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Skomer Marine Conservation Zone Sponge Diversity Survey 2019

J. Jones, K. Lock, M. Burton & P. Newman
NRW Evidence Report No. 460



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We work for the communities of Wales to protect people and their homes as much as possible from environmental incidents like flooding and pollution. We provide opportunities for people to learn, use and benefit from Wales' natural resources.

We work to support Wales' economy by enabling the sustainable use of natural resources to support jobs and enterprise. We help businesses and developers to understand and consider environmental limits when they make important decisions.

We work to maintain and improve the quality of the environment for everyone and we work towards making the environment and our natural resources more resilient to climate change and other pressures.

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- 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.

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Crynodeb

Mae sbyngau yn nodwedd bwysig o Barth Cadwraeth Forol Skomer. Mae rhaglen fonitro rhywogaethau bob pedair blynedd wedi bod ar waith ers 2003, ond mae cofnodion yn bodoli ers 1991. Mae nifer y rhywogaethau/endidau a gofnodwyd hyd yma yn 130, ac mae 42 ohonynt heb eu disgrifio neu'n gofyn am ymchwiliad pellach.

Cynhaliwyd arolwg o chwe safle yn 2019 ar ochr ddeheuol Skomer fel rhan o'r rhaglen barhaus i fonitro rhywogaethau o sbyngau. Cofnodwyd cyfanswm o 72 rhywogaeth/endid i gyd naill ai yn y fan a'r lle neu'n ddiweddarach ar ôl defnyddio microsgopig i adnabod sbigylau. O'r rhain, mae 14 heb eu disgrifio neu angen cael eu hymchwilio yn llawn.

Synopsis

Sponges are an important feature of Skomer Marine Conservation Zone. A four yearly full species monitoring programme has been in place since 2003, but records exist from 1991. The number of species/entities recorded to date is 130, of which 42 are undescribed or need further investigation.

In 2019 six sites were surveyed on the south side of Skomer as part of the continuing full sponge species monitoring programme. A total of 72 species/entities were recorded either in situ or later from microscopic identification of spicules. Of these, 14 are undescribed or need to be fully researched.

1. Introduction

The sponge communities at Skomer Marine Conservation Zone (MCZ) have been identified as a management feature due to their rich and diverse nature. Sponges form part of the fragile sponge and anthozoan communities on subtidal rocky habitats which are of priority importance under Section 7 of the Environment (Wales) Act 1916.

There are over 9,000 valid sponge species listed in the World Porifera database (Van Soest et al, 2018), but around 15,000 sponge species are thought to exist worldwide. Sponge biodiversity is still relatively poorly known, although in recent years a significant number of diving surveys have taken place around the UK specifically targeting sponges (Picton & Goodwin, 2007; Goodwin & Picton, 2011), and these have resulted in several new species being described and an increase in the occurrence of previously rarely recorded species.

There are approximately 375 sponge species reported from UK and Irish waters but only about 100 of these are well-known (Ackers et al., 1992). The area of the Skomer MCZ is only 13.2 square kilometres but to date 130 species/entities have been recorded. Of these, 88 are known species and 42 are undescribed or require further investigation. Four of the species present in the Skomer MCZ are on the nationally rare and scarce marine benthic species list for Great Britain (Sanderson 1996).

Marine Life Identification courses were held annually at Dale Fort Field Centre in Pembrokeshire between 1981 and 1991. During these courses, sponges were recorded along with other marine fauna by scuba divers around Skomer. These records were ultimately collated (Bunker *et al.*, 1992) and now provide a useful baseline for monitoring purposes. They are included in the total number of species recorded from Skomer MCZ.

In 2009, 106 sponge samples were collected from the Skomer MCZ as part of the Sponge Diversity of the UK project (Goodwin & Picton, 2011) and these species have been included in the total number of species recorded.

Sponge monitoring programmes have been in place at the Skomer MCZ since 1993, shortly after it was designated as a Marine Nature Reserve in 1991. Population monitoring was first set up at Thorn Rock on the south side of Skomer Island to investigate the temporal changes within sponge communities. The communities have been recorded annually since then using photographs taken from fixed positions along marked transects. Given the difficulty of identifying sponges either from photographs or in the field it was decided to complement this monitoring with a full species identification survey, although it was not deemed necessary for this to be on an annual basis.

The current sponge monitoring programme involves taking photographs at four transect sites at Thorn Rock annually to count the abundance of sponge species and morphology types, and completing a full species survey every four years. The first species survey was in 2003, when two Thorn Rock sites: Windy Gully and Spongy

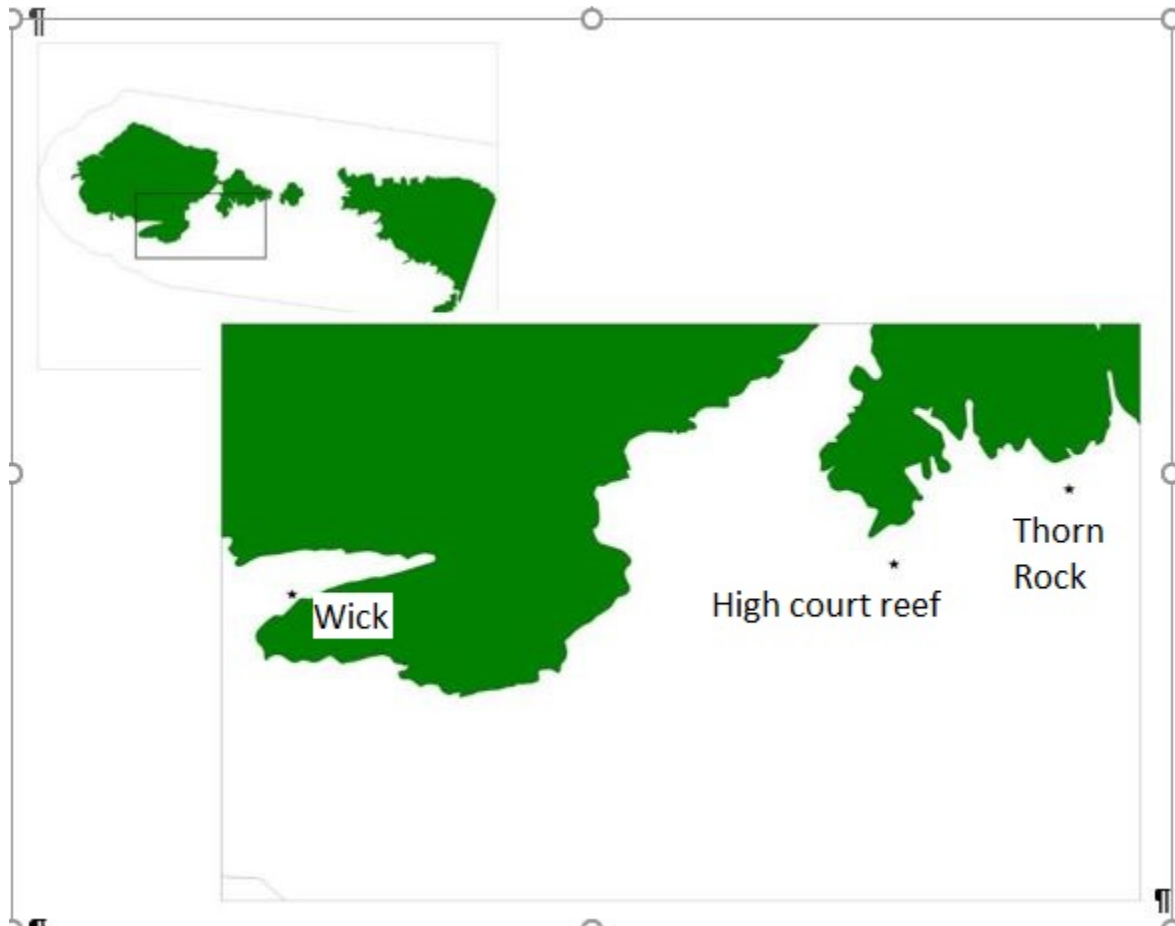
Hillocks were surveyed. In 2007 Dog Leg site at Thorn Rock was added to the survey and in 2011 Broad Gully was added giving four sites at Thorn Rock. In 2011 the species survey was expanded to two further sites on the south side of Skomer, the Wick and High Court Reef. The four Thorn Rock sites, the Wick and High Court Reef were all surveyed in the 2015 species survey. All six sites were again surveyed in 2019.

In 2015, in addition to the species survey, the Skomer MCZ collaborated with Portsmouth University to collect samples for DNA analysis from as many sponge species as possible. Currently there is very little DNA information for UK species, and it is hoped that this work will make a major contribution to the DNA database and act as a very important resource for future biodiversity surveys.

The barcoding of the Skomer MCZ sponges was carried out in conjunction with the Sponge Barcoding Project that aims to obtain DNA signature sequences from more than 8,000 described sponge species and an estimated 15,000 unknown. As sponges are notoriously difficult to identify, sponge barcodes are an essential tool for identification and understanding their importance for ecosystem functioning.

