Cyfoeth Naturiol Cymru
Natural Resources Wales

Skomer MCZ Grey Seal Survey, Marloes Peninsula 1992-2016.

Kate Lock, Philip Newman, Mark Burton and Jennifer Jones

NRW Evidence Report No 195

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1. Crynodeb Gweithredol

Mae morloi llwyd yn nodwedd ar Barth Cadwraeth Morol Sgomer ac mae morloi bychain i'w gweld ar safleoedd Ynys Sgomer a phenrhyn Marloes. Mae cynllun rheoli morloi Parth Cadwraeth Morol Sgomer yn adnabod y dangosyddion perfformiad a gofynion monitro rhesymegol.

Cychwynnwyd monitro rheolaidd ar forloi bychain ar Ynys Sgomer ym 1983 ac ar Benrhyn Marloes yn 1991. Er 1992 mae arolygon systematig wedi'u cynnal yn dilyn dulliau safonedig y ceir eu manylion yn 'Llawlyfr Morloi Llwyd Sgomer' a chynllun rheoli morloi diwygiedig Parth Cadwraeth Morloi Sgomer a Gwarchodfa Natur Genedlaethol Ynys Sgomer 2015.

Mae cynhyrchiad morloi bychain yn safleoedd penrhyn Marloes fel canran o gyfanswm cynhyrchiad morloi bychain ym Mharth Cadwraeth Morol Sgomer wedi cynyddu. Rhwng 1992 a 2002 cyfrannodd y safleoedd gyfartaledd o 22% o gyfanswm y cynhyrchiad, gan gynyddu i 45% yn 2013 a'r cyfartaledd yn ystod y pum mlynedd ddiwethaf yw 41% o gyfanswm y cynhyrchiad.

Yn ystod y cyfnod astudio mae cynnydd wedi bod yn nifer y morloi bychain a aned yn safleoedd penrhyn Marloes. Ganed cyfartaledd o 50 o forloi bychain rhwng 1992 a 2002 gan gynyddu i'w niferoedd brig o 153 o forloi bychain yn 2014. Y cyfartaledd yn ystod y 5 mlynedd ddiwethaf, (2012 i 2016) oedd 141 o forloi bychain.

Yn gyffredinol mae goroesiad morloi bychain yn amrywio o flwyddyn i flwyddyn, y cyfartaledd a gofnodwyd ar gyfer 1992 i 2016 yw 78%, yr isaf a gofnodwyd oedd 67% yn 2001 a'r cofnod uchaf oedd 91% ym 1999.

Digwydd genedigaethau morloi bychain yn bennaf rhwng misoedd Awst a Thachwedd er ceir cofnodion achlysurol o forloi bychain yn cael eu geni yn gynt ac yn ddiweddarach yn ystod y tymor. Yn safleoedd penrhyn Marloes roedd yr wythnos frig ar gyfer cynhyrchiad morloi bychain yn amrywio rhwng wythnos 37 i 40 gyda chyfartaledd ar wythnos 38 (17 – 23 Medi).

Traeth caregog a Jeffry's Haven, y ddau yn faeau bychain wedi'u lleoli ar ochr ddeheuol Parc y Ceirw, yw'r safleoedd mwyaf poblogaidd sydd i gyfrif am 47.6% o gynhyrchiad morloi bychain y tir mawr. Mae cyfradd marwolaethau morloi bychain yn amrywio o safle i safle ac wedi'u rhannu rhwng marw-anedig, wedi marw a marwolaeth dybiedig. Mae disgrifiadau a chrynodebau o gynhyrchiad a marwolaeth morloi bychain wedi'u cynhyrchu ar gyfer pob safle unigol.

Argymhellir parhau â'r arolwg morloi bychain blynyddol ar safleoedd penrhyn Marloes. Mae angen canlyniadau cyfun arolwg Penrhyn Marloes ac ynys Sgomer er mwyn adrodd ar statws morloi ym Mharth Cadwraeth Morol Sgomer yn dilyn Cynllun Rheoli Morloi Parth Cadwraeth Morol Sgomer. Mae canlyniadau'r arolwg hefyd yn hanfodol i werthuso statws nodwedd poblogaeth y morloi llwyd yn Ardaloedd Cadwraeth Arbennig Morol Sir Benfro amgylchynol.

2. Executive Summary

Atlantic grey seals are a feature of the Skomer Marine Conservation Zone and seal pupping sites are found both at Skomer Island and Marloes peninsula sites. The Skomer MCZ seal management plan identifies the rationale, performance indicators and monitoring requirements.

Regular monitoring of seal pup production started on Skomer Island in 1983 and on the Marloes Peninsula in 1991. Since 1992 systematic surveys have been completed following standardised methods detailed in the 'Skomer Grey Seal Handbook' and the revised Skomer MCZ and Skomer Island NNR seal management plan 2015.

Pup production at the Marloes peninsula sites as a percentage of the total pup production in the Skomer MCZ has increased. From 1992 to 2002 the sites contributed an average of 22% of total production, increasing to 45% in 2013 and the average over the last five years is 41% of total production.

During the period of study there has been an increase in numbers of pups born at the Marloes peninsula sites. An average of 50 pups were born between 1992 and 2002 increasing to a peak of 153 pups in 2014. The average over the last 5 years, (2012 to 2016) was 141 pups.

Overall pup survival varies between years, the average recorded for 1992 to 2016 is 78%, the lowest recorded was 67% in 2001 and the highest record was 91% in 1999.

Pup births occur mainly from August to November although there are occasional records of pups born both earlier and later in the season. At Marloes peninsula sites the peak week of pup production has fluctuated between week 37 to 40 and averages at week 38 (17th – 23rd September).

Pebbly beach and Jeffry's Haven, both small bays located on the southern side of the Deer Park, are the most popular sites accounting for 47.6% of mainland pup production. The mortality rate of seal pups varies between sites and is divided between still born, died and mortality assumed. Descriptions and summaries of pup production and mortality have been produced for each individual site.

It is recommended that the annual seal survey at the Marloes peninsula sites is continued. The combined results of the Marloes Peninsula and Skomer island survey results are needed to report on the status of seals in the Skomer MCZ following the Skomer MCZ Seal Management Plan. The survey results are also essential to evaluate the status of the grey seal population feature of the surrounding Pembrokeshire Marine SAC.

3. Marloes Peninsula grey seal survey 1992 to 2016

3.1 Introduction

3.1.1 Historical survey

Records of estimated Grey seal (*Halichoerus grypus*) population on the Pembrokeshire coast, including the Marloes Peninsula, have been made intermittently since 1947 (Davies 1949). It was not until 1973 that seal breeding and pup production studies to assess total seal populations commenced, including work by Anderson (1977) and Cullen (1978).

Cullen (1978) completed surveys of pup numbers at sites on the Marloes peninsula from 1973 to 1977 (Table 1). The results indicated that there had been an increase in the population in this area during this period.
In 1977 Cullen recorded 29 pups at the Marloes peninsula sites (Table 2) and suggested this indicated that seal numbers were increasing. He also proposed that the beaches could accommodate higher numbers of pups and that the Grey seal had not exploited all breeding sites available around the coast.

Table 1 Grey seal pup numbers at Marloes peninsula sites 1973 to 1977 (Cullen, 1978)

Year	1973	1974	1975	1976	1977
Number recorded	7	13	13	21	29

Table 2 Grey seal pup numbers at Marloes peninsula sites 1977 (Cullen 1978)
(Survey period September and October 1977)

Site	**Total pup numbers**
Little Castle Bay	1
Three Doors Cave	3
Renney Slip Cave	1
Anvil Beach (Boulder Beach)	4
Cathedral Cave (Horseshoe Cave	3
Pebbly Beach	5
Jeffrys Haven	4
Nostril Cave (Wooltack Cave)	8

(Names in brackets are the currently used names for these sites)

Since 1977 intermittent observations were made by amateur naturalists including the Brathay Exploration group in 1985 and 1989. In 1987 a liaison officer was appointed for the voluntary Skomer Marine Reserve and they maintained notes of seal pup numbers on the Marloes peninsula.

3.1.2 Skomer Marine Conservation Zone seal pup surveys

Skomer Marine Nature Reserve was designated in 1990 and became the Skomer Marine Conservation Zone (Skomer MCZ) in 2014. The site boundary extends around Skomer and Middleholm islands and around the Marloes peninsula and it is located within the Pembrokeshire Marine Special Area of Conservation (SAC). Atlantic Grey seals are a feature of both the Skomer MCZ and the Pembrokeshire Marine SAC.

Grey seal pup surveys have been completed at Skomer island sites since1983 and from 1990 have been the responsibility of the Skomer Marine Conservation Zone. Since then the surveys have been completed at the Skomer Island sites annually under contract to Wildlife Trust South and West Wales staff and at the Marloes peninsula sites by the Skomer MCZ staff. The surveys have followed standardised methods detailed in the 'Skomer Grey Seal Handbook' (Poole 1996a).

In 2015 a Skomer MCZ seal management plan (Alexander 2015) was completed which identified the rationale, performance indicators and monitoring requirements.

The results of the annual seal pup surveys are summarised in the Skomer MCZ project status report (Burton *et al* 2016). This is a summary of the seal production for both the Skomer Island and Marloes peninsula sites and conservation status targets identified in the management plan are assessed.

A full contract report is produced annually for the Skomer island sites surveys (Buche & Stubbings 2016), and includes: site production and survival summaries, identification of seals, haul-outs, pollution, disturbance and behaviour records. However, for the Marloes peninsula sites a detailed report was only ever produced in 1991 and the need for a summary report for these sites from 1992 to 2016 has been identified.

3.1.3 Report aims

The aim of this report is to summarise the results for the Marloes peninsula surveys from 1992 to 2016.

The objectives are:

1. To summarise the Marloes peninsula seal pup production as a component of the total production of Skomer MCZ.

2. To provide a summary of pup production, survival and probable cause of death of any fatalities for the Marloes peninsula sites.

3. To provide individual pupping site descriptions and site summaries of pup production and survival.

3.2 Survey method

3.2.1 Site visits and seal pup recording

All the main Grey Seal pupping sites on the Marloes Peninsula (Figure 1), are checked regularly from mid-August to December.

Most pups are found within two to three days of being born and therefore their date of birth is known reasonably accurately. Pups born in the cave sites have their date of birth estimated based on their size and development using E.A. Smith's five-stage age classification system (see Appendix 1).

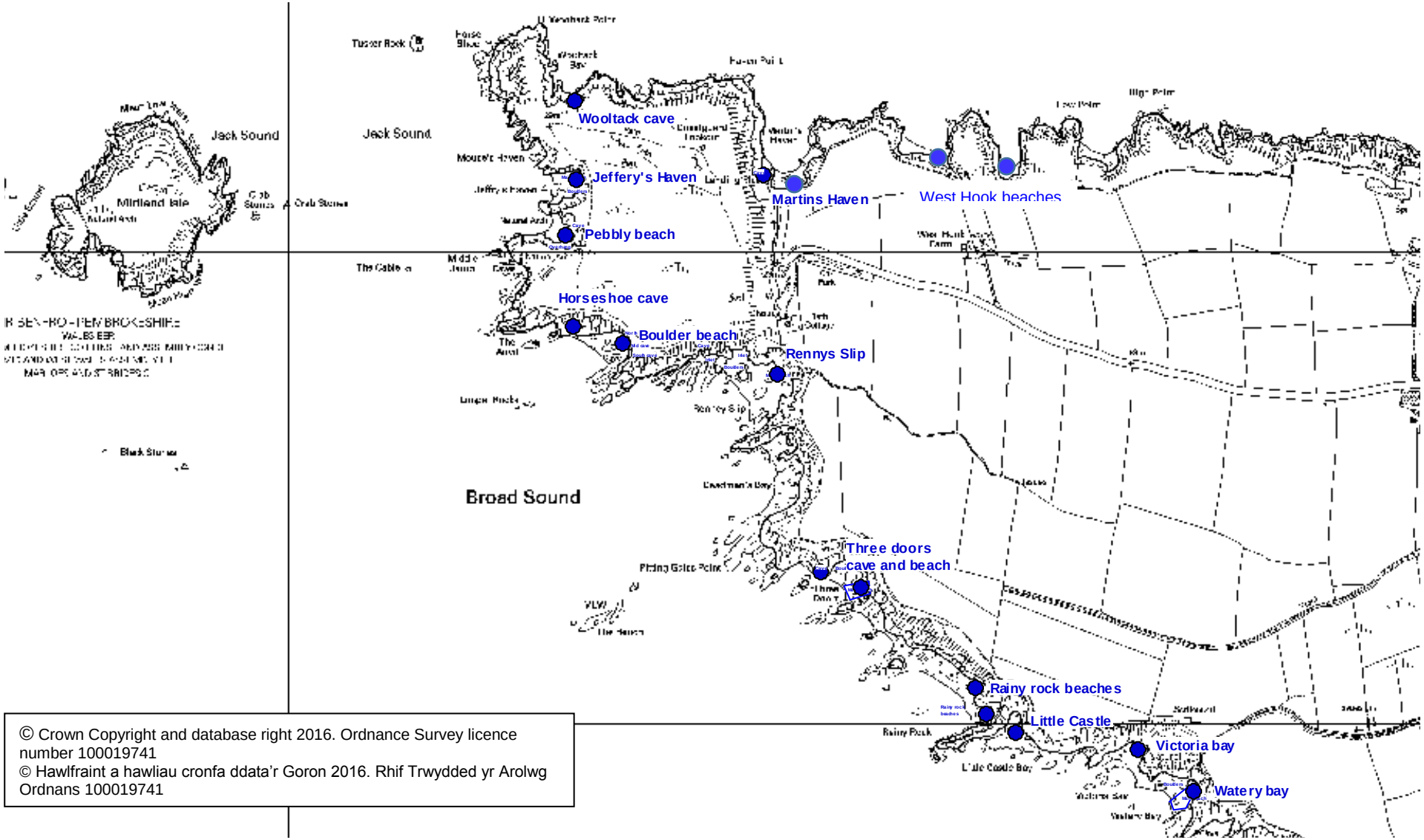
Each pup is allocated an individual number and its progress from birth through to moult is recorded, as laid out in the Grey seal monitoring handbook: Skomer Island (Poole 1996a) and more currently in the Skomer MCZ and Skomer Island NNR Grey Seal Management Plan (Alexander 2015).

