

JOINT NATURE CONSERVATION COMMITTEE REPORT DISTRIBUTION

Report number: 211
Joint Nature Conservation Committee Report
 Contract number/JNCC project number: F7-12-11-7/36
 Date received: November 1993
 Report title: Fair Isle seabird monitoring scheme: report to Joint Nature Conservation Committee of eighth season's work (1993)
 No. 211

Contractor: **FAIR ISLE SEABIRD MONITORING SCHEME: REPORT TO JOINT NATURE CONSERVATION COMMITTEE OF EIGHTH SEASON'S WORK (1993)**
 P Jenks, B Stammers, AJ Leitch & T Lewis (1993)

Contractor: Since 1986, JNCC has funded seabird monitoring schemes on Fair Isle and other islands in the Shetland archipelago. This report forms part of the Joint Nature Conservation Committee's commissioned research programme. Fair Isle is one of several widely-dispersed 'key sites' selected for detailed monitoring under this programme. Most island species reported to JNCC showed slight decreases in numbers since the previous year (of other species counted), but among the more notable changes was a 25% decrease in total numbers of black gulliforms since 1989. Most species had a successful breeding season in terms of numbers of chicks fledged, but breeding success of arctic terns was low.

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§ Biometrics

No analysis have been undertaken, but wing and weight measurements appeared normal.

SUMMARY

1 Whole Island Census :

Population changes from 1992 were Gannet -2.2%, Arctic Skua -1.8%, Great Skua -8.2%, Common Tern -47.7%, Arctic Tern -26.5%, and Common Gull : no change.

The whole island census of Shag indicated an 11.8% decrease in numbers of nests since the last census (1990). The whole island census of Razorbill suggested there were 5% more breeding birds attending sites than in 1988 (the last complete census).

The Black Guillemot whole island census, carried out in April, showed a 25.5% decline since the 1989 count.

2 Population changes at monitored plots :

At study plots, the numbers of Fulmars were the lowest since monitoring started in 1986. However this is partly due to the reduction in size of the N. Haven plot as a result of the new pier development: having excluded the N. Haven figures from calculation of pop. changes, the decrease appears to be within the fluctuation range for this species.

Numbers of Shags at study plots remained almost unchanged from 1992 (-0.6%), whilst the monitored Kittiwake numbers show a marked decline of 18.9%.

Guillemot numbers were down, but by an insignificant amount (3.6%).

The Burrista Puffin Transect showed an apparent increase in the numbers of occupied burrows (146.4% higher than 1992), but this may be due to observer differences in the interpretation of what constitutes an occupied burrow.

3 Breeding productivity :

Most seabird species had a successful breeding season, with Gannet, Great Skua, Guillemot, Razorbill and Black Guillemot all having their most productive year yet recorded. Terns and Kittiwakes were the exception : Arctic terns fledged only 50 chicks out of an estimated 808 apparently incubating adults. Kittiwakes, despite an apparently average success rate suffered from widespread post - fledge mortality, to the extent that their productivity figures suggest a much higher number of fledglings leaving the colonies than was really the case. The loss of Tern chicks and Kittiwake fledglings coincided with an apparent unavailability of Sandeels.

Adult survival :

Adult Kittiwake survival for 1992 - 1993 was estimated at 73.7%, and Puffin at 85.5%.

5 Diet :

Results of analysis of food sample data from 1992 are still awaited.

Samples were collected for Puffin and observed for Black Guillemot. This data, along with that of the feeding watches carried out for Guillemot and Arctic Tern, suggests that for part of the breeding season Sandeels were readily available to these species. The food samples collected for Puffin on the 12.7 however, show Sandeels comprising only 44.2% of chick diet.

6 Biometrics

No analysis have been undertaken, but wing and weight measurements appeared normal.

I INTRODUCTION

This report presents the results of seabird monitoring on Fair Isle in 1993. The work was carried out by the Fair Isle Bird Observatory Trust under contract to the Joint Nature Conservation Committee. The monitoring scheme commenced in 1986 and 1993 was the eighth season of work.

The 1993 season was overall a good one for the island's seabirds; some populations were down on previous years, notably Black Guillemot (according to the whole island census), but most species had above average breeding success rates and several had their most productive season yet recorded. Sandeels appeared to be readily available during the early part of the season although there were indications that they became scarcer from ca. mid-July.

II OBJECTIVES

- 1 to continuously update the status of all seabird species breeding on Fair Isle by annual or regular total island counts.
- 2 to monitor population changes of Fulmar, Shag, Kittiwake, Guillemot, Puffin and Black Guillemot at regular monitoring plots.
- 3 to collect data on breeding success for Fulmar, Gannet, Shag, Arctic Skua, Great Skua, Kittiwake, Common Tern, Arctic Tern, Guillemot, Razorbill, Puffin and Black Guillemot.
- 4 to monitor adult survival for Kittiwake, Puffin and Black Guillemot.
- 5 to collect samples of food from chicks of a number of species and to collect data from feeding watches for Guillemot, Puffin, and Black Guillemot.
- 6 to weigh and measure a sample of chicks of all accessible seabird species.

III METHODS

Methodology has been described fully by Riddiford and Osborn (1986) & (1987), Riddiford and Silcocks (1988), Harvey et al (1989) & (1990) and Harvey and Orsman (1991).

IV RESULTS

The results are presented fully in Tables 1 — 28 and Appendices I — IV, and summarised below. At present we still await results of analysis of food samples.

1 Complete Island Census 1993

Species too numerous to count annually are censused every 5 years. In 1993 Razorbill was the target species, but because of interest in possible effects of the Braer, both Shag and Black Guillemot were also censused. To carry out these counts the island was split into sectors. This information is presented in Appendix I.

1.1 Shag (Table 1, Appendix I)

The 1993 count took place during June. A total of 946 Apparently Occupied Nests was counted (inclusive of traces), 11.8% less than in 1990.

1.2 Razorbill (Table 2, Appendix II)

The 1993 count was carried out between 4 and 14 June. A total of 4130 individuals was counted, of which 3205 were on breeding sites (5% more than 1988). 925 were "loafers".

1.3 Black Guillemot (Table 3, Appendix III)

The 1993 count was carried out between 13 and 27 April. A total maximum count (from 2 combined counts) of 280 birds in breeding plumage represents a 25.5% decrease since 1989.

The counts were made between 6.00 a.m. and 9.00 a.m. B.S.T.. Attempts to flush individuals from the shore were made by clapping, and any birds within 200m of the shore were included along with any seen resting ashore.

1.4 Gannet (Table 4, Appendix I)

The total of 764 Apparently Occupied Nests counted, represents a 2.2% decrease from 1992.

1.5 Arctic Skua (Table 4, Appendix I)

The total of 107 Apparently Occupied Territories counted represents a 1.8% decrease from 1992.

1.6 Great Skua (Table 4, Appendix I)

The total of 101 Apparently Occupied Territories counted represents an 8.2% decrease from 1992.

1.7 Common Gull (Table 4, Appendix I)

10 nests were found, the same number as last year.

1.8 Common Tern (Table 4, Appendix I)

9 nests counted (6 at Bunes & 3 at S. Light), a 46% decrease from 1992.

1.9 Arctic Tern (Table 4, Appendix I)

808 nests counted (Tarryfield & Eas Brecks), a 26.5% decrease from 1992.

2 Population changes

2.1 Fulmar monitoring plots (Table 5)

The number of A.O.S. was lower at all plots than in 1992 and the total is the lowest since monitoring began in 1986. However, once the N. Haven figures (greatly reduced because of the new pier developments) are eliminated from the calculation, the decrease is only 19.3% since 1992 : apparently within the fluctuation range for this species.

2.2 Shag monitoring plots (Table 6)

Numbers of Shag nests remained almost unchanged from last year (-0.6%). Counts increased at two plots and decreased at three.

2.3 Kittiwake monitoring plots (Table 7)

The steady decline of Kittiwake A.O.N. numbers continued, with all plots down on last year and the total of 997 (lowest since monitoring began) representing a decrease of 18.9%

2.4 Guillemot monitoring plots (Table 8)

The total mean count of individuals at five monitoring plots was 3046.0, which represents an insignificant decrease of 3.6% (within the margin of error for this method of counting). Counts were marginally down at four plots and up at one.

2.5 Black Guillemot (Table 9)

Counts at the Busta Geo monitoring plot suggest a 20% decrease from last year, which would be broadly in line with the Whole Island Census and SOTEAG estimates. However, as has been the case for several years, breeding success was again lower at this site than all other monitored areas, so the suggestion that adults may be opting for other breeding sites is still a valid one.

2.6 Puffin (Table 10)

The count of 239 occupied burrows at the Burrista Transect would represent a considerable increase of 146% but this drastic difference may be partly due to observer differences in interpretation of occupied / unoccupied burrows from previous years. Percentage erosion was 47%, similar to 1992.

3 Breeding Success

3.1 Fulmar (Table 11)

The mean productivity at monitored plots was 0.57 chicks / A.O.S., the second highest since monitoring began in 1986 and 3.6% up on 1992. Productivity was again lowest at North Haven, but better than the last three years (the East side of the Haven is now unsuitable for breeding because of netting put up to protect the new pier).

3.2 Gannet (Table 12)

Productivity reached its highest recorded rate (equal to 1988 & 1989) : 0.78 chicks / nest.

3.3 Shag (Table 13)

Shags had their most successful season since monitoring began, with a rate of 1.81 chicks / nest.

3.4 Arctic Skua (Table 14)

Productivity was good with an estimated rate of between 0.76 and 0.93 chicks fledged / Apparently Occupied Territory.

3.5 Great Skua (Table 14)

Great skuas had their best ever breeding season, with an estimated rate of between 0.99 and 1.19 chicks fledged / A.O.T.

3.6 Common Gull (Table 15)

Ten pairs attempted to breed, out of which four chicks were thought to have fledged.

3.7 Kittiwake (Tables 16 — 18)

Overall productivity reached its second highest level since monitoring began, with an average rate of 1.08 chicks / A.O.N. The lowest rate was at South Gunnawark (0.69), and the highest was at Bergaroo (1.35). However, as is explained in the Discussion, these figures do not reflect the high percentage of post - fledge mortality and would thus be an overestimate of the "recruitment" of young Kittiwakes to the adult population.

3.8 Common Tern (Table 19)

Out of an estimated nine apparently incubating adults (6 on Bunes & 3 at S.Light), only one chick was thought to have fledged.

