



Protecting *Manx Wildlife*
for the future

Calf of Man Seal Surveys

Autumn Report 2014



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1. Introduction

The grey seal (*Halichoerus grypus*) is widely distributed throughout UK waters, with an estimated population size of 97,000–159,000 individuals in this area, equating to 39% of the global population (JNCC, 2007). Within the Irish Sea, where 5,000–7,000 individuals reside, the Isle of Man is an important haul-out site, providing ample coastline for resting and plentiful foraging opportunities (Stone et al., 2013). Important haul-out sites include The Sound, Langness, Maughold Head and the Calf of Man (Stone et al., 2013). The Calf of Man in particular, is a notable haul-out and pupping site (Barne et al., 1996), frequented by seals annually (Crow, 2013).

1.1 Study site

The Calf of Man (hereafter referred to as 'the Calf') is a largely-uninhabited islet off the south coast of the Isle of Man. The Calf boasts a diversity of habitats and species-rich communities, perhaps due to the presence of both exposed and sheltered areas (Barne et al., 1996). Grey seals inhabit both beaches and rocky inlets, that provide ideal conditions for hauling out and parturition (Crow, 2013). Although seals may use haul-out sites year-round, pupping season occurs in the autumn, typically between September and November (Stone et al., 2013).

1.2 Aims and objectives

1. Produce a grey seal pup census for the Calf; recording pup name, date of birth, mother ID and progression through developmental stages. Furthermore, pup location will be recorded in order to map pup distribution and determine relative popularity of sites.
2. Obtain photographic identification profiles of observed individuals to compare with the historical ID database, in order to determine whether individuals sighted previously, return to the Calf and particular sites in 2014.
3. Conduct a behavioural survey in order to investigate both male and female behaviour. An additional mother focal study aims to examine parental behaviours and provide an insight into differing personalities amongst the population.

2. Methods

Calf observation-based seal surveys have been conducted annually since 2009. The present survey was undertaken over a five-week period from 26/09/2014 to 31/10/2014. The entirety of the Calf was surveyed, including 15 sites where seals have been known to haul-out historically (**Figure 1**). The survey area was divided into the northern route (Bay Fine to The Cletts and all sites in-between) and the southern route (Ghaw Lang to South Harbour and all sites in-between). The following volunteers/staff were involved in conducting the seal surveys on a weekly basis: Bryony Manley, Emma Websdale, Steve Marsh, Becca Crow, Lara Howe and Mike Prior. Each week one or two volunteers would be responsible for conducting the surveys and at the end of the week there was a short change over period, during which information about pups was shared with new volunteers. It was particularly important to discuss areas where there were high numbers of seals.

2.1 Data collection

Surveys were conducted on a daily basis, with both routes surveyed each day. Observations were non-invasive and disturbance kept to a minimal level, through use of a long lens SLR camera and maintaining a distance of 50m. At each site date, location and numbers of pups,

females (juvenile and adult) and males (juvenile and adult) were recorded. Each pup was named using a designated letter for the 2014 cohort, in this instance the letter was 'N'. Pup developmental stage was also noted (**Appendix 1**). The observation of suckling behaviour was used to determine mother-pup pairs. Where possible, two photographs were taken of each individual adult, one of both the left and right side of the head (ideally with a wet pelage), for photographic identification at a later date.

Behavioural surveys were predominantly conducted in blocks of 2.75 hours (165 minutes) of continuous observation. Observation periods were separated into 15-minute intervals, in which the presence of behaviours was recorded separately for males and females. The following 11 behaviours were focused on: hauled out and resting (HR), hauled out and aggressive (HA), hauled out and travelling (HT), hauled out and suckling (HS), hauled out and courtship (HC), in the water and resting (WR), in the water and aggressive (WA), in the water and travelling (WT), in the water and courtship (WC), moving from land to sea (L-S) and moving from sea to land (S-L).

For the mother focal study mothers and corresponding pups (up to three mother and pup pairs at any one time) were observed for three-hour periods. At five-minute intervals the presence or absence of suckling behaviour was recorded, in addition to the distance between mother and pup. Four distance bands were used: <1m, 1-5m, 5-10m and >10m.

