

Brent Geese, mudflats and Man

M. A. OGILVIE and G. V. T. MATTHEWS

Introduction

In past times adaptive radiation leading to increased specialization was a fairly safe option in evolution. Animals which became adapted to unpleasant environments and unusual foods were freed from competition with more powerful or prolific rivals. Modifications in the environment were slow, so the specialized species could have a reasonably long evolutionary life-span. Technological Man is now plundering, corrupting and polluting his environment so rapidly and efficiently that an entirely new time-scale is being imposed on the pattern of evolution to extinction. Specialist animals are disappearing with sickening alacrity. One well down the slippery slope would seem to be the Dark-bellied Brent Goose *Branta bernicla bernicla*.

The specialization of the Dark-bellied Brent Goose

The bird breeds only on the harsh coastal areas of northern Siberia (Uspenski 1955), along an arc of some 500 miles up to 95°E and around 75°N (Figure 1A). Although there are 24 hours of daylight in the summer, only for a few weeks is snow cover absent and the soil warm enough for plant growth. This is barely long enough to allow the completion of the normal cycle of egg-laying, incubation and rearing the young to flying. Any setback, a late thaw, or a cold, rainy spell in mid-summer, will result in an almost complete breeding failure.

The Brent then undertake a long migration, of over 3,000 miles, to an equally circumscribed wintering area in NW. Europe (Figure 1B), to the coastal and

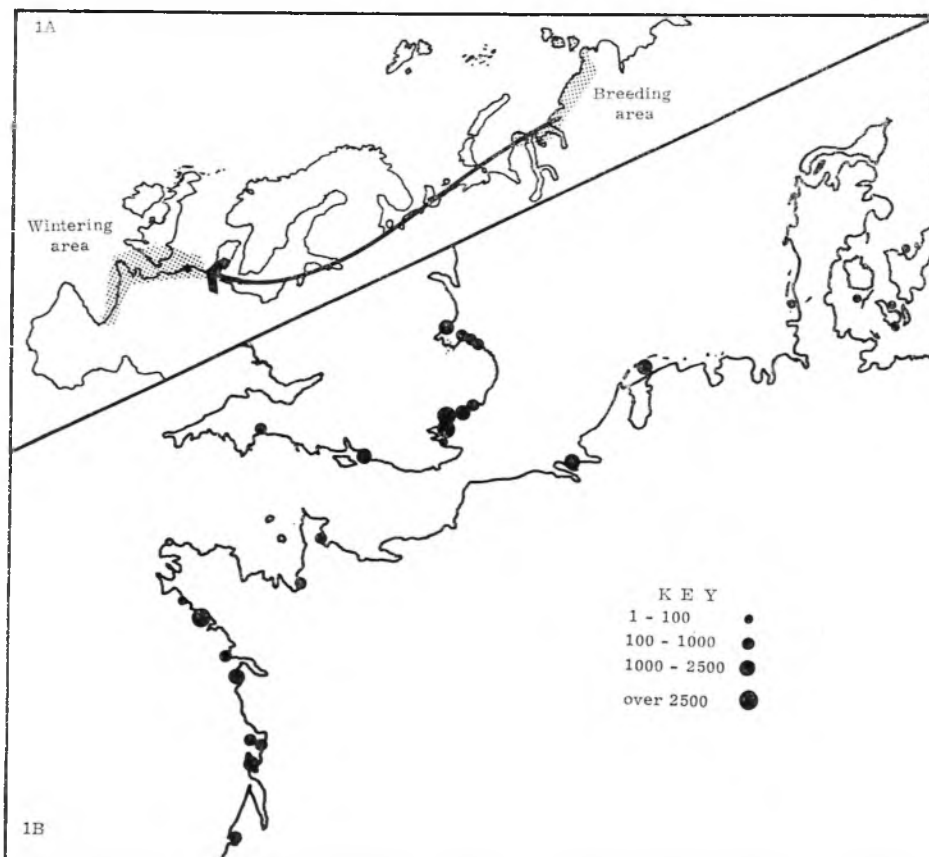


Figure 1A. The circumscribed breeding and wintering zones of the Dark-bellied Brent Goose.