3.9 Arctic Tern (Table 19)

There were an estimated 808 apparently incubating Arctic Terns, from which only 50 chicks were thought to have fledged. Widespread chick mortality coincided with an apparent unavailability of Sandeels and post - mortem examinations revealed malnutrition as the cause of death in all collected specimens.

3.10 Guillemot (Table 20)

Breeding success was at its highest rate since 1988, both at Peitron (0.86 chicks / A.I.A.), and at Da Swadin (0.84), although the early start to the season may have meant some early failures were missed.

3.11 Razorbill (Table 21)

Breeding success at Easter Lothar was 0.77 chicks ringed / egg laid, the highest rate since 1990.

3.12 Black Guillemot (Table 22)

Productivity at 31 monitored nests averaged 1.23 chicks fledged / nest, the highest rate since monitoring began in 1987.

2.13 Puffin (Table 23)

Productivity at monitored burrows was slightly down on 1992, with 0.69 chicks fledged / burrow.

4 Adult Survival Estimates*

4.1 Kittiwake (Table 24)

Four 2 hour visits were made to the colour - ringed colony at South Gunnawark, and eight to the colony at Goorn. The number of C/R birds seen in 1993 was 73, and the combined figure for survival for both plots is 73.7%

4.2 Black Guillemot (Table 24)

Eight definite C/R combinations were confirmed, but the sample size at Busta Geo is too small to be meaningful.

4.3 Puffin (Table 24)

A total of c.40 hours worth of visits were made to the C/R colony at Roskilie. The number of colour - ringed birds seen was 96, of which 94 were seen in 1992, and the figure for adult survival for 1992 - 1993 is 85.5%. 13 new birds were colour - ringed in 1993, bringing the new pool size to 109.

5 Diet

5.1 Arctic Tern (Table 25)

Feeding watches on 19.6, 24.6 and 1.7 indicated that Sandeels formed the major part of chick diet. At least 78% of the total 141 prey items delivered were Sandeels (18.4% were recorded as "too quick to identify" but it is likely that the majority of these were also Sandeels). There were a slightly higher percentage of smaller fish (< 85mm) presented to chicks than in 1992.

5.2 Guillemot (Table 26)

A total of 455 prey items were observed during feeding watches, of which at least 75.6% were Sandeels. Gadoids comprised at least 6.6%, Sprats 0.9%, and the rest were either unidentified or too quick to identify.

5.3 Razorbill

No samples were collected, but several deliveries of fish were observed during ringing / monitoring, all of which comprised of Sandeels.

5.4 Puffin (Tables 27 a & b)

A total of 137 deliveries of fish were observed during the all-day Puffin watch on 3.7.93, of which Sandeels comprised at least 78.1% of all fish, Sprats at least 1.5%, and 20.4% were too quick to identify. The average number of feeds / burrow / day was 5.2, slightly down on 1992, although the presence of Great Skuas for prolonged periods at the watch site undoubtedly inhibited adult Puffins from approaching with food. Fifteen samples were collected on 12.7. The mean load weight was 5.98g (down on 1992), and Sandeels comprised 44.2% of the fish collected. Rocklings made up 51%, and Sprats 3.8%.

5.5 Black Guillemot (Table 28)

A total of 38 prey items were observed. Chick diet was comprised mostly of Butterfish (66%), Gadoids (10%), Cottids (10%), and Sandeels (8%).

6 Biometrics

No analyses have been undertaken: weights and measurements appeared normal.

* Fair Isle updated survival estimates from 1993 data

The Scaup Puffin adult survival from 1992 - 1993 was 85.3% (slightly up on '91 - '92), while the Kittiwake adult survival rate was down to 78.7% ('91 - '92 = 82.4%).

Puffin

1992. The survival figure for 1992 was $102/127 = 80.3\%$. The updated 1992 figure is $104/127 = 81.9\%$.

1991. The original 1991 survival estimate was $104/137 = 75.9\%$ (1991 report). The updated figure given in the 1992 report was $107/137 = 78.1\%$. With the 1993 sightings, the new updated figure should be $108/137 = 78.8\%$.

Kittiwake

1992. The survival estimate in the '92 report was $98/119 = 82.4\%$. This should be updated to $101/119 = 84.9\%$.

1990. The original 1989-90 survival estimate (1990 report) was $81/120 = 67.5\%$. The updated 89-90 figure given in the 1992 report was $97/120 = 80.8\%$. The new updated estimate is $98/120 = 81.2\%$.

1989. The original 1988-89 survival estimate (1989 report) was $47/67 = 70.1\%$. The updated 88-89 figure given in the 1992 report was $50/67 = 74.6\%$.
The new updated estimate is $52/67 = 77.6\%$.

V DISCUSSION

Most species of seabird had a good season in 1993. Although several population counts were down on previous years, few showed a significant decline and nearly all species experienced good breeding success, many enjoying their most productive recorded year.

The populations of Gannet, Arctic Skua, Great Skua and Common Gull were little changed from 1992. 808 Arctic Terns attempted to breed, 26% down on last year's record count, and the small population of Common Terns also decreased (only 9 breeding attempts).

The whole Island census of Shags showed an 11.8% decrease since the last count in 1990 (broadly in line with changes at monitoring plots over the same period), whilst the whole Island count for Razorbill indicated an increase of 5% in the numbers of birds at breeding sites. The whole Island census of Black Guillemot showed a considerable decline of 25.5% since 1989, however the population may have 'compensated' for this with its most successful breeding season yet recorded.

The numbers of breeding Fulmars, Shags, Kittiwakes and Black Guillemots at study plots were the lowest since monitoring began. Guillemot numbers were little changed and the Burrista Puffin transect showed a considerable increase in occupied burrow numbers, although this may be due to differences in observer interpretation.

According to the feeding watches carried out for Guillemot, Arctic Tern and Puffin in June and early July, Sandeels appeared to be abundant and easily available. However, Puffin food samples collected in mid - July show sandeels comprising only 44.2% of chick diet and the mean load weight was lower than in 1992. There was a marked increase in the percentage of Butterfish in the diet of Black Guillemot.

Gannets, Great Skuas, Guillemots, Razorbills and Black Guillemots all had their best breeding seasons since monitoring began, and both Fulmars and Shags also had above average productivity. Terns and Kittiwakes had a poor year for breeding success: Arctic Terns reared only 50 chicks to fledging age (out of 808), and post - mortem examinations of Arctic Tern chicks showed starvation as the cause of death in all cases. Kittiwake adult attendance was low at fledging time and there was considerable post - fledge mortality; productivity figures therefore represent an overestimate of the numbers of fledglings actually leaving the colonies.

The figure for Puffin adult survival from 1992 - 1993 was 85.5% (slightly up on '91 - '92), while the Kittiwake adult survival rate was down to 73.7% ('91 - '92 = 82.4%).

VI ACKNOWLEDGEMENTS

We would like to thank Paul Harvey, Kevin Osborn, Brian Wilson, Lorna Brown, Christine Waters, Lesley Jameson, Ian Grier, Nick Ward, Matt, Danielle, Ben Mines, Sian May, Nicole Schneider, Mick Green, and everyone who helped with the seabird work over the season.

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Table 1

Total Island Black Gull census counts 1993, 1999, 1999 and 1975

1993	280
1999	345
1999	367
1975	360

% change 1999 - 1993 = -25.0%

Table 1

Total Island Shag Census counts 1993, 1990, 1986, 1975 and 1969 with % change since 1990.

Year	nests
1993	946
1990	1043
1986	1099
1975	1491
1969	1530

% change 1990 — 1993 = -11.8%

Note: 1990 and 1993 counts are inclusive of traces. All previous counts are exclusive of traces.

Table 2

Total Island Razorbill Census counts 1993, 1988, 1986 and 1975 with % change since 1988.

Year	B	L	Total
1993	3205	925	4130
1988	3053	383	3436
1986	3950		
1975	2500		

% change (breeders) 1988 — 1993 = +5.0%

Note: B = individuals on breeding sites. L = loafers (individuals ashore but not on breeding sites). Counts were made between 4 and 14 June.

Table 3

Total Island Black Guillemot Census counts 1993, 1989, 1986 and 1975.

1993	280
1989	345
1986	367
1975	360

% change 1989 — 1993 = -25.5%

Note: based on 1993 census data. One individual was counted in 1989 and one in 1990 were made in wind > Force 4 and have been excluded.

Note: only part of the Kistal Kamei was counted in 1986, so 1986 counts have been omitted from the table.

Table 4

Annual total island census counts for 1986 — 1993 and % change 1992 — 1993

	1993	1992	1991	1990	1989	1988	1987	% change	
								1986	1992 — 1993
Gannet	764	781	687	643	676	488	304	258	-2.2%
Arctic Skua (AOT)	107	109	99	105	114	78	95	115	-1.8%
Great Skua (AOT)	101	110	79	75	72	78	72	84	-8.2%
Common Gull (nests)	10	10	9	9	10	9	10	12	0
Common Tern (nests)	9*	17*	10*	7*	25*	59	37	26	-47.7%
Arctic Tern (nests)	808*	1100*	650*	400*	283*	345	211	83	-26.5%

* = Apparently occupied sites.

Table 5

Fulmar, population changes at five monitored plots 1986 — 1993 (AOS)

	1993	1992	1991	1990	1989	1988	1987	1986	% ch
North Haven	59*	95	86	104	96	72	136	118	*
South Gunnawark	50	62	73	67	60	66	59	90	-19.3%
South Ramnigeo	113	134	109	107	107	121	103	125	-15.7%
Easter Lothar	89	102	82	72	79	68	71	90	-12.7%
Heilli Stack/Linni Geo	50	76	51	73	77	71	70	87	-34.2%
Total	302*	469	401	423	419	398	439	510	-19.3%

Note: 1991 — 93 figures relate to sites occupied on 3 consecutive visits in early June (only on 2 consecutive visits in all previous years).

Note: The plot at North Haven has now been reduced in size due to development of the new pier. This figure has been excluded in the calculation of population change.

Table 6

Shag, population changes at five monitored plots 1986 — 1993 (nests).

