

THE WILDFOWL & WETLANDS TRUST
ISLAY GREENLAND WHITE-FRONTED GOOSE PROJECT
PROGRESS REPORT WINTER 1991-92

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1. GREENLAND WHITE-FRONTED GOOSE ROOST SITES, ISLAY & JURA 1991-92

1.1 INTRODUCTION

The traditional feeding and roosting habitat of the Greenland White-fronted Goose *Anser albifrons flavirostris* appears to have been the extensive peatlands in western and northern Scotland, central west Wales and Ireland. Whilst the feeding habits of Greenland White-fronts have changed over recent decades, increasingly favouring improved pastures and arable crops, there is still a strong affinity for roosting in bogs where these are available.

It is evident that White-fronted Geese also feed at night at these roosts, as described by Stroud (1984), on species such as White-beaked Sedge *Rhynchospora alba*, Cotton Grass *Eriophorum angustifolium*, Bulbous Rush *Juncus bulbosus*, Bogbean *Menyanthes trifoliata* and White Water Lily *Nymphaea alba*, thus retaining a link with their ancestral feeding habitats.

Over the winter of 1991-92 systematic observations were made of roost-fighting White-fronts on Islay and Jura in an attempt to locate the major roosts, their catchment areas and to assess patterns of roost-use.

1.2 METHODS

Greenland White-fronted Goose roost sites on Islay were investigated during the 1991-92 winter using three methods: roost-flight observations, roost counts and roost-site investigations on foot. Radio telemetry was also used to investigate the roost-use of two marked birds.

Roost-flights

Geese were located at least 30 minutes before dusk and watched until they left for their roost sites, when attempts were made to follow them visually or, if necessary, by car. The use of an image intensifier greatly increased the potential of this method for following birds over long distances in poor light. This method enabled precise counts of flock size prior to departure to be made, and meant that roost "catchment" areas could be identified. All the major sub-units of the Islay population were observed in this way, although it was not always possible to locate the precise roost site of each flock, especially for those birds which flew out of sight into hill areas.

Observations where birds merely flew "out of sight" (O) towards a roost were classified separately from those of birds seen landing at a definite (R) or approximate (C.) roost site.

The time of departure from feeding areas of roost-fighting birds was noted. Departure times of flocks accidentally flushed by the observer or prematurely flushed in some other way are not included in any analyses.

Roost counts

At known roost-sites, birds were counted as they came into the roost; this method probably gives good estimates of the number of birds using a roost on a particular night. However, it was often impossible to determine the feeding-site provenance of the birds involved and, as this was an important part of this project, roost-counts were made only infrequently. Another problem with making roost counts is that of knowing when all the birds have come in. I have regularly heard birds arriving in conditions too dark for birds to be spotted even using an image intensifier. At large roost sites, where birds are arriving from several directions, it may be impossible for a lone observer to get an accurate count.

Roost-site investigations

In the poor light conditions which prevail when White-fronts fly to roost, it is often difficult to determine exactly where the birds have landed. The only way to determine exact roost sites is to visit them on foot during daylight hours and look for droppings ("roost-piles" indicating that a bird spent several hours in one spot) and feathers. In remote areas where it is difficult to see where roost-fighting birds land, extensive surveys of likely roosting areas were made. The main limitation of this method is the difficulty of detection of roost signs left by birds roosting on the water at loch and lochan sites. When found, roost-site characteristics were described and brief habitat details recorded.

Radio-tracking of birds at roost

Two White-fronts were fitted with radio-transmitters at Rockside on 20th February 1992. These birds were tracked at their roost-sites on a regular basis for the two weeks before the transmitters were lost. Three fixes per night were made: 1) immediately after the birds had flown to roost, 2) at approximately midnight and 3) about an hour before dawn.

1.3 RESULTS

Distribution of roost sites, roost counts and roost catchment areas

The "source" feeding area and subsequent roost area of all roost flights are presented in Tables 1a-1h. Field codes for the "source" feeding areas from which the birds departed are given, along with the name and grid reference of the roost to which they flew.

The results of roost counts, or roost totals based on the number of birds observed roost-fighting to roosts simultaneously, are presented in Tables 2a-2f.

Both sets of data are summarised in figures 4-8 and on the accompanying 1:50000 OS *Landranger* series map of Islay. All known roost sites are marked by red hatching. Hatched areas represent areas where birds were seen to land or where roosting signs were found during roost investigations. Larger roost complexes are surrounded by a dashed red line to represent the general area of a roost, with exact roosting sites marked in red hatch within the overall boundary. Smaller roosts are marked by a red circle. Red circles with a question mark represent possible roost sites where birds were seen flying into a general area with the exact

Tables 1a-1h presented on the following pages give all observations of roost flights by White-fronts over the 1991-92 winter, giving field numbers of the "source area" in which the birds were seen feeding prior to departure for the roost. Time of departure is not presented due to lack of space, but was noted and entered on the data-base.

Key to roost flight tables

Table headings are presented as follows:

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
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Date = Date of observation

Source Field no = Area code and field number (eg. "EK 48") of source area of feeding flock prior to roost-flight

If only the area code is given (eg. "EK") this means that only the approximate area from which roost-fighting birds originated was known.

Flock = Flock size

Roost = Roost site to/wards which flock flew

Roost names followed by a question mark (?) are not definite

Roost Area = Nearest area code (in the field numbering system) to the roost
- this gives an approximate roost location without having to check its grid reference)

Ref Acc ("reference accuracy") - refers to accuracy of grid reference given for roost site in question:

O - birds seen flying "out of sight" at the grid ref given

c. - approximate roost area

R - accurate roost area - birds seen landing or droppings found at site subsequently

Grid Ref = six-figure grid reference of roost site, approximate roost site or site where birds disappeared from view (see **Ref Acc** above).

Table 1a Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
13 4 92	FL 06	45	Airigh nan Caisteal	FL	O	380 703
12 4 92	MR/FL	40	Airigh nan Clach	MR	O	380 710
13 4 92	FL 09	30	Airigh nan Clach	MR	O	380 710
6 4 92	KM 15	80	Allt Loch Bharra-dail	KM	c.	392 643
10 12 91	BH 09	200	Allt an Leacaich	BH	R	247 619
4 1 92	BH 07	182	Allt an Leacaich	BH	R	247 619
26 11 91	RK 02	100	Allt na Criche	RK	R	215 648
4 12 91	RK 08	340	Allt na Criche	RK	R	221 651
4 12 91	CO	100	Allt na Criche	RK	R	221 651
5 12 91	RK 02	290	Allt na Criche	RK	R	215 648
5 12 91	RK 10	390	Allt na Criche	RK	R	215 648
8 1 92	CO	120	Allt na Criche	RK	R	216 649
8 1 92	CO	100	Allt na Criche	RK	R	216 649
8 1 92	RK 02	110	Allt na Criche	RK	R	216 649
22 2 92	CO 03	130	Allt na Criche	RK	R	215 648
22 2 92	RK 04	60	Allt na Criche	RK	R	215 648
25 2 92	RK 02	170	Allt na Criche	RK	R	215 648
25 2 92	CO	80	Allt na Criche	RK	R	215 648
27 2 92	RK 02	300	Allt na Criche	RK	R	215 648
11 3 92	RK 02	230	Allt na Criche	RK	R	215 649
11 3 92	CO	50	Allt na Criche	RK	R	215 649
20 4 92	CO 03	200	Allt na Criche	RK	R	216 649
24 4 92	CO 03	72	Allt na Criche	RK	R	216 649
24 4 92	CO 04	100	Allt na Criche	RK	R	216 649
24 4 92	RK 02	147	Allt na Criche	RK	R	216 649
3 4 92	BE/KD	50	An Carn	KD	R	325 657
5 2 92	KP 09	140	An Sopachan area?	BM	O	374 691
24 2 92	BB	170	Ballinaby pool	BB	R	218 673
31 1 92	MY 09	15	Beinn Bhan	AV	O	385 575
30 3 92	AV	30	Beinn Bhan S	AV	O	384 556
24 3 92	NG	70	Beinn Bhreac?	NG	O	425 620
28 1 92	KI 08	6	Carn Mor by KI road KI31	KI	R	212 604
26 1 92	AO 51	30	Carra-mhoine?	GG	c.	266 678
15 2 92	GG	35	Casach Loch Ceara	GG	R	250 687
7 2 92	LR 12	30	Castlehill/B Uraraidh?	GD	O	375 515
6 3 92	GD 06	13	Castlehill	GD	O	370 515
14 1 92	CV 14	40	Cladville bog	CV	R	171 545
14 1 92	CV 06	20	Cladville bog	CV	R	171 545

