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Diets of Wolves on Northern Vancouver Island

Abstract

The purpose of our study was to determine the occurrence and seasonal variation of prey species in the diets of wolves on northern Vancouver Island. Columbian black-tailed deer were found to be the most frequent prey and comprised the greatest relative weight in the diet of wolves. Roosevelt elk comprised the next greatest component by relative weight in the diet. Hairs of fawns occurred with greater frequency in summer scats than did those of adult deer. Beaver hair was more frequent in winter scats than in summer scats. The proportion of beaver in the diet varied among years and was greatest when deer populations were low. On Vancouver Island, young ungulates were important prey of wolves during summer. Use of alternative prey by wolves increased when deer abundance was low.

Introduction

Diets of wolves (*Canis lupus*) are important to understanding their predator-prey relationships. Throughout North America ungulates are the primary prey of wolves (Theberge *et al.* 1978, Scott and Shackleton 1980, Fritts and Mech 1981, and Carbyn 1983). Other species, particularly beaver (*Castor canadensis*), may be seasonally important in the diet of wolves or important during declines in availability of ungulates (Pimlott 1967, Voight *et al.* 1976, Theberge *et al.* 1978).

Our study describes the diets of wolves on northern Vancouver Island. Our objectives were to determine the wolves' major food types, the relative occurrence of these types in their diet, seasonal variation in prey species and age-class utilization.

Study Area and Methods

The study area consists of the Nimpkish River Valley and Adam River Valley on northeast Vancouver Island, British Columbia. The area ranges in elevation from sea level to 2,158 m. Three biogeoclimatic zones occur: the Subalpine-Mountain Hemlock, Coastal Western Hemlock, and Coastal Douglas-fir Zones (Krajina 1965) in a mixture of old-growth forest and cutovers. The area supports two ungulate species, Columbia black-tailed deer (*Odocoileus hemionus columbianus*) and Roosevelt elk (*Cervus elaphus roosevelti*). Red squirrel (*Tamiasciurus hudsonicus*), beaver, black bear (*Ursus americanus*),

and cougar (*Felis concolor*) also occur in the area.

Wolf scats were collected monthly from transects along secondary logging roads. Collection occurred in the Nimpkish area from March 1983 to October 1985, and in the Adam area from November 1983 to September 1985. Scats were analysed using techniques described by Kennedy and Carbyn (1981). Impressions of guard hairs were examined microscopically for medulla form and cuticular scale pattern. Hair samples were identified using a reference collection of hairs from known species, and a guide to cuticular hair scales (Moore *et al.* 1974). Scats were grouped seasonally based on whether hairs from fawns and calves could or could not be distinguished from those of adults. Summer was June to August and winter included all other months. Hairs of fawns and calves were identified in scats collected from June to August. Maximum diameter, length, and colouration of hair were used to distinguish the hair of fawn deer and calf elk from those of adults (Scott and Shackleton 1980). Hairs of young ungulates (< 1 year old) could not be distinguished from hairs of adults in scats collected from September to May.

Contents of scats were analyzed by determining percent occurrence of prey species in scats and relative weight of each species consumed using the equation proposed by Floyd *et al.* (1978): $Y = 0.38 + 0.02 X$, where Y is kg of prey per collectable scat and X is prey weight (kg). Weights of prey used in our analyses were: adult

black-tailed deer (64.6 kg), fawn black-tailed deer (5.0 kg) (Harestad pers. comm.); adult Roosevelt elk (234 kg) (Bryant and Maser 1982); calf elk (25 kg), beaver (20 kg) (Cowan and Guiget 1965); red squirrel (0.19 kg) (Banfield 1974). Data were analyzed using G-tests (maximum likelihood ratio test) (MYSTAT 1988).

