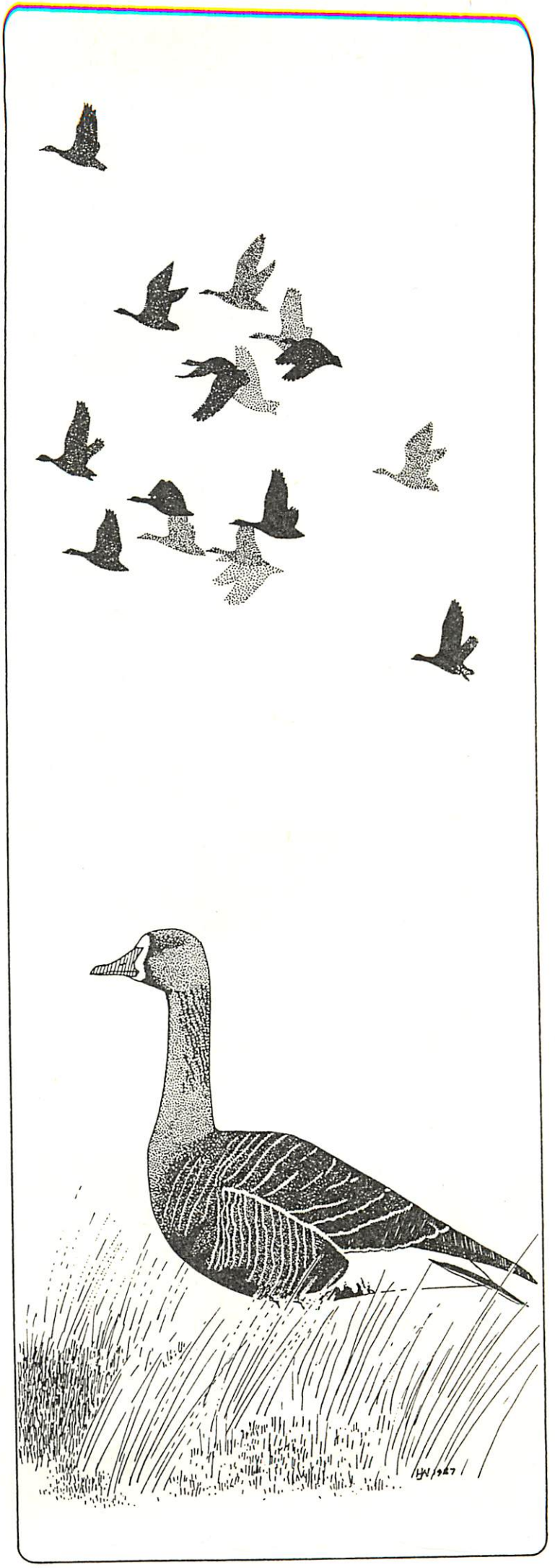
GREENLAND

WHITE-FRONTED GEESE IN BRITAIN

1987/88 - 1989/90



Greenland White-fronted Goose Study

Research Report No.7

1990

This report should be cited as:

Greenland White-fronted Goose Study (1990). Greenland White-fronted Geese in Britain: 1987/88 - 1989/90. Greenland White-fronted Goose Study Research Report No.7. Aberystywth, Dyfed.

ISSN 0952-763X

The Greenland White-fronted Goose Study is an entirely voluntary and non-profit making research organisation based at the University College of Wales, Aberystwyth. We were established in 1978 to undertake research on all aspects of the ecology, population, distribution and migration of these scarce geese. A major aspect of the last ten years work has been the promotion of Greenland Whitefront conservation in the British Isles, Iceland and Greenland. To that end, regular census counts are undertaken in autumn and spring each year to monitor the size of the wintering goose populations. The counts are made by volunteers and we are always grateful for information on past counts or offers of help with future counts.

Previously published reports are obtainable from the address below:

Stroud, D.A. (1983). Greenland White-fronted Geese in Britain; 1982/83. GWGS, Aberystwyth. 15pp. Research Report No. 1.

Stroud, D.A. (1984). Greenland White-fronted Geese in Britain; 1983/84. GWGS, Aberystwyth. 12pp. Research Report No. 2.

Stroud, D.A. (1985). Greenland White-fronted Geese in Britain; 1984/85. GWGS, Aberystwyth. 20pp. Research Report No. 3.

Greenland White-fronted Goose Study (1985). A conspectus of information relevant to the conservation of the Greenland White-fronted Goose (*Anser albifrons flavirostris*) in Britain and Ireland. Report to the Irish Wildlife Advisory Committee, Dublin. 17pp. Research Report No.4.

Greenland White-fronted Goose Study (1986). Greenland White-fronted Geese in Britain; 1985/86. GWGS, Aberystwyth. 20pp. Research Report No. 5.

Greenland White-fronted Goose Study (1988). Greenland White-fronted Geese in Britain; 1986/87. GWGS, Aberystwyth. 24pp. Research Report No. 6.

Greenland White-fronted Goose Study
School of Biological Sciences
University College of Wales
Aberystwyth, Dyfed
Wales, UK

CONTRACT REPORTS

Report number: 1137 File number: S16-03-14

Contract number: HF3-03-193 Date received: 1 October 1990

Report title: Greenland White-fronted Geese in Britain: 1987/88 - 1989/90

Contract title: Surveys of Greenland White-fronted Geese

Contractor: Greenland White-fronted Goose Study

Comments: Britain has particular responsibilities for the Greenland White-fronted Goose, most of whose very limited world population winter in Britain. A voluntary body, the Greenland White-fronted Goose Study has been co-ordinating British work on this species for the last ten years. NCC provides, via our grant-aid of the Wildfowl and Wetlands Trust (Bi7) a small contribution towards the expenses of survey and monitoring work. The present report covers this topic, as well as other of GWGS's activities, including an account of the conclusions of the Duich Moss case and a concise summary of the last decade of international Greenland Whitefront research and conservation, together with useful suggestions for further research and conservation needs. Some of these will be addressed through the NCC/RSPB Species Action Plan for this race, currently in draft.

There has been continued population growth over the last three years, although this has been especially at sites on Islay and a few other major resorts. Elsewhere, a number of small flocks using traditional sites are not increasing or are actively declining, and their current status gives great cause for concern. The challenge for future conservation of this race will be to ensure that there are not major range contractions if these flocks are lost.

Restrictions: None

Number of copies received: 40

Distribution:
Library Headquarters, Peterborough (top copy + 1)
Nominated Officer: Dr T M Reed (1 + spares)
CSD Set
Chairman
Chief Scientist
Assistant Chief Scientist (Terrestrial & FW)
WHQ Field Unit Leader
SHQ Field Unit Leader
Dr N Easterbee, Scottish Field Unit
Regional Officers: all Scottish Regions (SW, SE, NW, NE)
North Wales
Dyfed-Powys
Dr M G M Hughes, Cairnbaan
Dr R MacDonald, ARO Islay
P Cashman, ARO North Argyll
Dr E M Bignal
D A Stroud
Dr G P Mudge, International Sites Unit
M J Nugent, Ornithological Advice Branch

Ornithology Branch Species file
ACOS secretariat
Libraries SHQ & WHQ
EGI Library
SOC Library
RSPB Library

cc K Mossman - for the CSD file
Ornithology day-book

This document should be cited as:

Greenland White-fronted Goose Study (1990). *Greenland White-fronted Geese in Britain: 1987/88 - 1989/90.* Greenland White-fronted Goose Study Research

CONTENTS

1. SUMMARY

The international census of Greenland White-fronted Geese (*Anser albifrons flavirostris*) wintering in Britain and Ireland counted 24,455 birds in the population in autumn 1987, 27,341 in autumn 1988, but 26,716 in 1989. The British count totals were 12,515, 12,503 and 14,434 respectively, with 58.9%, 60.7% and 59.3% of those counted present on Islay, the most important British winter resort. Breeding success in all three years was similar, with 17.7%, 19.4% and 19.3% young amongst British wintering flocks.

Licences to shoot Greenland Whitefronts were issued by the Department of Agriculture and Fisheries for Scotland (DAFS) in all three winters; 13 in 1987/88 (when 76 were shot), four in 1988/89 (six shot) and two licences in 1989/90 (49 shot). The licenses were issued because of alleged serious agricultural damage caused by the geese, but DAFS did not and has not yet specified what criteria were used to assess this damage. The issue of these licences was widely condemned by conservation bodies in Britain, Ireland and elsewhere in Europe.

In July 1988, the British Government finally declared Eilean na Muice Dubh SSSI (Duich Moss) on Islay, a Special Protection Area under the European Birds Directive, and an internationally important wetland under the Ramsar Convention. This formal acknowledgement of the international importance of this site for its wintering Greenland Whitefronts comes at the end of a five year campaign which has seen many reverses. Protection under the Ramsar Convention was also given during the year to some 7,000 km^2 of the breeding grounds - the summering area of over 30% of the world population.

2. INTRODUCTION

The last three years have been notable for a variety of advances and setbacks in the conservation of Greenland White-fronted Geese. Whilst an average breeding season in 1987 and above average seasons in 1988 and 1989 have allowed the population to continue to increase, there have been conservation set-backs on Islay where the Government issued licenses to kill an unlimited number of geese in response to complaints of serious agricultural damage. The issue of these licenses was widely condemned and much press attention was again focused on the geese and the need for conservation. In contrast, and on a more positive note, the Greenland authorities declared 11 large areas as 'Ramsar' sites, or protected wetlands of international importance. Of these, five contain breeding Greenland White-fronted Geese and the area thus protected (c7,000 km^2) covers a substantial part of the breeding range. Among the sites protected is Eqalummiut Nunaat, the area visited by Greenland White-fronted Goose Study expeditions in 1979 and 1984.

In July 1988, Eilean na Muice Dubh SSSI (Duich Moss) on Islay was formally notified as a Special Protection Area and a Ramsar site. This is a direct result of legal intervention by the European Commission and virtually concludes a long-running campaign to protect this important roost site. The formal recognition by the Government of the importance of this area is welcomed. It has more recently been declared a National Nature Reserve. Also designated as Ramsar sites and SPAs have been Glac na Criche and Feur Lochain, two further Islay peatlands internationally important as roost sites. These sites were officially announced in April 1990.

Autumn and spring census counts have been undertaken as usual by a network of counters - 1989/90 marking the eighth year of internationally co-ordinated counts. The results of these counts, information on monitoring of productivity and sightings of individually marked geese are presented below.

3. ARRIVAL AND DEPARTURE DATES

1987: arrivals

The first arrivals in Britain were a small flock seen at Loch Bee on the unusually early date of 20 August. There must be some possibility that these were collection or tame birds, being in Scotland at a time when the rest of the population would still be in Greenland. A further 18 were seen flying southeast over Benbecula on 18 September, with 171 seen flying southeast over South Uist on 24 September.

The main arrival at most sites occurred between 7-11 October, although a small number arrived at Loch Gruinart, Islay on September 18. During the night of 7 October geese were heard flying over Kintyre and the following day small numbers were seen at Rhunahaorine. On the 9th 33 were seen flying south over South Uist. By 10 October, 112 were present at Rhunahaorine and 15 were seen at Westfield, Caithness. October 11 saw the arrival of 80 at Loch Lomond. By 16 October, 88 were present on the Isle of Danna, while at nearby Taynish the first birds were seen on 24 October. The almost synchronous influxes to several sites was clearly the result of the change from southerly to northerly winds on 9 October and the simultaneous onset of severe weather in Iceland which presumably pushed birds south from Icelandic staging sites.

As well as the mid-October influx, there also appears to have been arrivals in late October. Large movements of c2,000 were seen flying south over South Uist on 29 October. There were late first sightings of 32 on mainland Orkney on 30 October, while on Stronsay 35 were seen on 3 November.

1988: departures

There were early departures in the Western Isles, with 44 flying north from Askernish on 3 April and 17 flying north from Balavanich the following day. In south Shetland a migrant flock of 6 were present between 14-25 April at Quendale, although on Danna 132 were still present on 19 April.

Thirty remained at Loch Hallan on 16 April, but c40 flew north from Askernish on 17 April, with a further 100 seen flying north there the next day. The main departure was witnessed on Tiree on 19 April (Shepherd 1988). During the warm calm evening of that day 84 (74+10) were seen leaving Tiree and a total of 899 (800+50+49) was seen flying NNW high over the island. There was also a movement of over 3,300 Barnacle Geese and 960 Barnacle/White-fronted Geese during the same evening. These observations agree with the timing of the Islay departure which occurred the same evening. Observations of migrant geese at Balranald showed large movements (480) on 20 April with smaller numbers from 8 April and until 28 April. They were also heard flying

The timing of these observations is of particular interest with Tiree departures occurring at 19.15 and 20.00 hrs, and the passage birds being seen between 20.35 - 20.54 hrs. Previous departures from Islay have also been witnessed at night or in the late afternoon/evening. With favourable winds Francis & Fox (1987) calculated a 14 hour flight time from Islay to southeast Iceland which would give landfall between late morning - early afternoon the following day i.e. during daylight hours. Earlier departure from Scotland would seem to risk arrival in Iceland at night.

1988: arrivals

The first birds to be seen were 21 on the Dyfi Estuary on 29 September. Numbers there increased to 65 on 26 October and to 103 by the 28th. First birds at Loch Ken were 115 at Mains of Duchrae on 11 October increasing to 234 by the 15th.

1989: departures

Birds were gone from Machrihanish by April 15 and from Rhunahaorine by April 22. At Loch Ken 178 were still present at Mains of Duchrae on 14 April, however all had gone by 16 April. The main departure from Islay began on April 16 but was held up by the onset of northerly winds and there were still 3-4,000 birds present on the 20th, and several hundred on the 28th. The last seen on Islay were 13 at Loch Gruinart on May 12. The main departure period on Coll and Tiree was soon after 18 April and the last there were recorded on the 27th. On the Dyfi Estuary there seemed to be a progressive departure: 124 on 4th, 90+ on 12th, 88 on 13th, birds present on 14th, and all birds gone on 15 April.

