# The Survival of White-fronted Geese (*Anser albifrons flavirostris* Dalgety & Scott) Ringed in Greenland.

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(Med et dansk resumé: Levealderen hos den Grønlandske Blisgås (*Anser albifrons flavirostris* Dalgety & Scott)).

In the years 1946 to 1956 835 White-fronted Geese, *Anser albifrons flavirostris* Dalgety & Scott were ringed in West Greenland. One hundred and ninety-three of these birds had been recovered by the spring of 1957. Ringing and recovery details of those found away from Greenland have already been published by Dr. Finn Salomonsen in a series of communications (Salomonsen 1947–57), and the writer is indebted to him for supplying records of geese recovered in Greenland, which have not yet been published in detail. These recoveries can be used to provide preliminary estimates of the losses suffered by the ringed geese, which are of some interest when compared with the rather more complete statistics available for British-ringed Whitefronts of the race *A. a. albifrons* (Boyd 1957b) and for the Pink-footed Goose *Anser brachyrhynchus* (Boyd 1956, Scott, Boyd ans Sladen 1955).

The breeding range of *A. a. flavirostris* extends along the western side of Greenland from about 64° N to 72°30′ N. Geese have been caught for ringing at sixteen localities from 65°50′N to 72°28′ N, although the ringing effort has been greatest in Sarqaq-Dalen (70°6′ N, 52°8′ W), so that the marked geese should be fairly representative of the population as a whole. Most of the ringing was done in the years 1946–1950, 237 in 1947 being the largest annual total. In most of the calculations which follow, recoveries of birds ringed in 1951 or later have been excluded, since they are relatively few and complicate the calculations without improving their reliability.

## Adult Survival.

At least 575 (69 %) of the geese were goslings still too young to fly when they were ringed. One hundred and twenty-three were known to be full grown (*utoqaq*) when marked.

Dr. SALOMONSEN considers that most of these were one-year-olds, rather than sexually mature adults. The age of 137 others was not reported by the ringers. Thus the ringed sample is heavily biased in favour of young birds and it is necessary to allow for this bias in calculating the survival of different age-classes.

Table 1 records the distribution in time of the recoveries so far reported of birds ringed in the years 1946–1950. The intervals are years from the date of ringing. No distinction between the geese ringed before fledging and older geese is made here. This method of grouping is unusual but is adopted in order to make use of as much of the data as possible. It has not been practicable to distinguish recoveries of birds ringed before fledging from those of older birds because the information on summer recoveries in Greenland does not include details of age at marking. Inspection of the table shows that recoveries in the first two years after ringing are disproportionately heavy. The preponderance of early recoveries may be presumed to reflect the greater vulnerability of young birds (which has been demonstrated for all species so far studied). For the purpose of estimating adult mortality the numbers of recoveries in the first two years of the ringing may be rejected and the remainder of the recovery series treated as if the birds had been ringed after two additional years of life. This truncated recovery series decreases less regularly than would be expected on the assumption that the survival of mature birds does not vary with age. The irregularities are probably due to significant variations in mortality between one calendar year and another, as well as to the element of chance involved in reporting members of so small a population, but as a first approximation in the light of knowledge of other species it seems permissible to assume survival independent of age after the first two years. On this assumption the annual survival $s\ (= 1 - d$, where $d$ is the fraction killed annually) can be calculated to be $0.661 \pm 0.036$. (The method of estimation of the survival and its standard error is that due to LACK and extended by HALDANE (1955). HALDANE's correction for ringed birds still alive at the close of the study period has not been used: the estimate yielded by that procedure fits the observed

TABLE I.
Recovery series for White-fronted Geese ringed in Greenland in 1946–50.
Year intervals from date of ringing. Age at marking ignored.

| Year of Marking | Number Marking | Recovered after *n* years 0–1 | 1–2 | 2–3 | 3–4 | 4–5 | 5–6 | 6–7 | 7–8 | 8–9 | 9–10 | Total recovered |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1946 | 65 | 14 | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 20 |
| 1947 | 237 | 24 | 16 | 9 | 5 | 1 | 2 | 5 | 2 | 4 | .. | 68 |
| 1948 | 187 | 26 | 9 | 4 | 4 | 1 | 0 | 1 | 1 | .. | .. | 46 |
| 1949 | 111 | 4 | 4 | 3 | 3 | 1 | 1 | 4 | .. | .. | .. | 20 |
| 1950 | 49 | 9 | 3 | 3 | 1 | 1 | 0 | .. | .. | .. | .. | 17 |
| | 649 | 77 | 35 | 20 | 14 | 4 | 3 | 10 | 4 | 4 | 0 | 171 |

TABLE II.
Distribution of recoveries.

| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | No reliable date | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Greenland.. | 5 | 2 | .. | .. | .. | .. | .. | .. | .. | 11 | 6 | 25 | .. | 49 |
| Iceland .... | .. | .. | 2 | .. | 1 | .. | .. | 1 | .. | 5 | .. | .. | .. | 9 |
| Ireland .... | .. | .. | 4 | 28 | 29 | 28 | 24 | 3 | .. | 1 | .. | .. | 3 | 120 |
| Scotland ... | .. | 1 | 1 | 4 | 1 | 3 | .. | 1 | .. | .. | .. | .. | .. | 11 |
| England ... | .. | .. | .. | 1 | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 2 |
| Wales .... | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 1 |
| Canada .... | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| Total... | 5 | 3 | 8 | 33 | 31 | 33 | 24 | 5 | 0 | 17 | 6 | 25 | 3 | 193 |

data much less well and, in view of the high recovery rates, it is unlikely that many of the birds ringed in 1948 and 1950 were still alive in 1957, though the 1949 class may still contribute several records).

