

EU LIFE Roseate Tern Recovery Project



Photo by Brian Burke

Annual Site Breeding Report 2017

Draft report

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April 2018



“Improving the conservation prospects of the priority species roseate tern throughout its range in the UK and Ireland”

LIFE14 NAT/UK/000394 ROSEATE TERN

www.roseatetern.org

List of Abbreviations

BWI – BirdWatch Ireland

HCC – Hampshire County Council

NPWS – National Parks and Wildlife Service

NWWT – North Wales Wildlife Trust

RSPB – Royal Society for the Protection of Birds

SNH – Scottish Natural Heritage

ROC – Rockabill

COQ – Coquet

LIL – Lady’s Island Lake

SPA – Special Protection Area – sites designated under the EU Birds Directive

Table of Contents

1	Headlines.....	4
2	Scope of the report	6
2.1	Indicator species	6
2.2	Objectives of the report	6
3	Roseate tern colonies.....	8
3.1	Breeding numbers of roseate terns.....	8
3.2	Productivity of roseate terns	10
3.3	Breeding numbers and productivity of associated tern species in roseate tern colonies	11
3.3.1	Rockabill	11
3.3.2	Lady’s Island Lake.....	12
3.3.3	Coquet Island	15
3.4	Other roseate tern records in 2017 breeding season	16
3.5	Recommendations for the roseate tern colonies.....	17
3.5.1	Rockabill	17
3.5.2	Coquet.....	18
3.5.3	Lady’s Island Lake.....	19
4	Breeding numbers of tern species on non-roseate tern project sites.....	20
4.1	Forth Islands SPA	20
4.1.1	Leith Docks	21
4.1.2	Isle of May.....	21
4.1.3	Long Craig.....	22
4.1.4	Recommendations	24
4.2	Ynys Feurig, Cemlyn Bay and the Skerries SPA	26
4.2.1	Ynys Feurig	26
4.2.2	The Skerries.....	29
4.2.3	Cemlyn Bay.....	31
4.3	Solent and Southampton.....	34
4.3.1	Western Solent.....	34
4.3.2	Other sites within the SPA	36
4.3.3	Recommendations	36
4.4	Larne Lough SPA	38
4.4.1	Recommendations	40
4.5	Dalkey Islands.....	42
4.5.1	Recommendations	44

1 Headlines

Population trends

Roseate tern colonies

1. The growth of the Western European roseate tern metapopulation was sustained in 2017 by 3%, with a total of 1933 pairs, compared to 1869 pairs in 2016.
2. The growth was mostly driven again by Rockabill (1603 pairs – an increase of 47 pairs compared to 2016), Lady's Island Lake (219 pairs – increase of 10 pairs) and Coquet (111 pairs – increase of 7 pairs).
3. This represents a 30% of increase compared to the 5-year baseline mean (2011-2015) for Rockabill, 34% for Lady's Island Lake and 29% for Coquet.
4. Productivity of roseate terns was better than in 2016, but still relatively low on Rockabill (0.83), 1.01 on Lady's Island and a record high on Coquet (1.50).

Other project sites

5. The indicator species for the project success, expressed in the increased probability of roseate tern re-colonisation, is primarily the common tern, which is therefore the target species for conservation measures. However, the project should bring benefits to other associated species sharing the assemblage, namely Arctic and Sandwich terns. The size of the whole assemblage is important for the colony to defend against predators.

Forth Island SPA

6. There are two common tern colonies within Forth Islands SPA. Long Craig sustained the 2016 level of population (165 pairs), representing 87% increase compared to the 5-year mean baseline. There was a 53% increase on Isle of May, but only up to 29 pairs. The Forth Island SPA population is most certainly supported by Leith Docks colony, which increased 40% in 2017 up to 1001 pairs.
7. Productivity of common terns on Long Craig Island was 0.45 chicks per active nest.
8. Arctic terns and Sandwich terns breed only on Isle of May, with 832 (+58%) and 4 (-81%) respectively.

Ynys Feurig, Cemlyn Bay and the Skerries SPA

Ynys Feurig

9. A slight decline by 12 pairs of common terns down to 153 pairs in 2017 compared to the previous year, but still -23% behind the 5-year baseline mean.
10. Productivity of common tern was estimated at the minimum of 0.23 chicks per nesting pair, a vast improvement on 2016, when only two fledged, productivity 0.12.
11. Arctic terns increased from 238 pairs in 2016 to 352 pairs in 2017, but this still represents 11% decline, compared to the mean baseline.

The Skerries

12. Good year for common terns with 386 pairs in 2017 (290 in 2016), representing 49% increase compared to the 5-year mean baseline. Productivity was assessed using different methods, but the study nests yielded a figure of 0.54-0.8 chicks per active nest.
13. Arctic terns suffered a 27% decline (2770 pairs) compared to 2016 (3816 pairs), which was expected after the outbreak of botulism in 2016. However, the mean clutch size has increased to 2.03 which is 26% increase from 2016.

Cemlyn Bay

14. The colony suffered several predation events from otters in 2017, resulting in decline of all tern species and eventual collapse of the colony by the end of June.
15. Early in the season, a peak count of 20 pairs of common terns was recorded (down from 60 pairs in 2016). Common tern has declined sharply since 2012 (mean 5-year baseline is 122 pairs), which coincident with the peak size of the Sandwich tern population.

16. Peak count of 1980 Sandwich tern nests was recorded, down from 2595 in 2016 and 11% decline compared to the mean baseline figure of 2234.
17. Only 27 Arctic tern pairs were recorded, a decline from 60 pairs in 2016 and 33% against the 5-year mean baseline of 40 pairs.

Solent and Southampton SPA

18. 2017 was a much better year for common terns in the project area (Western Solent) with 122 AONs compared to 55 in 2016, representing only 1% decline compared to the project mean baseline (124 pairs). Productivity was however low (0.20) due to storm surges.
19. Sandwich terns declined from 81 pairs in 2016 to 48 pairs with productivity of 0.17.
20. Little tern has never been abundant in the recent years (5-year mean baseline is 15 pairs), but only 5 pairs breed in 2017, compared to 16 in 2016.

Larne Lough SPA

21. There was a 7% increase of common terns in 2017, from 333 pairs recorded in 2016 to 355 pairs, most of them breeding on Swan Island. This also represent a 23% increase to the 5-year mean baseline. The productivity suffered from otter predation and was estimated at a level of 0.15 chicks per active nest.
22. Sandwich terns declined between 2016 and 2017 from 1229 to 1141 but are still 147% above the 5-year mean baseline.

Dalkey Island SPA

23. A maximum 128 pairs of terns were recorded on Lamb (90) and Maiden (34) rocks as well as in SE corner of the main Dalkey Island (4). This included 120 Arctic terns and 8 pairs of common terns. This represents a record year for Dalkey islands since 2014.
24. Productivity of common terns was most likely null and only 4 Arctic terns are believed to fledge in 2017. This was due to storm surges affecting low laying Maiden Rock and predation.

2 Scope of the report

This report aims to summarise the 2017 breeding season for all of the project's sites. Management/monitoring recommendations have been made based on the discussions with wardens, site managers and reserve ecologists.

The extensive background information on the project's objectives, monitoring methods used on each site, general threats and description of each site was provided in the first season report for 2016 and it is not repeated here.

2.1 Indicator species

Roseate tern numbers are obviously the main indicator of the project's success for the two colonies directly involved (Rockabill and Coquet). Lady's Island Lake, although discussed in this report, is not part of the direct conservation measures driven by the project. Activities on this site are limited to the exchange of knowledge and networking.

Several graphs in this report show synchronised increases of roseate tern with common and Arctic tern populations. Performance of these species, and to a lesser extent, Sandwich terns, is important for the assessment of the overall "health" of the colony, especially in terms of their ability to defend against predators and in determination of threats affecting all species.

Common tern is the main indicator species for assessing the potential of roseate tern colonisation on all the remaining project sites and therefore the target species for the proposed conservation measures. Association with Arctic and especially Sandwich terns are less clear. While the roseate tern co-exists with both of these species on Coquet and Lady's Island Lake, on Rockabill, they share the colony only with common terns. However, while the presence of common terns is the most important factor, the size of the whole assemblage might have positive role for the protection of the colony. Therefore, all tern species are reported for these sites and some of the recommendation extend to the whole assemblage rather than single species.

2.2 Objectives of the report

The report summarises the 2016-2017 breeding season for all the project sites in the UK and Ireland in the context of the colony development over the last 10 years. Almost all project sites produce detailed season reports and they are the main source of information used for the compilation of this summary report. The reader should refer to these reports for more detailed analyses of the season, prepared first hand by the managers of individual colonies.

The specific objectives of this report are as follows:

1. To summarise the numbers and productivity of roseate and associated tern species in the three colonies (Rockabill, Coquet and Lady's Island Lake) in 2016-17, in comparison with the 5-year mean baseline (2011-2015).
2. To summarise the numbers of tern species on non-roseate tern project sites for 2016-17 in comparison with the 5-year baseline mean (2011-2015).
3. Review the management and its effectiveness.
4. Provide management and monitoring recommendations for each site.

Ultimately, the report attempts to assess the impact of the project on target species, however, it must be noted that this will be somewhat difficult in the first 2-3 years, as the first recruits from 2016 will breed for the first time in 2018. This means that a potential population growth resulting from the management during the project will be monitored only for the last two years of the project. However, the productivity can be measured throughout the project timeline and should give us a good indication of the expected population trend, if other demographic parameters like emigration/immigration and survival will remain at the mean level.



Figure 1 Location of the project sites

References:

Piec, D. 2016. EU LIFE Roseate Tern Recovery Project. Annual Site Breeding Report – 2016.

3 Roseate tern colonies

3.1 Breeding numbers of roseate terns

The growth of the roseate tern population has been sustained in 2017 in all colonies, although it was not as steep as in the last three years, due to a slower growth on Rockabill (Figure 2). There were 1603 pairs breeding on **Rockabill** in 2017 – a relatively “modest” between-year increase of 47 pairs, compared to the steep increase of 313 pairs between 2014 and 2016. The population on **Lady’s Island Lake** supported 219 pairs in 2017 (209 in 2016) and **Coquet** repeated its record from 2015 of 111 pairs (7 pairs more than in 2016). The growth on Coquet was sustained despite of a sudden and unexplained mortality of five adult birds at the beginning of the season. The mortality was thought to be caused by poor physical condition of these individuals as no disease was confirmed.

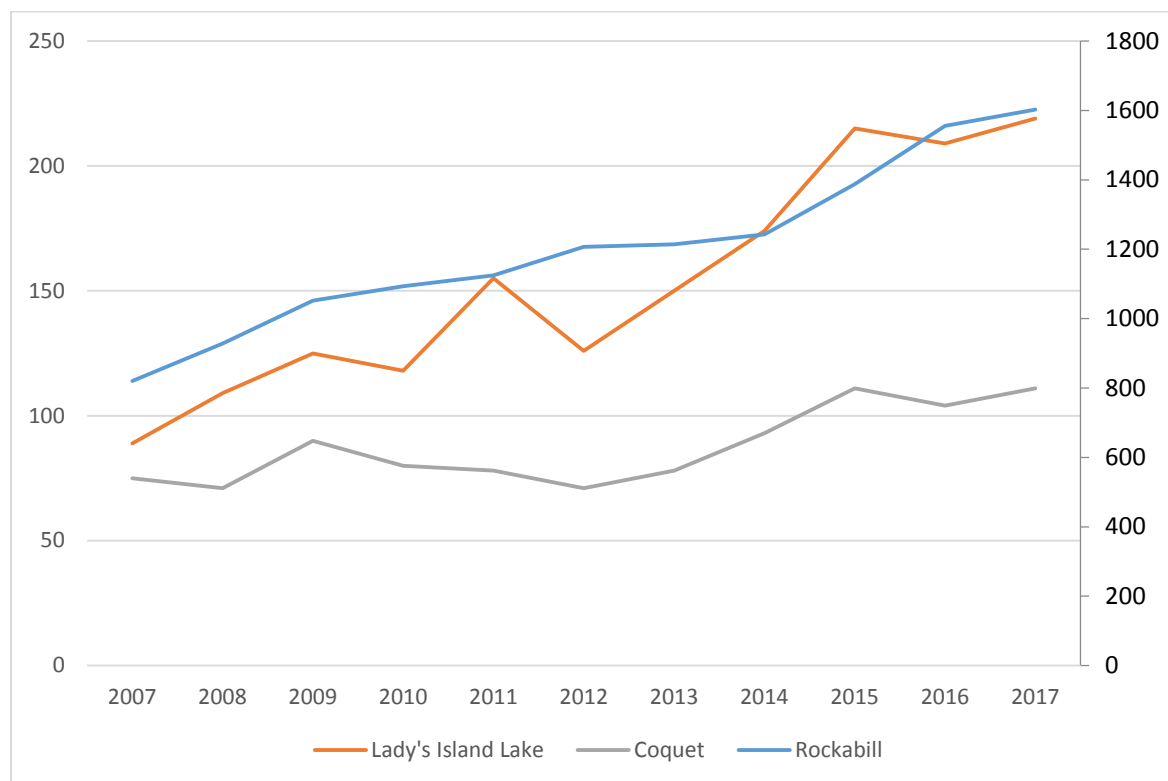


Figure 2 The numbers of breeding roseate terns on Rockabill (secondary axis), Lady’s Island Lake and Coquet (primary axis) in 2007-2017.

The steeper long-term relative growth has been recorded on Lady’s Island Lake (Figure 3), but it has not had much impact on the overall growth of the metapopulation due to relatively low number of breeding pairs at this site (11.3% of the whole metapopulation).

