Food Habits of the Magellanic Horned Owl (*Bubo virginianus magellanicus*) at Southernmost Patagonia, Argentina

Author(s): Anahí E. Formoso , Teta Pablo , and Cheli Germán
Source: Journal of Raptor Research, 46(4):401-406. 2012.
Published By: The Raptor Research Foundation
DOI: http://dx.doi.org/10.3356/JRR-12-22.1
URL: http://www.bioone.org/doi/full/10.3356/JRR-12-22.1

J. Raptor Res. 46(4):401–406

Food Habits of the Magellanic Horned Owl (*Bubo virginianus magellanicus*) at Southernmost Patagonia, Argentina

Anahí E. Formoso,[1] Teta Pablo, and Cheli Germán
Unidad de Investigación Diversidad, Sistemática y Evolución, Centro Nacional Patagónico (CONICET), Almirante Brown 2915, 9120 Puerto Madryn, Chubut, Argentina

Key Words: *Magellanic Horned Owl*; *Great Horned Owl*; Bubo virginianus magellanicus; *Argentina*; *diet*; *food-niche breadth*; *prey*; *small mammals*.

The Magellanic Horned Owl (*Bubo virginianus magellanicus*) is the largest representative of the family Strigidae in southern South America and its distribution ranges from central Peru and western Bolivia southward through Chile and western Argentina as far as Tierra del Fuego Island (del Hoyo et al. 1999). This owl is currently classified as a subspecies of the Great Horned Owl (*B. virginianus*) although it is recognized by some authors as a full species because of its smaller size and differentiation in vocalizations, morphology, and DNA (del Hoyo et al. 1999). Its diet is composed mostly of small mammals, but birds and insects are also consumed (del Hoyo et al. 1999). Several diet studies have been conducted along its distributional range (e.g., Jaksic and Marti 1984, Ortiz et al. 2010); however, in Argentinean Patagonia, most studies were performed north of 48°S (Donázar et al. 1997, Teta et al. 2001, Trejo et al. 2005, Nabte et al. 2006). Most such studies indicated that Magellanic Horned Owls are generalist predators feeding primarily on rodents, lagomorphs, and arthropods, in varying proportions according to habitat, season, and prey availability.

Our goals in this study were (1) to characterize the diet of the Magellanic Horned Owl in austral Patagonia, and (2) to compare our findings with those previously reported for other regions.

Methods

Our study was conducted in austral Argentinean Patagonia, Santa Cruz province, between 46°S and 52°S. The climate is cold temperate (8°C mean annual temperature), with a decreasing precipitation gradient from west to east (mean annual rainfall varies from 2000 to 200 mm) and strong winds from the west (Paruelo et al. 1998). Most of this area is included in the Patagonic Phytogeographic province, which is dominated by *Nassauvia glomerulosa, Junellia tridens,* and *Stipa* spp. (León et al. 1998), but a narrow western fringe along the Andean Cordillera is subantarctic forest of *Nothofagus* spp. (Cabrera 1976).

We collected seven samples along austral Patagonia. Localities 5 and 8 were breeding sites; the remaining localities (2, 3, 6, and 7) were roosting locations with prey remains. At locality 1, we collected two samples, one during breeding season and the other during winter (a roosting site). In addition, we included two previously published diet analyses for this area which corresponded to roosts (locality 9, Massoia et al. 1994; locality 4, Nabte et al. 2006; Fig. 1). All samples were collected between the years 1985 and 2010 and were dissected following standard techniques (Marti 1987).

We visited the collecting locations only once, except that locality 1 was visited two times. Prey remains were identified based on published keys (Brues and Melander 1932, Borror et al. 1976, Brewer and Arguello 1980, Pearson 1995) and in comparison to voucher specimens housed at the reference collections: Colección de Egagrópilas y Afines ''Elio Massoia'' and Colección de Entomología, both of Centro Nacional Patagónico (Puerto Madryn, Chubut, Argentina). Small mammals were classified to the species level, birds and reptiles to the class level, and arthropods to family level following the procedure of Marti (1987). Two Old World lagomorph species, the European hare (*Lepus europaeus*) and the rabbit (*Oryctolagus cuniculus*), have been introduced in Patagonia. Differentiating between the two species based on fragmentary remains of young individuals, such as those found in the samples, was virtually impossible (Donázar et al. 1997). The prey specimens were deposited in the previously mentioned collections with the following accession numbers: CNP-E 586, 511, 365, 102, 446, 480, 441, and 427.

