



Protecting *Manx Wildlife*
for the future

Calf of Man Seal Surveys

Autumn Report 2018



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Introduction

The UK is home to around 40% of the global grey seal (*Halichoerus grypus*) population (JNCC, 2018). It is estimated that between 5,000 and 7,000 grey seals are distributed throughout the Irish Sea, in the centre of which is the Isle of Man. The Isle of Man provides suitable habitat for grey seals year-round, with its relatively undisturbed coastlines and plentiful food sources. Seals are also a protected species under the Wildlife Act in the Isle of Man therefore physical disturbance from humans is minimised (Stone, Gell & Hanley, 2013).

Study site

Breeding grey seals (resident and transient individuals from other parts of the British Isles) are found each year on the coasts of the Isle of Man and Calf of Man (hereafter referred to as 'the Calf') (Crow, 2013). The Calf is a small islet off the South coast of the Isle of Man, and has been reported historically to be an important breeding site for seals (Duck, 1996; Stone, Gell & Hanley, 2013). The Calf is not inhabited year-round; the few who are situated on the Calf (wardens, staff and volunteers) are only there from March to November. There are no cars present and human disturbance is minimal, therefore the Calf supports high levels of species richness and diversity.

There are a number of key seal 'pupping' sites around the Calf's coastline – such as beaches and rocky inlets above the high-tide-line – that are ideal for seals to haul out on and give birth to their pups (Crow, 2013). These sites were the focus of the survey and will be further outlined in the methods section. The Calf is a more viable place to conduct land-based seal surveys than many other places in the British Isles because of its high ratio of suitable coastline to landmass (Duck, 1996; Stone, Gell & Hanley, 2013) and, though boat-borne seal surveys have been conducted around the Isle of Man before, these are not always feasible or reliable due to weather conditions during the Autumn season, among other logistical constraints.

Aims and objectives

1. Obtain photographic identification profiles of seals at each site, and used distinguishing features/markings to compare with historical database of individuals seen on the Calf of Man in previous seasons to determine which individuals (if any) return to the sites each year.



2. Produce a grey seal pup census for the Calf of Man; monitor pups as they enter new developmental stages and keep a record of all individuals containing their name; date of birth; mother ID and date at which they enter each new developmental stage.

Methods

Annual seal surveys have been carried out on the Calf since 2009, which makes this the 10th year of its running. One long-term surveyor (marine intern Libby Fox) was situated at the 'Bird Observatory' on the Calf for the six-week survey, with several volunteers (Mike Prior, Rebecca White and Rachel Jarvis) spending two weeks assisting and Anton Cashen for one week. Daily surveys were carried out all around the island, for 2018 12 sites were recorded with pups (figure 1).