1B. The wintering resorts with indications of maximum numbers present.

estuarine mudflats. During the winter they are almost exclusively maritime, seldom going above high-water mark. Their food is then virtually restricted to two plants, the alga *Enteromorpha* and eel-grass *Zostera*, one of the few flowering plants growing in the intertidal zone. The latter was the preferred plant when, in the 1930s, it was attacked by a mysterious disease associated with, if not caused by, the mycetozoan *Labyrinthula*. Over the whole of its Atlantic and Pacific range the beds of *Zostera* were wiped out. Among the many animals directly or indirectly dependent on them the Brent were as hard hit as any. Because there were no precise records of numbers before the catastrophe, its extent is arguable. Salomonsen (1958) suggested that the population in the early 1950s was barely 10% of that present in the second half of the nineteenth century. Morzer Bruijns and Timmerman (1968), confining themselves to Dutch data rather than the whole population, are in agreement with this figure. Atkinson-Willes and Matthews (1960) argued that Salomonsen's interpretation of early records was exaggerated and suggested that the diminution was of the order of 75%, but this was still a disastrous decline.

Control of hunting

After the last war, although detailed analyses were then lacking, the position was obviously alarming. Efforts were made to take the immediate positive action of imposing a ban on the killing of Brent in all countries in which they bred, passed through and wintered. Against varying opposition this has nearly been achieved and the birds are now protected in the U.S.S.R., Finland, Sweden, the Netherlands, Belgium, France, Great Britain and Ireland. The ban in the U.S.S.R. was particularly important in that hitherto the geese had been subject to massacres by the Samoyeds who rounded them up during the wing moult. The only country which at times holds important numbers of Brent and which has not imposed such a ban is Denmark. This is despite persistent efforts on the part of Danish conservationists, and international pressure. Fog (1967) gave figures that indicated the annual kill in Denmark was only about 1,300 birds. But even this, as will be apparent, is greater than the year's production for the whole population in bad breeding seasons.

It is now becoming accepted among thinking sportsmen that the only birds

which are suitable game species are those which regularly produce a large proportion of young birds each year. As these are surplus to the requirement for maintaining a steady population, a harvest can be taken instead of allowing birds to die off through natural adversities. What exactly constitutes a surplus is, of course, arguable, and if there are large numbers of sportsmen in proportion to the species population, then the kill must be rationed out in some way, by limiting the length of shooting season or the size of the bag.

There is now very little doubt that the Dark-bellied Brent Goose is not suitable as a game bird, for its production of young is negligible in as many years as it is substantial. The success of each breeding season can be determined by examination of the wintering flocks. Young birds of the year at first lack the white throat bar and, throughout the winter, have fairly conspicuous white edgings on their wing-coverts. Since 1954 detailed age ratio counts have been made among the massive Essex flocks by Burton (for example 1965) and others. Further counts have been made in other parts of England, the Netherlands and France. There is remarkably good agreement between such counts in any one season, indicating that the factors, adverse or beneficial, have been similar over the whole of the limited breeding range. The data for the past 15 years are shown in Table I. In only 8 years has there been a substantial production.

Table I. Proportion of young birds in wintering flocks of Dark-bellied Brent Geese, 1954-1969.

| Winter | % young | Winter | % young |
|---------|---------|---------|---------|
| 1954-55 | 40 | 1962-63 | <1 |
| 1955-56 | 26 | 1963-64 | 35 |
| 1956-57 | 7 | 1964-65 | 7 |
| 1957-58 | 53 | 1965-66 | 35 |
| 1958-59 | <1 | 1966-67 | 40 |
| 1959-60 | 23 | 1967-68 | 6 |
| 1960-61 | 45 | 1968-69 | <1 |
| 1961-62 | 3 | | |

Habitat conservation

While the prevention of active destruction may assist, it does not of itself ensure the continued existence of an animal population. A suitable environment and, especially, an adequate food supply, must be maintained.

