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# Grey Seal Pupping Phenology on Ynys Dewi / Ramsey Island, Pembrokeshire

Lisa H Morgan, Ceri W Morris, Thomas B Stringell

Evidence Report No 156

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The content and conclusions of this report do not necessarily reflect the views of RSPB or NRW. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. RSPB carried out and funded the survey from August to November under their management plan objectives. NRW funded a two-month extension to the survey. LM, CM and TS conceived the project; data were provided by LM and contributors listed in the acknowledgments. LM reviewed and collated data, LM and TS led the analyses and LM, CM and TS wrote the report; LM, CM and TS provided comment on draft and final versions. No animals were handled during this project.

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## 1. Crynodeb Gweithredol

- Dengys gwaith diweddar gan CNC (Strong *et al* ar y gweill) ac astudiaethau tymor hir gan RSPB Cymru (Morgan 2014) fod y nifer o loi bach morloi llwyd a anwyd ar Ynys Dewi wedi cynyddu ers i gofnodion ddechrau. Mae tystiolaeth yn awgrymu bod cychwyn tymor geni morloi bach wedi bod yn digwydd yn gynt dros amser. Fodd bynnag, nid yw'n amlwg os yw'r tymor wedi symud i fod yn gynt neu ei fod yn hirach. Felly, bu diddordeb mewn cofnodi diwedd tymor geni morloi bach yn fwy trwyadl.
- Er mwyn deall arwyddocâd unrhyw newidiadau tymhorol, cafodd yr arolwg blyneddol geni morloi bach ei ymestyn. Am y tro cyntaf, cafwyd ymweliadau â 9 safle monitro safonol ar Ynys Dewi yn ystod mis Rhagfyr 2015 a mis Ionawr 2016, gan ymestyn y tymor maes arferol o 2 fis a chynyddu'r arolwg llawn i gynnwys 138 diwrnod.
- Cynhaliwyd monitro o ben clogwyn ym mhob un o'r 9 safle bob 3-4 diwrnod, os oedd y tywydd yn caniatáu, rhwng 23 Awst 2015 a 8 Ionawr 2016 pan gafodd y nifer o forloi bach eu cyfri a'u rhoi mewn dosbarthiadau oedran. Tynnwyd lluniau o'r benywod oedd yno ar gyfer gwaith ffotograffau adnabod cyfredol CNC.
- Cafodd 380 morlo bach eu geni ar y safleoedd astudio rhwng 23 Awst 2015 a 16 Rhagfyr 2016. Dyma'r mwyaf o forloi bach i gael eu geni a'u cofnodi ar Ynys Dewi yn ystod 17 mlynedd pan mae'r dulliau arolygu wedi bod yn gyson (rhwng 1992 a 2015), ac mae'n uwch na cymedr y morloi bach a gyfrifwyd ar gyfer 1992–1996 (cymedr = 217) a 2011-2015 (cymedr = 343).
- Caiff mwyafrif y morloi bach eu geni yn ystod tymor bridio brig nodweddiadol de-orllewin Prydain, gydag 86% yn cael eu geni ym mis Medi a mis Hydref. Cafwyd nifer bychan ond pwysig (49 morlo bach) o enedigaethau ym mis Awst (6%) a mis Tachwedd (7%) ar ddechrau a diwedd y tymor.
- Dim ond 3 morlo bach gafodd eu geni ym mis Rhagfyr 2015 ac ni chafodd yr un ei gofnodi ym mis Ionawr 2016. Tynnwyd lluniau o famau'r lloi bach hyn ar gyfer ymchwil ffotograffau adnabod, ond roedd y tywydd yn golygu ei bod hi'n amhosibl tynnu lluniau o'r morloi bach oedd wedi bwrw eu blew, a gadael eu man geni bron yn syth ar ôl diddyfnu.
- Yn 2015, Aber Mawr (safle G030) oedd safle prysuraf yr ynys unwaith yn rhagor gyda 156 morlo bach yn cael eu geni ar y traeth mawr hwn sy'n wynebu'r gorllewin, gan gynrychioli 41% o'r morloi bach a gofnodwyd yn ystod yr arolwg.
- Mae parhau â monitro safonedig ar ben clogwyni Ynys Dewi yn un o brif flaenoriaethau monitro morloi llwyd yng Nghymru ac mae'n adlewyrchu pwysigrwydd Ynys Dewi fel prif fan bridio morloi llwyd Sir Benfro, Cymru a de-orllewin Prydain. Dylai monitro blyneddol gael ei gynnal rhwng mis Awst a mis Tachwedd a dylai'r tymor maes sy'n cael ei ymestyn i fis Rhagfyr a mis Ionawr gael ei ailadrodd bob dwy i bum mlynedd.

