

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales



Skomer Marine Nature Reserve
***Pecten maximus*, King scallop**
Survey 2012
CCW Regional Report CCW/WW/13/2

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SYNOPSIS

The present survey aimed to establish the current status of *Pecten maximus* in Skomer MNR and compare results with previous surveys in 2000, 2004 and 2008. A team of 32 volunteer divers swam transects along the seabed collecting any *P. maximus* encountered. Length, width and growth bands of each individual were measured. Each was then marked and returned to the site from which they were collected.

In 2012 the area surveyed was 3240 m² and 913 individuals were measured. The total density of *P. maximus* for all sites showed an overall density increase and the density at 2 of the 7 sites showed a statistically significant increase. The results suggest a continued recovery of the population since cessation of exploitation in 1990 at the Skomer MNR. In 2012 the mean scallop density was 28 / 100 m² compared with 16.9/100 m² in 2008.

Age distribution shows a normal distribution curve, however higher numbers of age 4-7 years were found compared to previous surveys. No bi-modal growth pattern was observed in 2012, suggesting a single annual spawning event in the Reserve. This pattern was also a feature of data from 2000, 2004 and 2008.

A new survey site was established in St Brides Bay north of the Skomer MNR boundary and a survey was completed. The aim of this site is to monitor any changes in *P. maximus* densities as a result of the current protection of the Scallop Fishing (Wales) Order 2010.

Crepidula fornicata is a non-native gastropod species first found in the Skomer MNR attached to *P. maximus*. Ten *C. fornicata* stacks (some with egg masses) were found in the present survey. These densities are currently very low, however as the northern record of *C. fornicata* in Wales its status needs to be monitored in future surveys.

CRYNODEB

Nod yr arolwg oedd darganfod beth yw statws presennol *Pecten maximus* yng Ngwarchodfa Natur Forol Ynys Sgomer a chymharu'r canlyniadau gydag arolygon a gynhaliwyd yn 2000, 2004 a 2008. Nofiodd 32 o ddeifars gwirfoddol ar hyd trawsluniau ar wely'r môr gan gasglu'r holl *P. maximus* y daethant ar eu traws. Mesurwyd hyd, lled a rhesi twf pob un. Yna, rhoddwyd marc ar bob un a'u dychwelyd i'r fan y cawsant eu casglu.

Yn 2012 roedd yr ardal a arolygwyd yn 32400 m² a chafodd 913 o gregyn bylchog eu mesur. Dangosodd cyfanswm dwysedd *P. maximus* ar gyfer yr holl safleoedd gynnydd yn y dwysedd yn gyffredinol, a dangosodd dwysedd dau safle o blith y saith gynnydd sylweddol o safbwynt ystadegol. Awgryma'r canlyniadau fod y boblogaeth wedi cynyddu'n barhaus ers i'r arfer o bysgota cregyn bylchog ddod i ben yng Ngwarchodfa Natur Forol Ynys Sgomer yn 1990. Yn 2012, dwysedd cymedrig y cregyn bylchog oedd 28 / 100 m² mewn cymhariaeth ag 16.9/100 m² yn 2008.

Yn ôl y dosbarthiad oed, ceir cromlin dosbarthiad normal. Fodd bynnag, daethpwyd o hyd i fwy o gregyn bylchog 4-7 oed nag yn yr arolygon a gynhaliwyd yn y gorffennol. Ni welwyd patrwm twf deufodd yn 2012, rhywbeth sy'n awgrymu iddynt silio yn y Warchodfa unwaith y flwyddyn honno oddeutu'r un amser â'i gilydd. Roedd y patrwm hwn hefyd yn nodweddu'r data a ddeilliodd o 2000, 2004 a 2008.

Sefydlwyd safle arolygu newydd ym Mae San Ffrêd i'r gogledd o ffin Gwarchodfa Natur Forol Ynys Sgomer, a chafodd arolwg ei gwblhau. Y nod gyda'r safle hwn yw monitro newidiadau yn nwysedd *P. maximus* o ganlyniad i'r warchodaeth a gynigir ar hyn o bryd gan Orchymyn Pysgota am Gregyn Bylchog (Cymru) 2010.

Boldroediad estron y daethpwyd o hyd iddo am y tro cyntaf yng Ngwarchodfa Natur Forol Ynys Sgomer ynghlwm wrth *P. maximus* yw *Crepidula fornicata*. Daethpwyd o hyd i ddeg tŵr o *C. fornicata* (rhai â phentwr o wyau) yn ystod yr arolwg presennol. Ar hyn o bryd, mae dwysedd y rhain yn isel iawn. Fodd bynnag, gan mai dyma'r cofnod mwyaf gogleddol o *C. fornicata* yng Nghymru, dylid monitro statws y rhywogaeth mewn arolygon pellach yn y dyfodol.

CONTENTS

SYNOPSIS	2
CRYNODEB	3
CONTENTS	4
FIGURES	4
1 INTRODUCTION	4
2. METHOD	7
3. RESULTS	10
4 DISCUSSION	15
5 RECOMMENDATIONS	18
6 ACKNOWLEDGEMENTS	19
7 REFERENCES	20
APPENDIX I Byelaws	21
APPENDIX 2 Statutory Instruments	22

FIGURES

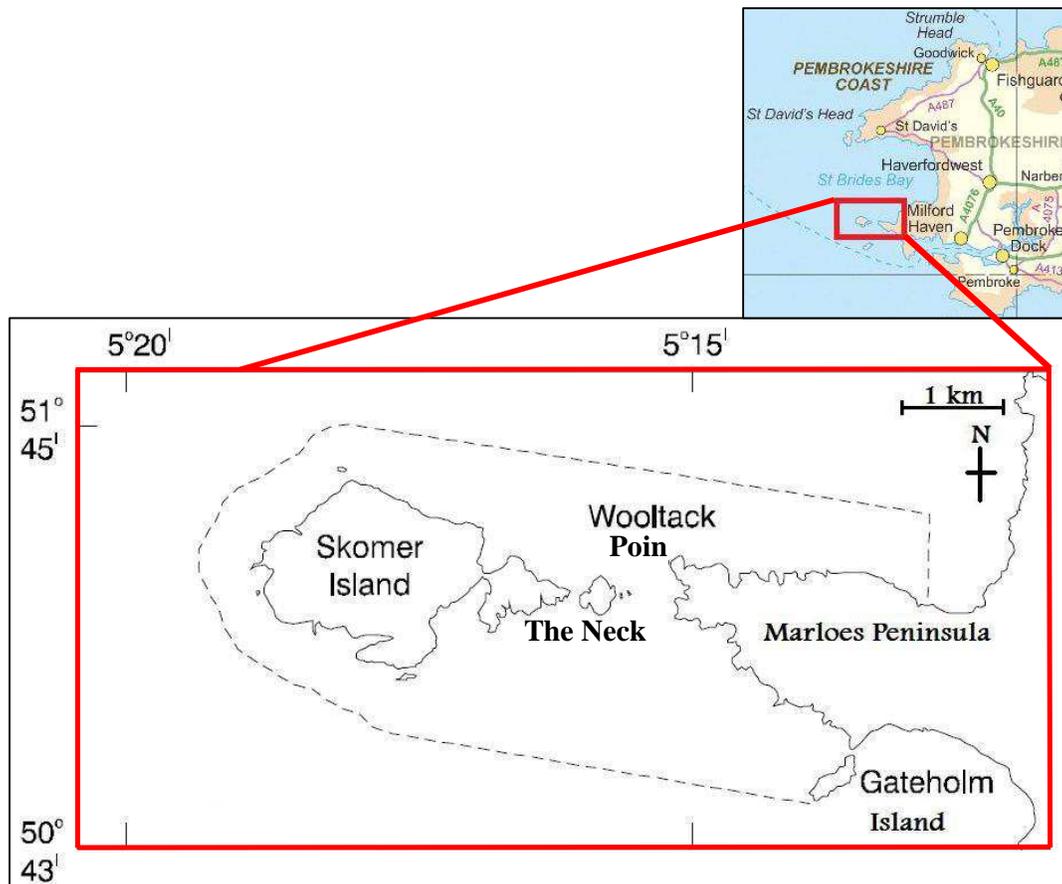
Figure 1. Map indicating (dashed line) the boundary limits of the Skomer Marine Nature Reserve. Reserve map adapted from Rogers, 1997. Scale map from Ordnance Survey.	5
Figure 2. Length and width dimensions measured and the position of the six annual growth rings relative to the umbo of the shell.	8
Figure 3. Overall density of <i>Pecten maximus</i> / 100m² from 1984 to 2012.	11
Figure 4. <i>Pecten maximus</i> density at sites 1-7, Skomer MNR 2000, 2004, 2008 & 2012. ..	11
Figure 5. <i>Pecten maximus</i> age distribution (per 500 population) Skomer MNR 2000, 2004, 2008 & 2012	12
Figure 6. Size frequency distribution of <i>P. maximus</i> in Skomer MNR 2012.	13
Figure 7. Length frequency graph, showing the first three growth rings of measured <i>Pecten maximus</i> 2012	13

