J Raptor Res. 34(4):334–338

DIET OF THE BARN OWL (*TYTO ALBA TUIDARA*) IN NORTHWESTERN ARGENTINE PATAGONIA

MARIA S. PILLADO AND ANA TREJO
Centro Regional Universitario Bariloche, Unidad Postal Universidad, 8400 San Carlos de Bariloche, Argentina

KEY WORDS: *Barn Owl*; Tyto alba; *diet*; *Patagonia*; *Argentina.*

Given its wide distribution and sedentary habits, the diet of the Barn Owl (*Tyto alba*) has been studied in more detail and more extensively than that of any other bird of prey (Everett et al. 1992). Rodents and other small mammals are the main prey in the diet of Barn Owl in all of its range along with variable proportions of birds, reptiles, amphibians, fish, and arthropods (Taylor 1994). The Barn Owl (*T. alba tuidara*) is widespread in continental Argentina and occasionally on islands (Canevari et al. 1991). Food habits of the Barn Owl have been thoroughly studied in agrosystems in Argentina (Bellocq 1990, Bellocq and Kravetz 1994), but little is known about its diet in southern Argentina. In Patagonia, most studies have focused on the arid eastern steppes (De Santis and Pagnoni 1989, De Santis et al. 1993, 1996, García Esponda et al. 1998). Our aim was to provide information on the diet of the Barn Owl in a somewhat different area with more mesic vegetation features and a small mammal fauna mixing typical steppe species with others more characteristic of humid forests nearby (Monjeau 1989).

STUDY AREA AND METHODS

The study site was located in the Reserve Area of Nahuel Huapi National Park, in northwestern Argentine Patagonia (71°07′25″W, 40°47′14″S) at 700 m elevation above sea level. The area is an ecotone between the arid Patagonian steppe to the east and the southern beech (*Nothofagus* spp.) forests to the west. The site was dominated by bunchgrasses (*Stipa speciosa*) and cushion bushes (*Mulinum spinosum*) with scattered trees (*Austrocedrus chilensis, Maytenus boaria,* and *Populus nigra*). At times, willows (*Salix fragilis*) formed small gallery forests.

Owl roosts were located by observing areas of whitewash or recording places where pellets were found. Pellets were collected every two weeks from June 1993–May 1994 at two known roost sites. Pellets were grouped into calendar seasons, oven-dried in 70°C for 72 hr, and processed following standard methods (Marti 1987). Most prey were identified to species. Mammalian prey were identified and quantified on the basis of skulls and dentaries using reference collections and keys (Pearson 1995). Insects were quantified by counting head capsules and mandibles.

Biomass of each rodent species in the total biomass of the diet was calculated by multiplying mean body mass of individuals by the number of individuals in pellets and expressed as a percentage of total rodent biomass consumed. We calculated the geometric mean of weight of prey (Marti 1987): GMW = antilog ($\Sigma\ n_i \log w_i / \Sigma\ n_i$), where n_i was the number of individuals of the ith species and w_i was the mean weight. We also determined the mean length of rodents consumed after Jaksić et al. (1977): MLR = $\Sigma\ f_i x_i / m$, where f_i was the frequency of the i species in the diet, x_i was mean body length, and m the total number of identified rodents. Mean weight of mammals and mean body length of rodents were taken from the literature (Redford and Eisenberg 1992, Pearson 1995).

Food-niche breadth (FNB) was estimated using Levins' (1968) index: FNB = $1/(\Sigma\ p_i^2)$, where p_i was the proportion of prey taxon i in the diet. A standardized niche breadth value (FNB_{st}) was then calculated, which ranged from 0–1: $FNB_{st} = (FNB - 1)/(n - 1)$, where n was the total number of prey categories (Colwell and Futuyma 1971). Evenness (J′) was calculated by the Shannon-Wiener function as follows: J′ = H′/H′max, where H′ was the Shannon-Wiener function and H′max was the maximum value of H′; that is, the logarithm of the number of species in the sample (Krebs 1989).

