

Brent Geese (*Branta bernicla* (L.)) in Denmark and the Colour Problem.

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(Med et dansk resumé: Knortegåsen (*Branta bernicla* (L.)) i Danmark og dens farvefaser).

It is well known that Pale-breasted and Dark-breasted Brent Geese *Branta bernicla hrota* et *B. b. bernicla* occur in Denmark (SCHIØLER 1925) from September until May and that they are only absent in winter when their feeding grounds freeze or become 'iced up'. Some birds arrive in late August and some stay on into June though this is not an annual occurrence. The Dark-breasted birds come to Denmark via the Baltic from Arctic Russian breeding grounds while the Pale-breasted birds probably come in the largest numbers from breeding grounds in Spitsbergen via the entire west coast of Norway, perhaps sometimes coming across to the Kattegat via Trondheim Fjord. Pale-breasted birds, which come to Denmark via the Baltic, probably come from breeding grounds in Arctic Russia and not from Spitsbergen (WEBBE, unpublished).

In the spring of 1957, I had the good fortune to meet friends in Denmark and pay a short visit to Nissum Fjord where I found about a thousand Pale-breasted Brent Geese. Dr. FINN SALOMONSEN visited the Fjord about a fortnight after my visit and was able to count them from photographs (cf. SALOMONSEN 1957, p. 119). I had determined to visit this Fjord in spring because one Pale-breasted Brent Goose, ringed in Spitsbergen by a small party of the British (SHERBORNE-CAMBRIDGE) expedition in 1954, had been recovered in the locality and Dr. HOLGER HOLGERSEN of Stavanger Museum had received a report that many Brent visited the Fjord in the spring. It seemed interesting to know how many Pale-breasted and Dark-breasted Brent were present in the Fjord and whether there were 'intergrades' between the two forms of *Branta bernicla*. Moreover, there was a possibility that a small expedition would be going to Vest-Spitsbergen in the summer of 1957 to ring more Pale-breasted Brent Geese.

Since Pale- and Dark-breasted Brent are found wintering

in the same localities, the question of mixing between the two forms remains an interesting subject for study. This is complicated by the difficulties which are encountered as soon as one tries to distinguish between the two forms in bad light or when they are sitting on the sea and upending. The best time and the most interesting period is the spring when the Brent come ashore to feed on grass. Denmark and the Baltic are the best places to make such a study, but nobody knows yet whether 'mixed flocks' can be found in the spring. Reports of breasts of every grade of colour between *bernicla* and *hrota* in 'mixed flocks' of Brent are frequent, but the frequency of such reports is reduced when the birds are observed in sun light or through a good telescope.

RUSSELL (1890) found that the two forms mixed on the wintering grounds on the Essex coast of England, but he also quoted the observation of a hunter who had found that a flock of about 12 Pale birds had stayed throughout the winter in a locality where Dark birds were common. In some years he found Pale-breasted Brent common on the Essex coastline where he was shooting, while in another year he had the greatest difficulty in obtaining a specimen. STEVENSON, who also wrote in 1890, quoted the opinion that the two forms do not mix. CATON-HAIGH (1917) observed 7 Dark birds did not mix with 100 Pale birds while they were feeding on the same mud bank in the Humber Estuary in England; they flew off separately, when 'put up'. He concluded from his observations that the two forms do not associate freely and that they arrive separately (it seems he did not think that there was a family party of 7 Dark birds). On the Exe Estuary in South West England there are similar reports (1948 and 1952) of 3 Pale birds near some Dark birds which stayed apart from the Dark birds and of 4 Pale birds which joined up with 5 Dark birds but still kept a little apart from them (Devon Bird Report). ROOKE (1935) saw 25 Brent, on a mud bank, feeding—8 were *bernicla* and the majority of the 17 others *hrota* and 2-3 were doubtful. All were spread evenly over the mud bank and mixed. Later 8 were at one end of the mud bank and 17 at the other end and these two parties flew away separately. On the next day, he saw 6 shot Brent apparently from the same

mixed flock of 25 (2 *bernicla*, 2 *hrota* and 2 doubtful with fairly heavily barred cinnamon brown underparts). WAYRE (1956) estimated he saw over 3000 Brent¹⁾ in a Norfolk Estuary in England in March 1955, of which about 75 % were *hrota* and some he says were intermediate between *bernicla* and *hrota*. He often saw mixed flocks and it was noticeable that *bernicla* were somewhat afraid of the more numerous *hrota*. When feeding, the Dark-breasted Brent kept a few yards apart from the Pale-breasted birds and were often chased away if they came too close to the Pale birds.