1 INTRODUCTION

Pecten maximus (Linnaeus, 1758) the King scallop is found in the Skomer Marine Nature Reserve (MNR). The *P. maximus* population in Skomer MNR has been protected since July 1990 upon designation of the Marine Nature Reserve. South Wales Sea Fisheries Committee (SWSFC) byelaws (no. 30 & 30a) prohibit the use of dredges and beam trawls as well as the removal of *P. maximus* from the MNR by any means (see Appendix I for SWSFC byelaws).

In 2008 commercial scallop dredging occurred in St Brides Bay for 3 weeks with vessels operating in close (100-150m) proximity to the Skomer MNR boundary. Seabed protection was further enhanced by the introduction of the Scallop Fishing (Wales) Order 2010, which has prohibited the use of scallop dredges within 1 nautical mile of the Welsh coast (see Appendix 2 for Fishing Order).

Figure 1. Map indicating (dashed line) the boundary limits of the Skomer Marine Nature Reserve. Reserve map adapted from Rogers, 1997. Scale map from Ordnance Survey.



Bullimore (1985) reviewed *P. maximus* survey data from 1979 to 1982 and 1984 in Skomer MNR to assess the status of the population at that time. These surveys estimated extent of habitat suitable for *P. maximus* in Skomer MNR, *P. maximus* density, age frequency distribution and first year growth bands and annual growth rates for individuals (Lock, 2001). Repeat surveys have been carried out in an attempt to monitor recovery of the population since MNR designation in 1990. The survey of *P. maximus* in 2000 was carried out by a team

of volunteer divers guided by MNR staff and established the field method and three survey sites. In 2004 the survey was repeated at the same 3 sites and established a further 4 sites (Luddington *et al* 2004). These field methods and 7 sites were again used in the 2008 and the present survey.

Survey results in 2000 showed an increase in *P. maximus* density compared to the 1984 survey data. The 2004 and 2008 surveys showed a continuation of this trend, with an overall increase in *P. maximus* density. Modal age and growth showed a similar pattern in the 2000, 2004 and 2008 surveys. Two spat collectors were deployed in 2005 and 2006 but only a single *P. maximus* spat was found, further collectors were deployed in the present survey.

Crepidula fornicata, the slipper limpet is a non-native species first introduced in the late 1800 from America. It lives in groups, forming curved chains of up to 15 animals attached to stones and shells mainly in mixed sediment habitats. Its UK northern distribution is in Pembrokeshire and it is abundant in the Milford Haven Waterway where its invasive nature competes and displaces other filter-feeders like oysters and mussels. It was first found in the Skomer MNR during the 2008 survey when 2 individuals were found attached to a *P. maximus* shell and further records were made in the present survey.

1.1 SURVEY OBJECTIVES

The survey aimed to establish the current status of the *P. maximus* population in Skomer MNR and compare the results to previous surveys. It also aims to establish a further study area outside of the Skomer MNR boundary where scallop dredging occurred in 2008 so that recovery of the habitat can be monitored.

The survey objectives were:

1. To determine the density of *P. maximus* at selected sites;
2. To determine *P. maximus* population dynamics: age distribution and size distribution and growth rates;
3. To compare results with previous surveys;
4. To attempt to collect *P. maximus* spat;
5. To record the invasive species *Crepidula fornicata*, the Slipper limpet;
6. To establish a study site in St Brides Bay (outside of the Skomer MNR boundary).

2. METHOD

2.1 SITE SELECTION

During the Skomer MNR *P. maximus* survey in 2000 Geographical Positioning System (GPS) positions for 3 permanent sites were established. In 2004 a further 4 sites were established following reconnaissance dives to assess their suitability as *P. maximus* survey sites. Each site position was recorded using GPS and marked with a buoyed sinker for the duration of the survey. All 7 sites were again used in the 2008 and 2012 survey. In 2012 a new site was established just north of the Skomer MNR boundary to act as a study site outside of the Reserve.

2.2 DIVING FIELD METHOD

In 2000 a method suitable for volunteer divers was established and this was repeated in the 2004, 2008 and 2012 surveys. Survey transects were conducted from each site marker, following compass bearing directions: N, NE, E, SE, S, SW, W and NW where topographic features allow. Survey transects were completed by divers working in buddy pairs. Each pair was equipped with a surface marker buoy (SMB), a compass, net bags, a torch and a 50m tape.

In 2000, 2004 and 2008 50m transects were completed at most sites. At some sites it was not appropriate to complete full 50m transects due to changes in benthic substrate and in these cases transects were omitted or reduced. At sites where high densities were found, transects were reduced to 30m length to allow completion in the limited dive time. The divers attached the tape measure to the fixed marker on the seabed and swam together laying out the tape for either 50m or 30m on an agreed compass bearing. The transect was then completed with one diver positioned on either side of the tape. The divers searched for all *P. maximus* found in a 2m (or 1m in low visibility) wide corridor on their side of the tape, collecting the animals into net bags. This was repeated by swimming back along the tape collecting any missed *P. maximus*. The divers returned to the boat with the collected *P. maximus* where they were stored in labelled buckets of clean seawater.

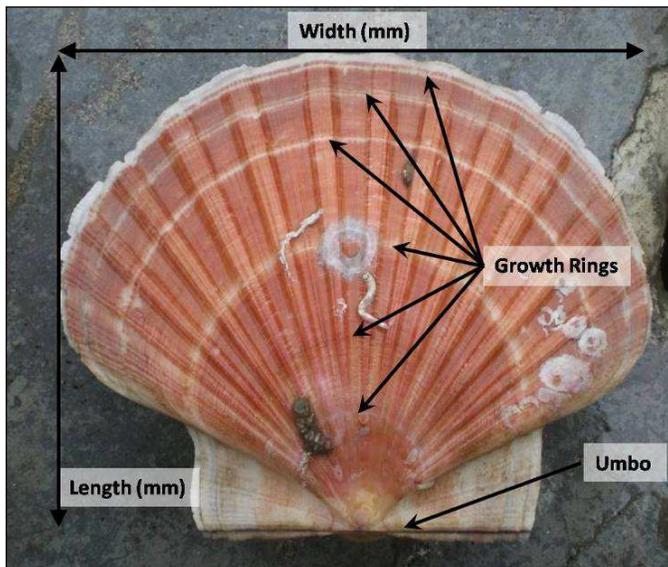
In 2012 difficult diving conditions on both of the survey weekends meant that the transect areas had to be reduced. Poor visibility meant that a thorough search for *P. maximus* took much longer to complete within the limited dive time. Transects were therefore reduced to 30m length at most sites and a 1m wide corridor on either side of the tape was searched.

2.3 FIELD RECORDING

On the boats the *P. maximus* were cleaned on the shells flat side using a scrubbing brush until the growth check rings were clearly visible. Length and width measurements were recorded. Growth rings were measured from the umbo (hinge line) to each annual growth check ring on the flat valve, as shown in figure 2. Each *P. maximus* was marked with a filed notch 2-3mm into the edge of the hinge to ensure that no scallop was measured twice during the survey. Once all the *P. maximus* from each transect had been measured, recorded and marked they were returned to the sea in the area immediately surrounding the site marker buoy from which they had been removed. During subsequent transects any scallop collected bearing a notch was omitted from further recordings.