When possible, beach and cave sites are visited by boat and swimming to shore to allow spray marking of the pups, following the method described in Poole (1996a). The marks assist with individual pup identification whilst monitoring their progress through to moult. During site visits disturbance is kept to a minimum and is avoided when a cow is present guarding her pup.

The Deer Park beaches: Martins Haven, Jeffry's Haven, Pebbly beach, Boulder beach and Renney Slip are checked 3-4 times a week from cliff top viewpoints. The south Marloes peninsula: Three doors bay, Rainy rock beaches, Little Castle bay, Victoria bay and Watery bay are checked twice a week also from cliff top viewpoints.

The cave sites: Wooltack cave, Horseshoe cave and Three Doors cave can only be accessed from the sea, as can West Hook beaches. These are only visited when the weather and tides allow access by boat.

Figure 1 Marloes Peninsula seal pupping sites



3.2.2 Condition at moult and survival assessment

Assessment of the condition of each pup when last seen is made to give an indication of its likelihood of survival. This is based on their size, health and stage of development along with the parental care it has received.
The following assessment scale is used:

Size	E. A Smith's age classification	Assessment
Very small	Class 1 or 2	Assumed not to survive
Small but healthy	Class 2, 3, 4 or 5	In good condition, reasonable chance of survival
Good size	Class 3, 4 or 5	Most should survive
Very good size	Class 3, 4 or 5	All should survive
Super moulter	Class 4 or 5	All should survive

This is a subjective assessment and requires some practice for consistency. Regularly observing pups as they grow will make this assessment easier. It also means assessment can be made if the pups 'disappears' from the beach before it has moulted or if access to a site limits observations. If when last seen the pup was healthy and well attended by its mother, it can be recorded as 'assumed survival'. In general this is for class 3 pups but does include some healthy class 2 pups.
If when last seen the pup was very small and still a class 1 or 2 pup then it is assumed not to have survived.

3.2.3 Mortality assessment

Mortality will occur for a number of reasons including still-birth, abandonment, insufficient growth and weather. It is not always possible to know the reason for death so for analysis purposes it has been simplified into three groups:

Stillborn	These include both stillborn and those that died immediately after birth and were not seen alive.
Died	All pups seen alive but subsequently recorded dead. These can be from class 1 to 5.
Assumed mortality	These include pups assessed not to have survived following the survival assessment scale in 3.2.

3.3 Results

3.3.1 Site visits and pup recording

During the 1992 to 2016 surveys the beach sites were checked and the pups monitored regularly from the cliff top viewpoints.

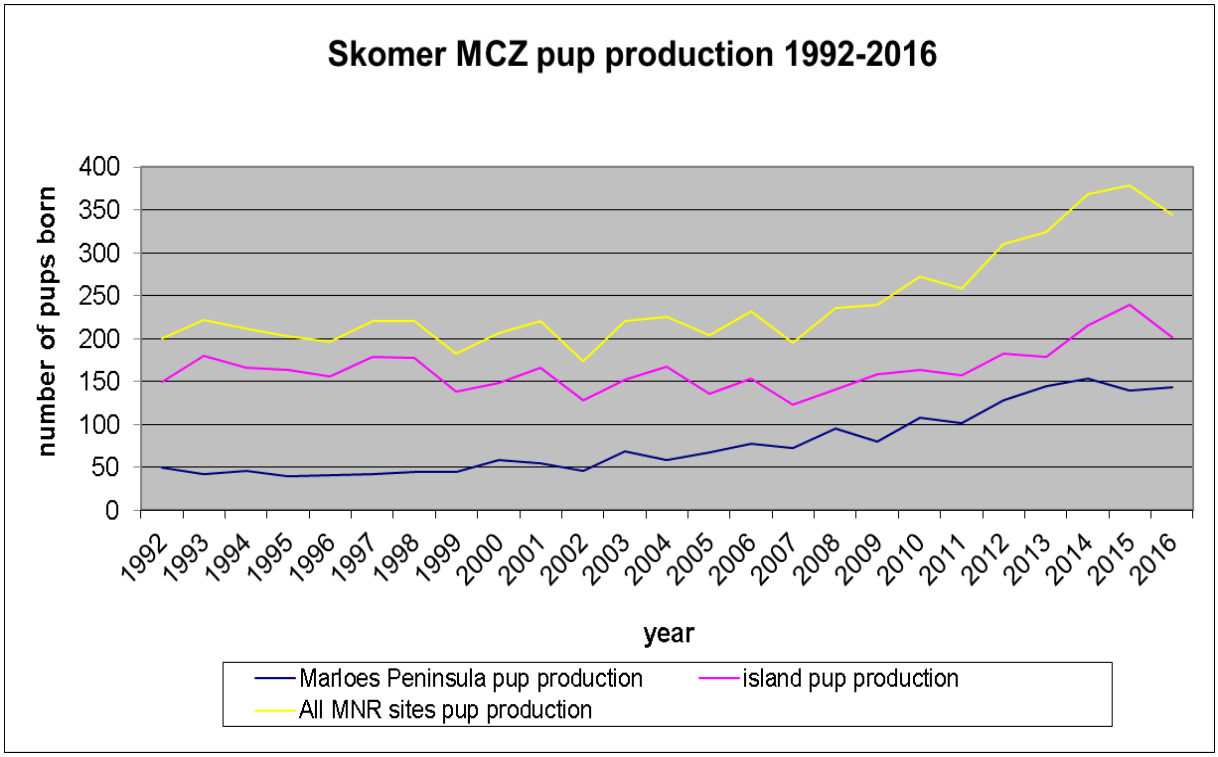
In 1992 pup production for each site was recorded and then each pup was monitored to provide the total survival to moult, mortality assessment for each pup however was not completed. The 1992 data have therefore not been used in the overall mortality assessment for the Marloes peninsula or for the individual sites summaries.

Between1992 to 2006, when possible, both the beach sites and cave sites were visited by boat and swimming to shore to allow marking of the pups. However from 2007 the number of pups born at many sites had increased and disturbance became difficult to avoid, therefore a decision was made to stop the beach visits and to complete the survey by regular cliff top survey only. Cave visits were also reduced to observations into the cave entrances from the boat, except for Martins Haven cave that could be accessed from the beach at low water.

3.3.2 Skomer MCZ pup production

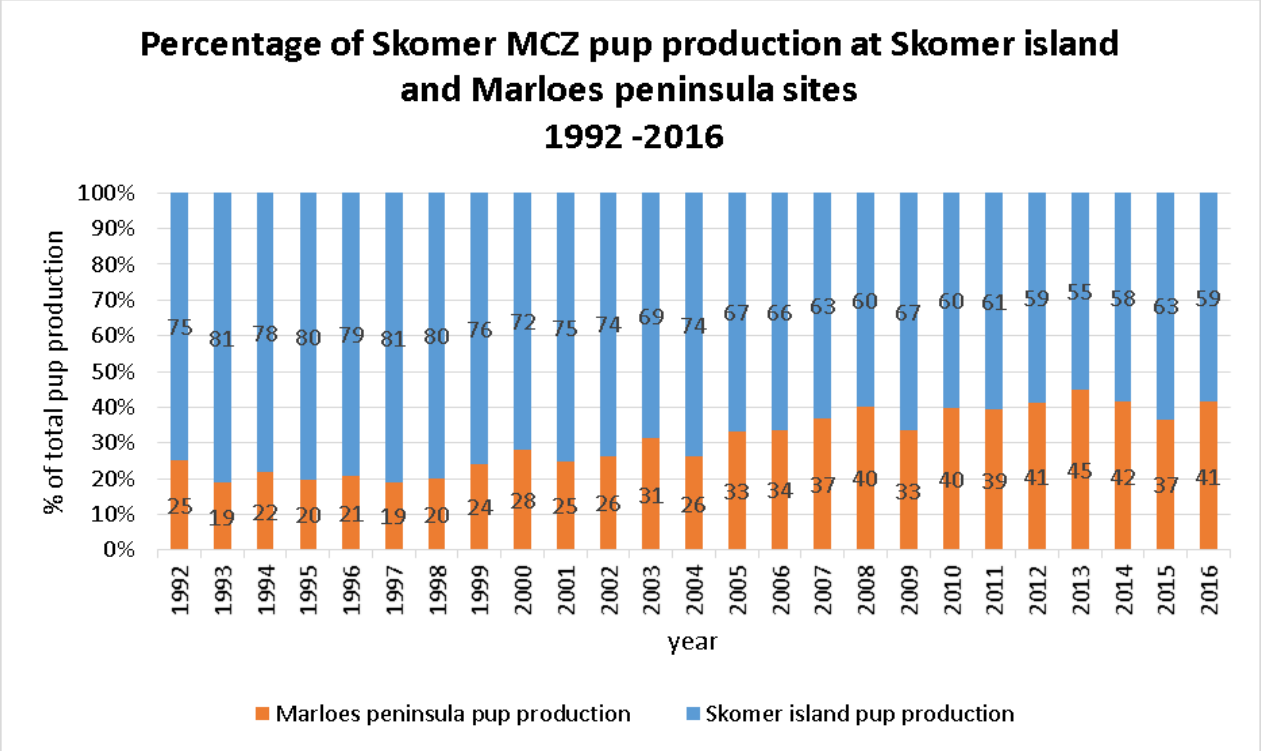
The total pup production in the Skomer MCZ from 1992 to 2008 remained fairly consistent with the expected natural fluctuations as shown in Figure 2. During this period there was an average of 208 pups born per year. Since 2009 there has been a steady increase in pup production: The greatest increase has been seen at the Marloes peninsula sites, but there has also been increases at the island sites from 2012. Pup production in the Skomer MCZ for the past 5 years has shown the highest totals recorded for the area with average production for 2012-16 at 345 pups.

Figure 2 Skomer MCZ pup production 1992 to 2016



Pup production at the Marloes peninsula sites versus the Skomer island sites expressed as a percentage of the total pup production for the Skomer MCZ is shown in Figure 3. From 1992 to 2002 Marloes peninsula contributed an average of 22% of total production, this has then gradually increased to a peak of 45% in 2013 and the average over the last five years is 41% of total production.

Figure 3 Percentage of Skomer MCZ production at Skomer Island and Marloes peninsula sites 1992 to 2016.

