

**ISLE OF MAY
NATIONAL NATURE RESERVE
ANNUAL REPORT 2016**



**Bex Outram
David Steel
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APPENDIX 1

Isle of May research reports for 2016 season

INTRODUCTION

This is the annual report for the Isle of May National Nature Reserve (NNR), which is owned and managed by Scottish Natural Heritage (SNH). The island lies in the entrance of the Firth of Forth, about 8 km south of the Fife Coast. Its east side is characterized by a low-lying rocky coastline, whilst the west side is dominated by high cliffs.

The Isle of May NNR hosts internationally important numbers of breeding seabirds and grey seals. The subtidal reefs are also of international importance and the wintering wader populations are of national importance.

Every year, two SNH staff members are resident on the island, from March to November, and they are responsible for the general management of the island, which includes biological monitoring, visitor management, site management and general liaison with various interested parties.

The Centre for Ecology and Hydrology (CEH), The Sea Mammal Research Unit (SMRU) and the Isle of May Bird Observatory Trust (IOMBOT) also provide data for this report.

If you would like information regarding any aspect of this report or any further information on the Isle of May, please contact:

The Reserve Manager
Scottish Natural Heritage
46 Crossgate
Cupar
KY15 5HS
Tel: 01334 654038

Email: isleofmay@snh.gov.uk

Blog: <https://isleofmaynnr.wordpress.com/>

RESERVE MANAGEMENT

1. BIOLOGICAL RECORDING

1.1 INTRODUCTION TO BREEDING SEABIRDS

SNH monitors breeding seabird populations as part of its management of the National Nature Reserve as well as to report on the Special Protection Area (SPA) qualifying species.

Further seabird monitoring is carried out by the Centre for Ecology and Hydrology (CEH), under contract to the Joint Nature Conservation Committee (JNCC). Data from this monitoring work is integral to JNCC's national system of long-term monitoring for seabird populations, as the island is one of four strategic monitoring sites in Great Britain. The other three sites are Skomer, Canna and Fair Isle.

SNH carries out the population monitoring of the cliff-nesting seabirds, gulls, eiders and terns. CEH monitors the breeding success, survival and food intake of the auks, shags, fulmar and kittiwakes. CEH also provides numerous other pieces of data invaluable to this report, such as the dates of first eggs/chicks; sightings of migrant birds; breeding seabird population counts in sensitive areas and casual observations of breeding passerines, shelduck and oystercatcher. The Isle of May Bird Observatory residents also provide data on migrant birds, cetaceans and lepidoptera.

1.2 POPULATION MONITORING OF CLIFF-NESTING SEABIRDS

1.2.1 Methods: All-island count (AIC) and monitoring plot counts

1.2.1.1 Sections and timings

The detailed AIC methodology for the five cliff-nesting bird species (guillemot, razorbill, kittiwake, fulmar and shag) is set out in the Isle of May Monitoring Handbook (SNH, 2001, revised 2002 and 2011). The island is divided into the same standardized count sections as have been used in previous years. All species are counted once during the AIC, including razorbill and guillemot, which have been counted twice in previous years. A total of 30 plots of guillemots and razorbills were counted five times during the first week of June.

The majority of the all-island count was carried out by Bex Outram. In sections that were sensitive, data was provided by Mark Newell of CEH to avoid additional disturbance. The AIC was completed between 3 June and 7 June.

1.2.1.2 Cornerstone plot counts

The counts of individual razorbill and guillemot during the AIC are converted to estimates of pair numbers. The number of both razorbill and guillemot pairs breeding at the Cornerstone plot is monitored by CEH. A count of each species was made at the Cornerstone plot at the beginning of every count session.

For each species, the number of pairs known to be breeding at Cornerstone was divided by the relevant Cornerstone count, for every count session. This provided a “k” value which represents the difference between the number of individuals counted and the number of pairs. By multiplying this “k-value” with the number of individual birds counted during a session, the number of pairs can be estimated for that session.

Keeping raw counts to within a few hours of the Cornerstone plot count allows for the variation in attendance of adults on the cliffs.

1.2.2. Results of all-island count

The overall 2016 counts for each of the five cliff-nesting species on the Isle of May are shown in Table 1.1. Counts from previous years are also shown for comparison. Table 1.2 shows the different section counts for each species. How the breeding populations of the five species relate to last year is shown in Table 1.3.

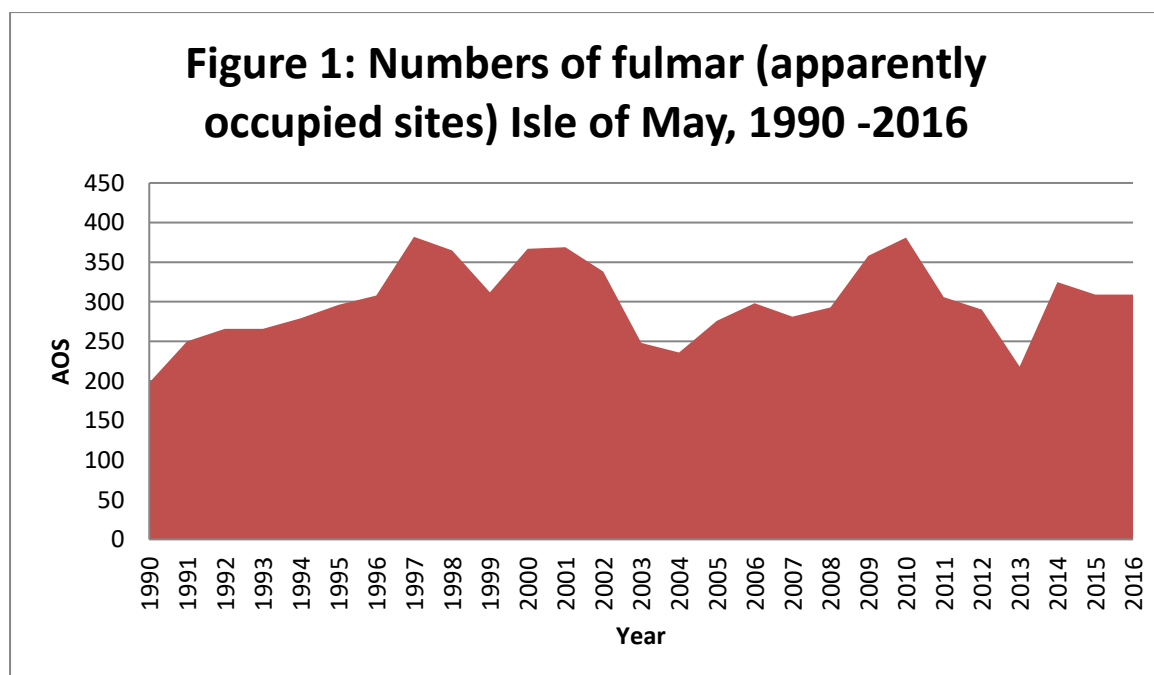
1.2.2.1 Fulmar (*Fulmarus glacialis*)

The number of Apparently Occupied Sites (AOS) was 309; this is equal to the previous year’s count. Although there was variation in the different sections (Table 1.3), the total was the same.

The first egg was seen on 15 May and the first chick on 13 July.

The breeding productivity this year has fallen from the previous years to 0.39 but is still above the long-term average.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	0.21	0.2	0.44	0.34	0.36	0.13	0.47	0.56	0.52	0.39



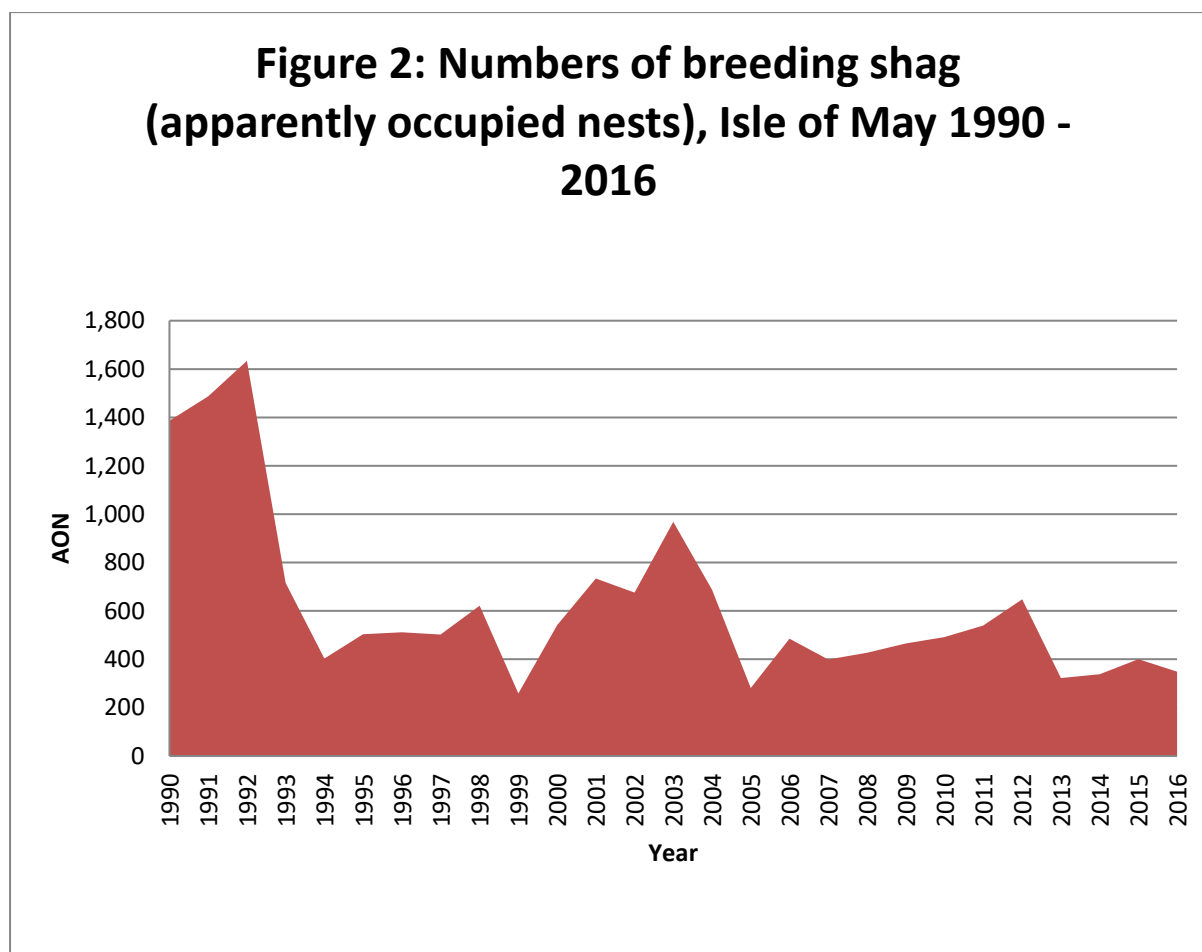
1.2.2.2 Shag (*Phalacrocorax aristotelis*)

The number of apparently occupied nests (AON) has declined this year by 13% to 349. Although there was an overall decline in the shag numbers, the plots monitored by CEH showed a high the return rate, 88.9, well above the long-term mean of 79.

The first shag egg was recorded on 22 March, and the first chick was seen on 26 April.