2. Survey Sites

Figure. 2.1 Map of Skomer MCZ showing sponge species survey locations



Most sponge species are tolerant of some silt, but as filter feeders they benefit from being in an area with some water movement. However, locations that are very tide swept are not suitable habitats for many sponges and therefore are not very rich in terms of diversity. The north side of Skomer has noticeably less variety than the south side, with very few encrusting species but large growths of massive sponges such as the boring sponge, *Cliona celata*, that are known to thrive in more exposed conditions. For this reason survey locations have been chosen around the south side of Skomer. However in 2015 some samples were collected from Rye Rocks on the north side, during a routine dive.

2.1. Thorn Rock

Four separate sites, chosen for their varying habitats, are surveyed at this location as part of the full species survey. There is a notable amount of silt at this location, making it particularly suitable for silt-tolerant sponges such as encrusting *Eurypon* spp. and branching *Raspailia* and *Stelligera* spp.

2.1.1. Windy Gully

Windy Gully is a narrow gully approximately 2 metres wide with vertical walls 2 metres high at a depth of 15 to 17m below chart datum (bcd). The walls are dominated by erect and encrusting sponges, anthozoans and hydroid and bryozoan turf. The nationally scarce sponges *Axinella damicornis* and *Tethyspira spinosa* are present.

2.1.2. Spongy Hillocks

Spongy Hillocks is an area of horizontal seabed with rock outcrops at a depth of 17m bcd covered with erect and cushion sponges including *Axinella dissimilis* and *Polymastia* spp.

2.1.3. Dog Leg

Dog Leg is an area of uneven bedrock at a depth of 15m bcd with erect and cushion sponges including *Polymastia* spp. on the horizontal surfaces and encrusting sponges on the shaded and overhanging areas, with abundant hydroid and bryozoan turf.

2.1.4. Broad Gully

Broad Gully is approximately 4 metres wide, with high vertical walls dominated by a large variety of encrusting sponges including a number of undescribed *Eurypon* spp. at a depth of 17m bcd. The nationally scarce sponges *Axinella damicornis* and *Tethyspira spinosa* are present.

2.2. The Wick

The south side of the Wick is a vertical rock face 50m high continuing underwater to 8m bcd with an undercut down to 12-15m bcd, where large patches of the encrusting sponge *Thymosia guernei* are present. The rock is covered with diverse fauna, dominated by sponges and jewel anemones *Corynactis viridis*, with frequent occurrences of the nationally scarce sponges *Phorbates dives* and *Stelletta grubbii*.

2.3. High Court Reef

This rugged site at 17m bcd consists of a series of rock pinnacles with vertical walls up to 5m high and deep gullies of between 2 to 5m width. These gully walls are rich with abundant faunal turf including encrusting sponges, cup corals *Caryophyllia smithii* and anthozoans. Away from the gullies, large boulders occur, some extensively covered with the encrusting sponge *Phorbates fictitius* amongst the massive sponge *Cliona celata* and erect species.

3. Methodology

Each site listed is visited on at least one occasion during each survey. All sponges that can be easily identified in-situ are recorded. If a sponge cannot be identified or if the identification needs confirmation, a series of photographs are taken of the sponge, including close ups of the surface, after which a sample is collected and placed in a numbered bag.

Figure 3.1. Surveyor recording and collecting samples at the Wick



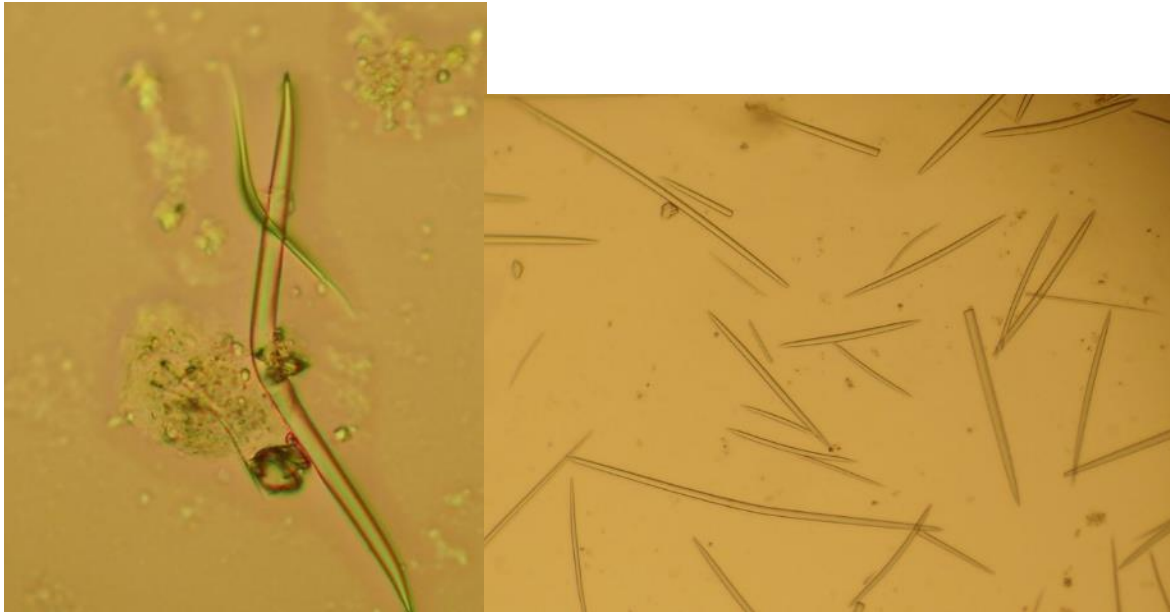
These samples are then placed in tubes of absolute alcohol for preservation.

Figure 3.2. Surveyor preserving samples



Following preservation, a thin cross-section is cut from a sample, immersed in clove oil to clear the tissue, then placed on a microscope slide and mounted in Canada balsam in order to examine the skeletal structure of the sponge. A further small portion of the sample is placed in thin household bleach to dissolve the tissue of the sponge for microscopic examination of the individual spicules making up the skeleton.

Figure 3.3. Sponge spicule preparation examples



4. Results

The 2019 survey was completed at the 4 Thorn Rock sites: Windy Gully, Broad Gully, Dog Leg and Spongy Hillocks, the Wick and High Court Reef. The survey resulted in 72 sponge species/entities being identified using a combination of in situ recording and collection of samples over 10 dives for analysis. Of these, 14 are undescribed or requiring further investigation. 99 samples were collected in total for identification.

Broad Gully (Thorn Rock) was the richest individual site in terms of species found, while Dog Leg (Thorn Rock) was the least diverse site. A full list of species found at each site is given in Table 1.

The most frequently recorded species were the massive sponges *Cliona celata* and *Pachymatisma johnstonia*, the cushion sponge *Dysidea fragilis*, encrusting sponges *Hemimycale columella* and *Plocamionida ambigua*, and erect sponges *Stelligera stupeosa* and *Stelligera montagui* (formerly *Stelligera rigida*). These species were found at all 6 sites.

Figure 4.1. *Cliona celata*

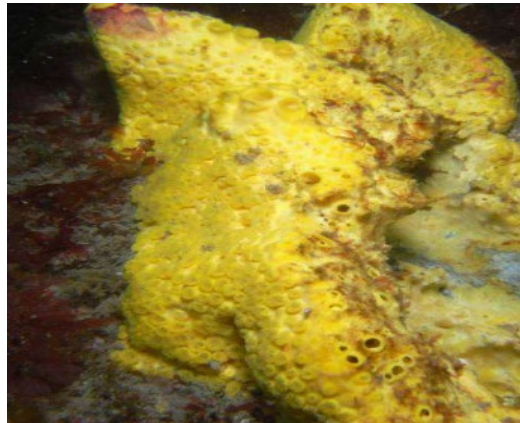


Figure. 4.2. *Hemimycale columella*

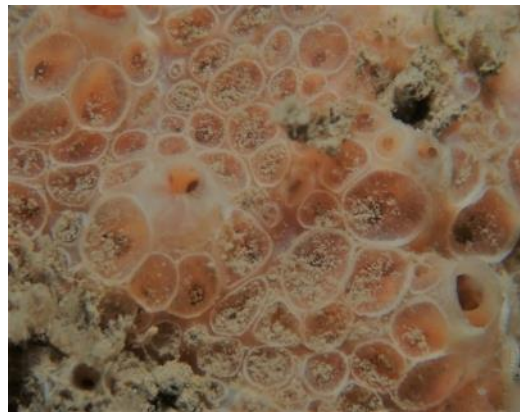


Figure. 4.3. *Stelligera stuposa*



Figure. 4.4. *Plocamionida ambigua*

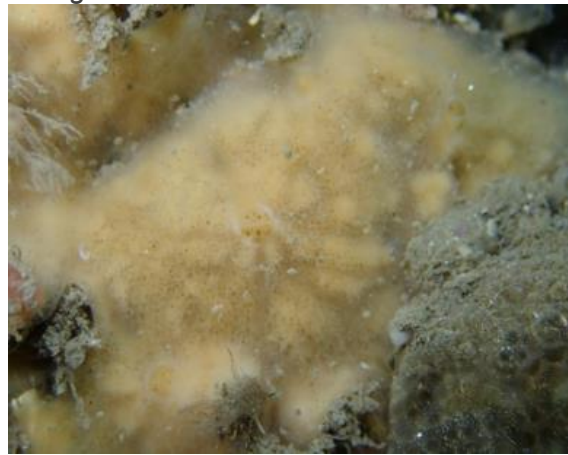


Figure. 4.5. *Stelligera montagui*



Two sponges, *Eurypon* sp. G and *Spongosorites* sp. A have not been found in previous surveys. Research on these is ongoing, however early findings suggest that these are species new to science.

