

MIGRATORY BEHAVIOR OF VANCOUVER CANADA GEESE:
RECOVERY RATE BIAS

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Abstract: A total of 4,665 Vancouver Canada geese (*Branta canadensis fulva*) has been banded in Southeast Alaska. Alaska accounted for 84 percent of the recoveries, and Oregon, British Columbia, and Washington accounted for 12, 3, and 1 percent, respectively. Information is presented supporting our hypothesis that the 12 percent recovery distribution in Oregon misrepresents migratory behavior of Vancouver Canada geese. This hypothesis is based on substantially different harvest pressures in Oregon versus Southeast Alaska. Comparative statistics are provided. A hypothetical data set is presented and demonstrates that, with given harvest and reporting rates, less than 2 percent of *B. c. fulva* actually migrate as far south as Oregon. Southeast Alaska habitats are probably more important to this subspecies than previously thought.

Delacour (1954) and Gabrielson and Lincoln (1959) report that Vancouver Canada geese (*Branta canadensis fulva*) are primarily nonmigratory with small numbers migrating as far south as northern California. However, band returns indicate that *B. c. fulva* banded in Southeast Alaska do not migrate beyond central Oregon (Hansen 1962, D. E. Timm, unpublished data). A total of 4,665 Canada geese was banded in Southeast Alaska (93 percent banded at Glacier Bay, 129 km west of Juneau) and hunting season recoveries have totaled 413. Alaska accounted for 84 percent of the recoveries, British Columbia 3 percent, Washington 1 percent and Oregon 12 percent (D. E. Timm, unpublished data). The purpose of this paper is to present information supporting our hypothesis that the 12 percent recovery distribution in Oregon likely misrepresents the actual number of *B. c. fulva* migrating as far south as Oregon. For the following discussion, our definitions of recovery, reporting, and harvest rates follow those of Anderson (1975).

Our hypothesis is based on a greater probability of a Canada goose being harvested in Oregon than in Southeast Alaska. Although the bias associated with differential harvest pressure on a given cohort of banded birds is known, the situation with Vancouver geese is especially interesting. Because most

B. c. fulva banding and recoveries occurred during the years 1956 through 1966, we will present analogous information from those years when possible.

Table 1 summarizes data which clearly indicate the greater harvest pressure in Oregon versus Southeast Alaska. Comparative harvest data between Oregon and Alaska are not available before 1971. However, we can compare federal duck stamp sales for this period and assume that stamp sales and harvest are positively correlated as suggested by Janzen (1964:738). During the period 1971-76, the mean harvest of Canada geese was over 5 times greater in Oregon than in Southeast Alaska (calculated from the percent of total goose harvest which occurred in counties where Glacier Bay geese have been recovered). Stamp sales were 3.3 times greater in Oregon than in Alaska during this period. During the 6-year period of 1955-60, stamp sales were 6.2 times greater in Oregon. Thus, we conclude that harvest pressure was more than 5 times greater in Oregon for the 1955-60 period.

Table 1. Comparative data that reflect differential harvest pressure of *B. c. occidentalis* in Oregon vs. *B. c. fulva* in Southeast Alaska.

	Oregon	SF Alaska
Mean 1955-60 Duck stamp sales	60,625	9,780
Mean 1971-76 Duck stamp sales	53,875	16,205
1971-76 Canada goose harvest	9,300 ^a	1,800
Harvest rate (percent)	41 ^b	5.7 ^c
Total recovery rate (percent)	35.6 ^b	10.1 ^d

^a goose harvest from counties where Glacier Bay geese were shot (Oregon Game Comm. Annu. Pacific Flyway Rep. and U.S. Fish and Wildl. Serv. Adm. Rep.)

^bChapman et al. 1969

^cthis paper

^dRatti et al. 1978

Differential harvest pressure is verified by reported data on recovery and harvest rates. Chapman et al. (1969) reported a total recovery rate of 35.6 percent and a harvest rate (for 1966-67) of 41 percent for the Dusky Canada goose (*B. c. occidentalis*) population. Southeast Alaska, by comparison, had a total recovery rate of 10.1 percent and a harvest rate of 2.1 percent for *B. c. fulva* (Hansen 1962, Ratti et al. 1978, J. Brooks 1977, Alaska Dept. of Fish and Game, Proposal to U. S. Fish and Wildl. Serv.). These statistics are not surprising, for geese in Oregon are accessible to large numbers of hunters while geese in Southeast Alaska inhabit remote regions and can easily escape hunting pressure. Although 2.1 percent may represent harvest pressure on the entire *B. c. fulva* population, the Glacier Bay population probably receives greater pressure. Assuming a reporting rate of approximately 50 percent for 1956 through 1960 (Martinson and McCann 1966, Henny 1967) band recoveries indicate a harvest rate of approximately 5.7 percent on the banded population (calculated from birds banded 1956 through 1960 and their respective direct recovery rates, Hansen 1962). Table 2 demonstrates results suggested by our hypothesis.