	93	92	91	90	89	88	87	86	% ch
North Ramnigeo	20	21	27	20	20	24	30	27	-4.8%
South Ramnigeo	35	49	53	60	73	53	31	38	-28.6%
South Naversgill	19	16	17	25	42	45	28	52	+18.8%
South Gunnawark	24	26	38	43	53	48	49	64	-7.7%
Lericum	76	63	63	54	53	51	102	36	+20.6%
Total	174	175	198	202	241	221	248	217	-0.6%

Table 7

Kittiwake, population changes at ten monitored plots 1986 — 1993

	93	92	91	90	89	88	87	86	% ch 92 — 93
Larger plots:									
South Gunnawark	139	172	162	178	196	197	c217	c207	-19.2%
Lericum	106	146	140	142	155	137	c165	c166	-27.4%
Da Nizz	139	160	182	186	184	189	c188	c203	-13.1%
Soond o Holms/Dog Geo	130	142	169	200	218	204	c205	c207	-8.5%
Johnny's Peats	127	155	154	178	177	176	c208	c217	-18.1%
Smaller plots:									
Stroms Heelor	71	81	76	82	92	94	c93		-12.3%
Shaldi Cliff	83	110	120	125	124	111	c93		-24.5%
Da Swadin	54	81	72	80	85	99	c91		-33.3%
Trottle Kame	97	111	100	106	97	100	c94		-12.6%
Bergaroo	51	72	78	86	99	111	c92		-29.2%
Total Large plots	641	775	807	884	930	903	c983	c1000	-17.3%
Total all plots	997	1230	1253	1363	1427	1406	c1446		-18.9%

Note: only 5 plots counted in 1986.

Table 8

Guillemot, mean counts of individuals at five monitored plots 1986 — 93.

	1993	S.D.	1992	1991	1990	1989	1988	1987	1986
Shaldi Cliff	457.8	+32.2	460.7	404.7	313.0	410.2	364.6	475.4	496.1
North Gunn.	183.4	+6.4	184.6	172.7	130.4	174.0	164.9	174.1	305.6
Guidicum	400.6	+27.0	456.4	352.9	288.0	432.5	432.0	456.4	506.1
Da Swadin	402.3	+34.4	356.8	286.9	219.4	292.4	254.3	282.2	243.3
Kristal Kame	1601.0	+101.0	1702.0	1332.6	807.3	1166.4	1171.8	1891.3	
All plots	3046.0		3160.5	2549.8	1758.1	2475.5	2392.4	3279.0	
combined S.D.	+166.0		+167.8	+177.9	+87.0	+58.7	+208.8	+326.0	

	% change 1992 — 93	P.Sig
Shaldi Cliff	-0.6	0.8
North Gunn.	-0.6	0.64
Guidicum	-12.2	0.0002
Da Swadin	+12.8	0.0051
Kristal Kame	-6.0	0.064
All plots	-3.6	0.14

Note: based on 10 counts between 1st and 22nd June at all plots in all years; however one count in 1988 and one in 1986 were made in wind > Force 4 and have thus been excluded.

Note: only part of the Kristal Kame was counted in 1986, so 1986 counts have been omitted from the table.

Table 9

Black Guillemot counts at Busta Geo, 1987 — 1993.

	1993	1992	1991	1990	1989	1988	1987
Count 1	26	32	30	39	41	32	40
Count 2	25	32	35	33	40	40	43

Count dates were:

1993(14/4 & 25/4), 1992(17/4 & 29/4), 1991(13/4 & 22/4), 1990(7/4 & 21/4), 1989(9/4 & 27/4), 1988(1/5 & 12/5), 1987(12/4 & 23/4).

Table 9a

Black Guillemot : SOTEAG Count (N. Light — S. Light, East side).

	Count 1	Count 2	% changes between max. counts
1982	244		
1986	254		
1987	220	209	
1989	281	286	+30%
1991	230	241	-15%
1993	183	190	-21%

% change 1987 — 1993 = -13.6%

Table 10

Puffin : Number of occupied burrows at Burrista transect 1982 — 1993.

	93	92	91	90	89	88	87	86	85	84	83	82
No. occupied	239	97	120	148	167	196	158	185	128	169	181	203

Census dates were:

1993(15/7), 1992(10/7), 1991(17/7), 1990(15/7), 1989(8/7), 1988(30/6 & 1/7), 1987(15/6 & 25/6), 1986(29/6), 1985(25/6 & 27/6), 1984(11/7), 1983(6 — 13/7), 1982(14/7).

Note: The apparent increase in occupied burrows may be due to observer differences in the interpretation of occupied/unoccupied burrows.

Table 11

Fulmar: Breeding success at five monitored plots 1986 — 1993.

	1993	1992	1991	1990	1989	1988	1987	1986
North Haven	0.46	0.37	0.24	0.25	0.48	0.35	0.66	0.32
South Gunnawark	0.51	0.58	0.52	0.21	0.43	0.38	0.69	0.53
South Ramnigeo	0.51	0.55	0.60	0.36	0.63	0.42	0.50	0.58
Easter Lothar	0.71	0.59	0.49	0.29	0.62	0.45	0.56	0.54
Heilli Stack/Linni Geo	0.66	0.64	0.73	0.23	0.47	0.55	0.58	0.60
Mean (+ S.E.) of all plots	0.57 ±0.05	0.55 ±0.05	0.52 ±0.08	0.27 ±0.03	0.52 ±0.04	0.43 ±0.03	0.60 ±0.03	0.51 ±0.05

Table 12

Production measured as number of chicks fledged / apparently occupied site.

Note: for productivity studies an A.O.S. is defined as:

- i) a site occupied on three consecutive visits in early June,
- or ii) any other site within the monitoring plot where a chick was subsequently present.

Plot	1993	1992	1991	1990	1989	1988	1987	1986
Jenny's Pass	127	2	118	0.00				
South Gunnawark	139	11	98	0.00				
Sound o' Hielms / Dog Geo	130	3	138	1.00				
De Heer	130	2	167	1.13				
Lerikum	108	7	110	1.04				
Mean of five plots				0.07				
F = Number of fledglings, P = Number of chicks fledged / A.O.S.								

Table 13

Kilbuck: Breeding success at five smaller monitored plots in 1993.

Plot	No. A.O.S.	No. chicks	F	P
Biggareo	51	3	98	1.30
Trethelgarn	100	1	128	1.30
Staidh Cliff	68	2	97	1.57
Da Swath	54	4	85	1.02
Mean of five plots				
F = Number of fledglings, P = Number of chicks fledged / A.O.S.				

Table 12

Gannet : Breeding success 1986 — 1993

	N	F	P
1993	152	117	0.78
1992	129	94	0.73
1991	150	78	0.52
1990	159	95	0.60
1989	147	114	0.78
1988	126	98	0.78
1987	107	51	0.48
1986	124	84	0.68

N = Number of occupied nests. F = Number of chicks fledged.

P = Number of chicks fledged / nest.

Table 13

Shag : Breeding success 1986 — 1993.

	N	F	P
1993	72	130	1.81
1992	74	122	1.65
1991	95	112	1.18
1990	62	60	0.97
1989	59	84	1.42
1988	64	83	1.30
1987	64	77	1.20
1986	66	100	1.52

N = Number of nests (with eggs or apparently incubating adults).

F = Number of chicks fledged. P = Number of chicks fledged / nest.

Table 14

Skuas : Breeding success in 1989 — 1993

	1993		1992		1991	1990	1989
	No. of AOT	F	P	P	P	P	P
Arctic Skua	107	-81 - 100	0.76 - 0.93	-1.2	-0.75	0.03	0.33
Great Skua	101	-100 - 120	0.99 - 1.19	0.5 - 0.8	-0.7	0.68	0.79

F = Number of fledglings. P = Number of chicks fledged / AOT

Table 15

Common Gull : Breeding success in 1989 — 1993

Nests	1993		1992		1991		1990		1989	
	F	P	P	P	P	P	P	P	P	
10	4	0.4	0	0.22	0.9	1.1				

F = Number of fledglings. P = Number of chicks fledged / nest.

Table 16

Kittiwake : Breeding success at five larger monitored plots in 1993.

	No. AON	No. traces	F	P
Johnny's Peats	127	2	118	0.93
South Gunnawark	139	11	96	0.69
Soond o Holms / Dog Geo	130	3	138	1.06
Da Nizz	139	2	157	1.13
Lericum	106	7	110	1.04

Mean of five plots 0.97

F = Number of fledglings. P = Number of chicks fledged / AON.

Table 17

Kittiwake : Breeding success at five smaller monitored plots in 1993.

	No. A.O.N.s	No. traces	F	P
Bergaroo	51	3	69	1.35
Trottie Kame	97	1	126	1.30
Shaldi Cliff	83	2	97	1.17
Da Swadin	54	4	55	1.02
Stroms Heelor	71	4	80	1.13

Mean of five plots 1.19

F = Number of fledglings. P = Number of chicks fledged / AON.

Table 18

Kittiwake : Breeding success at monitored plots 1986 — 1993.

	1993	1992	1991	1990	1989	1988	1987	1986
Johnny's Peats	0.93	1.20	0.74	0.0	0.36	0.06	1.04	1.08
South Gunnawark	0.69	1.09	0.78	0.0	0.34	0.08	1.15	1.01
Soond o Holms /Dog Geo	1.06	1.32	0.50	0.0	0.19	0.07	1.03	0.92
Da Nizz	1.13	1.43	0.92	0.0	0.40	0.06	1.05	1.02
Lericum	1.04	1.42	0.90	0.0	0.39	0.09	1.10	1.26
Bergaroo	1.35	1.25	0.86	0.0	0.42	0.04	0.96	
Trottle Karne	1.30	1.34	1.10	0.0	0.59	0.11	0.84	
Shaldi Cliff	1.17	1.24	1.01	0.0	0.29	0.13	1.00	
Da Swadin	1.02	1.15	1.00	0.0	0.32	0.14	0.94	
Stroms Heelor	1.13	1.54	1.08	0.0	0.38	0.04	0.96	
Mean of all plots (+ S.E.)	1.08 +0.06	1.30 +0.04	0.89 +0.06	0.0	0.37 +0.01	0.08 +0.01	1.01 +0.03	1.06 +0.06

Production = Number of chicks fledged / apparently occupied nest.

Table 19

Terns : Breeding success 1988 — 1993.

