Comparison of Food Habits of the Northern Saw-whet Owl (*Aegolius acadicus)* and the Western Screech-owl (*Otus kennicottii)* in Southwestern Idaho

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Abstract.—I compared the breeding-season diets of Northern Saw-whet Owls (*Aegolius acadicus*) and Western Screech-owls (*Otus kennicottii*). Prey items were obtained from regurgitated pellets collected from saw-whet owl and screech-owl nests found in nest boxes in the Snake River Birds of Prey National Conservation Area in southwestern Idaho. A total of 2,250 prey items of saw-whet owls and 702 prey items of screech-owls were identified. Saw-whet owl diet was analyzed for the years 1990-1993; screech-owl diet was analyzed for 1992 only. The most frequently found prey items in the saw-whet owls diet were: *Peromyscus, Mus, Microtus and Reithrodontomys;* there were no significant differences among years. When saw-whet owl prey frequency data were pooled across years and compared to the 1992 screech-owl data, significant differences in diet were found. However, a comparison of the 1992 saw-whet prey frequency data with the screech-owl data showed no significant differences. In addition, the among year saw-whet owl prey biomass was analyzed, and again there were no significant differences. *Microtus,* followed by *Mus,* accounted for the largest proportion of prey biomass (by percent) in the diets of saw-whet owls for all years. When saw-whet owl prey biomass data were pooled across years and compared to the 1992 screech-owl prey biomass, significant differences in diet were found. The 1992 saw-whet prey biomass compared to the 1992 screech-owl prey biomass also was significantly different. Saw-whet owl prey biomass fell mainly between 11 and 55 grams; screech-owl prey biomass was more evenly distributed across the weight classes (0.5 grams - 400 grams).

Northern Saw-whet Owls (*Aegolius acadicus)* and Western Screech-owls (*Otus kennicottii*) inhabit many different habitat types and are sympatric in many areas of their ranges (Johnsgard 1988). Saw-whet owl diet varies with habitat type (Cannings 1987, Dinsmore and Clark 1991, Holt and Leroux 1996, Swengel and Swengel 1992, Marks and Doremus 1988), and though few data are available for the Western Screech-owl it is reasonable to expect that screech-owl diet also will vary with habitat type. The Western Screech-owl has a varied diet, including small mammals, birds, and invertebrates (Barrows 1989, Brown *et al.* 1987, Marks and Marks 1981, Smith and Wilson 1971), and appears to be broader than that of the saw-whet owl whose diet tends to concentrate on a few small mammals (Cannings 1987, Dinsmore and Clark 1991, Holt and Leroux 1996, Swengel and Swengel 1992, Marks and Doremus 1988). I collected and analyzed breeding season pellets in order to characterize and compare Saw-whet Owl and Western Screech-owl diets in southwestern Idaho.

METHODS

Study Area

This study was conducted in southwestern Idaho in the Snake River Birds of Prey National Conservation Area (NCA) and the adjacent C.J. Strike Wildlife Management Area (WMA); these were administered by the Bureau of Land

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Management (BLM), and Idaho Department Fish and Game, respectively. Habitat in both areas was composed of a slightly-rolling shrub-steppe desert cut by the canyons of the Snake and Bruneau rivers. Vegetation within the riparian habitats consists of scattered groves of Russian olive (*Eleaegnus angustifolia),* black locust (*Robinia pseudocacia*), and willow (*Salix* spp.). Vegetation outside of the riparian areas was dominated by big sagebrush (*Artemisia tridentata*) associations, and introduced cheatgrass (*Bromus tectorium*). Public lands in the study area were interspersed with irrigated private cropland; elevation ranged from 775-1,000 m. USDI (1979) provides a more complete description of the vegetation and topography of the area.

In 1982, BLM began placing nest boxes in the riparian areas of the NCA and WMA for Western Screech-owls. Since then, more than 94 boxes have been placed in the study area. The first recorded nesting of Northern Saw-whet Owls within the study area occurred in 1986.

Food Habits

During my monitoring of the nesting saw-whet owls, whenever possible cached prey items were removed from the nest boxes and identified. The prey items were identified using field guides, and recorded. If the prey items were intact, the head and legs were removed to avoid the possibility of recounting the prey items in a pellet. No cached prey items were identified from the nest boxes of screech-owls.