2016 was a very successful year for the breeding shags, having the highest productivity since the long-term monitoring started: an average of 2.1 chicks fledging per breeding pair.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	1.07	1.9	2.02	2.04	1.54	1.18	1.20	1.58	1.91	2.1



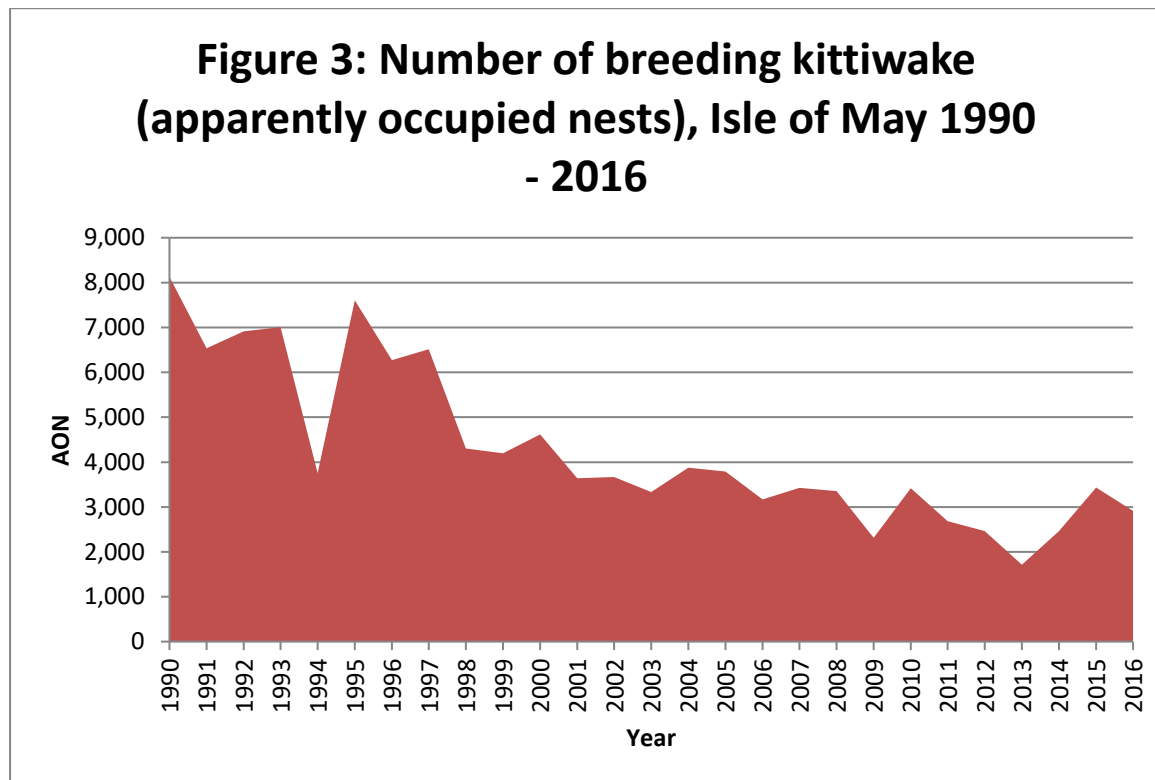
1.2.2.3 Kittiwake (*Rissa tridactyla*)

The kittiwake number of AON has declined to 2,912, a drop of 15% compared to last year's total. Although there was a decline in the breeding pairs it was in fact one of the highest return rates of colour-ringed individuals, with 88.3 returning (average long-term mean being 78.6), so it seems that some adults have taken a year off breeding.

The first egg was seen on 16 May and the first chick was seen to hatch on 11 June.

The productivity of the kittiwakes is down on the past two years but is still above the long-term mean of 0.59.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	0.24	0.23	0.7	0.29	0.87	0.98	0.41	1.17	1.07	0.78



1.2.2.4 Guillemot and razorbill (*Uria aalge* and *Alca torda*)

1.2.2.4.2 Guillemot (*Uria aalge*)

From the AIC, the estimated number of individuals has increased 7% on the 2015 count to 23,038 individuals. To calculate the number of pairs breeding on the island, the 'k' value is used. To determine this factor, the number of pairs at the Cornerstone plot is required from Mark Newell, CEH. This year, the number at the Cornerstone plot had increased to 229 breeding pairs and is now the highest count.

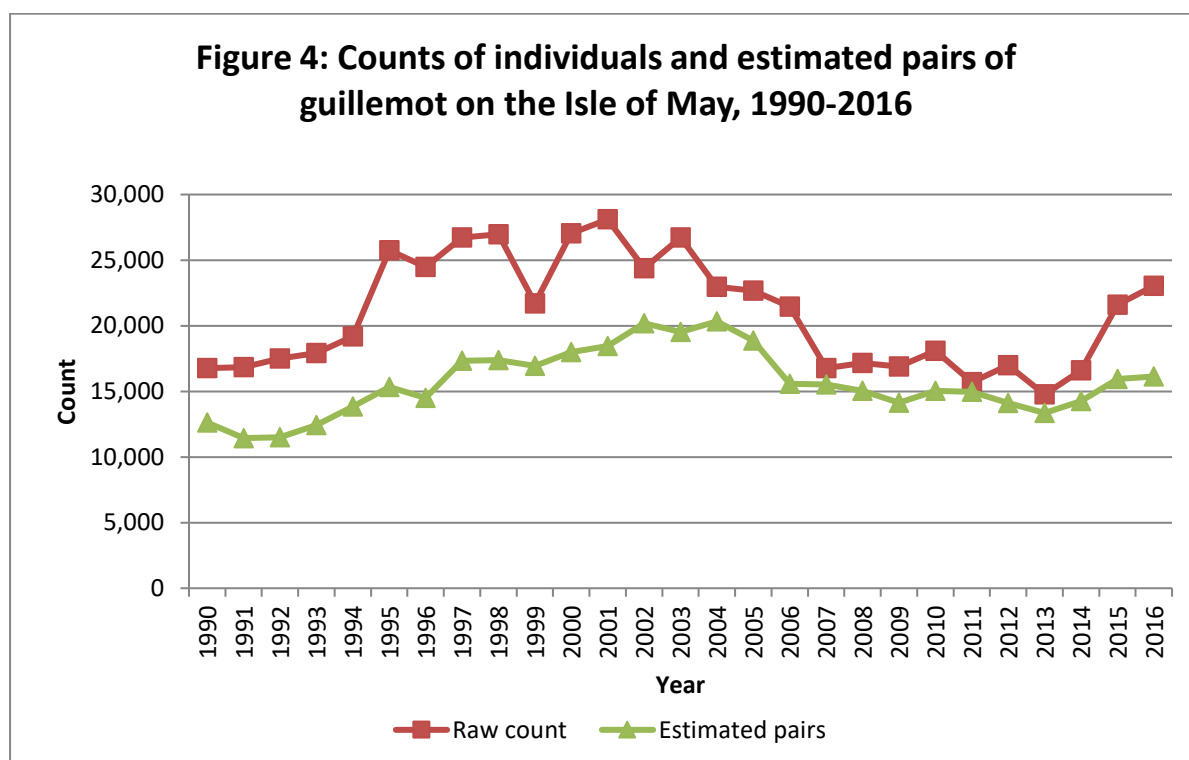
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. of pairs at Cornerstone	198	191	198	201	205	195	193	194	220	229

Using the "k" value (see Table 1.6), the number of pairs has been calculated to 16,134; this is up 1% on the previous year's count of 15,945 pairs. The return rate of the marked individuals was 93.6, the highest since 1998, and above the long-term average.

The first egg was seen on 17 April, a day earlier than last year. However, the majority of the colony did not lay until later in the month, probably due to unsettled weather. A chick was first seen on 7 May and the first jumping was noted on 17 June.

The guillemots had a below average breeding season with a productivity of 0.66, the lowest since 2008.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	0.28	0.63	0.75	0.8	0.71	0.79	0.69	0.72	0.78	0.66



1.2.2.4.3 Razorbill (*Alca torda*)

The number of individual razorbills counted was 5,117, and follows the increasing trend of recent years (12% up on 2015). As with the guillemots, a 'k' value has to be established in order to calculate the number of breeding pairs on the island. This year, the number of razorbills breeding at the Cornerstone plot was down to 79 pairs (provided by Mark Newell, CEH).

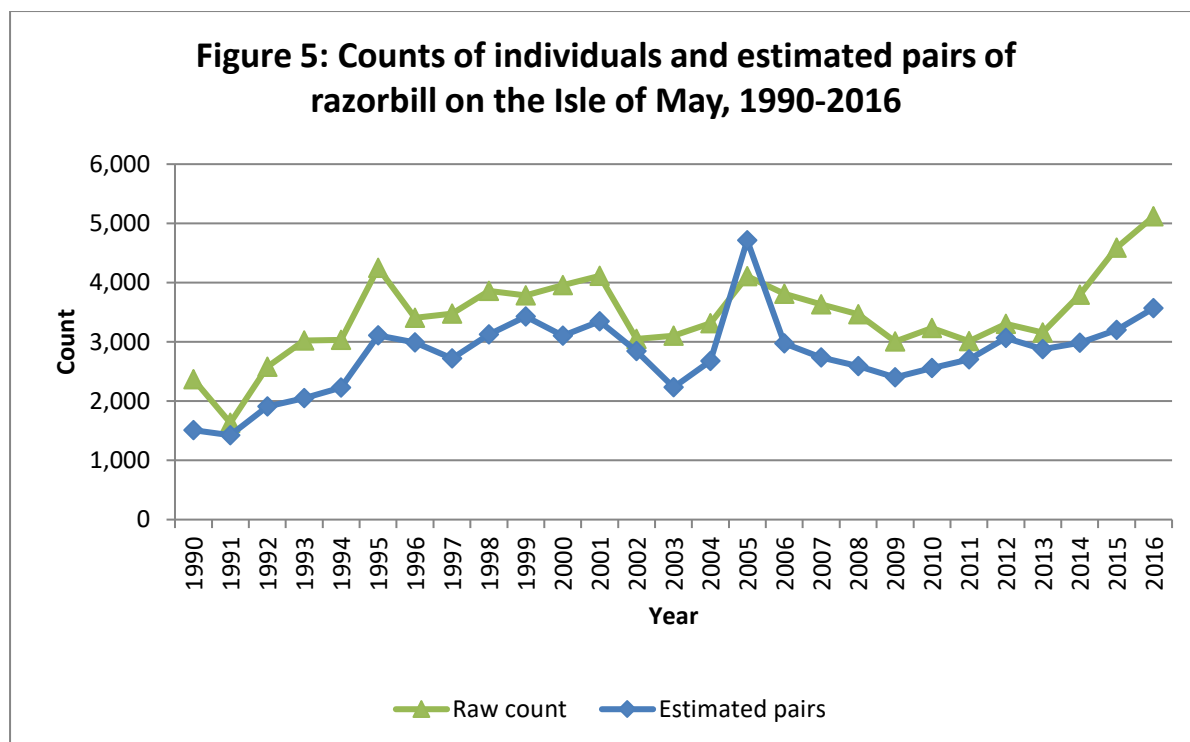
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. of pairs at Cornerstone	71	64	67	62	69	72	74	72	81	79

Using the 'k' value (see Table 1.6), the number of pairs of breeding razorbills has increased to 3,570 pairs, an increase of 12%. The return rate of colour-ringed individuals is 87.5, above average, as would be expected with an increasing population.

The first egg was seen on 29 April, 11 days later than last year.

The razorbills had a poor breeding season and productivity for 2016 was the lowest on record, 0.45 chicks fledging from each breeding pair in the monitoring plots. This is well below the average of 0.64.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	0.63	0.58	0.61	0.68	0.52	0.56	0.48	0.53	0.60	0.45



1.3 OTHER AUK SPECIES

1.3.1 Puffin

No puffin count was carried out during 2016. A full puffin census was undertaken in 2013, with a result of 46,200 estimated pairs. The return rate of the puffins this year was poor, 72.3, where the long-term average is 82.9 (figures supplied by CEH).

The first puffins carrying fish were seen on 25 May; this indicates that the first chicks had hatched. This was two days later than the previous year. The last puffin carrying fish was seen on 28 August; however, the majority of the colony had left earlier in the month.

Although the return rate was poor, those that did return to breed had a good season, with the productivity being 0.76; the highest since 2011.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	0.29			0.74	0.72	0.57	0.7	0.68	0.75	0.76

1.4 GULLS

1.4.1 Herring and lesser black-backed gull (*Larus argentatus* and *Larus fuscus*)

The first incubating herring gull was seen on the same date as the previous season, 22 April. The first lesser black-backed gull egg was noted on 3 May, two days earlier than last year.

1.4.1.1 Nest count

The gull nest count took place from 24 May to 31 May. The count was carried out by the two reserve managers, SNH long-term volunteers (Viv Hastie and James Crymble) and SNH staff (Elspeth Christie, Sarah Eaton, Caroline Gallacher, Gavin Johnson and David Shepherd). In sensitive areas in which activity would have caused disturbance to other nesting seabirds, the counts were carried out by CEH staff when they were doing their monitoring. The tern breeding areas (Beacon, Mouse House field, Kirkhaven and Visitor Centre area) were done at the same time as the tern count to minimise disturbance. This was done on several days due to weather constraints: 9, 16, 18 June respectively. Other small sections were counted during the AIC as these can only be accessed at low tide and also to minimise disturbance of other species.