Table 1b Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
4 1 92	BH 06	30	Cnoc Breac	CS	R	257 657
4 1 92	BH	4	Cnoc Breac	CS	R	257 657
28 2 92	CP 07	20	Corsapol Bog	CP	c.	308 664
3 4 92	BE	44	Corsapol Bog	CP	R	310 664
15 4 92	CP	20	Corsapol Bog (CP43)	CP	R	306 662
11 3 92	CO	50	Coulererach	CO	c.	216 653
20 4 92	CO 04	74	Coulererach	CO	R	216 653
25 3 92	CR	60	Cruach Bog (CR35)	CR	R	317 585
9 1 92	BW?	200	Duich Moss	DU	c.	325 560
9 1 92	TL	70	Duich Moss	DU	c.	325 560
9 1 92	LN?	50	Duich Moss	DU	c.	325 555
9 1 92	MY?	156	Duich Moss	DU	c.	332 557
9 1 92	BW?	20	Duich Moss	DU	c.	325 560
9 1 92	TL	112	Duich Moss	DU	c.	325 560
25 1 92	CC 27	140	Duich Moss	DU	R	332 556
25 1 92	AV 19	30	Duich Moss	DU	R	337 562
25 1 92	CN 24	190	Duich Moss	DU	R	332 556
25 1 92	CN 22	120	Duich Moss	DU	R	332 556
31 1 92	MY 04	64	Duich Moss	DU	c.	325 555
31 1 92	MY 08	168	Duich Moss	DU	c.	325 555
23 3 92	NB	200	Duich Moss	DU	c.	332 555
23 3 92	BW	150	Duich Moss	DU	c.	325 560
23 3 92	TL	191	Duich Moss	DU	c.	325 560
24 3 92	KG 27	70	Duich Moss	DU	c.	335 555
14 4 92	KG 23	100	Duich Moss	DU	c.	335 555
14 4 92	AV 19	130	Duich Moss	DU	c.	335 555
14 4 92	GC 50	100	Duich Moss	DU	c.	335 555
14 4 92	GC 12	60	Duich Moss	DU	c.	335 555
14 4 92	NB 07	50	Duich Moss	DU	c.	335 555
25 3 92	BW/RM	50	Duich flats?	DU	O	310 550
18 3 92	LO 50	50	Dun Bhoraraig	LO	R	179 571
29 2 92	KL	16	Dunlossit area	NG/KL	O	427 650
29 2 92	KL	250	Feolin Bog	JU	c.	455 695
3 3 92	KL	530	Feolin Bog	JU	R	452 698
9 4 92	KL 20	280	Feolin Bog	JU	c.	449 690
9 4 92	KL 13	134	Feolin Bog	JU	c.	449 690
13 4 92	KL 11	150	Feolin Bog	JU	c.	453 695
6 12 91	LK	34	Feur Lochain	SG	R	251 695
6 12 91	LK	90	Feur Lochain	SG	R	251 695
6 12 91	BB	60	Feur Lochain	SG	R	251 695
6 12 91	GG 13	90	Feur Lochain	SG	R	251 695
10 1 92	BB	54	Feur Lochain	SG	R	247 694
15 2 92	BB	240	Feur Lochain	SG	R	251 695

Table 1c Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
15 2 92	LK	45	Feur Lochain	SG	R	251 695
15 2 92	SG	85	Feur Lochain	SG	R	251 695
1 3 92	BB/LK	230	Feur Lochain	SG	R	251 695
10 3 92	BB 12	120	Feur Lochain	SG	R	251 695
10 3 92	BB 12	15	Feur Lochain	SG	R	251 695
10 3 92	BB	100	Feur Lochain	SG	R	251 695
12 3 92	BB	150	Feur Lochain	SG	R	251 695
26 3 92	SG 04	35	Feur Lochain	SG	R	251 695
26 3 92	SG 03	20	Feur Lochain	SG	R	251 695
26 3 92	SG 06	20	Feur Lochain	SG	R	251 695
26 3 92	LK	20	Feur Lochain	SG	R	251 695
20 4 92	BB 02	120	Feur Lochain	SG	R	250 695
20 4 92	BB 06	110	Feur Lochain	SG	R	250 695
20 4 92	BB 07	80	Feur Lochain	SG	R	250 695
10 1 92	LK	25	Glac na Criche	SG	R	226 710
24 3 92	NG	100	Glas Bheinn?	NG	O	420 590
29 3 92	KG	50	Glas Bheinn?	NG	O	420 590
3 2 92	KM 34	200	Gleann Maraiche	EK	O	386 640
3 2 92	EK/KM	100	Gleann Maraiche	EK	O	386 640
5 2 92	KM 03	70	Gleann Maraiche	EK	O	386 640
5 2 92	KM 12	90	Gleann Maraiche	EK	O	386 640
7 4 92	EK 16	50	Gleann Maraiche	EK	O	382 638
7 4 92	EK 34	85	Gleann Maraiche	EK	O	382 638
7 4 92	EK 31	65	Gleann Maraiche	EK	O	382 638
7 4 92	EK 44	200	Gleann Maraiche	EK	O	382 638
28 12 91	KB/GL	30	Glen Astaile S	GL	c.	287 448
29 12 91	GL?	20	Glen Astaile S	GL	c.	286 449
29 12 91	GL?	20	Glen Bun an Easa?	GA	O	295 466
29 12 91	GL?	50	Glen Bun an Easa?	GA	O	295 466
18 12 91	OV 02	950	Glen Droisay	SC	O	333 660
18 12 91	OV 02	220	Glen Droisay	SC	O	333 660
18 12 91	OV 02	100	Glen Droisay	SC	O	333 660
7 3 92	BE/SC	900	Glen Droisay	SC	O	330 677
7 3 92	EK 37	140	Glen Droisay?	SC	O	340 670
1 4 92	BE	400	Glen Droisay	SC	O	335 665
2 4 92	OV/EO	350	Glen Droisay	SC	O	330 676
2 4 92	OV/EO	20	Glen Droisay	SC	R	334 667
2 4 92	OV/BE	25	Glen Droisay	SC	R	332 660
2 4 92	OV/BE	20	Glen Droisay	SC	R	333 657
2 4 92	OV/BE	25	Glen Droisay	SC	R	327 664
2 4 92	OV/BE	60	Glen Droisay	SC	O	330 676
5 4 92	EO	230	Glen Droisay	SC	O	335 665
5 4 92	SC	220	Glen Droisay	SC	O	335 665
5 4 92	BE	100	Glen Droisay	SC	O	335 665
5 4 92	DA 04	160	Glen Droisay/Loch Sibhinn	SC	O	335 655
5 4 92	BE 26	200	Glen Droisay/Loch Sibhinn	SC	O	335 655

Table 1d Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
5 4 92	NB 19	180	Glen Droisay/Loch Sibhinn	SC	O	335 655
7 4 92	EK 17	47	Glen Droisay	SC	O	335 665
5 3 92	NG	73	Goirtean an Uruisge?	NG	c.	415 626
5 3 92	NG	134	Goirtean an Uruisge?	NG	O	415 626
4 1 92	BH 07	2	Gortanchuirn Glen	BH	R	250 623
21 12 91	AO	24	Grainel Bog (AO56)	AO	R	266 665
21 12 91	AO	30	Grainel Bog (AO56)	AO	R	266 665
30 4 92	SU 01	80	Grainel Bog	AO	R	267 666
30 4 92	SU 01	50	Grainel Bog (AO15)	AO	O	275 675
26 1 92	FO/US	50	Gruinart Bog	AO	c.	290 657
6 2 92	FO 12	30	Gruinart Bog/Flats	AO	O	270 660
16 4 92	FO/US	50	Gruinart Bog (AO67)	AO	R	289 659
20 1 92	SU	30	Gruinart Flats	AO	c.	280 666
27 2 92	SU 09	50	Gruinart Flats, or Bog	AO	O	270 658
28 2 92	CP 59	12	Gruinart Flats (AO25)	AO	c.	283 672
28 2 92	LY 28	23	Gruinart Flats (AO30)	AO	R	285 664
28 2 92	AO 55	28	Gruinart Flats (AO30)	AO	R	285 664
28 2 92	FO/SU	70	Gruinart Flats (AO30)	AO	R	285 664
9 3 92	SU	35	Gruinart Flats?	AO	c.	280 666
19 3 92	SU 18	20	Gruinart Flats?	AO	O	277 557
15 4 92	FO/US	40	Gruinart Flats (AO30)	AO	R	284 664
15 4 92	FO/US	60	Gruinart Flats (AO31)	AO	R	286 663
16 4 92	FO?	80	Gruinart Flats (AO31)	AO	R	286 664
16 4 92	AO55	40	Gruinart Flats (AO31)	AO	R	286 664
16 4 92	AO33?	30	Gruinart Flats (AO31)	AO	R	286 664
15 4 92	CP	30	Gruinart Flats (CP57)	CP	R	288 668
25 1 92	AV 19	70	Kilennan Bog	AV	R	373 579
23 3 92	CC?	40	Kilennan Bog (AV22)	AV	R	373 580
24 12 91	KB+RB 19	80	Kinnabus	KB	O	290 416
7 2 92	LR 12	50	Lag Odhar?	KT	c.	339 506
7 1 92	CT	25	Laggan Bog	LN	c.	292 575
7 1 92	CT 08	50	Laggan Bog	LN	c.	300 575
7 1 92	RM 18	48	Laggan Bog?	LN	O	295 575
7 1 92	CT 08	50	Laggan Bog/Grunnd Loch?	LN	O	288 573
21 1 92	PC	250	Laggan Bog?	LN	?	290 570
29 1 92	PC	100	Laggan Bog/Grunnd Loch?	LN	c.	290 573
29 1 92	LN 18	46	Laggan Bog	LN	R	290 566
29 1 92	LN 16	9	Laggan Bog	LN	R	290 566
25 3 92	CT 24	30	Laggan Bog	LN	c.	292 570
4 4 92	PC	140	Laggan Bog	LN	c.	290 570
4 4 92	PC	160	Laggan Bog	LN	c.	290 570
17 4 92	PC	330	Laggan Bog?	LN	c.	290 570
18 4 92	PC	290	Laggan Bog?	LN	c.	290 570

