

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales



**Skomer Marine Nature Reserve
Project Status Report
CCW West Area Report**

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Photo: John Liddiard.

SYNOPSIS

During the 1970's and 1980's large scale surveys took place in the waters and shores around Skomer Island. These surveys not only mapped littoral and sub-littoral habitats around the Reserve, but also started to collate species information. The ideas and information contained in these early projects provided a foundation for all the current littoral and sub-littoral projects.

Since the designation of the Skomer Marine Nature Reserve (SMNR) in 1990 the work of the SMNR team has focused on developing a range of projects to monitor the health of the Reserve and investigating the relevant aspects of species life histories for baseline information. This report is a summary of the current status of SMNR projects that have been reviewed to date.

CRYNODEB

Yn ystod y 1970au a'r 1980au, fe gafodd arolygon mawr eu cynnal yn y dyfroedd ac ar y glannau o amgylch Ynys Sgomer. Fe aeth yr arolygon hyn ati nid yn unig i fapio cynefinoedd rhynglanwol ac isarforol o amgylch y Warchodfa, ond hefyd fe aethant ati i goladu gwybodaeth am rywogaethau. Roedd y syniadau a'r wybodaeth a oedd wedi eu cynnwys yn y prosiectau cynnar hyn yn sail i'r holl brosiectau rhynglanwol ac arforol presennol.

Ers dynodi Gwarchodfa Natur Forol Sgomer (GNFS) yn 1990, mae gwaith y tîm GNFS wedi canolbwyntio ar ddatblygu ystod o brosiectau i fonitro iechyd y Warchodfa ac i ymchwilio i'r agweddau perthnasol ar hanes bywyd rhywogaethau er mwyn cael gwybodaeth llinell sylfaen. Crynodeb yw'r adroddiad yma o statws presennol prosiectau GNFS sydd wedi cael eu hadolygu hyd yn hyn.

CONTENTS

1.	INTRODUCTION	1
2.	SKOMER MNR PROJECT STATUS SUMMARY TABLE	3
3.	SKOMER MNR BIOLOGICAL PROJECT SUMMARIES	7
	LITTORAL COMMUNITIES AND ASSEMBLAGES	8
	EPI-BENTHIC ROCK COMMUNITIES: MESO-SCALE	11
	ALGAL COMMUNITIES	13
	SPONGE ASSEMBLAGES	15
	SEDIMENT INFAUNA COMMUNITIES	17
	SEDIMENT EPIFAUNA COMMUNITIES, MACRO AND MEGA-FAUNA AT THE SEDIMENT INTERFACE	19
	<i>ZOSTERA MARINA</i> POPULATION	20
	<i>EUNICELLA VERRUCOSA</i>: POPULATION AND GROWTH RATE	24
	<i>ALCYONIUM GLOMERATUM</i> POPULATION	28
	<i>PARAZOANTHUS AXINELLAE</i> POPULATION	30
	<i>PENTAPORA FOLIACEA</i> (ROSS CORAL) POPULATION	31
	CUP CORAL POPULATIONS; <i>BALANOPHYLLIA REGIA</i> <i>AND CARYOPHYLLIA SMITHII</i>	33
	<i>PECTEN MAXIMUS</i> (SCALLOP) POPULATION	35
	NUDIBRANCH SPECIES DIVERSITY	37
	TERRITORIAL FISH POPULATIONS	38
	ATLANTIC GREY SEAL (<i>HALICHOERUS GRYPUS</i>) POPULATION	40
4.	ACKNOWLEDGEMENTS	42
5.	REFERENCES	43

1. INTRODUCTION

The waters and shores around Skomer Island have a long history of marine biological survey and research. The designation of the Marine Nature Reserve was due, in part, to the enormous efforts of a wide variety of, largely volunteer, divers and marine biologists. These efforts resulted in a wealth of species and habitat information that highlighted the diverse and special nature of the area.

Bassingdale first described the littoral habitats around Skomer in 1946 and Hunnam first described the sub-littoral habitats in 1976. In the 1980's several large surveys took place that not only mapped littoral and sub-littoral habitats around the Reserve, but also started to collate species information. These are reviewed in Bunker and Hiscock (1987).

In 1982 Bullimore started the Skomer Marine Reserve Sub-littoral Monitoring Project (S.M.R.S.M.P) that has continued uninterrupted to this day. The first survey of eelgrass, *Zostera marina*, in North Haven was undertaken in 1979, with a comprehensive survey completed in 1982 (Jones & Jones 1984). In 1985 a project to tag sea fans (*Eunicella verrucosa*) was started (Bunker 1985), along with other species-specific projects.

The ideas and information contained in these early projects provided a foundation for many of the current littoral and sub-littoral projects.

Since the designation of the Skomer Marine Nature Reserve (SMNR) in 1990 the work of the SMNR team has focused on developing a range of projects to monitor the condition health of the Reserve's wildlife and investigating the relevant aspects of species life histories for baseline information.

A first step in the process was to map survey sites to enable accurate relocation each year. As site mapping was completed the collection of time series data began in earnest. New sites continued to be mapped allowing the expansion of projects. The projects encompassed a wide range of habitats and species, from exposed rock to sheltered muds and the scarlet and gold cup coral, *Balanophyllia regia* to territorial fish. Many of the projects involved photography and much time has been spent refining project methods in order to obtain consistent and reliable images that could subsequently be used to gain quantitative data.

After an initial period of photographic data collection, images were assessed for quality and consistency. An extensive review was begun to determine the quantity and quality of information that could be extracted from the images. Gilbert (1998) explored the use of digital analysis techniques to collect counts and measurements from the images. This review of the data and the image analysis methodology was the start of quantitative data analysis from time series projects in the Reserve.

In 2001 and 2002 these and further projects were again reviewed, but this time with the emphasis on analysing the data and producing monitoring targets to assess the condition of the species, communities and habitats in the Reserve.

Information that can be extracted from biotic time series data include:

- Life history details such as longevity, recruitment, mortality and growth rates.
- Stability of communities over time. Variability of community structure over time.
- Variability of species abundance over time
- The effects of known events (e.g. the Sea Empress oil spill) on species or communities.

Coupled with the biotic time series data is an extensive and accumulating set of environmental data (running from 1993) that has allowed the responses of the biota to environmental fluctuations to be investigated. This has proved very important; the goal of the projects is to separate “natural” change from change induced by anthropogenic activity. It is vital to build environmental factors into the surveillance programme.

What is described above is simply the development of a monitoring programme, not actual monitoring itself (in the sense of assessing a feature's condition against a set of ‘target’ conditions). This development process however is vital if the targets that we are to monitor against are to be meaningful.

The process can be summarised as follows:

- Survey and mapping – what we have got and how much.
- Surveillance of biota – collecting time series data (consistent, comparable data designed with monitoring in mind).
- Surveillance of environmental factors.
- Review of the surveillance data (biotic and environmental) to produce meaningful monitoring targets for species or habitats.

The Skomer MNR is currently at the stage of refining monitoring targets so that genuine monitoring can begin. Target values will continue to be modified as more data is gathered..

This report is a summary of the current status of Skomer MNR projects that have been reviewed to date. Section 2 is a summary table of all current projects in the Reserve. Section 3 comprises summary reports for each of the biological projects reviewed.

It is planned to revise and reproduce this report on an annual basis to complement the Reserve's annual management report.

2. SKOMER MNR PROJECTS STATUS SUMMARY TABLE

	Brief description	Year sets	Sampling frequency	Report	Data summary
PHYSICAL					
Met data	Wind, rain, sunshine, temp, humidity, radiation. Automatic station logging every 10secs.	1993 - Onwards	Continuous	No	Yes-Skomer MNR office
Wave data	Height, period, etc. Automatic station logging every 10secs.	1993-1998	Continuous	No	No - raw only
Seawater data	Temp, salinity, conductivity, suspended sediment. Data collected by a range of methods.	1992 - 2002	Weekly (May -Sept) Temp –semi-continuous year round (since 99)	No	Yes-Skomer MNR office
Seabed sedimentation	Auto sampler	1994-1998	Continuous	No	Yes-Skomer MNR office
	Sediment trap	1994 - 2002	Every 14 days (April-Oct)	No	Yes-Skomer MNR office
	Idronaut Turbidity logger	2001 - onwards	Continuous	No	No - raw only
Bathymetry	Sidescan & Multibeam (SAC)	2001		Longdin & Browning 2002	
ACTIVITY					
Recreation activities	Boats, divers, anglers recorded in the Reserve	1989 - 2002	Weekly (May -Sept)	Skomer MNR annual reports	
Commercial fishing activities	Pot buoys and fishing net positions	1989 - 2002	Weekly (May -Sept)	Burton 2002	Yes-Skomer MNR office
Tankers in St Brides bay	Number and names of tankers and movements	1994 - 2002	Daily	No	Yes-Skomer MNR office
BIOLOGICAL					
Littoral communitites:					
Macro scale (view point photographs)	Time series photos/digitised.	1992 - 2002	Annual	Yes not published	Yes-Skomer MNR office
Meso scale (transects)	6 Transects. Time series photos/digitised.	1992 - 2002	Annual	Adams 1979/ Bunker 1983/ Crump 93/96 Hudson 95.	Yes-Skomer MNR office