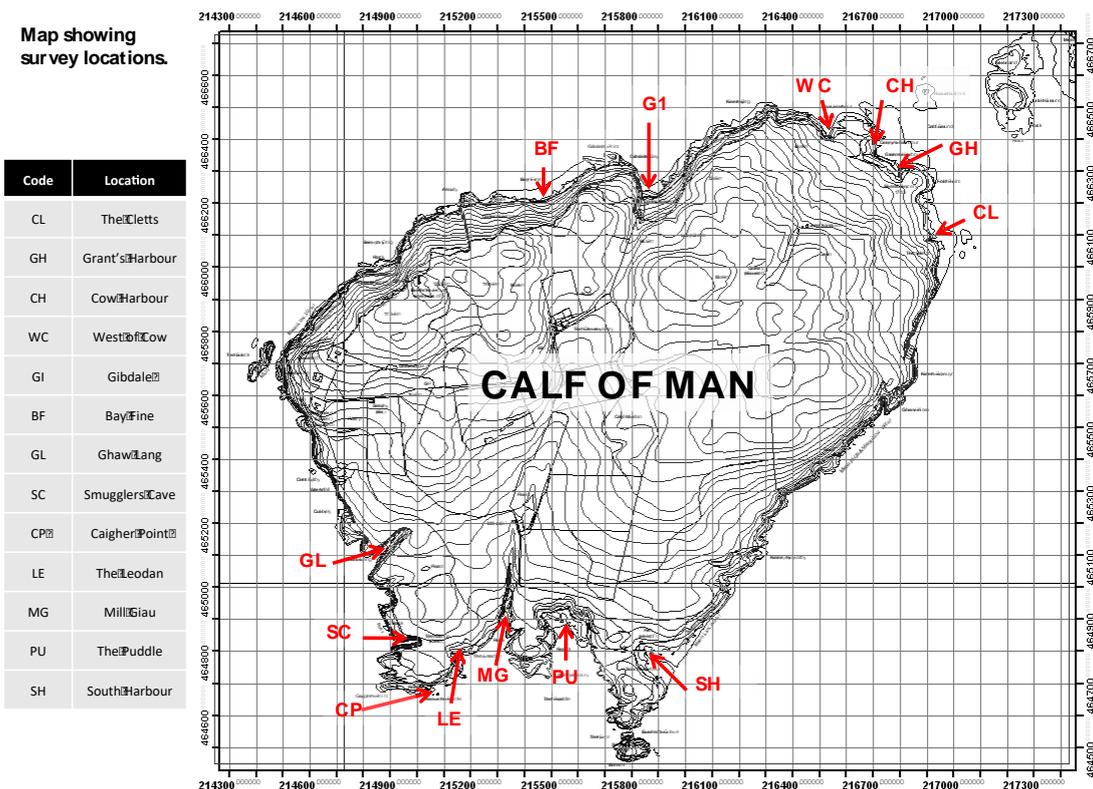


Figure 1: The pupping locations on the Calf of Man.



Data collection

The entire circumference of the Calf was surveyed but as seen in figure 1, only a few sites were seen to have pups on. The sites were split into the Northern route, starting at Bay Fine to The Cletts including all sites in-between, and the Southern route, from Ghaw Lang to South Harbour, including all sites in-between. The routes were carried out on alternate days, during the morning and dependent on weather, to keep disturbance to the seals to a minimum. Unless weather was unsafe for the volunteers, the survey would be carried out.

At each site, the location, time and a tally of pups, adult females and males would be recorded as a daily log. Photographs were taken of each individual either on the beach or in the water. It was important to try to obtain a good quality photo of each side of the adults' heads, paying close attention to females, preferably with a wet pelage, for later photographic identification purposes. The pups would be noted according to developmental stage and any suckling (Appendix 1). Significant effort was made to reduce human impact on the pups and seals present – the site was approached with caution and a long lens SLR camera was used to ensure that a distance of 50m could be kept wherever possible, to minimise disturbance on the seals and their pups.

If necessary, observers stayed at the sites and waited for clarification of mother and pups by witnessing suckling behaviour. In some crowded locations there may be several pups and females hauled out, so suckling is the most accurate way to correctly pair a cow with her pup. Sometimes this may incur a 'stakeout' during the afternoon, whilst the other volunteer inputs the data. At crowded locations, a sketch of the site with individuals labelled with frame numbers would be made to reference later. This procedure was repeated at each location.

Data processing and analysis

During the afternoon, the day's data would be inputted onto the laptop, continuing the on going excel spreadsheets: the daily log, pup developmental progression and ID catalogue. The data collected from each day was entered into the daily log and the day's totals contributed to the Observatories daily sightings log (Appendix 2).

There is a catalogue of photographs of every female and male seen on the Calf previously. The main albums are split into the locations according to where they were first seen and would comprise of a single, clear left and right side profile shot of their patterned pelage. This pattern is unique to each individual and remains the same from birth so is used as a reliable identifiable feature. The aim of this is to determine whether the females seen pupping this year have been here previously or whether they are new first time mothers that have been recorded as pupping on the Calf before.



Using the photos from the morning's data collection to compare to the catalogue, any females seen suckling could be identified and matched up with their pup. This is then added and entered onto both the pup developmental and catalogue of female's spreadsheet.

If the photo ID process was unsuccessful and was not matched, a note would be made to obtain better photos during the next trip and if it was still not found, it was classed as a potential new mother.

Each pup is named according to the letter for that years cohort, for 2018 it was 'S'. Dates of when it was first seen and where, then as it develops and reaches each stage, the dates are filled in accordingly (Appendix 3). Also record if it is deceased or missing, as a result of storms or other factors.

The females that were positively identified using the photo ID catalogue, the location and date of their pup was recorded (Appendix 4) This dataset contained every year since the surveys began in 2009. Similarly, any photos of males would be identified and recorded.



Results

Pup census

For the 2018 seal survey, a total of 65 pups were recorded across 10 of the possible 12 sites on the Calf of Man. 60 out of the total 65 pups born remained accounted for throughout the duration of the survey. Four of the five “dead / missing” pups were confirmed dead, and one was missing following a period of adverse weather conditions (Table 1).

Table 1: Proportion of pups born that survived/reached weaning age or died/became unaccounted for during the 2018 survey.

