



SOTEAG



Ornithological monitoring programme
in Shetland

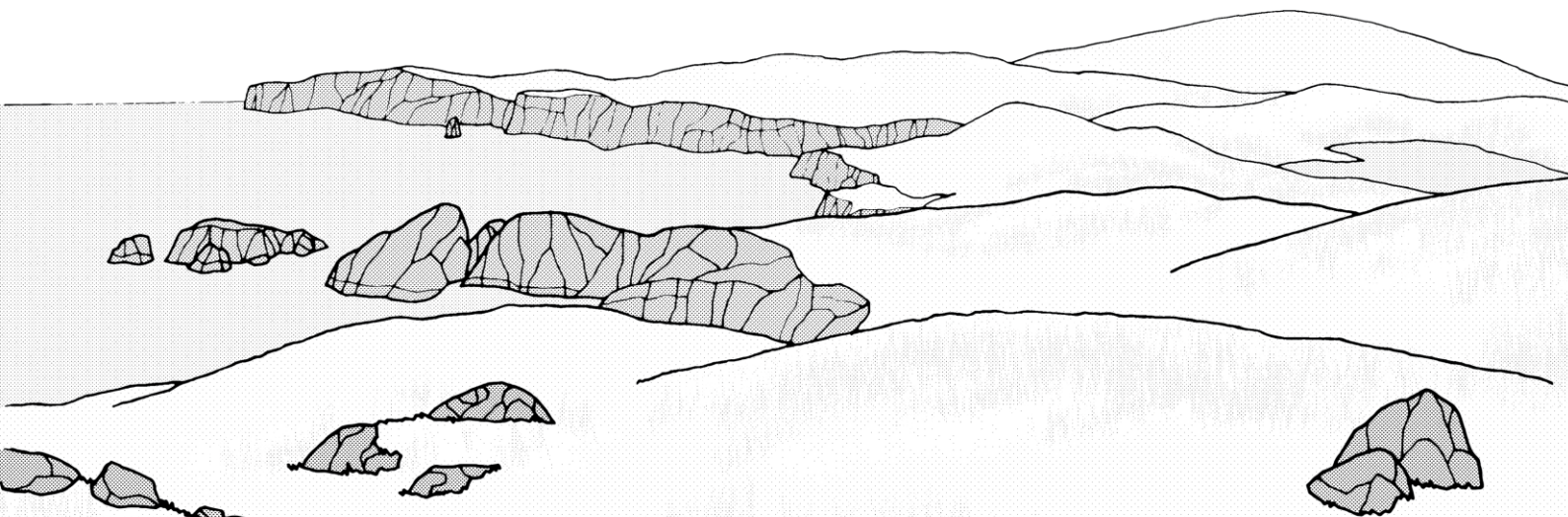
2019



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

by

University of St Andrews



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SOTEAG ORNITHOLOGICAL MONITORING PROGRAMME

2019 REPORT

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2019 Executive Summary

1. Monitoring of cliff-nesting seabirds

Northern Fulmar *Fulmarus glacialis*. Population counts (AOS) were very similar to those in 2018. Mean breeding success across the four monitored sites was also similar to last year (0.38 chicks fledged per AOS in 2019, 0.40 in 2018).

European Shag *Phalacrocorax aristotelis*. It was an unusually productive season in south Mainland Shetland, with population counts (nests) at Sumburgh Head and No Ness up by 28.9% and 50.6%, respectively, since 2018 and breeding success at Sumburgh Head 1.54 chicks fledged per incubated nest, up from 1.07 in 2018. At Burravoe, in Yell, breeding success was 1.08 chicks fledged per incubated nest, down from 1.55 in 2018.

Black-legged Kittiwake *Rissa tridactyla*. The population count at Compass Head was 35 nests, down by 22% since 2018. Population changes along the new monitoring transects, first surveyed in 2018, were variable, with increases of 3.2% and 7.7% at the Fetlar and the southeast Mainland transects but a decrease of 14.8% at the southeast Yell transect. Mean breeding success across five monitored sites was 0.63 chicks fledged per laying pair, down from 0.95 in 2018.

Common Guillemot *Uria aalge*. The mean population index was 47.1, slightly lower than in 2018 (49.8). Breeding success at Sumburgh Head was 0.76 chicks fledged per apparently incubating pair, the fourth highest record since 1989 and up by 40.7% since 2018. Chick diet was 93% gadids and 6% sandeels.

Razorbill *Alca torda*. The mean population index was 40.7, the second highest record since 2006 and only slightly lower than the value of 41.7 in 2018. Breeding success at Sumburgh Head was 0.64 chicks fledged per laying pair, the joint-highest value on record (with 2016) and up by 39.1% from 2018.

2. Pre-breeding season population counts of Black Guillemots *Cephus grille*. Changes in population counts (individuals in full breeding plumage) since the most recent previous surveys were variable across the standard monitoring sites, though the long-term pattern at most is population stability. A survey of the Sullom Voe Terminal jetties recorded 78 birds in full breeding plumage, compared with 88 in 2018.

3. Monitoring of breeding Red-throated Divers *Gavia stellata*. As is normal in years with a Shetland-wide population census of moulting Common Eiders, the Red-throated Diver monitoring was omitted in 2019.

4. Shetland-wide population census of moulting Common Eiders *Somateria mollissima*. The total census count was 3639 birds, down by 20.9% since 2015 (the most recent previous census). The 2019 census total extends the general pattern of long-term decrease in moulting Common Eider numbers across Shetland since 1997. The estimated total proportional decrease in numbers from 1997 to 2019 was -58.6%.

5. Winter counts of seaduck and diving seabirds. Six of the seven standard monitoring transects were surveyed in January and February 2019, and two of the seven in December 2019. Counts were within the normal range. In most of the survey areas, there has been a long-term pattern of decrease in numbers of Common Eiders in winter, in agreement with the general long-term pattern of decrease in numbers in late summer across Shetland.

6. Beached Bird Surveys. Unusually little oil was found in 2019, it was an exceptionally clean year on the surveyed beaches. Only five oiled seabirds were found. Three were sampled and the oil analysed, with two samples identified as fuel oil and the other crude oil, with similarities to crude oils from the East Shetland Basin but not an exact match. All samples likely originated from accidental release or illegal discharge. There were no incidences of oiling in September through to the end of the year, or 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 2019.

1. Monitoring of cliff-nesting seabirds

1.1. Weather during the 2019 seabird breeding season

There were prolonged periods of strong easterly winds and heavy sea swells throughout April. This limited the number of days when Black Guillemot population counts could be made. Conditions in May were far more favorable, being generally calm, dry and clear, and had little impact on fieldwork. June was dominated by strong winds, heavy sea swells, rain and fog. Conditions were particularly challenging during the first three weeks of the month. All fieldwork had to be carefully slotted into calmer breaks in the weather, with surveys by boat only possible during the last week of June. July was equally challenging, due to many days of either heavy rain or thick fog. By contrast, the first half of August was mostly calm and dry. However, the second half of August was very windy, with long periods of heavy sea swells, which limited the number of days on which Eider counts were possible for the Shetland-wide census.

Table 1.1. Summary of conditions for population plot counts of Northern Fulmars, Common Guillemots and Razorbills at the four monitored sites in 2019, including observer, date, time, wind (direction and force), general sea state and cloud conditions (0–8 cloud coverage score).

Sumburgh Head	Observer: Will Miles			
Date	Time (BST)	Wind	Sea state	Cloud cover
5 th June 2019	1300–1500	N 4	Rough, heavy swell	8/8
7 th June 2019	1140–1315	S 1	Calm	0/8
10 th June 2019	1100–1230	NW 2	Calm	7/8
16 th June 2019	1530–1650	SE 3	Moderate swell	1/8
19 th June 2019	1200–1400	S 2	Moderate swell	2/8
Troswick Ness	Observer: Will Miles			
Date	Time (BST)	Wind	Sea state	Cloud cover
5 th June 2019	1015–1145	NNE 4	Rough, heavy swell	8/8
7 th June 2019	0900–1015	SE 0–2	Calm	8/8
10 th June 2019	0830–0930	NW 3	Calm	8/8
16 th June 2019	1230–1340	SE 4	Rough, heavy swell	8/8
19 th June 2019	0930–1045	S 1	Moderate swell	2/8
Esha Ness	Observer: Mick Mellor			
Date	Time (BST)	Wind	Sea state	Cloud cover
5 th June 2019	1150–1255	N 3–4	Heavy swell	8/8
7 th June 2019	1245–1400	S 4–5	Moderate swell	4/8
10 th June 2019	1130–1300	W 4	Moderate swell	8/8
16 th June 2019	0900–1000	ESE 3	Light swell	8/8
19 th June 2019	1200–1300	S 3	Moderate swell	4/8
Burravoe, Yell	Observer: Mick Mellor			
Date	Time (BST)	Wind	Sea state	Cloud cover
5 th June 2019	0900–0930	NE 3–4	Light swell	8/8
7 th June 2019	0940–1030	S 4–5	Calm	1/8
10 th June 2019	0845–0945	W 3	Calm	8/8
16 th June 2019	1330–1400	SE 3	Light swell	8/8
19 th June 2019	0915–1000	S 2	Light swell	6/8

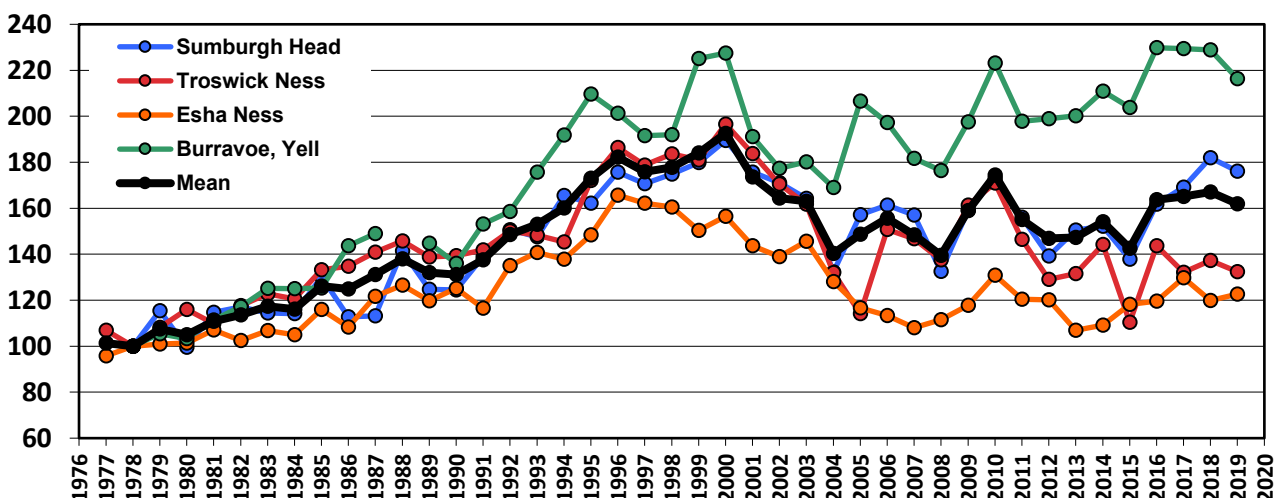
1.2a. Northern Fulmar *Fulmarus glacialis*: population counts

Population counts at the four monitored sites in 2019 were very similar to those in 2018 (**Table 1.2**). The mean population index was 161.9 in 2019 compared to 167.0 in 2018, equating to a small decrease of -3.1% (**Figure 1.1**). At Esha Ness, the mean count of individuals had increased by 10.7% since 2018, but this was the only instance where an interannual change of more than 10% was recorded (**Table 1.2**). The size of the monitored population at each site has generally remained stable for the last 15 years, except at Sumburgh Head where there has been a slight increase (**Figure 1.1**). The general long-term changes shown by the mean population index have been an increase between 1977 and 2000, a decrease between 2000 and 2004, but population stability thereafter (**Figure 1.1**). In comparison with the other monitored cliff-nesting species, numbers of Fulmars are high at all the monitored sites (mean individuals and AOS >200 at all sites).

Table 1.2. Fulmar population summary statistics for counts of individual birds (Individuals) and apparently occupied nest sites (AOS) at four monitoring sites, 2018–19: total counts (n), range, mean, standard deviation (SD), coefficient of variation (CV), % change since 2018 (% ch.) and population index for AOS where 1978 = 100 (Index).

Colony	Unit	Year	n	Range	Mean	SD	CV	% ch.	Index
Sumburgh Head	Individuals	2018	5	279–360	310.4	30.36	0.09		
		2019	5	296–329	314.8	13.37	0.04	+1.4	
	AOS	2018	5	252–295	267.0	16.46	0.06		182.0
		2019	5	243–280	258.4	14.81	0.06	–3.2	176.1
Troswick Ness	Individuals	2018	5	919–1075	1017.4	60.7	0.06		
		2019	5	897–1125	1000.2	102.4	0.10	–1.7	
	AOS	2018	5	795–898	847.4	46.69	0.06		137.2
		2019	5	765–893	817.2	54.22	0.07	–3.6	132.3
Esha Ness	Individuals	2018	5	288–407	354.8	42.8	0.12		
		2019	5	352–454	392.6	39.3	0.10	+10.7	
	AOS	2018	5	257–314	288.4	21.05	0.07		119.9
		2019	5	270–315	295.0	16.48	0.06	+2.3	122.7
Burravoe	Individuals	2018	5	252–272	259.6	7.83	0.03		
		2019	5	218–281	245.2	22.72	0.09	–5.5	
	AOS	2018	5	199–221	213.2	8.37	0.04		228.9
		2019	5	186–225	201.4	18.34	0.09	–5.5	216.3

Figure 1.1. Annual population index (1978 = 100) of Fulmar apparently occupied sites (AOS) at the four monitored sites and the mean index for the four sites, 1977–2019.



1.2b. Northern Fulmar *Fulmarus glacialis*: breeding success

In 2012 the ‘marked photograph’ method (here termed ‘method a’) was adopted by SOTEAG so that the same monitoring methodology was used throughout Shetland and elsewhere (Walsh *et al.* 1995). Previously, since 1985, breeding success had 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 (‘method b’). Both methods are now used.

Mean breeding success had changed little since 2018 (**Figure 1.2**). In 2019 it was 0.50 using method a (0.56 in 2018) and 0.38 using method b (0.40 in 2018) and variation around the mean was low for each method (**Figure 1.2, Table 1.3**). As is usual for method a, there were a few sites where chicks were recorded but where there had not been an AOS recorded on all three early-season checks (**Table 1.3**). The long-term general pattern of Fulmar breeding success has been a decrease from 1985 to 2008, a marked increase from 2008 to 2009, but since then general stability, although with high annual variation (**Figure 1.2**). Across the four monitored sites in 2019, method a breeding success was highest at Burravoe (0.57) and lowest at Troswick Ness (0.43), while method b breeding success was highest at Sumburgh Head (0.45) and lowest at Troswick Ness (0.31; **Table 1.3**).

Figure 1.2. Mean Fulmar breeding success (\pm SE) at 3–4 monitored sites, 1985–2019 (Burravoe, the fourth site, only from 2003), calculated as the number of chicks present in mid-August divided by the mean of five counts of apparently occupied nest sites (AOS) in June (‘method a’, black), and by the number of nest sites recorded as AOS on each of three dates in early May and early June (‘method b’, red).

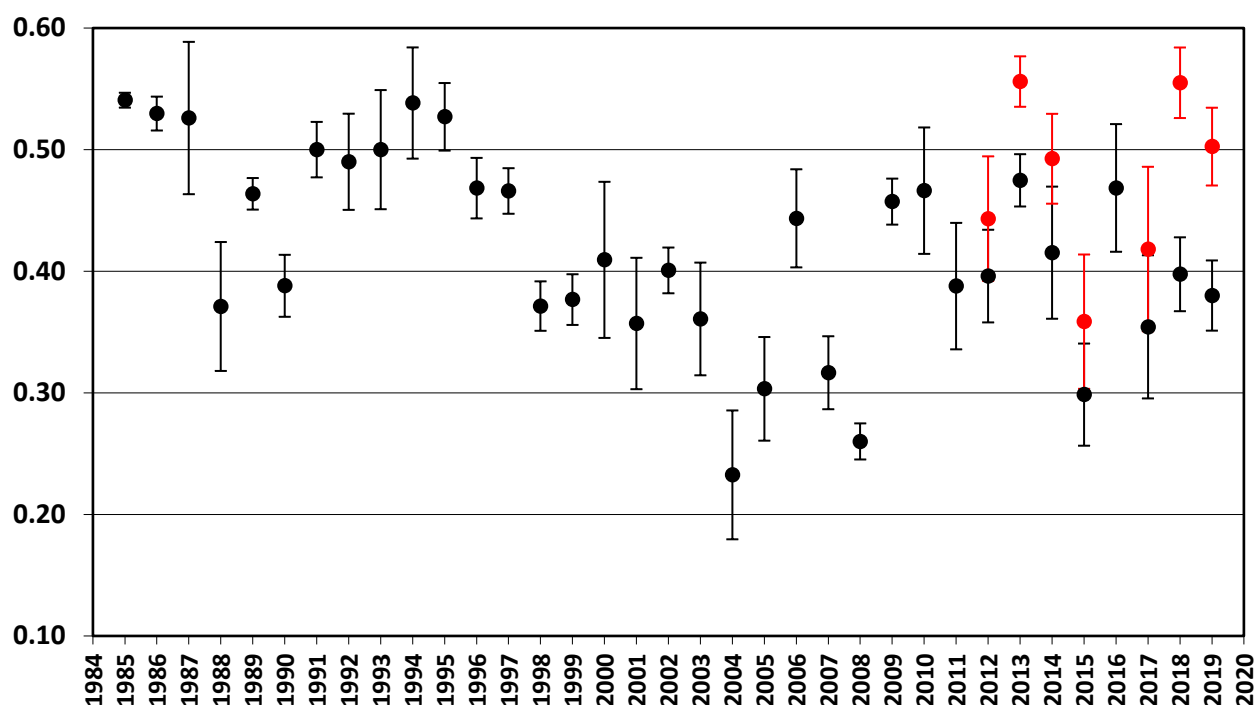


Table 1.3. Fulmar breeding success summary statistics for four monitoring sites, 2019: the dates of visits to the monitoring plots, the total number of nest sites recorded as an AOS on one or more of three checks in May/June (AOS), the number of nest sites recorded as an AOS on all three checks in May/June (AOSx3), the mean of the five Fulmar population monitoring counts of AOS (Mean), the number of nest sites where chicks were present in mid-August (Chicks), the number of nest sites at which chicks were present but where an AOS was recorded on only one, two or none of the May/June checks (Extra), and breeding success \pm SE calculated using the marked photograph method (Success A = Chicks/[AOSx3+Extra]) and the population count method (Success B = Chicks/Mean; with 2018 figures in brackets).

