West Anglesey fragile sponge and anthozoan communities dive survey, 2023: final report

Report No: 742

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I gefnogi'r cynnig ar gyfer Ardal Chwilio 'A', cynhaliwyd pythefnos o arolygon deifio oddi ar arfordir gogledd a gorllewin Ynys Môn ym mis Ebrill a Mai 2023 i arolygu'r ardal mewn perthynas â chymunedau bregus o sbyngau ac anthosoaid, yn benodol y cynefin:

CR.HCR.XFa.ByErSp.DysAct – 'Tyfiant cymysg o sbyngau talsyth a bryosoaid gyda Dysidea fragilis ac Actinothoe sphyrodeta ar graig isforlan ddofn sy'n cael ei hysgubo gan y llanw ac sy'n agored i'r tonnau.'

Cafodd tîm arolwg deifio gwyddonol y dasg o ail-arolygu cyfanswm o 17 o safleoedd, y cofnodwyd y rhan fwyaf o'r data ar eu cyfer yn wreiddiol yn 1996 ac 1997, ond yn cynnwys pum safle â data rhwng 2002 a 2018. Roedd prif dasgau'r deifwyr fel a ganlyn:

- Pennu presenoldeb cymunedau bregus o sbyngau ac anthosoaid.
- Os oedd y gymuned fregus o sbyngau ac anthosoaid yn bresennol: cynnal arolwg cam 2 MNCR a chwblhau ffurflen Cynefin Isforlannol MNCR ynghyd â ffurflen Safle MNCR yn cynnwys brasluniau deifio, gan nodi cwmpas y cynefin yn fras (os yn bosibl) a'r cynefinoedd cyfagos.
- Cofnodi unrhyw rywogaethau nodedig e.e. prin, Adran 7 o Ddeddf yr Amgylchedd (Cymru) 2016, rhywogaethau sy'n sensitif i sgrafellu a rhywogaethau estron / goresgynnol
- Cofnodi'r gymuned gyda ffotograffau a fideo o'r cynefin a'r rhywogaethau o ddiddordeb.
- Nodi unrhyw ddifrod gweladwy neu arwyddion o weithgarwch pobl.
- Blaenoriaethu (i'r graddau y bo modd) arolygu'r safleoedd sydd â'r cofnodion hynaf.
- Ystyried a fu unrhyw newidiadau ecolegol ers yr arolygon gwreiddiol.

I grynhoi, yn ystod mis Ebrill a Mai 2023:

- Deifiwyd mewn 20 safle a'u harolygu dros gyfnod o bythefnos; tri yn fwy na'r hyn a gynlluniwyd yn wreiddiol.
- Pennwyd bod 19 safle yn cefnogi'r biotop targed. Roedd un safle nad oedd yn cyd-fynd â'r biotop.
- O'r safleoedd a oedd yn cyd-fynd â'r biotop targed, roedd gan bedwar ar ddeg ohonynt 60% neu fwy o'r rhywogaethau a restrwyd sy'n nodweddu'r biotop

CR.HCR.XFa.ByErSp.DysAct. Gan Safle 11: I'r Gogledd-orllewin o The Fangs oedd y canran uchaf gyda 78% o'r rhywogaethau yn nodweddu'r biotop.

- O'r rhywogaethau o anthosoaid a sbyngau bregus yn unig (y rhywogaethau a restrwyd sy'n nodweddu ynghyd â thacsonau ychwanegol wedi'u pennu gan yr awduron), y ganran uchaf a gofnodwyd o unrhyw un o safleoedd yr arolwg yn 2023 oedd 76%, a hynny o Safle 6: Craig Darren a Safle 13 : Oddi ar Abraham's Bosom, roedd y ddau hefyd yn cefnogi o leiaf 75% o'r holl rywogaethau posib sy'n nodweddu'r biotop.
- Nid oes unrhyw arwydd yn y data o unrhyw newid ecolegol sylweddol neu niweidiol ar draws yr ardal arolygu yn gyffredinol.
- Cofnodwyd y rhywogaeth Adran 7 Palinurus elephas, y cimwch coch, mewn tri safle – i'r De-orllewin o Ynys Feurig, Porth y Gwin a Thrwyn Llanbadrig.
- Yr unig rywogaeth estron a gofnodwyd oedd y chwistrell fôr Corella eumyota yn y safle arolwg i'r De-orllewin o Ynys Feurig.
- Ymhlith yr effeithiau dynol a welwyd roedd eitemau wedi'u colli neu eu taflu, er enghraifft cyfarpar pysgota môr (bachau, abwyd, pwysau, leiniau un ffilament), fflêr argyfwng, cewyll cimychiaid a chregyn moch, ac eitemau plastig nad oedd modd eu hadnabod.

Roedd dadansoddiad o'r data rhywogaethau yn dangos fod y cymunedau'n perthyn i ddau grŵp gwahanol, sef clwstwr gogleddol (Bosom Abraham, Ynys Gybi, i'r gogledd a'r gorllewin i Lanbadrig) a chlwstwr deheuol (Rhosneigr tua'r gogledd i Benrhyn Mawr, Ynys Gybi) gydag ychydig eithriadau. Mae'n bosibl mai'r esboniadau posibl am hyn yw'r gwahaniaeth mewn cysylltiad â thonnau gan fod y safleoedd gogleddol a deheuol yn agored i ffrydiau llanwol cryf a chryf iawn. Mae'r safleoedd deheuol yn agored i'r prifwyntoedd de-orllewinol a allai fod yn ysgogi gwahaniaeth cynnil yng nghyfansoddiad y rhywogaeth. Er y gall fod rhesymau eraill am y gwahaniaethau hyn a byddai angen gwneud rhagor o waith i ddod i benderfyniad ar hyn.

Mae cymunedau sbwng ac anthosoaidd bregus (CR.HCR.XFa.ByErSp.DysAct) a nodwyd yn arolygon 1996-97 yn dal i fod yn bresennol yn yr ardal ac yn parhau i fod yn fiotop sy'n gyffredin i graig isforlan mewn ardaloedd sy'n agored i effaith tonnau a ffrydiau llanw cryf oddi ar ogledd a gorllewin Ynys Môn. Disgwylir i faint y cynefin fod yn fwy na'r hyn a amlinellwyd yn yr adroddiad hwn. Gellid disgwyl yn rhesymol i'r cymunedau sbwng ac anthosoaidd bregus fod yn bresennol ar lawer o'r cynefinoedd creigiog isforlan siltiog rhwng 7 - 30m o ddyfnder. Mae'r prif eithriadau yn debygol o fod mewn ardaloedd o ffrydiau llanw uchel, ee Trwyn Carmel, neu lle ceir erydiad trwm. Yn gyffredinol, canfuwyd canrannau uwch o sbyngau a bryosoaid bregus a thacsa â nodweddion biotop yn ddyfnach, gellid disgwyl dod ar draws rhagor o enghreifftiau o'r biotop a niferoedd uwch o sbyngau Axinellid pe bai safleoedd dyfnach (o leiaf i 30 m) yn cael eu harolygu.

Executive summary

The area around the north and west of Anglesey has been put forward as an Area of Search in the Marine Protected Area (MPA) Network Completion Programme by Welsh Government (WG). Area of Search ‘A’ has been selected due to the presence of the shortfall features ‘Subtidal coarse sediment and subtidal mixed sediment’, ‘Ross worm *Sabellaria spinulosa* reef’ and ‘Fragile sponge and anthozoan communities’, which are included on Section 7 of the Environment (Wales) Act 2016. More up to date evidence was required by Natural Resources Wales (NRW) and WG on the presence of the fragile sponge and anthozoans community. This piece of work was funded through the WG Marine Protected Area Network Management Grant Scheme.

In support of Area of Search ‘A’ proposal, in April and May 2023, two weeks of diving surveys were undertaken off north and west Anglesey to survey the area for fragile sponge and anthozoan communities, specifically the habitat:

CR.HCR.XFa.ByErSp.DysAct – ‘Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.’

A scientific dive survey team was tasked with re-surveying a total of 17 sites for which most data were originally recorded in 1996 and 1997, but included five sites with data from between 2002 and 2018. Divers’ main tasks were:

- Determine the presence of fragile sponge and anthozoan communities.
- If the fragile sponge and anthozoan community was present: carry out MNCR phase 2 survey and complete an MNCR Sublittoral Habitat form and an MNCR Site form including dive sketches, noting approximate extent of habitat (if possible) and adjacent habitats.
- Record any notable species e.g. rare and scarce, Section 7 of the Environment (Wales) Act 2016, species sensitive to abrasion and invasive / non-native species.
- Record the community with photographs and video of habitat and species of interest.
- Note any visible damage or signs of human activity.
- Prioritise (insofar as possible) surveying the sites with the oldest records.
- Consider if there had been any ecological changes since the original surveys.

In summary, during April and May 2023:

- 20 sites were dived and surveyed over a two-week period; three more than originally planned.
- 19 sites were determined to support the target biotope. One site was not a match for the biotope.

- Of the sites matching the target biotope, 14 had 60% or more of the listed characterising species of the biotope CR.HCR.XFa.ByErSp.DysAct. Site 11: NW of The Fangs has the highest percentage with 78% of the biotope characterising species
- Of the fragile sponge and anthozoan species only (listed characterising species plus additional taxa determined by the authors), the highest percentage recorded from any survey site in 2023 was 76% from Site 6: Darren's Rock and Site 13: Off Abraham's Bosom, both of which also supported at least 75% of all the potential biotope characterising species.
- The data offer no indication of any significant or detrimental ecological change across the broadscale survey area.
- The Section 7 species Crawfish *Palinurus elephas* was recorded at three sites – SW of Ynys Feirig, Porth y Gwin and Llanbadrig Head.
- The only non-native species recorded was the sea squirt *Corella eumyota* at the survey site SW of Ynys Feirig.
- Human impacts observed included lost or discarded items such as sea angling tackle (hooks, lures, weights, monofilament line), an emergency flare, lobster and whelk pots, and unidentifiable plastic items.

Analysis of the species data indicated that the communities fell into two distinct groups, a northern cluster (Abraham's Bosom, Holy Island, north and westwards to Llanbadrig) and a southern cluster (Rhosneigr northwards to Penrhyn Mawr, Holy Island) with a few exceptions. Possible explanations for this could be the difference in wave exposure as both the northern and southern sites are exposed to strong and very strong tidal streams. The southern sites are exposed to the prevailing south-westerly winds which could be driving a subtle difference in the species composition. Although there may be other reasons for these differences and further work would be require to determine this.

Fragile sponge and anthozoan communities' (CR.HCR.XFa.ByErSp.DysAct) identified in the 1996-97 surveys remain present in the area and continue to be a biotope common to circalittoral rock in areas exposed to high energy wave action and tidal streams off north and west Anglesey. The extent of the habitat is expected to be greater than outlined within this report. The fragile sponge and anthozoan communities could be reasonably expected to be present on much of the silty circalittoral rocky reef habitats between 7 – 30m depth. The main exceptions to this are likely to be in areas of high tidal streams, e.g. Carmel Head, or where there is heavy scour. Greater percentages of fragile sponges and bryozoans and biotope-characterising taxa were generally found at deeper depths, it could be expected that further examples of the biotope and greater numbers of Axinellid sponges would be encountered if more deeper sites (at least to 30 m) were surveyed.

Introduction

The area around the north and west of Anglesey has been proposed as an Area of Search (AoS) in the Marine Protected area (MPA) Network completion Programme by Welsh Government (WG) (Fact sheet: Area of Search A (gov.wales)). AoS A has been selected due to the presence of the shortfall features 'Subtidal coarse sediment and subtidal mixed sediment', and the Section 7 habitats 'Ross worm *Sabellaria spinulosa* reef' and 'Fragile sponge and anthozoan communities'. More up to date evidence was required by NRW and WG on the presence of the fragile sponge and anthozoans community. This piece of work was funded through the WG Marine Protected Area Network Management Grant Scheme

Fragile sponge and anthozoan communities are listed under Section 7 of the Environment (Wales) Act 2016. There are two biotopes in Wales that fall within the description of the habitat (see BAP Priority Habitat description):

- CR.HCR.XFa.ByErSp.Eun – *Eunicella verrucosa* and *Pentapora foliacea* on wave-exposed circalittoral rock

- CR.HCR.XFa.ByErSp.DysAct – Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock

The existing records for fragile sponge and anthozoan communities from AoS A, are all of the biotope CR.HCR.XFa.ByErSp.DysAct. The majority of the records were recorded in the late 1990s in the Marine Nature Conservation Review surveys (Table 1). These records required re-surveying to determine (i) whether the habitat was still present, and (ii) to get more detailed information, photos and an idea of the habitat condition. The order of survey priority for 2023 was determined by the age of the original survey data. The full description of the target biotope for the 2023 survey is provided in the Marine Habitat Classification for Britain and Ireland (JNCC, 2022) with a summary provided in 'Appendix B – JNCC Biotope Description'.

Table 1. Survey records of fragile sponge and anthozoan data in AoS A (17 records). The distribution of the records can be seen in Figure 1 and all records are available to download from DataMapWales.

Survey name	No. of records	2023 survey priority
1996 MNCR west Anglesey sublittoral survey	9	High
1997 MNCR west Anglesey sublittoral survey	3*	High
2002 Seasearch Survey of NW Anglesey	1	High
2007 Seasearch survey of Anglesey	1	Medium
2012 Seasearch North & West Anglesey Surveys	1	Medium
2017 Seasearch Survey of Anglesey, North Wales	1	Low
2018 Seasearch Survey of Anglesey, North Wales	1	Low

* - 1 site removed from the AoS due to overlap with an anchoring area

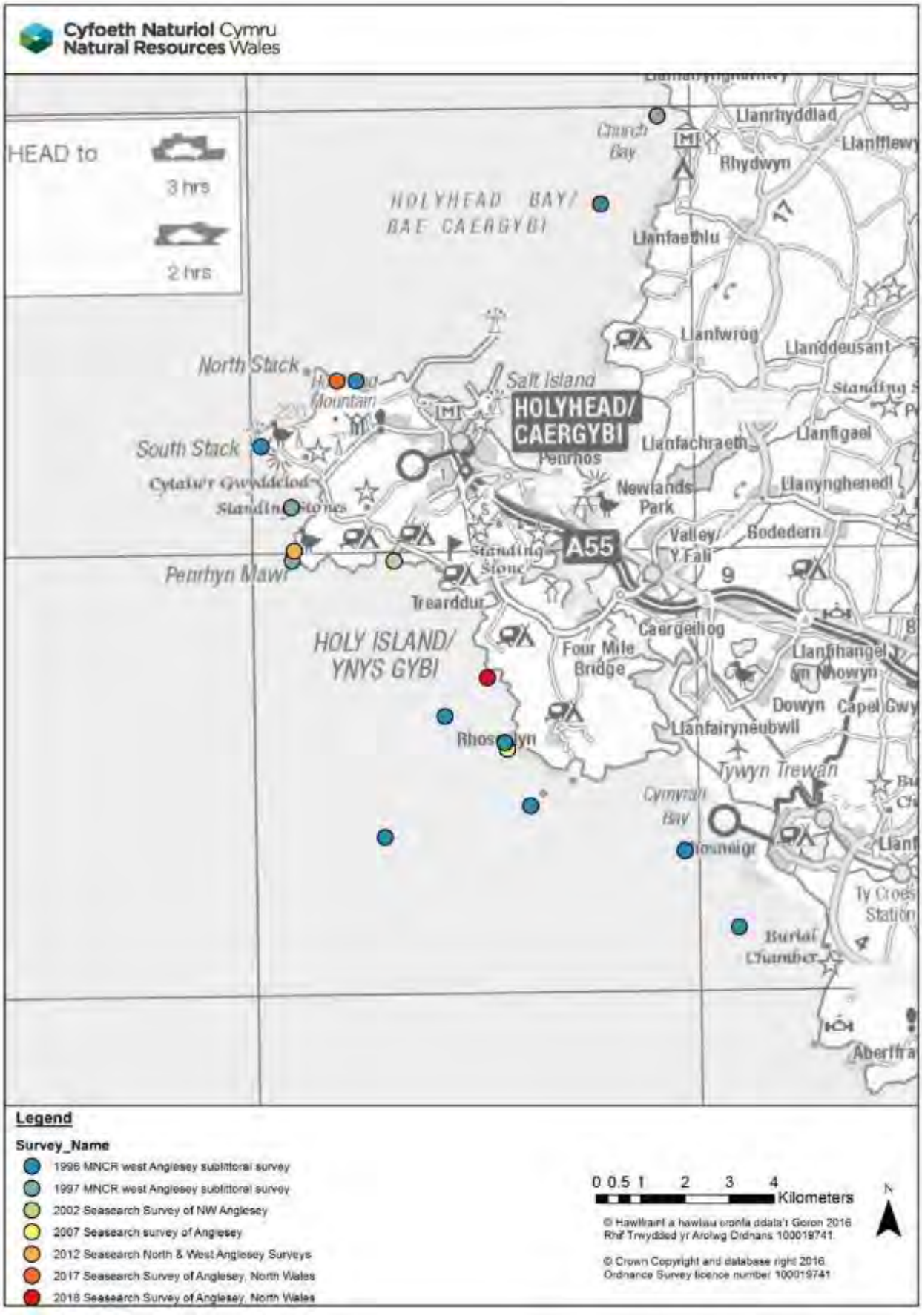


Figure 1. Map of fragile sponge and anthozoan communities by survey date and type.

Aims and Objectives

Survey Objectives:

- Determine the presence of fragile sponge and anthozoan habitat.
- If the fragile sponge and anthozoan community is present: carry out MNCR phase 2 survey, complete MNCR sublittoral habitat form including dive sketches, note approximate extent of habitat and adjacent habitats if possible. Record of any notable species (e.g. rare and scarce, Section 7, species sensitive to abrasion).
- If the community is not present, continue the dive to investigate if there are possible areas nearby that could support the habitat, do a more widescale survey, completing Seasearch Surveyor form of habitats present.
- Obtain photographs and video of habitat and species of interest of sufficient quality to use in publications.
- Note of any visible damage or signs of human activity.
- Consider if any ecological changes have occurred since the original surveys were completed.

Methods

Diving operations

The surveys took place over two separate one-week periods over neap tides. The first week's surveys were from 24-29 April 2023 inclusive, whilst the second week's surveys were from 11-16 May 2023 inclusive. Each day the survey team consisted of the following:

- 2 x diver pairs
- 1 x non-diving surface technical assistant
- 1 x diving supervisor
- 1 x dive vessel skipper

The vessel used for the survey work was the Interceptor, an 8 m RIB. The skipper had excellent local knowledge of both the dive locations and the tidal currents in the area, enabling the best slack periods to be selected for diving. The vessel was Marine Coastguard Agency (MCA) coded and fully equipped with echosounder, radio and all safety equipment required.

Figure 2. Diver photographing the biota at Port Wen, north Anglesey.

The diving contractor was Marine Ecological Solutions Ltd (Marine Ecosol) with additional diving support from NRW staff and Aquatic Survey and Monitoring Ltd (ASML). All the diving work was carried out under the Health and Safety Diving at Work Regulations 1997, the Scientific and Archaeological Approved Code of Practice (ACoP) (Health and Safety Executive, 2014) by experienced marine ecological surveyors, following the Marine Ecosol Diving Rules. A full risk assessment and Project Plan was completed prior to the start of the project.

Diver tasks

Priority was given to diving the sites with the oldest records i.e. MNCR sites from the 1990s. However, this was dictated to some extent by available slack water windows and prevailing weather conditions.

The majority of the locations were within 20 m depth bcd.

Slack water duration was limited on many sites. Both diver pairs kitted up at the same time so that pair 2 was ready to enter the water as soon as pair 1 confirmed the presence of the target biotope.

The specific tasks per diver pair were to:

- Determine the presence of fragile sponge and anthozoan habitat - CR.HCR.XFa.ByErSp.DysAct.
- Assuming the target biotope was present, diver pair 1 communicated this to the surface team and pair 2 entered the water.

- If the fragile sponge and anthozoan community was present, both diver pairs carried out an MNCR phase 2 survey and filmed / photographed the habitat and associated species. The divers recorded any notable species and habitats (e.g. rare and scarce, any section 7 species / habitats noted above, species sensitive to abrasion, non-native species), and any evidence of anthropogenic disturbance and / or impact.

Survey site locations

During the first week's survey it became apparent very quickly that the GPS positions for a number of sites did not correlate with the target habitats; most of these positions related to those from the original MNCR surveys in the late 1990s. The target fragile sponge and anthozoan biotope is found over rocky reefs whereas the boat's echo sounder and Garmin *Navionics* software indicated that several positions supplied were clearly over sand or other sediments.

A number of the divers on the survey team had participated in the original surveys in the 1990s and recalled that positions were estimated from maritime charts and may not therefore have been very accurate. Garmin *Navionics* software (available as an app on mobile devices) was deployed using the 'shaded relief' layer which provided detailed and accurate topographical multibeam data of the seabed features. This could then be used to pinpoint the nearest suitable areas of bedrock reef to the original positions, at the correct depth, to survey for the target biotope.

In total 11 sites were re-located from the original positions supplied, with other positions moving approximately from 50 to 200 m or more to suitable rocky reef habitat. This adaptation to the site location method was very successful with the target biotope recorded during all but one dive.

Favourable weather conditions throughout the survey window meant time was available to investigate several additional sites identified using the *Navionics* app, that were not included in the original survey brief. These included one site SE of Rhoscolyn Beacon, two sites around the Fangs rocks, a site northwest of Holyhead breakwater and two sites along the north Anglesey coast.

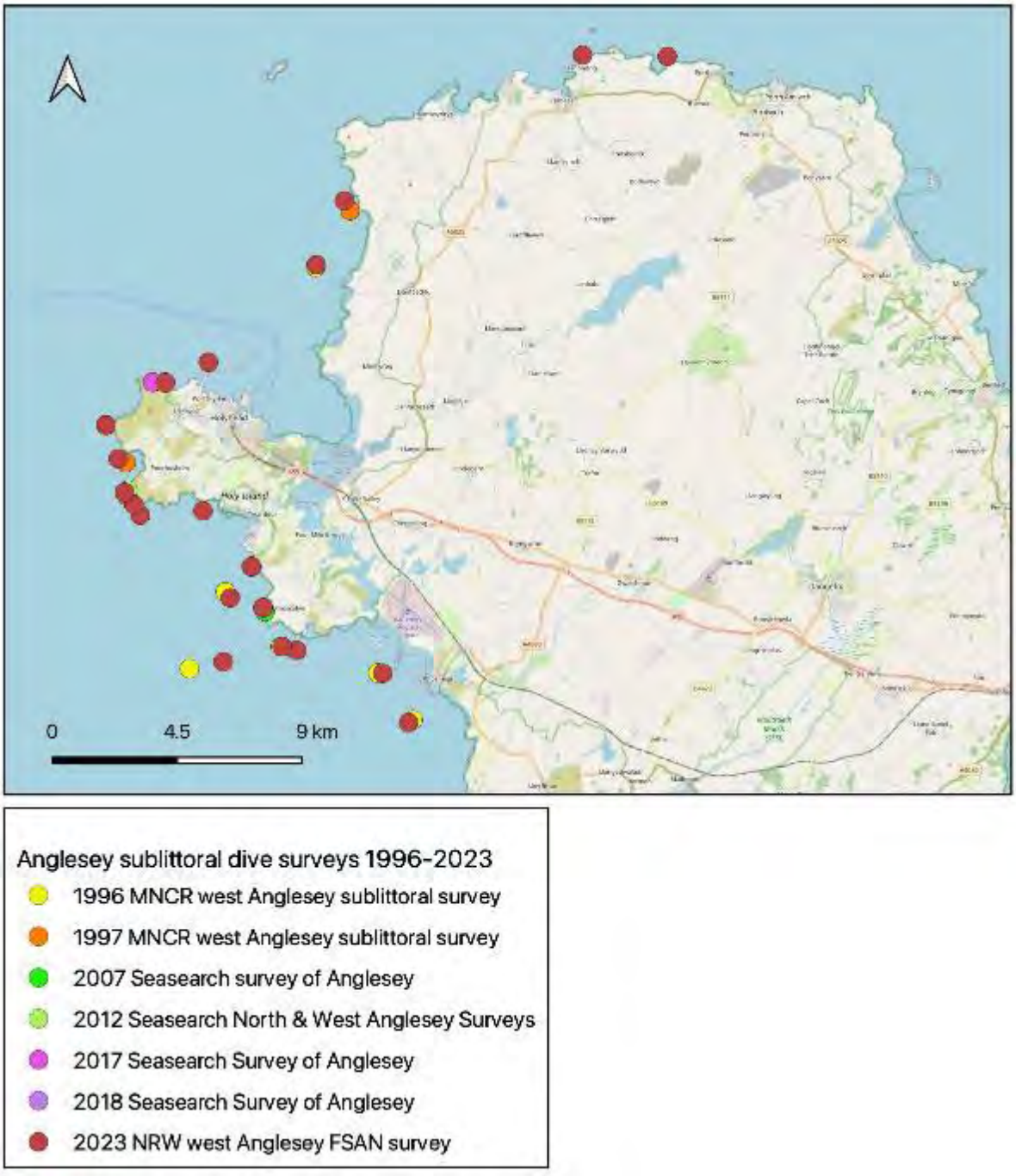


Figure 3: Survey sites around Anglesey where the fragile sponge and anthozoan habitat has been recorded previously (1996-2018) and 2023 locations where repeat / further surveys were completed.

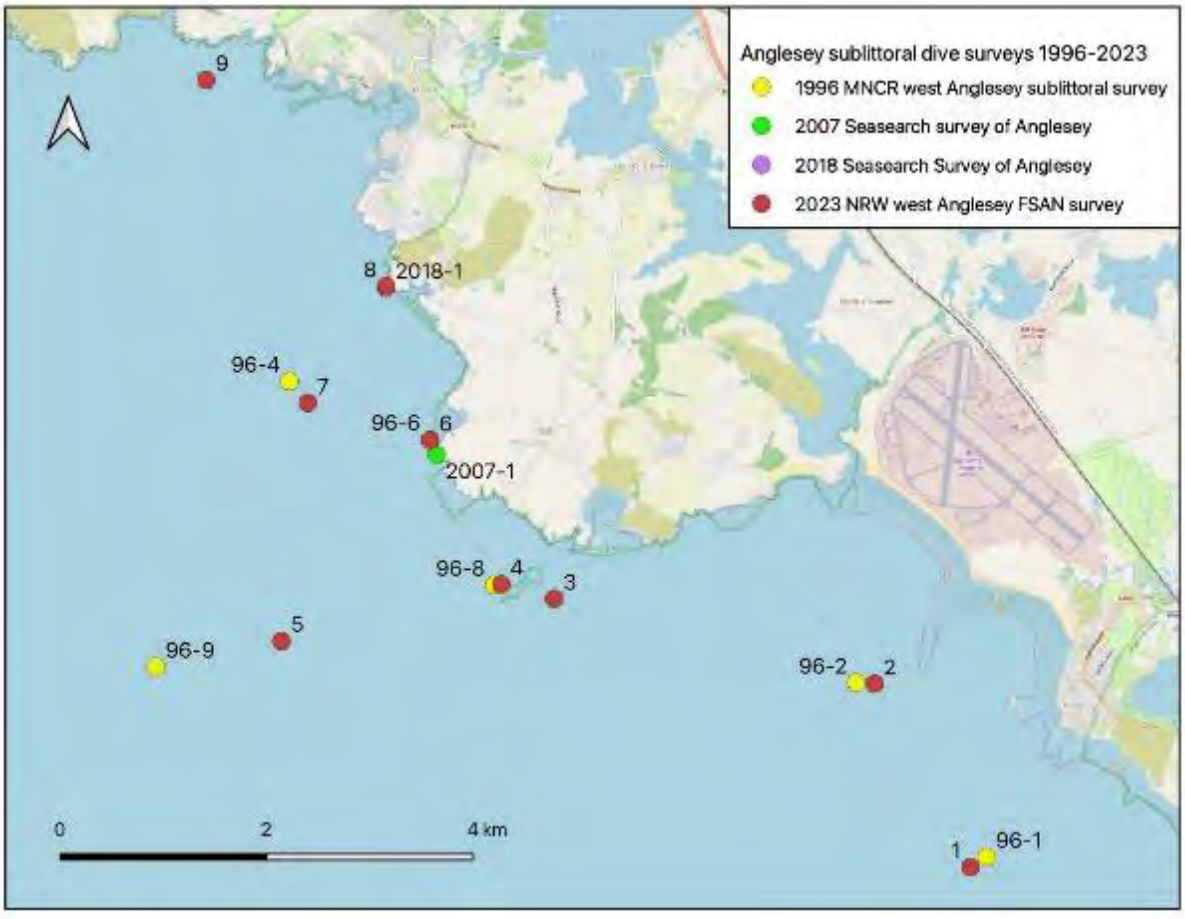


Figure 4: Close-up views of the sites to the south of Holy Island survey sites portrayed in Figure 3. For clarity the years are provided alongside the site numbers of historical survey data positions. Some points may overlap with 2023 data where the positions did not change.

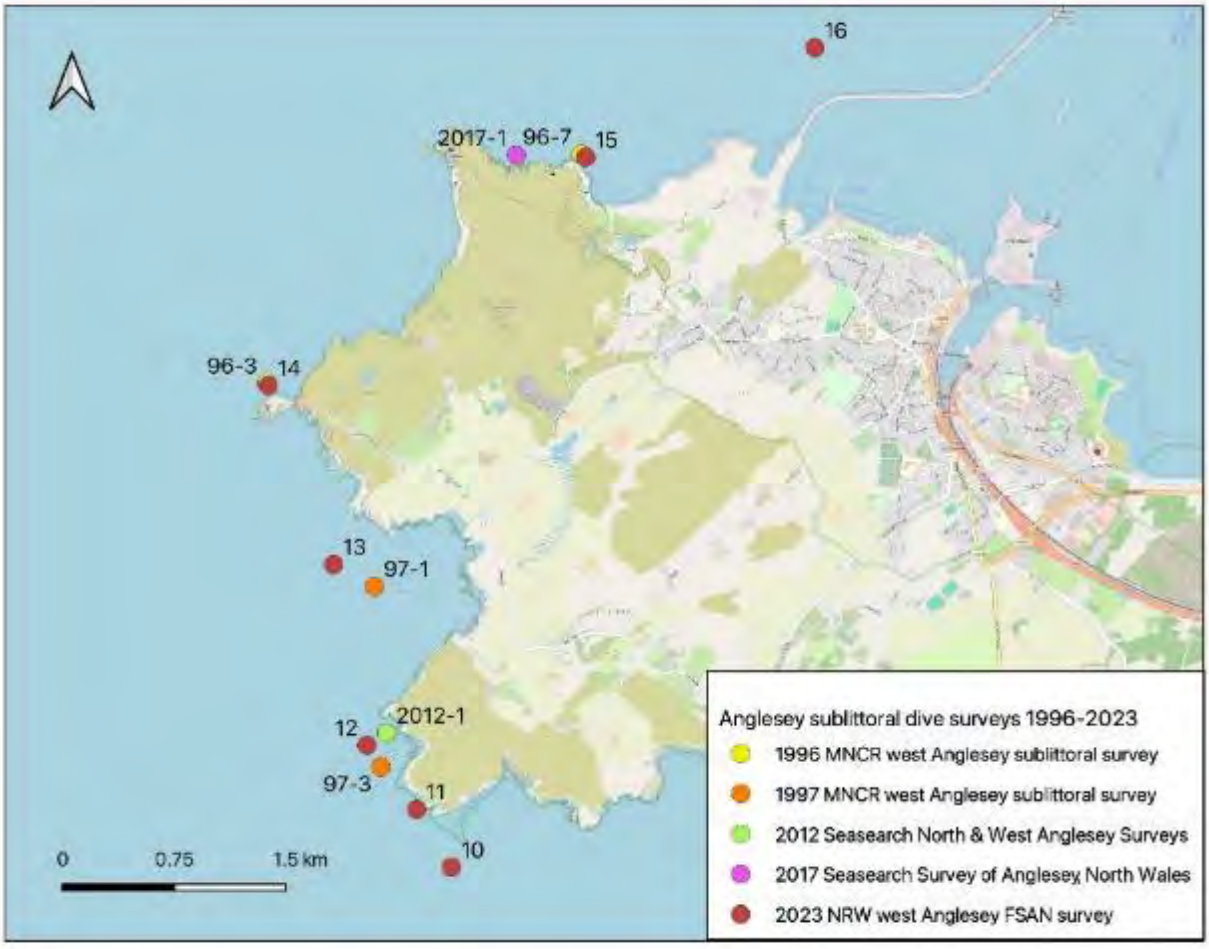


Figure 5: Close-up views of the survey sites around the north of Holy Island portrayed in Figure 3. For clarity the years are provided alongside the site numbers of historical survey data positions. Some points may overlap with 2023 data where the positions did not change.

