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**THE GREENLAND WHITE-FRONTED GOOSE IN IRELAND**

**1982/83 TO 1984/85**

**A report on its status, distribution and the impact of  
shooting**

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SUMMARY

1. *Prior to the introduction of a shooting moratorium in mid-1982 numbers of Greenland White-fronted geese at Wexford had remained stable but numbers in the rest of Ireland had declined markedly.*
2. *The Wexford flock increased from a mean winter count of 5550 in 1982/83 to 6881 in 1984/85, the highest in 17 years of regular counting. Significant immigration occurred annually between autumn and spring censuses.*
3. *Spring counts in the rest of Ireland increased from 2994 in 1982/83 to 3355 in 1984/85. Although coverage errors obscure any population trends, the decline has certainly now ceased and there may be a small increase (about 5%/year).*
4. *Recruitment is much lower (mean 1982/83 to 1984/85 : Wexford 16.1%, rest of Ireland 16.2% juveniles) than in other races of White-fronted geese.*
5. *Ringing evidence indicates a split in the population with the Wexford/Scottish birds separate from those in the rest of Ireland, and a higher winter mortality in the latter population segment.*

6. *Hunting pressure in Wexford from 1971/72 to 1980/81 is thought to have been at the maximum sustainable level. The recent concentration of geese on the North Slob and the build-up of flock size are bringing geese into increasingly serious conflict with agriculture.*
  
7. *Flocks outside Wexford are small and widely scattered. This population segment is thought to have been overshoot before the moratorium. Some flocks without refuges are still under severe pressure from disturbance during the shooting season. The rate of loss of bogland feeding and roosting sites threatens the survival of some flocks. There is probably little interchange between flocks and each is separately vulnerable to local habitat loss, disturbance and shooting pressures.*

## INTRODUCTION

The Greenland White-fronted Goose Anser albifrons flavirostris, first described as a distinct subspecies by Dalgety and Scott (1948), breeds in the coastal tundra belt of West Greenland, between 64° and 73°N, and stages in Iceland on spring and autumn migration. It winters exclusively in Ireland and western Britain (Fox and Stroud 1981, Fox et al 1983), traditionally on bogland but increasingly on farmland. The two largest concentrations, at Wexford and Islay, are on farmland and now comprise 62% of the world population. The remaining traditional bogland flocks are mainly confined to the west of Ireland.

Ruttledge and Ogilvie (1979) revised earlier population estimates for Ireland (1946-56: Ruttledge and Hall Watt 1958) from 8850-11200 to 12700-17300 and for Britain (1946-61: Atkinson-Willes 1963) from 2500-4500 to 4800-5800. New flocks had been found in the interim and coverage was generally better. They estimated the population in the 1970'S at 7800-9300 in Ireland and 6500-7300 for Britain and concluded that the Scottish population had increased slightly, the Wexford flock had remained stable, while flocks in the rest of Ireland had declined by about 60%. In the rest of Ireland this was reflected by a range contraction with the desertion of 29 sites and population decreases at a further 33 sites. In contrast two sites were deserted in Britain, decreases were noted at a further 3 while 10 sites showed increases, including the apparent establishment of two during the 1960's.

Population estimates for flocks outside Wexford and Islay were derived from the accumulation of several years' information. As the situation had also changed over time past assessments of population size were difficult. While the trends of the Scottish, Wexford and rest of Ireland population segments since the 1950's are clear, the quantitative estimates of change are sometimes in doubt due to the varying quality of coverage.

#### OBJECTIVES

In 1980 the Forest and Wildlife Service (FWS) identified five key areas of research on Greenland White-fronted geese to be carried out over the next 10 years. These were:

1. To collect information at wintering sites on numbers and productivity and to census the international population.
2. To inventory feeding and roosting sites according to habitat type.
3. To initiate a trapping and marking programme to study population dynamics and movement patterns.
4. To investigate feeding ecology and its implications for the desertion or decline of geese at sites in the midlands and west.

5. To investigate ways of reducing conflict between geese and agriculture and of conserving the flock at its main wintering site in Wexford.

This report is concerned with (a) changes in status since 1982/83, (b) the effects of shooting mortality and associated disturbance and (c) the ability of the population to withstand a reopening of the shooting season.

A trapping and marking programme to study population dynamics and movements of the geese was initiated in spring 1984. Other aspects of the project not directly relevant to this report (site conservation and a study of winter feeding ecology) will be published elsewhere.

#### METHODS

A network of observers from the FWS, the Irish Wildbird Conservancy, the National Shoot Promoters Association in the Republic and from the Department of the Environment, the Royal Society for the Protection of Birds and the Forest Service in Northern Ireland were involved in the survey. The observers visited sites at least at monthly intervals from November to April. These visits were synchronised during a five-day period each month in the Republic and

Northern Ireland and internationally during the autumn (mid-November) and spring (early April) census periods. Additional searches to locate new sites were ongoing.

Two areas - the bog of Erris in N.W. Mayo and Connemara - were particularly difficult to census due to their size and inaccessibility. Both were counted once each year during the spring census.

A standard recording card (see Appendix I) was filled on the occasion of each site visit, whether geese were present or not and the following categories of information recorded as appropriate:

(1) observer(s), (2) site number (office use only), (3) date, (4) time and duration of visit, (5) local site name from  $\frac{1}{2}$ " map, (6) 6-figure grid reference, (7) roosting or feeding area, habitat type and extent of flooding, (8) number, type and outcome of disturbance flights within the observation period, (9) flock size, numbers of adults and juveniles, size of family parties, presence of field signs (droppings, feathers, etc.), and (10) comments with space for map.



## RESULTS

### Population Trends

#### Wexford

Between 1968/69 and 1980/81 the mean population has cycled between 4598 and 6212 with little long-term change in the population (Appendix 4). During the survey the spring census total increased from 6363 in 1982/83 to 7590 in 1984/85 (Table 1). The mean winter count has increased from 5550 to 6881 in the same period and in 1984/85 was the highest recorded since regular counting started (Appendix 2).

Sudden increases of 600-1,600 geese have been recorded annually since 1982/83 between early December and late January (Appendix 2). No corresponding decreases have been noted elsewhere in the wintering range and their migration route remains unknown. Most of the variation before and after the mid-winter influxes can be attributed to counting and coverage errors and little real change is thought to occur.

