Cyfoeth Naturiol Cymru
Natural Resources Wales

Grey Seal Breeding Census Skomer Island 2018

Birgitta Büche and Edward Stubbings
The Wildlife Trust of South and West Wales

NRW Evidence Report 352

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Summary

250 pups were monitored on Skomer Island in 2018, of which 241 were definitely born on Skomer and nine pups turned up either just before the start of moult, or moulting (wanderers).

The total of 241 pups born on Skomer Island is the highest total ever recorded with 240 (in 2015) being the second highest total.

A total of 395 pups were born within the Skomer Marine Conservation Zone, of which 154 were born on the Marloes Peninsula. See section 4.2.

The busiest period was one week earlier than in the previous year. This year the busiest week was week 38 (17/9/18-23/9/18) with 51 pups born. See section 4.2.

The most productive beaches were Matthew's Wick (51 pups), South Haven (48 pups) and North Haven (40 pups). The fourth most popular beach was Driftwood Bay (23 pups). See section 4.2.

One hundred eighty-one pups are known, or assumed, to have survived on Skomer (the fate of six pups is unknown), giving a survival rate of 77%. See section 4.3.

In 2018 the maximum haul-out (on the main haul-out sites) of 319 animals was recorded on 13 November 2018, 25 days later than in the previous year. This is 14 more than last year's maximum count. See section 5.

In 2018 27 animals (17 females, three males and seven immature) were photographed with obvious signs of being entangled in nets at some time in their lives. See section 6.

Between 1 August and 22 November 2018 13 incidents of disturbance to seals around Skomer Island were observed and six incidents of vessels entering the voluntary no access zones recorded. See section 7 and Appendix 3 and 4.

A total of 305 photos were taken which will be entered into the NRW Wales Seal ID database. Ninety-nine seals with obvious scars were identified by eye, of these 42 were re-identified from previous years. See section 10.

Crynodeb

Cafodd 250 o forloi bach eu monitro ar Ynys Sgomer yn 2018, gyda 241 ohonynt wedi cael eu geni ar Sgomer a 9 morlo ifanc wedi dod i'r golwg naill ai cyn dechrau bwrw blew, neu yn ystod y cyfnod bwrw (crwydriaid).

241 yw'r swm uchaf erioed sydd wedi'i gofnodi o forloi ifanc i gael eu geni ar Ynys Sgomer, gyda 240 (yn 2015) yn ail agos.

Cafodd cyfanswm o 395 morlo ifanc eu geni yn Ardal Gadwraeth Forol Sgomer, a ganwyd 154 o'r rheiny ar Benrhyn Marloes. Gweler adran 4.2.

Roedd y cyfnod prysuraf wythnos yn gynt na'r llynedd. Eleni, yr wythnos brysuraf oedd wythnos 38 (17/9/18-23/9/18) gyda 51 o forloi yn cael eu geni. Gweler adran 4.2.

Y traethau mwyaf cynhyrchiol oedd Matthew's Wick (51 morlo ifanc), South Haven (48 morlo ifanc) a North Haven (40 morlo ifanc). Y pedwerydd traeth ar y rhestr oedd Driftwood Bay (23 morlo ifanc). Gweler adran 4.2.

Rydym yn gwybod, neu'n tybio, fod 181 o forloi ifanc wedi goroesi ar Sgomer (gyda thynged 6 morlo ifanc yn anhysbys), sy'n rhoi cyfradd byw o 77%. Gweler adran 4.3.

Yn 2018, y mwyafrif a gofnodwyd oedd 319 o anifeiliaid yn gorwedd ar lan y môr (ar y prif safleoedd gorwedd) ar 13 Tachwedd 2018, 25 diwrnod yn hwyrach na'r flwyddyn flaenorol. Mae hefyd 14 yn fwy na mwyafrif y llynedd. Gweler adran 5.

Yn 2018, tynnwyd llun 27 anifail (17 benyw, 3 gwryw a 7 ifanc) gydag arwyddion amlwg eu bod yn sownd mewn rhwydi ar ryw gyfnod yn eu bywydau. Gweler adran 6.

Rhwng 1 Awst a 22 Tachwedd 2018, sylwyd ar 13 achos o aflonyddu ar y morloi o gwmpas Ynys Sgomer a chofnodwyd chwe achos o gychod yn mynd i mewn i'r ardal dim mynediad gwirfoddol. Gweler adran 7 ac Atodiad 3 a 4.

Tynnwyd cyfanswm o 305 o luniau, a fydd yn cael eu mewnbynnu i gronfa ddata adnabod Morloi Cymru CNC . Cafodd 99 o forloi gyda chreithiau amlwg eu hadnabod trwy olwg, gyda 42 o'r rhain wedi'u hail-adnabod ers blynyddoedd blaenorol. Gweler adran 10.

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Between 30 July and 22 November 2018 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 Grey Seal Management Plan (Alexander, 2015), with revisions made regarding access to some sites (Nathan, 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 30 July and 22 November 2018 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 Grey Seal Management Plan (Alexander 2015).

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. The main island sites (High Cliff Boulders, The Basin, The Wick, Pig Stone Bay, The Garland Stone and South Stream Cave) were also checked regularly, approximately every four days. The Wick and South Stream Cave were checked more regularly during the peak pupping season.

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

Due to access difficulties, some of the main cave sites (The Lantern, Seal Hole and South Castle Beach Cave) were checked whenever conditions allowed. Entry to these 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 the SMRU five-stage age classification system (see appendix 1).

Sites were visited when necessary to mark pups. This was done in accordance with the Skomer MCZ & Skomer Island NNR Grey Seal Management Plan (Alexander, 2015), 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 every effort was made to keep disturbance 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 beginning of moult, unless they were in poor condition (Hewer, 1974). If a pup disappeared before the beginning of moult an individual assessment was made on its likelihood to have survived based on the above criteria. Pups ≥ size 3 were assumed successful, whereas pups smaller than size 3 were assumed unsuccessful.

4. Census Results

4.1 General

250 pups were monitored on Skomer Island in 2018, of which 241 were definitely born on Skomer and nine pups turned up either just before the start of moult, or moulting (wanderers).

The total of 241 pups born on Skomer Island is the highest total ever recorded with 240 (in 2015) being the second highest total.

The first pup of the season was born on Castle Bay on ca 18/7/18. It was found on 30/7/18.

One pup was born in July, 22 in August, 125 in September, 87 in October and six in November. The busiest month therefore was September.

In 2018 the busiest period was one week earlier than in the previous year. This year the busiest week was week 38 (17/9/18-23/9/18) with 51 pups born.

181 pups are known, or assumed, to have survived on Skomer (the fate of six pups is unknown), giving a survival rate of 77%.

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

Plate 1 Skomer Island overview

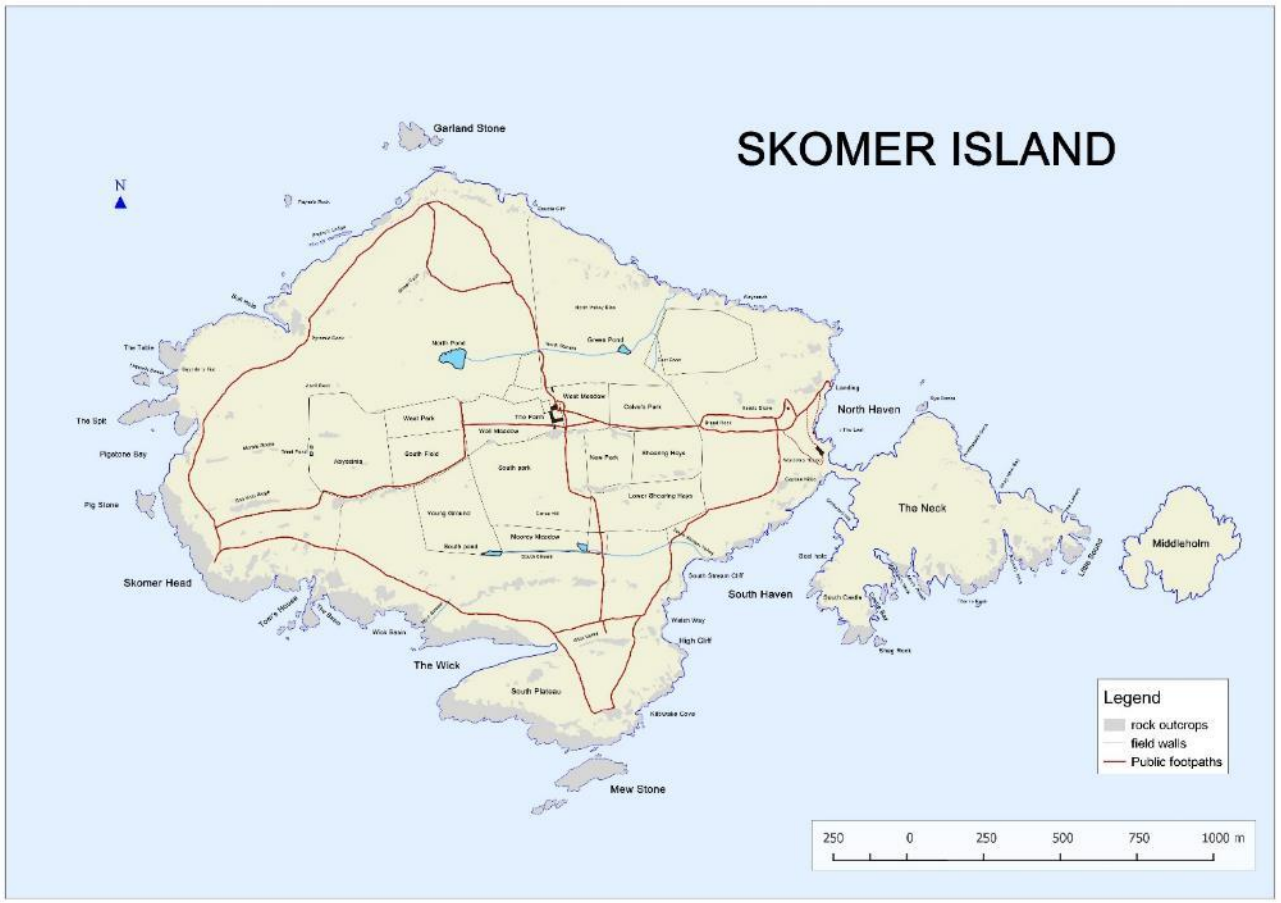


Plate 2 Skomer Island Grey Seal pupping sites East

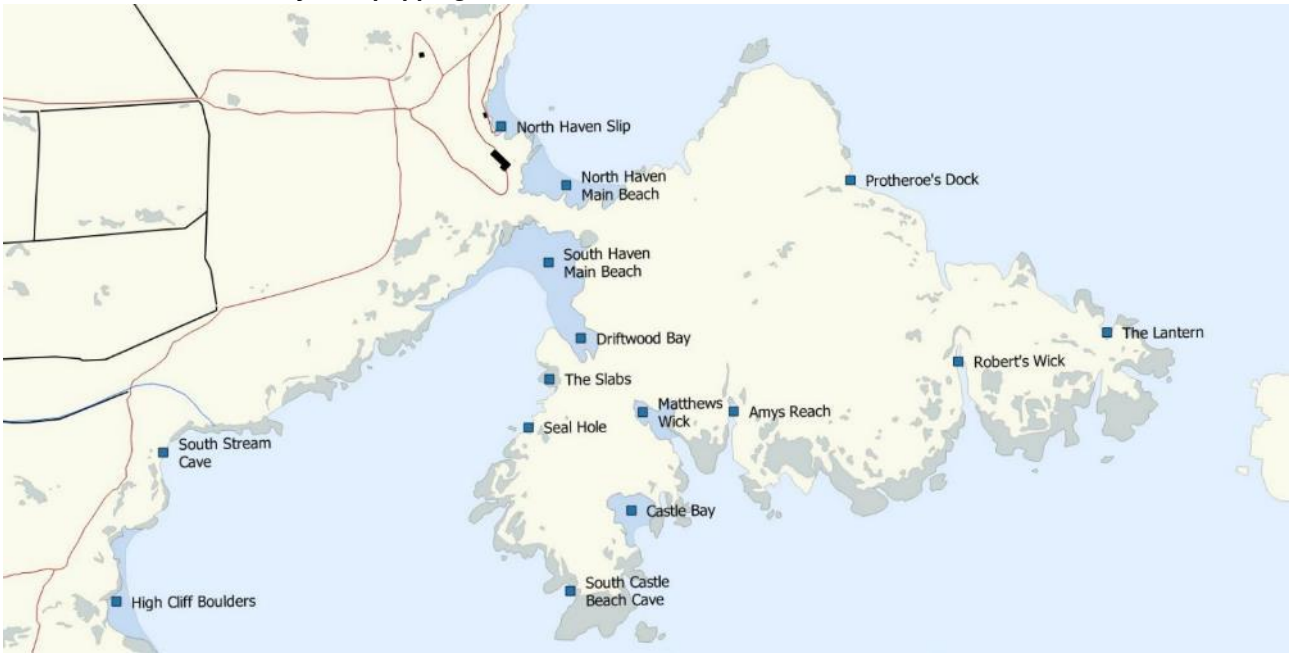


Plate 3 Skomer Island Grey Seal pupping sites West

4.2 Pup Numbers

2018 was an excellent breeding season for the seals within the Skomer Marine Conservation Zone (MCZ) with a total of 395 pups born, twelve more than in the previous record year of 2017. Of the 395 pups born this year 154 were born on the Marloes Peninsula.

On Skomer 250 pups were monitored in 2018. Two hundred and forty-one of them were definitely born on Skomer and nine pups (wanderers) turned up either just before the start of moult, or moulting. These were potentially also born within the Skomer MCZ but not recorded as they may have been born elsewhere or in locations hidden from view.

In 2016 the number of seal pups born on Skomer dipped slightly after two years of exceptional pup numbers. In 2017 the numbers were up again to 225 and in 2018 they reached their new record of 241 pups. The seal pup numbers on the Marloes Peninsula were also good with 154 pups born in 2018, resulting in the highest number of seal births within the whole of the MCZ since records began.

Figure 1 Number of seal pups born in Skomer MCZ 1983-2018

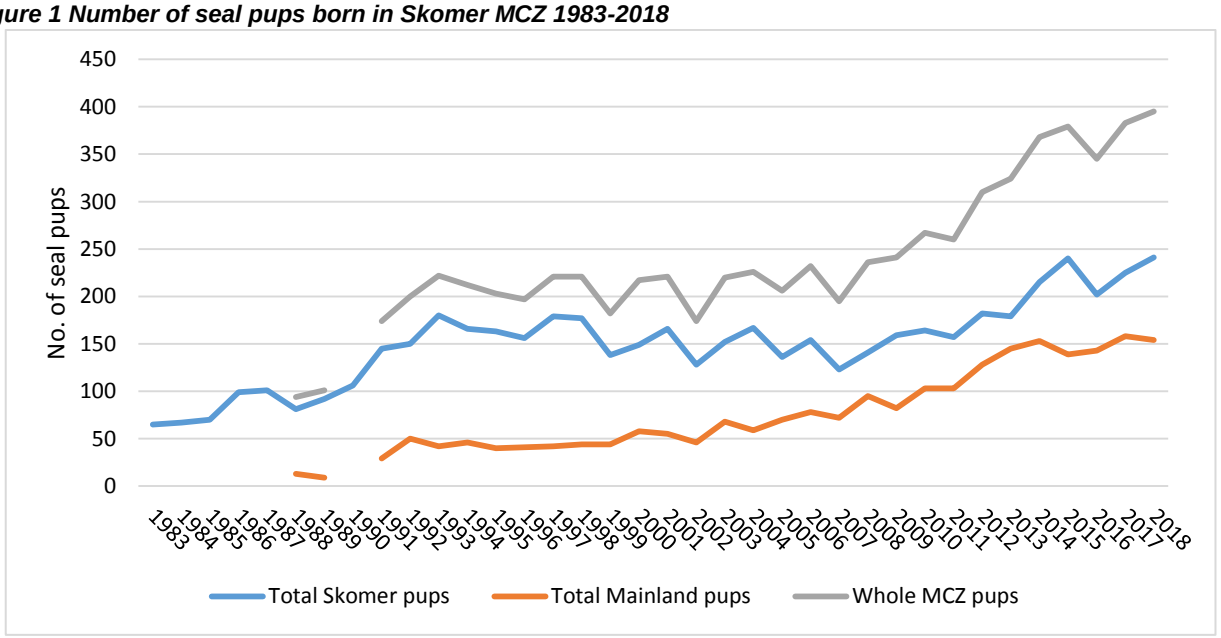


Figure 2 Daily totals of seal pups born on Skomer Island in 2018

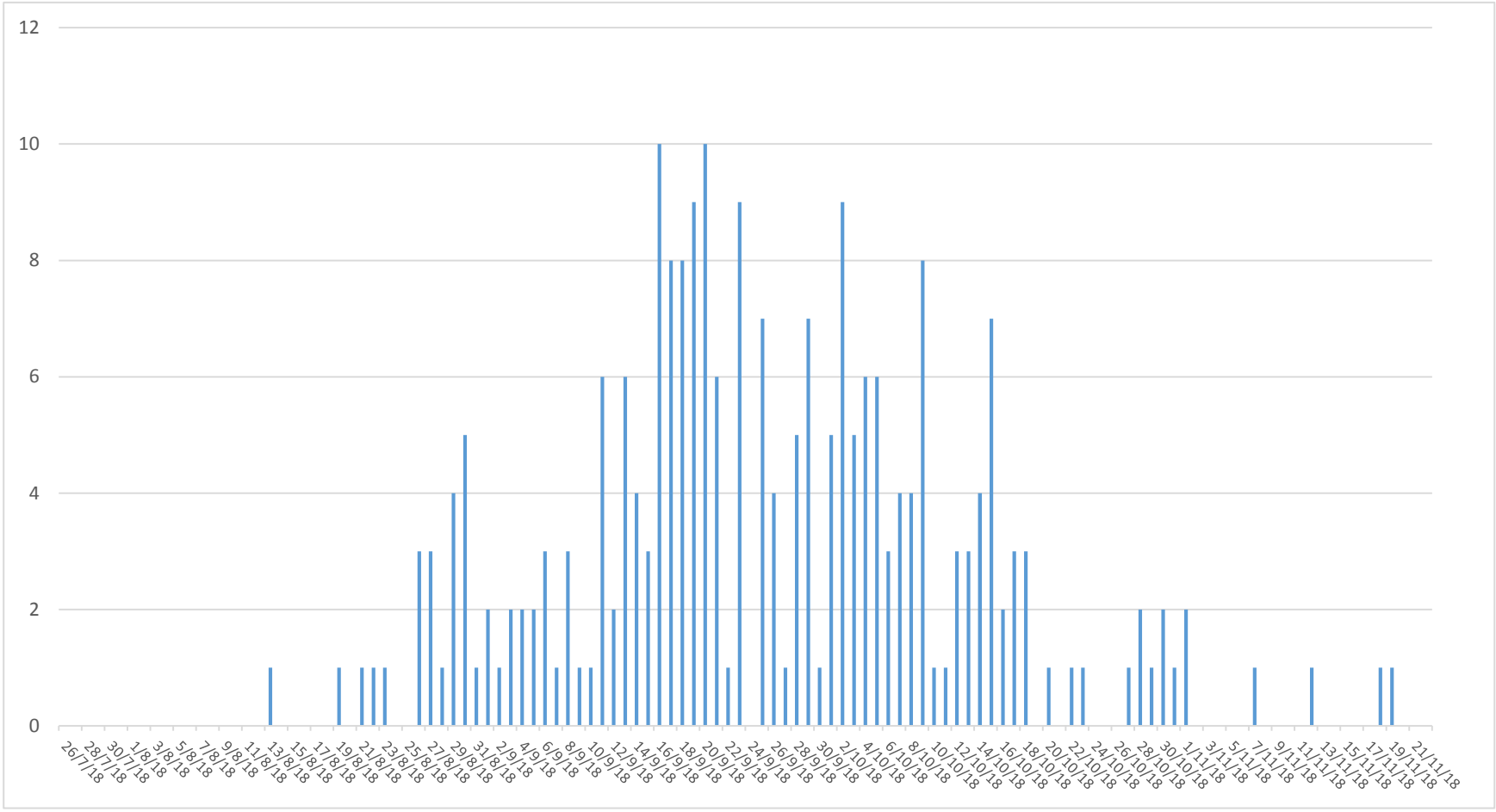


Table 1 Monthly number & percentage of seal pup births on Skomer Island 1983-2018

Year	July	August	September	October	November
2018	1 (0.4%)	22 (9.1%)	125 (51.9%)	87 (36.1%)	6 (2.5%)
2017	2 (0.9%)	12 (5.3%)	146 (64.9%)	57 (25.3%)	8 (3.5%)
2016	0	16 (7.9%)	96 (47.5%)	84 (41.58%)	6 (3.0%)
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%)

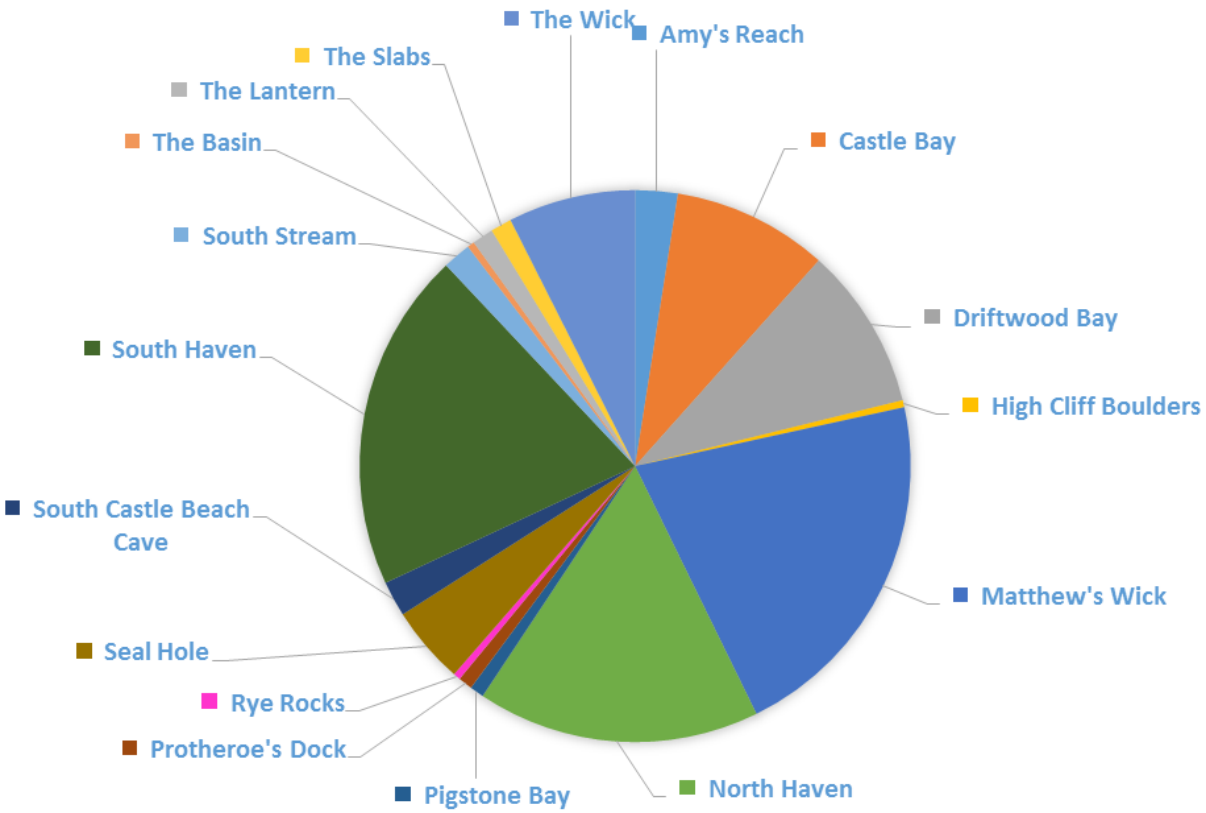
Seal observations continued to mid-December in 1983, 1985 and 1986 and to the end of January in 1984 and 1987. The following data was recorded in these survey years:
1983 Dec: 3 (4%), 1984 Dec: 6 (9%), Jan: 6 (9%). 1985 Dec: 14 (19%), 1986 Dec: 5 (5%), 1987 Dec: 15 (15%), Jan: 5 (5%). From 1989 onwards the survey has only continued up to the end of November, when the island is 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 and these are included in the table, however the full survey, with routine site visits, does not commence till August.