	Brief description	Year sets	Sampling frequency	Report	Data summary
Sublittoral communitites:					
Rocky reef communitites	Time series stereo photos.	1982 - 2002	Annual	Bullimore1986 & 87	Yes-Skomer MNR office
Algal communities	Survey and report completed	1999	Every 5 years Next survey planned 2004	Hiscock, S 1983 & 86 Scott 1994 Broodie 1999/2000	
Sponge assemblages	Time series mono-photo/digitised. Species recording.	1994 - 2002 2002/3	Annual Every 5 years	Bunker et al 1992	Yes-Skomer MNR office
Infaunal sediment	Surveys and reports completed	1993/1996/1998	Every 5 years Next survey planned 2003	Rostron 1994 & 96 Barfield 1998	
Epifaunal sediment	Survey and report completed	1995/ 2001	Every 5 years Next survey planned 2006	Rostron 1996 Moore 2002	
Flora:					
<i>Zostera marina</i>	Extent of NHV bed & density distribution.	1997/2002 (boundary maps for 2000 & 2002)	Every 5 years Next survey planned 2007	Jones and Hodgson 1980 & 1981, Jones et al 1983, Lock 1998 & 2003	
Fauna:					
<i>Eunicella verrucosa</i>	70 colonies, time series mono-photo/digitised. 4 colonies, stereo-photo.	1993-2002 1982-2002	Annual	Bunker et al 1985, Bullimore1986 & 87 Gilbert 1998	Yes-Skomer MNR office
<i>Alcyonium glomeratum</i>	Time series stereo-photo/digitised. North wall 5 transects (% frequency)	1984-2002 2002 new transects	Annual	Bullimore1986 & 87	Yes-Skomer MNR office

	Brief description	Year sets	Sampling frequency	Report	Data summary
<i>Parazoanthus axinellae</i>	6 sites, time series mono-photo/digitised.	2001/2002	Annual	Burton et al 2002	Yes-Skomer MNR office
<i>Pentapora foliacea</i>	3 sites, time series mono-photo/digitised. New sites established 2002.	1994-2002	Annual	Bullimore 1986 & 87 Bunker/ Mercer 88 Gilbert 1998	Yes-Skomer MNR office
<i>Balanopyllia regia</i>	Time series stereo-photo/digitised The Wick. 3 transects	1984 – 2002 2002 new transects	Annual	Bullimore 1986 & 87	Yes-Skomer MNR office
<i>Cayophyllia smithii</i> .	Counted from sponge project quadrats (stereo-photo/digitised)	1993 - 2002	Annual	No	Yes-Skomer MNR office
<i>Pecten maximus</i>	UCS survey, Survey completed, 3 sites.	1979/80, 1979-82 2000	Every 5 years Next survey planned 2007	Bullimore 1985 Jones, H 1979 & 80 Lock 2002	
Nudibranch species	Various surveys MNR survey completed.	1975-1991 2002	Every 5 years Next survey planned 2007	Bunker et al 1993, Luddington 2002	
Territorial fish	Survey methods developed. Survey completed.	1997 2001/2002	Every 5 years Next survey planned 2007	Lock 1998	Yes-Skomer MNR office
Atlantic Grey Seal	Surveys and reports.	1976-2002	Annual	Grey Seal breeding census, Skomer Island 1992-2002, Skomer MNR annual reports.	

3. SKOMER MNR BIOLOGICAL PROJECT SUMMARIES

LITTORAL COMMUNITIES AND ASSEMBLAGES (CMS code: RB03/02 & RB03/01)

STATUS Ongoing. Annual photographic sampling. Full survey every 5 years (next survey 2003). Presumed favourable.

PROJECT RATIONALE

Littoral communities are susceptible to impacts from the water and the air. They occupy a very harsh niche with an extreme range of environmental conditions. Salt tolerant terrestrial species exist within metres of truly marine species. These factors coupled with the relative ease of field work (compared to sub-littoral habitats) make littoral communities very useful for a wide range of environmental monitoring studies. There is a wealth of literature on the biology of rocky shores to provide guidance and support information for littoral monitoring projects.

A. LITTORAL COMMUNITIES MESO SCALE - SHORE TRANSECTS (CMS code: RB03/02)

OBJECTIVES

To monitor the littoral communities on bedrock shores over the continuum of exposure and aspect ranges.

SITES

- North Haven
- South Haven
- South Stream
- The Lantern
- The Wick
- Double Cliff
- Hopgang (North Marloes Peninsula)

METHODS

Transects with permanent, fixed position quadrats were established in 1992. The quadrats extend from spring low water into the splash zone at regular height intervals.

Species abundance is recorded using the semi-quantitative SACFOR abundance scale (Hiscock, K 1990) and photographs are taken of each 50 x 50cm quadrat along with a selection of close up photographs of 10 x 10cm quadrats within the main quadrat.

RESULTS

1982 – Bunker et al surveyed 22 sites around the Reserve as a baseline littoral survey.

1992 – 6 permanent transects were established around the island and surveyed / photographed. Crump 1993.

1992 – ongoing. Photographs of the 6 permanent transects have been taken and stored.

1996 – Following the Sea Empress oil spill (Feb 96) the 6 transects were resurveyed and a lichen monitoring site was set up at Hopgang (Crump 1996). The littoral shores around Skomer did not show any significant changes after the Sea Empress oil spill, although the lichens at Hopgang did show signs of necrosis.

2001 - Slide photographs from 1992 – 2000 were reviewed and abundance estimates from the photographs compared with abundance records from Crumps 1992 & 96 field data. Photograph quality was judged to be insufficient to give accurate abundance estimates.

2001/02 – Digital imaging trialed to obtain pictures of the permanent quadrats. This improved the image quality but there are still inaccuracies in using the pictures to estimate species abundance due to discrimination and identification. This method cannot replace collection on data in the field for quantitative assessment.

B: LITTORAL COMMUNITIES MACRO SCALE – VIEWPOINT PHOTOGRAPHS **(CMS code: RB03/01)**

OBJECTIVES

Document gross changes in shores and shore communities by means of viewpoint photography; identify shore or parameters requiring further or specific monitoring.

SITES

Martins Haven, North Haven, South Haven Deer Park beaches: Jeffreys Haven, Pebbly beach, Boulder beach, Rennys Slip, Lantern, Amys Reach, Matthews Wick

METHODS

A photograph is taken each year for each viewpoint. A colour photocopy of each view is used to assist relocation and ensure identical photographs are taken, these are stored in the Viewpoint monitoring handbook.

RESULTS

1987 – ongoing. Viewpoint photographs showing various shores around the Reserve from a distance have been taken on an annual basis.

2001- Daguet reviewed a time series set of viewpoint photographs taken from around the whole reserve. By using simple image analysis techniques it was possible to estimate the widths of biological zones on some of the shores. This may prove useful in assessing gross scale changes on the shores.

LITTORAL COMMUNITIES AND ASSEMBLAGES

TARGETS

To maintain a the range of littoral communities around the Reserve

CURRENT STATUS

Presumed favourable, quantitative assessment is difficult with the current methodology. Current methods under review and will be developed in the 2003 survey.

RECOMMENDATIONS

Increase the amount of quantitative data collected. The MarClim project (Plymouth Marine Laboratory) offers an opportunity to compare the Skomer shores to the rest of the UK and contribute to the assessment of the effects of global warming.

Photographs may prove useful in providing evidence of any gross scale changes to the littoral community.

REFERENCES

Adams 1979, Bunker et al 1983, Hiscock, K 1990, Crump 1993, Crump 1996, Hudson 1995, Skomer Littoral Monitoring Manual. Burton, Daguet, Lock & Newman 2001.

EPIBENTHIC ROCK COMMUNITIES: MESO-SCALE (CMS code: RM03/01)

STATUS Ongoing. Yearly samples. Condition unknown.

PROJECT RATIONALE

Very little is known about the community dynamics on sublittoral habitats. The epibenthic communities are one of the most abundant and important features in the Reserve. In order to make decisions about the conservation status of these communities it is vital to have some understanding of how these communities change over time.

OBJECTIVES

To monitor how species and communities vary over time. Possible measurements include species richness / diversity, growth rates, longevity and competitive interactions over time.

SITES

- North Wall
- Thorn Rock

METHODS

For full methodology see Bullimore 1986.

In 1982 four sites at North Wall were established at 5m depth intervals between 10 and 25m below chart datum. In 1984 a series of 11 fixed position quadrats were established at Thorn Rock. A stereo camera set was used fixed onto a 50 x 40cm frame. Samples have been taken at least twice every year (May & Sept) since the start of the project.

RESULTS

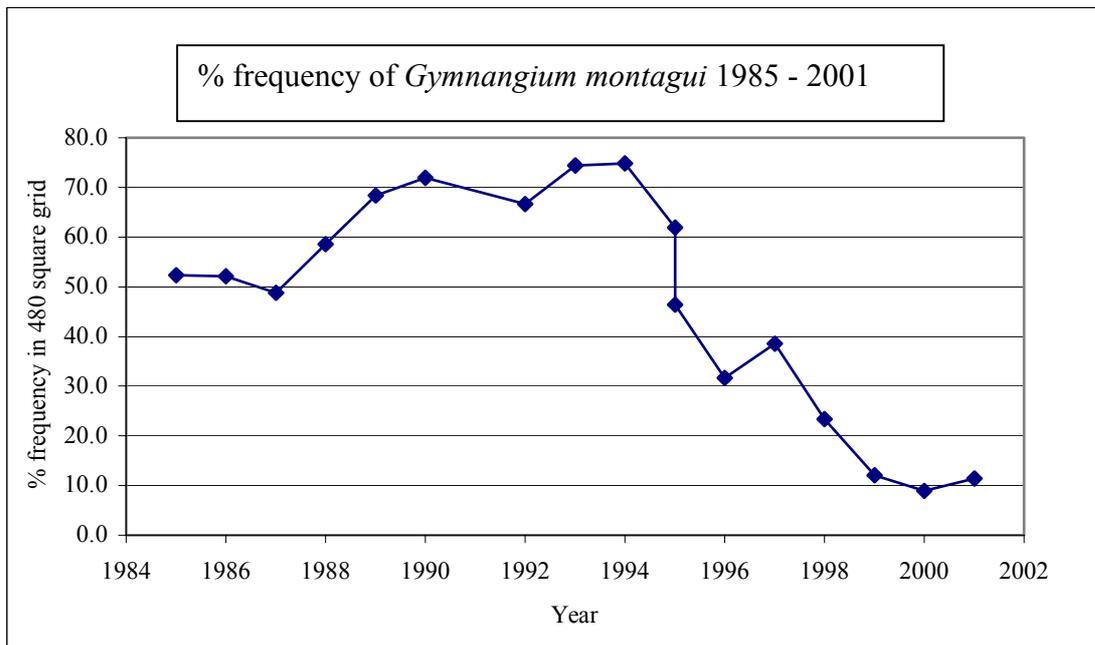
Bullimore (1987) analysed the results from 1982 –1987. The *Alcyonium glomeratum* pictures have been analysed from 1984 – 2002 (see *A. glomeratum* project).

