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Skomer Marine Conservation Zone Nudibranch Diversity Survey 2018

NRW Evidence Report No. 321

K. Lock, P. Newman, M. Burton, J. Jones



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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 noethdagelloion yn nodwedd o Barth Cadwraeth Morol Sgomer, lle mae amrywiaeth rhywogaethau a phresenoldeb rhywogaethau prin neu anfynych yn briodolddau a ddefnyddir i asesu statws cadwraeth. Arolygwyd cyfanswm o 16 safle sy'n cynrychioli amrediad o gynefinoedd ar gyfer rhywogaethau o noethdagelloion yn ystod 2018 a chofnodwyd cyfanswm o 58 rhywogaeth o ganlyniad.

Cofnodwyd cyfanswm o 79 rhywogaeth o noethdagelloion ym Mharth Cadwraeth Morol Sgomer rhwng 1972 a 2018 o arolygon plymio ac arolygon o isfilod gwaddod. Canfuwyd 69 o rywogaethau ar yr arolygon hynny a gynhaliwyd rhwng 2002 a 2018, ac nid oedd naw o'r rhywogaethau hynny wedi'u cofnodi ym Mharth Cadwraeth Morol Sgomer cyn 2002. Mae rhywogaethau o noethdagelloion a gofnodwyd yn cynnwys nifer sydd wedi'u dosbarthu fel rhai sy'n brin yn genedlaethol neu sydd â dosbarthiad cenedlaethol cyfyngedig yn Ynysoedd Prydain.

Mae amrywiaeth rhywogaethau o noethdagelloion ym Mharth Cadwraeth Morol Sgomer yn uchel iawn, gyda 70% o rywogaethau'r DU yn cael eu cynrychioli yn y Parth Cadwraeth Morol. Mae'r amrywiaeth fawr hon yn adlewyrchiad o amrywiaeth y cynefinoedd a'r amodau amgylcheddol sydd i'w canfod yn y Parth Cadwraeth Morol a'r cymunedau cyfoethog y maent yn eu cefnogi. Fel ysglyfaethwyr arbenigol, mae gan rywogaethau o noethdagelloion ddewis detholus iawn o ran organebau ysglyfaeth, ac maent felly yn ddangosydd da o iechyd yr ecosystem yn gyffredinol.

Mae targed monitro'r Parth Cadwraeth Morol ar gyfer amrywiaeth rhywogaethau o noethdagelloion wedi'i gyrraedd. Mae noethdagelloion yn cyfrannu mewn modd ffafriol tuag at amcan cadwraeth rhywogaethau nodweddiadol Ardal Cadwraeth Arbennig Forol Sir Benfro.

Synopsis

Nudibranchs are a feature of the Skomer Marine Conservation Zone (MCZ) for which species diversity and the presence of rare or scarce species are attributes used to assess conservation status. A total of 16 sites representing a range of habitats were surveyed for nudibranch species during 2018 resulting in a total of 58 species being recorded.

A total of 79 nudibranch species have been recorded in the Skomer MCZ between 1972 and 2018 from both diving and sediment infauna surveys. 69 species have been found on those surveys carried out between 2002 and 2018, of which 9 species were unrecorded in the Skomer MCZ before 2002. Nudibranch species recorded include several classed as nationally scarce or with limited national distribution in the British Isles.

The diversity of nudibranch species in the Skomer MCZ is very high with 70% of UK species represented in the MCZ. This high diversity is a reflection of the diversity of habitats and environmental conditions found in the MCZ and the rich communities that they support. As specialised predators nudibranch species have a very selective choice of prey organisms, and they are therefore a good indicator of the overall ecosystem health.

The MCZ monitoring target for nudibranch species diversity has been met. Nudibranchs contribute favourably to the typical species conservation objective for the Pembrokeshire Marine Special Area of Conservation.

1. Introduction

Nudibranchs are a feature of the Skomer Marine Conservation Zone (MCZ) for which species diversity and the presence of rare or scarce species are attributes used to assess conservation status. As top predators they can act as an indicator of the health of the communities they rely on.

Nudibranchs are molluscs of the Subclass Opisthobranchia in which the adult stage has completely lost both the shell and operculum. They share this character with the plant eating Sacoglossa (e.g., *Elysia viridis*) which are not covered in the present survey. Similarly, the Anaspidea or Sea Hares (e.g., *Aplysia punctata*) are also excluded. All known nudibranchs are carnivorous, and most are specialised predators feeding on specific prey organisms (Picton & Morrow, 1994). Some feed on ephemeral prey, such as hydroids and tend to exhibit several short-lived generations each year, whilst others feed on perennial prey and tend to live for one year or more. Such knowledge of food preference is useful in searching for nudibranch species and the timing of diversity surveys.

1.1 Historical Surveys

Up to the 1970's sublittoral organisms were accessible only through rather crude sampling by dredge and net. Increased use of aqualungs facilitated direct sublittoral observation and collection, and this helped produce many additions to marine fauna and flora lists. In 1972-73 Peter Hunnam at Dale Fort Field Centre and Greg Brown, a nudibranch mollusca specialist at Bristol University completed the first nudibranch sublittoral survey at 12 sites between Skomer and the mouth of Milford Haven. They completed 20 to 30 minutes searches for nudibranchs along arbitrary transects of the seabed, species were counted, and samples collected for identification in a laboratory. 35 nudibranch species were recorded at 6 sites located within the Skomer MCZ, (Hunnam & Brown 1975). These are listed in Appendix 1.

Between 1975 and 1991 general species records were made by Bernard Picton and Francis Bunker during both their own diving and during a series of identification courses held at Dale Fort Field Centre. A total of 99 dives at 44 sites were carried out in the Skomer area, during which 61 species of nudibranchs were recorded. (Bunker, Picton & Morrow 1992).

In 2002 Skomer MCZ staff completed a nudibranch species survey to establish a baseline over a short time-scale that could be used for future monitoring. A total of 16 sites representing a range of habitats were surveyed on 20 dives, resulting in a total of 32 species (Luddington, 2002). For monitoring purposes, a checklist of 16 species (see Appendix 2) was selected, these were chosen as species easily identifiable in the field and that could be recorded during other Skomer MCZ monitoring dives. The list included *Tritonia nilsodhneri* a nationally scarce species found on pink sea fan *Eunicella verrucosa*. A target of observing 12 of the 16 species annually was set, and it was recommended that a full nudibranch species survey was carried out every 4 years.

In 2003 and 2004 all 16 species from the checklist were recorded. The checklist was not completed in 2005.

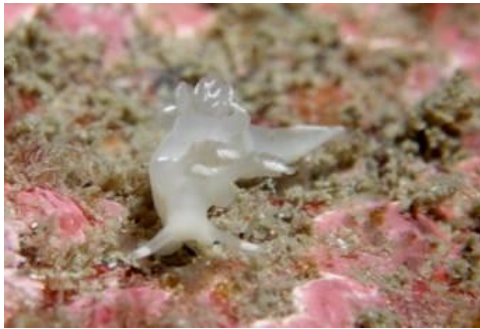
In 2006 surveys were completed at 13 sites representing a range of habitats for nudibranch species. 35 species were recorded during 21 dives. Notable records were *Doris sticta*, a nationally scarce species (Moore, 2002), and three species not previously recorded in the historical data set, *Cadlina laevis*, *Doto eireana* and *Onchidoris pusilla* (Burton et al., 2007).

In 2007 14 of the 16 species from the check list were recorded and in 2009 15 of the 16 species. Notable records in 2009 were *Trapania tartanella*, a new record for both Skomer and Wales; *Doto hystrix* and *Trichesia caerulea* which had not been not found on either the 2002 or 2006 surveys. These were recorded and photographed at Rye Rocks by diving volunteers Sarah Bowen and David Kipling (Lock et al., 2010).



Trapania tartanella DK 2009

In 2010 14 sites were surveyed resulting in a total of 55 species of nudibranchs. The number of species were considerably higher than the 2002 or 2006 surveys, this may have been due to extra efforts made to target a wider range of habitats. These included mixed sediment sites at Martins Haven east, West Hook, Martins Haven and Prothero's



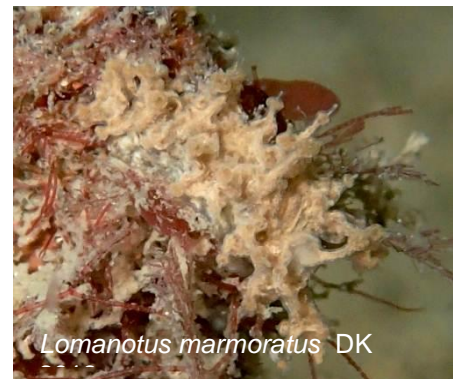
Dock. There was a general perception within the MCZ survey team that nudibranch abundance and species diversity were particularly high during the 2010 season compared to previous years. Specialist help from Bernard Picton also contributed to additional species being recorded. Two species not previously recorded in the Skomer MCZ were *Eubranchus vittatus* and *Trapania pallida*.

In 2011 *Diaphoreolis viridis*, a further new species, was identified in a photo taken at Martins Haven by volunteer George Brown during the 2010 survey. *Aeolidia papillosa* was found during a shore survey at Martins Haven. Although this is a widespread and relatively common species in the UK it is rarely recorded at Skomer MCZ.



Aeolidia papillosa MB

In 2013 15 of the 16 species from the check list were recorded, including *Tritonia nilsodhneri* on pink sea fan, *Eunicella verrucosa* at Rye Rocks. Notable records from volunteer divers were *Trinchesia caerulea*, *Diaphoreolis viridis* and *Diaphorodoris alba* at Martins Haven West recorded by Kerry Lewis and *Lomanotus marmoratus* (not recorded in the MCZ since 1991) at High Point recorded by David Kipling.



Lomanotus marmoratus DK

In 2014 13 survey sites were surveyed with 49 nudibranch species recorded. 3 species had not been recorded since 1992, these were *Cuthonella concinna*, *Eubranchius doriae* and *Doto floridicola*. *Doto floridicola* had previously been recorded as *Doto* sp 'A' in 1990 (Bunker *et al*, 1993), and its identification was confirmed in 2002 (Picton *pers. comm.*).