In 2018 the busiest period was one week earlier than in the previous year. This year the busiest week was week 38 (17/9/18-23/9/18) with 51 pups born.

Like in the previous three years the most productive beaches were Matthew's Wick (51 pups), South Haven (48 pups) and North Haven (40 pups). The fourth most popular beach was Driftwood Bay (23 pups).

Figure 3 Percentage of seal pups born at each site on Skomer Island in 2018



4.3 Survival Rate

The fate of 235 pups (of 241 born) is known with relative certainty. Six pups were excluded from the survival rate calculation.

The survival rate is calculated as the total number of pups

a) assumed to have survived (disappeared before beginning of moult (class III), size ≥ 3)
b) survived to beginning of moult (started moult (class IV) but disappeared before completion, in a healthy state)
c) survived and were weaned (finished moult (class V), in a healthy state)

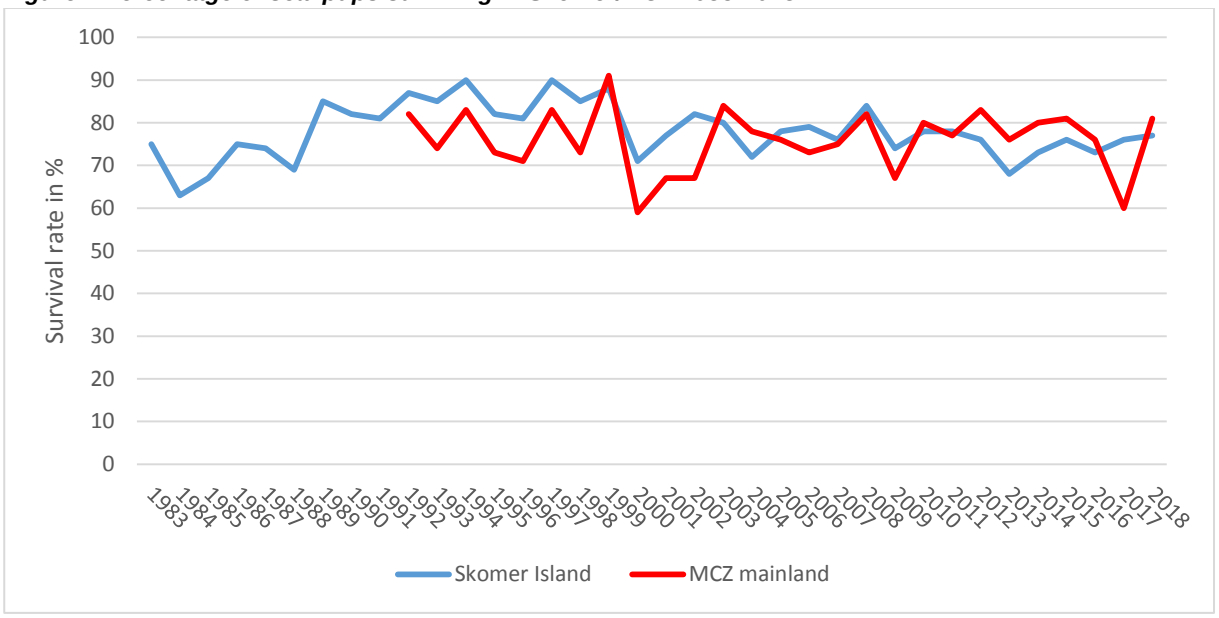
divided by the total number of pups born (where the fate is known).

181 pups are known, or assumed, to have survived on Skomer, giving a survival rate of 77%, which is 1% lower than the average since records began.

On the mainland 124 pups are known, or assumed to have survived, giving a survival rate of 81%.

The overall survival rate for the whole of the Skomer MCZ is 78%

Figure 4 Percentage of seal pups surviving in Skomer/MCZ 1983-2018



Due to a severe storm in 2017 two different survival rates were calculated: one following the standard methodology and one which assumed that pups (class III & IV, size ≥ 3) which disappeared in the storm actually died. The storm methodology survival rate for Skomer was 76% and for the mainland 47%. Note that the graph above only shows the 2017 survival rate calculated the standard way.

Figure 5 Weekly seal pup births and deaths on Skomer Island in 2017 and 2018

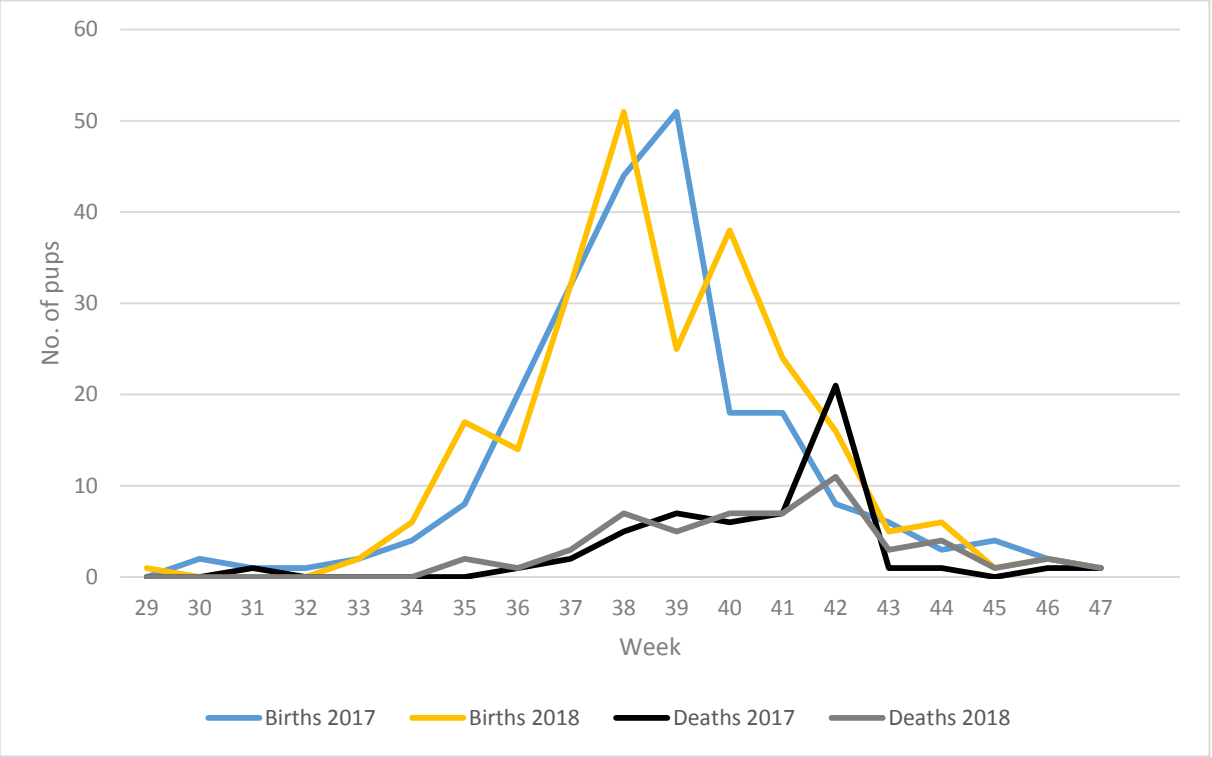


Table 2 Survival rates per site on Skomer Island 2013-2018

Site	Total Number of pups raised per beach (excl. pups whose fate is unknown)						No of pups survived						Survival Rate %					
	2013	2014	2015	2016	2017	2018	2013	2014	2015	2016	2017	2018	2013	2014	2015	2016	2017	2018
Amy's Reach	5	3	8	5	5	6	2	3	6	3	3	5	40	100	75	60	60	83
Castle Bay	21	30	23	16	14	22	14	17	15	9	10	17	67	57	65	56	71	77
Driftwood Bay	21	26	25	21	28	34	18	21	21	15	23	31	72	81	84	71	82	91
Garland Stone	0	26	2	0	0	0	n/a	n/a	1	n/a	n/a	n/a	0	0	50	n/a	n/a	n/a
High Cliff Boulders	4	0	0	0	1	1	4	0	0	0	0	1	100	0	0	n/a	n/a	100
Matthew's Wick	35	41	42	39	42	50	25	32	31	27	31	32	71	78	74	69	74	64
Mew Stone	0	0	1	0	0	0	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a
North Haven	18	24	36	25	41	39	8	19	28	19	31	32	44	79	78	76	76	82
Pigstone Bay	0	0	1	1	1	2	n/a	n/a	0	1	0	1	n/a	n/a	0	100	0	50
Protheroe's Dock	2	1	1	1	3	3	2	1	1	0	3	2	100	100	100	0	100	67
Seal Hole	6	9	9	8	7	9	5	5	5	7	3	7	83	56	56	88	43	78
South Castle Beach Cave	9	4	5	7	4	3	7	4	3	4	4	3	78	100	60	57	100	100
South Haven	34	33	40	44	40	38	21	23	34	27	6	30	72	70	85	61	15	79
South Stream	2	7	9	6	2	4	2	6	7	5	1	2	100	86	78	83	50	50
The Basin	1	4	2	1	2	1	0	4	1	0	2	1		100	50	0	100	100
The Lantern	4	1	1	4	3	2	3	1	1	3	1	2	75	100	100	75	33	100
The Slabs	4	6	8	4	8	3	1	2	5	2	7	2	25	33	63	50	88	67
The Wick	13	22	21	20	23	18	7	17	19	14	17	13	54	77	90	70	74	72

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 for 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 2018

Cause of death	No. of pups	% of deaths	% of total pups born
Abandoned/separated/starved	15	27.78	6.22
Accident/injured/killed	0	0.00	0.00
Disappeared ≤ stage 3	21	38.89	8.71
Diseased	1	1.85	0.41
Drowned	6	11.11	2.49
Stillborn	5	9.26	2.07
Unknown	5	9.26	2.07
Other*	1	1.85	0.41
Total	**54**		

* The female (16.SC-US-117.SHV) that wasn't able to feed her pup in 2016 and 2017 pupped on South Haven beach in 2018 and it seemed she had the same problems feeding her pup as in previous years. The pup didn't seem to put on weight although the female was on the beach attending it. The female has a large scar on her underside which possibly prevents her from suckling her pup.

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 and big tides. The beach is a popular haul-out site and it can become impossible to try and see hidden pups without disturbing hauled out animals. The North Haven site also includes North Haven Slip.

A total of 40 pups were born in North Haven in 2018, one less than in the previous year. The fate of 39 pups is known of which 32 are assumed to have survived to the beginning of moult or were weaned, giving a survival rate of 82%, which is 6% better than last year.

Figure 6 Number of seal pups born in North Haven 1983–2018

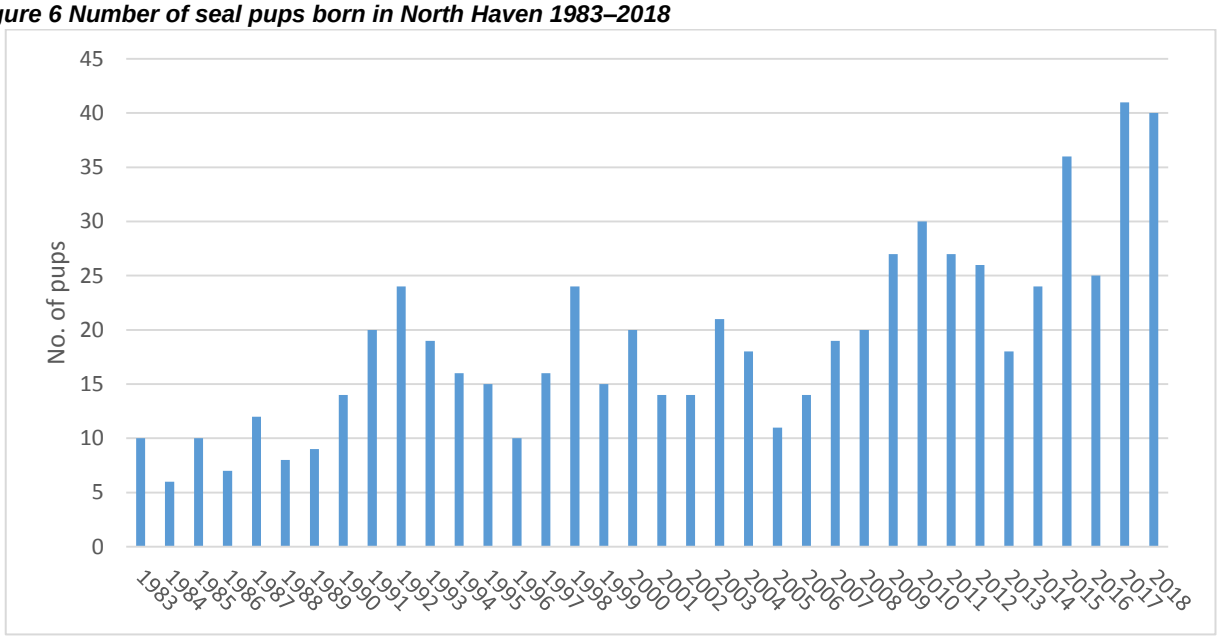


Figure 7 Weekly seal pup births in North Haven in 2018

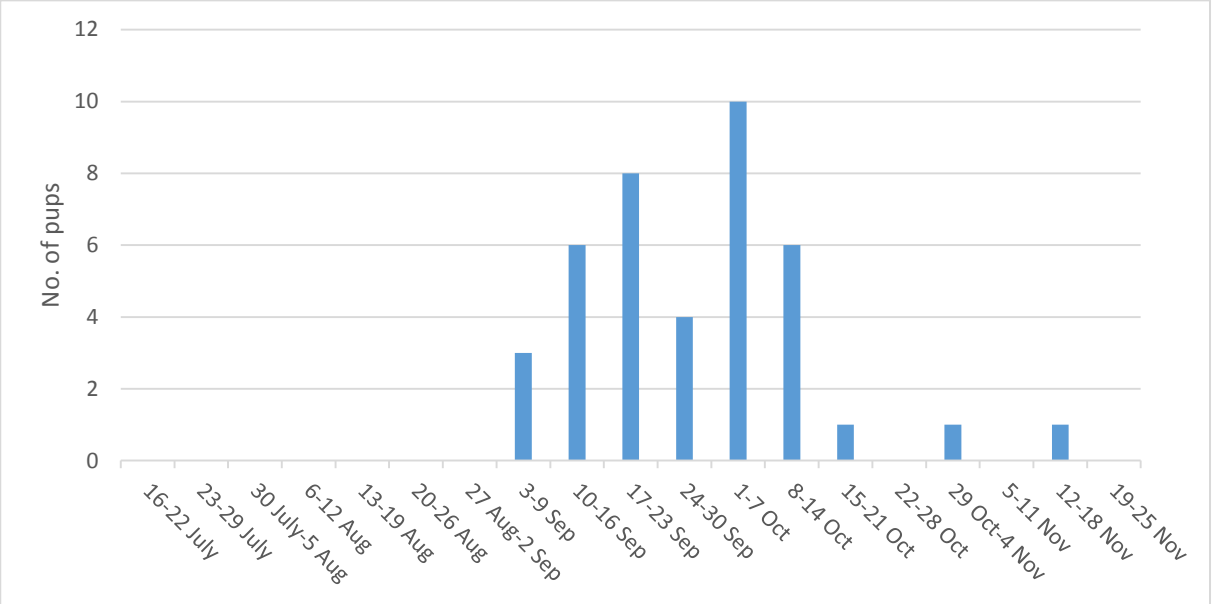


Table 4 Fate of pups in North Haven in 2018

Fate	**No. of pups**
Assumed survived	8
Survived to beginning of moult	6
Survived to weaning	18
Assumed dead	4
Dead	3
Unknown	1
Total	**40**

Table 5 Causes of seal pup deaths on North Haven beach in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	2
Diseased	0
Drowned	0
Stillborn	3
Unknown	1
Other	0
Total	**7**

4.4.2 Protheroe's Dock

In 2018 two pups were born on Protheroe's Dock, one in week 36 and the other in week 40. Furthermore a pup which was born on Rye Rocks on 9/10/18 moved to Protheroe's Dock. Ten site visits were conducted to Protheroe's Dock during the monitoring period. The two pups which were born on Protheroe's Dock are assumed to have survived, however the pup from Rye Rocks is assumed to be dead as it seemed separated from its mother, giving a survival rate of 67%.

Figure 8 Number of seal pups born in Protheroe's Dock 1983-2018

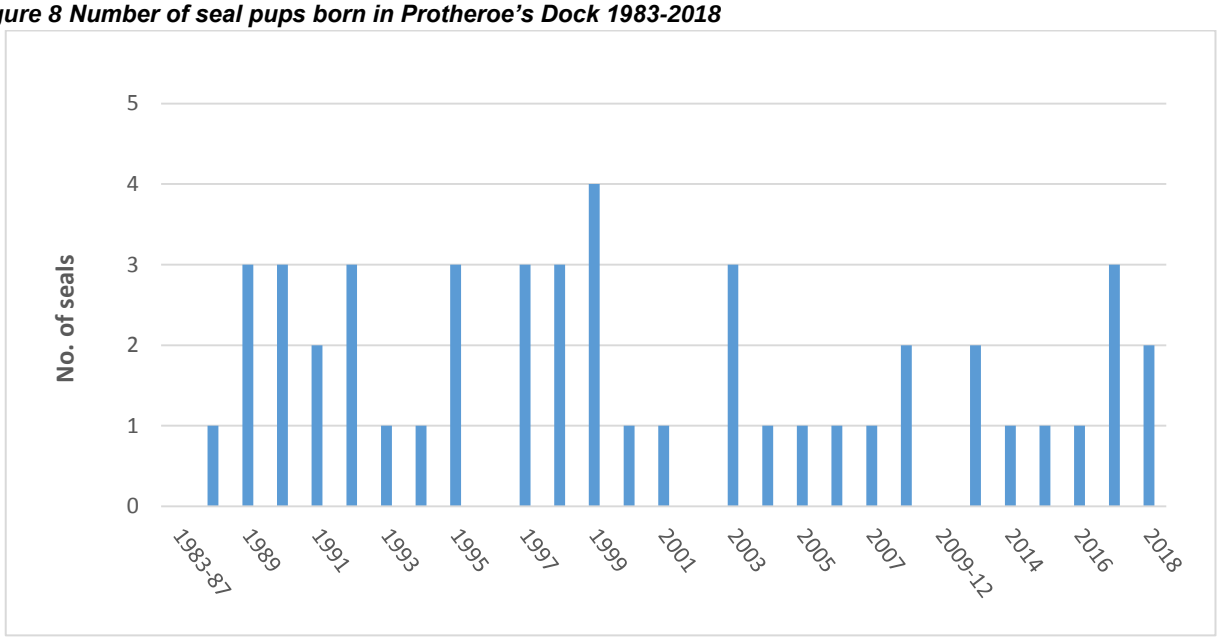


Figure 9 Weekly seal pup births on Protheroe's Dock in 2018

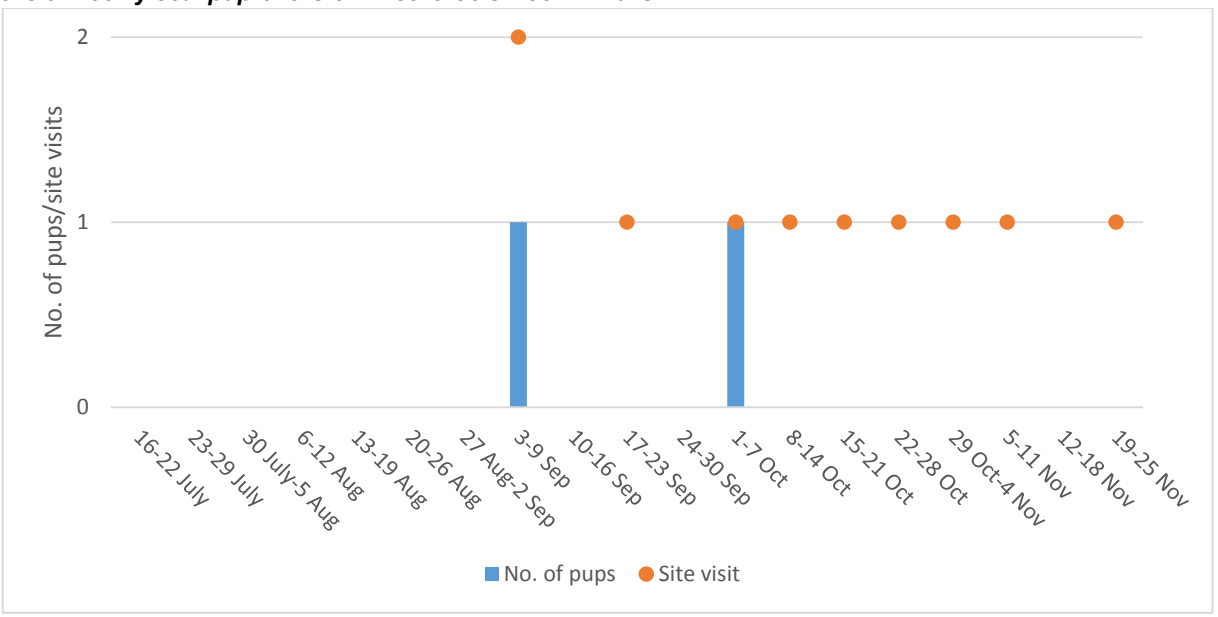


Table 6 Fate of pups on Protheroe's Dock in 2018

Fate	**No. of pups**
Assumed survived	2
Survived to beginning of moult	0
Survived to weaning	0
Assumed dead	1
Dead	0
Unknown	0
Total	**3**

Table 7 Causes of seal pup deaths on Protheroe's Dock in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	0
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Other*	0
Total	**1**

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 karabiner; this setup reduces the risk and speeds up the site visit.