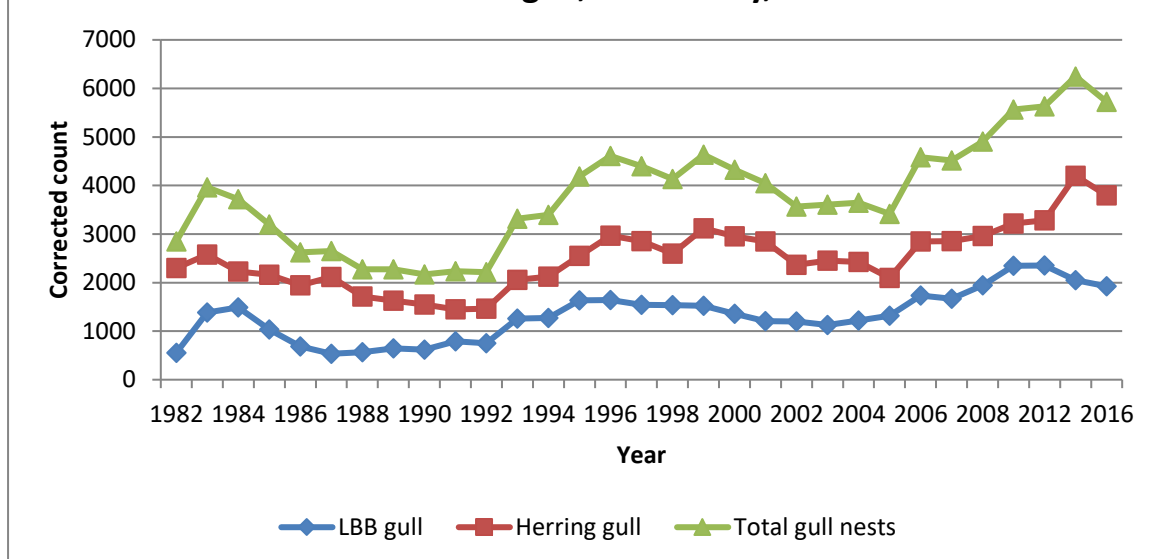
The gull count was conducted in teams, who counted each section of the island including the gull-free zones, recording the nest and its contents (Table 2.1). Immediately after, the counting efficiency and the species ratio of herring and lesser black-backed gull was completed (see Table 2.2 and Table 2.3 respectively). This was done by Bex Outram.

Small sections and sensitive areas counted by CEH were not checked for counting efficiency and therefore the average percentage efficiency was applied to these areas.

The raw count of both species was 5,480, down on the 2014 total of 6,247. The counting efficiency was applied to each section and the average (96% accuracy) to those not undertaken. This then produced a more representative figure of the island's gull population, 5,724 pairs (see Table 2.3). This is down on the last count in 2014 (6,247) by 8%.

The estimated total number of herring gulls is 3,800, and of lesser black-backed gulls is 1,924 (Table 2.5). This is a decrease of 10% and 6% respectively, the first decrease in the gull population since 2007.

Figure 6: Estimated nest totals for herring and lesser black-backed gull, Isle of May, 2016



1.4.1.2 Productivity

An area in West Tarbet was monitored again this season to produce the productivity rate of the herring gulls' breeding success. Numbered stones were placed next to nests, and with weekly monitoring, the number of eggs, chicks and fledged young was noted. The overall productivity of this area was 0.62 chicks per breeding pair, lower than the previous breeding season.

Herring gull		
	2016	2015
A) Nests monitored	52	79
B) Breeding attempts	52	79
C) Number of eggs	112	148
D) Average clutch size	2.15	1.87
E) Hatched eggs	53	58
F) Hatching success	0.47	0.39
G) Number of fledged	32	51
H) Productivity	0.62	0.65

1.4.1.3 Chick diet

No information on gull chick diet was recorded this year.

1.4.1.4 Gull management

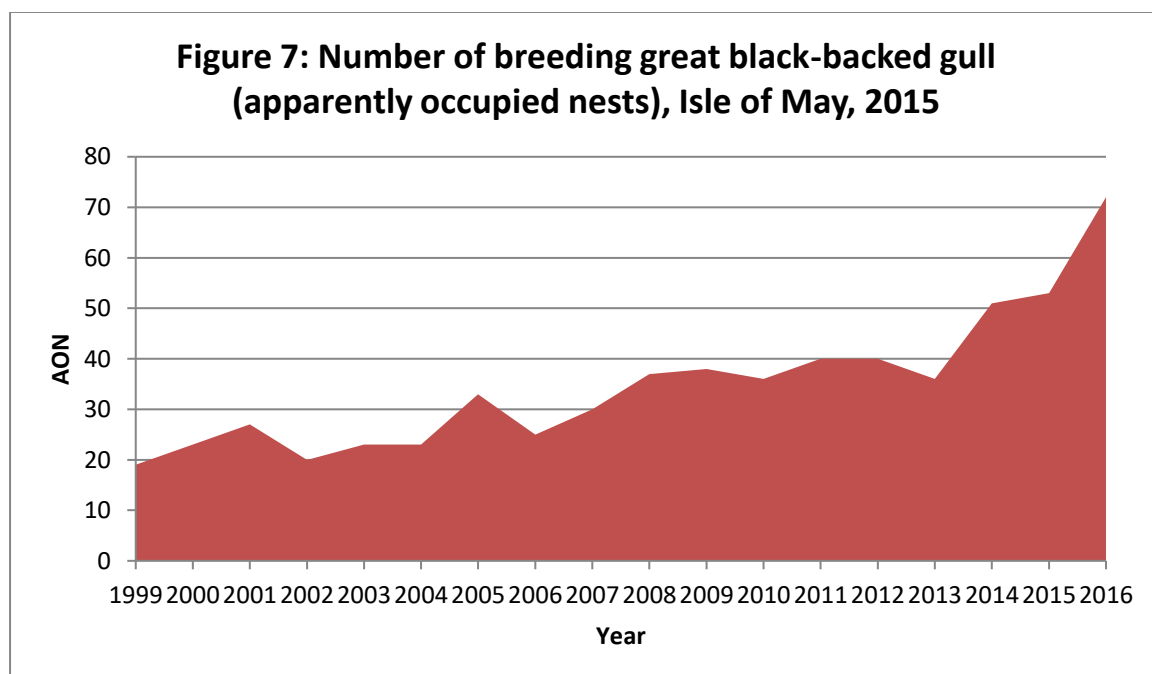
The gull-free zones were maintained during 2016. These areas were North Plateau South to Lochside, East and West Braes, Beacon, St Andrew's Well, Cross Park and Tennis Courts. Eighteen nests were removed from these gull-free zones. A further 69 nests were removed from the Harbour Rocks area, a 15 metre boundary around the tern colony at the Visitor Centre and jetty rocks.

Specialist gulls that predated within the tern breeding colony were identified through tern watches and were removed; an SNH marksman came to the island twice and removed three adult lesser black-backed gulls. Two of these adults were a pair, both predated on Arctic tern chicks; they had two chicks and these were also destroyed.

1.4.2 Great black-backed gull (*Larus marinus*)

1.4.2.1 Nest count

There has been a sharp rise in the number of great black-backed gulls this season; 72 were noted to have attempted to breed on the island, an increase of 36% from last year. Again the majority nested on Rona, 60, and the rest on the main island circumference.



The first great black-backed gull egg was seen on 17 April, one day earlier than last year. The first chick was seen on Rona on 19 May and the first chick fledged on 7 July.

1.4.2.2 Productivity

A total of 45 nests were monitored on Rona to establish a breeding productivity. Numbered stakes were placed next to nests and, with regular visits, the number of eggs, chicks and fledged chicks was noted. It was a poor year with, on average, each monitored pair only raising 0.71 chicks.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Productivity	1.75	No Count	1.57	No Count	No Count	1.6	1.38	1.34	1.18	0.71

With the help of the Isle of May Bird Observatory and Mark Oksien, we were able to fit the chicks with colour rings again this year. The colour rings are attached to the left leg and are yellow with a four-digit code. A total of 45 colour rings and 59 BTO metal rings were attached to this year's chicks. This system allowed us to keep track of mobile chicks as they began to leave the nest and gave us a more accurate productivity figure (see the table below).

Rona great black-backed gull		
	2016	2015
A) Nests monitored	45	28
B) Breeding attempts	45	28
C) Number of eggs	124	75
D) Average clutch size	2.76	2.68
E) Hatched eggs	91	57
F) Hatching succes	0.73	0.76
G) Number of fledged	32	33
H) Productivity	0.71	1.18

1.5 TERNS

For previous population counts, see Table 1.2. How the 2016 counts relate to the previous season is shown in Table 1.5. Information has been taken from the Isle of May 2016 Tern Report (V. Hastie and E. MacKenzie, 2015).

1.5.1 Roseate tern (*Sterna dougallii*)

No roseate terns attempted to breed this year. There were several sightings of roseate terns throughout May and June.

1.5.2 Sandwich tern (*Sterna sandvicensis*)

Sandwich terns were seen and heard regularly on the island at the beginning of the season and on 3 June a pair were seen on the ground and displaying on the new tern terrace at the Beacon. On 6 June, the first of 21 pairs were incubating a single egg. On 6 July, the first egg had hatched and the first fledged chick was noted on 30 July.

Sixteen of the eggs hatched and fledged, producing an overall productivity figure of 0.76.

Thirteen of the chicks were colour-ringed as part of an east coast colour-ringing project.

	Sandwich terns
A) Nest monitored	21
B) Breeding attempts	21
C) Number of eggs	21
D) Average clutch size	1
E) Hatched eggs	16
F) Hatching success	0.76
G) Number fledged	16
H) Productivity	0.76

1.5.3 Common and Arctic tern (*Sterna hirundo* and *Sterna paradisaea*)

1.5.3.1 Timing of breeding

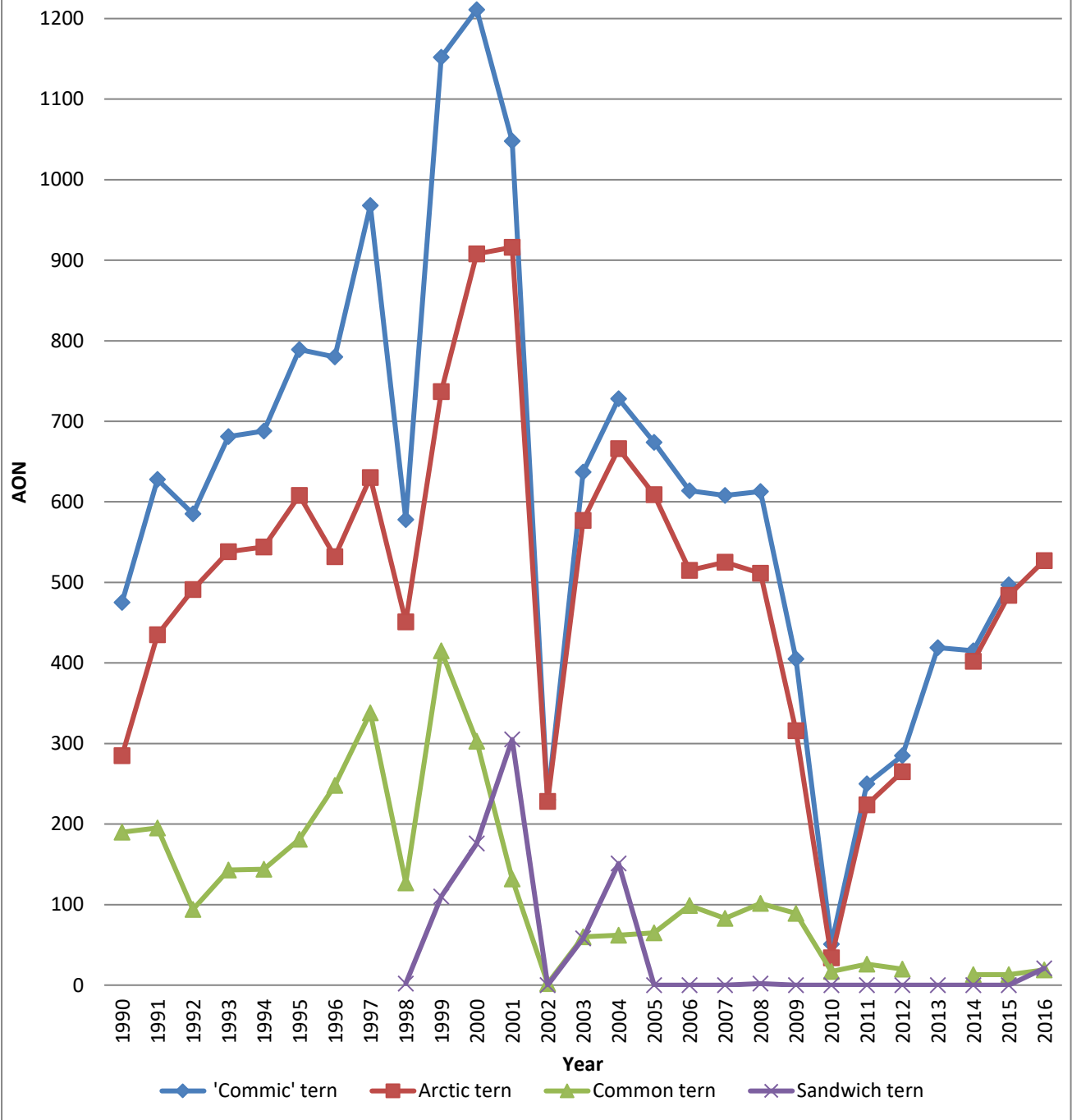
The first common tern egg was seen on 22 May at the Beacon, the first chick on 18 June and the first chick to fledge was on 8 July.