Number of pups	Survived / weaned (%)	Dead / missing (%)
65	92.3	7.7

Previous years’ data suggests that there is an overall increasing trend in number of pups born (Figure 2). The past few years have been fairly consistent with increasing numbers of pups with the exception of 2016.

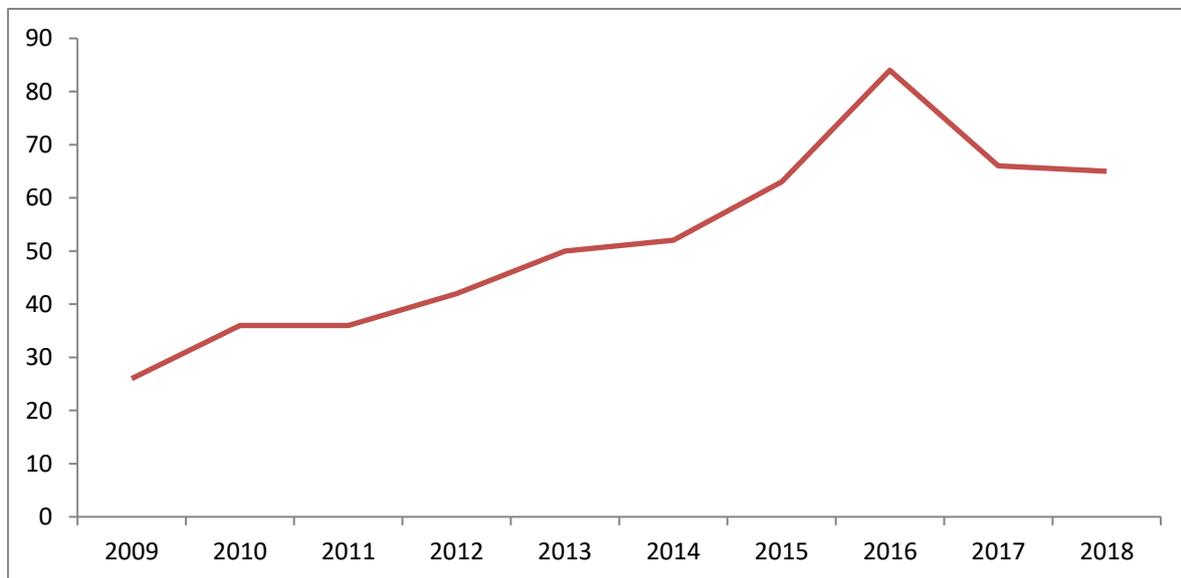


Figure 2: Number of pups recorded each year according to annual seal population surveys from 2009 and 2018.



Number of births per week

Out of the seven weeks surveys, week 2 and 3 showed the highest birth rates of 17 and 15 respectively (Figure 3). The final week in the survey was the least 'productive' with a birth rate of only one; therefore we were confident that, when concluding the survey at this point, we had recorded the majority of this year's births. The observed trend allows us to gain a more specific insight into the most productive period in the season for seal mothers to give birth – the potential reasons behind which will be further discussed later in this report.