1989: arrivals

First birds seen were 7 at Loch Gruinart, Islay on 1 October. A single bird was also seen at Fidden, Mull on the same day. At Machrihanish the first seen were 82 on October 9, and numbers there built to 720 by 27 October. However, in a series of detailed counts, Maguire & Angus (1989) showed that there was clearly passage through the area since daily numbers were very variable and not obviously cumulative. Daily peak counts were 9/10: 82, 10/10: 33, 11/10: 70, 14/10: 30, 16/10: 20, 18/10: 300, 21/10: 8, 22/10: 80, 24/10: 280, 27/10: 720. Such passage through Machrihanish has been previously indicated by sightings of darvic ringed geese which have later arrived at Wexford in the same season (observations by Sue Bignal and Alyn Walsh). Elsewhere, there were first sightings of 2 at Milbuie, Colonsay on 14 October, 63 on the Dyfi on 19 October, 62 at Rhunahaorine on 21 October and 17 at Moine Mhor on 27 October.

1990: departures

The major departure on Islay occurred on 20 April with flocks seen departing in significant

4. INTERNATIONAL CENSUS RESULTS

4.1 Count coverage

Coverage was generally good, with most major sites being counted during each of the three winters covered by this report. In particular, co-ordinated counts in Kintyre were undertaken minimising possible error due to movements between areas (Bignal 1988; Batty 1988). Coverage of some sites holding smaller numbers of birds during the international census periods in autumn and spring was not always possible, however, and some census totals have been interpolated from other counts at the site during the same winter. These sites have been clearly distinguished in Appendix 1. In particular, it would appear that Greenland Whitefronts may have ceased wintering at Loch Eye and adjacent areas along the southern shore of the Dornoch Firth, although attempts to census this area thoroughly have been difficult. Signs of bog feeding on *Eriophorum* have been reported from Sutherland and Wester Ross, but generally the regular coverage of vast areas of potential feeding ground is quite impossible to organise in this remote area. Past survey suggests that such areas represent autumn staging sites used by birds en route to other wintering resorts. It has not proved possible in recent years to cover the islands of Muck and Eigg and we would appeal to anyone able to visit these islands to do so and count geese there. It is also not clear to what extent a regularly wintering flock is present in the Bladnoch Valley, and further survey work is necessary here.

4.2 Census results

Full details of the census results for each of the three seasons are listed in Appendix 1. The following paragraphs summarise the main features of the counts andTable I summarises autumn and spring counts in Great Britain for every season since 1985/86.

Table I. Greenland White-fronted Goose counts in Great Britain:1985/86 to 1989/90.

	Autumn 1985	Spring 1986	Autumn 1986	Spring 1987	Autumn 1987	Spring 1988	Autumn 1988	Spring 1989	Autumn 1989	Spring 1990
NE Scotland	136	184	271	520	437	486	449	481	422	446
NW Scotland	192	402	214	203	249	224	236	201	277	264
North Argyll	1448	1032	1262	977	1472	1149	1240	1502	1749	1903
Islay	6332	5669	6126	6486	7373	7314	7588	6816	8560	7209
South Argyll	2095	1900	1909	2094	1953	2034	2190	2015	2471	2486
Galloway	848	737	1045	1020	925	583	695	684	816	583
England	1	0	3	0	4	1	0	0	16	1
Wales	93	98	81	95	102	127	105	124	123	93
TOTAL GB	11,145	10,022	10,911	11,395	12,515	11,864	12,503	11,823	14,434	12,984

1987/88

Autumn 1987 census

The autumn census located 12,515 geese in Britain, with 7,373 on Islay (58.9%).

Spring 1988 census

Spring totals decreased slightly to 11,864 birds, 7,314 of which were on Islay (61.7%). There was a 651 (5.2%) difference between the spring and autumn British totals, indicating no major movements into or from British flocks between autumn and spring.

1988/89
Autumn 1988 census

The autumn 1988 census located 12,503 geese in Britain, with 7,588 on Islay (60.7%).

Spring 1989 census

There was an apparent slight decrease in the spring of 1988 to 11,823 birds, 6,816 of which were on Islay (57.5%). There was a 680 (5.4%) difference between the spring and autumn grand British totals.

1989/90
Autumn 1989 census

The autumn 1989 census located 14,434 geese in Britain of which 8,560 were on Islay (59.3%). In December, the weather was settled over the count period and similar on each day of the Islay counts. There was early morning mist but this did not significantly interfere with the counts. There was little variation (6.3% change) between the Greenland Whitefront totals (Table II). The Islay total of 8,826 represents a small increase over the population estimate made at the same time in 1988, and reflects the good breeding season experienced in 1989.

Islay mid-winter count

An additional census on Islay was carried out on 10 and 11 February, when counting conditions were less than ideal (dull and overcast with heavy rain and hail showers on both days). As usual, when the weather deteriorates, the Greenland Whitefront count suffers in particular. The significantly lower numbers (6,208) on 11 February resulted in a 23% difference between counts and reflecting the difficulties experienced by counters. Under these circumstances, the higher count on the 10th (7,641) was probably the best estimate. Both goose species on Islay were so scattered in February (as at this time in previous years) that there was the distinct possibility that flocks could have been

Table II. Counts of Greenland White-fronted Geese on Islay; 1987/88 - 1989/90.

1987/88

Count area	Nov 28	Nov 29	Feb 6	Feb 7	Mar 28	Mar 29
Rhinns	752	617	944	919	942	833
Gorm	1221	930	1144	1210	1060	1026
Gruinart	899	779	508	523	374	295
Kilmeny	1905	1956	2387	2034	2010	1927
Laggan	701	1251	704	743	1075	662
Glen	525	431	751	432	446	353
Ardtulla	0	231	56	0	0	216
Oa	1370	960	1394	1367	1409	1314
TOTAL	**7373**	**7155**	**7888**	**7228**	**7316**	**6626**

1988/89

Count area	Dec 5	Dec 6			Mar 30	Mar 31
Rhinns	354	512			744	464
Gorm	1337	1086			869	1277
Gruinart	744	1085			179	217
Kilmeny	1765	1685			2278	1682
Laggan	491	1171			837	912
Glen	560	641			496	205
Ardtalla	224	240			0	0
Oa	1210	1168			1413	751
TOTAL	**6685**	**7588**			**6816**	**5508**

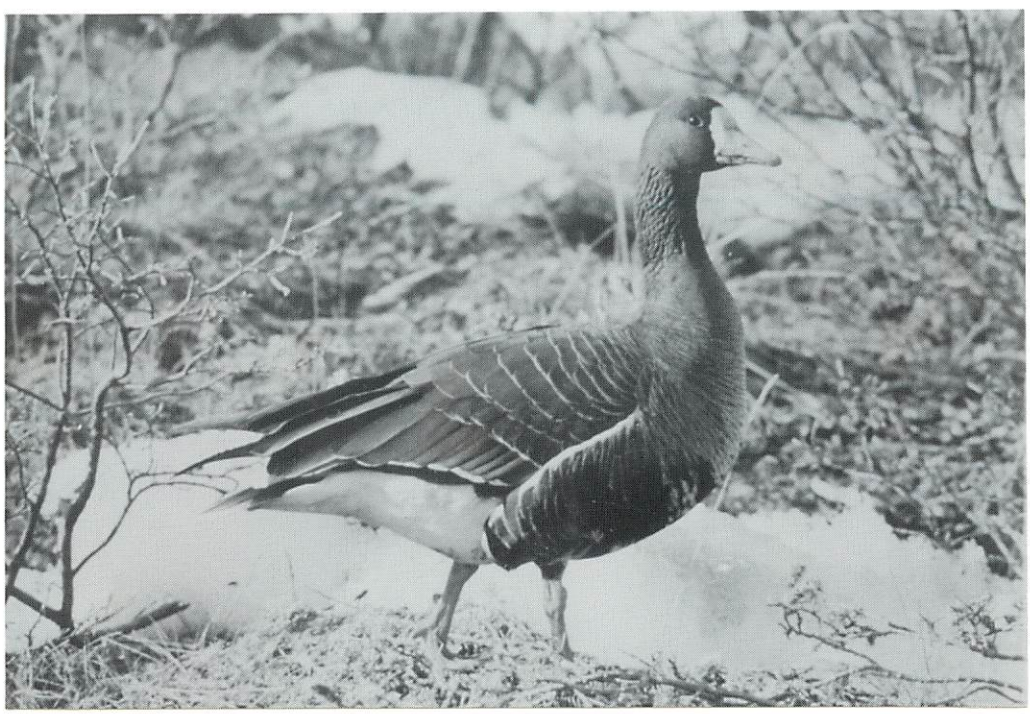
1989/90

Count area	Dec 3	Dec 4	Feb 10	Feb 11	Apr 1	Apr 2
Rhinns	1013	728	881	688	609	538
Gorm	1203	660	1236	429	1415	1269
Gruinart	1050	913	340	366	318	168
Kilmeny	2654	2709	1695	2644	2211	2283
Laggan	925	1120	1645	496	703	790
Glen	412	579	506	331	448	371
Ardtalla	287	0	465	300	109	579
Oa	1282	1591	873	954	768	1211
TOTAL	**8826**	**8300**	**7641**	**6208**	**6581**	**7209**

Spring 1990 census

There was an apparent slight decrease in the spring of 1990 to 12,985 birds, 7,209 of which were on Islay (55.5%). There was a 1,451 (10.1%) difference between the spring and autumn British grand totals, greater than in recent years. The spring count was undertaken on 1 and 2 April.

Of particular note in the last three years has been the high proportion of the British total now on Islay (autumn proportions of 58.9%, 60.7% and 59.3%). These percentages are higher than previously. The proportion on Islay has progressively crept up from the figure of 48.6% recorded in autumn 1982. However, whilst clearly there has been an increase on Islay, there have also been continuing flock declines and extinctions elsewhere. Many of the NE and NW Scotland flock totals are little changed or have even declined from previous years despite the overall population increase. Ringing information (below) would suggest that these extinctions are indeed genuine, rather than moves of birds to other sites. Clearly it gives concern that such a high proportion of the population is located in one small area. In conservation terms it is always unwise to have 'lots of eggs in one basket'. We have previously stressed the importance of the smaller flocks scattered throughout the rest of Scotland and Ireland in maintaining the range of the Greenland White-fronted Goose. It is clear now that particular attention should be paid to these flocks to encourage their numbers to increase.



4.3 Breeding success

1987

Productivity estimates are presented in Table III and show that breeding success in 1987 was slightly above average. On Islay there was an overall average of 17.7% young in the autumn flocks which compares with the long-term (1962-1982) mean of 14.8%. There were proportionally fewer young (10.8%) in the small Welsh flock on the Dyfi estuary, although numbers of young overall at other Scottish sites were substantially similar to Islay (18.2%).

By comparison, productivity at Irish wintering areas was greater than Scotland - as is the usual pattern. There was an estimated 18.5% young at Wexford and 21.7% at other Irish sites (Table III). There was also a significant difference in the average size of broods which was 2.45 overall in Britain, 3.69 in Wexford and 3.16 at other Irish sites.

1988

The 1988 breeding season was better than average, with 18.2% young in Islay flocks (mean brood size 2.96) whilst the productivity in the rest of Scotland was 20.0% (mean brood size 2.84). The small Dyfi flock in Wales had only 10.9% young.

Above average productivity was also found in Ireland, with 22.1% young at Wexford (mean brood size 4.32) and 15.4% (2.70) elsewhere in Ireland (Norriss & Wilson 1989).

1989

As for the preceding two years, 1989 proved to be a most successful breeding season with an overall 19.3% young in a sample of over 10,000 birds aged throughout Britain. On Islay, there were 18.7% young, less than the aggregate of 19.6% for other Scottish sites and 22.5% at the Dyfi Estuary, Wales. The significance of the apparently higher productively of birds away from Islay is not clear.

Mean brood size was also high, being 2.86 for Islay and 2.76 overall in the rest of Scotland (Table III).

The detailed information on productivity collected from both Islay, Wexford and increasingly from other wintering sites throughout the range is currently being used in an analysis of the factors determining these changes. In particular, weather in winter and spring (which may affect quality and quantity of food), weather and conditions on migration and arrival in Greenland (which may determine date of nesting and numbers of eggs laid), weather after the hatching (which may affect survival of goslings) and the role of possible predators of geese or goslings (such as Arctic Foxes),

Table III. Summary of productivity of British wintering Greenland White-fronted Geese, 1987 -1989. Irish data for comparison from Norriss & Wilson (1989) and pers.comm..

1987

	Proportions of young				Brood size frequencies							
	Total aged	Total juvs	% juvs	Sum broods	1	2	3	4	5	6	7	Mean brood
Scotland[1]	1172	322	18.2%	82	15	26	21	11	3	6	0	2.74
Islay	3941	698	17.7%	206	67	61	40	25	9	2	2	2.42
England	4	0										
Wales	102	11	10.8%	4	0	2	1	1	0	0	0	2.75
BRITAIN	5819	1031	17.7%	292	82	89	62	37	12	8	2	2.45
Wexford	5659	1047	18.5%	216	8	26	62	66	40	10	4	3.69
Ireland:other	1742	378	21.7%	74	17	13	13	13	10	6	2	3.16

1988

	Proportions of young				Brood size frequencies								
	Total aged	Total juvs	% juvs	Sum broods	1	2	3	4	5	6	7	8	Mean brood
Scotland[1]	5,206	1,042	20.0%	331	61	103	67	52	28	18	1	1	2.84
Islay	1,736	316	18.2%	103	15	33	19	19	11	6	0	0	2.96
Wales	110	12	10.9%										
BRITAIN	7052	1370	19.4%	434	76	136	86	71	39	24	1	1	2.87
Wexford	6275	1387	22.1%	229	6	21	40	50	50	37	14	2	4.32
Ireland:other	2551	393	15.4%	114	31	27	27	11	13	2	3	0	2.70

1989

	Proportions of young				Brood size frequencies								
	Total aged	Total juvs	%Sum juvs	broods	1	2	3	4	5	6	7	8	Mean brood
Scotland[1]	5,961	1,169	19.6%	254	50	65	67	36	19	13	4	0	2.86
Islay	4,392	823	18.7%	225	49	59	58	31	12	12	4	0	2.76
Wales	98	22	22.5%										
BRITAIN	10451	2014	19.3%	479	99	124	125	67	31	25	8	0	2.82
Wexford	6715	1066	15.9%	182	13	42	39	46	27	8	7	0	3.46
Ireland:other	2247	339	15.1%	90	17	30	20	11	10	2	0	0	3.70

N.B. [1] = Excluding Islay

4.4 Darvic-ringed geese and resightings

A large number of darvic-ringed geese have been seen during the past three winters. Summarised details of individual sightings of Greenland-ringed birds are given in Table IV. There has been a considerable increase in the numbers of resightings of neck-collared birds ringed mainly in Ireland, such that it has become impractical to list all sightings since, encouragingly, there are now so many each winter. However, a full listing of sightings is separately available on request (from David Stroud, 5 Parkway, Nassington, Peterborough PE8 6QE) to counters or observers of ringed birds. Please note also that some additional information has become available for the winter of 1986/87, so consequently the list of resightings, as published in GWGS research report 6, has now been revised. A full copy of this list is also available on request from the above address.