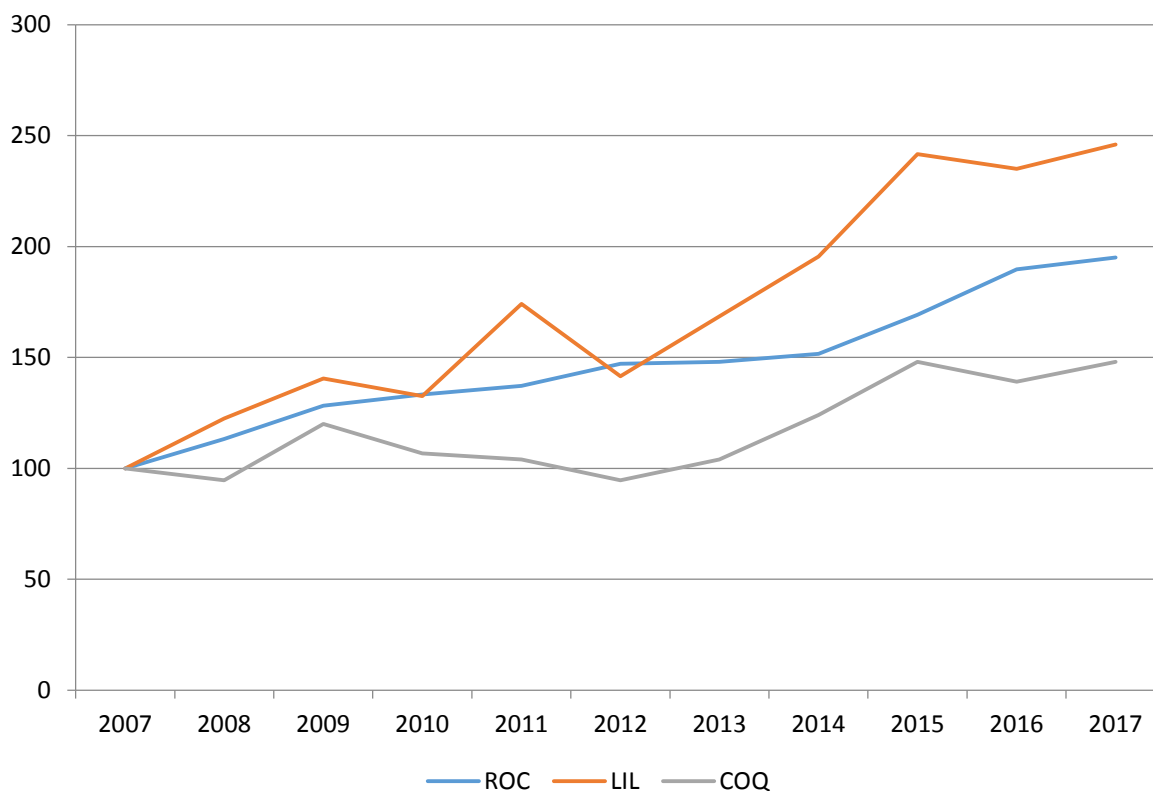


Figure 3 Long-term relative population growth on Rockabill (ROC), Lady's Island Lake (LIL) and Coquet (COQ) from 2007 to 2017

Compared to the 5-year mean baseline figures (2011-15), the population has grown 30% on Rockabill, 34% on Lady's Island Lake and 29% for Coquet (Table 1). This means that, with 1822 pairs in RoI and 111 pairs in the UK, we are well over the target stated in the Objective 1 of the project, which was set for 1710 pairs in RoI and 100 pairs in the UK by the end of the project.

Table 1 Baseline mean number of breeding roseate terns (2011-2015), breeding number of pairs in 2016 and 2017 and the percentage change between 2017 and the baseline mean for Rockabill, Lady's Island Lake and Coquet

Site	Baseline mean number of breeding pairs (2011-2015)	2016 breeding pairs	2017 breeding pairs	% change between baseline and 2017
Rockabill	1235	1556	1603	30%
Lady's Island Lake	164	209	219	34%
Coquet Island	86	104	111	29%
Total		1869	1933	

3.2 Productivity of roseate terns

The productivity on **Rockabill** in 2017 was slightly better than in 2016 (0.83 and 0.66 respectively), however still, 23% lower than the project’s mean baseline for this site (1.08) (Table 2). This is thought to be caused by a high mortality of B-chicks due to a competition for food from better surviving A-chicks (dry weather), underlined by a probable lack of food. Small number of pipefish were recorded being brought in, an increase from last year. The improved productivity was driven by open nests, as the productivity in boxes remained the same low as in 2016. However, 2017 has seen the highest number of chicks produced on Rockabill, because of the record high number of pairs nesting in 2017.

A slightly smaller downward trend has also been recorded on **Lady’s Island Lake**, however, the productivity of 1.01 was close to the project’s mean baseline for this site (1.13).

It was an extraordinary year for **Coquet** with the highest ever recorded productivity of 1.5 (40% increase compared to the mean baseline productivity of 1.07).

Table 2 Mean baseline productivity (2011-2015), productivity for 2016 and 2017 and the percentage change between mean baseline and 2017 productivity of roseate terns on Rockabill, Lady's Island Lake and Coquet

Site	Baseline mean productivity (2011-2015)	2016 productivity	2017 productivity	% change between baseline and 2017
Rockabill	1.08	0.66	0.83	-23%
Lady's Island Lake	1.13	1.08	1.01	-11%
Coquet Island	1.07	0.88	1.50	40%

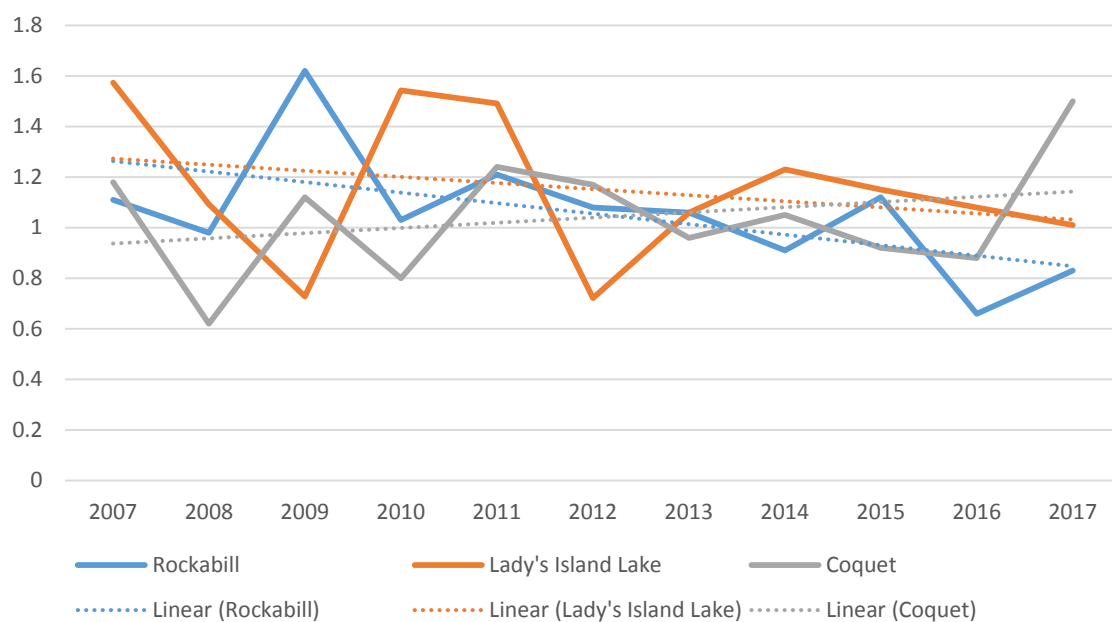


Figure 4 Long-trend of productivity in 2007-2017 for Rockabill, Lady’s Island Lake and Coquet

3.3 Breeding numbers and productivity of associated tern species in roseate tern colonies

3.3.1 Rockabill

It was a slightly better year for **common terns** on Rockabill (2035 compared to 2029 in 2016 (Table 3). Since 2011, common tern numbers on Rockabill have plateaued, after the intensive growth from the beginning of the 1990s, but the level of the population is still close to the 5-year mean (2063) (Table 3, Figure 5).

Arctic terns have decreased on Rockabill from 2009 (359 pairs) to 27 in 2017, representing a 92% decline and 74% decline against the 5-year mean (103 pairs) (Table 3, Figure 4). The species breeds on the fringes of the main colony around the helipad of the lighthouse. Birds trying to breed on the Bill are rapidly predated by large gulls. The rapid rate of predation prevents even basic monitoring checks such as the clutch size. It is believed that only one Arctic chick fledged from Rockabill in 2017. Agrilaser was used to deter large gulls, but it was not successful.

Table 3 Five-year mean number of breeding pairs (2011-15), breeding numbers for 2016 – 2017, % change between baseline and 2017, and the productivity in 2017 for common and Arctic on Rockabill

Species	5-year mean (2011-2015)	2016	2017	% change between baseline and 2017	Productivity 2017
Common Tern	2063	2029	2035	-1.4	0.36
Arctic Tern	103	60	27	-73.8	0.04

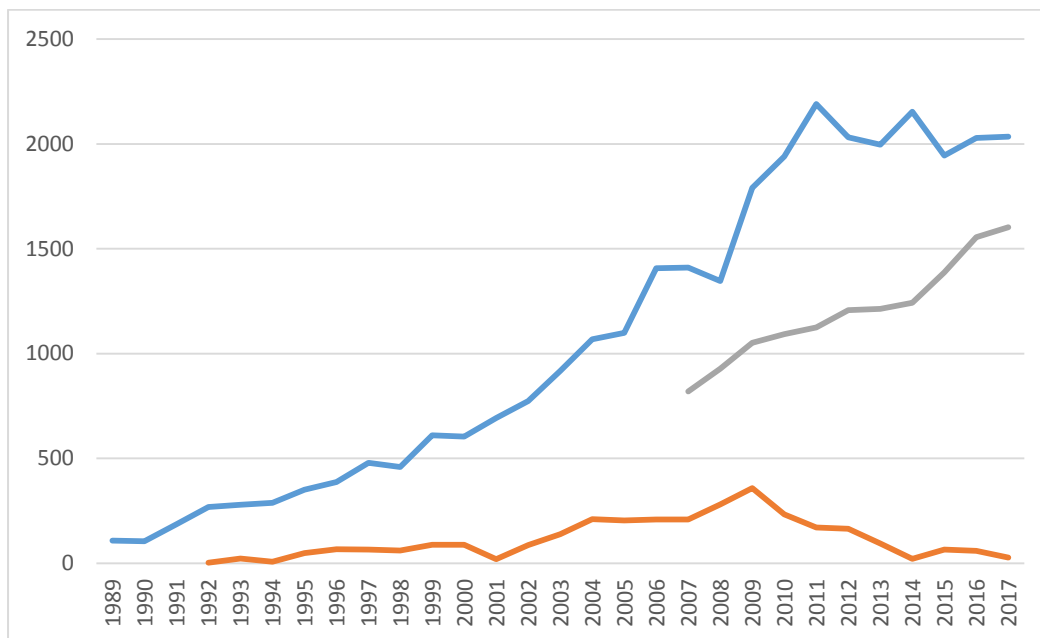


Figure 5 Population trend of common (blue), Arctic terns (orange) in 1989 - 2017 and roseates (grey) in 2007 - 2017 on Rockabill

The 5-year mean productivity of common tern between 2011 and 2015 was 0.77. The breeding success was record low in 2016 (0.26), and it was only slightly better in 2017 (0.36) (Figure 6). The lack of food was mostly responsible, which was expressed in a relatively weak growth rate of chicks. Predation from great black-back gull outside of the garden area was also thought to be a factor.

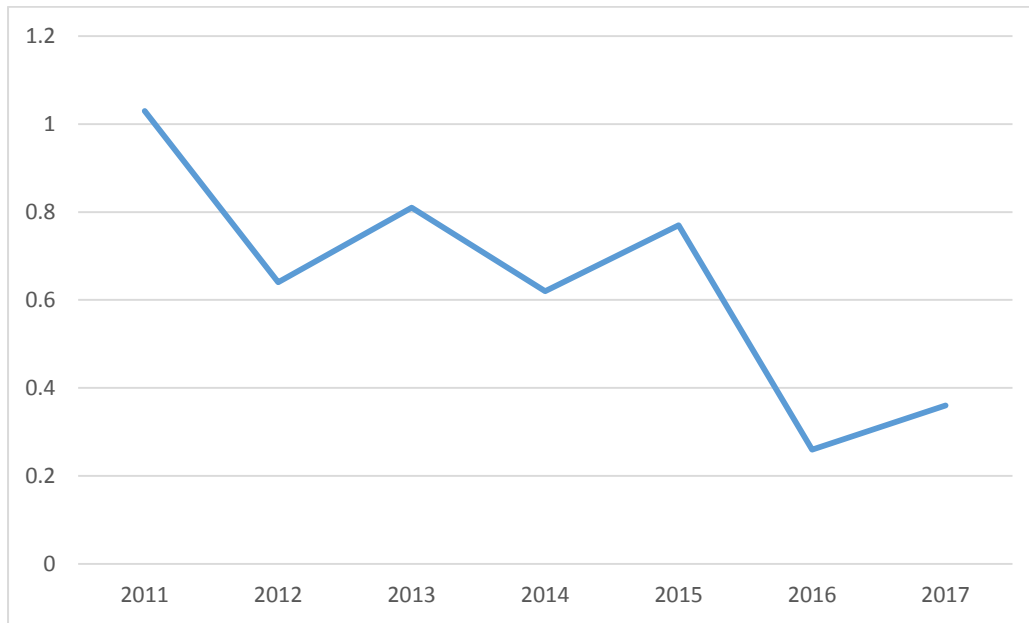


Figure 6 Common tern productivity on Rockabill in 2011-2017

3.3.2 Lady's Island Lake

It was a very similar year to 2016 for **common terns** at Lady's Island Lake (1010 pairs compared to 1012 pairs in 2016) (Table 4). This represent an increase of by 11.8%, compared to the mean baseline figure of 903 pairs. Productivity is not measured on Lady's Island – instead the mean clutch size is measured (2.54 eggs per nest in 2017) (Table 4).

The numbers of the **Arctic tern** declined between 2016 and 2017 from 844 down to 680 pairs (-19%). This also represents a -5.9% decrease compared to the mean baseline figure of 723 pairs.

Table 4 Five-year mean number of breeding pairs (2011-15), breeding numbers for 2016 – 2017, % change between baseline and 2017, and the productivity in 2017 for common, Arctic and Sandwich tern on Lady's Island Lake

Species	5-year mean (2012-2016)	2016	2017	% change between baseline and 2017	Productivity 2017
Common Tern	903	1012	1010	11.8	2.54*
Arctic Tern	723	844	680	-5.9	1.9*
Sandwich Tern	1691	1799	1674	-1.0	0.67*

* Mean clutch size

The combined long-term number of Arctic and common tern pairs shows a steep increase from 2001 onwards, following a probable unsustainable water level and subsequent near collapse of the colony in 2000 (Figure 7)¹. The roseate tern trend plotted against the combined Arctic and common tern

¹ The number of breeding pairs in 2000 is considered to be correct, but the reason behind such a low number of common terns is not on records. The water level on LIL is regulated through a cut in the shingle bar separating the lake from the sea, which is difficult to control. The most probable explanation for the near collapse of the colony in 2000 is either too low water level and subsequent incursion of land predators or flooding.

figures shows a similar pattern of increase, confirming the importance of associated species for the success of roseate terns.

