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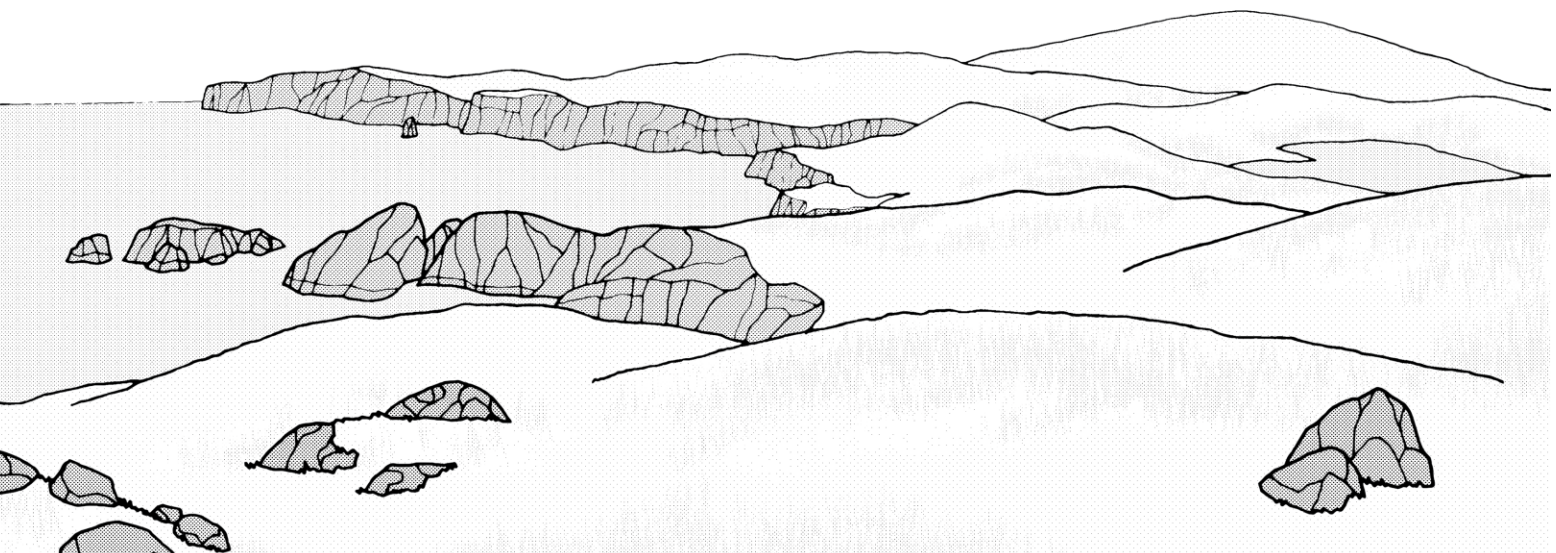
Ornithological monitoring programme  
in Shetland  
**2017**



*A report to the Shetland Oil Terminal  
Environmental Advisory Group*

*by*

*Aberdeen Institute for  
Coastal Science and Management, University of Aberdeen*



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# SOTEAG ORNITHOLOGICAL MONITORING PROGRAMME

## 2017 REPORT

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## 2017 Executive Summary

### 1. Monitoring of cliff-breeding seabirds

**Northern Fulmar *Fulmarus glacialis*.** There was little overall change since 2016 in the number of AOS; breeding success (0.35/AOS) was variable but below the long-term average (1985–2016: 0.42).

**European Shag *Phalacrocorax aristotelis*.** Nest counts were similar to 2016 at Sumburgh Head (114 c.f. 111) but 24% higher at No Ness (107 c.f. 86). Breeding success at Sumburgh Head (0.85 fledged per laying pair) was below average (1988–2016: 1.13) but higher at Burravoe (1.27; 1.08 in 2012–16).

**Black-legged Kittiwake *Rissa tridactyla*.** The only colonies counted were at Sumburgh and Compass Heads, where the total of nests (300) was 17% lower than in 2014 (362). Breeding success at 6 colonies (mean of 0.09 fledged per laying pair) was well below the long-term average (1988–2016: 0.40).

**Common Guillemot *Uria aalge*.** None of the few birds present at Esha Ness were seen incubating, and there was extensive non-breeding at Burravoe. The mean population index (33.3; 1978 = 100) was 30% lower than in 2016. Breeding success at Sumburgh Head (0.42 fledged per laying pair) was lower than in 2016 (0.71) and below the long-term average (1989–2016: 0.54); chick diet was 46% sandeels and 51% gadids.

**Razorbill *Alca torda*.** Numbers were lower than in 2016 at all colonies, but apart from at Sumburgh Head (down 14%) counts were mostly in single figures. Breeding success at Sumburgh Head was 0.60 per laying pair, above the 2011–16 average of 0.42.

### 2. Pre-breeding season census counts of Black Guillemots *Cepphus grylle*

Partial coverage of Yell Sound indicated little change in numbers since 1998–2000, while full coverage of Out Skerries and the East Whalsay islands found 49% fewer birds than in 1999–2000 (394 c.f. 769).

### 3. Breeding Red-throated Divers *Gavia stellata* in Northmavine

The biennial survey of the moorland between Sullom Voe and St Magnus Bay confirmed 23 breeding attempts (22 in 2015) plus empty nest scrapes at 6 other lochs (8 in 2015). Ten chicks fledged, giving a rather low breeding success of 0.43 fledged per breeding attempt (0.45 in 2015).

### 4. Moulting Common Eiders *Somateria mollissima* in Yell Sound and Sullom Voe

Counts from land located 201 birds: 55 (all females and/or juveniles) around aquaculture sites in Dales Voe, and 146 (including 110 adult males) in Sullom Voe. This compared to a total of 301 in August 2016.

### 5. Winter counts of seaduck and diving seabirds

Surveys were made of all standard inshore areas apart from the Scalloway islands. A count in February of 930 Long-tailed Ducks in Bluemull & Colgrave Sounds, mostly feeding at salmon cages, was the highest since 1992/93. Elsewhere, numbers of Great Northern Divers and Slavonian Grebes were generally similar to, or higher than those in recent winters.

### 6. Beached Bird Surveys

The only oiled birds in the first three months were two Fulmars in January, one contaminated with a weathered crude probably of Middle Eastern origin. Twenty oiled seabirds in April and May (14 Fulmars, 3 Gannets, 1 Shag, 2 Kittiwakes; 16% of the total of dead seabirds for those months) were mainly found in NW Mainland, Yell and Unst; 7 samples of oiled plumage and beached oil were all fuel oil residues. A Common Guillemot in September (fuel oil), a Red-throated Diver in November (Middle Eastern crude) and a Fulmar in December (fuel oil) were the only other oiled seabirds found later in the year. There was no evidence of abnormally high mortality of any seabird species during the year.

**In summary, there was no evidence that the operation of the Sullom Voe Terminal, or its associated tanker traffic, had any detrimental impact on Shetland's seabird populations during 2017.**

## 1. Monitoring of cliff-breeding seabirds

### 1.1. Weather during the 2017 seabird breeding season

Weather can influence the ability to carry out seabird monitoring, and in extreme cases, can directly affect seabirds' breeding success. High pressure over mainland Britain during the first 10 days of April resulted in strong westerly winds across Shetland, with no opportunities to count of Tysties. More variable weather in the middle third of the month allowed three mornings for boat surveys, but then strong northerlies prevented further fieldwork until 28<sup>th</sup>, when at the West Burra monitoring coast adult Tysties were either impossible to flush from their cliff perches, or were flying back in and entering nesting cavities. Such behaviour marks the end of Tystie fieldwork as counts become meaningless.

Weather during May, June and July had little impact on fieldwork, with less fog than usual for those months, although swell conditions during June limited opportunities for census work along the west coast of Shetland. Heavy swell on 25<sup>th</sup> June washed away some Shag nests at Sumburgh Head and some further nests were lost there following torrential rain on 3<sup>rd</sup> August.

**Table 1.1.** Details of observer, date, time, weather and sea conditions for study plot counts of Fulmars, Common Guillemots and Razorbills at four colonies in 2017.

<b>Sumburgh Head</b>	Observer: Martin Heubeck / Will Miles			
<b>Date</b>	<b>Time (BST)</b>	<b>Wind</b>	<b>Sea state</b>	<b>Cloud cover</b>
2 <sup>nd</sup> June 2017	1330–1515	NW 3	Moderate swell	3/8 fog cleared 1300
4 <sup>th</sup> June 2017	1315–1520	E 2	Calm	8/8 occasional light drizzle
7 <sup>th</sup> June 2017	1315–1500	E 1	Slight swell	7/8 occasional light drizzle
10 <sup>th</sup> June 2017	1315–1430	E 3	Moderate swell	7/8
13 <sup>th</sup> June 2017	1315–1445	W 2	Slight swell	8/8
<b>Troswick Ness</b>	Observer: Will Miles			
<b>Date</b>	<b>Time (BST)</b>	<b>Wind</b>	<b>Sea state</b>	<b>Cloud cover</b>
2 <sup>nd</sup> June 2017	1005–1130	W 1–2	Moderate swell	8/8
4 <sup>th</sup> June 2017	1000–1130	Calm	Calm	8/8
7 <sup>th</sup> June 2017	1000–1130	E 1	Slight swell	6/8
10 <sup>th</sup> June 2017	1000–1120	E 3	Slight swell	7/8
12 <sup>th</sup> June 2017	1100–1230	SW 0–1	Slight swell	8/8
<b>Esha Ness</b>	Observers: Martin Heubeck / Mick Mellor			
<b>Date</b>	<b>Time (BST)</b>	<b>Wind</b>	<b>Sea state</b>	<b>Cloud cover</b>
29 <sup>th</sup> May 2017	1230–1530	N 2–3	Slight swell	8/8
3 <sup>rd</sup> June 2017	0840–1115	SE 2–3	Heavy swell	3/8
7 <sup>th</sup> June 2017	1230–1330	SE 3	Moderate swell	8/8
11 <sup>th</sup> June 2017	0930–1100	SW 2–3	Moderate swell	8/8, light rain from 1030
13 <sup>th</sup> June 2017	0930–1100	W 3	Heavy swell	8/8 clearing 3/8
<b>Burravoe, Yell</b>	Observer: Mick Mellor			
<b>Date</b>	<b>Time (BST)</b>	<b>Wind</b>	<b>Sea state</b>	<b>Cloud cover</b>
30 <sup>th</sup> May 2017	1010–1040	SE 1	Slight swell	8/8
4 <sup>th</sup> June 2017	1030–1100	SE 3	Slight swell	8/8
8 <sup>th</sup> June 2017	1000–1030	NW 5	Calm	8/8
11 <sup>th</sup> June 2017	0930–1000	NW 3	Slight swell	8/8
13 <sup>th</sup> June 2017	0940–1015	NW 3	Calm	8/8

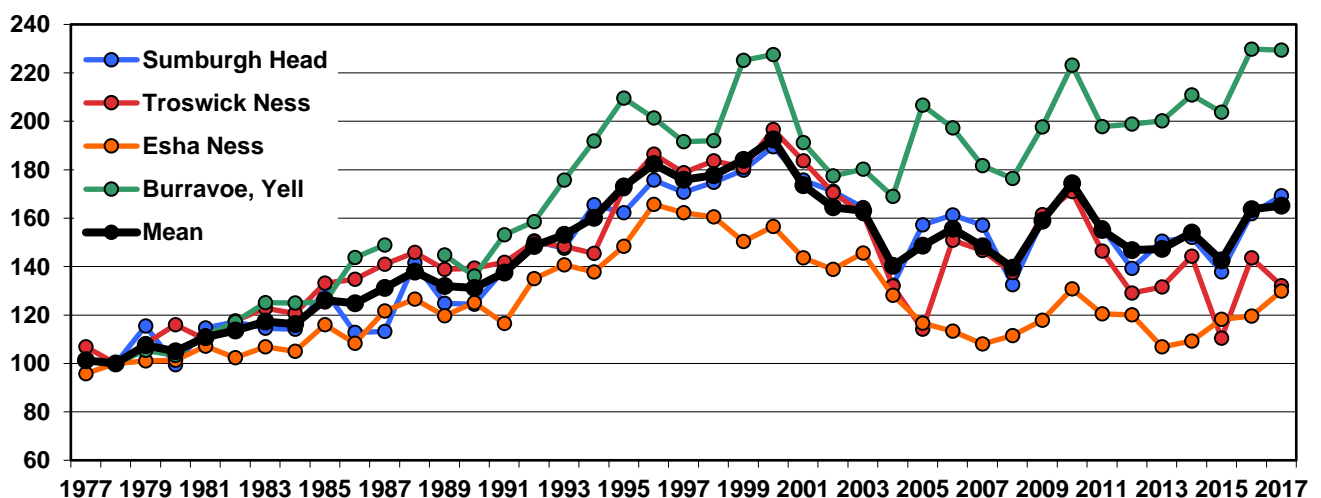
### 1.2a. Northern Fulmar *Fulmarus glacialis*: Population counts

The largest changes since 2016 in numbers of apparently occupied sites (AOS) at the population monitoring plots was a decrease of 8% at Troswick Ness, with no overlap in the counts in the two years, and an increase of 9% at Esha Ness, with virtually no overlap (**Table 1.2**). The mean population index during 2015–18 (the period of the current census) was 157.1 (1978 = 100), 12% lower than in 1998–2002 (178.5; the years of the *Seabird 2000* census), but with considerable differences between the four colonies monitored (**Figure 1.1**). A detailed analysis of census counts undertaken so far in 2015–17 would be premature, but they suggest a greater decrease than the 12% indicated by the monitored colonies, but with substantial regional variation, e.g. 1,224 AOS in East Yell on 20<sup>th</sup> June 2017 c.f. 1,316 on 2<sup>nd</sup> & 17<sup>th</sup> June 1999 (-7%), and 974 AOS between North Nesting and Lerwick on 16<sup>th</sup> June 2017 c.f. 2,415 on 27<sup>th</sup> May & 23<sup>rd</sup> June 1999 (-60%).

**Table 1.2.** Counts of Fulmars and apparently occupied sites (AOS) at four Shetland colonies, 2016–17. Statistics: number of counts, range, mean, standard deviation, coefficient of variation, % change since 2016 and population indices for AOS (1978 = 100).

Colony	Unit	Year	n	Range	Mean	SD	CV	% ch.	Index
Sumburgh Head	Birds	2016	5	292–367	326.4	28.00	0.09		
		2017	5	287–323	306.6	14.15	0.05	-6.1	
	AOS	2016	5	226–250	237.4	10.50	0.04		161.8
		2017	5	240–256	248.2	7.29	0.03	+4.5	169.2
Troswick Ness	Birds	2016	5	1174–1354	1261.0	64.37	0.05		
		2017	5	943–1034	993.8	34.74	0.03	-21.2	
	AOS	2016	5	876–897	886.6	9.56	0.01		143.6
		2017	5	778–871	815.6	38.57	0.05	-8.0	132.1
Esha Ness	Birds	2016	5	335–428	397.8	36.16	0.09		
		2017	5	368–511	415.4	55.37	0.13	+6.6	
	AOS	2016	5	271–296	287.6	10.36	0.04		119.6
		2017	5	295–343	312.0	18.43	0.06	+8.5	129.8
Burravoe	Birds	2016	5	254–307	287.8	21.06	0.07		
		2017	5	230–311	259.4	32.96	0.13	-9.9	
	AOS	2016	5	191–234	214.0	17.22	0.08		229.8
		2017	5	199–235	213.6	14.93	0.07	-0.2	229.4

**Figure 1.1.** Annual index (1978 = 100) of Fulmar apparently occupied sites in study plots at four colonies, 1976–2017, and the mean index for the four colonies.



## 1.2b. Northern Fulmar *Fulmarus glacialis*: Breeding success

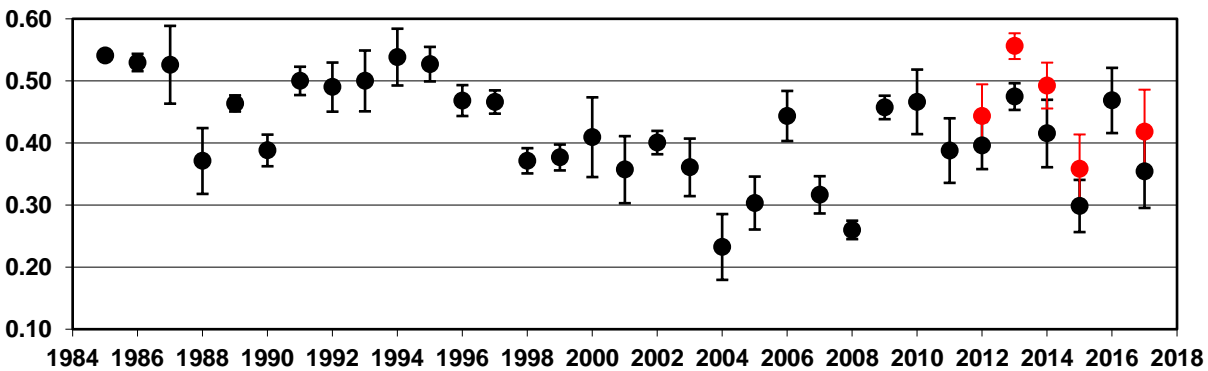
In 2012 the ‘marked photograph’ method was introduced to bring methodology in line with that used at other colonies in Shetland and elsewhere (method a). Whereas since 1985 breeding success has been calculated by dividing the number of chicks present in the population monitoring plots in mid August by the mean count of AOS in June (**Table 1.3**; method b). Both methods require judgement as to whether a bird sitting on the cliff qualifies as an AOS or not and both methods will over-estimate breeding numbers. However, the number of uniquely numbered AOS occupied on each of three dates in late May and early June will be closer to the number of birds actually incubating. The marked photograph method was not used in 2016 so comparisons are only between method b.

Chicks were counted on 14<sup>th</sup> and 16<sup>th</sup> August (**Table 1.3**). As usual a few chicks were recorded at sites that were not scored as an AOS on all three of the earlier checks. At Sumburgh Head, three such ‘extra’ sites had probably been overlooked on one of the early checks while two had had an adult present but were scored wrongly. The two ‘extra’ sites at Troswick Ness, the seven at Esha Ness and the 10 at Burravoe had all been overlooked on one of the May/June dates. Breeding success was variable: similar to 2016 at Sumburgh Head and Burravoe, but markedly lower at Troswick Ness and Esha Ness (**Table 1.3, Figure 1.2**); average success using the mean count of AOS (b) was 0.35, below the 1985–2016 average of 0.42.

**Table 1.3.** The dates of visits to Fulmar plots in 2017, the total number nest sites scored as AOS on one or more of three checks in late May and early June, the number scored as an AOS on all three checks, the mean June count of AOS, the number of chicks present in mid August, the number of (extra) sites at which chicks were present but only qualified as an AOS on one or two of the May/June visits or were overlooked completely, breeding success  $\pm$  SE calculated (a) by the marked photograph method (chicks / 3 visits + extra sites), and (b) by the population count method (chicks / mean June count), with 2016 figures for method b in brackets.

<b>Sumburgh Head: 28<sup>th</sup> May, 30<sup>th</sup> May, 1<sup>st</sup> June, 14<sup>th</sup> August</b>							
Plot	AOS	3 visits	Mean	Chicks	Extra	Success a	Success b (2016)
GSG	32	19	26.0	14	2	0.67	0.54 (0.50)
GTS	201	151	178.6	81	2	0.53	0.45 (0.55)
GPN	53	37	42.4	25	1	0.66	0.59 (0.54)
Sum	286	207	247.0	120	5	0.57	0.49 (0.54)
<b>Mean</b>						<b>0.62</b>	<b>0.53 (0.53)</b>
$\pm$ SE						0.04	0.04 (0.02)
<b>Troswick Ness: 28<sup>th</sup> May, 30<sup>th</sup> May, 1<sup>st</sup> June, 14<sup>th</sup> August</b>							
Plot	AOS	3 visits	Mean	Chicks	Extra	Success a	Success b (2016)
Brei Geo	405	277	325.2	98	2	<b>0.35</b>	0.30 (0.51)
Sand. Geo			473.8	155			0.33 (0.49)
Sum			799.0	253			0.32 (0.50)
<b>Mean</b>							<b>0.31 (0.50)</b>
$\pm$ SE							0.01 (0.01)
<b>Esha Ness: 29<sup>th</sup> May, 1<sup>st</sup> June, 3<sup>rd</sup> June, 14<sup>th</sup> August</b>							
Plot	AOS	3 visits	Mean	Chicks	Extra	Success a	Success b (2016)
CG	261	171	210.0	68	6	0.38	0.32 (0.53)
MC	42	26	34.4	13	1	0.48	0.38 (0.44)
FG	66	49	58.6	5	0	0.10	0.09 (0.64)
Sum	369	246	303.0	86	7	0.34	0.28 (0.54)
<b>Mean</b>						<b>0.32</b>	<b>0.26 (0.54)</b>
$\pm$ SE						0.11	0.09 (0.06)
<b>Burravoe: 28<sup>th</sup> May, 30<sup>th</sup> May, 4<sup>th</sup> June, 16<sup>th</sup> August</b>							
Plot	AOS	3 visits	Mean	Chicks	Extra	Success a	Success b (2016)
	254	166	213.6	67	10	<b>0.38</b>	<b>0.31 (0.31)</b>

**Figure 1.2.** Mean Fulmar breeding success ( $\pm$  SE) at 3–4 monitored colonies, 1985–2017 (Burravoe from 2003 only), calculated as the number of chicks present in mid-August divided by the mean of five counts of apparently occupied sites (AOS) in June (black), and by the number of sites qualifying as AOS on each of three dates in late May and early June (red).





