The Isles of Scilly Wildlife Trust

Seabird Monitoring & Research Project Isles of Scilly 2018

IOSWT Rangers surveying on Annet

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September 2018

Summary of Seabird Monitoring and Research 2018

Monitoring of seabird numbers and productivity on St Agnes and Gugh

- Manx shearwater
    - breeding population has increased from 22 pairs in 2013 (pre- rat eradication) to 64 pairs in 2018 (post rat eradication)
    - Further sub-colony site expansion seen on St. Agnes in 2018
    - 48+ 'star-gazing' chicks recorded (16 St. Agnes, 32 Gugh), none in 2013
    - no fledging recorded at sub-colonies on Bryher and St. Mary's (Peninnis) with rat presence and clear evidence of predation seen on St. Helen'
- Storm petrel
    - again recorded breeding successfully St. Agnes & Gugh in 2018 (first records 2015)
    - 4 calling chicks recorded so far in 2018 (2 on Gugh, 2 St. Agnes)
    - 6 storm petrel nest boxes in St. Agnes dry stone walling checked, no uptake
- Lesser black-backed gull
    - colony on Gugh increased from 296 pairs 2017 to 452 pairs in 2018 (875 in 2006)
    - productivity ranged from 0.38 to 0.50 chicks per pair

Productivity monitoring work across the archipelago

- Herring gulls: selected sub-colonies on Samson and in Hugh Town, St. Mary's
    - productivity 0.49 chicks per pair on Samson (n = 37)
    - productivity 1.60 chicks per pair Hugh Town rooftop sub-colony (n = 20, slight increase)
- Kittiwakes: all sub-colonies
    - only bred at one site on the east side of Gugh
    - total 35 pairs, 87% reduction since 2006 (266 pairs, 6 sub-colonies)
    - no chicks fledged
- Fulmars: selected sub-colonies Menawethan and Daymark
    - continued low productivity ranging from 0.19 to 0.34 chicks per pair
- Common terns: all sub-colonies
    - very few individual birds seen around the islands in 2018. Some interest by 5 or so pairs on the south of Annet in early June, but no breeding attempts recorded

Population monitoring work on Annet

- Puffins included for the first time in annual survey, 43 birds recorded (31 in 2015, 50 in 2006)
- Storm petrel continued increase in breeding numbers at southern study beach 2006-2018
- New annual sample area surveyed for Manx shearwaters, 30 AOBs recorded
- Shag numbers stable, decline in the number of pairs of greater black-backed gull (170 pairs)

Introduction - Isles of Scilly Seabird Heritage & Data set

The full Special Protection Area (SPA) count conducted in 2015/16 confirmed Scilly as supporting a greater diversity of seabirds than any other site in England, with over 8,000 pairs of 13 species of regularly breeding seabird. Seabirds are a named feature in the SPA and many of the SSSI designations for the area and are a vitally important part of our natural heritage. We have;

- Internationally important numbers of lesser black-backed gull and storm petrel
- Nationally important numbers of great black-backed gull, Manx shearwater and shag (possibly now the largest colony in the UK)
- Regionally important numbers of puffin, razorbill, common tern and fulmar
- One of only two sites in England where Manx shearwater and storm petrel breed (the other being Lundy).

Scilly's seabird breeding records comprise one of the best long term environmental data sets we have for the islands. Regular all-island counts have been completed since 1970 as well as annual records for breeding numbers on Annet since 2006 and for St Agnes and Gugh since 2012. Sadly these records have documented alarming declines in many of our seabird populations;

- Overall number of breeding seabird pairs declined by 9.8% since 2006 and by 31.3% since 1983
- Five species of seabird have declined in numbers across Scilly by more than 20% since 2006 (kittiwake 89%; common tern 65%; lesser black-backed gull 26%; herring gull 22%; shag 21%)
- Annual counts of Annet breeding numbers down by 12% since 2006 (mainly a reduction in herring and lesser black-backed gull numbers)

Birds are widely accepted as excellent indicators of environmental health; their changing populations often providing clues to the overall health of their habitat. These declines in the seabird populations of Scilly show that there is a clear need to take action. Measurement of variables over time in a systematic way informs management priorities and actions for maintaining and recovering our seabird populations. Annual counts are particularly important in the variable marine environment where isolated good or bad years can have a big impact, but also need to be analysed in the context of the long-lived seabirds' life history. Continuous data sets allow a much more useful picture of what is going on between the stark numbers of the periodic full SPA counts.

The data collected in Scilly also contributes to national seabird records and allows comparison between different regional populations. In particular Scilly provides a useful comparison site for many seabird species whose other more studied colonies are located in the North Sea e.g. Kittiwake, shag, storm petrel. Unbroken long-term data sets also provides us with a reliable baseline measure against which to compare the impact of any unexpected isolated events (e.g. Pollution, disease, wrecks)

The scope of this report

Since the full SPA survey in 2006 annual productivity data for key seabird species have been collected at key sites across the islands. This is building up a picture of various breeding successes and failures to add to the picture in the interim periods between full counts and helping us to get an idea of the causes of the major species trends observed. Productivity for the species recorded here were collected using standard methods as set out in *The Seabird Monitoring Handbook* (Walsh *et al*. 1995).

This report summarises the results of this seabird fieldwork conducted between April and September 2018 within the context of previous years' results from Scilly and elsewhere in the UK. This work was funded in 2018 by the Isles of Scilly Wildlife Trust through the Area of Outstanding Natural Beauty programme.