The crash in the Brent population coincident with the wiping out of *Zostera* by disease was strong evidence that in the wild these birds do not modify their winter feeding habits, even though some can

in captivity, being maintained in a healthy condition on grass supplemented with grain. In the spring the Brent begin to feed on plants growing above the high tide mark (Ranwell and Downing 1959) particularly as they move through the Netherlands and Denmark on their migration to the breeding grounds. But there remains this fatal rigidity of feeding behaviour in mid-winter, and if this cannot be accommodated the Brent do not thrive.

After the *Zostera* disease subsided, the plant began to regenerate, but slowly and

it would support. Burton (1961) attempted such an assessment for the coasts of the county of Essex, the major wintering ground, and concluded that there would be, theoretically, sufficient food for about 12,000 Brent throughout the winter. Allowing for the feeding of other birds and the fact that Brent will only tolerate a certain degree of crowding, he suggested that a comfortable winter-through average would be 6,000. This has been well exceeded in the last four seasons, as will be seen from the data in Table II (rounded to the nearest hundred). The

Table II. Monthly totals of Brent Geese in Essex, 1965-1969.

| Season | November | December | January | February | Mean |
|---------|----------|----------|---------|----------|------|
| 1965-66 | 8700 | 9000 | 12500 | 7700 | 9500 |
| 1966-67 | 7100 | 11000 | 8700 | 6700 | 8400 |
| 1967-68 | 8700 | 10300 | 11400 | 9100 | 9900 |
| 1968-69 | 10600 | 9200 | 10000 | 8900 | 9700 |

incompletely. The Atlas of the British Flora (Perring and Walters 1962) shows *Zostera marina* as having been recorded in 180 of the 3,500 10 kilometre squares investigated. Of that 180, the occurrence in 102 was based on pre-1930 records only, and the plant has not been identified since. It is therefore a fair statement to say that *Zostera marina* has been eliminated from more than half its previous localities. If we confine our statement to southern Britain, covering the coasts where the Dark-bellied Brent previously occurred, the proportion of recovery is only one-third (53 pre-1930-only records out of 78). Sometimes the disappearance of *Zostera* with its binding root system has led to the sweeping away of the mud-flats themselves (Voisin 1968). In some cases *Zostera marina* has been replaced by two other species of eel-grass, *Z. angustifolia* and *Z. noltii*. These have smaller leaves with, at maximum, areas 1/10th and 1/30th those of *Z. marina* and show comparably smaller yields (Burton 1961). There is also evidence that the alternative food plant, *Enteromorpha*, is less nutritious than *Zostera*, containing only a third of the protein and a good deal less carbohydrate (Ranwell and Downing 1959).

It is certain, therefore, that the winter food supplies are not, on the British evidence, anything like as good as they were in the era before the *Zostera* disease. The situation elsewhere in north-west Europe appears to be similar. We do not however have sufficient information to make a general quantitative statement on the total amount of food available and hence the size of the wintering population

similarity of the mean figure over the four years would indeed suggest that a limit of holding capacity has been reached, the numbers late in the season being smaller if the early numbers were large, and vice versa. There are further indications of some interrelation between the peak counts in southern England and those in western France (Table III).

Table III. Peak winter counts of Brent Geese in England and France, 1964-1969.

| Season | England | France |
|---------|---------|--------|
| 1964-65 | 10000 | 13500 |
| 1965-66 | 14000 | 11000 |
| 1966-67 | 15600 | 11500 |
| 1967-68 | 16000 | 8600 |
| 1968-69 | 13700 | 8900 |

When the former increase the latter decrease, and vice versa, although the relationship is not an absolute one. It does suggest, however, that when the standing crop of food plants in one country has been reduced some of the geese have to move elsewhere. More frequent counts in the French resorts are needed to test this hypothesis thoroughly. Other factors than goose grazing, such as weather conditions, may be affecting the production of the food plants, thus complicating the issue. F. Roux (pers. com.) is certainly of the opinion that maximum goose numbers in terms of food supply may have been reached in France in the last few years. Wolff *et al* (1967) showed in the Delta area of the south of the Netherlands a very close correlation between the distribution of the food plants and that of the geese.