In previous surveys two undescribed *Phorbas* spp. have been recorded (*Phorbas* sp. and *Phorbas* sp. A). However, after being sampled again in 2019, and following re-

examination of the spicule complement of all samples, it has been concluded that they are the same species, therefore all records have been adjusted accordingly and named *Phorbas* sp. A.

Two unknown *Sphaerotylus* spp. had been tentatively recorded in previous surveys as *Sphaerotylus* sp. A and *Sphaerotylus* sp. B, due to slight variations in one spicule type, however they have now been grouped together in accordance with the description of a new species, *Sphaerotylus renoufi* (Plotkin et al, 2017), and all records have been adjusted and re-named *Sphaerotylus renoufi*.

In 2015 two species notable by their absence were *Paratimea constellata* and *Hymeraphia stellifera*, having been consistently present in previous surveys. In 2019 the former was found once more at two sites, although the latter was again absent.

The total number of recorded species/entities found during the four yearly surveys from 2003 onwards is 108, of which 32 are undescribed or need further research (Table 2). The total number including all additional surveys since 1993 is 130, of which 42 are undescribed or need further research. A list of 22 species recorded only from historical or additional surveys is given below (Bunker, F., 1992; Goodwin C.E & Picton, B.E., 2011).

Antho (Jia) brattegardii

Antho sp.

Axinella sp.

Clathria (Microcionia) sp.

Clathrina sp.

Cliona sp.

Eurypon cinctum

Eurypon clavatum

Eurypon clavigerum

Halichondria (Halichondria) bowerbanki

Haliclona (Rhizoniera) rosea

Hemimycale sp.

Hymedesmia (Hymedesmia) sp.

Hymerhabdia typica

Iophon nigricans

Leuconia johnstoni

Ophlitaspongia papilla

Phorbas sp.

Plocamionida sp.

Protosuberites denhartogi

Spanioplone armaturum

Stelletta sp.

The DNA work on the 2015 samples is ongoing, and a report of the findings and results will be sent to the Skomer MCZ for information upon its completion.

All species records from surveys since 2003 have been entered onto the Marine Recorder database and are available on the JNCC National Biodiversity Network Atlas. Preserved samples from 2015 have been curated and stored at the Natural History Museum and some historic samples have been curated and stored at the Natural Museum Wales.

Table 1. List of sponge species found at each site in 2019 (Yes – recorded during the survey, No – not recorded during the survey)

Species	Windy Gully	Broad Gully	Spongy Hillocks	Dog Leg	High Court Reef	The Wick
<i>Amphilectus fucorum</i>	No	Yes	Yes	Yes	Yes	Yes
<i>Antho (Antho) inconstans</i>	Yes	Yes	No	Yes	No	Yes
<i>Aplysilla rosea</i>	No	No	No	No	No	Yes
<i>Aplysilla sulfurea</i>	Yes	No	No	No	Yes	Yes
<i>Axinella damicornis</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Axinella dissimilis</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Axinella infundibuliformis</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Chelonaplysilla noevus</i>	Yes	No	No	No	No	Yes
<i>Clathrina coriacea</i>	No	No	No	No	No	Yes
<i>Clathrina lacunosa</i>	No	No	No	No	No	Yes
<i>Cliona celata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Crella (yvesia) rosea</i>	No	No	No	No	Yes	No
<i>Dercitus (Dercitus) bucklandi</i>	Yes	Yes	No	No	Yes	Yes
<i>Desmacella cf. annexa</i>	Yes	Yes	No	Yes	No	Yes
<i>Dysidea fragilis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Eurypon major</i>	Yes	Yes	No	Yes	Yes	No
<i>Eurypon sp. A</i>	No	Yes	No	No	No	No
<i>Eurypon sp. B</i>	Yes	Yes	Yes	No	Yes	No
<i>Eurypon sp. C</i>	No	Yes	No	No	No	No
<i>Eurypon sp. D</i>	Yes	No	No	Yes	Yes	No
<i>Eurypon sp. E</i>	Yes	No	No	No	No	No
<i>Eurypon sp. F</i>	Yes	No	No	No	No	No
<i>Eurypon sp. G</i>	No	Yes	No	No	No	No
<i>Halichondria (Halichondria) panicea</i>	No	No	No	No	No	Yes
<i>Haliclona (Haliclona) oculata</i>	Yes	Yes	No	Yes	No	No
<i>Haliclona (Haliclona) urceolus</i>	Yes	Yes	Yes	No	Yes	No
<i>Haliclona (Rhizoniera) viscosa</i>	No	No	No	No	No	Yes
<i>Haliclona (Rhizoniera) sp.</i>	No	No	No	No	Yes	
<i>Halicnemia patera</i>	Yes	Yes	Yes	Yes		
<i>Hemimycale columella</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hexadella topsenti</i>	Yes	Yes	Yes	No	Yes	Yes
<i>Homaxinella subdola</i>	Yes	Yes	Yes	Yes	No	No
<i>Hymedesmia (Hymedesmia) pansa</i>	No	Yes	No	No	No	No
<i>Hymedesmia (Hymedesmia) paupertas</i>	Yes	No	No	No	Yes	Yes
<i>Hymedesmia (Stylopus) sp.</i>	No	Yes	No	No	No	No
<i>Hysmeniacidon perlevis</i>	No	No	No	No	No	Yes
<i>Leuconia nivea</i>	No	No	No	No	No	Yes
<i>Clathria (Microcionia) armata</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Clathria (Microcionia) cf. armata</i>	Yes	No	No	No	No	No

<i>Mycale (Carmia) macilenta</i>	No	No	No	No	Yes	Yes
<i>Mycale (Aegogropila) rotalis</i>	No	No	No	No	Yes	Yes
<i>Myxilla (Myxilla) incrustans</i>	No	No	No	No	No	Yes
<i>Myxilla (Myxilla) rosacea</i>	No	Yes	Yes	No	No	Yes
<i>Pachymatisma johnstonia</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Paratimea constellata</i>	Yes	Yes	No	No	No	No
<i>Phorbas dives</i>	No	No	No	No	No	Yes
<i>Phorbas fictitius</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Phorbas plumosus</i>	No	No	No	No	No	Yes
<i>Phorbas punctatus</i>	Yes	No	Yes	No	Yes	No
<i>Phorbas sp. A</i>	No	No	Yes	No	No	No
<i>Pleraplysilla sp.</i>	No	No	Yes	No	No	No
<i>Plocamionida ambigua</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>PolYesmastia boletiformis</i>	Yes	Yes	Yes	Yes	Yes	No
<i>PolYesmastia penicillus</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Prosuberites longispinus</i>	No	No	Yes	Yes	No	No
<i>Pseudosuberites sulphureus</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Raspaciona aculeata</i>	No	Yes	No	No	No	No
<i>Raspailia (Clathriodendron) hispida</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Raspailai (Raspailia) ramosa</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Sphaerotylus renoufi</i>	Yes	Yes	Yes	Yes	No	No
<i>Spongosorites calcicola</i>	No	No	No	No	No	Yes
<i>Spongosorites sp. A</i>	No	Yes	No	No	No	No
<i>Stelletta grubii</i>	No	No	No	No	No	Yes
<i>Stelligera montagui</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Stelligera stuposa</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Stryesphnus ponderosus</i>	No	No	No	No	No	Yes
<i>Suberites carnosus</i>	No	Yes	Yes	Yes	Yes	No
<i>Sycon ciliatum</i>	No	No	Yes	No	No	Yes
<i>Tethya citrina</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Tethyspira spinosa</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Thysmosia guernei</i>	No	Yes	No	No	No	Yes S
<i>Ulosa digitata</i>	No	No	No	Yes	Yes	No
Total no. species	39	42	32	31	35	35

Table 2. Species recorded in all survey years (yes – recorded on a survey, no – not recorded on a survey)