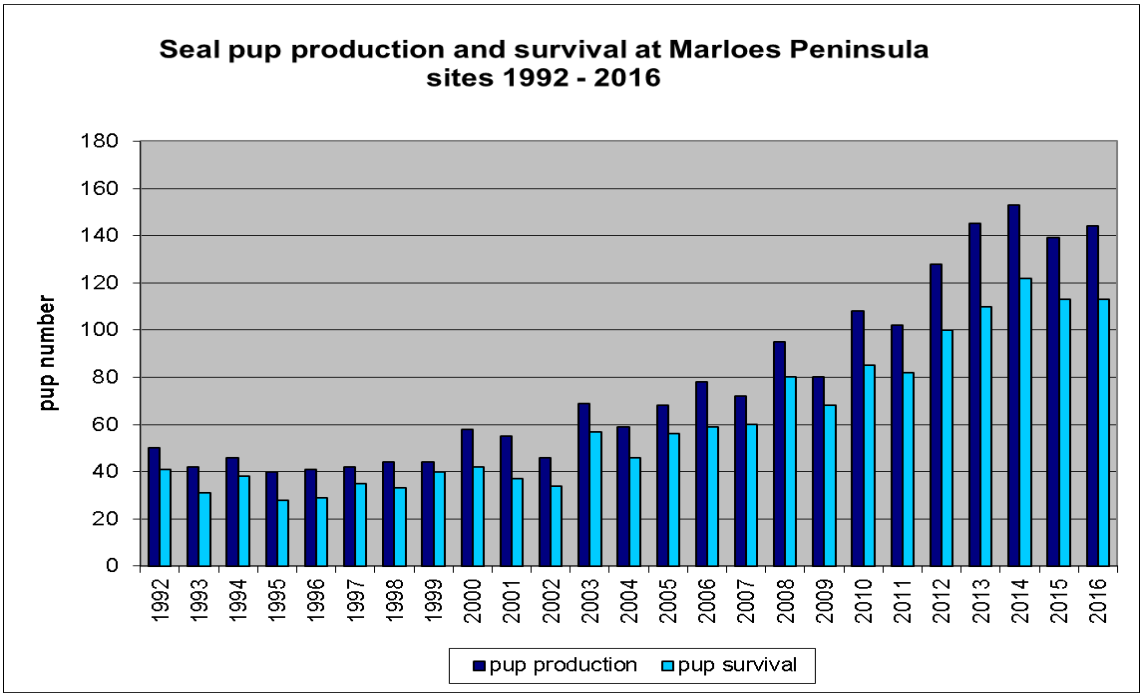


3.3.3 Marloes peninsula seal pup production and survival

During the period of study there has been a gradual increase in numbers of pups born at the Marloes peninsula sites (Figure 4). Between 1992 and 2002 an average of 50 pups was born at the mainland sites, but from 2003 a gradual increase of numbers occurred to a peak in 2014 of 153 pups. The average over the last 5 years, (2012 to 2016) was 141 pups.

Overall pup survival varies between years, the average recorded for 1992 to 2016 is 78%, the lowest recorded was 67% in 2001 and the highest record was 91% in 1999.

Figure 4 Seal production and survival at Marloes peninsula sites 1992 to 2016

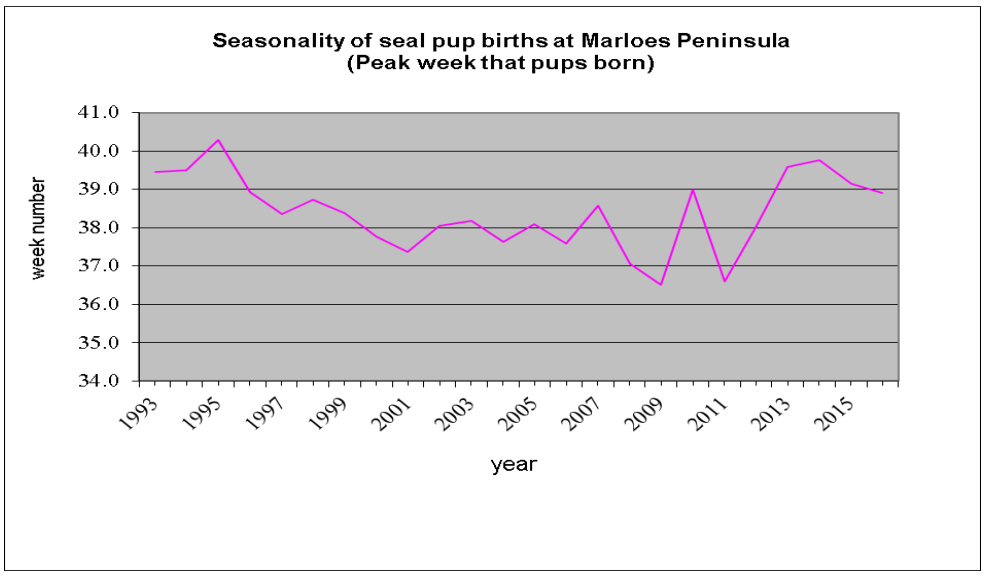


3.3.4 Seasonality of births

Pup births occur mainly from August to November although there are occasional records of pups born both earlier and later in the season. There are also occasional records of spring and summer births. Weekly figures are maintained for pup births from week 32 (beginning of August) to week 50 (mid-December) so that the seasonality of births can be identified and the average week of pup births be identified.

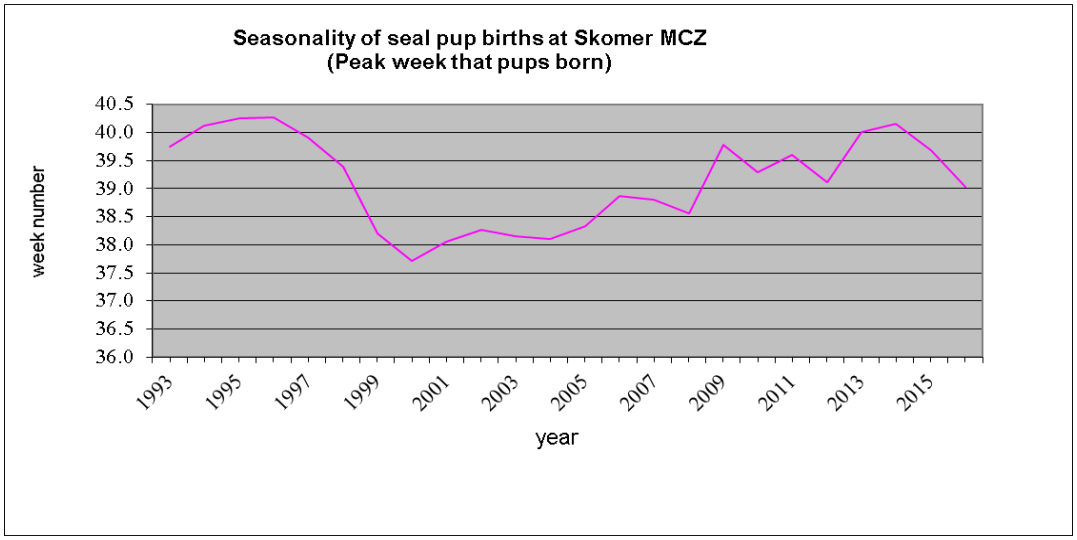
At Marloes peninsula sites the peak week of pup production has fluctuated between week 37 to 40 and averages at week 38 (17th – 23rd September), as shown in Figure 5.

Figure 5 Seasonality of pup births at Marloes Peninsula sites 1993 to 2016



The data for Skomer MCZ (Skomer island and Marloes Peninsula sites) shows a similar pattern of fluctuation between the years with an overall average at week 39 (24-30th September), Figure 6. 1993 to 1997 averages were in week 40 (1-7th October) but then it shifted to the earlier week 38 (17-23rd Sept) from 1999 to 2008. Since 2009 there has been a shift back to the average between week 39 and week 40.

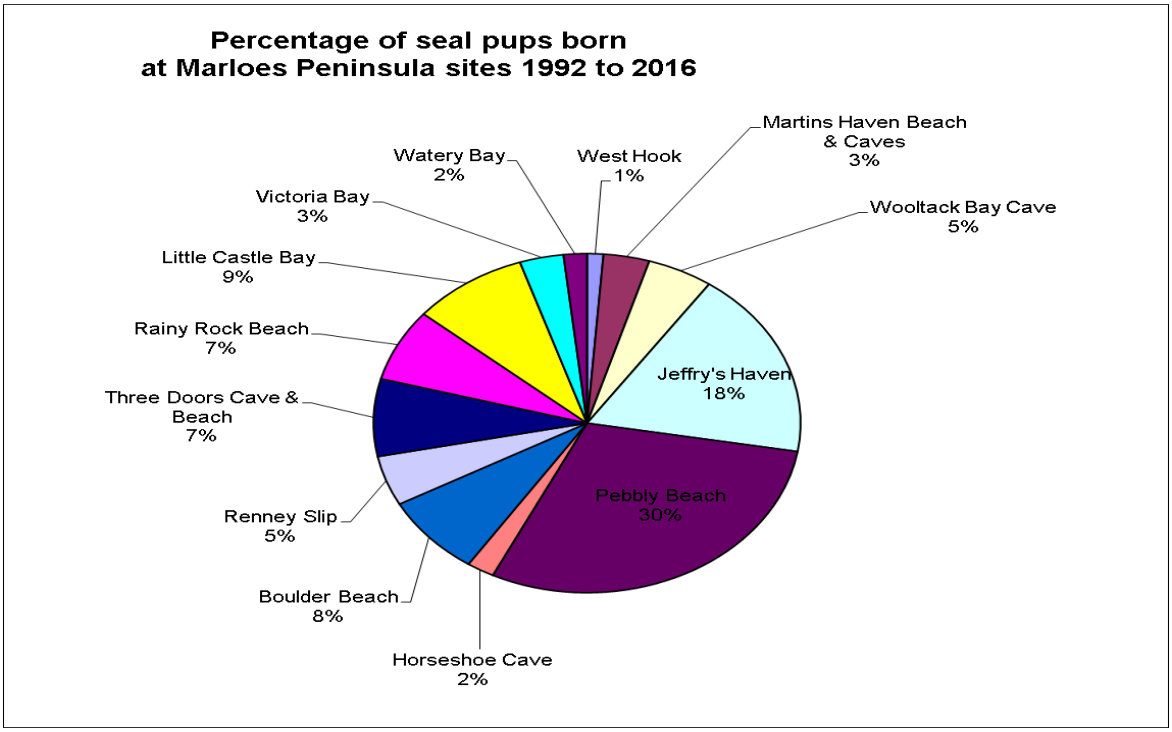
Figure 6 Seasonality of pup births at Skomer MCZ all sites 1993 to 2016



3.3.5 Site pup production and mortality

The percentage of pups born at each of the mainland sites from 1992 to 2016 is shown in Figure 7. Pebbly beach and Jeffry's Haven, both small bays located on the western side of the Deer Park, are the most popular sites accounting for 47.6% of mainland pup production. Detailed site summaries are provided in Section 3.4.

Figure 7 Percentage of seal pups born at Marloes Peninsula sites 1992 to 2016



The mortality rate of seal pups varies between sites. Figure 8 shows the total mortality recorded for each site from 1993 to 2016 and the division between still born, died and mortality assumed for each site is shown in Figure 9. Further details is provided in the site summaries, Section 3.4.