## 2. Executive Summary

- Recent work by NRW (Strong *et al* In Prep.) and long running studies by RSPB Cymru (Morgan 2014) found that the number of grey seal pups born on Ynys Dewi / Ramsey Island has been increasing since records began. Evidence suggests that the onset of pupping season has also been getting earlier over time. However, it is unclear whether the season has just shifted earlier or that duration is increasing. There was, therefore, interest in more rigorously documenting the end of the pupping season.
- To understand the significance of any temporal changes, the annual pup production survey was extended. For the first time, site visits were made to 9 standard monitoring sites on Ramsey during December 2015 and January 2016, thereby extending the normal field season by an additional 2 months and increasing the full survey to cover 138 days.
- Cliff-top monitoring at each of the 9 sites was conducted every 3-4 days, weather conditions allowing, between 23 August 2015 and 8 January 2016 and the number of seal pups counted and assigned to age classes. Adult females present were photographed for NRW's ongoing photo-ID work.
- 380 pups were born on the study sites between 23 August 2015 and 16 December 2016. This is the highest pup production recorded for Ramsey in the 17 years when survey methods have been consistent (between 1992 and 2015), and is higher than the mean pup production calculated for the years 1992–1996 (mean = 217) and 2011-2015 (mean = 343).
- The majority of pups continue to be born during the typical peak breeding season for south-west Britain, with 86% born in September and October. August (6%) and November (7%) account for a small but important number of births (49 pups) at the start and tail of the season.
- Only 3 pups were born in December 2015 and none were recorded in January 2016. The mothers of these pups were photographed for photo-ID research purposes, but weather conditions made it impossible to capture images of the moulted pups, which left their natal sites almost immediately after weaning.
- In 2015, Aber Mawr (site G030) remained the busiest site on the island with 156 pups born on this large west-facing beach, representing 41% of pups recorded during this survey.
- The continuation of standardised cliff-top monitoring on Ramsey Island is a top priority for grey seal monitoring in Wales and reflects the importance of Ramsey as the key breeding area for grey seals in Pembrokeshire, Wales and southwest Britain. Annual monitoring should cover the period from August to November and an extension of the field season into December and January should be repeated on a two to five-yearly basis.

### 3. Introduction

Approximately 4% of the UK population of Atlantic grey seal, *Halichoerus grypus* breed in Wales where most are found in Pembrokeshire, the largest breeding population in the Irish Sea and southwest Britain (Stringell *et al* 2014). The majority of pup production occurs on Ynys Dewi / Ramsey Island and the North Pembrokeshire mainland coast, between St Davids Head and the Teifi Estuary (Strong *et al* 2006).

Ramsey Island is a National Nature Reserve owned and managed by RSPB Cymru, and is located in the Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation (SAC) of which grey seal is a primary feature.

The number of pups born on Ramsey Island each year has been monitored by RSPB staff and local academic institutions for the last 20 years. Although the effort attributed to this project has varied from year to year, as have the fieldworkers involved, the breeding beaches studied and the methods of cliff-top observation have remained unchanged.

Recent work by NRW (Strong *et al* In Prep.) and long running studies by RSPB Cymru (Morgan 2014) found that the number of grey seal pups born on Ramsey Island has been increasing since records began. Evidence suggests that the onset of the pupping season has also been getting earlier over time (Strong *et al* In Prep.; Bull *et al* 2016). However, it is unclear whether the season has just shifted earlier or that duration of the season is increasing. The objective of this study was, therefore, to document the end of the pupping season, with the aim of starting a time series of late season observations.

### 4. Methods

#### 4.1. Cliff-top Vantage Point survey

Nine standard monitoring sites were visited on Ramsey Island by experienced observers (Lisa Morgan and Greg Morgan) (Table 1). These sites are easily viewed beaches and have provided the basis for pup production estimates since 1995. The 9 beaches accounted for just under half of all the pups born on the island in the years 1992-94 (Baines *et al* 1995).

Standard cliff top vantage points were used on each visit, as described in Strong *et al* (2006), to maintain a consistent field of view for each pupping site. This method relies on observations made from a distance by using binoculars.

At no time did observers climb down onto beaches or physically mark pups. Care was taken to avoid disturbance to seals using these colonies as they can be sensitive to movements from above and shadows cast by field workers.



Table 1 Location of Ramsey Island pup monitoring sites (see Figure 6 for map)

Site Name	Site Initials	Location Code	Grid Reference
Rhod Uchaf	RUF	G140	SM703242
The Waterings	WTG	G190	SM704242
Hwrddod	HWD	G230	SM705236
Aber Myharan	MHN	G250	SM704229
Rhosyn	RHN	G260	SM705228
Thomas Williams	TWS	G320	SM701226
Porth Lleuog	PLG	G360	SM700231
Garlic	GLC	G020	SM697239
Aber Mawr	AMR	G030	SM699244

Although an attempt was made to record newborn pups from late July onwards, the full systematic survey did not begin until 23 August. This mirrors the start date of the last Ramsey Island grey seal monitoring survey funded by CCW (Strong *et al* 2006) in which visit 1 was made on 22 August.

Thirty-five full survey visits were completed between 23 August 2015 and 08 January 2016, a period of 138 days. All 9 sites were visited on the same day, with a full survey, in peak season, taking in the region of 6 hours to complete. Due to the number of pups born at Aber Mawr and its large size, the site is split into two separate recording areas (main beach and north beach) using topographical features for ease and accuracy.

74% of visits were made 3-4 days apart, (see Appendix 9.3) although the maximum survey interval was 8 days, as a consequence of severe storms at the end of November and throughout December. Surveys were postponed in wind speeds of Force 7 or above to maintain accuracy and for observer safety.

Survey dates adequately cover the beginning, main increase, peak and main decrease of the pupping season, as described for 2014 (Morgan 2014). In 2015, surveys were also extended to cover the end of the pupping season. The start date was determined by the date the first pup was reported from one or more of the monitored beaches and by surveyor availability.

