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Food habits of two Vancouver Island wolf packs: a preliminary study

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The food habits of two packs of Vancouver Island wolves were studied between February and November 1978. Analysis of guard hairs in 616 scats showed that the major food of these wolves was black-tailed deer, Roosevelt elk, and beaver, respectively. Seasonal variation in the wolves' use of these three prey species and of different age-classes of ungulates were found. Composition of scats from den and rendezvous sites were significantly different from scats collected during equivalent periods along logging road and trails.

SCOTT, B. M. V., et D. M. SHACKLETON. 1980. Food habits of two Vancouver Island wolf packs: a preliminary study. Can. J. Zool. **58**: 1203–1207.

Le régime alimentaire de deux meutes de loups de l'île de Vancouver a été étudié de février à novembre 1978. L'examen des poils de garde extraits de 616 fèces de loup a révélé que le cerf à queue noire, l'élan de Roosevelt, et le castor constituent les principaux éléments du régime alimentaire. Cependant l'importance de ces trois espèces ainsi que des différentes classes d'âge pour une espèce donnée, a varié de façon saisonnière dans le régime alimentaire. Pour une même période, la composition des fèces prélevées près des tanières et des "lieux de rendez-vous" diffère significativement de celle des fèces recoltées le long des routes forestières et des sentiers.

Introduction

The wolf (*Canis lupus*) throughout its Nearctic distribution preys upon a wide diversity of species, depending upon prey species complex and availability (Pimlott 1967; Mech 1970; Peterson 1974; Haber 1977). Ungulates such as deer (*Odocoileus* spp.), moose (*Alces alces*), elk (*Cervus elaphus nelsoni*), and caribou (*Rangifer tarandus*), are generally the main prey species. Smaller vertebrates, particularly beaver (*Castor canadensis*) may be seasonally and locally important in the wolves' diet, or during declines in ungulate populations (Murie 1944; Thompson 1952; Pimlott 1967; Pimlott *et al.* 1969; Mech 1970; Voigt *et al.* 1976; Peterson 1974; Theberge *et al.* 1978).

Food habits of wild canids are most accurately determined from direct observations of hunting, or by examination of tracks and kill remains (Mech 1966; Kolenosky 1972; Peterson 1974; Haber 1977; Messier and Barrette 1979). These methods are not always practical, however, and analysis of stomach or scat contents must be used instead (Murie 1944;

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Cowan 1947; Thompson 1952; Stenlund 1955; Shelton 1966; Mech 1966; Pimlott *et al.* 1969; Kuyt 1971; Carbyn 1974; Van Ballenberghe *et al.* 1975; Voigt *et al.* 1976; Huot *et al.* 1978; Theberge *et al.* 1978). Two problems can arise with these types of analyses. First, scavenging cannot be separated from predation (Carbyn 1974). Second, due to the varying surface:volume ratio, and hence relative quantities of body hair of different-sized prey, a bias can be introduced. The contribution of large prey may be underestimated and small species overestimated (Shelton 1966; Mech 1966, 1979; Pimlott *et al.* 1969; Kruuk 1972; Carbyn 1974; Peterson 1974). To reduce the magnitude of this bias, Floyd *et al.* (1978) fed known quantities of different-sized prey species to a captive colony of wolves and collected the resulting scats. They developed a regression equation to predict the quantity of a given prey eaten from the number of collectible scats.

This paper presents information on the food habits of two packs of Vancouver Island wolves (*C. l. crassodon*), collected as part of a broader study of this subspecies (Scott 1979). The Vancouver Island wolf has received limited attention apart from investigations of its taxonomic status (Jolicoeur 1959; Lawrence and Bossert 1967). It is a subspecies which inhabits an ecosystem different in habitat types, climate, and potential prey species, from those described in previous publications.

Study area and methods

The study area covers approximately 530 km² located west of Kelsey Bay, Vancouver Island, British Columbia (latitude 50°20′, longitude 126°10′). Three biogeoclimatic zones (Krajina 1965) occur within its boundaries; the subalpine mountain hemlock, coastal western hemlock, and coastal Douglas fir zones. Elevations extend from sea level to 2158 m, in a complex of mountain ridges and river valleys. Further details are given in Scott (1979).

