

Skomer Marine Conservation Zone Sponge Diversity Survey 2023

NRW Evidence Report 754

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Crynodeb Gweithredol

Mae'r cymunedau o sbwng ym Mharth Cadwraeth Morol (PCM) Sgomer wedi'u pennu'n nodwedd reoli am eu natur gyfoethog ac amrywiol. Mae sbyngau yn rhan o'r cymunedau Anthosoaid a Sbyngau Bregus ar gynefinoedd creigiog islanwol sydd o flaenoriaeth o dan Adran 7 o Ddeddf yr Amgylchedd (Cymru) 2016.

Mae sbyngau yn bwydo drwy hidlo ac felly'n agored i newidiadau yn ansawdd y dŵr a dyddodiad gwaddod. Maent felly'n rhywogaeth ddangosol ddefnyddiol ar gyfer newidiadau yn y gyfradd o waddod mewn daliant a gwaddod wedi'i ddyddodi.

Mae rhaglen lawn ar gyfer monitro rhywogaethau bob pedair blynedd wedi bod mewn lle ers 2003, ond mae cofnodion yn bodoli ers 1991. Hyd yma, cofnodwyd cyfanswm o 131 o rywogaethau/endidau yn y PCM, ac mae 42 o'r rhain heb eu disgrifio neu mae angen ymchwilio iddynt ymhellach.

Yn 2023, arolygwyd chwe safle ar ochr ddeheuol Ynys Sgomer dros 10 sesiwn deifio fel rhan o'r rhaglen fonitro lawn sy'n dal i fynd rhagddi ar gyfer rhywogaethau o sbwng. Yn sgil yr arolwg, cofnodwyd cyfanswm o 78 o rywogaethau/endidau yn y PCM. Enwyd y sbyngau naill ai yn y fan a'r lle neu, neu os nad oedd hyn yn bosibl, cymerwyd sbesimenau i'w dadansoddi dan ficrosgop. O'r 78 o sbyngau a enwyd, mae 11 heb eu disgrifio eto neu mae angen ymchwilio iddynt ymhellach.

Mae nodwedd y cymunedau sbyngau yn y PCM yn sefydlog ac mewn cyflwr ffafrïol.

Executive summary

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 2016.

Sponges are filter feeders and therefore susceptible to changes in water quality and sediment deposition. They are therefore a useful indicator of change in suspended and deposited sediments (sedimentation).

A four yearly full sponge species monitoring programme has been in place since 2003, but records exist from 1991. The total number of sponge species/entities recorded in the MCZ to date is 131, of which 42 are undescribed or need further investigation.

In 2023, six sites were surveyed on the south side of Skomer Island, over 10 dives as part of the continuing full sponge species monitoring programme. The survey resulted in a total of 78 species/entities being recorded as present in the MCZ. The sponges were identified either *in situ*, or if this was not possible a specimen taken for further microscopic analysis. Of the 78 sponges identified, 11 of these are currently undescribed or need further research.

The sponge community feature of the MCZ is stable and in favourable condition.

Introduction

The sponge communities are an important feature of Skomer Marine Conservation Zone. 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 2016.

There are over 9,000 valid sponge species listed in the World Porifera database (de Voogd et al., 2024), 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). 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., 2007). The area of the Skomer MCZ is small at only 13.2 square kilometres but to date 132 species/entities have been recorded here. Of these, 90 are known species and 42 are known to be 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 and Northern Ireland (Sanderson, 1996).

A four yearly full sponge species monitoring programme has been in place in the MCZ since 2003, but records exist from 1991 from other events and surveys. 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 from within the MCZ (then Skomer Marine Nature Reserve).

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 in the Skomer MCZ to date.

In 2009, 106 sponge samples were collected from the MCZ as part of the Sponge Diversity of the UK project (Goodwin & Picton, 2011), 59 species/entities were identified and are also included in the total number recorded to date.

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 four marked transects. Total sponge numbers are counted from the photo quadrats and sponge morphology analysis is completed.

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, which is completed every 4 years.

The first species survey was in 2003, when 2 sites at Thorn Rock - Windy Gully and Spongy Hillocks were surveyed. In 2007 the Dog Leg site at Thorn Rock was added to the survey and in 2011 Broad Gully was added, totalling 4 sites at Thorn Rock. Also in 2011,

the species survey was expanded to include a further 2 sites on the south side of Skomer, The Wick and High Court Reef, making 6 sites in total, and these have all been visited in each subsequent survey (Figure 1).

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 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.

1. Survey Sites

Figure 1. Map showing the location of Thorn Rock, The Wick and High Court Reef sponge survey sites on the south side of Skomer Island.



1.1 Thorn Rock

Thorn Rock is an important monitoring site in the Skomer MCZ, where the major components of 'Fragile Sponge and Anthozoan communities on subtidal rocky habitat' are found. These include the yellow cluster anemone *Parazoanthus axinellae*, pink sea fan *Eunicella verrucosa*, and erect axinellid sponges.

Four separate sub-sites, Windy gully, Spongy hillocks, Broad gully and Dogleg chosen for their varying habitats, are surveyed at Thorn Rock as part of the full species survey. There is a notable amount of silt here, making it particularly suitable for silt-tolerant sponges such as encrusting *Eurypon* spp. and branching *Raspailia* and *Stelligera* spp. The nationally scarce sponges *Axinella damicornis*, *Stelletta grubii*, *Phorbastar dives* and *Tethyspira spinosa* are present at the location.

1.1.1 Windy Gully

Windy Gully is a narrow gully approximately 2 metres wide with vertical walls up to 2 metres high at a depth of 15 to 17 metres below chart datum (bcd). The walls are dominated by encrusting and erect sponges including undescribed *Eurypon* spp., anthozoans and hydroid and bryozoan turf.

1.1.2 Spongy Hillocks

Spongy Hillocks is an area of horizontal seabed with rocky outcrops at a depth of 17 m bcd. Cushion sponges *Polymastia* spp. are dominant, with the massive sponge *Cliona celata* and erect sponge *Axinella dissimilis* being common.

1.1.3 Dog Leg

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

1.1.4. Broad Gully

Broad Gully is approximately 4 metres wide, with high vertical walls dominated by a large variety of encrusting sponges and erect sponges including *Raspailia* and *Stelligera* spp. and large boulders at the base at a depth of 17 m bcd with massive sponges and *Polymastia* spp.

1.2 The Wick

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

1.3 High Court Reef

This rugged site at 17 m bcd consists of a series of rock pinnacles with vertical walls up to 5 m high and deep gullies of between 2 to 5 m width and the species found make up the habitat 'Fragile Sponge and Anthozoan communities on subtidal rocky habitat'. The gully walls are rich with abundant faunal turf including encrusting sponges, cup corals *Caryophyllia smithii* and the yellow cluster anemone *Parazoanthus axinellae*. Red dead mans fingers, *Alcyonium glomeratum*, pink sea fan *Eunicella verrucosa* and erect axinellid sponges are also present at the site. Away from the gullies, large boulders occur, some extensively covered with large patches of the encrusting sponge *Phorbas fictitius* among the massive sponge *Cliona celata* and erect species, with notably large numbers of the cushion sponge *Tethyspira spinosa*.

2. Methodology

2.1 Collection and preservation of samples

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. A sample of the sponge is then taken and placed into a numbered bag, and a photo taken of the bag number to cross reference the photographs with the specimen. This procedure is repeated for each sample collected.

Figure 2. Photo showing surveyor recording and collecting sponge samples at the Wick in Skomer MCZ.



As soon as possible after collection, samples are put into individual glass vials and covered with 100% ethanol for preservation awaiting microscopic identification. A label is placed into each vial giving the sample number, date collected and site name.

Figure 3. Photograph showing surveyor placing samples into glass vials of 100% ethanol for preservation.



2.2 Preparation of samples for identification

To prepare a sponge specimen for microscopic analysis, a thin cross section is cut from the 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 sponge tissue, leaving the individual spicules that make up the skeleton in the preparation. Using a pipette, a small amount of the preparation can be placed on a microscope slide with a cover slip to study the spicules in detail.

Figure 4. Two photographs showing examples of individual spicules.

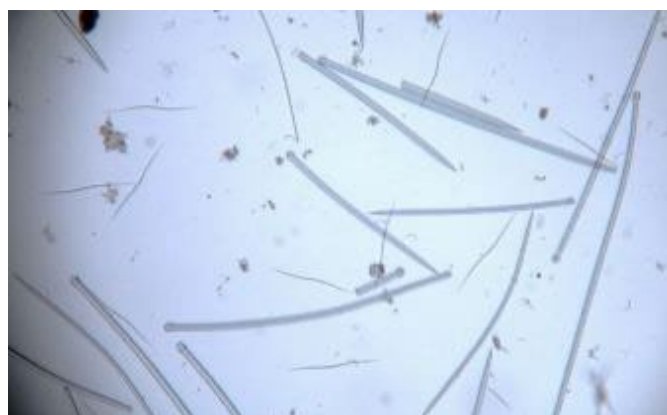
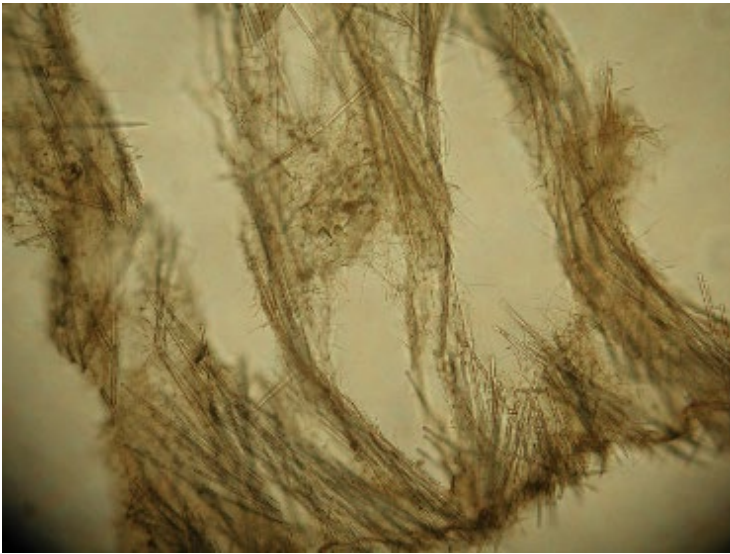


Figure 5. Photographs showing two examples of the skeletal structures found in different sponges.