Species Name	2003	2007	2011	2015	2019
<i>Amphilectus fucorum</i>	yes	no	yes	yes	yes
<i>Antho (Acarinia) coriacea</i>	yes	yes	yes	no	yes
<i>Antho (Antho) inconstans</i>	yes	yes	yes	yes	yes
<i>Antho (Antho) involvens</i>	yes	yes	yes	yes	no
<i>Aplysilla rosea</i>	no	no	no	yes	yes
<i>Aplysilla sulfurea</i>	no	no	no	yes	yes
<i>Axinella damicornis</i>	yes	yes	yes	yes	yes
<i>Axinella dissimilis</i>	yes	yes	yes	yes	yes
<i>Axinella infundibuliformis</i>	yes	yes	yes	yes	yes
<i>Biemna variantia</i>	no	no	yes	no	no
<i>Chelonaplysilla noevus</i>	yes	yes	yes	yes	yes
<i>Ciocalyptra penicillus</i>	no	no	yes	yes	no
<i>Clathria (Microcionia) armata</i>	no	no	yes	yes	yes
<i>Clathria (Microcionia) cf. armata</i>	yes	yes	yes	yes	yes
<i>Clathria (Microcionia) atransanguinea</i>	yes	no	no	no	no
<i>Clathria (Microcionia) sp.</i>	no	yes	no	no	no
<i>Clathria (Microcionia) sp. A</i>	no	no	no	yes	no
<i>Clathria (Microcionia) spinarcus</i>	no	no	yes	no	no
<i>Clathria (Microcionia) strepsitoxa</i>	yes	no	yes	no	no
<i>Clathrina coriacea</i>	no	no	yes	yes	yes
<i>Clathrina lacunosa</i>	yes	no	no	no	yes
<i>Cliona celata</i>	yes	yes	yes	yes	yes
<i>Crella (yvesia) rosea</i>	no	no	yes	no	yes
<i>Dercitus (Dercitus) bucklandi</i>	no	no	yes	yes	yes
<i>Desmacella sp.</i>	no	yes	no	no	no
<i>Desmacella cf. annexa</i>	yes	yes	yes	yes	yes
<i>DYsidea cf. pallescens</i>	no	no	yes	no	no
<i>DYsidea fragilis</i>	yes	yes	yes	yes	yes
<i>DYsidea (purple)</i>	no	no	no	yes	no
<i>Eurypon cf. simplex</i>	no	no	yes	no	no
<i>Eurypon major</i>	yes	yes	yes	yes	yes
<i>Eurypon sp. A</i>	yes	yes	yes	no	yes
<i>Eurypon sp. B</i>	no	no	yes	yes	yes
<i>Eurypon sp. C</i>	no	no	yes	yes	yes
<i>Eurypon sp. D</i>	no	no	yes	yes	yes
<i>Eurypon sp. E</i>	no	no	no	yes	yes
<i>Eurypon sp. F</i>	no	no	no	no	yes
<i>Eurypon sp. G</i>	no	no	no	no	yes
<i>Grantia compressa</i>	no	no	yes	no	yes
<i>Halichondria (Halichondria) panicea</i>	yes	no	no	yes	no
<i>Haliclona (Haliclona) oculata</i>	yes	yes	yes	yes	yes
<i>Haliclona (Haliclona) urceolus</i>	yes	no	yes	yes	yes
<i>Haliclona (Reniera) cinerea</i>	yes	no	yes	no	no
<i>Haliclona (Rhizoniera) sp.</i>	no	no	yes	no	yes
<i>Haliclona (Rhizoniera) viscosa</i>	yes	yes	yes	yes	yes
<i>Haliclona (Halichoelona) fistulosa</i>	yes	yes	yes	yes	no
<i>Haliclona sp. A</i>	no	yes	no	no	no
<i>Halicnemia patera</i>	yes	yes	yes	yes	yes
<i>Hemimycale columella</i>	yes	yes	yes	yes	yes
<i>Hexadella topsenti</i>		yes	yes	yes	yes
<i>Homaxinella subdola</i>	yes	yes	yes	yes	yes
<i>Hymedesmia (Hymedesmia) jecusculum</i>	yes	yes	yes	yes	no
<i>Hymedesmia (Hymedesmia) pansa</i>	no	no	yes	yes	yes
<i>Hymedesmia (Hymedesmia) paupertas</i>	yes	yes	yes	yes	yes

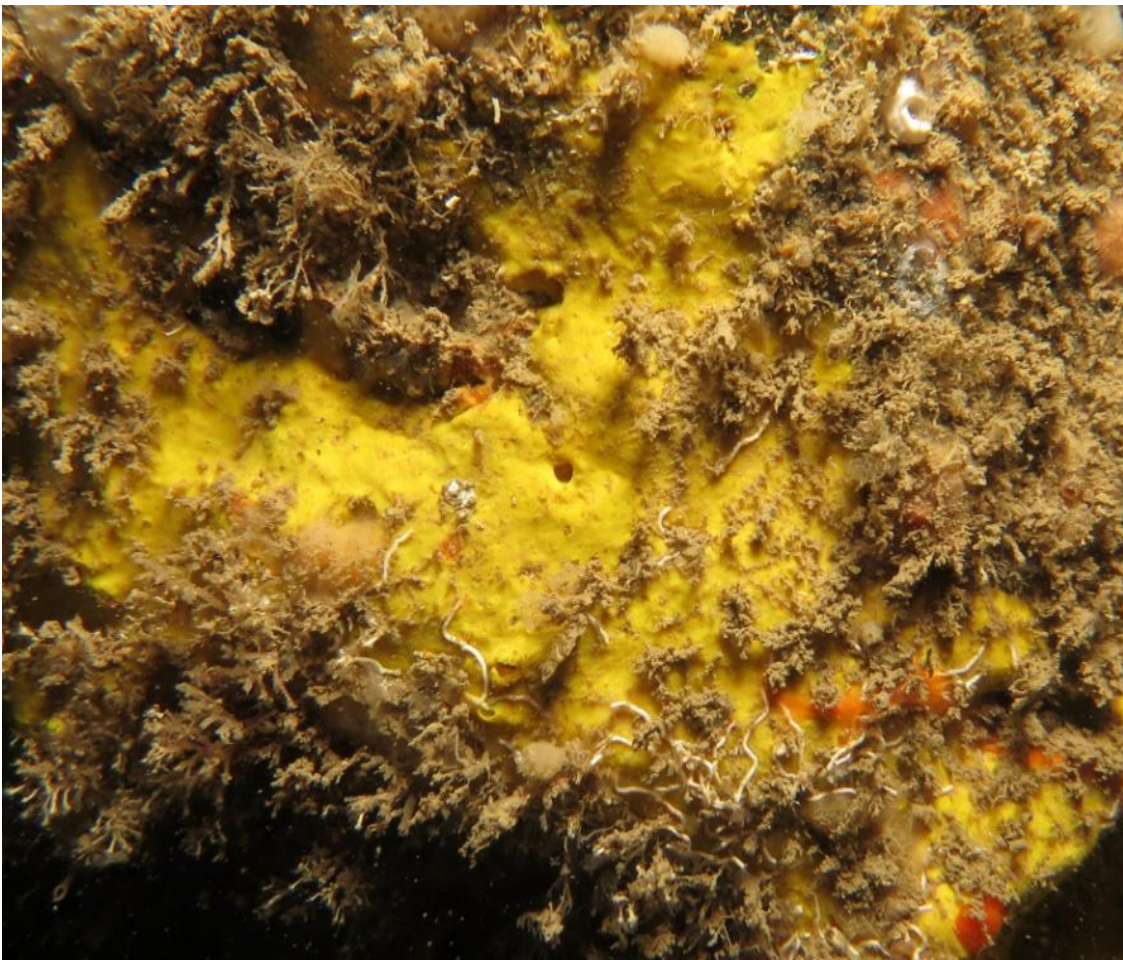
<i>Hymedesmia (Hymedesmia) sp.</i>	no	no	yes	no	no
<i>Hymedesmia (Hymedesmia) sp. A</i>	no	yes	yes	no	no
<i>Hymedesmia (Hymedesmia) sp. B</i>	no	yes	yes	no	no
<i>HYmedesmia (HYmedesmia) sp. C</i>	no	yes	no	no	no
<i>HYmedesmia (StYlopus) sp.</i>	no	no	yes	no	yes
<i>HYmedesmia (StYlopus) coriacea</i>	no	yes	no	no	no
<i>HYmeniacidon perlevis</i>	yes	yes	yes	yes	yes
<i>HYmeraphia stellifera</i>	yes	yes	no	no	no
<i>Iophon hYndmani</i>	no	yes	no	yes	no
<i>Leuconia nivea</i>	no	no	no	no	yes
<i>Mycale (Aegogropila) rotalis</i>	no	no	yes	yes	yes
<i>Mycale (Carmia) macilenta</i>	no	no	yes	no	yes
<i>Mycale (Carmia) minima</i>	no	yes	no	no	no
<i>Myxilla (Myxilla) incrustans</i>	yes	no	yes	yes	yes
<i>Myxilla (Myxilla) rosacea</i>	no	no	no	yes	yes
<i>Myxilla (Styloptilon) ancorata</i>	no	no	yes	no	no
<i>Pachymatisma johnstonia</i>	yes	yes	yes	yes	yes
<i>Paratimea sp.</i>	no	no	yes	no	no
<i>Paratimea constellata</i>	yes	yes	yes	no	yes
<i>Phorbas dives</i>	yes	yes	yes	yes	yes
<i>Phorbas fictitius</i>	no	yes	yes	yes	yes
<i>Phorbas plumosus</i>	no	no	no	yes	yes
<i>Phorbas punctatus</i>	no	no	yes	yes	yes
<i>Phorbas sp. 1</i>	yes	yes	no	no	no
<i>Phorbas sp. A</i>	no	no	yes	yes	yes
<i>PleraplySilla sp.</i>	no	no	yes	no	yes
<i>Plocamionida ambigua</i>	yes	yes	yes	yes	yes
<i>Polymastia (pink)</i>	yes	no	no	no	no
<i>Polymastia boletiformis</i>	yes	yes	yes	yes	yes
<i>Polymastia penicillus</i>	yes	yes	yes	yes	yes
<i>Polymastia p. A</i>	no	no	yes	no	no
<i>Polymastia sp. B</i>	no	yes	yes	no	no
<i>Prosuberites longispinus</i>	no	no	no	yes	yes
<i>Protosuberites incrustans</i>	no	no	yes	yes	no
<i>Pseudosuberites sulphureus</i>	yes	yes	yes	yes	yes
<i>Raspaciona aculeata</i>	yes	yes	yes	yes	yes
<i>Raspailia (Clathriodendron) hispida</i>	yes	yes	yes	yes	yes
<i>Raspailia (Raspailia) ramosa</i>	yes	yes	yes	yes	yes
<i>Sphaerotylus renoufi</i>	no	yes	yes	yes	yes
<i>Spongosorites calcicola</i>	no	no	no	yes	yes
<i>Spongosorites sp. A</i>	no	no	no	no	yes
<i>Stelleta grubii</i>	no	no	yes	yes	yes
<i>Stelligera montagui</i>	yes	yes	yes	yes	yes
<i>Stelligera stuposa</i>	yes	yes	yes	yes	yes
<i>Stryphnus ponderosus</i>	no	no	yes	yes	yes
<i>Suberites carnosus</i>	yes	yes	yes	yes	yes
<i>Suberites ficus</i>	yes	no	no	no	no
Suberitidae	no	yes	no	no	no
<i>Sycon ciliatum</i>	no	no	no	yes	yes
<i>Tethya citrina</i>	yes	yes	yes	yes	yes
<i>Tethyspira spinosa</i>	yes	yes	yes	yes	yes
<i>Thymosia guernei</i>	no	yes	yes	yes	yes
<i>Ulosa digitata</i>	no	no	no	no	yes