	Arctic Tern			Common Tern		
	N	F	P	N	F	P
1993	808	50	0.062	9	1	0.11
1992	~1100	1100+	1.0+	17	-16	1.0
1991	650		~1.0 - 1.3	10	2	0.2
1990	400	1	0.0025	7	0	0.0
1989	283	36	0.13	25	1	0.04
1988	345	1	0.003	59	2	0.03

N = Number of apparently incubating adults. F = Number of chicks fledged.
 P = Number of chicks fledged / apparently incubating adult.

Table 20

Guillemot : Breeding success at two monitored plots 1988 — 1993

	1993			1992 1991 1990 1989 1988				
	N	F	P	P	P	P	P	P
Peitron	148	127	0.86	0.75	0.79	0.72	0.79	0.77
Da Swadin	50	42	0.84	0.72	0.61	0.71	0.78	0.78
Mean	198	169	0.85	0.74	0.70	0.72	0.78	0.78

N = Number of apparently incubating adults. F = Number of chicks fledged.
 P = Number of chicks fledged / apparently incubating adult.

Table 21

Razorbill : Breeding success at Easter Lothar 1990 — 1993.

	N	P
1993	77	0.77
1992	69	0.55
1991	64	0.58
1990	48	0.69

N = Number of eggs laid.

P = Production in terms of chicks ringed / egg laid.

Table 22

Black Guillemot : Breeding success at monitored nests 1987 — 1993.

	N	F	P
1993	31	38	1.23
1992	47	47	1.00
1991	48	41	0.85
1990	33	24	0.73
1989	43	46	1.07
1988	14	8	0.57
1987	25	12	0.48

N = Number of monitored nests with eggs.

F = Number of chicks assumed to have fledged.

P = Number of chicks fledged / nest.

Table 23

Puffin : Breeding success at monitored burrows 1987 — 1993.

	N	F	P
1993	110	76	0.69
1992	97	73	0.75
1991	120	104	0.87
1990	96	55	0.57
1989	101	77	0.76
1988	71	54	0.75
1987	93	65	0.70

N = Number of monitored burrows with egg.

F = Number of chicks assumed to have fledged.

P = Number chicks fledged / burrow.

Feeding rate /

chick / hour 0.4 0.54 0.5 0.26 0.32 0.1

Average rate / chick / hour = 0.32

Table 24

Survival estimates for breeding adults 1992 — 1993

	No. colour - ringed birds known to be alive in 1992	No. seen in 1993	% survival
Kittiwake	99	73	73.7%
Puffin	110	94	85.5%

Observation :

Puffin : approx. 40 hours.

Kittiwake : 4 visits to S. Gunnawark, 8 visits to Goorn.

Note : The sample size for Black Guillemot at the Busta Geo site was too small to be meaningful.

Year	N	F	P	% survival
1992	100	75	75	75.0%
1993	100	75	75	75.0%
1994	100	75	75	75.0%
1995	100	75	75	75.0%
1996	100	75	75	75.0%
1997	100	75	75	75.0%

N = Number of monitored birds with eggs
 F = Number of chicks banded / eggs banded
 P = Number of chicks (banded) seen

Year	N	F	P	% survival
1992	100	75	75	75.0%
1993	100	75	75	75.0%
1994	100	75	75	75.0%
1995	100	75	75	75.0%
1996	100	75	75	75.0%
1997	100	75	75	75.0%

N = Number of apparently incubating birds
 F = Number of chicks banded / apparently incubating birds
 P = Number of chicks banded / apparently incubating birds

Year	N	F	P	% survival
1992	100	75	75	75.0%
1993	100	75	75	75.0%
1994	100	75	75	75.0%
1995	100	75	75	75.0%
1996	100	75	75	75.0%
1997	100	75	75	75.0%

N = Number of apparently incubating birds
 F = Number of chicks banded / apparently incubating birds
 P = Number of chicks banded / apparently incubating birds

Year	N	F	P	% survival
1992	100	75	75	75.0%
1993	100	75	75	75.0%
1994	100	75	75	75.0%
1995	100	75	75	75.0%
1996	100	75	75	75.0%
1997	100	75	75	75.0%

N = Number of apparently incubating birds
 F = Number of chicks banded / apparently incubating birds
 P = Number of chicks banded / apparently incubating birds

Table 24

Black Guillemot: Diet (% by number) of Black Guillemot at Peitron, 1997

Year	No. fish	Sandeel	Unidentified	Sandeel > 100mm	Pranny	Gadoid	Other
1997	51	37	1	1	1	1	1
1998	40	1	49	1	1	15	1
1999	130	2	40	1	22	6	1
2000	40	1	50	1	18	10	1
2001	33	1	71	1	3	10	1
		38	28	1	7	38	1
		6	60	1	10	10	1

Table 25

Number of food items presented to Arctic Tern chicks by adults on three dates in 1993.

	19.6	24.6	1.7	Total	% of Total
Sandeel <45mm	10	2	3	15	10.6
45 - 65	6	4	6	16	11.3
65 - 85	6	9	4	19	13.5
85 - 105	10	4	13	27	19.1
105 - 120	2	5	7	14	9.9
120 - 140	2	8	3	13	9.2
140 - 160		2	1	3	2.1
>160mm		1		1	0.7
Sandeel (all)	38	35	37	110	78.0
Too quick	9	8	9	26	18.4
Unidentified		2	2	4	2.8
Arthropod		1		1	0.7

(size of Sandeels estimated from adult bill length)

Table 26

Fish fed to Guillemot chicks during 6 2hr watches at Peitron in June 1993.

	19.6	20.6	23.6	24.6	27.6	30.6
No. of chicks	60	60	115	135	142	105
Sandeels	31	49	49	46	64	105
Gadoids	5	2	8	8	7	1
Sprats	2					2
Unidentified	3	9	4	7	10	4
Too quick	7	5	8	9	10	3
Feeding rate / chick / hour	0.4	0.54	0.3	0.26	0.32	0.1
Average rate / chick / hour = 0.32						

Table 27

Puffin : a) Summary of feeding watch on 3 July 0300 - 2300hrs

Burrow no.	No. feeds	Load composition		Sprat	Too quick
		S.E.>100mm	S.E.<100mm		
1	5	3	1		1
2					
3	6	3	2		1
4	9	5	1	2	1
5	6	2	2		2
6	5	3	2		
7	1				1
8	4	1	1		2
9	15	5	8		2
10	5	3	2		
11	4	1	2		1
12	4	1	1		2
13	8	3	3		2
14					
15	8	2	3		3
16	5	2			3
17	6	4			2
18	4	3			1
19	6	5	1		
20					
21	9		7		2
22	6	2	2		2
23	2		2		
24	10	9	1		
25	2	1	1		
26					
	7	3	4		
Total	147	61	46	2	28

Average no. of feeds / burrow / day = 5.2

b) Food samples

No. of samples : 15
 Date of collection : 12.7.93.
 Mean load weight : 5.98 (st. dev. = 3.49)

Species	Number	Mean length (mm)	S.E. mean	% by number
Sandeel (all)	23	65.9	6.01	44.2
Sandeel <100mm	20	55.8	2.40	38.5
Sandeel >100mm	3	133.3	8.19	5.8
Sprat	2	55.5	0.5	3.8
Rockling	27	48.7	2.11	51.9

Table 28

Black Guillemot : Diet (% by number) of Black Guillemot at Fair Isle 1987 - 1993

Year	No. fish	% total fish						
		Sandeel	Butterfish	Flatfish Sp.	Blenny Sp.	Gadoid Sp.	Cottid Sp.	Other
1987	51	37	61	2				
1988	40		48	8	5	15	25*	
1989	130	2	43	22	5	8	4	17
1990	40	5	58	18	5	10		5
1991	83	7	71	3	7	10	1	1
1992	54	28	26	7	4	26	6	4
1993	38	8	66			10	10	5

* This figure includes fish rejected by chicks and is thus an overestimate.

4.1 Counts Tern counts by colony (Apparently including pairs)

4.2 Counts Tern counts by colony (Apparently including pairs)

Total	183	Outer Stack
	90	Inner Stack
	38	Yellow Head
	54	Orange
4.2 Arctic tern	278	North Pole
East Brecks	78	Top o' West Hill
		North Stack
Tarryfield	99	Kame o' Outcum
Moon	101	Total
Bones	3	
Stock Light	0	

Total = 205 pairs

Appendix I - TOTAL ISLAND CENSUS RESULTS, 1993

1 Fair Isle 'Total Island' Seabird Census, 1993

Species	Dates	Count	Unit / Method
Gannet	27 - 28.6	764	4 / C
Shag	June	946	4 / C
Arctic Skua	June	107	5 / A
Great Skua	June	101	5 / A
Common Tern	June	9	3 / A
Arctic Tern	June	808	3 / A
Common Gull	June	10	4 / A
Razorbill	June	4130	1 / B
Black Guillemot	June	280	1 / A

KEY :

Unit 1 -- Total number of individuals
 2 -- Apparently occupied sites
 3 -- Total number of pairs
 4 -- Total number of nests
 5 -- Apparently occupied territories

Method A -- Count from land
 B -- Count from sea
 C -- Combination of above

2 Gannet counts by colony (Apparently occupied nests i.e. nest material with adult)

Outer Stack	163
Inner Stack	90
Yellow Head	35
Dronger	64
North Felsigeo	276
Toor o Ward Hill	78
Matchi Stack /	
Kame o Guidicum	58
Total	764

Razorbill
1993
Whole Island Census
Sectors

3 Sector by sector breakdown of Shag Whole Island Census

(sectors shown in fig. 1)

Sector	No. nests	No. traces
1	91	2
2	132	2
3	24	
4	102	1
5	139	1
6	40	
7	74	
8	39	
9	58	
10	116	
11	64	1
12	58	2
Total	937	9

4.1 Common Tern counts by colony (Apparently incubating pairs)

Buness	6
S. Light	3
Total	9

4.2 Arctic tern

Eas Brecks	314
Tarryfield	490
Meoness	1
Buness	3
South Light	0

Total = 808 pairs

5 Sector by sector breakdown of Razorbill Whole Island Census

(sectors shown in fig. 2)

Sector	Breeding birds	Loafers	Total
1	281	87	368
2	204	30	234
3	83	79	162
4	110	21	131
5	640	229	869
6	27	28	55
7	98	25	123
8	212	21	233
9	383	126	509
10	607	52	659
11	216	86	302
12	344	141	485
Total	3205	925	4130

6 Sector by sector breakdown of Black Guillemot Whole Island Census counts

(sectors shown in fig. 3)