RESULTS AND DISCUSSION

A total of 425 prey items was identified from 229 pellets. The mean number of prey/pellet was 1.9 ± 0.9 (±SD, range = 1–4) and the mean number of rodents/pellet was 1.8 ± 0.9 (range = 1–4). Barn Owls preyed mainly on rodents (95.1%). Hares and insects made up 0.5% and 4.4% of prey, respectively. The two European hares (*Lepus europaeus*) found in the diet were newborns. Insects were all in the family Scarabaeidae (Table 1).

By percent frequency, the most consumed sigmodontine rodent species were *Abrothrix longipilis, Loxodontomys micropus,* and *Oligoryzomys longicaudatus.* In terms of biomass, *Loxodontomys micropus* was the most important prey in the diet, followed by *Abrothrix longipilis* and *Oligoryzomys longicaudatus* (Fig. 1).

The Barn Owl feeds almost exclusively on small mammals throughout its range, although the proportions of other prey may vary slightly (Taylor 1994). Barn Owls in our study preyed almost exclusively on rodents with juvenile hares and insects rarely appearing in the diet, mostly in spring. We did not find birds, reptiles, nor amphibians to be important prey as was the case in La Pampa, Argentina (Noriega et al. 1993).

Based on the literature, the most important prey of Barn Owls in Argentine Patagonia are *Eligmodontia morgani* and *Reithrodon auritus* (De Santis and Pagnoni 1989, De Santis et al. 1993, Tiranti 1996, Travaini et al. 1997). In our study area, neither species represented >4% and 8% of total prey items, respectively. This was not surprising because the habitat characteristics of our study area

Table 1. Seasonal diet of the Barn Owl in northwestern Argentine Patagonia. N = number of prey, % calculated over the total number of prey, and FNB_{st} = standardized niche breadth.

Prey	Mean Weight (g)	Summer		Autumn		Winter		Spring		Total	
		N	%	N	%	N	%	N	%	N	%
Mammals											
Rodents											
Muridae											
Abrothrix longipilis	38.2	26	31.3	22	32.4	30	21.6	41	30.4	119	28.1
Abrothrix xanthorhinus	5.3	1	1.2	5	7.4	2	1.4	3	2.2	11	2.6
Eligmodontia morgani	16.6	—	—	6	8.8	3	2.2	5	3.7	14	3.3
Euneomys chinchilloides	84.7	2	2.4	—	—	1	0.7	—	—	3	0.6
Irenomys tarsalis	44.4	—	—	2	2.9	2	1.4	2	1.5	6	1.4
Loxodontomys micropus	72.8	10	12.1	15	22.1	46	33.1	25	18.5	96	22.7
Oligoryzomys longicaudatus	27.5	14	16.9	2	2.9	28	20.1	20	14.8	64	15.1
Phyllotis xanthopyga	57.5	3	3.6	1	1.5	2	1.4	3	2.2	9	2.1
Reithrodon auritus	81.7	14	16.9	6	8.8	4	2.9	7	5.2	31	7.3
Unidentified		7	8.4	6	8.8	16	11.5	9	6.7	38	8.9
Ctenomyidae											
Ctenomys haigi	164.0	4	4.8	3	4.4	5	3.6	1	0.7	13	3.0
Lagomorphs											
Lepus europaeus		—	—	—	—	—	—	2	1.5	2	0.4
Insects											
Coleopterans		2	2.4	—	—	—	—	17	12.6	19	4.4
Total prey items		83		68		139		135	425		
Total pellets		42		35		82		70	229		
FNB_{st}		0.501		0.486		0.369		0.431	0.415		
Evenness (J′)		0.837		0.843		0.747		0.807	0.802		
No. Prey/pellet		0.98		1.91		1.73		1.90	1.89		
Mean length of rodents (cm)		115.6		114.2		107.2		111.0	113.5		
Geometric mean weight (g)		50.2		44.2		48.1		42.3	46.1		

