An assessment of breeding success in the Dark-bellied Brent Goose *Branta b. bernicla* in the UK in 2000

R. D. Hearn

The Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire GL2 7BT

SUMMARY

A total of 91,582 Dark-bellied Brent Geese was aged at 18 estuaries and other coastal sites in Great Britain between September 2000 and March 2001.The overall proportion of juvenile birds present was 0.6%, varying between 0% in September and 1.1 % in December and March. The mean brood size per successful pair was 1.74 young.

INTRODUCTION AND METHODS

Britain has long been a major wintering area for Dark-bellied Brent Geese *Branta b. bernicla*. The UK Government has a special responsibility to safeguard this species under international legislation (Stroud et al. 1990), it is listed on category B(2b) of the African Eurasian Waterbird Agreement and additionally, it is an 'Amber Listed' species in 'Birds of Conservation Concern' (RSPB et al. 1996). Information is gathered not only about the abundance and distribution of Brent Geese wintering in Britain (e.g. Pollitt et al. 2000) but also on age ratios (e.g. Hearn 2000), through which estimates of annual recruitment can be made.

For the sixteenth consecutive autumn, the breeding performance of Dark-bellied Brent Geese was assessed by experienced voluntary observers. First-winter Brent Geese have obvious white edging to the wing coverts which the adults lack. Using a telescope in good light conditions, ageing is feasible at distances of up to 400 m. To determine brood size, distinct groups composed of two adults and one or more juveniles that could be recognised by behaviour or spatial separation from other geese were regarded as a family. Sample sizes are variable and determined by flock size and field conditions. Data were collected between 18 September and 15 March. Observers were asked to note the location, date, time and habitat for all observations and the size of flocks, number aged, total number of young and brood sizes.

Counters were encouraged to check flocks whenever possible and no emphasis was placed on obtaining a co-ordinated census that avoided double-counting. Therefore, counts conducted at the same estuaries on different dates will have undoubtedly recorded some birds more than once.

RESULTS

Brent Geese were aged at a total of 101 localities within 18 estuaries or coastal areas from North Lincolnshire to Devon (Figure 1), summarised in Table 1. Of 214 flocks assessed, 5.1 % were in September, the majority in October (24.3%) and November (35.1 %), 20.6% in December, 7.9% in January, 6.1 % in February and 0.9% in March. A total of 91,582 geese were

aged (an increase of 11 % on the number aged during 1999/2000); the largest numbers being at Langstone Harbour (19,979), The Blackwater (16,012), The Wash (14,415) Chichester Harbour (9,397), The Thames (8,992) and The Crouch (8,224). Sample sizes at all other estuaries were less than 6,000 birds. The overall proportion of first-winter birds was 0.6% and, of 319 broods recorded, the mean brood size was 1.74 young per successful pair.

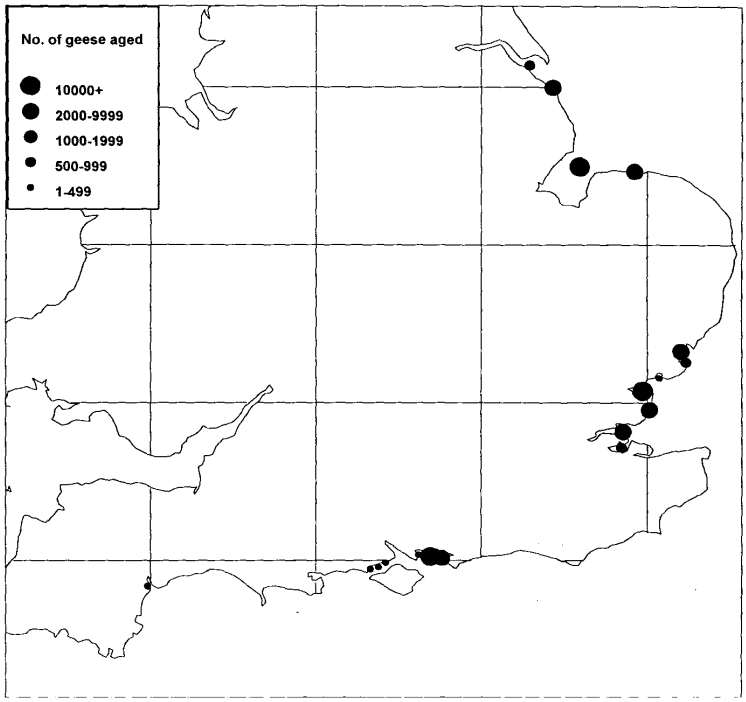

Figure 1. The distribution of estuaries and coastal areas where Dark-bellied Brent Geese were aged, winter 2000/01.

