Cyfoeth Naturiol Cymru
Natural Resources Wales

Grey Seal Breeding Census Skomer Island 2015

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Wildlife Trust of South and West Wales

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Summary

246 pups were monitored on Skomer Island in 2015, of which 240 were definitely born on Skomer and six turned up either just before the start of moult, or moulting (wanderers).

The total of 240 pups born on Skomer Island is the highest total ever recorded and 25 more than in 2014.

A total of 379 pups were born in the Skomer Marine Conservation Zone of which 139 were born on the Marloes Peninsula. See section 4.2.

The busiest week this year was week 41 (05-11/10), the same as last year. See section 4.2.

The most productive beaches were Matthew's Wick (42 pups) and South Haven (44 pups). In 2015 (in contrast to 2014) North Haven was the third most popular beach with 36 pups born (24 in 2014). On both Driftwood Bay and Castle Bay 23 pups were born. See section 4.2.

178 pups are known, or assumed to have survived on Skomer in 2015, giving a survival rate of 76%, which is higher than 2014 (68%) and in line with the average of the last ten years (76%). See section 4.3.

In 2015 the maximum haul-out of 360 animals was recorded on 16/11 on exactly the same date as the 2014 maximum haul-out (300 animals). See section 5.

27 different cows, and three bulls were photographed with obvious signs of being entangled in nets at some time in their lives, often with netting still embedded. See section 6.

Between mid-August and the end of November 2015 we observed 14 incidents of disturbance to seals around Skomer Island. See section 7 and Appendix 3.

In 2015 over 2800 photos were taken of seals, of which 477 will be entered into the NRW Wales Seal ID database. We identified 90 seals with obvious scars by eye, of these 43 were known from previous years. See section 10.

Crynodeb

Cafodd 246 o loi eu monitro ar Ynys Sgomer yn 2015. Gwyddom i sicrwydd fod 240 ohonynt wedi'u geni ar Sgomer; cyrhaeddodd chwech o loi (crwydriaid) naill ai ychydig cyn neu yn ystod y cyfnod bwrw blew.

Y cyfanswm o 240 o loi a aned ar Ynys Sgomer yw'r cyfanswm uchaf erioed a gofnodwyd, ac mae'n 25 yn fwy nag yn 2014.

Ganed cyfanswm o 379 o loi ym Mharth Cadwraeth Morol Sgomer, gan gynnwys 139 o loi a aned ar Benrhyn Marloes. Gweler adran 4.2.

Wythnos brysuraf y flwyddyn oedd wythnos 41 (05-11/10), yr un fath â'r llynedd. Gweler adran 4.2.

Y traethau mwyaf cynhyrchiol oedd Matthew's Wick (42 llo) a South Haven (44 llo). Yn 2015, yn wahanol i 2014, North Haven oedd y traeth trydydd mwyaf poblogaidd; ganed 36 o loi yno (24 yn 2014). Yn Driftwood Bay a Castle Bay, ganed 23 o loi yn y naill a'r llall. Gweler adran 4.2.

Fe wyddom, neu fe dybiom, fod 178 o loi wedi goroesi ar Sgomer, gan roi cyfradd oroesi o 76%, sef yn well na'r llynedd (68%) ac yn unol â'r cyfartaledd ar gyfer y deng mlynedd diwethaf (76%). Gweler adran 4.3.

Yn 2015, gwelwyd y nifer fwyaf yn gadael y dŵr, sef 360 o anifeiliaid, ar 16 Tachwedd. Dyna'r union ddyddiad ag y gwelwyd y nifer fwyaf (300 o anifeiliaid) yn gadael y dŵr yn 2014. Gweler adran 5.

Tynnwyd lluniau 27 o wahanol fuchod a thri tharw a oedd yn amlwg wedi bod yn sownd mewn rhwydi. Mewn rhai achosion, roedd darnau o'r rhwyd ynghlwm wrth eu cyrff o hyd. Gweler adran 6.

Rhwng canol Awst a diwedd Tachwedd 2015, gwelsom 14 o ddigwyddiadau o forloi yn cael eu haflonyddu o amgylch Ynys Sgomer. Gweler adran 7 ac Atodiad 3.

Yn 2015, tynnwyd dros 2800 o luniau o forloi, a bydd 477 o'r rhain yn cael eu cynnwys yng nghronfa ddata adnabod morloi Adnoddau Naturiol Cymru. Bu modd i ni adnabod 90 o forloi â'r llygad am fod ganddyn nhw greithiau amlwg, ac roedd 43 o'r morloi hyn yn hysbys eisoes. Gweler adran 10.

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1. Introduction

Between 06 August and 19 November 2015 the breeding activities of the Grey Seals (*Halichoerus grypus*) on Skomer Island were observed and recorded, using the methods employed in previous years. These methods are detailed in the Skomer MCZ & Skomer Island NNR Management Plan, with revisions made regarding access to some sites (NATHAN, L, 2015), and are also mentioned in the individual site sections of this report.

2. Objectives

1. To record the number of Grey Seal pups born at all known pupping sites around Skomer Island throughout the pupping season.

2. To determine the survival rate of seal pups up to their first moult and to record the probable cause of death of any fatalities.

4. To monitor the behaviour of all seals during site visits.

5. To maintain a daily record of the number of Grey Seals using the main haul-out sites, particularly Castle Bay and North Haven, including details of the age and sex of hauled out animals.

6. To record and document all observed cases of seal disturbance, their cause and outcome, including entanglement with man-made materials (angling line, fishing net, etc.).

7. To record and document individual adult and immature Grey Seals with distinctive scars/markings to compare with previous years.

8. To make comparisons of objectives 1 and 2 with previous years' data.

3. Census Methods

Between 20 August and 19 November 2015 all the main Grey Seal pupping sites on Skomer Island were checked regularly and individual records were kept of each pup's progress, from birth to completion of moult, as laid out in the Skomer MCZ & Skomer Island NNR Management Plan.

The most important beaches; North Haven, Amy's Reach, Matthew's Wick, Castle Bay, Driftwood Bay and South Haven were checked daily from the cliff tops. This year we also managed to check High Cliff Boulders, The Basin, The Wick, Pig Stone Bay, The Garland Stone and South Stream Cave almost daily between 20 August and 27 October.

Caves (e.g. South Haven) and beaches with difficult access (e.g. High Cliff) were only visited after having observed breeding behaviour by females in the vicinity to avoid disturbance.

Due to access difficulties all the main cave sites (The Lantern, Seal Hole and South Castle Beach Cave) were checked whenever conditions allowed. Entry to the caves is dependent on tides, weather and adult seal activity. To avoid causing more disturbance than absolutely necessary no cave was ever entered if a cow remained inside guarding her pup.

Beaches and caves were accessed no more than once a week to minimise disturbance.

Most pups are found within 24 hours of being born on Skomer and therefore their date of birth is known very accurately. When pups were born in the less frequently visited sites their date of birth was approximated based on the date of the previous visit, the pup's size and appearance using SMRU five-stage age classification system (see appendix 1).

Sites were visited when necessary to mark pups in accordance with Skomer MCZ & Skomer Island NNR Management Plan, unless otherwise stated due to recent safety recommendations, (Nathan 2015).

In most instances seal pups were individually marked using coloured aerosol sheep-fleece marker sprays. Pups younger than four days old were not routinely marked because of concerns that marking may interfere with the mother/pup bond. Younger pups were occasionally given a very small mark, usually near the tail, if the beach was being visited anyway. This allowed an individual to be monitored over the following days before being marked properly (when the pup was old enough).

During site visits and inspections disturbance was kept to a minimum.

An assessment was made of the condition of each pup when last seen, classified on a five-point scale:

1. Very small	Assumed not to have survived long after moult
2. Small but healthy	In good condition, would have a reasonable chance of survival
3. Good size	Most should survive
4. Very good size	All should survive
5. Super-moulter	An exceptional sized pup

Seal pups were considered successful if they survived until the onset of moult, unless they were in poor condition (HEWER, 1974). If a pup disappeared before the onset of moult an individual assessment was made on its likelihood to have survived based on the above criteria.

4. Census Results

4.1 General

246 pups were monitored on Skomer Island in 2015, of which 240 were definitely born on Skomer and six pups turned up either just before the start of moult, or moulting (wanderers).

The total of 240 pups born on Skomer Island is the highest total ever recorded and 25 more than in 2014.

The first pup of the season was born in the Wick on approximately 17/08 and was found on 20/08.

Eleven pups were born in August, 83 in September, 104 in October and 22 in November. Therefore the busiest month was October, the same as 2011-2015, whereas more pups were born in September than in October between 1998 and 2010.

The busiest week this year, like last year, was week 41 (05-11/10).

178 pups are known, or assumed, to have survived on Skomer, giving a survival rate of 76.1%, which is higher than last year's rate (73%) and in line with the average of the last ten years (76%).

The seal monitoring sites on Skomer are shown in Plates 1,2 and 3.

Plate 1 Skomer Island overview

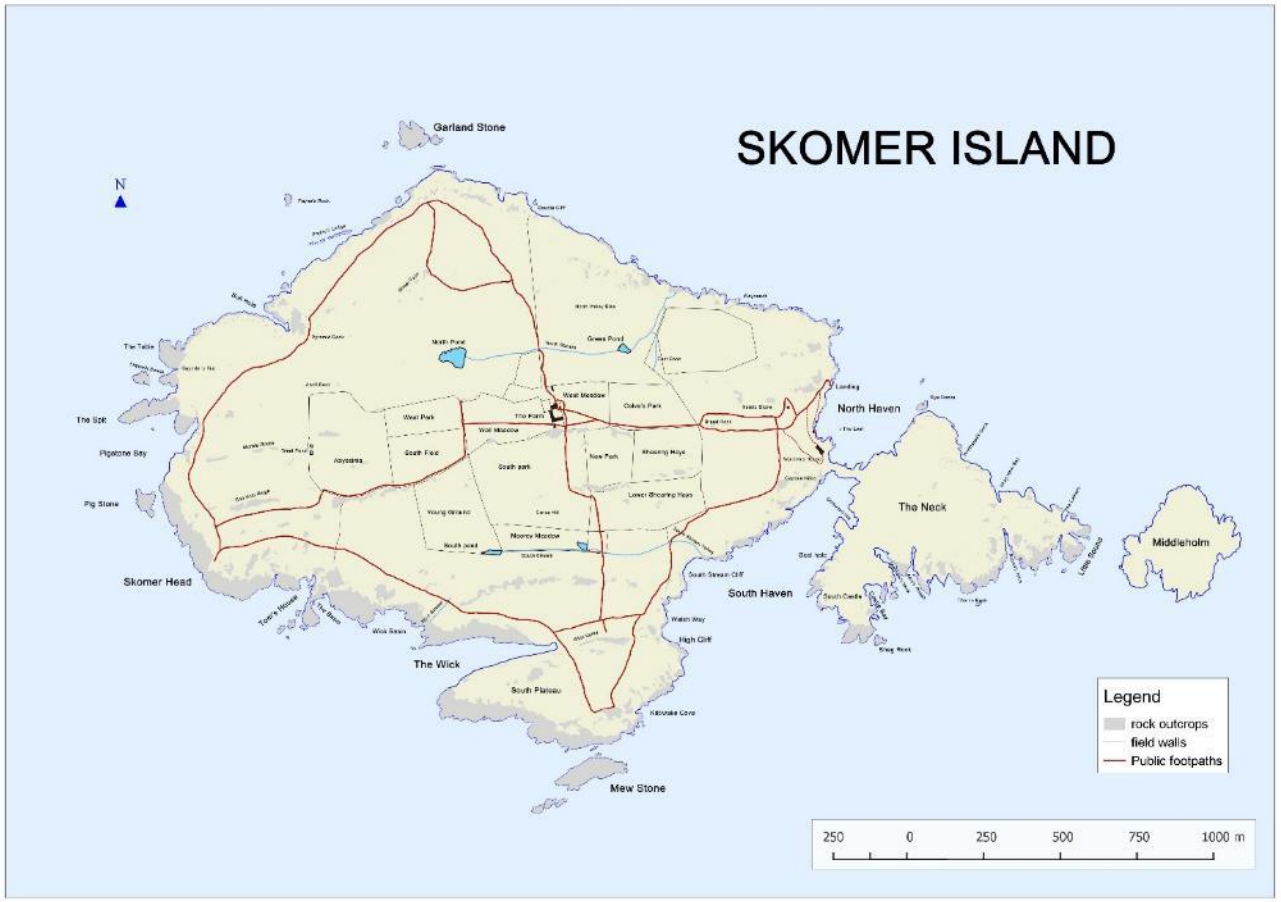


Plate 2 Skomer Island Grey Seal pupping sites East

Plate 3 Skomer Island Grey Seal pupping sites West

4.2 Pup Numbers

2015 was another very good breeding season for the seals within the Skomer Marine Conservation Zone (MCZ) with a total of 379 pups born, of which 139 were born on the Marloes Peninsula.

On Skomer 246 pups were monitored in 2015. 240 of them were definitely born on Skomer and six pups (wanderers) turned up either just before the start of moult, or moulting. These were potentially also born on Skomer but not recorded as they may have been born elsewhere or in locations hidden from view. November was a very wet and windy month and some of the caves were inaccessible for several weeks, thus seal pups born in these caves might have been missed.

Although Skomer once again experienced a rise in pup numbers, less pups were born on the Marloes Peninsula than in 2014. The number of seal pups born within the MCZ, however, is still the highest ever recorded.

Figure 1 Number of seal pups born in Skomer MCZ 1983-2015

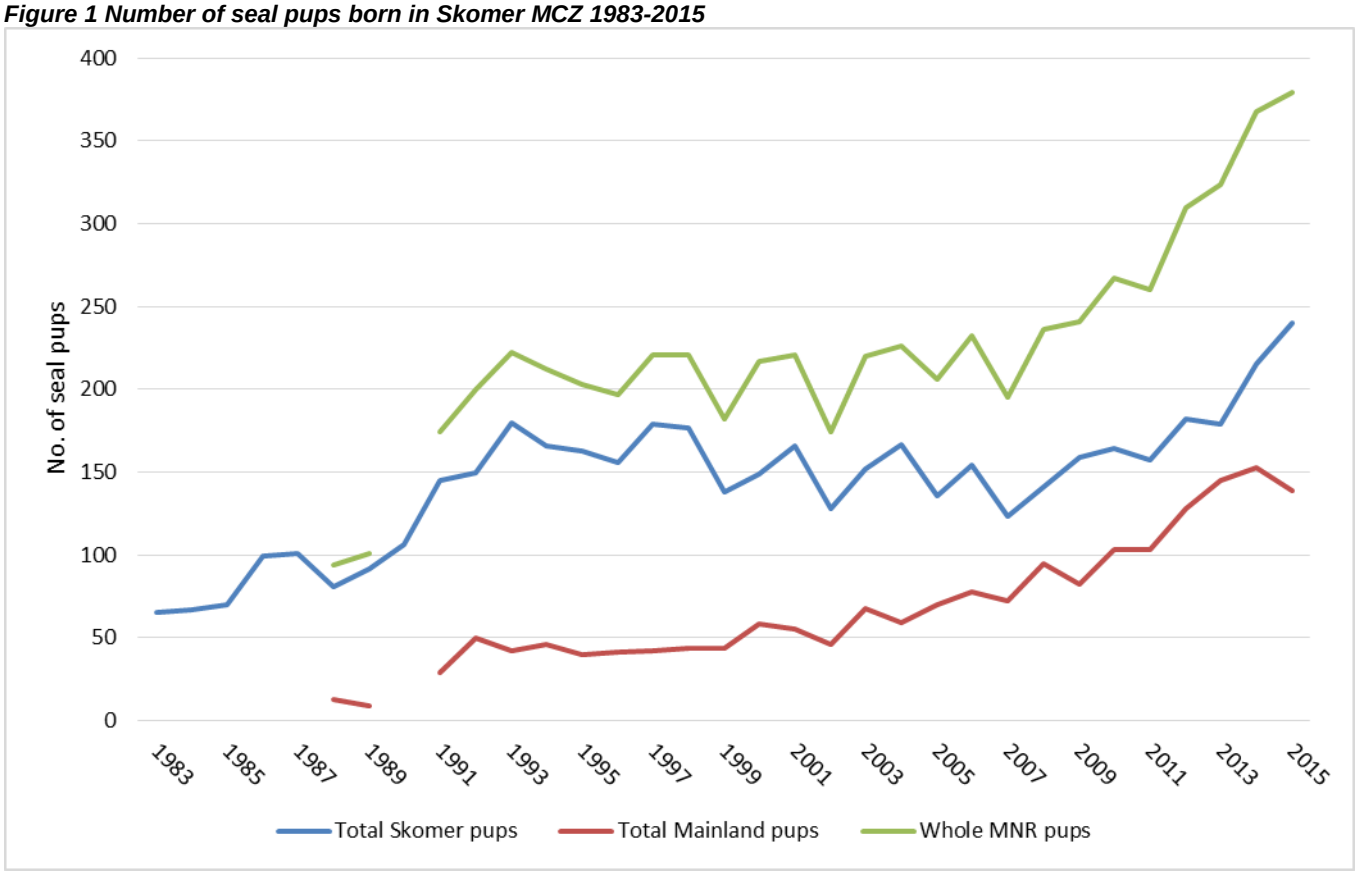


Figure 2 Daily totals of seal pups born on Skomer Island in 2015

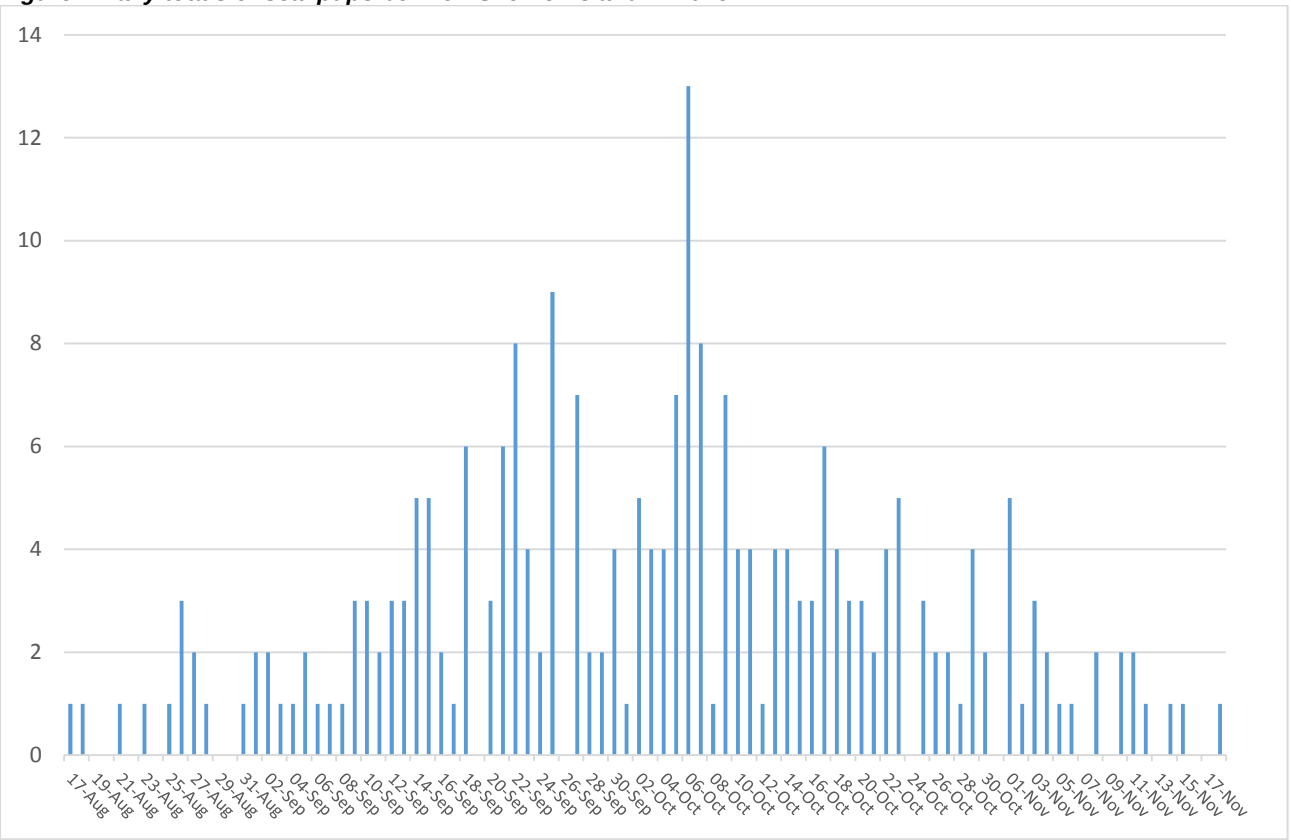


Table 1 Monthly number & percentage of seal pup births on Skomer Island 1983-2015