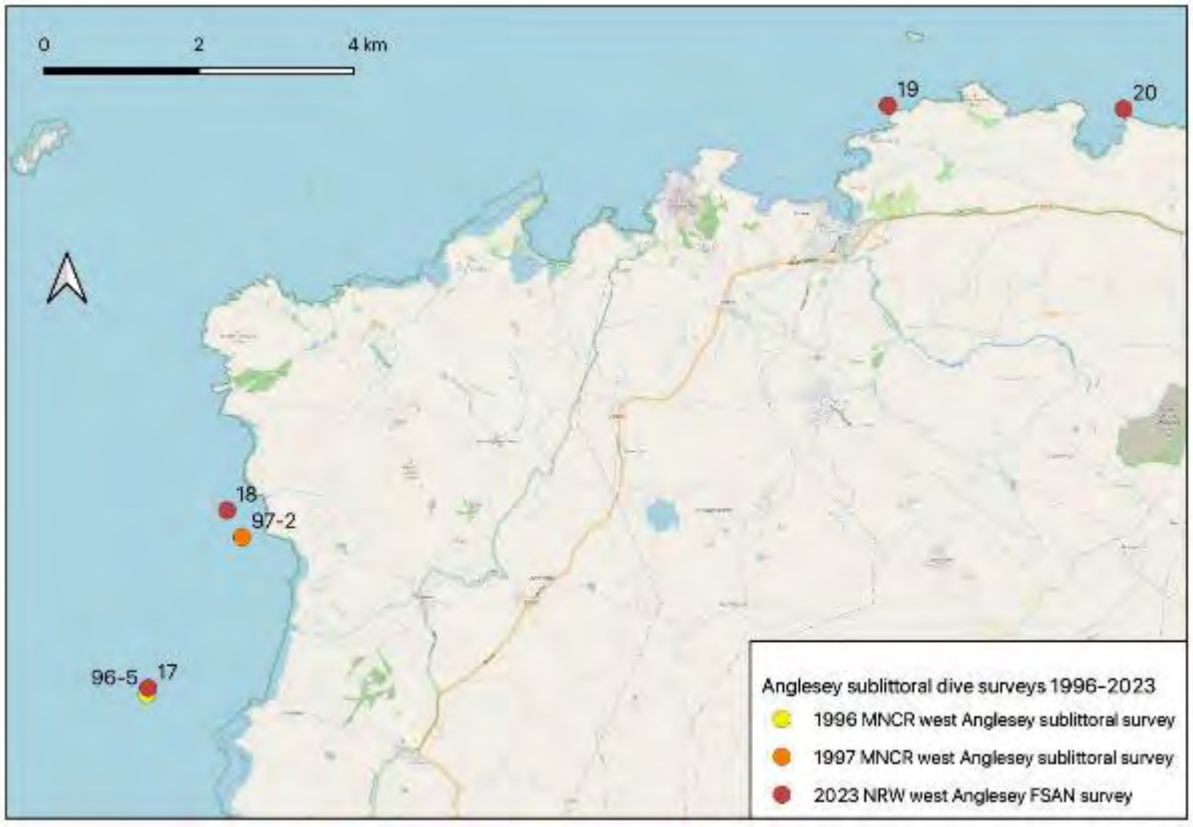


Figure 6: Close-up views of the northern survey sites portrayed in Figure 3. For clarity the years are provided alongside the site numbers of historical survey data positions.

Data recording and quality assurance

Due to limited underwater visibility and heavy siltation of the faunal turf, many turf species only became apparent in photographic analysis e.g. *Aplidium densum*, *Aplidium* 'strawberry', *Perophora listeri*, etc. The very small pin-head seasquirt *Pycnoclavella* spp. were often present in dense aggregations and very apparent during the dive due to their intense and distinct orange or white colouration. On some dives the combination of limited visibility and strong currents made recording by pencil on the divers' slates very difficult and the cameras proved an easier medium to capture species records.

Post-dive, the dive team collectively completed MNCR Sublittoral Habitat and Site survey forms including dive sketches, as shown accompanying each site overview, noting approximate extent of habitat (if possible) and adjacent habitats (JNCC, 1999).

Prior to and between survey dives, time was spent undertaking quality assurance to ensure consistency of taxa ID between surveyors.

All divers conferred and examined stills and video as a group, to agree species identification and agree abundances of species. Species over which there was uncertainty in identification were sampled and examined by microscope to determine

the identity e.g. *Sertularia* spp., *Aglaophenia* spp., Crisids etc. Of the sponges, *Stelligera stuposa* and *Raspailia hispida* are notoriously difficult to tell apart from one another *in situ*. Occasionally divers encountered both together and were able to differentiate between the two species whilst some divers felt confident in their ability to differentiate the species whenever they were encountered. Whilst recorded as separate species on the MNCR forms the sponges are referred to collectively as '*Stelligera stuposa / Raspailia hispida*' throughout this report to account for this uncertainty.

Data summary and analysis

2023 data

For each site surveyed a summary was produced outlining basic site data (name, position, depth, tidal streams and exposure) along with a site description, biotope assignation and example images. 'Species of Interest' were also highlighted and defined as any that were considered '*rare or scarce, any Section 7 species, species sensitive to abrasion and non-native species (INNS)*'. Abrasion was defined as '*mechanical interference, crushing, physical blows against, or rubbing and erosion of the organism of interest. Protrusive species may be crushed, and delicate organisms with fragile skeletons or soft bodies may be physically damaged or broken (snapped)*' (MarLIN, 2023). Species listed that may be sensitive to such abrasions included erect sponge species such as the Axinellids which are slow-growing and have shown little to no recovery over long monitoring programmes (Fowler & Lafoley, 1993; Hiscock, 1994; 2002) or brittle taxa such as the bryozoan *Pentapora foliacea*. Any human impacts observed were also cited.

The community data from the 2023 surveys were analysed in PRIMER^{TM} to explore the data for species and community distribution patterns across the survey area. The semi-quantitative SACFOR data were converted to numerical values to enable multivariate statistical analysis, as described by Strong and Johnson (2020). This process converts count and percentage cover data into comparable formats based on body size and growth form to enable full community analysis of the available data. Strong and Johnson (2020) acknowledge the limitations inherent with SACFOR data alone (e.g. lack of precision, open to surveyor bias, often under-replicated) and warn against over-analysing the numerical data made available via this approach. However, they suggest that "*SACFOR data, that includes information on multiple taxa, in -well-replicated surveys from large areas of marine habitat, provides sufficient power that these data sets should be considered useful for monitoring studies in areas lacking quantitative observations,*" as in the present case.

In addition to the numerical conversion, all taxonomic nomenclature were checked against the Marine Species of the British Isles and Adjacent Seas (MSBIAS) TaxonMatch database and corrected where necessary.

In PRIMER^{TM}, a SIMPROF cluster analysis was undertaken to identify any similarities between sites or changes in the biotope characteristics throughout the geographical area surveyed. The SIMPROF function identified clusters (linked by red lines) of samples (sites in this case) that were statistically similar. Multidimensional

Scaling (MDS) plots were also used to show how certain individual taxa varied in abundance and distribution across the survey area.

Historical data

Given that mostly only single historical data points existed for each site surveyed it was not feasible to carry out a valid statistical analysis to determine whether any temporal changes had occurred at the individual site level. Furthermore, there was not sufficient confidence that the exact same locations at each site were re-surveyed in 2023 given the relative inaccuracy of the original positions logged during the 1996-97 MNCR surveys. This could therefore cast doubt even on qualitative assessments of similarities or differences between survey records at the individual site level. However, it was possible to consider whether broadscale changes have occurred over the whole geographical survey area since the original surveys were completed. To this end, a cluster analysis and a multivariate Analysis of Similarity (ANOSIM) test were used to check for differences between the two main survey periods.

Results

This section summarises the results of the 2023 field survey which took place over two one-week periods, from 24 to 29 April 2023 and 11 to 16 May 2023.

The results provided in Table 2 are given in geographical order from south-west to north-east for easy reference, rather than the date order in which they were dived. All positions are given in WGS84 datum. In total, 14 of the original 17 target sites were dived, although several deviated from the original position which was found to be on sediment or in unsuitable depth, due to the inaccurate site positions, originally taken from Admiralty charts. The *Navionics* software was used, on the boat, to locate the most suitable bedrock area, in the correct depth, closest to the original points and likely to support the target biotope. The survey area was also extended further to the north coast of Anglesey, surveying extra sites at Llanbadrig Head and Porth Wen East; this was due to inclement weather on the west coast of Anglesey which prohibited diving along that coast on one of the survey days.

The site northwest of the breakwater off Holyhead Harbour was selected to replace one of the target sites next to East of North Stack, which was not found to be a good match to the target biotope. The *Navionics* app was used to locate a suitable site further east, NW Breakwater Reef.

Table 2. Site positions surveyed in 2023 to identify location of fragile sponge and anthozoan communities. * - indicates sites that were ‘re-located’ from the original positions supplied, using Garmin’s Navionics app. ‡ - indicates sites that were entirely new for which no previous survey records existed.

Date	Report site #	Name	Latitude	Longitude
25/04/2023	1	Carreg Goch	*53 12.725 N	04 32.187 W
11/05/2023	2	SW of Ynys Feirig, Cymyran Bay	*53 13.680 N	04 33.020 W
15/05/2023	3	SE Rhoscolyn Beacon	‡53 14.124 N	04 35.807 W
26/04/2023	4	Rhoscolyn Reef (nr Beacon)	*53 14.199 N	04 36.269 W
13/05/2023	5	SW off Rhoscolyn Head, Pinnacle ‘C’	*53 13.903 N	04 39.181 W
13/05/2023	6	Darren’s Rock	*53 14.950 N	04 36.887 W
12/05/2023	7	Maen Piscar	*53 15.145 N	04 37.951 W
12/05/2023	8	Porth y Garan	53 15.753 N	04 37.270 W
11/05/2023	9	Red Roof Reef, Porth Dafarch	*53 16.827 N	04 38.836 W
16/05/2023	10	The Fangs	‡53 16.744 N	04 40.862 W
16/05/2023	11	NW of the Fangs	‡53 16.953 N	04 41.073 W
25/04/2023	12	Porth y Gwin	*53 17.185 N	04 41.373 W
26/04/2023	13	Off Abraham’s Bosom	*53 17.838 N	04 41.576 W
25/04/2023	14	South Stack ‘north’	53 18.484 N	04 41.971 N
27/04/2023	15	East of North Stack	53 19.309 N	04 40.050 W
29/04/2023	16	NW Breakwater Reef	‡53 19.704 N	04 38.663 W
27/04/2023	17	North Bolivar Rock	53 21.585 N	04 35.175 W
28/04/2023	18	Off Clegir Point	*53 22.821 N	04 34.256 W
14/05/2023	19	Llanbadrig Head	‡53 25.635 N	04 26.559 W
14/05/2023	20	Porth Wen, East	‡53 25.614 N	04 23.826 W

It was not possible to determine the habitat extent at any of the survey sites owing to the visibility often being limited to <3m and the time required to search for and record the species present. Furthermore, the divers' ability to move in the strong currents which were encountered on many dives limited any opportunities to explore habitat extent. Moving shallower out of the circalittoral habitats, the biotopes often transitioned into infralittoral kelp habitat. Below the target survey habitats the biotope frequently (whenever the divers encountered it) transitioned into sediments of various types e.g. sand or coarse sand and shell gravel etc.

The following sections provide descriptions of each site surveyed in April and May 2023.

The biotope codes given follow the latest Marine Habitat Classification for Britain and Ireland (JNCC, 2022). Tidal streams and wave exposure of sites have been calculated in accordance with MNCR protocol (available at https://mhc.jncc.gov.uk/media/1038/mncrform_guidance.pdf).

The site location maps are taken from the 'Navionics Boating' app showing the shaded relief of the seabed features at each site. They are reproduced in the report with permission from the United Kingdom Hydrographic Office (UKHO) and Garmin Italy Technologies. The relief shading delivers highly detailed shading that combines colour and shadow to provide an easy-to-interpret, clearer view of bottom structure than contour lines alone.

The illustrated site diagrams, recorded on MNCR Site forms at time of survey, provide a useful interpretation of the key features of each site. All site photographs were taken during the 2023 survey.

Site 1: Carreg Goch

Date of dive: 24/04/2023

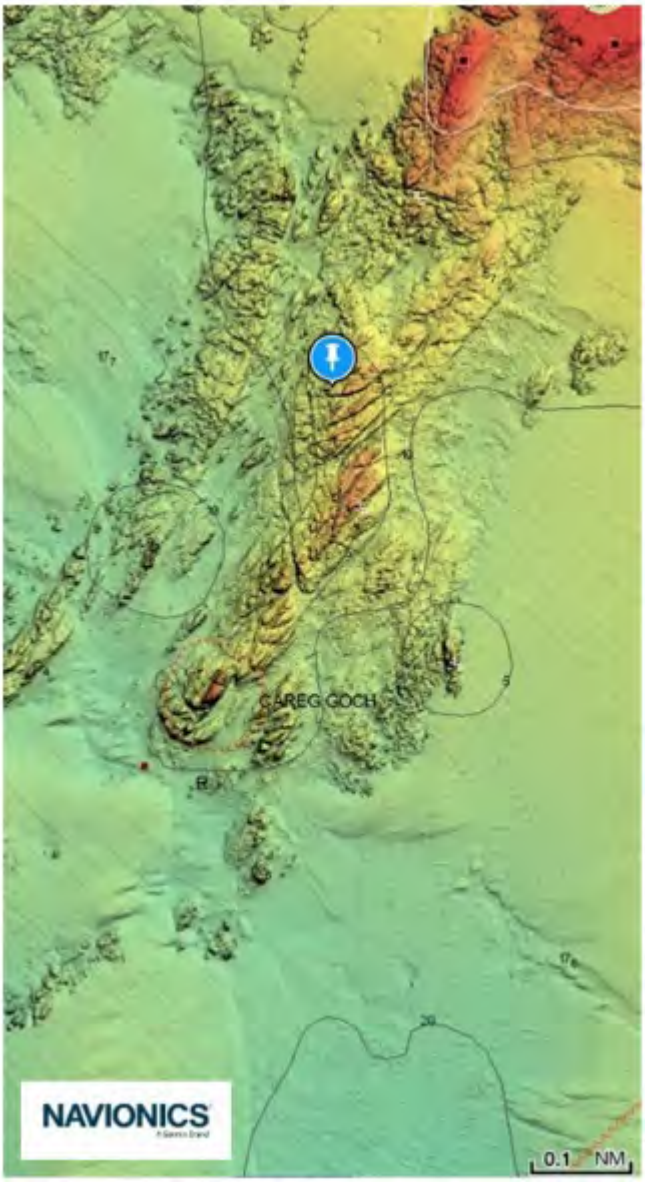
Position: 53° 12.725 N 04° 32.187 W

Depth range (metres):

11.0 – 14.1 BSL
6.6 – 9.7 BCD

Tidal Streams: Moderately strong

Exposure: Very exposed



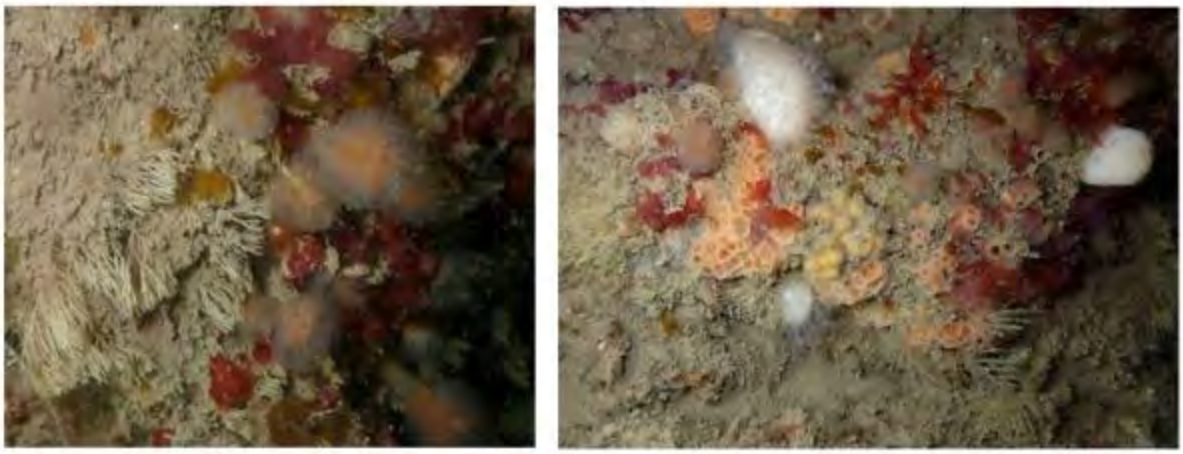
Site description

Carreg Gogh is situated approximately 1 nm SW of Rhosneigr, off Holy Island on the west coast of Anglesey. It was the most southerly of the survey sites visited in the 2023 diving survey. An extensive bedrock outcrop at approx. 6-10 m depth bcd, exposed to strong wave action and tidal streams.

The seabed comprised rocky gullies with short vertical faces and mixed sediment and sand in the bottom of the gullies. The area surveyed was upper circalittoral habitat, just below the vertical extent of brown algae to include steep and vertical faces with occasional red algae, dead men's fingers soft coral *Alcyonium digitatum*, the boring sponge *Cliona celata* and the golf ball sponge *Tethya aurantium* and robust hydroids and bryozoan turfs. Underlying most fauna, encrusting the rock were the polychaete worm *Sabellaria spinulosa* in their hard sandy tubes.

The habitat supported dense crissid bryozoan turf with hydroids, *Alcyonium digitatum* and sponges. There was a general lack of fragile erect sponges, only occasional *Stelligera montagui* and the chocolate finger sponge *Raspaillia ramosa*, with varied sponges including encrusting and massive-form species. Hydroids including antenna hydroids *Nemertesia antennina* and colonial ascidians (sea squirts) were also amongst the faunal turf.

Reef top with foliose red algae, *Alcyonium digitatum* and dense faunal turf.



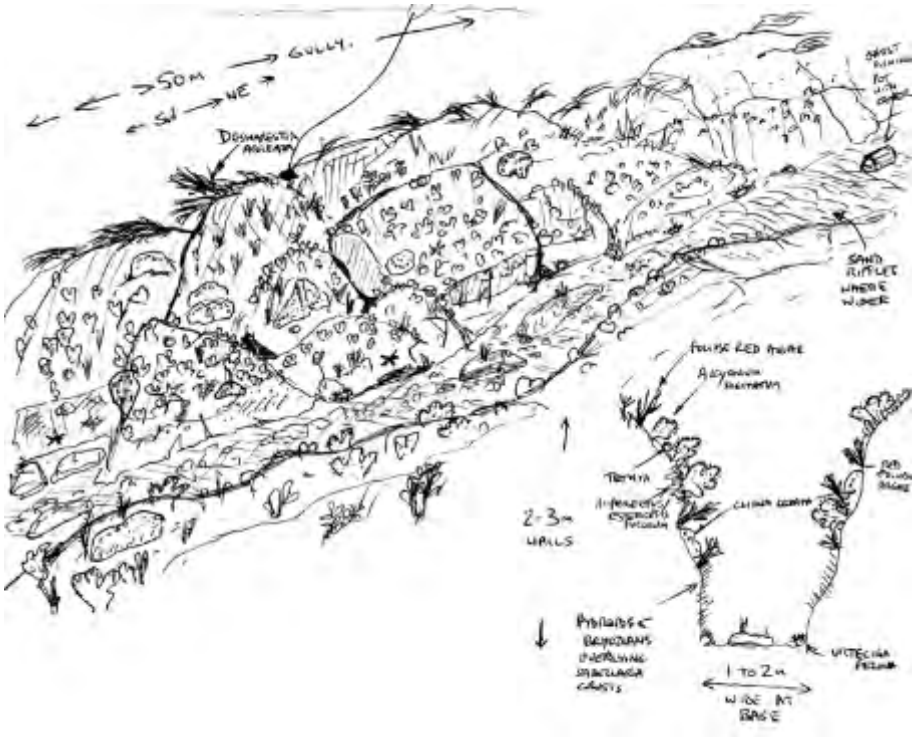
Dense silted faunal turf with crisid bryozoans, colonial ascidians and sponges.

Biotope
CR.HCR.Xfa.ByFa.ByErSp.DysAct - Mixed turf of bryozoans and erect sponges with the goosebump sponge *Dysidea fragilis* and the saddled anemone *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

None

Human impacts
Potting observed



Carreg Goch site sketch.

Site 2: SW of Ynys Feirig, Cymyran Bay

Date of dive: 11/05/23

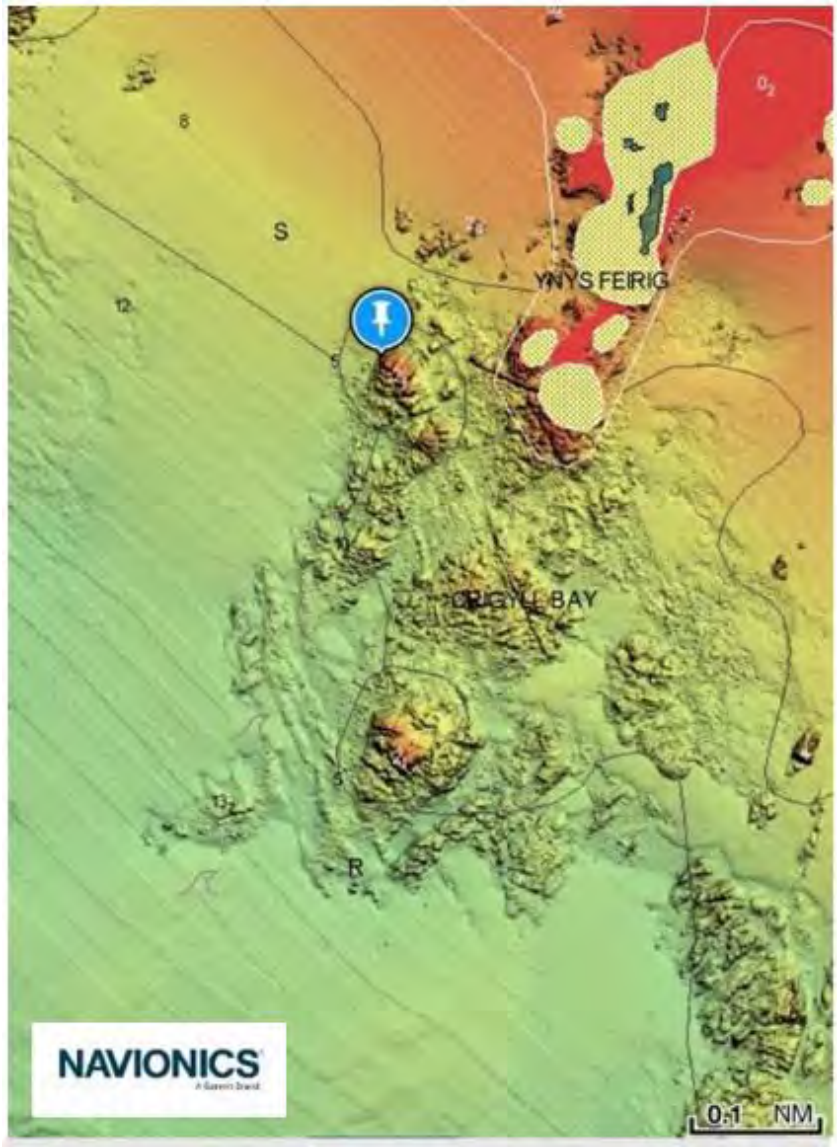
Position: 53° 13.680 N 04° 33.020 W

Depth range (metres):

12.0 – 15.0 BSL
8.0 – 11.0 BCD

Tidal Streams: Strong

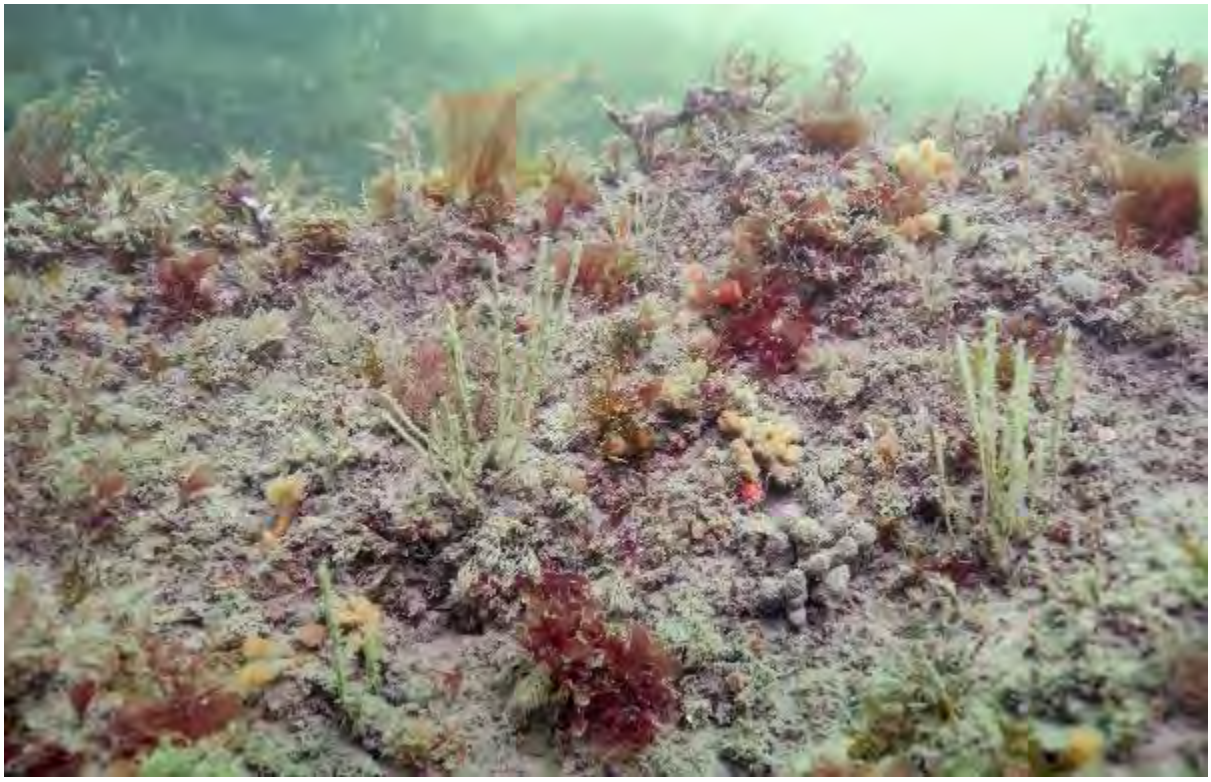
Exposure: Very exposed



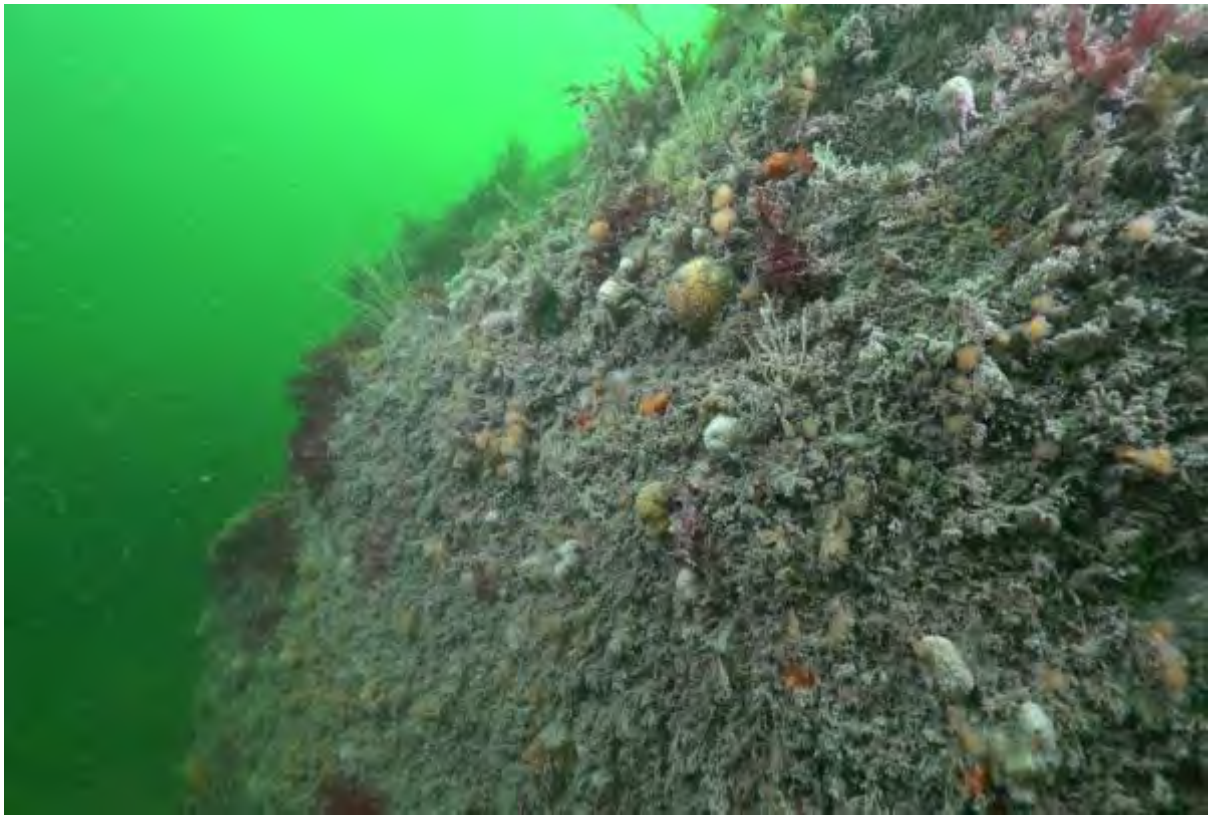
Site description

SW of Ynys Feirig, Cymyran Bay, off Holy Island on the west coast of Anglesey, bedrock outcrops in approx. 8.0 – 11.0 m BCD exposed to strong wave action and tidal streams.

The area surveyed comprised a rounded bedrock pinnacle with large boulders around its base leading down to a fine silted sandy seabed below. The bedrock reef supported an upper circalittoral community of dense, heavily silted, faunal turf with scattered foliose red algae with dominant callused drachiella *Drachiella heterocarpa*, siphoned feather weed *Heterosiphonia plumosa* and sea beech *Delesseria s*anguinea with occasional beautiful eyelash weed *Calliblepharis ciliata*. Characterising the site were *Alcyonium digitatum* and *Nemertesia* spp., bryozoan turf (*Chartella papyracea,* hornwrack *Flustra foliacea* and crisids) and a variety of large, massive-form sponges – *Cliona celata* and elephant hide sponge, *Pachymatisma johnstonia.* Erect sponges were occasional throughout the site – yellow staghorn sponge *Axinella dissimilis*, prawn cracker sponge *Axinella infundibuliformis*, *Raspaillia ramosa and* mermaid's glove sponge *Haliclona oculata*. Encrusting sponges, shredded carrot sponge *Amphilectus fucorum* and the black tar sponge *Dercitus bucklandi* were also present as were colonial ascidians such as *Aplidium* spp. The shallower upward facing bedrock tops supported a sparse kelp park, with one area revealing dozens of nursehound *Scyliorhinus stellaris* purses on the *Laminaria hyperborea* kelp park.



Bedrock reef with dense hydroid-bryozoan turf with prominent *Nemertesia antennina,* sponges such as *Raspailia ramosa* and occasional foliose red algae such as *Delessaria sanguinea.*



Encrusting and erect sponges amongst extremely silted faunal turf. *Dysidea fragilis* and *Tethya citrina* are clearly visible.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: the fragile potato crisp bryozoan *Pentapora foliacea*

Section 7 species: the spiny lobster *Palinurus elephas*

Non-native species: orange-tipped sea squirt *Corella eumyota*.

An area with many nursehound *Scyliorhinus stellaris* egg cases attached to the *Laminaria hyperborea* was also observed in the kelp park. (see picture)

Human impacts:

Potting observed.

SW of Ynys Feirig site sketch.

Site 3: SE Rhoscolyn Beacon

Date of dive: 15/05/2023

Position: 53° 14.124 N 04° 35.807 W

Depth range (metres):

14.0 – 17.1 BSL

11.0 – 14.1 BCD

Tidal Streams: Strong

Exposure: Very exposed

Site description

One of two sites located off Rhoscolyn Beacon, off Holy Island on the west coast of Anglesey, site 3 lies off the east coast of the beacon at the deepest limit of the bedrock reef in approx. 11.0 – 14 m BCD exposed to strong wave action and tidal streams. This site had not previously been surveyed.

The seabed comprised low-lying tide-swept, silted bedrock ridges with mixed sediment and flat, angular, scoured boulders in the valleys between them. The sloping bedrock had broken strata edges, with vertical rock broken by holes and crevices within them. Some of the reef tops were relatively level and very rugged, whereas the slopes were often relatively smooth, following the geological bedding plane.

Bedrock reef with dense bryozoan turf (crisids and Chartella), anthozoans and branching sponges.

Ridges and boulder tops were typically colonised by abundant *Alcyonium digitatum.* Bryozoans such as *Chartella papyracea*, *Flustra foliacea*, crisids and *Cellaria* sp. dominated the turf, with mixed hydroids including *Nemertesia* spp. and abundant sponges amongst them. Short, branching sponges (*Stelligera montagui / Raspaillia ramosa*) were present throughout the site with occasional *Axinella dissimilis*, *Axinella infundibuliformis*, and *Haliclona spp.*. Prominent amongst the sponges were also *Dysidea fragilis*, *Cliona celata*, *Tethya aurantium* and *Pachymatisma johnstonia.* Some areas were devoid of *A. digitatum* and more silted with characteristic tufts of hydroid *Nemertesia* spp. and foliose red algae.

