Furbearer Population Assessment from Harvest Data, Gates of the Arctic National Park and Preserve, Alaska

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Introduction

The U.S. National Park Service (USNPS) is directed by the 1980 Alaska National Interest Lands Conservation Act, the enabling legislation for most federal lands in Alaska, to "...protect habitat for and the populations of fish and wildlife..." in Gates of the Arctic National Park and Preserve. This legislation also requires USNPS to provide for subsistence use of park resources by local residents. Red fox (*Vulpes vulpes*), lynx (*Felis lynx*), and wolverine (*Gulo gulo*) are important resources for trappers living in the park's 10 resident zone communities who are permitted to trap in park lands. To examine the status and harvest of furbearer populations in the park and preserve, natural resource staff collected sex, age, and reproductive data from furbearer carcasses purchased from trappers working in and near the park and preserve (Golden 1988, Swanson 1992a, 1992b, 1994).

Study Area

Gates of the Arctic National Park and Preserve is located above the Arctic Circle (66° 33'N latitude) in the central Brooks Range, Alaska (Fig. 1). The 33,182 km² park and preserve unit is approximately 250 miles north of Fairbanks, AK. Two climate zones occur in the park and preserve: the subarctic zone at lower elevations south of the Brooks Range divide and the arctic zone to the north and at high elevations. Boreal forest, tundra, and shrub thicket are the major vegetation communities in the park and preserve (U.S. National Park Service 1986).

Methods

Carcasses of 231 red foxes, 129 lynx, and 54 wolverines were necropsied from the northern and eastern districts of the park (Fig. 1) during 5 trapping seasons from 1988-1993. Placental scars were counted from uterine tracts to assess reproductive histories. Canine teeth were collected for age determination (Matson and Matson 1993). Juvenile red foxes, lynx, and wolverines were defined as animals <2 years old, based on tooth cementum annuli.

Results

Red Fox

Since moist tundra predominates in the northern district and the eastern district is largely boreal forest, data from red fox carcasses purchased from these 2 different habitat areas are presented separately.

Sex and Age.–Though overall, more males than females were trapped in the northern area of the park during the study, only the 1991-92 trapping season resulted in a male:female ratio different from 50:50 (Binomial Probability, $P < 0.05$). Juveniles (including pups) accounted for >75% of the harvest in all trapping seasons and 85% of the overall aged harvest ($n = 119$). Pups alone accounted for 63% of the overall harvest. The number of juveniles harvested per adult female ranged from 8:1 to 100:0.

In the eastern part of the park, the number of trapped male red foxes did not differ from the number of females within any year of the study (Binomial Probability, $P > 0.05$). Juveniles (including pups) accounted for >50% in all trapping seasons and 73% of the 5-year pooled harvest. The percentage of pups in the harvest ranged from 26% in 1992-93 to 63% in 1988-89 and accounted

