Cyfoeth Naturiol Cymru
Natural Resources Wales

Grey Seal Breeding Census Skomer Island 2019

Nathan Wilkie and Sylwia Zbijewska
The Wildlife Trust of South and West Wales

NRW Evidence Report 399

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Summary

238 pups were monitored on Skomer Island in 2019, of which 237 were born on Skomer and one pup turned up either just before the start of moult, or moulting (wanderers), in this case the pup was moulting.

The total of 238 pups born on Skomer Island is slightly less than 2018's 241, which was the highest total ever recorded.

A total of 408 pups were born within the Skomer Marine Conservation Zone, of which 170 were born on the Marloes Peninsula. See section 4.2.

In 2019 the busiest period was evenly spread over three weeks with 42 pups born in week 38 (17/9-23/9), 41 pups born in week 39 (24/9-30/9) and 42 pups born in week 40 (01/10-07/10). The busiest week in 2018 was week 38 with 51 pups born. See section 4.2.

The most productive beaches were South Haven (54 pups), North Haven (42 pups), Matthew's Wick (39 pups), Driftwood Bay (29 pups) and The Wick (21 pups). See section 4.2.

177 pups are known, or assumed, to have survived on Skomer giving a survival rate of 77%. See section 4.3

In 2019 the maximum haul-out (on the main haul-out sites) of 285 animals was recorded on 6 October 2019, 38 days earlier than in the previous year. This is 34 less than last year's maximum count. See section 5.

In 2019 18 seals (12 females, 2 males and 4 immature) were photographed with obvious signs of being entangled in nets at some time in their lives. See section 6.

Crynodeb

Cafodd 238 o loi bach eu monitro ar Ynys Sgomer yn 2019, y cafodd 237 ohonynt eu geni ar Sgomer a daeth un llo bach i'r golwg naill ai ychydig cyn y cyfnod bwrw blew, neu yn ystod y cyfnod bwrw blew (crwydriaid), ac yn yr achos hwn roedd y llo bach yn bwrw blew.

Mae'r cyfanswm o 238 o loi bach a anwyd ar Ynys Sgomer ychydig yn llai na'r 241 a anwyd yn 2018, sef y cyfanswm mwyaf a gofnodwyd erioed.

Ganed cyfanswm o 408 o loi bach o fewn Parth Cadwraeth Morol Sgomer, y cafodd 170 ohonynt eu geni ar Benrhyn Marloes. Gweler adran 4.2.

Roedd cyfnod prysuraf 2019 wedi'i wasgaru'n gyfartal dros gyfnod o dair wythnos a ganwyd 42 o loi bach yn wythnos 38 (17/9-23/9), ganwyd 41 o loi bach yn wythnos 39 (24/9-30/9) a ganwyd 42 o loi bach yn ystod wythnos 40 (01/10-07/10). Yr wythnos brysuraf yn 2018 oedd wythnos 38 pan anwyd 51 o loi bach. Gweler adran 4.2.

Y traethau mwyaf cynhyrchiol oedd South Haven (54 o loi bach), North Haven (42 o loi bach), Matthew's Wick (39 o loi bach), Driftwood Bay (29 o loi bach) a The Wick (21 o loi bach). Gweler adran 4.2.

Gwyddys, neu tybir bod 177 o loi bach wedi goroesi ar Sgomer, gan roi cyfradd oroesi o 77%. Gweler adran 4.3

Yn 2019, cofnodwyd bod y nifer uchaf o anifeiliaid, sef 285 wedi gadael y dŵr (ar y prif safleoedd gadael) ar 6 Hydref 2019, 38 diwrnod yn gynharach na'r flwyddyn flaenorol. Mae hyn 34 yn llai na'r nifer fwyaf a gofnodwyd y llynedd. Gweler adran 5.

Yn 2019, tynnwyd ffotograffau o 18 o forloi (12 benyw, dau wryw a phedwar anaeddfed) a oedd ag arwyddion amlwg eu bod wedi mynd yn sownd mewn rhwydi rywbryd yn ystod eu bywydau. Gweler adran 6.

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Between 30th July and 23rd November 2019 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 23 November 2019 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

238 pups were monitored on Skomer Island in 201, of which 237 were definitely born on Skomer and one pup turned up either just before the start of moult, or moulting (wanderer), in this case the pup was moulting.

The total of 238 pups born on Skomer Island is slightly lower than in 2018, which is the highest total of 240.

The first pup of the season was born on Matthew's Wick on 09/08/19. It was found on 10/08/19.

16 pups were born in August, 144 in September, 73 in October and 5 in November. The busiest month therefore was September.

In 2019 the busiest period was evenly spread over three weeks with 42 pups born in week 38 (17/9-23/9), 41 pups born in week 39 (24/9-30/9) and 42 pups born in week 40 (01/10-07/10). The busiest week in 2018 was week 38 with 51 pups born.

178 pups are known, or assumed, to have survived on Skomer 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

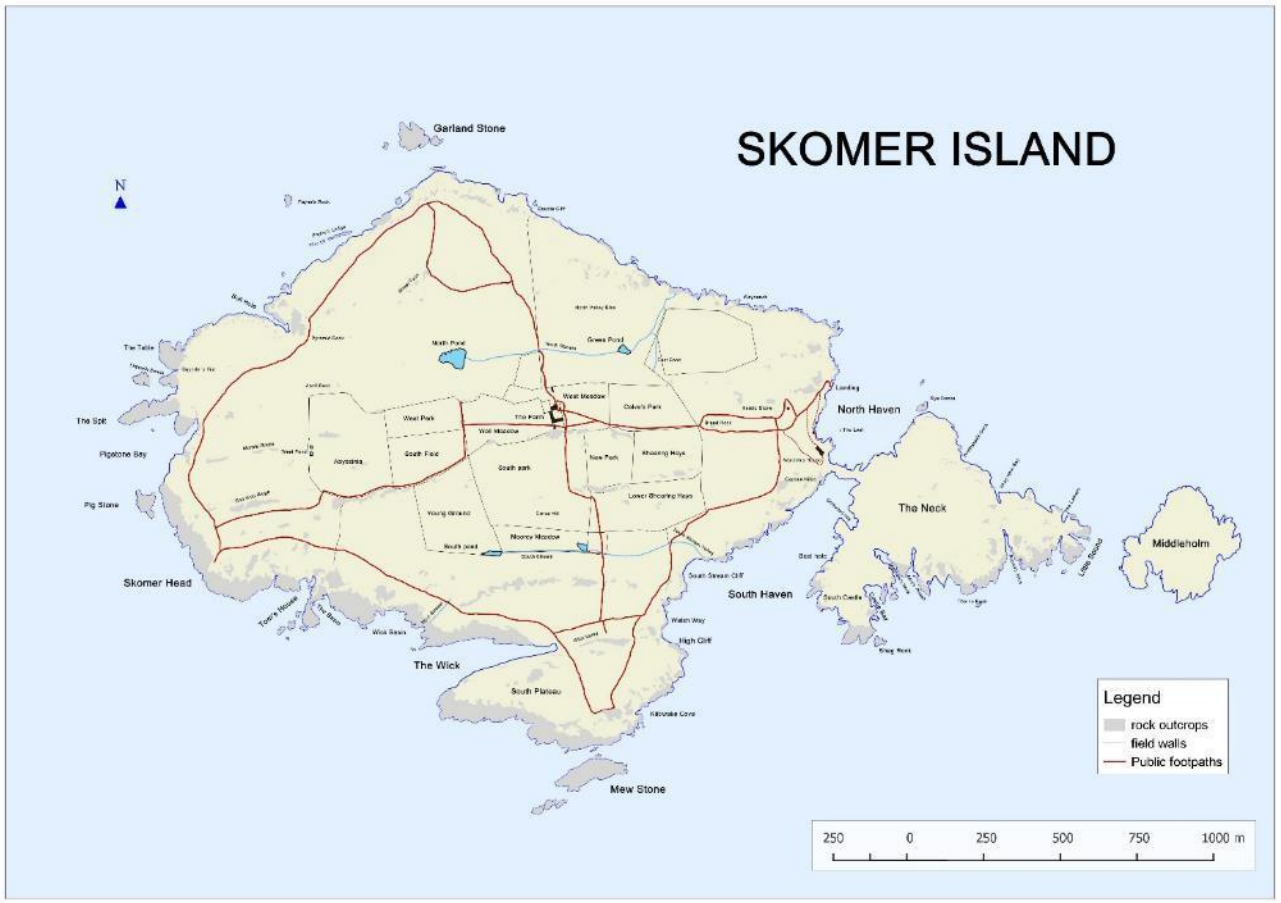


Plate 2 Skomer Island Grey Seal pupping sites East

Plate 3 Skomer Island Grey Seal pupping sites West

4.2 Pup Numbers

2019 was an excellent breeding season for the seals within the Skomer Marine Conservation Zone (MCZ) with a total of 408 pups born, 13 more than in the previous record year of 2018. Of the 408 pups born this year 170 were born on the Marloes Peninsula.

On Skomer 238 pups were monitored in 2019. 237 of them were definitely born on Skomer and a pup (wanderer) turned up either just before the start of moult, or moulting. This pup was potentially also born within the Skomer MCZ but not recorded as it may have been born elsewhere or in a location 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 a new record of 241 pups. The seal pup numbers on the Marloes Peninsula were also good in 2018 with 154 pups born, resulting in a total of 395 pups within the Skomer MCZ and the highest number of seal births since records began. This increase was experienced again in 2019 with 170 pups born on the Marloes Peninsula resulting in a total of 408 pups and a new record number of births for the Skomer MCZ.

Figure 1 Number of seal pups born in Skomer MCZ 1983-2019

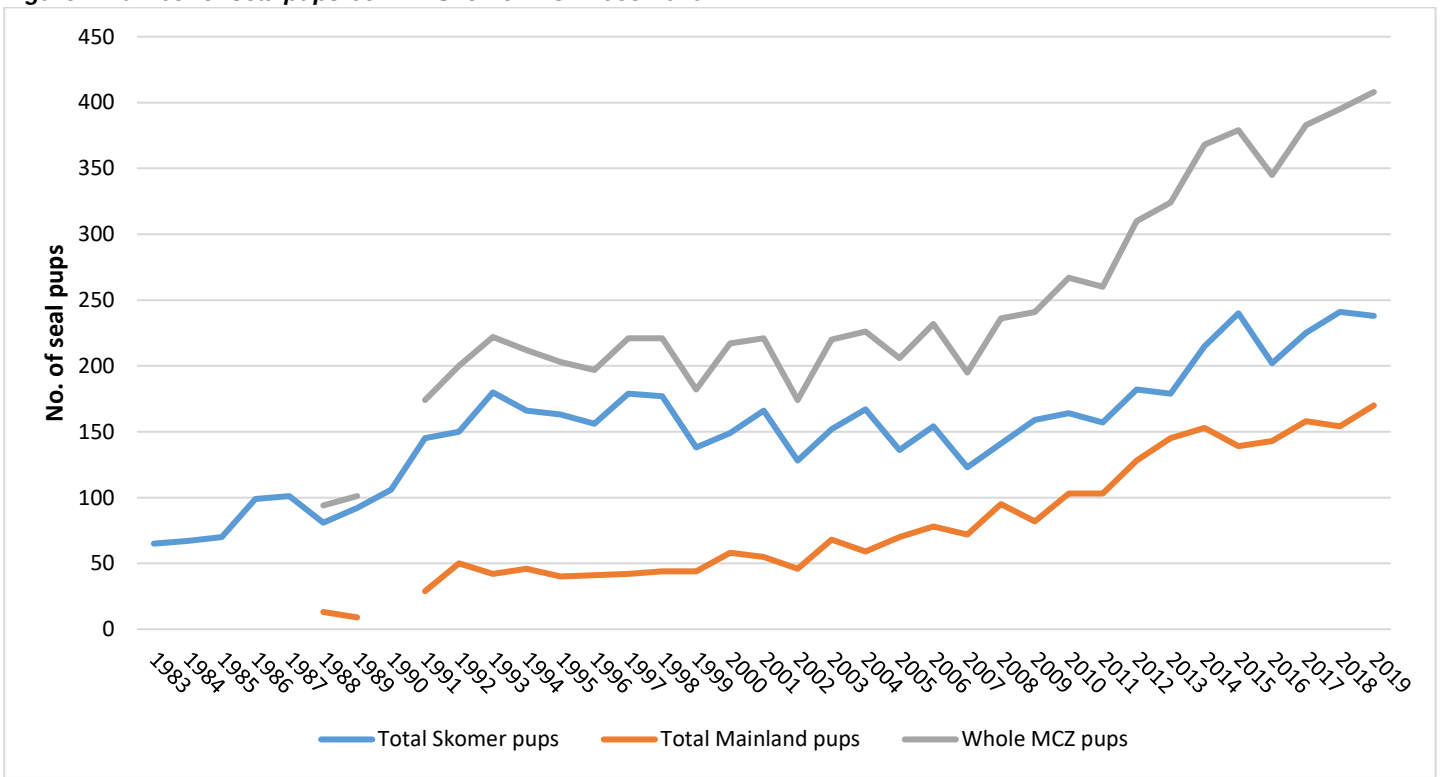


Figure 2 Daily totals of seal pups born on Skomer Island in 2019

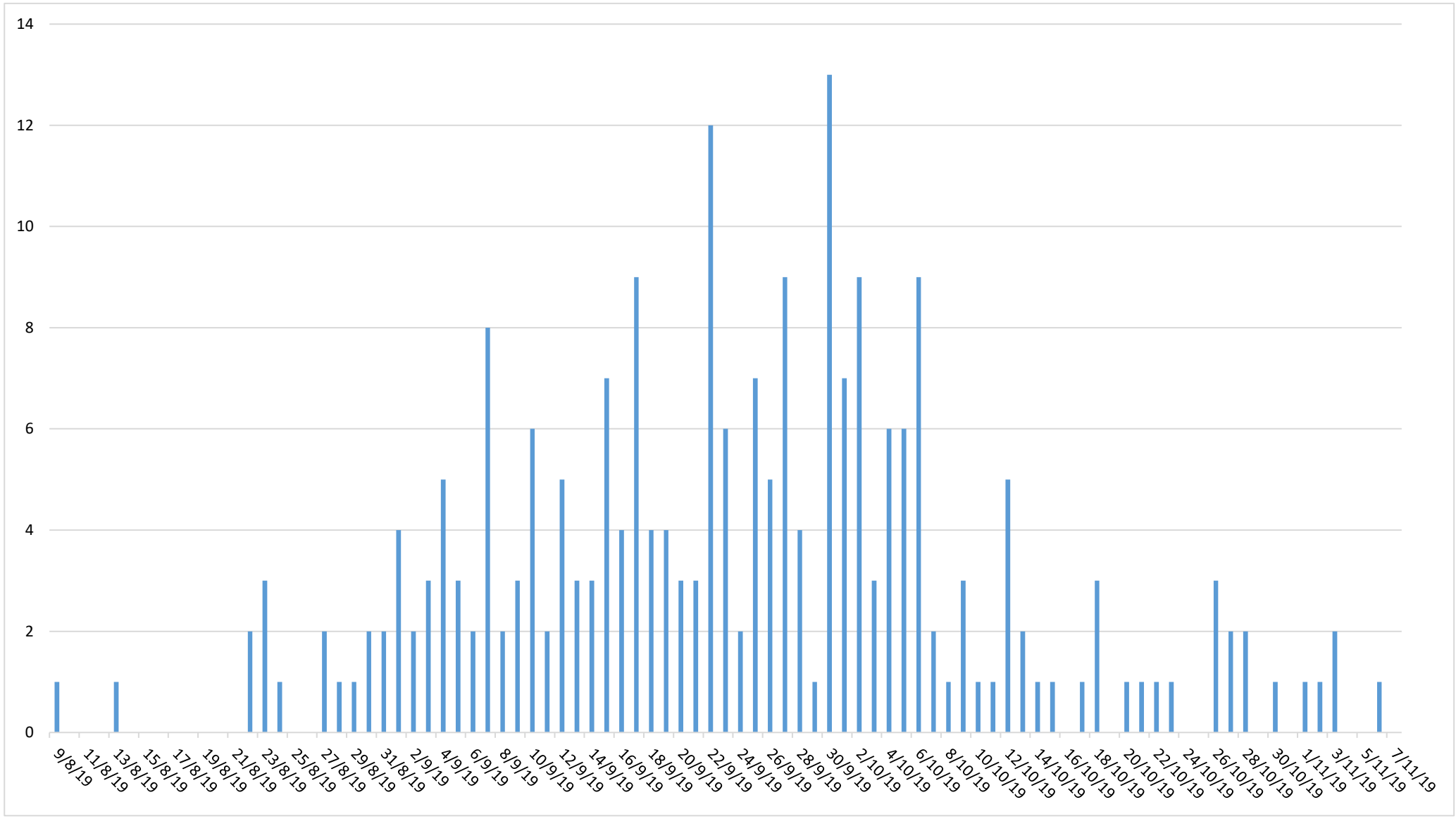


Table 1 Monthly number & percentage of seal pup births on Skomer Island 1983-2019

Year	July	August	September	October	November
2019	0	16 (6.7%)	144 (60.5%)	73 (30.7%)	5 (2.1%)
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%)

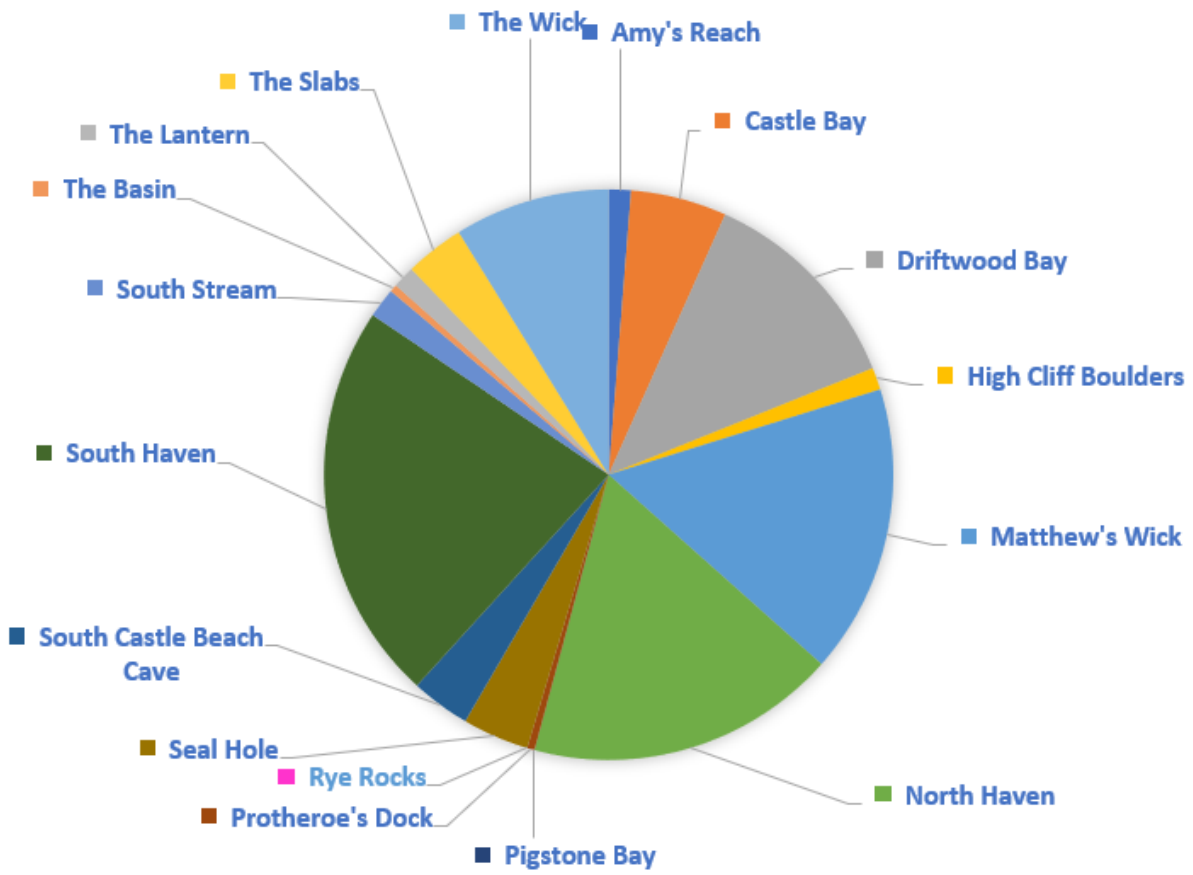
Seal observations continued to mid-December in 1983, 1985 and 1986 and to the end of January in 1984 and 1987. The following data was recorded in these survey years: 1983 Dec: 3 (4%), 1984 Dec: 6 (9%), Jan: 6 (9%). 1985 Dec: 14 (19%), 1986 Dec: 5 (5%), 1987 Dec: 15 (15%), Jan: 5 (5%). From 1989 onwards 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 2019 the busiest period was evenly spread over three weeks with 42 pups born in week 38 (17/9-23/9), 41 pups born in week 39 (24/9-30/9) and 42 pups born in week 40 (01/10-07/10). The busiest week in 2018 was week 38 with 51 pups born.

The most productive beaches were South Haven (54 pups), North Haven (42 pups), Matthew's Wick (39 pups), Driftwood Bay (29 pups) and The Wick (21 pups).

Figure 3 Percentage of seal pups born at each site on Skomer Island in 2019



4.3 Survival Rate

The fate of 231 pups (of 238 born) is known with relative certainty. 7 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)

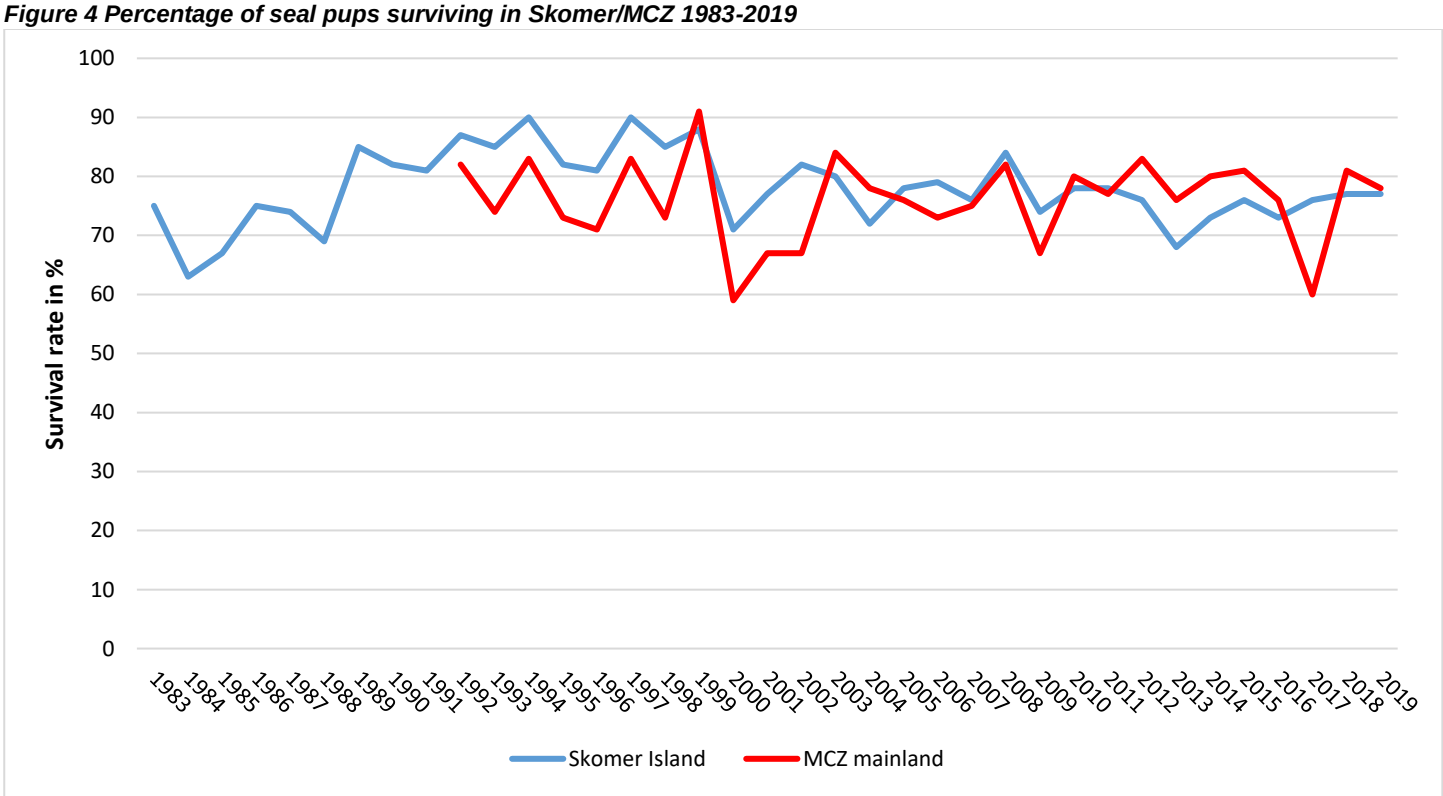
divided by the total number of pups born (where the fate is known).

178 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 132 pups are known, or assumed to have survived, giving a survival rate of 78%.

