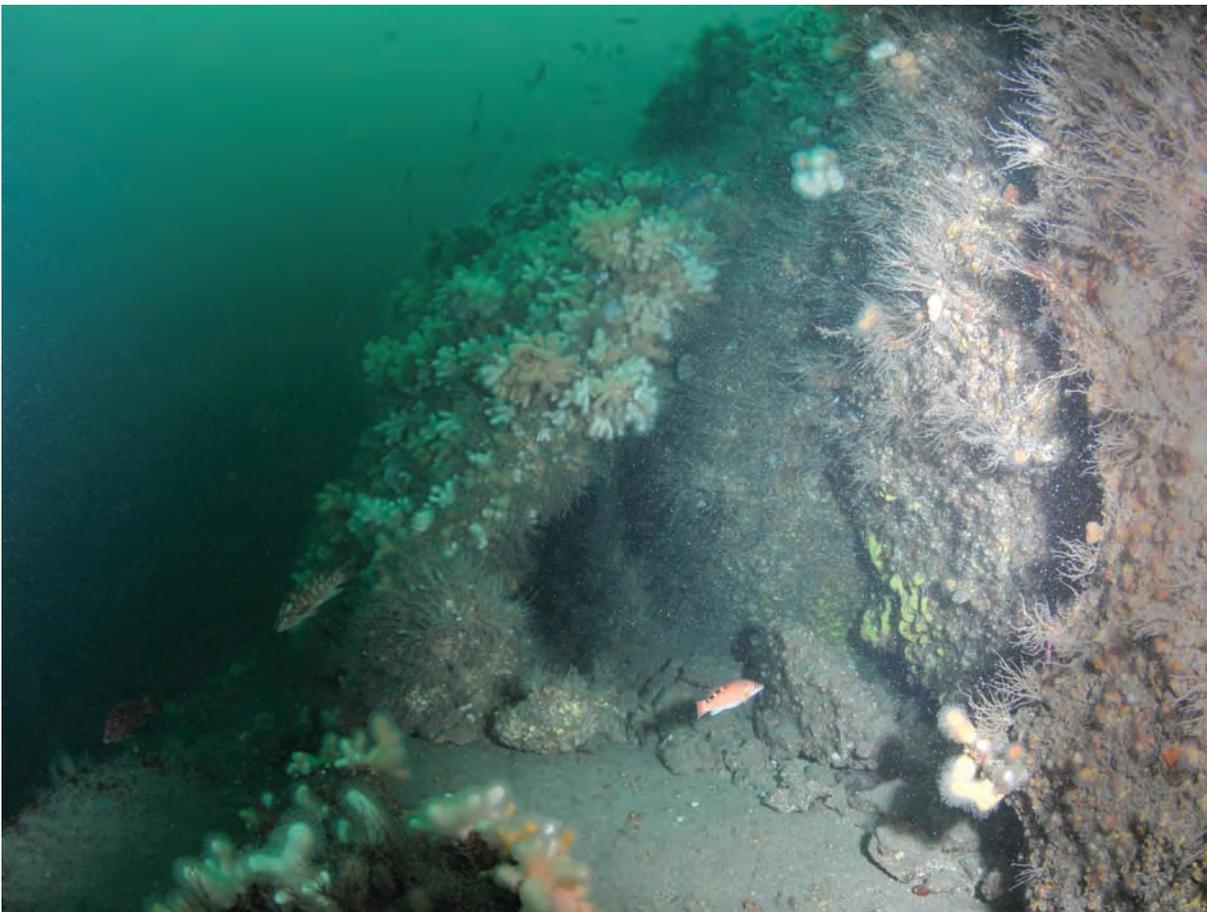


Figure 11. Limestone Cliff east end. End of small cave/tunnel which continues through cliff visible.

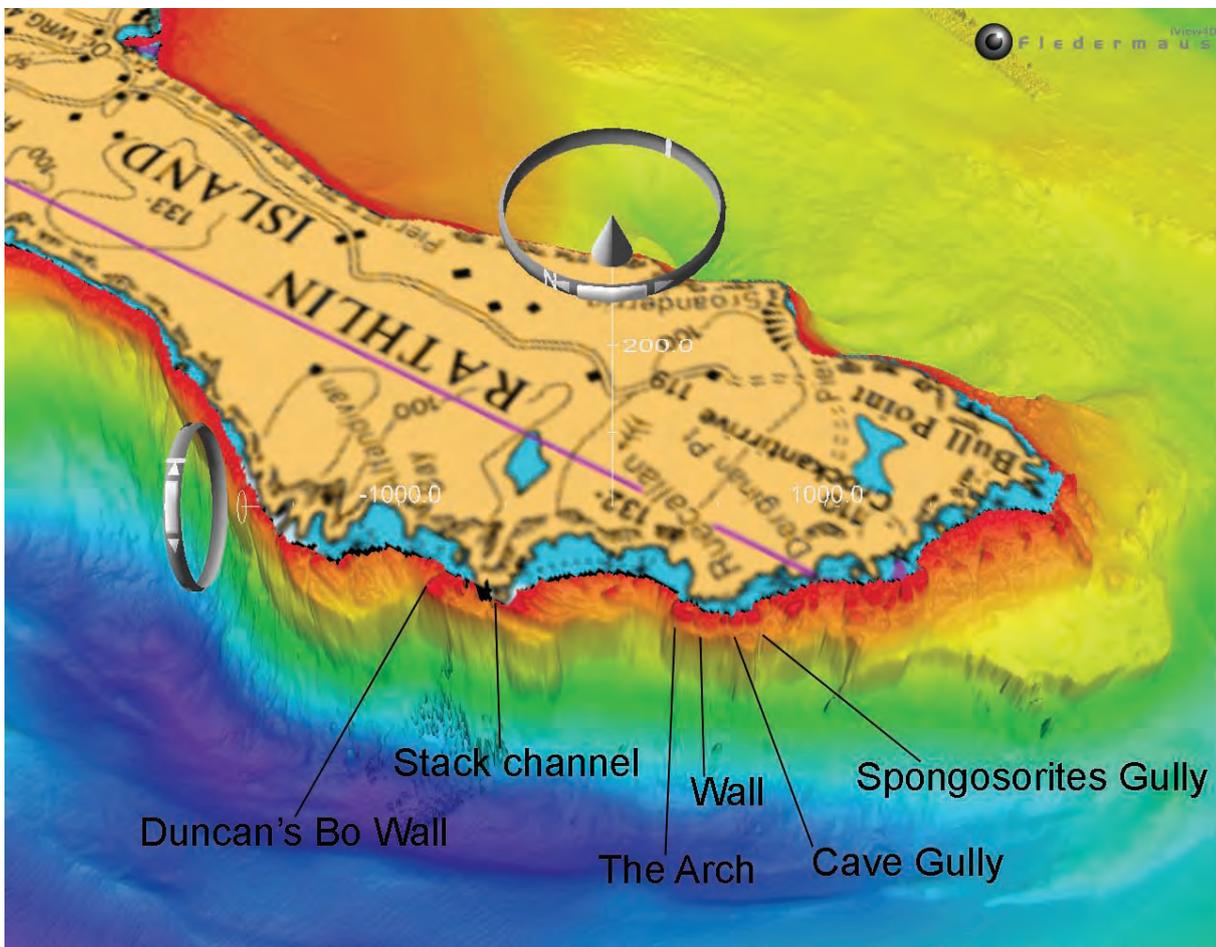


Figure 12. Sites on the North Wall of Rathlin Island.

(*Lophelia pertusa*) reefs off the Hebrides (Roberts et al. 2009). The area immediately adjacent to the cliff is a steep boulder slope covered in *Tubularia indivisa*.

5. Spongisorites Gully (19, 20, 21)

This gully lies on the north-west corner of Rathlin Island mid-way between the West Light and Ruecallan Point. The majority of this area is a steep infralittoral basalt bedrock shelf which slopes down to approximately 28m before dropping onto a sheer wall down to over 200m. The fauna is dominated by *Laminaria hyperborea* kelp forest (to about 23m) and foliose red algae (to edge of cliff in 28m).

There are some limestone outcrops in this rock, of which this gully is one. The base of the gully is in 30m. The gully sides are steep limestone bedrock cliffs. The side to the west is a sheer, slightly overhanging, wall from 23m to 32m. The east side is less steep with a small wall up to approximately 26m and then a more gradual slope up to 23m. The base of the gully is covered with boulders with very sparse epifauna. At its widest point the gully is approximately 10m across. The deeper areas (25-32m) of the sides of the gully are covered in massive sponges, *Caryophyllia smithii*, and *Tubularia indivisa*. The sponge fauna includes *Spongisorites calcicola* (O), *Stryphnus ponderosus* (O), *Desmacella* cf. *annexa* (O) and *Pachymatisma johnstonia* (O), as well as encrusting species. The shallow parts of the walls (23-28m) are characterised by *Delesseria sanguinea*, *Alcyonium digitatum* and *Pachmatisma johnstonia*.

The gully is of particular importance as it contains a population of *Caryophyllia inornata* (a Northern Ireland Priority Species). The recent records of this species are all from this site (dives listed and 070618/03). There is one earlier (1992) record from a nearby site, on the roof of a small cave near Ruecallan (Goodwin et al., 2008). The gully is also notable for the occurrence of *Spongisorites calcicola*, the sponge for which it is named. This massive bright yellow sponge is frequent on the limestone walls of the gully. Since its description from Rathlin (samples from Ruecallan Archway and White Cliffs) in 2007 (Picton and Goodwin 2007) it has been recorded



Figure 13. Spongisorites gully. Photo Lin Baldock.