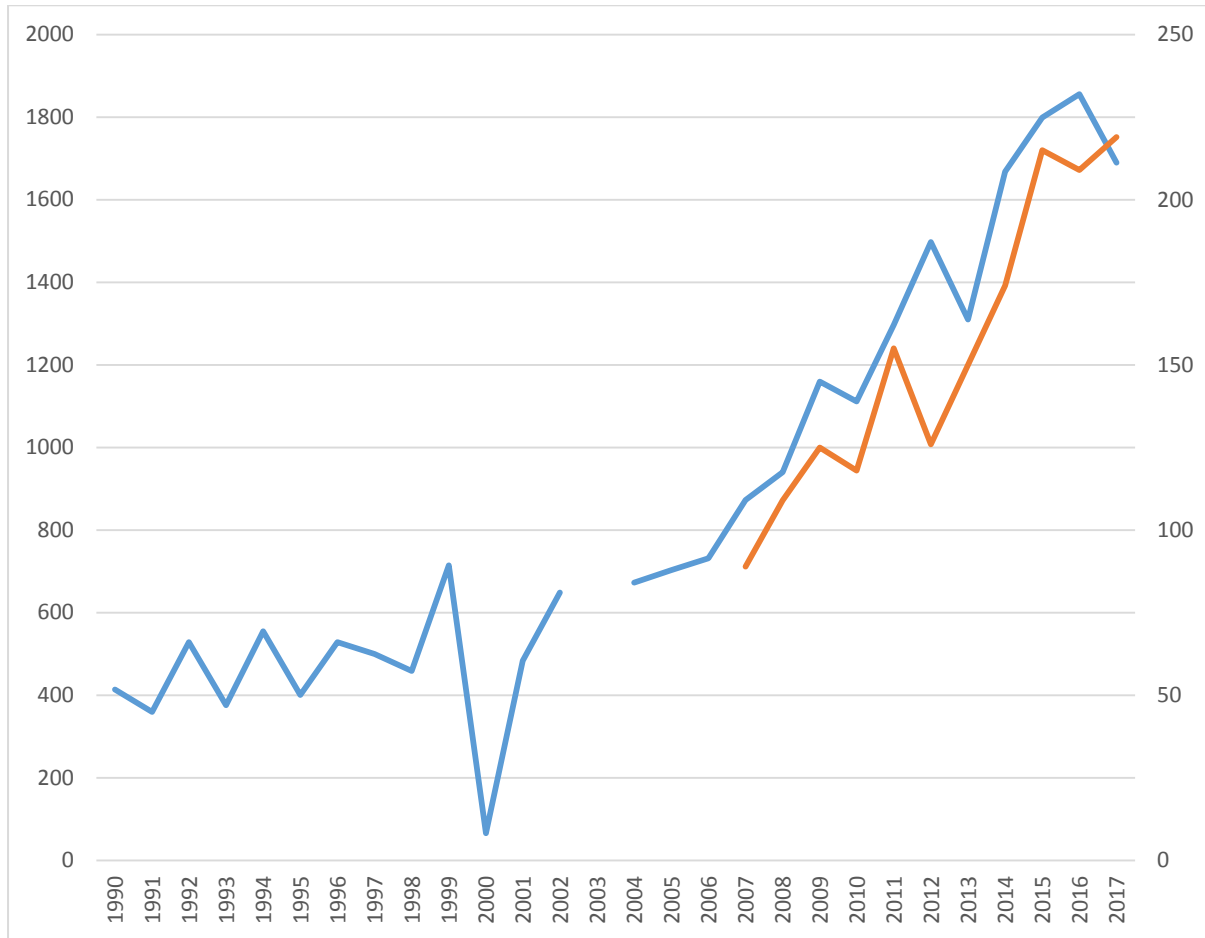


Figure 7 Combined number of Arctic and common tern pairs (blue) in 1990 – 2017 and roseate tern pairs (orange) in 2007-2017 for Lady’s Island Lake.

There was a 7% decrease of **Sandwich terns** from 1799 in 2016 down to 1674 in 2017, however it represented only 1% decrease compared to the 5-year mean of 1691 pairs (Table 4). The Lady’s Island population increased between 2005 and 2010, where the population subsequently decreased and then plateaued (Figure 8).

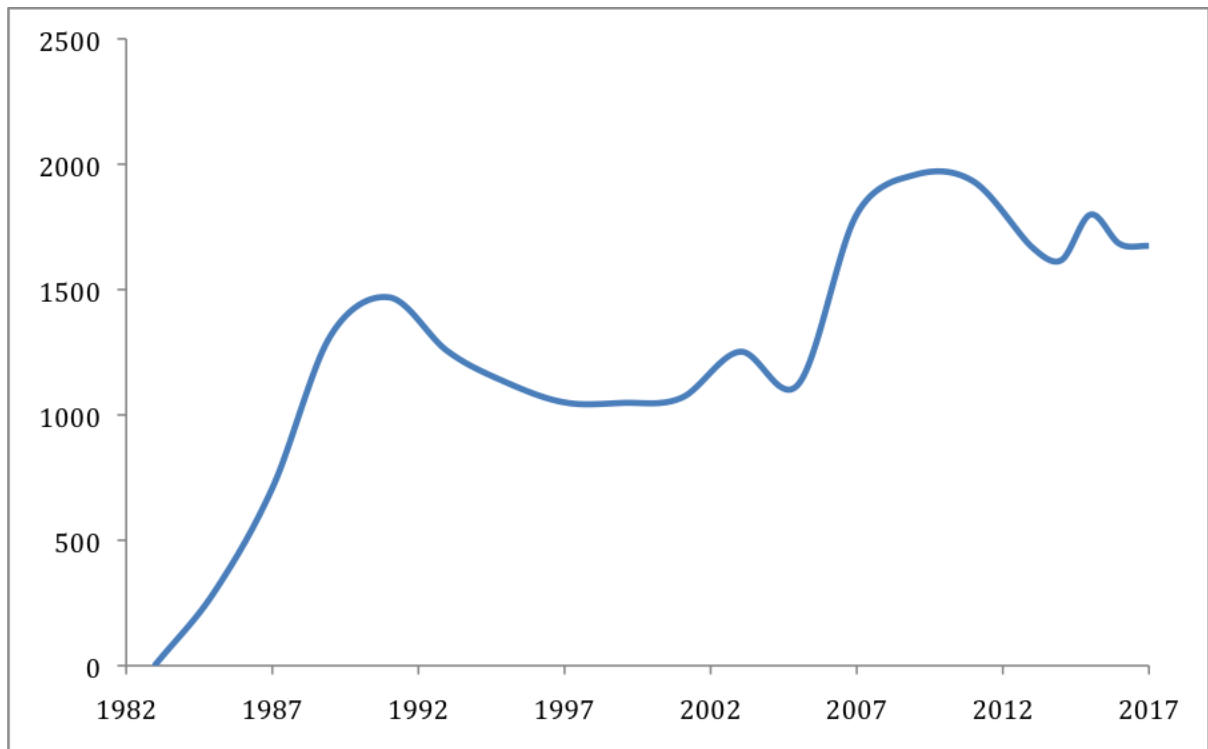


Figure 8 Population trend of Sandwich tern in 1983-2017 on Lady's Island Lake

The increase of the black-headed gull population at Lady's Island is worth noting (Figure 9). On one hand this should be welcomed as it is a "sacrificial" species for predators in the early breeding season, however some issues with predation attempts and encroaching onto the roseate tern colony by BHG in southern end of Inish has been recorded in previous years.

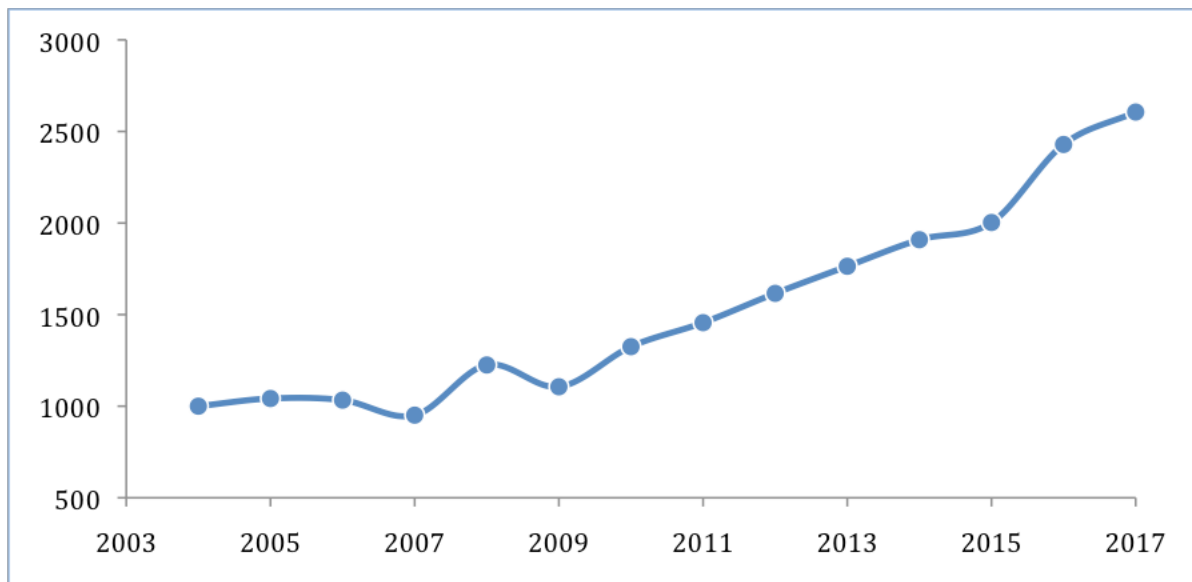


Figure 9 Number of black-headed gull pairs on Lady's Island Lake in 2004-2017.

3.3.3 Coquet Island

Common tern colony has increased for the third year in a row reaching 1257 pairs in 2017, compared to 1201 in 2016 and it follows a long-term upward trend since the early 1990s. (Figure 10). It represents a 9.3% increase against the 5-year mean (1150 pairs) (Table 5).

The long-term increase of the **Arctic tern** colony has been even steeper, reaching a record number of 1579 pairs in 2017, which represents 20.1% increase compared to the 5-mean baseline.

Table 5 5-year mean number of breeding pairs (2011-15), breeding numbers for 2016 – 2017, % change between baseline and 2017, and the productivity in 2017 for common, Arctic and Sandwich tern on Coquet

Species	5-year mean (2011-2015)	2016	2017	% change between baseline and 2017	Productivity 2017
Common Tern	1150	1201	1257	9.3	1.7
Arctic Tern	1315	1490	1579	20.1	1.39
Sandwich Tern	1411	1349	1573	11.5	-

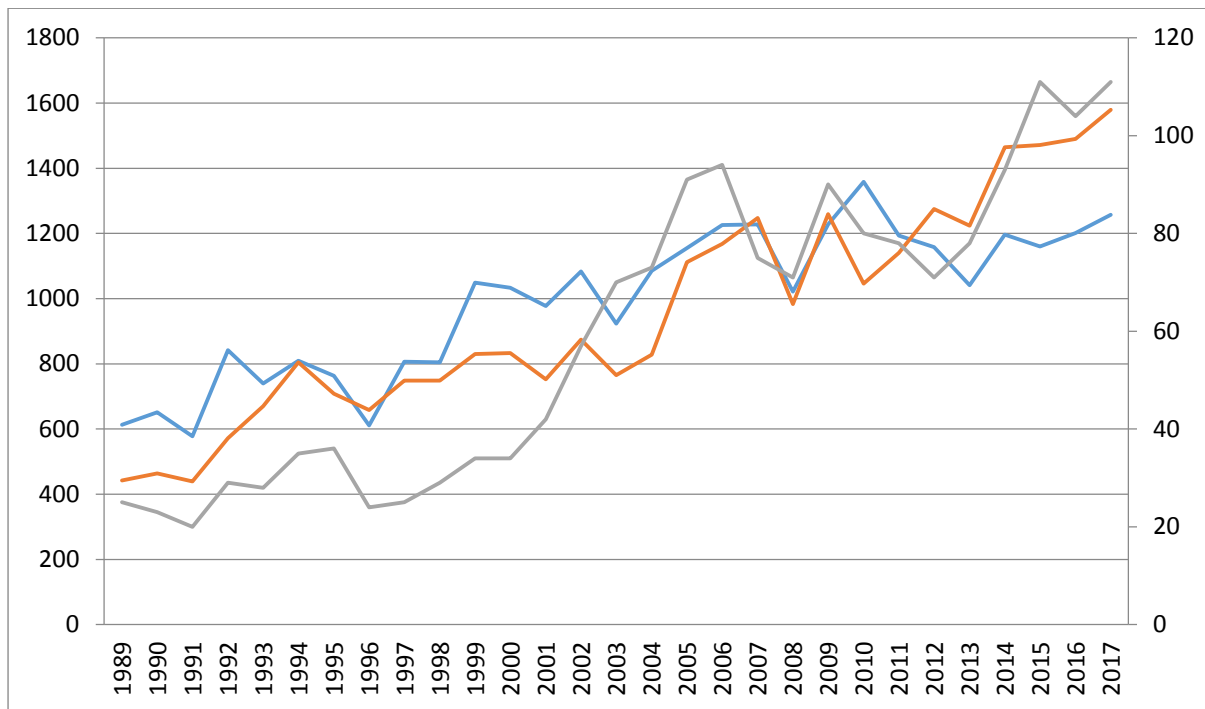


Figure 10 Relative number of common (blue), Arctic terns (orange) (primary axis) and roseate tern (grey) (secondary axis) on Coquet between 1989 and 2017

Like for all tern species on Coquet in 2017, the productivity was relatively high, i.e. 1.7 for common terns and 1.39 for the Arctic tern. For comparison, both common and Arctic terns had 0.6 productivity in 2016. The 5-year mean productivity for common tern on Coquet between 2011 and 2015 was 1.1 and for Arctic tern 0.93 chicks per nesting pair. The productivity of both species varies greatly across years, but follows a similar pattern suggesting that it is affected by similar drivers acting on both species (Figure 11).