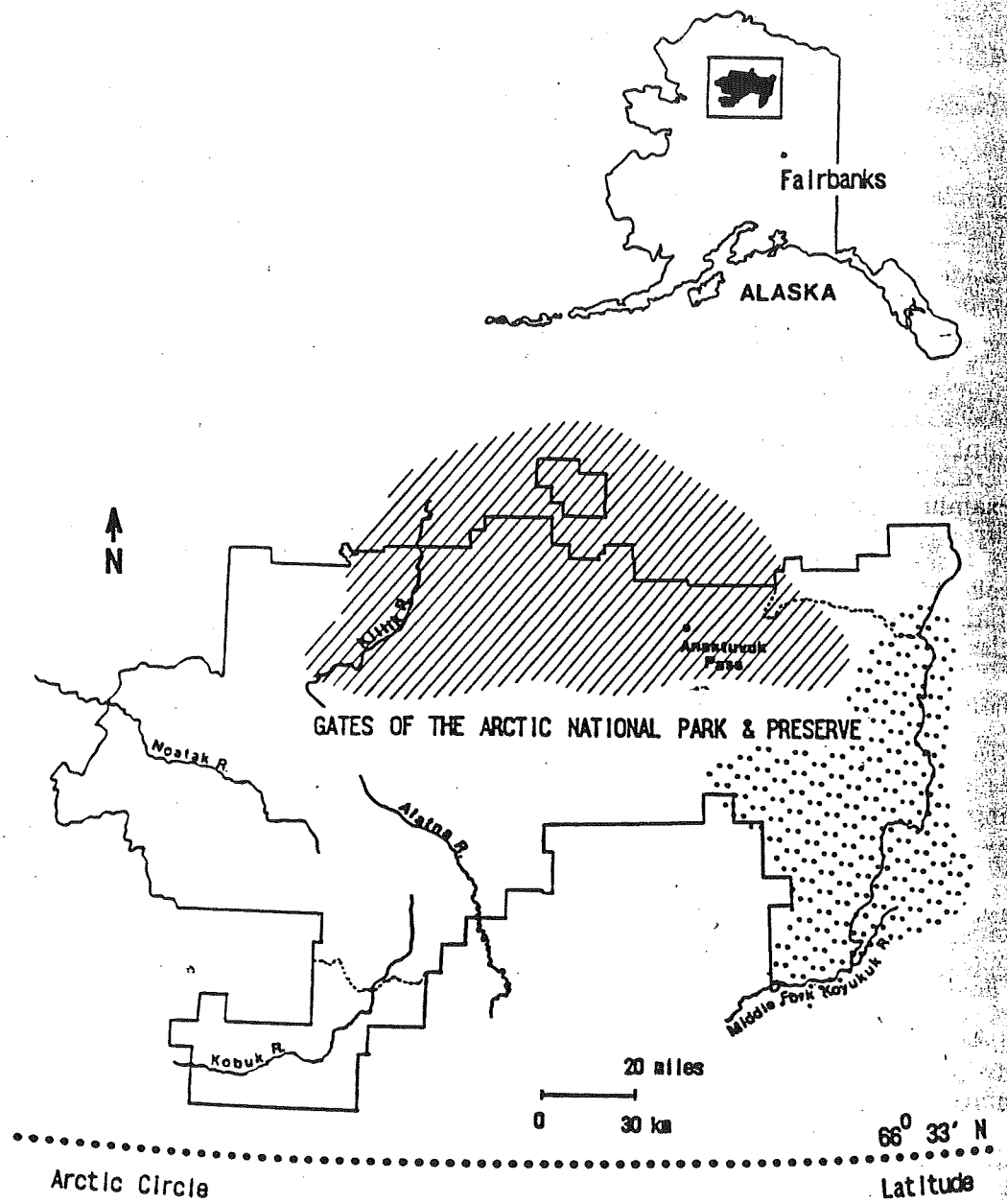

Figure 1. Location of northern and eastern districts within Gates of the Arctic National Park and Preserve, Brooks Range, Alaska.

for 41% of the overall harvest. Juvenile:adult female ratios in the harvest ranged from 3:1 to 100:0.

Reproduction.--Eight of the 10 adult females (80%) examined from the northern district had placental scars. Of the 12 yearling females, 6 (50%) had placental scars. Mean litter size (based on placental scars) from 14 harvested red fox in the northern district was 5.9.

Placental scars were present in all 10 adult females examined from the eastern district. Five of the 13 yearling females examined (38%) had placental scars. Based on placental scars, the mean litter size for 15 red foxes in the eastern district was 5.3.

Lynx

The following results are from 115 lynx harvested in the eastern district of the park.

Sex and Age.--The number of male lynx did not differ from the number of female lynx during any of the trapping seasons, but sample sizes for 3 trapping seasons (1988-1990) were less than 10. However, more females than males were found in the overall sex ratio (Binomial Probability, $P < 0.05$). More adult lynx were taken than juveniles during the 1992-93 trapping season and overall for the study (Binomial Probability, $P < 0.05$). Of 109 lynx examined during the study, 32% were juveniles (including kittens) and kittens alone accounted for 12%. The lynx juvenile to adult female ratio from the pooled data was 0.8:1.

Reproduction.--The mean litter size (based on placental scars) for 40 female lynx was 4.4. Placental scars were observed in 70% of the adult female lynx ($n = 46$), and 56% of the juvenile female lynx ($n = 9$).

Wolverine

Because wolverines have extensive home ranges, wolverine data from both the northern and eastern districts are combined for analysis in this section.

Sex and Age.--More males than females were trapped during the 1991-92 trapping season (Binomial Probability, $P < 0.05$), but sex ratios from other trapping seasons did not differ significantly from 1:1. Juveniles made up a high percentage of the harvest, though only during the 1991-92 trapping season were significantly more juveniles than adults taken (Binomial Probability, $P < 0.05$). Juvenile wolverines (including kits) accounted for 74% of the 47 wolverines harvested during the study, while kits alone accounted for 38%.