Counts were made of the number of white-coated pups in each age class (I-IV) and pups having completed moult (Class V) following the widely used five-class age classification system (Smith 1966) (Table 2). Numbers of maternal females, territorial males and sub-adults were also recorded.

Table 2 Classification for aging seal pups (adapted from Smith 1966)

Classification	Age	Description
Class I	1-5 days	Newborn, very loose baggy skin, wet/red umbilicus.
Class II	6-10 days	Starting to fill out but still an obvious neck, no loose skin folds on body.
Class III	11-15 days	Outline rounded to barrel shaped, no wrinkles, no neck.
Class IV	16-20 days	Patches of white natal fur moulted to reveal first-year pelage underneath.
Class V	21+ days	Fully moulted to first year pelage, pup independent.

Images were taken of female seals for photographic ID purposes during survey visits. A Canon EOS 60D with 500mm zoom lens was used to capture images of female pelage. Good quality images of seals lying on the beach perpendicular to the camera or of the side of heads in the water were input into a Microsoft Access database, allowing encounter information and images to be linked and catalogued correctly (see Appendix 9.4).

#### 4.2. Analysis of Field Data

A probability method (Strong *et al* 2006) was used to give a systematic estimation of whether a pup had been recorded on a previous visit or was newly born. It should be noted that the probability method does not address any non-systematic errors associated with classified pup data collected without the use of dye marking individuals. It cannot account for variation in the physical development between pups or for the movement of pups between sites. The consistent use of the same experienced fieldworkers during this study reduces errors associated with recorder subjectivity in allocating pups to an age class.

Pup counts were adjusted using the site specific field-of-view correction factors calculated during ground-truthing exercises carried out in the 1992-1994 fieldwork seasons (Baines *et al* 1995).

## 5. Results

The first pup born on the study beaches was an incidental record at Rhod Uchaf on 27 July 2015. There was then a gap of 2 weeks before the next birth was recorded on 13 August 2015 again at Rhod Uchaf. Eight sites had pups present by 30 August, with Garlic the latest site to begin pupping on 8 September. There was a 43 day interval between the commencement of pupping on the first site (Rhod Uchaf) and the last (Garlic).

Table 3 First dates of pups recorded on Ramsey Island study sites in 2015

Site	Days from 1 <sup>st</sup> August	First pup recorded	Age Class
Rhod Uchaf	-4	27 July	Class I
Porth Lleuog	13	13 August	Class I
Aber Mawr	17	17 August	Class I
The Waterings	23	23 August	Class II
Aber Myharan	23	23 August	Class I
Rhosyn	26	26 August	Class I
Thomas Williams	26	26 August	Class I
Hwrddod	30	30 August	Class I
Garlic	39	8 September	Class I

The last births were recorded at Garlic on 23 November, Thomas Williams on 1 December 2015 and Porth Lleuog on 16 December. No pups were born between 16 December and 8 January 2016, when the decision was made to conclude fieldwork.

A peak count of 150 white-coated pups was recorded on 24 September followed by a second peak of 151 two weeks later on 8 October (Figure 1), 80 of which were on the main island rookery at Aber Mawr. These are the highest totals ever recorded on a single visit.

The dip in pup numbers during the 14 day period between the two peaks reflects a true decline in the number of Class I-IV pups on the study sites at that time. There was a decline in the number of pups being born (Class I) most noticeably on Aber Mawr and Porth Lleuog. Also during this period the number of pups completing moult and entering the Class V age category increases and these pups drop out of the pup count at 21 days old.

No severe weather events were experienced during peak pupping season in 2015. Storms and large spring tides can result in large losses of white-coated pups in some years. A survey interval of 4 days was maintained between all visits during this time reducing the likelihood that newborn pups were not logged as Class I or were born and died between visits.

