

FLUOROSCOPIC MEASURES OF SHOOTING PRESSURE ON PINK-FOOTED AND GREY LAG GEESE

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CONCERN over the future of wildfowl populations in North America stems in part from the fact that human populations there have doubled in the past 50 years and, at present rates of increase, will double again long before another 50 years have passed. With American traditions of free-hunting and with game of all sorts being the property of the people and vested in the state, the shooting pressure applied by those in pursuit of game, and especially migratory birds, must necessarily rise proportionately with the increase in human populations. It therefore behoves the New World to look critically at the practices in Europe in order to learn how waterfowl have persisted so long in shootable numbers in the face of a comparatively dense human population.

In recent years many efforts have been made in America to estimate the comparative shooting pressure that the sporting public applies to various kinds of waterfowl. These have included tabulations of the numbers of licences sold to shooters, numbers of federal 'duck stamps' sold (a form of tax on those pursuing waterfowl only), estimates of total kill by sample counts of hunter's bags, voluntary report systems and rates of recoveries of rings from waterfowl shot and reported.

Each of these methods is fraught with particular difficulties, for total shooting pressure is the resultant of many forces, including number of guns in the field and the number of wildfowl at which they may shoot (as controlled by regulation of close-seasons and the weather phenology of the particular year). Shooting pressure is also influenced by the sporting traditions of the nation, for this determines the number of species considered worthy of the wildfowler's efforts.

In an earlier paper (Elder, 1950) it was pointed out that the amount of lead

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actually fired at waterfowl, of any given species, in the form of shot or pellets must be proportionate to the number killed and to the number that survive wounds to carry pellets in their flesh as a mark of the experience. Because pellets lodged in the flesh do not disintegrate but remain permanently intact they can be readily seen when the bird is examined in the dark under a fluorescent screen bombarded by X-rays.

A convenient apparatus for accomplishing this with live birds trapped for ringing was described in the paper cited above and I have now used it in the examination of more than 20,000 birds. My desire to compare the effects of the very different social traditions in Europe and North America on shooting pressures sustained by their respective waterfowl populations made me eager to accept the kind invitation of Peter Scott to come to the Wildfowl Trust in the autumn of 1953.

METHODS

It was my good fortune to accompany the goose-netting trips of the Trust and to examine nearly all birds caught for the presence of lead pellets in their bodies. This was accomplished by erecting a collapsible aluminium frame over which was stretched a rubberised black-out tent. Inside this dark room a small portable X-ray machine was held in a lead protective box, topped by a fluorescent screen. The unit was energised by a compact, aluminium, gasoline-driven generator of 1500 watt capacity; the generator weighed but 125 pounds and was connected by 100 feet of electric cable to the X-ray machine. This distance reduced the noise during operation. In practice each goose was firmly wrapped in a piece of burlap sacking, passed through a small light-tight door in the tent, slid beneath the fluorescent screen and examined for a few seconds under $3\frac{1}{2}$ milliamperes of current. When our crew became fully trained, we were able to examine as many as 190 birds per hour.

Because the two sexes of any species may have different average life spans, as shown for North American ducks (Bellrose and Chase, 1950), it is apparent that the males, being longer-lived, will have more years in which to accumulate pellets and hence the data must be grouped separately for the two sexes. It is also obvious that juveniles examined in October-November have experienced but part of their first year of being shot at and will have many fewer shot than adult geese, hence they too must be considered separately. When the data are thus broken down into age and sex groups they are too few to report separately from each trapping site and hence are lumped for the entire season.

For those interested in the local populations sampled, I shall add that they were captured in the following areas: West Lancashire, the Wash, the Humber, the Solway, South-east Scotland, Loch Leven, the Tay and Montrose.