There is a need for many more observations of 'mixed flocks' (especially in the spring); if there is no psychological barrier between the two forms, one would expect both intermixing and interbreeding to occur. So far no one has reported a pairing between a Pale and a Dark bird either on the wintering grounds in the spring or on the breeding grounds. TREVOR-BATTYE (1895) observed Pale and Dark birds together in the flocks of captured moulting birds on the breeding grounds on Kolguev; some persons have doubted the accuracy of this statement since no specimens were brought back from Kolguev and since then only Dark birds have been discovered there. The Dark-breasted Brent has never been seen in Spitsbergen. No breeding colony has ever been found where it is possible to find a high percentage of breeding pairs consisting of one of each form. It is possible to arrange a series of museum skins from the wintering grounds which grade right through from a very white *hrota* to *bernicla*. Unfortunately the numbers of breeding *Branta bernicla* are much reduced on Novaya Zemlya and Kolguev so it will probably be difficult to find a locality where *bernicla* and *hrota* breed in sufficient number for a study to be made. A similar position exists over *Branta b. nigricans* and *Branta b. hrota* in North America; they both winter along the Atlantic coast of North America and probably both breed in the eastern Canadian Arctic (DELACOUR & ZIMMER 1952). It has been assumed that the undiscovered breeding grounds of *Branta b. nigricans* lie to the South of the breeding grounds

¹⁾ Peak of 1,000 and many considered to be Pale-breasted (*Branta b. hrota*) at Blakeney; the rest were Dark-breasted (*Branta b. bernicla*). This is the largest concentration reported in the Norfolk Bird Report for 1955, which includes photographs of Brent Geese by PHILIP WAYRE.

of *Branta b. hrota* (possibly somewhere in the Hudson Bay) and that they migrate northwards in the spring via the Bay of Seven Islands on an *early* migration before *Branta b. hrota* (LEWIS 1937).

It is interesting that, by the POLUNIN classification of the Arctic, *bernicla* and *nigricans* and also *Branta b. orientalis* (DELACOUR & ZIMMER) would be low arctic breeding birds; there would be an area of overlap in the middle arctic before reaching the high arctic lands where the main breeding grounds of *hrota* are. It may be this classification is not specifically applicable in this case to the vegetational and other environmental differences of the breeding grounds of these forms of *Branta bernicla*. It should be possible to carry out breeding experiments on Pale and Dark breasted birds kept in captivity in Vest-Spitsbergen (*e.g.* in Adventdalen near Longyearbyen) or at a Canadian arctic station during the arctic spring and summer months. The study of the blood antigens and other inherited characters and their relative abundance and distribution amongst the forms of *Branta bernicla* might be interesting.

MANNING, HØHN & MACPHERSON (1956) in their work on the birds of Banks Island in the western Canadian Arctic say "... the position of Banks Island within the range of each species. This is often of particular interest, since the northern part of the island is farther north than any of the other islands south of the M'Clure Strait-Lancaster Sound water barrier, which effectively limits the northward distribution of several species". It seems unlikely that it is the water barrier itself that is the main cause of this, but that differing environmental factors on the lands to the north and south of the barrier are also probably important in determining the distribution of species. Thus Prince Patrick Island and Melville Island are places where the breeding ranges of the Black Brent *B. b. orientalis*¹⁾ and Pale-breasted Brent overlap. On Banks

¹⁾ To avoid ambiguity, I have taken *B. b. nigricans* to be a dark or true black-breasted Brent from undiscovered breeding grounds which winters on the Atlantic coasts of North America (DELACOUR & ZIMMER). I have taken *B. b. orientalis* to be the form of Black Brent which winters on the Asiatic and North American coasts of the Pacific Ocean and breeds in the western Canadian Arctic, Alaska and eastern Siberia (LEOPOLD & SMITH 1953). This means that I regard the Black