Resources: Sponge species are identified using **Systema Porifera: A guide to the classification of sponges** (Hooper et al, 2002), and online resource [Sponges of Britain and Ireland \(habitas.org.uk\)](http://habitas.org.uk). Where further research is required [The World Porifera database](http://www.marinespecies.org) is used.

Species names currently listed in the World Register of Marine Species (WoRMS) are used (www.marinespecies.org).

3. Results

In 2023, all 6 monitoring sites were visited: Windy Gully, Broad Gully, Dog Leg and Spongy Hillocks (Thorn Rock sites), High Court Reef and The Wick. The survey resulted in 78 species/entities being recorded and identified using a combination of *in situ* recording and collection of samples for analysis over 10 dives (Appendix 1). Of these, 11 are undescribed or require further research. In total, 91 samples were collected for analysis and identification. A list of species recorded is given with authority in Appendix 2.

Windy Gully was the richest individual site in terms of species found while Dog Leg was the least diverse site. A full list of species found at each site can be found below (Sections 4.1 to 4.6).

The most commonly occurring species found at all 6 sites were the massive sponges *Cliona celata* and *Pachymatisma johnstonia*, the cushion sponges *Amphilectus fucorum*, *Dysidea fragilis* and *Hemimycale columella*, the erect sponge *Stelligera montagui* and the encrusting sponges *Plocamionida ambigua* and *Pseudosuberites sulphureus*. Other frequently occurring species included the erect branching sponges *Axinella damicornis*, *Axinella dissimilis*, *Raspailia hispida*, *Raspailia ramosa* and *Stelligera stuposa* (Figures 6-18).

Figure 6. *Amphilectus fucorum*



Figure 7. *Cliona celata*



Figure 8. *Pachymatisma johnstonia*



Figure 9. *Dysidea fragilis*



Figure 10. *Hemimycale columella*



Figure 21. *Stelligera montagui*



Figure 32. *Plocamionida ambigua*

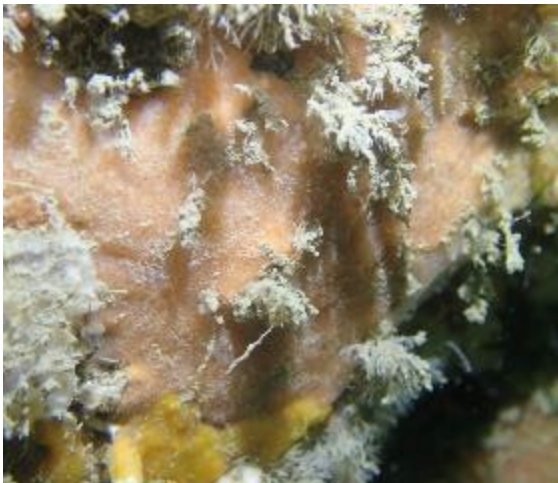


Figure 43. *Pseudosuberites sulphureus*

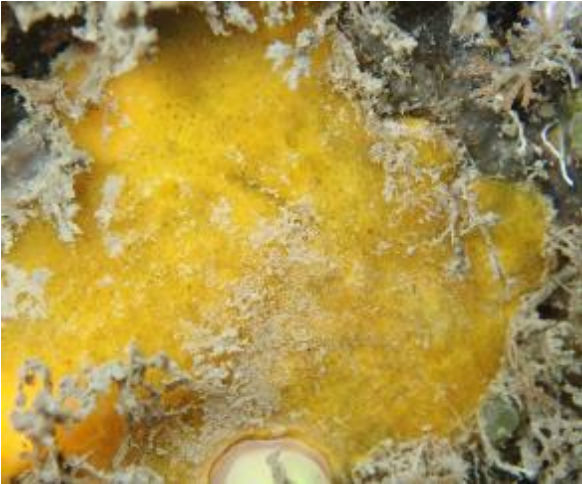


Figure 54. *Axinella damicornis*



Figure 65. *Axinella dissimilis*



Figure 76. *Raspailia hispida*



Figure 87. *Raspailia ramosa*



Figure 98. *Stelligera stuposa*



Three sponges were recorded in the MCZ for the first time: *Ophlitaspongia kildensis*, *Trachytedania* cf. *ferrolensis*, and *Hymerhabdia* sp., the latter requiring further research.

Two species found in 2023 have been recorded during historic surveys, but not during previous four-yearly surveys: *Eurypon clavigerum* and *lophon nigricans*.

The total number of species/entities found during the four yearly surveys from 2003 onwards is 112 of which 32 are undescribed or need further research (Appendix 3).

The total number found including all additional surveys since 1993 is 132. Twenty species/entities have been recorded only from historical or additional surveys as listed below:

<i>Antho (Jia) brattegardii</i>	<i>Hemimycale</i> sp.
<i>Antho</i> sp	<i>Hymedesmia (Hymedesmia)</i> sp.
<i>Axinella</i> sp.	<i>Hymerhabdia typica</i>
<i>Clathria (Microciona)</i> sp.	<i>Leuconia johnstoni</i>
<i>Clathrina</i> sp.	<i>Ophlitaspongia papilla</i>
<i>Cliona</i> sp.	<i>Phorbas</i> sp.
<i>Eurypon cinctum</i>	<i>Plocamionida</i> sp.
<i>Eurypon clavatum</i>	<i>Protosuberites denhartogi</i>
<i>Halichondria (Halichondria) bowerbanki</i>	<i>Spanioplion armaturum</i>
<i>Haliclona (Rhizoniera) rosea</i>	<i>Stelletta</i> sp

3.1 Windy Gully

Forty six species/entities were recorded from Windy Gully. Twenty one samples were collected for confirmation of identification over 2 dives. Species recorded were:

<i>Amphilectus fucorum</i>	<i>Hymedesmia (Hymedesmia) jecusculum</i>
<i>Antho (Antho) inconstans</i>	<i>Hymedesmia (Hymedesmia) paupertas</i>
<i>Axinella damicornis</i>	<i>Mycale (Carmia) macilenta</i>
<i>Axinella dissimilis</i>	<i>Myxilla (Myxilla) incrustans</i>
<i>Chelonaplysilla noevus</i>	<i>Ophlitaspongia kildensis</i>
<i>Clathria (Microciona) armata</i>	<i>Pachymatisma johnstonia</i>
<i>Clathria (Microciona) atrasanguinea</i>	<i>Phorbas</i> sp. A
<i>Clathria (Microciona) strepsitoxa</i>	<i>Phorbas dives</i>
<i>Cliona celata</i>	<i>Phorbas fictitius</i>
<i>Dercitus (Dercitus) bucklandi</i>	<i>Plocamionida ambigua</i>
<i>Desmacella</i> cf. <i>annexa</i>	<i>Polymastia boletiformis</i>
<i>Dysidea fragilis</i>	<i>Polymastia penicillus</i>
<i>Eurypon major</i>	<i>Pseudosuberites sulphureus</i>
<i>Eurypon</i> sp. A	<i>Raspaciona aculeata</i>
<i>Eurypon</i> sp. B	<i>Raspailia (Clathriodendron) hispida</i>
<i>Eurypon</i> sp. D	<i>Raspailia (Raspailia) ramosa</i>
<i>Haliclona (Haliclona) urceolus</i>	<i>Sphaerotylus renoufi</i>
<i>Haliclona (Rhizoniera) viscosa</i>	<i>Stelligera montagui</i>
<i>Halicnemia gallica</i>	<i>Stelligera stuposa</i>
<i>Hemimycale columella</i>	<i>Suberitidae</i>
<i>Hexadella topsenti</i>	<i>Tethya citrina</i>
<i>Homaxinella subdola</i>	<i>Tethyspira spinosa</i>
<i>Trachytedania</i> cf. <i>ferrolensis</i>	<i>Suberites carnosus</i>

3.2 Spongy Hillocks

Thirty one species/entities were recorded from Spongy Hillocks. Six samples were collected for confirmation of identification during 1 dive. Species recorded were:

<i>Amphilectus fucorum</i>	<i>Pachymatisma johnstonia</i>
<i>Antho (Antho) inconstans</i>	<i>Plocamionida ambigua</i>
<i>Aplysilla sulfurea</i>	<i>Polymastia boletiformis</i>
<i>Axinella damicornis</i>	<i>Polymastia penicillus</i>
<i>Axinella dissimilis</i>	<i>Pseudosuberites sulphureus</i>
<i>Ciocalypta penicillus</i>	<i>Raspailia (Clathriodendron) hispida</i>
<i>Clathria (Microciona) cf. armata</i>	<i>Raspailia (Raspailia) ramosa</i>
<i>Cliona celata</i>	<i>Sphaerotylus renoufi</i>
<i>Desmacella cf. annexa</i>	<i>Stelligera montagui</i>
<i>Dysidea fragilis</i>	<i>Stelligera stuposa</i>
<i>Eurypon sp. D</i>	<i>Suberites carnosus</i>
<i>Haliclona (Halichoclona) fistulosa</i>	<i>Sycon ciliatum</i>
<i>Haliclona (Haliclona) urceolus</i>	<i>Tethya citrina</i>
<i>Hemimycale columella</i>	<i>Tethyspira spinosa</i>
<i>Hexadella topsenti</i>	<i>Thymosia guernei</i>
<i>Homaxinella subdola</i>	

3.3 Dog Leg

Thirty species/entities were recorded from Dog Leg. Eight samples were collected for confirmation of identification during 1 dive. Species recorded were:

<i>Amphilectus fucorum</i>	<i>Pachymatisma johnstonia</i>
<i>Antho (Antho) inconstans</i>	<i>Phorbas fictitius</i>
<i>Aplysilla sulfurea</i>	<i>Plocamionida ambigua</i>
<i>Axinella damicornis</i>	<i>Polymastia boletiformis</i>
<i>Axinella dissimilis</i>	<i>Polymastia penicillus</i>
<i>Axinella infundibuliformis</i>	<i>Protosuberites incrustans</i>
<i>Cliona celata</i>	<i>Pseudosuberites sulphureus</i>
<i>Dysidea fragilis</i>	<i>Raspailia (Clathriodendron) hispida</i>
<i>Eurypon major</i>	<i>Raspailia (Raspailia) ramosa</i>
<i>Eurypon sp. B</i>	<i>Sphaerotylus renoufi</i>
<i>Halicnemia gallica</i>	<i>Stelligera montagui</i>
<i>Hemimycale columella</i>	<i>Stelligera stuposa</i>
<i>Homaxinella subdola</i>	<i>Suberites carnosus</i>
<i>Hymenaphia stellifera</i>	<i>Tethya citrina</i>
<i>Mycale (Aegogropila) rotalis</i>	<i>Tethyspira spinosa</i>