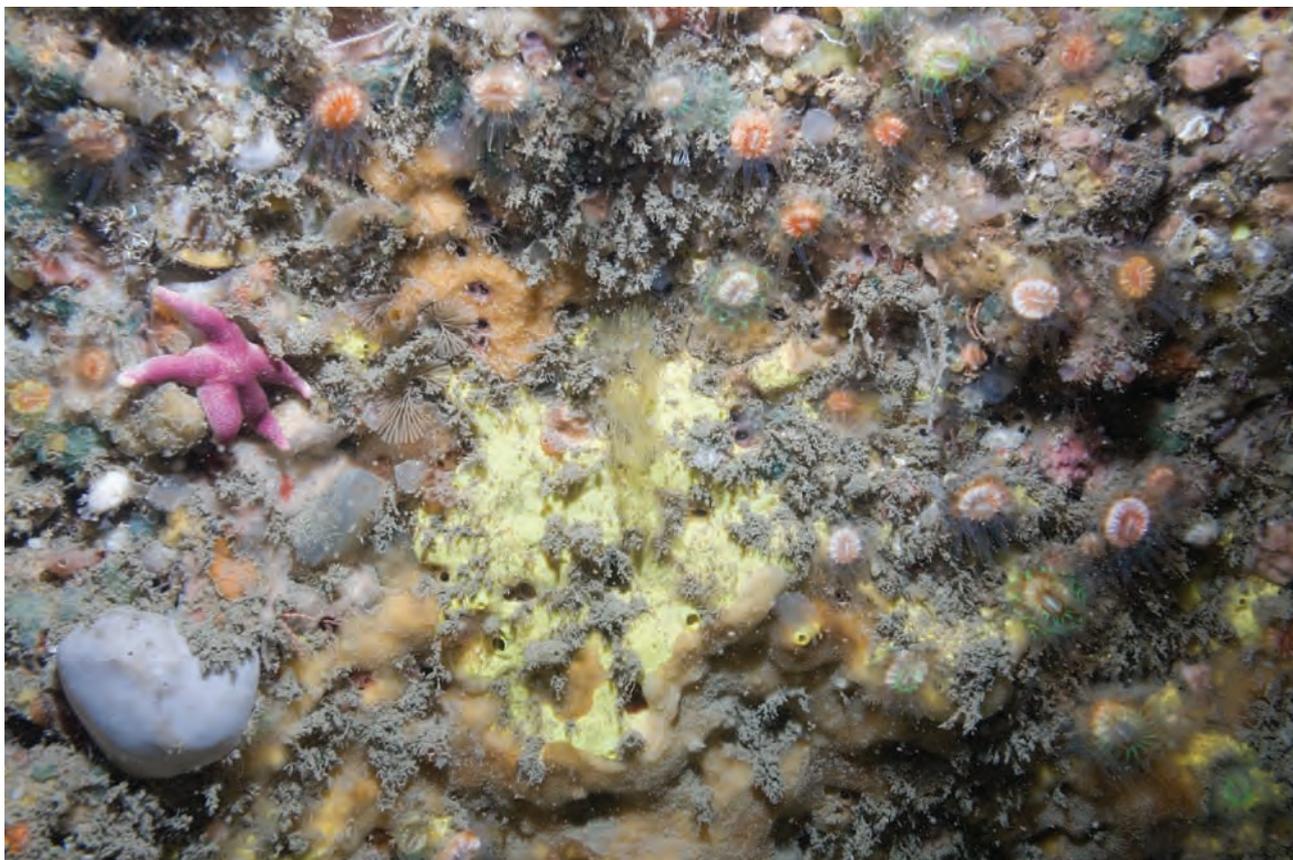


Figure 14. Spongisorites gully. Close up of encrusting fauna including *Spongisorites calcicola* (yellow sponge in centre). Photo Lin Baldock.

from the limestone cliff near Bull Point on Rathlin and deepwater sites on *Lophelia pertusa* coldwater coral reefs off the Hebrides (Roberts et al. 2009). This species has recently been recommended for inclusion on the Northern Ireland Priority list.

6. Cave Gully (22)

This gully lies slightly to the east of the *Spongisorites* gully. It is a steep sided gully with cobbles and pebbles lining its base. The walls are rugged bedrock with some overhanging faces and many crevices. It has a contrasting fauna to the *Spongisorites* gully which is possibly indicative of a different bedrock type: *Spongisorites calcicola* is not present. The top of the gully sides are in 25m and its base in 33m. The gully gets progressively narrower towards the edge of the cliff. At the far end of the gully there was a small cave, approximately 2m high and 3m in diameter across its mouth. The walls of the gully are dominated by *Pachmatisma johnstoni*, *Alcyonium digitatum*, *Parazoanthus axinellae* and encrusting sponges. There are also large patches of the sponge *Desmacella cf. annexa* and small areas of *Parazoanthus anguicomus*.

The gully is of importance because of its rich sponge fauna and the abundance of *Parazoanthus axinellae* (a NICP species). The cave at the end of the gully is a Annex I priority habitat.



Figure 15. Cave Gully. A gully with steep sided walls and boulders in its base.



Figure 16. Cave Gully. Encrusting fauna on gully walls including *Pachymatisma johnstonia*, *Alcyonium digitatum* and the yellow cluster anemone *Parazoanthus axinellae* (centre).

7. Ruecallan Archway and Caves (23,24,25)

The arch at Ruecallan is a well known feature, popular with recreational divers. It is on the eastern side of Ruecallan headland. The upper shelf in this area is mainly down to 23m, this is gently sloping and covered in kelp park and foliose red algae. There is a second small shelf at approximately 33m and it from this that the larger arch rises. The shelf itself is covered in small boulders. The top of the arch is in approximately 25m and the base in approximately 32m. The arch measures approximately 4m high and 8m wide. On the eastern side of the arch there is a small gully leading to a smaller second arch in 35m (2m high by 3m wide). The north side of this arch leads to a sheer cliff. On the shelf to the east of the large arch there are two caves and there is a further small cave immediately to its west side.

On the east side of the arch there is a slope of boulders, on the western side the shelf drops onto a sheer wall, part of the north wall. This wall is covered in *Dendrodoa grossularia* and *Alcyonium digitatum*.

The large arch is formed from rugged bedrock. This is probably limestone. The arch is densely encrusted with animal turf, mainly *Alcyonium digitatum*, *Caryophyllia smithii*, *Pachymatisma johnstonia*, *Actinothoe sphyrodeta* and encrusting sponges but with some patches of dense *Dendrodoa grossularia*, *Parazoanthus anguicomus* and *Parazoanthus axinellae*. There is a large patch of the soft coral *Alcyonium hibernicum* on the underside of the arch towards its north (wall) edge.

The boulders and rock terrace to the east of the arch are less rich but have a contrasting fauna of hydroids and sponges including two undescribed *Sphaerotylus* species and *Tethyspira spinosa*.

The small sea caves present at the site have not been fully investigated but initial surveys have recorded a fauna of massive and encrusting sponges and the anemone *Parazoanthus anguicomus*.

This site has been dived many times in the last few years but mainly for species recording rather than recording the habitat. Consequently no precise information on the arch sizes or the cave dimensions is available. The site would merit further survey to record these details and take additional wide angle photographs.

During 2009 the survey team noted two sites where it would appear that recent underwater landslides have occurred as evidenced by the presence of piles of non-encrusted shattered rocks.

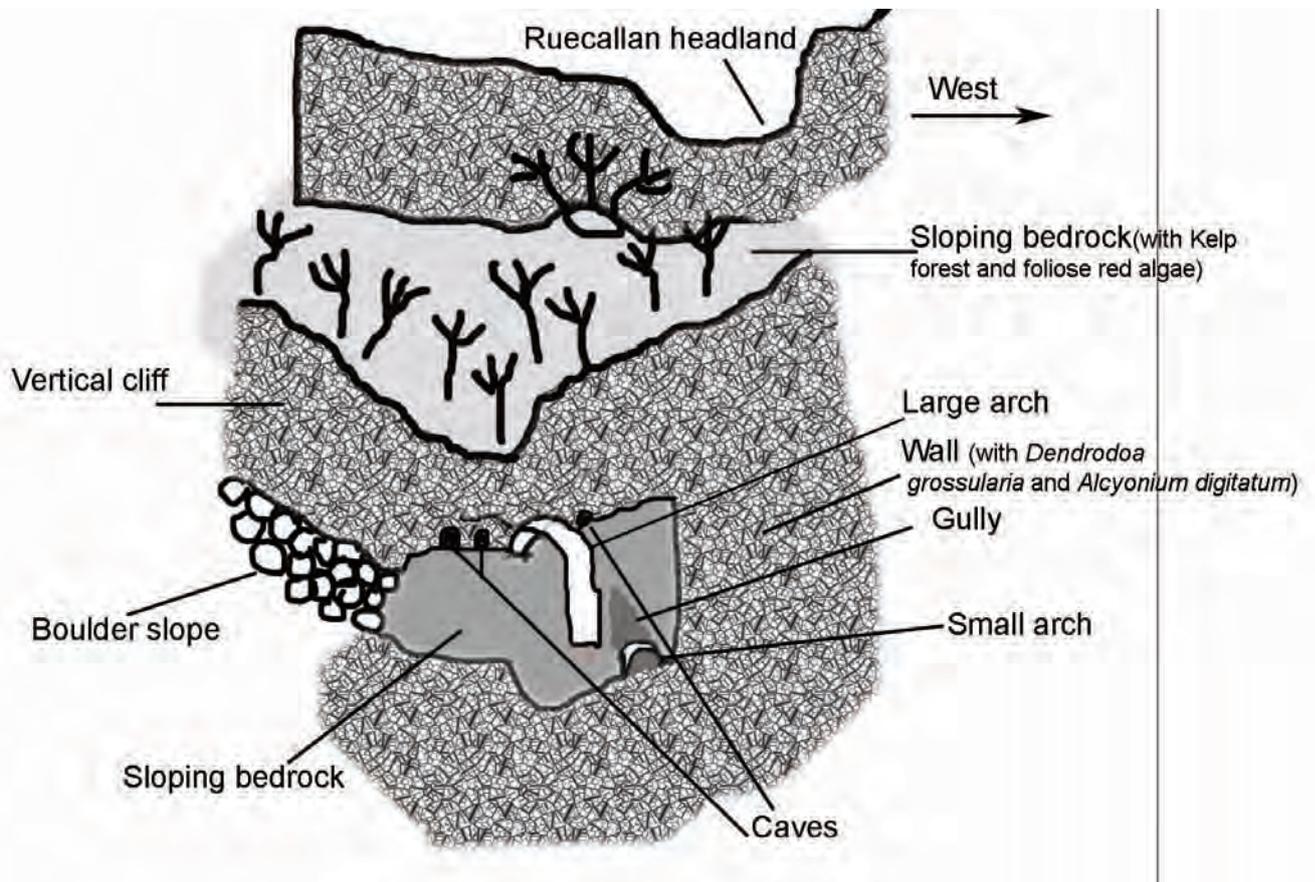


Figure 17. Diagram of the Ruecallan Arch site showing position of arches and caves.



Figure 18. The main arch at Rucallan archway.

