Cyfoeth Naturiol Cymru
Natural Resources Wales

Skomer Marine Conservation Zone Annual Report 2017

Phil Newman, Kate Lock, Mark Burton, Jen Jones

NRW Evidence Report 250

About Natural Resources Wales

Natural Resources Wales is the organisation responsible for the work carried out by the three former organisations, the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales. It is also responsible for some functions previously undertaken by Welsh Government.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future.

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.

Evidence at Natural Resources Wales

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

We will realise this vision by:

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

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

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Contents

1. Crynodeb Gweithredol

Dyma Adroddiad Blynyddol Parth Cadwraeth Morol Sgomer (GNFS) i'w Phwyllgor Ymgynghorol. Mae'r Pwyllgor Ymgynghorol yn cynnwys sefydliadau ac unigolion sydd â diddordeb yn yr ardal y mae GNFS yn ymdrin â hi.

Fe fydd yr adroddiad yn crynhoi pob agwedd ar waith GNFS, gan gynnwys dadansoddiad o amser gwaith maes y staff, gwaith stad, y defnydd a wneir o'r warchodfa wrth hamddena, digwyddiadau, gwaith cydgysylltu, wardenio, patrolio, monitro a gwaith ymchwil. Hefyd, mae canlyniadau rhai prosiectau monitro a rhai o grynodebau adroddiadau sydd wedi eu cyhoeddi, wedi eu cynnwys yma.

2. Executive Summary

This is the Skomer Marine Conservation Zone Annual Report to its Advisory Committee. The Advisory Committee is made up of organisations and individuals with an interest in the area covered by the MCZ.
The report summarises all aspects of the work of the MCZ including a breakdown of staff fieldwork, estate work, recreational use of the reserve, incidents, liaison, wardening, patrol, monitoring and research. Also included are results of some monitoring projects and summaries of published reports.

3. SMCZ and SMNR

The Environment (Wales) Act and the Wellbeing of Future Generations (Wales) Act provide the framework for NRW's work to pursue the sustainable management of natural resources (SMNR) as defined in the former whilst maximising our contribution to the well-being goals set out in the latter.

Sustainable management of natural resources follows nine main principles and the work of Skomer MCZ can be shown to apply (and to have been applying for many years) these principles:

Adaptive management – the management of Skomer MCZ is not set in stone. Our monitoring programme provides the evidence we need to review our management actions and where necessary change them.

Scale – whereas the boundary of the site was decided decades ago, our extensive knowledge of the MCZ allows us to apply aspects of our management to specific and appropriate areas. For instance, we are confident that the seabed in South Haven and parts of North Haven can tolerate current and historical levels of recreational anchoring, but the rest of the site cannot. This allows us to identify areas where recreational anchoring can happen rather than try to impose a blanket ban on anchoring. Similarly, we would not wish to restrict access to the coastline of Skomer without good reason when it is specific small areas that are more sensitive to disturbance at different times of year. For this reason our seasonal access restrictions are designed to protect breeding seals and birds at the most sensitive sites in the autumn and spring respectively.

Collaboration and engagement – this report demonstrates the importance we place upon liaison with academic institutions to increase our knowledge of the site by providing help with research projects. This report further documents our connections with regulatory and recreational organisations to ensure legal and voluntary measures are effective in protecting the site. The Skomer MCZ Advisory Committee is pivotal in this respect.

Public participation – without public participation we would be unable to carry out nearly as much monitoring work as we do. From teams of volunteer divers carrying out intensive surveys of things like scallops and eelgrass to individuals making up our own dive team to allow work to continue in the absence of staff, we are dependent on volunteers. Our voluntary controls would be unworkable without public support and the local community provide valuable help in safeguarding the site through their vigilance.

Evidence – gathering evidence is our bread and butter, whether we are collecting it ourselves or relying on our extensive collaborative network to provide it to us.

Multiple benefits – we are fully aware of the intrinsic value of a site such as Skomer MCZ where people can come to enjoy wildlife in as unspoilt a marine area as we are likely to have anywhere in Wales. We can only theorise on the level of benefits to the wider marine environment of larval export from communities and species deriving a high level of protection as a result of the fishery byelaws we have.

Long term – at Skomer MCZ we are in an almost unique position to be able to report on the long-term consequences of marine conservation management actions taken over two decades ago, and our continued contribution to the long-term datasets will help us making informed decisions well into the future.

Preventative action – the site-based nature of the team at Skomer MCZ is a major contributory factor in the protection of the site. We are able to respond quickly to potentially damaging events and intervene. Sometimes this is by our mere presence acting as a deterrent, sometimes by educating those who might cause harm unknowingly.

Building resilience – by applying nature conservation principles we can help to build diversity, populations, and connectivity; all of which contribute to the maritime ecosystem's resilience in the face of anthropogenic change.

4. Introduction and Foreword

Although all routine monitoring projects were carried out this year our diving activity was much reduced due to a combination of circumstances. We were fortunate in that good weather coincided with the tides we needed for shore surveys, which dominated August, but in between conditions were unsuitable for underwater operations, including our planned participation in surveys of the eelgrass beds in Milford Haven in support of our NRW Specialist Monitoring Team colleagues.

We were, however, able to carry out grab sampling for the Milford Haven Surveillance Group, dodging the Irish ferry and other marine traffic in our quest for muddy gravel. What the specialists analysing the samples made of some of the objects we found can only be guessed. The bullet (right) and the Brylcreme jar reminding us of the wartime history of the area.

Our volunteer divers also experienced "taxing" conditions during the trip out to Skomer, with the seas around St Anne's head doing their best to entertain us. The survey sites themselves were a lot friendlier and the volunteers completed 130 territorial fish transects over the two weekends. Full marks to the volunteers for persevering and to the charter boat skippers for getting us all round to the MCZ in one piece.

Arrangements for placements and volunteers now come under NRW's new *Cyfle* scheme, which is a work in progress and will not be in full operation until next year. This means that we have not been able to take on any placements during 2017, but we have assisted a number of students with projects, including long-term volunteers on Skomer looking at fish populations in North Haven and clingfish numbers and egg production on North Haven landing beach. We have also assisted a student from Swansea university, also looking at fish populations, but in eelgrass beds and kelp areas around the country.

In the meantime, our volunteers are getting their expenses paid without problems and we've come to a new arrangement with the Wildlife Trust for their Lockley Lodge staff to open the MCZ exhibition. Thanks to their enthusiasm the exhibition has been open on more days and for longer hours than ever before.
The exhibition appeared on the BBC Springwatch programme in 2017, when swallows nested in the pilot whale skull that is part of the display and video of the happy family featured on the BBC (and NRW) website.

Other news on the interpretation front is that we've had new information panels produced for Martins Haven.

Another interesting project we were asked to help with is a plan to kick-start reef regeneration using modular glass "Sea-Hives". We have two miniature prototypes deployed at Thorn rock and at the OMS, where we can photograph them as we pass by during our routine visits to the sediment traps at those sites.

Well, that was the good news and now, as they say, for something completely different:

We can not only confirm that the high number of sea fans lost in 2016 was correct, but also this season we were unable to find a further 4 fans, each from different sites around the MCZ, including one from the Bull Hole site that suffered so badly last year. In addition to this tally one large fan at the Pool site was gone this year, despite having survived since it was artificially reattached to the seabed in 2012.

A lucky survivor

As you are all probably aware from news and social media, ex-hurricane Ophelia and storm Brian were devastating for the seal pups around the Pembrokeshire coast striking as they did when large numbers of pups were still on the beaches. Well over 100 seal pups disappeared from mainland and island beaches within the MCZ and it has to be assumed that a large proportion of these were killed.

Having said that we have seen the seal population recover from low pup numbers in the early years of recording, so provided the adult population weathered the storms we hope this is just a temporary setback to the population.

It is with great sadness that we report the recent death of one of our early volunteers and stalwart supporter, Steve Myatt. Steve came to us as a volunteer but also to carry out a project as part of the degree course he was undertaking at Pembrokeshire College, while also serving as firefighter and rescue unit diver with Mid and West Wales Fire Service.

Steve's enthusiasm and good humour made him a pleasure to have as part of our team, even if sometimes he was a bit bemused by our mad scientist antics. We will always have fond memories of him.

5. Staff

5.1. Staffing

The staff complement at Skomer MCZ has remained the same: Phil Newman, Kate Lock, Mark Burton and Jen Jones make up the NRW team based at Martins Haven.

Smurfs or Blue Meanies – you decide

5.2. Volunteers

There have been changes to the way we are able to make payments to our volunteers. This has meant the demise of the old system of making "honorarium" payments, which was used to cover volunteers' expenses, but also as a token payment to demonstrate our gratitude for their assistance. The new system is less ad-hoc and provides only reimbursement for expenses.

NRW's new system, Cyfle, is intended to provide recruitment, co-ordination, support and management of volunteers, student placements, and those undertaking work experience. It is intended that a web-based system will make access to these opportunities easier to find. MCZ staff have been involved in the design stages of the scheme to ensure there is no impact on our volunteers. However, due to a lack of resources the scheme is still on hold and therefore we are currently unable to take on new student placements or work experience students.

In 2017 the MCZ team was supported by number of volunteers across a range of projects, including diving projects, intertidal survey, weekend boat patrol work and even winter sampling for the lagoon monitoring programme. The staff of the Wildlife Trust South and West Wales (WTSWW) shop at Lockley Lodge also helped MCZ staff by opening the MCZ exhibition at times when MCZ staff were unavailable and helped to ensure that the exhibition remained open whenever visitors were around. Their enthusiastic efforts are evident in the visitor figures for the exhibition (see Section 11.1).

The territorial fish survey was carried out entirely by volunteer divers under the supervision of a local dive charter company. The project involved divers from all over the UK and included divers from the School of Archaeology, History and Anthropology, University of Wales Trinity Saint David in Lampeter. (see Section 10.1.2).

We also stooped to poaching other people's volunteers and two of WTSWW's long-term volunteers were enticed into carrying out marine projects during their stay on Skomer. Ruby Temple-Long studied the clingfish (*Lepadogaster lepadogaster*) population at North Haven and Jake Taylor-Bruce, used MCZ camera equipment in his studies of marine fauna in North Haven (see Section 9.6 and Appendices 2 and 3).

5.3. Development and training

Skomer MCZ's annual dive safety refresher training event was held in April 2017. Instructors from West Wales Dive Company put MCZ staff and diving volunteers through their safety paces to ensure all were familiar with safety procedures and equipment aboard *Skalmey*.

Phil undertook media training as NRW sought to expand its pool of potential interviewees.

Kate did her first aid refresher early in 2018.

All MCZ staff attended a training event on the principles of Sustainable Management of Natural Resources and Phil gave a presentation on how these are inherent in the work of the MCZ.

Phil, Mark and Jen attended a maritime incident response workshop on 25th May 2017 and Mark went to an in-house training event for Water Framework Directive saltmarsh monitoring methodology.

Kate delivered a Shoreline Clean-up and Assessment (SCAT) course for Pembrokeshire County Council to great acclaim and Jen attended as a trainee.

Congratulations to Mark, who was granted full membership of the Chartered Institute of Ecology and Environmental Management (CIEEM) in 2017.

5.4. Health and Safety

MCZ staff continue to maintain health and safety documentation linked to diving and boat operations as well as more routine office-based safety elements.

No accidents or near-misses were recorded at Skomer MCZ during 2017.

5.5. Diving operations

Diving operations at Skomer MCZ continue to operate under the Scientific and Archaeological Diving Agreed Code of Practice, with staff assuming the legal responsibilities associated with the role of diving supervisor and Phil acting as NRW's Diving Project Manager.

Phil also acts as NRW's representative on the Scientific Diving Supervisory Committee, which is the HSE recognised representative body for the Scientific and Archaeological sector.

Diving figures for 2017 are substantially lower than previous years. There are a number of reasons for this: MCZ participation in the settlement plate project with Natural History Museum and the Polish Institute of Oceanography came to an end at the beginning of the year and the sponge monitoring project was cut back to annual sampling rather than attempting to make seasonal visits to the site. Despite this we were unable to invest the time saved in expanding other projects to more sites as hoped. A combination of bad weather, ill-health and a requirement to take leave left us accomplishing our core monitoring programme, but no more.

Table 5.1 Summary of MCZ Diving Activity 2017

	MCZ STAFF	CONTRACT & VOLUNTEER DIVERS	TOTAL
Dives	133	16	149
Dive time (min)	3987	517	4504
Dive time (hrs)	66.45	8.62	75.07
Average dive time (mins)	30	32	30.23
Diving days			27

Figure 5.1 Summary of MCZ Diving Activity 2017

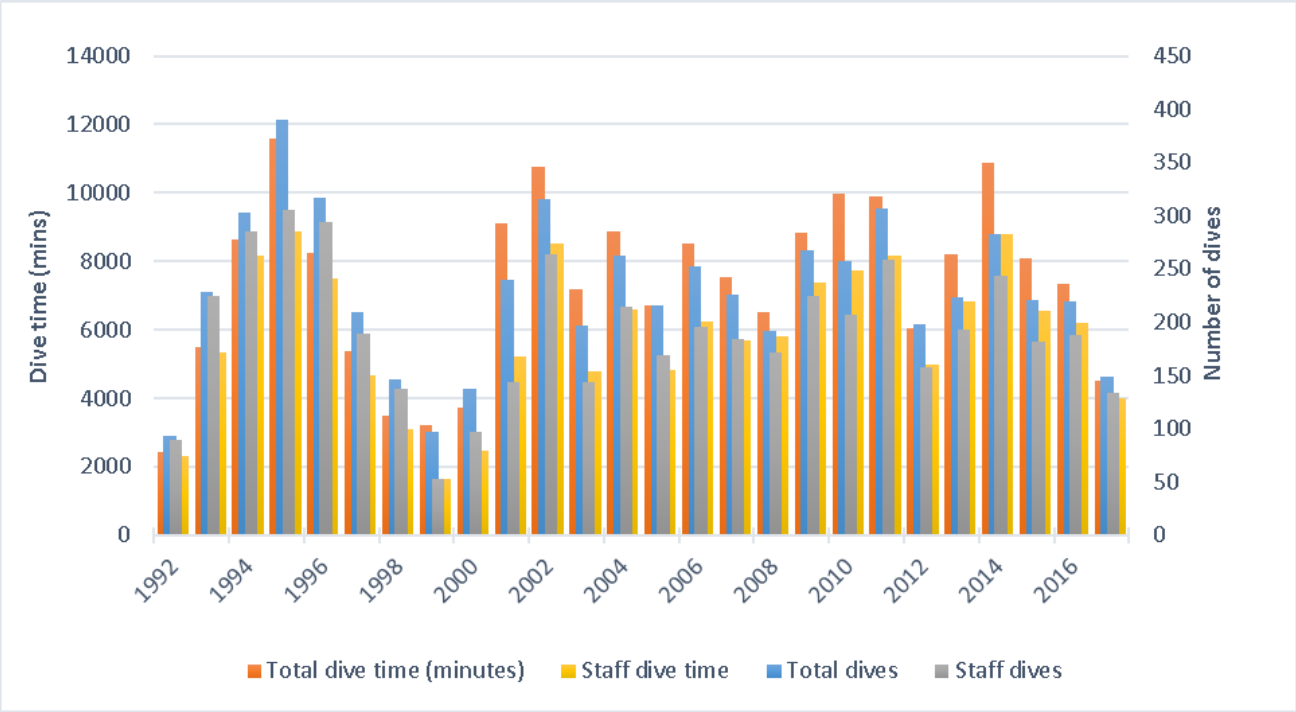


Figure 5.2 Skomer MCZ Diving Operations 2017 – dive time

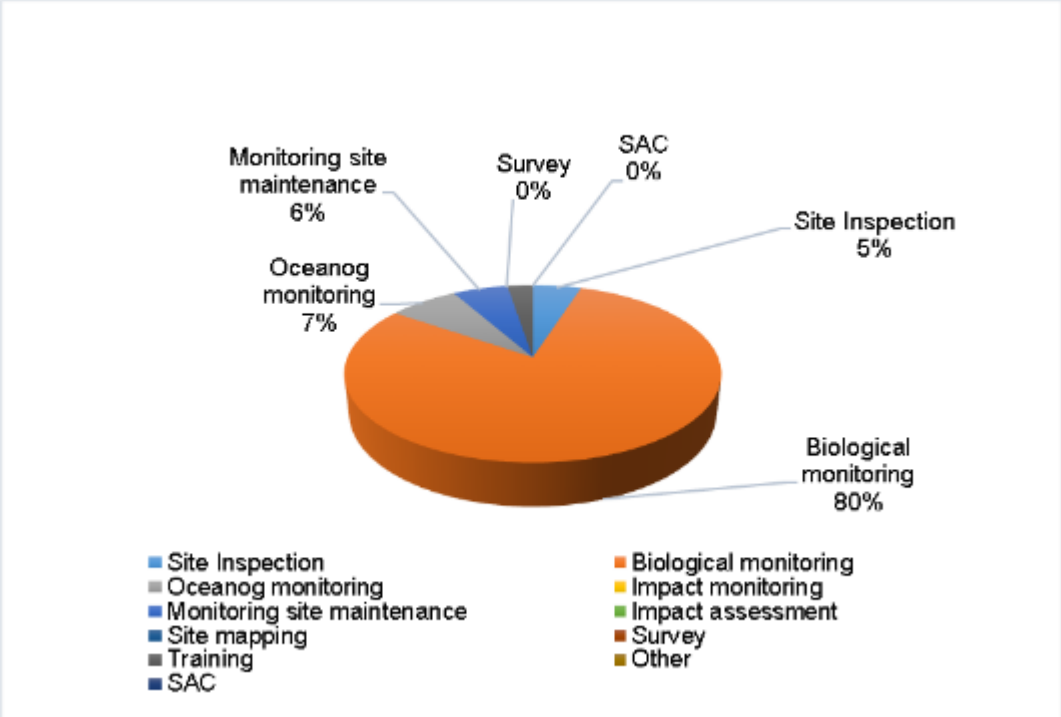


Figure 5.3 Skomer MCZ Diving Operations 2017 – number of dives

6. Estate

6.1. Buildings

Replacing the former storage barn at Runwayskiln has turned into quite a saga:

Initially an alternative was found at the former Dale airfield, where the former NAAFI hut has been converted in to a storage building. With the help of the landlords all our boats, trailers and more durable items were transferred to the site, which was an improvement on the old barn in terms of ease of access for trailers and availability of electricity and water.

Unfortunately, NRW's buildings team were not as taken with the building's rustic charm (and very reasonable rent) as we were and promptly told us to stop using the building!

Further enquiries by Mark revealed that an industrial unit in Milford Haven was about to become available, albeit at a much higher rent. NRW buildings team gave their blessing and everything was moved to the new unit by the end of February 2018 with the help of colleagues Stewart Ryan and Paul Culyer from Stackpole.

The new unit does have a number of advantages over the Dale site, being a purpose-built industrial unit with good access, mains services and even a toilet. This has allowed us to move some of the less robust equipment we formerly stored in our rather cramped offices at Martins Haven into the unit. Also, accommodation changes in other parts of NRW and the magpie eye of our local facilities manager have meant we can equip the unit with better shelving and storage that was otherwise surplus to requirement.

Signage at Martins Haven office has been replaced in line with NRW's corporate design (see Sections 7.2 and 11.1 for details).

The MCZ office and exhibition continue to be maintained by contractors and all waste handling, use of consumables and energy are monitored in accordance with ISO14001. An external environmental audit is scheduled for July 2018.

6.2. Boats

Skalmey spent 49 days at sea in 2017 and logged 145 engine hours.

Skalmey is the main workhorse of the MCZ and acts as dive support vessel, mooring maintenance tender and for grab sampling work, which this year was in support of the Milford Haven Waterway Environmental Surveillance Group in the Milford Haven waterway (see Sections 10.4). Skalmey was even pressed into service to return Skomer Island's boat trailer to the mainland (see Section 9.2).

Skalmey underwent its 5-yearly survey in March 2018 in order to comply with the Maritime and Coastguard Agency Small Workboat Code. This has involved a number of modifications and upgrades to the vessel's safety equipment, most of which was original to the boat when it was delivered 25 years ago. This includes higher and more continuous rails around the deck and better positioning of navigation lights.

Part of the survey involved a stability test with the lifting A-frame fully loaded, so Mark arranged for our lifting gear to be tested by our usual contractors at the same time.

The MCZ rigid hull inflatable *Morlo* spent 36 days at sea and logged 97 engine hours in 2017.

Morlo was mainly used for intertidal monitoring, seal work and weekend patrols.

During the winter Morlo was equipped with new outboard motors as the previous ones were coming to the end of their normal life and were becoming more temperamental.

Outboards still in their wrappers

The small inflatable tender was, as ever, very useful for our lagoon sampling efforts, especially at Carew millpond (see Section 10.4).

