Cyfoeth Naturiol Cymru
Natural Resources Wales

Grey Seal Breeding Census Skomer Island 2017

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

NRW Evidence Report 252

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Summary

237 pups were monitored on Skomer Island in 2017, of which 225 were definitely born on Skomer and twelve pups turned up either just before the start of moult, or moulting (wanderers).

The total of 225 pups born on Skomer Island is the second highest total ever recorded with 240 (in 2015) being the record.

A total of 383 pups were born within the Skomer Marine Conservation Zone, of which 158 were born on the Marloes Peninsula. See section 4.2.

The busiest period was week 39 (25/9-1/10) with 51 pups born. See section 4.2.

The most productive beaches were Matthew's Wick (42 pups), South Haven and North Haven (41 pups). The fourth most popular beach was Driftwood Bay (28 pups). See section 4.2.

170 pups are known, or assumed to have survived on Skomer, giving a survival rate of 76%. This survival rate assumes that all moulting pups (class 4) and all those size 3 or larger survived two severe storms in mid-October – even if they disappeared during the storms. Therefore a second, potentially more accurate, survival rate (storm methodology) of 62% was calculated. See section 4.3.

In 2017 the maximum haul-out (on the main haul-out sites) of 305 animals was recorded on 23 November, one day earlier than in 2016. See section 5.

In 2017 25 animals (15 females, six males, four immature) were photographed with obvious signs of being entangled in nets at some time in their lives. See section 6.

Between 1 August and 23 November 2017 14 incidents of disturbance to seals around Skomer Island were observed and there were 13 incidents of vessels entering the voluntary no access zones. See section 7 and Appendix 3 and 4.

In 2016 410 photos were taken which will be entered into the NRW Wales Seal ID database. Furthermore 127 seals were identified by eye, of these 50 were known from previous years. See section 10.

Crynodeb

Cafodd 237 o loi eu monitro ar Ynys Sgomer yn ystod 2017. O'r rheiny, gwyddom i sicrwydd fod 225 ohonynt wedi'u geni ar Sgomer, a chyrhaeddodd 12 o loi naill ai ychydig cyn neu yn ystod y cyfnod bwrw blew (crwydriaid).

Y cyfanswm o 225 o loi a aned ar Ynys Sgomer yw'r ail gyfanswm uchaf a gofnodwyd erioed – yr uchaf yw 240 yn 2015.

Ganed cyfanswm o 383 o loi o fewn Parth Cadwraeth Morol Sgomer – gydag 158 o'r rheiny wedi'u geni ym Mhenrhyn Marloes. Gweler adran 4.2.

Wythnos 39 (25/9-1/10) oedd y cyfnod prysuraf, gyda 51 o loi yn cael eu geni. Gweler adran 4.2.

Y traethau mwyaf cynhyrchiol oedd Matthew's Wick (42 llo), a South a North Haven (41 llo). Driftwood Bay oedd y traeth pedwerydd mwyaf poblogaidd (28 llo). Gweler adran 4.2.

Fe wyddys, neu fe dybir bod 170 o loi wedi goroesi ar Sgomer, gan roi cyfradd oroesi o 76%. Mae'r gyfradd oroesi hon yn tybio y gwnaeth pob llo a oedd yn bwrw blew (dosbarth 4), a'r rhai o faint 3 neu fwy, oroesi dwy storm ddifrifol yng nghanol mis Hydref - hyd yn oed os gwnaethant ddiflannu yn ystod y stormydd. O ganlyniad, cafodd ail gyfradd oroesi (methodoleg storm) o 62%, mwy manwl o bosibl, ei chyfrifo. Gweler adran 4.3.

Yn 2017, cofnodwyd y nifer fwyaf yn gadael y dŵr (ar y prif safleoedd gadael), sef 305 o anifeiliaid ar 23 Tachwedd – diwrnod yn gynharach nag yn 2016.Gweler adran 5.

Yn 2017, tynnwyd ffotograffau o 25 o anifeiliaid (15 benyw, chwe gwryw, pedwar iau) a oedd ag arwyddion amlwg eu bod wedi mynd yn sownd mewn rhwydi rywbryd yn ystod eu bywydau. Gweler adran 6.

Rhwng 1 Awst a 23 Tachwedd 2017, gwelwyd 14 digwyddiad o amharu ar forloi o amgylch Ynys Sgomer, ac roedd 13 digwyddiad o longau'n mynd i mewn i'r parthau dim mynediad gwirfoddol. Gweler adran 7 ac Atodiadau 3 a 4.

Yn 2016, tynnwyd 410 o ffotograffau a fydd yn cael eu mewnbynnu i gronfa ddata adnabod morloi Cyfoeth Naturiol Cymru. Ymhellach, cafodd 127 o forloi eu hadnabod â'r llygad am fod 50 o'r rhain yn hysbys o flynyddoedd blaenorol. Gweler adran 10.

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1. Introduction

Between 1 August and 23 November 2017 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,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 1 August and 23 November 2017 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 4 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, L, 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

237 pups were monitored on Skomer Island in 2017, of which 225 were definitely born on Skomer and twelve pups turned up either just before the start of moult, or moulting (wanderers).

The total of 225 pups born on Skomer Island is the second highest total ever recorded with 240 (in 2015) being the record.

The first pup of the season was born on the Wick on 26/7. It was found on 2/8.

Two pups were born in July, twelve in August, 146 in September, 57 in October and eight in November. The busiest month therefore was September. For the first time since 2003 there were pups born in July.

As in 2016 the busiest period was week 39 (25/9-1/10) with 51 pups born.

170 pups are known, or assumed, to have survived on Skomer, giving a survival rate of 76%.

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

Plate 1 Skomer Island overview

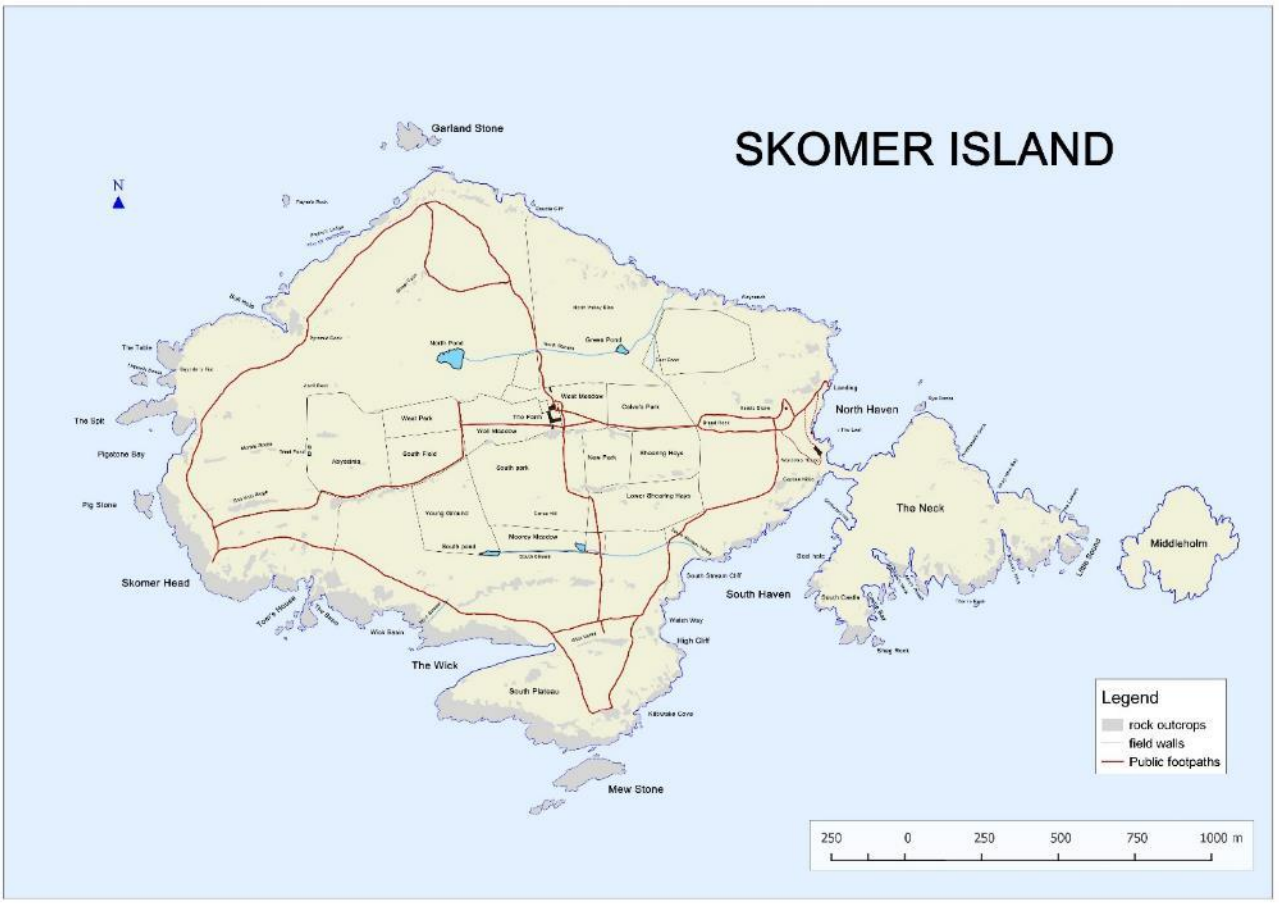


Plate 2 Skomer Island Grey Seal pupping sites East

Plate 3 Skomer Island Grey Seal pupping sites West

4.2 Pup Numbers

2017 was another good breeding season for the seals within the Skomer Marine Conservation Zone (MCZ) with a total of 383 pups born, of which 158 were born on the Marloes Peninsula.

On Skomer 237 pups were monitored in 2017. Two hundred and twenty-five of them were definitely born on Skomer and twelve 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 record pup numbers, however in 2017 the numbers were up again to 225. The seal pup numbers on the Marloes Peninsula were also up at 158 pups born, 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 1983-2017

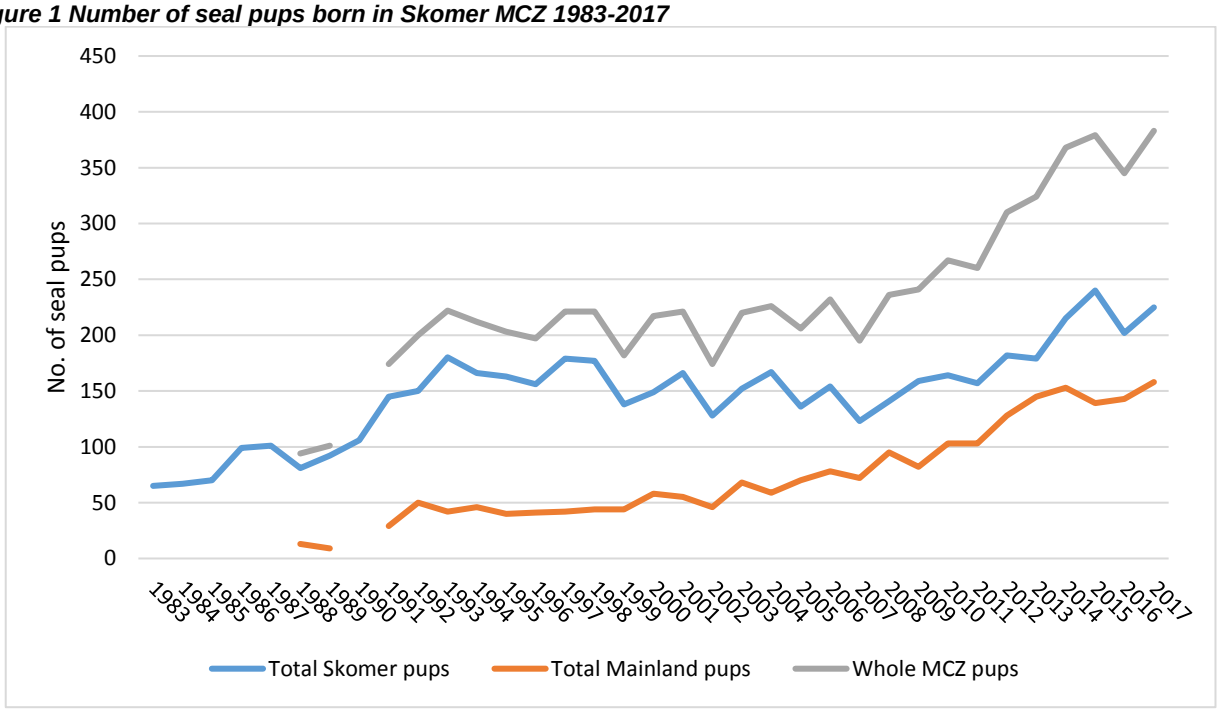


Figure 2 Daily totals of seal pups born on Skomer Island in 2017

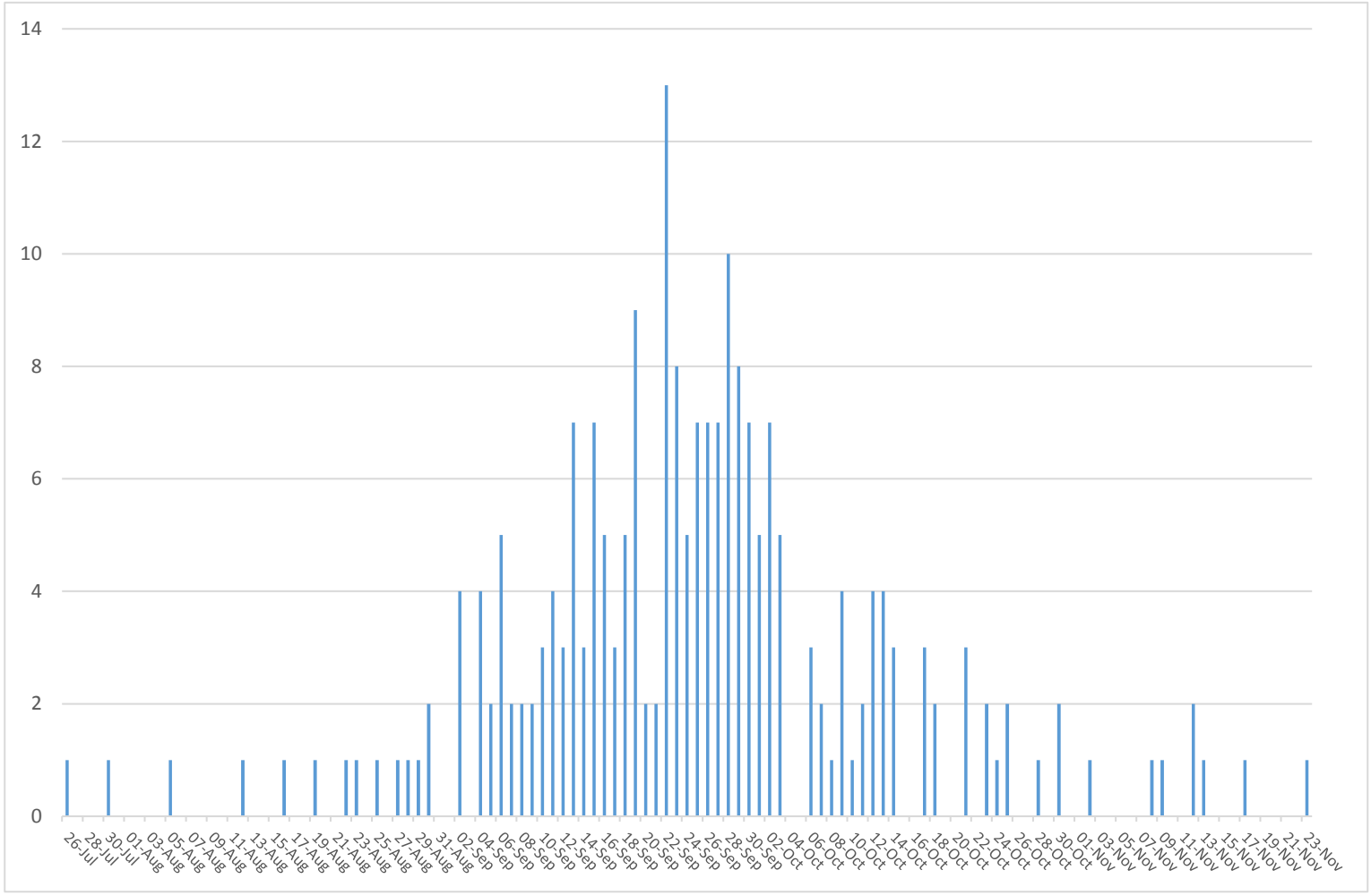


Table 1 Monthly number & percentage of seal pup births on Skomer Island 1983-2017

Year	July	August	September	October	November
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%)

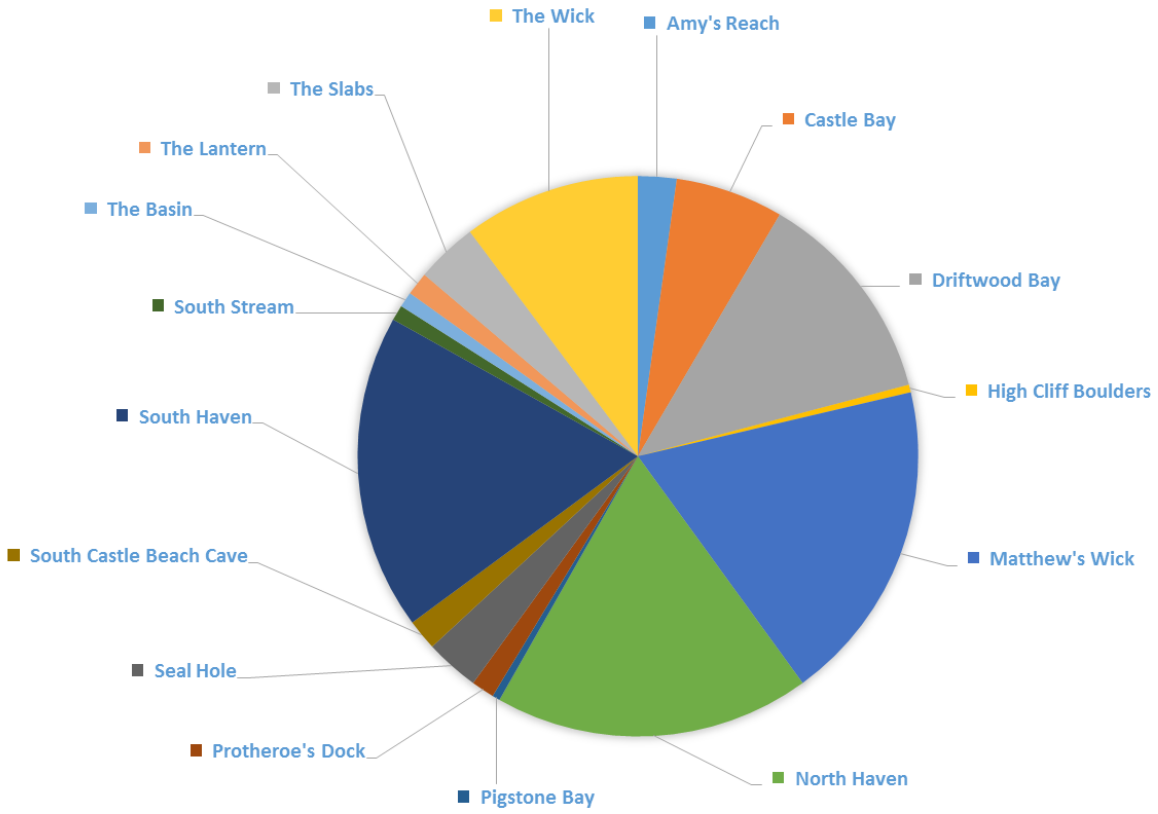
Seal observations continued to mid-December in 1983, 1985 and 1986 and to the end of January in 1984 and 1987. The following data was recorded in these survey years:
1983 Dec: 3(4%), 1984 Dec: 6(9%), Jan: 6(9%). 1985 Dec: 14(19%), 1986 Dec: 5(5%), 1987 Dec: 15(15%), Jan: 5(5%). From 1989 onwards the 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.

As in 2016 the busiest period was week 39 (25/9-1/10) with 51 pups born.

Like in the previous two years the most productive beaches were Matthew's Wick (42 pups), South Haven and North Haven (41 pups). The fourth most popular beach was Driftwood Bay (28 pups).

Figure 3 Percentage of seal pups born at each site on Skomer Island in 2017



4.3 Survival Rate

The fate of 224 pups (of 225 born) is known with relative certainty. Only one pup was 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).

170 pups are known, or assumed, to have survived on Skomer, giving a survival rate of 76%, which is only 2% lower than the average since records began.

This positive survival rate is rather astonishing given the two storms (Ophelia (16/10) and Brian (21/10)) which hit Skomer with immense force during peak pupping time. Storm Ophelia developed wind speeds of over 100km/h and the weather station at St. Ann's Head measured wave heights of more than 16 metres. Storm Ophelia washed roughly two-thirds of the white coated pups off the beaches and Storm Brian, only five days later, was less severe but no less devastating, sweeping some of the remaining pups away.

The survival rate of 76% assumes that all moulting pups (class IV) and all those size 3 or larger survived storm Ophelia – even if they disappeared during the storm.

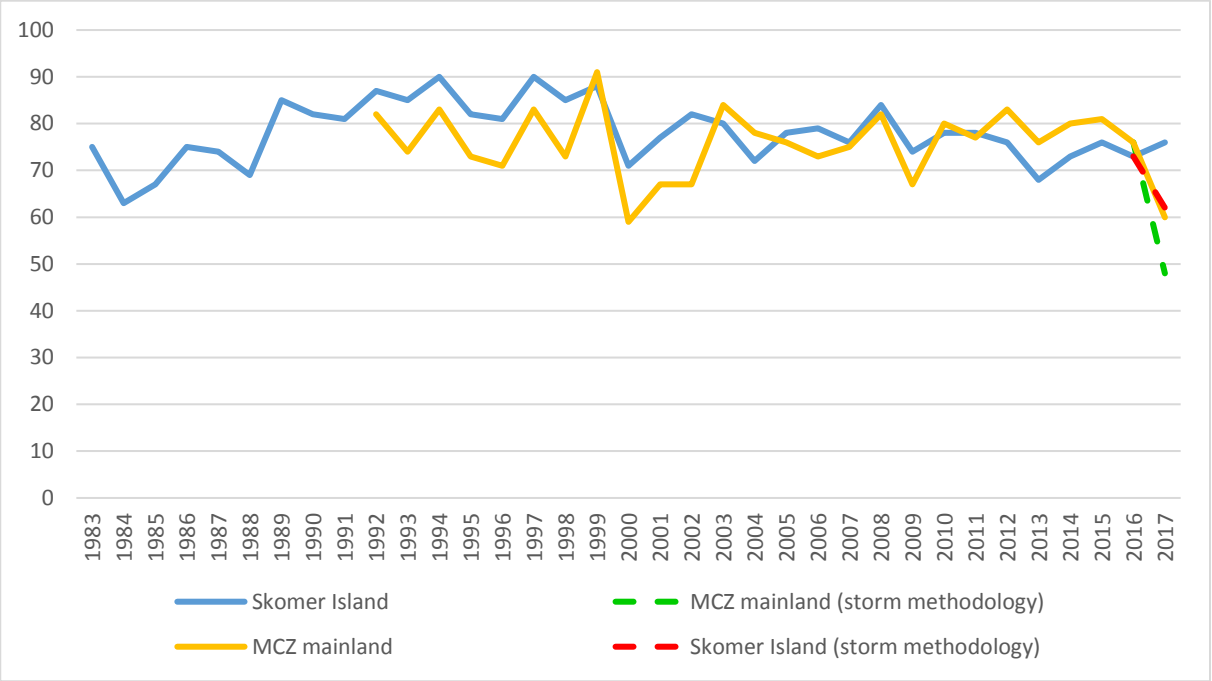
This technique of calculating the survival rate is in line with the methodology described in section 3. However, due to the severity of the storm the pups' chances of survival must be considered extremely low. Many large and well-nourished seal pups were washed up dead on Pembrokeshire's beaches in the weeks following the storms. Furthermore, lots of undersized pups and weaners were seen around Skomer and the mainland, some of which were taken to rescue centres (personal comment T. Leadbetter). Obviously, lots of pups had been separated from their mothers resulting in undernourishment.