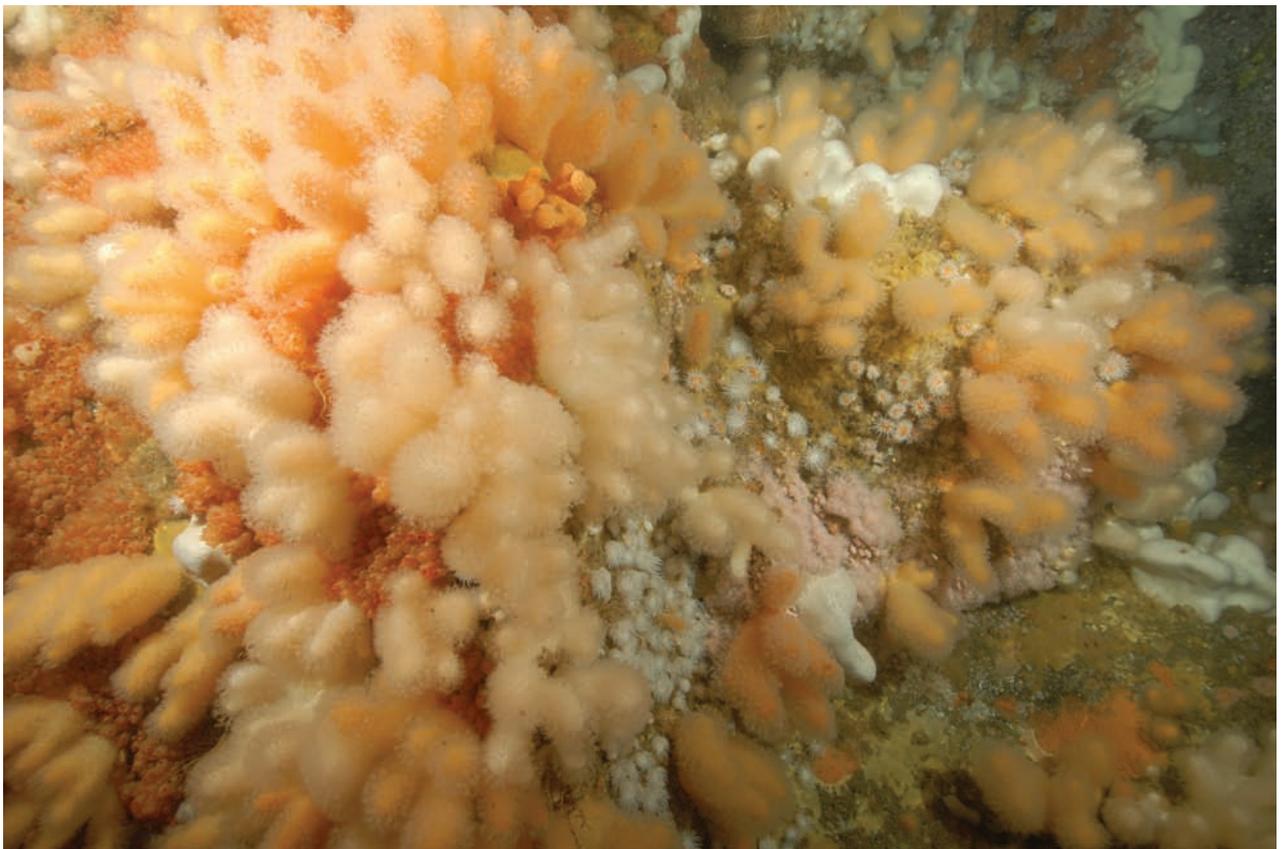


Figure 19. Fauna on the underside of the main arch at Rucallan Archway. Includes the colonial ascidian *Dendrodoa grossularia*, the soft coral 'dead men's fingers' *Alcyonium digitatum* and the Irish dead man's fingers *Alcyonium hibernicum* (a Northern Ireland species of Conservation Concern).



Figure 20. Overhanging section of wall in Duncan's Bo.

8. Duncan's Bo (26,27,28) The North Wall (vertical faces) (23,24)

At Duncan's Bo there is a submerged pinnacle in a bay with an east facing wall.

The species present on the vertical faces of the north wall can be very patchy. This is due to the influence of the headlands which create variable tidal conditions and eddies.

This site has a vertical bedrock wall from 28m to >100m. The wall faces north along the cliff edge but also extends around the pinnacle into the bay itself. Dominant cover *Alcyonium digitatum*, *Caryophyllia smithii*, *Tubularia indivisa*, and sponge crusts. Occasional fissures and overhangs with *Corynactis viridis* and *Parazoanthus anguicomus*. There are additional vertical wall habitats all along the north Rathlin coast.



Figure 21. Overhanging section of wall in Duncan's Bo with abundant white cluster anemone *Parazoanthus anguicomus* (a NICP Species).

9. Other Sea Caves

Other sea caves have been reported from the north wall but precise locations are not known. There are anecdotal records from Tommy Cecil and Bernard Picton of caves in >60m. This area would merit additional surveying by ROV or technical divers. The NIEA team dive on air and consequently are restricted to a depth of 50m. Diving deeper would require the use of Trimix (mixed gas) and consequently require additional training.

10. Farganlack Stack Channel. Dives 050617/01 and 02.

A small bedrock stack lies off the end of Farganlack Point. Behind this is a small gully with vertical bedrock sides. This site has only been surveyed during the Sponge Biodiversity of Rathlin Island project (2005) and consequently no detailed habitat information is available. Depth of the gully is approximately 15m. Several interesting species have been recorded here: the rare sponge *Crella rosea*, the red alga *Schmitzia hiscockiana*, a NICP species, and the nudibranch *Rostanga rubra*. It is the type locality for *Phorbas punctata* Picton and Goodwin 2007.



Figure 22. Farganlack Point showing location of stack at NW corner and channel behind stack.

11. Steep Boulder/bedrock slope with hydroid communities (30, 31)

There has been little survey carried out on this area of the Rathlin coast. It is exposed to extremely strong tidal streams, lying in close proximity to the McDonnell Race on the NE corner of the Island. The two sites surveyed here consisted of a steep bedrock slope and a steep (~70%) boulder slope. Both sites were dominated by hydroids, including the NICP species *Diphasia nigra* and *Polyplumaria flabellata*. Due to the depth survey time was limited and this area would merit further survey work.

12. East Coast Maerl Bed (33,34)

Maerl on gently sloping area between 27 and 28m BSL. Sediment approximately 40% live maerl, 20% dead, 25% Boulders, 10% pebbles, and 5% gravel. Hydroids (including *Polyplumaria flabellata* (O)) and bryozoan turf on boulders. Sparse foliose and filamentous red algae are also present. The squat lobster *Munida rugosa* (O) and the king scallop *Pecten maximus* (R) are present (both NICP species). The bed is probably quite extensive, the distance between the two survey sites was 150m. Site borders a slope of large boulders 28->36m. These are densely covered in the bryozoan *Securiflustra securifrons* and hydroids, including *Polyplumaria flabellata* and *Diphasia alata* (both NICP species).

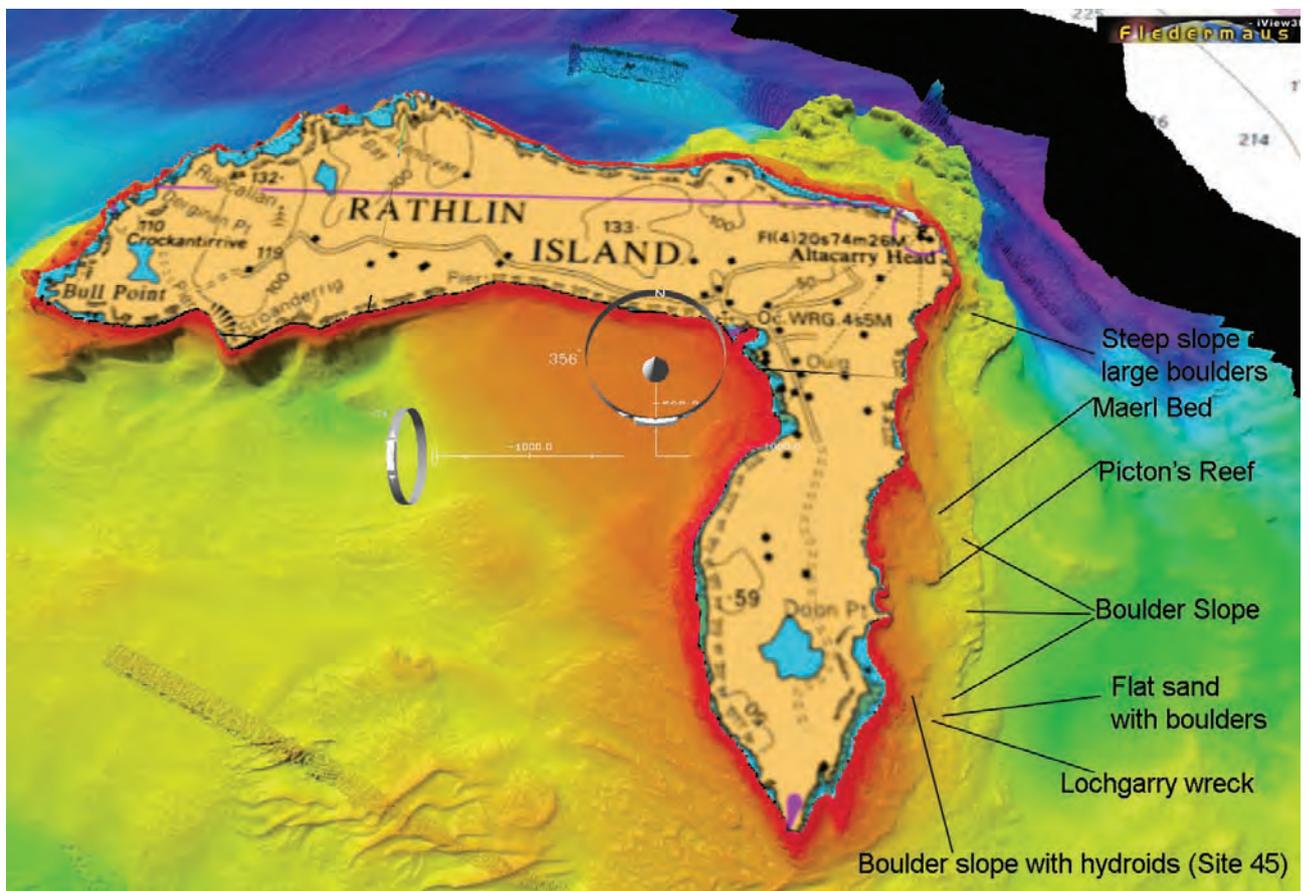


Figure 23. Sites on the East coast of Rathlin Island.



Figure 24. East coast Maerl Bed. Sediment with approximately 40% live maerl.