Figure 8 Seal pup mortality at Marloes Peninsula sites 1993 to 2016

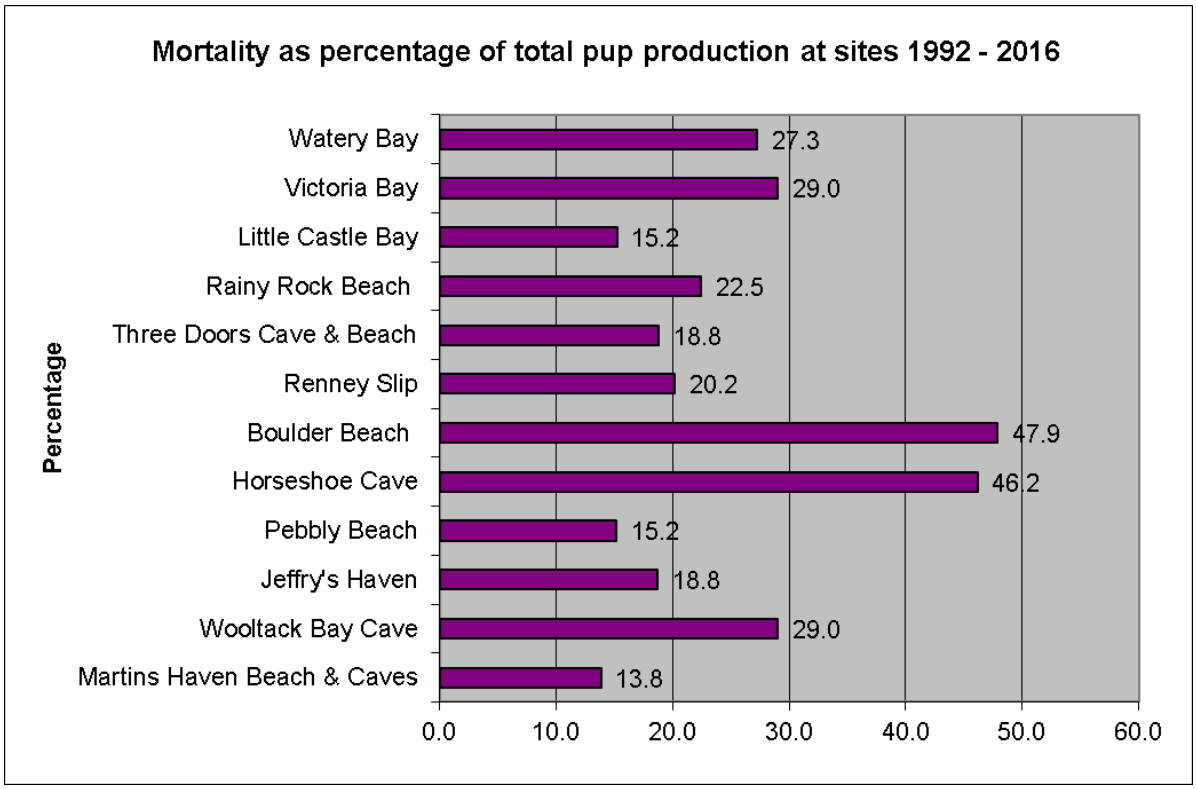
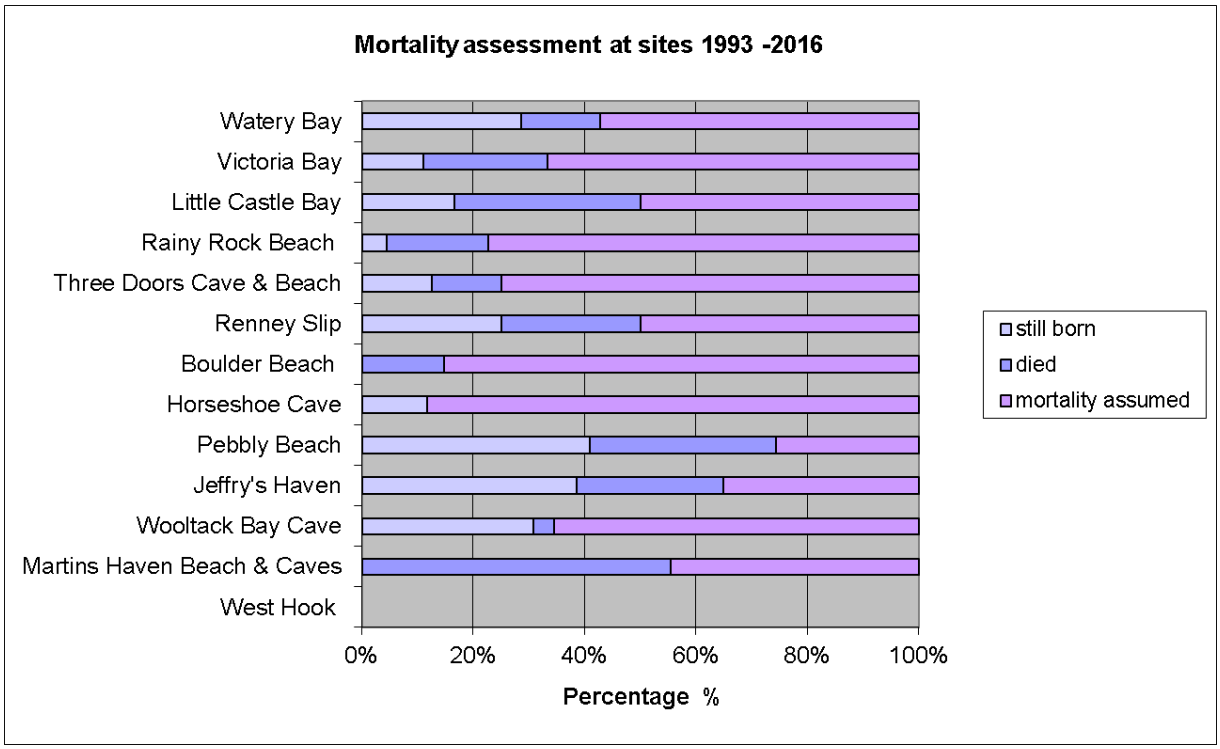


Figure 9 Seal pup mortality assessment at Marloes Peninsula sites 1993 to 2016

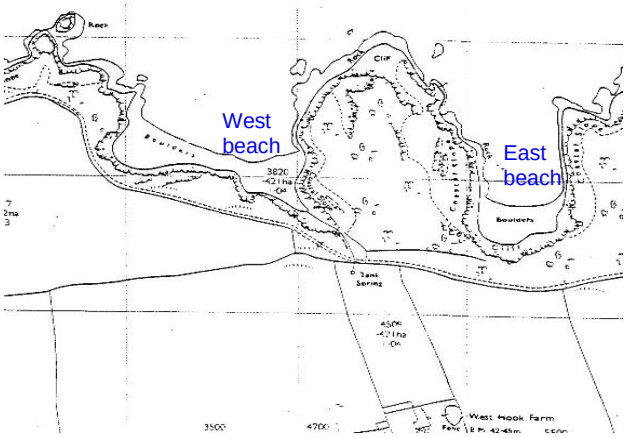


3.4 Site summaries

3.4.1 West Hook beaches

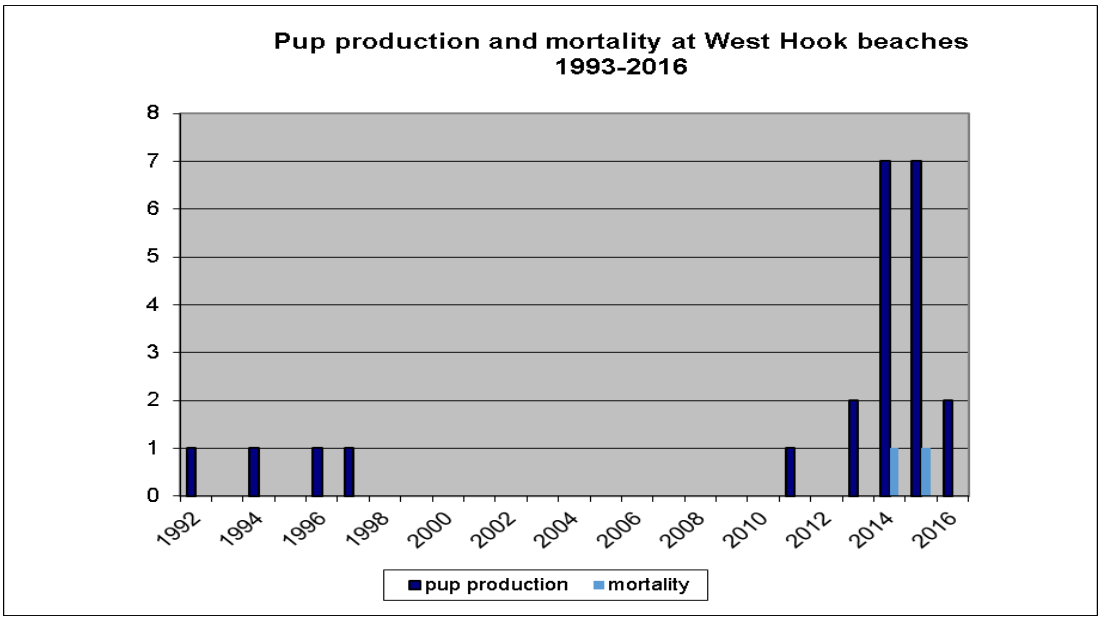
West Hook is located east of Martins Haven on the north side of the Marloes Peninsula. There are two narrow inlets backed by high cliffs with small cobble shores where pups are very occasionally found.

Figure 10 West Hook beaches site map



The steep sided cliffs and vegetation mean that it is not possible to view from cliff top viewpoints. Recording is restricted to access to the beaches at mid tide from a boat looking into the inlets. The beach can be viewed from cliff top viewpoints and also at mid tide from a boat looking into the beach.

Figure 11 Pup production and mortality at West Hook beaches 1993 to 2016

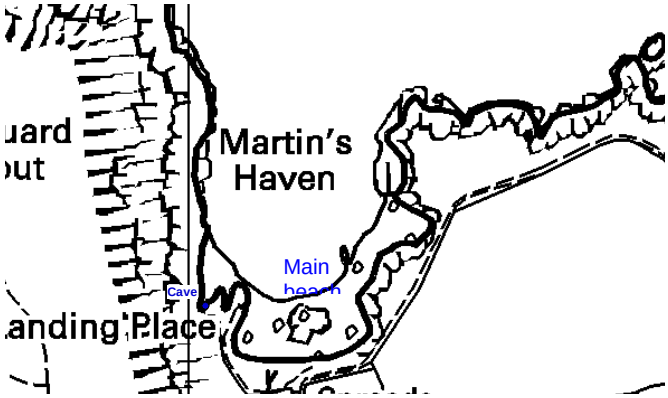


Seal pups were first recorded at West Hook in 1993 in low numbers and between 2000 to 2011 there were no pups recorded. However from 2012 to 2016 pups have been recorded again with 7 pups in both 2014 and 2015. Most pups were recorded through to a healthy class 3 pup or start of moult.

3.4.2 Martins Haven beach and cave

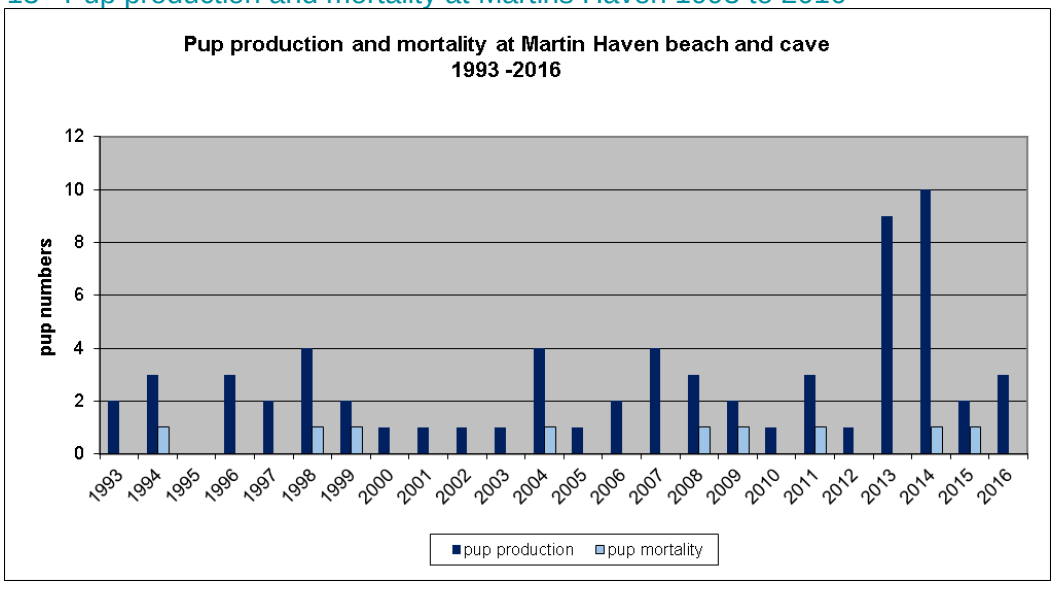
Martins Haven is a cobble beach facing north. The beach has open public access, the coast path passes the beach and it is also the access point for the Skomer ferry. There is a small cave within the bay where pups are regularly born and occasionally pups are born on the main beach

Figure 12 Martins Haven site map



Between1992 and 2016 there has been an average of 2.7 pups born per year. Total mortality has been low at 13.8% of total production. In 2014 10 pups were born either on the beach or in the cave, the highest ever for this site. Spray marked pups born at Skomer sites and wanderers from Wooltack cave have also been recorded on the beach where they have continued to develop to moult. Class 5 pups from other sites are also regularly recorded hauled out on the beach.

Figure 13 Pup production and mortality at Martins Haven 1993 to 2016



3.4.3 Wooltack cave

This is a large cave located in Wooltack Bay on the north side of Wooltack Point. It was previously known as 'Nostril Cave' (Cullen 1978) and pups have been recorded here since 1975. The cave has a narrow entrance with steep sides which opens out to a pebble beach around 4m width, it is around 20m deep with both height and width narrowing to the back. The pebble beach at the back of the cave will stay dry at high water spring tides. The cave is limited to sea access only. Both cows and bulls are often found swimming near the entrance of the cave and the cave is only entered if no cows are inside the cave itself, avoiding any unnecessary disturbance.