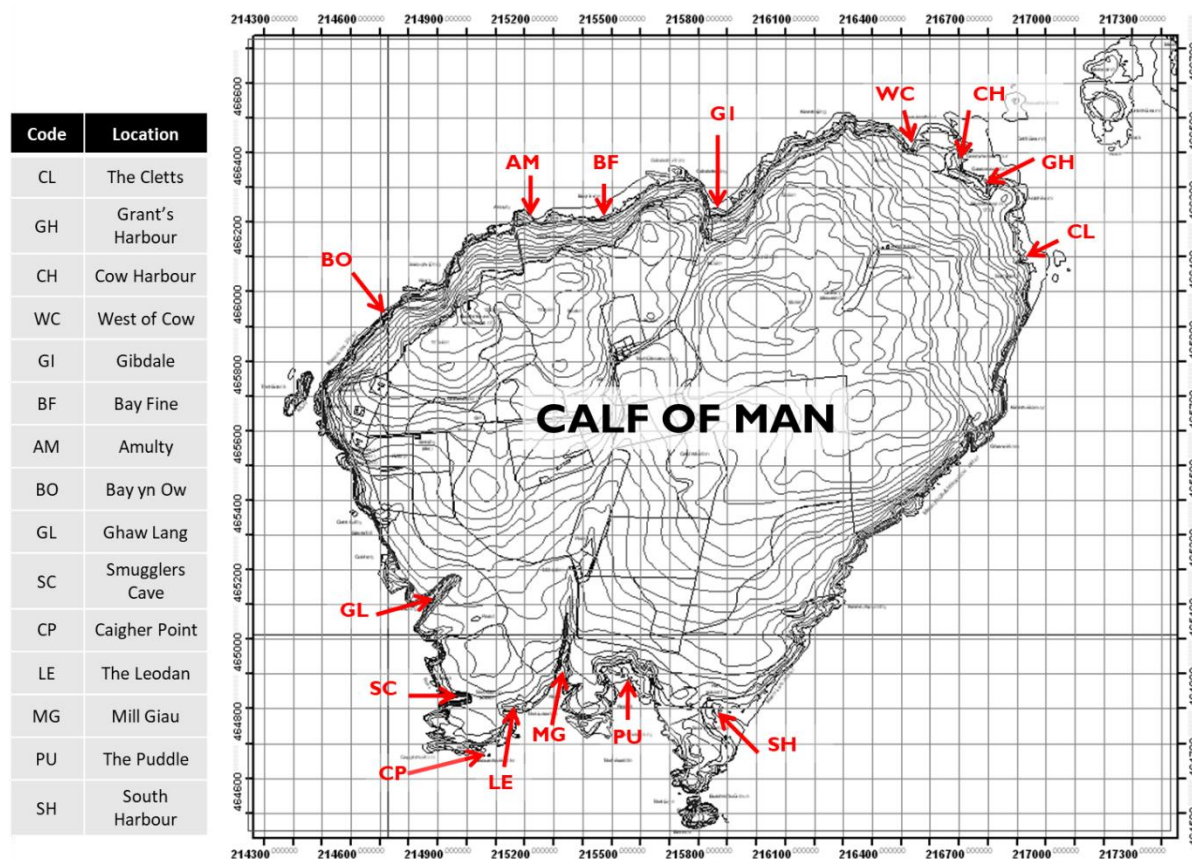


Figure 1 – Calf of Man historic pupping locations.

2.2 Data processing

Each day, data obtained was inputted onto existing Excel spreadsheets; daily log, pup developmental progress and ID catalogue. The ID catalogue contains photographs of each individual (females and males) previously seen on the Calf, labelled by the location at which the individual was first sighted. The left and right profile shots displaying a unique pelage pattern can be used to identify individuals. Once added to the catalogue, obtained photographs were compared to historical images and any females, including those exhibiting nursing behaviour, could be identified. Similarly, males were identified and recorded using the ID catalogue. In some instances it was not possible to obtain both left and right profile shots of individuals, but rather just left or right only. Photos of these individuals were added to the 'left/right nearly' catalogue.

3. Results

3.1 Pup census

A total of 52 pups were recorded across 14 sites (including 11 historic sites). Of these, 25% (n= 13) were known to survive to stage 5 of development (fully weaned), 15.38% (n= 8) were confirmed deceased and a further 59.62% (n= 31) were unaccounted for (**Table 1**). It is uncertain whether this insufficient data indicates survival or death and thus these individuals are subsequently referred to as 'missing'. **Figure 2** depicts the trend in total number of pups over a 6-year period from 2009 to 2014. There appears to be a positive trend with an increasing number of pups born annually, although there was no change between 2010 and 2011. There was only a minor increase between 2013 and 2014 from 50 to 52 individuals.

Table 1 – Total number of pups recorded and relative proportions of surviving, deceased and missing individuals.

Number of pups	Survived/weaned (%)	Deceased (%)	Insufficient data/missing (%)
52	25.00	15.38	59.62

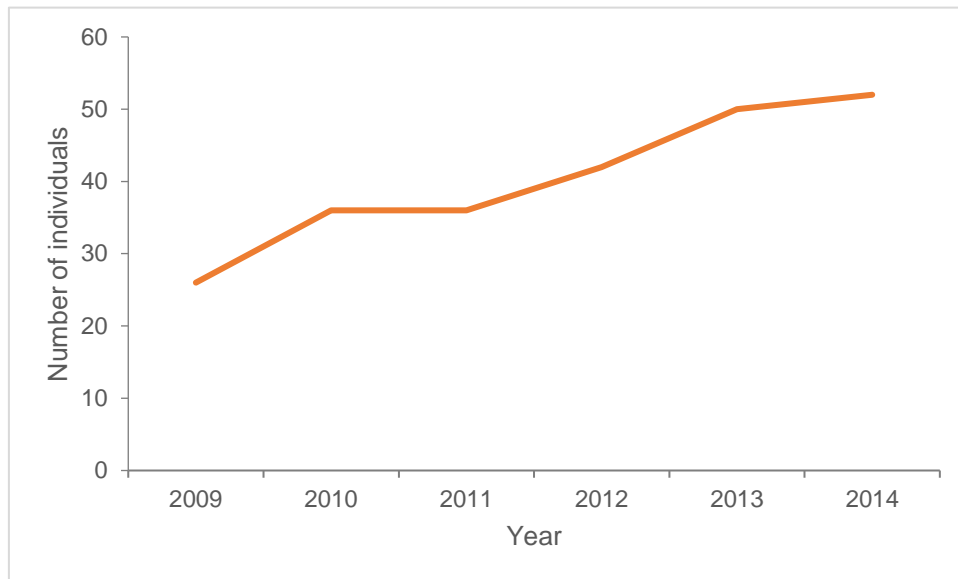


Figure 2 – Total number of pups observed on the Calf each year between 2009-2014.

3.2 Births per week

Figure 3 shows that the number of pups born was lowest in week 1 with just one confirmed birth in this week. Four other individuals were also sighted in week 1 (one individual at stage 1 and three individuals at stage 2), indicating births had occurred prior to the start of the survey. Number of births peaked in week 2, with 13 confirmed births. Following week 2 there was a gradual decline in number of births, with a slight increase in week 5 where one additional birth was recorded. It is possible that additional births occurred after the end of the survey, particularly as the study was conducted over a shorter time-frame of 5 weeks, compared to 5.5-6 weeks in previous years in which births were recorded in November.

