Diet of Western Screech-Owls in the interior of British Columbia

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Abstract: During 2006 and 2007, we radio-located Western Screech-Owls (*Megascops kennicottii macfarlanei*) at roost sites along the Shuswap River, British Columbia, Canada. Between March and November, we collected regurgitated pellets at these roosts and analysed them for content. Screech-owls had a diverse diet that included small mammals, birds, fish and insects. Female owls included more mammals in their diet than males did, and males included more insects than females did. We speculate that differential niche utilization may reduce intersexual competition for food resources within this endangered species.

***Key words*:** Western Screech-Owl, *Megascops kennicottii macfarlanei*, diet, intersexual competition, niche separation.

Introduction

The interior Western Screech-Owl (*Megascops kennicottii macfarlanei*) is an endangered species (COSEWIC 2002) that occurs in lowland areas of south-central British Columbia. Screech-owls have a varied diet: beetles, crickets and grasshoppers, snails, fish, birds, voles, mice, shrews, pocket gophers and bats have been found in the diet of screech-owls in previous studies (Munro 1929; Earhart and Johnson 1970; Smith and Wilson 1971; Marks and Marks 1981; Rains 1997; Cannings and Angell 2001). Understanding the composition of the diet of Western Screech-Owls can be useful for conservation programs because it will aid in identifying habitat factors that may affect abundance and distribution of food resources for this endangered species.

Methods

From 2005 to 2007, we captured and radio-tagged screech-owls as part of a study on the general ecology of the species. We used radiotelemetry to locate owls at daytime roosts and returned to these sites at a later date to search for regurgitated pellets and prey remains. Samples were collected, frozen and analysed later for contents.

We separated each raw pellet using fine forceps and spread the contents under a dissecting microscope. Using the key of Nagorsen (2002) and reference collections, we identified individual prey items to species where possible, and to genus or other taxonomic levels when this could not be accomplished.

We occasionally collected multiple pellets at a single site and grouped these pellets into a single sample. Because pellets found at a single roost site could be of multiple ages or from untagged owls, the provenance of the pellet or confidence in the dates of use may be reduced. We did not assign date or sex of owl to pellets that were collected > 2 weeks after the roost site was identified, nor to pellets collected from sites used by both male and female radio-tagged owls.

For each pellet sample, we recorded the prey species present and the minimum number of individuals of each prey species. We then grouped prey species into four broad taxonomic groups: insects, fish and molluscs, birds and mammals. Fish and molluscs were combined because of low sample sizes and presumed ecological similarities. We compared the diet composition between sexes by assessing the frequency of occurrence of each of the four taxonomic groups in the pellets. We used Chi-square goodness-of-fit test and Bonferroni-adjusted *Z*-tests to compare the frequency that each group occurred in the pellets collected from each sex. We set the acceptable Type I error rate at 0.05.

Table 1. Frequency of occurrence of prey items found in pellets collected from Western Screech-Owls along the Shuswap River, British Columbia, 2006 and 2007. The number of items of a category found in a single sample is not indicated. N = 75 pellet samples

	Sex of owl			
	Female	Male	Unknown	Total
Insects				
Beetle (Coleoptera: most or all Carabidae)	14	21	2	37
Cricket/grasshopper (Orthoptera)	2	2	0	4
Undifferentiated insects	2	4	0	6
Molluscs				
Snail	0	1	0	1
Fish				
Undifferentiated fish	0	4	0	4
Birds				
Ruffed Grouse (*Bonasa umbellus*)	4	1	0	5
Killdeer (*Charadrius vociferus*)	1	0	0	1
American Robin (*Turdus migratorius*)	1	0	0	1
Cedar Waxwing (*Bombycilla cedorum*)	0	1	0	1
Undifferentiated bird	4	5	1	10
Egg shell	0	1	0	1
Mammals				
Shrew (*Sorex* spp.)	6	0	1	7
Bat (Chiroptera)	0	0	1	1
Red Squirrel (*Tamiasciurus hudsonicus*)	1	0	0	1
Northern Pocket Gopher (*Thomomys talpoides*)	2	0	1	3
Meadow Vole (*Microtus pennsylvanicus*)	10	9	2	21
Undifferentiated vole (*Microtus* spp.)	9	6	1	16
Deer Mouse (*Peromyscus maniculatus*)	6	5	1	12
Undifferentiated rodent	4	4	0	8
Total	**66**	**64**	**10**	**140**

Results

Number of pellets collected varied throughout the year. Pellets were easiest to find prior to nesting, which occurred in April. Pellets were often very difficult to locate because of their small size (most < 2 cm long) and cryptic coloration. Pellets were found only between March and November; despite considerable search effort we did not find pellets at roosts during winter. We collected and analysed 75 samples of regurgitated pellets, with some samples containing multiple pellets. Individual pellets often contained multiple prey items.

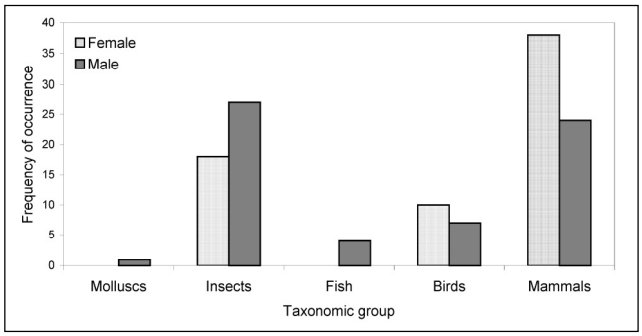

Figure 1. Frequency of occurrence of four taxonomic groups in pellets (n = 75) collected from Western Screech-Owls along the Shuswap River, British Columbia, 2006 and 2007.