The rest of the slide set has been catalogued.

Slides from 1992 onwards are stored at the Skomer MNR office. Slides prior to 1992 in a Bullimore's private collection though these are freely available for MNR use.

The 25, 20, & 15m bars have very consistent records with accurate relocation of the quadrats. The 10m bar is subject to movement in position and the complex rock surface in that area make comparisons difficult from year to year.

The *Gymnangium montagui* slides have been analysed for 1985 – 2001.



The colony had disappeared completely by 2002.

TARGETS

To assess the “natural” variations within epibenthic rock communities.

CURRENT STATUS

Large data set ready for analysis.

RECOMMENDATIONS

Produce a consistent, repeatable analysis method to work up the existing data set.

REFERENCES

Bullimore 1986, Bullimore 1987.

ALGAL COMMUNITIES (CMS code: RF43/01)

STATUS Ongoing. Survey every 5 years (next survey 2004). Condition unknown.

PROJECT RATIONALE

Skomer MNR's algal communities have been identified as being rich and diverse with 241 species of red, green and brown algae recorded in. This represents 34% of the British marine flora and 21% of North Atlantic marine flora including two nationally scarce species, five near their limit of distribution, four species with specialised habitat preferences and five deep water algal species.

OBJECTIVES

To monitor temporal change in algal communities associated with:

1. Undisturbed bedrock and large boulders
2. Disturbed bedrock and large boulders
3. Medium & small boulders, stones & pebbles

To monitor algal species of recognised importance:

1. near their limits of distribution
2. nationally scarce species
3. with specialised habitat preferences
4. deep water algal species
5. *Drachiella spectabilis*

SITES

- Martins Haven
- North Wall
- Mew Stone
- Wick
- Skomer Head
- Double Cliff
- Wick Basin

METHODS

Sites and methodology revisited following report by Brodie and Watson in 1999. Survey based on this advice carried out Aug 99, See Brodie & Bunker 2000 for methods.

RESULTS

1983 - Detailed surveys of macroalgal populations at a number of sites were conducted (Hiscock, S 1983). In 1984 monitoring of subtidal seaweeds at two sites on the north coast of Skomer was established for a 2 year project (Hiscock, S 1986).

Recommendations for monitoring of algal populations have been outlined in Scott, S (1994) following survey work in 1992.

1998 - Brodie and Watson were contracted to provide advice on development of conservation objectives for algal species and community monitoring and in Aug 99 a survey was carried out at seven sites based on their recommendations.

1999 – Survey and report completed (Brodie & Bunker 2000). A Herbarium for the Reserve was produced.

TARGETS

- To monitor changes in the algal community and identify natural fluctuations.
- To maintain the current species richness and diversity along with the presence of the scarce species and the species nearing their distribution limit.

CURRENT STATUS

Current condition is as yet unclear. Targets were based on wide-ranging surveys carried out in the past. Practical constraints dictate that effort is concentrated at selected sites within the MNR that do not necessarily include all previous survey sites.

RECOMMENDATIONS

More data are required including the size populations and reproductive states and a repeat of the 1999 survey (next survey due 2004), before establishing the current condition.

REFERENCES

Hiscock, S. 1983, Hiscock, S. 1986, Brodie & Watson 1999, Brodie & Bunker 2000.

SPONGE ASSEMBLAGES (CMS code: RM13/01)

STATUS Ongoing. Annual sampling of stereo photograph quadrats (1993-ongoing). Species list surveyed every 5 years (current survey 2002/3). Presumed favourable condition.

PROJECT RATIONALE

Skomer MNR's sponge communities have been identified as being rich and diverse with over 70 species (six nationally scarce species and eight near their limit of distribution). Sponges are filter feeders and therefore reliant on water quality and plankton supply.

OBJECTIVES

To monitor the sponge community structure and maintain the presence of rare/scarce species and species nearing their distribution limit.

SITES

- Thorn Rock (transects & species survey)

METHODS

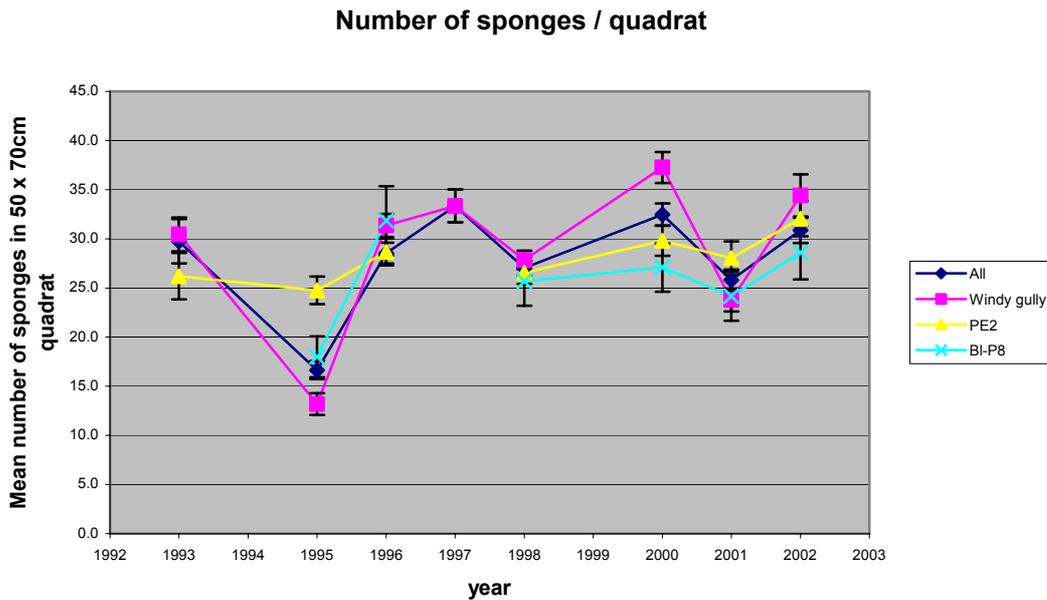
Transects: Four fixed transects are located at Thorn Rock. Photographs are taken from fixed positions along the transects using a stereo camera set up on a 50 x 70cm frame. The slides are analysed using a stereo viewer to count the abundance of sponge species and morphology types.

Species survey: All sponge species identified in 30 25 x 25cm quadrats from a selection of habitats completed. Species photographs taken in the field and samples taken for spicule preparations.

RESULTS

Data gathered from Thorn Rock sponge transects:

Year	No of samples	Transects
1993	24	Windy Gully
1995	77	Windy Gully, piton B – P8, piton B – P7, P2 – P8
1996	72	Windy Gully, piton B – P8, piton B – P7, P2 – P8
1997	20	Windy Gully
1998	60	Windy Gully, piton B – P8, P2 – P8
2000	63	Windy Gully, piton B – P8, P2 – P8
2001	62	Windy Gully, piton B – P8, P2 – P8
2002	81	Windy Gully, piton B – P8, piton B – P7, P2 – P8



Bell & Barnes (2001) describe a morphology method for assessing the diversity of sponge communities. This method has proved very useful in analysing the stereo slides. The results are suitable for multivariate analysis (using the Primer statistical software package, Clarke & Warwick 2001). A paper summarising the results in preparation for intended publication in 2003/4.

A species survey was begun in September 2002 and will be completed in the 2003 field season.

TARGETS

- To monitor changes in the sponge community and identify natural fluctuations.
- To maintain the current species richness and diversity along with the presence of the rare/scarce species and the species nearing their distribution limit.

CURRENT STATUS

The status is under review while the morphological data is analysed and the current species survey completed.

RECOMMENDATIONS

Explore the use of Bell / Barnes morphology method to monitor the community structure and to identify natural fluctuations.

REFERENCES

Bunker, Picton & Morrow 1992, Bell & Barnes 2001, Clarke & Warwick 2001.

SEDIMENT INFAUNA COMMUNITIES (CMS code: RM03/04)

STATUS Ongoing. Survey every 5 years (next survey 2003). Favourable.

PROJECT RATIONALE

Despite the relative high number of surveys much remains unknown about the sediment communities around Skomer. Sediments are known to accumulate pollutants and toxins and the communities within the sediment respond to these pollutants.

OBJECTIVES

To assess species richness and diversity and to sample for inorganic pollutants.

SITES

Nineteen sites around the Reserve were sampled in the first survey in 1993. This was reduced to 9 sites (7 on the north side and 2 in South Haven) in subsequent surveys.