Table 1a Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
8 3 92	LR	45	Leorin Lochs S	LR	R	368 480
8 3 92	LR	15	Leorin Lochs S	LR	R	370 481
9 4 92	KP 09	40	Loch Carn nan Gall	BM/FL	O	370 705
8 4 92	KP 09	119	Loch Carn nan Gall area?	BM/FL	O	370 705
8 4 92	KP 15	100	Loch Carn nan Gall area?	BM/FL	O	370 705
10 4 92	FL	40	Loch Carn nan Gall?	BM/FL	O	380 705
6 12 91	LK	30	Loch Corr	SG	R	225 695
10 1 92	LK	54	Loch Corr	SG	R	226 695
20 4 92	BB 04	30	Loch Corr	SG	O	225 685
11 2 92	LR	200	Loch Eighinn?	GD	O	330 503
11 2 92	LR	40	Loch Eighinn?	GD	O	330 503
3 2 92	NG 05	100	Loch Fada	NG	O	414 636
1 12 91	FL/KL	280	Loch Finlaggan	FL	R	389 680
6 12 91	LK	12	Loch Gorm North	BB	c.	227 665
6 12 91	LK	110	Loch Gorm North	BB	R	226 665
17 12 91	OV 02	1300	Loch Sibhinn area	KD	O	330 653
3 4 92	BE/KD	50	Loch Sibhinn Lochans	MC	R	322 649
9 12 91	KW 14	125	Loch Treunaidh	CS	c.	258 634
16 12 91	PC	25	Loch a' Bhogaidh	BS	R	225 578
4 4 92	PC 47	35	Loch a' Bhogaidh	BS	R	225 579
8 4 92	KP 15	70	Loch a' Chaorainn	BM	c.	370 694
12 4 92	KP	110	Loch a' Chaorainn?	BM	O	370 694
2 3 92	JU	120	Loch a' Chnuich Bhric Bog	JU	R	448 743
30 11 91	SU	80	Loch a' Gheoidh (AO)	AO	R	262 658
2 12 91	SU	35	Loch a' Gheoidh (AO)	AO	R	262 658
2 12 91	SU 18	120	Loch a' Gheoidh (AO)	AO	R	262 658
17 1 92	SU	150	Loch a' Gheoidh (AO)	AO	R	262 658
20 1 92	SU	342	Loch a' Gheoidh (AO)	AO	R	262 658
20 1 92	AO	4	Loch a' Gheoidh (AO)	AO	R	262 658
26 1 92	SU	300	Loch a' Gheoidh (AO)	AO	R	262 658
13 2 92	SU 09	150	Loch a' Gheoidh (AO)	AO	R	262 658
27 2 92	SU 07	20	Loch a' Gheoidh (AO)	AO	R	262 658
11 3 92	SU 18	50	Loch a' Gheoidh (AO)	AO	R	262 658
24 3 92	KG 27	140	Loch a' Mhuilinn-ghaoithe	AV	R	420 567
24 3 92	KG 23	158	Loch a' Mhuilinn-ghaoithe	AV	R	420 567
29 3 92	KG	50	Loch a' Mhuilinn-ghaoithe	AV	R	420 567
30 3 92	AV	100	Loch a' Mhuilinn-ghaoithe	AV	R	420 567

Table 1f Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
10 1 92	AO	24	Loch an Fhir Mhor?	AO	c.	265 695
10 1 92	AO	22	Loch an Fhir Mhor?	AO	c.	265 695
10 1 92	AO	17	Loch an Fhir Mhor?	AO	c.	265 695
13 1 92	KT 06	100	Loch an Lin/L Muchairt?	KT	R	321 478
17 1 92	FO 21	30	Loch an Raoin	FO	R	280 646
6 2 92	FO	40	Loch an Raoin	FO	R	280 645
6 2 92	FO 13	60	Loch an Raoin	FO	R	280 645
6 2 92	FO 21	50	Loch an Raoin	FO	R	280 645
15 4 92	FO 12	100	Loch an Raoin	FO	R	280 646
29 1 92	LN 16	8	Lochan na Nigheadaireachd	LN	R	280 558
29 1 92	PC	80	Lochan na Nigheadaireachd	LN	R	280 558
9 4 92	KP 09	40	Lochan na Tais Bheinn?	BM	c.	367 704
26 12 91	CV 27	150	Lossit?	LO	O	175 555
14 1 92	MN	310	Lossit?	LO	O	178 550
27 1 92	LO 51	250	Lossit Point	LO	O	173 563
18 3 92	CV?	8	Lossit Bog	LO	R	188 577
18 3 92	CV?	10	Lossit Bog?	LO	O	188 570
13 1 92	BV 13	120	Luig Rhadha?	KT	c.	304 466
13 1 92	BV 28	50	Luig Rhadha?	KT	c.	304 466
13 1 92	BV 14	100	Luig Rhadha?	KT	c.	304 466
20 3 92	BV 14	172	Luig Rhada/Glen Ghraisdail	KT/GA	c.	305 465
20 3 92	BV 22	70	Luig Rhada/Glen Ghraisdail	KT/GA	c.	305 465
20 3 92	BV 29	110	Luig Rhada/Glen Ghraisdail	KT/GA	c.	305 465
16 1 92	LY 24	130	Lyrabus Bog	LY	R	297 642
16 1 92	MC 04	64	Lyrabus Bog	LY	R	297 642
7 2 92	LR 04	170	Machrie Peat Cuttings	KT	R	338 493
11 2 92	LR 07	130	Machrie Peat Cuttings	KT	R	338 493
6 3 92	GD 06	15	Machrie Peat Cuttings	KT	R	338 493
20 3 92	BV 29	80	Machrie Peat Cuttings	KT	R	338 493
12 1 92	RB 18	100	Maile Mhor?	IV	O	325 435
24 12 91	KB 19	370	Maol Buidhe	GA	c.	300 460
24 12 91	RB	230	Maol Buidhe	GA	c.	300 460
28 12 91	KB/GL	170	Maol Buidhe	GA	O	300 460
29 12 91	GL/KB	120	Maol Buidhe	GA	c.	294 458
30 12 91	KB	100	Maol Buidhe?	GA	O	300 457
30 12 91	KB	100	Maol Buidhe?	GA	O	300 457
30 12 91	KB	50	Maol Buidhe?	GA	O	300 457
30 12 91	KB?	100	Maol Buidhe?	GA	O	300 457
12 1 92	RB 18	60	Maol Buidhe/Maol nan Eun	GA	c.	310 456
13 1 92	BV 22	70	Maol Buidhe/N Oa	GA	c.	300 460

Table 1g Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
13 12 91	BS 01	140	Maol Chuirn-a-mheall ?	BH	O	231 613
13 12 91	BS	60	Maol Chuirn-a-mheall ?	BH	O	231 613
13 12 91	BS	10	Maol Chuirn-a-mheall ?	BH	O	231 613
14 12 91	BS?	100	Maol Chuirn-a-mheall ?	BH	O	231 613
14 12 91	PC	50	Maol Chuirn-a-mheall ?	BH	O	231 613
14 12 91	BS 01	50	Maol Chuirn-a-mheall ?	BH	O	231 613
16 12 91	PC	15	Maol Chuirn-a-mheall	BH	c.	231 613
14 1 92	CV?	6	Maol Chuirn-a-mheall	BH	O	200 595
21 1 92	OM 19	110	Maol Chuirn-a-mheall	BH	c.	240 617
21 1 92	OM 20	130	Maol Chuirn-a-mheall	BH	c.	240 617
28 1 92	KI 08	120	Maol Chuirn-a-mheall	BH	c.	236 616
9 2 92	OF 19	90	Maol Chuirn-a-mheall	BH	c.	233 615
9 2 92	OF 12	45	Maol Chuirn-a-mheall	BH	c.	233 615
14 3 92	OF	150	Maol Chuirn-a-mheall	BH	c.	233 615
16 3 92	OF 03	26	Maol Chuirn-a-mheall	BH	c.	233 615
17 3 92	KI 04	300	Maol Chuirn-a-mheall	BH	c.	231 615
17 3 92	OF?	20	Maol Chuirn-a-mheall	BH	c.	231 615
17 3 92	OF?	120	Maol Chuirn-a-mheall	BH	c.	231 615
1 4 92	PC 35	277	Maol Chuirn-a-mheall	BH	c.	235 613
29 12 91	GL/KB	90	Maol Ghraisdail	GA	c.	306 455
20 3 92	BV 10	51	Maol Ghraisdail/Luig Rhada	GA	c.	300 460
20 3 92	BV 11	67	Maol Ghraisdail/Luig Rhada	GA	c.	300 460
20 3 92	BV 13	11	Maol Ghraisdail/Luig Rhada	GA	c.	300 460
20 3 92	KT 10	12	Maol Ghraisdail/Luig Rhada	KT/GA	c.	305 465
20 3 92	KT 01	30	Maol Ghraisdail/Luig Rhada	KT/GA	c.	305 465
30 1 92	CN/KG	54	Maol a' Chatadail	KG	O	413 599
30 1 92	CN 10	102	Maol a' Chatadail	KG	O	413 599
7 3 92	KP	150	Maol nan Caorach	BM	O	359 685
7 3 92	BM	130	Maol nan Caorach?	BM	O	359 685
5 1 92	LR	338	Moine na Surdaig?	LR	O	370 495
5 1 92	LR	100	Moine na Surdaig?	LR	O	377 499
5 1 92	LG	200	Moine na Surdaig?	LR	O	372 492
11 2 92	LR 13	71	Moine na Surdaig?	LR	O	375 500
11 2 92	LR 07	250	Moine na Surdaig?	LR	O	373 490
11 2 92	LR 07	160	Moine na Surdaig?	LR	O	380 497
8 3 92	LR	350	Moine na Surdaig?	LR	O	377 494
8 3 92	LG 06	360	Moine na Surdaig?	LR	O	387 484
26 11 91	RK 17	100	Moine nam Faoileann?	GG	R	258 682
29 11 91	SU 06	92	Moine nam Faoileann	GG	R	258 682
30 11 91	SU	300	Moine nam Faoileann	GG	R	258 682
2 12 91	RK?	60	Moine nam Faoileann	GG	R	258 682
2 12 91	SU 06	400	Moine nam Faoileann	GG	R	258 682
2 12 91	SU 18	20	Moine nam Faoileann	GG	R	258 682
6 12 91	RK?	120	Moine nam Faoileann	GG	R	258 682
13 12 91	SU 18	252	Moine nam Faoileann	GG	O	260 660
21 12 91	AO	24	Moine nam Faoileann	GG	R	258 682