Saw-whet owl and screech-owl pellets were collected from nest boxes during and after the breeding season. I also collected all of the nesting material (wood chips) after each nesting attempt had been completed or terminated. Because of the large volume of this material, it was processed using a modification of the procedure described by Marti (1987). Feathers and insect parts were first removed from the nesting material. The remaining material was then soaked in a dilute (10 percent) NaOH solution for several hours to dissolve hair. Subsequently, any parts of prey remains that could be used for identification were separated from the wood chips. Identifiable prey remains included: skulls, mandibles, dentaries, pelvic bones, limb bones, beaks, avian feet, and insect and crustacean body parts. A dissecting microscope was used in identifying prey remains. To identify prey items, I compared the remains to museum specimens or a skull key (Glass 1981). Most mammalian prey was identified to genus; other prey was identified to class.

Prey items were enumerated by counting left and right fragments of both the upper and lower jaws. A total count was determined by tabulating the largest possible number derived from the four counts. Some fragments were too small or were missing key parts for proper identification. These prey items were listed as "unknown." The total number of unknown items was determined by subtracting the number of missing pieces of the known items from the unknown items. For example, if a prey item was missing a left lower jaw, then a left lower jaw was subtracted from the unknown left lower jaw total. This method assured that no items were counted as "unknown" when they were actually a missing fragment of one of the known prey items.

Biomass of mammalian and avian prey was estimated using average weights (Dunning 1993, Steenhof 1983). Because bird remains were not identified beyond class, species of birds known to be prey of saw-whet owls and screech-owls and that were known to be in the study area, were used to calculate the avian biomass estimates (Holt and Leroux 1996, Ritchison and Cavanagh 1992). Other screech-owl prey biomass estimates were obtained from prey use of Eastern Screech-owls in Kentucky (Ritchison and Cavanagh 1992).

Food habit differences for saw-whet owls and screech-owls were statistically analyzed using SAS for Personal Computers (SAS Institute Inc. 1985). MANOVA analyses were used to test whether prey frequency and percent biomass differed significantly among years and between owl species.

RESULTS

Food Habits

Prey Frequency

The diet of saw-whet owls was analyzed for the years 1990-1993; there was no significant difference in saw-whet diet composition among years. Table 1 shows the pooled frequency of numbers (c.f. Marti 1987) of all prey species in the diet of saw-whet owls. In all years, *Mus, Microtus*, *Peromyscus,* and *Reithrodontomys*

Table 1.—*Percent frequency and percent biomass of 2,250 prey taken by Northern Saw-whet Owls (*Aegolius acadicus*) taken from 20 nest sites (nest boxes) within the Snake River Birds of Prey National Conservation Area, southwestern Idaho. The 1990-1993 data has been pooled as there were no significant differences among years.*

Prey species	Frequency	Biomass
	- - - - - *Percent* - - - - -	
Peromyscus	21.29	17.58
Mus	30.70	27.03
Microtus	25.16	43.46
Reithrodontomys	14.27	6.81
Sorex	2.58	0.60
Perognathus	0.37	0.35
Onychomys	0.29	0.29
Bird	1.03	0.84
Unknown	4.30	3.03

comprised the largest proportions of prey items in the diet.

Table 2 shows the frequency of numbers of all prey species in the diet of screech-owls for the year 1992. *Reithrodontomys, Mus,* and *Peromyscus* comprised the largest proportions of prey items.

The pooled saw-whet owl diet data were compared to the 1992 diet data of screech-owls (fig. 1). Screech-owl diet data was only available for the year 1992. Note that screech-owls had a broader diet including: ground squirrels, fish, lizards, and crayfish that were not found in the saw-whet diet. There were totals of 2,250 saw-whet and 702 screech-owl prey items. There was a significant difference between the mean prey item frequency for the pooled saw-whet owl data and the screech-owl data, $F = 3.83$, df = 13, 16, $p = 0.009$. I also compared prey frequency for just the 1992 saw-whet owl data and the 1992 screech-owl data. There was no significant difference in prey frequency between saw-whet owl and screech-owls in 1992.