We are faced with the prospect, therefore, that even if there were a run of good breeding years, considerations of winter food supply might already be a limiting factor. The obvious question is whether something could be done about this by increasing production of the food plants where they exist or propagating them where they do not. The matter has, in fact, been very thoroughly investigated, for the well-being of *Zostera* is a matter of concern to many fishery interests and to local industries using the dried material, as well as to wildfowl biologists. Phillips (1964) and McRoy and Phillips (1968) have published bibliographies on *Zostera marina* which cover 575 books and research papers. In none of them are there successful recipes for propagating eel grass on a large scale. Indeed the situation has not improved since Cottam and Munro (1954) reported that 'extensive attempts at planting by personnel of several States, the Fish and Wildlife Service, and a few private individuals and agencies, have not been successful.'

The total (world) population

Salomonsen (1958) from his enquiries came to the conclusion that the population level in the 1955 to 1957 era was between 15,000 and 16,500. Monitoring the fortunes of the Brent population was one of the first and continuing enterprises of the International Wildfowl Research Bureau's Goose Research Group set up in 1958 with Professor M. F. Mörzner Bruijns as Co-ordinator. The organisation of the Brent counts devolved on Mr. P. J. K. Burton who had pioneered counts and age ratio examinations of the Essex flocks. In 1964 the task was passed to one of us (M.A.O.).

Brent are not the easiest of geese to count in view of the fact that they both roost and feed offshore. Nevertheless at certain stages of tide, depending on local conditions, the flocks are concentrated and accessible enough for detailed and accurate counts to be made. The very limited number of places in which the birds occur is a great help, since sufficient local ornithologists of merit and application can usually be found to cover them. A major difficulty, when dealing with such a mobile population, is the synchronisation of counts, particularly between the different countries. The advent of the I.W.R.B.'s international mid-winter count around January 15th has been of great assistance in this respect. January counts are also best in that the main migratory movements have ceased,

with at least half the birds in England where counters are particularly numerous and active.

Reasonably satisfactory total censuses made in February 1961 and January 1963 were reviewed by Burton and Boyd (1964), and others have been made for each subsequent winter. The results are given in Table IV and shown graphically in Figure 2.

Table IV. Estimated total population of Dark-bellied Brent Geese, 1955-1969.

| Winter | No. | Winter | No. |
|-----------|-------|---------|-------|
| 1955-1957 | 16500 | 1965-66 | 25000 |
| 1960-61 | 22000 | 1966-67 | 30500 |
| 1962-63 | 23000 | 1967-68 | 29000 |
| 1963-64 | 23500 | 1968-69 | 26000 |
| 1964-65 | 25000 | | |

In view of the infrequency of successful breeding and the current limitation of habitat and food supplies, it is perhaps not surprising that the Brent have made only a slow recovery from the trough of the early 1950s and that already there are indications that the population has begun to stabilise and fluctuate in the 25-30,000 range — a tiny population for a migratory bird.

The dubious future

To face reality, it is not a question as to whether we can improve this situation, but whether it can be prevented from worsening. For too long the technocrats have regarded coastal sand and mudflats as waste lands whose only purpose is to absorb industrial waste, to serve as sites for dirty, smelly or dangerous factories or, more positively, to be reclaimed for agricultural or other purposes. Previously the rate of corruption and destruction was slow, but modern techniques have accelerated the process until the estuarine habitat is rapidly becoming the most restricted in Europe. It is of great scientific interest because of the complexity and richness of its flora and invertebrate fauna, and the wide range of fish and bird life which derive their nutrition therefrom (see Verwey *et al* 1967, for example). Many interests besides those of the Dark-bellied Brent Goose will suffer as more and more inroads are made.