#### Rest of Ireland

Numbers increased (Table 1) between autumn and spring censuses by 14% in 1983/84 and 1984/85 (no autumn census in 1982/83). These increases are thought to be real, and due to continuing immigration into December (Appendix 3A). Spring census figures (Table 1) are higher (and more

TABLE 1: SUMMARY OF AUTUMN AND SPRING CENSUSES FOR WEXFORD, 'REST OF IRELAND' AND BRITAIN IN 1982/83, 1983/84 AND 1984/85.

	1982/83		1983/84		1984/85	
	Autumn	Spring	Autumn	Spring	Autumn	Spring
Wexford	4913	6363	4758	6267	6331	7590
Rest of Ireland	-	2994	2768	3231	2989	3355
Britain <sup>1</sup>	7189	7282	8188	7926	9490	<del>8862</del> 8952
TOTALS	-	16639	15714	17424	18810	<del>19807</del> 19,897

1,710

1,087

<sup>1</sup> Census results for Britain from Stroud (1983, 1984 and 1985).

accurate) than peak counts from December to March because longer days, better weather, larger flocks and increased effort to ensure complete coverage improve census efficiency. They have been used annually as minimum population estimates (Appendix 3B, Figure 1).

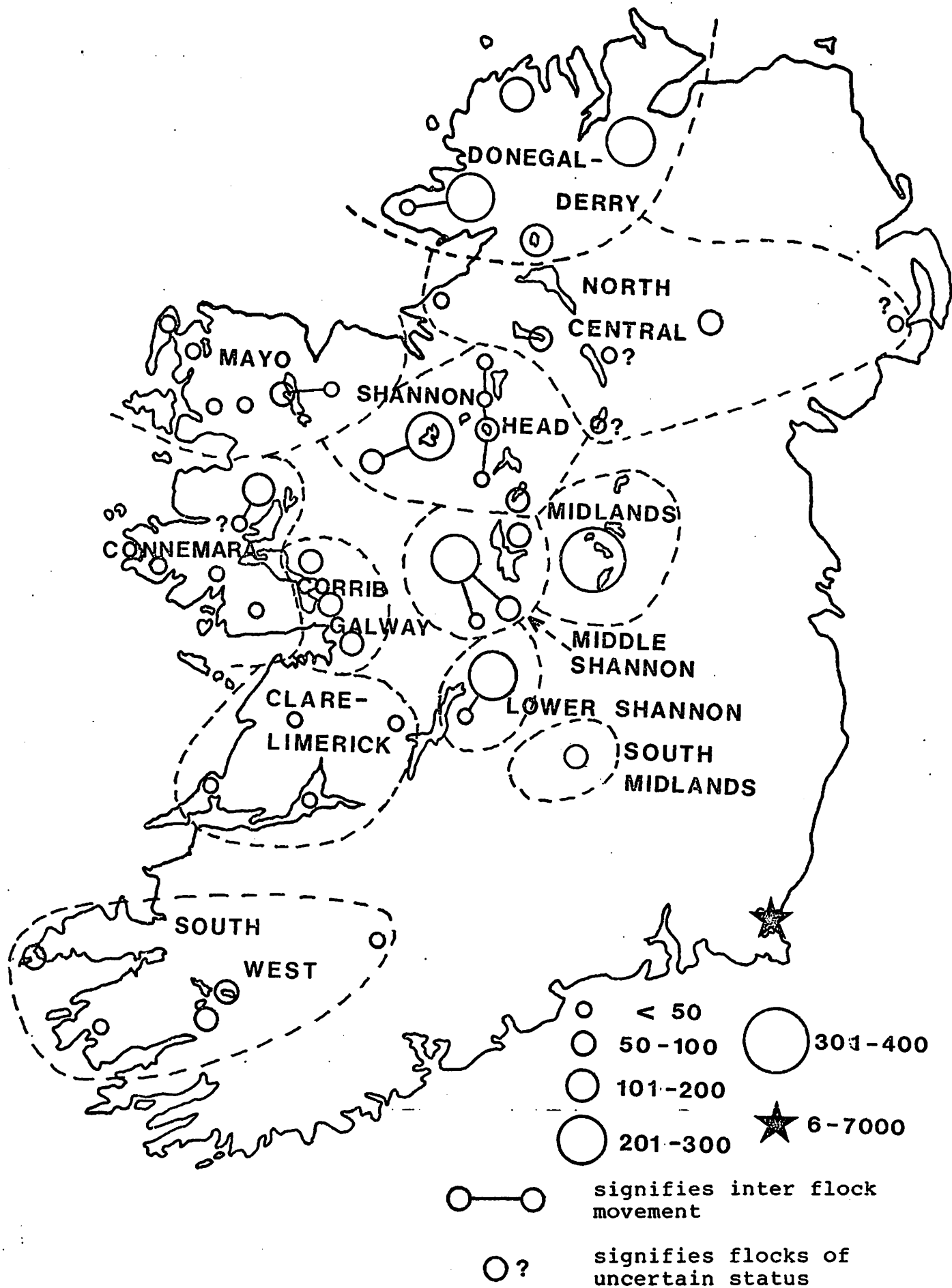
The spring census total has increased from 2994 in 1982/83 to 3355 in 1984/85 (Table 1). Improved coverage is thought not to have affected the figures. This population segment is now at least stable. It is possible that there has been a small increase (about 5%/year), but this lies within the limits of census accuracy.

#### Survey Coverage and Accuracy

##### Wexford

Coverage in early winter may have been incomplete during 1982/83 as some geese were found feeding on root crops away from the Slobs during the 1983/84 and 1984/85 surveys. However, with such a large flock, most inaccuracies stem from counting error. In 1983/84 a series of repeat counts was made using the same team and technique on consecutive days to assess accuracy. Repeat counts differed, with one exception when there was a major disturbance, by less than 7% (Appendix 2). Subsequently the standard procedure has been to repeat a count when it differed by more than 7% from the previous one.

FIG. 1: FLOCK DISTRIBUTION, SIZE AND REGIONAL BOUNDARIES (1985).



