J Raptor Res. 31(4):376–380

DIET OF MEXICAN SPOTTED OWLS IN CHIHUAHUA AND AGUASCALIENTES, MEXICO

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ABSTRACT.—We analyzed pellets of Mexican Spotted Owls (*Strix occidentalis lucida*) collected at roost and nest sites in Chihuahua from 1992–94, and Aguascalientes, Mexico from 1994–95 to determine diet composition. We identified 647 prey items from 13 owl territories in Chihuahua and four owl territories in Aguascalientes. Vertebrates constituted 64% of all prey items and 99% of total prey biomass. Woodrats (*Neotoma* spp.), mice (*Peromyscus* spp.) and cottontail rabbits (*Sylvilagus floridanus*) comprised 82% of total prey biomass in Chihuahua and 89% of total prey biomass in Aguascalientes.

KEY WORDS: *Mexican spotted owl*; Strix occidentalis lucida; *diet*; *Chihuahua*; *Aguascalientes*; *Mexico.*

Dieta del *Strix occidentalis lucida* en Chihuahua y Aguascalientes, Mexico

RESUMEN.—Nosotros analisamos bolitas de *Strix occidentalis lucida* colectados en perchas y sitios de nido en Chihuahua de 1992–94, y Aguascalientes, Mexico de 1994–95 para determinar la composicion de dieta nosotros identificamos 647 articulos de presa en 13 territorios de buhos en Chihuahua y cuatro territorios de buhos en Aguascalientes. Vertebrados componieron 64% de los articulos de presa y 99% del total biomass de presa. (*Neotoma* spp.), (*Peromyscus* spp.) y (*Sylvilagus floridanus*) compnieron 82% del total de biomass de presa en Chihuahua y 895 del total biomass de presa en Aguascalientes.
[Traducción de Raúl De La Garza, Jr.]

Mexican Spotted Owls (*Strix occidentalis lucida*) are considered habitat specialists (Ganey and Dick 1995, Seamans and Gutiérrez 1995) that inhabit mature mixed conifer and ponderosa pine (*Pinus ponderosa*) forests (Ganey and Balda 1994) from southern Colorado and Utah, south to the southern end of the Mexican Plateau (Ward et al. 1995). The Mexican Spotted Owl was listed as threatened by the U.S. Fish and Wildlife Service in 1993 (U.S. Department of Interior 1993) and the Mexican government in 1994 (Anonymous 1994).

Mexican Spotted Owls are perch and pounce predators of small- to medium-sized mammals (Gutiérrez et al. 1995). Ward and Block (1995) reviewed Mexican Spotted Owl diets and found that diet varied by location, but mammals generally comprise a greater percentage of the diet than do birds, reptiles or arthropods. Within mammalian species, woodrats (*Neotoma* spp.) and mice (*Peromyscus* spp.) are taken more commonly than other species. Although Mexican Spotted Owls are opportunistic, the predominance of woodrats and mice in diets suggests they may be more specialized in their diet than was previously thought. The studies that Ward and Block (1995) reviewed were conducted in the southwestern U.S., except for one study in Chihuahua, Mexico (Tarango 1994). As such, the diet of the Mexican Spotted Owl outside the U.S. is largely unknown. Herein, we describe their diet in southwestern Chihuahua and northwestern Aguascalientes, Mexico.

STUDY AREA AND METHODS

Regurgitated pellets were collected opportunistically from March–September at roost sites in the Sierra Fria

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in northwestern Aguascalientes during 1994–95, in the Sierra Madre Occidental in southwestern Chihuahua in 1992–93 (Tarango 1994) and 1994 (Young 1996). Mexican Spotted Owl habitat in Chihuahua consisted primarily of pine/oak (*Quercus* spp.) forests (71%), with Durango pine (*P. durangensis*), Mexican white pine (*P. ayachuite*), and Arizona pine (*P. arizonica*) dominating. Pure pine and mixed conifer represented 17% and 12%, respectively, of spotted owl habitat in Chihuahua (Young 1996). In Aguascalientes, occupied habitat was primarily pine/oak forest. Dominant pine species were ocote (*P. hairieri*), nut pine (*P. cembroides*), Chihuahua pine (*P. chihuahuana*) and Michoacan pine (*P. michoacana*). Elevations of roost sites ranged from 2200–2600 m in Chihuahua, and from 2450–2560 m in Aguascalientes.

Pellets were separated into bones, arthropod exoskeletons, and fur and feathers following procedures outlined in Marti (1987). Prey remains were identified to the lowest taxon possible by comparing skulls, chitinous material, beak sheaths, claws and feathers to keys (Anderson 1972, Dunning 1993) and reference specimens at New Mexico State University. We were unable to differentiate the years of origin of pellets collected in Chihuahua during 1992–93, or in Aguascalientes during 1994–95. Diet was expressed as relative frequency (number of prey in each taxonomic category divided by the total number of prey collected) and relative biomass (number of individuals in each taxonomic group divided by average body mass for the taxon). Average body masses were estimated for mammals from Anderson (1972) and Ganey (unpubl. rep.), for birds from Dunning (1993) and for arthropods from Ganey (unpubl. rep.). A list of average body masses used in the analysis was recorded in Young (1996). Due to small sample sizes, no statistical analyses were conducted.