Sumburgh Head: 5th June, 7th June, 10th June, 13th August							
Plot	AOS	AOSx3	Mean	Chicks	Extra	Success A	Success B (2018)
Greystane Geo	38	24	33.2	14	1	0.56	0.42 (0.35)
Geo of Toun South	199	150	172.0	85	6	0.54	0.49 (0.55)
Geo of Parks North	53	41	50.6	22	2	0.51	0.43 (0.35)
Sum	290	215	255.8	121	9	0.54	0.47 (0.49)
Mean						0.54	0.45 (0.42)
\pm SE						0.01	0.02 (0.06)
Troswick Ness: 5th June, 7th June, 10th June, 12th August							
Plot	AOS	AOSx3	Mean	Chicks	Extra	Success A	Success B (2018)
Brei Geo	365	256	340.8	116	16	0.43	0.34 (0.36)
Sandvis Geo			476.4	138			0.29 (0.26)
Sum			817.2	254			0.31 (0.29)
Mean							0.31 (0.31)
\pm SE							0.01 (0.05)
Esha Ness: 5th June, 7th June, 10th June, 12th August							
Plot	AOS	AOSx3	Mean	Chicks	Extra	Success A	Success B (2018)
Calders Geo	243	152	192.8	73	5	0.46	0.38 (0.54)
Main Colony	39	25	33.4	16	0	0.64	0.48 (0.39)
Fulmar Geo	72	46	57.6	14	0	0.30	0.24 (0.44)
Sum	354	223	283.8	103	5	0.45	0.36 (0.51)
Mean						0.47	0.37 (0.45)
\pm SE						0.10	0.07 (0.04)
Burravoe: 5th June, 7th June, 10th June, 12th August							
Plot	AOS	AOSx3	Mean	Chicks	Extra	Success A	Success B (2018)
	238	137	201.4	78	0	0.57	0.39 (0.41)

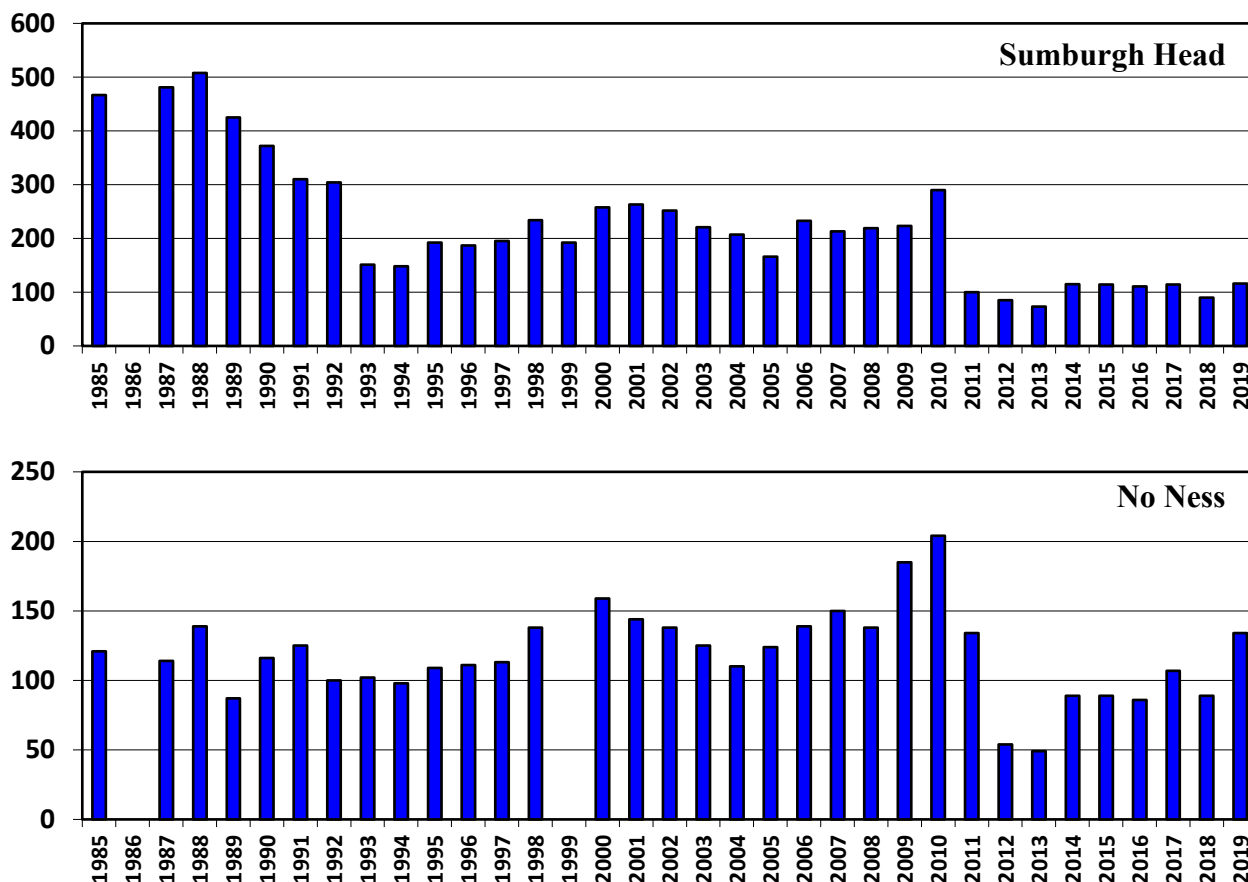
1.3a. European Shag *Phalacrocorax aristotelis*: population counts

The number of Shag nests counted from land at Sumburgh Head was 116 and at No Ness was 134, an increase since 2018 of 28.9% and 50.6%, respectively (**Table 1.4**). The 2019 counts continue a trend since 2012 of low but stable numbers at Sumburgh but gradually increasing numbers at No Ness (**Figure 1.3**). Following the *Braer* oil spill in January 1993, the number of nests at Sumburgh decreased by 50%, but there was no similarly timed decrease at No Ness (**Figure 1.3**). Currently, breeding numbers at Sumburgh are c.75% lower than in the late 1980s (**Figure 1.3**). The timing of Shag nesting is often highly asynchronous, so not all nesting attempts in a season will be captured by a single count of nests, since some nests may fail and disintegrate prior to the count date and some may be built subsequently. However, observations from the Shag breeding success plots are a useful guide as to when the highest number of active nests occurs each season. Since 2014, timing of the population counts has coincided with a high proportion of active nests (>82%).

Table 1.4. Counts of Shag nests at Sumburgh Head and No Ness, 2007–2019, including the grand total (in bold = all active, empty and trace nests), the percentage of nests which were active, and the count date. These two colonies are counted annually from land. When more than one count from land was made in a year the highest nest total is given (*).

Coastline	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sumburgh Head	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	90 83% 8/6	116 97% 8/6
No Ness	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	89 82% 7/6	134 94% 9/6

Figure 1.3. Counts from land of Shag nests at Sumburgh Head and No Ness, 1985–2019.



In 2018, two transects of coastline with relatively large numbers of breeding Shags were surveyed by boat, as a pilot survey to determine whether they could be added to the existing regularly monitored sites for annual Shag population monitoring (Miles & Mellor 2018). To maximise data-return from survey days in the boat, which can be irregular because of poor weather, the transects selected for this work were the same as those used for pilot Kittiwake population monitoring in 2018. The work proved feasible and useful for monitoring both species and has been added to the annual monitoring program. It became obvious, however, that for practical purposes (counting time required) it was necessary to treat the survey areas as three transects rather than two, namely: 1) southeast Mainland, 2) southeast Yell and 3) Fetlar (**Figure 1.4**).

Each transect is surveyed once by boat during the peak incubation period (judged from breeding success monitoring) and all visible fully built Shag nests (total AON) are counted and mapped. In 2018, logistical difficulties resulted in an inaccurate initial count of the southeast Yell and Fetlar transects. These areas were counted accurately in 2019, providing the baseline data for future counts.

The Fetlar transect was surveyed on 27th June 2019 and a total of 229 AON recorded. The southeast Yell transect was surveyed on 28th June, with a total of 177 AON. The southeast Mainland transect was surveyed on 28th June and a total of 276 AON was recorded, an increase of 17.4% since 2018, when the total was 235 AON.

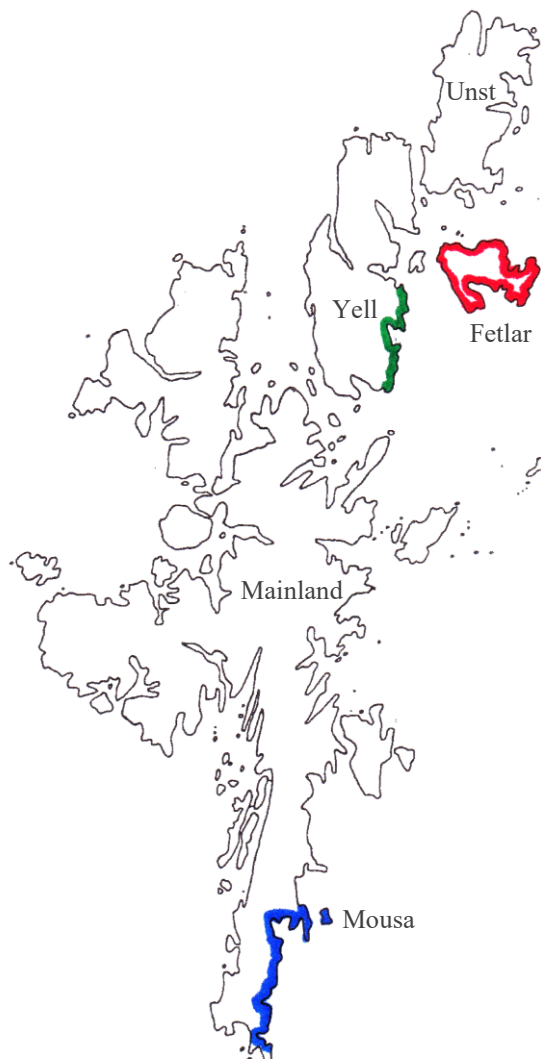


Figure 1.4. Location of the three Shag and Kittiwake annual population monitoring transects. The southeast Mainland transect (blue) begins in the south at The Slithers (OS grid reference: HU407092) and ends further north at the Taing of Sandsayre (HU437251), but also includes the entire coastline of Mousa. The southeast Yell transect (green) begins in the south east corner of Yell at Ladies Hole (HU531801) and ends on Yell further north, at the Wick of Vatsetter (HU535896). The Fetlar transect (red) comprises the entire coastline of Fetlar.

1.3b. European Shag *Phalacrocorax aristotelis*: breeding success

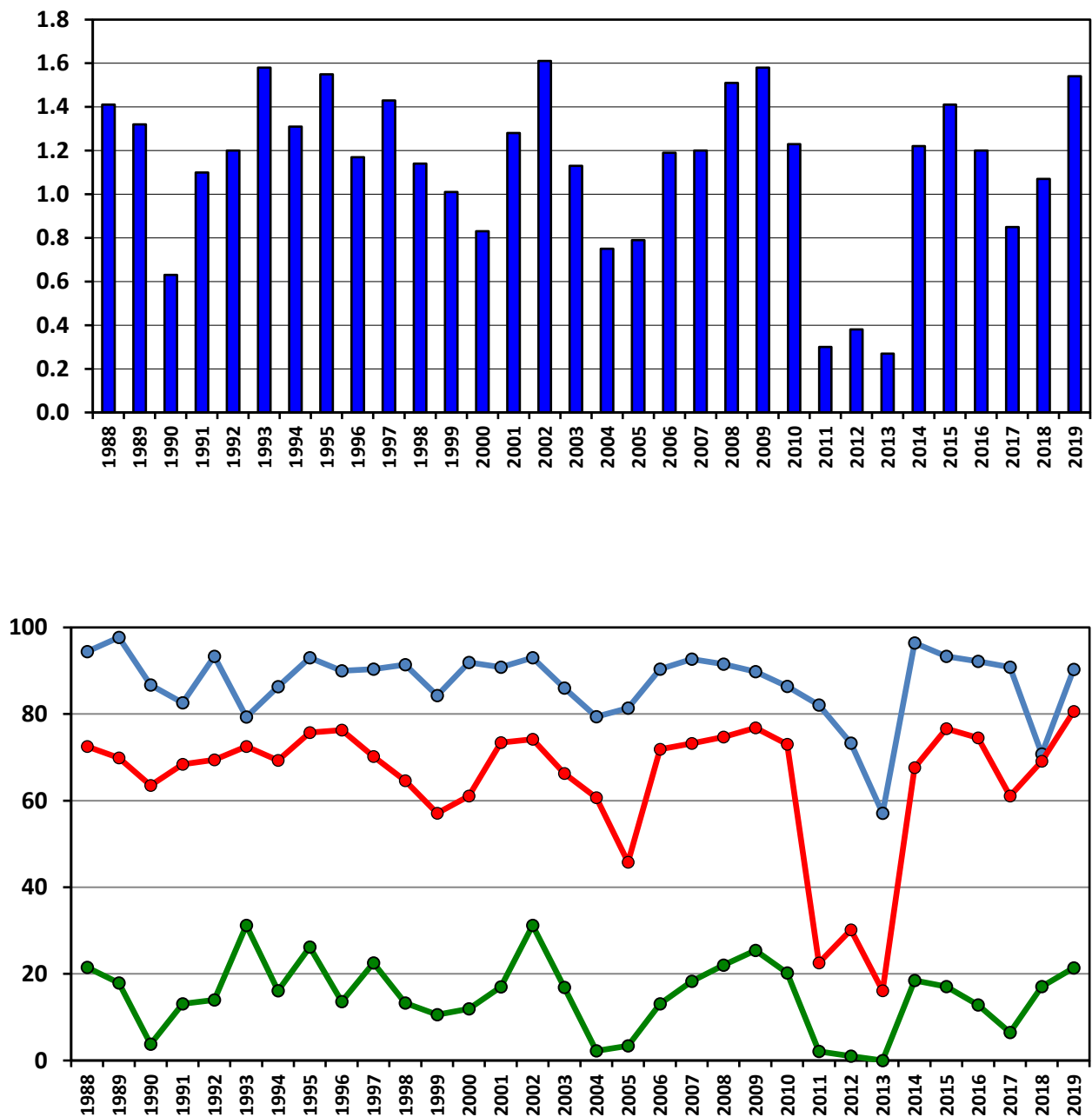
Shag breeding success was monitored at the usual plots at Sumburgh Head (28 checks, 25th March–30th September) and Burravoe on Yell (30 checks, 1st April–28th September). At Sumburgh, breeding success was 1.54 chicks fledged per incubated nest in 2019, the fifth highest measure on record and 43.9% higher than in 2018, when breeding success was 1.07 (**Table 1.5, Figure 1.5**). At Burravoe, breeding success was 1.08 chicks fledged per incubated nest and lower than in 2018 (**Table 1.5**). A comparatively high proportion of the incubated nests at Sumburgh progressed to hatch (80.6%), mean brood size was unusually high (2.06) and there was a high proportion of fledged broods of three chicks in 2019 (21.4%), indicating that food availability during the incubation and chick-rearing periods was not greatly constrained this year (**Table 1.5, Figure 1.5**). It is difficult to explain the difference in fortunes between the two monitored sites, but it is possible that breeding success at Burravoe in 2019 was constrained by a pair of Ravens nesting at the site, that were seen to have eaten Shag's eggs.

Table 1.5. Shag breeding success summary statistics at Sumburgh Head and Burravoe, Yell, 2012–19: the total number of trace nests (Tr), well-built but empty nests (AON) and incubated nests (Inc), the percentage of all nests which progressed to incubation (% Inc.), the percentage of incubated nests at which chicks were recorded (% H), the percentage of incubated nests from which no chicks fledged (0 Fl), the number of chicks fledged (Ch), mean brood size at fledging (Brood), and sum breeding success (SBS [=Ch/Inc]).

Sumburgh Head									
Year	Tr	AON	Inc	% Inc	% H	0 Fl	Ch	Brood	SBS
2012	21	14	96	73.3	30.2	76.0	36	1.57	0.38
2013	15	27	56	57.1	16.1	83.9	15	1.67	0.27
2014	2	2	108	96.4	67.6	36.1	132	1.91	1.22
2015	5	3	111	93.3	76.6	28.8	157	1.99	1.41
2016	2	6	94	92.2	74.5	36.2	113	1.88	1.20
2017	6	5	108	90.8	61.1	50.9	92	1.74	0.85
2018	11	17	68	70.8	69.1	38.2	73	1.78	1.07
2019	3	8	103	90.3	80.6	25.2	159	2.06	1.54

Burravoe									
Year	Tr.	AON	Inc.	% Inc.	% H.	Fl. 0	Ch.	Brood	SBS
2012	6	2	36	81.8	52.8	50.0	26	1.44	0.72
2013	2	1	39	92.9	64.1	46.2	36	1.71	0.92
2014	4	2	27	81.8	81.5	25.9	42	2.10	1.56
2015	2	0	35	94.6	54.3	51.4	28	1.65	0.80
2016	3	0	22	88.0	72.7	31.8	31	2.07	1.41
2017	2	2	26	86.7	69.2	38.5	33	2.06	1.27
2018	2	2	20	83.3	60.0	40.0	31	2.58	1.55
2019	2	2	39	90.7	61.5	43.6	42	1.91	1.08

Figure 1.5. Shag breeding parameters at Sumburgh Head, 1988–2019. **Upper:** Breeding success (chicks fledged per incubated nest). **Lower:** The percentage of nests that progressed to incubation (blue), incubating nests where chicks were recorded (red) and laying pairs that fledged a brood of three chicks (green).



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

Kittiwake nests at Compass Head were counted from the sea on 28th June 2019. The count total was 35 nests whereas in 2018 it was 45 (22% decrease; **Table 1.6**). Due to poor weather and sea conditions the 2019 survey was done at the end of June. Surveying in mid-June might have resulted in a few more nests being present, although the Kittiwake breeding success monitoring at Sumburgh suggested a high proportion of nests were still active at the end of the month. The Compass Head Kittiwake colony has substantially decreased since 1981 and the last four annual counts have each produced the lowest nest total on record (**Table 1.6**).

Table 1.6. Counts of Kittiwake nests (total of all incubating, empty and trace nests) at Compass Head in 1981 (baseline count) and from 2010-2019. All counts were made from the sea.

	1981		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Compass Head	464		163			90	109		65	46	45	35

The three survey transects that are now used for annual Shag population monitoring (see information and location map on p.8) are also now used for annual Kittiwake population monitoring. Each transect is surveyed once by boat during the peak incubation period (judged from breeding success monitoring) and all visible fully built Kittiwake nests (total AON) are counted and mapped. Surveys began in 2018 (Miles & Mellor 2018).

In 2019, the Fetlar transect was surveyed on 27th June and a total of 64 AON counted, an increase of 3.2% since 2018, when the total was 62 AON. The southeast Yell transect was surveyed on 28th June and the total was 75 AON, down by 14.8% since 2018, when there were 88 AON. The southeast Mainland transect was surveyed on 28th June and there was a total of 210 AON, up by 7.7% since 2018, when the total count was 195 AON.

Overall, from 2018 to 2019 Kittiwake population size decreased by over 10% at two of the monitored sites (Compass Head and the southeast Yell transect), while at the other two sites it slightly increased but by less than 10% (the southeast Mainland and Fetlar transects).

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

Five sites were monitored in 2019 compared with six in 2018 since the St Ninian's Isle monitoring site had been entirely abandoned (no adults were seen there in 2019; **Table 1.7**). Mean breeding success from the other sites in 2019 was 0.63 chicks fledged per apparently laying pair, a decrease of 33.7% since 2018, when mean breeding success was 0.95 (**Figure 1.6**). Breeding success across the monitored sites was highly variable in 2019 (Standard Error of the mean = 0.22), with the highest value recorded at No Ness (1.14) and lowest (zero) at Esha Ness (**Table 1.7**).

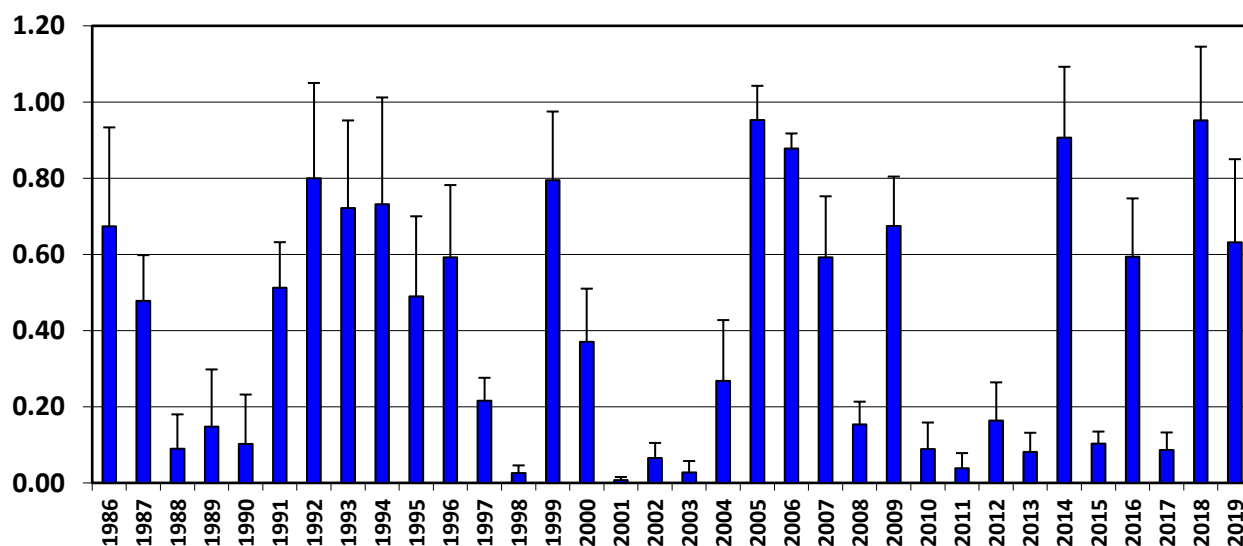
Table 1.7. Kittiwake breeding success summary statistics for six monitoring sites, 2010–19: the number of nests (Total nests [= full nests + trace nests]); the number of nests where incubation was recorded or assumed (Incubating); the percentage of nests where incubation was recorded or assumed (% Incubating [= (Incubating / Total nests) x100]); The number of sites where adults were seen but no nests (Sites adult(s) only); the percentage of incubated nests where at least one chick was known to have hatched (% Nests hatched); the percentage of hatched nests where two chicks were seen (% Nests hatched b/2); the percentage of hatched nests where one or more dead chicks were seen (% Hatched with dead); the percentage of incubated nests that failed (% Nests failed); the total number of chicks fledged (Chicks fledged); and breeding success (Breeding success = [Chicks fledged / Incubating]).