Monitoring of seabird numbers and productivity on St Agnes and Gugh

- Annual counts of all breeding seabirds before and after rat removal
- Manx shearwater playback surveys and monitoring of productivity
- Storm petrel playback survey of sample habitat and productivity
- Monitoring of lesser black-backed gull productivity on Gugh

Productivity and monitoring work across the archipelago

- Herring gulls: selected sub-colonies on Samson and Hugh Town
- Kittiwakes: all sub-colonies
- Fulmars: selected sub-colonies Menawethan and Daymark
- Common terns: all sub-colonies
- Manx shearwaters on Bryher, St. Martins, Tresco, Peninnis and St Helen's

Population monitoring work on Annet

- Annual counts of breeding seabirds on Annet to include puffins
- Sample area surveyed for breeding Manx shearwaters
- Sample beach on surveyed for breeding storm petrel

Results: Monitoring of seabird numbers and productivity on St Agnes and Gugh

A full survey of all seabird species breeding on St. Agnes and Gugh has been conducted annually since 2012 with the results from this and the two previous SPA counts included in Tables 1 and 2 below. Over this period the number of both herring and lesser black-backed gulls has decreased. This is in line with population trends across the islands as a whole (Heaney & St. Pierre 2017). Kittiwakes first bred on St. Agnes at the Turks Head in 2009 following the desertion of a number of sub-colonies elsewhere in the archipelago. Following two years of failure at this site a small number of birds returned to breed at their former site on the eastern side of Gugh in 2017 and succeeded in raising a few chicks. However, they were not successful in raising any chicks in 2018 on Gugh.

Table 1. Breeding seabirds on St. Agnes*

	FUL	MX	SH	LBBG	HG	GBBG	KIT	COT	SP	RPL	OYC	Total
2000	0	5	0	2	25	0	0	3	0	-	-	**35**
2006	0	8	0	0	15	1	0	0	0	-	-	**24**
2012	0	8	0	8	61	0	24	0	-	2	9	**112**
2013	2	5	0	8	32	0	38	0	0	1	8	**94**
Rat Removal												
2014	3	9	0	16	27	1	62	0	0	1	10	**129**
2015	4	12	0	14	11	1	75	0	6	1	7	**131**
2016	6	22	0	15	12	1	5	0	9	2	8	**80**
2017	8	23	0	1	7	0	0	0	11	2	10	**62**
2018	5	23	0	2	7	0	0	0	8	1	7	**53**

SH – shag; GBBG – great black-backed gull; LBBG – lesser black-backed gull; HG – herring gull; RAZ – razorbill; FUL – fulmar; KIT – kittiwake; COT – common tern; SP – storm petrel; MX – Manx shearwater; PUF – puffin; OYC –oystercatcher; RPL – ringed plover.

* Counts do not include Burnt Island and Tins Walbert (Connected to St. Agnes at low tide)

Table 2. Breeding seabirds on Gugh

	FUL	MX	SH	LBBG	HG	GBBG	KIT	COT	SP	RPl	OYC	Total
2000	2	22	0	1123	159	3	155		0	-	-	**1464**
2006	3	9	0	875	69	4	131		0	-	-	**1091**
2012	4	16	2	361	53	10	0		-	0	7	**453**
2013	1	17	0	418	51	7	0		0	0	10	**504**
Rat Removal												
2014	5	17	0	411	30	5	0		0	0	10	**478**
2015	1	45	0	419	30	6	0		2	1	5	**509**
2016	1	52	0	400	36	5	0		4	0	10	**508**
2017	3	36	2	296	20	2	30		5	0	9	**403**
2018	2	41	0	452	28	0	35		11	1	9	**579**

During this time period the big event is of course the removal of rats from St. Agnes and Gugh in the winter of 2013/14 (although not officially declared rat free until February 2016). The most obvious change following this has been the increase in both breeding numbers, productivity and range of Manx

shearwaters and the first recording in living memory of storm petrels breeding on St. Agnes in 2015 and Gugh in 2016.

Manx shearwater settlement and productivity

The numbers of apparently occupied Manx shearwater burrows on both St. Agnes and Gugh have increased dramatically since the removal of rats in the winter of 2013-4. In addition to the increase in breeding numbers, new burrows are being occupied year on year with the sub-colony at Troytown spreading towards Hellweathers and Long Point and new birds on the East side of St Agnes towards Tolgillian also.