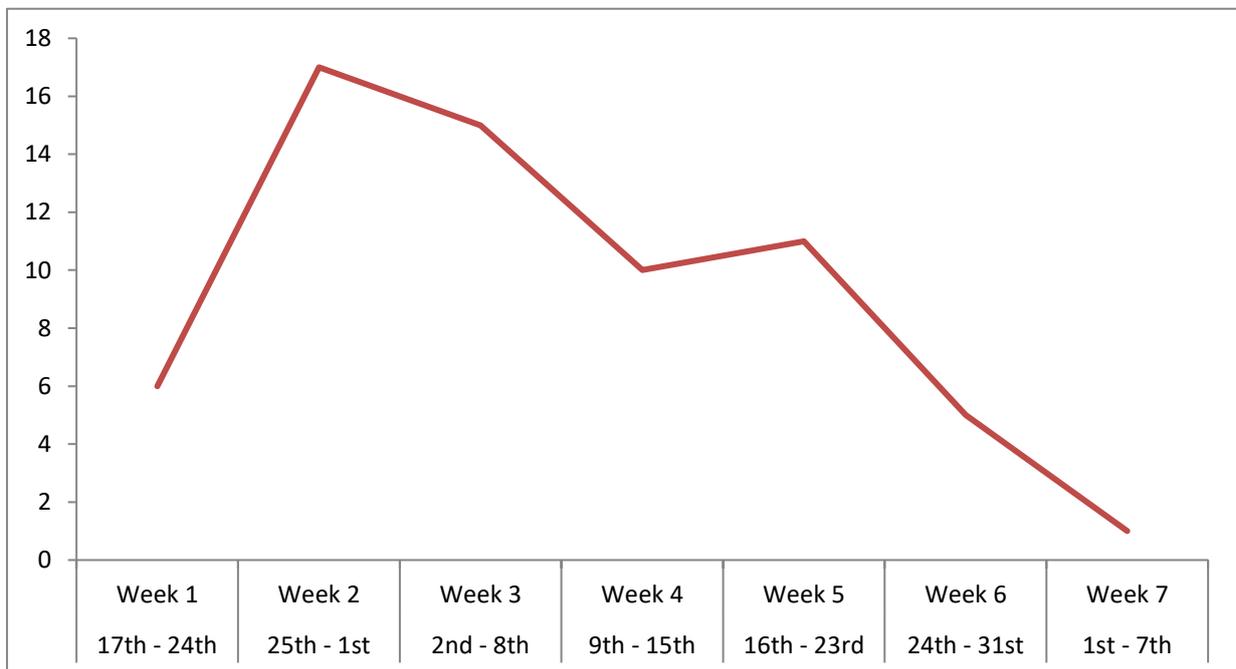


Figure 3: Rate of pups born per week during the 2018 survey.

Pup distribution

A visual representation of the distribution of the pups recorded in 2018 across the sites on the Calf. From figure 4 it shows that Cow Harbour was the most popular site with 18% (n=12), closely followed by Grants Harbour and Mill Giau both with 17% (n=11). The least popular site was Bay Fine with just 3% (n=2) of the total pups. The overall distribution of pups was similar with 43% within the northern sites and 57% of pups were located within the southern sites on the island.