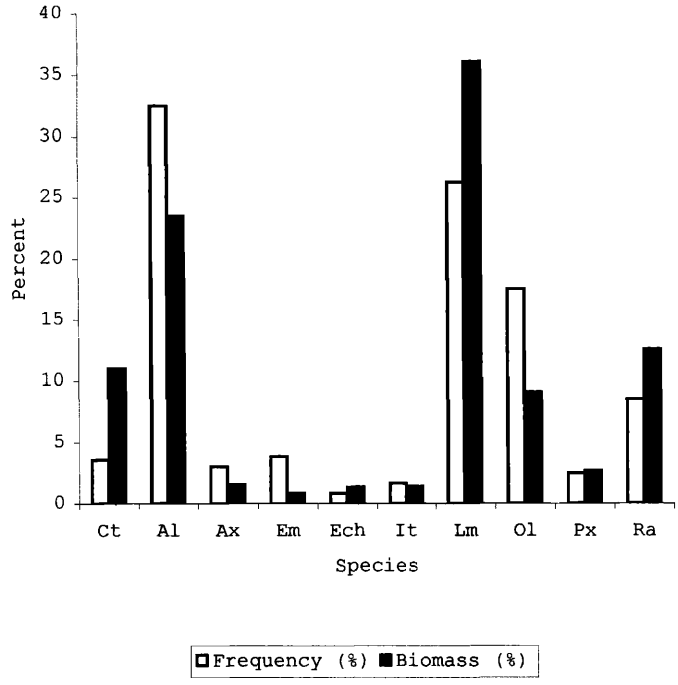

Figure 1. Frequency and biomass of rodent prey species in the diet of the Barn Owl. Biomass is expressed as the percentage of biomass of each species calculated on total rodent biomass. Ct—*Ctenomys haigi*, Al—*Abrothrix longipilis*, Ax—*A. xanthorhinus*, Em—*Eligmodontia morgani*, Ech—*Euneomys chinchilloides*, It—*Irenomys tarsalis*, Lm—*Loxodontomys micropus*, Ol—*Oligoryzomys longicaudatus*, Px—*Phyllotis xanthopyga*, Ra—*Reithrodon auritus*.

were not optimal for these rodents, which prefer the more xeric and open habitats of the Patagonian steppe (Pearson 1995).

The most common species in the diet, both in frequency and biomass, *Abrothrix longipilis*, *Oligoryzomys longicaudatus*, and *Loxodontomys micropus* are good climbers and prefer brushy places, although the latter is also found in shallow wet grasslands (Pearson 1983). Taking this into account, we inferred that the most frequently-used habitats in the Barn Owls' hunting range were those with good vegetation cover and ample water.

Hares were only occasionally eaten by Barn Owls despite their relative abundance (approximately 4–18 hares/ha; Novaro et al. 1992), their crepuscular or nocturnal habits, and their open nests (Bonino and Montenegro 1997), all traits which might make them vulnerable to an aerial nocturnal predator like the Barn Owl. There is only one citation for the Argentine Patagonia recording predation by Barn Owls on rabbits (*Oryctolagus cuniculus*, 0.1% of total prey, Travaini et al. 1997). In central Chile, the proportion of rabbits in the diet of Barn Owls is also very low (0.03% of total prey, Herrera and Jaksić 1980). In Chilean Patagonia, Iriarte et al. (1990) did not record predation on hares by Barn Owls although they were eaten by Great Horned Owls (*Bubo virginianus*) in variable proportions (Donázar et al. 1997, Trejo and Grigera 1998). Even juvenile hares may not be very suitable prey for Barn Owls since they are much smaller than Great Horned Owls (Everett et al. 1992). According to Jaksić (1986), this is a common situation in southern South America where some predators hunt mainly the more abundant native rodents, often ignoring abundant introduced lagomorphs. Jaksić (1986) attributed this fact to an "escape in size." Maximum weight of juvenile hares is about 300 g (Bonino and Montenegro 1997), which puts them beyond the size of prey more frequently consumed by Barn Owls. Rabbits, although smaller than hares, were probably not in our study area.