METHODS

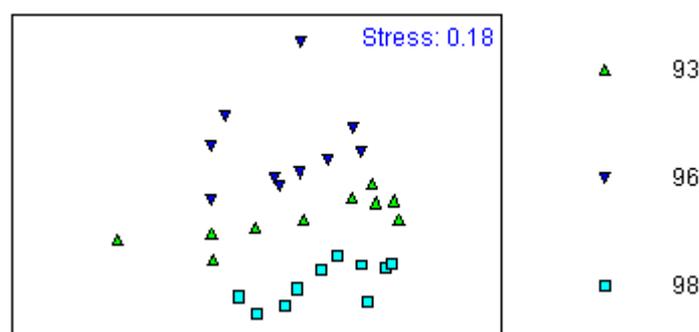
Three replicate samples are taken at each site using a 0.1m² day grab, and processed and preserved on site. The retained samples are then identified and enumerated by a specialist contractor. A further sample taken for sediment grain size characteristics is also analysed under contract.

RESULTS

Surveys have been completed for 1993, 1996 and 1998. The next survey is due in 2003. The 1996 sample was undertaken to assess the effect of the Sea Empress oil spill. The 1996 data did significantly differ from 1993 and 1998. Crustacean, polychaete and bivalve species all showed declines in 1996. Population levels returned to 1993 levels or higher by 1998 suggesting that whatever the reason for the declines (weather conditions may have contributed to the declines in addition to or instead of the oil spill) the community had recovered.

Multi-dimensional scaling (MDS) plot using PRIMER showing the separation of sample from 1993, 96 and 98 datasets.

averaged to site for all years sites 1- 17



TARGETS

Targets are to be set. The community has shown an ability to recover from the 1996 state so this could be used as a minimum favourable condition, caution must be taken however allow for potentially large natural fluctuations in communities.

CURRENT STATUS Favourable

RECOMMENDATIONS Due for re-survey 2003

REFERENCES

Rostron 1994, Rostron 1996, Barfield 1999.

SEDIMENT EPIFAUNA COMMUNITIES, MACRO AND MEGA-FAUNA AT THE SEDIMENT INTERFACE (CMS code: RM03/03)

STATUS Ongoing. Surveyed every 5 years, (next survey 2006). Favourable.

PROJECT RATIONALE

Studies of the sediment benthos around Skomer are limited but have shown the region to be species rich. A lot of the species are poorly understood and some of the larger species are presumed to be rare (burrowing anemones).

OBJECTIVES

To monitor this poorly understood community looking for changes in the community structure over time.

SITES

- Low point
- North of the Neck

METHODS

Three transects have been established at each site.

Records of large mobile species were made by counts from within a 2 metre wide strip off the seabed adjacent to the transects. Detailed insitu counts from 0.25m² quadrats were used to record the surface fauna.

The shallow infauna was sampled using a suction sampler from a 0.1m² area down to a depth of 20cm.

RESULTS

1995 – used as a base line survey.

2001 – Methodology changed to increase the quantitative sampling effort. The results are not comparable with the 1995 survey.

Both surveys show the areas to be species rich (265 taxa). No rare/scarce species (Sanderson 1996) were recorded.

TARGETS

To be set.

CURRENT STATUS

Presumed favourable.

RECOMMENDATIONS

Continue survey every 5 years following method established in 2001, next survey 2006.

Monitor sea temperature and suspended turbidity levels to provide background data for the biological monitoring.

REFERENCES

Rostron 1996, Moore 2002.

ZOSTERA MARINA POPULATION (CMS code: RF23/01)

STATUS Ongoing. Surveyed every 5 years, (next survey 2007). Favourable.

PROJECT RATIONALE

Zostera marina is the only flowering plant within the British Isles that grows and produces seed entirely submerged by seawater. *Zostera* populations are highly productive habitats and they provide an important stabilising function for the mobile marine sediments. The maintenance of *Zostera* populations directly influences the associated algal & invertebrate communities that it supports, which are an important source of food for birds.

Zostera marina is one of three seagrass species which are listed as nationally scarce and are included as a key habitat for conservation in the UK Biodiversity Action Plan 1994.

OBJECTIVES

1. To map the boundaries of the *Zostera marina* bed.
2. To determine and identify changes in its distribution and abundance.
3. Record conspicuous organisms associated with the *Zostera* population.

SITES North Haven

METHODS

Permanent markers define the corners of a survey plot of 60 x 60 m² in North Haven and lead lines marked every 5m are laid for the survey duration. Within the plot area transects are completed every 5m. Every 5 metres along each transects *Zostera* shoot counts are taken in 6 25 x 25 cm² quadrats. The transects are continued outside the survey plot where *Zostera* is present. Quadrat counts are completed along these transects at 5 metres until no more *Zostera* is found.

A boat based GPS unit was used to electronically record the boundary of the *Zostera* bed as divers with a surface marker buoy (SMB) swam the edge of the *Zostera* bed.

For detailed methodology see Lock 2003.

RESULTS

The first mapping studies were completed in 1979, 1980 and 1981 by divers swimming on compass bearings and taking abundance readings at 20m intervals. The results were sparse and patchy and comparison between years was difficult.

1982 A detailed method was devised based on a fixed grid area and used a defined abundance scale this method formed the basis of the survey completed in 1997.

1997 Permanent plot markers established and methods developed for *Zostera* shoot density and boundary maps, this method was repeated in 2002 and maps compared.

1997 A student project was completed by Joanne Trigg: Temporal changes in distribution and abundance of *Zostera marina* and possible effects on benthic community structure.

2002 A study on the epiflora in *Zostera* beds in Wales, including North Haven was completed (Edwards et al inprep).

Zostera bed area has been calculated for 1982, 1997, 2000 and 2002. The area calculations have been made either from the abundance and distribution maps or from GPS maps.

Year	Area (m ²)	Method
1982	5475	Distribution and abundance map
1997	6771	Distribution and abundance map
2000	6979	Map derived from GPS
2002	7652	Map derived from GPS
	6700	Distribution and abundance map

The areas from the distribution and abundance maps is very thorough and more reliable than the GPS maps for area calculations. The maps produced using GPS should be used with caution for area calculations, but are useful for a simple comparison in the extent and position of the *Zostera* bed every two years as an indicator of gross change.

In 1997 the mean density was 36.2 shoots/m² this increased to 54 shoots/m² in 2002. The percentage frequency of 50 shoots/m² or greater was 38% in 1997 increasing to 56% in 2002; in 2002 11% was recorded as 100 shoots/m² or greater whilst in 1997 this was less than 1%. The 2002 map shows that there has been an overall increase in shoot density and a significant shoot density increase in the southwest and northeast areas of the bed.

TARGETS

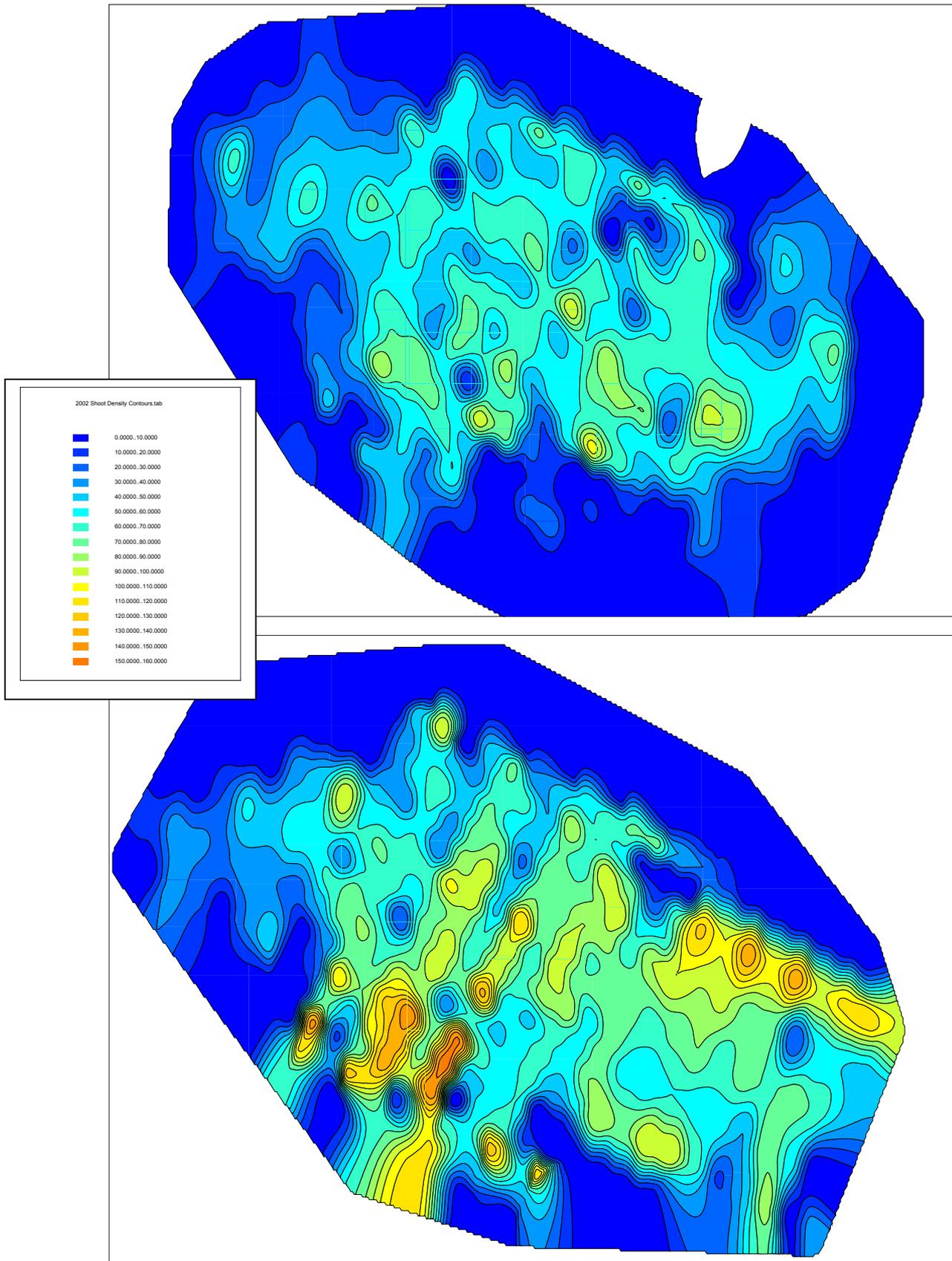
The population of *Zostera marina* in North Haven is to remain in favourable condition where:

1. The extent of the *Zostera* population is 6700m² with a lower level of acceptable change (LAC) of 5500m². In 2002 the extent is 6700m² and is therefore in favourable condition.
2. The mean density of the *Zostera* population bed is 36 shoots/m² with a lower LAC of 36 shoots/m². In 2002 the mean density is 54 shoots/m² and is therefore in favourable condition.