3.4 Broad Gully

Thirty eight species/entities were recorded from Broad Gully. Seventeen samples were collected for confirmation of identification over 2 dives. Species recorded were:

<i>Amphilectus fucorum</i>	<i>Hemimycale columella</i>
<i>Antho (Antho) inconstans</i>	<i>Hexadella topsenti</i>
<i>Aplysilla rosea</i>	<i>Hymedesmia (Hymedesmia) paupertas</i>
<i>Aplysilla sulfurea</i>	<i>Pachymatisma johnstonia</i>
<i>Axinella damicornis</i>	<i>Phorbas dives</i>
<i>Axinella dissimilis</i>	<i>Phorbas fictitius</i>
<i>Chelonaplysilla noevus</i>	<i>Plocamionida ambigua</i>
<i>Cliona celata</i>	<i>Polymastia boletiformis</i>
<i>Dercitus (Dercitus) bucklandi</i>	<i>Polymastia penicillus</i>
<i>Desmacella cf. annexa</i>	<i>Protosuberites incrustans</i>
<i>Dysidea fragilis</i>	<i>Protosuberites sulphureus</i>
<i>Eurypon major</i>	<i>Raspailia (Clathriodendron) hispida</i>
<i>Eurypon sp. A</i>	<i>Raspailia (Raspailia) ramosa</i>
<i>Eurypon sp. C</i>	<i>Sphaerotylus renoufi</i>
<i>Eurypon sp. D</i>	<i>Spongosorites sp. A</i>
<i>Haliclona (Haliclona) oculata</i>	<i>Stelligera montagui</i>
<i>Haliclona (Haliclona) urceolus</i>	<i>Stelligera stuposa</i>
<i>Haliclona sp.</i>	<i>Suberites carnosus</i>
<i>Halicnemia gallica</i>	<i>Tethya citrina</i>

3.5 The Wick

Forty species/entities were recorded from The Wick. Twenty one samples were collected for confirmation of identification over 2 dives. Species recorded were:

<i>Amphilectus fucorum</i>	<i>Hymedesmia (Hymedesmia) jecusculum</i>
<i>Antho (Acarnea) coriacea</i>	<i>Hymedesmia (Hymedesmia) pansa</i>
<i>Antho (Antho) inconstans</i>	<i>Hymedesmia (Hymedesmia) paupertas</i>
<i>Aplysilla sulfurea</i>	<i>Hymeniacidon perlevis</i>
<i>Chelonaplysilla noevus</i>	<i>Mycale (Aegogropila) rotalis</i>
<i>Clathria (Microciona) spinarcus</i>	<i>Myxilla (Myxilla) incrustans</i>
<i>Clathria (Microciona) strepsitoxa</i>	<i>Pachymatisma johnstonia</i>
<i>Clathrina coriacea</i>	<i>Phorbas sp. A</i>
<i>Cliona celata</i>	<i>Phorbas dives</i>
<i>Dercitus (Dercitus) bucklandi</i>	<i>Phorbas fictitius</i>
<i>Desmacella cf. annexa</i>	<i>Pleraplysilla sp.</i>
<i>Dysidea fragilis</i>	<i>Plocamionida ambigua</i>
<i>Halichondria (Halichondria) panicea</i>	<i>Protosuberites incrustans</i>
<i>Haliclona (Reniera) cinerea</i>	<i>Pseudosuberites sulphureus</i>
<i>Haliclona (Haliclona) oculata</i>	<i>Spongosorites calcicola</i>
<i>Haliclona (Haliclona) urceolus</i>	<i>Stelletta grubii</i>
<i>Haliclona (Rhizoniera) viscosa</i>	<i>Stelligera montagui</i>
<i>Haliclona sp.</i>	<i>Stryphnus ponderosus</i>
<i>Halicnemia gallica</i>	<i>Sycon ciliatum</i>
<i>Hemimycale columella</i>	<i>Thymosia guernei</i>

3.6 High Court Reef

Forty four species/entities were recorded from High Court Reef. Eighteen samples were collected for confirmation of identification over 2 dives. Species recorded were:

<i>Amphilectus fucorum</i>	<i>Hymedesmia (Hymedesmia) paupertas</i>
<i>Axinella damicornis</i>	<i>Hymerhabdia</i> sp.
<i>Axinella dissimilis</i>	<i>Iophon hyndmani</i>
<i>Axinella infundibuliformis</i>	<i>Iophon nigricans</i>
<i>Chelonaplysilla noevus</i>	<i>Mycale (Aegogropila) rotalis</i>
<i>Clathria (Microciona) armata</i>	<i>Myxilla (Myxilla) incrustans</i>
<i>Clathria (Microciona) cf armata</i>	<i>Myxilla (Myxilla) rosacea</i>
<i>Clathria (Microciona) atrasanguinea</i>	<i>Ophlitaspongia kildensis</i>
<i>Cliona celata</i>	<i>Pachymatisma johnstonia</i>
<i>Dercitus (Dercitus) bucklandi</i>	<i>Phorbas dives</i>
<i>Dysidea fragilis</i>	<i>Phorbas fictitius</i>
<i>Dysidea (purple)</i>	<i>Plocamionida ambigua</i>
<i>Eurypon clavigerum</i>	<i>Polymastia boletiformis</i>
<i>Eurypon major</i>	<i>Polymastia penicillus</i>
<i>Eurypon</i> sp. B	<i>Pseudosuberites sulphureus</i>
<i>Eurypon</i> sp. D	<i>Raspailia (Clathriodendron) hispida</i>
<i>Haliclona (Rhizoniera) viscosa</i>	<i>Raspailia (Raspailia) ramosa</i>
<i>Halicnemia gallica</i>	<i>Stelligera montagui</i>
<i>Hemimycale columella</i>	<i>Stelligera stuposa</i>
<i>Hexadella topsenti</i>	<i>Suberites carnosus</i>
<i>Homaxinella subdola</i>	<i>Tethya citrina</i>
<i>Hymedesmia (Hymedesmia) pansa</i>	<i>Tethyspira spinosa</i>

4. Notable species

4.1 *Ophlitaspongia kildensis*

This encrusting sponge was found in the MCZ for the first time during the 2023 survey at two sites, High Court Reef and Windy Gully (Figure 19). It was described in 1999, having been sampled from sites in Scotland, Northern Ireland and the Republic of Ireland (Howson & Chambers, 1999). It has been very rarely recorded since with only 5 records currently on the NBN Atlas, all from Rathlin Island, N. Ireland (<https://nbn.org.uk/>), and no records from Wales or England.

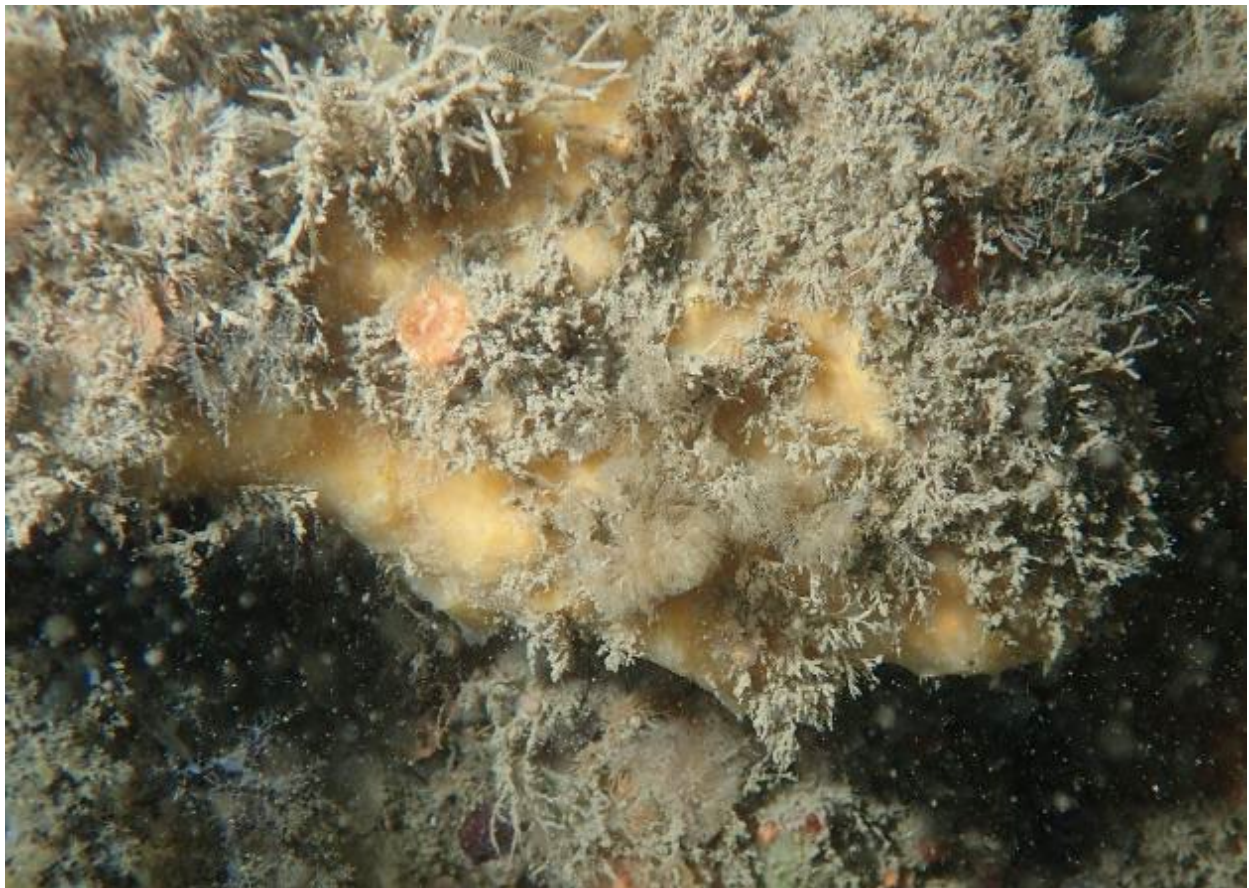
Figure 19. *Ophlitaspongia kildensis*



4.2 *Trachytedania cf. ferrolensis*

Trachytedania ferrolensis was originally described from Galicia in NW Spain (Cristobo & Urgorri, 2001). Specimens very similar to this species have since been collected and identified from Lundy Island and Dorset (Lin Baldock, Jennifer Jones, Shirley Stone unpublished data) and from North Pembrokeshire and Isles of Scilly (Goodwin & Picton, 2011). In 2023 a specimen was collected and identified from Windy Gully as being the same as the above-mentioned specimens (Figure 20). There are currently no *Trachytedania* species listed from the United Kingdom, hence the name *Trachytedania cf. ferrolensis* is being used, pending further research and examination of the type species for comparison.