The overall survival rate for the whole of the Skomer MCZ is 77%

Figure 4 Percentage of seal pups surviving in Skomer/MCZ 1983-2019



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 2018 and 2019

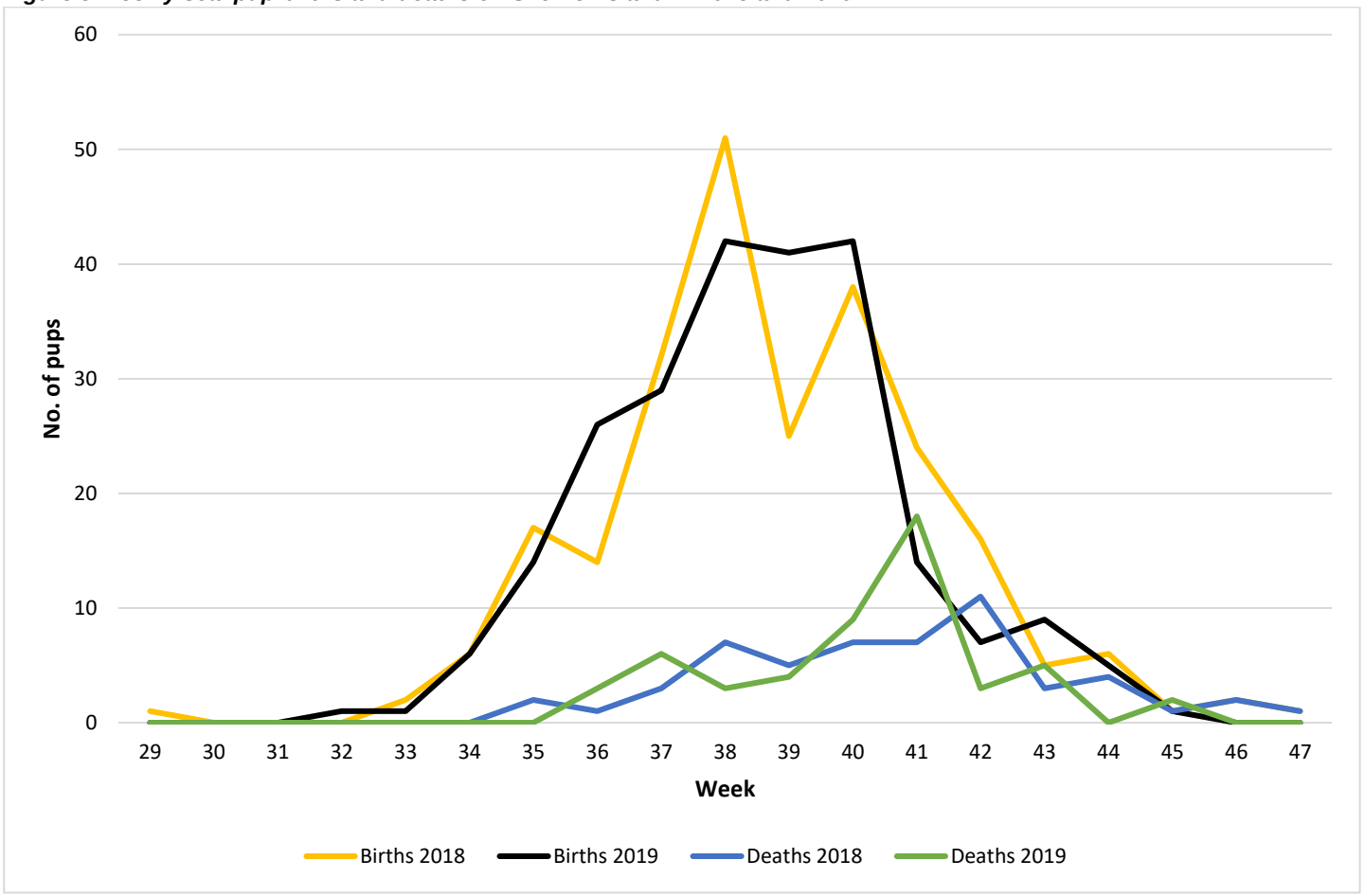


Table 2 Survival rates per site on Skomer Island 2014-2019

Site	**Total Number of pups raised per beach** (excl. pups whose fate is unknown)						**No of pups survived**						**Survival Rate %**					
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Amy's Reach	3	8	5	5	6	3	3	6	3	3	5	3	100	75	60	60	83	100
Castle Bay	30	23	16	14	22	13	17	15	9	10	17	11	57	65	56	71	77	85
Driftwood Bay	26	25	21	28	34	32	21	21	15	23	31	29	81	84	71	82	91	91
Garland Stone	26	2	0	0	0	0	n/a	1	n/a	n/a	n/a	n/a	0	50	n/a	n/a	n/a	n/a
High Cliff Boulders	0	0	0	1	1	3	0	0	0	0	1	3	0	0	n/a	n/a	100	100
Matthew's Wick	41	42	39	42	50	39	32	31	27	31	32	30	78	74	69	74	64	77
Mew Stone	0	1	0	0	0	0	n/a	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a
North Haven	24	36	25	41	39	42	19	28	19	31	32	33	79	78	76	76	82	79
Pigstone Bay	0	1	1	1	2	0	n/a	0	1	0	1	n/a	n/a	0	100	0	50	n/a
Protheroe's Dock	1	1	1	3	3	0	1	1	0	3	2	n/a	100	100	0	100	67	n/a
Seal Hole	9	9	8	7	9	8	5	5	7	3	7	6	56	56	88	43	78	75
South Castle Beach Cave	4	5	7	4	3	4	4	3	4	4	3	2	100	60	57	100	100	50
South Haven	33	40	44	40	38	52	23	34	27	6	30	36	70	85	61	15	79	69
South Stream	7	9	6	2	4	4	6	7	5	1	2	3	86	78	83	50	50	75
The Basin	4	2	1	2	1	1	4	1	0	2	1	1	100	50	0	100	100	100
The Lantern	1	1	4	3	2	2	1	1	3	1	2	1	100	100	75	33	100	50
The Slabs	6	8	4	8	3	8	2	5	2	7	2	3	33	63	50	88	67	38
The Wick	22	21	20	23	18	21	17	19	14	17	13	18	77	90	70	74	72	86

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 2019

Cause of death	No. of pups	% of deaths	% of total pups born
Abandoned/separated/starved	21	39.62	8.82
Accident/injured/killed	2	3.77	0.84
Disappeared ≤ stage 3	18	33.96	7.56
Diseased	4	7.55	1.68
Drowned	1	1.89	0.42
Stillborn	1	1.89	0.42
Unknown	5	9.43	2.10
Other*	1	1.89	0.42
Total	**53**		

* The female (16.SC-US-117.SHV) that wasn't able to feed her pup in 2016, 2017 and 2018, was not seen in 2019. However, another cow (19.SC123.MWK.12102019) with a scar that potentially prevented her pup from feeding effectively was present on Matthew's Wick, the pup didn't seem to put on weight despite being seen suckling on numerous occasions.

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 42 pups were born in North Haven in 2019, two more than in the previous year. The fate of all 42 pups is known of which 33 are assumed to have survived to the beginning of moult or were weaned, giving a survival rate of 79%, which is 3% lower than last year.

Figure 6 Number of seal pups born in North Haven 1983–2019

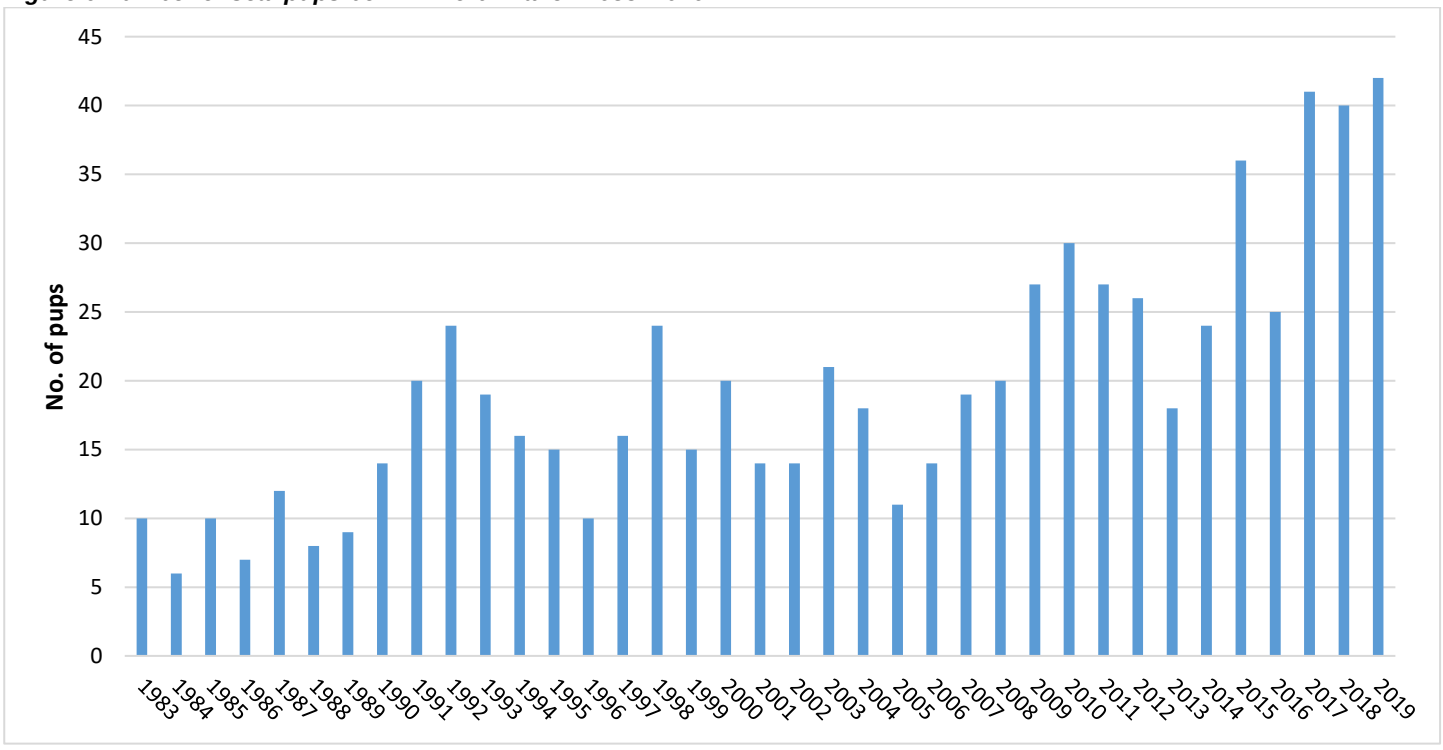


Figure 7 Weekly seal pup births in North Haven in 2019

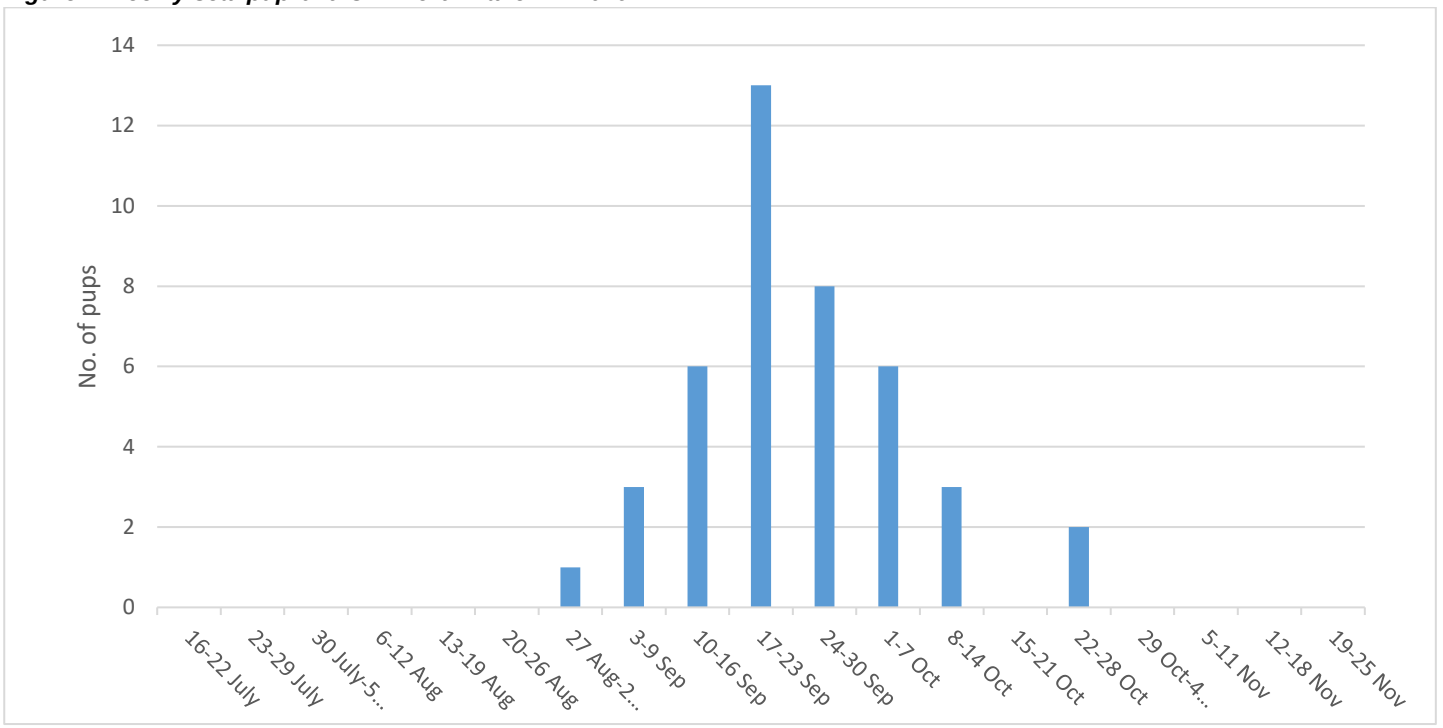


Table 4 Fate of pups in North Haven in 2019

Fate	**No. of pups**
Assumed survived	3
Survived to beginning of moult	14
Survived to weaning	16
Assumed dead	3
Dead	6
Unknown	0
Total	**42**

Table 5 Causes of seal pup deaths on North Haven beach in 2019

Cause of death	No. of pups
Abandoned/separated/starved	4
Accident/injured/killed	0
Disappeared ≤ stage 3	3
Diseased	1
Drowned	0
Stillborn	1
Unknown	0
Other	0
Total	**9**

Plate 4 Pup number 32 born on North Haven beach

This pup was last seen at 19 days old on North Haven beach on the 26th of September. and then appeared on Skokholm Island in North Haven on the 30th of September as a nearly fully weaned pup (Plate 5)

Plate 5 Pup number 32 found on Skokholm Island (North Haven) at the age of 23 days.

4.4.2 Protheroe's Dock

In 2019 one pup was born on Protheroe's Dock, in week 44. Seven site visits were conducted to Protheroe's Dock during the monitoring period. Unfortunately, due to a combination of bad weather conditions and neap tides at the wrong time, it was not possible to access Protheroe's Dock within the required time frame to obtain an accurate estimate on the fate of this pup.

Figure 8 Number of seal pups born in Protheroe's Dock 1983-2019

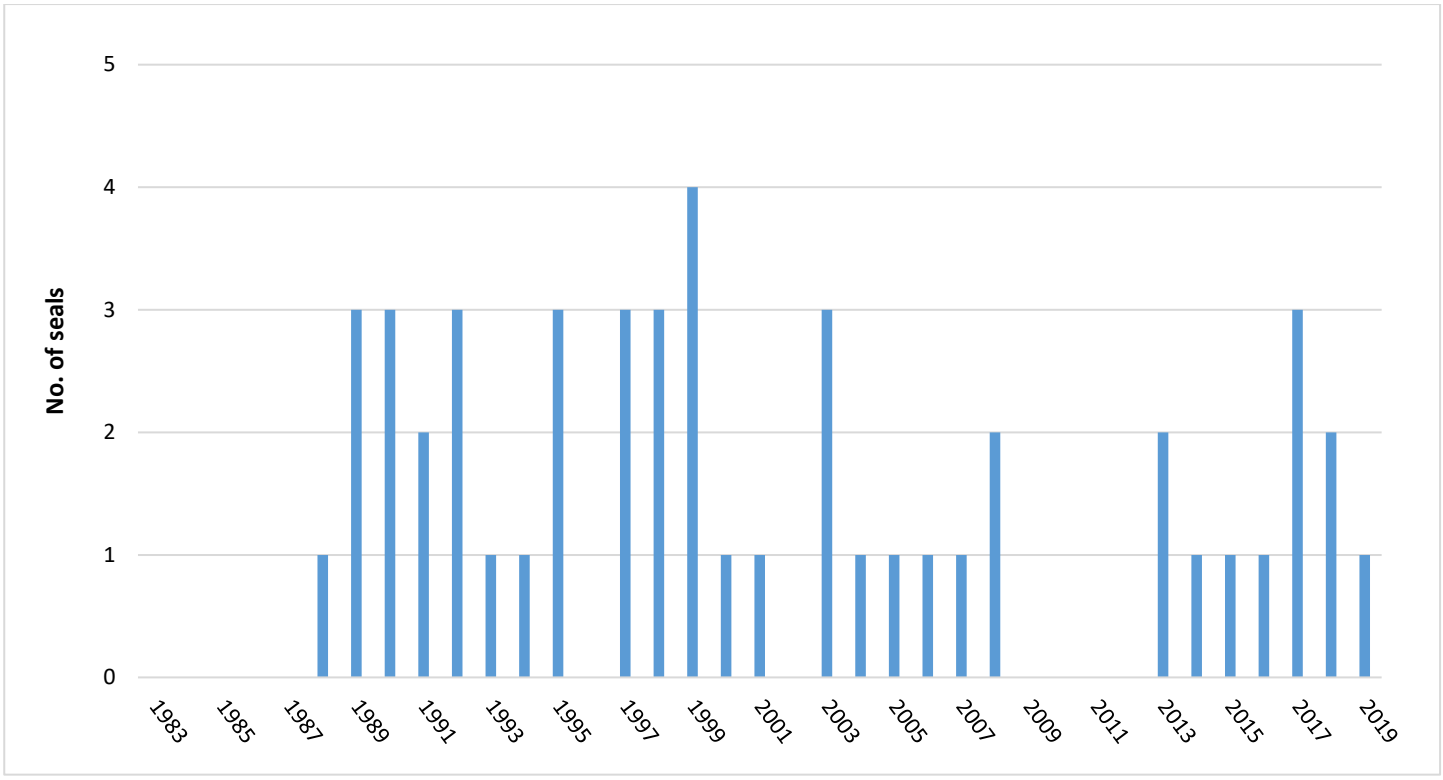


Figure 9 Weekly seal pup births on Protheroe's Dock in 2019

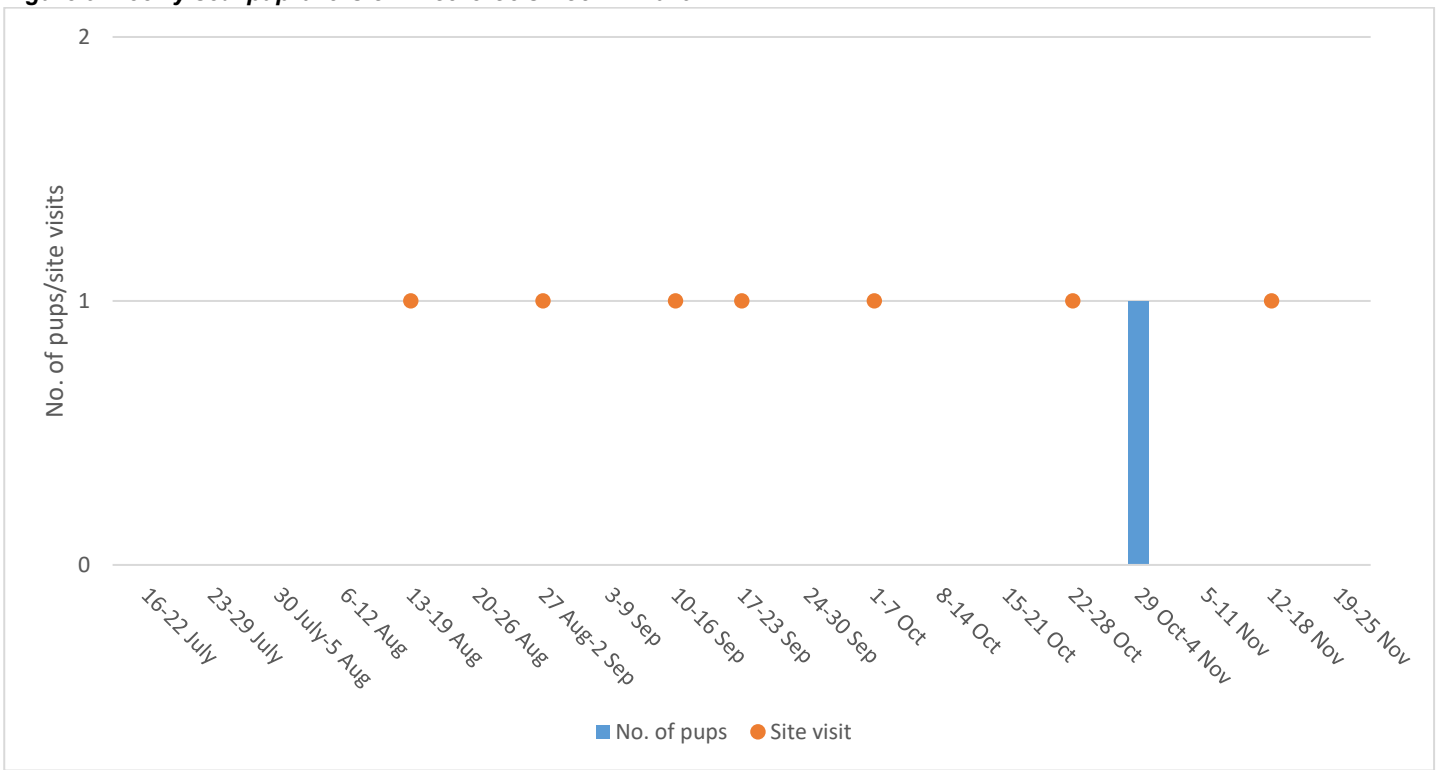


Table 6 Fate of pups on Protheroe's Dock in 2019

Fate	No. of pups
Assumed survived	0
Survived to beginning of moult	0
Survived to weaning	0
Assumed dead	0
Dead	0
Unknown	1
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 2019 the Lantern was checked six times and three pups were found. These pups were born in week 36, 37 and 40. The fate of one pup is unknown (and therefore removed from analysis), another pup is assumed to have survived and the other is known to have died, giving a survival rate of 50%.