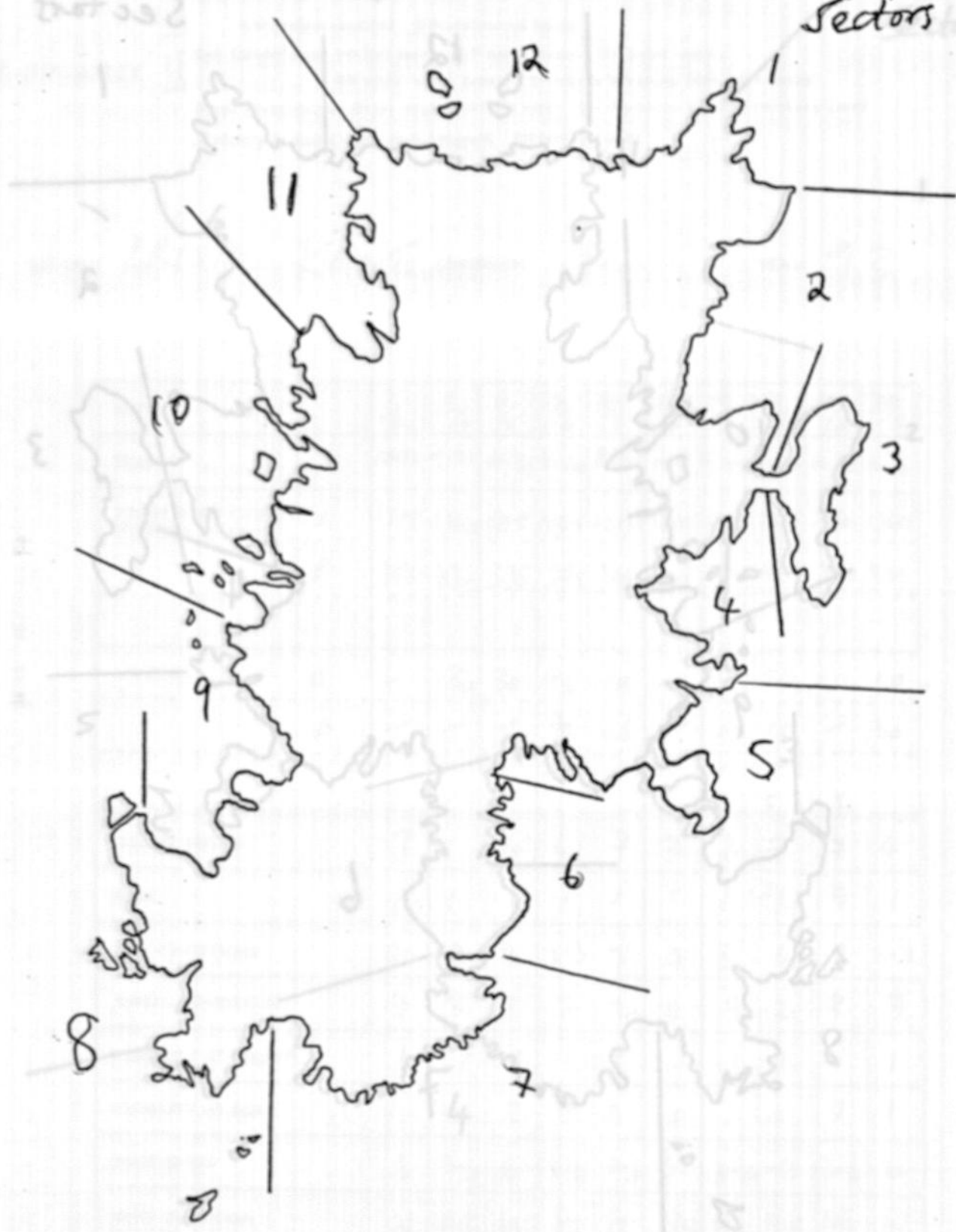
Sector	Count 1	Count 2
1	16	22
2	34 (2)	39 (1)
3	38 (1)	37
4	105 (4)	92
5	44	56
6	20	17
Total	257 (7)	263 (1)

Total maximum count = 280 (6)

Note, figures in brackets refer to birds in non - breeding plumage.

Razorbill
1993
Whole Island Census
Sectors

Whole Island Census
Sectors



S nag
1993
Whole Island Census
Sectors



Black Guillemot

FAIR ISLE GUILLEMOT CENSUS COUNTS

1993

Whole Island Census

Sectors

APPENDIX II

KEY TO WEATHER: Cloud cover in eighths. Wind speed in Beaufort. Visibility in miles. Rain 1/8 inch. 2/8 (cloud) 1/8 inch light. 2/8 (cloud) 1/8 inch heavy. 4/8 (cloud) 1/8 inch light. 2/8 (cloud) 1/8 inch heavy. Sea Conditions: 1/8 (1st) calm. 2/8 (2nd) smooth. 3/8 (3rd) choppy. 4/8 (4th) white. 5/8 (5th) small waves. 6/8 (6th) waves breaking. 7/8 (7th) breaking. 8/8 (8th) heavy seas. Best Conditions: 1/8 (1st) light wind. 2/8 (2nd) light wind. 3/8 (3rd) light wind. 4/8 (4th) heavy wind. Visibility Category: 1/8 (1st) good. 2/8 (2nd) fair. 3/8 (3rd) poor.

CRISTAL K... 23



DATE	1	2	3	4	5	6	7	8	9	10
TIME	10:30	11:30	12:30	13:30	14:30	15:30	16:30	17:30	18:30	19:30
STUDY PLOT COORDINATES	A 115	B 126	A 115	B 145	A 115	B 126	A 115	B 145	A 115	B 126
LOAFERS	A -	30	30	95	48	50	60	50	A -	30
SEAS	3	1	4	6	7	7	7	7	7	4
WIND	1	1	1	1	1	1	1	1	1	1
SEA CONDITIONS	4	4	4	2-3	2	4	3	1	2	2-3
WIND DIRECTION	3	3	3	3	2	4	3	2	3	3
WIND SPEED	1	1	1	1	1	1	1	1	1	1
WIND DIRECTION	4	2	2	2	1	1	1	1	1	1
WIND SPEED	4	2-4	4	3-4	2	4	2-4	2	3-4	4
WIND DIRECTION	N	NE	SW	SE	SE	NW	NW	NW	NE	W

FAIR ISLE GUILLEMOT CENSUS COUNTS

KEY TO WEATHER: Cloud cover in eighths Wind speed = Beaufort scale

Rain: 1 = none 2 = discontinuous light 3 = discontinuous heavy

4 = continuous light 5 = continuous heavy

Sea Conditions: 1 = flat calm 2 = small waves 3 = large waves

4 = white wave crests 5 = waves breaking high onto rocks

Swell Conditions: 1 = no swell 2 = light swell 3 = moderate swell 4 = heavy swell

Visibility (colony and sea): 1 = good 2 = fair 3 = poor

APPENDIX II

COLONY: KRISTAL KAME OBSERVER: Ben YEAR: 93

DATE		1/6	2/6	6/6	7/6	8/6	13/6	14/6	16/6	15/6	20/6
TIME		10-25	9-30	10-30	10-40	10-00	11-15	9-45	10-30	10-70	10-30
STUDY PLOT COUNT (see photo for key)	A	1115	1360	1115	1265	1215	1210	1230	1215	1360	1360
	B	355	330	335	375	340	345	340	415	390	335
LOAFERS	A	-	30	30	95	45	-	5	80	60	50
	B	-	-	-	70	65	-	-	10	-	30
CLOUD COVER		3	1	4	6	7	7	7	7	7	4
RAIN		1	1	1	1	1	1	1	1	1	1
SEA CONDITIONS		4	3	4	2-3	2	4	3	1	2	2-3
SWELL CONDITIONS		3	3	3	3	2	4	3	2	3	3
VISIBILITY AT COLONY		1	1	1	1	1	1	1	1	1	1
VISIBILITY AT SEA		1	1	2	2	2	1	1	1	1	1
WIND SPEED		4	3-4	4	3-4	3-4	4	3-4	2	3-4	4
WIND DIRECTION		N	NE	SW	SE	SE	NW	NW	NW	NE	W

FAIR ISLE GUILLEMOT CENSUS COUNTS

KEY TO WEATHER: Cloud cover in eighths Wind speed = Beaufort scale

Rain: 1 = none 2 = discontinuous light 3 = discontinuous heavy

4 = continuous light 5 = continuous heavy

Sea Conditions: 1 = flat calm 2 = small waves 3 = large waves

4 = white wave crests 5 = waves breaking high onto rocks

Swell Conditions: 1 = no swell 2 = light swell 3 = moderate swell 4 = heavy swell

Visibility (colony and sea): 1 = good 2 = fair 3 = poor

APPENDIX II

COLONY: LERI CUM
(OLD FLAT)

OBSERVER: Ben

YEAR: 93

DATE	1/6	2/6	4/6	7/6	8/6	13/6	14/6	16/6	18/6	19/6
TIME	11-30	10-10	11-00	11-15	10-45	11-30	10-15	11-05	11-00	11-00
STUDY PLOT COUNT (see photo for key)										
middle / top	126	134	109	129	107	135	112	118	115	104
bottom	18	11	18	22	17	28	25	18	26	22
LOAFERS										
CLOUD COVER	2-3	0-1	3	7	6	7	7	7	7	3
RAIN	1	1	1	1	1	1	1	1	1	1
SEA CONDITIONS	3	3	4	3	2	4	3	1	2	2-3
SWELL CONDITIONS	3	3	3	3	2	4	3	2	3	3
VISIBILITY AT COLONY	1	1	1	1	1	1	1	1	1	1
VISIBILITY AT SEA	1	1	1-2	1-2	2	1	1	1	1	1
WIND SPEED	3-4	3	3-4	3-4	4	4	4	2	3-4	4
WIND DIRECTION	N	NE	SW	SE	E	NN	NW	VARIABLE	NE	W

FAIR ISLE GUILLEMOT CENSUS COUNTS

KEY TO WEATHER: Cloud cover in eighths Wind speed = Beaufort scale

Rain: 1 = none 2 = discontinuous light 3 = discontinuous heavy

4 = continuous light 5 = continuous heavy

Sea Conditions: 1 = flat calm 2 = small waves 3 = large waves

4 = white wave crests 5 = waves breaking high onto rocks

Swell Conditions: 1 = no swell 2 = light swell 3 = moderate swell 4 = heavy swell

Visibility (colony and sea): 1 = good 2 = fair 3 = poor

APPENDIX II

COLONY: KAME OF GUDICUM.