At the present time the vast Delta works in the south of the Netherlands will eliminate many of the favoured Brent feeding grounds in that country by the late 1970s. If attention is then switched to cutting off the Wadden See in the north, by linking the Frisian Islands with dams, the Brent will have no place in the

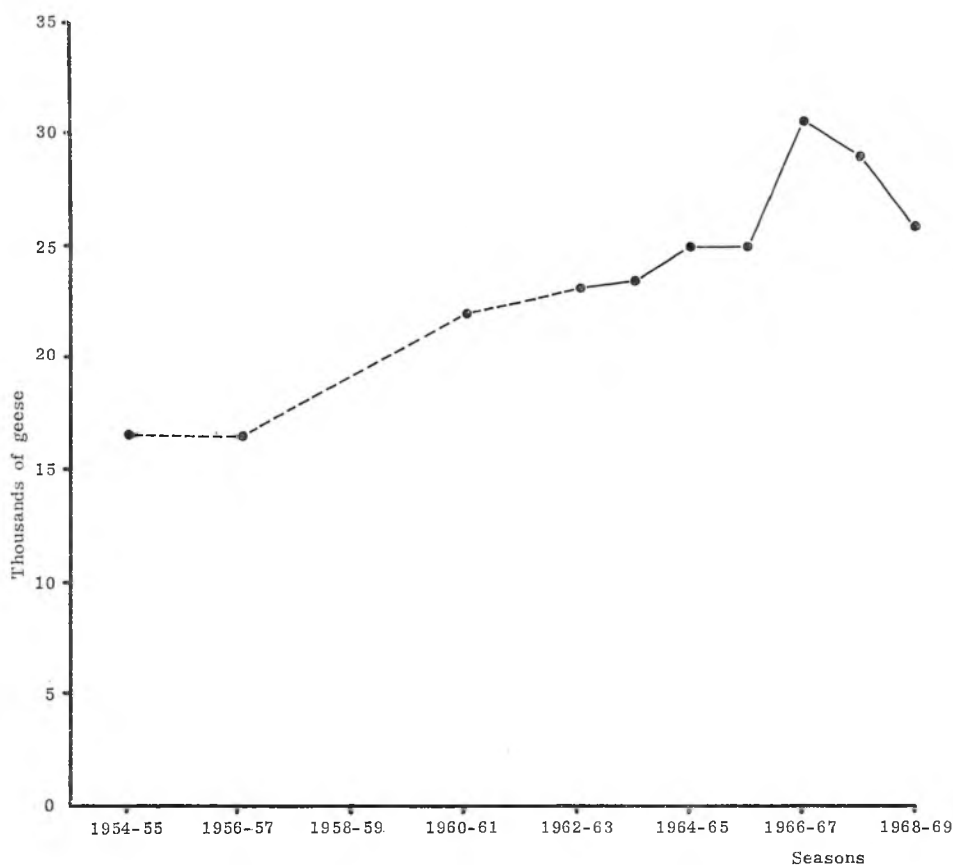


Figure 2. Changes in the total mid-winter population of the Dark-bellied Brent Goose, 1955-69.

Netherlands at all. The scheme is being vigorously resisted by Dutch conservationists but once vast amounts of equipment and armies of trained men are available for 'coastal engineering' it is exceedingly difficult to divert them on to other types of activity. The Danish Wadden Sea is similarly threatened and if both schemes came about there would be an arc of concrete from Jutland to Belgium. The main French Brent resort in the Gulf of Morbihan in Brittany is facing piece-meal reclamation and the spreading requirements of the oyster-culture industry.

In Britain, estuaries and coastal waters are as much under threat as anywhere. The increasing need for fresh water has aroused interest in coastal empoundments and one such scheme is being studied for Morecambe Bay, another is adumbrated for the Solway Firth. On the east coast the already polluted Teesmouth faces further reclamation to support chemical factories. Of more immediate importance

to the Brent are proposals to close off the Wash in a barrage scheme, various development threats to Langstone Harbour in Hampshire and last, and worst of all, the proposal to site the Third London Airport on land reclaimed from the Foulness Sands, Essex.