FINDINGS

In Table I below are shown the data resulting from the fluoroscopy of 1476 geese. On the basis of this sample we cannot conclude that there is a statistically significant difference between Grey Lag and Pink-footed Geese or between the males and females of either species. In the Pinkfoot, where the sample is most nearly adequate, the slightly greater proportion of adult males carrying pellets can be almost entirely accounted for by their slightly larger body size presenting a bigger target to the shooter. If we compute their comparative silhouette

areas by the formula :

$$\frac{\text{Area of Male}}{\text{Area of the Female}} \therefore \frac{(\text{Average Weight Male}) \text{ to the power of } \frac{2}{3}}{(\text{Average Weight Female}) \text{ to the power of } \frac{2}{3}}$$

we find that males have 7.1% more area. Because the proportion of the two sexes is very nearly equal in each group, it is safe to average the samples and conclude that among the 825 adult Pink-footed Geese 41% were carrying the evidence that they had been hit by shotgun fire while 37% of the 161 adult Grey Lag Geese carried the same evidence.

Less than 5% of the juvenile geese experiencing their first gunning season had yet acquired lead pellets. This strongly suggests that the shooting pressure they have sustained prior to reaching Britain is not very great and that perhaps most of the pellets they will acquire will be from British guns.

TABLE I

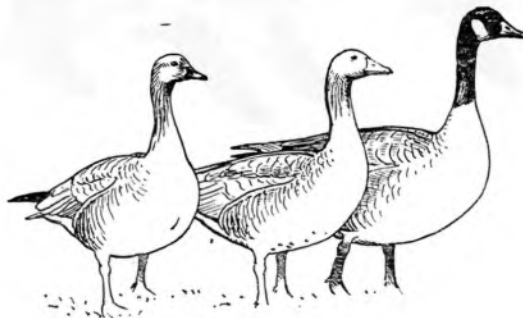
Incidence of Lead Pellets Found in the Flesh of Pink-footed Geese and Grey Lag Geese in Britain by Means of the Fluoroscope, 11 October-23 November 1953, and Canada Geese in Missouri, U.S.A., 7 November-9 December 1949

	Adult Males			Adult Females			Juvenile		
	No. Examined	No. with Pellets		No. Examined	No. with Pellets		No. Examined	No. with Pellets	
Pink-footed Goose ..	407	179	44.0%	418	161	38.5%	309	15	4.9%
Grey Lag Goose ..	82	30	36.6%	79	30	38.0%	99	3	3.0%
Canada Goose ..	402	179	44.5%	333	144	43.3%	596	129	21.6%

TABLE II

Number of Pellets Carried by Adult Pink-footed Geese, Detected by Fluoroscope, Autumn 1953

	Number of Pellets											Number of Geese Examined
	1	2	3	4	5	6	7	8	9	16	23	
Number of Geese ..	167	87	44	15	10	6	1	4	4	1	1	825



Unpublished evidence on the Canada Goose *Branta canadensis interior* in Missouri (Shanks, *in litt.*) indicates that the adult populations of this species traversing North America in the Mississippi Valley carry approximately the same percentage of lead pellets in their flesh as do British geese. The similar gunning pressures in America and Great Britain as indicated by the fluoroscopic evidence are extremely interesting, for geese on their wintering ground in Great Britain are pursued for at least four months. This is approximately the same time span that the Canada Goose endures pursuit by gunners from its nesting ground in Canada to wintering areas in the southern United States. It appears that the fast transportation in America (where nearly all shooters proceed by private auto) and wide use of automatics and pump guns offsets the effects of the tremendous distances and multiplicity of restrictive regulations so that American geese are shot as heavily as British geese, despite the fact that British geese are confined to a comparatively small wintering area and are protected by few restrictive regulations.

However, before final interpretations can be made we must know the average life span or mortality rates of the species on the two continents. In America 95% of the population 'turns over' or is replaced by reproduction every five years (Hanson and Smith, 1950) but this will not be known for Europe until there is a greater accumulation of recoveries from the ringing programme.¹

¹ The most recent figures indicate that 95% of the British population of Pink-footed Geese 'turns over' in 6 years.

REFERENCES

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