5. Notable Species

5.1. *Spongosorites calcicola*

This species was described from Rathlin Island, Northern Ireland in 2007 (Picton & Goodwin, 2007), although it had been seen previously at scattered locations in southern Ireland. It was subsequently recorded from one site in Scotland. It was found in the Skomer MCZ for the first time in 2015 at the Wick, forming extensive large patches on the wall. This was the first record of the species for Wales, and the first time it had been found on igneous rock, it had previously only been found on limestone. It was recorded in the Wick again in 2019.

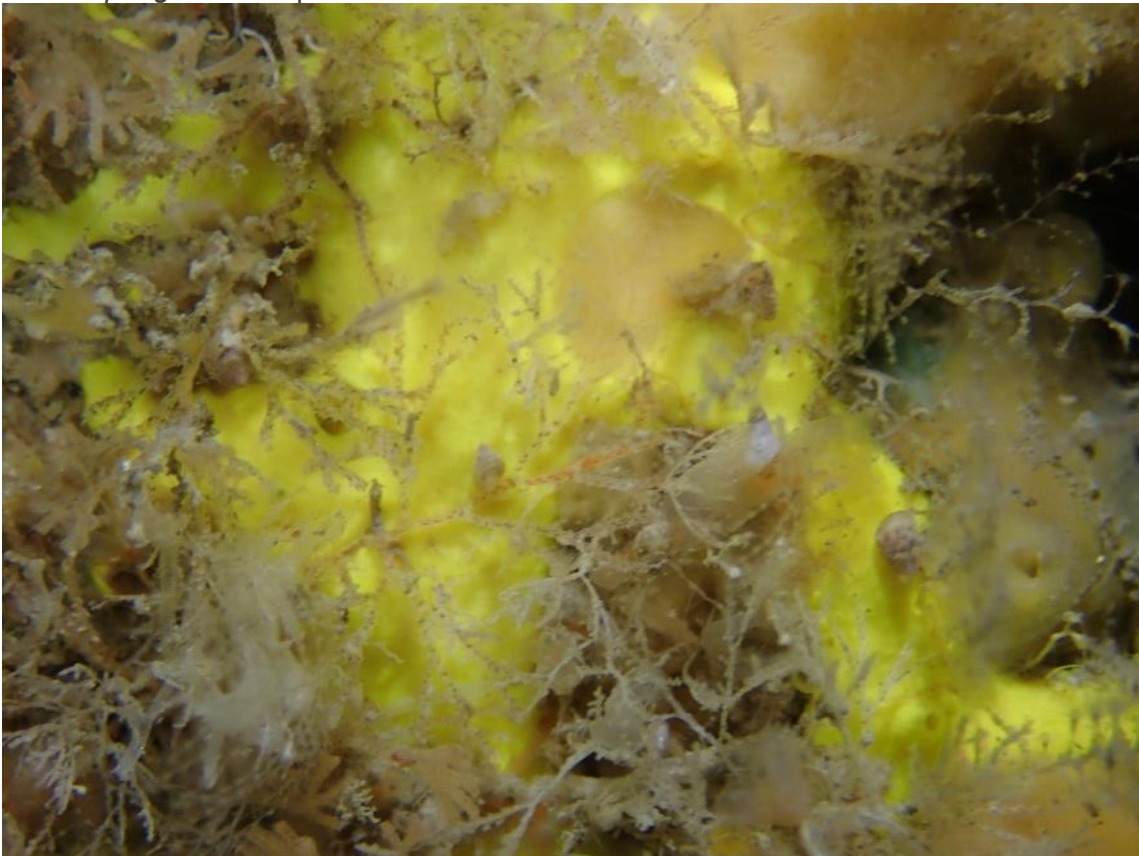
Figure. 5.1. *Spongosorites calcicola* (Picton & Goodwin, 2007)



5.2. *Spongosorites* sp. A

In 2019 a single sample of this sponge was collected from Broad Gully. Externally it is very similar in appearance to *Spongosorites calcicola*, however examination of the internal skeleton has proved it to be a different species. This is the first time it has been found in the Skomer MCZ. Research is currently ongoing, and early indications are that it is a new species of the genus. A detailed description and photographs of the skeletal structure and spicules have been forwarded to Bernard Picton, Ulster museum, for comparison to the type specimen of *Spongosorites genatrix* (Schmidt, 1870), which has been recorded from the west coast of Ireland and Roscoff.

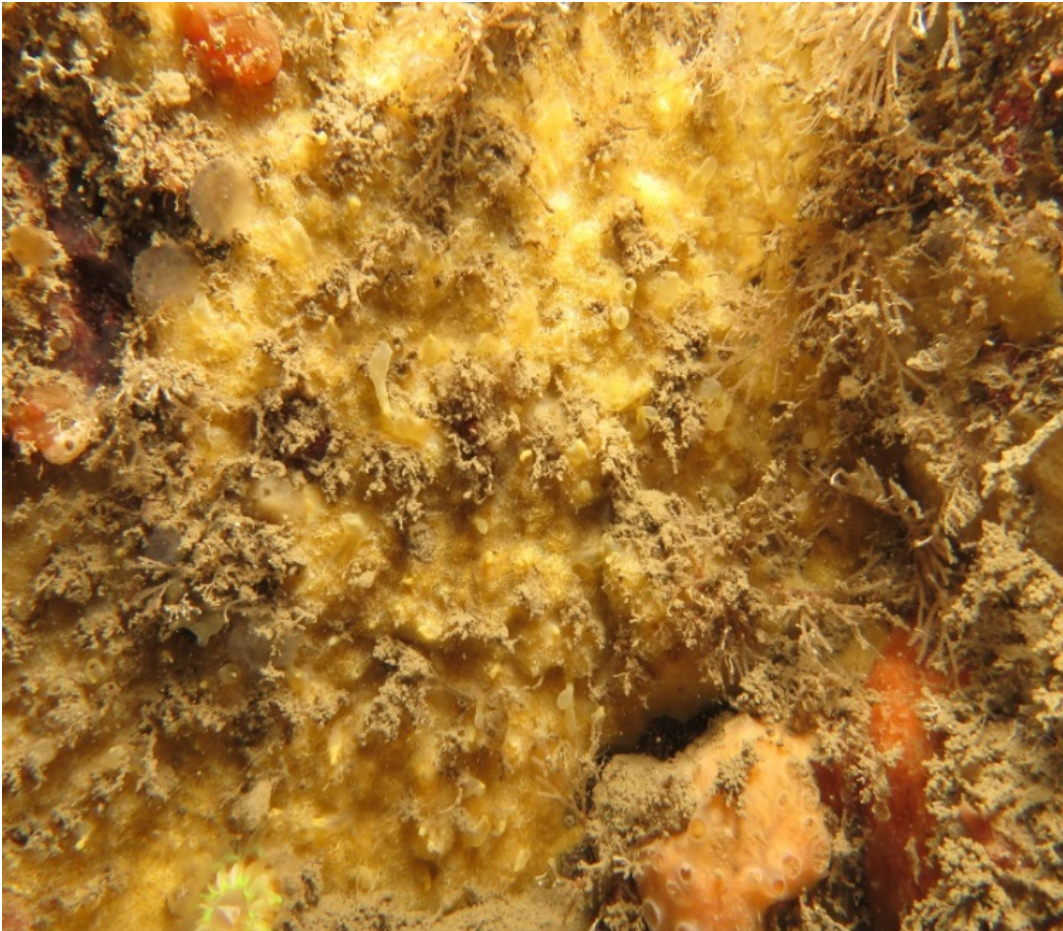
Figure. 5.2. *Spongosorites* sp.



5.3. *Prosuberites longispinus*

Prosuberites longispinus is a thin Yellow encrusting sponge, of which a few records exist from Roscoff, northern France. It was found in the Skomer MCZ for the first time in 2009 during the Sponge Diversity of the UK project (Goodwin & Picton 2011), the first record for the UK. It was found again during the 2015 species survey at The Wick and in 2019 at both Spongy Hillocks and Dog Leg sites.