In 2015 15 of the 16 species from the annual check list were recorded, and in both 2016 and 2017 14 species. *Tritonia nilsodhneri* was recorded in 2016 at North Wall east and in 2017 at Rye Rocks during pink sea fan, *Eunicella verrucosa* monitoring dives. Other notable records include: *Doris sticta* at Thorn Rock in 2015, *Lomonotus genei* at Junko's Reef, *Facelina bostoniensis* at North of the Neck in 2016 and *Okenia elegans* at Martins Haven West in 2017.

1.2 2018 Survey Aims

- To complete a nudibranch species diving survey at sites representing a range of habitats in the Skomer MCZ.
- To photograph nudibranch species, both *in situ* or in an aquarium.
- To produce a 2018 survey species list and compare to previous surveys. Combine survey data to produce a Skomer MCZ nudibranch species list and augment the long- term data set.

2. Method

Sites around the Skomer Marine Conservation Zone are chosen to provide a range of habitats and environmental conditions. At each site divers firstly search for nudibranch spawn and prey species and search nearby for the animal; special attention being given to the base of hydroids and bryozoans on which spawn is found. Photographs of the nudibranch, the spawn and prey species are taken as a record of each species. Animals that can't be identified *in situ* are taken to the laboratory for further examination. For animals that are difficult to spot *in situ*, a small amount of hydroid, bryozoan and algal turf is collected and carefully sorted under a microscope. Voucher specimens are preserved for DNA work by Bernard Picton and all other live nudibranchs are returned to the MCZ.

Nudibranch species are identified using the online Encyclopaedia of Marine Life of Britain and Ireland <http://www.habitas.org.uk/marinelife/>, Picton & Morrow (1994), Thompson (1976), Thompson & Brown (1984). Species names currently listed in the World Register of Marine Species (WoRMS) are used.

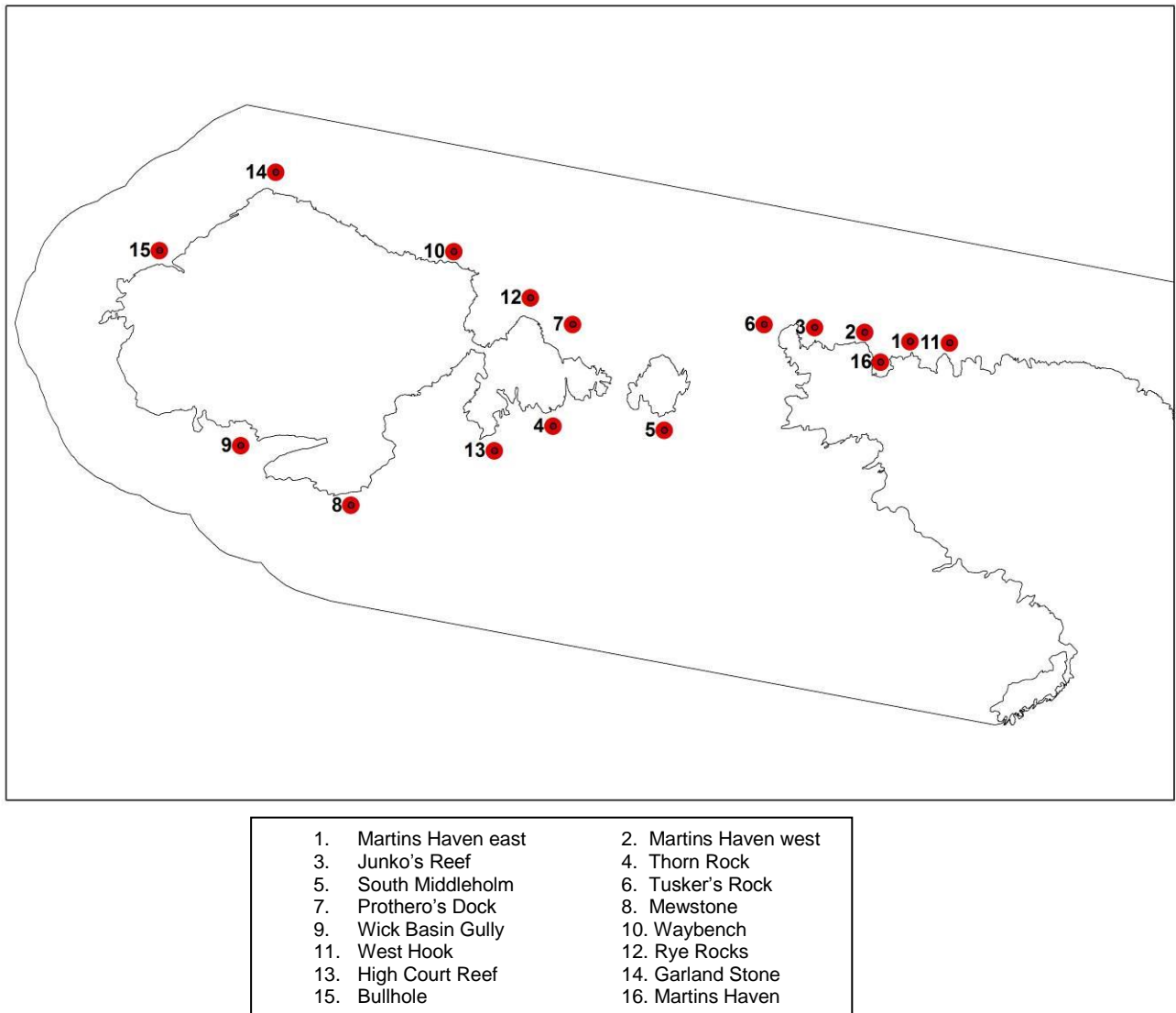
The sublittoral habitat found at each site is described briefly and associated nudibranch species recorded as a list for each site. In addition, an overall list of species is compiled for the Skomer MCZ.

3. Results

A total of 58 nudibranch species were recorded at 16 survey sites in the Skomer MCZ during the 2018 survey.

30 nudibranch recording dives were completed at 15 sites by the Skomer MCZ team and volunteers between 18th June and 29th June 2018. Seasearch divers surveyed Martins Haven (34 divers) as part of a nudibranch “Bioblitz” weekend. Additional sites were also briefly explored during other Skomer MCZ monitoring dives. A survey site location map is shown in Figure 1.

Figure 1. Site map for nudibranch diversity survey, Skomer MCZ, 2018



3.1 2018 Site Records

The sublittoral habitat found at each site is described briefly and associated nudibranch species recorded (alphabetical order) as a list for each site. Species names with associated authority are listed in Appendix 3.

Site 1. Martins Haven East (MHVe) 15 species, 2 dives.

A rocky reef extending to 20m below chart datum (bcd) with moderate current exposure, tall hydroid turf dominated by *Nemertesia antennina* and *N. ramosa* and lush algal communities. Below the reef is a plateau of mixed sediments and encrusted cobbles.

Diaphorodoris luteocincta
Diaphorodoris alba
Doto dunnei
Doto fragilis
Doto pinnatifida
Edmundsella pedata
Eubranchus farrani
Facelina annulicornis

Facelina auriculata
Favorinus branchialis
Goniodoris nodosa
Janolus cristatus
Limacia clavigera
Polycera faeroensis
Tritonia lineata

Site 2. Martins Haven West (MHVw) 14 species, 2 dives.

Rocky reef exposed to moderate wave action and currents with tall hydroid turf and algal communities. Reef gives way to a mixed sediment plateau with burrowing anemones and scallops.

Crimora papillata
Diaphorodoris luteocincta
Doto dunnei
Doto fragilis
Doto pinnatifida
Doto tuberculata
Edmundsella pedata

Facelina auriculata
Fjordia lineata
Janolus cristatus
Limacia clavigera
Microchlamylla gracilis
Polycera faeronensis
Tritonia lineata

Site 3. Junko's Reef (JUN) 18 species, 1 dive

Rocky reef with steep walls, exposed to moderate to strong currents. The rocks are covered in large expanses of *Alcyonium digitatum* and *Corynactis viridis*.

Crimora papillata
Diaphorodoris luteocincta
Diaphorodoris alba
Doto dunnei
Doto fragilis
Doto pinnatifida
Edmundsella pedata
Eubranchus linensis
Facelina annulicornis

Facelina auriculata
Janolus cristatus
Limacia clavigera
Onchidoris pusilla
Onchidoris oblonga
Polycera faeroensis
Polycera quadrilineata
Thecacera pennigera
Tritonia lineata

Site 4. Thorn Rock (TRK) 24 species, 4 dives.

A rocky reef extending to 18m bcd with rock platforms and gullies covered with fine silt and exposed to moderate currents. Rocks covered in hydroid and bryozoan turf and rich sponge community. Lush algal meadows are found in the shallows.

<i>Acanthodoris pilosa</i>	<i>Eubranchus tricolor</i>
<i>Diaphorodoris luteocincta</i>	<i>Facelina annulicornis</i>
<i>Doto cuspidata</i>	<i>Favorinus branchialis</i>
<i>Doto dunnei</i>	<i>Goniodoris nodosa</i>
<i>Doto fragilis</i>	<i>Janolus cristatus</i>
<i>Doto lemchei</i>	<i>Jorunna tomentosa</i>
<i>Doto maculata</i>	<i>Okenia elegans</i>
<i>Doto millbayana</i>	<i>Onchidoris oblonga</i>
<i>Doto pinnatifida</i>	<i>Polycera faeroensis</i>
<i>Doto tuberculata</i>	<i>Rubramoena amoena</i>
<i>Edmundsella pedata</i>	<i>Thecacera pennigera</i>
<i>Eubranchus pallidus</i>	<i>Tritonia lineata</i>

Site 5. South Middleholm (SMD) 18 species, 2 dives.

A rocky reef extending to 18m bcd with rock plateau, gullies and boulders. Exposed to moderate currents. Short hydroid and bryozoan turf including dense patches of *Alcyonidium diaphanum*. Rich algal meadows in the shallows.