Corresponding estimates for other British-wintering grey goose populations are: $0.72 \pm 0.106$ for *A. a. albifrons* (Boyd 1957b), $0.74 \pm 0.016$ for *A. brachyrhynchus* (Boyd 1956) and $0.77 \pm 0.022$ for *A. anser* (Boyd 1957a).

An approximate measure of survival in the first year after ringing of birds marked while still too young to fly may be obtained from the recovery series. There have been 90 recoveries abroad of geese marked before fledging. Forty-one of these recoveries were reported within a year of ringing, compared with $90 \times .339 = 30.6$ expected on the assumption that young birds survive as well as adults. This discrepancy indicates that losses in the first year after ringing (corresponding roughly to 1–13 months after hatching) may be of the order of 46 %, compared with 34 % of mature birds.

A similar calculation suggests that losses between 13 and 25 months after hatching are of the order of 43 %.

## The Distribution of Annual Losses.

Table 2 records how recoveries have been distributed through the months of the year and in what countries the ringed geese have been found. It would be rash to assume without further evidence that this distribution corresponds accurately to the occurrence of losses among the ringed geese, and it is even less likely to represent the unmarked population. Recoveries may mislead for several reasons. First, because they are largely confined to birds killed by man and losses might be extensive from other causes and could occur in a different sequence. Second, people killing geese may be more or less liable to report them according to where they live and whether killing is legally permitted at the time of shooting. Third, because the majority of the geese ringed have been young ones: if increasing experience makes them harder to kill, recoveries may exaggerate the apparent importance of losses among the mature population in late summer and autumn.

Among 134 recoveries in the British Isles, 129 (96 %) were

of birds shot. Seven of these were found wounded or dead by persons other than the shooter. Two birds were found killed by collision with overhead wires, two more were "found dead", no cause being given, and the remaining ring was found without any trace of the bird. Seven of the nine Iceland recoveries were from geese that had been shot, the other two being found dead (one eaten by a Raven). Details of the cause of death of those geese found in Greenland are not available, but the great majority are known to have been due to man. However, it would be surprising if natural deaths were as rare as this evidence suggests. Losses due to predators during the summer and from bad weather on the long migratory flights are unlikely to be represented. In many places and in most years these may be inconsiderable, but they may occasionally become important.

Attempts to estimate the relative magnitude of natural losses and of the human kill by comparing variations in reported summer losses with those reported in preceding winters, and by similar comparisons between successive years, have been unsuccessful. There is a general tendency for heavy reported casualties in one season to depress the number of recoveries subsequently reported, but the data are too few and too erratic to yield useful quantitative results, although this tendency is consistent with the view that natural losses may nowadays be small relative to those inflicted by man. Further support for this view may be found in the very high cumulative recovery rates for those geese ringed in the early years of the Greenland scheme. Recoveries of geese ringed in 1946–1948 now amount to no less than 27.4 %, a far higher proportion than has been obtained from other geese wintering in Britain.

The clear inference from Table II that Ireland is by far the most important wintering place of this population is not, of course, a new one. The small scale of the admitted kill in Ireland in March and April is of some interest, but the apparently light shooting pressure on this population in September and October is even more striking to anyone aware of the fate of other species of grey geese which arrive in Britain and North-west Europe earlier than the Greenland White-fronts.

The peak of recoveries in Greenland in July indicates that considerable losses are inflicted on full-grown birds at this time. No recoveries of newly-ringed goslings are included in this July total, though there are three in the five August recoveries. The recovery series for geese killed in Greenland does not suggest that young pre-breeders suffer heavier losses than mature geese during the summer.

A search for possible differences in the distribution of the recoveries outside Greenland of geese ringed in different localities has yielded one unexpectedly clear-cut result. The 120 recoveries in Ireland include no fewer than 69 from Wexford (in the south-east), the remainder being distributed among fifteen other counties, with twelve from Galway the second largest regional total. This distribution of recoveries is consistent with the known distribution of the species in Ireland (KENNEDY, RUTTLEDGE and SCROOPE 1954) which occurs in much larger numbers in Wexford than elsewhere. No less than 65 of the 69 recovered in Wexford were ringed north of 69° N (46 in Sarqaq-Dalen) whereas among the recoveries elsewhere in Ireland geese ringed north of 69° N contributed only 13, as compared with 38 from more southerly catching places.