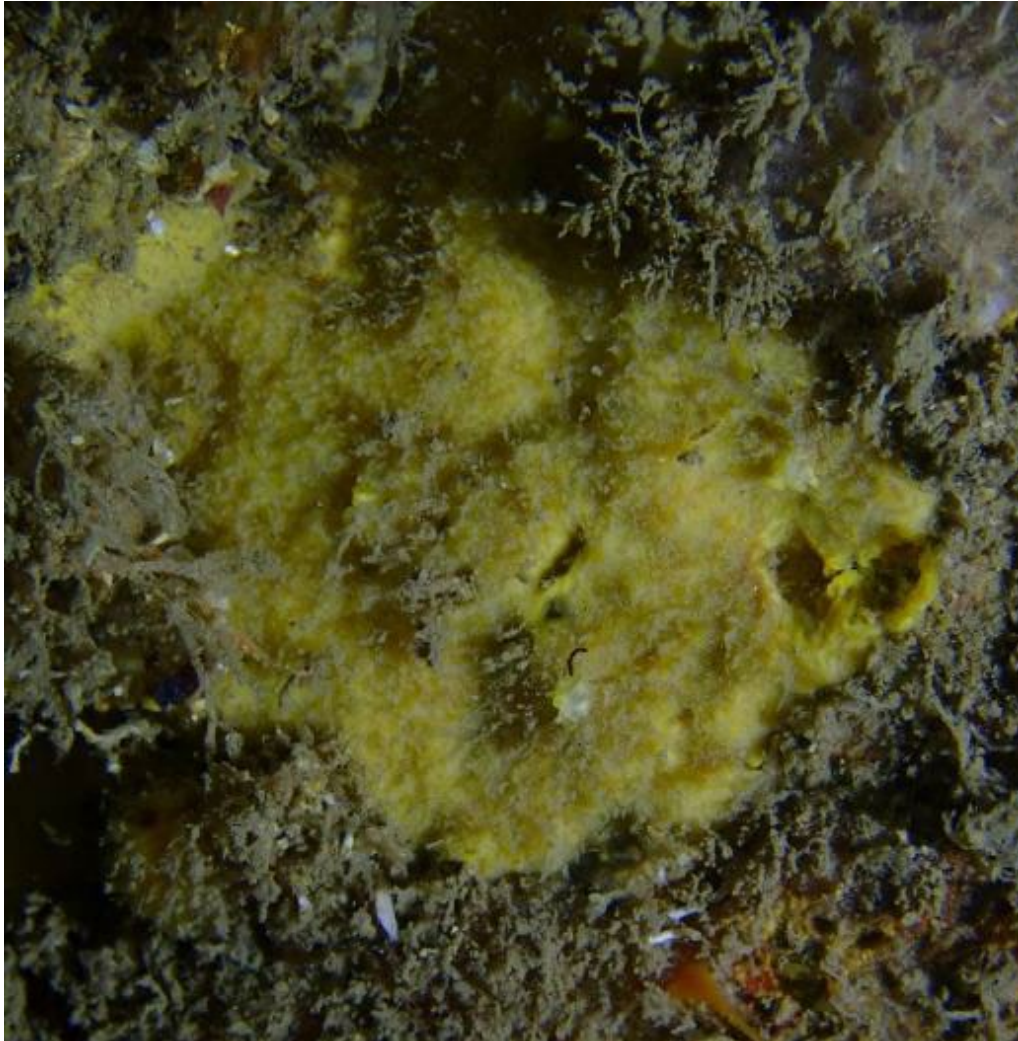
Figure 20. *Trachytedania cf. ferrolensis*



4.3 *Hymerhabdia* sp.

One sample was collected from High Court Reef during the 2023 survey and identified as *Hymerhabdia* sp. (Figure 21). Currently only one species of this genus, *Hymerhabdia typica* has been found in the UK and this has been recorded from the MCZ during other surveys (Bunker et al., 1992). However, the 2023 specimen has much larger spicules and further research needs to be carried out to determine whether it is a new species.

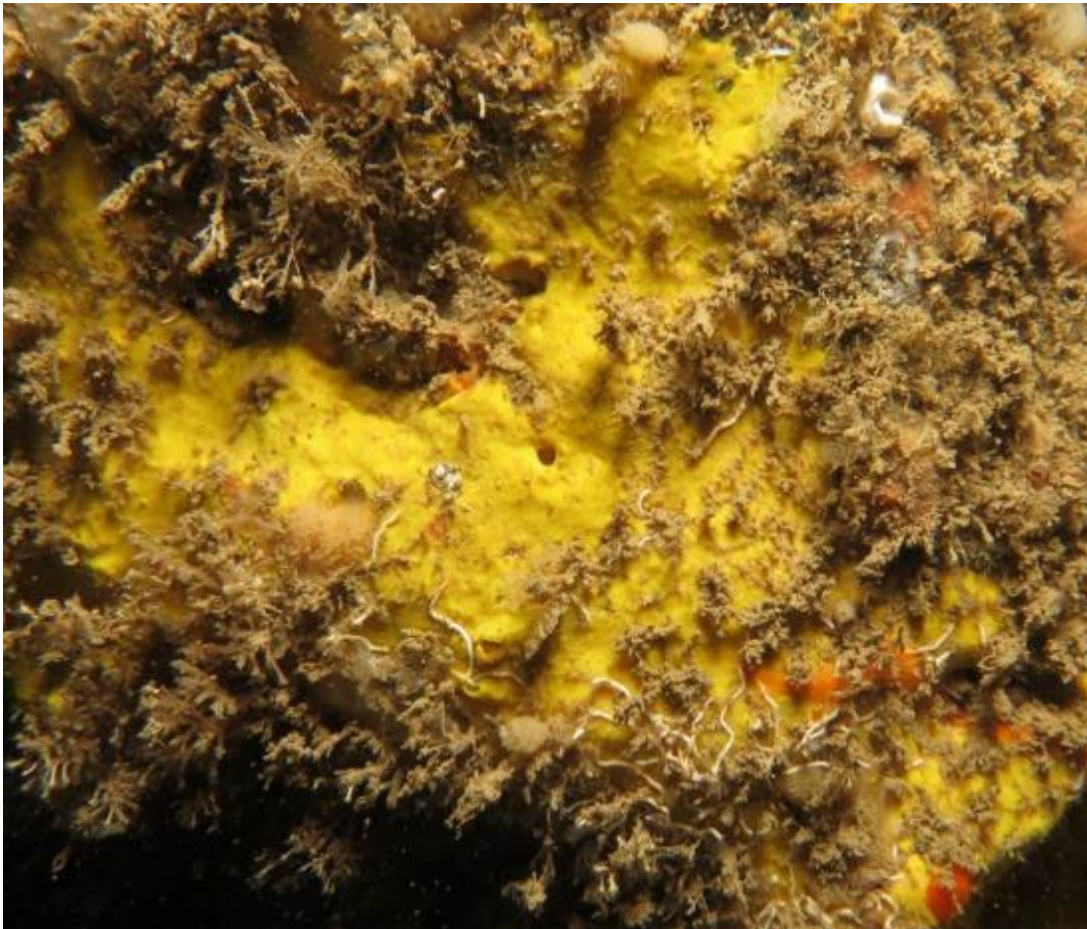
Figure 101. *Hymerhabdia* sp.



4.4 *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 found in the Skomer MCZ for the first time in 2015 at the Wick, forming extensive large patches on the wall (Jones et al., 2016). This was the first record of the species for Wales, and the first time it had been found on igneous rock, having previously been found only on limestone. It was recorded in the Wick again in 2019 and 2023 (Figure 22). There are very few records of this species, all from Northern Ireland and Pembrokeshire (<https://nbn.org.uk/>).