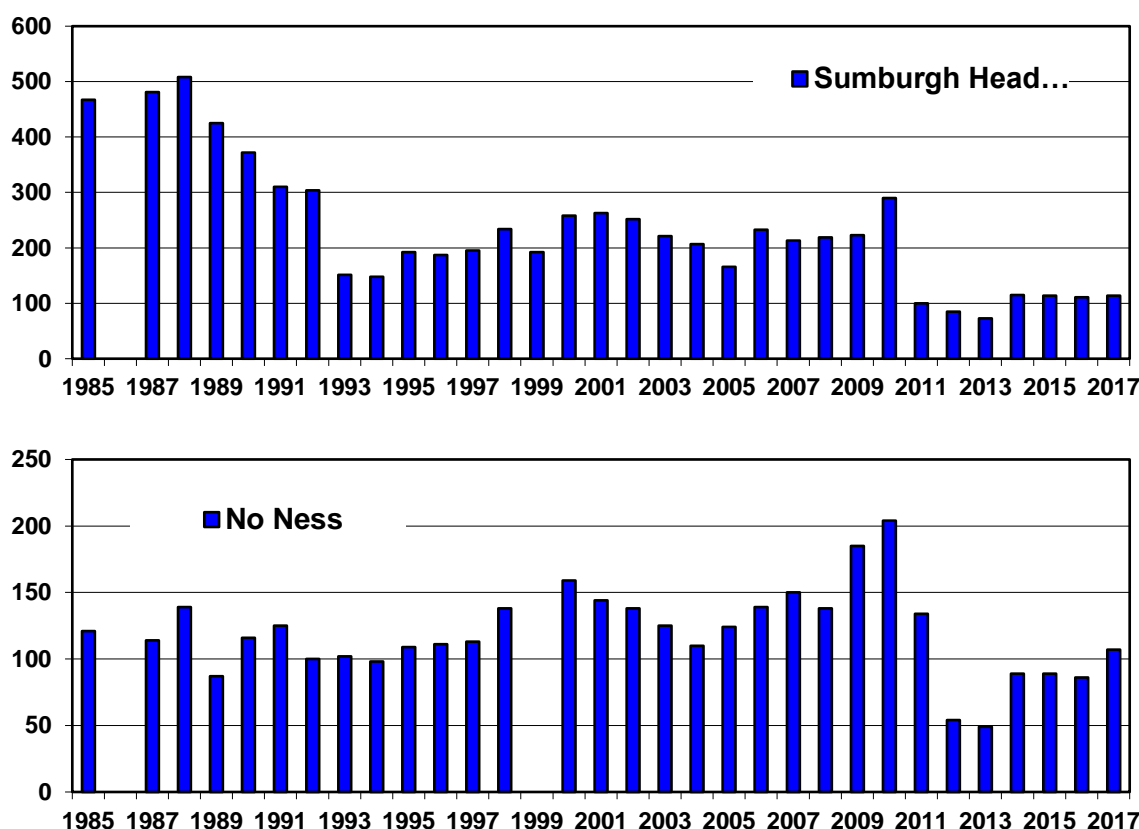
### 1.3a. European Shag *Phalacrocorax aristotelis*: Population counts

Counts of nests made from land at No Ness and Sumburgh Head were slightly higher than in 2016 (**Table 1.4**), with a continued (since 2014) high proportion of nests being ‘active’ (apparently incubating or containing chicks). At Sumburgh Head, a further 26 nests (all active) were counted from the sea on 14<sup>th</sup> June on sections of cliff not visible from land, reconfirming that the annual counts from land capture a high percentage of nests (c.80%) at this colony. Not all breeding attempts in a season will be captured by a single count of nests, but on 6<sup>th</sup> June, the day before the land count at Sumburgh Head, 79% of the season’s total of nests in the breeding success plots were recorded as either trace, empty or active. Although presently stable after extensive non-breeding in 2011–13, breeding numbers at Sumburgh Head are still c.25% of those in the late 1980s (**Figure 1.3**). The 50% decrease between 1992 and 1993 followed the January 1993 *Braer* oil spill, but the 40% decline between 1988–91 remains unexplained. Neither of these earlier decreases was particularly evident at No Ness, where breeding numbers in 2014–17 remain less than half of the recent peak in 2010.

**Table 1.4.** Counts of Shag nests (trace, empty, and active) along regularly monitored coasts surveyed in 2017, the percentage of nests which were active, and count date. At No Ness and Sumburgh Head, where more than one count from land was made in a year the highest nest total is given (\*).

Coastline	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No Ness (land)	124* 83% 14/6	139* 97% 13/6	150* 95% 22/6	138* 94% 13/6	185* 89% 23/5	204* 95% 9/6	134* 84% 27/5	54* 48% 12/6	49* 47% 10/6	89 87% 12/6	89 93% 16/6	86 92% 1/6	107 92% 7/6
Sumburgh Head (land)	166* 83% 5/6	233* 97% 13/6	213* 99% 22/6	219* 95% 31/5	223* 93% 16/6	290* 97% 8/6	100* 67% 27/5	85* 54% 30/5	73* 33% 10/6	115 85% 9/6	114 92% 13/6	111 94% 5/6	114 91% 6/6

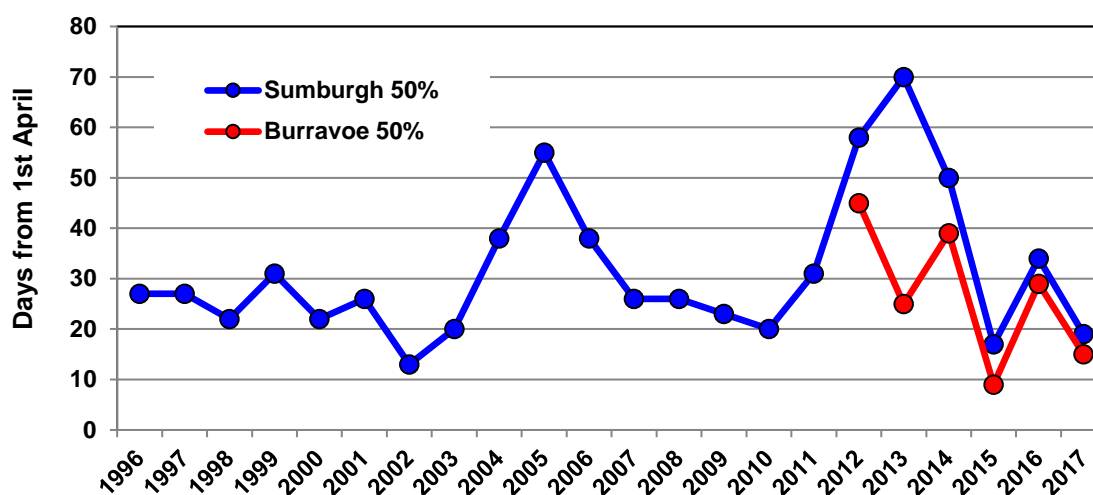
**Figure 1.3.** Counts from land of Shag nests at Sumburgh Head and No Ness, 1985–2017.



### 1.3b. European Shag *Phalacrocorax aristotelis*: Breeding success

This was monitored in plots at Sumburgh Head (25 checks, 3<sup>rd</sup> April–18<sup>th</sup> August) and Burravoe (25 checks, 6<sup>th</sup> April–16<sup>th</sup> August). As in 2016 (but in contrast to 2013), timing of laying was similar at the two colonies (**Figure 1.4**) and a high proportion of nests had eggs laid (**Table 1.5**). At Sumburgh, heavy swell on 25<sup>th</sup> June was believed to have washed away six nests with broods and four nests with eggs, while very heavy rain on 3<sup>rd</sup> August probably caused the loss of two nests with broods and one nest with eggs. This will have contributed to the relatively low percentage of nests where chicks were recorded, the relatively high percentage of breeding attempts that failed, and the moderate breeding success of 0.85 which was well below the 1988–2016 mean of 1.13 young fledged per incubating nest (**Figure 1.5**). No chicks were seen dead in nests, but mean brood size at fledging was lower than in 2014–16.

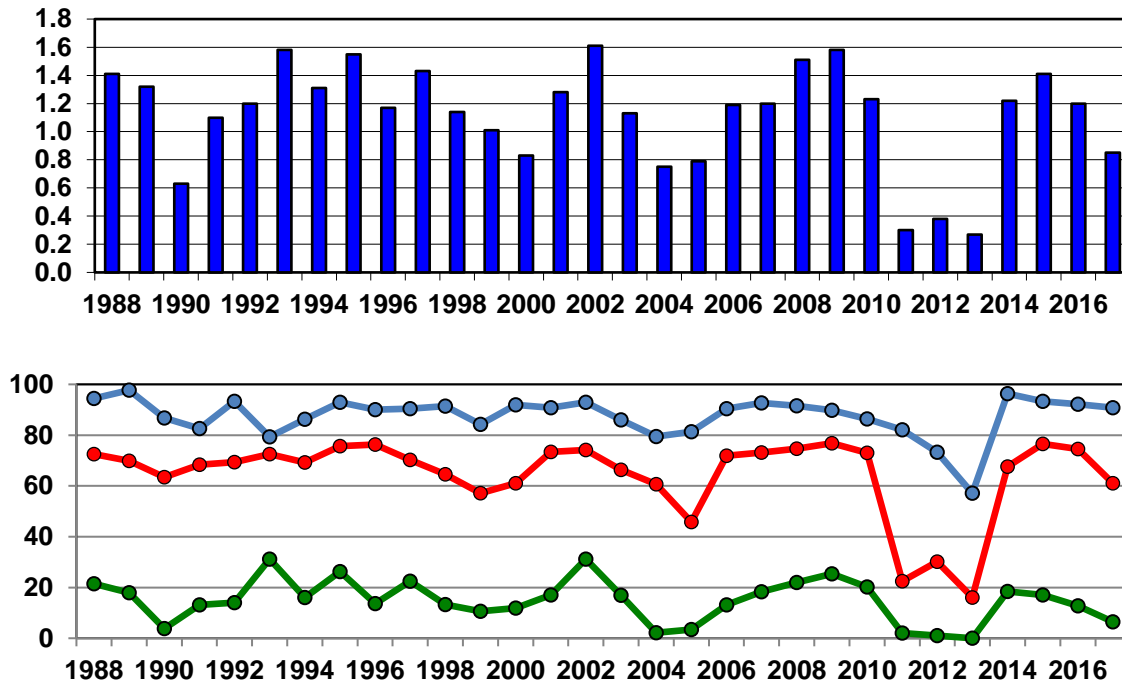
**Figure 1.4.** The estimated dates (1<sup>st</sup> April = 1) by which 50% of apparently incubating Shag nests were first recorded as such in study plots at Sumburgh Head, 1996–2017, and Burravoe, 2012–2017.



**Table 1.5.** Shag breeding success at Sumburgh Head and Burravoe: the number of former nest sites where an adult(s) but no nest material was recorded (Ad.), the number of trace (Tr.), well-built but empty (AON), and incubated nests (Inc.), the percentage of all nests which progressed to incubation (% Inc.), the percentage of incubating nests at which chicks were recorded (% H.), the percentage of incubating nests from which no chicks fledged (Fl. 0), the number of chicks fledged (Ch.), mean brood size at fledging (Brood), and sum breeding success (Succ.: Ch./Inc.).

Sumburgh Head										
Year	Ad.	Tr.	AON	Inc.	% Inc.	% H.	Fl. 0	Ch.	Brood	Succ.
2012	51	21	14	96	73.3	30.2	76.0	36	1.57	<b>0.38</b>
2013	36	15	27	56	57.1	16.1	83.9	15	1.67	<b>0.27</b>
2014	25	2	2	108	96.4	67.6	36.1	132	1.91	<b>1.22</b>
2015	10	5	3	111	93.3	76.6	28.8	157	1.99	<b>1.41</b>
2016	12	2	6	94	92.2	74.5	36.2	113	1.88	<b>1.20</b>
2017	6	6	5	108	90.8	61.1	50.9	92	1.74	<b>0.85</b>
Burravoe, Yell										
Year	Ad.	Tr.	AON	Inc.	% Inc.	% H.	Fl. 0	Ch.	Brood	Succ.
2012	-	6	2	36	81.8	52.8	50.0	26	1.44	<b>0.72</b>
2013	2	2	1	39	92.9	64.1	46.2	36	1.71	<b>0.92</b>
2014	6	4	2	27	81.8	81.5	25.9	42	2.10	<b>1.56</b>
2015	2	2	0	35	94.6	54.3	51.4	28	1.65	<b>0.80</b>
2016	0	3	0	22	88.0	72.7	31.8	31	2.07	<b>1.41</b>
2017	1	2	2	26	86.7	69.2	38.5	33	2.06	<b>1.27</b>

**Figure 1.5.** Shag breeding parameters at Sumburgh Head, 1988–2017. **Upper:** chicks fledged per incubated nest. **Lower:** The percentage of: nests that progressed to incubation (blue); incubating nests where chicks were recorded (red); laying pairs that fledged a brood of three chicks (green).



The much smaller number of nests monitored at Burravoe appeared not to have been affected by weather. Mean brood size at fledging was similar to 2016 and the slightly reduced breeding success in 2017 was largely a consequence of a higher percentage of breeding failures (eight nests failed to hatch and two broods were lost).

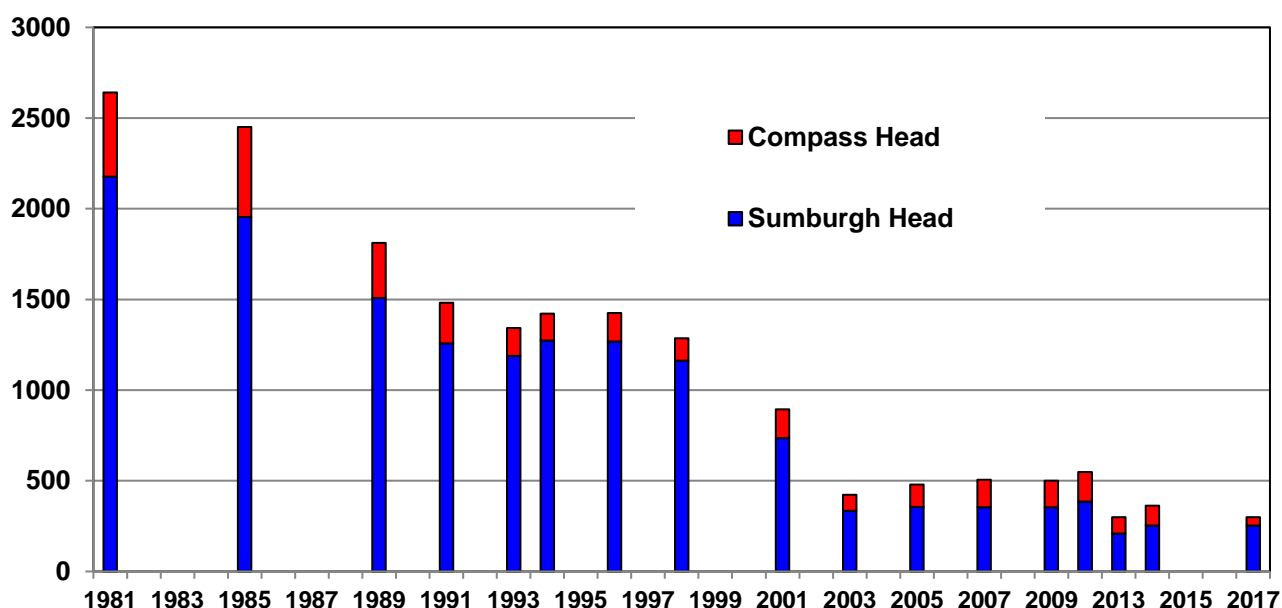
#### 1.4a. Black-legged Kittiwake *Rissa tridactyla*: Population counts

Nests were counted from the sea at Compass and Sumburgh Heads on 14<sup>th</sup> June. The count of nests at Compass Head (46; 85% active) was 29% lower than in 2016 and 58% lower than in 2014, while that at Sumburgh Head (254; 81% active) was virtually identical to the count in 2014 (**Table 1.6**). The closest sub-colonies at Compass and Sumburgh Heads are only 1 km apart and the two Heads have previously been treated as a single breeding station. Since the first counts of nests were made from the sea in 1981 there have been two periods of steep decline in numbers, in the late 1980s and between 1998 and 2003 (**Figure 1.6**). While the 2017 total of 300 nests was 89% lower than in 1981, this is less of a decrease than at many other colonies in Shetland.

**Table 1.6.** Counts of Kittiwake nests (incubating, empty and trace) at breeding stations surveyed from the sea in 2017, compared with counts in 1981 (used as a baseline), and from 2007.

Sumburgh area	1981	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Compass Head	464	152		146	163			90	109		65	46
Sumburgh Head	2177	354		354	386			210	253			254
<b>Total nests</b>	<b>2641</b>	<b>506</b>		<b>500</b>	<b>549</b>			<b>300</b>	<b>362</b>			<b>300</b>

**Figure 1.6.** Counts from the sea of Kittiwake nests at Compass and Sumburgh Heads, 1981–2017.



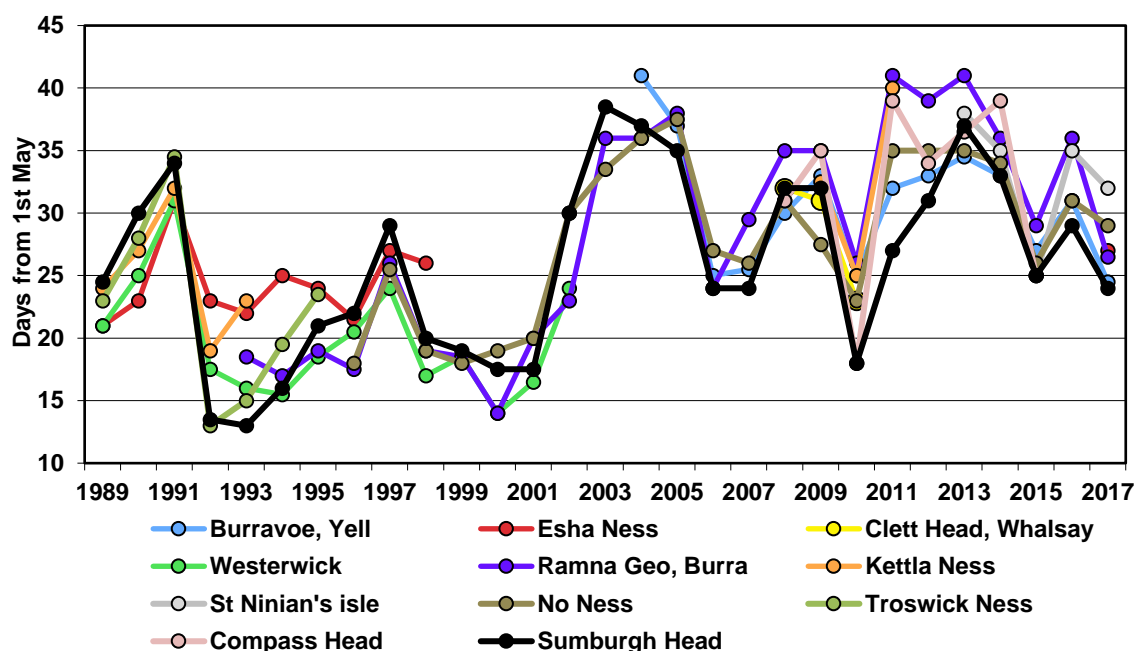
#### 1.4b. Black-legged Kittiwake *Rissa tridactyla*: Breeding success

This was monitored at the same five colonies as in 2016, while a resurgence in numbers breeding at Esha Ness meant success could also be monitored there for the first time since 1998. Laying was slightly earlier than in 2016, on average by five days (**Figure 1.7**), and at all colonies incubation was recorded at a relatively high percentage of nests that were started (**Table 1.7**).

At Sumburgh Head, chicks were recorded at 59% of active nests, only 4 broods of two chicks were seen, most chicks losses and deaths in nests occurred in late June and the first half of July, and 81% of the 42 chicks alive on 22<sup>nd</sup> July survived to fledge. The sample size of nests at No Ness is now very small; chicks were recorded at only five of the ten nests and none fledged. At St Ninian's Isle and at Ramna Geo chicks were recorded at a higher percentage of nests than at Sumburgh, but the pattern and timing of losses and deaths was similar to Sumburgh, although only two of the six chicks alive on 21<sup>st</sup> July at St Ninian's Isle survived to fledge, and the two surviving chicks at Ramna Geo on the same date died or disappeared. The pattern of breeding failure was different at Esha Ness, with 93% of the 27 breeding attempts having failed by 27<sup>th</sup> June; the only chick seen at the colony was presumed to have survived to fledge. At Burravoe, 13% of breeding attempts had failed by 26<sup>th</sup> June and 62% by 21<sup>st</sup> July, and chick losses continued into early August with only eight of the 28 chicks present on 21<sup>st</sup> July surviving to fledge. No predation attempts on Kittiwake eggs, chicks or adults were witnessed at any of the monitored colonies.

At 0.09 chicks fledged per incubating pair, mean breeding success in 2017 at the colonies monitored for SOTEAG was well below the annual average of 0.40 in 1986–2016 (**Figure 1.8**).

**Figure 1.7.** Dates by which 50% of Kittiwakes breeding that year were presumed to have laid their first eggs, 1989–2017.