TABLE IV. Summary table of leg-ringed Greenland White-fronted Geese resighted in 1987/88 - 1989/90.

	1979 ringed	1984 ringed
Total birds seen in 1987/88	10	22
Total birds dead in 1987/88	1	3
Total of 'first sightings' seen	1	4
Total unread rings	(1)	(2)
Total recorded to end 1987/88	70/96 = 73%	53/88 = 60%
Total birds seen in 1988/89	9	11
Total birds dead in 1988/89	0	0
Total of 'first sightings' seen	0	0
Total unread rings	(1)	(0)
Total recorded to end 1988/89	70/96 = 73%	53/88 = 60%
Total birds seen in 1989/90	6	9
Total birds dead in 1989/90	0	1
Total of 'first sightings' seen	1	1
Total unread rings	(1)	(1)
Total recorded to end 1989/90	71/96 = 74%	54/88 = 61%

1987/88

We received information during the year about four birds that had been shot. One 1979 ringed bird (A51) was illegally shot on spring passage in Iceland (May 1986), and had been reported as a Barnacle Goose. Three 1984 ringed birds (K24, T23 & K44) were (legally) shot between 12 September and 17 October 1987. In addition, some 15

of recent recoveries (of a small ringed proportion of the population) would suggest that the total kill of Greenland Whitefronts on migration in Iceland is more substantial than previously thought (e.g. Francis & Fox 1987). This is disquieting and deserves further urgent investigation.

Four birds ringed in Greenland in 1984 were seen/recovered for the first time (K15, K27, K50 and K24 - shot in Iceland). Amazingly, there was a first sighting of a 'new' 1979 bird (A92) on Islay. This brings the proportion of this group of birds either seen or recovered to 73% in nine years. Most of the 1979 ringed birds seen in 1987/88, however, were 'old faithfuls' - regular on Islay for the last nine years.

During the 1987/88 winter, 94 Greenland White-fronted Geese were trapped at Wexford between October to December, with a further catch of 14 geese at a site in Co. Donegal (Norriss & Wilson 1988). These latter birds are the first to be caught at a site away from Wexford since the present ringing programme started in 1983.

Of the 560 geese marked over the last five winters, 39 were identified in Britain during 1986/87. These were on Islay (19), Stranraer (1), Stockport, Lancashire (1 with Pink-footed Geese), at Machrihanish (7), Caithness (1), Rhunahaorine (2), Loch Ken (6) and the islands of Coll (4) and Tiree (2). Of the 39 sightings, 7 had been seen in Britain during 1986/87.

1988/89

There was a healthy increase in the number of resightings made, which in part reflects the increasing numbers of birds now marked at Wexford. With a small proportion of these birds appearing to transfer between sites each year, this now means greater numbers of Irish neck-collared birds at British sites.

Only nine geese marked in 1979 were seen: A10, A14, A19, A24, A26, A33, A56, A66 and A92. All were seen on Islay with the exceptions of A10 at Carrowmore Lough, Co. Mayo and A33 which was at Westfield, Caithness during the winter. Thirteen geese marked in 1984 were seen: K07, K15, K16, K23, K25, K27, K33, K36, K54, K56, K60, K77 and T17. All 1984 records were from Islay with the exceptions of K07, K25, K27 and K33 seen at Wexford, K56 which is paired with A10 and which wintered in Co. Mayo and K60 which was seen in Iceland.

A total of 24 birds marked at Wexford was seen in Britain during the winter; mainly on Islay, but with sightings at Machrihanish (0KJ, 4KK), Caithness (2RT), Stranraer (4JR), Loch Ken (4KY), and Coll (6MM). A most interesting sighting was of 9UE which was seen as a member of a small group of geese at Fidden, Mull on 30 October and was later seen on 17 November at the North Slob, Wexford where it spent the winter. As with previous sightings from Islay and Machrihanish, this demonstrates early autumn staging at Scottish sites by at least some birds which subsequently winter in Ireland. The

1989/90

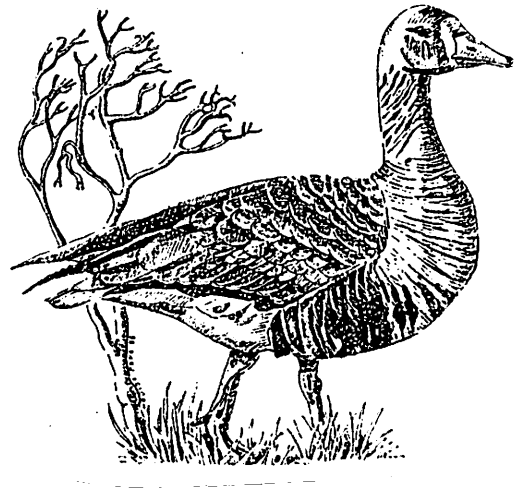
This year saw a great increase in numbers of darvic sightings. Of Greenland ringed geese there were fewer 1979 birds seen than ever: only 6 (A14, A19, A24, A33, A66 and A75). All were seen on Islay with the exception of A33 which was again at Westfield, Caithness during the winter. The sighting in March of A75 on the Little Brosna River in Ireland is fascinating since this is the first record of this bird since ringing in 1979. It demonstrates that there may still be birds out there unrecorded!

Ten geese marked in 1984 were seen: K02, K03, K15, K16, K22, K34, K51, K54, K74 and T17. All 1984 records were from Islay, with the exception of K54 (Wexford) and K74 found dead on Stronsay. This latter bird had been earlier recorded at Rhunahaorine in 1986/7 and 1987/8. A total of 59 birds marked in Ireland (mostly at Wexford) was seen in Britain during the winter. These mainly were seen on Islay, but with interesting sightings at Tiree (0UY, 2RU, 3KT, 6UY), Stranraer (1JT, 4JR, 9JT), Moine Mhor (1RU), Caithness (2RT), Machrihanish (3RT, 4KK, 7RT), Loch Ken (4KT, 4KY) and Rhunahaorine (4PM, 9KK).

In summer 1989, a WWT/GWGS/Wildlife Service expedition to Søndre Strømfjord, Greenland caught and marked 32 geese with darvic neck collars. By the end of the following winter, an amazing 81% (26) of these had been resighted as follows:

Tiree	2CA, 8CA, 9CA, 5CC, 6CC
Islay	3CA, 7CA, 8CA, 8CC, 9CC, 0CC, 1CE, 2CE, 3CE, F01, F02, F04, F05, 6CE
Corrib,Ireland	1CC
Loch Ken	2CC
Machrihanish	3CC, 7CC
Rhunahaorine	4CE, 5CE
Iceland	F07 - shot

Aside from the very high resighting rate, it is of particularly interest that all but one of the sightings were in Scotland, despite a very high level of search effort in Ireland, especially at Wexford. This provides further support for Salomonsen's hypothesis of leapfrog migration since the geese were among the most southerly ever ringed in Greenland. Earlier ringing has suggested that the breeding grounds for Wexford birds lie much further north in the west Greenland. The fate of these birds (all with rings in the series xCA, xCC, xCC, or F0x (where x = digit)) will be followed with great interest.



5. REGIONAL REPORTS

5.1 Caithness aerial survey 1987

A.D. Fox and D.A. Stroud

The blanket bogs of Caithness and Sutherland have been much in the news during recent years owing to the continuing fight to preserve these unique bogs of global importance from continuing coniferous afforestation. A detailed account of the status and distribution of the geese in Caithness has recently been published by Laybourne & Fox (1988), which summarises several earlier surveys in the area and information gained from the intensive ring reading efforts of Stan Laybourne. They found that numbers of geese wintering in the county have declined from over 730 in the 1970s to c220 in spring 1987, although numbers remain of international importance.

Many of these Whitefronts are now resorting to stubble fields in autumn, taking advantage of spilled grain. Once this grain is finished, they move to poorer pastures and peatlands, and several peatland lochs and areas of dubh lochain are known to be of importance. However, the extent to which the peatlands are used at different times of the year has always been difficult to ascertain because of the difficulty of thoroughly searching these bogs on foot. Given the enormous change due to afforestation in recent years we were keen to establish the extent of bog-feeding and to locate further sites of importance.

In November 1987 an aerial survey was undertaken, financed by NCC and using a plane chartered from the Sea Mammal Research Unit who were en route to Orkney. The boglands were visually very striking from the air - the full patterning of the pools becoming fully apparent at 100 - 200'. Although we saw bands of Red Deer and small groups of Mallard and Teal on the pools, we unfortunately did not find any geese. This was probably because they were still on stubble fields closer to the coast, making the most of a very poor cereal harvest which had resulted in much grain being lost.

5.2 Greenland White-fronts in mid-Wales,1987-1988

Ian Francis and Nicola Penford

Greenland White-fronted Geese are known to have been present on the Dyfi Estuary north of Aberystwyth, since at least 1907. In general terms, the numbers wintering on the saltings and, in the past on Cors Fochno and other nearby peatlands, have declined since the early 1950s when more than 300 birds were recorded (Fox & Stroud 1985). During the 1980s the population has numbered around 80-100 each winter with evidence of a slight increase during the decade. This article describes the situation during the 1987-88 winter.

Each year the birds spend most of their time in the Wader Bay - Ynys-hir saltings area on the south side of the estuary (central part of Plate 2). This latter area is a RSPB reserve where watching intensity is high, which results in regular counts. During 1987-88 the geese were counted 20 times. First arrivals were 25 on Ynys-hir saltings on 8 October, and numbers rapidly built up to c100 on 11 October. Figure 1 shows the counts for the rest of the winter. The population remained around 100 throughout the season (though a peak count of 127 is discussed below), with a rapid decline in numbers in mid-April. The last birds were seen on 17 April - none were present the next day.

Plate 2. Dyfi Estuary from the east Ian Francis

A total of 11 young (c10.8% of the late November population), in three or four family parties, was recorded. There were no sightings of darvic ringed birds and indeed, there have been none seen since the present phase of colour marking of these geese began in 1979. This is perhaps ironic, since much of the recent activity in Greenland Whitefront research was prompted by the Dyfi flock.

On all but one occasion the geese were on the saltings. The birds traditionally spend most of the time on the intertidal areas, feeding on close-grazed estuarine grassland amidst patches of *Spartina*. Occasionally they frequent the improved grass fields south of the railway, but this was noted only once during the winter. This fact helped considerably when a flock of Russian White-fronted Geese (*Anser a. albifrons*) visited the Dyfi between 5 - 20 December. Up to 164 were present and the flock was always found on improved grassland, often on the Ynys-hir reserve. Separating the races, especially at a distance, is not always easy, and their clear habitat preferences helped. Large influxes of Russian Whitefronts are rare on the Dyfi (at least recently), and the last was in 1982 when 54 birds were seen. Smaller numbers are recorded slightly more frequently.

Figure 1. Greenland White-front numbers on the Dyfi Estuary, 1987/88

The 1987-88 season was thus characterised by the highest numbers of Greenland Whitefronts on the Dyfi in recent years, and made more interesting by the close proximity of a large flock of Russian birds. One other feature which added intrigue to interest was the peak count of 127 birds in March: 25 more than the normal number during the rest of the winter. It is tempting to speculate that this peak may have been related to the passage through of a putative small flock of geese wintering in the hills inland from the Dyfi Estuary.

This possibility was discussed by Fox & Stroud (1985) who described a sequence of records since 1968 from upland Ceredigion and Montgomery, centred around a small cluster of lakes near Caersws (Bryn y Fawnog and Llyn y Tarw). To date there has been no evidence of regular wintering at this site, but casual sightings and evidence of geese have been recorded during most winters. 1988 was no exception and on 27 February the Bryn y Fawnog area was visited and evidence of recent use by Greenland Whitefronts was found. However, no other sightings were recorded during the winter. It is known that a number of other sites in central Wales have been used over the years by Whitefronts, and the possibility remains that there is a small flock, perhaps more mobile than most, regularly visiting the Cambrian mountains. This may even be a small sub-flock of the Dyfi birds. The possibility remains to be further investigated in future years.

Postscript: Greenland Whitefronts in mid-Wales in 1988-89 and 1989-90.

Greenland Whitefronts were seen during both recent winters at Llyn Hir, south of Llanerfyl, Montgomeryshire: in November 1988, 26 were present, and in March 1990, 10 were seen. There were no other sightings by goose counters at the site, despite several visits, but local fishermen reported that they were present at other times. Evidence of goose feeding, in the form of droppings and uprooted *Eriophorum angustifolium* was found by the lake. In addition, evidence of goose feeding was found several times at Bryn y Fawnog common. Although uprooted *E.angustifolium* cannot in itself be taken as conclusive proof of the presence of Greenland Whitefronts (Fox *et al.* 1990), it may be a useful pointer where other geese are not known to occur. Canada Geese *Branta canadensis* are present occasionally at Llyn Hir, but have never been seen in the large mire at Bryn y Fawnog. The areas used by the geese at both localities are large quaking soligenous mires dominated by *E.angustifolium* and *Carex rostrata*, and they are of considerable interest botanically. Fortunately, neither area is apparently threatened in the short-term, since Llyn Hir is owned by a sympathetic fishing club, and Bryn y Fawnog is common land with active rightholders. The confirmation that a regular flock of geese does occur in the Cambrian mountains is very exciting, and we hope that the birds continue to use the sites.