In 2018 the Lantern was checked eight times and three pups were found. These were born in week 36, 38 and 44. The fate of one pup is unknown but the other two pups are assumed to have survived/survived to beginning of moult, giving a survival rate of 100%.

Figure 10 Number of seal pups born in The Lantern 1983-2018

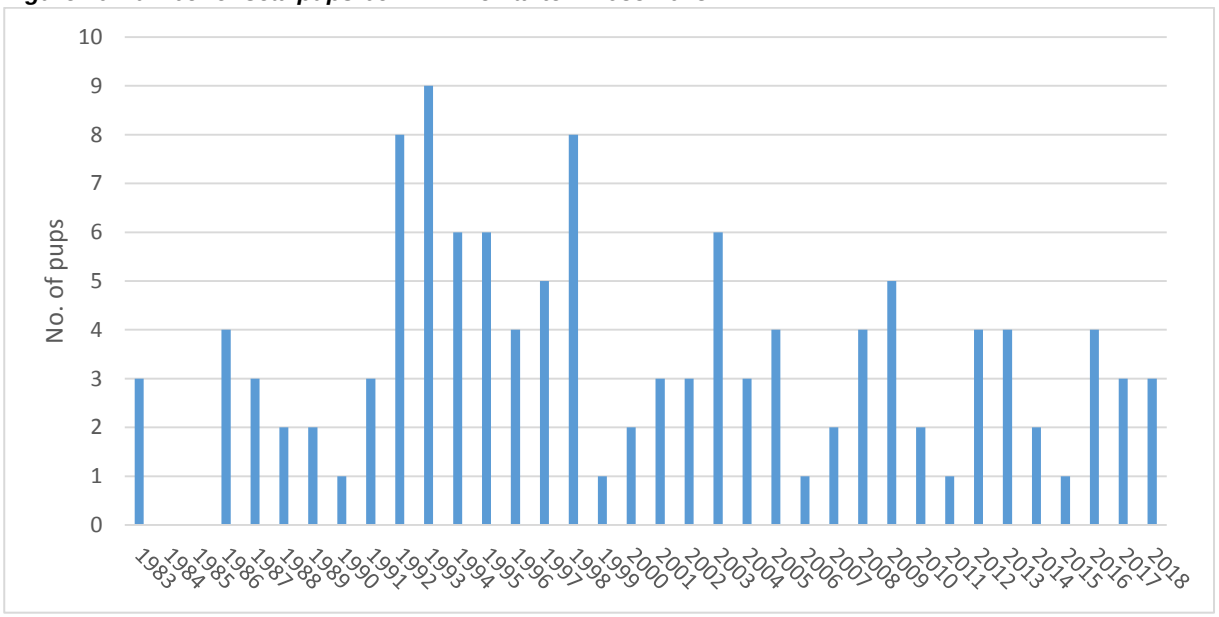


Figure 11 Weekly seal pup births in the Lantern in 2018

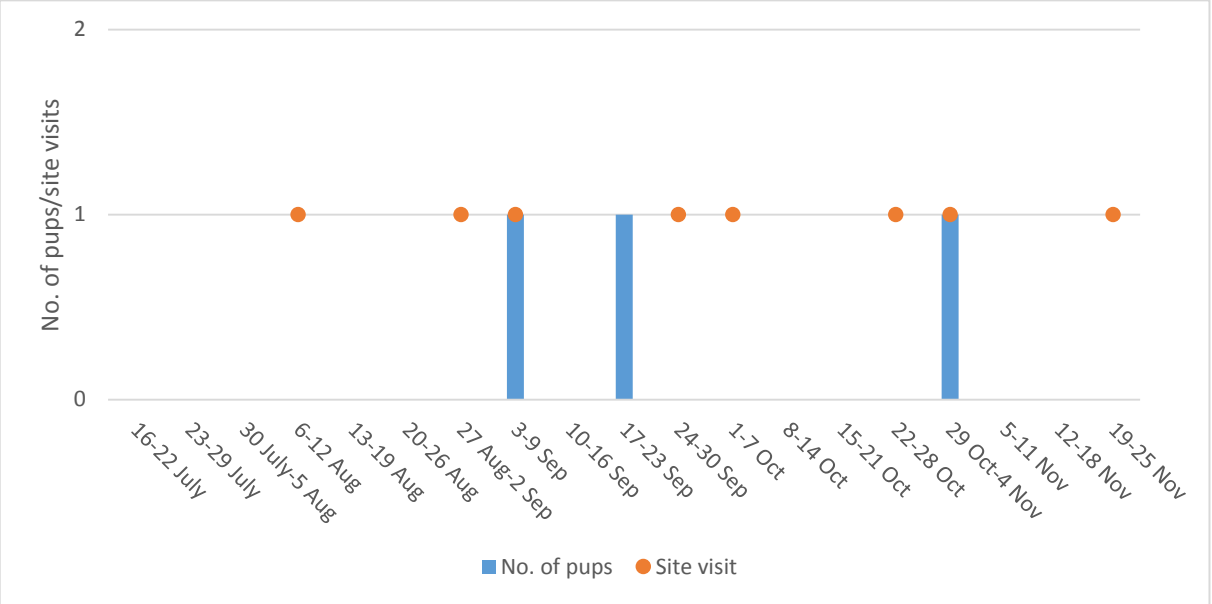


Table 8 Fate of pups in the Lantern in 2018

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	1
Survived to weaning	0
Assumed dead	0
Dead	0
Unknown	1
Total	**3**

4.4.4 Amy's Reach

Six pups were born in Amy's Reach in 2018 of which five are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 83%.

Figure 12 Number of seal pups born in Amy's Reach 1983–2018

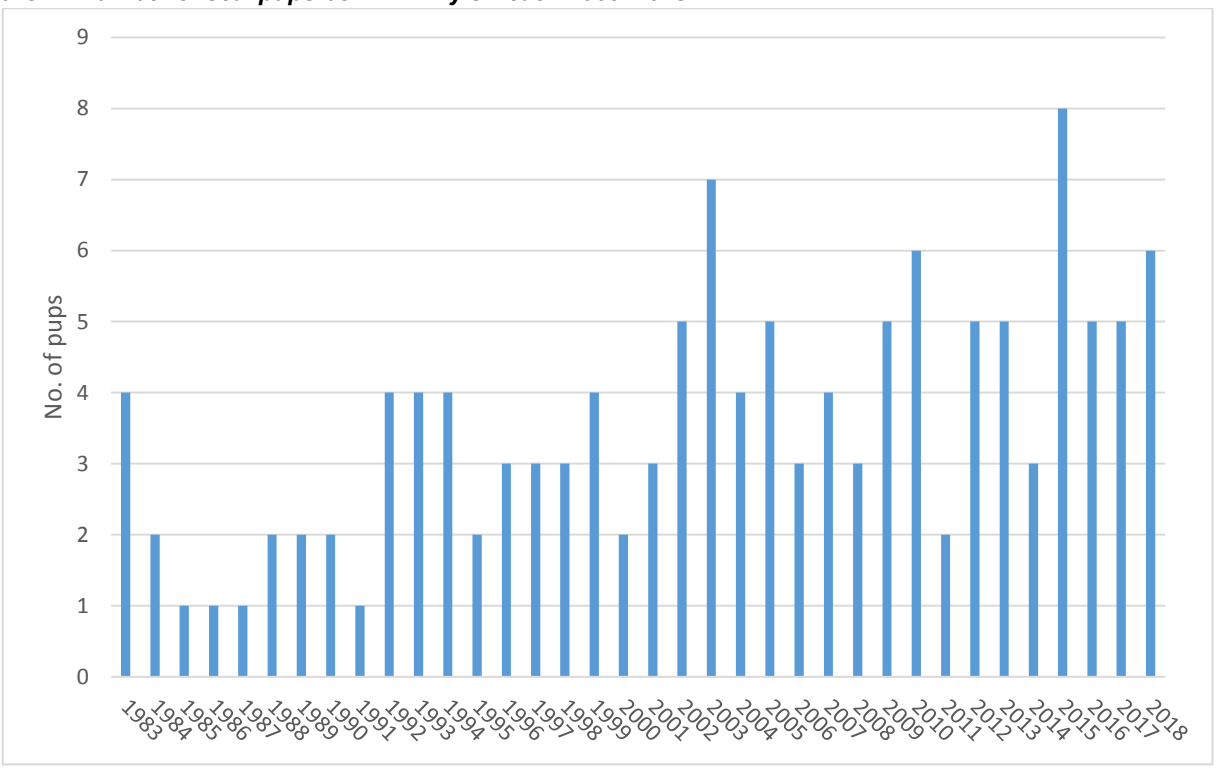


Figure 13 Weekly seal pup births in Amy's Reach 2018

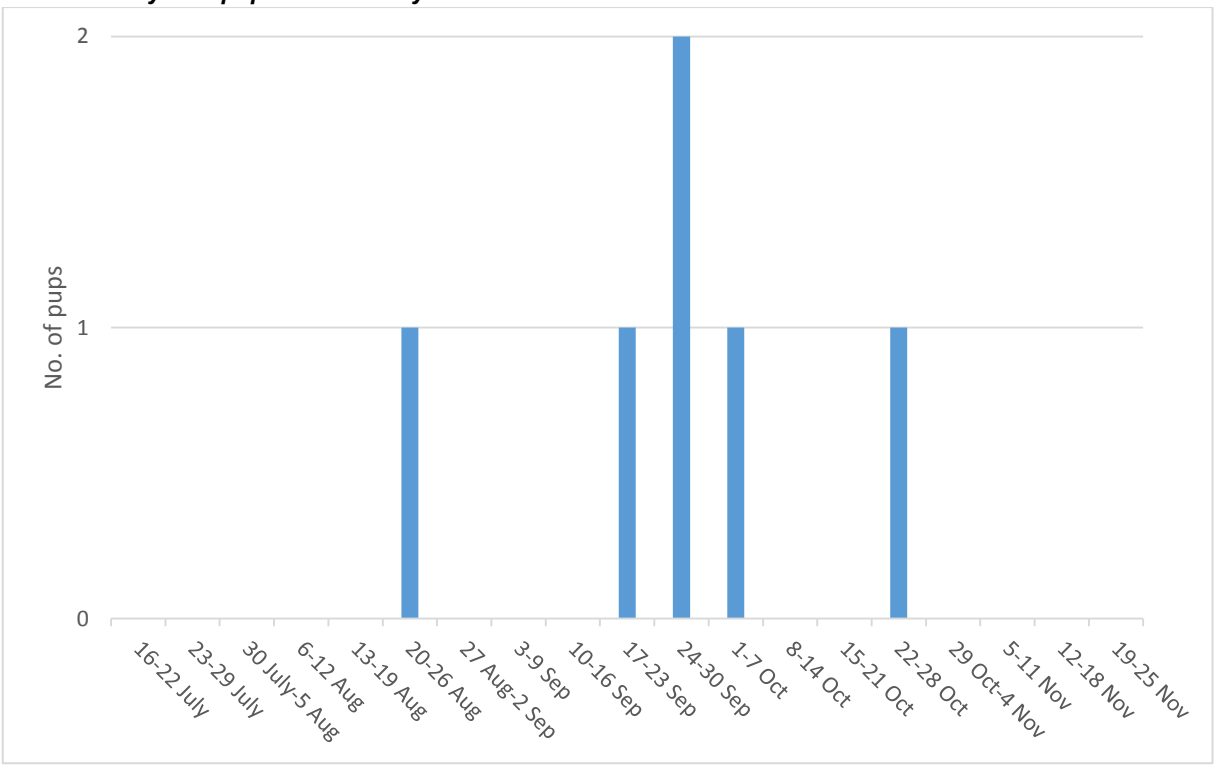


Table 9 Fate of pups in Amy's Reach in 2018

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	3
Survived to weaning	2
Assumed dead	0
Dead	1
Unknown	0
Total	**6**

Table 10 Causes of seal pup deaths in Amy's Reach 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	0
Accident/injured/killed	0
Disappeared ≤ stage 3	0
Diseased	0
Drowned	0
Stillborn	0
Unknown	1
Other*	0
Total	**1**

4.4.5 Matthew's Wick

In 2018 51 pups were born on Matthew's Wick which is highest total ever recorded on this site. Thirty-two pups are assumed to have survived, survived to beginning of moult or survived and were weaned. One pup wasn't included in the survival rate calculations as it was taken into a rescue centre giving a survival rate of 64% which is rather low for this site; it is lower than the whole island survival rate and lower than last year's survival rate on Matthew's Wick (74%).

Figure 14 Number of seal pups born in Matthew's Wick 1983–2018

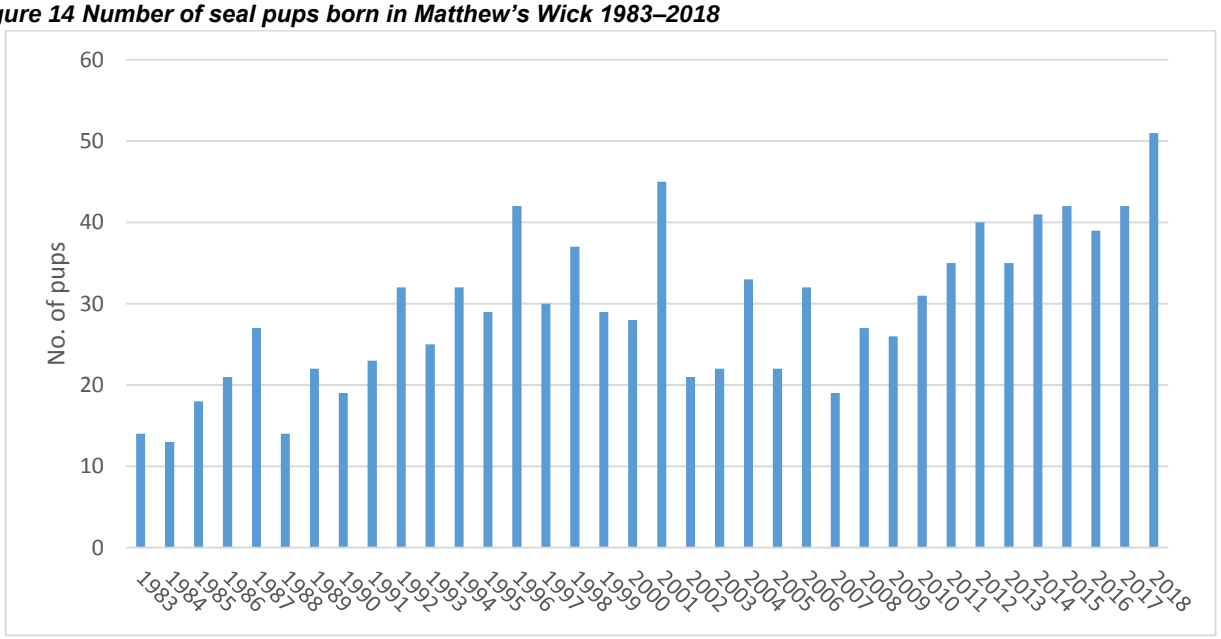


Figure 15 Weekly seal pup births in Matthew's Wick in 2018

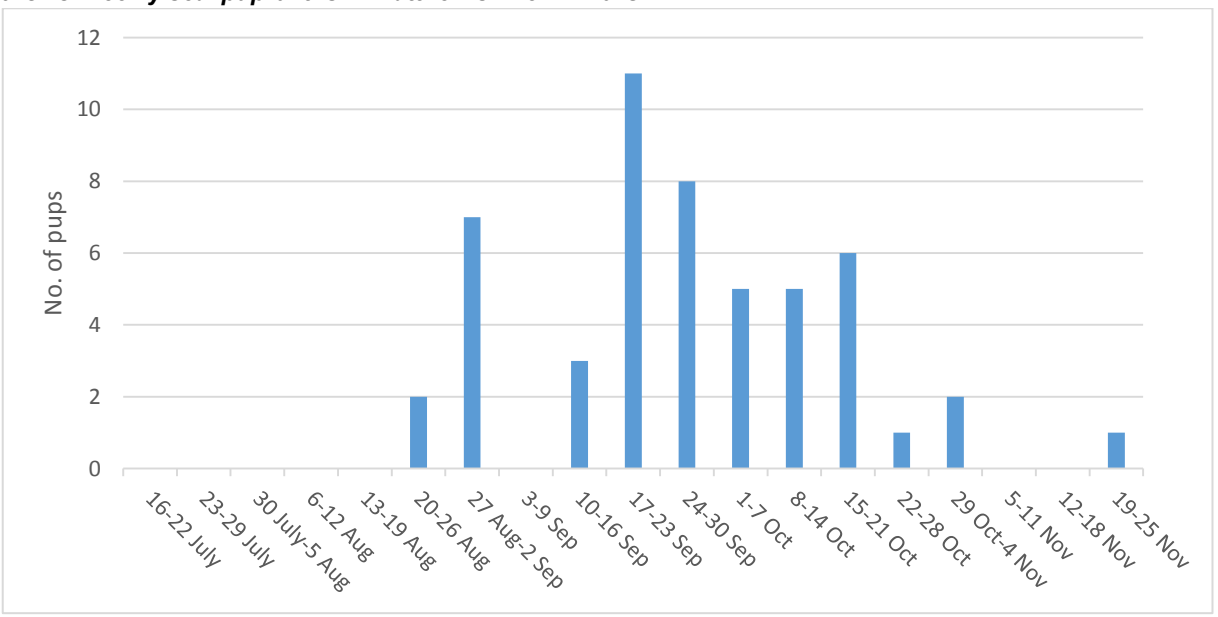


Table 11 Fate of pups on Matthew's Wick in 2018

Fate	**No. of pups**
Assumed survived	3
Survived to beginning of moult	4
Survived to weaning	25
Assumed dead	8
Dead	10
Unknown	1
Total	**51**

Table 12 Causes of seal pup deaths on Matthew's Wick in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	7
Accident/injured/killed	0
Disappeared ≤ stage 3	6
Diseased	0
Drowned	3
Stillborn	1
Unknown	1
Other	0
Total	**18**

Pup 217 was born 16/10/18 on Matthew's Wick and was recorded on the beach till it was 17 days old. Unfortunately its mother wasn't attending it very well or possibly it was even abandoned. It didn't grow much past a size 2 and had an eye infection. Astonishingly, once the pup had left Skomer, it swam to Wicklow (Arklow specifically) on the east coast of Ireland where it was found on 8/11/18 and taken to a rescue centre.

Plate 4 Pup 217 on 26/10/18. The only time it was observed suckling.

Plate 5 Pup 217 on 8/11/18 in Ireland

4.4.6 Castle Bay

Access to Castle Bay is impossible and pups born there do not get marked. Hence monitoring is more challenging than on other beaches and potentially less accurate. Twenty-two pups were born in Castle Bay in 2018. Seventeen pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 77% which is six percent higher than last year and 14% higher than in 2016 and bucks the trend of previous years. Usually Castle Bay's survival rate is below the whole island survival rate as it is directly facing into the prevailing wind direction and gets fully flooded during storm tides. However, the beach is rather wide which will protect the pups on all but the biggest tides. Castle Bay is also the beach with the largest and most permanent haul-out. Maybe the presence of other seals usually 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.

Figure 16 Number of seal pups born in Castle Bay 1983-2018

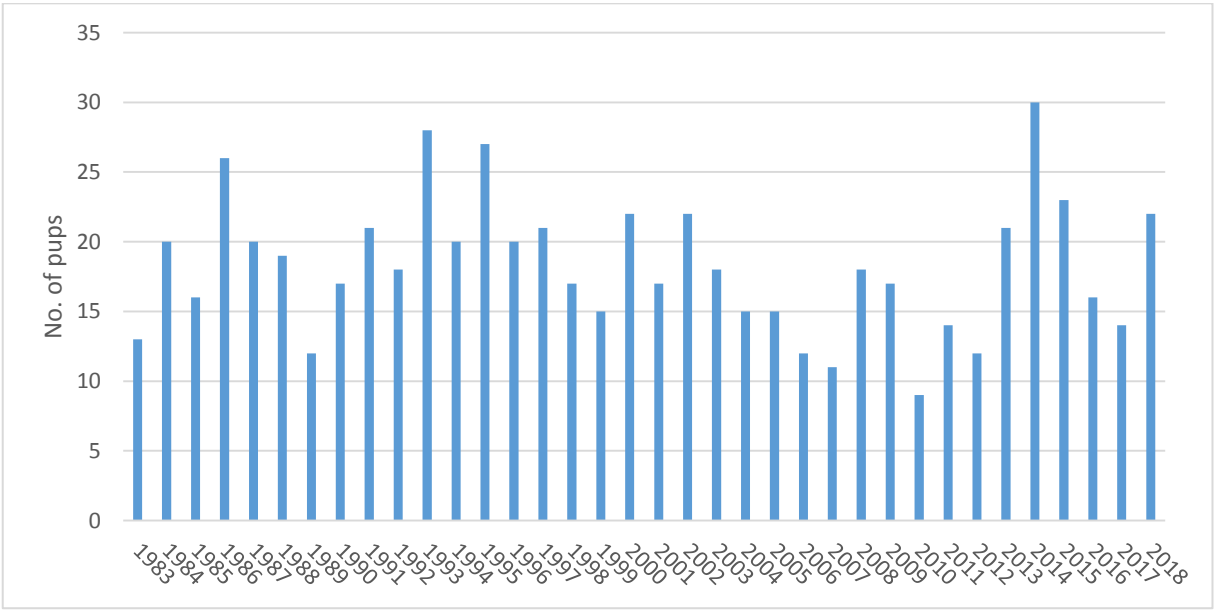


Figure 17 Weekly seal pup births in Castle Bay in 2018

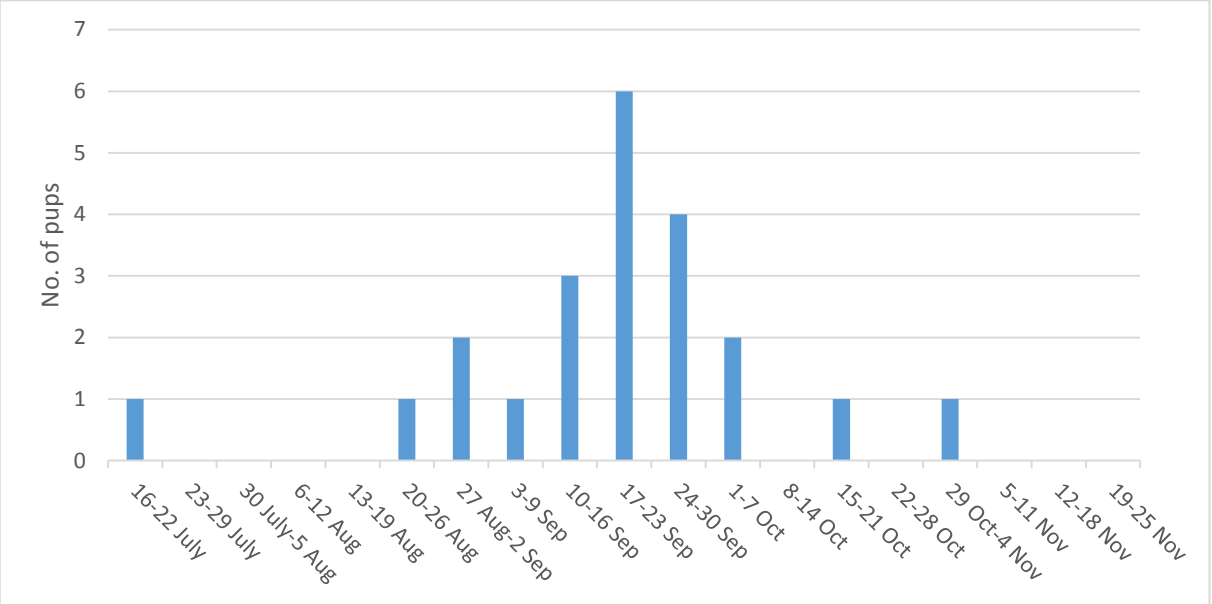


Table 13 Fate of pups on Castle Bay in 2018

Fate	**No. of pups**
Assumed survived	5
Survived to beginning of moult	5
Survived to weaning	7
Assumed dead	3
Dead	2
Unknown	0
Total	**22**

Table 14 Causes of seal pup deaths on Castle Bay in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	0
Accident/injured/killed	0
Disappeared ≤ stage 3	3
Diseased	0
Drowned	2
Stillborn	0
Unknown	0
Other	0
Total	**5**

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 was (and remains) 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). However, in 2015 the route was reassessed 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.