Rest of Ireland

Two flocks which were reported as previously undocumented (Norris and Wilson 1983) were in fact included in Rutledge and Ogilvie's (1979) paper (Rutledge, pers. comm.) otherwise the picture of distribution has remained much the same as Rutledge and Ogilvie (1979) reported for the mid-seventies. No new flocks have been found since. Altogether 570 goose sites <sup>are thought</sup> have been used since 1982. From the annual rates at which sites have been found it is estimated that 86% of all sites are now known, although our knowledge is less complete for the more dispersed feeding ranges of bogland flocks than for flocks on callows and farmland (Table 2). Our ability to find goose flocks is better than indicated by this figure however, since almost all the major sites are now known.

TABLE 2: CUMULATIVE NUMBERS OF GOOSE SITES LOCATED BY THE SURVEY FROM 1982/83 TO 1984/85 IN RELATION TO THE ESTIMATED TOTAL NUMBER OF SITES

Number of Sites	1982/83	1983/84	1984/85	Estimated Total No. of Sites <sup>1</sup>	% Found
Bogland Flocks	128	80 (208) <sup>2</sup>	46 (254)	310	82%
Others	167	39 (206)	28 (234)	260	90%
Totals all Flocks	295	119 (414)	74 (488)	570	86%

1 Cumulative totals in brackets

2 Derived from curves fitted by eye

A consistent feature of the better-counted flocks is the constancy of numbers both within and between winters. Although two flocks of 90-100 geese in Co. Kerry showed unaccountable decreases of approximately 50% between 1983/84 and 1984/85, other changes in flock size were mainly temporary movements to adjacent feeding ranges in response to disturbance and/or severe weather.

Counts of goose flocks were too often incomplete for an assessment of accuracy using normal statistical methods. However, the accuracy of counts and completeness of survey coverage may be judged by the mode, mean and range of complete flock counts. With perfect coverage and counting of discrete flocks, the values of mode, mean and maximum will be equal. In practice we have accepted a season's coverage as adequate when the mean, or occasionally the mode, approximated to the maximum three or more times and when the maximum winter count was close to the previous winter's maximum. Satisfactory coverage of the Shannon was achieved in 1984/85 (Table 3) by bringing in additional personnel for a series of locally-synchronised counts. Maximum population estimates (Appendix 3B) differed by 11.8% from the spring census figures for all flocks, except four in Co. Donegal where coverage (no. sites/field-worker) was least intense, goose numbers were high and there was a shift in site use between winters. This decrease in coverage accuracy of Donegal flocks (maximum-minimum estimates differed by 30%) had little effect on overall accuracy (14.5%).

TABLE 3: VARIABILITY OF COUNTS ON SELECTED FLOCKS IN THE 'REST OF IRELAND' 1984/85

Flock	Intensity of Coverage (No. sites/field worker)	No. Complete Counts	Mode (as % of max.)	No. Complete Counts Within Modal Range	Mean	Range	1983/84 Max.
Shannon A	11	5	90 - 100	3	149	84 - 174	174 <sup>1</sup>
Shannon B	4	6	30 - 40	4	27	15 - 60	
Shannon C	5	6	80 - 90	2	72	40 - 106	100
Shannon D	4	5	90 - 100	4	417	368 - 436	436
Shannon E <sup>2</sup>	6	32	90 - 100	8	196	5 - 299	313
Donegal A	9	4	90 - 100	2	85	38 - 120	93
Donegal B	30	7	80 - 90	4	146	66 - 185	310
Donegal C	9	6	90 - 100	3	79	44 - 112	104
Donegal D	30	6	60 - 70	3	21	22 - 23	80

<sup>1</sup> Movements between flocks A and B inferred.

<sup>2</sup> Best series of counts for 1984/85, but does not cover whole feeding range.

Breeding success

Recruitment on the Wexford Slobs during the three years of the survey has been close to the long-term mean ( $\bar{X}$  = 16.1% 1982/83 to 1984/85;  $\bar{X}$  = 15.9% 1970/71 to 1984/85) and has closely paralleled recruitment in the rest of Ireland ( $\bar{X}$  = 16.2%, Table 4, Fig.2). The latter has consistently shown a smaller mean brood size, with more broods of one and two than are found in Wexford or Britain (Appendix 5).

This rate of recruitment is low, particularly for a quarry species and is less than half that of European and American races of White-fronted geese (Ogilvie 1978).

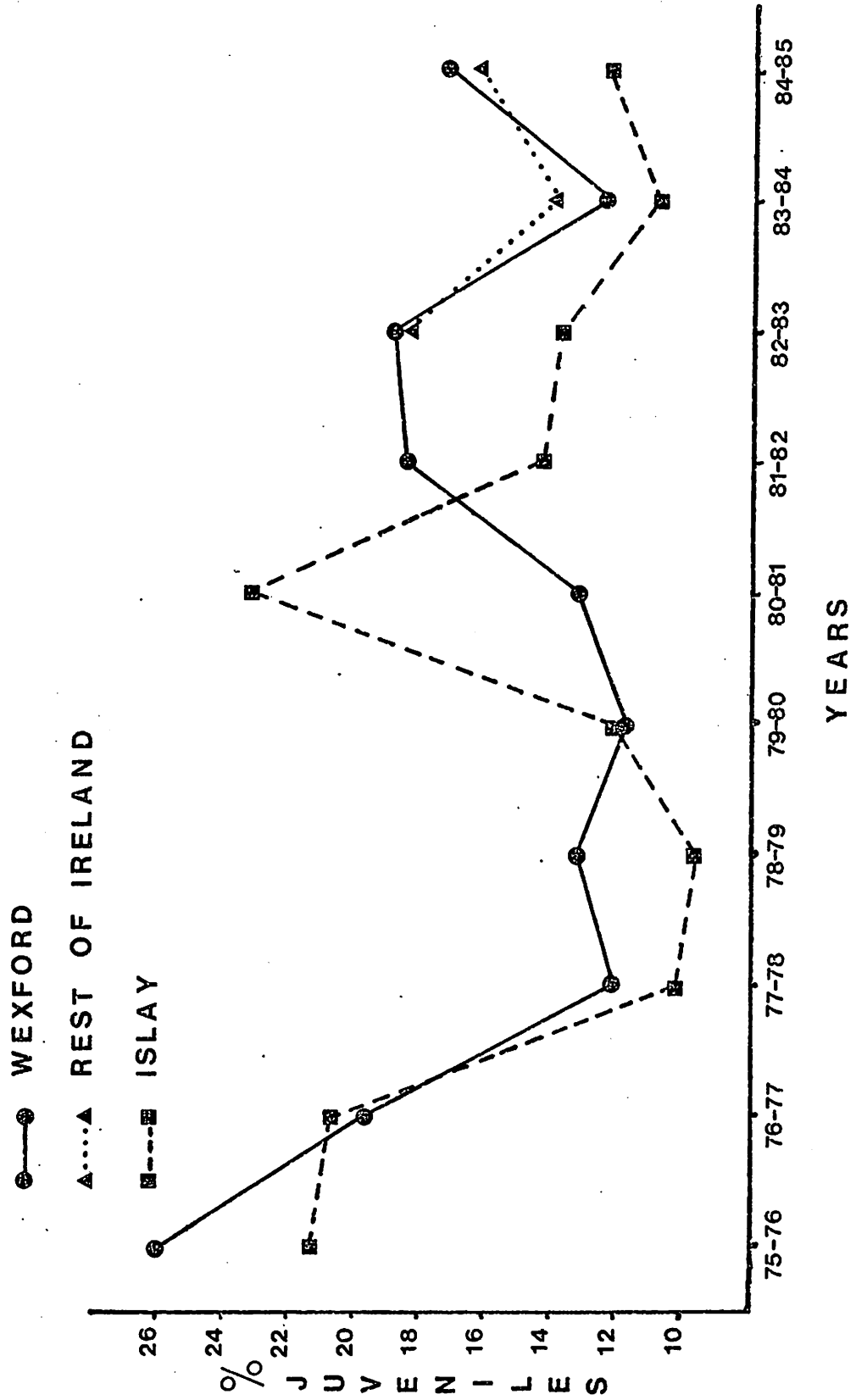
TABLE 4: SUMMARY OF AGE COUNTS FOR WEXFORD, 'REST OF IRELAND' AND BRITAIN IN 1982/83, 1983/84 AND 1984/85.