<i>Acanthodoris pilosa</i>	<i>Facelina auriculata</i>
<i>Crimora papillata</i>	<i>Favorinus brachialis</i>
<i>Doto coronata</i>	<i>Fjordia lineata</i>
<i>Doto fragilis</i>	<i>Janolus cristatus</i>
<i>Doto hydrallmaniae</i>	<i>Polycera faeroensis</i>
<i>Doto maculata</i>	<i>Rostanga rubra</i>
<i>Doto pinnatifida</i>	<i>Tritonia lineata</i>
<i>Edmundsella pedata</i>	<i>Zelentia pustulata</i>
<i>Eubranchus vittatus</i>	
<i>Facelina annulicornis</i>	

Site 6. Tusker Rock (TSK) 11 species, 1 dive.

Steep rock reef with wide gullies and boulder areas, exposed to strong currents. Lush algal meadows in the shallows, dense walls of *Alcyonium digitatum* and a rich diversity of bryozoan and hydroid turf.

<i>Crimora papillata</i>	<i>Facelina auriculata</i>
<i>Doto coronata</i>	<i>Janolus cristatus</i>
<i>Doto fragilis</i>	<i>Limacia clavigera</i>
<i>Doto millbayana</i>	<i>Microchlamylla gracilis</i>
<i>Doto pinnatifida</i>	<i>Polycera faeroensis</i>
<i>Edmundsella pedata</i>	

Site 7. Prothero's Dock (PRO) 33 species, 4 dives.

Bedrock outcrop semi-exposed to current and with tall hydroid and algal communities giving way to a mixed sediment plain at 18m bcd.

<i>Aegires punctilucens</i>	<i>Facelina annulicornis</i>
<i>Diaphoreolis viridis</i>	<i>Facelina auriculata</i>
<i>Diaphorodoris luteocincta</i>	<i>Favorinus brianus</i>
<i>Diaphorodoris alba</i>	<i>Fjordia lineata</i>
<i>Doto dunnei</i>	<i>Janolus cristatus</i>
<i>Doto floridicola</i>	<i>Limacia clavigera</i>
<i>Doto fragilis</i>	<i>Microchlamylla gracilis</i>
<i>Doto hystrix</i>	<i>Onchidoris oblonga</i>
<i>Doto lemchei</i>	<i>Polycera faeroensis</i>
<i>Doto pinnatifida</i>	<i>Polycera quadrilineata</i>
<i>Doto tuberculata</i>	<i>Rubramoena amoena</i>
<i>Edmundsella pedata</i>	<i>Rubramoena rubescens</i>
<i>Eubbranchus doriae</i>	<i>Tergipes tergipes</i>
<i>Eubbranchus exiguus</i>	<i>Thecacera pennigera</i>
<i>Eubbranchus linensis</i>	<i>Trichesia caerulea</i>
<i>Eubbranchus tricolor</i>	<i>Tritonia lineata</i>
<i>Eubbranchus vittatus</i>	

Site 8. Mew Stone (MST) 20 species, 2 dives.

A steep rocky reef extending to 18m bcd with strong wave action and tidal currents. The walls are carpeted in ascidians and *Mytilus edulis*. Hydroid species include *Tubularia* spp.

<i>Dendronotus frondosus</i>	<i>Facelina auriculata</i>
<i>Doris pseudoargus</i>	<i>Goniodoris nodosa</i>
<i>Doto coronata</i>	<i>Janolus cristatus</i>
<i>Doto dunnei</i>	<i>Jorunna tomentosa</i>
<i>Doto fragilis</i>	<i>Limacia clavigera</i>
<i>Doto maculata</i>	<i>Polycera faeroensis</i>
<i>Doto millbayana</i>	<i>Polycera quadrilineata</i>
<i>Edmundsella pedata</i>	<i>Rubramoena amoena</i>
<i>Eubbranchus doriae</i>	<i>Rubramoena rubescens</i>
<i>Eubbranchus tricolor</i>	<i>Zelenia pustulata</i>

Site 9. Wick Basin gully (WBG) 12 species, 2 dives.

A long, narrow, south facing and very wave exposed gully, 2-4m wide and penetrating 25m into the island with depth varying from 15m (seaward) to 8m (landward). Short bryozoan turf and encrusting bryozoans, sponges and ascidians dominate the deeper area of the steep vertical walls and *Pachymatisma johnstoni*, *Dendrodoa grossularia* and *Corynactis verrucosa* are found immediately below a shallow kelp zone.

<i>Catriona aurantia</i>	<i>Facelina auriculata</i>
<i>Doris pseudoargus</i>	<i>Goniodoris nodosa</i>
<i>Doto cuspidata</i>	<i>Janolus cristatus</i>
<i>Doto dunnei</i>	<i>Limacia clavigera</i>
<i>Edmundsella pedata</i>	<i>Polycera faeroensis</i>
<i>Eubbranchus pallidus</i>	<i>Rostanga rubra</i>

Site 10. Waybench (WAY) 12 species, 1 dive.

Vertical cliffs and boulder slopes down to a depth of 30m bcd, semi-exposed to wave action from the north and moderate tidal currents. The reef is richly covered in bryozoan and hydroid turf, *Alcyonium digitatum* is abundant and *Eunicella verrucosa* is regularly recorded.

Diaphorodoris luteocincta
Doto fragilis
Doto pinnatifida
Doto turberculata
Edmundsella pedata
Facelina annulicornis

Facelina auriculata
Goniodoris nodosa
Janolus cristatus
Onchidoris oblonga
Polycera faeroensis
Tritonia lineata

Site 11. West Hook (WHK) 14 species, 1 dive.

Steeply sloping bedrock walls with gullies and boulder slopes extending down to 15m bcd. Semi-exposed to wave action from the north and moderate tidal currents. The vertical walls are covered in the soft coral *Alcyonium digitatum* and rich in bryozoan and hydroid turf. At the bottom of the bedrock a gently sloping plain of muddy shell gravel leads down to 20m bcd.

Crimora papillata
Diaphorodoris luteocincta
Doto dunnei
Doto eireana
Doto floridicola
Doto fragilis
Edmundsella pedata

Eubranchus doriae
Eubranchus linensis
Facelina auriculata
Facelina annulicornis
Janolus cristatus
Limacia clavigera
Polycera faeroensis

Site 12. Rye Rocks (RRK) 13 species, 1 dive

A rock outcrop, semi-exposed to wave action and moderate tidal currents. The bedrock drops down in a series of 5m steps to a depth of around 40m bcd. Between the rocky areas patches of coarse shell gravel and sand have accumulated and boulder slopes are found. The diverse nature of the seabed substrate in turn leads to a diverse range of habitats and species.

Diaphorodoris luteocincta
Doto dunnei
Doto fragilis
Doto maculata
Doto pinnatifida
Edmundsella pedata
Facelina annulicornis

Facelina auriculata
Fjordia lineata
Janolus cristatus
Limacia clavigera
Polycera faeroensis
Polycera quadrilineata

Site 13. High Court Reef (HCR) 17 species, 3 dives

A series of rock pinnacles with vertical walls up to 15m high and deep wide gullies between up to 5m width, with large boulders. The vertical walls are covered in rich sponge and bryozoan communities.

Diaphorodoris luteocincta
Doto cuspidata
Doto fragilis
Doto pinnatifida
Edmundsella pedata
Facelina auriculata
Fjordia lineata
Geitodoris planata

Goniodoris nodosa
Janolus cristatus
Limacia clavigera
Polycera faeroensis
Polycera quadrilineata
Rubramoena rubescens
Thecacera pennigera
Tritonia lineata
Zelentia pustulata

Site 14. Garland Stone (GST), 16 species, 2 dives

Steep current swept vertical walls, extending to below 40m bcd. Gullies up to 4m wide, with scoured boulders at the bottom. The walls are smothered with carpets of jewel anemone *Corynactis viridis*, and oaten pipe hydroids *Tubularia* spp., along with rich communities of hydroids and bryozoans.

Dendronotus frondosus
Doto coronata
Doto cuspidata
Doto dunnei
Doto fragilis
Doto pinnatifida
Edmundsella pedata
Eubranchus doriae

Eubranchus linensis
Eubranchus pallidus
Eubranchus tricolor
Facelina auriculata
Fjordia lineata
Janolus cristatus
Limacia clavigera
Polycera faeroensis

Site 15. Bullhole (BHO), 18 species, 2 dives

Series of long rock ridges with vertical faces between 2-3m high. The ridges run parallel to each other with gullies 4+m wide between filled with cobbles and boulders. The rocks are dominated by the soft coral *Alcyonium digitatum* and rich in bryozoan and hydroid turf. The pink sea fan *Eunicella verrucosa* is locally common.

Doto coronata
Doto cuspidata
Doto dunnei
Doto fragilis
Doto lemchei
Doto millbayana
Doto pinnatifida
Edmundsella pedata
Eubranchus tricolor

Facelina annulicornis
Facelina auriculata
Fjordia lineata
Janolus cristatus
Polycera faeroensis
Polycera quadrilineata
Rubramoena rubescens
Tritonia lineata
Zelentia pustulata

Site 16. Martins Haven shore dive (MHV) 29 species, Seasearch divers

Rocky reef exposed to moderate wave action and currents with tall hydroid turf and algal communities. Reef gives way to a mixed sediment plateau with burrowing anemones and scallops.

Crimora papillata

Diaphorodoris luteocincta

Diaphorodoris alba

Doto dunnei

Doto floridicola

Doto fragilis

Doto lemchei

Doto millbayana

Doto pinnatifida

Doto tuberculata

Edmundsella pedata

Eubbranchus farrani

Eubbranchus linensis

Eubbranchus tricolor

Eubbranchus vittatus

Facelina annulicornis

Facelina auriculata

Favorinus branchialis

Fjordia lineata

Goniodoris nodosa

Janolus cristatus

Limacia clavigera

Microchlamylla gracilis

Polycera faeroensis

Polycera quadrilineata

Rostanga rubra

Rubramoena amoena

Thecacera pennigera

Tritonia lineata

Additional nudibranch records during other Skomer MCZ monitoring projects:

Tritonia nilsodhneri at High Point (HLP), *Tritonia hombergii* on North Neck site marker rope (NNK) and *Palio nothus* on The Loaf, North Haven (NHV).