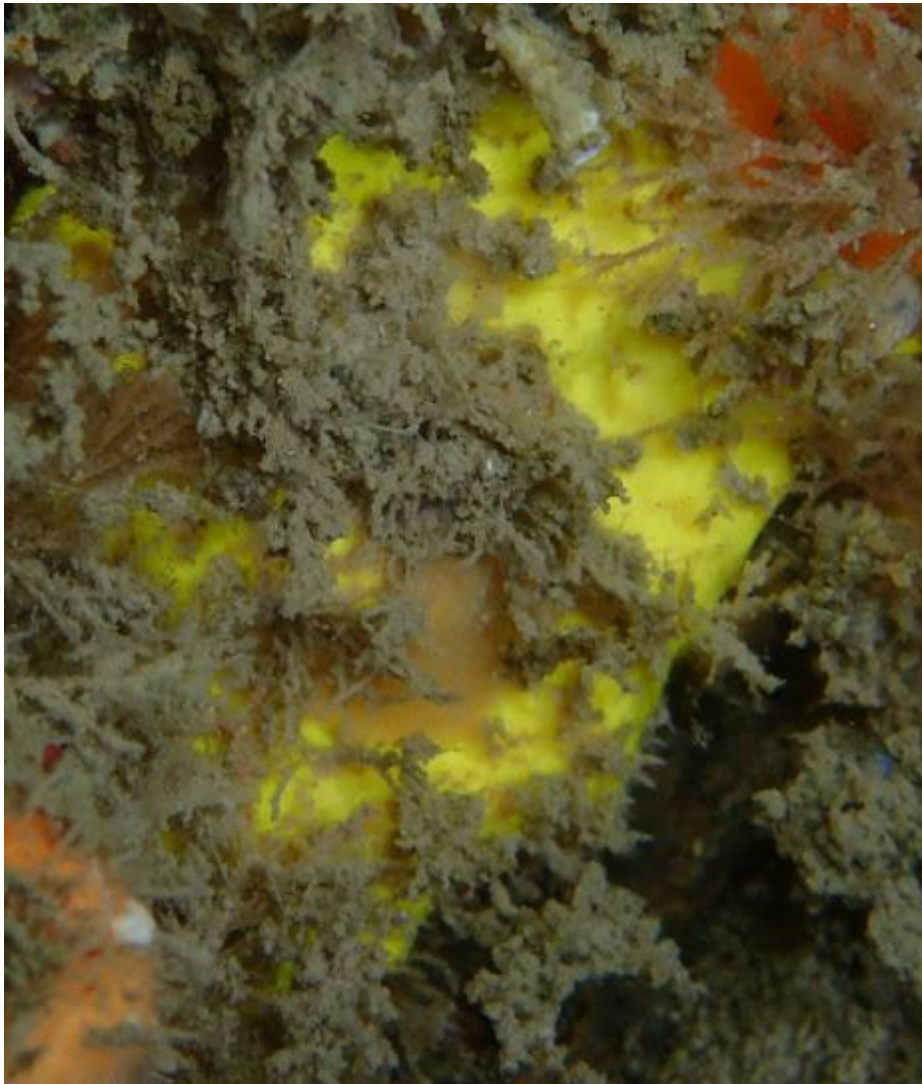
Figure 112. *Spongosorites calcicola*



4.5 *Spongosorites* sp. A

In 2019 a single sample of this sponge was collected from Broad Gully (Jones et al., 2020) and it was found again in 2023 (Figure 23). Externally it is very similar in appearance to *Spongosorites calcicola*, however examination of the internal skeleton has proved it to be a different species. Research is currently ongoing, a detailed description and photographs of the skeletal structure and spicules have been forwarded to Bernard Picton, Ulster museum for comparison with the type specimen of *Spongosorites genatrix* (Schmidt, 1870), which has been recorded from the west coast of Ireland and Roscoff. However, early indications are that this is a new species of the genus.

Figure 123. *Spongosorites* sp. A



4.6 *Eurypon clavigerum*

This species was identified from a sample collected at High Court Reef during the 2023 survey, the first time it has been recorded during the four yearly surveys (Figure 24). It has been previously recorded in the MCZ (Bunker et al, 1992), and in North Pembrokeshire (Goodwin & Picton, 2011). No other records can be found from the UK for this species apart from the type locality, the Firth of Clyde (Bowerbank, 1866).

Figure 24. *Eurypon clavigerum*



4.7 *Eurypon* spp.

Eurypon species are thinly encrusting, mostly silt covered sponges, 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 7 undescribed species of the genus have been identified from Skomer MCZ alongside the relatively common *Eurypon major* during previous four yearly surveys. In 2023, 4 of these species were found again, *Eurypon* spp. A, B, C and D (Figures 25-28). Research on the group is currently being carried out by Bernard Picton, Ulster Museum.

Figure 135. *Eurypon* sp. A



Figure 146. *Eurypon* sp. B

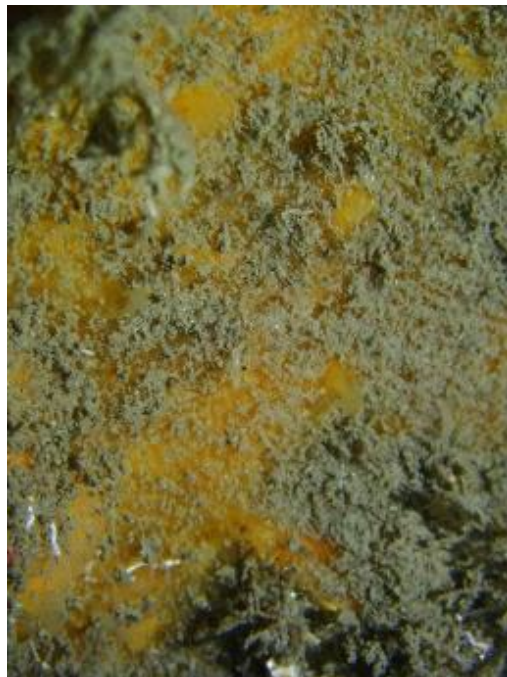
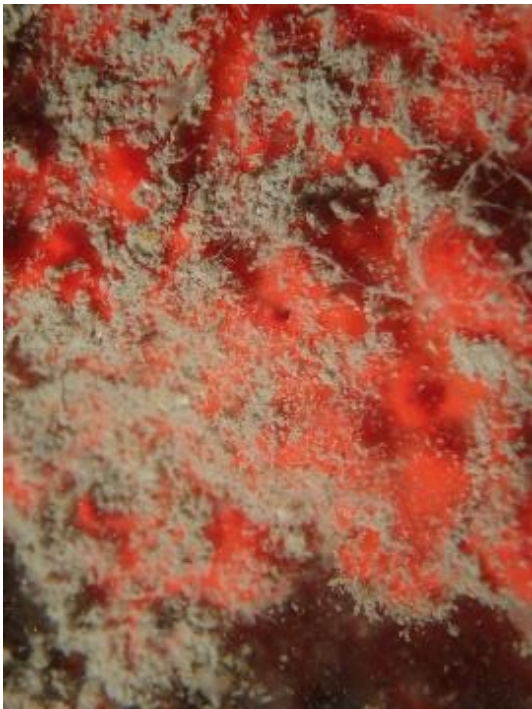


Figure 157. *Eurypon* sp. C



Figure 168. *Eurypon* sp. D



4.8 *Phorbas dives*

Phorbas dives is listed as nationally scarce (Sanderson, 1996). 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 (<https://nbn.org.uk/>). 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 occurs most frequently at the Wick with sporadic patches on the steep rock face (Figure 29).

Figure 29. *Phorbas dives*



4.9 *Axinella damicornis*

The yellow branching sponge *Axinella damicornis* is listed as a nationally scarce species (Sanderson, 1996), although it is locally common throughout the Skomer MCZ (Figure 30). 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 170. *Axinella damicornis*



4.10 *Stelletta grubii*

Stelletta grubii is listed as nationally scarce (Sanderson, 1996) and is sparsely distributed in the south-west and west of Britain and Northern Ireland (<https://nbn.org.uk/>). 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. It has been recorded from the Wick in all subsequent 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 31).

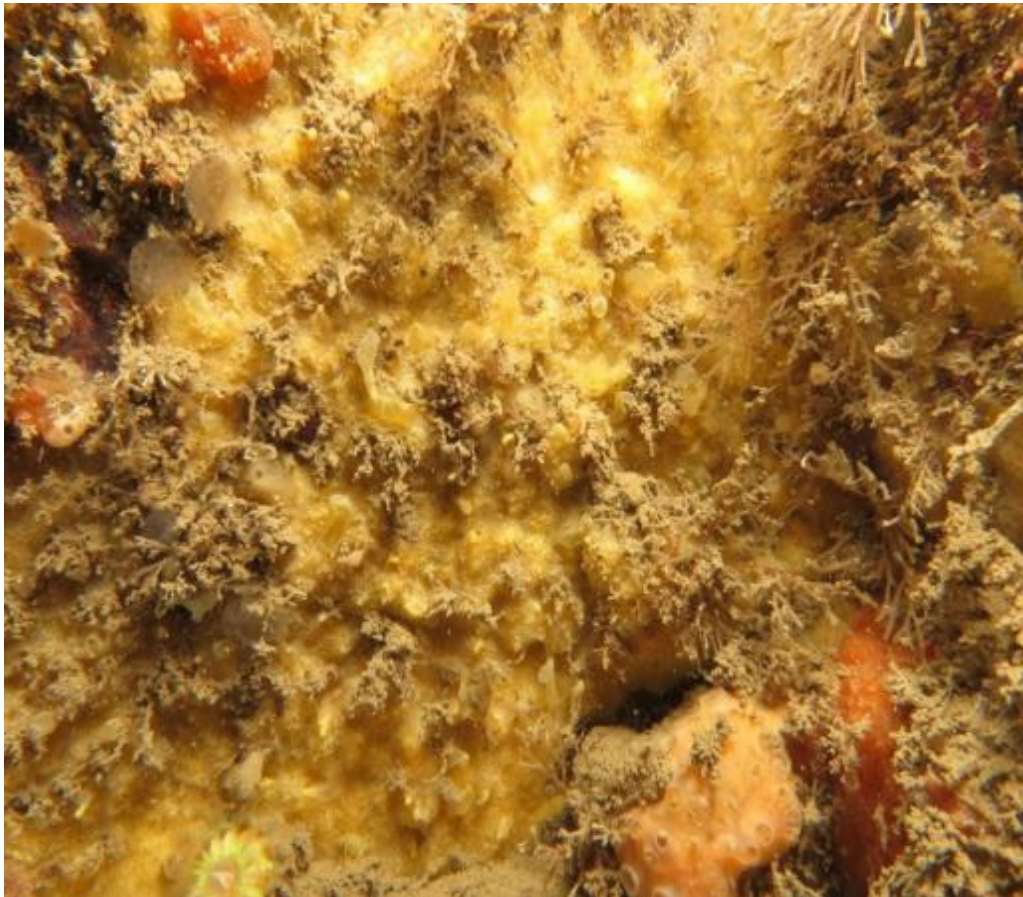
Figure 181. *Stelletta grubii*



4.11 *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 (Figure 32). It was found again during the 2015 species survey at The Wick and in 2019 at both Spongy Hillocks and Dog Leg sites. It was not recorded in 2023.