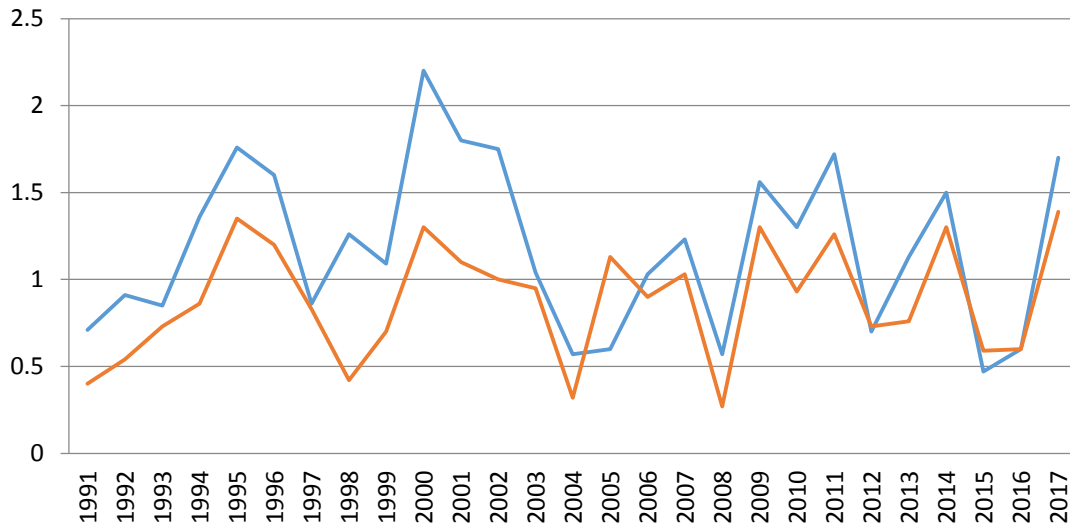


Figure 11 Productivity of common (blue) and Arctic tern (orange) on Coquet between 1991 and 2017

Coquet supported 1573 Sandwich terns in 2017 – 16.6% increase compared to 2016 and 11.5% against the 5-year baseline (Table 5). Typically for the Sandwich tern, there has been a large variation in the number of breeding pairs between years, most visibly between 2011 and 2014 (Figure 12).

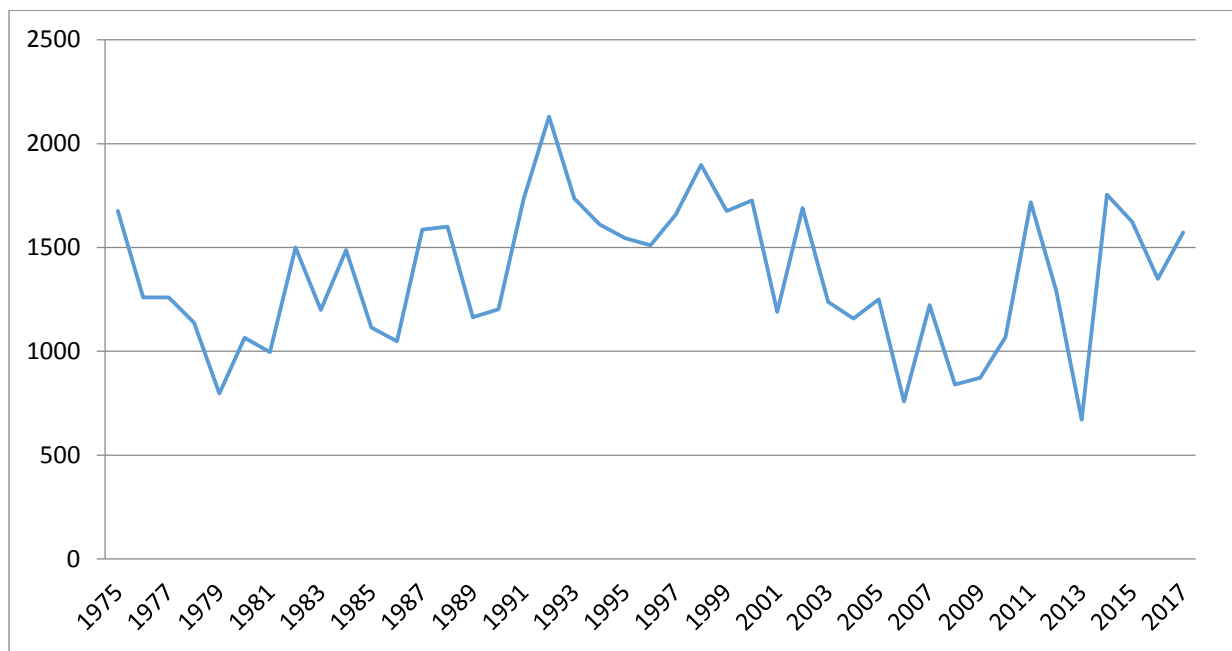


Figure 12 Population trend of Sandwich tern in 1975-2017 on Coquet.

3.4 Other roseate tern records in 2017 breeding season

In 2017, there was one pair of roseate terns breeding on **Larne Lough (Northern Ireland)**. The single pair bred in a nest box on the north-east corner of Blue Circle Island, raising two chicks, which were thought to be subsequently predated.

There was a roseate tern egg found on **Dalkey Islands**, however the adults were not seen, which suggests that they abandoned the nest shortly after laying.

Furthermore, the following sightings during the breeding season were recorded, but not breeding confirmed.

- There were three sightings of roseate tern on **Ynys Feurig** in 2016, on 24 June, 03 July and 06 July. In 2017, there were three sightings of Roseate Tern, on 16 May, 15th July and 19th July
- One Roseate Tern paired with a Common Tern on **the Skerries** in 2017, producing one fledgling from two eggs.
- A mixed pair of roseate and common tern bred for the second year running in **Leith Docks**, Forth Island, Scotland.

3.5 Recommendations for the roseate tern colonies

3.5.1 Rockabill

Target species	2015-2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Roseate tern	+26% (0.66)	+30% (0.83)
Common tern	-1.6% (0.26)	-1.4% (0.36)

Threat/ issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Avian predation	Employ additional warden early in the season before terns arrive to manage large gull species while conducting vegetation clearance.	Additional warden was employed, but the wardening has not started earlier due to issues with the site lease between Irish Lights and NPWS	Continue recruiting three wardens, one of them dedicated to gull scaring early in the season. Consider recruiting volunteers to release warden's time for gulls control.
Avian predation	Purchase Agrilaser and potentially new rifle to assist with gull management.	Agrilaser was purchased and it was a useful aid, but only on poor light conditions	Continue using agrilaser in low light condition.
Avian predation		Down and dusk patrols were carried out	Continue down and dusk patrols.
Avian predation			Start using three gull scarers during the day, one on the Bill and two on the peripheries of the main colony.
Nesting space		New nesting area was clear and extra 111 more boxes were provided than in 2016,	Clear vegetation and provide 200 more boxes. Provide terraces in 4BN,

		reaching a total of 878 boxes	west side of 4BS and south side of 4AS
Monitoring	Erect new hide to increase recording effort	Two new hides were erected with the benefit of increased number of read rings	None
Monitoring			Carry out supplementary provisioning watches for the assessment of quality of clupeid brought to the colony. 1-2 hours watches from the hides.
Biosecurity		Biosecurity plan was developed however, no issues registered so far	Observe biosecurity measures from the plan
Disturbance			Install “keep distance” boards.

3.5.2 Coquet

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Roseate tern	+21% (0.88)	+29% (1.5)
Common tern	+4.4% (0.6)	+9.3% (1.7)
Arctic tern	+13.3% (0.6)	+20.1% (1.39)

Threat/ issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Avian predation	Employ a dedicated seasonal warden for gull management.	Warden employed through the season	Continue
Avian predation	Use a mix of large gull deterrent methods, i.e. laser, gull scarer, nest removal, elimination of rough gulls	All methods were deployed	Continue
Nesting space	Undertake trials for vegetation suppression methods within the garden area for Arctic terns.	This idea was abandoned due to concerns over artificial nesting materials.	Continue traditional management using mowing
Nesting space	Undertake trials for using artificial platforms for common terns.	Platforms were provided for common tern to reduce interspecies competition, which was successful	Continue provision of platforms, increase if necessary

Nesting space			Build up additional terrace for 100 extra boxes
Biosecurity		Biosecurity plan was developed enabling a rapid rat incursion response in spring 2017	Continue biosecurity measures
Monitoring		Extra hide was deployed next to the southern terrace, enabling improved ring reading	Consider using the hide for the diet monitoring
Disturbance	Continue employing seasonal warden for species protection against egg collectors	Warden employed through the season	Continue
Disturbance	Deploy 'no landing' sign near the jetty	Done	Continue

3.5.3 Lady's Island Lake

Lady's Island Lake is not a project site. Recommendations are taken from the annual report.

Threat: Vegetation inhabiting Sandwich tern nesting and monitoring of roseate terns

1. Create vegetation patches using herbicide to improve Sandwich tern nesting areas.
2. Use herbicide to create paths through roseate tern colony and improve ring reading.

Threat: Potential rat incursion

1. Clear vegetation in perimeter ditch surrounding BHG colony to allow rat baiting.
2. Carry out rat control before the season

Threat: Mammalian predation

1. Install central fence to protect southern Inish from mammalian predation.

Threat: Avian predation

1. Remove any oystercatcher nests.
2. Remove BHG nest encroaching on tern nesting areas.
3. Remove any hooded crow nest and actively trap crows in the vicinity of the colony if predation occurs.

References:

- McKeon, C., Miley, D., Somers, S., Newton, S. (2017). Rockabill. Annual reserve report 2017. BWI
- Daly, D., Murphy, B., Murray, T. (2017) Lady's Island Lake. Tern Report 2017. NPWS
- Davies, W., Morrison, P. (2017). Coquet. Annual reserve report 2017. RSPB

4 Breeding numbers of tern species on non-roseate tern project sites

The overview of the 2017 season is presented in Table 6, following by a discussion of each of the site separately.

Table 6 Number of common, Arctic, Sandwich and roseate tern on project sites without active roseate tern colonies in 2017

	Common Tern	Arctic Tern	Sandwich Tern	Roseate Tern
Forth Islands SPA				
<i>Long Craig</i>	165	n/a	n/a	0
<i>Leith Dock SPA</i>	1005	n/a	n/a	0
<i>Isle of May</i>	29	832	4	0
Ynys Feurig, Cemlyn Bay and the Skerries SPA				
<i>Ynys Feurig</i>	123-153*	352-382*	n/a	0
<i>The Skerries</i>	386	2770	n/a	0
<i>Cemlyn Bay</i>	20	27	1980	0
Solent and Southampton SAP	122	n/a	48	0
Larne Lough SPA				
<i>Blue Circle Island</i>	116	n/a	941	1 (failed at chick stage)
<i>Swan Island</i>	239	n/a	200	0
Dalkey Islands SPA (RoI)	8	97	n/a	1 (failed at egg stage)

* Numbers in bold are thought to be more accurate

4.1 Forth Islands SPA

There are two common tern colonies within Forth Islands SPA, i.e. Long Craig and Isle of May, however because of the significance of Leith Docks colony for this area, we have also included breeding figures for this site.

Table 7. Apparently Occupied Nests (AONs) of common, Arctic and Sandwich terns in the Firth of Forth. (%) = trend against 2016 counts (See Appendix D for long-term data).

Species	Long Craig	Leith Docks	Isle of May
Common tern	165 (-2%)	1005 (+40%)	29 (+53%)
Arctic tern	N/a	N/a	832 (+58%)
Sandwich terns	N/a	N/a	4 (-81%)

4.1.1 Leith Docks

The site supports the second largest colony of common terns in the UK (after Coquet Island) and it is certainly a source population for Long Craig and Isle of May. It should therefore be discussed in the context of the local metapopulation. The colony is located on a disused pier within the operating docks. This presents limitations in the extent of monitoring activities, which can be allowed on this site, however the Forth Seabird Group carries out the annual nest counts. In 2017, the colony reached a record 1005 breeding pairs (40% increase to 2016). Data suggest that the colony has been growing due to the misplacement of terns by gulls from natural islands in the mid-1990s, mostly from Inchmickery (Figure 13).

In 2017, RSPB Tern Warden – Chris Knowles assisted the Forth Seabird Group in monitoring visits to the site.

Two adult roseate terns were observed at the Leith Docks colony this year; one of them visited only briefly, while the other was reported to be “brooding a single egg” (Keith Gillon, FSG, pers. comm.).

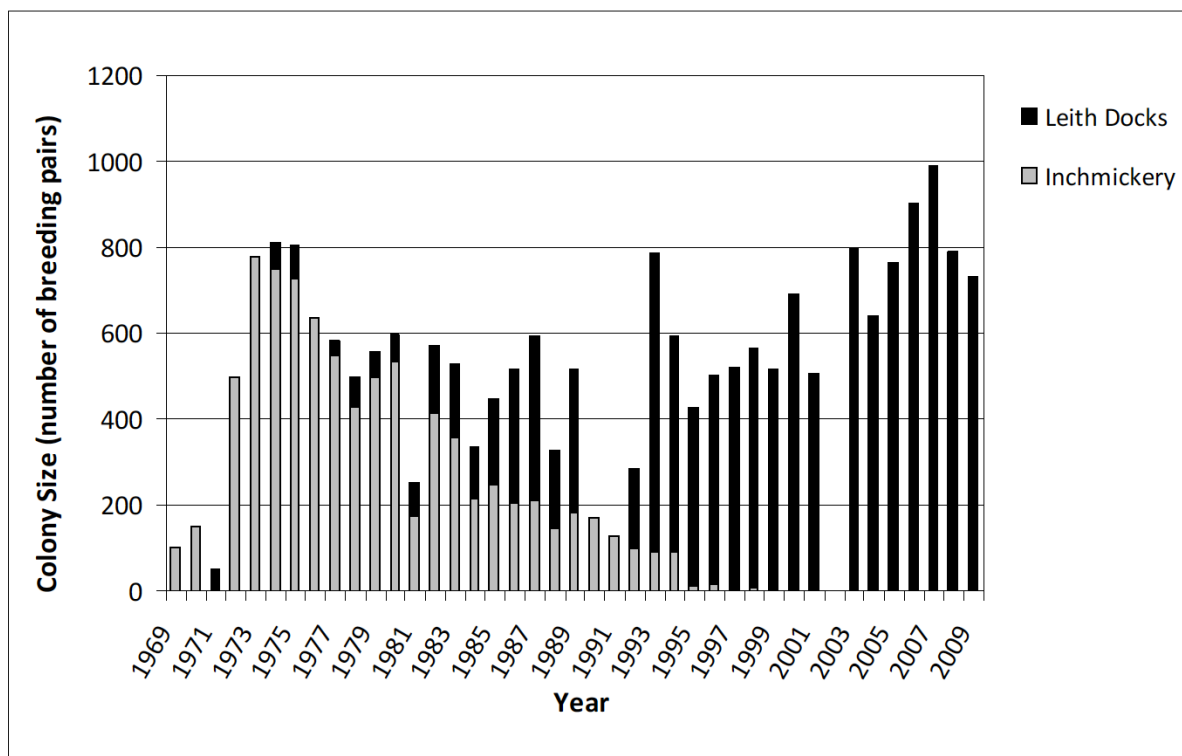


Figure 13 Number of breeding common terns on Inchmickery and Leith Docks in 1969 – 2009 (http://www.sbes.stir.ac.uk/conservation_conference/documents/GJennings.pdf)

4.1.2 Isle of May

SNH has invested a lot of effort to create tern nesting areas on Isle of May and with good results, mostly for Arctic terns with 832 pairs and 58% of increase compared to 2016. After a successful return of Sandwich tern’s breeding on the island in 2016 (an eight-year hiatus), there were only four pairs breeding in 2017, representing a decrease of 81%. Common terns are showing a sign of recovery with 29 pairs breeding in 2017, however this is still far away from its former peak counts with the mean number of 210 pairs in 1990-1999 and 97 pairs in 2000-2009. The mean number of pairs in the last eight years was only 23 pairs (Figure 14).