Figure 14 Wooltack cave site map

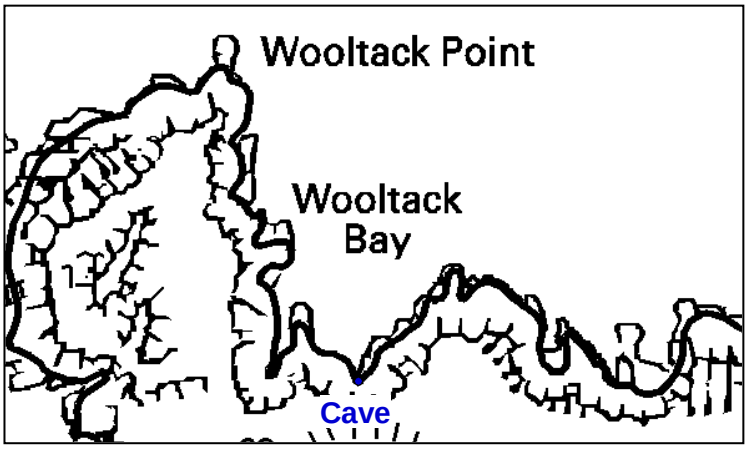
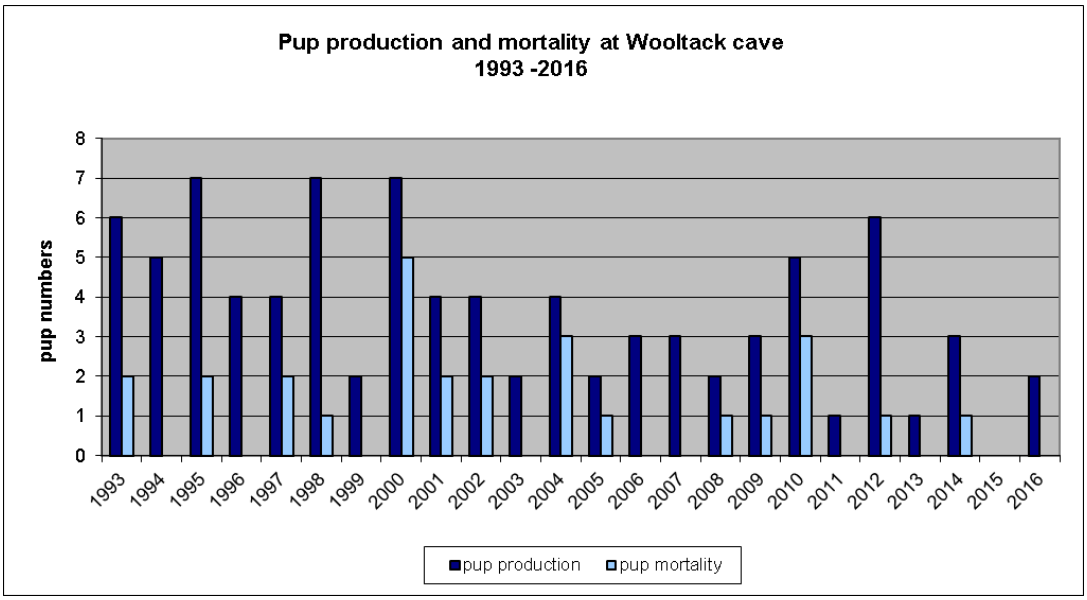


Figure 15 Pup production and mortality at Wooltack cave 1993 to 2016

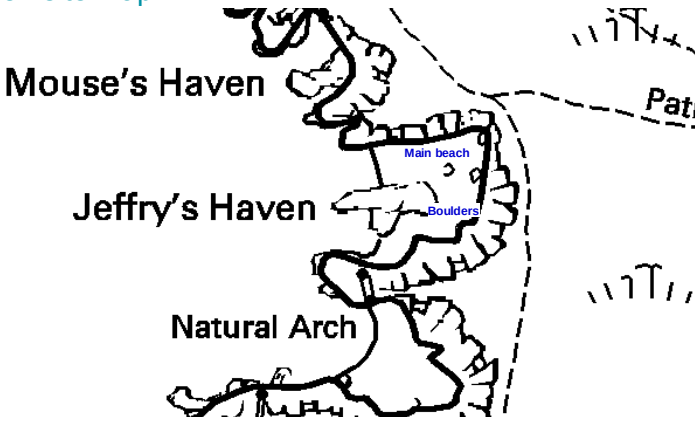


Due to the restricted access to this site the numbers of pups recorded are likely to be an underestimate. The mean between 1992 -2016 is 3.9 pups per year with 6-7 pups recorded on 5 occasions. Tracking the pups from birth to moult is also very difficult as sufficient visits are not possible. Site mortality is 29% which is likely to be an over estimate as 63% of mortality is 'assumed mortality' due to pups not being seen past a class 1 small class 2 due to the limited access and visits to the site.

3.4.4 Jeffry's Haven

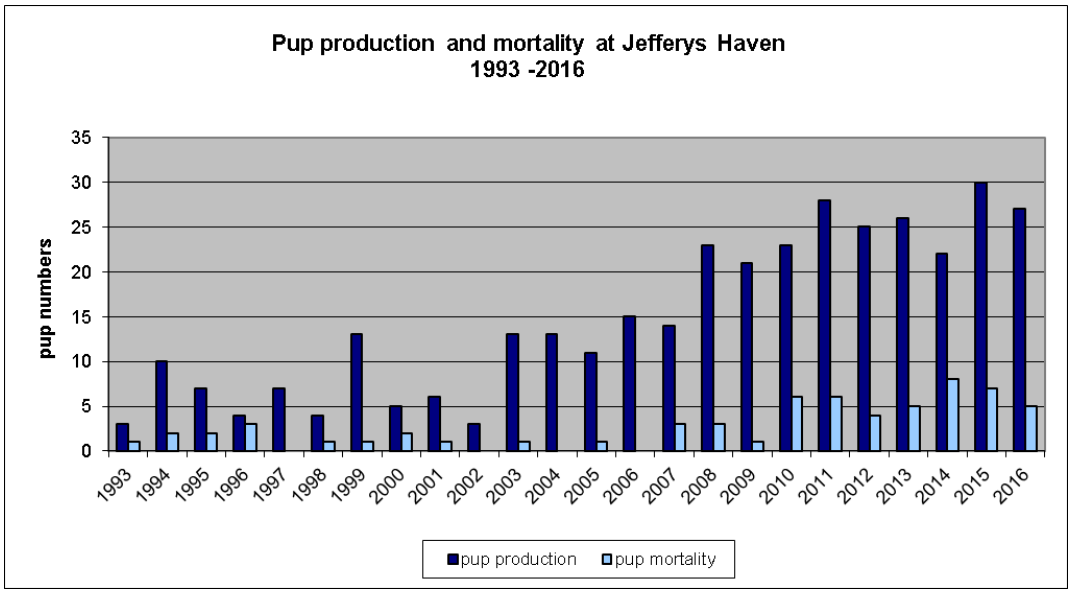
Jeffry's Haven is located on the west side of the Deer Park, at the end of the Marloes peninsula. The beach faces to the west and is bounded on three sides by sheer cliffs. The length of the beach is 50m, and it is composed of pebbles and boulders. The boulders are close to the water and on the south side of the beach. There are shallow caves at the south end of the shore but these are flooded at high water.

Figure 16 Jeffry's Haven site map



The beach can be seen clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult.

Figure 17 Pup production and mortality at Jeffry's Haven 1993-2016



Pups have been recorded at Jeffry's Haven since 1975. Since 1992 the popularity of the site has varied, 10 or more pups per year have been regularly recorded and over 20 pups a year since 2008. The mean between 1992 and 2016 is 14 pups per year and this represents an average of 18.8% of the mainland pup production.
Pups are easily tracked from birth to moult. Site mortality is low at only 18% of total production, cause of death primarily being either still born or died soon after birth.

3.4.5 Pebbly Beach (South Deer Park)

Pebbly beach is located on the west side of the Deer Park, just south of Jeffry's Haven at the end of the Marloes peninsula. The beach faces to the west and is bounded on three sides by sheer cliffs. The beach length is only 30m and it is dominated by cobbles with some small bedrock outcrops. On the north side of the beach is a cave where pups are often found, this is linked to the main beach at low water. There is a small overhang under the cliffs at the south side of the beach where pups are regularly found. At the south end of the shore some shallow inlets and boulders are exposed at low water where cows are often recorded hauled out. The beach can be seen clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult. The only difficulty is when pups are in the cave.

Figure 18 Pebbly Beach site map

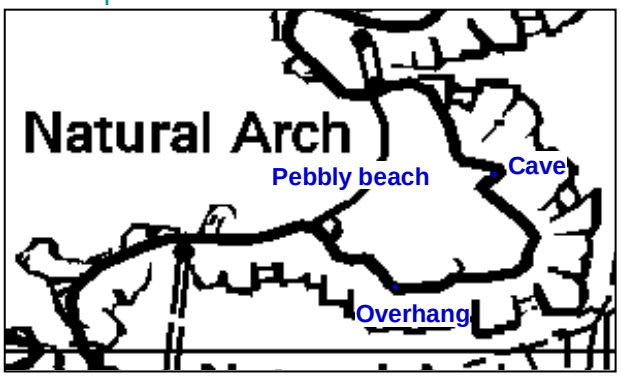
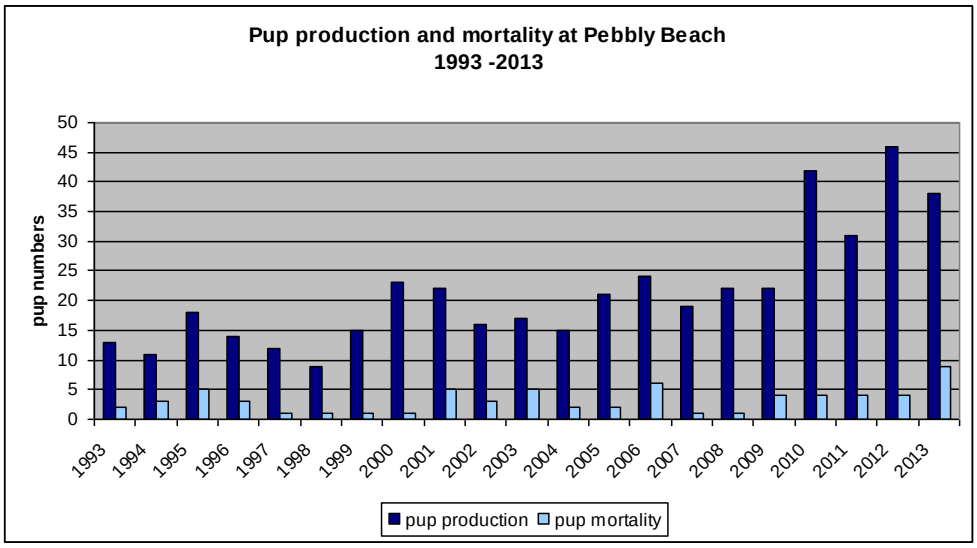


Figure 19 Pup production and mortality at Pebbly Beach 1993 to 2016



Pups have been recorded at Pebbly beach since 1974. The site has been consistently popular from 1992 -2016 with a mean of 23 pups born for the period, representing 29.6% of the mainland pup production. Up to 2009 pup production at the site had been reasonably consistent and it was assumed that the carrying capacity of the site was around 24 pups. However since 2009 over 30 pups have been born each year with a record 50 in 2014. Pups are easily tracked from birth to moult. Site mortality is low at only 15.2% of total production, cause of death primarily being either still born or died soon after birth.

3.4.5 Horseshoe Cave

This is a large cave located on the south side of the Deer Park and the entrance faces south west. The cave has two wide entrances both filled with boulders, inside the cave enormous boulders are found with narrow gaps between filled with pebbles, at the back of the cave a small pebble beach of which only a narrow strip is dry at high water. The cows mainly access the cave at mid to high water and often stay in the cave either resting or tending their pups at low water. Pups have been recorded in Horseshoe cave since 1975. The cave is limited to sea access only. Both cows and bulls are often found swimming near the entrance of the cave. The cave is only entered if no cows are inside the cave itself, avoiding any unnecessary disturbance.