Prey Biomass

Table 1 also presents the estimated biomass that each prey type contributed to the saw-whet owl diet (years pooled). Analysis of among

Table 2.—*Percent frequency and percent biomass of 702 prey taken by Western Screech-owls (*Otus kennicottii*) from 11 nest sites (nest boxes) within the Snake River Birds of Prey National Conservation Area, southwestern Idaho. All prey items were from the 1992 nesting season.*

Prey species	Frequency	Biomass
	- - - - - *Percent* - - - - -	
Peromyscus	15.00	10.77
Mus	17.37	12.19
Microtus	12.86	23.66
Reithrodontomys	17.81	7.44
Sorex	0.66	0.16
Perognathus	13.18	8.20
Dipodomys	9.67	19.23
Thomomys	1.07	8.03
Spermophilus	0.12	0.86
Neotoma	0.12	1.41
Bird	2.23	2.67
Insect	0.99	0.02
Crayfish	0.40	0.09
Lizard	0.28	0.19
Fish	0.12	0.05
Unknown	8.11	5.04

year saw-whet owl mean prey biomass did not reveal any significant differences. The largest proportion of prey biomass was *Microtus* followed by *Mus* and *Peromyscus*.

There was a significant difference ($F = 3.63$, df = 13, 16, $p = 0.011$) between the pooled saw-whet prey biomass data and the 1992 screech-owl prey biomass (fig. 2). The 1992 saw-whet prey biomass and the 1992 screech-owl prey biomass were also significantly different ($F = 885.8$, df = 1, 16, $p = 0.026$).

I then compared the biomass size class of prey taken by saw-whet owls with that taken by screech-owls (fig. 3). Here the 0.5-10 grams size class included *Sorex* and insects; the 11-20 grams—*Peromyscus* and *Mus*; the 31-50 grams—*Microtus*; the 51-100 grams—*Onychomys*, and the 101-400 grams—*Spermophilus*, *Neotoma*, and *Thomomys*. Figure 3 shows that screech-owl prey biomass is distributed across a broader range of size classes than that of the saw-whet owl.