Figure 5.3. *Prosuberites longispinus* (Topsent 1893)



5.4. *Clathria (Microciona) sp 'A'*

A single specimen of this encrusting sponge was found at Windy Gully, Thorn Rock in 2015. Microscopic examination of the skeleton showed a distinct difference between this and all currently known *Microciona* species. It was not found in 2019.

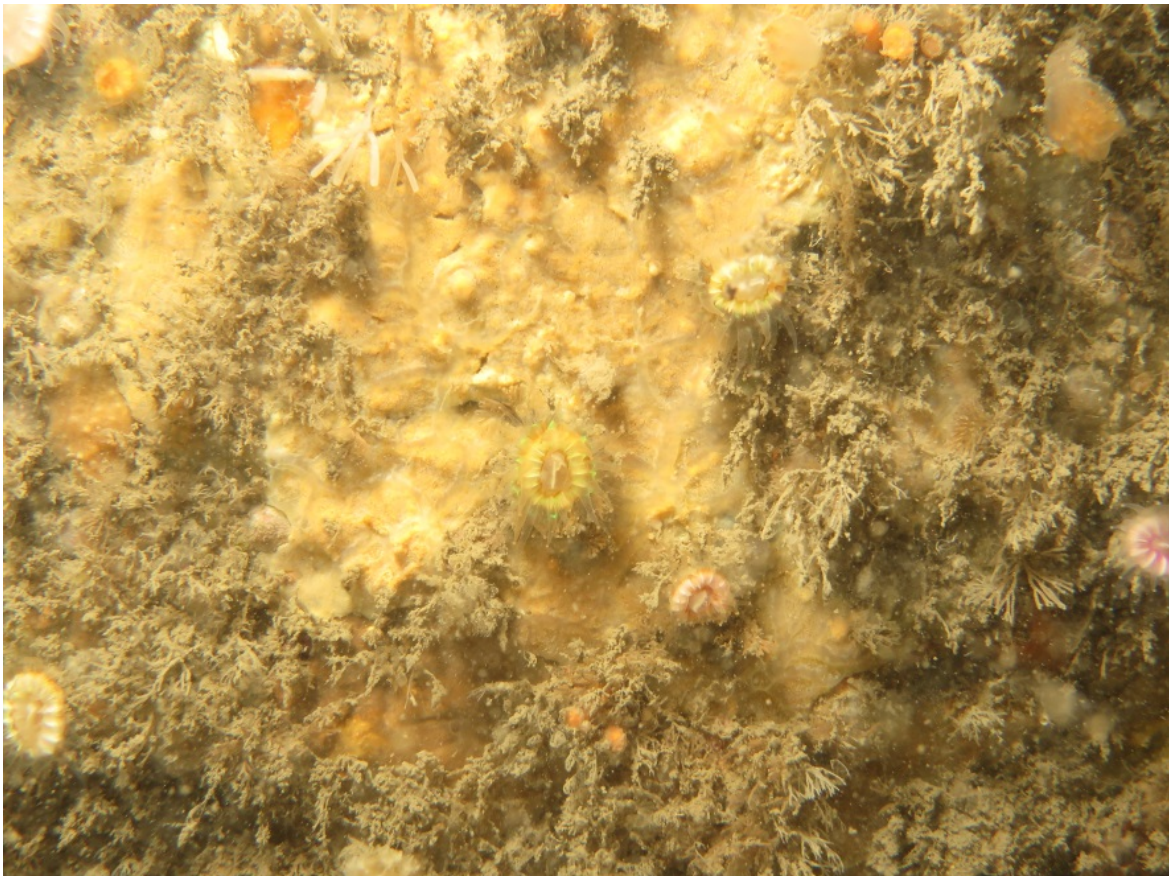
Figure 5.4. *Clathria (Microciona) sp A*.



5.5. *Phorbas* sp A

A number of samples were collected for analysis from Thorn Rock sites in 2007, 2011 and 2015 and identified as unknown *Phorbas* species, and it initially appeared that there were 2 distinct species. These were named *Phorbas* sp. and *Phorbas* sp. A. In 2019 samples were again collected of these, but microscopic examination prompted re-analysis of previous samples, and it has now been concluded that all are in fact the same species. Previous records have now been adjusted and renamed *Phorbas* sp. A. The spicule complement differs from other *Phorbas* species known to exist.

Figure 5.5. *Phorbas* sp A



5.6. *Sphaerotylus renoufi*

Samples of this papillate sponge were first collected in 2007 from Skomer MCZ from Spongy Hillocks, Dog Leg and Windy Gully (Bunker & Jones, 2008), and were recorded as *Sphaerotylus* sp. A and *Sphaerotylus* sp. B. The species had previously been found in southern and Northern Ireland and it was recognised that it was new to science. It was found again in 2011, 2015 and 2019 at Thorn Rock sites and is occurring more frequently. It has recently been described as *Sphaerotylus renoufi* (Plotkin et al, 2017), and material examined included 2 samples collected from Thorn Rock during the Sponge Diversity of the UK project (Goodwin & Picton, 2011).

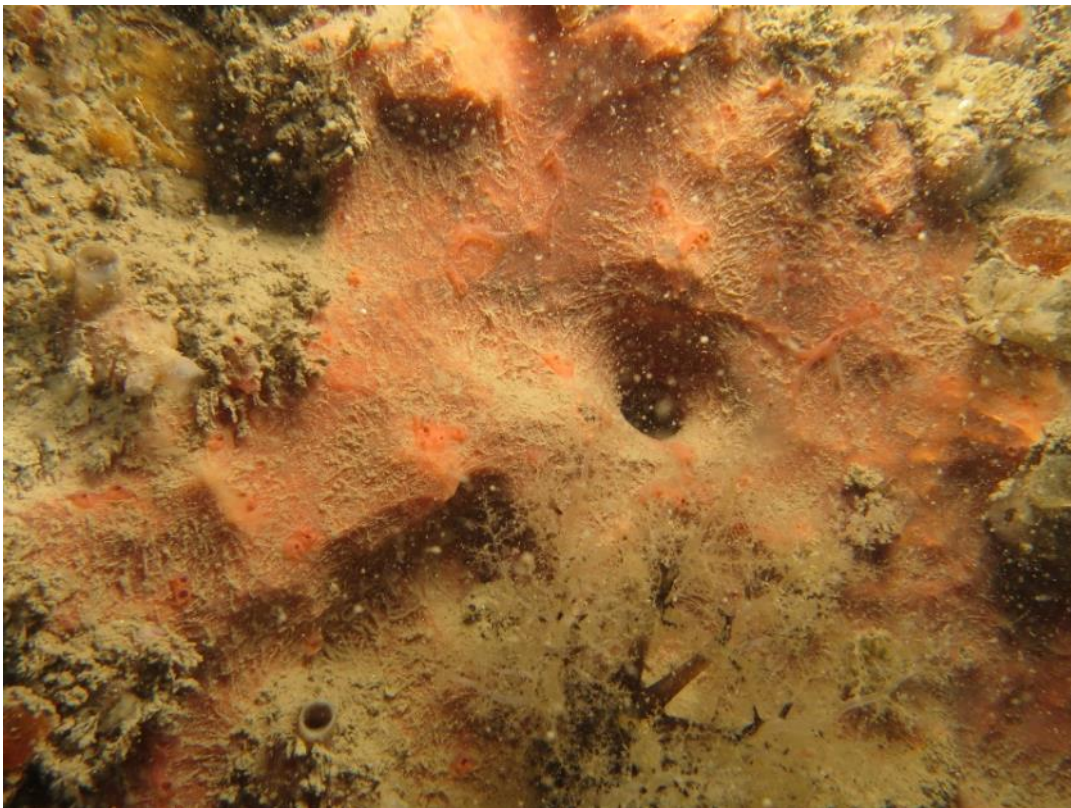
Figure. 5.6. *Sphaerotylus renoufi* (Plotkin, Morrow, Gerasimove & Rapp, 2017)



5.7. *Hexadella topsenti*

This species was previously known as *Hexadella racovitzai*. However, recent molecular research on specimens collected from the Mediterranean and Atlantic has resulted in the genus being split, with two new species being described (Reveillaud et al, 2012). It was first recorded as *H. racovitzai* in the British Isles from the Aran Islands, Co. Galway (Morrow & Picton, 1996). The first record of it in Great Britain was from Skomer at Windy Gully in 2007 (Bunker & Jones, 2008) but it now appears to be relatively common in the Skomer MCZ and is being seen with increasing frequency in Pembrokeshire and the south of England.