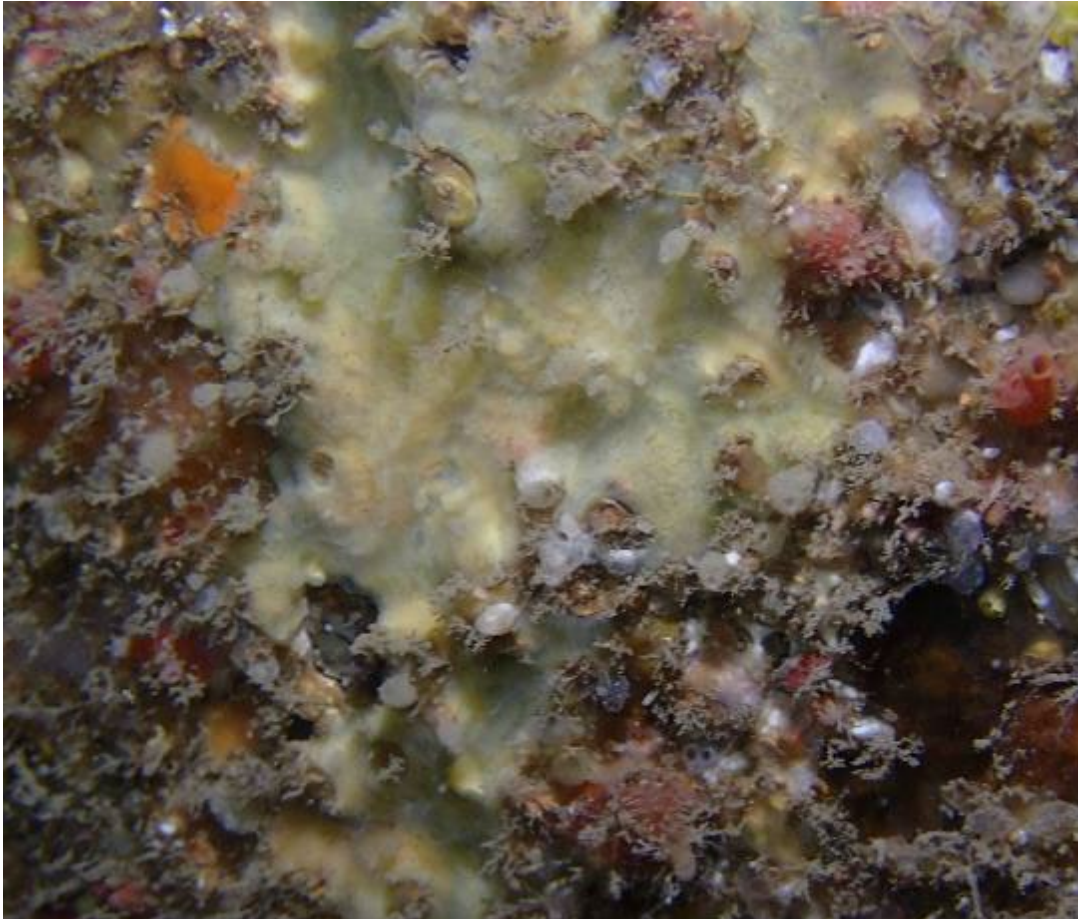
Figure 192. *Prosuberites longispinus*



4.12 *Phorbas* sp. A

Samples have been collected from Thorn Rock sites and identified as an unknown *Phorbas* species in all four yearly species surveys since 2007, and a sample was collected again in 2023 (Figure 33). The spicule complement differs from all other *Phorbas* species known to exist in the UK. Further research is required to confirm whether it is new to science.

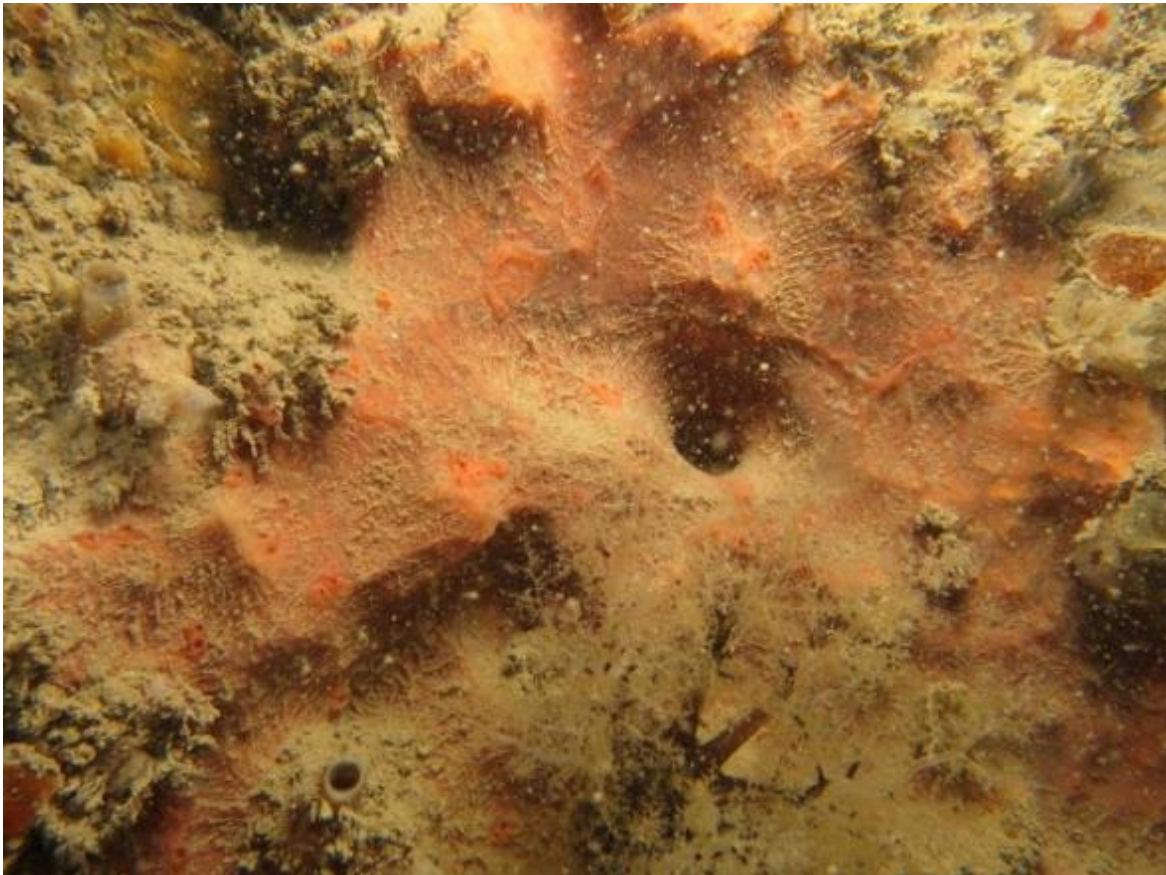
Figure 33. *Phorbas* sp. A



4.13 *Hexadella topsenti*

This species was previously known as *Hexadella racovitzai* (Figure 34). 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 MCZ at Windy Gully during the 2007 full species survey but it now appears to be relatively common in the MCZ and is being seen with increasing frequency in Pembrokeshire and the south of England.

Figure 34. *Hexadella topsenti*



4.14 *Desmacella* cf. *annexa*

This species has been collected and 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 (Figure 35). It has been recorded elsewhere from Roscoff, Norway, south-west and Northern Ireland, and the Isles of Scilly. The species *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 found.

Figure 205. *Desmacella* cf. *annexa*



4.15 *Tethyspira spinosa*

Tethyspira spinosa is a nationally scarce species (Anderson, 1996), but has a wide distribution along the south-west and west coasts of mainland Britain and Northern Ireland (<https://nbn.org.uk/>). It has been recorded in the MCZ during all four yearly species surveys since 2003, records also exist from other surveys. It is seen at all monitoring sites apart from the Wick (Figure 36).

Figure 216. *Tethyspira spinosa*

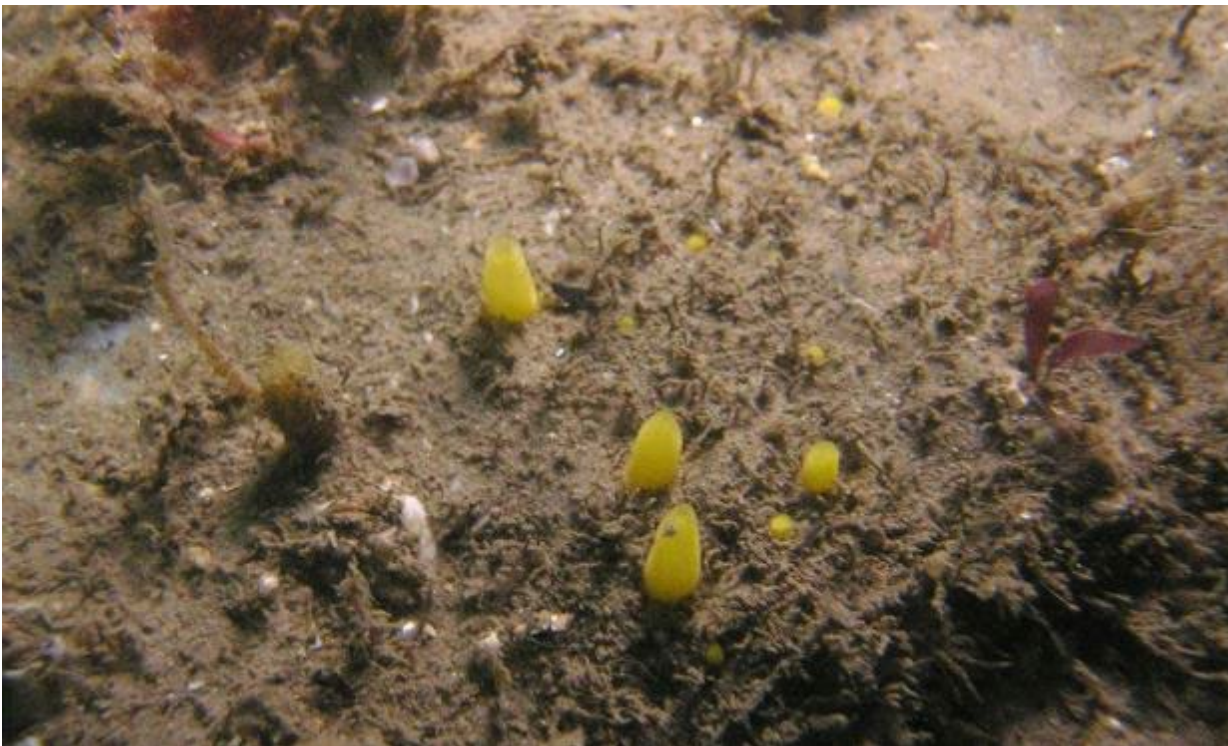


4.16 *Sphaerotylus renoufi*

Samples of this papillate sponge were first collected from Skomer MCZ in 2007 during the four yearly species survey (Figure 37). Samples were collected from Spongy Hillocks, Dog Leg and Windy Gully and were recorded as *Sphaerotylus* spp. Samples from similar sponges had previously been collected in southern and Northern Ireland and it was recognised that it was a species new to science. It has recently been described as *Sphaerotylus renoufi* (Plotkin et al, 2017), and material examined included 2 samples collected from the Thorn Rock site during the Sponge Diversity of the UK project (Goodwin & Picton, 2011).

This sponge has since been recorded on all species surveys and is becoming increasingly common at Spongy Hillocks.