Year	July	August	September	October	November
2015	0	12 (5%)	91 (37.9%)	114 (47.5%)	23 (9.6%)
2014	0	8 (3.7%)	77 (35.8%)	107 (49.8%)	23 (10.7%)
2013	0	8 (4.5%)	60 (33.5%)	92 (51%)	19 (11%)
2012	0	19 (10%)	65 (36%)	77 (42%)	21 (12%)
2011	0	11 (7%)	55 (35%)	56 (36%)	35 (22%)
2010	0	11 (7%)	75 (46%)	50 (30%)	28 (17%)
2009	0	13 (8%)	62 (39%)	47 (30%)	36 (23%)
2008	0	11 (8%)	79 (57%)	37 (27%)	11 (8%)
2007	0	10 (8.5%)	63 (53%)	35 (30%)	10 (8.5%)
2006	0	11 (7%)	78 (52%)	47 (31%)	15 (10%)
2005	0	12 (9%)	79 (58.5%)	35 (26%)	9 (6.5%)
2004	0	24 (14%)	98 (59%)	37 (22%)	8 (5%)
2003	1 (1%)	17 (11%)	92 (60%)	38 (25%)	6 (4%)
2002	0	21 (16.5%)	62 (48.5%)	42 (33%)	3 (2%)
2001	0	17 (10%)	90 (54.5%)	57 (34.5%)	1 (1%)
2000	2 (1%)	14 (9%)	102 (65%)	40 (25%)	No survey
1999	0	6 (4%)	91 (65%)	44 (31%)	No survey
1998	0	7 (4%)	96 (54%)	70 (39%)	5 (3%)
1997	0	3 (2%)	75 (43%)	85 (49%)	10 (6%)
1996	0	0	61 (39%)	75 (48%)	20 (13%)
1995	0	2 (1%)	49 (30%)	99 (61%)	13 (8%)
1994	0	2 (1%)	51 (31%)	96 (58%)	16 (10%)
1993	0	6 (3%)	67 (38%)	87 (49%)	18 (10%)
1992	1 (0.5%)	4 (3%)	40 (28%)	73 (50%)	27 (18.5%)
1991	1 (1%)	0	20 (14%)	75 (54%)	43 (31%)
1990	0	3 (3%)	17 (16%)	69 (64%)	18 (17%)
1989	0	2 (2%)	18 (19%)	45 (46%)	32 (33%)
1987*	0	0	11 (11%)	41 (41%)	32 (32%)
1986*	0	4 (4%)	22 (25%)	32 (36%)	34 (39%)
1985*	0	0	18 (24%)	20 (27%)	20 (27%)
1984*	0	0	9 (13%)	28 (41%)	18 (26%)
1983*	0	0	24 (33%)	31 (42%)	15 (20%)

Seal Observations continued to mid-December in 1983, 1985 and 1986 and to the end of January in 1984 and 1987. The following data was recorded in these survey years:
1983 Dec: 3(4%), 1984 Dec: 6(9%), Jan: 6(9%). 1985 Dec: 14(19%), 1986 Dec: 5(5%),

1987 Dec: 15(15%), Jan: 5(5%). From 1989 onwards the survey only continued to the end of November when the island was vacated of all staff. This table also excludes 1988 as it was not possible to extract the data.

There are occasional records of seal pups in July by island staff and these are included in the table, however the full survey with routine site visits does not commence till August.

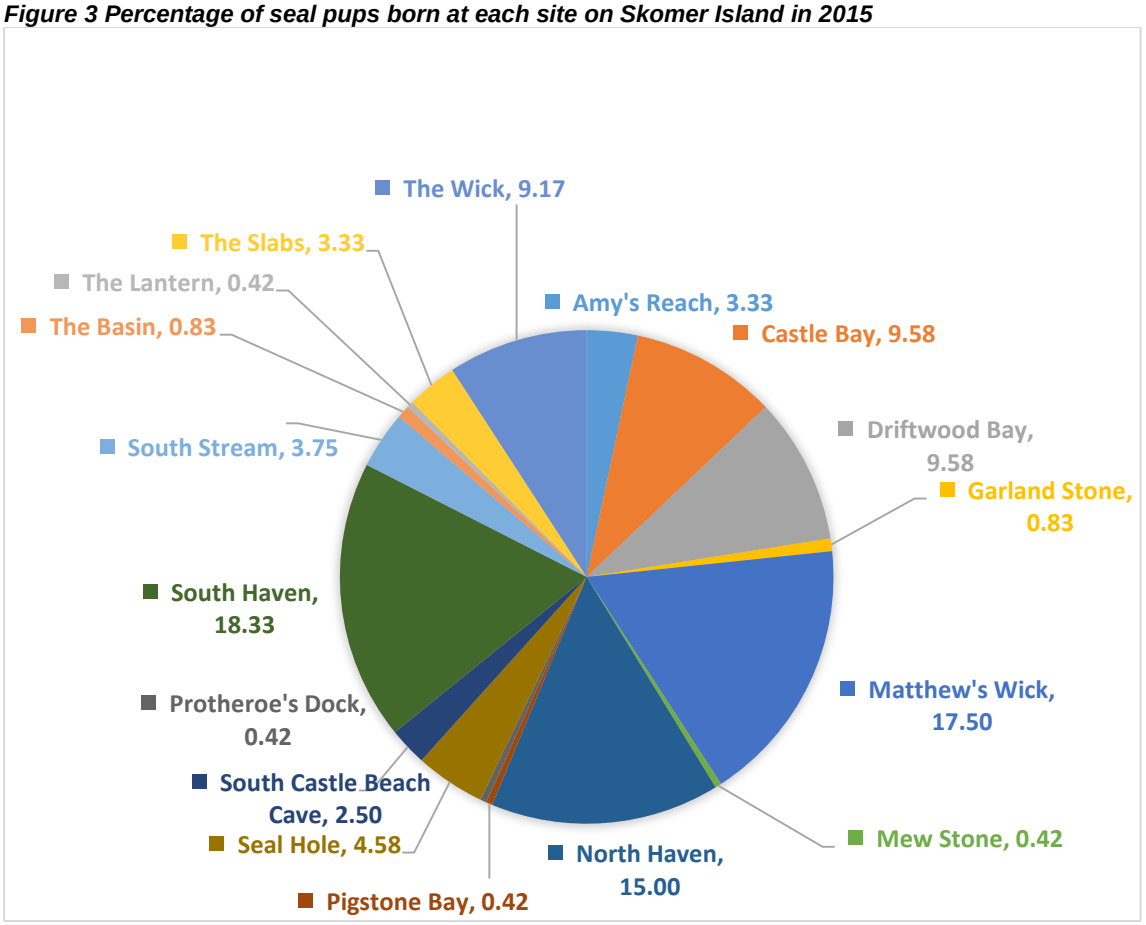
The busiest week this year was week 41 (5th to 11th October), the same as in 2014.

Like in the previous two years the most productive beaches were Matthew's Wick (42 pups) and South Haven (44 pups). In 2015 (in contrast to 2014) North Haven was the third most popular beach with 36 pups born (24 in 2014). On both Driftwood Bay and Castle bay 23 pups were born.

The fact that there were no strong northerly winds during the main pupping period (October) made North Haven beach an attractive pupping site.

Interestingly there were several pups born in unusual locations. One was seen on top of Garland Stone, but disappeared the next day, another one was raised on a rocky slope opposite the Garland Stone and weaned successfully, furthermore a dead new born pup, was observed at the foot of the Mew Stone and one cow pupped at Pigstone Bay, the first birth at this location since 2012.

Figure 3 Percentage of seal pups born at each site on Skomer Island in 2015



4.3 Survival Rate

The fate of 234 pups is known with relative certainty. The fate of six pups is unknown, either because they were born just before the island was vacated or because they were born in a cave which could not be accessed for several weeks due to adverse weather conditions. When calculating the survival rate, these unknown pups were not considered, thus not effecting the overall result.

178 pups are known, or assumed to have survived on Skomer, giving a survival rate of 76%, which is higher than in 2014 (68%) and in line with the average of the last ten years (76%). On the mainland 113 pups are known, or assumed to have survived, giving a survival rate of 81% for those sites. The overall survival rate for the Skomer MCZ was 75%.

The very settled weather in October was beneficial to the seal pup's survival and development.

Figure 4 Percentage of seal pups surviving in Skomer/MCZ 1983-2015

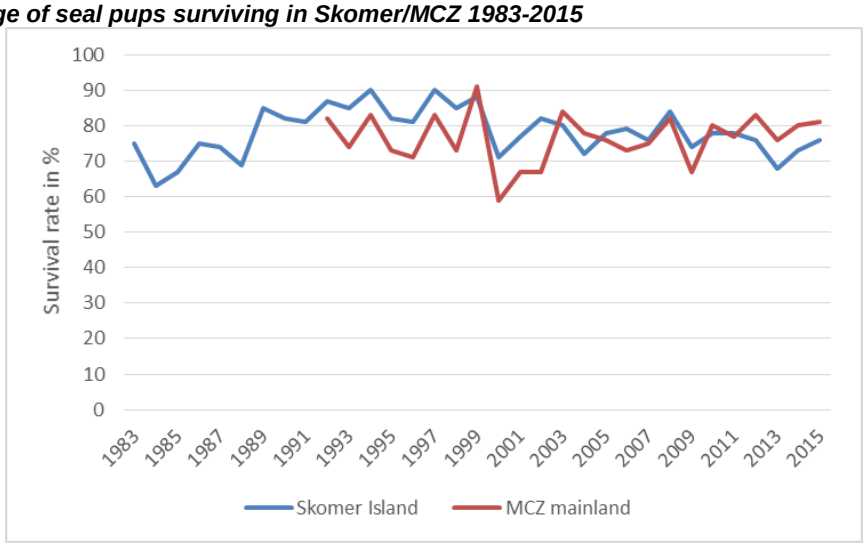


Figure 5 Weekly seal pup births and deaths on Skomer Island in 2014 and 2015

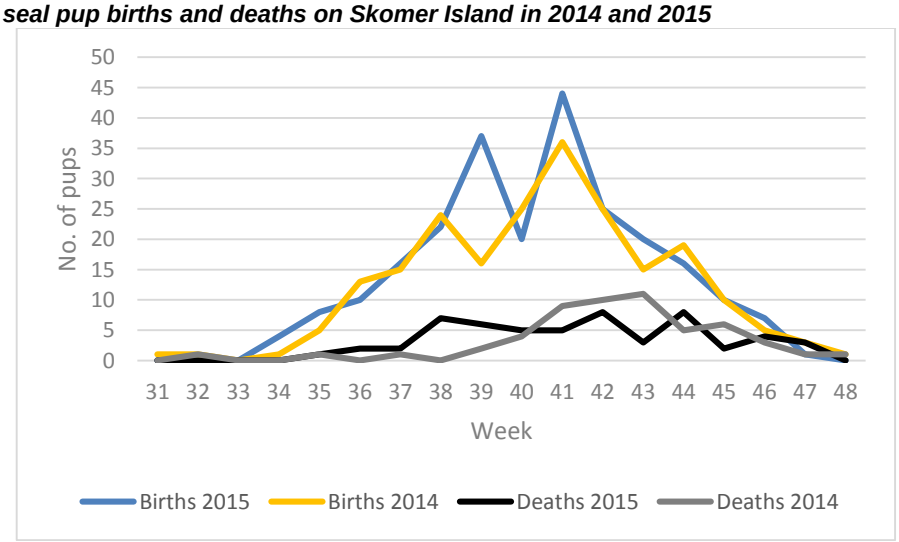


Table 2 Survival rates per site on Skomer Island in 2015

Site	Total Number of pups raised per beach (excl. pups whose fate is unknown)			No of pups survived			Survival Rate %		
	2013	**2014**	**2015**	**2013**	**2014**	**2015**	**2013**	**2014**	**2015**
Amy's Reach	5	3	8	2	3	6	40	100	75
Castle Bay	21	30	23	14	17	15	67	57	65
Driftwood Bay	21	26	25	18	21	21	72	81	84
Garland Stone	0	0	2	0	0	1	0	0	50
High Cliff Boulders	4	0	0	4	0	0	100	_	_
Matthew's Wick	35	41	42	25	32	31	71	78	74
Mew Stone	0	0	1	0	0	0	_	_	0
North Haven	18	24	36	8	19	28	44	79	78
Pigstone Bay	0	0	1	0	0	0	_	_	0
Protheroe's Dock	2	1	1	2	1	1	100	100	100
Seal Hole	6	9	9	5	5	5	83	56	56
South Castle Beach Cave	9	4	5	7	4	3	78	100	60
South Haven	34	33	40	21	23	34	72	70	85
South Stream	2	7	9	2	6	7	100	86	78
The Basin	1	4	2	0	4	1	0	100	50
The Lantern	4	1	1	3	1	1	75	100	100
The Slabs	4	6	8	1	2	5	25	33	63
The Wick	13	22	21	7	17	20	54	77	95

Note: Pups that moved from their natal beach to a new location and spent the majority of their time there were added to that beach's total to establish the survival rate for this location. Pups which fates were unknown were not taken into account when calculating the survival rate.

Table 3 Causes of seal pup deaths on Skomer Island in 2015

Cause of death	No. of pups	% of deaths	% of total pups born
Abandoned/ diseased	2	3.57	0.85
Abandoned/separated/starved	15	26.79	6.36
Accident/killed	3	5.36	1.27
Disappeared ≤ stage 3	17	30.36	7.20
Diseased	2	3.57	0.85
Drowned	2	3.57	0.85
Drowned/diseased	1	1.79	0.42
Stillborn	2	3.57	0.85
Stillborn/drowned	11	19.64	4.66
Unknown	1	1.79	0.42
Total	**56**		

4.4 Site Summaries

4.4.1 North Haven

Pups on the main North Haven beach can be very difficult to monitor as there are several caves and overhangs at the back of the beach where pups often disappear, especially during rough weather. The beach is a popular haul-out site and it can become impossible to try and see hidden pups without disturbing the haul out.

A total of 36 pups were born in North Haven in 2015, the highest number ever recorded at this location. 28 pups are assumed to have survived to the onset of moult or were weaned, giving a survival rate of 78% which is only one percent lower than last year's (79%). In 2015, as in 2014 the seal pups on North Haven beach profited from the lack of strong northerly winds.