Mean weights and sizes of rodents were approximately the same during the four seasons, suggesting that in our study area the Barn Owl preyed more upon medium-sized (*A. longipilis*, *L. micropus*, and *O. longicaudatus*) than on the smaller-sized (*A. xanthorhinus* and *E. morgani*) rodents in the area. Mean weight of prey of the Barn Owl in Chilean Patagonia is smaller (29.9 g), due to a greater consumption of smaller species (Iriarte et al. 1990).

Food-niche breadth is intermediate, as has been shown in Chilean Patagonia (Iriarte et al. 1990). This indicated that the Barn Owls in our study behaved essentially as specialized rodent predators. Diets of sympatric Great

Horned Owls have been studied in two sites in northwestern Patagonia (Donázar et al. 1997, Trejo and Grigera 1998) and, in both cases, a lower food niche breadth (0.20) was found to be due to lower species evenness in the diet.

RESÚMEN.—En el presente trabajo se estudió la dieta de *Tyto alba tuidara* en el noroeste de la Patagonia argentina. Los roedores sigmodontinos fueron el componente principal de la dieta, tanto en número como en biomasa. Las liebres y los insectos fueron poco consumidos. Las especies de roedores más consumidas fueron *Abrothrix longipilis, Loxodontomys micropus* y *Oligoryzomys longicaudatus*. De los datos de la dieta y teniendo en cuenta los hábitats de las presas se infiere que la actividad de caza de *T. alba* en el área de estudio se desarrolló preferentemente en ambientes húmedos o mésicos con buena cobertura vegetal.
[Traducción de los autores]

LITERATURE CITED

BELLOCQ, M.I. 1990. Composición y variación temporal de la dieta de *Tyto alba* en ecosistemas agrarios pampeanos, Argentina. *Vida Silv. Neotrop.* 2:32–35.

——— AND F.O. KRAVETZ. 1994. Feeding strategy and predation of the Barn Owl (*Tyto alba*) and the Burrowing Owl (*Speotyto cunicularia*) on rodent species, sex, and size, in agrosystems of central Argentina. *Ecol. Aust.* 4: 29–34.

BONINO, N. AND A. MONTENEGRO. 1997. Reproduction of the European hare in Patagonia, Argentina. *Acta Theriol.* 42:47–54.

CANEVARI, M.P., P. CANEVARI, G.R. CARRIZO, G. HARRIS, J. RODRÍGUEZ MATA AND R.J. STRANECK. 1991. Nueva guía de las aves argentinas. Fundación Acindar, Buenos Aires, Argentina.

COLWELL, R.K. AND D.J. FUTUYMA. 1971. On the measurements of niche breadth and overlap. *Ecology* 52:567–576.

DE SANTIS, L.J.M. AND G.O. PAGNONI. 1989. Alimentación de *Tyto alba* (Aves: Tytonidae) en localidades costeras de la Provincia del Chubut (República Argentina). *Neotropica* 35:43–49.

———, I.M. PEÑA COZZARIN, AND M.F. GROSSMAN. 1993. Vertebrados depredados por *Tyto alba* (Aves, Tytonidae) en las proximidades del río Corintos (Provincia del Chubut, Argentina). *Neotropica* 39:53–54.

———, C.M. GARCÍA ESPONDA, AND G.J. MOREIRA. 1996. Vertebrados depredados por *Tyto alba* (Aves: Tytonidae) en el sudoeste de la provincia de Chubut (Argentina). *Neotropica* 42:123.

DONÁZAR, J.A., A. TRAVAINI, O. CEBALLOS, M. DELIBES, AND F. HIRALDO. 1997. Food habits of the Great Horned Owl in northwestern Argentine Patagonia: the role of introduced lagomorphs. *J. Raptor Res.* 31: 364–369.

EVERETT, M., I. PRESTT AND R. WAGSTAFFE. 1992. Barn and Bay Owls *Tyto, Pholidus*. Pages 36–50 *in* J.A. Burton [ED.], Owls of the world. Eurobook, Italy.