The Greenland Whitefront totals for the Dyfi during 1988/89 and 1989/90 are tabulated in Appendix 1. One feature of interest in addition to the continuing slight increase in the flock size is a far greater increase in the number of resident Canada Geese on the estuary. Numbers have increased from virtually none in the early 1980s to at least 108 at the end of summer 1990. The Canada Geese feed on the same area of saltings as the Greenland Whitefronts, and although there is no evidence yet of any competitive interaction, at the present rate of increase, the Canada Geese will soon greatly outnumber the Greenland birds. This may present a problem in future years.

5.3 Greenland White-fronts at Sullom Voe Oil & Gas terminal, Shetland

Peter Dale

Greenland White-fronted Geese have been recorded near the Terminal in most years since 1984, although these have usually been only occasional sightings of birds seen once or twice during the winter. In 1987/88 birds were present continuously between 22 October and 19 April. A total of nine birds was present from 8 November through until 15 April, with an additional five birds being present at the end of the season on 16 & 17 April. Peak monthly counts are given in Appendix 1.

The area where the birds are found originally formed part of Orka Voe, a sea inlet north east of the terminal complex. During construction, vast quantities of peat were recovered from the main site and deposited in Orka Voe resulting in an area of reclaimed land of some hectares in extent. This was covered with topsoil and seeded, mainly with rye grass and clover, some six years ago. The land has since settled resulting in the formation of two large pools, many smaller pools and an area of marshy ground. Sheep have been allowed to graze the area keeping a very short sward over most of the ground, and leaving the marsh to grow rank. There has been no change in either drainage or agricultural practice since the creation of the area and grassland management is left to the sheep. The overall effect of these activities has been an increase in both the species and number of wintering wildfowl.

The area is not normally shot over, but due to operational requirements, shotgun training very occasionally takes place. Aside from this, disturbance here is minimal and the area is only visited by security patrols from the Terminal. Public access is restricted to a visit once or twice a year by a local crofter to tend his sheep, since there is overall protection by virtue of the site security fence.

In the unlikely event of disturbance the birds move to the island of Bigga in Yell Sound, although they usually return within about two hours. If left undisturbed, they remain all day and night, feeding on the short grass and on occasion moving into the rank grass area to roost. Some time is spent on the larger pools. In autumn 1987, gravel was removed from the mouth of Crooksetter Burn to encourage the sea-trout to run. The excavated gravel is visited by the geese, usually in the mornings between 07.00 and 09.30 hours in order to take up grit.

No ringed birds of any kind have ever been seen. Although a flock of up to 31 Greylags (*Anser anser*) was also present in 1987/88, the Whitefronts only mix with these geese occasionally, preferring to remain apart in their own small flock. The one exception to this during the winter was during the snowstorm of 13 February when all the geese settled together on the edge of a bund facing into the wind.

It is intriguing to speculate as to whether this wintering flock of Shetland will return and 'colonise' the islands!

5.4 Greenland White-fronted Geese on Colonsay and Oransay

John and Pamela Clarke

Background

The Greenland White-fronted Goose has only become common on these islands since the 1930s (Jardine, Clarke & Clarke 1986). Prior to the introduction of Canada Geese in 1934, only two records - both of single birds, are known. Two pinioned pairs of Canada Geese were introduced by the gamekeeper in 1934 at the request of Lord Strathcona to try and increase the numbers of wintering wildfowl (Clark 1977). It seemed to work because the gamekeeper recalled that, by the time he left the islands in 1968, an average of about 200 Greenland Whitefronts were wintering. However, it is also possible that their arrival coincided with that of the Kintyre population which apparently dates from the 1930s.

By the late 1970s average numbers seem to have dropped to about 70, although since 1980 they have increased to up to 150 (Table V). The changes in numbers seem to reflect quite well the changes in the British population, at least for the period that regular monitoring has been undertaken (since 1982/83). However, as we have been researching agricultural returns for Colonsay, Islay and Jura, we looked for possible links between population changes and changing patterns of agriculture. Since Greenland Whitefronts on Colonsay and Oransay spend most time on in-bye land, we have looked for changes in management of these areas.

Table V. Numbers of Greenland White-fronted Geese wintering on Colonsay and Oransay, 1967/68-1987/88.

	OCT	NOV	DEC	JAN	FEB	MAR	APR
1967/68					c200		
1972/73							0
1977/78							0
1981/82						35	c60
1982/83	50					58	58
1983/84	73	29		82			c50
1984/85				54		66	14
1985/86	7		78	30-40		23	c50
1986/87	48	110	118	150	c120		126
1987/88				116	116	110+	137+

In the 1960s it would appear that 3 year leys were popular with island farmers, about 75 ha being under this management. Thus an average of 25 ha was reseeded each year. The population of Whitefronts was less than 200 although counts are poor.

In the 1970s, farmers tried 7 year leys, with up to 110 ha managed in this way. Thus an average of c15 ha was reseeded each year (in 1970 only 6 ha). The population of geese was between 70-80. It is worth noting that one of the farms most favoured by the geese did little or no reseeding during this period.

In the 1980s, it seems that 5 year leys have been more popular, with about 100 ha being managed this way. Thus about 20 ha per year have been reseeded (in 1985 - 23 ha). The most favoured farm was responsible for about 50% of this reseeding. The numbers of Greenland Whitefronts have risen to a peak of 137+.

Timing of and numbers seen on migration

Colonsay and Oransay lie directly on the main migration route south to Islay and other wintering areas. The earliest date they have been seen is 9 October 1985. Large numbers of skeins pass through on obvious "goose days', travelling mainly down the west side of Colonsay, then swinging south across Ardskenish peninsula, over Oransay and on towards northern Islay: e.g. 125 in small groups in two hours 18 October 1976; a steady stream of geese all day in parties of 10-30 21 October 1982; 150-200 in three hours 18 October 1985; 20 skeins in one hour 18 October 1986. Numbers stopping off are fairly small, the population increasing in November/December and usually peaking in January /February.

In spring few migrating groups have been reported, although there would appear to be a slight increase in population prior to the departure of the birds. The latest recorded date is 22 April 1984. A feral flock of Greylags (first proved breeding in 1986), increased to 27 by August 1988 and may well encourage migrating geese to stay.

Habitat use

We have noted areas most favoured by Greenland Whitefronts for grazing and roosting, both by observation and by looking for droppings. We have also talked to farmers whose fields are used about the areas most heavily grazed by the geese. Sites used, in order of importance, are:

Kiloran	12 ha
Machrins	6 ha
Oransay	8.5 ha
Scalasaig	3 ha
Kilchatten	2 ha
Total	31.5 ha

Each area comprises several small fields. The geese do not use all of each field, but seem to favour areas of good grazing away from potential danger. In this way, probably less than half of the area of fields may be used and therefore the geese occur mainly on an area of c15 ha. Any resulting crop damage is related not only to weather conditions but to the

proportion of the population feeding at one site during any particular period. For example, in 1978/88, c100 birds were concentrated on two fields - one at Kiloran, the other at Machrins.

Roosting

For most of the winter the geese seem to roost in or close to their feeding areas. In early winter and late March/April however, they use lochs or marshy areas away from the feeding sites - Loch an squid, Ardskenish Pond, Loch Fada or the southern part of Oransay. One explanation might be that the geese take a while to settle into their winter habitat, and then in spring there is a sudden increase in farming and tourist activities. Alternatively, the change in pattern (which is similar to changes noted on Islay), might be related to day-length, with different roosts being used in the shorter days of mid-winter in contrast to the longer autumn and spring days.

Current Problems

The damage caused by Greenland Whitefronts in recent winters has necessitated the reseeding of some sites e.g. one field on Oransay and one on Colonsay in 1987, two on Colonsay in 1988. Local grazing pressure may be exacerbated by other geese. Sometimes the Whitefronts feed with Greylags (up to 55 in 1987/88) and Barnacle Geese (e.g. 150 Greenland Whitefronts and c250 Barnacle Geese on two small fields at Kiloran and one at Machrins in January/February 1988). Judging from press reports, the farmers of Colonsay and Oransay have been comparatively tolerant of the geese to date. However, the increasing crop damage in recent winters is causing a great deal of disquiet.

5.5 Greenland 1988 and 1989

A.D. Fox and D.A. Stroud

One of the key problems associated with the adequate conservation of arctic-nesting geese is the fact that most are solitary-nesting species with low densities of breeding birds spread over vast areas of the tundra. The Greenland Whitefront is no exception, being highly dispersed throughout much of the summer range. Their breeding areas are remote and very rarely visited by scientists, so protection through reserve networks is difficult without some overall knowledge of where the birds are during the summer and whether particular concentrations merit special protection.

With this in mind, GWGS and WWT were funded by the Greenland Home Rule Government to carry out trials of aerial survey techniques to census Whitefronts on the breeding grounds in 1988. We chartered a specially modified aircraft used for counting whales offshore. The perspex-domed nose of the aircraft and bubble windows offer all-round visibility, even directly under the aircraft.

Our first target was to overfly Eqalummiut nunaat, our study area during the expeditions of 1979 and 1984, since for this area at least, we had some ground counts by which to measure the effectiveness of the technique. We found the geese in familiar moulting areas, and they proved relatively easy to see. We had chosen the moulting period during which to carry out the pilot census work for two reasons. Firstly, their habitat is relatively predictable: whilst flightless in moult, the geese tend to associate with water bodies to

which they resort when threatened by terrestrial predators. Secondly, groups of non-breeding birds tend to aggregate together during the moult, and families also join together during the time that the parents are flightless during their moult. Hence the birds are more concentrated at this stage of the summer than at any other time. Since the geese moult close to the breeding areas, this would give us a reasonable reflection of the distribution of breeding birds.

The pilot project proved a great success, with numbers counted from the air comparable with those on the ground. This meant that we had an extremely valuable technique enabling extensive survey over vast areas in relatively short periods of time. As well as Eqalummiut nunaat, we surveyed other areas south and north of Søndre Strømfjord to assess their importance for the geese. In particular, we overflew Naternaq, on the southern side of Disko Bay, a huge lowland expanse of unexplored wetland. This area was rumoured to hold large numbers of geese and had been our original intended study area in 1979. We were amazed to find some 2,000 geese in an area of 500 square kilometres before the weather closed in and brought the survey to an early end. By extrapolating over the area it was not possible to count, we concluded that at least twice that number were potentially present. This was confirmed in 1989, when we returned to resurvey the area.

We also overflew the high plateau south of Søndre Strømfjord in 1988 to confirm that areas above the 600 metre contour were indeed unsuitable for nesting geese. The bare rocky landscape bore little vegetation and the extensive snow fields indicated the harshness of the climate. This negative result also proved useful, as it enabled us to restrict our areas of search to lower altitude areas of west Greenland.

In 1989 we continued to survey areas immediately north of Søndre Strømfjord to determine the status and distribution of geese in this important breeding area. We have been delighted at the designation of five major Ramsar sites, protected as wetlands of international importance, all of which safeguard large areas of tundra which, based on our aerial and ground counts support an estimated 40% of the summering population of Whitefronts (see section 6.3).

We knew from the 1988 fieldwork that the area immediately north of the airbase at Søndre Strømfjord supported reasonable numbers of geese; we had found 150 within one day's walk of the site. So in July 1989 we decided to try to catch some of these birds whilst they were flightless. A team of eight from Scotland, Wales, Ireland, Denmark and England flew via Iceland to Sondre Stromfjord early in the month, and we set off into the hinterlands to hunt for geese.

The conventional wisdom was that there were no geese near to the airbase, but being such a secretive species, we suspect they have always been there, the casual observer would simply have missed them. Scouting for geese takes enormous patience, since the tiniest movement or the least breaking of the skyline will cause the geese to move to another lake when they are moulting. In the space of three weeks, we covered an area of 500 square kilometres, and we worked out that we must have each walked about 150 miles. We found about 230 Whitefronts, including five families, and caught 32 new birds. We found that many of the geese were already flying, and we suspect that the non-breeders had moulted very early, making them impossible to catch. Several times we spent the entire day encircling a lake, putting the birds onto the water, setting up the nets, launching the boats

and cajoling the geese into the mouth of the nets....only to see 20 birds out of 22 fly off over our pathetic funnel of nets to the safety of the next lake!

As usual, we were able to record detailed information about the feeding habitat of moulting geese and to assess the distribution of the birds throughout our study area. We took detailed notes on the other bird species of the area, including the presence of Canada Geese again. In 1988, we were a little dismayed to see one pair of Canada Geese with goslings in the same part of west Greenland, but in 1989 we found four families of the American interlopers! The Canada Goose family on one lake was feeding in prime Whitefront habitat with two Whitefront families, so perhaps they get on with each other better than Greenlands do with Pink-feet (see Section 5.6). Whatever, it will be very interesting to see whether the numbers of Canada Geese in this area continue to increase and whether they have any impact on Whitefront numbers.

In August 1990, DAS travelled to Greenland again to carry out further aerial survey of geese in conjunction with the Greenland Fisheries and Environment Institute, this time concentrating rather more effort in the southern part of the Whitefront range around the capital of Greenland, Nuuk. Details of the results of this visit will appear in due course.

5.6 Iceland 1989 and 1990

A.D. Fox

In April 1989, a Wildfowl and Wetlands Trust expedition travelled to southern Iceland to study the spring behaviour of the Pink-footed Goose (*Anser brachyrhynchus*) during the period between their arrival there and egg-laying on the breeding grounds in the interior of Iceland. Since both Pink-feet and Whitefronts share similar lowland staging areas in the south of Iceland, this also provided the team of four with an opportunity to study Greenland White-fronted Geese en route to their breeding grounds in Greenland.

Whitefronts stage in two separate areas in Iceland, one of which lies on the west coast amongst the bogs and peatlands; the other, their first landfall, is on the south coast where they feed on the intensive agricultural land of the region. The southern lowlands enjoy a relatively mild climate and are usually clear of snow by the third week of April. Cereal crops and potatoes are grown in the rich peaty soils of these productive areas, and the geese utilise these crops left by the previous harvest before moving to feed on the extensive areas of hayfields.