Figure 6 Number of seal pups born in North Haven 1983–2015

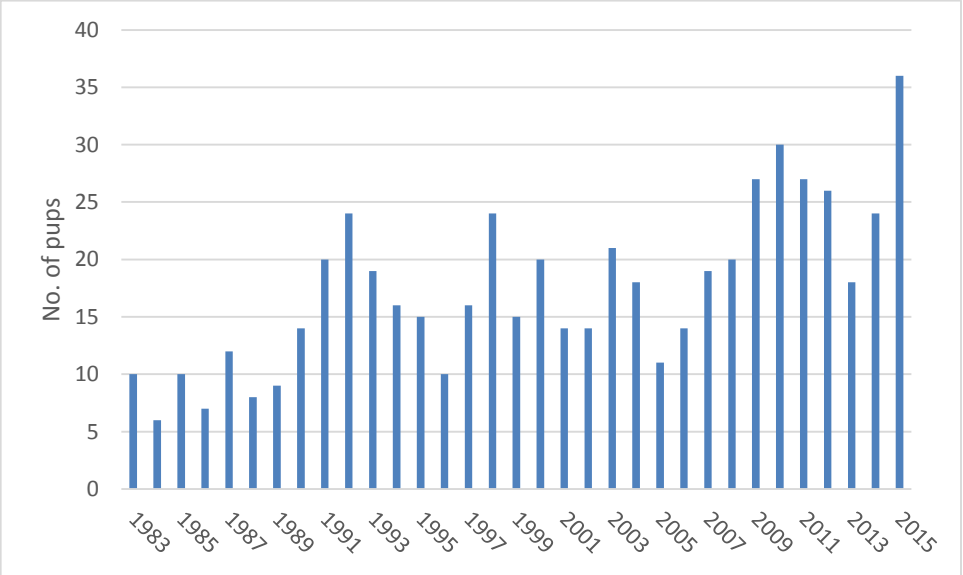


Figure 7 Weekly seal pup births in North Haven in 2015

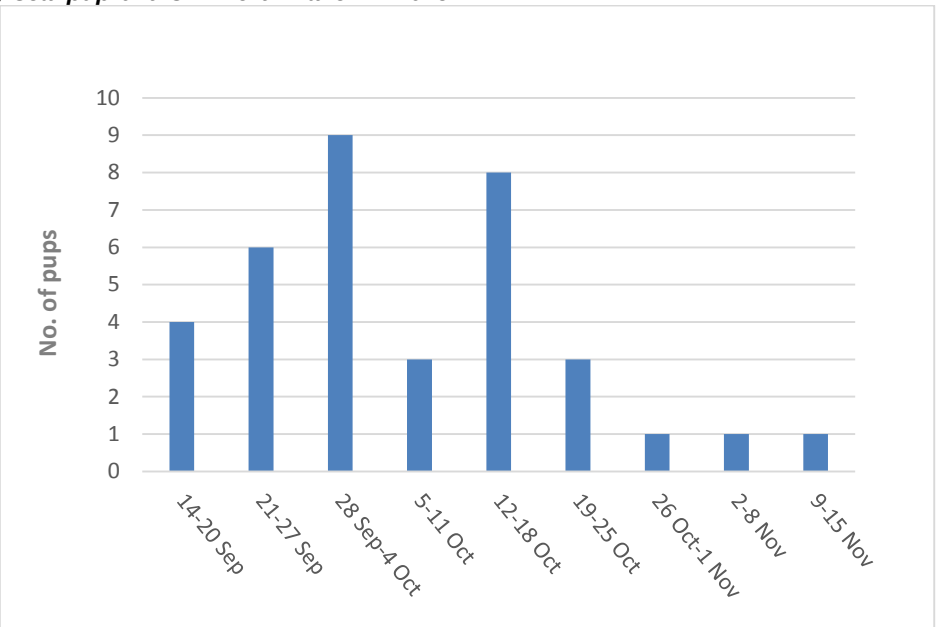


Table 4 Fate of pups in North Haven in 2015

Fate	**No of pups**
Assumed dead	3
Assumed survived	1
Dead	5
Survived to onset of moult	8
Survived to weaning	19
Total	**36**

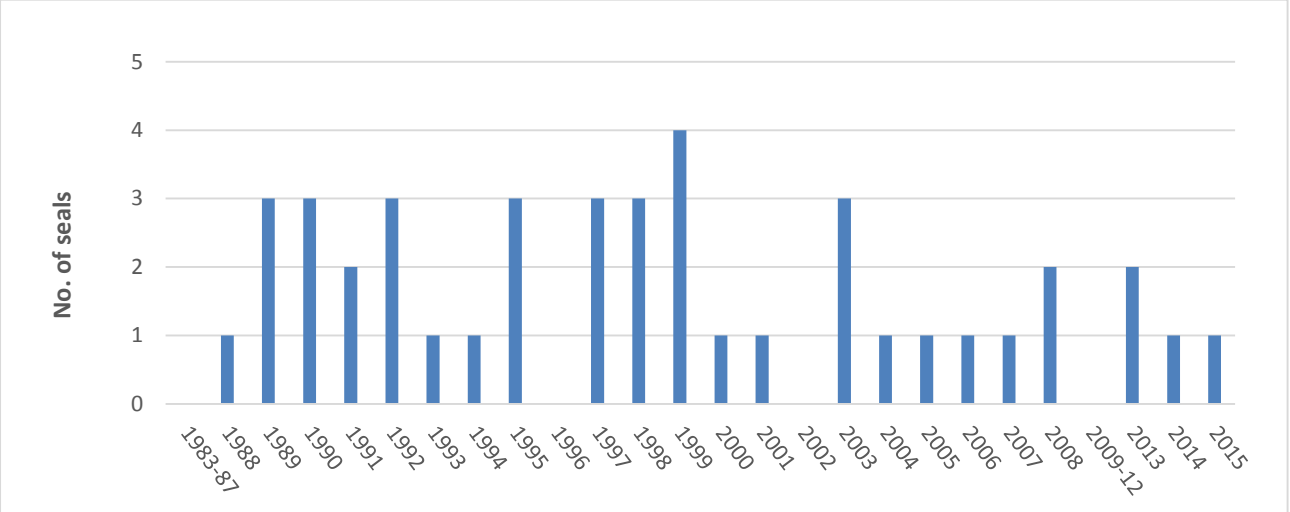
Table 5 Causes of seal pup deaths on North Haven beach in 2015

Cause of death	**No. of pups**
Abandoned/separated/starved	3
Accident/killed	2
Disappeared ≤ stage 2	1
Stillborn/drowned	2
Total	**8**

4.4.2 Protheroe's Dock

In 2015 one pup was born on Protheroe's Dock in week 41 and weaned successfully.

Figure 8 Number of seal pups born in Protheroe's Dock 1983-2015



Ten site visits were conducted to Protheroe's Dock during the monitoring period.

4.4.3 The Lantern

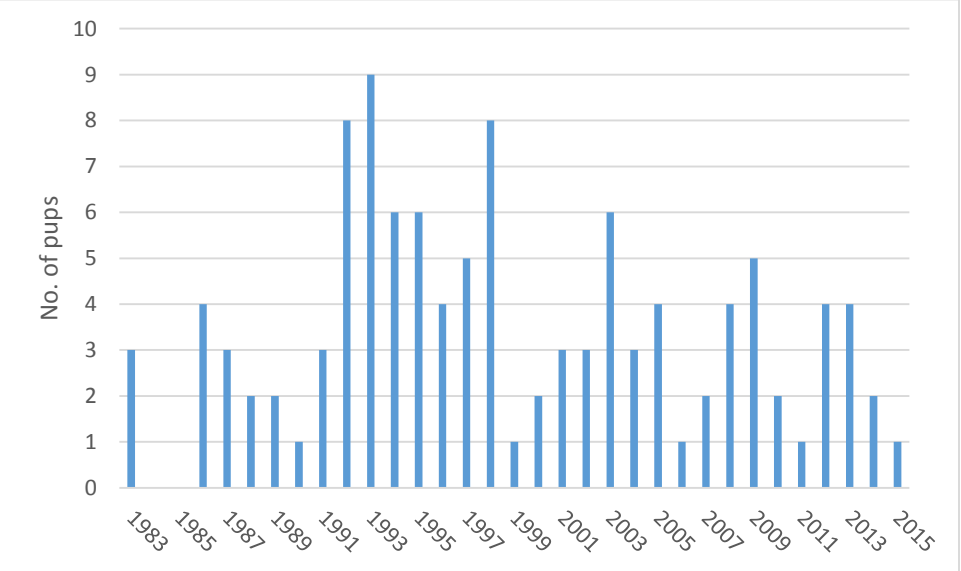
Access to the Lantern is only possible at low tide. All access routes into the Lantern are hazardous in wet weather or when there is a big swell. Even if access is possible cows often remain deep inside the cave making marking pups impossible and accurately assessing their progress very difficult.

Since 2014 access has been gained by abseiling from a rocky outcrop into the eastern entrance which enables access even on smaller tides (>2.5). In 2015 this route was risk assessed by Leo Nathan and was deemed to be the best and safest way of entering the Lantern. A semi-permanent rope (which is removed in winter) was installed around a rocky outcrop. When conducting a site visit the abseil rope is clipped on to this one via a carabiner; this setup reduces the risk of making mistakes and speeds up the site visit.

This year we accessed The Lantern six times. There was very little activity at The Lantern and thus little need to check it more often than every two to three weeks. In November the weather prevented us from conducting a site visit.

Only one pup was born in the Lantern in week 34. We assumed this pup survived.

Figure 9 Number of seal pups born in The Lantern 1983-2015



4.4.4 Amy's Reach

A record number of pups (eight) were born in Amy's Reach in 2015.

Figure 10 Number of seal pups born in Amy's Reach 1983–2015

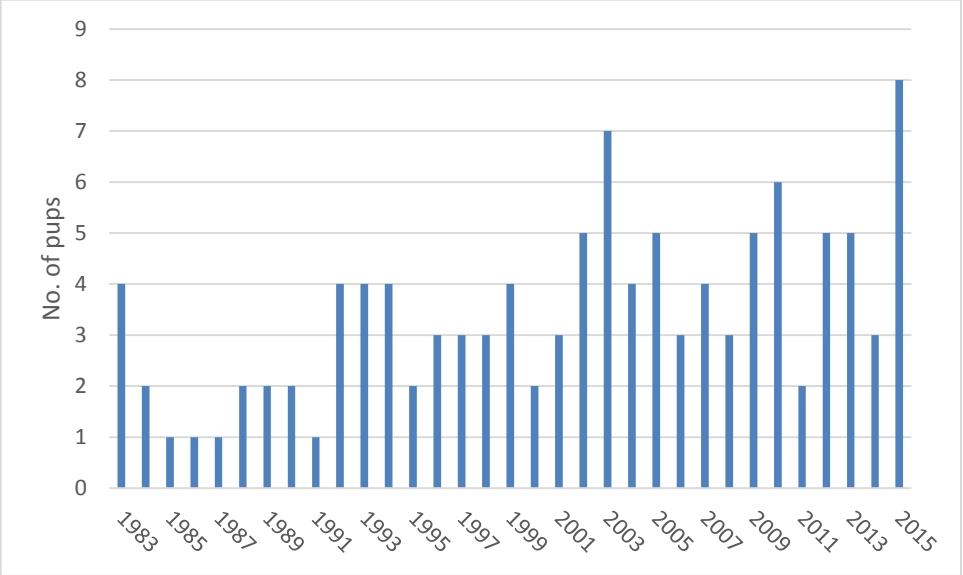


Figure 11 Weekly seal pup births in Amy's Reach 2015

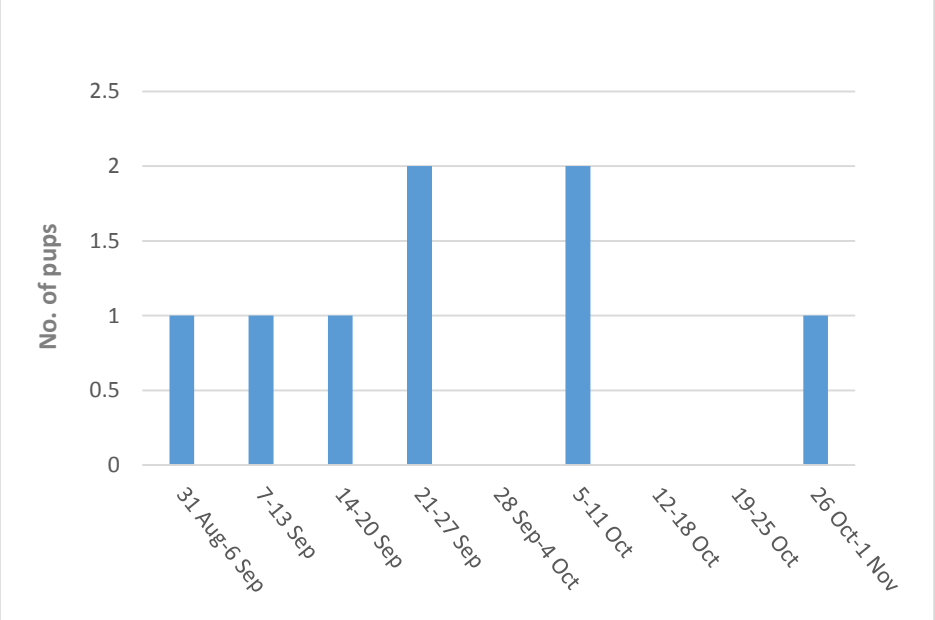


Table 6 Fate of pups in Amy's Reach in 2015

Fate	No of pups
Dead	2
Survived to onset of moult	1
Survived to weaning	5
Total	**8**

Table 7 Causes of seal pup deaths in Amy's Reach 2015

Cause of death	No. of pups
Abandoned/separated/starved	1
Disappeared ≤ stage 2	1
Total	**2**

A pup which was abandoned was also found to be ill (Plate 4). It had pus clogging up its eyes and was severely malnourished. Whether the pup was abandoned because it was ill or whether the infection was result of malnutrition is unknown. This pup did not survive.

Plate 4 Pup 145 with eye infection

4.4.5 Matthew's Wick

42 pups were born on Matthew's Wick in 2015, one more than last year.

Figure 12 Number of seal pups born in Matthew's Wick 1983–2015

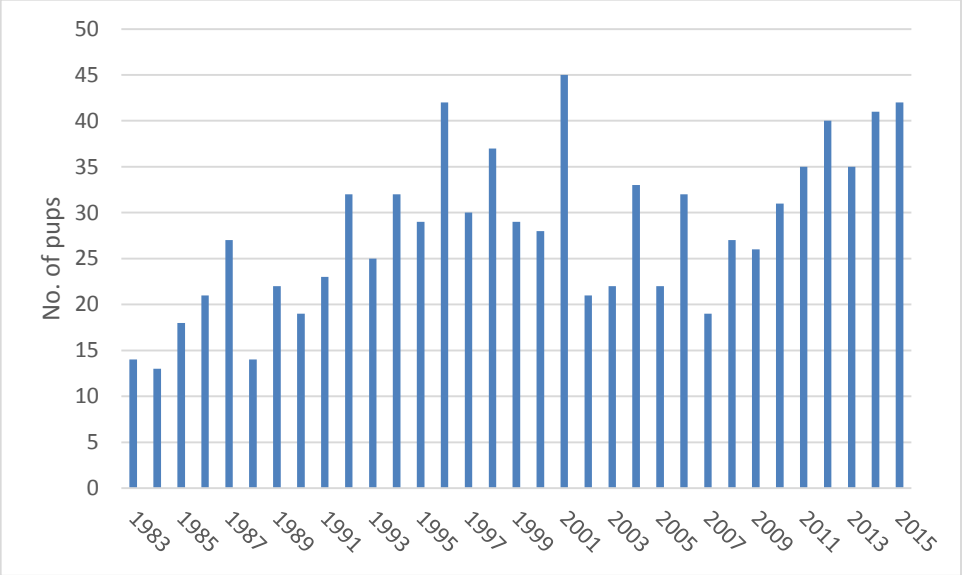
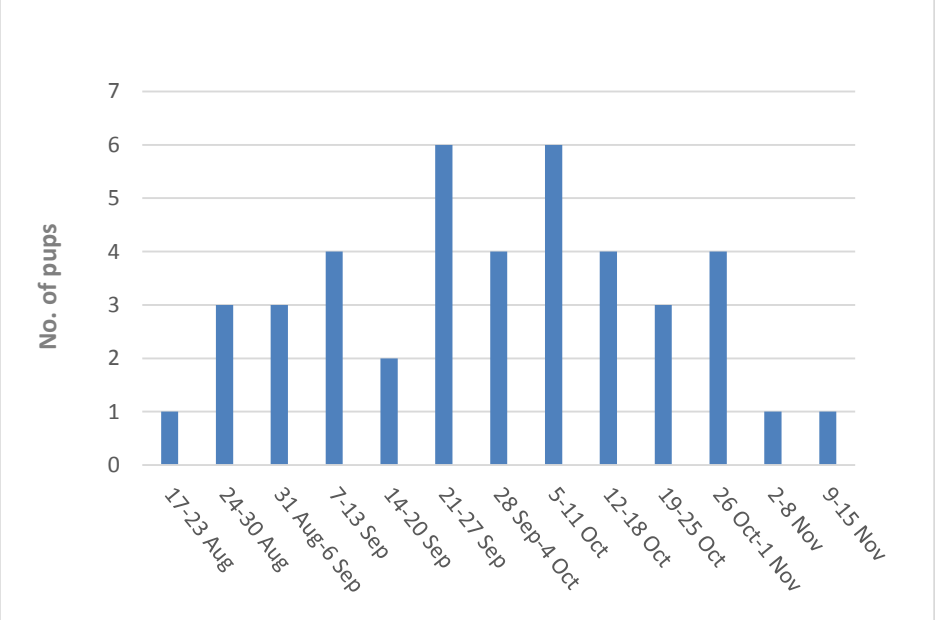


Figure 13 Weekly seal pup births in Matthew's Wick in 2015



31 pups are assumed to have survived, survived to onset of moult or survived and were weaned, giving a survival rate of 74%.

Table 8 Fate of pups on Mathew's Wick in 2015

Fate	No of pups
Assumed dead	2
Assumed survived	6
Dead	9
Survived to onset of moult	7
Survived to weaning	18
Total	**42**

Table 9 Causes of seal pup deaths on Mathew's Wick in 2015

Cause of death	No. of pups
Abandoned/separated/starved	4
Accident/killed	1
Disappeared <size 3	1
Diseased	1
Drowned	1
Stillborn/drowned	3
Total	**11**

4.4.6 Castle Bay

In total 23 pups were born in Castle Bay in 2015, seven less than the previous year.