Figure 2. Length and width dimensions measured and the position of the six annual growth rings relative to the umbo of the shell.



2.4 SPAT COLLECTORS

Spat collectors were made using mesh bags and monofilament line.

In April 2012 two collectors were deployed, one at 2 metres and one at 5 metres above the seabed at survey site 1. These were retrieved in September and the collectors were carefully examined for any juvenile *P. maximus*.



2.5 *CREPIDULA FORNICATA*

All *P. maximus* that were brought to the surface were inspected carefully for the presence of *C. fornicata*. Care was taken to remove encrusting barnacles so that the numbers of *C. fornicata* could be counted.



2.6 ST BRIDES BAY STUDY SITE

Reconnoitre dives were completed at several sites in St Brides Bay, just north of the Skomer MNR boundary. These dives assessed the substrate, habitat and extent along with the presence of any *P. maximus*, all of which contribute to suitability as a *P. maximus* survey site. The depth of the sites was also a dictating factor as areas greater than 20-25m greatly reduced dive and subsequent survey time. A site was established, its position was recorded using GPS and marked with a buoyed sinker for the duration of the survey. Skomer MNR staff completed the diving at this site. The survey was completed using 50m tapes and a 2m wide corridor on their side of the tape and the same diving and field recording methods were followed as with the sites within the Skomer MNR.

3. RESULTS

3.1 DENSITY AND DISTRIBUTION

The 2012 survey was carried out over two weekends with a total of over 32 divers. A total of 3240m² of seabed was surveyed at the seven pre-selected sites and 913 *P. maximus* collected and measured giving a mean density of 0.28 m⁻² or 28 per 100m⁻². A summary of the 2012 survey is shown in Table 1. Site 1 consists of a set of 3 seabed markers from which transects are completed, therefore more transects are completed at this site. At sites 4 and 7 the number of transects possible is limited by nearby unsuitable rocky habitat.

Table 1. Summary of *P. maximus* survey 2012

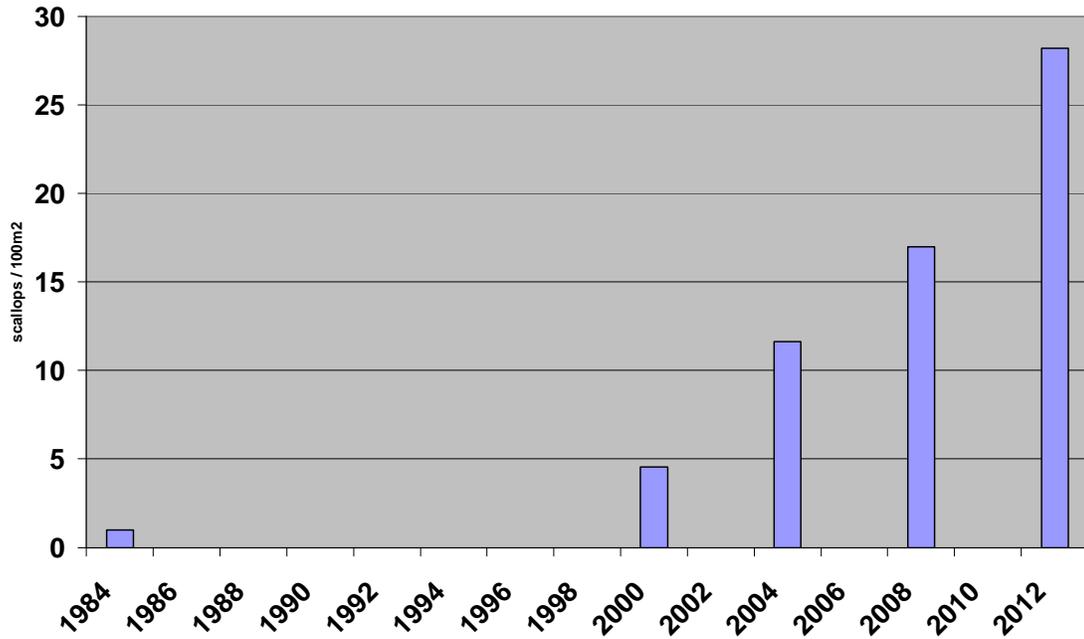
Site	Transects completed	Total area m ²	Total <i>P. maximus</i>	Mean density m ⁻²	Mean density 100m ⁻²
1	12	900	107	0.12	12
2	7	420	168	0.4	40
3	4	240	196	0.82	82
4	7	300	214	0.48	48
5	8	420	46	0.13	13
6	7	600	167	0.29	29
7	5	360	15	0.05	5
Total	50	3240	913	0.28	28

The overall mean densities for the MNR from the 1984 to 2012 surveys are shown in Table 2. In 2004, 2008 and 2012 all 7 survey sites were completed, in 2004 and 2008 similar survey areas were also completed. However in 2012 the survey area was significantly lower due to the poor visibility during the survey. A continued overall increase in mean density for the MNR is shown from 2000 to 2012.

Table 2. Summary of *P. maximus* surveys at Skomer MNR in 1984, 2000, 2004, 2008 and 2012.

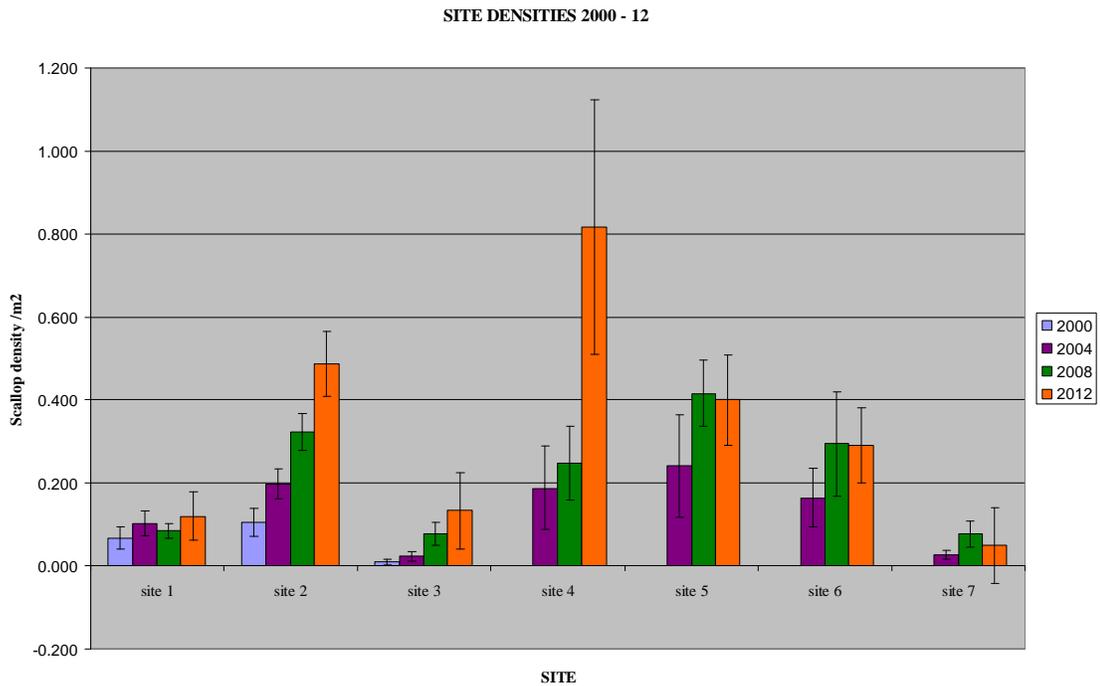
Year	No. sites	Total area m ²	Total <i>P. maximus</i>	Mean density m ⁻²	Mean density 100m ⁻²
1984	10	Na -Timed searches	36	-	Estimated 1
2000	3	4200	155	0.045	4.5
2004	7	10,632	1312	0.115	11.5
2008	7	9780	1653	0.169	16.9
2012	7	3240	913	0.28	28

Figure 3. Overall density of *Pecten maximus* / 100m² from 1984 to 2012



The differences in scallop densities at each site over the twelve years are shown in Figure 4. The error bars are the 1.96 standard error bars, representing the 95% confidence interval.