Left, erect hydroid turf, anthozoan *Alcyonium digitatum* and branching sponges and sponge crusts. Right, branching sponge *Haliclona simulans*.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

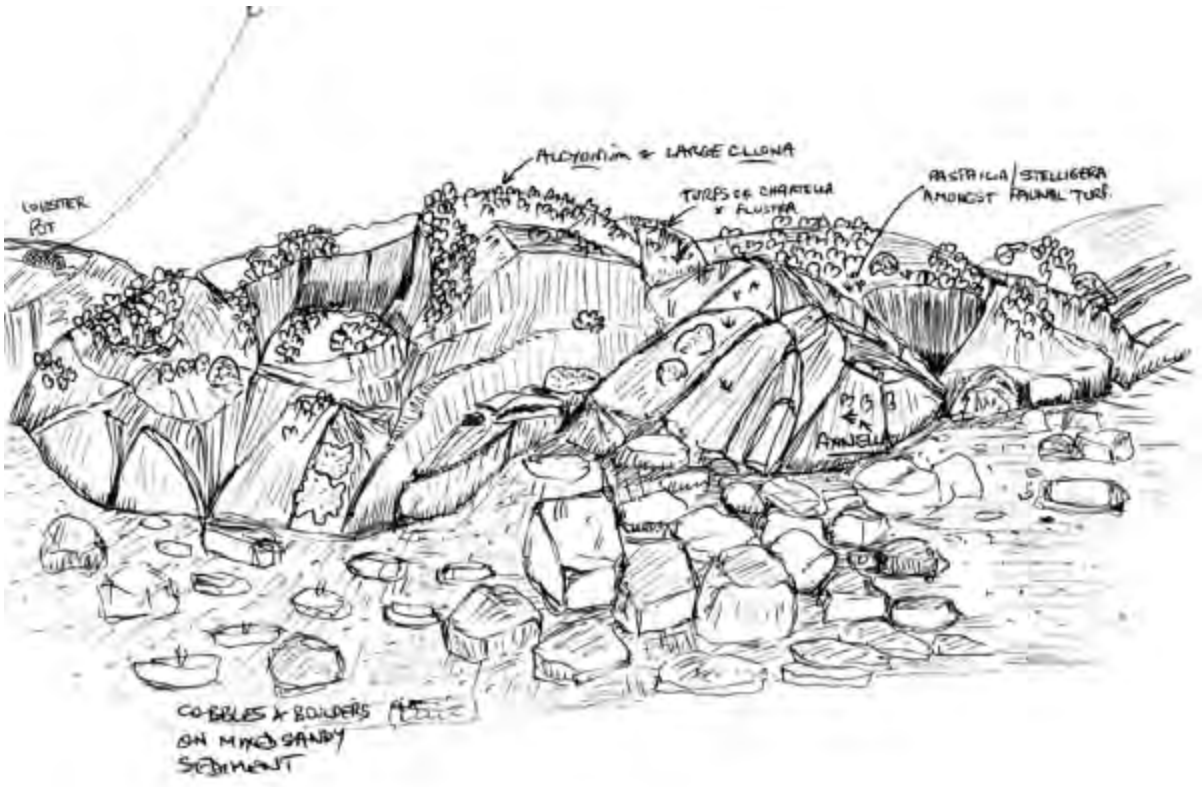
Species that may be sensitive to abrasion: *Axinella dissimilis, Axinella infundibuliformis.*

Human impacts

Potting activity present. Unidentified litter under ledge.

Several large boring sponge *Cliona celata* observed to have various stages of decay from partial to complete blackening. One damaged *Pachymatisma* seen and photographed.

Site view



SE Rhoscolyn Beacon site sketch.

Site 4: Rhoscolyn Reef (nr Beacon)

Date of dive: 26/04/2023

Position: 53° 14.199 N 04° 36.269 W

Depth range (metres):

10.0 – 17.0 BSL
6.8 – 13.8 BCD

Tidal Streams: Strong

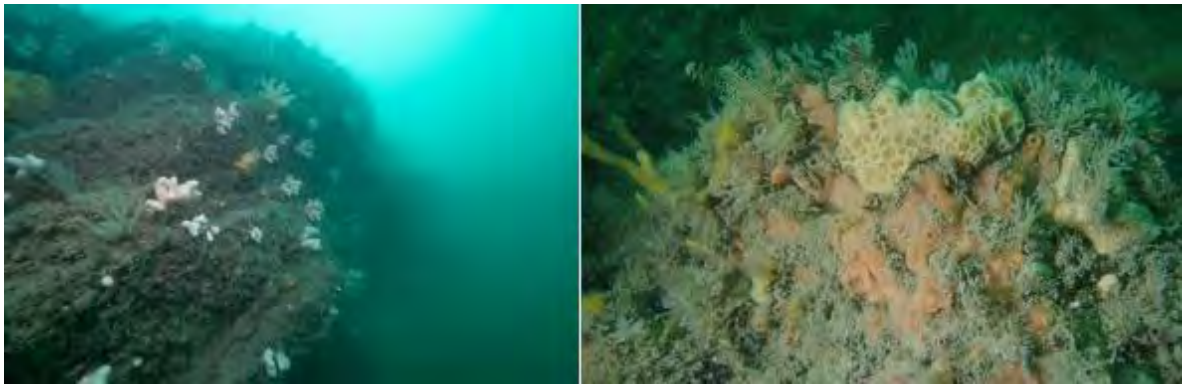
Exposure: Very exposed

Site description

The second of two sites located off Rhoscolyn Beacon, off Holy Island on the west coast of Anglesey, site 4 lies off the east coast of the small island on the lower edge of the bedrock reef in approx. 7 – 14 m BCD exposed to strong wave action and tidal streams.

Circalittoral seabed of steeply sloping vertical bedrock and boulders dominated by a short, mixed turf of bryozoans (*Flustra foliacea, Chartella papyracea* and crisids), hydroids (*Nemertesia antennina* and herring bone hydroid *Halecium halecinum*), ascidians and sponges, including some erect sponges (*Stelligera* spp. and *Raspailia ramosa*). Red algae were present on the upper areas of the reef. Below, the habitat was a mosaic of boulders on sand and shell gravel. Faunal turf dominated the steeply sloping bedrock and gave way to more vertical bedrock around the island. The verticals had more *Alcyonium digitatum* and *Pachymatisma johnstonia* but otherwise the habitat was the same.

Bedrock reef with *Alcyonium digitatum*, hydroids (*Nemertesia* sp.) and large sponges *Cliona celata* and *Pachymatisma johnstonia.*



Left, vertical bedrock with mixed fauna. Right, mixed sponges including the crater sponge *Hemimycale columella* amongst dense bryozoan turf including *Chartella papyracea*.

Biotope

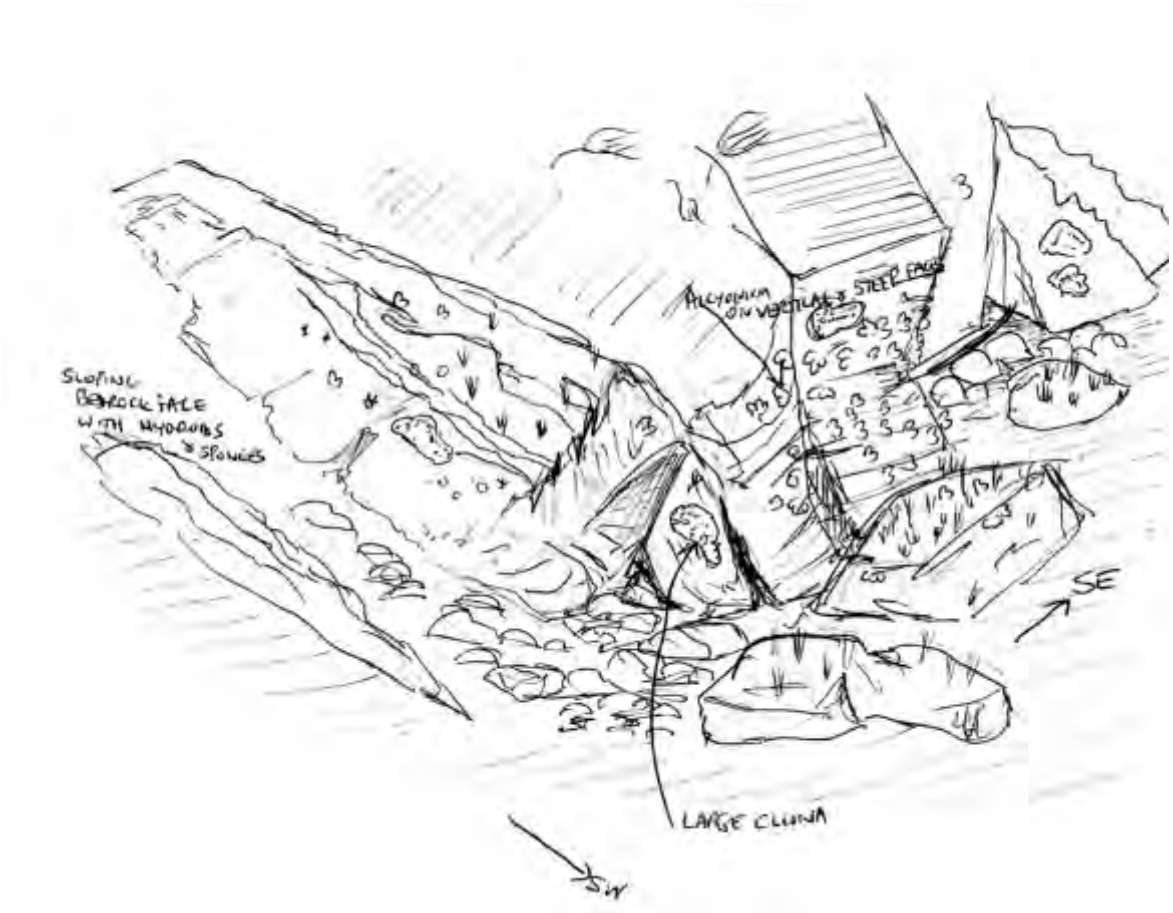
CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

None.

Human impacts

Potting observed.



Rhoscolyn Reef (nr Beacon) site sketch.

Site 5: SW off Rhoscolyn Head, Pinnacle ‘C’

Date of dive: 13/05/23

Position: 53° 13.903 N

04° 39.181 W

Depth range (metres):

13.0 – 29.8 BSL
11.3 – 28.1 BCD

Tidal Streams:

Strong

Exposure:

Very exposed

Site description

The submerged bedrock pinnacle, known as Pinnacle ‘C’ lies 3 nm offshore from Trearddur Bay, off Holy Island on the west coast of Anglesey.

The site comprised seabed pinnacles with a small valley between them rising steeply from >28 m bcd to approx. 11 m bcd. The rocky reef presented as a series of angular rocky buttresses and vertical faces with sparse fauna including the colourful jewel anemones *Corynactis viridis*, colonial ascidians, hydroids and bryozoans. Branching sponges including the crumpled duster sponge *Axinella damicornis*, *Axinella dissimilis* and *Axinella infundibuliformis* were found in small gullies and on deeper rock. *Dysidea* fragilis was only ‘rare’ at this site, whilst the anemone *Actinothoe* was common. *Flustra foliacea* and *Alcyonium digitatum* were particularly prevalent in the deeper areas of the reef.

Above, bedrock reef with *Axinella dissimilis* and *Pentapora foliacea.*


Above left: crisid turf, anemone *Actinothoe sphyrodeta* and sea star *Henricia* sp.
Above right: sponge *Axinella* sp. with mermaid's purse.

Above: A patch of feather hydroid, *Gymangium montagui* on the reef at Pinnacle 'C'.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

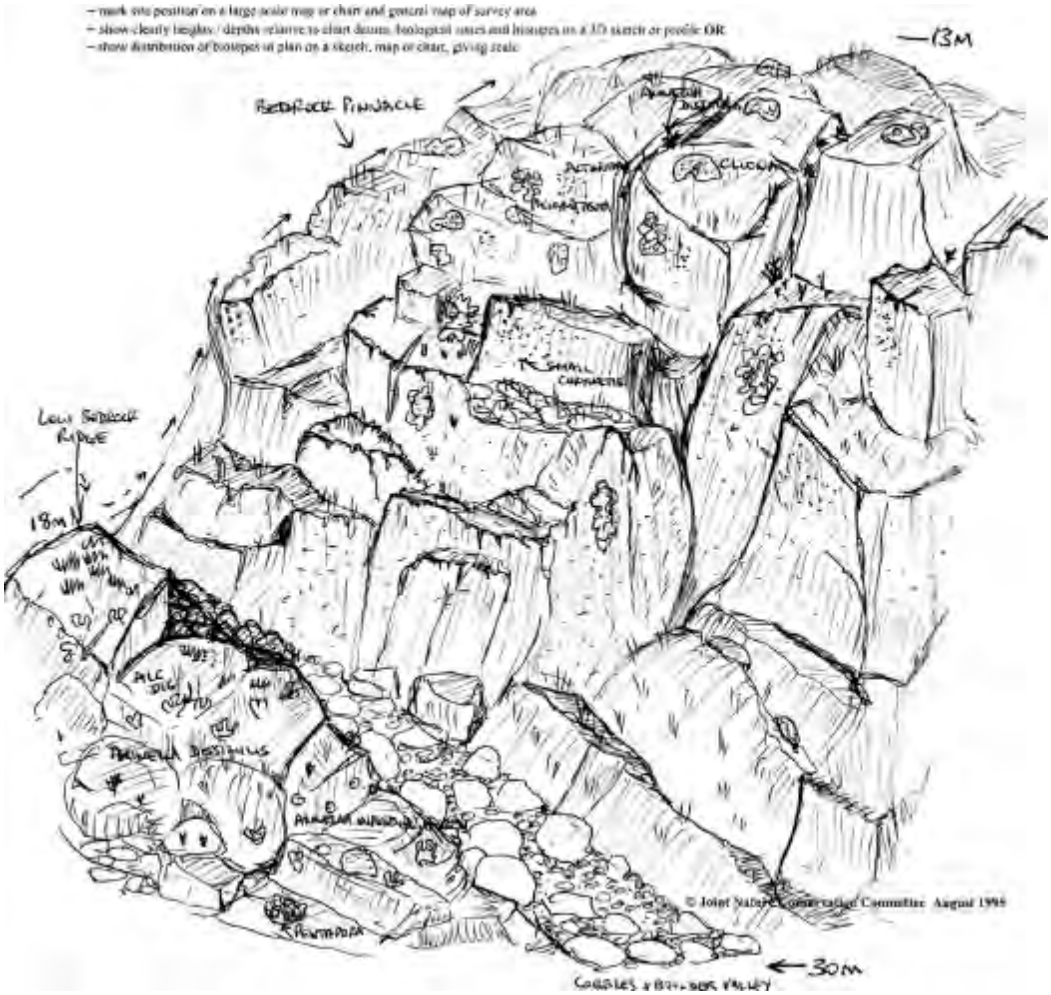
Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella damicornis, Axinella dissimilis, Axinella infundibuliformis* and fragile bryozoan *Pentapora foliacea.*

Rare or scarce species: a large specimen of mashed potato sponge *Thymosia guernei* (shown below), known to occur in offshore areas exposed to moderately strong wave action and tidal streams. Only two previous records from Anglesey from Seasearch surveys in 2017 and 2018 (NBNatlas.org).

Human impacts

Potting and angling activities observed whilst at site.



Pinnacle C site sketch.

Site 6: Darren's Rock

Date of dive: 13/05/2023

Position: 53° 14.950 N

04° 36.887 W

Depth range (metres):

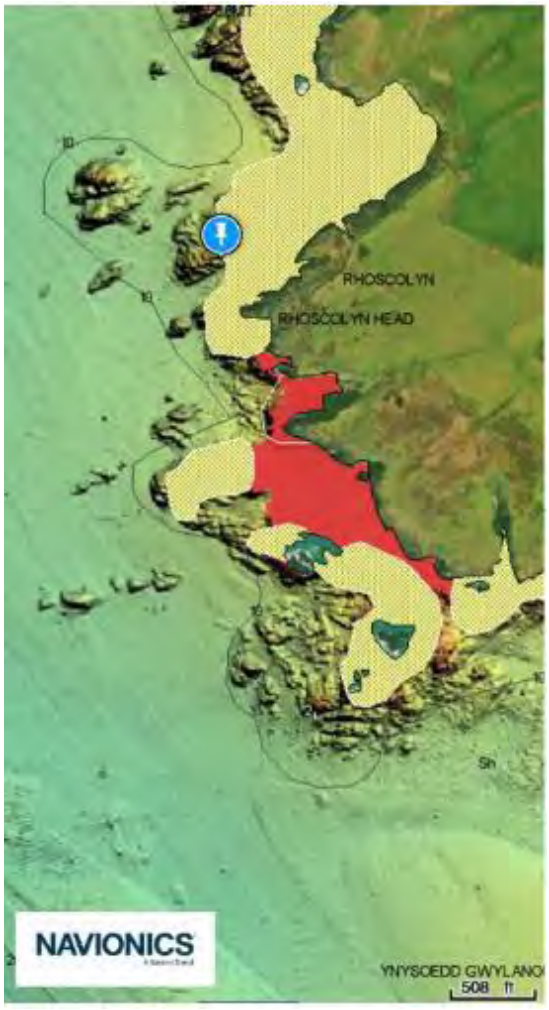
15.0 – 19.3 BSL
12.1 – 16.4 BCD

Tidal Streams:

Moderately strong

Exposure:

Very exposed



Site description

Darren's Rock is a steeply sloping bedrock ridge adjacent to the north side of Rhoscolyn Head, off Holy Island on the west coast of Anglesey. It was known from previous visits as an interesting species-rich dive site.

Shallower areas of the reef had steep walls up to 3 m high, topped by kelp. Deeper areas of the reef had verticals of a lesser height and wide areas of upward facing rock. The base of the reef ran onto mobile shell gravel.

Steeply sloping bedrock outcrops supported a dense hydroid-bryozoan turf, interspersed with cushion and erect sponges – *Dysidea fragilis*, *Tethya aurantium*, *Stelligera* and *Raspaillia* were particularly abundant. *Alcyonium digitatum* was present throughout the site as were patches of anemones (the sandy creeplet *Epizoanthus couchii*, *Actinothoe sphyrodeta* and *Corynactis viridis*). The many crevices provided refuge for crevice sea cucumbers *Pawsonia saxicola*. Prominent above the turf species were large sponges *Cliona celata* and the fragile bryozoan *Pentapora foliacea.*

Diverse faunal turf with sponges (*Dysidea fragilis*, *Raspaillia ramosa*, *Cliona celata, Tethya citrina, Axinella dissimilis*), dense turf-forming bryozoans including finger bryozoans *Alcyonium diaphanum* and occasional foliose red algae.

Left: large boring sponge *Cliona celata*. Right: hydroid and bryozoan turf with *Alcyonium digitatum*.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

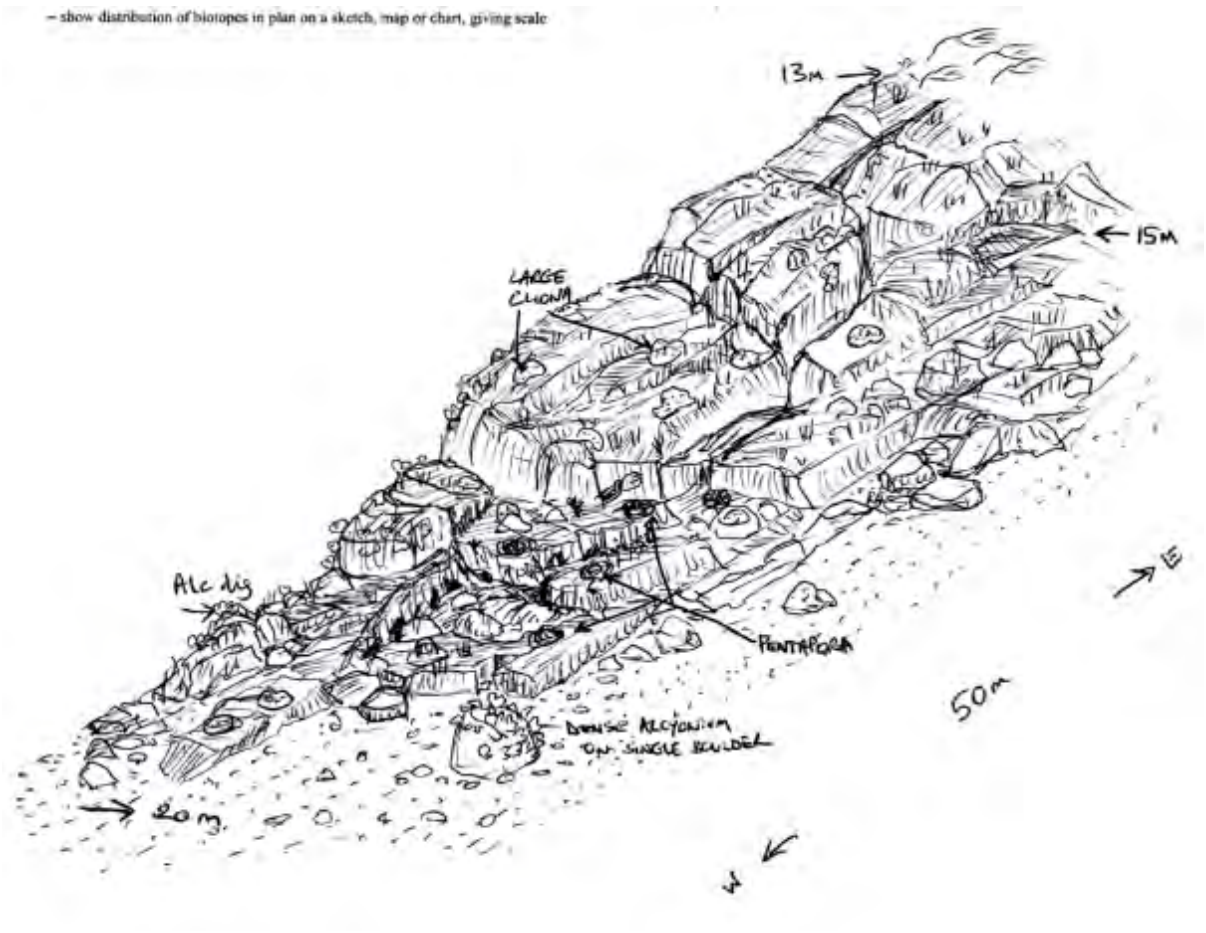
Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis, Pentapora foliacea*

Section 7 species: *Palinurus elephas* known to be present at this site previously, but none seen during survey.

Human impacts

Small quantities of lost fishing tackle were found.



Darren’s Rock sketch.

Site 7: Maen Piscar

Date of dive: 12/05/23

Position: 53° 15.145 N. 04° 37.951 W

Depth range (metres):

13.0 – 17.3 BSL
10.6 – 14.9 BCD

Tidal Streams:

Strong

Exposure:

Very exposed

Site description

Maen Piscar is an offshore pinnacle, awash at low water, north-west of Rhoscolyn Head, off Holy Island on the west coast of Anglesey.

The stepped bedrock reef descends as steps, ledges and slopes, amidst boulders and gives way to shelly gravel at the deepest extent at approx. 15 m bcd. The fauna is characterised by *Alcyonium digitatum* and large *Cliona* sponges with dense hydroid-bryozoan turf with patches of *Flustra foliacea*, *Sertularia argentea* and *Aglaophenia* spp. However, there were very few branching sponges, more encrusting and cushion sponges such as *Amphilectus fucorum* and *Hemimycale columella* with sparse *Pentapora foliacea*. The anemone *Actinothoe sphyrodeta* was present in discrete patches. Of note were curled octopus *Eledone cirrhosa*, ballan wrasse *Labrus bergylta,* cuckoo wrasse *Labrus mixtus*, goldsinny wrasse *Ctenolabrus rupestris* and shoals of pollack *Pollachius pollachius*.

Above, hydroid and bryozoan turf with sparse red algae, *Amphilectus fucorum* and *Actinothoe sphyrodeta.*

Above left: close up of *Amphilectus fucorum,* baked bean sea squirt *Dendrodoa grossularia* and *Actinothoe sphyrodeta.* Above right: hydroid bryozoan turf with *Chartella papyracea* and *Halecium halecinum*.

Biotope

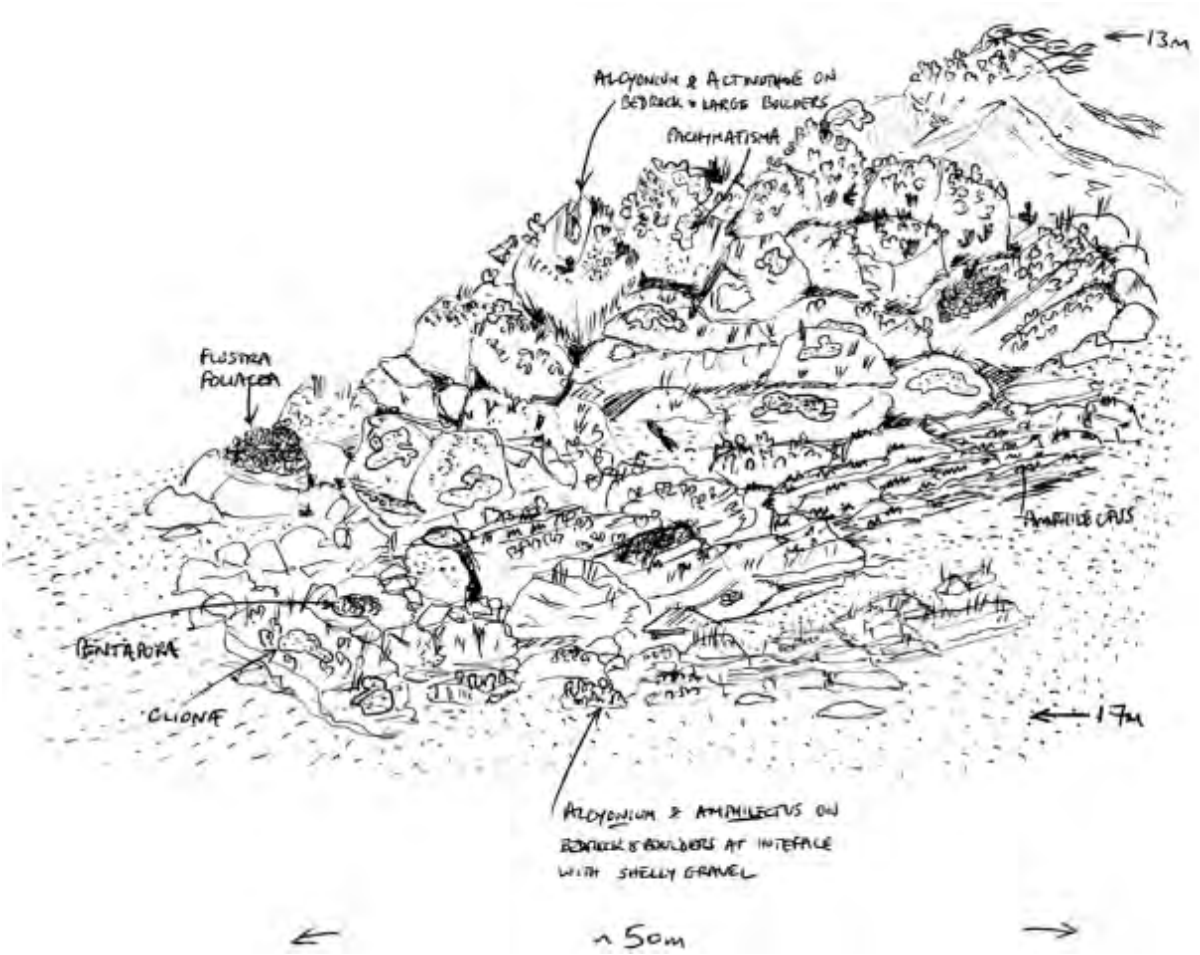
CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: *Pentapora foliacea.*

Human impacts

Potting and angling observed.



Maen Piscar site sketch.

Site 8: Porth y Garan

Date of dive: 12/05/23

Position: 53° 15.753 N 04° 37.270 W

Depth range (metres):

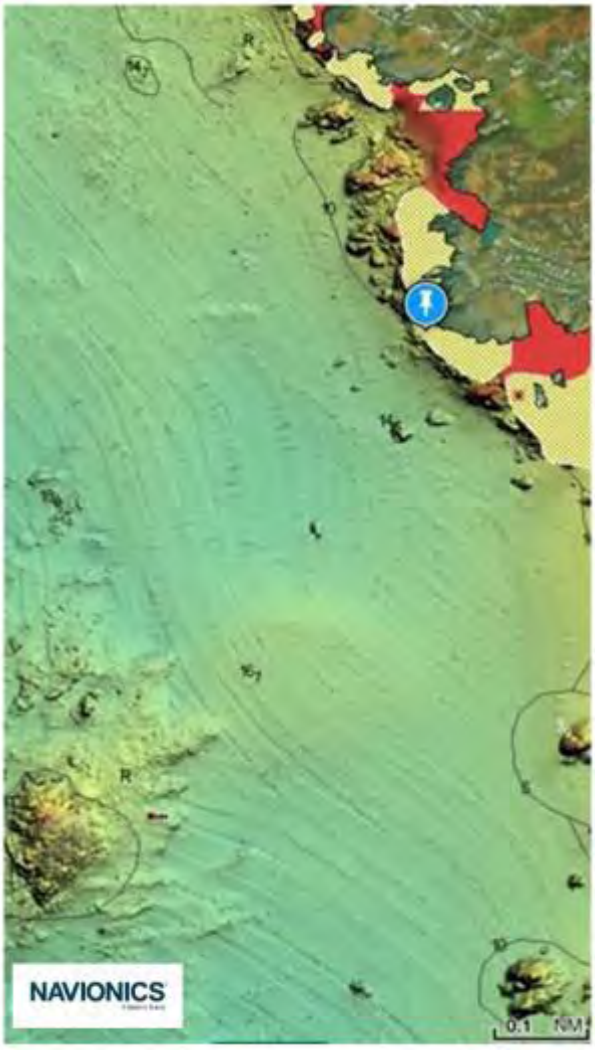
14.0 – 18.0 BSL
11.0 – 15.0 BCD

Tidal Streams:

Strong

Exposure:

Very exposed



Site description

Porth y Garan is situated south of Treaddur Bay off Holy Island on the west coast of Anglesey.

The site was located by the wreckage of the *Hermine* which is found in shallow water, then a series of bedrock spurs lead into deeper water.

A stepped reef of bedrock and angular boulders descended below 15 m bcd. The community below 10 m bcd was dominated by a mixed turf of hydroids and bryozoans and sponges. Both *Dysidea fragilis* and *Actinothoe sphyrodeta* were prominent in the community. Bryozoans were dominated by *Chartella papyracea*, *Alcyonidium diaphanum* and *Flustra foliacea*, the hydroids were characterised by *Aglaophenia* sp. and *Nemertesia antennina*. Patches of *Alcyonium digitatum* were present on the ridge edges and boulder tops.

Above: bedrock reef with dense hydroid-bryozoan turf, *Alcyonium digitatum* and a brown crab *Cancer pagurus*.

Above, bedrock reef with dense hydroid-bryozoan turf, sparse red algae and the branching sponge *Haliclona oculata*.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: *Pentapora foliacea.*

Human impacts

None observed.

Porth y Garan site sketch

Site 9: Red Roof Reef, Porth Dafarch

Date of dive: 11/05/23

Position: 53° 16.827 N 04° 38.836 W

Depth range (metres):

15.6 BSL

13.4 BCD

Tidal Streams:

Strong

Exposure:

Exposed

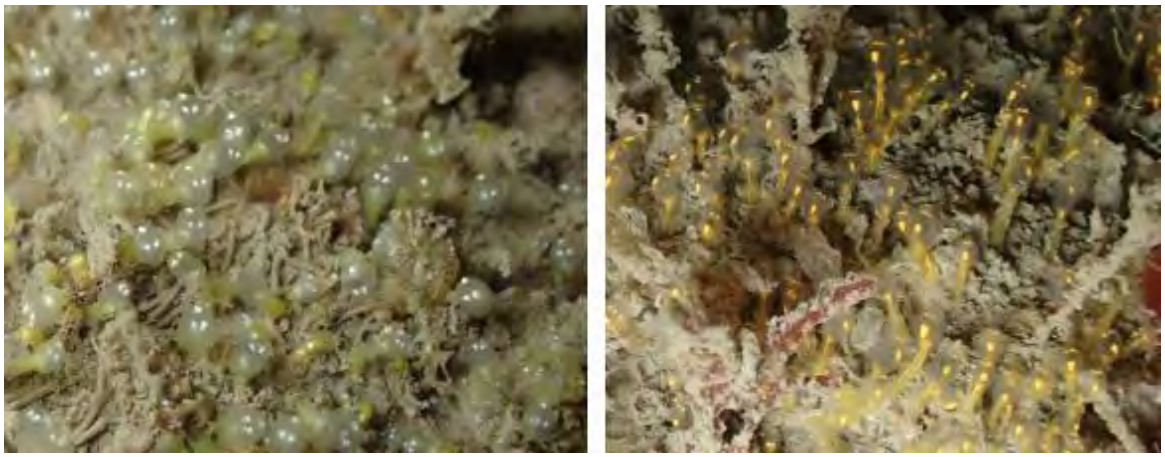
Site description

Site, known locally as Red Roof Reef, located near to the entrance to Porth Dafarch, off Holy Island on the west coast of Anglesey. The discrete bedrock and boulder reef was located using the Navionics multibeam chart (Navionics app).

The site comprised tide-swept but heavily silted bedrock and boulder reef bisected by a gully. Characterising the upper circalittoral community were a mix of heavily silted hydroids (*Nemertesia* spp. and *Hydrallmania falcata*) and bryozoan turf of *Flustra foliacea* and *Chartella papyracea* with occasional branching sponges (*Stelligera montagui*, *Axinella dissimilis*, *Raspaillia* spp.), many globe sponges *Tethya aurantium* and large *Cliona celata*. The delicate bryozoan *Pentapora foliacea* colonies were found on boulders and bedrock throughout the site. Large patches of the pinhead ascidian *Pycnoclavella* stood out from the silted rocks and the crevices in the rock provided refuge for many sea cucumbers *Pawsonia saxicola*. Occasional red algae included *Delessaria sanguinea*, under-tongue weed *Hypoglossum hypoglossoides* and *Heterosiphonia plumosa.*

Above, angular boulder slab with silted bryozoan turf and large *Cliona celata*.

Above, highly silted hydroids, *Nemertesia* spp. and *Pentapora foliacea*.



Above, large patches of pinhead ascidian *Pycnoclavella* spp.