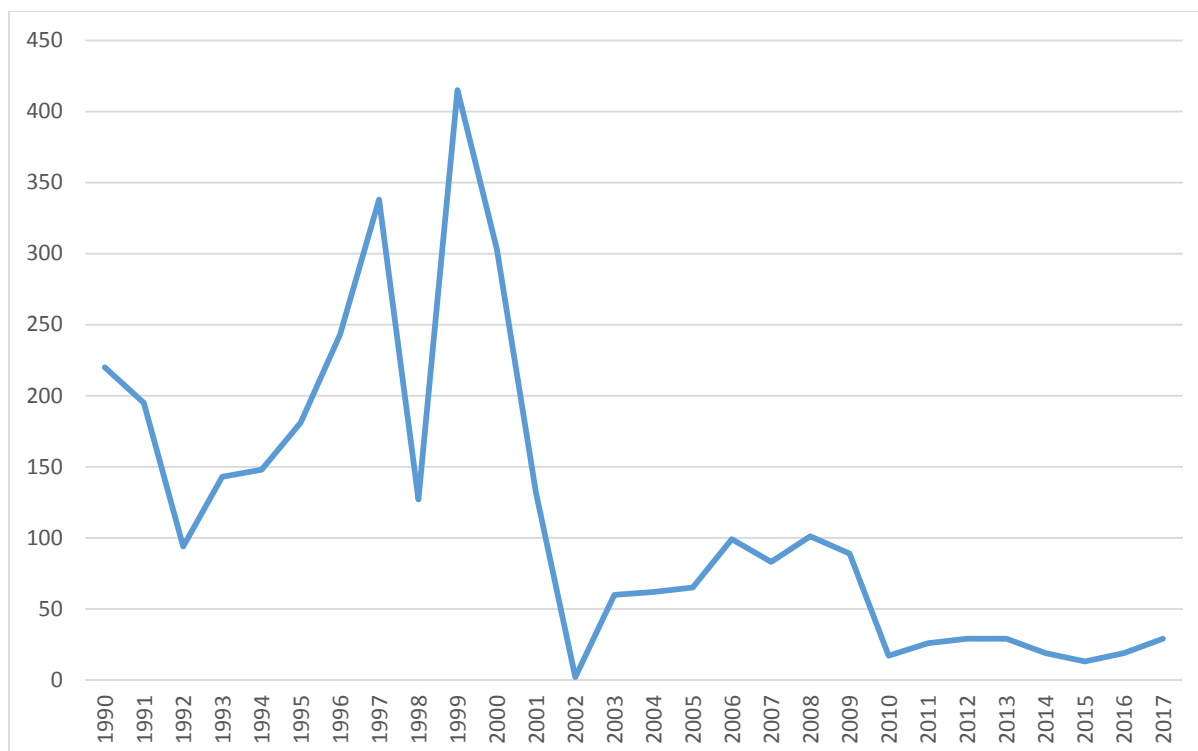


Figure 14 Number of breeding common tern pairs on Isle of May in 1990 - 2017

4.1.3 Long Craig

Long Craig is currently the only site within Forth Island SPA, where the project is involved in management.

There was a slight decrease of nests in 2017 (165) in relation to the previous year (168) (Table 8).

The trend of common terns has always been erratic on Long Craig however, the last eight years have seen the highest mean number of nests (110), compared to 2000-2009 (101 nests) and 1990-1999 (94 nest) (Figure 15).

During the 2017 season, no avian or mammalian predation was detected. Large gulls were often seen sitting at the fringe of the island, but not a single attempt of predation was recorded during 33 monitoring visits. The most important pressure was flooding during the breeding season. Terns do not nest above the high-water mark, which significantly reduces the capacity of the site.

Table 8 Project mean baseline, number of AONs in 2016 and 2017, and change between project baseline and 2017 number of AONs on Long Craig Island

Species	Project mean baseline (2011-2015)	2016	2017	% change between project baseline and 2017
Common Tern	88.2	168	165	+87%

Table 9 Demographic parameters for 2016 and 2017 season for common terns at Long Craig

Year	Maximum number of AONs	Minimum number of active nests	Minimum number of chicks fledged	Number of dead chicks recovered	Number of abandoned eggs recovered
2017	165	78	35	4	61
2016	168	73	44	20	unknown

A 2017 productivity figure of 0.45 was calculated by dividing the number of large /fledged chicks by the peak count of active nests.

Although it is not clear why so many eggs remained unhatched in 2017, it was observed that a high proportion were laid very early in the season before territorial disputes were settled. These eggs were abandoned from the start, which might point out to the competition for space.

In addition to the four very young dead chicks that were recovered (three from nest 35 and one near nest 14), 1 further chick was known to have drowned following a ringing session.

The deployment of the 8x8 m tern raft in Port Edgar Marina in spring 2018, just 1.5 km away from the colony, can be seen as a satellite/ spill-over site for Long Craig, which suffers from the limited nesting space above the spring tide level.

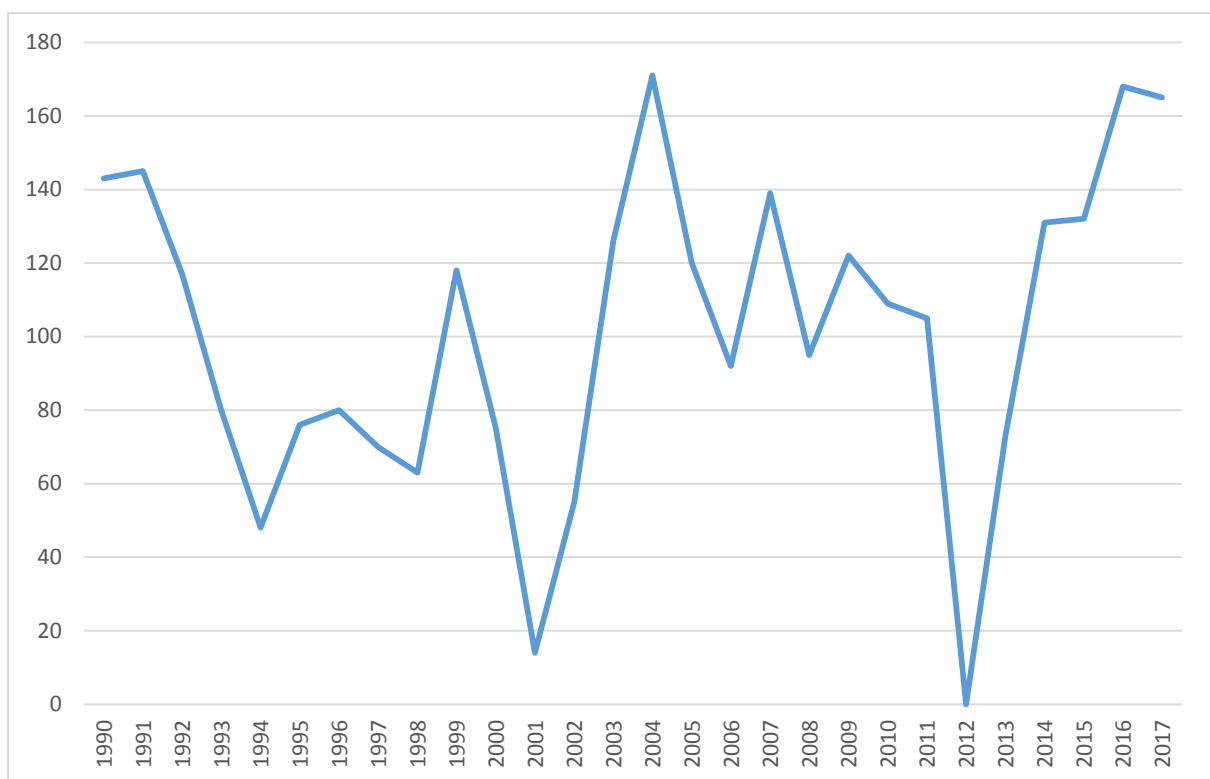


Figure 15 Number of breeding common tern pairs on Long Craig in 1990 – 2017. Terns abandoned the colony in 2012 due to extreme weather.

4.1.4 Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern	+90% (0.6)	+87% (0.45)

Threat/issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Nesting space	Management of Long Craig colony should focus on maximising the productivity through increasing the space for nesting, as well as on minimising the impact of predation. The colony is probably heavily dependent on the immigration from Leith Docks population and the provision of space should accommodate more immigrants and decrease density dependent effects	Feasibility study completed. Not possible to implement due to cost.	<ul style="list-style-type: none"> i. Deploy tern raft in Port Edgar Marina to support Long Craig population. ii. Provide shingle material on top of large stones and between large rocks to create flat nesting areas. iii. Remove lower quality shelter such as car tyres, plastic boxes, etc. and provide 20 nest boxes and ridge tiles. iv. Remove any debris and rubbish limiting nesting space. v. Carry out a trial of providing gabion baskets to secure higher nesting areas.
Nesting space	The provision of at least 20 roseate tern nest boxes should be made if the other threats are such as predation and nesting space are in control.	This has been delayed until 2018 season as we were not clear about predation pressure. Since then, we established that avian predation is almost absent, and no mammalian predation was recorded. Consequently, the boxes have been ordered for 2018 season.	Deploy 10-15 nest boxes in 2018 season. Continue monitoring of AONs, clutch size and productivity. Continue monitoring of the factors affecting productivity, i.e. weather, predation, food provisioning.
Predation	Depending on the results of disturbance and rat monitoring, provisions to minimise the risk of predations should be considered including fencing against foxes and poisoning of rats before the season.	No registered issues	Continue predation monitoring

Predation	Gulls should be discouraged from settling on the island before the tern breeding season, and then actively discouraged from using the island with electronic scarers and, if necessary, the use of Agri-lasers.	No registered issues	Continue predation monitoring
Monitoring	Consideration should be given to ring and flag common tern chicks to assess the survival rates and juvenile recruitment. Ideally similar study should be undertaken on Leith Docks, however there are issues with access.	Very limited access to Leith Docks, not possible at the moment to implement any additional conservation and monitoring measures.	Contact has been made with the person responsible for the monitoring - John Alan from Forth Seabird Group to include Leith Docks in the Forth Tern Liaison Group.
Monitoring	The monitoring should extend to include baiting stations for rats, determination of disturbance sources and possibly provisioning observations to assess the rates and fish quality. These activities should be carried out by dedicated warden and the use of trap cameras.	Rats cannot survive on the island due to winter storms - it has never been a registered issue. Provisioning observations have been carried out in 2017.	Continue provisioning monitoring by the warden
Partnership working			<ol style="list-style-type: none"> 1. Facilitate the exchange of knowledge and good practice with the Forth Seabird Group, colony managers and statutory agencies. 2. Maintain close collaboration with the Scottish Wildlife Trust for providing numbers and productivity figures for Isle of May. 3. Obtain annual figures for common terns from Leith Docks SPA in Forth Islands.

References:

- Jennings, G. (2012). The ecology of an urban colony of common terns *Sterna hirundo* in Leith Docks, Scotland. PhD thesis.
- Knowles, C. (2017). Forth Islands Tern Warden – Season Report 2017. RSPB Internal report
- Oksien, M. (2016). Long Craig Island. Annual reserve report 2017. SWT

4.2 Ynys Feurig, Cemlyn Bay and the Skerries SPA

4.2.1 Ynys Feurig

The pre-season fox and crow control resulted in a better year than in 2016, especially in terms of the productivity. A territorial pair of crows were taken out using Larson traps early in May. Peregrine falcon was observed taking up to 14 adult and juvenile “commic” terns. In total, losses of 24 eggs, 9 juveniles and 5 adults were recorded. This marked the best breeding success since 2012.

However, the colony size is still below the project’s 5-year mean for common and Arctic tern, -23% and -11% respectively (Table 10).

With the consistent predator control, it is possible that the colony will eventually recover to the previous high numbers of over 700 pairs recorded for “commic terns” between 2005 through to 2012 (Figure 16), although the fluctuations in the last seven years have been driven by Arctic terns, since the common tern population has been relatively stable (Figure 17).

Table 10 Project mean baseline, number of pairs in 2016 and 2017, and change between project baseline and 2017 number of pairs on Ynys Feurig

Species	Project mean baseline (2011-2015)	2016	2017	% change between project baseline and 2017
Common (max pairs)	198.2	165	153	-23
Arctic (max pairs)	394.6	238	352	-11
Comic Total	592.8	403	505	-15

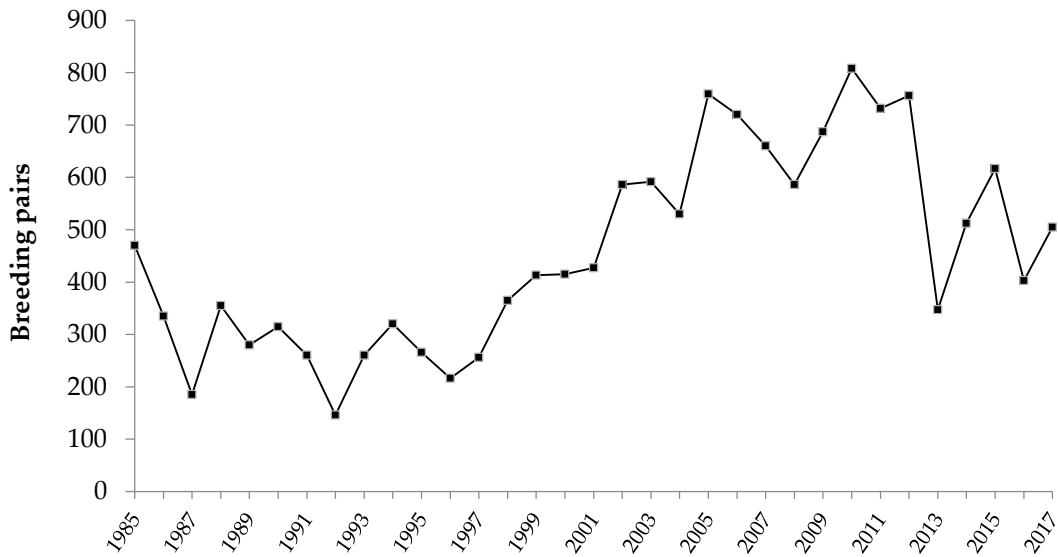


Figure 16 Number of breeding “comic terns” on Ynys Feurig in 1985-2017

Productivity of common tern was estimated at the minimum of 0.23 chicks per nesting pair, a significant improvement on 2016 (2 fledged from 165 pairs, productivity 0.12).