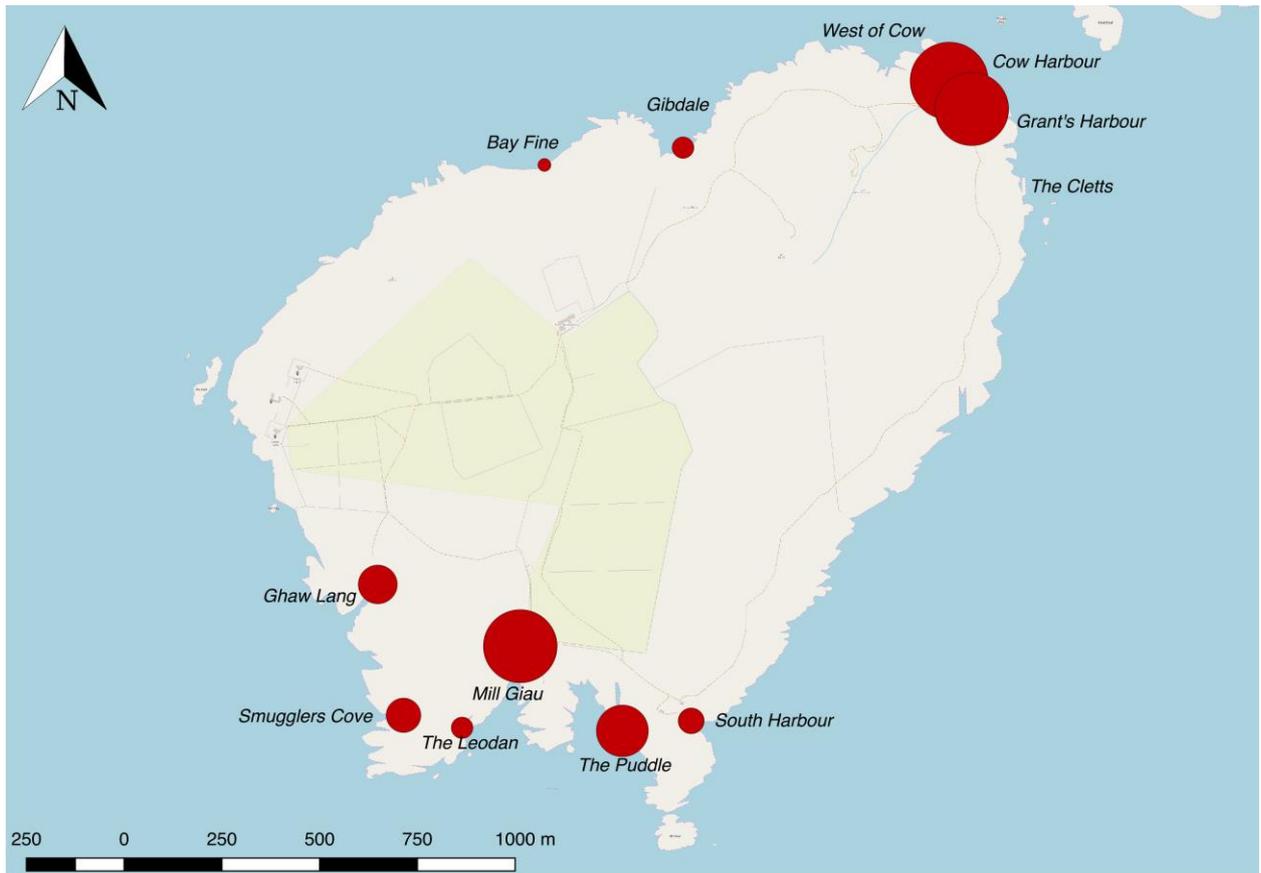


Figure 4: Pup distribution across the sites on the Calf of Man 2018 (size of the dots according to percentage).

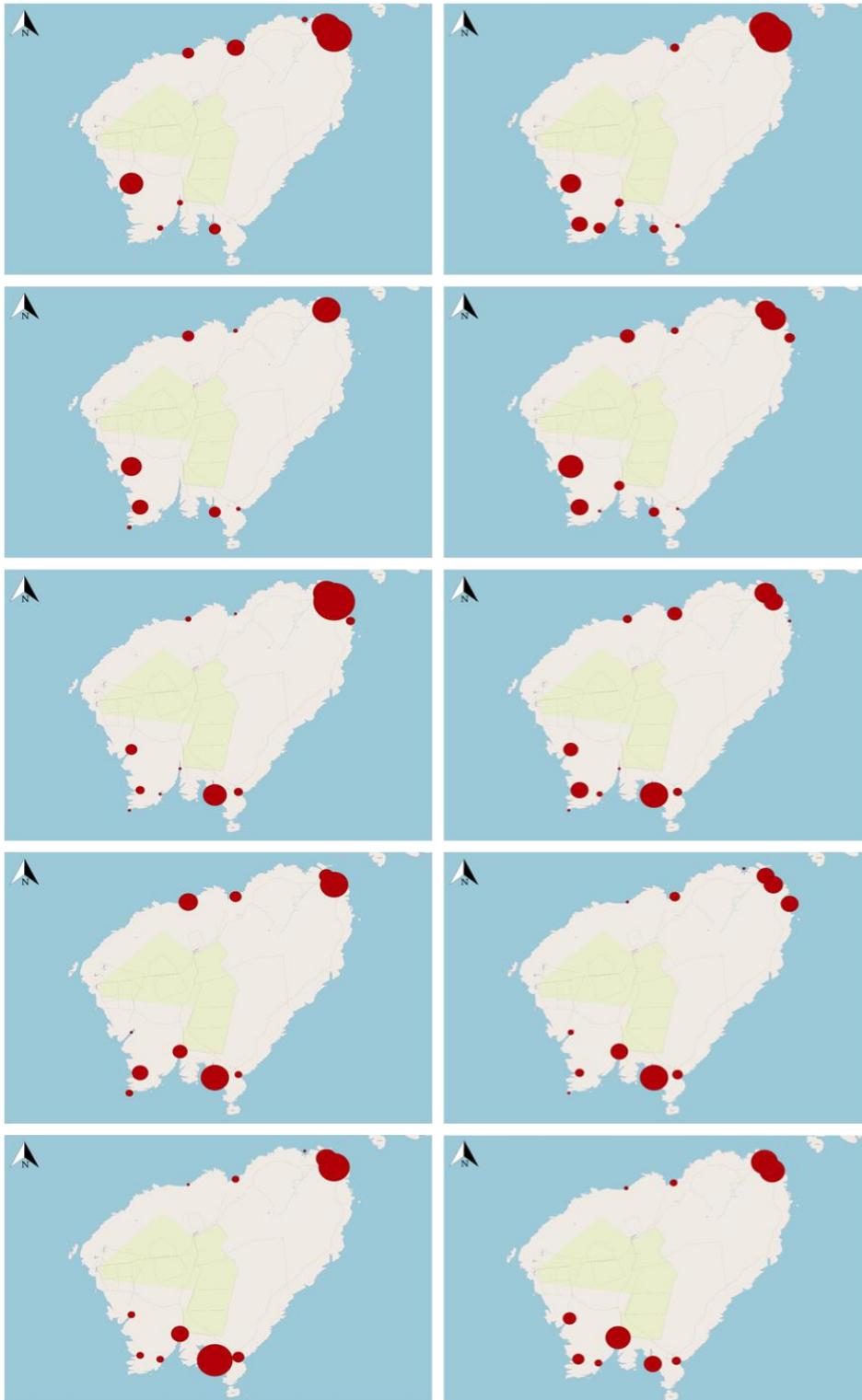


Figure 5: Pup distribution across the sites on the Calf of Man from 2009 – 2018 (* 2009 at the top, reading left to right – 2018 is the final one)



Mother ID

From the 25 mothers (38.5%) not identified, 14 of these had viable photographs of both side of their heads but were still unable to be identified using the catalogue. The remaining 11 were not witnessed at all. The potential reasons behind this will be addressed in the discussion.