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Days at sea																		
Skalmey	42	48	73	77	52	48	58	72	58	61	69	99	95	65	70	73	69	49
SkalmeyII/Morlo	38	31	37	32	40	43	40	38	36	38	48	36	35	30	43	32	34	36
Total	**80**	**79**	**110**	**109**	**92**	**91**	**98**	**110**	**94**	**99**	**117**	**135**	**130**	**95**	**113**	**105**	**103**	**85**
MCZ Staff seatime (hrs)																		
Skalmey	492.5	622	883	777	640	618	621	933	685	747	718	942	743	684	815	743	753	467
SkalmeyII/Morlo	254	226	277.4	279	461	405	331	339	278	278	295	313	234	188	288	188	219	220
Total	**746**	**847**	**1160**	**1056**	**1101**	**1023**	**952**	**1272**	**962**	**1025**	**1013**	**1255**	**977**	**872**	**1103**	**931**	**972**	**687**
MCZ Staff days at sea																		
Skalmey	96	129	225	205	154	158	165	202	170	189	183	279	253	178	211	193	198	143
SkalmeyII/Morlo	60	58	80	70	104	99	86	84	73	73	93	76	75	65	89	60	72	78
Total	**156**	**187**	**305**	**275**	**254**	**257**	**251**	**286**	**243**	**262**	**276**	**355**	**328**	**243**	**300**	**253**	**270**	**221**
Other Staff seatime (hours)																		
Skalmey	274	197	204	88	76.7	75.25	233	257	107	225	390.4	220	279	140	220	150	220	96
SkalmeyII/Morlo	106	89	89.7	69	107	88	142.5	77	113	77.5	157	51	50	39	100	89	118	55
Total	**379**	**286**	**293**	**157**	**184**	**163**	**376**	**334**	**220**	**303**	**547**	**271**	**329**	**179**	**320**	**239**	**338**	**151**
Other Staff days at sea																		
Skalmey	40	36	23	21	15	18	30	26	26	57	94	48	83	35	57	50	58	32
SkalmeyII/Morlo	17	19	22	15	21	17	22	12	29	18	35	11	14	9	24	28	36	19
Total	**57**	**55**	**45**	**36**	**36**	**35**	**52**	**38**	**55**	**75**	**129**	**59**	**97**	**44**	**81**	**78**	**94**	**51**
Total Staff seatime (hrs)																		
Skalmey	766	819	1087	865	717	693	854	1190	791	973	1109	1162	1022	825	1034	893	973	563

SkalmeyII/Morlo	360	315	367	348	568	493	473	416	392	355	452	313	284	227	388	277	337	275
Total	**1126**	**1134**	**1454**	**1213**	**1285**	**1186**	**1328**	**1606**	**1183**	**1328**	**1561**	**1475**	**1634**	**1051**	**1422**	**1170**	**1310**	**838**
Total Staff days at sea																		
Skalmey	213	242	248	226	169	176	195	228	196	246	277	327	336	213	268	243	256	175
Morlo	77	77	102	85	125	116	108	96	102	91	128	87	89	74	113	88	108	97
Total	**213**	**319**	**329**	**311**	**294**	**292**	**303**	**324**	**298**	**337**	**405**	**414**	**425**	**287**	**381**	**331**	**364**	**272**
Engine hours																		
Skalmey	188.03	181.1	245.3	284.54	171.07	150.16	169	244.38	168.62	224	241	322	266	222	249	284	237	145
SkalmeyII/Morlo	142	99	118	96	162.7	160	141.25	120.5	144.67	139	157	118	110	139	137	98	105	97
Total	**330**	**280.1**	**363.3**	**380.54**	**333.8**	**310.2**	**310.25**	**364.9**	**313.3**	**363**	**398**	**440**	**376**	**361**	**386**	**382**	**342**	**242**

MCZ Staff = Philip Newman, Kate Lock, Mark Burton, Jen Jones
Other Staff = NRW Staff and Volunteers

Staff days at sea = total days on which each member of staff went out in a boat.

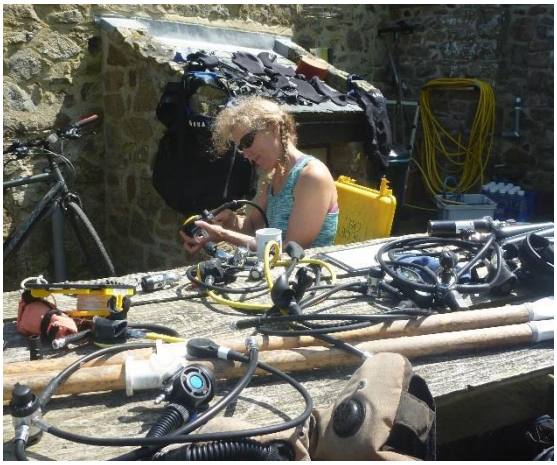
Staff seatime = total of each member of staff's seatime.

Boat days at sea = number of times the boat left its moorings.

6.3. Equipment

6.3.1. Safety, diving and protective equipment

All safety-critical, diving or protective equipment is serviced and maintained to regulatory or manufacturer's requirements.



6.3.2. Optical, photographic and scientific

Photographic equipment continues to be serviced by contractor on an annual basis with routine maintenance carried out by MCZ staff.

Scientific equipment is serviced and calibrated according to manufacturer recommendations with minor maintenance (battery replacement, etc.) carried out by MCZ staff.

6.4. Marine estate work

Following the wholesale renewal of moorings in North Haven last year, maintenance of visitor and MCZ moorings consisted mainly of checking and renewing shackles in 2017.

Early season dives to redeploy the sediment traps at Thorn Rock were thwarted when the seabed frame was found to have gone "AWOL" during the winter. It was subsequently relocated several metres away and repositioned, only for the same to happen at the end of the season. On that occasion visibility was too poor to be able to find the frame, but we hope to find it early in 2018.

The "no-anchoring" buoys came under the normal annual scrutiny of Trinity house as they are officially navigation buoys.

7. Management

7.1. Wardening and Patrol

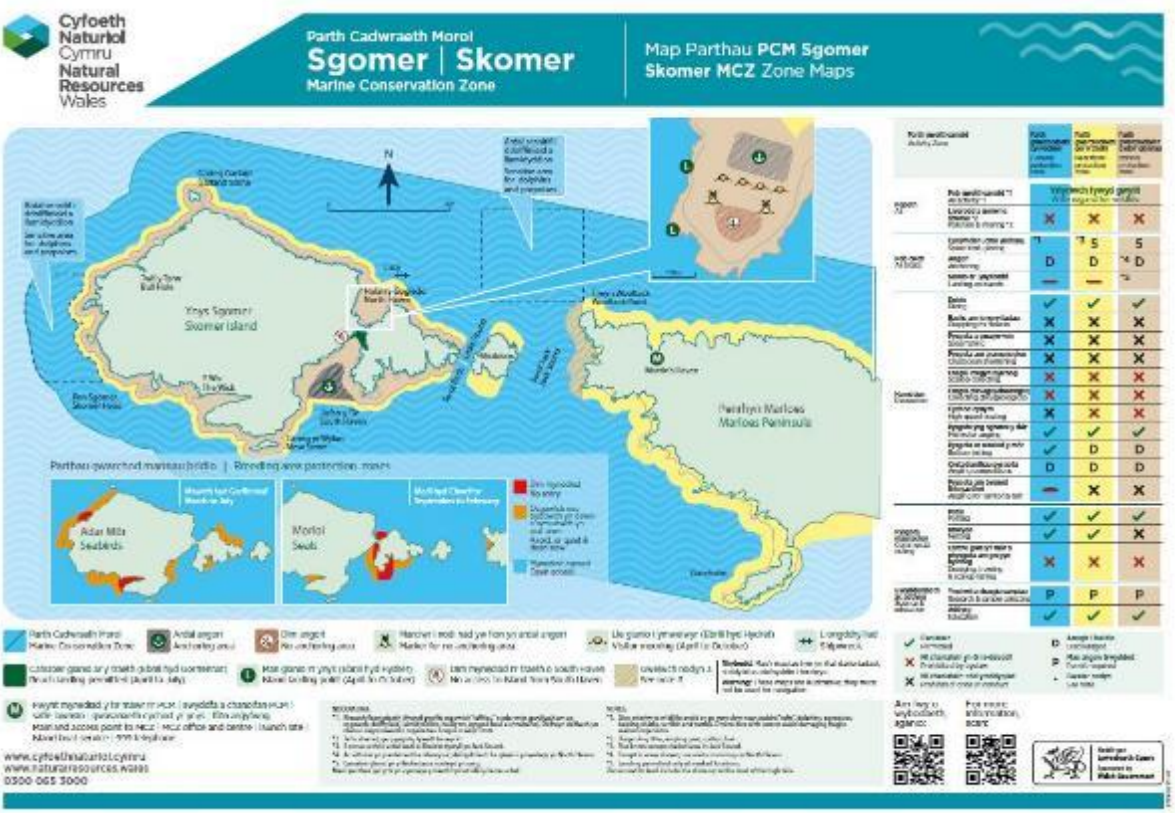
Skomer MCZ staff carried out boat patrols on 20 Sundays and Bank Holiday weekend days between the end of April and September 2017. To make best use of sea time mapping of fishing effort (see Section 8.1) and sampling for water quality and plankton monitoring (see Sections 10.2.4 and 10.1.7) were carried out during these patrols.

Observations of visiting recreational and commercial users were also made during routine monitoring visits and when MCZ staff were aboard the volunteer diving survey support vessels, in 2017 for the territorial fish surveys.

See Section 8 for all data relating to visitors and use of the MCZ.

7.2. Information

The production of the new MCZ signage at Martins Haven provided an opportunity to comprehensively update the zone map in NRW's corporate style and incorporating elements missing from the original such as the cetacean areas and correct top-marks for the North Haven no-anchoring buoys.



We still have stocks of the old format waterproof zone map leaflet, and, while they last, these will continue to be issued to boating visitors as the information on them is still relevant.

See Section 11.1 for developments with the Skomer MCZ booklet.

7.3. Management Issues

7.3.1. Dredging/beam trawling

No illegal dredging or beam trawling was recorded or reported to MCZ staff in 2017.

7.3.2. Potting

Commercial fishing vessels operating in the MCZ are listed in Section 8.1 and fishing effort records are presented in Figures 8.1 and 8.2.

7.3.3. Tangle and gill netting

No tangle or gill netting was observed in 2017.

7.3.4. Collection of shellfish by divers

No collection of shellfish by divers was observed in 2017.

7.3.5. Collection of curios

No collection of curios was observed in 2017.

7.3.6. Collection of specimens for education and research

Skomer MCZ staff encountered staff from Aberystwyth University and one of Plymouth's academic institutions collecting kelp samples from sites in Pembrokeshire and were able to advise them where they could collect samples in the MCZ without damaging monitoring sites (and notifying them that they required a licence).

7.3.7. Disturbance or entanglement of seals

Disturbance and entanglement of seal is recorded as part of the Skomer seal monitoring contract and by MCZ staff. In 2017 25 Skomer animals (15 females, 6 males, 4 immature) were photographed with obvious signs of having been entangled in nets at some time in their lives, most commonly a deep scar around their necks, often with netting still embedded. Seven of the animals with old scars were known from previous years.

No cases of disturbance to seals were recorded at mainland sites. Seal watching leaflets and information was given to the visiting public during the seal pup season. There were a number of seal disturbance incidents recorded by Skomer Island Wardens. Most incidents involved loafing seals going into the water in response to the proximity of recreational boats and kayaks, but on one occasion kayaks were observed on South Haven beach near a seal pup.

7.3.8. Disturbance to cliff-nesting birds

Bird disturbance came from several sources in 2017 including kayaks, recreational motor boats and commercial fishing vessels and at sites including the Wick, Protheroe's Dock and North Haven.

7.3.9. Spear-fishing

Two spearfishermen were encountered by MCZ staff off the Crab Stones in 2017. When approached, they said they were aware that the area was a Marine Conservation Zone, but not that we have a no-spearfishing code of conduct within the site. They said they had enquired about this via their association, but had been told there were no restrictions. They were quite happy to cooperate by moving to a site outside of the MCZ at our suggestion.

Phil wrote to the secretary of the British Spearfishing Association to ask for the links to the MCZ visitor information website to be circulated among their membership and to pass our thanks on to the members we had met for being so understanding.

7.3.10. Angling

See Section 8.2 for records of visiting anglers. Neptune's Army of Rubbish Collectors (NARC) have continued to target sites within the MCZ for their seabed litter collection activities, and their leaflets advising anglers how best to avoid snagging and losing tackle in the Martins Haven area continue to be well-received.

7.3.11. Mooring and anchoring

Compliance with the no-anchoring code of conduct by visiting recreational and commercial vessels continues to be good with most vessels anchoring only in permitted areas of North and South Haven.

The visitor moorings in North Haven continue to be popular with all visiting vessels.

7.3.12. General boating

No comments further to sections above.

7.3.13. Wrecks

The buoy marking the wreck of the *Lucy* remained attached throughout most of 2017 before disappearing towards the end of the diving season. MCZ staff will re-establish the buoy in 2018 as the *Lucy* continues to be popular with visiting divers and made up about 22% of dives carried out in 2017.

7.3.14. Oil pollution

No oil pollution was recorded at Skomer MCZ during 2017.

7.3.15. Litter

A large polystyrene buoy was washed up on Marloes Sands and reported to NRW via Pembrokeshire County Council staff and directly by local community members to MCZ staff. There was a fear that about 2500 litres of foam polystyrene might be released to the sea if the buoy broke up in bad weather.

The buoy was eventually recovered ashore through local community efforts.

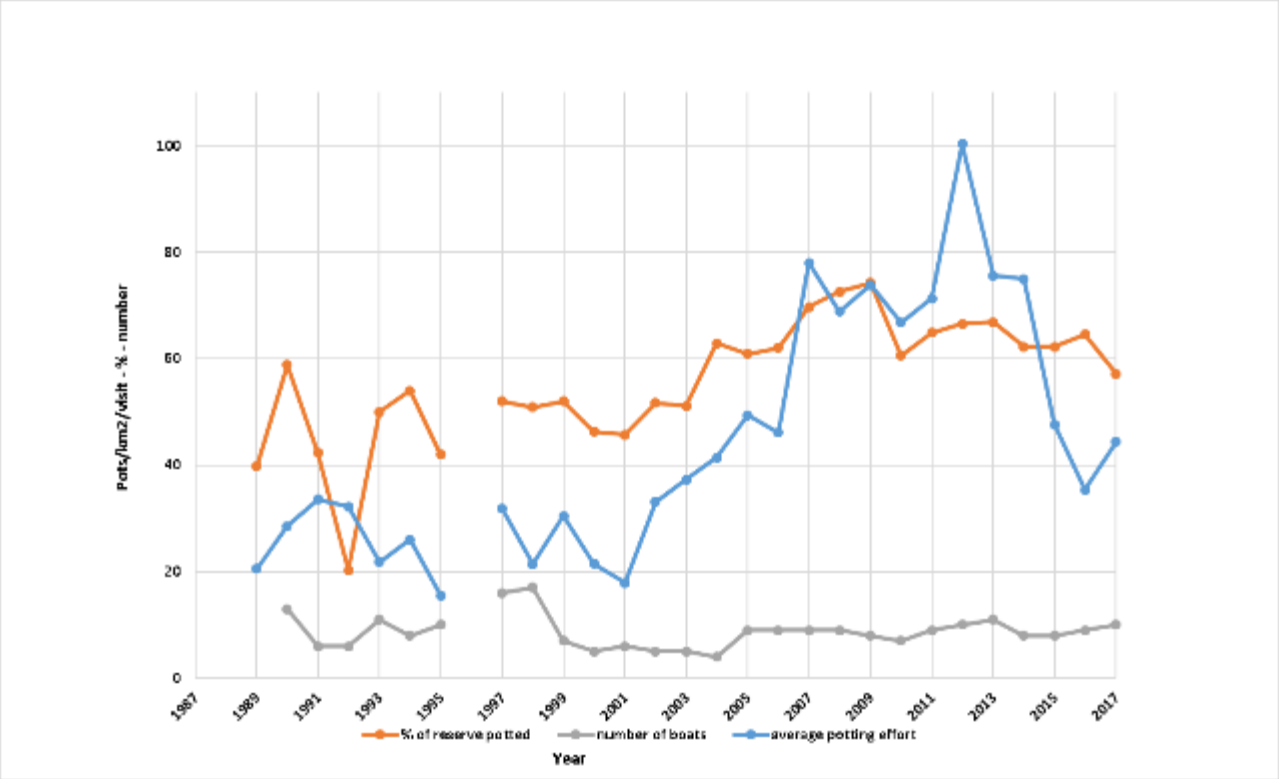
Our near neighbours, the Tusas at Rath Cottage, collected a large piece of trawl netting from Martin's Haven in February.

8. Visitors and Use of the MCZ

8.1. Commercial use

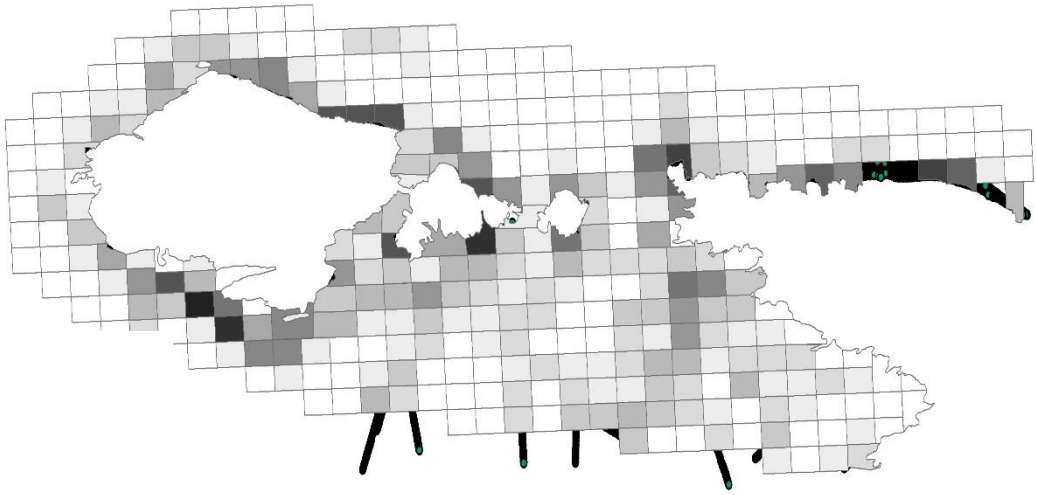
Fishing vessels recorded operating within Skomer MCZ during 2017 included *Warren Edwards* (M15), *Evara* (M150), *Danny Boy* (M77), M1140, M22, M627, M11 and *Storm Child* (M83).

Figure 8.1 Summary of fishing effort within Skomer MCZ



Pot fishing effort remains at a lower level than that seen prior to 2005, although the numbers of boats involved and the proportion of the MCZ area fished remain fairly constant. From our observations it would appear that diversification into whelk fishing activity outside the MCZ and in the outermost areas of the MCZ may have contributed to this decrease.

Figure 8.2 Pot fishing relative intensity within Skomer MCZ (darker = more intense)



Until now commercial pleasure craft from a number of local companies have been recorded only when anchoring or mooring, or when carrying anglers or divers. Their passengers have then been included in the recreational user statistics. However, given the economic importance of these commercial operations more effort will be made to record and monitor their use of the Skomer MCZ as a separate dataset.

Tanker movements within St Brides Bay are also logged to record use of the anchorage that lies within Pembrokeshire Marine Special Area of Conservation.

8.2. Recreational use

Recreational use of Skomer MCZ is presented in Table 8.1 and figures 8.3 to 8.7.

Other than numbers of divers, recreational visitor numbers have remained fairly constant over the last three years. Diver numbers have fallen back from last year mostly due to fewer boat divers being recorded. Martins Haven continues to be popular for shore divers, although at a fraction of the totals seen 10 or 20 years ago.

Shore angler numbers have risen a little since last year, with increased records at sites previously affected by access closures. Numbers remain low overall for shore anglers. The map below illustrates how shore angling continues to be concentrated along the north Marloes peninsula coast, but “hot-spots” for boat angling can also be seen.

Figure 8.3 Recorded Recreational Use Skomer MCZ

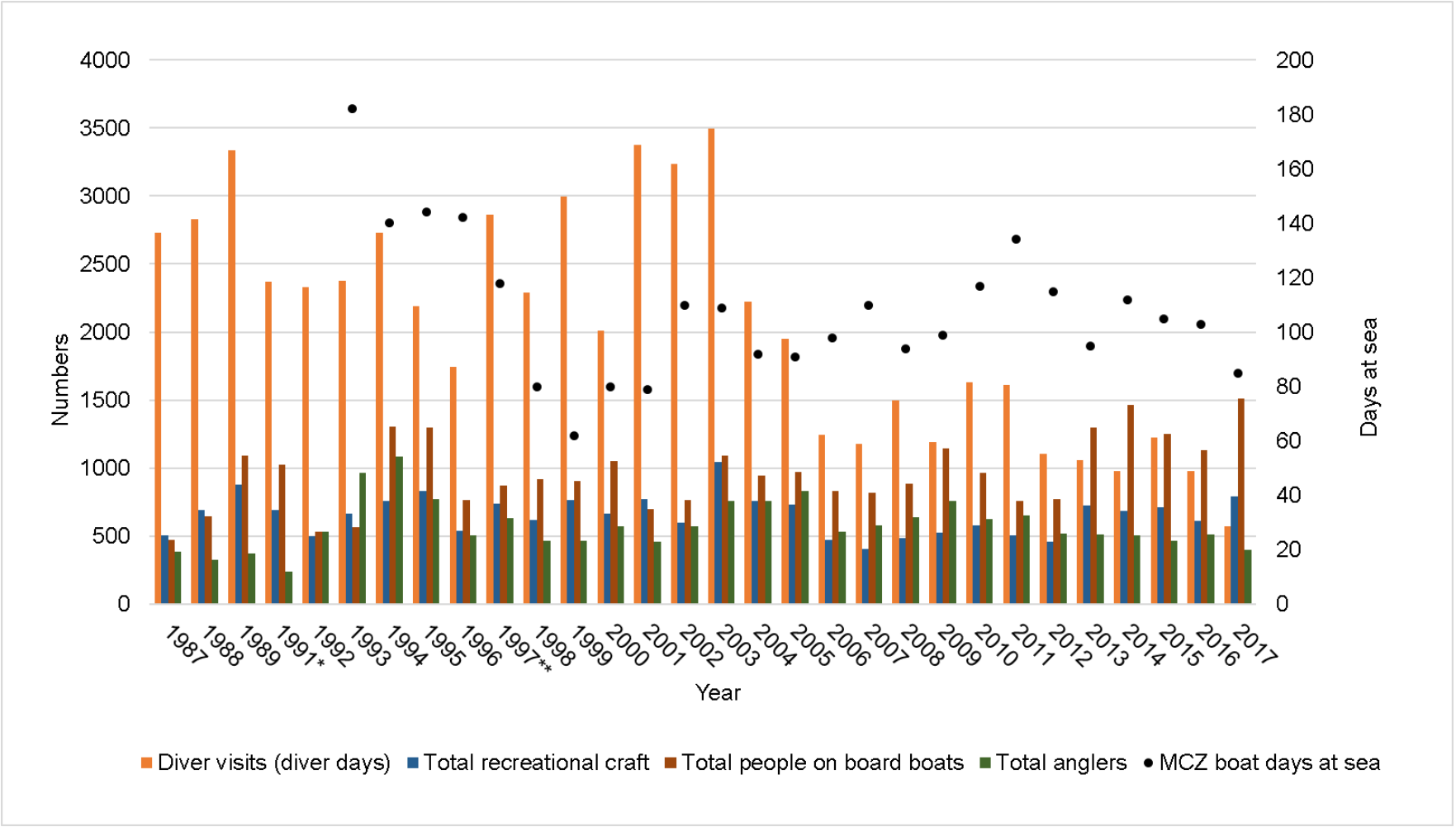


Table 8.1 Recorded Recreational Use Skomer MCZ

	** 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Diver visits (diver days)	2862	2287	2996	2008	3378	3234	3492	2224	1950	1244	1179	1496	1189	1632	1611	1106	1059	976	1228	980	570
Shore dives @ Martins Haven	814	817	503	537	555	575	522	666	492	474	439	478	293	428	368	347	242	291	237	313	177
Dive boat visits	355	254	380	278	349	367	389	234	258	132	152	140	92	128	149	90	89	83	134	80	79
Total yachts	215	182	223	232	252	119	335	224	188	129	92	119	115	139	132	117	247	230	218	190	180
Total motor boats (not angling boats)	66	65	66	93	119	49	190	165	114	76	59	85	73	74	29	45	127	98	98	70	177
Canoes	94	98	82	63	37	39	81	100	111	101	72	67	186	166	126	140	176	202	195	210	289
Angling boats	7	21	16		15	22	49	33	61	35	31	76	62	69	67	66	84	74	68	60	66
Total recreational craft	737	620	767	666	772	596	1044	756	732	473	406	487	528	576	503	458	723	687	713	610	791
(D, Y, M, C & A)																					
Total people on board boats	869	917	904	1051	696	764	1093	944	975	834	817	887	1143	967	757	769	1297	1465	1253	1129	1508
(Y, M, C & A) not D																					
Shore anglers	574	372	354	501	396	458	519	556	569	379	398	344	448	313	321	202	160	220	219	264	144
Boat anglers	56	93	109	72	65	112	243	206	266	150	178	294	308	315	333	316	350	285	244	247	256
Total anglers	630	465	463	573	461	570	762	762	835	529	576	638	756	628	654	518	510	505	463	511	400

** Figures are for Jan 97 to end of March 98 All subsequent figures are for financial year April to end of March
As represented in Fig 8.4 data goes back to 1987, Table 8.1 has been curtailed for clarity.