The Third London Airport site controversy

This is a classical case of the wetlands-are-wastelands approach. A requirement is made out for an airport covering a huge area at which a steady procession of thundering vehicles will take off and land. The planners look around for a site that will meet the technical requirements and cause the minimal clash with vested interests or amenity requirements. Those responsible for the Foulness suggestion probably thought it an ideal solution, apart from the extra cost of grappling the land from the sea. Fortunately the Government has set up a Commission to investigate and weigh the merits of the

Foulness site and of three other, inland, sites. The national and local societies concerned with bird conservation showed an unparalleled degree of unanimity of opinion and co-ordination of action. The Army Bird Watching Society, the British Trust for Ornithology, the Essex Bird Watching and Preservation Society, the Essex Joint Council of Wildfowling Clubs, the Essex Naturalists' Trust, the Foulness Wildfowl Counting and Bird-watching Group, the Royal Society for the Protection of Birds, the Seabird Group, the South Essex Natural History Society, the Wildfowlers' Association of Great Britain and Ireland, and the Wildfowl Trust joined together to present a reasoned objection at the Public Enquiry held by the Commission. They were supported by the International Council for Bird Preservation, and the International Wildfowl Research Bureau. Letters were also written to the Commission by foreign experts in Denmark, the Netherlands and France. The representatives of 15 nations meeting at the I.W.R.B. conference in Vienna in May cabled the Commission with the request that it should most carefully consider the scientific evidence submitted to it.

This evidence, as presented by the objecting naturalists' organisations, together with a neutral factual document from the government body, the Nature Conservancy, laid primary emphasis on the threat that the siting of the Airport at Foulness would represent to the population of the Dark-bellied Brent Goose. It was pointed out that England now provides the winter quarters of half the world population. The figures for 1968-69 were England 13,700, France 8,900, the Netherlands 3,300. In the past four winter seasons the numbers present on the Foulness sands alone have reached 7,000 and, over the months November to January, averaged 6,200. Thus the conversion of the Foulness sands would remove the feeding grounds of more than a fifth of the world population of this goose. We have already seen that the existing resorts are at near-capacity and that there is nowhere left in their winter range in which such a number of Brent could be accommodated. It is not even necessary to consider whether the birds could tolerate the disturbance and feed on what vegetation was left. The planners have clearly stated that the geese would have to be driven away because of the danger these relatively large and heavy birds would represent to aircraft landing and taking off. This problem of bird-strikes

on aircraft (see Murton and Wright 1968) is a very real one, particularly at coastal airports. The ornithological bodies have properly emphasised this risk to the Enquiry. Besides the Brents, some 5,000 Wigeon, 200 Mute Swans, tens of thousands of waders and up to 180,000 gulls frequent the area at certain times.

To be cynical it is 'practical' considerations such as the dangers of bird-strikes, the cost of construction of the site, its isolation from the main industrial centres and its being out on a communications limb that will sway the ultimate decision, hopefully against the choice of Foulness. How much more edifying it would be if an advanced country such as Britain could set a civilised example by making the decision on the grounds of international responsibility for maintaining a fast-vanishing type of natural habitat and for ensuring the continuation of a race of geese.

The racial question

There are those who ask why there is such a fuss about a mere race of birds. There are several answers. This is not some fiddling race dreamed up by a museum systematist laying out dreary rows of skins. It is one clearly distinguishable in the field, breeding as a population entity with very little, if any, overlap with other races. It is the Brent Goose of Europe and if it went we would be left with only some slivers of the Light-bellied race *B. bernicla hrota* coming from Spitsbergen to Denmark (about 2-3,000, of which a few hundred may spend a time on the Northumberland coast) and from Greenland to Ireland (some 8,000 at the most recent counts). It would be a sad thing if we had to travel to North America to see Brent. There, after a similar decline with the *Zostera* disease, numbers have built back to over the 100,000 mark. Similarly the Pacific race *B. bernicla nigricans* has recovered something like its former status. In both cases it has been possible to re-open a limited shooting season. The failure of European stocks to recover despite near total protection certainly suggests that habitat limitations are a prime cause.

But surely the necessity to secure the future of the Dark-bellied Brent Goose needs no stressing, for in this day and age we should not tolerate the elimination of any species or race, even by default.

