CANADA GOOSE POPULATIONS

Wm. H. Elder - University of Missouri

Paper No. 7 in the Roundtable Discussion of
Game and Fur Population Mechanisms
Conducted by Aldo Leopold for the
Ecological Society, A.A.A.S. Meetings, Chicago
Dec. 31, 1947

Mr. Hawkins has discussed means of measuring population trends and turnover in ducks. I will present our attempt to measure turnover in the Canada Goose. My discussion is based upon an analysis of banding returns from two widely separated populations. One is a non-migratory population breeding in the Bear River Marshes in Utah. It was intensively studied by Cecil Williams, now chief of waterfowl investigations for the U. S. Fish and Wildlife Service, to whom I am indebted for his giving freely of data which I shall present. The other population is a migratory one breeding in the James Bay region just south of Hudson's Bay and wintering in the southern tip of Illinois at Horse Shoe Lake Refuge. This flock my wife and I studied during two winters while I was in the employ of the Illinois State Natural History Survey. It is the returns from the banding we did there as well as those from banding done by Arthur Hawkins the preceding year which I shall discuss with you. (I am using "return" in the sense that bird banders use "recovery"--namely a report from a band found on a dead bird.)

First let us look at the Utah data. There, banding was done in mid-summer when the birds were nearly all flightless, the adults having shed their primary feathers and the young not yet having acquired their flight feathers. At this time the juveniles are easily distinguished by their small size [illegible]ng down feathers. Band recoveries from these birds [illegible]ly a result of legal kill during the 2-3 month [illegible]ason permitted by federal regulation during the [illegible]is study.

[illegible]he 2600 geese banded in Utah during the 5 year period I am discussing, 672 returns were received from hunters, or approximately 26% -- a high percentage of returns even for waterfowl. First let us look at the returns from banded juvenile geese. We see that 64% of these were killed in the first fall after hatching, 21% the next fall, 9% the [illegible]rd year, 5% the next, and only 1% in the 5th year, with [illegible]y one or two birds in the 6th year. (Fig. 1)

In this same histogram we see similar data for the adult [illegible]se banded in Utah. Although not all were sexually mature, [illegible] at least, were more than one year of age. This group

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First let us look at the Utah data. There, banding was done in mid-summer when the birds were nearly all flightless, the adults having shed their primary feathers and the young not yet having acquired their flight feathers. At this time the juveniles are easily distinguished by their small size and remaining down feathers. Band recoveries from these birds are primarily a result of legal kill during the 2-3 month shooting season permitted by federal regulation during the years of this study.

From the 2600 geese banded in Utah during the 5 year period I am discussing, 672 returns were received from hunters, or approximately 26% -- a high percentage of returns even for waterfowl. First let us look at the returns from banded juvenile geese. We see that 64% of these were killed in the first fall after hatching, 21% the next fall, 9% the third year, 5% the next, and only 1% in the 5th year, with only one or two birds in the 6th year. (Fig. 1)

In this same histogram we see similar data for the adult geese banded in Utah. Although not all were sexually mature, all at least, were more than one year of age. This group

shrinks and disappears in 5 years as we should expect since the juveniles, which had at least one more year of life to live, disappear in 6 years. It seems clear that in these geese the turnover period is 6 years -- that is, it takes six years for a generation to shrink to the level that no more returns are received from 2000 banded juveniles.

Before discussing mortality rates I should like to present the general population turnover picture for another group of geese of this species -- the migratory flock wintering in Illinois. Here the birds had to be trapped for banding and the ages determined by examination of the tail feathers and cloaca, in much the same manner as Mr. Hawkins has described the process for ducks. One difference that we found after handling many birds was that in geese the presence or absence of notched tail feathers remains a reliable criterion of age throughout the winter for rarely does a juvenile goose complete its tail molt before the spring migration is begun.

Let us examine the histogram showing the returns received from approximately 2300 geese trapped and banded in Illinois from 1940-1943. (Fig. 2.) First I should say, that while the number of geese banded at Horse Shoe Lake in Illinois nearly equals the number banded in Utah during the period reported, the number of returns was less than half as great. You may recall that the percent of banded geese from which band returns were received in Utah was nearly 26, while from Horse Shoe Lake bandings only 10% were returned. In some ways this was a surprise for the non-migratory flock was subject to shooting pressure during only a few months while the Horse Shoe Lake geese not only were under extremely heavy shooting pressure in Illinois, but are shot by Indians in Canada during the latter part of the spring migration, as well as occasionally in summer, and again heavily in early fall as migration begins. But in spite of the lesser number of returns the percentage received from each year-class was very similar to those for the Utah geese.