Extensive logging occurs in the study area, and excellent access is provided by logging roads. Forest harvesting results in a complex forest pattern of climax forest, various aged second-growth stands, and freshly logged areas.

The only ungulate species are the Columbian black-tailed deer (*Odocoileus hemionus columbianus*) and the Roosevelt elk (*Cervus elaphus roosevelti*). Beaver (*Castor canadensis leucodontus*) are common in riparian habitats, and many small mammals are also present (Cowan and Guiget 1975).

Fresh wolf scats were collected every 5 to 7 days from February until November 1978, along logging roads and trails within the home ranges of the Upper and Lower Adam Packs, and at their den and rendezvous sites after animals had vacated them (Scott 1979). A portion of each scat was placed in a plastic bag, labelled with date and location, sealed, and stored in a freezer. The remainder of the scat was used as an attractant for capture of wolves (Scott 1979). Guard hairs in scats were compared with a reference collection and identified by maximum diameter, length, colouration, and pigment banding (Scott 1979).

Seasonal variation in the diet of the wolves was determined by both frequency of occurrence and relative weight with which various prey species and age-classes in monthly scat samples occurred. Floyd *et al.*'s (1978) regression equation was used to transform frequency of occurrence of each prey type to their relative weight in the diet. The equation requires weights of prey species to be known. Weights of Roosevelt elk and beaver from Vancouver Island were obtained from Cowan and Guiget (1975), and weights of adult black-tailed deer from Cowan and Wood (1955) and Rochelle (personal communication). Weights of black-tailed deer fawns captured in the study site were obtained from June through July.

Results

The two packs were estimated to be composed of six adults plus four pups of the year in the Upper Adam Pack and two adults with three pups in the Lower Adam Pack (Scott 1979). A total of 616 fresh scats was collected in the home ranges of the two packs between February and November 1978. Percent composition of scats for the whole study period by frequency of occurrence and relative weight, respectively, was black-tailed deer, 79.5%, 71.4%; Roosevelt elk, 18.4%, 28.0%; and beaver, 2.1%, 0.7%.

Seasonal changes in the diet composition were found throughout the study period (Fig. 1). Beaver was only in scats collected between February and June, and from den sites. However, some scats examined in the field in December 1977 and January 1978 indicated use of this species during these months.

Deer fawns and elk calves contributed increasingly to the wolves' diet from their appearance in scats collected in June through to August (Fig. 1). They may also have been important prey types at other periods, but by October their guard hairs were indistinguishable from adults.

Ignoring age-class for the two ungulate prey, black-tailed deer form more than 50% of the diet for all months and home sites, except during July and August. During these 2 months the diet was composed primarily of elk, with the greatest contribution coming from calves.

Den sites were occupied between early May and mid-July by both packs, whereas the Upper Adam Pack used its rendezvous site from mid-August to mid-October (Scott 1979). Contents of scats from both home sites were significantly different from those collected during equivalent periods along logging roads and trails (scats from roads and trails versus den sites: $\chi^2 = 68.5, p < 0.01$, df = 4; versus rendezvous sites: $\chi^2 = 34.2, p < 0.01$, df = 3, scat composition expressed as relative weights). Scats from both home sites show higher proportions of adult deer and no evidence of adult elk (Fig. 1).

