Cyfoeth Naturiol Cymru
Natural Resources Wales

NRW 2016 North Anglesey INNS and *Sabellaria* video and still image analysis

Lin Baldock & Harry Goudge
Marine EcoSol

Report No 206

About Natural Resources Wales

Natural Resources Wales' purpose is to pursue sustainable management of natural resources. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

Evidence at Natural Resources Wales

Natural Resources Wales is an evidence based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

This Evidence Report series serves as a record of work carried out or commissioned by Natural Resources Wales. It also helps us to share and promote use of our evidence by others and develop future collaborations. However, the views and recommendations presented in this report are not necessarily those of NRW and should, therefore, not be attributed to NRW.

Report series:	Evidence Report
Report number:	206
Publication date:	June 2017
Contract number:	N/A
Contractor:	Marine EcoSol
Contract Managers:	L. Grant and K. Robinson
Title:	North Anglesey INNS and Sabellaria video and still image analysis
Author(s):	L. Baldock and H. Goudge
Technical Editor:	Laura Grant / Karen Robinson
Peer Reviewer(s)	Karen Robinson / Kirsten Ramsay
Approved By:	Laura Grant / Karen Robinson
Restrictions:	None

Distribution List (core)

NRW Library, Bangor	2
National Library of Wales	1
British Library	1
Welsh Government Library	1
Scottish Natural Heritage Library	1
Natural England Library (Electronic Only)	1

Recommended citation for this volume:

Baldock, L. and Goudge, H. 2017. NRW 2016 North Anglesey INNS and *Sabellaria* video and still image analysis. NRW Evidence Report Series. Report No: 206, 61pp, Natural Resources Wales, Bangor

Contents

List of Figures

1. Crynodeb Gweithredol

Mae ein gwybodaeth ynghylch dosbarthiad a maint cynefinoedd gwely'r môr yn nyfroedd Cymru yn brin iawn ac mewn rhai ardaloedd ychydig iawn sy'n hysbys ynghylch pa gynefinoedd a allai fod yn bresennol. Un o amcanion yr arolwg hwn oedd casglu data am rywogaethau estron goresgynnol, yn enwedig mewn perthynas â Dyfnder Caergybi. Mae'r safle gwaredu hwn yn derbyn deunydd carthu, yn bennaf o Borthladd Caergybi, sy'n agos at gyffiniau Marina Caergybi, lle mae cofnodion o rywogaethau estron goresgynnol.

Mae riffiau *Sabellaria spinulosa* (a adwaenir fel y Ross Worm yn Saesneg) yn gynefin sy'n dirywio. Cafodd ei nodi fel cynefin sydd o dan fygythiad gan Gonfensiwn Oslo–Paris ar Warchod yr Amgylchedd Morol yn Rhan Ogledd-ddwyreiniol yr Iwerydd (OSPAR) ac mae'n cynnwys elfen o riff Atodiad 1. Mae unigolion a chramennau *Sabellaria spinulosa* yn cael eu cofnodi'n aml ledled Cymru, ond prin yw'r achlysuron pan mae presenoldeb y riff wedi cael ei gadarnhau. Mae arolygon masnachol blaenorol a gynhaliwyd oddi ar arfordir gogledd a gorllewin Ynys Môn wedi nodi presenoldeb riff *Sabellaria spinulosa* yno. Bwriad yr arolwg hwn felly oedd gwirio'r cofnodion hyn a rhoi syniad o ba mor fawr oedd y cynefin.

Dewiswyd trydedd set o safleoedd arolwg o'r data amlbelydr a gasglwyd oddi ar arfordir gogledd a gorllewin Ynys Môn, gyda'r nod o wirio dehongliad o ba fath o wely'r môr oedd yno.

Prif amcan y contract hwn oedd ymgymryd â dadansoddiad tacsonomig o ddelweddau fideo a llonydd o'r gwaith arolwg a wnaed ledled gogledd a gorllewin Ynys Môn ym mis Hydref 2016. Roedd ardal yr arolwg yn ymestyn i'r gorllewin o Drwyn y Balog hyd at Borth Swtan ac allan i safleoedd ar Ynysoedd y Moelrhoniaid, Riff Gorllewin Ynys Môn a Dyfnder Caergybi.

Cymerwyd y casgliad o ddelweddau fideo a lluniau llonydd tan ddŵr ar gyfer yr arolwg hwn gan long arolwg arfordirol RV Mersey Guardian ym mis Hydref 2016 gan ddefnyddio camera gollwng i lawr digidol manylder uwch. Roedd set ddata'r fideo yn cynnwys ffilm o 25 o achosion gwahanol, a oedd yn cynnwys mwy nag wyth awr o fideo yn ei gyfanrwydd. Casglwyd cyfanswm o 3,759 o ddelweddau llonydd, a gymerwyd tua bob saith eiliad, ar yr un pryd â'r ffilm fideo.

Ar bob achlysur, cafodd yr holl ffilm fideo a set o luniau llonydd eu hadolygu cyn iddynt gael eu hasesu a'u cofnodi'n fanwl, a chafodd y ffiniau rhwng cynefinoedd (biotopau) neu grwpiau o gynefinoedd eu nodi. Wedyn, cafodd y rhywogaethau a'r is-haenau ym mhob 'sampl' eu cofnodi a chafodd cynefinoedd eu neilltuo.

Nodwyd cyfanswm o 35 o gynefinoedd arwahanol a hynny o fewn 25 gorsaf arolwg, a chafodd riffiau *Sabellaria spinulosa* eu cofnodi mewn 34 o'r 35 cynefin. Canfuwyd riffiau sylweddol, tua 10 cm o uchder, mewn naw o'r gorsafoedd arolwg ac roedd y riffiau *Sabellaria spinulosa* mwyaf amrywiol i'w gweld ar riff caregog o gerrig crynion ymhlith cerrig mân ger y Wylfa.

Ni nodwyd unrhyw rywogaethau estron yn ystod yr arolwg. Yn benodol, roedd pryder y gallai'r chwistrell fôr garped (*Didemnum vexillum*) fodoli mewn rhai safleoedd sy'n derbyn deunydd carthu o Borthladd Caergybi, ond nid oedd i'w gweld ar unrhyw un

o'r delweddau. Mae'r rhywogaeth hon wedi'i chanfod yn ddiweddar mewn cynefinoedd naturiol oddi ar arfordir gogledd Caint.

Cymharol brin oedd y sbwriel a welwyd yn y fideo, ac roedd hwn yn cynnwys darnau o fonoffilament, plastig a lliain yn bennaf. Nodwyd bod rhai riffiau *Sabellaria spinulosa* oedd wedi cael eu dymchwel ger Cemlyn a Phorth Swtan. Roedd dau allan o'r tri safle yn Nyfnder Caergybi sy'n derbyn deunydd carthu o Borthladd Caergybi yn ymddangos fel eu bod yn cynnwys mwy o silt na lleoliadau arolwg oedd yn agosach at y lan.

2. Executive Summary

Our knowledge of the distribution and extent of seabed habitats in Welsh waters is extremely patchy and in some areas little is known of which habitats may be present. One of the aims of this survey was to collect data on Invasive Non-Native Species particularly in relation to Holyhead Deep. This disposal site receives dredged disposal material mainly from Holyhead Port, which is in close proximity to Holyhead Marina where there are known records of non-native species.

Sabellaria spinulosa (Ross Worm) reef is an OSPAR threatened and declining habitat and a component of Annex I Reef. Individuals and crusts of *Sabellaria spinulosa* are recorded commonly around Wales but the presence of reef has rarely been confirmed. Previous commercial surveys off north and west Anglesey have indicated the presence of *Sabellaria spinulosa* reef. This survey, therefore, also aimed to verify these records and give an indication of extent of the habitat.

A third set of survey sites were selected from multibeam data collected around north and west Anglesey with the aim of verifying an interpretation of the seabed type.

The principal objective of this contract was to undertake a taxonomic analysis of video and still images from survey work undertaken around north and west Anglesey in October 2016. The survey area extended from Point Lynas west to Church Bay and out to sites on the Skerries, West Anglesey Reef and Holyhead Deep.

The collection of underwater video using a high definition digital drop-down camera and stills for this survey was undertaken by the coastal survey vessel RV Mersey Guardian in October 2016. The video dataset encompassed 25 tows, comprising over eight hours of video in total. A total of 3759 still images taken at approximately seven second intervals were collected simultaneously with the video tows.

The entire video /set of stills from each tow were reviewed prior to detailed assessment and recording, and the boundaries between habitats (biotopes) or habitat complexes noted. The species and substratum in each tow section or ‘sample’ was then recorded, and habitats assigned.

A total of 35 discrete habitats were identified within the 25 survey stations, with Ross Worm reef recorded in 34 of the 35 habitats. Substantial reef over 10cm high was found at nine survey stations with the most diverse Ross worm reef habitat occurring on stony reef of cobbles among pebbles off Wylfa.

No non-native species were recorded during the survey. In particular there was concern that the Carpet Squirt (*Didemnum vexillum*) might occur at some sites receiving dredge material from Holyhead Port, but it was not identified in any of the imagery. This species has recently been reported in natural habitats off the north Kent coast.

Relatively little litter was seen in the video, mostly fragments of monofilament, pieces of plastic and cloth. Some toppled Ross worm reef was noted off Cemlyn and Church Bay. Two of the three sites in Holyhead Deep receiving dredge material from Holyhead Port appeared to be siltier than the near shore survey locations.

3. Introduction

Our knowledge of the distribution and extent of seabed habitats in Welsh waters is extremely patchy and in some areas little is known of which habitats may be present. In order to increase our knowledge and evidence base, Natural Resources Wales (NRW) worked in collaboration with the Environment Agency under the organisations' joint Service Level Agreement to undertake a 3-day survey on board the RV Mersey Guardian to collect video and still images in areas where it is believed habitats or species of conservation importance may be present as well as those that have the potential to threaten our native marine species and habitats. The data will also allow NRW better to understand the seabed structure and biological communities at the survey sites.

One of the aims of this survey was to collect data on Invasive Non-Native Species (INNS) particularly in relation to Holyhead Deep disposal site. This site receives dredged disposal material mainly from Holyhead Port, which is in close proximity to Holyhead Marina where there are known records of INNS. Sites inside and outside of Holyhead Deep were surveyed to assess the potential effects of dredge disposal activities in this area and increase our evidence base required when assessing the risk of spread of non-natives and producing biosecurity plans. Species on Schedule 9 of the Wildlife and Countryside Act 1981 and other 'high risk' species were of particular concern although all non-native species were of interest. The survey at Holyhead Deep is part of a wider aim to survey all disposal sites in Wales for non-natives, providing a useful baseline for INNS management in Wales.

Sabellaria spinulosa reef is an OSPAR threatened and declining habitat and a component of Annex I Reef. Individuals and crusts of *Sabellaria spinulosa* are recorded commonly around Wales but the presence of reef has rarely been confirmed. Previous commercial surveys off north and west Anglesey have indicated the presence of *Sabellaria spinulosa* reef. This survey, therefore, also aimed to verify these records and give an indication of extent of the habitat.

Multibeam data has been collected for the north west Anglesey area by the Maritime and Coastguard Agency, who have shared this data with NRW as part of a pan-government Memorandum of Understanding. An initial examination of this data suggests that there are large areas of rocky habitat. However, in order to interpret the multibeam data with any confidence verification is required in the form of groundtruthing of survey sites that appear to have a different acoustic signature. The number of sites surveyed was relatively small, as the survey of Holyhead Deep and potential *Sabellaria spinulosa* reef were the primary objectives.

The principal objective of this contract was to undertake a taxonomic analysis of video and still images from survey work undertaken around north and west Anglesey in October 2016. All species and habitats listed in Section 7 of the Environment (Wales) Act (formerly Section 42 of the Nerc Act 2006) were to be recordedSection 7 of the Environment (Wales) Act creates a duty on Welsh Ministers to publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales. At the time of writing the Section 7 list was the same as the previous section 42 list of the NERC Act 2006. Following this analysis, biotopes were to be assigned (in accordance with the JNCC Marine Habitat Classification for Britain and Ireland). The presence of INNS was to be particularly noted. In addition, data were entered into Marine Recorder (NRW's marine biological sample database). This short report summarises the findings of the data analysis work.

The collection of underwater video using a high definition digital drop-down camera and stills for this survey was undertaken by the coastal survey vessel RV Mersey Guardian between the 10th and 12th October 2016. The video dataset encompassed 25 tows, the majority of the tows being between 200 and 300m in length, although tows ranged from 30m to 860m comprising over eight hours of video in total. A total of 3759 still images taken at approximately seven second intervals were collected simultaneously with the video tows.

4. Methods

4.1 Camera Equipment

The camera equipment used for the survey was a sledge mounted C-Tecnics High definition CT3009 camera providing full 1080i HD recording (1920 x 1080). This was obliquely mounted on a sledge accompanied by two C-Tecnics CT4004 LED Lamps each of approximately 1100 lumens, accompanied by two C-Tecnics Laser lights (CT4005 – subsea Laser Modules) and two lasers set 10cm apart to provide a visual scale on the resulting video footage. The video unit had its own integrated depth sensor. The video feed was relayed to the surface unit via a 200m umbilical where realtime GPS positional data and other information were over-laid on the video footage and recorded on the surface unit's computer hard drive.

The drop down sledge was also equipped with a RovTech Seacam 18megapixel auto stills camera with an 18 mm lens, twin strobes and battery pack. This was a self-contained system that was set to take pictures at predefined intervals (for this study the stills camera interval varied from 6 to 10 seconds). The camera was set to start recording before the sledge was placed in the water and continued to take images at the predefined interval until it was brought back on board. Images were then downloaded between each camera tow and saved to a computer hard drive.

The drop down video survey method followed the MESH (Mapping European Seabed Habitats) standard protocols (Coggan *et al.*, 2007) as closely as possible. Drops were carried out during a neap tide and where possible during the period either side of slack water. Even on a neap tide, given the depth of some of the survey locations and the fast running currents in the area, it was difficult to position the video tow so that it passed exactly through the survey location, although every effort was made to get as close as possible.

During the survey, the vessel's position was logged every five seconds and plotted onto a trackline in the Manifold GIS (Geographical Information System) software package. After the survey, the points relating to each individual video tow line were extracted from this position log using the recorded times and locations for the start of line and end of line.

For each survey station visited, a hand-written station log was completed to record essential information relating to the location, video quality, water depth, locations of the start and end of line and also any notes taken by the surveyor watching the video on the vessel. This was used to help inform post-survey data analyses and data entry.

The metadata for each tow at the 25 survey stations at which usable imagery was collected are presented in Appendix 1. In general image quality was adequate to good though there were some instances where the towing speed was too fast and the cameras too high off the seabed allowing only general habitat information to be gleaned and little information collated on species. The location of the survey stations is shown in Figure 1.

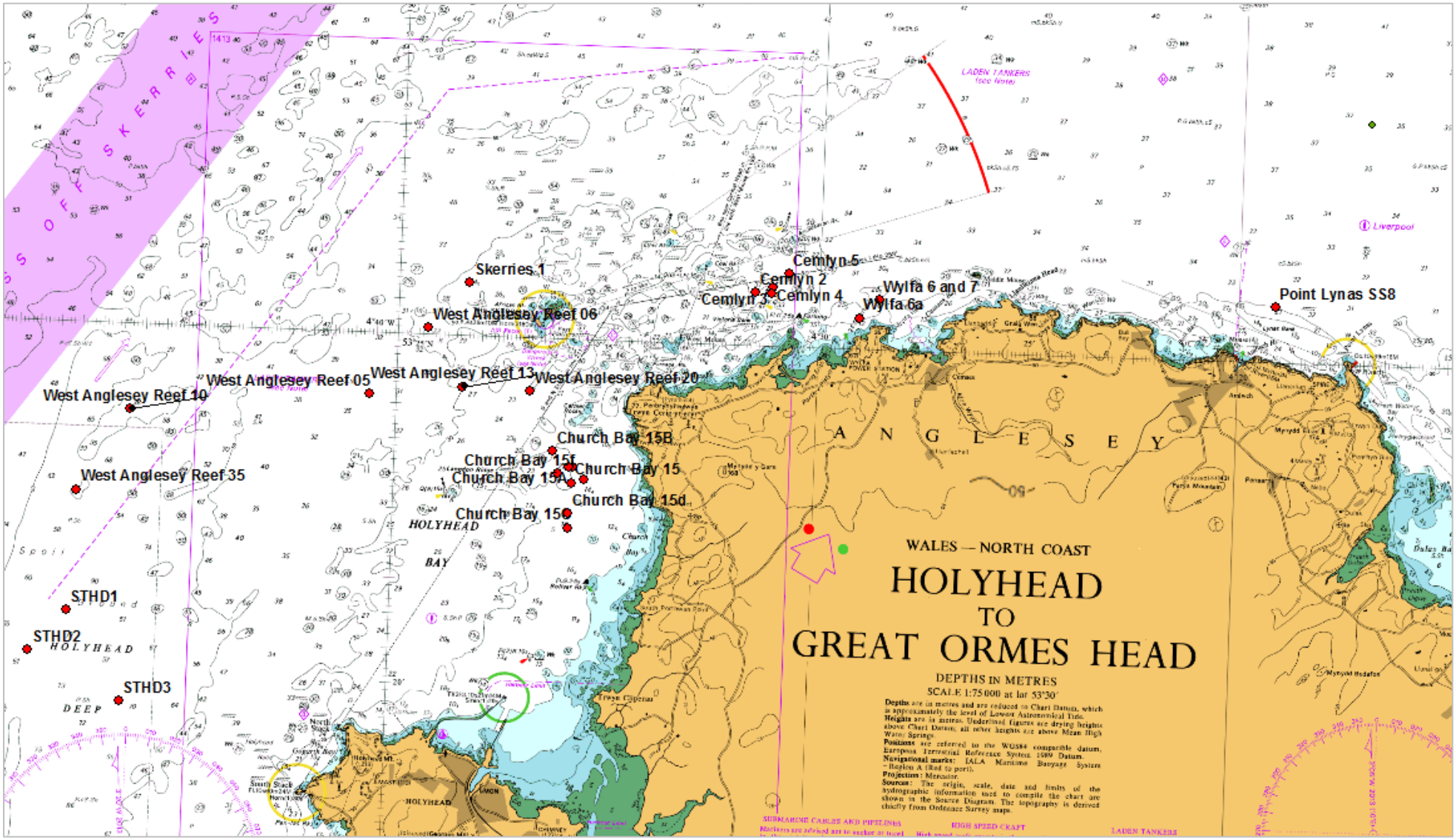


Figure 1: Map showing survey sites off the north and west coast of Anglesey. © British Crown and OceanWise Ltd, 2017. All rights reserved. License No. EK001-20120402. Not to be used for Navigation.