Therefore, it seems sensible to calculate a second, potentially more accurate, survival rate (storm methodology) of 62% which assumes that the 32 pups (class III & IV, size ≥ 3) which disappeared in the storm actually died out at sea or during the following days.

On the mainland 95 pups are known, or assumed to have survived, giving a survival rate of 60% (standard methodology) or 47% (storm methodology).

The overall survival rate for the whole of the Skomer MCZ was 69% (standard methodology) and 56% respectively (storm methodology). The reality probably lies somewhere in between these two estimates, but is impossible to verify. Therefore, the two methods simply reflect the upper and lower survival limits.

Figure 4 Percentage of seal pups surviving in Skomer/MCZ 1983-2017



The relatively good Skomer survival rate in spite of two devastating storms, can be explained by the very good start of the seal pupping season (of the first 52 pups born only four died). The peak timing of births and the number of pups born during this peak varies from year to year, as shown in figure 5 for 2016 and 2017.

In 2017 the peak week for pup births was week 39 (51 pups) with high numbers also born in week 38 (44 pups) and week 37 (32 pups). The storms occurred in week 42 causing the peak in pup deaths (figure 5 & 6) with 21 pup deaths recorded (standard method). The relative low number was because by the time the storms hit many pups had already left the natal beaches as they take approximately three weeks from birth to weaning. Of 225 pups 125 (56%) were a minimum of 20 days old before the storms hit. A good end to the seal pupping season on Skomer (of the last 24 pups born only two died) and the fact that some Skomer beaches are more sheltered than the ones on the mainland also contributed to a higher survival rate than on the mainland.

Figure 5 Weekly seal pup births and deaths on Skomer Island in 2016 and 2017

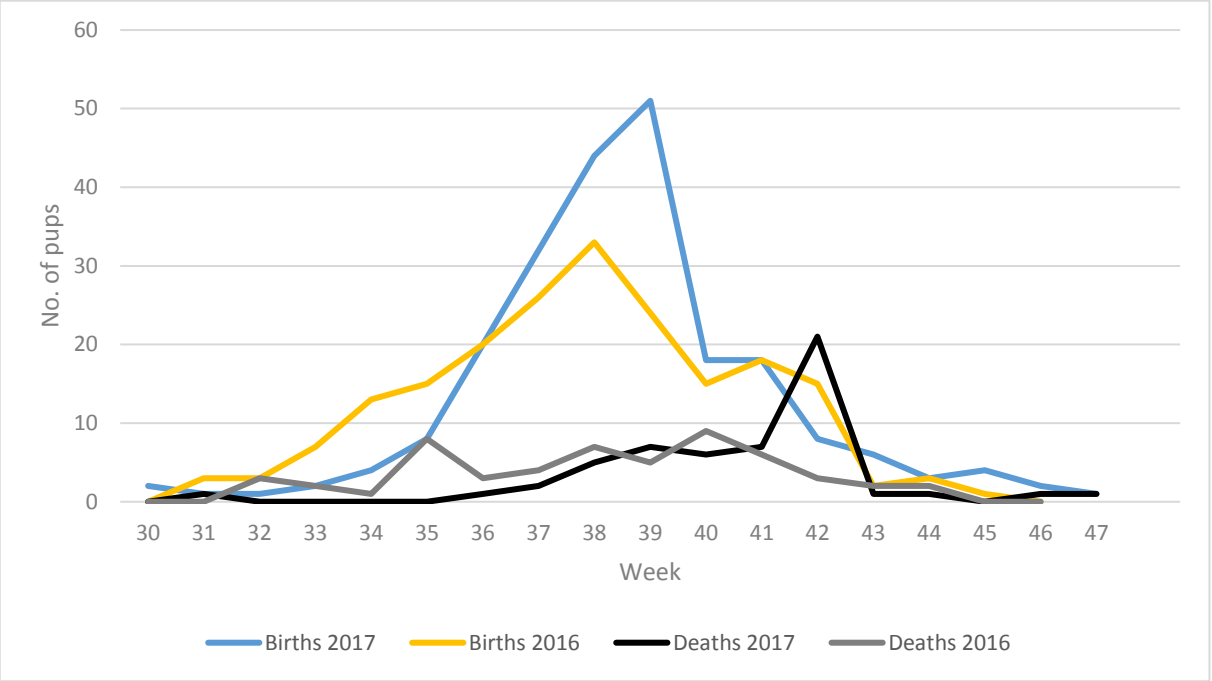
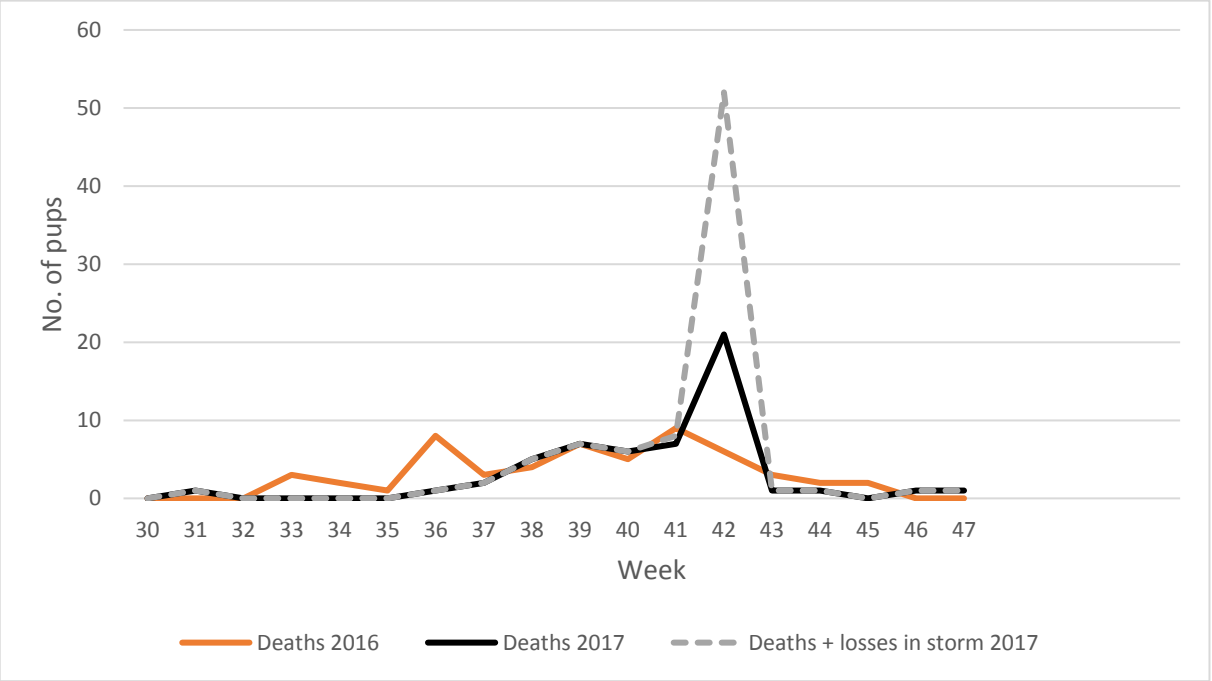


Figure 6 Weekly seal pup deaths on Skomer Island in 2017 including the pups which disappeared during the storm Ophelia



In contrast to Skomer the pup deaths caused by the storms was much higher at the mainland sites. At these sites the peak births were in weeks 40 to 42 (46 pups), therefore a high number of class 1 and 2 pups were on the beaches at the time of the Storms. Therefore, many of the pups on the beaches at the time did not survive (figure 7).

Figure 7 Weekly seal pup births and deaths on the mainland sites in 2017 including the pups which disappeared during the storms

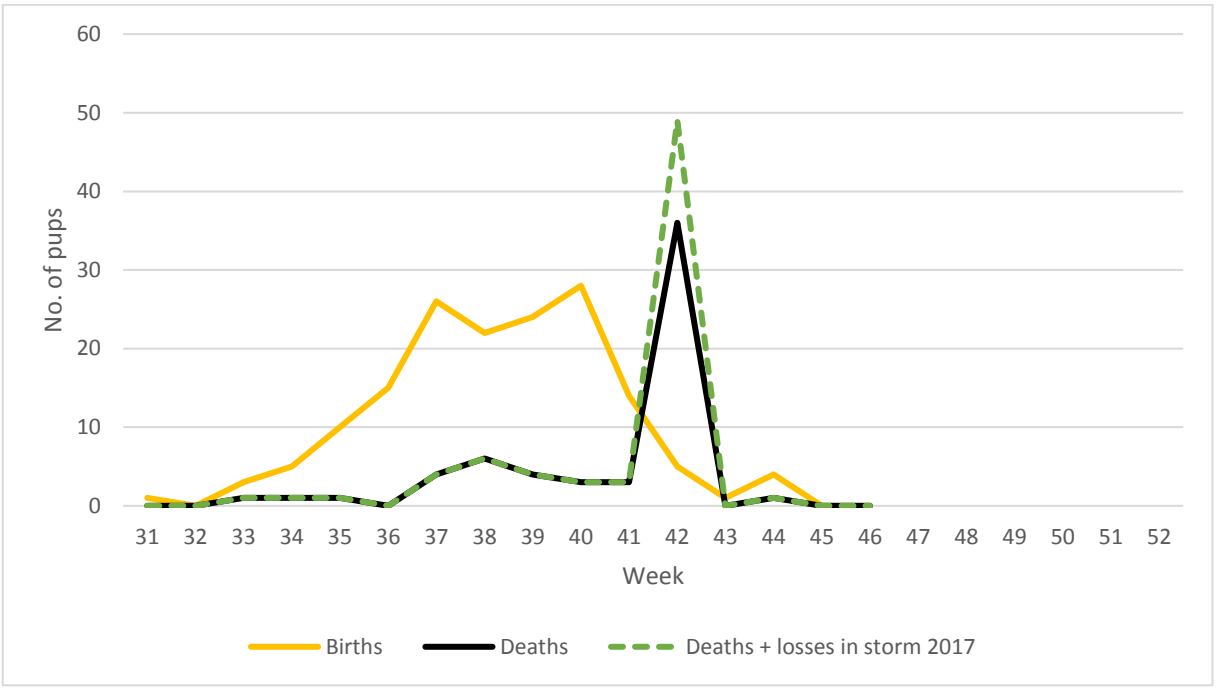


Plate 4 A surviving pup lying next to a nearly moulted and healthy pup which died in storm Ophelia, 19/10/17

Plate 5 Seal pup which was trapped under rocks during the storm on 16/10/17 and died two days later.

Plate 6 Dead seal pups washed up on South Haven beach on 1/11/17

Table 2 Survival rates per site on Skomer Island 2013-2017

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

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 2017

Cause of death	No. of pups	% of deaths	% of total pups born
Abandoned/separated/starved	11	20.37	4.91
Accident/injured/killed	3	5.56	1.34
Disappeared[1] ≤ stage 3	31	57.41	13.84
Diseased	2	3.70	0.89
Drowned	1	1.85	0.45
Stillborn	3	5.56	1.34
Unknown	2	3.70	0.89
Other*	1	1.85	0.45
Total	**54**		

[1] including pups class I-III, size ≤ 3 that disappeared in storms

* The same female (16.SC-US-117.SHV) that wasn't able to feed her pup in 2016 pupped on North Haven beach in 2017 and it seemed she had the same problem as the previous year. 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. As the pup disappeared in the storm we weren't able to record its further progress.

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 41 pups were born in North Haven in 2017, 16 more than in the previous year and the highest total since records began. Thirty-one pups are assumed to have survived to the beginning of moult or were weaned, giving a survival rate of 76%, which is the same as last year.

Figure 8 Number of seal pups born in North Haven 1983–2017

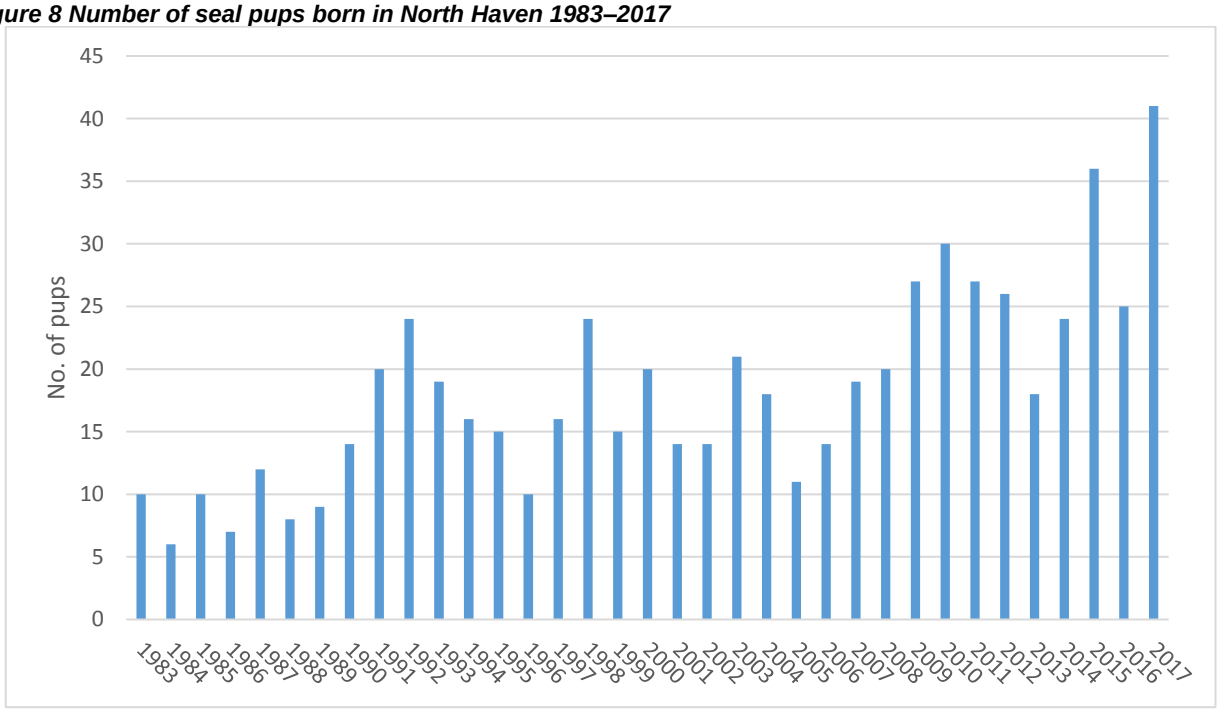


Figure 9 Weekly seal pup births in North Haven in 2017

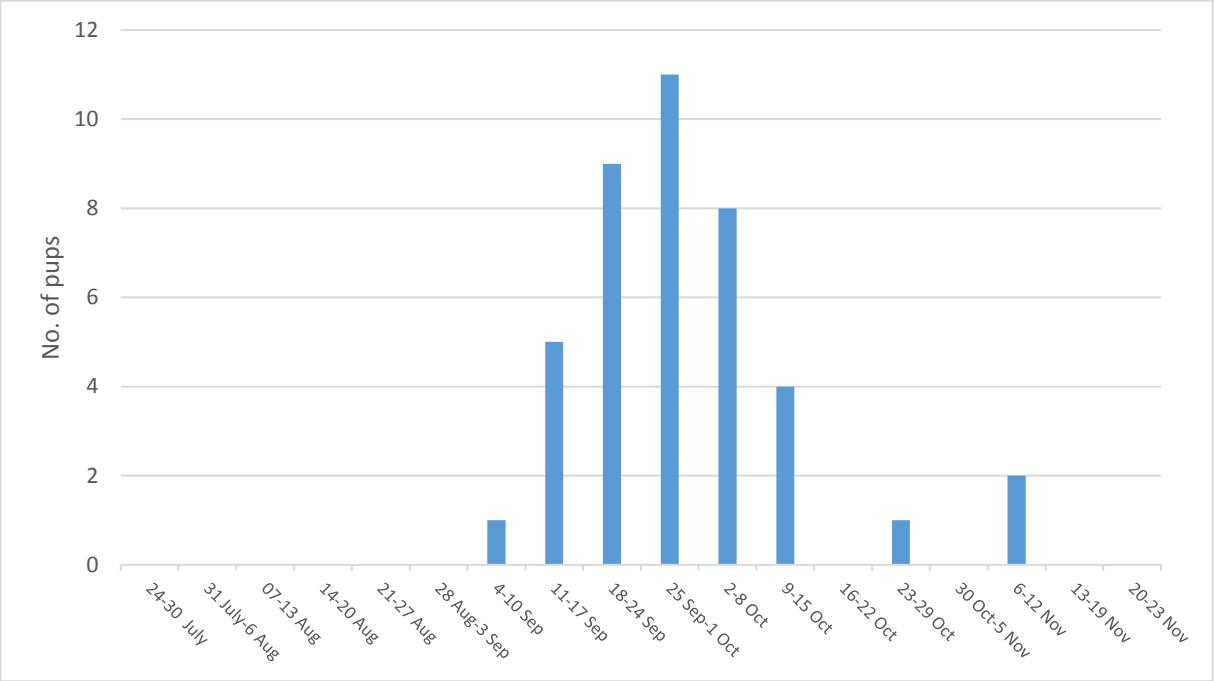


Table 4 Fate of pups in North Haven in 2017

Fate	**No. of pups**
Assumed survived	8
Survived to beginning of moult	12
Survived to weaning	11
Assumed dead	7
Dead	3
Unknown	0
Total	**41**

Table 5 Causes of seal pup deaths on North Haven beach in 2017

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	6
Diseased	0
Drowned	0
Stillborn	2
Unknown	0
Other*	1
Total	**10**

*Mother was unable to feed pup and then pup disappeared in storm

4.4.2 Protheroe's Dock

In 2017 three pups were born on Protheroe's Dock, two in week 39 and one in week 45. Nine site visits were conducted to Protheroe's Dock during the monitoring period and three checks were made at a distance from a boat. All three pups are assumed to have survived, giving a survival rate of 100%.

Figure 10 Number of seal pups born in Protheroe's Dock 1983-2017

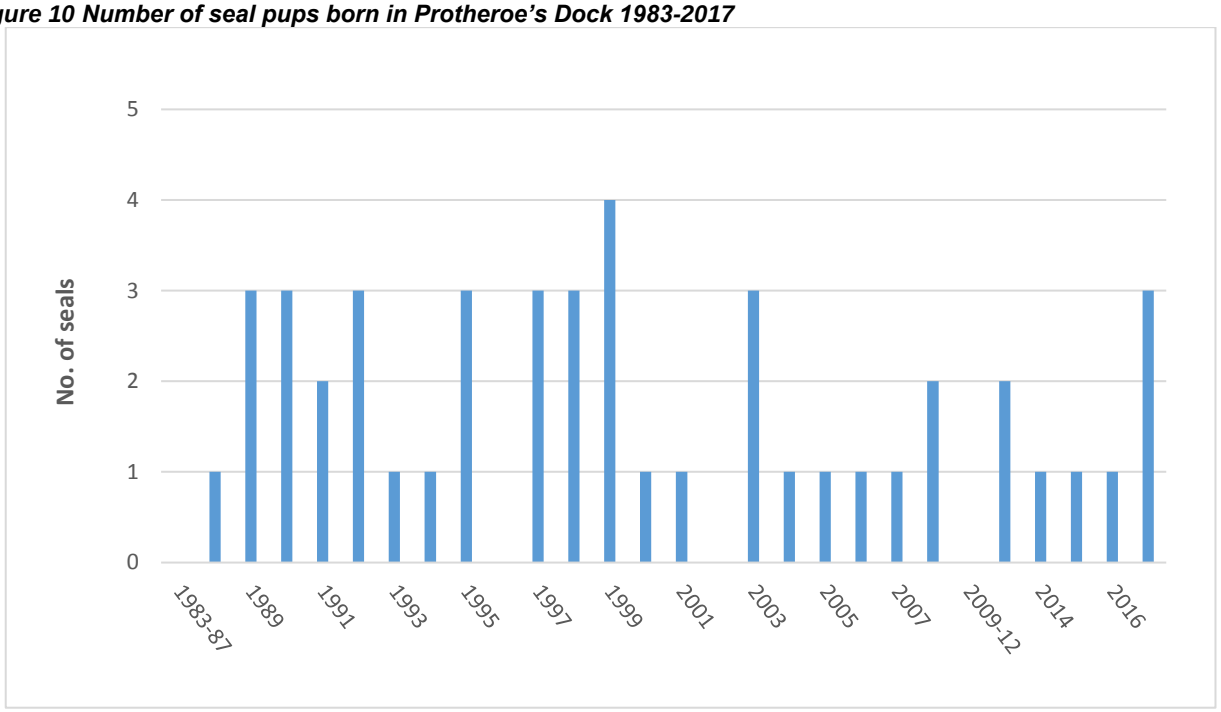


Figure 11 Weekly seal pup births on Protheroe's Dock in 2017

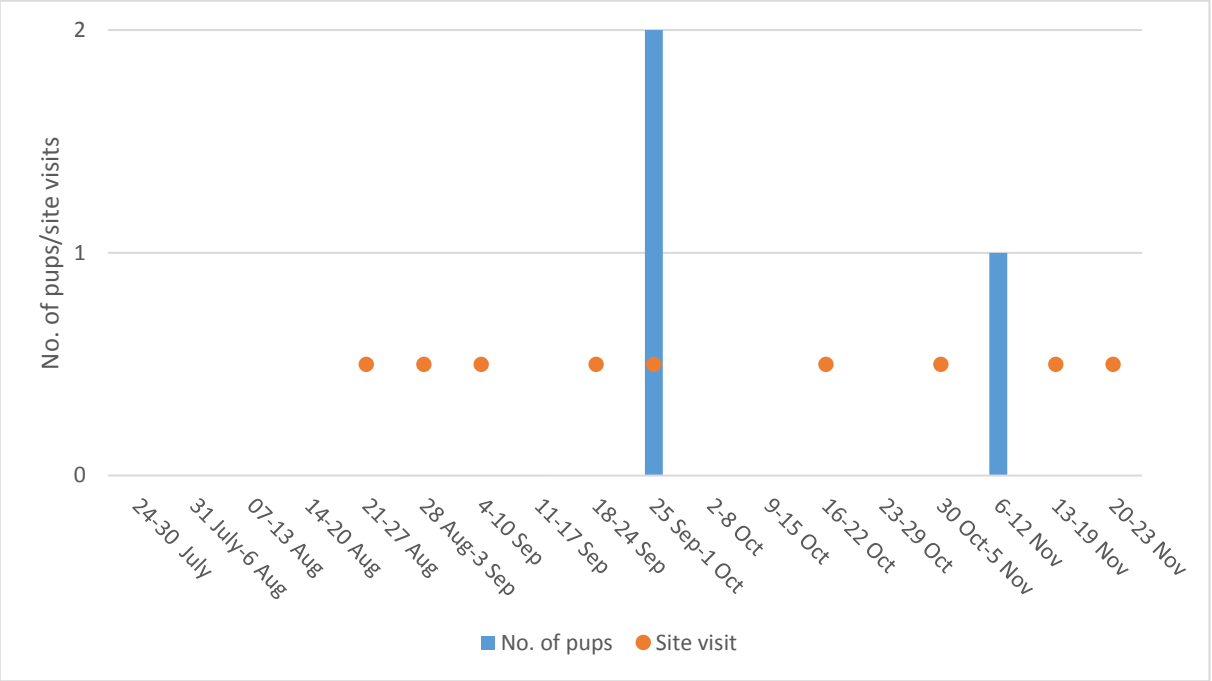


Table 6 Fate of pups on Protheroe's Dock in 2017

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

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 2017 the Lantern was checked eight times and three pups were found. These were born in week 38, 39 and 43. Only one pup is known to have survived to the beginning of moult, giving a survival rate of 33%.