Table 2: Proportion of mothers identified using the photographic catalogue and those not seen at all during or before the 2018 survey.

Number of mothers	Identified (%)	New / not identified (%)
65	61.5	38.5

Site fidelity

$$\% \text{ Fidelity} = \frac{\text{\# of times seen at site } x \text{ in 2018}}{\text{\# of times seen in previous years at any site}} \times 100$$

Females at four of the sites (Bay Fine; Gibdale; Smugglers' Cove; South Harbour) showed 100% site fidelity, meaning that each year they have been observed to have pups on the Calf of Man, it has continually been at that site.

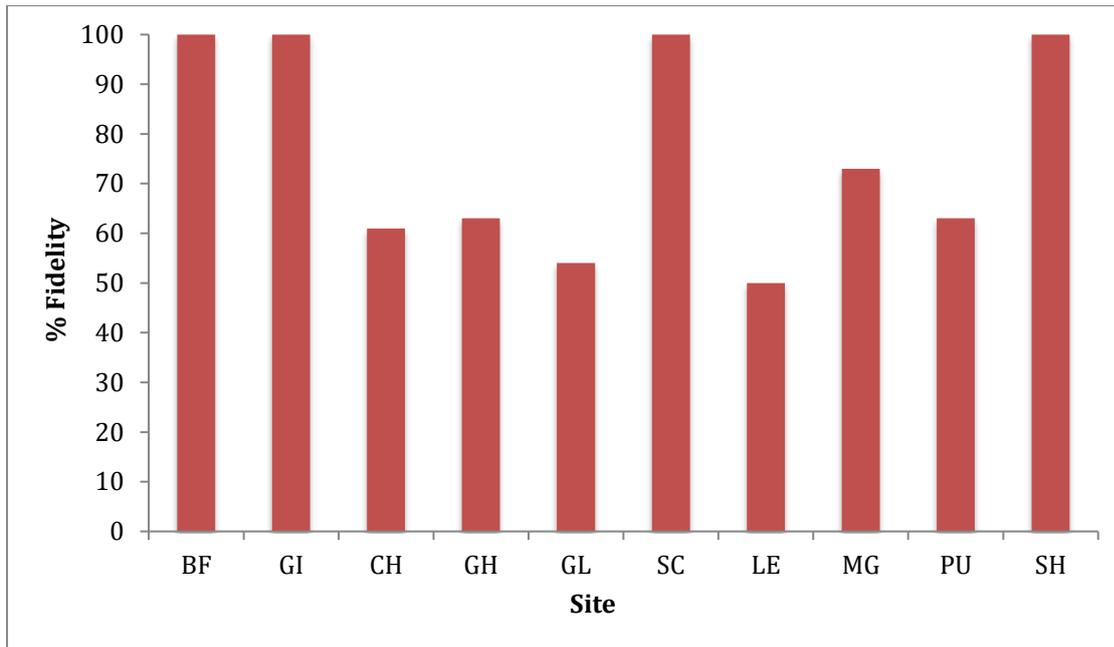


Figure 9: Fidelity (%) shown by 2018's females across all pupping sites. BF = Bay fine; GI = Gibdale; CH = Cow Harbour; GH = Grant's Harbour; GL = Ghaw Lang; SC = Smugglers' Cove; LE = Leodan; MG = Mill Giau; PU = Puddle; SH = South Harbour.



Discussion

Pup census

The overall trend in the seal population on the Calf of Man has been steadily increasing since the surveys began in 2009, with the exception of a spike in numbers in 2016 before decreasing again in 2017. This sharp increase may have been due to a number of reasons, such as more favourable weather conditions or an increased abundance in the seals' food supply (Pomeroy et al., 1994). Alternatively, it could have stemmed from systematic error during that year's data collection – for instance, some individual pups may have been counted twice or human error may have occurred during the photo ID process, though this is not certain. With an added trend line to the population trend graph, it can be predicted that approximately 70 pups will be born, if the current trend continues. However, it should be noted that we cannot be certain if there really has been a factual increase in seal numbers around the Calf of Man, or whether sampling effort or accuracy has simply improved. For instance, the survey's duration has differed slightly from year to year, and the quality of photos for the ID process (with the addition of a better camera) have improved, enabling the identification process to become more reliable in the years since the surveys began in 2009. This year's pup 'success' (survival rate) was 92%, which is an increase compared with a lower rate of 73% in 2017, though this relatively low rate can be attributed to the severe stormy weather experienced during that pupping season (e.g. storm Ophelia).