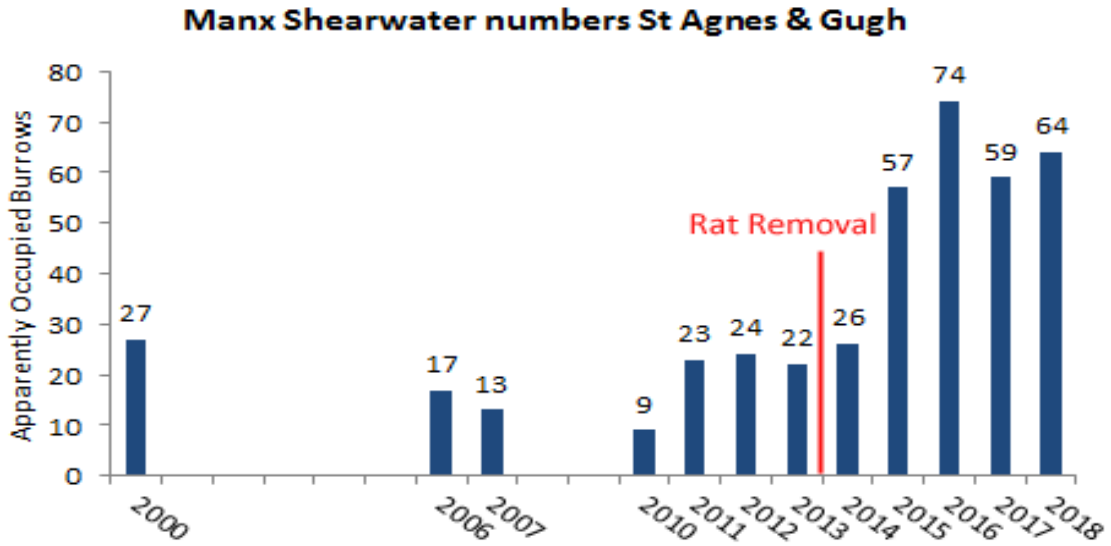
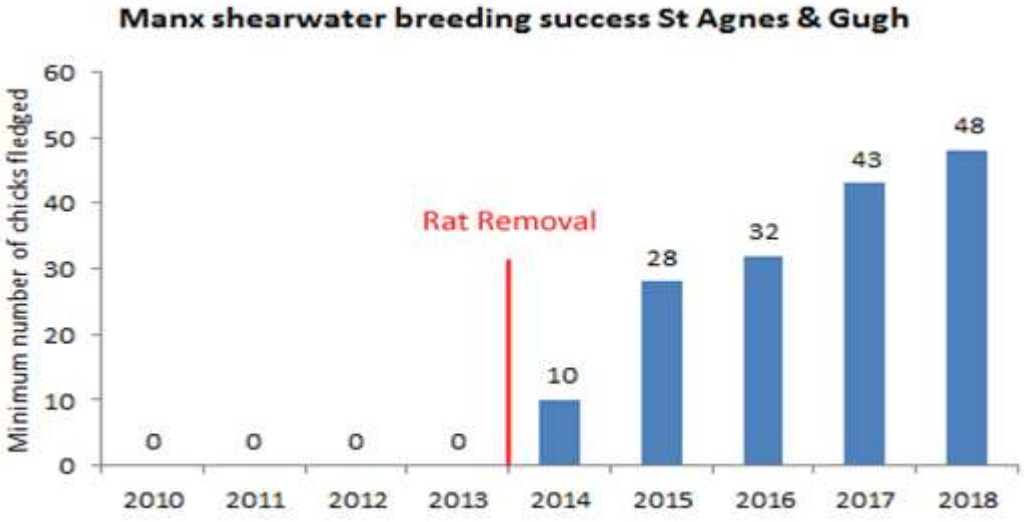


Table 3. Manx shearwater breeding numbers – selected counts across Scilly

	Gugh	St. Agnes	Bryher	St. Helen's	Peninnis, St. Mary's	Annet	Tresco	Daymark, St. Martin's
2000	22	5	12	5	0	123	0	0
2006	9	8	13	9	0	-	0	0
2007	8	5	-	-	-	-	-	-
2010	6*	3*	-	-	4	-	-	-
2011	13	10	-	39	7	-	-	-
2012	16	8	-	-	4	-	-	-
2013	17	5	12	-	2	(21)	-	-
2014	17	9	12	27	4	(20)	-	-
2015	45	12	39	36	8	229	46	26
2016	52	22	(16)	42	7	-	-	(4)
2017	36	23	(16)	-	4	-	(28)	(3)
2018	41	23	(23)	49	5	(30)	(27)	(0)

*AOBs recorded mid-June, likely to be an underestimate; Numbers in brackets represent only a sample of total; Dash means no count. All breeding pair counts above include a correction of 1.08 to account for incubating birds that did not respond.

So far 48 chicks have been recorded during the evening checks for 'star-gazing chicks' (conducted mid-August to late September). This translates to a breeding success in excess of 0.75 chicks per Apparently Occupied Burrow, which is good with breeding success on Lundy after rat removal recorded at 0.62 to 0.76 chicks per pair and the National Average 1986-2015 at 0.66.



A number of evening checks have also been made at Peninnis and on Bryher in 2018 but so far no fledglings have been recorded with a number of nocturnally active rats being sighted in and around the burrows at Shipman Head. In addition, a daytime check of the St. Helen's sub-colony in July showed ample and distressing evidence of predation around the apparently occupied breeding burrows. It is likely that these feathers are from chicks and possibly adults in the 2017 season as most of the feathers were in sheltered areas or under dense vegetation so would not necessarily have blown away over winter (see pictures below).

Evidence of predation at Manx shearwater burrows on St. Helen's in 2018

Storm petrel settlement and productivity

Since the storm petrels' return as a breeding bird to St Agnes & Gugh in 2015 following rat removal, numbers have been increasing, with as many as 20 apparently occupied sites estimated from diurnal playback on St Agnes and Gugh in 2018. Also in 2018 a new breeding area with a couple of Apparently Occupied Sites was found near Kittern Hill on Gugh.

Although storm petrel chicks do not stargaze like shearwater fledglings, they do call noisily from their burrows towards the end of their fledging period allowing confirmation of successful breeding. Fledglings have been heard cheeping and whistling from beneath the rocks on calm dark nights each year in late August and through September since 2015 and so far in 2018 5 chicks have been heard.

In 2016 six storm petrel nest boxes were placed within a short section of stone walls at Castella Down. These have an enclosed nest chamber made from clear plastic tubs fixed together and accessed by a plastic entrance tube. They are monitored annually for any activity or settlement. Although there has

been no sign yet, it is hoped that if they are occupied in subsequent years it may be possible to access view the nest using the burrow-scope causing minimal disturbance.