Reproduction.--Four of 9 adult female wolverines had placental scars or fetuses, but none of the juvenile wolverines had either placental scars or fetuses. Three of the 5 adult female wolverines without placental scars or fetuses were captured in November or December when only corpora lutea or blastocysts in the uterus (neither were recorded) would indicate reproductive activity. Based on placental scars and presence of fetuses, the mean litter size for 4 wolverines was 3.0.

Discussion

The difficulty and expense of studying furbearers has resulted in a general lack of management information. Consequently, management decisions often are based on harvest statistics, subjective information, best professional guesses, and results of limited research projects in specific areas (Hash 1987). Using harvest data to assess population trends within natural populations requires caution as harvest data probably reflects harvest effort and methods more than population level changes (Erickson 1982). Harvest effort is influenced by trapper effort, economic conditions, fur prices, weather, species abundance, and regulation changes, all of which make annual comparisons of harvest records difficult. Additionally, animals taken by trappers may not constitute a representative sample of the population, since males are frequently captured

more often than females and young animals are more vulnerable to trapping than adults (Gilbert 1987). However, Erickson (1982) believed that harvest data summarized by locality could be used to determine geographical differences in abundance and identify temporal shifts in abundance and distribution.

Red Fox

Male-biased sex and age ratios for harvested northern red fox populations are most commonly reported (Stubbe 1980, Pils et al 1981, Voigt 1987). Higher male activity levels and larger home ranges predispose them to harvest (Stubbe 1980, Pils et al 1981). Sex ratios of 50:50 have only been reported for red fox at birth (Pils and Marten 1978, Zabel 1987).

Inexperienced juveniles are more prone to capture than adults and tend to be highly represented in the harvest. High juvenile harvests may indicate high reproductive output and pup survival. The percentages of juvenile red fox in harvests from the park were comparable to those from other areas with high red fox carrying capacity (Pils et al 1981, Voigt 1987).

In areas of high fox density (or low food resources), few yearlings produce pups and productivity is low among adult vixens (Harris 1979). Conversely, in areas of low fox density, high annual mortality, or high food resource availability, a high percentage of vixens are reproductively active (Layne and McKeon 1956). The low percentage of reproductively active yearlings in both park districts would seem to indicate moderate population densities and mortality levels. Low food resources may be moderating reproductive output.

Red fox litter sizes derived from counts of placental scars range from 4.2 to 8.0 (Voigt 1987). Placental scar counts for vixens in both park districts appear to be average (assuming little or no intrauterine loss) and lend further evidence to moderate fox density.

Lynx

Few female-biased sex ratios for harvested lynx have been reported in the literature. Female-biased harvest sex ratios were obtained from an increasing lynx population in Alberta (48:52; Brand and Keith 1979), and a declining population in Nova Scotia (45:55; Parker et al 1983). Generally male lynx, being more prone to capture, comprise a higher percentage of the harvest.

Reported lynx litter sizes based on placental scars range from 2.2 (Berrie 1970) to 4.6 (Brand and Keith 1979); the average litter size (4.4) from this study is relatively high. High litter sizes and percentages of reproductively active females have been associated with increasing or stable populations that are not limited by food resources (Banville 1986, Quinn and Parker 1987). High mean placental scar counts also have been associated with periods of snowshoe hare abundance in Alaskan lynx (O'Connor 1984). The number of juvenile (56%) and adult females (70%) with placental scars in this study is relatively high. Placental scars were observed in 53% of the harvested yearlings in central Alaska (Nava 1970). Nearly all yearlings were reproductively active in an Ontario study (Quinn and Thompson 1987). A 3-year average of 60% reproductively-active adult females was reported from a dense lynx population in Quebec (Banville 1986).

The average litter size and percentage of adult and juvenile female lynx with placental scars in this study indicate that productivity should be relatively high. However, the low proportion of juveniles in the harvest, particularly in 1992-93, suggests that juvenile survival may be low. Survival of juvenile lynx is closely tied to prey (snowshoe hare) abundance. When food supplies are limited, kitten growth and development is inhibited and, consequently, survival and recruitment rates for that

cohort are low (Brand and Keith 1979). In first winters after winters of snowshoe hare scarcity in Alaska, O'Connor (1984) found that kits made up 22% of the harvest, but in first winters following winters of hare abundance, 76% of the harvest was kits. Observations from trappers in the area indicate that though snowshoe hare densities are not as high as they have been in the past, there are pockets of hares that reach fairly high densities.