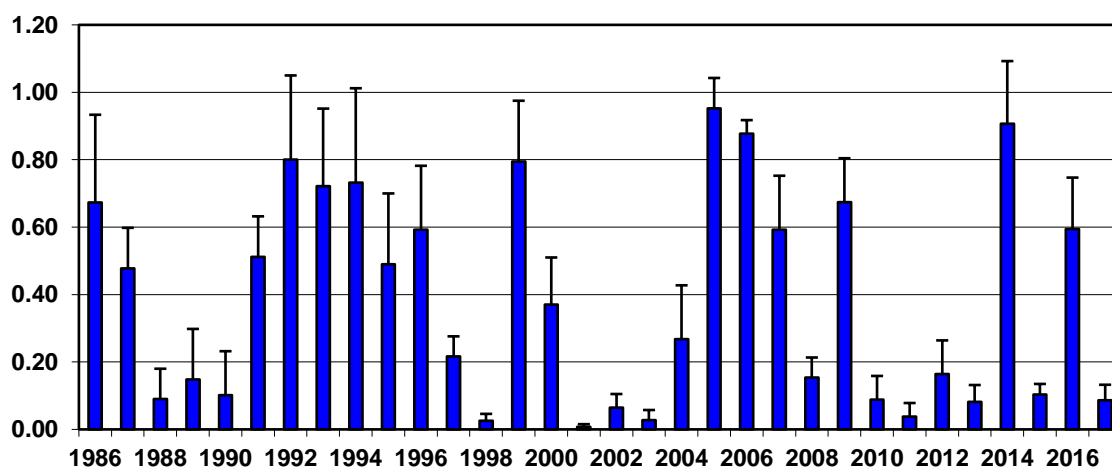
**Table 1.7.** The number of Kittiwake nests and occupied sites at monitored colonies 2008–17; the percentage of: (i) all nests at which incubation was recorded or assumed, (ii) incubating nests in which at least one chick was known to have hatched, (iii) hatched nests in which two chicks were seen, (iv) nests where young hatched in which one or more dead chicks were seen, (v) incubating nests that failed; the number of young fledged; breeding success (young fledged per incubating nest). Mean success and standard error is given for plots at Sumburgh Head; all visible nests are monitored at the other colonies.

<b>Sumburgh Head</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total nests	148	177	177	145	139	138	150	135	142	148
Incubating	89	128	151	94	93	89	115	117	119	119
% Incubating	60.1	72.3	85.3	64.8	66.9	64.5	76.7	86.7	83.8	80.4
Sites adult(s) only	36	39	22	39	35	40	29	21	29	22
% Nests hatched	21.3	80.5	86.8	21.3	60.2	32.6	85.2	59.8	82.4	58.8
% Nests hatched b/2	5.3	24.3	11.5	15.0	1.8	0	46.9	2.9	31.6	5.7
% Hatched with dead	5.3	3.9	8.4	10.0	26.8	20.7	2.0	2.9	4.1	17.1
% Nests failed	98.9	44.5	88.1	100	84.9	100	20.9	71.8	43.7	72.3
Chicks fledged	1	75	18	0	14	0	132	33	79	34
<b>Sum success</b>	<b>0.01</b>	<b>0.59</b>	<b>0.12</b>	<b>0</b>	<b>0.15</b>	<b>0</b>	<b>1.15</b>	<b>0.28</b>	<b>0.66</b>	<b>0.29</b>
<b>Mean success</b>		<b>0.51</b>	<b>0.11</b>	<b>0</b>	<b>0.13</b>	<b>0</b>	<b>1.20</b>	<b>0.19</b>	<b>0.65</b>	<b>0.24</b>
SE		0.09	0.06		0.04		0.10	0.06	0.18	0.07
<b>No Ness</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total nests	43	45	50	29	22	19	17	14	12	11
Incubating	32	39	38	21	16	14	14	13	12	10
% Incubating	74.4	86.7	76.0	72.4	72.7	73.7	82.4	92.9	100	90.9
Sites adult(s) only	14	0	0	8	9	5	4	3	8	4
% Nests hatched	40.6	74.4	50.0	38.1	31.3	0	71.4	61.5	66.7	50.0
% Nests hatched b/2	0	34.5	15.8	0	0	0	60.0	0	12.5	0
% Hatched with dead	7.7	6.9	5.3	0	20.0	0	0	0	0	10.0
% Nests failed	75.0	51.3	100	100	100	100	35.7	92.3	66.7	100
Chicks fledged	8	23	0	0	0	0	15	1	5	0
<b>Sum success</b>	<b>0.25</b>	<b>0.56</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.07</b>	<b>0.08</b>	<b>0.42</b>	<b>0</b>
<b>St Ninian's Isle</b>						<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total nests						58	61	61	46	42
Incubating						38	54	41	44	40
% Incubating						67.9	88.5	68.3	95.7	95.2
Sites adult(s) only						5	6	5	5	7
% Nests hatched						13.2	77.8	0	81.8	70.0
% Hatched b/2						0	61.9	-	8.3	3.6
% Hatched with dead						0	0	-	2.8	14.3
% Nests failed						100	27.8	100	34.1	95.0
Chicks fledged						0	64	0	31	2
<b>Sum success</b>						<b>0</b>	<b>1.19</b>	<b>0</b>	<b>0.70</b>	<b>0.05</b>
<b>Ramna Geo, Burra</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total nests	91	111	117	76	64	48	68	37	32	29
Incubating	55	81	74	45	24	34	64	30	28	25
% Incubating	60.4	73.0	63.2	59.2	37.5	70.8	94.1	81.1	87.5	86.2
Sites adult(s) only	16	14	11	22	15	8	13	8	11	9
% Nests hatched	16.9	85.2	18.9	2.2	0	35.3	6.2	66.7	75.0	76.0
% Hatched with b/2	10.0	62.3	7.1	0	0	0	0	0	4.8	5.3
% Hatched with dead	0	0	14.3	0	0	8.3	0	5.0	4.8	21.1
% Nests failed	83.1	17.3	98.6	100	100	70.6	100	93.3	85.7	100
Chicks fledged	11	103	1	0	0	10	0	2	4	0
<b>Sum success</b>	<b>0.19</b>	<b>1.27</b>	<b>0.01</b>	<b>0</b>	<b>0</b>	<b>0.29</b>	<b>0</b>	<b>0.07</b>	<b>0.14</b>	<b>0</b>

**Table 1.7.** continued.

<b>Esha Ness</b>										<b>2017</b>
Total nests										38
Incubating										27
% Incubating										71.1
Sites adult(s) only										0
% Nests hatched										3.7
% Hatched with b/2										0.0
% Hatched with dead										0.0
% Nests failed										96.3
Chicks fledged										1
<b>Sum success</b>										0.04
<b>Burravoe, Yell</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total nests	98	113	135	117	128	130	114	98	100	82
Incubating	85	99	107	87	94	99	95	84	84	69
% Incubating	86.7	87.6	79.3	74.4	73.4	76.2	83.3	85.7	84.0	84.1
Sites adult(s) only	7	4	8	12	9	15	16	14	12	9
% Nests hatched	34.1	72.7	69.2	28.7	51.1	40.4	76.8	73.8	86.9	72.5
% Hatched with b/2	34.5	51.5	6.8	8.0	43.8	2.5	60.3	13.1	58.9	12.0
% Hatched with dead	0	1.4	8.1	4.0	2.1	15.0	1.4	4.9	2.7	4.0
% Nests failed	72.9	35.4	53.3	78.2	59.6	87.9	32.6	79.8	29.8	87.0
Chicks fledged	33	95	52	20	49	12	100	17	89	10
<b>Sum success</b>	<b>0.39</b>	<b>0.96</b>	<b>0.49</b>	<b>0.23</b>	<b>0.52</b>	<b>0.12</b>	<b>1.05</b>	<b>0.20</b>	<b>1.06</b>	<b>0.14</b>

**Figure 1.8.** Mean Kittiwake breeding success (+ SE) at colonies (4–7 per year), 1986–2017. Breeding success is defined as chicks fledged per apparently laying pair.



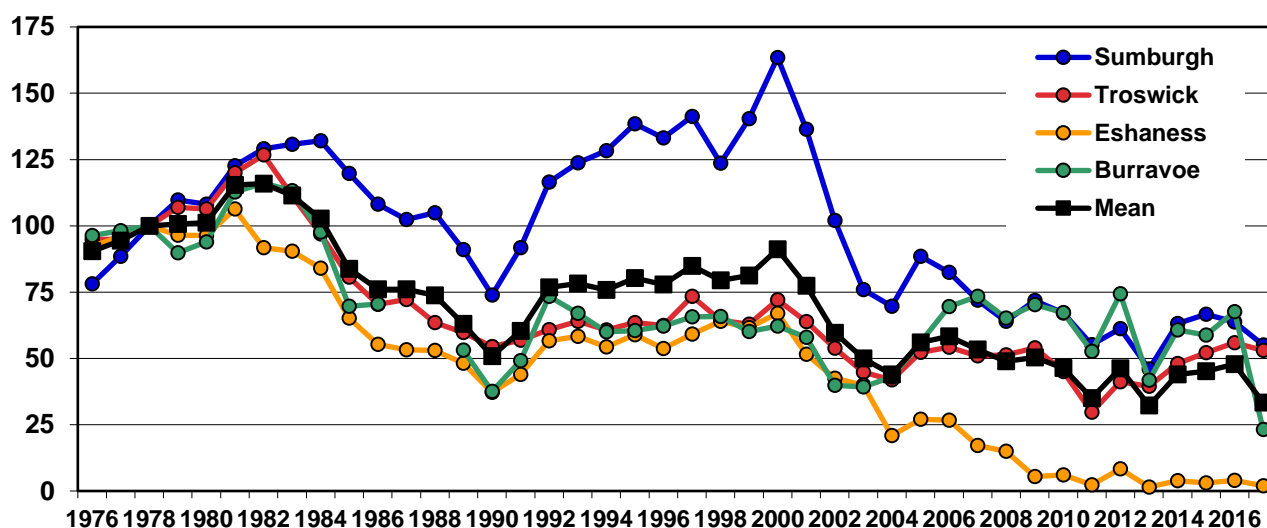
### 1.5a. Common Guillemot *Uria aalge*: Population counts

Numbers in plots were lower than in 2016 at all four colonies monitored (**Table 1.8, Figure 1.9**). At Sumburgh Head, four counts ranged from 682–744, with a high count of 829 on the afternoon of 10<sup>th</sup> June being entirely due to increased numbers in the three plots on the west side of the Head. Four of the five counts at Troswick Ness ranged from 278–288 birds, with a higher count of 326 on 10<sup>th</sup> June. There were no Guillemots at Esha Ness on 7<sup>th</sup> June and none of those present on the other four dates were incubating. Things seemed normal at Burravoe on 3<sup>rd</sup> May when 222 birds were present in the breeding success plot, which in 2016 held 80% of birds at the colony. The first eggs were seen on 18<sup>th</sup> May, when 104 adults were counted in the success plot but 43 of these flew off within a matter of minutes for no apparent reason. By 28<sup>th</sup> May the 16 pairs known to have laid had all lost their eggs and only three birds were present (outside the success plot) on 30<sup>th</sup> May. Thereafter, the population counts ranged from 194 on 4<sup>th</sup> June to 32 on 13<sup>th</sup> June, and none was present on 16<sup>th</sup> June. The mean population index for the four colonies was 33.3 (1978 = 100), 30% lower than in 2016.

**Table 1.8.** Counts of individual Common Guillemots in study plots at four Shetland colonies, 2016–17. Statistics are: number of counts, range, mean, standard deviation, coefficient of variation, percentage change since 2016, and population indices (1978 = 100).

Colony	Unit	Year	n	Range	Mean	SD	CV	% ch.	Index
Sumburgh Head	Birds	2016	5	795–965	846.0	68.77	0.08		63.8
		2017	5	682–829	729.4	60.45	0.08	-13.8	55.0
Troswick Ness	Birds	2016	5	289–320	307.4	12.34	0.04		55.9
		2017	5	278–326	291.4	19.69	0.07	-5.2	53.0
Esha Ness	Birds	2016	5	23–35	27.8	4.44	0.16		4.0
		2017	5	0–21	13.0	8.57	0.66	-53.2	1.9
Burravoe	Birds	2016	5	206–246	225.8	18.31	0.08		67.6
		2017	5	3–194	77.4	75.82	0.98	-65.7	23.2

**Figure 1.9.** Annual index (1978 = 100) of Common Guillemot numbers in study plots at four monitored colonies, 1976–2017, and the mean index for the four colonies.





### 1.5b. Common Guillemot *Uria aalge*: breeding success and chick diet at Sumburgh Head

The Sumburgh Head breeding success plot was checked daily from 20<sup>th</sup> April until 18<sup>th</sup> July. At the start of each check the total number of attending adults (adults present) was recorded. As in previous years, early season adult attendance fluctuated greatly, with 49 adults present on 23<sup>rd</sup> April, a peak of 180 on 28<sup>th</sup>, down to 14 on 1<sup>st</sup> May, back up to 165 on 4<sup>th</sup> May, 18 on 7<sup>th</sup> May, 180 on 11<sup>th</sup> May (180 = highest total of the year) and 78 on 13<sup>th</sup> May. Thereafter, adult attendance remained relatively stable, with 118 on 14<sup>th</sup> May and >100 present every day until 30<sup>th</sup> June (**Figure 1.10**).

The first egg was recorded on 9<sup>th</sup> May and the next (4) on 10<sup>th</sup> May, after which laying was rapid, with the median laying date being 15<sup>th</sup> May (**Table 1.11**). The latest-laid presumed first egg was recorded on 30<sup>th</sup> May.

No eggs were recorded as unattended on site and casual observations of mixed pairs (one bridled and one non-bridled) suggested frequent change-overs during incubation, indicating that food availability was sufficient for continuous egg attendance with regular change-overs. The first display fish, an unidentified medium-sized gadoid, was seen on 19<sup>th</sup> May.

The first chicks (4) were seen on 11<sup>th</sup> June, after which chick numbers increased every day, up to a peak of 75 on 24<sup>th</sup> June (**Figure 1.10**). However, after this date numbers began to decrease, and continued to do so consistently until the last chick on the 17<sup>th</sup> July. From 17<sup>th</sup> June to 4<sup>th</sup> July, loss of first egg chicks prior to fledging was regular (**Figure 1.10**) and relatively high compared with in 2016 (Heubeck & Mellor 2016). Gull predation was likely a contributing factor to chick losses in 2017. During chick-feeding watches in late June, Great Black-backed Gulls and Herring Gulls were frequently seen patrolling the colony. Surprisingly though, gulls were hardly seen at all during the chick-feeding watches in July, suggesting predation may have abated towards the end of the chick rearing period.

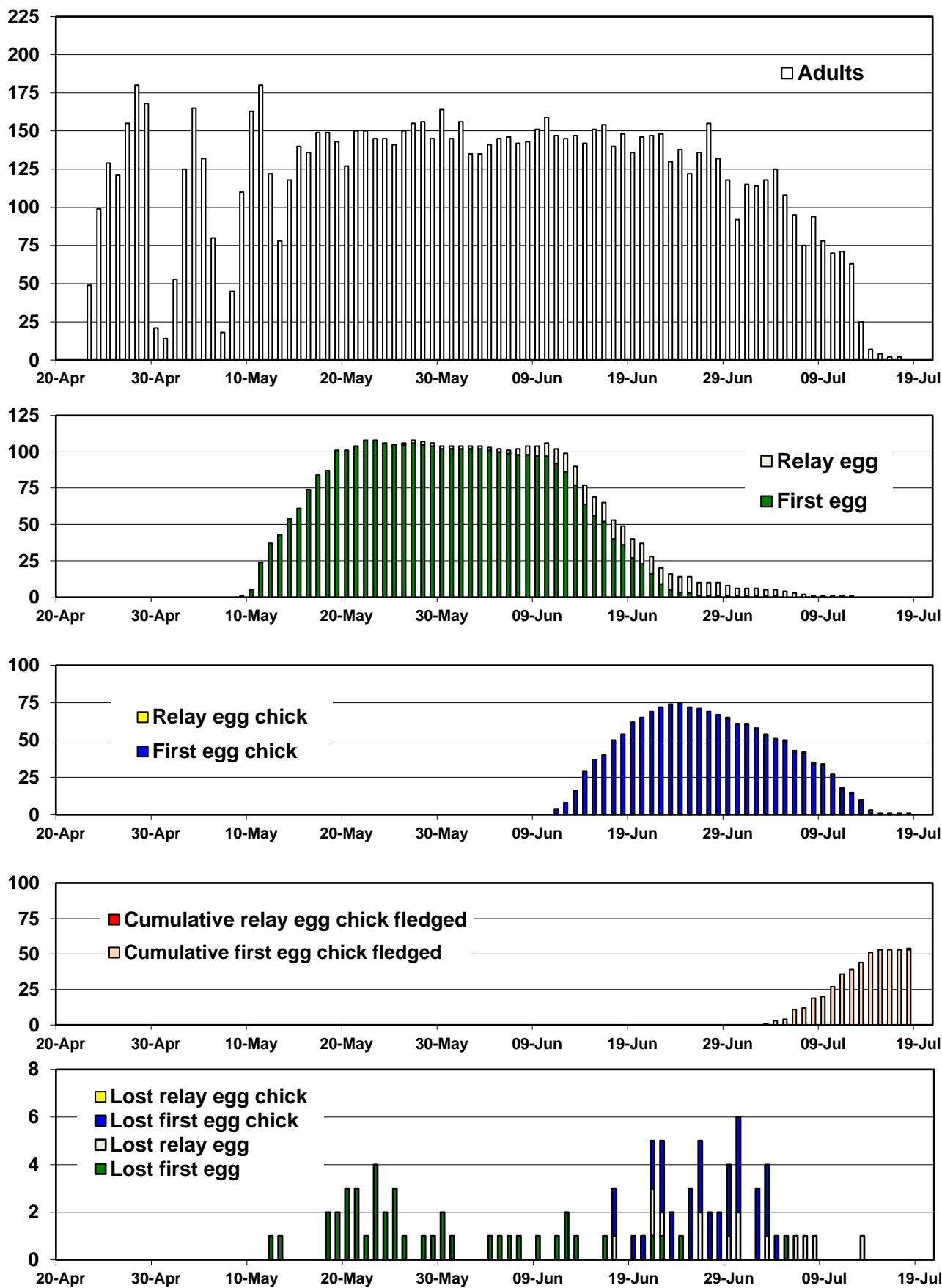
The first chick fledged overnight on the 3<sup>rd</sup> / 4<sup>th</sup> July (**Figure 1.10**) and the last chick on 17<sup>th</sup> / 18<sup>th</sup> July (the first date with no adults or chicks in the plot). Breeding success was 0.42 chicks fledged per laying pair, down from 0.71 in 2016 (**Figure 1.11**) and below the long-term mean of 0.54 (1989–2016).

**Table 1.9.** Common Guillemot breeding parameters and success in a study plot at Sumburgh Head, 2008–17, calculated as young fledged per regularly attended site, and per site at which eggs were laid.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Attended sites	166	169	169	164	163	155	158	153	150	142
Sites with egg laid	137	144	154	142	140	98	122	135	132	130
% sites laid	83%	85%	91%	87%	86%	63%	77%	88%	88%	92%
First egg date	4/5	2/5	2/5	29/4	4/5	7/5	6/5	5/5	4/5	9/5
Median laying date	16/5	10/5	9/5	9/5	14/5	19/5	16/5	14/5	13/5	15/5
% Hatched first egg	49%	65%	68%	21%	68%	11%	66%	70%	74%	68%
Chicks fledged	39	91	78	2	55	0	66	70	94	54
Fledged/site	0.23	0.54	0.46	0.01	0.34	0.00	0.42	0.46	0.63	0.38
<b>Fledged/egg</b>	<b>0.28</b>	<b>0.63</b>	<b>0.51</b>	<b>0.01</b>	<b>0.39</b>	<b>0.00</b>	<b>0.54</b>	<b>0.52</b>	<b>0.71</b>	<b>0.42</b>

**Figure 1.10. Upper four figures:** The daily number of adults, first eggs and relay eggs, first egg chicks and relay egg chicks in the breeding success plot at Sumburgh Head in 2017, and the cumulative number of

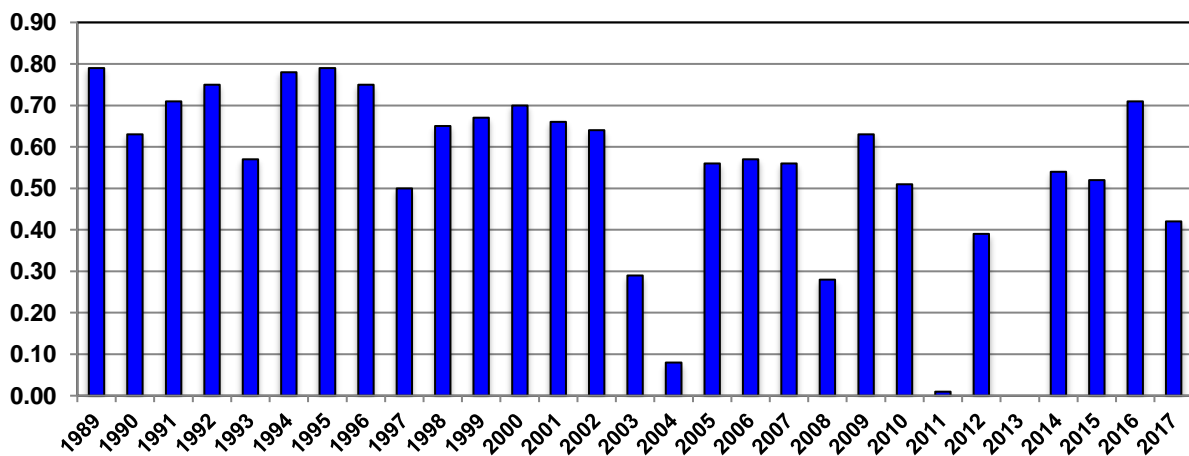
fledged first-egg chicks and relay-egg chicks. **Lowest figure:** The number of eggs and chicks missing from the previous day, or known to have been lost that day.