CURRENT STATUS

Favourable.

Density contour maps to show the distribution and abundance of *Zostera marina* shoots/m² in 1997 (top) and 2002 (bottom) .



RECOMMENDATIONS

1. Future mapping should continue to follow the methods and using the permanent markers established in 1997.
2. A complete distribution and abundance mapping survey should be repeated at five-year intervals and a boundary map continue to be completed every 2 years to record changes in the extent and position of the *Zostera* bed.
3. Continue to maintain the 'no anchorage zone' in North Haven and visitor moorings as currently identified in the Skomer MNR Management Plan 2000.
4. Record all recreational and fishing activities that may have a potential impact on the *Zostera* population.
5. Conduct a detailed bathymetric map of North Haven to identify the area the *Zostera* bed is limited to by depth.
6. Record conspicuous organisms associated with the *Zostera* population.

REFERENCES

Jones and Hodgson 1980 &1981, Jones & Jones 1983, Lock 1997, Trigg 1998, Lock 2003, Edwards, Bunker, Maggs & Johnson inprep.

***EUNICELLA VERRUCOSA*: POPULATION AND GROWTH RATE (CMS code: RM23/01 & RM24/01)**

STATUS Ongoing. Annual sampling. Favourable condition

PROJECT RATIONALE

Eunicella verrucosa (the pink seafan) is a Lusitanian anthozoan soft coral nearing the northern limit of its distribution in North Pembrokeshire. It is a UK Biodiversity Action Plan Species on Schedule 5 of the Wildlife and Countryside Act 1981.

Seafans are slow growing erect species susceptible to permanent damage. Recovery and reproduction rates are thought to be very slow.

OBJECTIVES

To monitor numbers, size, growth rate and condition of the recorded sea fans in the Reserve.

SITES

- Bernie's Rocks (East and West)
- Bull Hole
- The Pool
- North Wall
- North Wall East
- Sandy Sea Fan Gully
- Thorn Rock
- Way Bench

METHODS

Photographic monitoring using a single camera on a 50 x 70 cm frame with a black grid board as a background.

Both sides of the seafan are photographed and each fan is visually inspected for: damage, epiphytes, entanglement with man-made materials, necrosis (dead areas on branches) and the nudibranch *Tritonia nilsodhneri*.

The images are scanned and registered into Mapinfo to allow the measurement of fan area and branch length measurements to assess growth rate (see Gilbert 1998 for details).

RESULTS

Sampling effort

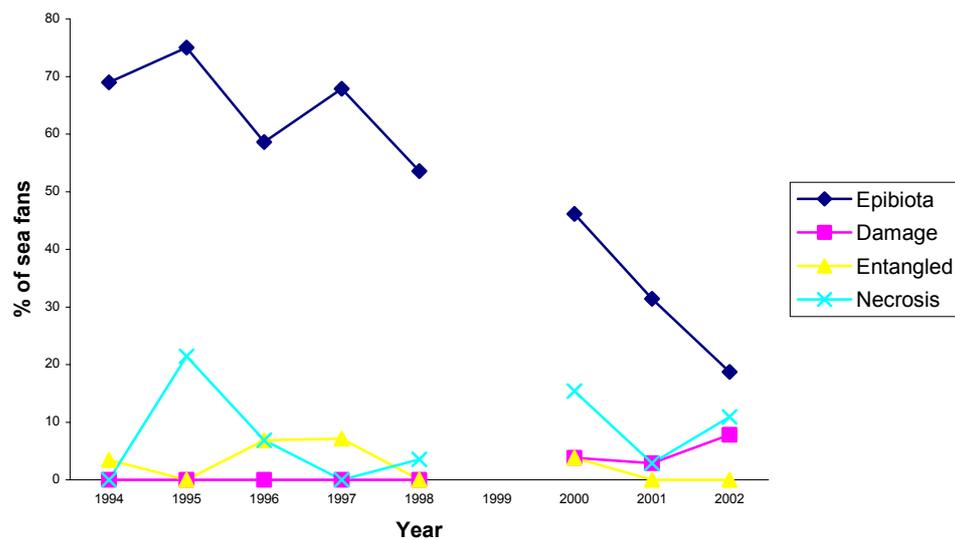
Year	Number Recorded	No of fans analysed	No area / growth data	Missing or lost sea fans
1994	33	29	Way 11	0
1995	32	28	Way 12	Way 9
1996	33	29		0
1997	37	28	Brk 1	0
1998	37	28	Ssg 13	0
1999	4	0	All except Nwa stereo set	0
2000	55	26	Way 7, way10, Brk 3, New 3	0
2001		35	Way 7, Ssg 13, Nwe 3,	Trk1

	54		12, 13,14	
2002	74	64	Way 3, Way12, Trk 2/3, Nwe 3	0

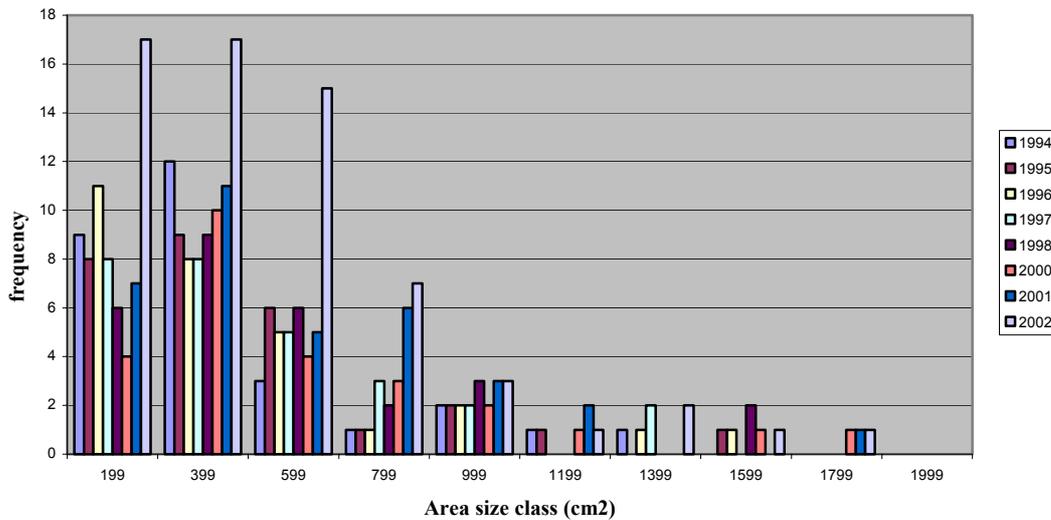
Condition of monitored sea fans

Year	DAMAGE	NECROSIS	EPIPHYTE	ENTANGLED	TRITONIA
	%	%	%	%	
1994	0.0	0.0	69.0	3.4	
1995	0.0	21.4	75.0	0.0	
1996	0.0	6.9	58.6	6.9	
1997	0.0	0.0	67.9	7.1	
1998	0.0	3.6	53.6	0.0	
1999					
2000	3.8	15.4	46.2	3.8	
2001	2.9	2.9	31.4	0.0	
2002	7.8	10.9	18.8	0.0	0.0

Condition of sea fans in the Skomer MNR



Size frequency distribution of sea fans- Skomer MNR



During 2002 small clippings were taken from MNR *Eunicella* colonies for a CCW Species Challenge funded project into the reproductive biology of seafans. Reef Research (Colin and Lexie Munroe) are undertaking the study based on seafan colonies in Devon and at Skomer MNR. MNR clippings have shown what are thought to be eggs and sperm, although at lower levels than the Devon population. Time of spawning in Devon is thought to be during late August.

TARGETS

- **Sea fan numbers:** No loss of individuals. Evidence of recruitment.
- **Sea fan size (area):** Maintain the current size frequency distribution or see an increase in the size of individual fans.
- **Condition:** Limits to be set, but no significant increase in necrosis, damage or entanglement. Look for signs of recovery from previous records of necrosis, damage or entanglement. Monitor levels of epiphytes and *Tritonia nilsodhneri*.

CURRENT STATUS

- **Numbers:** 2 losses in 9 years, none lost in 2002
- **Fan size:** Modal size class constant, evidence of increase in size for several individuals.
- **Condition:** No records of entangled fans in 2002, steady decline in epiphyte coverage, increases in damage and necrosis records (this information from photos only prior to 2002 and photos and field records in 2002).