Occasionally, exact date of birth was unknown, however for those individuals for which date of birth was known (25 individuals/48%), first sighting was usually on the same day and no more than three days after. Therefore, date first seen is a relatively good indicator of date of birth and likewise **Figure 3** shows a similar trend line for both records.

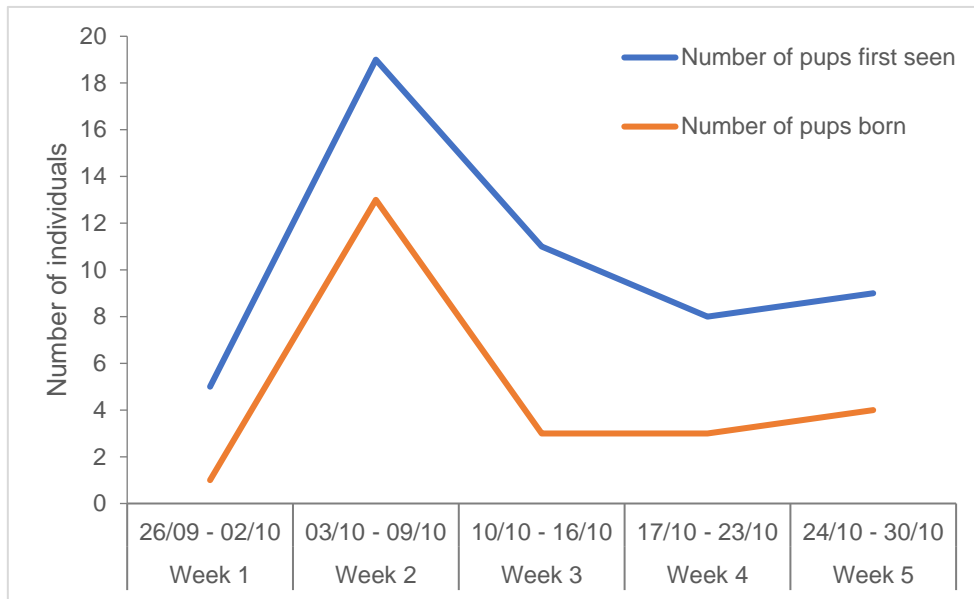


Figure 3 – Rate of pups born/first seen per week during the five-week survey period. Number of pups born describes pups for which exact birth date was known.

3.3 Pup distribution

Of the 52 pups recorded in total, 48 individuals were recorded across 11 historic sites. A further four individuals were first sighted at three alternative locations: two individuals between Caigher Point (CP) and The Leodan (LE), one individual between Ghaw Lang (GL) and Smugglers Cave (SC) and one individual between Gibdale (GI) and Bay Fine (BF) (**Figure 4**). The greatest number of individuals were recorded at The Puddle (PU), on the south coast of the Calf, equating to 19.23% of pups ($n=10$), followed by Cow Harbour (CH) and Grants Harbour (GH) each with 13.46% ($n=7$) of pups. Amulty (AM), Mill Giau (MG) and Fold Point (FP) were the least popular pupping sites, with only 1.92% of pups recorded at each of these locations. No pups were recorded at Bay yn Ow (BO), The Cletts (CL), Caigher Point (CP), The Leodan (LE) or West of Cow (WC). Overall 55.77% ($n=29$) of pups were located at southern sites and 44.23% ($n=23$) were located at northern sites.