	1982/83	1983/84	1984/85
Wexford	18.8	12.3	17.2
Rest of Ireland	18.5	13.9	16.2
Britain <sup>+</sup>	12.9	9.9	12.1

<sup>+</sup> Age counts for Islay only, Stroud (1983, 1984 and 1985).



FIG. 2: ANNUAL PRODUCTIVITY ESTIMATES FOR THE WEXFORD, REST OF IRELAND AND ISLAY POPULATION SEGMENTS



### Shooting seasons and protection status

Historically the species has been hunted throughout its range. There has been a trend to reduce the length of shooting seasons in response to habitat loss and increased shooting pressure, culminating in either temporary closure of the season or complete protection, except in Iceland. Appendix 7 tabulates previous shooting seasons, the current regulations and the protection requirements of conservation legislation (see also Fig. 3).

### Shooting Mortality and Refuges

#### Wexford

Between 1971/72 and 1980/81 there was little long-term change in the population. Mean mortality for the period was 18.2% (derived from data in Appendix 4) whilst mean winter shooting mortality was 8.2% (Table 5).

Early season shooting bags in 1981/82 were small and the introduction of a cold-weather shooting ban resulted in a small overall bag for that season. In effect there has been little or no shooting in Wexford for the past four winters. Mean mortality since 1981/82 has decreased by 10.6% (Appendix 4) and may be accounted for by the elimination of winter shooting mortality. (Observed crippling loss in 1981/82 was 20% and has been used as a correction factor in all estimates of shooting mortality).

FIG. 3: SHOOTING STATUS OF THE GREENLAND WHITE-FRONTED GOOSE IN 1985.