In 1989, the weather was quite exceptional and the spring thaw was well behind when the team arrived on April 24. There was deep snow in many areas and the first flush of grass growth (which has usually started by this time on the hayfields of the previous autumn) was delayed.

At peak migration time, we counted some 2840 Whitefronts in the southern staging area, rather more than when we counted the same area in April 1986, and, in collaboration with Icelandic colleagues, read the codes of some 30 neck-collared geese captured at Wexford, including one group of six birds which loitered in the same area of southern Iceland for six days.

We were interested to see that, generally, the Whitefronts kept away from the Pink-footed Geese of the area. Overall, Whitefronts were most common at the coast, whereas

Pink-feet became more common travelling further and further inland from the sea. Where both species did overlap, the Pink-feet chose the most productive farm fields, the greenest ones being those where the snow was melting. Further away from the coast, Whitefronts either chose the poorer pastures or fed on natural marshland vegetation. Pink-feet do not nest in the southern lowlands of Iceland, so both are merely temporary visitors to the area. It was therefore very intriguing to see these two goose species feeding in different geographical areas, or where they overlap, in subtly different habitats.

By May 9th, most of the Whitefronts had departed for Greenland, and when we carried out an aerial survey that day, a flight over the whole of the southern lowlands found only 12 birds in all. Counts from Icelanders in the western staging area suggested that a few geese were still present in that part of the country, but it was clear that most had departed for Greenland. Most birds arrive in Greenland during the first ten days of May.

It is hoped that the study of spring staging geese in Iceland can be continued in coming years. A WWT/GWGS team travelled north again in April 1990 to carry on the work started in 1989, primarily to census the geese during migration, record feeding behaviour and attempt to read rings. The 1990 spring was also extremely late, and the Whitefront resorts were again characterised by late snow lie and restricted feeding opportunities. Geese and swans fed in large concentrations on spilled potatoes and grain where ever these were available, and when the thaw came, switched to the grass which had commenced growth under the snow.

A further 54 collars were read in the southern lowlands and during a brief but exciting visit to the western Whitefront staging areas. We achieved multiple resightings of several birds, showing that individuals were remaining in the same area for as many as six days. More interesting were the observations of geese moving between different sites within Iceland, including some geese which were seen both in the southern lowlands and on the west coast north of Reykjavik. This was most interesting, since previous resightings had suggested individuals used the same farms in spring each year, and we had rather assumed that they only stopped in one area during their staging period in Iceland. This again underlines the significance of a large area of south and west Iceland in the ecology of staging Whitefronts and the importance of adequate site safeguard in area where there are currently no feeding or roost sites enjoying protection for the geese.

6. CONSERVATION

6.1 Eilean na Muice Dubh: an ending?

In July 1988, Eilean na Muice Dubh SSSI (Duich Moss) on Islay was formally notified as a Special Protection Area and a Ramsar site. This is a direct result of legal intervention by the European Commission and virtually concludes a long-running campaign to protect this important roost site. The formal recognition by the Government of the importance of this area is welcomed. It has more recently been declared a National Nature Reserve.

The announcement was appropriately made on 14 July - Bastille Day! The background to the case has given in previous census reports and elsewhere (GWGS 1986). Essentially the concluding stages of the case were marked by a vindication of the

arguments made by those wishing the protect this internationally important site. The Scottish Office contracted a survey of an alternative peat source at Castlehill on Islay in 1987. This found, to no-one's great surprise, that the peat was not of significantly different quality to that at Eilean na Muice Dubh and that the quantities present would be quite sufficient for the long-term needs of Scottish Malt Distillers (SMD). This had been precisely what GWGS, RSPB and NCC had been saying since 1983! At about the same time, the European Commission sent the government a 'reasoned opinion' which is the first legal stage in a case going before the European Court of Justice.

We have evidence that the Cabinet set up a subcommittee to examine the case in 1987 and this received evidence from the Attorney-General that the government's legal position was not sustainable. In the light of the almost certain loss of the case should it proceed further before the European Court, the government decided to backdown.

The supply of alternative peat has been resolved by the sale of an alternative area called Castlehill to NCC by the Forestry Commission. NCC are now leasing Castlehill to SMD. This is a crowning irony since SMD previously held peat cutting rights at Castlehill. In order to allow Laggan Estates to sell Castlehill for forestry, SMD entered into an agreement with the estate on 24 September 1979 in which they agreed to "*discharge and give up any rights competent to them in the terms of the said Disposition or otherwise to cut peat on the Castle Hill area of Laggan Estate..*" To replace the loss of peat supplies "*Laggan Estate will make available ... the right to cut peat on an area of land on Monadh nan Cathag* [Duich Moss]". In the event, the Forestry Commission never got round to planting Castlehill which meant that it was still available for peat-extraction some ten years on. Had SMD stayed put, the whole fiasco of the Eilean na Muice Dubh case need never have happened ...

Additional costs of peat extraction at Castlehill have been covered by a management agreement from NCC. This ensures that there is no extra financial burden on SMD for forgoing their rights to Eilean na Muice Dubh. Once again, this confirms the views of GWGS and others that there was never any threat to jobs from conservation proposals.

The cost of the arrangements and the restoration of the part of the site already illegally damaged by SMD will be over £270,000. As one journalist put it: "*Although it is gratifying that this issue appears to have been amicably resolved, one wonders, given the available peat elsewhere on the island, why it has taken five years and hundreds of thousands of pounds of taxpayers money to resolve this situation*". Exactly.

National Nature Reserve status

Laggan Estate have also entered an agreement with the NCC so that the whole of Eilean na Muice Dubh can be managed as a National Nature Reserve. NCC are progressively undertaking management work on the site and this will, in the long-term, improve the quality of the bog vegetation. In particular, there are parts of the site which have been damaged by the effects of old moor-grips and other surface drainage. If these can be blocked, then the surface vegetation will become wetter, improving the quality of feeding for the geese. Considerable work still requires to be undertaken in repairing the damage caused by SMD illegal ditching in the Phase 2 area of the bog. Although some dams have been constructed in these ditches, there is an urgent need for more dams to raise the water-table further and to monitor the effects of the restoration.

Thank you everybody who helped

There are times when a mere 'thank you' is inadequate given the scale of the achievement. The survival of Eilean na Muice Dubh and a secure future for the goose roost is the best thank-you anyone could have.

This conservation victory could not have been achieved without the combined efforts of many people at all stages of the campaign. Thank you all.

There are perhaps several lessons that can be learnt. First is the power of the pen. The many people who had never been to Islay, yet wrote simple letters to government putting embarrassing questions contributed most significantly. Such letters force government officials to address issues that they would otherwise prefer to be quietly forgotten. Letters also give our political masters a gauge of strength of public feeling. This was a significant factor in this case. A second lesson is the importance of co-ordination. There were many times in the last years when the co-ordination of actions by various parties meant that the effects of those actions were that much greater. Responses to one organisation's letters or meetings were used to pose questions by other individuals. (The only time when this co-ordination was less than it could have been was during the period around the FoE action on Islay. Then the media drove events so fast that the campaign became responsive rather than leading). Finally, the main lesson must be that even when all seems to be lost - don't give up!

The case has had ramifications way beyond Islay and has been influential in the implementation of the EEC Birds Directive throughout Europe. It has been quoted in several international meetings in the last few months alone as being a key case with implications for all other EEC Member States. In this way what started as a local planning issue on a small Hebridean island has become a profoundly important international precedent for bird conservation.

In the words of Peter Melchett:
"*it has been a historic victory for conservation, commonsense and the long-term prosperity of Islay which would not have happened without the determination of a small number of people*".

6.2 Licenses to shoot on Islay

Despite the protection of the Wildlife and Countryside Act 1981, licenses have been given to farmers to shoot unlimited numbers of Greenland White-fronted Geese because of alleged 'serious agricultural damage'. All the licenses have been granted on Islay; 13 licenses in 1987/88 (when 76 geese were shot), 4 in 1988/89 (6 shot) and 2 licenses in 1989/90 (49 shot).

At present, there are no ceilings on the numbers of geese which can be shot under each license. They run effectively to the date of departure of the geese for their breeding grounds. We support the opinion of the Nature Conservancy Council that this is in breach of Article 7.4 of the Birds Directive because it permits shooting during a period which is essential to breeding. It has been shown that the quality of forage available to some northern nesting geese is correlated to subsequent breeding success (Fox *et al*.1989),

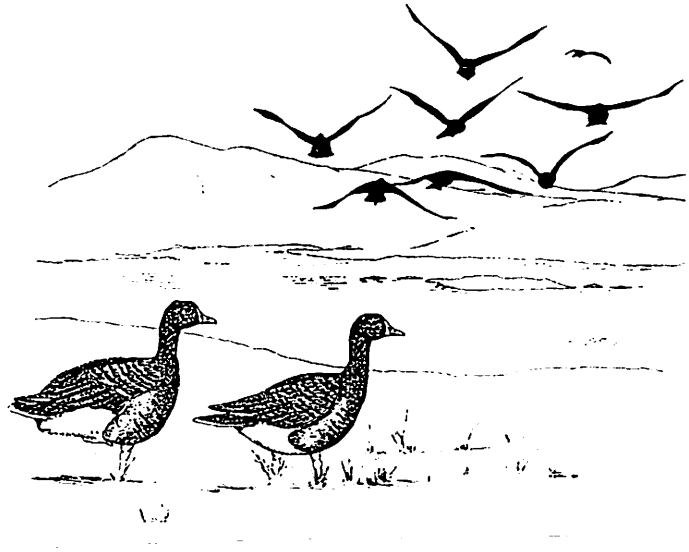
and it is very likely that undisturbed feeding during the last few weeks before departure on Islay influence the breeding success of individuals.

Although the numbers of birds actually shot are low, it sets a very poor precedent for other countries and for management of the population at other sites in Scotland. The sub-species is still one of the rarest geese in the world, and a sensible flyway management strategy is an urgent requirement for its future safeguard.

We remain very concerned that the criteria for judging agricultural damage have never been defined by the Department for Agriculture and Fisheries for Scotland. The law makes a clear differentiation between "agricultural damage" and "serious agricultural damage" and there is real need for a simple, objective, clear definition of the difference. There is evidence of abuse of licenses which are now being used for sports shooting rather than crop protection. This is against both the letter and the spirit of the Act and gives continuing cause for concern.

There is little evidence to show that the present system of uncoordinated licensed shooting actually solves any of the perceived agricultural problems. There is currently no overall strategy for scaring, and no established network of refuges such as exist for the Barnacle Geese (*Branta leucopsis*) on Islay. Uncoordinated shooting may actually be counter-productive in bringing geese together into the safety of larger flocks which then resort to the more intensively managed fields on the island.

It is seems extraordinary that licenses have been issued in some of the mildest winters for many years, when it might be expected that the loss of grass to geese has been minimal. Their issue has been widely condemned by conservation bodies in Britain, Ireland and elsewhere in Europe, particularly since there are many other potential solutions to agricultural conflict. The feeding areas of geese are now well defined from several years of detailed survey, and the exploration of management agreements and Environmentally Sensitive Area arrangements on the island offer great potential for removing pressure from sensitive parts of Islay. There is a very real need to explore these types of solution in order to adequately protect the interests of both the geese and the farming community.



6.3 Wetlands of international importance: Ramsar sites in Greenland and Scotland

In November 1987, we were delighted to hear that the Greenland Home Rule authorities had placed a very high priority on conservation by declaring 11 protected areas under the "Ramsar" Convention on Wetlands of International Importance. This treaty, popularly called after the town in Iran where it was instigated in 1971, provides a framework for international co-operation in the conservation of important wetland habitats. The Convention also places obligations on its contracting states to conserve and use wisely their wetland sites, particularly those which support significant populations of certain species. Guidelines are that an area is internationally important if it holds more 1% of the world population of Greenland Whitefronts (currently a nominal 220 birds).

Five of the protected areas hold populations of Greenland White-fronted Geese, the total area of some 7,000 km^2 being the summer home for an estimated 9,000 geese (Table VI) - or 40% of the world population!

Table VI. Areas protected under the Ramsar Convention as Wetlands of international importance which include summering areas for Greenland White-fronted Geese.

Location	Area (km^2)	Estimated number of geese
Eqalummiut Nunaat - Nassuttuup Nunaa	5,000	2,500 +
Naternaq (Lersletten)	1,500	6,000
Aqajarua - Sullorsuaq	300	250 +
Qinnguata maraa - Kuussuaq	60	100
Kuannersuit kuussuat	45	100 +

The commitment of the Greenland government is especially commendable from such a relatively young state, and the designation of these sites in conjunction with its other wildlife legislation will hopefully ensure the combination of conservation and sustainable utilisation of natural resources by the human population. We have urged the Greenland authorities also to designate the Svartenhuk peninsula in the north of the breeding range since recent surveys have shown there to be internationally importance numbers of geese using this area also.

The notification of these Greenlandic sites is a major contribution to the international conservation of a population of geese which, in world terms, remains small and threatened. It is ironic that a developing country such as Greenland, which is so dependent on its wildlife resources, has made such a move in the same year as our own Scottish Office decided to issue licences which allow the shooting of unlimited numbers of Greenland Whitefronts on Islay.

Recent designation of several Greenland Whitefront sites have also taken place in Scotland. In July 1987, Eilean na Muice Dubh SSSI was formally declared a Ramsar site and Special Protection Area (under the EEC Wild Birds Directive). This has been more recently followed by Glac na Criche SSSI and Feur Lochain SSSI, both on Islay, which were designated as both Ramsar sites and SPAs in April 1990. Feur Lochain and Glac na Criche are major roost sites and their recognition in this way affords a considerable degree of protection to these internationally important peatlands.

Welcome though these designations are, there are several other sites which qualify as internationally important in Britain and which have been identified as such by the NCC. Along with other conservation bodies, GWGS is urging the government to greatly increase the speed of designation of these key areas. NCC has identified the following sites as being internationally important for Greenland White-fronted Geese: Coll and Tiree; Rhinns of Islay; The Oa (Islay); Ken/Dee Marshes; West Freugh, Stranraer; Loch Lomond; Caithness Lochs; Rhunahaorine; Machrihanish and Tangy Loch; and Castle Loch, Dumfries. Given that many of these sites are already designated as Sites of Special Scientific Interest there should be no reason to further delay their designation as sites of international importance.