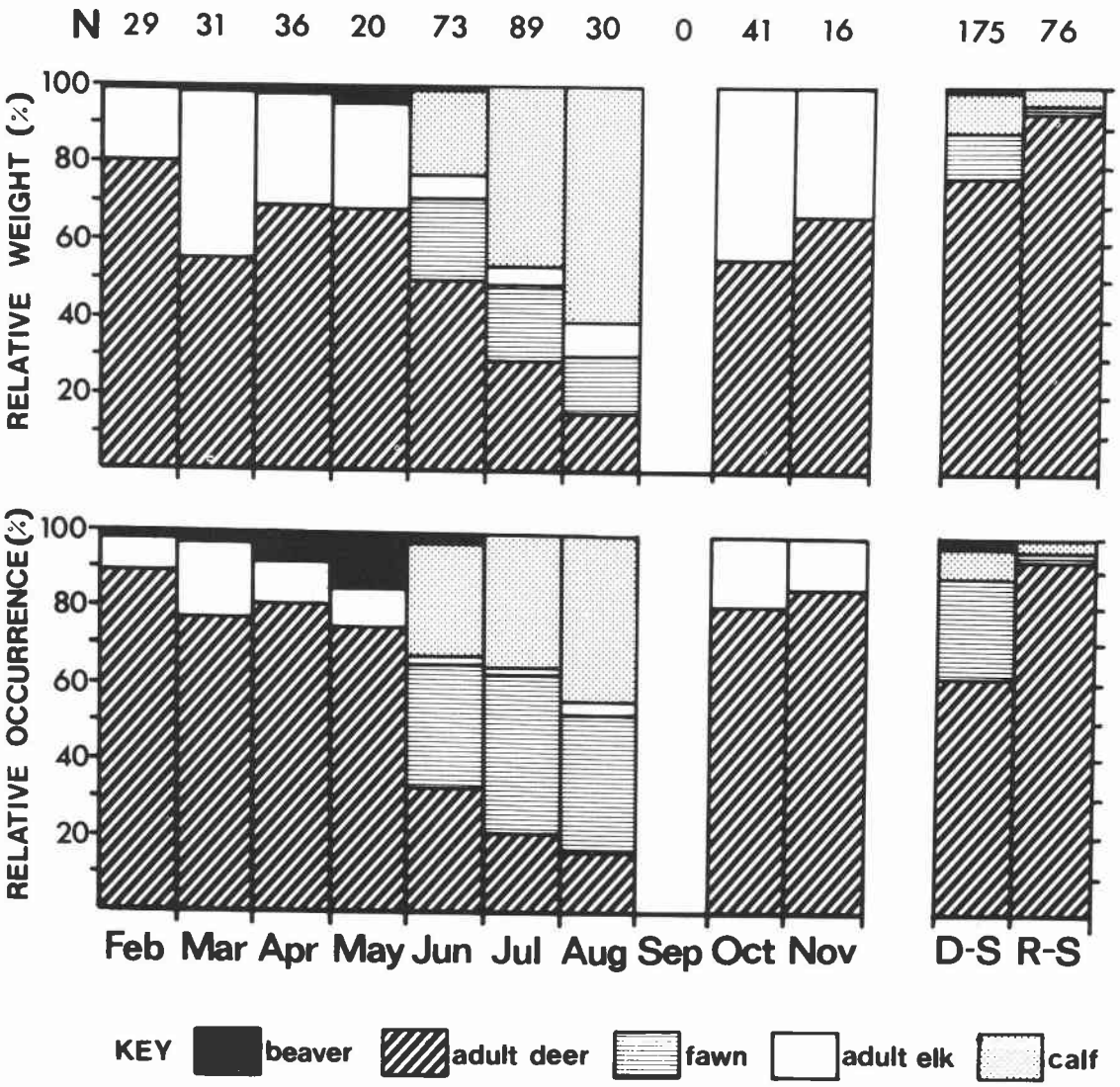

FIG. 1. Contents of 616 scats collected along roads and trails and from den and rendezvous sites for two packs of Vancouver Island wolves. Den sites (D–S) were occupied from early May to mid-July and rendezvous sites (R–S) from mid-August to mid-October. *N* represents sample sizes.

Discussion

During the period of this study, the two packs of Vancouver Island wolves preyed primarily upon adult black-tailed deer, adult and calf elk, deer fawns, and beaver. It is possible that smaller species were also preyed upon by the wolves, but the sampling method used may not be sensitive to their presence. This potential bias is considered of minor significance, considering the occurrence of prey smaller than beaver in scats examined in other studies (Pimlott 1967; Mech 1970). However, no evidence was found of more than one prey type present per scat, and this appears to be generally true in other studies (Murie 1944; Pimlott *et al.* 1969; Haber 1977).

The relative importance of the three main prey species in the diets of the two wolf packs studied follow the rank order one would expect from previous research. Where available, though not necessarily numerically the most abundant, deer are selected by wolves over other potential prey species (Pimlott 1967; Pimlott *et al.* 1969; Mech 1970; Carbyn 1974).

Beaver hair was found in winter and spring scats, but not during summer. Seasonal use of beaver in other studies generally occurs in summer when it is

argued that their ponds are ice free and the animals more vulnerable (Mech 1966, 1970; Pimlott *et al.* 1969). On Vancouver Island mild winter conditions prevail and thus this rodent may be available to wolves throughout the year. In some studies, beaver are important to wolves when other major prey, such as deer, suffer declines in numbers or when the beaver themselves are at high densities (Peterson 1974; Voigt *et al.* 1976; Theberge *et al.* 1978).