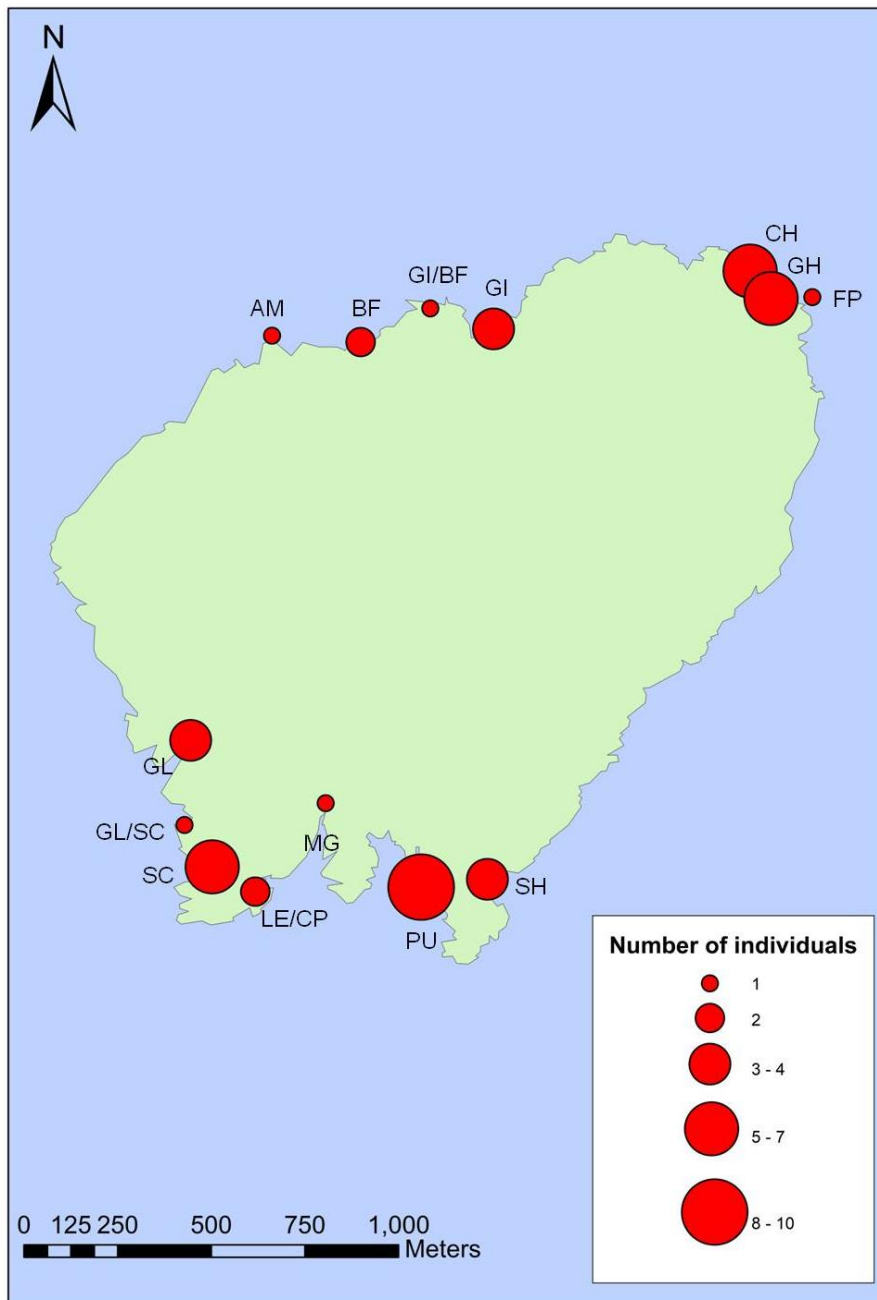


Figure 4 – The distribution of pups across 14 pupping sites on the Calf. Symbol size equates to number of individuals present/abundance. AM= Amulty, BF= Bay Fine, GI= Gibdale, CH= Cow Harbour, GH= Grants Harbour, FP= Fold Point, SH= South Harbour, PU= The Puddle, MG= Mill Giau, LE/CP= The Leodan/Caigher Point, SC= Smugglers Cave, GL= Ghaw Lang.

3.4 Mother ID

Of the 52 pups recorded, 63.46% (n= 33) of corresponding mothers were identifiable (viable left and right profile shots were obtained and added/compared to previous catalogue photographs) (**Table 2**). Furthermore, 60.61% (n=20) of the identified individuals had previously given birth and 39.39% (n=13) were first time mothers. Mother identification was unsuccessful for 36.54% (n= 19) of pups (**Table 2**).

Table 2 – Relative proportions (%) of identified and unidentified mothers, based on photographic identification methods.

Number of pups/mothers	Identified mothers (%)	Unidentified mothers (%)
52	63.46	36.54

3.5 Catalogue

As of 2014, there are 115 females and 16 males in the ID catalogue (for which left and right profile shots have been acquired). Of these, 28 females and no males were newly added to the catalogue this year. Additionally, there are 28 'L/R nearly' records which describe individuals that have been observed but at present photographs of both the left and right profile are unavailable.

3.6 Behaviour

Behavioural observations were conducted for a total of 97.75 hours (424 observation intervals) at six sites, across 17 days. The total observation time for each site is depicted in **Table 3**.

Table 3 – Total behavioural observation effort (hours) across six sites (GI= Gibdale, CH= Cow Harbour, GH= Grants Harbour, CL = The Cletts, SH= South Harbour, PU= The Puddle).

Site	Observation effort (hours)
GI	3.00
CH	35.75
GH	19.25
CL	2.75
SH	8.25
PU	28.75

Figure 5 displays the relative proportion of the occurrence of behaviours, considering both males and females. This depicts the number of observational intervals for which each of the 11 behaviours occurred. Resting whilst hauled out (hauled/resting) was the most frequently performed behaviour, occurring in 81.37% of intervals. Similarly, resting whilst in the water (in water/resting) occurred in 75.00% of intervals. This is consistent with results obtained in each of the previous survey years (2009-2013) in which resting behaviours (hauled out and in the water) occurred most frequently. Suckling was observed in 9.43% of intervals, similar to the value obtained in 2009 (8%). However between 2010 and 2013 suckling behaviour occurred more frequently, ranging between 15%-21%.

When considering males and females separately, both sexes exhibited resting behaviour most frequently, particularly whilst hauled out (**Figure 6**). Whilst it looks as though females performed these behaviours more than males, it should be noted that there were more females present and therefore more females were observed than males.

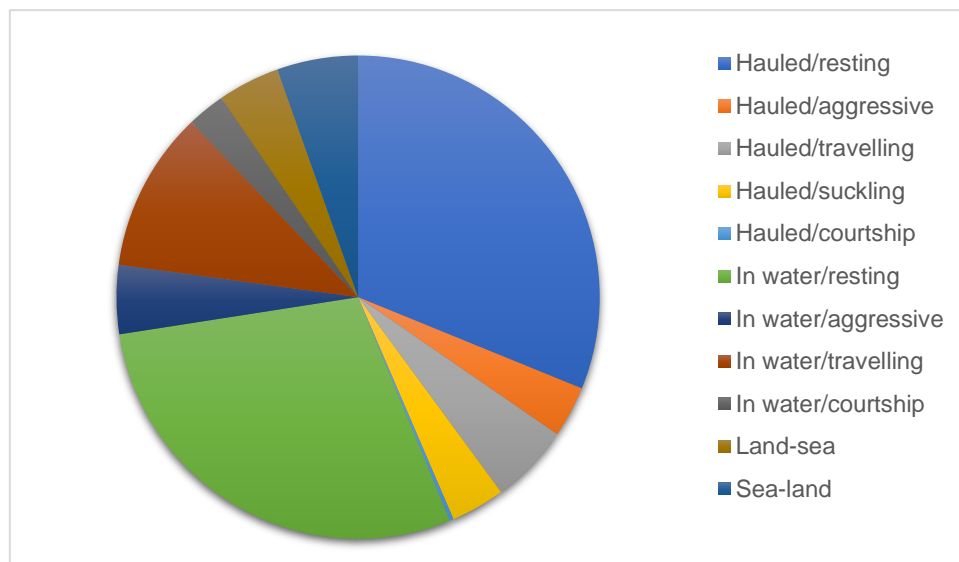


Figure 5 – Occurrence of behaviours exhibited by both males and females, as proportions of the number of observation intervals for which the behaviour occurred.

