

A NOTE ON MIGRATION MORTALITY AND ITS SIGNIFICANCE IN GOOSE POPULATIONS DYNAMICS

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In most goose populations, even those which are not legitimate quarry, man-induced mortality, normally through shooting, accounts for the great majority of deaths. As has been demonstrated frequently, (e.g. Ebbinge 1991) hunting holds down numbers below the potential of the habitat, so that density dependent mechanisms are not acting to limit numbers. Rarely, therefore, is natural mortality a significant factor in goose populations, and the way in which natural regulation would operate in the absence of hunting is not understood.

This paper examines the contribution of natural and hunting season mortality into the overall losses in the population of Barnacle Geese, *Branta leucopsis* breeding in the Svalbard archipelago (Spitsbergen) and wintering in the Solway Firth in northern Britain. The population has been protected from shooting throughout its range since 1961 and much of the wintering area is protected from shooting. From a low of 300 birds in 1948, numbers rose to 3000-4000 through the 1960s. A further period of growth followed the protection of further feeding areas by the (then) Wildfowl Trust in 1970. The population now numbers 12 000 individuals.

To separate natural from hunting mortality, the times of disappearance of adults were split into October-February (shooting season) and March-September (migration and breeding). Within the latter period, it has been found that the autumn migration is responsible for most of the deaths (Owen 1982). The relationship between mortality rates in the two periods and population size (log scale) for males and females is shown in Fig. 1. The mortality rate during the shooting season is not significantly related to density. Non-shooting season (natural) mortality has, however, shown a remarkably close correlation with the number of geese in the population for both sexes.

The results of ringing in 1986 indicated that, in some years at least, a high proportion of young geese (35% in 1986) fail to complete the 3000 km migration from Svalbard to Britain. Losses in 1986 increased in relation to hatching date and, independently of hatching date, body mass of goslings at 3-5 weeks of age. There were also differences in survival in different rearing and premigratory fattening areas, and these appeared to be related to habitat quality and the density of geese in the various areas. The results of this analysis are presented more fully elsewhere (Owen & Black 1989, 1991).

This analysis has demonstrated that natural mortality is important and density dependent for adults

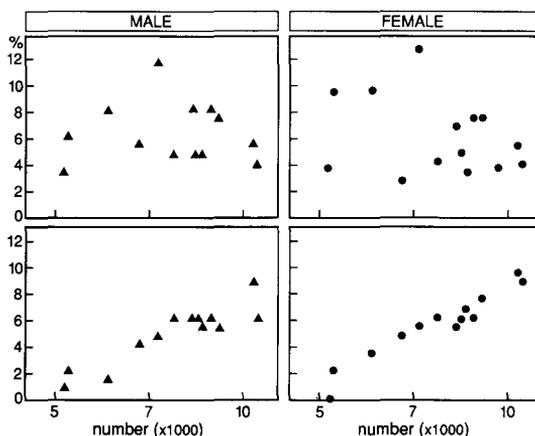


Fig. 1. The mortality rate of male (left) and female (right) geese during the shooting season (above) and outside it (below), based on the disappearance of marked individuals. Sample sizes for each sex range between 150 and 900. There is no significant relationship during the shooting season ($P > 0.05$ for both sexes). Mortality outside the shooting season (natural mortality) is largely on autumn migration and is significantly correlated with density for both sexes ($r^2 = 0.82$ and 0.92 ; $P < 0.001$, for males and females respectively).

as well as young in the Svalbard Barnacle Goose population. The 3000 km autumn migration is the most hazardous part of the birds' life cycle and most deaths are probably the result of birds failing to lay down sufficient fat reserves for the flight. We suggest that the density effect operates through competition for food amongst adult and young during the rearing and fattening periods in the breeding area. This aspect of goose biology is difficult to investigate and its importance has not hitherto been recognised. We suggest that losses on autumn migration will prove to be the most important single factor controlling the numbers of geese in non-hunted populations. More efforts should be directed at understanding the mechanisms involved.

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References

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Samenvatting

De natuurlijke mortaliteit in de Svalbardpopulatie van de Brandgans is aanzienlijk en dichtheidsafhankelijk, zowel voor ouderejaars als juvenielen. De meeste slachtoffers vallen gedurende de 3000 km lange herfst-trek. Waarschijnlijk betreft het individuen die niet genoeg vetreserves hebben opgebouwd. Het is de voornaamste sterftefactor bij niet bejaagde ganzepopulaties. Mogelijk gaat het om concurrentie om voedsel in de broedgebieden. Dit is een slecht onderzocht aspect van de biologie van deze ganzen. Owen verwijst naar een boek (Owen & Black 1991) voor nadere analyse van het probleem.