Table 1h Roost-flights of Greenland White-fronted Geese, Islay 1991-92

Date	Source Field no	Flock	Roost	Roost Area	Ref Acc	Grid Ref
10 1 92	AO	31	Moine nam Faoileann?	GG	c.	258 681
10 1 92	SU	125	Moine nam Faoileann?	GG	c.	258 681
17 1 92	SU	150	Moine nam Faoileann	GG	R	258 682
24 1 92	RK?	90	Moine nam Faoileann	GG	R	258 682
26 1 92	SU	70	Moine nam Faoileann	GG	R	258 682
4 2 92	SU 01	100	Moine nam Faoileann	GG	R	258 682
4 2 92	SU 02	50	Moine nam Faoileann	GG	R	258 682
27 2 92	RK 09	160	Moine nam Faoileann	GG	R	258 682
27 2 92	SU 09	250	Moine nam Faoileann	GG	R	258 682
27 2 92	SU 07	110	Moine nam Faoileann	GG	R	258 682
9 3 92	SU	300	Moine nam Faoileann	GG	R	258 682
9 3 92	RK	160	Moine nam Faoileann	GG	R	258 682
11 3 92	SU 18	400	Moine nam Faoileann	GG	R	258 682
11 3 92	RK 10	70	Moine nam Faoileann	GG	R	258 682
11 3 92	CO	30	Moine nam Faoileann?	GG	O	222 655
19 3 92	SU 18	300	Moine nam Faoileann	GG	R	258 682
24 4 92	RK 08	133	Moine nam Faoileann	GG	R	258 682
24 4 92	SU 01	40	Moine nam Faoileann	GG	R	258 682
30 4 92	SU 01	60	Moine nam Faoileann	GG	R	258 682
29 3 92	KG	30	Monadh a' Choilich	KG	R	390 588
14 4 92	KG 23	100	Monadh a' Choilich	KG	R	393 590
16 1 92	MC 20	80	Na Binneagan (KD)	KD	c.	318 654
3 4 92	MC 23	120	Na Binneagan (KD)	KD	R	318 654
3 4 92	BE 14	200	Na Binneagan (KD)	KD	R	318 654
3 4 92	BE 09	105	Na Binneagan (KD)	KD	R	318 654
3 4 92	BE/KD	200	Na Binneagan (KD)	KD	R	318 654
30 3 92	NG/KG	40	Na Binneagan (NG)	NG	R	398 593
22 1 92	CO 01	110	Sliabh nan Grainnseag	CO	R	217 653
22 1 92	CO 17	130	Sliabh nan Grainnseag	CO	R	217 657
20 4 92	CO 04	100	Sliabh nan Grainnseag	CO	R	216 656
19 12 91	FL ??	60	Srath Luachrach	MR	O	396 691
23 12 91	MR 08	39	Srath Luachrach	MR	R	397 700
23 12 91	MR 19	82	Srath Luachrach	MR	R	397 700
23 12 91	FL?	100	Srath Luachrach	MR	R	397 700
9 4 92	KP 30	110	Srath Luachrach	MR	R	397 700
9 4 92	FL 03	34	Srath Luachrach	MR	O	399 696
9 4 92	MR 03	88	Srath Luachrach	MR	O	399 696
13 4 92	KL 13	110	Srath Luachrach	MR	R	397 700
13 4 92	FL 27	260	Srath Luachrach	MR	R	397 700
13 4 92	MR/KL	30	Srath Luachrach	MR	R	397 700
3 2 92	NG 05	100	Storakaig	NG	O	415 625
12 4 92	KP	100	Tais Bheinn?	BM	c.	363 703
11 2 92	LR	70	Uisge na Criche?	GD	O	325 520
6 3 92	GD 06	15	Uisge na Criche?	GD	O	326 516
8 4 92	EK 07	140	Upper Esknish Pool (EK34)	EK	R	375 641
8 4 92	EK 48	250	Upper Esknish Pool (EK34)	EK	R	375 641

Table 2a Roost counts of Greenland White-fronted Geese, Islay 1991-92

Date	Roost	Roost area	Total	Grid Ref
13 4 92	Airigh nan Caisteal	FL	45	c.380 703
12 4 92	Airigh nan Clach	MR	40	c.380 710
13 4 92	Airigh nan Clach	MR	30	
6 4 92	Allt Loch Bharra-dail	KM	80	c.392 643
10 12 91	Allt an Leacaich	BH	200	215 648
4 1 92	Allt an Leacaich	BH	182	
26 11 91	Allt na Criche	RK	100	215 648
4 12 91	Allt na Criche	RK	440	
5 12 91	Allt na Criche	RK	680	
8 1 92	Allt na Criche	RK	330	
22 2 92	Allt na Criche	RK	190	
25 2 92	Allt na Criche	RK	250	
27 2 92	Allt na Criche	RK	300	
11 3 92	Allt na Criche	RK	280	
20 4 92	Allt na Criche	RK	200	
24 4 92	Allt na Criche	RK	319	
3 4 92	An Carn	KD	50	325 657
5 2 92	An Sopachan area?	BM	140	c.374 691
24 2 92	Ballinaby pool	BB	170	219 673
12 3 92	Ballinaby pool	BB	10	
31 1 92	Beinn Bhan	AV	15	c.385 575
30 3 92	Beinn Bhan S	AV	30	
24 3 92	Beinn Bhreac?	NG	70	c.425 620
1 3 92	Carn Beannachd	GG	60	253 673
28 1 92	Carn Mor by KI road KI31	KI	6	214 612
26 1 92	Carra-mhoine?	GG	30	c.266 678
15 2 92	Casach Loch Ceara	GG	35	250 687
7 2 92	Castlehill/B Uraraidh?	GD	30	c.375 515
6 3 92	Castlehill	GD	13	
14 1 92	Cladville bog	CV	60	171 545
4 1 92	Cnoc Breac	CS	34	257 657
28 2 92	Corsapol Bog	CP	20	308 664
3 4 92	Corsapol Bog	CP	44	
15 4 92	Corsapol Bog (CP43)	CP	20	
28 2 92	Corsapol fields (CP07)	CP	60	302 604

Table 2b Roost counts of Greenland White-fronted Geese, Islay 1991-92

Date	Roost	Roost area	Total	Grid ref
11 3 92	Coulererach	CO	50	216 653
20 4 92	Coulererach	CO	74	
25 3 92	Cruach Bog (CR35)	CR	60	317 585
9 1 92	Duich Moss	DU	608	325 555
25 1 92	Duich Moss	DU	480	
31 1 92	Duich Moss	DU	232	
23 3 92	Duich Moss	DU	541	
24 3 92	Duich Moss	DU	70	
14 4 92	Duich Moss	DU	440	
25 3 92	Duich flats?	DU	50	c.310 550
18 3 92	Dun Bhoraraig	LO	50	179 571
29 2 92	Dunlossit area	NG/KL	16	c.427 650
29 2 92	Feolin Bog	JU	250	455 695
3 3 92	Feolin Bog	JU	530	
9 4 92	Feolin Bog	JU	414	
13 4 92	Feolin Bog	JU	150	
6 12 91	Feur Lochain	SG	274	251 695
10 1 92	Feur Lochain	SG	54	
15 2 92	Feur Lochain	SG	370	
1 3 92	Feur Lochain	SG	230	
10 3 92	Feur Lochain	SG	235	
12 3 92	Feur Lochain	SG	150	
26 3 92	Feur Lochain	SG	95	
20 4 92	Feur Lochain	SG	310	
10 1 92	Glac na Criche	SG	25	226 710
24 3 92	Glas Bheinn?	NG	100	c.420 590
29 3 92	Glas Bheinn?	NG	50	
3 2 92	Gleann Maraiche	EK	300	c.386 640
5 2 92	Gleann Maraiche	EK	160	
7 4 92	Gleann Maraiche	EK	400	
28 12 91	Glen Astaile S	GL	30	287 448
29 12 91	Glen Astaile S	GL	20	
29 12 91	Glen Bun an Easa?	GA	70	c.295 466
18 12 91	Glen Droisay	SC	1270	c.330 675
7 3 92	Glen Droisay	SC	1040	
1 4 92	Glen Droisay	SC	400	
2 4 92	Glen Droisay	SC	500	
5 4 92	Glen Droisay/Loch Sibhinn	SC	990	
7 4 92	Glen Droisay	SC	47	

Table 2c Roost counts of Greenland White-fronted Geese, Islay 1991-92

Date	Roost	Roost area	Total	Grid ref
5 3 92	Goirtean an Uruisge?	NG	207	c.415 626
4 1 92	Gortanchuirn Glen	BH	2	250 623
21 12 91	Grainel Bog (AO56)	AO	54	266 665
30 4 92	Grainel Bog	AO	80	
30 4 92	Grainel Bog (AO15)	AO	50	
26 1 92	Gruinart Bog	AO	150	c.290 657
9 1 92	Gruinart Bog (AO55)	AO	32	
6 2 92	Gruinart Bog/Flats	AO	30	
16 4 92	Gruinart Bog (AO67)	AO	50	
9 1 92	Gruinart Flats (AO29)	AO	78	c.280 666
20 1 92	Gruinart Flats	AO	30	
27 2 92	Gruinart Flats, or Bog	AO	50	
28 2 92	Gruinart Flats (AO25)	AO	12	
28 2 92	Gruinart Flats (AO30)	AO	121	
9 3 92	Gruinart Flats?	AO	35	
19 3 92	Gruinart Flats?	AO	20	
15 4 92	Gruinart Flats (AO30)	AO	40	
15 4 92	Gruinart Flats (AO31)	AO	60	
15 4 92	Gruinart Flats (CP57)	CP	30	
16 4 92	Gruinart Flats (AO31)	AO	150	
25 1 92	Kilennan Bog	AV	70	373 579
23 3 92	Kilennan Bog (AV22)	AV	40	
24 12 91	Kinnabus	KB	80	c.290 416
7 2 92	Lag Odhar?	KT	50	c.339 506
6 1 92	Laggan Bog	LN	10	c.290 570
7 1 92	Laggan Bog	LN	75	
7 1 92	Laggan Bog?	LN	48	
7 1 92	Laggan Bog/Grunnd Loch?	LN	50	
21 1 92	Laggan Bog?	LN	250	
29 1 92	Laggan Bog	LN	55	
29 1 92	Laggan Bog/Grunnd Loch?	LN	100	
25 3 92	Laggan Bog	LN	30	
4 4 92	Laggan Bog	LN	300	
17 4 92	Laggan Bog?	LN	330	
18 4 92	Laggan Bog?	LN	290	
8 3 92	Leorin Lochs S	LR	60	368 480
8 4 92	Loch Carn nan Gall area?	BM/FL	219	c.370 705
9 4 92	Loch Carn nan Gall	BM/FL	40	
10 4 92	Loch Carn nan Gall?	BM/FL	40	
6 12 91	Loch Corr	SG	30	225 695
10 1 92	Loch Corr	SG	54	
20 4 92	Loch Corr	SG	30	