RESULTS

We identified 674 prey items from Mexican Spotted Owl pellets in Mexico. A total of 238 prey items were identified from seven pairs and one single male in 1992 and 1993 in Chihuahua, 347 prey items were identified from 10 pairs and two single males in 1994 in Chihuahua (Table 1) and 89 prey items were identified from four pairs in 1994 and 1995 in Aguascalientes.

Pellets from Aguascalientes were collected from the following spotted owl sites: Cueva Prieta, Los Pillares, El Carrizal and Barranca Los Laureles. Prey items represented 15 mammalian genera, five avian families, one reptile genus and nine arthropod families. Vertebrates constituted 64% of all prey items and 99% of prey biomass. Woodrats (*N. albigula* and *N. mexicana*), mice (*Peromyscus* spp.) and cottontail rabbits (*Sylvilagus floridanus*) comprised 51% of total prey and 82% of prey biomass in Chihuahua, and 42% of total prey and 89% of prey biomass in Aguascalientes (Table 2).

Woodrats comprised a larger proportion of prey biomass in Aguascalientes (63%) than in Chihuahua (38 and 48%). Biomass of mice only differed by 6% among years and locations. Peromyscid mice comprised 95% of total mouse prey. Grasshopper mice (*Onychomys torridus*) were absent from diets in Chihuahua in 1994, but were present in all other locations and years, while harvest mice (*Reithrodontomys* spp.) were present in diets in Chihuahua in 1992 and 1993 but were not found at other locations or during other years. Pocket gophers (*Thomomys* spp.) comprised 4–9% of total prey biomass in Chihuahua, but were absent from owl diets in Aguascalientes.

Relative biomass of birds in diets was greater in Chihuahua (7 and 11%) than in Aguascalientes (4%; Table 2). Bats (*Eptesicus, Lasiurus, Myotis* and *Pipistrellus* spp.), diurnal sciurids (*Spermophilus* and *Eutamias* spp.), cotton rats (*Sigmodon* spp.), voles (*Microtus* spp.) and shrews (*Sorex* spp.) accounted for <4% of the total prey and <3% of total prey biomass in all locations and years. Four lizards (*Sceloporus* spp.) were identified in the owl's diet in Chihuahua in 1994, but they comprised <1% of total biomass. Arthropods contributed 31–54% of prey items in diets, yet they accounted for <2% of total prey biomass in diets.

Table 1. Social status and number of prey items identified in diets at Mexican Spotted Owl sites in Chihuahua, Mexico.

	1992–93		1994	
SITE	SOCIAL STATUS	# OF PREY ITEMS	SOCIAL STATUS	# OF PREY ITEMS
Agua Fresca	Pair	78	Pair	72
Arroyo Cuervo	Pair	65	Pair	44
Arroyo Enmedio	Pair	23	—	0
Arroyo Sonorecomchi	—	0	Pair	9
Arroyo San Vicente	Pair	13	Pair	0
Arroyo Hojasichi	Male	21	Male	141
Arroyo Hondo	Pair	8	Pair	10
Arroyo La Laguna	—	0	Pair	5
Chimoto	Pair	7	Pair	44
El Yeposo	Pair	23	Pair	3
Guacayvo	—	0	Pair	10
Guaqueachi	—	0	Male	1
Puerto Pino Hueco	—	0	Pair	8
TOTAL		238		347

Table 2. Relative percent frequency and percent biomass (g) of prey in diets of Mexican Spotted Owls in Chihuahua and Aguascalientes, Mexico.