3.2 Species Records

58 nudibranch species were recorded in the Skomer MCZ during the 2018 survey. These are listed alphabetically below with sites codes (see Appendix 4) and photographs. Species names with associated authority are listed in Appendix 3.

1. ***Acanthodoris pilosa*** 2 sites TRK and SMD
Feeds on *Alcyonidium diaphanum*.



Thorn Rock
27/06/18 KL

2. ***Aegires punctilucens*** 1 site PRO.
Feeds on *Leucosolenia botrylloides*.



Prothero's Dock
26/06/18 MB

3. ***Crimora papillata*** 6 sites MHV, WHK, JUN, MHVw, SMD, TSK. Feeds on *Chartella papyracea* and *Securiflustra securifrons*.



Junkos
19/06/18 JM

4. ***Catriona aurantia*** 1 site WBG.
Feeds on *Tubularia larynx*.



5. ***Dendronotus frondosus*** 2 sites MST, GST.
Feeds on *Tubularia indivisa* and *Sertularia argentea*.



Mewstone
25/6/18 PN



Mewstone
25/6/18 HC

6. ***Diaphoreolis viridis*** 1 site PRO.
Feeds on *Sertularella* spp.



Prothero's Dock
26/06/18 BB
(Spotted in photo following dive)

7. ***Diaphorodoris luteocincta*** 9 sites MHV, MHVw, MHVe, TRK, PRO, HCR, WAY, RRK, WAY.
Feeds on *Crisia* spp.



Martins Haven
23/06/18 JM

8. ***Diaphorodoris alba*** 4 sites: MHV, MHVe, JUN, PRO



Prothero's Dock 28/06/18 BB



Martins Haven east 26/06/18 BB
(Comparison of *D. luteocincta* and *D. alba*)

9. ***Doris pseudoargus*** 2 sites: WBG, MST. Feeds on sponges.



Mewstone
25/06/18 HC

10. ***Doto coronata*** 6 sites: MHV, WBG, GST, MST, BHO, TSK
 Feeds on *Sertularia argentea* and *Obelia geniculata*.
Doto coronata is possibly more than one species and DNA work is currently being completed to investigate this further, Picton *pers. comm.*



Prothero's Dock
 26/06/18 BB

11. ***Doto cuspidata*** 5 sites: TRK, HCR, GST, WBG, BULL.
 Feeds on *Nemertesia ramosa*.



Thorn Rock 24/6/14 KL

12. ***Doto dunnei*** 12 sites: MHV, MHVe, MHVw, WHK, JUN, TRK, WBG, MST, GST, PRO, BHO, RRK.
 Feeds on *Kirchenpaueria pinnata*.



Junkos 6/06/18 KL



Junkos 19/6/18 BEP

13. ***Doto eireana*** 1 site WHK.
Feeds on *Amphisbetia operculata*.



Garland Stone
22/06/10 KL

14. ***Doto floridicola*** 3 sites: MHV, WHK, PRO.
Feeds on *Aglaophenia kirchenpaueri*.



Martins Haven 23/06/18 HC

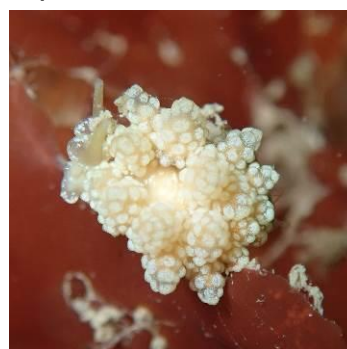


Prothero's Dock 26/6/18 KLE

15. ***Doto fragilis*** 15 sites: JUN, HCR, TRK, SMD, TSK, PRO, WAY, MHV, RRK, MHVe, MHVw, BHO, MST, GST, WHK.
Feeds on *Nemertesia antennina*, *N. ramosa* and *Halecium halecinum*.
Doto fragilis is possibly more than one species and DNA work is currently being completed to investigate this further, Picton *pers. comm.*



Thorn Rock 23/6/18 PN



Thorn Rock 27/6/18 KL

16. ***Doto hydrallmaniae*** 1 site SMD. First record for Skomer MCZ.
Feeds on *Hydrallmania falcata*.



Photo taken in Isle of Man, BEP

17. ***Doto hystrix*** 1 site PRO
Feeds on *Schizotricha frutescens*.



Rye Rocks 23/06/10 MB

18. ***Doto lemchei*** 4 sites: TRK, MHV, PRO, BHO.
Feeds on *Aglaophenia tubulifera*.



Thorn Rock 27/6/18 KL

19. ***Doto maculata*** 4 sites: TRK, SMD, MST, RRK.
Feeds on *Halopteris catharina*.



June 2018 BEP

20. ***Doto millbayana*** 5 sites: MHV, TRK, MST, BHO, TSK.
Feeds on *Plumularia setacea*.



Thorn Rock 27/6/18 KL

21. ***Doto pinnatifida*** 13 sites: MHVe, MHVw, TRK, TSK, RRK, MHV, JUN, GST, BHO, PRO, SMD, HCR, WAY.
Feeds on *Nemertesia antennina*.



Prothero's Dock 26/6/18 MB

22. ***Doto tuberculata*** 5 sites: TRK, MHV, MHVw, PRO, WAY.
Feeds on *Sertularella gayi*.



Prothero's Dock
28/6/18 BB

23. ***Edmundsella pedata*** 16 sites: JUN, HCR, TRK, SMD, TSK, PRO, WAY, MHV, RRK, MHVe, MHVw, BHO, MST, GST, WHK, WBG.
Feeds on *Eudendrium* spp.



Martins Haven
23/6/18 JM

24. ***Eubranchus doriae*** 4 sites: WHK, MST, GST, PRO.
Feeds on *Kirchenpaueria similis*.



Prothero's Dock
28/6/18 KLE

25. ***Eubranchus exiguus*** 2 sites RRK, MHV.
Feeds on *Obelia geniculata*.



Martins Haven
23/06/18 BEP

26. ***Eubranchus farrani*** 2 sites: MHV, MHVe.
Feeds on *Obelia* spp. and *Aglaophenia pluma*.



Martins Haven 23/6/18 KL



Garland Stone 28/6/18 PN

27. ***Eubranchus linensis*** 5 sites: MHV, WHK, JUN, GST, PRO. First record for Skomer MCZ.



West Hook,
19/6/18 BEP

28. ***Eubbranchus pallidus*** 3 sites TRK, WEN, GST.
Feeds on *Obelia dichotoma* and *Halecium halecinum*.



Garland Stone 27/06/18 BB



Mew Stone 16/06/10 BEP (aquarium)

29. ***Eubbranchus tricolor*** 6 sites: MHV, TRK, MST, GST, PRO, BHO.
Feeds on *Nemertesia antennina* and *N. ramosa*.



Thorn Rock 27/6/18 KL

30. ***Eubbranchus vittatus*** 3 sites: PRO, SMD, MHV.
Feeds on the hydroid *Kirchenpaueria pinnata*.

Protheros Dock
28/06/18 BB

31. ***Facelina annulicornis*** 10 sites: WHK, JUN, TRK, HCR, PRO, MHV, MHVe, SMD, WAY, BHO.
Feeds on hydroids and other aeolid nudibranchs.



Prothero's Dock 28/6/18 PN



Martins Haven 23/6/18 JM

32. ***Facelina auriculata*** 15 sites: JUN, HCR, SMD, TSK, PRO, WAY, MHV, RRK, MHVe, MHVw, BHO, MST, GST, WHK, WBG.
Feeds on *Obelia geniculata* and other hydroids.



South Middleholm 25/6/18 PN



Prothero's Dock 28/6/18 MB

33. ***Favorinus branchialis*** 3 sites: MHV, TRK, PRO.
Feeds on spawn of other nudibranchs.

Wick Basin Gully
25/06/18 BB

34. ***Favorinus blianus*** 1 site: PRO.
Feeds on spawn of other nudibranchs.



Prothero's Dock 26/6/18 KLE

35. ***Fjordia browni*** 1 site: HCR.
Feeds on *Tubularia indivisa*.



Waybench 21/06/10 PN

36. ***Fjordia lineata*** 8 sites: MHV, MHVw, PRO, SMD, GST, BHO, RRK, HCR.
Feeds on *Tubularia indivisa* and other hydroids.



Martins Haven
23/6/18 JM

37. ***Geitodoris planata*** 1 site: HCR
Feeds on *Hemimycale columella*.



High Court Reef 11/6/18 KL

38. ***Goniodoris nodosa*** 7 sites: MHV, TRK, MHVe, WBG, MST, HCR, WAY.
Feeds on *Diplosoma listerianum* and *Dendrodoa grossularia*.



Mewstone 26/6/18 PN



West Hook 18/6/18 MB

39. ***Janolus cristatus*** 16 sites: JUN, HCR, TRK, SMD, TSK, PRO, WAY, MHV, RRK, MHVe, MHVw, BHO, MST, GST, WHK, WBG.
Feeds on *Bugula* spp.



Mewstone 26/6/18 PN



High Court Reef 11/6/18 KL

40. ***Jorunna tomentosa*** 2 sites: MST, TRK.
Feeds on *Haliclona* spp.



Garland Stone
27/6/18 PN

41. ***Limacia clavigera*** 13 sites: JUN, HCR, TSK, PRO, WAY, MHV, RRK, MHVe, MHVw, MST, GST, WHK, WBG.
Feeds on *Electra pilosa*.



Junko's Reef
20/6/18 KL

42. ***Microchlamylla gracilis*** 4 sites: MHV, MHVw, PRO, TSK.
Feeds on *Eudendrium* spp.



Tusker Rock
18/6/18 PN

43. ***Okenia elegans*** 1 site: TRK.
Feeds on *Polycarpa scuba*.



Thorn Rock
27/06/18 KL

44. ***Onchidoris oblonga*** 3 sites: JUN, TRK, PRO.
Feeds on *Cellaria fistulosa*.