6.4 Irish peatland conservation: too little, and much too late

Whilst research into distribution and movements of Greenland White-fronted Geese continues in Ireland, the conservation of peatlands (in many areas important habitat for the geese) leaves much to be desired. Attention to this was drawn in a resolution passed at a recent meeting in Sweden of the International Mire Conservation Group (who have previously lobbied for the protection of Eilean na Muice Dubh SSSI). The resolution concerns the future of Irish raised and blanket bogs and in summary states:

"1. The IMCG is in no doubt that Ireland has a major international responsibility to conserve the unique and threatened raised and blanket bogs which comprise such a significant part of the world resource of this biotope...

2. We warmly welcome the statement of intent by the ... Minister of State at the Department of Finance [who indicated that the Irish government was prepared to conserve 10,000 ha of raised bogs and 40,000 ha of blanket bog] This appeared to herald a major step forward in the Irish Government's approach to the conservation of peatlands.

3. ... intent must be followed by action, however, and we are concerned that it appears no practical attempt is being made to ... implement the stated objectives. [At present only 7.6% of the raised bog target and 17.3% of the blanket bog target have actually been conserved]. We note ... the total lack of a peatland acquisition budget and the fact that the Wildlife Service appears to have borne the brunt of recent financial cutbacks. Such

action would appear to offer little possibility of conserving the areas ... in the critically short period before the predicted extinction date for these sites.

4. We recommend that Ireland immediately allocate ... funding for site protection ... (which) would also encourage the expansion of a strong peatland based tourist industry."

The Irish Wildlife Service has estimated the extinction date of raised bogs (when all remaining intact sites will have been destroyed) to be 1995 at current rates of destruction.

Damage to many important sites occurred during the year including Clara Bog (Co. Offaly), Clonfinane Bog (Co. Tipperary), All Saints' Bog (Co. Offaly), Knockacolla Bog (the last remaining raised bog in Co. Laois), Garriskill (an internationally important site for Greenland Whitefronts in Co. Westmeath), and Ballykenny (Co. Longford).

6.5 National Peatlands Campaign

In March 1990, a major campaign against the exploitation of peatlands was launched. There has since been much publicity about peat, and there have been many positive moves for bog conservation across the country. GWGS is a member of the consortium of nature conservation bodies organising the campaign, which aims to give protection to all peatlands of nature conservation importance, promote investment to research peat substitutes, prevent additional large-scale commercial peat digging and bring existing peat workings within planning law, and provide more resources for peatland survey, management and conservation. Greenland White-fronts provide a distinctive faunal element to the campaign. Although described somewhat ungraciously in *ECOS* 11 (1990, p.60)) as " a bog 'cuddly' made famous by the hoohah on Islay in 1985", there is a grain of truth in the fact that birds can always attract more sympathy and support than other less glamorous aspects of nature conservation. Peatlands are generally not glamorous, but their role in the ecology of Greenland White-fronts is very important. GWGS is concerned with peatland conservation, and holds the view that in many parts of their range, without the conservation of extensive tracts of peatland habitat, the future survival of the geese would be threatened. In addition, its inclusion on Annex 1 of EEC Birds Directive makes it both a valuable tool for site protection, and a 'flagship species' around which other conservation arguments can be mustered. We hope that Greenland White-fronts can help in this way in the national campaign to conserve peatlands in Britain and also in Ireland.

7. A DECADE OF GREENLAND WHITEFRONT RESEARCH AND CONSERVATION

In the late 1970s the Greenland White-fronted Goose was one of the most poorly known of British, and probably European geese. The wintering grounds are to a large extent in remote areas of western Scotland and Ireland with many on offshore islands. These areas have few resident birdwatchers and even fewer goose enthusiasts! Ten years on it seems appropriate to review the past decade, during which we have learned so much, yet still have so much more to understand about the details of the life of Greenland White-fronted Geese. Most of what we have learnt has been due to the careful collection of

information by goose counters throughout the range of the birds, and we would like to give special thanks for their efforts.

In 1978, the formation of the Greenland White-fronted Goose Study (GWGS) based at Aberystwyth gave impetus to studies in Britain and Greenland, whilst in 1982 the Irish Wildlife Service (IWS) initiated a major census and marking programme associated with conservation measures. We here summarise some of the results of these studies to date and indicate some of the major areas of research which remain, particularly in terms of conservation needs.

Distribution and population dynamics

Prior to Ruttledge & Ogilvie's 1979 baseline paper, information on population size and distribution was very difficult to obtain. Their study provided an inventory of known sites derived from the relatively few goose counters then active in the west of Scotland and Ireland. It also gave an assessment of population size and analysis of population trends. The picture was far from encouraging: a decline from an estimated 17,500-23,000 in the 1950s to 14,300-16,6000 in the late 1970s. In Ireland there had been a 50% decline particularly associated with wetland habitat loss. In 1983, GWGS and IWS (with RSPB in Northern Ireland) undertook the first international census of all known sites in autumn and spring. This has been continued to the present and has shown a most encouraging increase in numbers from c16,600 in spring 1983 to the 1989/90 level of c27,000.

Recent monitoring of productivity has confirmed earlier findings of generally very small numbers of successful pairs compared with other Whitefront races. However, in the last three years there has been significantly higher productivity seemingly associated both with fine spring weather in the British Isles and fine weather during the early part of the breeding season. The greater number of young birds entering the now largely protected population has given it a welcome boost.

Table VII. Population monitoring of Greenland White-fronted Geese in Britain and Ireland. Data from IWS and GWGS Reports (Stroud *et al.* in press). Autumn (late November) census only.

	1983	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
Wexford	4758	6097	7930	7033	7988	10510	8238
Rest of Ireland	2879	3030	3565	3185	3952	4328	4044
Britain	8188	9490	11145	10911	12515	12503	14434
TOTAL	15825	18617	22640	21129	24455	27341	27716

Movements and site-fidelity

Greenlandic ringing stimulated by Finn Salomonsen in the 1950s outlined the major migration paths and wintering areas of this population (Salomonsen 1967). It also indicated leap-frog migration with apparently different population segments breeding in northerly and southerly parts of the breeding range. In 1979 and 1984, 184 birds were marked with darvic leg-rings in central west Greenland, and Figure 2 shows the distribution of resightings in winter up to the end of the 1987/88 winter. Using data from these birds, and analysing a total of 1,504 birds ringed in Greenland since 1946, Kampp *et al.* (1988) showed that strong site fidelity exists in Greenland Whitefronts on both breeding and wintering grounds. For example, using different age classes of geese, between 96 and 97% of resighted birds were seen at the same site as the previous observation, and between 93 and 96% of birds wintered at the same site as in previous winters. Of 12 recorded moves between wintering sites, only one occurred within a winter. Kampp *et al.* (1988) concluded that there are still considerable gaps in our understanding of Greenland Whitefront population dynamics, and urged caution in management due to the small size and scattered distribution of the geese.

In summary, recent work on movements and site-fidelity has shown:

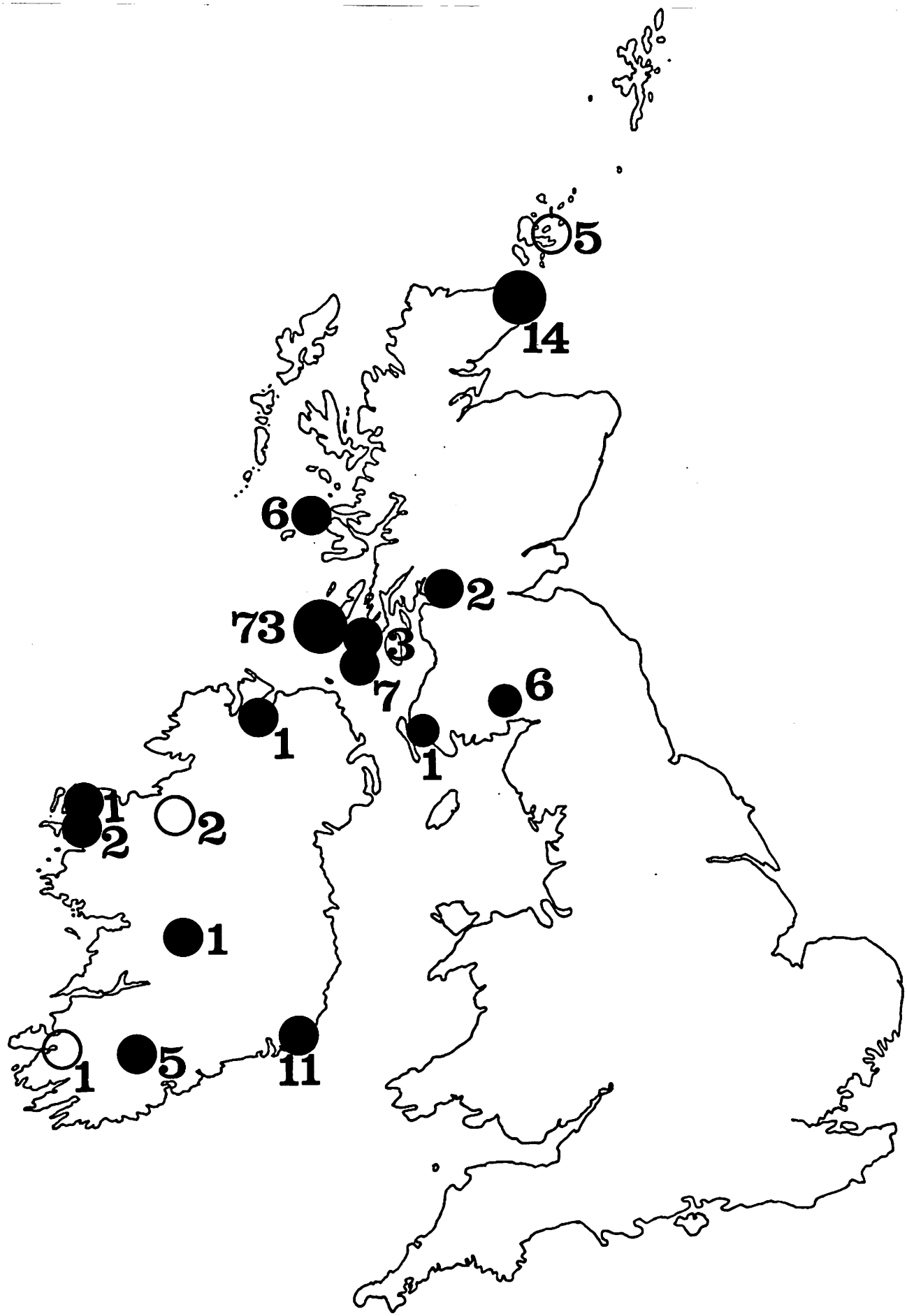
a) the race demonstrates extreme site-fidelity both within and between winters.
b) leap-frog migration seems to have been generally confirmed.
c) within a general leap-frog trend, there is wide dispersal of birds from one ringing site more or less throughout the wintering range.
d) there is a between-winter element of exchange between sites, although proportionately this is small.

Ringing with darvic collars was started in Ireland in 1983/4. To date 749 geese have been caught, largely (693) at the major wintering haunt of the Wexford Slobs. Virtually daily observations of large numbers of marked birds by a resident warden has given an extensive data-base of unique detail. A major IWS-funded analysis has started, based at Wildfowl & Wetlands Trust (WWT). A preliminary analysis of some aspects of the data was presented at the IWRB Kleve Conference in 1989 (Wilson *et al.* 1990 in press). Since then, 32 geese were ringed with collars in Greenland in 1989. To date there have been sightings or recoveries of 26 of these birds, demonstrating a much greater first winter location rate than leg-rings.

Breeding ground studies

GWGS mounted major expeditions to west Greenland in 1979 and 1984. These lasted from the arrival of geese through to post-moult flocking. Aside from observations by Fencker in the 1950s, there was very little published information on the summer life of the geese before the GWGS expeditions. A wide range of basic studies have been undertaken, although work has always been confounded by the extremely low densities at which the geese occur. Fundamentals such as information on nesting habitats and breeding biology (Stroud 1982; Fox *et al.* 1983; Fox & Stroud 1988) are now better understood, whilst significant studies have been made on the role of pre-breeding feeding (Fox & Madsen 1981; Fox & Ridgill 1985). Interactions with predators such as Arctic Foxes were addressed by specific studies (Birks & Penford 1990). Basic information on feeding has been gained, but much else remains to be undertaken

Figure 2. Numbers of Greenland White-fronted Geese ringed in Eqalummiut nunaat, west Greenland and seen on wintering grounds: 1979/80 - 1987/88.



in this field. Indeed, virtually all aspects of summer ecology remain poorly understood, and derive from just one breeding area of a range which extends over 7° of latitude.

The main problem remains logistical. Geese seem to occur at very low densities in much of their range, giving particular problems in experimental design. The recent discovery of higher densities at one location (see below) may widen opportunities.

Breeding distribution

As for the breeding ecology, distribution in summer is poorly known and no significant advances have been made until recently. In summers 1989 and 1990, the presence of a suitable spotter aircraft in west Greenland meant that limited aerial survey work could be undertaken (see Section 5.5), funded by the Greenland Dept. of Physical Planning and Nature Conservation in 1988 and by WWT/GWGS in 1989. Surveys concentrated on several areas near Søndre Strømfjord. Of major significance has been the confirmation of several thousand geese using an extensive plain near Disko Bugt called Naternaq. This area is one of several recently protected as Ramsar sites. Prior to these surveys the area was thought to hold large numbers of geese, but recent counts have suggested that a significant proportion of the population occurs there.

Migration studies

In 1986, visits were made by GWGS members to Iceland to investigate both spring and autumn passage (Francis & Fox 1987), since little was known outside Iceland about the degree to which Greenland White-fronts stopped there on passage. Since then a number of Icelandic ornithologists have become involved in studies, with counts and ring-reading occurring on a more or less regular basis. WWT studies of Pink-footed goose spring ecology in 1989 and 1990 have also investigated White-fronted geese where possible (Section 5.6).