Figure 10 Number of seal pups born in The Lantern 1983-2019

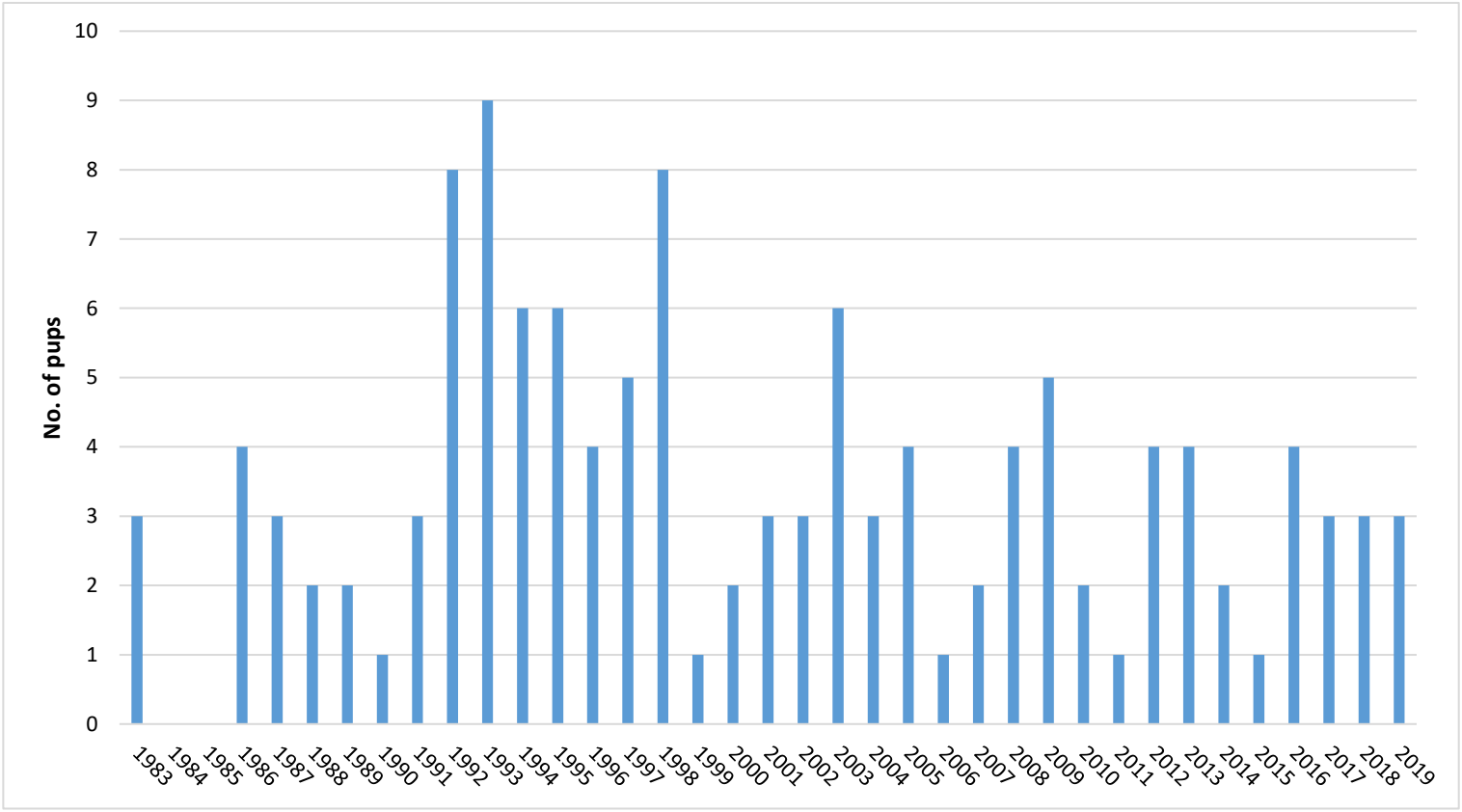


Figure 11 Weekly seal pup births in the Lantern in 2019

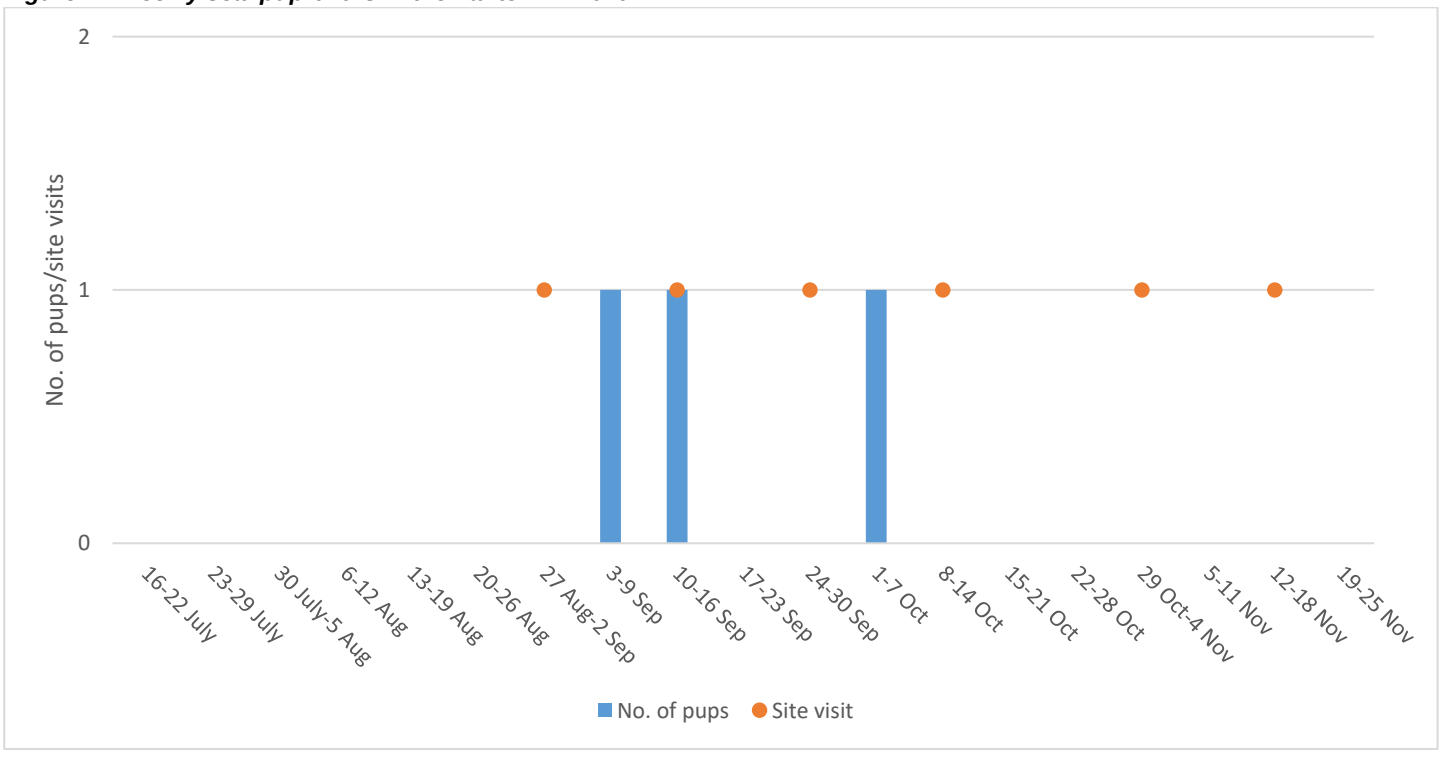


Table 7 Fate of pups in the Lantern in 2019

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

Table 8 Causes of seal pup deaths in the Lantern in 2019

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**

4.4.4 Amy's Reach

Three pups were attributed to Amy's Reach in 2019, the term "attributed" is used instead of the usual "born" because there was one pup that first appeared on Amy's Reach at approximately 14 days old and after 3 days it moved to the Slabs where it only spent 2 days to finish its moult. The two other pups first seen on Amy's Reach were more typical in that they confidently assumed to have been born on Amy's Reach, one stayed on Amy's Reach until it weaned and the other's fate was unknown. This results in a survival rate of 100%.

Figure 12 Number of seal pups born in Amy's Reach 1983–2019

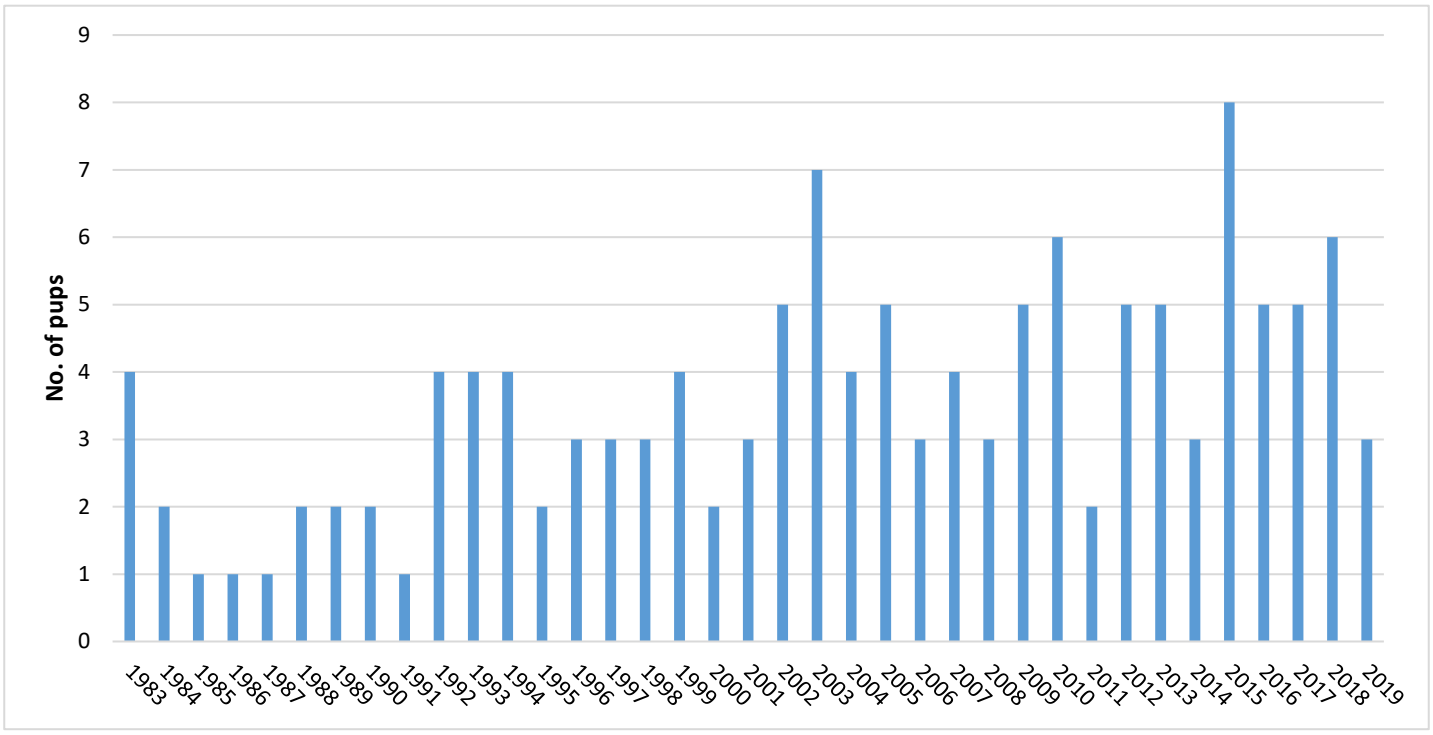


Figure 13 Weekly seal pup births in Amy's Reach 2019

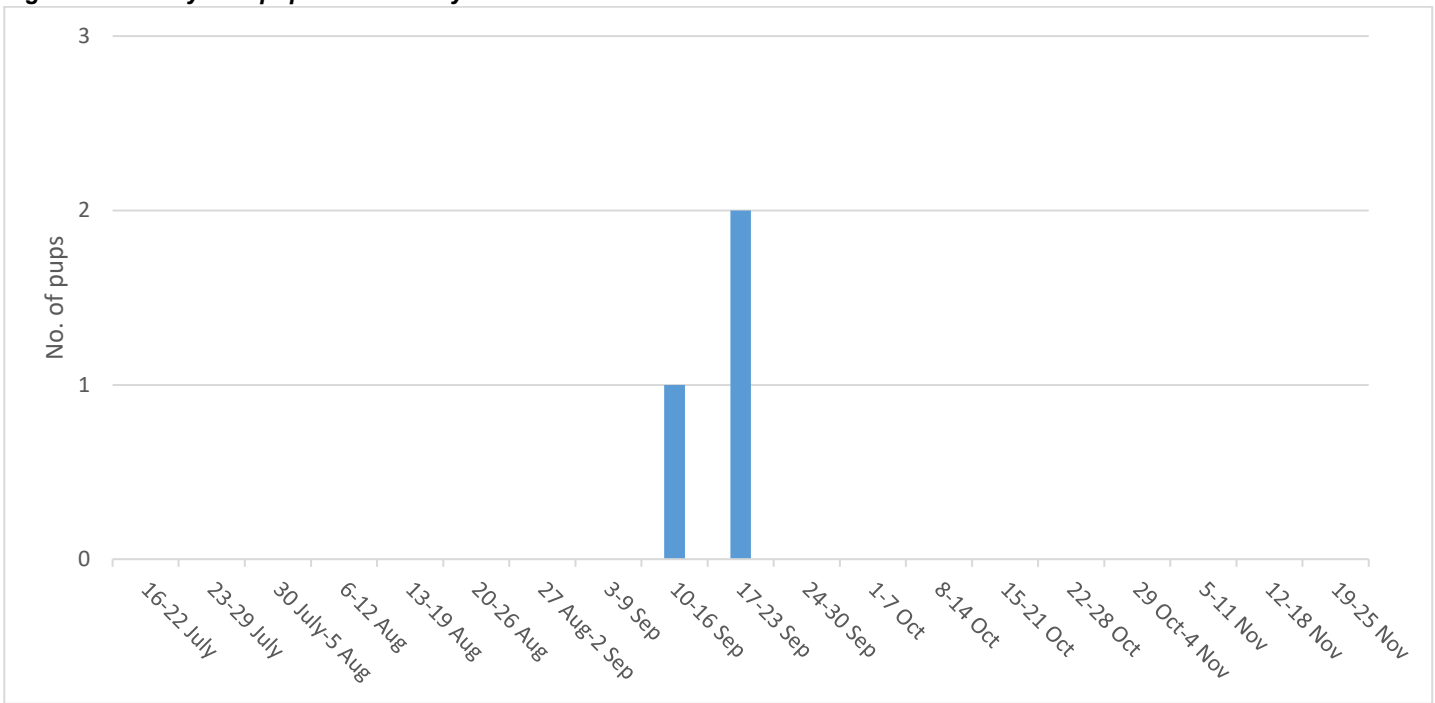


Table 9 Fate of pups in Amy's Reach in 2019

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

4.4.5 Matthew's Wick

In 2019 39 pups were born on Matthew's Wick which is 12 less than in 2018. 30 pups are assumed to have survived, survived to the beginning of moult or survived and were weaned. This gives a survival rate of 77% which is 13% more than last year.

Figure 14 Number of seal pups born in Matthew's Wick 1983–2019

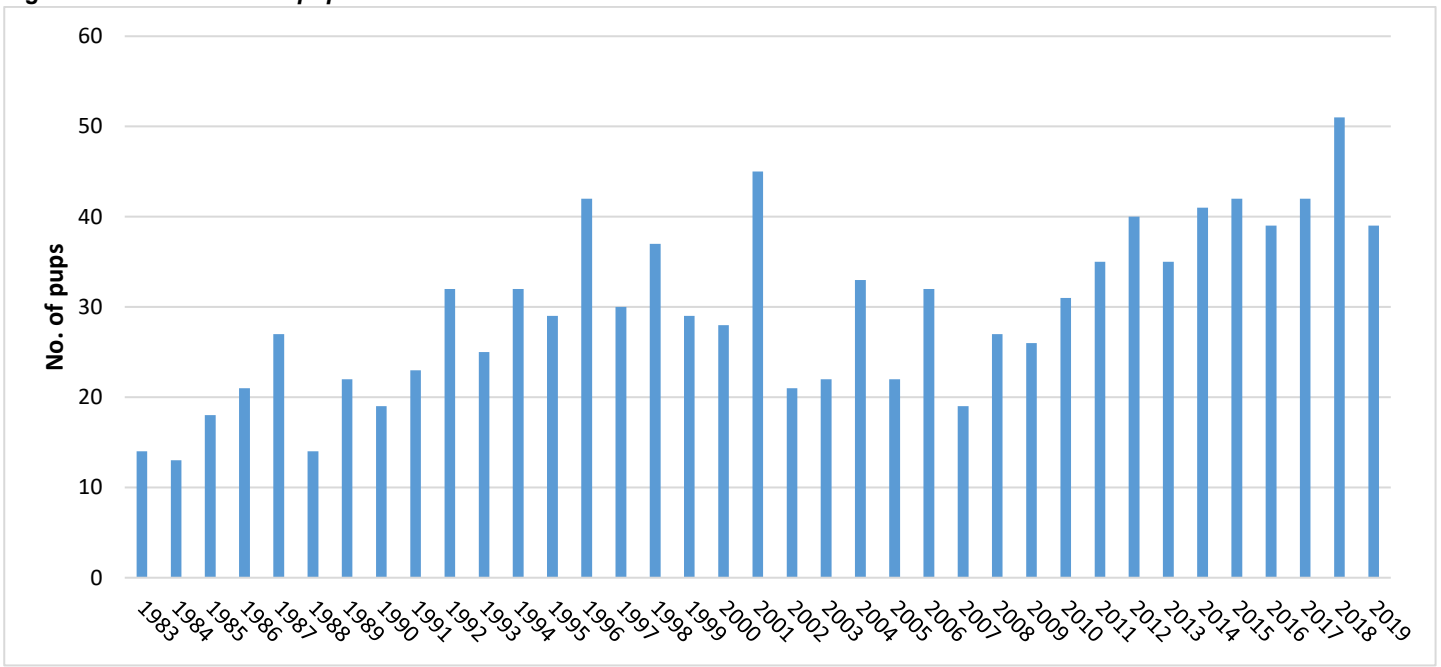


Figure 15 Weekly seal pup births in Matthew's Wick in 2019

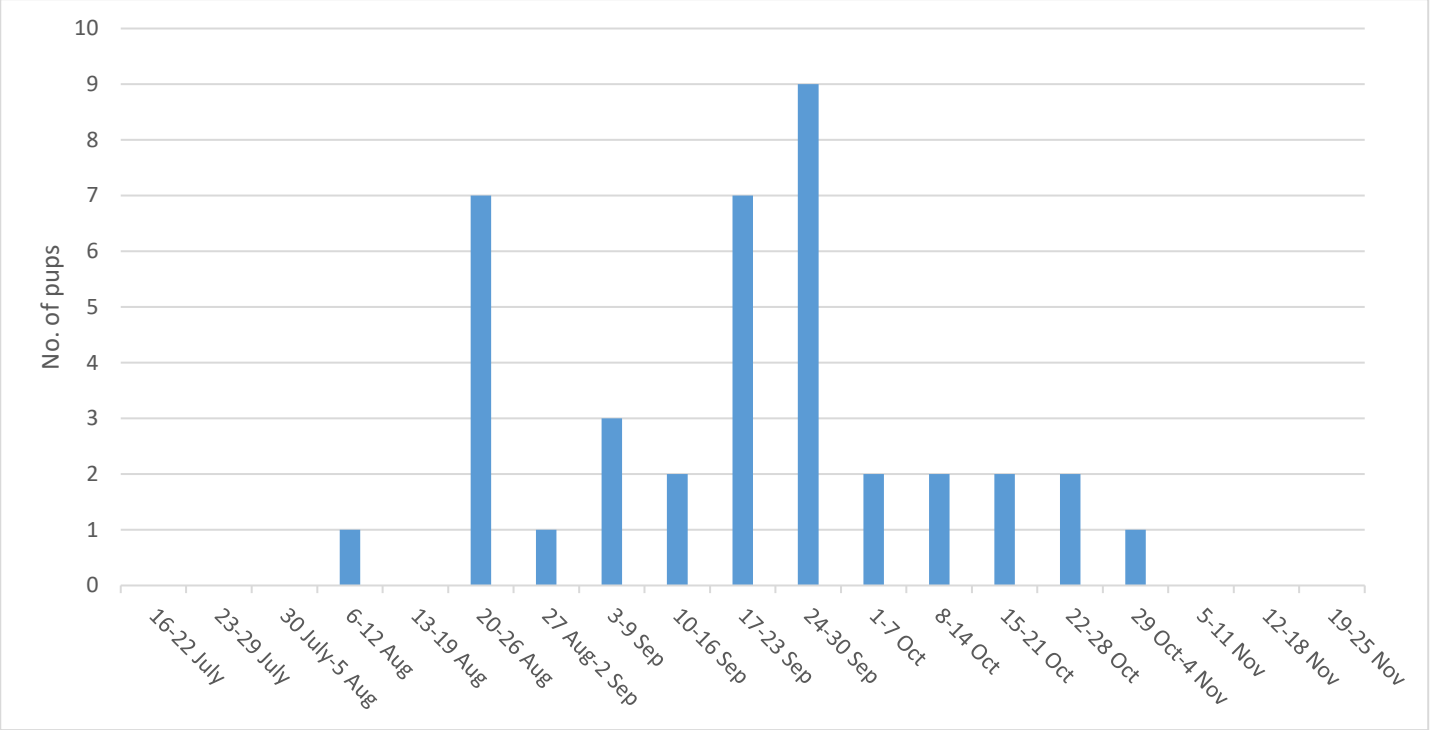


Table 10 Fate of pups on Matthew's Wick in 2019

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	10
Survived to weaning	20
Assumed dead	1
Dead	8
Unknown	0
Total	**39**

Table 11 Causes of seal pup deaths on Matthew's Wick in 2019

Cause of death	No. of pups
Abandoned/separated/starved	6
Accident/injured/killed	1
Disappeared ≤ stage 3	1
Diseased	1
Drowned	0
Stillborn	0
Unknown	0
Other	0
Total	**9**

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. 13 pups were born in Castle Bay in 2019. 11 pups are assumed to have survived, survived to the beginning of moult or survived and were weaned, giving a survival rate of 85% which is 8 percent higher than last year. This 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 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 1983-2019

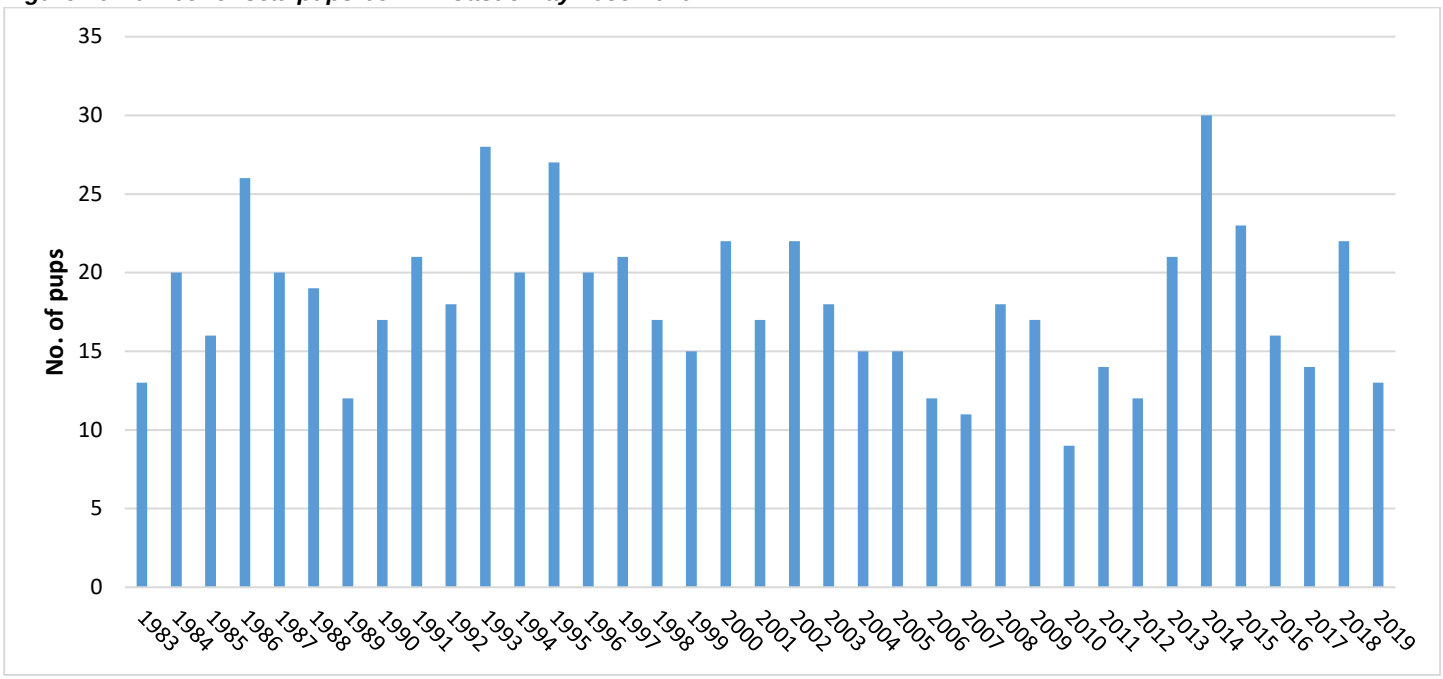


Figure 17 Weekly seal pup births in Castle Bay in 2019

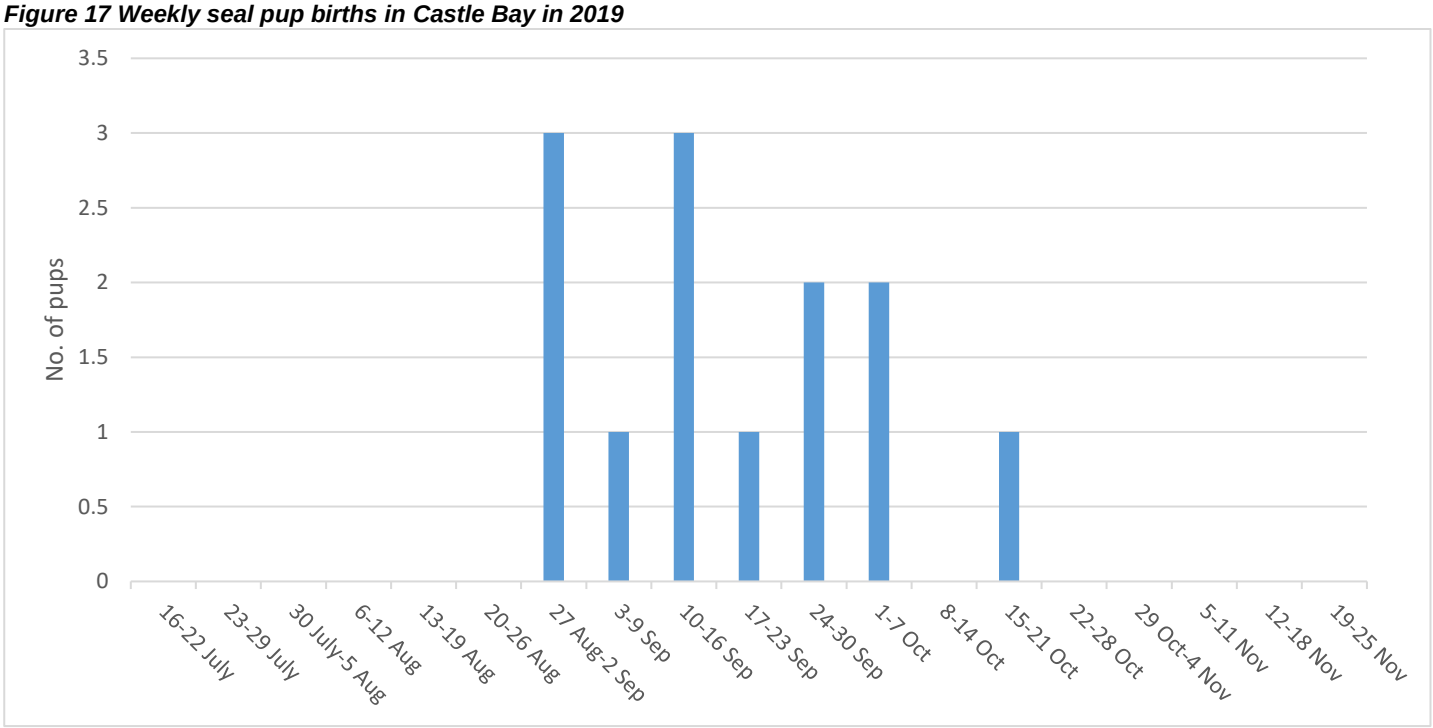


Table 12 Fate of pups on Castle Bay in 2019

Fate	No. of pups
Assumed survived	2
Survived to beginning of moult	3
Survived to weaning	6
Assumed dead	0
Dead	2
Unknown	0
Total	**13**

Table 13 Causes of seal pup deaths on Castle Bay in 2019

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

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.

Eight pups were born in South Castle Beach Cave in 2019 and two pups survived to beginning of moult or survived, four pups' fate are unknown (and therefore are removed from analysis) and two pups are known to have died, giving a survival rate of 50%.