The absence of any sixth year returns from the Illinois banding is a result of the closure of the entire Mississippi flyway to shooting of Canada Geese in 1946, or just 5 years after the intensive banding program was started. However, a few returns could be anticipated in the sixth and subsequent years for we know from captive birds that the longevity in Canada Geese may be several times six, and we trapped a goose banded ten years before by Jack Miner in Ontario.

I believe that we can conclude from these data that the turnover period is identical in these two geographically distinct populations of Canada Geese and that almost of it occurs in approximately 5 years.

A moment of digression here. In a previously published paper we pointed out that geese do not breed their first year and few in their second year of life. This means that the bulk of breeding geese are 3 or 4 years of age and that only a small segment of the population is biologically productive at any one time. In fact not more than 25%.

Now as to rate of turnover or the percent annual loss in any one generation. Since the turnover period in the two populations was the same and there seemed to be little difference between the rate of band recoveries from Utah and Illinois geese, I lumped the returns from the juveniles or geese of known age from both regions and determined the percent of returns in each year of life. These are shown in Fig. 3. You will notice that the percent of returns decreases by about 60% per year.

In order to compare the population picture in geese with that which has been so thoroughly worked out in pheasants, the mortality series was used to construct a survival series on the basis of 100 birds. (Fig. 4). In other words, for every 100 birds in the population this year, 36 will be alive the next, 15 the next, 5 the next, and one the last. Perhaps only one goose in 1000 lives to be ten years old.

If we in the field of applied ecology are to use such statistics to predict population behaviors, it would be a great help to know whether the rate of mortality was constant from year to year. I will mention just one of the ways we attempted to discern this for geese. It may not be the best way and perhaps is not valid at all.

When we divide the percent returns in one year by the percent returns the next, we get a mortality rate which is 3 for the first drop, 2 for the second, 2 1/2 for the third, up to 4 the next, and in the last shoots up to ten. (See Fig. 5.) The numbers must always be small at the end of the curve and the apparent increase in mortality rate with age may not be real. But the high mortality in the first year was clearly shown by a comparison of age ratios. In hunters' bags we found 5 juveniles for each old pair shot, while in banding after the close of shooting we found only 3 young per adult pair. If this first leg of the curve (Fig. 5) is preceded by a high mortality rate in infancy, adolescence shows a declining rate, the prime reproductive period a low rate, and old age a rapidly increasing rate. If this mortality rate curve gives us a real picture, Canada goose mortalities show the same characteristics as human mortalities, only in a much more contracted time span.