RECOMMENDATIONS

- Continue annual photographic monitoring programme.
- Search for new recruitments at established sites.
- Complete field records for each seafan, recording damage, entanglement, necrosis, levels of epiphytes and numbers of *Tritonia nilsodhneri*.
- Map new sites to increase the number of seafans monitored on the south side of the Reserve.

- Growth rate measurements are still very variable but useful to show evidence of growth.
- Monitor sea temperature and suspended turbidity levels to provide background data for the biological monitoring.
- Support research work on the biology of seafans.

REFERENCES

Bunker 1985, Gilbert 1998.

***ALCYONIUM GLOMERATUM* POPULATION (CMS code: RM23/03)**

STATUS Ongoing. Annual sampling. Favourable condition.

PROJECT RATIONALE

Alcyonium glomeratum (red sea fingers) is a Lusitanian species nearing its northern limit of distribution. Colonies are long-lived and possible indicators of climate change.

OBJECTIVES

To monitor colony size and to look for damage and disease.

SITES

- North Wall (2 sites)
- Thorn Rock

METHODS

North Wall stereo site: three quadrats (50 x 40cm) photographed in stereo

North Wall "A glom" wall: A series of five transects (50 x 70cm quadrats) were tested at North Wall. The colonies were "wafted" before photographing to make them all retract in an attempt to control the variability in colony size. Percentage frequency counts from a 5 x 5cm grid were taken using GIS techniques.

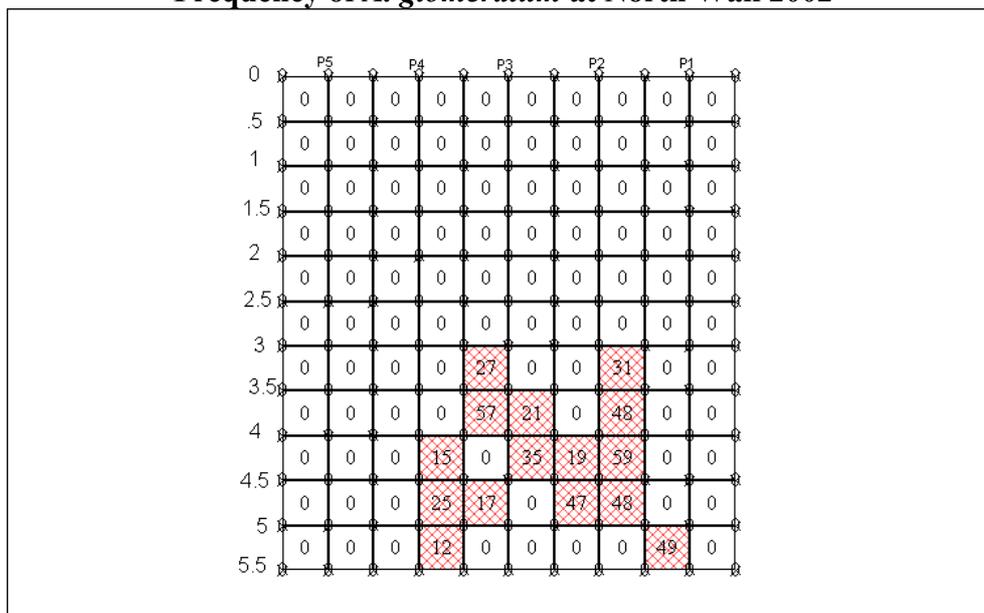
The Thorn Rock site consists of three fixed position quadrats (50 x 70cm).

RESULTS

The three quadrats from the North Wall stereo site have a steady abundance of *A. glomeratum* of approximately 50% since 1984. Quadrat 2 and 3 show some evidence of an increase in abundance.

2002 was the first sampling event for the North Wall "A. glom" wall and Thorn Rock.

Frequency of *A. glomeratum* at North Wall 2002



TARGETS

To maintain the current colony sizes and to monitor levels of damage / disease.

CURRENT STATUS

The colonies in the North Wall stereo quadrats have shown no evidence of damage or disease and assumed to be in a favourable condition.

The North Wall "A. glom" and the Thorn Rock sites need further surveillance to assess their status.

RECOMMENDATIONS

Continue with monitoring. Expand the number of sites.

REFERENCES

***PARAZOANTHUS AXINELLAE* POPULATION (CMS code: RM23/05)**

STATUS Ongoing, annual sampling, condition unknown.

PROJECT RATIONALE

The *Parazoanthus axinellae* (the yellow trumpet anemone) population is an important feature of the Reserve. Parazoanthus is a Lusitanian (south-western) species nearing the edge of its range. This could mean that it is vulnerable to relatively minor changes in the environment and could act as an indicator of climate fluctuations and changes to the sub littoral rocky reef community.

OBJECTIVES

P. axinellae colonies are monitored for changes in polyp density and colony area.

SITES

- Sandy Sea Fan Gully
- Thorn Rock (3 colonies)
- Way Bench (2 colonies)

METHODS

Density estimates; Close up photographs are taken and polyps are counted using GIS image analysis techniques.

Area of the colony; A series of transects are placed through the colonies. Photographs are taken using a 50 x 70cm framer. The images are analysed by overlaying a 5 x 5cm grid and recording presence/absence of *P. axinellae* within the grid squares.

See Burton, Lock & Newman 2002 for details.

RESULTS

Data set started 2001.

Site	Density method	Index of Area
Sandy Sea Fan Gully	16 samples	5 transects (20 samples)
Waybench – New Wall	16 samples	11 re-locatable samples
Waybench – Deep	16 samples	2 transects (8 samples)
Thorn Rock – Piton 7	None	3 re-locatable samples
Thorn Rock Mooring	None	3 re-locatable samples
Thorn Rock – Piton 3	18 samples	3 transects (12 samples)

TARGETS

Monitor the colonies to establish sensible levels of acceptable change.

CURRENT STATUS

Methods have been developed and sampling is to continue on an annual basis whilst levels of acceptable change are still unknown.

REFERENCES

Gilbert 1998, Burton, Lock & Newman 2002.

***PENTAPORA FOLIACEA* (ROSS CORAL) POPULATION (CMS code: RM63/01)**

STATUS Ongoing. Annual survey. Unfavourable.

PROJECT RATIONALE

Colonies of the bryozoan; *Pentapora foliacea* are fragile structures thought to be moderately slow growing, and long lived. They are important microhabitats for mobile species and are regarded as useful indicators of anthropogenic activity.

OBJECTIVES

To monitor the numbers and growth rate of Ross coral colonies. To monitor the amount of damage occurring to the colonies.

SITES

- North of the Neck (2002)
- North wall (1984 – 2002)
- Way bench (1993/4 restarted 2002)
- Bernie's Rocks (2 sites 1995 onwards)

METHODS

Photographs are taken using a single or stereo camera set up on a frame. Gilbert 1998 tested various image analysis methods for assessing growth rate but concluded that a 3D method would be most suitable. Colonies can be put into size classes using base area (cm²) but this is a very crude measure of colony size.

RESULTS

Number of colonies at each site:

SITE	1993	1994	1995	1997	1998	2000	2002
North of the Neck							11
North wall							0
Way bench	53	?					17
Bernie's Rocks – deep			17	8	2	0	0
Bernie's Rocks - shallow		10	14	9	4	8	2

Bernie's Rocks transects have shown a steady decline over the years. These sites are subject to heavy shellfish potting activity but there is no direct correlation between potting intensity and lost colonies.

New transects were established at North of the Neck and Way bench in 2002 for continued monitoring of Ross corals. The size of colonies monitored varies from a base area of 0.7 cm² to 2482 cm².

TARGETS No significant decrease in number of colonies. Evidence colony growth.

CURRENT STATUS Unfavourable.

RECOMMENDATIONS

Needs continued surveillance to establish the longevity of the colonies and their response to damage. Further information needed in the biology of *Pentapora foliacea*.

REFERENCES Bunker & Mercer 1988, Bullimore 1987, Gilbert 1998.

CUP CORAL POPULATIONS; *BALANOPHYLLIA REGIA* AND *CARYOPHYLLIA SMITHII* (CMS code: RM23/04)

STATUS Ongoing. Annual sampling. Favourable condition.

PROJECT RATIONALE

Balanophyllia regia is a Lusitanian species with Skomer being close to the most northerly record in the UK.

Caryophyllia smithii is a common feature of the sub-littoral benthic community of western Britain.

Cup corals are slow growing filter feeders, which are susceptible to changes in water quality and planktonic food supply.

OBJECTIVES

To monitor the population for changes in abundance and to look for evidence of recruitment.

SITES

- Thorn Rock
- The Wick

METHODS

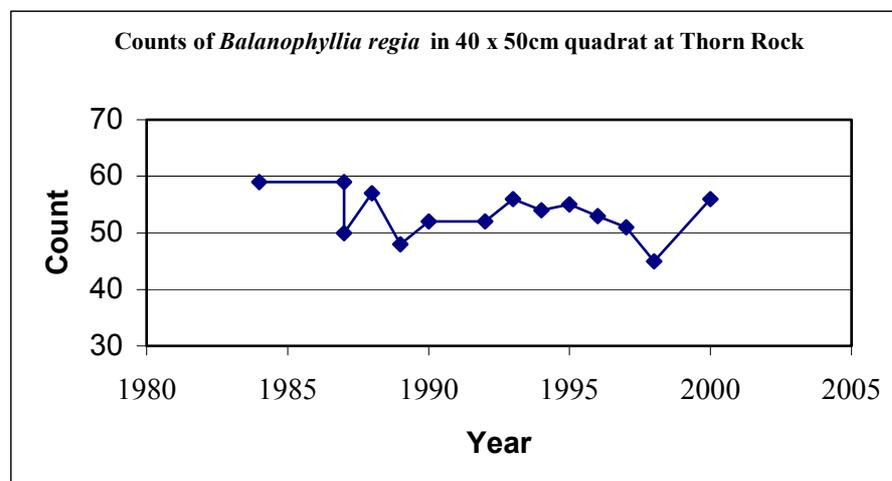
Balanophyllia regia: five fixed position quadrats at Thorn Rock have been photographed since 1985 and in 2002 three transects with 51 quadrats were established at The Wick.