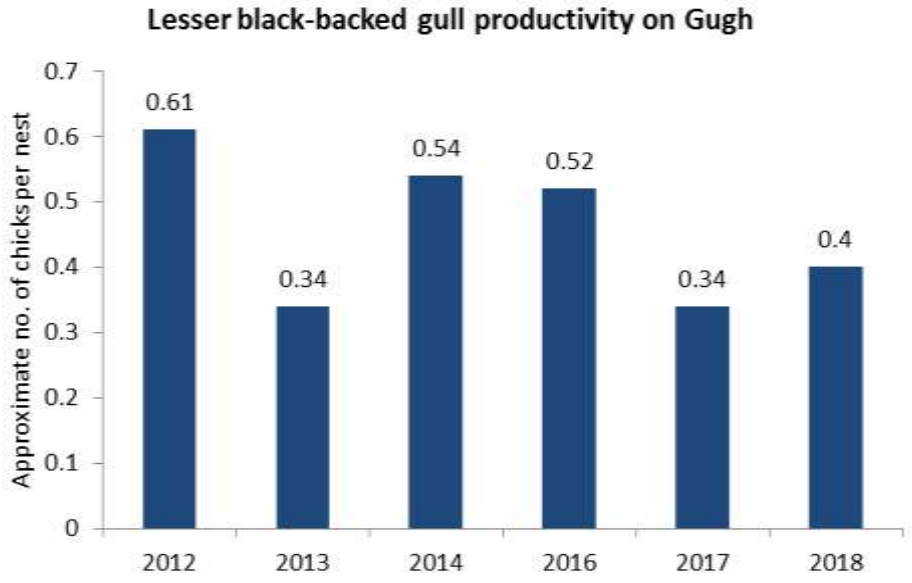
Lesser black-backed gull productivity

The number of lesser black-backed gulls breeding in Scilly has fallen dramatically in recent years, with a decline of 26% between 2006 and 2015 to just under 2,500 breeding pairs (Heaney & St. Pierre 2017). The majority of the birds in Scilly now breed in three main sub-colonies; Samson, St. Helen's and Gugh. Since 2012 the numbers and productivity at the Gugh sub-colony, where breeding numbers have halved since 2006, have been recorded annually (see below). Fledging success estimated by observing nests from a vantage point above the colony suggests a fledging success ranging from 0.34 to 0.61 chicks per pair. Although the 25% reduction in numbers settling in 2017 was reversed in 2018, fledging success was still below that needed to maintain a stable population.

Table 4. Lesser black-backed gull productivity on Gugh

Year	LBBG	Productivity Estimates
2012	361	Approx. 180 chicks fledged from 262 nests South Col top colony (0.69 ch/pr); minimum 19 chicks fledged from 65 nests lower rocks colony Cuckold's Carn (0.29 ch/pr).
2013	418	Minimum 103 chicks fledged from 355 nests South Col top colony (0.29 ch/pr)*; minimum 32 chicks fledged from 48 nests lower rocks colony Cuckold's Carn (0.67 ch/pr).
2014	411	Approx. 185 chicks fledged from 325 nests South Col top colony (0.57 ch/pr); minimum 28 chicks fledged from 70 nests lower rocks colony Cuckolds Carn (0.40 ch/pr)
2016	400	Approx. 182 chicks fledged from 359 nests South Col top colony (0.51 ch/pr); minimum 24 chicks fledged from 40 nests lower rocks colony Cuckolds Carn (0.60 ch/pr)
2017	293	Approx. 79 chicks fledged from 249 nests South Col top colony (0.32 ch/pr)*; maximum 21 chicks fledged from 44 nests lower rocks colony Cuckolds Carn (0.48 ch/pr)
2018	452	Approx. 147 chicks fledged from 384 nests South Col top colony (0.38 ch/pr); minimum 22 chicks fledged from 44 nests lower rocks colony Cuckolds Carn (0.50 ch/pr)

***** High vegetation means this count was probably an under-estimate



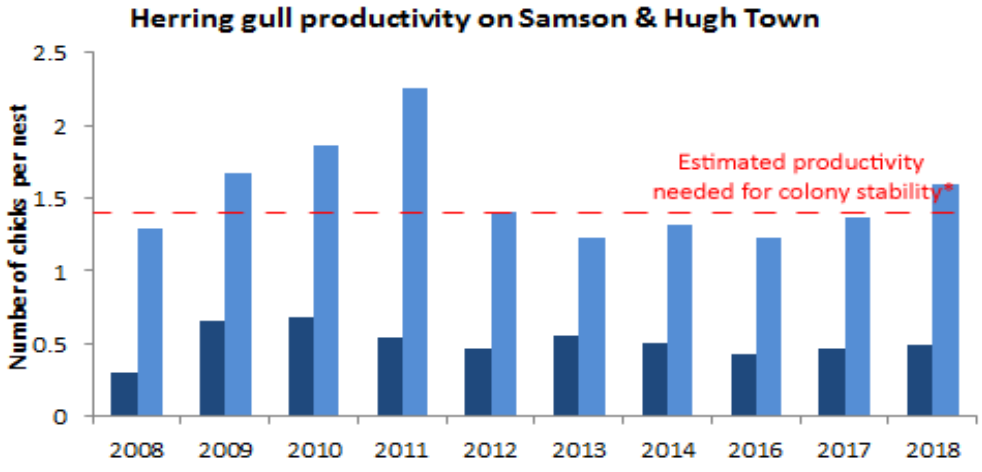
Herring gull productivity

In 2015 herring gulls were red-listed as a species of conservation concern due to recent declines in their numbers nationally (estimated 72% loss of abundance between 1969 and 2014, JNCC 2015). Numbers across Scilly of this species have been falling at a similarly rapid rate with a decline of 22% between 2006 and 2015/6 to just 556 breeding pairs (Heaney & St. Pierre 2017). Since 2008 the productivity of herring gulls at three sub-colonies on St. Marys, Tresco and Samson has been recorded by observing minimum fledging success at mapped nests. The results are presented below.

Over the years of this study the small roof-top colony in Hugh Town which presumably relies on more anthropomorphic food sources than those on Samson has fared consistently better. Whilst the absolute number of birds nesting on the study beaches on Samson has declined the number of birds in town, although low, has been increasing. The fledging success in Hugh Town is also substantially higher and well above that needed for colony stability, thus potentially fuelling growth. Unfortunately the gulls nesting in town are not universally welcomed and the amount of suitable undisturbed roof space very limited.