Five pups were born in South Castle Beach Cave in 2018 and three pups are assumed to have survived, survived to beginning of moult or survived and were weaned, two pups' fate is unknown, giving a survival rate of 100%.

Eight site visits were made to South Castle Beach Cave during the observation period.

Figure 18 Number of seal pups born in South Castle Beach Cave 1990-2018

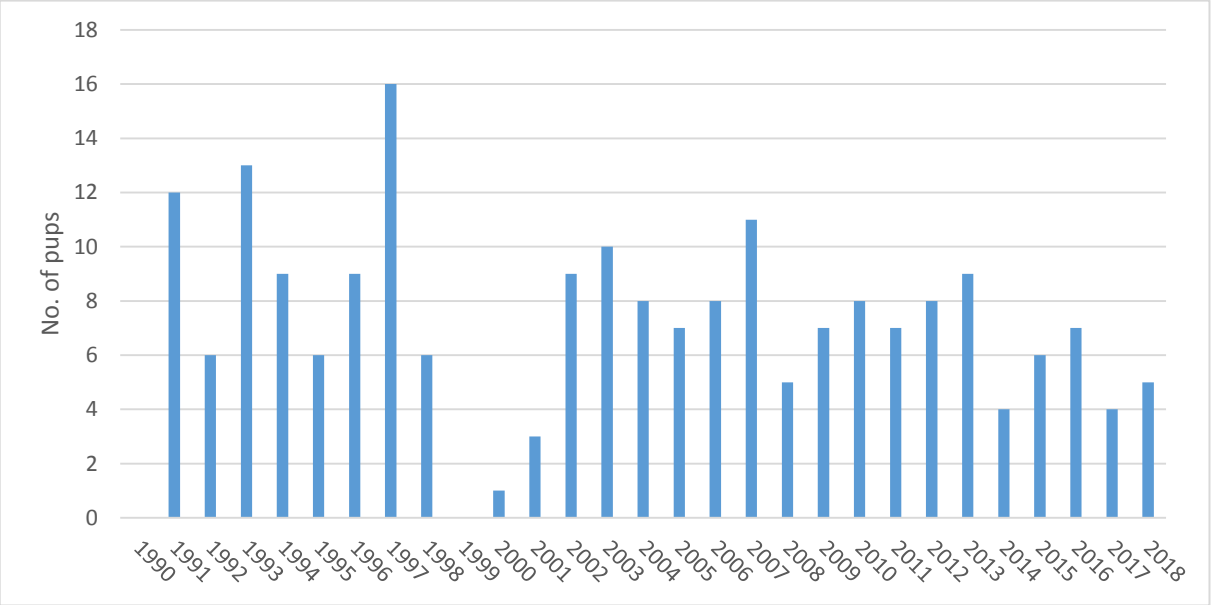


Figure 19 Weekly seal pup births in South Castle Beach Cave in 2018

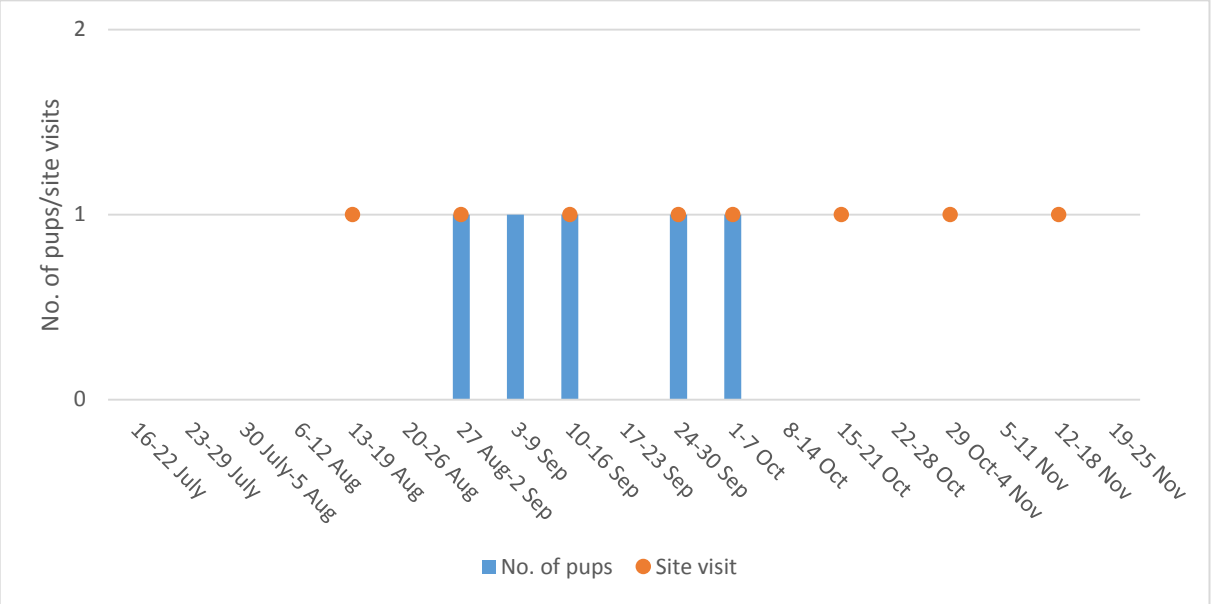


Table 15 Fate of pups in South Castle Beach Cave in 2018

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	2
Survived to weaning	1
Assumed dead	0
Dead	0
Unknown	2
Total	**5**

4.4.8 Seal Hole

Eleven pups were born in Seal Hole in 2018 of which seven pups are assumed to have survived, survived to beginning of moult or survived and were weaned, one pup's fate is unknown and one pup moved from Seal Hole to South Haven giving a survival rate of 78% which is much better than last year's survival rate of 43%.

In 2018 eight site visits were made to Seal Hole.

Figure 20 Number of seal pups born in Seal Hole 1983-2018

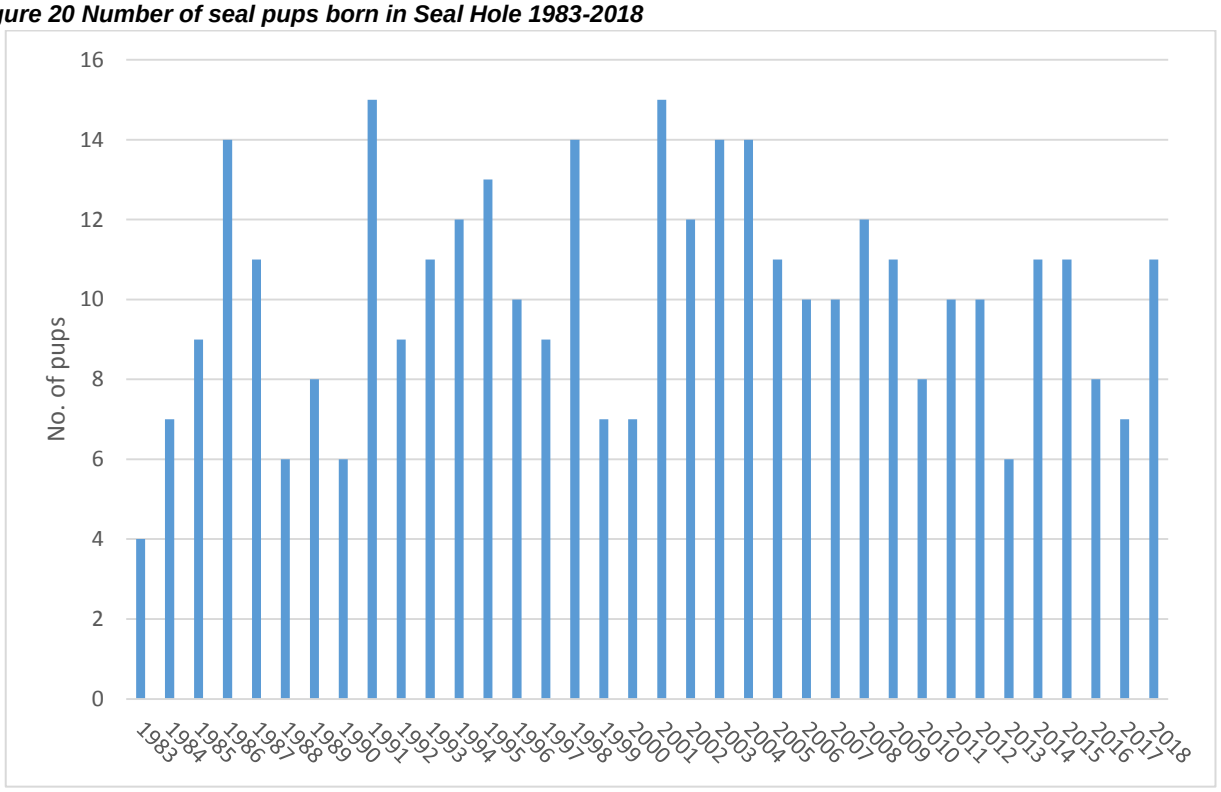


Figure 21 Weekly seal pup births in Seal Hole in 2018

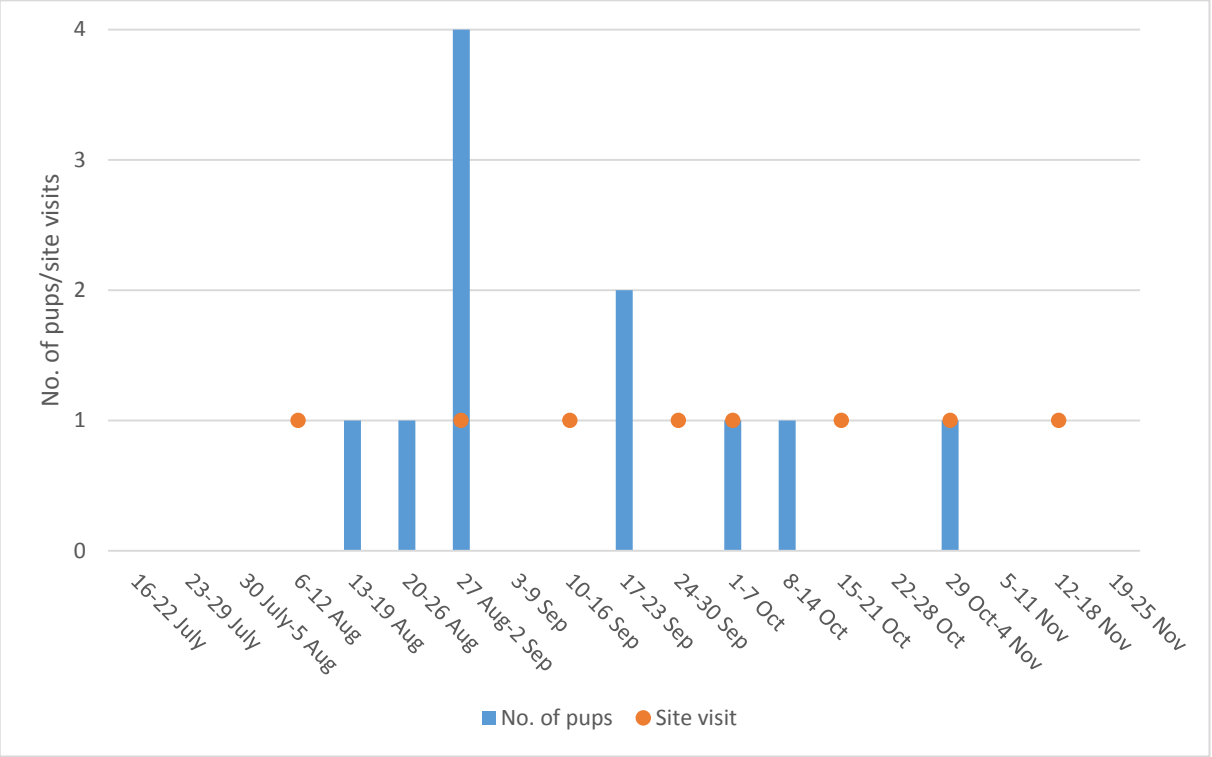


Table 16 Fate of pups in Seal Hole in 2018

Fate	**No. of pups**
Assumed survived	4
Survived to beginning of moult	2
Survived to weaning	1
Assumed dead	1
Dead	1
Unknown	1
Total	**10**

Table 17 Causes of seal pup deaths in Seal Hole in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	1
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Other	0
Total	**2**

4.4.9 The Slabs

Three pups were born on The Slabs in 2018 of which two are assumed to have survived/ survived to beginning of moult, giving a survival rate of 67%

Figure 22 Number of seal pups born on The Slabs 1983-2018

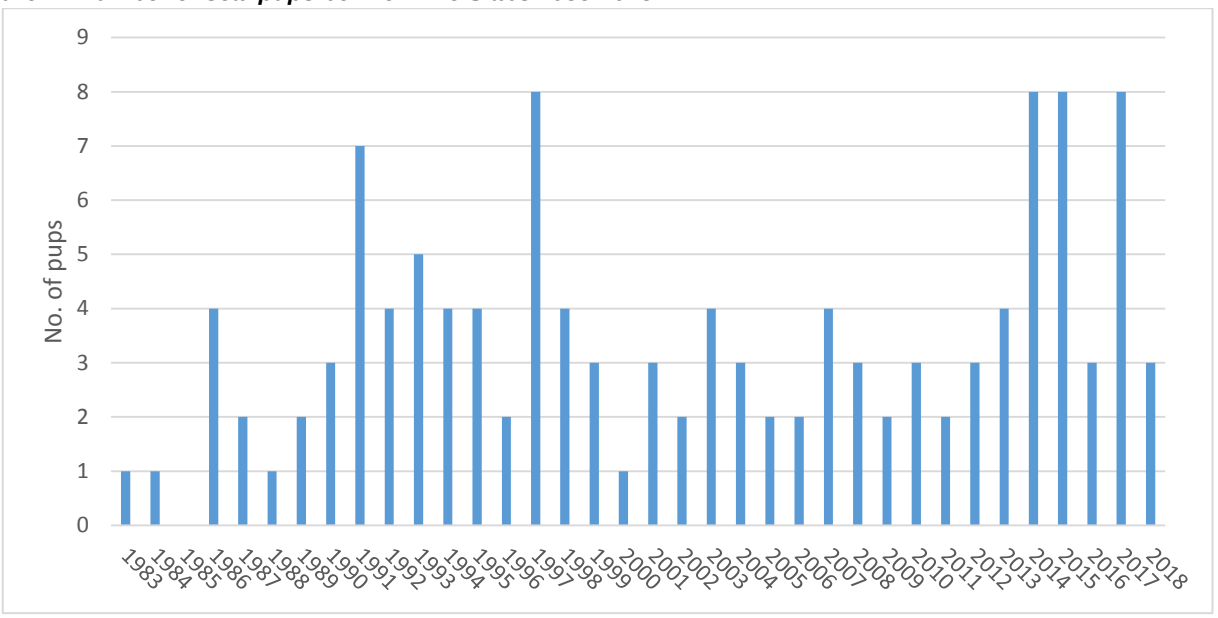


Figure 23 Weekly seal pup births on The Slabs in 2018

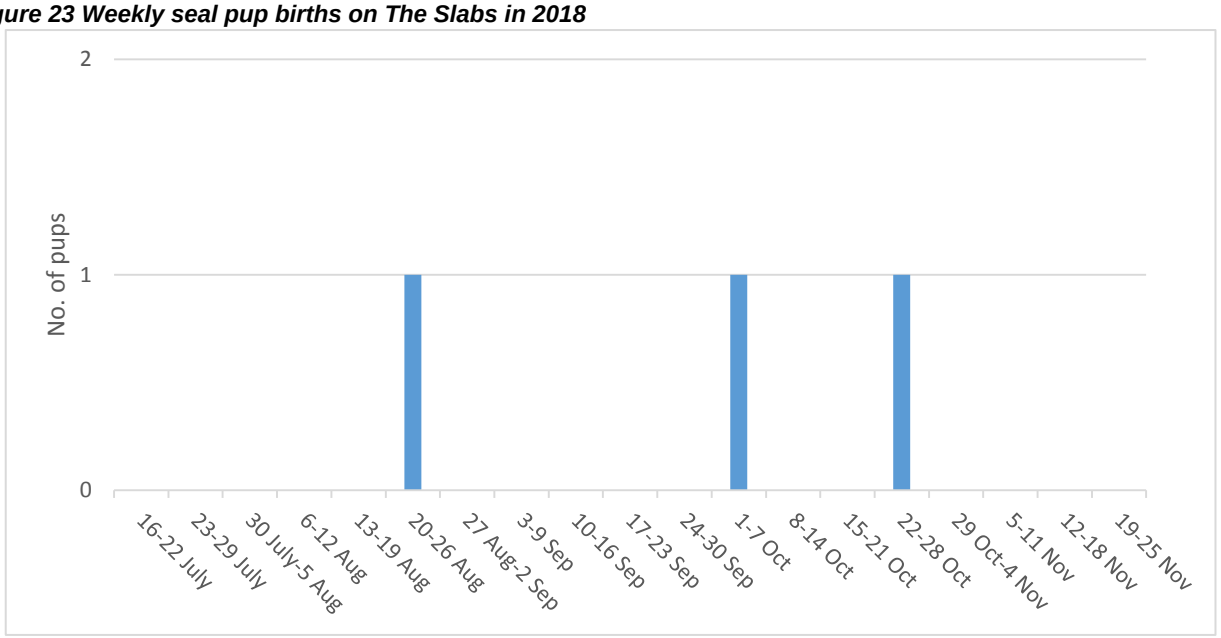


Table 18 Fate of pups on The Slabs in 2018

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	1
Survived to weaning	0
Assumed dead	0
Dead	1
Unknown	0
Total	**3**

Table 19 Causes of seal pup deaths on The Slabs in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	0
Accident/injured/killed	0
Disappeared ≤ stage 3	0
Diseased	0
Drowned	0
Stillborn	0
Unknown	1
Other	0
Total	**1**

The death of pup 150 was a real mystery: the pup was born on 1/10/18 and well attended by its mother but on 4/10/18 it was observed floating dead in a pool of water next to its mother.

Plate 6 Pup 150 with its mother on 3/10/18

Plate 7 Pup 150 dead in water with its mother still attending it on 4/10/18

4.4.10 Driftwood Bay

Twenty-three pups were born in Driftwood Bay in 2018. Eleven pups were born on South Haven but spent the majority of their time before weaning on Driftwood Bay and hence were included in the Driftwood Bay figures.

Of the 34 pups 31 pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 91% which reflects the good quality of the beach. It is the most sheltered pupping site on Skomer.