Figure 12 Number of seal pups born in The Lantern 1983-2017

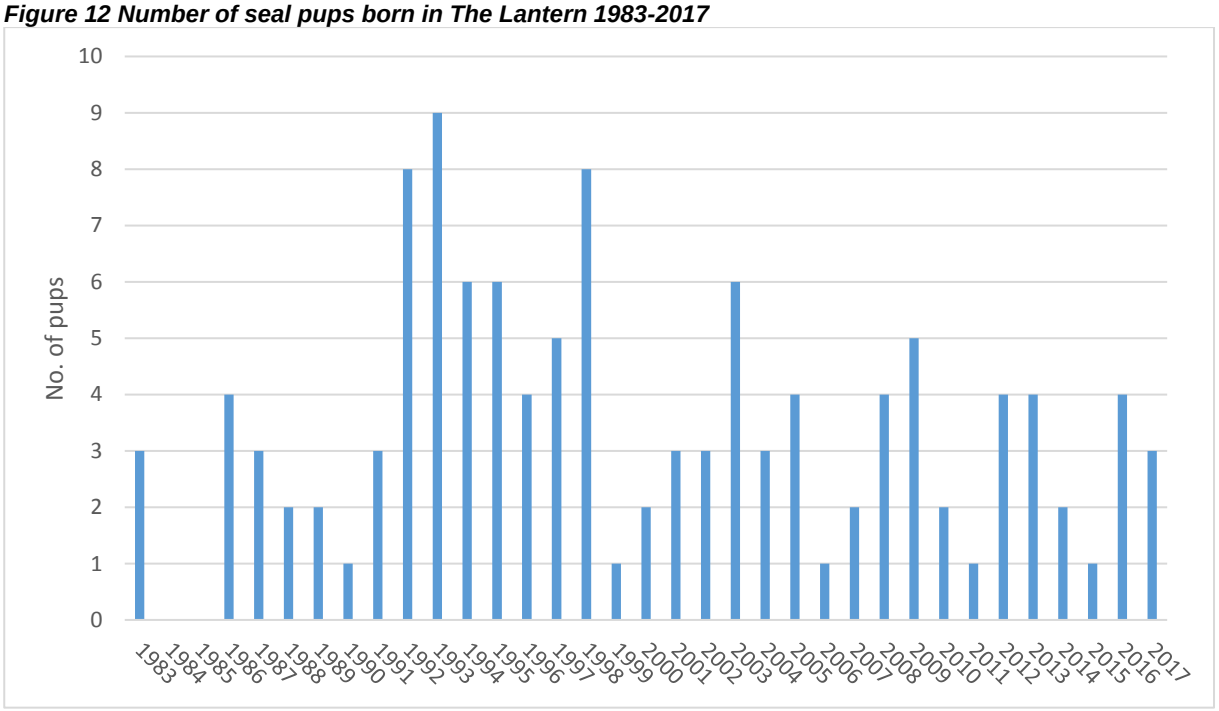


Figure 13 Weekly seal pup births in the Lantern in 2017

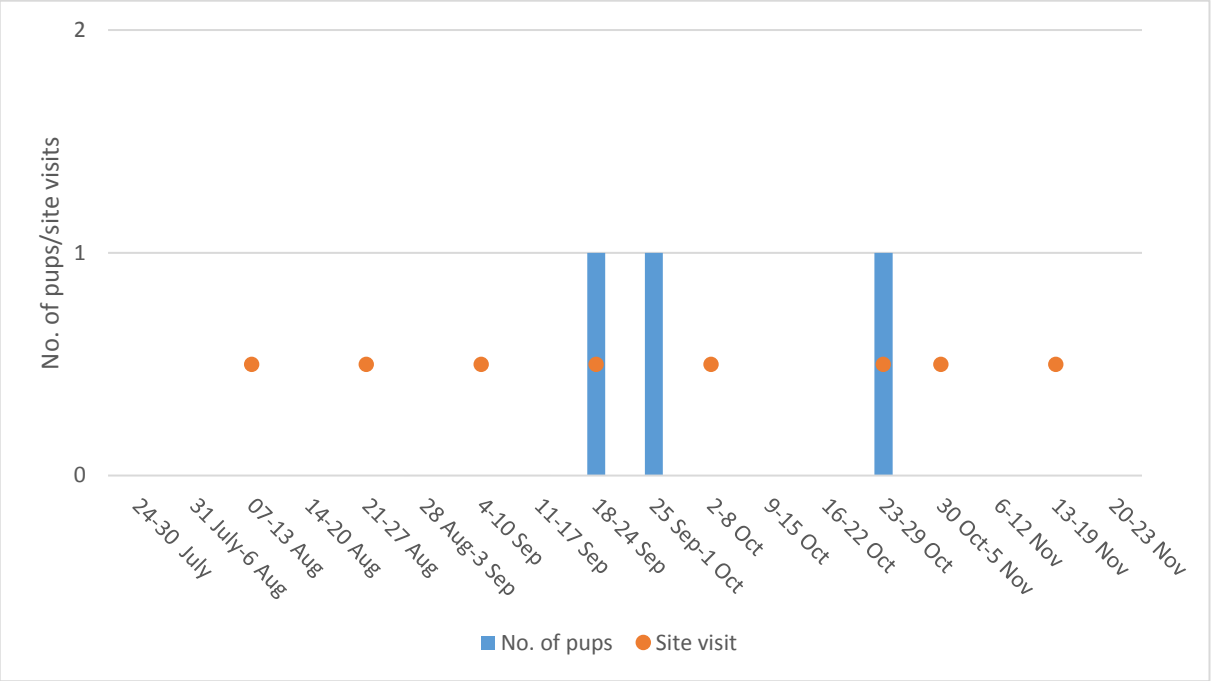


Table 7 Fate of pups in the Lantern in 2017

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

Table 8 Causes of seal pup deaths in the Lantern in 2017

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
Total	**2**

4.4.4 Amy's Reach

Five pups were born in Amy's Reach in 2017 of which three are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 60%.

Figure 14 Number of seal pups born in Amy's Reach 1983–2017

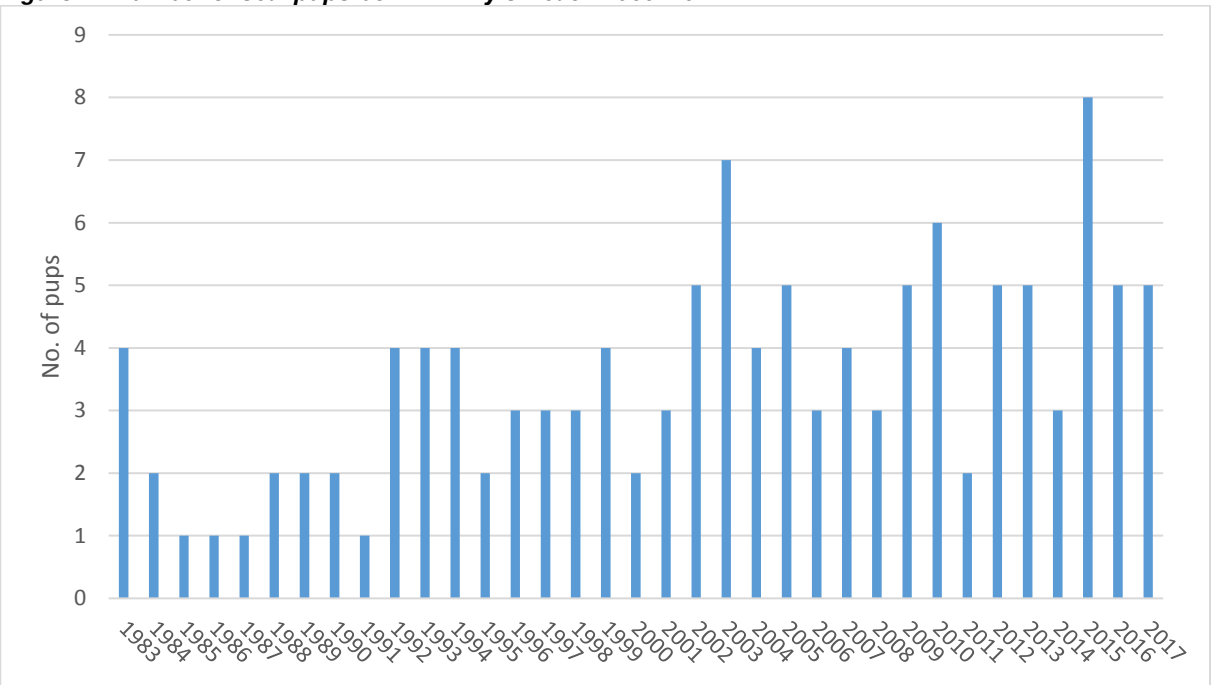


Figure 15 Weekly seal pup births in Amy's Reach 2017

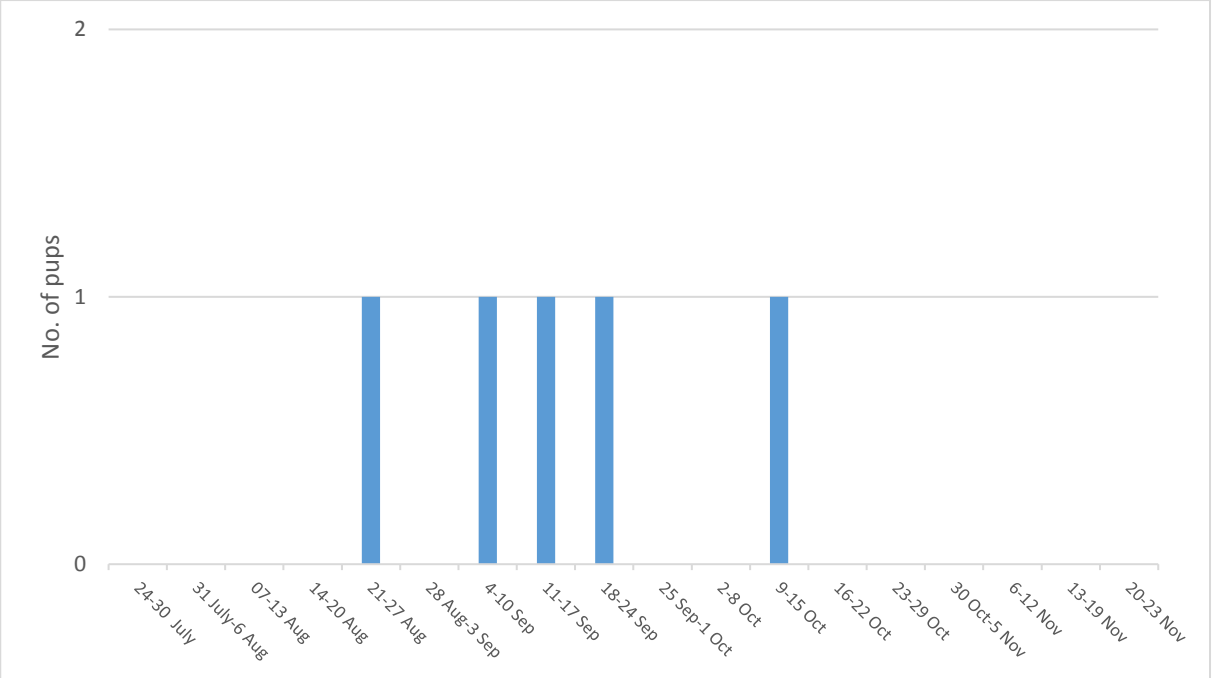


Table 9 Fate of pups in Amy's Reach in 2017

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

Table 10 Causes of seal pup deaths in Amy's Reach 2017

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
Total	**2**

4.4.5 Matthew's Wick

42 pups were born on Matthew's Wick in 2017. Thirty-one pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 74%.

Figure 16 Number of seal pups born in Matthew's Wick 1983–2017

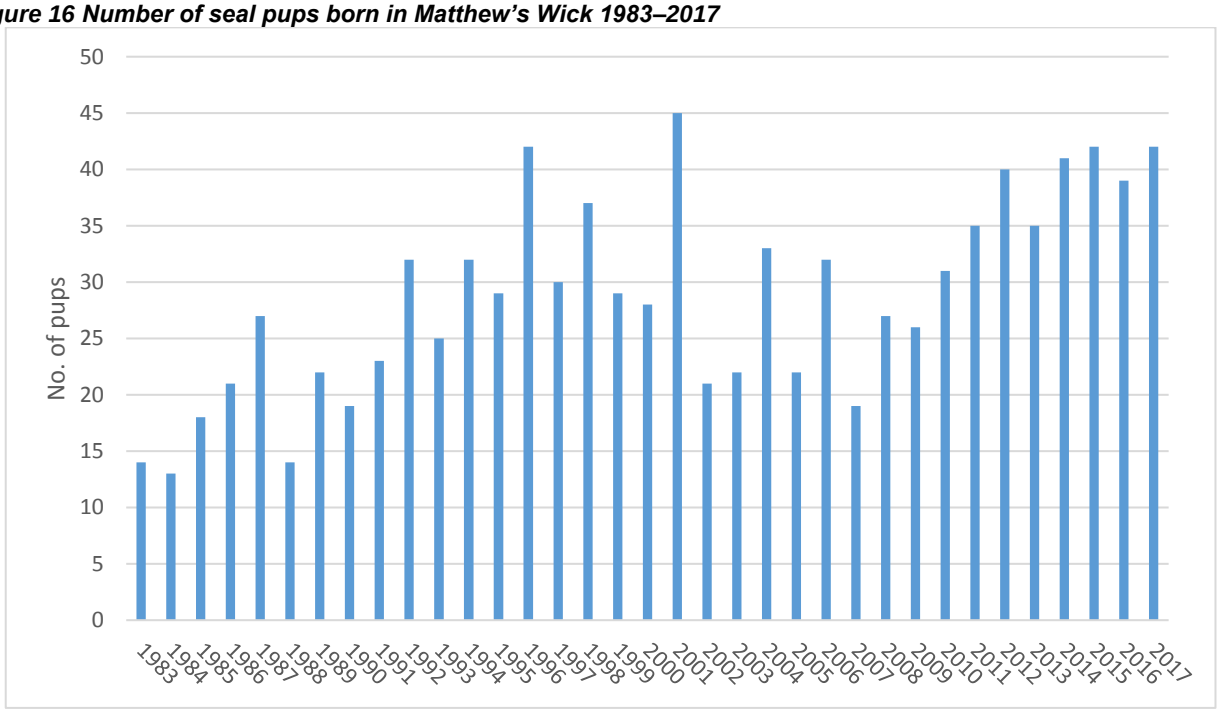


Figure 17 Weekly seal pup births in Matthew's Wick in 2017

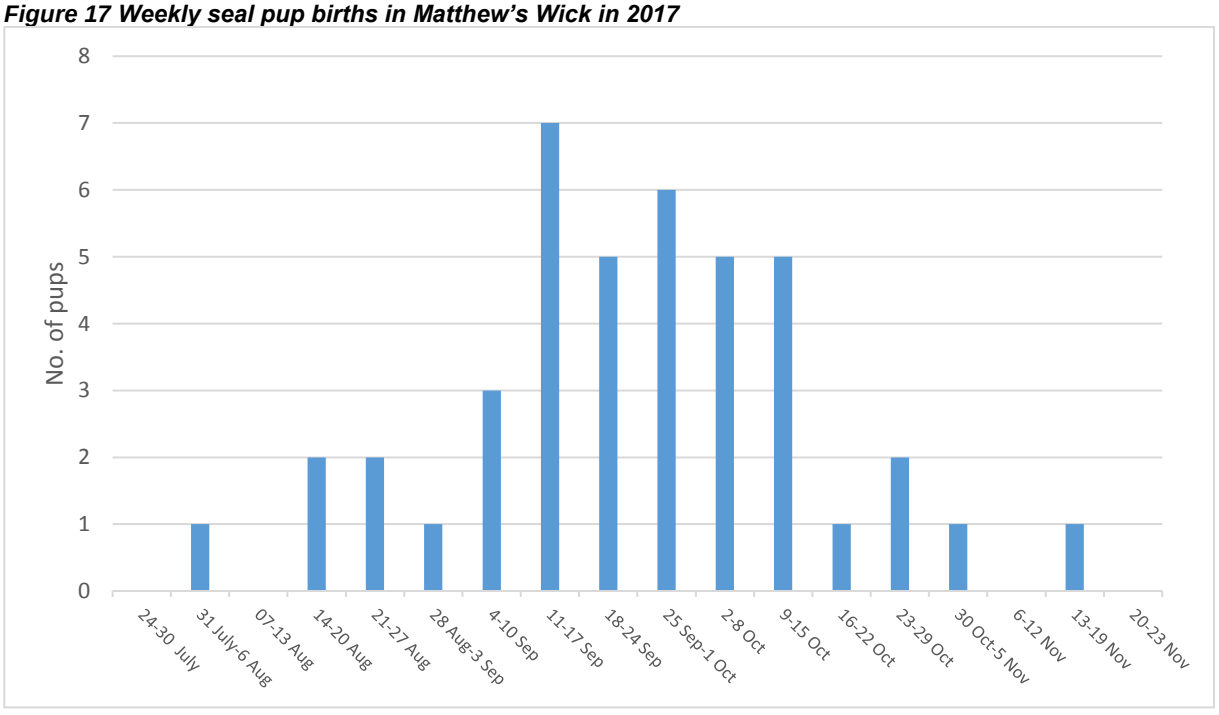


Table 11 Fate of pups on Matthew's Wick in 2017

Fate	**No. of pups**
Assumed survived	5
Survived to beginning of moult	8
Survived to weaning	18
Assumed dead	10
Dead	1
Unknown	0
Total	**42**

Table 12 Causes of seal pup deaths on Matthew's Wick in 2017

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	8
Diseased	2
Drowned	0
Stillborn	0
Unknown	0
Total	**11**

4.4.6 Castle Bay

Access to Castle Bay is impossible and pups born there do not get marked. Fourteen pups were born in Castle Bay in 2017, which is a low total for this site. Ten pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 71%, which is 14% higher than in 2016 and bucks the trend of previous years. Usually Castle Bay's survival rate is below the overall 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 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 18 Number of seal pups born in Castle Bay 1983-2017