Five 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 1990-2019

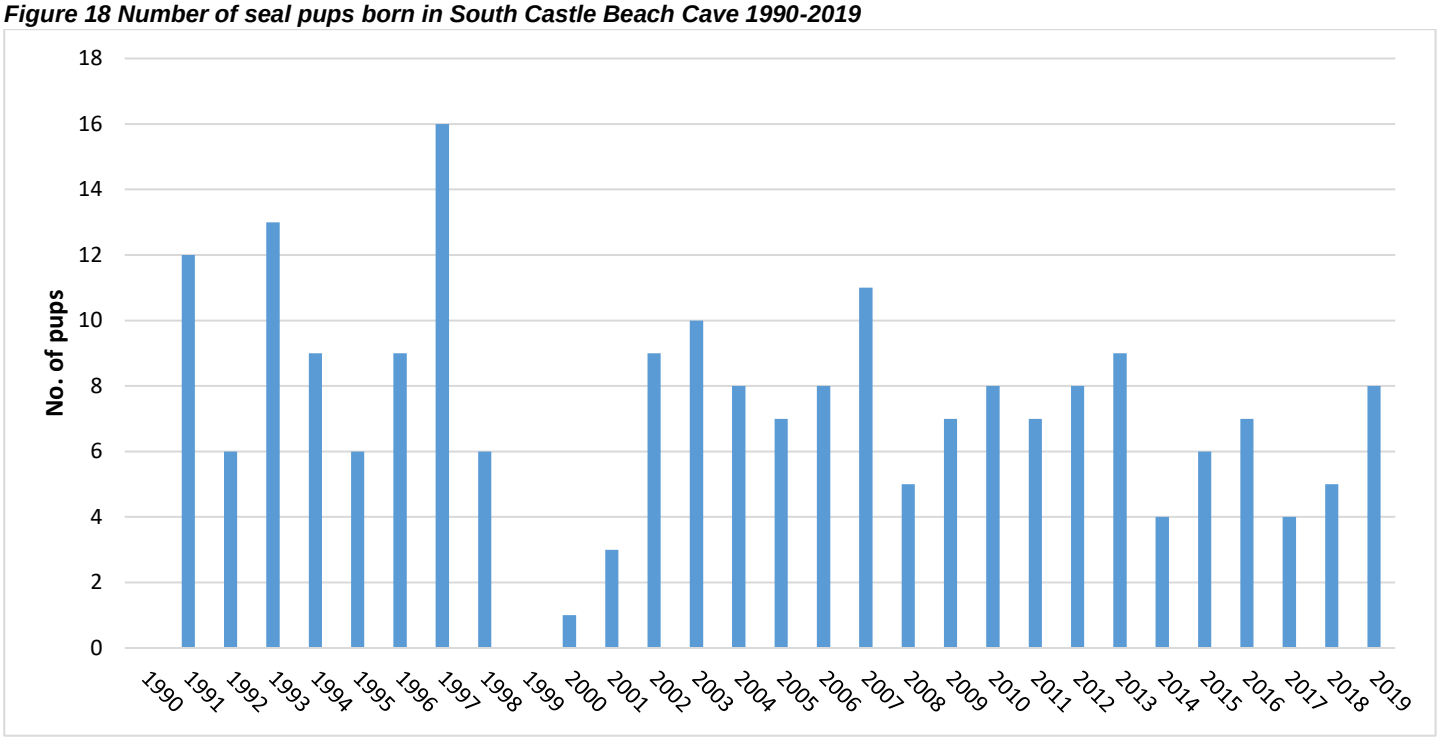


Figure 19 Weekly seal pup births in South Castle Beach Cave in 2019

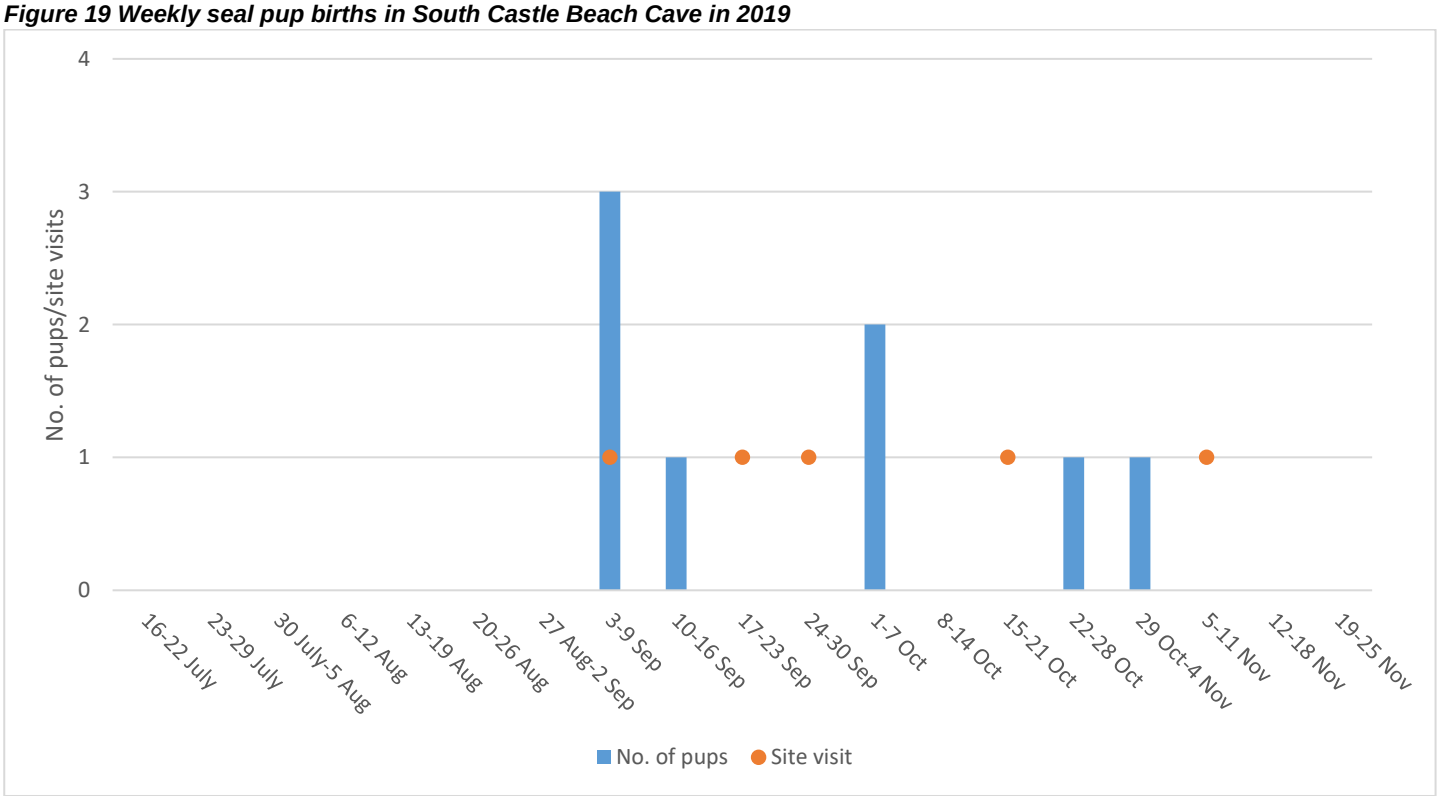


Table 14 Fate of pups in South Castle Beach Cave in 2019

Fate	No. of pups
Assumed survived	0
Survived to beginning of moult	2
Survived to weaning	0
Assumed dead	0
Dead	2
Unknown	4
Total	**8**

4.4.8 Seal Hole

Nine pups were born in Seal Hole in 2019, one pup moved from Seal Hole to Driftwood Bay at 7 days old and therefore is attributed to Driftwood Bay as it spent the majority of its time as an unweaned pup there. Another pup surprisingly moved to North Haven Slip Beach, presumably travelling around the Neck, it did so at 14 days old and is therefore still attributed to Seal Hole, this pup had begun moulting and was assumed to have survived. Therefore, eight pups are attributed to Seal Hole and of these six pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 75% which is comparable to last year's survival rate of 78%.

In 2019 six site visits were made to Seal Hole.

Figure 20 Number of seal pups born in Seal Hole 1983-2019

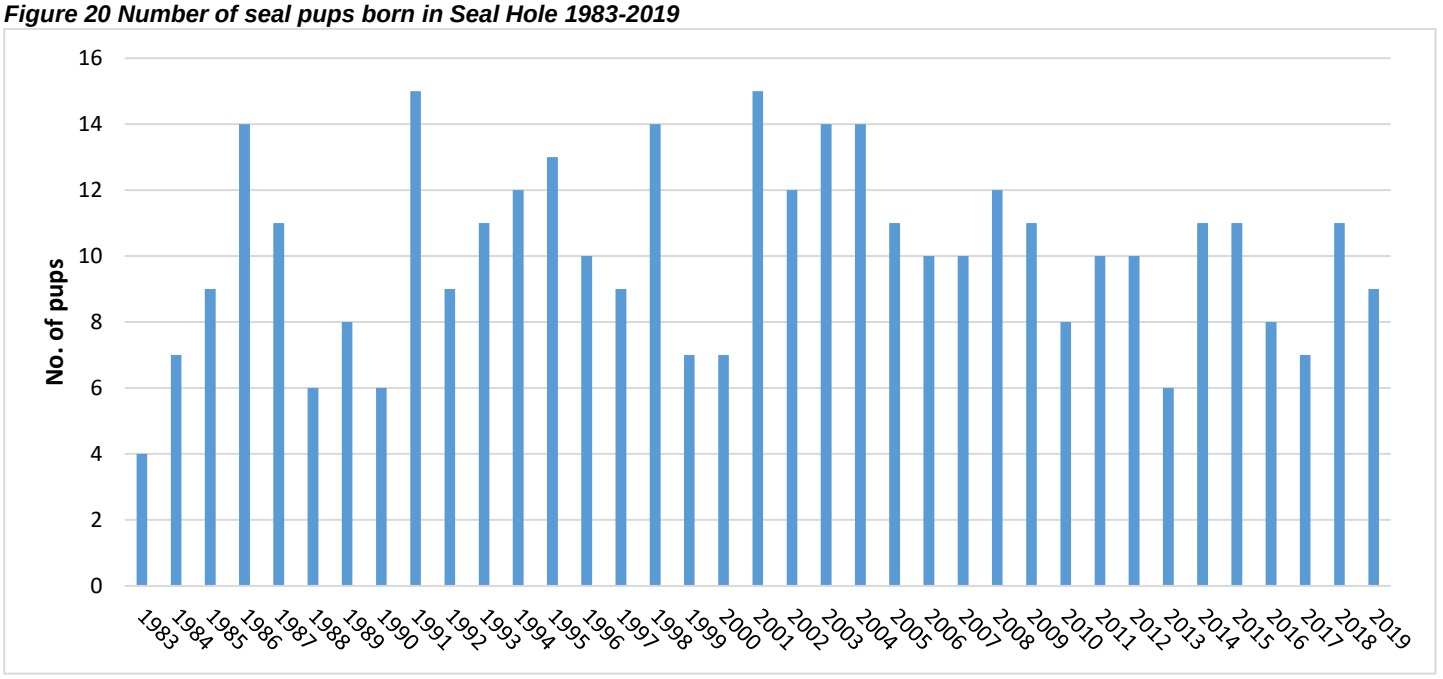


Figure 21 Weekly seal pup births in Seal Hole in 2019

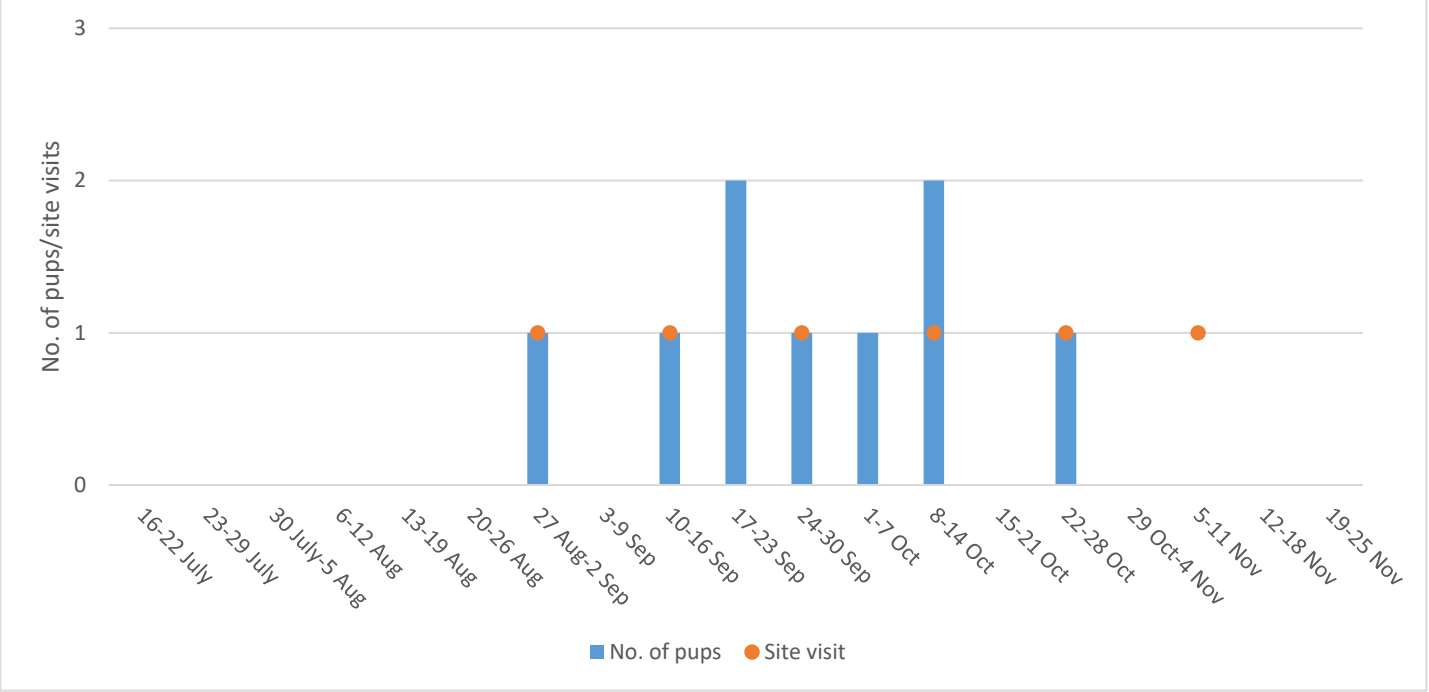


Table 15 Fate of pups in Seal Hole in 2019

Fate	**No. of pups**
Assumed survived	1
Survived to beginning of moult	3
Survived to weaning	2
Assumed dead	1
Dead	1
Unknown	0
Total	**8**

Table 16 Causes of seal pup deaths in Seal Hole in 2019

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	1
Other	0
Total	**2**

4.4.9 The Slabs

Eight pups were born on The Slabs in 2019 of which three are assumed to have survived/ survived to beginning of moult, giving a survival rate of 38%, which is considerably lower than last year's 67%, but does accurately represent the challenges of pupping on a rocky slab that is often submerged by high tides.

Figure 22 Number of seal pups born on The Slabs 1983-2019

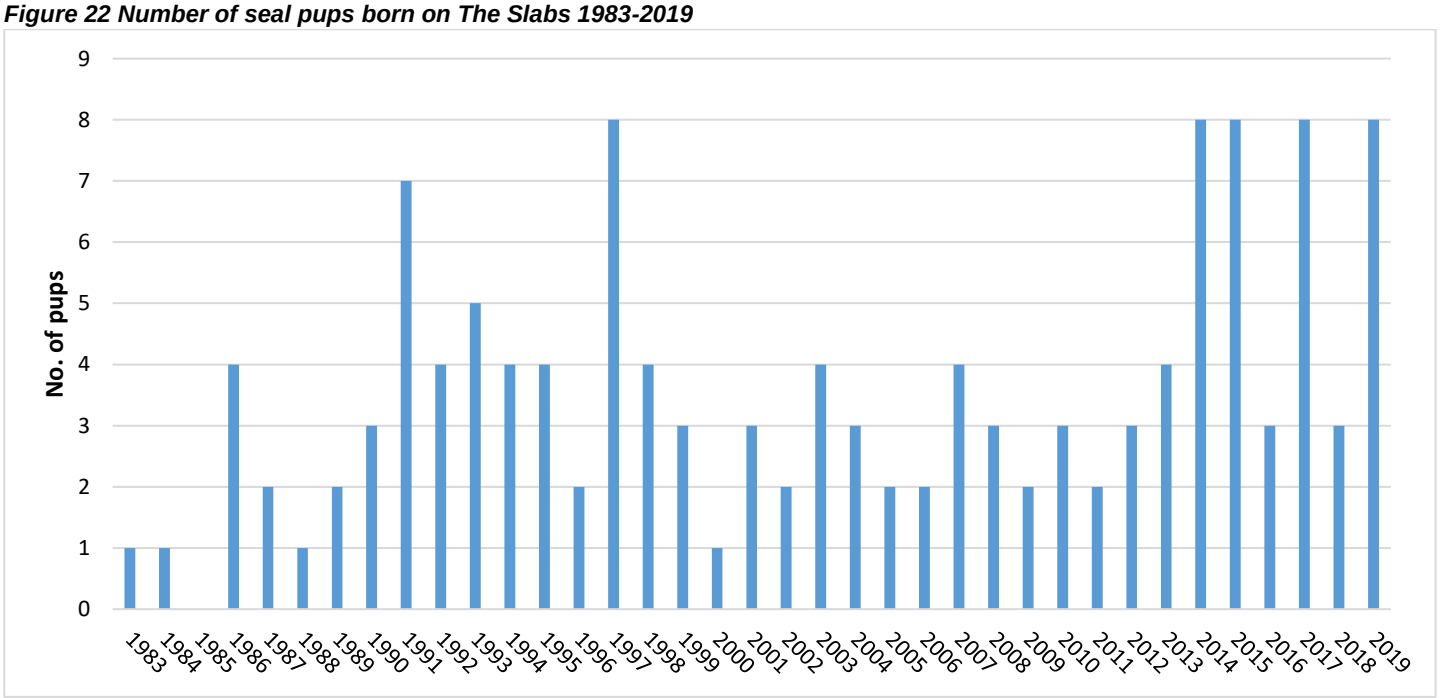


Figure 23 Weekly seal pup births on The Slabs in 2019

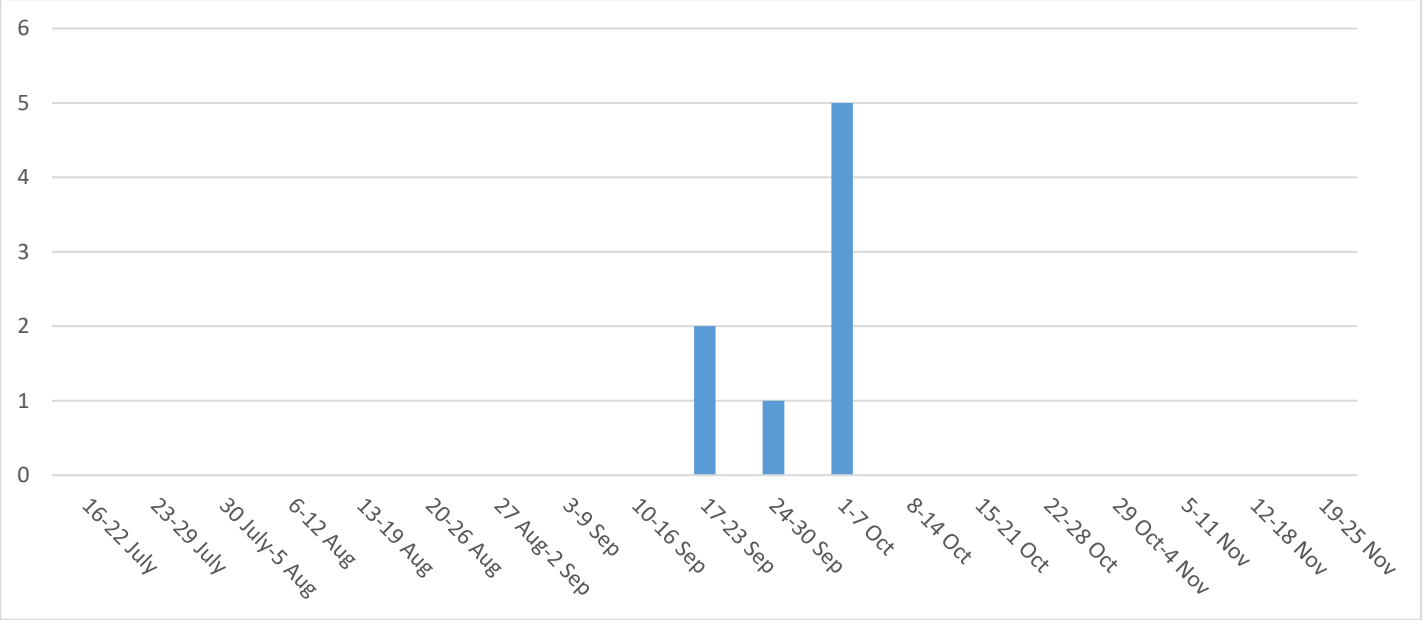


Table 17 Fate of pups on The Slabs in 2019

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	1
Survived to weaning	2
Assumed dead	3
Dead	2
Unknown	0
Total	**8**

Table 18 Causes of seal pup deaths on The Slabs in 2019

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**

4.4.10 Driftwood Bay

29 pups were born in Driftwood Bay in 2019, which is the most on record. Additionally, one pup moved from Seal Hole and two moved from South Haven and spent the majority of their time prior to weaning on Driftwood and therefore are attributed to Driftwood Bay. Two of the pups born on Driftwood Bay moved to other sites, one to the Slabs and one to South Haven, but both did so after already spending 21 and 17 days respectively on Driftwood Bay. This results in 32 pups spending the majority of their time prior to weaning on Driftwood Bay, 29 of these pups are assumed to have survived, survived to beginning of moult or survived and were weaned, giving a survival rate of 91%, which is one percent less than the previous year and 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 1983-2019

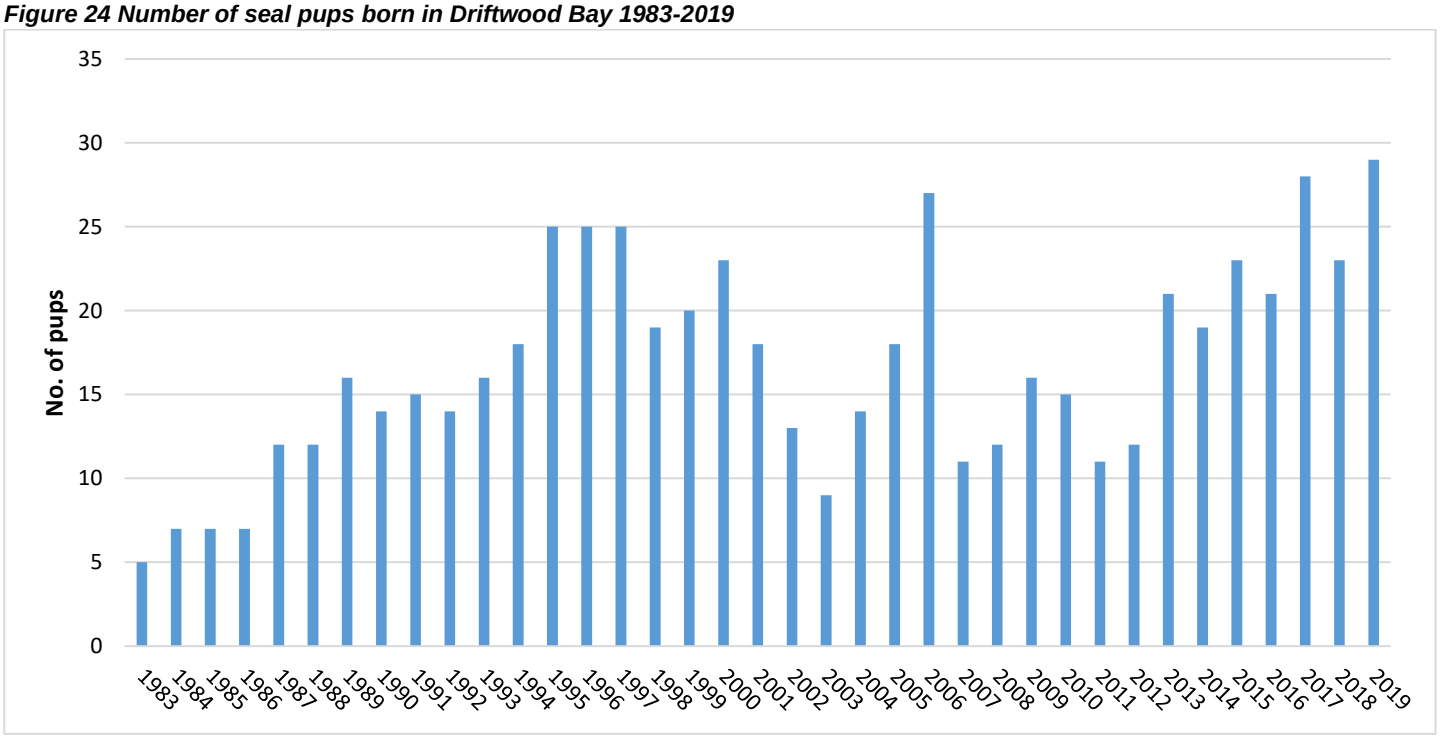


Figure 25 Weekly seal pup births in Driftwood Bay in 2019

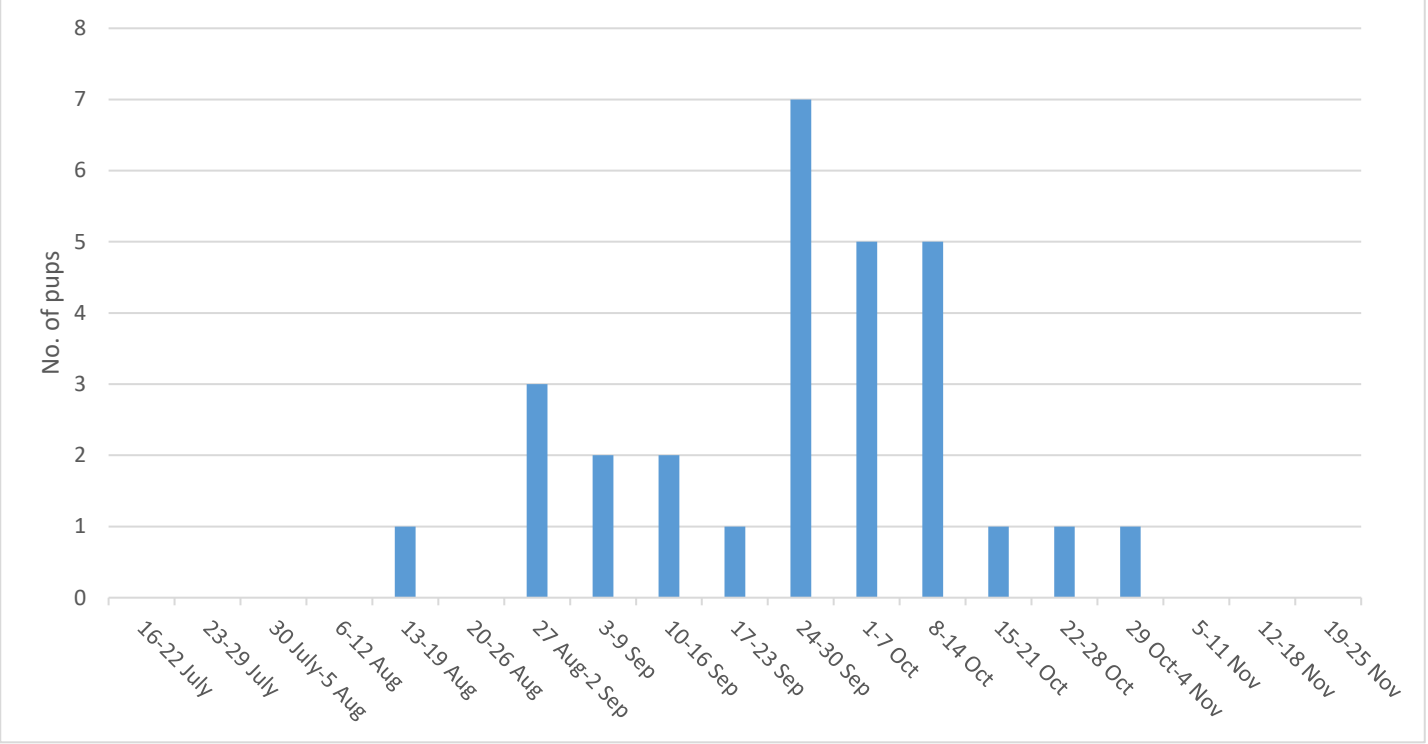


Table 19 Fate of pups on Driftwood Bay in 2019

Fate	**No. of pups**
Assumed survived	3
Survived to beginning of moult	12
Survived to weaning	14
Assumed dead	1
Dead	2
Unknown	0
Total	**32**

Table 20 Causes of seal pup deaths on Driftwood Bay in 2019

Cause of death	**No. of pups**
Abandoned/separated/starved	1
Accident/injured/killed	0
Disappeared ≤ stage 3	1
Diseased	1
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 2019 a record number of 54 pups were born in South Haven. Two pups moved from South Haven to Driftwood Bay and spent most of their time before weaning there. Of the 52 pups which were raised on South Haven beach 36 are assumed to have survived, survived to the beginning of moult or survived and were weaned, giving a survival rate of 69%, which is less than the previous year's 79%.