Figure 37. *Sphaerotylus renoufi*



5. Discussion

Skomer MCZ is an area of only 13.2 square kilometres, and to date 132 sponge species/entities have been recorded here, including records from historical and additional surveys, of which 42 are new to science or require further investigation, and 90 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 one more being found during this survey subject to further research. 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 difficult 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. If changes in sponge distribution continue to be observed then long-term monitoring would be a valuable means of gathering evidence in relation to this. The Skomer MCZ monitoring program 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 are entered onto the Marine Recorder database and are or will be available on the JNCC National Biodiversity Network Atlas. NBN data can be used to contribute to UK knowledge on abundance and distribution (<https://nbn.org.uk/>).

The four yearly sponge survey is providing *in situ* photographs, preserved sponge samples spicule preparations mounted in resin and photographed. These are important in aiding UK sponge species research and identification. 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 species 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.

6. Recommendations

- Continue with the current programme of four yearly sponge species surveys, next survey due 2027.
- Support academic sponge research projects, in particular new species research and identification work on Skomer MCZ samples.
- Continue to provide preserved samples to National Museum Wales for record verification and future research.
- Maintain Skomer MCZ sponge species records on Marine Recorder database and NBN Atlas.

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World Register of Marine Species www.marinespecies.org

Appendix 1

List of sponge species found at each site in 2023 (Yes – recorded; No – not recorded)

Species	Windy Gully	Broad Gully	Spongy Hillocks	Dog Leg	High Court Reef	The Wick
<i>Amphilectus fucorum</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Antho (Acarnia) coriacea</i>	No	No	No	No	No	Yes
<i>Antho (Antho) inconstans</i>	Yes	Yes	Yes	Yes	No	Yes
<i>Aplysilla rosea</i>	No	Yes	No	No	No	Yes
<i>Aplysilla sulfurea</i>	No	Yes	Yes	Yes	No	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>	No	No	No	Yes	Yes	No
<i>Chelonaplysilla noevus</i>	Yes	Yes	No	No	Yes	Yes
<i>Ciocalyptra penicillus</i>	No	No	Yes	No	No	No
<i>Clathrina coriacea</i>	No	No	No	No	No	Yes
<i>Cliona celata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Dercitus (Dercitus) bucklandi</i>	Yes	Yes	No	No	Yes	Yes
<i>Desmacella cf. annexa</i>	Yes	Yes	Yes	Yes	No	Yes
<i>Dysidea fragilis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Dysidea (purple)</i>	No	No	No	No	Yes	Yes
<i>Eurypon clavigerum</i>	No	No	No	No	Yes	No
<i>Eurypon major</i>	Yes	Yes	No	Yes	Yes	No
<i>Eurypon sp. A</i>	Yes	Yes	No	No	No	No
<i>Eurypon sp. B</i>	Yes	No	No	Yes	Yes	No
<i>Eurypon sp. C</i>	No	Yes	No	No	No	No
<i>Eurypon sp. D</i>	Yes	Yes	Yes	No	Yes	No
<i>Halichondria panicea</i>	No	No	No	No	No	Yes
<i>Haliclona (Reniera) cinerea</i>	No	No	No	No	No	Yes
<i>Haliclona (Halichoelona) fistulosa</i>	No	No	Yes	No	No	No
<i>Haliclona (Haliclona) oculata</i>	No	Yes	No	No	No	Yes
<i>Haliclona (Rhizoniera) viscosa</i>	Yes	Yes	No	No	Yes	Yes
<i>Haliclona sp.</i>	No	Yes	No	No	No	No
<i>Halicnemis gallica</i>	Yes	Yes	No	Yes	Yes	Yes
<i>Hemimycale columella</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hexadella topsenti</i>	Yes	Yes	Yes	Yes	No	No
<i>Homaxinella subdola</i>	Yes	No	Yes	Yes	Yes	No
<i>Hymedesmia (Hymedesmia) jecusculum</i>	Yes	No	No	No	No	Yes

Species	Windy Gully	Broad Gully	Spongy Hillocks	Dog Leg	High Court Reef	The Wick
<i>Hymedesmia (Hymedesmia) pansa</i>	No	No	No	No	Yes	Yes
<i>Hymedesmia (Hymedesmia) paupertas</i>	Yes	Yes	No	No	Yes	Yes
<i>Hymeniacion perlevis</i>	No	No	No	No	No	Yes
<i>Hymeraphia stellifera</i>	No	No	No	Yes	No	No
<i>Hymerhabdia</i> sp.	No	No	No	No	Yes	No
<i>Iophon hyndmani</i>	No	No	No	No	Yes	No
<i>Iophon nigricans</i>	No	No	No	No	Yes	No
<i>Clathria (Microcionia) armata</i>	Yes	No	No	No	Yes	No
<i>Clathria (Microcionia) atrasanguinea</i>	Yes	No	No	No	Yes	No
<i>Clathria (Microcionia) spinarcus</i>	No	No	No	No	No	Yes
<i>Clathria (Microcionia) strepsitoxa</i>	Yes	No	No	No	No	Yes
<i>Clathria (Microcionia) cf. armata</i>	No	No	Yes	No	Yes	No
<i>Mycale (Carmia) macilenta</i>	Yes	No	No	No	No	No
<i>Mycale (Aegogropila) rotalis</i>	Yes	No	No	Yes	No	Yes
<i>Myxilla (Myxilla) incrustans</i>	Yes	No	No	No	Yes	Yes
<i>Myxilla (Myxilla) rosacea</i>	No	No	No	No	Yes	No
<i>Ophlitaspongia kildensis</i>	No	No	No	No	Yes	No
<i>Pachymatisma johnstonia</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Phorbas</i> sp. A	Yes	No	No	No	No	Yes
<i>Phorbas dives</i>	Yes	Yes	No	No	Yes	Yes
<i>Phorbas fictitius</i>	Yes	Yes	No	Yes	Yes	Yes
<i>Pleraplysilla</i> sp.	No	No	No	No	No	Yes
<i>Plocamionida ambigua</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Polymastia boletiformis</i>	Yes	No	Yes	Yes	Yes	Yes
<i>Polymastia penicillus</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Protosuberites incrustans</i>	No	No	No	Yes	No	Yes
<i>Pseudosuberites sulphureus</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Raspaciona aculeata</i>	Yes	No	No	No	No	No
<i>Raspailia (Clathriodendron) hispida</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Raspailia (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</i> sp. A	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

Species	Windy Gully	Broad Gully	Spongy Hillocks	Dog Leg	High Court Reef	The Wick
<i>Stryphnus ponderosus</i>	No	No	No	No	No	Yes
<i>Suberites carnosus</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Suberitidae</i>	Yes	No	No	No	No	No
<i>Sycon ciliatum</i>	No	No	Yes	No	No	Yes
<i>Tethya citrina</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Tethyspira spinosa</i>	Yes	No	Yes	Yes	Yes	No
<i>Thymosia guernei</i>	No	No	Yes	No	No	Yes
<i>Trachytedania cf. ferrolensis</i>	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 2

Species names and authority recorded in this report.

<i>Amphilectus fucorum</i>	(Esper, 1794)
<i>Antho (Acarinia) coriacea</i>	(Bowerbank, 1874)
<i>Antho (Antho) inconstans</i>	(Topsent, 1925)
<i>Aplysilla rosea</i>	(Barrois, 1876)
<i>Aplysilla sulfurea</i>	Schulze, 1878
<i>Axinella damicornis</i>	(Esper, 1794)
<i>Axinella dissimilis</i>	(Bowerbank, 1866)
<i>Axinella infundibuliformis</i>	(Linnaeus, 1759)
<i>Chelonaplysilla noevus</i>	(Carter, 1876)
<i>Ciocalypta penicillus</i>	Bowerbank, 1862
<i>Clathrina coriacea</i>	(Montagu, 1814)
<i>Cliona celata</i>	Grant, 1826
<i>Dercitus (Dercitus) bucklandi</i>	(Bowerbank, 1858)
<i>Desmacella cf. annexa</i>	
<i>Dysidea fragilis</i>	(Montagu, 1814)
<i>Dysidea (purple)</i>	
<i>Eurypon clavigerum</i>	(Bowerbank, 1866)
<i>Eurypon major</i>	Sarà & Siribelli, 1960
<i>Eurypon sp. A</i>	
<i>Eurypon sp. B</i>	
<i>Eurypon sp. C</i>	
<i>Eurypon sp. D</i>	
<i>Halichondria (Halichondria) panicea</i>	(Pallas, 1766)
<i>Haliclona (Reniera) cinerea</i>	(Grant, 1826)
<i>Haliclona (Halichocona) fistulosa</i>	(Bowerbank, 1866)
<i>Haliclona (Haliclona) oculata</i>	(Linnaeus, 1759)
<i>Haliclona (Haliclona) urceolus</i>	(Rathke & Vahl, 1806)
<i>Haliclona (Rhizoniera) viscosa</i>	(Topsent, 1888)
<i>Haliclona sp.</i>	
<i>Halicnemia gallica</i>	(Topsent, 1893)
<i>Hemimycale columella</i>	(Bowerbank, 1874)
<i>Hexadella topsenti</i>	Reveillaud et al., 2012
<i>Homaxinella subdola</i>	(Bowerbank, 1866)
<i>Hymedesmia (Hymedesmia) jecusculum</i>	(Bowerbank, 1866)
<i>Hymedesmia (Hymedesmia) pansa</i>	Bowerbank, 1882
<i>Hymedesmia (Hymedesmia) paupertas</i>	(Bowerbank, 1866)
<i>Hymeniacion perlevis</i>	(Montagu, 1814)
<i>Hymeraphia stellifera</i>	Bowerbank, 1864
<i>Hymerhabdia sp.</i>	
<i>Iophon hyndmani</i>	(Bowerbank, 1858)
<i>Iophon nigricans</i>	(Bowerbank, 1858)
<i>Clathria (Microciona) armata</i>	(Bowerbank, 1862)
<i>Clathria (Microciona) atrasanguinea</i>	(Bowerbank, 1862)
<i>Clathria (Microciona) spinarcus</i>	(Carter & Hope, 1889)
<i>Clathria (Microciona) strepsitoxa</i>	(Hope, 1889)