Figure 24 Number of seal pups born in Driftwood Bay 1983-2018

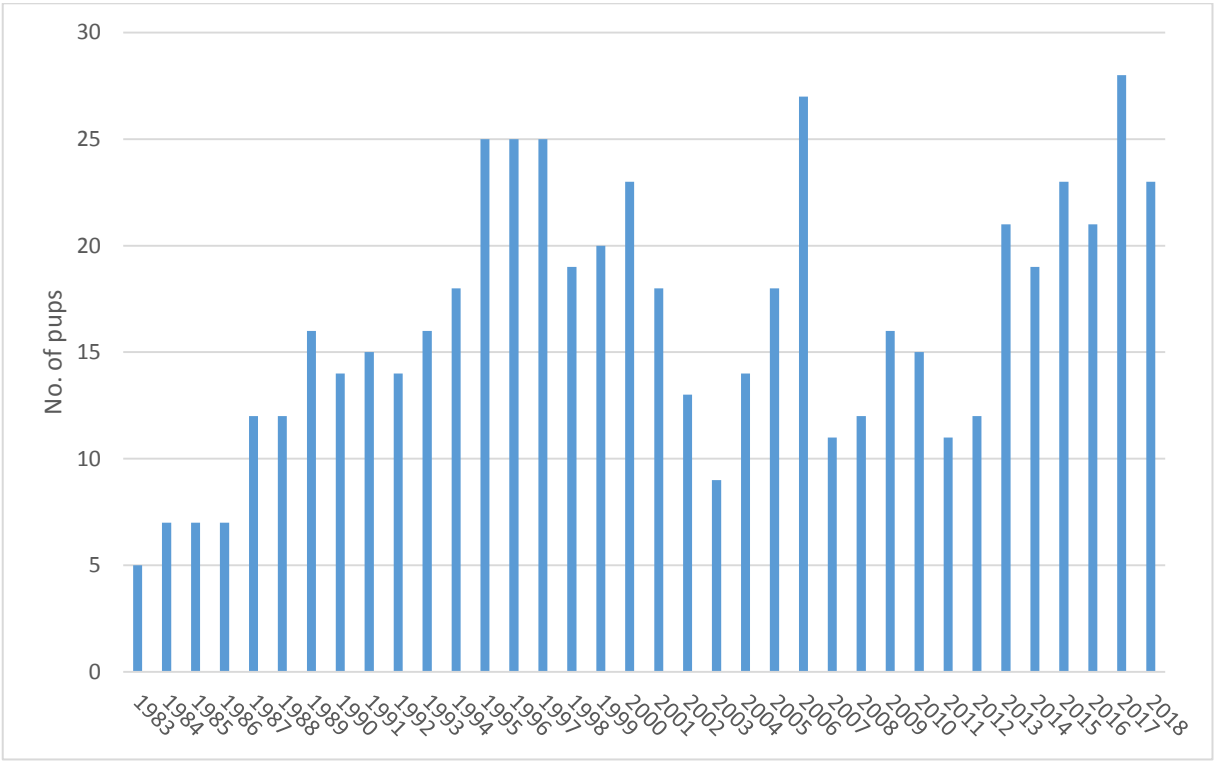


Figure 25 Weekly seal pup births in Driftwood Bay in 2018

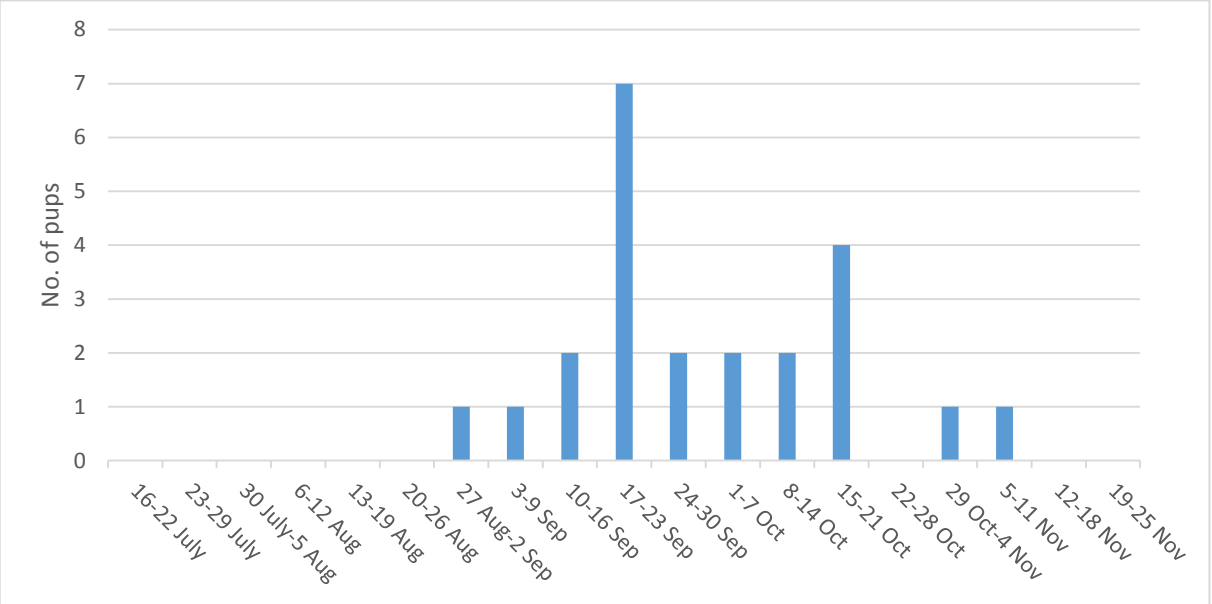


Table 20 Fate of pups on Driftwood Bay in 2018

Fate	**No. of pups**
Assumed survived	2
Survived to beginning of moult	5
Survived to weaning	24
Assumed dead	1
Dead	2
Unknown	
Total	**34**

Table 21 Causes of seal pup deaths on Driftwood Bay in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	2
Accident/injured/killed	0
Disappeared ≤ stage 3	1
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Other	0
Total	**3**

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, moreover, pups tend to move out of the caves within their first week and can be observed from above thereafter.

In 2018 the record number of 48 pups were born on South Haven. Eleven pups moved from South Haven to Driftwood Bay and spent most of their time before weaning there. One pup from Seal Hole moved to South Haven and spent most of its time before weaning there. Of the 38 pups which were raised on South Haven beach 30 are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 79%.

Figure 26 Number of seal pups born in South Haven 1983-2018

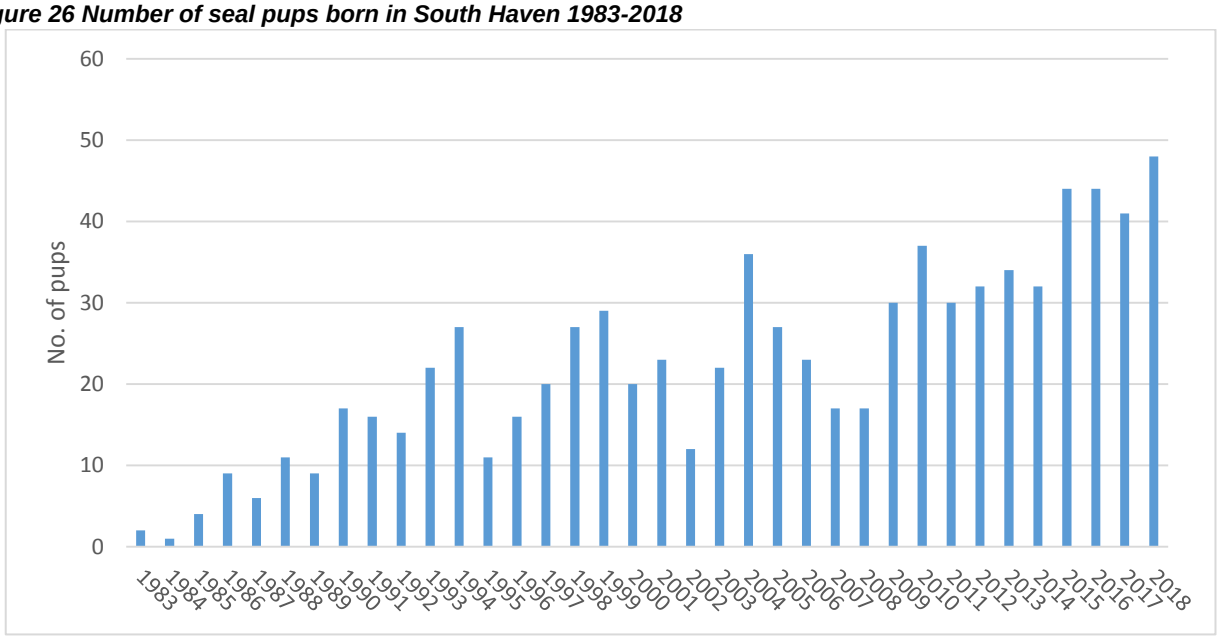


Figure 27 Weekly seal pup births in South Haven in 2018

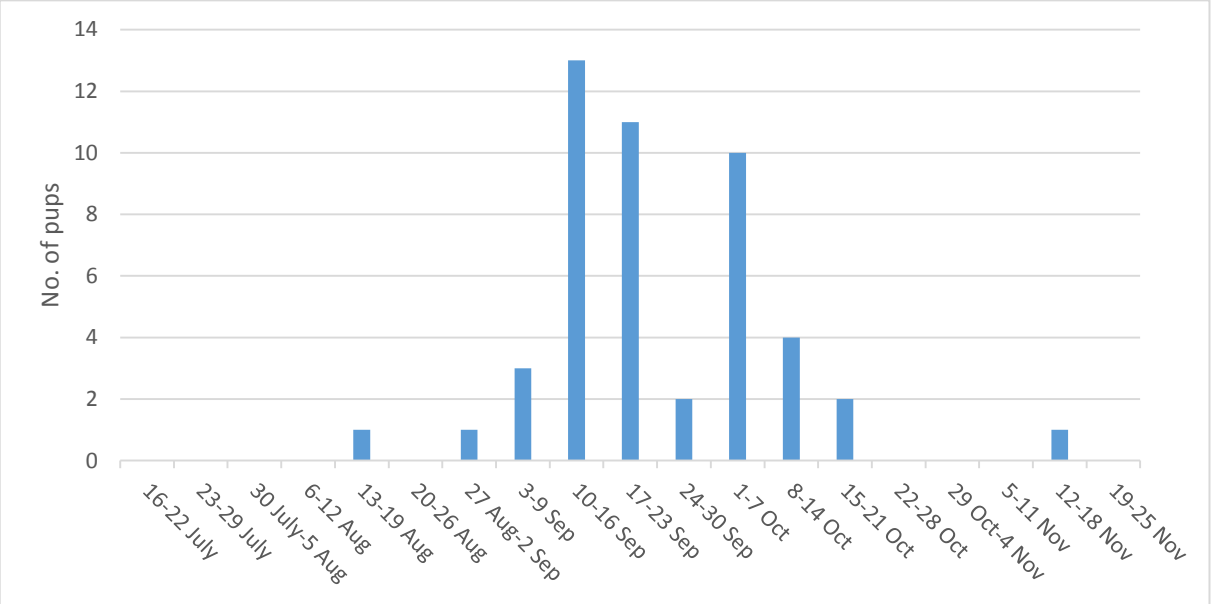


Table 22 Fate of pups in South Haven in 2018

Fate	**No. of pups**
Assumed survived	4
Survived to beginning of moult	5
Survived to weaning	21
Assumed dead	3
Dead	5
Unknown	0
Total	**38**

Table 23 Causes of seal pup deaths in South Haven in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	3
Accident/injured/killed	0
Disappeared ≤ stage 3	2
Diseased	0
Drowned	0
Stillborn	1
Unknown	1
Other*	1
Total	**8**

* The female (16.SC-US-117.SHV) that wasn't able to feed her pup in 2016 and 2017 pupped on South Haven beach in 2018 and it seemed she had the same problems feeding her pup as in previous years. The pup didn't seem to put on weight although the female was on the beach attending it. The female has a large scar on her underside which possibly prevents her from suckling her pup.

A curious seal pup death of a South Haven pup occurred on Driftwood Bay on 2/11/18. Pup 204 was born on South Haven beach on 14/10/18 and grew to a healthy size 4. On 1/11/18 it moved to Driftwood Bay were it was found dead a day later. The pup had no signs of disease or injury and the cause of death is a complete mystery.

Plate 8 Pup 204 on 16/10/18

Plate 9 Seal pup 204 on 23/10/18

Plate 10 Seal pup 204 dead on Driftwood Bat on 2/11/18

4.4.12 South Stream Cave and Boulders

South Stream Cave and Boulders (hereafter South Stream) 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 2018 the site was checked from South Stream outfall every two to three days and, as activity was low, no full site visits was necessary.

Four pups were born at South Stream in 2018, of which two survived to beginning of moult, giving a survival rate of 50%.

Figure 28 Number of seal pups born in South Stream 1983-2018

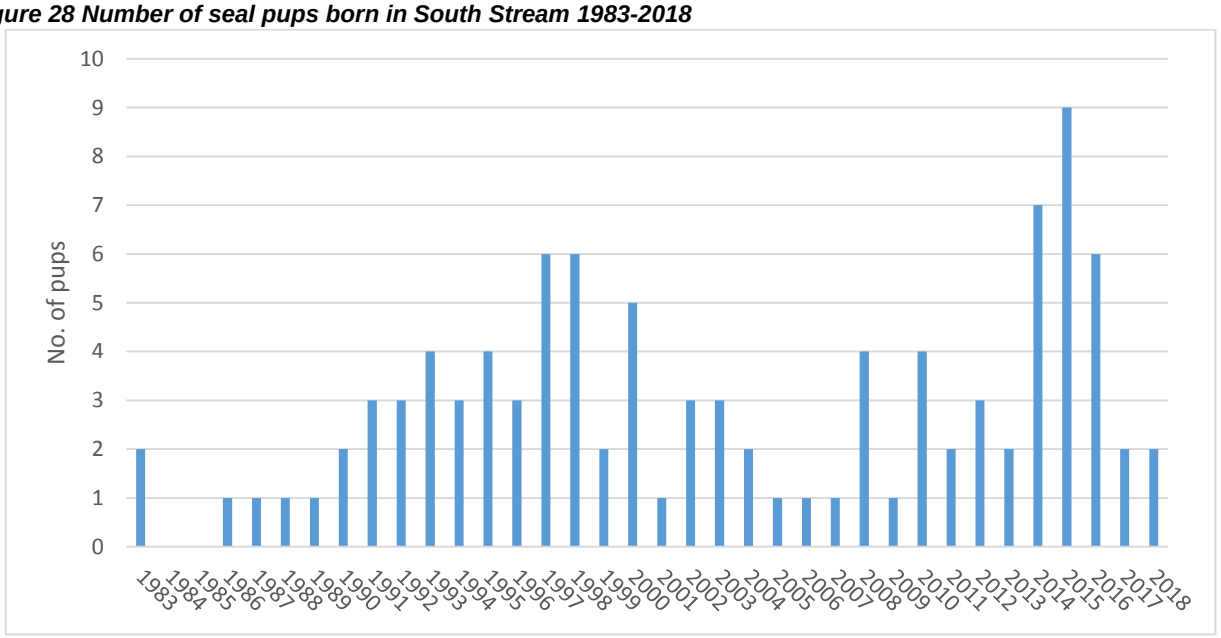


Figure 29 Weekly seal pup births in South Stream in 2018

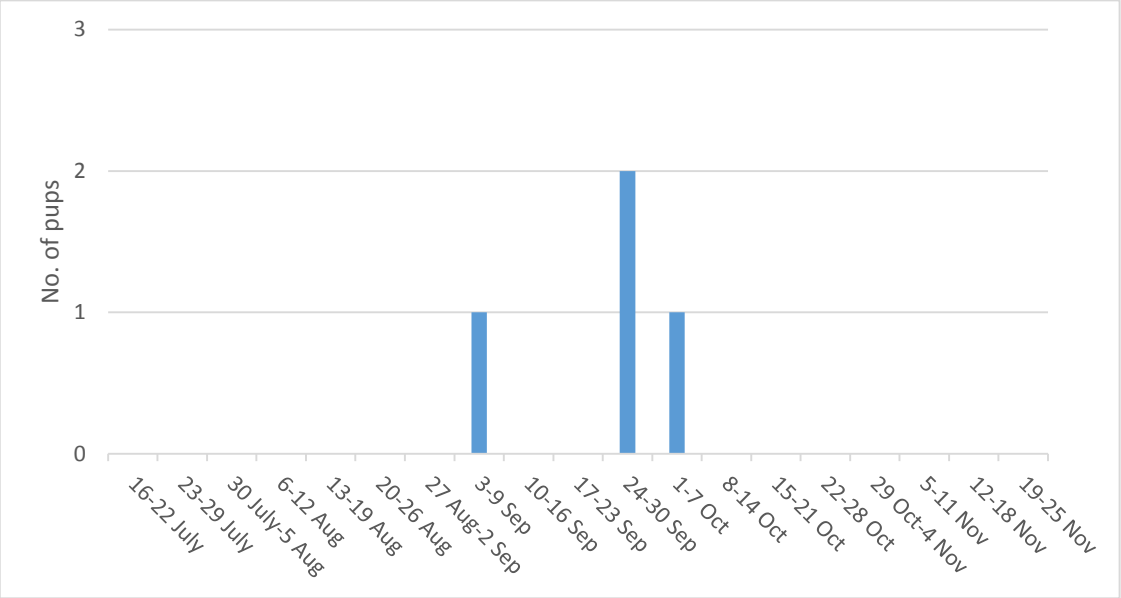


Table 24 Fate of pups in South Stream in 2018

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	2
Survived to weaning	0
Assumed dead	2
Dead	0
Unknown	0
Total	**4**

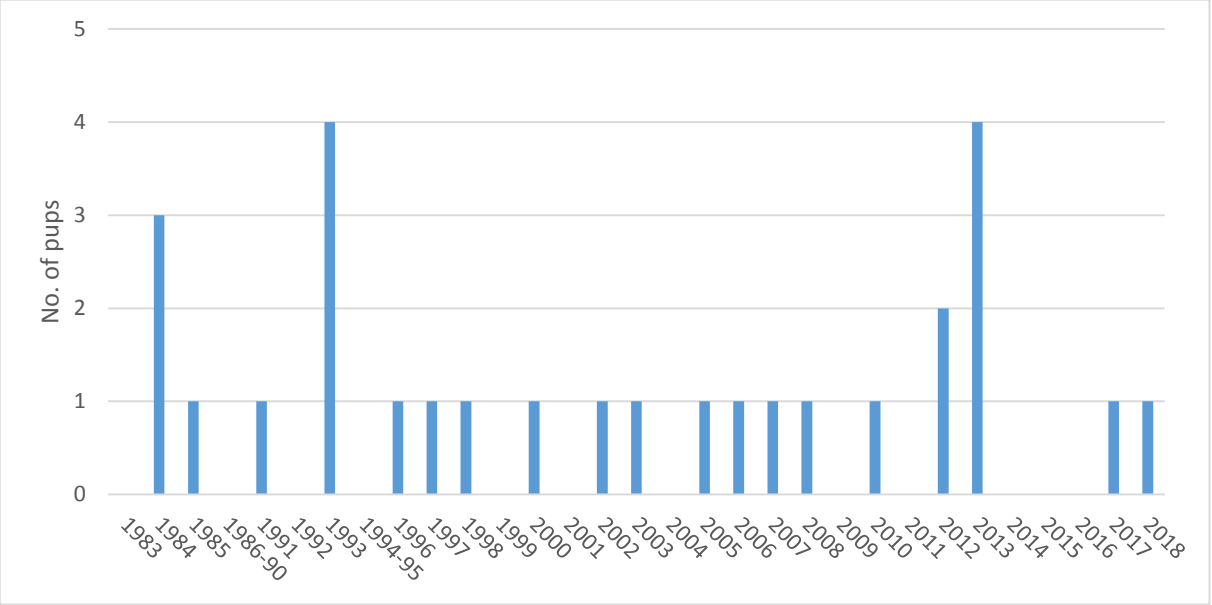
Table 25 Causes of seal pup deaths in South Stream in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	0
Accident/injured/killed	0
Disappeared ≤ stage 3	2
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Other*	0
Total	**2**

4.4.13 High Cliff Boulders

High Cliff Boulders is a site which is difficult to monitor as the boulders can 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 approximately every four days from Welsh Way and one pup was found. It was born in week 39 and weaned moulted successfully, giving a survival rate of 100%.

Figure 30 Number of seal pups born at High Cliff Boulders 1983-2018



4.4.14 The Wick

18 seal pups were born on The Wick in 2018.

Thirteen pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 72%.

Figure 31 Number of seal pups born in The Wick 1983-2018

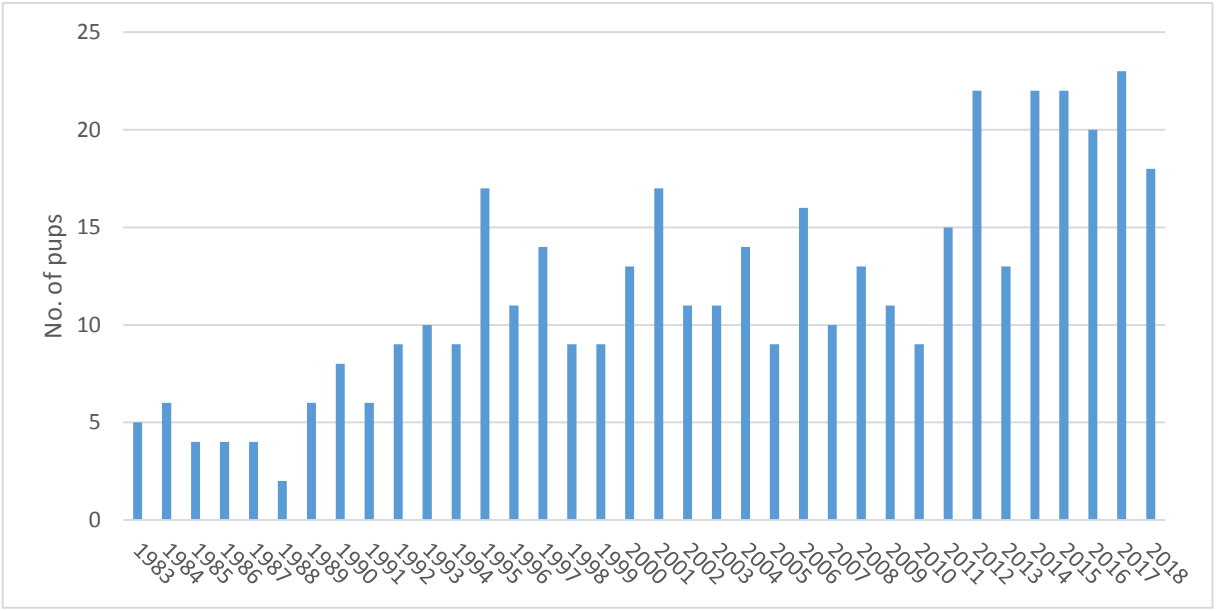


Figure 32 Weekly seal pup births in The Wick in 2018

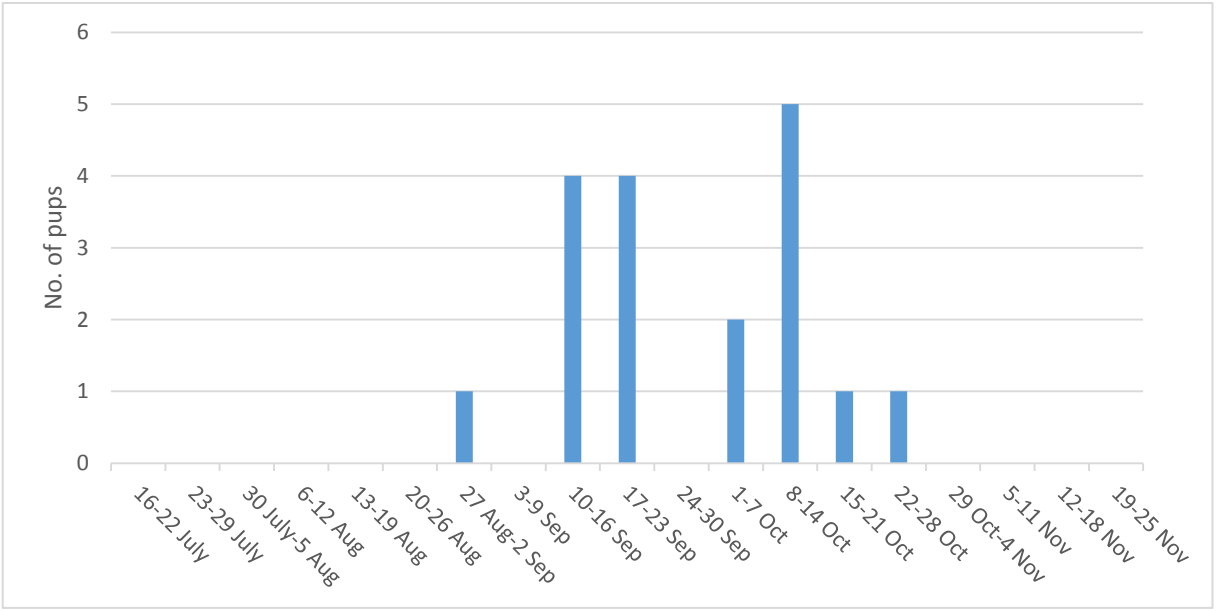


Table 26 Fate of pups on The Wick 2018

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	3
Survived to weaning	9
Assumed dead	3
Dead	2
Unknown	0
Total	**18**