**Table 1.10.** Outcome (%) of Common Guillemot breeding attempts in a study plot at Sumburgh Head.

	2013	2014	2015	2016	2017
Number of breeding pairs	98	122	135	132	130
Lost first egg before possible hatching (< 29 days), no relay	50.0	11.5	8.1	9.8	16.9
Lost first egg around possible hatching (29–37 days), or chick died hatching	4.1	7.4	7.4	3.0	2.3
Presumed infertile first egg, incubated 38+ days	0.0	2.5	3.7	4.5	1.5
Lost relay egg before possible hatching (< 29 days)	34.7	4.9	7.4	3.8	9.2
Lost relay egg around possible hatching (29–37 days), or chick died hatching	0.0	0.8	0.0	0.8	1.5
Presumed infertile relay egg, incubated 38+ days	0.0	0.8	0.0	0.0	0.0
First egg chick missing before presumed fledging (< 15 days)	11.2	12.3	8.1	3.8	23.8
First egg chick seen dead	0.0	0.0	5.2	0.8	3.8
First egg chick seen predated	0.0	0.8	0.7	0.0	0.0
First egg chick missing 15+ days, assume predated	0.0	2.5	5.9	0.0	3.1
Relay chick missing before presumed fledging (< 15 days)	0.0	3.3	0.7	2.3	0.0
Relay chick seen dead	0.0	0.0	0.0	0.0	0.0
Relay chick missing 15+ days, assume predated	0.0	0.0	0.7	0.0	0.0
Fledged chick from first egg	0.0	50.8	50.4	68.9	40.8
Fledged chick from relay egg	0.0	3.3	1.5	2.3	0.8

**Figure 1.11.** Common Guillemot breeding success in the study plot at Sumburgh Head, 1989–2017.

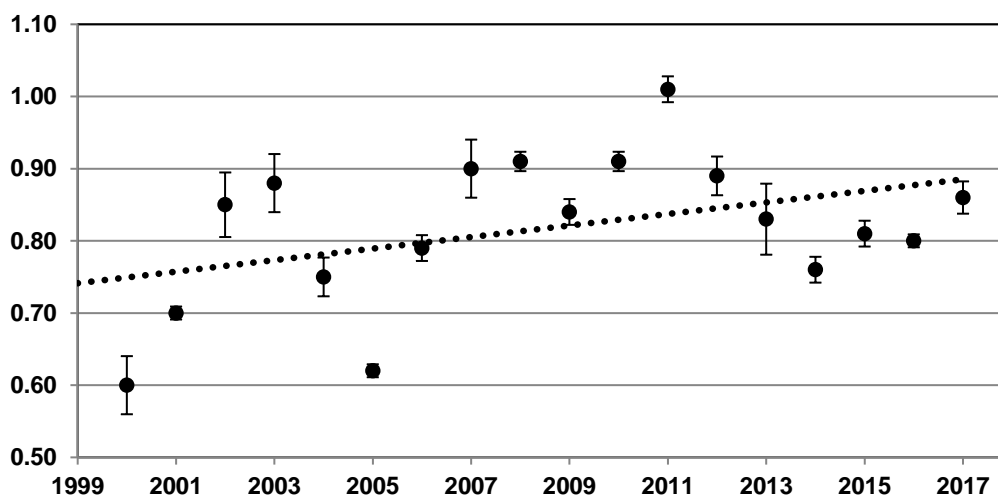


Adult attendance at the breeding success plot (mean of 116 adults per 100 breeding pairs), on the dates of the five population counts elsewhere around Sumburgh Head, was slightly lower than in 2016 (mean of 125), giving a mean  $k$ -value of 0.86 in 2017, compared with 0.80 in 2016 (**Table 1.11**). The linear regression of  $k$ -values on years (2000–2017) suggests that on average there has been an increase in  $k$ -values across years (**Figure 1.12**).

**Table 1.11.** Details of counts of Common Guillemots in the Sumburgh Head breeding success plot in 2017 (with mean and standard deviation), breeding numbers, derived  $k$ -values (with mean and standard deviation), and the deviation of counts in population monitoring plots on the same dates from the monthly mean.

Count date in 2017	2/6	4/6	7/6	10/6	13/6	Mean	SD
Time (BST)	1330	1315	1315	1315	1315		
Total birds in plot (n)	153	155	148	161	139	151.2	8.26
Total regularly attended sites (a)	142	142	142	142	142		
Total breeding pairs (b)	130	130	130	130	130		
$k$ -value regular sites (a/n)	0.93	0.92	0.96	0.88	1.02	0.94	0.05
<b><math>k</math>-value breeding pairs (b/n)</b>	<b>0.85</b>	<b>0.84</b>	<b>0.87</b>	<b>0.81</b>	<b>0.94</b>	<b>0.86</b>	<b>0.05</b>
Population count as % of mean for 2017	102%	96%	95%	114%	94%		

**Figure 1.12** Mean ( $\pm$  SE)  $k$ -values at the Common Guillemot breeding success plot on the dates of the five annual counts of adults in the population monitoring plots, 2000–17.



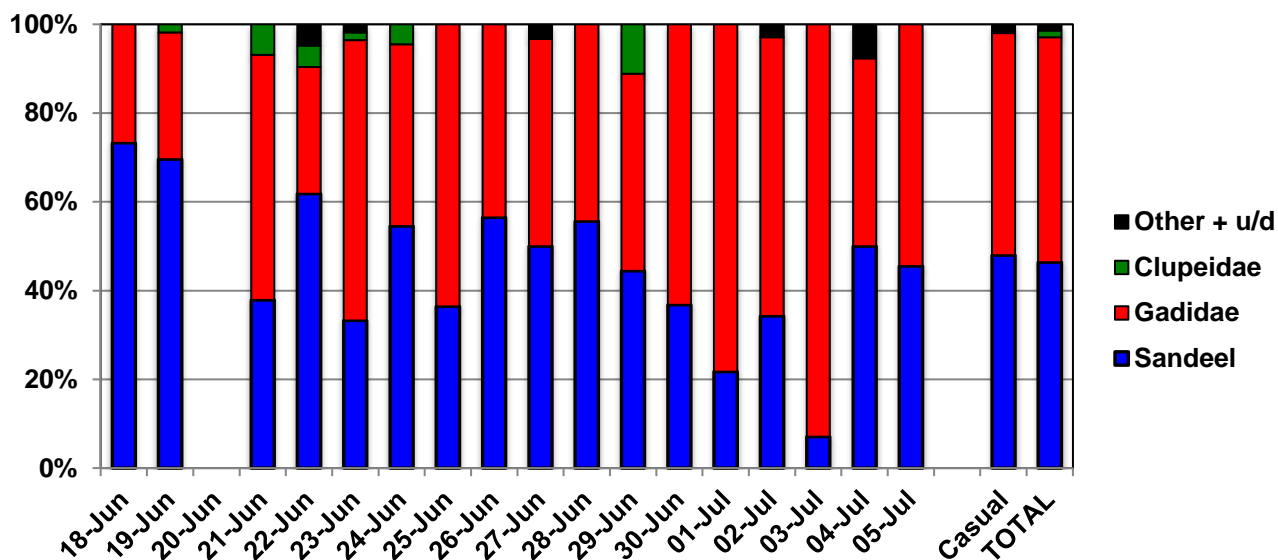
Between 18<sup>th</sup> June and 5<sup>th</sup> July inclusive, feeding watches were carried out on 17 days at the standard chick diet monitoring plot (which includes the breeding success plot). Using a telescope, each adult Guillemot flying in to the plot was checked to see if it was carrying a fish, and if so the adult was watched to see if its fish was presented to a chick. The identification of each fish presented to a chick was recorded to the lowest possible taxon, the time was recorded and, where possible, chick site number and age. Watches on 19<sup>th</sup>, 23<sup>rd</sup> and 24<sup>th</sup> June lasted 180 minutes while all others lasted 120 minutes. Observations of feeds seen incidentally during daily checks of the breeding success plot were also recorded (i.e. when fish-carrying adults entered the telescope field of view during daily checks), and were classified as ‘casual observations’.

As in previous years, in 2017 Guillemot chick diet mostly comprised sandeels (46.4%) and gadids (50.7%) (**Table 1.12**, **Figure 1.13**). The total percentage occurrence of sandeels in chick diet was the highest since 2008 (**Figure 1.14**). Total percentages of each fish type recorded during timed feeding watches and during casual observations were very similar (**Figure 1.13**). Most gadids were identified as ‘Norway pout-type’ (48.9%) and the ‘medium’ size category occurred most frequently, as was true for sandeels (**Table 1.12**). Unlike in 2016, in 2017 ‘Saithe-type’ gadids did not feature prominently in chick diet (74.2% in 2016 c.f. 1.0% in 2017; **Table 1.12**). The daily percentage occurrence of sandeels was highest at the start of the watch period, on 18<sup>th</sup> June (73.3%) and 19<sup>th</sup> June (69.6%), and lowest on the 3<sup>rd</sup> July (7.1%), but there was no consistent pattern of decrease across the watch period (18<sup>th</sup> June to 5<sup>th</sup> July; **Figure 1.13**). Instances of three or more feeds during a 2-hour watch or feeds occurring 30 minutes or less apart were few in 2017, with only 4 occurrences, all in June (**Table 1.13**).

**Table 1.12.** The percentages (and number) of fish types fed to Common Guillemot chicks at Sumburgh Head on 17 feeding watches, 18<sup>th</sup> June – 5<sup>th</sup> July (n = 459), and seen casually by telescope during checks of the breeding success plot (n = 50).

<b>Fish type</b>	<b>Large</b>	<b>Medium</b>	<b>Small</b>	<b>Total</b>
Sandeel	7.5 (38)	28.3 (144)	10.6 (54)	46.4 (236)
‘Norway Pout-type’ gadid	7.5 (38)	36.7 (187)	4.7 (24)	48.9 (249)
‘Rockling-type’ gadid	0	0.2 (1)	0.6 (3)	0.8 (4)
‘Saithe-type’ gadid	0	0.4 (2)	0.6 (3)	1.0 (5)
Clupeid	0.4 (2)	0.4 (2)	0.9 (4)	1.7 (8)
Unidentified/other but not sandeel	0	1.0 (5)	0.4 (2)	1.4 (7)

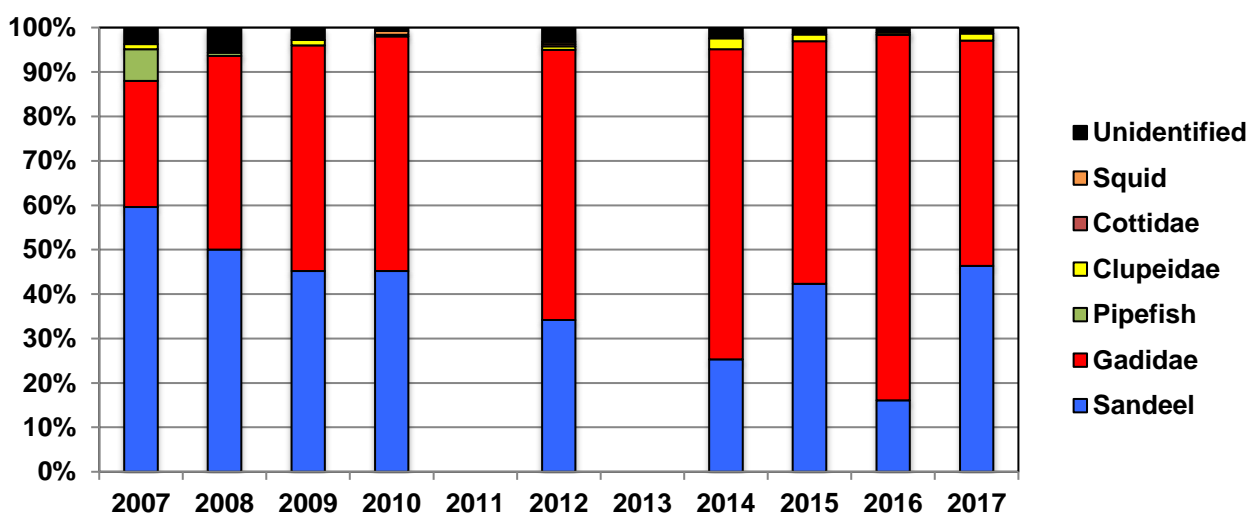
**Figure 1.13.** The percentage of prey items of different fish families fed to Common Guillemot chicks on feeding watches on 17 dates in 2017 (n = 459), casually during checks of the success plot (n = 50), and the total (n = 509). u/d = unidentified.



**Table 1.13.** Instances of Common Guillemot chick feeds 30 minutes or less apart (**bold**), or of three or more feeds during the watch. These are minima, as some chicks may have received additional feeds un-noticed.

Date	Chick (age)	Feeds (time and fish type)
19/6	36 (3 d)	14:41 medium sandeel; <b>15:00 medium sandeel</b>
23/6	87 (6 d)	16:15 medium pout-type; <b>16:19 medium pout-type</b>
23/6	50B (4 d)	15:59 small pout-type; <b>16:12 medium pout-type</b>
27/6	23A (16 d)	11:20 medium sandeel; <b>11:47 small sandeel</b>

**Figure 1.14.** Guillemot chick diet (% of feeds) at Sumburgh Head, 2007–17. Sample sizes: 2007 = 324; 2008 = 140; 2009 = 250; 2010 = 250; 2012 = 401; 2014 = 629; 2015 = 515; 2016 = 790; 2017 = 509. Too few chicks survived long enough in 2011 and 2013 for meaningful observations.



### 1.5c. Common Guillemot *Uria aalge*: Breeding success at Burravoe, Yell

This was monitored in the same plot as in 2012–16. Because viewing distances from safe vantage points are greater than at Sumburgh Head, the presence of an egg is more difficult to confirm, and sites at which eggs were assumed to have been laid were defined as those where an adult was sitting tight (ST) throughout the visit on two consecutive dates (**Table 1.14**, a). Other sites where an adult was sitting tight on one or more non-consecutive dates from the date of first assumed laying to 30<sup>th</sup> June (**Table 1.14**, b), or where adults were only ever recorded as standing upright on two or more dates (**Table 1.14**, c) are listed separately.

There were 222 adults present on the first check on 3<sup>rd</sup> May, higher than any count in 2016 either pre-laying (164 on 12<sup>th</sup> May) or post-laying (194 on 6<sup>th</sup> June). Birds were sitting tight at a total of 11 sites on 8<sup>th</sup>, 11<sup>th</sup> and 14<sup>th</sup> May but none on two consecutive checks. The first (9) eggs were seen on 18<sup>th</sup> May, when 104 adults were present, although 43 of these flew off minutes after the observer arrived, for no apparent reason. Only one of these nine eggs was still present on 22<sup>nd</sup> May, when birds were recorded incubating at a further five sites, but only two of these eggs survived to 25<sup>th</sup> May, when a further new egg was recorded. The plot was completely deserted on 30<sup>th</sup> May, and while eggs were recorded at a further nine sites in the first half of June, only three adults were present on 13<sup>th</sup> June, and the whole colony was deserted on 16<sup>th</sup> June. Given the uncertainty over how many pairs laid, the parameters given in **Table 1.14** for 2017 are approximates only.

Such a level of non-breeding, or colony desertion so soon after first laying, has not been recorded before at Burravoe. The reason(s) for this can only be speculated at, but the nervousness of the adults (especially evident on 8<sup>th</sup> June, 86 present) was reminiscent of the 2013 breeding season in the south Mainland. In that year the Compass Head colony was completely deserted by mid June, very few chicks hatched, there was complete failure in the single plot monitored at Sumburgh Head (**Table 1.10**) and very few chicks fledged from elsewhere in that colony. A shortage of prey was undoubtedly behind the events in 2013.

**Table 1.14.** Common Guillemot breeding success monitoring at Burravoe, 2013–17. Adults sitting tight (ST) on two or more consecutive checks (a) were assumed to be incubating. Those sitting tight on just one, or on two or more non-consecutive checks (b) were assumed not to have laid an egg.

	2013	2014	2015	2016	2017
Date range visited	2/5–8/8	12/5–6/8	5/5–10/8	9/5–29/7	3/5–16/6
Checks (mean interval in days)	30 (3.4)	27 (3.2)	27 (3.6)	27 (3.0)	14 (3.1)
Date first egg seen / assumed incubation	16/5	12/5	5/5	18/5	18/5
<b>ST 2+ checks, assumed laid (a)</b>	<b>75</b>	<b>90</b>	<b>97</b>	<b>104</b>	<b>24</b>
ST 1 check only from first egg to 30/6 (b)	17	19	9	14	17
Other regularly attended sites (c)	38	34	29	15	77
% laid (a/a+b+c)	57.7%	62.9%	71.9%	78.2%	20.3%
Sites where chicks were seen	30	57	51	66	0
Minimum % hatched	40.0%	63.3%	52.6%	63.5%	0
Date first assumed fledged	8–11/7	30/6–3/7	29/6–3/7	8–11/7	-
Number assumed fledged (d)	27	55	49	62	0
<b>Success (d/a)</b>	<b>0.36</b>	<b>0.61</b>	<b>0.51</b>	<b>0.60</b>	<b>0.00</b>

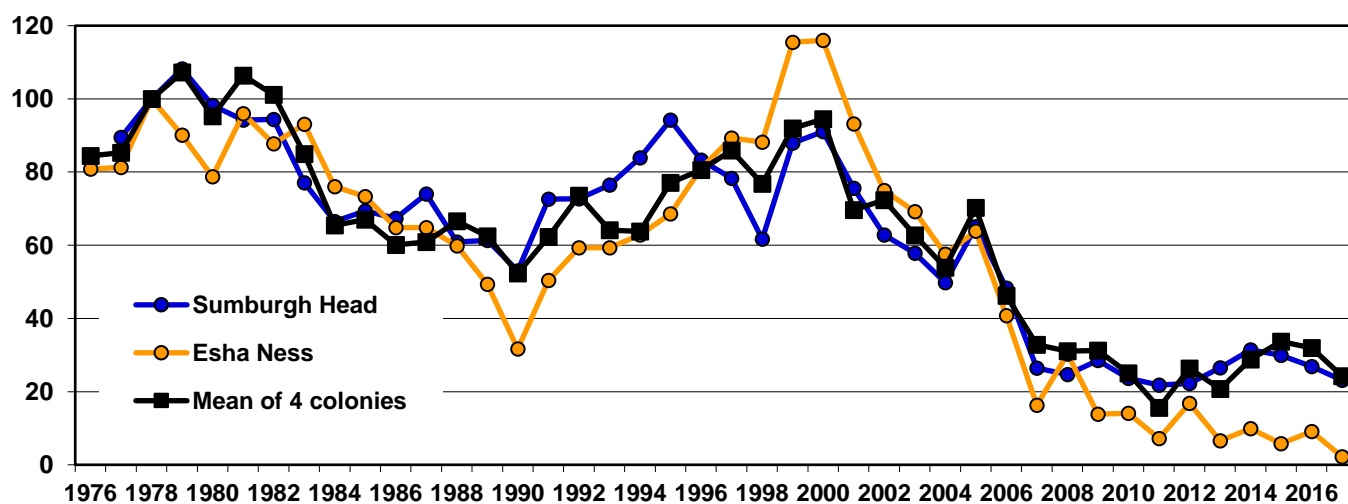
### 1.6a. Razorbill *Alca torda*: Population counts

As in 2016, counts of adults were highly variable at the Sumburgh Head plots, with the highest count (92 on 10<sup>th</sup> June) being more than double the lowest, of 42 on 7<sup>th</sup> June (**Table 1.15**). The population index at Sumburgh Head has fluctuated between 20–30 (1978 = 100) over the past 11 years (**Figure 1.15**). Most counts at the other three colonies were in single figures. The mean population index for 2017 was 24.3 (1978 = 100).

**Table 1.15.** Counts of individual Razorbills in study plots at four Shetland colonies, 2016–17. Statistics given are: number of counts, range, mean, standard deviation, coefficient of variation, percentage change since 2016, and population indices (1978 = 100). *NB: indices for Burravoe have been recalculated following the discovery of an error in the 1978 baseline mean count.*

Colony	Unit	Year	n	Range	Mean	SD	CV	% ch.	Index
Sumburgh	Birds	2016	5	59–102	78.0	16.66	0.21		26.9
Head		2017	5	42–92	66.8	17.92	0.27	-14.4	23.1
Troswick	Birds	2016	5	9–15	11.0	2.45	0.22		52.4
Ness		2017	5	3–13	7.8	3.63	0.47	-29.1	37.1
Esha Ness	Birds	2016	5	5–9	6.6	1.52	0.23		9.1
		2017	5	1–3	1.6	0.89	0.56	-75.8	2.2
Burravoe	Birds	2016	5	2–9	6.4	2.70	0.42		39.5
		2017	5	2–7	5.6	2.07	0.37	-12.5	34.6

**Figure 1.15.** Annual index (1978 = 100) of Razorbill numbers at Sumburgh Head and Esha Ness, 1976–2017, and the mean of indices at these two colonies plus Troswick Ness and Burravoe.



### 1.6b. Razorbill *Alca torda*: Breeding success at Sumburgh Head

This was monitored for the 7th successive year, using the same marked photographs and adding on new nest sites as they became apparent. The presence and number of attending adults at potential nest sites was recorded and pairs were assumed to have laid an egg if an adult was recorded as sitting tight (ST) on two consecutive checks (**Table 1.16**). An incubation period of 35 days, a minimum fledgling period of 15 days, and the state of chick plumage development were all used to help assess probable hatching periods, chick ages, and whether they could have fledged or not. The nest sites monitored were scattered around different areas of the Head where Razorbills could be seen reasonably closely using a telescope at a safe vantage point, and it would be spurious to clump them into 'plots'.