Table 2d Roost counts of Greenland White-fronted Geese, Islay 1991-92

Date	Roost	Roost area	Total	Grid ref
11 2 92	Loch Eighinn?	GD	240	c.330 503
3 2 92	Loch Fada	NG	100	c.414 636
1 12 91	Loch Finlaggan	FL	280	390 680
6 12 91	Loch Gorm North	BB	122	226 665
17 12 91	Loch Sibhinn area	KD	1300	c.330 653
3 4 92	Loch Sibhinn Lochans	MC	50	
8 12 91	Loch Treunaidh	CS	138	c.260 634
9 12 91	Loch Treunaidh	CS	125	
15 12 91	Loch Treunaidh	CS	60	
15 12 91	Loch Treunaidh NW	CS	8	
15 12 91	Loch Treunaidh SE	CS	50	
16 12 91	Loch a' Bhogaidh	BS	25	225 579
4 4 92	Loch a' Bhogaidh	BS	35	
8 4 92	Loch a' Chaorainn	BM	70	c.370 694
12 4 92	Loch a' Chaorainn?	BM	110	
2 3 92	Loch a' Chnuich Bhric Bog	JU	120	448 743
30 11 91	Loch a' Gheoidh (AO)	AO	80	262 658
2 12 91	Loch a' Gheoidh (AO)	AO	155	
17 1 92	Loch a' Gheoidh (AO)	AO	150	
20 1 92	Loch a' Gheoidh (AO)	AO	346	
26 1 92	Loch a' Gheoidh (AO)	AO	300	
13 2 92	Loch a' Gheoidh (AO)	AO	150	
27 2 92	Loch a' Gheoidh (AO)	AO	20	
11 3 92	Loch a' Gheoidh (AO)	AO	50	
15 3 92	Loch a' Gheoidh (SU)	SU	40	238 642
16 3 92	Loch a' Gheoidh (SU)	SU	90	
24 3 92	Loch a' Mhuilinn-ghaoithe	AV	298	420 567
29 3 92	Loch a' Mhuilinn-ghaoithe	AV	50	
30 3 92	Loch a' Mhuilinn-ghaoithe	AV	100	
10 1 92	Loch an Fhir Mhor E (AO61)	AO	6	c.265 695
10 1 92	Loch an Fhir Mhor?	AO	63	
13 1 92	Loch an Lin/L Muchairt?	KT	100	c.321 478
17 1 92	Loch an Raoin	FO	30	280 646
6 2 92	Loch an Raoin	FO	150	
15 4 92	Loch an Raoin	FO	100	
15 4 92	Loch na Cachle	RK	24	221 646
29 1 92	Lochan na Nigheadaireachd	LN	88	280 558

Table 2a Roost counts of Greenland White-fronted Geese, Islay 1991-92

Date	Roost	Roost area	Total	Grid ref
9 4 92	Lochan na Tais Bheinn?	BM	40	c.367 704
26 12 91	Lossit?	LO	150	c.188 570
14 1 92	Lossit?	LO	310	
15 1 92	Lossit Point	LO	32	
15 1 92	Lossit reseed (L051)	LO	106	
27 1 92	Lossit Point	LO	250	
18 3 92	Lossit Bog	LO	8	
18 3 92	Lossit Bog?	LO	10	
20 3 92	Luig Rhada/Glen Ghraisdail	KT/GA	352	c.310 460
13 1 92	Luig Rhadha?	KT	270	c.310 460
16 1 92	Lyrabus Bog	LY	194	297 642
7 2 92	Machrie Peat Cuttings	KT	170	338 493
8 2 92	Machrie Peat Cuttings	KT	370	
11 2 92	Machrie Peat Cuttings	KT	130	
6 3 92	Machrie Peat Cuttings	KT	15	
20 3 92	Machrie Peat Cuttings	KT	80	
12 1 92	Maicile Mhor?	IV	100	c.325 435
24 12 91	Maol Buidhe	GA	600	c.300 460
28 12 91	Maol Buidhe	GA	170	
29 12 91	Maol Buidhe	GA	120	
30 12 91	Maol Buidhe?	GA	350	
10 1 92	Maol Buidhe	AO	2	
12 1 92	Maol Buidhe/Maol nan Eun	GA	60	
13 1 92	Maol Buidhe/N Oa	GA	70	
13 12 91	Maol Chuirn-a-mheall ?	BH	210	c.240 617
14 12 91	Maol Chuirn-a-mheall ?	BH	200	
16 12 91	Maol Chuirn-a-mheall	BH	15	
4 1 92	Maol Chuirn-a-mheall	BH	40	
14 1 92	Maol Chuirn-a-mheall	BH	6	
21 1 92	Maol Chuirn-a-mheall	BH	240	
28 1 92	Maol Chuirn-a-mheall	BH	120	
9 2 92	Maol Chuirn-a-mheall	BH	135	
14 3 92	Maol Chuirn-a-mheall	BH	150	
16 3 92	Maol Chuirn-a-mheall	BH	26	
17 3 92	Maol Chuirn-a-mheall	BH	440	
1 4 92	Maol Chuirn-a-mheall	BH	277	
29 12 91	Maol Ghraisdail	GA	90	c.308 455
20 3 92	Maol Ghraisdail/Luig Rhada	GA	171	
30 1 92	Maol a' Chatadail	KG	156	c.413 599
7 3 92	Maol nan Caorach	BM	150	c.359 685
7 3 92	Maol nan Caorach?	BM	130	

Table 2f Roost counts of Greenland White-fronted Geese, Islay 1991-92

Date	Roost	Roost area	Total	Grid ref	
5 1 92	Moine na Surdaig?	LR	638	c.384 494	
11 2 92	Moine na Surdaig?	LR	481		
8 3 92	Moine na Surdaig?	LR	710		
26 11 91	Moine nam Faicileann?	GG	100	c.258 682	
29 11 91	Moine nam Faicileann	GG	92		
30 11 91	Moine nam Faicileann	GG	300		
2 12 91	Moine nam Faicileann	GG	480		
6 12 91	Moine nam Faicileann	GG	120		
13 12 91	Moine nam Faicileann	GG	252		
20 12 91	M n Faicileann or L a Gheoidh	GG/AO	265		
21 12 91	Moine nam Faicileann	GG	24		
10 1 92	Moine nam Faicileann?	GG	156		
17 1 92	Moine nam Faicileann	GG	150		
24 1 92	Moine nam Faicileann	GG	90		
26 1 92	Moine nam Faicileann	GG	70		
4 2 92	Moine nam Faicileann	GG	150		
27 2 92	Moine nam Faicileann	GG	520		
1 3 92	Moine nam Faicileann	GG	420		
9 3 92	Moine nam Faicileann	GG	460		
11 3 92	Moine nam Faicileann?	GG	30		
11 3 92	Moine nam Faicileann	GG	470		
19 3 92	Moine nam Faicileann	GG	300		
24 4 92	Moine nam Faicileann	GG	173		
30 4 92	Moine nam Faicileann	GG	60		
29 3 92	Monadh a' Choilich	KG	30	390 588	
14 4 92	Monadh a' Choilich	KG	100		
3 4 92	Na Binneagan	KD	625	c.318 654	
16 1 92	Na Binneagan	MC	80		
30 3 92	Na Binneagan	NG	40	c.398 593	
20 4 92	Sliabh nan Grainnseag	CO	100	217 653	
22 1 92	Sliabh nan Grainnseag	CO	240		
19 12 91	Srath Luachrach	MR	60	397 700	
23 12 91	Srath Luachrach	MR	221		
11 1 92	Srath Luachrach	MR	250		
9 4 92	Srath Luachrach	MR	232		
10 4 92	Srath Luachrach	MR	300		
12 4 92	Srath Luachrach	MR	330		
13 4 92	Srath Luachrach	MR	400		
3 2 92	Storakaig	NG	100		
12 4 92	Tais Bheinn?	BM	100		c.415 625
6 4 92	Tiervaagin	EK	10		c.363 703
11 2 92	Uisge na Criche?	GD	70		
6 3 92	Uisge na Criche?	GD	15		381 646
21 3 92	Uisge na Criche	GD	140		322 528
8 4 92	Upper Esknish Pool (EK34)	EK	390	140	

Number of cases listed = 242

site not subsequently confirmed. Likely roost sites checked on foot but where no evidence of roosting was found are marked by black circles containing a cross.

Roosts with counts of over 100 birds (1% of the 1991-92 island population) are accompanied by a yellow marker with the maximum observed count for the site. Roosts of fewer than 100 birds have the maximum count marked in pencil alongside. Sites which were considered to have been pre-roost bathing sites are marked as small red circles with no figure for number of birds using the site alongside.

Roost-flight paths are marked by black arrows, with a number on or alongside the arrow representing the maximum number of birds observed using this route. Dashed tails represent flight paths to alternative roosts ("satellite" roosts) used by the same feeding flock on different nights (probably related to the lunar cycle and night-feeding - see below). Arrows with dashed tails with a question mark represent unconfirmed flight paths.

Source feeding areas are marked in black hatch and represent all the major feeding flocks on the island. The roost-flight paths emanating from each feeding area have been carefully assessed to exclude possible overlap caused by the same flocks flying to roosts from different source areas on different nights. Feeding flocks linked by arrows are thought to be the same birds feeding in different areas. Roost-flight arrows from these areas are shown converging with the sum minimum total from all contributory areas marked on the arrow after convergence.

By interpolation it is possible to arrive at an upper estimate of the number of birds using a roost by summing the numbers on each roost-flight path converging at a roost-site. This probably represents a maximum but realistic estimate of roost-use. Table 3 presents observed counts and interpolated estimates using the above method for the major roost sites, along with counts for the early 1980s (from Stroud 1984).