The average proportion of young present in flocks for each month (Figure 2) increased as the winter period advanced, from 0% in September to 0.22% in October, 0.6% in November and a peak of 1.1 % in December. The proportion declined during January and February, peaking again at 1.1 % in March. During this period, the mean brood size of successful pairs declined from the October peak, although there was another increase during March.

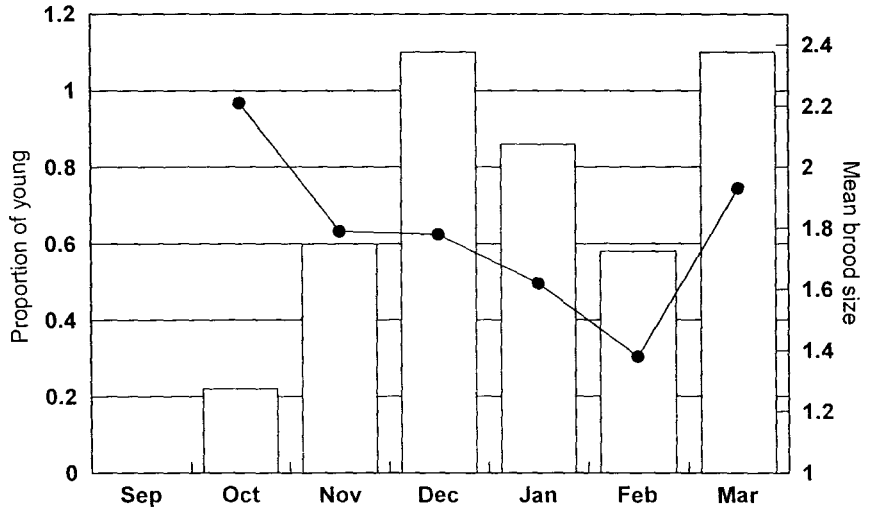

Figure 2. The proportion of young (bars) and mean brood size (dots) recorded in each month, winter 2000/01.

Despite the low proportion of young overall, the proportion within individual flocks varied from 0% to 30% (not including a reported "flock" of one juvenile). However, the vast majority (93%, n = 199) held less than 5% young, with 128 of these containing no young at all. This does not take into account the size of each flock and a comparison of flock size with the proportion of young and mean brood size found that as flock size increases, the proportion of young decreases but mean brood size increases (Figure 3).

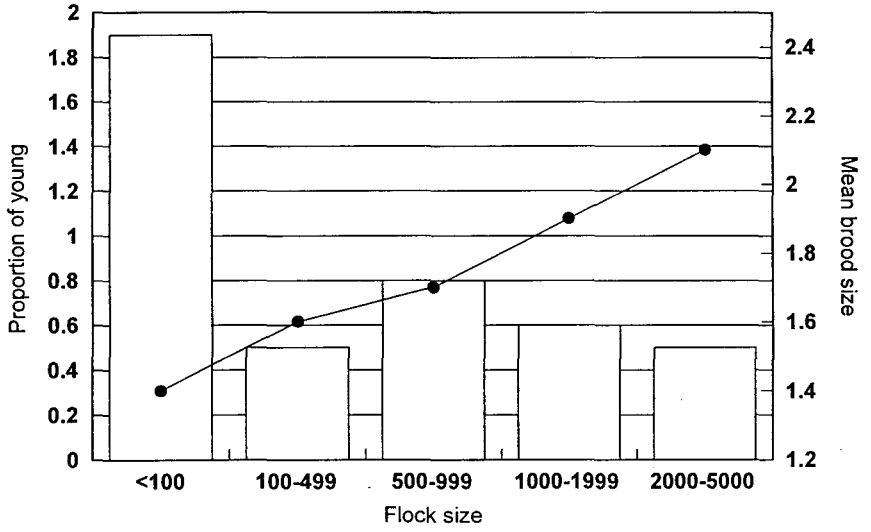

Figure 3. The proportion of young (bars) and mean brood size (dots) recorded in flocks of different size, winter *2000/01.*

Table 1. Numbers of Dark-bellied Brent Geese aged at 18 British estuaries and coastal areas in winter 2000/01 and the distribution of flocks across habitats.