Biotope

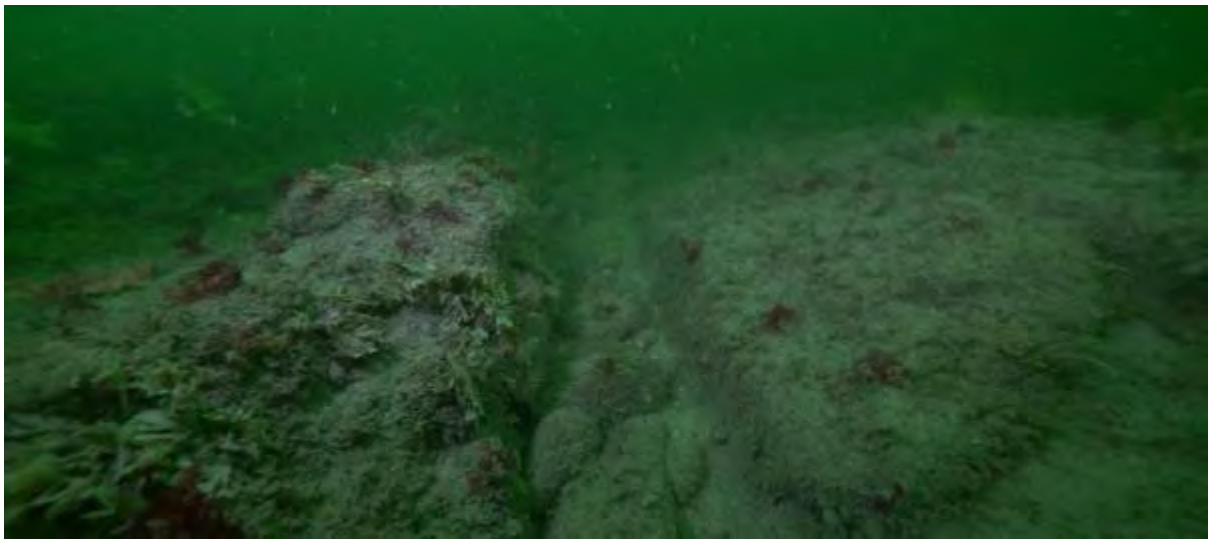
CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

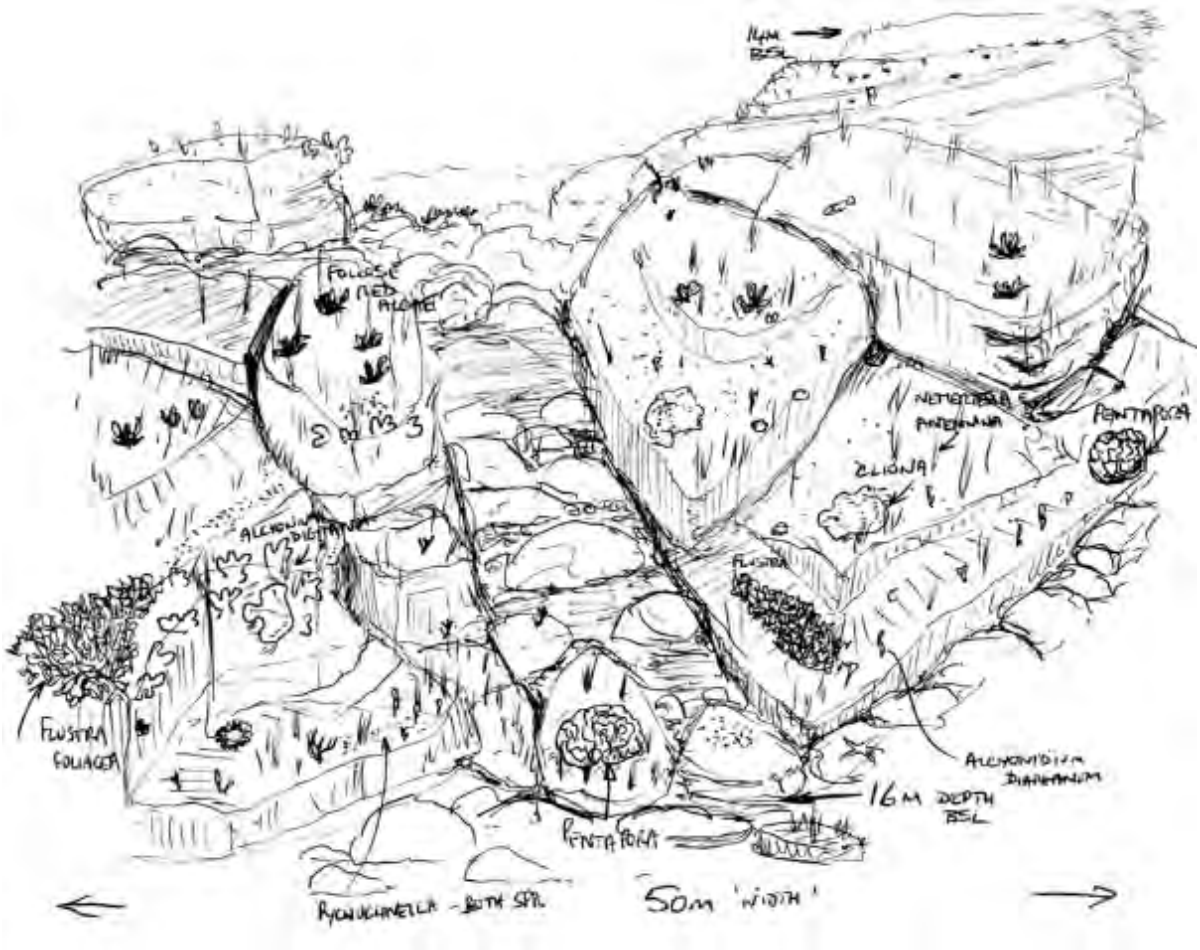
Species that may be sensitive to abrasion: *Axinella dissimilis*, *Pentapora foliacea.*

Human impacts

None observed.



Above, gully bisecting the reef.



Red Roof Reef site sketch.

Site 10: The Fangs

Date of dive: 16/05/23

Position: 53° 16.744 N

04° 40.862 W

Depth range (metres):

13.0 – 21.0 BSL
10.0 – 18.0 BCD

Tidal Streams:

Very strong

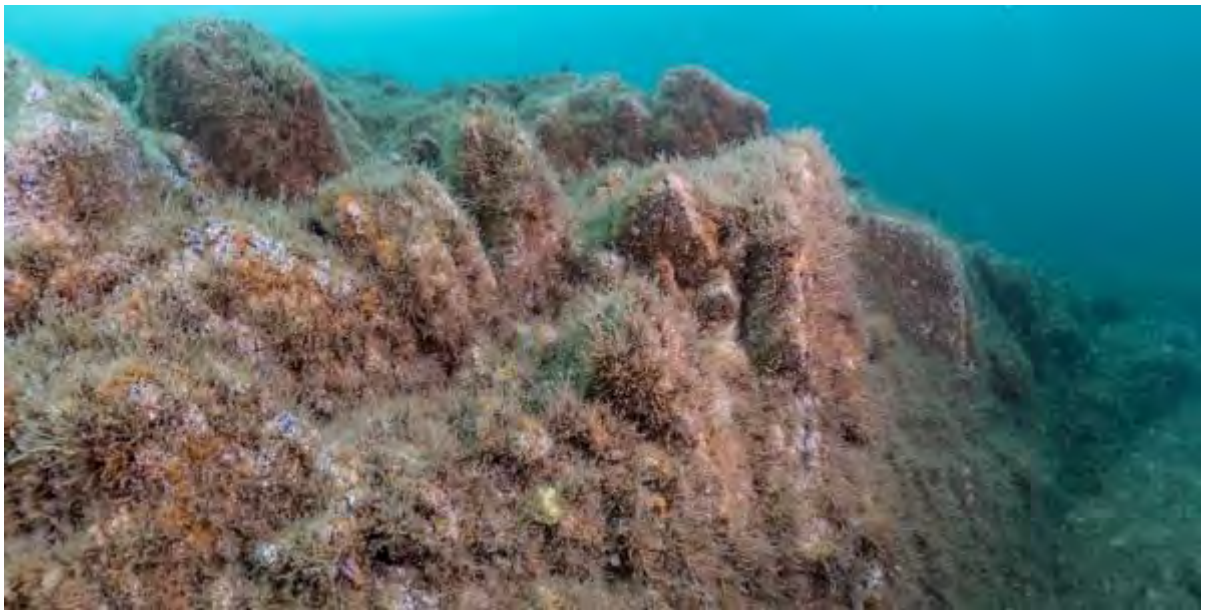
Exposure:

Very exposed

Site description

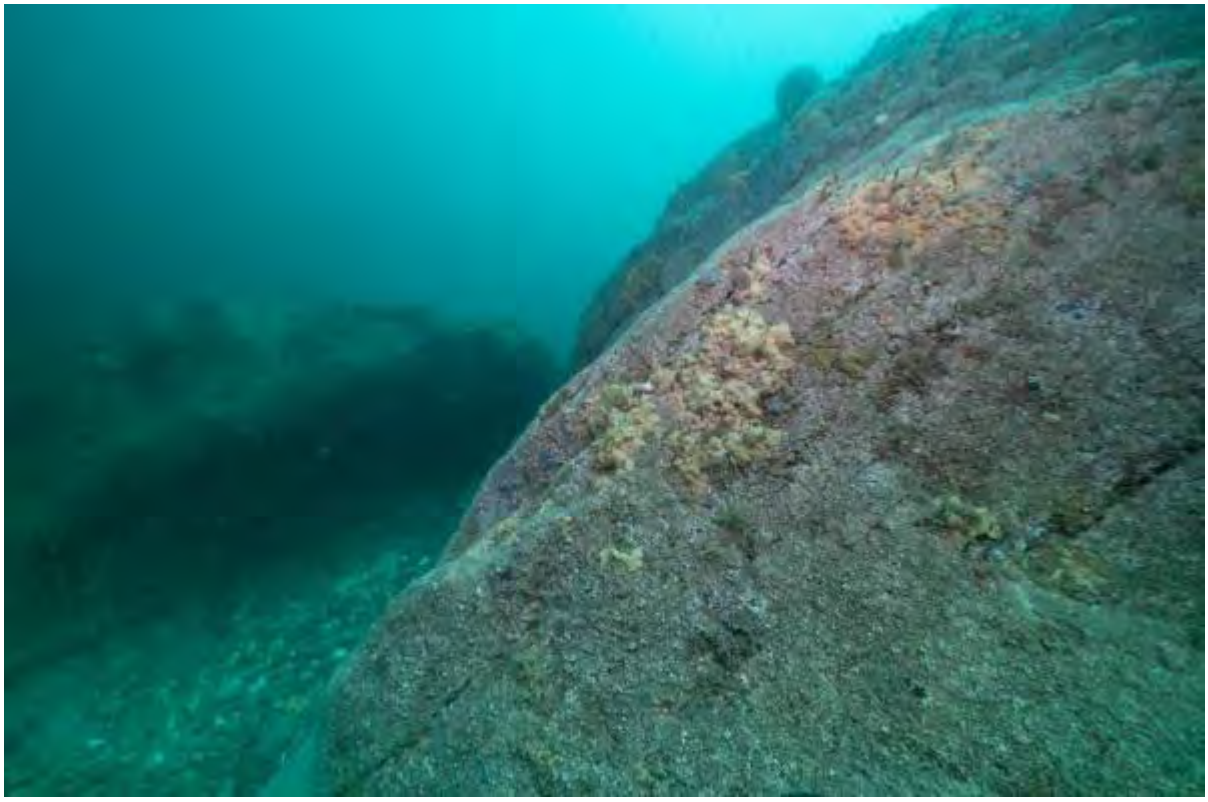
The Fangs are a series of offshore, steep-sided bedrock ridges, off Holy Island on the west coast of Anglesey. The site was chosen from Navionics multibeam chart (Navionics app) as a potential fragile sponge and anthozoan biotope location. This site had not previously been surveyed.

The whole area is subject to extremely strong tidal streams, so there were very few branching sponges. Instead, vast areas of rock were colonised by more robust barnacles *Balanus crenatus* with sparse *Alcyonium digitatum* on localised areas sheltered from strongest currents, and patchy sponges *Cliona celata* and *Pachymatisma johnstonia*. Short turfs of the oaten pipes hydroid *Tubularia indivisa* optimised the strong tidal currents with colonial ascidians and the breadcrumb sponge *Halichondria panicea* amongst them. At the deepest section of the site, the rounded cobbles and boulders were an indication of the powerful energy exerted on this site during seasonal storms, often scouring much of the lower bedrock completely bare, with all but the most robust epibiota present.



Above: scour-tolerant taxa such as *Tubularia indivisa* dominate the site.

Top left, patch of anemones *Actinothoe sphyrodeta* amongst hydroid turf. Top right and bottom left, dense faunal turf of sponges, anemones and hydroids on sheltered vertical rock. Bottom right, sponge *Pachymatisma johnstonia*.



Above, heavily scoured bedrock with dense barnacle cover and encrusting sponges.

Biotope

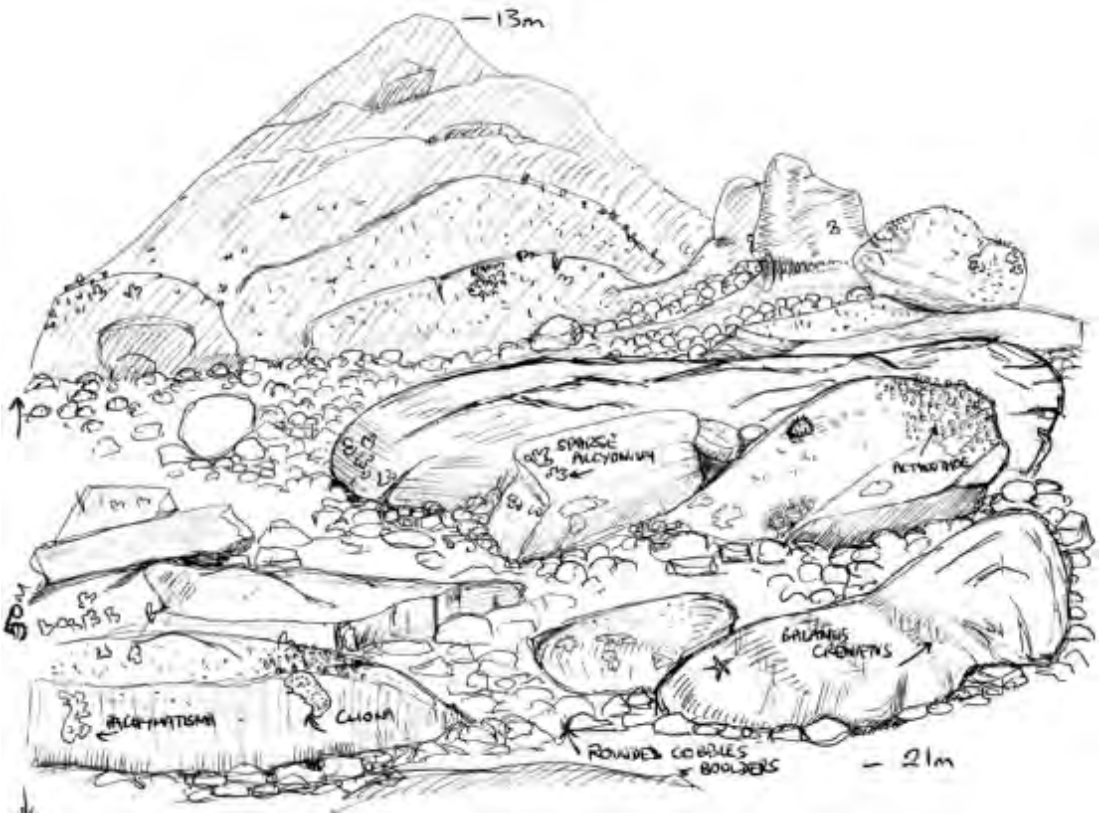
Non-target, CR.HCR.FaT.Ctub, *Tubularia indivisa* on tide-swept circalittoral rock

Species of interest including INNS

Species that may be sensitive to abrasion: *Pentapora foliacea.*

Human impacts

None observed.



The Fangs site sketch.

Site 11: NW of the Fangs

Date of dive: 16/05/2023

Position: 53° 16.953 N 04° 41.073 W

Depth range (metres):

11.4 – 12.8 BSL
9.8 – 11.2 BCD

Tidal Streams:

Strong

Exposure:

Very exposed

Site description

Site 11, was an additional dive, situated inshore, north-west of the Fangs, close into the cliffs, off Holy Island on the west coast of Anglesey. The site was chosen as an additional site once two diver pairs had dived The Fangs. This site had not previously been surveyed.

The site was a more sheltered gully closer to the original site 8 and reaching a depth of 11 m bcd. The majority of the dive was in the infralittoral zone, within *Laminaria hyperborea* kelp forest. The upper depth limit of the fragile sponge biotope was encountered at the maximum depth of the dive (11 m bcd) where most of the core species were observed. The bryozoan turf comprised crisids and Bugula spp., with small sponges (*Stelligera / Raspaillia*) and occasional axinellid sponges. There were occasional patches of anemones *Actinothoe sphyrodeta.* The surveyors considered that at this deeper point the biotope was transitioning into the fragile sponge biotope, but the site went no deeper and ran into a cobble bottom. The data suggest the biotope occurs in many of the deeper gullies in this area that are afforded greater shelter from the prevailing tides.

Left: habitat 1 – shallow kelp park, with octopus. Right: habitat 2 – sponges, faunal turf and red algae on vertical rock.

Above: dense faunal turf with anemones *Actinothoe sphyrodeta*.

Biotope

Habitat 1 Kelp park – IR.MIR.KR.LhypT.Ft. *Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock.

Habitat 2 The transition to the fragile sponge and anthozoan biotope was recorded adjacent to the shallower kelp biotope.

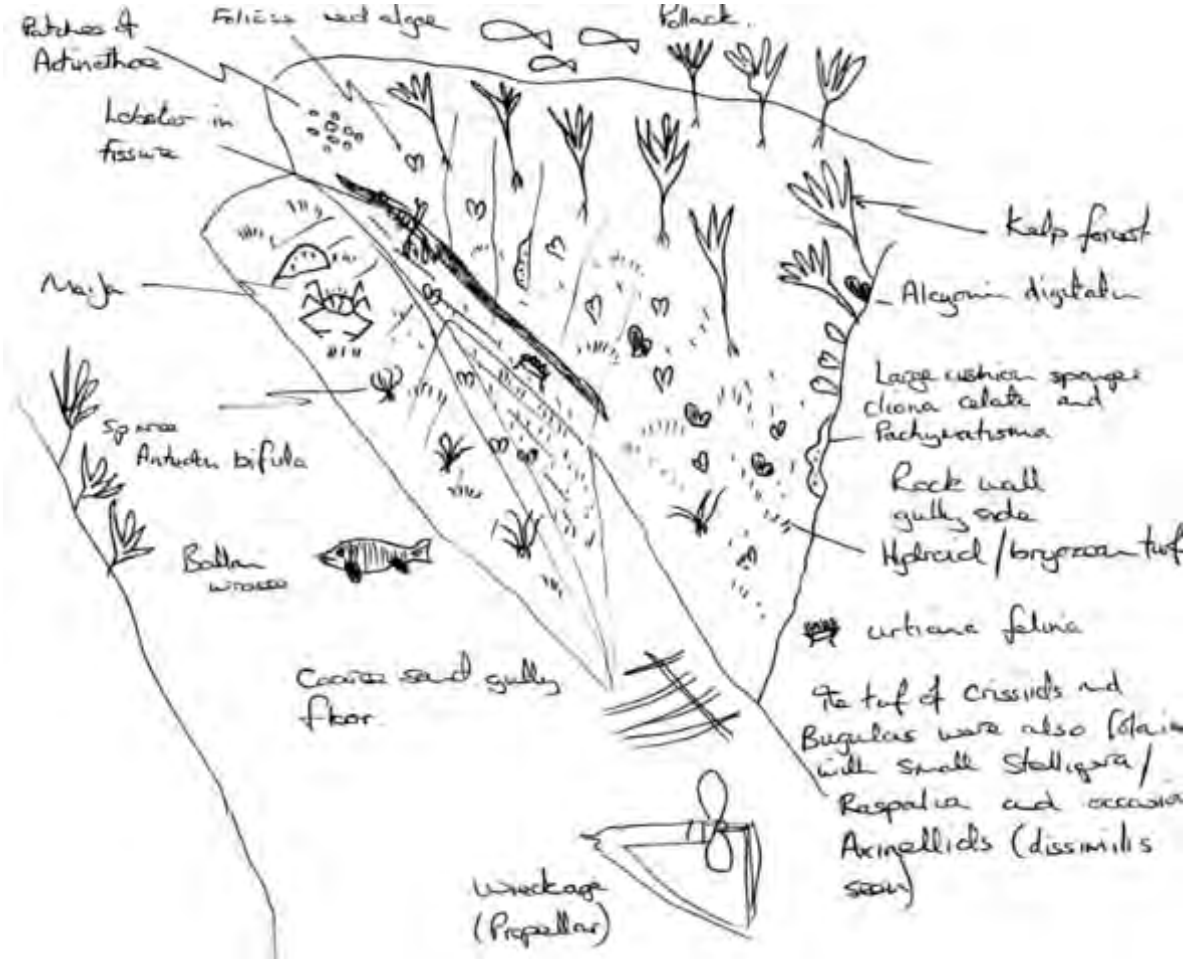
CR.HCR.Xfa.ByFa.ByErSp.DysAct. Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis*, *Pentapora foliacea.*

Human impacts

None observed.



NW of The Fangs site sketch.

Site 12: Porth y Gwin

Date of dive: 25/04/2023

Position:

53° 17.185 N 04° 41.373 W

Depth range (metres):

11.0 – 16.1 m BSL
9.0 – 14.1 m BCD

Tidal Streams:

Moderately strong

Exposure:

Very exposed

Site description

Porth y Gwin is a small open bay, south of South Stack, off Holy Island on the west coast of Anglesey. The seabed consists of large and small boulders with rugged bedrock ridges supporting mixed sponges, anthozoans, hydroids and colonial ascidians.

Inshore, in shallower water above the target biotope was a large boulder field with *Laminaria hyperborea* kelp park and red algae on upward facing rock, and with vertical and steep sides of massive boulders with faunal turf (recorded by pair 1).

Vertical bedrock walls in the upper circalittoral were mainly dominated by sponges, particularly *Pachymatisma johnstonia* and many colourful encrusting species, numerous branching sponges (including *Stelligera*, *Raspaillia* and *Axinella* spp.), ascidians, particularly *Aplidium punctum* and patchy areas of *Dendrodoa grossularia* and *Pycnoclavella* spp. interspersed with silted crisid turf (recorded by pair 2).

Above: sponge *Pachymatisma johnstonia* amongst silted faunal turf with scattered red algae.

Above, branching sponge *Axinella dissimilis* and encrusting sponges *Hemimycale* columella and *Dysidea fragilis*.

Biotope

Habitat 1: IR.MIR.KR.LhypT.Pk – *Laminaria hyperborea* park with hydroids, bryozoans and sponges on tide-swept lower infralittoral rock.

Habitat 2: CR.HCR.Xfa.ByFa.ByErSp.DysAct – Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

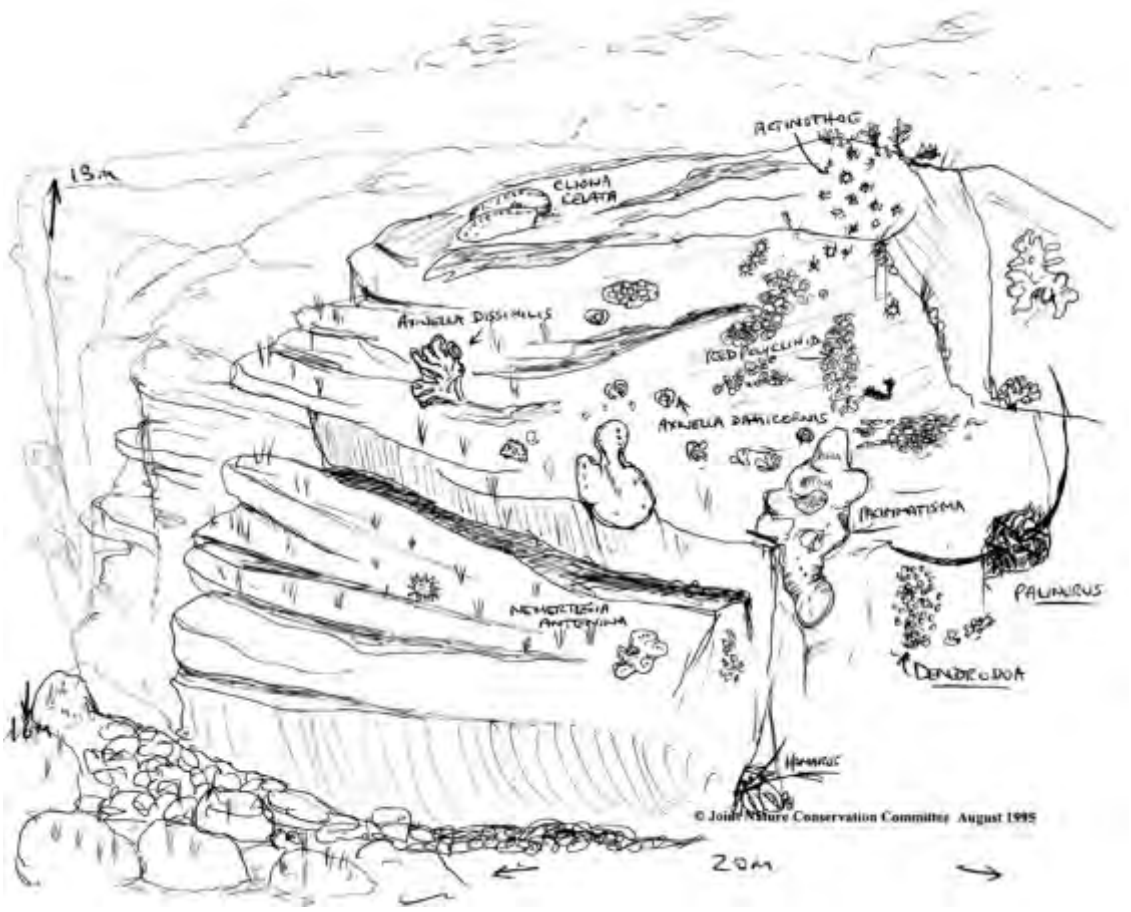
Species that may be sensitive to abrasion: *Axinella damicornis*, *Axinella dissimilis*

Rare or scarce species: the sponge crust *Hexadella topsenti* was present; the only other North Wales records are from nearby off north Holy Island, Anglesey.

Section 7 species: *Palinurus elephas*

Human impacts

Potting observed.



Porth y Gwin site sketch

Site 13: Off Abraham’s Bosom

Date of dive: 26/04/2023

Position: 53° 17.851 N 04° 41.594 W

Depth range (metres):

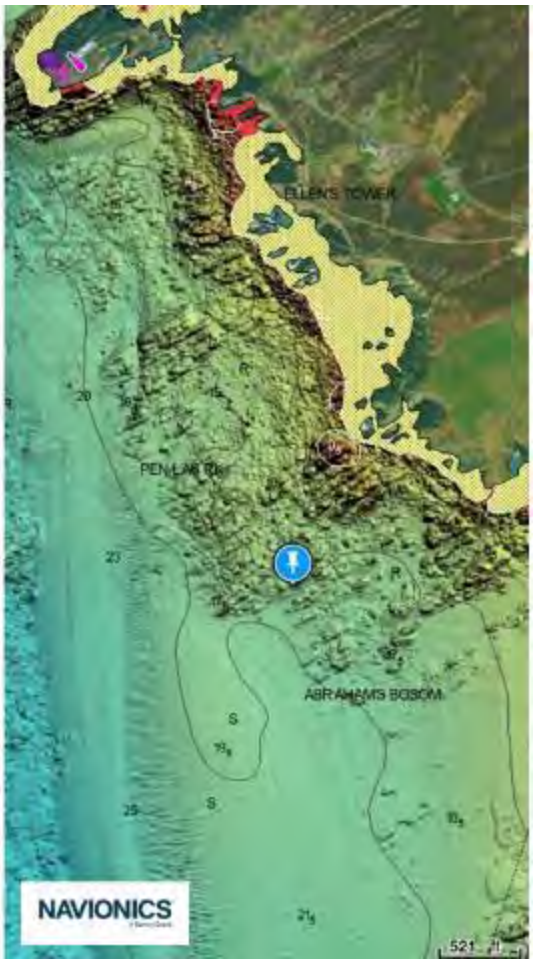
18.0 – 20.0 m BSL
16.2 – 18.2 m BCD

Tidal Streams:

Strong

Exposure:

Very exposed



Site description

Abraham's Bosom forms an extensive bedrock outcrop situated in an open bay south-east of South Stack, off Holy Island, west Anglesey. The site is very exposed to wave action and strong tidal streams.

The area of seabed surveyed comprised a boulder field and although appearing to be quite sparsely colonised and highly silted, there were some very large boulders with more diverse faunal turfs on the vertical faces. The site was characterised by sponges, hydroid turf (including *Aglaophenia* spp.), bryozoan turf of *Flustra foliacea*, distinct patches of the small pinhead ascidians *Pycnoclavella producta* and *Pycnoclavella stolonialis* and clusters of the anemone *Actinothoe sphyrodeta*. A variety of sponge species included fragile, erect specimens of *Stelligera* spp., *Axinella dissimilis, Axinella infundibuliformis* and *Haliclona oculata*. Patches of the yellow feathers hydroid *Gymnangium montagui* were also found.

Above: rounded boulder with sponges and bryozoan *Flustra foliacea.*


Above left: very large boulder with massive growth of *Pachymatisma johnstonia*. Above right: *Stelligera montagui* sponge and *Aglaophenia* hydroid.


Above left: anemones *Actinothoe sphyrodeta* buffeted by the tide. Above right: cup sponge *Axinella infundibuliformis* and pinhead ascidian *Pycnoclavella aurilescens*.

Biotope

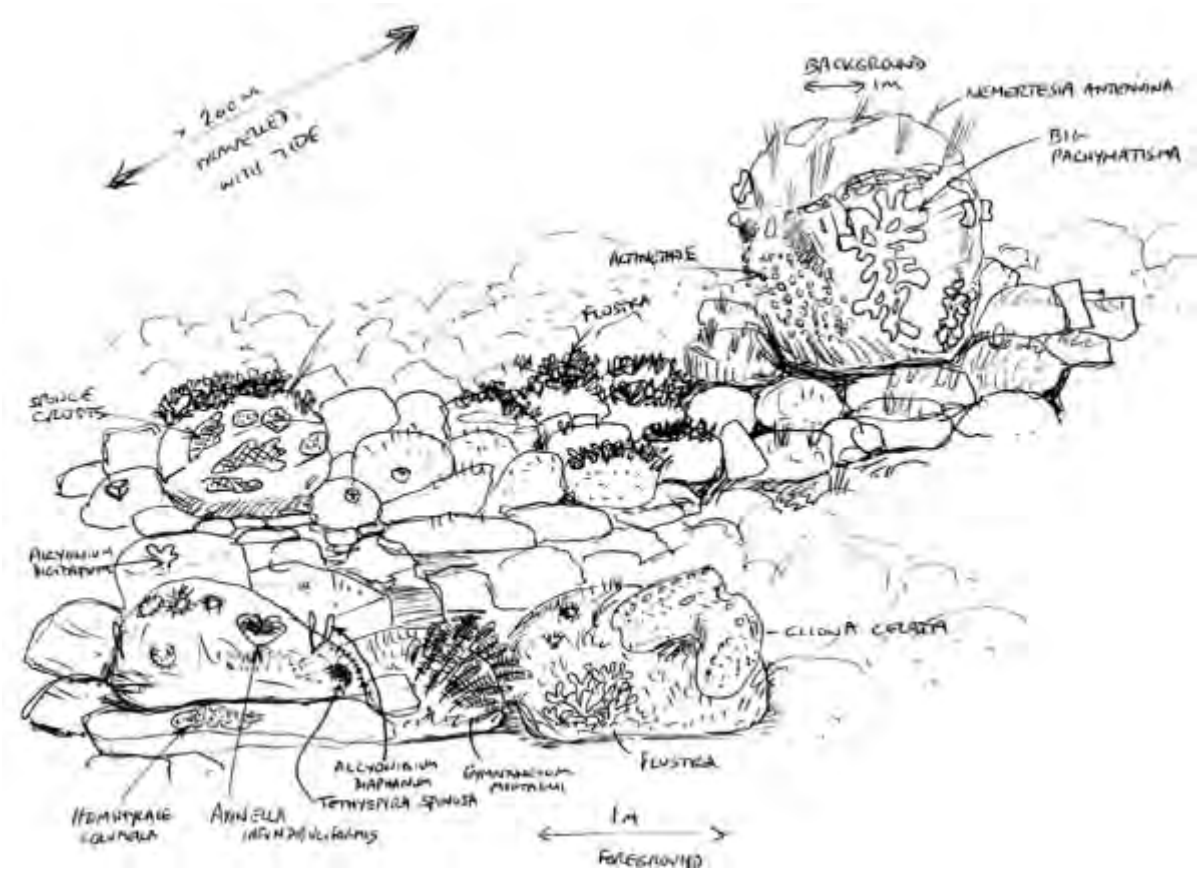
CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis*, *Axinella infundibuliformis*

Human impacts

Potting observed.



Off Abraham's Bosom site sketch.