Sumburgh Head	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total nests	177	145	139	138	150	135	142	148	151	156
Incubating	151	94	93	89	115	117	119	119	116	129
% Incubating	85.3	64.8	66.9	64.5	76.7	86.7	83.8	80.4	76.8	82.7
Sites adult(s) only	22	39	35	40	29	21	29	22	30	22
% Nests hatched	86.8	21.3	60.2	32.6	85.2	59.8	82.4	58.8	83.6	87.6
% Nests hatched b/2	11.5	15.0	1.8	0	46.9	2.9	31.6	5.7	47.4	34.5
% Hatched with dead	8.4	10.0	26.8	20.7	2.0	2.9	4.1	17.1	0.0	0.0
% Nests failed	88.1	100	84.9	100	20.9	71.8	43.7	72.3	17.2	20.2
Chicks fledged	18	0	14	0	132	33	79	34	139	127
Breeding success	0.12	0	0.15	0	1.15	0.28	0.66	0.29	1.20	0.98
No Ness	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total nests	50	29	22	19	17	14	12	11	12	13
Incubating	38	21	16	14	14	13	12	10	10	7
% Incubating	76.0	72.4	72.7	73.7	82.4	92.9	100	90.9	83.3	53.8
Sites adult(s) only	0	8	9	5	4	3	8	4	0	0
% Nests hatched	50.0	38.1	31.3	0	71.4	61.5	66.7	50.0	80.0	100.0
% Nests hatched b/2	15.8	0	0	0	60.0	0	12.5	0	62.5	42.9
% Hatched with dead	5.3	0	20.0	0	0	0	0	10.0	0.0	0.0
% Nests failed	100	100	100	100	35.7	92.3	66.7	100	20.0	0.0
Chicks fledged	0	0	0	0	15	1	5	0	12	8
Breeding success	0	0	0	0	1.07	0.08	0.42	0	1.20	1.14
St Ninian's Isle				2013	2014	2015	2016	2017	2018	2019
Total nests				58	61	61	46	42	39	0
Incubating				38	54	41	44	40	35	n/a
% Incubating				67.9	88.5	68.3	95.7	95.2	89.7	n/a
Sites adult(s) only				5	6	5	5	7	3	n/a
% Nests hatched				13.2	77.8	0	81.8	70.0	22.9	n/a
% Hatched b/2				0	61.9	-	8.3	3.6	0.0	n/a
% Hatched with dead				0	0	-	2.8	14.3	0.0	n/a
% Nests failed				100	27.8	100	34.1	95.0	100.0	n/a
Chicks fledged				0	64	0	31	2	0	n/a
Breeding success				0	1.19	0	0.70	0.05	0.00	n/a

Table 1.7. continued.

Ramna Geo, Burra	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total nests	117	76	64	48	68	37	32	29	39	53
Incubating	74	45	24	34	64	30	28	25	30	43
% Incubating	63.2	59.2	37.5	70.8	94.1	81.1	87.5	86.2	76.9	81.1
Sites adult(s) only	11	22	15	8	13	8	11	9	1	3
% Nests hatched	18.9	2.2	0	35.3	6.2	66.7	75.0	76.0	80.0	86.0
% Hatched with b/2	7.1	0	0	0	0	0	4.8	5.3	75.0	37.2
% Hatched with dead	14.3	0	0	8.3	0	5.0	4.8	21.1	0.0	0.0
% Nests failed	98.6	100	100	70.6	100	93.3	85.7	100	26.7	37.2
Chicks fledged	1	0	0	10	0	2	4	0	35	34
Breeding success	0.01	0	0	0.29	0	0.07	0.14	0	1.17	0.79
Esha Ness								2017	2018	2019
Total nests								38	32	38
Incubating								27	24	32
% Incubating								71.1	75.0	84.2
Sites adult(s) only								0	8	6
% Nests hatched								3.7	87.5	31.3
% Hatched with b/2								0.0	52.4	0.0
% Hatched with dead								0.0	0.0	0.0
% Nests failed								96.3	25.0	100.0
Chicks fledged								1	28	0
Breeding success								0.04	1.17	0.00
Burravoe, Yell	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total nests	135	117	128	130	114	98	100	82	87	76
Incubating	107	87	94	99	95	84	84	69	71	64
% Incubating	79.3	74.4	73.4	76.2	83.3	85.7	84.0	84.1	81.6	84.2
Sites adult(s) only	8	12	9	15	16	14	12	9	16	11
% Nests hatched	69.2	28.7	51.1	40.4	76.8	73.8	86.9	72.5	94.4	70.3
% Hatched with b/2	6.8	8.0	43.8	2.5	60.3	13.1	58.9	12.0	55.3	28.1
% Hatched with dead	8.1	4.0	2.1	15.0	1.4	4.9	2.7	4.0	2.1	11.1
% Nests failed	53.3	78.2	59.6	87.9	32.6	79.8	29.8	87.0	32.4	82.8
Chicks fledged	52	20	49	12	100	17	89	10	69	16
Sum success	0.49	0.23	0.52	0.12	1.05	0.20	1.06	0.14	0.97	0.25

Figure 1.6. Mean Kittiwake breeding success (+ SE) at monitored sites (4–7 per year), 1986–2019. Breeding success is defined as chicks fledged per apparently laying pair.



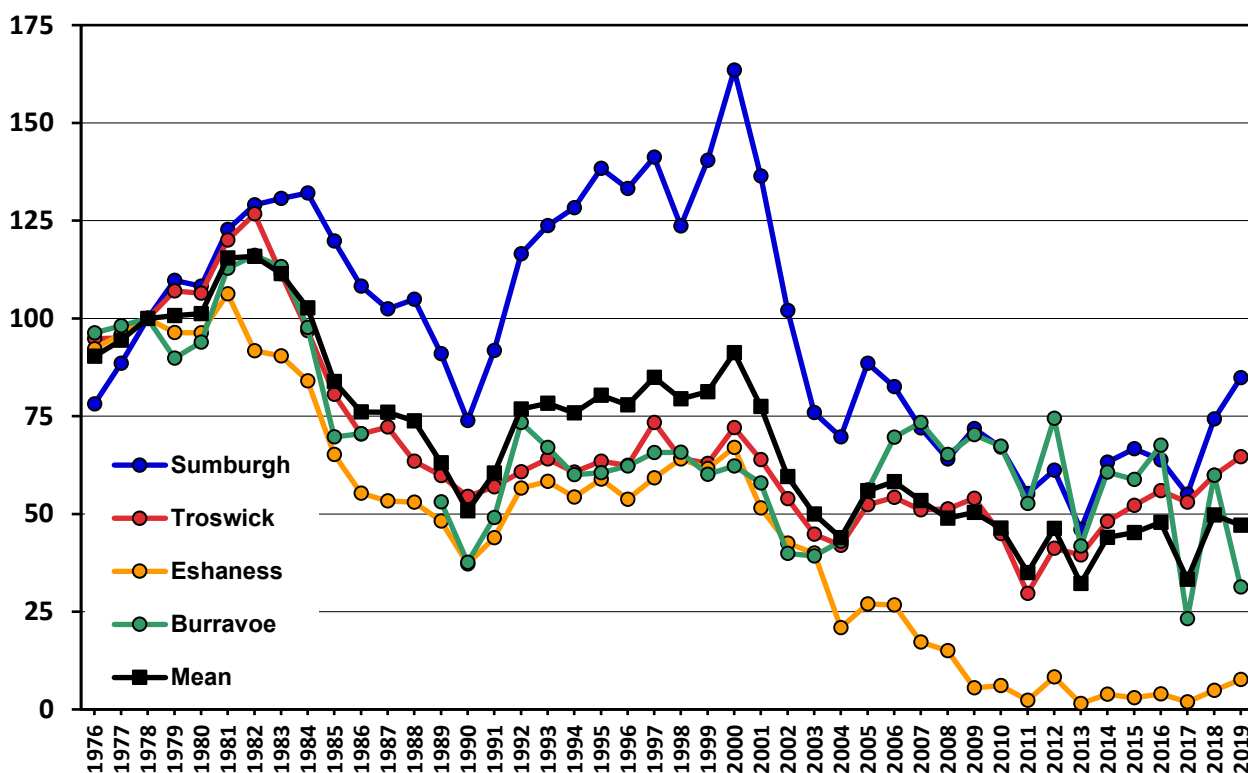
1.5a. Common Guillemot *Uria aalge*: population counts

Mean population counts were higher in 2019 than in 2018 at Sumburgh Head, Troswick Ness and Esha Ness (**Table 1.8**). By contrast, at Burravoe, the mean population count had decreased since 2018 and variation in counts across the five visits was relatively very high (**Table 1.8**). Here but not elsewhere, a pair of Ravens nested on the cliff very close to the Guillemot breeding ledges and ate many Guillemot eggs. Adult Guillemot attendance was highly erratic throughout the spring and summer at Burravoe and there was total breeding failure at this site. The 2019 population index value for Sumburgh Head (84.8) was the highest since 2005, for Troswick Ness (64.6) the highest since 2000 and for Esha Ness (7.7) the highest since 2012. However, the mean population index (47.1) was influenced by low counts of birds at Burravoe, was slightly lower than in 2018 (percentage change = −5.4%) and continued the pattern of low but comparatively stable mean index values since 2009 (**Figure 1.7**).

Table 1.8. Common Guillemot population counts summary statistics, 2018–19: total counts (n), range, mean, standard deviation (SD), coefficient of variation (CV), % change since 2018 (% ch.) and population index where 1978 = 100 (Index). The population counting unit for Common Guillemot is individual birds.

Colony	Unit	Year	n	Range	Mean	SD	CV	% ch.	Index
Sumburgh Head	Individuals	2018	5	965–1029	985.8	25.65	0.03		74.3
		2019	5	1043–1173	1125.2	54.15	0.05	+14.1	84.8
Troswick Ness	Individuals	2018	5	313–352	329.6	14.35	0.04		59.9
		2019	5	326–394	355.4	28.58	0.08	+7.8	64.6
Esha Ness	Individuals	2018	5	26–43	33.4	6.58	0.19		4.9
		2019	5	46–58	52.8	5.17	0.10	+58.1	7.7
Burravoe	Individuals	2018	5	189–217	199.8	10.85	0.05		59.9
		2019	5	4–214	104.6	95.11	0.91	−47.6	31.3

Figure 1.7. Annual population index (1978 = 100) of Common Guillemots (individuals) at four monitoring sites and the mean index for the four sites, 1976–2019.



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

In 2019, the Sumburgh Head breeding success plot was checked from 16th April to 31st July. A detailed examination of the historical dataset by Mike Harris in 2018 showed that a reduction in the frequency of monitoring visits from daily visits to visits every 2 or 3 days caused no significant reduction in the estimate of breeding success. In 2019, monitoring visits were made once per day during the main egg laying and chick fledging periods but were less than daily during the peak incubation period (28th May to 28th June, mean interval between checks = 1.6 days). The majority of monitoring visits, including adult attendance counts, were in the morning between 0700 and 1000 BST. However, when other work had to be prioritized (e.g. boat surveying), visits were made later in the day.

Guillemot breeding success at the Sumburgh monitoring plot in 2019 was 0.76 chicks fledged per apparently incubating pair, the fourth highest record since 1989 and up by 40.7% since 2018, when it was 0.54 (**Table 1.9** and **Figure 1.8**). At the start of each plot check the total number of adults attending the site was recorded. As in previous years, at the start of the season the number of adults at the plot fluctuated greatly, for example from zero on 23rd April up to 189 on 27th April, down to 23 on 30th April and back up to 194 on 7th May (**Figure 1.9**). Adult attendance remained high (>100 individuals) from 5th May to 15th July, with 203 adults on 23rd June the 2019 peak count (**Figure 1.9**). Numbers of adults decreased rapidly from 17th July onwards, with the last bird seen on 31st July (**Figure 1.9**).

The first egg was seen on 9th May and laying was then rapid (**Figure 1.10**), with the median laying date falling on the 13–14th May (laying data are almost entirely post-event observations, precluding greater phenological precision). Four pairs were known to lose their eggs and to relay; however, without multiple frequent plot checks every day, undetected egg loss and relaying is unavoidable. The first chick was assumed to have fledged on the evening of 26th June and the last chicks (two) on the evening of the 28th July (**Figure 1.10**). In 2019, gulls and skuas were seen around the colony only very rarely and no instances of chick predation were observed.

Table 1.9. Common Guillemot breeding parameters at Sumburgh Head, 2010–2019, including breeding success calculated as chicks fledged per apparently incubating pair.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Incubating pairs	154	142	140	98	122	135	132	130	134	129
First date an egg was seen	2/5	29/4	4/5	7/5	6/5	5/5	4/5	9/5	8/5	9/5
Median laying date	9/5	9/5	14/5	19/5	16/5	14/5	13/5	15/5	17-18/5	13-14/5
Chicks fledged	78	2	55	0	66	70	94	54	72	98
Breeding success	0.51	0.01	0.39	0.00	0.54	0.52	0.71	0.42	0.54	0.76

Figure 1.8. Common Guillemot breeding success at the Sumburgh Head monitoring plot, 1989–2019.

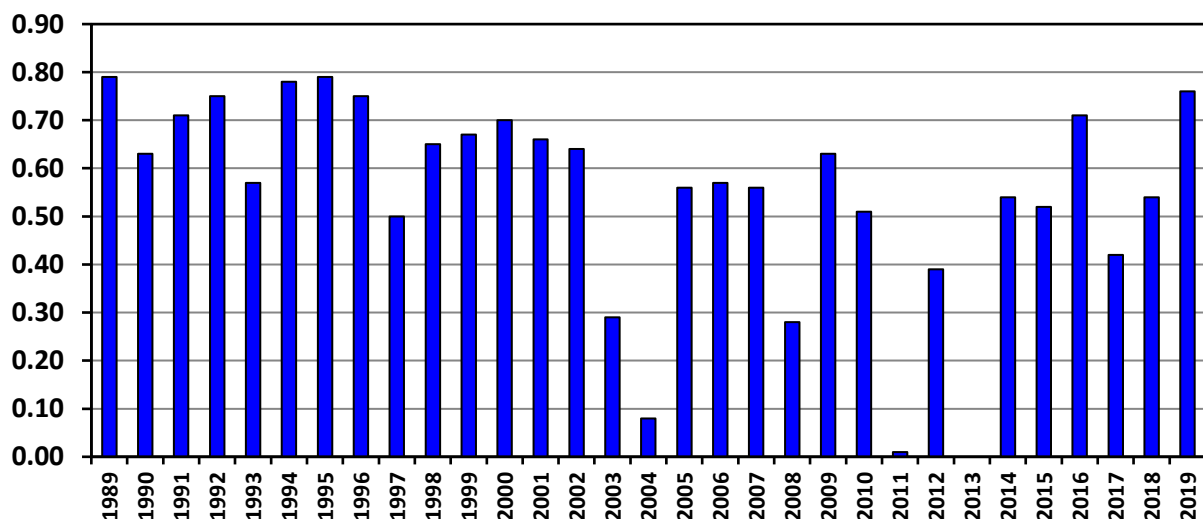


Figure 1.9. Total daily numbers of attending adult Common Guillemots (blue) and breeding pairs apparently with an egg or chick (red) at the Sumburgh Head breeding success monitoring plot through the 2019 breeding season.

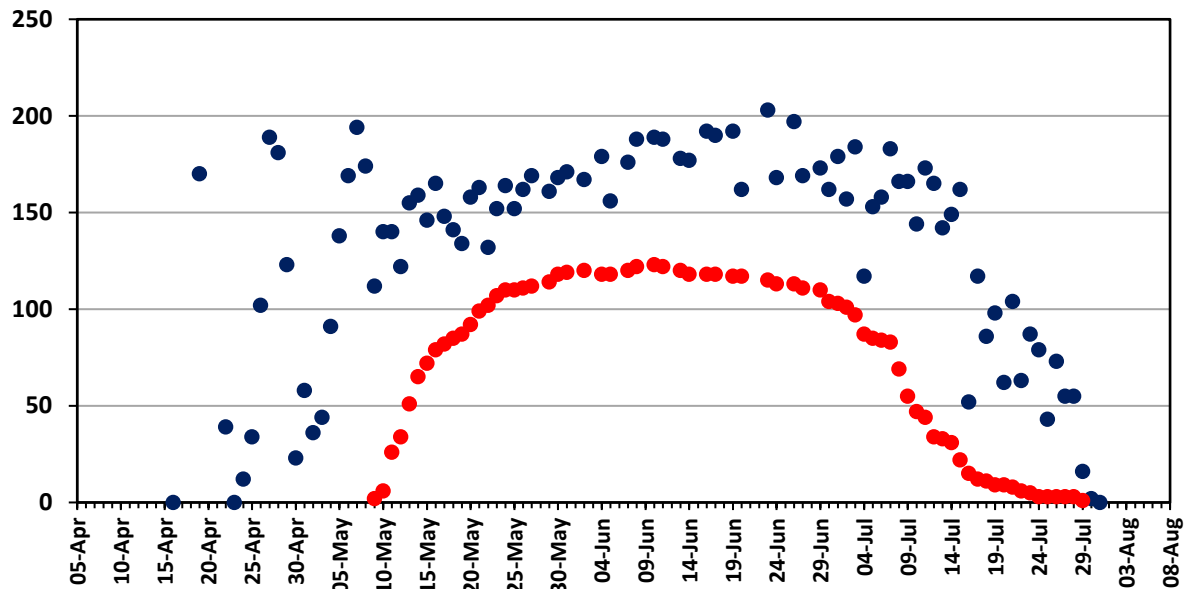
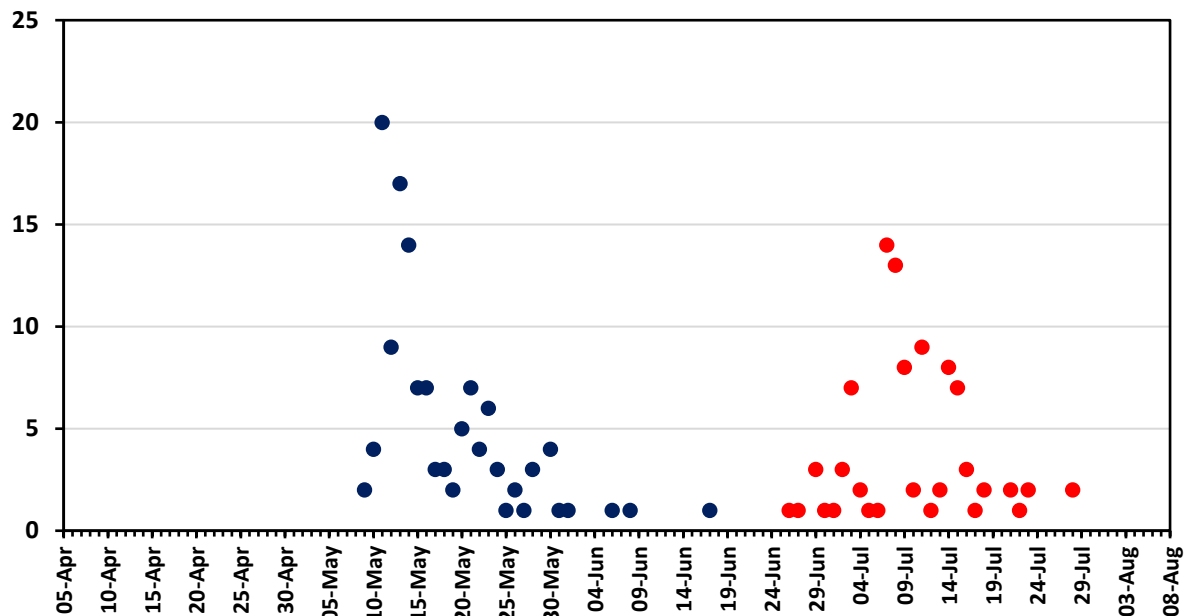


Figure 1.10. Approximate Common Guillemot egg laying and chick fledging phenology at the Sumburgh Head breeding success monitoring plot in 2019. Blue = the number of adults apparently incubating for their first day (eggs laid). Red = the number of chicks apparently fledged that day (chicks fledged).



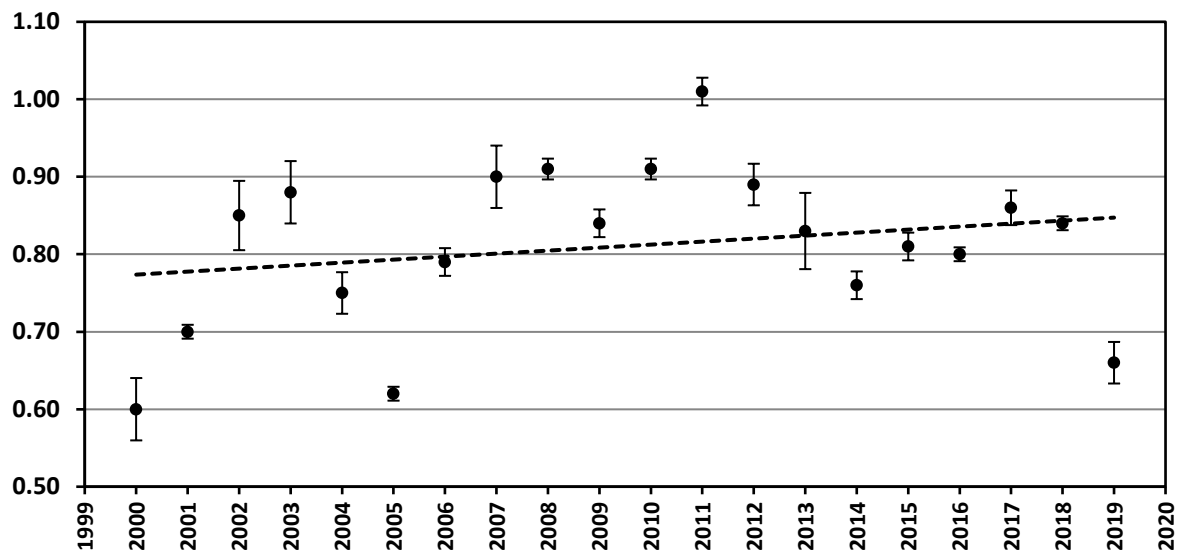
Egg laying and chick fledging phenology data from the Sumburgh Head breeding success monitoring plot (**Figure 1.10**) are approximate because of potential phenological inaccuracy. The process of either egg laying or chick fledging is rarely directly observed, so for each breeding pair the timing of these events usually has to be inferred from post-event observations; namely, the first time that an adult was seen apparently incubating (inferred egg laying date) and the first morning that the chick was absent from the plot and could have fledged the previous evening (inferred chick fledging date). The use of post-event observations to measure event phenology carries inherent inaccuracy, but because the Sumburgh Head plot is monitored daily during the egg laying and chick fledging periods inaccuracy is reduced to ≤ 1 day.