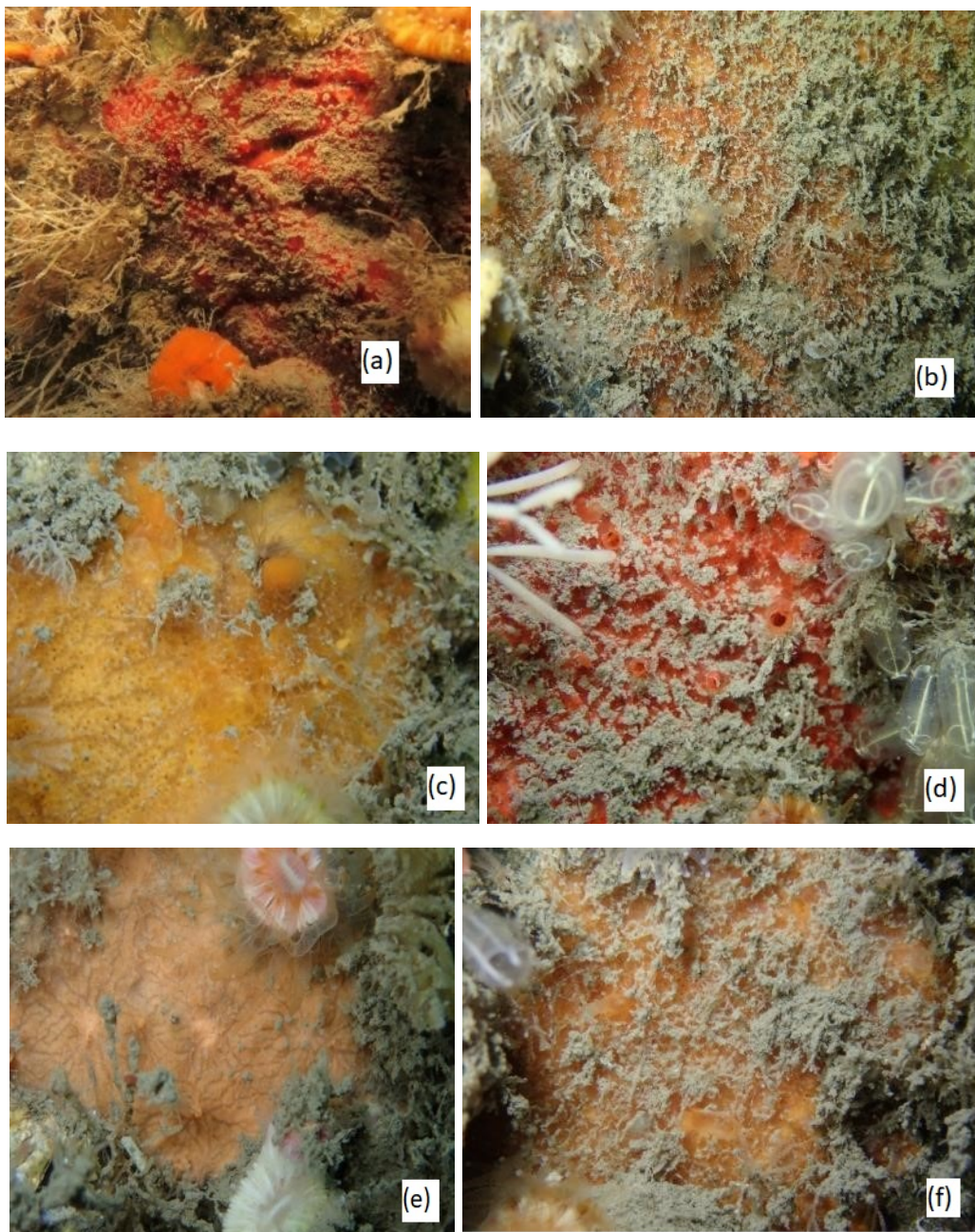
Figure 5.7 *Hexadella topsenti* (Reveillaud, Allewaert, Pérez, Vacelet, Banaigs & Vanreusel, 2012)



5.8. *Eurypon* spp

Eurypon species are thinly encrusting, mostly silt covered sponges, and usually found on shaded vertical rock. Several undescribed *Eurypon* species are known to exist and have been recorded from various locations around the British Isles. At least seven undescribed species of the genus have been identified from Skomer MCZ alongside the relatively common *Eurypon major*. In 2019, 6 *Eurypon* species found over previous Years species surveys (named *Eurypon* spp. A-F) were all found once again, and an additional species was identified (*Eurypon* sp. G). Research on the group is currently being carried out by Bernard Picton, Ulster Museum.

Figure 5.8. (a) *Eurypon major*, (b) *Eurypon* sp. A (c) *Eurypon* sp. C (d) *Eurypon* sp. D (e) *Eurypon* sp. E (f) *Eurypon* sp. G



5.9. *Desmacella cf. annexa*

This species has been identified during all species surveys since 2003 and mostly occurs inside crevices and on vertical rock faces at Windy Gully, Broad Gully and the Wick, or overgrowing other sponges. It has been recorded elsewhere from Roscoff, Norway, South West and Northern Ireland and the Isles of Scilly. *Desmacella annexa* (Schmidt, 1870) was originally described from deep water off the coast of Florida, hence the tentative assignment of the name to European specimens.

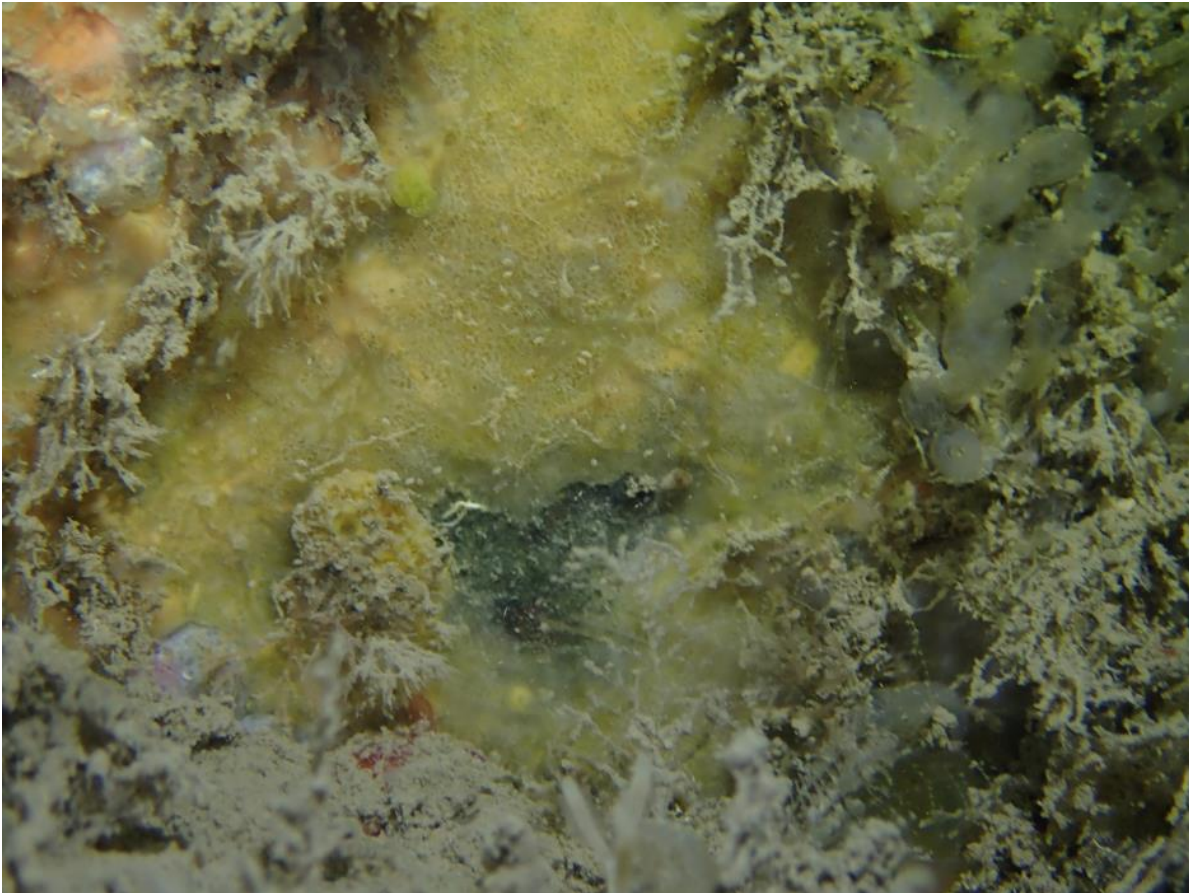
Figure 5.9. *Desmacella cf annexa*



5.10. *Phorbas punctatus*

This encrusting species was described from Rathlin Island, Northern Ireland in 2007, and was found for the first time in the Skomer MCZ in 2009 at Wendy's Gully (Goodwin & Picton, 2011). It was subsequently found during the 2011 species survey at Windy Gully and Broad Gully sites (Jones & Bunker, 2011), and again in 2015 at Dog Leg. In 2019 it was found at Windy Gully, Spongy Hillocks and High Court Reef.

Figure 5.10. *Phorbas punctatus* (Picton & Goodwin, 2007)



5.11. *Phorbas dives*

Phorbas dives is listed as nationally scarce. It is a southern species, known mainly from the south west of the British Isles and is at the northern limit of its distribution at Skomer according to the UK distribution maps from the National Biodiversity Network (NBN) Atlas. It was first recorded in the Skomer MCZ during the 2003 full species survey at the Windy Gully site and has been found in all subsequent species surveys. It is most frequent at the Wick with sporadic patches on the steep rock face.

