AUTUMN WEIGHTS OF BLUE GEESE *(CHEN CAERULESCENS)*

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EACH autumn since 1952, the authors have been engaged in bag checking along the coast of James Bay and as a result have handled a sample of 2,870 Blue Geese *(Chen caerulescens)*.

Data used in this discussion were obtained by weighing geese on a spring balance, calibrated with standard weights. Dead birds were weighed by inserting the hook of the balance through the nostril, while live birds were placed in a net bag suspended from the hook. All weights were recorded to the nearest quarter pound. More precise measurement would contribute little, because of variation in crop content, wetness of feathers, and interval since the birds were shot.

The sex of each bird was determined by eversion of the vent, using the method described by Elder (1946) to detect the presence or absence of the penis.

In addition, the sample was divided into three age categories: (a) adult; (b) subadult or yearling; and (c) immature or juvenile. The division is easily accomplished on the breeding grounds, but is more difficult to do in James Bay where subadults closely resemble breeding-age adults. As late as October, however, most subadults still commonly exhibit a nail that is incompletely defined along its proximal margin, minor plumage differences, and frequently retain black patches on the bill. All of those characters are lacking in fully developed adults. In addition, the penis of a subadult male is incompletely sheathed and smaller than that of a breeding male. Most subadult females retain the bursa of Fabricius and a closed oviduct. Black feathering, extending along the nape and occasionally extending to the crown and cheeks, cannot be used as a criterion of immaturity in either sex. Females having the appearance of typical subadults have been recorded incubating on the breeding grounds (Cooch, 1958). Incubating birds captured at Boas River, Southampton Island, in 1952 and noted as retaining the melanistic pattern were color-marked and sketches made of the degree of melanism. Twenty-one birds recaptured in 1953 showed no decrease in melanism. Immature blue-phase *caerulescens* are readily distinguishable from all other categories because of their dark heads and bills, yellow chin patch, and black feet; white-phase immatures are characterized by gray feet and bills, plus a generally dirty appearance, especially on the greater wing coverts and scapulars.

Most published data on the weights of game birds are based on samples taken during the hunting season. In order to make the present data more readily comparable with those previously published for other waterfowl, weights of Blue Geese taken in the period 10 September through 15 October are presented in Table 1. Since those weights were taken over a seven-year period, they cannot be used for comparative data on sex and age distribution. The difference between mean weights of males and females is significant at the 5 per cent level.

Although Table 1 is derived from a sample of 2,870 geese, it does not exhibit the variation in weights that exists from year to year. Data are available that indicate that the autumn weight of Blue Geese in James Bay is dependent upon breeding phenology and the date at which the postnuptial molt ended. The nest-initiation period of the Blue Goose is unusual because of its shortness (10 days; cf. Cooch, 1958). Thus if the date of first laying is delayed a week or 10 days, juveniles shot in James Bay would on the average be a week or 10 days younger, and thus lighter. The date of the postnuptial molt of successful breeding adults is delayed in retarded seasons, but that of subadults and failed-breeding adults occurs at about the same time each year. Dates of first nesting during the present study have been 4 June 1952; 9 June 1953; 14 June 1954; 6 June 1955; 12 June 1956; 16 June 1957; 12 June 1958; and the average, 10 June. Comparative data on the annual variation in weights for the period 1–10 October are given in Table 2.

The relationship between weight of juvenile geese and date of nest initiation was tested by linear regression and correlation. Both negative regressions are significant at the 5 per cent level. Figure 1 demonstrates clearly the futility of gathering weights in a single season and assuming that they are always representative, regardless of the phenology of the season.

Weights of subadults do not vary significantly from year to year, since the timing of their molt is not dependent on the date of nest initiation. They may be affected by delays in the appearance of new vegetation and the date on which they were hatched in the previous year.

After their arrival on the breeding grounds, adult males undergo a 17 per cent weight reduction as a result of activities associated with reproduction. Unlike data from juvenile birds, data from adult males taken in James Bay do not show a significant variation among years, since varying proportions of adult birds that did not breed successfully are included in each year's sample. Nonbreeding individuals have more time in which to regain weight after the postnuptial molt. In retarded seasons the proportion of birds in that category is large, which in turn tends to elevate the mean weight of geese in the sample.