We obtained the minimal number of individuals (MNI) by counting homologous mandibles or skull remains (for the vertebrates; Grayson 1984) and elytra, head and/or telsons (for arthropods). We expressed diet composition as the relative frequency (number of individuals of each prey item divided by the total number of prey by locality, %F). Average prey mass estimates were derived from published reports (Donázar et al. 1997, Nabte et al. 2006) and our own data records. To characterize the diet we calculated the food-niche breadth (FNB) using Levins' (1968)

[1] Email address: formoso@cenpat.edu.ar

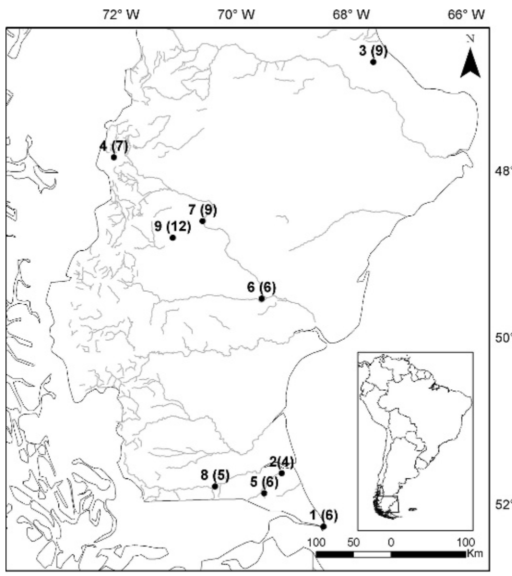

Figure 1. Study areas in Santa Cruz Province, southern South America. Small mammal species richness is noted between brackets, next to locality number. (1) 4 km W of Faro Cabo Vírgenes, (2) 6.7 km S of Río Gallegos, (3) Cañadón Minerales, (4) Cerro Gorra de Vasco, (5) Cerro Tres Hermanos, (6) Estancia Julia, (7) Estancia La Angostura, (8) Estancia La Carlota, (9) Lago Cardiel.

equation and following the procedure described by Marti (1988):

$$\mathrm{FNB} = 1/\hat{\imath}P_{ij}^2$$

where P_i is the proportion of the i^{th} prey category of species *j*. Because of the different numbers of available prey types in the different sites, we also calculated the standardized food-niche breadth (FNBs) as follows:

$$\mathrm{FNBs} = (\mathrm{FNB} - 1)/(\mathrm{n} - 1)$$

where n is the number of prey categories (Levins 1968). Mean weight of captured prey (MWP) was calculated as: $\sum (w_i N_i) / N_t$, where w_i is the mean weight of the prey item *i*, N_i is number of individuals of each prey item, and N_t is the total number of prey by locality (Jaksic and Marti 1981). We also evaluated the degree of correlation using the Spearman correlation between latitude, longitude, and altitude vs. niche breadth and mean weight of captured prey by means of separate linear regressions.

RESULTS

We identified 1637 prey items, of which 853 (52.1%) were small mammals, 760 (46.4%) arthropods, 23 (1.4%) birds, and 1 (0.1%) reptiles. The numbers of prey species or species groups per locality were 12 (locality 9), 11 (localities 1, 5, and 8), 10 (locality 7), 9 (locality 3), 7 (localities 4 and 6), and 5 (locality 2). Among the small mammals, the most common species were the native sigmodontine rodents *Abrothrix olivaceus* (31%), *Eligmodontia morgani* (22.3%), and *Reithrodon auritus* (13.8%). The introduced species made up 0.6% (*Mus musculus*, detected only in locality 2 [Fig. 1]) to 8.3% (lagomorphs). Small mammal species richness ranged from 4 to 12, with lower values south of 49°S (localities 1, 2, 5, 6, and 8; Fig. 1) and higher values in the west-central part of the study area (locality 9; Fig. 1). Trophic-niche breadth varied between 1.94 (FNBs = 0.04; locality 4) and 5.73 (FNBs = 0.22; locality 7). The MWP captured by Magellanic Horned Owl ranged from 13.5 (locality 5) to 133.3 g (locality 7). In terms of biomass, the prey that contributed the most to the diet were, in decreasing order, lagomorphs, *Reithrodon auritus*, *Euneomys chinchilloides*, *Eligmodontia morgani*, *Abrothrix olivaceus*, *Microcavia australis*, and *Ctenomys* spp. No trends were observed between FNB, FNBs, or MWP and latitude, longitude, or altitude.