The first Arctic tern egg was laid on 20 May in the Mouse House field; this is three days earlier than last season. The first Arctic tern chick hatched on 13 June in the Mouse House field, the same date as 2015. The first fledged chick was seen flying around the Mouse House Field on 4 July; the last fledgling was seen on the 21 August, with the majority of the terns leaving the island earlier in the month.

1.5.3.2 Breeding pairs

The nest count was conducted on several days due to weather conditions: Beacon and West Braes on 9 June, Kirkhaven on 16 June and Mouse House on 18 June. It was later in the month that there appeared to be more nests on West Braes and a second count was undertaken on 27 June; a second count of the Visitor Centre bank was done on 30 June. A total of 527 Arctic tern and 19 common tern were noted; this was a 9% and 46% increase from last breeding season, respectively.

Figure 8: Counted number of nests of Arctic, common, "commic" and Sandwich terns, Isle of May, 1990-2016



1.5.3.3 Breeding success

For the second year running, specific Arctic tern plots were monitored to establish a productivity figure. Three plots were chosen: Mouse House, Visitor Centre and Jetty Rocks, South Logan's. The chicks in these areas were ringed, this helped keep track of the number of chicks that fledged from each plot, this was then used to productivity

figure. The table below shows the different areas monitored and their productivity and the overall productivity (average of these areas) that can be used to represent the whole colony.

The average productivity rate is 0.65, an increase from last season when it was 0.59. As the table above shows, this productivity rate was brought down by the Jetty Triangle area, which suffered from predation. South Logan's and the Visitor Centre areas were also subject to a high level of predation for a short period of time. This was a result of the presence of a pair of lesser black-backed gulls that nested by the pipeline in front of the Visitor Centre.

	Mouse House	Mouse House Terrace	Jetty Triangle	Visitor Centre	South Logan's	Overall A.tern
Nests monitored	36	17	5	27	65	150
Breeding attempts	36	17	5	28	65	151
Eggs	66	31	6	42	112	257
Average clutch size	1.83	1.82	1.2	1.5	1.72	1.70
Number hatched eggs	47	27	2	25	69	170
Hatching success	1.31	0.87	0.33	0.6	1.06	0.66
Fledged	32	16	0	15	34	97
Productivity	0.89	0.94	0	0.56	0.52	0.65

1.5.3.3 Predation by gulls

Tern watches were conducted at both the Beacon and Kirkhaven Colony, with a total of 147 hours being conducted this year. This included watches undertaken by the Master's student watching the Mouse House colony. During the watches, a total of 65 predation attempts were recorded (59 at Kirkhaven and 6 at the Beacon), with 13 of those being successful (10 at Kirkhaven and 3 at the Beacon), see Table 3.2. However, more successful attempts were noted when in the area during visitor hours and general observations. Three specialist gulls were identified that were preying the terns, all lesser black-backed gulls, and all were removed by the marksman.

1.5.4 Feeding rates and prey composition

No information was acquired this season.

1.5.5 Positive management for terns

1.5.5.1 Herbicide spraying

No herbicide spraying was used this year.

1.5.5.2 Visitor control for tern management

Clear branded signs were installed around the colonies once again this season. The Kirkhaven colony was roped off around the paths. The Mouse House field was roped

off as the terns nested and the picnic site moved further south towards the Priory. The Beacon and West Braes colony only required signs as this colony is away from the visitor path network.

As the visitors arrive to the island, they are greeted by staff and volunteers and are given an introductory talk including how to behave once in the tern colony, not to linger too long and to stay on the paths, to avoid disturbing the nesting terns too much.

1.5.5.3 Garden canes, bunting and twine

Garden canes were put in and around the colonies to make entry by predating gulls more difficult. Chicken wire fences were erected in areas where gulls were walking into the colony and predating eggs and chicks: south of the Mouse House field, South Logan's and east of the Visitor Centre. There was no need for bunting and twine this season.

1.5.5.4 Tern shelters

Tern shelters were put beside nests to provide cover for chicks, especially in areas where there was little vegetation such as West Braes and the tern terraces.

1.5.5.5 Tern terraces

A major overhaul of the Beacon site was undertaken in autumn 2015 and the previous tern platforms were replaced by terraces, on the same principle but larger. Areas of rank vegetation were removed, a wooden frame was built and tarpaulin was laid down. Onto this, substrates were laid, either aggregate or sand. This was also done on the areas of concrete bases.

The large concrete base in the Mouse House field was also covered with sand to make a terrace.

Both of these areas were very successful and attracted more terns to nest, either on the terrace or in the area (see Table 3.1). The Sandwich terns all nested on one of the terraces at the Beacon.

Future work on these will continue.

1.5.5.6 Tern buckets

No terns nested below the high tide mark this season, so no buckets were needed. This was probably due to low numbers nesting in the Jetty Triangle area.

1.6 EIDER (*Somateria mollissima*)

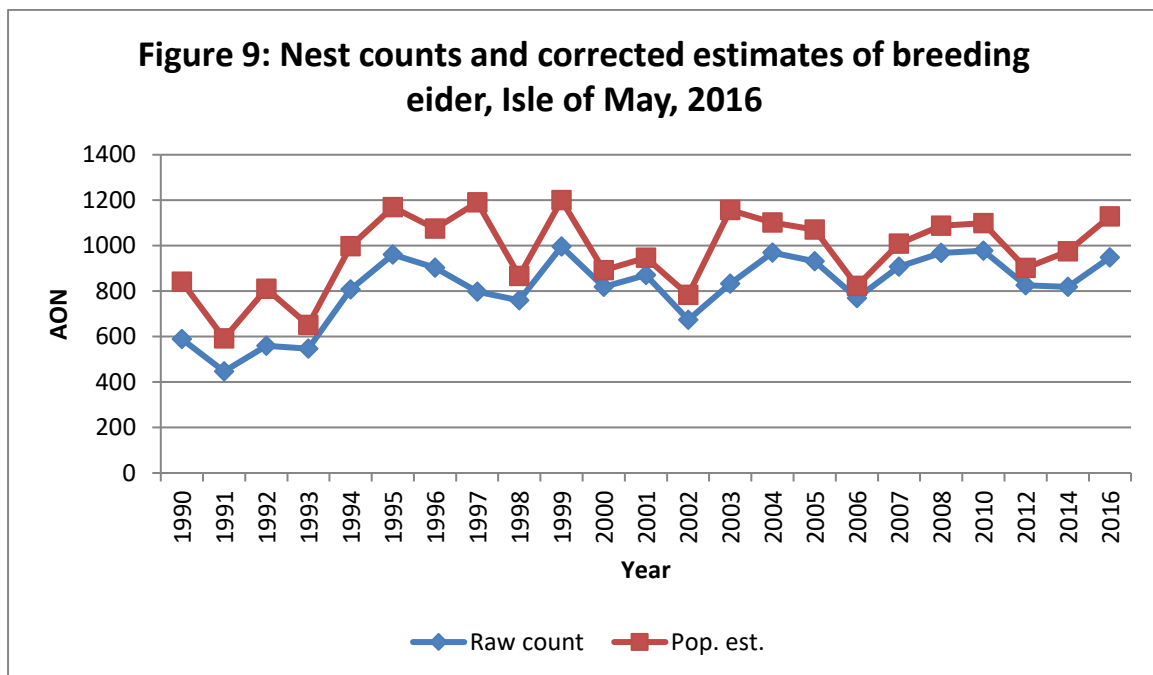
The first sitting female was seen on 16 April, four days earlier than last year. The first brood of ducklings was seen on the Loch on 13 May. This, however, was not the first female that was sitting so presumably the first nest date would have been earlier than 16 April.

1.6.1 Nest count

The eider population count was conducted in conjunction with the gull count. Each female sitting and empty nest was noted. To account for any errors in counting, 100 numbered canes were randomly placed next to eider nests a week previous to the count. The number of the cane was noted when counting the nests; from this a percentage was produced of those not counted and a counting efficiency was then used to convert the raw count to a corrected estimate number of breeding female eiders.

The counting efficiency was 83%. This was calculated from 18 unrecorded canes from a total of 93. Seven of the numbered canes that were not recorded during the count were not found after or had been found in areas where they had not been originally placed and may have been moved by shags or crows. Therefore these seven canes were disregarded and the counting efficiency calculated from 93 canes.

The raw count of eiders had increased and the corrected total increased by 16% from 2014 to 1,127 female eiders, (Table 4.1). This is a welcome increase and the highest count since 2003.



1.6.2 Hatching success

Disregarding the seven canes that could not be found or were removed, only 74 canes could be found after the count, either due to long vegetation or, again, being removed. Of these 74 nests, 66 hatched chicks, seven were predated and one was abandoned, resulting in an 89% hatching rate in 2016, higher than 2014.

Year	2007	2008	2010	2012	2014	2016
% Success	94	95	93	95	80	89

1.6.3 Eider management

No management specific to eiders was undertaken this year. Visitors were warned during their introductory talk that females would be nesting close to the path network and of the potential risk of coming across a female taking her ducklings to water, and advised to avoid them.

Some ducklings were found paralysed from nettle stings. These were kept in a box for an hour or so until they had recovered and then put with females and ducklings on the Loch, who took them into their crèche.

1.7 OTHER BREEDING BIRDS

These are observations of numbers from around the island from SNH staff and volunteers, CEH and members of the Isle of May Bird Observatory.

1.7.1 Manx shearwater (*Puffinus puffinus*)

Work by David Thorne *et al.*, of the Isle of May Bird Observatory, identified nest activity on the island and one occupied burrow and, with several visits to the island over the season, managed to identify both male and female Manx shearwater as the previous breeders due to their BTO metal rings. The pair were successful in raising one chick and fledged in the early hours of 12 September.

1.7.2 Shelduck (*Tadorna tadorna*)

At least four pairs of shelduck nested on the island this season, two on Rona, one in the North and one around Ardcarron. One pair was seen with ducklings on the High Road and another (the Ardcarron pair) was seen with seven ducklings swimming out of Kirkhaven.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pairs	3 - 4	5	6	6	4 - 8	6	4	3-4	3-4	4

1.7.3 Mallard (*Anas platyrhynchos*)

There were no records of breeding on the May this year. Females were not present during the spring and no broods were seen on the Loch, an area where females usually take the ducklings once they have first left the nest.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pairs	2	0	0	0	0	0	2	3	0	0

1.7.4 Oystercatcher (*Haematopus ostralegus*)

Oystercatcher nests were noted and mapped across the island during the gull count, when the whole island is walked. This year a total of 24 nests were identified. Although no monitoring of the nests was undertaken, several fledged chicks were seen and ringed throughout the season.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pairs	19	19	17	17	14	16	9	20	19	24

1.7.5 Feral pigeon (*Columba livia* (domest.))

No specific counts were made of feral pigeons on the island. They appear to nest on the island in burrows and rock crevices.