Figure 14 Number of seal pups born in Castle Bay 1983-2015

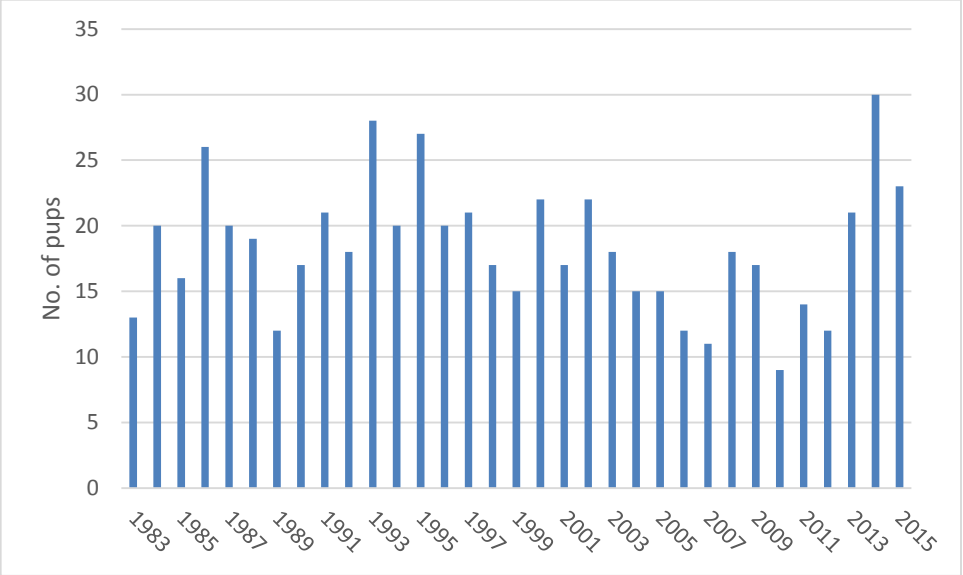
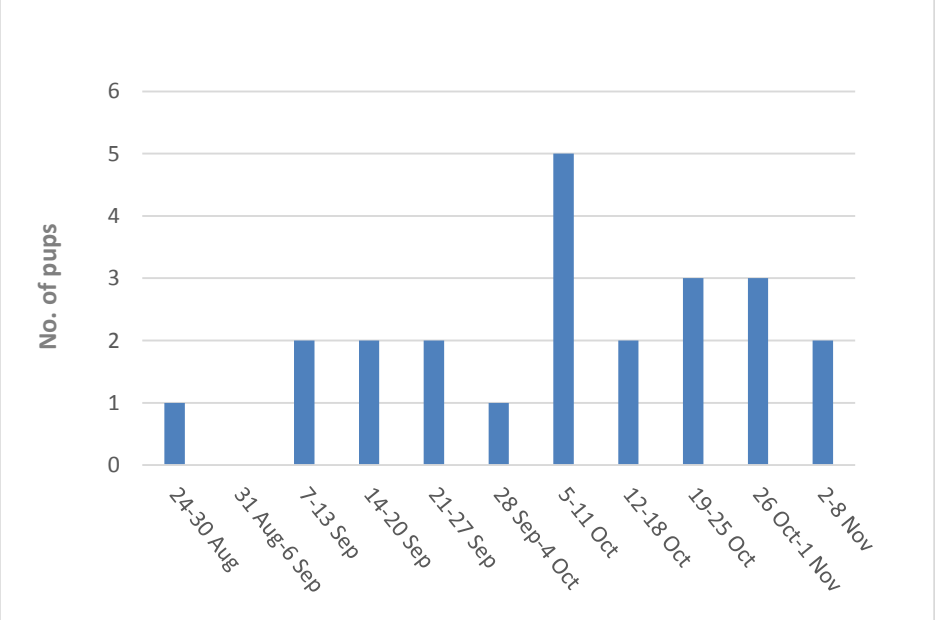


Figure 15 Weekly seal pup births in Castle Bay in 2015



Access to Castle Bay is impossible and pups born there do not get marked. In Castle Bay 15 pups are assumed to have survived, survived to onset of moult or survived and were weaned, giving a survival rate of 65%. Castle Bay seems recently to be a less suitable beach for raising seal pups. The survival rate in the years 2013-2015 was lower than the year's average and lower than the average survival rate of the last ten years. Castle Bay is facing into the prevailing wind direction hence it gets fully flooded during storms. However, the beach is rather wide which will protect the pups on all but the bigger tides. Castle Bay is also the beach with the largest and most permanent haul-out. Maybe the presence of other seals unsettles the mothers and pups and leads to abandonment of the pup, or the site. As these pups are not marked it is difficult to say whether pups that disappear turn up somewhere else and wean successfully.

Table 10 Fate of pups on Castle Bay in 2015

Fate	**No of pups**
Assumed dead	1
Assumed survived	8
Dead	7
Survived to onset of moult	5
Survived to weaning	2
Total	**23**

Table 11 Causes of seal pup deaths on Castel Bay in 2015

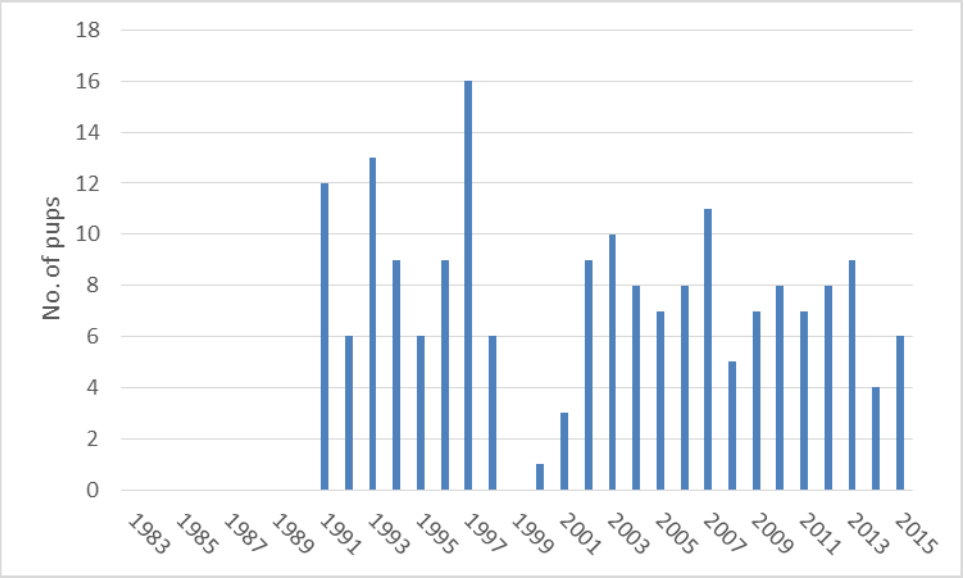
Cause of death	**No. of pups**
Abandoned/separated/starved	3
Disappeared ≤ stage 2	2
Stillborn/drowned	1
Stillborn	2
Total	**8**

4.4.7 South Castle Beach Cave

South Castle Beach Cave was overlooked as a pupping site prior to 1990, and between 1999-2001 access was severely limited as the unstable nature of the rock above was deemed unsafe for the rope access recommended in the Handbook (POOLE, J, 1996a), and boat access is virtually impossible due to the almost constant swell. Following a re-assessment in 2002 it was considered that a scramble route without rope was a reasonable option in dry conditions (Hughes, 2002). In 2015 the route was reassessed again by Leo Nathan and an abseil route was installed making access easier and safer. The cave is only accessible from land at low tide and because of the long and rocky route from the cave to the water it was decided not to enter the cave when cows were present to avoid excessive disturbance.

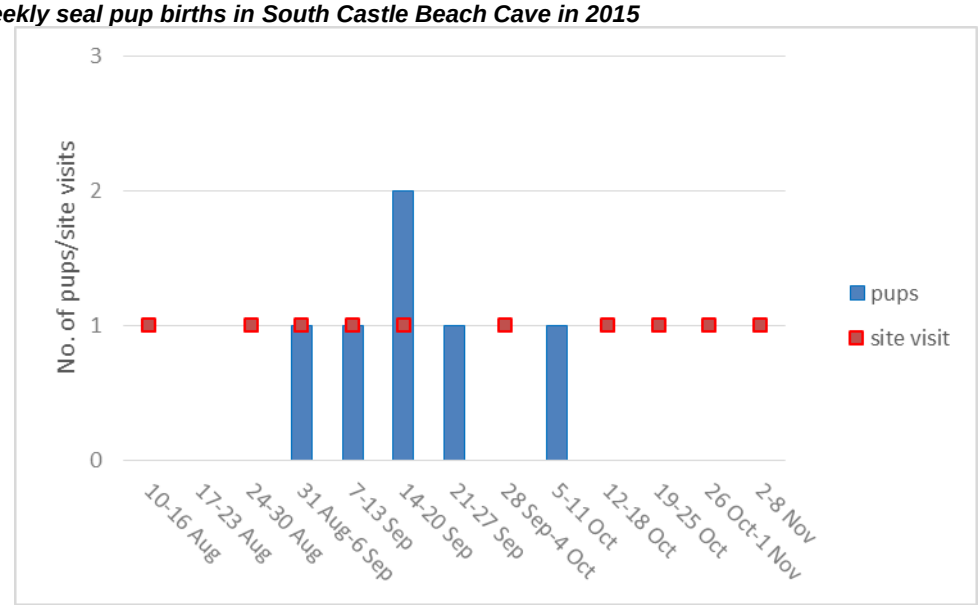
Six pups were born in South Castle Beach Cave in 2015. Three pups are assumed to have survived, survived to onset of moult or survived and were weaned and one pup's fate is unknown, giving a survival rate of 60%.

Figure 16 Number of seal pups born in South Castle Beach Cave 1983-2015



Ten visits were made to South Castle Beach Cave during the observation period. In November high winds made it very difficult to access the site.

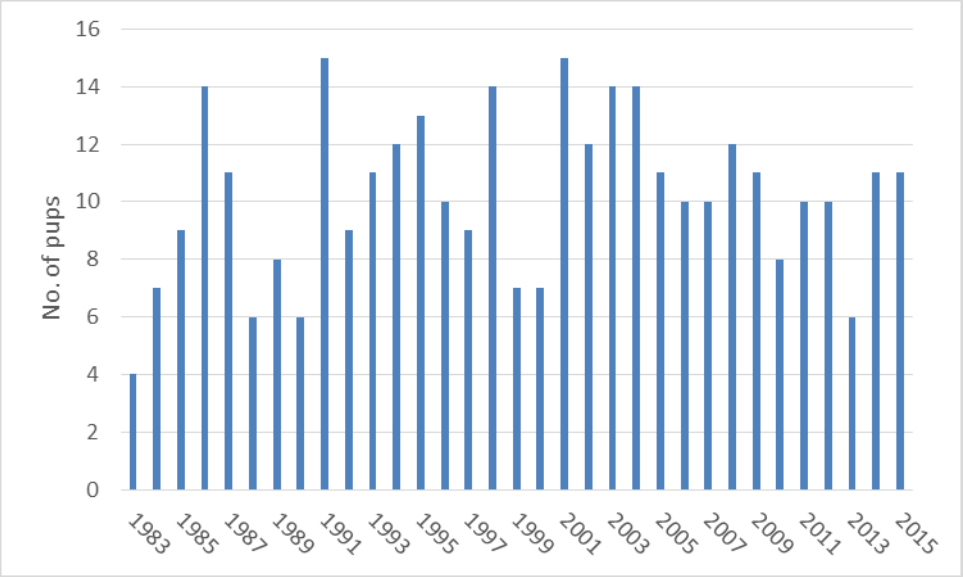
Figure 17 Weekly seal pup births in South Castle Beach Cave in 2015



4.4.8 Seal Hole

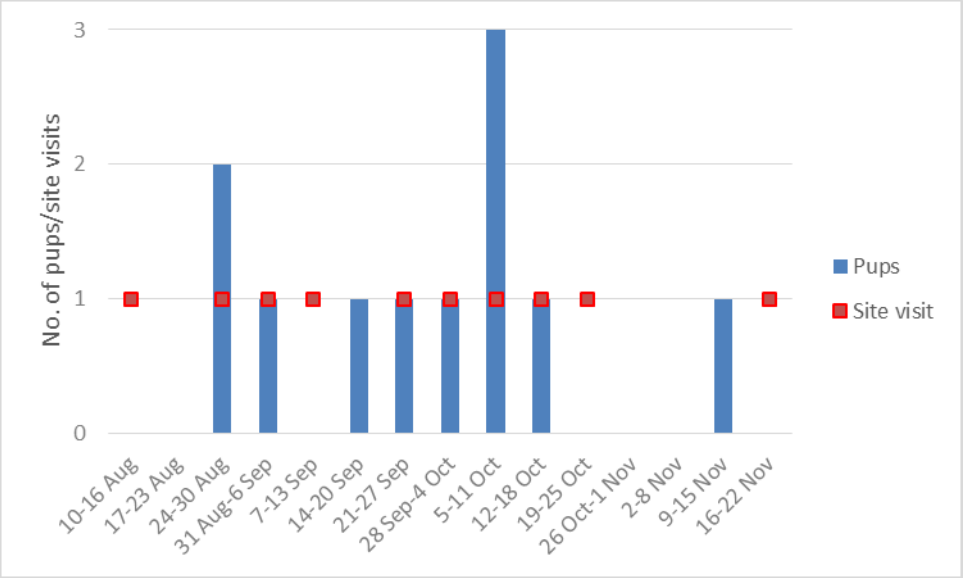
Eleven pups were born in Seal Hole in 2015, the same as last year.

Figure 18 Number of seal pups born in Seal Hole 1983-2015



In 2015 ten site visits were made to Seal Hole.

Figure 19 Weekly seal pup births in Seal Hole in 2015



Five pups born in Seal Hole are assumed to have survived, survived to onset of moult or survived and were weaned, giving a survival rate of 56%. The fate of two pups is unknown.

Three pups which were born in Seal Hole drowned or were still born. Pup 31 was marked black/purple on 12/9, a healthy size 2. After spraying, it left the cave and we observed it playing with its mother outside Seal Hole (Plate 5). Unfortunately, it seems that the cow and pup got separated later as the pup turned up on Castle Bay the next day where it died on 23/9. It seems likely that the pup left the cave due to our activities and it is very regrettable that they may have affected the survival of the pup

Plate 5 Pup 31 and cow in the water outside Seal Hole

Table 12 Fate of pups in Seal Hole in 2015

Fate	**No of pups**
Assumed survived	2
Survived to onset of moult	3
Dead	4
Unknown	2
Total	**11**

Table 13 Causes of seal pup deaths in Seal Hole in 2015

Cause of death	**No. of pups**
Separated	1
Stillborn/drowned	3
Total	**4**

4.4.9 The Slabs

Eight pups were born on The Slabs in 2015. Pup 187 moved onto South Haven when it was eleven days old and weaned there successfully.

Five pups survived and were weaned, giving a survival rate of 63% which is considerably higher than the survival rate of the last two years (33% in 2014, 25% in 2013). This site again profited from the calm weather in October and only in November, when storms hit, were pups washed off The Slabs.

Figure 20 Number of seal pups born on The Slabs 1983-2015

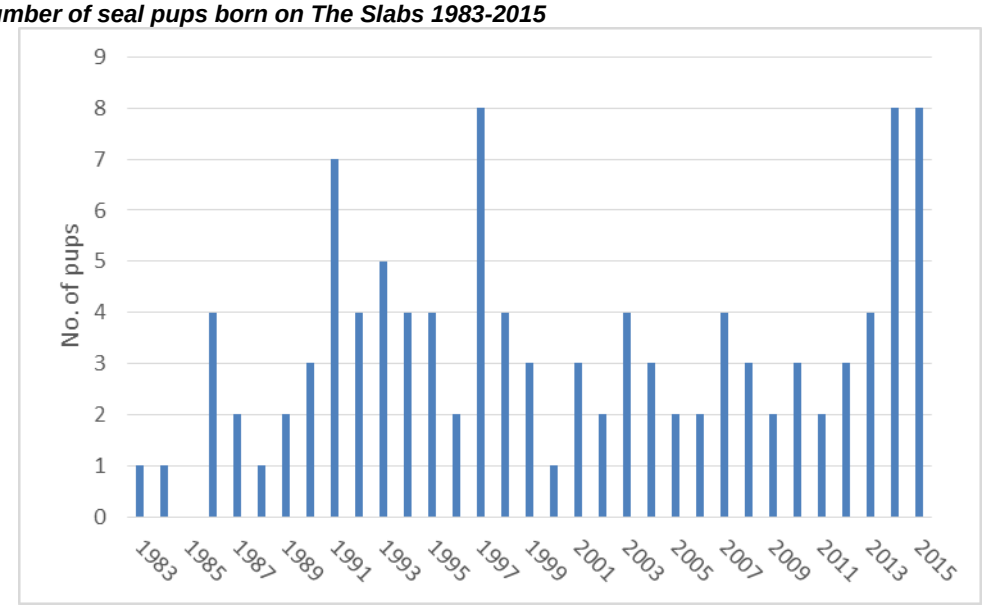
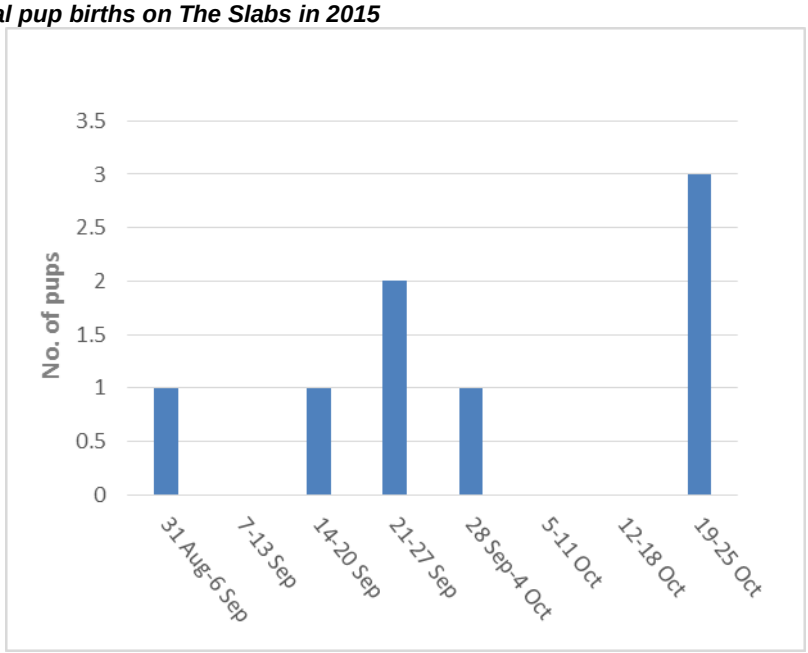


Figure 21 Weekly seal pup births on The Slabs in 2015



4.4.10 Driftwood Bay

23 pups were born in Driftwood Bay in 2015.