The first bird appeared to have laid by 9<sup>th</sup> May and the first egg was confirmed on 10<sup>th</sup> May. Breeding was proved at 59 sites while at a further nine sites adults were sitting tight on two consecutive checks but no egg was seen. Chicks were seen at 45 sites suggesting hatching success of 66% (70% in 2016) and 41 chicks were judged to have survived to potential fledging age, giving breeding success of 0.60. Only three chick feeds were observed, all involving single sandeels (two small, one medium).

**Table 1.16.** The number, status and outcome of Razorbill breeding sites monitored at Sumburgh Head, 2011–16. Adults sitting tight (ST) on two or more consecutive checks (a) were assumed to be incubating. Those recorded as sitting tight on just one check, or on two or more non-consecutive checks (c) were assumed not to have laid an egg.

	2012	2013	2014	2015	2016	2017
Date range visited	3/5–26/7	3/5–6/8	7/5–26/7	6/5–6/8	3/5–17/8	4/5–1/8
Checks (mean interval in days)	42 (2.0)	41 (2.4)	26 (3.1)	38 (2.4)	54 (2.0)	51(1.7)
First egg seen / assumed incubation	3/5	8/5	7/5	9/5	5/5	9/5
ST 2+ checks, no egg seen (a)	25	25	35	16	11	9
Egg / chick seen (b)	29	18	23	51	70	59
<b>Breeding pairs (a + b)</b>	<b>54</b>	<b>43</b>	<b>58</b>	<b>67</b>	<b>81</b>	<b>68</b>
ST 1 check only to 30/6 (c)	5	15	10	15	16	14
Other attended sites	7	14	19	14	13	16
Sites where chicks were seen	38	13	32	40	57	45
Date first assumed fledged	27–28/6	16/7	21–25/6	23–30/6	30/6–2/7	3/7
Chicks assumed fledged (d)	30	10	30	38	52	41
<b>Success: d/(a+b)</b>	<b>0.56</b>	<b>0.23</b>	<b>0.52</b>	<b>0.57</b>	<b>0.64</b>	<b>0.60</b>



## 2. Pre-breeding season census counts of Black Guillemots *Cepphus grylle*

Work continued to update counts of Black Guillemots ('Tysties') along coasts not surveyed since the *Seabird 2000* census in 1998-2002. Adverse weather during April 2017 limited opportunities for surveys, especially along the west coast of Shetland, but here we compare the results with those of previous surveys.

### Yell Sound

Five complete surveys of Yell Sound were made during the *Seabird 2000* census period (**Table 2.1**).

For the current census, the Mainland coast from Fethaland to North Collafirth was surveyed from land in excellent conditions on 18<sup>th</sup> April 2015 and numbers were well below the mean of the earlier counts from Skea north to Fethaland, for no obvious reason. The rest of the Mainland coast and the islands were surveyed from the SOTEAG RIB in good sea conditions on 14<sup>th</sup> and 15<sup>th</sup> April 2017. Along the Mainland coast south of Colla Firth the main apparent difference between the early surveys and 2017 was the presence of 30 adults at the tanker jetties in Sullom Voe, where birds are now almost certainly attempting to nest in the structures. When this association began is uncertain. All previous counts of northern Sullom Voe had been made by Zodiac launched at Toft and after 1988 the survey route stopped at Calback Ness just north of the jetties because of a lack of natural habitat. In 2017 the RIB was launched at Sella Ness and the birds (which were displaying on the sea underneath all four jetties and flying to perch on the fenders) were detected unexpectedly as we cruised north along Calback Ness.

Counts of Tysties at the Yell Sound Islands are difficult to interpret. Apart from at Lamba colonies are small, and because some islands are close together (e.g. Brother Isle, Uynarey and Bigga) some adults may attend locations at different islands on different mornings. A further complication is that Tysties feed in the tide races immediately around the islands and on some surveys it has not been easy to distinguish between birds feeding and birds attending colonies (this was particularly the case with the second survey in 2002, and may have contributed to the relatively high total). Despite these caveats, the 2017 total was very similar to the mean of the 1998–2002 counts.

**Table 2.1.** Counts of adult Black Guillemots in Yell Sound in 1998–2002, and in 2015 (the Mainland coast from Fethaland to North Colla Firth) and 2017 (all other sections). \* = counted from land, otherwise all counted from the sea. Counts not in bold may have been low because of adverse sea or weather conditions, or the birds' behaviour. The percentage differences between the 2015–17 counts and the mean of the 1998–2002 counts are given.

Mainland coast (N to S)	1998/1	1998/2	2001	2002/1	2002/2	Mean	2015/17	% diff.
Fethaland to Burra Voe	<b>222*</b>	<b>257</b>	<b>163</b>	201	157	<b>200.0</b>	<b>147*</b>	<b>-26.5</b>
Burra Voe to Skea	<b>80</b>	<b>83</b>	<b>80</b>	88	76	<b>81.4</b>	<b>42*</b>	<b>-48.4</b>
Skea to North Colla Firth	<b>26</b>	<b>26</b>	<b>17</b>	22	<b>31</b>	<b>24.4</b>	<b>34*</b>	<b>39.3</b>
South Colla Firth to Gluss Isle	<b>50</b>	<b>46</b>	<b>64</b>	49	<b>66</b>	<b>55.0</b>	<b>55</b>	<b>0.0</b>
Calback Ness to Lunna Ness	<b>9</b>	<b>7</b>	<b>19</b>	<b>16</b>	<b>22</b>	<b>14.6</b>	<b>47</b>	<b>221.9</b>
<b>Mainland coast total</b>	<b>387</b>	<b>419</b>	<b>343</b>	<b>376</b>	<b>352</b>	<b>375.4</b>	<b>325</b>	<b>-13.4</b>
Islands (N to S, W to E)	1998/1	1998/2	2001	2002/1	2002/2	Mean	2017	% diff.
Muckle Holm	<b>8</b>	<b>6</b>	<b>6</b>	<b>10</b>	<b>11</b>	<b>8.2</b>	<b>12</b>	<b>46.3</b>
Little Holm	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	
Lamba	<b>54</b>	<b>56</b>	<b>43</b>	<b>50</b>	<b>64</b>	<b>53.4</b>	<b>46</b>	<b>-13.9</b>
Little Roe	<b>12</b>	<b>16</b>	<b>9</b>	<b>15</b>	<b>19</b>	<b>14.2</b>	<b>11</b>	<b>-22.5</b>
Brother Isle	<b>25</b>	<b>24</b>	<b>10</b>	<b>27</b>	<b>19</b>	<b>21.0</b>	<b>21</b>	<b>0.0</b>
Uynarey	<b>12</b>	<b>17</b>	<b>6</b>	<b>19</b>	<b>22</b>	<b>15.2</b>	<b>18</b>	<b>18.4</b>
Bigga	<b>9</b>	<b>8</b>	<b>11</b>	<b>10</b>	<b>28</b>	<b>13.2</b>	<b>28</b>	<b>112.1</b>
Samphrey	<b>4</b>	<b>2</b>	<b>10</b>	<b>8</b>	<b>9</b>	<b>6.6</b>	<b>8</b>	<b>21.2</b>
Fish Holm	<b>6</b>	<b>11</b>	<b>3</b>	<b>7</b>	<b>7</b>	<b>6.8</b>	<b>9</b>	<b>32.4</b>
Linga	<b>32</b>	<b>19</b>	<b>33</b>	<b>30</b>	<b>37</b>	<b>30.2</b>	<b>25</b>	<b>-17.2</b>
Wether Holm	<b>10</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>9</b>	<b>7.2</b>	<b>5</b>	<b>-30.6</b>
Lunna Holm	<b>3</b>	<b>9</b>	<b>4</b>	<b>8</b>	<b>6</b>	<b>6.0</b>	<b>2</b>	<b>-66.7</b>
<b>Islands total</b>	<b>175</b>	<b>173</b>	<b>141</b>	<b>190</b>	<b>231</b>	<b>182.0</b>	<b>186</b>	<b>2.2</b>

## Out Skerries and the East Whalsay islands

There were few meaningful data on Tystie numbers in this area prior to the *Seabird 2000* counts in 1999 and 2000. Estimates for parts of the Out Skerries were from late May 1982 and early July 1984, while a survey of the East Whalsay islands on the afternoon of 6<sup>th</sup> August 1982 recorded 75 adults close inshore (and therefore assumed to be ‘associated’ with breeding colonies) but a further 103 adults of unknown status offshore (**Table 2.2**). Zodiac surveys of these areas in 1999 and 2000 were both made in good to excellent conditions. Birds were difficult to flush around Out Skerries on 30<sup>th</sup> March 2000 but this was not thought to have affected the total of 687 ‘associated’ adults, a major concentration for the species in northeast Shetland.

On 18<sup>th</sup> April 2017, the whole area was surveyed simultaneously using two RIBs, in perfect conditions. Around Out Skerries numbers were lower than in 2000 along virtually all sections of coast, in total by 51%. Although many birds were sitting ashore they were easy to see (by four observers) on the low cliffs of the area. With a mostly glass calm sea any adults feeding offshore would probably have been detected during the survey, and none were seen feeding offshore while in transit to and from Out Skerries. We conclude that there has been a substantial decrease in breeding numbers since 2000, for reasons unknown.

There are no large colonies at the East Whalsay islands, and while the total counted in 2017 was 27% lower than in 1999 the difference was only 22 birds, with numbers being higher at some islands and lower at others. No adults were recorded offshore between the islands, although 27 immatures (separable by plumage) were seen, again suggesting that most adults were at the colonies.

**Table 2.2.** Counts of adult Black Guillemots around Out Skerries and the East Whalsay islands. Figures for 1982–84 are not comparable with later counts, while the 1999, 2000 and 2017 surveys were all made in good to excellent conditions. The percentage differences between the 2017 and the 1999/2000 counts are given.

<b>Out Skerries</b>	<b>1982/84</b>	<b>30/3/00</b>	<b>18/4/17</b>	<b>% diff.</b>
Muckle Skerry	(42)	35	17	-51.4
Little Skerry & Vongs	(0)	15	16	+6.7
North coast of Housay & Bruray		133	41	-69.2
Gruney & Bound Skerry		195	99	-49.2
South coast of Housay		178	134	-24.7
North & South Benelips	(c.100)	78	12	-84.6
Filla & the Guens	(0)	53	15	-71.7
<b>Out Skerries total</b>		<b>687</b>	<b>334</b>	<b>-51.4</b>
<b>East Whalsay islands</b>	<b>6/8/82</b>	<b>18/4/99</b>	<b>18/4/17</b>	<b>% diff.</b>
Nacka Skerry	(0)	7	0	-100.0
Nista & Mooa	(10)	17	11	-35.3
Isbister Holm	(12)	10	14	+40.0
East Linga	(30)	17	23	+35.3
Grif Skerry	(23)	28	11	-60.7
Rumble	(0)	3	1	-66.7
<b>East Whalsay islands total</b>	<b>(75)</b>	<b>82</b>	<b>60</b>	<b>-26.8</b>

## East coast of Lunna Ness

A survey by RIB on 14<sup>th</sup> April 2017, from north to south, was hampered by rain during the first hour, and then a freshening SE wind and a choppy sea along the central section made birds hard to see except at close range. These adverse conditions clearly affected the numbers counted along the northern section of the coast but in the more sheltered entrance to Vidlin Voe the total was very similar to that in 2000, made in good conditions (**Table 2.3**). The only two previous surveys made in reasonable conditions (in 1983 and 2000) would suggest a decrease in numbers has occurred since 1983 along the northern section. Conditions were less favorable in 1995, when the breeze was moderate to fresh, and in 2000, when there was only the boat driver and one observer, who noted that birds were hard to see on the rippled sea and against the light.

**Table 2.3.** Counts of adult Black Guillemots along East Lunna Ness. The percentage difference between the 2017 and 2000 counts is given.

East Lunna Ness	18/5/83	6/4/95	8/4/00	14/4/17	% diff.
Method	Land	Zodiac	Zodiac	RIB	
Wind	Calm	NW 4-5	NW 3-4	SE 3-4	
North (Lunna Holm to Ramna Geo)	127	104	70	8	-88.6
South (Ramna Geo to Vidlin)	37	21	36	40	+11.1
<b>Total</b>	<b>164</b>	<b>125</b>	<b>106</b>	<b>48</b>	<b>-54.7</b>

### 3. Breeding Red-throated Divers *Gavia stellata* in Northmavine

The moorland between Sullom Voe and St Magnus Bay has been surveyed for breeding Red-throated Divers biennially since 1994 (but annually in 1981–83 and 1989–93). Up to 2011, two checks were made to establish the number of breeding pairs but in 2013 and 2015 follow-up visits were made later in the summer to confirm the outcome of breeding attempts. Red-throated Divers make a shallow nest scrape (or several scrapes) at the water's edge and lay a clutch of one or two eggs, so are capable of fledging up to two chicks in a season.

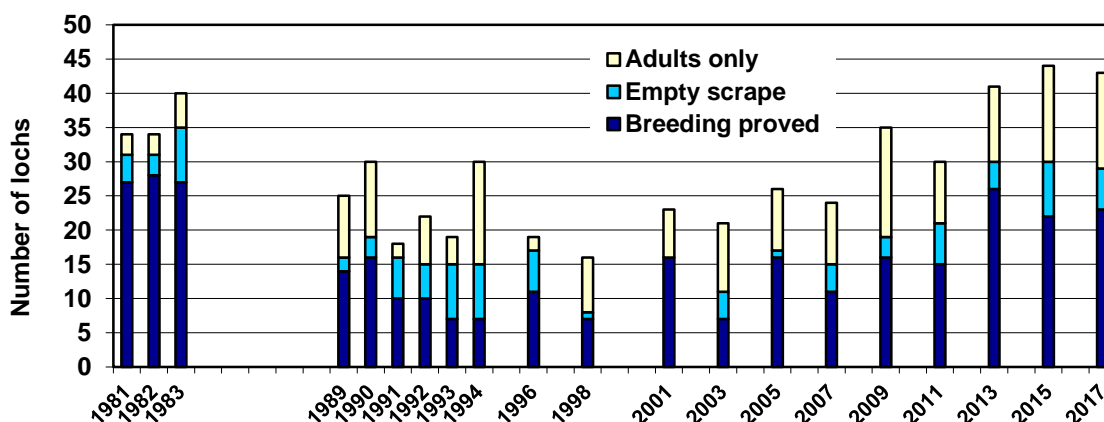
In 2017, all 71 loch and pools in the study area were checked on 8<sup>th</sup>–15<sup>th</sup> June, when 8 breeding pairs were confirmed, and again on 27<sup>th</sup>–30<sup>th</sup> June when a further 13 breeding pairs were detected, indicating a relatively late breeding season. A third check of all lochs on 21<sup>st</sup>–27<sup>th</sup> July detected a further incubating bird, and a medium-sized chick on a pool where only an empty scrape had been detected earlier (the chick presumably had been hiding against a bank); any medium to large chicks present on these dates were assumed to have fledged. Follow-up checks on the remaining 7 breeding pairs were made on 17<sup>th</sup>–18<sup>th</sup> August; 2 pairs had failed, 3 medium to large-sized chicks were assumed to have fledged subsequently, one pair still incubating since mid June was assumed to have failed subsequently, and a brood of two small chicks (the only brood of two detected) was checked finally on 30<sup>th</sup> August when they were 'large' and assumed to have survived to fledge.

The number of lochs with breeding activity (i.e. at least an empty nest scrape) has been similar (29–30) in the last three surveys, while breeding success has been rather low (**Table 3.1, Figure 3.1**). Since Red-throated Divers in Shetland feed at sea the reason(s) for this low success may be related to that affecting other breeding seabird species. However, the increased number of Greylag geese frequenting moorland lochs in spring and summer may be having a detrimental effect on diver breeding performance. It is beyond the scope of SOTEAG to investigate this in detail, but in future we plan to simply record the presence of geese by ranking the presence droppings around the lochs in the study area.

**Table 3.1.** Red-throated Diver nesting activity and breeding success in the Northmavine study area in 2013, 2015 and 2017.

Northmavine study area	2013	2015	2017
Lochs with adults present only	11	14	14
Lochs with empty nest scrapes only	4	8	6
<b>Confirmed breeding pairs</b>	<b>26</b>	<b>22</b>	<b>23</b>
Broods known to have hatched	15	9	11
Broods assumed to have fledged	8	7	9
Chicks assumed to have fledged	10	10	10
Mean brood size at fledging	1.25	1.43	1.11
<b>Breeding success</b>	<b>0.38</b>	<b>0.45</b>	<b>0.43</b>

**Figure 3.1.** Red-throated Diver nesting activity in the Northmavine study area, 1981–2017.



#### 4. Moulting Common Eiders *Somateria mollissima* in Yell Sound and Sullom Voe

A Shetland-wide census of moulting Common Eiders in August 2015 located a total of 4,610 birds (including juveniles). The next census is scheduled for August 2018, and in the intervening years counts of moulting Eiders are limited to Yell Sound and Sullom Voe, i.e. the Sullom Voe Harbour Oil Spill Plan (SVHOSP) area.

In southern Yell Sound, the areas around aquaculture sites in Dales Voe and Colla Firth, and off Lunna Ness were surveyed from land on 8<sup>th</sup> August using a telescope from various vantage points. The only Eiders seen were a total of 55 females and/or juveniles in Dales Voe, either at or close to mussel lines. This is in marked contrast to the much larger numbers that summered in this area in 2009–2013 (**Table 4.1**).

The northern half of Sullom Voe was surveyed from land on 30<sup>th</sup> August, again using a telescope from different vantage points. Of the total of 146 Eiders seen, the main concentration was of 110 males and 23 females and/or juveniles around Ungam. Although surveying this area from a boat would have been preferable, it is unlikely any birds were overlooked unless they were feeding between the tanker jetties and the shoreline of Calback Ness, which some females and juveniles have a habit of doing.

In northern Yell Sound there was no coverage of the former moulting sites of Tinga Skerry, Little Holm and Muckle Holm, but this would have made little difference to the recorded total. Tinga Skerry and Muckle Holm have not been frequented by moulting Eiders since the 1980s. Two or three pairs breed at Little Holm and 2–3 females are usually present with surviving juveniles in August.

**Table 4.1.** Counts of moulting Common Eiders in Yell Sound and Sullom Voe, 2005–17 (nc = no count; totals with incomplete coverage in italics).

Area	2005	2006		2009	2010	2011	2012	2013	2014	2015	2016	2017
North Yell Sound	nc	0		3	nc	nc	12	nc	0	8	5	nc
Sullom Voe	11	0		4	nc	nc	72	118	59	160	210	146
South Yell Sound	190	109		666	771	386	499	494	151	240	86	55
<b>Total</b>	<b>201</b>	<b>109</b>		<b>673</b>	<b>771</b>	<b>386</b>	<b>583</b>	<b>612</b>	<b>210</b>	<b>408</b>	<b>301</b>	<b>201</b>

## 5. Winter counts of seaduck and diving seabirds

### 5.1. Sullom Voe and southern Yell Sound

A survey on 22<sup>nd</sup> January began in favourable conditions with a light F2 south-westerly breeze, but thickening overcast by Sullom Voe coupled with slight to moderate ripples meant cryptic species became difficult to see, although with three observers few birds were probably missed (**Table 5.1**). In Yell Sound, eight **Common Eiders** in Linga Sound and five at Tinga Skerry were the only ones seen, while the count of **Long-tailed Ducks** was similar to those in winters 2011/12 to 2014/15, after a low count in December 2015 (**Table 5.2, Figure 5.1**); a small group in Sullom Voe (Garths Voe) was still present in early April. Two **Common Scoters** and three **Velvet Scoters** (all singles) were noteworthy. After mild weather and with all freshwater open the count of **Goldeneye** in Sullom Voe was rather low, although numbers of **Red-breasted Mergansers** were similar to recent winters. A **Black-throated Diver** in northern Sullom Voe was possibly the same returning individual seen there in December 2015 and January 2013. The 12 **Great Northern Divers** in Yell Sound, the highest count along the survey route since November 1989, comprised a single bird and a flock of six off Lunna Ness, a group of four in Orka Voe, and the usual single bird in the Wick of Copister (south Yell); the four in Sullom Voe were all north of the tanker jetties. The count of 25 **Slavonian Grebes** reconfirmed Sullom Voe as a local stronghold for the species, after a rather low count in December 2015. **Cormorants** were scattered throughout Yell Sound in small numbers, apart from a roost of 220 on Orfasay, while **Shags** were present in both feeding flocks and roosts on the islands. No **Guillemots** or **Razorbills** were seen, and the only **Puffin** seen, in central Sullom Voe, appeared sickly. Although not counted, at least 300 **Kittiwakes** (c.25% first-winter) were present throughout the area in small, mobile feeding flocks. There were also at least 32 **Harbour Porpoises** between Orka Voe and Little Roe, and two **Common Dolphins** at the head of Sullom Voe.

On 29<sup>th</sup> December a light F 2-3 westerly breeze maintained ripples in Yell Sound throughout, although Sullom Voe was largely glass calm. Again, very few **Common Eiders** were seen, **Long-tailed Duck** numbers in Yell Sound were similar to January, while the count of 97 **Red-breasted Mergansers** in Sullom Voe was the lowest since 2011/12. In Sullom Voe, there were seven **Great Northern Divers** in the northern half of the voe and four at the head of the voe, while in Yell Sound there were three off Lunna Ness, three in the Orka Voe/Little Roe area and two off South Yell.