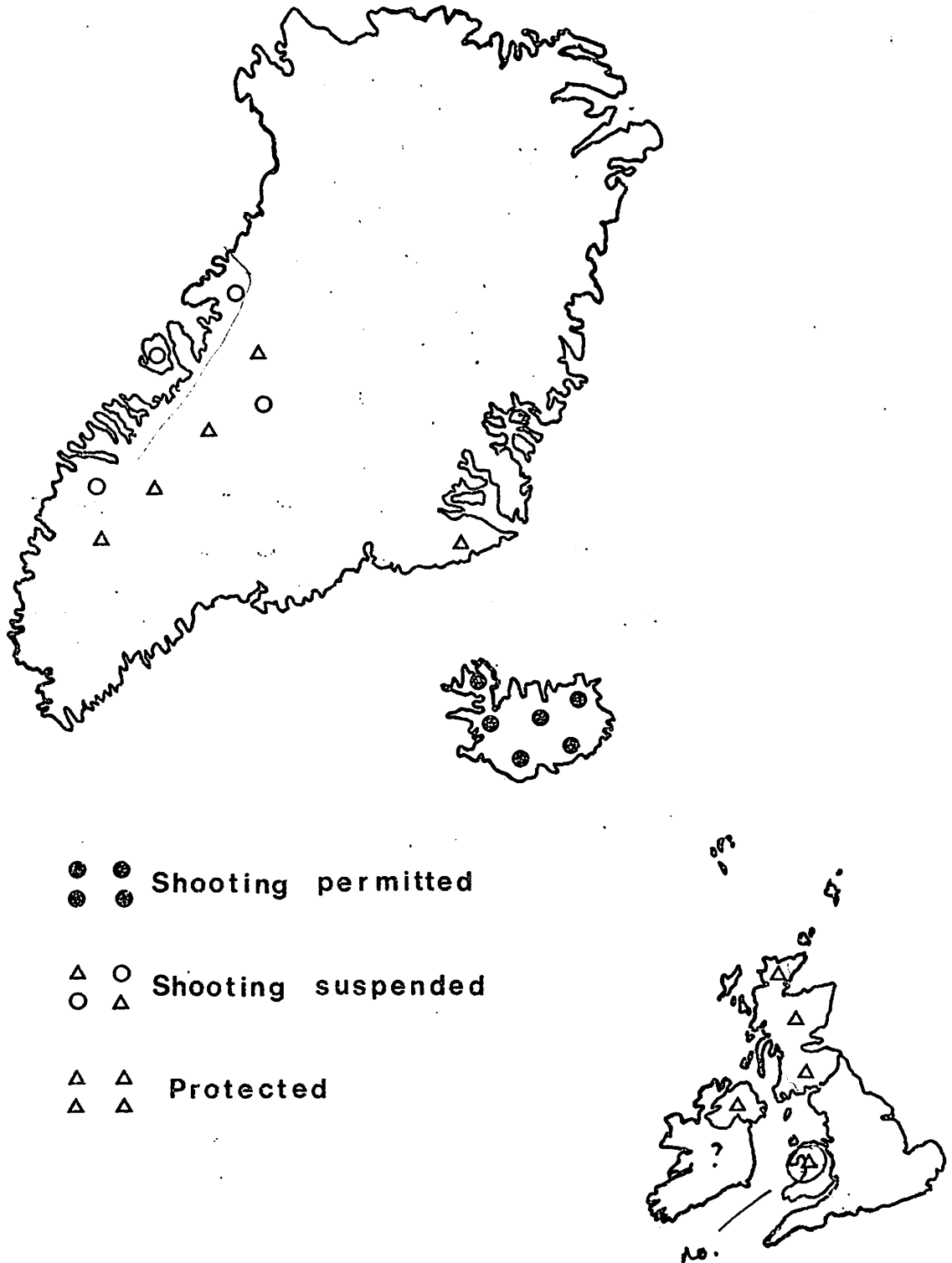


TABLE 5: SHOOTING MORTALITY ON THE WEXFORD SLOBS FROM  
1971/72 TO 1980/81

Year	No. Shot <sup>1</sup>	% Total Population Shot <sup>2</sup>
71/72	698	13.3
72/73	263	5.3
73/74	-	-
74/75	419	8.2
75/76	452	8.9
76/77	360	6.6
77/78	360+	6.4
78/79	507	10.0
79/80	366	7.1
80/81	480	10.4
		$\bar{X}^3 = 8.2$

- 1 The totals are derived from accurate records of North and South Slob shoots, estimates of bags in Wexford Harbour and small syndicate shoots on the North Slob and 20% crippling loss.
- 2 Mean of mid-November to mid-April counts.
- 3  $\sum$  losses (year t to tx)  $\div$   $\sum$  population number (year t-1 to tx-1).

## Rest of Ireland

There is insufficient data to estimate past shooting mortality in these flocks. However, the survey has recorded two instances of shifts in feeding range apparently associated with heavy hunting pressure.

Firstly, goose use (observed no. of goose-days) increased by 75% in Co. Clare between 1982/83 and 1983/84 and a number of traditional sites have been re-used for the first time in recent years. There has been no recorded habitat alteration of goose sites but shooting pressure and associated disturbance to the geese were particularly severe until the shooting moratorium.

Secondly, two large flocks of geese are based in no-shooting areas on the Shannon tributaries, Suck and Little Brosna. The adjoining Shannon between Athlone and Portumna has no sanctuaries and is scarcely used by the geese during the shooting season, despite its traditional importance. In all three years of the survey geese only moved out in numbers onto the Shannon at the end of the shooting season.

A comparison of the change in status of partly-protected and unprotected flocks has shown that geese with no-shooting areas within their range have increased by 37% whilst unprotected flocks have decreased by 35% between the 1970's and 1984/85 (Appendix 6). The difference may be due either to movement of geese into protected areas or to differential mortality rates in the two situations. ]

## DISCUSSION

### Wexford

The introduction of the shooting moratorium has resulted in a reduction in overall mortality equivalent to the mean winter shooting mortality prior to the moratorium. While there has been unexplained movement into Wexford in winter it would appear that shooting mortality is not compensatory. The best estimate of maximum sustainable yield is 8.2% (mean winter shooting mortality when there was little long-term change in population size), which is equivalent to an annual bag of 7.1% of the flock (8.2% less crippling rate of 20%).

In the absence of change in long-term recruitment and mortality rates, the Wexford flock may be expected to continue to increase by about 7-8% per year. As Greenland has introduced a shooting moratorium this year the Wexford flock may increase at a faster rate if the moratorium remains in force.

Not only has flock size increased, but geese have progressively concentrated on the farms of the North Slob during the last fifteen years. Small farmers may displace geese from crops with simple scaring devices while FBD, the major North Slob land-owner, supports increasingly heavy goose-use.

A continuation of the present population trend will result in aggravation of the existing conflict of interests there and hastens the categorisation of the species as a pest unless flock size is managed through controlled hunting.

#### Rest of Ireland

Coverage problems were encountered when censusing Greenland White-fronted geese in the north, west and midlands since many flocks split up and ranged over large areas. Inter-regional movement, problems of flock identification, incomplete coverage and non-synchronous counts resulted in variable peak monthly counts. Whilst a site inventory was being compiled, the intensity of coverage (no. sites/field-worker) was low. Subsequently the emphasis has shifted to a series of locally-synchronised counts involving additional personnel. Better coverage accuracy is reflected by a reduced count variability in 1984/85 (Appendix 3A).

Overall accuracy, as measured by the difference between maximum and minimum population estimates, is 14.5%. Improved accuracy is unlikely because of increasing survey costs and clarification of population trends will take several years of continued monitoring.

A feature of most of these flocks is their stability in numbers both within and between winters which together with the winter site fidelity of the species demonstrated in Scotland (Stroud 1983, 1985, Fox and Stroud, in prep.) suggest that they are discrete and separately vulnerable to local habitat loss, disturbance and shooting pressures.

A comparison of the change in status of protected and unprotected flocks (Appendix 6) and the change in distribution associated with two extreme examples of hunting pressure (see p. 20) show the importance of shooting pressure and disturbance. Rutledge and Ogilvie (1979) have pointed out the importance of raised bogs as refuges from disturbance, particularly on the Shannon between Athlone and Portumna. The exploitation of these raised bogs has continued since their paper was written, to the extent that this area of the Shannon is now of little use to geese during the shooting season without the provision of alternative refuges.

Ryan and Cross (1984) have documented the rapid loss of other categories of peatland habitats and this survey has found an alarming rate of destruction of western blanket bog goose sites (unpublished material). Whereas the flocks occupying these remaining boglands have been comparatively poorly counted, their feeding ranges and roost sites have been systematically surveyed and the most important complexes identified.

The creation of adequate refuges and the conservation of bogland roosts and feeding sites are of immediate importance in conserving several flocks.

Rutledge and Ogilvie (1979) estimated the total Irish population at 7,800 - 9,300. The Irish spring census total in 1982/83 (9357, Table 1) is close to the upper limit of



their estimate. A recent assertion by Coffey (1985) that the population was much larger than estimated at the time the ban was introduced is incorrect for the Irish segments of the population.