Figure 20 Horseshoe Cave site map

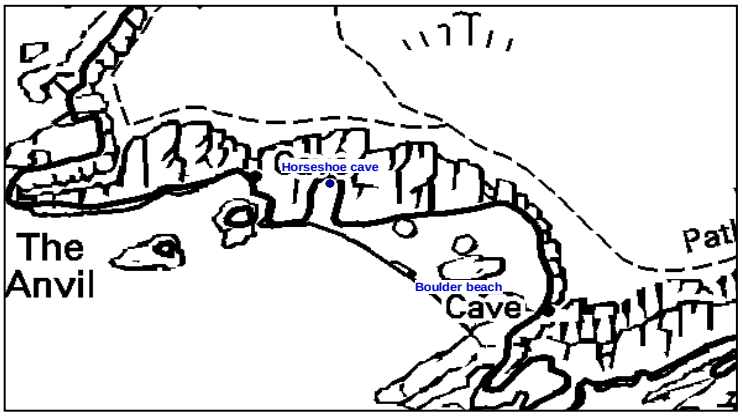
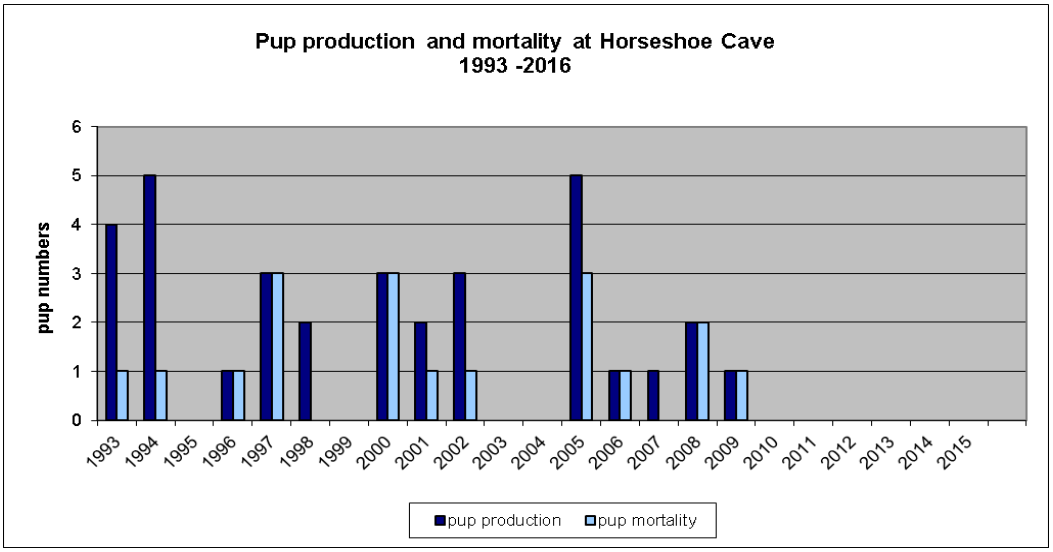


Figure 21 Pup production and mortality at Horseshoe Cave 1993 to 2016



Due to the restricted access to this site the numbers of pups recorded are likely to be an underestimate. Since 1992 there have been 12 years when the cave was not accessed and in many of the years when access was possible it was often restricted to just 1-2 visits. The highest record was 5 pups in 1992 and 2005. Tracking the pups from birth to moult is also very difficult as sufficient visits are not possible. Mortality for the site appears high at 46.2% of total production, of which 83% are 'assumed mortality' due to pups not being seen past a class 1 small class 2.

3.4.6 Boulder Beach

Boulder beach is located just south of Horseshoe cave on the west side of the Deer Park, at the end of the Marloes Peninsula. The beach faces to the west and is surrounded by sheer cliffs. The beach is mainly a large boulder field with three shallow caves at the back which have small pebble beaches and are separated at high water . The cows mainly access shore at mid to high water due to the difficulty getting through the boulders at low water. Pups have been recorded at Boulder beach since 1992.
The beach and caves are difficult to view clearly and it is impossible to observe the whole shore area and into the caves. At low water some pups move down into the boulder area where they are often hidden from sight. A thorough survey of the shore can only occur by going on to the beach, but access is limited, especially during rough weather. The large boulder field is difficult to navigate often restricting access to mid to high water times only. The shore is very exposed and often washed out completely on high water spring tides and on stormy days causing pup fatalities.

Figure 22 Boulder Beach site map

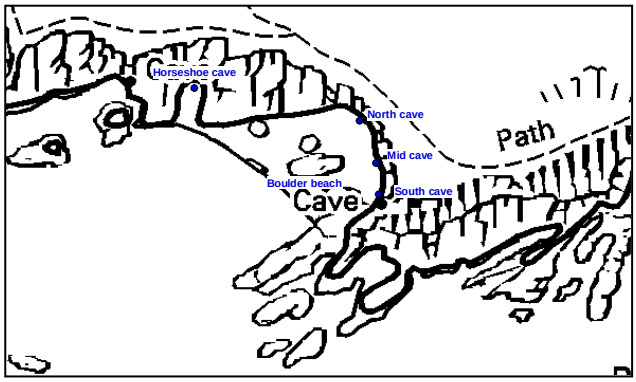
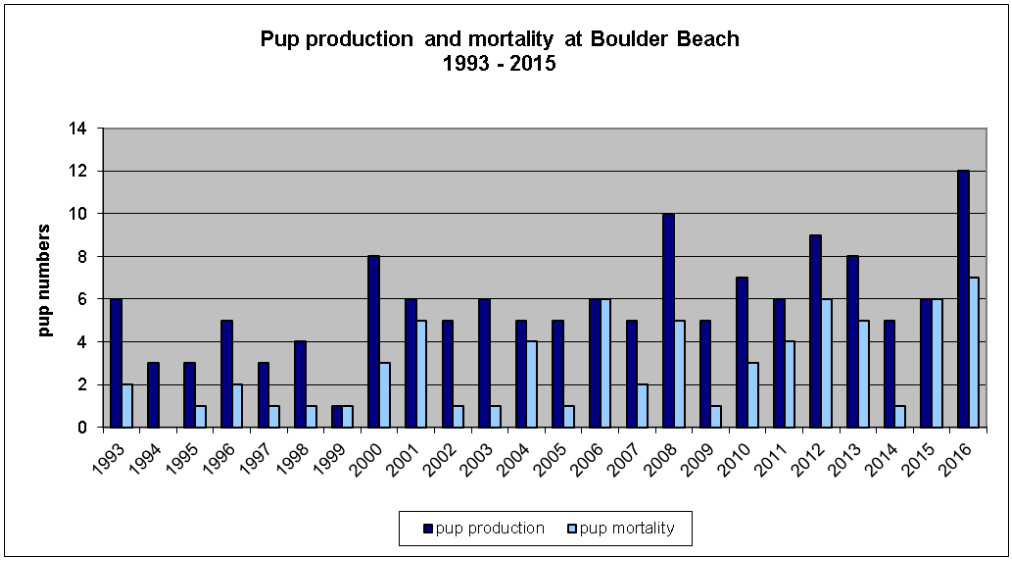


Figure 23 Pup production and mortality at Boulder Beach 1993 to 2016



Due to the restricted viewing and access to this site the numbers of pups recorded are likely to be an underestimate and assumed mortality to be overestimated. Mean production is 5.7 pups per year with the highest record of 12 pups recorded in 2016. Mortality for the site appears high at 48% of total production of which 75% are 'assumed mortality' due to pups not being seen past a small class 2 as they are either hidden or washed out by high tides and storms.

3.4.7 Renney Slip

Renney Slip is a beach located just south of the Deer Park, on the southern side of the Marloes Peninsula. The beach faces to the south west and is backed by a steep cliff. The main beach is 40m long and has a pebble bank up against the cliff, leading into a large sandy beach at low water. On the north side of the beach are a series of small inlets full of boulders. At the top of one a small pebble bank is found and a cave with a narrow entrance can be found along the cliffs on the north side. A low number of pups are recorded on the main beach, the inlets and on occasion in the cave.
The main beach can be seen reasonably clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult. Viewing of the pups in the inlet is also possible but is limited if the pups hide in the boulders. The cave is accessed by sea only and thus recording here is very limited. Pups have been recorded at Renney Slip since 1974.

Figure 24 Renney Slip site map

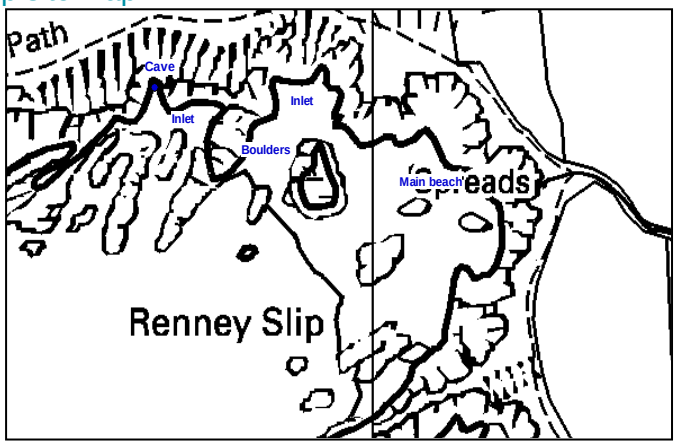
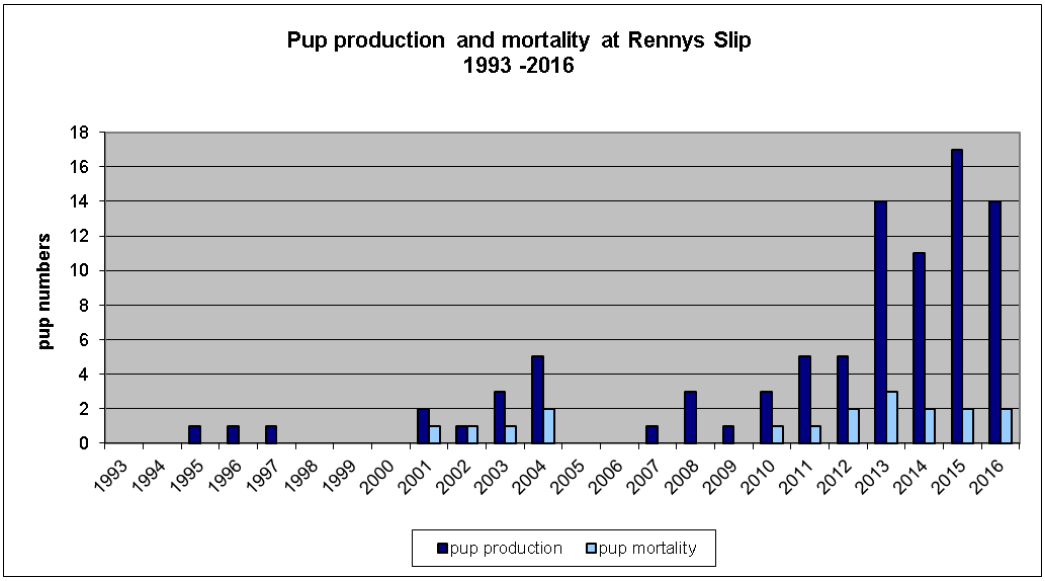


Figure 25 Pup production and mortality at Renney Slip 1993 to 2016



From 1992 to 2016 there has been an average of 3.7 pups born per year. From 1992 to 2012 the numbers of pups born was inconsistent, in 7 of the years no pups were recorded. Then in 2013 to 2016 the site increased in popularity with 16 pups born in 2015. Most pups on the main beach are easily tracked from birth to moult, but those born in the inlet or

cave are more difficult as sufficient sightings of pups are not always possible. Mortality for the site is low at 20.2% of total production.

3.4.8 Three Doors Beach and Cave

Three Doors bay is located on the south side of the Marloes Peninsula. The beach faces to the south west and is backed by a steep cliff. The south side of the beach is a mix of bedrock gullies, boulders and pebble banks with a small pebble beach under the cliffs, it is here that seal pups can be found. A deep cave with a pebble beach at the back is found on the north side of the bay, cows are observed swimming at the entrance of the cave and pups are born in the cave.
The cave is accessed by sea only and thus recording here is very limited.