We identified 219 prey items in the 75 samples, for an average of 2.9 prey items per sample (SD = 2.8). The largest number of prey items in one sample was 16 found in 3.5 pellets, which were mostly beetles (14 of 16 items). Beetles were the most common prey item (100 or 45.7%) followed by species of voles (*Microtus)* as a group (46; 21%). Not all prey items could be identified to the species level, since most specimens were badly broken with missing teeth or bones, some of which were critical to species identification. For example, *Microtus* samples were often not identified to species, although most of them were likely *M. pennsylvanicus*.

The frequency of occurrence of four taxonomic groups was significantly different ($\chi^2 = 7.88$, df = 3, $P = 0.049$; Table 1) between the diets of males and females (Figure 1). Males consumed significantly more insects than did females, whereas females consumed more mammals than did males (Bonferroni-adjusted *Z*-tests, $P < 0.05$).

We observed few noticeable differences in the seasonal occurrence of the different species of prey (Figure 2). However, beetles were used as soon as they became available at the end of March, peaked in use in

April, and gradually declined in frequency in the pellets through autumn.

Discussion

Composition of the diet of Western Screech-Owls in the Shuswap River drainage was similar to that reported elsewhere within the range of the *macfarlanei* subspecies. Insects and small mammals were the primary components of their diet, although a wide variety of other species were consumed in minor amounts. Composition of the pellets varied; 50.2% contained insects, 38.9% mammals and 7.9% of the items were birds. Interestingly, our results are different from those of Smith and Wilson (1971) whose 67 pellets collected during winter in Utah yielded a total of 80 prey items of which 23.8% were insects, 24.9% were mammals and 51.3% were birds. One would expect diets to be different between our study and Smith and Wilson's (1971) study because of differences in the seasons of collection and ecological settings; very little snow cover occurred in the Utah study area (D. Smith, Southern Connecticut State University, personal communication).

While proportions varied, few prey species found in this study had not been detected in the diet of screech-owls or other small owls elsewhere. This observation suggests that screech-owls in our study area did not use a different suite of prey species than found in other areas. Our detection of a red squirrel in a pellet was the only diet item that has not been reported in other studies (Cannings and Angell 2001).

It is unclear how important birds are in the diet of Western Screech-Owls because they comprised such a small component of the prey items that we identified. Although unidentified bird bones were found in 10 pellet samples in this study, all prey items from birds that were identified to species consisted of feathers that we had collected on the ground beneath roosts. We found remains of a Cedar Waxwing, American Robin and Killdeer and 4 adult Ruffed Grouse under roosts. We cannot be sure that these feathers were of prey eaten by screech-owls; it is possible that the remains were left by another raptor. However, birds were a recognized diet item in other studies (e.g., Marks and Marks 1981; Rains 1997; Cannings and Angell 2001). Although Ruffed Grouse are large for this small owl, screech-owls do occasionally take large prey; adult cottontails (*Sylvilagus* spp.) were found 3 times in a screech-owl nest box in Idaho (Cannings and Angell 2001).

We observed substantial differences between diets of male and female screech-owls which has not been noted previously. Male screech-owls consumed more small prey items (fish and insects) than females, whereas females ate more small mammals than did males. Differential niche utilization within a common territory may reduce intersexual competition for food resources (Selander 1966). Differential niche utilization by sexes is not unexpected by Western Screech-Owls due to their sexual size dimorphism; male screech-owls in this study were much smaller ($\bar{x}$ = 191 g, SD = 12.0, n = 6) than females ($\bar{x}$ = 242 g, SD = 34.2, n = 10). In addition to segregation of food resources, we also found that the male and female owl of one breeding pair used different parts of the territory outside of the breeding season, which may further reduce intersexual competition for food resources.

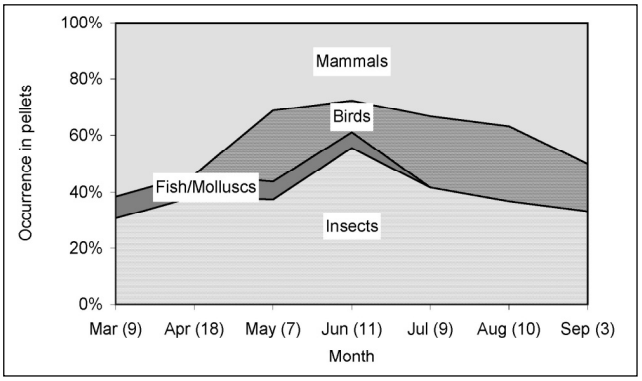

Figure 2. Monthly variation in occurrence of taxonomic groups in pellets collected from Western Screech-Owls along the Shuswap River, British Columbia, 2006 and 2007. Number of pellet samples analysed in parentheses beside name of month.

Our results are consistent with the findings of Smith and Wilson (1971), who concluded Western Screech-Owls are relatively opportunistic predators, taking the most easily attainable prey. It is unlikely that lack of suitable prey contributes to the low population numbers and endangered status of this species. Prey species that owls consumed occur in a wide variety of habitats. However, exposure to predation by larger owls may affect the types of habitats that owls can safely exploit in order to acquire these prey resources.

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