Dividing the number of 53 Arctic terns thought to have fledged by the minimum number of 352 breeding pairs gives an Arctic Tern productivity of 0.15. No Arctic terns are thought to have fledged in 2016.

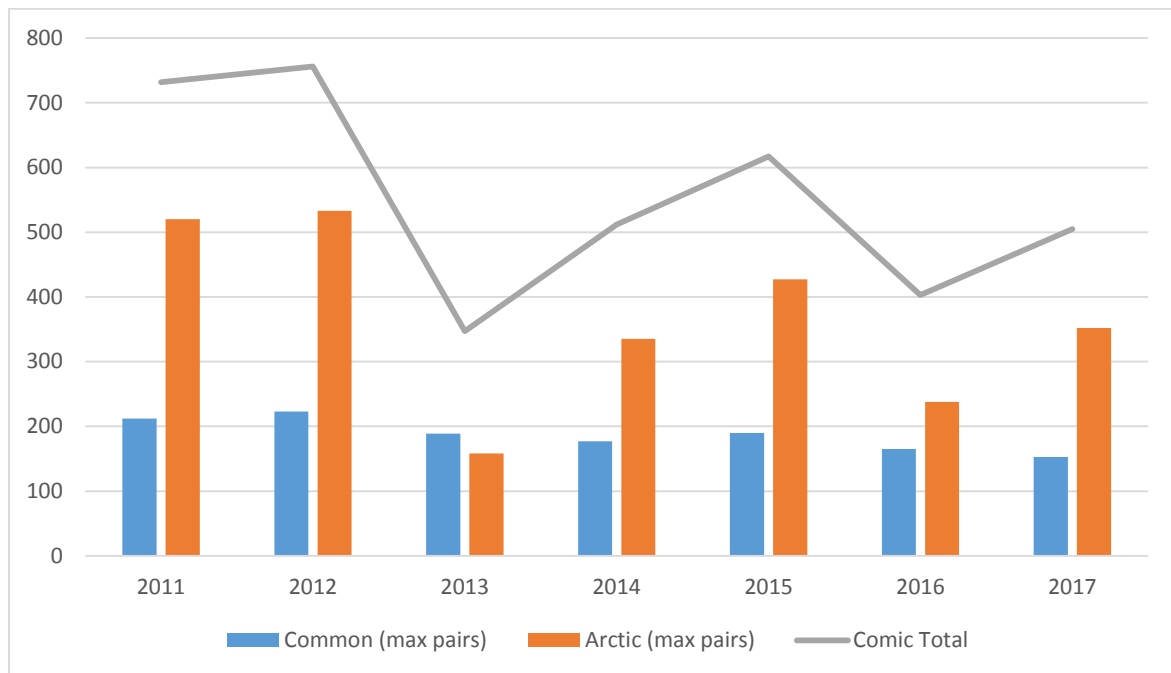


Figure 17 Number of common, Arctic and “commic” terns on Ynys Feurig in 2011-2017.

Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern Arctic tern	-17% (0.12) -40% (0)	-23% (0.23) -11% (0.15)

Threat/ issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Avian predation	Develop a formal plan of action with the RAF airbase to destroy any crow nests on their property before the breeding season and any subsequent re-nesting attempts made during the season.	No formal plan has been developed due to changes in RAF personnel, however the relationship is maintained. Two nests were removed before 2017 season.	Continue liaison with RAF to remove crow nests.
Avian predation		A Larson Trap was taken out to Middle Island on the 4th May and a call bird placed inside. This was to try and remove a pair of crows seen on here displaying territorial behaviour during the first week of the season. This proved to be immediately effective with 2 crows being caught and humanely despatched in quick succession, on the 5th and 6th May.	Continue using Larson trap if necessary
Avian predation	Consider use of laser hazing to deter other avian predators and discuss this with RAF.	This has not been approved by RAF due to the close proximity of airbase.	Working gull scarer to be made available to wardens from the outset to be set-up on islands to deter gulls early in the season
Mammalian predation	Identify the owner and holder of shooting rights of the section of dunes between the RAF station and the islands, and gain permission to shoot crows as they fly between the two.	Fox control was carried out before the 2017 season, resulting in elimination of two foxes.	Continue pre-season fox control. In times of extremely low tides (i.e. spring tides falling to <1.0m at low tide) two wardens were present on the beach and this should continue. Thermal Imaging Scope to be available for fox

			watches as this proved invaluable in 2017.
Biosecurity		Rat monitoring stations were deployed and checked before the season.	Continue biosecurity measures

4.2.2 The Skerries

Common terns have been increasing on the Skerries for a number of years now (Figure 18) and it was no different in 2017, reaching the highest number ever recorded of 386 breeding pairs, compared to 290 in 2016 (Table 11). Common terns were not affected to the same extent as Arctic terns by the outbreak of botulism in 2016. Arctic terns suffered a 27% decline (2770 pairs) compared to 2016 (3816 pairs), which was expected. However, the mean clutch size has increased to 2.03 which is 26% increase from 2016. The higher mean clutch size has meant only a small decrease to the total number of eggs observed laid compared to last year.

Table 11 Project mean baseline, number of pairs in 2016 and 2017, and change between project baseline and 2017 number of pairs on the Skerries

Species	Project mean baseline (2011-2015)	2016	2017	% change between project baseline and 2017
Common (max pairs)	259	290	386	+49
Arctic (max pairs)	3659	3816	2770	-24

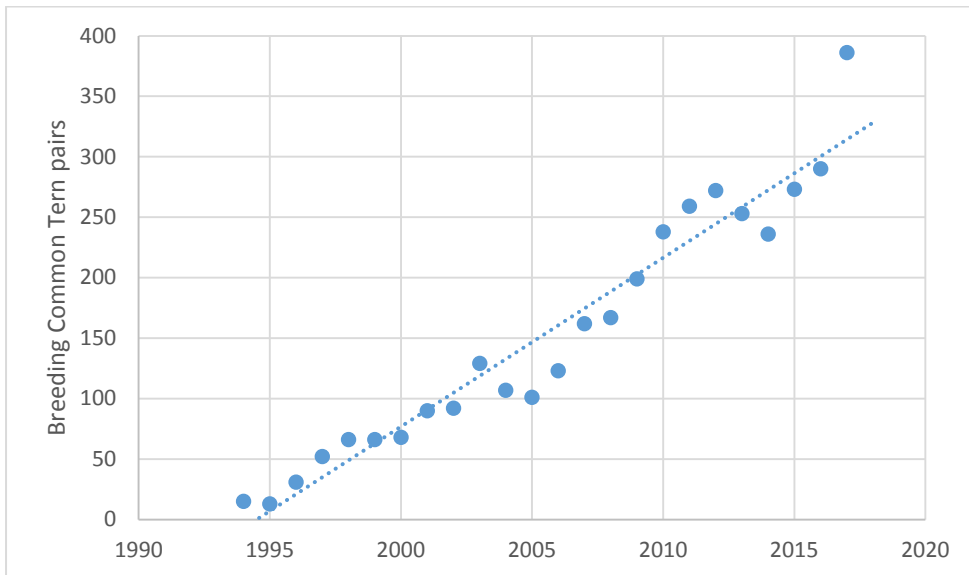


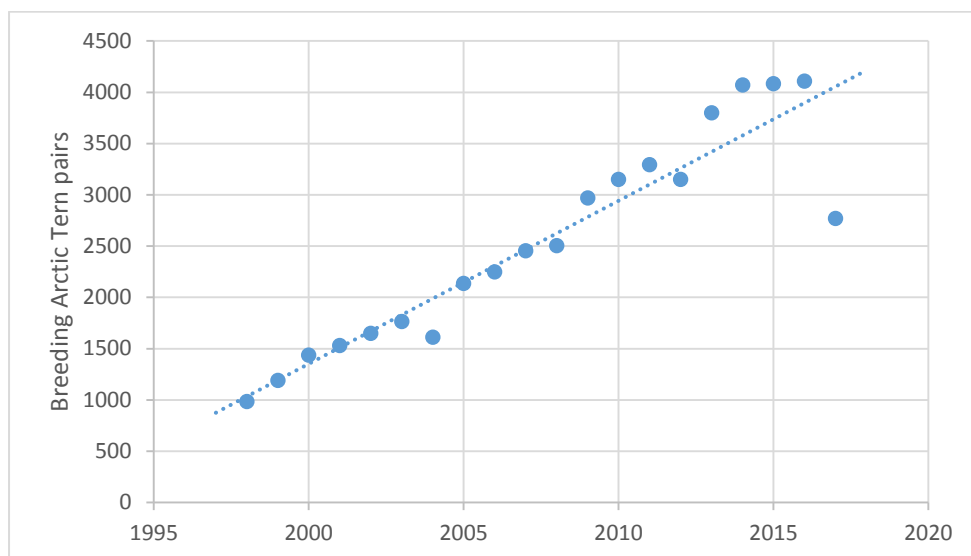
Figure 18 Long-term trend of common terns

The productivity of Arctic terns was estimated using three different methods:

- Total fledgling count: 0.21
- Study nests: 0.54-0.8

- Accounted losses: 1.45

One roseate tern female bred with a common tern male producing two eggs and one hybrid fledging.



Main Issues:

Predation: the total losses were much smaller in 2017 (84) compared with 903 in 2016. This figure comprises 9 eggs, 48 chicks, 22 fledglings and 5 adults. Peregrine falcon was present during the whole season and took adults and fledglings. Raven was recorded taking eggs on couple of occasions. Laser hazing was used against both species, which was very effective. Large gulls were seen preying chicks and eggs. Greater Black-back gull was also seen taking fledglings on the water and some apparently healthy adults.

Vegetation: Mayweed has been a major issue for common terns in previous years and the treatment of 13 areas in 2017 was successful. However, some of the nest were washed out, suggesting that patches of vegetation should be left in situ for protection.

Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern Arctic tern	+12% (0.57 – Commic) +4% (0.57 - Commic)	+49% (no estimation) -24% (0.54-0.8)

Threat/issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Avian predation	Tackle oystercatcher predation early in the season.	Avian predation was much lower than in 2017, with 84 registered losses compared to 903 in 2016. Agrilaser was used to deter avian predators, which proved	Agrilaser should continue to be used as it proved an effective tool against peregrine falcon, raven and some large gulls. Gull scarer should be used

		effective against perching peregrines, ravens and large gulls in low light conditions.	near the common tern colony.
Nesting space	Start vegetation suppression measures for stinging nettle and sea mayweed for common tern.	Chemical treatment of common tern nesting plot was used with success. The bare ground remained throughout the season, however some eggs rolled due to the lack of vegetation	Continue treatment however leave small section of vegetation to prevent egg loss.
Roseate tern luring			Roseate tern boxes, lures and decoys should be placed nearer the common tern colony.
Monitoring			Common tern productivity should be estimated.
Biosecurity			Deploy biosecurity monitoring stations for the winter.

4.2.3 Cemlyn Bay

The colony suffered several predation events from otters in 2017 resulting in decline of all tern species and eventual collapse of the colony by the end of June. The figures in Table 12 are from the early season.

Table 12 Project mean baseline, number of pairs in 2016 and 2017, and change between project baseline and 2017 number of pairs at Cemlyn Bay

Species	Project mean baseline (2011-2015)	2016	2017	% change between project baseline and 2017
Common Terns	122	60	20	-84
Arctic Terns	40	60	27	-33
Sandwich Terns	2234	2595	1980	-11

In the last decade the Sandwich tern colony has increased steeply but within the last three year, it has suffered losses due to otter predation s (Figure 19). The decline of common tern in the last five years from 197 in 2012 to just 20 in 2017 is more alarming. Initially, between 2010 and 2012, the common tern trend followed the increase of Sandwich tern, but then it deviated declining sharply in the following years (Figure 19).

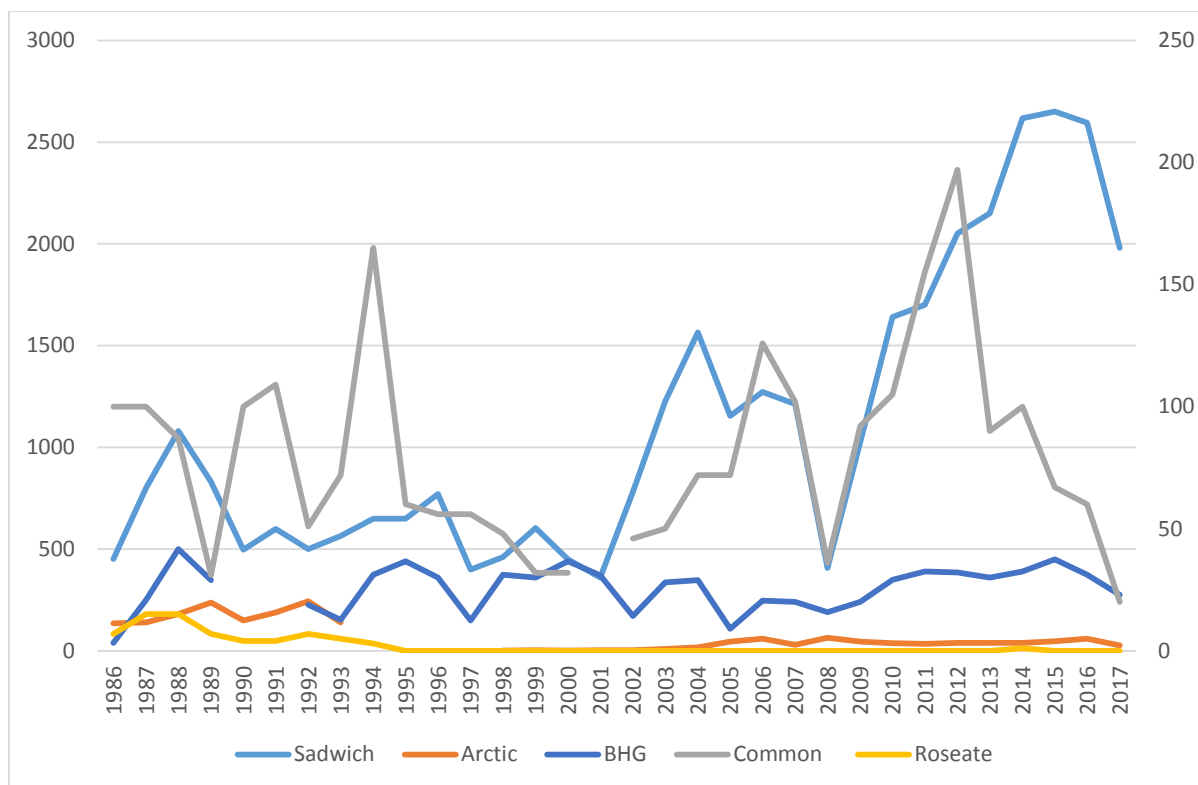


Figure 19 Long term trends for Sandwich, Arctic, roseate tern and black-headed gull (BHG) (primary axis) and common terns (secondary axis) in 1986 – 2017

Registered issues:

Otter predation has been the main issue in the last three years. Initially, the predation attempts were irregular as it seemed that otters fed on a different type of prey and however in 2017, predation increased causing a desertion of birds for several hours during the night and eventual abandonment of the colony.