Over 60 roosts or roost complexes were recorded, including 16 used by >300 birds, making them potential Ramsar sites (if not already designated as such, see Table 3). Roost-site characteristics are described below in the discussion.

Using all the above information, roost catchment areas were determined for roosts in areas where the most intensive observations were made - the Gorm, Laggan and Rhinns count areas. Catchments are marked in blue on the map.

Roost-flight departure times in relation to sunset

The frequency distribution of roost-flight departure times is presented in Figure 1 in relation to sunset times for Edinburgh. (Edinburgh is 100 miles east of Islay at the same latitude, so the sunset time for Islay will be slightly later than that indicated. This will exaggerate the time interval between sunset and roost-flight departure, but the difference is probably only a matter of a few minutes and is constant and thus should not affect the overall pattern of the results).

Most roost-flights occurred about 25-70 minutes after sunset (mean time difference between sunset and roost departure 49.4 minutes, SD 23.05) In Figure 2 the seasonal pattern of roost

Table 3 Roost-sites used by >100 White-fronted Geese, Islay 1980-84 (Stroud 1984) and 1991-92 - roost counts and interpolated estimates.

Roost-site ¹	1981-84 Stroud (1984)	1991-92 max. observed count ²	1991-92 interpolated estimate ²
Allt an Leacaich	-	200	200
<i>Ballinaby Pool</i>	-	170	170
Duich Moss	600+	608	1322
Feolin Bog, Jura	-	530	530
FEUR LOCHAIN	300+	370	520
<i>Glac na Criche</i>	150	25	25
Gleann Maraiche	-	400+	400+
GLEN DROLSAY AREA	+	1000	1100
Goirtean an Uruisge area	-	207	207
Gruinart Flats & Bog	-	150	150
LAGGAN BOG/L na Nigh'dchd	?	330	505
<i>Loch Finlaggan</i>	400	280	280
<i>Loch Gorm North</i>	800	122	122
LOCH GORM WEST	-	680	680
Loch Treunaidh Area	50+	138	168
<i>Loch a' Bhogaidh</i>	200+(?)	35	35
Loch a Chnuic Bhric Bog	-	120+	120+
<i>Loch a' Geoidh (AO)</i>	0	346	346
Loch Leathan /M nan Caorach	+	-	280?
<i>Loch Kinnabus (NR 300 420)</i>	?	0	0
<i>Loch a' Mhuilinn-ghaoithe</i>	-	298	298
Loch an Raoin	100+	130	190
LOSSIT AREA	-	310	310
NORTH OA Total	-	600	1200
(<i>Maol Bhuidhe</i>)	-	600	600
(<i>Maol Ghrasdail</i>)	-	130+	130+
(<i>Luig Rhada</i>)	-	350	350
Lyrabus Bog	-	194	194
Machrie Peat Cuttings	-	370	370
MAOL CHUIRN-A-MHEALL	-	440	690
Maol a' Chatadail	-	156	156
Moine na Surdaig	-	710	710+
MOINE NAM FAOILEANN	200+	520	580
Monadh a' Choilich	-	100	100
NA BINNEAGAN (KD)/L Sibhinn	300	675	675
Srath Luachrach	-	400	400
TAIS BHEINN AREA	-	250	339
Uisge na Criche	-	140	140
<i>Upper Esknish Pool</i>	-	390	390
TOTAL		9728	12516

Notes: 1. Roost-sites in capitals represent totals for roost complexes
Sites in italics are thought to be satellite roosts or pre-roost
bathing sites, and are not included in the calculation of totals.

2. Figures in bold represent potential Ramsar sites.

departures is shown in relation to sunset. All roost-flight departures occurred after sunset. In December and January the earliest departures occurred at least 30 minutes after sunset, with further departures spread over the next hour. In contrast, by March, the earliest departures occurred at, or very soon after, sunset and most roost-flights had ceased within 30 minutes of sunset.

This seasonal trend was examined by regressing the time interval between sunset time and roost-flight departure on sunset time (a measure of daylength) (see Figure 3). There was a highly significant negative correlation between sunset-departure interval and sunset ($r = -.466$, $p < .0001$), indicating that following sundown White-fronts delay departure to their roost-sites longer the earlier that the sun sets.

Figure 1 Frequency distribution of time difference between sunset and roost-flight departures of White-fronted Geese, Islay 1991-92.

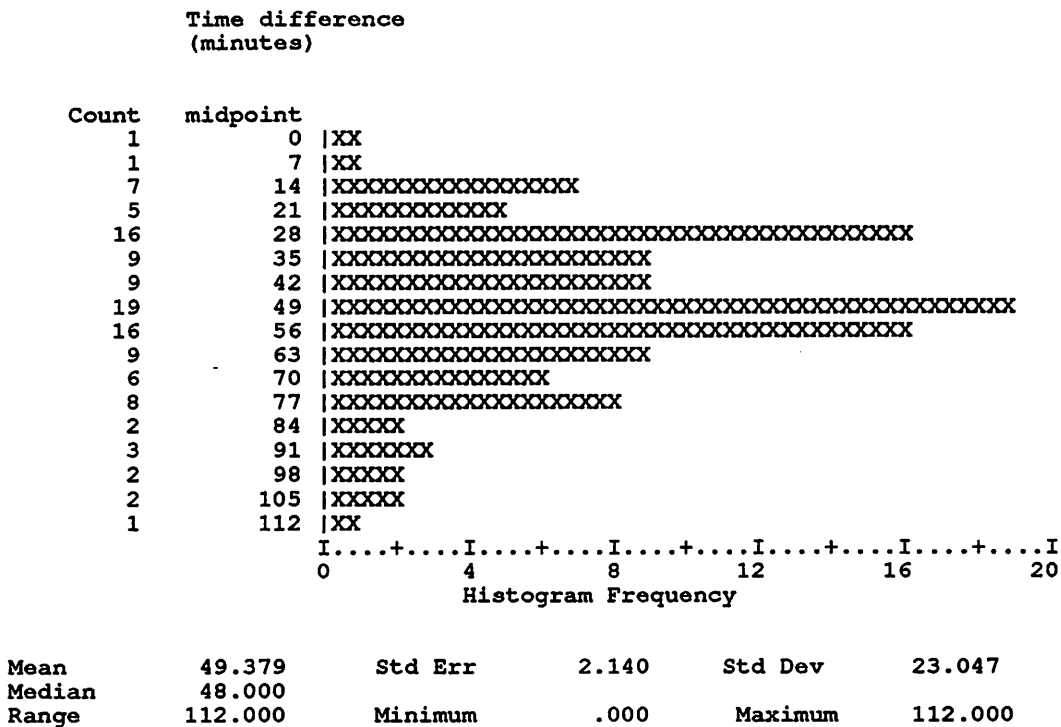
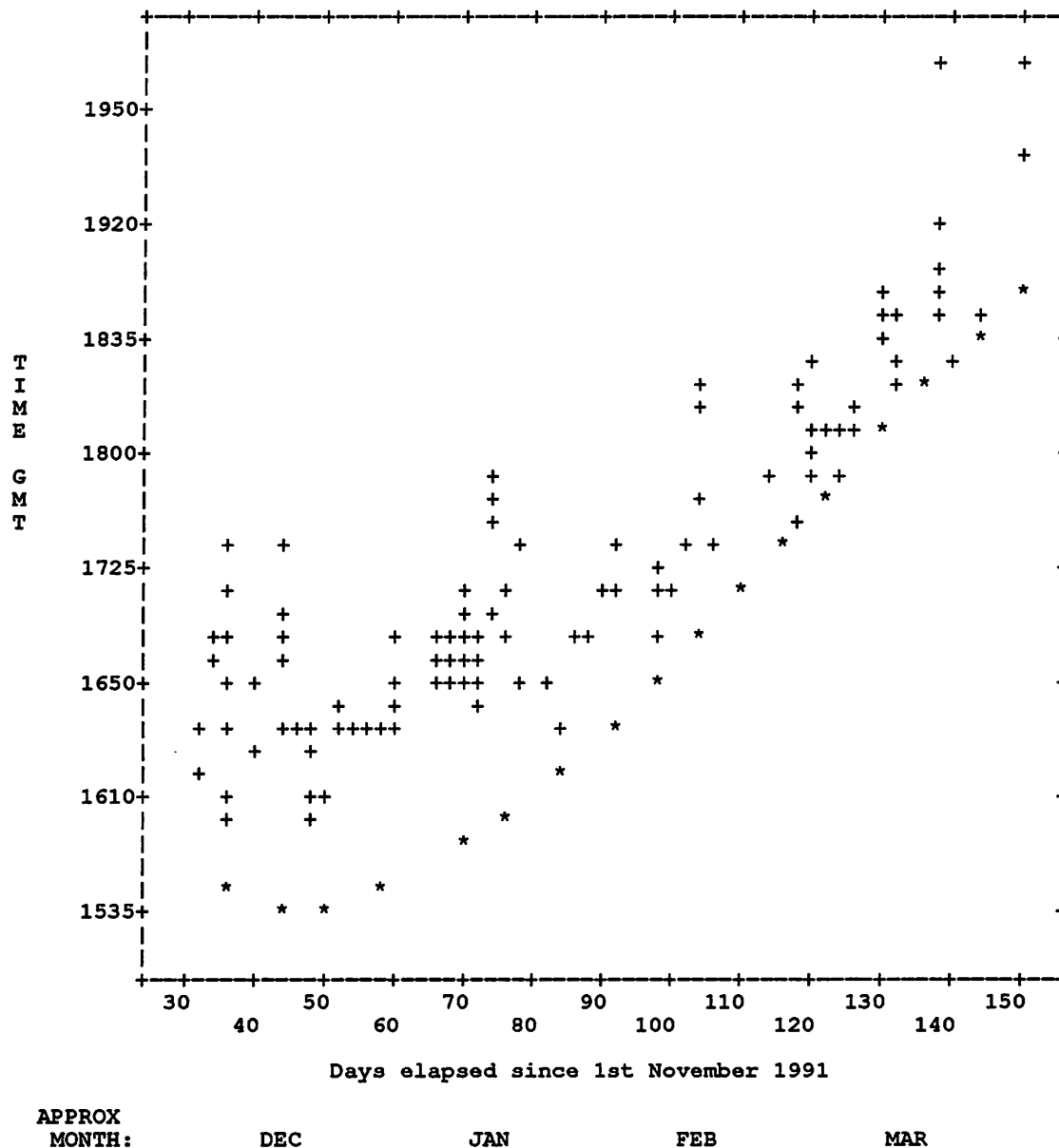
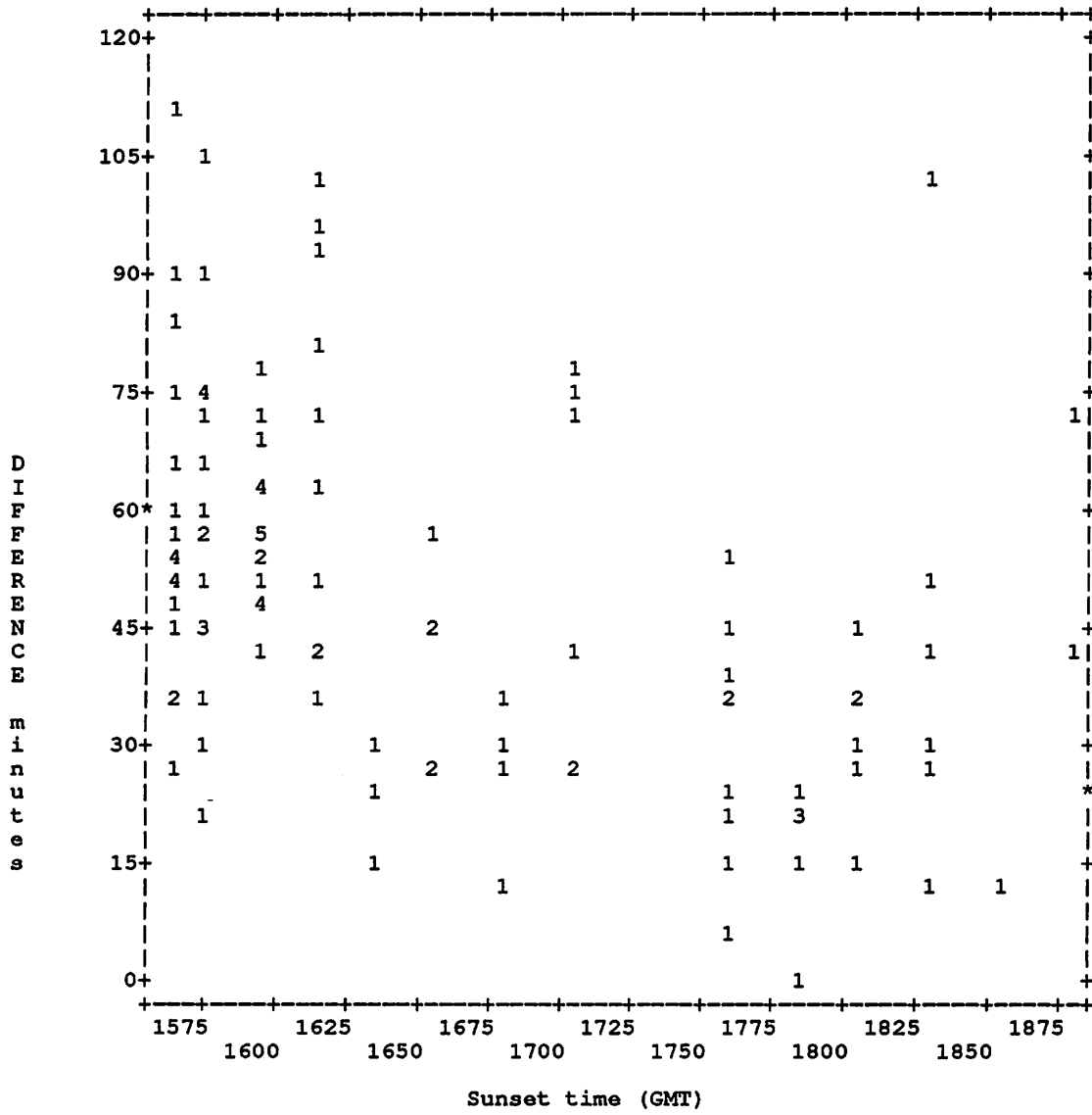