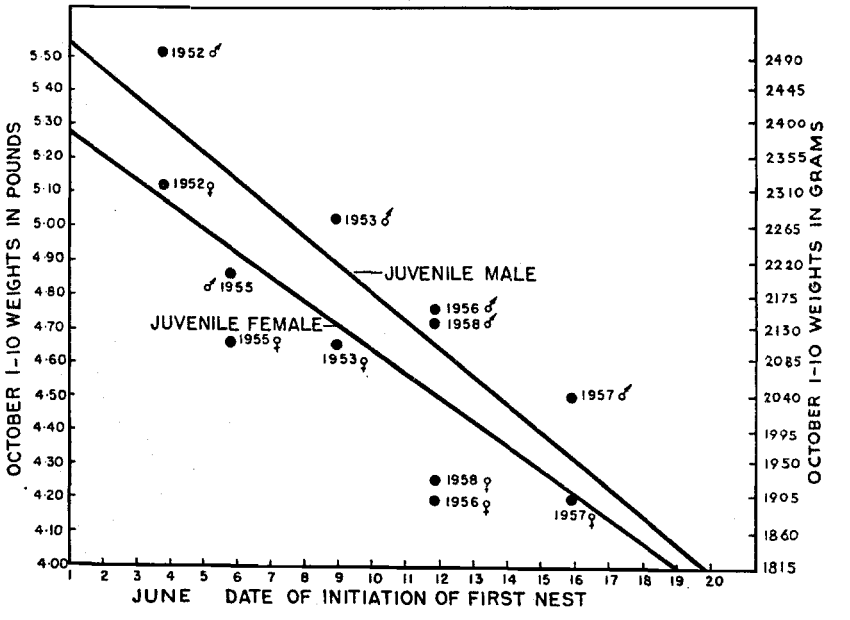

Figure 1. Regression showing relationship between autumn weight of immature *Chen c. caerulescens* and June date of nest initiation.

An interesting situation is noted in mean weights of adult females that normally exhibit a 25 per cent reduction in weight as a result of nesting activities. If their clutches are destroyed, they follow the same sequence as described for failed-breeding males. If the season is somewhat successful, but retarded, weights of this category will tend to be greatly reduced, unless the proportion of failure is great. Weights of adult males are not so greatly depressed because of food consumed while their mates are incubating. The successful female, however, has, in very retarded seasons, little opportunity to regain weight before leaving for James Bay.

Only one difference has been noted in weights of blue-phase and white-phase geese: in very retarded seasons, weights of juvenile white-phase geese are less than blue-phase geese of similar age and sex. Some have soft primaries as late as 10 October and weigh less than four pounds. These small, retarded geese may originate from breeding areas far to the north of those generally used by blue-phase birds, or may be late-hatched birds from a mixed brood.

The Blue Geese that stop in some autumns in South Dakota and other midwestern states breed on Southampton Island, northern Baffin Island,

TABLE 1

WEIGHT IN POUNDS AND GRAMS—10 SEPTEMBER–15 OCTOBER 1952–58

Weight		*Immature*		*Subadult*		*Adult*	
Gms.	*Lbs.*	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*
1361	3.00	6	2				
1474	3.25	7	5				
1587	3.50	27	13				
1701	3.75	63	32	1			
1814	4.00	84	54	5	2	1	
1928	4.25	106	91	5	5	2	
2041	4.50	136	129	11	6	9	
2155	4.75	90	126	21	8	25	3
2268	5.00	60	136	40	23	36	12
2381	5.25	28	109	58	25	78	25
2595	5.50	14	73	51	33	91	66
2608	5.75	6	35	37	37	82	74
2721	6.00	3	16	22	48	53	88
2835	6.25		6	12	26	27	74
2948	6.50		3	6	18	12	59
3061	6.75		1	1	9	3	41
3175	7.00		1		8	3	15
3288	7.25				1		7
3402	7.50						3
N		630	832	270	249	422	467
Mean (lbs.)		4.40	4.80	5.35	5.73	5.55	6.05
(gms.)		1996	2177	2427	2599	2517	2744
S.D. (lbs.)		.525	.597	.527	.632	.479	.519
(gms.)		238	271	249	287	217	235

and at Eskimo Point. Variations in breeding phenology affect not only weight but also apparently have a pronounced effect on the autumn mortality of Blue Geese.

The existence of a relationship between the date of nest initiation, mean weight, and the nature of the autumn migration has wide implications for the study of many species of waterfowl nesting in the Arctic. Its application to species capable of renesting will be difficult, but should eventually prove feasible.

SUMMARY

The weight of Blue Geese in autumn is dependent on the phenology of the breeding season. A short delay in the start of nesting causes significant decreases in the autumn weight, especially of immature birds. Subadults and failed-breeding adults show little annual variation, whereas successful breeding adults, particularly females, follow the same pattern as the juvenile cohorts.

TABLE 2

ANNUAL VARIATION IN WEIGHT OF BLUE GEESE TAKEN IN JAMES BAY, 1–10 OCTOBER 1952–1958

	Adult						*Subadult*						*Juvenile*					
	Male			*Female*			*Male*			*Female*			*Male*			*Female*		
Year	*N*	$\overline{M}$	*S.D.*	*N*	$\overline{M}$	*S.D.*	*N*	$\overline{M}$	*S.D.*	*N*	$\overline{M}$	*S.D.*	*N*	$\overline{M}$	*S.D.*	*N*	$\overline{M}$	*S.D.*
1952	20	2867	242	18	2585	247	2	2781	—	2	2781	—	37	2595	273	38	2341	164
1953	49	2790	189	36	2567	174	25	2781	224	22	2604	199	106	2263	226	103	2109	169
1954	33	2744	219	22	2527	207	10	2595	177	12	2354	188	—	—	—	—	—	—
1955	39	2672	248	42	2559	209	13	2626	210	18	2490	158	89	2191	249	88	2118	254
1956	48	2872	211	46	2617	185	18	2676	253	11	2585	193	79	2150	271	71	1900	189
1957	31	2676	224	32	2472	185	10	2676	240	15	2404	207	64	2059	272	54	1905	231
1958	22	2849	244	21	2353	197	39	2731	209	38	2449	200	57	2136	228	62	1928	236
Total	242	2767	218	218	2549	204	117	2699	243	118	2490	214	432	2200	277	416	2041	258

LITERATURE CITED

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