William H. Elder
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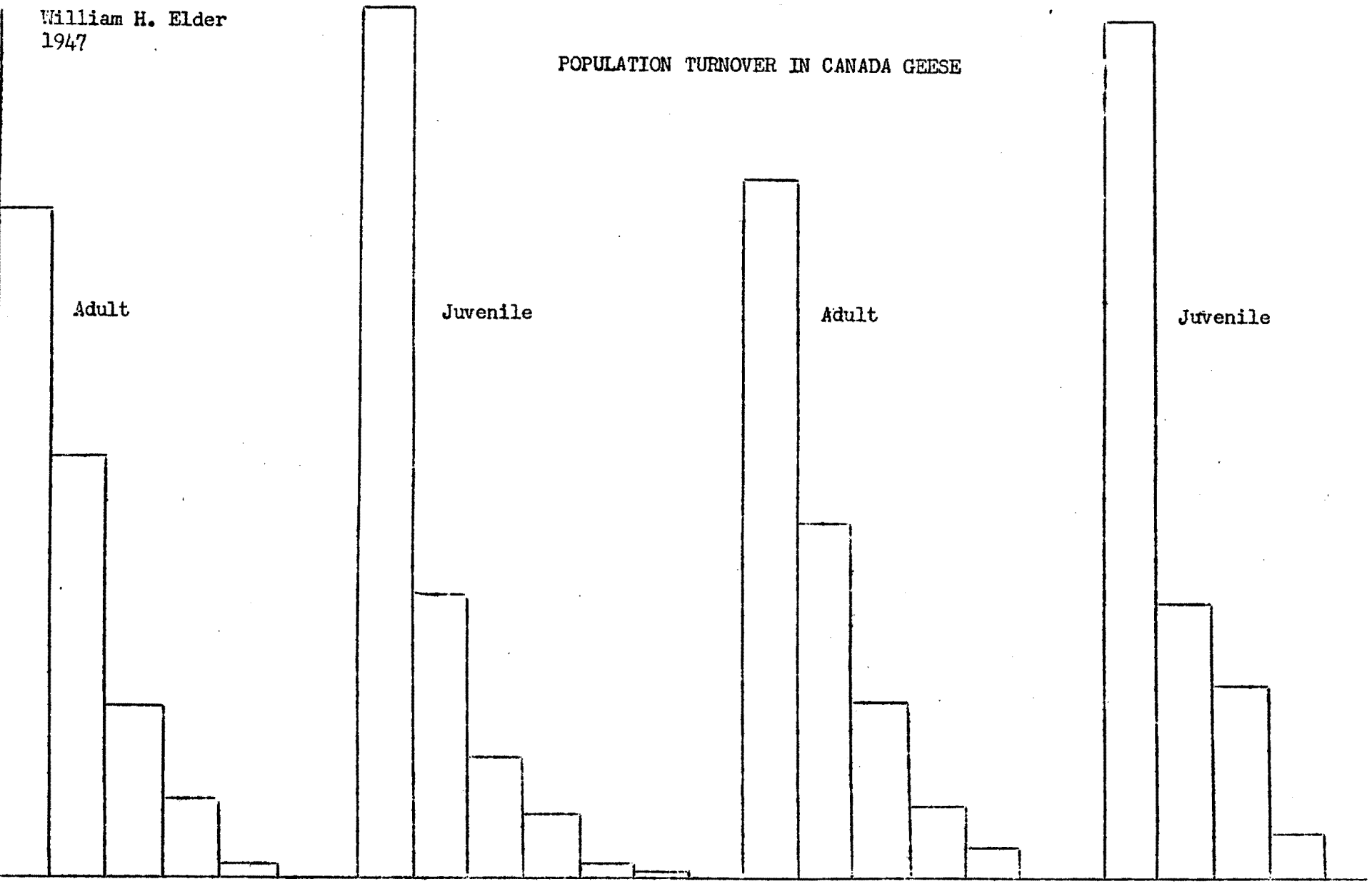
POPULATION TURNOVER IN CANADA GEESE



g. 1

Fig. 2

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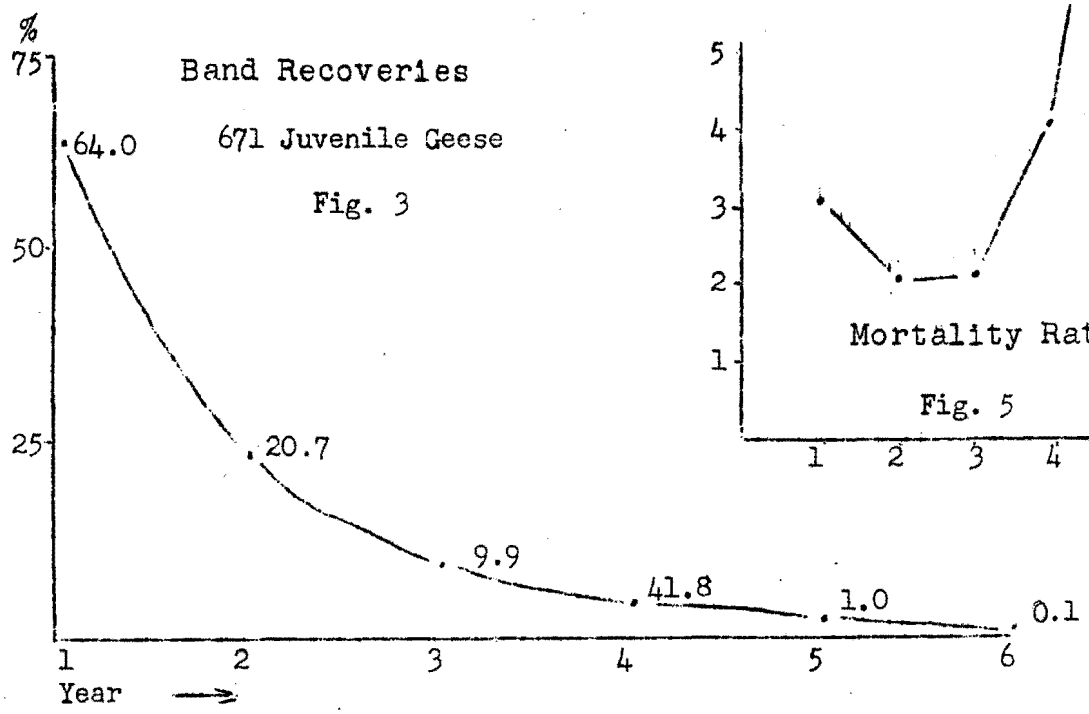
ILLINOIS AND UTAH