The two packs of wolves used fawns and calves increasingly throughout the three summer months. Onset of this use coincides with the birth period of deer and elk in the study area, and relative use of young ungulates by wolves during summer is comparable with that found in other studies (Murie 1944; Mech 1966; Shelton 1966; Pimlott *et al.* 1969; Carbyn 1974; Peterson 1974; Voigt *et al.* 1976; Haber 1977). It would appear that young ungulates are particularly vulnerable (Haber 1977) during the first few months of life, and are easily captured by wolves (Cowan 1947; Mech 1966, 1970; Pimlott *et al.* 1967; Peterson 1974). Although scat analysis does not yet permit separation of calves and fawns from adults once young develop winter pelage, it is probable that wolves in this study continued to use young ungulates at other periods (Mech 1966; Kolenosky 1972; Peterson 1974; Haber 1977).

Scat contents from den and rendezvous sites were significantly different from the contents of those scats collected during equivalent periods from other areas in the home ranges. Theberge *et al.* (1978) found higher proportions of beaver in scats from rendezvous sites compared with collections from other areas used by wolves in Algonquin Park. They attributed the high occurrence of beaver to the fact that beaver colonies were adjacent to rendezvous sites. However, no comparable argument can be made for the Vancouver Island scats to explain why adult deer should dominate scat contents from den and rendezvous sites.

Unfortunately no data were available on relative availabilities of the three major prey species in the study area. Further study is required to compare the wolves' seasonal use of the prey species with prey distribution patterns, particularly with respect to social structure and seasonal movements of the two ungulates. Habitat modifications brought about primarily by forestry practices also influence the abundance and distribution of these species, particularly the ungulates (Cowan 1945; Gates 1968). In addition Vancouver Island experiences heavy hunting pressure for black-tailed deer (Kale 1979). Although data on distributions and numbers of the Vancouver Island wolf are limited, available evidence (Cowan, personal communication) suggests that they have undergone major fluctuations in the past and are currently increasing (Hebert, personal communication). The logical step is to now examine other wolf packs on the Island which inhabit areas with and without the influence of forestry activities.

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Range extensions, new distribution sites, and notes on the biology of sacoglossan opisthobranchs (Mollusca: Gastropoda) in British Columbia

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Northern ranges of six species of sacoglossan gastropods are extended into British Columbia. New distribution sites and observations on food, habitat, and spawning are included for the following eight species: *Alderia modesta*, *Aplysiopsis smithi*, *Elysia hedgpethi*, *Hermaea oliviae*, *Hermaea vancouverensis*, *Olea hansineensis*, *Placida dendritica*, and *Stiliger fuscovittata*.

MILLEN, S. V. 1980. Range extensions, new distribution sites, and notes on the biology of sacoglossan opisthobranchs (Mollusca: Gastropoda) in British Columbia. Can. J. Zool. **58**: 1207–1209.

Les répartitions de six espèces de gastéropodes sacoglosses s'étendent au nord jusqu'en Colombie Britannique. On trouvera ici une liste des nouveaux sites connus ainsi que des observations sur les habitudes alimentaires, l'habitat et la reproduction des huit espèces suivantes: *Alderia modesta*, *Aplysiopsis smithi*, *Elysia hedgpethi*, *Hermaea oliviae*, *Hermaea vancouverensis*, *Olea hansineensis*, *Placida dendritica* et *Stiliger fuscovittata*.

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Sacoglossan opisthobranchs are small, usually shell-less, marine and estuarine gastropods. They are found in intertidal and shallow subtidal waters in close association with a variety of algae upon which they graze. Sacoglossans tend to be cryptic in coloration; patchy and seasonal in abundance. These factors, along with their small size, result in their being overlooked by most collectors. Two species have been previously recorded from British Columbia. This paper extends the known range of six additional species into British Columbia with new distribution sites and notes on habitat, natural history, and algal associates for all eight species.

New distribution sites in British Columbia are listed in Table 1. Those species with range extensions are indicated by an asterisk. Range extensions are measured in direct latitudinal distances. Sample specimens, collected intertidally, and sub-

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