There are no clear indications of segregation elsewhere in Ireland: the twelve recoveries in Galway, for example, include three from northern summer localities and nine from southern ones. Recoveries in Scotland are still too few to yield conclusive results, but include eight northern-breeding geese and only three from south of 69° N.

These findings are of interest because White-fronted Geese have been increasing in Wexford in winter during the last twenty years or more, while they have been extending their breeding range northward into the Upernavik District (FENCKER 1950, SALOMONSEN 1950). The increase in the north of the breeding range has been attributed to the amelioration of the climate. Unfortunately the recovery data are not yet sufficient to establish whether the survival of geese from the northern and southern breeding groups differs at present.

The recoveries do not suggest that pre-breeders, in their second or third winters, tend to stray from the established

winter haunts of their parents, to which the young birds were taken in their first winter. If this negative result is confirmed it will be in contrast to the behaviour of the British-wintering population of *A. brachyrhynchus*, in which pre-breeders have been shown to breakaway from parental traditions (BOYD 1955). Highly conservative breeding groups, with relatively stable wintering habits, seem likely to be more vulnerable than less attached groups, even though pioneering increases the risk to the individual.

## Conclusion.

This inquiry has shown that the Greenland White-fronted Goose resembles other populations of *Anser* in the mortality experience of adults and of young birds after fledging. For a fuller understanding of the dynamics of the species, further investigations into breeding success are essential. But it also appears that continued ringing of adult and young geese can be expected to yield valuable results, particularly in comparing the success of different groups within the population. Marking of these geese in winter would increase the rate of development of such studies.

## DANSK RESUMÉ

### Levealderen hos den Grønlandske Blisgås (*Anser albifrons flavirostris* Dalgety & Scott).

Et samlet antal på 193 genfangster blandt 835 Grønlandske Blisgæs ringmærket i perioden fra 1946 til 1956 er anvendt til udarbejdelsen af et foreløbigt skøn over levealderen hos denne fugl. Det procentvise antal, der årligt overlever blandt gæs som er over to år gamle, er udregnet til 0,661 $\pm$ 0,036, d. v. s. at omkring 34 % omkommer årligt. Dette tal svarer til dem, der er udregnet for andre populationer af gæs, der overvintrer på de Britiske Øer. Tabet af ungfugle i det første år efter ringmærkningen andrager rimeligvis omkring 46 %, og hos de toårige fugle omkring 43 %.

Skydning er næsten i alle tilfælde angivet som dødsårsag, og genfangstprocenten er usædvanlig høj. De fleste omkommer mellem oktober og februar (på Irland) og i juli (i Grønland). De blisgæs som yngler nord for 69° nordl. br. synes om vinteren at samles i Co.Wexford, Irland, mens de der yngler længere mod syd spreder sig mere om vinteren. Den nordlige ynglepopulation synes at tiltage i antal.

For at give et mere fuldstændigt billede af forandringerne i populationerne er det imidlertid nødvendigt at foretage yderligere ringmærkning om vinteren såvel som på ynglepladserne.

## Literature Cited.


BOYD, H. 1955: The Rôle of Tradition in Determing the Winter Distribution of Pinkfeet in Britain. – Wildfowl Trust Seventh Annual Report, p. 107–122.

— 1956: Statistics of the British Population of the Pinkfooted Goose. J. Anim. Ecol. **25**, p. 253–273.

— 1957a: Recoveries of British-ringed Greylag Geese. – Wildfowl Trust Eighth Annual Report, p. 51–54.

— 1957b: Mortality and Fertility of the White-fronted Goose. – Bird Study **4**, p. 80–93.

FENCKER, H. 1950: Den grønlandske Blisgås (*Anser albifrons flavirostris* Scott & Dalgety) og dens ynglebiologi. – Dansk Ornith. Foren. Tidsskr. **44**, p. 61–65.

HALDANE, J. B. S. 1955: The Calculation of Mortality Rates from Ringing Data. – Acta XI Congr. Internat. Orn. p. 454–458.

KENNEDY, P. G., RUTTLEDGE, R. F. and SCROOPE, C. F. 1954: The Birds of Ireland, p. 79–80. – Edinburgh.

SALOMONSEN, F. 1950: Grønlands Fugle (*The Birds of Greenland*), pt. 1, pp. 56–64. – Copenhagen.

— 1947–1957: First-Seventh Preliminary List of Recoveries of Birds Ringed in Greenland. – Dansk Ornith. Foren. Tidsskr. **41**, 1947, p. 141; **42**, 1948, p. 100; **43**, 1949, p. 251; **44**, 1950, p. 168; **46**, 1952, p. 110; **49**, 1955, p. 130; **51**, 1957, p. 33.

SCOTT, P., BOYD, H. and SLADEN, W. J. L. 1955: The Wildfowl Trust's Second Expedition to Central Iceland, 1953. – Wildfowl Trust Seventh Annual Report, p. 63–98.