4.2 Image Analysis

The video camera showed a swath of seabed approximately 0.5m wide, still images covered an area of about 0.25m^2. All images were reviewed using appropriate high quality imaging equipment capable of playing and displaying full HD video at 1080p resolution.

The entire video /set of stills from each tow were reviewed prior to detailed assessment and recording, and the boundaries between biotopes or biotope complexes noted by recording the time and positional coordinates at which major changes in seabed and habitat type occurred. The species and substratum in each tow section or 'sample' was then recorded, and biotopes assigned.

Discrete tow sections or 'samples' as defined above were determined using video data. The still images were then linked to the "sample" in terms of data recording using the time at which they were taken.

In summary, image analysis (stills and video) followed these steps:

1. Brief review of image for quality and suitability in relation to the analytical methods to be used. Any image deemed not to be of sufficient quality was not analysed.
2. The initial viewing of the video record divided it into sections considered to represent different seabed habitat types. Habitat types extending less than 25m^2 were considered as incidental patches in a habitat mosaic. Each video section and the associated set of still images represented the data for one sample.
3. Analyse imagery:
    a. For each image set (video section and associated stills) the quality was categorised as good/moderate/poor.
    b. Habitats were described in one sentence for each section (sample) of video and associated set of stills (habitat name).
    c. Taxa were identified to the to the lowest taxonomic level possible and counted (erect epibenthic species) or their percentage cover estimated (colonial/encrusting epibenthic species). All taxa were enumerated per section of video and associated set of stills, before conversion to SACFOR using MNCR guidelines. Taxonomic nomenclature followed the European Register of Marine Species.
    d. Substrate composition was estimated as per MNCR categories.
    e. Percentage cover of *Sabellaria spinulosa* reef was recorded and classified into three categories according to its height (Gubbay, 2007) and the extent of cover estimated.
    f. The presence of litter and physical damage was noted.
    g. Any Section 7 (formerly Section 42 of the NERC Act 2006) or OSPAR species or habitats, or other particularly noteworthy features were recorded and the position (coordinates), date, time and still image file name(s) (if applicable) recorded on a proforma spreadsheet.

h. The occurrence of invasive non-native species (INNS) was recorded.
i. Where identification of taxa or habitats was uncertain, a note was made and comments provided, stating the reason for the uncertainty e.g. blurred image, partially concealed from view, cannot be identified by image alone.
j. A reference collection of images for each biotope recorded was compiled as well as interesting and/or unusual taxa.

4. Biotopes were assigned to the highest resolution possible using the JNCC (2015) on-line Marine Habitat Classification v15.03 with the aim of matching biotopes at level four or five of the classification hierarchy.
5. All above information was recorded in an Excel spreadsheet.
6. A final check was then made that all above information had been recorded and was correct for each sample.

Note: all algae seen in the video and stills were considered to be drift material and not recorded. None of the drift algae seen were non-native species.

5. Results

A total of 35 samples were derived across the 25 survey stations. Summary parameters for all samples are provided in a series of tables in Appendices 1-3: sample metadata, sample biotope information and details of *Sabellaria spinulosa* reef height, extent and % cover, as well as the presence of Section 7 and OSPAR species and habitats. Annex 1 habitats, litter and other impacts. Over 190 taxa were recorded in these samples in nine biotopes. Example images of all biotopes recorded are provided in Appendix 4. It was noted that at some sites many of the components of the fauna were of a small size either individuals e.g. juvenile *Aequipecten opercularis*, or small colonies e.g. many colonial tunicates.

5.1 Invasive Non-Native Species (INNS)

No INNS were recorded in any of the samples. In particular the invasive Carpet squirt (*Didemnum vexillum)* was absent from all survey sites, which was of particular relevance as there are records of this species in nearby Holyhead Marina. Some images of didemnid tunicates were selected which appeared to represent this species and these were submitted for expert evaluation (Those with experience identifying *Didemnum vexillum* who reviewed the images included John Bishop (Marine Biological Association); Rohan Holt (independent expert); Kirsten Ramsay, Paul Brazier and Ben Wray (Natural Resources Wales) but after review, none were considered to be this species. A selection of these images is shown Appendix 5.

5.2 Sabellaria spinulosa Reef

Sabellaria spinulosa was recorded in 34 of the 35 samples, Church Bay_15d with highly mobile rippled sand being the only site without. Substantial and extensive *S. spinulosa* reef >10cm in height was recorded at nine survey stations (Cemlyn 3 & 4, West Anglesey Reef_35 and Church Bay 15, 15a, 15b, 15f, and N2S. The most diverse *S. spinulosa* biotope was CR.MCR.CSab.Sspi. Elsewhere it occurred over stony reef of cobbles and small boulders at Wylfa 6&7 where 71 taxa were recorded. The *S. spinulosa* biotope on bed rock rather than stony reef (Church Bay_15_H1, WestAnglesey_Reef_35_H1) was relatively impoverished due in part to the high level of scour by adjacent mobile gravel and coarse sand which would appear to affect these sites.

5.3 Groundtruthing multibeam data

Six sites which were visited during this survey had been surveyed using multibeam so it was of interest to compare the predicted seabed obtained from the acoustic signature with video data captured during the survey. Of the six sites visited, three were predicted to be rock (West Anglesey Reef (WAR) 6, 10 and 35) and three were predicted to be sediments (West Anglesy Reef 5, 13 and 20).

Of the three sites predicted to be rock, the majority were mixed substrates, predominantly composed of stable mixed sediments and coarse sediments with small proportions of bedrock (approx 5-15%). WAR 35 appeared to have bedrock just under the surface for a large part of the tow with a thin layer of

sand and *Sabellaria spinulosa* on the surface. WAR 6 also had mussel beds present. Of the three sites which were predicted not to be rock, these again were predominantly stable mixed sediments composed principally of gravel, cobbles and occasional small boulders. Overall, there did not appear to be a significant correlation between those sites predicted to be rock and not rock and the substrate observed but a stony substrate was present in some form for most of the survey sites.

Positional error of the tows may be the cause of the discrepencies in some cases as the video tow may not have been exactly over the site identified from the multibeam. Further analysis of the data will be undertaken to investigate this. Initial estimations of the substratum from the multibeam data, however, were uncertain, therefore the results obtained may not be unexpected. Bedrock with a veneer of of sand is a seabed type which is hard to identify using multibeam. Further survey work would be required to groundtruth more locations in the future.

5.4 Section 7 / OSPAR Listed Species /Habitats & Annex 1 Habitats

Occurrences of these features are summarised in Appendix 3.

5.5 Other Interesting Taxa

- *Capnea sanguinea* – Imperial anemone a relatively rare species occurring in muddy, mixed sediments A single individual recorded at Wylfa_6_&_7_H2. There are no nearshore records on the NBN around northwest Anglesey.
- Juvenile *Cancer pagurus* (~5cm carapace width) were noted as occasional at Cemlyn_5_H1 (SS.SBR.PoR.SspiMx) and frequent in West Anglesey Reef_06_H1 among the small blue mussel biotope (SS.SBR.SMus.MytSS) which might indicate potentially important nursery areas for this commercial species.
- *Pandalus montagui* were observed in relatively high abundances within most habitats reviewed (27 of 35 habitats recorded as frequent or common). Of these 27 habitats, the majority also recorded high abundances of *Sabellaria spinulosa* reef or crusts (23 with abundances greater than frequent). Conversely, within the 11 habitats where *Sabellaria spinulosa* reef or crusts were recorded in low abundance (frequent or lower), *P. montagui* was also recorded less frequently (7 of 11 habitats recording *P. montagui* as occasional, rare or absent).
- *Pentapora foliacea* –the Potato Crisp bryozoan was recorded from PointLynas_SS8_H2 and small fragments at all stations at Cemlyn with rare large, very pale colonies recorded at Cemlyn_2 and 3
- A dense bed of the brittlestar *Ophiothrix fragilis* was present at Wylfa_6A for the whole of the 310m of the tow.
- *Polysyncraton bilobatum* – a didemnid tunicate recorded at PointLynas_SS8_H1. There are records from Pembrokeshire in Wales and Norfolk and Dorset in England. Probably under recorded reflecting distribution of expertise in identification.

5.6 Litter, Damage and Other Impacts

Relatively little litter was recorded across the survey stations, mostly comprising small scraps of twine, plastic sheet, cloth, rope, monofilament etc.. Items recorded are detailed Appendix 3. The only evidence of possible anthropogenic damage was represented by relatively large areas of toppled columns of *Sabellaria spinulosa* reef which was especially evident at Cemlyn_5, and Church Bay_15A and 15F (Figures 2-4). However there is no way to be sure what caused this damage, and it could equally be evidence of natural reef decay if *Sabellaria spinulosa* undergoes similar cyclic development and decay stages, as occurs in *Sabellaria alveolata* reefs. Toppled towers of *S. spinulosa* at Church Bay_15 were considered to be too isolated to have resulted from anthropogenic activity, so were likely a result of natural reef decay.

Two of the three sites in Holyhead Deep (STHD_1 and STHD_3) appeared to be siltier than any of the other stations with plumes of fine sediment disturbed by the camera rig and in some instances obscuring the view of the seabed. Coarse sediments of pebbles and gravel had a thin layer of mobile fines dusting the surface less evident at other sites. This area is used for the disposal of dredged material mainly derived from Holyhead Port.

Figure 2 Eroded or damaged Ross worm reef – Cemlyn_5_H1

Figure 3 Toppled Ross worm reef – Church Bay_15A_H1

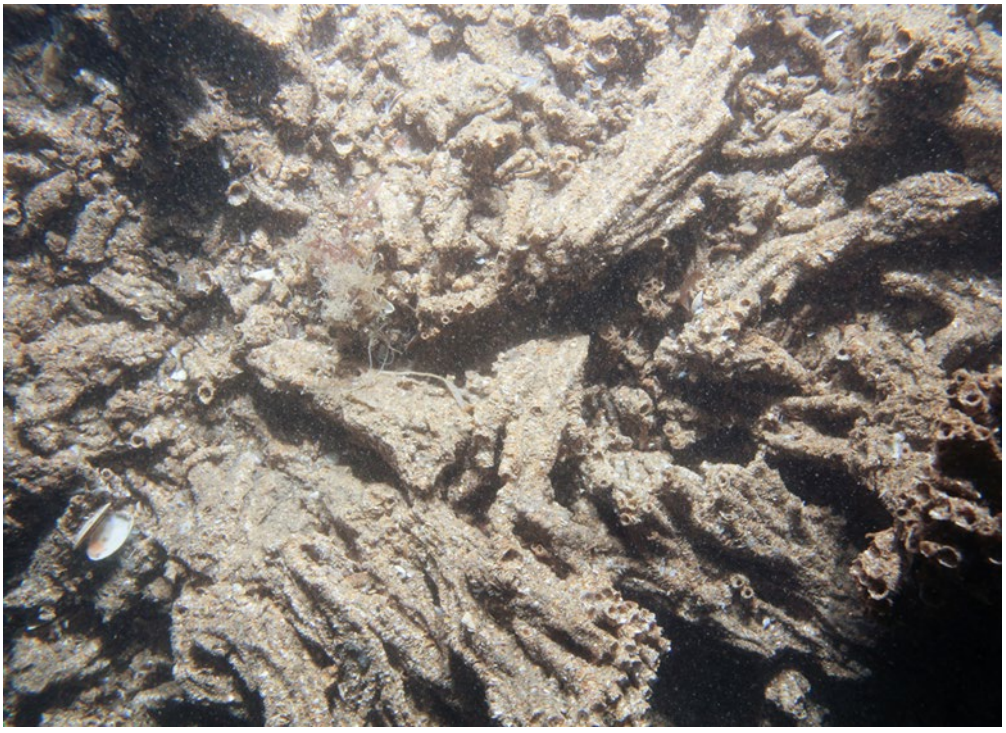


Figure 4 Toppled Ross worm reef – Church Bay_15F_H1

6. Discussion

6.1 *Sabellaria spinulosa* Reef

It has been assumed that the species recorded forming reefs and crusts in the present survey was *Sabellaria spinulosa*. Although this is the species commonly responsible for subtidal reefs around the British Isles, no evidence was gathered during the current survey, positively identifying the reef building species observed. To identify between the species of *Sabellaria* requires physical sampling and microscopic examination of the opercular chaetae, which was beyond the scope of the current project. However previous commercial surveys off north and west Anglesey (i.e. the same area as the present survey) included physical sampling and microscopic examination of the *Sabellaria* species collected, and these were identified as *Sabellaria spinulosa*. There are records from commercial surveys around north Anglesey for subtidal *Sabellaria alveolata* but no evidence that the species forms reef. There are published records of a reef of *S. alveolata* occurring at a depths between 12m and 30m below Chart Datum off Wicklow Head in the Irish Sea (De Grave & Whitaker, 1997) and also in the Bristol Channel (Mettam et al 1994) where it formed extensive reefs in the inner estuary while *S. spinulosa* was the dominant species in the outer Bristol Channel (George & Warwick, 1985).

Wylfa 6&7_H2 with circalittoral stony reef of cobbles in a matrix of stone gravel and pebbles consolidated by a mixed turf of *S. spinulosa* and small tunicates had the highest taxon count at 77. The characteristics of stony reef habitat under the Habitats Directive have been detailed by Irving (2009) and the criteria presented there in have been used in the present study. The biotope "*Sabellaria spinulosa on stable circalittoral mixed sediment*" (SS.SBR.PoR.SspiMx) supported a considerable range in the number of taxa (21-71) but certainly showed a more diverse community compared with the coarse sediment biotope (SS.SCS.CCS) with 1-11 taxa recorded at three sites while a fourth (STHD2_H1 in Holyhead Deep) supported 37 taxa where a very sparse crust of *S. spinulosa* occurred on the pebbles.

At some sites it was noted that well developed *Sabellaria* reef occurred alternating with areas of coarse sediment composed either of pebbles and gravel with low reef or crusts of *Sabellaria* (Cemlyn_2, Church Bay 15B, West Anglesey Reef 10) or mobile, medium sand (Church Bay 15, 15A and Church Bay North2South). Pearce et al (2011) reported that reefs of *S. spinulosa* offshore of Great Yarmouth and Lowestoft showed a characteristic wave length of 4-7m. This character they illustrated with a topographic profile of the reef and multibeam backscatter data. It would seem likely that the *Sabellaria* reef features at these North Anglesey sites are showing a similar pattern of alternating tall *Sabellaria* reef and low reef or pebbles although the wave length is unknown.

Pearce et al (2011) found no significant relationship between the physical attributes of a reef (height, percent cover) and the number of species it supported. They concluded that the best measure of the quality of a *Sabellaria*

reef was the density of living *S. spinulosa*. It is quite likely that the development of *S. spinulosa* reef in a given area is cyclical.

Sabellaria spinulosa reef has been assumed to be sensitive to physical destruction for example by bottom trawling; the sensitivities of this species where it forms reefs have been discussed in detail by Jackson & Hiscock (2008). It has been noted that the presence of adult worms assists in larval settlement, the tubes being the preferred substrate.

It was observed during the present survey that the drop video gave a much better impression of the scale and quality of the *Sabellaria spinulosa* reef, compared with the top down views from the stills camera. However, the latter allowed much more detail to be recorded of the epifauna associated with the reefs than was possible from the video. It is therefore necessary to deploy both systems during a survey if detailed data on community composition is to be obtained.

6.2 Invasive Non-native Invasive Species (INNS)

No invasive non-native species were recorded during the present analysis of imagery. This provides limited information regarding the current status of the disposal site with regard to non-natives and increases our ability to assess the risk from movements of waste to this disposal site. However further surveys within this site and in the surrounding area would be required to increase confidence in these conclusions as only a small number of sites were visited.

The invasive colonial ascidian *Didemnum vexillum* was first recorded in Holyhead Marina in September 2008 (Griffith et al, 2009) which was the earliest recorded established population for this species in Great Britain. Partially successful efforts were made to eradicate it from the marina and the species has not yet been recorded outside the marina in the wider Holyhead harbour area. The concern is that propagules might be disseminated to the dumping ground in Holyhead Deep where dredge material from the marina is deposited and the species might become established there. However *Didemnum vexillum* was not recorded during the present survey. It was concluded that images thought to potentially be of this species submitted for expert evaluation were in fact not *D. vexillum*.

Since 2008 well established populations of *D. vexillum* have been reported around Great Britain, but largely from marinas or aquaculture sites. It has however been reported in natural habitats in Kent both intertidal in 2011 (Hitchin, 2012) and subtidal (2016). It has been known from subtidal sites on the northeast and west coasts of America since the 1980s (Bullard et al, 2007) with natural sites off New England including the Georges Banks supporting 50-90% cover over more than 200km^2 of *Didemnum* sp. A. This entity was later confirmed to be *Didemnum vexillum* (Lambert, 2009) an invasive species with a worldwide distribution (Stefaniak et al, 2009).