Results

Six hundred and forty seven scats were collected in the two study areas between 1983 and 1985. The prey species were black-tailed deer, beaver, Roosevelt elk, and red squirrel (Figure 1). In scats collected from the Adam area, black-tailed deer occurred most frequently in all years followed by beaver, with the exception of 1985 when elk occurred with a frequency greater than that for beaver. Black-tailed deer was also the most frequent prey species in scats from the Nimpkish area. Elk occurred with the next greatest frequencies, except in 1984 when beaver hair occurred with a frequency of 40 percent compared to 19 percent for elk. Red squirrel occurred least frequently in both study areas for all years.

In terms of relative weight, black-tailed deer was the most important prey species in the Adam area (Figure 1). Black-tailed deer was also the

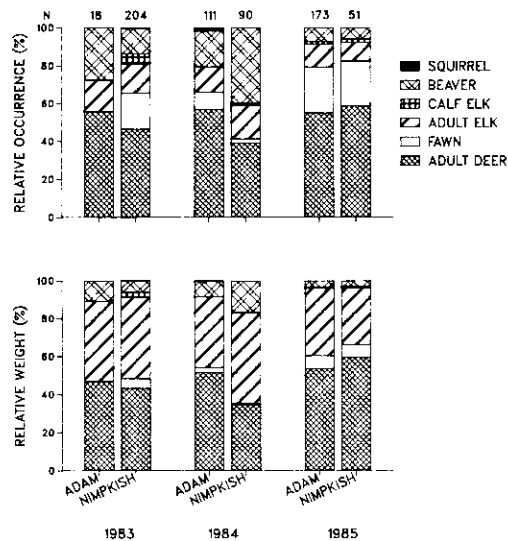


Figure 1. Percent occurrence and relative weight of prey in the diet of wolves from Adam River and Nimpkish River on northern Vancouver Island between 1983 to 1985. Number of scats are indicated above the histograms.

most important prey species in the Nimpkish area, with the exception of 1984, when elk comprised 48 percent of the total prey biomass consumed compared to 35 percent for deer. Relative total weights of beaver and squirrel consumed in the Adam area were small throughout the study period. Similarly, beaver and squirrel in the Nimpkish area comprised small percentages of the total biomass consumed.

To compare diets between seasons, fawns were included with adult deer and calves with adult elk for summer data. Summer and winter diets of wolves for all study years combined were different in both the Adam area ($G = 13.5, P \leq 0.01$) and the Nimpkish area ($G = 20.5, P \leq 0.01$) (Figure 2). Black-tailed deer was the most frequently detected prey in winter and summer scats from both study areas. Scats from the two

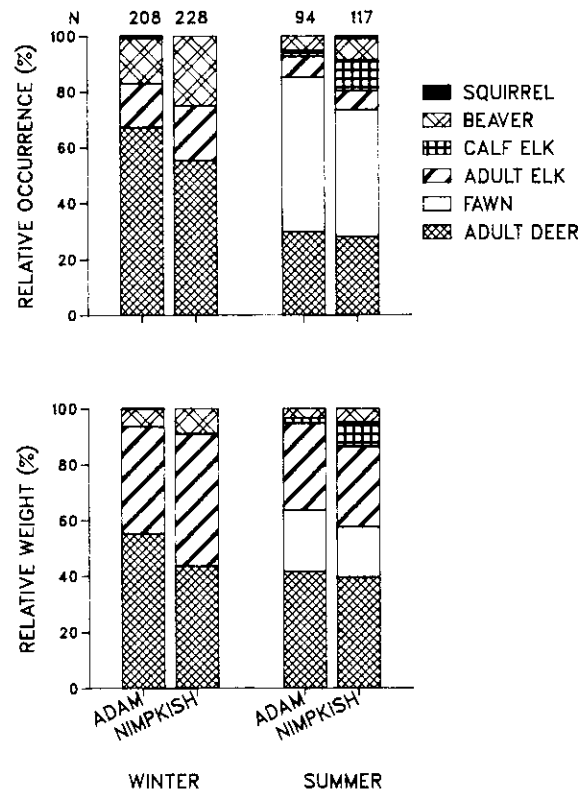


Figure 2. Percent occurrence and relative weight of prey in summer and winter in the diet of wolves from Adam River and Nimpkish River on northern Vancouver Island between 1983 to 1985. Number of scats are indicated above the histograms.