GARCÍA ESPONDA, C.M., L.J.M. DE SANTIS, J.I. NORIEGA, G.O. PAGNONI, G.J. MOREIRA, AND N.M. BERTELLOTTI 1998. The diet of *Tyto alba* (Strigiformes: Tytonidae) in the lower Chubut valley (Argentina). *Neotropica* 44: 57–63.

HERRERA, C.M. AND F.M. JAKSIĆ. 1980. Feeding ecology of the Barn Owl in central Chile and southern Spain. A comparative study. *Auk* 97:760–767.

IRIARTE, J.A., W.L. FRANKLIN, AND W.E. JOHNSON. 1990. Diets of sympatric raptors in southern Chile. *J. Raptor Res.* 24:41–46.

JAKSIĆ, F.M. 1986. Predation upon small mammals in shrublands and grasslands of southern South America: ecological correlates and presumable consequences. *Rev. Chil. Hist. Nat.* 59:209–221.

———, R. PERSICO, AND J. TORRES. 1977. Sobre la partición de recursos por las Strigiformes de Chile central. *An. Mus. Hist. Nat. Valparaíso* 10:185–194.

KREBS, C.J. 1989. Ecological methodology. Harper and Row, New York, NY U.S.A.

LEVINS, R. 1968. Evolution in changing environments: some theoretical explorations. Princeton Univ. Press, Princeton, NJ U.S.A.

MARTI, C.D. 1987. Raptor food habit studies. Pages 67–80 *in* B.A. Giron Pendleton, B.A. Millsap, K.W. Cline, and D.M. Bird [EDS.], Raptor management techniques manual. Sci. Tech. Ser. 10. Natl. Wildl. Fed., Washington, DC U.S.A.

MONJEAU, J.A. 1989. Ecología y descripción geográfica de los pequeños mamíferos del Parque Nacional Nahuel Huapi y áreas adyacentes. Ph.D. dissertation, Univ. Nac. de La Plata, La Plata, Argentina.

NORIEGA, J.I., R.M. ARAMBURÚ, E.R. JUSTO, AND L.J.M. DE SANTIS. 1993. Birds present in pellets of *Tyto alba* (Strigiformes, Tytonidae) from Casa de Piedra, Argentina. *J. Raptor Res.* 27:37–38.

NOVARO, A., A. CAPURRO, A. TRAVAINI, M. FUNES, AND J. RABINOVICH. 1992. Pellet-count sampling based on spatial distribution: a case study of the European hare in Patagonia. *Ecol. Aust.* 2:11–18.

PEARSON, O.P. 1983. Characteristics of a mammalian fauna from forests in Patagonia, southern Argentina. *J Mammal.* 64:476–492.

———. 1995. Annotated keys for identifying small mammals living or near Nahuel Huapi National Park or Lanín National Park, Southern Argentina. *Mastozool. Neotrop.* 2:99–148.

REDFORD, K.H. AND J.F. EISENBERG. 1992. Mammals of the Neotropics, the southern cone. Vol. 2. Univ. Chicago Press, Chicago, IL U.S.A.

TAYLOR, I. 1994. Barn Owls. Predator-prey relationships

and conservation. Cambridge Univ. Press, Cambridge, U.K.

TIRANTI, S.I. 1996. Small mammals from Chos Malal, Neuquén, Argentina, based upon owl predation and trapping. *Tex. J. Sci.* 48:303–310.

TRAVAINI, A., J.A. DONÁZAR, O. CEBALLOS, A. RODRÍGUEZ, F. HIRALDO, AND M. DELIBES. 1997. Food habits of common Barn Owls along an elevational gradient in Andean Argentine Patagonia. *J. Raptor Res.* 31:59–64.

TREJO, A. AND D. GRIGERA. 1998. Food habits of the Great Horned Owl (*Bubo virginianus*) in a Patagonian steppe in Argentina. *J. Raptor Res.* 32:306–311.

Received 10 February 2000; accepted 21 July 2000