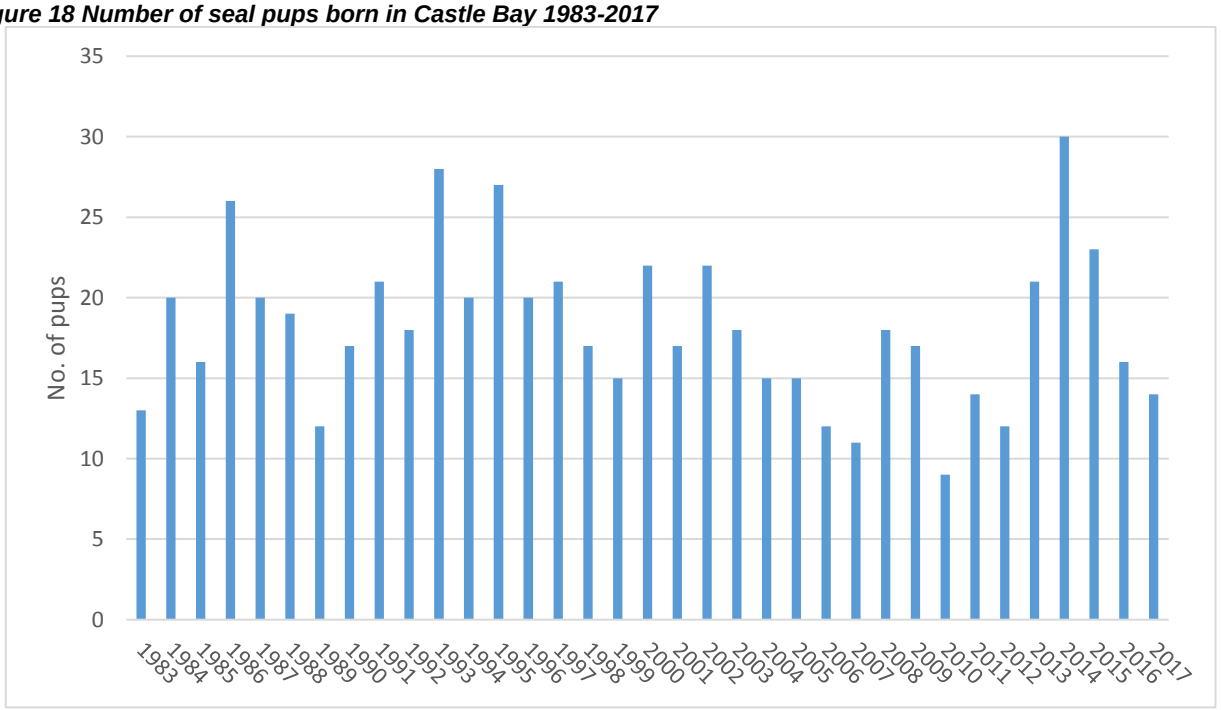


Figure 19 Weekly seal pup births in Castle Bay in 2017

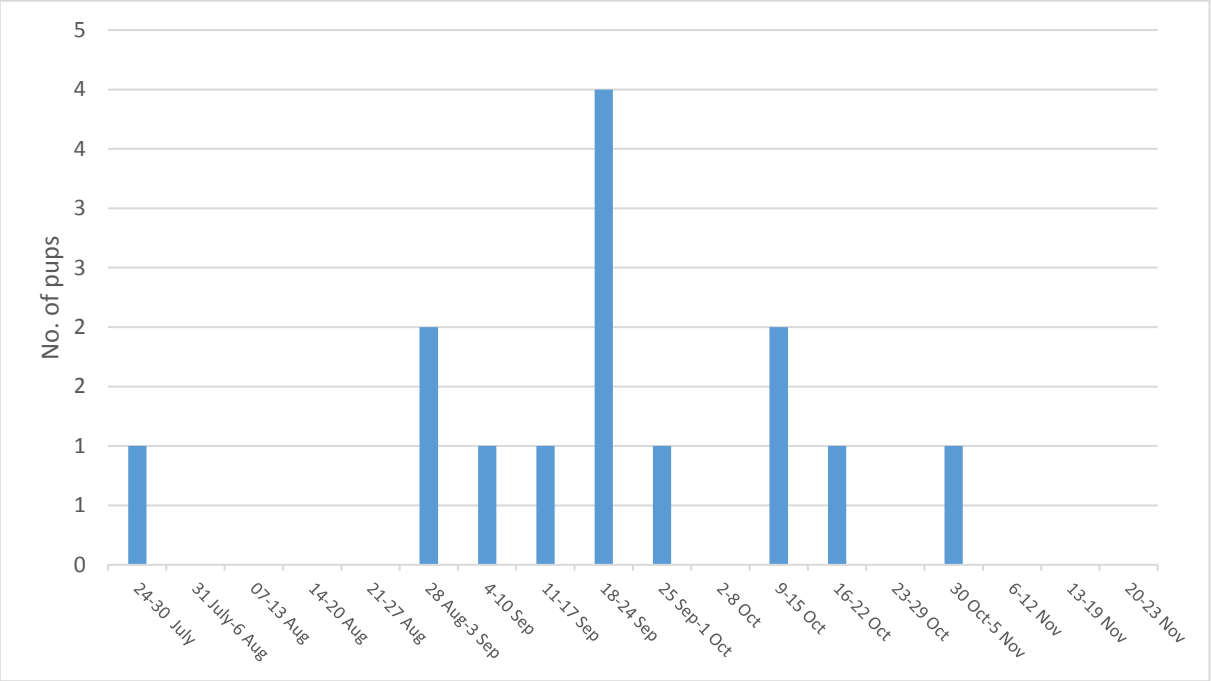


Table 13 Fate of pups on Castle Bay in 2017

Fate	**No. of pups**
Assumed survived	2
Survived to beginning of moult	5
Survived to weaning	3
Assumed dead	1
Dead	3
Unknown	
Total	**14**

Table 14 Causes of seal pup deaths on Castle Bay in 2017

Cause of death	**No. of pups**
Abandoned/separated/starved	2
Accident/injured/killed	0
Disappeared ≤ stage 3	0
Diseased	0
Drowned	0
Stillborn	0
Unknown	2
Other*	0
Total	**4**

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.

Four pups were born in South Castle Beach Cave in 2017 and all four pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 100%.

Nine visits were made to South Castle Beach Cave during the observation period and one full site visit on 15/11.

Figure 20 Number of seal pups born in South Castle Beach Cave 1990-2017

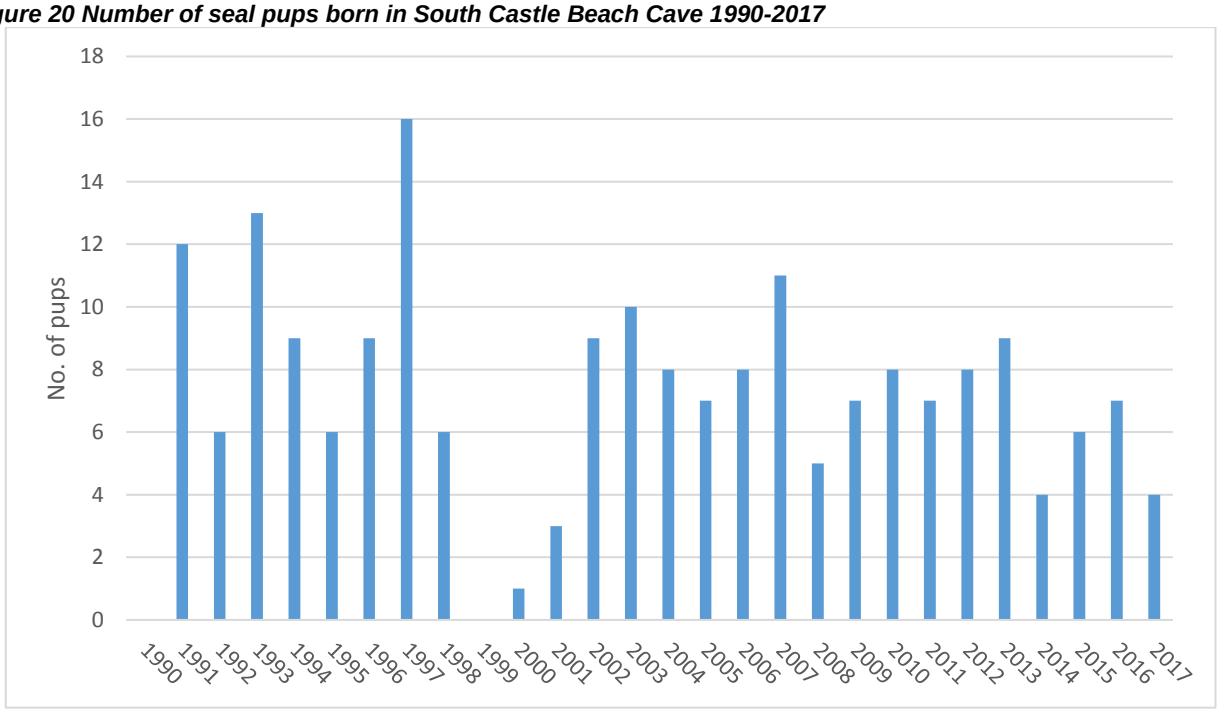


Figure 21 Weekly seal pup births in South Castle Beach Cave in 2017

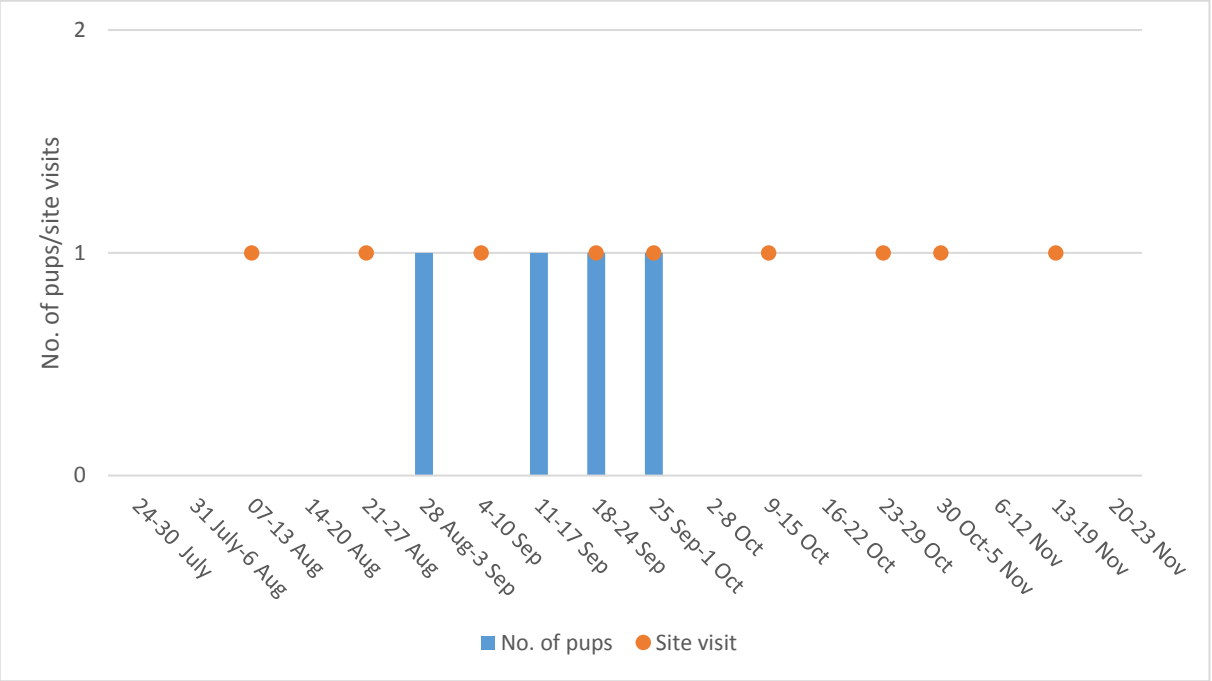


Table 15 Fate of pups in South Castle Beach Cave in 2017

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

4.4.8 Seal Hole

Seven pups were born in Seal Hole in 2017 of which three pups are assumed to have survived, survived to beginning of moult or survived and were weaned giving, a survival rate of 43%.

In 2017 nine site visits were made to Seal Hole.

Figure 22 Number of seal pups born in Seal Hole 1983-2017

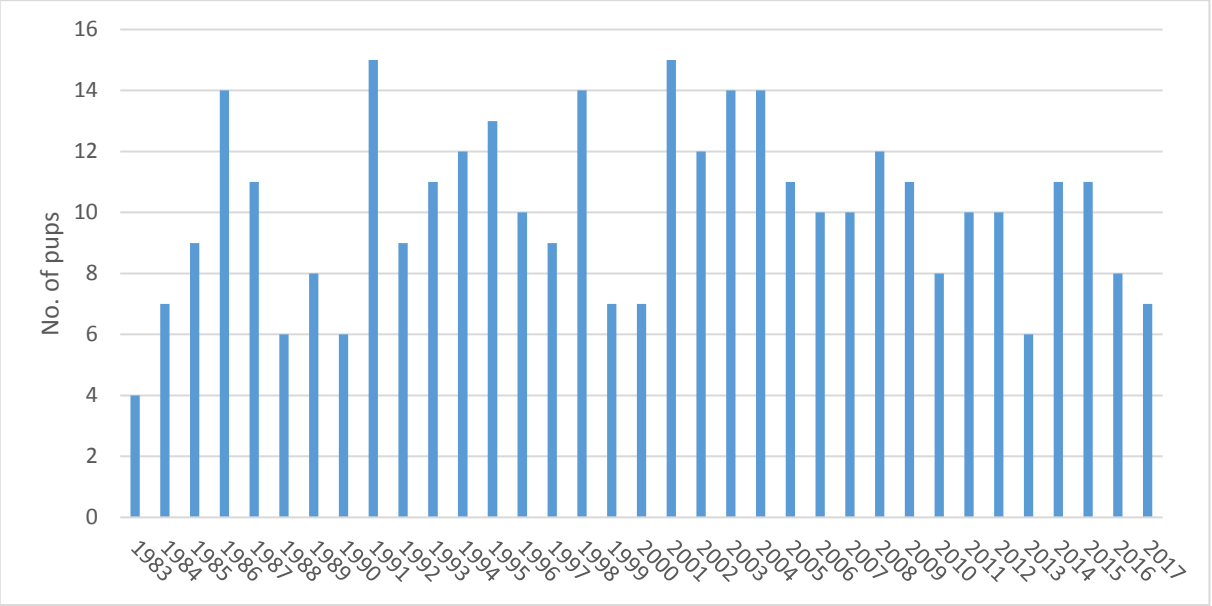


Figure 23 Weekly seal pup births in Seal Hole in 2017

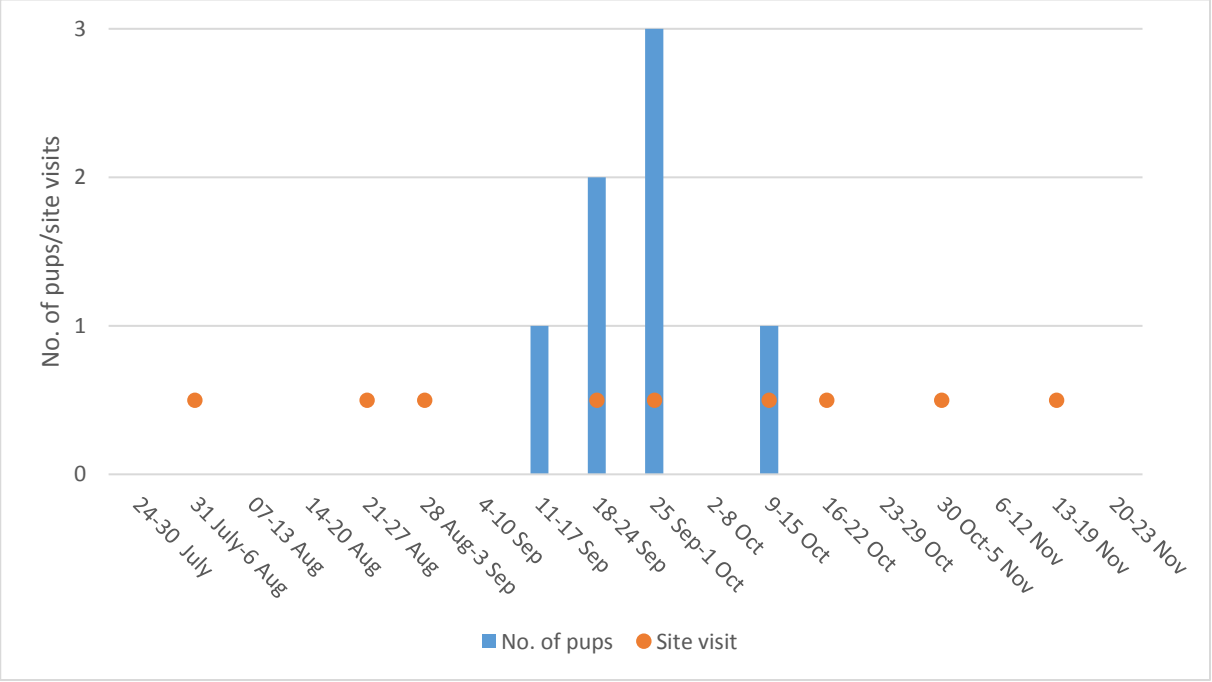


Table 16 Fate of pups in Seal Hole in 2017

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	2
Survived to weaning	0
Assumed dead	1
Dead	3
Unknown	0
Total	**7**

Table 17 Causes of seal pup deaths in Seal Hole in 2017

Cause of death	**No. of pups**
Abandoned/separated/starved	2
Accident/injured/killed	1
Disappeared ≤ stage 3	0
Diseased	0
Drowned	1
Stillborn	0
Unknown	0
Total	**4**

4.4.9 The Slabs

Seven pups were born on The Slabs in 2017 of which six are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 86%

Figure 24 Number of seal pups born on The Slabs 1983-2017

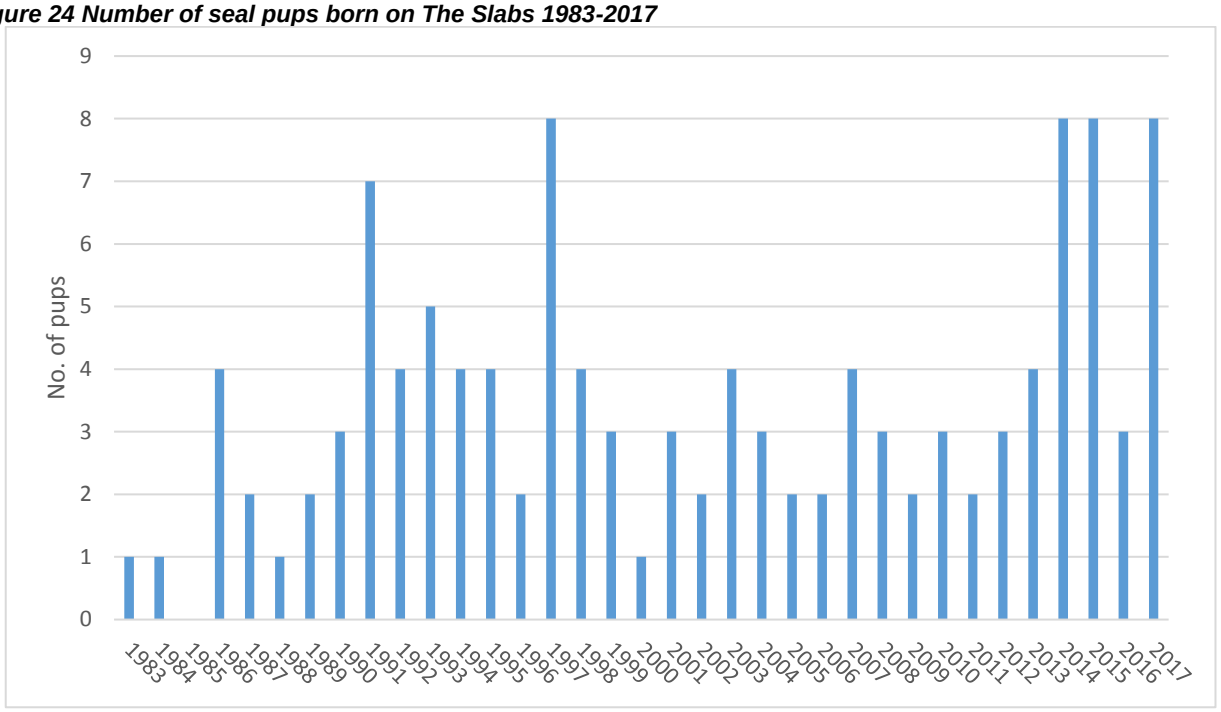


Figure 25 Weekly seal pup births on The Slabs in 2017

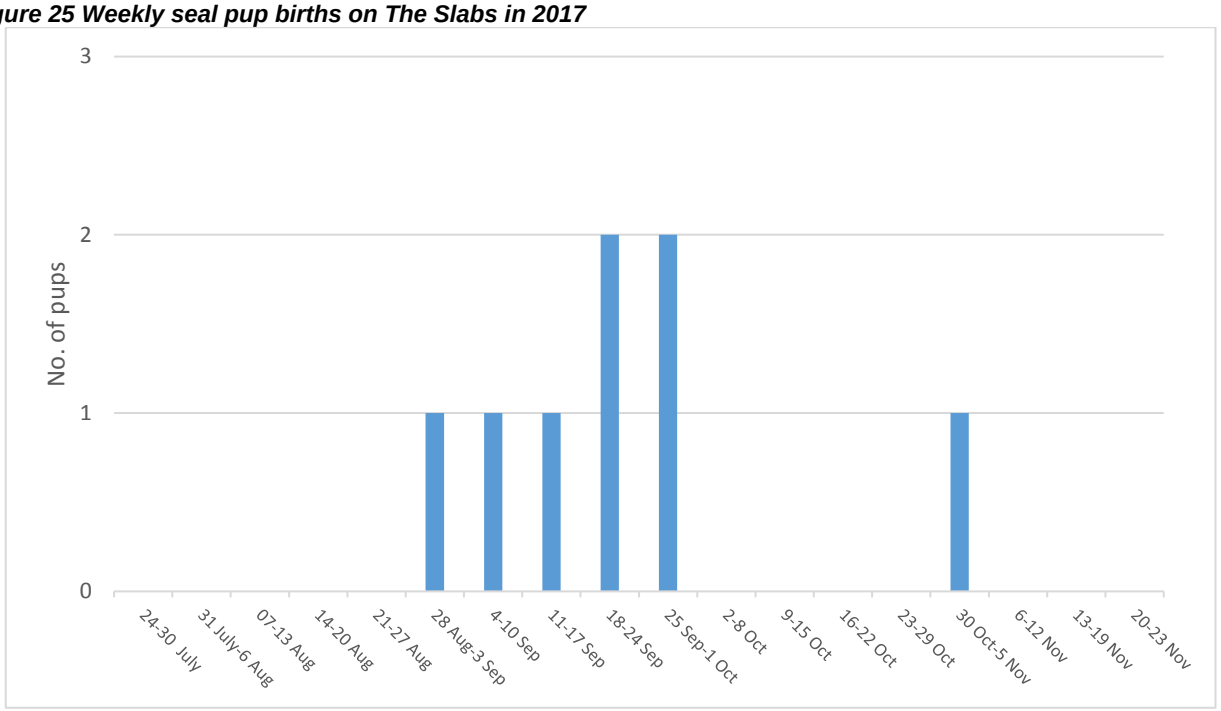


Table 18 Fate of pups on The Slabs in 2017

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	6
Survived to weaning	0
Assumed dead	0
Dead	1
Unknown	0
Total	**8**

Table 19 Causes of seal pup deaths on The Slabs in 2017

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**

4.4.10 Driftwood Bay

Twenty-eight pups were born in Driftwood Bay in 2017, three moved to South Haven and spent the majority of their time before weaning there and hence were included in the South Haven figures. Three 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 28 pups 24 pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 86%.