Site 14: South Stack ‘north’

Date of dive: 25/04/2023

Position:

Start 53° 18.484 W 04° 41.971 N

End 53° 18.524 W 04° 42.005 N

Depth range (metres):

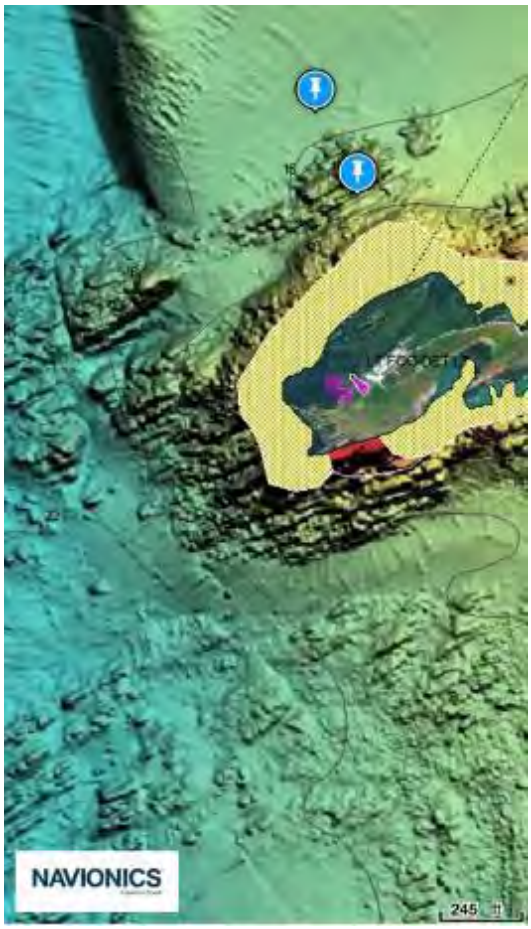
18.0 – 20.0 m BSL
13.3 – 15.3 m BCD

Tidal Streams:

Strong

Exposure:

Very exposed



Site description

The survey site at South Stack ‘north’, off Holy Island, west Anglesey, was selected as a likely area for fragile sponge and anthozoan communities from previous survey data, based on the depth profile and indication of bedrock, in an exposed location. The original MNCR survey position was over sedimentary substrate and would not have supported the target biotope (see top site marker in site plan above). Abraham’s Bosom was the intended site for this dive but due to a back eddy there was no slack water at the predicted time. Observation of a local pot buoy suggested slack was present off South Stack, so this site was dived instead.

The seabed comprised a series of lower circalittoral, very silted bedrock ridges and scoured boulders with solitary ascidians such as sand encrusted *Molgula* sp., *Aplidium* spp. and *Polycarpa scuba. B*ryozoan turf (*Flustra foliacea*), dense hydroids (*Aglaophenia* spp., *Nemertesia antennina* and *Sertularia* spp.) and *Axinella dissimilis* on bedrock were interspersed with gravelly cobble plains aligned parallel to South Stack Island. An increasingly very strong current and limited visibility prevented completion of the survey.

Above, very silted, tide-swept bedrock reef with hydroid and bryozoan turf.

Above, silted, stepped bedrock reef with an array of sponges – *Dysidea fragilis*, *Aplysilla rosea*, *Hemimycale columella* and the ascidian *Pycnoclavella stolonialis.*

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

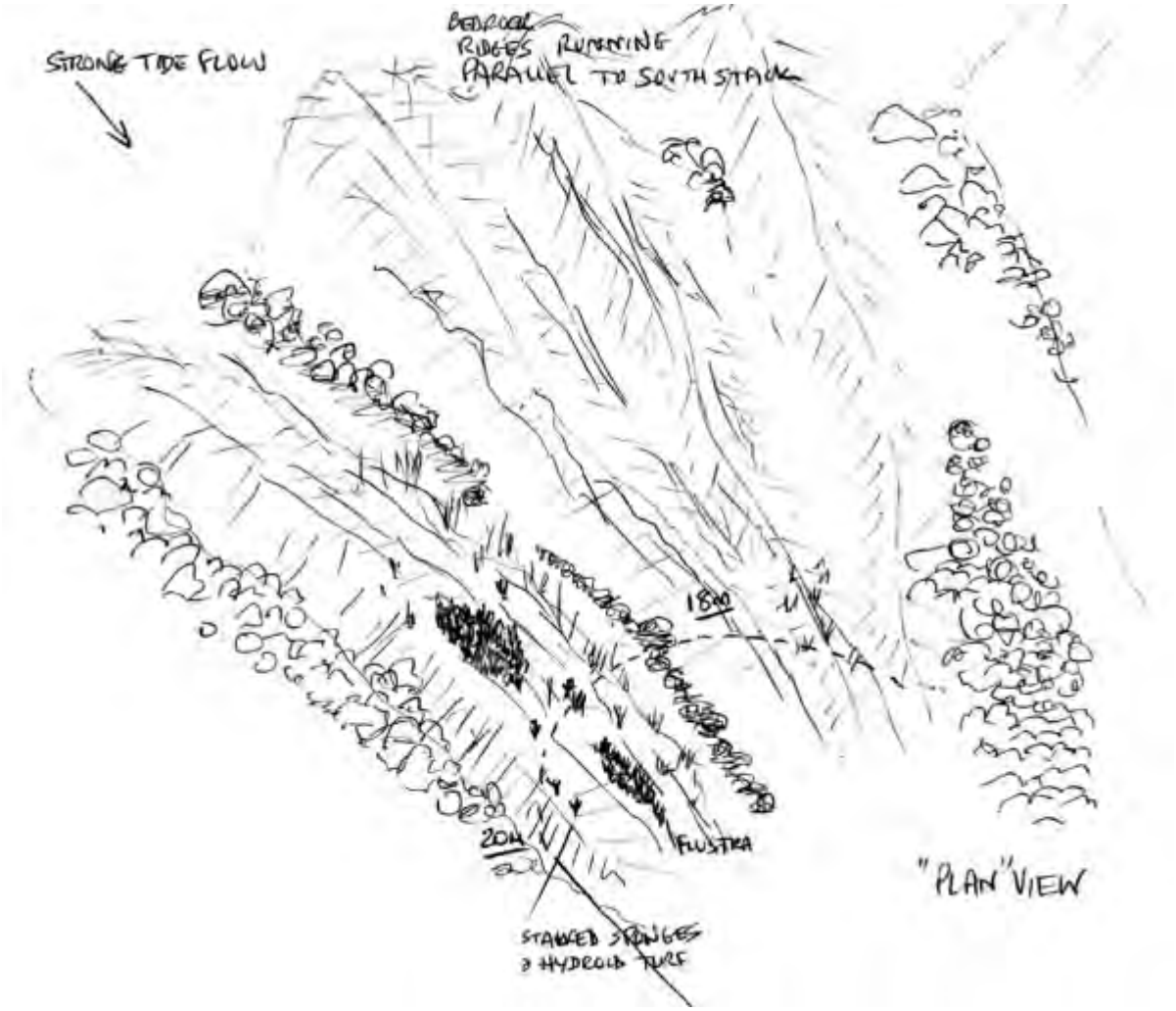
Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis*

Section 7 species: Harbour porpoise *Phocoena phocoena* observed from the boat, breaking the surface c. 20 m from the dive site. Three individuals seen.

Human impacts

Potting observed.



South Stack North site sketch.

Site 15: East of North Stack

Date of dive: 27/04/2023

Position:

Start: 53° 19.318 N 04° 40.054 W

End: 53° 19.295 N 04° 40.048 W

Site centre 53° 19.309 N. 04° 40.050. W

Depth range (metres):

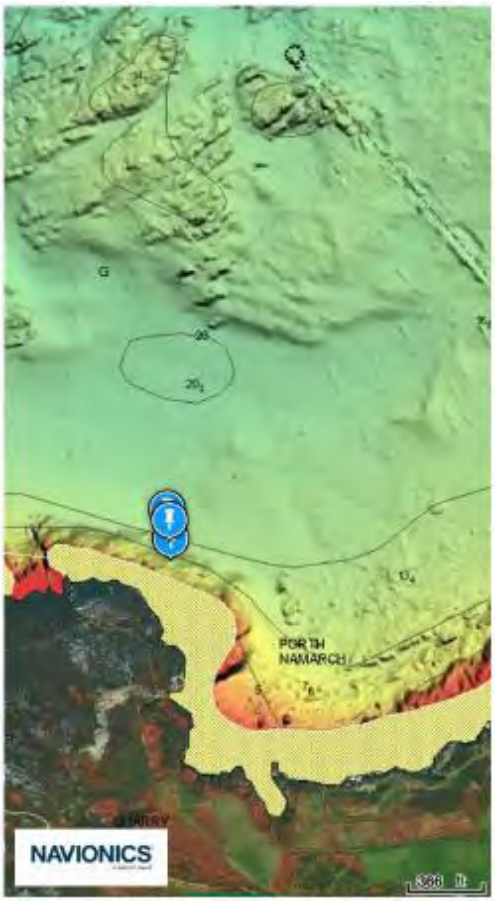
11.0 – 17.0 m BSL
8.1 – 14.1 m BCD

Tidal Streams:

Strong

Exposure:

Moderately exposed



Site description

The survey site was situated off Porth Namarch, Holy Island, on the north-west coast of Anglesey. It was selected as a likely area for fragile sponge and anthozoan communities from previous survey data based on the depth profile and indication of bedrock, in a moderately exposed, tide-swept location.

The lower circalittoral slope of very silted bedrock and large boulders descended to cobble and boulder plain with sediment. Dense aggregations of *Dendrodoa grossularia* dominated the rock, particularly on the shallower boulders with branching sponges, particularly *Stelligera stuposa.* The hydroid *Nemertesia antennina* and the erect bryozoan *Alcyonidium diaphanum* also characterised the site but were sparely distributed as localised patches. Vertical rock supported a variety of encrusting sponges and bryozoan turf species (Crisiidae, *Scrupocellaria* sp. and *Chartella papyracea*).

The site was not considered the best representation of the biotope given the dense aggregations of *Dendrodoa* and with only very few branching sponges or *Actinothoe* in localised areas.

Above: silted, tide-swept bedrock densely colonised by the orange ascidian *Dendrodoa grossularia*; inset close-up of dense *Dendrodoa*).

Above, fragile, erect sponges (*Axinella dissimilis*, *Raspailia ramosa* and *Raspaillia hispida / Stelligera stuposa*).

Above, extremely silted habitat with erect sponges, *Nemertesia antennina* hydroids, sun star *Crossaster papposus*; inset papillate sponge *Polymastia* sp. buried by sediment.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

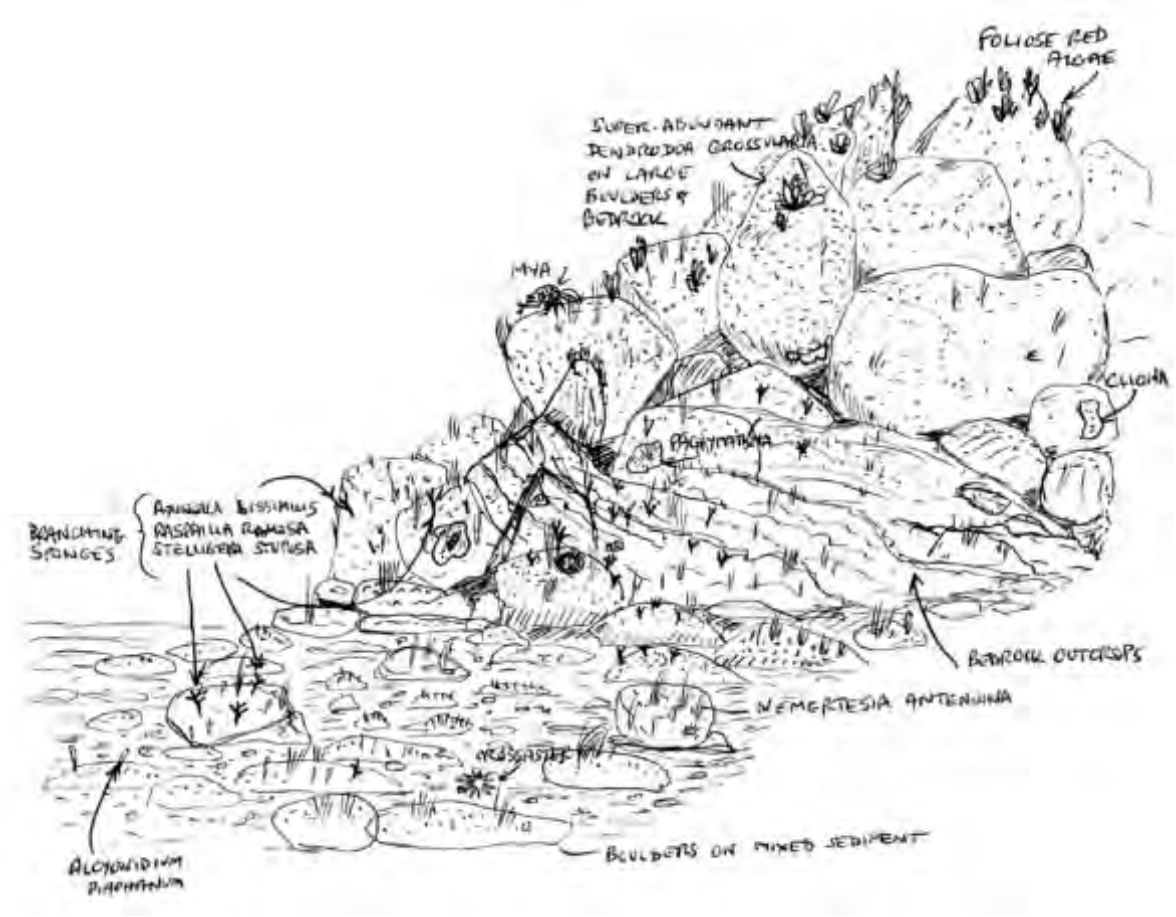
Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella damicornis, Axinella dissimilis*

Rare or scarce species: The sponge crust *Hexadella topsenti* was present; the only North Wales records are from the same coastal area, north Holy Island.

Human impacts

Potting observed.



East of North Stack site sketch.

Site 16: NW Breakwater Reef

Date of dive: 29/04/2023

Position: 53° 19.704 N 04° 38.663. W

Depth range (metres):

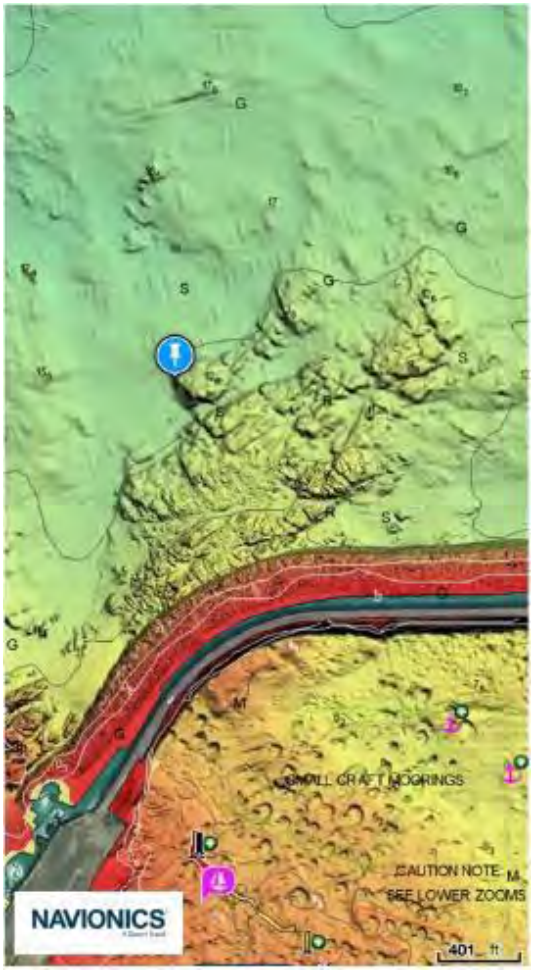
15.0 – 19.3 m BSL
12.2 – 16.5 m BCD

Tidal Streams:

Strong

Exposure:

Moderately exposed



Site description

This survey site, north-west of Holyhead breakwater, Holy Island, west Anglesey, was selected as a likely area for fragile sponge and anthozoan communities based on the depth profile and indication of bedrock, in a moderately exposed, tide-swept location. This site had not previously been surveyed.

The site comprised a seabed of wide bedrock slopes interspersed with short vertical faces with crevices providing shelter for holothurians *Pawsonia*, crabs, and fish. The bedrock graded into a boulder and cobble field at depth. Vertical rock and ledges supported a diverse variety of erect sponges, hydroids and ascidians. Crisiidae were abundant in the silted turf and *Cellaria* sp. was present throughout. Beneath the turf the encrusting polychaete worm *Sabellaria spinosa* was common.

Also present at this site was a dense patch of feather stars *Antedon bifida* at the upper most flat plateau and occasional edible sea urchins, *Echinus esculentus.*

Above: hydroids (*Nemertesia* spp.) and bryozoan turf (mostly Crisiidae); inset sponge or scorpion spider crab *Inachus* spp.

Above: the hydroid *Halecium halecinum* covers the top of the rock with dense colonial ascidian *Aplidium* spp. below. Insert bloody henry starfish Henricia sp.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct

Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

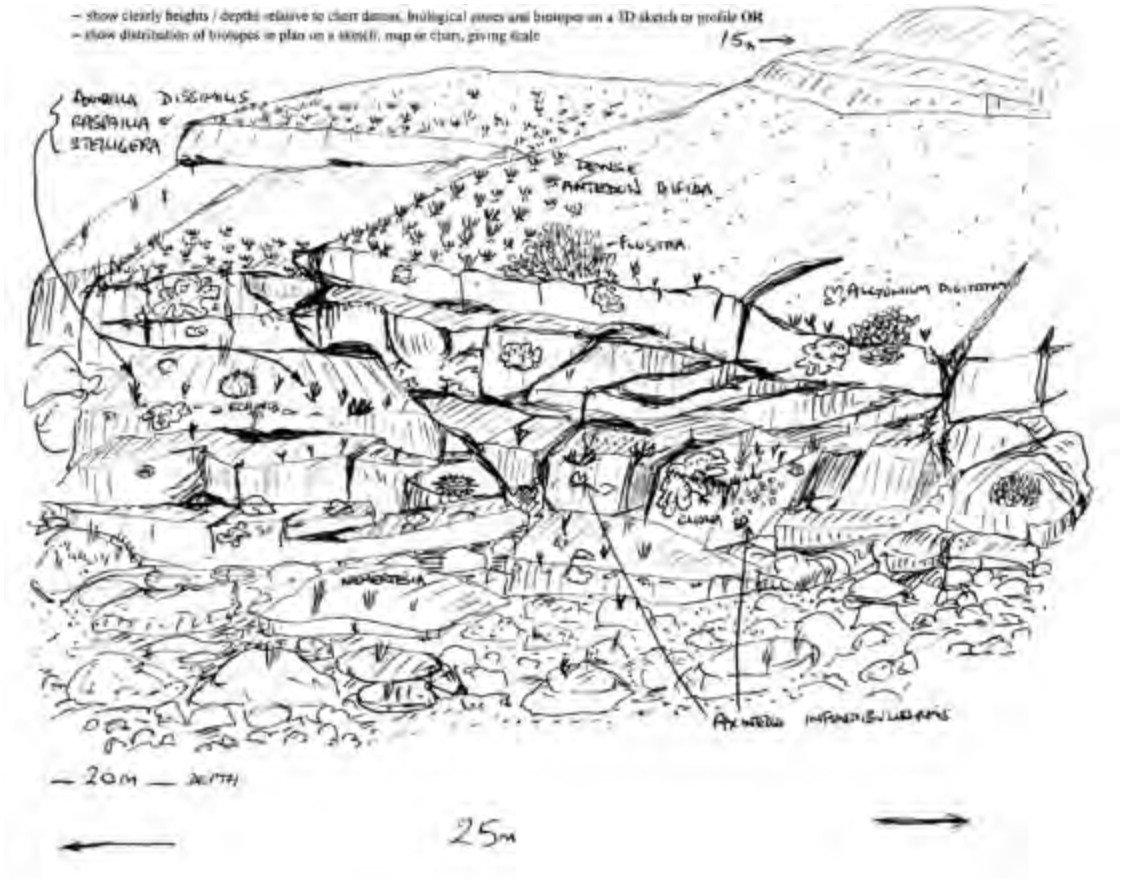
Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella damicornis, Axinella dissimilis, Axinella infundibuliformis.*

Human impacts

Potting observed.

Above: view of stepped bedrock at NW Breakwater Reef.



NW Breakwater Reef site sketch.

Site 17: North Bolivar Rock

Date of dive: 27/04/2023

Position: 53° 21.582 N 04° 35.176 W

Depth range (metres):

10.0 – 13.7 m BSL
 7.7 – 11.4 m BCD

Tidal Streams:

Moderately strong

Exposure:

Exposed

Site description

North Bolivar Rock was selected as a survey site based on previous MNCR data as an area likely to support fragile sponge and anthozoan communities. It is situated on the north-west coast of Anglesey, in Holyhead Bay in a moderately exposed, tide-swept location. The outcrop comprises a series of rounded pinnacles surrounded by cobble and sediment plains and was one of the most silted sites visited in 2023.

Low-lying, stepped, bedrock lead down to a boulder plain with branching sponges, hydroids, bryozoans and patches of anemones. Silted rock supported branching sponges (particularly *Stelligera stuposa*), occasional starfish, feather stars *Antedon bifida*, the bryozoan *Alcyonidium diaphanum*, the hydroid *Nemertesia* spp. and anemones *Actinothoe sphyrodeta*. Vertical and overhanging edges of bedrock and boulders were colonised by ascidians (particularly *Dendrodoa grossularia*, which was locally abundant on some vertical faces, and *Aplidium punctum*), hydroids (particularly *Aglaophenia* sp.), and bryozoans (*Bugula* spp. and Crisiidae). Sponges included *Pachymatisma johnstoni* and *Axinella infundibuliformis*. Small foliose red algae were present in shallower areas.

Above: upper circalittoral tide-swept, stepped, highly silted bedrock reef with a hydroid-bryozoan turf, erect sponges, *Tethya citrina* sponges and red algae.

Above: lower circalittoral tide-swept, bedrock and boulders with fragile erect sponges (*Stelligera stuposa / Raspailia hispida* and *Axinella dissimilis*) and feather stars *Antedon bifida* amongst a highly silted faunal turf.

Above, fragile, erect axinellid sponges. Left: *Axinella dissimilis*. Right: *Axinella dissimilis* and *Axinella infundibuliformis*.

Biotope

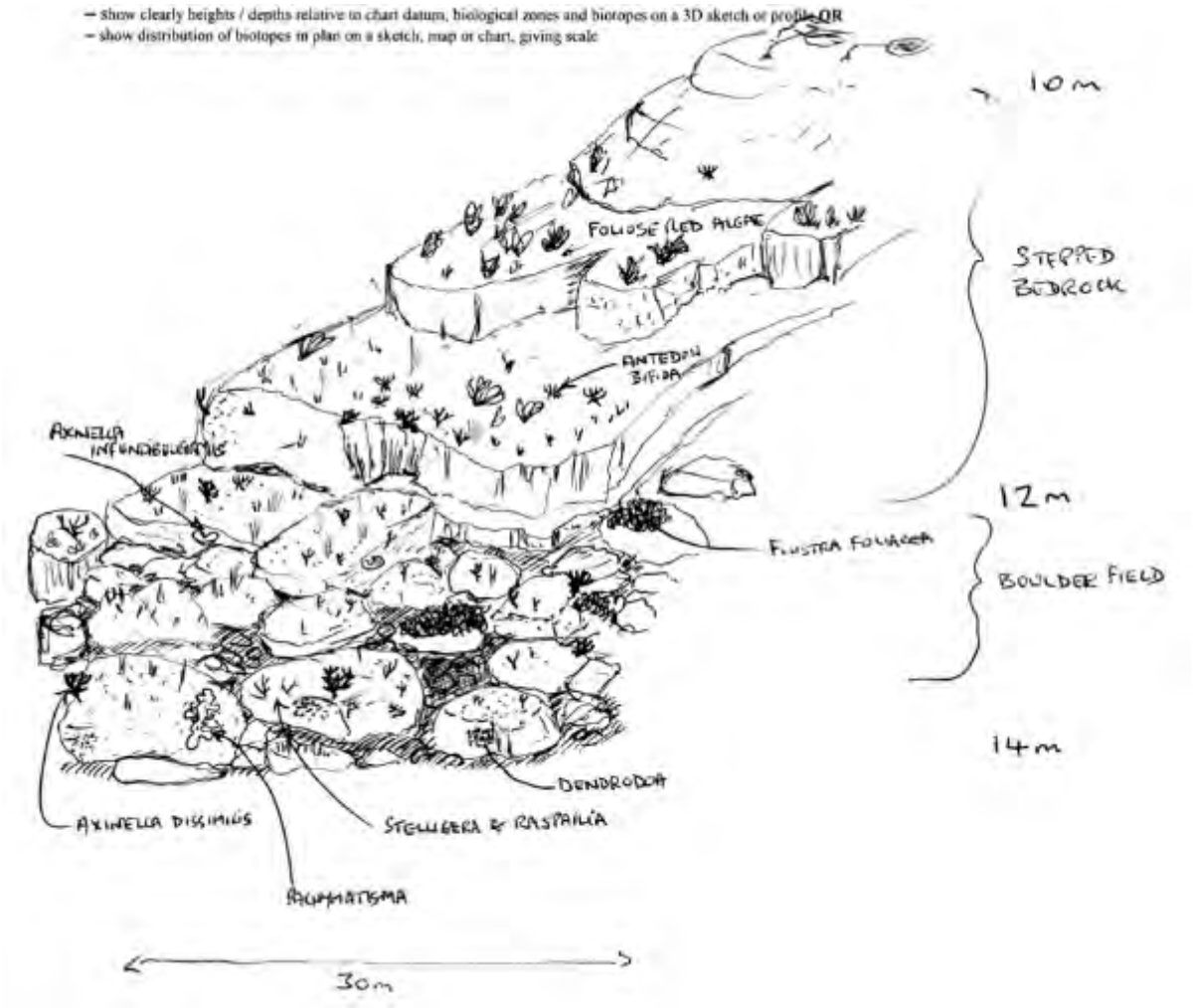
CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis, Axinella infundibuliformis*

Human impacts

Potting observed.



North Bolivar Rock site sketch.

Site 18: Off Clegir Point

Date of dive: 28/04/2023

Position: 53° 22.821 N 04° 34.256 W

Depth range (metres):

10.0 – 16.0 m BSL
7.6 – 13.6 BCD

Tidal Streams:

Moderately strong

Exposure:

Very exposed

Site description

The survey site selected off Clegir Point was based on previous MNCR survey sites, as an area likely to support fragile sponge and anthozoan communities. It is situated north of Holyhead Outer Harbour, on the north-west coast of Anglesey.

The area surveyed was a silted, rounded bedrock promontory surrounded by a boulder plain with larger boulders and bedrock. The steep, circalittoral bedrock and boulders were characterised by the hydroids *Nemertesia antennina* and *Aglaophenia* sp. (with *Tubularia indivisa* also present) with a dense, low bryozoan crisid turf. The delicate bryozoan *Pentapora foliacea* was recorded from the boulders. Feather stars *Antedon bifida* and occasional large sponges *Cliona celata* and *Pachymatisma johnstonia* were also prominent.

Erect, fragile sponges were sparse throughout the site but included *Axinella dissimilis*, *Axinella infundibuliformis*, *Stelligera montagui*, *Raspailia hispida* / *Stelligera stuposa.* The surveyors considered there were sufficient to justify assigning the target biotope.

Above: boulder with encrusting sponges, a *Pachymatisma* sponge and crisid turf.

Above: fragile branching sponges. Left: *Axinella dissimilis* and *Axinella infundibuliformis*. Top right: *Stelligera montagui*. Bottom right: *Axinella dissimilis*.

Biotope

CR.HCR.Xfa.ByFa.ByErSp.DysAct Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

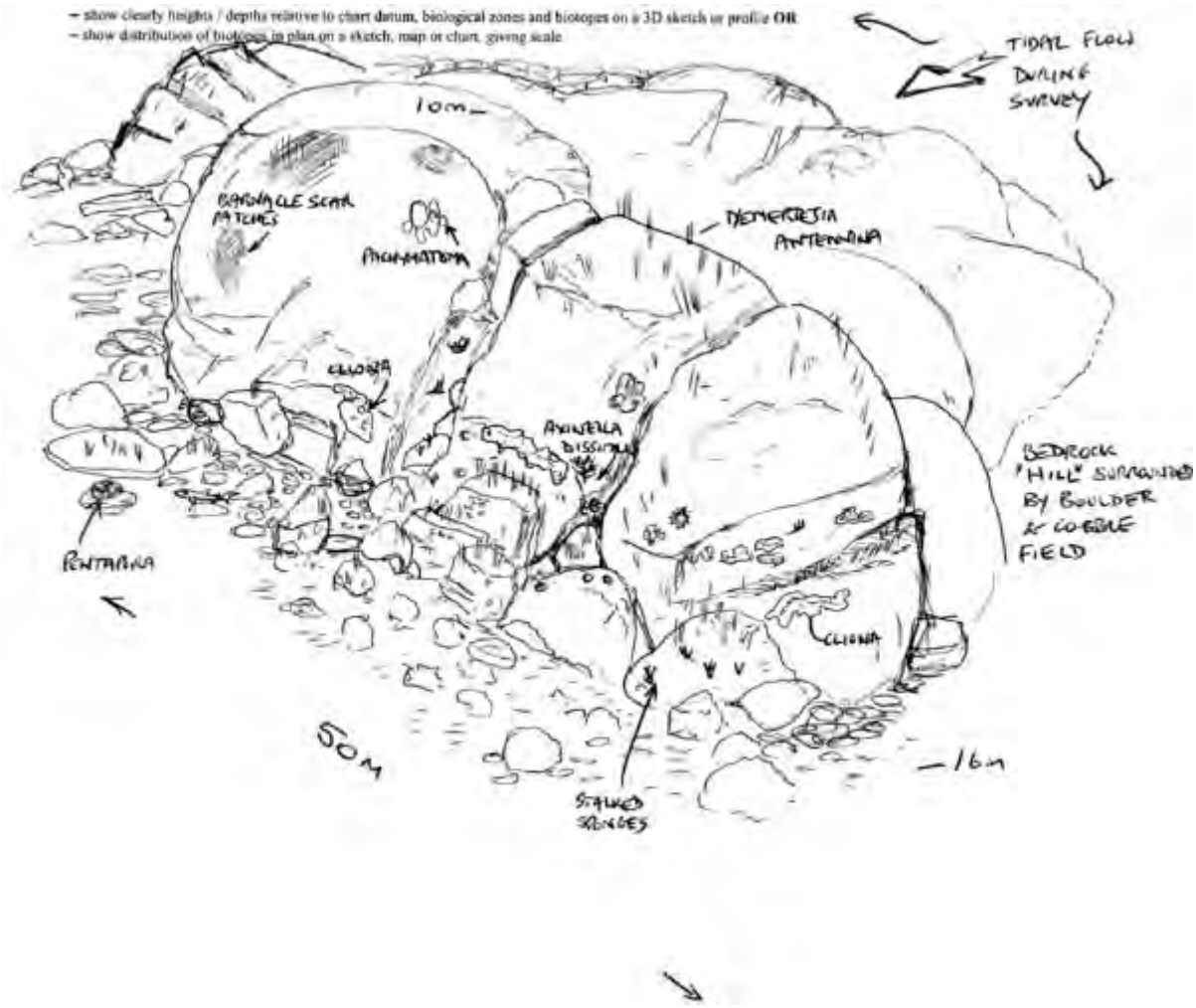
Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis, Axinella infundibuliformis. Pentapora foliacea* with signs of physical damage.

Section 7 species: Harbour porpoise *Phocoena phocoena* seen breaking the surface halfway between Holyhead Marina and the survey site. One individual was seen.

Human impacts

Potting observed.



Off Clegir Point site sketch.

Site 19: Llanbadrig Head

Date of dive: 14/05/23

Position: 53° 25.644 N 04° 26.558 W

Depth range (metres):

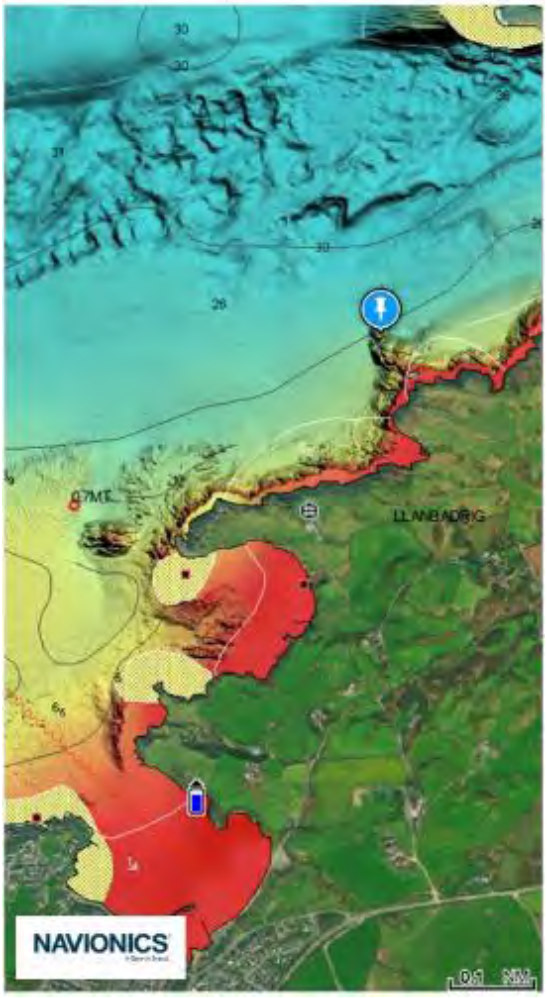
14.0 – 23.0 m BSL
10.2 – 19.2 m BCD

Tidal Streams:

Strong

Exposure:

Moderately exposed



Site description

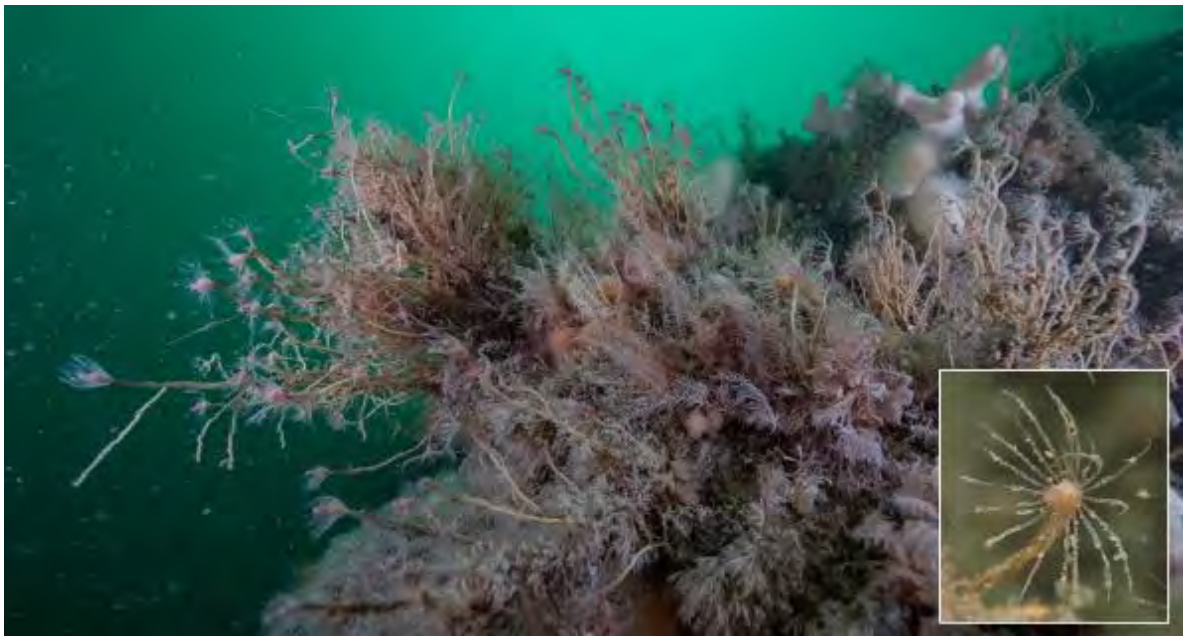
Llanbadrig Head is situated on the north coast of Anglesey. It was selected using the Navionics app as a potential fragile sponge and anthozoan biotope location based on the presence of bedrock in an exposed area with strong tidal streams. This site had not previously been surveyed.