Figure 4. *Pecten maximus* density at sites 1-7, Skomer MNR 2000, 2004, 2008 & 2012 (95% confidence level standard error bars)



Sites 2 and 4 have seen a significant increase in *P. maximus* density between 2008 and 2012 at the 95% confidence level, with the greatest increase seen at site 4. Site 2 shows that there has been steady increase in each survey since 2000. Site 3 has not shown significant

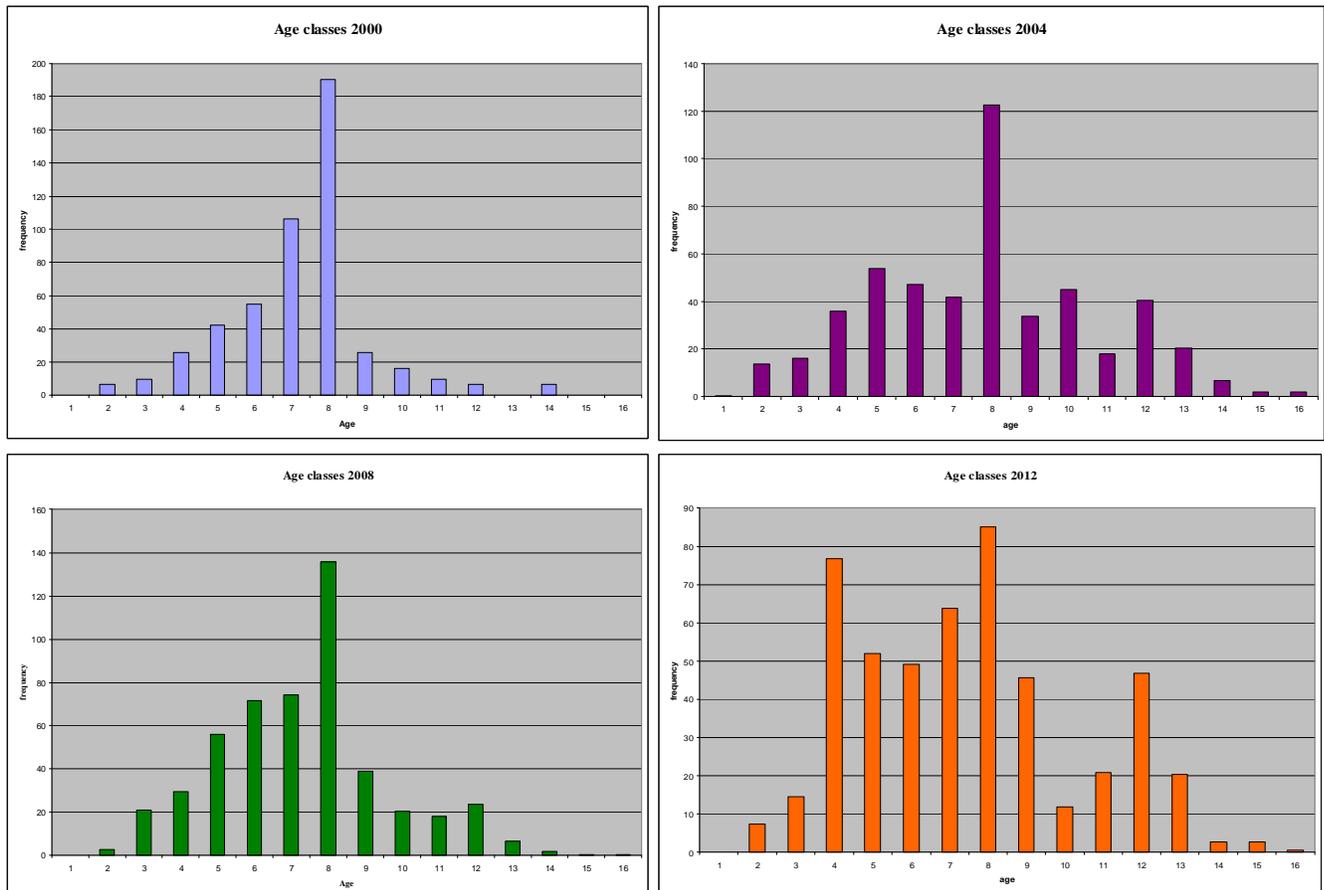
increase, the data has very broad error bars indicating possible difficulty with the sampling. Site 1, site 5 and site 6 show consistent density levels in 2008 and 2012. Site 7 shows a slight drop in density from that recorded in 2008 but density is consistently low at this site.

3.2 AGE CLASSES

P. maximus age is determined by counting the number of growth rings present, one growth ring representing one year of growth. Growth rings up to the age of seven are reasonably distinguishable but growth rings from year eight and above are more difficult to measure as growth slows down and the distance between the rings is very small. Therefore for ages of eight years or above, the measured growth for all *P. maximus* were used to provide a calculated mean annual growth rate of 1.033 times the previous year. This calculated mean growth rate was then applied to all *P. maximus* eight years or more to extrapolate *P. maximus* sizes and estimate ages.

Figure 5 shows the age distribution for Skomer MNR in 2000, 2004, 2008 and 2012. The modal age class was 8 years in each year. In each year age classes 2-4 are present and in 2012 data shows that age 4 was particularly high. In years 2004 and 2012, there are slightly higher numbers of the oldest individuals in the population with the oldest individual estimated as 16 years old.

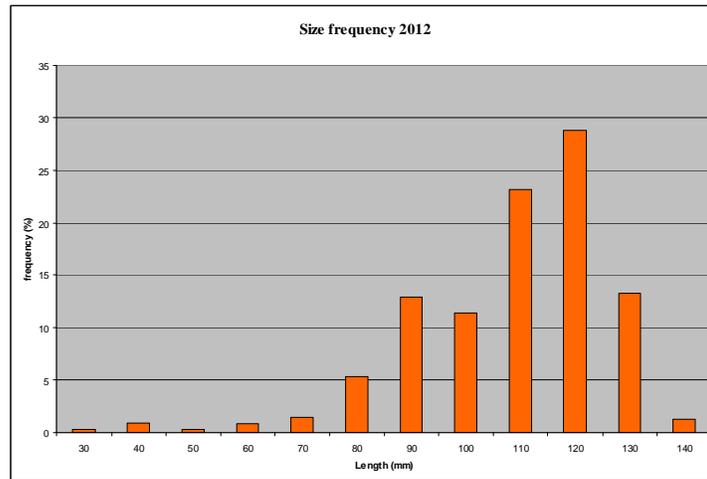
Figure 5. *Pecten maximus* age distribution (per 500 population) Skomer MNR 2000, 2004, 2008 & 2012



3.3 SIZE

The size frequency distribution of *P. maximus* is negatively skewed, the size ranged from 30 to 140mm with a mode size of 120mm as shown in Figure 6.

Figure 6. Size frequency distribution of *P. maximus* in Skomer MNR 2012.



3.4 GROWTH

P. maximus growth is determined by measuring the length distance of each growth ring. Growth rings on some *P. maximus* were difficult to identify but because of the high numbers of *P. maximus* measured it is possible to smooth out this difficulty.