Figure 26 Number of seal pups born in South Haven 1983-2019

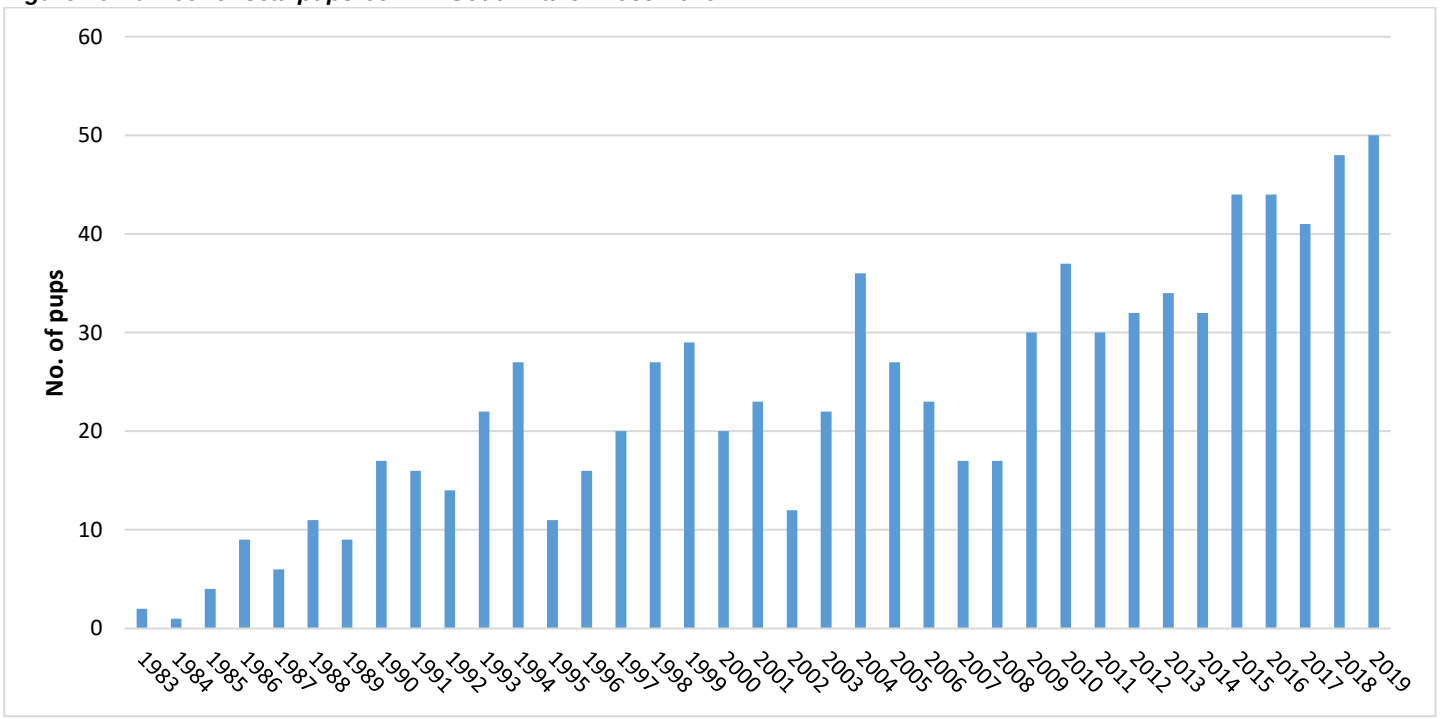


Figure 27 Weekly seal pup births in South Haven in 2019

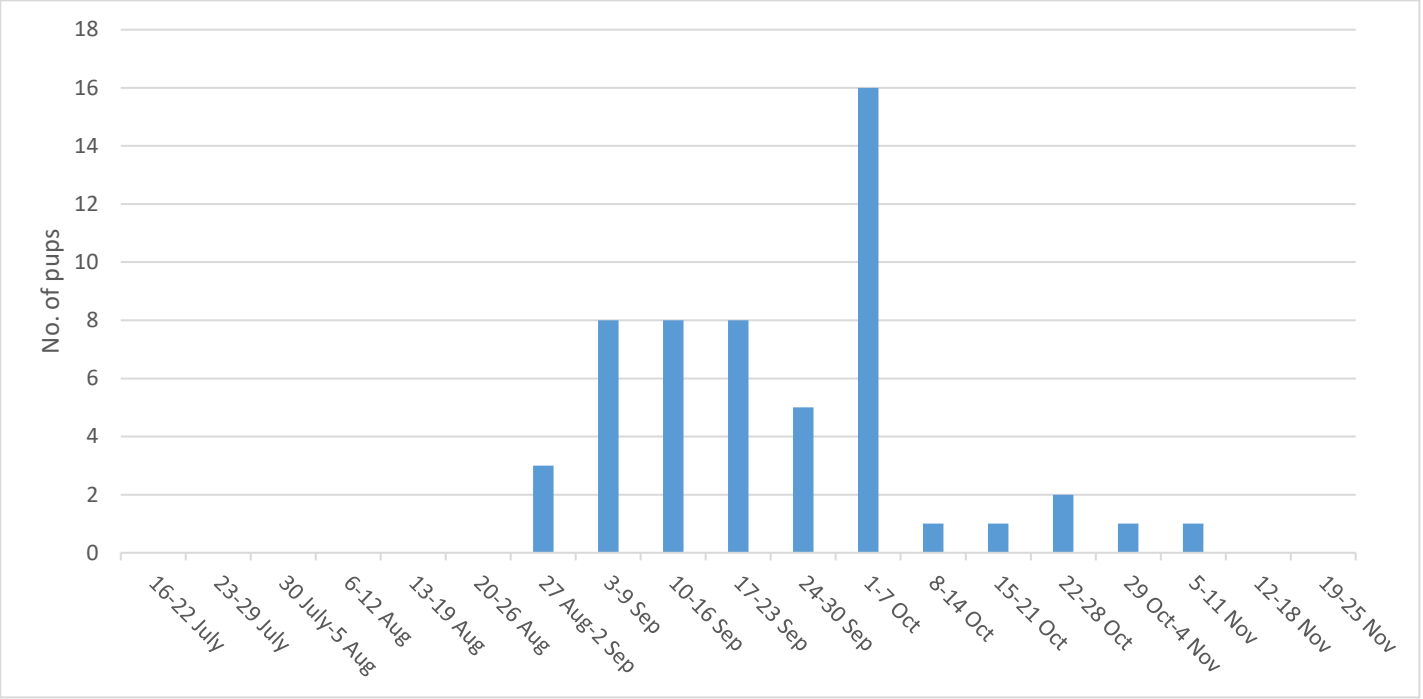


Table 21 Fate of pups in South Haven in 2019

Fate	**No. of pups**
Assumed survived	2
Survived to beginning of moult	13
Survived to weaning	21
Assumed dead	5
Dead	11
Unknown	0
Total	**52**

Table 22 Causes of seal pup deaths in South Haven in 2019

Cause of death	**No. of pups**
Abandoned/separated/starved	9
Accident/injured/killed	0
Disappeared ≤ stage 3	6
Diseased	1
Drowned	0
Stillborn	0
Unknown	0
Other	0
Total	**16**

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 it was discovered that pups can easily be missed when inspecting from such a distance. In 2019 the site was checked from South Stream outfall every two to three days and, as activity was low, no full site visits were necessary.

Four pups were born at South Stream in 2019, of which three were assumed to have survived, survived to the beginning of moult or survived and were weaned, giving a survival rate of 75%.

Figure 28 Number of seal pups born in South Stream 1983-2019

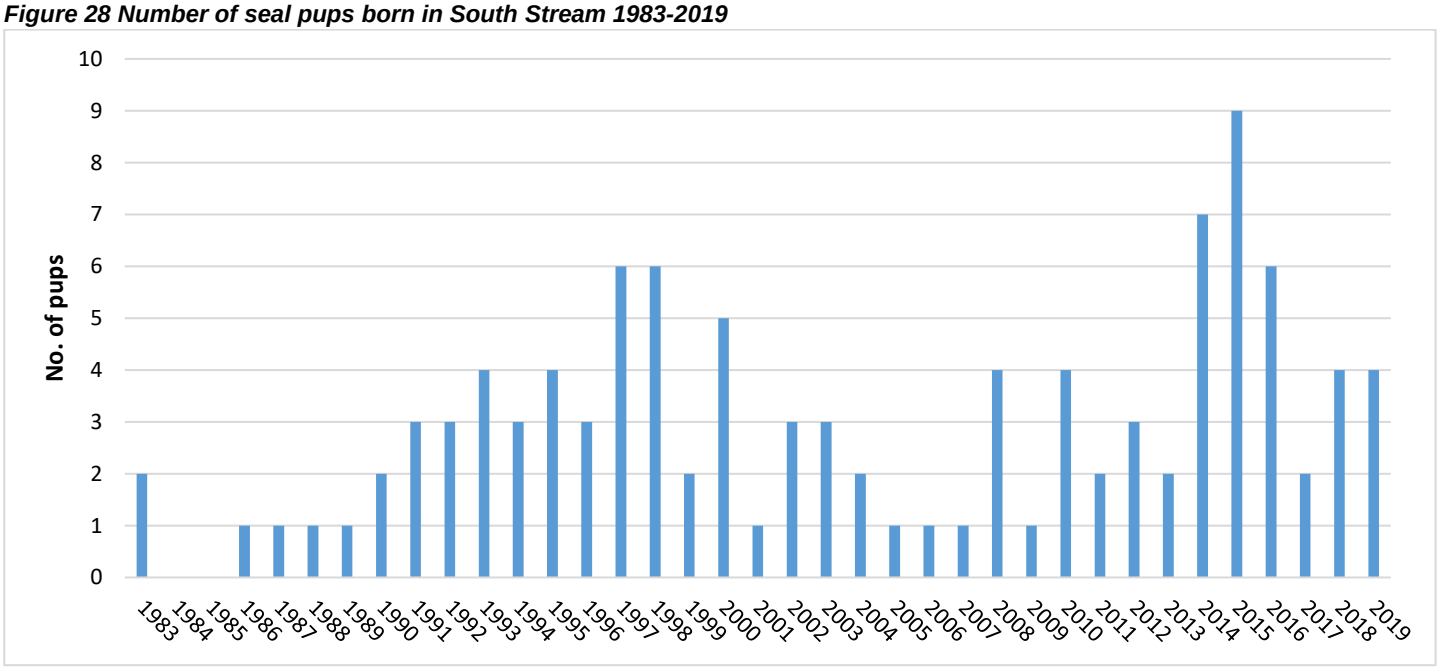


Figure 29 Weekly seal pup births in South Stream in 2019

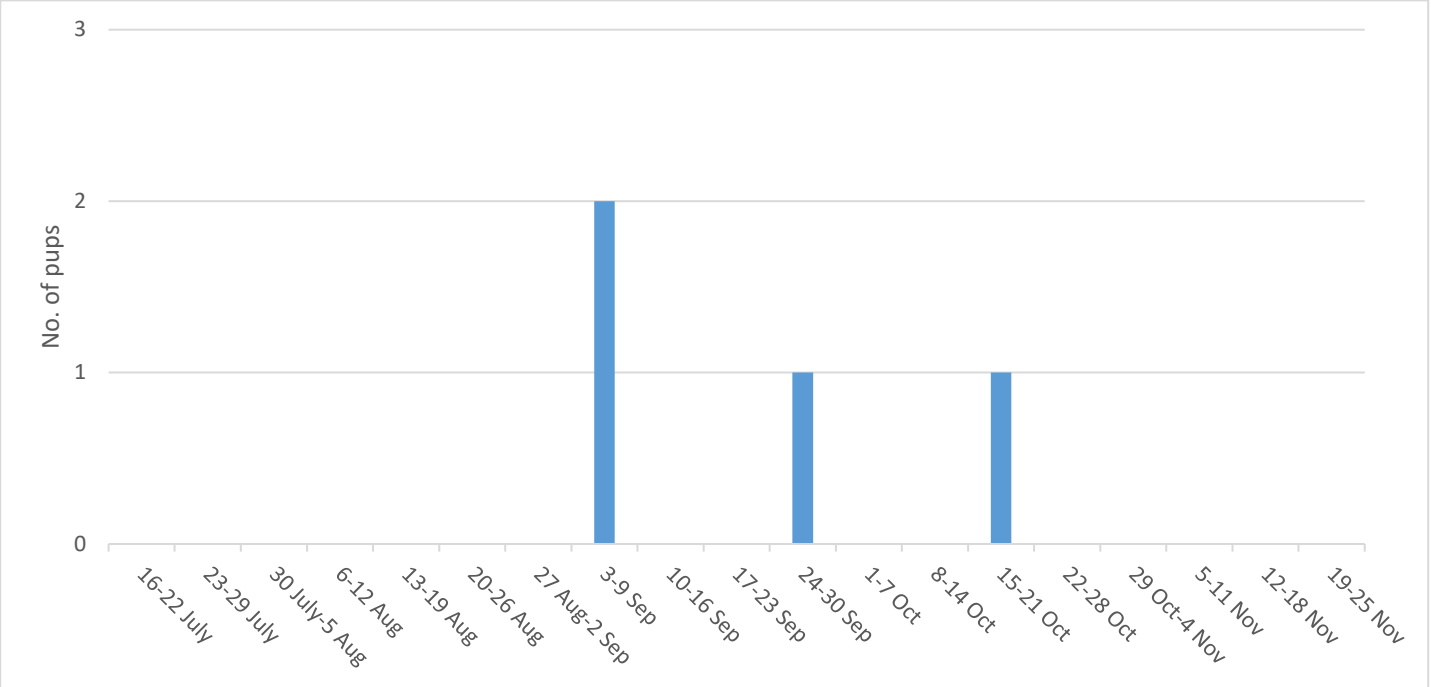


Table 23 Fate of pups in South Stream in 2019

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	1
Survived to weaning	2
Assumed dead	1
Dead	0
Unknown	0
Total	**4**

Table 24 Causes of seal pup deaths in South Stream in 2019

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**

4.4.13 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 three pups were found. All three were assumed to have survived, survived to the beginning of moult or survived and were weaned, giving a survival rate of 100%.

Figure 30 Number of seal pups born at High Cliff Boulders 1983-2019

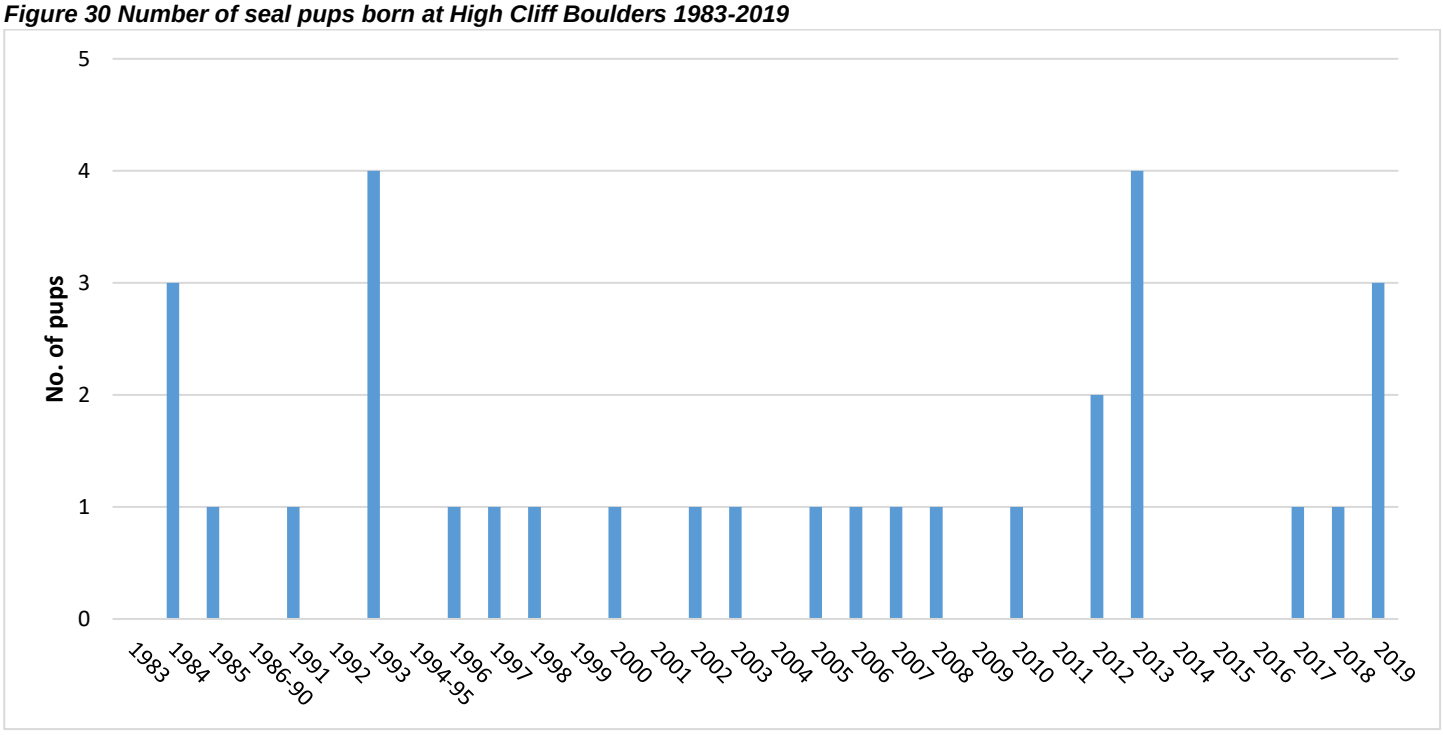
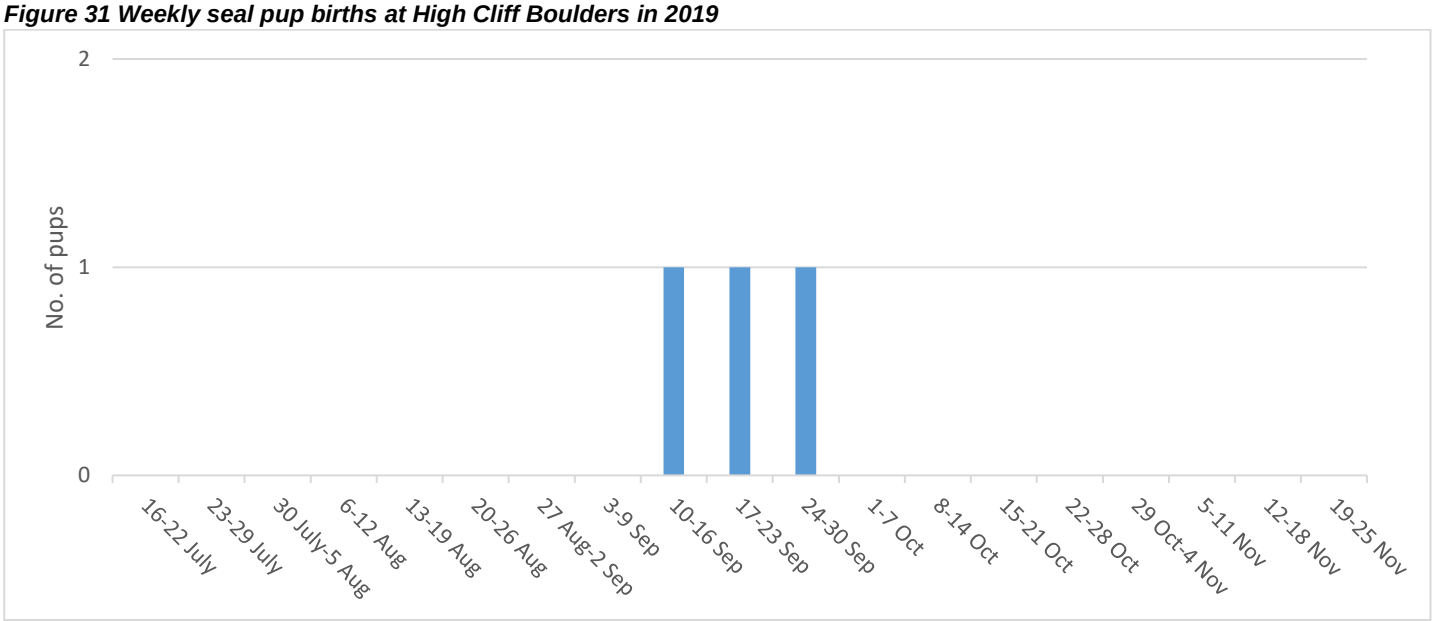


Figure 31 Weekly seal pup births at High Cliff Boulders in 2019



4.4.14 The Wick

21 seal pups were born on The Wick in 2019.

18 pups are assumed to have survived, survived to the beginning of moult or survived and were weaned, giving a survival rate of 86%.