1.7.6 Swallow (*Hirundo rustica*)

Four pairs of swallow bred on the island in the usual buildings: the Freezer Room, Quad Bike Shed, Engine Room and Bath House. All were successful in raising and fledging young. The Freezer Room and Engine Room pairs had two broods and were still present around the island until late September before migrating south.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pairs	0	0	0	0	0	2	3	3	6	4

1.7.7 Rock Pipit (*Anthus petrosus*)

The number of rock pipit territories was four down on last year, 20 compared to 24 in 2015.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pairs	8-9	9-10	12-14	15	13	23	18	24	24	20

1.7.8 Pied Wagtail (*Motacilla alba*)

Pied wagtail territories were plotted on a map throughout the season and approximately 12 were noted again this year; the same as in 2015.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pairs	8	9	11	12	13	18	14	13	12	12

1.7.9 Carrion crow (*Corvus corone*)

A pair was noted for much of the spring, and a nest was found on the Loch side containing five eggs. The nest was removed to avoid any predation of nesting seabirds.

1.7.10 Peregrine falcon (*Falco peregrinus*)

Every year a pair of peregrines are seen in early spring displaying but it has been six years since they actually successfully raised young on the island (fledged three chicks in 2010). This was no different, a pair was seen early in the season but no breeding attempt was made. No adults were seen after this date until the autumn.

1.7.11 Wren (*Troglodytes troglodytes*)

Like the previous year, birds were singing in early spring with three territories noted, Fluke Street, the Low Light bushes and the south end of the island. The latter did not come to anything but the others were successful in fledging chicks.

The Fluke Street pair had three broods. They nested first behind the cottages up near the water tank, and the second nest was in the external building in the garden of the principal keeper's cottage, above the door. The third brood emerged from lower down the bank behind the principal keeper's cottage on 5 September. A nest was not located for the Low Light pair but adults and young were seen in the Low Light bushes.

1.7.12 Dunnock (*Prunella modularis*)

Dunnock successfully bred again on the island, the second consecutive year since 1961. The nest was located in the Low Light bushes and the pair were noted to have had one brood.

1.7.13 Blackbird (*Turdus merula*)

After blackbird successfully bred and fledged chicks in 2015, the first year since 1951, no attempts were made this year.

1.7.14 Woodpigeon (*Columba palumbus*)

2015 was the first time that woodpigeons bred on the island, when two bred and fledged chicks. This year, two pairs were noted, again in the Top garden and in the Low Light water tank bushes. However, both failed after adverse weather. In early summer, a pair was seen regularly flushing from the Low Light bushes, presumably on a nest, and then later seen with two juveniles. The pair at the Top garden did not make a second breeding attempt.

1.8 MIGRANT AND WADER COUNTS

1.8.1 Migrants

Records of migrants were noted throughout the season from March through to November, with the most noticeable listed below. For a more detailed account of the season, see the Isle of May Bird Observatory Annual Report 2016.

3 rd record	Citrine wagtail	Two previous records in autumn 1968 and 2014
	Dusky warbler	Two previous records in 1985 and 2011
	Water pipit	Two previous records in 1970 and 2007
4 th & 5 th	Blyth's reed warbler	Three previous records in 1991, 2003, 2007
7 th record	Olive-back pipit	Previous records in 1985, 1994, 1998, 2005, and two in 2015
	White-tailed eagle	Last recorded in 2012

7 th & 8 th	House sparrow	Eight records in the last 50 years, involving 14 birds
8 th record	Radde's warbler	(Caught and ringed) Last recorded in 2013
9 th record	Slavonian grebe	Last recorded in 2009
11 th record	Western subalpine warbler	(First - summer) The first since 2007
13 th bird	Leach's petrel	(Caught and ringed) The first since 2011
14 th record	Black-throated diver	Last recorded in 2012
16 th record	Marsh harrier	(Female) Last recorded in 2013
17 th bird	Coal tit	Last recorded in 2013
20 th bird	Rustic bunting	(Female) Last recorded in September 1999
13 th & 14 th	Barn owl	Last recorded in 2015
16 th record	Greenish warbler	(Caught and ringed) Last recorded in 2012
20 th bird	Thrush nightingale	Last recorded in May 2012
8	Bluethroat	6 males and 2 females - best since 1998
6	Little bunting	Best year total, last recorded in 2013
5	Red-backed shrike	4 females and 1 male - best since 2013
4	Firecrests	1 in spring and 3 in autumn
4	Barred warbler	All autumn records
3	Red-breasted flycatcher	2 in spring and 1 in autumn
3	Waxwings	Last recorded in 2010
3	Icterine warbler	1 in spring and 2 in autumn
3	Treecreeper	First since 2013
2	Common rosefinch	All in autumn
1	Wryneck	Last recorded in 2015
1	Wood warbler	Last recorded in 2015
1	Long-tailed tits	Involving 4 birds and last recorded in 2011
1	Little grebe	Last recorded in 2011
1	Great grey shrike	Last recorded in 2015
1	Bullfinch	Last recorded in 2013

1.8.2 Wader counts

Wader counts were conducted throughout the year, with peaks in July and August. A full list of all counts can be found in the Isle of May Bird Observatory Annual Report 2016.

1.9 MAMMALS

1.9.1 Grey seal

The number of adult seals started to increase in September and the first seal pup was born on 26 September on Rona. However, there was an earlier stillborn pup, again on Rona.

1.9.2 Cetaceans

Observations of cetaceans were made by SNH staff, CEH, Bird Observatory occupants and the crew from the May Princess and Osprey.

It has been a poor year for cetaceans; none were recorded in April and there were only a few sightings throughout the rest of the year. A dead sperm whale was seen from the island to the east and was present for three days before drifting north. A summary of the sightings is below; see table 5.1 for full details.

Bottlenose dolphins were seen from the May Princess on several occasions close to the harbour entrance.

	March		April		May		June		July		Aug		Sept		Oct		Nov	
	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
Harbour porpoise	1				3	3	2	3	6	5	4	5	5	5	1	1		
Minke whale					5	2			5	3	2	1	4	1			1	1
Sperm whale									3	1 dead male								
Common dolphin											1	2						
Bottlenose dolphin					1	6	1	6							1	40		
Dolphin species																	1	1

D= Days, M=Max

1.9.3 Mice

Mice have been present in the buildings throughout the year, with numbers building during August inside the cottages. Nottingham University continued their research on the island, looking at survival rates, bacterial resistances and genetics. They came out for a week at a time during April, July and October.

1.10 LEPIDOPTERA

1.10.1 Butterflies

Records of butterflies were made by informal observations from members of Fluke Street and the Isle of May Bird Observatory residents throughout the season.

The highlights of the season were an orange-tip, recorded by the Bird Observatory, and a single ringlet seen in July. An emergence of 200 individual painted lady butterflies during one day in June was noted. See table 6.1 for the overview of the butterfly records.

1.10.2 Moths

Moth trapping was attempted most nights when SNH staff were present on the island; the trap was run from 8 April until 9 October.

The MV light trap was set up in the garden outside the principal keeper's cottage; the trap was put into an outdoor shelter when the weather was adverse and for a certain time when pufflings were leaving their burrows as they are drawn towards the light. The trap was also moved a couple of times around the buildings as the breeding wrens were getting into the trap and feeding on the caught moths.

Trapping was conducted on 136 nights during 2016. See Table 6.4 for the number of days trapping occurred per month.

A total of 85 different macro species were recorded and 17 micro species, more than last year. The most numerous moth species on the island is likely to be Silver Y; however, these are mainly day-flying moths and are not caught in the MV light trap frequently.

2016 highlights include several moth species that were recorded for the first time: Lempke's gold spot, shaded broad-bar, grass rivulet and a probable common wave.

Other scarce moths recorded this year include: chevron, large wainscot, magpie, plain golden y, small rivulet and spinach. See Table 6.2 and 6.3 for an overview of the season.

2 VISITORS

Following on from last year's success, the Isle of May welcomed a record number of visitors between 26 March and 2 October. A combination of events, improved publicity and good weather resulted in 12,064 people visiting during the year (the previous record was set last year with 10,929).

Three boats were licensed to land visitors on the island (the third and final year of the current agreement): the *May Princess* from Anstruther, the *Osprey* RIB from Anstruther and the *Seabird* RIB from North Berwick. As expected, the *May Princess* carried the bulk of visitors with 9,820 (8,803 in 2015), *Osprey* 1,327 (1,219 in 2015) and *Seabird* 743 (669 in 2015). The other 164 visitors during the season arrived on private boats (including kayaks).

The weather dictates passenger runs and the island was closed on 23 planned dates (22 in 2015) whilst another 23 sailing days (29 in 2015) were lost to poor weather and bad sea states. Overall, the island was open for 149 days (132 days in 2015) with a daily average of 81 people (83 in 2015). Interestingly, the weather in the summer months was excellent, with no closed or lost days in July and only two days lost in both June and August. Overall, new record monthly visitor numbers were achieved for June, July and August.

As normal, a number of public events were held on the island throughout the season including Seabird Weekend (June), Family Fun Day (July), Open Doors Event (September) and Seal Weekend (October). There was also the added feature of celebrating the islands 60th year as a National Nature Reserve (NNR) and the 200th year since the construction of the main Stevenson Lighthouse (which was opened to the public throughout the year).

	May Princess	Osprey	Seabird	Others	Total	Open	Closed	Cancelled
March	83	22	0	0	105	3	2	1
April	650	124	48	16	838	18	6	6
May	1,609	234	94	14	1,951	22	5	4
June	2,224	258	235	75	2,792	24	4	2
July	2,705	302	238	18	3,263	31	0	0
Aug	1,924	265	104	12	2,306	29	0	2
Sept	543	105	12	12	673	20	6	4
Oct	92	17	12	15	136	2	0	0
Total	9,830	1,327	743	164	12,064	149	23	19

Table 1.1: Population estimates of Isle of May cliff nesting seabirds, 1980-2016

Year	Fulmar	Shag	Kittiwake	Guillemot		Razorbill	
	(AOS)	(AON)	(AON)	(Individual)	(Estimated pairs)	(Individual)	(Estimated pairs)
1980	143	1,041	n/c	n/c		n/c	
1981	n/c	1,163	n/c	16,300		2,086	
1982	n/c	1,425	n/c	n/c		n/c	
1983	101	1,567	6,115	22,550		2,220	
1984	175	1,639	6,012	19,005		2,051	
1985	156	1,524	5,510	18,390		1,825	
1986	150	1,310	4,801	19,151		1,864	
1987	n/c	1,916	6,765	17,546		1,887	
1988	n/c	1,290	7,638	16,791		2,128	
1989	212	1,703	7,564	18,328		2,613	
1990	198	1,386	8,129	16,778	12,632	2,368	1,508
1991	250	1,487	6,535	16,834	11,440	1,633	1,425
1992	266	1,634	6,916	17,512	11,511	2,581	1,909
1993	266	715	7,009	17,919	12,418	3,022	2,052
1994	279	403	3,751	19,186	13,843	3,034	2,227
1995	296	503	7,603	25,754	15,326	4,248	3,108
1996	308	512	6,269	24,468	14,500	3,405	2,989
1997	382	502	6,518	26,711	17,340	3,478	2,719
1998	365	621	4,306	26,963	17,384	3,859	3,126
1999	312	259	4,196	21,694	16,933	3,786	3,429
2000	367	541	4,618	27,045	17,979	3,958	3,105
2001	369	734	3,639	28,103	18,442	4,114	3,346
2002	338	676	3,666	24,369*	20,185*	3,050*	2,844*
2003	248	968	3,335	26,722*	19,519*	3,105*	2,233*
2004	236	687	3,876	22,970*	20,332*	3,313*	2,677*
2005	276	281	3,790	22,667*	18,858*	4,109*	4,713*
2006	298	485	3,167	21,444*	15,578*	3,811*	2,975*
2007	281	399	3,424	16,770*	15,536*	3,635*	2,735*
2008	293	427	3,354	17,157*	15,036*	3,464*	2,591*
2009	358	465	2,316	16,888*	14,143*	3,008*	2,400*
2010	381	492	3,422	18,096	15,029	3,234	2,557
2011	306	540	2685	15691	14955	3012	2705
2012	290	648	2465	16991	14100	3305	3068
2013	218	322	1712	14764	13349	3155	2879
2014	325	338	2464	16602	14248	3796	2987
2015	309	401	3433	21598	15945	4590	3202
2016	309	349	2912	23038	16134	5117	3570