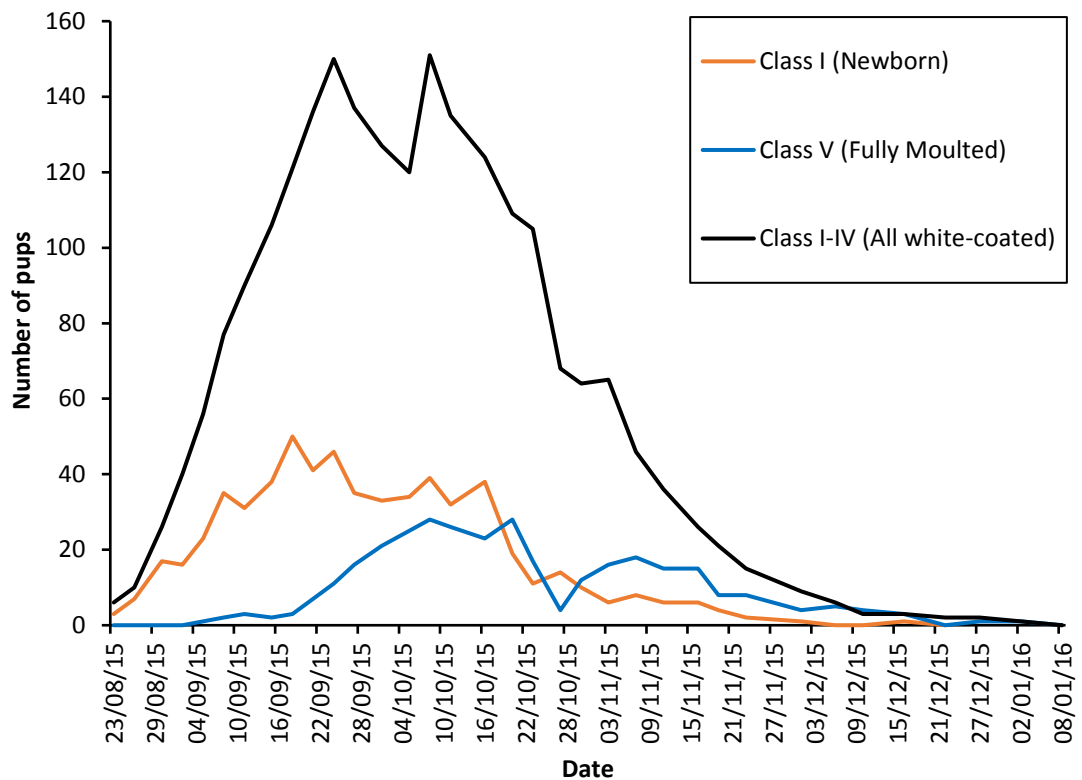


Figure 1 Temporal distribution of 2015 pupping season on Ramsey Island

The number of white-coated pups present on Ramsey Island remained over 100 for 39 days from 15 September to 23 October 2015 (Figure 1).

Using the probability method of analysing the field data, and having corrected for field of view, the estimated total pup production for Ramsey Island’s 9 study sites is 380 for the 2015 season (Table 3). This is the highest total ever recorded for Ramsey Island, in the years between 1992 and 2015 when the survey method has been comparable, although it is only just above the previous high of 376 recorded in 2014 (Figure 2). It is considerably higher than the 5-year mean pup production calculated for the years 1992–1996 of 217 and the 2011–2015 mean of 343. It should be noted that monitoring continued considerably longer in 2015 (139 days compared with 92 in 2014) but resulted in an insignificant increase in the number of pups recorded.

Table 4 2015 Ramsey Island pup production for nine standard monitoring sites between 23 August 2015 and 8 January 2016

Site Name	Estimated Pup total <sup>1</sup>	Field of View correction Factor	Total Pup production
Rhod Uchaf	23.83	1.21	28.84
Waterings	12.50	1.25	15.63
Hwrddod	15.83	1.00	15.83
Aber Myharan	23.67	1.00	23.67
Rhosyn	17.50	1.00	17.50
Thomas Williams	53.50	1.00	53.50
Porth Lleuog	49.00	1.00	49.00
Garlic	18.33	1.08	19.80
Aber Mawr main	113.00	1.10	124.30
Aber Mawr north	28.59	1.10	31.53
<b>Total</b>			<b>379.60</b>

<sup>1</sup> Estimated using the probability method described in Strong *et al* (2006). This is multiplied by the Field of View correction factor to obtain total pup production at each site

Aber Mawr continues to serve as the main rookery on the island with an estimated 156 pups born at this site, between 17 August and 6 December 2015, accounting for 41% of the total born in that year. The south-west facing bay at Porth Lleuog produced 49 pups in 2015 and 54 at the narrow beach site of Thomas Williams.

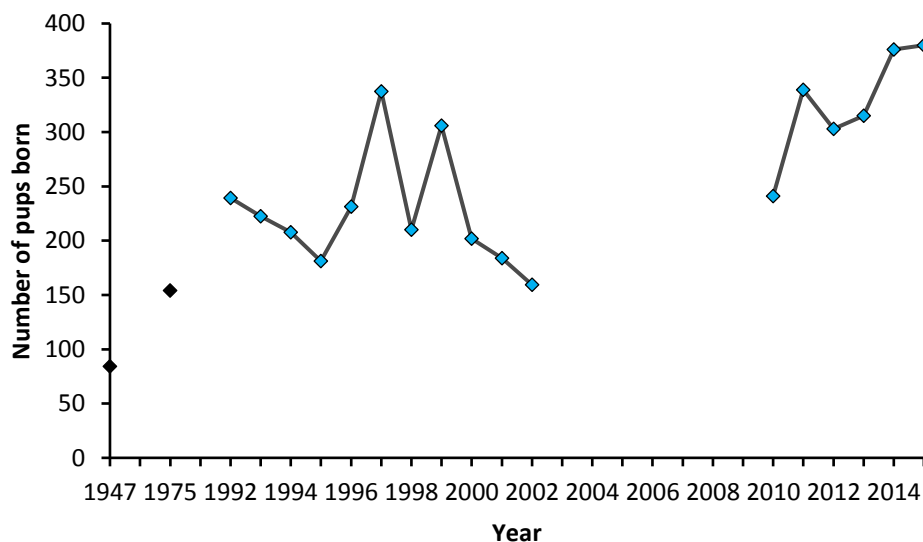


Figure 2 Pups born at standard monitoring sites of Ramsey Island between 1947 - 2015 (in years where survey methods are comparable). Note data for 1947 and 1975 are included as reference points.

The majority of pups continue to be born during the typical pupping season for south-west Britain, with 86% of pups in 2015 born in September and October (Figure 3).