Figure 2 Roost-flight times of White-fronted Geese in relation to sunset times, Islay, December 1991-March 1992.



KEY: + Time of roost-flight departures
 * Sunset time (Edinburgh)

Figure 3 Regression analysis of a) time difference between White-fronted Goose roost-flight departure and sunset on b) sunset time.



Regression statistics of sunset-departure time difference on sunset time.

Correlation $-.46635$ R Squared $.21748$ S.E. of Est 20.47618 Sig. $.0000$
 Intercept(S.E.) $235.32148(33.08867)$ Slope(S.E.) $-.11247(.01998)$
 $n = 115.$

KEY: Numbers represent number of cases

Roost use by birds fitted with radio transmitters

The two birds fitted with radio transmitters were paired, and thus data obtained from them cannot be considered independent. This pair was marked at Rockside, and roosted at the Allt na Criche roost, part of the Loch Gorm West roost complex. The birds were monitored on seven nights over the two weeks that they carried the transmitters: they roosted at Allt na Criche on all nights (though in slightly different positions within the roost area) and were present at the roost at all three observation times on each occasion. The period during which the birds carried transmitters coincided with a new moon phase, so roost-use in relation to different phases of the moon could not be assessed.

1.4 DISCUSSION

Roost Sites and Counts

Over 60 roost-sites or roost complexes used by >100 birds were found over the winter (see Roost Map), including 16 with >300 birds, representing 1% of the world population of this sub-species, and thus candidates for designation as Ramsar sites (if not already designated). Further fieldwork will surely find more roosts, and more information is required for the remote areas to the north of the Ballygrant valley and east of the Glen road which were not visited on foot.

The total of 9728 birds counted at all roosts used by >100 birds in 1991-92 (see Table 3) corresponds closely with the December 1991 whole-island White-front count (10,003). Roosts of <100 birds were not included in the calculation of totals as these were all considered to be satellites of other, larger roosts (see below).

Accurate counting of White-fronts entering roosts is difficult, even when using an image intensifier, and is particularly difficult at larger roost complexes where geese come in from different directions and land at different sub-roosts. In this study, I concentrated on making observations of roost-fighting flocks leaving their source feeding areas, rather than on waiting at roosts for birds to arrive. By aggregating the roost-flights from discrete feeding flocks, interpolated estimates of numbers of geese using the main roosts were made (see Table 3 and 1:50000 Roost Map).

Whilst the total of the interpolated estimates (12,516) exceeds the maximum 1991-92 Islay White-front count of 10,003 by 25%, I believe that the estimates for each roost are probably valid estimates of the number of individual birds using a particular roost site over the course of a winter, a figure which may be considerably higher than the number of birds using a roost on any one night. This suggests that there is a degree of overlap in roost tenancy by individual birds, and this is perhaps to be expected. As described below, birds may use satellite roosts at certain times of year, and it is likely that some of these have been mistakenly classified as core roosts in Table 3. Moreover, it is possible that birds make decisions on roost-use on a day-to-day basis depending on factors such as weather conditions and proximity to night-feeding sites. For example, the south Port Charlotte feeding flock generally roosted at Laggan Bog/Lochan na Nigheadaireachd, but on the evening of 1st April 1992 during a strong northerly gale this flock (of 277 birds) headed off east towards Laggan

as usual, but then apparently found the wind too strong and flew north-west to Maol Chuirn-a-mheall - thereby avoiding a possibly risky flight across Loch Indaal. Moreover, ring sightings suggest that some of these birds also made a seasonal shift in their feeding distribution, spending the first part of the winter in the Ronnachmore/Clachantachree area, and the latter part around Port Charlotte. In this instance, this fact has been taken into account in calculating roost totals for Laggan Bog but, where such information is lacking, duplication is likely to occur.

Roost Catchment Areas

Preliminary estimates of roost catchments for the Rhinns, Gorm and Laggan areas are marked on the Roost Map in blue - only in these areas was I reasonably confident that all potentially confusing satellite roosts had been identified. The approximate catchment areas of the main roosts over the rest of the island can be determined from the Roost Map by tracing the roost-flight arrows to the feeding areas from which they originate. Before definitive catchment areas for these roosts can be determined more work is needed to identify those roosts which are satellites of larger roosts.

Catchments in the Rhinns, Gorm and Laggan areas showed little overlap (though the Gruinart Flats picture is more complex than indicated on the map, and may include overlap with the Loch an Raoin and Moine nam Faoileann roosts). Not surprisingly, the larger roosts had larger catchment areas. The link between Laggan Bog and Port Charlotte feeding areas was unexpected, but mirrors similar movements by Barnacle Geese from the Laggan Point roost (Percival 1988).

White-fronts did not necessarily roost at the roost-site nearest to their feeding areas. For example, the Sunderland Farm flock flies 4 km to Moine nam Faoileann when a much closer roost site at Loch Treunaidh is only 1.5 km distant. Most feeding areas were <4 km from roosts. The most distant regularly observed roost-flight was that of 7-8 km made by birds flying to Maol Chuirn-a-mheall from feeding areas at Octofad. One wonders whether these birds have been displaced from a former roost site by afforestation of the bog areas adjacent to Octofad, perhaps Loch a' Gheoidh (see Stroud 1984).

Roost characteristics

The major roost complexes and core roosts were in bogs, often with patterned mire systems or old peat cuttings. Perhaps as a consequence of the above, they were also in areas of very low relief, providing clear all-round views, but also very exposed. Many roosts were associated with small pools and lochans. The edges of such lochans, as well as vegetation hummocks within lochans, appear to be favoured sites, provided that they are covered by short vegetation. There was little evidence of birds using open-water for roosting, those lochans that were used being very small (<50 m wide). More direct observations of roosting birds are needed to clarify the role of open-water at roost-sites.