The bedrock reef comprised a very rugged set of gullies and vertical faces with dense patches of *Alcyonium digitatum and* turfs of bryozoans such as crisids, *Chartella papyracea* and *Flustra foliacea*. Hydroids such as squirrel tails hydroid *Sertularia argentea*, *Halecium halecinum*, *Abietinaria abietina* were all present and *Tubularia indivisa* was recorded in dense patches on the exposed rock edges and vertical walls. Feather stars *Antedon bifida* also characterised the site. Erect sponges were relatively common and included *Raspailia ramosa*, *Stelligera stuposa* / *Raspailia hispida* and a few larger *Axinella dissimilis* branching sponges on an overhanging vertical face. The cushion sponges were dominated by *Dysidea fragilis*. Two crawfish *Palinurus elephas* were seen in crevices.

The site differed from those on the west coast with more steeply sloping and vertical rock faces. The surveyors felt the individual erect sponges were generally of a smaller size on this site compared to others, although direct measurements were not taken to confirm this. *Tubularia indivisa* was also characteristic of the site. *Actinothoe sphyrodeta* was abundant yet patchy with the small anemone *Epizoanthus couchii* frequent in amongst the turf.

Above, large boulders with prominent anthozoan *Alcyonium digitatum* and sponge *Pachymatisma johnstonia*.

Above, dense bryozoan turf with branching sponges, *Raspaillia ramosa* and *Stelligera stuposa / Raspailia hispida*. A single *Actinothoe sphyrodeta* anemone is just visible.



Dense hydroid *Tubularia indivisa* (and inset).

Rounded boulder with dense feather stars *Antedon bifida* amidst a dense bryozoan turf and patches of ascidian *Aplidium punctum* (inset).

Biotope

CR.HCR.XFa.ByFa.ByErSp.DysAct

Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

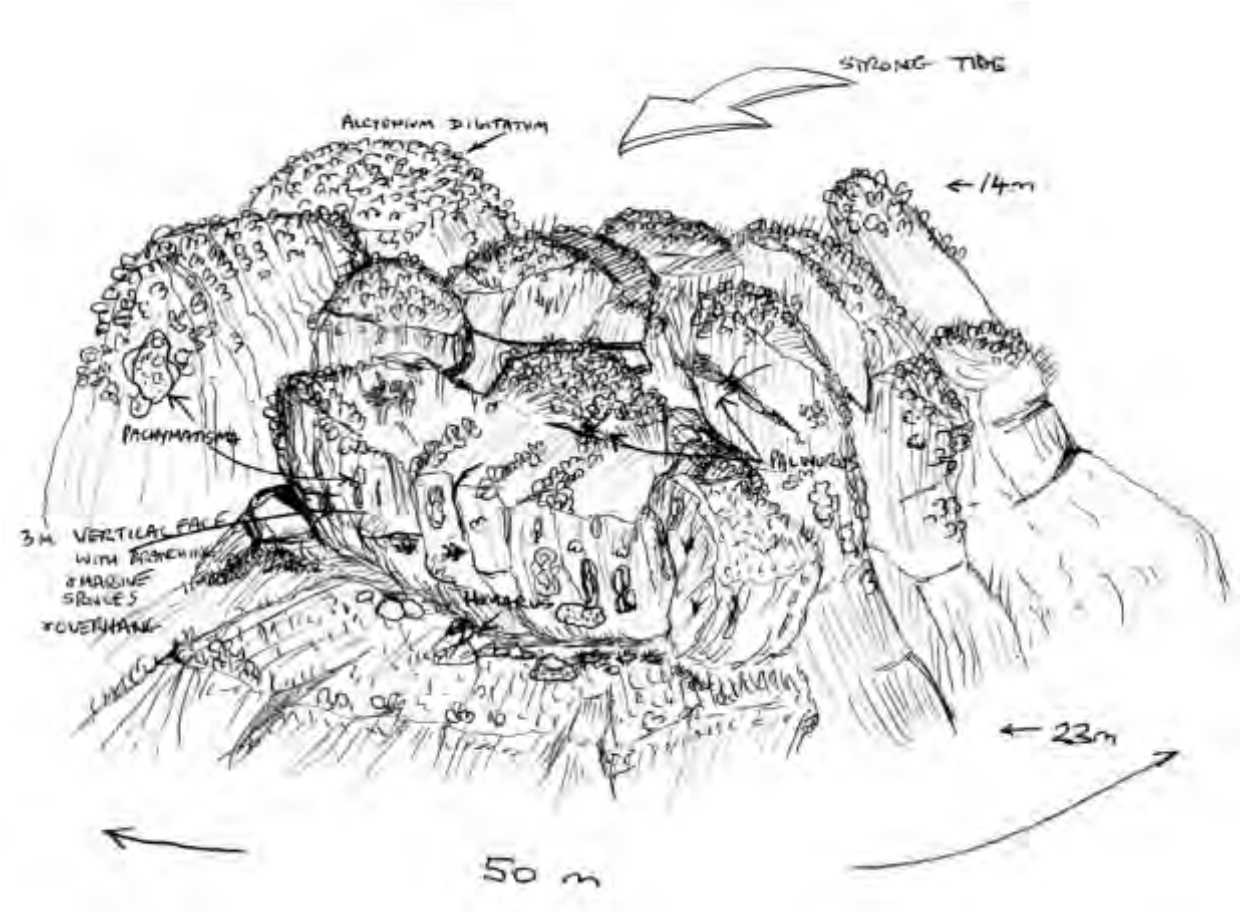
Species that may be sensitive to abrasion: *Axinella damicornis, Axinella dissimilis, Axinella infundibuliformis*.

Section 7 species: 2x *Palinurus elephas*.

Human impacts

Potting observed. Also, a line of three whelk pots were found, half buried in the sediment at the base of a gully, still strung together and colonised by epifauna.

Litter included a flare casing and heavy-duty wire (presumed to be shark fishing tackle).



Llanbadrig Head site sketch.

Site 20: Porth Wen, East

Date of dive: 14/05/23

Position: 53° 25.612 N 04° 23.812 W

Depth range (metres):

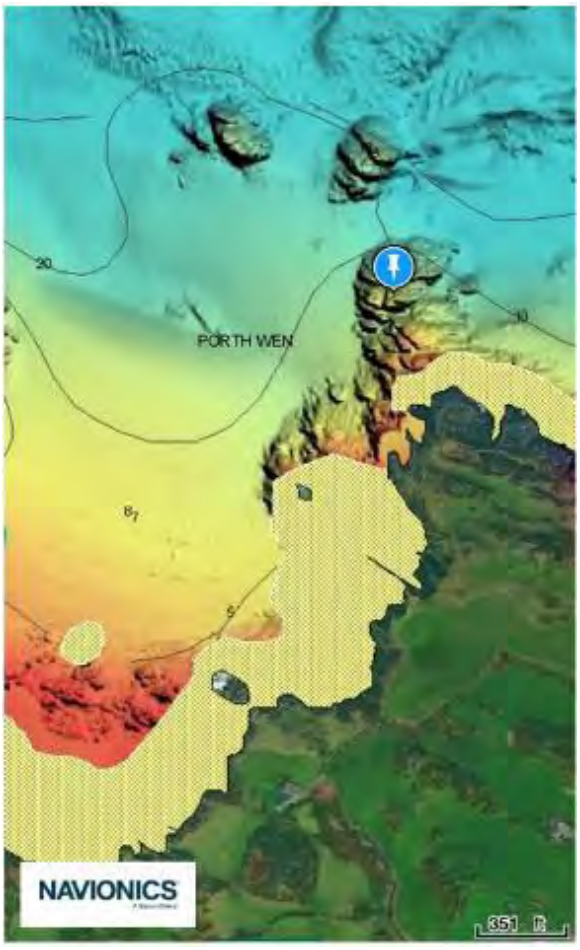
13.0 – 21.0 m BSL
11.3 – 19.3 m BCD

Tidal Streams:

Strong

Exposure:

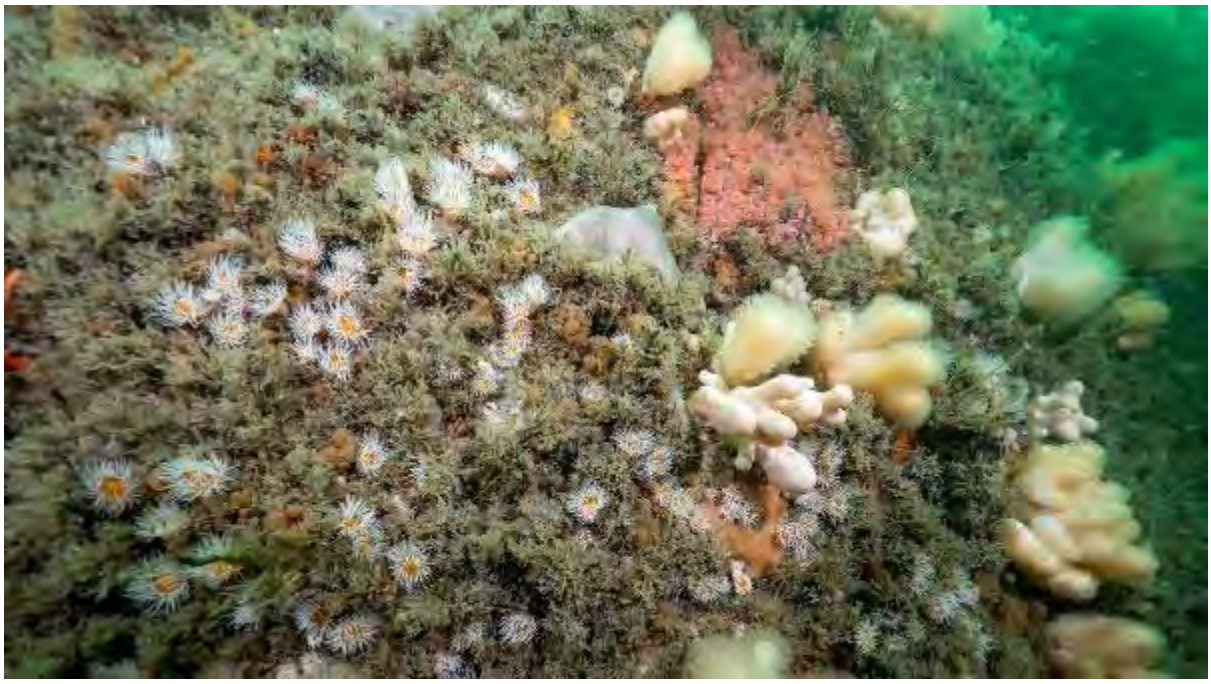
Moderately exposed



Site description

Porth Wen, East is situated off the north coast of Anglesey. It was selected using the Navionics app as a potential fragile sponge and anthozoan biotope location based on the presence of bedrock in an exposed area with strong tidal streams. This site had not previously been surveyed. It was the most north easterly of the survey sites visited in the 2023 diving survey.

A series of bedrock ridges with steep/vertical walls dropped sharply to a silted sandy seabed with a meadow of burrowing anemones *Cerianthus lloydii* and Dahlia / horseman anemones *Urticina* sp. Dips between the ridges often contained shell gravel. The site was relatively clean, compared to the sites on the west coast, with only a covering of silt. The top of the site was characterised by dense *Actinothoe sphyrodeta* which quickly gave way to *Alcyonium digitatum* on the steeper rock faces, together with large *Pachymatisma johnstonia*. The fragile sponge community was present, but the site differed from those on the west coast due to high abundances of *Antedon bifida* and *Tubularia indivisa* in areas most exposed to the accelerated tidal streams; the lower ridges also supported dense stands of the plumose anemone *Metridium senile*. Throughout the site the faunal turf contained dense patches of *Flustra foliacea*, *Chartella papyracea* and crisids. As at Llanbadrig Head, the surveyors felt the erect sponges were shorter than at the other sites but this was not confirmed with any direct measurements; species present included *Raspaillia ramosa*, *Stelligera stuposa / Raspaillia hispida* and *Stelligera montagui*. Cushion sponges included *Myxilla* sp., *Amphilectus fucorum*, *Hemimycale columella* and *Dysidea fragilis*.



Above, dense faunal turf of hydroids, bryozoans, sponge crusts, *Alcyonium digitatum* and a cluster anemones *Actinothoe sphyrodeta.*

Above: abundant *Antedon bifida*, branching sponge (*Stelligera stuposa / Raspailia hispida*) and *Alcyonium digitatum.*

Above: *Alcyonium digitatum* and *Pachymatisma johnstonia* amongst dense hydroid *Tubularia indivisa* turf with adults and spawn of *Fjordia browni* nudibranchs.

Above: dense cluster of plumose anemones *Metridium senile*.

Biotope

CR.HCR.XFa.ByFa.ByErSp.DysAct

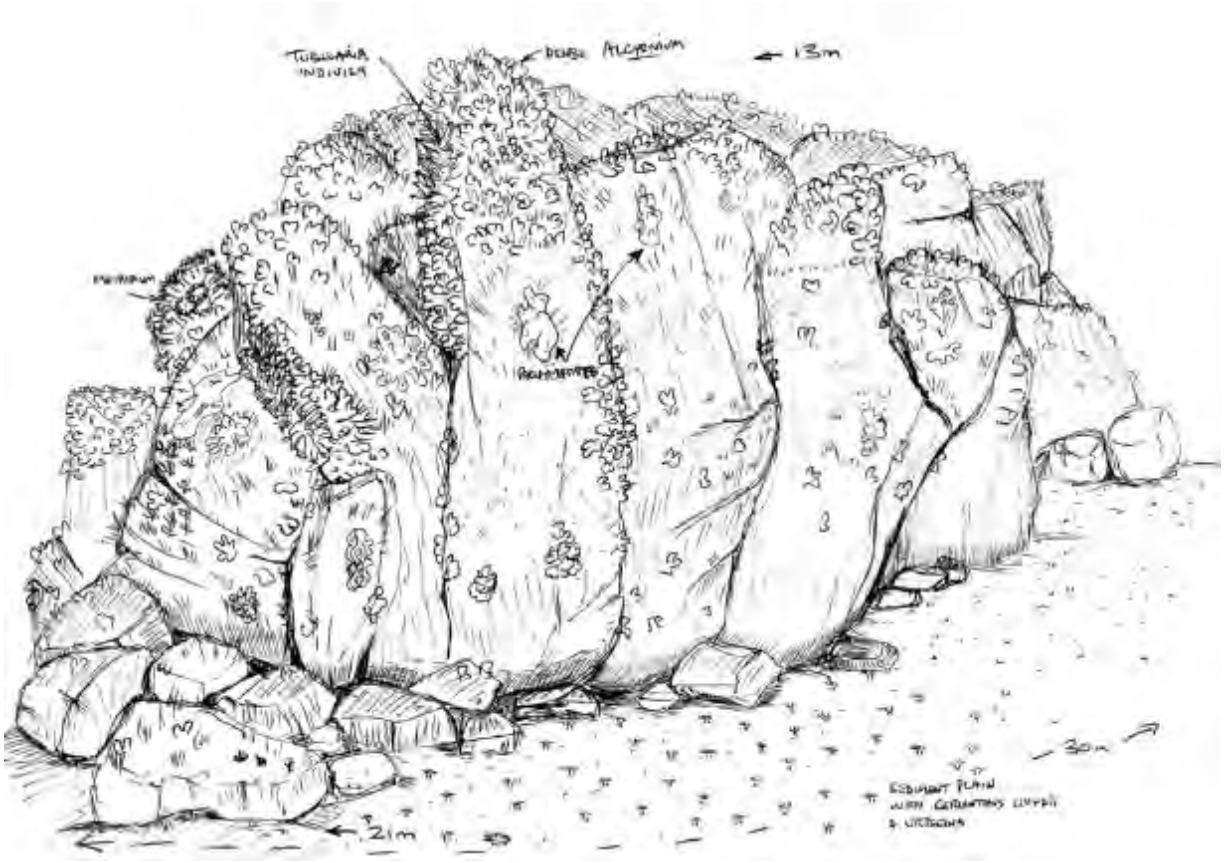
Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock.

Species of interest including INNS

Species that may be sensitive to abrasion: *Axinella dissimilis*, *Axinella infundibuliformis, Pentapora foliacea.*

Human impacts

Potting observed.



Porth Wen East site sketch.

Habitat extent

Figure 7 provides an indication of the nature of the seabed off north-west Anglesey. Exposed bedrock outcrops and boulders can clearly be seen as discreet entities surrounded by sediment plains. The subtidal seabed around this area of coast descends gradually with increasing distance offshore. The fragile sponge and anthozoan community was encountered on circalittoral rock, at the lower depths of the rocky exposures and generally gives way to areas of sediment below. During the survey, the limited available time on the relatively deep dive sites precluded venturing off the bedrock onto the surrounding sediment areas to complete detailed habitat assessments. Coupled with the restricted underwater visibility, it was not possible to determine the bordering biotopes. In addition, divers dropped directly down a shot line to deeper circalittoral bedrock. Where divers surveyed shallower sites, e.g. in habitat 1 at Site 13: Abraham's Bosom and Site 11: NW of The Fangs, the infralittoral kelp zone was encountered, which then gave way to the target biotope on progressing offshore to deeper reef.

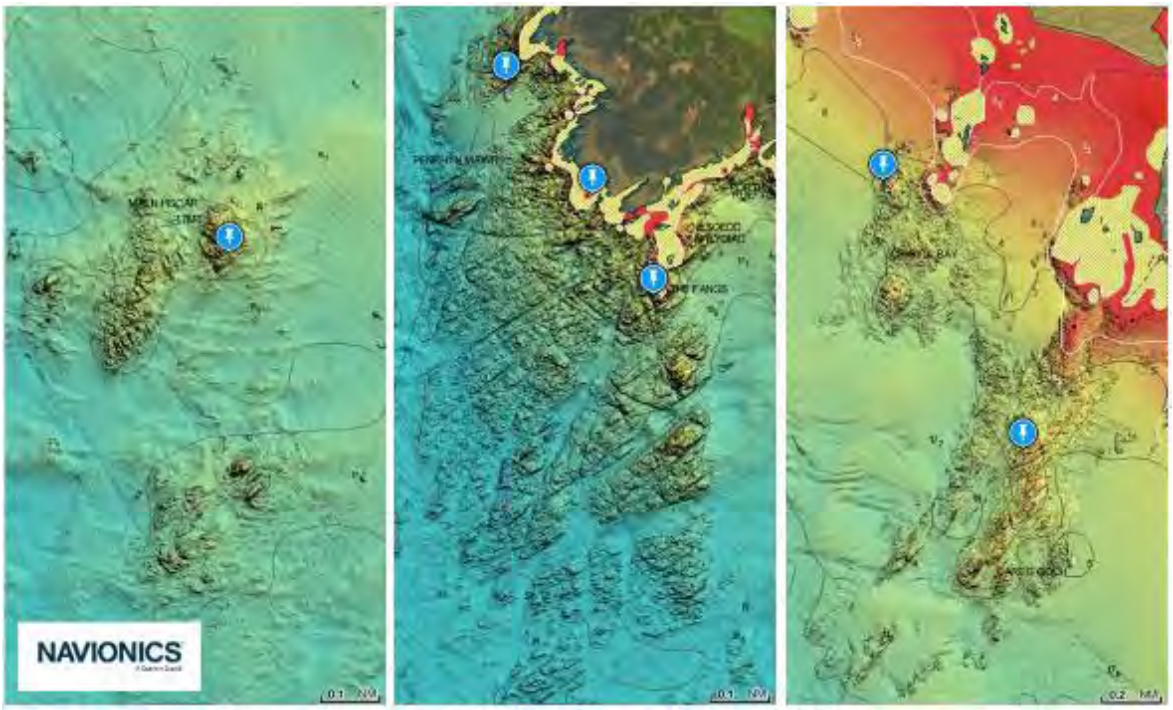


Figure 7. Navionics maps showing relief contours detailing subtidal bedrock exposures and surrounding sediment seabed. Blue pins denote some of the 2023 survey sites.

Figure 8 and Figure 9 illustrate the transition from bedrock to mobile, coarse sediment plains of mixed substrata including cobbles, shell and sand. The lower area of bedrock is dominated by robust, scour-tolerant Sabellid tube worms (e.g. *Spirobranchus* sp.) and encrusting coralline algae.

Figure 8. Site 1: Carreg Goch, illustrating bedrock/sediment interface.

Figure 9. Site 9: Red Roof Reef, discrete bedrock and boulders reef give way to broken cobbles and mixed substrata.

It is not possible to definitively state where else the target fragile sponge and anthozoan biotope occurs without ground-truthing more locations. However, based on the observations made throughout the survey area and the confirmation of the

biotope presence at almost all the sites visited certain assumptions can be made with a degree of confidence. At least within the geographical and depth limits of the present survey, approx. 7-30 m BCD between Site 1: Carreg Goch and Site 20: Porth Wen, the fragile sponge and anthozoan communities could be reasonably expected to be present on much of the silty circalittoral rocky reef habitats. The main exceptions to this are likely to be in areas of high tidal streams with heavy scour, as evidenced by the very different biotope encountered at Site 10: The Fangs i.e. the biotope is less likely to occur in the immediate vicinity of areas such as Carmel Head. Within the geographical limits stated above, the community composition of the fragile sponge and anthozoan community will vary between locations, depending on local conditions. The following section characterises this variation within the 2023 survey data.

2023 data analysis

The initial SIMPROF cluster analysis (Figure 10) identified a significant cluster of the most northerly sites from Site 13: Off Abraham's Bosom northward (sites 13, 14, 16-20, see blue line in Figure 10) whilst the other large cluster consisted of sites located to the south of this area (sites 1, 3-9, 11, see green line in Figure 10) contained two significantly similar clusters. The four remaining sites to the left-hand side were either non-target biotopes (Site 10: The Fangs) or exhibited lower statistical similarity to the other sites. The locations of the clusters can be seen in Figure 11.

Given that not all communities within the secondary 'southern' cluster were statistically similar to one another, further statistical comparison with the northern cluster would not be valid. However, by aggregating the survey data to taxonomic family level as opposed to species or genus (and thereby reducing any potential discrepancies in recording accuracy) groupings of the north (sites 14 and 16-20, blue) and south (sites 3-9, green) became more distinct, with four remaining sites continuing to be less similar to the main clusters (sites 2, 12, 13 and 15) (Figure 12). Non-target biotopes (Site 10: The Fangs) or the site where the biotope was only just starting to be encountered by surveyors due to depth limitations (Site 11: NW of The Fangs) were removed before this analysis.

A SIMPER analysis between the 'north' and 'south' clusters demonstrated the differences and similarities of the various taxonomic family groups between these two areas. The highest contributor to dissimilarities came from taxa such as *Antedon bifida* (Antedoniidae), Crisiidae, Tubulariidae and Molgulidae which were more abundant at the northern sites, whilst families such as Sabellariidae, Plumulariidae, Corallinaceae and Bugulidae were more apparent at the southern sites.

In terms of sponges, the SIMPER analysis indicated that despite occurring throughout the survey area, taxa from the Dysideidae, Stelligeridae, Raspailiidae, Axinellidae, Polymastiidae and Clathrinidae were most abundant overall in the northern sites whilst the Syconidae, Esperiopsidae, Tethyidae, Chalinidae (*Haliclona* spp.), Clionidae and Halichondriidae were more abundant at the southern sites. The Sagartiidae which includes the anemone *Actinothoe sphyrodeta*, exhibited little discernible difference in abundance between the two clusters identified by the SIMPER analysis.

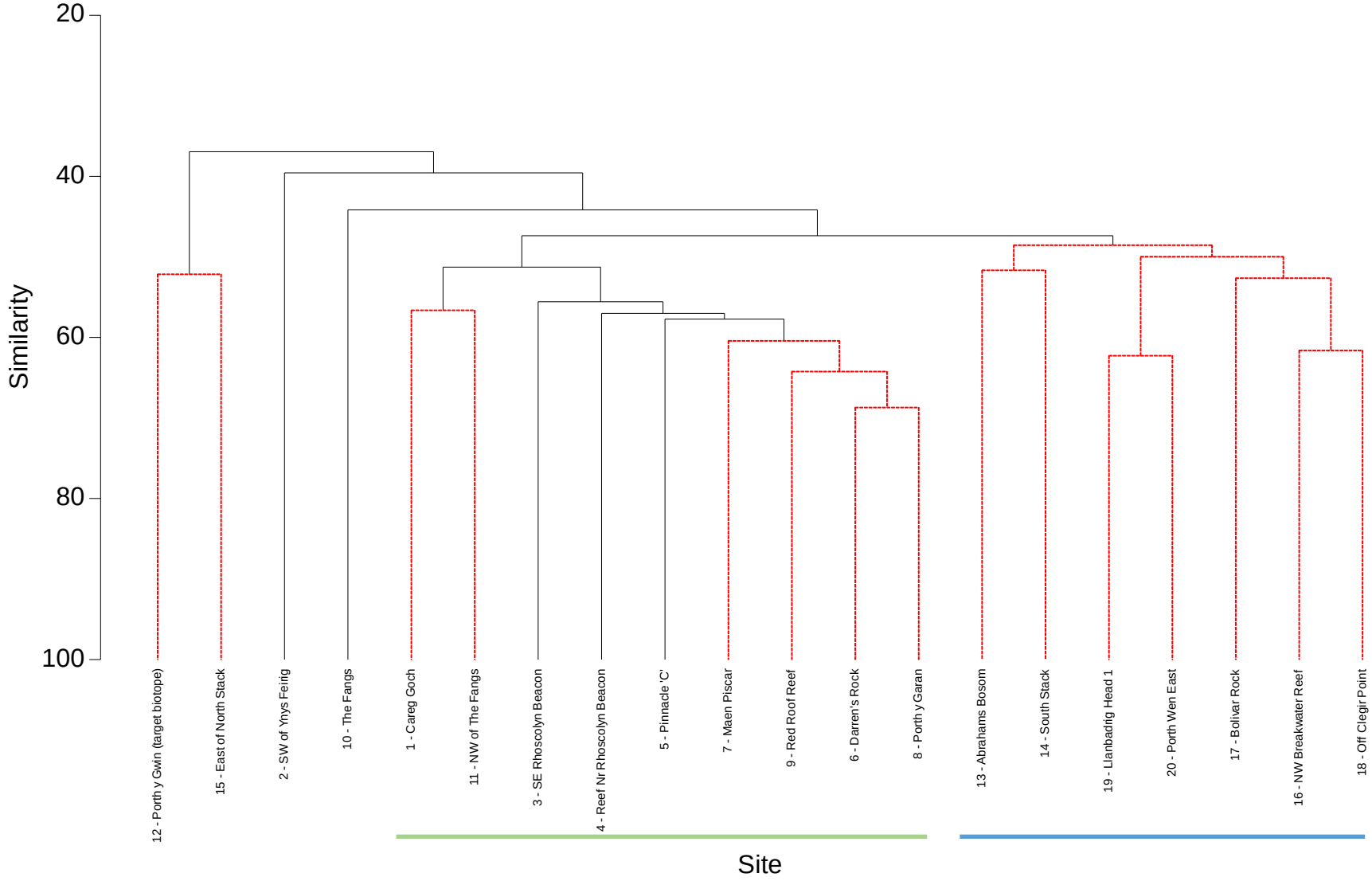


Figure 10: SIMPROF cluster analysis of all 2023 survey sites with data at Genus and species level. The two main clusters show the more southern sites (green line) and the more northern sites (blue line).

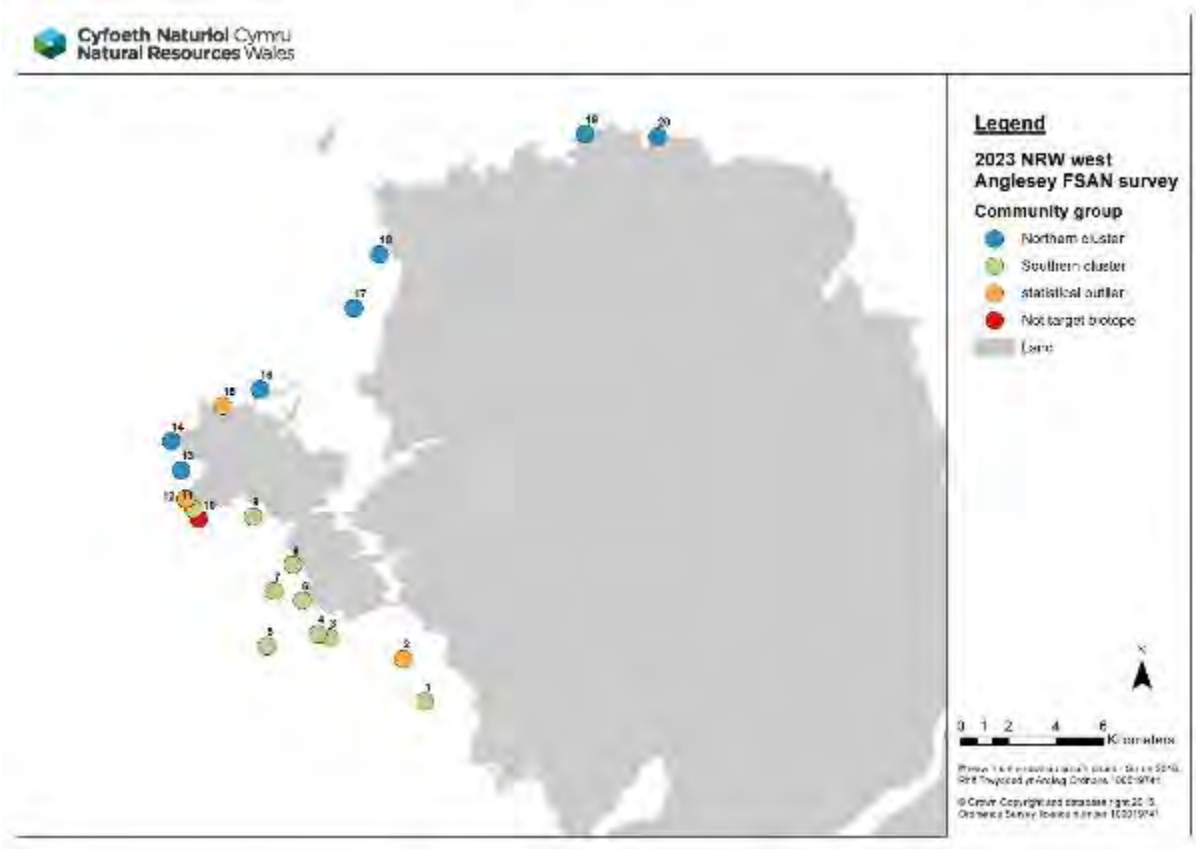


Figure 11 Fragile sponge and anthozoan SIMPROF community clusters (all survey sites)

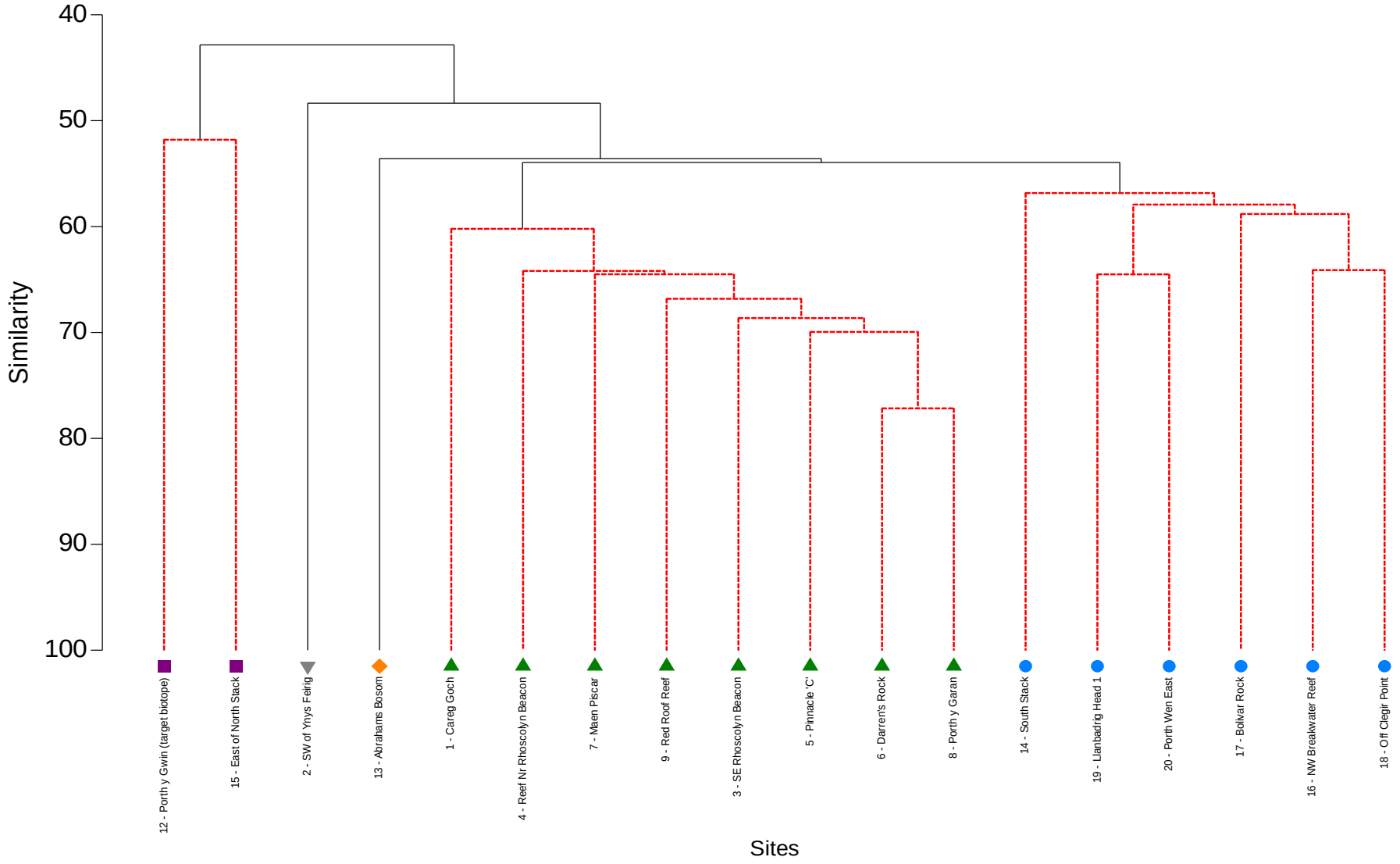


Figure 12: SIMPROF cluster analysis of all 2023 matching biotope survey sites with data at Family level. The northern (blue sites) and southern (green sites) clusters were more distinct when analysed at the Family level.