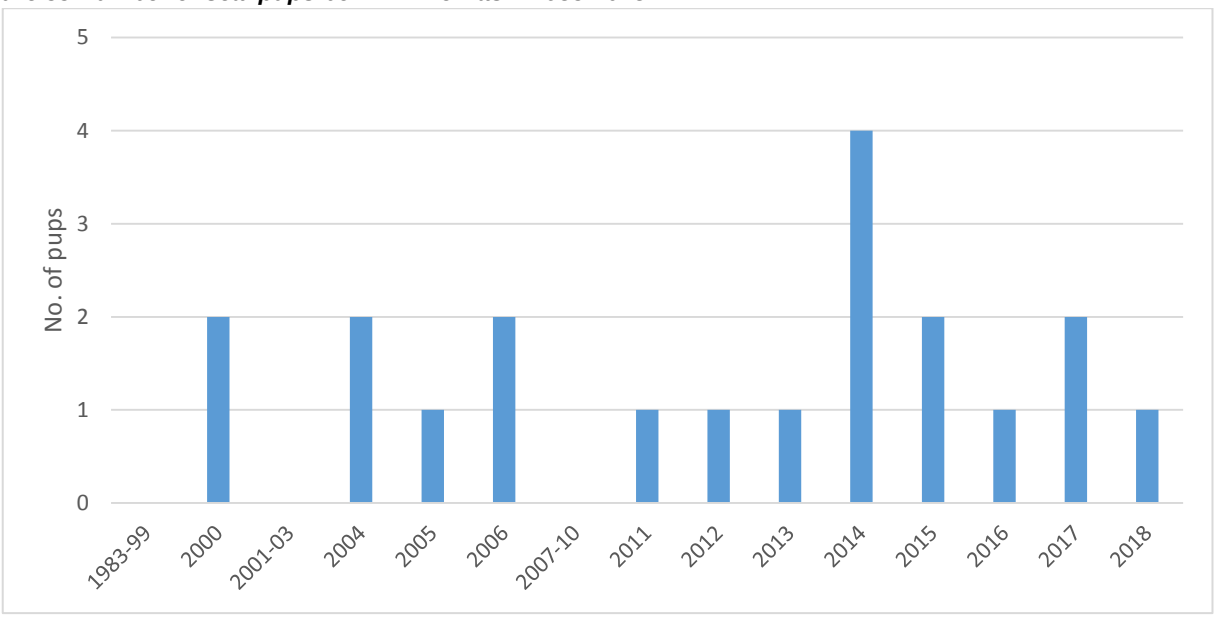
Table 27 Causes of seal pup deaths on The Wick in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	3
Diseased	0
Drowned	0
Stillborn	0
Unknown	1
Other	0
Total	**5**

4.4.15 The Basin

In 2018 one pup was born in week 36 in The Basin. It survived to beginning of moult, giving a survival rate of 100%.

Figure 33 Number of seal pups born in The Basin 1983-2018



4.4.16 Pigstone Bay

Pigstone Bay is a difficult site to monitor as there is a sea cave, which is impossible to access from land. 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.

The Pigstone Bay site comprises not only a cave but also a beach where it has been thought that pups were occasionally born, or washed onto when displaced from the cave. Up until 2016 Pigstone Bay was monitored solely from the cliff top but, as only half the beach is visible from above, a route down to the beach was sought and is now used on occasions.

It is possible to walk down to the beach without having to scramble by following the edge of the bay and making one's way along a grassy slope until one comes to the start of the rocky slabs.

In 2018 the site was monitored approximately every four days during the main pupping time and as access is quite straight forward the site was regularly fully inspected. Two pups were born at Pigstone Bay of which one is assumed to have survived, the other one disappeared ≤ size 3 and is assumed dead, giving a survival rate of 50%.

Figure 34 Number of seal pups born in Pigstone Bay 1983-2018

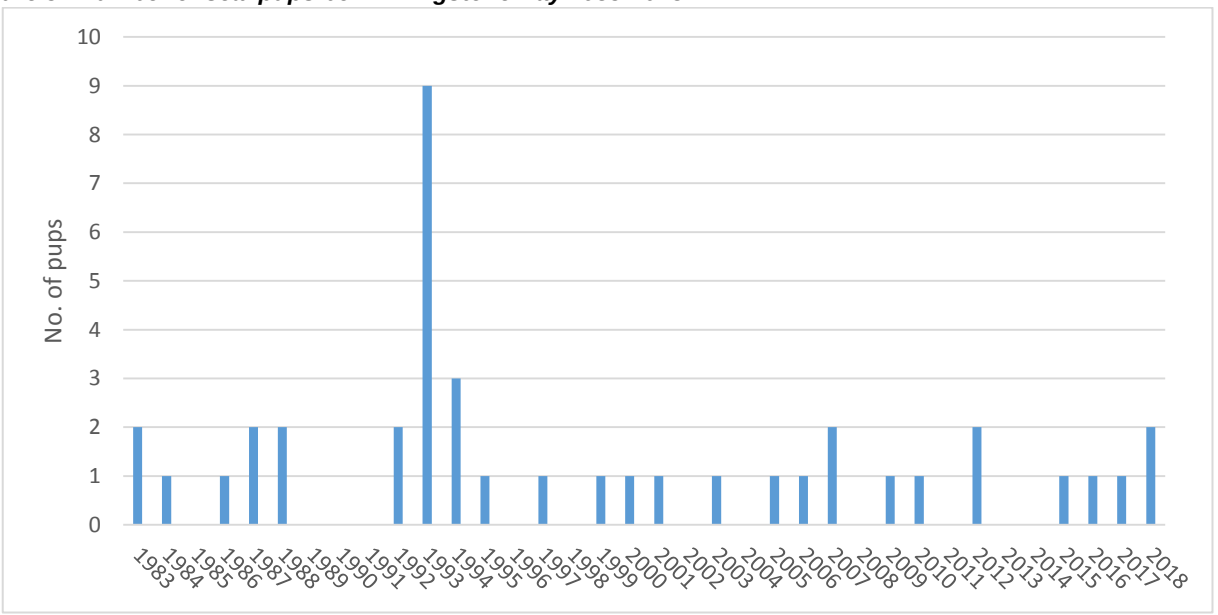


Figure 35 Weekly seal pup births in Pigstone Bay in 2018

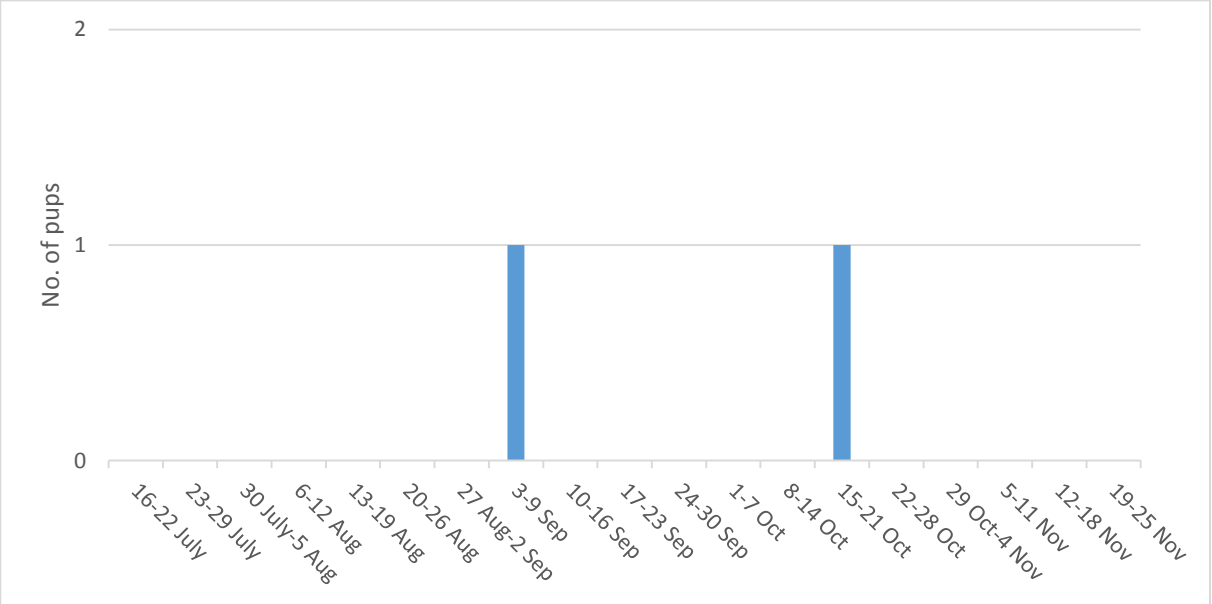


Table 28 Fate of pups in Pigstone Bay 2018

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	0
Survived to weaning	0
Assumed dead	1
Dead	0
Unknown	0
Total	**2**

Table 29 Causes of seal pup deaths in Pigstone Bay in 2018

Cause of death	**No. of pups**
Abandoned/separated/starved	0
Accident/injured/killed	0
Disappeared ≤ stage 3	1
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Other*	0
Total	**1**

4.4.17 The Garland Stone

No pups were born at the Garland Stone in 2018.

Single pups was born at this site in 2015, 2007 and in 2001.

4.4.18 The Mew Stone

No pups were born at the Mew Stone in 2018. This site was only used once in 2015 when a freshly dead pup was found floating at the base of the Mew Stone.

4.4.19 Robert's Wick

No pups were observed in Robert's Wick in 2018. This site was possibly used once, in 2001.

4.4.20 Tom's House

No pups were observed at Tom's House in 2018. The site has only been used once, in 1997, when a single pup was born.

4.4.21 Rye Rocks

One pup was born on Rye Rocks and was attended by its mother. However it disappeared after two days and was assumed to have moved to Protheroe's Dock. It disappeared from this size 2 so is assumed dead.

4.5 Movements

During 2018, 24 pups were recorded making movements between beaches on Skomer.

According to Boyle (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. This is certainly true, 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 30 Movements of pups on Skomer Island in 2018

Pup No.	**Natal Site**	**Destination ***	**Age** (on arrival at destination)	**Fate***
4	SHV	DWB	6	SW
12	SHO	SHV	5	D
59	SHV	DWB	7	SW
61	SHV	DWB	9	SBM
131	MWK	DWB	16	SW
136	AMR	MWK	12	SBM
137	SHV	DWB	16	SW
157	SHV	DWB	8	SBM
159	SHO	SBS	9	AS
164	SHV	DWB	10	AS
165	SHV	DWB	17	AS
166	SHV	DWB	4	SW
167	SHV	DWB	6	SW
168	SHV	DWB	10	SW
177	SHV	DWB	7	SW
190	RR	PDK	3	AD
194	SHV	DWB	6	SW
195	SHV	DWB	9	SW
196	SHV	DWB	6	AD
204	SHV	DWB	18	D
212	DWB	SHV	18	AS
218	MWK	DWB	18	AD
222	SHV	DWB	15	SW
228	SBS	DWB	9	SBM

* see Appendix 2 for key to abbreviations

4.6 Wanderers

Nine 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. Most wanderers were recorded in October after the storms.

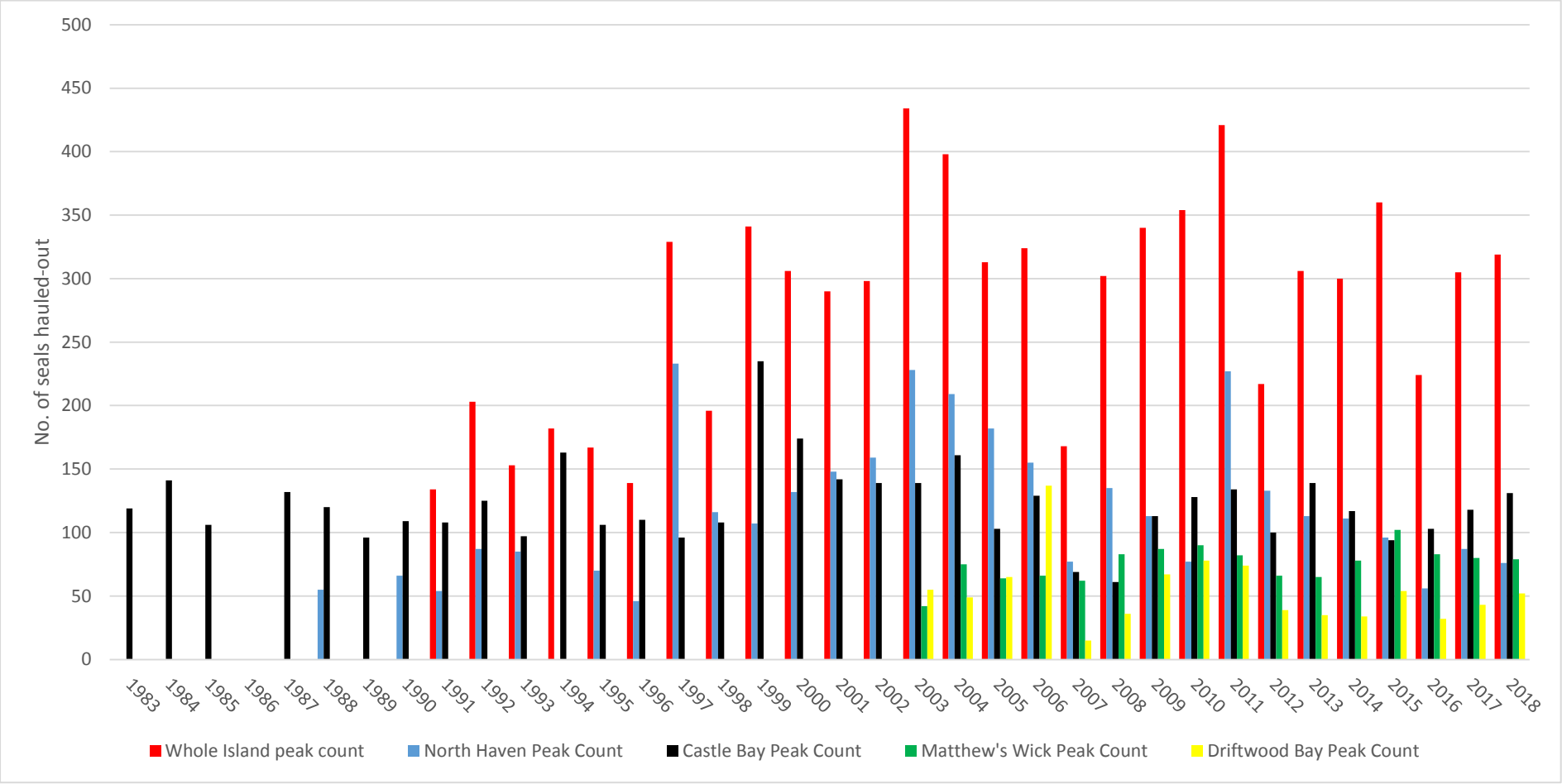
5. Haul-outs in 2018

In 2018 the maximum haul-out (on the main haul-out sites) of 319 animals (14 more than in 2017) was recorded on 13 November 2018, 25 days later than in the previous year.

The average maximum haul-out on the main haul-out sites for the last ten years is 313, hence the number of seals using Skomer to haul-out in 2018 was in line with the ten year average.

In 2018 North Haven and Driftwood Bay had their peak haul-out counts on 16/11/18, Castle Bay and Matthew's Wick had their peak haul-out count on 13/11/18.

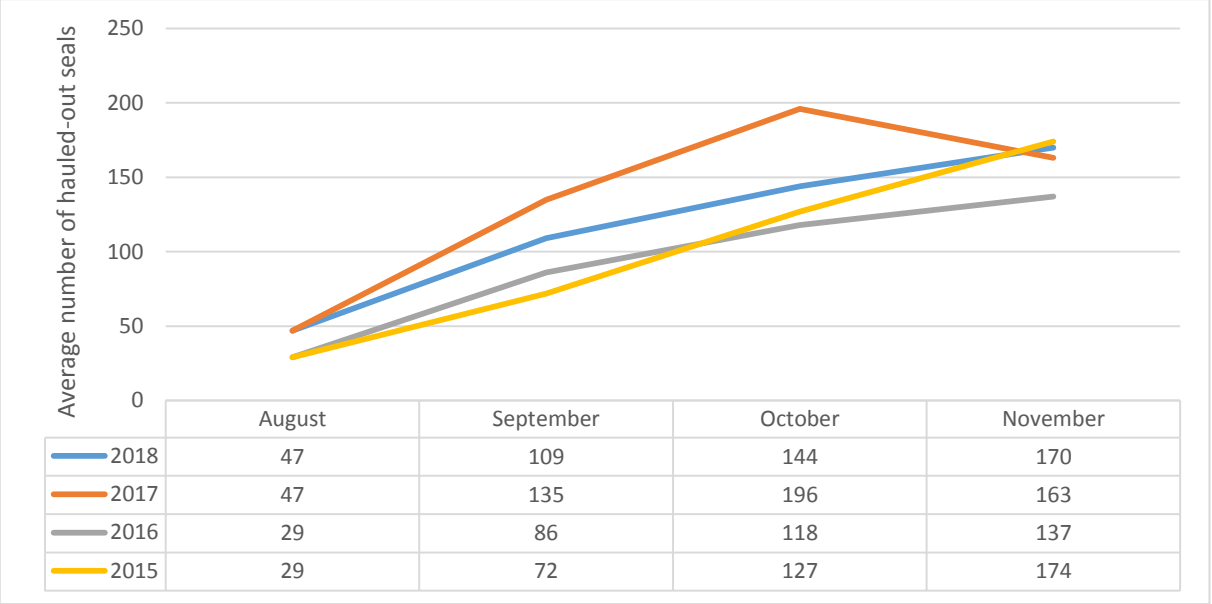
Figure 36 Peak haul-out counts on Skomer Island 1983-2018



For haul-out details see “2018 Haul-outs” 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 37 Average number of seals using Skomer per month 2015-2018



	August	September	October	November
2018	47	109	144	170
2017	47	135	196	163
2016	29	86	118	137
2015	29	72	127	174

2018 was and interesting year in regard to haul-out behaviour as it was different to the previous year. The number of hauled-out animals during the entire observation period was lower than in 2017, furthermore the haul-outs peaked at the end of November and not in October like in 2017. However, the 2018 haul-out pattern mirrors exactly the one from 2016 therefore it is probably within the normal variation of haul-out behaviour. Whether the lower numbers in 2018 (compared to 2017) are a result of the severe storms in the previous year is unknown.

When looking at the average number of seals hauled-out per site, Castle Bay (including Shag Rock) was the most popular haul-out site with an average daily haul-out of 41 seals. Like last year, the second most popular beach was North Haven (including Rye Rocks and the slip beach) with an average daily haul-out of 31 animals.

In 2018 Matthew's Wick was the third most important haul-out site with a daily average of 23 seals. The Garland Stone doesn't seem to play a major role as a haul-out site during the autumn, although seals do use it to rest all year round. A daily average of only ten seals was recorded during the monitoring period, just one more animal than the average haul-out on South Haven beach.

The number of seals hauled-out per site varies significantly from day to day and is most likely determined by weather conditions.