Table 5. Herring gull productivity estimates

Year	Gimble Porth	Samson	Hugh Town
2008	0.48 (*n*=50)	0.30 (*n*=84)	1.29 (*n*=7)
2009	0 (*n*=41)	0.66 (*n*=73)	1.67 (*n*=6)
2010	0 (*n*=17)	0.68 (*n*=63)	1.86 (*n*=7)
2011	0 (*n*=9)	0.54 (*n*=71)	2.25 (*n*=8)
2012	0 (*n*= 3)	0.46 (*n*=56)	1.4 (*n*= 10)
2013	0 (*n*=2)	0.56 (*n*=55)	1.22 (*n*=9)
2014	Deserted	0.50 (*n*=34)	1.31 (*n*=13)
2015	Deserted	(*n*=56)	(*n*=14)
2016	Deserted	0.43 (*n*=53)	1.22 (*n*=9)
2017	Deserted	0.46 (*n*=44)	1.44 (*n*=16)
2018	Deserted	0.49 (*n*=37)	1.60 (*n*=20)



KEY: Samson dark blue; Hugh Town light blue. No productivity recorded in 2015.

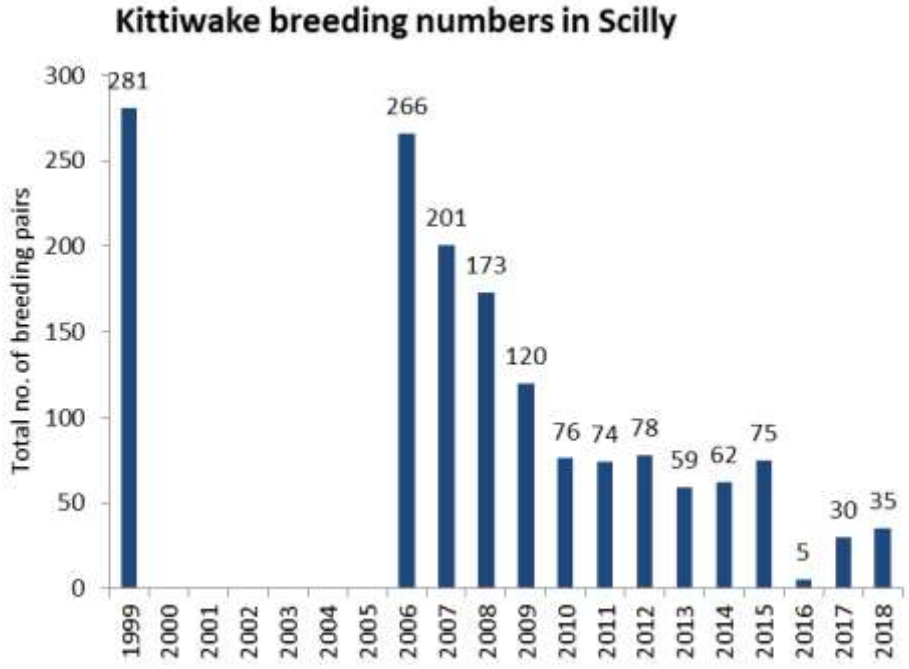
*Cook and Robinson (2010) estimate that an average productivity of 1.3-1.5 chicks per pair per year is needed for colony stability.

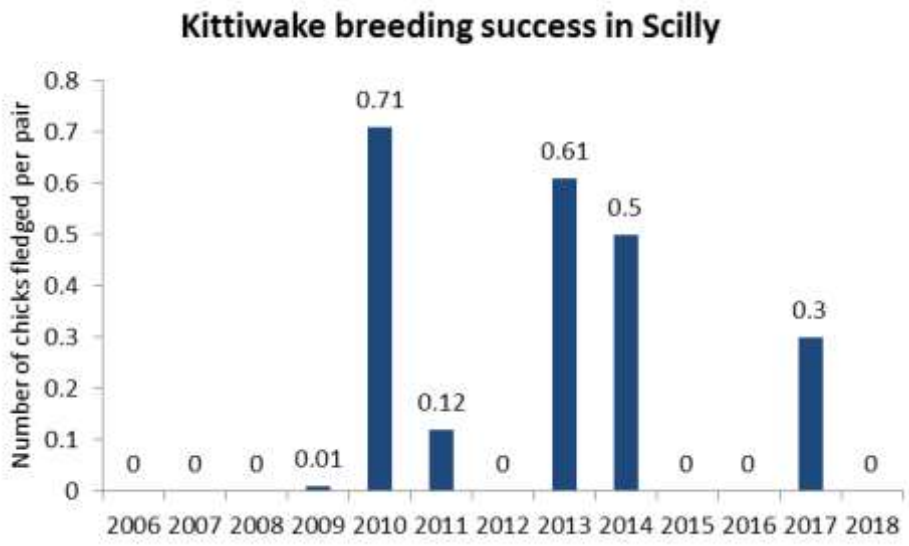
Kittiwake productivity

All kittiwake sub-colonies across Scilly have been counted annually since 2006. Over this period dramatic declines have been recorded; 87% drop in numbers, loss of 5 sub-colonies and total breeding failure in 7 of the last 13 years. In the last five years only one sub-colony site has been occupied by all of the remaining birds (below the Turk's Head at St Agnes 2014-16 and then Gugh 2017-18). At no time in this study has the productivity of the kittiwakes in Scilly approached the level of 1.5 chicks per pair per year, estimated to be needed for colony stability (Cook & Robinson 2010).