Estuary	Sample flocks			No. sites	Total aged	% Young	Mean Brood Size	Percentage distribution across habitats of aged samples				
	First	Last	n					Water	Intertidal	Marsh	Grass	Cereal
Beaulieu	30 Sep	30 Sep	1	1	24	[0]	-	100				
Blackwater	2 Nov	20 Feb	14	11	16,012	0.8	1.92		5.6		73.1	21.3
Chichester Harbour	1 Oct	17 Feb	45	19	9,397	1.7	1.62	26.2	8.6	2.1	62.4	0.7
Colne	7 Dee	7 Dee	1	1	213	[0]	-				100	
Crouch	9 Nov	30 Jan	8	5	8,224	1.2	1.7		0.8		39	60.2
Exe	3 Dee	3 Dee	1	1	448	[0]	-		100			
Hamford Water	4 Nov	4 Dee	5	5	814	0.3	2	5.3	93.5		1.2	
Humber	30 Nov	7 Dee	5	4	824	0.5	1	22.3	37.2	40.5		
Langstone Harbour	24 Sep	9 Mar	56	10	19,979	0.5	1.81	2.7	41.5	3.1	52.7	
Lymington	12 Jan	12 Jan	1	1	495	[0]	-				100	
Medway	9 Nov	9 Nov	1	1	555	1 .1	2					
										100		
North Lines coast	1 8 Sep	10 Feb	9	6	2,367	0.4	2		23.6	28.5		47.9
North Norfolk	26 Oct	26 Feb	13	9	5,423	0.4	1.16		4.5	11.9	65.5	18.1
Portsmouth Harbour	12 Jan	14 Jan	2	2	492	[0.2]	1				100	
Stour	14 Oct	22 Dee	26	11	2,848	<0.1	1	21	76.5	2.5		
Thames	8 Oct	2 Nov	10	4	8,992	0.1	3.67		100			
The Solent	22 Nov	22 Nov	1	1	60	[11.7]	1.75				100	
The Wash	23 Sep	15 Mar	15	9	14,415	0.3	2.25		14.1	74		11.9
Totals	18 Sep	15 Mar	214	101	91,582	0.6	1.74	4.3	28.5	15.4	38.9	12.9

Note: percentage young in square brackets are based on small sample sizes (less than 500 birds aged)

Geese were recorded in five main habitat types: water, intertidal (including *Zostera* beds), saltmarsh, grass/pasture and cereal fields, including stubble and oilseed rape. The first three habitat types, which together represent all intertidal habitats, supported 48.2% of birds aged, while a further 38.9% were aged in grass fields and 12.9% were aged in cereal fields. As in previous estimates *(e.g.* Mitchell *et al.* 1997), a greater proportion of families were found foraging on food types with higher nutritional values, such as grass and cereals. However, in contrast to most years, mean brood size did not vary greatly between these habitats (Figure 4).

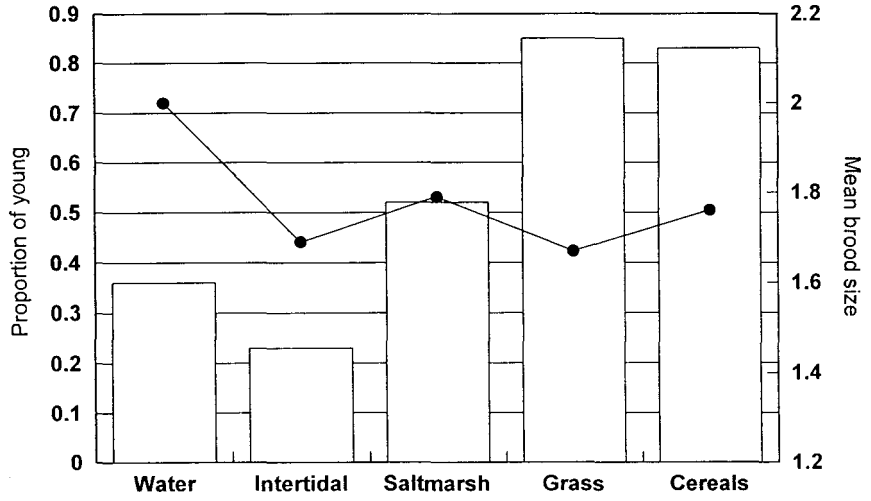

Figure 4. The proportion of young (bars) and mean brood size (dots) recorded in different habitat groups, winter 2000/01.

DISCUSSION

The proportion of young Dark-bellied Brent Geese present in Britain in each year since 1990 is shown in Figure 5. According to the predicted three year cycle of good, poor and variable breeding success (Dhondt 1987), 2000 was expected to be a good season. However, the cycle missed a year in the mid-1 990s as the peak years for lemming abundance occurred in 1991, 1 994, 1 996 and 1 999. Therefore, an adjusted cycle correctly predicts 2000 to be a poor breeding year, following the previous year's peak lemming abundance and high breeding success.