Figure 8.4 Skomer MCZ 2017 Recreational Craft

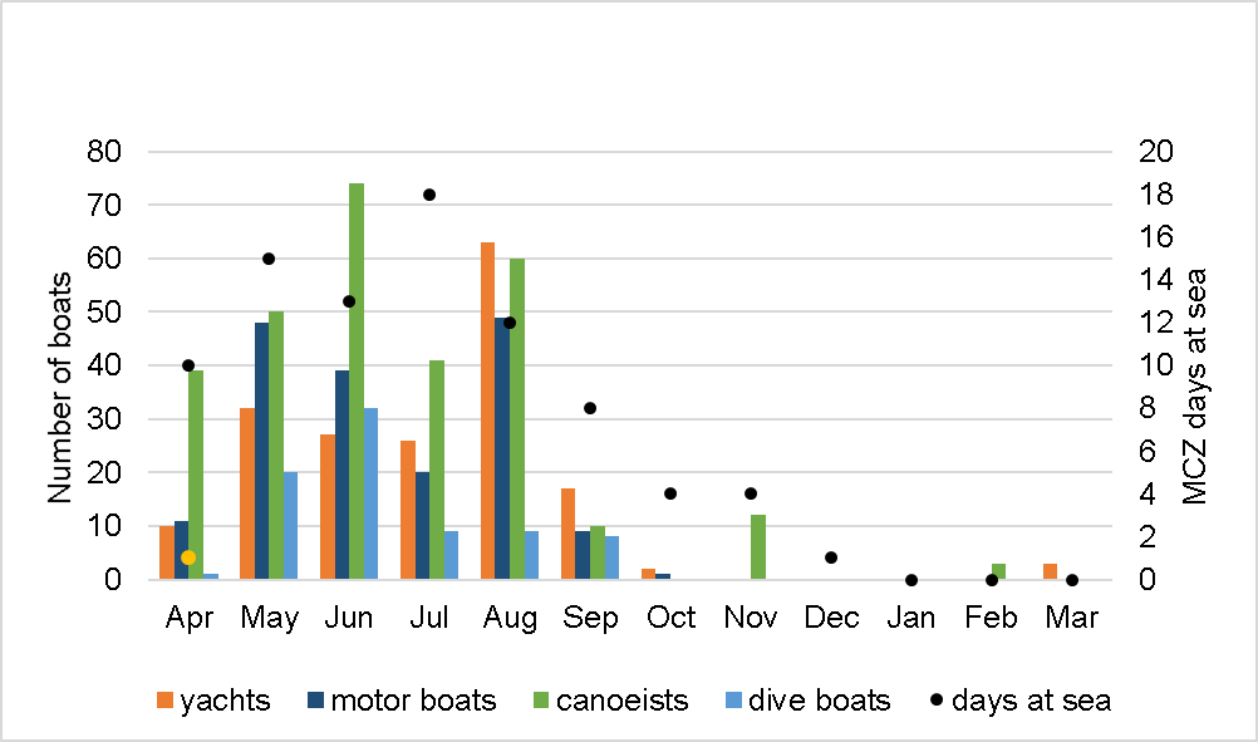


Figure 8.5 Skomer MCZ 2017 SCUBA divers

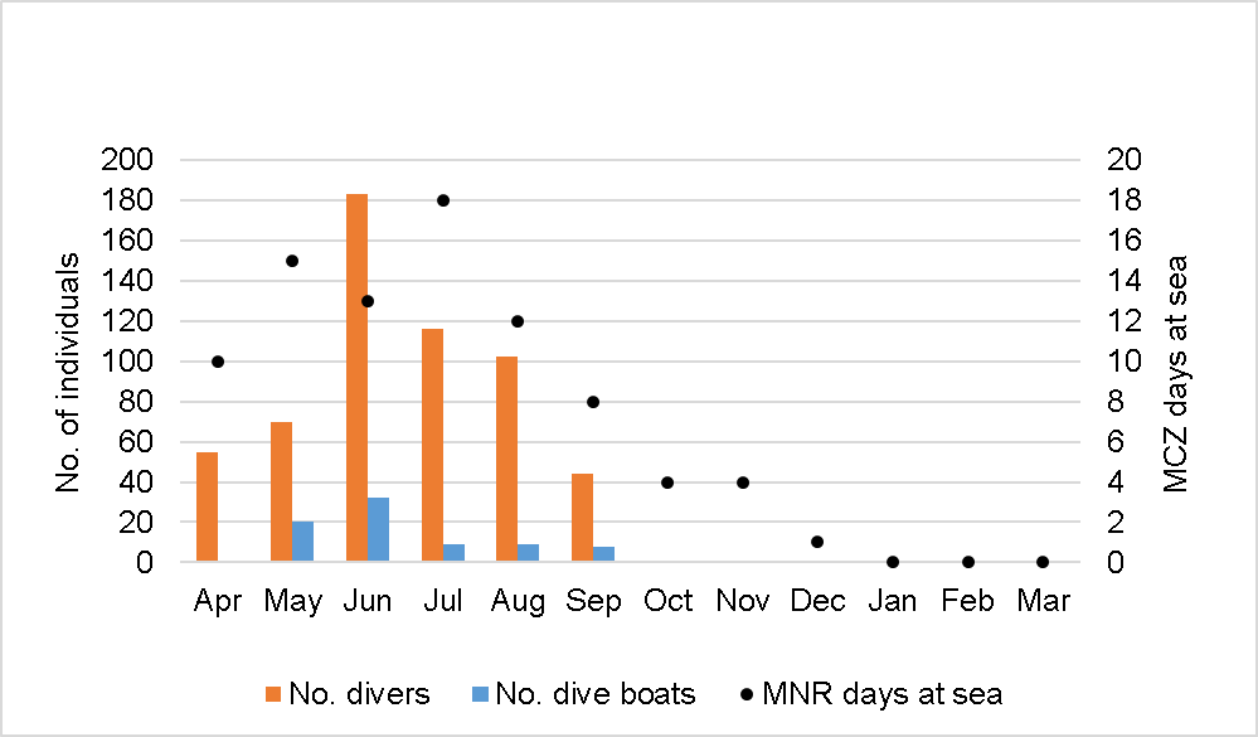


Figure 8.6 Skomer MCZ 2017 Anglers

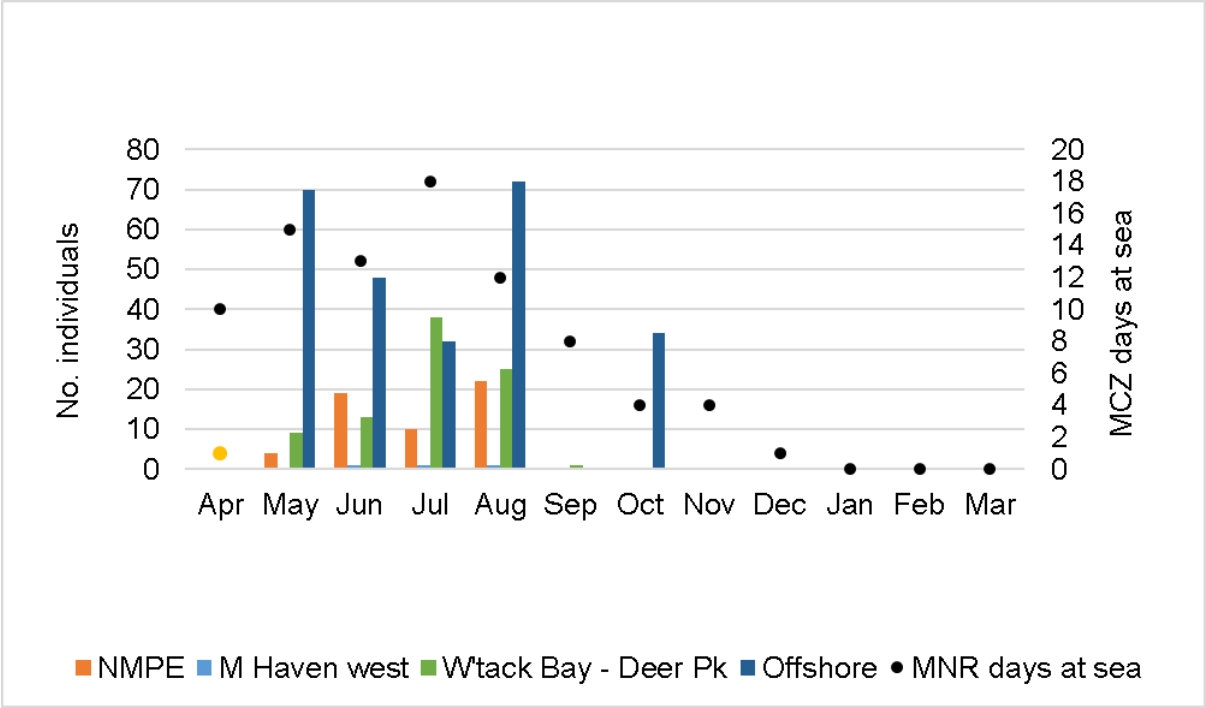
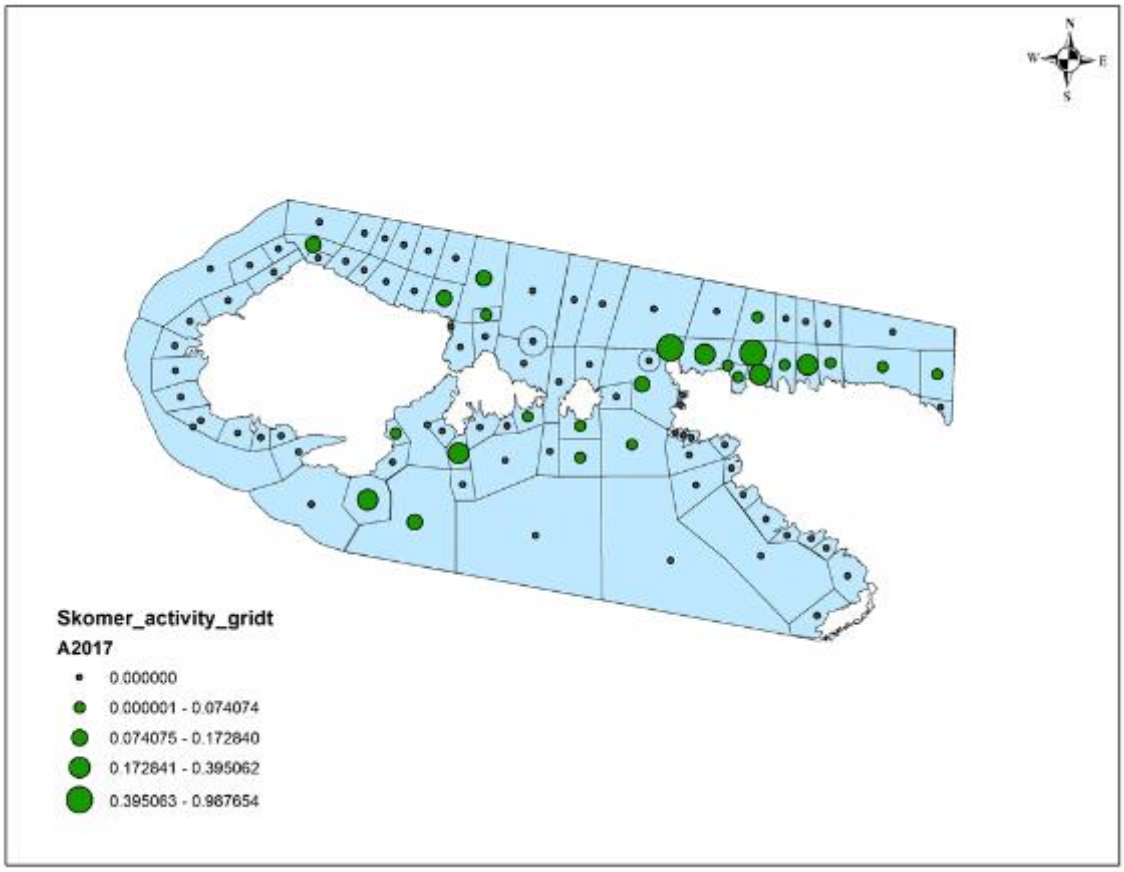


Figure 8.7 Angling intensity map



9. Liaison and Advisory Committees

9.1. Advisory Committee

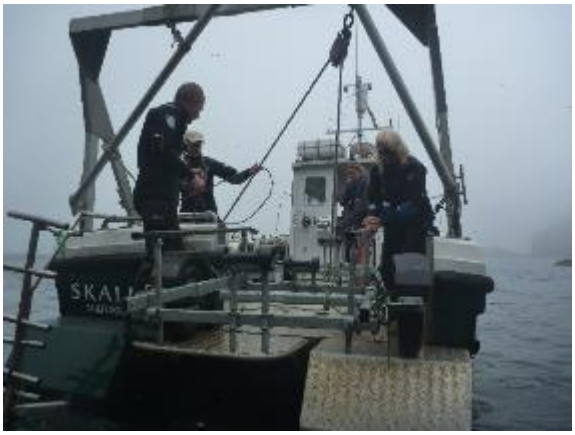
Skomer MCZ Advisory Committee meeting was held in April 2017, chaired by Dr Robin Crump. 13 members attended together with 4 MCZ staff. Updates were given on various aspects of MCZ work, including liaison and monitoring efforts. The ladies of Dale and Marloes WI made sure that those attending were suitably fortified with cake and hot drinks.

At the meeting concerns were again raised about the future of Skomer MCZ and about the lack of meaningful response from either Welsh Government or NRW to letters written. Members were updated on the Marine Protected Area enquiry in Wales and the visit of the Welsh Government Climate Change, Environment and Rural Affairs Committee visit to Pembrokeshire. The importance to the marine environment of the forthcoming Marine Area Statement was also highlighted.

9.2. Wildlife Trust South and West Wales

Skomer Island NNR Wardens, Bee Büche and Eddie Stubbings, and Skomer MCZ staff continue to work closely together on such issues such as dealing with disturbance incidents and the seal monitoring contract, which was carried out again by Wildlife Trust South and West Wales (see Section 9.1 and Appendix 1).

At the beginning of the season Skalmey was used to ferry the Island's boat trailer back from the island.



In the aftermath of storms Ophelia and Brian, Island and MCZ staff helped to coordinate the sightings and marking of seal pups washed up on beaches all over Pembrokeshire with other seal workers in the county (see Section 10.1.1).

MCZ staff also contributed comments on an article requested by Pembrokeshire Life about the seals and the effect of the storms.

MCZ staff liaised with other Wildlife Trust, including staff at Lockley Lodge who went out of their way to help with opening up the MCZ exhibition at

Fisherman's cottage and the wardening staff on Skokholm during MarClim surveys (see Section 10.4).

Mark used a volunteer day to help with the Skomer Island "shearwater week".

9.3. Welsh Government Marine Enforcement

Skomer MCZ staff continue to liaise with officers on fishery matters and the department is represented on the Advisory Committee.

9.4. Pembrokeshire Coast National Park

Skomer MCZ staff continue to liaise with Pembrokeshire Coast National Park (PCNPA) staff locally and via the Advisory Committee. In February Phil and Kate attended a meeting of Pembrokeshire field staff from PCNPA, NRW, National Trust and others.

9.5. National Trust

Liaison with National Trust staff continues through the Advisory Committee and National Trust staff, including Matt Thompson, local Ranger, and Mark Underhill. See also the Pembrokeshire field staff meeting above.

9.6. Academia

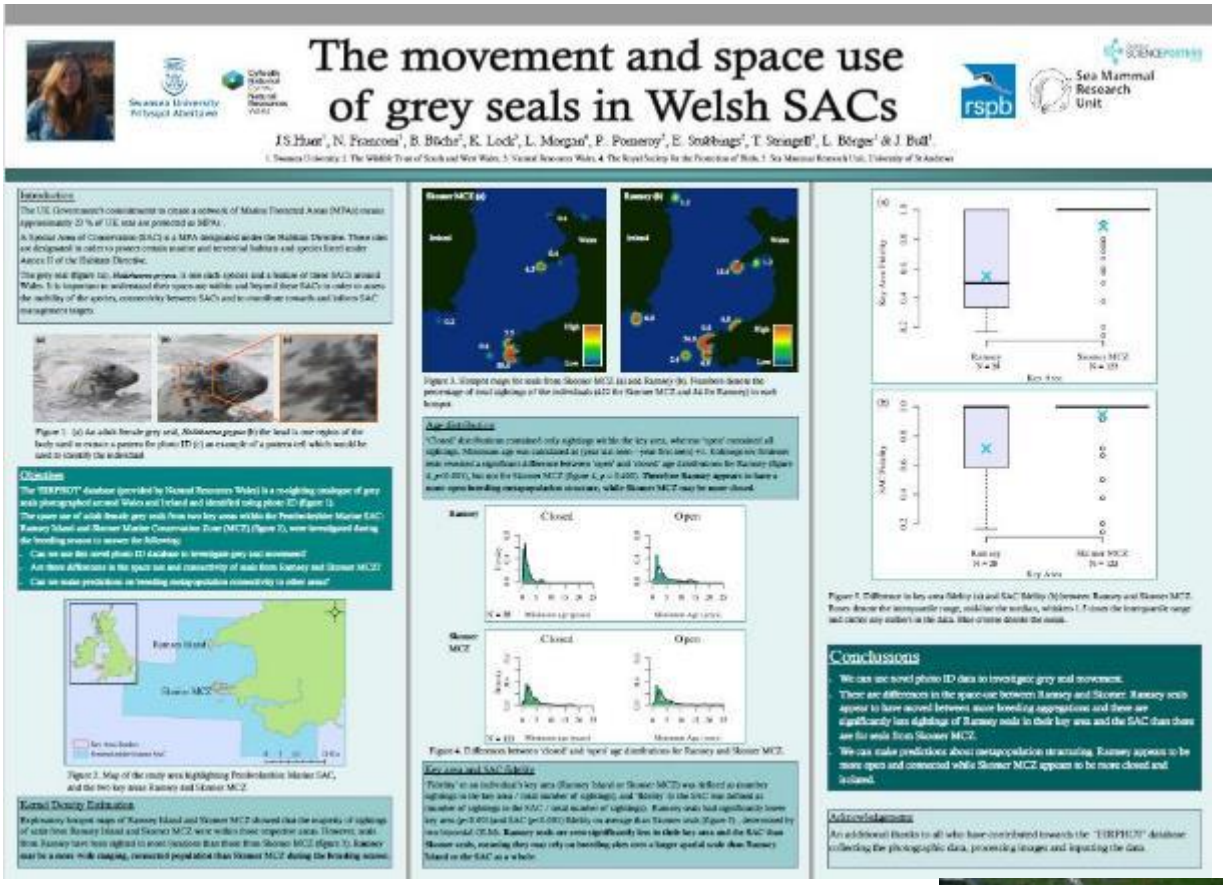
Close working relationships have been maintained with a number of academic institutions:

Swansea University have featured in many of the collaborative projects MCZ staff have been involved with:
Recently concluded work with Swansea University included work by researchers Dr Jim Bull and Dr Luca Borger studying Skomer MCZ's long-term seal pup data from the Marloes Peninsula (1992-2014) to look at temporal trends and phenology in grey seal pups. (Bull JC, Börger L, Banga R, Franconi N, Lock KM, Morris CW, Newman PB, Stringell TB. 2016. Temporal trends and phenology in grey seal (*Halichoerus grypus*) pup counts at Marloes Peninsula, Wales. NRW Evidence Report No: 155, 23pp, Natural Resources Wales, Bangor)

The same team used statistical models to look at the long-term data sets (1985-2015) for the Skomer Island sites (Bull JC, Börger L, Franconi N, Banga R, Lock KM, Morris CW, Newman PB, Stringell TB. 2017. Temporal trends and phenology in grey seal (*Halichoerus grypus*) pup counts at Skomer, Wales. NRW Evidence Report No: 217, 23pp, Natural Resources Wales, Bangor).

M.Res. Biosciences student at Swansea University, Josella Hunt, presented a poster at the British Ecological Society Aquatic Ecology Group annual meeting in London. Her work involved use of the EIRPHOT grey seal re-sighting

database (including entries from Skomer) to investigate the movements of the species in the Pembrokeshire Marine SAC.



Another Swansea University student, Evie Furness, and her research assistant (dad) were able to take advantage of space aboard Skalmey during weekend patrols to deploy miniature video cameras in North Haven. This was part of her project studying fish populations in eelgrass beds and kelp areas around the country.

Collaboration work with Swansea University also included advice on a study to determine levels of disturbance to seals from drones. MCZ staff also supplied cetacean observation data and deployed a C-Pod acoustic logging device for Swansea University workers studying the cetacean use of the MCZ (see Appendix 2).