* Based on first all-island count (AIC1)

Table 1.2: Population estimates of Isle of May ground nesting seabirds, 1980-2016

Year	Gulls			Terns					Eider
	LBB gull	Herring gull	GBB gull	Common tern	Arctic tern	'Commic' tern	Sandwich tern	Roseate tern	
1982	550	2300	1	14	0	14	0	0	241
1983	1385	2578	0	29	0	29	0	0	545
1984	1488	2230	0	36	19	55	0	0	413
1985	1053	2165	1	80	87	167	0	0	520-550
1986	682	1943	3	22	128	150	0	0	557
1987	534	2117	3	76	126	202	0	0	735
1988	563	1711	3	50	200	250	0	0	600-700
1989	643	1629	3	NC	NC	312	0	0	680
1990	618	1551	3	190	285	475	1	0	841
1991	788	1447	4	195	435	628	0	0	592
1992	751	1462	8	94	491	585	0	0	810
1993	1259	2059	7	143	538	681	0	0	651
1994	1270	2122	6	144	544	688	0	0	998
1995	1635	2554	7	181	608	789	0	1	1169
1996	1641	2969	7	248	532	780	0	1	1075
1997	1540	2856	9	338	630	968	0	0	1191
1998	1533	2607	14	127	451	578	2	0	866
1999	1519	3115	19	415	737	1152	110	0	1200
2000	1442	3067	23	303	908	1211	176	0	892
2001	1203	2845	27	132	916	1048	305	0	947
2002	1198	2367	20	2	228	230	0	0	783
2003	1128	2451	23	60	577	637	58	0	1156
2004	1221	2428	23	62	666	728	151	0	1101
2005	1320	2094	33	65	609	674	0	0	1070
2006	1732	2851	25	99	515	614	0	0	823
2007	1665	2854	30	83	525	608	0	0	1009
2008	1944	2962	37	102	511	613	2	0	1088
2009	NC	NC	38	89	316	405	0	0	NC
2010	2348	3215	36	17	34	51	0	0	1099
2011	NC	NC	40	26	224	250	0	0	NC
2012	2352	3281	40	20	265	285	0	0	902
2013	NC	NC	36			419	0	0	NC
2014	2047	4200	51	13	402	415	0	0	975
2015	NC	NC	53	13	484	497	0	0	NC
2016	1924	3800	72	19	527	546	21	0	1128

Table 1.3: All-island section count of fulmar, shag, kittiwake, guillemot and razorbill, Isle of May, 2016

Section		Species						
		Fulmar	Shag	Kittiwake	Guillemot		Razorbill	
		AOSs	AONs	AONs	Ind	Pairs	Ind	Pairs
A	Rona (West)	15	43	182	811	577	180	112
B	Altarstones to Peregrine's Nest	41	25	257	1919	1361	666	379
C	Greengates	37	4	553	4998	3308	1072	694
D	South Plateau	41	7	851	7288	5082	1203	866
E	Cornerstone to Pilgrim's Haven	12	6	380	4800	3387	1029	772
F	Pilgrim's Haven to Lady's Cave	33	20	219	1235	959	385	307
G	The Maidens	10	48	30	129	100	50	50
H	South Ness to Lady's Bed	0	17	93	314	244	77	63
I	South Ness to Colm's Hole	21	64	88	0	0	16	15
J	Colm's Hole to Low Light	19	69	66	386	292	131	109
K	Low Light to Tarbet	33	32	164	1158	824	274	170
L	Rona (North and East)	4	14	0	0	0	0	0
M	Lochside (South)	37	0	0	0	0	0	0
N	Lochside (North)	6	0	29	0	0	34	33
Totals		309	349	2912	23038	16134	5117	3570

Table 1.4: Population change 2015-2016 for cliff-nesting species

	Fulmar (AOS)	Shag (AON)	Kittiwake (AON)	Guillemot		Razorbill	
				Ind.	Pairs	Ind.	Pairs
2015 total (AIC)	309	401	3433	21598	15945	4590	3202
2016 total (AIC)	309	349	2912	23038	16134	5117	3570
Change 2015-2016	0	-52	-521	1440	187	527	368
%age change 2015-2016	0	-13	-15	7	1	12	12

Table 1.5: Population change 2014/15-2016 for gulls, terns and eiders

	Gulls			Terns			Eider
	LBB gull	Herring gull	GBB gull	Common tern	Arctic tern	Sandwich tern	
2014/2015 total	2047	4200	53	13	484	0	975
2016 total	1924	3800	72	19	527	21	1127
Change 2014/15-2016	-123	-401	19	6	43	21	151
%age change 2014/15-2016	-6%	-10%	36%	46%	9%		16%

Table 1.6: Conversion of individual guillemots and razorbills to pair for the all-island count, Isle of May, 2016

Date	Time of Cornerstone count	Guillemot				Razorbill			
		Individuals at Cornerstone	k-value	Individual main count	Pairs main count	Individuals at Cornerstone	k-value	Individual main count	Pairs main count
02/06/2016	08:05	334	0.69	3856	2644	108	0.73	706	516
02/06/2016	14:35	291	0.79	944	743	100	0.79	323	255
03/06/2016	08:25	342	0.67	6301	4219	123	0.64	922	592
03/06/2016	14:45	262	0.87	987	863	81	0.98	281	274
03/06/2016	14:45	262	0.87	0	0	81	0.98	34	33
04/06/2016	08:05	346	0.66	4998	3308	122	0.65	1072	694
05/06/2016	08:15	322	0.71	811	577	127	0.62	180	112
05/06/2016	08:15	322	0.71	1158	824	127	0.62	274	170
06/06/2016	08:05	323	0.71	1919	1361	139	0.57	666	379
07/06/2016	08:20	295	0.78	1235	959	99	0.80	385	307
07/06/2016	08:20	295	0.78	314	244	99	0.80	70	56
07/06/2016	08:20	295	0.78	129	100	99	0.80	0	0
07/06/2016	13:15	303	0.76	0	0	95	0.83	5	4
07/06/2016	13:15	303	0.76	386	292	95	0.83	131	109
Total				23038	16134			5049*	3501*

*A total of 68 pairs were noted by CEH in three sections. This figure was added to the totals of both individuals and pairs.

Table 1.7: Counts of guillemots in individual count sections during the all-island count, Isle of May 2016

	A		B		C		D		E		F		G		H		I		J		K		L		M		N	
	ind	prs	ind	prs	ind	prs	ind	prs	ind	prs	ind	Prs	ind	prs	ind	prs	ind	prs	ind	Prs	ind	prs	ind	prs	ind	prs	ind	prs
2/6									3856	2644																		
2/6									944	743																		
3/6							6301	4219																	0	0		
3/6							987	863																		0	0	
4/6					4998	3308																						
5/6	811	577																			1158	824	0	0				
6/6			1919	1361																								
7/6											1235	959	129	100	314	244	0	0	386	292								
TOTAL	811	577	1919	1361	4998	3308	7288	5082	4800	3387	1235	959	129	100	314	244	0	0	386	292	1158	824	0	0	0	0	0	0

Table 1.8: Counts of razorbills in individual count sections during the all-island count, Isle of May 2016

	A		B		C		D		E		F		G		H		I		J		K		L		M		N	
	ind	prs	ind	prs	ind	prs	ind	prs	ind	prs	ind	prs	ind	prs	ind	prs	ind	prs	ind	Prs	ind	Prs	ind	prs	ind	prs	ind	prs
2/6									706	516																		
2/6									323	255																		
3/6							922	592																				
3/6							281	274																	0	0	34	33
4/6					1072	694																						
5/6	180	112																			274	170	0	0				
6/6			666	379																								
7/6											385	307	0	0	70	56	5	4	131	109								
TOTAL	180	112	666	379	1072	694	1203	866	1029	771	385	307	0	0	70	56	5	4	131	109	274	170	0	0	0	0	34	33

Table 2.1: Nest counts and contents of herring and lesser black-backed gulls, Isle of May, 2016

Date	Section	0	1	2	3	4	5	Unknown	Total
24 May	Mars Rocks (1)	9	3	14	19				45
24 May	North Ness (2)	97	100	187	324	2			710
24 May	North Horn (3)	37	11	16	46				110
24 May	East Rona (4)	48	126	248	449	1		8	880
24 May	North Horn to Bridge (5)	18	18	47	117				200
24 May	Bridge to Altarstanes (6)	10	10	14	33				67
24 May	Altarstanes to Horsehole (7)	1	1	5	13				20
24 May	Horsehole (8)	0	3	2	11				16
26 May	North Plateau North (9)	51	68	148	314	1	1		583
30 May	North Plateau South (10)	1	4	2	3				10
30 May	Lighthouse (11)								0
01 May	North Lochside to Mill Door (12)							4	4
03 June	South Mill Door (13)								0
01 June	North Lochside (14)								0
01 June	South Lochside (15)							1	1
31 May	St Andrew's Well (16)	1							1
31 May	Beacon (17)								0
31 May	West Braes (18)								0
25 May	East Braes (19)								0
24 May	Tarbet (20)	37	45	75	115				272
25 May	Tarbet to Low Light (21)	11	25	52	95				183
05 June	Low Light Rocks (22)							13	13
25 May	Burrian (23)	13	33	63	137				246
25 May	Colm's Hole (24)	8	5	15	32				60
25 May	Kettle to Colm's Hole (25)	88	119	216	500				923
25 May	Kirkhaven Rocks (26)								0
31 May	South Plateau (27)	7	26	41	145			1	220
01 June	South Plateau Cliffs (28)							3	3
31 May	Cornerstone to Pilgrim's Haven (29)								0
31 May	South Horn (30)	1	10	15	70				96
31 May	South Horn Cliffs (31)								0
30 May	Fields (32)			3					3
01 June	Ardcarron to Kirkhaven (33)	39	44	99	226				408
26 May	Ardcarron Rocks (34)							2	2
31 May	Lady's Bed (35)	8	26	65	170				269
01 June	South Ness (36)	3	7	25	56				91
07 June	The Clett (37)								0
07 June	The Middens (38)								0
07 June	Pillow (39)								0
01 June	Maidens (40)							44	44
31 May	The Cleaver (41)								0
01 June	Lady's Bed Stacks (42)								0
Total		488	684	1352	2875	4	1	76	5480

Table 2.2: Counting efficiency of gull nests, Isle of May, 2016

Section	Section total	Number missed	% accuracy
Mars Rocks (1)	45	0	100
North Ness (2)	710	10	99
North Horn (3)	110	11	90
East Rona (4)	880	54	94
North Horn to Bridge (5)	200	4	98
Bridge to Altarstanes (6)	67	4	94
Altarstanes to Horsehole (7)	20	3	85
Horsehole (8)	16	1	94
North Plateau North (9)	583	27	95
North Plateau South (10)	10	0	100
Lighthouse (11)	0	0	
North Lochside to Mill Door (12)	4		
South Mill Door (13)	0		
North Lochside (14)	0	0	
South Lochside (15)	1		
St Andrew's Well (16)	1		
Beacon (17)	0		
West Braes (18)	0		
East Braes (19)	0		
Tarbet (20)	272		
Tarbet to Low Light (21)	183	10	95
Low Light Rocks (22)	13	0	100
Burrian (23)	246	17	93
Colm's Hole (24)	60	0	100
Kettle to Colm's Hole (25)	923	17	98
Kirkhaven Rocks (26)	0		
South Plateau (27)	220	14	94
South Plateau Cliffs (28)	3	0	100
Cornerstone to Pilgrim's Haven (29)	0		
South Horn (30)	96	8	92
South Horn Cliffs (31)	0		
Fields (32)	3	0	100
Ardcarron to Kirkhaven (33)	408	12	97
Ardcarron Rocks (34)	2		
Lady's Bed (35)	269	24	91
South Ness (36)	91	0	100
The Clett (37)	0		
The Middens (38)	0		
Pillow (39)	0		
Maidens (40)	44		
The Cleaver (41)	0		
Lady's Bed Stacks (42)	0		
Total	5480		96

Table 2.3: The corrected total number of nests using the % accuracy for each section and the average % accuracy where the counting efficiency was not made, Isle of May, 2016