Ruttledge and Ogilvie (1979) reported that these flocks have declined substantially in the past, but there has been disagreement about the extent of the decline and suggestions that the decline was really a shift in wintering range to the Wexford Slobs, (Coffey, 1983) or Islay, (Hutchinson, 1979) in response to habitat loss. However, the increase in Wexford took place earlier than the decline in the rest of Ireland and Stroud and Fox (1985) attributed the apparent long-term increase on Islay until 1982/83 to better coverage. Ring recovery data (Owen 1980) show the Wexford flock and Scottish birds to have a common breeding range in Greenland, significantly different from the range of other Irish flocks. This analysis supports the conclusion of Stroud (1983) that 'any Scottish (or Wexford) increase is better explained in terms of lower winter mortality of (these) population segments', rather than by a shift in wintering range (Wilson and Norriss 1984a).

The loss of sites and disturbance pressures on geese in the rest of Ireland continue to be important, while a stemming and possible reversal of the decline coincided with the introduction of a shooting moratorium. The inference is that these flocks have been overshot prior to the shooting moratorium.

Since this population segment

- (1) is comparatively small (17% of the international spring census total), has a low recruitment rate ( $\bar{X}$  = 16.2%, 1982/83 to 1984/85) and, by analogy with Wexford, a low sustainable harvest rate,
- (2) has shown a substantial though unquantified decline until recently, but has at least stabilised since the introduction of a moratorium,
- (3) is divided into about 45 widely-dispersed, small flocks (Fig. 1: mean flock size 75, range 12-238),
- (4) is continuing to come under pressure from disturbance, compounded by habitat loss,

we would conclude that it is not able to withstand a re-opening of the shooting season, even in a restricted way.

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APPENDIX 1: SURVEY RECORDING CARD

GREENLAND WHITEFRONT SITE VISIT CARD				OFFICE USE ONLY																					
1. OBSERVER(S)				2. SITE NO. <span style="border: 1px solid black; padding: 2px;">2</span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>																					
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5. LOCATION				6. GRID REF. <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>																					
7. <u>SITE DESCRIPTION</u> Roost (A to H)/feeding (I to S) habitat used: <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> Other .....				8. <u>DISTURBANCE</u> Duration geese present (mins) <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>																					
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">A river</td> <td style="width: 50%; border: none;">J marsh</td> </tr> <tr> <td style="border: none;">B lake/pool</td> <td style="border: none;">K wet pasture</td> </tr> <tr> <td style="border: none;">C lake margin</td> <td style="border: none;">L flood meadow</td> </tr> <tr> <td style="border: none;">D island</td> <td style="border: none;">M dry pasture</td> </tr> <tr> <td style="border: none;">E blanket/raised bog</td> <td style="border: none;">N reseeded pasture</td> </tr> <tr> <td style="border: none;">F sand bank</td> <td style="border: none;">O stubbles</td> </tr> <tr> <td style="border: none;">G saltmarsh/mud flats</td> <td style="border: none;">P root crops</td> </tr> <tr> <td style="border: none;">H other (specify)</td> <td style="border: none;">R salt marsh</td> </tr> <tr> <td style="border: none;">I blanket/raised bog</td> <td style="border: none;">S other (specify)</td> </tr> </table>				A river	J marsh	B lake/pool	K wet pasture	C lake margin	L flood meadow	D island	M dry pasture	E blanket/raised bog	N reseeded pasture	F sand bank	O stubbles	G saltmarsh/mud flats	P root crops	H other (specify)	R salt marsh	I blanket/raised bog	S other (specify)	Number of disturbance flights: due to agriculture <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> shooting <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> aircraft <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> other (specify) <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> ..... Did geese leave area because of disturbance (Yes/No) <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>			
A river	J marsh																								
B lake/pool	K wet pasture																								
C lake margin	L flood meadow																								
D island	M dry pasture																								
E blanket/raised bog	N reseeded pasture																								
F sand bank	O stubbles																								
G saltmarsh/mud flats	P root crops																								
H other (specify)	R salt marsh																								
I blanket/raised bog	S other (specify)																								
Feeding Site Flooded (Yes/No) <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>																									

9. <u>COUNT DATA</u>		FLOCK SIZE <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>				FIELD SIGNS ONLY <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>				
NUMBER ADULTS AGED <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>		NUMBER JUVENILES AGED <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>								
COMPLETE BROODS IDENTIFIED:-										
Brood Size		1	2	3	4	5	6	7		
Number of Broods <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span> <span style="border: 1px solid black; padding: 2px;"> </span>										
10. <u>COMMENTS</u>										
PLEASE RETURN TO: J. WILSON, GWF SURVEY, 2 SIDMONTON PLACE, BRAY, CO. WICKLOW.										

APPENDIX 2: COUNTS AND INTERNATIONAL CENSUSES ON WEXFORD SLOES, 1982/83 to 1984/85.

1982-83			1983-84			1984-85		
Date	Count	Mean	Date	Count	% Diff.	Date	Count	% Diff.
17-11-82	4913	5113	19-11-84	4795	4707	19-11-84	6571	6097
10-12-82	5290		30-10-83	4569		22-11-84	6325	
5-1-83	5015		11-11-83	4758		29-11-84	6331	
18-1-83	5232		22-11-83					
11-2-83	5749		19-12-83	6275		17-12-84	4926*	
1-3-83	5888		12-1-84	6553	5.4%	18-12-84	7918	37.8%
15-3-83	5644		15-2-84	6499		19-12-84	7073	
22-3-83	5783	5799	16-2-84	6145		14-1-85	7304	
30-3-83	5632		13-3-84	6595	0.2%	12-2-85	7174	4.3%
5-4-83	6363		14-3-84	6606		13-2-85	7499	
14-4-83	5536		2-4-84	5759*	8.1%	11-3-85	6986	1.8%
			3-4-84	6267		11-3-85	7113	
						1-4-85	7590	

\* Major disturbances during count. Asterisked counts excluded from calculation of means Autumn and Spring censuses underlined.

APPENDIX 3 (A): REGIONAL SUMMARY OF PEAK MONTHLY COUNTS AND CENSUSES FOR 1982/83 (NORRISS AND WILSON 1983), 1983/84 (WILSON AND NORRISS 1984b) and 1984/85. (REGIONAL BOUNDARIES SHOWN IN FIG. 1).