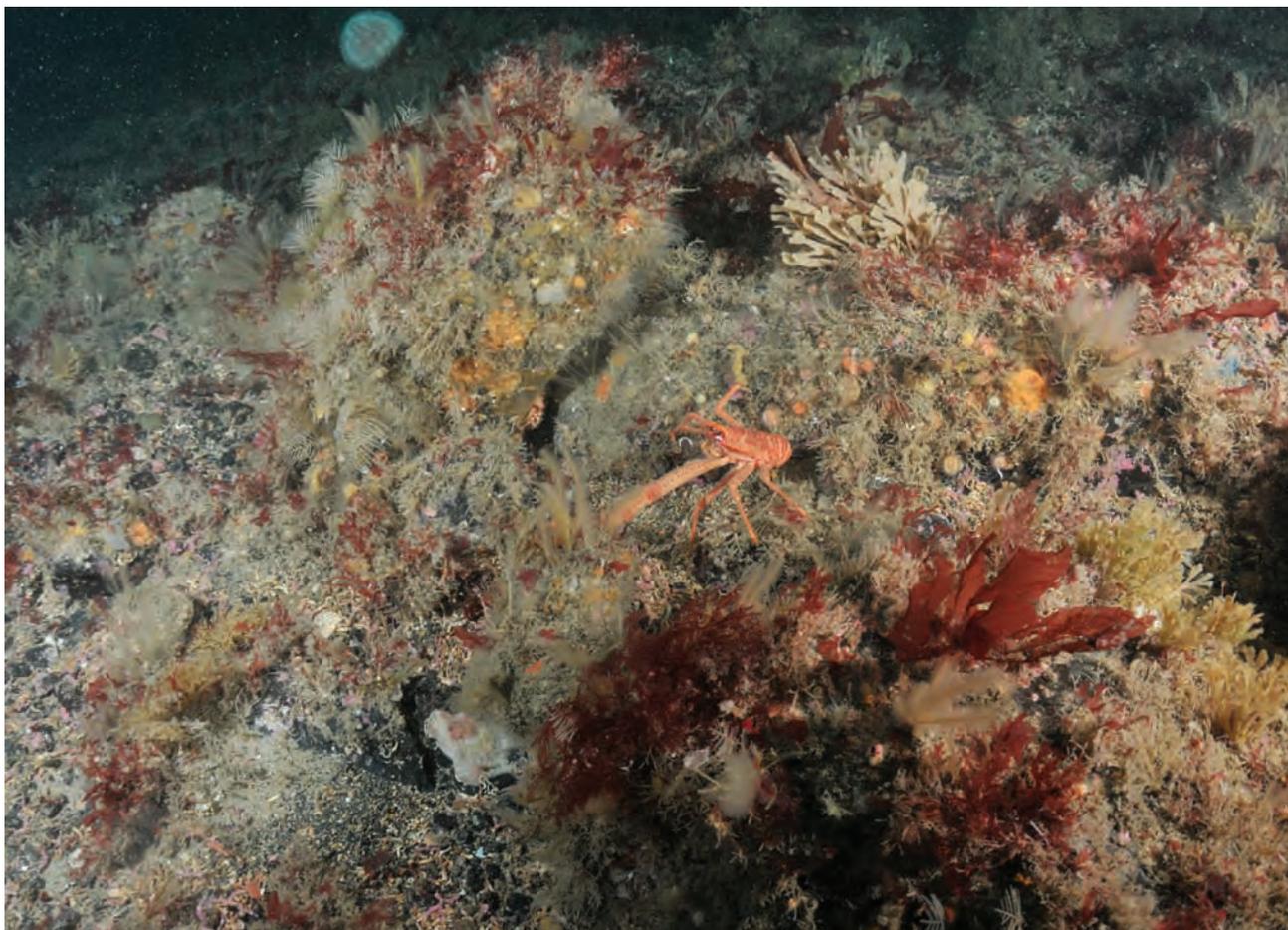


Figure 25. East coast maerl bed. Boulders with the bryozoan *Securiflustra securifrons*, hydroids, and the squat lobster *Munida rugosa*.

13. Picton Reef (38-40)

Picton reef is part of a submerged ridge protruding from the east coast north of Doon Point. We have termed it Picton Reef here for easy reference as we were unable to find an existing name. However, any existing local name would take precedence. Whilst the east side of the reef slopes up fairly gently towards the coast, the south, north and east sides drop steeply. The top of the reef is in approximately 18m and the base of these sides in around 36m. Part of the sides of the reef are formed of stepped bedrock (Site 38), in other areas (Site 39, 40) they are a combination of vertical bedrock faces and large boulders. The top of the reef is covered in foliose red algae whereas the sides are dominated by a hydroid, bryozoan and sponge community including *Polyplumaria flabellata* (F) – a NICP species, *Diphasia alata* (F), encrusting and erect sponges (C)

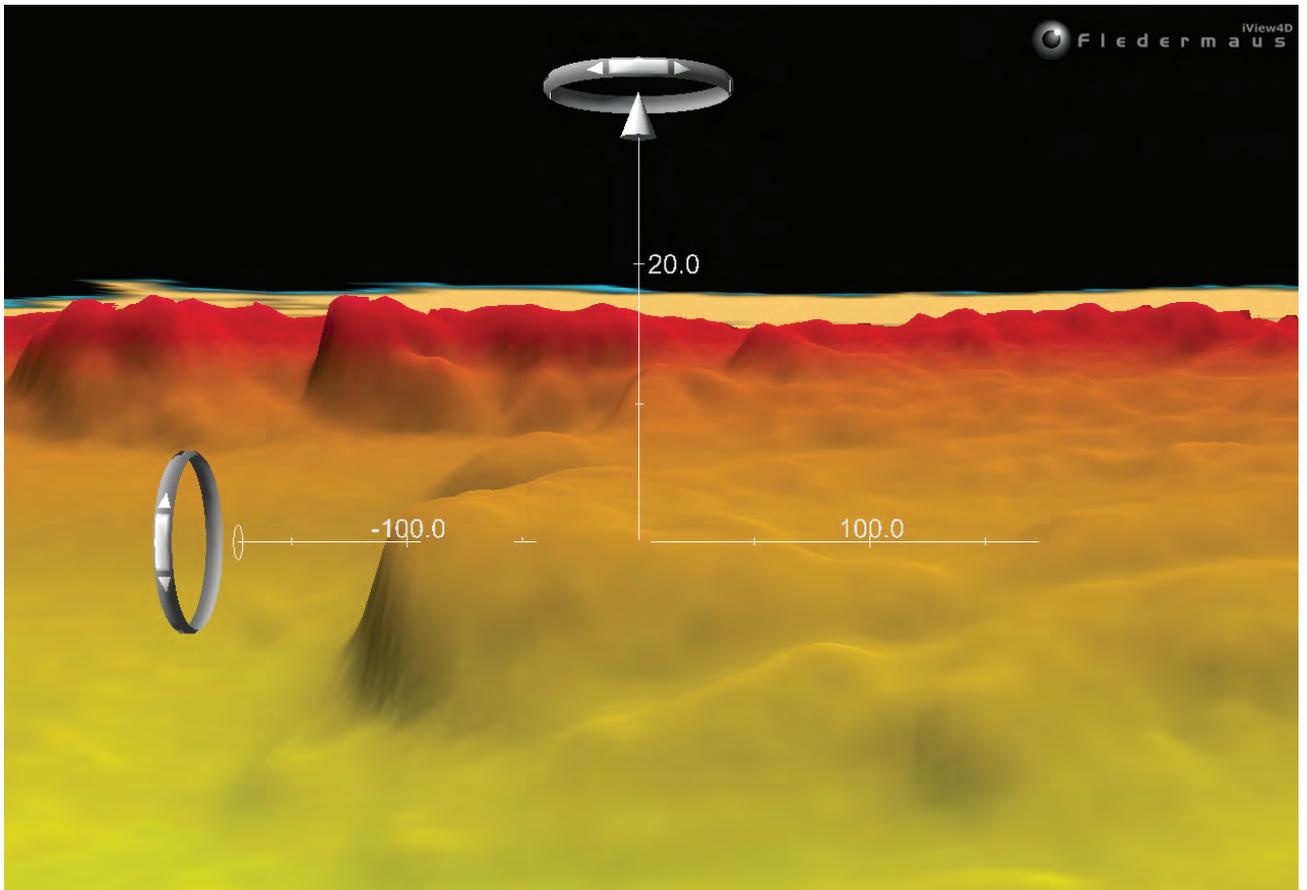


Figure 26. Picton Reef. Viewed from the east.