Section	Section total	% accuracy	Corrected total
Mars Rocks (1)	45	100	45
North Ness (2)	710	99	720
North Horn (3)	110	90	122
East Rona (4)	880	94	938
North Horn to Bridge (5)	200	98	204
Bridge to Altarstones (6)	67	94	71
Altarstones to Horsehole (7)	20	85	24
Horsehole (8)	16	94	17
North Plateau North (9)	583	95	611
North Plateau South (10)	10	100	10
Lighthouse (11)	0	100	0
North Lochside to Mill Door (12)	4	96	4
South Mill Door (13)	0	96	0
North Lochside (14)	0	100	0
South Lochside (15)	1	96	1
St Andrew's Well (16)	1	96	1
Beacon (17)	0	96	0
West Braes (18)	0	96	0
East Braes (19)	0	96	0
Tarbet (20)	272	96	283
Tarbet to Low Light (21)	183	95	194
Low Light Rocks (22)	13	100	13
Burrian (23)	246	93	264
Colm's Hole (24)	60	100	60
Kettle to Colm's Hole (25)	923	98	940
Kirkhaven Rocks (26)	0	96	0
South Plateau (27)	220	94	235
South Plateau Cliffs (28)	3	100	3
Cornerstone to Pilgrim's Haven (29)	0	96	0
South Horn (30)	96	92	105
South Horn Cliffs (31)	0	96	0
Fields (32)	3	100	3
Ardcarron to Kirkhaven (33)	408	97	420
Ardcarron Rocks (34)	2	96	2
Lady's Bed (35)	269	91	295
South Ness (36)	91	100	91
The Clett (37)	0	96	0
The Middens (38)	0	96	0
Pillow (39)	0	96	0
Maidens (40)	44	96	46
The Cleaver (41)	0	96	0
Lady's Bed Stacks (42)	0	96	0
Total	5480		5722

Table 2.4: Head counts of individual herring gulls and lesser black-backed gulls (LBB), Isle of May, 2016

Section	Herring gull	LBB gull	Total	% Herring gull
Mars Rocks (1)	16	1	17	94
North Ness (2)	232	69	301	77
North Horn (3)	36	12	48	75
East Rona (4)	132	17	149	89
North Horn to Bridge (5)	71	11	82	87
Bridge to Altarstanes (6)	66	1	67	99
Altarstanes to Horsehole (7)	20	0	20	100
Horsehole (8)	16	0	16	100
North Plateau North (9)	79	87	166	48
North Plateau South (10)	4	6	10	40
Lighthouse (11)			0	
North Lochside to Mill Door (12)	4	0	4	100
South Mill Door (13)			0	
North Lochside (14)			0	
South Lochside (15)	1		1	100
St Andrew's Well (16)		1	1	0
Beacon (17)			0	
West Braes (18)			0	
East Braes (19)			0	
Tarbet (20)	145	8	153	95
Tarbet to Low Light (21)	32	38	70	46
Low Light Rocks (22)	13		13	100
Burrian (23)	75	64	139	54
Colm's Hole (24)	60		60	100
Kettle to Colm's Hole (25)	71	85	156	46
Kirkhaven Rocks (26)	1		1	100
South Plateau (27)	32	57	89	36
South Plateau Cliffs (28)	3		3	100
Cornerstone to Pilgrim's Haven (29)			0	
South Horn (30)	12	40	52	23
South Horn Cliffs (31)			0	
Fields (32)		3	3	0
Ardcarron to Kirkhaven (33)	76	45	121	63
Ardcarron Rocks (34)	2		2	100
Lady's Bed (35)	52	35	87	60
South Ness (36)	91		91	100
The Clett (37)			0	
The Middens (38)			0	
Pillow (39)			0	
Maidens (40)	44		44	100
The Cleaver (41)			0	
Lady's Bed Stacks (42)			0	

Table 2.5: The corrected estimate number of herring gull and lesser black-backed gull (LBB), Isle of May, 2016

Section	Herring	LBB	Total
Mars Rocks (1)	42	3	45
North Ness (2)	555	165	720
North Horn (3)	92	31	123
East Rona (4)	831	107	938
North Horn to Bridge (5)	177	27	204
Bridge to Altarstanes (6)	70	1	71
Altarstanes to Horsehole (7)	24	0	24
Horsehole (8)	17	0	17
North Plateau North (9)	291	320	611
North Plateau South (10)	4	6	10
Lighthouse (11)	0	0	0
North Lochside to Mill Door (12)	4	0	4
South Mill Door (13)	0	0	0
North Lochside (14)	0	0	0
South Lochside (15)	1	0	1
St Andrew's Well (16)	0	1	1
Beacon (17)	0	0	0
West Braes (18)	0	0	0
East Braes (19)	0	0	0
Tarbet (20)	269	15	284
Tarbet to Low Light (21)	88	105	193
Low Light Rocks (22)	13	0	13
Burrian (23)	143	122	265
Colm's Hole (24)	60	0	60
Kettle to Colm's Hole (25)	428	512	940
Kirkhaven Rocks (26)	0	0	0
South Plateau (27)	84	150	234
South Plateau Cliffs (28)	3	0	3
Cornerstone to Pilgrim's Haven (29)	0	0	0
South Horn (30)	24	81	105
South Horn Cliffs (31)	0	0	0
Fields (32)	0	3	3
Ardcarron to Kirkhaven (33)	264	156	420
Ardcarron Rocks (34)	2	0	2
Lady's Bed (35)	177	119	296
South Ness (36)	91	0	91
The Clett (37)	0	0	0
The Middens (38)	0	0	0
Pillow (39)	0	0	0
Maidens (40)	46	0	46
The Cleaver (41)	0	0	0
Lady's Bed Stacks (42)	0	0	0
Total	3800	1924	5724

Table 3.1: Number of tern nests in different sections, Isle of May, 2016

Section		2016			2015		2014	
		Arctic tern	Common tern	Sandwich tern	Arctic tern	Common tern	Arctic tern	Common tern
Kirkhaven Colony	Mouse House	137	0	0	79	0	30	0
	Visitor Centre (VC)	22	0	0	91	0	(197)	0
	VC Roof	0	0	0	25	0	5	0
	VC Bank	14	0	0	15	0	(197)	0
	Jetty-VC	3	0	0	49	0	(197)	0
	Jetty Triangle	5	0	0	10	0	(197)	0
	Chapel Bank and Chapel	2	0	0	14	0	0	0
	Logan's Road South	64	0	0	47	0	26	0
Beacon Colony	Beacon	156	0	0	154	13	83	13
	Terrace	77	19	21				
	West Brae	47	0	0				
	Total	527	19	21	484	13	341	13

Table 3.2: Number of mobbing and predation events, involving herring and lesser black-backed gull, Kirkhaven harbour and the Beacon, Isle of May, 2016

Week	Mobbing events <i>KH/Beacon</i>	Predation attempts <i>KH/Beacon</i>	Successful predation attempts <i>KH/Beacon</i>	Proportion of predation attempts successful (%) <i>KH/Beacon</i>
1 21-27 May	9/0	5/0	0/0	0/0
2 28 May- 3 June	16/0	12/0	1/0	8.3/0
3 4-10 June	25/2	15/0	1/0	6.7/0
4 11-17 June	3/0	2/0	1/0	50/0
5 18-24 June	10/0	4/0	1/0	25/0
6 25 Jun-1 July	10/4	8/3	0/1	0/33.3
7 2-8 July	29/6	13/3	6/2	46.2/66.7
8 9-15 July	0/0	0/0	0/0	0/0
TOTAL	102/12	59/6	10/3	16.9/50

Table 4.1: Counted and estimated numbers of eider nests, Isle of May, 2016

Section	Female	Hatched	Predated	Total	Corrected total (18/93)
Mars Rocks (1)	1			1	1
North Ness (2)	50	3	3	56	67
North Horn (3)	16		1	17	20
East Rona (4)	71	6	4	81	96
North Horn to Bridge (5)	13	2	1	16	19
Bridge to Altarstanes (6)	4			4	5
Altarstanes to Horsehole (7)	11		1	12	14
Horsehole (8)				0	0
North Plateau North (9)	37	5	2	44	52
North Plateau South (10)	51	34	5	90	107
Lighthouse (11)	5	1	1	7	8
North Lochside to Mill Door (12)	1			1	1
South Mill Door (13)				0	0
North Lochside (14)	5			5	6
South Lochside (15)	1			1	1
St Andrew's Well (16)	14	8	3	25	30
Beacon (17)	37	13	1	51	61
West Braes (18)	52	25	2	79	94
East Braes (19)	26	5		31	37
Tarbet (20)	15	1		16	19
Tarbet to Low Light (21)	39	3	2	44	52
Low Light Rocks (22)				0	0
Burrian (23)	30		2	32	38
Colm's Hole (24)	4			4	5
Kettle to Colm's Hole (25)	73	16	2	91	108
Kirkhaven Rocks (26)				0	0
South Plateau (27)	42	31		73	87
South Plateau Cliffs (28)				0	0
Cornerstone to Pilgrim's Haven (29)	26	22		48	57
South Horn (30)	5	1		6	7
South Horn Cliffs (31)	3			3	4
Fields (32)	27	13	1	41	49
Ardcarron to Kirkhaven (33)	36	9	1	46	55
Ardcarron Rocks (34)				0	0
Lady's Bed (35)	14	6		20	24
South Ness (36)	1	1		2	2
The Clett (37)				0	0
The Middens (38)				0	0
Pillow (39)				0	0
Maidens (40)				0	0
The Cleaver (41)				0	0
Lady's Bed Stacks (42)		1		1	1
Total	710	206	32	948	1127

Table 5.1: Cetacean sightings from the Isle of May, 2016

Date	Species	Number
26/03/2016	Harbour porpoise	1
16/05/2016	Minke whale	2
16/05/2016	Harbour porpoise	3
16/05/2016	Minke whale	2
18/05/2016	Harbour porpoise	3
22/05/2016	Minke whale	1
23/05/2016	Minke whale	2
24/05/2016	Minke whale	1
29/05/2016	Minke whale	2
29/05/2016	Harbour porpoise	3
29/05/2016	Bottlenose dolphin	6
03/06/2016	Bottlenose dolphin	6 including 1 juvenile
05/06/2016	Harbour porpoise	1
15/06/2016	Harbour porpoise	3
05/07/2016	Harbour porpoise	1
06/07/2016	Harbour porpoise	1
07/07/2016	Harbour porpoise	3
09/07/2016	Minke whale	1
13/07/2016	Minke whale	1
13/07/2016	Sperm whale	1 dead male
14/07/2016	Sperm whale	1 dead male
15/07/2016	Sperm whale	1 dead male
19/07/2016	Harbour porpoise	4 (in 3 groups)
19/07/2016	Minke whale	1
20/07/2016	Minke whale	3
20/07/2016	Minke whale	2
23/07/2016	Harbour porpoise	3
23/07/2016	Minke whale	1
24/07/2016	Harbour porpoise	3
09/08/2016	Harbour porpoise	4
15/08/2016	Harbour porpoise	4
21/08/2016	Minke whale	1
22/08/2016	Minke whale	1
23/08/2016	Common dolphin	2
27/08/2016	Harbour porpoise	3
28/08/2016	Harbour porpoise	5
03/09/2016	Harbour porpoise	2
03/09/2016	Harbour porpoise	4
05/09/2016	Harbour porpoise	1
05/09/2016	Minke whale	1
06/09/2016	Minke whale	1
07/09/2016	Harbour porpoise	5 (6)
08/09/2016	Minke whale	1
13/09/2016	Harbour porpoise	2
Date	Species	Number

14/09/2016	Minke whale	1
16/09/2016	Common dolphin	3
18/09/2016	Minke whale	1
28/09/2016	Harbour porpoise	5
21/10/2016	Harbour porpoise	1
31/10/2016	Bottlenose dolphin	40
02/11/2016	Minke whale	1
06/11/2016	Dolphin Spp.	1

Table 6.2: Macro moths: first and last dates, the number of days and peak count per month, Isle of May, 2016