areas had similar frequencies of fawn black-tailed deer which was the most frequently detected food type in summer scats from both the Nimpkish River Valley (45%) and the Adam River Valley (55%). Adult elk hair occurred with similar frequencies in both study areas in winter and summer scats. Beaver hair occurred more frequently in winter scats than in summer scats for both areas. The occurrence of each prey type was similar for the Adam and Nimpkish areas in summer ($G = 9.5$, $P = 0.09$) but in winter adult elk and beaver occurred with greater frequencies in scats from the Nimpkish area than in scats from the Adam area ($G = 10.2$, $P = 0.02$). Black-tailed deer accounted for the greatest percentage of biomass consumed by wolves in winter and summer in the Adam area (Figure 2). In the Nimpkish area, elk comprised the greatest percentage of biomass consumed in winter; however, deer accounted for the greatest percentage of biomass consumed in summer.

Diets of wolves varied among years in both the Adam area ($G = 32.1$, $P \leq 0.01$) and Nimpkish area ($G = 55.1$, $P \leq 0.01$). The occurrence of black-tailed deer in scats from the Adam area increased by 23 percent between 1983 and 1985 and that of beaver hair decreased by 20 percent. In the Nimpkish area, the occurrence of black-tailed deer decreased by 24 percent between 1983 and 1984. During this same period there was a 27 percent increase in the occurrence of beaver. From 1984 to 1985 the occurrence of black-tailed deer increased by 40 percent and beaver decreased by 34 percent.

Discussion

Black-tailed deer are the most important prey of wolves on Vancouver Island. Comparisons of summer and winter diets indicate that wolves on northern Vancouver Island vary their use of prey species and age-classes on a seasonal basis. Deer fawns and elk calves were important prey during summer corroborating other studies in which young ungulates are a substantial proportion of the diets of wolves (Cowan 1947, Theberge *et al.*

1978, Scott and Shackleton 1980, Fritts and Mech 1981, Carbyn 1983).

In contrast to other regions where beaver are prey mainly during summer (Pimlott 1967, Theberge *et al.* 1978), beaver were most frequent in winter scats of wolves on northern Vancouver Island. This winter use of beaver likely occurs because of the mild climate on Vancouver Island which ensures beaver are available all year. Scott and Shackleton's (1980) study in the Adam River Valley during 1978 did not find use of beaver by wolves during summer. However, beaver occurred in summer scats of both Adam and Nimpkish wolves in 1983-1985. Differences between our results and Scott and Shackleton's (1980) may be due to decreases in the density of deer since 1979 (Atkinson and Janz 1986).

Since 1983, deer densities have increased in the Nimpkish Valley (Janz and Hatter 1986). This renewed availability of black-tailed deer is reflected in the scat contents of wolves from the Nimpkish Valley. In 1985, the frequency of occurrence of black-tailed deer in wolf scats increased by 40 percent over the previous year. A similar pattern is apparent in the Adam Valley where the deer population has fluctuated in an increasing direction (Janz and Hatter 1986). The frequency of occurrence of deer in scats from the Adam Valley increased between 1983 and 1985. Wolves on northern Vancouver Island used black-tailed deer as their primary prey between 1983 and 1985. When the relative abundance of deer was low, wolves increased their use of alternate prey types, specifically beaver. Increased use of beaver when white-tailed deer (*Odocoileus virginianus*) densities were low was also reported by Theberge *et al.* (1978).

Acknowledgments

We thank V. Banci for her advice and the British Columbia Ministry of Environment for collecting the wolf scats. Simon Fraser University and the Natural Sciences and Engineering Research Council of Canada provided support.

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Received 2 June 1988

Accepted for publication 2 December 1988