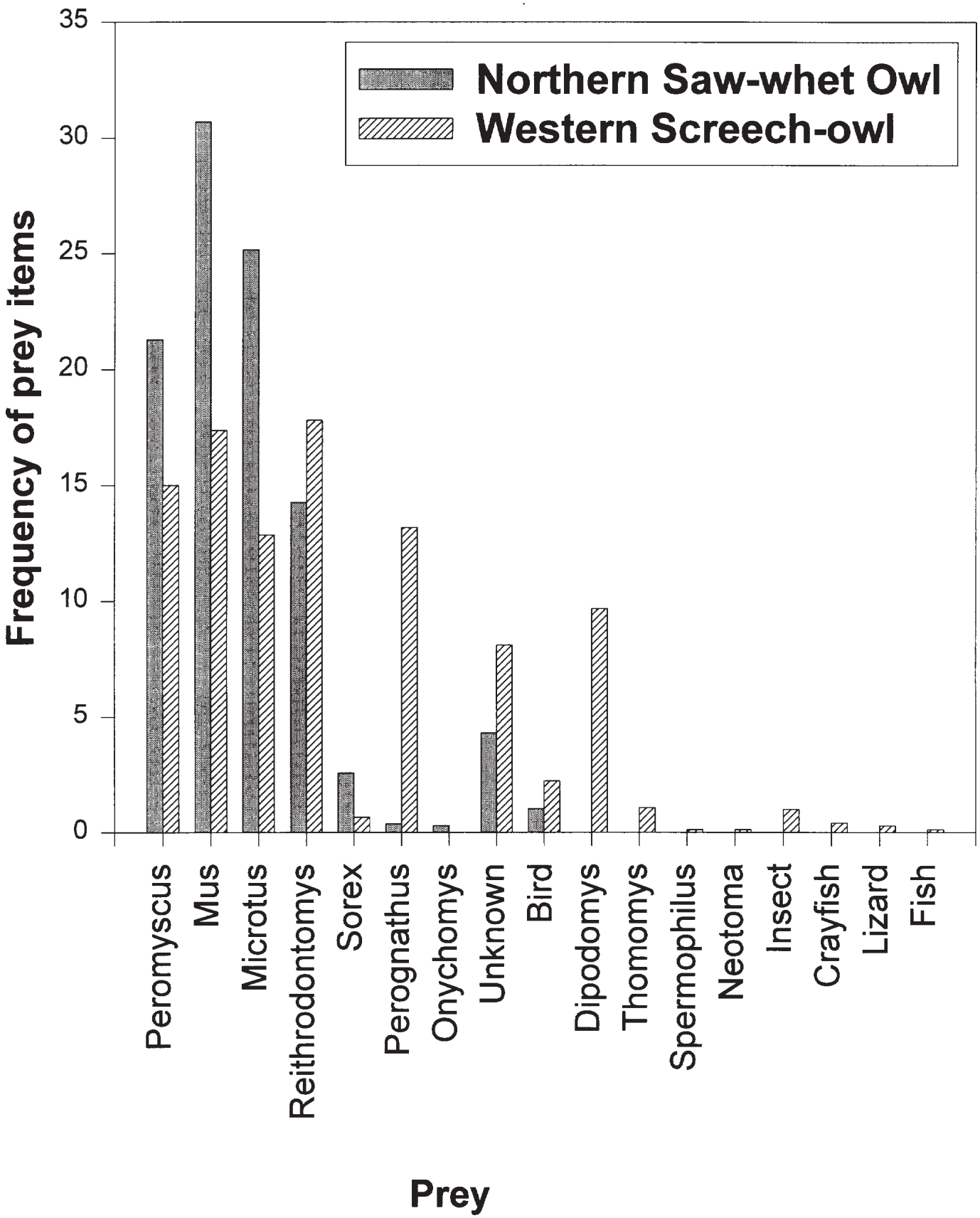

Figure 1.—*Comparison of the prey frequency during the breeding season of Northern Saw-whet Owls (*Aegolius acadicus*) (1990-1993) and Western Screech-owls (*Otus kennicottii*) (1992) within the Snake River Birds of Prey National Conservation Area, Southwestern Idaho. The MANOVA showed a significant difference between the owl species (F = 3.83, df = 13, 16, p = 0.009).*