	First	Last	April		May		June		July		August		September		October	
			Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Day	Max
Angle shades	9/6	9/10					2	1	2	1	1	1	6	6	2	1
Antler moth	25/6	4/9					1	1	11	9	12	5	1	1		
Beautiful golden Y	3/7	25/7							6	4						
Bright-line brown-eye	29/5	28/8			1	1	15	11	23	14	3	2				
Brimstone moth	4/7								1	1						
Broad-bordered yellow underwing	7/6						1	1								
Brown-line bright-eye	21/7								1	1						
Brown-spot pinion	2/9												1	1		
Burnished brass	13/7	16/8							4	3	4	1				
Cabbage moth	20/6	28/7					1	1	1	1						
Campion	17/5	5/9			1	1	10	5	6	1			3	1		
Chamomile shark	24/4	12/5	2	1	1	1										
Chevron	4/7								1	1						
Cinnabar	23/5	25/6			1	2	3	1								
Clouded-bordered brindle	9/6	12/7					5	1	3	3						
Common carpet	8/6	22/8					1	1			1	1				
Common marbled carpet	12/9	20/9											2	1		
Common pug	2/6	10/7					2	1	2	2						
Common/lesser rustic	21/6	5/9					6	4	16	7	15	22	4	4		
Common swift	7/6	4/7					13	12	1	12						
Common wainscot	7/7	24/7							3	1						
Common wave	4/7								1	1						

Species	First	Last	April		May		June		July		August		September		October	
			Days	Max.	Days	Max.	Days	Max.	Days	Max.	Days	Max.	Days	Max.	Days	Max.
Dark arches	21/6	20/9					4	4	25	238	23	160				
Dark spinach	7/7	29/7							10	10						
Dark sword-grass	18/9												1	1		
Dotted clay	2/8										1	1				
Double square-spot	17/7	23/7							2	1						
Dusky brocade	20/6	24/6					3	2								
Flame shoulder	21/5	11/7			1	1	6	4	4	1						
Flounced rustic	2/9	12/9											4	2		
Foxglove pug	4/7								1	1						
Garden carpet	2/9															
Garden dart	21/8	20/9									6	14				
Garden tiger	18/7	16/8							9	10	5	1				
Ghost moth	7/6	18/7					5	7	8	3						
Grass rivulet	17/6	18/6					2	1								
Grey chi	30/8										1	2				
Heart and club	23/6	28/7					1	1	1	1						
Heart and dart	3/6	23/7					8	4	7	3						
Hebrew character	24/4	30/6	3	6	13	6	11	3								
Ingrailed clay	8/6	25/6					3	1								
July highflyer	15/8										1	1				
Large wainscot	4/9												1	1		
Large yellow underwing	6/7	20/9							11	6	12	61	11	18		
Lempke's gold spot	17/7								1	1						
Lesser broad-bordered yellow underwing	24/7	30/8							1	1	8	4				
Lesser yellow underwing	2/8	18/9									10	5	7	5		
Light arches	20/7								1	1						
Lime-speck pug	22/6	24/7					2	1	4	2						

Lunar underwing	4/9	2/10											12	8	1	1
Species	First	Last	April		May		June		July		August		September		October	
			Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max
Magpie	6/7								1	1				1		
Map-winged swift	25/6						1	1								
Marbled beauty	24/7	31/7							2	1						
Marbled coronet	8/5	2/9			17	63	25	39	21	29			1	1		
Marbled minor	23/6						1	1								
Mottled beauty	23/7	28/7							2	1						
Mottled rustic	22/6	28/7					5	12	15	7						
Mouse moth	30/8	18/9									1	1	4	3		
Northern spinach	12/9												1	2		
Netted pug	20/6	24/7					5	4	8	2						
Plain golden Y	28/7	14/8									1	1				
Red-green carpet	20/9												1	1		
Riband wave	23/7								1	1						
Rosy rustic	8/8	26/9									8	10	12	13		
Rustic	20/6	25/7					1	2	3	1						
Rustic/uncertain agg	23/7	1/8							4	6	1	1				
Setaceous hebrew character	17/7								1	1						
Shaded broad-bar	23/7								1	2						
Silver-ground carpet	8/6	23/7					5	3	5	2						
Silver Y	13/6	8/10					4	2	1	1	4	2	7	6	5	10
Six-striped rustic	23/7	28/7							3	1						
Small rivulet	23/7	24/7							2	2						
Small square-spot	8/6	18/9					5	2	12	4	4	2	4	3		
Small wainscot	21/7								1	1						
Smoky wainscot	5/7	15/8							17	18	2	3				
Snout	19/7	28/7							2	2						
Spectacle	9/6	28/8					5	3	4	2	1	1				

Spinach	23/6	25/7					2	1	4	3						
Species	First	Last	April		May		June		July		August		September		October	
			Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max
Square-spot dart	18/8	2/9									3	5	2	2		
Square-spot rustic	28/6	26/9					1	1	4	1	6	13	7	1		
Twin-spot carpet	12/8	13/8									2	2				
Valerian pug	20/6						1	1								
White ermine	22/6	10/7					3	1	2	1						
Willow beauty	23/8	23/8									1	1				
Wormwood pug	24/6	28/7					2	1	9	5						

Table 6.3: Micro moths: first and last dates, number of days and peak count per month, Isle of May, 2016

Species	First	Last	April		May		June		July		August		September		October	
			Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max	Days	Max
Aethes cnicana	23/7								1	7						
Agapeta hamana	6/7	4/8							2	4	1	1				
Agriphila selasella	20/8	27/8									5	4				
Bee moth Apherusa sociella	23/7								1	2						
Celypha lacunana	23/7								1	1						
Cochylis dubitana	4/7	6/7							3	3						
Cochylis Spp.	27/8										1	1				
Crambus perlella	4/7	6/7							2	1						
Diamond-back moth Plutella xylostella	23/7								1	1						
Eudonia lacustrata	23/7								1	2						
Eudonia pallida	23/7	24/7							2	3						
Garden pebble Evergestis forficalis	14/8										1	1				
Mother of pearl Pleuroptya ruralis	23/8										1	1				
Phycitodes Spp.	22/7								1	1						
Scoparia pyralella	6/7	23/7							2	2						
Small magpie Anania hortulata	23/6	27/7					3	3	8	3						
Thistle ermine Myelois circumvoluta	24/7								1	1						

Table 6.4: The number of days moth trapping occurred per month on the Isle of May, 2016

Month	Number of trapping days
April	11
May	21
June	27
July	29
August	23
September	18
October	7
Total	136

APPENDIX 1

Isle of May research reports for 2016 season

Long-term studies of breeding seabirds on the Isle of May

M Newell, M Harris, S Burthe, C Gunn, S Wanless & F Daunt
CEH Edinburgh, Bush Estate, Penicuik, Midlothian, EH26 0QB

The 2016 breeding season on the Isle of May NNR proved to be a mixed year following the general success of 2014 and 2015. Breeding in 2016 commenced early for European shags but was late for black-legged kittiwakes and Atlantic puffins. There were no significant weather events in 2016, with winds mainly light and precipitation at normal levels.

The number of birds nesting in the study plots showed a mixed picture, with northern fulmar and common guillemot up, razorbill similar and black-legged kittiwakes and European shag down from last year. The drop in black-legged kittiwakes seemed to be a result of a non-breeding year rather than an actual population drop.

Northern fulmars had an above average breeding season (0.43 chicks per breeding pair) for the fourth year in succession. European shags had their most productive season on record (2.1 chicks per breeding pair) although the number of pairs in the plots was the second lowest on record. After two highly successful seasons, black-legged kittiwakes had another above average year (0.78). There were mixed fortunes for the auks, with Atlantic puffin having an above average breeding season (0.76) while common guillemot (0.66) were below average and razorbill (0.45) had the worst season on record. Return rates were above the long-term average in four study species, with European shag at 89%, black-legged kittiwake 88%, common guillemot 94% and razorbill 88%. The exception was Atlantic puffin (72%), which was considerably below the long-term average with only four poorer years.

Sandeels (*Ammodytes sp.*) remained the main food of young razorbill, puffins, shags and kittiwakes. The diet of guillemots was dominated by clupeids.

2) Post-fledging survival of seabirds

- In association with ringers resident at the Low Light, large numbers of young seabirds were ringed. The actual totals will appear in the annual report of the Isle of May Bird Observatory.
- Attention focussed on shag and guillemot and systematic searches were made to find and read the ring numbers of adult birds. This was made easier by many birds having been colour-ringed in previous years.
- Attempts were made to age and ring all shag chicks for future estimates of survival rates and age-specific breeding performance.

- As in previous years, guillemot chicks were weighed and measured to assess hatching date and condition, and then colour-ringed. A total of 182 chicks were sampled in 2016.

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Overwintering foraging ecology of seabirds

M. Newell, M Harris, S Burthe, S Wanless & F Daunt
CEH Edinburgh, Bush Estate, Penicuik, Midlothian, EH26 0QB

This project aims to obtain fine scale data on movements and foraging behaviour of seabirds in winter, by attaching specially designed loggers to European shags, Atlantic puffins, black-legged kittiwakes, razorbills and common guillemots. The loggers record daily location and foraging effort. Detailed data on location-specific foraging effort of seabirds will enable patterns of distribution and behaviour in relation to season and breeding status to be analysed.

The work on shags is a continuation of work commenced in 2002. A total of 41 geolocator loggers were retrieved from shags with a further 42 deployed which we plan to retrieve in 2017.

In 2016, 30 retrievals of geolocator loggers were made from guillemots with a further 30 deployments.

In 2016, a single geolocator logger was retrieved from a razorbill but there were no further deployments. In 2016, 40 loggers were deployed on puffins with 17 retrieved from previous deployments. Of these, four were retrieved from dead puffins which had been predated by great black-backed gulls in an area of over one hundred predated puffins. These deployments will be targeted for retrieval in 2017.

A total of 13 loggers were retrieved from kittiwakes in 2016 which had been deployed in previous years. A further 30 new deployments were made.

A multi-colony assessment of stress in black-legged kittiwakes (2016)

Sarah Burthe¹, Mark Newell¹, Carrie Gunn¹ & Sarah Wanless¹

¹Centre for Ecology & Hydrology, Penicuik, Midlothian, EH26 0QB

Kittiwake populations are in severe decline across the northern hemisphere. This study aims to look at individual data on stress measures (corticosterone in feathers and telomere shortening rates) across a series of kittiwake colonies in conjunction with colleagues at the University of Alaska. Stress levels can be measured from feather and blood samples and used to investigate whether colonies exhibiting pronounced declines in numbers or breeding success are those that exhibit evidence of stress linked to diet or food availability, for example.

We successfully obtained adequate sample sizes of both blood and feather samples from both adults and chicks in 2015 but due to a shortage of direction and feedback from our colleagues at the University of Alaska, no samples were obtained in 2016.

Environmental and intrinsic drivers of population change – an energetics approach

O. Hicks, F. Daunt, S. Burthe, J. Green

We aim to understand the energetic costs responsible for environmental and intrinsic drivers of population change which will allow us to much more effectively quantify the mechanisms responsible for reproductive skew in the population. By doing so, we can predict how populations will respond to anthropogenic changes to their environment.

In particular, we consider the role that endoparasites play in driving seabird population dynamics. The recently established endoscope method of quantifying gut parasite load in the European shag (*Phalacrocorax aristotelis*) showed significant variation in parasite loads between individuals.

By attaching accelerometers to adult shags, we are able to calculate energy expenditure and how this varies with parasite load. Building on previous work which found that parasites can affect reproductive success, we aim to use energetics to understand the mechanism behind this.

Breeding pairs were targeted to ensure male and female numbers are equal. Individuals for which parasite data and accelerometry data exist from previous years were targeted.

The loggers fitted (D3GT; and AXY-Depth) measured acceleration in three axes, depth and temperature and were attached to the central back feathers.

A total of 50 adult shags were endoscoped and fitted with acceleration data loggers. 19 birds were fitted with D3GT loggers and 31 were fitted with AXY-Depth loggers.

The accelerometer data has been downloaded and behaviours assigned and is currently being analysed with the parasite data to understand how different parasite loads affect energy expenditure during the breeding season. Data from 2014 and 2011 has been added to the dataset to help understand how the effects of parasitism are driven by varying environmental factors.

Breeding season foraging ecology of seabirds

M Newell, M Harris, C Gunn, M Bogdanova, S Wanless & F Daunt
CEH Edinburgh, Bush Estate, Penicuik, Midlothian, EH26 0QB

In 2016 we intended to deploy GPS loggers on four species in order to better understand their foraging ranges. However, due to time restrictions we were unable to deploy any devices.