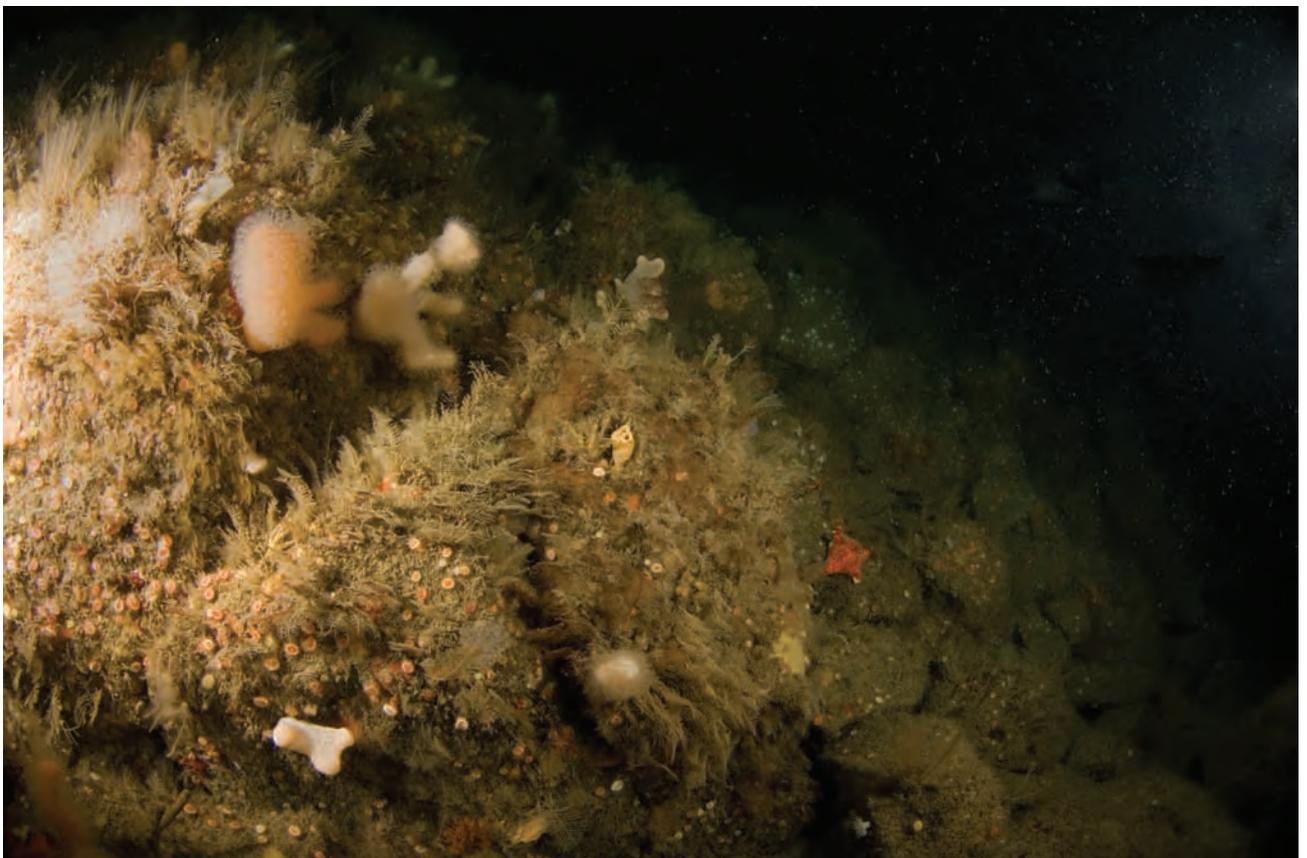


Figure 27. Picton Reef. Bedrock outcrop and boulder slope.



Figure 28. Picton Reef. Boulders at base of reef with hydroids and the white cluster anemone *Parazoanthus anguicomus*.

and *Parazoanthus anguicomus* (F), a Northern Ireland Species of Conservation Concern.

14. East Coast boulder slopes with *Diphasia nigra* (35-37, 41)

This area of the coast is varied with the substrate comprising of areas of bedrock, gravel and boulders in variable proportions. Site 35: gravel with small boulders and a boulder slope, Site 36 approximately 60% small boulders lying on gravel and sand; Site 37: mixed sediment, predominately gravel with some 15% small boulders; and Site 41: a steep slope of small and large boulders. The area is very tideswept and the gravel and sand substrate quite mobile. Although the tidal conditions produce favourable feeding conditions more stable substrate is needed for long lived species to be able to colonise these areas. Where present, stable substrate, such as large cobbles and small boulders, supports a rich community of hydroids and sponges. These communities also used to occur on shallower areas of the Rathlin coast but it is suspected that dredging has removed the boulder substrate which once supported them (see discussion). More extensive survey work is required to determine the exact extent of the boulder habitat in this area.

The boulders have an erect sponge and hydroid cover which include Northern Ireland Priority Species hydroids *Diphasia nigra*, *Polyplumaria flabellata* and *Lytocarpia myriophyllum* and the NICP sponge *Clathria barleei*. These species are all rare in Northern Ireland with the only other records from the Maidens (Goodwin et al. 2011b) In some areas (Site 36) the NICP bryozoan *Pentapora fascialis* var. *foliacea* was abundant with 8 colonies recorded on one dive. Rathlin appears to be a stronghold for this species in Northern Ireland (Goodwin et al. 2011a).

The hydroid and sponge community present on the boulders is rare, occurring only here and on the Maidens in Northern Ireland (Goodwin et al. 2011b) and, from distribution of *Polyplumaria flabellata*, is likely to be rare in Britain and Ireland with the only verified example in the Scilly Isles. The biotope can be characterised by the presence of the hydroids *Polyplumaria flabellata*, *Diphasia alata* and *Aglaophenia tubulifera*, with *Diphasia fallax* often present growing on other hydroids. These species may vary in proportions but usually all are common or frequent. The hydroid *Lytocarpium myriophyllum* may be present, often only patchily. Massive sponges including *Axinella infundibuliformis* may be frequent. The closest JNCC biotope is: 'Bryozoan turf



Figure 29. The hydroid *Diphasia nigra* on the east coast boulder slopes.



Figure 30. The sponge *Clathria barleei* on the east coast boulder slopes.

and erect sponges on tide-swept circalittoral rock. CR.HCR.XFa.ByErSp'. However, this community should be recognised as a new sub-biotope.

15. Steep boulder slope over bedrock – (45)

This site represents a shallower example of the above boulder community, indicating that it may be more widespread along the east coast of Rathlin. This site appeared to be bedrock from topography on JIBS data but was actually a slope of boulders over bedrock reef. Undisturbed boulders and gravel seabed at base of slope with larger boulders supporting the *Diphasia alata* / *Polyplumaria flabellata* hydroid biotope described above.

16. Boulder area SE of Lochgarry wreck (46). Fan mussel.

The area adjacent to the Lochgarry wreck has, to some extent, been protected from dredging and small boulders are still present here with a sponge and hydroid community, as described above, present on them. It was from this site that a Fan Mussel, *Atrina fragilis*, a UK Biodiversity Action Priority and NICP species, was recorded in 2007 (Goodwin et al. 2011a). However, although four dives in 2009 were undertaken to relocate the *Atrina fragilis* specimen it was not found. There was evidence of recent dredging along the side of the wreck where the specimen had been present.

It is possible that further specimens are present on this coast but, despite surveying the immediate area, none were found. The main surviving UK populations of this UK BAP species appear to be in Cornwall and Devon (those in the Salcombe estuary and Plymouth sound are particularly well documented), and the west coast of Scotland, and between John O' Groats and the Shetland Isles. In the Republic of Ireland, it is only known recently from Galway Bay (1962, 1970s) and Valentia (1975). The only other recent Northern Ireland record is from the north coast of Northern Ireland in 1971, where an individual was taken during a trawling survey for the queen scallop *Aequipecten opercularis* (Nunn 2007).

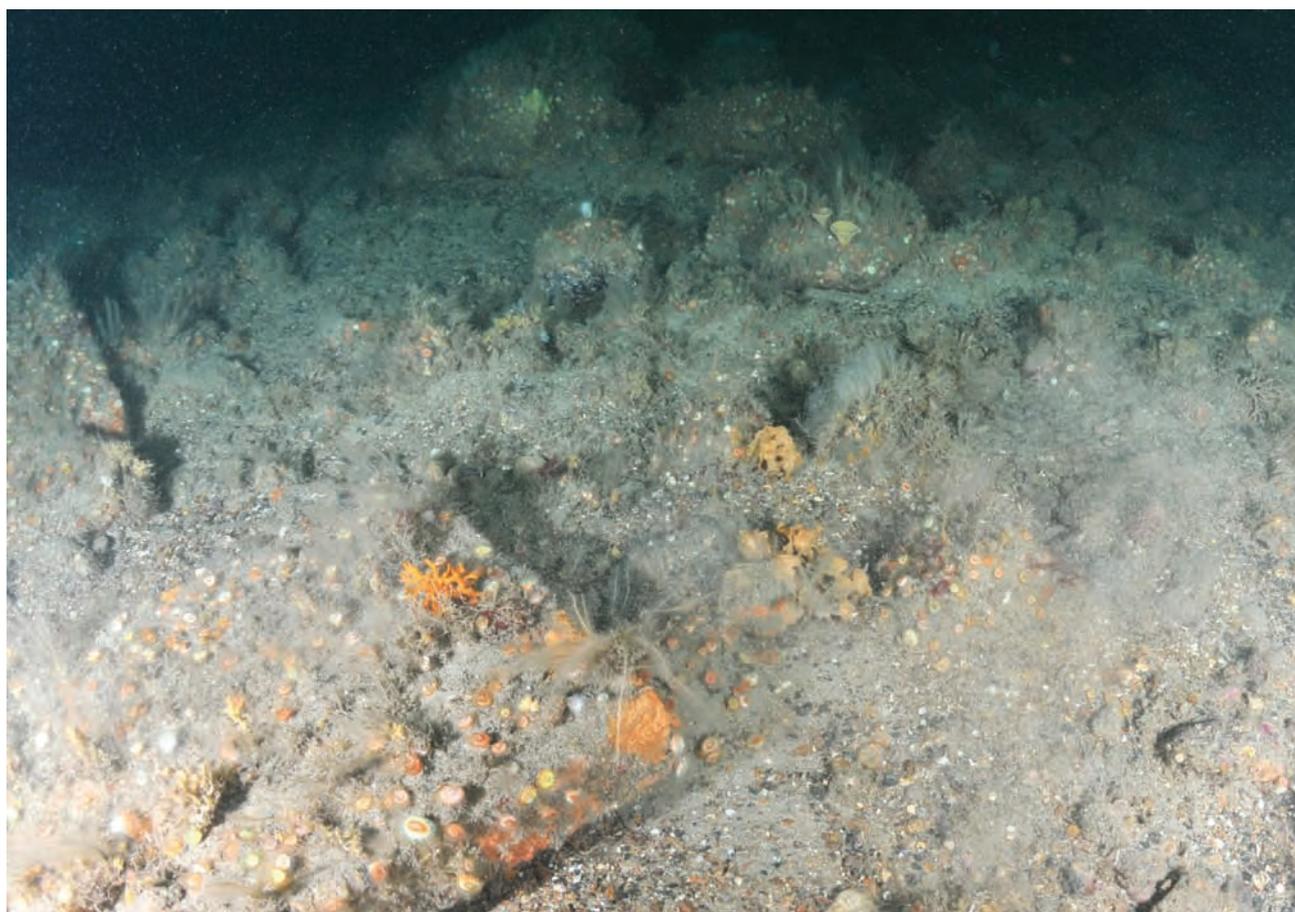


Figure 31. Boulder area SE of the Lochgarry Wreck. Small boulders with much encrusting fauna, including the bryozoan *Pentapora fascialis* var. *foliacea*, hydroids and sponges.



Figure 32. Fan mussel *Atrina fragilis* in Boulder Area SE Lochgarry. Dive 070618/02

17. Lochgarry wreck (47)

The Lochgarry is the wreck of a troop transport ship sunk in 1942. It lies in 34m with the height of the wreck being 7m. Dominant cover on the wreck is *Tubularia indivisa*, *T. larynx* and *Caryophyllia smithii*. Fish are common around the wreck including ling, pollack and wrasse.