Figure 26 Number of seal pups born in Driftwood Bay 1983-2017

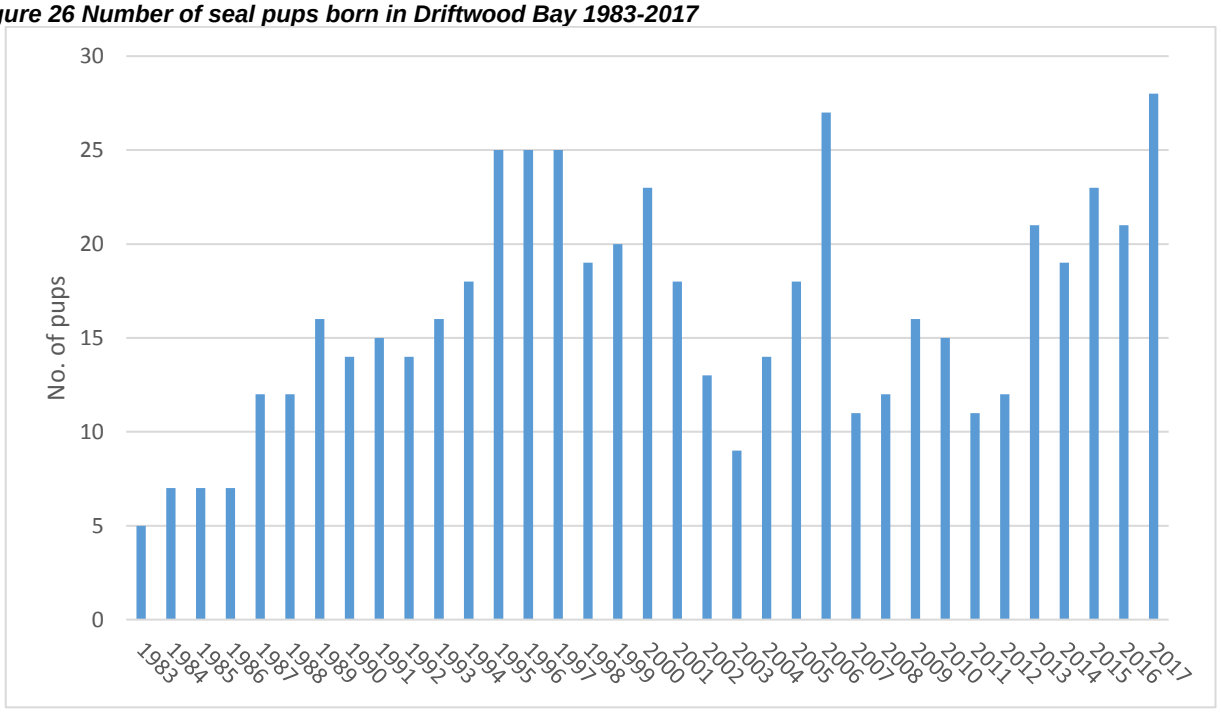


Figure 27 Weekly seal pup births in Driftwood Bay in 2017

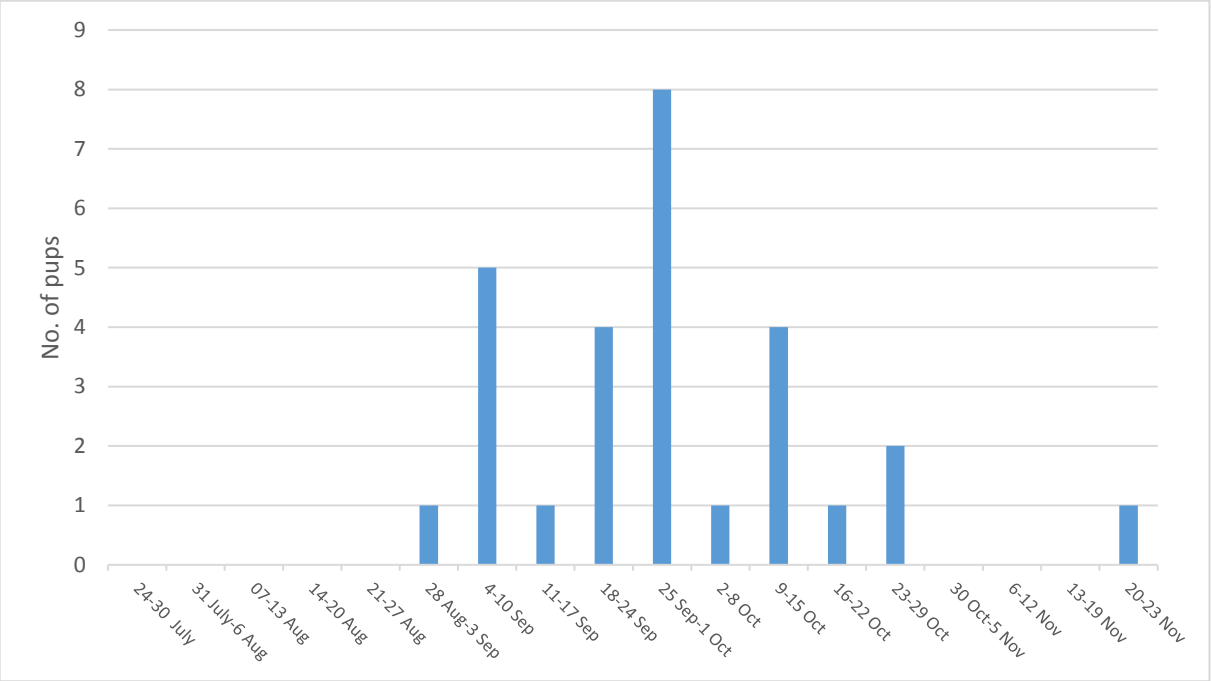


Table 20 Fate of pups on Driftwood Bay in 2017

Fate	**No. of pups**
Assumed survived	3
Survived to beginning of moult	6
Survived to weaning	15
Assumed dead	0
Dead	4
Unknown	0
Total	**28**

Table 21 Causes of seal pup deaths on Driftwood Bay in 2017

Cause of death	**No. of pups**
Abandoned/separated/starved	2
Accident/injured/killed	1
Disappeared ≤ stage 3	0
Diseased	0
Drowned	0
Stillborn	1
Unknown	0
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, moreover, pups tend to move out of the caves within their first week and can be observed from above thereafter.

In 2017 41 pups were born on South Haven. Three pups moved from South Haven to Driftwood Bay and spent most of their time before weaning there. Three pups were born on Driftwood Bay but spent most of their time before weaning on South Haven beach. Of the 41 pups which were born/raised on South Haven the fate of 40 is known with relative certainty. Of these 34 are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 85%.

Figure 28 Number of seal pups born in South Haven 1983-2017

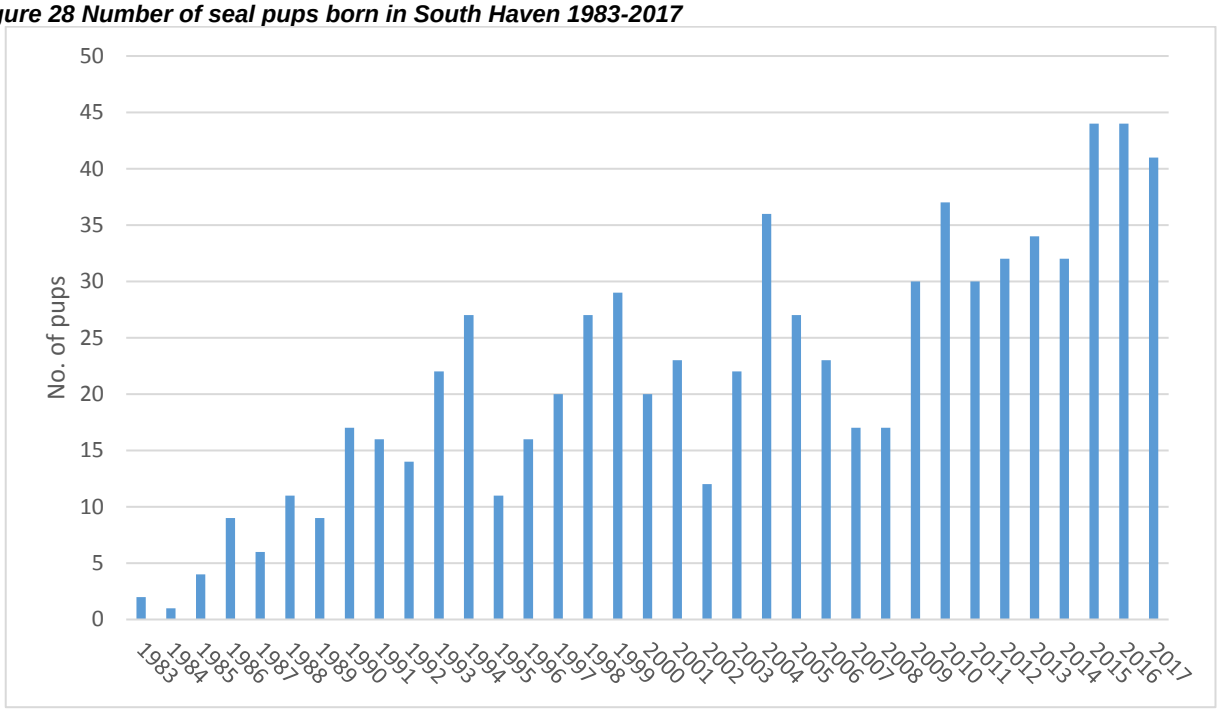


Figure 29 Weekly seal pup births in South Haven in 2017

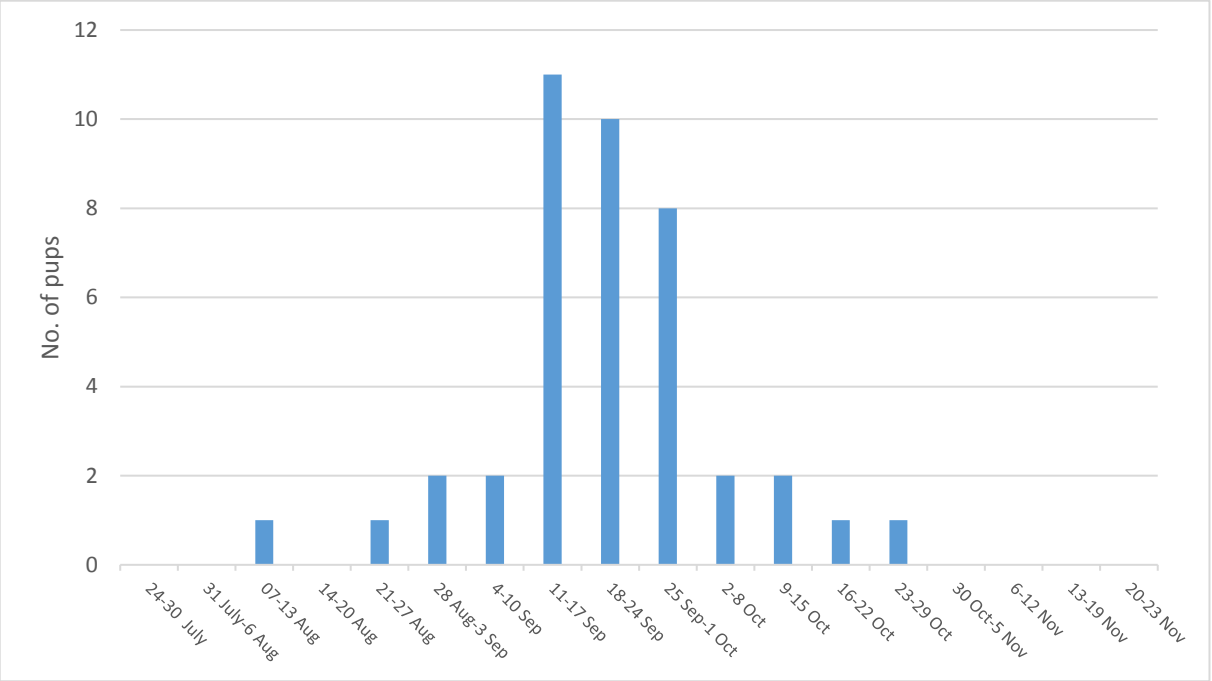


Table 22 Fate of pups in South Haven in 2017

Fate	No. of pups
Assumed survived	2
Survived to beginning of moult	16
Survived to weaning	16
Assumed dead	5
Dead	1
Unknown	1
Total	**41**

Table 23 Causes of seal pup deaths in South Haven in 2017

Cause of death	No. of pups
Abandoned/separated/starved	2
Accident/injured/killed	1
Disappeared ≤ stage 3	3
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Other*	0
Total	**6**

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 2017 we checked the site from South Stream outfall every two to three days and, as activity was low, only one full site visits was necessary.

Two pups were born at South Stream in 2017, of which one survived to beginning of moult, giving a survival rate of 50%.

Figure 30 Number of seal pups born in South Stream 1983-2017

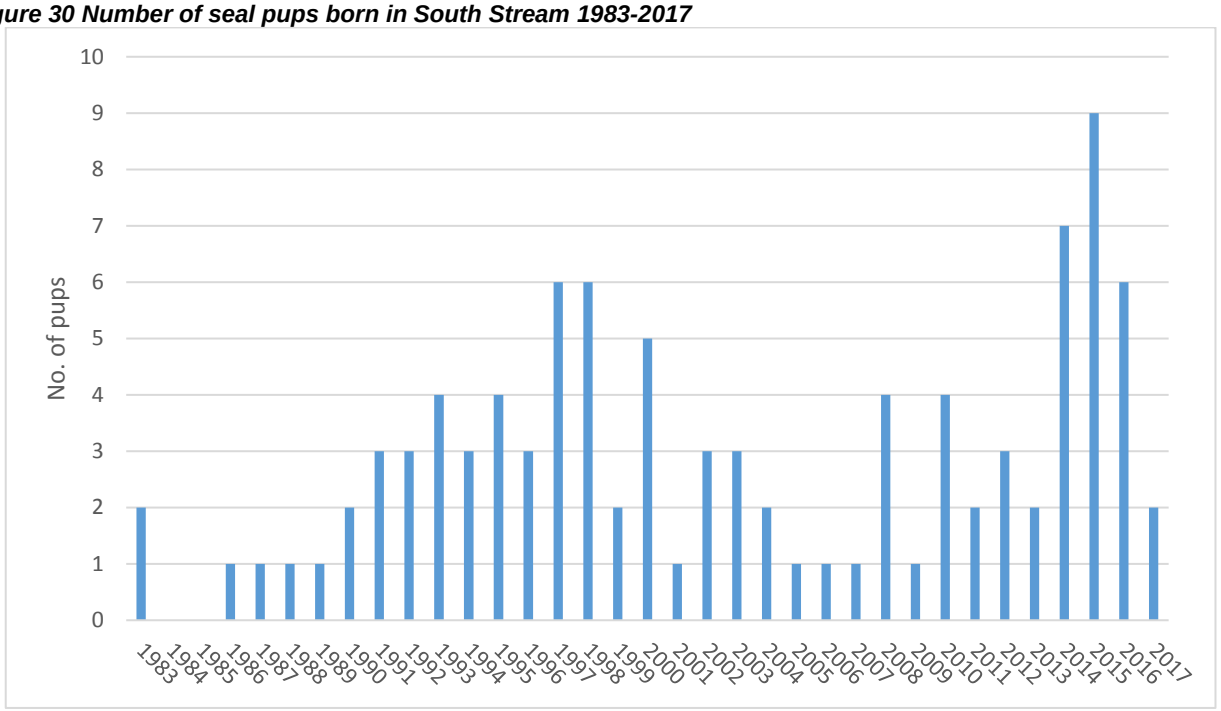


Figure 31 Weekly seal pup births in South Stream in 2017

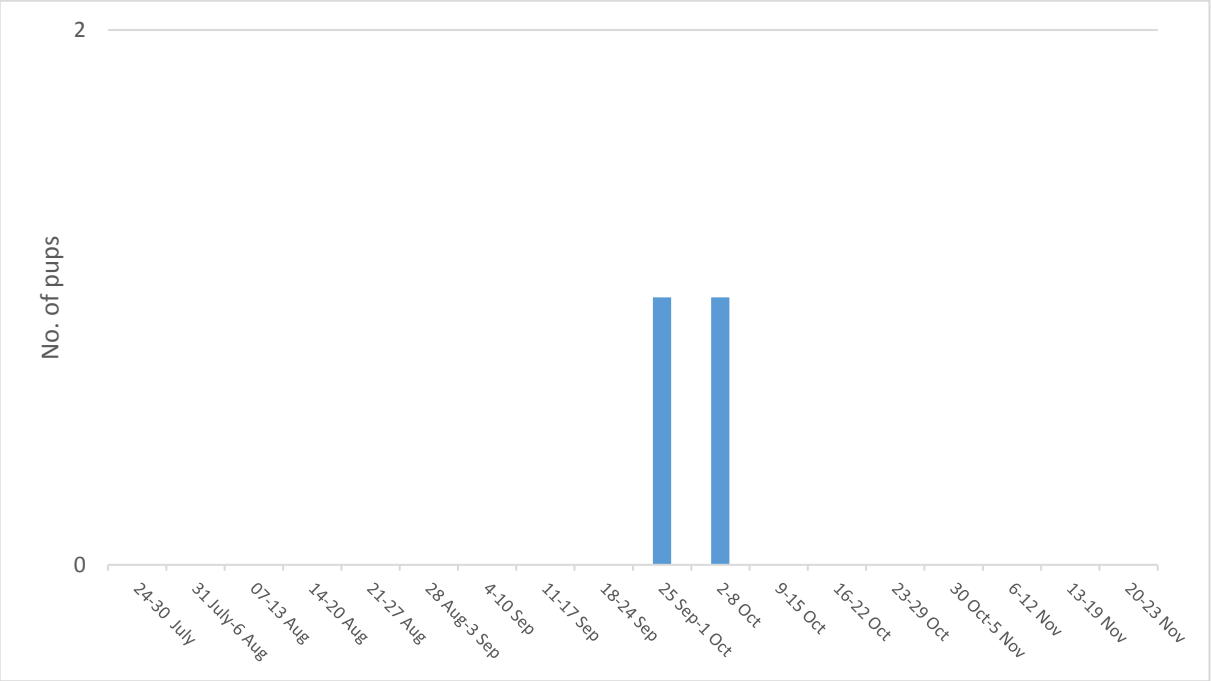


Table 24 Fate of pups in South Stream in 2017

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

Table 25 Causes of seal pup deaths in South Stream in 2017

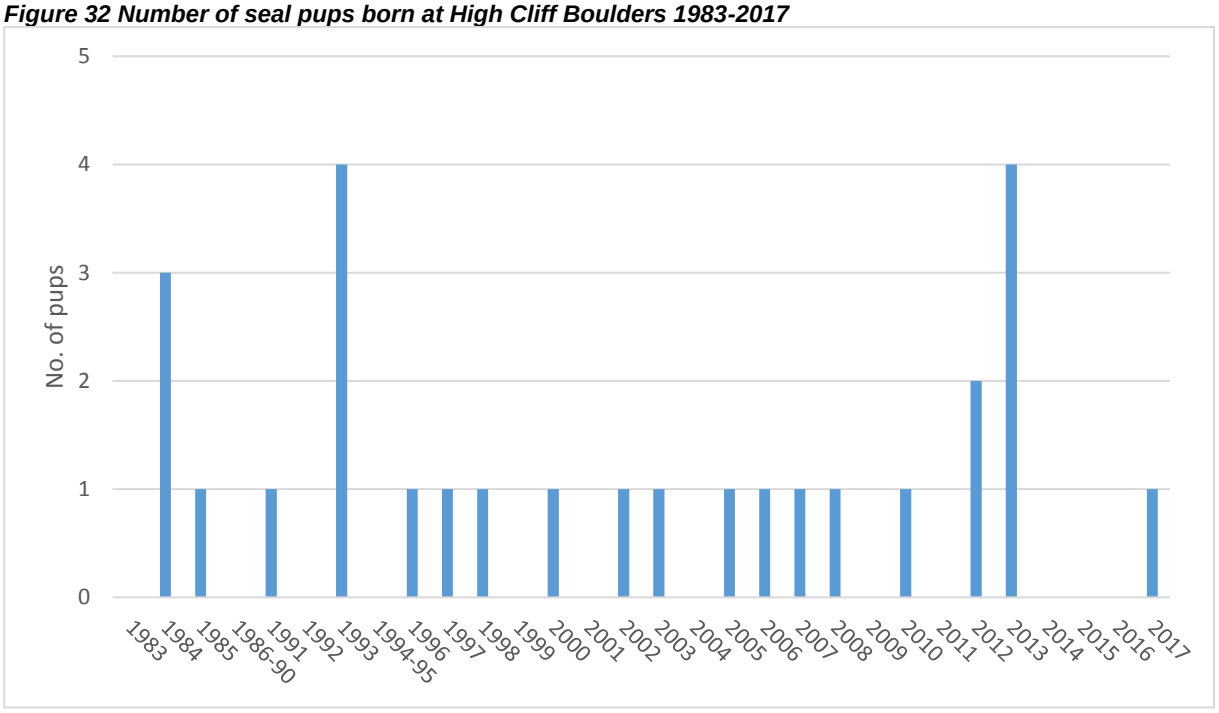
Cause of death	No. of pups
Abandoned/separated/starved	0
Accident/injured/killed	0
Disappeared ≤ stage 3	1
Diseased	0
Drowned	0
Stillborn	0
Unknown	0
Total	**1**

4.4.13 High Cliff Boulders

High Cliff Boulders is another 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 40 but disappeared three days later and was assumed dead.

Figure 32 Number of seal pups born at High Cliff Boulders 1983-2017



4.4.14 The Wick

23 seal pups were born on The Wick in 2017.

Seventeen pups are assumed to have survived, survived to beginning of moult or survived and were weaned and one pup's fate is unknown, giving a survival rate of 74%.