Figure 26 Three Doors Beach and Cave site map

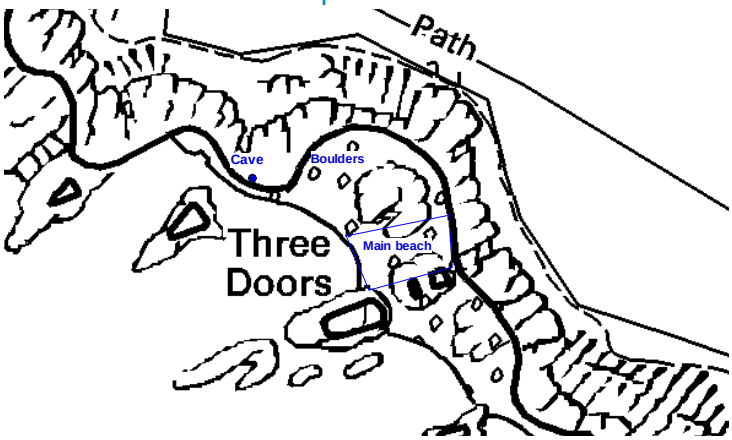
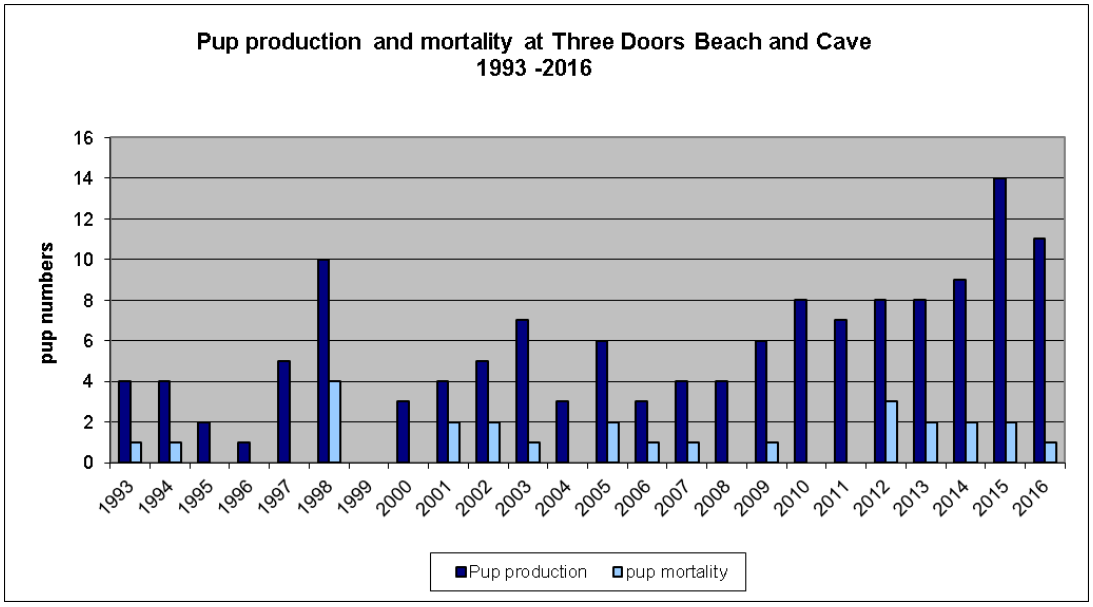


Figure 27 Pup production and mortality at Three Doors Beach and Cave 1993 to 2016



Pups were found in the cave up to 2002, before access was stopped by a rock fall blocking the entrance. In the 8 years that the cave was accessed there was a mean number of 2.8 pups per year with the highest record of 7 pups recorded in 1998. Due to restricted

access a high number of ‘assumed mortality’ was recorded for the cave leading to a high mean mortality of 30.7%.

The main beach can be seen reasonably clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult. Since 2002, following the closure of the cave, the beach has become more popular with the highest record of 14 pups in 2015. The mean number of pups per year at the beach from 2002 to 2016 is 6.8 pups and mortality is low at 17.6% of total production.

3.4.9 Rainy Rock Beaches

Rainy rock is a large promontory located on the south side of the Marloes Peninsula, to the north of the rock is a small inlet with a pebble bank at the back referred to as “inner beach”. To the north of this is the main beach which is divided into two sections; the north side is a combination of bedrock and boulders, unsuitable for seals, and the south side is a mix of boulders and pebbles and at low water it is connected to the inner beach. The main beach faces to the south west and the inner beach to the west, both are backed by a steep cliffs. Seal pups are recorded at both the main and inner beaches and often move between the two at low water.

The main beach is tricky to view from cliff top viewpoints. The pups often tuck high up on the shore and are hidden in amongst boulders, viewing is best at mid to low water. The inner beach can be seen reasonably clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult.

Figure 28 Three Doors Beach and Cave site map

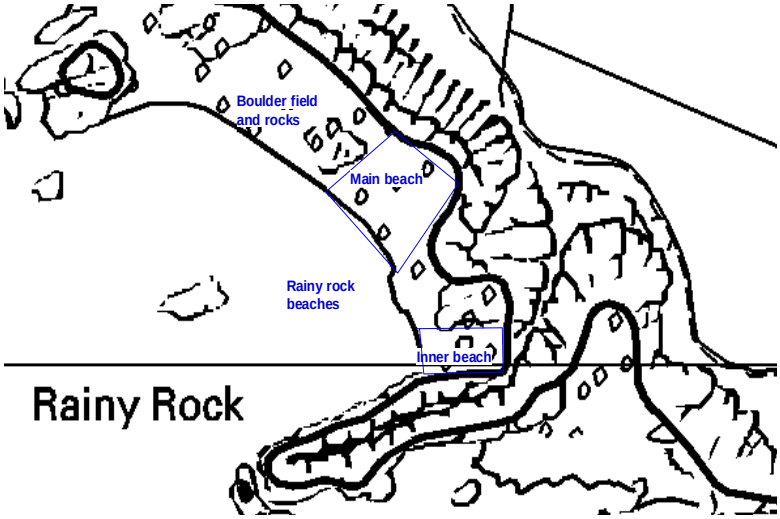
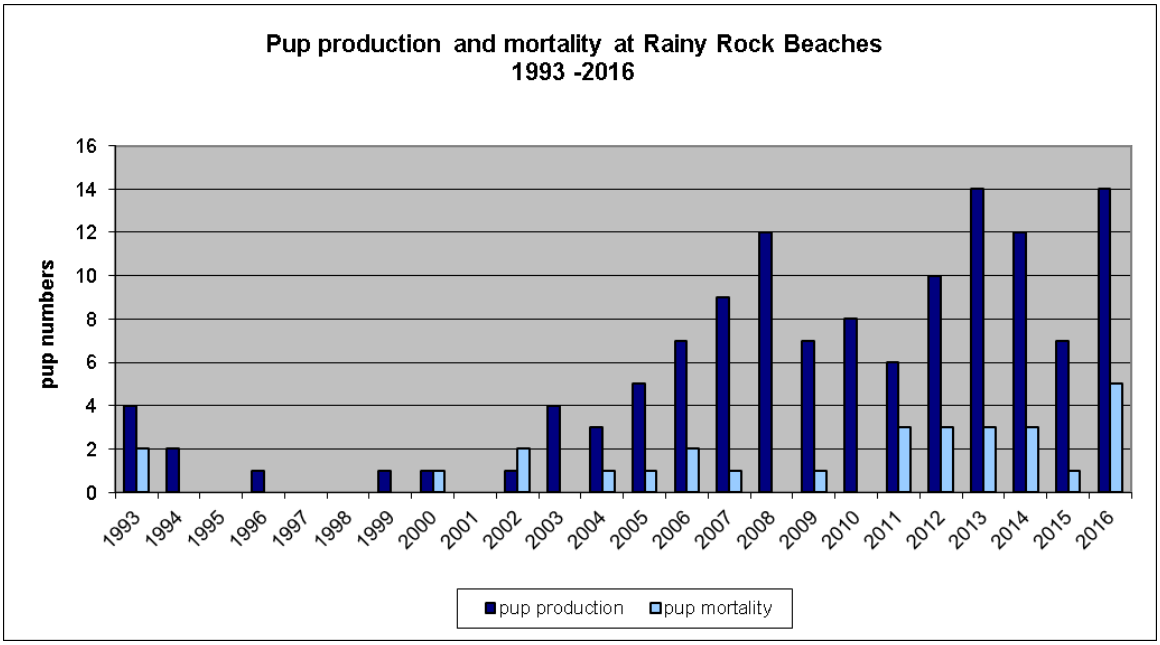


Figure 29 Pup production and mortality at Rainy Rock beaches 1993 to 2016

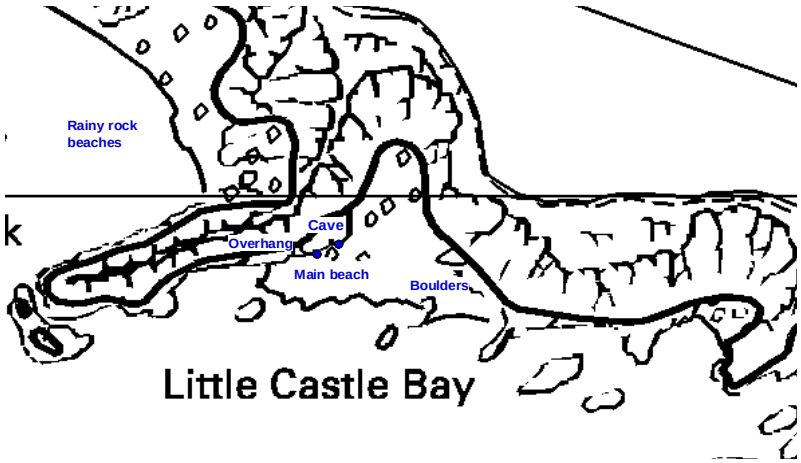


Seal pups have been recorded at Rainy rock beaches since 1992 and from 2005 the area has increased in popularity with the highest record of 14 pups in 2013 and 2016. Mean mortality is 22.5 % of total production, of which 58.6% are recorded as 'assumed mortality'.

3.4.10 Little Castle Beach

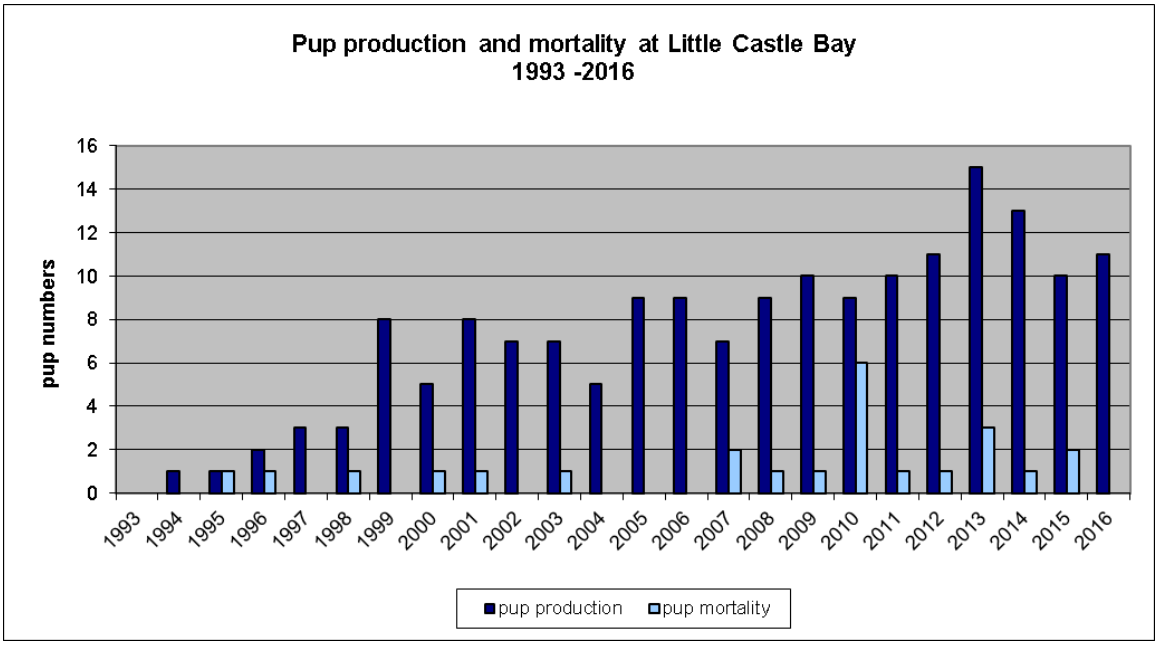
Little Castle beach is located just south of Rainy Rock on the south side of the Marloes Peninsula and faces south. Pebbles make up the main beach with a boulder field on the east side. On the west side is a shallow cave and overhangs which are flooded at high water. The beach can be seen clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult. Difficulty only occurs when pups tuck up in the cave area at low water or are hidden among the boulders to the east of the beach.