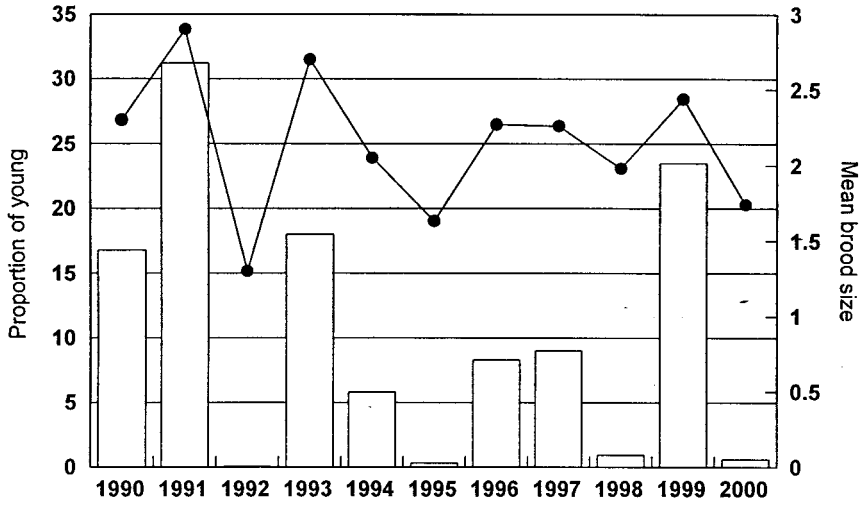

Figure 5. The proportion of young (bars) and the mean brood size (dots) of Dark-bellied Brent Geese recorded in Britain, 1990-2000.

The arrival of families and the relationship between flock size and measures of productivity showed similar patterns to the previous year, when reproductive success was high. Family arrival during autumn 2000 peaked during mid-winter, with observers in Essex reporting a notable increase in young during December (D. Wood pers. comm.). The proportion of young then declined again, although there was an increase in both the proportion of young and mean brood size in March. Such increases during the spring have been shown to occur in other parts of the wintering range (Lambeck 1990a). A number of explanations could account for this trend, such as families remaining in Britain for longer than non-breeding birds or larger families moving back through Britain during the spring from more southerly wintering areas.

As in 1999, the proportion of young showed a negative relationship with flock size, whilst mean brood size showed a positive one. Using all data from 1985/86 onwards, this relationship remains the same (Figure 6). This contradicts the findings of Lambeck (1990b), who found that mean brood size and the proportion of juveniles were positively correlated (although the data presented here have not been tested statistically). Jones & Jones (1966) reported that autumn staging Black Brant flocks in Alaska distributed themselves in small flocks composed almost entirely of families and large flocks of almost exclusively composed of failed and non-breeders. However, they did not report on brood size.

The social hierarchy based upon family size that exists within goose flocks, where large families dominate small families, small families dominate pairs and pairs dominate singletons has been understood for some time (*e.g.* Boyd 1953). Families are also known to position themselves within the flock non-randomly, with higher numbers on the flock edge where enhanced foraging conditions are found *(e.g.* Teunissen *et al.* 1985, Black &

Owen 1989). This results in a disproportionate number of subordinates in the centre of the flock. However, differences in flock size preference for different sized families have not been described previously in geese.

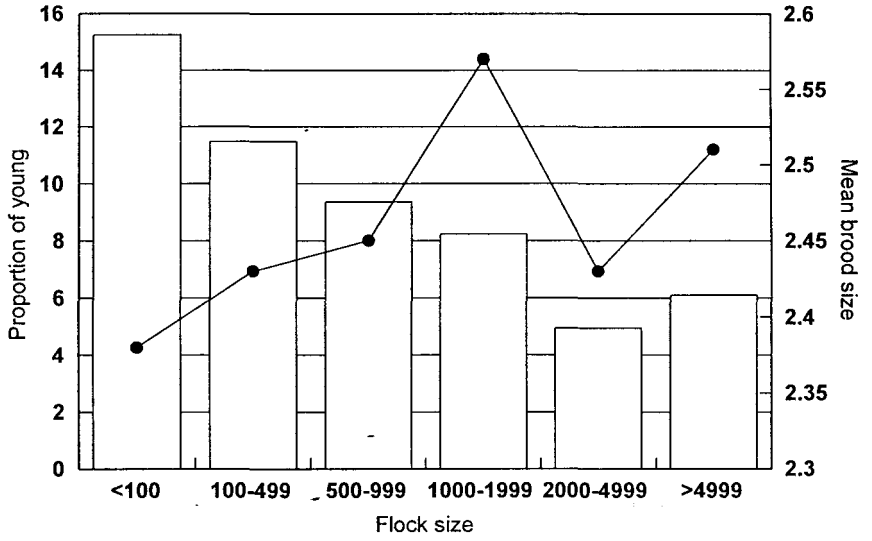

Figure 6. The proportion of young (bars) and mean brood size (dots) recorded in flocks of different size, 1985/86-2000/01.

These results suggest that there is a tendency for small families to select small flocks and large families to select large flocks. If true, this further suggests that there are benefits for families to be gained by avoiding different sized families; a relationship that could operate one-way or both. However, at this stage these benefits must remain speculation, but further research into this interesting phenomenon would be worthwhile, both from a behavioural perspective and for its implications for estimates of productivity.

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