OBSERVER: A. J. LEITCH.

1993.

DATE	01/06	02/06	06/06	07/06	08/06	13/06	14/06	16/06	18/06	20/06
TIME	1020 1040	0925 0945	1030 1100	1045 1110	1030 1100	1015 1030	1100 1130	0940 1000	1000 1015	1025 1040
STUDY PLOT COUNT (see photo for key)	367	462	376	389	404	397	397	421	411	392
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
LOAFERS	4	16	0	22	1	22	3	14	28	20
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
CLOUD COVER	2/8	1/8	7/8	6/8	1/8	7/8	7/8	8/8	6/8	2/8
RAIN	1	1	1	1	1	1	2	2	1	1
SEA CONDITIONS	1/2	2	3	2	2/3	2/3	2	2	2	2
SWELL CONDITIONS	1	2	3	2	2	2	1-2	2	2	2
VISIBILITY AT COLONY	1	1	1	1	1	1	1	1	1	1
VISIBILITY AT SEA	1	1	1	1	1	1	1	1	1	1
WIND SPEED	3-4	2-3	3-4	3-4	3	4	3-4	2-3	3	3/4
WIND DIRECTION	N/NW	NE	SW	S/SE	S/SE	N.	NW.	Variable	NE.	SW

FAIR ISLE GUILLEMOT CENSUS COUNTS

KEY TO WEATHER: Cloud cover in eighths Wind speed = Beaufort scale
 Rain: 1 = none 2 = discontinuous light 3 = discontinuous heavy
 4 = continuous light 5 = continuous heavy
 Sea Conditions: 1 = flat calm 2 = small waves 3 = large waves
 4 = white wave crests 5 = waves breaking high onto rocks
 Swell Conditions: 1 = no swell 2 = light swell 3 = moderate swell 4 = heavy swell
 Visibility (colony and sea): 1 = good 2 = fair 3 = poor

COLONY:

DA SWAIN

OBSERVER:

PJ

1993

DATE		1/6	2/6	6/6	7/6	8/6	13/6	14/6	15/6	15/6	20/6
TIME		09.30	9.35	10.00	10.00	10.00	10.00	10.45	10.10	10.30	10.00
STUDY PLOT COUNT (see photo for key)	A	117	111	126	135	134	138	127	131	158	142
	B	104	113	113	118	150	141	108	122	132	128
	C	126	148	128	139	157	142	153	163	164	157
LOAFERS		17	36	101	61	114	120	154	113	286	96
CLOUD COVER		4/8	1/8	7/8	8/8	8/8	8/8	7/8	8/8	8/8	3/8
RAIN		1	1	1	1	1	1	1	2	1	2
SEA CONDITIONS		2	2	2	2	2	3	2	1	2	2
SWELL CONDITIONS		3	3	3	2	2	3	2	1	2	2
VISIBILITY AT COLONY		1	1	1	1	1	1	1	1	1	1
VISIBILITY AT SEA		1	1	1	1	2	1	1	1	1	1
WIND SPEED		4	4	4	3	4	4	3	2	4	4
WIND DIRECTION		N	NE	SW	SE	SE	NE	NW	W	NE	NW

FAIR ISLE GUILLEMOT CENSUS COUNTS

KEY TO WEATHER: Cloud cover in eighths Wind speed = Beaufort scale

Rain: 1 = none 2 = discontinuous light 3 = discontinuous heavy

4 = continuous light 5 = continuous heavy

Sea Conditions: 1 = flat calm 2 = small waves 3 = large waves

4 = white wave crests 5 = waves breaking high onto rocks

Swell Conditions: 1 = no swell 2 = light swell 3 = moderate swell 4 = heavy swell

Visibility (colony and sea): 1 = good 2 = fair 3 = poor

COLONY: NORTH GUNNAWARK

OBSERVER: A. J. LEITCH

1993

DATE	01/06	02/06	06/06	07/06	08/06	13/06	14/06	16/06	18/06	20/06
TIME	1115 1140	1035 1100	1135 1155	1115 1145	1145 1200	1045 1100	1045 1100	1100 1120	1045 1100	1000 1015
STUDY PLOT COUNT (see photo for key)	172	182	184	189	174	185	181	187	192	188
	/	/	/	/	/	/	/	/	/	/
	/	/	/	/	/	/	/	/	/	/
LOAFERS	0	0	0	8	0	2	0	6	3	8
	/	/	/	/	/	/	/	/	/	/
	/	/	/	/	/	/	/	/	/	/
CLOUD COVER	3/8	1/8	7/8	8/8	2/8	7/8	7/8	8/8	8/8	8/8
RAIN	1	1	1	1	1	1	1	2	1	2
SEA CONDITIONS	1	2	2	2	2/3	2/3	2	2	2	2
SWELL CONDITIONS	1	2	3	2	2	2	1	2	2	2
VISIBILITY AT COLONY	1	1	1	1	1	1	1	1	1	1
VISIBILITY AT SEA	1	1	1	2/3	1	1	1	1	1	1
WIND SPEED	3-4	2-3	3-4	3-4	3	4	3/4	2/3	3	3/4
WIND DIRECTION	N/NW	NE	SW	S/SE	S/SE	N	NW	Variable	E	SW

FAIR ISLE GUILLEMOT CENSUS COUNTS

KEY TO WEATHER: Cloud cover in eighths Wind speed = Beaufort scale

Rain: 1 = none 2 = discontinuous light 3 = discontinuous heavy

4 = continuous light 5 = continuous heavy

Sea Conditions: 1 = flat calm 2 = small waves 3 = large waves

4 = white wave crests 5 = waves breaking high onto rocks

Swell Conditions: 1 = no swell 2 = light swell 3 = moderate swell 4 = heavy swell

Visibility (colony and sea): 1 = good 2 = fair 3 = poor

APPENDIX II

COLONY:

SHALDI

OBSERVER:

PJ

1993

DATE		1/6	2/6	6/6	7/8	8/8	3/6	14/6	16/6	18/6	20/6
TIME		10.40	10.30	11.00	11.15	11.30	11.00	10.00	10.55	10.00	10.45
STUDY PLOT COUNT (see photo for key)	A	203	202	197	232	206	225	233	235	228	213
	B	140	165	159	169	153	170	168	202	196	154
	C	71	77	70	74	74	71	79	72	73	67
LOAFERS	X	NIL	NIL	NIL	13	3	NIL	4	4	24	11
	Y	42	102	143	155	74	44	166	67	141	62
	Z	57	10	27	112	49	103	144	42	8	55
CLOUD COVER		3/8	1/8	6/8	8/8	8/8	8/8	7/8	8/8	7/8	6/8
RAIN		1	1	1	1	1	1	1	2	1	2
SEA CONDITIONS		2	2	2	2	2	3	1	1	2	2
SWELL CONDITIONS		3	3	3	2	2	3	1	1	2	2
VISIBILITY AT COLONY		1	1	1	1	1	1	1	1	1	1
VISIBILITY AT SEA		1	1	1	1	2	1	1	1	1	1
WIND SPEED		4	4	4	4	4	4	3	2	4	4
WIND DIRECTION		N	NE	SW	SE	SE	NE	NW	W	NE	NW

APPENDIX III

WEIGHTS AND WING-LENGTHS OF CHICKS IN 1993

1 Shag: Broods weighed and measured once.

Brood	Date	WL (mm)	WT (g)	WL (mm)	WT (g)	WL (mm)	WT (g)	WL (mm)	WT (g)
Brood 1	14.6.	50	540	79	750	75	799		
Brood 2	14.6.	126	1165	134	1410	110	1130		
Brood 3	14.6.	84	805						
Brood 4	14.6.	108	1020	97	1035	114	1090		
Brood 5	14.6.	149	1280	149	1440				
Brood 6	14.6.	158	1395						
Brood 7	14.6.	71	790	83	860	69	730		
Brood 8	14.6.	119	1210						
Brood 9	14.6.	74	640						
Brood 10	17.6.	160	940	87	820	92	850		
Brood 11	17.6.	79	790	61	620	81	820		
Brood 12	17.6.	53	520	60	580				
Brood 13	17.6.	85	720	64	655				
Brood 14	17.6.	66	650	52	540	69	680		
Brood 15	17.6.	98	900	96	900				
Brood 16	17.6.	164	1440	161	1640	165	1530		
Brood 17	17.6.	126	1380	123	1140				
Brood 18	17.6.	62	740	58	530	65	590		
Brood 19	17.6.	97	1040	74	810	95	940		
Brood 20	17.6.	48	480	124	1390	137	1270	135	1390
Brood 21	17.6.	132	1290						
Brood 22	17.6.	83	780	108	1050	107	960		
Brood 23	17.6.	134	1240	139	1290				
Brood 24	17.6.	91	910	113	1090	128	1250		
Brood 25	17.6.	55	420	56	490	53	490		
Brood 26	18.6.	75	690	75	680				
Brood 27	18.6.	155	1320	165	1500	171	1610		
Brood 28	18.6.	101	1030	151	1400				
Brood 29	18.6.	183	1600	179	1450	168	1460		
Brood 30	18.6.	162	1590	165	1460				
Brood 31	18.6.	122	1120						
Brood 32	18.6.	146	1270	140	1410				
Brood 33	18.6.	88	950	69	690	96	940		
Chick 34	8.7.								
Chick 37	8.7.								