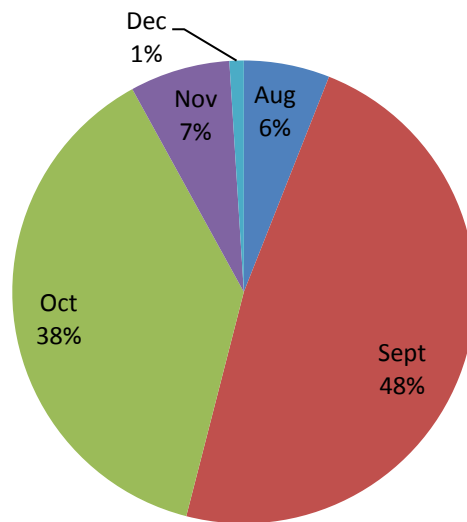


Figure 3 Temporal distribution of pup births on Ramsey Island in 2015

## 6. Discussion

Aber Mawr continues to serve as the main rookery on the island (Figure 3) and the number of pups born at this site and at others around the island has increased. Due to Aber Mawr's large size and the availability of space, the increase on this open beach site has been disproportionate to the modest changes on other Ramsey Island sites. Between 1999 and 2002 an average of 25% of pups were born on Aber Mawr. This proportion had increased to an average of 45% for the years 2010 and 2014.

The cliff-top monitoring method was established on Ramsey Island following recommendations for future work made at conclusion of the West Wales Grey Seal Census (Baines *et al* 1995). The major advantages include lower resource demands and minimal disturbance to seals compared to a sea-borne census of pup production. However, the method does have limitations and is liable to under-estimate the total number of pups born when the interval between survey visits is lengthened either as a result of bad weather, difficult site access or fieldworker availability.

As in 2014, high pressure weather systems sat over the UK throughout September and October 2015. Calm seas, meant that the number of pups may have built up to an unprecedented high and allowed survey visits to be completed every 3-4 days as planned. During December and January, a series of Atlantic storm systems made visual observations difficult and unsafe, extending the survey interval to 4-8 days. When sea conditions are rough and during spring tide phases, it is inevitable that some newborn pups will die and be washed away between survey visits and therefore never recorded. Keeping the interval between visits to a minimum helps to reduce this risk.

Evidence suggests that the onset of pupping season in Pembrokeshire has been getting earlier over time (Strong *et al* In Prep.; Bull *et al* 2016). However, it is unknown whether the season has shifted earlier over time or that the season duration has increased. At other sites in Pembrokeshire with longer running data sets, it is evident that the pupping season has been shifting earlier over the last 25 years (Bull *et al*, 2106). Although reasons for an earlier pupping season are unknown, it has been demonstrated on the Farne Islands that there is a correlation between increasing size and density of the breeding colony and the tendency for earlier pupping (Coulson 1981; Bull *et al* 2016).

Data on first pup dates is available from incidental sightings made by RSPB staff from 2008 onwards. Any trend for earlier pupping is unclear from this recent data (Figure 4) although the variability in the commencement of pupping between sites is evident.

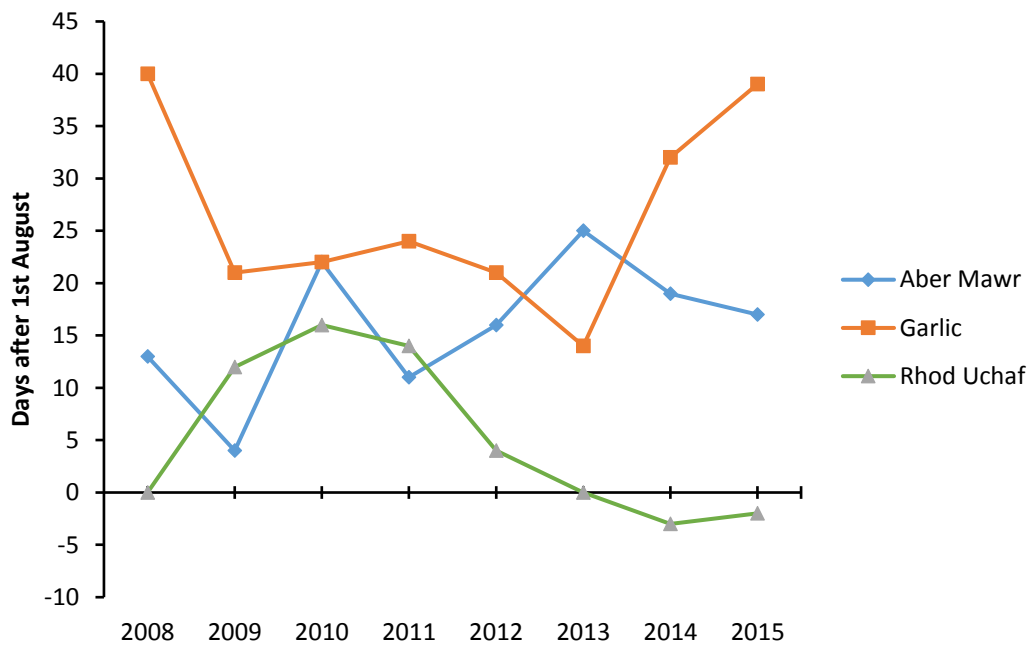


Figure 4 Start of pupping season from incidental records 2008 - 2015

The start and end dates of the pup production survey have varied greatly in previous years making meaningful comparative analysis difficult. Completion of seabird monitoring and tracking projects in late July – mid August prohibits allocation of RSPB staff time to the seal survey until mid-August. The seal pup production objective in the Ramsey Island management plan was designed around the 2005 survey timings (Strong *et al* 2006) and makes no allowance for any additional survey work required to cover an earlier start to the pupping season. However, incidental records of pups born in July and early August are available for the years 2008 – 2015 (Figure 4).