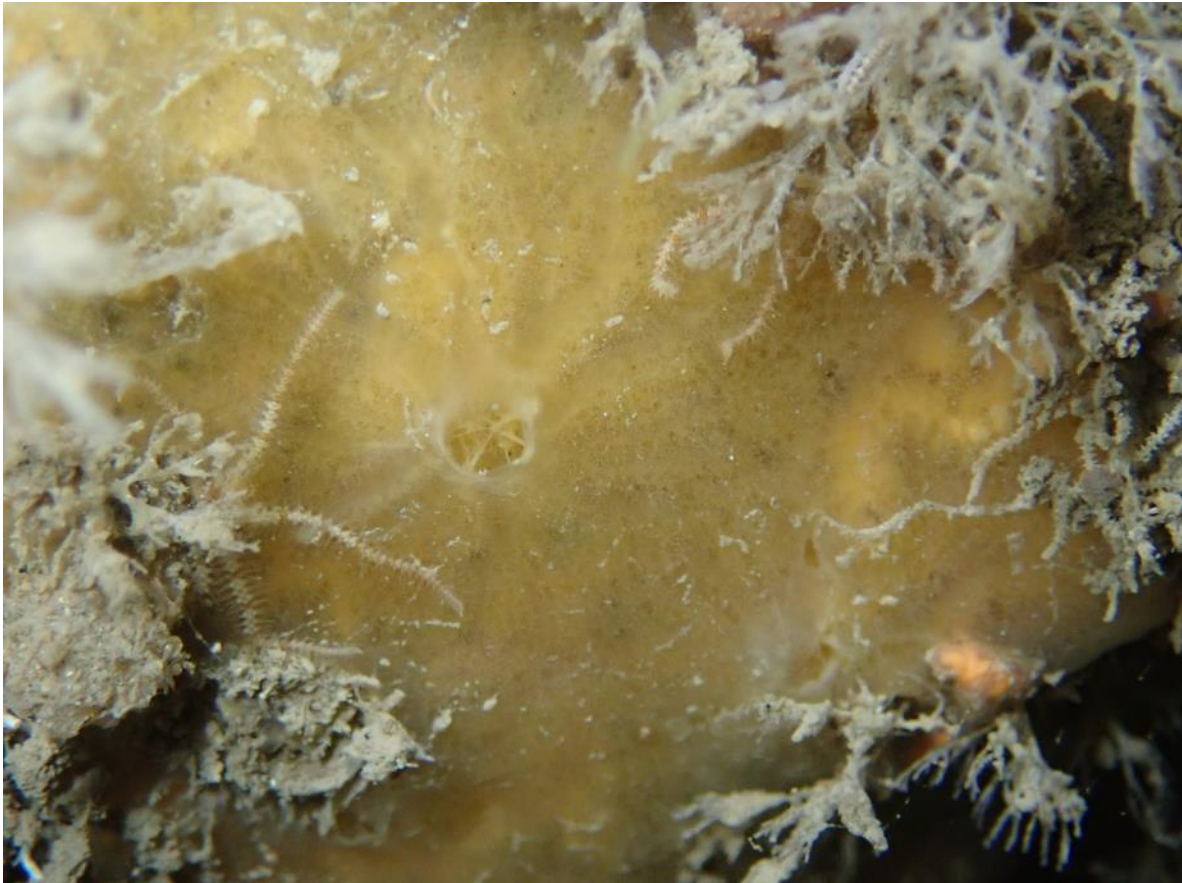
Figure 5.11 *Phorbas dives* (Topsent, 1891)



5.12. *Hymedesmia (Stylopus) sp.*

This undescribed species was first found in the Skomer MCZ at the Dog-leg site during the 2011 species survey, and it was found again in 2019 at Broad Gully. There are not many *Hymedesmia (Stylopus)* species known to exist in the UK, and three were only recently described after being discovered at Rathlin Island, Northern Ireland (Goodwin & Picton, 2009). However, none of these, or any *Hymedesmia (Stylopus)* species from the North East Atlantic, have spicules matching those present in the Skomer MCZ species.

Figure 5.12. *Hymedesmia (Stylopus) sp*



5.13. *Axinella damicornis*

The Yellow branching sponge *Axinella damicornis* is listed as a nationally scarce species, although it is locally common throughout the Skomer MCZ. Its main distribution is limited to the south west, with sparse records from the west coast of Britain as far as the north west of Scotland, and from Northern Ireland. It has been recorded during all Skomer MCZ species surveys since 2003.

Figure 5.13. *Axinella damicornis* (Esper, 1794)



5.14. *Stelletta grubii*

Stelletta grubii is listed as nationally scarce and is sparsely distributed in the south west and west of Britain and Northern Ireland. It is rare in the Skomer MCZ, first recorded during a full species survey in 2011 from the Wick, although it had been recorded previously during other diving surveys and was recorded from the Wick again during the 2015 and 2019 surveys. Although it is a robust goblet shaped sponge, it can be easily overlooked due to the amount of epibiota, including encrusting sponges, covering its surface.

Figure 5.14. *Stelletta grubii* (Schmidt, 1862)



5.15. *Tethyspira spinosa*

Tethyspira spinosa has been found in the Skomer MCZ in all species surveys since 2003 and has been recorded from all monitoring sites apart from the Wick. It is a nationally scarce species and has a wide distribution along the south west and west coasts of mainland Britain and Northern Ireland.

Figure 5.15. *Tethyspira spinosa* (Bowerbank, 1874)



6. Discussion

Skomer MCZ is an area of only 13.2 square kilometres, and to date 130 sponge species/entities have been recorded here, including records from historical surveys, of which 42 are new to science or require further investigation, and 88 are confirmed species. The total number of sponges currently known from Great Britain and Ireland is approximately 375 but only around 100 are well known. During each survey additional species are being discovered, with potentially two more being found during this survey subject to confirmation. Four species present in the Skomer MCZ are on the nationally rare and scarce marine benthic species list for Great Britain (Sanderson 1996) and several have only recently been described or have limited distribution in the British Isles.

Sponges are not easy to identify in-situ and therefore have been poorly recorded in the past. However, in recent Years records have been increasing and many new species are being discovered, and species that have been rarely recorded previously are now being observed more frequently. This could be due in part to the fact that the group has not been extensively studied until now, but it is also evident that some species such as *Hexadella topsenti* and *Sphaerotylus renoufi* are becoming more widespread and occurring more frequently since first being recorded in the UK. Continued changes in sponge distribution could possibly be an indicator of climate change, and long-term monitoring could be a valuable means of gathering evidence in relation to this. The Skomer MCZ monitoring programme is the only one of its kind in the UK, and it is proving to be a valuable means of gathering long term data on shallow water sponges. All species records from surveys since 2003 have been entered onto the Marine Recorder database and are available on the JNCC National Biodiversity Network Atlas. NBN data can be used to contribute to UK knowledge on abundance and distribution.

The four Yearly sponge survey is providing in-situ photographs, preserved sponge samples and microscope sponge spicule preparations. These are essential in supporting UK sponge species research. The Skomer MCZ long term sponge monitoring data can additionally be used to study sponge assemblages and shifts in abundance and distribution. Preserved samples from the 2015 survey have been curated and stored at the Natural History Museum and National Museum Wales, and samples from the 2003 survey and some historic samples have been curated and stored at National Museum Wales.

The Barcoding Project will provide a comprehensive survey of the biodiversity of the Skomer MCZ sponge community. Significantly, it will also be the most comprehensive genetic analysis of UK Marine sponges to date. The sequences will be added to the Sponge Biodiversity Barcoding project and GenBank, and therefore provide indispensable tools for the identification of sponge species worldwide. Clarification of sponge identification will greatly aid taxonomists and ecologists.

The Skomer MCZ is within the Pembrokeshire Marine Special Area of Conservation (SAC) and data collected here is used to help assess the condition of features of the SAC. The main relevant features are 'Reef' and 'Large Shallow Inlet and Bay'. The sponge species data is applicable to some of the attributes of Favourable Conservation Status, particularly those relating to typical species. Examples are shown in the table below:

Table 6.1 Pembrokeshire Marine SAC features, example Favourable Conservation Status Statement

Favourable Conservation Status Statement	Attribute	Measure	Target
Species richness and diversity of Large Shallow Inlets and Bays is not degraded	Number of species	Change in species richness or diversity measures indicative of anthropogenic impact, which is not explained by inherent dynamism in structure and function; indicated, for example, by univariate and multivariate analytical techniques. This measure could include occurrence of non-native species.	No change in species richness or diversity measures indicative of anthropogenic impact, which is not explained by inherent dynamism in structure and function.
No degradation of species richness and diversity. As above.	Taxonomic spread of species	Change in taxonomic distinctness indicative of anthropogenic impact, which is not explained by inherent dynamism in structure and function; indicated, for example, univariate and multivariate analytical techniques.	No change in taxonomic distinctness indicative of anthropogenic impact which is not explained by inherent dynamism in structure and function.

These two targets have been met for sponges in the Skomer MCZ.

7. Recommendations

- Continue with the current programme of 4 Yearly sponge species surveys, next survey due 2023
- Support academic sponge research projects, in particular, new species identification work on Skomer samples.
- Provide preserved samples to National Museum Wales for record verification and future research.
- Maintain Skomer MCZ sponge species records on Marine Recorder database.
- Feed the data into the Pembrokeshire Marine SAC feature condition assessments

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