Prothero's Dock 26/06/18
BEP

45. ***Onchidoris pusilla*** 1 site: JUN
Feeds on *Escharella immersa*, *Porella concinna* and *Schizomavella linearis*.



Junko's Reef
19/06/18 BEP

46. ***Palio nothus*** 1 site: LOAF.
Feeds on *Bowerbankia* bryozoans.



The Loaf
070718 KLE

47. ***Polycera faeroensis*** 16 sites: JUN, HCR, TRK, SMD, TSK, PRO, WAY, MHV, RRK, MHVe, MHVw, BHO, MST, GST, WHK, WBG.
Feeds on *Crisia* spp and *Bicellariella ciliata*.



Thorn Rock
21/06/18 PN

48. ***Polycera quadrilineata*** 7 sites: MHV, JUN, MST, PRO, BHO, HCR, RRK.
Feeds on *Membranipora membranacea*.



Prothero's Dock
26/06/18 MB

49. ***Rostanga rubra*** 3 sites: MHV, WBG, SMD.
Feeds on *Ophlitaspongia papilla*.



Wendy's Gully
21/6/18 KLE

50. ***Rubramoena amoena*** 4 sites: MHV, TRK, MST, PRO.
Feeds on *Halecium halecinum*.



TRK 24/06/14 RS

51. ***Rubramoena rubescens*** 4 sites: MST, PRO, BHO, HCR.
Feeds on *Halecium halecinum*.



Prothero's Dock 28/06/18 BB



Prothero's Dock 28/06/18 MB

52. ***Tergipes tergipes*** 1 site: PRO.
Feeds on *Obelia geniculata*.



Prothero's Dock
15/06/10 BEP

53. ***Thecacera pennigera*** 4 sites MHV, TRK, PRO, HCR.
Feeds on *Crisularia plumosa*.



Thorn Rock
27/06/18 MB

54. ***Trichesia caerulea*** 1 site PRO
Feeds on *Sertularella polyzonias*.



Prothero's Dock 28/06/18 BB

55. ***Tritonia hombergii*** 1 site North Neck (NNK) site marker rope.
Feeds on *Alcyonium digitatum*.



South Middleholm
25/05/10 PN

56. ***Tritonia lineata*** 10 sites MHV, JUN, TRK, MHVw, MHVe, SMD, PRO, BHO, HCR, WAY.
Feeds on octocorals such as *Sarcodictyon catenatum*.



Waybench 25/06/18 KLE



High Court Reef 11/06/18 KL

57. ***Tritonia nilsodhneri*** 1 site HPT
Feeds on *Eunicella verrucosa*



Prothero's Dock
15/06/10 PN

58. ***Zelentia pustulata*** 4 sites SMD, MST, HCR, BHO.
Feeds on *Halecium muricatum*



Bullhole
28/06/18 BEP

3.3 Skomer MCZ Records

Nudibranch survey records for 2002, 2006, 2010, 2014 and 2018 have been combined, along with previous records from both diving surveys and sediment grab sampling surveys to produce a list of all current known records for the Skomer MCZ. The combined total recorded is 79 species.

Table 1. Nudibranch species recorded in the Skomer MCZ (alphabetical order).

Species	2002	2006	2010	2014	2018	Years
<i>Acanthodoris pilosa</i>	1		1	1	1	4
<i>Aegires punctilucens</i>	1		1	1	1	4
<i>Aeolidia papillosa</i>		1				1
<i>Ancula gibbosa</i>			1	1		2
<i>Cadlina laevis</i>		1	1	1		3
<i>Crimora papillata</i>	1	1	1	1	1	5
<i>Cuthonella concinna</i>				1		1
<i>Catriona aurantia</i>		1	1	1	1	4
<i>Dendronotus frondosus</i>		1	1	1	1	4
<i>Diaphoreolis viridis</i>			1		1	2
<i>Diaphorodoris luteocincta</i>	1	1	1	1	1	5
<i>Diaphorodoris alba</i>	1		1		1	3
<i>Doris pseudoargus</i>	1	1	1	1	1	5
<i>Doris sticta</i>		1		1		2
<i>Doto coronata</i>	1	1		1	1	4
<i>Doto cuspidata</i>	1	1	1	1	1	5
<i>Doto dunnei</i>			1	1	1	3
<i>Doto eireana</i>		1	1	1	1	4
<i>Doto floridicola</i>				1	1	2
<i>Doto fragilis</i>	1	1	1	1	1	5
<i>Doto koenneckeri</i>	1		1			2
<i>Doto hydrallmaniae</i>					1	1
<i>Doto hystrix</i>			1		1	2
<i>Doto lemchei</i>	1		1	1	1	4
<i>Doto maculata</i>			1	1	1	3
<i>Doto millbayana</i>	1	1	1	1	1	5
<i>Doto pinnatifida</i>	1	1	1	1	1	5
<i>Doto tuberculata</i>	1		1	1	1	4
<i>Edmundsella pedata</i>	1	1	1	1	1	5
<i>Eubranchus doriae</i>				1	1	2
<i>Eubranchus exiguus</i>	1		1	1	1	4
<i>Eubranchus farrani</i>	1	1	1	1	1	5
<i>Eubranchus linensis</i>					1	1
<i>Eubranchus pallidus</i>		1	1	1	1	4
<i>Eubranchus tricolor</i>	1	1	1	1	1	5
<i>Eubranchus vittatus</i>			1		1	2

Facelina annulicornis	1	1	1	1	1	5
Facelina auriculata	1	1	1	1	1	5
Facelina bostoniensis			1	1		2
Favorinus branchialis	1	1	1	1	1	5
Favorinus blianus			1		1	2
Fjordia browni		1	1		1	3
Fjordia lineata		1	1	1	1	4
Fjordia chriskaugei			1			1
Geitodoris planata			1	1	1	3
Goniodoris nodosa		1	1	1	1	4
Janolus cristatus	1	1	1	1	1	5
Jorunna tomentosa			1	1	1	3
Limacia clavigera	1	1	1	1	1	5
Lomanotus genei			1			1
Microchlamylla gracilis	1		1	1	1	4
Okenia aspersa			1			1
Okenia elegans			1	1	1	3
Onchidoris pusilla		1			1	2
Onchidoris oblonga			1	1	1	3
Palio nothus					1	1
Polycera faeroensis	1	1	1	1	1	5
Polycera quadrilineata	1	1	1	1	1	5
Rostanga rubra		1	1	1	1	4
Rubramoena amoena		1	1	1	1	4
Rubramoena rubescens	1			1	1	3
Tergipes tergipes	1		1	1	1	4
Thecacera pennigera		1	1	1	1	4
Trapania pallida			1			1
Trinchesia caerulea					1	1
Tritonia lineata	1	1	1	1	1	5
Tritonia hombergii	1		1	1	1	4
Tritonia nilsodhneri			1		1	2
Zelentia pustulata		1	1		1	3
Totals	30	34	57	50	58	

69 species recorded on MCZ diving surveys

Other diving records in Skomer MCZ

Cuthona foliata	75 Saunders
Goniodoris castanea	72 JSD, 88 RRK
Onchidoris bilamellata	72 NNK
Polycera elegans	72 NWA, 75 WTK
Lomanotus marmoratus	91 MHV, 13 HPT
Trapania tartanella	09 RRK
Tritonia plebeia	72 NNK, 89 PRK, 90 GST, 91 MST

76 species recorded on ALL diving surveys

Additional records from Sediment Infauna surveys (Rostron 93, 96, Barfield 98,03,07)					
<i>Embletonia pulchra</i>	98 sites 7 WTP				
<i>Onchidoris muricata</i>	93 sites 12, 19				
<i>Onchidoris sparsa</i>	98 sites 6/7, 03 sites 5/7/12, 07 site 6.				
79 species recorded on all diving and grab sampling surveys					

3.4 Martins Haven Nudibranch “Bioblitz” records

Nudibranch “Bioblitz” records, by volunteer Seasearch divers in 2010, 2014 and 2018 are shown in Table 2. The combined total recorded is 44 species.

Table 2. Martins Haven Seasearch ‘Nudibranch bioblitz’ 2010, 2014 and 2018 species list.



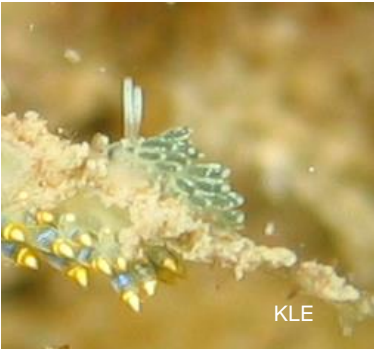

Species	2010	2014	2018	Species	2010	2014	2018
<i>Acanthodoris pilosa</i>	Y			<i>Facelina bostoniensis</i>		Y	
<i>Aegires punctilucens</i>	Y			<i>Favorinus branchialis</i>	Y	Y	Y
<i>Ancula gibbosa</i>		Y		<i>Fjordia browni</i>	Y		
<i>Crimora papillata</i>	Y	Y	Y	<i>Microchlamylla gracilis</i>		Y	Y
<i>Diaphorodoris luteocincta</i>	Y	Y	Y	<i>Fjordia lineata</i>	Y	Y	Y
<i>Diaphorodoris alba</i>	Y		Y	<i>Edmondsella pedata</i>	Y	Y	Y
<i>Doris pseudoargus</i>	Y	Y		<i>Goniodoris nodosa</i>	Y	Y	Y
<i>Doto coronata</i>		Y		<i>Janolus cristatus</i>	Y	Y	Y
<i>Doto dunnei</i>		Y	Y	<i>Jorunna tomentosa</i>	Y	Y	
<i>Doto floridicola</i>		Y	Y	<i>Limacia clavigera</i>	Y	Y	Y
<i>Doto fragilis</i>	Y	Y	Y	<i>Okenia elegans</i>	Y	Y	
<i>Doto lemchei</i>	Y	Y	Y	<i>Onchidoris oblonga</i>	Y	Y	
<i>Doto maculata</i>	Y			<i>Polycera faeroensis</i>	Y	Y	Y
<i>Doto millbayana</i>			Y	<i>Polycera quadrilineata</i>		Y	Y
<i>Doto pinnatifida</i>	Y		Y	<i>Rostanga rubra</i>	Y		Y
<i>Doto tuberculata</i>	Y	Y	Y	<i>Rubramoena amoena</i>		Y	Y
<i>Eubranchedus doriae</i>	Y	Y		<i>Rubramoena rubescens</i>		Y	
<i>Eubranchedus exiguus</i>		Y		<i>Thecacera pennigera</i>			Y
<i>Eubranchedus farrani</i>			Y	<i>Trapania pallida</i>	Y		
<i>Eubranchedus linensis</i>			Y	<i>Tritonia lineata</i>	Y	Y	Y
<i>Eubranchedus tricolor</i>	Y	Y	Y	<i>Tritonia hombergii</i>	Y	Y	
<i>Eubranchedus vittatus</i>			Y		31	33	29
<i>Facelina annulicornis</i>	Y	Y	Y	44 Species recorded at Martins Haven			
<i>Facelina auriculata</i>	Y	Y	Y				