The end date of systematic pup production survey has also been variable, depending on the availability of resident staff who between 1992 and 2005 vacated the island at the end of October each year. Survey duration also varies widely between years from a minimum of 69 days in 2008 to 138 days in the current survey. Further regular surveys incorporating the whole of November and December (and possibly January) are required before being able to determine whether the pupping season has been extending over time on Ramsey Island.



Table 5 Seal pup production survey effort on Ramsey Island, 2008 - 2015

Year	Survey start Date	Survey end Date (day number)	Survey Duration	Number of visits	White-coated pups remaining at survey end date
2008	25-Aug	01-Nov (93)	69	11	28
2009	26-Aug	31-Oct (92)	67	13	32
2010	17-Aug	07-Nov (99)	87	28	21
2011	14-Aug	15-Nov (107)	94	29	40
2012	05-Aug	07-Nov (99)	89	30	41
2013	14-Aug	13-Nov (105)	92	26	22
2014	24-Aug	12-Nov (104)	81	21	20
2015	23-Aug	08-Jan (161)	138	35	0

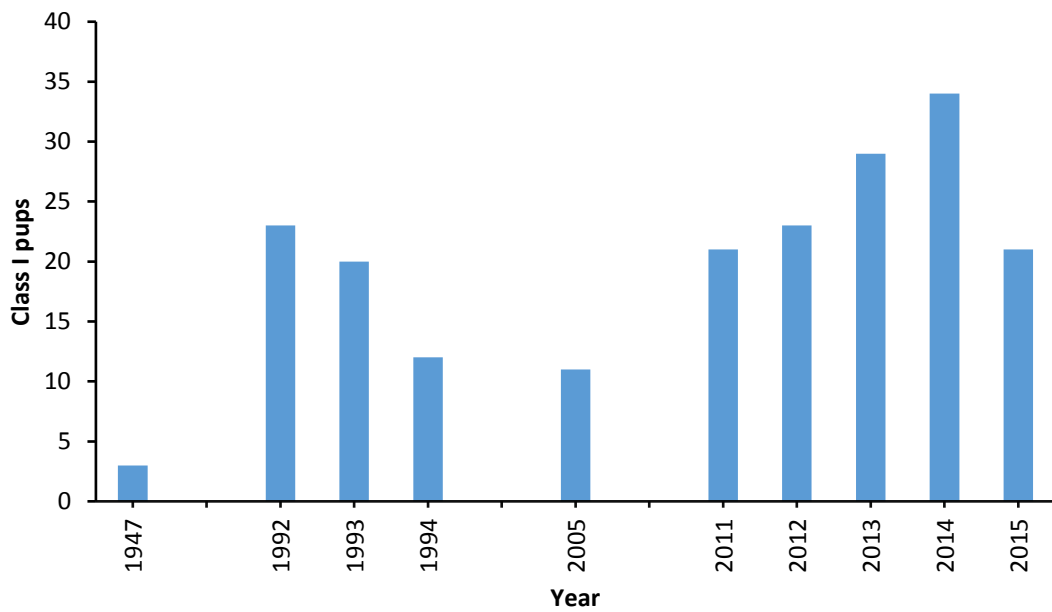


Figure 5 Newborn pups recorded at nine sites in week 43 (17-23 November).

From the limited data sets available for Ramsey Island, direct comparisons of survey results from late in the pupping season are difficult. Week 43 (17– 23 November) is the only week for which raw data is available to the authors and in which all 9 beaches surveyed in the 2015 study were visited. 10 survey years made counts of newborn pups born in that week (Figure 5). There is considerable variation in number of pups born in week 43 between consecutive years and trends cannot be determined for these data. However, only 3 pups were born in week 43 of 1947 compared with an average of 18.3 during the 1992-1994 West Wales Grey Seal Census (Baines *et al* 1995) and 25.6 in the five years between 2011 and 2015.

The objective of this work was to begin to observe the possible extension of the seal pupping season in Pembrokeshire, and in particular to look at the incidence of pup births in December and January. Long term monitoring of pupping on Ramsey Island and a commitment to monitoring provision from mid-October onwards is required to track changes in pupping phenology.