In July 2016 the Marine Biological Association (MBA) provided a link to a video taken off Herne Bay on the north Kent coast showing a very extensive

population of *D. vexillum* identification being confirmed by experts at the MBA. The video was taken by Debbie Phillips, a member of Canterbury Divers on 6th July 2016 and shows in places the tunicate covering over 50% of the sea bed (Figures 5-6). It is interesting to note that a survey carried out by the Kent & Essex IFCA along the north Kent coast in 2013 found no evidence of the species at five subtidal sites (Kent & Essex IFCA, 2013).

Figure 5 *Didemnum vexillum* at a subtidal site off Herne Bay, Kent 2016. (Image ©Debbie Phillips)

Figure 6 *Didemnum vexillum* at a subtidal site off Herne Bay, Kent 2016. (Image ©Debbie Phillips).

6.3 Litter, Damage and Other Impacts

Not much in the way of litter was recorded during the image analysis, what there was was generally small, e.g. scraps of monofilament, fragments of sheets of plastic etc. The only possible evidence of direct anthropogenic damage to the Ross worm reef was represented by toppled columns of *S. spinulosa* which was especially evident at Cemlyn_5, and Church Bay_15F. Two of the sites in Holyhead Deep on the dumping ground were siltier than any of the other survey locations.

7. References

Bullard SG, Lambert G, Carman MR, Byrnes J, Whitlach RB, Ruiz G, Miller RJ, Harris L, Valentine PC, Collie JS, Pederson J, McNaught DC, Cohen AN, Asch RG, Dijkstra J, Heinonen K. 2007. The colonial ascidian *Didemnum* sp. A: current distribution, basic biology and potential threat to marine communities of the northeast and west coasts of North America. *Journal of Experimental Marine Biology and Ecology* 342, 99-108.

Curtis M, Coggan R. 2007. *Video and imagering techniques. 19. Remote video techniques*. In: Coggan R, Populus J, White J, Sheehan K, Fitzpatrick F. Piel S. (eds) (2007). Review of standards and protocols for seabed mapping. [online] MESH. Available from: http://www.emodnet-seabedhabitats.eu/DEFAULT.ASPX?page=1442 [Accessed 31 January 2017].

De Grave S, Whitaker A. 1997. The occurrence of a subtidal *Sabellaria alveolata* (L.) reef off Wicklow Head, *Irish Sea. Irish Naturalists' Journal* 25, 416-418.

George CL, Warwick RM. 1985. Annual macrofauna production in a hard-bottom reef community. *Journal of the Marine Biological Association of the United Kingdom*. 65,713-735.

Griffith K, Mowat S, Holt RHF, Ramsay K, Bishop, JDD, Lambert G, Jenkins SR. 2009.First records in Great Britain of the invasive colonial ascidian *Didemnum vexillum* Kott, 2002. *Aquatic Invasions,* 4, 581-590.

Gubbay S.2007. *Defining and managing* Sabellaria spinulosa *reefs: report of an inter-agency workshop 1-2 May, 2007*. JNCC Report No. 405, Peterborough.

Hitchin B. 2012. New outbreak of *Didemnum vexillum* in North Kent: on stranger shores. *Porcupine Marine Natural History Society Newsletter*, 31, 43-48.

Irving R, 2009. *The identification of the main characteristics of stony reef habitats under the Habitats Directive.* Summary report of inter-agency workshop 26-27 March 2008. Joint Nature Conservation Committee Report No. 432. Available from: http://jncc.defra.gov.uk/pdf/web432.pdf [Accessed: 23 December 2016].

Jackson A, & Hiscock K. 2008. *Sabellaria spinulosa* Ross worm. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: http://www.marlin.ac.uk/species/detail/1133 [Accessed 31 January 2017].

Joint Nature Conservation Committee 2015 (JNCC) *The Marine Habitat Classification for Britain and Ireland Version 15.03* [Online]. [Date accessed:

January 2017]. Available from: jncc.defra.gov.uk/MarineHabitatClassification [Accessed on 31 January 2017].

Kent & Essex Inshore Fisheries Conservation Authority (2013) *Annual report 2012-2013.* Available from:http://www.kentandessex-ifca.gov.uk/wp-content/uploads/2014/05/KEIFCA-Annual-Report-12-131.pdf [Accessed on 31 January, 2017].

Lambert G. 2009. Adventures of a seasquirt sleuth: unravelling the identity of *Didemnum vexillum*, a global ascidian invader. *Aquatic Invasions* 4, 5-28.

Mettam C, Conneely M, White SJ. 1994. Benthic macrofauna and sediments in the Severn Estuary. *Biological Journal of the Linnean Society*, 51, 71-81.

Pearce B, Hill JM, Wilson C, Griffin R, Earnshaw S, & Pitts J. 2011. Sabellaria spinulosa *Reef Ecology and Ecosystem Services*. The Crown Estate, 120pp. Available from https://www.thecrownestate.co.uk/media/5692/sabellaria-spinulosa-reef-ecology-and-ecosystem-services.pdf [Accessed on 10 January 2017].

Stefaniak L, Lambert G, Gittenberger A, Zhang H, Lin S. 2009. Genetic conspecificity of the worldwide populations of *Didemnum vexillum* Kott, 2002. *Aquatic Invasions* 4, 29-44.

8. Appendices

8.1 Appendix 1 Summary metadata for all survey samples

Sample Reference	Survey Date	Start Lat/Lon WGS84	End Lat/Lon WGS84	Length (m)	Water Depth Start (m)	Water Depth End (m)	Imagery Quality
Cemlyn_2_H1	11/10/2016	53 25.7482 -4 31.5411	53 25.7365 -4 31.5900	77	33.5	31.7	Poor: barely adequate for habitat identification, rather too fast for species enumeration. Stills images poorly focused.
Cemlyn_2_H2	11/10/2016	53 25.7365 -4 31.5900	53 25.7354 -4 31.6340	57	31.7	29.7	Moderate: adequate for habitat identification, rather too fast for species enumeration. Many stills images poorly focused.
Cemlyn_2_H3	11/10/2016	53 25.7354 -4 31.6340	53 25.7379 -4 31.6891	132	29.7	30.8	Moderate: adequate for habitat identification, rather too fast for species enumeration. Many stills images poorly focused.
Cemlyn_3_H1	11/10/2016	53 25.8226 -4 31.3289	53 25.8162 -4 31.2256	160	30.4	28.0	Good for species and habitat identification.
Cemlyn_3_H2	11/10/2016	53 25.8162 -4 31.2256	53 25.8644 -4 31.0462	266	28.0	36.7	Good for habitat identification, rather too fast for species enumeration.
Cemlyn_4_H1	11/10/2016	53 25.7521 -4 31.1428	53 25.7502 -4 31.3560	265	29.0	25.6	Moderate: adequate for habitat identification, rather too fast for species enumeration. Stills images poorly focused.
Cemlyn_5_H1	11/10/2016	53 26.039 -4 30.7996	53 26.0327 -4 30.6534	214	42.9	48.0	Good for species and habitat identification.
Cemlyn_5_H2	11/10/2016	53 26.0327 -4 30.6534	53 26.0008 -4 30.5831	105	48.0	47.7	Good for species and habitat identification.
ChurchBay_15_H1	10/10/2016	53 22.9414 -4 35.7733	53 22.7738 -4 35.8141	356	23.4	24.0	Good for habitat and Adequate for species identification.
ChurchBay_15A_H1	10/10/2016	53 23.1733 -4 35.7378	53 23.3234 -4 35.6978	389	26.0	24.0	Good for habitat and species identification.
ChurchBay_15B_H1	11/10/2016	53 23.3849 -4 36.2231	53 23.2972 -4 36.2436	216	24.6	23.4	Moderate: adequate for habitat identification, too fast and too far from seabed for species enumeration. Most stills images poorly focused, due in part to 3D nature of habitat.
ChurchBay_15C_H1	11/10/2016	53 22.2867 -4 35.8121	53 22.2211 -4 35.8591	141	20.5	21.3	Good for species and habitat identification.
ChurchBay_15d_H1	12/10/2016	53 22.4990 -4 35.8158	53 22.4419 -4 35.8406	114	19.5	19.5	Moderate: adequate for habitat and species identification.

Sample Reference	Survey Date	Start Lat/Lon WGS84	End Lat/Lon WGS84	Length (m)	Water Depth Start (m)	Water Depth End (m)	Imagery Quality
ChurchBay_15e_H1	12/10/2016	53 22.9929 -4 35.4539	53 22.9344 -4 35.4374	112	19.1	19.0	Moderate: adequate for habitat and species identification although visibility poor.
ChurchBay_15e_H2	12/10/2016	53 22.9344 -4 35.4374	53 22.8817 -4 35.4327	102	19.0	20.0	Moderate: adequate for habitat and species identification although visibility poor.
ChurchBay_15f_H1	12/10/2016	53 23.0660 -4 36.0913	53 23.0180 -4 36.1080	118	23.2	21.0	Moderate: adequate for habitat and species identification.
ChurchBay_North_to_South_H1	10/10/2016	53 23.1714 -4 35.8240	53 22.7792 -4 35.8116	828	26.1	23.6	Good for habitat and species identification (stills only).
PointLynas_SS8_H1	11/10/2016	53 25.7885 -4 19.1564	53 25.7877 -4 19.1257	42	36.4	37.3	Good for species and habitat identification.
PointLynas_SS8_H2	11/10/2016	53 25.7877 -4 19.1257	53 25.7864 -4 19.0203	155	37.3	37.1	Good for species and habitat identification.
PointLynas_SS8_H3	11/10/2016	53 25.7864 -4 19.0203	53 25.7982 -4 18.9553	93	37.0	37.0	Good for species and habitat identification.
Skerries_1_H1	10/10/2016	53 25.7472 -4 38.3485	53.428543 -4.639752	117	30.2	31.5	Good for habitat and Adequate for species identification.
Skerries_1_H2	10/10/2016	53.428543 -4.639752	53.428195 -4.640213	63	33.0	33.8	Good for habitat and Adequate for species identification.
STHD1_H1	10/10/2016	53 20.8631 -4 47.6686	53 21.0526 -4 47.5171	540	77.4	84.0	Moderate: adequate for habitat and species identification.
STHD2_H1	10/10/2016	53 20.2752 -4 48.5276	53 20.3966 -4 48.3584	388	57.0	60.0	Moderate: adequate for habitat and species.
STHD3_H1	10/10/2016	53 19.5854 -4 46.3186	53 19.7429 -4 46.2135	373	84.1	84.6	Moderate: video too fast but stills adequate for habitat and species.
WestAnglesey_Reef_05_H1	12/10/2016	53 24.1095 -4 40.6508	53 24.2331 -4 40.6601	315	42.2	42.7	Poor, video too fast and high off bed. Stills images of better quality but many too far from seabed.
WestAnglesey_Reef_06_H1	12/10/2016	53 25.0918 -4 39.2856	53 25.1575 -4 39.1731	280	32.2	29.4	Moderate: variable, some too fast and high off the seabed.
WestAnglesey_Reef_10_H1	12/10/2016	53 23.7782 -4 46.3154	53 23.8559 -4 46.2045	253	55.7	52.4	Very poor, too fast and high off bed. Varied seabed types but not possible to separate habitats at all accurately.
WestAnglesey_Reef_13_H1	12/10/2016	53 24.2599 -4 38.4470	53 24.2284 -4 38.2537	270	34.3	33.0	Moderate: variable, some too fast and high off the seabed.

Sample Reference	Survey Date	Start Lat/Lon WGS84	End Lat/Lon WGS84	Length (m)	Water Depth Start (m)	Water Depth End (m)	Imagery Quality
WestAnglesey_ Reef_20_H1	12/10/2016	53 24.2363 -4 36.8078	53 24.2727 -4 36.7180	230	27.8	28.6	Good for habitat and species identification.
WestAnglesey_ Reef_35_H1	12/10/2016	53 22.5852 -4 47.5172	53 22.6160 -4 47.4494	45	55.0	49.0	Very poor. Minimal data obtained.
WestAnglesey_ Reef_35_H2	12/10/2016	53 22.6160 -4 47.4494	53 22.6474 -4 47.3818	169	49.0	52.5	Very poor. Minimal data obtained.
Wylfa_6_&_7_H1	11/10/2016	53 25.7026 -4 28.5948	53 25.7032 -4 28.5374	71	36.0	35.2	Good for species and habitat identification.
Wylfa_6_&_7_H2	11/10/2016	53 25.7032 -4 28.5374	53 25.7025 -4 28.4081	241	35.1	32.7	Good for species and habitat identification.
Wylfa_6a_H1	11/10/2016	53 25.4426 -4 29.0401	53 25.4970 -4 28.8583	310	29.2	30.0	Good for species and habitat identification.

8.2 Appendix 2 Summary biotoped information for each survey sample

Sample Reference	No of taxa	Biotope Code	Biotope Name	Biotope Fit
Cemlyn_2_H1	23	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
Cemlyn_2_H2	35	CR.MCR.CSab.Sspi	*Sabellaria spinulosa* encrusted circalittoral rock	Uncertain poor imagery quality
Cemlyn_2_H3	44	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
Cemlyn_3_H1	47	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
Cemlyn_3_H2	56	CR.MCR.CSab.Sspi	*Sabellaria spinulosa* encrusted circalittoral rock	Certain
Cemlyn_4_H1	42	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
Cemlyn_5_H1	67	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
Cemlyn_5_H2	45	SS.SBR.PoR.SspiMx & SS.SCS.CCS	*Sabellaria spinulosa* on stable circalittoral mixed sediment & Circalittoral coarse sediment	Certain although lacking significant mud proportion; *Sabellaria* crusts/reef
ChurchBay_15_H1	31	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Uncertain mobile veneer of sand over course/mixed sediment. Lacking significant mud proportion
ChurchBay_15A_H1	44	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Uncertain mobile veneer of sand over mixed sediment. Lacking significant mud proportion
ChurchBay_15B_H1	42	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
ChurchBay_15C_H1	5	SS.SCS.CCS	Circalittoral coarse sediment	Uncertain. This is circalittoral medium clean sand - not really course sediments
ChurchBay_15d_H1	1	SS.SCS.CCS	Circalittoral coarse sediment	Certain

Sample Reference	No of taxa	Biotope Code	Biotope Name	Biotope Fit
ChurchBay_15e_H1	30	CR.HCR.XFa.FluCoAs.SmAs & SS.SCS.CCS	*Flustra foliacea*, small solitary and colonial ascidians on tide-swept circalittoral bedrock or boulders & Circalittoral coarse sediment	Certain
ChurchBay_15e_H2	11	SS.SCS.CCS	Circalittoral coarse sediment	Certain
ChurchBay_15f_H1	40	SS.SBR.PoR.SspiMx & SS.SCS.CCS	*Sabellaria spinulosa* on stable circalittoral mixed sediment & Circalittoral coarse sediment	Certain although lacking significant mud proportion
ChurchBay_North_to_South_H1	54	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Uncertain mobile veneer of sand over mixed sediment. Lacking significant mud proportion
PointLynas_SS8_H1	19	SS.SCS.CCS.PomB	*Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	Certain
PointLynas_SS8_H2	61	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion; *Sabellaria* crusts/reef
PointLynas_SS8_H3	64	CR.MCR.CSab.Sspi	*Sabellaria spinulosa* encrusted circalittoral rock	Uncertain transitional habitat between stable sediments and stony reef; *Sabellaria* crusts/reef
Skerries_1_H1	36	SS.SCS.CCS & CR.MCR.EcCr.UrtScr	Circalittoral coarse sediment & *Urticina felina* and sand-tolerant fauna on sand-scoured or covered circalittoral rock	Certain *Sabellaria* crusts/reef
Skerries_1_H2	11	CR.MCR.CSab.Sspi	*Sabellaria spinulosa* encrusted circalittoral rock	Uncertain *Sabellaria* crusts/reef
STHD1_H1	71	SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
STHD2_H1	37	SS.SMx.CMx.FluHyd	*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment	Certain
STHD3_H1	57	SS.SMx.CMx.FluHyd	F*lustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment	Certain *Sabellaria* crusts/reef
WestAnglesey_Reef_05_H1	37	SS.SBR.PoR.SspiMx	Sabellaria spinulosa on stable circalittoral mixed sediment	Certain although lacking significant mud proportion; *Sabellaria* crusts/reef

Sample Reference	No of taxa	Biotope Code	Biotope Name	Biotope Fit
WestAnglesey_ Reef_06_H1	48	SS.SBR.SMus.MytSS, SS.SBR.PoR.SspiMx, CR.MCR.CSab.Sspi & SS.SCS.CCS	*Mytilus edulis* beds on sublittoral sediment & *Sabellaria spinulosa* on stable circalittoral mixed sediment & Circalittoral coarse sediment	Certain although lacking significant mud proportion; *Sabellaria* crusts/reef
WestAnglesey_ Reef_10_H1	38	SS.SCS.CCS & SS.SBR.PoR.SspiMx	Circalittoral coarse sediment & Sabellaria spinulosa on stable circalittoral mixed sediment	Certain although lacking significant mud proportion
WestAnglesey_ Reef_13_H1	36	SS.SBR.PoR.SspiMx & CR.MCR.CSab.Sspi	*Sabellaria spinulosa* on stable circalittoral mixed sediment & *Sabellaria spinulosa* encrusted circalittoral rock	Certain although lacking significant mud proportion; *Sabellaria* crusts/reef
WestAnglesey_ Reef_20_H1	37	CR.HCR.XFa.FluCoAs.SmAs	*Flustra foliacea,* small solitary and colonial ascidians on tide-swept circalittoral bedrock or boulders	Certain. Sabellaria *crusts* not reef
WestAnglesey_ Reef_35_H1	16	CR.MCR.CSab.Sspi	*Sabellaria spinulosa* encrusted circalittoral rock	Certain
WestAnglesey_ Reef_35_H2	21	SS.SBR.PoR.SspiMx & CR.MCR.CSab.Sspi	*Sabellaria spinulosa* on stable circalittoral mixed sediment & *Sabellaria spinulosa* encrusted circalittoral rock	Certain although lacking significant mud proportion
Wylfa_6_&_7_H1	41	CR.MCR.CSab.Sspi.As & SS.SBR.PoR.SspiMx	*Sabellaria spinulosa*, didemnids and other small ascidians on tide-swept moderately wave-exposed circalittoral rock & Sabellaria spinulosa on stable circalittoral mixed sediment	Uncertain transitional between stable sediments and stony reef; *Sabellaria* crusts/reef; Lacking significant mud proportion
Wylfa_6_&_7_H2	77	CR.MCR.CSab.Sspi.As	*Sabellaria spinulosa*, didemnids and other small ascidians on tide-swept moderately wave-exposed circalittoral rock	Uncertain transitional between stable sediments and stony reef; Sabellaria crusts/reef
Wylfa_6a_H1	51	SS.SMx.CMx.OphMx	*Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Certain although lacking significant mud proportion

8.3 Appendix 3 Occurance of *Sabellaria spinulosa* reef including reef elevation, abundance (SACFOR), extent and cover, together with Section 7 and OSPAR species and habitats present and the occurrence of litter, other anthropogenic impacts and Invasive Non-Native Species (INNS).