During the five Common Guillemot population monitoring counts at Sumburgh Head, adult attendance at the breeding success plot (mean of 153 adults per 100 breeding pairs) was higher than in 2018 (mean of 120), giving a relatively low mean k -value of 0.66 in 2019, compared with 0.84 in 2018 (**Table 1.11**). The weather in the first half of June was mostly very windy and wet (although not on the days population counts were made), and this general pattern may have reduced the number of adults attending the colony at that time. The linear regression of k -values on years (2000-2019) suggests that, on average, k -values are slowly increasing (**Figure 1.11**).

Table 1.11. Population counts of Common Guillemots in the Sumburgh Head breeding success plot in 2019 (with mean and standard deviation), the total number of breeding pairs in the plot in 2019, and derived k -values (with mean and standard deviation).

Count date in 2018	5/6	7/6	10/6	16/6	19/6	Mean	SD
Time (BST)	1300	1200	1200	1530	1200		
Total birds in plot (n)	156	176	189	192	197	182.0	16.48
Total breeding pairs (b)	118	120	123	118	117		
k -value breeding pairs (b/n)	0.76	0.68	0.65	0.61	0.59	0.66	0.06

Figure 1.11 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, 2000–19. Dashed line = the linear regression of k -values on years (2000–2019).



Between 30th June and 9th July inclusive, in-between some challenging weather, Guillemot chick feeding watches were carried out on six days at the standard chick diet monitoring plot at Sumburgh (which includes the breeding success plot). During watches, each adult Guillemot flying into 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, fish size was estimated against bill length and the time recorded. All watches lasted 90 minutes, from 0900 to 1030 BST.

In 2019, a total of 202 fish were observed during feeding watches; 92.6% were gadids and 6.4% sandeels (**Table 1.12**), compared with 79.7% gadids and 10.9% sandeels in 2018 (**Figure 1.13**). The proportional occurrence of gadids in the chick diet in 2019 was the highest on record, and the occurrence of this prey type has increased across the study years (2007-19) while the occurrence of sandeels has decreased (**Figure 1.13**). On each day that feeding watches were carried out in 2019, most fish presented to chicks were gadids (>80% each day) and sandeels occurred infrequently (<13% each day; **Figure 1.12**). No clupeids and just a single squid were recorded (**Table 1.12** & **Figure 1.13**).

Table 1.12. The percentages (and number) of different general prey types and sizes (n prey = 202) fed to Common Guillemot chicks at the Sumburgh Head chick diet monitoring plot, during feeding watches on 6 dates in 2019 (date range: 30/6–9/7).

Prey type	Large	Medium	Small	Total
Sandeel	3.0 (6)	3.5 (7)	0 (0)	6.4 (13)
Gadoid	30.2 (61)	54.5 (110)	7.9 (16)	92.6 (187)
Clupeid	0 (0)	0 (0)	0 (0)	0 (0)
Squid	0.5 (1)	0	0	0.5 (1)
Not identified / too quick	-	0.5 (1)	-	0.5 (1)

Figure 1.12. The percentages of different general prey types (n prey = 202) fed to Common Guillemot chicks at Sumburgh Head during feeding watches on 6 dates in 2019 (date range: 30/6–9/7).

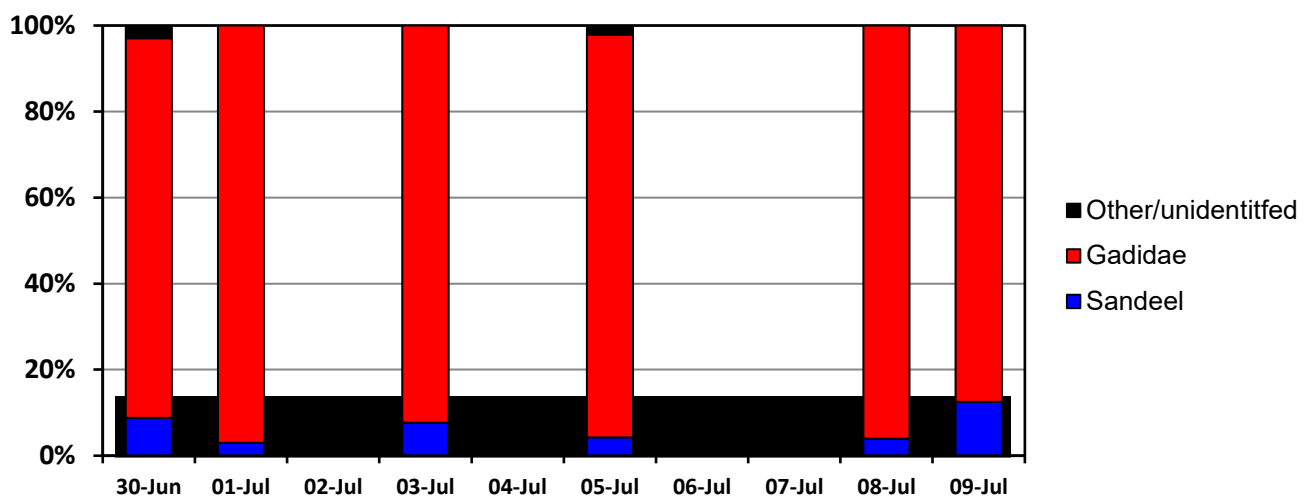
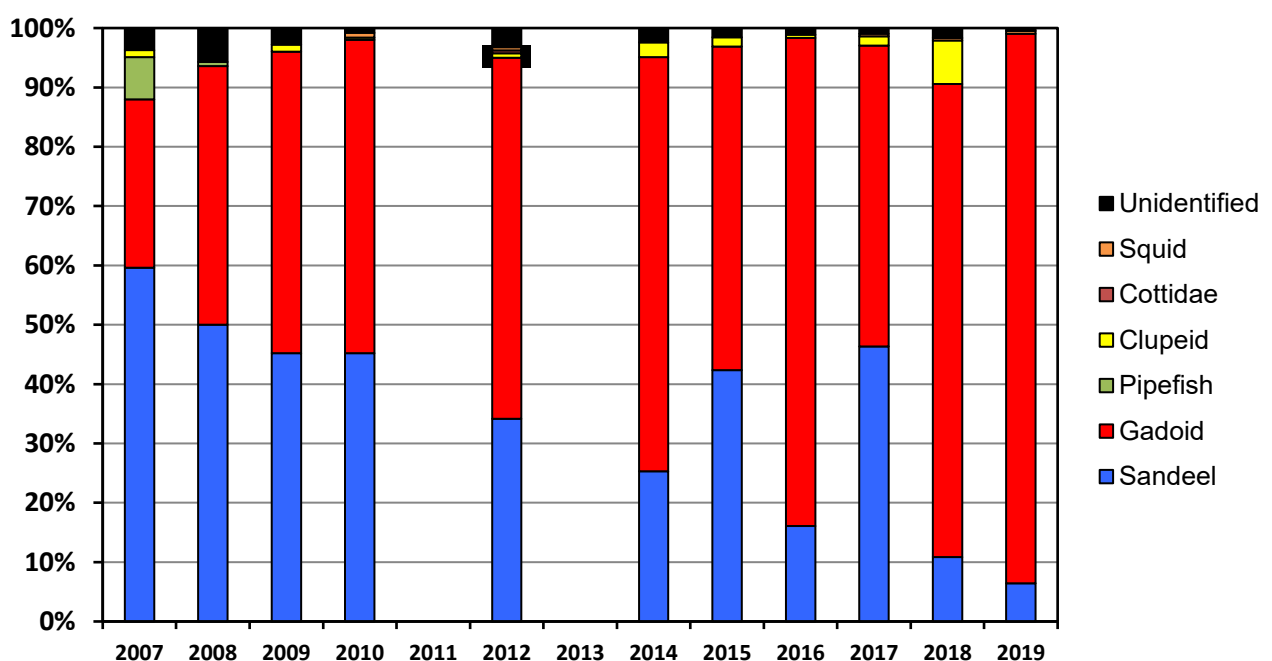


Figure 1.13. The percentages of different general prey types fed to Common Guillemot chicks at Sumburgh Head during feeding watches in 2007–2019. Prey sample sizes: 2007 = 324; 2008 = 140; 2009 = 250; 2010 = 250; 2012 = 401; 2014 = 629; 2015 = 515; 2016 = 790; 2017 = 509, 2018 = 492, 2019 = 202. Too few chicks survived long enough in 2011 and 2013 for meaningful observations.



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

The plot at Burravoe was monitored as normal (2012–19). The presence/absence of eggs is more difficult to confirm at this plot than at the Sumburgh Head plot because viewing distances are greater and visits less frequent, being generally made every three to four days. When an adult was observed sitting tight throughout two consecutive monitoring visits then an egg was assumed to have been laid and the bird assumed to have been incubating, even if no egg was ever seen (**Table 1.13**).

In 2019, there were no occasions when an adult was observed sitting tight throughout two consecutive monitoring visits, only one egg was ever seen, and this was soon lost, and breeding success was zero (**Table 1.13**). The 2019 breeding season was a marked contrast to 2018, when 85 pairs were assumed to have laid and breeding success was 0.69 chicks fledged per assumed laying pair (**Table 1.13**). However, in 2017, breeding success was also zero and the entire colony was deserted by mid-June – an unprecedented occurrence in the history of SOTEAG monitoring. It is not clear why egg laying and breeding success at this colony have been so variable across the last 4 years (**Table 1.13**). Ravens have nested at Burravoe in very close proximity to the seabird colonies for several years, but in 2019, for the first time, the shells of many Guillemot eggs were found near to the Raven nest. So one possibility is that heavy predation by Ravens was the reason why Guillemot colony attendance was highly erratic in 2019, only one egg was seen, and there was total breeding failure.

Table 1.13. Common Guillemot breeding parameters at Burravoe, 2015–19, including breeding success calculated as chicks assumed fledged per site where an egg was assumed to have been laid. Adults seen sitting tight during two or more consecutive checks of the colony (ST 2+) were assumed to have laid and be incubating (a). Those seen sitting tight during just one check (ST1), or during two or more non-consecutive checks (ST2 non-consecutive), were assumed not to have laid an egg.

	2015	2016	2017	2018	2019
Date range visited	5/5–10/8	9/5–29/7	3/5–16/6	11/5–9/8	20/5–24/6
Checks (mean interval in days)	27 (3.6)	27 (3.0)	14 (3.1)	26 (3.5)	10 (3.2)
Date first egg seen / assumed incubation	5/5	18/5	18/5	25/5	3/6
Assumed laid, ST 2+ (a)	97	104	24	85	1
ST 1 / ST2 non-consecutive	9	14	17	13	1
Sites where chicks were seen	51	66	0	61	0
Minimum % hatched	52.6%	63.5%	0%	72.8%	0%
Date first assumed fledged	29/6–3/7	8–11/7	-	19–21/7	-
Chicks assumed fledged (b)	49	62	0	59	0
Breeding success (b/a)	0.51	0.60	0.00	0.69	0.00

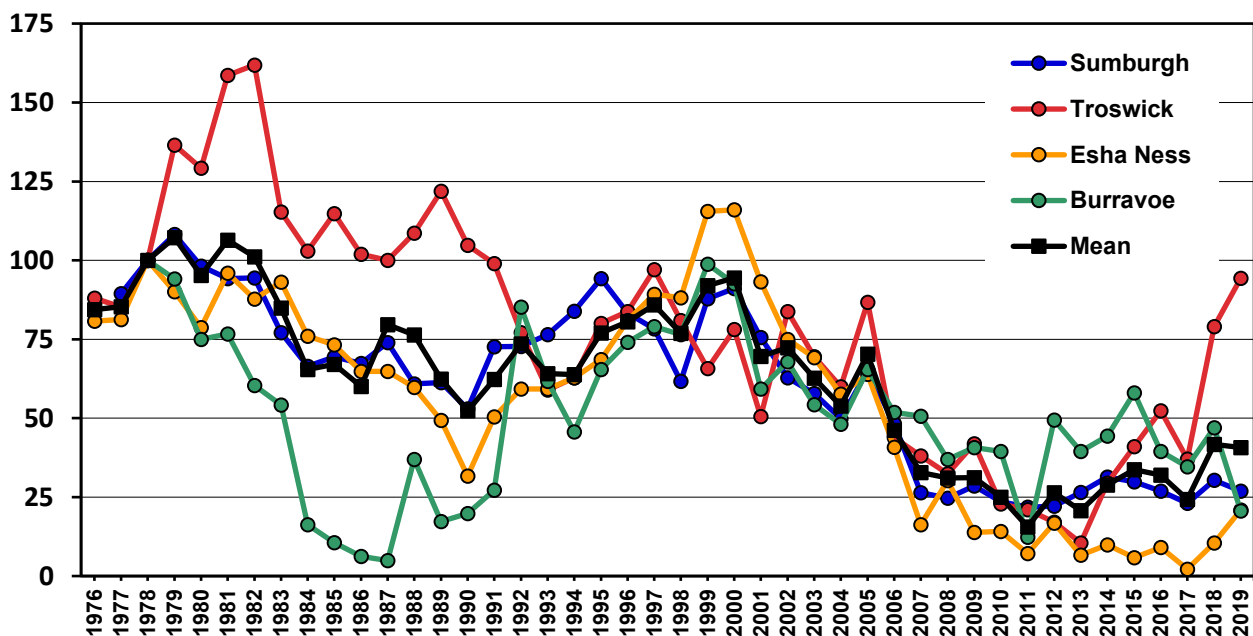
1.6a. Razorbill *Alca torda*: population counts

Mean population counts of Razorbills were higher in 2019 than 2018 at Troswick Ness and Esha Ness but had decreased since 2018 at Sumburgh Head and Burravoe (**Table 1.14**). The mean population index for 2019 was 40.7, the second highest value recorded since 2006 and only slightly lower (–2.4%) than the 2018 value of 41.7 (**Figure 1.14**). At Sumburgh Head, the 2019 population index had slightly decreased since 2018 (26.9 in 2019, 30.4 in 2018, percentage change = –11.5%) but continued the general pattern of population stability since 2006 (**Figure 1.14**). There are comparatively few Razorbills at the monitoring sites other than Sumburgh Head, where the annual mean population count has always been higher than 50 individuals. When the number of birds at a monitoring site is low (e.g. less than 20 individuals) then calculated proportional changes in population size are comparatively large and appear far larger than calculated changes at sites where there are higher numbers of birds (**Table 1.14**).

Table 1.14. Razorbill population counts summary statistics, 2018–19: total counts (n), range, mean, standard deviation (SD), coefficient of variation (CV), % change since 2018 (% ch.) and population index where 1978 = 100 (Index). The population counting unit for Razorbills is individual birds.

Colony	Unit	Year	n	Range	Mean	SD	CV	% ch.	Index
Sumburgh Head	Individuals	2018	5	74–112	88.0	18.09	0.21		30.4
		2019	5	56–103	77.8	17.80	0.23	–11.6	26.9
Troswick Ness	Individuals	2018	5	13–22	16.6	3.36	0.20		79.0
		2019	5	13–30	19.8	6.46	0.33	+19.3	94.3
Esha Ness	Individuals	2018	5	4–10	7.6	2.51	0.33		10.5
		2019	5	9–21	15.2	4.38	0.29	+100.0	20.9
Burravoe	Individuals	2018	5	6–10	7.6	1.52	0.20		47.0
		2019	5	2–5	3.8	1.30	0.34	–50.0	20.7

Figure 1.14. Annual population index (1978 = 100) of Razorbills (individuals) at Sumburgh Head, Esha Ness, Troswick Ness and Burravoe, 1976–2019.



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

For the 9th consecutive year, Razorbill breeding success was monitored at Sumburgh Head using the marked photograph method. The presence of attending adults and the presence of an egg or chick was recorded. At sites where no egg or chick was seen, pairs were assumed to have laid an egg if an adult was seen sitting tight on at least two consecutive monitoring visits (**Table 1.16**). An incubation period of 35 days, a minimum fledgling period of 15 days and the development of the juvenile plumage were all used to help assess probable hatching periods, chick ages and whether chicks could have fledged or not. The monitored nest sites are located all around Sumburgh Head, in areas where Razorbills are clearly visible using a telescope and safe vantage points, and for this species the whole site is treated as one breeding success plot.

Razorbill breeding success in 2019 was 0.64 chicks assumed fledged per breeding pairs (egg assumed laid), an increase of 39.1% from 2018, when breeding success was 0.46 (**Table 1.15**). The total number of breeding pairs in 2019 was 86 (= sites where an adult was seen sitting tight on at least two consecutive monitoring visits &/or an egg was seen &/or a chick was seen), compared with 81 breeding pairs in 2018 (**Table 1.15**). Breeding success in 2019 was the joint-highest on record (with 2016) and the number of breeding pairs was the highest to have been monitored since the study began (**Table 1.15**).

Table 1.15. Razorbill breeding parameters at Sumburgh Head, 2015–2019, including breeding success calculated as chicks assumed fledged per site where an egg was assumed to have been laid (breeding pairs). Adults seen sitting tight during two or more consecutive checks of the colony (ST2+) were assumed to have laid and to be incubating. Those seen sitting tight during just one check (ST1), or during two or more non-consecutive checks (ST2 non-consecutive), were assumed not to have laid an egg.

	2015	2016	2017	2018	2019
Date range visited	6/5–6/8	3/5–17/8	4/5–1/8	5/5–6/8	3/5–30/7
Checks (mean interval in days)	38 (2.4)	54 (2.0)	51(1.7)	47(2)	51(1.8)
First egg seen / assumed incubation	9/5	5/5	9/5	5/5	5/5
ST2+ and no egg seen	16	11	9	20	35
Egg / chick seen	51	70	59	61	71
Breeding pairs (ST2+ &/or egg / chick seen)	67	81	68	81	86
ST1 / ST2 non-consecutive to 30/7	15	16	14	7	9
Sites where chicks were seen	40	57	45	41	59
Chicks assumed fledged	38	52	41	37	55
Breeding success	0.57	0.64	0.60	0.46	0.64

2. Pre-breeding season population counts of Black Guillemots *Cephus grylle*

Counts of pre-breeding Black Guillemots are only made in late March and April (before egg laying) in dry conditions with little or no sea swell and little or no wind (or at most an offshore wind of Force 4). Ideally, two counts of each of the SOTEAG standard monitoring sites are made each year. This is not always possible however, as it requires many days in April with the right weather and sea conditions. During surveys, attempts are made to flush any birds on land out onto the sea, to join displaying groups that can be readily counted. The willingness of individuals to leave the land varies from day to day though and diminishes through April. Also, after about 0900 displaying individuals tend to disperse, but the timing of this varies, with birds occasionally departing the colony area unusually early. Counts are therefore subject to high variation, sometimes including low counts that are difficult to interpret.