Figure 7. Length frequency graph, showing the first three growth rings of measured *Pecten maximus* 2012

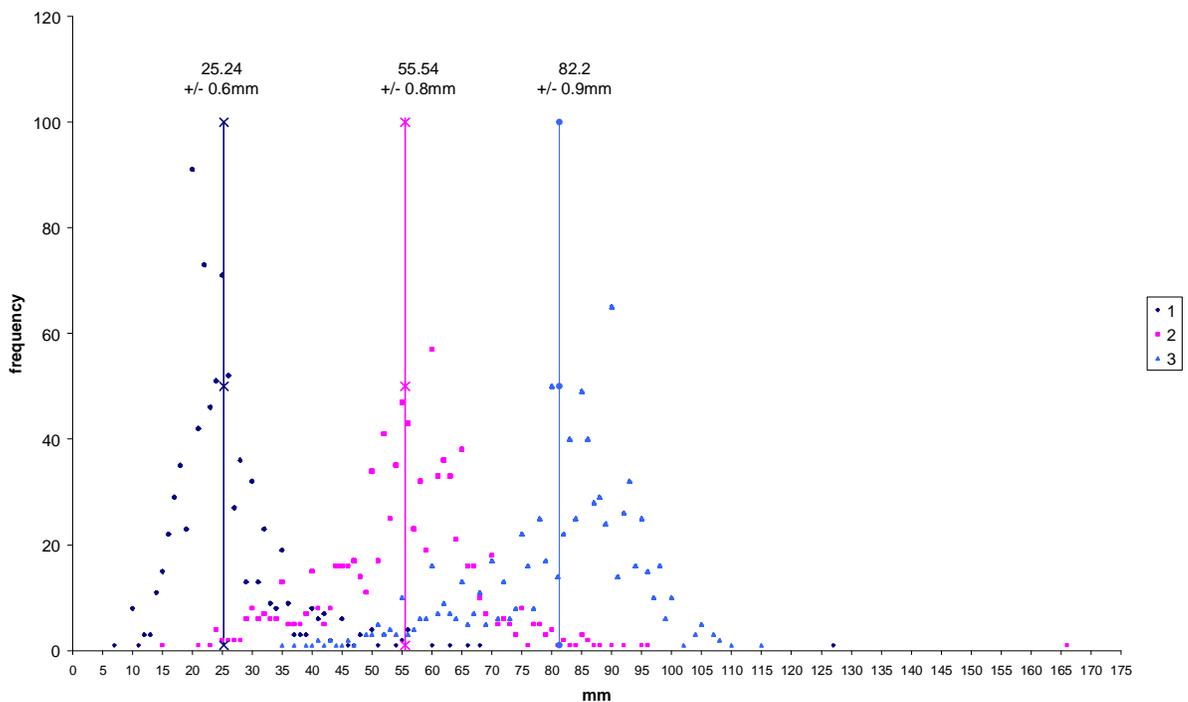


Figure 7 shows that the position of each growth ring is fairly normally distributed about a common mean and this pattern was also seen for the 2000, 2004 and 2008 data (Lock *et al* 2008). No obvious bimodal pattern is observed in the data.

3.5 SPAT COLLECTORS

No *P. maximus* juvenile were found from the two spat collectors that were deployed between April and September 2012.

3.6 CREPIDULA FORNICATA

C. fornicata were found at 4 sites as shown in Table 3.

Table 3. Numbers of *C. fornicata* found at Skomer MNR *P. maximus* survey sites 2012.

Site	Number of stacks	Number in stack
St Brides	1	2
Site 2	3	1, 1, 2
Site 5	2	1, 1
Site 6	4	1, 1, 1, 1

3.7 ST BRIDES STUDY SITE

A suitable site was identified just north of the Skomer MNR boundary. In addition to finding suitable habitat the site depth had to be considered to allow for sufficient dive time. A total area of 1040m² was surveyed, 158 *P. maximus* were found giving a density of 0.152m⁻² (15.2 /100 m⁻²).

4 DISCUSSION

4.1 DENSITY & DISTRIBUTION

Seven sites were surveyed in 2012 in the Skomer MNR and data compared to 2008, 2004 and 2000 surveys. The total population density of *P. maximus* for all sites showed increase compared to the previous surveys suggesting a continued recovery of the population from pre-1990 exploitation. Studies off the Isle of Man in areas closed to fishing for *P. maximus* similarly showed an increase in population densities. Between 1989 and 2003 density was seven times higher in the closed areas compared to fished areas (Beukers-Stewart *et al*, 2005).

An increase in density was seen at four of the seven sites and at two of these sites a significant increase (95% confidence interval) was recorded. The greatest increase was found at site 4 where a four fold increase was recorded. Site 2 has shown a steady increase since 2000 reflecting the suitability of this site for *P. maximus* beds. Natural factors such as habitat, food availability and competition will all contribute to the density of *P. maximus* at a site and naturally *P. maximus* will thrive better at some sites. Sites 1 and 7 both show consistent densities between the surveys and the densities at sites 5 and 6 are very similar in 2008 and 2012, it is possible that these areas have reached their 'carrying capacity'. If this is the case then it is possible that any increases in *P. maximus* at these sites might be contributing to a 'spill over effect' either to other areas within the Skomer MNR or outside of the Reserve boundary (Gell & Roberts, 2003; Goni *et al*, 2008).

Site 3 also had an increase in density and there has been a steady pattern of increase since the very low numbers recorded in 2000. The low numbers in 2000 and 2004 were possibly due to it being a popular site with recreational shore divers and where there had been reports of divers removing *P. maximus*. In 2005 new posters were put up informing divers of the SWSFC byelaw and of the fines that could be imposed. Since then there have been no reports of divers removing *P. maximus* and both the 2008 and 2012 have shown an increase in the density at this site.

4.2 AGE STRUCTURE & SIZE

The modal age class was 8 years, matching that in 2000, 2004 and 2008. However although a 'normal' age distribution pattern was found in each of the surveys in 2012 a higher number of young *P. maximus* were recorded, in particular years 4 to 7. The frequency of particular age classes may reflect variations in the success of recruitment. For example, spawning and settlement may be more successful some years than others due to variations in environmental conditions, suitable substratum, food availability and level of predation. Franklin *et al*. (1980) reported that one characteristic of *P. maximus* is extremely irregular spat settlement and /or survival, so that certain year classes may be absent from the population. The oldest measured were 140mm and estimated as 16 years old suggesting that *P. maximus* of this age are close to their maximum life expectancy.

4.3 GROWTH

The 1985 study suggested that there is a biannual nature to the growth of *P. maximus*, with two distinct spawning times during one year. No obvious bimodal pattern was present in 2012 as was also found in the 2000, 2004 and 2008 data, with all growth ring data graphs indicating only a single mid point with varying degrees of spread. It is possible that the bimodal effect is so slight it is not detectable within the level of noise (spread of curve) of these data.

The spawning patterns of *P. maximus* have been described for a variety of different geographical areas and there does not appear to be any firm consistency. Research conducted by Mason (1957;1958) around the Isle of Man reveals that *P. maximus* in this area had a partial spawning in April/May and July followed by a more complete spawning in August/September depending on their age. In the Bay of St. Brieuc (France) spawning events appeared to follow a cyclic pattern with an initial (all population) spawning seen between the end of June and beginning of July. The second spawning event was recorded here during July - all gonads were fully spent by August. Spawning was seen to be initiated by water temperatures of 15.5-16°C characteristic of these seasonal times (Paulet *et al.*, 1988). In the Bay of Brest (France) spawning in *P. maximus* was seen to occur continuously with numerous spawning between April and October. Mature individuals were observed throughout this period of time (Paulet *et al.*, 1988). Populations of *P. maximus* around the Western Norwegian coast were observed to spawn over an extended period of time ranging from March to September. Full adult gonads were found throughout this time, but not after September/October (Duinker & Nylund, 2002).

In general *P. maximus* is observed to spawn frequently throughout the period of spring to autumn (Isle of Man, Bay of Brest France, western Norway).

4.4 JUVENILE PECTEN MAXIMUS

In the 2012 and 2008 surveys emphasis was placed on a careful search by the divers for small *P. maximus*, as a result more 2-3 year old individuals were found. However the total numbers of small *P. maximus* found on the survey were still very low and it is unknown if they occupy the same areas as the adult population (Franklin *et al* 1980). Luddington *et al* 2004 recommended that spat collectors should be deployed to investigate settlement of *P. maximus* spat in the Skomer MNR. The trial completed in 2006 only found a single juvenile and in 2012 none were found. This highlights the trial's limitations including: a single style of spat collector used, single site for deployment, only two collectors deployed, sampling time only 3 months and only two depth zones sampled.

In the North Water of Mulroy Bay in County Donegal, Ireland techniques were developed during 1980 and 1981 for the prediction of *P. maximus* spatfall. The research focussed on gonad monitoring, plankton analysis, spat settlement and spat collection trials to develop a technique for prediction of the date and location of the peak *P. maximus* spatfall. The results from these investigations allowed commercial application of the technique in 2002 by the scallop culture industry (Slater 2006).