DISCUSSION

The Magellanic Horned Owl is considered a small-mammal predator, which feeds mainly on native rodents and, to a lesser degree on small marsupials, arthropods, birds, and reptiles (del Hoyo et al. 1999). Donázar et al. (1997) found high consumption of introduced hares and rabbits in the diet of this owl in northwestern Patagonia, a result not repeated in subsequent studies in the same general area (e.g., Trejo and Grigera 1998, Teta et al. 2001), even in areas with relatively high lagomorph densities (see Monserrat et al. 2005). Lagomorph consumption was consistently high in other parts of the distributional range of this owl (central Chile: Jaksic and Yañez 1980, Jaksic 1986). In our study, lagomorph frequencies varied from 1.3 to 11.5%; however, despite these relatively low frequencies, hares and rabbits represented most of the biomass consumed by the owls and were present in most localities (Table 1). Similar results were reported by Iriarte et al. (1990) for southern Chile and Nabte et al. (2006) at some localities in Argentinean Patagonia. Overall, these varied reports suggest that lagomorph consumption by Magellanic Horned Owls is a complex issue, more so than previously envisioned, where several factors are likely involved (e.g., seasonal or interannual variation in prey abundance, behavioral [''novel prey rejection''; Jaksic and Soriguer 1981] and morphological constrains [''escape by size''; Jaksic 1986]).

Consumption of great numbers of arthropods can be considered occasional, although not exceptional, in the feeding habits of *Bubo virginianus magellanicus* (Nabte et al. 2006), as only three of the nine study areas contained arthropods remains. As has been suggested by other authors, a high consumption of invertebrates may be associated with the nestling stage or the first attempts at hunting by newly independent young (Marti 1974). In fact, the three samples with arthropod remains (localities 1, 5, and 8) were collected during breeding season (first summer), and a second collection made in late winter in locality 1 lacked invertebrate remains. Similar results were reported by Nabte et al. (2006), who found high arthropod consumptions in the northern semiarid steppes of Patagonia during the breeding season. Alternatively, the lower availability of arthropods during autumn–winter may reduce consumption during those months. Our sample sizes were insufficient to test for seasonal variation in diet.

The standardized food-niche breadth values (Table 1) were similar to those found in other areas of this owl's distributional range (e.g., 0.2 to 0.67 in steppe and ecotonal areas of Argentinean and Chilean Patagonia [Jaksic et al. 1986, Iriarte et al. 1990, Donázar et al. 1997, Trejo and Grigera 1998, Nabte et al. 2006]; 0.66–0.83 in the Mediterranean-type habitats of central Chile [Jaksic et al. 1986]; 0.4–0.5 in shrubby steppes of the Monte Desert [Nabte et al. 2006]; 0.07–0.33 in high altitude grasslands and steppes of the Andes of northwestern Argentina [Ortiz et al. 2010]).

Mean weight of the consumed prey (Table 1) was mostly similar to others previously reported in the literature (e.g., 36.5–80.3 g in steppe and ecotonal areas of Argentinean and Chilean Patagonia [Jaksic et al. 1986, Iriarte et al. 1990, Donázar et al. 1997, Trejo and Grigera 1998, Nabte et al. 2006]; 43.2–86.6 g in shrubby steppes of the Monte Desert [Nabte et al. 2006]; 40.9–49.1 g in high altitude grasslands and steppes of the Andes of northwestern Argentina [Ortiz et al. 2010]), although lower than those reported for Mediterranean-type habitats in central Chile [up to 189.1 g; Jaksic et al. 1986]. For two of our study areas (locations 1 in breeding season and 5), MWP values (30.6 g and 13.5 g, respectively) were among the lowest ever calculated for this species, a result of the high percentage of arthropods in the diet at these sites.