Though roosts are often centred on pool systems, evidence from the distribution of roost piles shows that White-fronts may roost up to 100 m away from water. Some roosts had no pool systems at all, but usually possessed some form of hummock and hollow system, which seems to be highly preferred by roosting Greenland White-fronted Geese, the birds roosting on the

drier hummocks between the wetter hollows. Even the atypical roost sites away from bogs tended to possess hummock and hollow characteristics. At the recently grazed bogs at Gruinart and at Lossit Point these characteristics are produced by old surface drainage systems.

Short vegetation appeared to be favoured over rank vegetation (eg. very short prostrate wet-heath and moss-dominated bog vegetation). A range of "quaking mire"-type sites was also used, from pristine *Sphagnum*-dominated communities to degraded peat "wallows".

At many roosts (eg. Moine nam Faoileann, Loch Gorm West, Loch Treunaidh, Laggan Bog and Meall Chuim-a-mheall) derelict hand-cut peat cuttings provided the focal pools and quaking *Sphagnum*-dominated communities which seem to be so preferred. It is difficult to assess whether geese would roost at these sites if there were no peat-cut areas. Either way, it is clear that the *Eriophorum angustifolium* and *Menyanthes*, which often grow in these "artificially" wet areas, provide an abundance of night-feeding opportunities which would otherwise not exist.

Unusual roost sites included Gruinart Flats where White-fronts roosted in open fields, possibly gaining "protection" from the large number of night-feeding or roosting Barnacle Geese in the fields. Nearby at Corsapol small numbers of White-fronts were also recorded roosting in fields, but with no Barnacle Geese in the vicinity. At Lossit Point birds roosted on a gently sloping headland and/or in the fields. The large roost at Machrie Peat Cuttings was also unusual in that the birds roosted in a wet area of machine-cut peat, the peat apparently providing similar "quaking" conditions to those often found at more normal bog sites. Presumably this site provides no feeding opportunities for the birds, and it would be interesting to look at its use in relation to season and moon-phase.

Roost-flight behaviour

In the late afternoon feeding flocks of White-fronts appear to coalesce, and spend the last few hours prior to departure feeding intensively. (Counts made during this period may give a mis-leading impression of the number of birds using a particular area, as there appear to be favoured roost-departure fields, often elevated and/or sloping providing a good view and unobstructed take off.)

Flocks are noisy at take off, though this gradually decreases as the birds head roost-wards and sort themselves out into skeins. Roost-flights usually occur directly towards the roost, though the route taken depends on the prevailing wind and weather - sometimes resulting in misleading conclusions if the birds go out of sight before they are near their eventual roost-site.

White-fronts generally depart for roosts in poor light conditions, up to 112 minutes after sunset, thus tracking them to their roost site can be very difficult and may take several nights. Departure is usually earlier in poor weather conditions. There was a seasonal trend in the timing of roost departure, with birds delaying departure longest in mid-winter when day-length is shortest. As the geese feed intensively during the pre-roost-flight departure period, it is likely that they delay departure in order to maximise feeding time during the short days. This in turn may indicate that in mid-winter White-fronts on Islay may experience

difficulty in achieving their daily food intake requirement (possibly exacerbated by poor grass growth at this time). A similar situation has been demonstrated at the Little Brosna flood plain, Ireland (Mayes 1991). As daylength increases, there is less delay between sundown and roost departure, suggesting that the birds have achieved their daily food intake requirement. Hence autumn and spring are probably the best times for observing roost flights in reasonable light conditions, and at these times accidentally flushing the birds from feeding areas when making roost-flight observations should have the least detrimental effect upon their net daily food intake.

Pre-roost bathing sites

On some nights, roost-fighting birds land at lochs and lochans to preen and bathe before flying on to roost sites later, which can lead to confusion regarding true roost sites. This behaviour was observed at Loch Drolsay, Loch Gorm and Loch Finlaggan. Birds finally flew from these sites to known roosts in very poor light conditions. Clearly care must be taken when assigning roost status to lochs and lochans. The majority of roost-sites found in 1991-92 were on bog vegetation or around the edges of small lochs (see Roost Characteristics above). Of the few nightscope observations made on birds at roost sites where open water was present, no birds were seen roosting on the open water itself. However, 80 birds were observed at Lochan na Nigheadaireachd (Laggan) one hour after sunset, apparently roosting on the open water, and they looked as if they might spend the night there.

Counts of large numbers of geese at Ballinaby Pool and Upper Esknish Pool were thought to represent pre-roost bathing aggregations or possibly satellite roosts (see below).

Roost-use variations

It was clear from repeated observations in the Loch Gorm area that use of any particular roost varied throughout the course of a winter. This appeared to be related to the state of the moon: during new moon phases, most geese roosted at the major "core" roosts such as Feur Lochain, Moine nam Faoileann and Loch Gorm west. With a full moon, "satellite" roosts were used, such as Loch a' Gheoidh (AO), Loch a' Gheoidh (SU), Ballinaby Pool and Loch na Cachle. Satellite roosts may be feeding sites themselves (as evidenced by uprooted *Eriophorum* and other semi-aquatic vegetation), or they may act as bases from which nocturnal excursions can be made to nearby feeding sites. This includes night-feeding in fields - in the Sunderland Farm area, for example, the Loch a' Gheoidh (AO) roost was used by birds which later flew out into the adjacent fields to feed. The same probably occurs at Ballinaby Pool.

However, use of satellite roosts was most evident in mid-winter, with some being unused by March/April. It could be that their use is partly governed by short day length, when night-feeding is presumably most important in maintaining the daily food intake requirement (as has been noted for Barnacle Geese on Islay (Percival 1988)). It would be interesting to make a full winter's observations at a satellite roost to monitor its use in relation to daylength and moon-phase.

The characteristics of roosts and their catchments

It is clear that the juxtaposition of bog roost sites in proximity to suitable feeding areas is one of the factors which makes Islay so suitable for White-fronted Geese. Few areas can have this intimate mixing of habitats. In addition, the existence of derelict hand-worked peat cuttings provides an abundance of suitable roost sites within degraded bog areas which otherwise would not provide suitable roost sites.

Roosts were divided into core and satellite roosts, the latter being used perhaps primarily as feeding sites and/or as bases from which to move out into nearby night-feeding areas (including improved fields). Core roosts typically consist of large numbers of birds, occur in exposed bog situations in areas where incidental human disturbance is minimal/non-existent, and probably act as important refuges for these birds which roost on the ground often away from water.

The roles of the "core" vs. "satellite" roosts must be considered in the development of any species management plan. It is clear that the dynamics of roost-use are complex, depending on season, the phase of the moon, day-time feeding, and possibly prevailing weather conditions. D. Stroud (pers. comm.) has also suggested that there may be year-to-year variations depending on the exploitation and subsequent growth of *Eriophorum angustifolium*, possibly operating on a three-year cycle.

The research carried out over the 1991-92 winter has related most Islay White-fronted Goose feeding areas to specific roost sites. The roost sites found probably account for most of the island population on any one night. Roost-site characteristics have yet to be described fully, and may require more survey work in the coming winter. Further research over the course of a whole winter should help to answer some of the questions raised in this report concerning roost-use, and should help to clarify the status of more roosts on an island-wide basis.

2. SIGHTINGS OF RINGED GREENLAND WHITE-FRONTS ON ISLAY, WINTER 1991-92

2.1 INTRODUCTION

Ringling of Greenland White-fronted Geese in Greenland, Wexford and Islay has resulted in the establishment of a small marked population of birds on Islay.

Ringling by the Greenland White-fronted Goose Study Group expeditions to the Equalungmiut Nunaat area of West Greenland in 1979 and 1984 showed that most birds from this area wintered in West Scotland, mostly on Islay. These two expeditions marked birds with darvic leg rings only. A GWGS expedition to Sondre Stromfjord in 1989 marked 34 birds with neck collars; again, these birds all wintered in western Scotland, with the majority occurring on Islay.

Over 800 Greenland White-fronted Geese have been ringed in Ireland, mostly at Wexford Slobs, as part of the on-going Irish Wildlife Service project studying the ecology of this species. A small percentage of these birds has joined the Islay wintering population, and provided the first neck-collared birds to occur on the island; the greater ease of reading neck-collars proved the worth of this method to Scottish-based observers. Cannon-netting of White-fronts on Islay was first employed successfully in the winter of 1990/91, and resulted in the marking of 25 birds at Sunderland and Coultorsay.

The aims of the fieldwork in the 1991-92 winter were two-fold: 1) To establish how many ringed White-fronts were present on the island, to determine their home ranges over the winter and to use these birds as "markers" to indicate the degree of overlap between different feeding flocks, and 2) to make further attempts to catch White-fronts by means of cannon-netting to increase the sample size of marked birds on the island, and to fit radio-transmitters to a small sample of birds to investigate their home ranges in detail and to obtain data on roosting and night-feeding behaviour.

2.2 METHODS

Observations

Leg rings and/or neck collars were read at distances up to 500 m using a 22-60 x 75 telescope. Ringed White-fronts were located primarily a) on farm area counts, where each entire goose-count area was searched thoroughly to obtain a total count of geese within the area, or b) as random sightings when birds were located by chance close to roads etc. Only the former type of observation was used in analyses which required the amount of observer effort to be known. For example, in calculating the detectability of a particular ringed bird within an area the total number of sightings of that bird on area counts only is divided by the total number of area counts for that area. Area counts were undertaken either in isolation (for example the SU (Sunderland) area might be surveyed on its own, without covering the neighbouring areas of RK (Rockside), FO (Foreland) and AO (Aoradh)) or, more usually, as part of a larger transect - for example, whole island goose-counts, or Loch Gorm 10 km sq transects. The initial aim was to cover all areas twice monthly, and up to four times monthly