Following the 2016 scallop survey a University of York student is doing some more detailed analysis on our data. The goal is to combine it with data on scallop populations in other protected areas around the UK to get the "big picture" and hopefully a peer-reviewed paper out of it. This may include data from a recently completed survey of the Port Erin,

Isle of Man scallop closed area. As the project supervisor, Dr Bryce Beukers-Stewart commented; “A comparison between the two sites (the longest running in the UK) would be really interesting”.

Skomer MCZ weather data has been used in a number of research projects including:
Swansea University – modelling wind patterns around Skomer and how these affect birds in flight around the Island;
Oxford University “Ox Nav” shearwater research project;
Bristol University – use the meteorological data, plankton data and sea temperature data in studies of changes in fish populations, especially prey species for seabirds.
Skomer and Ramsey Island staff also use MCZ weather data for reporting purposes.

Other student projects included long-term volunteers on Skomer looking at the marine fauna of North Haven and clingfish (*Lepadogaster lepadogaster*) numbers and egg production on the North Haven landing beach (see Appendices 3 and 4).

Students from Aberystwyth University met MCZ staff to discuss the effectiveness of marine conservation legislation as research for their M.Sc. dissertations.

Skomer MCZ staff also helped Dr Mike Kent in his search for a rare and cryptic nudibranch, *Onchidella celtica*, at North Haven during our monitoring visit to the site. Despite being recorded at some time in the past, no signs of this sea slug were found.

As a change from the normal student projects Phil was contacted by Jake Campton, an M.Sc. Science communication student from the University of the West of England. His task was to interview Phil about the work at Skomer MCZ for a magazine primarily focused on 14 to18 year olds looking potential career options within the science/environmental field.

Bristol University kindly supplied all their diving records to MCZ staff for their visit in June.

9.7. Other organisations and individuals

West Wales Biodiversity Information Centre (WWBIC) staff contacted MCZ staff to see if we could identify a strange critter found on a local beach. This turned out to be a sipunculid or peanut worm, which normally lives buried in the sand.

Another request for help came from a project looking to use modular glass “Sea-Hives” to kick-start reef regeneration in areas of the world where reefs have suffered damage and raw materials are in short supply. The two miniature prototypes we have are deployed at Thorn rock and at the OMS, where we can photograph them during our routine visits to the sediment traps at those sites.

Seaweed samples taken from Skomer and other sites in Pembrokeshire are now on display at the Natural History Museum and a video explaining the collection (including MCZ staff participation) in now on their website (see Section 11.4).

A large variety of seaweeds, collected from Devon and Pembrokeshire, had to be pressed and dried for preservation

Skomer MCZ also had a visit from a group of European Marine Site officers from around Wales meeting in Pembrokeshire to discuss site management (and eat cake).

Within NRW, MCZ staff have liaised with a number of different teams:

The acoustic imaging system, ARIS, used in trials at Skomer to map the eelgrass bed has also been used to look at its potential use for monitoring

Sabellaria, the reef-building worm, in Welsh coastal waters, including the Severn estuary. The mounting bracket manufactured by MCZ staff was adapted for use on the vessel used in these trials. It is hoped to use further developments in the technique to supplement the volunteer diver surveys of the North Haven eelgrass bed planned for 2018 in partnership with NRW's Fishery Assessment Team.

Phil was involved in internal stakeholder meetings with staff preparing the marine Area Statement.

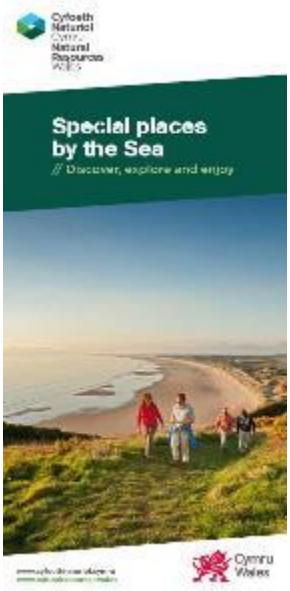
2017 saw a number of visits from NRW colleagues including the NRW Customer Care Centre (CCC) "road trip" to Skomer and the Sampling and Collection Team. This was a valuable opportunity for each team to learn about the work of the other and also demonstrated how changeable the weather can be during the autumn!

Liaison with the local community and neighbours has continued through informal contacts and via the Advisory Committee. MCZ staff are grateful for the support of the local community and their help in safeguarding the MCZ.

Other organisations and individuals that Skomer MCZ staff have worked with include National Coastwatch Institution, who maintain watches at the former Coastguard lookout on the Deer Park, Trinity House, who inspect our "no-anchoring" buoys, MCZ staff supplied Natural England staff with information for the "eco-moorings" workshop held in October, Pembrokeshire Coastal Forum, Rod Penrose, Strandings Co-ordinator (Wales) for the UK Cetacean Strandings Investigation Programme (CSIP) and Endurance Life who organise the Coastal Trail running event.

9.8. Wider marine environmental initiatives

Another project recently completed was the Pembrokeshire Sustainable Shellfish Initiative, which was a joint initiative between West Wales Shell Fisherman's Association, Pembrokeshire Marine SAC and Neptune's Army of Rubbish Collectors (NARC) to promote and test ideas to make fishing more sustainable. MCZ staff helped with experiments to test the longevity of different materials/weak links used to close escape hatches in pots and testing degradable hook closure methods. The final report to the Sustainable Development Fund was submitted in March 2018 (see Appendix 4 for executive summary).



Phil and Kate have been involved in various projects related to the 2018 Year of the Sea, including an initiative to extend existing marine codes of conduct to the whole coast of Wales being led by NRW and leaflets promoting NRW's coastal sites (see also Section 11.2).

Kate has continued to ensure that seal identification photographs are collated for Pembrokeshire and included in the NRW seal photo identification database.

Kate is also the local coordinator for the Marine Conservation Society Seasearch volunteer diving surveys.

MCZ staff helped to monitor one of the Capturing the Coast (CoCoast) sites at Dale for which MCS is one of the partner organisations. Data on the invasive seaweed *Sargassum muticum* are collected from these sites and passed to workers at the Marine Biological Association in Plymouth, who are also involved in the project.

Kate used one of her "environmental volunteer" days to assist with the annual Snorkel Safari planned as part of Pembrokeshire Fish Week. Pupils from Broad Haven School were introduced to the marine environment in a project involving West Wales Dive Company and Pembrokeshire Marine SAC.

10. Science

All the following projects are reported on in greater detail in the Skomer MCZ Project Status Report 2017/2018 (NRW evidence Report number 251), which is available via the NRW website.

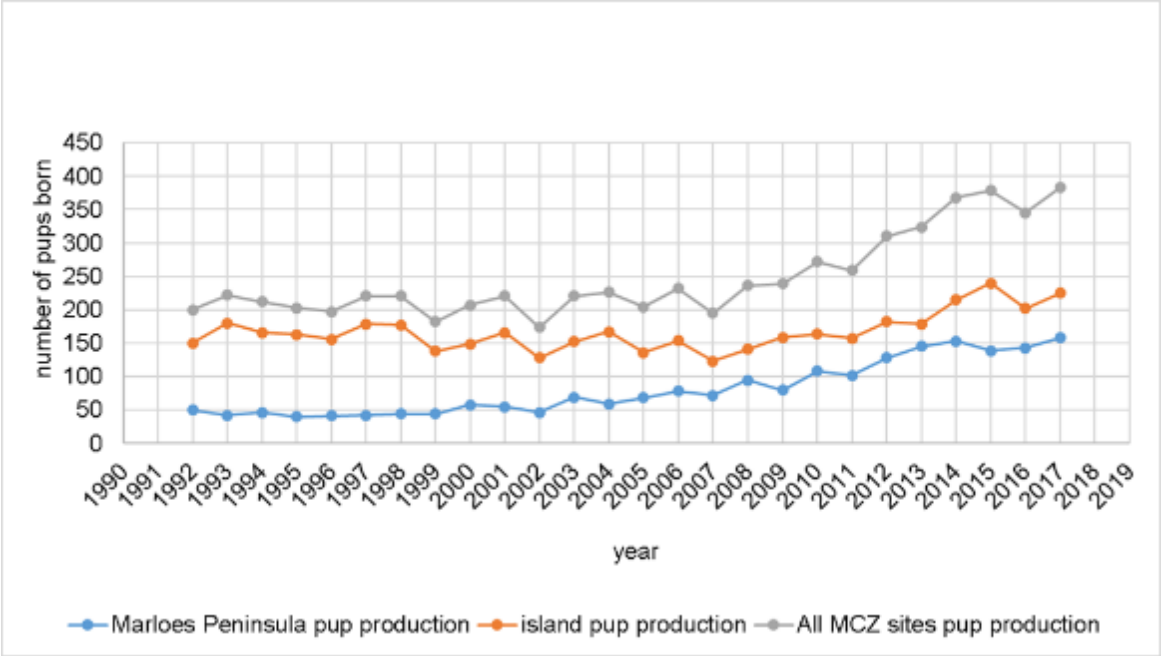
10.1. Biology

10.1.1. Project code: RA03/01 Seals

Grey seal monitoring was carried out for Skomer Island sites by Wildlife Trust of South and West Wales workers under contract to NRW (see Appendix 1 for the contract report executive summary). Sites on the mainland within the MCZ were monitored by the NRW Skomer MCZ team.

In 2017 225 pups were born at Skomer Island sites and 158 pups at mainland sites giving a total of 383 pups born in the MCZ.

Figure 10.1 Skomer MCZ pup production 1992 - 2016

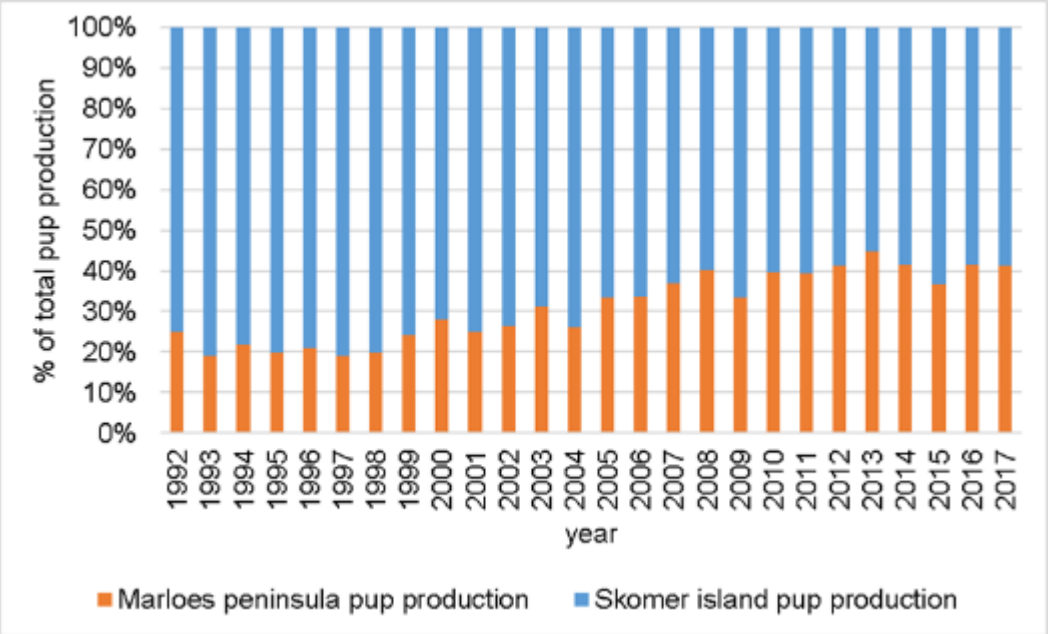


Pup production in the Skomer MCZ for the past 5 years has shown the highest totals recorded for the area with average production for 2013-17 at 360 pups. The pup production from 1992 to 2008 remained fairly consistent, within expected natural fluctuations, and with an average of 208 pups. Since 2009 there has been a steady increase in pup production at both the island and mainland sites.

Pup production at the Marloes peninsula sites versus the Skomer island sites expressed as a percentage of the total pup production for the Skomer MCZ is

shown in Figure 10.2. From 1992 to 2002 Marloes peninsula contributed an average of 22% of total production. This has then gradually increased to a peak of 45% in 2013 and the average over the last five years is 41% of total production.

Figure 10.2 Skomer MCZ pup production – proportion born on Island vs. mainland sites



Mortality will occur for different reasons including still-birth, abandonment, starvation, disease, insufficient growth, injury and severe weather. It is not always possible to know the reason for death so for analysis purposes it has been simplified into three groups:

Stillborn	These include both stillborn and those that died immediately after birth and were not seen alive.
Died	All pups seen alive but subsequently recorded dead. These can be from class 1 to 5.
Assumed mortality	These include pups assessed not to have survived following the survival assessment.

Every autumn, there are regular storms and large tides, which impact on pup survival. In 2017 there were two 'super storms' that impacted the seal pups – these storms were significantly greater than the average autumn storm. Ophelia (16th October) and Brian (21st October). Storm Ophelia developed wind speeds of over 100km/h and the weather station at St. Ann's Head measured wave heights of more than 16 metres. Many white coated pups were washed off the beaches and Storm Brian, only five days later, was less severe but no less devastating, sweeping some of the remaining pups away.

The survival rates calculated using the standard method assumes that all moulting pups and those of class 2/3 and in healthy condition survived the storms - even if they disappeared in the storm. However, due to the severity of the storm the pups' chances of survival must be considered extremely low.

Many large and well-nourished seal pups were washed up dead on Pembrokeshire's beaches in the weeks following the storms. Undersized pups and weaners were seen around Skomer and the mainland, many would have been separated from their mothers resulting in undernourishment.

Therefore, it is sensible to calculate a second survival rate (storm methodology) which assumed that all pups (class 2-4) that disappeared from the beaches did not survive.

Numbers of pups born	Survival (standard method)	Survival (storm method)
Skomer Island sites	76%	62%
Marloes Peninsula sites	60%	47%
Skomer MCZ total	**69%**	**56%**

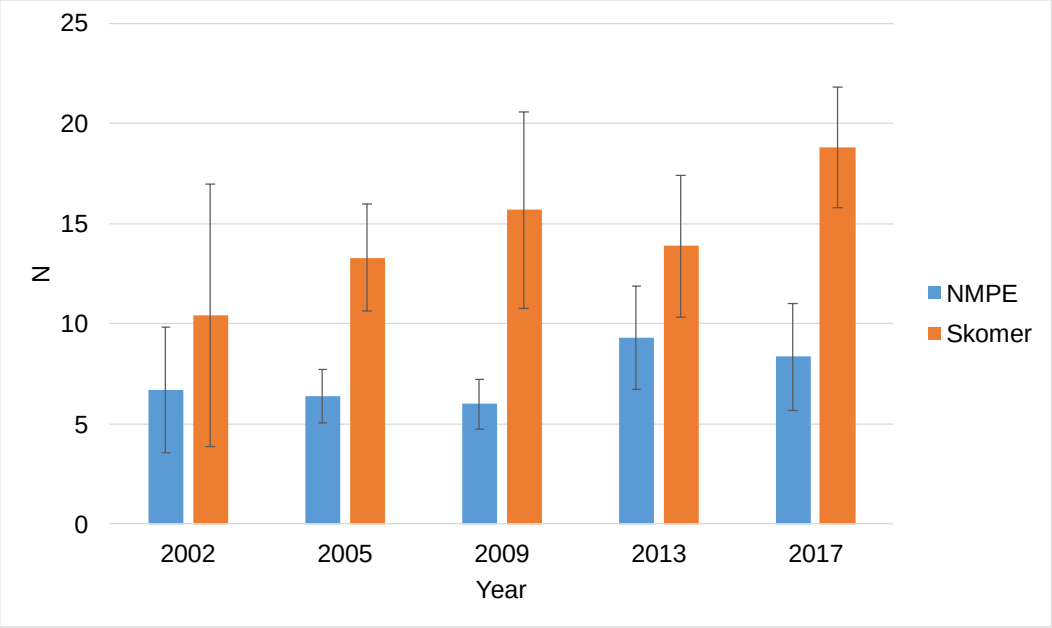
The reality probably lies somewhere in between these two estimates, but is impossible to verify. Therefore, the two methods simply reflect the upper and lower survival limits.

10.1.2. Project code: RA33/01 Territorial Fish

Volunteer divers completed 130 territorial fish transects over two weekends in 2017.

Overall abundance of fish (N).

Overall abundance of individuals (N) was calculated by summing the counts of all fish species. These were averaged to area by year, and area / depth zone by year (Fig. 10.3).



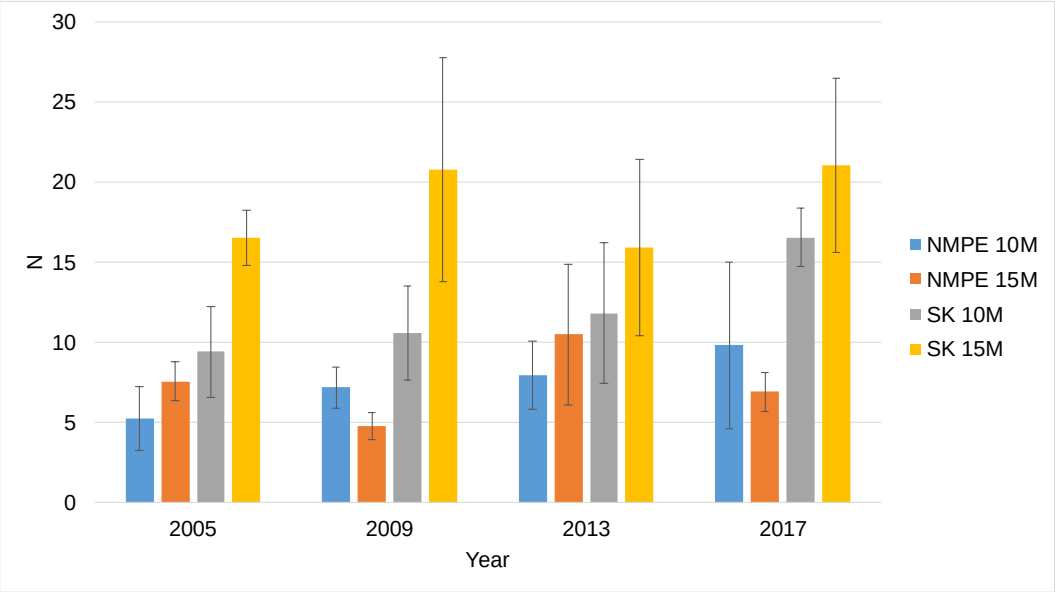


Figure 10.3. Overall fish abundance (N / 90m^2) for each year by area (top graph) and by area / depth zone (lower graph) with 95% S.E. bars. NMPE = North Marloes Peninsula, SK = Skomer

The Skomer area has significantly higher numbers of fish compared to NMPE for all years except 2002.

2017 Differences between areas (Skomer & North Marloes Peninsula).

Transects were averaged to area for the 2017 survey and the abundances of each species, the species richness (S) and the overall abundance of all fish (N) were compared.

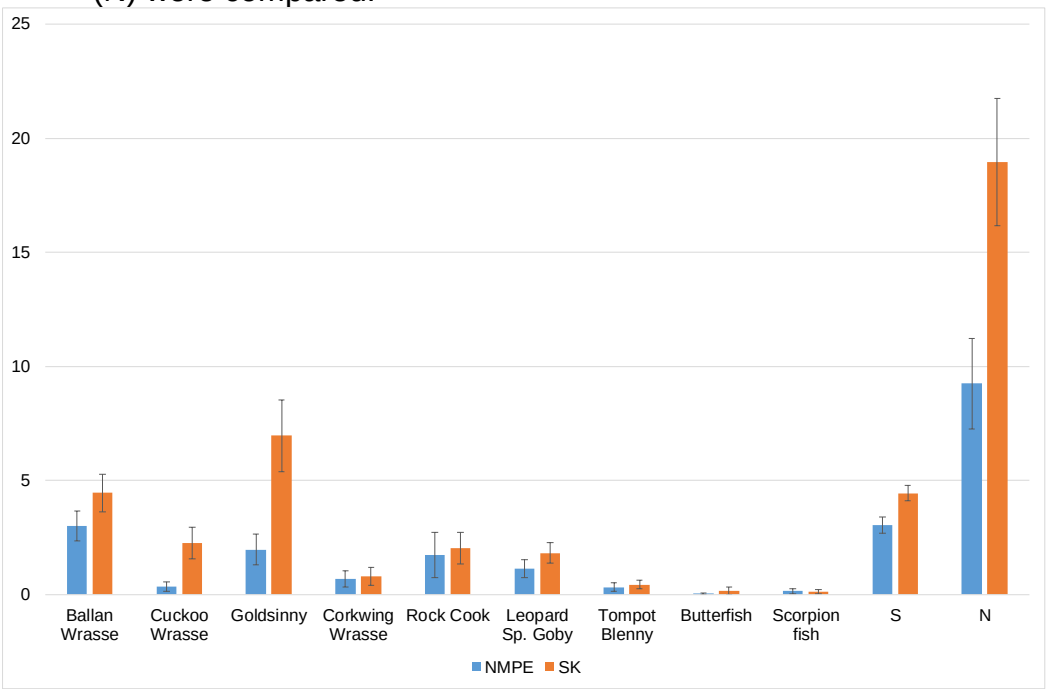


Figure 10.4 Species abundances, Species richness (S) & Overall abundance (N) for 2017 data averaged to area with 95%S.E. bars.

Cuckoo wrasse and goldsinny wrasse had significantly higher abundances in the Skomer area than North Marloes Peninsula. Statistical tests show that over 75% of the difference between the Skomer and North Marloes Peninsula populations is due to wrasse species abundance. Historically, wrasse have always been found in higher abundance in the Skomer area.

Without unfished control sites it is difficult to be certain as to the reason for this difference, but both the extended depth of suitable fish habitat at the island sites and the greater pressure from recreational angling at the mainland sites are possible contributory factors.