Births per week

The reduction in birth 'productivity' during week 4 of the 2018 survey coincided with a storm. Birth productivity here does not mean pup developmental success (i.e. survival rate) but simply the number of births per week; therefore it is unclear whether this is merely a coincidence or whether there is an underlying cause. It was originally hypothesised that females due to give birth may have the ability to detect adverse weather conditions and delay parturition. There is evidence to suggest that mammals, including some seal species, are able to delay post-copulatory fertilisation in order to aid sexual selection, though there is no evidence to show that a delay at the time of near-parturition is possible (Orr & Zuk, 2014). It can also be noted that, given the observed trend in birth rates for the 2018 season, we can confidently claim that the 'peak' pupping season was covered during the survey, with the final week's birth rate being only one pup born. It may, however, be beneficial to extend the survey to a seven-or-eight-week period over the coming years (starting earlier in the Autumn season), to ensure that the survey covers the full breadth of the seal pupping season each year.



Distribution

It was found that, similarly to previous years' data, the most 'popular' pupping sites (sites at which the highest number of births occurred) were Cow Harbour, Grants Harbour, Mill Giau and The Puddle. There appears to be little to no difference in pup density between the north and the south of the Calf, though it remains clear that certain sites are more desirable than others to females waiting to give birth. This desirability is likely affected by accessibility (how easy it is for females to haul out); how much 'dry' space there is for pups to rest above the high-tide-line; availability of food in nearby waters for females; shelter from adverse weather conditions and presence of pools (Pomeroy, Anderson, Twiss & McConnell, 1994; Pomeroy, Twiss & Redman, 2000; Anderson, Burton & Summers, 1975).

It can also be noted that the distribution of pups/pupping females and adults without pups is different. For instance, there have only been a very small number of pups born at The Cletts since 2009, though numbers of up to approximately 100 adults are frequently seen there at any one time during the survey season. One may speculate that, though there may be a lack of feasible pupping sites at The Cletts, it provides an appropriate breeding ground for adults without pups, or feeding grounds due to its proximity to the Isle of Man's shores and the Sound's strong currents. It would therefore be beneficial to explore the different factors that are associated with high numbers of seals in different life stages (females without pups; females with pups; males seeking a mate) before conclusions can be drawn about site characteristics that provide appropriate habitat for the species.

Photo ID

This year's survey showed that we have had 14 'new' (not previously identified, therefore assumed to be a first-time visitor) females giving birth to pups on the shores of the Calf of Man. This demonstrates the potential fluidity of British seal populations, in that they may have re-located from elsewhere in the British Isles to have their pups on the Calf, and supports the claim that transient individuals may be present (Crow, 2013). The 14 newcomers may also, however, simply be resident females who were breeding for the first time this year. The majority of seal mothers observed in this year's survey were identified as returning individuals. This further demonstrates to how desirable the Calf's coastline appears to be for breeding seals and their pups, since many individuals are choosing to return to the same beach to give birth year after year. The significance of this site 'fidelity' will be further discussed in the next section.

Site Fidelity



The results show that 50% or more site fidelity was observed within the females identified during the 2018 pupping season. Site fidelity within the female grey seals has been observed in other locations such as Isle of May, North Rona and the Moray Firth in Scotland (Pomeroy, Twiss & Redman, 2000; Pomeroy et al., 1994; Thompson et al., 1996). Factors affecting site fidelity such as topography, presence of pools and accessibility to the sea have been shown to be contributing factors (Pomeroy, Anderson, Twiss & McConnell, 1994; Pomeroy, Twiss & Redman, 2000; Anderson, Burton & Summers, 1975). However there are limitations within this conclusion as the data only includes the 40 females that were positively identified as being seen previously, and does not include the 11 females who weren't seen at all or the 14 new mothers. Therefore the results may not be an accurate representation of the whole Calf of Man.