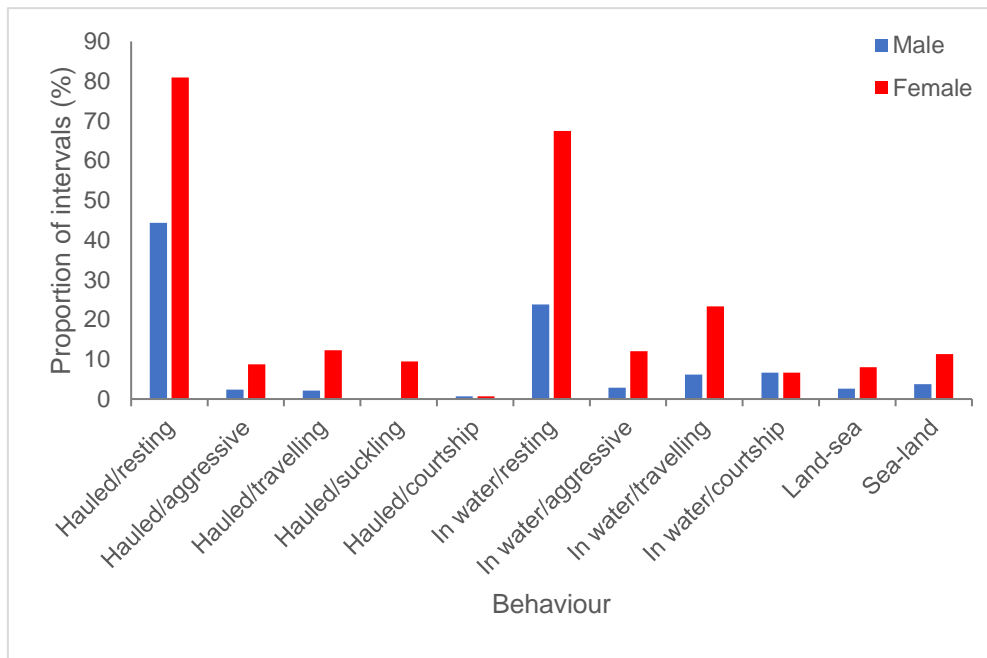


Figure 6 - Occurrence of behaviours exhibited by males and females, as proportions of the number of observation intervals for which the behaviour occurred.

3.6.1 Mother focal study

Behavioural observations of individual mothers totalled 79 hours. It should be noted that several mothers could be observed simultaneously, resulting in a greater number of total observation hours when considering each individual separately (**Table 4**).

Table 4 – Total observation effort (hours) per individual and corresponding location. In total, 36 mothers were observed, however 16 individuals were unidentified and thus are described as ‘unknown’.

Mother ID	Observation effort (hours)	Location
004	15.00	CH
007	12.00	GH
017	9.00	CH
098	9.00	SH
074	8.75	GH
129	8.08	PU
135	8.08	PU
094	6.00	CH
101	6.00	SH
130	6.00	CH
133	6.00	CH
136	6.00	PU
137	6.00	PU
138	6.00	PU
030	5.08	PU
005	3.00	GH
014	3.00	CH
102	3.00	PU
132	3.00	PU
070	2.50	GH
Unknown	9.60	Various

3.6.1.1 Suckling

Across 36 mothers (20 identified and 16 unidentified), the average proportion of intervals during which suckling was observed was 4.50%. This is similar to the value obtained in both 2013 (4.60%) and 2012 (6.50%). Proportionally, individual 102 (mother to Nabcy) exhibited the greatest level of suckling (11.11% of intervals). Individuals 005 (mother to Nostradamus), 101 (mother to Nancy), 129 (mother to Nutloaf) and 132 (mother to Neo) did not exhibit any suckling during observations.

For ten individuals with the greatest number of pup births since 2009, the proportion of intervals during which suckling occurred is displayed in **Table 5**. This demonstrates a low level of individual variation in time spent suckling with pups. There does not appear to be any relationship between the proportion of intervals during which suckling occurred and number of pups known to have been born to the mother since 2009. Furthermore, the extent of suckling observed does not appear to be associated with pup survival. None of the ten pups born to these mothers died, with five confirmed to reach stage 5 development.

Table 5 – The relative proportion of intervals during which suckling was exhibited for ten individuals, selected on the basis of the total number of pups born to them since 2009. Location is also displayed (GH= Grants Harbour, CH= Cow Harbour, SH = South Harbour, PU= The Puddle).

Mother ID	Proportion of intervals suckling (%)	Number of pups	Location
007	5.56	6	GH
004	4.44	5	CH
005	0.00	5	GH
014	8.33	5	CH
017	3.70	5	CH
074	9.52	3	GH
094	9.72	2	CH
098	2.78	2	SH
101	0.00	2	SH
102	11.11	2	PU

A comparison of the proportion of intervals during which suckling was exhibited for two individuals that were observed each year between 2012 and 2014, is depicted in **Figure 7**. Interestingly, both individuals appear to have spent less time suckling this year compared to 2013, however overall suckling behaviour appears to have increased for individual 014 and decreased for individual 007.