Figure 32 Number of seal pups born in The Wick 1983-2019

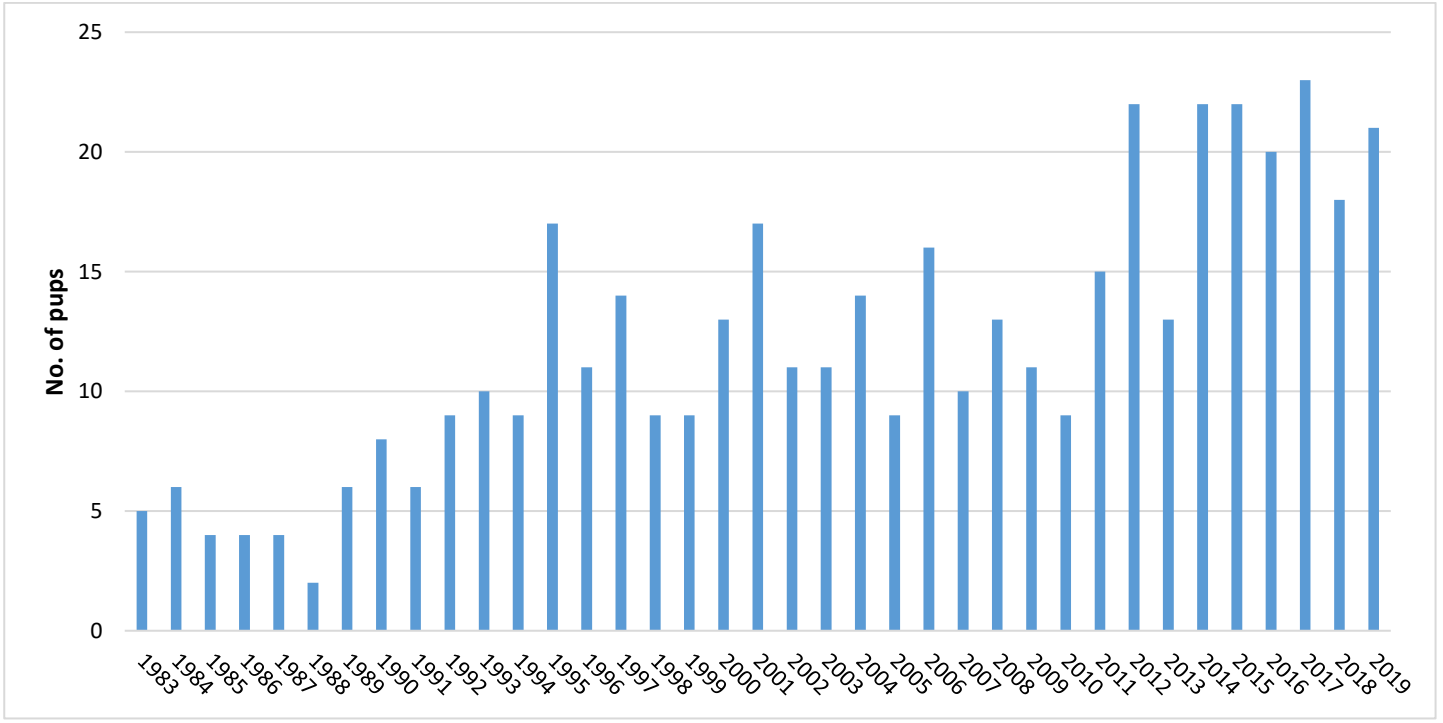


Figure 33 Weekly seal pup births in The Wick in 2019

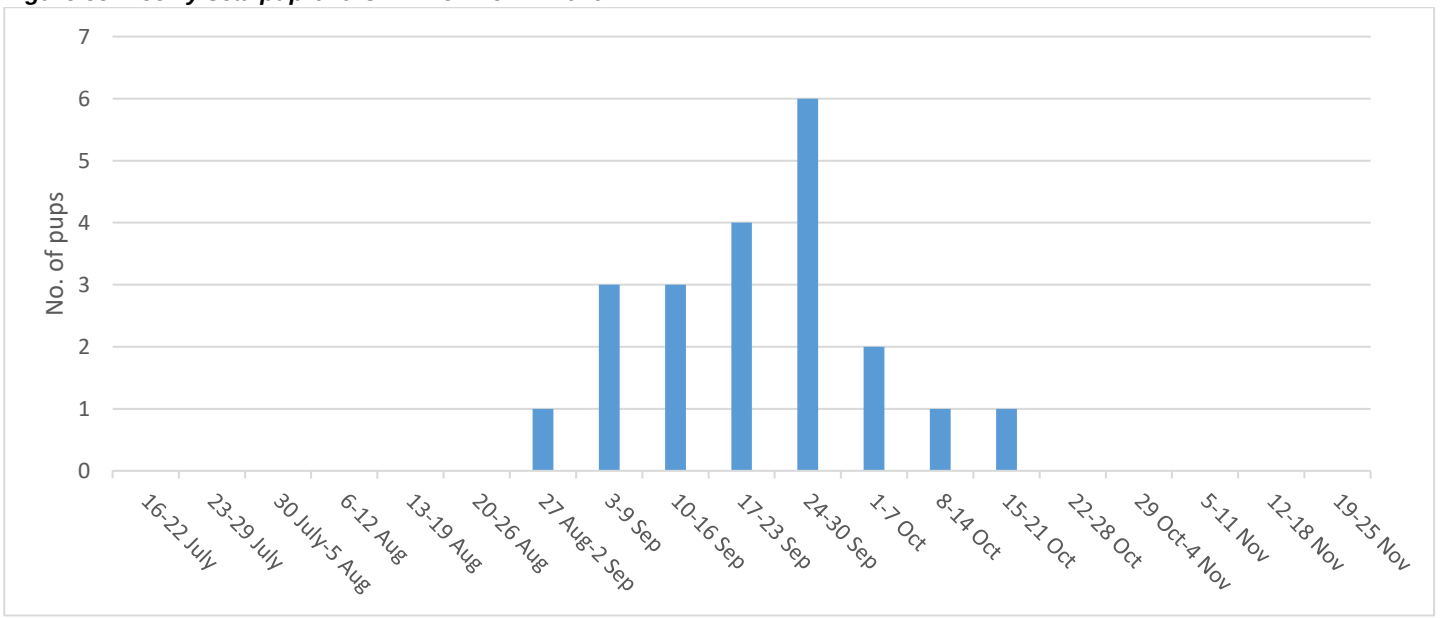


Table 25 Fate of pups on The Wick 2019

Fate	**No. of pups**
Assumed survived	0
Survived to beginning of moult	11
Survived to weaning	7
Assumed dead	0
Dead	3
Unknown	0
Total	**21**

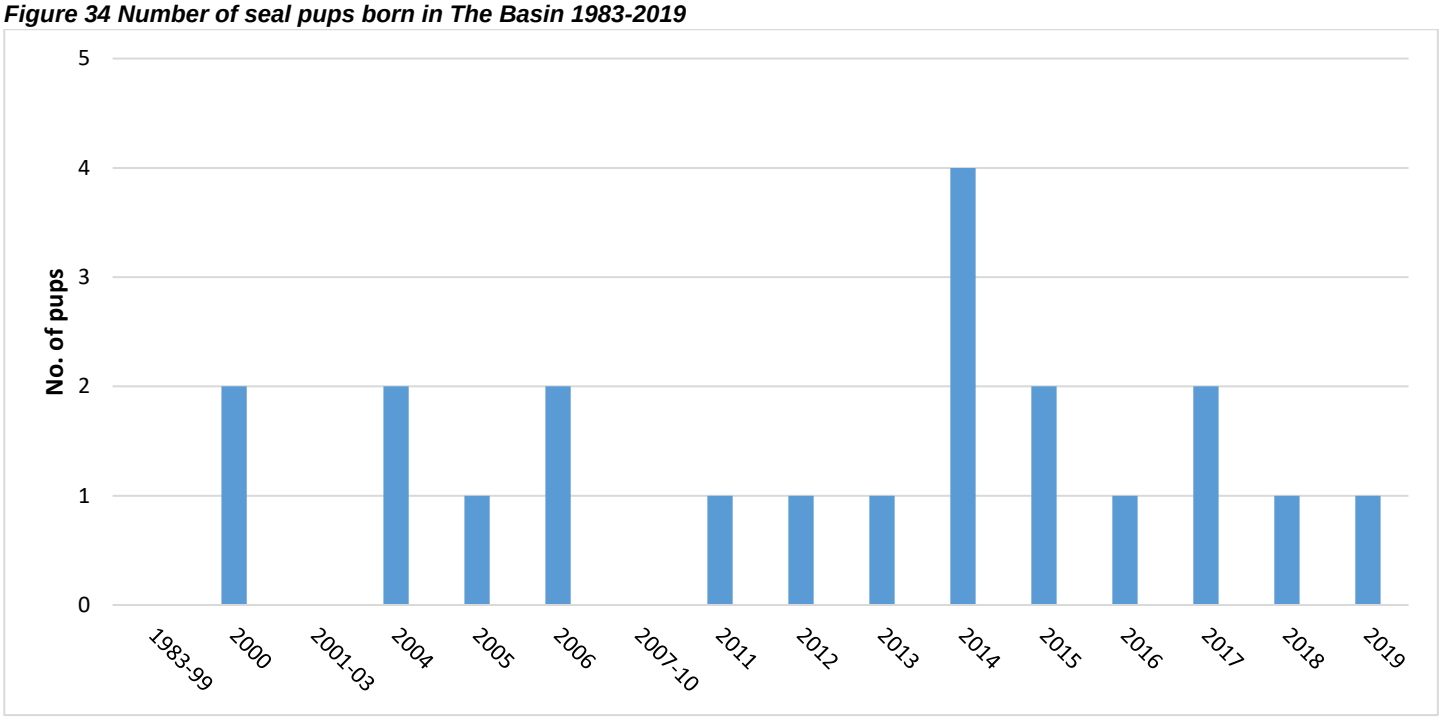
Table 26 Causes of seal pup deaths on The Wick in 2019

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**

4.4.15 The Basin

In 2019 one pup was born in week 38 in The Basin. It survived to the weaning stage, giving a survival rate of 100%.

Figure 34 Number of seal pups born in The Basin 1983-2019



4.4.16 Pigstone Bay

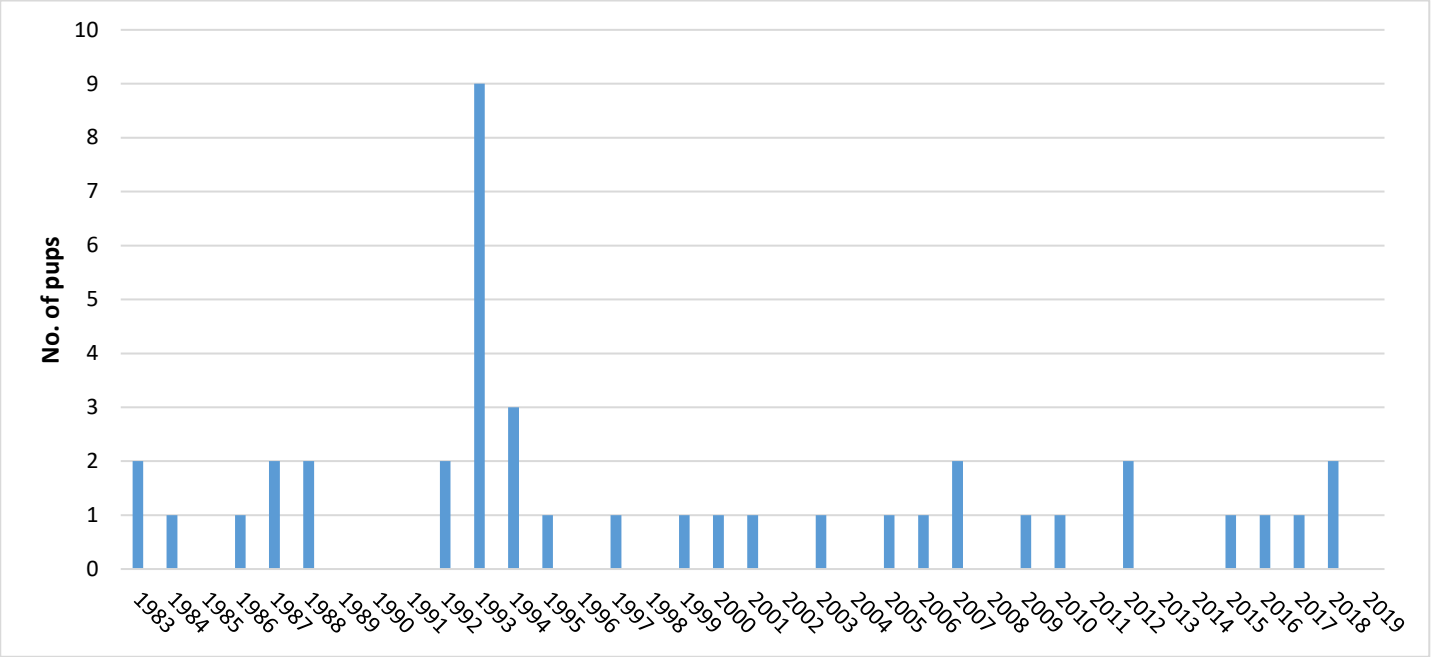
Pigstone Bay is a difficult site to monitor as there is a sea cave, which is impossible to access from land. The cave was entered by boat in 1985 and found to end in a shingle beach which held about a dozen hauled out seals and it was considered the cave could be an important pupping site (Alexander & 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 2019 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. No pups were born at Pigstone Bay in 2019.

Figure 35 Number of seal pups born in Pigstone Bay 1983-2019



4.4.17 The Garland Stone

No pups were born at the Garland Stone in 2019.

Single pups were 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 2019. 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 2019. This site was possibly used once, in 2001.

4.4.20 Tom's House

No pups were observed at Tom's House in 2019. The site has only been used once, in 1997, when a single pup was born.

4.4.21 Rye Rocks

No pups were observed at Rye Rocks in 2019. The last time the site was used in 2018.

4.5 Movements

During 2019, 10 pups were recorded making movements between beaches on Skomer. Interestingly the survival rate of these pups is 100%, with 8 pups surviving to weaning, 1 survived to at least the beginning of moult and the other pup's fate is unknown.

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 27 Movements of pups on Skomer Island in 2019

Pup No.	**Natal Site***	**Destination ***	**Age** (on arrival at destination)	**Fate***
51	DWB	SBS	21	SW
55	SHV	MWK	17	SW
97	SHV	DWB	9	SW
98	SHV	DWB	9	SW
107	SHO	DWB	7	SW
108	SHO	NHV	14	UNK
129	DWB	SHV	17	AS
154	AMR	SBS	18	SW
165	SHV	DWB	15	SW
177	SHV	DWB	13	SW

* see Appendix 2 for key to abbreviations

4.6 Wanderers

One pup was recorded as a wanderer. Wanderers 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.

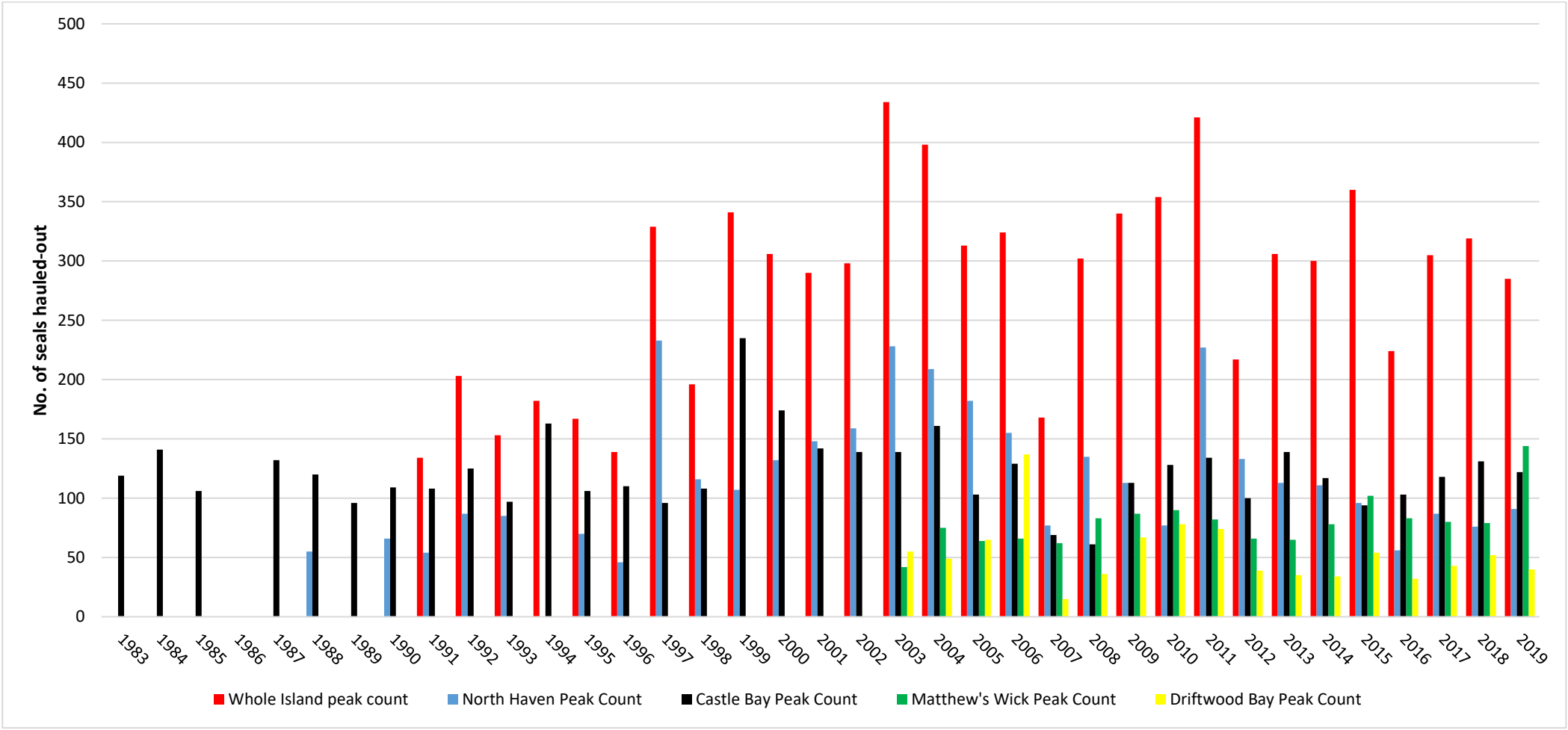
5. Haul-outs in 2019

In 2019 the maximum haul-out (on the main haul-out sites of North Haven, Driftwood Bay, Castle Bay and Matthew's Wick) of 252 seals (62 less than in 2018) was recorded on 18th November 2019, 5 days later than in the previous year. It is worth noting that this was actually the last count of the season and therefore a higher number of seals may have been hauled out after the Wardens left Skomer for the winter.

The average maximum haul-out on the main haul-out sites for the last ten years is 315, hence the peak number of seals using Skomer to haul-out in 2019 was below the ten year average.

In 2019 North Haven had its peak haul-out count on 18/11/19, Driftwood Bay on the 4/11/19, Castle Bay had its haul-out peak count on the 8/10/19 and Matthew's Wick on the 12/11/19.

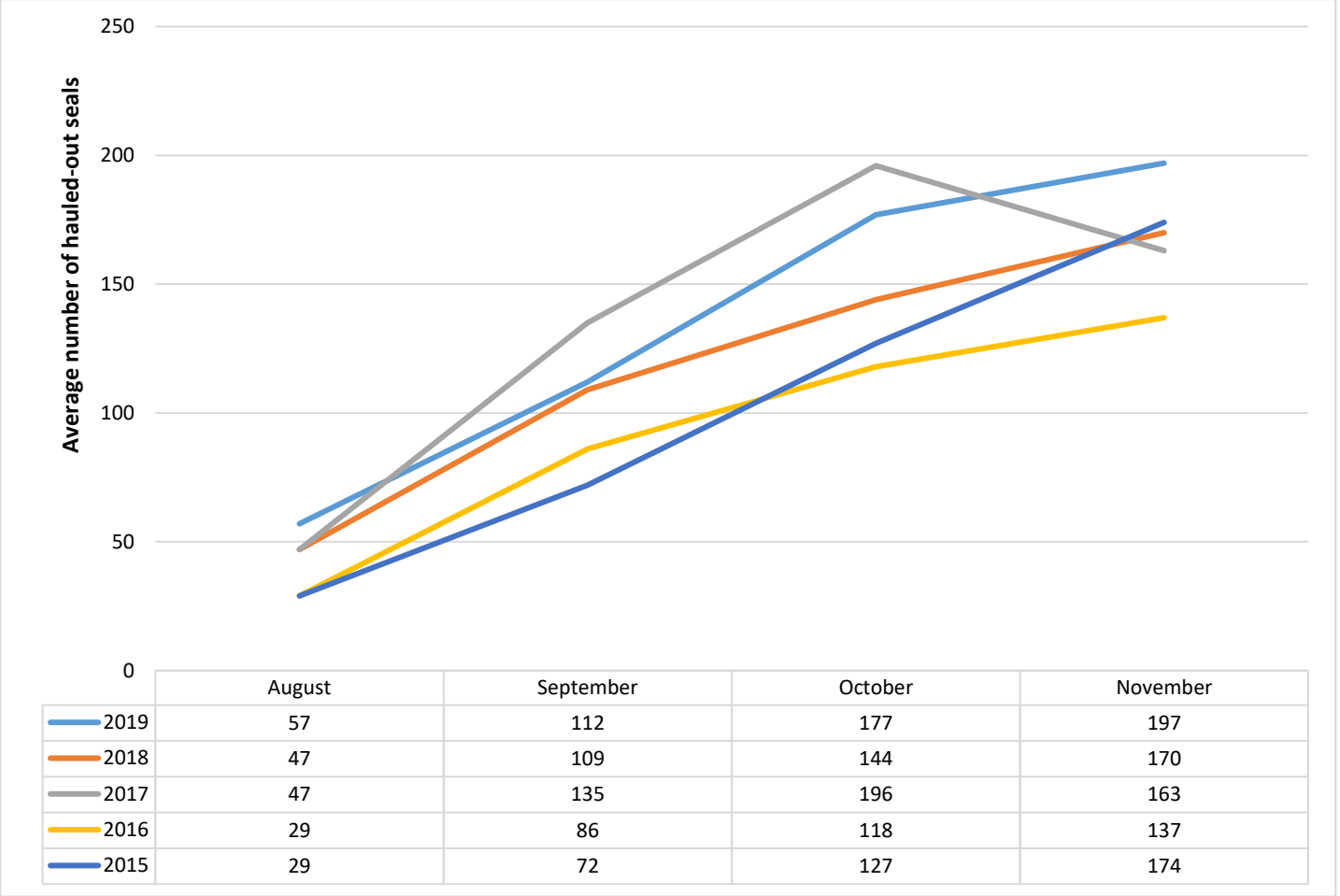
Figure 36 Peak haul-out counts on Skomer Island 1983-2019



For haul-out details see “2019 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 2015-2019



	August	September	October	November
2019	57	112	177	197
2018	47	109	144	170
2017	47	135	196	163
2016	29	86	118	137
2015	29	72	127	174

The number of hauled-out animals during the entire observation period was similar to that of 2017, after a decrease in 2018. The trendline of haul-outs is typical for Skomer, with increases throughout the season.

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 42 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 35 animals. Matthew's Wick was the third most important haul-out site with a daily average of 25 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 14 seals was recorded during the monitoring period. South Haven beach had a daily average of 10.

The number of seals hauled-out per site varies significantly from day to day and is most likely determined by weather conditions. How weather and sea condition impacts on the haul-outs was especially visible when looking at the numbers at Garland Stone throughout the monitoring period with many consecutive days of no seals due to strong winds and big swells.