<u>1982-83</u>	Nov.	Dec.	Jan.	Feb.	March	Spring Census
Donegal/Derry	475	418	630	482	595	<u>642</u>
N. Central	141	(156)	(163)	(122)	178	<u>174</u>
Mayo	132	109+	96+	154	118	( <u>199</u> )
Connemara	226	126	109	189	137+	<u>140</u>
Corrib/Galway	149	180+	222	233	209+	<u>187</u>
Clare/Limerick	1	68	102	110+	56+	<u>46</u>
Shannon Head	223	235	327	148	(314)	( <u>335</u> )
Midlands	160	276	264	271	366	<u>338</u>
Middle Shannon	320+	184	133	344	257	<u>358</u>
Lr. Shannon	192	322	359	317	304	<u>374</u>
South Midlands	40	60	77	70	80	<u>47</u>
South West	265	246+	202+	(200)	(200)	<u>154</u>
<b>TOTALS</b>	<b>2,324</b>	<b>2,380</b>	<b>2,684</b>	<b>2,640</b>	<b>2,814</b>	<b><u>2,994</u></b>

<u>1983-84</u>	Autumn Census	Dec.	Jan.	Feb.	March	Spring Census
Donegal/Derry	<u>603</u>	514+	640	(610)	642	<u>713</u>
N. Central	<u>96</u>	(132)	73+	(62)	<u>110</u>	( <u>110</u> )
Mayo	<u>219</u>	164	144	166	122	<u>190</u>
Connemara	<u>143</u>	(59)	(125)	(132)	(132)	<u>113</u>
Corrib/Galway	<u>196</u>	194	194	204	199	<u>198</u>
Clare/Limerick	<u>86</u>	101	85	115	185+	<u>96</u>
Shannon Head	<u>344</u>	419	397	(472)	334	<u>438</u>
Midlands	<u>208+</u>	207+	218+	230	276	<u>250</u>
Middle Shannon	<u>322</u>	166	545	312	308	<u>460</u>
Lr. Shannon	<u>310</u>	351	271	330+	313	<u>393+</u>
South Midlands	<u>35</u>	45	60	70	60	<u>55</u>
South West	<u>206</u>	236+	196	206	233	<u>215</u>
<b>TOTALS</b>	<b><u>2,768</u></b>	<b>2,588</b>	<b>2,948</b>	<b>2,909</b>	<b>2,914</b>	<b><u>3,231</u></b>

APPENDIX 3A (contd.)

<u>1984-85</u>	Autumn Census	Dec.	Jan.	Feb.	March	Spring Census
Donegal/Derry	<u>557</u>	480	412	621	<u>610</u>	(540)
N. Central	<u>96</u>	147	124	104	56	<u>152</u>
Mayo	<u>202</u>	157	179	146	(118)	<u>193</u>
Connemara	<u>190</u>	139	154	204	68	<u>192</u>
Corrib/Galway	<u>144</u>	199	206	237	230	<u>221</u>
Clare/Limerick	<u>96</u>	79	114	74	79	<u>146</u>
Shannon Head	<u>501</u>	528	602	585	553	<u>538</u>
Midlands	<u>250</u>	342	320	78	<u>325</u>	200
Middle Shannon	<u>436</u>	447	368	471	396	<u>493</u>
Lr. Shannon	<u>299</u>	215	293	296	299	<u>281</u>
South Midlands	<u>35</u>	50	200	56	60	<u>58</u>
South West	<u>183</u>	131	156	146	135	<u>146</u>
<b>TOTALS</b>	<u><b>2,989</b></u>	<b>2,914</b>	<b>3,128</b>	<b>3,018</b>	<b>2,929</b>	<u><b>3,355</b></u>

Counts in brackets are estimates where not all flock(s) were counted. Underlined counts have been used in calculating autumn and spring census totals.

(B): MAXIMUM-MINIMUM ESTIMATES FOR THE 'REST OF IRELAND'  
POPULATION SEGMENTS

	Max.	Min.
1982/83	3,583	2,994
1983/84	3,708	3,231
1984/85	3,924	3,355

Maximum population estimates have been calculated on the assumption of separate flock identities where these remain unclear and the peak winter count of each flock or region as seemed most appropriate. Minimum estimates are based on spring census figures.



APPENDIX 4: SUMMARISED COUNT AND PRODUCTIVITY DATA FOR THE  
WEXFORD SLOBS FROM 1968/69 to 1984/85

Year	Mean <sup>1</sup> (n) (mid-Nov. to mid-Apr)	Range	Percentage Juveniles <sup>2</sup> (n)	Mean Brood Size <sup>2</sup> (n)
1968-69	5090 (46)	3831-6244	(15.4 (1))	(4.16 (45))
1969-70	5716 (58)	4594-7284	(32.5 (4))	(4.05 (94))
1970-71	6212 (55)	5257-6910	15.1 (4)	3.72 (78)
1971-72	5252 (47)	4413-5933	14.8 (1)	3.19 (64)
1972-73	5001 (44)	3966-5565	12.7 (1)	3.11 (46)
1973-74	4836 (22)	3769-5206	15.8 (1)	3.18 (75)
1974-75	5141 (26)	4182-5800	17.7 (1)	3.40 (162)
1975-76	5058 (29)	2364-5769	25.8 (1)	3.82 (132)
1976-77	5417 (31)	4263-6504	19.6 (1)	3.78 (123)
1977-78	5632 (31)	4726-6715	12.1 (2)	3.58 (86)
1978-79	5074 (24)	3569-5798	13.2 (1)	2.94 (124)
1979-80	5191 (23)	3718-6076	11.8 (1)	2.82 (56)
1980-81	4598 (19)	3189-5267	13.2 (1)	2.44 (63)
1981-82	5158 (13)	4075-5725	18.4 (2)	3.64 (192)
1982-83	5550 (11)	4913-6363	18.8 (3)	3.62 (312)
1983-84	6004 (10)	4569-6595	12.3 (1)	3.37 (128)
1984-85	6881 (12)	4926-7918	17.2 (2)	3.53 (249)
MEAN			15.9 <sup>3</sup>	

- 1 Data for 1968/69 to 1981/82 from Merne (1969-80 and unpublished records).
- 2 Definitive figures (recalculated from original data) as errors found in published literature.
- 3 Excludes 1968-69 and 1969-70 productivity estimates because of small sample sizes.