There were no significant differences in the maximum or minimum site depths surveyed (below chart datum) between these north and south areas, ruling out depth as a likely influencing factor of these differences in species distributions.

MDS bubble plots of the sites surveyed illustrated some of the differences in distributions of key taxa used to identify the target biotope such as fragile branching sponges and anemones, as well as other characterising taxa (see Appendix A – MDS plots). Of the Axinellidae, *A. infundibuliformis* and *A. dissimilis* were generally more abundant in the north of the survey area with *A. damicornis* recorded less frequently. *Stelligera montagui* showed little change in abundance from north to south whereas *S. stuposa* was recorded more frequently and in greater abundance at northern sites. *Haliclona oculata* was recorded more frequently and at greater abundances in more southern sites whilst *Dysidea fragilis* and *Raspailia ramosa* were generally more abundant in the northern area. The elegant anemone *Cylista elegans* and *Actinothoe sphyrodeta* showed little difference in abundance between the north and south areas. Whilst the hydroids Crisiidae were more abundant in the north and Flustridae in the south. The feather star *Antedon bifida* was recorded at greater abundance and more frequently in the north of the survey area compared to the south. In general, but not always exclusively, the more fragile sponge species were recorded in greater abundances in the northern cluster of sites compared to the south.

The differences in taxon abundance and distribution patterns illustrated by the MDS bubble plots and cluster analysis illustrates the variable nature of the target biotope around the Anglesey coastline and can be used to help define the biotope at a local level for comparison with future records. Further discussion of possible factors that might influence the community composition are discussed following the comparison with historical data.

The JNCC biotope description lists 30 species that characterise the CR.HCR.XFa.ByErSp.DysAct biotope (see Appendix B – JNCC Biotope Description). A further 10 species from the present survey were added to this list on the basis they were either (i) erect and therefore potentially fragile sponges, (ii) species in the same genus as others listed, (iii) were considered to be characterising of the sites surveyed or (iv) were very fragile slow-growing species (see Table 3). These 10 extra taxa included several *Haliclona* spp. and additional *Axinella* spp. sponges recorded, *Polymastia* spp., *Raspailia hispida, Cylista elegans* and the fragile bryozoan *Pentapora foliacea*.

Table 3: Rationale for including additional taxa in the list of locally characterising species of the FSAN biotope.

Species	**Reason for inclusion as additional locally characterising / fragile taxa**
Axinella damicornis *Axinella infundibuliformis*	Axinellids are erect and slow-growing and may be susceptible to abrasion (Reeve, 2005). They occurred throughout the survey area but particularly from Site 13: Off Abraham's Bosom and northward.
Haliclona (Halichoclona) fistulosa *Haliclona (Haliclona) oculata* *Haliclona (Haliclona) simulans*	Species of the genus *Haliclona* were frequently recorded throughout the survey area, particularly at the sites south of Site 13: Off Abraham's Bosom. *H. oculata* is an erect sponge and may therefore be susceptible to abrasion. It is however fast-growing, subject to short-term population fluctuation and is an opportunistic coloniser. It may therefore be of less use as an indicator of disturbance compared to the slower-growing Axinellids, particularly if regular (annual) monitoring is not being undertaken.
Polymastia penicillus *Polymastia mamillaris*	Recorded frequently throughout the survey area. Same genus as other characterising sponge *Polymastia boletiformis*.
Raspailia hispida	Erect sponge, potentially susceptible to abrasion damage, hard to distinguish *in situ* from *Stelligera stuposa* and present throughout the survey area, particularly in the 'northern' sites.
Cylista elegans	Recorded throughout the survey area and occurs in the same habitat as *Actinothoe sphyrodeta*.
Pentapora foliacea	Very fragile, brittle and slow-growing, present at many sites in the 'southern' group

Taxa richness is summarised for each site in column 3 of Table 4. The total number and percentage occurrence of the 40 locally characterising and fragile taxa (30 biotope characterising taxa plus the additional 10 outlined in Table 3) recorded at each site are given in columns 4 and 5 respectively of Table 4. Columns 6 and 7 of Table 4 give the number and percentage recorded at each site of a subset of 17 key species (drawn from the 40 species) which were selected on the basis of being potentially fragile sponges / bryozoans or characterising anemones from the sites surveyed – the full list is given in Appendix C.

Fourteen of the sites had 60% or more (n>24) of the characterising species recorded during 2023. Site 11: NW of The Fangs had the highest percentage, with 78% of the biotope characterising species despite the surveyors only being able to reach the margins of the biotope owing to the presence of a cobble bottom at the base of the reef. During the survey many team members considered Site 16: NW Breakwater Reef, and Site 17: Bolivar Rock, to have been the best examples of the biotope recorded during the survey period owing to the diversity of sponges recorded, and perhaps the greater abundance of *Stelligera stuposa / Raspailia hispida*. The data analysis showed these locations supporting at least 73% and 65% of the biotope characterising species and 65% and 59% respectively of the subset of fragile sponges / bryozoans and anthozoans recorded throughout the area. However, of the fragile sponge, bryozoan and anthozoan species only, the highest percentage recorded from any survey sites was 76% from Site 6: Darren's Rock and Site 13: Off Abraham's Bosom, both of which also supported at least 75% of all the potential biotope characterising species. Site 13: Off Abraham's Bosom had similar SACFOR abundances of erect sponges to Site 16: NW Breakwater Reef and Site 17: Bolivar Rock with the exception of *Stelligera stuposa / Raspailia hispida* which was recorded as 'common' and 'frequent' at the latter sites and only 'occasional' at Site 13; this may explain why surveyors felt Site 16 and Site 17 were visually the best examples of the target biotope and not Site 13 if more tall, erect sponges were apparent.

Site 2: SW of Ynys Feirig and Site 15: East of North Stack had the lowest number of taxa recorded, the lowest percentage (40%) of biotope characterising species and 35% and 41% respectively of the subset of fragile sponges / bryozoans and anthozoans recorded throughout the area. Site 12: Porth y Gwin also had a low number of total taxa recorded (n = 59). These three sites along with Site 10: The Fangs (non-biotope match) were also indicated as being the most dissimilar to the other survey sites in the initial cluster analysis (Figure 10).

Many of the sites with the highest percentages of fragile species (column 7, Table 4) were, as a general rule, deeper than those with lower percentages (see column 2, Table 4). This observation would be expected given the circalittoral nature of the target biotope. There were exceptions to this observation e.g. Site 11: NW of the Fangs had very high percentages of the fragile and biotope characterising species; although shallow, this site was in a relatively sheltered transitional zone between the infralittoral and circalittoral and supported many sponge species. Likewise, Site 14: South Stack was one of the deeper sites but strong currents hindered the surveyors from making a complete site assessment.

Table 4: Total taxa recorded at each site surveyed in 2023 for the target CR.HCR.XFa.ByErSp.DysAct biotope and presented in decreasing order of the number and percentage of the locally characterising and fragile taxa (total n = 40) at each site. The final two columns show the number and percentage of only the fragile (erect) sponges, bryozoan and anthozoan species at each site (total n = 17) (see Appendix C).

Site	**Depth range surveyed (m bcd)**	**Total taxa recorded**	**Number of locally characterising / fragile taxa recorded (n_{max} = 40)**	**% of locally characterising / fragile taxa**	**Number of FSAN subset taxa recorded (n_{max} = 17)**	**% FSAN subset taxa only**
11 - NW of The Fangs	9.8 - 11.2	74	31	78%	12	71%
6 - Darren's Rock	12.1 - 16.4	97	30	75%	13	76%
13 – Abraham's Bosom	16.2 - 18.2	64	30	75%	13	76%
8 - Porth y Garan	11.0 - 15.0	95	29	73%	12	71%
16 - NW Breakwater Reef	12.2 - 16.5	92	29	73%	11	65%
18 - Off Clegir Point	7.6 - 13.6	82	29	73%	11	65%
20 - Porth Wen East	11.3 - 19.3	64	29	73%	12	71%
3 - SE Rhoscolyn Beacon	11.0 - 14.1	91	28	70%	11	65%
5 - Pinnacle 'C'	11.3 - 28.1	73	28	70%	12	71%
1 - Carreg Goch	6.6 - 9.7	86	26	65%	8	47%
4 - Reef Nr Rhoscolyn Beacon	6.8 - 13.8	81	25	63%	7	41%
17 - Bolivar Rock	7.7 - 11.4	69	26	65%	10	59%
9 - Red Roof Reef	11.8 - 13.4	77	24	60%	9	53%
19 - Llanbadrig Head	10.2 - 19.2	65	24	60%	12	71%
7 - Maen Piscar	10.6 - 14.9	73	23	58%	8	47%
10 - The Fangs (non-biotope match)	10.0 - 18.0	87	22	55%	7	41%
12 - Porth y Gwin	9.0 - 14.1	59	23	58%	11	65%
14 - South Stack	13.3 - 15.3	67	23	58%	9	53%
2 - SW of Ynys Feirig	8.0 - 11.0	44	16	40%	6	35%
15 - East of North Stack	8.1 - 14.1	44	16	40%	7	41%

Historical data analysis

Previous survey data collected between 1996 and 2018 from the original MNCR surveys and Seasearch divers were considered in relation to those from the present survey to determine whether the communities may have changed over time.

Given that mostly only single historical data points existed for each site surveyed it was not possible to carry out a valid statistical analysis to determine whether any temporal changes had occurred at the individual site level. Furthermore, there was not sufficient confidence that the exact same locations at each site were re-surveyed in 2023 given the relative inaccuracy of the original positions recorded during the 1996-97 MNCR surveys; this could cast doubt even on qualitative assessments of similarities or differences between survey records at the individual site level. However, it was possible to consider whether broadscale changes have occurred over the whole geographical survey area since the original surveys were completed.

A cluster analysis using the full species data showed an obvious split between the 1996/97 MNCR data and that from 2023 (Figure 13). Seasearch data were dissimilar to all the MNCR data and were distributed toward the left side of the dendrogram. A multivariate ANOVA test (ANOSIM) on the aggregated Family-level data (to eliminate differences in taxonomic recording levels) showed a significant difference existed between the 1996-97 MNCR data and those from 2023 ($R = 0.545$, $P<0.001$). The medium strength R-value indicated the difference identified between the two data sets was reasonably strong but that certain similarities existed between the two.

The differences indicated by the ANOSIM test between the two sets of MNCR data were examined using a SIMPER analysis (1996-97 vs 2023). Being mindful of not ‘over-analysing’ the data (as described above) it was possible to examine the average converted SACFOR abundances for each Family group to understand what differences existed in general between the data sets. Most Families were present in both the historical and contemporary survey data, with any individual Family making only small contributions to the dissimilarities (<2.64% per taxon with the majority <2%). Of the 35 Families contributing to the top 50% dissimilarity between the surveys, all except six had higher abundance scores in the 1996-97 MNCR surveys. With only two temporal data points it is not possible to determine any trend or pattern from this difference.

Of the key biotope identifiers (fragile sponges, anemones), all were present in both survey periods, sometimes higher in 2023 and sometimes lower. Differences such as these could be expected given factors such as: (i) changes in surveyor experience (three of the original MNCR surveyors were also present in 2023); (ii) interannual community dynamics and species fluctuations; and (iii) that it was unlikely the exact same areas of seabed were re-surveyed in 2023. Advances in taxonomy mean some taxa identified in 2023 were not differentiated from others in the late 1990s e.g. certain tunicates and sponges, which further justifies analysing the data at the Family level.

Despite the statistical differences identified, the data offer no indication of any significant or detrimental ecological change across the broadscale survey area. On an individual site basis, statistical analysis cannot offer any reliable measure of change at present owing to the lack of replicate samples. The original MNCR data indicated that the fragile sponge and anthozoan biotope was present throughout the survey area. The 2023 data show the biotope continues to be present throughout the survey area. Where the target biotope has been identified in 2023 and the data show the characterising taxa are present, the data provide no evidence to support any assertion of either positive or negative change along this area of the Anglesey coastline.

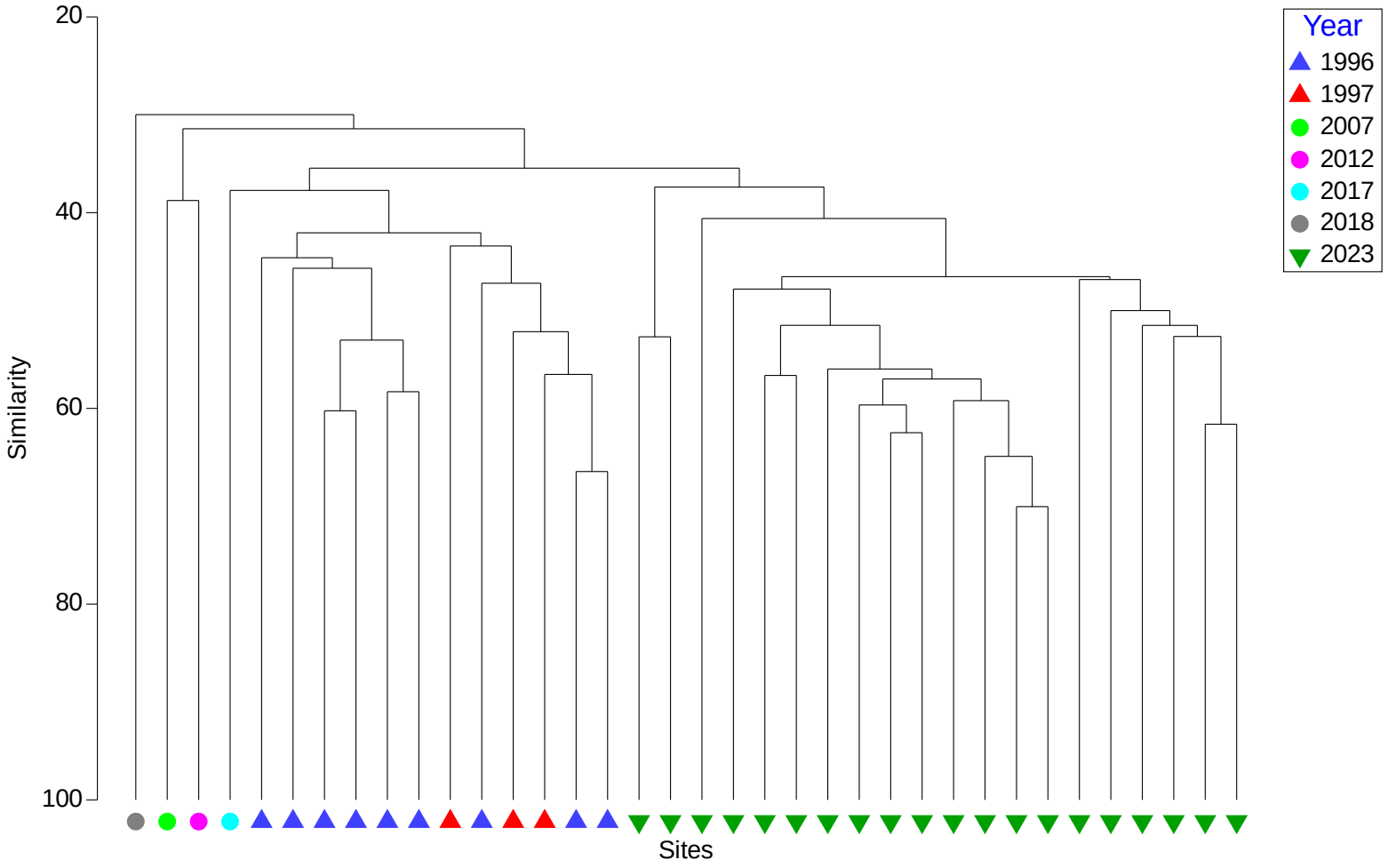


Figure 13: Cluster analysis of site survey data from MNCR (1996-97), Seasearch (2007-2018) and MNCR (2023) surveys where the target biotope was identified.

Discussion and Conclusions

The target fragile sponge and anthozoan biotope (CR.HCR.XFa.ByFa.ByErSp.DysAct) was encountered at 19 of the 20 sites surveyed in 2023. Table 5 summarises the dates of each site surveyed, which sites recorded the target biotope and which were on the original target survey list.

Table 5. Sites surveyed in 2023 showing which recorded the fragile sponge and anthozoan communities (FSAN) and which were the original target sites.

Date	Report site #	Name	FSAN	Target Site
25/04/2023	1	Carreg Goch	Y	Y
11/05/2023	2	SW of Ynys Feirig, Cymyran Bay	Y	Y
15/05/2023	3	SE Rhoscolyn Beacon	Y	N
26/04/2023	4	Rhoscolyn Reef (nr Beacon)	Y	Y
13/05/2023	5	SW off Rhoscolyn Head, Pinnacle ‘C’	Y	Y
13/05/2023	6	Darren’s Rock	Y	Y
12/05/2023	7	Maen Piscar	Y	Y
12/05/2023	8	Porth y Garan	Y	Y
11/05/2023	9	Red Roof Reef, Porth Dafarch	Y	N
16/05/2023	10	The Fangs	N	N
16/05/2023	11	NW of the Fangs	Y	Y
25/04/2023	12	Porth y Gwin	Y	Y
26/04/2023	13	Off Abraham’s Bosom	Y	Y

Date	Report site #	Name	FSAN	Target Site
25/04/2023	14	South Stack ‘north’	Y	Y
27/04/2023	15	East of North Stack	Y	Y
29/04/2023	16	NW Breakwater Reef	Y	N
27/04/2023	17	North Bolivar Rock	Y	Y
28/04/2023	18	Off Clegir Point	Y	Y
14/05/2023	19	Llanbadrig Head	Y	N
14/05/2023	20	Porth Wen, East	Y	N

The target biotope (CR.HCR.XFa.ByFa.ByErSp.DysAct) was generally extensive and divers deployed via a shot directly onto site, so a depth gradient, which may give rise to different biotopes was not generally surveyed. In addition, poor underwater visibility and restricted ability to move in strong currents encountered during several dives further limited the divers’ ability to see and record adjacent biotopes and their extent.

Dive sites located in shallower water, on lower infralittoral rock, were characterised by kelp park and red algal turf species, with the fragile sponge and anthozoan community typically occurring below in the circalittoral zone. The target biotope spanned the upper circalittoral, where red algae extended into the biotope and the lower circalittoral, where the faunal component of the community remained the same but the algal species were lost with increased depth and insufficient light to maintain them. Kelp park with red algal sparse turf was encountered at two sites, Site 13: Off Abraham’s Bosom, south of South Stack and Site 11: NW of the Fangs. Most of the sites surveyed encompassed the lower infralittoral and upper circalittoral, with relatively few in the lower circalittoral only; this aspect of the survey was related to the aim of re-surveying many sites visited previously (see Figure 1). With the data in Table 4 suggesting greater percentages of fragile sponges and bryozoans and biotope-characterising taxa at deeper depths, it could be expected that further examples of the biotope would be encountered if more deeper sites (at least to 30 m) were surveyed.

The national biotope description for the target biotope CR.HCR.XFa.ByErSp.DysAct (mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave exposed circalittoral rock) representing the Section 7 ‘*Fragile sponge and anthozoan communities*’ conformed well with the characterising species encountered during the survey. Fourteen of the sites had 60% or more of the species characterising the target biotope. Abraham’s Bosom (site 13) had 75% of all the

potential biotope characterising species and 76% of the subset of fragile sponge, bryozoan and anthozoan species alone.

The biotope description was defined predominantly from key records from across Wales (Figure 14). Whilst it was not possible to analyse historical sites on a site-by-site basis, it can be concluded that '*Fragile sponge and anthozoan communities*' (CR.HCR.XFa.ByErSp.DysAct) identified in the 1996-97 surveys remain present in the area and continue to be a biotope common to circalittoral rock in areas exposed to high energy wave action and tidal streams off north and west Anglesey. As stated above, the biotope can be reasonably expected to be present on much of the silty circalittoral rocky reef habitats around north and northwest Anglesey where similar conditions exist to those sites in the present survey as well as in deeper areas.

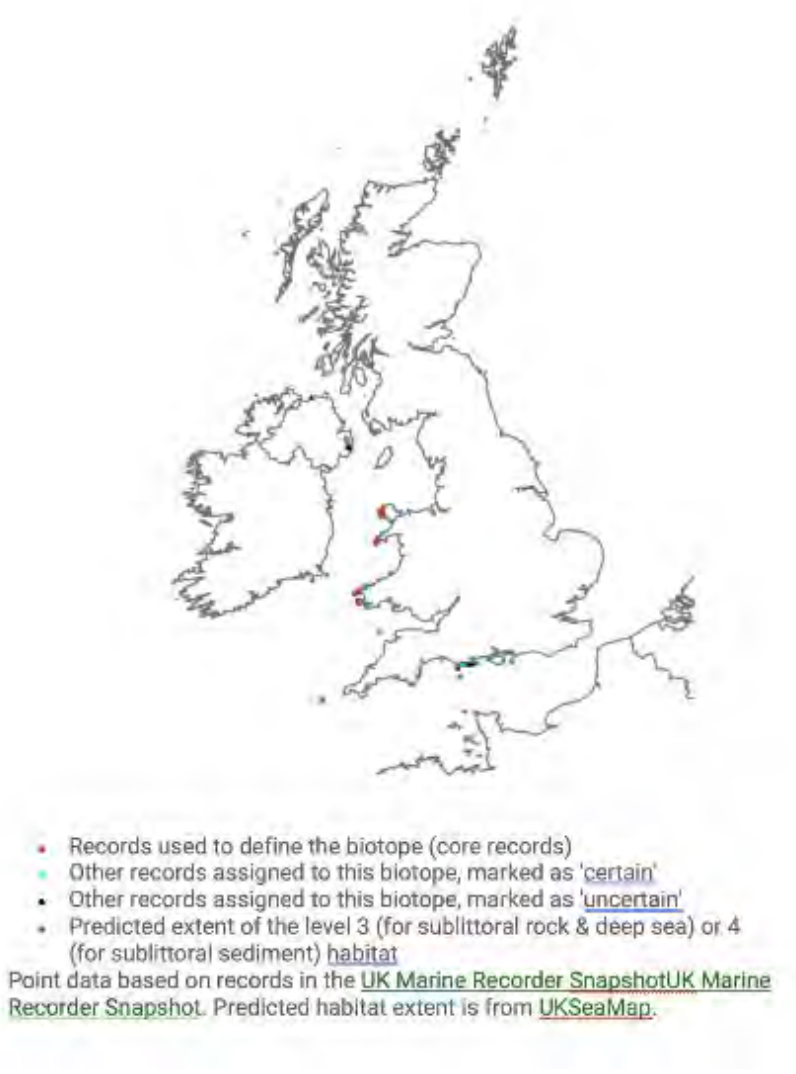


Figure 14: From The Marine Habitat Classification for Britain and Ireland (JNCC, 2022), showing the core records used to define the biotope CR.HCR.XFa.ByErSp.DysAct in red on the map.

The statistical analysis revealed there were two main clusters representing the target biotope in the area – a northern cluster and a southern cluster.

In the northern cluster, the feather star *Antedon bifida* and hydroid *Tubularia indivisa* characterised the sites, often occurring in high abundances. Crisiidae bryozoans, forming the underlying turf species were also more abundant in the north compared to the south, as were Molgulidae ascidians. In terms of sponges, the analysis indicated that despite occurring throughout the survey area, taxa from the Dysideidae, Stelligeridae, Raspailiidae, Axinellidae, Polymastiidae and Clathrinidae were most abundant overall in the northern sites (see MDS plots in Appendix A for examples). Of the fragile branching sponges, Axinellidae, *A. infundibuliformis* and *A. dissimilis* were generally more abundant in the north of the survey area whilst *A. damicornis* was recorded less frequently (see Figure 15 to Figure 17 in Appendix A). *S. stuposa* was recorded more frequently and in greater abundance at the northern sites.

In the southern cluster, families such as Sabellariidae (polychaetes), Plumulariidae (hydroids), Bugulidae (bryozoans) and Corallinaceae (encrusting coralline algae) were more apparent at the southern sites. In terms of sponges, Syconidae, Esperiopsidae, Tethyidae, Chalinidae (*Haliclona* spp.), Clionidae and Halichondriidae were more abundant. Of the potentially fragile, erect branching sponges, *Haliclona oculata* was recorded more frequently and at greater abundances in the southern part of the survey area (see Figure 20 in Appendix A). Flustridae bryozoa (*Flustra foliacea*) were recognisable as characteristic fauna in the south although they did occur throughout the survey area. The fragile and slow-growing bryozoan *Pentapora foliacea* was present at eight of the survey sites, mostly in the south of the survey area (see Figure 28, Appendix A).

Common across both north and south sites were anemones in the family Sagartiidae which includes the anemones *Actinothoe sphyrodeta* and *Cylista elegans*. These two species were of similar abundance at sites in both the north and south of the survey area and where present, tended to be found in discrete patches (see Figure 23 and Figure 24 in Appendix A). The branching sponge *Stelligera montagui* also showed little change in abundance from north to south.

The depth ranges of the survey sites were consistent between the north and south clusters overall and spanned the upper and lower circalittoral, so depth is unlikely to be a sole factor driving the difference in community composition between the north and south clusters of survey sites. More discernible is the difference in wave exposure. Whilst both north and south sites are exposed to strong and very strong tidal streams and can both receive strong wave action from seasonal storms, more of the southern sites are exposed to the prevailing south-westerly winds which could be driving a subtle difference in the species composition between north and south. The overall greater presence and abundance of the fragile Axinellid sponge species at the sites in the northern cluster could be suggestive of a less disturbed environment; this could equally apply to individual ‘southern’ sites where Axinellids were also recorded more frequently, such as Site 3: SE Rhoscolyn Beacons, Site 5: Pinnacle ‘C’ and Site 6: Darren’s Rock where site-specific factors such as greater depth or shelter from reef structures may offer protection from wave exposure. Alternatively local hydrodynamic regimes and tidal races around the northwest headlands of Holy Island could influence levels of sponge recruitment between the identified northern and southern site clusters. Differences in levels of human

disturbance have also not been quantified between the northern and southern areas so cannot be ruled out as a further influential factor. All these potential reasons for the differences in the biotope communities between the two areas are purely hypothetical and further work would be required to determine the driving factors with greater confidence.

Being long-lived, slow-growing and fragile, Axinellid sponges can act as important indicators of disturbance and have been shown to be sensitive to towed fishing gears (Hinz et al., 2011; Hiscock, 2014; Kedra et al., 2017; Graves, 2022). Axinellids tend to favour the lower circalittoral, diving in which was limited in the current project by both the need to re-visit historical survey sites and remain within diving no-decompression limits. The consensus among the dive team was that the deeper sites often yielded more Axinellids and that exploring more such sites would likely lead to increased records of these species.

Further work could be carried out to identify and survey further sites in the lower circalittoral zone within ‘Area of Search A' to confirm the presence of the fragile sponge and anthozoan communities (CR.HCR.XFa.ByErSp.DysAct) biotope. Data from the present survey suggests the biotope occurs mainly in areas near to but not directly in strong tidal streams and, in areas near to but not directly in sheltered habitats.

Other observations

The only non-native species recorded was the ascidian *Corella eumyota*, encountered at Site 2: SW of Ynys Feirig on the west coast of Holy Island, Anglesey.

The only Section 7 species recorded *in situ* was the crawfish *Palinurus elephas*, which was recorded at three sites: Site 2: SW of Ynys Feirig, Site 12: Porth y Gwin and Site 19: Llanbadrig Head.

Another Section 7 species, the harbour porpoise *Phocoena phocoena* was seen from the boat on two occasions, off South Stack on the west coast of Holy Island and between Holyhead Harbour and Church Bay to the north.

Potting activity was evident around the entire coastal area surveyed. Ghost pots were encountered at two sites, one a lobster pot off the west coast and a string of whelk pots off the north coast. No direct impacts on fragile sponge species were observed during the survey work but cannot be ruled out.

Acknowledgements

The authors are grateful for the permissions from the United Kingdom Hydrographic Office (UKHO) and Garmin Italy Technologies to reproduce the figures herein from the 'Navionics Boating' app showing the shaded relief of the seabed features at each site surveyed.

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- Kate Northen
- Matt Doggett
- Rohan Holt
- Dan Gill
- Jon Moore
- Tom Mercer
- Paul Brazier
- Harry Goudge
- James King

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Photographic images: habitats by Rohan Holt and Matt Doggett; macro images by Jon Moore, Kate Northen, Tom Mercer and Dan Gill.