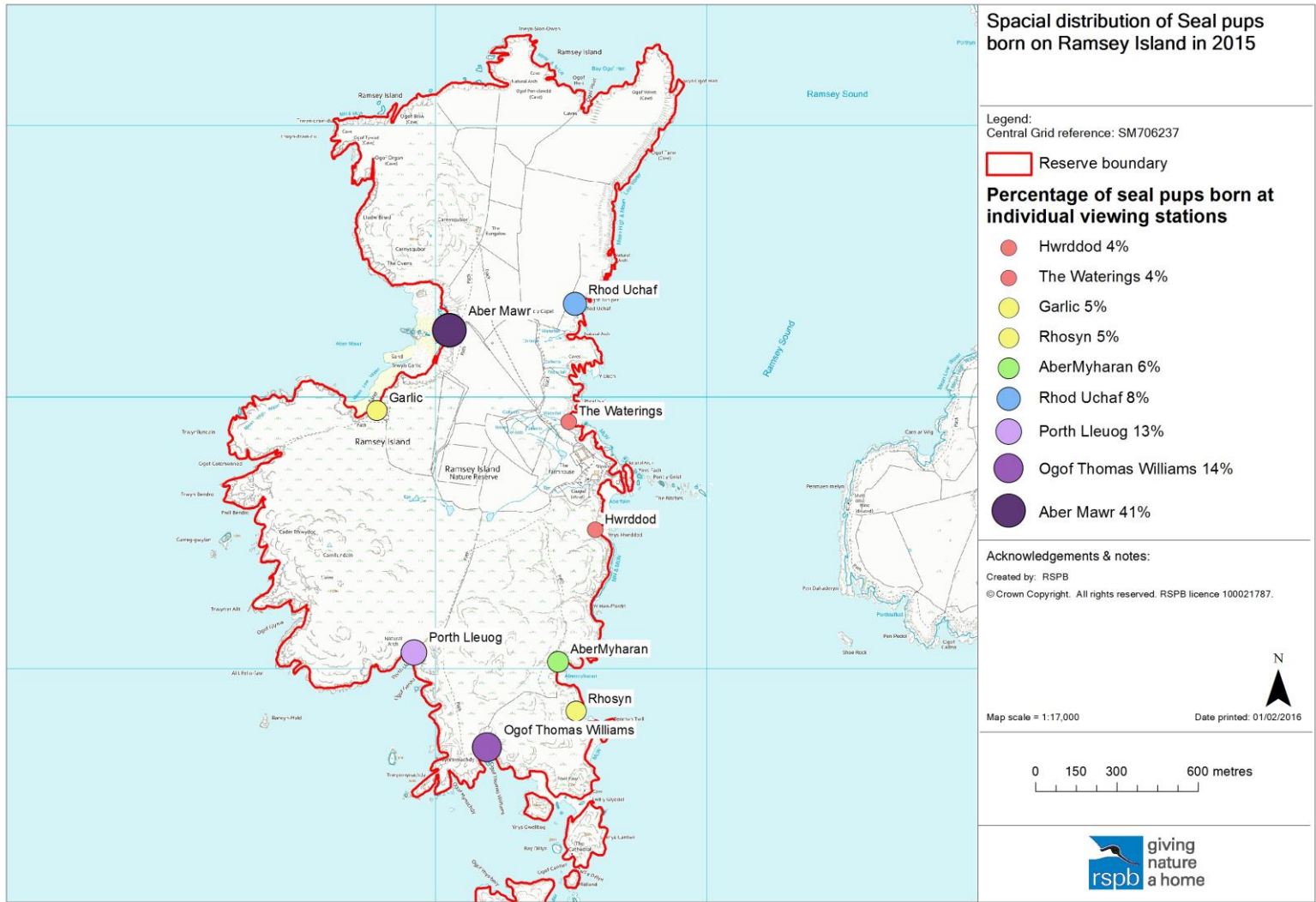


Figure 6 Distribution of seal pups born on Ramsey Island study beaches in 2015

## 7. Acknowledgements

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## 8. References

Baines ME, Earl SJ, Pierpoint CJL and Poole J. 1995. The West Wales Grey Seal Census. CCW Contract Science Report 131.

Bull JC, Börger L, Banga R, Franconi N, Lock K, Morris C, Newman P, Stringell T. 2016. Temporal trends and phenology in grey seal (*Halichoerus grypus*) pup counts at Marloes Peninsula, Wales. NRW Evidence Report No: 155. Natural Resources Wales, Bangor

Coulson JC. 1981. A study of the factors influencing the timing of breeding in the grey seal *Halichoerus grypus*. Journal of the Zoological Society of London. 194: 553-571.

Morgan LH. 2014. Ramsey Island Grey Seal Report 2014. Internal report for RSPB.

Smith EA. 1966 A review of the world's grey seal population. Journal of Zoology (London) 150: 463–489

Stringell TB, Millar CP, Sanderson WG, Westcott SM, McMath MJ. 2014. When aerial surveys will not do: grey seal pup production in cryptic habitats of Wales. Journal of the Marine Biological Association of the United Kingdom. 94: 1155-1159.

Strong PG, Lewill J, Morris SR, Stringell TB. 2006. Pembrokeshire Marine SAC Grey Seal Monitoring 2005. CCW Marine Monitoring Report No: 26.

Strong PG, Lewill J, Morris SR, Moir R, Morgan LH, Quinton S, Stoddart H. *In Preparation*. North Pembrokeshire grey seal pup production trends 1992 to 2014. NRW Evidence Report Series.