Figure 30 Little Castle Beach site map



Seal pups have been recorded at Little Castle since 1992 with the site becoming popular from 1999. The mean production between 1992 and 2016 is 6.8 pups per year with the highest record of 15 pups in 2013. Site mortality is low at only 15.2% of total production, cause of death primarily being either still born or died soon after birth.

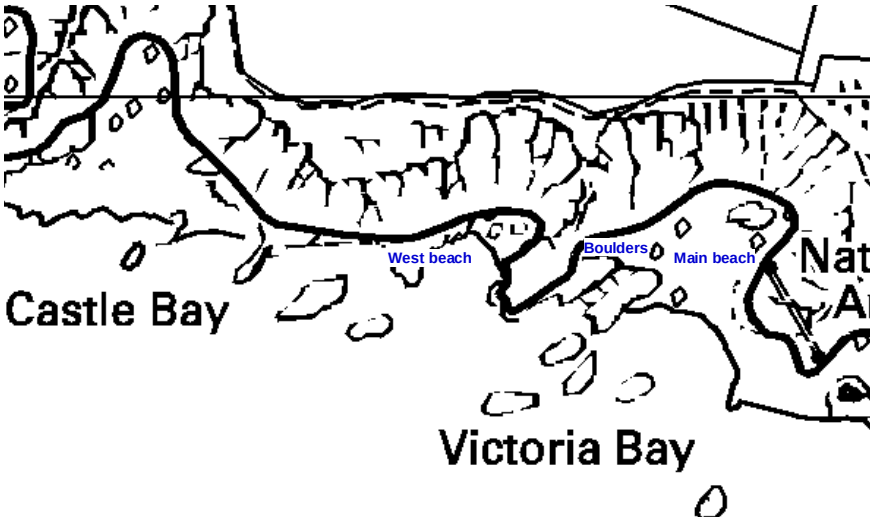
Figure 31 Pup production and mortality at Little Castle Beach 1993 to 2016



3.4.11 Victoria Bay

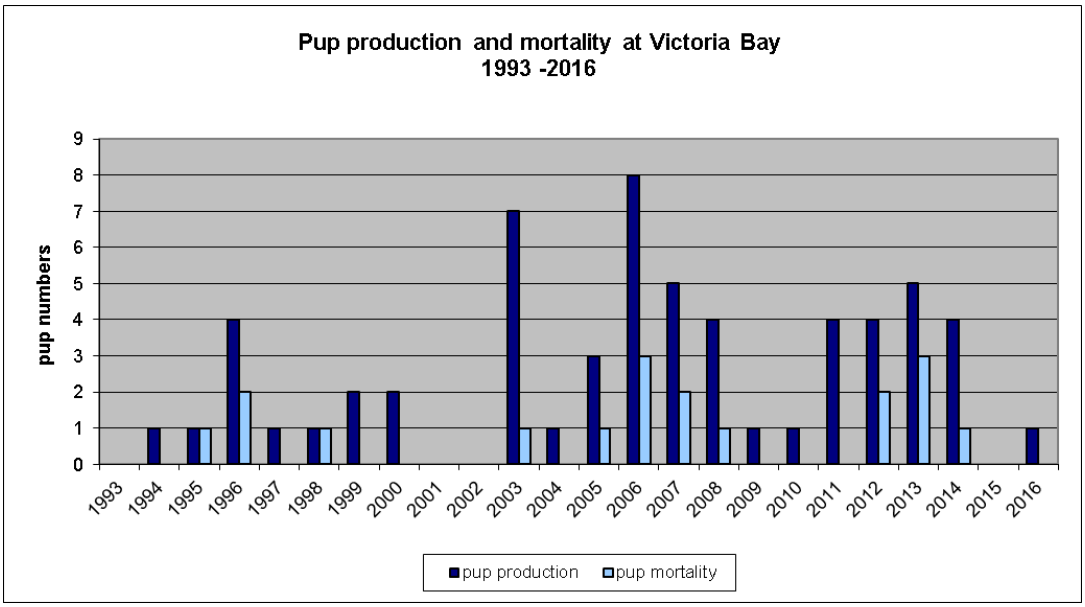
Victoria Bay is located on the south side of the Marloes Peninsula and faces south west. Pebbles and boulders make up the main beach with a pebble bank at the top of the beach under the cliffs. To the west there is a narrow inlet known as Victoria west, which, although boulder filled, has a small pebble beach at the top where 1 or 2 pups are recorded each year.

Figure 32 Victoria Bay site map



The beach can be seen clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult. Tracking is not always possible as pups often are hidden in amongst the boulders.

Figure 33 Pup production and mortality at Little Castle Beach 1993 to 2016

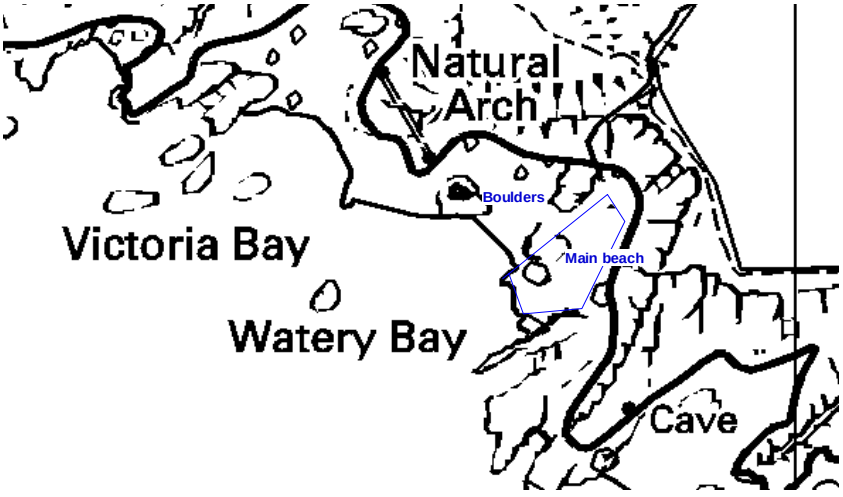


Seal pups have been recorded at Victoria bay since 1992, numbers are generally between 1-4 pups per year. Higher numbers are occasionally recorded with the highest record of 8 pups recorded in 2006. Mortality is a little high at this site with a mean 29.8% of total production, of which 64% are 'assumed mortality'.

3.4.12 Watery Bay

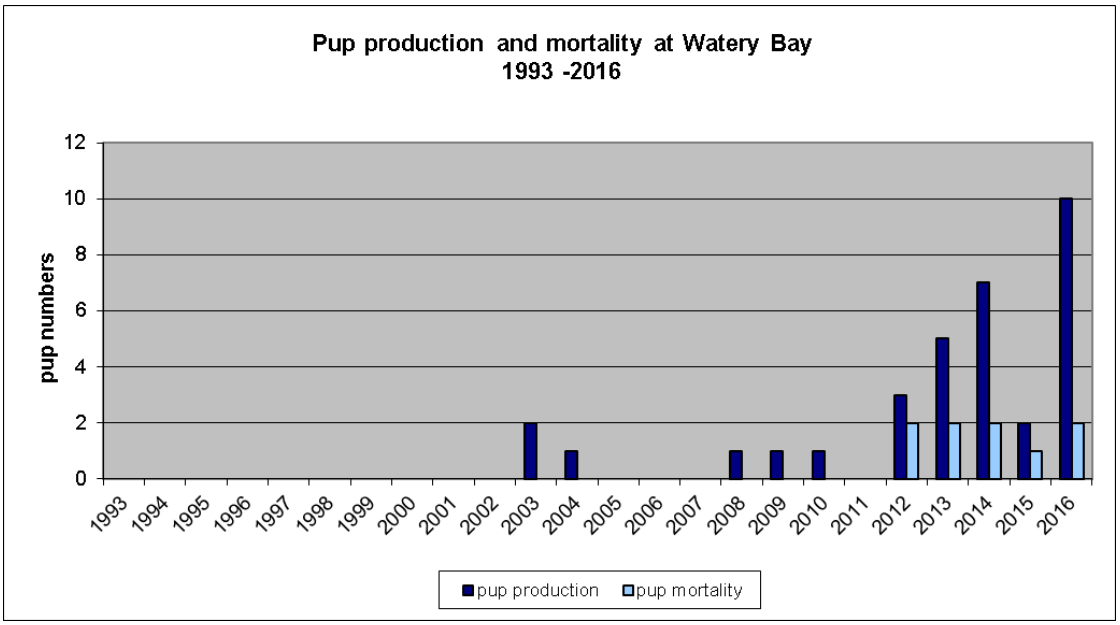
Watery Bay is located east of Victoria Bay on the south side of the Marloes Peninsula and faces south west. The bay is divided by some large rocks; on the west side is a boulder beach and on the east side a sandy beach with a pebble bank at the top. Seal pups are occasionally found on both west and east sides.

Figure 34 Watery Bay site map



The beach can be seen clearly at all states of the tide from the cliff top viewpoints allowing regular recording of the pups and tracking them through to moult. Difficulty only occurs when pups are hidden amongst the boulders.

Figure 35 Pup production and mortality at Watery Bay 1993 to 2016



Seal pups were first recorded at Watery bay in 2003 and up to 2012 only an occasional pup was found and all pups were recorded through to moult. Since 2012 pups have been recorded each year at the site with the highest record of 10 pups born in 2016. The mean mortality is 27% for all years and these have been a combination of still born, died and 'assumed mortality'.

3.4 Conclusion

Pup production at the Marloes peninsula sites as a percentage of the total pup production in the Skomer MCZ has increased. From 1992 to 2002 the sites contributed an average of 22% of total production, increasing to 45% in 2013 and the average over the last five years is 41% of total production.

There has been a significant increase in numbers of pups born at the Marloes peninsula sites. The average of 50 pups born each year from 1992 to 2002 has increased to an average of 141 pups from 2012 to 2016.

A steady increase in pup production has been recorded at West Hook beaches, Jeffry's haven, Pebbly beach, Renney slip, Three Doors beach, Rainy rock beaches, Little Castle and Watery bay.

Overall pup survival varies between years, the average recorded for 1992 to 2016 is 78%, the lowest recorded was 67% in 2001 and the highest record was 91% in 1999.

Sites with the highest average mortality from 1992 to 2016 are those most exposed to rough seas, the highest was recorded as 48% at Boulder Beach. The lowest mortality was recorded as 13.8% at Martins Haven.

3.5 Recommendations

- To continue the annual seal survey at Marloes peninsula sites.

- To use the combined Marloes peninsula and Skomer island seal survey results to report on the status of seals in the Skomer MCZ following the Skomer MCZ and Skomer Island NNR Seal Management Plan.

- To use the Skomer MCZ seal survey results to evaluate the status of the grey seal population feature of the Pembrokeshire Marine SAC;

- One theoretical aspect of climate change is increased extreme weather to which seal pups are most vulnerable. Seal monitoring needed to assess impact of climate change on seals.

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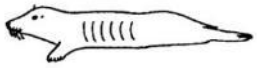
5. Appendices

Appendix 1. E.A. Smiths's Age Classification System (Radford *et al* 1978)

Stage 1: 1 – 5 days old



Body contour thin, neck well defined, skin in loose folds around body. Coat often stained yellow by prenatal excreta. Umbilical cord conspicuous, pink or brown, not dried (variable character). Claws soft, whitish. Voice a weak bleat. Docile.

Stage 2: 6 – 10 days old

Outline smoother with neck still recognisable, but no loose folds on body. Cord atrophied, or a conspicuous scar. Claws dark and hard. Voice loud, snarling when handled

Stage 3: 11 to 15 days old

Outline rounded to barrel-shaped. Neck indistinguishable and naval inconspicuous. Vigorous attack and escape reactions to handling,

Stage 4: 16 – 20 days old

As Stage 3 but with patches of white natal fur moulted to reveal first-year pelage underneath. These pups are weaned or approaching weaning.

Stage 5: 21+ days old

Fully moulted to first-year pelage. All weaned and often segregated (with some Stage 4's) from breeding area

Data Archive Appendix

Data outputs associated with this project are archived in [NRW to enter relevant corporate store and / or reference numbers] on server–based storage at Natural Resources Wales.

Or

No data outputs were produced as part of this project.

The data archive contains: [Delete and / or add to A-E as appropriate. A full list of data layers can be documented if required]

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A full set of maps produced in JPEG format.

[C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers

[D] A set of raster files in ESRI and ASCII grid formats.

[E] A database named [name] in Microsoft Access 2000 format with metadata described in a Microsoft Word document [name.doc].

[F] A full set of images produced in [jpg/tiff] format.

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