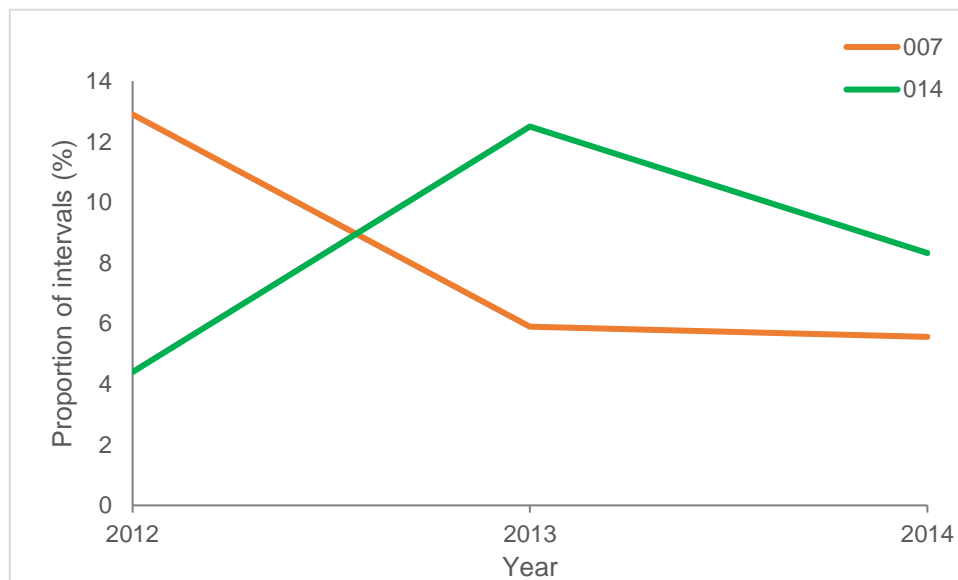


Figure 7 - Change in the proportion of intervals during which suckling was observed for two individuals that were observed during the mother focal study, for the past three years (2012-2014).

3.6.1.2 Distance from pup

Maternal investment and behavioural strategies may also be investigated by recording the distance between a mother and pup. **Figure 8** displays the proportional distance of the ten key mothers from their pups, as recorded in each of the observation intervals. Overall average distance, including all individuals, is also depicted. On average, >10m was the most frequently observed distance between mothers and corresponding pups (35.09%). When considering the ten key mothers, individual 007 (mother to Nero) spent the greatest proportion of intervals less than 1m away from her pup (43.06%). It may be of interest to note that this individual has also had the greatest number of pups on the Calf since 2009 (six pups), however any link between these variables cannot be proven. There appears to be substantial variation between the individuals perhaps reflecting personality differences, particularly differing vigilance.

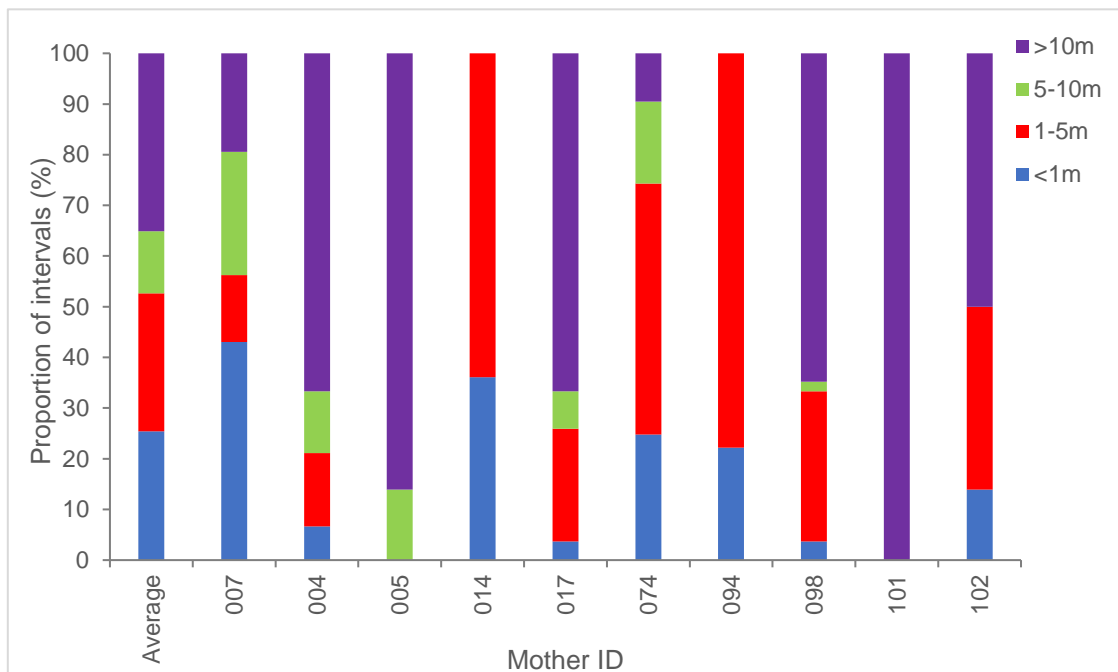


Figure 8 – The relative proportion of intervals during which each of the four distance bands were observed (distance between mother and corresponding pup). Mother-pup distance for ten key mothers (selected on the basis of the total number of pups born to them since 2009) are displayed in addition to overall average.

Figure 9 and **Figure 10** display the comparative distance bands for the two individuals observed during 2012, 2013 and 2014 (individuals 007 and 014 respectively). The results depict that each of the individuals exhibited somewhat different behavioural patterns across the years. This year, individual 007 spent a greater proportion of intervals less than 1m from her pup and fewer intervals at a distance of 5-10m. In both 2013 and 2014, individual 007 also spent slightly more time at a distance greater than 10m, compared to 2012.

During observations, individual 014 spent no time at a distance greater than 5m from her pup. A similar proportion of intervals were spent at a distance of less than 1m in the past three years, however intervals of 1-5m distance have substantially increased this year.