Figure 33 Number of seal pups born in The Wick 1983-2017

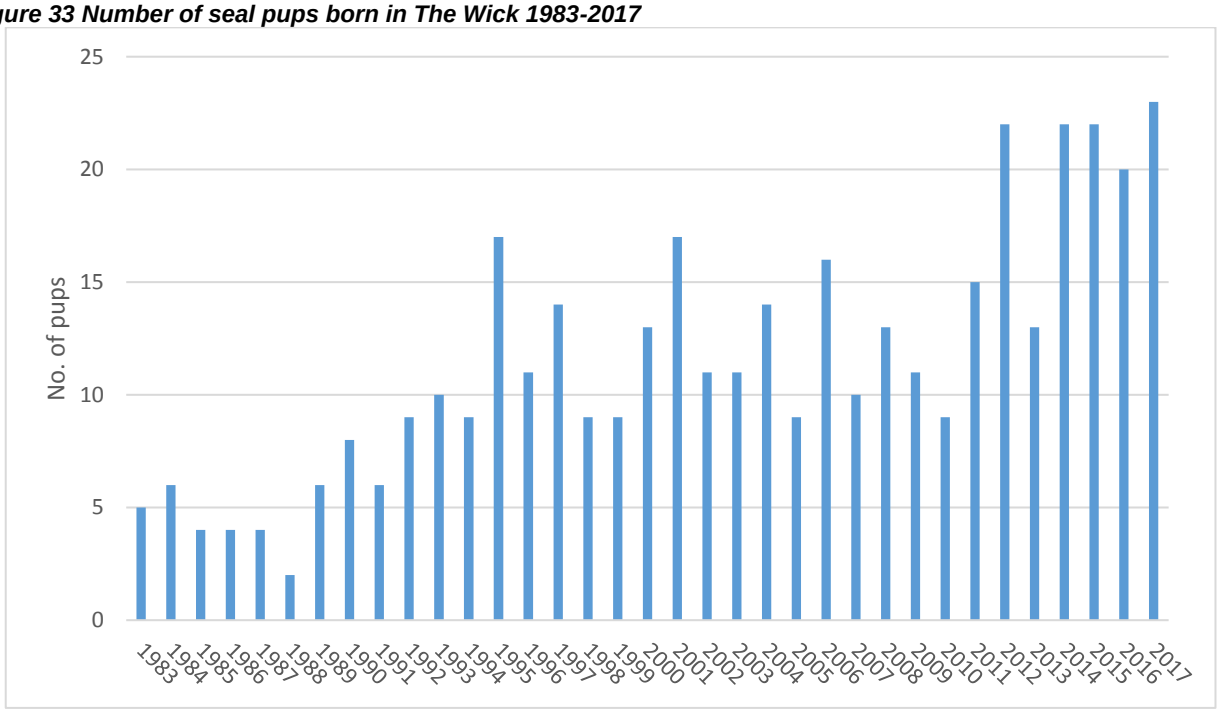


Figure 34 Weekly seal pup births in The Wick in 2017

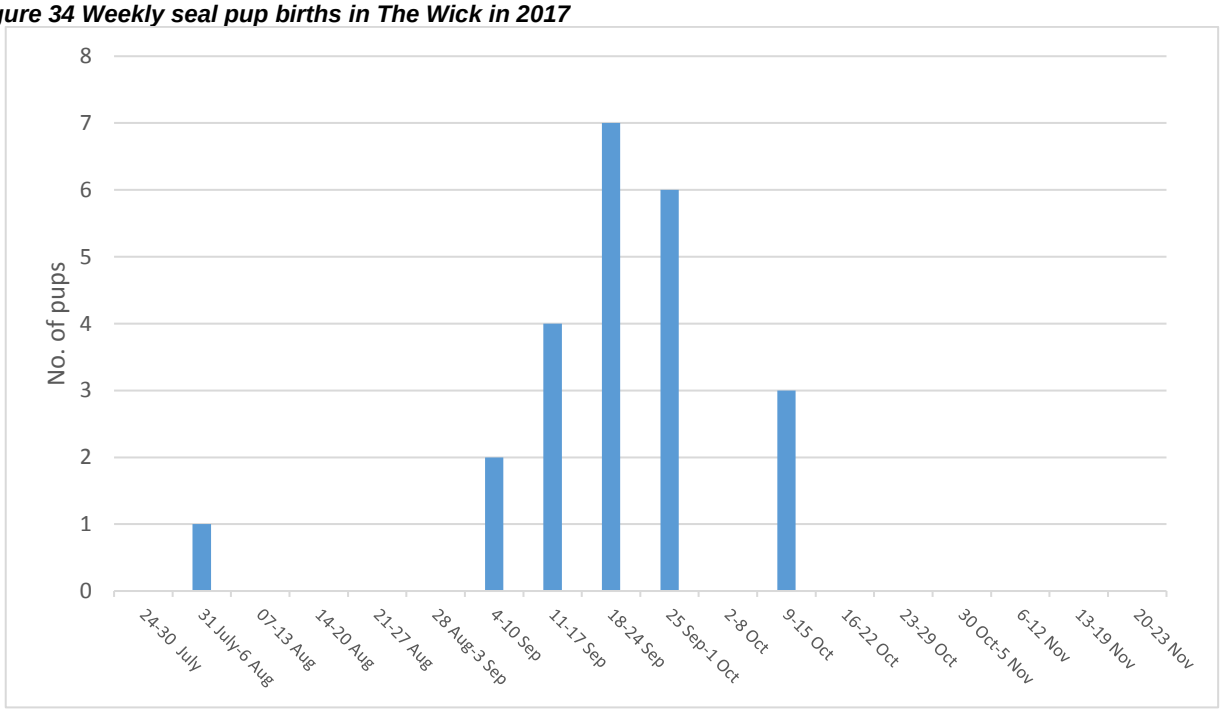


Table 26 Fate of pups on The Wick 2017

Fate	**No. of pups**
Assumed survived	3
Survived to beginning of moult	5
Survived to weaning	9
Assumed dead	6
Dead	0
Unknown	0
Total	**23**

Table 27 Causes of seal pup deaths on The Wick in 2017

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

4.4.15 The Basin

In 2017 two pups were born in The Basin and both pups are assumed to have survived/survived to beginning of moult, giving a survival rate of 100%.

Figure 35 Number of seal pups born in The Basin 1983-2017

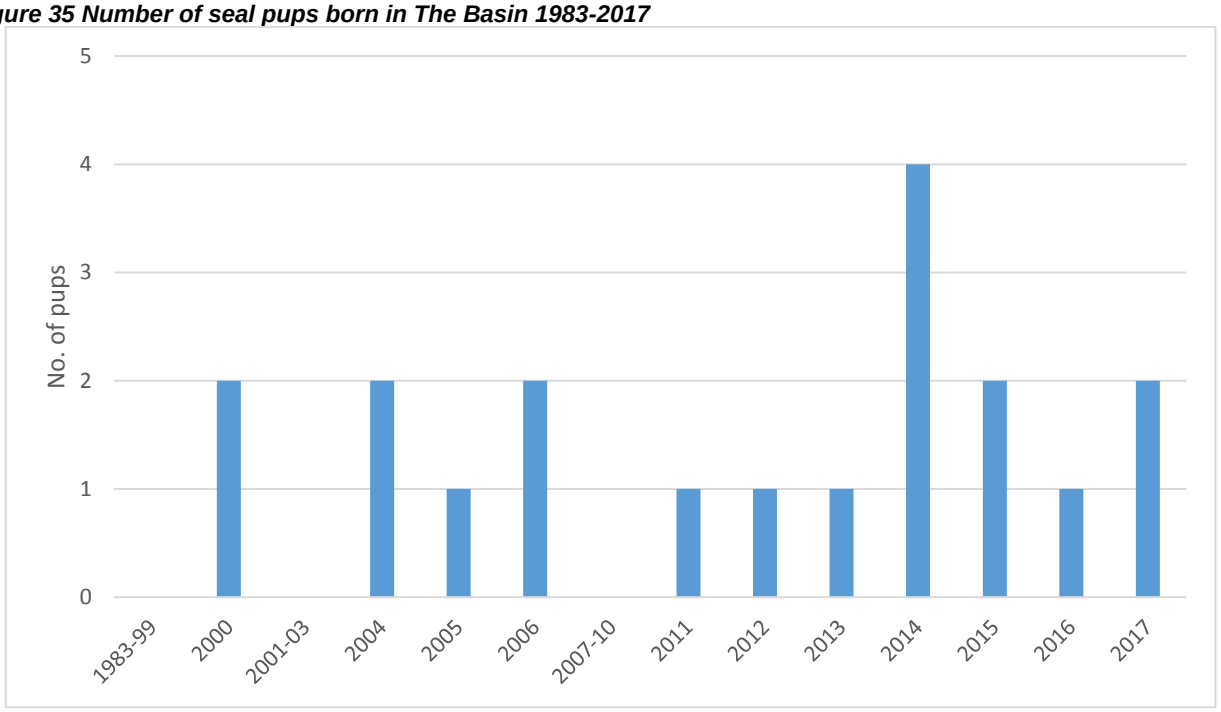


Figure 36 Weekly seal pup births in The Basin in 2017

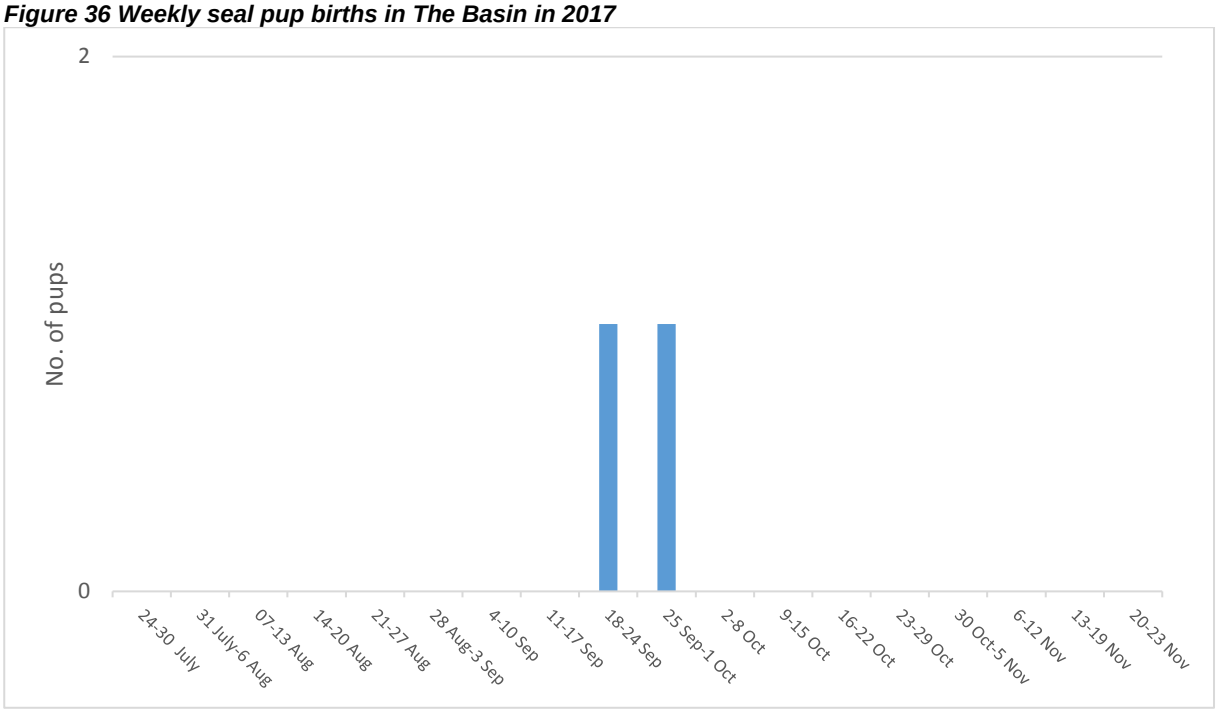


Table 28 Fate of pups in The Basin 2017

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

4.4.16 Robert's Wick

As far as we are aware no pups were born in Robert's Wick in 2017. This site was possibly used once, in 2001.

4.4.17 Tom's House

No pups were born at Tom's House in 2017. The site has only been used once, in 1997, when a single pup was born.

4.4.18 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 2017 we managed to monitor this site approximately every four days during the main pupping time. One full site visit to the beach was undertaken on 2/10/17. One pup was born at Pigstone Bay which disappeared ≤ size 3 and is assumed dead, giving a survival rate of 0%.

Figure 37 Number of seal pups born in Pigstone Bay 1983-2017

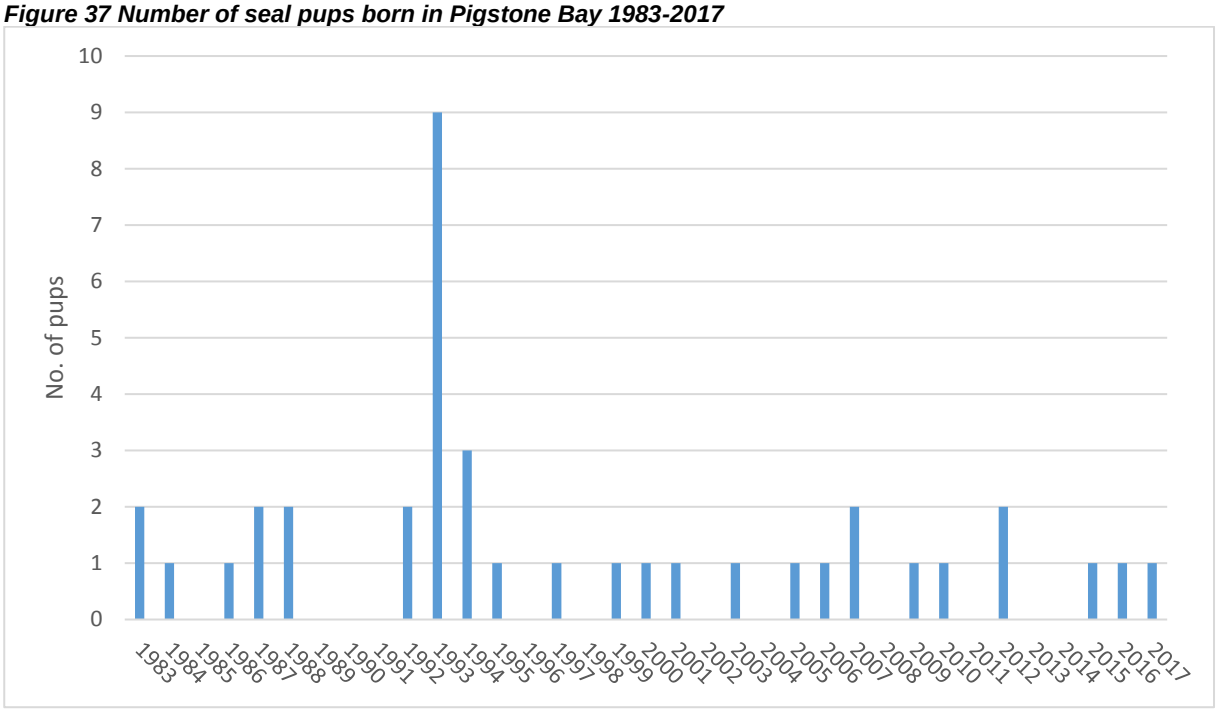


Figure 38 Weekly seal pup births in Pigstone Bay in 2017

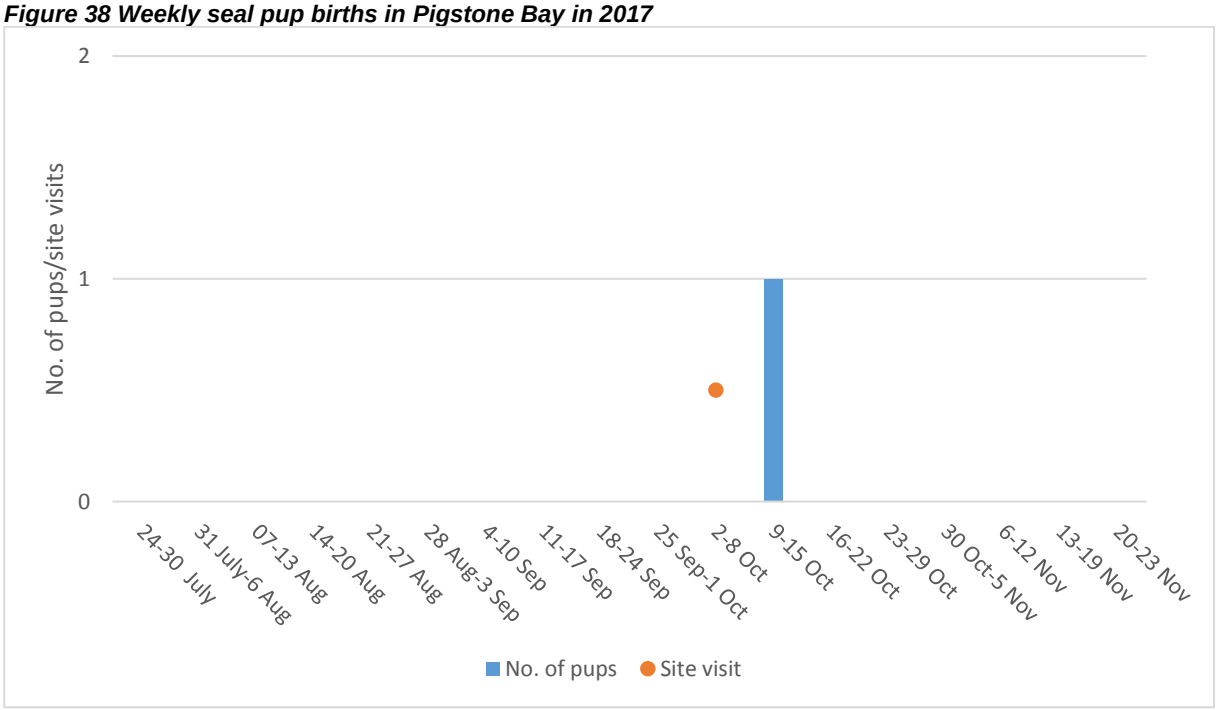


Table 29 Fate of pups in Pigstone Bay 2017

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

Table 30 Causes of seal pup deaths in Pigstone Bay in 2017

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
Total	**1**

4.4.19 The Garland Stone

No pups were born at the Garland Stone in 2017.

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

4.4.20 The Mew Stone

No pups were born at the Mew Stone in 2017. This site was only used once in 2015 when a freshly dead pup was found floating at the base of the Mew Stone.

4.5 Movements

During 2017, 14 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 31 Movements of pups on Skomer Island in 2017

Natal Site	**Pup No.**	**Destination ***	**Age** (on arrival at destination)	**Pup condition** * (when last seen)
SHV	12	DWB	13	3
SHV	14	SBS	21	3
SHV	**38**	DWB	2	3
SHV	**39**	DWB	11	3
SHV	**95**	DWB	12	1
DWB	**131**	SHV	20	3
DWB	**134**	SHV	21	3
DWB	**163**	SHV	16	3
SHO	**164**	DWB	13	1
SHV	**202**	DWB	5	2
DWB	**211**	SHV	23	4
DWB	**217**	SHV	9	3
MWK	**225**	ARM	24	4
SBS	**235**	SHV, DWB	19, 21	5

* see Appendix 2 for key to abbreviations

4.6 Wanderers

Twelve 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.

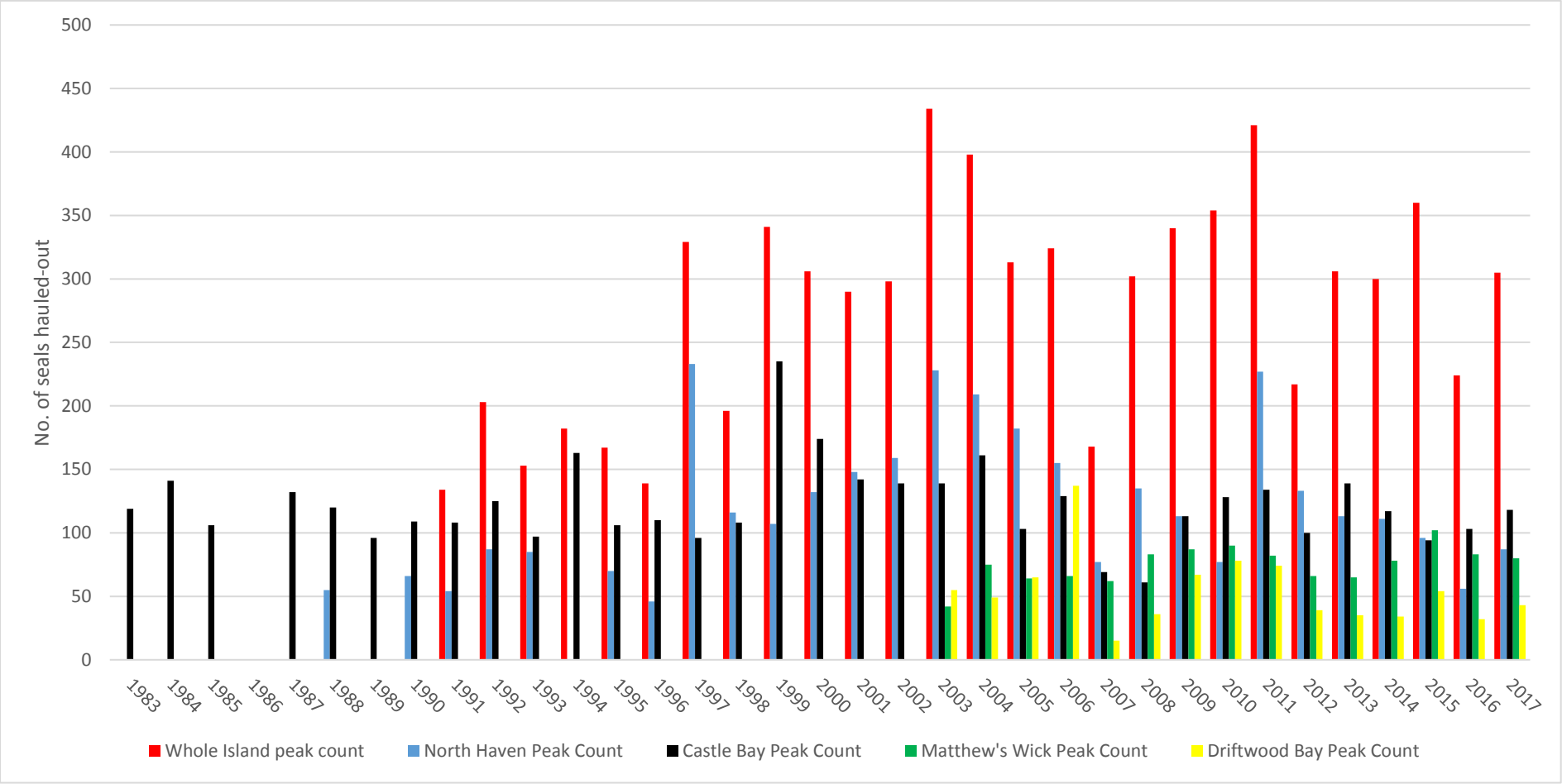
5. Haul-outs in 2017

In 2017 the maximum haul-out (on the main haul-out sites) of 305 animals was recorded on 23 November, one day earlier than in 2016. This is 81 more than last year's maximum count of 224.

The average maximum haul-out on the main haul-out sites for the last ten years is 299, hence the number of seals using Skomer to haul-out in 2017 was in line with the ten year average.

In 2017 North Haven had its peak haul-out count on 1/10. Driftwood Bay, Castle Bay and Matthew's Wick had their peak haul-out count on 23/10.