10.1.3. Project code: RM44/01 Record commercial crustacean populations

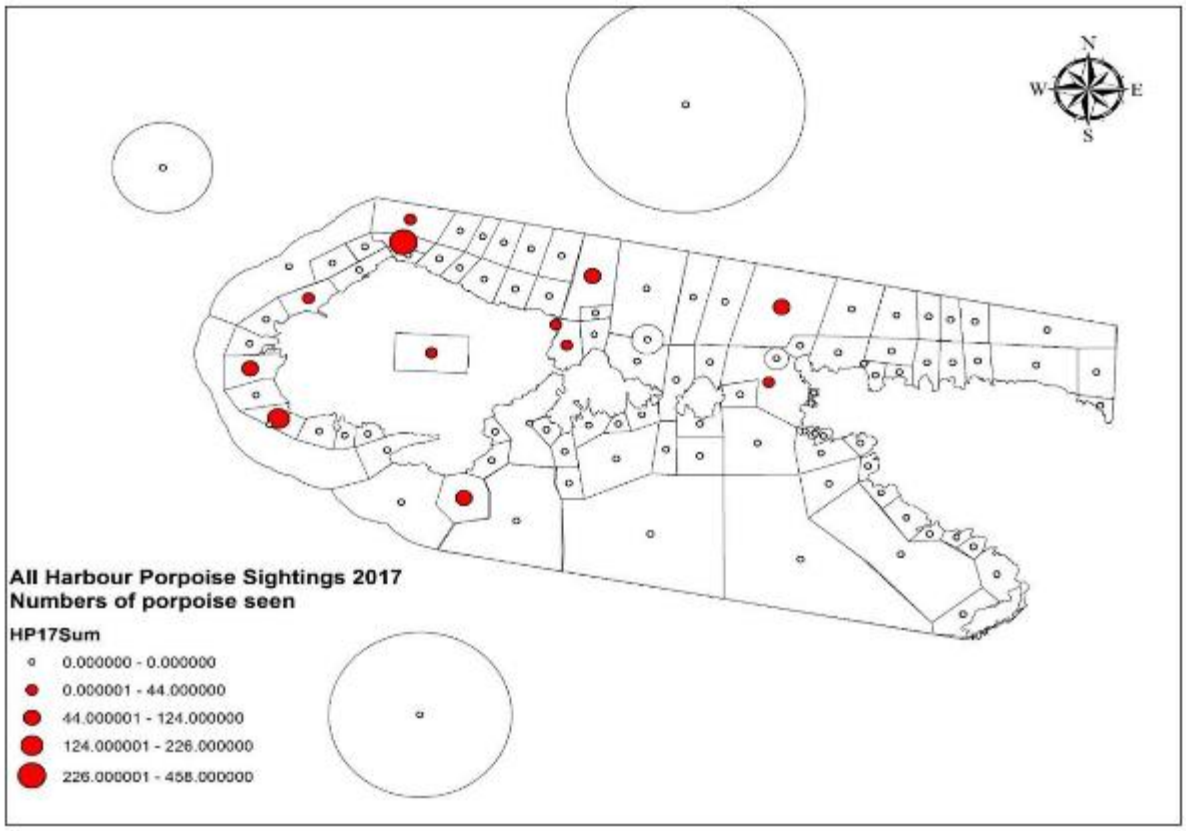
Crawfish *Palinurus elephas* became a national Biodiversity Action Plan species in 2008, and is now an Environment Act (Wales) 2016, Section7 species. Between 2009 and 2016 it has been recorded in low numbers in the MCZ by MCZ staff and volunteers. These records continue to be entered into the online recording scheme that has been set up on the Seasearch website with the aim of gaining better knowledge of the historical and current status of this species in the UK.

10.1.4. Project code: RA01/01 Record Cetaceans

All sightings of cetaceans collected by NNR staff, MCZ staff and *Dale Princess* crew have been collated for the period between 2001 and 2016.
There are no records in years 2003, 2007, 2010 and 2011 and effort is variable not just between years but also during the season, which makes the data difficult to effort correct.

Total number of Harbour porpoise sightings in 2017 is displayed below. These data are not effort corrected, but are useful in showing areas that harbour porpoise frequent. All vagrant and mobile species records are now recorded using this site code format.

Figure 10.5 Harbour porpoise sightings Skomer MCZ



In 2017 a static acoustic data logger was placed in the MCZ by the SEACAMS2 research group based at Swansea University. This was a trial deployment to see what data could be collected and what type of species of cetacean could be detected. A summary of the results can be found in Appendix 2).

10.1.5. Project code: RB01/01 Record Vagrant & Alien Species

Vagrant and alien species were recorded by MCZ staff and the crew of the Dale Princess. Vagrant species recorded in 2017 included Grey triggerfish, *Balistes capriscus,* which was recorded during the territorial fish survey. *B.capriscus* is a regular visitor to the Pembrokeshire coast during late summer. They have however, only been recorded in the Skomer MCZ on a small number of occasions.

In September and October high numbers of Portuguese man-o- war, *Physalia physalis,* were found washed up all along the coast of SW England and Wales, brought in with the strong winds and Atlantic storms. They were recorded in large numbers at many beaches in Pembrokeshire including Marloes sands and Musselwick beach which are adjacent to the Skomer MCZ. One was recorded on Martins Haven beach (pictured).

The Portuguese man-o-war *(P. physalis*), is a marine hydrozoan of the family *Physaliidae* found in the Atlantic, Indian and Pacific Oceans. Despite its outward appearance, it is not a jellyfish but a siphonophore, a colonial organism made up of specialised polyps. These polyps are specialised for movement, catching prey, feeding and breeding. The individual polyps are dependent on each other for survival, each having a distinct role. A large, purple, gas filled float (the pneumatophore) reaching up to 30 cm in height allows it to float on the surface and the crest running along the top acts as a sail. Its venomous tentacles can deliver a painful sting, which though very rare can be fatal.
Even though individual sightings are not unusual on the coasts of Britain and Ireland, mass standings are uncommon. Strandings were recorded at some beaches in Cornwall and Devon in 2009 and 2012 but this year was one of the largest known strandings on Welsh beaches.

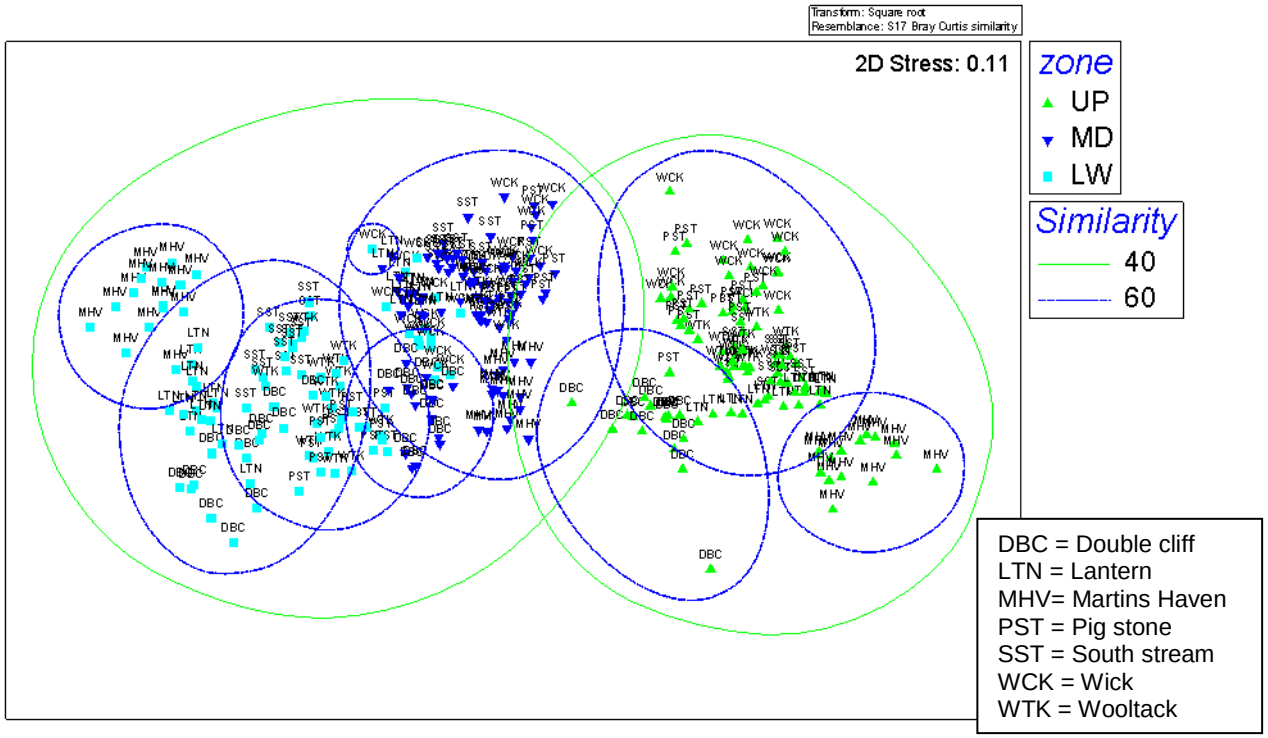
10.1.6. Project code: RB03/01 Monitor Littoral Habitats / Communities

Viewpoint photographs of shore communities were taken for all sites.

All sites at which permanent quadrats were established were surveyed in 2017.

All data from 2003 to 2016 is displayed on an MDS (Multidimensional scaling) plot below, which represents how similar sites are to each other for each year.

Figure 10.6 MDS Plot of All Littoral Community Data 2003 – 2017 (UP = upper shore, MD = middle shore, LW = lower shore, similarity is % similarity)



In summary:

- Upper shores group neatly on the right.
- Lower shore sites are much more disparate and grouped on the left.
- Middle shore sites sit in between with some overlap (at 60% similarity) with the lower shores.
- Some sites form distinct clusters e.g. Martins Haven Upper, Martins Haven Lower.
- Some sites are very variable from year to year e.g. Pig Stone Lower and Wooltack Lower

2017 did not show any major variations from the overall trends seen since 2004 and further statistical testing showed no significant difference between any of the years.

Testing for climate change effects on the intertidal community.
The MarClim survey specifically addresses climate change in the intertidal. Three sites are surveyed within the MCZ using the MarClim methodologies which allows the Skomer shores to be directly compared to all the other MarClim survey sites throughout the UK.
A full summary of the MarClim results can be found in Mieszkowska, N. (2017), but in summary the trends seen since 2003:

- Lusitanian warm water topshells have shown increases in range and abundance at established populations in Wales throughout the 2000s correlated to climate warming, and a reduction in abundance between 2010 and 2013 correlated to the hiatus in global warming detected during the 2000s.

- The abundance of both the cold-water sponge *Halichondria panicea* and the warm water sponge *Hymeniacidon perlevis* have declined over the 2010s across Wales at MarClim sites.
- Several species of invasive, non-native macro-algae and invertebrates are recorded as part of the MarClim surveys in Wales but very few have been recorded at Skomer MCZ, (*Sargassum muticum* is sporadically found at Martins Haven).

Another way of looking for temperature-related changes in communities is to use a technique called Community Temperature Index (CTI).

Community Temperature Index approach characterises each species by its thermal affinity, here taken effectively as the mid-point temperature in the geographical range and termed the Species Temperature Index (STI). The average of species thermal affinity across an entire community is obtained by weighting each species thermal midpoint (STI) value by the average abundance of that species, to give the Community Temperature Index (CTI). CTI values can be calculated for each site and averaged across all sites to give an average index for each year of the survey. Changes in annual CTI can be directly compared to annual changes in temperature, with the relationship between CTI and temperature showing the climate change response of the community.

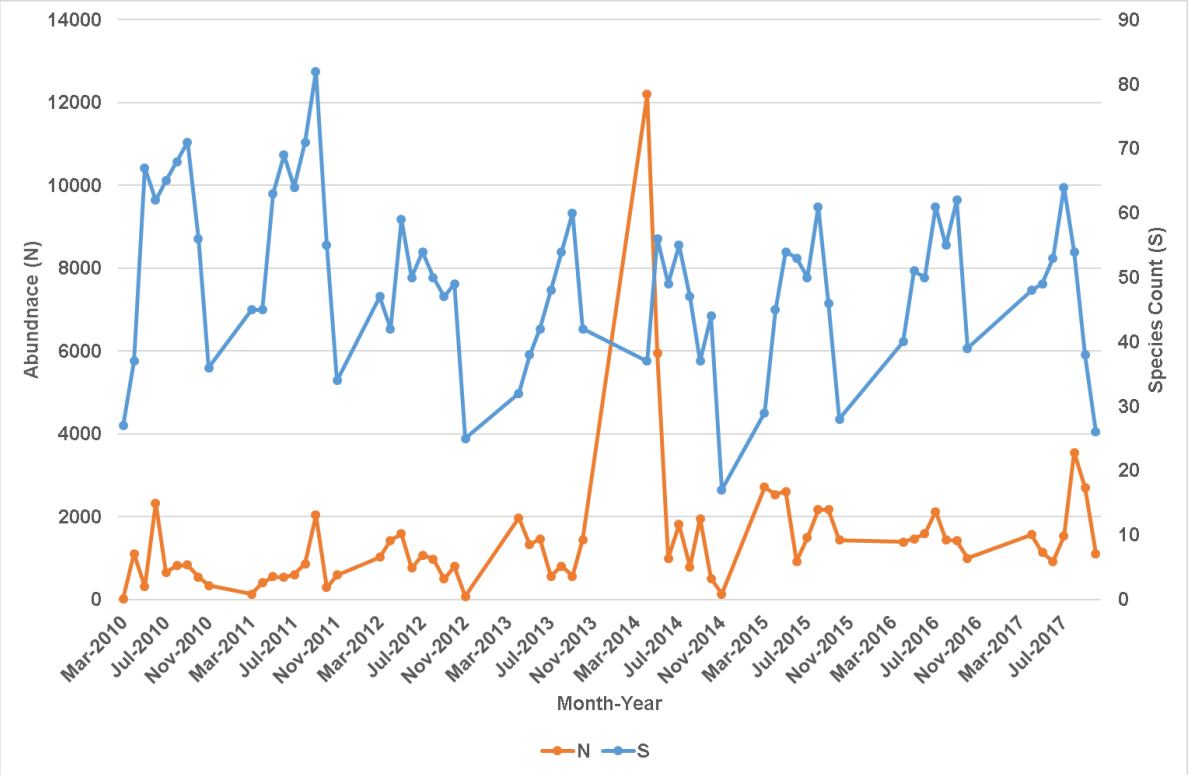
The MarClim survey data for the Pembrokeshire and Skomer MCZ shores have been used to calculate CTI for the period 2003 – 2017. Sea surface temperatures (SST) from temperature probes at Skomer MCZ were then used to calculate mean SST for the period. An annual mean and a summer mean (July – Sep) have been calculated.

The CTI scores for the 3 shores surveyed at Skomer show no significant change averaging a CTI of 12ºC which would match the ambient SST for the same period.

10.1.7. Project code: RB04/01 Plankton Recording

Zooplankton samples continued to be taken at Skomer MCZ in 2017 using methods recommended following a review by Plymouth Marine Laboratory in 2014.

Figure 10.7 Average species richness (S) and total number of individuals (N) for zooplankton at Skomer MCZ 2009- 2016



There were some notable species recorded in the 2017 samples; *Scyllarus arctus*, European locust lobster (or Slipper lobster): this is a new record for the MCZ recorded on the 16th July 2017. It is an unusual species to find in the UK. It is related to the crawfish (*Palinurus elephas*) and rarely occurs in plankton samples.

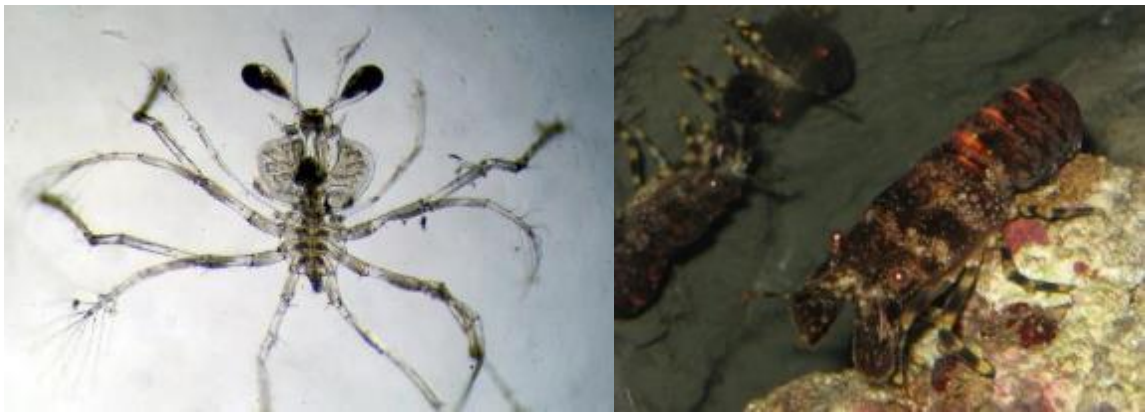


Figure 10.8 Image of plankton larvae of Scyllarus arctus (D. Conway) found on the 16/07/2017 and an image of the adult in an aquarium.

Facetotectan larva, another new record for the MCZ on the 7th Oct 2017. This is a rarely recorded group (possibly due to under recording), and are often misidentified. The adult stage is unknown and is possibly an internal parasite. The species found in the UK so far have not been classified and need describing, and it is possible they are new to science.

Figure 10.9 Facetotectan larva (D. Conway)

Rissoides desmaresti (Mantis Shrimp). This is the third record for the MCZ, found on the 16th July 2017 in the same sample as the *Scyllarus arctus.* Previous records have been in 2014 and 2015 both in August. The adult has not been recorded in the MCZ but there are several records in Cardigan Bay and Lundy Island.

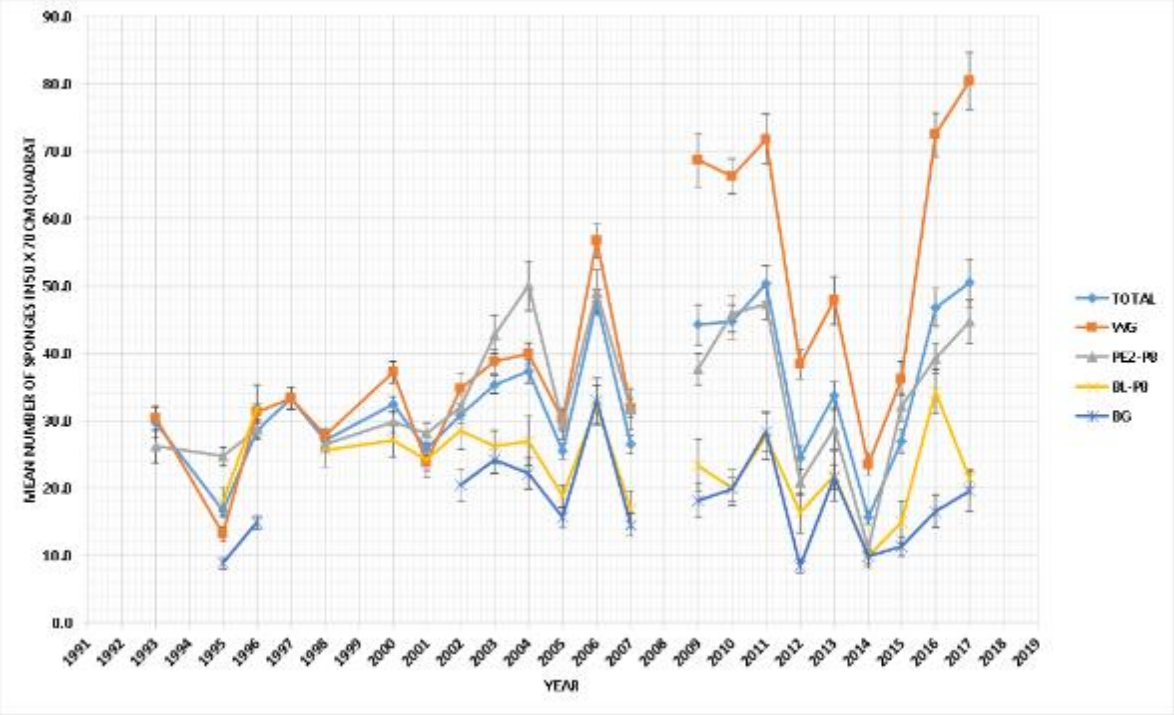
Figure 10.10 *Rissoides desmaresti* larvae (D. Conway) and adult (R. Holt)

10.1.8. Project code: RM13/01 Monitor Sponge Populations

In 2017 quadrats at all sponge monitoring transects were photographed.

Improvement in image quality and resolution has meant that more sponge entities have been recorded from 2009 onwards than in previous years. However, in 2012 and 2014 there was a noticeable drop in the numbers of sponges across all transects. In 2013 and 2015 all transects showed an increase in abundance of visible sponges and this increase continued in 2017 in all but one transect. This variability will in part be due to the image quality. “Wafting” the surface sediment away would improve consistency but does compromise the comparability of the whole-time series.

Figure 10.11 Mean number of sponges counted in each quadrat at 4 transects at Thorn Rock 1993-2017



Statistical analysis of what types of sponge (based on their morphology) make up the communities at Skomer shows similar results to previous years.

The species surveys show that Skomer has a very biodiverse range of sponge species, one of the highest in the UK.
The sponge assemblage at Thorn Rock is a “hot spot” for sponges within the MCZ. The community at Thorn Rock is quite dynamic in terms of total number of sponges visible but the overall community structure appears stable.

10.1.9. Project code: RM23/01 Monitor Pink sea fan Population

All sea fan monitoring sites and remaining individual colonies were visited and photographed in 2016, with some sites getting a second visit in September.

A total of 24 losses of natural sea fans and 5 of artificially attached fans have been recorded throughout the period of this project. There are currently a further 5 missing fans whose status needs to be confirmed in 2018.
In 2016, 10 sea fans were lost which was unusually high. Five of these, all from Bull Hole were found in 2016 reduced to small stumps or just their bases. A further five fans recorded as missing in 2016

were confirmed as losses in 2017, these were BH16, BRKw8, NWA11, TRK1 and TRK4.
Four additional fans were absent in 2017, BH25, BRKw2, RRK14, MDS5, these will be checked again and their status confirmed in 2018. POL4 was also recorded absent, this sea fan was a natural fan that was found broken off in 2011and the subsequently re-attached with a ring bolt and cable tie. It was a large sea fan and it continued to thrive until last seen in 2016.