Figure 38 Average haul-out at the main haul-out sites per week in 2019

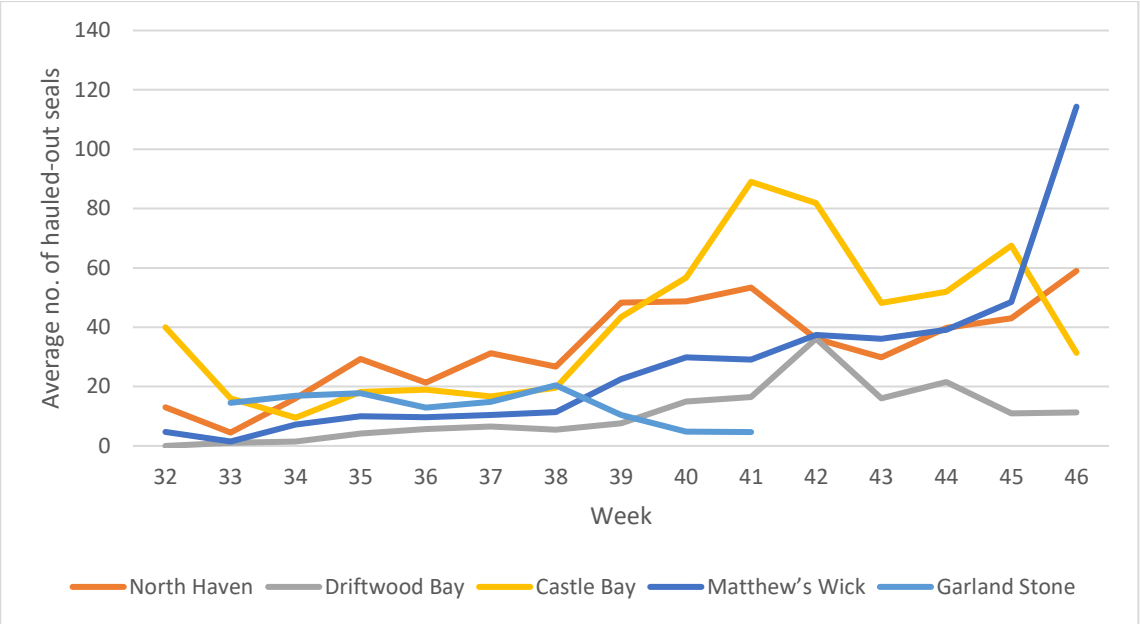


Figure 39 North Haven haul-out in 2019

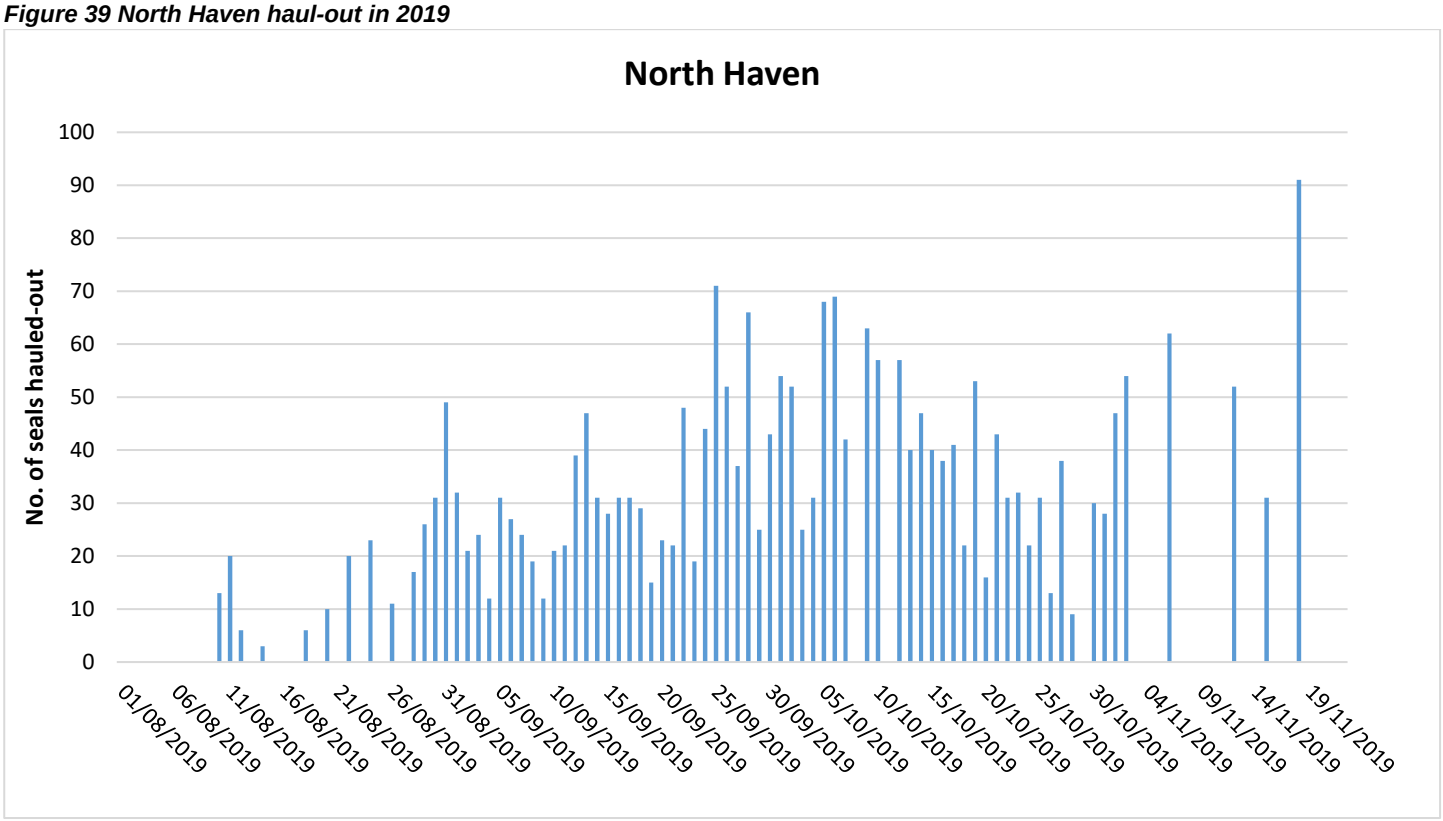


Figure 40 Castle Bay haul-out in 2019

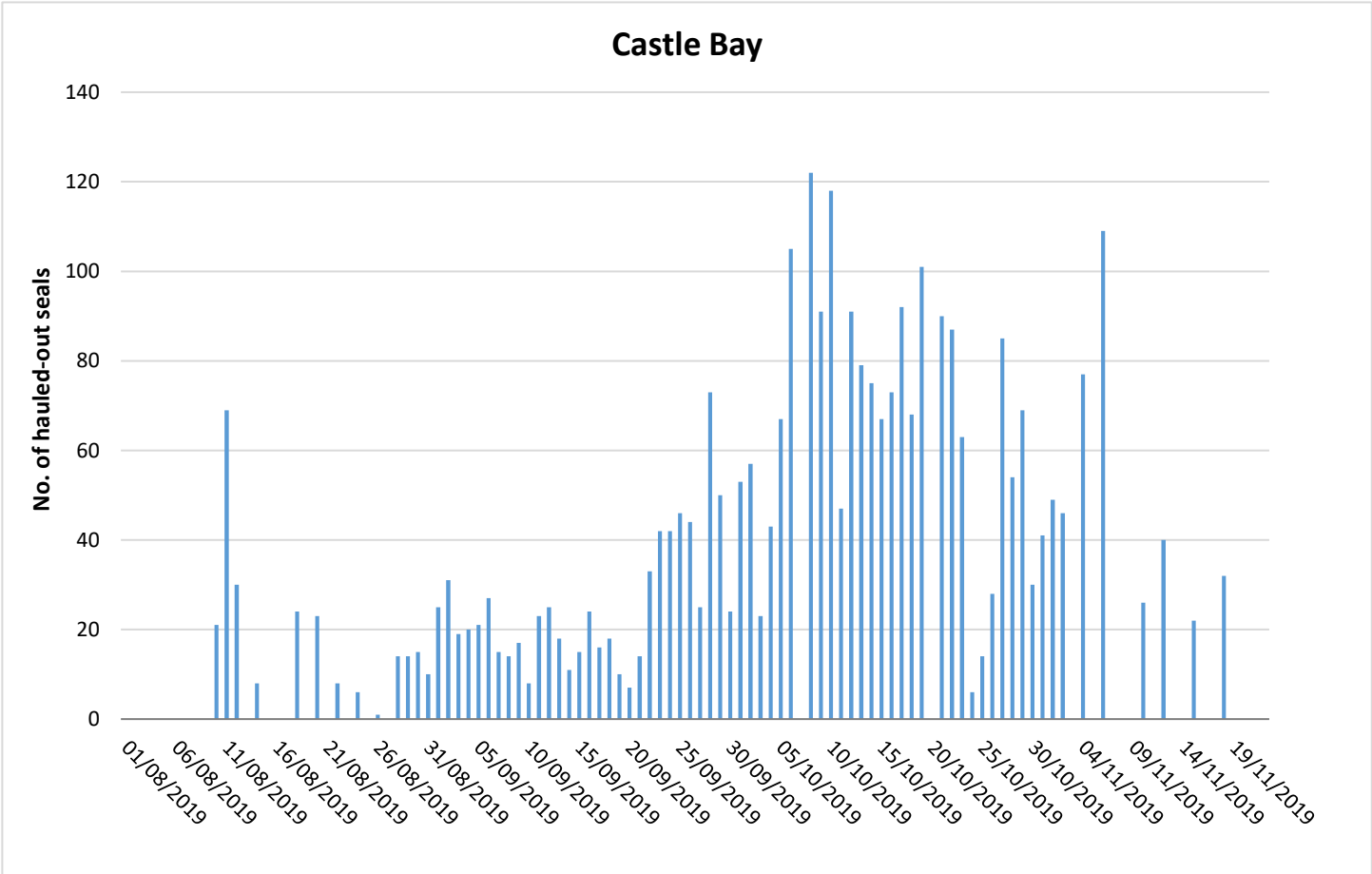


Figure 41 Driftwood Bay haul-out in 2019

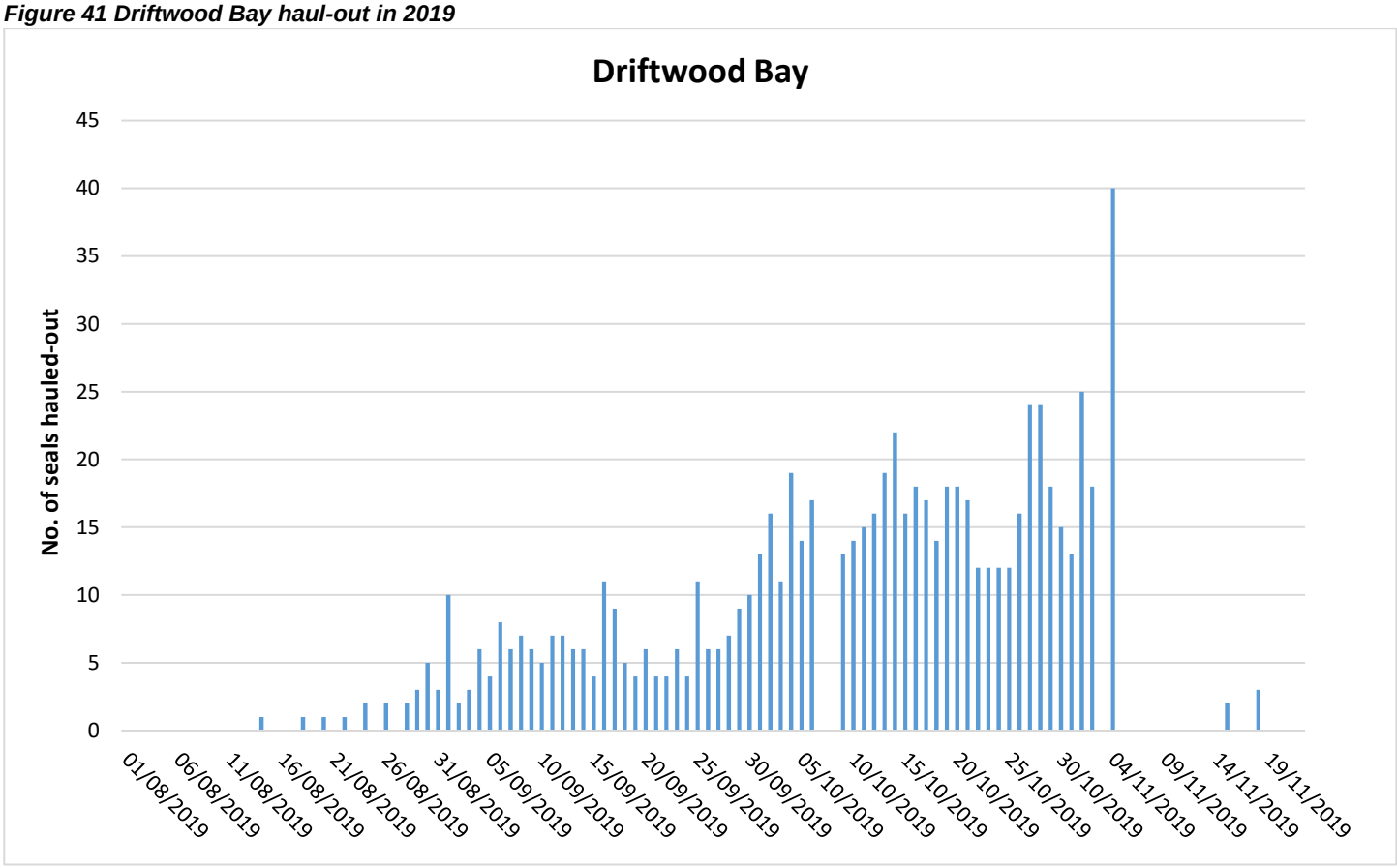


Figure 42 Matthew's Wick haul-out in 2019

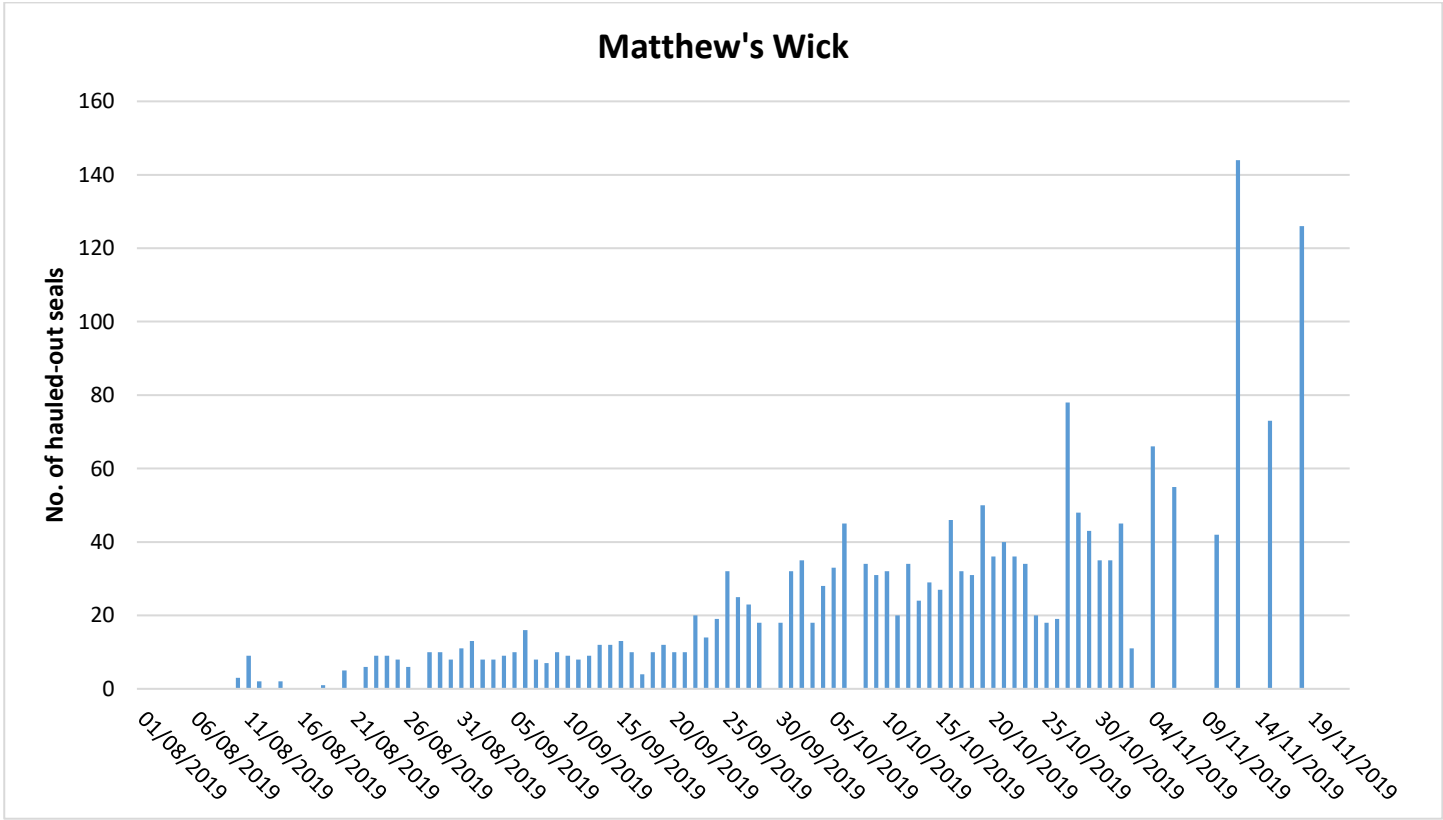


Figure 43 Garland Stone haul-out 2019

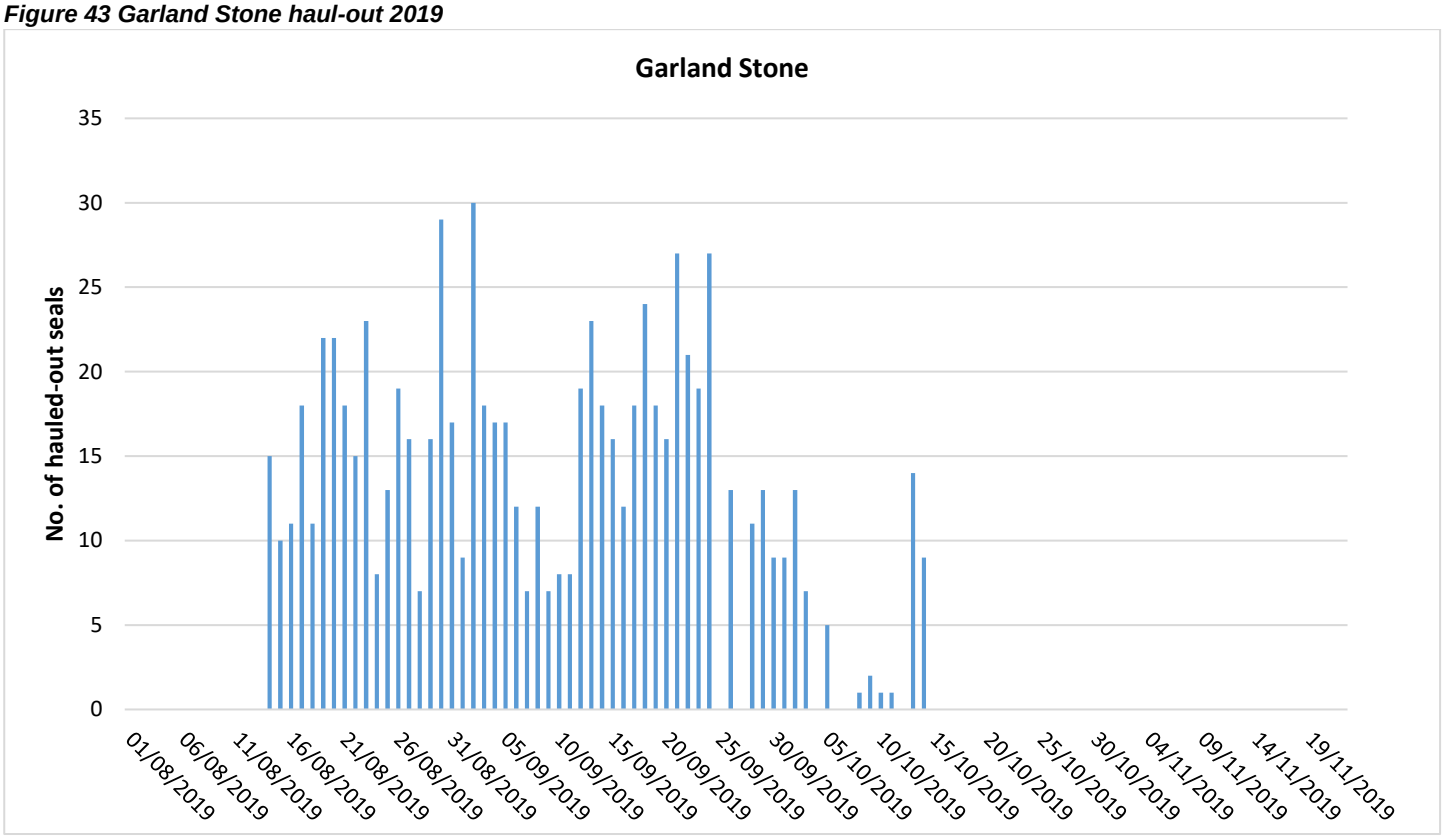
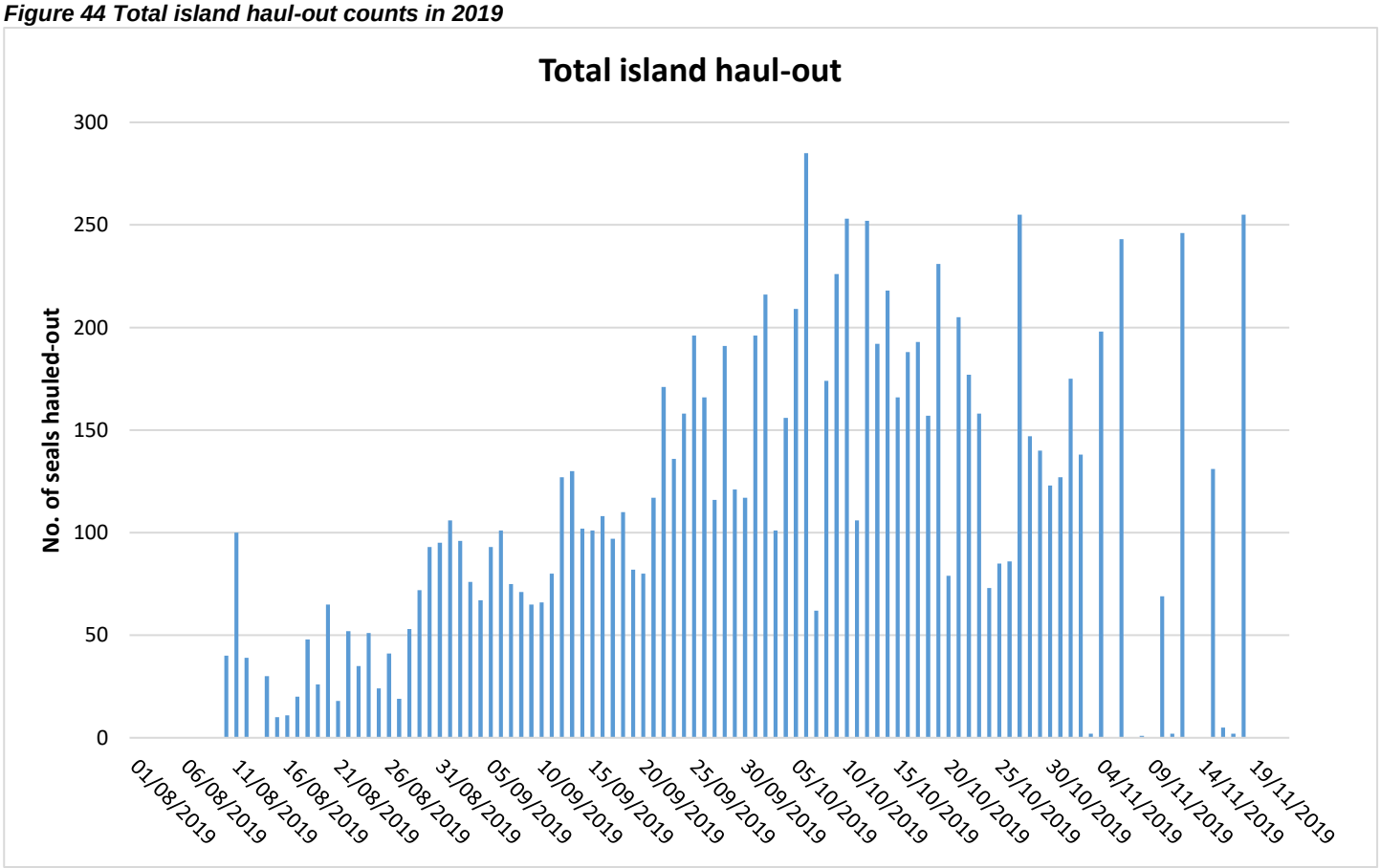


Figure 44 Total island haul-out counts in 2019



6. Pollution

6.1 Netting

Monofilament line and netting were the most obvious pollutants affecting seals, in 2019. 16 seals (9 females, 3 males and 4 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 2019 four seals with scars caused by netting were known from previous years, all of which were adult females.

17.SC-NET-183.MWK was first recorded in 2017, was not identified around Skomer in 2018m,

Plate 6 Cow 17.SC-NET-183.MWK on Matthew's Wick 22/09/2019

BK-066 has been recorded most years since she was first recorded in 2011; 2013, 2015, 2017, 2018 and in 2019 was seen in a haulout on Castle Bay.

Plate 7 Cow BK-066 on Castle Bay 21/10/2019

14.SC-NK-109.MWK which was first recorded in 2014 and subsequently identified around Skomer in 2015, 2017 and 2018, she successfully weaned a pup on Driftwood Bay in 2019.

Plate 8 Cow 14.SC-NK-109.MWK on Driftwood Bay with pup on 13/10/2019

NK-020 was first recorded in 2008 and has subsequently been identified around Skomer every year except 2013 and 2018. In 2019 she was recorded on Castle Bay.

Plate 9 Cow NK-020 on Castle Bay 21/10/2019

6.2 Oil/Tar

Skomer's beaches remain relatively clean, no pollution by oil or tar was observed in 2019.

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 bags or plastic fishing containers.

7 Disturbance

During the busiest pupping time which was between the second week of September and the second week of October, no significant disturbance was recorded. A notable disturbance occurred on the 27th of August when a RIB caused 10 seals to enter the water, including a pregnant female. A few other incidents involved flushing up to 28 seals, which entered water but no major disturbance was caused. Additional information on boats and kayaks entering voluntary no access zone but causing no disturbance can be found in Appendix 2.

Table 28 Seal disturbance (records made internally) on Skomer Island in 2019

INTERNAL TABLE		
Level of disturbance: 1 = little disturbance (lifting of heads); 2 = Seals enter water in response to perceived threat; 3 = major disturbance involving abandonment of pup or similar		
Date	**Details**	**Level of disturbance**
27/08/19	RIB to Grassholm stopped east of the Garland Stone to look at Common Dolphin and turned. Roughly 10 seals entered water in response including pregnant female.	2
18/09/19	Group of kayakers wanted to land at North Haven slip but they were asked not to land due to seal pups being present on the slip. They landed on the rocks closer to the landing steps and no seals were disturbed.	1
12/10/19	Cows at the Wick fled to water after seeing surveyor off path looking towards the cliff overhang.	2
01/11/19	6 seals rushed down the beach at Castle Bay to enter water when they spotted a surveyor, no pups were present at that point.	2
04/11/19	About 7 seals entered water when a surveyor approached Driftwood Bay. They all stayed within a close proximity and returned back in a very short time.	2
05/11/19	A small RIB with two people aboard entered the voluntary no access zone at North Haven but didn't cause any disturbance other than some seals lifting their heads.	1
10/11/19	Fishing boat M36 being close to Matthew's Wick resulted in 28 seals of the 39 that were hauled out on Matthew's Wick flushing into the water. The seals gradually came back to the beach after the boat had left.	2

Table 29 Seal disturbance (records obtained from the public) on Skomer Island in 2019

PUBLIC TABLE		
Level of disturbance: 1 = little disturbance (lifting of heads); 2 = Seals enter water in response to perceived threat; 3 = major disturbance involving abandonment of pup or similar		
Date	**Details**	**Level of disturbance**
23/08/19	the Princess got a bit too close and spooked 2 seals off of GST.	2
24/08/19	Immature seal disturbed off bottom of the steps by the Princess for changeover.	2

8. Seal Behaviour

Limited unusual seal behaviour was observed in 2019. However, one seal bull was observed to be more aggressive towards pups than others. This resulted in many of the pups in South Haven beach having brown bite marks all over their body. It was initially thought to be an illness developed from the unclean beach and the pups being exposed to many storms in 2019. Further observations lead to a conclusion that it was a male causing turmoil amongst pups. During that time a number of pups were abandoned by their mothers, but it is difficult to judge whether the male and his aggressive behaviour caused abandonment. It was between the end of the 1st week of October and the 3rd week of October when the pups with bite marks were most prominent.

There are clear bite marks on the pups shown below and it is very possible that pup 167 for example which disappeared after the 9th October 2019 and was then found dead on the 14th October 2019. It is suspected that the female abandoned the pup due to the aggressive behaviour of the male present on the beach. However, that is only a potential reason.

Plate 10 Pup 167 on South Haven beach found dead on the 14.10.19

Plate 11 Pup 186 on South Haven beach on the 16.10.19

9. Disease

In 2019, as in previous years, the usual amount of small and ill-looking weaners was 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 2019. 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.

It is also worth mentioning that one pup was abandoned at a very early age on South Haven beach around the 7th of October, probably at 2 days old, which had a very bad eye infection, different to the usual eye infection seen around the island. The eye was out of the eye pocket and there was a lot of pass coming out of it. There is a possibility that the pup was injured by the aggressive bull present on the beach, which led to an abandonment by the cow. When found on the day 2 it had already developed a shock moult. The pup was found dead on the 11th of October at 6 days old.

Plate 12 Pup 168 on South Haven beach on the 09.10.19

10. Identification of individual seals

For the 15th year photographic monitoring of adults continued in 2019 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 2019, as in previous years photos of all breeding females were taken where possible. These photos are stored and ready to be used for identification in order to find any returning individuals.