Figure 38 Average haul-out at the main haul-out sites per week in 2018

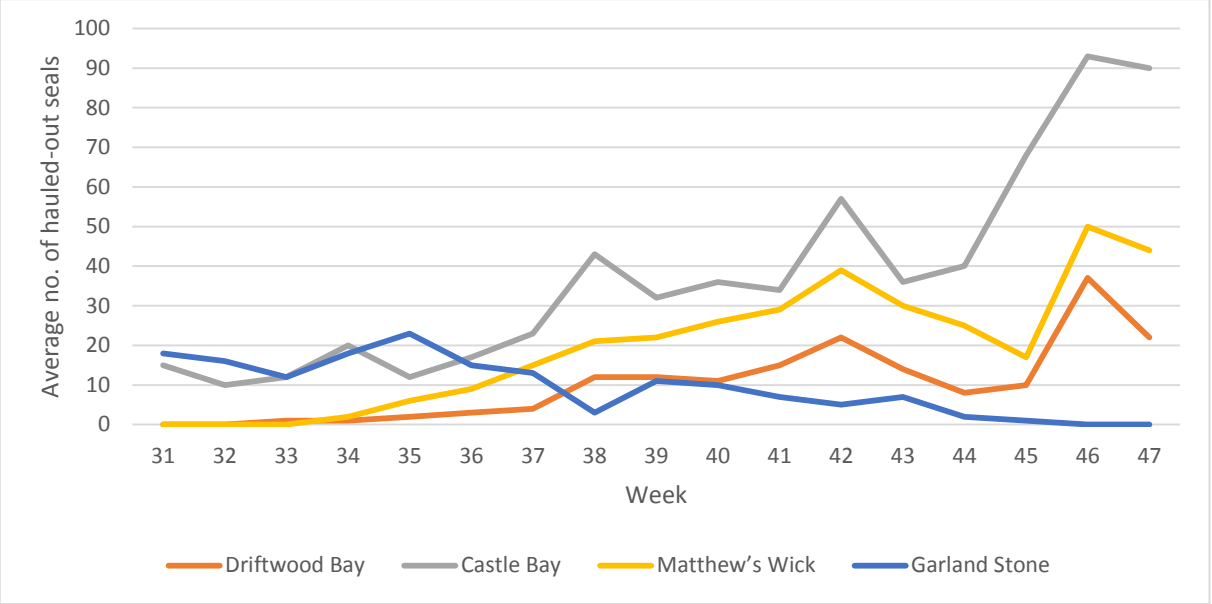


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Figure 39 North Haven haul-out in 2018

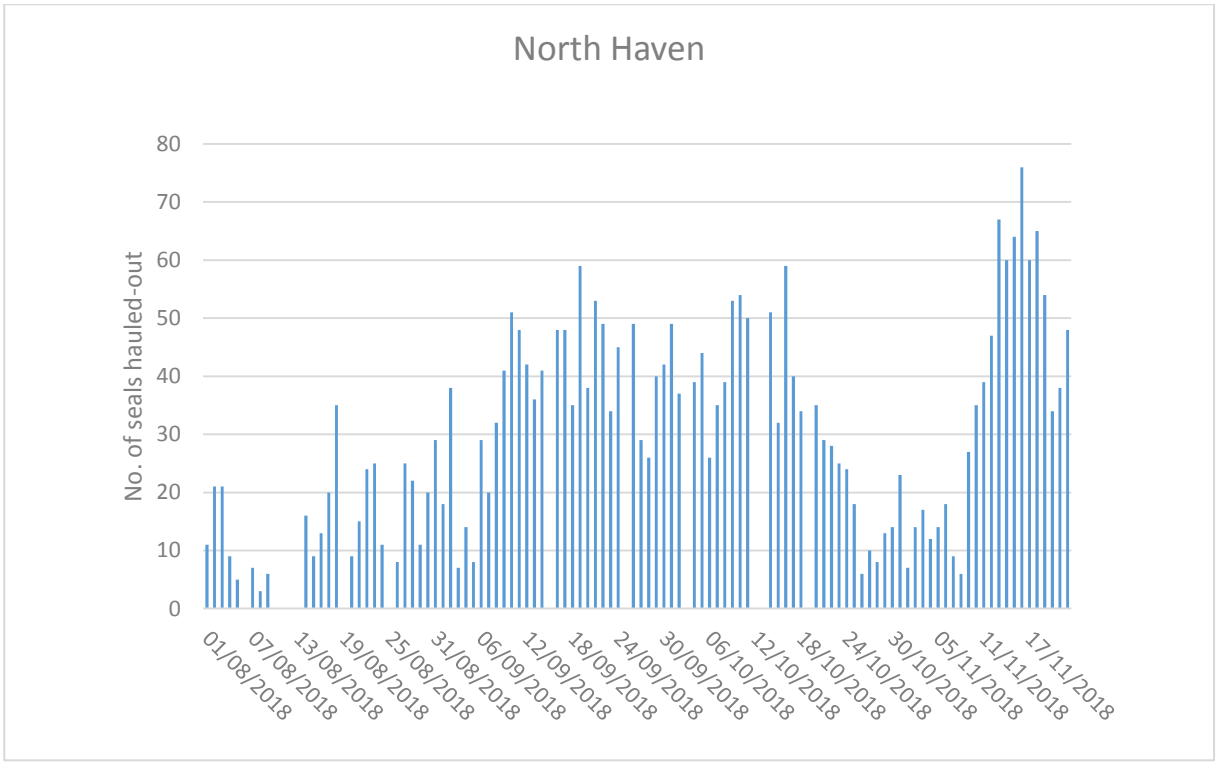


Figure 40 Castle Bay haul-out in 2018

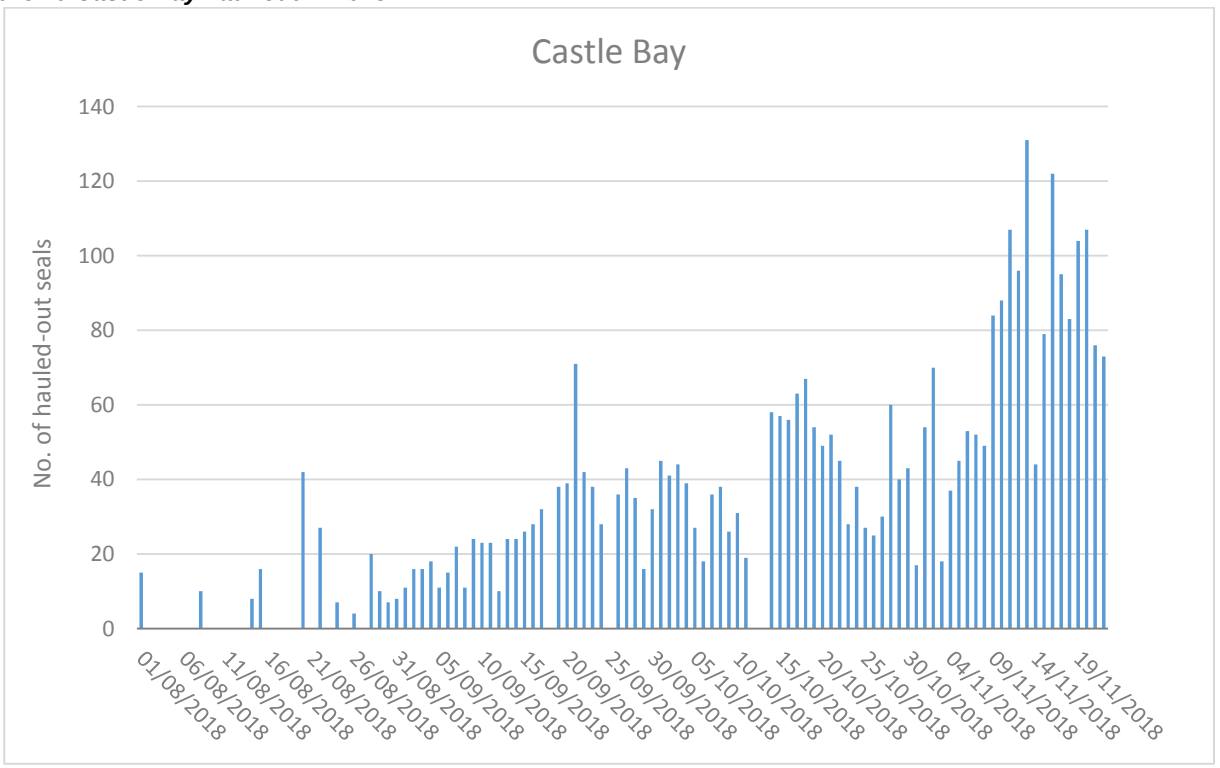


Figure 41 Driftwood Bay haul-out in 2018

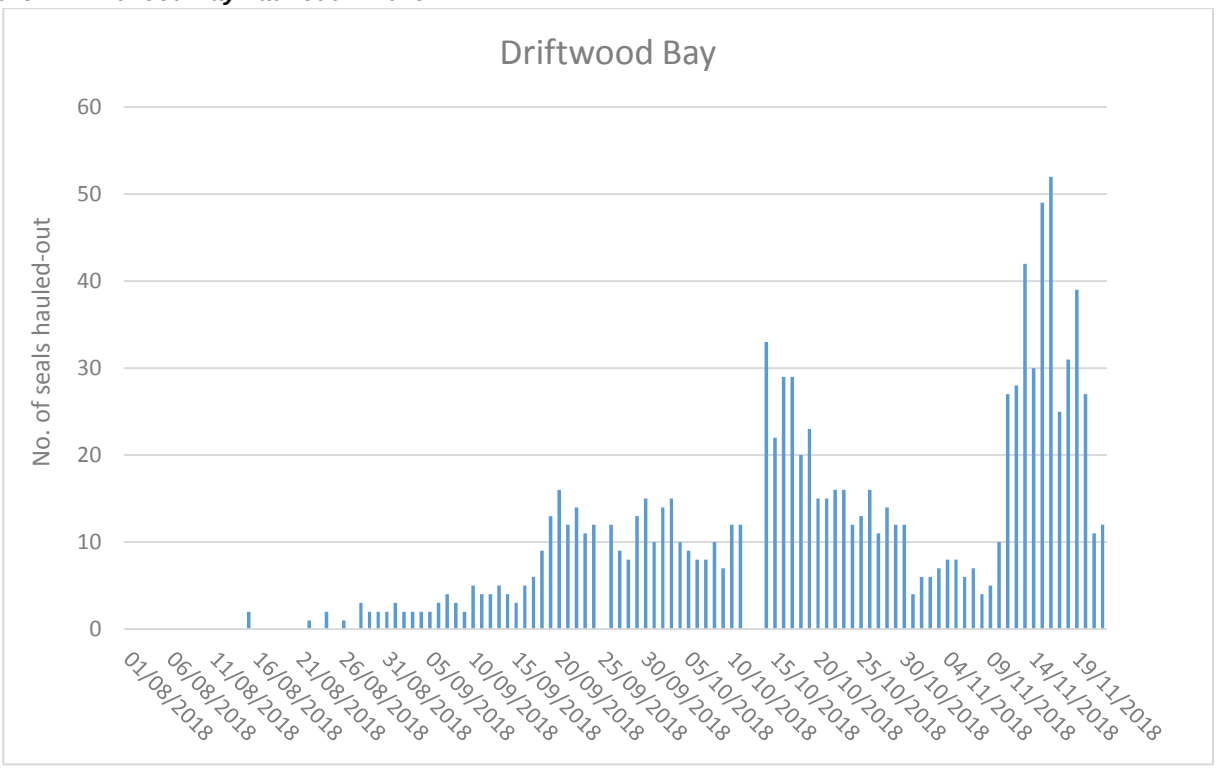


Figure 42 Matthew's Wick haul-out in 2018

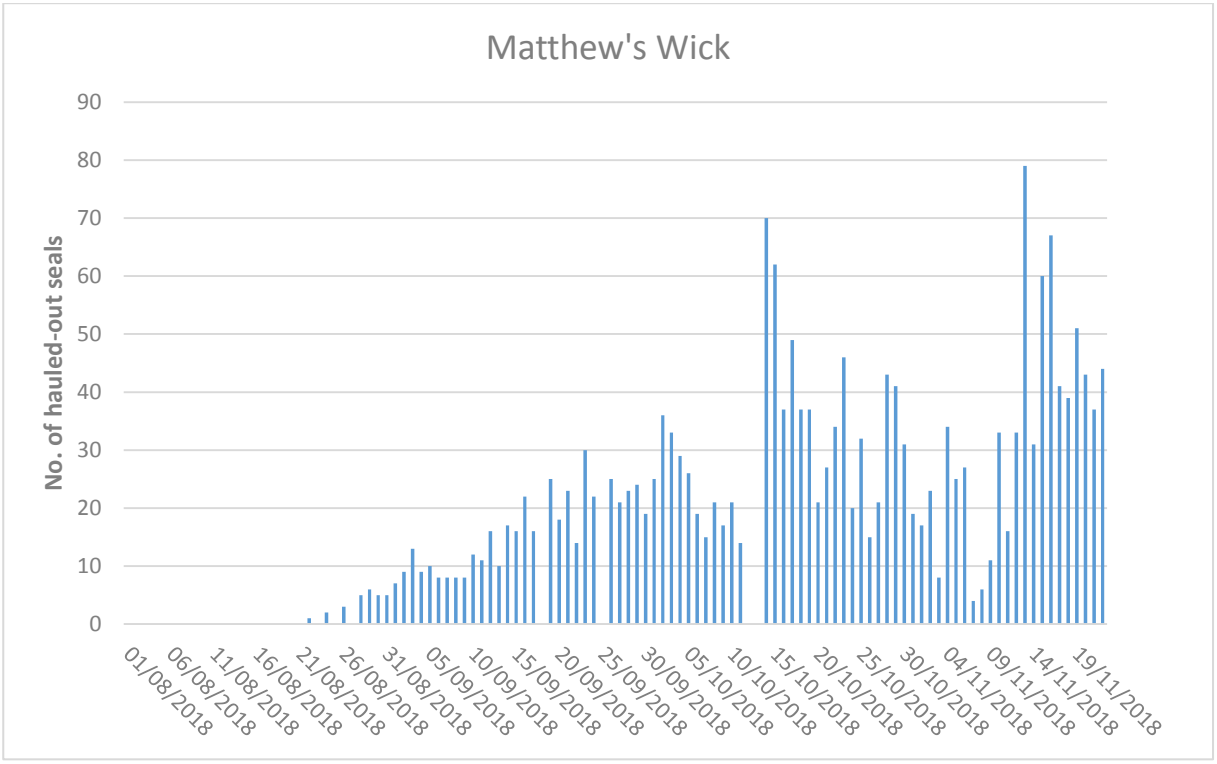


Figure 43 Garland Stone haul-out 2018

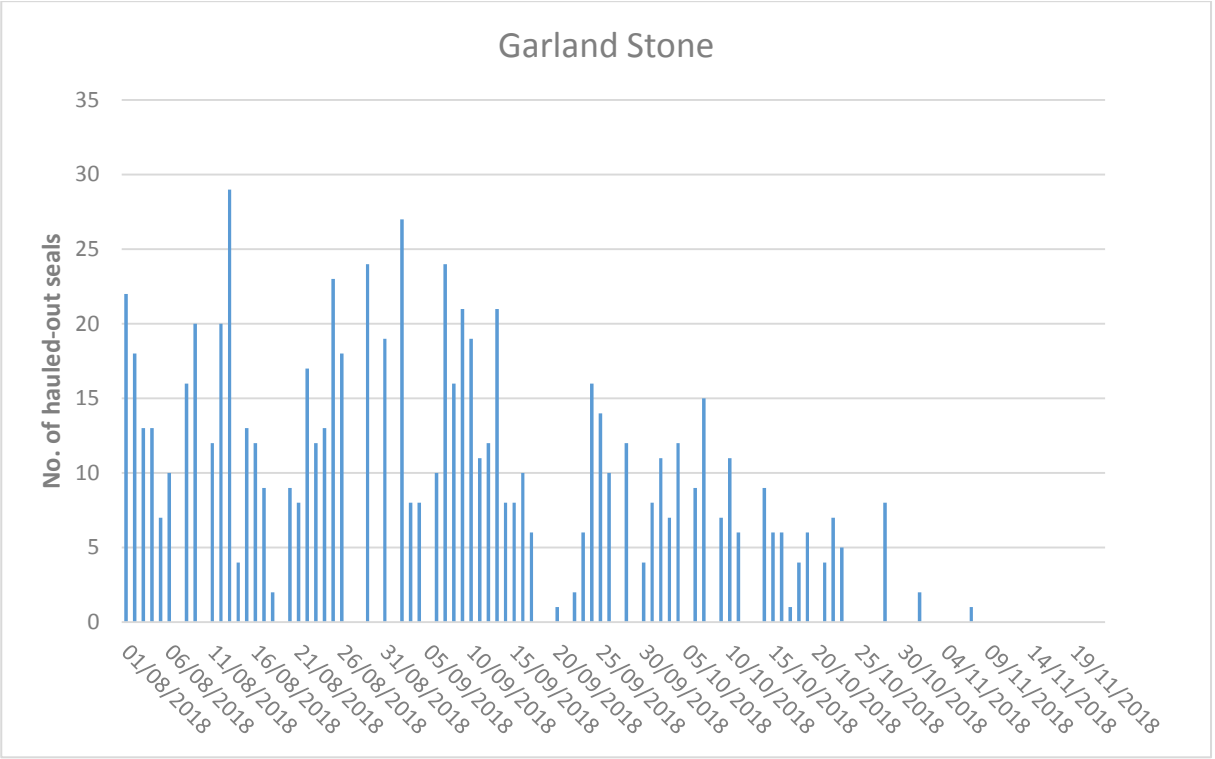
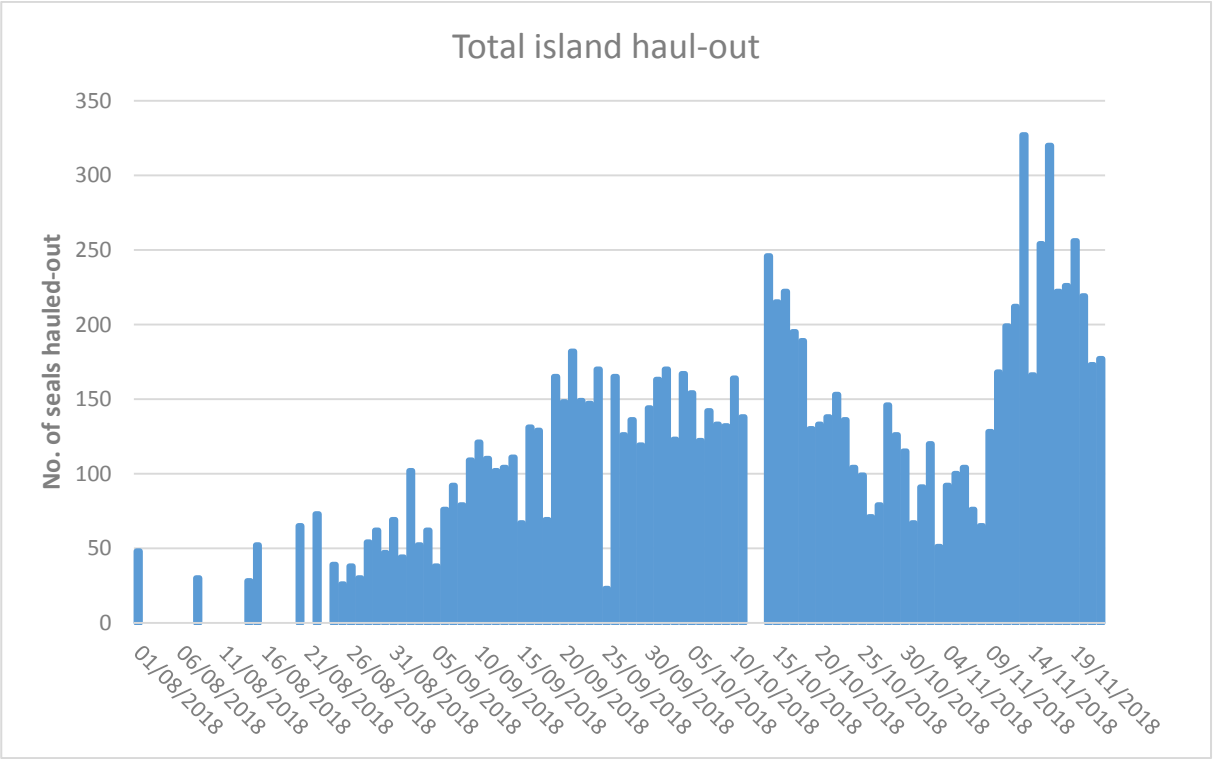


Figure 44 Total island haul-out counts in 2018



Note: On 12 and 13/10/18 no counts were conducted due to heavy storms

6. Pollution

6.1 Netting

Monofilament line and netting were the most obvious pollutants affecting seals. In 2018, 28 animals (18 females, three males and seven immature) 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 2018 seven animals with scars caused by netting were known from previous years.

NK-58
BK-006*
14.SC-NET-317.NHV
14.SC-NK-109.MWK
17.SI-NET-004.NHV
17.SC-NET-045.SHV
14.SB-NK-005

*This cow was recorded in spring (14/4/18) and not during the main seal monitoring period.

The bull 14.SB-NK-005 appears to be prone to get entangled in plastic packing straps. In 2014 he was photographed with a blue plastic strap around his neck which he acquired between 6 November and 14 November 2014. Luckily by 17 November 2014 he had lost the strap. However in 2018 he was seen again entangled in plastic; this time he had a white packing strap around his neck on 7 November 2018.

Plate 11 Bull 14.SC-NK-005 on 06/10/2014

Plate 12 Bull 14.SC-NK-005 on 14/10/2014

Plate 13 Bull 14.SC-NK-005 on 16/10/2014

Plate 14 Bull 14.SC-NK-005 on 07/10/2018

For more detailed information on these animals see the raw data file “2018 Returning and new seals”.

6.2 Oil/Tar

Skomer’s beaches remain relatively clean, no pollution by oil or tar was observed in 2018. However a large piece of wood, possibly a railway sleeper, washed up on South Haven beach and later moved to Driftwood Bay. This piece of wood must have been treated with noxious substances. During high tide an oily, shiny film covered the water surrounding the wood and at low tide its chemical smell was noticeable from the top of the cliff. Unfortunately the piece of wood was so large and heavy (ca. six meters long) that it was impossible to remove it from South Haven.

6.3 Plastic

Attempts were made at the beginning of the seal breeding season to clear beaches of plastic, however there was still plastic present on the beaches throughout the season. Especially immature seals were observed playing with pieces of plastic bag.

7 Disturbance

Between 1 August and 22 November 2018 13 incidents of disturbance to seals around Skomer Island were observed and there were six incidents of vessels entering the voluntary no access zones. All such events were noted in a disturbance log and the severity of the disruption to seals rated: 1= little 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. Ten incidents of category 1 (incl. two which were rated 1-2) and three incidents of category 2 were observed.

Similar to previous years, boats were frequently recorded in the voluntary no access zones especially in South Haven. Some boats come far into South Haven and even launch row boats to watch seals. Boats anchored in South Haven risk disturbing seals 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 and dive boats etc. throughout the entire season. Furthermore some lobster potters take no notice of the voluntary no access zones and place their pots extremely close to pupping and haul-out sites.

For details see Appendix 3 and 4.

Plate 15 Boat circling Rye Rocks to photograph seals which resulted in seals entering the water (20/10/18)

Plate 16 Lobster potters fishing in the mouth of Matthew's Wick inside the voluntary no access zone on 7/9/18

Plate 17 Kayakers inside the voluntary no access zone very close to the beach at Matthew's Wick on 27/9/18

8. Seal Behaviour

Very little unusual seal behaviour was observed in 2018. Of interest was the cow 16.SC-US-117.SHV which pupped again on South Haven beach and again wasn't able to feed her pup (see 4.4.11) and the pup which swam to Ireland (see 4.4.5)

9. Disease

In 2018, as in previous years, the usual amount of small and ill-looking weaners were observed, especially towards the end of the pupping season. As the survival rate of weaners born on Skomer is unknown no assumption to the extent of mortality in weaners can be made. Observations suggest that a large proportion of young seals die within weeks of being weaned.

Eye infections were the most common illnesses among seal pups in 2018. It seems to affect mostly pups on Matthew's Wick. A possible explanation for this is the fact that Matthew's Wick only gets flooded during large tides so rotting seaweed, seal excrement, dead pups etc. accumulate on the beach, possibly spreading diseases. Furthermore Matthew's Wick, being a busy pupping and haul-out site, could also lead to a higher rate of disease transmission as seals lie closely bunched up on the shore.

One healthy looking pup size 4 died mysteriously, see 4.4.11

10. Identification of individual seals

For the 14th year photographic monitoring of adults continued in 2018 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 other Pembrokeshire sites: Marloes Peninsula and Ramsey Island in 2010.

NRW have been continuing to develop the Wales Seal Photo ID database called EIRPHOT. Photos are entered using head and neck profiles and standardised patches of pelage patterns extracted and matched within the database. In 2014 NRW workers and trained volunteers were contracted 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. Photos for 2015 and 2016 are stored ready for entering into the database.

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 Seal Photo ID database.

In 2018, as in previous years photos of all breeding females were taken where possible. Photos of dominant bulls and seals with scars or netting were also taken. A total of 305 of these photos are stored ready to be entered into the Wales Seal Photo ID database. Ninety five seals with obvious scars were identified by eye.

Of the 241 breeding females we managed to photograph 156 (65%) well enough for identification by eye and/or inclusion in the database.