Photographs are taken using a 50 x 40 cm quadrat and counts are carried out using GIS techniques (see Burton, Lock & Newman 2002).

Caryophyllia smithii: 70 (approx) quadrats have been analysed on a yearly basis (1993 onwards) from the Sponge community project at Thorn Rock. Photographs are taken using a 50 x 70cm framer and counts are carried out by eye using a loupe.

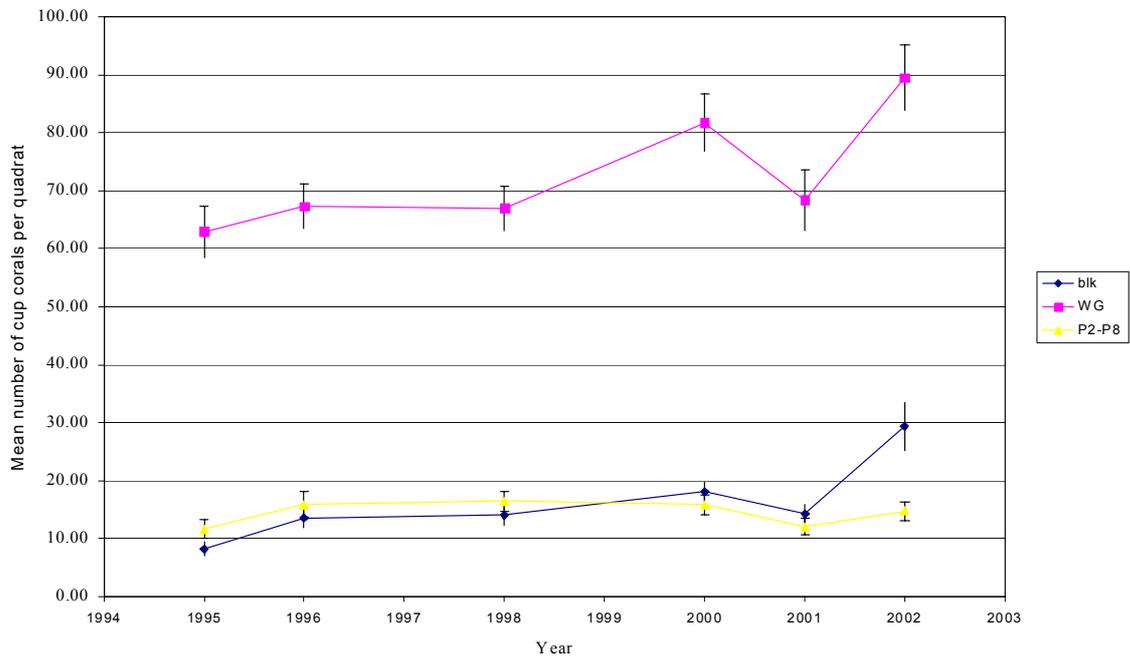
RESULTS

Balanophyllia regia: Individuals have been traced for 18 years. There is some evidence of recruitment but variable levels of sediment makes small cup corals hard to see.



***Caryophyllia smithii*:**

Abundance of *C. smithii* from 3 sites at Thorn Rock 1995 – 2002



Variable levels of surface sediment are the most likely explanation for the changes in mean abundance.

TARGETS

- Maintain the current abundance levels.
- Evidence of recruitment.

CURRENT STATUS

Ongoing. Presumed in a favourable condition.

RECOMMENDATIONS

Records of surface sediment levels would be very useful in assessing if drops in abundance are significant.

REFERENCES

***PECTEN MAXIMUS* (SCALLOP) POPULATION (CMS code: RM53/01)**

STATUS Ongoing. Volunteer survey every 5 years (next survey 2005). Favourable recovering.

PROJECT RATIONALE

The scallop population in the northeast of the Reserve is of conservation value because of its small size and its remoteness from any substantial population. Scallops were collected commercially and recreationally in the area of the Reserve until 1990. In 1990 the South West Sea Fisheries Committee (SWSFC) introduced a byelaw prohibiting scallop collecting by any means. The population of scallops needs to be monitored in order to assess the effectiveness of this byelaw.

OBJECTIVES

To estimate the density of scallops within suitable habitats in the Reserve and to assess the age structure in the population.

SITES

- Various sites on the north side of the Reserve (see various reports for full site list).
- 2000 survey used 3 sites; Low point, Martins Haven and North of the Neck.

METHODS

Different surveys have used slightly different methods. In 2000 a standard method was adopted which will be repeated in the subsequent surveys. Full methods detailed in Lock & Newman 2002.

Scallops are collected by divers from a two metre band, one metre either side of 50m transects (100m²). The scallops are brought to the surface, their growth rings measured, shells marked with notches for identification and then returned to the site.

This is repeated for several transects over several sites of suitable habitat.

RESULTS

1979 / 80 (Jones & Hodgson) small survey. No density estimates. Age class data suggests strong recruitment in 1973-75 and then a decline for 1976-1980.

Bullimore 1985a summarises the available data for 1979 – 1982. Scallop densities of 1 scallop / 100 m² were estimated.

2000 survey suggest an increase in density to 1 scallop / 27 m² with a maximum density of 1 scallop / 9.6 m² at Low Point. The age class data suggested strong recruitment in 1992 – 94, 2 years after the SWSFC byelaw was introduced.

A joint collaborative SWSFC/ MNR scallop poster, explaining the byelaw, was produced in 2002 and distributed to all the local dive clubs and dive shops and has been posted at local slipways.

TARGETS

To maintain or increase the scallop population density.

CURRENT STATUS

Standard method developed for future surveys

RECOMMENDATIONS

Future surveys should continue to follow the methods established in the 2000 survey and be repeated every five years (next survey 2005).

REFERENCES Jones & Hodgson 1979 & 1980, Bullimore 1985a, Lock & Newman 2002.

NUDIBRANCH SPECIES DIVERSITY (CMS code: RM54/01)

STATUS: Ongoing. Full survey every 5 years (next survey 2007).

PROJECT RATIONALE

Nudibranchs are predators on a wide range of epibenthic species. Most are seasonal and reliant on their prey for food, shelter and a place to lay their eggs. Being near the top of the food chain they can act as an indicator of the health of the communities they rely on. The Skomer MNRs nudibranch population have been identified as being rich and diverse with over 62 species including one nationally rare species and four nationally scarce species (Bunker, Picton & Morrow 1992).

OBJECTIVES

To produce a species list for the entire Reserve on a 5 yearly basis.

To record a minimum of 16 common species annually in the Skomer MNR from a check list.

SITES

All of the Skomer MNR

See Luddington 2002 for a list of 2002 survey sites.

METHODS

Surveys are done in spring and late summer to account for variances in species life cycles. Sites from around the whole Reserve are chosen to provide a range of habitat types. The sublittoral habitat found at each site is described briefly and associated nudibranch species recorded as a list for each site. In addition, an overall list of species is compiled for the Skomer MNR and species recorded photographically.

RESULTS

Between 1975 and 1991 sixty two species of nudibranchs were recorded during a total of 99 dives at 44 sites were carried out in the Skomer MNR (Bunker *et al.*, 1993).

In 2002 sixteen sites representing a range of habitats were surveyed for nudibranch species resulting in a total of 32 species. A check list of 16 species was selected for annual monitoring (Luddington 2002).

TARGETS

Observe all 16 species on annual check list.

To maintain a full species list for the Reserve every 5 years.

CURRENT STATUS

2002 species list much lower than full species list but the effort was a fraction of the historical data.

RECOMMENDATIONS

Complete the annual check list and collect any unusual species for identification.

REFERENCES

Bunker, Picton & Morrow 1993, Luddington 2002.

TERRITORIAL FISH POPULATIONS (CMS code: RA33/01)

STATUS Ongoing, sampling every 5years. Presumed favourable

PROJECT RATIONALE

Fish have received little attention and are poorly described in the survey literature. There is a need to improve knowledge of the diversity and distribution of territorial fish species.

OBJECTIVES

1. To survey the distribution and abundance of territorial fish species and to describe their key habitats.
2. To compare territorial fish populations at angling and non-angling sites.

Nine territorial fish species were selected based on common occurrence in the MNR.

Ballan wrasse	<i>Labrus bergylta</i>
Cuckoo wrasse	<i>Labrus mixtus</i>
Goldsinny	<i>Ctenolabrus rupestris</i>
Corkwing wrasse	<i>Ctenolabrus melops</i>
Rock cook	<i>Centrolabrus exoletus</i>
Butterfish	<i>Pholis gunnellus</i>
Tompot blenny	<i>Parablennius gattorugine</i>
Sea Scorpion	<i>Myoxocephalus scorpius/ Taurulus bubalis</i>
Leopard spotted goby	<i>Thorogobius ephippiatus</i>

SITES

Sites are selected from a range of locations around the North Marloes peninsula and from around the North side of Skomer Island.