Acknowledgements

We are grateful for the dedicated work of those ornithologists in several countries

who counted and investigated the Brent Geese and made their results freely available through the Goose Research Group of the I.W.R.B. Mr. P. J. K. Burton's efforts must be singled out for special

praise.

The paper was written while we were holding posts at the Wildfowl Trust financed through the grant of the Natural Environment Research Council.

Summary

The specialised behaviour and ecology of the Dark-bellied Brent Geese, and the vulnerability these impose, are discussed. The intermittent reproductive success makes it unsuitable to be a game bird. The habitat and food supplies available would now appear to be a limiting factor. After recovering from a low of about 16,500 the total (world) population appears to be fluctuating in the 25,000 to 30,000 range. Further destruction of habitat and in particular the proposal to site the Third London Airport off Foulness make the future of these geese dubious.

References

- ATKINSON-WILLES, G. L. and G. V. T. MATTHEWS. 1960. The past status of the Brent Goose. *Brit. Birds* 53 : 352-7.
- BURTON, P. J. K. 1961. The Brent Goose and its food supply in Essex. *Wildfowl Trust Ann. Rep.* 12 : 104-12.
- BURTON, P. J. K. 1965. Brent Geese in Western Europe during the winters of 1962-63 and 1963-64. *Wildfowl Trust Ann. Rep.* 16 : 40-43.
- BURTON, P. J. K. and H. BOYD. 1964. The present status of the Brent Goose in Europe. *Proc. 1st European Mtg. on Wildfowl Conservation, St. Andrews, Scotland.* 1963 : 73-75.
- FOG, M. 1967. An investigation on the Brent Goose in Denmark. *Danish Rev. Game Biol.* 5 : 3-40.
- MCROY, C. P. and R. C. PHILLIPS. 1968. Supplementary bibliography on eelgrass, *Zostera marina*. U.S. Dept. Interior, Bureau Sport Fisheries and Wildlife, S.S.R.(W) 114 : 1-14.
- MORZER BRUYNIS, M. F. and A. TIMMERMAN. 1968. Over het voorkomen van de Rotgans in Nederland. *Limosa* 41 : 90-106.
- MURTON, R. K. and E. N. WRIGHT (Eds.). 1968. The problems of birds as pests. *Symp. Inst. Biol.* 17 (Papers on 'Birds and aircraft', pp. 1-116).
- PERRING, F. H. and S. M. WALTERS. 1962. *Atlas of the Flora of the British Isles*. London: Nelson.
- PHILLIPS, R. C. 1964. Comprehensive bibliography of *Zostera marina*. U.S. Dept. Interior, Bureau Sport Fisheries and Wildlife, S.S.R.(W) 79 : 1-35.
- RANWELL, D. S. and B. M. DOWNING. 1959. Brent Goose winter feeding pattern and *Zostera* resources at Scolt Head Island, Norfolk. *Anim. Behaviour* 7 : 42-56.
- SALOMONSEN, F. 1958. The present status of the Brent Goose in Western Europe. *Vidensk. Medd. Dansk Naturh. Foren.* 120 : 43-80.
- USPENSKI, S. M. 1965. *Die Wildgänse Nordeurasiens*. Wittenberg Lutherstadt: Ziemsen.
- VERWEY, J., M. F. MORZER BRUYNIS and H. P. GORTER. 1967. Papers in: *A Plea for the Wadden Sea*. Contract Committee for Nature and Landscape Preservation. Amsterdam, Netherlands.
- VOISIN, C. 1968. Le Bernaches du Golfe du Morbihan. *L'Oiseau* 38 : 150-74, 225-48.
- WOLFF, W. J., P. de KOEIJER, A. J. J. SANDEE and L. de WOLF. 1967. De verspreiding van Rotgansen in het Delta gebied in relatie tot de verspreiding van hun voedsel. *Limosa* 40 : 163-74.

M. A. Ogilvie and G. V. T. Matthews, The Wildfowl Trust, Slimbridge, Gloucester.