Table 6. Kittiwake breeding numbers across Scilly

SUB-COLONY SITE	1999	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Gugh	155	131	69	50	41	26	0	0	0	0	0	0	30	35
Gimble Porth, Tresco	54	37	39	30	29	0	0	0	0	0	0	0	0	0
St. Helen's	7	36	31	35	18	2	0	0	0	0	0	0	0	0
Samson North Hill	28	25	26	21	9	0	0	0	0	0	0	0	0	0
Samson South Hill	10	22	15	10	0	0	0	0	0	0	0	0	0	0
St. Martin's, Daymark	27	15	21	27	22	47	69	54	21	0	0	0	0	0
Turk's Head, St. Agnes	0	0	0	0	1	1	5	24	38	62	75	5	0	0
Total Breeding Pairs	**281**	**266**	**201**	**173**	**120**	**76**	**74**	**78**	**59**	**62**	**75**	**5**	**30**	**35**
Total Chicks Fledged	**-**	**0**	**0**	**0**	**1**	**54**	**9**	**0**	**36**	**31**	**0**	**0**	**9**	**0**



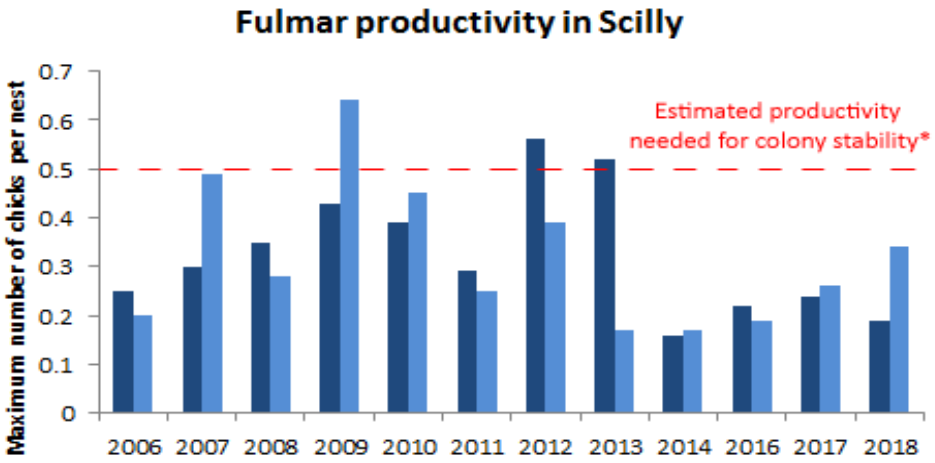


Fulmar productivity

Since 2006 two of the main discrete cliff-side fulmar sub-colonies, those on Menawethan and the Daymark St. Martin's, have been monitored from the sea. The numbers settling at the two sites have been fairly consistent over this time but the fledging success quite variable (see Table 9). In particular in the last few years it has been consistently lower than the level needed to sustain the population (Cook & Robinson 2010) and this will go some way to explaining the recent slowing of population growth across Scilly. This poor success in recent years appears to have been repeated elsewhere on the islands, with very few chicks seen to fledge from Round Island or Annet either (W. Wagstaff., & *pers. obs*.). Across the UK the mean productivity recorded for fulmars between 1986 and 2008 was 0.39 chicks per pair per year, declining at a rate of 0.005 ch/pr/yr.

Table 7. Fulmar productivity estimates

	Menawethan	Daymark	Total
2006	0.25 (*n* = 44)	0.20 (*n* = 46)	90
2007	0.30 (*n* = 41)	0.49 (*n* = 45)	86
2008	0.35 (*n* = 37)	0.28 (*n* = 46)	83
2009	0.43 (*n* = 33)	0.64 (*n* = 36)	69
2010	0.39 (*n* = 30)	0.45 (*n* = 51)	81
2011	0.29 (*n* = 24)	0.25 (*n* = 49)	73
2012	0.56 (*n* = 25)	0.39 (*n* = 59)	84
2013	0.52 (*n* = 27)	0.17 (*n* = 54)	81
2014	0.16 (*n* = 44)	0.17 (*n* = 52)	96
2015	(n = 43)	(n = 46)	89
2016	0.22 (*n* = 45)	0.19 (*n* = 57)	102
2017	0.24 (*n* = 34)	0.26 (*n* = 54)	98
2018	0.19 (*n* = 33)	0.34 (*n* = 50)	83



KEY: Dark blue Menawethan, light blue Daymark.

*Cook and Robinson (2010) estimate that an average productivity of 0.5 chicks per pair per year is needed for colony stability in fulmars. Productivity not recorded in 2015.