Band Recoveries

671 Juvenile Geese

Fig. 3

Mortality Rate

Fig. 5

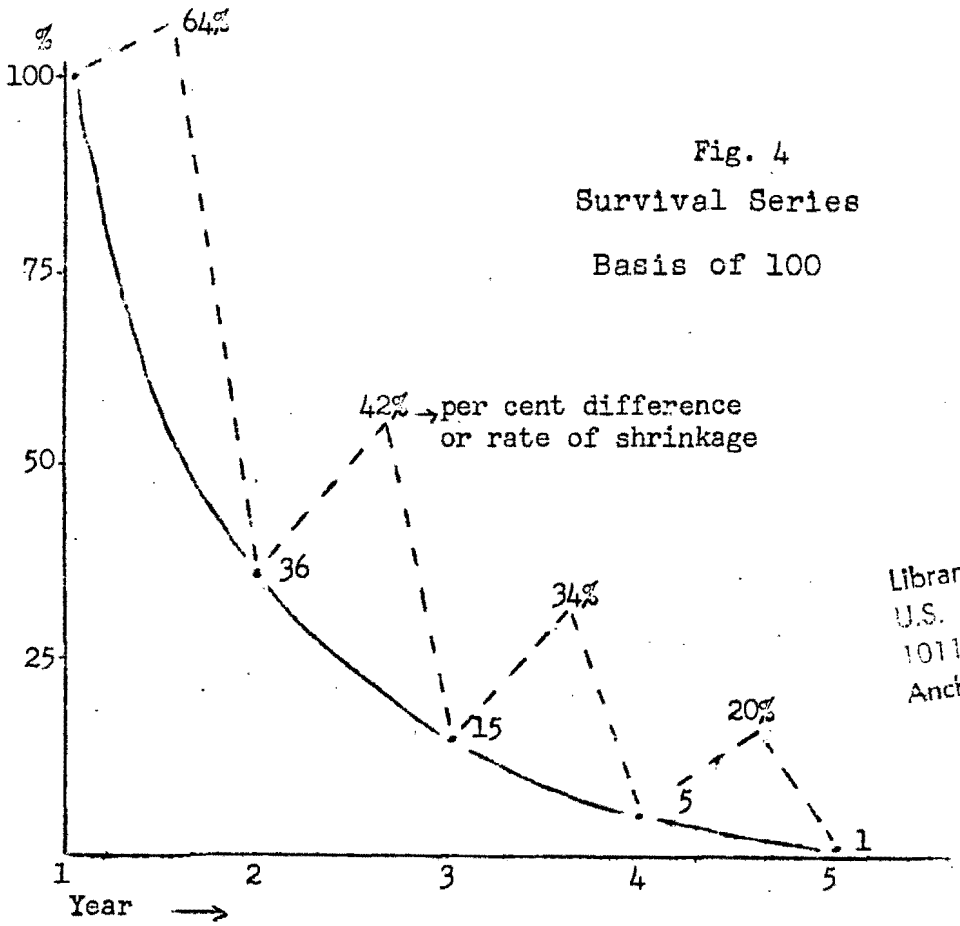


Fig. 4

Survival Series

Basis of 100

per cent difference or rate of shrinkage