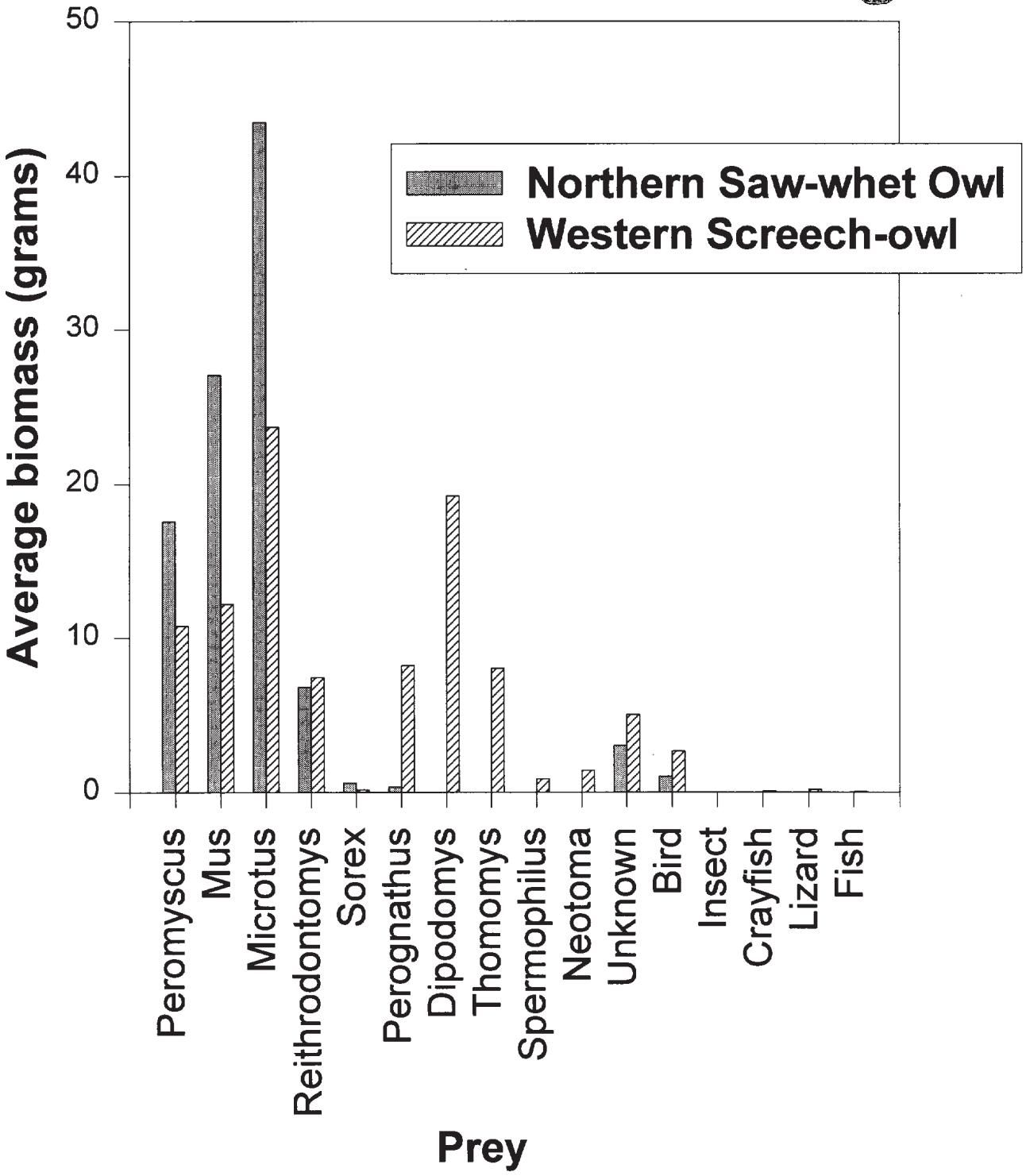

Figure 2.—*Comparison of the prey biomass (grams) of Northern Saw-whet Owls (*Aegolius acadicus*) and Western Screech-owls (*Otus kennicottii*) nesting within the Snake River Birds of Prey National Conservation Area, southwestern Idaho. The MANOVA showed a significant difference between the two owl species ($F = 3.63$, $df = 13, 16$, $p = 0.011$).*