**Table 5.1.** Counts of seaduck and diving seabirds in Sullom Voe during winter.

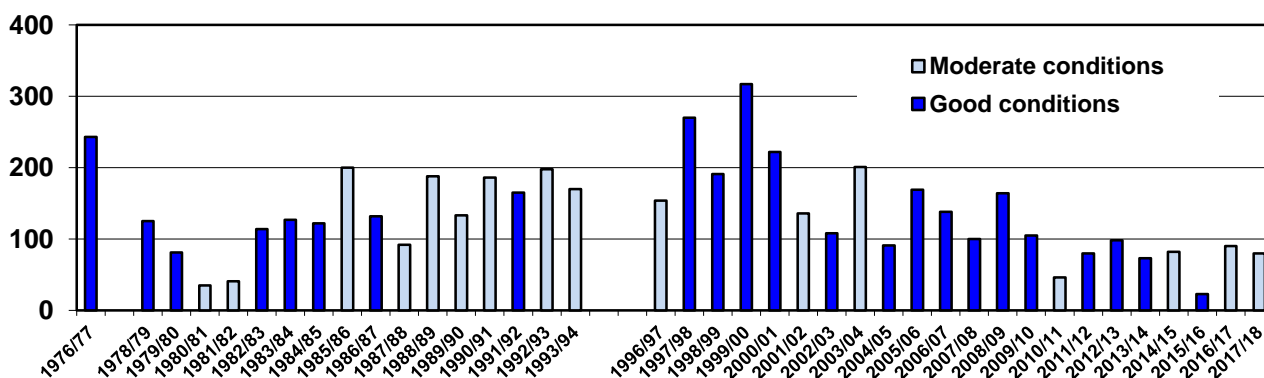
Winter	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Date	21/12	16/1	23/1	10/1	19/1	13/12	22/1	29/12
Number of observers	3	2	3	3	2	2	3	2
Common Eider	0	2	0	0	3	11	1	4
Long-tailed Duck	0	1	1	2	2	0	6	7
Common Scoter	0	0	0	1	0	0	0	0
Velvet Scoter	1	0	0	0	1	0	2	0
Goldeneye	39	33	47	18	30	19	15	26
Red-breasted Merganser	194	74	124	141	141	112	130	97
Goosander	0	0	1	0	1	0	0	0
Red-throated Diver	0	1	2	1	0	4	0	1
Black-throated Diver	0	0	1	0	0	1	1	0
Great Northern Diver	5	2	3	8	3	2	4	11
Slavonian Grebe	18	29	21	32	26	16	25	18
Cormorant	62	5	18	8	2	0	2	0
Shag	732	87	90	158	125	141	134	150
Common Guillemot	0	1	0	2	0	0	0	0
Razorbill	0	1	2	1	0	0	0	0
Black Guillemot	145	121	195	156	143	85	93	134
Little Auk	0	1	0	0	1	2	0	0
Puffin	0	0	0	1	0	0	1	0
<b>Total</b>	<b>1208</b>	<b>358</b>	<b>505</b>	<b>529</b>	<b>478</b>	<b>393</b>	<b>414</b>	<b>448</b>

There were seven fewer **Slavonian Grebes** in Sullom Voe than in January, although one was in Orka Voe. Most (190) of the **Cormorants** seen in Yell Sound were flying east over Lunna Ness towards Vidlin Voe shortly after dawn, behaviour that has been before (180 on 9<sup>th</sup> January 2014), and very few were seen along the rest of the survey route. As in recent winters, **Common Guillemots**, **Razorbills** and **Little Auks** were notable by their absence.

**Table 5.2.** Counts of seaduck and diving seabirds around the southern Yell Sound islands during winter. Count conditions: \*\* = moderate to good, \*\*\* = good or excellent throughout.

Winter	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Date	21/12	16/1	23/1	10/1	19/1	13/12	22/1	29/12
Number of observers	3	2	3	3	2	2	3	2
Count conditions	**	***	***	***	**	**	**	**
Common Eider	19	55	27	57	83	21	13	9
Long-tailed Duck	46	80	98	73	82	23	90	80
Velvet Scoter	0	0	0	1	0	1	1	0
Common Scoter	0	0	0	0	0	0	2	0
Goldeneye	28	18	8	6	6	2	14	0
Red-breasted Merganser	0	13	13	5	12	2	4	1
Red-throated Diver	3	3	2	0	0	5	3	1
Great Northern Diver	2	5	3	2	2	4	12	8
Slavonian Grebe	5	3	6	4	1	0	0	1
Cormorant	484	104	353	230	463	579	326	212
Shag	575	513	691	440	706	911	812	436
Common Guillemot	3	1	1	12	1	0	0	0
Razorbill	1	0	0	1	0	0	0	0
Black Guillemot	362	325	580	513	349	286	390	442
Little Auk	0	1	0	0	0	5	0	0
Puffin	0	0	4	0	1	0	0	0
<b>Total</b>	<b>1528</b>	<b>1121</b>	<b>1786</b>	<b>1344</b>	<b>1706</b>	<b>1839</b>	<b>1667</b>	<b>1190</b>

**Figure 5.1.** Counts of Long-tailed Ducks during winter (mid November to mid March) along a standard route around the southern Yell Sound islands.



## 5.2. Hascosay, Bluemull and Colgrave Sounds (HBC), and South Unst.

Sea conditions were excellent on 16<sup>th</sup> February, glass calm for most of the survey apart from off the east side of Uyea when a light NW breeze briefly gave slight to moderate ripples (**Table 5.3**). Very low, murky cloud and low light levels at times did not hamper the counts, nor did bands of light drizzle that persisted from Unst to the finish off south Hascosay. Numbers of **Common Eider** were very similar to January 2016, the largest flocks being 215 in Hascosay Sound and 776 to the south of Linga, both feeding in open water clear of aquaculture, and 247 feeding at salmon cages at the entrance to Uyea Sound. **Long-tailed Ducks** were difficult to count accurately, with about 760 birds feeding at, flying between, or sitting offshore from four groups of salmon cages off southwest Unst and Uyea; the largest flock away from salmon cages was 56 south of Linga. This habit of feeding at salmon cages, first recorded in February 2013 and not seen elsewhere in Shetland to any great extent, has undoubtedly fuelled the recent increase in wintering numbers in the area (**Figure 5.2**). Whether these birds are feeding on the seabed or on marine life growing on the infrastructure is unknown. A drake **Surf Scoter**, which had been present all winter, was the first one recorded on a SOTEAG winter survey. Only four **Great Northern Divers** were seen along the HBC route, with the 28 off east Uyea and in Skuda Sound including a flock of 13 (**Figure 5.2**).

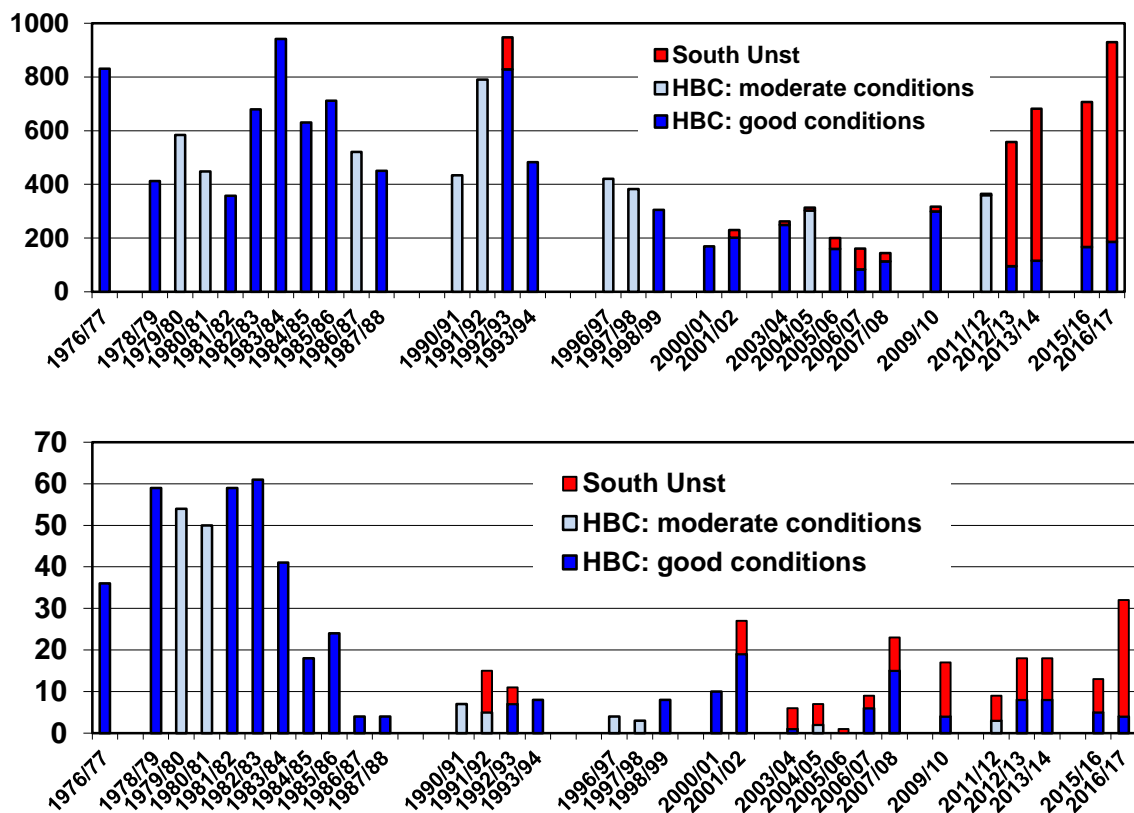
As in January 2016, Basta Voe was surveyed but little of note was seen (**Table 5.4**). However, it is interesting that, despite the extensive mussel lines in Basta Voe, **Common Eiders** in the area (probably the largest winter concentration in Shetland) appear to prefer feeding at natural sites or at salmon cages.

**Table 5.3.** Counts of seaduck and diving seabirds in Hascosay, Bluemull and Colgrave Sounds (HBC), and off South Unst. Count conditions: \*\* = moderate to good, \*\*\* = good or excellent throughout.

Winter	2006/07	2007/08	2009/10	2011/12	2012/13	2013/14	2015/16	2016/17
Date	18/2	2/12	23/12	22/1	8/2	18/2	17/1	16/2
No. observers	3	3	4	2	3	3	3	3
Count Conditions	***	***	***	**	***	**	***	***
Common Eider	1159	1241	1084	978	1458	1394	1319	1305
King Eider	0	0	0	0	0	2	0	0
Long-tailed Duck	161	144	317	365	555	720	707	930
Common Scoter	1	0	3	1	2	4	2	0
Velvet Scoter	0	0	0	0	0	1	0	0
Surf Scoter	0	0	0	0	0	0	0	1
Goldeneye	4	7	25	11	12	0	51	0
Red-breasted Merganser	15	17	13	36	26	20	33	13
Red-throated Diver	51	12	16	20	21	12	0	21
Great Northern Diver	9	23	17	9	18	18	13	32
White-billed Diver	1	0	0	0	1	0	2	1
Cormorant	263	96	90	252	243	157	261	180
Shag	1243	1496	569	554	804	306	808	637
Common Guillemot	10	3	2	2	6	13	6	8
Razorbill	2	0	0	0	1	1	0	1
Black Guillemot	359	367	506	277	885	364	451	379
Little Auk	0	0	0	0	0	0	1	0
Puffin	0	0	0	1	0	0	1	0
<b>Total</b>	<b>3278</b>	<b>3406</b>	<b>2642</b>	<b>2506</b>	<b>4032</b>	<b>2974</b>	<b>3655</b>	<b>3504</b>



**Figure 5.2.** Counts of Long-tailed Duck (upper) and Great Northern Divers (lower) along the Hascosay, Bluemull and Colgrave Sounds (HBC) survey route, and off south Unst (added to the route in 1991/92 and 1992/93, and included on every survey from 2001/02). Until 1991/92 up to three surveys were made each winter and the highest count per winter is plotted; from 1992/93 only a single count was made in any winter.



**Table 5.4.** Counts of diving seabirds and seabirds in Basta Voe, Yell. Count conditions were good or excellent throughout on all three dates.

Winter	2011/12	2015/16	2016/17
Date	22/1	17/1	16/2
No. of observers	2	3	3
Common Eider	1	0	2
Long-tailed Duck	1	0	0
Goldeneye	0	0	1
Red-breasted Merganser	33	47	7
Goosander	0	4	0
Red-throated Diver	7	6	3
Great Northern Diver	2	5	0
Cormorant	48	7	1
Shag	125	23	10
Common Guillemot	0	9	2
Razorbill	0	0	2
Black Guillemot	91	46	67
<b>Total</b>	<b>308</b>	<b>147</b>	<b>98</b>

### 5.3. Rova Head to Kirkabister, East Mainland

A survey on 7<sup>th</sup> January was in perfect conditions throughout (**Table 5.5**). Few **Common Eiders** were seen, the largest flocks being 14 at salmon cages in Lax Firth, 23 near mussel lines in Wadbister Voe, and 16 at the Sneekan rock off the Eswick coast. **Long-tailed Ducks** are benthic feeders, preferring a particular substrate and water depth, and their daytime distribution is rather predictable; small flocks were found in the usual places but the total count of 219 was the highest since December 2001 (221). The count of 181 **Red-breasted Mergansers** was also towards the higher end of the range for this area. Small numbers of **Red-throated Divers** winter along this coast, with higher counts in the second half of February (e.g. 17<sup>th</sup> February 2014) probably including some early returning migrants. This coast holds internationally important numbers of wintering **Great Northern Divers** and the count of 133 was a record for the area (**Figure 5.3**). This species can be found both close inshore in shallow water and scattered well offshore over deeper water and sea and light conditions, as well as the number of observers, play a large part detecting the latter birds. The count of 68 **Slavonian Grebes** was also a record for the area, with birds in the usual sheltered voes. Numbers of **Cormorants**, **Shags** and **Black Guillemots** were unremarkable, and only a handful of **Common Guillemots** and **Razorbills** were seen (all but one Common Guillemot were in winter plumage).

**Table 5.5.** Counts of seaduck and diving seabirds along the coast from Rova Head (north Bressay Sound) to Kirkabister (North Nesting) during winter. Count conditions: \*\*\* = good to excellent throughout.

Winter	2009/10	2010/11	2011/12	2012/13	2013/14	2015/16	2016/17	2017/18
Date	11/12	27/1	19/12	30/11	17/2	12/12	7/1	12/12
Number of observers	3	3	2	3	2	2	3	3
Count Conditions	***	***	***	***	***	***	***	***
Common Eider	204	125	126	93	59	154	77	50
Long-tailed Duck	164	98	119	134	161	121	219	189
Common Scoter	4	0	3	0	0	1	0	1
Velvet Scoter	0	0	0	0	0	0	1	0
Goldeneye	37	46	31	27	16	9	27	25
Red-breasted Merganser	117	116	181	126	101	105	181	134
Goosander	1	0	0	0	0	0	0	0
Red-throated Diver	0	5	20	10	43	11	14	19
Great Northern Diver	113	45	107	94	103	110	133	119
Red-necked Grebe	0	0	0	0	0	0	0	1
Slavonian Grebe	49	61	57	48	46	38	68	48
Cormorant	5	115	69	41	52	11	4	36
Shag	507	327	515	382	419	362	333	478
Common Guillemot	11	14	8	47	43	15	6	9
Razorbill	0	0	3	4	7	5	5	0
Black Guillemot	603	336	422	409	281	329	306	370
Little Auk	2	0	0	0	0	8	5	1
Puffin	0	0	4	0	1	1	1	1
Total	1817	1288	1665	1415	1332	1280	1380	1481

A survey on 12<sup>th</sup> December was also in excellent conditions. Slightly fewer **Common Eiders**, **Long-tailed Ducks** and **Red-breasted Mergansers** were seen than in January, while the count of **Great Northern Divers** was the second highest on record. A **Red-necked Grebe** in Es Wick was highly unusual, and numbers of **Slavonian Grebes** were similar to those in winters 2012/13 and 2013/14 (**Figure 5.3**).

This area is part of the ‘East Mainland Coast, Shetland’ Proposed Special Protection Area, with wintering numbers of Common Eider, Long-tailed Duck, Red-breasted Merganser, Great Northern Diver and Slavonian Grebe being proposed qualifying interests. Of these species, SOTEAG data suggest that only Common Eider has declined in numbers over the past 18 winters (**Figure 5.3**). Long-tailed Duck and Red-breasted Merganser numbers have fluctuated somewhat, Slavonian Grebes have certainly increased, while Great Northern Divers may have increased.

**Figure 5.3.** Counts of Common Eiders, Long-tailed Ducks, Red-breasted Mergansers, Great Northern Divers and Slavonian Grebes (overleaf) along a standard route between Rova Head and Gletness (blue; largely sheltered waters with extensive aquaculture), and between Gletness and Kirkabister (red; more exposed waters with no history of aquaculture). There were no complete surveys in winters 2004/05 and 2014/15.

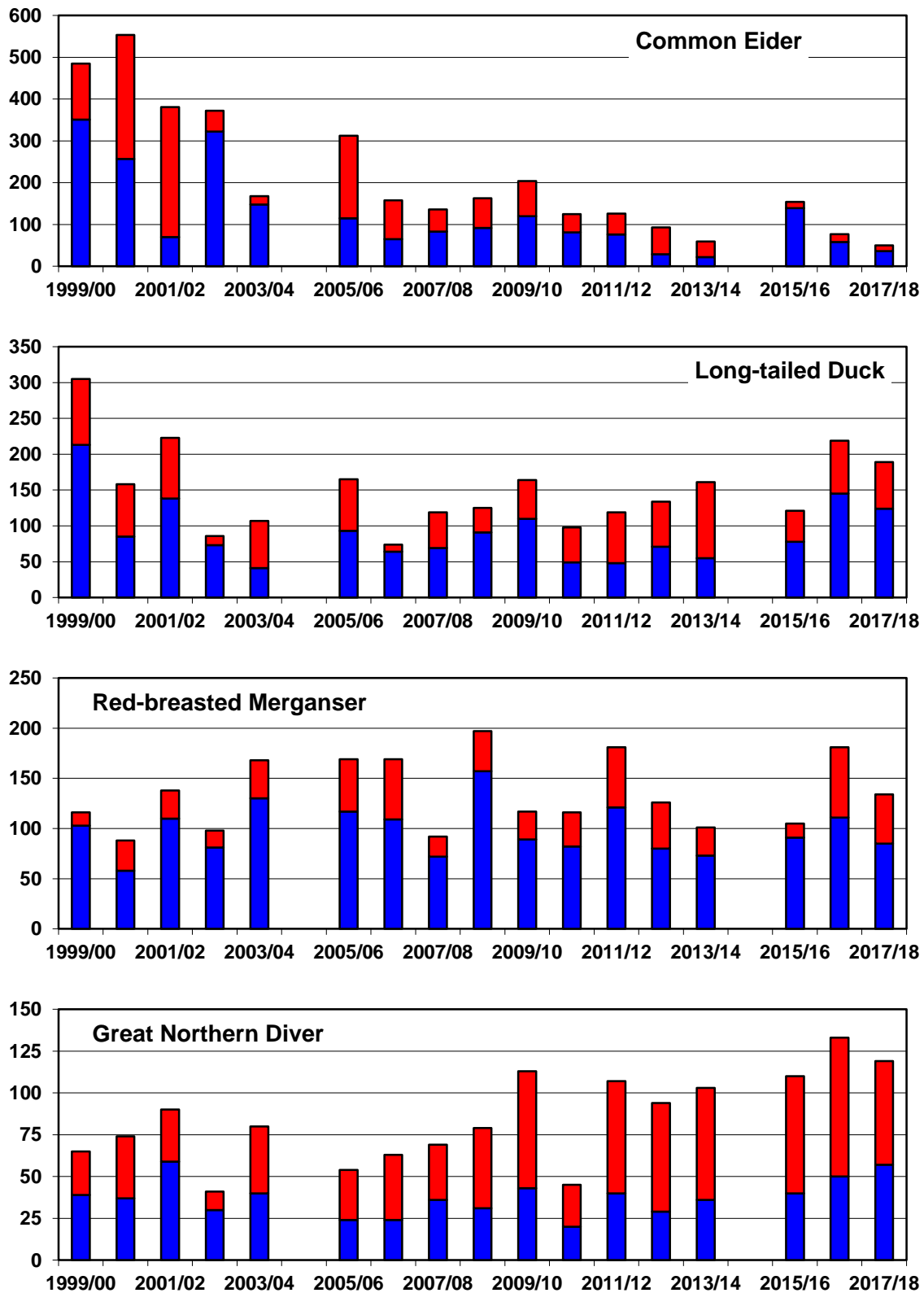
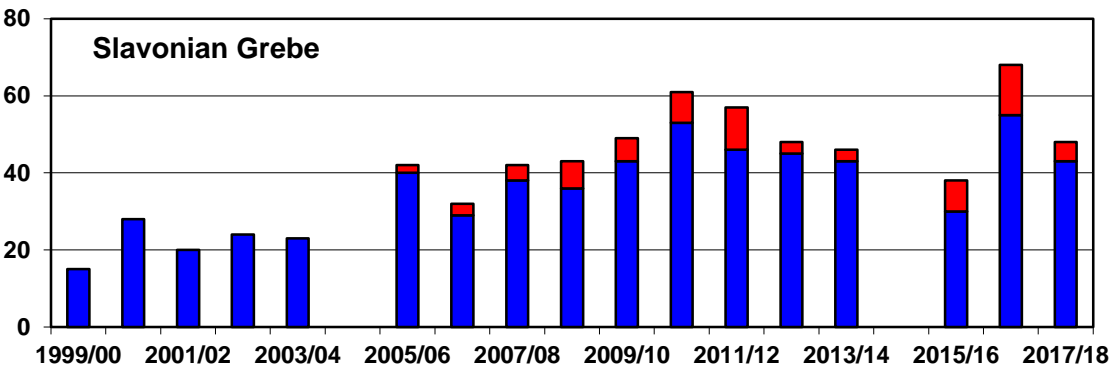


Figure 5.3 continued.