Figure 33. Lochgarry wreck with encrusting fauna. Dive 080605/01

Discussion

Fishing Damage

Boulder habitat on the east coast of Rathlin

It was noted during the Sponge Biodiversity of Rathlin Island Project (Picton and Goodwin 2007a,b) that the east coast of Rathlin, previously a boulder strewn area with a rich associated sponge and hydroid fauna, appeared to have been significantly altered since the 1980's. Many of the boulders had apparently disappeared and the previously abundant rare hydroid communities were greatly reduced. Records of east coast habitat from the 1986 sublittoral survey describe an apparently undisturbed habitat with sediment distributed by the current and many large boulders; large cup sponges *Axinella infundibuliformis* were present, these are likely to have been over 50 years old (Picton and Costelloe 1998) (Figure 34). In 1989 scallop dredging commenced in this area and subsequently boulders were observed to have been turned and the gravel had a harrowed appearance (Bernard Picton pers. obs.), see (Figure 35). It appears that the area has been damaged by scallop (*Pecten maximus*) dredging. This is likely to have adversely affected *Clathria barleei* populations as well as the NICP hydroids *Diphasia alata*, *Diphasia nigra*, and *Polyplumaria flabellata*, which were previously abundant in this area.

The patchy nature of the substrate on the east coast and the imprecision of the position fixing technology available during the Northern Ireland Sublittoral Survey makes revisiting survey sites difficult so it is hard to quantify the changes which have taken place. However, dredging activity was reported during summer 2009 from beside the Lochgarry wreck. A local dive boat was on site when a scallop dredger towed gear immediately adjacent to the wreck. The site was subsequently surveyed (dive 090610/02). The side of the wreck was formerly a sand and gravel plain with cobbles and small boulders, the larger boulders had a dense cover of upright sponges and hydroids (Figure 29). The wreck lies SE to NW with the stern facing SW. The eastern side of the wreck showed signs of dredge damage towards the north-west (stern) end of the wreck. An area towards the centre of the wreck side appeared to be heavily impacted with no pebbles boulders or cobbles

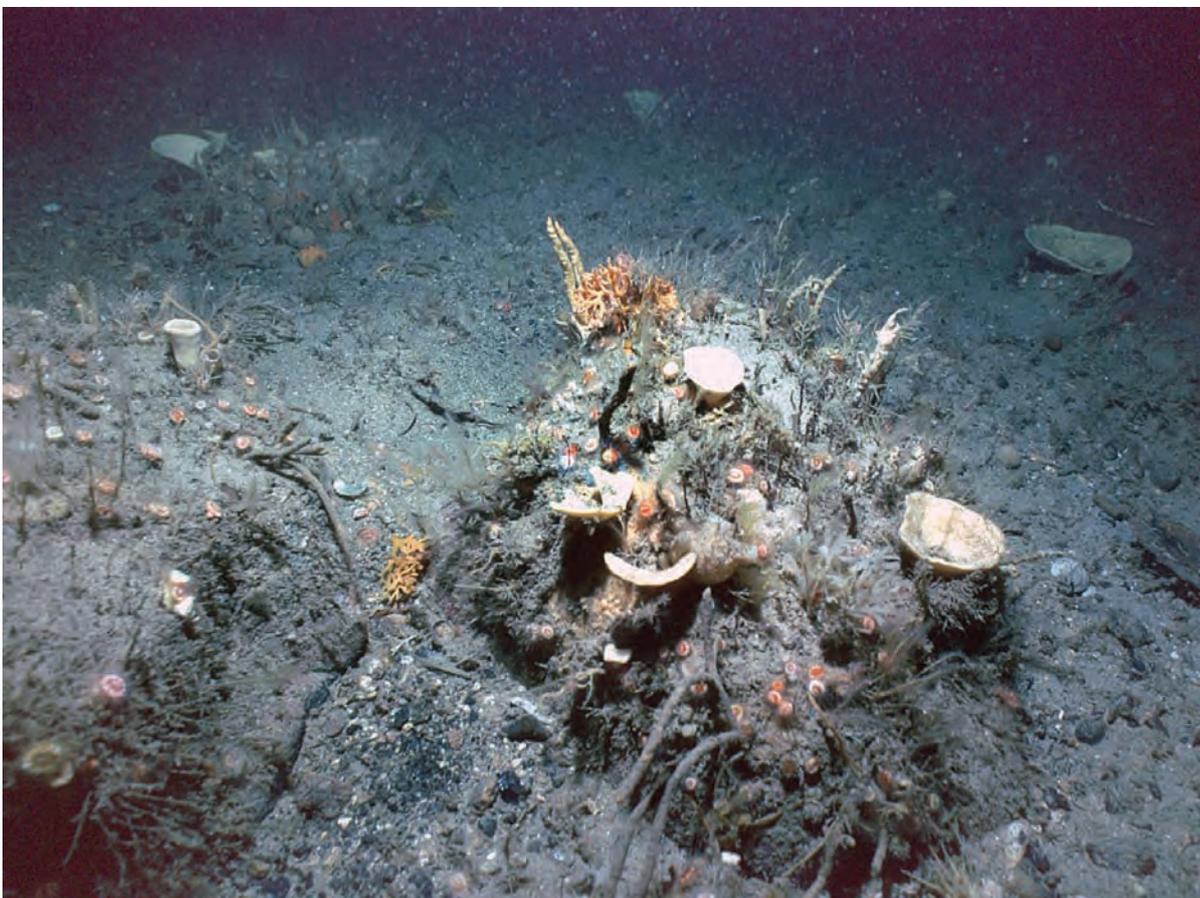


Figure 34. Undisturbed boulder habitat on the east coast of Rathlin, 14 August 1984. Dive 840814/03.



Figure 35. Overturned boulder following dredging. 25 August 1989. Dive 890825/02 - east coast Rathlin, approximate position 55° 16.00'N, 006° 10.00'W.



Figure 36. Fishing gear scar running alongside the Lochgarry (stern section of port side of hull just visible on left) 10 June 2009. Dive 090610/02



Figure 37. Undredged area east side of Lochgarry adjacent to wreck's boiler. Dive 090610/02.



Figure 38. Recently dredged area to stern of Lochgarry, east side. Displaced slender sea pen *Virgularia mirabilis* (a NICP species, centre) and dead man's fingers *Alcyonium digitatum* (left) visible.



Figure 39. A dredger with gear deployed in close proximity to a dive RIB. The RIB is tied to the Lochgarry buoy and divers are in the water (as indicated by the A-flag).

visible. A gear scar was visible running alongside the wreck and several sea pens *Virgularia mirabilis* were lying on their sides on the sediment, presumably having been uprooted.

A fan mussel *Atrina fragilis* had been recorded in 2007 from the bow end of the eastern side of the wreck. Its position was marked by large white stones and had been found to be easily relocatable. We resurveyed this area (090611/01 and 02 and 090615/01, 02) but the fan mussel was not found.

Church Bay

A section of the white cliffs area of Church Bay at which scallop dredging had been previously observed (and a position taken with a GPS) was surveyed (090612/04 (55° 17.574'N, 006° 14.157'W; 090612/05, 55° 17.575'N, 006° 14.408'W and 090612/06 55° 17.568'N, 006° 14.347'W). This site had a substrate of gently sloping sand with small boulders, cobbles and pebbles. Much encrusting fauna was present on the boulders and small stones, the dominant species being *Securiflustra securifrons* and *Polymastia boletiformis*. The kelps *Laminaria hyperborea* and *L. saccharina* were also present. An unusual feature of the site was the presence of free living cup corals *Caryophyllia smithii*. These are normally associated with hard rock substrate and are rarely recorded in sediment. Further examination showed them to be attached to small stones buried in the sand. Depth surveyed ranged from 19-24m. Proceeding down the slope into deeper water, approximately 25m from the edge of the boulders in 23-24m, the substrate is visually altered with very few stones being present and the majority of the ground being bare sand. Very little life was present. This site has the appearance of being trawled or dredged. Furrows were visible in the sand running parallel to the base of the slope, the troughs of these were filled with fine sediment. Small stones and boulders which would enable colonisation are absent and consequently the fauna is impoverished compared to the adjacent habitat of mixed sand and stone.



Figure 40. White Cliffs Church Bay, area not dredged. Small cobbles and boulders with the bryozoan *Securiflustra securifrons*, the sponge *Polymastia boletiformis* and hydroids. Dive 090612/06.



Figure 41. White Cliffs Church Bay. Dredged area (grab from video). Dredge scar visible on bottom right corner. Dive 090612/04.

Ecological effects of Fishing

Bottom fishing will affect these sensitive habitats in two ways 1) by the removal of substrate and 2) by damaging epifauna. Studies in Lyme Bay demonstrated that after one trawl pass much erect sedentary fauna was removed with *Pentapora foliacea*, *Phallusia mamillata* and *Alcyonium digitatum* all absent (Dorset Wildlife Trust 2004). Dredging has also been shown to have a significant effect on hydroid assemblages, reducing number of species present and resulting in a shift to assemblages characterised by small unbranched colonies (Henry and Kenchington 2004). Bottom fishing may significantly affect sponge biomass, Sainsbury (1987) and Sainsbury et al. (1993) reported that catch rate of sponges in a bottom fished area decreased over the course of the fishery from over 500kg/h to only a few kg/h. In the Aegean, scallop dredging has been shown to result in a significant reduction in sponge biomass (Kefalas et al. 2003). Whereas sponges in warm water may recover relatively quickly from bottom fishing damage (Van Dolah et al. 1987), in cold water environments the process may be much slower; a study of deepwater sponge communities in Alaska showed that recovery had not taken place after 11 months, with lowered sponge densities and level of damage to individuals persisting (Freese et al. 1999; Freese 2003). In addition to direct damage, dredging releases quantities of suspended sediment into the water column. This may smother or bury vulnerable organisms: scallop dredging led to a 70% reduction in live maerl on a bed in Brittany (Hall-Spencer and Moore 2000), probably due to the burial of live thalli by redistributed sediment.

Trawling has been shown to remove substrate such as boulders, with 19% of boulders being recorded as removed by a single trawl pass (Freese et al. 1999), a study in Lyme Bay has demonstrated dredging has a similar effect with a clear reduction in boulders and cobbles <50cm after just one dredge pass and virtually all boulders and cobbles being removed after six passes (Devon Wildlife Trust, 2004). Removal of boulders prevents re-establishment of these communities as there is no longer any substrate for larval settlement. The boulder areas and the epifauna present on them which characterise undamaged areas of the Rathlin coast result in a highly heterogenous habitat structure. Removal of this by dredging and the consequent loss of structural complexity will impact ecosystem function; these structures play important roles in ecosystem processes providing refuges from predation and competition, food sources, and critical nursery or spawning habitat (see Turner et al. 1999 for a review). Consequently reductions in heterogeneity have implications for the maintenance of diversity and stability at the population, community and ecosystem level (Thrush et al. 1995).