Island, the Black Brent is very common and the Pale-breasted Brent seems to be of 'casual occurrence only'. In the area of overlap, 'intergrades' between *orientalis* and *hrota* (MANNING et al., 1956) occur like those between *hrota* and *bernicla* in western Europe. As far as breast colour is concerned, *bernicla* must lie with the 'intergrades' between *orientalis* and *hrota*. *Bernicla* may not have such a dark breast colour as *orientalis* because the greater part of its low arctic breeding range may lie in a region which is more high arctic (POLUNIN) than that of *orientalis*. It was reported in the English *Shooting Times* in 1957, that a Black Brent (*orientalis* or *nigricans*) had been seen on the Essex coastline of England early in the year by a number of observers; however, there have been other claims of very dark Brent in flocks of *bernicla* in eastern England in the past (STEPHENSON 1890, CHAPMAN 1917).

HANDLEY (1950) visited Prince Patrick Island in the Canadian Arctic and found Black Brent and Pale-breasted Brent nesting in the same habitat. They arrived in spring at the same time and he found no mixed pairs breeding. He regards *orientalis* as distinct from *hrota*. RAND (1948) has stated that a similar situation exists in the Pacific and Atlantic Eider Ducks (*Somateria mollissima*) in which some biological discontinuity seems indicated from the scarcity of intermediates¹). Certainly a former separation and a later meeting seems indicated. This would corredate with the glacial period, with eastern and western maritime populations separated by the breadth of ice, and the subsequent meeting following the disappearance of the ice'.

It seems the colouration of *Branta bernicla* is related to a general problem of the Arctic as discussed by SALOMONSEN (1950) under *Falco rusticolis*. It does not seem to be connected with the wintering grounds as so far no-one has demonstrated

Brent on Banks Island as *orientalis* for the purposes of this paper and until it is proved that Black Brent on Banks Island winter on the Atlantic coast of North America or that the presence of *B. b. nigricans* on the Atlantic coasts of North America is really due to the presence of 'intergrades' between *orientalis* and *hrota* which have come from places where the two breeding ranges overlap (MANNING et al., 1956).

¹) According to the recent investigation of SNYDER (Arctic Birds of Canada, Toronto 1957, p. 87) the breeding ranges of the two Eider Ducks in question do not overlap.

that the paler form prefers a slightly different wintering ground or range than the darker forms. An environmental factor or factors acts around the polar basin and throughout the true arctic and immediate sub-arctic zone affecting colouration. It is not only geographical barriers that are responsible for the distribution of the various forms of *Branta bernicla*. The work of DEMENTIEV (1943), BANNERMAN (1956) on *Falco rusticolis*, SOUTHERN (1943) on *Stercorarius parasiticus* and COOCH (1954) on *Chen caerulescens* is related to this and recently KETTLEWELL (1956) has been investigating the evolution of melanism in a species of Lepidoptera in Britain.

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The basis of this paper comes from a section of an unpublished report made by me to the Royal Society of London in May 1955 of part of the biological work of a small party of the British (SHERBORNE-CAMBRIDGE) Expedition to Vest-Spitsbergen (Leader: G. T. WRIGHT, M.A., Ph. D.). This expedition received a grant from the Royal Society.

DANSK RESUMÉ

Knortegåsen (*Branta bernicla* (L.)) i Danmark og dens farvefaser.

Knortegåsens mørkbugede (*bernicla*) og lysbugede (*hrota*) form forekommer begge i Danmark. Det vides ikke endnu om de to former blander sig, men det er et interessant emne at undersøge. Iagttagelser i England tyder på, at de to former ikke blander sig tilfældigt med hinanden, når de forekommer på de samme lokaliteter. Det er imidlertid ofte vanskeligt at skelne de to former fra hinanden i naturen.

Der fremsættes den mening, at den lysbugede form er en højarktisk race, mens den mørkbugede og den sortbugede (*nigricans*) form er lavarktiske racer. Dette diskuteres nærmere.

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