Conservation

Much of the research outlined above has been initiated because of urgent conservation needs. The population has been given complete protection in Scotland and Ireland since 1982 (although limited shooting seasons have been allowed at Wexford in Ireland in winters 1985/6 and 1989/90). In Greenland, the shooting season was significantly shortened in 1985 to the period after 15 August. The geese can be legally shot in Iceland on autumn passage. There is increasing concern at the seemingly large numbers shot there and indications are that the autumn bag may be increasing.

Habitat protection has been addressed in Greenland by the designation of five large Ramsar sites in 1987. These will be most important to the long-term conservation of the race. It is hoped that recently identified sites of international importance will also be designated by the Home Rule Authorities in due course. In Ireland, a major extension to the refuge on the Wexford Slobs was announced in February 1990, however elsewhere the level of site-based protection is poor (although improving). Significant progress in the purchase of key peatland areas in Ireland will probably require EEC funding.

In Britain, many important sites are protected under domestic legislation (as Sites of Special Scientific Interest). In 1983 a major conservation dispute arose over the British government's decision to allow commercial peat extraction from Eilean na Muice Dubh (Duich Moss); the most important roost in Britain and a protected peatbog. The protracted history of this case has been described in successive Greenland White-front census reports, and by GWGS (1986); see also section 6.1. The case has been influential throughout the EEC in setting a precedent concerning the enforcement of habitat protection requirements of the 1979 Birds Directive.

The next ten years .....

There are several important areas to be addressed in years to come.

Flyway management plans and site networks

The world range is limited to Greenland, Iceland, UK and Ireland. This presents opportunities to derive a flyway management plan to guide national conservation and management actions. There are possibilities for this either within the Ramsar Convention (under Article 5) or under the Bonn Convention (as a Western Palearctic Waterfowl AGREEMENT). Development of formal linkages between sites within the flyway (i.e. site 'twinning') could also have a variety of advantages, over and above the individual protection of the sites in question. These would include: enhanced site protection; encouragement of further site protection in parts of the range where this is lacking; enhanced public relations opportunities; links with a flyway management plan; and better exchange of information on site management, threats and research.

Ringing

Much of the historical data reviewed by Kampp *et al.* (1988) derived from periods when the geese were legal quarry throughout their range. There is an important need to continue the ringing programme started by GWGS & IWS in order to obtain better present-day estimates of mortality and to continue the investigation of site-use and fidelity. The darvic programme has given great insights into site-use and has provided data of importance to conservation agencies.

Iceland

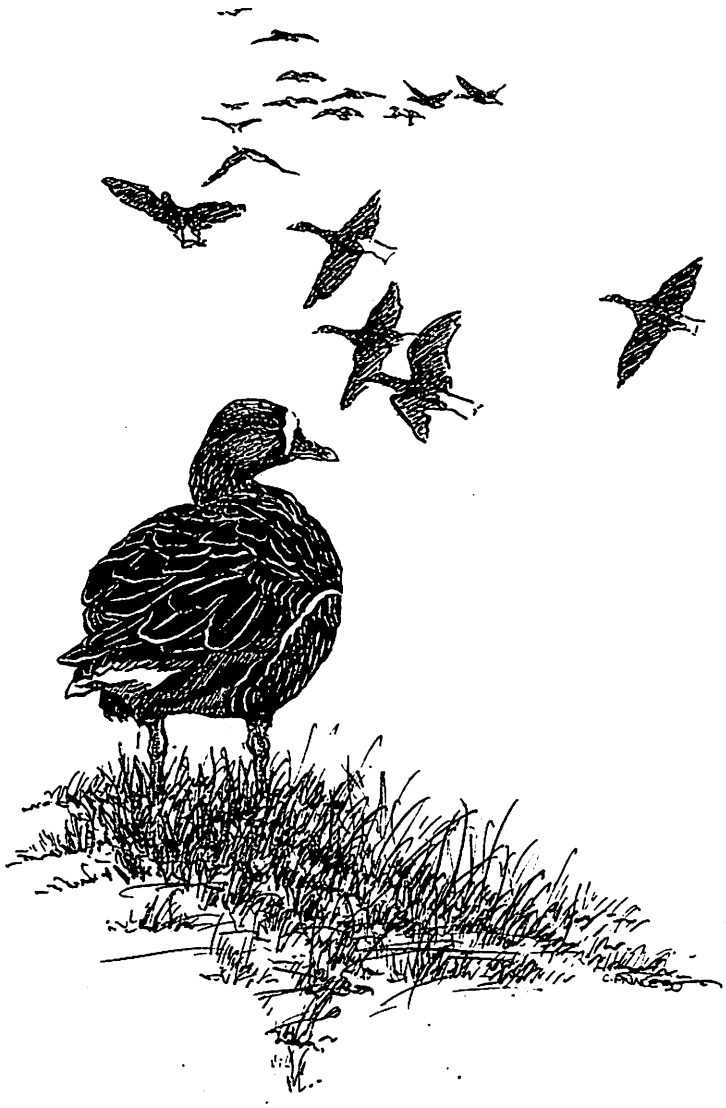
Information from Iceland remains poor. Knowledge of the dynamics of spring-staging and spring feeding will be crucial to a better understanding determinants of breeding success. There remains no protection for key areas used by geese on passage, and the introduction of protection measures is an urgent priority.

Greenland

Greenland White-fronts are protected in Greenland until 15 August, and although they can be shot thereafter, very few birds are likely to be killed. Shooting is banned during the spring, and it is crucial that encouragement should be given to the Greenland authorities to maintain this spring ban.

Habitat conservation and management plans

Whilst in some areas key sites have statutory protection, many important sites remain without protection, especially in Iceland and in some areas of Ireland. In many areas, the geese occur within agricultural landscapes and here the agreement of management plans with farmers will be important for long-term conservation. In some areas where high densities are found in relative intensive farming areas, refuge management is appropriate (e.g. Wexford, Kintyre). In other areas, where geese occur at lower densities on traditional low-intensity farms, wider measures (such as payments to farmers under the Environmentally Sensitive Area provisions of EEC agricultural policies) would be beneficial to encourage the maintenance of this situation.



8. ACKNOWLEDGEMENTS

As ever, we are indebted to the large number of people without whose help we would not be able to undertake the census work, searching for ringed geese or the increasingly important task of lobbying for site protection. We thank you all for your help.

I.S.Angus, R.A.G.Angus, I. Bainbridge, T.Banks MP, H.Barker, A.C. Bastable, Dr L.A.Batten, D.Batty, P.Batty, M.Bellinger, S.Benn, Dr E.Bignal, R.Bignal, S.Bignal, Dr J.D.S.Birks, C.J. Booth, T.Bormann, P. Boyer, J. Boyle, R.A.Broad, G.J.Brock, Dr D.M.Bryant, Dr M Burn, Dr R.R.Burn, C. Burton, Dr D.Cabot, K.A.H.Cassels, G.P.Catley, D.G.P.Chatfield, J.Claricoates, J. & P.Clarke, D.Coleman, P.Collin, C.Corrigan, Dr C.Craik, L.Cranna, W.A.J.Cunningham, A.Currie, T.Curtis, P.Dale, Commissioner S.C.Davis, P.Dedicoat, R.H.Denham, R.Dennis, T.D.Dick, R.C.Dickson, D. & B.Dix, T.Dix, Dr & Mrs R.H.Dobson, T.Doughty, P.B.Duncan, Rev. & Mrs A. & J.Duncan-Jones, J.Dye, A.Easterbee, Dr N.Easterbee, O.Einarsson, V.Einarsson, D.Elliot, J.Elliott, M.Elliott, European Commission, F.Evans, D.& D.Evans, Dr I.Evans, Cllr. A.Fletcher, V.Fletcher, W.D.Forshaw, Dr A.D.Fox, A.E.M.Fox, Dr I.S.Francis, Friends of the Earth, Friends of the Earth (Scotland), J.Frikke, W.Gernander, A.G.Gordon, J.J.Gordon, M.Green, M.Gregory, I.Guldberg, P.Gyseman, H.Th.Hafsteinsson, J.Halliday, F.Hamilton, E.S.Hansen, B.Haran, Y.Harpin, G.Hauksson, R.Hawley, M.Heubeck, W.Higgs, N.E.Hill-Trevor, J.O.Hilmarsson, J.Holloway, M.G.B.Hughes, I. Hulbert, D.Jackson, G. & M.Jackson, D.C.Jardine, N.Jarrett, Dr A.R.Jennings, R.Jones, K.Kampp, Dr T.Keatinge, L.Kinnes, J.Kirk, J.Kirby, A.Knight, L.Kramer, S. & E.Laybourne, A.Leach, P.Leonard, R.A.Lindsay, B.Little, K.Lydiatt, D.MacAllister, C.McCarty, Dr R.MacDonald, C.R.McKay, W.Maclaughlin, M.Madders, J.Madsen, E.Maguire, S.Malmquist, D.Massen, J.Matthews, B.N.K.Mayes, E.Mayes, E.Meek, P.Melchett, D.Minns, J.Mitchell, J.Moore, P.Moore, E.Morley MP, Dr de Mornay, Dr G. Mudge, S.Murphy, Namminersornerullutik Oqartussat, B.Neill, S.Newton, D.Norriss, M.J.Nugent, Dr M.A.Ogilvie, P.O'Sullivan, Dr M.Owen, J.Palfery, Dr I.Paterson, M.Peacock, N.Penford, S.Percival, Dr A.Petersen, Dr M.W.Pienkowski, R.Pollock, L.Pope, R.Quick, A.Rafsson, N.Rankin, J.Ray, P.S.Read, A., A.& C.Reenberg, P.Reynolds, P.Robinson, G.Room, A.Rothwell, Royal Society for the Protection of Birds, RSPB volunteers at Loch Gruinart and Ynys Hir Reserves, N.N.Russell, D.Salmon, K.Shepherd, P.Shimmings, J. Skilling, M.Smith, I.Smitton, R.Squires, E.Still, S.Street, Dr & Mrs R.A.Stroud, D.A.Stroud, Dr.J.M.Stroud, S.Sutton-Jones, R.Tanner, A.C.Thirlwell, H.Thing, D. Thompson, P.Thompson, E.O.Thorleifsson, D.Thorogood, R.Tozer, V.Tulloch, A.Unnsteinsson, K.Vaegter, A.Walsh, S.Warren, A.D.Watson, Dr J.Watson, T.Weir, J.Welstead, S.Whyte, Sir W.Wilkinson, H.J.Wilson and J.Young.

We gratefully acknowledge continuing financial assistance from the Nature Conservancy Council to defray the costs of the autumn and spring census. We also thank the Wildfowl and Wetlands Trust and the Irish Wildlife Service for their continuing co-operation and help. Finally, we thank Louise Pope, Elaine Hill and Clare Prince for drawing the vignettes of White-fronts in this report, Paul Leonard for the GWGS logo, Michael Bülck for allowing us to use the photograph in Plate 1, and Hilary Welch for the cover illustration.

9. REFERENCES

BATTY, P. (1988). *Mid Argyll Goose Counts Winter 1987/88.* Unpublished report, NCC Peterborough. 13pp.

BIGNAL, S. (1988). *Counts of Grey Geese in Kintyre 1987-88.* Unpublished report, NCC Peterborough. 13pp.

BIRKS, J.D.S. & PENFORD, N. (1990). Observations on the ecology of arctic foxes *Alopex lagopus* in Eqalummiut Nunaat, west Greenland. *Meddelelser om Grønland, Bioscience 32: 1-26.*

CLARK, M. (1977). Canada geese breeding, and other geese wintering, on the island of Colonsay. *Western Naturalist 1977: 103.*

FOX, A.D. & MADSEN, J. (1981). The pre-nesting behaviour of the Greenland White-fronted Goose. *Wildfowl 32: 48-54.*

FOX, A.D., MADSEN, J. & STROUD, D.A. (1983). A review of the life history and ecology of the Greenland White-fronted Goose. *Dansk Orithologisk Forenings Tidsskrift 77: 43-55.*

FOX, A.D. & RIDGILL, S.C. (1985). Spring activity patterns of migrating Greenland White-fronted Geese in west Greenland. *Wildfowl 36: 21-28.*

FOX, A.D. & STROUD, D.A. (1985). The Greenland White-fronted Goose in Wales. *Nature in Wales New Series 4: 20-27.*

FOX, A.D. & STROUD, D.A. (1988). The breeding biology of the Greenland White-fronted Goose (*Anser albifrons flavirostris*). *Meddelelser om Grønland, Bioscience 27: 1-16.*

FOX, A.D., STROUD, D.A. & FRANCIS, I.S. (1990) in press. Up-rooted Common Cotton-grass *Eriophorum angustifolium* as evidence of goose feeding in Britain and Ireland. *Bird Study 37.*

FOX, A.D., GITAY, H., OWEN, M., SALMON, D.G. & OGILVIE, M.A. (1989). Population dynamics of Icelandic nesting geese. *Ornis Scandinavica 20: 289-297.*

FRANCIS, I.S. & FOX, A.D. (1987). Spring migration of Greenland White-fronted Geese through Iceland. *Wildfowl 38: 7-12.*

GREENLAND WHITE-FRONTED GOOSE STUDY (1986). Duich Moss: a minor administrative hitch .... *Ecos 7(2): 24-31.*

JARDINE, D.C., CLARKE, P. & CLARKE, P.M. (1986). *The Birds of Colonsay and Oransay.*

KAMPP, K., FOX, A.D. & STROUD, D.A. (1988). Mortality and movements of the Greenland White-fronted Goose *Anser albifrons flavirostris. Dansk Ornithologisk Forenings Tidsskrift 82: 25-36.*

LAYBOURNE, S. & FOX, A.D. (1988). Greenland White-fronted Geese in Caithness. *Scottish Birds 15: 30-35.*

MAGUIRE, E.J. & ANGUS, R.A.G. (1989). *Results of intensive sea watching in south-west Kintyre (Strathclyde), Autumn, 1989.* Unpublished report.

NORRISS, D.W. & WILSON, H.J. (1988). *Greenland White-fronted Geese in Ireland 1987-1988:* Wildlife Service report, OPW, Bray, Ireland.

