

AGE AND SEX CHARACTERISTICS OF BEAVERS (*CASTOR CANADENSIS*) IN EASTERN SOUTH DAKOTA

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ABSTRACT

Population characteristics of beavers (*Castor canadensis*) were examined in fall 2001 along the Big Sioux River Basin of eastern South Dakota. Over half (54.3%) of the beaver population consisted of kits (0.5-1 year) and yearlings (1.5-2 years). Males were more prevalent in age-classes 2.5-3 and 3.5-4, and there were more females in the 1.5-2 and 4.5-5+ age-classes, but the sex ratio was not significantly different from a 1:1 ratio. The beaver population in eastern South Dakota appears to be increasing so complaints to State Wildlife Agencies about beaver damage will continue to rise.

Keywords

Beaver, Big Sioux River, *Castor canadensis*, sex ratio

INTRODUCTION

Beaver (*Castor canadensis*) ecology has been well documented over much of its range, but not the northern Great Plains region. Beaver populations increased markedly during the 1980's over most of the northern Great Plains due to low fur prices and reduced trapping pressure (Miller 1985). Along the Big Sioux River in eastern South Dakota, landowner complaints also increased, causing concern of excessive beaver damage to riparian habitat (Miller 1985). Today, fur prices are still low and the number of people trapping beavers has continued to decrease. Conversely, the number of depredation complaints from farmers and landowners continues to increase (Jerry Reidel, South Dakota Game Fish and Parks, pers. Comm.). Our objective was to determine the age and sex structure of beavers in eastern South Dakota. This information will aid state agencies to better understand and manage the beaver population.

Study Area

The study area was located in the Big Sioux River Basin in eastern South Dakota. The Big Sioux River originates in southwestern Roberts County, South Dakota, and flows in a southerly direction to its confluence with the Missouri River at Sioux City, Iowa. The basin contains about 117,160 square km of contributing area of which 68,880 square km are in South Dakota. The river occupies a broad, shallow valley from its source to approximately Sioux Falls, South Dakota. The width of the river channel within the study area varies from 15 to 40 m and water depth ranges from 0.3 to 1.7 m. The South Dakota portion of the river contains many small, intermittent streams, which provide additional beaver habitat. Riparian tree and large shrub species commonly found in the study area are green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), peachleaf and sandbar willows (*Salix amygdaloides* and *S. exigua*) and American elm (*Ulmus americana*). Land use along the Big Sioux River is predominantly livestock grazing and cultivated crops. Widely scattered large trees with no regeneration and/or little to no understory characterize grazed areas. In contrast, ungrazed areas have a thick understory and are heavily forested by small trees interspersed by a few larger trees (Smith and Flake 1983).

Methods

During fall 2001, 103 beaver carcasses were obtained from Animal Damage Control employees of the South Dakota Game, Fish and Parks Department. Some biases, such as hunter selectivity, are associated with all types of harvesting methods, and representation may be skewed by kit mortality (Dieter 1992), but in our study some biases were eliminated. Sampling was done when all individuals in the colony would be actively collecting food for winter and feeding outside the lodge. In addition, beavers were harvested by several lethal methods including, but not limited to, trapping in all types of aquatic systems in the Big Sioux River Basin. After the beavers were trapped, they were transported to a lab at South Dakota State University and examined.

The lower jaw was removed from each beaver and the teeth were extracted using laboratory tools. Beavers were aged based on the degree of root closure on the mandibular teeth or by grinding the teeth to reveal the cementum layer (Van Nostrand and Stephenson 1964, Larson and Van Nostrand 1968, Hartman 1992). Five age classes were recognized: kits (0.5-1 year), yearlings (1.5-2 years), 2.5-3 years, 3.5-4 years, and 4.5-5 years and older. A Chi-square statistical analysis was performed to test for deviation from a 1:1 male:female sex ratio on the entire population as well as between age categories.

Results

Kits and yearlings comprised the majority (54.3%) of the population, while adults (2.5 and up) comprised 45.7% of the population (Table 1). The male:female ratio in all age classes, and the overall male:female ratio (1.34:1.00), were not significantly different from a 1:1 ratio (Chi-square = 3.8415, 1 df, P = 1.08)

Table 1: Sex and age distribution of beaver collected during September-November 2001 in eastern South Dakota.