As many breeding females were photographed as possible well enough for identification by eye and/or inclusion in the database.

- 14 of these cows and 4 bulls were re-identified from previous photos.

- The oldest cow to have returned to Skomer was BK-006. She was first seen on Castle Bay in 2002, interestingly she has never been known to pup on Skomer. She has been seen hauled out every year since 2002, except for 2006, 2013 and 2014 and predominantly being seen at Castle Bay or Matthew’s Wick.

- The oldest bulls to have returned to Skomer in 2019 were LBK-052 and NK-049, both of which were first recorded in 2010.

Table 1 Year of first sighting of seals seen on Skomer Island in 2019

Year first observed	No. of animals seen in 2019 which were known from previous years
2018	2
2017	0
2016	4
2015	1
2014	2
2013	1
2012	1
2011	0
2010	4
2009	0
2008	1
2007	1
2006	0
2005	0
2004	0
2003	0
2002	1
TOTAL	**18**

10.1 Breeding Cows Returning In 2019

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.

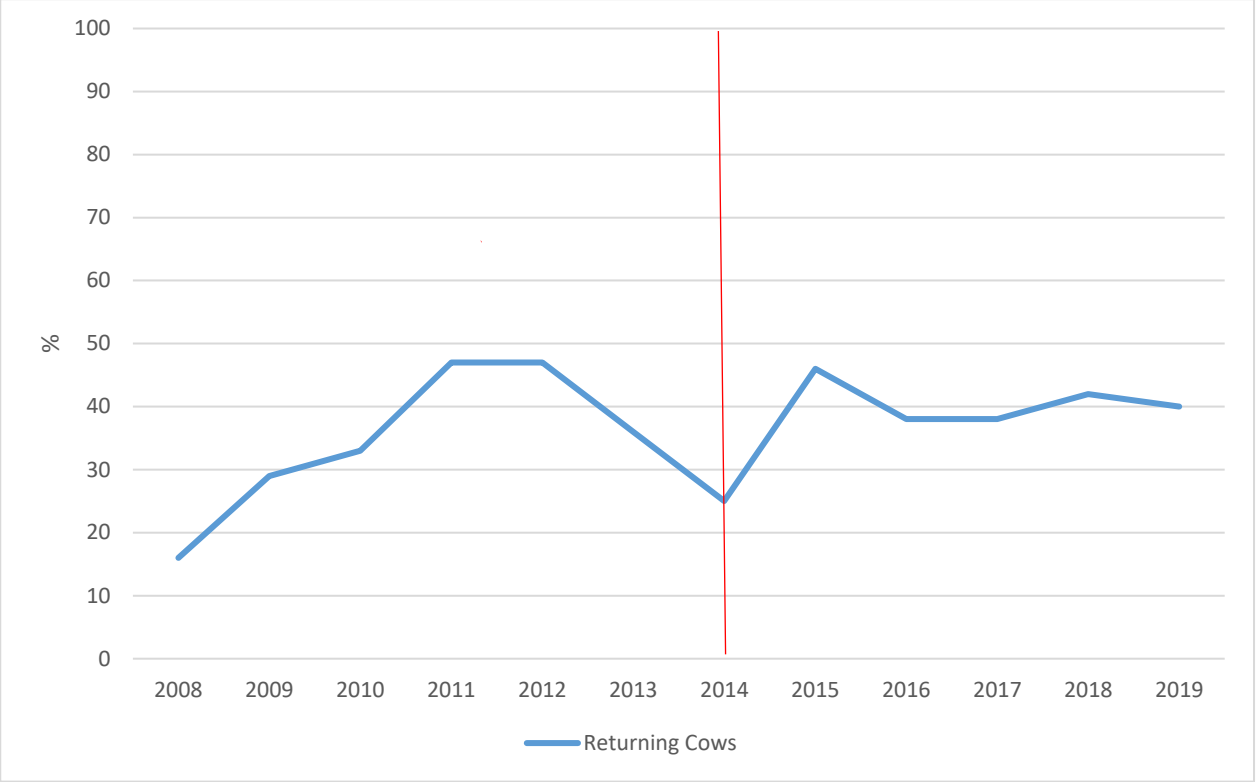
Of the 238 cows which pupped on Skomer in 2019, 35 had distinctive markings/scars and were photographed well enough for comparing with the catalogue. 14 matches were found, hence 40% of identifiable breeding cows were returning cows, similar to last year (42%). The percentage of returning cows usually lies around 40% (10 year average is 38.1%) 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.

- 4 (29%) of the 14 matched cows that pupped on Skomer in 2019 also pupped on Skomer in 2018 (68% in 2018, 38% in 2017, 44% in 2016)

- 2 cows (14%) pupped in three consecutive years on Skomer (18% in 2018, 8% in 2017, 25% in 2016).

- 14.SC-LS-058.NHV pupped in four consecutive years on Skomer.

Figure 1 Percentage of returning and new pupping cows on Skomer Island 2008-2019



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

10.1.2 Site fidelity

- Of the 4 cows that pupped on Skomer in both 2019 and 2018, 3 (75%) returned to pup at the same site (40% in 2018, 60% in 2017, 57% in 2016, 45% in 2015, 78% in 2014).

- Of the 2 cows that pupped on Skomer in three consecutive years 2017-2019, 1 (50%) used the same site in all three years (50% in 2018, 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.

10.1.3 Pupping date

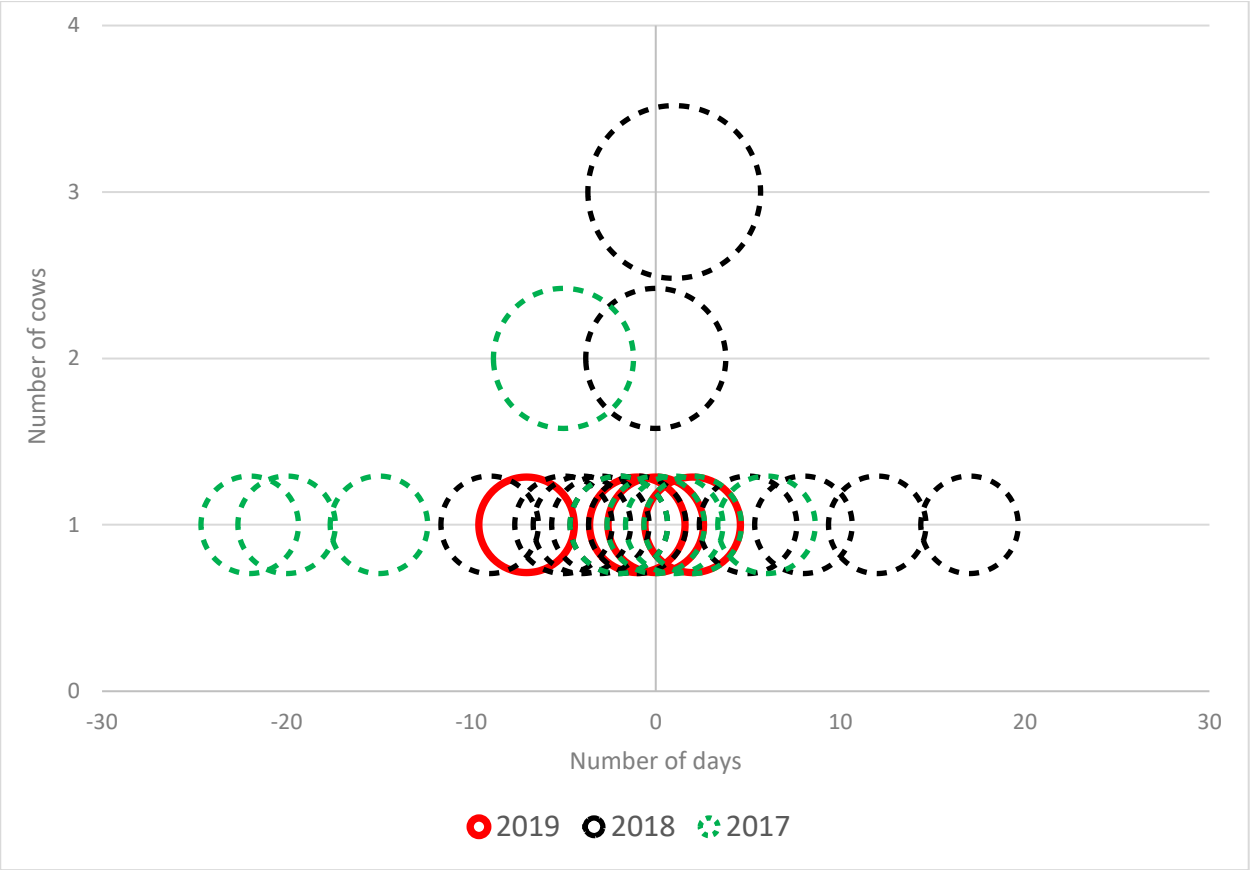
Table 2 Pupping date of returning cows on Skomer Island in 2017-2019

Cow	Pupping date 2017	Pupping date 2018	Pupping date 2019	Difference (days) 2017/18	Difference (days) 2018/19	Average difference (days)
14.SC-NK-109.MWK	1/10/19	n/a	30/09/19	n/a	n/a	1
LS-007		8/9/18	7/9/19	n/a	1	1
LS-020	2/10/17	n/a	27/9/19	n/a	n/a	5
17.SC-LBK-131.DWB	28/9/17	19/9/18	12/9/19	9	7	8
16.SC-BK-177.MWK	13/10/17	n/a	6/10/19	n/a	n/a	7
18.SC-LS-106.SHV	n/a	20/9/18	22/9/19	n/a	2	2
14.SC-LS-058.NHV	2/9/17	19/9/18	19/9/19	17	0	8.5

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, it seems that 2019 was a normal year with most cows pupping around the same time than in previous years.

17.SC-LBK-131.DWB has contrastingly moved her pupping date forward by 16 days in this 3 year period.

Figure 2 Difference in pupping date of returning cows on Skomer Island 2017-2019



For pupping site fidelity and pupping date details see “2019 Returning and new seals” raw data file.

10.2 Returning Bulls

4 bulls were identified in 2019, of which one was recorded in 2018 on Skomer.

11. Seals from elsewhere seen on Skomer

On the 31st of August a red tag 80256 female also known as Wombat (Sprite) was photographed in Castle Bay and then again on the 12th of September at Protheroe's Dock. This was the first time this individual has been recorded around Skomer. This female was released from North Devon by the RSPCA West Hatch Wildlife Hospital.

Plate 13 Tagged female known as Wombat

Also 80275 red tagged male was photographed on the 4th of November on North Haven beach. This is one released from North Devon by the RSPCA West Hatch Wildlife Hospital – he is called Ranger (Blue). This was the first time this individual has been recorded around Skomer.

Plate 14 Tagged male known as Ranger

Another individual, a red tag 80335 female was spotted and photographed on the 25th of September in North Haven. This was the first time this individual has been recorded around Skomer.

Plate 15 Tagged immature seal

Additionally, on the 10th of January 2019 a bull that is in the Skomer catalogue, 18.SB-TAG-001.MWK, was sighted in West Cornwall on the 10/01/19. This individual was first seen around Skomer on the 5th and 6th of November 2018 as a young bull. The orange tag used to read LP472 but has become worn and illegible.

12. Further Research

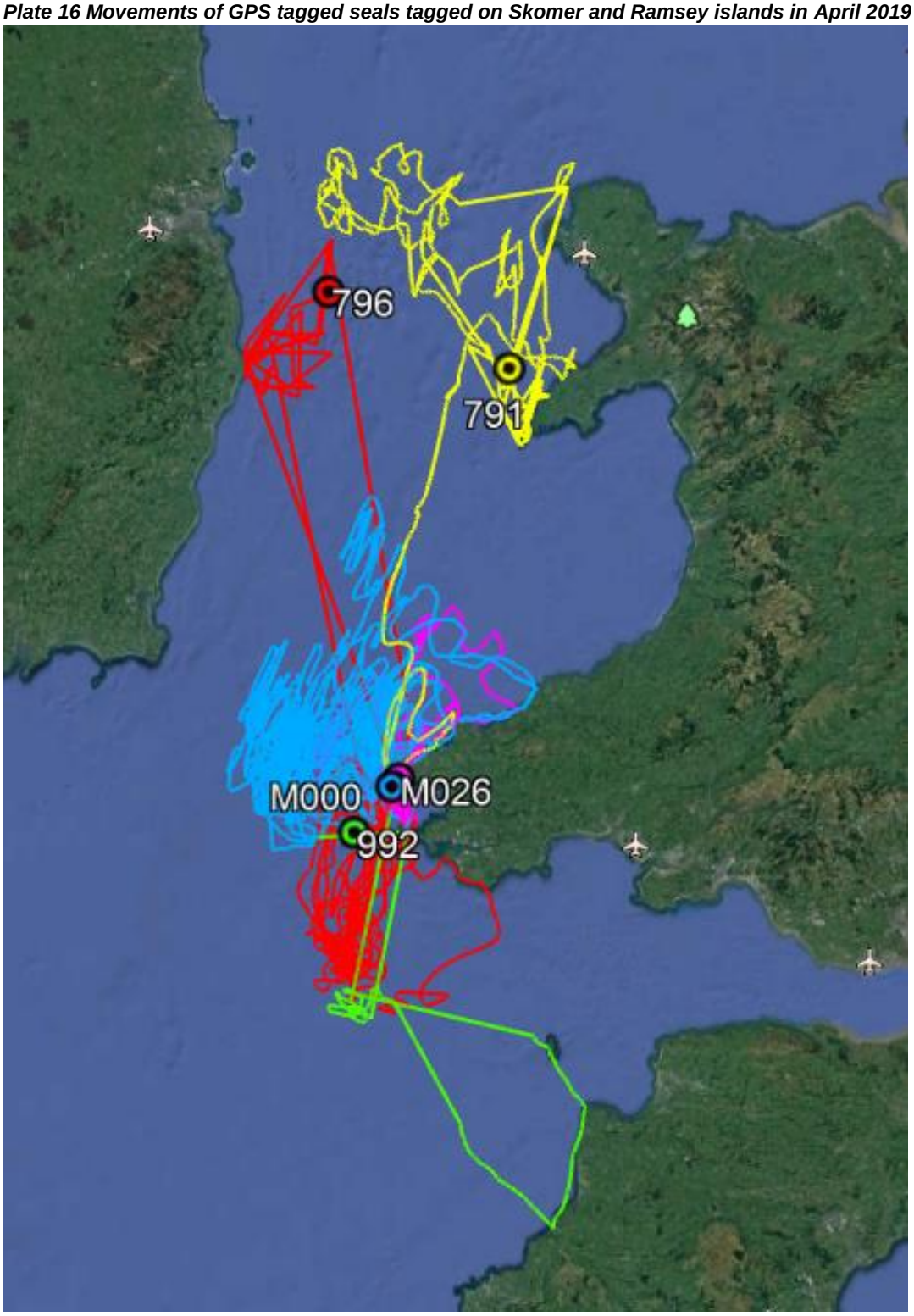
There was one research project on Grey Seals on Skomer conducted in 2019.

GPS tracking undertaken on Skomer and Ramsey in 2019 – written by Dr Matt Carter, SMRU

A small team of marine biologists from the Sea Mammal Research Unit (SMRU), University of St Andrews, visited Skomer and Ramsey between the 15-18th of April to study the region's population of grey seals. The study involved deploying satellite tags on adult seals as part of a larger project, funded by the UK Government's Department for Business, Energy and Industrial Strategy, to investigate the movements and habitat preferences of both grey and harbour seals around the UK. Developing an understanding of important at-sea habitat for marine top predators in the UK is crucial to mitigating any potential impacts of offshore human activities such as oil and gas extraction and the construction of marine renewable energy installations. Compared to seal populations in Scotland and eastern England, relatively little is known about the at-sea distribution and behaviour of Welsh seals. Therefore, this work is an important step towards understanding regional differences in the movement patterns and habitat requirements of grey seals in the UK. The tracks of the seals tagged on Skomer and Ramsey will be analysed alongside seals tagged on Bardsey in 2018, and in the Dee Estuary in 2017. An additional aim of the project is to identify the seals' foraging and breeding sites to better understand where seals acquire the food resources required to support breeding. Grey seals are typically capital breeders, meaning that they fast on land during the lactation period and must depend on their energy reserves acquired throughout the summer to feed the pup and sustain themselves. There is evidence that female grey seals return to the colony where they were born to breed as adults, but that they do not necessarily forage in areas adjacent to the breeding colony.

Seven devices were deployed on seals (5 males, 2 females) caught at sites on Skomer and Ramsey, including two males caught in North Haven beach on Skomer. Two different device types (designed and built by SMRU Instrumentation) were used. The first device type, a "GPS phone tag", provides GPS location estimates as well as information on the haul-out and dive behaviour of seals. The data are stored in a buffer memory on-board the tag whilst the seal is at sea and later transmitted via the GSM phone network once the seal hauls out on land within phone coverage. The second device type, a "dual tag", performs the same function but additionally collects temperature readings throughout the water column as the seal dives. These temperature data are then transmitted at-sea via polar-orbiting Argos satellites when the seal is at the surface. The data are used by the Met Office in real-time to inform their ocean forecasting models. Therefore, the seals are simultaneously contributing data to ecological and meteorological datasets. The tag is glued to the fur on the seal's neck. This keeps the device streamline as the seal dives, and allows the aerial to be exposed when the seal comes to the surface to breathe, facilitating a connection with satellites. The tags will detach when the old fur is moulted off next spring, leaving no trace on the seal.

Plate 16 Movements of GPS tagged seals tagged on Skomer and Ramsey islands in April 2019

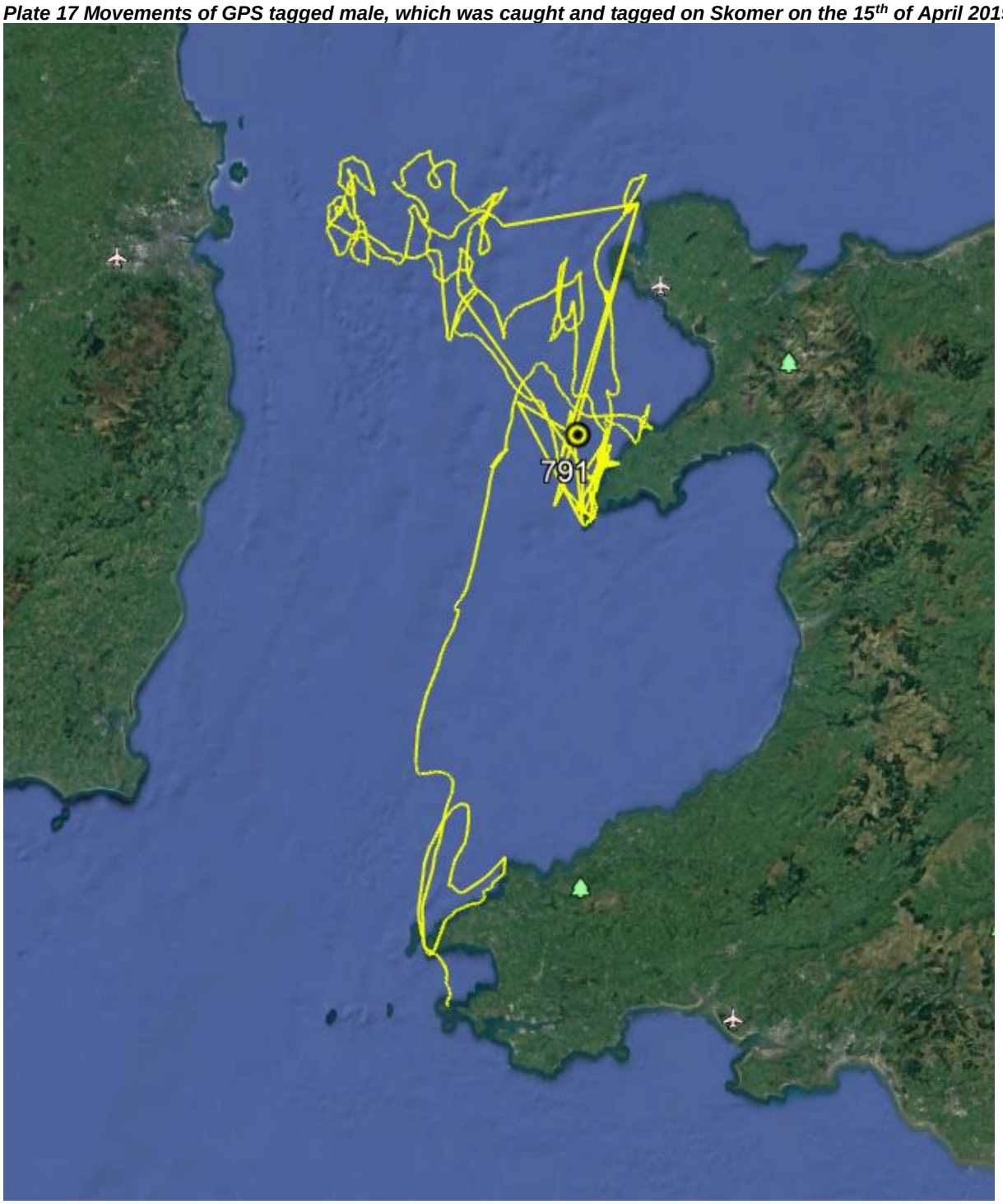


Each colour corresponds to an individual seal tagged on both Ramsey and Skomer. Two of those: red 796 and yellow 791 were tagged on Skomer. Seals were tagged during the last two weeks of April 2019 on both islands.

M000, a female tagged on Ramsey between the 17-19th of April (captured at Bachelor Pad) has visited Skomer and later travelled up into Cardigan Bay.

M026, another female captured in a cave on Ramsey between the 17-19th of April, and tagged at the shore adjacent to the harbour has also travelled up into Cardigan Bay.

Plate 17 Movements of GPS tagged male, which was caught and tagged on Skomer on the 15th of April 2019



791, a male tagged on Skomer (North Haven) on the 15th of April has travelled the furthest, up to the Llyn Peninsula and to the Skerries.

Male 796 tagged on Skomer (North Haven) on the 15th of April has travelled all the way to the Irish Sea and stayed around Dalkey Island for a while.

13. Study recommendations

As the number of seals increases the amount of time required increases exponentially, it impacts on many aspects individually and they all add up. For example, the difference between the impacts on workload of an additional pup to a site that already has 4 pups compared to a site that already has 10 is almost incomparable. The chances that a pup will be instantly or even easily identified in the field or when inputting into the spreadsheet via it being the only pup that could be that size, only pup with that colour, only pup with a cow that looks distinctively like that, etc. are drastically reduced. With increased numbers of pups born also increases the likelihood of the challenges that result from pups moving sites.

In addition to suggestions made in previous reports, it might be worth also considering dividing the monitoring. Particularly during the most busy period, when it is almost impossible to get around all the sites within the time-frame of the methods, but also very challenging to keep up with the data input when there is so many pups to try and work out which pup is which is which on the spreadsheet. Perhaps when data is being gathered one person should be dedicated purely to pups and cows, i.e. identify pup, assign a size/condition to the pup, record if moulting, cow present, suckling and photograph any cows present to use to identify or confirm identity of pups, with an additional person monitoring haul outs and photographing all adult seals. They would probably have to move around the sites together to reduce disturbance and particularly to reduce the impacts of disturbance on the data, e.g. if seals are disturbed at one site prior to the person monitoring haul outs the counts will be lower. The pup monitoring in particular will still not be achievable by one person and would either require additional staff or volunteers. There would still be overlap and for example when caves are accessed all monitoring would be continue to be conducted at the same time. It could be argued that the increased time for taking photos of adult seals would result in more work due to more photos to sort and compare against the ever-increasing catalogue of historical photos.

In 2019, towards the end of the season, a different combination/pattern of spray was tested. This method was to use horizontal lines, in the usual location of the pup's lower back. This allows for all colour combinations to be known (e.g. yellow top, blue middle, purple bottom) even if only one side of the pup's back is seen. Although a limited sample size, it does appear to be a better method. There is the potential that it is more difficult to achieved neat marking if the pup is moving but this did not seem too much of an issue. Interestingly this method has historically been used on Skomer.

As long as it doesn't impact the ability to compare with historical data, it is worth considering introducing a scoring system for moult. For example, no moult, less than a third moulted, between a third and two thirds, more than two thirds but not complete, completed moult. This should increase accuracy of estimates on survival, reduce the subjectivity of if a pup comes under the category of beginning of moult or assumed survived (e.g. beginning of moult equals anything less than a third of fur moulted) and improve accuracy of and reduce time taken to identify pups.

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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 Boats and kayaks in voluntary no access zone

INTERNAL TABLE	
Boat and kayak in voluntary no access zone but no disturbance noted	
Date	**Details**
03/09/2019	Otter (yacht) with 8 people moored in voluntary no access zone in NHV
07/09/2019	3203Y yacht entered voluntary no access zone in NHV
08/09/2019	Lady Jaloria yacht entered voluntary no access zone in NHV
08/09/2019	Motorboat accessed voluntary no access zone in NHV
08/09/2019	Motorboat Piquad accessed voluntary no access zone in NHV
11/09/2019	Yacht entered voluntary no access zone in NHV

15/09/2019	Motorboat Eva Ann accessed voluntary no access zone in NHV
17/09/2019	Fishing boat M150 accessed voluntary no access zone in NHV
18/09/2019	Otter yacht entered voluntary no access zone in NHV
30/09/2019	Fishing boat M36 entered voluntary no access zone in NHV
01/10/2019	Sun Oddysey (yacht) with 5 people moored in voluntary no access zone in North Haven over two days but no disturbance was noted
02/10/2019	Fishing boat (150) accessed voluntary no access zone in North Haven but no disturbance was noted
12/10/2019	A rib accessed voluntary no access zone in NHV
12/10/2019	Yacht accessed voluntary no access zone in NHV
22/10/2019	Yacht accessed voluntary no access zone in NHV

Appendix 3 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 survival	In good condition, should have a reasonable chance of
3	Good Size	Most should survive
4	Very good size	All should survive
5	Super-moulter	An exceptionally sized pup