Of the 95 seals identified by eye

- 38 of them were re-identified from previous photos.
- 51 new seals were photographed and added to the ID catalogues. Six new seals were not added to the ID catalogues as the quality of the photos was too poor.
- The oldest cow to have returned to Skomer was LS-002. She hauled-out on Castle Bay in 2003 and 2004 and was seen with a pup on South Haven beach in 2005. The next year she was observed hauled-out and from 2008 till 2012 she pupped every year on Skomer. After two years in which she wasn’t seen she pupped again in 2015 and was seen hauled-out in 2016.
- The oldest bull to have returned to Skomer was 10.SHV.B03 which was first recorded in 2010.

Table 31 Year of first sighting of seals seen on Skomer Island in 2018

Year first observed	No. of animals seen in 2018 which were known from previous years
2017	9
2016	3
2015	3
2014	6
2013	2
2012	2
2011	3
2010	3
2009	0
2008	3
2007	0
2006	1
2005	0
2004	2
2003	1
TOTAL	**38**

10.1 Breeding Cows Returning In 2018

Boyle (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 (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 241 cows which pupped on Skomer in 2018, 53 had distinctive markings/scars and were photographed well enough for comparing with the catalogue. Twenty-two matches were found, hence 42% of identifiable breeding cows were returning cows, similar to last year (38%). The percentage of returning cows usually lies around 40% and annual variation is possibly 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.

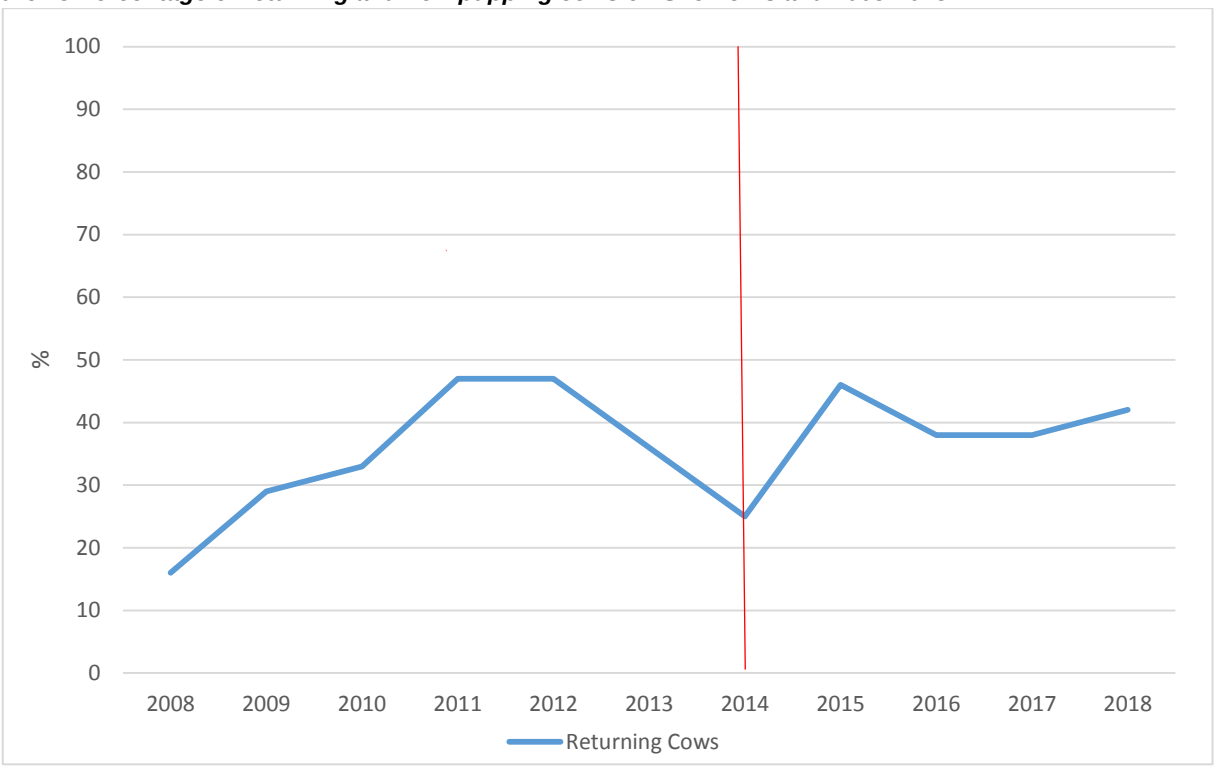
- Fifteen (68%) of the 22 matched cows that pupped on Skomer in 2018 also pupped on Skomer in 2017 (38% in 2017, 44% in 2016, 55% in 2015)

- Four cows (18%) pupped in three consecutive years on Skomer (8% in 2017, 25% in 2016, 30% in 2015).

- 15.SC-HD-129.SHV and 16.SC-US-117.SHV* pupped in four consecutive years on Skomer.

*This cow pupped in 2015 but was only identified in 2016, hence received the name 16.SC etc.

Figure 45 Percentage of returning and new pupping cows on Skomer Island 2008-2018



— Change in methodology (only scarred seals identified by eye since 2014).

10.1.2 Site fidelity

- Of the 15 cows that pupped on Skomer in both 2018 and 2017, six (40%) returned to pup at the same site (60% in 2017, 57% in 2016, 45% in 2015, 78% in 2014).

- Of the four cows that pupped on Skomer in three consecutive years 2016-2018 two (50%) used the same site in all three years (0% in 2017, 50% in 2016, 40% in 2015, 67% in 2014).

This year's data shows once again, that there are cows which have preferred pupping sites but some animals which are not site faithful and 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

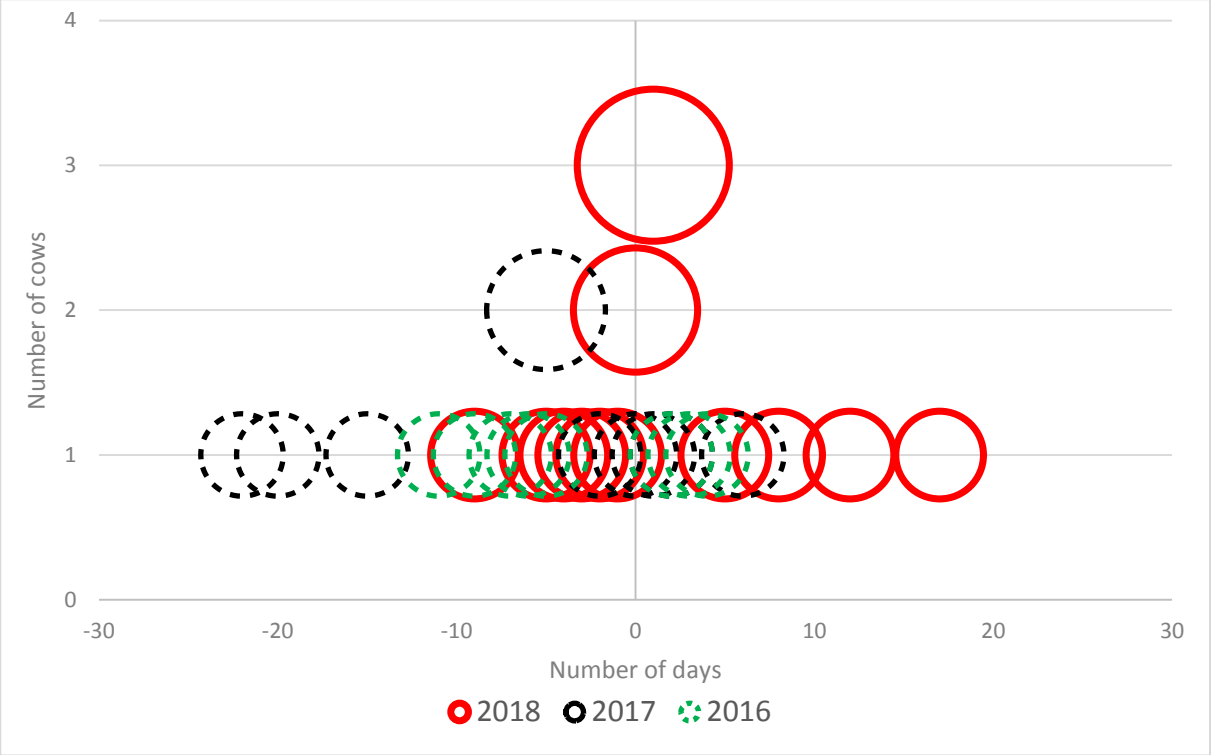
Table 32 Pupping date of returning cows on Skomer Island in 2013-2018

Cow	Pupping date 2016	Pupping date 2017	Pupping date 2018	Difference (days) 2016/17	Difference (days) 2017/18	Average difference (days)
LBK-017		14-Oct	14-Oct	n.a.	0	0
13.SC-BK-178.MWK		30-Oct	01-Nov	n.a.	+1	1
14.SC-LS-058.NHV	22-Sep	02-Sep	19-Sep	20	+17	18.5
15.SC-HD-129.SHV	08-Oct	03-Oct	04-Oct	5	+1	3
15.SC-LS-189.SHV		13-Oct	08-Oct	n.a.	-5	5
16.SC011.MWK	27-Aug	27-Aug	27-Aug	0	0	0
16.SC-US-117.SHV	01-Oct	07-Oct	04-Oct	6	-3	4.5
17.SC-EYE-239.NHV		12-Nov	31-Oct	n.a.	-12	12
17.SC-LBK-073.DWB		20-Sep	16-Sep	n.a.	-4	4
17.SC-LBK-131.DWB		28-Sep	19-Sep	n.a.	-9	9
17.SC-LBK-212.DWB		17-Oct	15-Oct	n.a.	-2	2
17.SC-LBK-217.SHV		18-Oct	19-Sep	n.a.	+1	1
14.SC-NK-033.SHV		13-Sep	18-Sep	n.a.	+5	5
17.SC-RS-035.DWB		10-Sep	18-Sep	n.a.	+8	8
17.SC-RS-092.SBS		22-Sep	21-Sep	n.a.	-1	1

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 bubbles in the bubble graph below (which show the difference in pupping date for the ten identified cows) it seems that 2018 was a normal year with most cows pupping around the same time than in previous years.

16.SC011.MWK is a rather astonishing cow as she has managed to pup on the exact same day in three consecutive years. Another interesting animal is LBK-017 as she pupped on the same date in 2018 and 2017.

Figure 46 Difference in pupping date of returning cows on Skomer Island 2015-2018



For pupping site fidelity and pupping date details see “2018 Returning and new seals” raw data file.

10.2 Returning Bulls

Seventeen bulls were identified in 2018, of which seven had been recorded previously on Skomer.

11. Skomer Seals Seen Elsewhere

On 5 November a young bull seal with an orange tag was seen on Matthew's Wick beach and the next day he was photographed. Unfortunately the numbers on the tag were worn off and none of the rehabilitation centres were able to identify this seal. Sue Sayer from the Cornwall Seal Group Research Trust photographed the same seal on 19 and 22 November and twice in December on a West Cornwall site so the young bull had moved from Skomer to the south coast.

Plate 18 The young tagged bull 18.SB-TAG-001.MWK that was photographed on Matthew's Wick on 6/11/18

On 17 April a young bull seal was photographed on North Haven with an orange tag on his right flipper with the number 038. He was traced to the aquarium Oceanopolis in Brest, France where he had been rehabilitated. He arrived at the rescue centre on 5 March 2016 after he was found in Cap Ferret (West coast of France) and he was released on 4 May 2016 in Ile Ségal near Brest.

Plate 19 Seal with the orange tag 038 on 17/4/18 on North Haven beach

On the 23 April 2018 another seal with a tag was spotted on Driftwood Bay. It had a yellow-white tag with the number 6307(1?) and looked like a young bull. The last digit was difficult to read but most likely the correct number was 63071. Richard Thompson, wildlife rehabilitation team manager at Mallydams Wood, Surrey confirmed that the centre had rehabilitated and returned several Grey seals to South Wales in April 2018 and in the previous year. They use white tags with a numerical prefix of 630** and they are very visible but do discolour to yellow. Finally the animal was traced and it turned out it was a male from Cornwall, rescued on 18/1/2018. It was named Tretoil and was returned to Cornwall via the BDMLR on 28/3 2018 weighing 60kg.

Plate 20 Tretoil on Driftwood Bay on 23/04/2018

A very curious seal was noted on 15 June as it came right up to staff rowing the island tender. It was seen again hauled -out at North Haven slip on 17 June and in the water at the landing on 31 July 2018. The seal has red tag with the number 80284 and is called Morgan. He was picked up from Newquay and transferred to RSPCA West Hatch Wildlife centre in Somerset on the 11 January 2018. He was released at Combe Martin on 13 April.

Plate 21 Morgan in North Haven on 16/07/2018

April was another seal which moved from Devon to Skomer. She was photographed on Skomer hauled-out on North Haven beach on 10 April 2018. This was the first time she was spotted post release in 2017. She had been picked up underweight from Newquay on the 20 December 2016 and taken to RSPCA West Hatch Wildlife Centre in Somerset where she was released at Combe Martin on the 17 February 2017.

Plate 22 April on North Haven beach on 10 April 2018

Furthermore the seal Trixie with the orange tag 80191 was also seen several times in 2018. She was photographed on 17 August and 21 September.

Plate 23 Trixie in North Haven on 21/09/2018

Another known tagged seal called Velma hauled-out on NHV on 06 March and 1 April 2018. For more information about Trixie and Velma see last year's report.

12. Further Research

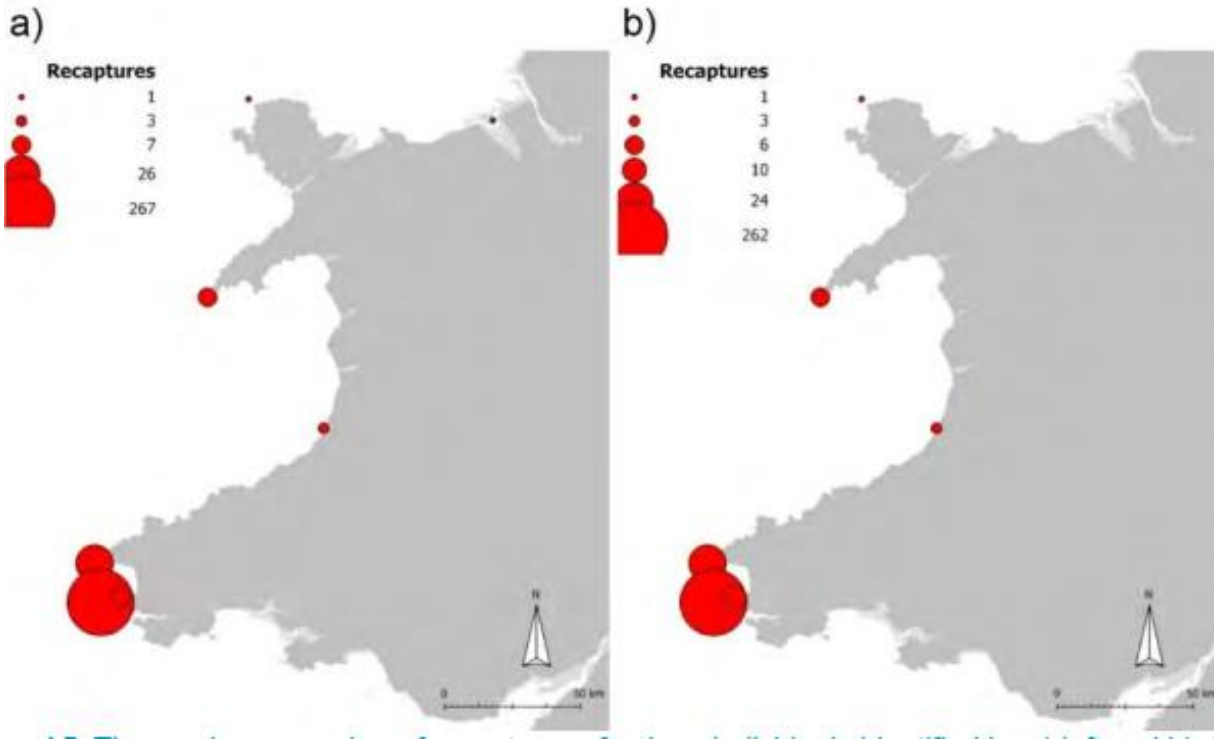
In 2018 no research projects on Grey Seals on Skomer were conducted. However the Sea Mammal Research Unit together with the Conservation Research Ltd. Cambridge and Natural Resources Wales conducted a study to assess, error check, update and report on Wales' photo-ID database EIRPHOT.

On completion of this analysis, the EIRPHOT database contained 35,724 extracts, from 17,056 images across 3,273 sampling occasions between 1992 and 2016. Almost 30% of these extracts came from individuals identified at Bardsey and just over 20% came from Skomer. For the main seven areas within the EIRPHOT database, the highest quality images were taken at Skomer. The most prominent issue in quality was image focus and the misidentification/non-identification of sex.

The study found that the majority of individuals recorded within the EIRPHOT database were only seen once. Of the individuals seen more than once, 12-13% were recorded twice, 5% were recorded three times, 2% were recorded four times, 1% were recorded five and six times and <1% were recorded seven times or more. The individual with the highest number of recaptures was "SH_057" who was first recorded at J090 (Castle Bay, Skomer) and was recaught 12 times between 1993 and 2016, at locations J090, J100 (Matthew's Wick, Skomer), J020 (The Wick, Skomer), G020 (Garlic, Ramsey) and G030 (Aber Mawr, Ramsey). The same individual had the longest capture history within the EIRPHOT database, which spanned 23 years from 1993 to 2016.

For individuals seen more than once, there were connections (implied movements) among the seven broad areas and to locations outside of these, ie "other". Skomer was the most connected. The highest probability of inferred movement to Skomer was from Marloes. The highest probability of inferred movement from Skomer was to Ramsey. Skomer was connected with all other broad areas within the EIRPHOT database. However, only single individuals were recorded to have moved from Skomer to the Dee Estuary and to the Skerries, and from Cardigan Bay to Skomer.

Figure 47 The maximum number of recaptures of unique individuals identified by a) left and b) right head extracts, moving to or from the area of Skomer.



For more information see NRW report 280: EIRPHOT: A critical assessment of Wales' grey seal (Halichoerus grypus) photo-identification database

13. Study recommendations

The 2018 breeding season was once again very demanding on staff resources. Last year a lot of cows pupped at the same time and up to 94 pups were present on the beaches simultaneously. This year up to 80 white coated pups were on the beaches at the same time and it was a record year in terms of the overall number of births. The workload has increased over the years with higher pup numbers and better photography equipment and we recommend that the field methodology is adjusted as it is virtually impossible to monitor more than 60 pups daily. Monitoring could be done every two or three days only to allow for data entry in-between or a system of rotating beaches could be introduced. Unfortunately the accuracy of pup production and survival will inevitably sink with reduced site visits as, for example, pups which are born and disappear on the same day will be missed.

Another option to ease workload is to mark pups on a selection of beaches only, e.g. the ones which have lots of caves in which pups can hide. The beaches which can be viewed well from above could get monitored according to the “mainland” methodology without identifying individual pups.

Furthermore we recommend to rethink the seal ID work. Taking photos for EIRPHOT is very time consuming and should only be continued if the photos actually get uploaded to the database and only when time allows (e.g. beginning and end of season).

One aspect of the life history of Skomer seals which is not being investigated at all is what happens to the pups once they wean and leave. A lot of resources are spent on observing the first three weeks of a pup’s life but it would be most interesting to know how many weaners actually make it to breeding age and whether they return to their natal site. We recommend to develop a tagging project to mark seal pups/weaners individually in collaboration with a research facility e.g. Swansea University. The tagging could be done on a variety of selected beaches during the normal seal marking visit, hence limiting disturbance.

The Cornish Seal Sanctuary has been very successful with its tagging project. Between 1996 and 2014 the sanctuary tagged 740 Grey Seals of which 186 have been sighted. This equates to an average of 25% (79% alive, 21% dead). There has been a total of 1359 sightings since 1996. Over this time the percentage sighted has varied from 0% to 59%.

A resighting rate of 25% is very good, especially when comparing this with what can be achieved through scientific bird ringing. According to the Institute of Avian Research, Helgoland an average of 3.8 million birds are ringed, and about 90,000 recovered in Europe each year which equates to a resighting rate of only 2.4%.

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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 beginning of moult
SW	Known to have survived and weaned
D	Known to have died
ASM	Assumed to have survived to the beginning 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
LAN	The Lantern (former LTN)
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 Beginning 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
21/08/18	Tourist RIB with passengers went very close to Rye Rocks	1
29/08/18	Lobster potter checking pots in NHV, disturbed some seals off RR	2
07/09/18	Lobster potter inside MWK and then around entrance to CBY. Seals at CBY slightly agitated. Likely spooked all seals at MWK into water as eight animals were in water when I got there five minutes later and not a single one on land	1-2
13/09/18	Tourist RIB close to Rye Rocks, several seals in water but not seen entering, seals on rock lifting heads	1
20/09/18	Sailing school yacht in voluntary no access zone in SHV. Something clanged against mast and seals lifted their heads	1
27/09/18	Two kayakers around entrance to MWK, staff on beach spraying so seals already disturbed but didn't help as possibly made seals feel trapped	1
29/09/18	Private landers disturbing seals on NHV slip beach	2
05/10/18	Lobster potter going very fast up to North Haven main beach, very far into no access zone, seals splashing in water but as high tide only few animals on strip of beach	1-2
07/10/18	Lobster potter potting in North Haven very close to seal beach, well within the voluntary no access zone, seals on beach and Rye Rocks alarmed	1
19/10/18	Three Kayakers paddled through RR but as there were only sleepy males on there little disturbance was caused	1
20/10/18	Dive RIB with 4 people aboard went up to RR, almost touching rocks, went through middle and one male entered water	2
24/10/18	Yacht with six people on board was anchored in SHV, probably just on the border of the no access zone. When they lifted the anchor the noise disturbed the seals on SHV	1
24/10/18	Motorboat and yacht anchored inside voluntary no access zone in SHV. Yacht raised anchor and mums on SHV to raise heads and become alert	1

Level of disturbance
1= little disturbance (lifting of heads or similar)
2= seals enter water in response to perceived threat
3= major disturbance involving abandonment of pup or similar

Appendix 4 Incidents of breach of the marine code of conduct

Boat in voluntary no access zone but no disturbance noted	
Date	**Details**
05/09/18	Yacht in voluntary no access zone in SHV
05/09/18	Yacht in voluntary no access zone in SHV lowering anchor whilst cow was giving birth on beach, no disturbance noted
13/09/18	Tourist RIB in voluntary no access zone in South Haven and North Haven
28/09/18	Yacht in voluntary no access zone in SHV, no disturbance noted
30/10/18	Motorboat anchored inside voluntary no access zone in SHV at 14.00h, 1p
01/11/18	Motorboat cruising around inside voluntary no access zone in SHV at 14.30, 2p