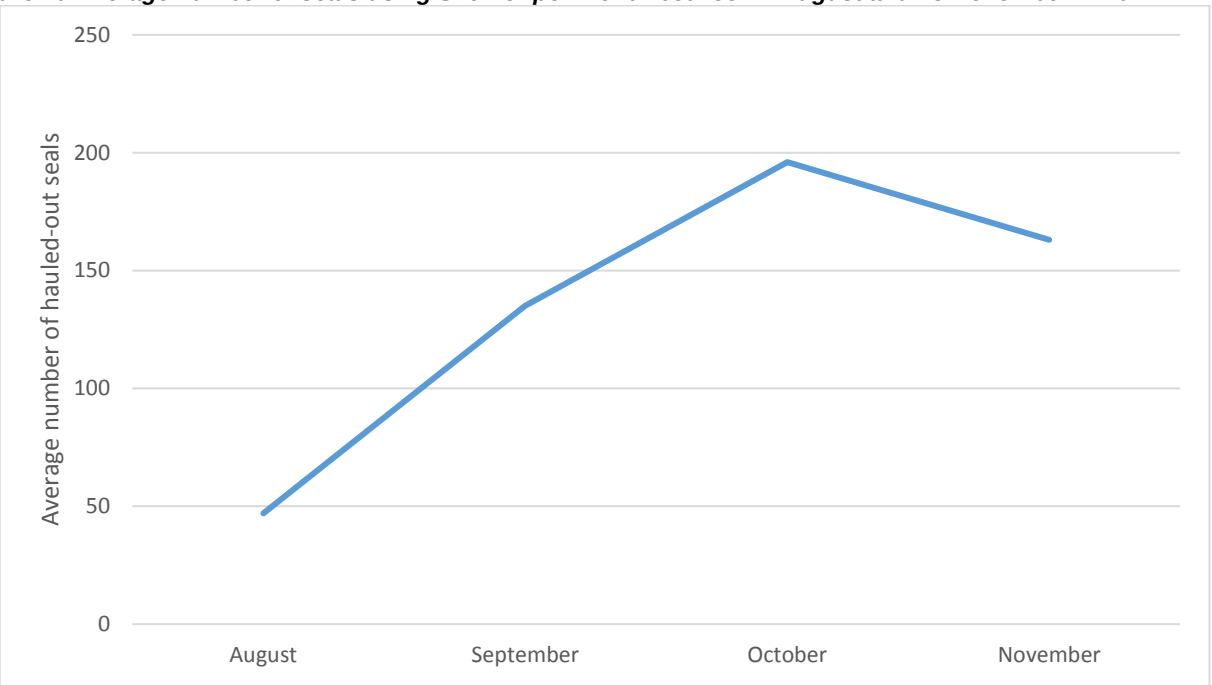
Figure 39 Peak haul-out counts on Skomer Island 1983-2017



For haul-out details see 2017 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 40 Average number of seals using Skomer per month between 1 August and 23 November in 2017



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 44 seals. The second most popular beach was North Haven (including Rye Rocks and the slip beach) with an average daily haul-out of 33 animals, contrary to the two previous years in which Matthew's Wick was more popular than North Haven.

In 2017 Matthew's Wick was the third most important haul-out site with a daily average of 24 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 eight 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 41 Average haul-out at the main haul-out sites per week in 2017

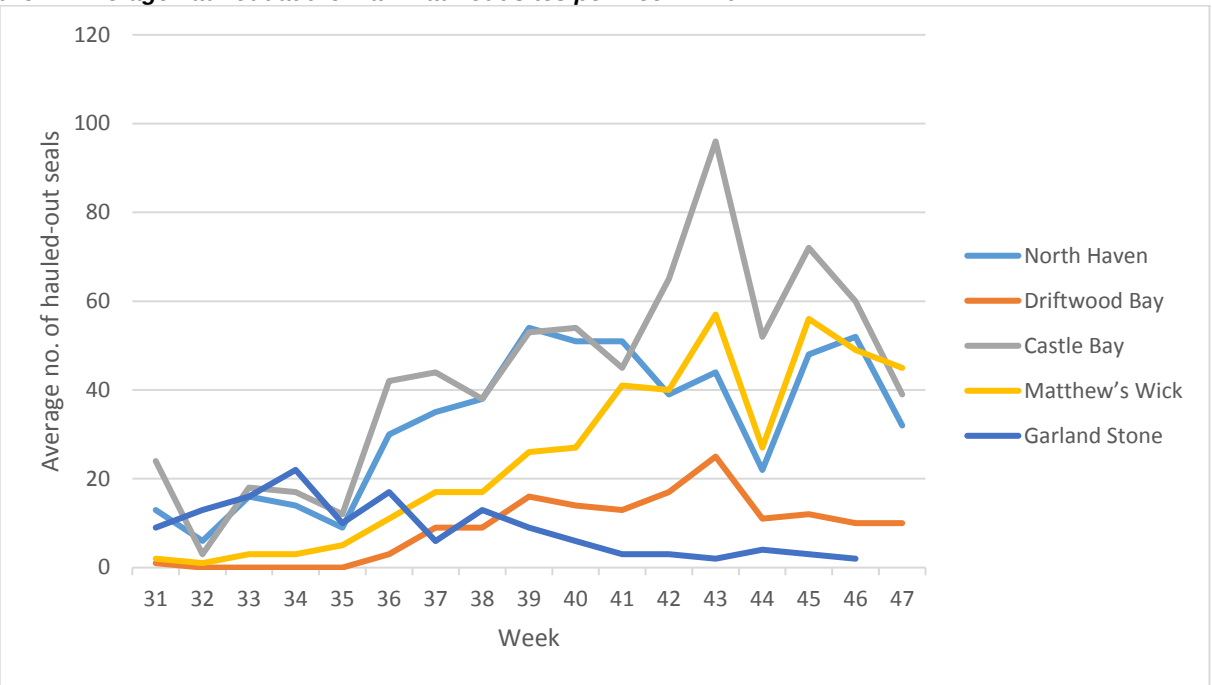


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Figure 42 North Haven haul-out in 2017

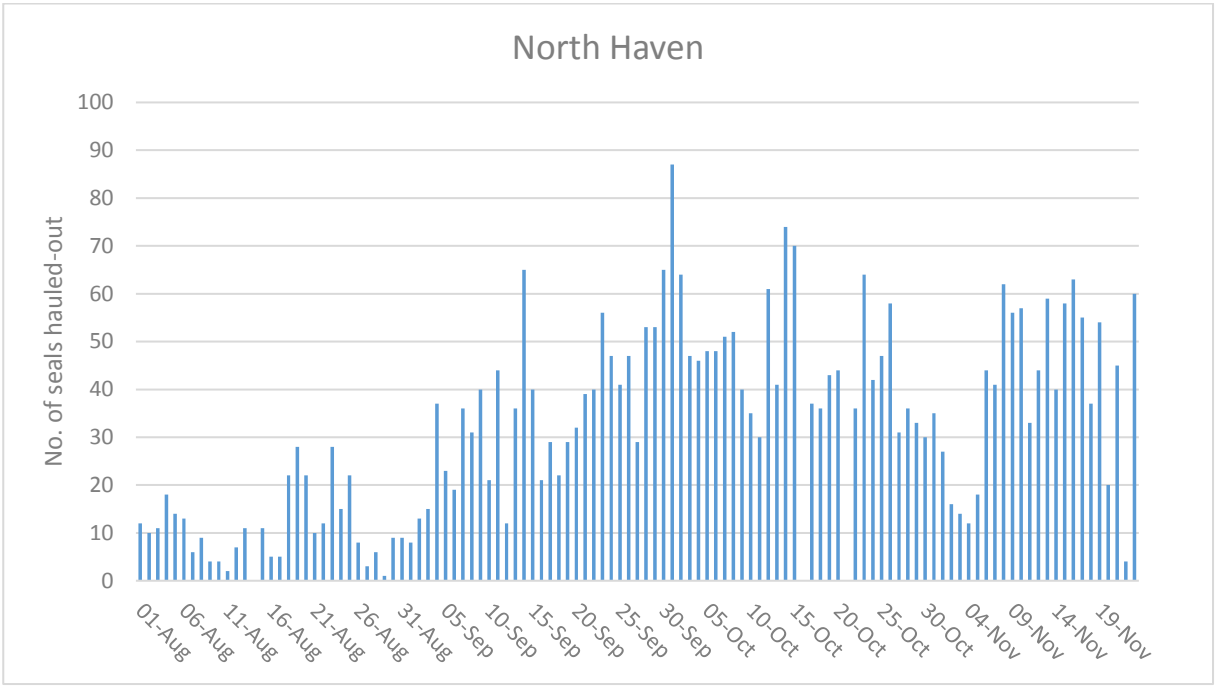


Figure 43 Castle Bay haul-out in 2017

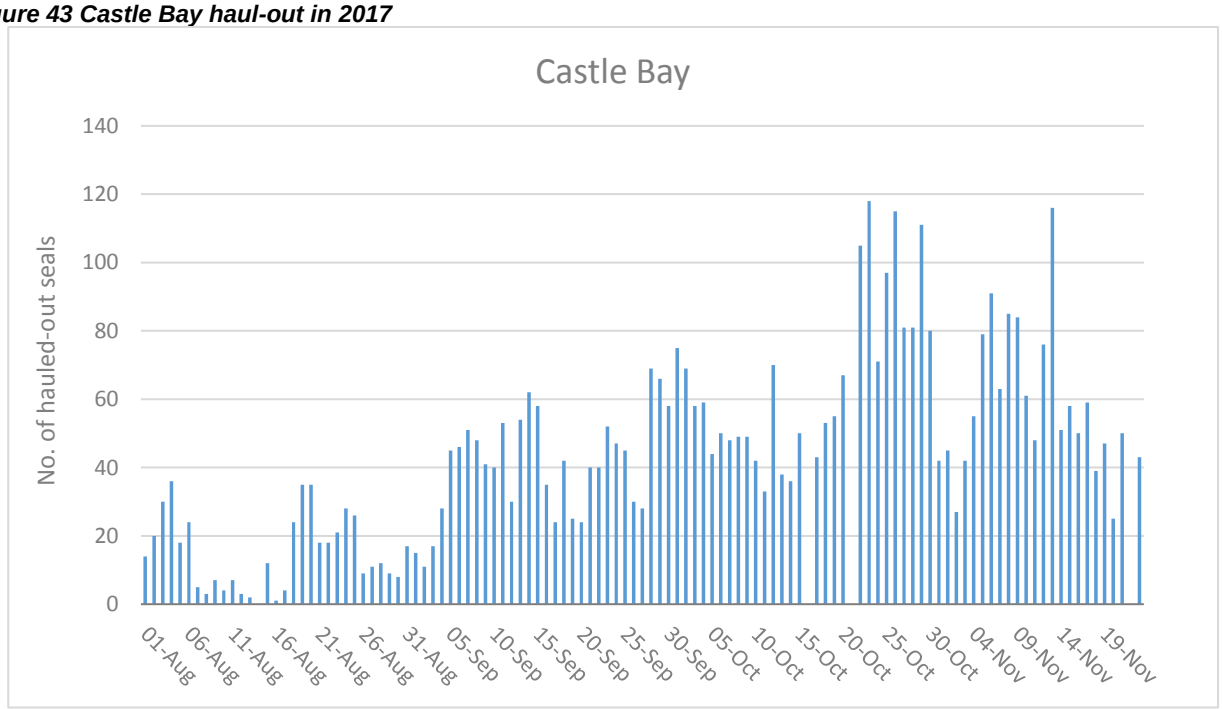


Figure 44 Driftwood Bay haul-out in 2017

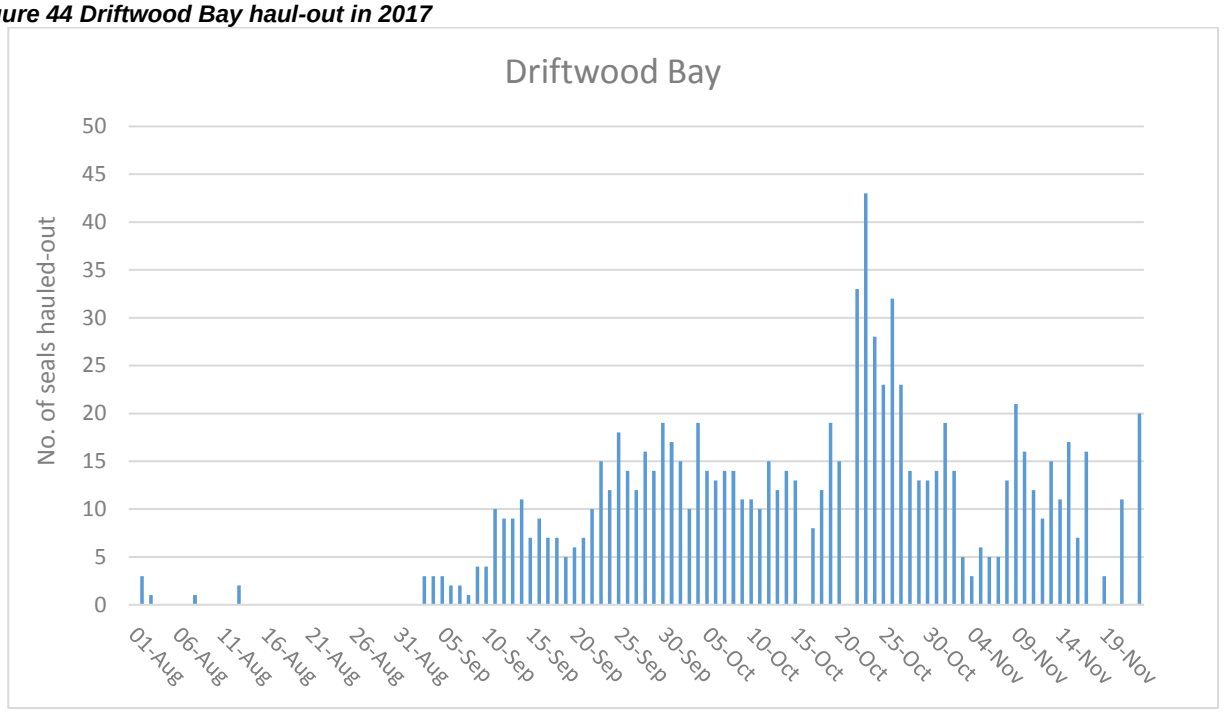


Figure 45 Matthew's Wick haul-out in 2017

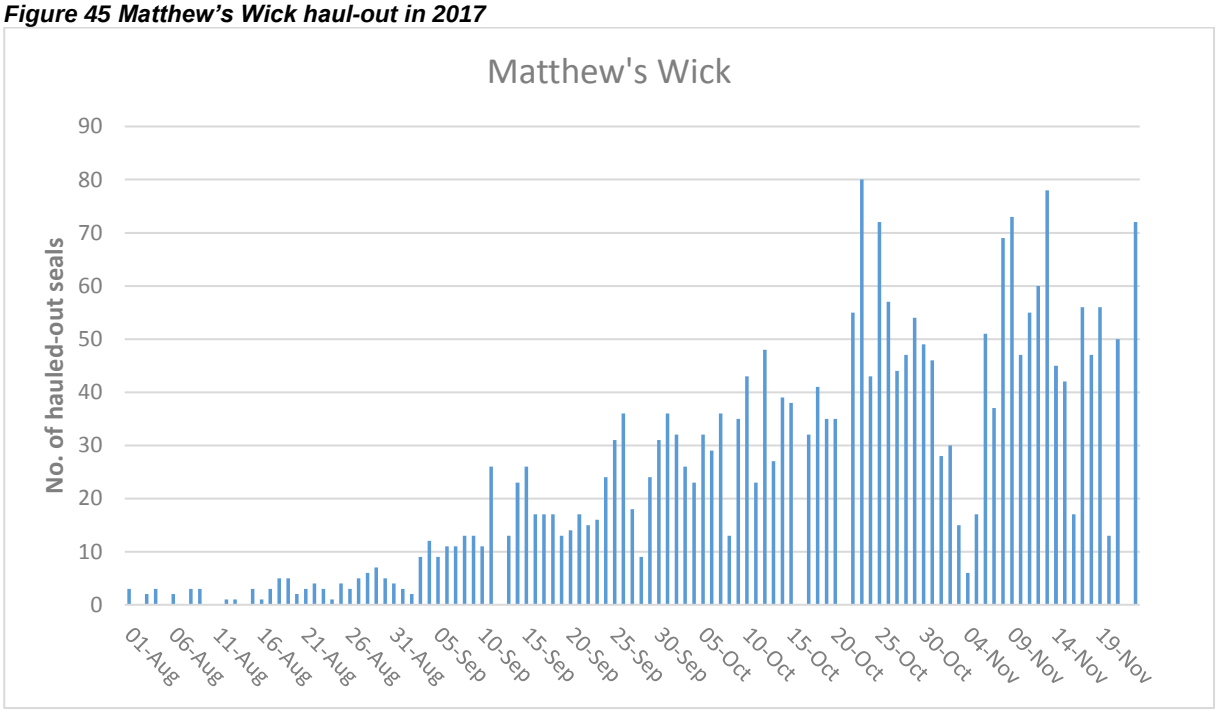


Figure 46 Garland Stone haul-out 2017

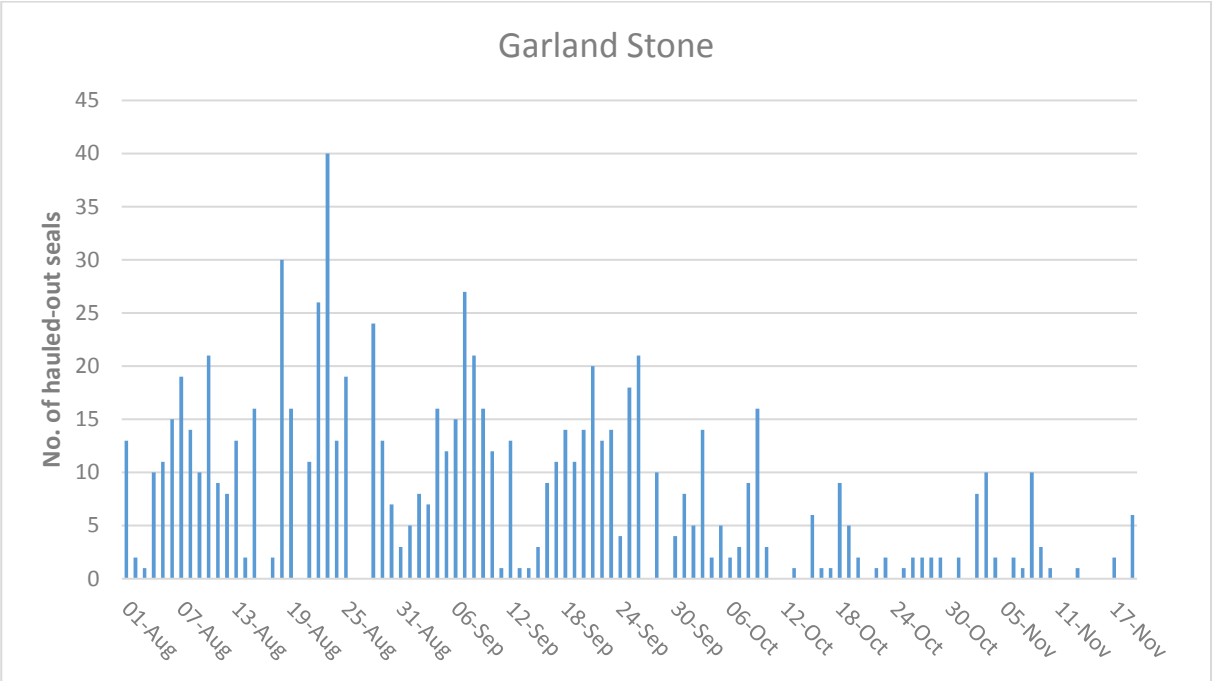
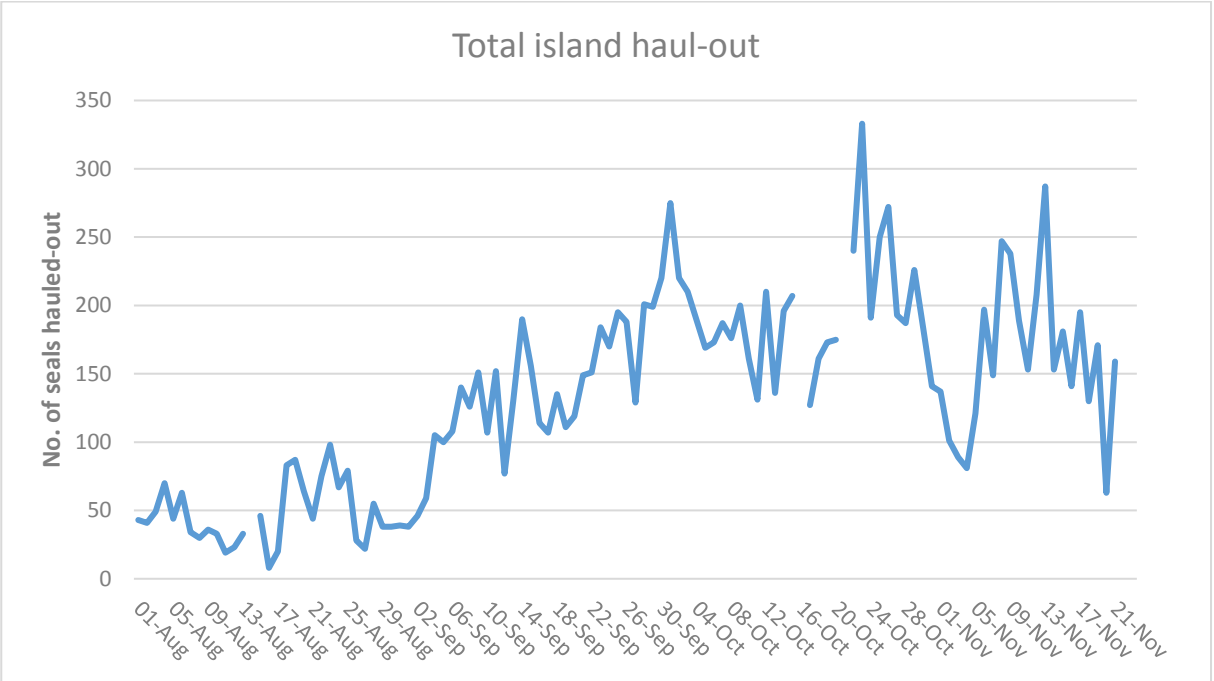


Figure 47 Total island haul-out counts in 2017



6. Pollution

6.1 Netting

Monofilament line and netting were the most obvious pollutants affecting seals. In 2017, 25 animals (15 females, six males and four 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 2017 seven animals with scars caused by netting were known from previous years.

NK-085
NK-020
14.SC-NK-109.MWK
14.SB-NK-015.NHV
BK-066
14.SC-NK-033.SHV
13.SB002.CBY

For more detailed information on these animals see the raw data file “1994-2017 distinctive seals”.

6.2 Oil/Tar

Skomer’s beaches remain relatively clean, no pollution by oil or tar was observed in 2017.

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. One immature seal was recorded playing with a plastic bag, trying to stick its head through the handles, in North Haven on 4/10.

7 Disturbance

Between 1 August and 23 November 2017 14 incidents of disturbance to seals around Skomer Island were observed and there were 13 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. Five incidents of category 1 (incl. two which were rated 1-2) and nine incidents of category 2 (incl. one which was rated 2-3) 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 7 Boats in voluntary no access zone in South Haven on 27/8/17

8. Seal Behaviour

2017 was a quiet season in terms of unusual seal behaviour. Of interest was the cow 16.SC-US-117.SHV which pupped on South Haven beach in 2016 and on North Haven beach in 2017. It seems that in both years she wasn't able to feed her pup, possibly due to a large scar on her underside where her teats are.