The lack of nesting space has probably been another reason behind the decline of common terns. The presence of tern rafts and the restoration of the eroded area of the main island in January 2017 will most likely improve the situation in the coming years.

Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern	-51% (0.03)	-84% (0)
Arctic tern	+49% (0)	-33% (0)
Sandwich tern	+16% (0.73)	-11% (0)

Threat/ issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Mammalian predation	Further methods of deterring otters including sonic alarms and improved fencing around the islands.	Fencing was not erected. Sonic deterrent failed. Otters accessed the island on a few occasions causing abandonment of the colony.	Erect and maintain otter fence around the main and small islands. Purchase night vision equipment to monitor otter activity and effectiveness of the fence. Initiative 24-hour wardening and provide facilities for the wardens to recover from night shifts (mobile caravan).
Avian predation			Use agrilaser against avian predators. Install gull scarer against large gulls.
Nesting space	Further nesting area to be created by work on the islands and rafts.	Rafts were deployed, but not successful	Continue providing rafts Restore eroded area of the main island
Monitoring	Improved monitoring via use of rings/tags or similar.	This was not implemented, but it might have been useful to see where Sandwich terns went after the collapse of the colony.	Discuss the colour ringing with NRW improve our knowledge of alternative sites and potential mitigation measures in relation to Wylfa development.
Monitoring			Introduce more frequent monitoring visits to the islands to capture basic demographic parameters, i.e. number of nests, clutch size and productivity, as well as monitor for the signs of predation.

References:

Dymond, D., Smith, W. 2017. The Skerries. Annual Report 2017. RSPB Internal Report

Smith, A., Lane, C. 2017. Ynys Feurig. Annual Report 2017-18. Management Plan Year 1. RSPB Internal Report

Wynne, C. Pers. Comms for Cemlyn Bay

4.3 Solent and Southampton

4.3.1 Western Solent

2017 was a much better year for common terns in the project area (Western Solent) with 122 AONs compared to 55 AONs in 2016, representing only 1% decline compared to the project mean baseline (124 pairs). Unfortunately, it was a different picture for Sandwich terns with 33 AONs less than in 2016 (81 AONs) representing a 41% between years decline and 54% decline compared to the project mean baseline figure of 105 AONs (Tables 13 and 14).

Table 13 Project mean baseline, number of AONs in 2016 and 2017, and change between project baseline and 2017 number AONs in the project area (Western Solent)

Species	Project mean baseline (2013-2016)	2016	2017	% change between project baseline and 2017
Common tern	124	55	122	-1
Sandwich tern	105	81	48	-54

Overall productivity was poor with 0.20 for common tern, 0.17 for Sandwich tern and no breeding success for little terns in 2017. While this level of productivity is not sustainable in a long-term, it represents an improvement from 2016, when no breeding success was recorded for any tern species (Table 14).

The main issue was a storm surge in at the end of May resulting in flooding of some nest of common and Sandwich terns on Boiler Marsh, forcing them to relay and move to Cockleshell Marsh. There was another storm surge at the end of June causing further losses.

The presence of the breeding pair of peregrine falcon on Cockleshell, near the chenier recharge area created suboptimal conditions for terns, although it is thought that Peregrine did not cause many losses amongst terns and concentrated on black-headed gulls instead.

Large gulls were recorded hunting over tern colonies, usually unsuccessful.

On a positive side, there was no recorded predation of foxes in 2017, leading to a relatively good productivity on Normandy lagoon and the establishment of the black-headed gull colony on Cockleshell. This allows for the conclusion that the pre-season fox control was successful.

None of the newly created habitat on the Cockleshell chenier, Lymington breakwater and Butt's lagoon tern rafts were occupied by terns. This was attributed, due to the presence of peregrine falcon (chenier), great black-back gull (breakwater) and the lack of interest towards rafts. Moreover, the recharge area was significantly diminished through the winter, however some of the material was deposited on top of chenier creating still the highest place in the area.

Table 14 Number of AONs, fledglings and productivity for different location within Western Solent in 2017

Species	Location	Peak AONs	Number of Fledglings	Productivity
Common tern, <i>Sterna hirundo</i>	Hawker's Island	10	1	0.1
	Cockleshell	28	11	0.39
	Boiler	24	1	0.04
	Pylewell	60	12	0.2
	<i>Total:</i>	<i>122</i>	<i>25</i>	<i>Overall productivity: 0.20</i>
Sandwich tern, <i>Sterna sandvicensis</i>	Cockleshell	42	6	0.14
	Normandy Lagoon	2	0	0.00
	Boiler	4	2	0.5
	<i>Total:</i>	<i>48</i>	<i>8</i>	<i>Overall productivity: 0.17</i>
Little tern, <i>Sternula albifrons</i>	Hawker's Island	5	0	0.00
	Normandy Lagoon	7	0	0.00
	<i>Total:</i>	<i>12</i>	<i>0</i>	<i>Overall productivity: 0.00</i>
Black-headed gull, <i>Larus ridibundus</i>	Cockleshell	2721	Not recorded	N/a
	Boiler & Pylewell	3479	Not recorded	N/a
	<i>Total:</i>	<i>6200</i>	<i>N/a</i>	<i>Overall productivity: N/a</i>
Mediterranean gull, <i>Larus melanocephalus</i>	Cockleshell	2	0	0.00
	Normandy Lagoon	1	0	0.00
	Pylewell	3	0	0.00
	<i>Total:</i>	<i>6</i>	<i>0</i>	<i>Overall productivity: 0.00</i>
Oystercatcher, <i>Haematopus ostralegus</i>	Hawker's Island	2	0	0.00
	Boiler	3	Not recorded	N/a
	Pylewell	1	Not recorded	N/a

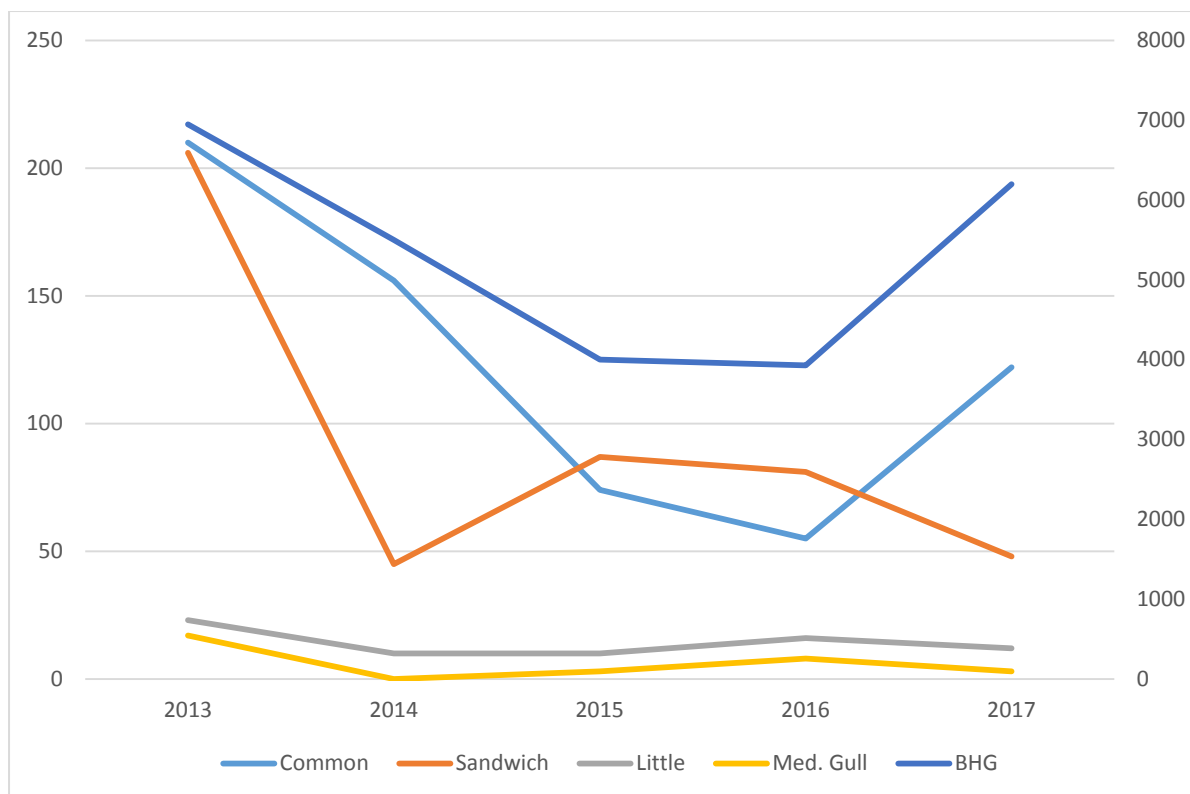


Figure 20 Recent trends for common, Sandwich, little terns, Mediterranean (primary axis) and black-headed gulls – BHG (secondary axis) in Western Solent between 2013 and 2017.

4.3.2 Other sites within the SPA

North Solent NNR – no terns have bred there since 2004. Formerly, the site supported a large colony of black-headed gulls (up to 8500 pairs), but it collapsed after the egg collectors stopped the activity (and subsequently fox control) due to the presence of Med gulls. Breeding peregrine falcon and human disturbance contributed to the decline of this site.

Tichfield haven NNR – a small colony of common terns (12 pairs in 2017) nesting on wooden platforms inside man-made scrapes. All terns were predated by foxes early in the season and relayed later producing seven fledged chicks. The fast-growing population of black-headed gulls is causing competition for nesting space.

Newton Harbour NNR – no terns nested there since 2007 due to human disturbance to the West Spit.

4.3.3 Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern	-56% (none)	-1% (0.20)
Sandwich tern	-23% (none)	-54% (0.17)

Threat/ issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Mammalian predation	Introduce fox control west of Limington Harborough.	Fox control was carried out before the 2017 season, resulting in elimination of 7 Dog foxes, 4 Vixens and 3 unrecovered foxes. This resulted in a very good breeding season on Normandy lagoon with first attempts of nesting for Med. Gull and Sandwich tern, as well as the establishment of BHG colony on Cockleshell.	Continue to monitor and control fox activity.
Monitoring	Develop methods and monitor the whole SPA for terns.	The monitoring was carried out by the project and HCC personnel in Western Solent area, other data was obtained through liaison with site managers	Continue monitoring of AONs, clutch size and productivity.
Nesting space		Eight rafts were deployed on Butt's lagoon and North Solent NNR, but were not successful	Redeploy two tern rafts on Butt's lagoon, including chick shelters, lures and decoys. Deploy two tern rafts on Normandy lagoon, including chick shelters, lures and decoys.
Nesting space			Provide chick shelters on cheniers once the colonies are established.
Avian predation			Install a gull scarer and decoys on breakwater and/or recharge nesting areas.
Avian predation			Increase the time allocation for predation watches for Lymington marshes colonies.
Avian predation			Use agrilaser against avian predators. Install gull scarer against large gulls.
Avian predation			Conduct a trial for using a drone for the assessment of AONs.
Partnership working			Continue working relationship with other site managers within the SPA.

References:

Belcher, C., Brown, M. (2017). North – West Solent. Breeding Tern Report 2017. RSPB Internal Project Report

4.4 Larne Lough SPA

Terns breed on two islands within Larne Lough reserve – Blue Circle and Swan islands.

Common terns have increased 23% compared to the project mean baseline number of 290 and have remained stable with 355 pairs breeding in 2017. The majority (67%) of which nest on Swan Island (Table 15, Table 16 and Figure 20). However, the population has not recovered to the level from mid-2000s, when the peak number of breeding pairs reached over 700 pairs. In that time, the island supported up to 19 pairs of roseate tern. It is likely that this decline was caused by the development of vegetation and subsequent reduction of these adequate nesting areas.

Sandwich terns declined 7% compared to 2016 down to 1141 pairs from 1229 in 2017. However, this still represents a 147% increase compared to the project mean baseline of 462 pairs (Table 15, Figure 20). Majority (82%) of Sandwich tern breeds on Blue Circle Island with only 200 breeding on Swan Island (Table 16).

Table 15 Project mean baseline, number of pairs in 2016 and 2017, and change between project baseline and 2017 number pairs on Larne Lough

Species	Project mean baseline (2011-2015)	2016	2017	% change between project baseline and 2017
Common (max pairs)	290	333	355	+23
Sandwich (max pairs)	462	1229	1141	+147

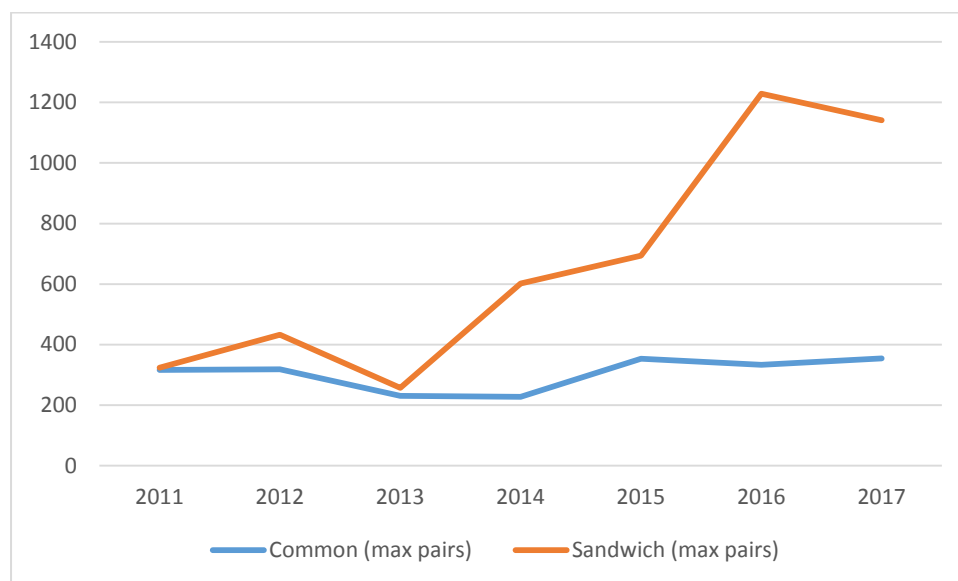


Figure 21 Population trend of common and Sandwich tern on Larne Lough in 2011-2017.