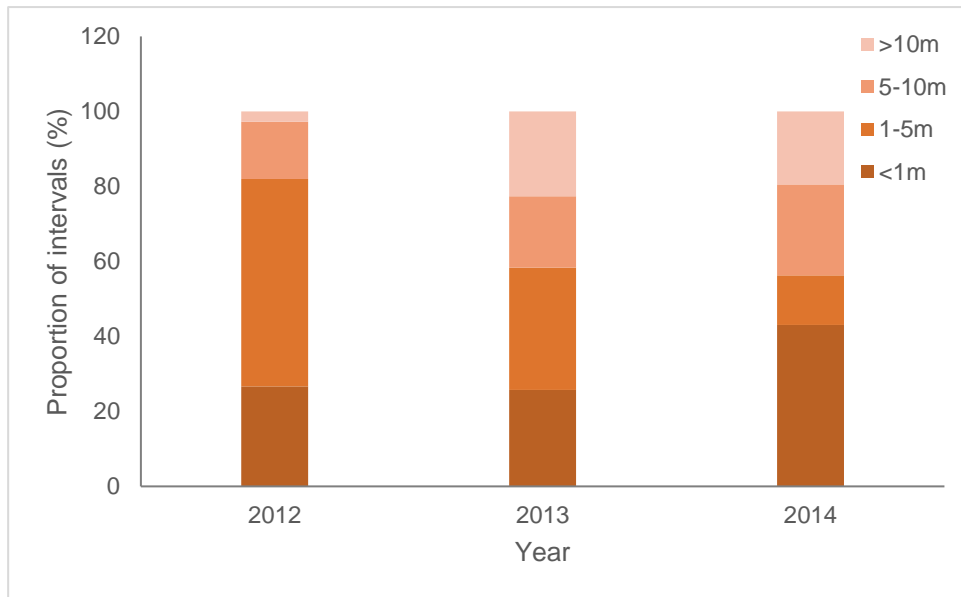


Figure 9 – The relative proportion of intervals during which each of the four distance bands were observed (distance between mother 007 and corresponding pup) across three years (2012-2014).

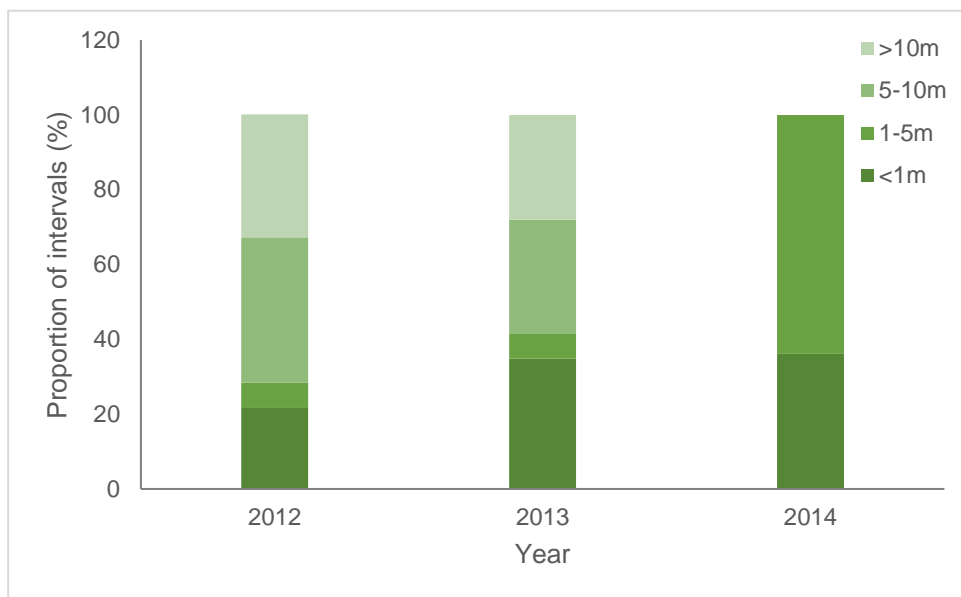


Figure 10 – The relative proportion of intervals during which each of the four distance bands were observed (distance between mother 014 and corresponding pup) across three years (2012-2014).

4. Discussion

4.1 *Pup census*

Overall, 2014 pup survival rate appears relatively high (84.62%) when considering all pups that were not confirmed deceased. Only eight individuals (15.38%) were confirmed deceased, however in previous years (2009-2013) this value was much lower with only 0-2 pup deaths recorded, equating to 0-7.69% mortality rate. The reason for this is uncertain, however it is possible that increased mortality rate may have resulted from factors such as food supply, which may vary between years (Anderson et al., 1979). Grey seal pup mortality rate recorded for a colony observed in the Outer Hebrides was similar, ranging from 14.3-23.2% (Baker, 1984), suggesting the value obtained presently may not be unusually high and thus not a major cause for concern. Insufficient data was obtained for the majority of pups (59.62%) and it is uncertain whether these individuals survived to stage 5 of development or died. It is possible that the location of these individuals had changed (e.g. to a position that was not in observer field of view) or perhaps these individuals were washed off and unable to re-position themselves on haul-out sites, as is sometimes the case for grey seal pups (Anderson et al., 1979). If this is the case, overall productivity was low on the Calf this year, though this cannot be assumed based on the data obtained. It should be noted that at some sites where there were high numbers of pups it is possible that surveyors were uncertain of the identify of pups, making it difficult to record the developmental progress of each individual. This is likely to have become particularly difficult at later development stages when pups become more mobile and may have moved position compared to prior survey days. This may in part explain why insufficient data was available for a substantial portion of individuals.

There appears to be a general increase in pup observations/births between 2009-2013. This may suggest the Calf grey seal colony is undergoing successful growth or perhaps the area is becoming a more popular pupping site for transient individuals. However, it is uncertain whether the data obtained is truly reflective of an increase in seal abundance or whether it is in fact describing an improvement in sampling effort and/or accuracy.