Wolverine

Male-biased sex ratios are frequently obtained for wolverine harvests in Alaska (Abbott 1993). Larger home range sizes for resident males and dispersal activities of young transient males may result in male-biased sex ratios (Rausch and Pearson 1972, Hornocker and Hash 1982, Magoun 1985). Adult female wolverines often shift their home ranges to accommodate their female offspring, while male offspring are forced to disperse and establish their own territories, making them more vulnerable to capture (Magoun 1985). Magoun (1985) cautions that sex ratios from harvested animals often do not reflect the actual sex ratio of the population and may be a function of harvest pressure, timing, method, or location. For example, if heavy trapping pressure occurred in mid- to late spring, males are more likely to be trapped or shot than less active females that are spending time in dens with young.

The relatively high percentage of harvested juveniles in this study may indicate either a healthy population with high reproductive output and juvenile survival or, as suggested by Magoun (1985), a heavily exploited local population where resident animals have been removed and individuals establishing territories are juvenile immigrants unfamiliar with the area and therefore easily captured.

Low reproductive output is characteristic of wolverines due to low pregnancy rates, small litter sizes, erratic litter production, and low kitten survival (Hash 1987). Banci and Harestad (1988) reported a mean litter size (based on placental scars) of 3.3 +/- 1.2 S.D. A mean of 3.4 placental scars was obtained from female wolverines collected in Alaska and Yukon (Rausch and Pearson 1972). The mean litter size obtained in this study from placental scar and fetal counts (3.0) was moderate. Rausch and Pearson (1972) calculated that the number of kittens surviving the first summer averaged 1.5 young per female less than indicated by the in utero data.

The 4 of 9 adult females with placental scars or fetuses in this study results in a relatively low percentage of reproductively active adult females (44%); examination of the ovaries for corpora lutea may have increased the number of reproductively active adults detected. Eighty-eight percent of 26 adult female wolverines (2 years old and older) examined in British Columbia (Liskop et al 1981) and 90% of 98 adult females (2 years old and older) in Alaska and Yukon (Rausch and Pearson 1972) were pregnant or postpartum. Yearling wolverines in this study were nonreproductive, as were those in British Columbia (Liskop et al 1981). However, 7.4% yearling wolverines in Yukon had corpora lutea present, indicating pregnancy (Banci and Harestad 1988).

Management Implications

Red fox population levels appear to be moderate and stable in the northern and eastern park and preserve areas. Given the sex, age, and reproductive data from the harvested red fox populations and that trappers have been expending little effort on red fox in recent years (due to steadily dropping pelt prices since 1987; Osborne 1993), no further monitoring appears to be necessary at this time. Annual fur prices, however, should be followed to note any increases in red fox pelt prices that

may increase trapping pressure and harvest levels. Trapper's observations on red fox density also should be solicited to gain additional knowledge of population trends.

Though lynx harvest data do not indicate any immediate cause for harvest regulation change, the female-biased sex ratio and apparent low juvenile survival rate may lead to low lynx density (particularly if trapping pressure in the area increases) and should be monitored. A monitoring strategy that incorporates the sex and age structure and reproductive output of harvested lynx with hare density estimates is recommended. Additionally, habitat areas that consistently support hare populations (particularly in times of low hare abundance) should be identified and mapped to facilitate designation of protected refugia should the need arise.

The wolverine population appears able to sustain current harvest levels. However, continued monitoring of the age structure of the harvest and female reproductive indices (corpora lutea and placental scar counts) is recommended to determine if the percentage of juveniles in the harvest is the result of (1) high reproductive success and survival of kits in the population or (2) heavy exploitation, where juvenile immigrants are being harvested after resident animals have been removed. More detailed information on where and when wolverines are being trapped will be necessary to ascertain if (2) above is occurring since this situation only occurs in specific areas where trapping pressure for wolverine has been heavy for a number of years (A. Magoun, AK Dep. Fish and Game, pers. commun.). Denning habitats and high density wolverine reservoir areas should be identified for future conservation efforts if population numbers decline or trapping pressure increases.

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