Figure 22 Number of seal pups born in Driftwood Bay 1983-2015

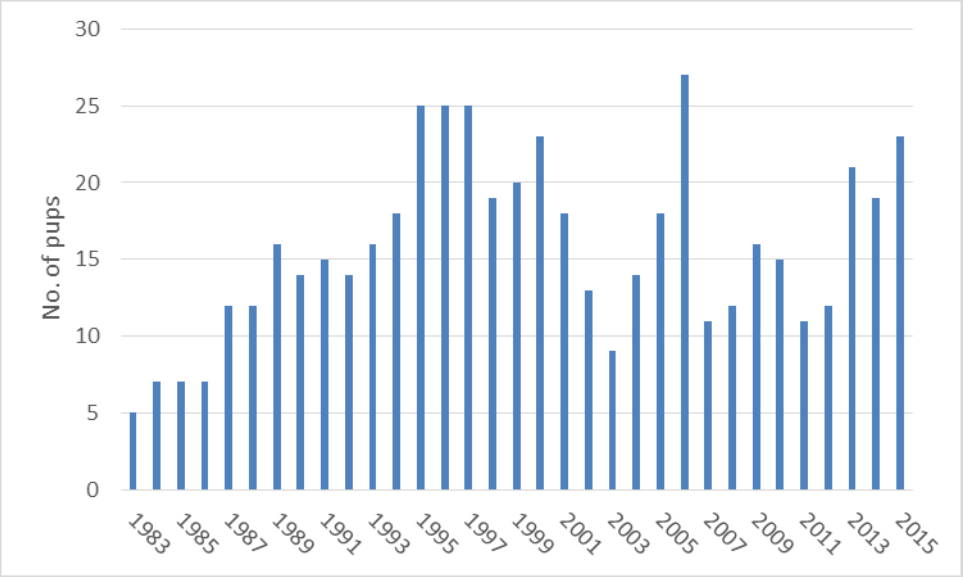
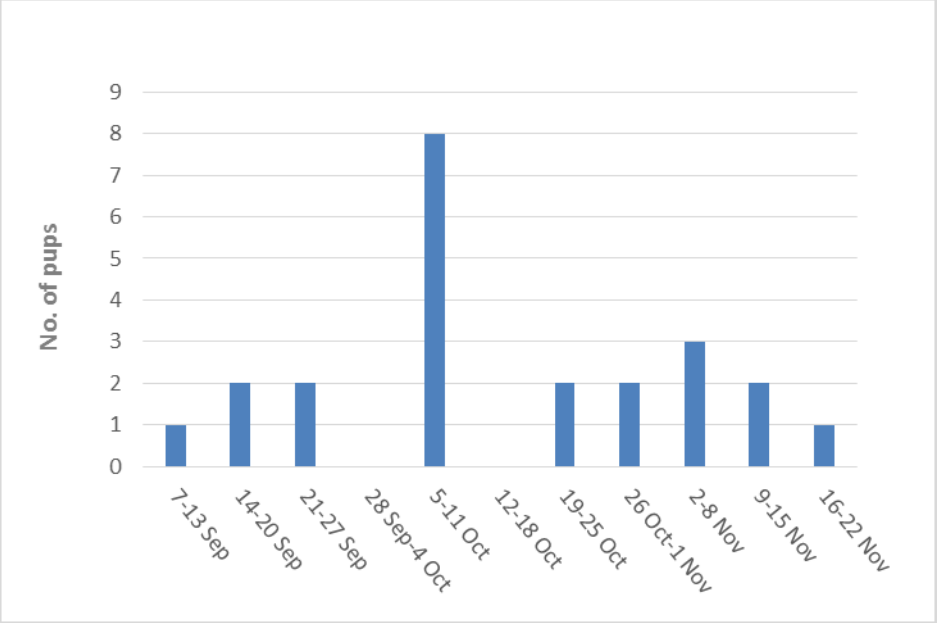


Figure 23 Weekly seal pup births in Driftwood Bay in 2015



Four pups moved from South Haven and spent the majority of their time in Driftwood Bay. The fate of two pups in unknown. Therefore a total of 25 pups was used to calculate the survival rate for this site. Of these, 21 pups are assumed to have survived, survived to onset of moult or survived and were weaned, giving a survival rate of 84% which is even better than last year's 81% and reflects the good quality of Driftwood Bay as a breeding site.

Table 14 Fate of pups on Driftwood Bay in 2015

Fate	No of pups
Assumed survived	5
Dead	4
Survived to onset of moult	5
Survived to weaning	11
Unknown	2
Total	**27**

Table 15 Causes of seal pup deaths on Driftwood Bay in 2015

Cause of death	No. of pups
Abandoned/separated/starved	1
Ill	1
Stillborn/drowned	2
Total	**4**

4.4.11 South Haven

This site is made up of South Haven main beach and the two caves between the beach and Driftwood Bay. The caves were only visited when pups were marked on the main beach as accessing the caves inevitably disturbs all seals on the beach. The entrances to the caves can be monitored from across the bay and pups tend to move out of the caves within their first week and can be observed from above thereafter.

A record number of pups (44) were born on South Haven in 2015.

Figure 24 Number of seal pups born in South Haven 1983-2015

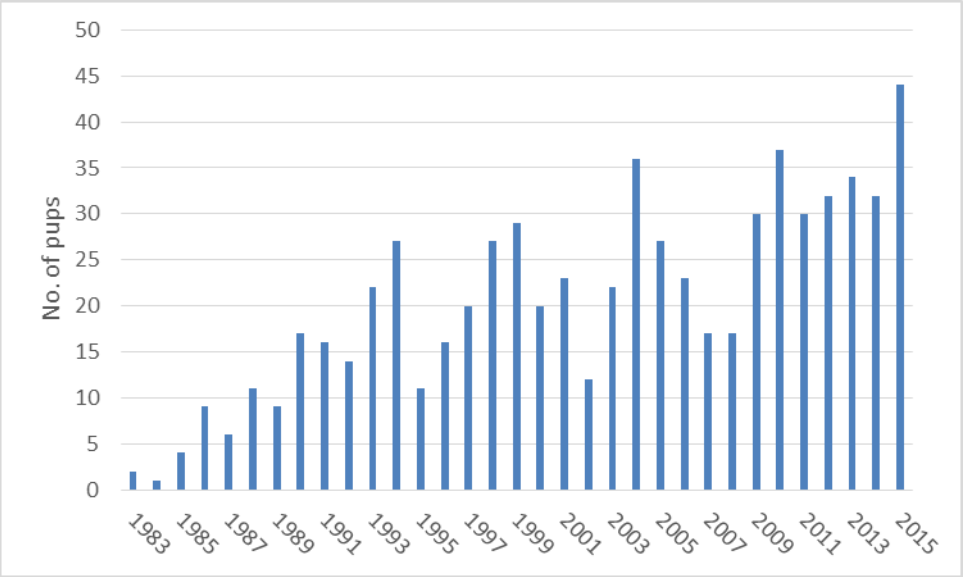
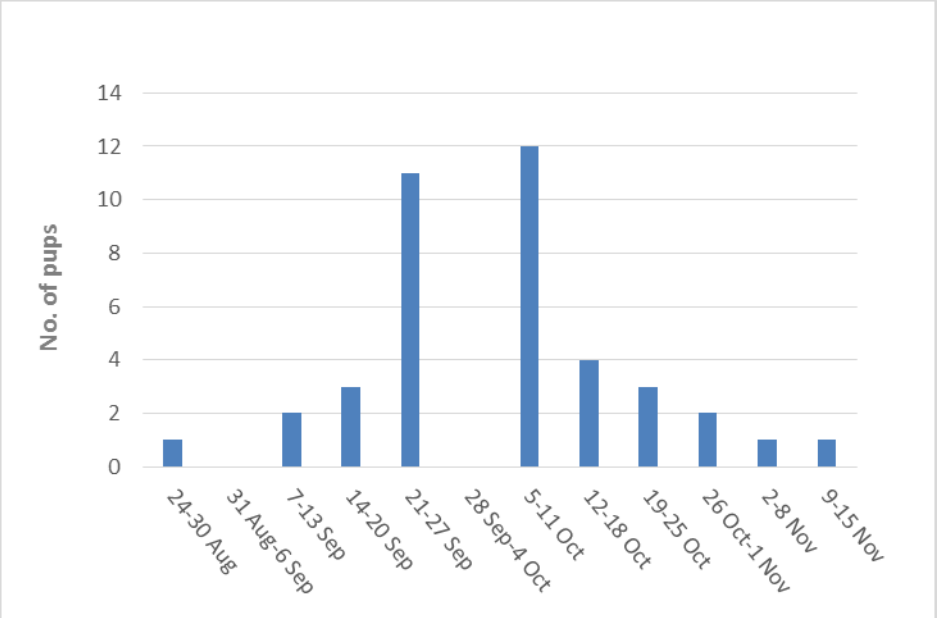


Figure 25 Weekly seal pup births in South Haven in 2015



Four pups moved to Driftwood Bay and spent most of their time there before weaning. The survival rate for the remaining 40 pups which were raised on South Haven is 85%.

Table 16 Fate of pups in South Haven in 2015

Fate	**No of pups**
Assumed dead	4
Assumed survived	6
Dead	2
Survived to onset of moult	14
Survived to weaning	14
Total	**40**

Table 17 Causes of seal pup deaths in South Haven in 2015

Cause of death	**No. of pups**
Abandoned/separated/starved	2
Disappeared <3	3
Unknown	1
Total	**6**

4.4.12 South Stream Cave and Boulders

South Stream Cave and Boulders is a hard site to monitor well. Access to the cave is only possible at low tide and is very treacherous in wet weather, pups are usually hidden in the cave or behind boulders and the only sign that they are present is when cows are seen swimming offshore. Before 2014 it was customary to check the site daily from The Neck and then follow up any activity with a visit to the cave. However in August 2014 we discovered that pups can easily be missed when inspecting from such a distance. In 2015 we checked the site from South Stream outfall every two to three days and conducted full site visits on 8/10 and 18/10.

South Stream Cave was very popular in 2015. Nine pups were born, the highest number of pups at this site since records began.

Figure 26 Number of seal pups born in South Stream Cave 1983-2015

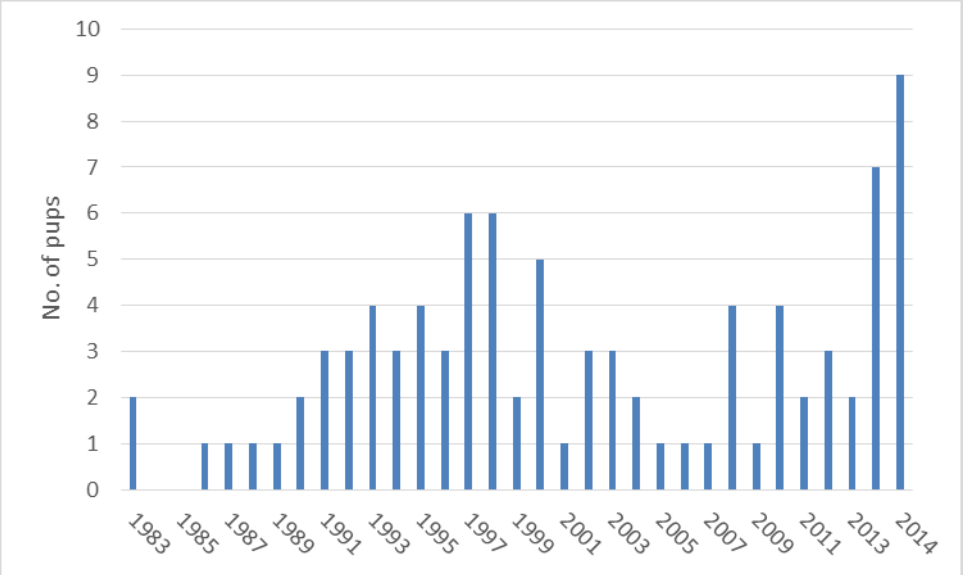
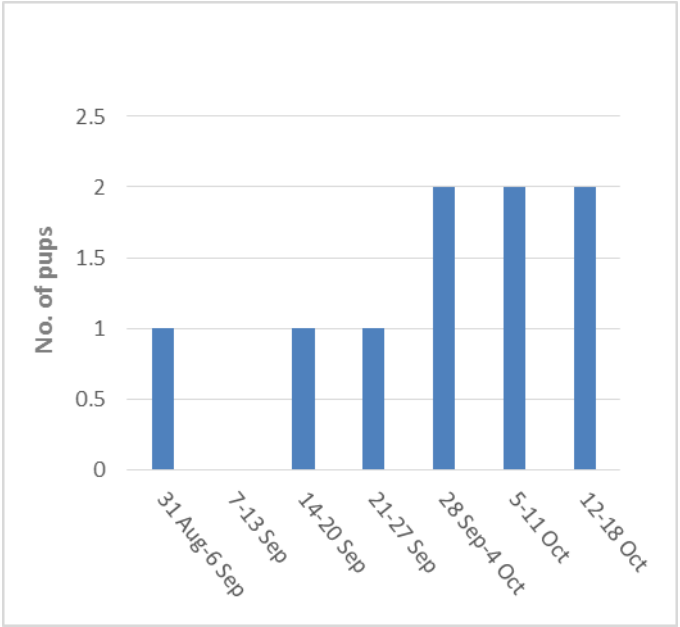


Figure 27 Weekly seal pup births in South Stream Cave and Boulders in 2015



Seven pups are assumed to have survived, survived to onset of moult or survived and were weaned, giving a survival rate of 78%.

Table 18 Fate of pups in South Stream Cave in 2015

Fate	No of pups
Assumed dead	1
Dead	1
Survived to onset of moult	3
Survived to weaning	4
Total	**9**

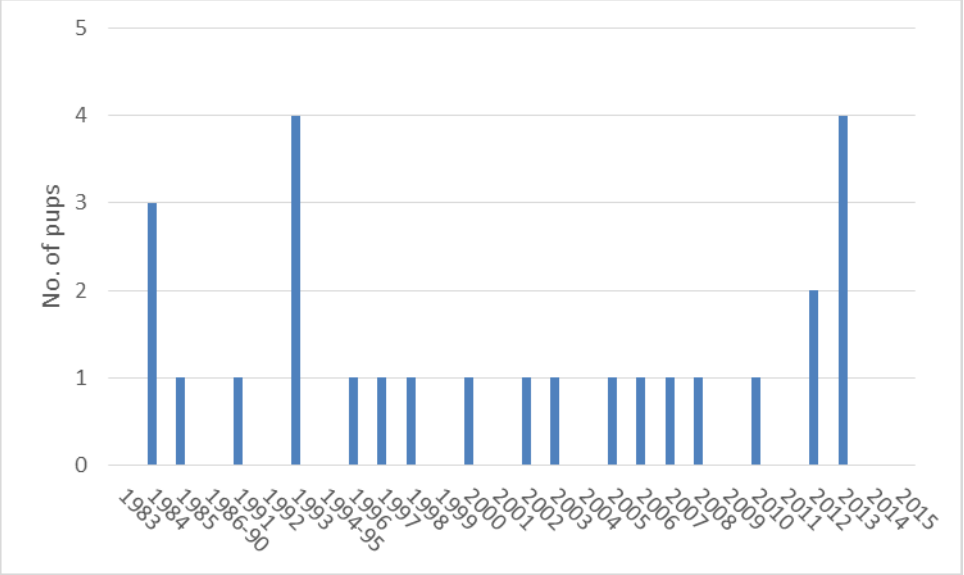
Table 19 Causes of seal pup deaths in South Stream Cave in 2015

Cause of death	No. of pups
Abandoned/separated/starved	1
Disappeared <3	1
Total	**2**

4.4.13 High Cliff Boulders

High Cliff Boulders is another site which is difficult to monitor as the boulders shield the pups from view. The only way to check the beach fully is to scramble to the bottom and search within the rocks. High Cliff Boulders was checked almost daily from Welsh Way and we conducted one full site visit after a seal pup was observed from the top. This turned out to be Pup 162 from South Stream Cave which had moved to High Cliff Boulders when it was 20 days old and moulted there successfully. No pups were recorded born on this site in 2015.

Figure 28 Number of seal pups born at High Cliff Boulders 1983-2015



4.4.14 The Wick

22 seal pups were born on The Wick in 2015; the same number as the previous year.

Figure 29 Number of seal pups born in The Wick 1983-2015

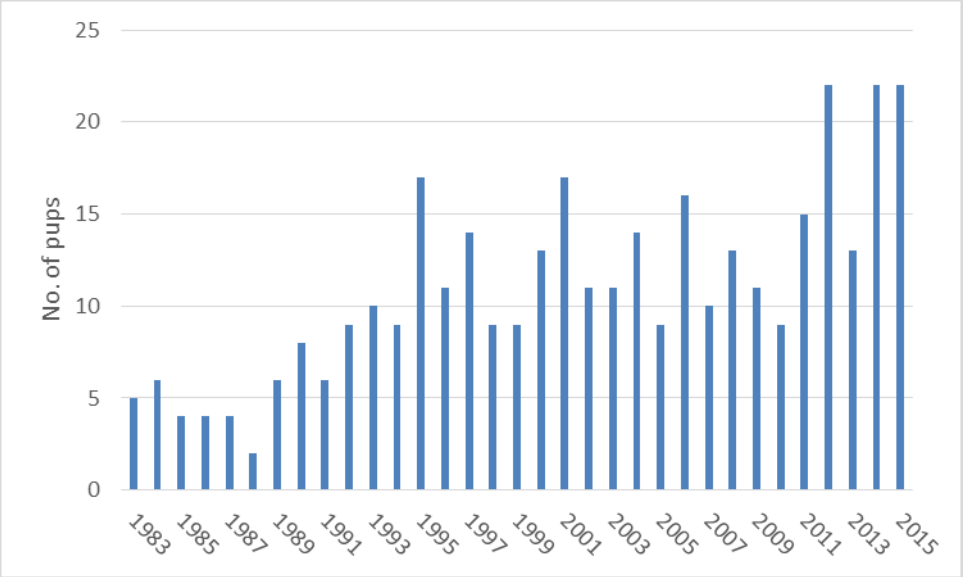
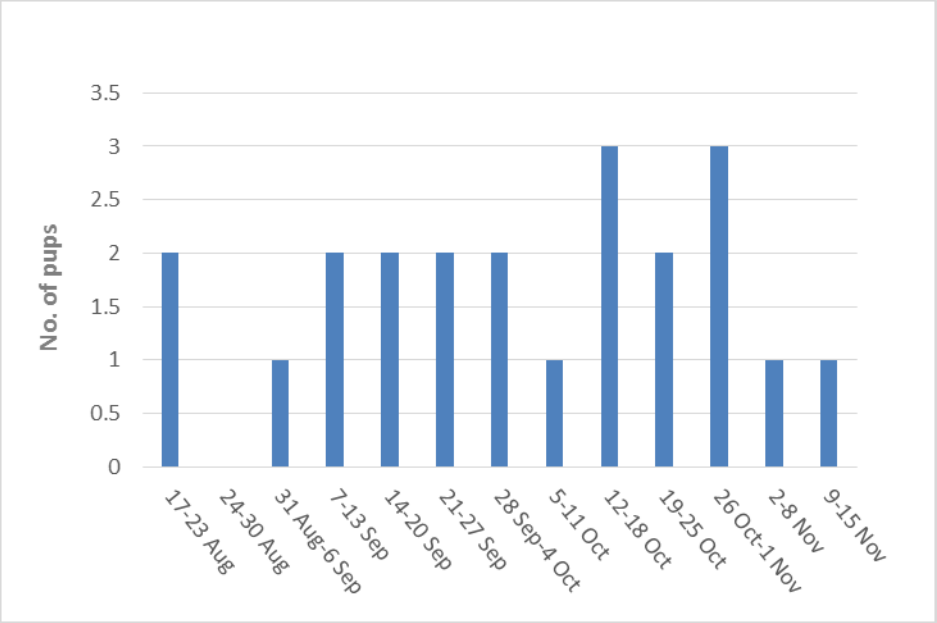


Figure 30 Weekly seal pup births in The Wick in 2015



19 pups are assumed to have survived, survived to onset of moult or survived and were weaned and one pup's fate is unknown, giving a survival rate of 90%. This is much higher than the survival rate for this site over the previous two years (2014: 77% and 2013: 54%), possibly reflecting the calm autumn weather up until November at a site which is particularly susceptible to bad weather.