NORRISS, D.W. & WILSON, H.J. (1989). *Greenland White-fronted Geese in Ireland 1988-89:* Wildlife Service report, OPW, Bray, Ireland.

OGILVIE, M.A. (1983). Wildfowl of Islay. *Proceedings of the Royal Society of Edinburgh 83B: 473-489.*

OWEN, M. (1990). The damage-conservation interface illustrated by geese. *Ibis 132, 238-252.*

RUTTLEDGE, R.F. & OGILVIE, M.A. (1979). The past and current status of the Greenland White-fronted Goose in Ireland and Britain. *Irish Birds 1: 293-363.*

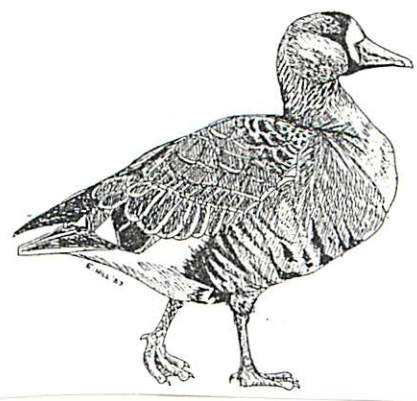
SALOMONSEN, F. (1967). *Fuglene pa Grønland.* København, Rhodos.

SHEPHERD, K.B. (1988). *Ornithological observations made during visits to the Isle of Tiree, Argyll in February 1987 and Spring 1988.* NCC Chief Scientist Directorate commissioned research report No. 856.

STROUD, D.A. (1982). Observations on the incubation and post-hatching behaviour of the Greenland White-fronted Goose. *Wildfowl 33: 63-72.*

STROUD, D.A., FOX, A.D., WILSON, H.J. & NORRISS, D. (in press). Greenland White-fronted Geese in Ireland and Britain 1982-87: population monitoring and conservation. *Biological Conservation*

WILSON, H.J., NORRISS, D.W., WALSH, A., FOX, A.D. & STROUD, D.A. (in press). Winter site fidelity in Greenland White-fronted Geese: implications for conservation and management. *Ardea.*



APPENDIX 1 (see end notes for explanation)

Appendix 1(a). GREENLAND WHITE-FRONTED GOOSE CENSUS: 1987 - 1988

SITE NAME	September	October	November 1-16	November 17-30	AUTUMN CENSUS	December	January	February	March	SPRING CENSUS	April	May
NORTH-EAST SCOTLAND												
Shetland: Sullom Voe		2	9	9	9	9	9	9	9	9	14	
Orkney: Tankerness/Holm									26	26		
Orkney: Loons/Ibister		32	30	75	75				56	56		
Orkney: Stronsay			53	51	51	54		52	54	54		
Orkney: Sanday			53									
Caithness: Westfield		15	115	120	115	158		152		163	102	
Caithness: Loch Heilen			157		157		140	140	138	138	105	
Caithness: Scarmclate												
Caithness: Wester			30		30				0	40	40	
Caithness: Meadie												
Sutherland: Loubcroy						signs						
Sutherland: Cnoc na Moine									0	*0*	0	
Cromarty: Loch Eye					0			10				
Cromarty: Morrich More												
Moray: Loch Spynie											20	
					437					486		
NORTH-WEST SCOTLAND												
Lewis:Barvas/Shawbost		13	17		17	15			18	18		
Benbecula: Nunton					*0*		41		41	*41*		
North Uist												
South Uist: Loch Bee			40		40		37	57				
S. Uist: Kilphedar/Hallan/Askernish			26	56	56	46	30	8	36	36		
Skye: Snizort			32		32				26	26	24	
Skye: Broadford					*30*	30	49		43	*43*	43	
Gairloch: Loch Sguod					*14*				0	0		
Gairloch: Greenstone Point												
Muck/Eigg					*60*					60	60	
					249					224		
NORTH ARGYLL												
Loch Sheil/Claish & Kentra Mosses		1	0	0	51	51	47	21	27	27		
Tiree (whole island)					759	759			460	460	500	
Coll (whole island)					*400*	175			400	400		
Gunna						0						
Staffa						0						
Mull: Loch Poit na h-I		10	47		47					*47*		
Mull: Fidden/Iona	0	5	0		0					*0*		
Lismore/Benderloch					215	215				*215*		
Eriska						0						
Loch Rannoch							4					
					1472					1149		

1987/88 (continued)

SOUTH ARGYLL										
Colonsay/Oransay		76		**76**	108	116	116	105	**105**	137
Danna/Keils	104	118	131	**131**	197	7	136	160	**145**	132
Moine Mhor/Crinan		100	54	**54**	0	54	20	54	**52**	63
Jura: Loch a' Chnuic Bhric				*54*					**54**	
Jura: Lowlandman's Bay				*84*					*84*	
Rhunahaorine	279	592	726	**553**	671	786	745	817	**802**	290
Machrihanish	392	944	696	**691**	743	685	612	502	**502**	348
Isle of Bute				*145*					*50*	
Barr Loch, Renfrew				*0*					*0*	
Loch Lomond: Endrick Mouth			165	**165**	240			240	**240**	0
				1953					**2034**	
ISLAY			7373	**7373**			7888	7314	**7314**	
GALLOWAY										
Loch Ken	142	*300*	330	**330**	370	310	73	130	**130**	
Stranraer: West Freugh	550			**550**		178		410	**410**	
Lochinch			500							
Bladnoch Valley/Clugston Loch				*43*					*43*	
Cree Valley and Moss of Cree				*0*					*0*	
Solway: Caerlaverock		2		**2**	4					
Solway: Rockcliffe					5					
				925					**583**	
ENGLAND										
Lancashire			4	**4**		2	1	1	**1**	2
WALES										
Ynyshir	102		102	**102**	102	100	108	127	**127**	99
Llyn Hir										

Summary (1987/88):

	AUTUMN	SPRING
North-east Scotland	437	486
North-west Scotland	249	224
North Argyll	1,472	1,149
South Argyll	1,953	2,034
Islay	7,373	7,314
Galloway	925	583
England	4	1
Wales	102	127
BRITISH TOTAL	12,515	11,864

Appendix 1(b). GREENLAND WHITE-FRONTED GOOSE STUDY CENSUS: 1988 - 1989

SITE NAME	September	October	November	AUTUMN CENSUS	December	January	February	March	SPRING CENSUS	April	May
NORTH-EAST SCOTLAND											
Orkney: Tankerness/Holm				*0*	? flock moved to Stronsay ?				*0*		
Orkney: Loons/Ibister				**49**	49				**66**	66	
Orkney: Stronsay				**49**	49				**0**	0	
Caithness: Westfield		200	80	**80**			199	197	**198**	198	
Caithness: Loch Heilen				**162**	162	108			*108*		
Caithness: Scarmclate				*95*					**95**	95	
Caithness: Wester				**14**	14				*14*		
Caithness: Meadie				*0*					*0*		
Cromarty: Loch Eye				*0*					*0*		
Cromarty: Morrich More				*0*					*0*		
				449					**481**		
NORTH-WEST SCOTLAND											
Lewis: Barvas/Shawbost				**20**	20				**20**	20	
Benbecula: Nunton				*37*		37	22	12	**12**		
North Uist						1					
South Uist: Askernish											
South Uist: Loch Bee				*17*		0	17		*17*		
South Uist: Kilphedar/Loch Hallan				*22*		22	46		*46*		
Skye: Snizort			30	**30**	30	28	25	0	**0**		
Skye: Broadford			70	**70**	66				*66*		
Gairloch: Loch Sguod			0	**0**	0				*0*		
Gairloch: Greenstone Point					signs						
Muck/Eigg				*40*					*40*		
				236					**201**		
NORTH ARGYLL											
Cuil Bay						2					
Lismore/Benderloch/Port Appin				*76*		76			*76*		
Loch Sheil/Claish & Kentra Mosses		48	26	**26**	45	51	79	49	**49**	49	
Tiree (whole island)			518	**518**		517		711	**711**	728	
Coll (whole island)			534	**534**		647		593	**593**	641	
Mull: Loch Poit na h-I/Fidden/Iona		55		*55*				25	**25**		
Mull: Loch Assapol			31	**31**				23	**23**		
Mull: Ross of Mull							43	25	**25**		
Mull: Inner Loch Scridain						1	1	1			
				1240					**1502**		
SOUTH ARGYLL											
Colonsay/Oransay				*120*		120	140	165	**165**	140	
Danna	6	74	150	**140**	140	168	124	200	**200**		
Moine Mhor/Crinan			60	**58**		40		44	**41**		
Jura: Loch a' Chnuic Bhric				*54*					*54*		
Jura: Lowlandmans Bay				*36*					*36*		
Rhunahaorine		788	1116	**800**	902		864	864	**445**	864	
Machrihanish		679		**862**	862			907	**774**		
Gigha				**0**	0				*0*		
Loch Lomond: Endrick Mouth			240	**240**					**300**	300	
				2190					**2015**		

1988/89 (continued)

ISLAY				**7588**	7588			6816	**6816**	13
GALLOWAY										
Loch Ken		234	342	**342**	280	268	200	240	**291**	291
Stranraer: West Freugh				*353*			353		**393**	393
Bladnoch Valley/Clugston Loch				*0*					*0*	
Cree Valley and Moss of Cree				*0*					*0*	
				695					**684**	
ENGLAND										
Lancashire: Southport					1					
Lancashire: Downholland					1					
WALES										
Ynyshir	21	103	115	**103**	103	114	121	121	**124**	124
Llyn Hir		14	26	*2*						

Summary (1988/89):

	AUTUMN	SPRING
North-east Scotland	449	481
North-west Scotland	236	201
North Argyll	1,240	1,502
South Argyll	2,190	2,015
Islay	7,588	6,816
Galloway	695	684
England	0	0
Wales	105	124
BRITISH TOTAL	12,503	11,828

Appendix 1(c). GREENLAND WHITE-FRONTED GOOSE STUDY CENSUS: 1989 - 1990

SITE NAME	October	November	AUTUMN CENSUS	December	January	February	March	SPRING CENSUS	April
NORTH-EAST SCOTLAND									
Shetland: Sullom Voe									
Orkney: Tankerness/Holm			*0*	? flock moved to Stronsay ?				*0*	
Orkney: Loons/Ibister		94	**94**			40	60	**60**	87
Orkney: Stronsay			*0*				28	**28**	
Caithness: Westfield	42		*76*		76	15	209	**209**	
Caithness: Loch Heilen	24		*120*		120	130	17	**17**	70
Caithness: Scarmclate			*123*				123	**123**	130
Caithness: Wester			*0*					*0*	
Cromarty: Loch Eye			*0*					*0*	
Cromarty: Morrich More			*0*					*0*	
Loch of Strathbeg		9	*9*	9	9	9	9	*9*	9
			422					**446**	
NORTH-WEST SCOTLAND									
Lewis: Barvas/Shawbost	2		**42**	42	36		27	**27**	
Benbecula: Nunton			*34*					*12*	
South Uist: Askernish		55	**55**					*55*	
South Uist: Loch Bee		46	**46**					*46*	
Skye: Snizort		23	**25**	25		28	24	**24**	
Skye: Broadford			*35*			12	60	**60**	22
Gairloch: Loch Sguod			*0*					*0*	
Muck/Eigg			*40*					*40*	
			277					**264**	
NORTH ARGYLL									
Loch Sheil/Claish Moss	7	60	**60**		58	58	58	**58**	58
Benderloch/Lismore/Port Appin		120	**120**					*120*	
Tiree (whole island)			**765**	765			987	**987**	
Coll (whole island)			**671**	671				*671*	
Mull: Loch Poit na h-I/Fidden/Iona			-					48	**48**
Mull: Loch Assapol			-			57		19	**19**
Ross of Mull: total for 3 flocks		133	**133**						
			1749					**1903**	
SOUTH ARGYLL									
Colonsay/Oransay	2		**120**	120				*120*	
Danna		224	**224**	155			203	**203**	
Moine Mhor/Crinan	46	48	**57**	57	48	58	58	**57**	42
Jura: Loch a' Chnuic Bhric			*54*					*54*	
Jura: Lowlandmans Bay			**36**	36				*36*	
Jura: Loch a' Mhuilen				+					
Rhunahaorine	500	856	**887**	887			914	**914**	
Machrihanish	720	718	**718**	1005	920		657	**657**	
Isle of Bute			*145*					*145*	
Barr Loch, Renfrew			*0*					*0*	
Loch Lomond: Endrick Mouth			*230*					*300*	
			2471					**2468**	

1989/90 (continued)

ISLAY			**8560**	8560		7641		**7209**	7209
GALLOWAY									
Loch Ken		165	**240**	346	184	236	218	**233**	233
Stranraer: West Freugh			*576*		576			**350**	350
Bladnoch Valley/Clugston Loch			*0*					*0*	
Cree Valley and Moss of Cree			*0*					*0*	
			816					**583**	
ENGLAND									
Lancashire: Southport	16	16	**16**	2	1	1	1	*1*	1
WALES									
Ynyshir	111		*111*	83				*83*	
Llyn Hir		+	*12*			0	10	**10**	

Summary (1989/90):

	AUTUMN	SPRING
North-east Scotland	422	446
North-west Scotland	277	264
North Argyll	1,749	1,903
South Argyll	2,471	2,486
Islay	8,560	7,209
Galloway	816	583
England	16	1
Wales	123	93
BRITISH TOTAL	14,434	12,985

NOTES FOR APPENDICES: Values are the maximum count recorded for a site in the month concerned. Census columns derived from the peak count in the relevant census period, and since some groups of sites are counted on a co-ordinated basis, the census count may be lower than the maximum recorded in either November/December or March/April.

Census count are shown in **bold type** thus. Maximum counts for months are indicated in normal type, whilst where there is no census data for the period immediately around the census period, the value is either the closest count undertaken that winter, or data from the previous winters census. Such interpolated counts are shown in *italics*.

Most data relate to discrete flocks, but for a few areas, such as Coll and Tiree, where there are a number of flocks whose relationship is not entirely clear, area totals are given. The finer scale data are also available on file.