<i>Clathria (Microciona) armata</i>	(Bowerbank, 1862)
<i>Mycale (Carmia) macilenta</i>	(Bowerbank, 1866)
<i>Mycale (Aegogropila) rotalis</i>	(Bowerbank, 1874)
<i>Myxilla (Myxilla) incrustans</i>	(Johnston, 1842)
<i>Myxilla (Myxilla) rosacea</i>	(Lieberkühn, 1859)
<i>Ophlitaspongia kildensis</i>	Howson & Chambers, 1999
<i>Pachymatisma johnstonia</i>	(Bowerbank in Johnston, 1842)
<i>Phorbas</i> sp. A	
<i>Phorbas dives</i>	Duchassaing & Michelotti, 1864
<i>Phorbas fictitius</i>	(Bowerbank, 1866)
<i>Pleraplysilla</i> sp.	Topsent, 1905
<i>Plocamionida ambigua</i>	(Bowerbank, 1866)
<i>Polymastia boletiformis</i>	(Lamarck, 1815)
<i>Polymastia penicillus</i>	(Montagu, 1814)
<i>Protosuberites incrustans</i>	(Hansen, 1885)
<i>Pseudosuberites sulphureus</i>	(Bowerbank, 1866)
<i>Raspaciona aculeata</i>	(Johnston, 1842)
<i>Raspailia (Clathriodendron) hispida</i>	(Montagu, 1814)
<i>Raspailia (Raspailia) ramosa</i>	(Montagu, 1814)
<i>Sphaerotylus renoufi</i>	Plotkin, Morrow, Gerasimova & Rapp, 2017
<i>Spongosorites calcicola</i>	Picton & Goodwin, 2007
<i>Spongosorites</i> sp. A	
<i>Stelletta grubii</i>	Schmidt, 1862
<i>Stelligera montagui</i>	Van Soest & Hooper, 2020
<i>Stelligera stuposa</i>	(Ellis & Solander, 1786)
<i>Stryphnus ponderosus</i>	(Bowerbank, 1866)
<i>Suberites carnosus</i>	(Johnston, 1842)
Suberitidae	Schmidt, 1870
<i>Sycon ciliatum</i>	(Fabricus, 1780)
<i>Tethya citrina</i>	Sarà & Melone, 1965
<i>Tethyspira spinosa</i>	(Bowerbank, 1874)
<i>Thymosia guernei</i>	Topsent, 1895
<i>Trachytedania</i> cf. <i>ferrolensis</i>	

Appendix 3

Species recorded in all survey years (yes - recorded on a survey; no - not recorded on a survey)

Species Name	2003	2007	2011	2015	2019	2023
<i>Amphilectus fucorum</i>	Yes	No	Yes	Yes	Yes	Yes
<i>Antho (Acarinia) coriacea</i>	Yes	Yes	Yes	No	No	Yes
<i>Antho (Antho) inconstans</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Antho (Antho) involvens</i>	Yes	Yes	Yes	Yes	No	No
<i>Aplysilla rosea</i>	No	No	No	Yes	Yes	Yes
<i>Aplysilla sulfurea</i>	No	No	No	Yes	Yes	Yes
<i>Axinella damicornis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Axinella dissimilis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Axinella infundibuliformis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Biemna variantia</i>	No	No	Yes	No	No	No
<i>Chelonaplysilla noevus</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Ciocalypta penicillus</i>	No	No	Yes	Yes	No	Yes
<i>Clathria (Microcionia) armata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Clathria (Microcionia) atrasanguinea</i>	Yes	No	No	No	No	Yes
<i>Clathria (Microcionia) cf. armata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Clathria (Microcionia) sp.</i>	No	Yes	No	No	No	No
<i>Clathria (Microcionia) spinarcus</i>	No	No	Yes	No	No	Yes
<i>Clathria (Microcionia) strepsitoxa</i>	Yes	No	Yes	No	No	Yes
<i>Clathrina coriacea</i>	No	No	Yes	Yes	Yes	Yes
<i>Clathrina lacunosa</i>	Yes	No	No	No	Yes	No
<i>Cliona celata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Crella (Yvesia) rosea</i>	No	No	Yes	No	Yes	No
<i>Dercitus (Dercitus) bucklandi</i>	No	No	Yes	Yes	Yes	Yes
<i>Desmacella sp.</i>	No	Yes	No	No	No	No
<i>Desmacella cf. annexa</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Dysidea cf. pallescens</i>	No	No	Yes	No	No	No
<i>Dysidea fragilis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Dysidea (purple)</i>	No	No	No	Yes	No	Yes
<i>Eurypon cf. simplex</i>	No	No	Yes	No	No	No
<i>Eurypon clavigerum</i>	No	No	No	No	No	Yes
<i>Eurypon major</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Eurypon sp. A</i>	Yes	Yes	Yes	No	Yes	Yes
<i>Eurypon sp. B</i>	No	No	Yes	Yes	Yes	Yes
<i>Eurypon sp. C</i>	No	No	Yes	Yes	Yes	Yes
<i>Eurypon sp. D</i>	No	No	Yes	Yes	Yes	Yes
<i>Eurypon sp. E</i>	No	No	No	Yes	Yes	No
<i>Eurypon sp. F</i>	No	No	No	No	Yes	No
<i>Eurypon sp. G</i>	No	No	No	No	Yes	No
<i>Grantia compressa</i>	No	No	Yes	No	No	No
<i>Halichondria (Halichondria) panicea</i>	Yes	No	No	Yes	Yes	Yes
<i>Haliclona (Haliclona) oculata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Haliclona (Haliclona) urceolus</i>	Yes	No	Yes	Yes	Yes	Yes
<i>Haliclona (Reniera) cinerea</i>	Yes	No	Yes	No	No	Yes
<i>Haliclona (Rhizoniera) sp.</i>	No	No	Yes	No	Yes	No
<i>Haliclona (Rhizoniera) viscosa</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Haliclona (Halichoelona) fistulosa</i>	Yes	Yes	Yes	Yes	No	Yes
<i>Haliclona sp. A</i>	No	Yes	No	No	No	Yes
<i>Haliclona sp. B</i>	No	Yes	No	No	No	No
<i>Halicnemis gallica</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hemimycale columella</i>	Yes	Yes	Yes	Yes	Yes	Yes

Species Name	2003	2007	2011	2015	2019	2023
<i>Hexadella topsenti</i>	No	Yes	Yes	Yes	Yes	Yes
<i>Homaxinella subdola</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hymedesmia (Hymedesmia) jecusculum</i>	Yes	Yes	Yes	Yes	No	Yes
<i>Hymedesmia (Hymedesmia) pansa</i>	No	No	Yes	Yes	Yes	Yes
<i>Hymedesmia (Hymedesmia) paupertas</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hymedesmia (Stylopus) sp.</i>	No	No	Yes	No	No	No
<i>Hymedesmia (Stylopus) coriacea</i>	No	Yes	No	No	No	No
<i>Hymedesmia (Hymedesmia) sp.</i>	No	No	Yes	No	No	No
<i>Hymedesmia (Hymedesmia) sp. A</i>	No	Yes	Yes	No	No	No
<i>Hymedesmia (Hymedesmia) sp. B</i>	No	Yes	Yes	No	No	No
<i>Hymedesmia (Hymedesmia) sp. C</i>	No	Yes	No	No	No	No
<i>Hymeniacion perlevis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hymeraphia stellifera</i>	Yes	Yes	No	No	No	Yes
<i>Hymerhabdia sp.</i>	No	No	No	No	No	Yes
<i>Iophon hyndmani</i>	No	Yes	No	Yes	No	Yes
<i>Iophon nigricans</i>	No	No	No	No	No	Yes
<i>Leuconia nivea</i>	No	No	No	No	Yes	No
<i>Mycale (Aegogropila) rotalis</i>	No	No	Yes	Yes	Yes	Yes
<i>Mycale (Carmia) macilenta</i>	No	No	Yes	No	Yes	Yes
<i>Mycale (Carmia) minima</i>	No	Yes	No	No	No	No
<i>Myxilla (Myxilla) incrustans</i>	Yes	No	Yes	Yes	Yes	Yes
<i>Myxilla (Myxilla) rosacea</i>	No	No	No	Yes	Yes	Yes
<i>Myxilla (Styloptilon) ancorata</i>	No	No	Yes	No	No	No
<i>Ophlitaspongia kildensis</i>	No	No	No	No	No	Yes
<i>Pachymatisma johnstonia</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Paratimea sp.</i>	No	No	Yes	No	No	No
<i>Paratimea constellata</i>	Yes	Yes	Yes	No	Yes	No
<i>Phorbas dives</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Phorbas fictitius</i>	No	Yes	Yes	Yes	Yes	Yes
<i>Phorbas plumosus</i>	No	No	No	Yes	Yes	No
<i>Phorbas punctatus</i>	No	No	Yes	Yes	Yes	No
<i>Phorbas sp. A</i>	No	No	Yes	Yes	Yes	Yes
<i>Pleraplysilla sp.</i>	No	No	Yes	No	Yes	Yes
<i>Plocamionida ambigua</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Polymastia - pink</i>	Yes	No	No	No	No	No
<i>Polymastia boletiformis</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Polymastia penicillus</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Polymastia sp. A</i>	No	No	Yes	No	No	No
<i>Polymastia sp. B</i>	No	Yes	Yes	No	No	No
<i>Prosuberites longispinus</i>	No	No	No	Yes	Yes	No
<i>Protosuberites incrustans</i>	No	No	Yes	Yes	No	Yes
<i>Pseudosuberites sulphureus</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Raspaciona aculeata</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Raspailia (Clathriodendron) hispida</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Raspailia (Raspailia) ramosa</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Sphaerotylus renoufi</i>	No	Yes	Yes	Yes	Yes	Yes
<i>Spongosorites calcicola</i>	No	No	No	Yes	Yes	Yes
<i>Spongosorites sp. A</i>	No	No	No	No	Yes	Yes
<i>Stelletta grubii</i>	No	No	Yes	Yes	Yes	Yes
<i>Stelligera montagui</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Stelligera stuposa</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Stryphnus ponderosus</i>	No	No	Yes	Yes	Yes	Yes
<i>Phorbas (2)</i>	Yes	Yes	No	No	No	No
<i>Suberites carnosus</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Suberites ficus</i>	Yes	No	No	No	No	No
Suberitidae	No	Yes	No	No	No	Yes
<i>Sycon ciliatum</i>	No	No	No	Yes	Yes	Yes

Species Name	2003	2007	2011	2015	2019	2023
<i>Tethya citrina</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Tethyspira spinosa</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Thymosia guernei</i>	No	Yes	Yes	Yes	Yes	Yes
<i>Trachytedania cf. ferrolensis</i>	No	No	No	No	No	Yes
<i>Ulosa digitata</i>	No	No	No	No	Yes	No