Table 20 Fate of pups on The Wick 2015

Fate	**No of pups**
Assumed dead	2
Assumed survived	5
Survived to onset of moult	2
Survived to weaning	12
Unknown	1
Total	**22**

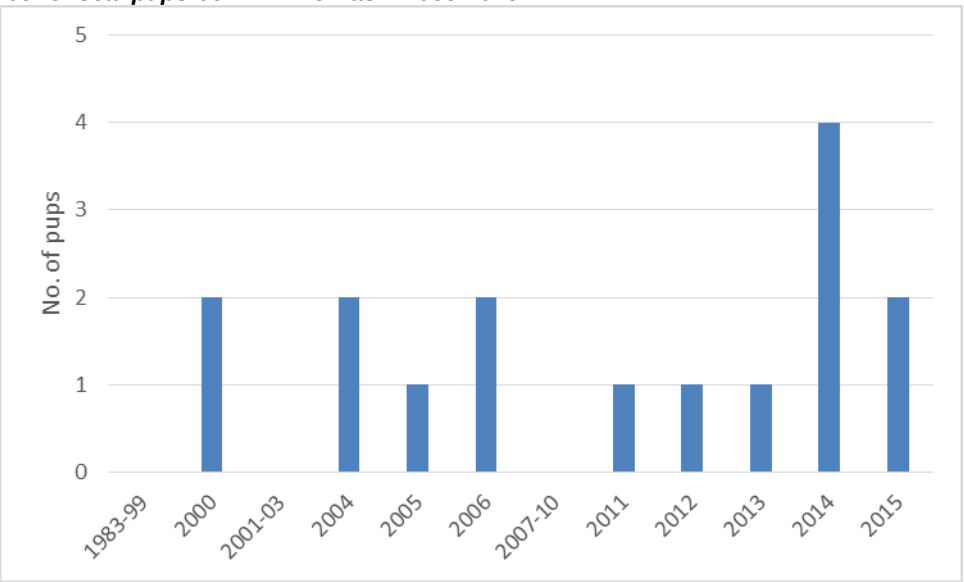
Table 21 Causes of seal pup deaths on The Wick in 2015

Cause of death	**No. of pups**
Disappeared <stage 3	2
Total	**2**

4.4.15 The Basin

Two pups were born in The Basin in 2015, one in week 37 and one in week 38. The Basin was visited nearly daily and one full site visit was conducted during the monitoring period.

Figure 31 Number of seal pups born in The Basin 1983-2015



One pup is assumed to have survived and one pup disappeared <size 3, giving a survival rate of 50%.

4.4.16 Robert's Wick

As far as we are aware no pups were born in Robert's Wick in 2015. This site was possibly used once, in 2001.

4.4.17 Tom's House

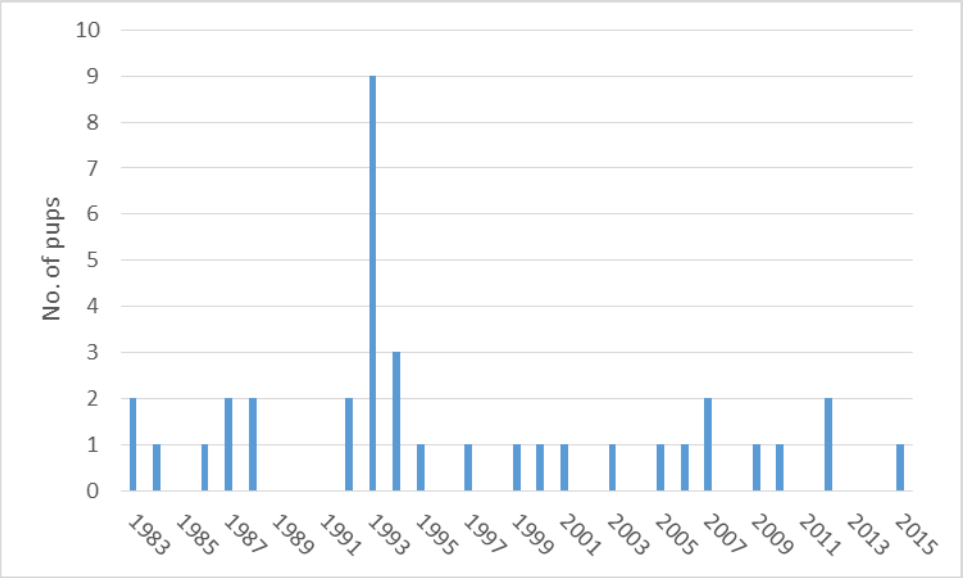
No pups were born at Tom's House in 2015. The site has only been used once, in 1997, when a single pup was born.

4.4.18 Pigstone Bay

Pigstone Bay is the only site on Skomer which is almost impossible to monitor. There is a boulder beach (a part of which is visible) where it has been thought pups were occasionally born. However, there is a sea cave, which is impossible to access from land, which seems to be the source of pups found on the beach, presumably having been washed out during spring tides/storms. The cave was entered by boat in 1985 and found to end in a shingle beach which held about a dozen hauled out seals and it was considered the cave could be an important pupping site (ALEXANDER & ALEXANDER, 1987). Any pups that are found at Pigstone Bay are rarely seen again and are usually assumed to have died, although it is equally possible they could have just swum back to the cave or to some other spot around the island.

In 2015 we managed to visit this site nearly daily from the end of August to the end of October. One pup was born at Pigstone Bay in week 42 and was attended by its mother until it was seven days old, when it disappeared <size 3. The survival rate for this site is therefore 0%.

Figure 32 Number of seal pups born in Pigstone Bay 1983-2015



4.4.19 The Garland Stone

The Garland Stone was visited nearly daily between mid-August and the end of October during low tide to count the seal haul-out. On 3/9 a seal pup was found opposite the Garland Stone on the main island lying on a rocky slope. Although the site seemed less than ideal the pup weaned there and was last seen, a healthy size 3.5, at 20 days of age. This pup's success story was very popular with Skomer Blog followers and nearly 800 readers viewed the post (see http://skomerisland.blogspot.de/2015/10/the-trials-of-life.html).

Plate 6 Pup 16 opposite the Garland Stone on a rocky ledge

Plate 7 Pup 16 was regularly washed off the cliff at high tide (13/9)

Plate 8 Pup 16 and its mother withstanding the elements on 13/9

On 4/9 another pup was observed at the Garland Stone, this time actually on the rock. On 6/9 it was once again seen but this time on Payne's Ledge. Unfortunately this was the last time it was seen and so was not thought to have survived.

Plate 9 Pup 18 on the Garland Stone on 4/9

Plate 10 Pup 18 on Payne's Ledge 6/9

Before 2015 the site had only been used twice before, in 2001 (in spring) and in 2007, when single pups were born.

4.4.20 The Mew Stone

For the first time since monitoring began a seal pup was observed at the Mew Stone. It is unknown whether it had actually been born on/around the Mew Stone and was seen floating dead in the water, size 1. It looked new born and it hadn't been in the water for long as it was still intact.

4.5 Movements

During 2015 eleven marked pups were recorded making movements between beaches on Skomer.

According to BOYLE, D (2012) movements of pups between beaches usually occur during periods of strong winds and spring tides and are presumably a result of pups running out of dry land on their natal beach and then swimming to the nearest available dry site. However pups seem to move frequently between Seal Hole, Driftwood Bay and South Haven and also between North Haven main beach and North Haven slip irrespective of tides.

Table 22 Movements of marked pups on Skomer Island in 2015

Natal Site	**Pup No.**	**Destination**	**Age** (on arrival at destination)	**Pup condition** (when last seen)	**Comments**
SHO	31	CBY	7	2	Got separated from mother and starved
SHV	35	DWB	4	3.5	Weaned on DWB
DWB	63	SHV	21	3.5	Weaned on SHV
SHV	70	DWB	8	3.5	Started moult on DWB
MWK	101	CBY,NHV(S)	20,27	2	Moulted but was in bad condition and had seeping wounds
SHV	145	DWB	18	3	Weaned on DWB
SSC	162	HCB	20	3	Weaned on HCB
SBS	187	SHV	11	3	Weaned on SHV
SHV	189	DWB	6	3	Weaned on DWB
NHV	193	RAMSEY	8	4	Weaned on Ramsey
SHV	232	DWB	4	3.5	Assumed survived

The most spectacular movement was undertaken by pup 139 which was born on North Haven main beach on 22/10 and marked on 25/10 with black and purple dots. It was well attended by its mother but disappeared during rough weather on 28/10. Two days later we heard from the Ramsey Wardens (Greg and Lisa Morgan) that it had turned up on Ramsey together with its mother. Here it moulted successfully and was last seen as a weaner on 16/11.

Plate 11 Pup 193 new born on Skomer on 22/10/15

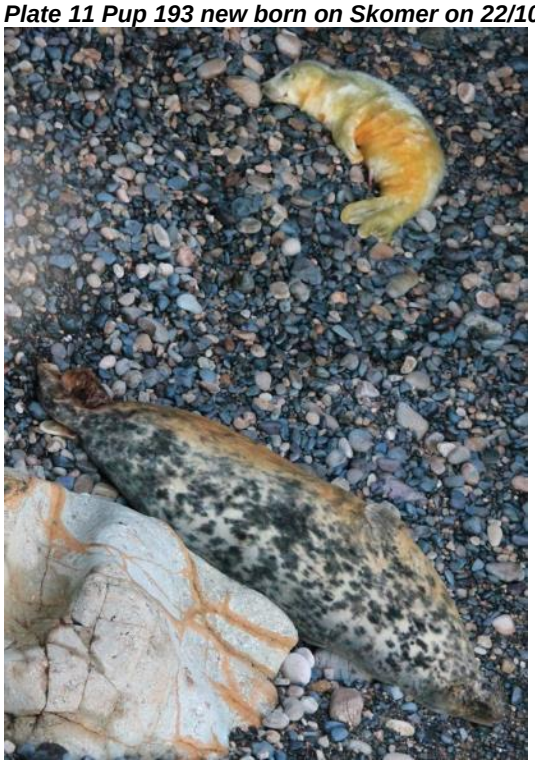


Plate 12 Pup 193 on Ramsey, nine days old

Plate 13 Pup 193 starting to moult on 10/11

Plate 14 Pup 139 moulted and weaned on 16/11

4.6 Wanderers

Six pups were recorded as wanderers. These are pups which turn up unaccompanied by their mothers, either moulting or just before the start of moult, and where their natal beach is unknown. Large wandering pups usually finish moult once they have established themselves on a beach whereas the smaller ones (presumably abandoned or separated) usually disappear within days.

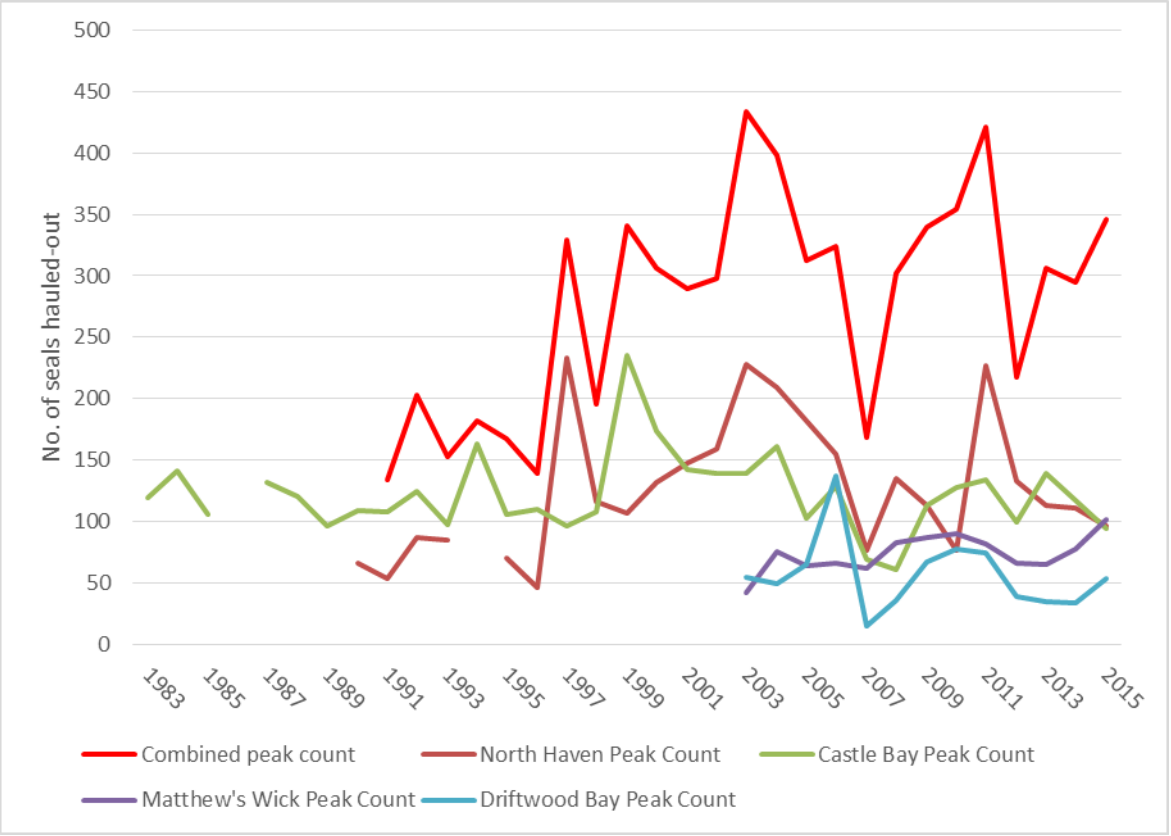
The appearance of wandering (unknown) pups is most likely linked with storm and spring tide events. No wandering pups had been noted before the last week of October and five of the six wandering pups appeared in November once the weather had deteriorated.

5. Haul-outs in 2015

In 2015 the maximum haul-out of 360 animals was recorded on 16/11 on exactly the same day as the 2014 maximum haul-out of 300 animals. The average maximum haul-out on the main haul-out sites for the last ten years is 304, hence the number of seals using Skomer to haul-out in 2015 was higher than the ten year average. Interestingly, the maximum haul-outs at North Haven and Castle Bay was lower than in the last four and six years respectively, but the maximum haul-out on Mathew's Wick was the highest ever recorded.

All main haul-out beaches (Mathew's Wick, North Haven, Castle Bay and Driftwood Bay) had their peak haul-out count on 16/11.

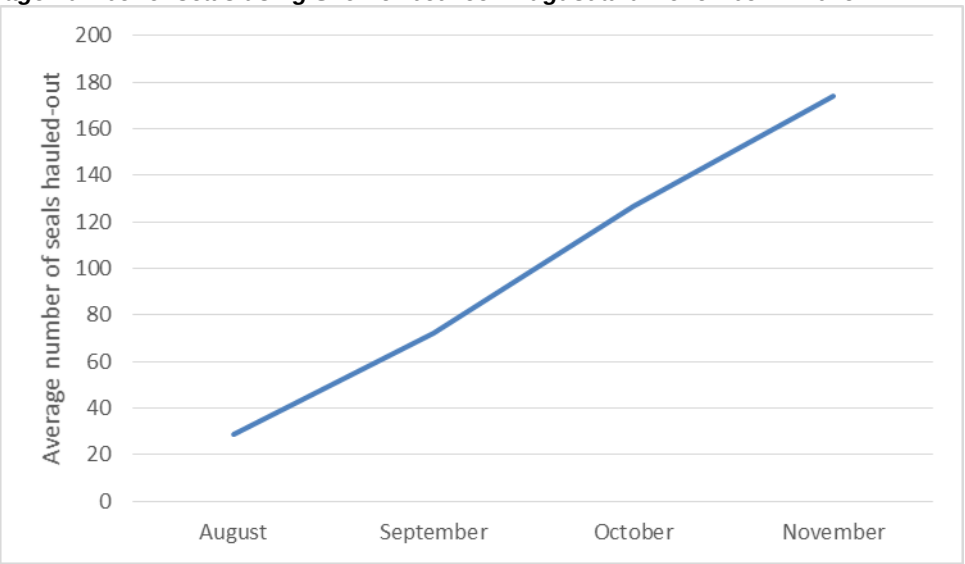
Figure 33 Peak haul-out counts on Skomer Island 1983-2015



For haul-out details see 2015 Haul-out Raw Data file.