APPENDIX I
WEIGHTS AND WING-LENGTHS OF CHICKS REARED ON

2 Fulmar: Chicks measured and weighed once.

Date:	4.8.93	
	WT (g)	WT (g)
Chick 1	115	725
Chick 2	137	695
Chick 3	144	945
Chick 4	147	975
Chick 5	175	955
Chick 6	160	985
Chick 7	182	985
Chick 8	137	985
Chick 9	182	805
Chick 10	177	1155
Chick 11	186	795
Chick 12	156	780
Chick 13	153	885
Chick 14	149	820
Chick 15	137	805
Chick 16	169	1055
Chick 17	159	1165
Chick 18	206	1040
Chick 19	148	1075
Chick 20	96	625
Chick 21	166	875
Chick 22	145	675
Chick 23	186	1065
Chick 24	162	955
Chick 25	163	935
Chick 26	177	1265
Chick 27	182	825
Chick 28	193	1155
Chick 29	170	1015
Chick 30	128	1045
Chick 31	108	795

	2	2	2	3	4	1	2	2
	3	3	2	2	3	1	2	2
	1	1	1	1	1	1	1	1
	1	1	1	2	1	1	1	1
	4	4	4	4	4	3	4	4
	4	4	4	4	4	4	4	4

APPENDIX B

Black-legged Kittiwake Chicks weighed and measured once

3 Arctic Skuas:

Chicks weighed and measured once

Chick	Date	WL (mm)	WT (g)	WL (mm)	WT (g)	Date	Chick
Chick 1	1.7.	177	380	177	380	1.7.	Chick 1
Chick 2	1.7.	118	270	118	270	1.7.	Chick 2
Chick 3	1.7.	125	310	125	310	1.7.	Chick 3
Chick 4	1.7.	161	310	161	310	1.7.	Chick 4
Chick 5	1.7.	145	335	145	335	1.7.	Chick 5
Chick 6	1.7.	149	280	149	280	1.7.	Chick 6
Chick 7	2.7.	117	255	117	255	2.7.	Chick 7
Chick 8	2.7.	150	355	150	355	2.7.	Chick 8
Chick 9	2.7.	112	275	112	275	2.7.	Chick 9
Chick 10	2.7.	113	240	113	240	2.7.	Chick 10
Chick 11	2.7.	121	260	121	260	2.7.	Chick 11
Chick 12	2.7.	168	350	168	350	2.7.	Chick 12
Chick 13	4.7.	191	455	191	455	4.7.	Chick 13
Chick 14	4.7.	178	370	178	370	4.7.	Chick 14
Chick 15	4.7.	81	195	81	195	4.7.	Chick 15
Chick 16	4.7.	137	300	137	300	4.7.	Chick 16
Chick 17	4.7.	183	335	183	335	4.7.	Chick 17
Chick 18	4.7.	171	335	171	335	4.7.	Chick 18
Chick 19	4.7.	138	315	138	315	4.7.	Chick 19
Chick 20	4.7.	125	265	125	265	4.7.	Chick 20
Chick 21	4.7.	142	300	142	300	4.7.	Chick 21
Chick 22	5.7.	189	450	189	450	5.7.	Chick 22
Chick 23	5.7.	150	370	150	370	5.7.	Chick 23
Chick 24	5.7.	172	350	172	350	5.7.	Chick 24
Chick 25	5.7.	202	370	202	370	5.7.	Chick 25
Chick 26	5.7.	164	360	164	360	5.7.	Chick 26
Chick 27	5.7.	60	195	60	195	5.7.	Chick 27
Chick 28	6.7.	95	252	95	252	6.7.	Chick 28
Chick 29	6.7.	96	195	96	195	6.7.	Chick 29
Chick 30	7.7.	201	370	201	370	7.7.	Chick 30
Chick 31	7.7.	172	330	172	330	7.7.	Chick 31
Chick 32	7.7.	204	420	204	420	7.7.	Chick 32
Chick 33	7.7.	219	430	219	430	7.7.	Chick 33
Chick 34	7.7.	219	410	219	410	7.7.	Chick 34
Chick 35	7.7.	216	445	216	445	7.7.	Chick 35
Chick 36	8.7.	146	310	146	310	8.7.	Chick 36
Chick 37	8.7.	168	380	168	380	8.7.	Chick 37

4 Great Skua:

a) Chicks weighed and measured once.

Chick	Date	WL (mm)	WT (g)
Chick 1	1.7.	75	530
Chick 2	1.7.	70	440
Chick 3	1.7.	68	410
Chick 4	1.7.	68	435
Chick 5	1.7.	137	780
Chick 6	1.7.	95	640
Chick 7	2.7.	74	470
Chick 8	2.7.	91	570
Chick 9	4.7.	127	995
Chick 10	4.7.	225	1080
Chick 11	4.7.	210	1035
Chick 12	4.7.	75	600
Chick 13	4.7.	110	665
Chick 14	4.7.	103	495
Chick 15	4.7.	137	790
Chick 16	5.7.	63	450
Chick 17	5.7.	66	430
Chick 18	5.7.	70	545
Chick 19	5.7.	91	590
Chick 20	5.7.	76	450
Chick 21	5.7.	228	980
Chick 22	5.7.	215	1800
Chick 23	5.7.	66	460
Chick 24	5.7.	102	640
Chick 25	6.7.	70	460
Chick 26	6.7.	73	530
Chick 27	6.7.	51	395
Chick 28	6.7.	70	435
Chick 29	6.7.	71	585
Chick 30	6.7.	128	825
Chick 31	6.7.	198	1105

b) Chicks weighed and measured more than once.

Chick	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)
Chick 1	1.7.	42	320	4.7.	67	425	6.7.	77	500
Chick 2	1.7.	47	340	4.7.	67	435	6.7.	76	445
Chick 3	1.7.	62	470	6.7.	111	690			
Chick 4	2.7.	67	425	4.7.	90	515			
Chick 5	2.7.	138	835	6.7.	179	985			
Chick 6	2.7.	147	960	6.7.	194	1130			
Chick 7	2.7.	70	455	6.7.	112	635			
Chick 8	2.7.	115	750	6.7.	149	845			

APPENDIX III

Lesser Black-backed Gull : Chicks weighed and measured once.

Chick	Date	WL(mm)	WT(g)	WT(g)	WT(g)
5	5.7.	62	402		
6	5.7.	70	420		
7	5.7.	51	312		
8	5.7.	186	630		
9	5.7.	159	710		
10	5.7.	103	455		
11	5.7.	130	450		
12	5.7.	101	450		
13	5.7.	187	735		
14	5.7.	186	735		
15	5.7.	185	640		
16	21.6	34	115		
17	"	46	160		
18	"	30	80		
19	"	40	105		
20	"	61	197		
21	"	32	133		
22	"	41	137		
23	"	48	180		
24	"	58	182		
25	"	39	135		
26	"	106	380		
27	"	63	187		
28	"	55	170		
29	"	120	300		
30	"	38	145		
31	"	96	270		
32	"	122	314		
33	"	89	241		
34	"	47	209		
35	"	122	361		
36	"	86	175		
37	"	102	280		
38	"	36	131		
39	"	43	143		
40	"	44	240		
41	"	88	260		
42	"	92	285		
43	"	68	208		
44	"	148	337		
45	"	174	413		

5 Herring Gull: Chicks weighed and measured once.

	Date	WL (mm)	WT (g)
Chick 1	8.7.	215	790
Chick 2	8.7.	187	760
Chick 3	8.7.	196	730
Chick 4	8.7.	186	630

6 Kittiwake: Broods weighed and measured once.

	Date	WL (mm)	WT (g)	WL (mm)	WT (g)
Brood 1	21.6	34	115		
Brood 2	"	46	160	38	165
Brood 3	"	30	80	44	95
Brood 4	"	45	155	38	130
Brood 5	"	61	197	56	168
Brood 6	"	33	133	35	131
Brood 7	"	41	137		
Brood 8	"	48	180	60	215
Brood 9	"	58	182	49	175
Brood 10	"	39	135	36	110
Brood 11	"	166	380	120	210
Brood 12	"	65	187	58	275
Brood 13	"	56	170		
Brood 14	"	120	300		
Brood 15	"	38	145	57	155
Brood 16	"	96	270	82	215
Brood 17	"	133	314	117	349
Brood 18	"	89	241	67	287
Brood 19	"	47	259	37	122
Brood 20	"	113	261	70	205
Brood 21	"	56	175	43	172
Brood 22	"	102	280		
Brood 23	"	36	131	36	103
Brood 24	"	45	145	46	171
Brood 25	"	66	245	52	170
Brood 26	"	88	240	76	225
Brood 27	"	92	285	90	265
Brood 28	"	68	208	49	170
Brood 29	"	148	337		
Brood 30	"	174	413	157	370

7 Arctic Terns:

a) Chicks weighed and measured more than once.

	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)
Chick 1	19.6.	49	50	24.6.	104	113
Chick 2	19.6.	63	60	24.6.	114	101
Chick 3	19.6.	48	42	24.6.	83	64
Chick 4	24.6.	56	64	7.7.	154	110
Chick 5	24.6.	61	54	7.7.	165	100

b) Chicks weighed and measured once.

	Date	WL (mm)	WT (g)
Chick 1	19.6.	21	25
Chick 2	19.6.	33	40
Chick 3	19.6.	49	57
Chick 4	24.6.	81	82
Chick 5	24.6.	60	72
Chick 6	24.6.	109	125
Chick 7	27.6.	82	92
Chick 8	27.6.	93	109
Chick 9	27.6.	87	96
Chick 10	27.6.	80	91
Chick 11	27.6.	77	97
Chick 12	27.6.	100	119
Chick 13	27.6.	109	120
Chick 14	27.6.	67	82
Chick 15	27.6.	63	81
Chick 16	28.6.	91	102
Chick 17	28.6.	58	67
Chick 18	28.6.	78	70
Chick 19	28.6.	99	93
Chick 20	28.6.	35	46
Chick 21	28.6.	100	99
Chick 22	28.6.	77	82
Chick 23	28.6.	57	71
Chick 24	28.6.	69	76
Chick 25	28.6.	91	97
Chick 26	28.6.	108	109
Chick 27	28.6.	90	89
Chick 28	28.6.	94	96
Chick 29	28.6.	74	67
Chick 30	28.6.	89	99
Chick 31	28.6.	93	92
Chick 32	28.6.	84	91
Chick 33	28.6.	76	77
Chick 34	28.6.	82	83
Chick 35	28.6.	140	109
Chick 36	7.7.	160	105
Chick 37	7.7.	120	75
Chick 38	7.7.	119	100
Chick 39	7.7.	152	105
Chick 40	7.7.	164	95
Chick 41	7.7.	142	85
Chick 42	7.7.	133	75

Chick 31-18.6.64-32.7.64 149
 8 Guillemot: Chicks weighed and measured once.