Plate 8 Cow 16.SC-US-117.SHV with pup 178 and a bleeding scar on her belly

Although the storms caused a lot of fatalities it also showed how resilient Grey Seals are. Two pups disappeared off Skomer's beaches only to be found again later.

Pup 125 was born on North Haven beach on 28/9/17 but disappeared during the storm on 16/10/17. Nine days later it was found healthy and nearly moulted on the mainland at Martin's Haven beach.

Plate 9 Pup 125 on North Haven beach (Skomer) on 28/9/17, born 26/9/17

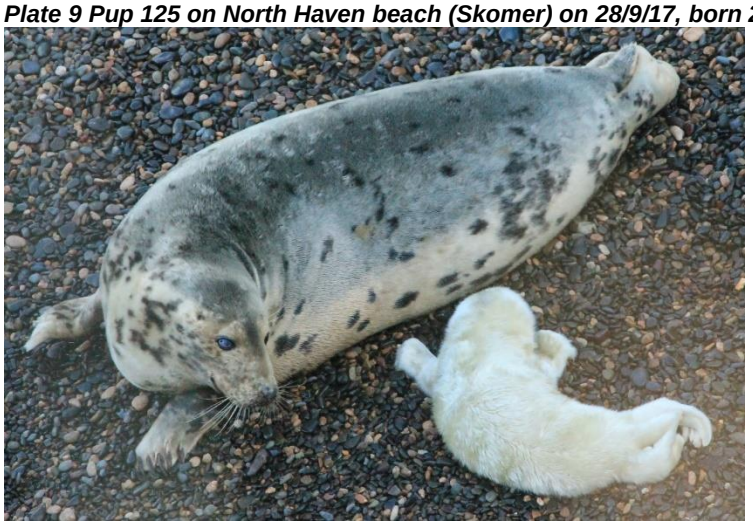


Plate 10 Pup 125 (marked blue/orange) starting to moult on North Haven beach on 15/10/17

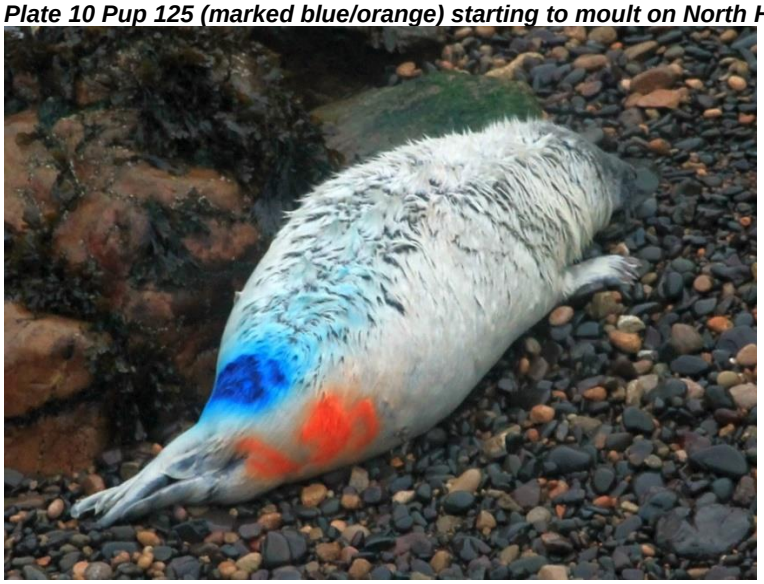


Plate 11 Pup 125 on Martin's Haven beach, (mainland) on 25/10/17, photographed by J. Riordan

Pup 175 disappeared off North Haven beach during the storm on 16/10/17 but was seen on St. Bride's beach (mainland) the next day. The pup was found by a member of the public and the Welsh Marine Life Rescue were called to investigate its health. As it was found to be in good health it was marked blue/red above the original purple/orange mark and left on the beach. Astonishingly, it returned to Skomer, North Haven beach on 22/10/17

Plate 12 Pup 175, Skomer, North Haven on 3/10/17

Plate 13 Pup 175, Skomer, North Haven marked purple/orange on 8/10/17

Plate 14 Pup 175, St Bride's Beach (mainland) 17/01/17 photographed by A. Sutcliffe

Plate 15 Pup 175 back on Skomer, North Haven 22/10/17

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9. Disease

In 2017, as in previous years, quite a large number of small and ill-looking weaners were observed, especially following the storms. 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.

Plate 16 Injured and undernourished weaner photographed on 23/10/17 which died two days later

The usual cases of eye infections among seal pups were observed in 2017. 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.

10. Identification of individual seals

For the 13th year photographic monitoring of adults continued in 2017 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 2017, 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 410 of these photos are stored ready to be entered into the Wales Seal Photo ID database. 127 bulls or female seals with obvious scars were identified by eye, of these 50 were re-identified from previous years.

Of the 225 breeding females we managed to photograph 160 (71%) well enough for identification by eye and/or inclusion in the database.

Of the 124 seals identified by eye

- 47 of them were re-identified from previous photos.
- 77 new seals were photographed and added to the ID catalogues.
- In 2017 the oldest cow to have returned to Skomer was LBK-003. She pupped for the first time on Skomer in 2001, then again in 2002, 2004, 2005 and from 2009 to 2012 every year and then again in 2014 and 2016.
- The oldest bull to have returned to Skomer was 07.CBY.B01 which was first recorded in 2007.

Table 32 Year of first sighting of seals seen on Skomer Island in 2017

Year first observed	No. of animals seen in 2017 which were known from previous years
2001	1
2002	3
2003	0
2004	2
2005	0
2006	1
2007	3
2008	3
2009	1
2010	3
2011	3
2012	5
2013	4
2014	7
2015	3
2016	7

10.1 Breeding Cows Returning In 2017

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 225 cows which pupped on Skomer in 2017, 69 had distinctive markings/scars and were photographed well enough for comparing with the catalogue. Twenty-six matches were found, hence 38% of identifiable breeding cows were returning cows, the same as last year. The percentage of returning cows is, however, smaller than in 2015 (46%). 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.

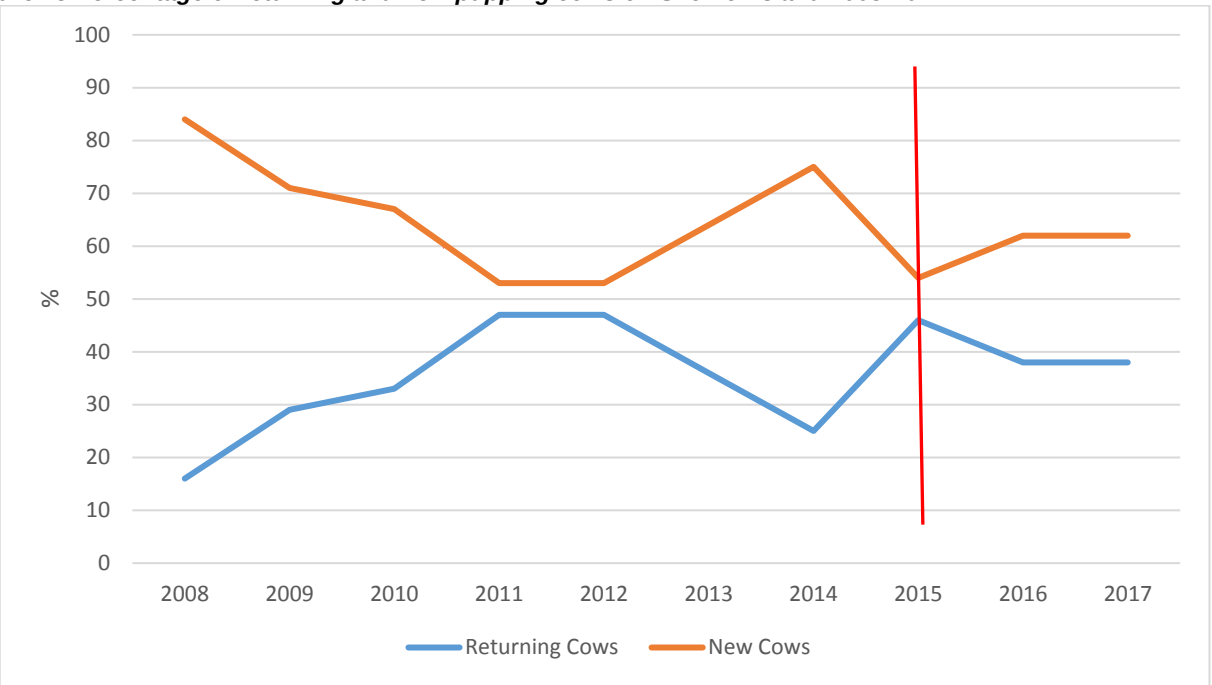
- Ten (38%) of the 26 matched cows that pupped on Skomer in 2017 had also pupped in 2016 (44% in 2016, 55% in 2015)

- Two cows (8%) pupped in three consecutive years (25% in 2016, 30% in 2015).

- One cow (LBK-030) has pupped every year on Skomer since 2010. She was first recorded with a pup in 2008 and was seen pregnant in 2009 but was not observed with a pup that year.

It seems that some of the regular breeding cows were missing on Skomer in 2017 whilst other females that had not been seen in recent years returned to Skomer to breed in 2017.

Figure 48 Percentage of returning and new pupping cows on Skomer Island 2008-2017



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

10.1.2 Site fidelity

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

- Of the two cows that pupped on Skomer in three consecutive years 2015-2017 none used the same site in all three years (50% in 2016, 40% in 2015, 67% in 2014). However both cows kept swapping between adjacent beaches (Driftwood Bay and South Haven) and therefore showed a preference to beaches within South Haven.

- In 2017 LBK-003 pupped for the eleventh time on South Haven beach (non-consecutive years).She is very site faithful and has pupped on this beach ever since she was first observed on Skomer in 2001. She pupped on Skomer in eleven out of 17 years.

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.

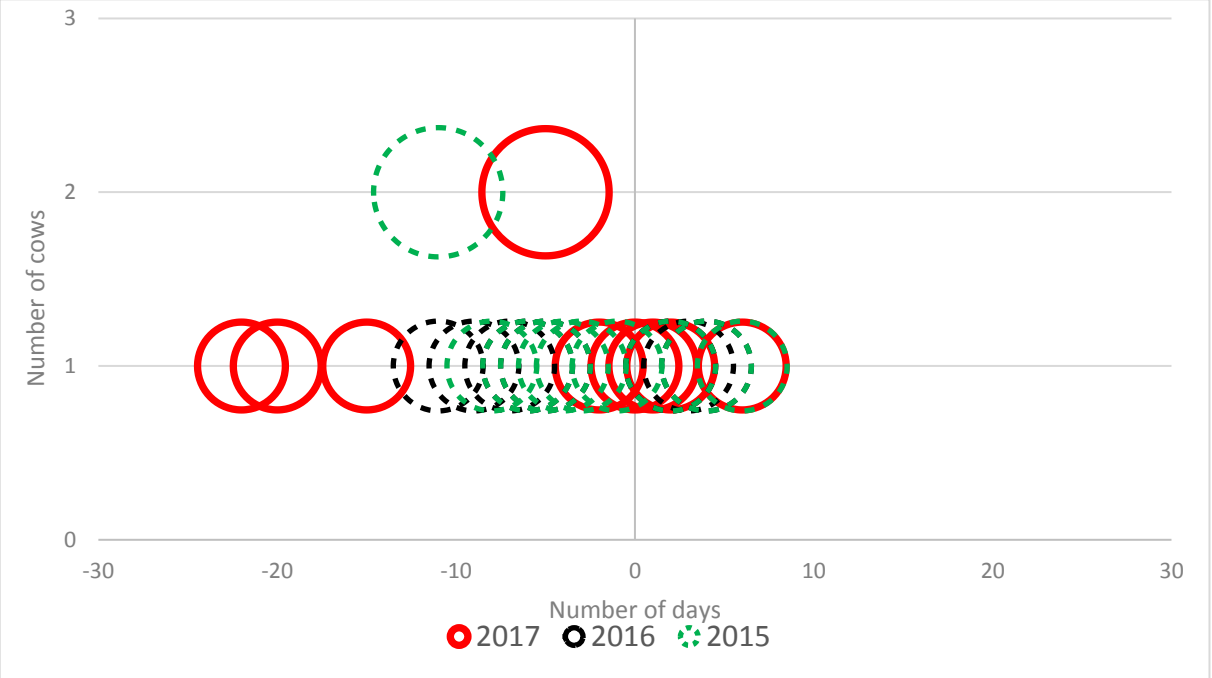
11.1.3 Pupping date

Table 33 Pupping date of returning cows on Skomer Island in 2013-2017

Cow	Pupping date 2015	Pupping date 2016	Pupping date 2017	Difference (days) 2015/16	Difference (days) 2016/17	Average difference (days)
13.SC-BK-178.MWK	11-Nov		30-Oct			
13.SC-LS-000.CBY			19-Aug			
14.SC-BK-160.DWB	10-Oct		25-Sep			
14.SC-HD-166b.SBS			01-Oct			
14.SC-LS-058.NHV		22-Sep	02-Sep		-20	
14.SC-NK-033.SHV			13-Sep			
14.SC-NK-109.MWK	05-Oct		01-Oct			
15.SC-BK-301.SHV	17-Oct		13-Sep			
15.SC-HD-129.SHV	06-Oct	08-Oct	03-Oct	2	-5	-0.5
15.SC-LS-189.SHV	20-Oct		13-Oct			
16.SC011.MWK		27-Aug	27-Aug		0	
16.SC-BK-177.MWK		18-Oct	13-Oct		-5	
16.SC-BK-213.MWK		07-Nov	09-Nov		2	
16.SC-LBK-004.WCK		17-Aug	26-Jul		-22	
16.SC-LS-085.SHV(C1)		25-Sep	26-Sep		1	
16.SC-US-117.SHV		01-Oct	07-Oct		6	
BK-066			28-Sep			
BK-077	05-Oct		19-Sep			
LBK-003		27-Aug	12-Aug		-15	
LBK-007	16-Oct		05-Aug			
LBK-017	01-Nov		14-Oct			
LBK-030	12-Sep	06-Sep	04-Sep	-6	-2	-7
LBK-033	26-Aug		30-Aug			
LS-016			18-Sep			
LS-020	21-Oct		02-Oct			
RS-019			13-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 bubbles in the bubble graph below (which show the difference in pupping date for the ten identified cows) it seems that 2017 was a mixed year: some cows pupped much earlier than in the previous year and others pupped around the same time as in 2016 or slightly later.

Figure 49 Difference in pupping date of returning cows on Skomer Island 2015-2017



For pupping site fidelity and pupping date details see “2017 Returning Cows Raw Data” file.

The 2017 breeding season was demanding on staff resources as a lot of cows pupped at the same time. The beginning and end of the season appeared slow, however week 40 (2-8 October) was very busy with up to 94 white-coated pups (42% of the total pups born) present on the beaches simultaneously. This lead to a highly increased workload and very intense monitoring period. In 2016 the maximum amount of white-coated pups monitored simultaneously was 60 (30% of the total pups born).

If, in future years, this phenomenon continues we recommend that the field methodology is adjusted as it is virtually impossible to monitor more than 60 pups daily. Either monitoring would need to be done every two or three days only to allow for data entry in-between or a system of rotating beaches should be introduced. Furthermore marking could only be done on some of the beaches, 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.

10.2 Returning Bulls

27 bulls were identified in 2017, of which ten had been recorded previously on Skomer.

11. Skomer Seals Seen Elsewhere

On 29/5/17 an immature seal with an orange flipper tag with a black code (80191) turned up on North Haven beach. The young cow was seen throughout the summer and autumn and was last photographed on 11/11/17. She was born in 2016 and tagged at the RSPCA West Hatch Wildlife centre in Somerset last year. She was called Trixie and she originally came from Salcombe in Devon. She was released on 07/02/17 at Combe Martin.

Plate 17 Tagged immature seal Trixie

On 13/11/17 another immature seal with an orange flipper tag (number 80207) hauled-out on North Haven beach. This seal was rescued by the British Divers Marine Life Rescue late one evening, in the dark, from Dollar Cove, Gunwalloe on 19th October 2016. It had minor injuries and was skinny and was initially treated at their holding facility and then transferred to West Hatch the following day. The RSPCA West Hatch Wildlife centre in Somerset called her Smurfette and released her at Combe Martin on the 17th Feb 2017.

Plate 18 Orange tagged seal on 13/11/17

We observed two more tagged seals but were unable to read the number on the tags. One seal had a yellow tag and was seen on North Haven beach on 4/8/17; the other seal had an orange tag and was hauled-out on Rye Rocks on 7/9/17.

Plate 19 Two tagged seals observed in 2017

We have had two reports of “Skomer” seals seen by the Cornwall Seal Group Research Trust. The cow 14.SC-BK-079.SHV was seen at Pentire, North Cornwall on 15/2/17. The cow LS-021 was seen in West Cornwall on 09/01/17 and in North Cornwall at Trevose on 23/01/17

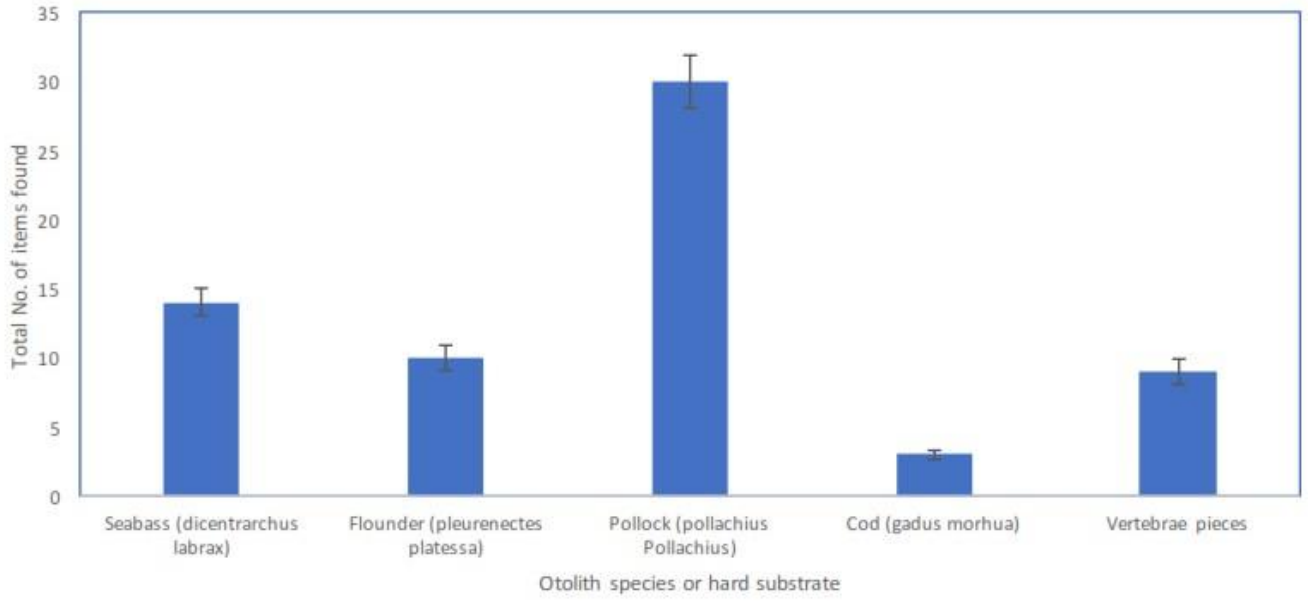
From Ramsey we had reports about two cows. BK-061 had a class IV pup at Ramsey beach The Waterings on 4/9/17 and NK-069 had a class II pup on Ramsey beach Aber Mawr on 4/9/17.

Further Research

In 2016 the Skomer team collected Grey Seal faeces samples from several Skomer beaches which were analysed by Callan Lofthouse (Swansea University) for his BSc study "Assessing the Grey Seal Diet (Halichoeres Grypus) from colonies found in south Wales".

From the identifiable otoliths the species found were Seabass, Flounder, Cod and Pollock; Pollock being the most common and Cod the least common, see figure 50.

Figure 50 Otolith species found in seal faeces



Furthermore large pieces of plastic were found as well as beads of plastic.

Plate 20 Grey Seal feaces

Plate 21 Faeces after washing

Plate 22 Otoliths found

Plate 23 Plastics found

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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
06/08/17	Cling fish survey on NHV slip beach. 2 immature females flushed into water	2
12/08/17	Yacht, dropped anchor noisily in SHV close to shore, 3 people, at 14.30	1
13/08/17	6 Kayaks landed DWB not far from day old pup. Mum still present but cut off from water. When asked they left but then paddled very close past seal hole	2
28/08/17	5 Kayakers landed on NHV(S) for a pee then went through RR after being asked to steer clear	2
31/08/17	1 Yacht anchored in SHV. Launched one kayak. Kayak very close to cliffs and beach. Talked to them and they agreed to stay away from beach	1-2
31/08/17	1 Yacht anchored in SHV. Launched one row boat with 2 people. Row boat very close to cliffs and beach. Talked to them and they agreed to stay away from beach	1-2
01/09/17	Motor Boat, came into SHV voluntary no access zone at some speed. Approached beach and dropped anchor, 4 people on board. Female was suckling pup, left pup and entered water	2-3
02/09/17	6 Kayaks disturbed hauled-out seals at Rye Rocks at 10:30	2
02/09/17	Dive boat disturbed hauled-out seals at Rye Rocks at 11.00	2
09/09/17	One female seal flushed off NHV slip beach by staff rockpooling	2
17/09/17	Motorboat sped into North Haven and went close to beach watching seals, tried to radio them but didn't have their radio on	1
17/09/17	Motorboat in voluntary no access zone and much too close to DWB giving commentary over radio. We spoke to them and they said they would be more careful in future	1
24/09/17	Two females, one male and one immature flushed off Garland Stone by Lobster Potter at 16:18	2
26/09/17	Motorboat went into voluntary no access zone in NHV and close to beach, seals in water alarming continuously	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

Date	Details
07/08/17	Yacht in SHV in voluntary no access zone, 2 people landed on DWB with tender
10/08/17	Grey RIB with 5 people very close to SHV in voluntary no access zone, 2 people snorkelling at 16:00
10/08/17	4 boats in SHV in voluntary no access zone at 14:00
12/08/17	Yacht, SHV, 6 people, anchored in voluntary no access zone at 14.20
23/08/17	Yacht, 2 people anchored in voluntary no access zone in SHV
27/08/17	2 yachts, 3 motor boats 12 people SHV
28/08/17	Yacht in SHV
31/08/17	Yacht anchored in voluntary no access Zone in SHV at lunch time
31/08/17	Yacht in voluntary no access Zone in SHV at lunch time
31/08/17	Unknown yacht in voluntary no access Zone in SHV at lunch time
01/09/17	Yacht anchored in voluntary no access zone in SHV overnight
17/09/17	Yacht stayed overnight (16-17) within voluntary no access zone in SHV
17/09/17	Motorboat in voluntary no access zone in SHV