Further analysis into the site topography would be beneficial to determine factors affecting female grey seal site choice on the Calf of Man. Collecting information from aerial photographs, slope, access to the sea and presence of pools of water to determine a score (Pomeroy, Twiss & Duck, 2000). This information could then be used to compare sites on the Isle of Man, if they are identified as potential sites for pupping, effort could be made to restrict access during the pupping season. Furthermore, it has been shown that Grey seals on the Isle of May have expressed natal philopatry (Pomeroy, Twiss & Redman, 2000), in that they have some extent of fidelity to the site in which they were born.

Limitations and future recommendations

With every scientific study comes a number of logistical constraints and limitations. During the 2018 seal population survey, one main surveyor (Libby Fox) remained on the Calf throughout (except 5 days), but a second 'constant' surveyor was not available for the entire season. Therefore, some changeovers were necessary and in particular during the third week of the survey, when Libby left and two completely new surveyors arrived. Due to stormy weather there was not the usual possibility of a '24 hour changeover' period, during which information and methods would have usually been conveyed and shared. Each new survey volunteer required the necessary training in data collection methods and health and safety while completing surveys in challenging conditions and unfavourable terrain. At times, this had the potential to increase the risk of human error. It would be beneficial to ensure the same group of people cover the survey's duration each year, though it must be acknowledged that it is often not possible to recruit appropriately-skilled people for 6-week unpaid positions under challenging conditions, and that this may simply be one of the unavoidable limitations of surveys of this nature.

There were potential detectability issues at certain sites, such as Bay Fine, at which the shore is filled with large rocks making it ideal for young pups to be concealed by. During



the survey, we were aware of a pup that had been born at Bay Fine and should have still been there based on its age, but we were unable to see the pup on several occasions. It was therefore difficult to know whether the pup was still there but hiding, or whether it had moved or died. A similar situation occurred across a few sites during this season's surveys, but due to the nature of the landscape (steep cliffs) and requirement to keep a distance of 50m from seals to avoid disturbing them, a hindered detectability/visibility may be another unavoidable limitation of the survey.

When carrying out photo ID, it was often difficult to determine whether the ID was a match because of the poor quality of some of the photographs taken in previous years, though this can be understood due to lack of a high quality long-lens camera in the first few years of the survey. It can therefore be assumed that there is a potential risk of identification error, in that some individuals may have been counted twice or incorrectly identified as a "new" female, despite the possibility she may have already been on the system with an old, low-quality photograph. The risk of identification error can be minimised as much as possible by ensuring new volunteers gain some training in how to correctly ID seals using their markings, so they can be sure that the ID matches are accurate.



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Appendix

Appendix 1: The 5 stages of pup development used for reference.

Stage	Age	Characteristics	
Stage 1	0-2 days	Thin baggy-skinned body Yellow stained or white natal fur Conspicuous umbilical cord Docile & poorly coordinated	
Stage 2	3-7 days	Smoother bodyline, few loose folds Neck still distinguishable Umbilical cord atrophied Aware & coordinated	
Stage 3	7-15 days	Rounded or barrel shaped body Neck thickened/indistinguishable Partial moulting from head or flippers May be aggressive on approach	
Stage 4	16-20 days	Rounded body Partial moulting from torso Head & flippers moulted May be aggressive on approach	
Stage 5	18-25+ days	Fully moulted to short fur coat (< 100cm ² natal coat remaining) May be aggressive on approach	



DATE:										
SITE ID	SITE NAME	TIME	ADULTS	PUPS	TIME	ADULTS	PUPS	TIME	ADULTS	PUPS
BF	BAY FINE									
GI	GIBBDALE									
WoC	WEST OF COW									
CH	COW HARBOUR									
GH	GRANTS HARBOUR									
CL	CLETTS									
↑ NORTH	↓ SOUTH									
GL	GHAW LANG									
SC	SMUGGLERS CAVE									
LE	LEODAN									
MG	MILL GIAU									
PU	PUDDLE									
SH	SOUTH HARBOUR									
TOTAL:			0	0	TOTAL:	0	0	TOTAL:	0	0

Appendix 2: The daily log template.

Calf Seal Pups 2018

Pup Number	Pup Name (letter R)	Date First Seen	DoB (if known)	Location	New Location?	Mother name/ID	Date at Stage 2	Date at Stage 3	Date at Stage 4	Date at Stage 5
1										
2										
3										
4										

Appendix 3: Seal developmental template.

Records	Individual Number	Nickname	Sex	Location	Pup?	Pup DOB/*first seen
1	001	Scarback	F			
2	002	Heartbean	F			
3	003		F			
4	004	Pancake	F			

Appendix 4: Catalogue of individual females and the information about the pups for 2018.