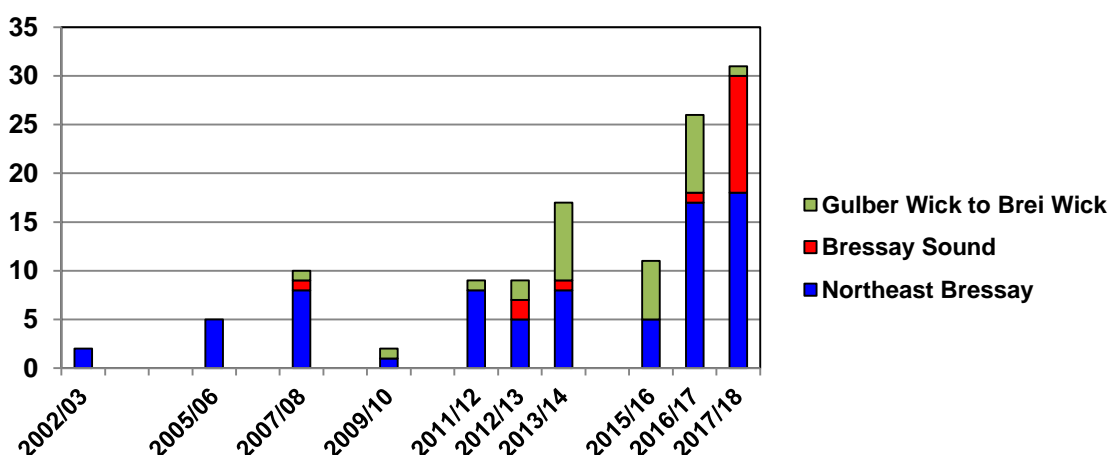
## 5.4. Bressay Sound and north Bressay

A survey on 14<sup>th</sup> December began in a SW 3 breeze but this soon dropped to calm, resulting in perfect conditions. Few **Common Eiders** were seen and the count of **Long-tailed Ducks** was the lowest on record for the area (**Table 5.6**). In contrast, the total of 31 **Great Northern Divers** included 12 in Bressay Sound itself (including a group of eight close inshore at Leira Ness) (**Figure 5.4**). The three **Slavonian Grebes** were in the usual haunt of Aith Voe, Bressay. The calm conditions allowed an extension of the normal survey route, south along the Bressay coast from Loder Head to Noss Sound, and east along the north coast of Bressay but little of note was seen and those birds are not included in **Table 5.6**.

**Table 5.6.** Counts of seaduck and diving seabirds in Bressay Sound and North Bressay. Count conditions: \*\* = moderate to good, \*\*\* = good to excellent throughout.

Winter	2007/08	2009/10	2011/12	2012/13	2013/14	2015/16	2016/17	2017/18
Date	14/11	3/2	3/2	12/12	19/2	26/2	13/12	14/12
No. of observers	3	2	2	2	2	2	2	2
Count conditions	***	**	***	**	***	***	***	***
Common Eider	249	253	223	99	150	144	109	94
Long-tailed Duck	126	82	62	84	127	78	97	31
Common Scoter	0	1	4	1	3	2	3	0
Goldeneye	0	34	1	3	2	20	2	3
Red-breasted Merganser	41	38	44	23	16	30	28	31
Red-throated Diver	1	0	11	0	9	8	3	4
Great Northern Diver	10	2	9	9	17	11	26	31
Slavonian Grebe	0	3	2	0	0	4	3	3
Cormorant	7	15	3	1	5	3	4	28
Shag	432	374	234	359	150	221	357	681
Common Guillemot	7	3	9	11	20	12	6	3
Razorbill	10	4	18	0	7	13	11	1
Black Guillemot	394	381	358	302	326	283	279	193
Little Auk	3	0	19	0	0	0	2	0
Puffin	4	0	0	0	0	1	0	0
<b>Total</b>	<b>1284</b>	<b>1191</b>	<b>998</b>	<b>892</b>	<b>887</b>	<b>830</b>	<b>930</b>	<b>1103</b>

**Figure 5.4.** Numbers and distribution of Great Northern Divers in Bressay Sound and north Bressay.



## 5.5. Pool of Virkie to Bay of Quendale, South Mainland

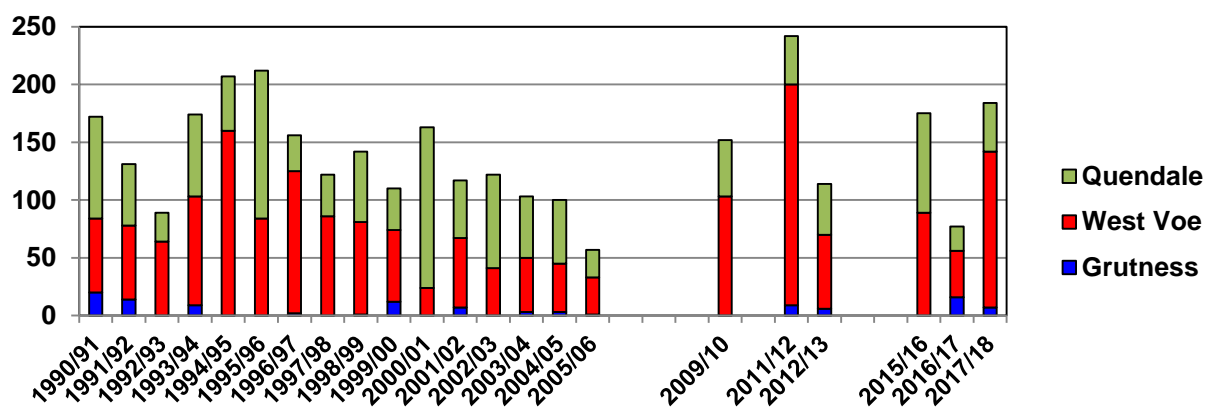
A count on 12<sup>th</sup> February was in excellent conditions, although a residual westerly swell made the sea between Garths Ness and Lady's Holm rather disturbed. Few **Long-tailed Ducks** were seen, mostly in twos and threes, whereas larger numbers had been reported earlier in the winter, e.g. 95 in West Voe of Sumburgh on 6<sup>th</sup> November 2016. (**Table 5.7**). The 13 **Great Northern Divers** in West Voe of Sumburgh were mostly feeding along Scat Ness in ones and twos. In contrast, the 41 in Bay of Quendale were mainly in socialising groups of up to 12 birds (including birds calling), mostly between Lady's Holm and Hestigott, and close inshore on the southeast coast of Garths Ness. At least three were in full wing moult (as was one in West Voe) and the high count probably reflected an early start to the usual spring build-up in the bay rather than over-wintering numbers. **Common Guillemots** were ashore at the Sumburgh Head colony at about 75% of summer numbers and those on the sea immediately below the colony were not counted.

A count on 10<sup>th</sup> December, also in excellent conditions, found more **Long-tailed Ducks** than in February, most (135) being in the West Voe of Sumburgh (**Table 5.7, Figure 5.5**). The 30 **Great Northern Divers** were split between the West Voe of Sumburgh (14) and Bay of Quendale (16). **Common Guillemots** were again attending the Sumburgh Head colony but these birds do not feed in the immediate vicinity in winter.

**Table 5.7.** Counts from land of seaduck and diving seabirds between Pool of Virkie and Bay of Quendale. Count conditions: \*\* = moderate to good, \*\*\* = good or excellent throughout.

Winter	2007/08		2009/10		2011/12	2012/13	2015/16	2016/17	2017/18
Date	12/1	19/2	13/12	10/2	30/12	9/2	12/1	12/2	10/12
Count conditions	**	***	**	***	**	**	***	***	***
Common Eider	45	59	23	43	21	9	14	7	18
Long-tailed Duck	201	93	152	121	242	114	165	77	184
Common Scoter	0	0	1	0	7	1	2	0	1
Goldeneye	32	38	7	15	38	12	12	12	0
Red-breasted Merganser	0	1	0	0	1	0	3	8	6
Red-throated Diver	10	0	10	1	10	5	1	7	1
Black-throated Diver	0	0	0	0	0	0	1	0	0
Great Northern Diver	18	27	15	30	24	43	35	54	30
Cormorant	0	3	6	2	1	2	0	2	0
Shag	76	102	418	115	119	139	132	148	119
Common Guillemot	2	0	1	4	26	79	6	3	2
Razorbill	1	2	0	0	2	2	0	1	0
Black Guillemot	34	24	4	61	29	71	45	48	63
Little Auk	0	0	0	0	1	0	0	0	1
<b>Total</b>	<b>419</b>	<b>349</b>	<b>637</b>	<b>392</b>	<b>521</b>	<b>477</b>	<b>416</b>	<b>367</b>	<b>425</b>

**Figure 5.5.** Counts from land of Long-tailed Ducks in the Pool of Virkie to Bay of Quendale survey area.



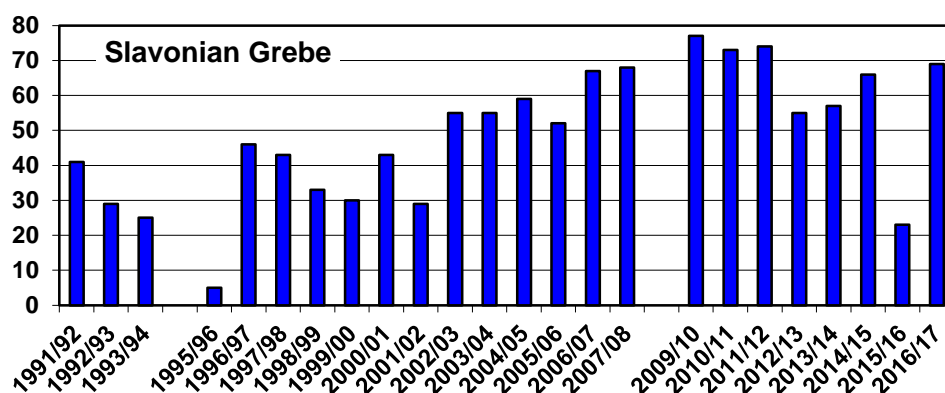
## 5.6. Whiteness Voe to Skelda Voe, West Mainland

A survey from land on 11<sup>th</sup> February was in excellent conditions, although there was extensive sea ice in The Firth at Tresta, and in some other sheltered bays. The largest group of **Common Eiders** was 43 in Whiteness Voe, while the few **Long-tailed Ducks** seen equaled the record low count in January 2016 (**Table 5.8**). Surprisingly few **Goldeneye** were seen considering that most freshwater was frozen, while the count of **Red-breasted Mergansers** was also unexceptional. There were four **Goosanders** in Weisdale Voe. **Great Northern Diver** numbers were similar to those in the previous two winters. After a low count in January 2016, the total of **Slavonian Grebes** was similar to the numbers recorded in 2009-2012, with 27 in Whiteness Voe, 11 in Weisdale Voe, 13 in Sandsound Voe (presumably having moved out of The Firth because of ice), 7 in The Firth, 3 in Sand Voe and 8 in Garderhouse Voe (**Figure 5.6**). All but one of the few **Razorbills** seen appeared healthy.

**Table 5.8.** Counts from land of diving seabirds and seaduck in the voes between Whiteness Voe and Skelda Voe. Count conditions were good to excellent throughout on each date.

Winter	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Date	12/2	25/1	23/1	13/12	7/2	15/2	12/1	11/2
Common Eider	201	169	58	317	42	134	16	94
Long-tailed Duck	46	33	36	26	23	20	12	12
Common Scoter	4	3	5	0	2	0	1	0
Velvet Scoter	0	0	1	0	0	0	0	0
Goldeneye	35	11	21	18	28	15	2	9
Red-breasted Merganser	156	83	110	156	188	109	72	96
Goosander	2	1	3	0	1	0	0	4
Smew	1	0	0	0	0	0	0	0
Red-throated Diver	0	1	1	2	3	0	2	3
Black-throated Diver	0	0	0	0	1	0	0	0
Great Northern Diver	15	26	39	17	42	25	29	27
Slavonian Grebe	77	73	74	55	57	66	23	69
Cormorant	26	14	10	17	27	8	0	7
Shag	101	103	104	145	127	128	146	99
Common Guillemot	6	0	0	0	76	1	26	1
Razorbill	0	1	0	3	11	4	4	8
Black Guillemot	57	76	76	44	106	81	61	117
Little Auk	0	0	0	0	0	0	23	0
Puffin	0	0	0	0	1	1	5	2
<b>Total</b>	<b>727</b>	<b>587</b>	<b>528</b>	<b>800</b>	<b>735</b>	<b>592</b>	<b>422</b>	<b>548</b>

**Figure 5.6.** Counts from land of Slavonian Grebes in the voes between Whiteness Voe and Skelda Voe.



## 6. Beached Bird Surveys

The Shetland-wide monthly beached bird survey has operated continuously since March 1979 and is carried out by the authors and a coordinated team of volunteers. All seabird corpses down to a single wing with all primary feathers present are identified to species, aged externally as far as possible, and examined for oil contamination. Selected samples of oiled plumage or oil residues found on beaches are sent for analysis. Following an external review, coverage of some particularly unproductive beaches was dropped in 2016, reducing the monthly distance surveyed from 49.6 km in 2015 to 32.9 km. The main recent trends have been reductions in the number of seabirds found per km surveyed, as populations of many species have declined and/or non-breeding distributions have shifted, and in the proportion of corpses oiled (**Table 6.1**).

**Table 6.1.** Summary details for the Shetland Beached Bird Survey for the 10 years to 2017. \*A reduction in coverage in 2016 means these figures are not directly comparable with earlier years.

Year	Km.	Corpses	Oiled	Total/km	% Oiled	Oiled/km.
2008	577.80	1,159	90	2.006	7.77	0.156
2009	553.90	942	40	1.701	4.25	0.072
2010	551.30	857	46	1.555	5.37	0.083
2011	577.80	935	23	1.618	2.46	0.040
2012	579.20	1031	21	1.780	2.04	0.036
2013	581.12	811	49	1.396	6.04	0.084
2014	587.52	1,152	11	1.961	0.96	0.019
2015	585.17	691	27	1.181	3.91	0.046
2016	389.42	752	35	*1.931	4.65	*0.090
<b>2017</b>	<b>387.82</b>	<b>523</b>	<b>25</b>	<b>*1.349</b>	<b>4.78</b>	<b>*0.064</b>
<b>5-Year Annual Means:</b> 1979–1983				4.064	9.98	0.408
1984–1988				3.933	7.86	0.311
1989–1993				3.990	7.19	0.285
1994–1998				4.307	9.50	0.409
1999–2003				3.171	2.39	0.073
2004–2008				2.163	2.97	0.061
2009–2013				1.610	4.04	0.063
<b>2014–2017</b>				<b>*1.606</b>	<b>3.58</b>	<b>*0.055</b>

### 6.1. Incidence of oiling

**January to April:** Two lightly oiled Fulmars on west coast beaches (Culswick and Stenness) were the only oiled seabirds found in the first three months; oil on one was heavily weathered but probably an unrefined crude of Middle Eastern origin (**Tables 6.2, 6.3**). During 15–16<sup>th</sup> April members of the public reported small quantities of oil on several beaches on Unst and in north Mainland, and a live, very heavily oiled Common Guillemot was seen in Yell Sound. Beached oil sampled at Ronas Voe on 18<sup>th</sup> April was a refined fuel oil residue, similar to that taken from a Fulmar on West Yell on 24<sup>th</sup> April, while other samples taken at the end of April suggested three different types of fuel oil contaminated seabirds during the month.

**May to August:** The eight oiled seabirds in May (**Table 6.3**) were again mainly found in northwest and north Shetland, apart from a lightly oiled Gannet at Sandwick in southeast Mainland. The Shag (at Mavis Grind) and a Fulmar at Sandvoe on 24<sup>th</sup> May were both contaminated with fuel oils, the latter sample being similar to that from West Yell on 24<sup>th</sup> April. No oiled seabirds were found on the June to August surveys.

**September to December:** A heavily oiled Common Guillemot at Ulsta in Yell Sound, the only oiled auk of the year, had been contaminated with refined fuel oil residue with no match to earlier samples. The only other oiled birds towards the end of the year were a moderately Red-throated Diver (weathered crude of Middle Eastern origin) and a lightly oiled Fulmar (fuel oil), both at Banna Minn, West Burra in November and December, respectively (**Table 6.2**).



**Table 6.2.** Results of analyses of oil samples collected in 2017. L = lightly oiled (< 10%); M = moderately oiled (10–25%); H = heavily oiled (> 25%). \*Similarities but no exact match between these samples. \*\*Match between these samples.

No.	Date	Location	Sample	Type	Possible type; source
259	26/1	Culswick, W Mainland	Fulmar L	Crude	Heavily weathered, probably crude of Middle Eastern origin
260	18/4	Blade, NW Mainland	Beached oil	Fuel* <sup>1</sup>	Illegal bilge discharge/accidental release
261	24/4	Ness of Sound, W Yell	Fulmar M	Fuel* <sup>1,2</sup>	Illegal bilge discharge/accidental release
262	25/4	Quendale, S Mainland	Gannet H	Fuel	Mix of lube oil and wax enriched heavy fuel
263	27/4	Mavis Grind, NW Mainland	Fulmar M	Fuel**	Illegal bilge discharge/accidental release
264	30/4	Banna Minn, W Burra	Gannet M	Fuel**	Illegal bilge discharge/accidental release
265	24/5	Mavis Grind, NW Mainland	Shag L	Fuel	Illegal bilge discharge/accidental release
266	24/5	Sandvoe, NW Mainland	Fulmar H	Fuel* <sup>2</sup>	Illegal bilge discharge/accidental release
267	26/9	Ulsta, S Yell	Guillemot H	Fuel	Illegal bilge discharge/accidental release
268	24/11	Banna Minn, W Burra	Red-throated Diver M	Crude	Weathered, probably crude of Middle Eastern origin
269	31/12	Banna Minn, W Burra	Fulmar L	Fuel	Illegal bilge discharge/accidental release

## 6.2. Non-oiled mortality

**January to April:** Few Shags (six first-winters/immatures, four adults, one unaged), and very few of the pelagic auk species (Common Guillemot, Razorbill, Puffin) were found dead (**Tables 6.3, 6.4**).

**May to August:** As in 2016, the summer months were notable only for the low numbers of the seabird species that breed in Shetland. A Red-throated Diver at Aswick in South Nesting in May was entangled in fishing netting, and a juvenile Red-throated Diver was found at Whiteness Voe in August.

**September to December:** There was no evidence of unusually high mortality of auks in September or October, as has happened in some years. A freshly dead Red-breasted Merganser with a neck wound that was found at Gluss Ayre in December had almost certainly been killed by an Otter. Predation by Otters of Common Eiders, Red-breasted Mergansers and Black Guillemots occurred in Sullom Voe in the mid to late 1990s, but this ceased in 1999/2000, presumably as the particular individual animal responsible died.

**Table 6.3.** Seabirds and seaduck found on beached bird surveys in 2017. For each species the first figure given each month is the total found, the second is the number that were oiled (in bold).

**Other species:** Whooper Swan 1, Greylag 19, Grey Heron 1, Oystercatcher 13, Rock Dove 8, Hooded Crow 4, Raven 4.

**Net/rope/hook tangled:** Red-throated Diver 1 (fishing net), Fulmar 1 (monofilament net).

SPECIES	J	F	M	A	M	J	J	A	S	O	N	D	SUM
Common Eider	2					1	1				2		6
Long-tailed Duck	1											1	2
Red-breasted Merganser												1	1
<b>Red-throated Diver</b>					1			1			<b>1/1</b>		<b>3/1</b>
<b>Fulmar</b>	<b>8/2</b>	4	10	<b>26/8</b>	<b>44/6</b>	36	24	51	18	4	6	<b>9/1</b>	<b>240/17</b>
<b>Gannet</b>	1	4	7	<b>4/2</b>	<b>9/1</b>	3	12	8	13	7	2		<b>70/3</b>
Cormorant		3				1							4
Shag	4	3	1	3	<b>1/1</b>	5	1	4	1	2	1	4	<b>30/1</b>
Great Skua					2	2		2			1	1	8
Black-headed Gull			1	2		1	1						5
Common Gull					2	1		1					4
Lesser Bl.-backed Gull					1								1
Herring Gull		1	1		2	3	6	2		5		3	23
Great Bl.-backed. Gull	2	2	3	5	2	4	2	7		3	2	1	33
Kittiwake	3		2	<b>5/2</b>			1	2					<b>13/2</b>
Arctic Tern						2		1					3
Common Guillemot	6	3	4	6	8	5	8	1	<b>3/1</b>		1	1	<b>46/1</b>
Razorbill			1		1		2	1					5
Black Guillemot		1			2	2	2	2	2		1		12
Puffin				2	1	3	1	6	1				14
<b>Total</b>	<b>27</b>	<b>21</b>	<b>30</b>	<b>53</b>	<b>76</b>	<b>69</b>	<b>61</b>	<b>89</b>	<b>38</b>	<b>21</b>	<b>17</b>	<b>21</b>	<b>523</b>
<b>Oiled</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>25</b>
Km. surveyed	31.9	31.9	32.9	31.4	31.9	32.5	29.5	32.9	32.9	32.8	32.9	31.8	387.82
Corpses / km.	0.85	0.66	0.91	1.69	2.38	2.12	2.07	2.70	1.15	0.64	0.52	0.66	1.349
<b>% oiled</b>	<b>7.4</b>	<b>0</b>	<b>0</b>	<b>22.6</b>	<b>10.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2.6</b>	<b>0</b>	<b>5.9</b>	<b>4.8</b>	<b>4.780</b>
<b>Oiled / km.</b>	<b>0.06</b>	<b>0</b>	<b>0</b>	<b>0.38</b>	<b>0.25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.03</b>	<b>0</b>	<b>0.03</b>	<b>0.03</b>	<b>0.064</b>
Oiled after death	0	0	0	0	1	1	0	0	0	0	0	0	2
Net/rope/hook tangled	0	1	0	0	1	0	0	0	0	0	0	0	2
Other species	4	2	4	4	3	7	11	9	4	1	0	1	50

**Table 6.4.** Age composition of Common Guillemots found on 2017 beached bird surveys. No white tips to the greater underwing coverts means birds were older than their first year, white tips means they were in their first winter year. Percentages given are of the total of aged corpses only.