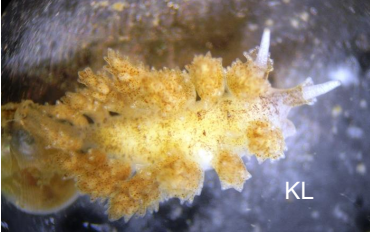

3.5 Notable Nudibranch Species







A list of notable species has been selected from diving surveys between 2002 and 2018. These include dives not completed on the dedicated nudibranch surveys. Some of the species are new records to the Skomer MCZ; others are notable due to their national scarcity or limited national distribution, see Table 3. The current distribution of each species can be seen on the UK distribution maps from the National Biodiversity Network (NBN) Atlas, contributors to this data are shown in Appendix 5.

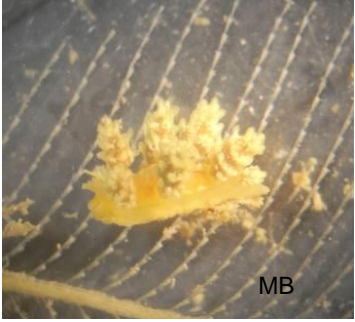






Table 3. Notable nudibranch records for diving surveys 2002-2018




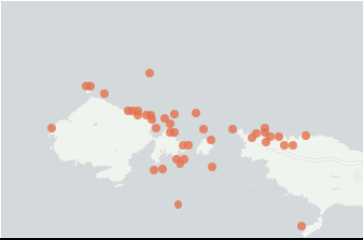


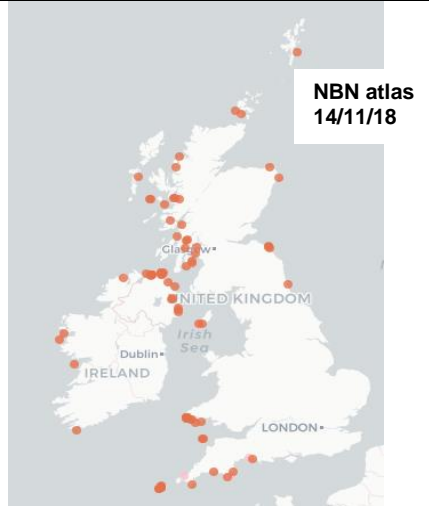
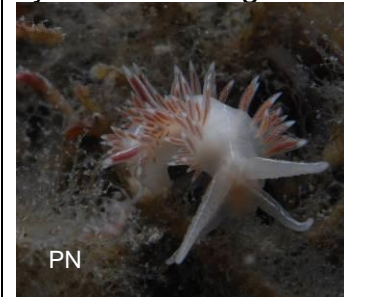
(Maps sourced through the NBN atlas www.data.nbn.org.uk The recorders, data provider¹ and the NBN Trust bear no responsibility for any further analysis or interpretation of the data)







SPECIES	COMMENTS (Bunker <i>et al</i> 1993, Picton & Morrow 1994, www.habitas.org.uk)	DISTRIBUTION MAP (NBN Atlas www.data.nbn.org.uk)
<p><i>Cuthonella concinna</i></p>  <p>BEP</p>	<p>This is a northern species with sparse records at Skomer and the south coast. It feeds on the hydroid <i>Sertularia argentea</i> which is usually found in strong tidal flows or wave action.</p> <p>Recorded in 1989 and 1992. First record on a survey in 2014.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Diaphoreolis viridis</i></p>  <p>KLE</p>	<p>Found all around the British Isles, however records are sparse as it can often be highly camouflaged. It feeds on <i>Sertularella</i> hydroids.</p> <p>First record for Skomer in 2010 and again in 2013 AND 2018</p>	 <p>NBN atlas 14/11/18</p>







<p><i>Diaphorodoris alba</i></p> 	<p>Several varieties of <i>D. luteocincta</i> occur in the Mediterranean. The variety <i>alba</i> was confirmed to be a distinct species in 2016. It occurs in the Mediterranean, on the north coast of France and south coast of Britain.</p> <p>First record for Skomer in 2002 and on several occasions since.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Doris sticta</i></p>  <p>PN</p>	<p>A nationally scarce species found on the west of Ireland and south west Britain (Moore, 2002). Feeds on sponges but it is unknown which species.</p> <p>Recorded in 1975, 1990 and 1991. Found on both 2006 and 2014 surveys and in 2015.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Doto cuspidata</i></p>  <p>KL</p>	<p>An uncommon species that feeds exclusively on <i>Nemertesia ramosa</i>. It is found in the south of Britain but more regularly in the north.</p> <p>Found in 1988, 1999 and all the Skomer surveys.</p>	 <p>NBN atlas 14/11/18</p>







<p><i>Doto eireana</i></p> 	<p>Found on the west coast of Britain, however records are few due to its separation from <i>Doto coronata</i>. It feeds exclusively on <i>Amphisbetia operculata</i>.</p> <p>New record for Skomer in 2006, recorded again in 2010, 2014 and 2018.</p>	
<p><i>Doto floridicola</i></p> 	<p>First recorded at Skomer as "<i>Doto sp A</i>" in 1990. In 2002 Picton confirmed it to be "<i>Doto floridicola</i>". It is a southern species found in the Azores and Mediterranean. In Britain it feeds on <i>Aglaophenia kirchenpaueri</i>.</p> <p>Recorded in 2014 survey at 2 sites and 2018 at 3 sites.</p>	
<p><i>Doto hydrallmaniae</i></p> 	<p>Described from the Isle of Man in 1992. Feeds on the hydroid <i>Hydrallmania falcata</i>, found mainly on rocks, stones and pebbles in areas subject to scour.</p> <p>First record for Skomer in 2018.</p>	







<p><i>Doto hystrix</i></p> 	<p>A scarce species found in deep waters below 25m found on the hydroid <i>Schizotricha frutescens</i>. A north west species with occasional records at Skomer and Lundy.</p> <p>Recorded in 1988 and on the 2010 and 2018 surveys.</p>	
<p><i>Doto koenneckeri</i></p> 	<p>A widely distributed animal recorded from Spain to Scotland.</p> <p>Feeds on the hydroid <i>Aglaophenia pluma</i> which grows on the seaweed <i>Halidrys siliquosa</i>.</p> <p>Recorded on the 2002 and 2010 surveys.</p>	
<p><i>Eubranchus doriae</i></p> 	<p>This is a very small camouflaged species. Few records exist however it has been found on the west and south coasts of Britain. It feeds on the plumularian hydroid <i>Kirchenpaueria similis</i>.</p> <p>Recorded in 1997 and on the 2014 and 2018 surveys.</p>	
<p><i>Eubranchus linensis</i></p> 	<p>This species was first described in 1990 in Spain and has been recorded in Portugal and the Netherlands. It was first recorded in the UK in 2015. In Wales it was first recorded in St Brides Bay in 2017 and was found at 5 sites during the 2018 survey.</p>	<p>Distribution map not available</p>


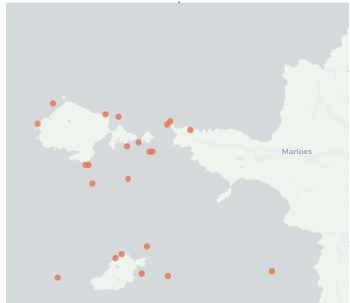

<p><i>Eubranchus vittatus</i></p> 	<p>A frequent species in the north west of Britain but scarcer in the south. It feeds on the hydroid <i>Kirchenpaueria pinnata</i>.</p> <p>New record for Skomer in 2010 and found again in 2018.</p>	
<p><i>Facelina annulicornis</i></p> 	<p>An uncommon species but with a wide spread distribution in Britain. It feeds on a variety of hydroids and has been known to attack and eat other nudibranchs.</p> <p>It is particularly common at Skomer.</p> 	
<p><i>Favorinus blianus</i></p> 	<p>Distributed along the north and west coasts of Britain. It eats other nudibranch spawn.</p> <p>Collected in 1972 and subsequently described in 1974 as a new species with Martins Haven the type locality for the species, Hunnam & Brown (1975).</p> <p>Recorded in 1975, 1989 and on the 2010 and 2018 surveys.</p>	
<p><i>Fjordia chriskaugei</i></p> 	<p>Recently described in 2017 in Norway. Previously confused with <i>Fjordia lineata</i>. It feeds on the hydroid <i>Tubularia indivisa</i> as adults and on hydroids with smaller polyps as juveniles. Currently known from southern Norway to Croatia including all around Britain and Ireland.</p> <p>Recorded in the 2010 survey.</p>	<p>Distribution map not available</p>