The absence of correlation between diet parameters and latitude, longitude, or altitude disagreed with suggestions previously made by other authors (Jaksic et al. 1986, Teta et al. 2001, Nabte et al. 2006). However, it was not unexpected, considering the large area in our study, the trophic opportunism of this species, and the data limitations in our study (only nine locations). Differences in prey communities (and thus prey availability), particularly for rodents, were also evident between the northern and southern area covered by our study (e.g., Pardiñas et al. 2011). In addition, most studies in which food-niche breadth or mean weight of prey and latitude or longitude were correlated included few samples (e.g., Jaksic et al. 1986) or covered a small geographic area within the range of *Bubo virginianus magellanicus* (e.g., Teta et al. 2001). A comprehensive analysis, considering a large database and without geographical limitations, is needed to test this hypothesis and to explore other topics, such as the contribution of introduced lagomorphs to the diet of this owl.

HÁBITOS DE ALIMENTACIÓN DE *BUBO VIRGINIANUS MAGELLANICUS* EN EL EXTREMO SUR DE LA PATAGONIA, ARGENTINA

RESUMEN.—*Bubo virginianus magellanicus*, actualmente clasificado como una subespecie de *B. virginianus*, a pesar de que algunos autores lo reconocen como especie, es el representante de mayor tamaño de la familia Strigidae en el sur de América del Sur. Distintos estudios se han realizado sobre su dieta a lo largo de su rango de distribución, aunque la mayoría se realizó al norte de los 48°S. En este trabajo caracterizamos la dieta de *B. virginianus magellanicus* en nueve áreas de estudio localizadas en la Patagonia austral (entre los 46°S y los 52°S, Argentina), y la comparamos con trabajos de otras regiones realizados previamente. Nuestros resultados mostraron que la dieta está compuesta principalmente por pequeños mamíferos (52.1% por frecuencia) y artrópodos (46.4%). Las especies de pequeños mamíferos más consumidas fueron los roedores *Abrothrix olivaceus*, *Eligmodontia morgani,* y *Reithrodon auritus.* Con respecto a la biomasa, las presas que más contribuyeron fueron: lagomorfos, *R. auritus*, *Euneomys chinchilloides* y *Eligmodontia morgani.* A pesar de su baja frecuencia, los lagomorfos representaron las presas más importantes en cuanto a la biomasa consumida y estuvieron presentes en la mayoría de las muestras. Aunque los artrópodos fueron frecuentes en la dieta, su consumo puede considerarse un fenómeno local, ya que sólo tres de las nueve áreas estudiadas presentaron restos de artrópodos y contribuyeron muy poco a la biomasa total de presas. Los valores de nicho trófico estandarizado y de peso promedio de las presas fueron similares a los hallados en otras áreas de la Patagonia argentina.

[Traducción del equipo editorial]

ACKNOWLEDGMENTS

We greatly appreciate the field assistance given to us by E. Cuellar, U. Pardiñas, D. Podestá, J. Sanchez, D. Udrizar Sauthier, and the owners of Estancia La Angostura. S. Imberti and D. Voglino facilitated some samples. H. Pastore helped us with collection permits. Two anonymous reviewers provided helpful comments on earlier version of the manuscript. U. Pardiñas encouraged us to make this contribution and discuss several aspects of this paper. Danielle Castle kindly revised the English document. This work was partially funded by Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) and Agencia Nacional de Promoción Científica y Técnica (ANPCyT, PICT 2008-0547 awarded to U. Pardiñas).

LITERATURE CITED

BORROR, D.J., D.M. DE LONG, AND C.A. TRIPLEHORN. 1976. An introduction to the study of insects, Fourth Ed. Holt, Rinehart, and Winston, New York, NY U.S.A.

BREWER, M.M. AND N.V. ARGUELLO. 1980. Guía ilustrada de insectos comunes de Argentina. Ministerio de Agricultura y Educación, Fundación Miguel Lillo, Tucumán, Argentina.

BRUES, C.T. AND A.L. MELANDER. 1932. Classification of insects: a key to the known families of insects and other terrestrial arthropods. *Bulletin of the Museum of Comparative Zoology* 73:1–672.

Table 1. Diet composition of *Bubo virginianus magellanicus* in nine localities of Santa Cruz, southern Argentina. %F = percentage by frequency, %B = percentage by biomass; FNB = food-niche breadth; FNBs = standardized food-niche breadth; MWP = mean weight of captured prey.