Table 2. Hypothetical example of how geographic differences in harvest pressure misrepresent migratory behavior of *B. c. fulva*. From a hypothetical population of 4,665 geese banded in Southeast Alaska, this example assumes that 2 percent (93) of the banded birds migrate to Oregon and 98 percent (4,572) are sedentary. The example is based on a harvest rate of 5.7 percent in Southeast Alaska, 41 percent in Oregon (Chapman et al. 1969), and a reporting rate of 50 percent from both locations (Martinson and McCann 1966 and Henny 1967).

Area	Number present	Number harvested	Number recovered	Percent of recoveries
SE Alaska	4,572 (.057) =	260.6 (.5) =	130.3	87
Oregon	93 (.41) =	38.1 (.5) =	19.1	13
Total recoveries			149.4	

Our example data (Table 2) show that, although 2 percent of our hypothetical population have migrated to Oregon, total band returns indicate that nearly 13 percent have migrated. The influence of differential harvest pressure suggests that substantially less than 12 percent of *B. c. fulva* banded at Glacier Bay migrate as far south as Oregon.

DISCUSSION

Our data suggest that very few members of the Vancouver Canada goose population exhibit migratory behavior. Although this appears to be an unusual situation, a number of bird populations are reported to follow a similar pattern. Thomas (1926:300) refers to "individual migration" where "individual birds belonging to the same species and native to the same area may behave differently as regards migration." Lack (1943-1944) described this behavior as "partial migration." Stewart (1952) reported 169 recoveries from a northern population of Barn Owls (*Tyto alba*); 80 percent of these recoveries were reported from within 320 km of their hatching location, yet over 2 percent were recovered between 1,280 and 1,760 km from the hatching site. Stewart (1952) reported these birds as "partly migratory" but found a more southerly population to be "relatively sedentary." "Individual migration" has been reported for a number of species by Thomas (1929), Boyd (1931), Miller (1931), Thomas (1934), and Nice (1964). Migratory differences within a population are not restricted to birds; Orr (1970) reports such behavior for the arctic lamprey (*Lampetra japonica*). Age and sex differences in migratory behavior are reported commonly (Orr 1970, Welty 1975, Van Tyne and Berger 1976). Considering how few *B. c. fulva* migrate to Oregon, a large-scale banding program would be required to provide sufficient data to correlate age, sex, or location with individuals which migrate to Oregon. Due to the financial burden of banding large numbers of birds, such a program probably is not warranted at this time.

Vancouver Canada geese inhabit lands which are owned and managed by the U. S. Forest Service and the State of Alaska. Most of Alaska's commercial timber is harvested in southeastern Alaska, and the effects of logging on the goose population remain unknown (Bartonek et al. 1971). Our findings suggest

that Southeast Alaska is even more important to Vancouver geese than previously thought, with approximately 98 percent of the population being relatively sedentary. Future research on *B. c. fulva* needs to consider the ecology of these birds throughout the year.

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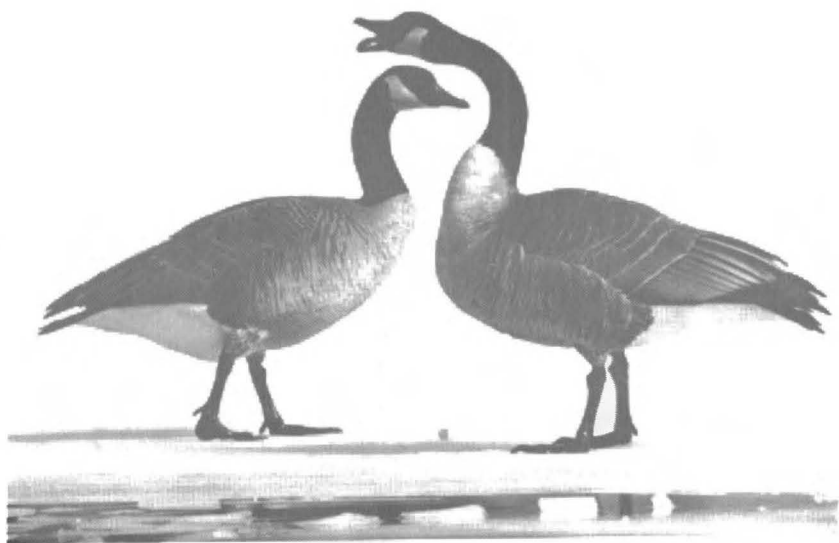
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