<p><i>Lomanotus genei</i></p> 	<p>A scarce species with sporadic records but with a wide distribution from the west coast of Scotland to the Mediterranean. It feeds on <i>Nemertesia ramosa</i>.</p> <p>Found in 1988, on the 2010 survey and at one site in 2016.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Lomanotus marmoratus</i></p>  <p>DK</p>	<p>This is a highly camouflaged species and most likely under-recorded. It has been found all around the British isles. It feeds on <i>Nemertesia antennina</i>.</p> <p>Found in 1989 and 2013.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Okenia aspersa</i></p>  <p>KL</p>	<p>A scarce burrowing nudibranch that feeds on the ascidian <i>Molgula occulta</i>. <i>M. occulta</i> live buried in muddy sand and often the only clue to <i>O. aspersa</i>'s presence is the distinct spawn shaped like coiled springs.</p> <p>Found in 1989 and on the 2010 survey and egg masses were recorded in both 2014 and 2018.</p>	 <p>NBN atlas 14/11/18</p>

<p><i>Okenia elegans</i></p> 	<p>A nationally scarce species that feeds on <i>Polycarpa scuba</i>. Found at scattered locations on the south and west coasts of Britain. (Moore, 2002)</p> <p>Found in 1991 and the 2010, 2014 and 2018 surveys. It is regularly found in the MCZ.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Onchidoris oblonga</i></p> 	<p>It is found at scattered on the south and west coasts of Britain but rarely recorded. It is very small and well camouflaged on its food <i>Cellaria fistulosa</i>.</p> <p>Found in 1987, 1989 and on the 2010, 2014 and 2018 surveys.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Onchidoris pusilla</i></p> 	<p>Found all around the coast of Britain but rarely recorded as it is particularly well camouflaged. Feeds on encrusting bryozoans.</p> <p>New record for Skomer in 2006 and again in 2013. Found on the 2018 survey.</p>	 <p>NBN atlas 14/11/18</p>

<p><i>Palio nothus</i></p> 	<p>This species is found all around the UK and the north to the Arctic circle.</p> <p>It feeds on <i>Bowerbankia</i> bryozoans.</p> <p>It was first recorded at Skomer during the 2018 survey.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Thecacera pennigera</i></p> 	<p>A species that is confined to the south and west coasts of Britain. It feeds on the bryozoan <i>Crisularia plumosa</i>.</p> <p>It is regularly recorded at Skomer.</p>	 <p>NBN atlas 14/11/18</p>
<p><i>Trapania tartanella</i></p> 	<p>Found on the Atlantic coasts of Spain and Portugal. A rare species first recorded in Britain at the Manacles, Cornwall in 2007.</p> <p>First record for both Wales and Skomer in 2009, by David Kipling and Sarah Bowen.</p>	 <p>NBN atlas 14/11/18</p>

<p><i>Trapania pallida</i></p> 	<p>A scarce species found from west Scotland to the Atlantic coast of Spain. It feeds on kamptozoa.</p> <p>First record for Skomer in 2010.</p>	
<p><i>Trinchesia caerulea</i></p> 	<p>Found all around the British Isles but most frequently on the west coast of Scotland. It feeds on <i>Sertularella</i> hydroids.</p> <p>Recorded in 1975, 1989, 2009, 2013 and 2018</p>	
<p><i>Tritonia nilsodhneri</i></p> 	<p>A nationally scarce species (Moore, 2002) found in the south west of Britain. Feeds on the Pink sea fan, <i>Eunicella verrucosa</i>.</p> <p>Present in small numbers around Skomer and monitored on the Pink sea fan surveys.</p>	

<p><i>Zelentia pustulata</i></p>  <p>KL</p>	<p>A northern species but regularly found around Skomer.</p>  <p>It feeds on the hydroid <i>Halecium muricatum</i> which is local in its distribution at scattered exposed localities. Recorded on the 2006, 2010 and 2018 surveys.</p>	<p>NBN atlas 14/11/18</p> 
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4. Discussion

58 species were recorded from 16 sites surveyed in 2018, representing 76% of the 76 nudibranch species that have been recorded on dives in the Skomer MCZ. This is higher than in 2014 (49 species) and 2010 (54 species). The lower number of species in 2014 was most likely due to poor diving visibility and the survey sites being covered in a thick layer of silt which buries many of the sessile filter feeding animals: hydroids, bryozoans, sponges and ascidians which are food sources for the different nudibranch species. In contrast there was a low level of silt on the reefs and good diving visibility during both 2010 and 2018 surveys.

The total number of species recorded in 2010, 2014 and 2018 surveys was considerably higher than the 2002 (32 species) and 2004 (34 species) surveys (Lock, 2011). The greater numbers of species recorded in the last 3 surveys may have been due to extra efforts to target a wider range of habitats. These included mixed sediment sites at Martins Haven east, West Hook, Martins Haven and Prothero's Dock. In addition, the identification skills of the diving team have increased through experience and training. A number of species were also recorded as a direct result of having specialist help from Bernard Picton.

In 2010, 2014 and 2018 a weekend was organised for Seasearch volunteer divers to complete a nudibranch "Bioblitz" at Martins Haven. Between 20-34 divers took part in each survey and were assisted by specialist Bernard Picton. The results were impressive with 31 species recorded in 2010, 33 species in 2014 and 29 species in 2018. Combining these records gives a total of 44 species for Martins Haven. The concentrated effort at a single site with volunteer divers has proved incredibly valuable.

5 Skomer MCZ nudibranch species surveys have been completed (2002, 2006, 2010, 2014 and 2018), and when combining the survey data, 69 nudibranch species have been recorded. Of these, 9 species, *Cadlina laevis*, *Doto eireana*, *Onchidoris pusilla*, *Eubranchus vittatus*, *Trapania pallida*, *Palio nothus*, *Fjordia chriskaugei*, *Doto hydrallmaniae* and *Eubranchus linensis* had not been recorded before the 2002 survey. *Doto floridicola* was recorded in both 2014 and 2018, this had been recorded as *Doto sp 'A'* in previous reports and literature, but it was recognised in 2002 as a species already recorded from the Mediterranean and Azores (Picton, 2002). The surveys have proved valuable in adding to the nudibranch species records for the Skomer MCZ.

Lomanotus marmoratus was not recorded on any of the 5 surveys but was recorded and photographed by a volunteer diver in 2013. In addition, a new species for Wales, *Trapania tartanella*, was recorded in the Skomer MCZ in 2009. These records from volunteers are invaluable.

5 nudibranch species were recorded in diving surveys in the Skomer MCZ between 1972 and 2001 but not found since. These are *Cuthona foliata*, *Goniodoris castanata*, *Onchidoris bilamellata*, *Tritonia plebia* and the nationally rare *Polycera elegans* (Bunker, Picton & Morrow, 1992 and Hunnam & Brown, 1975). The habitats and food sources for these species need to be targeted in future surveys.

For all diving surveys (1972 to 2018) in the MCZ a total of 76 species have been recorded, with an additional 3 species recorded from sediment infauna surveys. 79 nudibranch species have thus been recorded in the MCZ from approximately 108 described species from the British Isles (Picton & Morrow, 1994). The diversity of nudibranch species in the Skomer MCZ is very high. The area of the Skomer MCZ is only 13.2 square kilometres and despite only a selection of sites being surveyed, 70% of the UK species have been recorded here. This high diversity is a reflection of the diversity of habitats and environmental conditions found in the Skomer MCZ and the rich communities that they support. As specialised predators nudibranch species have a very selective choice of prey organisms, they are therefore a good indicator of the overall ecosystem health (Luddington, 2002).

A number of the survey sites have a wide range of habitats including rock, sediment and algae communities and thus support a high diversity of nudibranch species. Particularly rich were Prothero's Dock (33 species), Martins Haven (29 species), and Thorn Rock (24 species). Other sites were selected to target specific prey species which are found under particular environmental conditions. An example is the hydroid *Tubularia spp.*, which is the prey of *Cuthona gymnota* and *Dendronotus frondosus* and is found at sites with strong current, such as Tusker Rock and Mew Stone. The most common species (found at 15 or 16 sites) were *Doto fragilis*, *Edmundsella pedata*, *Facelina auriculata*, *Janolus cristatus* and *Polycera faeroensis*, all of which feed on common hydroid and bryozoan species.

The rare and scarce marine species list for the UK (Sanderson, 1996), which includes nudibranch species *Okenia elegans*, *Tritonia nilsodhneri* and *Doris sticta*, is now dated. Species have been since found or described in the UK, for example *Trapania tartanella*, *Eubranchus linensis* and *Diaphorodoris alba*. The most up to date species distribution maps for the UK are from the Marine Recorder national database administered by the Joint Nature Conservation Council and available on the internet via the National Biodiversity Network (NBN) atlas. These distribution maps are useful to highlight notable species in the Skomer MCZ. This includes species with northern distributions (*Doto hystrix*, *Zelentia pustulata*, *Okenia aspersa* and *Doto eireana*) or southern distributions (*Doris sticta* and *Tritonia nilsodhneri*) and those with a widespread distribution but particularly common in the Skomer MCZ (*Facelina annulicornis*). These highlight the importance of Skomer MCZ as a location for high nudibranch diversity.

5. Conclusion

The survey results continue to show a high diversity of nudibranchs within the Skomer MCZ.

The annual target of observing 14 of the 16- species checklist was achieved each year since the last survey in 2014.

The four-yearly survey and contributions from volunteer divers has provided valuable nudibranch species records for the Skomer MCZ, new species records continue to be found.

The long-term data set is now beginning to give us a good indication of species occurrence in the MCZ over time and we are building up a picture of which species tend to be seen every year (e.g. *Doto fragilis*, *Edmundsella pedata*, *Facelina auriculata*, *Janolus cristatus* and *Polycera faeroensis*) and which species occur only occasionally (e.g. *Doris sticta* and *Facelina bostoniensis*).

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 nudibranch 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:

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 nudibranchs in the Skomer MCZ.

6. Recommendations

- Annually complete the 16 species checklist and photograph unusual species for identification during other Skomer MCZ dive survey work;
- Complete a nudibranch species survey in the Skomer MCZ every 4 years, next survey due 2022.
- Skomer MCZ staff to complete specialist identification training.
- Complete a nudibranch “Bioblitz” at Martins Haven with volunteer divers alongside the main survey every 4 years.
- Feed the data into the Pembrokeshire Marine SAC feature condition assessments.