Table 10.1 Survey results 1994 -2017:

year	Sites surveyed	Total fans recorded	Total natural fans	Total attached fans	New recruits (babies)	Natural fan Losses (confirmed)	Attached fan losses	Missing (to be confirmed)
1994	4	34	34					
1995	4	33	33			1		
1996	4	33	33					
1997	5	39	39					
1998	5	39	39					
1999	0							
2000	5	54	54					
2001	5	55	55			1		
2002	9	86	86			1		
2003	9	99	99		1			
2004	9	101	100					
2005	10	114	111	3	1	1		
2006	10	119	116	3	7			
2007	10	121	118	3	1	2		
2008	10	126	122	4		1		
2009	10	128	121	7				
2010	10	126	120	6		3	1	
2011	10	126	122	4			2	
2012	10	126	121	5		1		
2013	10	129	124	5				
2014	9	124	120	4				
2015	10	125	123	2		3	2	
2016	10	118	115	3	1	10		
2017	10	114	112	2			1	4
totals					11	24	6	

No new sea fan colonies were found in 2017.

In 2017 one sea fan sea slug (*Tritonia nilsodhneri)* with its eggs was recorded at Rye Rocks.

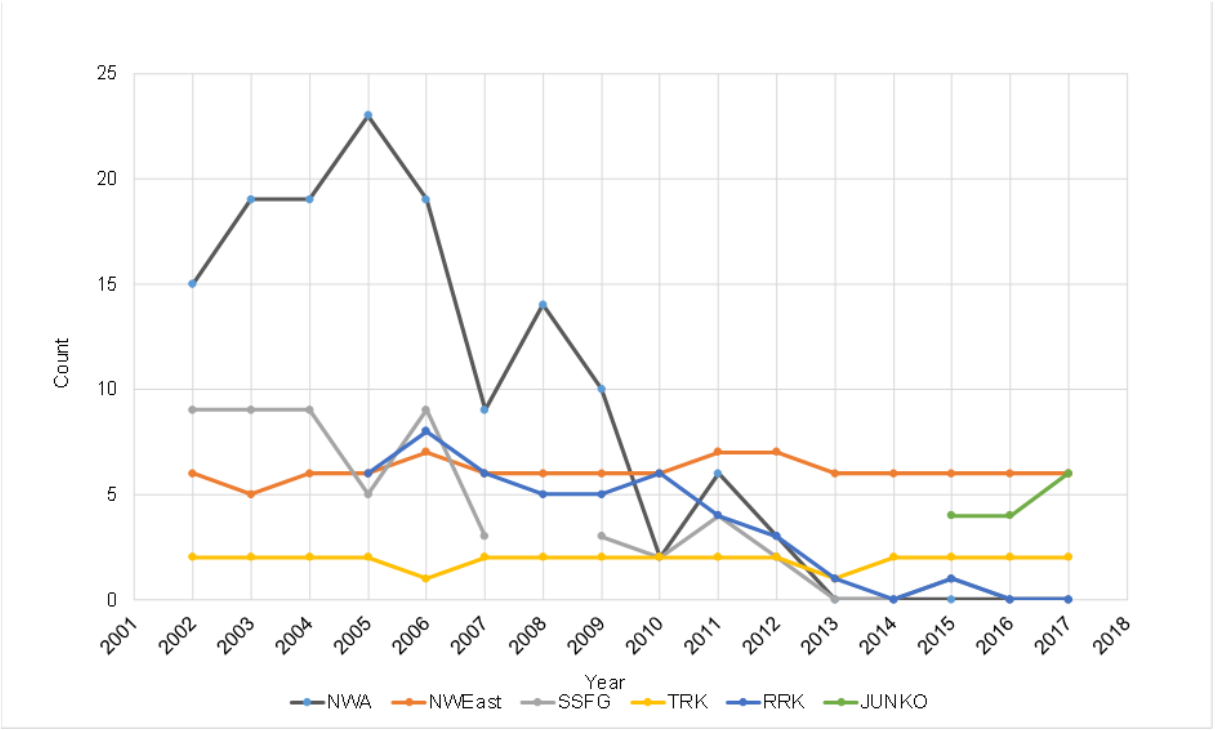
In terms of sea fan condition; necrosis was found in 35% of the sea fans, which lower than the average of 48% recorded for the last 16 years. Epibiota was recorded on 62% of the sea fans; this is slightly above the average of 61% recorded for the last 16 years.

10.1.10. Project code: RM23/03 Monitor *Alcyonium glomeratum* Population

The abundance of *Alcyonium glomeratum* at the monitoring sites is declining: North Wall East and Junko's reef have sizable colonies of *A. glomeratum*. North Wall main, Rye Rocks and Sandy sea fan gully now have no visible colonies.

The reason for this decline is unknown. There is no evidence of disease or mechanical damage at the monitoring sites and changes in environmental conditions are not thought to be significant enough to cause colony loss.

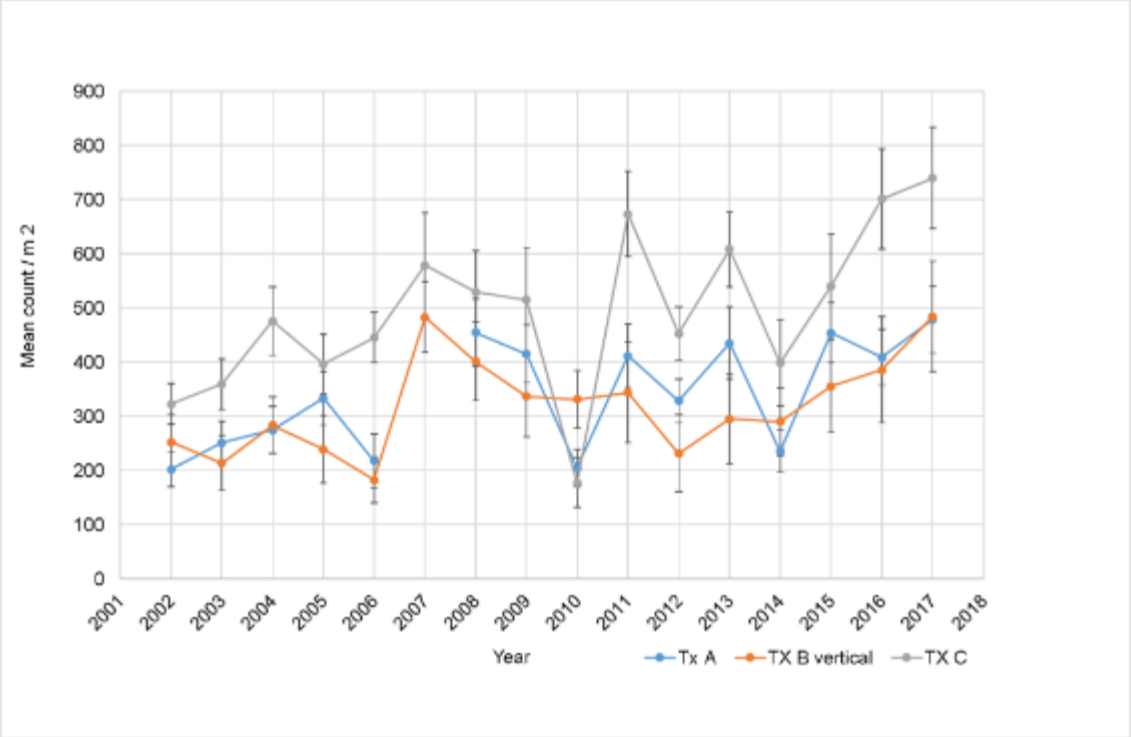
Figure 10.12 Number of quadrats with *A. glomeratum* present at Skomer MCZ sites 2002 – 2017.



10.1.11. Project code: RM23/04 Monitor Cup Coral Populations

Quadrats were photographed for both Devonshire cup corals (*Caryophyllia smithii*) and the Lusitanian scarlet and gold cup coral (*Balanophyllia regia*), except at the Thorn Rock stereo site.

Figure 10.13 Balanophylia regia abundance at Transects A, B and C at the Wick



The average number/m^2 of *B. regia* has fluctuated at transects A, B and C. The variability is caused by dense covering of silt across the site hiding individuals and occasional very poor photographic conditions (e.g. 2010). This might explain why counts were higher in 2017 when silt was reduced and more cup corals were visible.

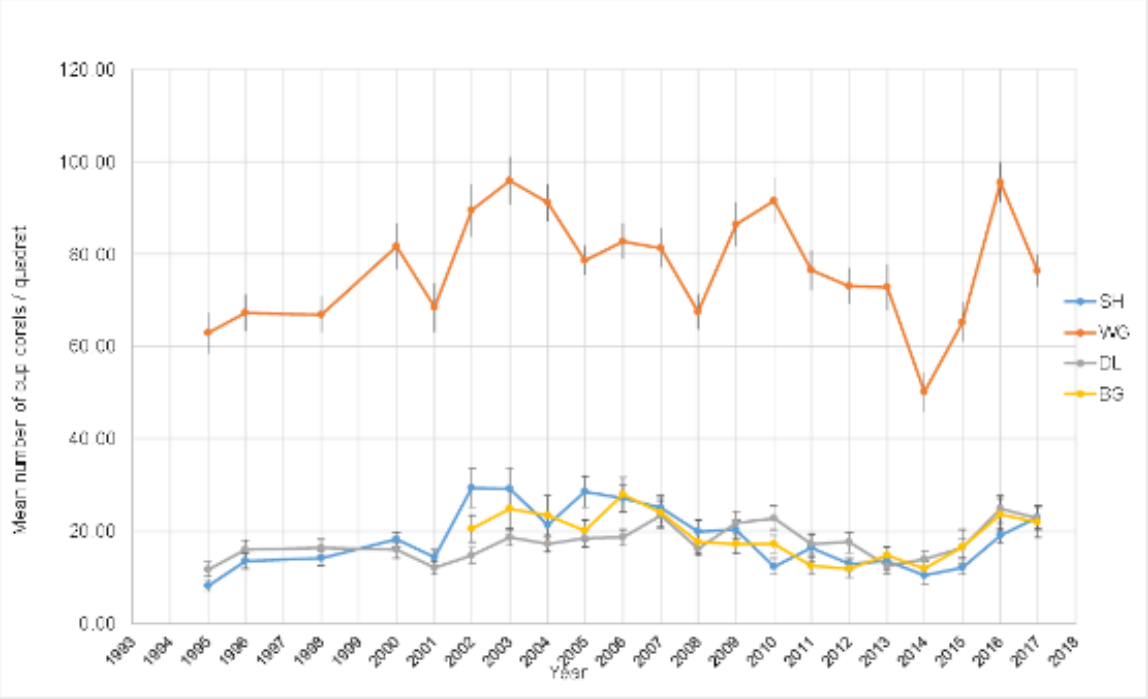
Caryophyllia smithii

The average number/m^2 of *C. smithii* has fluctuated at each of the Thorn Rock sites. This may be due to variable levels of surface sediment affecting the actual numbers visible during recording.

The Windy gully (WG) quadrats show significantly higher counts compared to the other sites. This is most likely due to it being the only vertical wall site

where less surface sediment accumulates. The other three sites are all on horizontal rock.

Figure 10.14 Mean Number of Cup Corals per Quadrat at Thorn Rock 1996 - 2016



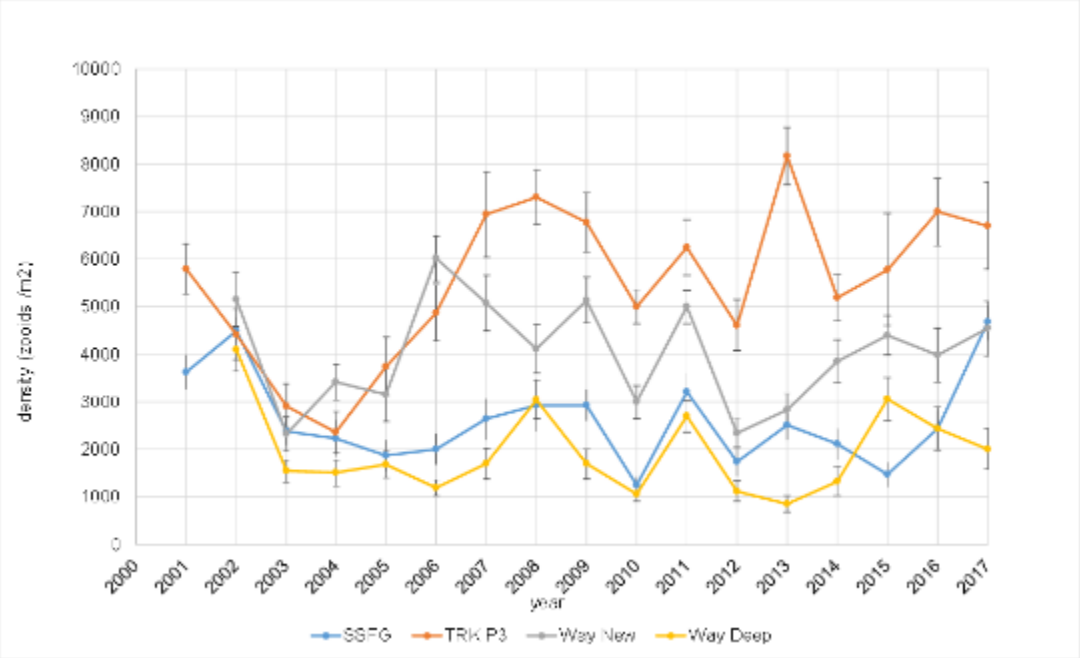
10.1.12. Project code: RM23/05 Monitor *Parazoanthus axinellae*

All monitoring sites were visited and all yellow trumpet anemone colonies were still present.

The Thorn rock sites all decreased in frequency of polyp compared to 2015, whereas other sites show a slight increase.

No significant changes in polyp density were seen at any site in 2017.

Figure 10.15 Density of *Parazoanthus axinellae* polyp (numbers of polyps /m^2) at Skomer MCZ sites 2001 – 2017

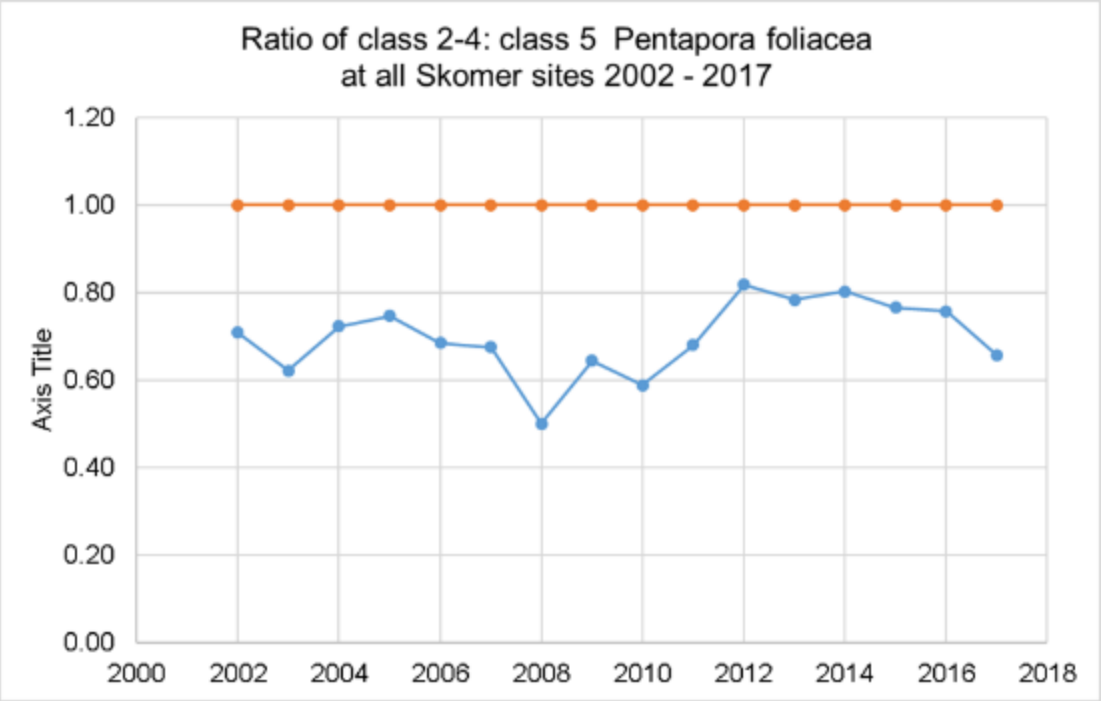


10.1.13. Project code: RM63/01 Monitor *Pentapora foliacea* Population

In 2017 all Ross coral sites were visited and photographed. The classification system developed in 2006 and revised in 2010 has been used to characterise the population at Skomer.

By comparing numbers of class 2-4 colonies, which represent healthy growing colonies, with class 5 colonies, which represent those with deterioration from either natural or anthropogenic factors, it can be demonstrated that there are more class 5 colonies than class 2-5, which might indicate a population under pressure.

Figure 10.16 *Pentapora foliacea* - ratio of class 2-4 colonies to class 5 colonies - all Skomer sites



However, without comparing this ratio to that for an unimpacted area of seabed, no definite conclusion can be made.

10.2. Meteorology/Oceanography

10.2.1. Project code: RP04/01 Record Meteorological Factors

Weather data at Skomer MCZ continues to be collected via an automatic weather station, which is compatible with other Environmental Change Network sites across Wales.

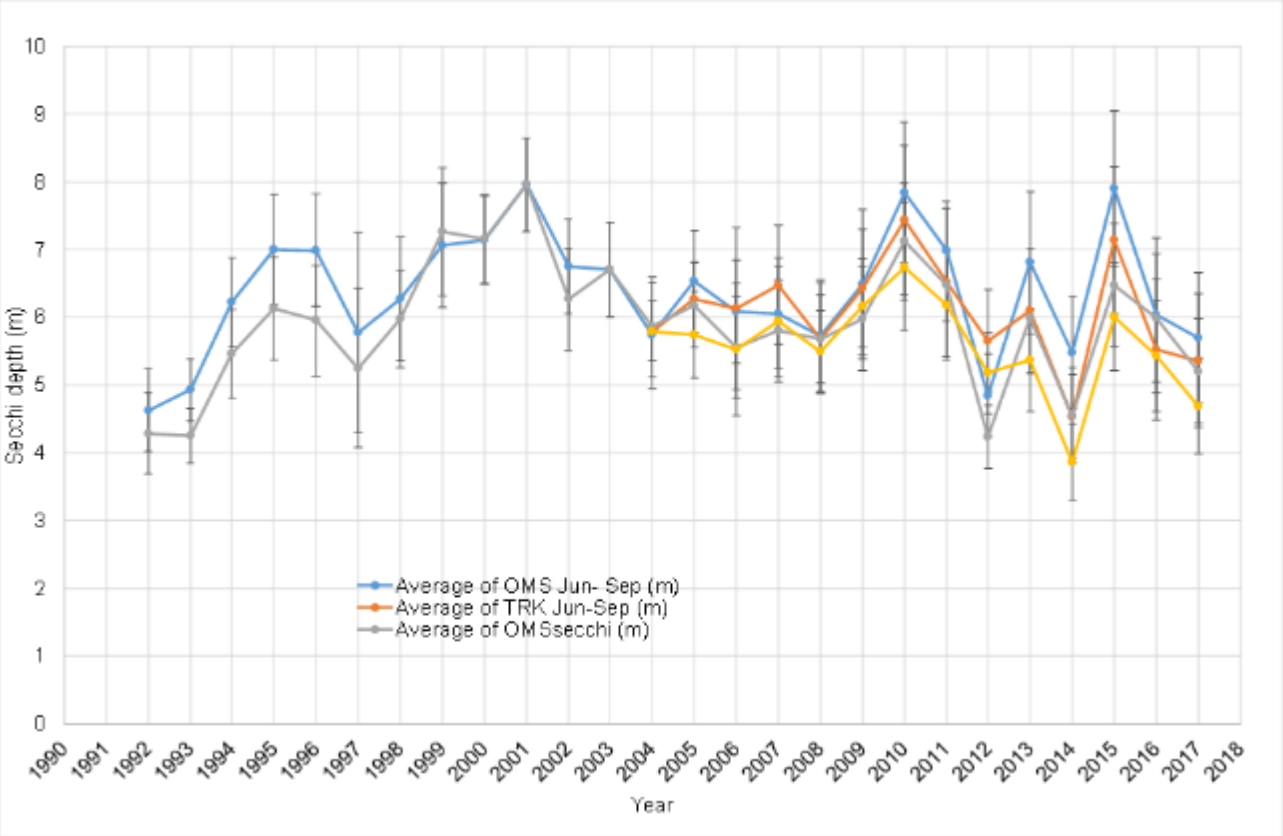
The highs and lows of the weather for 2017:

Maximum temperature (ºC)	24.4 (July)
Minimum temperature (ºC)	-2.5 (Feb)
Annual Maximum gust (knots)	77.7 (Oct)
Direction of Maximum gust	189 degrees

10.2.2. Project code: RP63/01 Monitor Seawater Turbidity / Suspended Sediment

Seawater turbidity was measured using a Secchi disk 23 times at Thorn Rock and 24 times at OMS. Turbidity at Skomer MCZ in 2017 appears to be marginally below average when compared with previous years.

Figure 10.17 Skomer MCZ summary of annual mean Secchi disc data (m) with 95% S.E. bars



10.2.3. Project code: RP63/04 Monitor Seabed Sedimentation

Seabed sedimentation samples were collected at OMS and Thorn Rock sites using passive sediment traps.

Analysis of the samples is carried out by NRW laboratories for dry weight, organic content, grainsize analysis and metal content.

We are still awaiting results from samples taken in 2016 and 2017.

10.2.4. Project code: RP64/01 Record Seawater Temperature

Seawater temperature data was collected from an automatic logger located at 19m below chart datum at the OMS site and from vertical temperature, salinity profiles carried out from surface to near seabed at the same time as plankton sampling.

Maximum and minimum seabed temperature from the logger are presented in Table 10.2.

Table 10.2 Maximum and minimum seabed temperature from OMS logger

Year	Minimum temperature ºC	Maximum temperature ºC
2000	8.4	16.27
2001	7.27	16.3
2002	8.7	15.6
2003	7.6	17.1
2004	7.7	16.76
2005	7.36	16.4
2006	7.5	16.3
2007	8.8	16.3
2008	8.4	16.3
2009	7.0	16.8
2010	6.9	16.8
2011	7.6	15.9
2012	8.0	16.6
2013	6.98	16.82
2014	8.14	16.72
2015	7.8	15.98
2016	8.5	16.8
2017	8.3	16.4

Comparison of annual mean temperatures with the overall mean indicate that temperatures in 2017 continued to be “very average”.