	CHIHUAHUA 1992–93		CHIHUAHUA 1994		AGUASCALIENTES 1994–95	
PREY GROUP	FREQ (N = 238)	BIOMASS (13 160 g)	FREQ (N = 347)	BIOMASS (25 308 g)	FREQ (N = 89)	BIOMASS (3 493 g)
Woodrats	**14.3**	**47.5**	**15.0**	**37.8**	**13.5**	**63.2**
Neotoma spp.[a]	14.3	47.5	13.2	33.4	13.5	63.2
N. albigula	—	—	0.6	1.4	—	—
N. mexicana	—	—	1.2	3.0	—	—
Mice	**34.8**	**15.6**	**28.8**	**10.4**	**27.0**	**15.0**
Onychomys torridus	0.8	0.4	—	—	4.5	3.0
Peromyscus spp.[a]	31.9	15.1	28.8	10.4	22.5	15.0
Reithrodontomys spp.[a]	2.1	0.1	—	—	—	—
Rabbits *Sylvilagus floridanus*	**1.7**	**11.9**	**7.2**	**38.5**	**1.1**	**11.2**
Gophers	**3.8**	**8.8**	**2.0**	**3.6**	**0.0**	**0.0**
Thomomys spp.[a]	3.8	8.8	1.4	2.5	—	—
T. umbrinus	—	—	0.6	1.1	—	—
Bats	**2.1**	**0.6**	**3.5**	**0.8**	**2.2**	**0.3**
Eptesicus fuscus	0.4	0.1	—	—	—	—
Lasiurus borealis	—	—	0.3	<0.1	—	—
L. cinereus	1.3	0.5	2.6	0.7	—	—
Myotis spp.[a]	—	—	—	—	2.2	0.3
M. lucifugus	—	—	0.3	<0.1	—	—
M. velifer	—	—	0.3	<0.1	—	—
Pipistrellus hesperus	0.4	<0.1	—	—	—	—
Sciurids	**0.8**	**0.9**	**0.3**	**0.6**	**0.0**	**0.0**
Spermophilus spilosoma	—	—	0.3	0.6	—	—
Eutamias spp.[a]	0.8	0.9	—	—	—	—
Cotton Rats *Sigmodon* spp.[a]	**1.7**	**2.6**	**0.3**	**0.3**	**1.1**	**2.4**
Voles *Microtus mexicanus*	**1.3**	**0.5**	**0.3**	**0.1**	**0.0**	**0.0**
Shrews *Sorex vagrans*	**1.3**	**0.1**	**0.3**	**<0.1**	**0.0**	**0.0**
Birds	**7.1**	**10.8**	**6.3**	**7.1**	**1.1**	**3.6**
Strigiformes	2.5	2.8	2.6	2.2	—	—
Trogonidae	0.4	0.7	—	—	—	—
Aphelocoma ultramarina	0.8	1.9	2.3	3.9	1.1	3.6
Cyanocitta stelleri	2.5	5.2	0.6	0.9	—	—
Psaltriparus minimus	0.4	<0.1	0.9	<0.1	—	—
Sayornis spp.[a]	0.4	0.1	—	—	—	—
Reptiles *Sceloporus* spp.[a]	**0.0**	**0.0**	**1.2**	**0.3**	**0.0**	**0.0**
Arthropods	**31.1**	**0.6**	**34.9**	**0.5**	**53.9**	**1.4**
Arachnida	—	—	0.9	<0.1	—	—
Cicadidae	0.8	<0.1	0.3	<0.1	1.1	<0.1
Formicidae	—	—	0.6	<0.1	—	—
Lyctidae	2.9	0.1	6.9	0.1	2.2	<0.1
Mantidae	0.4	<0.1	—	—	—	—
Orthoptera	0.8	<0.1	—	—	—	—
Scarabaeidae	19.3	0.3	8.9	0.1	14.6	0.4
Tenebrionidae	5.0	0.1	15.9	0.2	30.4	0.8
Coleoptera[b]	1.6	<0.1	0.6	<0.1	5.6	0.1

[a] Unknown species of given genera.
[b] Unknown beetle.

DISCUSSION

Woodrats and mice comprised 41–49% of prey items and 48–78% of biomass of Mexican Spotted Owls in Chihuahua and Aguascalientes, Mexico. Similar high incidences of woodrats and mice have been reported in the diets of other subspecies of spotted owls (Forsman et al. 1984, Barrows 1987, Verner et al. 1992), and for Mexican Spotted Owls in the southwestern U.S. (Ganey 1992, Ward and Block 1995). We found that woodrats made up a larger percentage of biomass of the Mexican Spotted Owl diet in Aguascalientes than in Chihuahua, but that gophers, sciurids, voles and shrews were absent in the diet in Aguascalientes. Proportions of cottontail rabbits differed among locations and years. Prey density, geographic variation, sample size, sampling duration or differences in habitat may have influenced differences we observed.

Habitats used by woodrats and brush mice (*P. boylii*) are dissimilar from those used by deer mice (*P. maniculatus*). Mexican woodrats, white-throated woodrats and brush mice are commonly found near rocky outcrops within pine, pinyon-juniper (*P. edulis-Juniperus* spp.), and oak and mixed-conifer forests (Anderson 1972, Armstrong 1972, Hoffmeister 1986), where they use areas with steep slopes, high shrub density, high oak cover and high log volume (Ward and Block 1995). Conversely, deer mice use open sites on gentle slopes, low shrub cover, low densities of oak trees and high litter depth (Ward and Block 1995). Forests in Chihuahua are subjected to frequent fires, intense firewood collection and livestock grazing that results in reduced woody debris, few shrubs and sparse herbaceous ground cover (Young 1996). Such habitat components may favor deer mice, but not woodrats or brush mice, thus, possibly decreasing the diversity of prey base. Maintenance of a mosaic of vegetation communities should be promoted.

ACKNOWLEDGMENTS

We thank J. Black, R. Ontivaros, M. Watson, M. Marquez, J. Payne, personnel at Conservation and Forest Development Unit 5, San Juanito, Chihuahua, and the Colegio de Postgraduados, San Luis Potosi, Mexico, for their assistance. M. Livingston, J. Blakesley and P. Ward provided useful comments on earlier drafts of this manuscript. Funding was provided by the U.S. Forest Service, U.S. Fish and Wildlife Service and New Mexico State University's Agricultural Experiment Station.

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Received 23 January 1997; accepted 13 August 1997