## 9. Appendices

### 9.1. Summary field data of white coated pups recorded on Ramsey Island's nine study sites in 2015.

DATE	TOTAL WHITE COATED PUPS (I - IV)										TOTAL
	WTG	RUF	AMR Main	AMR North	GLC	PLG	TWS	RSN	MHN	HWD	
23/08/15	1	2	0	1	0	1	0	0	1	0	6
26/08/15	0	2	0	1	0	1	3	1	2	0	10
30/08/15	0	2	7	4	0	4	3	2	2	2	26
02/09/15	0	4	10	9	0	7	6	1	1	2	40
05/09/15	1	4	17	8	0	9	6	2	6	3	56
08/09/15	1	7	26	9	5	11	6	2	7	3	77
11/09/15	2	7	31	10	4	13	11	3	6	3	90
15/09/15	5	7	45	6	7	15	8	3	6	4	106
18/09/15	6	7	52	6	10	14	11	4	7	4	121
21/09/15	7	11	60	8	8	15	12	4	8	3	136
24/09/15	8	9	57	15	10	16	13	4	11	7	150
27/09/15	6	12	58	13	8	9	12	5	9	5	137
01/10/15	10	9	49	8	9	12	10	6	8	6	127
05/10/15	6	8	52	4	4	14	11	5	9	7	120
08/10/15	8	8	62	18	6	14	7	6	10	12	151
11/10/15	7	8	53	15	4	16	8	4	8	12	135
16/10/15	5	4	47	17	4	19	12	3	6	7	124
20/10/15	3	2	40	19	4	18	8	3	7	5	109
23/10/15	3	3	43	19	2	13	6	2	8	6	105
27/10/15	2	3	29	3	0	12	4	5	7	3	68
30/10/15	2	3	23	1	3	17	5	4	4	2	64
03/11/15	7	4	17	2	3	16	8	4	0	4	65
07/11/15	4	3	8	2	1	11	9	4	1	3	46
11/11/15	2	1	7	1	2	6	9	5	0	3	36
16/11/15	0	1	6	0	0	7	8	2	0	2	26
19/11/15	0	0	3	0	2	6	6	1	1	2	21
23/11/15	0	0	4	1	2	2	1	2	1	2	15
01/12/15	0	0	5	0	0	1	1	0	1	1	9
06/12/15	0	0	2	0	1	0	1	0	1	1	6
10/12/15	0	0	0	0	0	0	1	0	1	1	3
16/12/15	0	0	0	0	1	1	1	0	0	0	3
22/12/15	0	0	0	0	1	1	0	0	0	0	2
27/12/15	0	0	0	0	1	1	0	0	0	0	2
02/01/16	0	0	0	0	1	0	0	0	0	0	1
08/01/16	0	0	0	0	0	0	0	0	0	0	0

### 9.2. Raw field data by site

Full field data and metadata is available on request from RSPB Cymru. Please contact the author for a data release form at [ramsey.island@rspb.org.uk](mailto:ramsey.island@rspb.org.uk). No data outputs belonging to NRW were produced as part of this project.

### 9.3. Survey date and interval between visits (Day 1 = 1 August 2015)

<b>Day</b>	<b>Date</b>	<b>Interval</b>
23	23/08/2015	0
26	26/08/2015	3
30	30/08/2015	4
33	02/09/2015	3
36	05/09/2015	3
39	08/09/2015	3
42	11/09/2015	3
46	15/09/2015	4
49	18/09/2015	3
52	21/09/2015	3
55	24/09/2015	3
58	27/09/2015	3
62	01/10/2015	4
66	05/10/2015	4
69	08/10/2015	3
72	11/10/2015	3
77	16/10/2015	5
81	20/10/2015	4
84	23/10/2015	3
88	27/10/2015	4
91	30/10/2015	3
95	03/11/2015	4
99	07/11/2015	4
103	11/11/2015	4
108	16/11/2015	5
111	19/11/2015	3
115	23/11/2015	4
123	01/12/2015	8
128	06/12/2015	5
132	10/12/2015	4
138	16/12/2015	6
144	22/12/2015	6
149	27/12/2015	5
155	02/01/2016	6
161	08/01/2016	6

#### 9.4. Photographic Identification of grey seals on Ramsey Island, 2015

Images were taken of female seals for photographic ID purposes during survey visits. A Canon EOS 60D with 500mm zoom lens was used to capture images of female pelage. Good quality images of seals lying on the beach perpendicular to the camera or of the side of heads in the water were input into an 'Append' version of the EIRPHOT (Wales' grey seal photoID catalogue) Microsoft Access database, allowing encounter information and images to be linked and catalogued correctly.

In 2015 a total of 224 females were photographed, predominantly on beaches during the breeding season. All images were entered into the Ramsey Island Append version of EIRPHOT to allow immediate linkage of images and encounter information. This has resulted in 523 head and neck extractions currently pending.

In addition, researchers from the Sea Mammal Research Unit photographed animals at the main pupping beach, Aber Mawr, for six weeks at the peak of the pupping season. These images are held in an additional append version of the database.

Until arrangements can be made for the Ramsey Island Append databases to be merged with the master database held by NRW, no matches or conclusions on site fidelity or movements can be drawn at this time.

Capturing images of breeding females becomes more challenging as the weather deteriorates late in the season. Poor conditions which allow cliff-top counts with binoculars to continue are often unsuitable for camera equipment. Moulded pups are also very difficult to photograph on Ramsey Island due to the distances and angles involved in cliff-top surveying. Later in the breeding season, when the sea state becomes worse, moulded pups are often unable to remain on their natal beach for as long as those born in August and September, again reducing the opportunities for photography.



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