10.3. Data handling developments

Most document storage and IT systems within NRW now operate over the internet, however, the line speed is so slow at Martins Haven that this “on-line” approach is not practicable. Recent enquiries with BT have established that the cost of installation of fibre-optic broadband to Fisherman’s Cottage would be prohibitive.

With this, and failures of previous storage options in mind, new equipment has been provided with the facility to back up all our documents, data and images to portable hard drive so back-ups can be stored off-site.

MCZ reports continue to be available via the NRW internet site.

10.4. Other work

MCZ staff continue to be involved in NRW projects outside of the Skomer MCZ itself, especially where it is most efficient logistically for us to carry out the work or where the MCZ team have the necessary skills or equipment:

Skalmey was again used to support the work of the Milford Haven Waterway Environmental Surveillance Group by carrying out grab sampling in the Haven.

MCZ staff have also continued to support the work of NRW's specialist monitoring team, carrying out lagoon sampling surveys at Pickleridge, Neyland and Carew.

As Skomer MCZ data are used extensively for reporting on European Marine Site condition Phil attended the Marine SAC Site condition workshop in Bangor in May.

Mark continues to service a number of temperature loggers around the Pembrokeshire coast and the whole team has continued to fulfil NRW's commitment to the UK-wide MarClim project, carrying out shore surveys throughout Pembrokeshire, including on Skokholm Island.

11. Education and Interpretation

11.1. Fisherman's Cottage MCZ exhibition

Visitor numbers to the Skomer MCZ exhibition room at Martins Haven have been boosted in 2017 by the efforts of the staff at Lockley Lodge who have opened the exhibition for us, especially when we are not around.

Figure 11.1 MCZ Exhibition Visitor numbers 2017

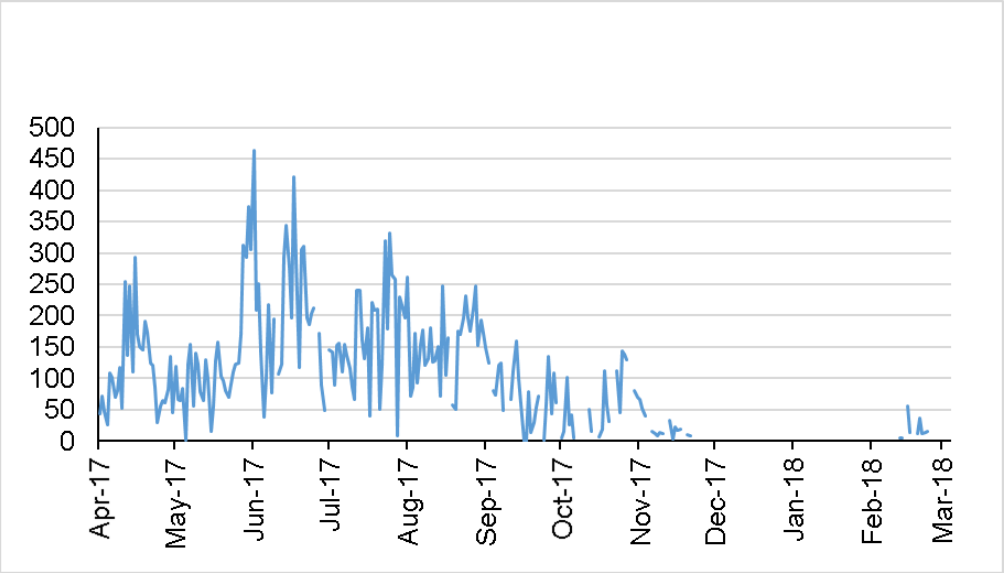
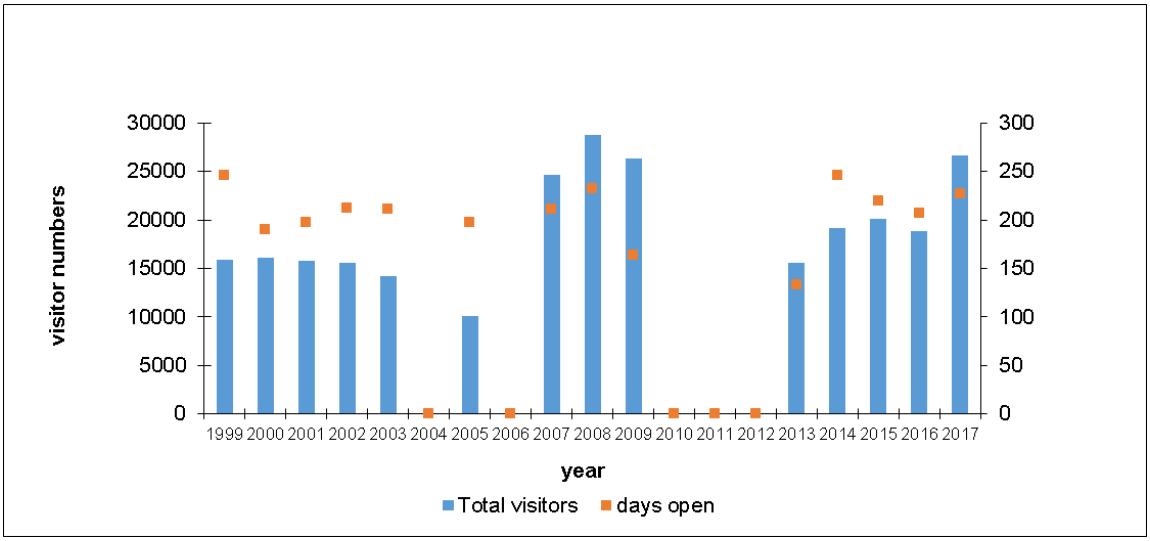
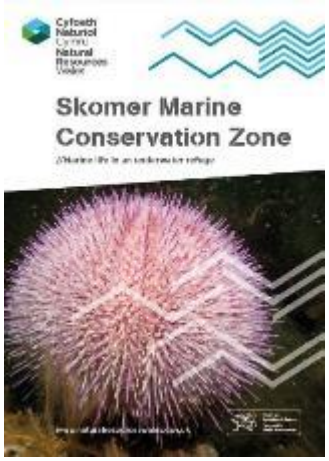


Figure 11.2 MCZ Exhibition Visitor numbers and days open 1999 to 2017





The exhibition itself has not been changed, but the supporting booklet has been reprinted with much-improved image quality after stocks ran low at the end of last year.

An addition to the interpretation at Martins Haven was our new signage, including a general information panel following a corporate design in keeping with other NRW sites.

11.2. Other initiatives

The Skomer MCZ Martins Haven Marine Day in August 2017 was not blessed by good weather, but despite a slow start a number of children came to help us explore the shore. Naturally, the weather had improved by the time we adjourned to the village hall so numbers were further depleted as people went off to do outdoor things.

Skomer MCZ staff have made a variety of contributions to the Visit Wales “Year of the Sea” campaign via the Wales Marine and Coastal Recreation Project, NRW’s Year of the Sea webpage, and NRW’s social media campaign. Our own Facebook page was also maintained.

It just goes to show that even seal poo can be interesting to people on social media (799 people reached)! The post about our plankton records reached an even more impressive 2559 people.

MCZ staff also posted various articles on NRW’s internal social medium, “Yammer”, from updates on seal casualties during the autumnal storms to latest results from the plankton recording at Skomer MCZ.

MCZ staff provided images for NRW’s corporate plan and Phil was interviewed for the accompanying video (in the pouring rain).

Kate co-authored an article in one of our most obscure claims to fame. The article on seal pup monitoring in Wales appeared in the “Habitats Regulations Assessment Journal”.

Kate also prepared a blog for the NRW website on the MCZ’s seal work.

11.3. Talks and presentations

As mentioned in Section 5.3 Phil gave a presentation on how the principles of Sustainable Management of Natural Resources are applied to the work at Skomer to an NRW training event. This despite having initially signed up to the course to learn what SMNR was himself.

In September Phil gave a talk to the Pembroke branch of WTSWW.

Mark continues to be the darling of the Women's Institute circuit and now grades his hosts on the quality (and amount) of cake he receives – so ladies, beware! WI groups visited included Redberth, Fishguard, Saundersfoot, Bwlchygroes, and Cosherton.

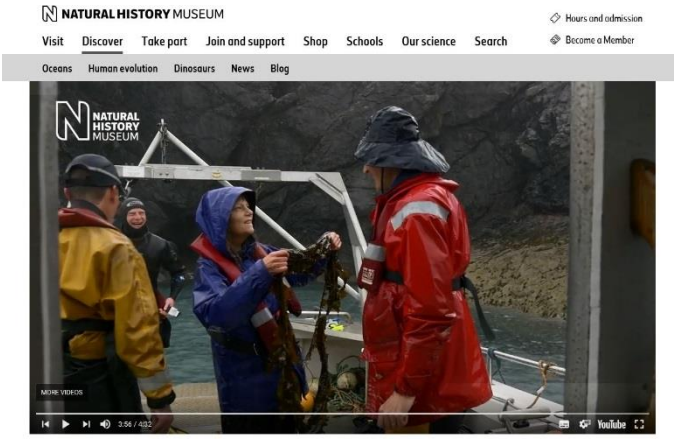
Mark also gave a presentation on the work of Skomer MCZ to the Dale Fort science camp during July.

11.4. Media

Skomer MCZ staff have responded to a variety of enquiries from film and TV media, including:
Offspring Films, who were researching for a new wildlife series and planning to film puffins, but also some underwater filming around Skomer as well.
Plimsoll Productions were scoping a new BBC Wales/S4C television series focussing on the unique wildlife of Wales and thinking about including sea slugs.

Kate was interviewed by Radio Pembrokeshire to discuss the 'mega swarm' of barrel jellyfish that washed ashore in May.

The Natural History Museum broadcast unit, who filmed the collection of specimens for the Museum's new seaweeds display (see Section 9.7), featured MCZ staff in their on-line video. Again, pouring rain appeared to be the theme:



One of “our” swallow broods made the website of BBC’s Springwatch programme when the nest was made in the pilot whale skull that is part of the MCZ exhibition. The video was also posted on NRW’s website.

Swallow flap in action

12. Acknowledgements

Skomer MCZ staff wish to thank all those who have supported our work or contributed directly to it over the past year.

Special thanks to:

- Members of the Advisory Committee, especially Dr Robin Crump who chairs the Committee;
- All of our volunteers;
- Bee Büche and Eddie Stubbings and the rest of the Skomer Island NNR staff;
- John Archer Thomson and Blaise Bullimore for diving support;
- Rob Gibbs for support at weekends, on the fish survey and for freezing his bits off in various Pembrokeshire lagoons;
- Blaise Bullimore for the use of his photographs in this and other reports;
- The crew of the *Dale Princess;*
- Neptune's Army of Rubbish Collectors for helping to keep the MCZ (and indeed the waters of Pembrokeshire) less full of rubbish;
- Our heroic volunteer diving teams without whom we would not have been able to carry out the territorial fish surveys;
- Skippers of the dive charter vessels for getting the volunteers on site safely.

With apologies to anyone missing from the list above.

13. Appendices

Appendix 1 – Grey Seal Breeding Census Skomer Island 2017, Birgitta Büche and Edward Stubbings, Wildlife Trust of South and West Wales. NRW Evidence Report 252

Summary

237 pups were monitored on Skomer Island in 2017, of which 225 were definitely born on Skomer and twelve pups turned up either just before the start of moult, or moulting (wanderers).

The total of 225 pups born on Skomer Island is the second highest total ever recorded with 240 (in 2015) being the record.

A total of 383 pups were born within the Skomer Marine Conservation Zone, of which 158 were born on the Marloes Peninsula. See section 4.2.

The busiest period was week 39 (25/9-1/10) with 51 pups born. See section 4.2.

The most productive beaches were Matthew's Wick (42 pups), South Haven and North Haven (41 pups). The fourth most popular beach was Driftwood Bay (28 pups). See section 4.2.

170 pups are known, or assumed to have survived on Skomer, giving a survival rate of 76%. This survival rate assumes that all moulting pups (class 4) and all those size 3 or larger survived two severe storms in mid-October – even if they disappeared during the storms. Therefore a second, potentially more accurate, survival rate (storm methodology) of 62% was calculated. See section 4.3.

In 2017 the maximum haul-out (on the main haul-out sites) of 305 animals was recorded on 23 November, one day earlier than in 2016. See section 5.

In 2017 25 animals (15 females, six males, four immature) were photographed with obvious signs of being entangled in nets at some time in their lives. See section 6.

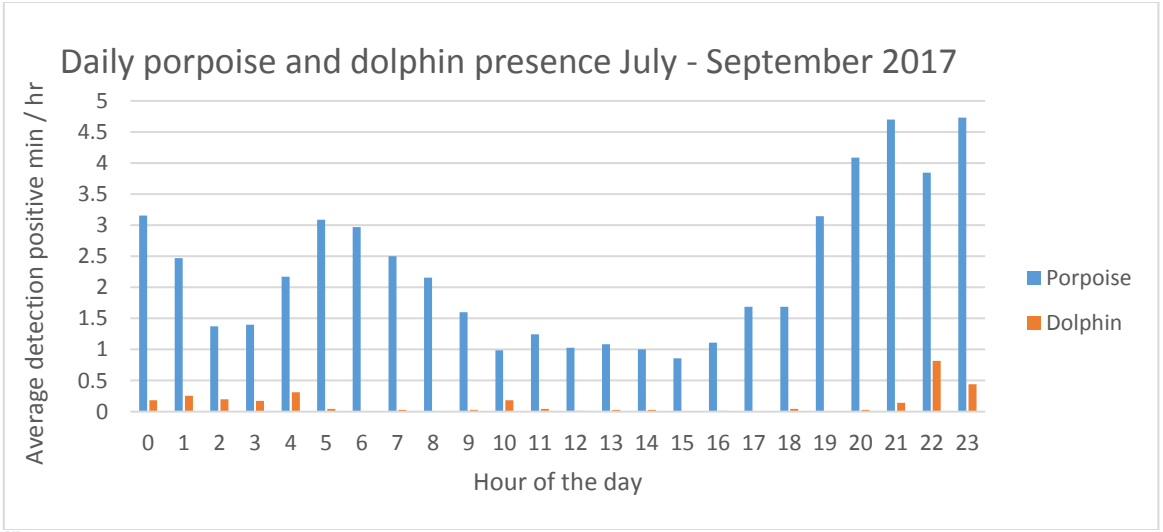
Between 1 August and 23 November 2017 14 incidents of disturbance to seals around Skomer Island were observed and there were 13 incidents of vessels entering the voluntary no access zones. See section 7 and Appendix 3 and 4.

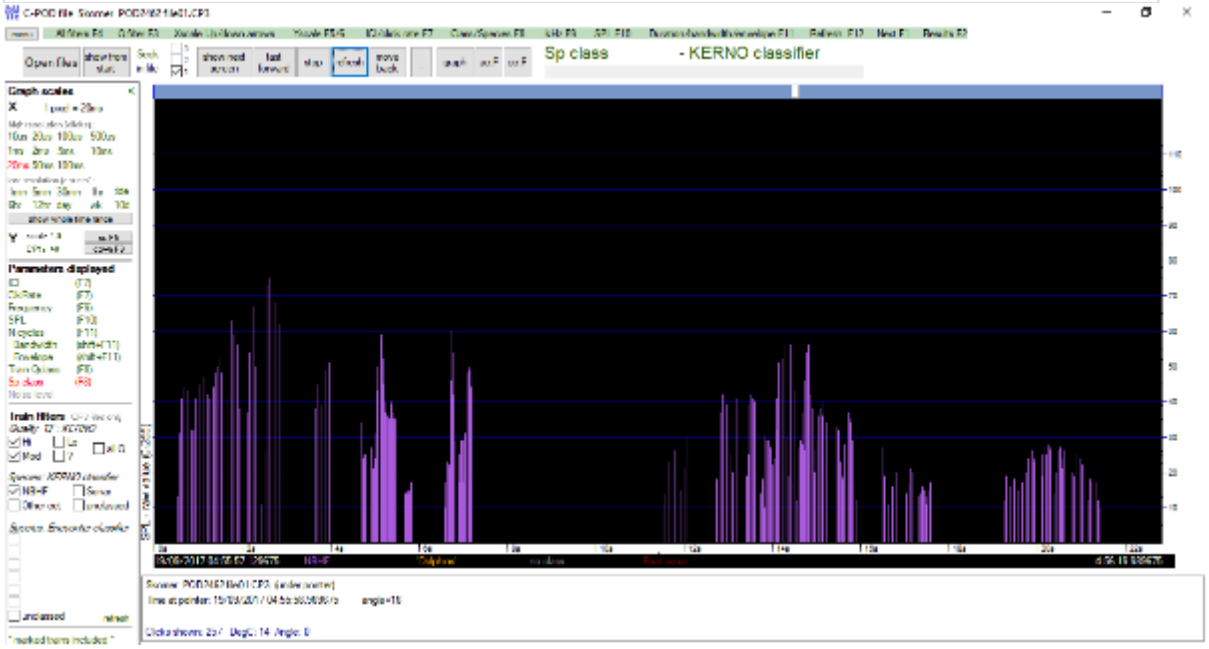
In 2016 410 photos were taken which will be entered into the NRW Wales Seal ID database. Furthermore 127 seals were identified by eye, of these 50 were known from previous years. See section 10.

Appendix 2 - Skomer MNR cetacean presence recorded by a static acoustic data logger (C-POD)

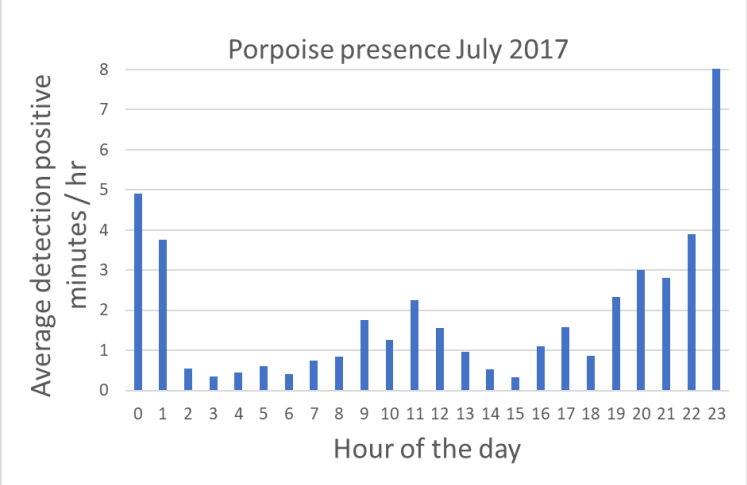
Initial data analysis by Hanna Nuuttila, SEACAMS2 Scientist, Swansea University

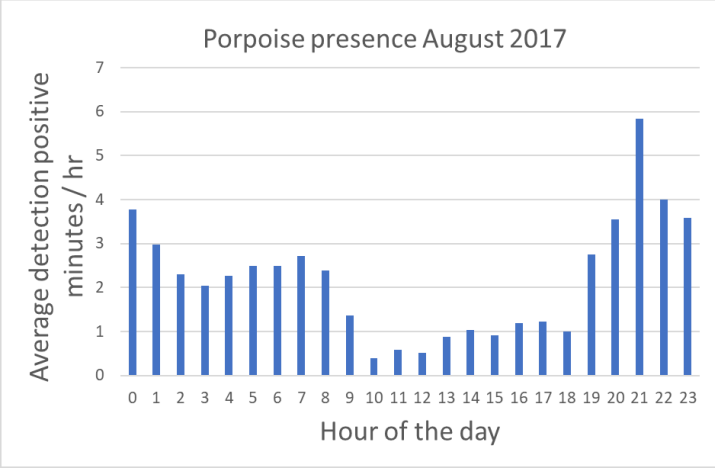
Brief preliminary results from a fieldwork collaboration between SEACAMS2 project at Swansea University and the Skomer team. The MCZ team deployed, secured and retrieved the data logger, whilst data handling and analyses was conducted by SEACAMS2 team at Swansea University.
High numbers of harbour porpoises were recorded nearly every day of the recording period. There were frequent recordings of dolphin (species unknown), although detection rates of dolphins were much lower throughout the study period.

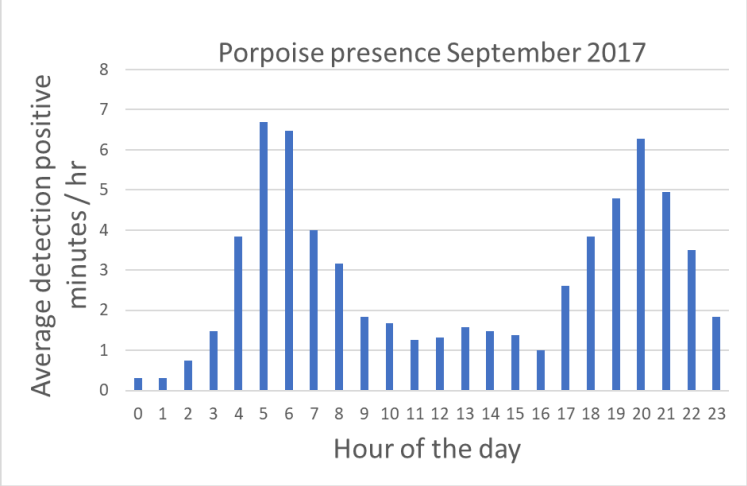




Above:View of the software (CPOD.exe) depicting porpoise clicks as purple lines. Time on X-axis, source pressure level (amplitude) on Y-axis.