The habitats on the east coast of Rathlin and in Church Bay are extremely vulnerable to damage by dredging. Species which may be affected include two UK BAP species (*Arachnanthus sarsi* and *Atrina fragilis* (also listed on the new Wildlife Order (NI)), several priority species (*Diphasia alata*, *D. nigra*, *Polyplumaria flabellata*, *Lytocarpia myriophyllum*, *Clathria barleei*, *Pentapora fascialis* var. *foliacea*, *Virgularia mirabilis*, *Munida rugosa*, *Cestopagurus timidus*, and *Anseropoda placenta*) and additional species of conservation concern (*Aureliana heterocera*, *Porania pulvillus*, and *Ludia sarsi*). Many of these species do not occur elsewhere in Northern Ireland (see Goodwin et al. 2011a for a review). Dredging has the potential to cause significant damage or even result in the removal of rocky reef boulder features on the east coast which are a primary reason for the designation of the site as a SAC. Sediment from dredging could also smother the maerl bed on the east coast, maerl is a European priority habitat. Rathlin has been identified as a UK marine 'hotspot' due to its exceptional species richness and number of rare species (Hiscock and Breckels 2007) but continued fishing with mobile gear could threaten this status. In order to conserve the biodiversity of this important area we recommend that fishing in Rathlin SAC be regulated preferably by excluding all mobile gear from an area at least within the SAC boundary. Currently Rathlin Island SAC reefs are in unfavourable condition.

Additional higher level protection in the form of small highly protected closed areas excluding all potentially damaging activity (diving, anchoring, pot fishing and angling) could be considered. This would involve consultation and consensus amongst all the relevant stakeholders. Whilst there would be some impact on local fishermen as a result of the closure this is likely to be compensated for by the beneficial effects of the a closed area on local populations of scallops and other commercial species. The effects of marine protected areas have been demonstrated to enhance the fecundity of other commercially harvested species and augment fishing yields through biomass exportation from the protected area (see Garcia-Charton et al. 2008 for a review). In the Isle of Man closed areas have been demonstrated to increase scallop densities, both in closed areas and on adjacent fishing ground. Furthermore, population structure in the closed area shifted towards larger and

older scallops which is likely to result in greater larval export to surrounding areas (Beukers-Stewart et al. 2005). The Rathlin hydroid communities, as well as being significant in terms of biodiversity, are likely to play an ecologically important role as settlement substrate for scallop spat: Bradshaw et al. (2003) found 8.4 times as many spat in sediment cores from hydroid areas as from those without. Consequently protection of these hydroid communities will safeguard scallop recruitment. Both biodiversity and fisheries stand to benefit from the development of no-take marine reserves (Roberts et al. 2005) and the development of a network of such areas has been recognised as essential in conserving Northern Ireland's biodiversity and fishing industry (Thurstan et al. 2008).

Acknowledgements

This project is a partnership between Northern Ireland Environment Agency and National Museums Northern Ireland. We are grateful to the support of these organisations for this work. The project was funded by the NIEA Natural Heritage Directorate research and development series through a CEDaR (Centre for Environmental Data and Recording) initiative. This CEDaR initiative brings together resourced and the expertise of scientists from the National Museum Northern Ireland's Department of Natural Sciences and the NIEA conservation science team. We are greatly indebted to the programme for the support of this and other similar initiatives. We would like to specially thank Damian McFerran and Julia Nunn (CEDaR) and Mark Wright (NIEA) for their assistance with this project. This report would not have been possible without the data collected by the Joint Irish Bathymetric Survey project, funded under the INTERREG IIIA programme, more information on this project and the project data is available from <http://www.marine.ie/home/services/surveys/seabed/JIBS.htm>. Thanks also to Richard Lafferty of Aquaholics dive centre who provided much helpful information on local habitats and tides. Thanks to Stephanie Bennett (NIEA) for editorial assistance.

References

- Beukers-Stewart, B.D., Vause, B.J., Mosely, M.W.J., Rossetti, H.L., Brand, A.R. (2005). Benefits of closed area protection for a population of scallops. *Marine Ecology Progress Series*. 298, 189-204.
- Bradshaw, C., Collins, P. Brand, A. (2003). To what extent does upright sessile epifauna affect benthic biodiversity and community composition. *Marine Biology* 143, 783-791.
- Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L., Northern, K., Reker, J.B. (2004). *The Marine Habitat Classification for Britain and Ireland Version 04.05*. JNCC, Peterborough. ISBN 1 861 07561 8 (internet version) www.jncc.gov.uk/MarineHabitatClassification.
- Devon Wildlife Trust. (2004). Initial results of a visual survey on the impacts of dredging for scallops on the seabed. Report, 11pp.
- Erwin, D.G., Picton, B.E., Connor, D.W., Howson, C.M., Gilleece, P. & Bogues, M.J., (1986). The Northern Ireland Sublittoral Survey. Ulster Museum.
- Erwin, D.G., Picton, B.E., Connor, D.W., Howson, C.M., Gilleece, P. & Bogues, M.J., (1990). Inshore marine life of Northern Ireland. HMSO: Belfast.
- Freese, J.L. (2003). Trawl-induced damage to sponges observed from a research submersible. *Marine Ecology Progress Series*, 63, 7-13.
- Freese, J.L., Auster, P.J., Heifetz, J. and Wing, B.L. (1999). Effects of trawling on seafloor habitat and associated invertebrate taxa in the Gulf of Alaska. *Marine Ecology Progress Series*. 182, 119-126.
- García-Charton, J.A., Pérez-Ruzafa, A., Marcos, C., Claudet, J., Badalamenti, F., Benedetti-Cecchi, L., Falcón, J.M., Milazzo, M., Schembri, P.J., Stobart, B., Vandeperre, F., Brito, A., Chemello, R., Dimech, M., Domenici, P., Guala, I., Le Diréach, L., Maggi, E., and Planes, S. (2008). Effectiveness of European Atlanto-Mediterranean MPAs: do they accomplish the expected effects on populations, communities and ecosystems. *Journal for Nature Conservation* 15, 193-221.
- Goodwin, C., Edwards, H., Breen, J., and Picton, B. (2011a). Sublittoral Survey Northern Ireland: A review of the status of Northern Ireland Priority Species of marine invertebrates - a report from the Sublittoral Survey Northern Ireland Project 2006-2008. Northern Ireland Environment Agency Research and Development Series No 11/01. Belfast. 143pp.
- Goodwin, C., Edwards, H., Breen, J., and Picton, B. (2011b). The Maidens - Report from the Sublittoral Survey Northern Ireland project. Northern Ireland Environment Agency Research and Development Series No 11/02. Belfast. 67pp.
- Hall-Spencer, J.M. & Moore, P.G. (2000). Scallop dredging has profound, long-term impacts on maerl habitats. *ICES journal of marine science*. 57, 1407-1415.
- Henry, L.A. & Kenchington, E. (2004). Differences between epilithic and epizoic hydroid assemblages from commercial scallop grounds in the Bay of Fundy, northwest Atlantic. *Marine Ecology Progress Series* 266,123-134.
- Hiscock, K. ed. 1996. *Marine Nature Conservation Review: rationale and methods*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)
- Hiscock, K. and Breckels, M. (2007). *Marine biodiversity hotspots in the UK. A report identifying and protecting areas for marine biodiversity*. WWF, UK.
- Kefalas, E. Castritsi-Catharios, J. Miliou, H. (2003). The impacts of scallop dredging on sponge assemblages in the Gulf of Kalioni (Aegean Sea, northeastern Mediterranean). *ICES journal of marine science* 60,402-410.

- Nunn, J. (2007). *Atrina fragilis* - fan mussel. Northern Ireland Priority Species and Species of Conservation Concern Reports [online]. Cultra: National Museums Northern Ireland [cited 15/02/2008]. Available from <http://www.habitas.org.uk/priority/species.asp?item=40786>.
- Picton, B.E. & Costello, M.J., (1998). BioMar biotope viewer: a guide to marine habitats, fauna and flora of Britain and Ireland, Dublin: Environmental Sciences Unit, Trinity College.
- Picton, B.E. and Goodwin, C.E. (2007a). Sponge Biodiversity of Rathlin Island. *Journal of the Marine Biological Association of the United Kingdom*, 87:1441-1458.
- Picton, B. and Goodwin, C. (2007b). Sponge Biodiversity of Rathlin Island. Project report for EU BSP and EHS. Ulster Museum, Department of Zoology.
- Roberts, C.M., Hawkins, J.P, Gell, F.R. (2005). The role of marine reserves in achieving sustainable fisheries. *Philosophical transactions of the Royal Society - B*. 360, 123-132.
- Roberts, J.M., Davies, A.J., Henry, L.A., Dodds, L.A., Duineveld, G.C.A., Lavaleye, M.S.S., Maier, C., van Soest, R.W.M., Bergman, M.J.N., Hühnerbach, V., Huvenne, V.A.I., Sinclair, D.J., Watmough, T., Long, D., Green, S.L. and van Haren, H. (2009). Mingulay reef complex: an interdisciplinary study of cold-water coral habitat, hydrography and biodiversity. *Marine Ecology Progress Series*, 397, 139-151.
- Sainsbury, K.J., (1987). Assessment and management of the demersal fishery on the continental shelf of north-western Australia. In *Tropical snappers and groupers: Biology and fisheries management.*, (eds. J.J. Polovina and S. Ralston), pp. 465-503. Boulder, Colorado: Westview press.
- Sainsbury, K.J., Campbell, R. & Whitelaw, A.W., (1993). Effects of trawling on the marine habitat on the north-west shelf of Australia and implications for sustainable fisheries management. In *Sustainable fisheries through sustainable fish habitats*. Australian society for fish biology workshop Australian Bureau of Resource Sciences Proceedings volume 17, pp 137-145, (ed. D.A. Hancock), AGPS, Canberra.
- Thrush S.F., Hewitt J.E., Cummings V.J. & Dayton P.K. (1995). The impact of habitat disturbance by scallop dredging on marine benthic communities: what can be predicted from the results of experiments? *Marine Ecology Progress Series* 129, 141-150.
- Thurstan, R.H., Roberts, C.M., Hawkins, J.P., and McAuslan, L.A.B. (2008). *Marine Reserves in Northern Ireland: the way forward*. Ulster Wildlife Trust/WWF Northern Ireland.
- Turner, S.J., Thrush, S.F., Hewitt, J.E., Cummings, V.J., Funnell, G. (1999). Fishing impacts and the degradation or loss of habitat structure. *Fisheries management and ecology* 6, 401-420.
- Van Dolah, F., Wendt, P.H., Nicolson, N. (1987). Effects of a research trawl on a hard-bottom assemblage of sponges and corals. *Fisheries Research* 5, 39-54.
- Wilson, H.E. & Robbie, J.A. (1971). *Geology of the county around Ballycastle*. Memoirs of the Geological Survey. Government of Northern Ireland, Belfast.