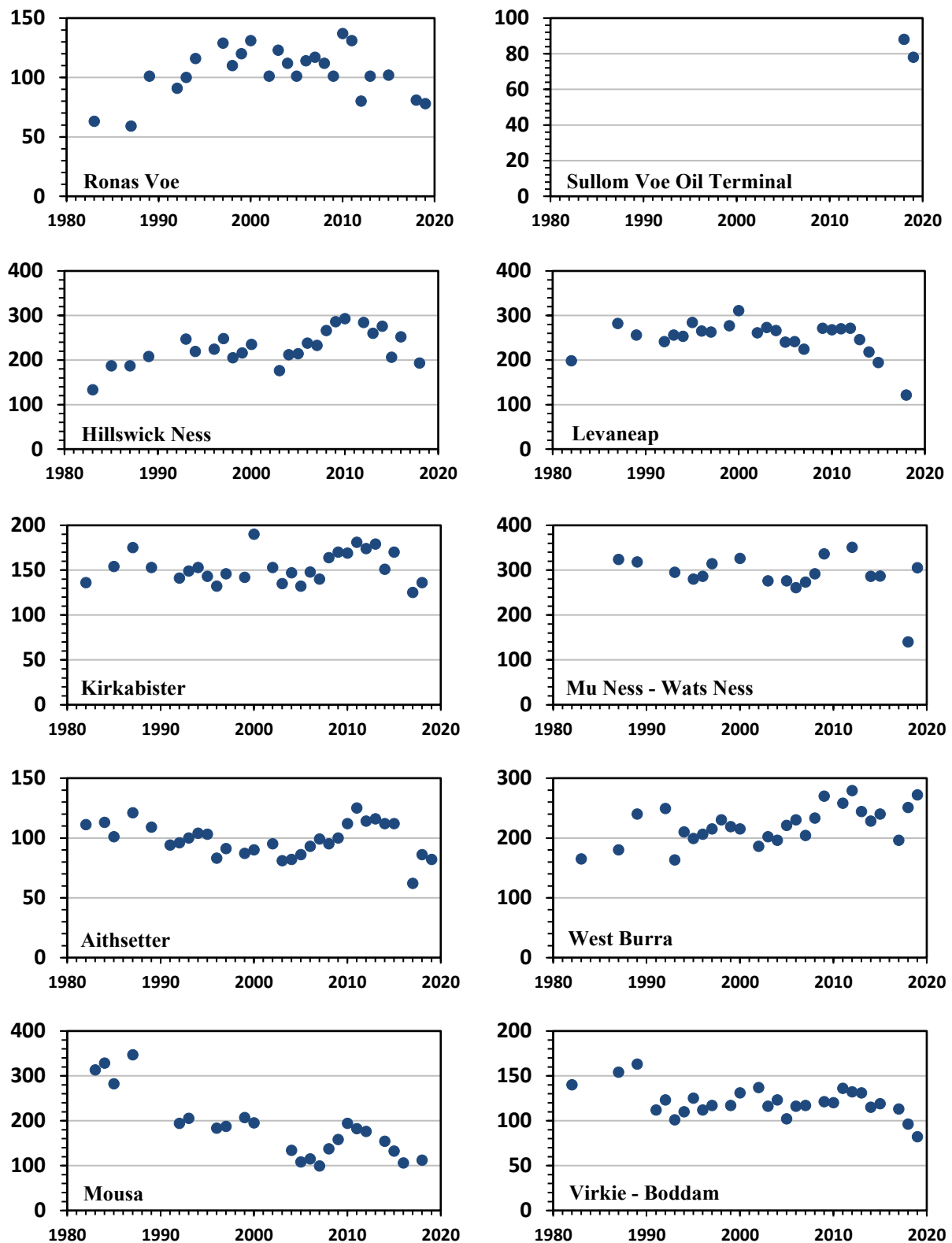
In 2019, the weather in April was extremely challenging. Prolonged periods of strong easterly winds and heavy sea swells throughout the month greatly limited the number of days when counts could be made. Efforts were focused on surveying the standard monitoring sites, but also trying to fit in counts of other coastal sections for the current national seabird census (see Appendix 4). Following the discovery in 2018 of a comparatively large colony of Black Guillemots nesting on the Sullom Voe oil terminal jetties, the jetties were made a priority annual monitoring site. Access to the terminal requires special arrangements and can be logistically difficult, particularly when the terminal is very busy and/or staff changes are taking place. Due to a combination of unavoidable logistical factors, the terminal jetties could not be surveyed until 1st May. The survey conditions were excellent and the terminal staff extremely helpful and accommodating. The count of 78 birds in full summer plumage was slightly lower than in 2018, when 88 birds were counted (**Table 2.1**). This may be due to the relatively late count date in 2019, rather than a real decline, as some individuals may already have been settled on their nest sites and therefore out of sight.

Changes in count totals since the most recent previous surveys were variable across the monitoring sites. Numbers had increased slightly at Mu Ness and Wats Ness and at West Burra, but decreased at Ronas Voe, Aithsetter and Virkie-Boddam (**Table 2.1**). At most of the monitored sites numbers of Black Guillemots have generally remained stable for several decades, but there has been a gradual long-term increase at West Burra and a long-term decrease at Mousa (**Figure 2.1**).

Table 2.1. Counts of Black Guillemots in full breeding plumage at ten standard monitoring sites, 2010–19. Data presented are the highest early spring day counts for the year, with sites listed north to south. Percentage change is between 2019 and the most recent previous count (% ch.). Sullom Voe Oil Terminal was first surveyed in 2018. In 2016 and 2017 Black Guillemot counts of sections of the Shetland coastline elsewhere, for the national seabird census, were prioritised over the standard monitoring sites (see 2016 and 2017 SOTEAG ornithological monitoring reports).

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	% ch.
Ronas Voe	137	131	80	101		102			81	78	-3.7
Sullom Voe Oil Terminal									88	78	-11.4
Hillswick Ness	293	249	284	260	276	206	252		193		
Levaneap	268	270	271	246	218	194			121		
Kirkabister	169	181	174	179	151	170		125	136		
Mu Ness - Wats Ness		264	351	285	286	287				305	+6.3
Aithsetter	112	125	114	116	112	112		62	86	82	-4.7
West Burra		258	279	244	228	240		196	251	272	+8.4
Mousa	194	182	176		154	132	106		112		
Virkie-Boddam	120	136	132	131	115	119		113	96	82	-14.6

Figure 2.1. Counts of Black Guillemots in full breeding plumage at the standard monitoring sites, 1982–2019. Data presented are the highest early spring day counts for the year, with sites listed from north to south. Monitoring at Sullom Voe Oil Terminal began in 2018.



3. Monitoring of breeding Red-throated Divers *Gavia stellata*

As is normal in years with a Shetland-wide population census of moulting Common Eiders, the Red-throated Diver monitoring was omitted in 2019. Monitoring of breeding Red-throated Divers will resume in 2020.

4. Shetland-wide population census of Common Eiders *Somateria mollissima*

The Shetland-wide population census of Common Eiders is done in late summer (late-July to early-September), when large flocks of Eiders form together and the adults moult, temporarily becoming flightless. During the 1970s, 1980s and 1990s in Shetland, flocks of moulting Eiders repeatedly occurred and were surveyed at the same ‘traditional’ natural sites. These were often remote and isolated locations, such as offshore skerries, where the birds could feed, find shelter in varying wind directions, rest ashore and avoid disturbance from predators. Since the early 2000s, however, increasing numbers of moulting birds have been seen at aquaculture sites, now common throughout the islands in sheltered voes and sounds, and these sites are now also surveyed.

The first survey of the 2019 census was on 24th July and the last survey on 30th August (**Table 4.1**). The first half of August was mostly calm and dry and there was very little sea swell, which was ideal for Eider surveys. The second half of the month was very windy, with long periods of heavy seas, that limited the number of days on which surveys were possible. There are 30 standard survey areas for the Shetland-wide Eider census (**Table 4.1, Appendix 3**). Survey areas 14, 15, 23 and 25 were not counted in 2019 due to unsuitable weather and sea conditions. For the same reason, it was not possible to count the Out Skerries (survey area 22) from the sea, as has been done in past censuses, but counts were made from land on 24th and 30th August. In 2019, boat surveys were carried out using the SOTEAG RIB and two charter boats, one based in Lerwick and the other in Uyeasound, south Unst.

The 2019 census total of 3639 individuals (**Table 4.1**) was 20.9% lower than the total of 4599 individuals in 2015, the year of the most recent previous census (**Table 4.2**). In 2019, the total number of males counted was 1497 (41.1%), total number of females was 1787 (49.1%), total number of juveniles was 158 (4.3%) and total number of ‘unknown’ individuals that could not be sexed or aged was 197 (5.7%; **Table 4.1**). By comparison, in the 2015 census, the total number of males was 2623 (56.9%), total number of females was 1365 (29.6%), total number of juveniles was 167 (3.6%) and total number of ‘unknown’ individuals was 455 (9.9%).

As in previous recent censuses, in 2019, flocks of Eiders were found around mussel and salmon farms as well as at natural sites with no nearby aquaculture. In total, 1171 individuals were located at salmon farms (32.2%), 1407 were located at mussel farms (38.7%) and 1061 were located at natural sites (29.2%). So overall, 2578 Eiders were located at aquaculture sites in 2019, equating to 70.8% of the surveyed population. This percentage is similar to the 2015 census (82.1%) and 2012 census (64.3%) and continues the pattern of more than 50% of the surveyed population of moulting Eiders in Shetland occurring at salmon and mussel farms.

Counts from 1997 to 2019 are presented in **Table 4.2**. Changes between the number of birds counted in each survey area in 2015 and 2019 were variable, with numbers having increased in some areas and decreased in others (**Table 4.2**). The highest increases since 2015 were in southern Yell Sound (+240 birds) and the Lunna and Nesting voes area (+178 birds). The highest decreases since 2015 were in the Gletness to Dales Voe area (-576 birds), the Burra and Trondra area (-460 birds) and the Busta Voe and Olna Firth area (-263 birds).

In each of the survey areas, the number of birds counted during the censuses from 1997 to 2019 has fluctuated year on year, with short-term increases and decreases apparent in most areas, frequently involving over 100 birds (**Table 4.2**). This suggests that individuals are not necessarily site faithful, and in different years may moult in different places, located many miles apart. Use of different moult sites by individual Common Eiders is not unprecedented, having been recorded in Canada and Greenland (Waltho & Coulson 2015).

Table 4.1. Counts of Common Eiders in July and August for the 2019 Shetland-wide census. Survey areas 1 to 30 are the standard census survey areas (see Appendix 3 for mapped locations). Survey areas 14, 15, 23 and 25 were not counted in 2019 (-) due to unsuitable weather and sea conditions. Unknown = birds that could not be confidently identified as males, females or juveniles.

Survey area		Date(s) surveyed	Total Eider count	Males		Females		Juveniles		Unknown	
				Count	%	Count	%	Count	%	Count	%
1	Garths Ness to South Havra	9&24/8	14	0	0.0	5	35.7	9	64.3	0	0.0
2	Burra & Trondra	7/8	721	515	71.4	197	27.3	9	1.2	0	0.0
3	Scalloway Islands	7/8	585	228	39.0	170	29.1	0	0.0	187	32.0
4	Weisdale Voe	7/8	76	0	0.0	76	100.0	0	0.0	0	0.0
5	Westside voes	9/8	41	0	0.0	41	100.0	0	0.0	0	0.0
6	Foula	4/8	186	79	42.5	58	31.2	49	26.3	0	0.0
7	Papa Stour	2/8	0	0	0.0	0	0.0	0	0.0	0	0.0
8	Ve Skerries	2/8	25	21	84.0	4	16.0	0	0.0	0	0.0
9	Melby to Aith Voe	1&2/8	106	20	18.9	84	79.2	2	1.9	0	0.0
10	Olna Firth & Busta Voe	2/8	116	0	0.0	101	87.1	15	12.9	0	0.0
11	St Magnus Bay	2&8/8	23	0	0.0	20	87.0	3	13.0	0	0.0
12	Muckle Ossa	5/8	25	1	4.0	24	96.0	0	0.0	0	0.0
13	Ronas Voe to Uyea	5/8	29	2	6.9	23	79.3	4	13.8	0	0.0
14	Gloup Holm, Yell	-	-	-	-	-	-	-	-	-	-
15	NW Unst	-	-	-	-	-	-	-	-	-	-
16	NE Unst	19/8	18	0	0.0	11	61.1	7	38.9	0	0.0
17	S Unst & E Yell	19,26&27/8	252	7	2.8	234	92.9	1	0.4	10	4.0
18	Fetlar	26/8	0	0		0		0		0	
19	Sullom Voe	5/8	123	50	40.7	67	54.5	6	4.9	0	0.0
20	N Yell Sound	5/8	19	0	0.0	14	73.7	5	26.3	0	0.0
21	S Yell Sound	6/8	480	226	47.1	251	52.3	3	0.6	0	0.0
22	Out Skerries	24&30/8	2	0	0.0	2	100.0	0	0.0	0	0.0
23	Whalsay	-	-	-	-	-	-	-	-	-	-
24	Lunna & Nesting voes	8&12/8	213	69	32.4	144	67.6	0	0.0	0	0.0
25	S Nesting skerries	-	-	-	-	-	-	-	-	-	-
26	Gletness to Dales Voe	12/8	308	222	72.1	83	26.9	3	1.0	0	0.0
27	Kebister Ness to Gulberwick	24/7, 12/8	61	22	36.1	34	55.7	5	8.2	0	0.0
28	Mail to Levenwick	11&13/8	6	0	0.0	6	100.0	0	0.0	0	0.0
29	Virkie to Quendale	13/8	101	3	3.0	95	94.1	3	3.0	0	0.0
30	Fair Isle	19/8	109	32	29.4	43	39.4	34	31.2	0	0.0
TOTAL			3639	1497	41.1	1787	49.1	158	4.3	197	5.7

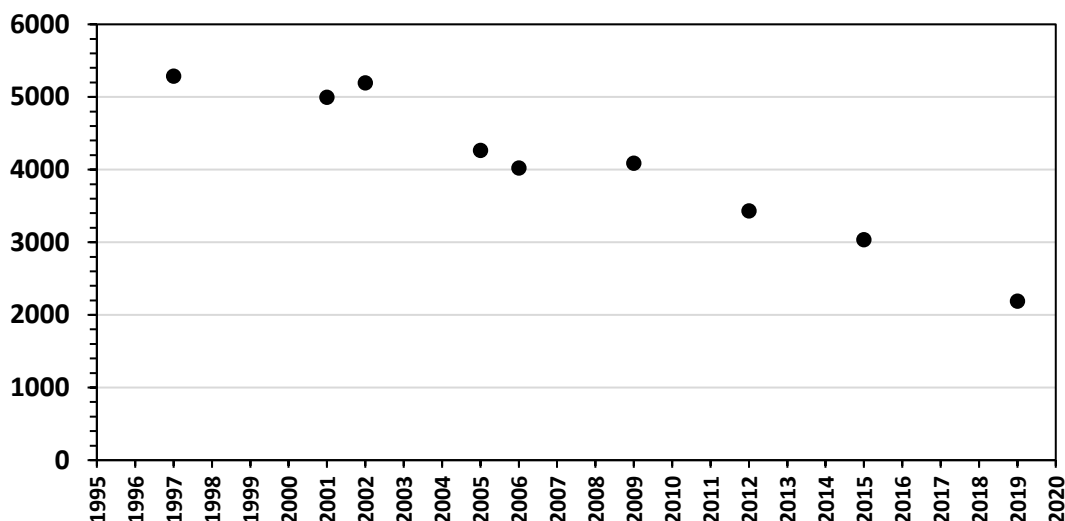
In addition to short-term fluctuations in counts, most survey areas also show a long-term general pattern of decrease in numbers from 1997 to 2019 (**Table 4.2**). The most extreme example of this is the Kebister Ness to Gulberwick area (survey area 27), where 1451 birds were counted in 1997 but just 61 in 2019 (**Table 4.2**). The overall census totals (sum of all area counts) across the years from 1997 to 2019 also clearly show a long-term general pattern of decrease in numbers, with the 1997 census total of 5824 the highest on record and the 2019 total of 3639 the lowest (**Table 4.2**). These census totals are not strictly comparable, however, because there are missing data, from different survey areas in different years (**Table 4.2**). From 1997 to 2019, there have been only two censuses in which all 30 survey areas were counted (2009 and 2012). In all the other censuses there have been some survey areas that could not be counted, due to unsuitable weather and sea conditions. This is not unexpected, given the magnitude of the total sea area around Shetland that is included in the census (**Appendix 3**), the relatively short time-window to survey it and the variability of Shetland weather in late summer.

There are 17 survey areas which have been counted in all years of the census, from 1997 to 2019 (**Table 4.2**, **Figure 4.1**). These survey areas are located widely across Shetland (**Appendix 3**). The sum totals of the counts of these areas for each census are comparable across years (because there are no missing counts) and are perhaps the best indicator of change in the population status of Common Eiders in Shetland (**Figure 4.1**). These data show a clear and consistent pattern of decrease in the size of the surveyed population, by 58.6% from 1997 to 2019 (**Figure 4.1**).

Table 4.2. Total counts of Common Eiders for the Shetland-wide census, 1997 to 2019. Survey areas 1 to 30 are the standard census survey areas (see Appendix 3 for mapped locations). During census years, sometimes there are survey areas that cannot be counted (-) because of unsuitable weather and sea conditions. * = survey areas that have no missing counts across all years of the census. Change = change in the number of birds from 2015 to 2019. %Change = percentage change in the number of birds from 2015 to 2019.

Survey area	1997	2001	2002	2005	2006	2009	2012	2015	2019	Change	%Change
1 Garths Ness to South Havra	48	41	-	-	42	11	20	18	14	-4	-22.2
2 Burra & Trondra*	115	685	341	654	978	1366	635	1181	721	-460	-38.9
3 Scalloway Islands*	190	193	663	573	203	389	305	727	585	-142	-19.5
4 Weisdale Voe*	5	27	4	9	299	667	578	24	76	+52	+216.7
5 Westside voes	-	-	-	233	212	232	102	101	41	-60	-59.4
6 Foula*	232	283	307	231	165	252	239	106	186	+80	+75.5
7 Papa Stour*	120	65	111	24	36	5	0	0	0	0	0
8 Ve Skerries*	159	223	319	271	115	182	115	55	25	-30	-54.5
9 Melby to Aith Voe	-	-	-	-	101	36	22	15	106	+91	+606.7
10 Olna Firth & Busta Voe*	10	38	110	72	90	241	489	379	116	-263	-69.4
11 St Magnus Bay*	80	57	63	34	9	29	19	7	23	+16	+228.6
12 Muckle Ossa*	28	71	140	170	100	80	7	5	25	+20	+400.0
13 Ronas Voe to Uyea*	377	319	100	36	106	30	50	46	29	-17	-36.9
14 Gloup Holm, Yell	0	0	-	-	3	0	0	-	-	-	-
15 NW Unst	175	104	29	-	8	18	11	-	-	-	-
16 NE Unst	32	12	39	-	30	24	48	17	18	+1	+5.9
17 S Unst & E Yell	-	-	-	-	188	151	167	235	252	+17	+7.2
18 Fetlar *	12	0	0	0	0	0	18	0	0	0	0
19 Sullom Voe*	68	4	22	11	0	4	72	160	123	-37	-23.1
20 N Yell Sound	15	2	-	-	0	3	12	8	19	+11	+137.5
21 S Yell Sound	-	-	-	190	109	666	499	240	480	+240	+100.0
22 Out Skerries*	429	246	455	282	372	110	322	60	2	-58	-96.7
23 Whalsay	62	4	36	2	22	0	5	6	-	-	-
24 Lunna & Nesting voes	0	-	-	-	-	61	15	35	213	+178	+508.6
25 Nesting skerries	206	169	145	76	129	0	35	3	-	-	-
26 Gletness to Dales Voe	-	-	-	-	377	493	259	884	308	-576	-65.2
27 Kebister Ness to Gulberwick*	1451	1317	1039	1117	812	297	242	60	61	+1	+1.7
28 Mail to Levenwick*	211	195	312	361	255	31	66	16	6	-10	-62.5
29 Virkie to Quendale*	1322	1035	831	209	355	122	97	91	101	+10	+10.9
30 Fair Isle*	477	239	376	211	126	282	178	120	109	-11	-9.2
TOTAL	5824	5329	5442	4766	5242	5782	4627	4599	3639		

Figure 4.1. Sum total counts of Common Eiders in the Shetland-wide census survey areas that have no missing counts across all census years from 1997 to 2019 (survey areas 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 18, 19, 22, 27, 28, 29 and 30; see Table 4.2 and Appendix 3).



5. Winter counts of seaduck and diving seabirds

5.1. Sullom Voe and southern Yell Sound

The 2018/19 winter survey of the Sullom Voe and Yell Sound transect was done on 18th January 2019 from MV *Seabird* with 3 observers. The survey began at 0915 and finished at 1420. The wind was southwesterly 0-4 knots (mostly 0-2 knots) and the sea lightly rippled, with occasional patches of large ripples but no swell. Cloud cover was 0-1/8, it was clear and sunny, visibility was good (>10km) and it remained dry throughout the survey.

The number of Slavonian Grebes in Sullom Voe during the 2018/19 survey was unusually high, with 37 counted, compared with 18 during the 2017/18 survey (**Table 5.1**). Numbers of Shags and Black Guillemots were also up in 2018/19 compared with 2017/18, by 20.7% and 26.9%, respectively (**Table 5.1**). Numbers of Goldeneyes and Red-breasted Mergansers were respectively 34.6% and 24.7% lower this year than during the 2017/18 survey (**Table 5.1**). Single figures of Common Eiders, Long-tailed Ducks and Cormorants were seen in Sullom Voe in 2018/19, which was similar to most recent years (**Table 5.1**). The sighting of a Common Scoter in the Voe during the 2018/19 survey was unusual.

In the southern Yell Sound survey area, the numbers of Shags and Black Guillemots during the 2018/19 survey were unusually high and up by 69.0% and 26.2%, respectively, compared with the 2017/18 survey (**Table 5.2**). Cormorant numbers in 2018/19 were also high in comparison with 2017/18, having increased by 50.5%, although in the context of the previous seven surveys (**Table 5.2**), the total count of 319 Cormorants in 2018/19 was not so unusual as the 2018/19 Shag and Black Guillemot counts. The high count of seven Red-throated Divers in 2018/19 was notable, as was the count of six Common Scoters (**Table 5.2**). Numbers of Slavonian Grebes and Great Northern Divers remained low but were the same or similar to numbers during the 2017/18 survey (**Table 5.2**). Numbers of Long-tailed Ducks had increased slightly, from 80 individuals counted during the 2017/18 survey to 97 in 2018/19 (**Table 5.2**). The count of Common Eiders was the lowest on record (**Table 5.2 and Figure 5.1**).

Table 5.1. Counts of seaduck and diving seabirds seen in Sullom Voe during winter boat count surveys, winters of 2011/12 to 2019/20.