Age - class	No. of individuals in age - class (%)	Male	Female	Sex ratio M:F	P value ^a
0.5 - 1	33 (32.0%)	20	13	1.54:1.00	0.76
1.5 - 2	23 (22.3%)	11	12	1.00:1.09	0.04
2.5 - 3	14 (13.6%)	10	4	2.50:1.00	1.34
3.5 - 4	12 (11.7%)	8	4	2.00:1.00	0.68
4.5 - 5+	21 (20.4%)	10	11	1.00:1.10	0.04
	Total n=103	59	44	1.34:1.00	1.08

^aP = probability for differences in sex ratio using Chi-square analysis with 1 df at $\alpha = 0.05 = 3.8415$.

(Table 1). Males were more prevalent in age classes 2.5-3 and 3.5-4, while there were a greater number of females in the 1.5-2 and 4.5-5+ age-classes.

DISCUSSION

Most beaver population studies are based on samples recreationally trapped during the winter (Henry and Bookhout 1969, Bergerud and Miller 1977, Lyons 1979, Payne 1982 and 1984) or on unexploited populations (Taylor 1970, Hodgdon 1978, Svendson 1980, Busher 1987). Several researchers (Leege and Williams 1967, Henry and Bookhout 1969, Gunson 1970, Payne 1982) have suggested that the age ratio of trapped beavers approximates the age ratio of the population, whereas others (Novakowski 1967, Boyce 1974) believe that trapping may be more selective for adults and does not approximate the age ratio of the population. Our study was unique compared to other studies of beavers due to the timing of harvest. Beavers were harvested in late summer and early fall after Game, Fish, and Parks Department Animal Damage Control personnel tried to kill all beavers (with no animal size preference as fur-trappers would have in an area) to avoid further nuisance complaints. Therefore, we believe that our sample provided the actual age and sex ratio of the local beaver population.

The percentage of kits (32.0%) and yearlings (22.3%) were similar to the averages found by Hill (1982) for kits (30%) and yearlings (23%) from unexploited populations. Nordstrom (1972) found that exploited populations contained 34-39% kits. Hodgdon (1978) and Svendson (1980) found that unexploited increasing beaver populations consist of around 30% adults, whereas the Big Sioux River Basin population contained 32% adults. Larson (1967), Nordstrom (1972), and Lyons (1979) found productive beaver populations to have a mean age of 2.5-3.0 and percent kits to be between 27-39%. We found similar numbers in the eastern South Dakota beaver population, which suggested that the beaver population in eastern South Dakota is increasing.

Sex ratios of beaver populations do not normally deviate significantly from a 1:1 ratio (Novak 1987). However, habitat condition and trapping methods may cause sex ratios to vary (Bradt 1947, Hodgdon and Hunt 1953, Rutherford 1964). We found that males were more prevalent in the juvenile age-class, which is consistent with other studies (Leege and Williams 1967, Vanden Berge and Vohs 1977). Some researchers (Nordstrom 1972, Boyce 1974 and Lyons 1979) suggest exploitation disrupts sex ratios due to differences in trap vulnerability. Several studies found females were more prevalent in older age groups (Henry and Bookhout 1969, Leege and Williams 1967). We found more females in the 1.5-2 and the 4.5-5+ year classes.

In 1992, the beaver population in eastern South Dakota was considered stable (Dieter and McCabe 1989), but our data suggests the beaver population is increasing. This change may be due to the continued decline in trapping pressure, reduced fur prices, or a combination of these factors. As beaver populations continue to increase, wildlife managers should expect a related rise in the number of beaver nuisance complaints.