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Appendix A – MDS plots

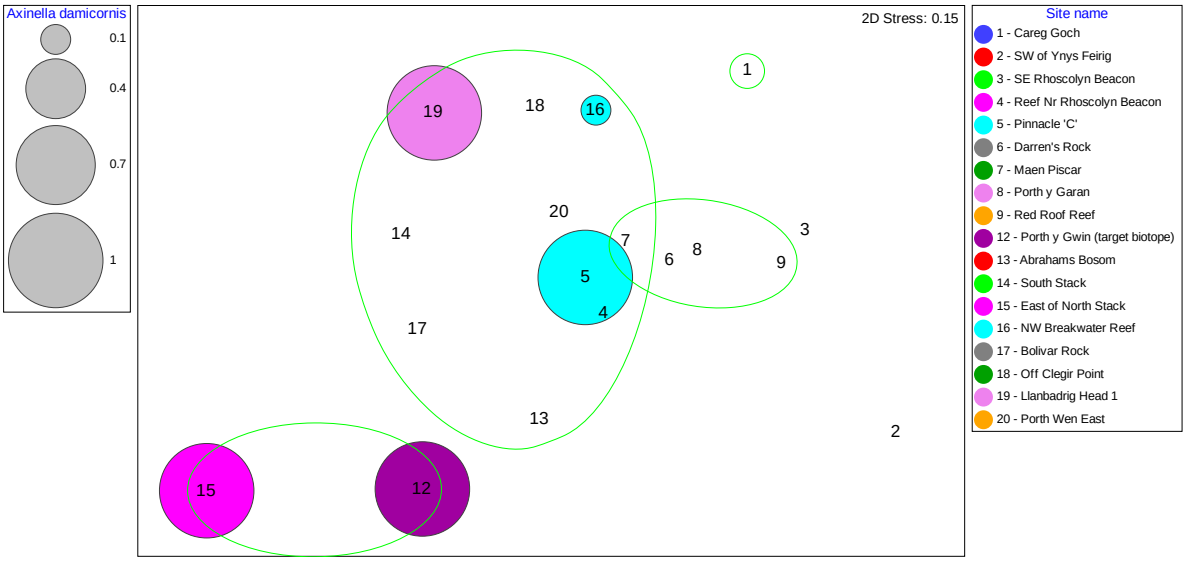

Figure 15: MDS bubble plot showing differences in occurrence and abundance of *Axinella damicornis* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

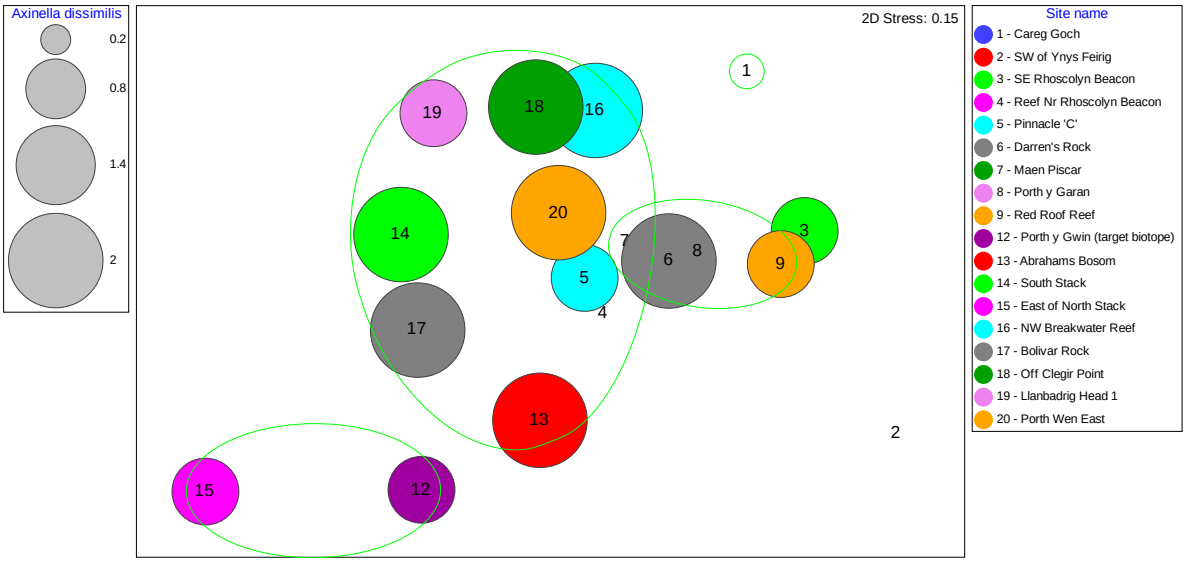

Figure 16: MDS bubble plot showing differences in occurrence and abundance of *Axinella dissimilis* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

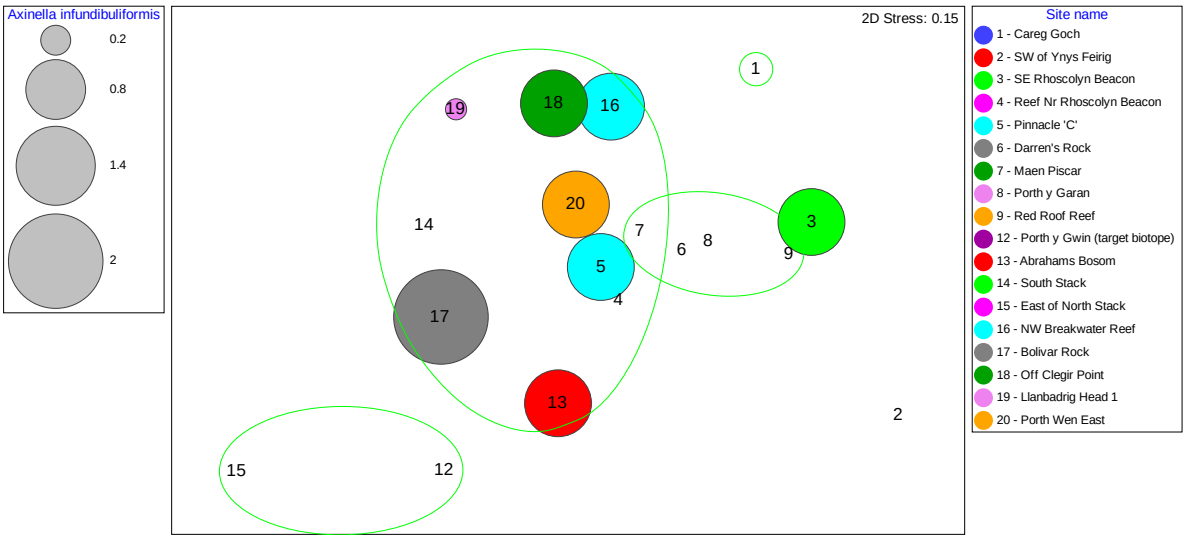

Figure 17: MDS bubble plot showing differences in occurrence and abundance of *Axinella infundibuliformis* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

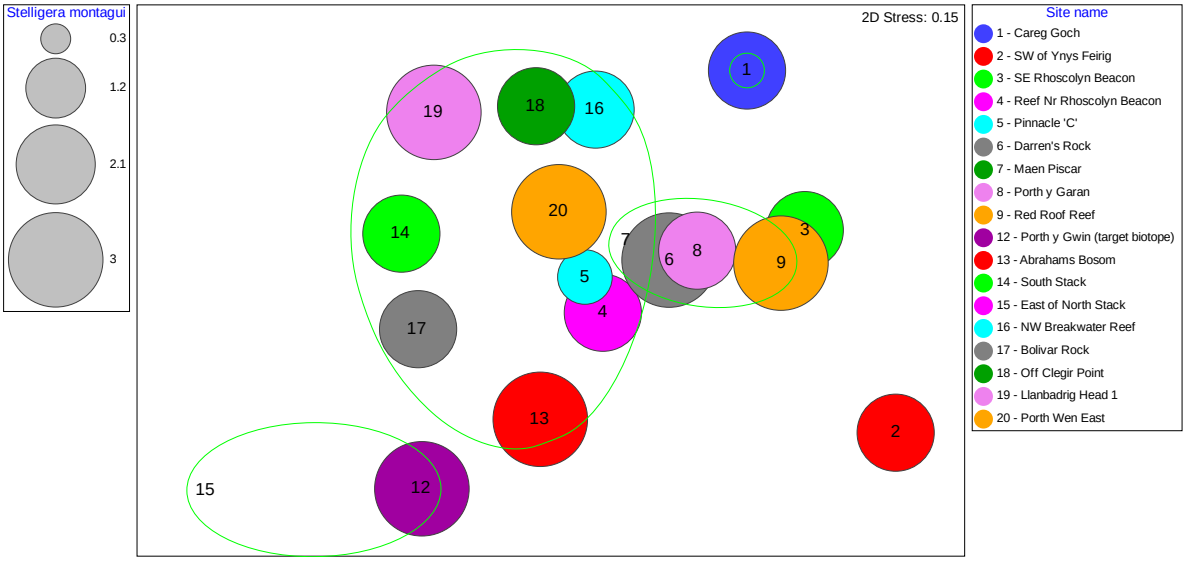

Figure 18: MDS bubble plot showing differences in occurrence and abundance of *Stelligera montagui* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

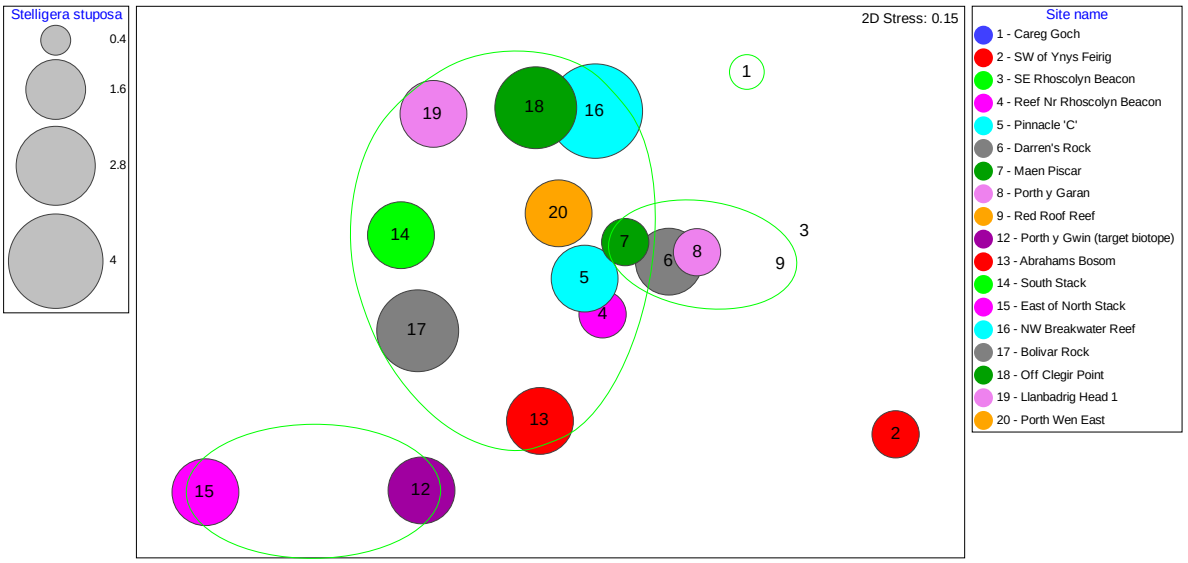

Figure 19: MDS bubble plot showing differences in occurrence and abundance of *Stelligera stuposa* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

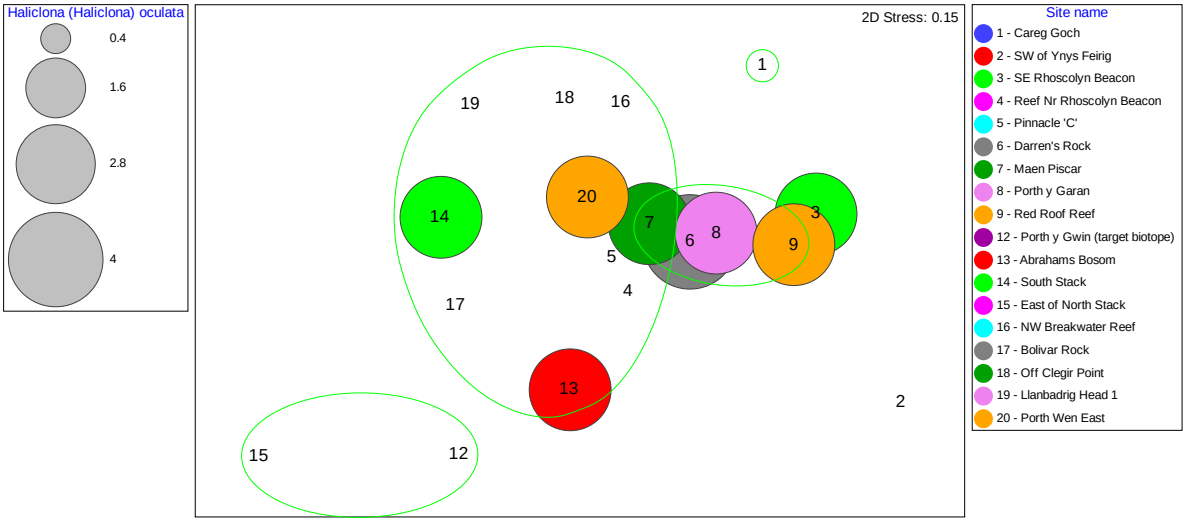

Figure 20: MDS bubble plot showing differences in occurrence and abundance of *Haliclona (Haliclona) oculata* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

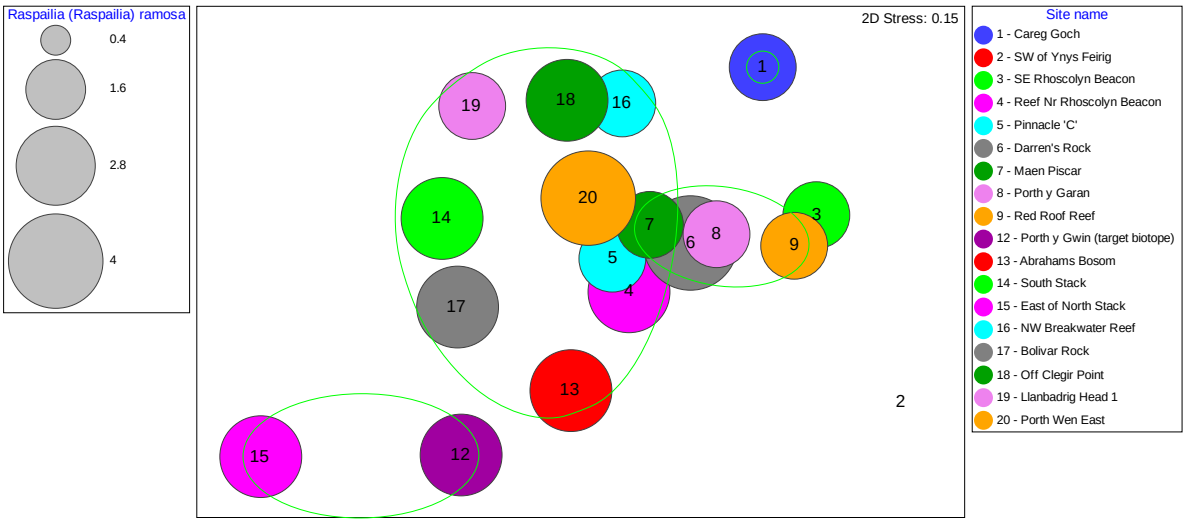

Figure 21: MDS bubble plot showing differences in occurrence and abundance of *Raspailia (Raspailia) ramosa* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

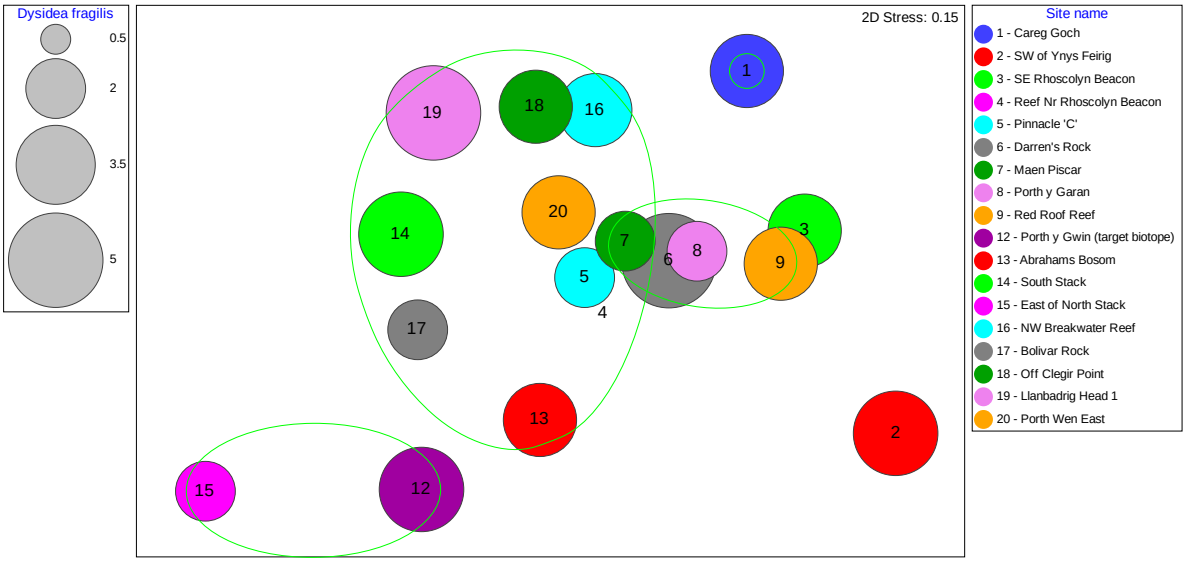

Figure 22: MDS bubble plot showing differences in occurrence and abundance of *Dysidea fragilis* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

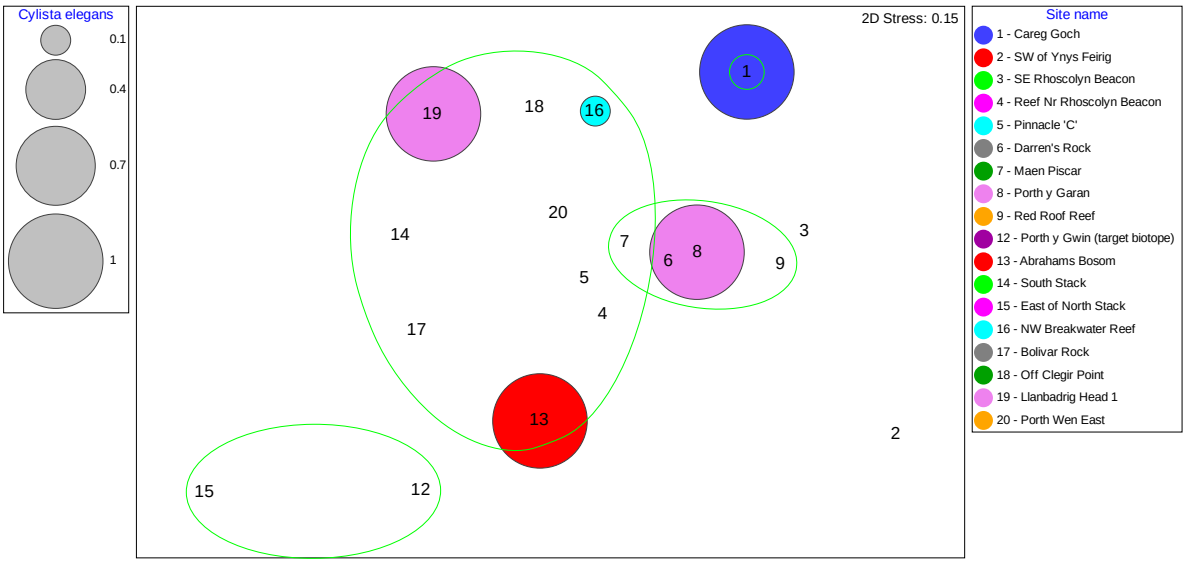

Figure 23: MDS bubble plot showing differences in occurrence and abundance of *Cylista elegans* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

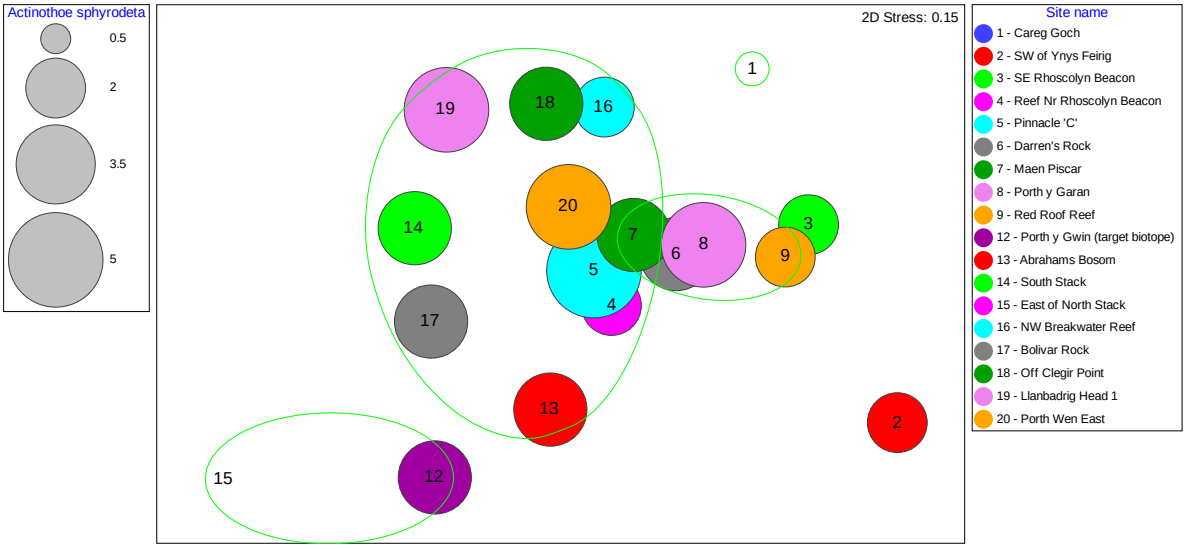

Figure 24: MDS bubble plot showing differences in occurrence and abundance of *Actinothoe sphyrodeta* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

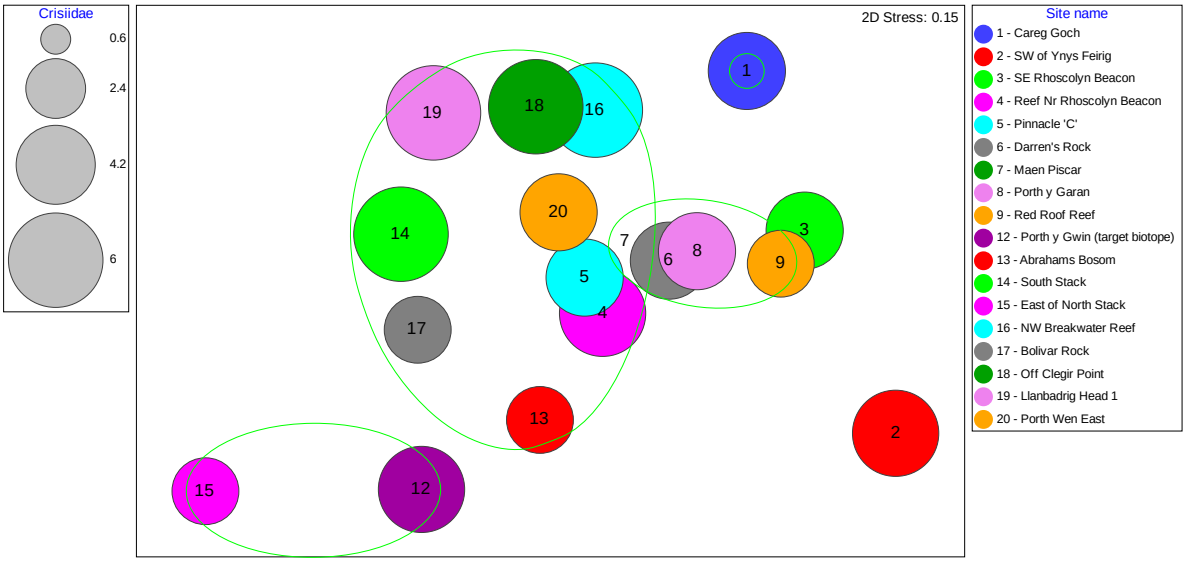

Figure 25: MDS bubble plot showing differences in occurrence and abundance of Crisiidae across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

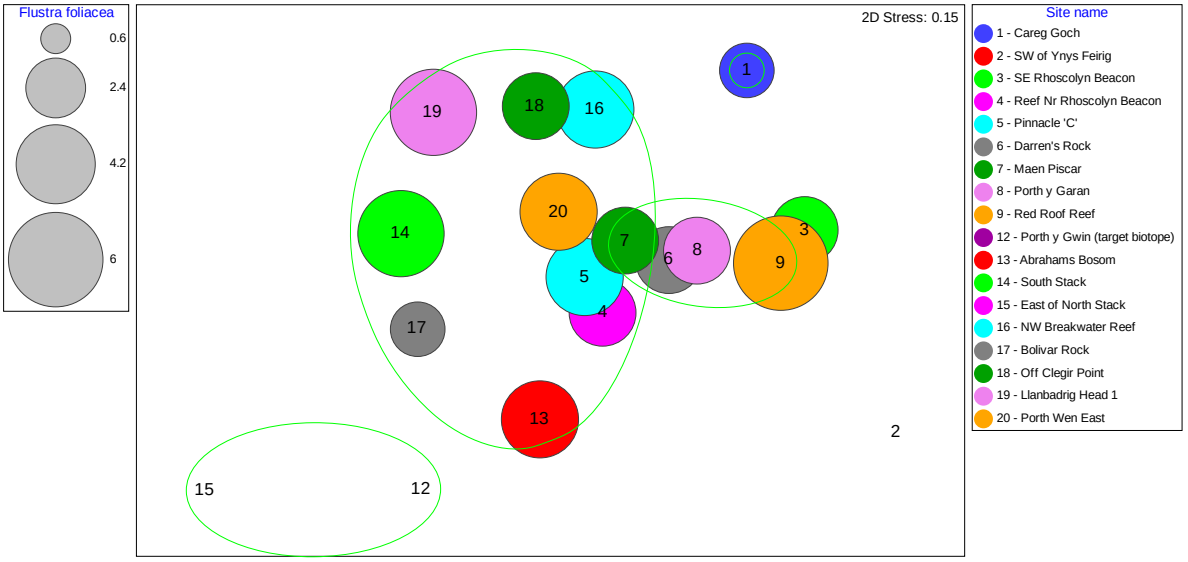

Figure 26: MDS bubble plot showing differences in occurrence and abundance of *Flustra foliacea* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

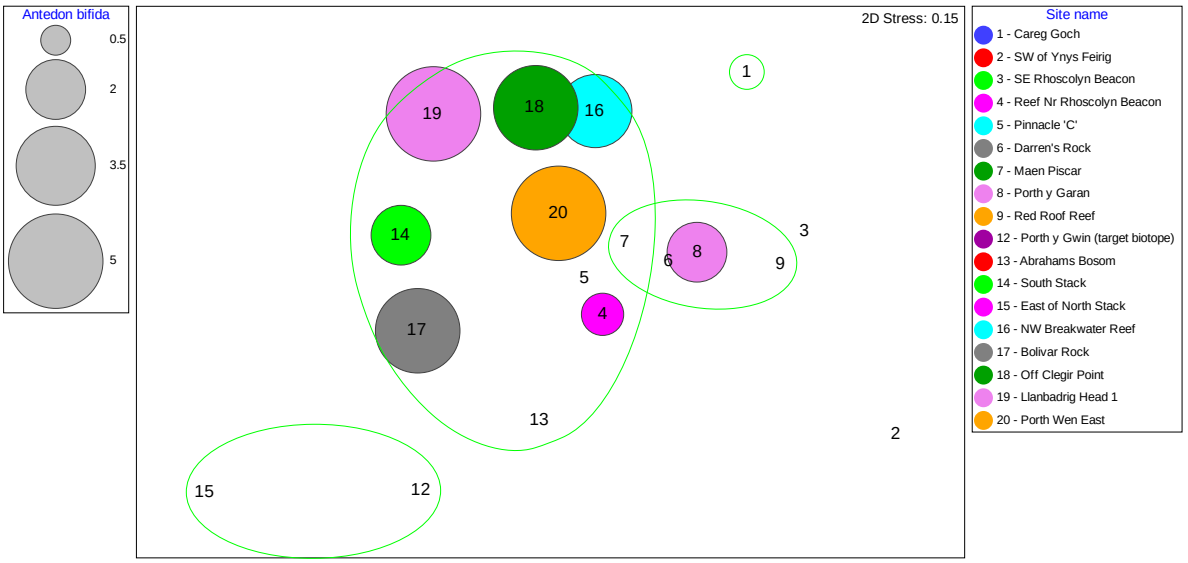

Figure 27: MDS bubble plot showing differences in occurrence and abundance of *Antedon bifida* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

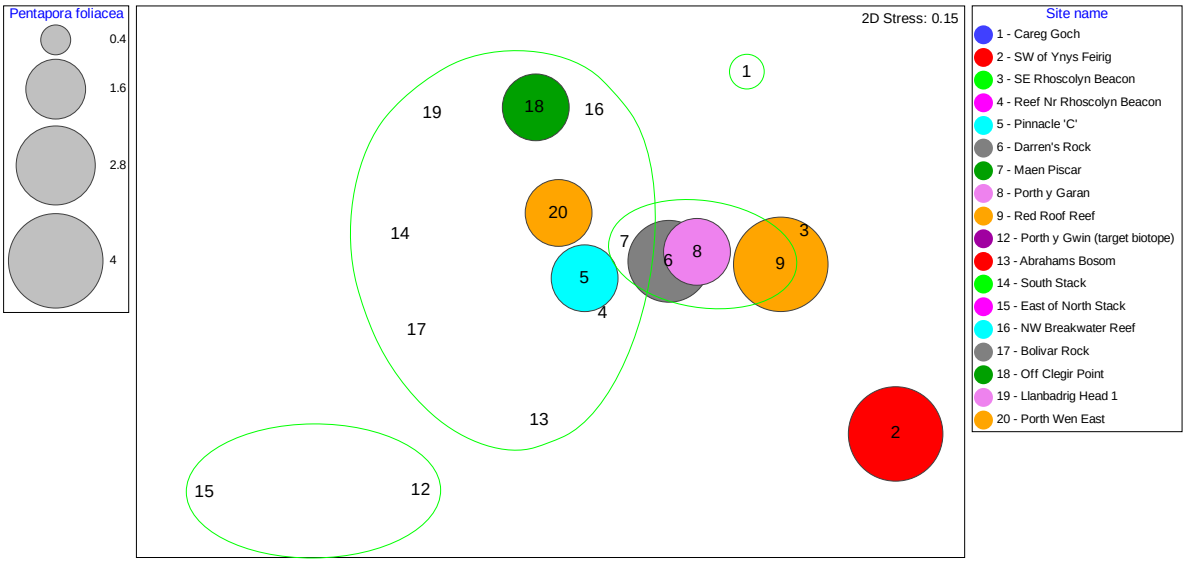

Figure 28: MDS bubble plot showing differences in occurrence and abundance of *Pentapora foliacea* across the sites where the target biotope was identified in 2023. Green lines represent the significant SIMPROF clusters.

Appendix B – JNCC Biotope Description

The following information is taken from the JNCC biotope description. A full version of the description is available at: the Marine Habitat Classification for Britain and Ireland (JNCC, 2022).

CR.HCR.XFa.ByErSp.DysAct: Mixed turf of bryozoans and erect sponges with *Dysidea fragilis* and *Actinothoe sphyrodeta* on tide-swept wave-exposed circalittoral rock.

Physical habitat description

Salinity	Full (30-35 ppt)
Wave exposure	Extremely exposed, Very exposed, Exposed, Moderately exposed
Tidal streams	Strong (3-6 kn), Moderately strong (1-3 kn)
Substratum	Bedrock; boulder
Zone	Circalittoral - lower, Circalittoral - upper
Depth Band	5-10 m, 10-20 m, 20-30 m

Description

This variant typically occurs on exposed and moderately wave-exposed bedrock and boulders subject to a variety of tidal regimes (from strong through to weak). It is found mainly in the 10-20m depth range and does not usually occur deeper than 30 m. It therefore often straddles the upper circalittoral and lower infralittoral. It often has a light covering of silt and sand may be in the vicinity. Sponges form a dominant part of this variant, although cover usually appears patchy, with no single species dominating. Species present include *Dysidea fragilis*, *Pachymatisma johnstonia*, *Amphilectus fucorum*, *Hemimycale columella*, *Cliona celata*, *Stelligera montagui*, *Polymastia boletiformis*, *Stelligera stuposa*, *Raspailia ramosa*, *Tethya aurantium*, *Polymastia mamillaris* and *Axinella dissimilis*. Tufts of large hydroids such as *Nemertesia antennina*, frequently recorded on the tops of outcrops and boulders, stand out more clearly than the understorey of finer hydroid and bryozoan turf such as *Aglaophenia pluma*, *Bugulina flabellata*, *Crisularia plumosa*, crisiids, *Cellaria sinuosa* and *Bugulina turbinata*. Other bryozoans such as *Alcyonidium diaphanum* and *Flustra foliacea* are also frequently recorded. Other more widespread species present include *Asterias rubens*, *Actinothoe sphyrodeta*, *Balanus crenatus*, *Caryophyllia smithii*, *Corynactis viridis*, *Necora puber* and *Clavelina lepadiformis*. This variant has been recorded off the south east coast of Ireland, the welsh coast and Lundy Island.

Situation

This biotope is typically found on exposed coasts, with exposed kelp forest in the infralittoral zone, characterised by species such as *Laminaria hyperborea* and *Saccorhiza polyschides*. The ByErSp.DysAct variant is usually found below ByErSp.Eun, with similar geographic range.

Characterising species

Taxon	Relative importance of taxon for defining this community (%)	Typical abundance - SACFOR scale
Dysidea fragilis	5	Frequent
Asterias rubens	4	Frequent
Pachymatisma johnstonia	4	Occasional
Actinothoe sphyrodeta	3	Frequent
Alcyonium digitatum	3	Occasional
Balanus crenatus	3	Frequent
Caryophyllia smithii	3	Frequent
Amphilectus fucorum	3	Frequent
Flustra foliacea	3	Frequent
Nemertesia antennina	3	Frequent
Alcyonidium diaphanum	2	Frequent
Bugulina flabellata	2	Occasional
Crisularia plumosa	2	Frequent
Cliona celata	2	Occasional
Crisiidae	2	Common

Taxon	Relative importance of taxon for defining this community (%)	Typical abundance - SACFOR scale
Hemimycale columella	2	Occasional
Polymastia boletiformis	2	Frequent
Raspailia ramosa	2	Occasional
Stelligera montagui	2	Occasional
Stelligera stuposa	2	Occasional
Aglaophenia pluma	1	Frequent
Axinella dissimilis	1	Occasional
Bryozoa	1	Frequent
Bugulina turbinata	1	Frequent
Cellaria sinuosa	1	Frequent
Clavelina lepadiformis	1	Occasional
Corynactis viridis	1	Frequent
Necora puber	1	Occasional
Polymastia mamillaris	1	Occasional
Tethya aurantium	1	Occasional

Appendix C – Subset of potentially fragile / characterising benthic species

Columns 5 and 6 of Table 4 give the number and percentage of a subset of 17 key sponge and anemone species recorded at each site. These were selected by the authors on the basis of being potentially fragile and/or characterising of the sites surveyed. The list is not necessarily exhaustive but provides a further method of understanding differences and similarities between the sites surveyed. The species selected were:

Species	**Reason for inclusion**
Axinella damicornis *Axinella dissimilis* *Axinella infundibuliformis* *Pentapora foliacea*	Fragile and sensitive to abrasion
Haliclona (Haliclona) fistulosa *Haliclona (Haliclona) oculata* *Haliclona (Haliclona) simulans* *Raspailia (Clathriodendron) hispida* *Raspailia (Raspailia) ramosa* *Stelligera montagui* *Stelligera stuposa* *Tethya citrina*	Potentially fragile and sensitive to abrasion
Actinothoe sphyrodeta *Amphilectus fucorum* *Corynactis viridis* *Cylista elegans* *Dysidea fragilis*	Characterising species

Appendix D - Data Archive

Data outputs associated with this project are archived on server–based storage at Natural Resources Wales.

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A full set of images and video produced in .jpg and .mp4 format respectively.

[C] An image catalogue in Excel format detailing filenames and location / habitat / species information for the images and video.

[D] An Excel file of the survey data in MEDIN-compliant format.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue https://libcat.naturalresources.wales (English Version) and https://catllyfr.cyfoethnaturiol.cymru (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no NRW_DS161318

Further copies of this report are available from library@cyfoethnaturiolcymru.gov.uk