Black-headed gull is another notable species for the assemblage of especially Blue Circle Island with 2914 pairs breeding there and 146 on Swan Island in 2017. The population of black-headed gull has been steadily increasing since the mid-1990s, which has probably had a significant contribution towards the increase of Sandwich terns, which often occurs in breeding colonies together with black-headed gulls.

Table 16 Breeding numbers of gull and tern species on Blue Circle and Swan islands in 2016 and 2017

Species	Blue Circle	Swan	Total 2016	Total 2017
black-headed gull	2,914	146	3201	3060
common gull	32	0	27	32
Mediterranean gull	2	0	5	2
Sandwich tern	941	200	1229	1141
common tern	116	239	333	355
roseate tern	1	0	1	1

Main issues

Predation by otter was, similarly to the previous year, a significant issue in 2017, with the total of 168 birds predated on Blue Circle and 81 on Swan Island (Table 17). Additionally, literally all 140 Sandwich tern chicks “disappeared” between 9 and 16 of June from Swan Island with no plausible explanation as to how. The largest losses were recorded for the black-headed gull (65) and Sandwich tern (250), however because of a relatively good productivity (ca. 2.0 and 1.0 respectively), these losses represent respectively ca. 1% and 10% of the juvenile cohort for these species (adult birds consist only a small proportion of all losses). Therefore, it can be concluded that the otter predation had a small impact on black-headed gull productivity and medium impact for Sandwich tern. Quite contrary, the impact of predation on common tern was significant, with only approx. 5 chicks fledged. Roseate tern nest box was also predated at the chick stage.

Table 17 Records of otter predation on Blue Circle and Swan islands in 2017. BH – black headed gull, TE – Sandwich tern, CN – common tern, CM – Med gull, TU – tufted duck

Visit date	Blue Circle Island					Swan Island		
	BH	TE	CN	CM	TU	BH	TE	CN
22/04	2					2		
07/05	6	4					2	
11/05	4	1						
19/05	2					1	1	
26/05	1					2	1	
04/06	2							
09/06	2							
16/06							2	3
21/06							5	

02/07	2	22	17				5	13
10/07	31	58	10	2	2	2	6	25
20/07						6	3	2
01/08								
Species totals	52	85	27	2	2	13	25	43
Blue Circle total					168	Swan total		81
Grand total								249

Notes

1. There may be some minor duplication of numbers between 02/07 and 10/07, but it is not thought to be significant.
2. All remains on and before 26/05 were of adult birds. Those after this date were mainly young birds.
3. The above figures are thought to be a minimum because it is unlikely that all predated remains will have been found. Some remains will have been removed from the island, some will have decayed in warm weather, some will have been removed by scavengers, and some will simply not have been spotted and recorded.
4. The above figures do not include the exceptional event that involved the disappearance of 140 Sandwich tern young between 09/06 and 16/06.
5. Avian predation was limited to herring and lesser blacked gulls and recorded during two out of 13 monitoring visits to the site. It limited to black-headed gulls. However, 60 predated eggs was found predated by, most likely, a large gull.

Apart from predation, the main issues are:

On Blue Circle Island:

- Loss of one third of island to subsidence and tidal inundation
- Deterioration and limitation of common tern nesting habitats
- Understanding common and Sandwich tern productivity
- Habitat management for Sandwich terns – currently too dense and high

On Swan Island:

- Vegetation control/management
- Managing for bur chervil – any management of vegetation would need to consider the needs of this protected plant
- Monitoring to identify source of young birds disappearance

4.4.1 Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern Sandwich tern	+15% (poor/ fair) +166% (good)	+23% (0.15) +47% (good)

Threat/ issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Monitoring	Start earlier than in 2016, i.e. April	First monitoring visits started in March	Continue first visits from March. Employ Tern Conservation Officer for 2019 season, instead of external contractor
Monitoring	Install a makeshift hide	This has been followed. The hide allowed for extending monitoring time without disturbance.	Continue using the hide for the predator watches
Monitoring	Keep a path clear for monitoring the interior of Swan Island	This has been done	Continue cutting paths for the monitoring
Nesting space	Review 2016 habitat management and amend accordingly for 2017/2018	This has been postponed Blue Circle Island till the restoration in autumn 2018	Review vegetation management for Swan Island considering management for bur chervil
Nesting space	Re-deploy new roseate nest boxes	23 nest boxes were deployed, additionally to concrete nest boxes. The latter are preferable by the single roseate tern pair	Clear areas around concrete nest boxes and provide a cluster of approx. 30 boxes near the two common tern nesting areas on BCI
Nesting space			Provide chick shelters for common tern
Nesting space			Prepare nesting areas for Sandwich and common terns by cutting or chemically treating vegetation before the breeding season.
Mammalian predation			Erect otter fence on BCI
Mammalian predation			Carry out trial of sound deterrent equipment on Swan Island
Monitoring			Continue predation monitoring
Monitoring			Provide figures for clutch size for Sandwich and common terns
Monitoring			Continue using monitoring enclosure for common tern to estimate productivity. Conduct a count of chick outside of enclosure

Biosecurity			Continue biosecurity measures
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References

Wolsey, S. (2017). Larne Lough. Annual Reserve Report 2017. RSPB Internal Report

4.5 Dalkey Islands

Regular monitoring on Dalkey Island started in 2014 and the data previous to that is very sporadic. This limits the estimation of project mean baseline number to the period of 2014-16, with 4.3 pairs for common tern and 52 pairs of Arctic.

The main aim of the project on Dalkey is to provide secure nesting conditions on higher Lamb Island rather than vulnerable to storm surges Maiden Rock. Up to 90 nests and 175 eggs were recorded on Lamb Island on 16th June, but birds moved to Maiden Rock soon after (Figure 21).

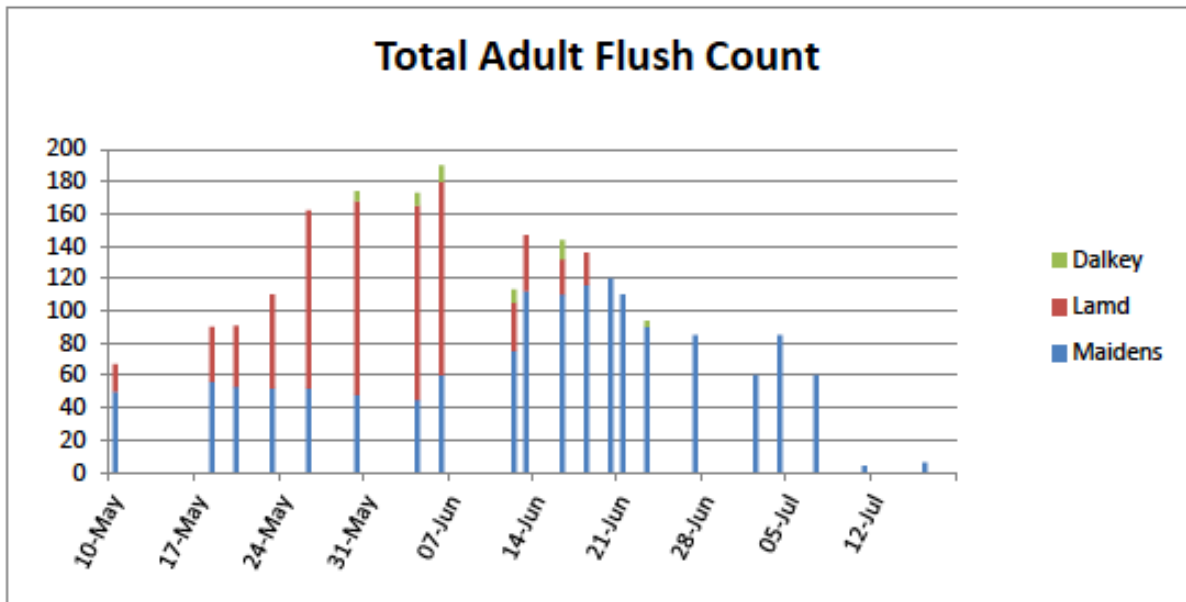


Figure 22 Maximum adult flush counts on Dalkey, Lamb and Maidens rocks throughout the breeding season.

A maximum number of 128 tern pairs were recorded on Lamb Island (90) and Maiden (34) Rock as well as in SE corner of the main Dalkey Island (4). This included 120 Arctic terns and 8 pairs of common terns. This represents a record year for Dalkey islands since 2014 (Table 18).

However, in terms of the productivity, the picture looks depressing. In total, 416 eggs were laid in 209 nesting attempts, 1.88 on Lamb and 2.07 on Maiden rock, giving a mean of 1.99. There were subsequently many losses due to predation, storm events, rolled eggs and unknown events.

Only 24 chicks were recorded hatching, with 16 on Maiden Rock (minimum of 10 Arctic and 5 common terns) and 8 on Dalkey. Of these, only 4 Arctic terns fledged.

Table 18 Project mean baseline and number of breeding pairs in 2011-2017 on Dalkey Island

Species	Project mean baseline (2014-2016)	2014	2015	2016	2017	% change between 5-year baseline and 2017
Common	4.3	5	5	3	8	+86
Arctic	52	20	35	101	120	+131
Productivity CT			0.2	0	0	
Productivity AT			0.17	0.2	0.03	

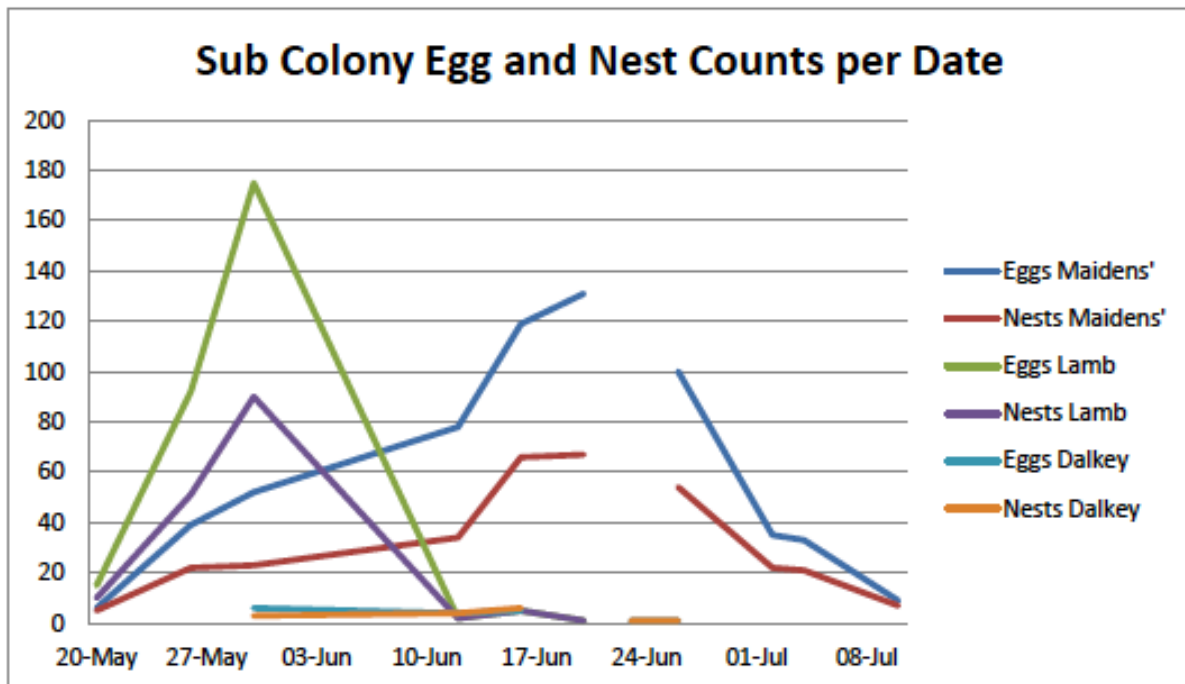


Figure 23 Number of active nests over the breeding season. Incomplete counts are not included.

One pair of roseate tern was observed in courtship on 4th June, but nesting attempt was made. A single egg was found, which was probably dumped as no adults were seen in the vicinity.

Main issues

1. Between 9th and 12th of June unknown events led to a significant reduction of nests down to 36 nest, including only 2 on Lamb Island. Birds relayed, with the second peak number of 77 nests, majority of which (66) were on Maiden rock. Many were found depredated, however the storm surge on 2 July practically washed majority of these nest on Maiden rock.
2. Predators include brown rat, ravens, hooded crows, peregrine falcon, large gulls and even turnstone.
3. The public can access the island, but no disturbance was recorded during the monitoring visits.

4.5.1 Recommendations

Target species	2016 trend against mean baseline (productivity)	2017 trend against mean baseline (productivity)
Common tern Arctic tern	-30% (0) +94% (0.2)	+86% (0) +131% (0.3)

Threat/issue	Recommendation 2016	Progress 2016-17	Recommendation 2017
Biosecurity	Carry out brown rat eradication in winter 2017	This has been delayed until spring 2018	Carry out rat monitoring and if necessary eradication in winter/spring
Monitoring	Increase the frequency of monitoring visits.	Nine monitoring visits were carried out additionally to observations from Coliemore Harbour and ringing trips	Due to the unexplained losses, the frequency of visits should be increased, possibly with the use of local volunteers.
Monitoring	Consider introducing colour ringing (of Common and Arctic Terns)	This has not been implemented.	Consider in future years, but not essential
Monitoring	Erect a hide to facilitate additional monitoring effort	Not implemented	Consider using canvas hides and trap cameras for determining the source of mortality. Search the colony for corpses
Nesting space		Nesting patches were created, and nest boxes deployed in 2017.	Continue providing suitable nesting areas on Lamb Island, including nest boxes and chick shelters. Continue providing suitable nesting areas, including gravel patches, nest boxes and chick shelters on Maiden rock as a backup site.

References:

Butler, A., Newton, S. (2017) Dalkey Island Tern Report 2017. BWI