PREY/LOCALITIES	4 km W of Faro Cabo Vírgenes		6.7 km S of Río Gallegos		Cañadón Minerales		Cerro Gorra de Vasco[1]		Cerro Tres Hermanos		Estancia Julia		Estancia La Angostura		Estancia La Carlota		Lago Cardiel[2]	
	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B
Mammalia	56.8	95.9	97.3	93.8	100	99.7	100	100	7.3	84	96.7	97.3	99.3	99.6	18.6	91.5	100	94
Rodentia	53.7	47.3	94.1	51.9	98.3	88.5	98.3	82.4	6	38.9	85.2	34	90.6	68.5	10.9	16.9	98.8	93.7
Cricetidae	53.1	41.9	86	51.9	92.4	70.9	98.3	82.4	5.4	31.1	81.9	27.8	63.6	23.7	10.7	16.1	94.9	79.8
Long-haired mouse (*Abrothrix longipilis*)	—	—	—	—	—	—	5.2	4.2	—	—	—	—	—	—	—	—	23.4	16.7
Olive-colored mouse (*Abrothrix olivaceus*)	39.9	26.1	21	11.5	5.1	1.42	62.6	26.7	0.6	0.9	9.8	2.3	5.6	0.8	1.7	0.7	15.6	5.8
Patagonian field mouse (*Akodon iniscatus*)	—	—	—	—	0.8	0.3	—	—	—	—	—	—	—	—	—	—	—	—
Drylands laucha (*Calomys musculinus*)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.6	0.9
Western Patagonian laucha (*Eligmodontia morgani*)	9.7	6.6	65	37.1	29.7	8.7	—	—	—	—	59	14.4	24.6	3.9	—	—	18.2	7.1
Chinchilla rat (*Euneomys chinchilloides*)	0.9	2.4	—	—	—	—	22.6	41	4.2	26.2	—	—	2.4	1.5	8	13.8	6.5	10.3
Common pericote (*Graomys griseoflavus*)	—	—	—	—	9.3	7	—	—	—	—	—	—	—	—	—	—	—	—
Southern pericote (*Loxodontomys micropus*)	—	—	—	—	—	—	0.9	1.3	—	—	—	—	—	—	—	—	7.8	10.6
Patagonian colilargo (*Oligoryzomys longicaudatus*)	—	—	—	—	—	—	—	—	—	—	—	—	3.2	0.7	—	—	1.3	0.8
Yellow-rumped pericote (*Phyllotis xanthopygus*)	—	—	—	—	1.7	1.4	6.1	7.5	—	—	4.9	3.3	2.4	1	—	—	5.2	5.6
Coney rat (*Reithrodon auritus*)	2.6	6.9	—	—	45.8	52	0.9	1.5	0.6	3.9	8.2	7.8	25.4	16	1	1.6	14.3	22
Muridae	—	—	8.1	3.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
House mouse, *Mus musculus* (exotic)	—	—	8.1	3.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 1. Continued.