Chick	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)	
Chick 1	18.6.	32	180							
Chick 2	18.6.	30	155							
Chick 3	18.6.	64	246							
Chick 4	18.6.	36	205							
Chick 5	18.6.	33	174							
Chick 6	18.6.	32	163							
Chick 7	18.6.	31	134							
Chick 8	18.6.	26	80							
Chick 9	19.6.	36	193							
Chick 10	19.6.	40	210							
Chick 11	19.6.	46	245							
Chick 12	19.6.	43	236							
Chick 13	19.6.	39	200							
Chick 14	19.6.	42	215							
Chick 15	19.6.	46	236							
Chick 16	19.6.	38	190							
Chick 17	19.6.	40	203							
Chick 18	19.6.	29	122							
Chick 19	19.6.	35	191							
Chick 20	19.6.	33	157							
Chick 21	19.6.	35	195							
Chick 22	19.6.	50	240							
Chick 23	19.6.	55	264							
Chick 24	19.6.	44	242							
Chick 25	19.6.	48	295							
Chick 26	19.6.	36	158							
Chick 27	19.6.	42	250							
Chick 28	19.6.	49	252							
Chick 29	19.6.	43	261							
Chick 30	19.6.	57	270							
Chick 31	19.6.	43	239							
C5	14.6.	37	102	22.6.	47	263	1.7.	97	360	
C6	14.6.	43	164	22.6.	83	270	1.7.	118	385	
C7	14.6.	36	95	22.6.	62	195	1.7.	94	325	
C8							1.7.	31	115	
C9							1.7.	35	115	
C10							1.7.	30	115	
b) Chicks weighed and measured once.										
C1	14.6.	24	82							
C2	14.6.	25	87							
C3	14.6.	41	132							
								12.7.	191	326
								12.7.	170	328
								12.7.	77	146
								12.7.	97	212
								12.7.	111	278

9 Razorbill:

a) Chicks weighed and measured more than once.

	Date	WL(mm)	WT(g)	Date	WL(mm)	WT(g)	Date	WL(mm)	WT(g)	Date	WL(mm)	WT(g)
C1	13.6.	28	97	18.6.	44	177	22.6.	60	218			
C2	13.6.	55	175	18.6.	73	190	22.6.	80	198			
C3	13.6.	32	85	18.6.	48	151	22.6.	62	190			
C4	13.6.	32	97	18.6.	48	73	22.6.	64	185			
C5	13.6.	30	114	18.6.	51	70	22.6.	66	195			
C7	13.6.	32	98	18.6.	52	80	22.6.	66	187			
C8	13.6.	35	114	18.6.	52	150	22.6.	64	161			
C9	13.6.	34	92	18.6.	50	76	22.6.	63	178	1.7.	81	210
C10	13.6.	25	59				22.6.	46	179	1.7.	77	205
C11	13.6.	27	64				22.6.	52	162	1.7.	78	185
C12	13.6.	31	92				22.6.	62	180			
C13	13.6.	29	78				22.6.	61	189			
C14	13.6.	34	112				22.6.	71	201			
C15	13.6.	38	136	18.6.	59	195						
C16				18.6.	33	98	22.6.	47	148	1.7.	76	190
C17				18.6.	40	112	22.6.	55	174	1.7.	80	210
C18				18.6.	37	128	22.6.	53	188	1.7.	80	200
C19				18.6.	46	137	22.6.	60	172	1.7.	84	185
C20				18.6.	33	95	22.6.	43	148	1.7.	71	170
C21				18.6.	50	160	22.6.	65	195			
C22				18.6.	45	169	22.6.	63	206			
C23				18.6.	46	160	22.6.	62	200			
C24				18.6.	48	150	22.6.	62	207			
C25				18.6.	37	110	22.6.	52	162			
C26				18.6.	26	69				1.7.	65	185
C27				18.6	26	80				1.7.	67	200

Greenhale continued

Chick	Date	WL (mm)	WT (g)
Chick 51	18.6.	32	110
Chick 52	19.6.	40	133
Chick 53	19.6.	43	157
Chick 54	19.6.	56	160
Chick 55	19.6.	49	151
Chick 56	19.6.	63	213
Chick 57	19.6.	60	195
Chick 58	19.6.	30	84
Chick 59	19.6.	52	147
Chick 60	19.6.	61	186
Chick 61	19.6.	33	96
Chick 62	19.6.	56	164
Chick 63	19.6.	68	192
Chick 64	1.7.	58	195
Chick 65	1.7.	38	155
Chick 66	1.7.	57	195
Chick 67	1.7.	72	185
Chick 68	1.7.	42	170
Chick 69	1.7.	37	150
Chick 70	1.7.	30	140
Chick 71	1.7.	76	245
Chick 72	1.7.	35	145
Chick 73	1.7.	61	215
Chick 74	1.7.	62	185
Chick 75	1.7.	39	150

a) Chicks weighed and measured twice.

10 Puffin:

a) Chicks weighed and measured more than once.

Easter Lother.

	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)
C1	14.6.	40	156	22.6.	78	271	12.7.	137	357
C2	14.6.	41	127	22.6.	77	247	12.7.	137	321
C3	14.6.	29	113	22.6.	68	253	12.7.	135	329
pC4	14.6.	31	84	22.6.	58	211	12.7.	128	362
C5	14.6.	37	102	22.6.	67	243	1.7.	97	360
C6	14.6.	43	164	22.6.	83	270	1.7.	118	385
C7	14.6.	36	95	22.6.	62	195	1.7.	94	335
C8							1.7.	31	115
C9							1.7.	35	115
C10							1.7.	30	115

b) Chicks weighed and measured once.

	Date	WL (mm)	WT (g)
C1	14.6.	24	52
C2	14.6.	23	57
C3	14.6.	41	133
C4			
C5			
C6			
C7			
C8			

b) Chicks weighed and measured once.

	Date	WL (mm)	WT (g)
Chick 1	13.6.	31	88
Chick 2	13.6.	26	73
Chick 3	13.6.	28	60
Chick 4	13.6.	32	89
Chick 5	18.6.	26	55
Chick 6	18.6.	36	101
Chick 7	18.6.	45	130
Chick 8	18.6.	28	69
Chick 9	18.6.	30	92
Chick 10	18.6.	32	85
Chick 11	18.6.	30	90
Chick 12	18.6.	52	175
Chick 13	18.6.	45	140
Chick 14	18.6.	46	194
Chick 15	18.6.	43	125
Chick 16	18.6.	34	146
Chick 17	18.6.	73	235
Chick 18	18.6.	31	100
Chick 19	18.6.	47	95
Chick 20	18.6.	30	130
Chick 21	18.6.	40	135
Chick 22	18.6.	62	185
Chick 23	18.6.	49	155
Chick 24	18.6.	62	190
Chick 25	18.6.	57	178
Chick 26	18.6.	32	105
Chick 27	18.6.	29	83
Chick 28	18.6.	56	156
Chick 29	18.6.	61	193
Chick 30	18.6.	63	166
Chick 31	18.6.	28	78
Chick 32	18.6.	58	167
Chick 33	18.6.	38	145
Chick 34	18.6.	74	193
Chick 35	18.6.	36	125
Chick 36	18.6.	54	183
Chick 37	18.6.	26	65
Chick 38	18.6.	48	150
Chick 39	18.6.	52	185
Chick 40	18.6.	56	155
Chick 41	18.6.	30	85
Chick 42	18.6.	36	126
Chick 43	18.6.	46	161
Chick 44	18.6.	59	177
Chick 45	18.6.	51	150
Chick 46	18.6.	27	73
Chick 47	18.6.	55	165
Chick 48	18.6.	56	175
Chick 49	18.6.	55	176
Chick 50	18.6.	28	100

Greenholm.

a) Chicks weighed and measured twice.

	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)
C1	22.6.	64	219	8.7.	116	320
C2	22.6.	28	90	8.7.	84	275
C3	22.6.	46	197	8.7.	107	350
C4	22.6.	63	245	8.7.	121	365
C5	22.6.	45	173	8.7.	106	340
C6	22.6.	34	134	8.7.	99	296
C7	22.6.	58	222	8.7.	117	375
C8	22.6.	38	133	8.7.	96	340
C9	22.6.	32	105	8.7.	96	270
C10	22.6.	64	244	8.7.	121	340
C11	22.6.	69	250	8.7.	118	350
C12	22.6.	42	104	8.7.	101	295
C13	22.6.	47	190	8.7.	111	320
C14	22.6.	60	246	8.7.	124	338

Brood 6 26.7.

b) Chicks weighed and measured once.

C1	22.6.	45	173
C2	22.6.	37	156
C3	22.6.	35	128
C4	22.6.	40	184
C5	22.6.	29	111
C6	22.6.	46	182
C7	22.6.	90	291
C8	22.6.	70	253
C9	22.6.	53	197
C10	22.6.	33	145
C11	22.6.	43	216
C12	22.6.	41	175
C13	22.6.	45	163

Brood 12 28.7.

Brood 13 28.7.

Brood 14 28.7.

Brood 15 5.8.

11 Black Guillemot:

a) Chicks weighed and measured twice.

	Date	WL (mm)	WT (g)	Date	WL (mm)	WT (g)
Brood 1	12.7.	76	261	30.7.	137	415
		88	302		/	/
Brood 2	12.7.	37	130	30.7.	116	385
		30	100		103	321
Brood 3	12.7.	52	201	30.7.	126	326
		31	116		107	354
Brood 4	12.7.	53	196	30.7.	127	428
Brood 5	26.7.	47	168	5.8.	93	306
		76	261		114	176
Brood 6	26.7.	27	103	5.8.	73	271
		24	86		63	256

APPENDIX IV

TABLE III. b) Chicks weighed and measured once.

Brood	Date	Weight	Measure
Brood 1	12.7.	53	175
Brood 2	15.7.	84	304
		65	250
Brood 3	15.7.	44	148
Brood 4	15.7.	79	285
		60	255
Brood 5	26.7.	28	104
		37	140
Brood 6	26.7.	80	290
		91	335
Brood 7	26.7.	108	389
Brood 8	26.7.	30	122
Brood 9	28.7.	74	186
Brood 10	28.7.	86	327
		103	351
Brood 11	28.7.	93	330
		84	314
Brood 12	28.7.	57	228
		61	236
Brood 13	28.7.	73	247
Brood 14	28.7.	82	298
Brood 15	5.8.	102	351

APPENDIX IV

WEIGHTS AND WING-LENGTHS OF ADULT RAZORBILLS IN 1993.

Date	WL (mm)	WT (g)
18.6.	195	680
18.6.	199	665
18.6.	196	597
18.6.	206	605
18.6.	198	645
18.6.	198	645
18.6.	197	655
18.6.	200	600
19.6.	197	630