Sample Reference	*Sabellaria spinulosa* reef elevation & abundance (SACFOR)	Reef extent m^2	% cover	Section 7 / OSPAR habitats & species	Annex 1 habitat	Litter or other impacts	INNS identified
Cemlyn_2_H1	>10cm: S;	38.5	50%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
Cemlyn_2_H2	<5cm: A & >10cm: F;	28.5	50%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Stony.	None	None
Cemlyn_2_H3	<5cm: F & >10cm: A;	66	60%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
Cemlyn_3_H1	5-10cm: S;	80	60%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	Many components of the fauna of a small size suggesting disturbance.	None
Cemlyn_3_H2	5-10cm: A & >10cm: A;	133	50%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Stony & Biogenic.	Many components of the fauna of a small size suggesting disturbance.	None
Cemlyn_4_H1	5-10cm: A & >10cm: A;	133	60%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
Cemlyn_5_H1	<5cm: C & 5-10cm: A;	116.5	50%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	Many components of the fauna of a small size suggesting disturbance. Broken Sabellaria reef.	None
Cemlyn_5_H2	<5cm: A;	25.5	50%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	Many components of the fauna of a small size suggesting disturbance.	None
ChurchBay_15_H1	<5cm: O & >10cm: A;	178	40%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	Rope tangled monofilament, cloth. dislodged Sabellaria towers too isolated for anthropogenic damage.	None
ChurchBay_15A_H1	<5cm: O & >10cm: A;	195	60%.	Ross worm (*Sabellaria spinulosa*) reef & Nucella lapillus (O).	Reefs - Biogenic.	Rag, twine, webbing bag	None
ChurchBay_15B_H1	>10cm: S;	108	50%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
ChurchBay_15C_H1	crusts present (not reef): R;	-	-	Subtidal sands and gravels.	None	None	None
ChurchBay_15d_H1	absent.	-	-	Subtidal sands and gravels.	None	None	None

Sample Reference	*Sabellaria spinulosa* reef elevation & abundance (SACFOR)	Reef extent m^2	% cover	Section 7 / OSPAR habitats & species	Annex 1 habitat	Litter or other impacts	INNS identified
ChurchBay_15e_H1	<5cm: F; 5-10cm: R & >10cm: R;	56	10%.	Subtidal sands and gravels & Nucella lapillus (O).	Reefs - Stony.	None	None
ChurchBay_15e_H2	>10cm: F;	51	8%.	Subtidal sands and gravels.	None	None	None
ChurchBay_15f_H1	>10cm: S;	59	60%.	Ross worm (*Sabellaria spinulosa*) reef & *Nucella lapillus* (O).	Reefs - Biogenic.	Toppled Sabellaria reef, fragments of monofilament.	None
ChurchBay_North_to_South_H1	<5cm: C & >10cm: A;	414	40%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Uncertain Biogenic.	None	None
PointLynas_SS8_H1	<5cm: R;	21	<1%.	None	None	None	None
PointLynas_SS8_H2	<5cm: A;	78	60%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Stony & Biogenic.	None	None
PointLynas_SS8_H3	<5cm: A;	46.5	40%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Uncertain Stony & Biogenic.	Many components of the fauna of a small size suggesting disturbance.	None
Skerries_1_H1	<5cm: F;	58.5	15%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef & *Nucella lapillus* (R)	None	None	None
Skerries_1_H2	<5cm: C;	31.5	25%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef & Nucella lapillus (O).	Reefs - Stony.	None	None
STHD1_H1	<5cm: F & 5-10cm: C;	270	15%.	Ross worm (*Sabellaria spinulosa*) reef & Nucella lapillus (O).	Reefs - Biogenic.	Plastic pipe, plastic bag.	None
STHD2_H1	<5cm: R & >10cm: R;	194	2%.	None	None	Scrap of fishing twine.	None
STHD3_H1	<5cm: C;	187	20%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	None	Rope	None
WestAnglesey_Reef_05_H1	<5cm: C;	158	20%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
WestAnglesey_Reef_06_H1	<5cm: F;	140	10%.	Blue Mussel Beds on Sediment & Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
WestAnglesey_Reef_10_H1	<5cm: O; 5-10cm: F & >10cm: O;	126.5	20%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None

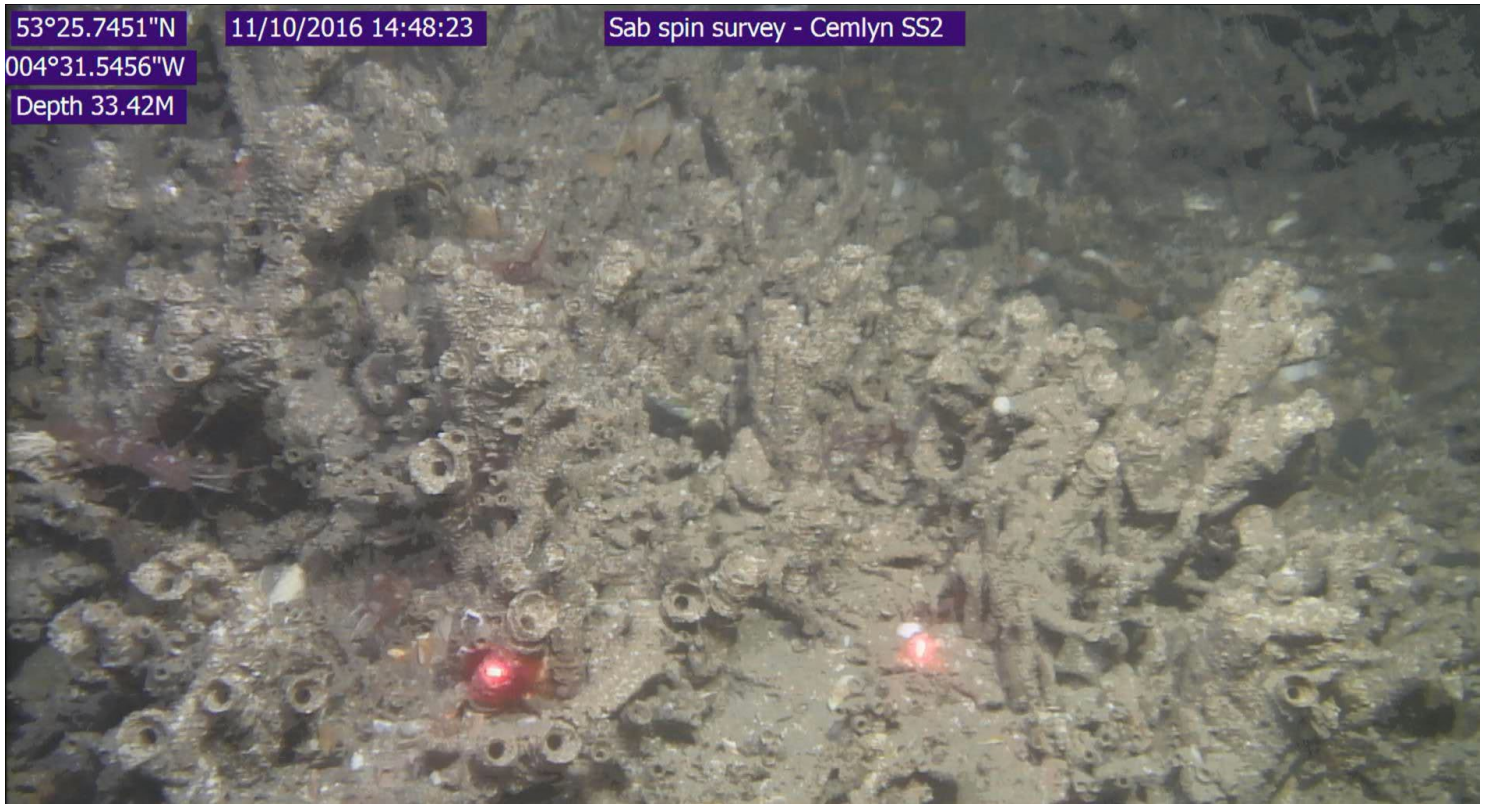
Sample Reference	*Sabellaria spinulosa* reef elevation & abundance (SACFOR)	Reef extent m^2	% cover	Section 7 / OSPAR habitats & species	Annex 1 habitat	Litter or other impacts	INNS identified
WestAnglesey_ Reef_13_H1	<5cm: C;	135	30%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef & *Nucella lapillus* (O).	Reefs - Stony & Biogenic.	None	None
WestAnglesey_ Reef_20_H1	<5cm: R;	115	<1%.	*Nucella lapillus* (O)	Reefs - Stony.	None	None
WestAnglesey_ Reef_35_H1	<5cm: F & >10cm: C;	22.5	30%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
WestAnglesey_ Reef_35_H2	<5cm: O & 5-10cm: F;	84.5	10%.	Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Biogenic.	None	None
Wylfa_6_&_7_H1	<5cm: C;	35	20%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Uncertain Stony & Biogenic.	Many components of the fauna of a small size suggesting disturbance.	None
Wylfa_6_&_7_H2	<5cm: C;	120	30%.	Uncertain Ross worm (*Sabellaria spinulosa*) reef.	Reefs - Uncertain Stony.	Many components of the fauna of a small size suggesting disturbance.	None
Wylfa_6a_H1	crusts present (not reef): R;	-	-	None	None	None	None

8.4 Appendix 4 Example biotope images

Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Cemlyn_2_H1

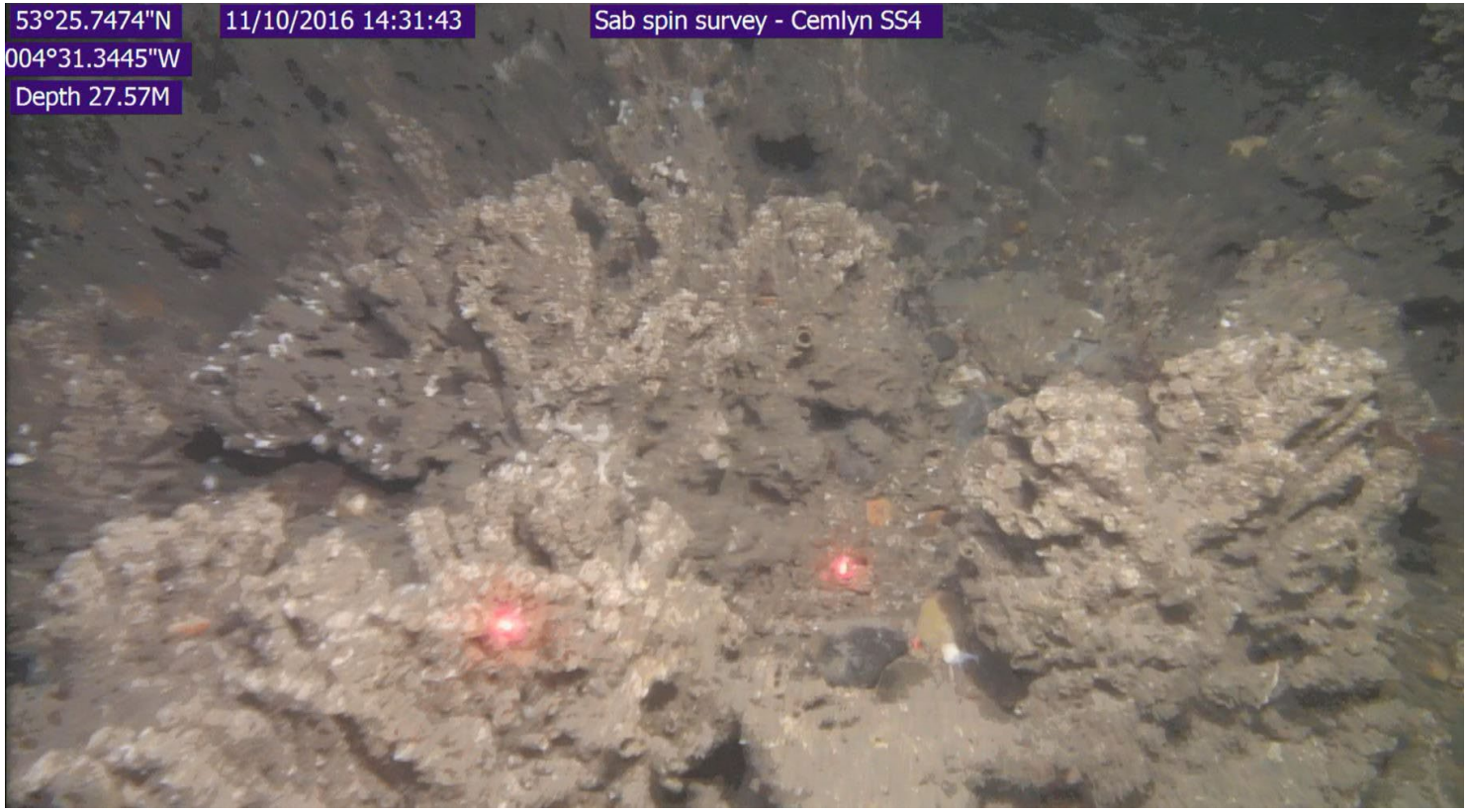
Image:



Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Cemlyn_4_H1

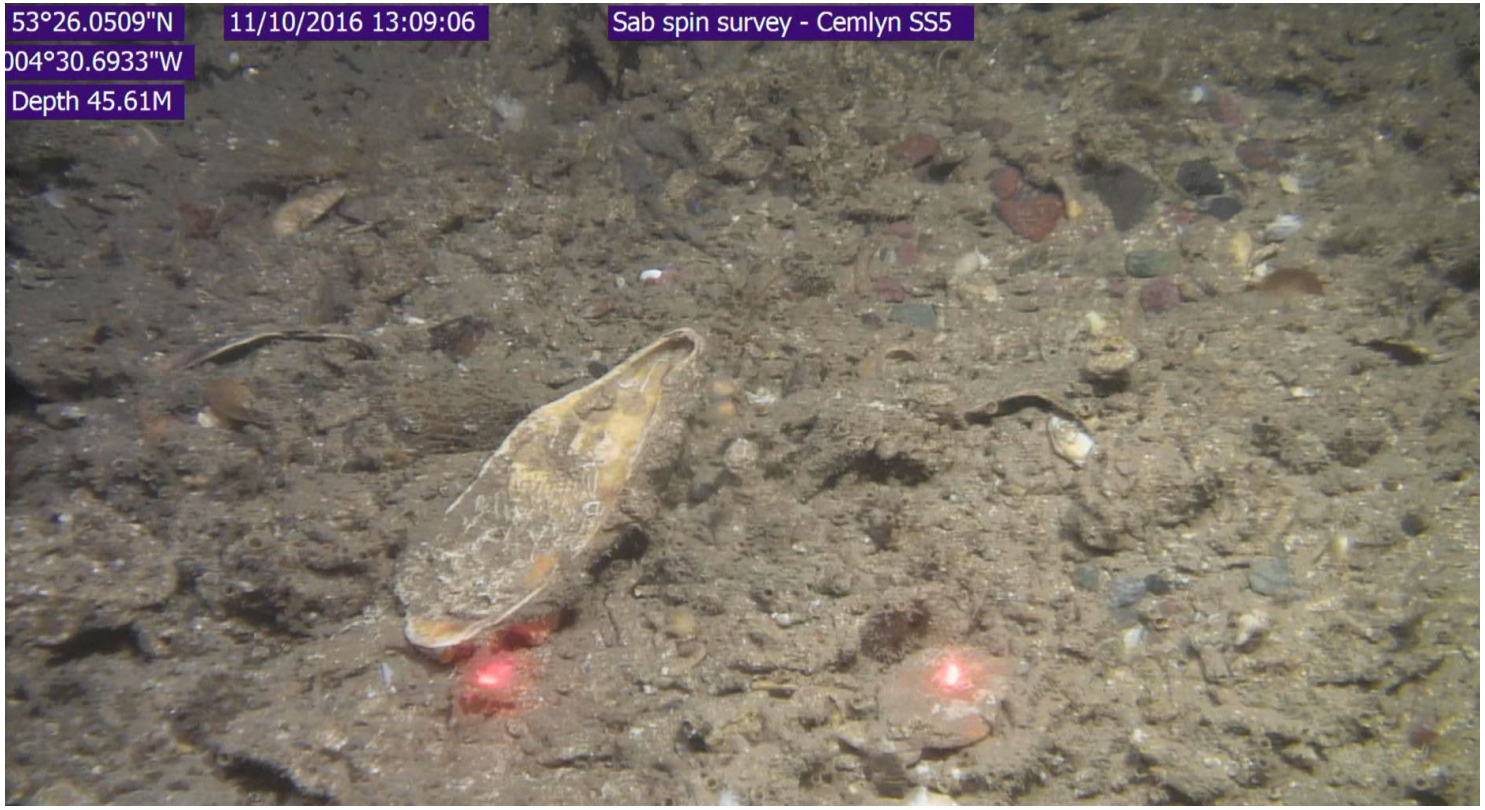
Image:



Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Cemlyn_5_H1

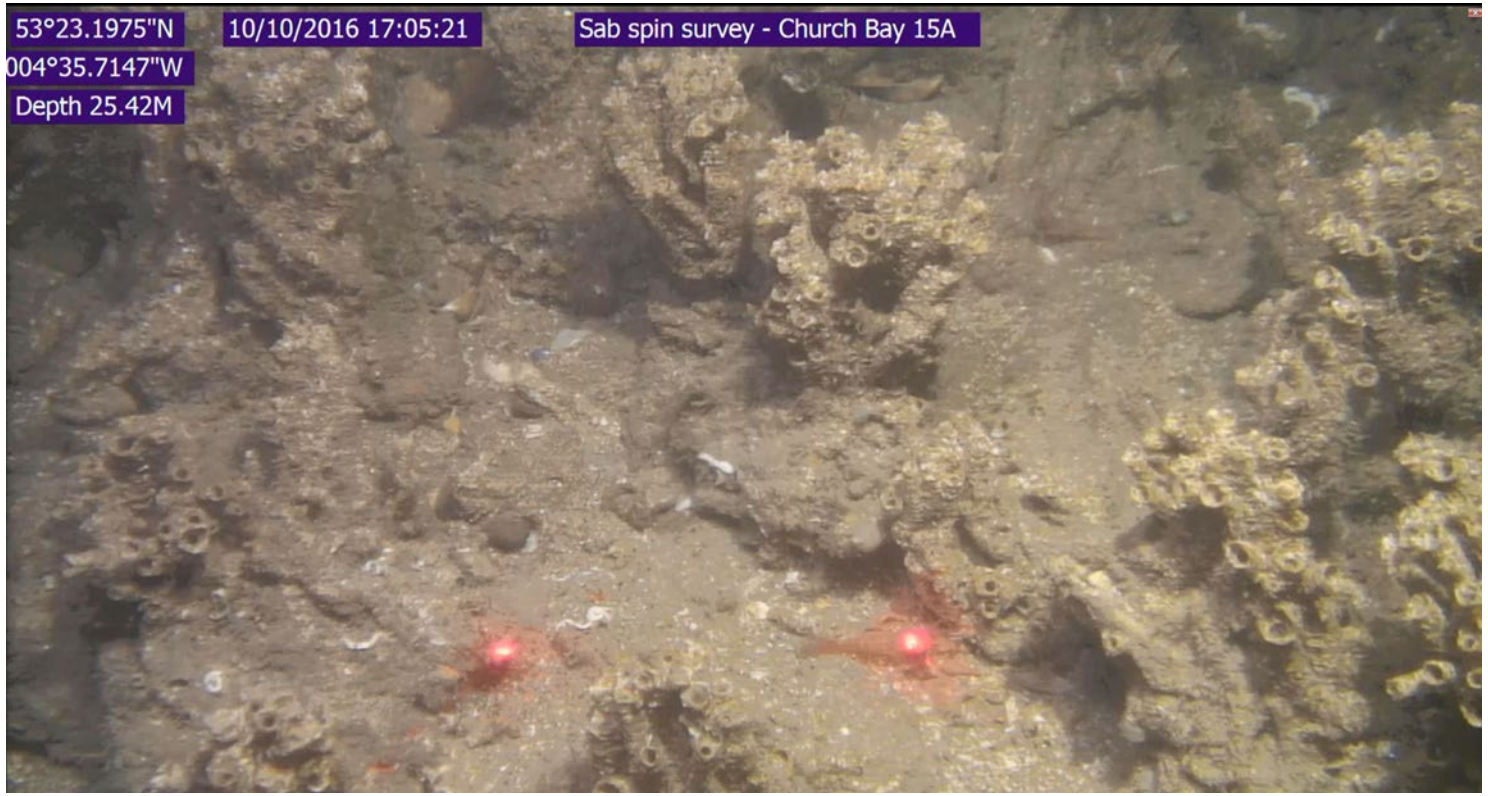
Image:



Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Church Bay_15a H1

Image:



Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

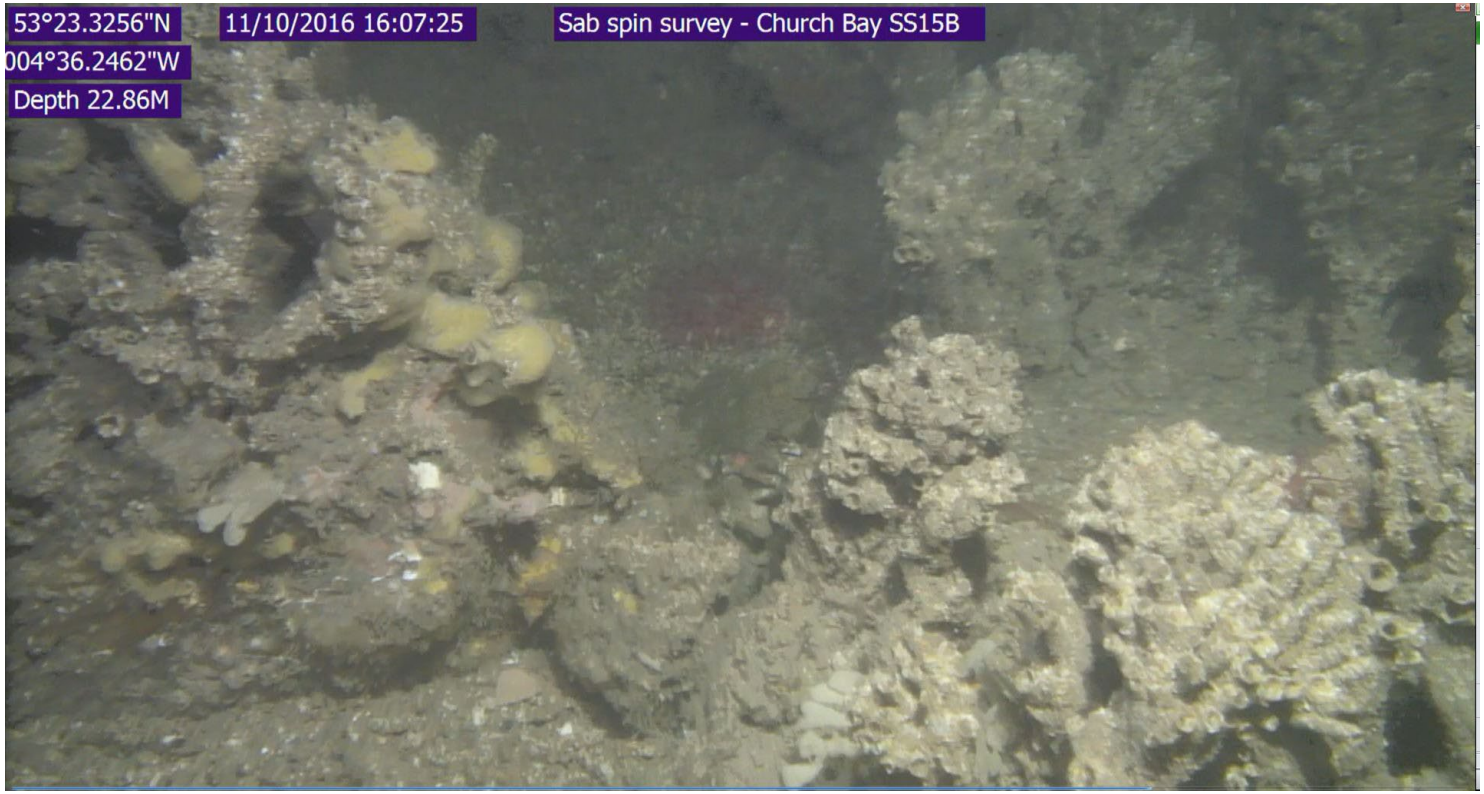
Name: Church Bay_15f_H1

Image:

Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Church Bay_15b_H1

Image:



Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

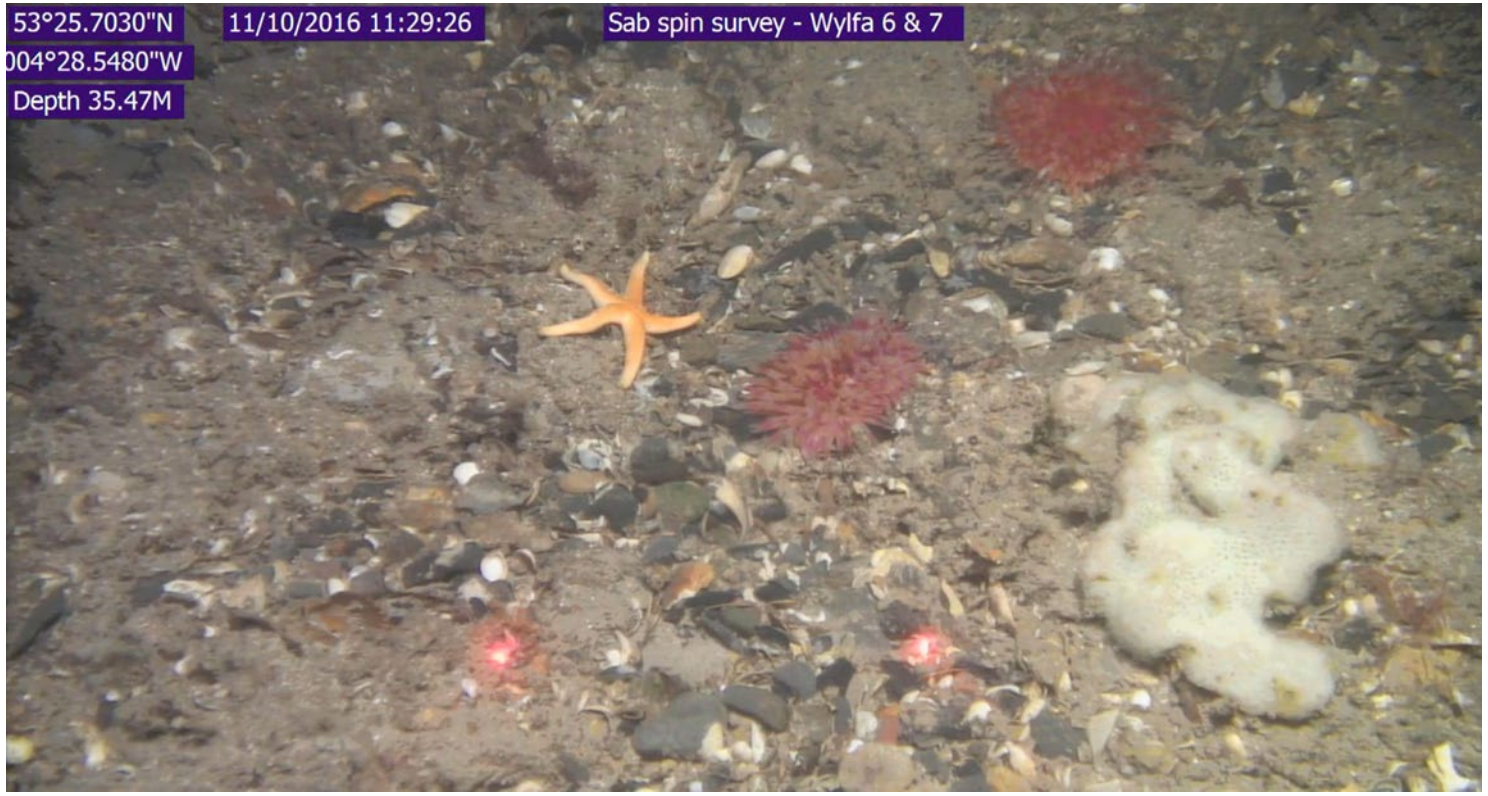
Name: STHD_1_H1

Image:

Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Wylfa 6&7_H1

Image:



Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

Name: Point Lynas SS8_H2

Image:

Code: SS.SBR.PoR.SspiMx - *Sabellaria spinulosa* on stable circalittoral mixed sediment

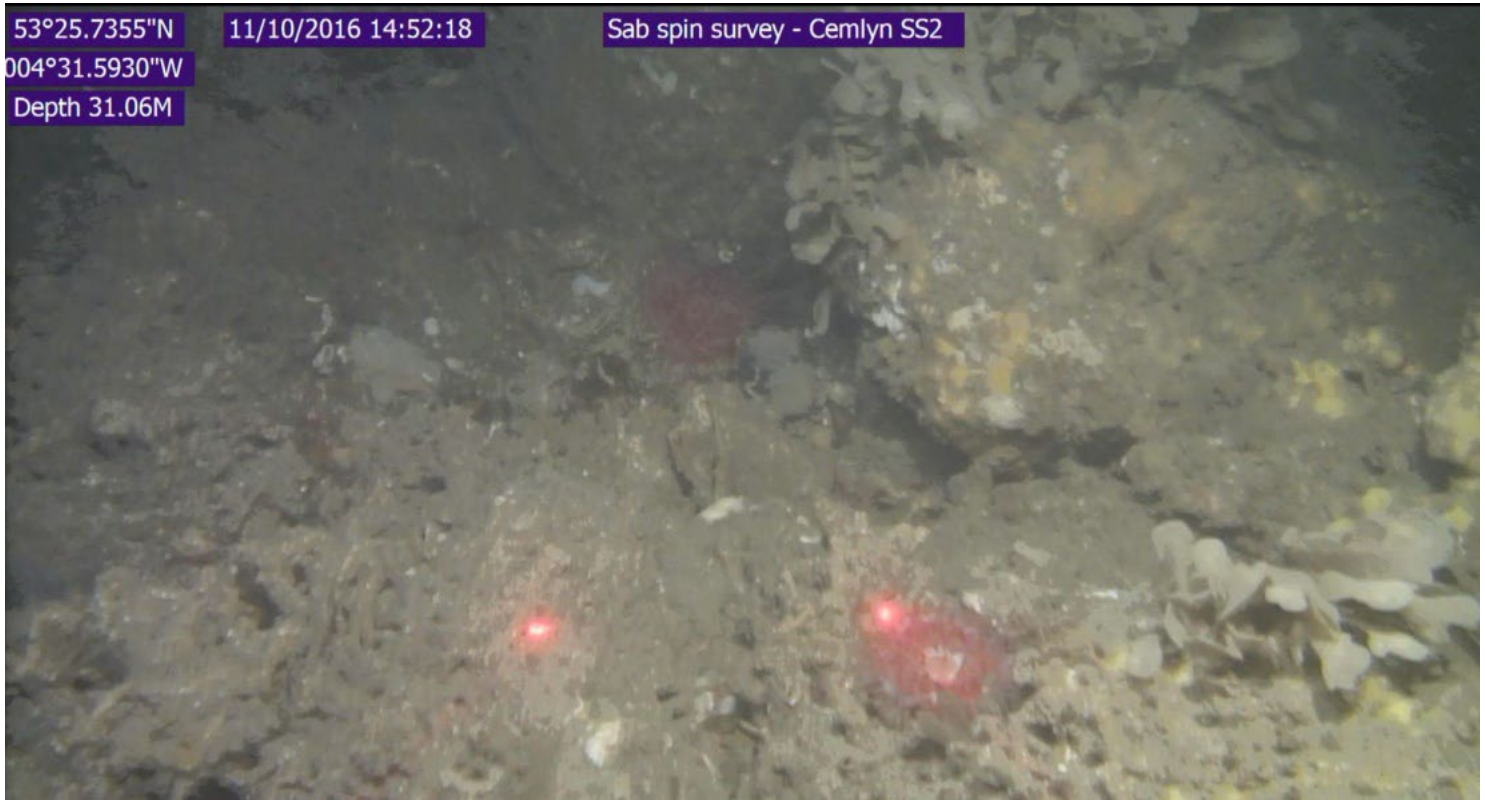
Name: West Anglesey Reef_06_H1

Image:

Code: CR.MCR.CSab.Sspi - *Sabellaria spinulosa* encrusted circalittoral rock

Name: Cemlyn_SS2_H2

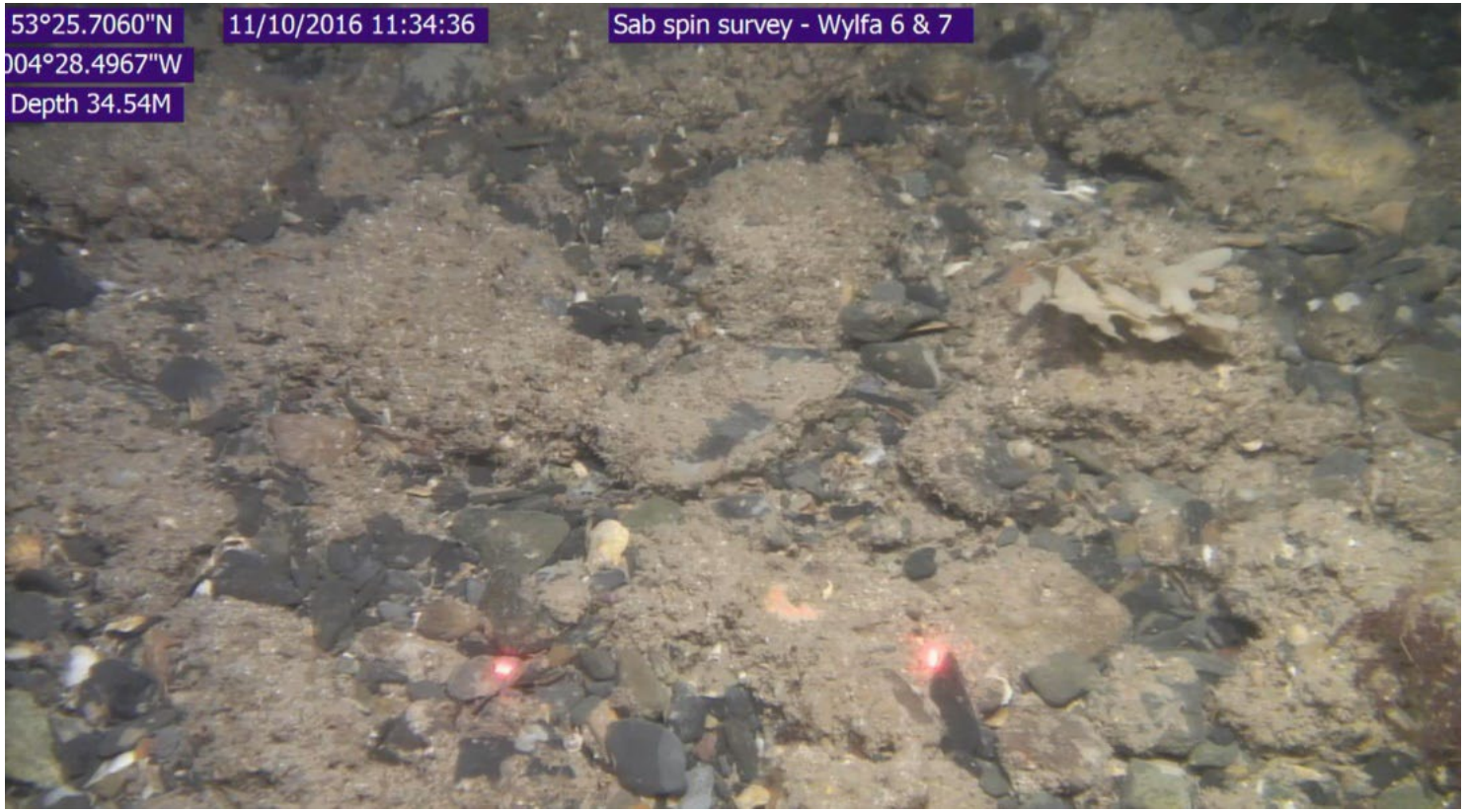
Image:



Code: CR.MCR.CSab.Sspi - *Sabellaria spinulosa* encrusted circalittoral rock

Name: Wylfa 6&7_H2

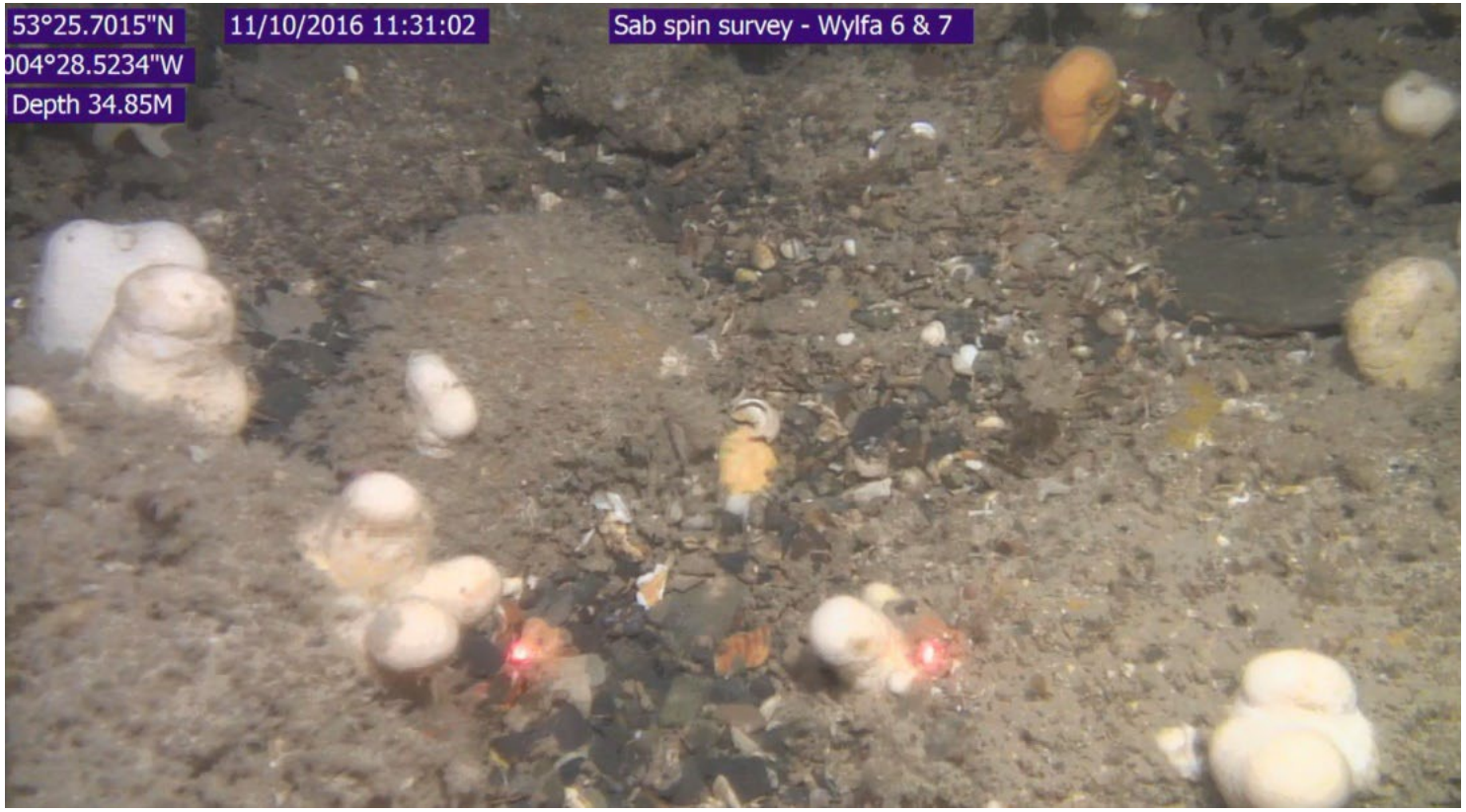
Image:



Code: CR.MCR.CSab.Sspi - *Sabellaria spinulosa* encrusted circalittoral rock

Name: Wylfa 6&7_H2

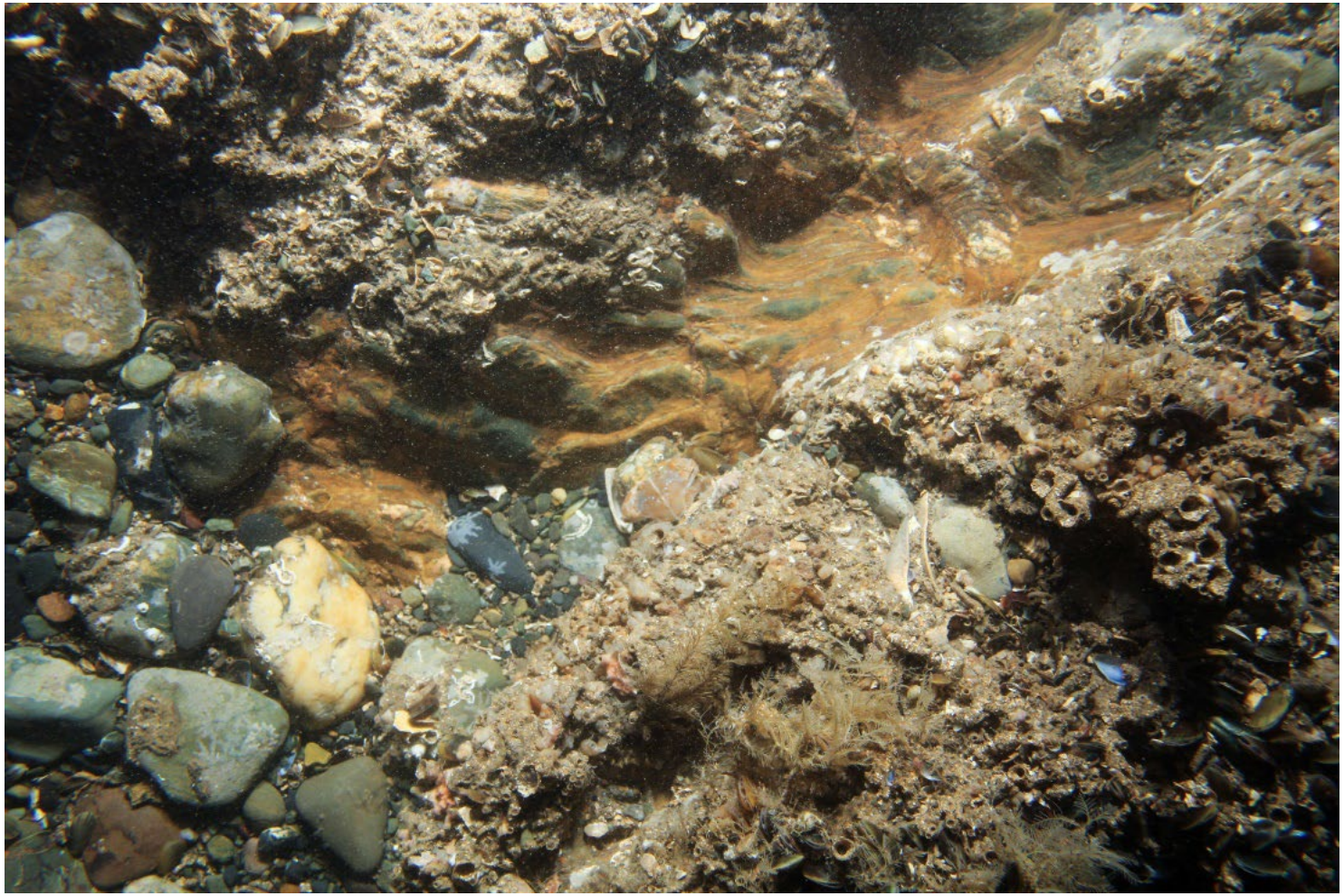
Image:



Code: CR.MCR.CSab.Sspi - *Sabellaria spinulosa* encrusted circalittoral rock

Name: West Anglesey Reef_06_H1

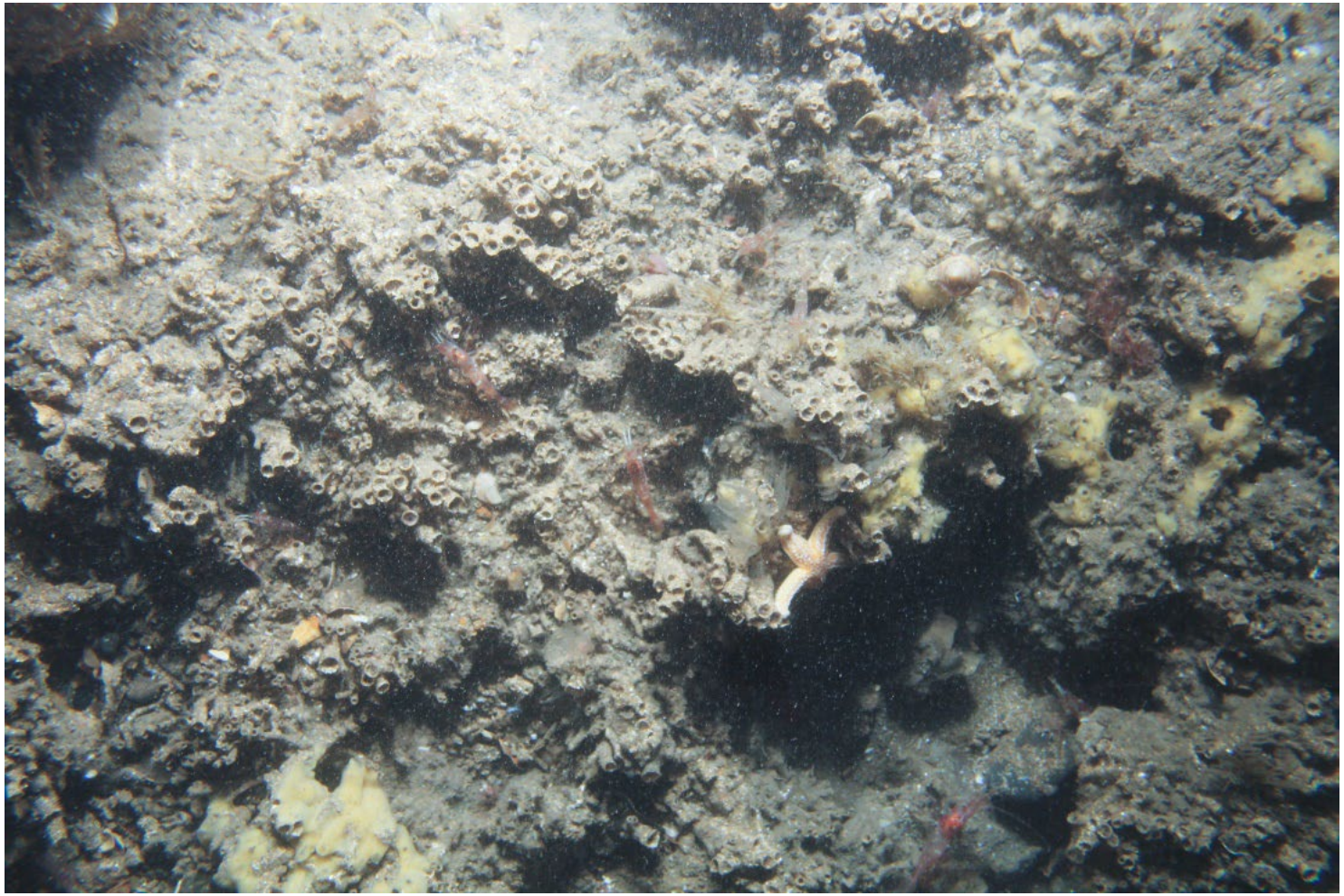
Image:



Code: CR.MCR.CSab.Sspi - *Sabellaria spinulosa* encrusted circalittoral rock

Name: Cemlyn_2_H2

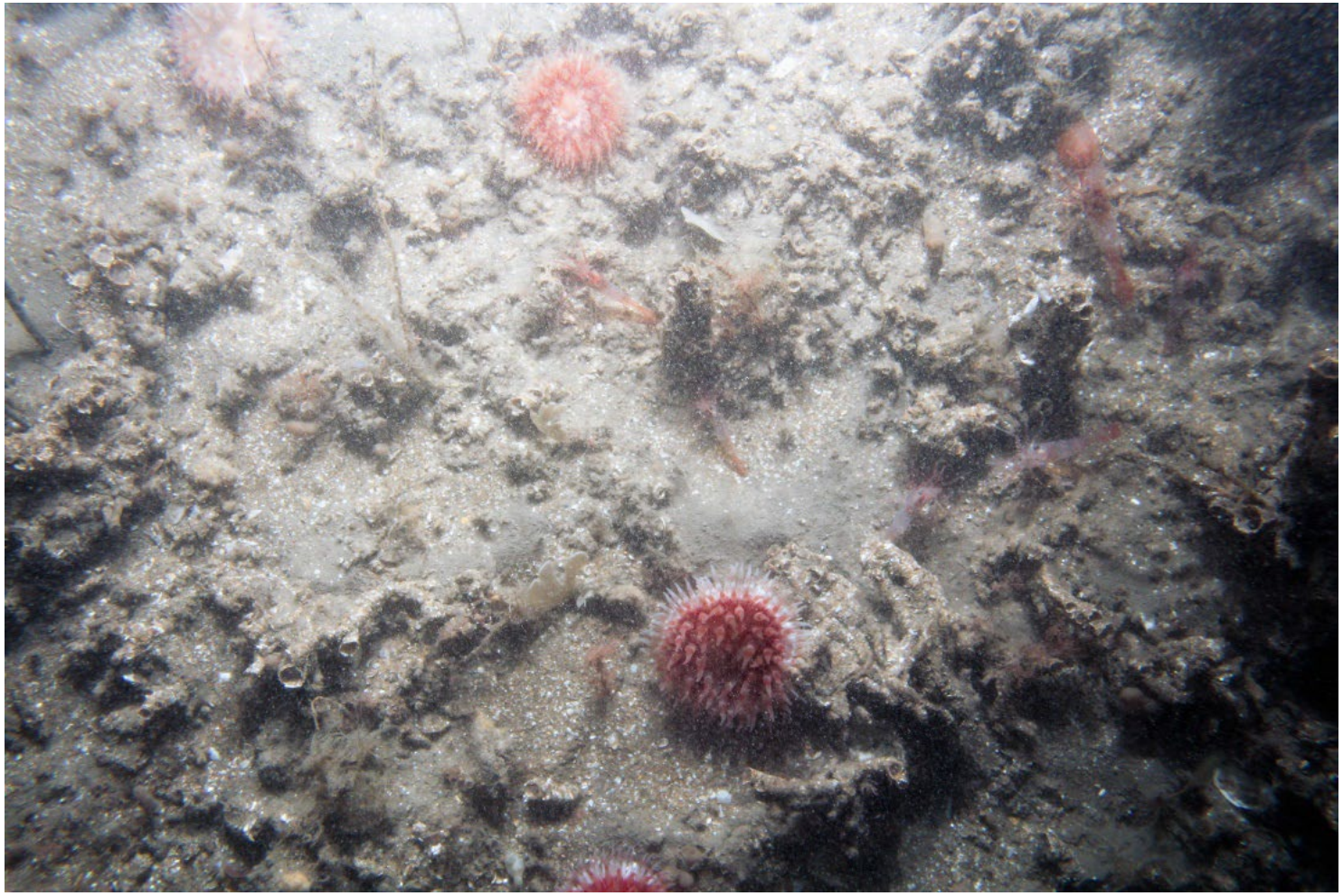
Image:



Code: CR.MCR.CSab.Sspi - *Sabellaria spinulosa* encrusted circalittoral rock

Name: West Anglesey Reef_35_H2

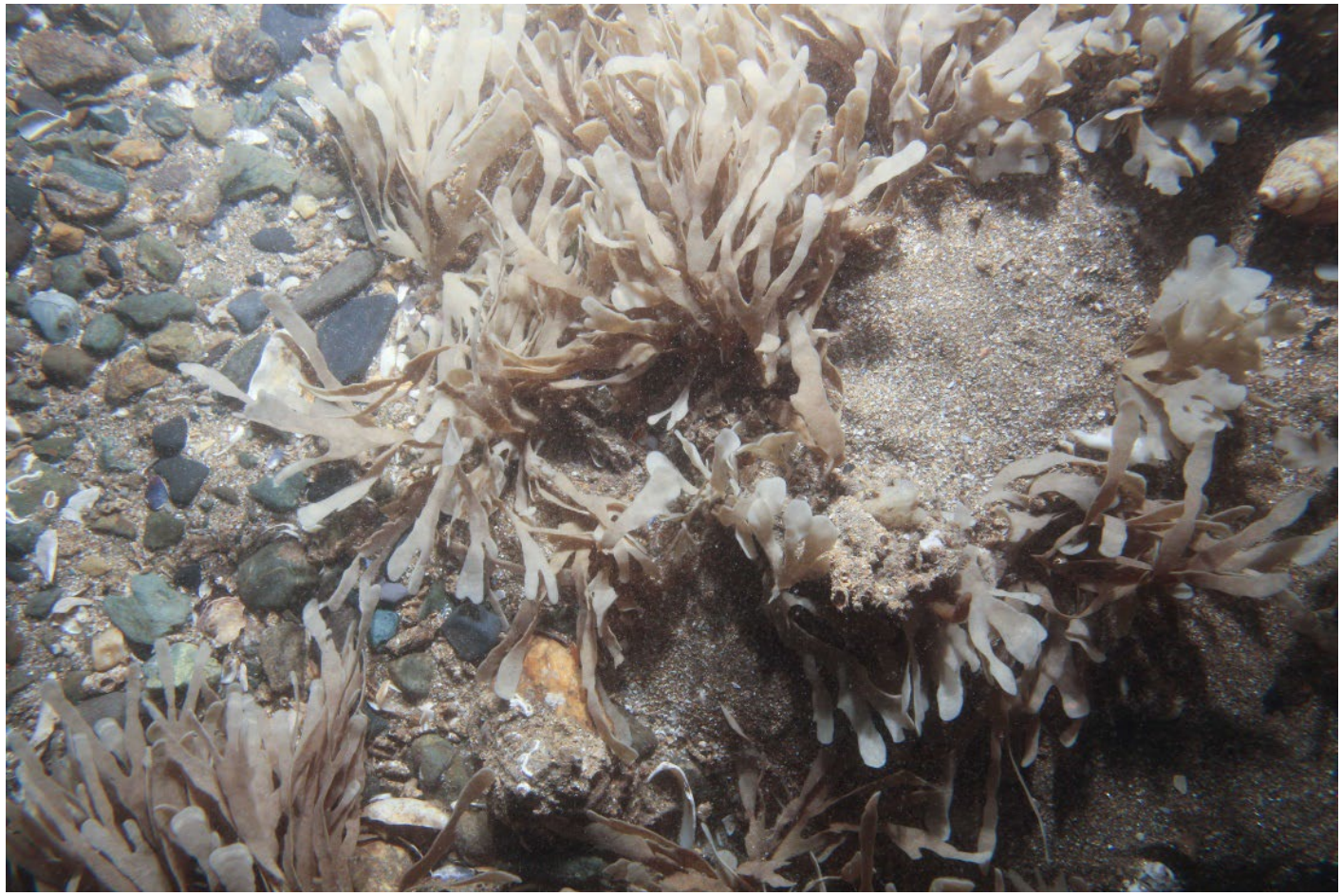
Image:



Code: CR.HCR.XFa.FluCoAs.SmAs - *Flustra foliacea*, small solitary and colonial ascidians on tide-swept circalittoral bedrock or boulders

Name: Church Bay 15e_H1

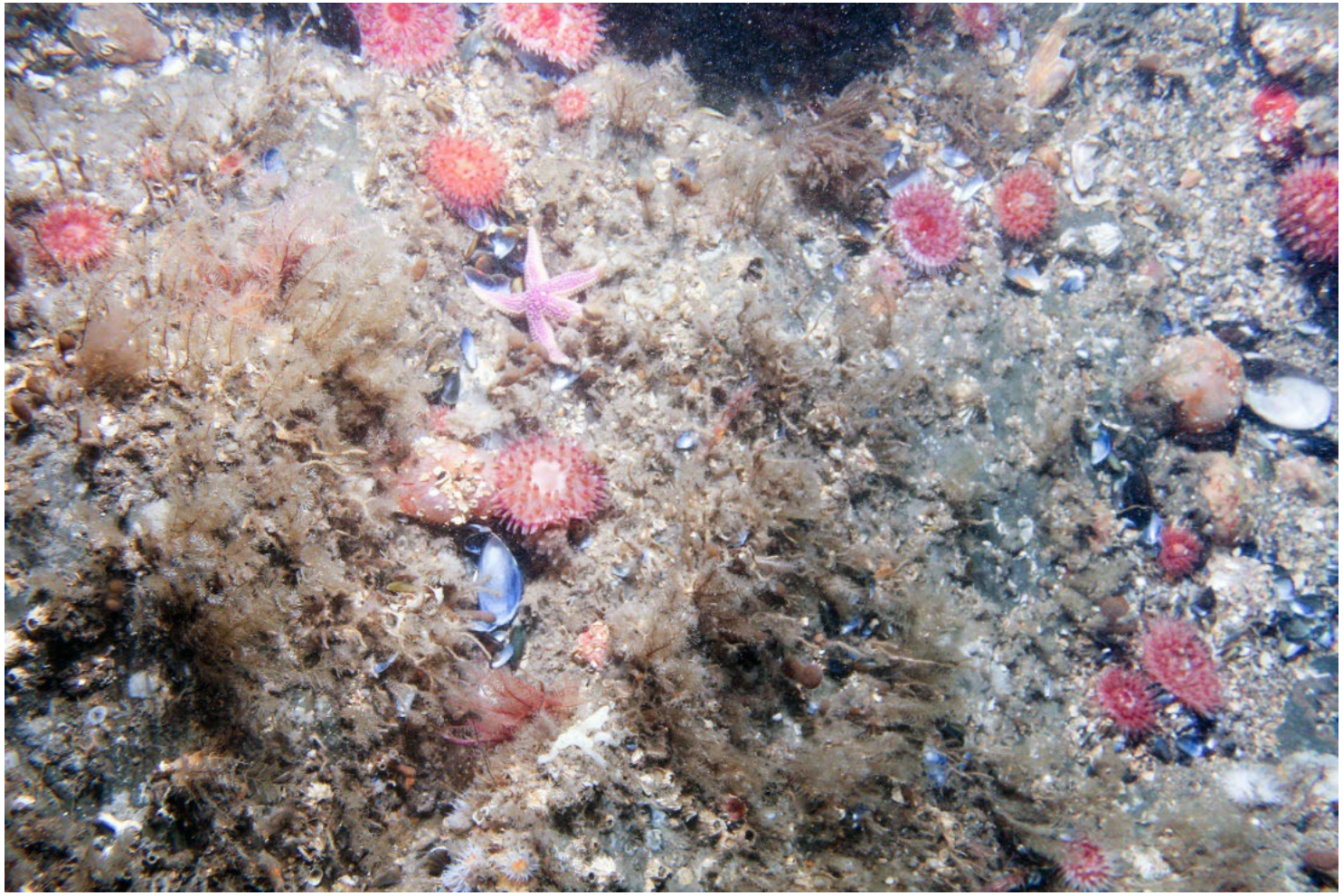
Image:



Code: CR.MCR.EcCr.UrtScr - *Urticina felina* and sand-tolerant fauna on sand-scoured or covered circalittoral rock

Name: Skerries_H1

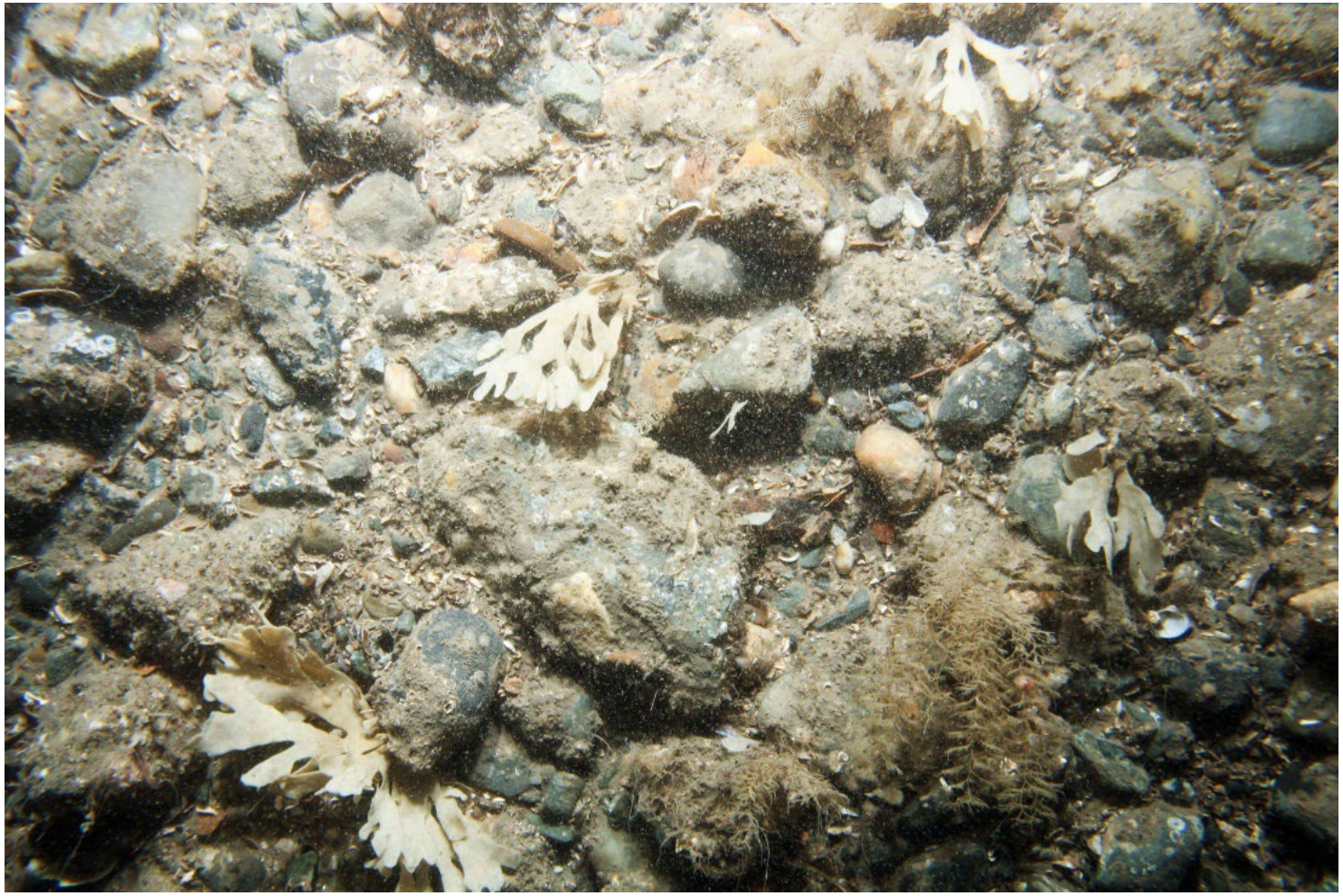
Image:



Code: SS.SMx.CMx.FluHyd - *Flustra foliacea* and Hydrallmania falcata on tide-swept circalittoral mixed sediment

Name: STHD3_H1

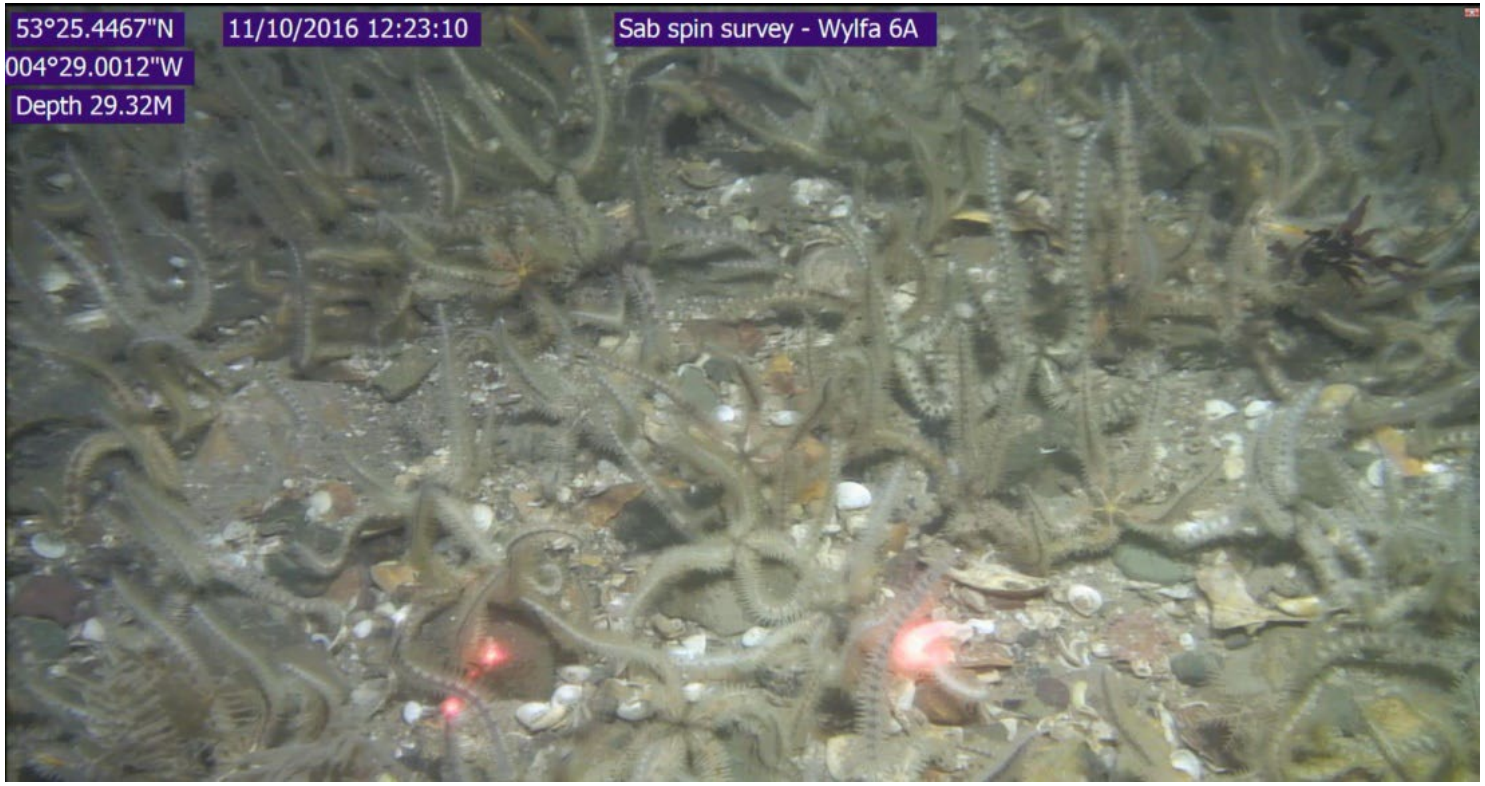
Image:



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

Name: Wylfa_6a_H1

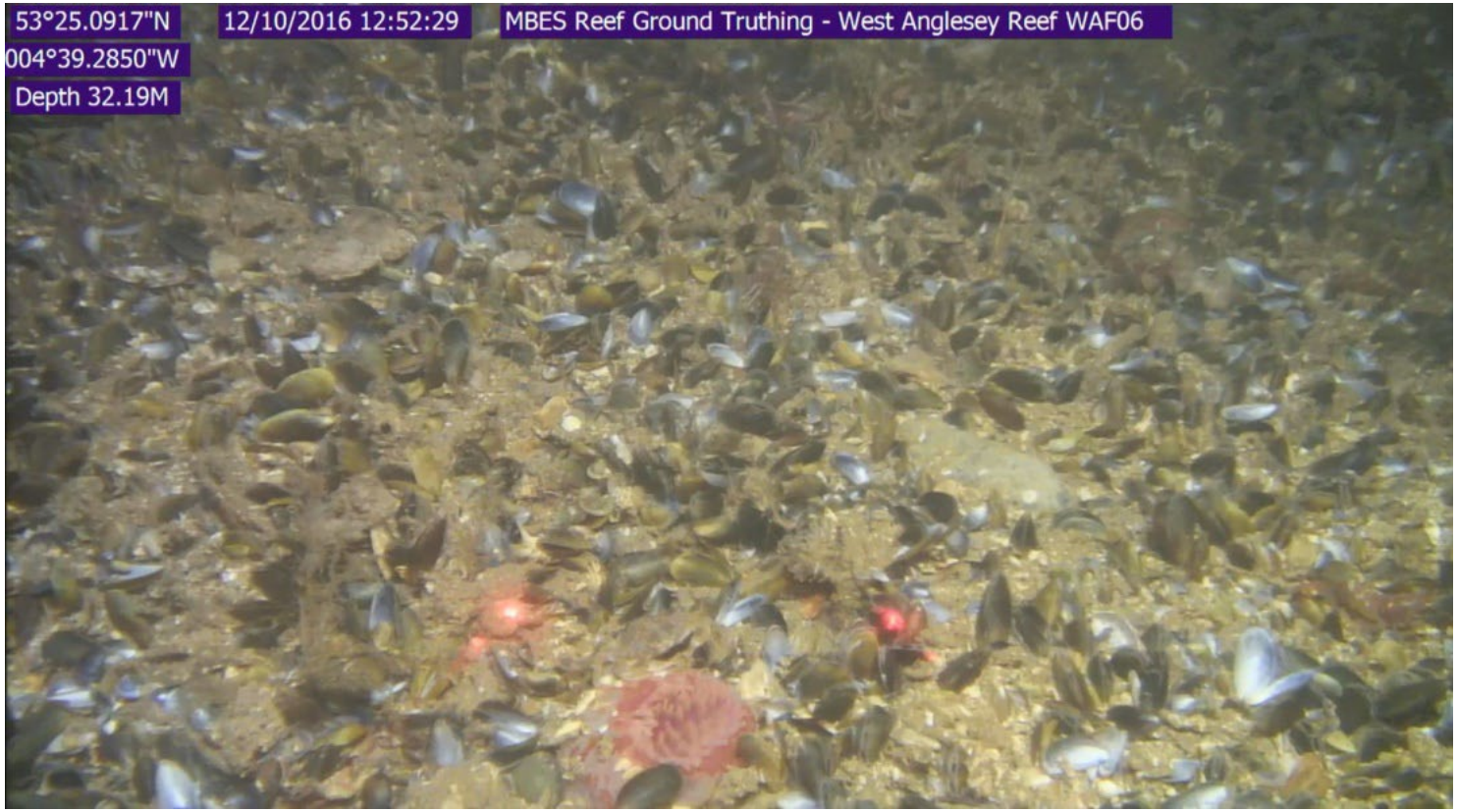
Image:



Code: SS.SBR.SMus.MytSS - *Mytilus edulis* beds on sublittoral sediment

Name: West Anglesey Reef_6_H1

Image:



Code: SS.SCS.CCS Circalittoral coarse sediment

Name: Church Bay_15c_H1

Image:

Code: SS.SCS.CCS Circalittoral coarse sediment

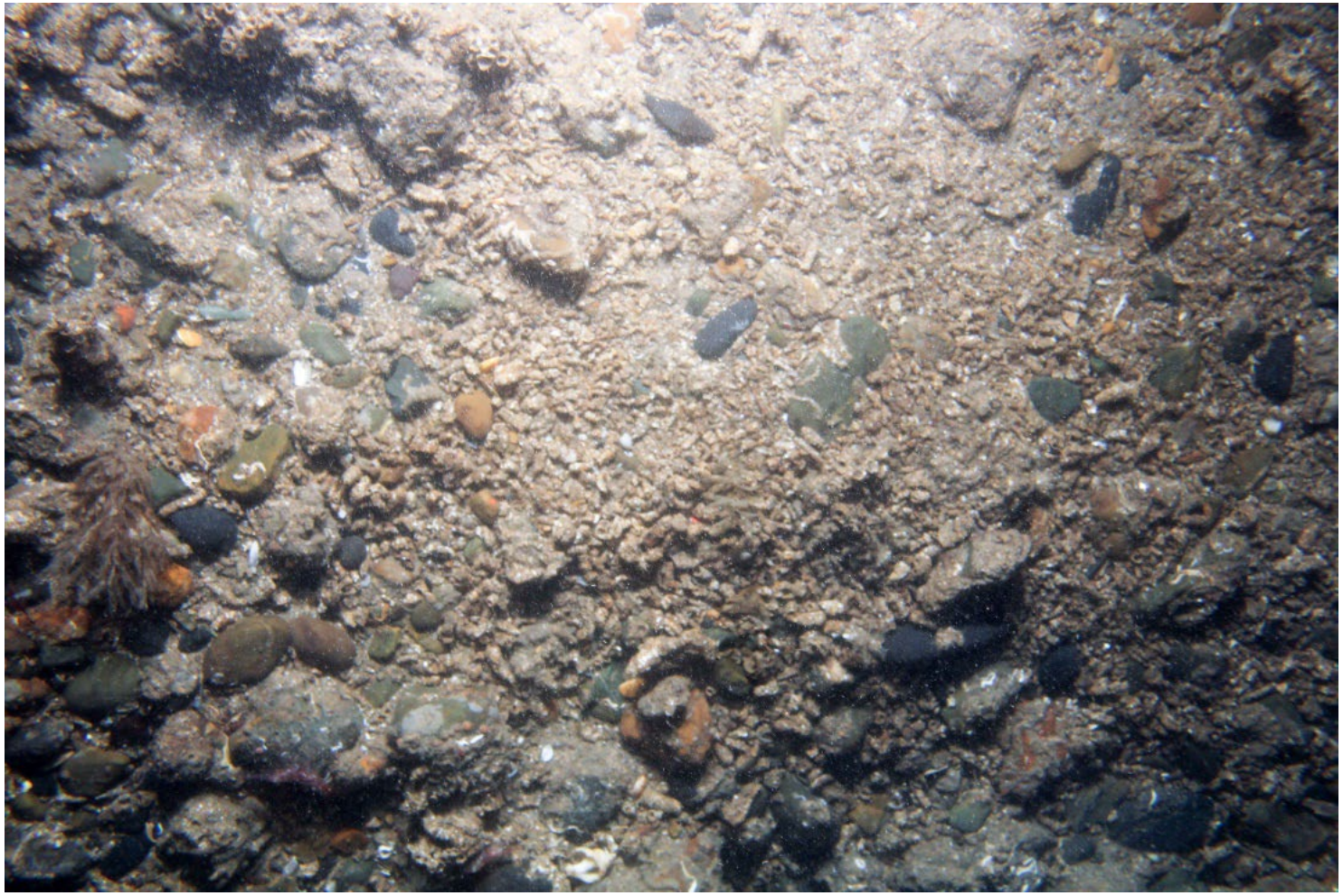
Name: Church Bay_15c_H1

Image:

Code: SS.SCS.CCS Circalittoral coarse sediment

Name: Church Bay_15f_H1

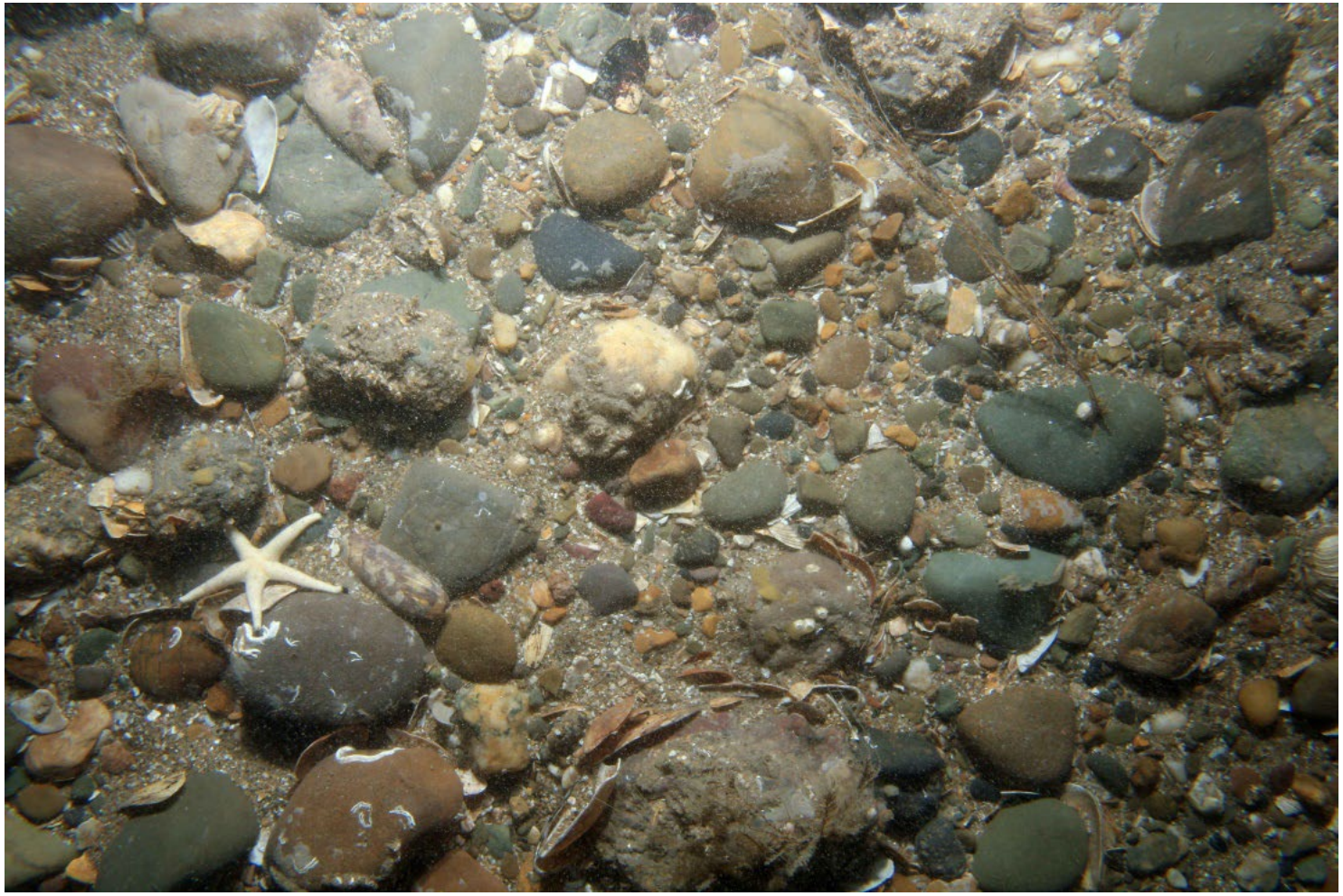
Image:



Code: SS.SCS.CCS Circalittoral coarse sediment

Name: STHD2_H1

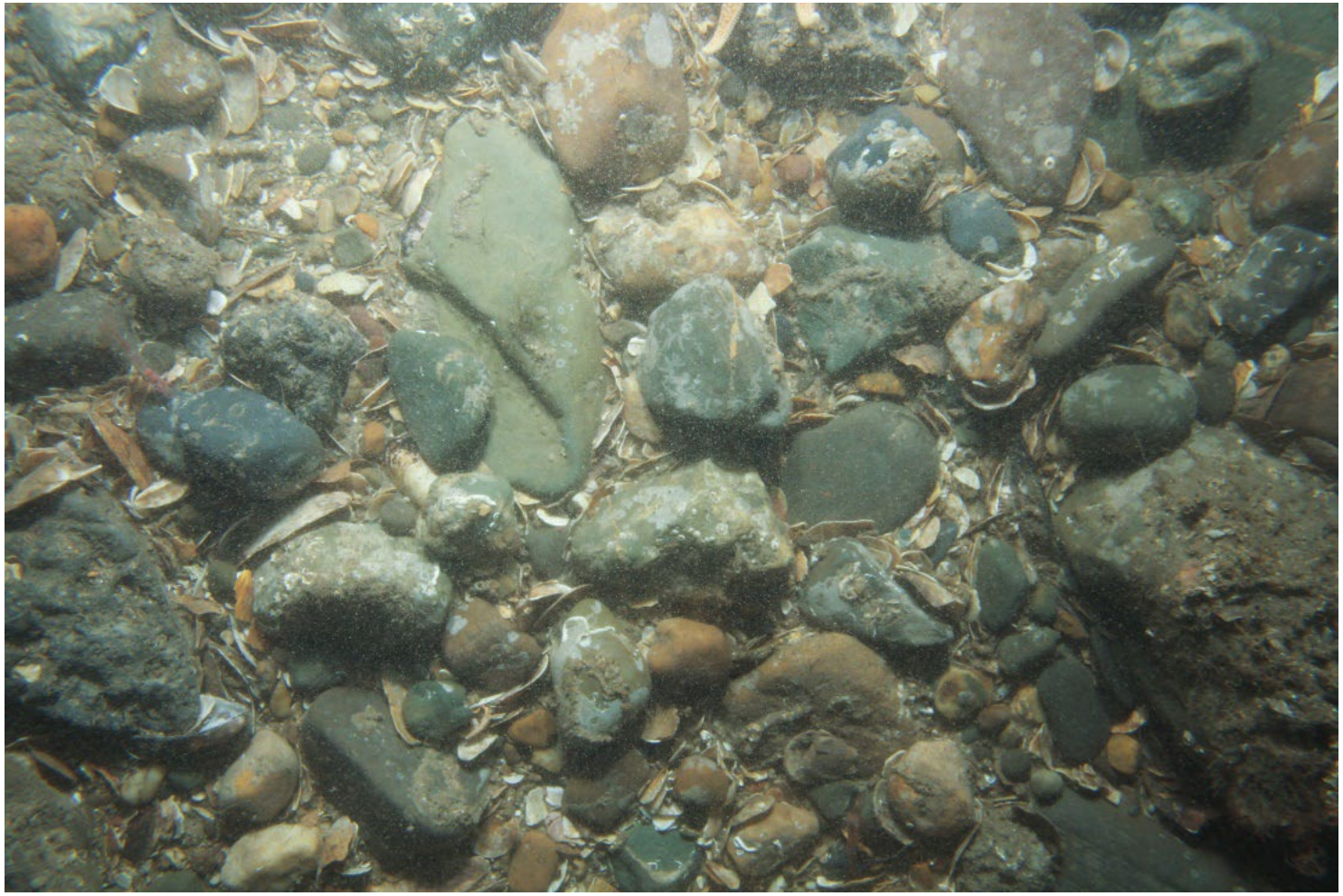
Image:



Code: SS.SCS.CCS Circalittoral coarse sediment

Name: West Anglesey Reef_10_H1

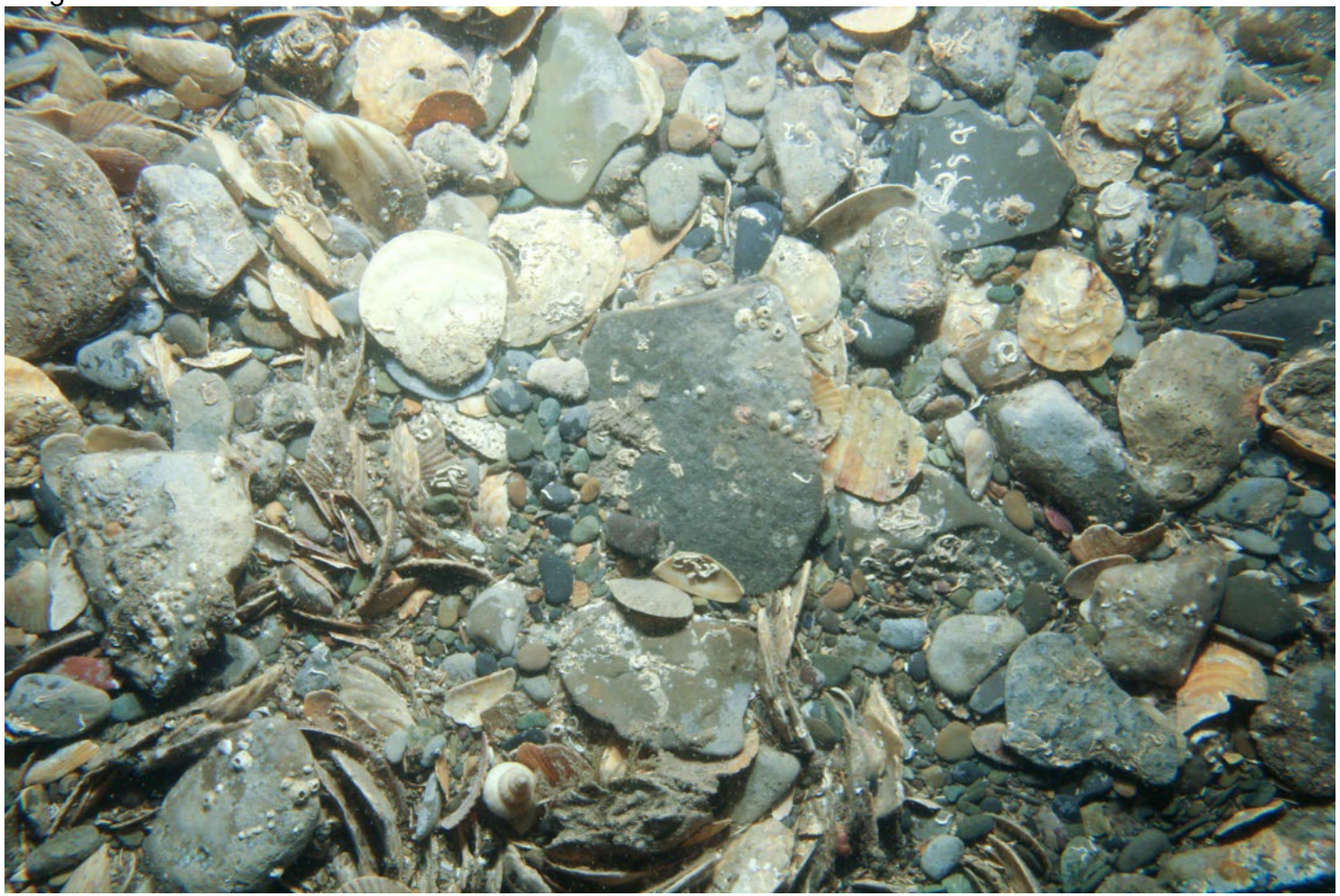
Image:



Code: SS.SCS.CCS.PomB - *Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles

Name: Point Lynas_SS8_H1

Image:



Code: SS.SSa.CFiSa Circalittoral fine sand

Name: West Anglesey Reef_35_H1

Image:

Data Archive Appendix

Data outputs associated with this project are archived as project 477, media 1554 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 (videos and still images) produced in .asf and jpg format.

[C] Survey logs as .XLSM and .TXT format

[D] Track GPS data in GIS format

[E] The paper log of the survey

[F] Marine Recorder Survey [MRCCW32600000002]

[G] Species data for import to Marine Recorder in .xls 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 118982.

Published by:
Natural Resources Wales
Maes y Fynnon
Penrhosgarnedd
Bangor
Gwynedd
LL57 2DW

0300 065 3000

© Natural Resources Wales 2017

All rights reserved. This document may be reproduced with prior permission of Natural Resources Wales

Further copies of this report are available from:

Email: library@cyfoethnaturiolcymru.gov.uk