Month	January		February		March		April		May		June	
Guillemot	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No white tips	3	60	3	100	2	50	3	50	6	75	5	100
White tips	2	40	0	0	2	50	3	50	2	25	0	
Unaged	1		0		0		0		0		0	
<b>Total</b>	<b>6</b>		<b>3</b>		<b>4</b>		<b>6</b>		<b>8</b>		<b>5</b>	
Month	July		August		September		October		November		December	
Guillemot	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No white tips	8	100	1	100	1	50	0		0		0	
White tips	0	0	0		1	50	0		0		1	100
Unaged	0		0		1		0		1		0	
<b>Total</b>	<b>8</b>		<b>1</b>		<b>3</b>		<b>0</b>		<b>1</b>		<b>1</b>	

## 7. Publications

**Heubeck, M.** & Parnaby, D. 2017. Shetland's Breeding Seabirds in 2015. *Shetland Bird Report* 2015: 110-124. Shetland Bird Club, Lerwick.

**Heubeck, M.** & Thomas, T. 2017. The *Torrey Canyon*: 50 years on. *British Birds* 110. 130-133.

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## Appendix 1. Seabird monitoring on Foula in 2017, conducted by Sheila Gear (Foula Ranger Service).

**Common Eider.** The count along the east coast was done on 29<sup>th</sup> July by Penny and Sheila Gear in good, sunny conditions, with a light to moderate SE breeze. Breeding appeared to have been quite late, with the first chicks seen on 20<sup>th</sup> June, and breeding success was poor.

	26/7/08	27/7/09	24/7/10	26/7/11	27/7/12	25/7/13	27/7/14	25/7/15	24/7/16	29/7/17
Males	94	110	48	74	108	94	81	33	81	45
Females	70	89	66	51	50	71	87	52	68	69
<b>Adults</b>	<b>164</b>	<b>199</b>	<b>114</b>	<b>125</b>	<b>158</b>	<b>165</b>	<b>168</b>	<b>85</b>	<b>149</b>	<b>114</b>
Chicks	25	53*	19	26	81	27	49	21	70	38
<b>Total</b>	<b>189</b>	<b>252</b>	<b>133</b>	<b>151</b>	<b>239</b>	<b>192</b>	<b>217</b>	<b>106</b>	<b>219</b>	<b>152</b>
Brood/1	8	10	8	7	7	15	5	3	14	4
Brood/2	7	12	3	6	12	3	11	2	7	6
Brood/3	1	4	0	1	8	2	6	2	7	6
Brood/4	0	1	0	1	4	0	1	2	4	1
Brood/5	0	0	1	0	2	0	0	0	1	0
<b>Mean Br.</b>	<b>1.56</b>	<b>1.85</b>	<b>1.58</b>	<b>1.73</b>	<b>2.45</b>	<b>1.35</b>	<b>2.13</b>	<b>2.33</b>	<b>2.12</b>	<b>2.38</b>

**Red-throated Diver.** Breeding pools were checked on eight dates from 17<sup>th</sup> April – 4<sup>th</sup> September. Seven of the breeding pools had Greylag geese on them at the beginning of summer and divers on five of these pools either failed to breed (2) or laid and failed (3). Eleven sites were occupied with 10 breeding attempts. Four chicks appeared to survive long enough to have fledged by 20<sup>th</sup> August and there was another late chick, hatched in August, which was last seen on 25<sup>th</sup> September and assumed to have fledged by 1<sup>st</sup> October.

<b>Foula Red-throated Divers</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Sites occupied at least once	10	12	10	13	12	13	13	12	15	11
Breeding attempts	8	11	9	11	8	12	12	12	13	10
Sites where chicks hatched	6	7	5	7	6	7	11	11	11	6
Minimum number of chicks	6	10	5	9	8	9	17	12	12	7
Chicks presumed fledged	4	9	4	5	5	4	15	10	6	5
<b>Breeding success</b>	<b>0.50</b>	<b>0.82</b>	<b>0.44</b>	<b>0.45</b>	<b>0.63</b>	<b>0.33</b>	<b>1.25</b>	<b>0.83</b>	<b>0.46</b>	<b>0.50</b>

**Northern Fulmar.** Four of the monitoring sites were picked at random, AOS were scored on 26<sup>th</sup> May, 29<sup>th</sup> May and 1<sup>st</sup> June, and chicks were counted on 20<sup>th</sup> August. Weather conditions were generally dry during incubation and hatching periods and waterlogging of nest sites was not a problem this year. However, a family party of five Ravens was seen preying eggs on a number of occasions.

<b>Plot</b>	<b>Total AOS</b>	<b>AOS on all 3 checks (%)</b>	<b>Chicks at all-3-check sites + 'extra' sites</b>	<b>Success</b>
1	95	28 (29.5%)	16 + 7	23/35 = 0.66
5	65	44 (67.7%)	24 + 4	28/48 = 0.58
6	50	27 (54.0%)	11 + 5	16/32 = 0.50
8	33	20 (60.7%)	10 + 2	12/22 = 0.55
	243	119 (49.0%)	61 + 18	79/137 = 0.58
<b>Mean ± SE of 4 plots</b>				<b>0.58 ± 0.03</b>

Breeding success was similar to that in 2016 and higher than elsewhere in Shetland (see P.5).

<b>Fulmar</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Qualifying AOS	127	111	140	119	196	135	113	123	137	119
'Extra' AOS	20	9	5	0	0	0	33	16	10	18
Chicks in August	77	51	88	57	125	96	97	45	80	79
<b>Mean success</b>	<b>0.55</b>	<b>0.45</b>	<b>0.62</b>	<b>0.48</b>	<b>0.64</b>	<b>0.73</b>	<b>0.67</b>	<b>0.33</b>	<b>0.56</b>	<b>0.58</b>

**European Shag.** Plots were checked on 14 dates, from 13<sup>th</sup> April – 2<sup>nd</sup> September. Numbers continue to decline and many former nesting areas remain deserted. Chicks were known to have hatched at 12 of the nest sites (55%) and five broods of two chicks and two broods of a single chick were judged to have fledged.

<b>Shag</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Trace nest only	3	2	1	0	4	3	0	1	1	2
Empty nest only	10	2	1	1	3	4	0	1	0	0
Incubating nests	27	44	41	27	10	4	35	29	26	22
% Incubating	67.5	91.7	95.3	96.4	58.8	36.4	100	93.5	96.3	91.7
Young fledged	7	55	56	20	5	3	66	23	19	12
<b>Fledged / inc.</b>	<b>0.26</b>	<b>1.25</b>	<b>1.37</b>	<b>0.74</b>	<b>0.50</b>	<b>0.75</b>	<b>1.89</b>	<b>0.79</b>	<b>0.73</b>	<b>0.55</b>

**Arctic Skua.** The first bird was seen ashore on 28<sup>th</sup> April but most returned very late and did not lay until June. There were 23 AOTs, one of which only had a single adult. Only 17 pairs were seen to lay. Most birds on the other territories were only seen during the first half of June and then disappeared. Mean clutch size was 1.81 eggs per pair laid. All pairs had failed by 21<sup>st</sup> June, during incubation. Most of the birds were not seen after this but occasionally two or three came ashore on fine days.

<b>Arctic Skua</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
First seen on land	21/4	24/4	26/4	22/4		3/5	29/4	26/4	26/4	28/4
AOT	41	63	50	41	37	35	24	28	27	23
Pairs laid	10	49	39	32	27	26	21	26	17	17
Mean clutch	1.71	1.43	1.73	1.63	1.58	1.77	1.70	1.62	1.47	1.81
Fledged	0	22	(1)	0	4	0	18	17	4	0
<b>Success/AOT</b>	<b>0</b>	<b>0.35</b>	<b>0.00</b>	<b>0</b>	<b>0.11</b>	<b>0</b>	<b>0.75</b>	<b>0.61</b>	<b>0.15</b>	<b>0</b>

**Great Skua.** The first bird was seen on land on 4<sup>th</sup> April but many did not come ashore until May. The sample plot in the Bitten was monitored and numbers of AOTs in the plot were the same as in 2016. Birds were very aggressive suggesting they were in good condition, although mean clutch size was only 1.69. Conspecific predation of chicks was high and only 11 chicks survived to the last week of July, at the end of ringing. Predation by adults continued and only two chicks were seen to survive to fledge, giving productivity of 0.04 fledglings per pair, the 8<sup>th</sup> successive year of low breeding success.

<b>Great Skua</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
First seen on land	4/4	10/4	6/4	2/4	28/3	10/4	10/4	3/4	2/4	4/4
AOT monitored	62	45	48	53	38	41	48	42	54	54
Mean clutch	-	1.94	1.87	1.74	1.76	1.54	1.88	1.62	1.77	1.69
Fledged (*see below)	70	65	11	14	8	3	8	3	14	2
<b>Success/AOT</b>	<b>1.13</b>	<b>1.44</b>	<b>0.23</b>	<b>0.26</b>	<b>0.21</b>	<b>0.07</b>	<b>0.17</b>	<b>0.07</b>	<b>0.26</b>	<b>0.04</b>

\*2008: 57 live chicks (marked) and 9 dead on 28/7; most chicks flying on 9/8 but a further 13 live and 4 dead unmarked found, so assume 70 fledged.

\*2009: 66 chicks marked on 24–25/7; fledglings not counted but one marked chick found dead 21/8.

\*2010: 40 chicks ringed on 21 & 26/7; 9 fledged, 2 unfledged and 35 dead on 8/8.

\*2011: 38 chicks ringed on 21 & 28/7, 3 of which predated; 11 fledged and 3 unfledged (adults defending well so assume fledged) on 14/8.

\*2012: 17 chicks ringed on 24 & 27/7; 8 fledged and 4 unfledged (these assumed didn't fledge) on 12/8.

\*2013: 16 chicks ringed between 21/7 & 8/8; 3 fledglings on 19/8.

\*2014: 14 chicks ringed on 21–22/7; 8 fledglings (including one un-ringed) on 12/8.

\*2015: 13 chicks ringed on 19 & 22/7 (2 of which predated); 3 fledglings on 15/8.

\*2016: 20 chicks ringed in late July; 14 survived to fledge.

**Common Gull.** Two pairs nested at the Groups Quarry; they failed early on, one pair relaid and failed again.

**Herring & Lesser Black-backed Gulls.** Seven pairs of Herring Gulls nested at the Swaa but only 7 chicks fledged (2 broods of single chicks, 1 brood of two chicks and 1 brood of three chicks). One pair of Lesser Black-backed Gulls was present.

**Black-legged Kittiwake.** The whole-island count was made from the sea on 27<sup>th</sup> June, the first suitable day of the season although there was still some swell and chop. The total of 256 well-built nests, in 15 sub-colonies, was slightly lower than in 2016.

<b>Black-legged Kittiwake</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Census count (AON)	nc	509	582	480	378	327	361	277	272	256
% change per year		-28.5	+14.3	-17.5	-21.3	-13.5	+10.4	-23.3	-1.8	-5.9

At In Under da Stee material was still coming down from a loose area of rock high above the site so only three checks were made; three well-built nests on 11<sup>th</sup> and 27<sup>th</sup> June were reduced to unattended traces on 2<sup>nd</sup> August. At Hodden (7 checks, 25<sup>th</sup> May – 6<sup>th</sup> August) nine chicks (1 large, 7 medium, 1 small) were present in nine nests on the penultimate check on 25<sup>th</sup> July but all had gone by 6<sup>th</sup> August; assuming the small chick died and the other eight survived to fledge would give maximum productivity of 0.35.

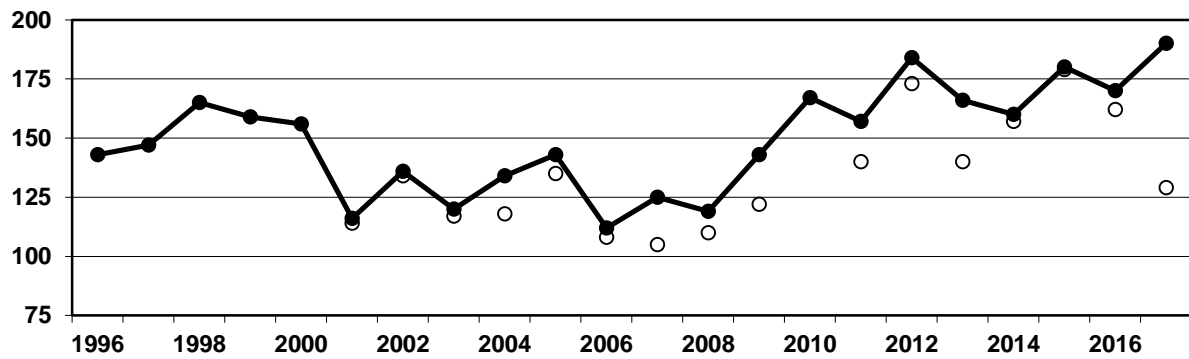
<b>In Under da Stee</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Completed nests	13	70	52	50	44	32	20	2	2	3
Fledged	0	23	3	0	0	0	0	1	1	0
Success	0	0.33	0.06	0	0	0	0	0.50	0.50	0.00
<b>Hodden</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Completed nests	2	46	31	22	20	18	18	21	20	23
Fledged	0	22	0	2	0	0	15	4	9	8
Success	0	0.48	0	0.09	0	0	0.83	0.19	0.45	0.35
<b>Mean success</b>	<b>0</b>	<b>0.41</b>	<b>0.03</b>	<b>0.05</b>	<b>0</b>	<b>0</b>	<b>0.42</b>	<b>0.35</b>	<b>0.48</b>	<b>0.18</b>

**Arctic Tern.** Arctic Terns had a very unsettled season. The first birds were seen on 14<sup>th</sup> May at the Hame Banks, early in the morning. By 21<sup>st</sup> May numbers had increased to 28 and on 8<sup>th</sup> June 56 were at the Hame Banks. On 12<sup>th</sup> June c.30 birds were near the airstrip and the first egg was seen but on 21<sup>st</sup> June the area was deserted and there were only eggshells. On 26<sup>th</sup> June c.40 terns were observed on the Cletts, north of the harbour. After this they gathered at the South Ness and by 2<sup>nd</sup> July there were c.100 there and some had laid. On 10<sup>th</sup> July they had all left the South Ness and the eggs were gone, except for one pair which had a chick, a few days old, on 25<sup>th</sup> July. This was the only chick observed this year but it was not seen to fledge. By 29<sup>th</sup> July c.450 adults were at the Hame Banks along with four fledged juveniles, presumably from colonies elsewhere.

**Black Guillemot.** The stretch of coast monitored extends from Selchie Geo (HT952412) in the northwest of the island down along the entire east coast to Husawick (HT961370) in the southwest and is covered by two observers. Conditions were difficult on the first count, on 15<sup>th</sup> April, when most birds were ashore in the northern section but flushed easily, while most birds in the southern section were already on the sea. The second count, of 190 adults on 19<sup>th</sup> April, was in more favourable conditions and was the highest yet for this coastline (**Figure 1**).

<b>Area counted</b>	<b>Date &amp; time</b>	<b>Weather &amp; tide</b>	<b>Count</b>
East coast	15/4: 7.20–9.35am	Wind N 4, sunny, some swell, chop and shore break; tide flowing	129 adults
East coast	19/4: 6.15-8.30 am	Wind S 3, sunny, tide ebbing	190 adults

**Figure 1.** Counts of adult Black Guillemots along the east coast of Foula, 1996–2017. Open symbols indicate the lower count when two were made in a year (symbols overlap in 2015).



**Atlantic Puffin.** Most pairs appeared to fail during incubation or around hatching and very few raised chicks. A transect of the colony *en route* to In Under da Stee on 11<sup>th</sup> June gave 33 apparently occupied burrows and 44 burrows showing no sign of use. Non-breeders arrived first on 12<sup>th</sup> June and returned sporadically through the summer during fine spells of weather.

## Appendix 2. Seabird ringing in Shetland in 2017.

Ringing of seabirds provides valuable information on population distributions, individual movements, longevity and causes of mortality. SOTEAG has supported seabird ringing in Shetland since 1980 by contributing to the cost of seabird rings. Annual ringing totals have fluctuated due to variation in demographic factors and the number of adults and chicks available for ringing. Over the years, ringing totals have generally decreased in Shetland though, as seabird numbers have decreased and accessible colonies have become fewer.

The total of 1,459 seabirds ringed at breeding colonies in 2017 was lower than in 2016 (2,850), largely because species productivity was lower in 2017 and fewer chicks were available. The largest differences between the 2017 and 2016 ringing totals occurred in the following species: Great Skua (287 c.f. 842), Arctic Skua (11 c.f. 47), Common Guillemot (253 c.f. 970) and Atlantic Puffin (102 c.f. 193).

**Recommendation:** SOTEAG offers reimbursement of ring costs for all species listed in Table 1, except for non-breeding European and Leach's Storm Petrels (as per existing policy). In 2017, the total reimbursement cost was £282.96, comprising £209.52 to Fair Isle Bird Observatory, £42.93 to Shetland Ringing Group, and £30.51 to the University of Glasgow, which supplied all rings used on Foula.

**Table 1.** Seabirds ringed in Shetland in 2017. FI = Fair Isle Bird Observatory; SRG = Shetland Ringing Group; FO = Foula. The unit cost of British Trust for Ornithology (BTO) rings includes manufacturing costs and administration (e.g. of recovery data from live/dead ringed birds). BTO does not charge for Guillemot and Razorbill rings. Total (a) = site totals and grand totals for numbers ringed and cost; Total (b) = age and breeding category totals. \*The cost of Red-throated Diver rings is covered by a separate SOTEAG grant to SRG.

	Chicks			Adults breeding			Adults non-breeding		Total	Unit cost £	Total cost £
Species	FI	SRG	FO	FI	SRG	FO	FI	SRG			
Eider						1			<b>1</b>	0.39	<b>0.39</b>
Red-throated Diver*		21			1				<b>22</b>	0.26	<b>5.72</b>
Northern Gannet		1			2				<b>3</b>	0.26	<b>0.78</b>
Northern Fulmar	154					44			<b>198</b>	0.23	<b>45.54</b>
European Storm Petrel		31		25			4064	559	<b>4679</b>	0.45	<b>25.20</b>
Leach's Storm Petrel							11	10	<b>21</b>	N/A	<b>N/A</b>
European Shag	3	12	8	1	1	1			<b>26</b>	0.26	<b>6.76</b>
Great Skua	225	18	44						<b>287</b>	0.39	<b>111.93</b>
Arctic Skua	1			10					<b>11</b>	0.25	<b>2.75</b>
Common Gull	2	11							<b>13</b>	0.25	<b>3.25</b>
Lesser Black-backed Gull	1								<b>1</b>	0.11	<b>0.11</b>
Herring Gull	33	28	1		1				<b>63</b>	0.11	<b>6.93</b>
Great Black-backed Gull			1						<b>1</b>	0.39	<b>0.39</b>
Arctic Tern	364	3							<b>367</b>	0.13	<b>47.71</b>
Common Guillemot	1	196		13	3	40			<b>253</b>	Free	-
Razorbill	34			11		10			<b>55</b>	Free	-
Atlantic Puffin	48			31	23				<b>102</b>	0.25	<b>25.5</b>
<b>Total (a)</b>	<b>866</b>	<b>321</b>	<b>54</b>	<b>91</b>	<b>31</b>	<b>96</b>	<b>4075</b>	<b>569</b>	<b>6103</b>		<b>282.96</b>
<b>Total (b)</b>	<b>1241</b>			<b>218</b>			<b>4644</b>				



### Appendix 3. Census counts of cliff-nesting seabirds in June, 2015–17.

Limited progress was made in 2017. The coast from Brae to West Burrafirth, including the islands of Linga, Papa Little and Vementry was surveyed from the SOTEAG RIB on 5<sup>th</sup> June but unfortunately both engine shafts were damaged which put the boat out of action for the rest of the month. A count from land of Sumburgh Head on 10<sup>th</sup> June was followed up by a Zodiac survey on 14<sup>th</sup> June of those sections invisible from the clifftop, as well as a count of Compass Head. On the same day Shetland Amenity Trust staff surveyed the Scalloway islands using a chartered RIB. The same RIB was used to survey the coast between Lerwick and Kirkabister, North Nesting, on 16<sup>th</sup> June. Finally, an aluminium workboat was chartered on 20<sup>th</sup> June to survey the east Yell coast from Cullivoe south to the Horse of Burravoe, including the islands of Linga and Hascosay.

**Figure 1.** Census coverage of the Shetland coast achieved in 2015–17 by SOTEAG, SNH and Shetland Amenity Trust.