METHODS

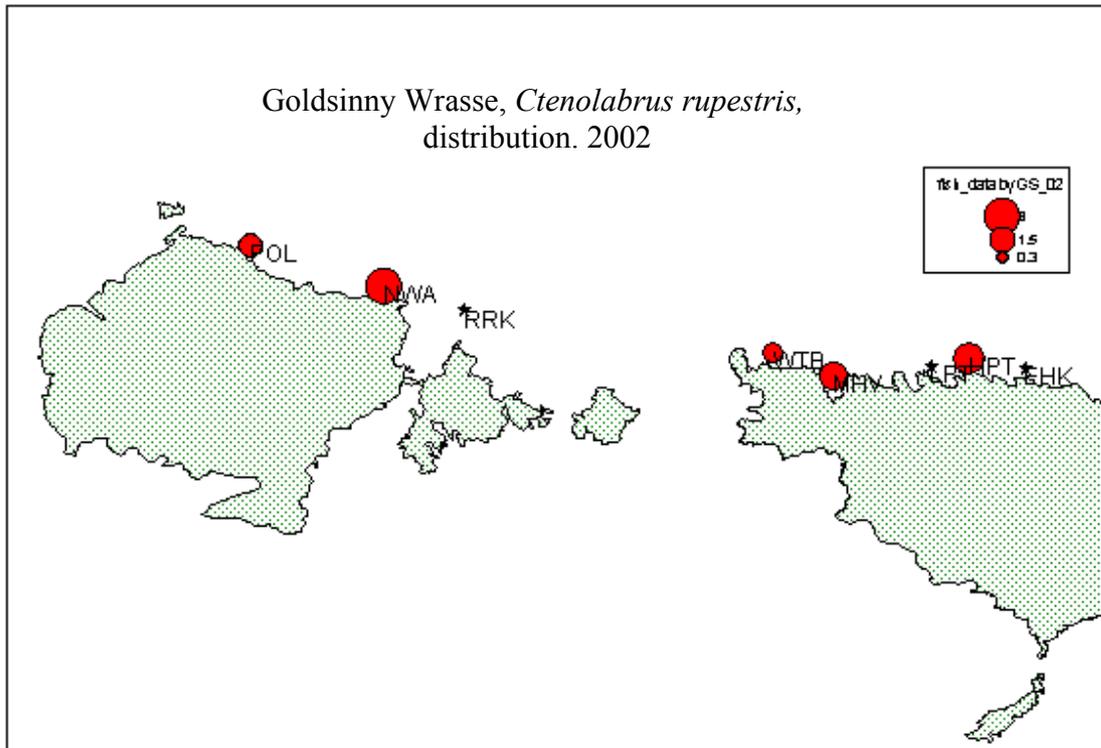
The methods involve recording sightings of the target species along a 30m transect (from within a 2m wide strip). The methods have been designed for use with volunteer divers and are fully described in Lock 1998.

RESULTS

Surveys have been completed in 2001 and 2002. The 2001 survey was conducted in a period of dense plankton blooms that affected the numbers of fish counted. The repeat survey in 2002 was successful and can be used as a baseline for future surveillance.

Number of fish per transect (60m ²)								
Year/Site	NWA	POL	RRK	EHK	HPT	LPT	WTB	MHV
2001	2.1	2.7	3.5	0.6	0.5	2.2	2.1	na
2002	11.2	5.2	na	na	8.6	na	6.7	6.1

Example distribution map generated by MapInfo GIS:



TARGETS

To assess the natural distribution and abundance of territorial fish species within the Reserve.

CURRENT STATUS

Baseline survey completed.

RECOMMENDATIONS

Continue with the volunteer survey methodology as established in 1997 to produce a time series of comparable data.

Surveys to be repeated every five years, next survey 2006.

REFERENCES

Lock 1998

ATLANTIC GREY SEAL (*HALICHOERUS GRYPUS*) POPULATION (CMS code: RA03/01)

STATUS Ongoing. Annual survey. Favourable.

PROJECT RATIONALE

Grey seals are a protected species of conservation importance, which live and breed in the Reserve. The West Wales population is the largest in SW Britain and a feature of the Pembrokeshire Islands SAC.

OBJECTIVES

To monitor the number of seal pups born in the MNR and the survival rate of those pups.

SITES

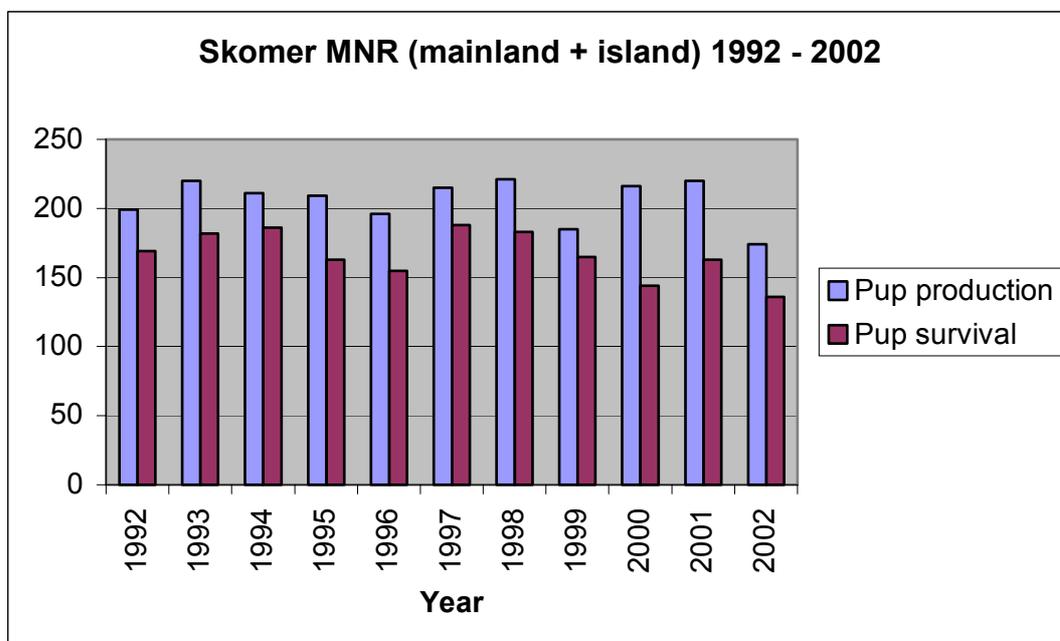
All pupping beaches and caves in the MNR.

METHODS

The pups are recorded from birth through to their first moult using the “Smith 5 fold classification system” (Poole 1996). Reason for death is recorded if possible. Additional behavioural observations are recorded for the Island seals. Full method described in ‘Grey Seal Monitoring Handbook’ Poole 1996.

RESULTS

Regular recording begun in 1974 and surveys have been completed annually since 1983. From 1992 onwards a standard protocol has been adopted to record the pupping success on the island and the mainland and an annual seal report has been produced each year.



1998 – ongoing information about seal watching and current pup numbers at sites around the Marloes Peninsula is provided at the MNR Visitor Centre.

2002 - A study into seal disturbance was tested and should be continued in 2003 to gather more data. An MNR 'seal watching' leaflet was produced and distributed at the National Trust car park at Martins Haven. The leaflet included information about how to behave whilst watching seals.

TARGETS

- Number of pups born greater than 190
- Percentage survival of pups greater than 70%

CURRENT STATUS

A relatively low number of pups were born in 2002 but the survival rate was above average 84%. Continued monitoring is essential.

RECOMMENDATIONS

1. To continue annual survey following the 'Grey Seal Monitoring Handbook' Poole 1996.
2. To continue the seal disturbance study following methods developed in 2002.
3. Provide visitors with information about Atlantic grey seals both in the Visitor Centre and through the distribution of the 'seal watching' leaflet developed in 2002.

REFERENCES

Information on grey seal pupping, behaviour and haul-outs on Skomer Island is documented in a series of reports dating from 1976 (Davis & Davis 1976; Alexander & Alexander 1985; Hellawell, 1987, 1988; Sutcliffe, 1989; Orsman, 1990, 1991; Poole, 1992 - 1999; Field, 2000; Pillsworth, 2001).

Less information is available for the mainland and is on pup production only until 1992. (Anderson 1977; Cullen 1978; MNR records 1992-2000).
Poole 1996. Grey Seal Monitoring Handbook.

4. ACKNOWLEDGEMENTS

This is the first Project Status Report to be produced. It is therefore appropriate to acknowledge the contributions made by the MNR staff of the last 13 years:

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Philip Newman 1990 to current
Sarah Curran 1992
Liz Macedo 1993/94
Sue Burton nee.Gilbert 1995
Kate Lock 1996 to current
Mark Burton 2001 to current
Louise Luddington 2002
Mike Camplin (Pembrokeshire team) 1997 to current

Many projects have been possible through the expertise of contract marine biologists and their help and wealth of knowledge has greatly assisted progress especially in specialised projects. Reports produced by these contractors are detailed in the references, Section 5, for each project.

The MNR team is greatly in debt to a host of volunteers, both individuals and teams, that have assisted on both shore and diving projects. Without their help the wide range of projects and large quantities of data collected would not have been possible.

Individual volunteers: Steve Myatt, Dawn Wilde, Caroline Davies, James Perrins, John Archer Thompson, Jon Moore, Jen & Bruce Jones, Nick Jeremy.

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MCS divers (Fish 1997 and general surveys 1999 & 2000)

Vicky Billings, Jane Lilley, Liz Wood, Chris Wood, Graham Ackers, Ben Wells, Graham Bates, Jane Burnett, Nick & Susan Davis, Keith May, Gary Rhodes, Val Shepard, Susie Landers.

Rohan Holt and Bill Sanderson, CCW HQ Marine staff, have assisted with diving projects during their visits to the Reserve.

These acknowledgements are long and we are in debt to many helpers, apologies therefore to anyone we have missed out – your help has been much appreciated!!

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