Winter	2011/12	2012/13	2013/14	2014/15	2016/17	2017/18	2018/19	2019/20
Date	16/1	23/1	10/1	19/1	22/1	29/12	18/1	17/12
Number of observers	2	3	3	2	3	2	3	4
Common Eider	2	0	0	3	1	4	2	1
Long-tailed Duck	1	1	2	2	6	7	4	13
Common Scoter	0	0	1	0	0	0	1	0
Velvet Scoter	0	0	0	1	2	0	0	0
Goldeneye	33	47	18	30	15	26	17	43
Red-breasted Merganser	74	124	141	141	130	97	73	62
Goosander	0	1	0	1	0	0	0	0
Red-throated Diver	1	2	1	0	0	1	0	4
Black-throated Diver	0	1	0	0	1	0	0	0
Great Northern Diver	2	3	8	3	4	11	0	4
Slavonian Grebe	29	21	32	26	25	18	37	39
Cormorant	5	18	8	2	2	0	1	1
Shag	87	90	158	125	134	150	181	138
Common Guillemot	1	0	2	0	0	0	0	1
Razorbill	1	2	1	0	0	0	0	0
Black Guillemot	121	195	156	143	93	134	170	224
Little Auk	1	0	0	1	0	0	0	1
Puffin	0	0	1	0	1	0	0	0
Total	358	505	529	478	414	448	486	531

The 2019/20 winter survey of the Sullom Voe and Yell Sound transect was done on 17th December 2020 from MV *Seabird* with 4 observers. The survey began at 0935 and finished at 1435. There was no wind except for very occasional gentle movements of less than Force 1. The sea was flat calm. There was no swell, but for a very few small patches of light swell in the areas most exposed to the north. Cloud cover was 2-4/8, it was generally sunny and clear, visibility was good (>10km) and it remained dry throughout the survey.

In Sullom Voe, the count of Black Guillemots during the 2019/20 survey was the highest on record, with 224 seen, compared with 170 during the 2018/19 survey and less than 200 in all previous years (**Table 5.1**). Similarly, the count of 39 Slavonian Grebes was the highest on record, though just two higher than during the 2018/19 survey. Numbers of Long-tailed Ducks and Goldeneyes were also higher during the 2019/20 survey than in the previous winter (**Table 5.1**). By contrast, numbers of Red-breasted Mergansers and Shags were lower during the 2019/20 survey than in 2018/19, by 15.1% and 23.8%, respectively (**Table 5.1**). Four Red-throated Divers and a Little Auk in Sullom Voe were unusual.

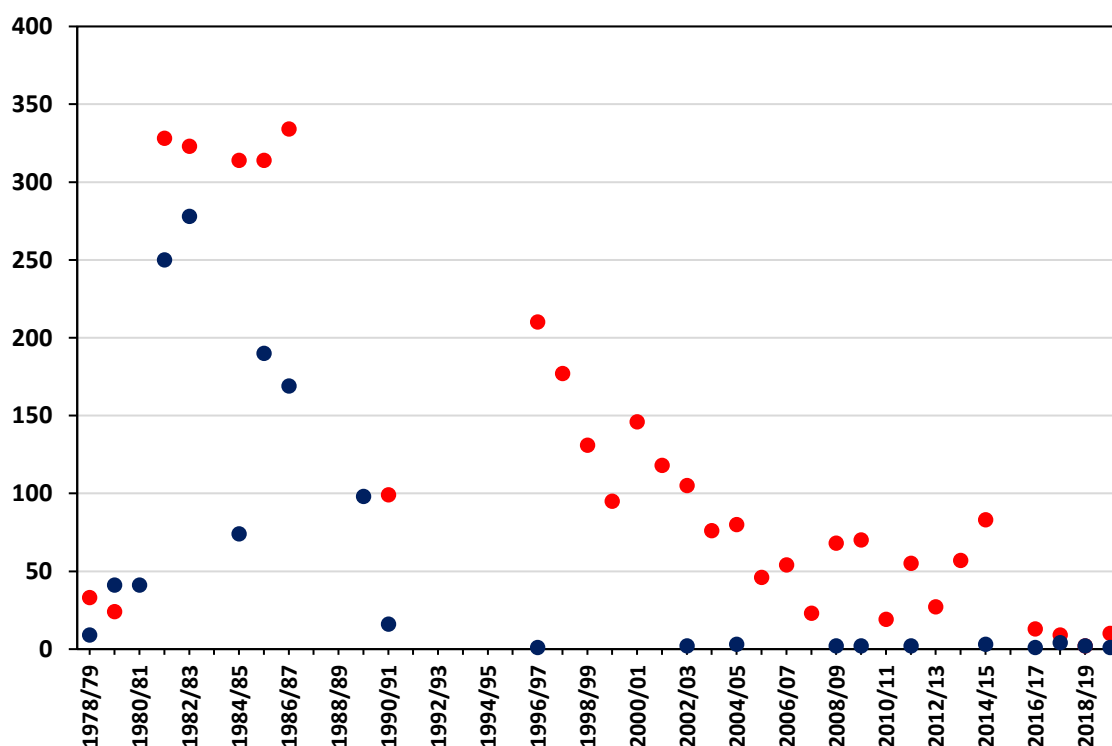
In the southern Yell Sound survey area, the counts of Shags and Black Guillemots during the 2019/20 survey were unusually high, up by 52.8% and 27.4%, respectively, compared with the 2018/19 survey (**Table 5.2**). The count of 19 Red-throated Divers was the highest total since the winter of 2007/08. Ten Common Eiders during the 2019/20 survey was a considerable increase on the two seen in 2018/19 (**Table 5.2**). Numbers of Long-tailed Ducks, Great Northern Divers and Cormorants during the 2019/20 survey were the same as or similar to numbers in 2018/19 (**Table 5.2**). Goldeneyes were down from eight during the 2018/19 survey to just two in 2019/20 (**Table 5.2**). Unusual, sub-annual species sightings during the 2019/20 survey were four Common Scoters and two Little Auks.

Table 5.2. Counts of seaduck and diving seabirds seen in the southern Yell Sound survey area during winter boat count surveys, winters of 2011/12 to 2019/20.

Winter	2011/12	2012/13	2013/14	2014/15	2016/17	2017/18	2018/19	2019/20
Date	16/1	23/1	10/1	19/1	22/1	29/12	18/1	17/12
Number of observers	2	3	3	2	3	2	3	4
Common Eider	55	27	57	83	13	9	2	10
Long-tailed Duck	80	98	73	82	90	80	97	96
Velvet Scoter	0	0	1	0	1	0	0	0
Common Scoter	0	0	0	0	2	0	6	4
Goldeneye	18	8	6	6	14	0	8	2
Red-breasted Merganser	13	13	5	12	4	1	5	0
Red-throated Diver	3	2	0	0	3	1	7	19
Great Northern Diver	5	3	2	2	12	8	7	7
Slavonian Grebe	3	6	4	1	0	1	2	1
Cormorant	104	353	230	463	326	212	319	302
Shag	513	691	440	706	812	436	737	1126
Common Guillemot	1	1	12	1	0	0	3	2
Razorbill	0	0	1	0	0	0	0	0
Black Guillemot	325	580	513	349	390	442	558	711
Little Auk	1	0	0	0	0	0	0	2
Puffin	0	4	0	1	0	0	0	0
Total	1121	1786	1344	1706	1667	1190	1751	2282

The long-term data series of winter boat counts of Common Eider in Sullom Voe and the southern Yell Sound survey area is shown in Figure 5.1. In both these survey areas, the highest numbers of Common Eider in winter were seen during the 1980s. Since then, the number of birds in the southern Yell Sound survey area has greatly decreased, down to the current level of just ten birds or fewer. In Sullom Voe, a similar decrease happened but more quickly, with the drop to single figure counts occurring during the late 1980s and early 1990s, and single figures seen during all surveys thereafter.

Figure 5.1. Counts of Common Eiders in Sullom Voe (blue) and the southern Yell Sound survey area (red) during winter boat counts in the winters of 1978/79 to 2019/20. In winters when more than one survey was completed, data are from the survey that occurred within the standard survey period (15th December to the last day of February) and that was closest to the winter solstice date.



5.2. Hascosay, Bluemull and Colgrave Sounds, south Unst and Basta Voe.

The 2018/19 winter survey of the Hascosay, Bluemull and Colgrave Sounds, south Unst and Basta Voe transect was done on 28th February 2019 from MV *Seabird* with three observers. The survey began at 0915 and finished at 1440. The wind was light westerly (2-4 knots dropping to 0-1 knots) and the sea was mostly calm, with small waves for the first two hours, decreasing thereafter to a very light ripple and flat calm. Cloud cover was 2-4/8, it was generally bright and clear, visibility was good (>10km) and it remained dry throughout the survey.

Numbers of Common Eiders and Long-tailed Ducks in Hascosay, Bluemull and Colgrave Sounds and the south Unst survey area in the 2018/19 winter survey were down by 263 (-20.2%) and 158 (-17.0%) individuals, respectively, in comparison with the 2017/18 survey (**Table 5.3**). Cormorant and Shag numbers were also down, by 52 (-28.9%) and 204 (-32.0%) individuals, respectively (**Table 5.3**). The numbers of other frequently occurring species were generally similar in 2018/19 to 2017/18 (**Table 5.3**). Counts of 18 Common Scoters and two Velvet Scoters were notable in 2018/19, so too was the White-billed Diver in Bluemull Sound, seen in the same place for the fourth consecutive winter and assumed to be the same returning individual. Numbers of seabirds counted in Basta Voe during the 2018/19 survey were mostly similar to or fewer than during the survey of the previous winter (**Table 5.4**). The standout exception to this, however, was a high count of 30 Red-throated Divers in Basta Voe during the 2018/19 survey, compared with just 3 seen during the 2017/18 survey (**Table 5.4**).

Table 5.3. Sum total counts of seaduck and diving seabirds seen in Hascosay, Bluemull and Colgrave Sounds and the south Unst survey area during winter boat count surveys, winters of 2011/12 to 2019/20.

Winter	2011/12	2012/13	2013/14	2015/16	2016/17	2017/18	2018/19	2019/20
Survey date	22/1	8/2	18/2	17/1	16/2	2/1	28/2	18/12
No. observers	2	3	3	3	3	3	3	4
Common Eider	978	1458	1394	1319	1305	1335	1042	1273
King Eider	0	0	2	0	0	1	0	0
Long-tailed Duck	365	555	720	707	930	764	772	668
Common Scoter	1	2	4	2	0	2	18	2
Velvet Scoter	0	0	1	0	0	0	2	4
Surf Scoter	0	0	0	0	1	1	0	0
Goldeneye	11	12	0	51	0	1	0	0
Red-breasted Merganser	36	26	20	33	13	32	7	11
Red-throated Diver	20	21	12	0	21	9	29	11
Great Northern Diver	9	18	18	13	32	28	28	16
White-billed Diver	0	1	0	2	1	1	1	1
Slavonian Grebe	0	0	0	0	0	1	0	0
Cormorant	252	243	157	261	180	351	128	227
Shag	554	804	306	808	637	1480	433	1260
Common Guillemot	2	6	13	6	8	0	6	10
Razorbill	0	1	1	0	1	0	0	0
Black Guillemot	277	885	364	451	379	645	415	421
Little Auk	0	0	0	1	0	0	0	0
Puffin	1	0	0	1	0	0	0	0
Total	2506	4032	2974	3655	3504	4651	2881	3904

The 2019/20 winter survey of the Hascosay, Bluemull and Colgrave Sounds, south Unst and Basta Voe transect was done on 18th December 2019 from MV *Seabird* with four observers. The survey began at 0900 and finished at 1435. There was no wind in the morning, but in the afternoon from 1300hr onwards, there was a light southerly of Force 0-1. There was no swell throughout the day. The surface of the sea was entirely flat and unrippled in the morning, but a light to moderate ripple developed in the afternoon. Cloud cover was 1-2/8, it was bright and clear, and visibility was good (>10km). It remained dry throughout the survey.

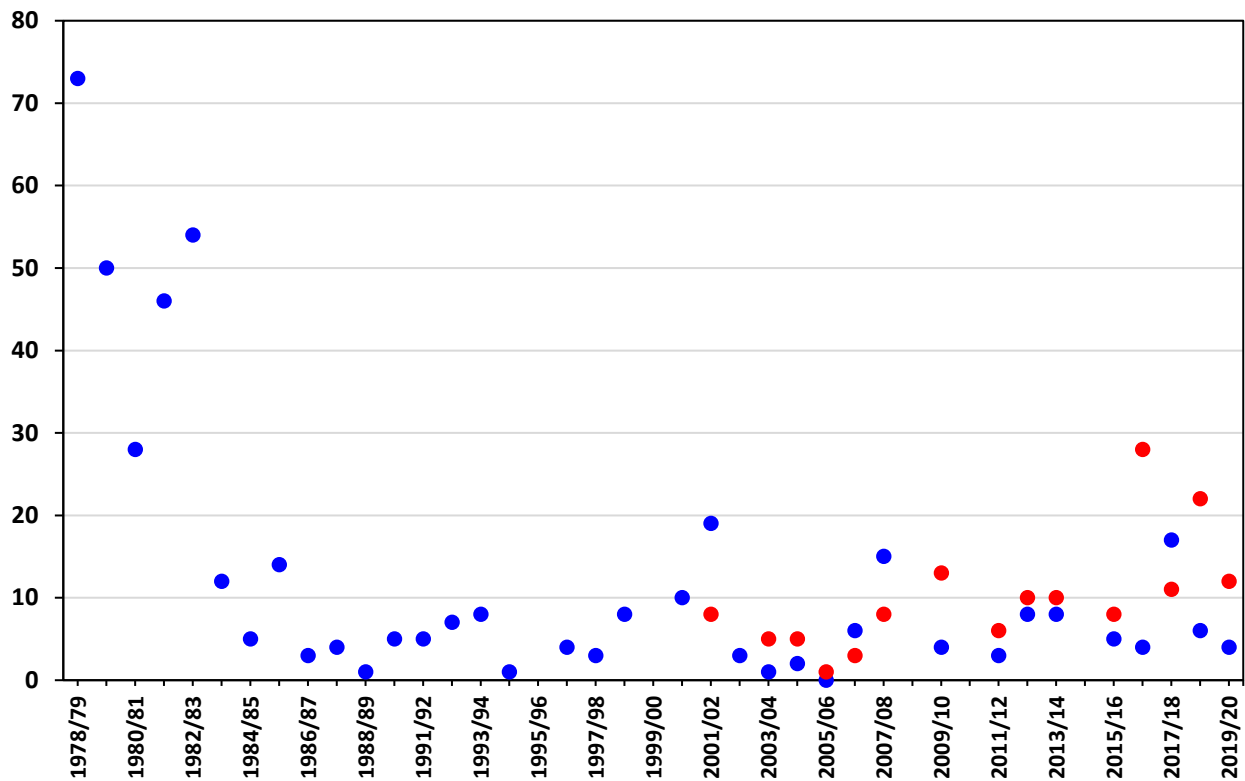
The count of 1273 Common Eiders during the 2019/20 survey was 22.2% higher than the count of 1042 in 2018/19 (**Table 5.3**). Numbers of Shags and Cormorants were also higher in the 2019/20 survey than in 2018/19, by 77.3% and 191.0%, respectively (**Table 5.3**). The count of Black Guillemots in 2019/20 was similar to that in 2018/19 (**Table 5.3**). Counts of Long-tailed Ducks, Red-throated Divers and Great Northern Divers during the 2019/20 survey were lower than in 2018/19 (**Table 5.3**). A single White-billed Diver was seen during the 2019/20 survey, in the same place that an individual of this species has been seen during the previous five winters. However, high-resolution photographs suggest that this series of sightings involves more than one individual. Notable other counts in 2019/20 included two Common and four Velvet Scoters. The counts of seaduck and diving seabirds in Basta Voe during the 2019/20 survey were mostly within the numerical range of respective counts of the previous five years, although five Slavonian Grebes was exceptional (**Table 5.4**).

Table 5.4. Counts of seaduck and diving seabirds in Basta Voe, Yell, during winter boat count surveys, winters of 2011/12 to 2019/20.

Winter	2011/12	2015/16	2016/17	2017/18	2018/19	2019/20
Survey date	22/1	17/1	16/2	2/1	28/2	18/12
No. of observers	2	3	3	3	3	4
Common Eider	1	0	2	2	2	0
Long-tailed Duck	1	0	0	0	0	1
Goldeneye	0	0	1	1	1	2
Red-breasted Merganser	33	47	7	7	7	41
Goosander	0	4	0	0	0	0
Red-throated Diver	7	6	3	3	30	2
Great Northern Diver	2	5	0	8	1	3
Cormorant	48	7	1	15	0	0
Shag	125	23	10	93	8	13
Slavonian Grebe	0	0	0	0	0	5
Common Guillemot	0	9	2	0	6	1
Razorbill	0	0	2	0	0	0
Black Guillemot	91	46	67	93	70	63
Total	308	147	98	222	125	131

The long-term data series for Great Northern Diver counts along the Hascosay, Bluemull and Colgrave Sounds transect section (1978/79 to 2018/19) and the south Unst section (2001/02 to 2018/19) are presented in **Figure 5.2**. Between the winters of 1978/79 and 1982/83 numbers in the Hascosay, Bluemull and Colgrave Sounds section were relatively high, fluctuating between a high of 78 (1978/79) and low of 28 (1980/81). Thereafter, however, numbers have been relatively low, with less than 20 birds seen each year (**Figure 5.2**). Numbers in the south Unst section have increased slightly, from less than ten between 2000/01 and 2007/18, up to between ten and 30 individuals in more recent years (**Figure 5.2**).

Figure 5.2. Numbers of Great Northern Divers along the Hascosay, Bluemull and Colgrave Sounds winter boat count transect section in the winters of 1978/79 to 2019/20 (blue), and along the south Unst section in the winters of 2001/02 to 2019/20 (red). In winters when more than one survey was completed, data are from the survey that occurred within the standard survey period (15th December to the last day of February) and that was closest to the winter solstice date.



5.3. Rova Head to Kirkabister, east Mainland

The Rova Head to Kirkabister transect was surveyed on 11th January 2019 from MV *Seabird* with four observers. The survey began at 0940 and finished at 1420. Conditions were not ideal. The survey began breezy, with gusts of up to 14 knots, but wind strength decreased through the day down to <10 knots by 1030 and <5 knots by 1200. The sea was choppy at first, roughest offshore but calmer within the voes, where there was a moderate or light ripple only. As the wind dropped through the day, wave size decreased everywhere and by the afternoon most offshore areas were relatively calm, with only a light ripple. Cloud cover was 7-8/8, so the day was very overcast. Visibility was >5km to begin with, although occasionally less during showers and heavy drizzle, but became very poor from 1300 to 1400 (c.300-1500m visibility) due to a thick mist developing at sea level. It was generally wet, with frequent drizzle and occasional showers, especially in the afternoon.

Despite the conditions, counts of some species were higher in the 2018/19 survey than in 2017/18, for example Common Eider (+34.0%), Red-breasted Merganser (+48.5%), Great Northern Diver (+2.5%) and Black Guillemot (+5.7%; **Table 5.5**). However, counts of other species were lower in 2018/19 than in 2017/18, for example Long-tailed Duck (-27.5%), Goldeneye (-44.0%), Red-throated Diver (-42.1%), Slavonian Grebe (-18.8%) and Shag (-34.7%; **Table 5.5**). Single Common Scoter, Little Auk and Puffin were notable. The count of Red-breasted Mergansers was the highest on record and of Great Northern Divers the second highest, after 133 were seen in 2016/17 (**Table 5.5**). The count of 67 Common Eider continued the long-term pattern of decline in numbers along this area of coastline in winter (Heubeck *et al.* 2017).

Table 5.5. Counts of seaduck and diving seabirds seen from Rova Head (north Bressay Sound) to Kirkabister (north Nesting) during winter boat count surveys, winters of 2010/11 to 2018/19.