4.2 *Births per week*

Birth rate/number of pups recorded was greatest during week 2 of the survey period. It is perhaps likely that this time period (03/10 – 09/10), in which there were 13 confirmed births, covered the peak of pupping season for this year. Births/sightings on either side of this week were much lower supporting this conclusion. However, the total survey period covered just five weeks and thus it may be beneficial to extend survey duration to 6-8 weeks. This would ensure the entire pupping season is covered and allow for more accurate determination of peak parturition period.

4.3 *Pup distribution*

The most frequented sites were The Puddle (PU), Cow Harbour (CH) and Grants Harbour (GH). Likewise, in each of the previous years, most pups were observed at Grants Harbour (GH) often closely followed by a similarly high number at Cow Harbour (CH). This may suggest that these locations are particularly important pupping sites. The popularity of these sites may be affected by accessibility, level of 'dry space'/area above the high-tide line and level of exposure to weather conditions (Pomeroy et al., 1994; Pomeroy et al., 2000a), which is perhaps likely when considering both sites possess gentle shelving beaches with some higher areas to haul-out in stormier conditions. Due to their geographical position, the most popular sites are more sheltered from north-westerly prevailing winds (Barne et al., 1996),

possibly contributing to the higher numbers of pups observed at the northeast corner and southern sites.

High levels of adult seals without pups have previously been reported in The Cletts (CL) area, south of Grants Harbour (GH) (Manx Bird Atlas, 2007). In contrast, no pups were reported at The Cletts (CL) in the present study, perhaps implying the site requirements for pupping differ from those for general hauling out/resting. Whilst some rocky outcrops and patches of suitable haul-out substrate are retained, The Cletts (CL) is largely covered by water at high-tide, thus making it unsuitable for pupping. Further investigation exploring specific biotic and abiotic factors influencing pupping site selection may be beneficial to increase understanding of pup survival rate.

4.4 Mother ID

A relatively high proportion of mothers were identified (63.46%), meaning the photography and cataloguing process was successful. It is possible that photograph quality (particularly of older photographs) restricted identification to some extent. Of the 13 first-time mothers, 12 females had not been previously sighted around the Calf. This potentially suggests the Calf may be an important pupping site for transient individuals/those that migrated to the area specifically for the purpose of parturition. Alternatively, in some instances grey seals have been shown to express natal philopatry, whereby they return to the site at which they were born (Pomeroy, 2000b), and thus it is possible that these individuals were born on the Calf and have returned to give birth once reaching sexual maturity. It will be interesting to learn whether these 'new' individuals return in following years.

4.5 Behaviour

Overall behavioural patterns of males and females, both combined and separately, show similar patterns this year to those of previous years. It is perhaps unsurprising that both males and females exhibited resting behaviour most frequently as grey seals are known to predominantly use land for rest (Pomeroy et al., 2000a).

Four of 20 identified mothers (two of which were considered key individuals) were not observed to exhibit any suckling behaviour. Previous research has suggested that whilst mothers on minimally disturbed beaches typically suckle their own pups consistently, disturbance can result in a breakdown of the mother-pup bond and cause inconsistent or lack of suckling (Fogden, 1971). Therefore, it is possible that the presence of surveyors disturbed mothers, influencing the likelihood of suckling occurring. However, surveyors made sure to approach carefully (slowly and quietly) and wherever possible a considerable distance was maintained. Therefore the impact surveyor presence had on suckling is perhaps fairly low. Furthermore, observations were limited to three-hour periods and thus it should be considered that suckling behaviour is likely to have occurred at alternate periods throughout a day, not exclusively during observations.

Variation in suckling behaviour and mother-pup distances may be indicative of different personality traits. These differences may reflect the complex society that grey seals live in and suggest varying levels of ability to adapt to a changing environment (Twiss et al., 2012). It is also possible that varying mother-pup distances over a three-year period for individuals 007 and 014, imply changes in personality traits or perhaps even learning, particularly as both individuals have consistently given birth at the same location for six and five years respectively (007 at Grants Harbour and 014 at Cow Harbour). However, two individuals is a very limited sample size and it cannot be certain that any patterns seen are not a result of other variables (e.g. abiotic conditions or crowding).

4.6 Limitations and future recommendations

There are several limitations which are likely to have impacted the present survey. The abundance and distribution of pups recorded may not be a fully accurate reflection of true values, as pups may have been miscounted at various locations. Decreased visibility/variable weather conditions, topography (e.g. large rocky outcrops and steep cliffs) and the 50m distance between the observer and the seals (implemented to minimise disturbance) may have reduced the likelihood of sighting seals. Similarly, the number of pups may have been underestimated or overestimated (duplicate counts of a single individual) on occasions when a high number of seals were hauled-out at any one time. At particularly crowded sites it often proved difficult to tell individuals apart. Furthermore, during the photo identification process, the poor quality of some photographs made it difficult to be certain of a match. Therefore, there was a risk of identification error and thus it is possible that individuals deemed to be new to the Calf may have been present previously. Further constraints include the extensive time and effort required to conduct the identification process (comparing photographs with the large collection already existing in the catalogue), and volunteer change-over periods which only allowed a short time for discussion of findings between volunteers.

The results from the present survey suggest the Calf is an important pupping site for grey seals inhabiting the Irish Sea. Whilst site popularity may vary annually, there are particular sites that have appeared to retain relatively high pup sightings since 2009 (e.g. Grants Harbour (GH) and Cow Harbour (CH)). This year, The Puddle (PU) has been more popular than previously, and thus it will be interesting to see if this site retains a high abundance of pups in upcoming years.

It would perhaps also be insightful to record abiotic factors and greater detail about each site, in order to investigate site selection and how such factors influence seal abundance. Being able to draw conclusions about pupping site requirements would be invaluable for conservation of the grey seal in Manx waters.

The Manx Wildlife Trust was granted a licence by the Isle of Man Department of Environment, Food and Agriculture (DEFA) in order to carry out this research.





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6. Appendices

Appendix 1: The 5 stages of pup development.

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	