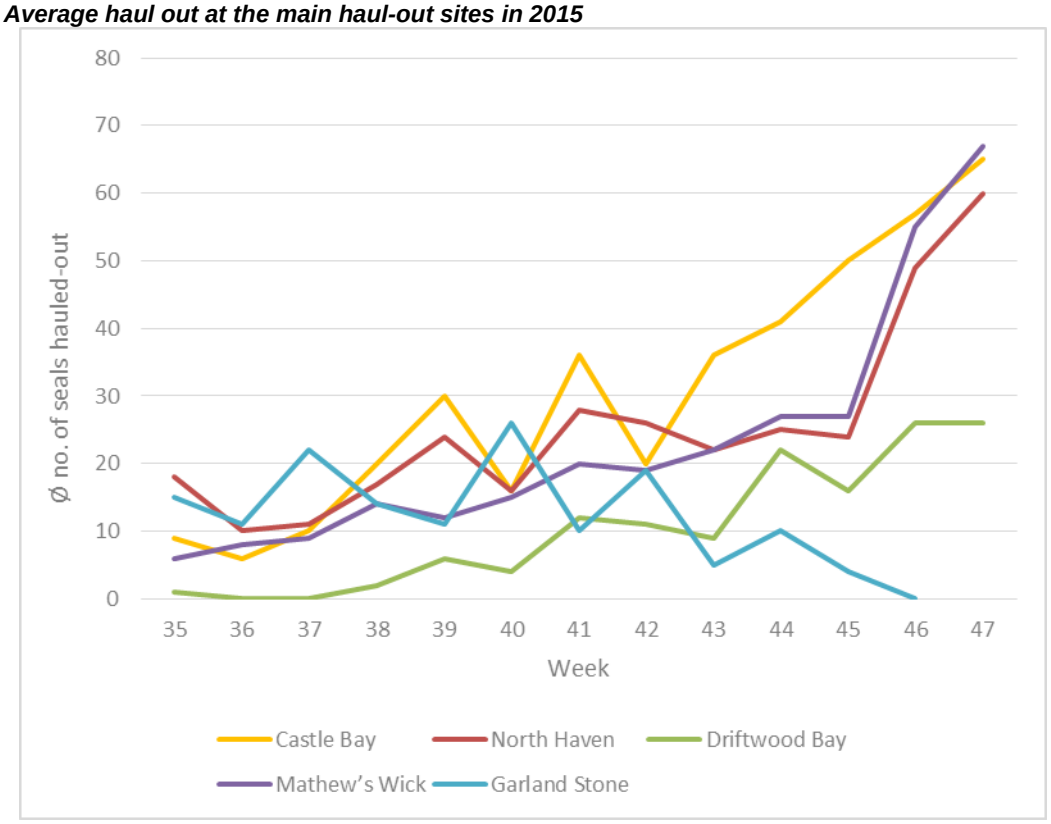
As in previous years an attempt was made to cover all beaches suitable for hauling-out simultaneously during low tide in order to establish how many seals are actually using Skomer on a daily basis.

Figure 34 Average number of seals using Skomer between August and November in 2015.



When looking at the average number of seals hauled-out per site, Castle Bay (including Shag Rock) and Mathew's Wick were the most popular haul-out sites. The most popular beaches in 2014 were North Haven and Castle Bay. North Haven (incl. Rye Rocks) was the third most popular haul-out site followed by the Garland Stone, Driftwood Bay and The Wick. The number of seals hauled-out per site varies significantly from day to day and is most likely determined by weather conditions. For example the Garland Stone became completely unsuitable in November due to strong westerly winds.

Figure 35 Average haul out at the main haul-out sites in 2015



Note: The Garland Stone was not counted in week 47.

Figure 36 North Haven haul-out in 2015

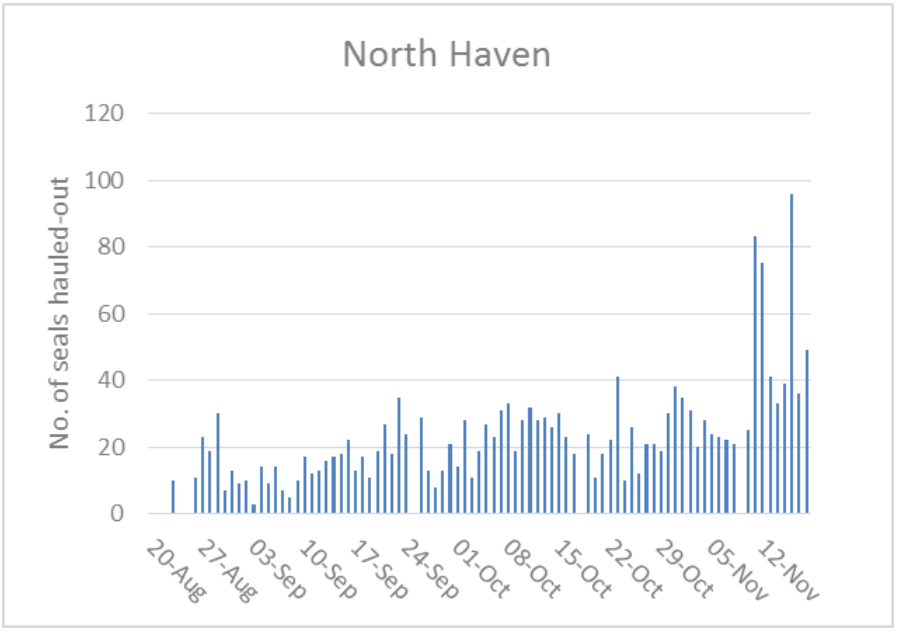


Figure 37 Castle Bay haul-out in 2015

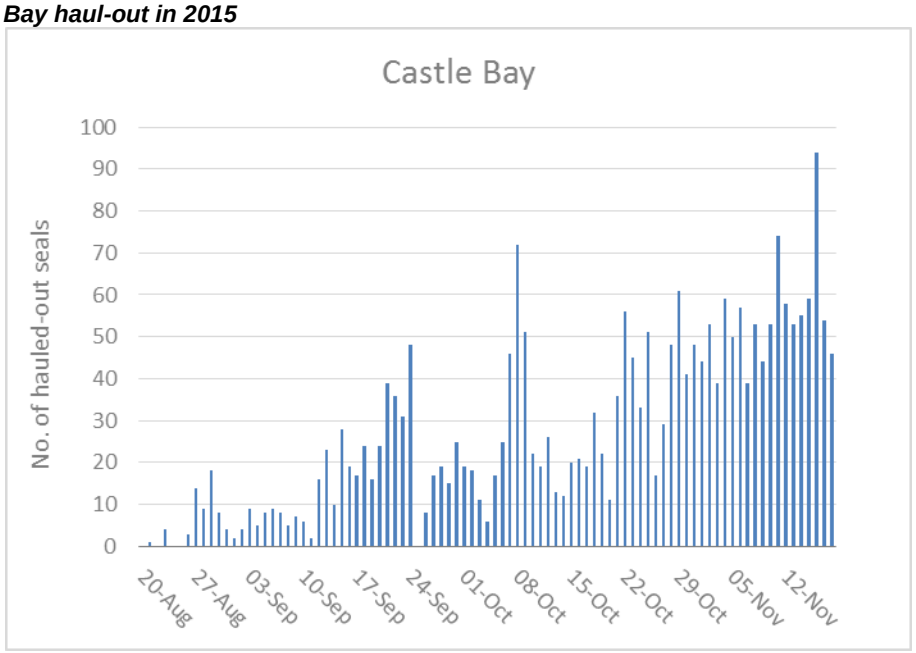


Figure 38 Driftwood Bay haul-out in 2015

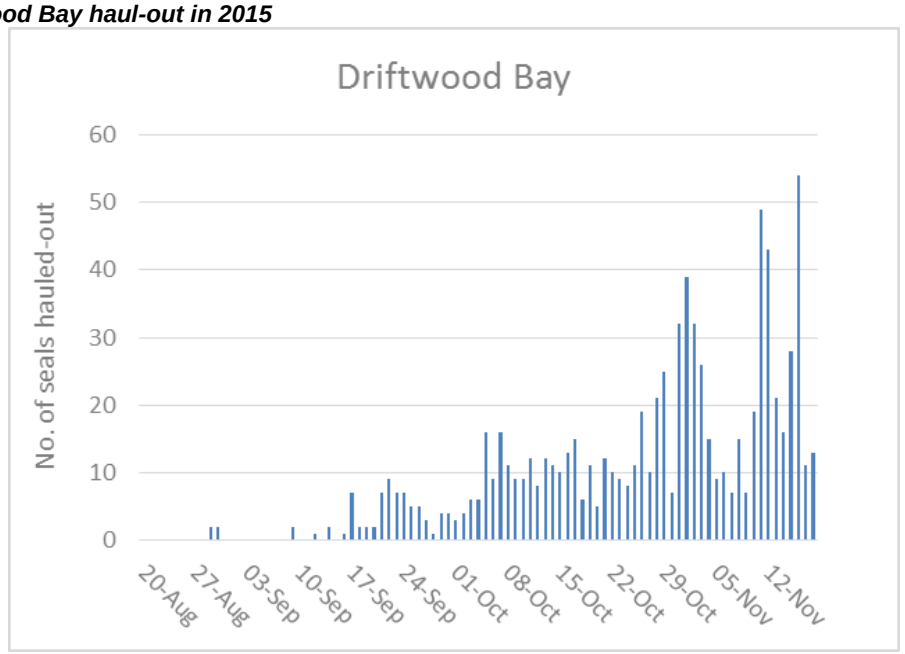


Figure 39 Mathew's Wick haul-out in 2015

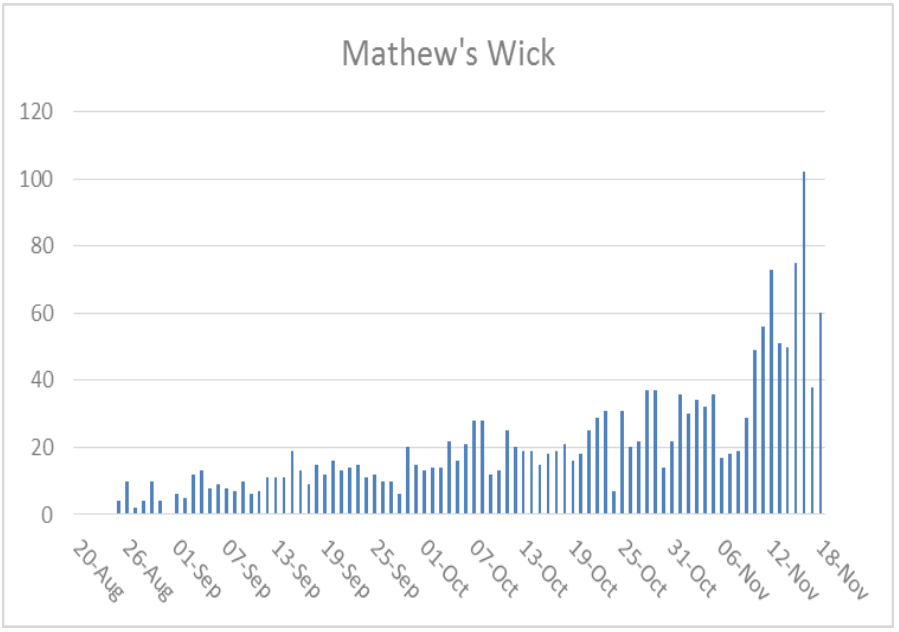


Figure 40 Garland Stone 2015

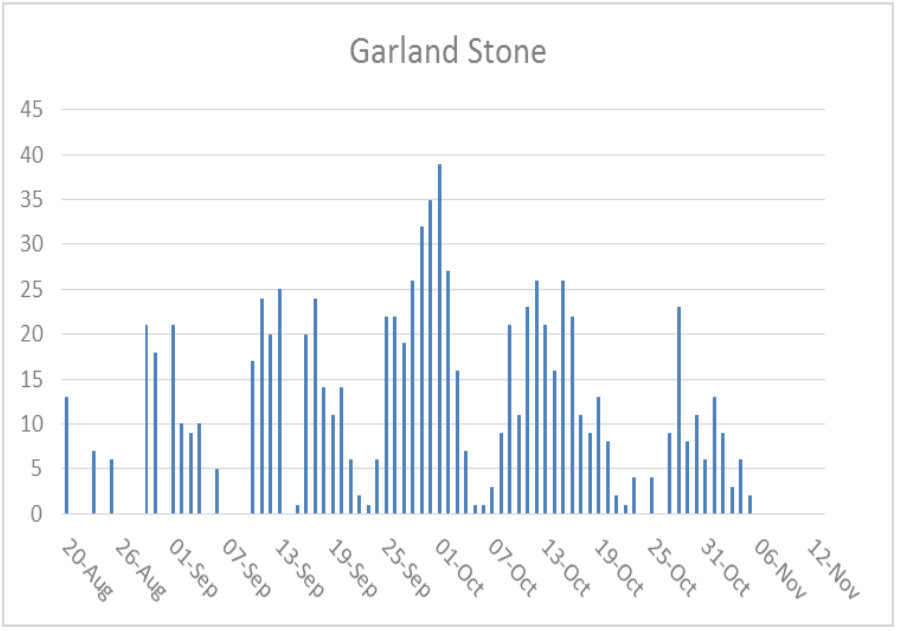
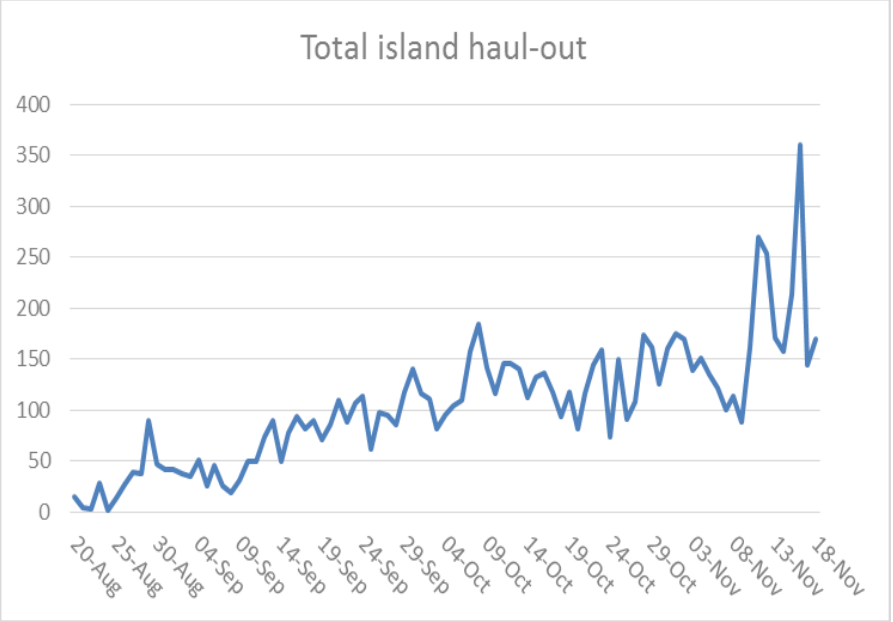


Figure 41 Total island haul-out counts in 2015



6. Pollution

6.1 Netting

Monofilament line and netting were the most obvious pollutants affecting seals. In 2015 27 different cows and three bulls were photographed with obvious signs of being entangled in nets at some time in their lives, most commonly a deep scar around their necks, often with netting still embedded.

In 2015 we photographed nine animals with scars caused by netting, which were known from previous years.

NK-058
NK-020
14.SC-NK-109.MWK
NK-055
13.SC-NK-073.CBY
NK-073
14.SB-NK-015.NHV
NK-071
NK-016

For more detailed information on these animals see the raw data file “1994-2015 distinctive seals”.

6.2 Oil/Tar

Skomer’s beaches remain very clean, no pollution by oil or tar was observed in 2015.

7 Disturbance

Between mid-August and the end of November 2015 we observed 14 incidents of disturbance to seals around Skomer Island. We noted all such events in a disturbance log and rated the severity of the disruption to seals: 1= little or no disturbance (e.g. lifting of heads but not leaving beach); 2= Seals enter water in response to perceived threat; 3= major disturbance involving abandonment of pup or similar. We recorded nine incidents of category two disturbance and three of the category one disturbance.

Furthermore we observed that the voluntary no access zones, including South Haven, are either not well known or not considered to be important enough to be respected. On sunny weekends (for example 27/9) up to six boats were anchored in South Haven. Some caused disturbance as they anchored far too close to Driftwood Bay and South Haven beach. Disturbance was caused either by their presence alone or by noise caused by lifting the anchor etc.. Another area of concern are the hauled- out seals on Rye Rocks which regularly get frightened into the water by kayakers, dive boats etc. throughout the entire season.

For details see Appendix 3.

Plate 15 Man in inflatable boat in South Haven disturbing breeding female seals into the water 02/10/15

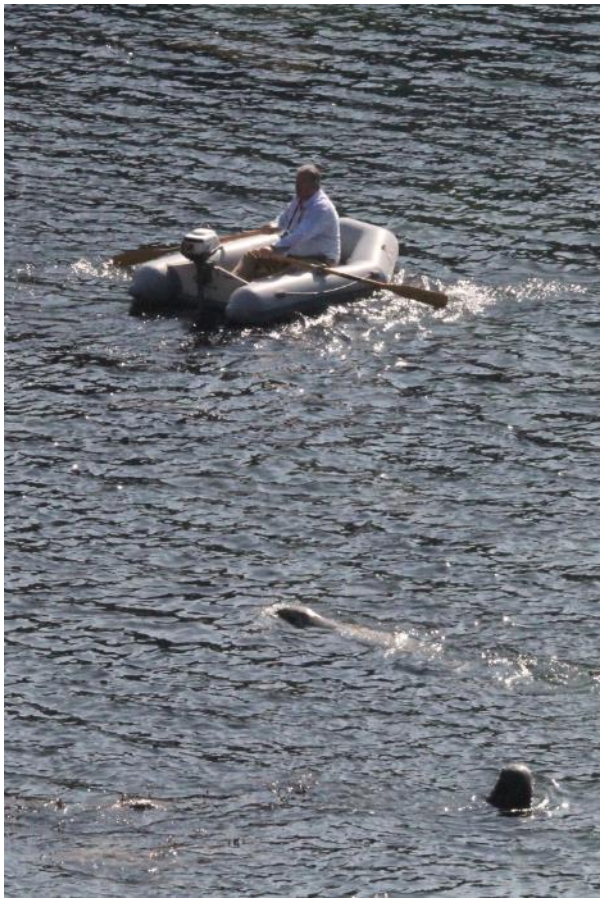


Plate 16 Dive RIB too close to Rye Rocks causing seals to rush into the water on 10/10/15

8. Seal Behaviour

2015 was a quiet season in terms of unusual seal behaviour. A few seals and incidents are noteworthy, for example the struggle for survival by pup 16 and its mother, see section 4.4.19.