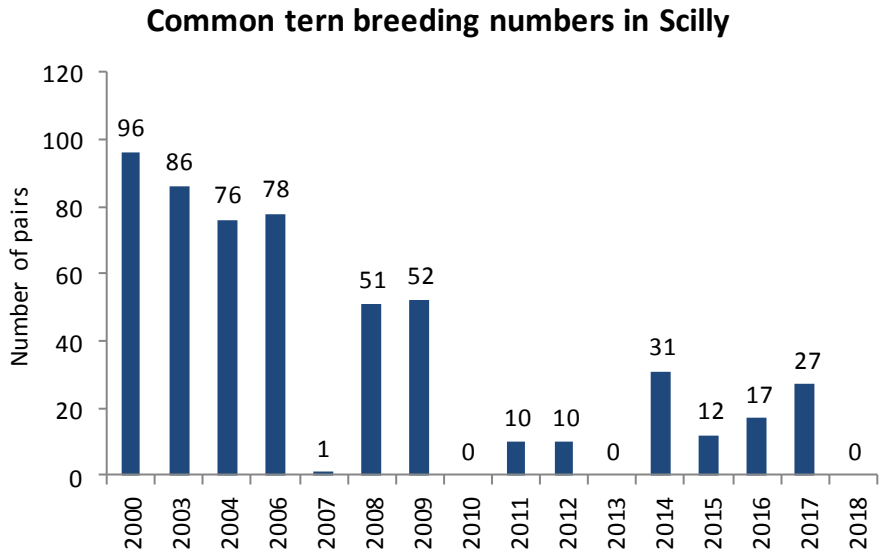
Common tern productivity

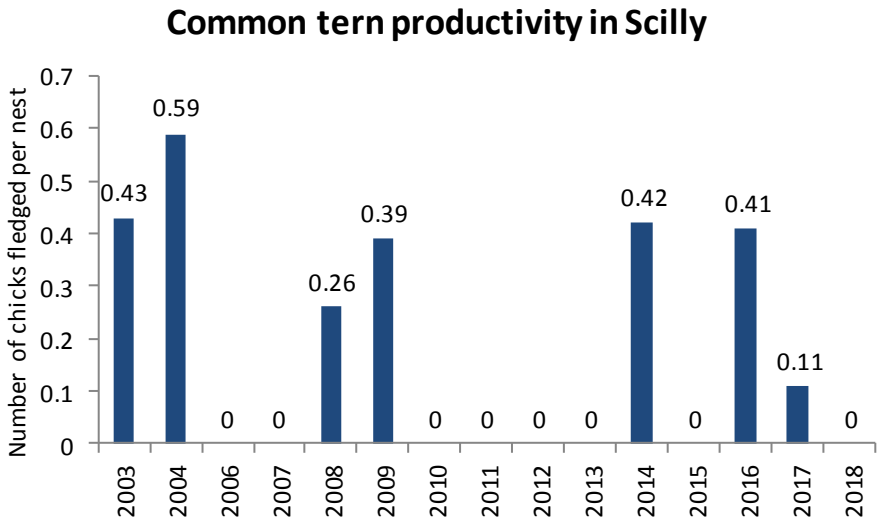
Following a maximum count of 210 breeding pairs in 1983, the number of common terns breeding in Scilly has been in rapid decline (Heaney & St. Pierre 2017). Alongside this steep decline in numbers of terns returning to breed each year, the birds have suffered repeated low success or total breeding failure (see Figure 9). In a number of cases this has been due to their repeated choice of the low-lying Green Island, where high tides often swamp the colony resulting in egg and chick loss.

In recent years the terns have been very late to return to the islands and show any interest in breeding, with hatching observed well into July in both 2016 and 2017. Although in both these years a few chicks fledged, numbers were low and the lateness likely to affect post-fledging survival adversely. In 2018 very few common terns were recorded around the islands at all and no breeding attempts observed.

Table 8. Common tern productivity estimates

Year	Productivity	Notes
2003	0.43 (*n* = 86)	Appletree Bank Tresco, Samson and Annet
2004	0.59 (*n* = 76)	Majority of nests on North Hill, Samson
2006	0 (*n* = 78)	Young inundated by storm tide, Green Island
2007	0 (*n* = 1)	Only one breeding attempt recorded, Annet
2008	0.26 (*n* = 51)	Green Is. 41 nests; Peasehopper 10 nests
2009	0.39 (*n* = 52)	Green Is. 51 nests; Annet 1 nest
2010	0 (*n* = 0)	Birds settling on Green Is. But site abandoned before laying
2011	0 (*n* = 10+)	Late settlement, then Green Is. Site inundated by storm tide
2012	0 (*n* ≤ 10)	Late settlement, some eggs lost to storm tide Green Island
2013	0	No breeding attempts recorded
2014	0.42 (n = 31)	3 chicks from 12 nests Green Is.; 10 from 19 North Hill Samson
2015	0 (n = 12)	2 Annet; 10 Samson (failed early egg stage)
2016	0.41 (n = 17)	South end Annet very late settling; also 3 newly fledged chicks seen Merrick Island
2017	0.11 (n = 27)	South end Annet extremely late settling again
2018	0	Very few common terns returned to Scilly at all in 2018; 10 or so birds showed some interest in the South end Annet again in late May but no eggs were found.




Common tern productivity in Scilly
Number of chicks fledged per nest
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.43
0.59
0
0
0.26
0.39
0
0
0
0
0.42
0
0.41
0.11
0
2003
2004
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

Annual count of breeding seabirds on Annet

A count of the seabirds breeding on Annet has been made in most years since 2000 (see Table 5 - no counts were made in 2001 & 2005). This annual count concentrates mainly on the numbers of gulls and shags. Oystercatchers and ringed plovers are included, however due to logistics, an annual count of the burrow nesting puffin, Manx shearwater and storm petrel was not done. In 2010 a sample of boulder beach to study storm petrel numbers was added to the annual count and in 2018 puffins were also added as well as a sample area for Manx shearwaters (to include both cairn, grass and thrift habitat) between Carn Windlass and South Carn.

These regular counts document a steep decline in the number of shags nesting on Annet which is mirrored although not so steeply across the rest of the islands (Heaney & St. Pierre 2017). As elsewhere the number of small gulls has also declined. In particular, the sub-colony of lesser black-backed gulls which numbered 517 in 2000 is now deserted. Common terns have bred on the South end of the island in recent years and the number of Great black-backed gulls has increased, although numbers fell by 23% in 2018 and overall numbers across the islands are still less than 60% of the peak for this species before they were controlled by JNCC in the late 1970s (Heaney & St. Pierre 2017).