Further investigation using a combination of techniques: plankton analysis and spat settlement within the Reserve and gonad monitoring at a site outside of the Reserve

boundaries, is needed to provide a clearer and fuller picture of juvenile *P. maximus* in the Skomer MNR area.

4.5 CREPIDULA FORNICATA

The American slipper limpet *Crepidula fornicata* was first recorded from Welsh coastal waters in 1952 when single individuals were found in the low intertidal in the Milford Haven Waterway (MHW), South West Wales. Its establishment and local spread happened rapidly. However, there was no indication of a northwards range extension until 2008 when two individuals were found in the Skomer MNR just north of the MHW (Bohn 2012). Bohn (2012) completed surveys at a range of suitable sites in Wales and did not find any live *C. fornicata* outside its known northern range limit in Wales (the MHW). However, *C. fornicata* was found to be well established in most of the MHW, occurring in local very abundant aggregations, intertidally and subtidally, with maximum densities of 2750 and 1150 individuals m⁻², respectively.

In the 2012 survey a total of ten *C. fornicata* stacks were found, all attached to *P. maximus* or *Aequipecten opercularis*. Individuals were solitary or occurred in stacks of two, and at least three of the bottom-most individuals were carrying eggs, i.e. had reached sexual maturity and reproduced successfully. The sampling effort involved in the 2012 survey is considered high with 1074 *P. maximus* inspected and densities of *C. fornicata* were very low (Bohn 2012).

4.6 ST BRIDES STUDY SITE

In 2008 commercial scallop dredging occurred in St Brides Bay for 3 weeks with vessels operating in close (100-150m) proximity to the Skomer MNR boundary. In 2012 a study site was successfully established in a suitable area outside the Skomer MNR boundary. *P. maximus* density of 0.152 m⁻² is lower than that found as the overall mean density (0.28 m⁻²) for the 7 sites within the Skomer MNR during the 2012 survey but is similar to the overall mean densities recorded in 2004 (11.5 m⁻²) and 2008 (16.9 m⁻²).

Future surveys at this site will help monitor the *P. maximus* densities and see if benefits have been gained by the current protection of the Scallop Fishing (Wales) Order 2010, which has prohibited the use of scallop dredges within 1 nautical mile of the Welsh coast (see Appendix 2 for Fishing Order).

5 RECOMMENDATIONS

- Continue surveys every 4 years using volunteer divers.
- Future surveys follow the methods established in 2000, and use sites established in 2000 and 2004.
- Continue survey sites outside of the Skomer MNR boundaries.
- Support research work on the biology of *Pecten maximus*.
- Investigate gonad monitoring, plankton analysis and spat settlement in the Skomer MNR area.
- Continue recording presence of *Crepidula fornicata*
- Continue to inform divers using the MNR about the SWSFC byelaws and report any incident involving the collection of *P. maximus* in the Skomer MNR to the SWSFC.
- Monitor sea temperature and suspended turbidity levels to provide background data for the biological monitoring.

6 ACKNOWLEDGEMENTS

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APPENDIX I Byelaws

SOUTH WALES SEA FISHERIES COMMITTEE BYELAWS

Fishing within the MNR is governed by national legislation and by byelaws made by the South Wales Sea Fisheries Committee, which regulate matters such as the minimum permissible landing size for certain fish species, the prohibition of the deposition or discharge of substances detrimental to sea fish and sea fishing, etc.

Byelaws which, if this order is made, the South Wales Sea Fisheries Committee propose making under Section 5 of the Sea fisheries Regulation Act 1966.

Byelaw No. 30 Prohibited area for use of dredges and beam trawls.

No person shall use in fishing for sea fish any fishing dredge or any beam trawl within the area detailed below:-

from the northern point of Gateholm due north to the mainland,

from the southern point of Gateholm a straight line in a direction of 278° (T) to position 2¾ cables due south (T) of the western extremity of the Mewstone,

thence 2¾ cables off the mainland shore of Skomer around the west coast of the Island to a position 2 cables due north (T) of the Garland Stone,

thence a straight line in a direction of 098° (T) to a position 51° 44.50'N, 05° 13.00'W,

thence due south (T) to the mainland coast.

Byelaw No 30A Prohibited area for scallop fishing - Skomer Island

No person shall fish for take or land any scallop of the species *Pecten maximus* or of the species *Chlamys opercularis* from the area detailed below:-

from the northern point of Gateholm due north to the mainland from the southern point of Gateholm a straight line in a direction 278° (T) to a position 2¾ cables due south (T) of the western extremity of the Mewstone, thence 2¾ cables off the mainland shore of Skomer

around the west coast of the Island to position 2 cables due north (T) of the Garland Stone,

thence a straight line in a direction of 098° (T) to a position 51° 44.50N, 05° 13.00'W,

thence due south (T) to the mainland coast.

APPENDIX 2 Statutory Instruments

W E L S H

S T A T U T O R Y I N S T R U M E N T S

2010 No. 203 (W. 30)

SEA FISHERIES, WALES

CONSERVATION OF SEA FISH

The Scallop Fishing (Wales) Order
2010

EXPLANATORY NOTE

(This note is not part of the Order)

This Order, which applies in relation to Wales, regulates scallop fishing in “Welsh waters” and comes into force on 1 March 2010. For the purposes of the Order “Welsh waters” are defined as being those sea areas falling within “Wales” as defined by section 158 of the Government of Wales Act 2006.

Article 3 restricts the engine output capacity of British fishing boats which may use scallop dredges.

Article 4 provides for a closed season in respect of scallop fishing, being a period commencing on 1 June 2010, and on 1 May in each subsequent year, and ending on the 31 October.

Article 5 prohibits the use of scallop dredges at any time within one nautical mile of the baselines from which the breadth of the territorial sea is measured.

Article 6 provides limits as to the number of scallop dredges that may be used at any one time in the areas between 1 and 3 nautical miles, 3 to 6 nautical miles and 6 to 12 nautical miles off the Welsh coast.

Article 7 requires that, when not lawfully in use, all scallop dredges must be securely stored onboard the fishing boat.

Article 8 provides restrictions as to the size of the tow bars which may be used by British fishing boats in the areas between 1 and 3 nautical miles, 3 to 6 nautical miles and 6 to 12 nautical miles off the Welsh coast.

Article 9 provides for the maximum external diameter of tow bar which may be used.

2

Article 10 fixes the specification of scallop dredges which may be towed.

Article 11 fixes the minimum size of scallop which may be carried by a British fishing boat and the method to be used for measuring scallops.

Article 12 prohibits fishing for scallops by dredging within designated areas set out in the Schedule.

Article 13 provides for British sea fishery officers to have certain powers to board, search and detain British fishing boats and to inspect, copy and detain documents.

Article 14 revokes the Prohibition of Fishing for Scallops (Wales) Order 2009.

The provisions contained in articles 2, 3, 6, 8, 9, 10

and 11 of this Order were notified in draft to the European Commission in accordance with the requirements of Article 8 of Directive 98/34/EC of the European Parliament and of the Council laying down a procedure for the provision of information in the field of technical standards and regulations (OJ No L 204, 21.7.98, p.37) as amended by Directive 98/48/EC of the European Parliament and of the Council (OJ No L 217, 5.8.98, p.18).

A regulatory impact assessment has been undertaken in respect of this Order and is available for inspection at the offices of the Welsh Assembly Government, Cathays Park, Cardiff, CF10 3NQ.