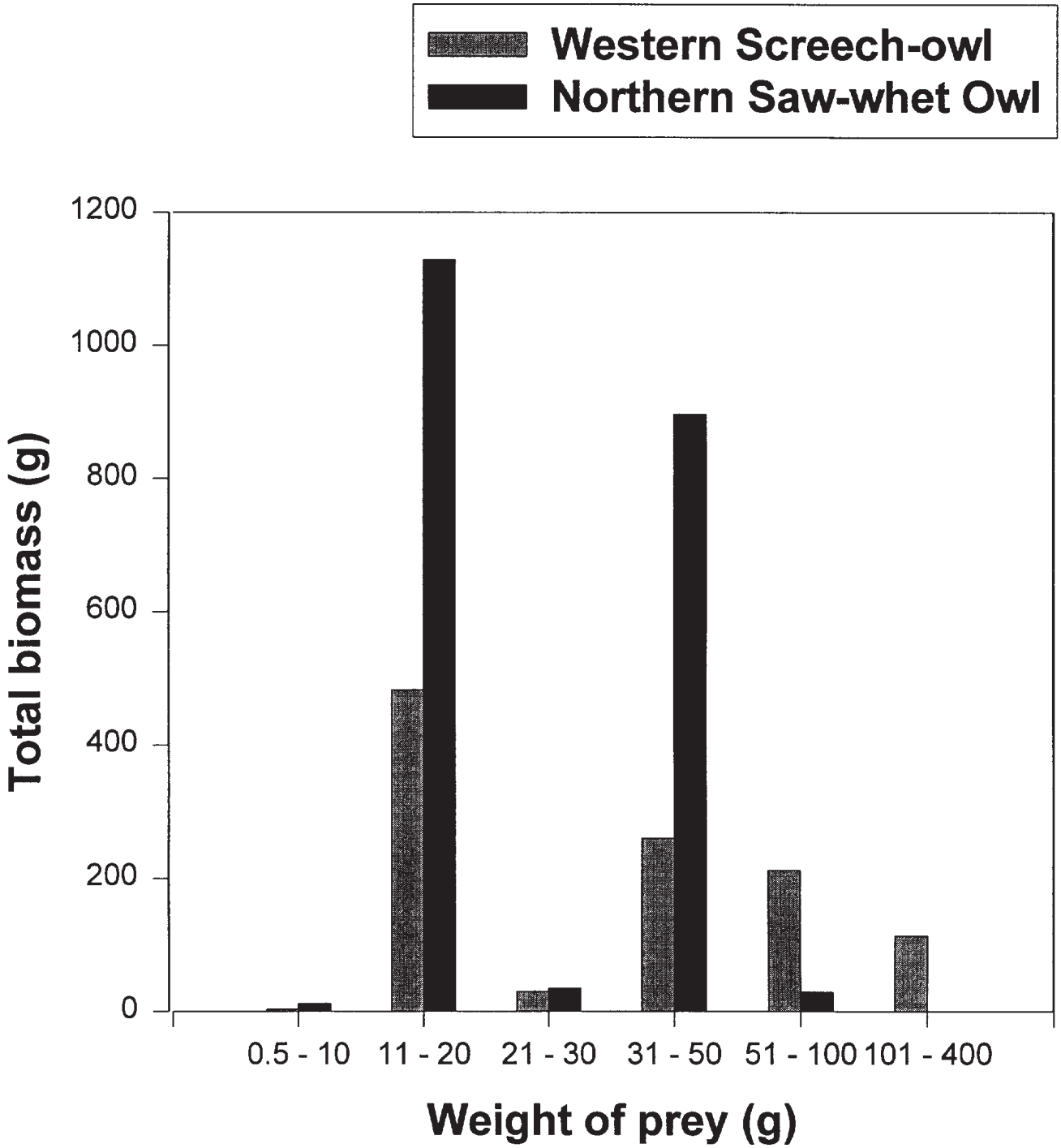

Figure 3.—*Comparison of the pooled prey biomass (grams) by weight of Northern Saw-whet Owls (*Aegolius acadicus*) and Western Screech-owls (*Otus kennicottii*). The 0.5-10 gram class would include* Sorex *and insects, 11-20 grams:* Peromyscus *and* Mus, *31-50 grams:* Microtus, *51-100 grams:* Dipodomys, *and 101-400 grams:* Neotoma, Spermophilus, *and* Thomomys.

DISCUSSION

Food habits of Northern Saw-whet Owls have been reported for the non-breeding season (Dinsmore and Clark 1991, Holt *et al.* 1990, Swengel and Swengel 1992) and for the breeding-season (Cannings 1987, Holt and Leroux 1996, Marks and Doremus 1988). Here I have provided breeding-season diet data. My study results concurred with an earlier study in the Snake River Birds of Prey NCA which found *Mus* to be the most numerous prey (Marks and Doremus 1988); my results place *Mus, Microtus*, and *Peromyscus* as the three most numerous prey taken. However, Holt and Leroux (1996) noted that *Microtus* was the most frequently taken prey species in Montana. The non-breeding season studies noted that *Peromyscus* was the most frequently consumed prey item (Dinsmore and Clark 1991, Holt *et al.* 1990, Swengel and Swengel 1992). The results of my study were similar to Cannings (1987) who found that *Microtus* was the most important prey in biomass but not in frequency.

Relatively few studies have been done on the food habits of Western Screech-owls. In my study, *Reithrodontomys* was the prey most frequently consumed by screech-owls followed by *Mus, Peromyscus, Perognathus, Microtus, Dipodomys,* and birds. The most frequently identified prey item in other studies were *Passer domesticus* (Smith and Wilson 1971), *Dipodomys* (Brown *et al.* 1987), *Peromyscus* (Marks and Marks 1981), and *Perognathus* (Barrows 1989). I found *Microtus* and *Dipodomys* to be the most important prey in terms of biomass. Marks and Marks (1981) noted that *Peromyscus* composed 62 percent of screech-owl diet biomass, while *Passer domesticus* made up 50 percent of the diet biomass of wintering screech-owls in Utah (Smith and Wilson 1971).

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