Winter	2010/11	2011/12	2012/13	2013/14	2015/16	2016/17	2017/18	2018/19
Survey date	27/1	19/12	30/11	17/2	12/12	7/1	12/12	11/1
Number of observers	3	2	3	2	2	3	3	4
Common Eider	125	126	93	59	154	77	50	67
Long-tailed Duck	98	119	134	161	121	219	189	137
Common Scoter	0	3	0	0	1	0	1	1
Velvet Scoter	0	0	0	0	0	1	0	0
Goldeneye	46	31	27	16	9	27	25	14
Red-breasted Merganser	116	181	126	101	105	181	134	199
Goosander	0	0	0	0	0	0	0	0
Red-throated Diver	5	20	10	43	11	14	19	11
Great Northern Diver	45	107	94	103	110	133	119	122
Red-necked Grebe	0	0	0	0	0	0	1	0
Slavonian Grebe	61	57	48	46	38	68	48	39
Cormorant	115	69	41	52	11	4	36	34
Shag	327	515	382	419	362	333	478	312
Common Guillemot	14	8	47	43	15	6	9	33
Razorbill	0	3	4	7	5	5	0	2
Black Guillemot	336	422	409	281	329	306	370	391
Little Auk	0	0	0	0	8	5	1	1
Puffin	0	4	0	1	1	1	1	1
Total	1288	1665	1415	1332	1280	1380	1481	1368

5.4. Bressay Sound and north Bressay

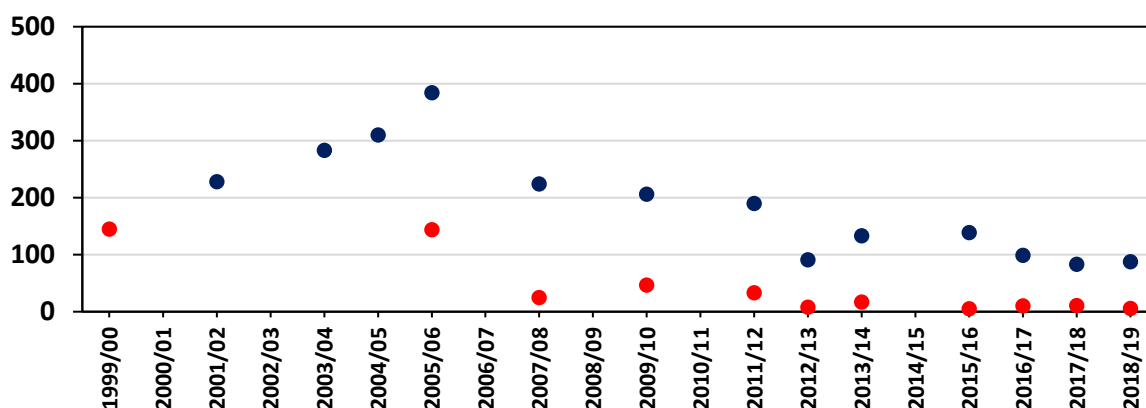
The Bressay Sound and north Bressay transect was surveyed on 9th January 2019 from MV *Seabird* with three observers. The survey began at 1000 and finished at 1235. The wind was westerly (0-5 knots), beginning calm but picking up slightly by 1130. The sea had a light ripple and no swell in the areas south of Lerwick Harbour and in Bressay Sound, but there was a heavy surface ripple and swell of up to 1.5 metres along the north coast of Bressay. Cloud cover was 6-8/8 and it was generally overcast, but visibility was good (>10km) and it was dry throughout the survey.

Long-tailed Ducks and Black Guillemots were more numerous in the 2018/19 survey than in 2017/18, by 30 (+96.8%) and 181 (+93.8%) individuals, respectively (**Table 5.6**). In contrast, lower numbers were seen of Great Northern Divers (-45.2%), Cormorants (-32.1%) and Shags (-47.7%; **Table 5.6**). Numbers of Common Eiders and Slavonian Grebes in the 2018/19 survey were identical to the 2017/18 survey (**Table 5.6**). There has been a long-term decrease in the numbers of Common Eiders seen in Bressay Sound and along the coast of north Bressay in winter, with the 2018/19 survey counts continuing this pattern (**Table 5.6**, **Figure 5.3**).

Table 5.6. Counts of seaduck and diving seabirds seen in Bressay Sound and along the north Bressay coastline during winter boat count surveys, winters of 2009/10 to 2018/19.

Winter	2009/10	2011/12	2012/13	2013/14	2015/16	2016/17	2017/18	2018/19
Date	3/2	3/2	12/12	19/2	26/2	13/12	14/12	9/1
No. of observers	2	2	2	2	2	2	2	3
Common Eider	253	223	99	150	144	109	94	94
Long-tailed Duck	82	62	84	127	78	97	31	61
Common Scoter	1	4	1	3	2	3	0	1
Goldeneye	34	1	3	2	20	2	3	0
Red-breasted Merganser	38	44	23	16	30	28	31	36
Red-throated Diver	0	11	0	9	8	3	4	6
Great Northern Diver	2	9	9	17	11	26	31	17
Slavonian Grebe	3	2	0	0	4	3	3	3
Cormorant	15	3	1	5	3	4	28	19
Shag	374	234	359	150	221	357	681	356
Common Guillemot	3	9	11	20	12	6	3	9
Razorbill	4	18	0	7	13	11	1	2
Black Guillemot	381	358	302	326	283	279	193	374
Little Auk	0	19	0	0	0	2	0	0
Puffin	0	0	0	0	1	0	0	1
Total	1191	998	892	887	830	930	1103	981

Figure 5.3. Numbers of Common Eider along the Bressay Sound winter boat count transect section (blue) and North Bressay section (red), winters of 1999/00 to 2018/19.



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

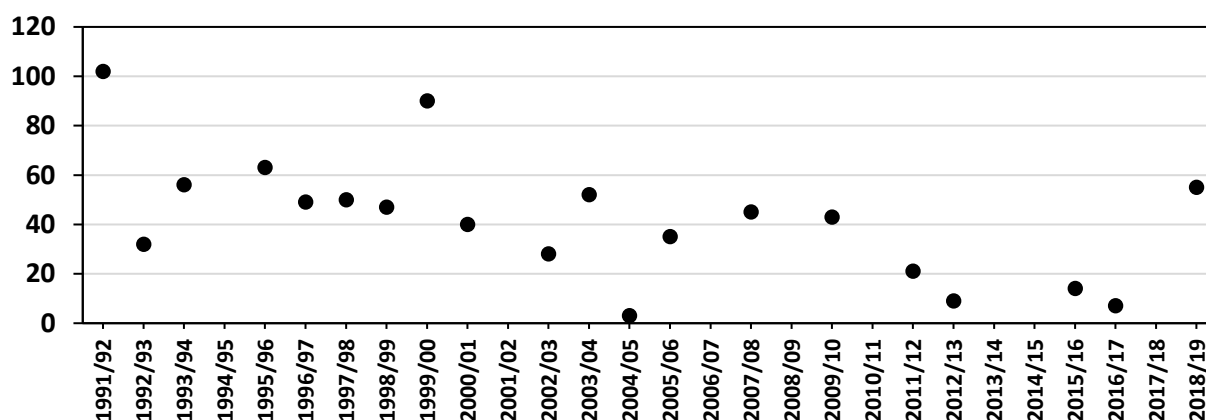
The Pool of Virkie to Bay of Quendale area was surveyed on 24th January 2019 from land by two observers. The survey began at 1330 and finished at 1530. The wind was southwesterly with variable gust strength (up to 8 knots), although mostly calm (0-2 knots). The sea was calm in most areas with no swell, though offshore there was a moderate to heavy ripple. Cloud cover was variable (4-8/8) and it began sunny, becoming overcast after 1500. Visibility was good (>10km) and apart from one heavy shower that passed through quickly it remained dry throughout the survey.

The count of Long-tailed Ducks during the 2018/19 survey was 101 individuals, 31.2% higher than the most recent previous survey (in 2016/17), when 77 individuals were counted (**Table 5.7**). Counts in 2018/19 were lower than in the 2016/17 survey for the following species: Goldeneye (-100%), Great Northern Diver (-35.2%), Shag (-20.9%) and Black Guillemot (-54.2%; **Table 5.7**). The comparatively high counts of Red-throated Diver and Common Guillemot during the 2018/19 survey were unusual (**Table 5.7**). The count of 55 Common Eider in 2018/19 was a substantial increase on the 2016/17 survey total (7) and the highest total since the winter of 1999/2000 (**Figure 5.4**).

Table 5.7. Counts of seaduck and diving seabirds seen within the Pool of Virkie to the Bay of Quendale survey area during land-based winter surveys, winters of 2009/10 to 2018/19.

Winter	2005/06	2007/08	2009/10	2011/12	2012/13	2015/16	2016/17	2018/19
Survey date	2/2	12/1	10/2	30/12	9/2	12/1	12/2	24/1
Common Eider	24	45	43	21	9	14	7	55
Long-tailed Duck	57	201	121	242	114	165	77	101
Common Scoter	0	0	0	7	1	2	0	0
Goldeneye	5	32	15	38	12	12	12	0
Red-breasted Merganser	0	0	0	1	0	3	8	6
Red-throated Diver	11	10	1	10	5	1	7	14
Black-throated Diver	0	0	0	0	0	1	0	0
Great Northern Diver	22	18	30	24	43	35	54	35
Cormorant	0	0	2	1	2	0	2	1
Shag	77	76	115	119	139	132	148	117
Common Guillemot	6	2	4	26	79	6	3	27
Razorbill	2	1	0	2	2	0	1	2
Black Guillemot	21	24	61	29	71	45	48	22
Little Auk	0	0	0	1	0	0	0	0
Total	225	409	392	521	477	416	367	380

Figure 5.4. Numbers of Common Eider in the Pool of Virkie to Bay of Quendale winter counts survey area, winters of 1991/92 to 2018/19. In winters when more than one survey was completed, data are from the survey that occurred within the standard survey period (15th December to the last day of February) and that was closest to the winter solstice date.



5.6. Whiteness Voe to Skelda Voe, West Mainland

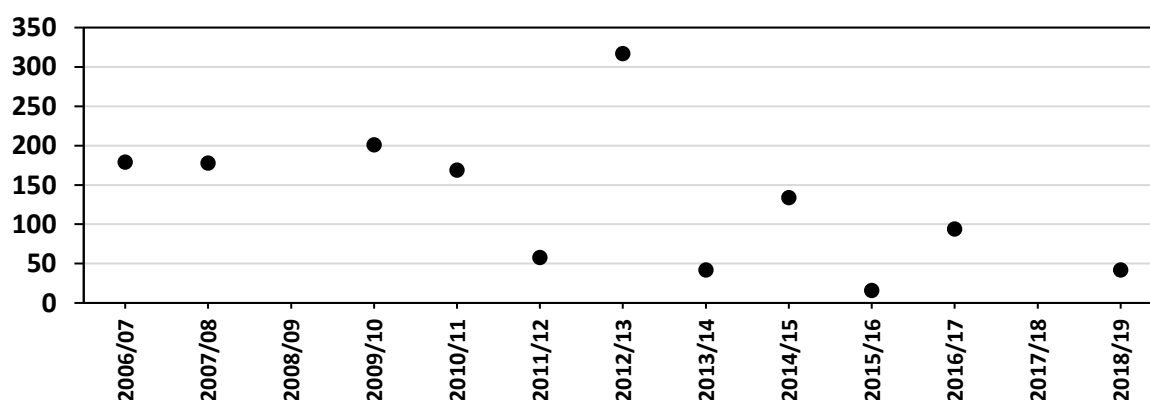
The Whiteness Voe to Skelda Voe area was surveyed on 2nd February 2019 from land by one observer. The survey began at 0900 and finished at 1445. The wind was northerly 0-3 knots and the sea calm with an occasional light ripple. Cloud cover was 2/8, visibility was good (>10km) and it remained dry throughout the survey.

Counts of several of the commoner species were lower during the 2018/19 survey than during the most recent previous survey (in 2016/17), for example Common Eider (-55.3%), Long-tailed Duck (-58.3%), Slavonian Grebe (-44.9%), Shag (-28.3%) and Black Guillemot (-31.6; **Table 5.8**). Numbers of Great Northern Divers in 2018/19 were very similar to numbers in 2016/17, while numbers of Red-breasted Mergansers were 14.6% higher in 2018/19 than in 2016/17 (**Table 5.8**). There has been a general long-term decrease in numbers of Common Eider counted in winter in the Whiteness Voe to Skelda Voe survey area, with counts over 100 during the first four surveys but less than 50 in 2015/16 and 2018/19 (**Figure 5.5**).

Table 5.8. Counts of seaduck and diving seabirds seen in the Whiteness Voe to Skelda Voe survey area during land-based winter surveys, winters of 2010/11 to 2018/19.

Winter	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2018/19
Date	25/1	23/1	13/12	7/2	15/2	12/1	11/2	11/2
Common Eider	169	58	317	42	134	16	94	42
Long-tailed Duck	33	36	26	23	20	12	12	5
Common Scoter	3	5	0	2	0	1	0	0
Velvet Scoter	0	1	0	0	0	0	0	0
Goldeneye	11	21	18	28	15	2	9	13
Red-breasted Merganser	83	110	156	188	109	72	96	110
Goosander	1	3	0	1	0	0	4	4
Red-throated Diver	1	1	2	3	0	2	3	2
Black-throated Diver	0	0	0	1	0	0	0	0
Great Northern Diver	26	39	17	42	25	29	27	29
White-billed Diver	0	0	0	0	0	0	0	1
Slavonian Grebe	73	74	55	57	66	23	69	38
Cormorant	14	10	17	27	8	0	7	1
Shag	103	104	145	127	128	146	99	71
Common Guillemot	0	0	0	76	1	26	1	11
Razorbill	1	0	3	11	4	4	8	11
Black Guillemot	76	76	44	106	81	61	117	80
Little Auk	0	0	0	0	0	23	0	0
Puffin	0	0	0	1	1	5	2	0
Total	587	528	800	735	592	422	548	548

Figure 5.5. Numbers of Common Eider in the Whiteness Voe to Skelda Voe survey area, winters of 2006/07 to 2018/19.



6. Beached Bird Surveys

The Shetland-wide monthly beached bird survey has operated continuously since March 1979 and is carried out by SOTEAG staff and many local 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 oil ‘fingerprinting’ analyses (molecular structure determined and cross-checked with a global reference database of oil types, including those from the Shetland oil industry). The main long-term patterns in the beached bird surveys dataset have been decreases in the number of seabirds found per km surveyed and decreases in the proportion of corpses found oiled (**Table 6.1**).

Table 6.1. Summary statistics from the Shetland Beached Bird Survey from 2010 to 2019 and 5-year annual mean statistics from 1979 to 2018. Km = total kilometers surveyed, Corpses = total number of corpses found, Oiled = total number of oiled corpses found, % Oiled = percentage of all corpses that were oiled, Corpses/km = number of corpses found per kilometer surveyed [Corpses/Km], Oiled/km = number of oiled corpses found per kilometer surveyed [Oiled/Km].

Year	Km	Corpses	Oiled	% Oiled	Corpses/km	Oiled/km
2010	551.30	857	46	5.37	1.555	0.083
2011	577.80	935	23	2.46	1.618	0.040
2012	579.20	1031	21	2.04	1.780	0.036
2013	581.12	811	49	6.04	1.396	0.084
2014	587.52	1,152	11	0.96	1.961	0.019
2015	585.17	691	27	3.91	1.181	0.046
2016	389.42	752	35	4.65	1.931	0.090
2017	387.82	523	25	4.78	1.349	0.064
2018	367.10	828	24	2.89	2.255	0.065
2019	358.2	542	5	0.92	1.513	0.013
5-Year Annual Means: 1979–1983				9.98	4.064	0.408
1984–1988				7.86	3.933	0.311
1989–1993				7.19	3.990	0.285
1994–1998				9.50	4.307	0.409
1999–2003				2.39	3.171	0.073
2004–2008				2.97	2.163	0.061
2009–2013				4.04	1.610	0.063
2014–2018				3.57	1.744	0.060
2019–2023				0.92	1.510	0.013

6.1. Incidence of oiling

January to April: One heavily oiled Fulmar was found on Brae beach on 28th January and a heavily oiled Gannet was found on North Garth beach on 26th April. Unusually, the Fulmar was entirely covered in oil (most oiled birds found during the beaches survey are only partially covered). Analysis of an oil sample from the Fulmar determined the oil was fuel oil, probably from an illegal discharge or tanker washings.

May to August: A lightly oiled Fulmar was found on Sandvøe beach on 25th June. On 23rd July, oil was found along the tideline of South Mills beach, Out Skerries. Analyses determined it was crude oil, with similarities to crude oils from the East Shetland basin, although there was not an exact match. A lightly oiled Fulmar was found on St Ninian’s Ayre on 24th August. Analyses determined the oil was fuel oil, probably from an illegal discharge or tanker washings. Another Fulmar, lightly oiled, was found on the Wick of Tresta beach, Fetlar, on 29th August. Analyses determined the oil was crude oil, with similarities to crude oils from the East Shetland basin, although there was not an exact match.

September to December: No oil was found during these months.

Table 6.2. Results of analyses of oil samples collected in 2019. L = lightly oiled (< 10%); M = moderately oiled (10–25%); H = heavily oiled (> 25%).

No.	Date	Location	Sample	Type	Source information
278	28/1	Brae, N Mainland	Fulmar H	Fuel	Probably illegal discharge or tanker washings
279	23/7	South Mills, Out Skerries	Beach	Crude	Similarities with crude oils from the East Shetland basin, but not an exact match; source probably an illegal bilge discharge or accidental release
280	24/8	St Ninian's Ayre	Fulmar L	Fuel	Probably illegal discharge or tanker washings
281	29/8	Wick of Tresta, Fetlar	Fulmar L	Crude	Similarities with crude oils from the East Shetland basin, but not an exact match; source probably an illegal bilge discharge or accidental release

6.2. Non-oiled mortality

January to April: Relatively few corpses were found in January, February and March (<30 found per month) compared with April (>70 found). An increase in the number of corpses found on the beaches in April is not usual and coincides with the first time that many breeding seabirds are inshore and on the cliffs across Shetland. The three most frequently recorded species in the April survey were Fulmar, Gannet and Common Guillemot (>15 corpses found of each species; **Table 6.3**).

May to August: Relatively high numbers of corpses were found throughout the period (>70 in each month). This is an established pattern and is presumably due to the high numbers of seabirds inshore around Shetland at this time of year, through the core months of the breeding season. The species found most frequently during this period were Fulmar, Gannet and Common Guillemot (**Table 6.3**).

September to December: Relatively few corpses (<30) were found in each month. Fulmar and Gannet were the most frequently recorded species during the period, with sum totals of 23 and 21 found, respectively. Unusual species encountered included one each of Goldeneye, Puffin, Little Auk and Long-eared Owl (**Table 6.3**).

Table 6.3. Monthly totals of seabirds and seaduck found on beached bird surveys in 2019. Species numbers are total corpses found, with the number that were oiled given in parentheses. Other species found in 2019: Greylag Goose 18, Pink-footed Goose 1, Mallard 2, Osprey 1, Redshank 1, Oystercatcher 13, Curlew 2, Whimbrel 3, Golden Plover 1, Turnstone 1, Wood Pigeon 1, Rock Dove 7, Long-eared Owl 1, Meadow Pipit 1, Raven 2, Hooded Crow 4. Birds found tangled in nets/ropes/hooks in 2019: Fulmar 2 (rope/string), Shag 1 (rope).

SPECIES	J	F	M	A	M	J	J	A	S	O	N	D	SUM
Common Eider			2										2
Long-tailed Duck			1										1
Goldeneye												1	1
Red-breasted Merganser											1		1
Great Northern Diver											1		1
Red-throated Diver								1				1	2
Fulmar	9(1)	6	10	19	29	42(1)	33	49(2)	8	6	2	7	220
Gannet	2	1	6	24(1)	10	8	7	8	5	8	4	4	87
Cormorant		1										1	2
Shag	1	1	1	3	3	4	1	1	2	3	3	1	24
Great Skua					3	4	2	1	1				11
Black-headed Gull					1	1	2						4
Common Gull							1	1					2
Herring Gull			1	2	4	6	2	7	1	3	1	1	28
Great Bl.-backed. Gull	6	1	3	2		4	4	4	1	1	4	4	34
Kittiwake	1	1			2	2		5	1				12
Arctic Tern						2	2						4
Common Tern						1							1
Common Guillemot	2	1	4	17	19	14	6	3	5	2		1	74
Razorbill		1		2			2	3					8
Black Guillemot				1		1	4	1	2				9
Puffin			1	1	1	1	3	4				1	12
Little Auk											1		1
Total	21	13	29	71	72	90	69	88	26	23	17	22	542
Oiled	1	0	0	1	0	1	0	2	0	0	0	0	5
Km. surveyed	30.5	30.7	29.7	30.7	29.6	28.1	29.2	30.7	29.2	29.7	29.4	30.7	358.2
Corpses / km.	0.69	0.42	0.98	2.31	2.43	3.20	2.36	2.87	0.89	0.77	0.58	0.72	1.51
% oiled	4.76	0.00	0.00	1.41	0.00	1.11	0.00	2.27	0.00	0.00	0.00	0.00	0.92
Oiled / km.	0.03	0.00	0.00	0.03	0.00	0.04	0.00	0.07	0.00	0.00	0.00	0.00	0.01
Oiled after death	0	0	0	0	0	0	0	0	0	0	0	0	0
Net/rope/hook tangled	1	0	0	0	0	1	0	0	0	1	0	0	3
Other species	2	3	4	7	9	6	6	12	3	3	2	2	59

Table 6.4. Age composition of Common Guillemots found on beached bird surveys in 2019. No white tips to the greater underwing coverts determines that birds were older than their first year (>12 months), white tips means they were in their first year (≤12 months). 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	2	100.0	1	100.0	3	75.0	5	38.5	9	56.3	10	76.9
White tips	0	0.0	0	0.0	1	25.0	8	61.5	7	43.7	3	23.1
Unaged	0		0		0		4		3		1	
Total	2		1		4		17		19		14	
Month	July		August		September		October		November		December	
Guillemot	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No white tips	2	40.0	2	66.7	3	75.0	0	0	0	0	0	0
White tips	3	60.0	1	33.3	1	25.0	2	100.0	0	0	1	100.0
Unaged	1		0		0		0	0	0	0	0	0
Total	6		3		4		2		0		1	

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Pre-breeding census counts of Black Guillemots: Kristopher Wilson (Sullom Voe Terminal) and Roger Riddington.

Annual monitoring of cliff-nesting seabirds: Helen Moncrieff and Lynne McKenzie (RSPB).