3

W E L S H

S T A T U T O R Y I N S T R U M E N T S

2010 No. 203 (W. 30)

SEA FISHERIES, WALES

CONSERVATION OF SEA FISH

The Scallop Fishing (Wales) Order
2010

Made 3 February 2010

Laid before the National

Assembly for Wales 4 February 2010

Coming into force 1 March 2010

The Welsh Ministers make the following Order in exercise of the powers conferred by sections 1, 3, 5, 5A, 15(3) and 20(1) of the Sea Fish (Conservation) Act 1967(1), now vested in them(2), and paragraph 1A

(1) 1967 c.84. Section 1 was substituted by the Fisheries Act 1981 (c. 29), section 19(1) and amended by the Merchant Shipping Act 1995 (c. 21), section 314(2) and Schedule 13, paragraph 38(a) and the Scotland Act 1998 (Consequential Modifications) (No. 2) Order 1999 (S.I. 1999/1820), Schedule 2, paragraph 43(1), (2) and (3). Section 3 was amended by the Fishery Limits Act 1976 (c.86), section 9 and Schedule 2, paragraph 16(1), the Inshore Fishing (Scotland) Act 1984 (c. 26), section 10(1) and Schedule 1 and S.I. 1999/1820, article 4 and Schedule 2, paragraph 43(1), (2) and (4). Section 5 was amended by the Fisheries Act 1981 (c.29), section 22(1), (2) and (3) and amended by the Merchant Shipping Act 1995 (c.21), section 314(2) and Schedule 13, paragraph 38(b) and S.I. 1999/1820, article 4 and Schedule 2, paragraph 43(1) and (2). Section 5A was inserted by the Environment Act 1995 (c. 25), section 103(1). Section 15(3) was substituted by the Sea Fisheries Act 1968 (c. 77), section 22(1) and Schedule 1, paragraph 38(3) and amended by the Fishery Limits Act 1976 (c. 86), section 9 and Schedule 2, paragraph 16(1) and S.I. 1999/1820, article 4 and Schedule 2, paragraph 43(1) and (2). *See* section 22(2) for definitions of "the Ministers"; section 22(2) was amended by the Fisheries Act 1981 (c. 29), sections 19(2)(d), 45(a), (b) and (c) and 46(2) and by S.I. 1999/1820, article 4 and Schedule 2, paragraph 43(1) and (12) and the Northern Ireland Constitution Act 1973 (c. 36), section 40 and Schedule 5, paragraph 8(1).

(2) By virtue of article 2 of and Schedule 1 to the National Assembly for Wales (Transfer of Functions) Order 1999 (S.I. 1999/672) the functions exercisable under sections 1, 3, 5, 5A, 15(3) and 20 of the 1967 Act were transferred to the National Assembly for Wales (as constituted under the Government of Wales Act 1998 (c.38)) in so far as exercisable in relation to Wales (acting concurrently with any Minister of the Crown by whom they are exercisable in

4

of Schedule 2 to the European Communities Act 1972(1).

This Order makes provision for a purpose mentioned in section 2(2) of the European Communities Act 1972, and it appears to the Welsh Ministers that it is expedient for the reference in article 11 of this Order to Council Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juvenile marine organisms(2) to be construed as a reference to that Regulation as amended from time to time.

Title, commencement and application

1. —(1) The title of this Order is the Scallop Fishing (Wales) Order 2010.

(2) This Order applies in relation to Wales and comes into force on 1 March 2010.

(3) In this Order “Wales” has the same meaning as in section 158 of the Government of Wales Act 2006(3) and “Welsh waters” means those sea areas within Wales.

Interpretation

2. In this Order, unless the context requires otherwise—

“the Act” (“*y Ddeddf*”) means the Sea Fish (Conservation) Act 1967;

“baselines” (“*gwaelodlinau*”) means the baselines from which the breadth of the territorial sea is measured for the purposes of the Territorial Sea Act 1987(4);

“British fishing boat” (“*cwch pysgota Prydeinig*”) means a fishing boat which is either registered in the United Kingdom under Part II of the Merchant Shipping Act 1995(5) or is owned wholly by persons qualified to own British ships for the purposes of that part of that Act;

“equivalent provision” (“*darpariaeth gyfatebol*”) means a provision in any other order extending or relation to section 15(3)). Those functions of the National Assembly for Wales were transferred to the Welsh Ministers by virtue of section 162 of and paragraph 30 of Schedule 11 to the Government of Wales Act 2006 (c.32).

(1) 1972 c. 68. Section 2(2) was amended by section 27(1) of the Legislative and Regulatory Reform Act 2006 (c. 51) (“the 2006 Act”). Paragraph 1A of Schedule 2 was inserted by section 28 of the 2006 Act. The Welsh Ministers have been designated (S.I. 2005/2766) for the purposes of section 2(2) of the 1972 Act in relation to the common agricultural policy of the European Community.

(2) OJ No. L125, 27.4.1998, p. 1.

(3) 2006 c.32.

(4) 1987 c.49.

(5) 1995 c.21.

5

applying to any part of the United Kingdom which has equivalent effect to a provision in this Order;

“scallop” (“*cregyn bylchog*”) means shellfish of the species *Pecten maximus*;

“scallop dredge” (“*llusgrwyd cregyn bylchog*”) includes any appliance with a rigid framed mouth which is towed through the water and is manufactured, adapted, used or intended for use for the purpose of fishing for scallops;

“tow bar” (“*bar tynnu*”) means any device or

appliance which is capable of being used for the purpose of fixing or attaching a scallop dredge to a vessel for the purpose of enabling such a dredge to be towed by the vessel; and
 “Wales” (“*Cymru*”) has the meaning given in section 158 of the Government of Wales Act 2006(1).

Fishing restrictions

3. No British fishing boat is permitted, at any time, to fish for, take or kill scallops using a scallop dredge in Welsh waters, unless that boat’s engine has a power output not exceeding 221 kilowatts.

4. —(1) Subject to paragraph (2), no person is to fish for, take or kill scallops in Welsh waters during the period 1 May to 31 October inclusive in each year by any means, including diving.

(2) In respect of the calendar year 2010 the period referred to in paragraph (1) is to commence on 1 June 2010.

Restrictions on number and use of scallop dredges

5. No British fishing boat is permitted, at any time, to fish for, take or kill scallops using a scallop dredge in any part of Welsh waters which lie within 1 nautical mile of baselines.

6. No British fishing boat is permitted, at any time, to fish for, take or kill scallops using a scallop dredge—

(a) in any part of Welsh waters which lies beyond 1 nautical mile and within 3 nautical miles of baselines, unless that boat’s overall length does not exceed 10 meters and it is towing no more than 6 scallop dredges in total;

(b) in any part of Welsh waters which lies beyond 3 nautical miles and within 6 nautical miles of baselines, unless that boat is towing no more than 8 scallop dredges in total; and

(1) 2006 c.32.

6

(c) in any part of Welsh waters which lies beyond 6 nautical miles and within 12 nautical miles of baselines, unless that boat is towing no more than 14 scallop dredges in total.

7. When not in use in accordance with the provisions of this Order all scallop dredges must be inboard, stowed and secured.

Restriction on size of tow bars

8. —(1) No British fishing boat is permitted, at any time, in any part of Welsh waters which lies beyond 1 nautical mile and within 3 nautical miles of baselines, to use a tow bar in connection with fishing for, taking or killing scallops, unless that tow bar—

(a) does not exceed 3 metres in length; and

(b) is not constructed in a way which enables more than 3 scallop dredges to be attached to it at the same time.

(2) No British fishing boat is permitted, at any time, in any part of Welsh waters which lies beyond 3 nautical miles and within 6 nautical miles of baselines,

to use a tow bar in connection with fishing for, taking or killing scallops, unless that tow bar—

- (a) does not exceed 4 metres in length; and
- (b) is not constructed in a way which enables more than 4 scallop dredges to be attached to it at the same time.

(3) No British fishing boat is permitted, at any time, in any part of Welsh waters which lies beyond 6 nautical miles and within 12 nautical miles of baselines, to use a tow bar in connection with fishing for, taking or killing scallops, unless that tow bar—

- (a) does not exceed 6.8 metres in length; and
- (b) is not constructed in a way which enables more than 7 scallop dredges to be attached to it at the same time.

9. No British fishing boat is permitted at any time, in any part of Welsh waters to use any tow bar in connection with fishing for, taking or killing scallops, which exceeds 185 millimetres in external diameter.