APPENDIX 5: AGE COUNTS AND FREQUENCY DISTRIBUTION OF BROOD SIZES FOR WEXFORD, 'REST OF IRELAND' AND BRITAIN IN 1982/83, 1983/84 AND 1984/85

Date and Location	Total Aged	% Juvs.	Mean Brood Size	Number Broods	Brood size							Calculated Totals of	
					1	2	3	4	5	6	7	Young	Families
<u>1982-83</u>													
Wexford													
25-11-82	3540	19.5	3.31	130	6	22	50	35	13	3	1	1196	330
17-12-82	3283	17.8	3.54	72	0	20	17	14	18	3	0		
8- 3-83	3313	18.9	4.09	110	2	13	28	22	27	13	4 <sup>1</sup>		
Rest of Ireland	1445	18.5	2.50	72	16	21	22	10	2	1	0	560	224
Britain <sup>2</sup>													
Autumn '82	2933	13.5	2.95	107	-	-	-	-	-	-	-	971	329 <del>983</del>
Spring '83	1760	13.5	3.01	65	-	-	-	-	-	-	-	983	327
<u>1983-84</u>													
Wexford													
15-12-83	4399	12.3	3.37	128	9	26	37	31	17	5	3	771	229
Rest of Ireland	2030	13.9	2.40	81	24	28	13	9	4	2	1	449	187
Britain <sup>2</sup>													
Autumn '83	3509	9.7	2.57	128	27	42	33	16	5	5	0	794	309 <del>725</del>
Spring '84	3100	10.2	2.51	123	42	27	26	11	11	6	0	764	305
<u>1984-85</u>													
Wexford													
15-11-84	3656	18.7	3.46	120	8	25	32	26	20	5	4	1305	370
20- 2-85	4964	16.1	3.58	129	2	26	40	25	30	4	2		
Rest of Ireland	1763	16.2	2.58	118	26	34	35	14	5	3	1	544	211
Britain <sup>2</sup>													
Autumn '84	3822	13.9	2.95	152	31	31	37	30	16	4	3	1319	447 <del>1028</del>
Spring '85 <sup>3</sup>	1010	12.9	2.62	48	10	14	14	5	4	1	0	-	-

- 1 Single brood of 8 recorded
- 2 From Stroud (1983, 1984 and 1985)
- 3 Figures for Islay only

878  
Σ = 900

APPENDIX 6: COMPARISON OF POPULATION CHANGES<sup>1</sup> BETWEEN NO-SHOOTING AREAS AND UNPROTECTED FLOCKS, REST OF IRELAND, 1970'S AND 1984/85.

	1970's <sup>2</sup>	1984/85	% Change
Flocks in no-shooting areas <sup>3</sup>	1085	1733	+37%
Unprotected flocks <sup>4</sup>	1220	791	-35%

1 Maximum counts used

2 Data from Ruttledge and Ogilvie (1979)

3 No-shooting areas established 1970-1976

4 Includes only the better-counted flocks on callows and farmland

APPENDIX 7: PAST AND PRESENT SHOOTING SEASONS AND CURRENT PROTECTION STATUS OF THE GREENLAND WHITE-FRONTED GOOSE

COUNTRY	PERIOD	SEASON	COMMENT
<u>Republic of Ireland</u>	up to 1977	1 Sept. to 31 Jan.	Extended season to end of February on South Slob, Co. Wexford ceased with implementation of the Wildlife Act in 1976
	1977 - 1980	1 Oct. to 31 Jan.	
	1980 - 1982	15 Nov. to 31 Jan.	Cold weather shooting ban from 13 to 31 Jan 1982 closed season early. Statutory suspension of shooting for 3 seasons
	1982 - 1985	Protected	
<u>Northern Ireland</u>	up to 1985	1 Sept. to 31 Jan.	Voluntary ban operated by wildfowling clubs for past 4 or 5 seasons.
	1985	Protected	Statutory protection afforded under The Wildlife (NI) Order, SI 1985/171 (NI 2).
<u>Britain</u> (a) England and Wales	1954 - 1985	1 Sept. to 20 Feb.+	The Wildlife and Countryside Act (1981) recognises an open season for White-fronts. In practice applies to European White-front as only regularly used GWF site (Wales) protected by local (not statutory) agreement since 1972.
	(b) Scotland	1954 - 1982	
	1982	Protected	Protected by the Field and Countryside Act in 1982. Illegally shot annually in small numbers under licences issued by Dept. of Agr. and Fish., Scotland to control Barnacle Geese on Islay only.
<u>Iceland</u>	1966 - 1985	20 Aug. to 15 Mar.	Traditionally hunters concentrate on the more accessible Greylag and Pink-foot populations. In theory only autumn hunting possible as spring passage occurs after 15 Mar., but ring recoveries show that limited hunting in spring exists (Fox et al 1983). Full protection being considered presently.

APPENDIX 7: (contd.)

COUNTRY	PERIOD	SEASON	COMMENT
<u>Greenland</u>	up to 1985	"arrival - 15 June" 15 August - "departure"	Traditionally hunted throughout 'summer' period. Lately (circa 1970) protected during period of incubation and moult (15 June-15 August), permitting shooting upon arrival and in autumn. (Ruttledge and Ogilvie 1979).
	1985	Protected	Full protection granted in spring 1985, but conditional upon decisions reached in Ireland. To be reviewed in February 1986.

+ Hunting below high water mark (foreshore) permitted between 1-20 February throughout Britain.

PROVISIONS OF INTERNATIONAL DIRECTIVES AND CONVENTIONS.

EEC Bird Directive: Recognises the species' small population size, low productivity and recent quarry status by including it in Annex 1 (as a vulnerable species), Annex II/2 (as a huntable species) and Annex III/3 (as a species requiring further study).

Article 4 requires that Annex 1 species "shall be the subject of special conservation measures concerning their habitat", that Ireland "shall classify in particular the most suitable territories in number and size as special protection areas for the conservation of these species" and within the special protection areas shall take appropriate steps to avoid pollution or deterioration of habitats and disturbance.

Berne Convention or 'Convention on the Conservation of European Wildlife and Natural Habitats' (Council of Europe): This Convention, ratified by Ireland, places the species in Appendix 3 which requires that special attention is given to the protection of areas where it occurs, that "appropriate and necessary legislative and administrative measures" are taken to ensure protection and that any exploitation shall be carried out in a regulated fashion.