7. Acknowledgements

The nudibranch survey could not have been completed without the support of many people. We are grateful for the help and enthusiasm of our diving volunteers that supported the Skomer MCZ dive team during the 2018 survey: Blaise Bullimore, John Archer Thomson, Kerry Lewis, and Jon Moore.

We are grateful for the help of Bernard Picton, who certainly helped boost both the skills of the team and the numbers of nudibranch found. Bernard brought his dive RIB and dived independently with a small team of volunteer divers: Jane Morgan, Hayden Close, Stephanie Eccles, Karl Mason, Matt Perkins, Erin Smyth-Evans and Ross Bullimore.

Finally, many thanks to all the Seasearch volunteer divers who contributed their records from Martins Haven on the ‘Nudibranch Bioblitz’.

Photos are an essential part of the survey; all photos have been credited in this report as follows:

Skomer MCZ diving team:

MB	Mark Burton
KL	Kate Lock
PN	Philip Newman
JJ	Jennifer Jones

Volunteer divers:

BEP	Bernard Picton
JAT	John Archer Thomson
BB	Blaise Bullimore
KLE	Kerry Lewis
DK	David Kipling
HC	Hayden Close
JM	Jane Morgan
RG	Rob Gibbs

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World Register of Marine Species www.marinespecies.org

APPENDIX 1.

Nudibranch species records, Hunnam & Brown 1975.						
Diving surveys completed 1972 and 1973						
	Martins Haven	Jack Sound	North Neck	North Wall	Wick	High Cliff
<i>Acanthodoris pilosa</i>	1				1	
<i>Aegires punctilucens</i>	1			1		
<i>Ancula gibbosa</i>	1					
<i>Cadlina laevis</i>		1		1		
<i>Crimora papillata</i>	1	1	1	1		1
<i>Diaphorodoris luteocincta</i>	1	1	1			1
<i>Doris pseudoargus</i>	1	1				
<i>Doris sticta</i>	1			1		
<i>Geitodoris planata</i>	1					
<i>Doto coronata</i>		1				
<i>Doto fragilis</i>	1	1	1	1		
<i>Doto pinnatifida</i>	1	1	1	1		
<i>Eubranchus exiguus</i>		1	1			
<i>Eubranchus farrani</i>	1	1	1			
<i>Eubranchus tricolor</i>		1				
<i>Facelina annulicornis</i>	1	1	1	1		
<i>Facelina auriculata</i>	1	1	1	1		
<i>Facelina bostoniensis</i>	1					
<i>Favorinus blianus</i>	1					
<i>Edmundsella pedata</i>	1	1	1			
<i>Goniodoris nodosa</i>	1	1	1		1	
<i>Goniodoris castanea</i>		1				
<i>Janolus cristatus</i>	1	1				
<i>Jorunna tomentosa</i>				1		
<i>Limacia clavigera</i>	1	1		1		
<i>Okenia elegans</i>						1
<i>Onchidoris bilamellata</i>			1			
<i>Polycera elegans</i>				1		
<i>Polycera faeroensis</i>	1	1	1			1
<i>Polycera quadrilineata</i>	1	1	1			
<i>Rostanga rubra</i>			1			
<i>Tergipes tergipes</i>		1	1			
<i>Tritonia lineata</i>	1	1		1		1
<i>Tritonia hombergii</i>	1	1		1		1
<i>Tritonia plebeia</i>			1			
	23	22	16	13	2	6

APPENDIX 2.**16-species checklist to be observed annually in the Skomer MCZ**

Number of species	Species	Food preference
1	<i>Acanthodoris pilosa</i>	<i>Alcyonidium diaphanum</i>
2	<i>Doris pseudoargus</i>	Sponges
3	<i>Crimora papillata</i>	<i>Chartella papyracea</i> and <i>Securiflustra securifrons</i> .
4	<i>Diaphorodoris luteocincta</i>	<i>Crisia</i> spp.
5	<i>Doto fragilis</i>	<i>Nemertesia ramosa</i> and <i>Halecium halecinum</i> .
6	<i>Doto pinnatifida</i>	<i>Nemertesia antennina</i> .
7	<i>Eubranchus farrani</i>	<i>Obelia</i> sp. and <i>Aglaophenia pluma</i>
8	<i>Facelina annulicornis</i>	Hydroids
9	<i>Facelina auriculata</i>	<i>Obelia geniculata</i> and <i>Tubularia</i> spp.
10	<i>Edmundsella pedata</i>	<i>Eudendrium</i> spp.
11	<i>Janolus cristatus</i>	<i>Bugula</i> spp.
12	<i>Limacia clavigera</i>	<i>Electra pilosa</i>
13	<i>Polycera faeroensis</i>	<i>Crisia</i> spp. and <i>Bugula</i> spp.
14	<i>Polycera quadrilineata</i>	<i>Membranipora membranacea</i>
15	<i>Tritonia lineata</i>	Possibly octocorals
16	<i>Tritonia nilsodhneri</i>	<i>Eunicella verrucosa</i>

APPENDIX 3

Species names and authority recorded in this report

Acanthodoris pilosa (Abildgaard in Müller, 1789)
Aegires punctilucens (d'Orbigny, 1837)
Aeolidia papillosa (Linnaeus, 1761)
Ancula gibbosa (Risso, 1818)
Cadlina laevis (Linnaeus, 1767)
Catriona aurantia (Couthouy, 1838)
Crimora papillata Alder & Hancock, 1862
Cuthonella concinna (Alder & Hancock, 1843)
Diaphoreolis viridis (Forbes, 1840)
Dendronotus frondosus (Ascanius, 1774)
Diaphorodoris alba (Portman & Sandmeier, 1960)
Diaphorodoris luteocincta (M. Sars, 1870)
Doris pseudoargus (Rapp, 1827)
Doris sticta (Iredale & O'Donoghue, 1923)
Doto coronata (Gmelin, 1791)
Doto cuspidata (Alder & Hancock, 1862)
Doto dunnei (Lemche, 1976)
Doto eireana (Lemche, 1976)
Doto floridicola (Simroth, 1888)
Doto fragilis (Forbes, 1838)
Doto koenneckeri (Lemche, 1976)
Doto hydrallmaniae (Morrow, Thorpe & Picton, 1992)
Doto hystrix (Picton & Brown, 1981)
Doto lemchei (Ortea & Urgorri, 1978)
Doto maculata (Montagu, 1804)
Doto millbayana (Lemche, 1976)
Doto pinnatifida (Montagu, 1804)
Doto tuberculata (Lemche, 1976)
Edmundsella pedata (Montagu, 1815)
Embletonia pulchra (Alder & Hancock, 1844)
Eubranchus doriae (Trinchese, 1874)
Eubranchus exiguus (Alder & Hancock, 1848)
Eubranchus farrani (Alder & Hancock, 1844)
Eubranchus linensis (Garcia-Gomez, Cervera & Garcia, 1990)
Eubranchus pallidus (Alder & Hancock, 1842)
Eubranchus tricolor (Forbes, 1838)
Eubranchus vittatus (Alder & Hancock, 1842)
Facelina annulicornis (Chamisso & Eysenhardt, 1821)
Facelina auriculata (Müller, 1776)
Facelina bostoniensis (Couthouy, 1838)
Favorinus branchialis (Rathke, 1806)
Favorinus blianus Lemche & Thompson, 1974
Fjordia browni (Picton, 1980)
Fjordia lineata (Lovén, 1846)
Fjordia chriskaugei (Korshunova et al 2017)

Geitodoris planata (Alder & Hancock, 1846)
Goniodoris nodosa (Montagu, 1808)
Goniodoris castanea Alder & Hancock, 1845
Janolus cristatus (Delle Chiaje, 1841)
Jorunna tomentosa (Cuvier, 1804)
Limacia clavigera (O. F. Müller, 1776)
Lomanotus genei (Vérany, 1846)
Lomanotus marmoratus (Alder & Hancock, 1845)
Microchlamylla gracilis (Alder & Hancock, 1844)
Okenia aspersa (Alder & Hancock, 1845)
Okenia elegans (Leuckart, 1828)
Onchidoris muricata (O. F. Müller, 1776)
Onchidoris pusilla (Alder & Hancock, 1845)
Onchidoris oblonga (Alder & Hancock, 1845)
Onchidoris sparsa (Alder & Hancock, 1846)
Palio nothus (Johnston, 1838)
Polycera elegans (Bergh, 1894)
Polycera faeroensis Lemche, 1929
Polycera quadrilineata (O. F. Müller, 1776)
Rostanga rubra (Risso, 1818)
Rubramoena amoena (Alder & Hancock, 1845)
Rubramoena rubescens Picton & Brown, 1978
Tergipes tergipes (Forsskål in Niebuhr, 1775)
Thecacera pennigera (Montagu, 1815)
Trapania pallida (Kress, 1968)
Trapania tartanella (Von Ihering, 1886)
Trinchesia caerulea (Montagu, 1804)
Trinchesia foliata (Forbes & Goodsir, 1839)
Tritonia lineata (Alder & Hancock, 1848)
Tritonia hombergi (Cuvier, 1803)
Tritonia nilsodhneri (Marcus Ev., 1983)
Tritonia plebeia Johnston, 1828
Zelentia pustulata (Alder & Hancock, 1854)

APPENDIX 4**Skomer MCZ site code abbreviations**

SITE No.	ABBREVIATION	SITE NAME
1	MHVe	Martins Haven east
2	MHVw	Martins Haven west
3	JUN	Junko's Reef
4	TRK	Thorn Rock
5	SMD	South Middleholm
6	TSK	Tusker Rock
7	PRO	Prothero's Dock
8	MST	Mew Stone
9	WBY	Wick Basin Gully
10	WAY	Waybench
11	WHK	West Hook
12	RRK	Rye Rocks
13	HCR	High Court Reef
14	GST	Garland Stone
15	BHO	Bull Hole
16	MHV	Martins Haven shore

APPENDIX 5

National Biodiversity Network Atlas: www.data.nbn.org.uk

Data provided by:

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Seasearch

Centre for Environmental Data and Recording

Marine Biological Association

Porcupine Marine Natural History Society

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