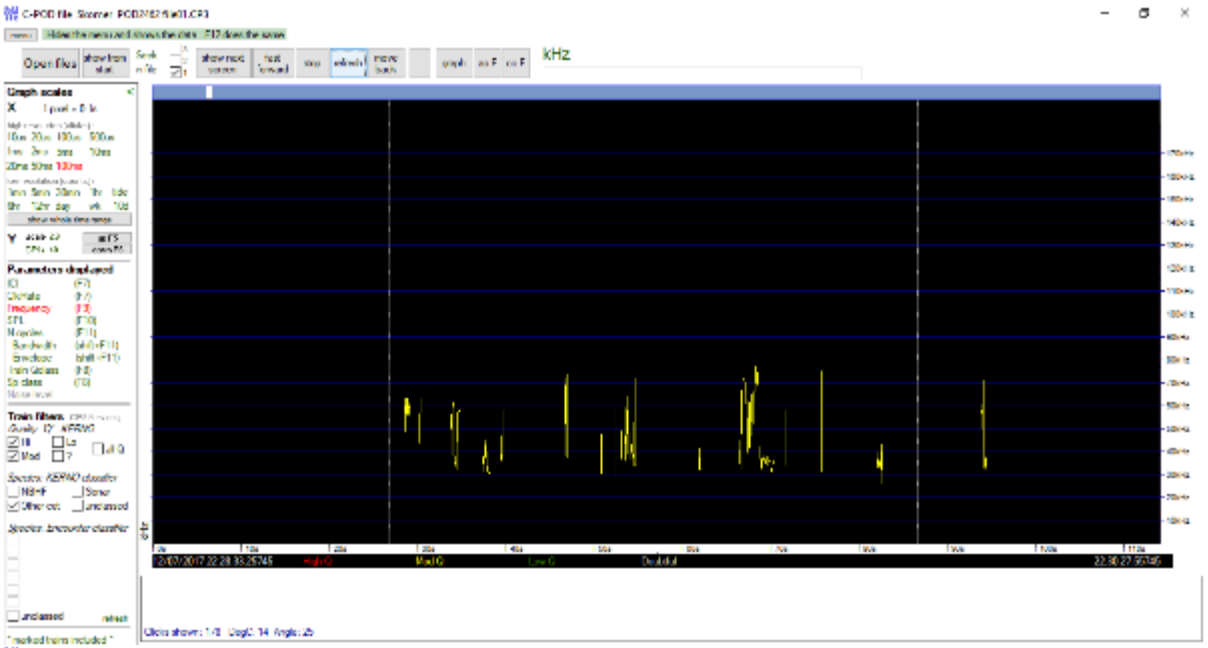


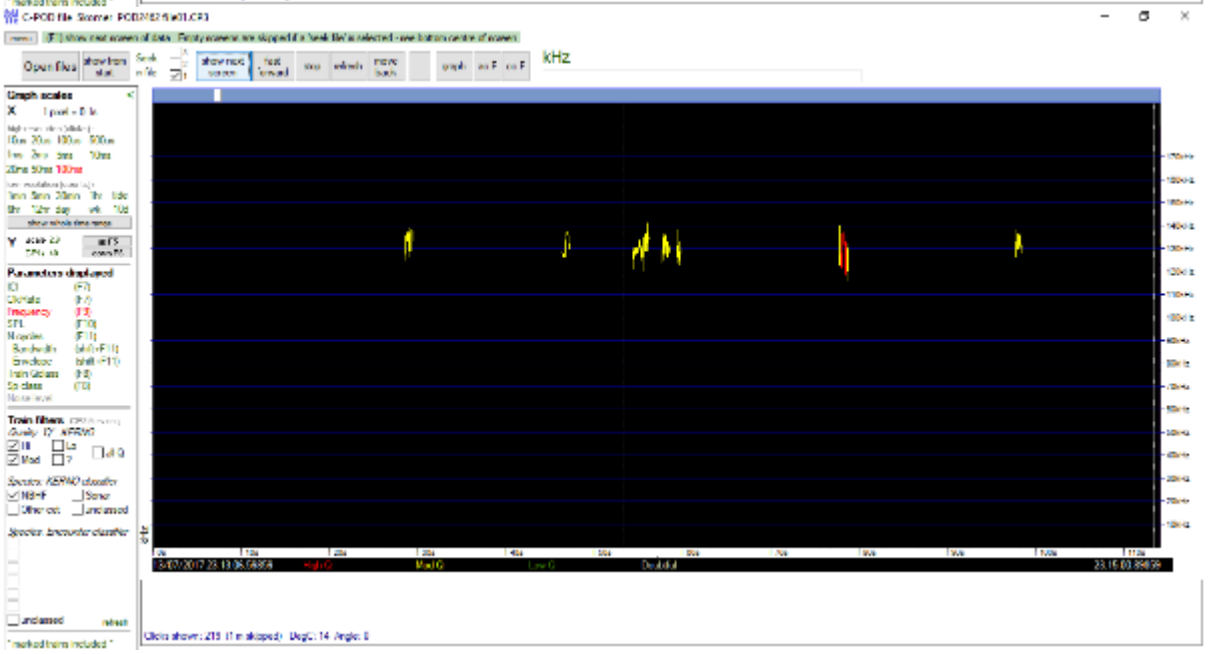




Above: Average porpoise detection rates for July-September.
The software can distinguish porpoise clicks from dolphin clicks by their characteristics, one of which is the difference in their peak frequency. Porpoise clicks contain their energy around 130 kHz, whereas dolphin clicks have energy in much wider band, around 50-70 kHz. Unfortunately the software cannot (yet) identify different dolphin species.

Below: The software (CPOD.exe) depicting typical dolphin clicks – with energy centred around 50-70 kHz.





Above: The software (CPOD.exe) depicting typical porpoise clicks – with energy centred around 130 kHz.

Appendix 3 – Skomer long term volunteer project – Ruby Temple-Long: Clingfish at North Haven landing beach.

In 2017 a long-term volunteer working on Skomer Island NNR (Wildlife Trust South and West Wales) conducted a research project on the clingfish population at North Haven landing beach. The population was surveyed between 28th April and 06th September 2017 every 2 weeks. 2 x 30m transects were set up, one in the middle shore (3m above chart datum (ACD)) and one in the lower shore (~1m ACD). Counts were made of all clingfish and egg masses found within a 1m band either side of the transect (60m^2).

Summary of results:
No cling fish were found in the middle shore.

Lower shore.

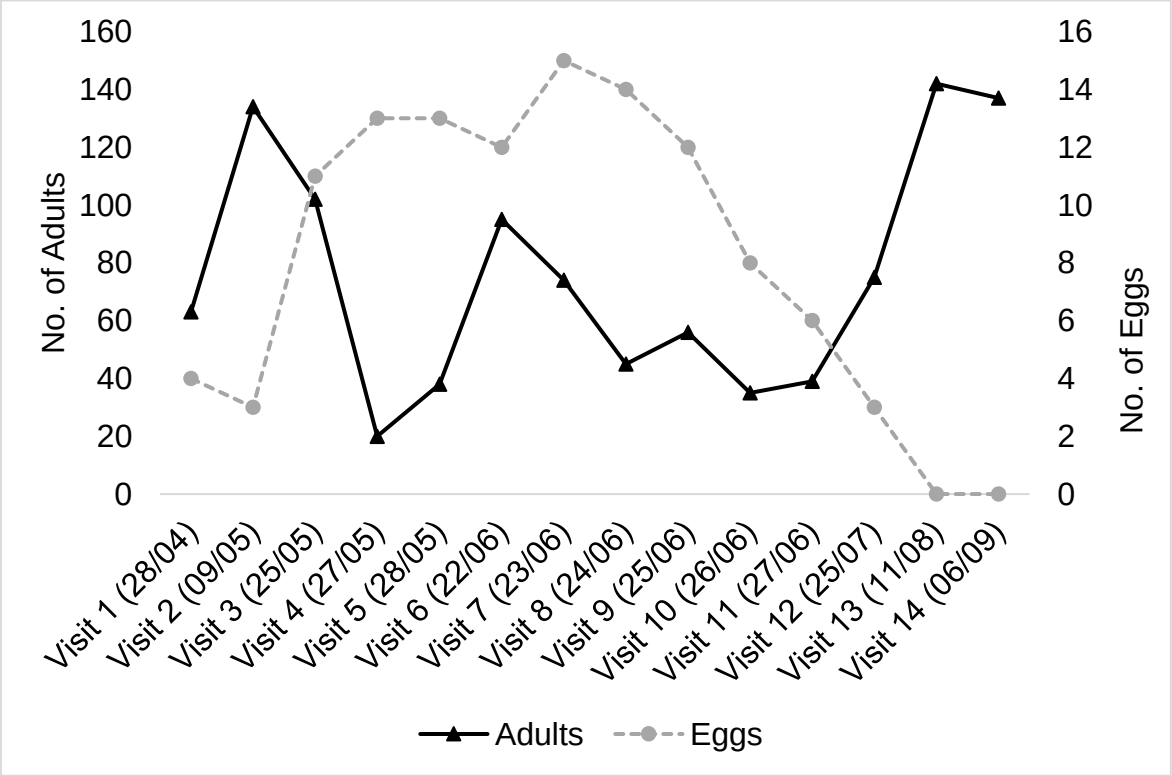


Figure 6.1.8 Number of adult clingfish and eggs masses found on the lower shore (60m^2) North haven, (R. Temple-long 2017).

Adult cling fish were seen on all visits, even when no eggs were present. Egg laying period had started before the survey began on the 28th April and extended into early July. It is hoped that this study will be repeated in future years with surveys conducted earlier in the year to see when the egg laying season starts.

Appendix 3 - Skomer long term volunteer project – Jake Taylor-Bruce: Marine fauna of North Haven.

The aim of the project was to make a record of the marine fauna of North Haven, as well as to compare the fauna found in two separate areas of the haven, the kelp forests at the cliffs edge, and the bed of eel grass that occupies much of the center of North Haven. This project came about as a result of discussions with both the wardens of Skomer Island and the staff of Skomer MCZ, where it was realised that there was very little record of the variety of species that could be found within these murky depths. It was helped in no small measure by my love of the sea and free diving!

The project had two main components, the first being the use of an underwater camera mounted on a metal frame that was placed on the sea floor. The camera was set on time lapse for around 45 minutes, taking one photo every half second. These photos could then be viewed as a film which showed all the fish species that had passed in front of the camera during the 45 minutes of recording while there was no human impact to scare or attract certain species. The second component involved myself snorkeling and diving along the kelp forest and noting the species that occurred there. By using these two separate methods I was able to observe not just larger fish species, but also much smaller species, both vertebrates and invertebrates in an effort to gain a reasonably accurate understanding of the underwater fauna of the bay.

Illustration 1: Sea Bass (Dicentrachus labrax) seen on the underwater camera.

Over all the project was successful, not to mention interesting! A total of 75 species were recorded from 14 different phyla. The vast majority of these species were recorded while snorkeling and diving, with only a relatively small contingent being recorded on the camera. The camera did however record species that were not seen during snorkeling sessions on the same day, with sea bass being especially common on camera. Notable species included sea bass, and a small population of king scallop just off the kelp forest on the sandy floor. Of personal interest were the feather star (which marked the first

time I have ever seen one), the jewel anemones which cover areas of rocky overhang with spectacular swathes of fluorescent colour and the ethereal twin spire fan worms, the tentacular crown of which resembles a ghostly white flower protruding from rocky crevices. Perhaps the most common species of vertebrate seen were the ballan wrasse and gold sinny, both of which could be found in abundance drifting silently through the kelp forests. On the invertebrate side, Ctenophores (comb jellies) far outnumbered anything else, with sea gooseberrys occurring in very large numbers during favorable conditions. The kelp forest recorded significantly higher numbers of species than were seen in the seagrass beds.

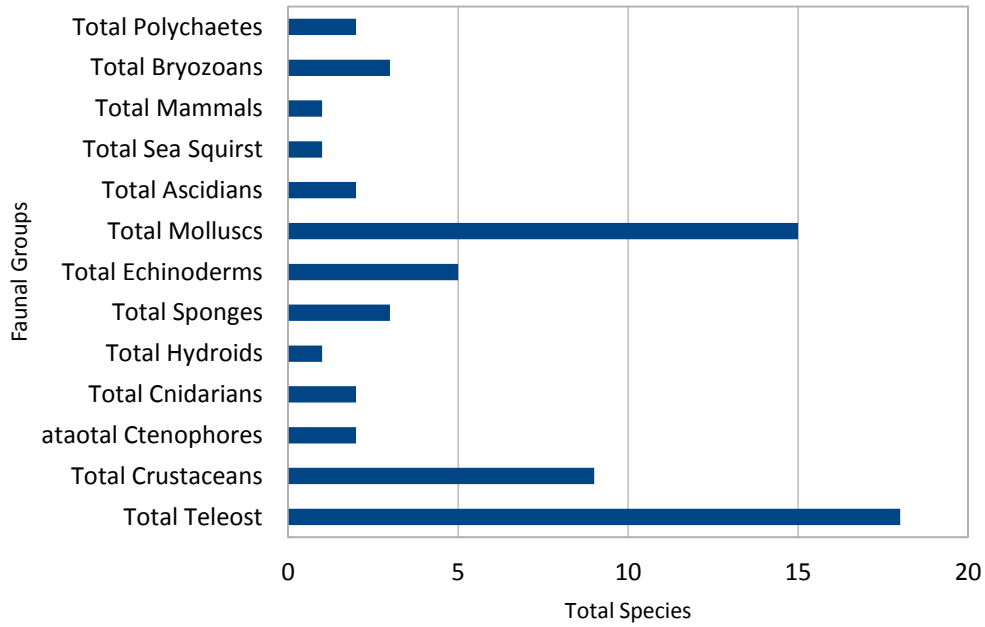


Illustration 2: Bar Chart showing the total number of species found in each group of organisms recorded.

While this project was both interesting to carry out and enjoyable for myself, there certainly were problems associated with it. In the seagrass bed the fragmented nature of the habitat, coupled with the jerky frame rate of the time lapse camera, meant that it was difficult to spot animals moving through the sea grass. Furthermore, the decreased visibility over the seagrass beds (likely due to the sandier substrate compared to the kelp forest) meant that it is possible that species were under recorded in a way that was not seen in the kelp forest. Future efforts may find a continual film better than time lapse (although this does come with its own difficulties); for some reason the camera stopped filming after 15 minutes. Further, due to the fact that I was diving without the use of a breathing apparatus, I was limited to 2-3 minutes of time when exploring underwater. This undoubtedly has led to a under recording of a number of species, particularly small well hidden organisms such as nudibranchs, or highly cryptic organisms, such as certain species of Innachus spider crab that were recorded in the sea grass beds. Certain species will have been under recorded due to my own unfamiliarity with them. A more detailed

investigation on sponges for example would doubtless show a much greater diversity than the three recorded species.

Even with the above issues, this survey project clearly shows that the waters of North Haven support a wonderful diversity of life, and that the sea surrounding Skomer hold just as many treasures as the island itself.

My thanks go to both the wardens of Skomer Island (Ed and Bee) for facilitating this project, as well as to the staff of the Skomer MCZ, for allowing me to use their underwater camera and mount.

Executive Summary

The Pembrokeshire Sustainable Shellfish Initiative Pilot demonstrated that practical modifications can be easily incorporated into lobster pots as effective means of minimising ghost fishing. Anti-ghost fishing mechanisms utilise 'weak links' in the gear that, after biodegrading, create a structural flaw in the fishing pot and allow the escape of trapped animals. These are not generally included in the pot design at the point of manufacture due to the desire to create as robust a pot as possible, and due to regional differences in legislation. Incorporating a biodegradable element to the pot hook offers a novel solution that the fisher can easily monitor; failure of the hook is most likely to occur during tensioning of the hook to close the pot door. This can be quickly replaced using spare modified hooks and the risk to losing catch during active fishing minimised. Pot hooks modified with Ghost Buster hog rings (made of annealed steel and designed to last approximately 12 months) were tested in the pilot trial and deemed a success from the fishing industry point of view as they held for between 11 – 17 months. This was an acceptable working lifespan for all fishers whether potting seasonally (April – October) or right through the year.

Incorporating a biodegradable element to a drop-out panel or escape hatch is more commonly the mechanism by which ghost fishing is usually minimised. The pilot found that participating fishers were keener on the biodegradable hooks as a failing escape hatch is more easily overlooked and can result in loss of catch. The trial found that biofouling (the growth of marine life over the pot) could 'smother' escape hatches (or 'blank' drop-out panels) and prevent the hatch from opening once biodegradable fixings 'rotted'. This mirrored extensive experience in the US where an alternative fully biodegradable panel made of Polyhydroxyalkanoate (PHA) was the recommended solution.

It is clear from the experience of divers in Pembrokeshire that in 'recently' lost pots which have been found (this is estimated as within 2 years of being lost), ghost fishing can occur. From the contents recorded in some of these pots, the data is showing a high number of target species trapped – testament indeed to the efficiency of the pots. Such catch is a wasted 'home goal' for fishers, and not beneficial to the long term sustainability of the inshore crustacean fishery or to the marine ecosystem on which crustaceans rely. The way in which a trap becomes lost and where, and the type of trap lost, are all factors that influence the likelihood of any ghost fishing occurring and its duration. Pots may well become too damaged after longer periods of time and be unable to retain any catch; certainly not every lost pot found is capable of ghost fishing.

Use of 82mm x 43mm escape hatches to allow release of <90mm European lobsters was universally popular within the trial. No negative impacts to catches were noted and pot clearing times were generally reduced.

Testing voluntary proactive actions to improve fishing sustainability, and the sustainability of the environment upon which fishing is wholly dependent, has provided experience to help inform future Welsh fisheries management to move toward a hopefully more prosperous and resilient Wales.

More information including a short film on the Pembrokeshire Sustainable Shellfish Pilot Initiative
can be found at www.pembrokeshiremarinesac.org.uk/pssi.html

Or contact the project manager. Email: pembrokeshireSSI@gmail.com
@PembsMarineLife @PembrokeshireMarineWildlife

Crynodeb Gweithredol

Dangosodd y Fenter Pysgod Cregyn Cynaliadwy yn Sir Benfro fod modd gwneud addasiadau ymarferol i botiau cimychiaid fel ffordd effeithiol o leihau pysgota anfwriadol cymaint â phosib. Mae mecanweithiau sy'n atal pysgota anfwriadol yn defnyddio 'dolenni gwan' yn y cyfarpar sy'n bioddiraddio i greu nam strwythurol yn y pot pysgota ac yn galluogi anifeiliaid sydd wedi eu dal i ddianc. Yn gyffredinol, nid yw'r rhain wedi'u cynnwys yn nyluniad y pot adeg eu gwneuthuro, oherwydd y dyhead i greu pot sydd mor gryf â phosib, ac oherwydd gwahaniaethau rhanbarthol mewn deddfwriaeth. Mae cynnwys elfen fioddiraddadwy i'r pot yn ddatrysiad newydd y gall y pysgotwr ei fonitro'n hawdd; mae'r bachyn yn fwy tebygol o fethu wrth roi tensiwn ar y bachyn i gau drws y pot. Mae modd gosod un newydd yn gyflym gan ddefnyddio bachau sbâr, wedi eu haddasu, ac mae hyn yn sicrhau cyn lleied o berygl â phosib o golli'r ddalfa wrth bysgota. Profwyd bachau pot wedi'u haddasu gyda chylchoedd mochyn Ghost Buster (wedi'u gwneud o ddur aneliedig ac wedi'u dylunio i bara tua 12 mis) yn y treial, a chanfuwyd eu bod yn llwyddiannus o safbwynt y diwydiant pysgota gan eu bod yn dal am gyfnod o rhwng 11 a 17 mis. Roedd hyn yn oes gweithio dderbyniol i bob pysgotwr, waeth a oeddent yn gosod eu potiau'n dymhorol (mis Ebrill tan fis Hydref) neu drwy'r flwyddyn. Er nad yw addasiadau o'r fath yn debygol o atal pysgota anfwriadol yn gyfan gwbl, os digwydd i'r potiau fynd ar goll mae'n gymorth i ostwng pysgota anfwriadol.

Fel arfer, cedwir pysgota anfwriadol i leiafswm trwy gynnwys elfen fioddiraddadwy ar banel sy'n disgyn allan neu agoriad dianc. Yn ystod y treial, gwelwyd bod yn well gan y pysgotwyr a gymerodd ran y bachau bioddiraddadwy gan ei bod yn hawdd peidio â sylwi ar agoriad dianc sydd wedi methu, sy'n golygu bod modd colli'r ddalfa. Yn y treial, gwelwyd y gallai biofaeddu (tyfiant bywyd morol dros y pot) 'dagu' agoriadau dianc (neu banelau disgyn allan 'blanc') ac atal yr agoriad rhag agor unwaith fydd y gosodiadau bioddiraddadwy wedi 'pydru'. Roedd hyn yn atseinio profiad helaeth yn Unol Daleithiau America lle awgrymwyd panel hollol fioddiraddadwy wedi'i wneud o Polyhydrocsyalcanoat (PHA).

Mae'n amlwg o brofiad y deifars yn Sir Benfro fod potiau a gollwyd 'yn ddiweddar' (amcangyfrifir bod hyn o fewn 2 flynedd i'w colli), yn gallu pysgota'n anfwriadol. O'r cynnwys a gofnodwyd yn rhai o'r potiau hyn, mae'r data'n dangos bod nifer uchel o rywogaethau targed wedi'u dal – sy'n dyst i effeithlonrwydd y potiau. Mae dalfa o'r fath yn wastraffus i bysgotwyr, ac nid yw'n fuddiol i gynaliadwyedd hirdymor y pysgodfeydd cramenogion tua'r lan nac i'r ecosystem forol y mae cramenogion yn dibynnu arni. Mae'r ffordd y caiff magl ei cholli, ble caiff ei cholli, ynghyd â'r math o fagl a gollir, yn ffactorau sy'n dylanwadu ar y tebygolrwydd o unrhyw bysgota anfwriadol ac am ba hyd y bydd yn para. Gallai potiau gael eu difrodi'n ormodol ar ôl cyfnodau hirach o amser ac efallai na fyddant yn gallu cadw unrhyw ddalfa; yn sicr, ni allai pob pot colledig a ddarganfyddir bysgota'n anfwriadol.

Roedd y defnydd o agoriadau dianc 82mm x 43mm fel bod modd i gimychiaid Ewropeaidd <90mm gael eu rhyddhau, yn boblogaidd yn gyffredinol o fewn y treial. Ni nodwyd unrhyw effeithiau negyddol ar ddalfeydd ac, yn gyffredinol, gwelwyd amserau clirio potiau'n gostwng.

Mae profi camau gweithredu rhagweithiol, gwirfoddol i wella cynaliadwyedd pysgota, a chynaliadwyedd yr amgylchedd y mae pysgota'n llwyr ddibynnol arno, wedi darparu

profiad i fwydo'r gwaith o reoli pysgodfeydd Cymru yn y dyfodol er mwyn symud ymlaen at yr hyn a fydd, gobeithio, yn Gymru sy'n fwy llewyrchus a chydnerth.

Ceir gwybodaeth bellach, a ffilm fer ar y Fenter Peilot Pysgod Cregyn yn Sir Benfro ar www.pembrokeshiremarinesac.org.uk/pssi.html
Neu gallwch gysylltu â rheolwr y prosiect. E-bost: pembrokeshireSSI@gmail.com
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