Also of interest was mother of pup 39 on South Haven beach. This cow was blind in both eyes but raised her pup successfully. She was very attentive, always stayed within “smelling” distance, and did not leave her pup once until it was weaned.

Plate 17 Mother and pup 39

Pup 174 on Mathew's Wick had two cows which were fighting over the pup regularly. At the same time pup 176 was dying as it had been abandoned. It is speculative to say that one of the cows attending pup 174 was actually mother of pup 176 but not unlikely. Possibly the pup and mother were not able to bond properly and the cow ended up attending a different pup.

Plate 18 pup 174 with arguing mothers

Also see section 4.5.

9. Disease

Although 2015 was very productive season we observed many small and ill-looking weaners. This seems not to be unusual as we experienced the same in 2014.

We observed the usual cases of eye infections among seal pups and one was so severe that the pup died, see section 4.4.4.

Plate 19 Pup 168 with eye infection

Pup 33 in Amy's Reach had lots of little sore patches which were bleeding and seeping (plate 20). This didn't seem to effect the pup much as it weaned successfully.

Plate 20 Pup 33 with strange skin condition

10. Identification of individual seals

For the eleventh year photographic monitoring of adults continued in 2015 and has now completely replaced the old method of drawing sketches. In 2007 David Boyle developed a catalogue of seal ID photos which has been updated annually and now comprises nearly 800 individual seals and ca. 2500 photos. Identifying seals by matching pictures with the existing catalogue became more and more laborious and a new way of identifying seals was needed especially as the photo work was expanded to the MNR (now MCZ) team (Kate Lock) on the Marloes Peninsula and by surveyors on Ramsey Island (Lisa Morgan) in 2010.

NRW have been developing an EIRPHOT database called the Wales Seal Photo ID database. Photos are entered using head and neck profiles and matched within the database. In 2014 NRW contracted workers and trained volunteers to get as many of the seal ID images onto this database as possible and by March 2015 all existing Pembrokeshire photos (2007 to 2014) had been entered.

Since 2014 only animals with obvious scars have continued to be identified by eye. Photos of unscarred seals get stored in preparation to be entered into the Wales Sea Photo ID database.

In 2015 a total of 2800 photos of seals were taken of which 477 have been stored ready to enter the database. 90 seals with obvious scars were identified by eye, of these 43 were re-identified from previous years.

Of the 240 breeding females we managed to photograph 153 (64%) well enough for identification. In October 2015 The Wildlife Trust of South and West Wales purchased, especially for the seal work, one new camera body and two new 400mm lenses. The new equipment will help greatly with the seal identification work in future years.

Of the 90 seals identified by eye

- 43 of them were re-identified from previous photos.
- 47 new seals were photographed and added to the ID catalogues.
- In 2015 the oldest cow to have returned to Skomer was BK-002, the same as last year. She pupped for the first time on Skomer in 2001, then again in 2004 and every year from 2007 onwards.
- The oldest bulls (07.CBY.B01, 07.NHV.B02) to have returned to Skomer were also the same as last year and both were first recorded in 2007.

Table 23 Year of first sighting of seals seen on Skomer Island in 2015

Year	No. of animals first seen on Skomer
2001	1
2002	3
2003	0
2004	2
2005	0
2006	2
2007	5
2008	6
2009	1
2010	3
2011	5
2012	2
2013	7
2014	6
2015	47

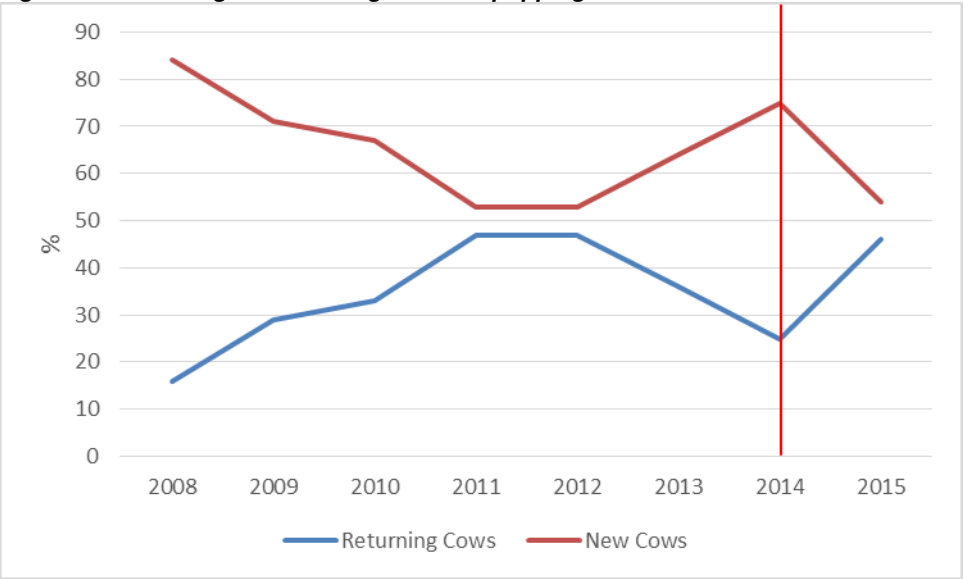
10.1 Breeding Cows Returning In 2015

BOYLE, D (2012) says that the main reason for expanding the seal identification work was to try and learn more about the pupping cows on Skomer Island. He had assumed there was going to be a 'resident' Skomer population which could be largely identified in a few years. In his report for 2012 he stated that 32% of the breeding cows had bred the previous year and that over the five year period, when the majority of breeding cows were photographed, only 47% of the cows had given birth to pups sometime during the previous five years. ALEXANDER, M (2015) suggests that the Skomer MCZ animals are part of a much larger, but ill-defined, mobile population, which can use a range of different areas for breeding and hauling out. It is possible that any or all of the individuals which are part of the Irish Sea and southwest British population could, for certain periods in their lives, spend time in the Skomer MCZ.

Of the 240 cows which pupped on Skomer in 2015, 44 had distinctive markings/scars and were photographed well enough for comparing with the catalogue. 20 matches were found, hence 46% of identifiable breeding cows were returning cows. The percentage of returning cows is much larger than in 2013 (36%) and 2014 (25%). BÜCHE, B and STUBBINGS, E (2014) suggested that in 2014 the low percentage or returning cows might be the result of a decreased sample size as only scarred individuals were identified by eye (photos of unscarred cows being analysed by the extract/compare software). The results of 2015 seem to contradict this assumption as the percentage of returning cows is the second highest since 2008. It seems that the annual variation is the result of a combination of factors such as different photographic equipment, observer skill, weather conditions and most of all unknown dynamics in the seal population.

- Eleven of the 20 matched cows (55%) that pupped on Skomer in 2015 had also pupped in 2014 (60% in 2014, 86% in 2013).
- Six cows (30%) pupped on Skomer in three consecutive years (40% in 2014, 48% in 2013).
- Four cows pupped on Skomer in five consecutive years and two in six.
- One cow (BK-002) has pupped every year on Skomer since 2007. She was first recorded with a pup in 2001 thus is also the oldest pupping cow of the 2015 season.

Figure 42 Percentage of returning and new pupping cows on Skomer Island 2008-2015



— Change in methodology (only scarred seals identified by eye).

2015 was an interesting year as nine (45%) of the 20 returning cows had not been seen in 2014 or 2013; either they had not bred, had bred elsewhere or had not been detected. In 2014 only four (29%) of the 15 returning cows had not been seen in the previous two years.

10.1.2 Site fidelity

- Of the eleven cows that pupped on Skomer in both 2015 and 2014, five (45%) returned to pup at the same site (78% in 2014, 67% in 2013).
- Of the six cows that pupped on Skomer in three consecutive years 2013-2015, three (40%) used the same site in all three years (67% in 2014, 70% in 2013).
- In 2015 BK-002 pupped on Castle Bay for the fifth year in row.
- 07.C114.SHV was the most site faithful cow in 2015. She pupped on South Haven for the seventh time (in non-consecutive years)

This year's data shows once again, that there are cows which have preferred pupping sites but most animals are not site faithful and have the ability to switch between sites, possibly influenced by weather conditions and competition. It also seems likely that cows use different sites on Skomer but also that they migrate to other beaches within the Skomer MCZ or travel even further.

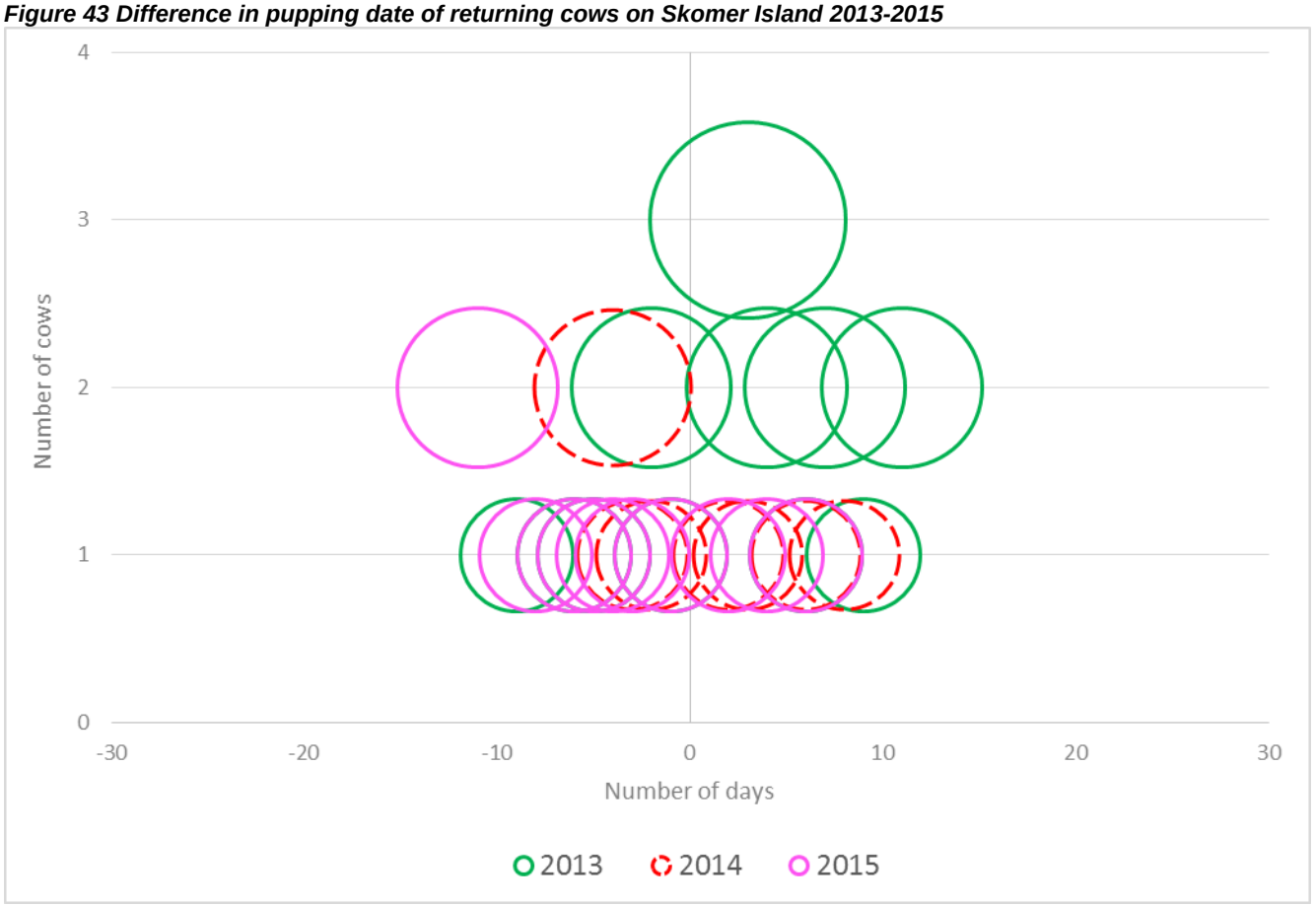
11.1.3 Pupping date

Table 24 Pupping date of returning cows on Skomer Island in 2013-2015

	2015	2014	2013	Difference (Days)	Difference (Days)	Average difference
				2015/2014	2014/2013	(Days)
07.C114.SHV	13-Oct	08-Oct	02-Oct	4	6	5
BK-002	09-Sep	07-Sep	09-Sep	2	-2	0
BK-018	1-Sep					
BK-077	5-Oct					
13.SC-BK-178.MWK	11-Nov	05-Nov	09-Nov	6	-4	1
14.SC-BK-160.DWB	10-Oct	18-Oct		-8		-8
14.SC-NK-109.MWK	5-Oct	8-Oct		-3		-3
14.SC-LBK-038.CBY	4-Sep	15-Sep		-11		-11
14.SC-BK-079.SHV	23-Sep	29-Sep		-6		-6
LBK-017	01-Nov					
LBK-030	12-Sep	16-Sep	13-Sep	-4	3	-0.5
LBK-033	26-Aug	06-Sep	29-Aug	-11	8	-1.5
LBK-065	23-Sep	22-Sep	26-Sep	1	-4	-1.5
LS-002	27-Aug					
LS-007	14-Sep					
LS-018	6-Oct					
LS-020	21-Oct	27-Oct		-5		-5
NK-016	2-Sep					
NK-055	10-Oct					
12.C081.SHV	22-Sep					

Due to the small sample size it is difficult to make an accurate statement about the timing of breeding. However, looking at the distribution of the difference in pupping date for the eleven identified cows it seems that 2015 was an early to average year.

Figure 43 Difference in pupping date of returning cows on Skomer Island 2013-2015



For pupping site fidelity and pupping date details see “2015 Returning Cows Raw Data” file.

10.2 Returning Bulls

19 bulls were identified in 2015, of which eight had been recorded previously on Skomer.

11. Skomer Seals Seen Elsewhere

In 2015 we took photos of three tagged seals, one was an immature which had been tagged by Oceanopolis in Brest France. The other tagged seals were a breeding female and an immature. At the time of writing we are still awaiting further information about all of the tagged seals seen on Skomer in 2015.

Plate 21 Tagged immature from France hauled-out in North Haven

We have had two reports of “Skomer” seals on Ramsey: NK-033 pupped on 5/10 2015 on Ramsey's main pupping beach Aber Mawr.
LBK-021 pupped on Ramsey at Aber Felin on 2/10/12 and 1/10/14 but hadn’t been seen in 2015.

Also see section 4.5

No further matches were available at time of writing.

Acknowledgments

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Appendix 1 SMRU Age classification of pups

I –first day or two after birth, fresh pink umbilicus, poor coordination, ribs visible, white coat stained yellow

II- usually days 3-9, white coat, ribs less prominent early on, good coordination

III- usually days 10+, white coat (although dark marks around head/flips may be visible), noticeably fat – abdomen rounded out

IV- usually days 14+, some white coat, but moulting

V- anytime from day 16+, no white coat left, fully moulted.

Appendix 2 Key

Fate:

SBM	Known to have survived to the onset of moult
SW	Known to have survived and weaned
D	Known to have died
ASM	Assumed to have survived to the onset of moult
AD	Assumed to have died

Birth Sites:

AMR	Amy's Reach
BAS	The Basin
CBY	Castle Bay
DWB	Driftwood Bay
GST	Garland Stone
HCB	High Cliff Boulders
LTN	The Lantern
MWK	Matthew's Wick
NHV	North Haven
NHV(S)	North Haven Slip
NHV(SC)	North Haven Slip Cave
MST	Mew Stone
PSB	Pigstone Bay
SBS	The Slabs
SCBC	South Castle Beach Cave
SHO	Seal Hole
SHV	South Haven
SHV(C)	South Haven Cave
SHV (CKI)	South Haven (Captain Kites Inlet)
SSC	South Stream Cave
WCK	The Wick

Condition at Onset of Moult:

1	Very Small	Assumed not to have survived long after moult
2	Small, but healthy	In good condition, should have a reasonable chance of survival
3	Good Size	Most should survive
4	Very good size	All should survive
5	Super-moulter	An exceptionally sized pup

Appendix 3 Disturbance Log

Date	**Details**	**Level of disturbance**
30/08/15	12:30h Crazy Frog dive RIB drove past Rye Rocks without any reason, disturbed hauled-out seals and then went and moored on visitor buoy. Footage available	2
30/08/15	15:00h Three people in tiny rubber inflatable and one lady in kayak went right up to Rye Rocks and disturbed seal haul-out	2
31/08/15	15:00h Dive boat Kitty Socks with 5 people on board was very close to the mouth of Amy's Reach and South Castle, no direct disturbance observed but seal mother on CBY kept looking up	1
01/09/15	15:15 Man on SHV beach with dog. Went back to his yacht Bright Star once spoken to. No direct disturbance observed but one seal was keeping a close eye on them from the water, pos. mother of pup 8.	1
04/09/15	16:10 Two men in a row boat tried to land on SHV beach, I called to them and they left	1
06/09/15	Dive boat predator close to mouth of Mathew's Wick, drove up to seal bull in water which got agitated and splashed away, pictures available	2
27/09/15	Yacht approaching SHV scared off all females, 15 min later Motorboat lifting anchor disturbed all females off beach again	2
27/09/15	RIB and a kayak disturbed seals on Rye Rocks	2
02/10/15	Man in dinghy was right up against beach, all females in water swimming around him and splashing, photo available	2
10/10/15	Dive RIB a bit too close to Rye Rocks around low tide, disturbing 3-4 seals off rocks	2
13/10/15	Yacht Kalel disturbed seals in SHV when lifting anchor	2
17/10/15	6 yachts in SHV. A man off one went swimming in SHV with seals and a woman and girl rowed around in a dinghy	2
01/11/15	RIB with 6 people on board came into North Haven to look at seals on Main Beach, spoke to them to make them aware of the voluntary no access zones during the seal season, seems the skipper didn’t know anything about it and questioned why there were so many boats anchored in South Haven if you weren't really supposed to.	1

Level of disturbance
1= little or no disturbance (lifting of heads)
2= seals enter water in response to perceived threat
3= major disturbance involving abandonment of pup or similar

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