LITERATURE CITED

- Bergerud, A. T. and D. R. Miller. 1977. Population dynamics of Newfoundland beaver. *Canadian Journal of Zoology*. 55: 1480-1492.
- Boyce, M. S. 1974. Beaver population ecology in interior Alaska. M.S. Thesis, University of Alaska, Fairbanks. 161p.
- Bradt, G. W. 1947. Michigan beaver management. Michigan Department of Conservation. 56p.
- Busher, P.E. 1987. Population parameters and family composition of beaver in California. *Journal of Mammology*. 68: 860-864.
- Dieter, C. D. 1992. Population characteristics of beaver in eastern South Dakota. *American Midland Naturalist*. 128: 191-196.
- Dieter, C. D. and T. R. McCabe. 1989. Habitat use by beaver along the Big Sioux River in eastern South Dakota. *Riparian Resource Management Workshop*, May 8-11, 1989. Billings, Montana. 135-140.
- Gunson, J. R. 1970. Dynamics of the beaver of Saskatchewan's northern forest. M.S. Thesis, University of Alberta, Edmonton. 122p.
- Hartman, G. 1992. Age determination of live beaver by dental X-ray. *Wildlife Society Bulletin*. 20: 216-220
- Henry, D. B. and T. A. Bookhout. 1969. Productivity of beavers in northeastern Ohio. *Journal of Wildlife Management*. 33: 927-932.
- Hill, E.P. 1982. Beaver (*Castor canadensis*), p. 256-281. In: J.A. Chapman and G.A. Feldhammer (eds.). *Wild mammals of North America. Biology, management, and economics*. John Hopkins University Press, Baltimore, Maryland.
- Hodgdon, H. E. 1978. Social dynamics and behavior within an unexploited beaver (*Castor canadensis*) population. Ph.D. Dissertation, University of Massachusetts, Amherst. 292p.

- Hodgdon, K. W. and J. Hunt. 1953. Beaver management in Maine. Maine Department of Inland Fish and Game Bulletin Number 3. 102p.
- Larson, J. S. 1967. Age structure and sexual maturity within a western Maryland beaver (*Castor canadensis*) population. Journal of Mammology. 48: 408-413.
- Larson, J. S. and F. C. Van Nostrand. 1968. An evaluation of beaver aging techniques. Journal of Wildlife Management. 31: 326-332.
- Leege, T. A. and R. M. Williams. 1967. Beaver productivity in Idaho. Journal of Wildlife Management. 31: 326-332.
- Lyons, P. J. 1979. Productivity and population structure of western Massachusetts beavers. Transactions of the Northeast Section of the Wildlife Society Fish and Wildlife Conference. 36: 176-187.
- Miller, A. 1985. Annual report animal damage control section. South Dakota Game, Fish and Parks Department, Pierre. 12p.
- Nordstrom, W. R. 1972. Comparison of trapped and untrapped beaver populations in New Brunswick. M.S. Thesis, University of New Brunswick. 104p.
- Novakowski, N. S. 1967. The winter bioenergetics of a beaver population in northern latitudes. Canadian Journal of Zoology. 45: 1107-1118.
- Novak, M. 1987. Beaver, p. 282-312. In: M. Novak, J. A. Baker, M. E. Obbard, B. Malloch (eds.). Wild furbearer conservation and management in North America. Ontario trappers Association.
- Payne, N. F. 1982. Colony size, age, and sex structure of Newfoundland beaver. Journal of Wildlife Management. 46: 655-661.
- Payne, N. F. 1984. Reproductive rates of beaver in Newfoundland. Journal of Wildlife Management. 48: 912-917.
- Rutherford, W. J. 1964. The beaver in Colorado/Its biology, ecology, management, and economics. Colorado Game, Fish and Parks Department, Game Research Division, Technical Publication. 17: 1-49.
- Smith, R. L. and L. D. Flake. 1983. The effects of grazing on forest regeneration along a prairie river. Prairie Naturalist. 15: 41-44
- Svendson, G. E. 1980. Population parameters and colony composition of beavers (*Castor canadensis*) in southeast Ohio. American Midland Naturalist. 104: 47-56.
- Taylor, D. 1970. Growth, decline, and equilibrium in a beaver population at Sagehen Creek, California. Ph.D. Dissertation, University of California, Berkeley. 169p.
- Vanden Berge, R. J. and P. A. Vohs, Jr. 1977. Population status of beaver on the free-running Missouri River in southeast South Dakota. Proceedings of the South Dakota Academy of Science. 56: 230-236.
- Van Nostrand, F. C. and A. B. Stephenson. 1964. Age determination for beavers by tooth development. Journal of Wildlife Management. 28: 430-434.