Appendix 1. List of survey dives. Report number indicated the sites of conservation importance referred to in this report. Marine Recorder reference is the identifier from ‘Marine Recorder’ database - this can be accessed through CEDaR.

Report Number	Dive Number	EventName	Marine Recorder Reference	Position	Surveyors	Depth metres (BSL)
1	060608/04	Mill Bay	MRUMU10000000167	55° 17.161'N 006° 11.679'W	Anne Marie Mahon, Claire Goodwin, Jennifer Jones	6-12
1	090611/03	Mill Bay	MRUMU10000000363	55° 17.161'N 006° 11.679'W	Fiona Crouch, Lin Baldock	7-8
2	090616/02,03	Church Bay	MRUMU10000000368	55° 17.350'N 006° 13.160'W	Bernard Picton, George Brown, Hugh Edwards, Jennifer Jones	15-16.7
3	090604/03	Church Bay	MRUMU10000000356	55° 17.552'N 006° 14.004'W	Bernard Picton, Lin Baldock	31
4	070618/06	White Cliffs	MRUMU10000000191	55° 17.541'N 006° 14.057'W	Claire Goodwin, Jennifer Jones	24.6-27.1
5	070618/05	White Cliffs	MRUMU10000000190	55° 17.532'N 006° 14.133'W	Bernard Picton, Lin Baldock	
6	070611/07	White Cliffs	MRUMU1000000018D	55° 17.537'N 006° 14.203'W	Bernard Picton, Claire Goodwin	
7	060608/05	White Cliffs	MRUMU10000000168	55° 17.583'N 006° 14.289'W	Bernard Picton, Claire Goodwin	24-36
8	090612/04,05, 06	White Cliffs	MRUMU10000000365	55° 17.568'N 006° 14.347'W	Claire Goodwin, Fiona Crouch, Jennifer Jones, Lin Baldock, Joe Breen, Hugh Edwards	24-27
9	060531/03	White Cliffs	MRUMU10000000161	55° 17.578'N 006° 14.399'W	Bernard Picton, Claire Goodwin	24.5
10	070613/02,03	White Cliffs	MRUMU1000000018F	55° 17.555'N 006° 14.430'W	Bernard Picton, Claire Goodwin, Erling Svensen, Joe Breen	25-31
11	060607/05	White Cliffs	MRUMU10000000220	55° 17.537'N 006° 14.509'W	Claire Goodwin, Jennifer Jones	28-37
12	60605/02 and 03	Church Bay	MRUMU10000000165	55° 17.411'N 006° 14.216'W	Anne Marie Mahon, Bernard Picton, Claire Goodwin, Jennifer Jones	26-32
13	090609/05	Damicornis Bay	MRUMU10000000360	55° 17.459'N 006° 15.172'W	Fiona Crouch, Lin Baldock	18-20
14	060601/04	Damicornis Bay	MRUMU10000000163	55° 17.447, 006° 15.204'W	Bernard Picton, Claire Goodwin	28-31
15	090608/02,03	Damicornis Bay	MRUMU1000000035B	55° 17.456'N 006° 15.215'W	Fiona Crouch, Lin Baldock	20-25
16	070619/04	Damicornis Bay	MRUMU10000000193	55° 17.461'N 006° 15.219'W	Claire Goodwin, Jennifer Jones	28-32
17	090605/02	Damicornis Bay	MRUMU10000000358	55° 17.460'N 006° 15.241'W	Bernard Picton, Lin Baldock	28-31
18	090605/01	Limestone Cliff	MRUMU10000000357	55° 17.370'N 006° 16.918'W	Claire Goodwin, Jennifer Jones	26-33
19	090602/01,02	Spongosorites Gully	MRUMU10000000351	55° 18.292'N 006° 16.640'W	Claire Goodwin, Jennifer Jones	21-29
20	070612/01,02,03	Spongosorites Gully	MRUMU1000000018E	55° 18.303'N 006° 16.644'W	Claire Goodwin, Jo Porter, Joe Breen, Scott Tompsett	24-30
21	090601/01	Spongosorites Gully	MRUMU1000000034F	55° 18.292'N 006° 16.640'W	Bernard Picton, Lin Baldock	20-31

21	090608/04,05	Spongosorites Gully	MRUMU1000000035C	55° 18.304'N 006° 16.622'W	Fiona Crouch, Lin Baldock	25-32
22	090605/03,04	Cave Gully	MRUMU10000000359	55° 18.384'N 006° 16.471'W	Bernard Picton, Claire Goodwin, Jennifer Jones, Lin Baldock	25-33
23	070611/01	The Archway, Ruecallan	MRUMU1000000018B	55° 18.471'N 006° 16.162'W	Bernard Picton, Claire Goodwin, Erling Svensen, Joe Breen	25-33
24	070611/02	The Archway, Ruecallan	MRUMU10000000225	55° 18.479'N 006° 16.158'W	Jo Porter, Scott Tompsett	18-29
25	060605/01	The Archway, Ruecallan	MRUMU10000000164	55° 18.478'N 006° 16.127'W	Anne Marie Mahon, Bernard Picton, Claire Goodwin, Jennifer Jones	27-34
26	060608/02	E of Farganlack Point	MRUMU10000000166	55° 18.720'N 006° 15.168'W	Claire Goodwin, Jennifer Jones	28-33
27	070622/01,02,03	Duncan's Bo	MRUMU10000000199	55° 18.705'N 006° 15.093'W	Bernard Picton, Claire Goodwin, Jennifer Jones, Lin Baldock	28-34
28	090609/04	North Wall	MRUMU1000000035F	55° 18.696'N 006° 15.093'W	Claire Goodwin, Jennifer Jones	20-27
29	070620/04	Kinrea	MRUMU10000000197	55° 18.739'N 006° 14.091'W	Bernard Picton, Lin Baldock	23-32
30	090617/03	East Rathlin Island	MRUMU1000000036B	55° 17.657'N 006° 10.031'W	Claire Goodwin, Jennifer Jones	35-36
31	090617/04	S of Bruce's Cave	MRUMU1000000036C	55° 17.635'N 006° 10.090'W	Bernard Picton, George Brown	27-34
32	090601/03	East coast of Rathlin	MRUMU1000000036E	55° 17.362'N 006° 10.328'W	Bernard Picton, Claire Goodwin	16-23
33	090612/02	East coast of Rathlin	MRUMU1000000035A	55° 16.717'N 006° 10.168'W	Claire Goodwin, Jennifer Jones	35-38
34	90612/01,02	East Coast Maerl Bed	MRUMU10000000364	55° 16.650'N 006° 10.260'W	Claire Goodwin, Fiona Crouch, Jennifer Jones, Lin Baldock	30
35	070620/02	NE Picton's Reef - hydroid boulder slope	MRUMU10000000195	55° 16.656'N 006° 09.984'W	Bernard Picton, Lin Baldock	40-42
36	070619/02	NE Picton's Reef - hydroid boulder slope	MRUMU10000000192	55° 16.651'N 006° 09.989'W	Claire Goodwin, Jennifer Jones	40-42
37	070620/01	NE Picton's Reef - hydroid boulder slope	MRUMU10000000194	55° 16.559'N 006° 10.010'W	Claire Goodwin, Jennifer Jones	39-42
38	070611/05, 06	Picton's Reef, east coast	MRUMU1000000018C	55° 16.497'N 006° 10.320'W	Claire Goodwin, Jo Porter, Joe Breen, Scott Tompsett	20-33
39	060601/01	East coast reef	MRUMU10000000162	55° 16.480'N 006° 10.295'W	Bernard Picton, Claire Goodwin	33
40	070622/06 (04,05)	Picton's Reef	MRUMU1000000019A	55° 16.479'N 006° 10.309'W	Bernard Picton, Claire Goodwin, Jennifer Jones, Lin Baldock	28-32
41	070621/02,03	Slope E of Illanacarragh Bay - hydroid boulder slope	MRUMU10000000198	55° 16.141'N 006° 10.145'W	Bernard Picton, Claire Goodwin, Jennifer Jones, Lin Baldock	42-46
42	090609/02	West of Lochgarry wreck	MRUMU1000000035D	55° 16.089'N 006° 10.469'W	Fiona Crouch, Lin Baldock	23-25

43	090617/02	Doon Point	MRUMU10000000369	55° 16.073'N 006° 10.413'W	Bernard Picton, George Brown	
44	090609/03	NW of Lochgarry wreck	MRUMU1000000035E	55° 16.035'N 006° 10.544'W	Henk Van Rein, Hugh Edwards	16-23
45	090616/01	East Rathlin Island	MRUMU10000000367	55° 16.011'N 006° 10.532'W	Bernard Picton, Claire Goodwin, George Brown, Jennifer Jones	21-30
46	070618/02,03?	SE Lochgarry wreck	MRUMU10000000227	55° 15.953'N, 006° 10.397'W	Bernard Picton, Claire Goodwin, Erling Svensen, Jennifer Jones, Lin Baldock	30-34
46	070613/04,05	SE Lochgarry Wreck	MRUMU100000002B0	55° 15.953'N 006° 10.397'W	Bernard Picton, Erling Svensen	
47	060531/01	Lochgarry wreck	MRUMU10000000160	55° 15.956'N 006° 10.411'W	Bernard Picton, Claire Goodwin	27-32
47	060531/01	Lochgarry wreck	MRUMU10000000196	55° 15.956'N 006° 10.411'W	Claire Goodwin, Jennifer Jones	27-29
47	090610/01	Lochgarry wreck	MRUMU10000000361	55° 15.956'N 006° 10.411'W	Fiona Crouch, Lin Baldock	32
47	090610/02	Lochgarry wreck	MRUMU10000000362	55° 15.956'N 006° 10.411'W	Claire Goodwin, Jennifer Jones	30-33



Our aim is to protect, conserve and promote the natural environment and built heritage for the benefit of present and future generations.

Northern Ireland Environment Agency
Klondyke Building
Cromac Avenue
Gasworks Business Park
Belfast BT7 2JA
T. 0845 302 0008

www.ni-environment.gov.uk



ISSN — 1367-1979 (Print)
ISSN — 1751-7796 (Online)