Specification of scallop dredges

10. —(1) Subject to the provisions of this article, no British fishing boat is permitted to tow any scallop dredge within Welsh waters unless in relation to such a dredge—

- (a) no part of its frame is greater than 85 centimetres wide;
- (b) it includes a functioning, operational and moveable spring loaded tooth bar;
- 7
- (c) it does not contain any attachments to the rear, top or inside of the dredge;
- (d) it does not contain a diving plate or any other similar device;
- (e) the total weight of the dredge including all fittings does not exceed 150 kilogrammes;
- (f) the number of belly rings in each row suspended from the belly bar does not exceed 7;
- (g) the number of teeth on the tooth bar does not exceed 8; and
- (h) each tooth on the tooth bar measures no more than 22 millimetres in diameter and 110 millimetres in length.

(2) In this article—

- (a) a row of belly rings is a line of single interconnecting rings, where the ring at one end of the line hangs either from the belly bar or from the main structure of the dredge perpendicular to the belly bar;
- (b) a belly bar is the bar attached to the frame of the dredge which runs parallel to the tooth bar and from which the belly rings hang;
- (c) a tooth bar is the bar to which are attached teeth, the ends of which point downwards and are intended to be in contact with the sea bed when the dredge is in operation;
- (d) the diameter of a tooth is its maximum width measured in the direction of the line of the

tooth bar; and

(e) the length of a tooth is the distance between the underside of the tooth bar and the tip of the tooth.

(3) Belly rings and the fastenings which attach them to each other and to the frame are not to be regarded as attachments for the purpose of paragraph (1)(c).

Minimum size of scallop

11. —(1) For the purposes of section 1(3) of the Act, the minimum size of scallop that may be carried by a British fishing boat in Welsh waters is 110 millimetres.

(2) For the purposes of paragraph (1), the size of a scallop is to be measured in accordance with paragraph 6 of Annex XIII to Council Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juvenile marine organisms(1) as amended from time to time.

(1) OJ No. L125, 27.4.1998, p. 1.

8

Prohibition on dredging

12. Notwithstanding articles 3 to 11 of this Order fishing for, taking or killing of scallops by the use of a scallop dredge by British fishing boats is prohibited in the areas designated in the Schedule to this Order.

Powers of British sea-fishery officers

13. —(1) For the purposes of enforcing this Order or any equivalent provision, a British sea fishery officer may exercise the powers conferred by this article in relation to any fishing boat to which this Order applies in Welsh waters.

(2) The officer may go on board the boat, with or without persons assigned to assist in that officer's duties, and may require the boat to stop and do anything else which will facilitate boarding or disembarkation.

(3) The officer may require the attendance of the master and other persons on board the boat and may make any examination and inquiry as appears to the officer to be necessary for the purpose mentioned in paragraph (1), and in particular may—

(a) search for fish or fishing gear on the boat and examine any fish on the boat and the

equipment of the boat, including the fishing gear, and require persons on board the boat to do anything which appears to the officer to be necessary for facilitating the examination;

(b) require any person on board the boat to produce any document in that person's custody or possession relating to the boat, to any fishing or ancillary operations or to persons on board;

(c) for the purpose of ascertaining whether the master, owner or charterer of the boat has committed an offence under the Act as read with this Order or any equivalent provision, search the boat for any such document and may require any person on board the boat to

do anything which appears to the officer to be necessary for facilitating the search;

(d) inspect and copy any such document produced or found on board the boat and, where any such document is kept by means of a computer, require it to be produced in a form in which it may be taken away; and

(e) where the boat is one in relation to which the officer has reason to suspect that an offence under this Order or an equivalent provision has been committed, subject to paragraph (4), seize and detain any such document produced or found on board the boat for the purpose of

9
enabling the document to be used as evidence in proceedings for the offence.

(4) Nothing in paragraph 3(e) permits any document required by law to be carried on board the boat to be seized and detained except while the boat is detained in a port.

(5) Where it appears to a British sea-fishery officer that an offence under this Order or any equivalent provision has at any time been committed in relation to a fishing boat, the officer may—

(a) take, or require the master of the boat to take, the boat and its crew to the port which appears to the officer to be the nearest convenient port; and

(b) detain or require the master to detain the boat in the port.

(6) A British sea-fishery officer who detains or requires the detention of a boat must serve on the master a written notice stating that the boat is, or is required to be, detained until the notice is withdrawn by the service on the master of a further written notice signed by a British sea-fishery officer.

(7) In this article, “officer” (“*swyddog*”) means British sea-fishery officer.

Revocation

14. The Prohibition of Fishing for Scallops (Wales) Order 2009(1) is revoked.

Elin Jones

Minister for Rural Affairs, one of the Welsh Ministers.

3 February 2010

(1) S.I. 2009/2721 (W.232).

10

SCHEDULE

Prohibition on dredging

Article 12

In the Schedule a group of two letters and five or six figures identifying or associated with any point represents the map co-ordinates of that point estimated to the nearest ten metres on the grid of the national reference system used by the Ordnance Survey on its maps and plans.

All latitude and longitude co-ordinates given are in degrees, minutes and decimal fractions of a minute

and are co-ordinates of the World Geodetic System.

Liverpool Bay

The area enclosed between the shoreline, the boundary between Welsh and English territorial waters and a line drawn between the following points:
where line of longitude 3°48.40 W crosses the shore at Llandudno to 53°24.82 N, 3°48.40 W, then to 53°24.82 N, 3°32.97 W to 53°27.07 N, 3°25.40 W to the line of latitude 53°27.07 N that crosses the boundary between Welsh and English territorial waters north of the Dee Estuary.

Menai, Anglesey and Conwy

All waters up to the mean high water mark in the area bounded by the following :
a line drawn from 53°21.6N, 4°15.02W to 53°22.18N, 3°46.54W to 53°19.60N, 3°46.54W; and
a line drawn north along the longitude line of 4°19. 58. W between Fort Belan and Abermenai Point.

North Llŷn Area

The area enclosed between the shoreline and a line drawn between points with the following co-ordinates:
52°56.909 N, 04°34.055 W to 52°59.858 N, 04°38.782 W to 52°55.455 N, 04°45.891 W to 52°52.928 N, 04°41.878 W to 52°52.155 N, 04°43.359 W to 52°51.563 N, 04°42.372 W.

11

Pen Llŷn a' r Sarnau

The area enclosed between the shoreline and a line drawn between points with the following co-ordinates:
52°56.909 N, 04°34.055 W to 52°59.858 N, 04°38.782 W to 52°55.455 N, 04°45.891 W to 52°52.928 N, 04°41.878 W to 52°52.155 N, 04°43.359 W to 52°51.563 N, 04°42.372 W.

Cardigan Bay

The area enclosed between the shoreline and a line drawn between points with the following co-ordinates :
OS Grid Reference SN47874/SN64087 to 52°25.10 N, 4°23.80W to 52°20.09N, 4°39.04W to 52°13.00N, 4°34.07W to 52°11.04N, 4°41.19W to 52°17.76N, 4°46.14W to 52°13.15N, 5°00.15W to OS Grid Reference SN10438/SN45534.

Pembrokeshire

The area of sea landward of a line drawn between the points with the following co-ordinates:
OS Grid Reference SM80320/SM32330 to 51°56.69N, 5°30.07W to 51°48.02N, 5°30.06W to 51°48.02N, 5°45.06W to 51°38.52N, 5°45.06W to 51°38.53N, 5°10.07W to 51°32.02N, 5°10.07W to 51°32.02N, 4°48.07W to OS Grid Reference SS06267/SS96997.

Carmarthen Bay

The area of sea landward of a line drawn between the points with the following co-ordinates:
OS Grid Reference SS13336/SS99905 to 51 36.02N, 4° 42.06W to 51°36.02N, 4°27.06W to 51°30.03N, 4°27.03W to 51°30.02N, 4°10.07W to OS Grid Reference SS49771/SS84968.

North Anglesey

The area bounded by a line drawn between the points

with the following coordinates:

53°35.19 N, 4°33.78 W to 53°36.41 N, 4°16.36 W to
53°33.20 N, 4°33.99 W to 53°31.57 N, 4°16.36 W.

West Anglesey

The area bounded by a line drawn between the points
with the following coordinates:

53°24.21 N, 4°59.55 W to 53°19.09 N, 4°51.03 W to
53°17.27 N, 4°54.65 W to 53°22.19 N, 5°1.03 W.

12