National Seabird Census counts of cliff-nesting seabirds: David Cooper, Phil Harris (Shetland Seabird Tours), Paul Harvey (Shetland Amenity Trust), Peter Hunter, Mike Pennington, Brydon Thomason (Shetland Nature) and Glen Tyler (SNH).

Data digitisation: Chris Atkins and Struan Haswell.

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Appendix 1. Seabird monitoring on Foula in 2019, conducted by Sheila Gear (Foula Ranger Service).

Common Eider. In 2019, male Eider numbers were up but female numbers were down in comparison with 2018. The count was done on 4th August by Penny Gear and Sheila Gear. Conditions were good, with a light northerly wind and an overcast, cloudy sky. Breeding was late and breeding success was poor, similar to 2018. Mean brood size in 2019 was the same as in 2018.

	24/7/10	26/7/11	27/7/12	25/7/13	27/7/14	25/7/15	24/7/16	29/7/17	12/8/18	4/8/19
Males	48	74	108	94	81	33	81	45	64	79
Females	66	51	50	71	87	52	68	69	65	58
Adults	114	125	158	165	168	85	149	114	129	137
Chicks	19	26	81	27	49	21	70	38	47	49
Total	133	151	239	192	217	106	219	152	176	186
Brood/1	8	7	7	15	5	3	14	4	10	9
Brood/2	3	6	12	3	11	2	7	6	6	8
Brood/3	0	1	8	2	6	2	7	6	7	8
Brood/4	0	1	4	0	1	2	4	1	1	0
Brood/5	1	0	2	0	0	0	1	0	0	0
Mean Br.	1.58	1.73	2.45	1.35	2.13	2.33	2.12	2.38	1.96	1.96

Red-throated Diver. Red-throated Divers had a poor season in 2019. Fourteen sites were occupied and there were 11 breeding attempts. Five pairs failed for certain and probably one other as well. Extra adults were observed at three of the failed sites (conclusively at all three sites, the chicks there were lost when small). Five chicks appeared to fledge successfully. One fledgling was seen on a site at which it seemed too old to have been raised by the resident pair, so may have moved there from a different lochan. There was one late chick, which hatched on 7th August but was subsequently observed being eaten by a Bonxie when 2 weeks old.

Foula Red-throated Divers	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sites occupied at least once	10	13	12	13	13	12	15	11	12	14
Breeding attempts	9	11	8	12	12	12	13	10	11	11
Sites where chicks hatched	5	7	6	7	11	11	11	6	9	9
Minimum number of chicks	5	9	8	9	17	12	12	7	14	13
Chicks presumed fledged	4	5	5	4	15	10	6	5	9	5
Breeding success	0.44	0.45	0.63	0.33	1.25	0.83	0.46	0.50	0.82	0.45

Northern Fulmar. Four of the Foula plots were picked at random and monitored by Sheila Gear. The weather in 2019 during incubation was very dry and no nest sites were flooded out. Predation of eggs by a pair of Ravens nesting just south of the plots was frequently observed. A total of 14 fledglings were produced in nest sites where birds had been present on less than three observations earlier in the year.

Plot	Total AOS	AOS on all 3 checks (%)	Chicks at all-3-check sites + 'extra' sites	Success
1	80	43 (53.8%)	12 + 1	13/44 = 0.29
5	144	82 (56.9%)	39 + 9	48/91 = 0.53
6	59	37 (62.7%)	12 + 2	14/39 = 0.36
7	94	57 (60.6%)	24 + 2	26/59 = 0.44
	377	219 (58.1%)	87 + 14	101/233 = 0.43
Mean ± SE of 4 plots				0.41 ± 0.04

Overall breeding success in 2019 was 0.41 fledglings per AON, 29.3% lower than in 2018.

Fulmar	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Qualifying AOS	140	119	196	135	113	123	137	119	124	233
'Extra' sites	5	0	0	0	33	16	10	18	28	14
Chicks in August	88	57	125	96	97	45	80	79	88	87
Mean success	0.62	0.48	0.64	0.73	0.67	0.33	0.56	0.58	0.58	0.41

European Shag. Foula once had a very large Shag population. Shag numbers continue to be very low and many areas remain deserted. Productivity was poor in 2019, with 1.09 chicks fledged per well-built nest, compared with 1.83 in 2018. A number of nest sites were very wet from mid-June onwards due to spells of heavy rain.

Shag	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Trace nest only	1	0	4	3	0	1	1	2	5	1
Incubating nests	41	27	10	4	35	29	26	22	24	33
% Incubating	95.3	96.4	58.8	36.4	100	93.5	96.3	91.7	82.8	97.0
Young fledged	56	20	5	3	66	23	19	12	44	36
Fledged / inc.	1.37	0.74	0.50	0.75	1.89	0.79	0.73	0.55	1.83	1.09

Arctic Skua. In 2019, the first bird was seen ashore on 25th April, but most birds returned much later. There were 19 AOTs but only 16 pairs were observed to have laid. Mean clutch size was 1.73 eggs per pair that laid. Because the number of AOTs had fallen below 20, the decision was made to try supplementary feeding. Eight of the pairs that laid were fed one feed per day - in the evening, in order to encourage them to still hunt for themselves through the day. The feed was mainly mackerel, though sometimes herring, saithe or octopus, cut up into small strips about the size of a fully grown sandeel. Three strips were fed per pair during incubation, increasing to 8 strips for pairs with two chicks. The birds were fed until 22nd August, by which time the chicks were deemed to be large enough and old enough to leave the colony with the adults. Eight of the pairs that laid were not fed. The fed pairs fledged 12 chicks and the unfed pairs fledged 4 chicks. Breeding success in 2019 was relatively high in comparison with the previous four years, probably due to the supplementary feeding in 2019. Adults were aggressive throughout the summer and no fledglings were found predated. Two adults were found dead of unknown causes. One, ringed as a chick in 2014, was found beside a newly erected small meteorology mast with a strange indentation down one side, and the other, ringed as an adult in 2013, was found on the Punds Club site, in thin condition and with what appeared to be the remains of winter-plumage barring on its breast. The total number of Arctic Skua AOTs in Foula has greatly decreased during the past decade, from 63 AOTs in 2009 to 19 in 2019.

Arctic Skua	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
First seen on land	26/4	22/4		3/5	29/4	26/4	26/4	28/4	27/4	25/4
AOT	50	41	37	35	24	28	27	23	20	19
Pairs laid	39	32	27	26	21	26	17	17	14	16
Mean clutch	1.73	1.63	1.58	1.77	1.70	1.62	1.47	1.81	1.71	1.73
Fledged	(1)	0	4	0	18	17	4	0	2	16
Success/AOT	0.00	0	0.11	0	0.75	0.61	0.15	0	0.14	0.84

Great Skua. Great Skuas again returned very late. Two were seen on 28th March but many did not come to the breeding areas until May. The sample plot in the Bitten was monitored. Numbers of AOTs on the plot had decreased by 4 pairs since 2018, to a total of 46 AOTs in 2019. Birds were very aggressive, suggesting they were in good condition, and mean clutch size was 1.80. Predation of chicks was high, particularly during periods of fog, and only 13 chicks survived to the end of July. Productivity was low in 2019 at 0.26 chicks fledged per AOT.

Great Skua	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
First seen on land	6/4	2/4	28/3	10/4	10/4	3/4	2/4	4/4	12/4	28/3
AOT monitored	48	53	38	41	48	42	54	54	50	46
Mean clutch	1.87	1.74	1.76	1.54	1.88	1.62	1.77	1.69	1.90	1.80
Fledged	11	14	8	3	8	3	14	2	11	12
Success/AOT	0.23	0.26	0.21	0.07	0.17	0.07	0.26	0.04	0.22	0.26

Black-legged Kittiwake. Kittiwakes were counted on 23rd June, in good conditions. Numbers during the whole-island count in 2019 were similar to numbers in 2017 and 2018, with a total of 257 complete attended nests seen and 2 unattended nests. There are now no Kittiwakes nesting on the big open cliff faces on the west side of the isle, where the very large colonies used to be.

Black-legged Kittiwake	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Census count (AON)	582	480	378	327	361	277	272	256	262	259
% change per year	+14.3	-17.5	-21.3	-13.5	+10.4	-23.3	-1.8	-5.9	+2.3	-1.1

Four pairs attempted to nest again at the sub-colony known as In Under da Stee. Cliff material continues to come down from a large loose area of rock high above this site, meaning that only minimal monitoring could be carried out in 2019. Three chicks fledged and 1 chick was found dead out of the nest. Breeding success was 0.75 chicks per well-built nest.

At the Hodden sub-colony there were 41 well-built nests, an increase of 14 on the 2018 total of 27 completed nests. This increase was possibly due to birds moving from the exposed high cliff faces on the west side of Foula to the more sheltered caves on the east side of the island. Thirty-four chicks survived to fledge, these were mainly single chick broods, though 9 pairs fledged 2 chicks each. Breeding success was 0.83 chicks per well-built nest.

In Under da Stee	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Completed nests	52	50	44	32	20	2	2	3	4	4
Fledged	3	0	0	0	0	1	1	0	0	3
Success	0.06	0	0	0	0	0.50	0.50	0.00	0.00	0.75
Hodden	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Completed nests	31	22	20	18	18	21	20	23	27	41
Fledged	0	2	0	0	15	4	9	8	19	34
Success	0	0.09	0	0	0.83	0.19	0.45	0.35	0.70	0.83
Mean success	0.03	0.05	0	0	0.42	0.35	0.48	0.18	0.35	0.79

Arctic Tern. Arctic Terns had a noticeably better season in 2019 than in 2018. The first birds were seen on 14th May at the airstrip and had increased to c100 by mid-June. The main colony was east of the Punds dyke with a few also on the Cletts. On 7th July the main colony was flushed and the birds photographed, giving a count of 291. It was estimated that breeding productivity was circa 1 fledgling per pair. Twenty adults were also counted at the Cletts but with only 3 pairs attempting to breed there. Most of the terns had left by 7th August but a few lingered on with late chicks, which all fledged successfully.

Common Guillemot. Guillemots appeared to have an extremely poor season. Numbers were very low and chicks were very scarce.

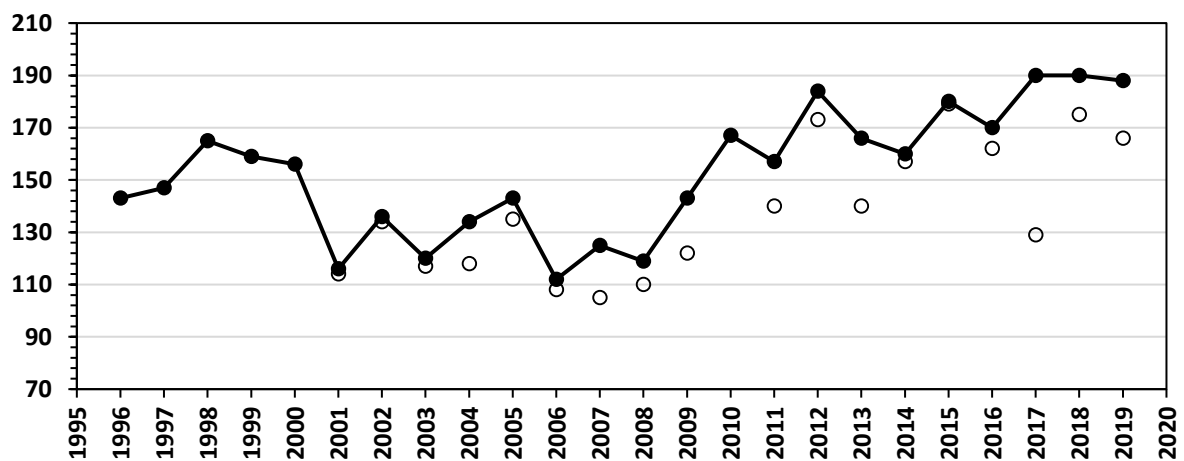
Razorbill. Razorbills appeared to do slightly better than Guillemots in 2019, but numbers of adults were still very low.

Atlantic Puffin. Puffins had a very poor, late season with numbers appearing to have declined further. The first birds were seen inshore on 18th April, but individuals were not seen on land until 8th May. Very few appeared to be breeding but those that did appeared to raise their chicks successfully, with no chicks found dead at burrow entrances. Adults were seen coming in with a wide variety of small fish, but none appeared to be sandeels. Non-breeders returned through the summer during fine spells of weather, apparently far outnumbering the breeders.

Black Guillemot. The east coast survey area 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 surveyed annually by two observers, one surveying the north section and the other the south section. In 2019, conditions for counting were very good for the first count but harder on the second count because of intense sunlight glitter on the sea. Numbers of birds were high again this year. On the first count birds were mainly on the sea. On the second count there was a mix of birds sitting up on the cliffs and down in the water. No birds were seen in winter plumage this spring.

Area counted	Date & time	Weather & tide	Count
East coast survey area	28/4: 7.30–10.25am	SE 3, cloudy, swell at Hellibriks Wick and Husabriks Wick	188 adults
East coast survey area	29/4: 7.40-10.10 am	SE 3, sun, sunlight glittering on the sea, swell at Hellibriks Wick and Husabriks Wick	166 adults

Figure 1. Counts of adult Black Guillemots along the East coast survey area, 1996–2019. Open symbols indicate the lower count when two were made in a year.



Appendix 2. Seabird ringing in Shetland in 2019.

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 making a donation 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, corresponding with seabird numbers decreasing and accessible colonies becoming fewer.

The total of 1,683 seabirds ringed at breeding colonies in 2019 was slightly lower than in 2018 (1,708), although the total number of chicks ringed in each year was almost identical (1606 in 2019, 1610 in 2018). The largest differences between the 2019 and 2018 ringing totals occurred in the following species: Great Skua (359 cf. 565), Northern Fulmar (213 c.f. 138) and European Shag (69 c.f. 21). The total number of birds ringed in 2019 and 2018 were remarkably similar for Common Guillemots (433 cf. 436) and Arctic Terns (230 cf. 235).

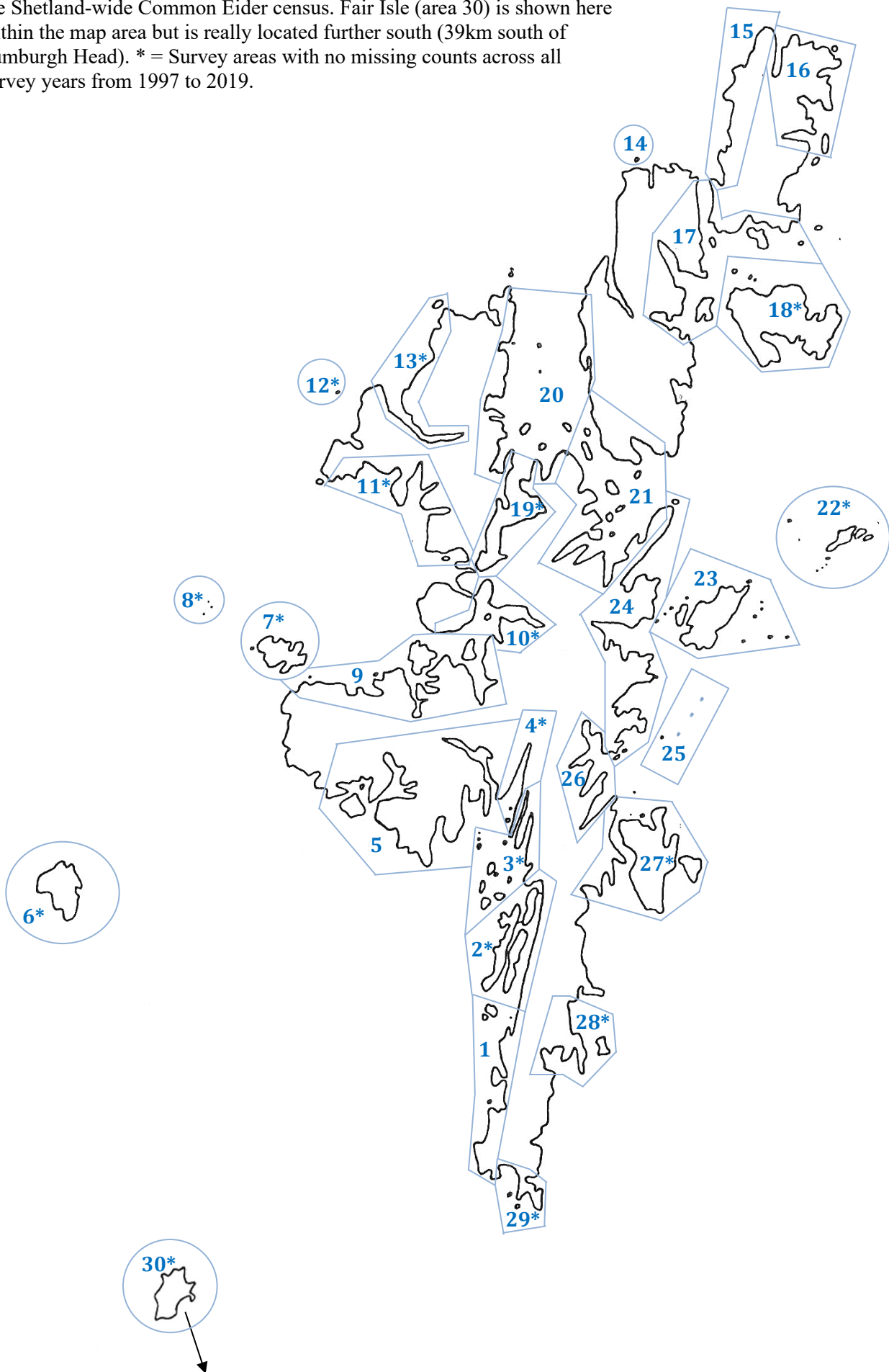
Recommendation: SOTEAG offers a donation for the cost of seabird rings for all species listed in Table 1 (except for non-breeding European and Leach's Storm-petrels, as per the normal policy). In 2019, this donation would amount to £619.13 in total, comprising £361.86 to Fair Isle Bird Observatory, £221.05 to Shetland Ringing Group (plus £21.62 for Red-throated Diver rings), and £14.60 to the University of Glasgow, which supplies the rings used on Foula.

Table 1. Seabirds ringed in Shetland in 2019. FI = Fair Isle Bird Observatory; SRG = Shetland Ringing Group; FO = Foula. Numbers of non-breeding adult storm-petrels are omitted as ringing costs are not covered by SOTEAG. 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.

Species	Chicks			Breeding adults			Non-breeding adults		Total birds ringed	Unit cost	Total cost
	FI	SRG	FO	FI	SRG	FO	FI	SRG			
Red-throated Diver*	0	40	0	0	6	0	0	0	46	£0.47	£21.62
Northern Fulmar	189	12	0	12	0	0	0	0	213	£0.40	£85.20
European Storm Petrel	0	33	0	0	1	0	n/a	n/a	34	£0.47	£15.98
Leach's Storm Petrel	0	0	0	0	0	0	n/a	n/a	0	£0.18	£0.00
European Shag	34	28	0	4	3	0	0	0	69	£0.47	£32.43
Great Skua	150	195	13	0	1	0	0	0	359	£0.68	£244.12
Arctic Skua	25	0	12	1	0	0	0	0	38	£0.48	£18.24
Common Gull	0	0	0	0	0	0	0	0	0	£0.48	£0.00
Lesser Black-backed Gull	1	0	0	0	0	0	0	0	1	£1.90	£1.90
Herring Gull	12	26	0	0	0	0	0	0	38	£1.90	£72.20
Great Black-backed Gull	1	3	0	1	0	0	0	0	5	£0.70	£3.50
Arctic Tern	226	4	0	0	0	0	0	0	230	£0.23	£52.90
Common Guillemot	2	430	0	1	0	0	0	0	433	Free	-
Razorbill	58	2	0	9	0	0	0	0	69	Free	-
Atlantic Puffin	109	0	0	35	0	0	0	0	144	£0.48	£69.12
Black Guillemot	1	0	0	3	0	0	0	0	4	£0.48	£1.92
Total A	808	773	25	66	11	0	0	0	1683		£619.13
Total B	1606			77			0				

Appendix 3. Shetland-wide Common Eider census - survey areas map.

Map showing the locations of the standard survey areas (1 to 30) used for the Shetland-wide Common Eider census. Fair Isle (area 30) is shown here within the map area but is really located further south (39km south of Sumburgh Head). * = Survey areas with no missing counts across all survey years from 1997 to 2019.



Appendix 4. National Seabird Census – SOTEAG survey work in 2019.

In 2019, heavy sea swells limited the number of possible survey days. SOTEAG was able to contribute seven survey days. Counts of Black Guillemots were made of the entire coastline of Papa Stour and of the section of coast from Huxter to Vementry, in West Mainland Shetland (**Figure 1**). All counts were made in April by boat. The Papa Stour count total was 156 birds in full breeding plumage, compared with 378 in 2000, the most recent previous count (percentage change = -58%). Comparable counts within the Huxter to Vementry section were 263 birds in full breeding plumage in 2019 and 237 in 1999/2000 (percentage change = $+11\%$). Counts of other cliff nesting seabirds were made around south, east and north Unst in late June.

Figure 1. Sections of the Shetland coastline where Black Guillemots have been counted in late March or April for the national seabird census (2016-19) or for site condition monitoring (2013) by SOTEAG, SNH and the Shetland Amenity Trust.