Table 9. Breeding seabirds on Annet (a dash indicates that no count was made)

Year	SH	GBBG	LBBG	HG	RAZ	FUL	COT	SP*	MX*	PUF	OYC	RPL
2000	209	137	517	42	4	21	1	938	123	47	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	171	215	7	4	-	-	-	-	-	-	-
2003	150	164	18	17	0	45	0	-	-	-	-	-
2004	159	197	7	32	2	44	0	-	-	-	5	0
2005	-	-	-	-	-	-	-	-	-	-	-	-
2006	177	187	281	24	4	37	0	788	89	50	-	-
2007	140	88	0	5	1	37	0	-	-	-	5	0
2008	164	47	(5)	4	3	48	0	-	-	-	6	0
2009	154	168	54	7	7	43	0	-	-	-	6	0
2010	198	213	76	11	2	40	0	-	-	-	7	1
2011	115	180	27	5	4	37	0	-	-	-	4	2
2012	107	177	32	8	2	49	0	-	-	-	-	-
2013	99	208	6	4	1	36	0	-	-	-	5	0
2014	96	205	10	5	1	38	0	-	-	-	9	1
2015	85	235	1	20	5	57	2	778	229	31	6	0
2016	86	215	1	16	6	41	14	(106)	-	-	4	1
2017	74	222	7	12	5	41	27	(132)	-	-	7	1
2018	81	170	6	19	0	46	0	(175)	(30)	43	8	0

**Counts in brackets represent only a sample of the total breeding population on Annet.*

Storm petrel study beach on Annet

Between 2010 and 2014 the number of Apparently Occupied Sites at a study beach between Smith's Carn and Minmow on the south end of Annet was recorded annually using diurnal tape-playback. Unfortunately, this boulder beach was totally destroyed by storms in February 2014. A new study beach running between South Carn and Carn Windlass was identified in 2016 and results from this are presented below along with the previous SPA counts from 2000, 2006 and 2015. Although confidence intervals on playback survey results are relatively large due to low response rates, these counts suggest an increase in storm petrel numbers on Annet.

Table 10. Storm petrel numbers at Annet study beach

Year	Number AOSs	Notes
2000	109 (±)	38 responses x 2.86
2006	87	31 responses x 2.86
2015	92	32 responses x 2.86
2016	106	37 responses x 2.86
2017	132	46 responses x 2.86
2018	175	61 responses x 2.86

Discussion

The threats to seabirds in Scilly were covered in depth in the 2017 Seabird Technical Report and will not be repeated in full here. The productivity monitoring and numbers data presented in this report show that a number of often complex and in many cases inter-related factors are likely to be contributing to the breeding successes and failures recorded. The following table adapted from the 2017 Seabird Technical Report attempts to summarise the principal drivers of change. Future monitoring and possible management measures and research areas resulting from this analysis are explored further in the updated Isles of Scilly Seabird strategy 2018-22.

Factor driving change	**Mechanism of effect**	**Species impacted**
Mammalian predators	Rats – lowering productivity, clear driver of population change	Particularly burrow-nesters – clear and sustained increase in numbers and breeding success of Manx shearwaters and storm petrels on St. Agnes & Gugh following removal. Continued absence of storm petrels and failure of shearwater breeding at sites with rats (e.g. Bryher, St. Helen's, Peninnis)
	Hedgehogs – lowering productivity	Ground-nesters – particularly waders
	Rabbits – destroy habitat and compete for burrows, but also alternative food source for large gulls on Annet	Particularly burrow nesters
	Domestic and feral cat predation	Affected gulls on Gugh in 2007
Climate change	Increased storminess particularly in Spring reducing productivity and survival of juveniles and adults – food supply issues clear driver of population change	Wrecks - shags and auks Reduction in foraging success hard to attain breeding condition and later feed chicks – all species, particularly terns and kittiwakes Wet weather chilling eggs and young chicks Collapse of unstable waterlogged cliff nesting sites - kittiwake Inundation of nests when rough weather combined with high tides - terns Destruction of nesting beaches – storm petrel Flooding - burrow-nesters
	Reduction of food supply by disrupting ocean fronts in early	All but particularly small-bodied inshore surface feeders – kittiwakes and terns

	spring	
	Higher sea temperatures reduce the abundance of small fish at the surface and cause reductions/ changes in zooplankton that sandeels feed on; though sprats may increase	Small-bodied inshore surface feeders – can't access food deeper in water column Delay in sandeel availability can cause delay in breeding also – kittiwakes, terns
Avian predators	Gulls, ravens and crows – reducing productivity (limited direct evidence and mostly secondary cause of failure after poor food supply – reduced colony size and lower nest attendance)	All but particularly - shags, terns, kittiwakes, storm petrel
Habitat change	Changes in vegetation cover affecting productivity - relationship between level and density of cover and settlement and success of gulls ambiguous – scrub clearance unlikely to reverse decline but ensure dense vegetation not a limiting factor if declines reversed	Possible reduction in habitat suitability – Lesser black-backed gull Dense brambles round burrow entrances - Manx shearwater Terns need bare/ sparsely vegetated areas
Human disturbance	Disturbance of nests (dog-walkers, picnickers, kite-surfers, kayakers etc.)	Gulls (most sub-colonies on inhabited islands lost in last 15 years), terns and waders on beaches in particular
	Dogs not on leads digging and entering breeding colonies	Manx shearwater burrows dug up (Gugh, St. Marys and Bryher) and occasionally adults killed (Giants Castle 2007, Shipman Head 2008) Terns on Samson disturbed by dog walkers
Changes in anthropomorphic food sources	Reduction in fisheries discards	Particularly gulls and fulmars
	Reduction in domestic refuse	Gulls
Disease	Killing adults and/ or chicks – suspected to be a major driver in gull population declines through adult mortality	Botulism in gulls from refuse (reduced discards feed more on waste); red tide toxins in shags and kittiwakes; Puffinosis in shearwater chicks
Pollution	Marine plastics ingested	Surface feeders - fulmars particularly
Fisheries by-catch	Drowning in inshore fixed gill nets, hooked on long-lines	Mainly pursuit diving auks, shag and fulmars

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