Prey/localities	4 km W of Faro Cabo Vírgenes		6.7 km S of Río Gallegos		Cañadón Minerales		Cerro Gorra de Vasco[1]		Cerro Tres Hermanos		Estancia Julia		Estancia La Angostura		Estancia La Carlota		Lago Cardiel[2]	
	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B	%F	%B
Caviidae	0.6	5.3	—	—	2.5	10.1	—	—	—	—	—	—	12.7	27.2	—	—	2.6	13.9
Southern mountain cavy (*Microcavia australis*)	0.6	5.3	—	—	2.5	10.1	—	—	—	—	—	—	12.7	27.2	—	—	2.6	13.9
Ctenomyidae	—	—	—	—	3.4	7.7	—	—	0.6	7.8	3.3	6.2	14.3	17.6	0.2	0.8	1.3	6
Tuco-tuco (*Ctenomys* spp.)	—	—	—	—	3.4	7.7	—	—	0.6	7.8	3.3	6.2	14.3	17.6	0.2	0.8	—	—
Magellanic Tuco-tuco (*Ctenomys magellanicus*)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	6
Chiroptera	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	0.3
Vespertilionidae	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	0.3
Big-eared brown bat (*Histiotus montanus*)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	0.3
Lagomorpha (exotic)	3.1	48.6	3.2	41.9	1.7	11.2	1.7	17.6	1.3	45.1	11.5	63.3	8.7	31.1	7.7	74.6	—	—
Reptilia	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.2	0.1	—	—
Aves	0.6	1.3	3.2	6.18	—	—	—	—	0.3	1.7	3.3	2.6	0.8	0.4	3.6	5.1	—	—
Arthropoda	42.7	2.8	—	—	—	—	—	—	92.4	14.3	—	—	—	—	77.5	3.2	—	—
Carabidae	8.5	0.6	—	—	—	—	—	—	55	8.2	—	—	—	—	29.7	1.2	—	—
Tenebrionidae	10.8	0.7	—	—	—	—	—	—	14.7	2.2	—	—	—	—	21	0.8	—	—
Curculionidae	6.6	0.4	—	—	—	—	—	—	7	1.0	—	—	—	—	18.4	0.7	—	—
Scarabaeidae	16.8	1.1	—	—	—	—	—	—	11.5	1.7	—	—	—	—	6.5	0.3	—	—
Bothriuridae	—	—	—	—	—	—	—	—	4.2	1.2	—	—	—	—	1.9	0.1	—	—
Total	351		62		118		115		313		61		126		414		77	
FNB	4.51		2.13		3.21		1.94		2.89		2.61		5.73		5.41		4.54	
FNBs	0.16		0.05		0.1		0.04		0.09		0.07		0.22		0.2		0.16	
MWP	30.6		36.5		71.9		46.9		13.5		86.1		133.3		49.2		53.5	

[1] Nabte et al. (2006).
[2] Massoia et al. (1994).

CABRERA, A.L. 1976. Regiones fitogeográficas Argentinas. *Enciclopedia Argentina de Agricultura y Jardinería* 1:1–85.

DEL HOYO, J., A. ELLIOTT, AND J. SARGATAL. 1999. Handbook of the birds of the world. Vol. 5: barn-owls to hummingbirds. Lynx Edicions, Barcelona, Spain.

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

GRAYSON, D.K. 1984. Quantitative zooarchaeology. Topics in the analysis of archaeological faunas. Studies in Archaeological Science, Academic Press, Inc., New York, NY U.S.A.

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

JAKSIC, F.M. 1986. Predation upon small mammals in shrublands and grasslands of southern South America: ecological correlates and presumable consequences. *Revista Chilena de Historia Natural* 59:209–221.

——— AND C.D. MARTI. 1981. Trophic ecology of *Athene* owls in Mediterranean-type ecosystems: a comparative analysis. *Canadian Journal of Ornithology* 59:2331–2340.

——— AND ———. 1984. Comparative food habits of *Bubo* owls in Mediterranean-type ecosystems. *Condor* 86: 288–296.

——— AND R. SORIGUER. 1981. Predation upon the European rabbit (*Oryctolagus cuniculus*) in the Mediterranean habitats of Chile and Spain: a comparative analysis. *Journal of Animal Ecology* 50:269–281.

——— AND J. YAÑEZ. 1980. Differential utilization of prey resources by Great Horned Owls and Barn Owls in central Chile. *Auk* 97:895–896.

———, ———, AND J.R. RAU. 1986. Prey and trophic ecology of Great Horned Owls in western South America: an indication of latitudinal trends. *Journal of Raptor Research* 20:113–116.

LEÓN, J.C., B. DONALDO, J.M. PARUELO, AND A. SORIANO. 1998. Grandes unidades de vegetación de la Patagonia extra andina. *Ecología Austral* 8:125–144.

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

MARTI, C.D. 1974. Feeding ecology of four sympatric owls. *Condor* 76:45–61.

———. 1987. Raptor food habits studies. Pages 57–80 *in* B.A. Millsap, K.W. Kline, and D.M. Bird [EDS.], Raptor management techniques manual. National Wildlife Federation, Washington, DC U.S.A.

———. 1988. A long term study of food-niche dynamics in the common Barn Owl: comparisons within and between populations. *Canadian Journal of Zoology* 66: 1803–1812.

MASSOIA, E., J.C. CHÉBEZ, AND S. HEINONEN FORTABAT. 1994. Depredación de pequeños mamíferos por *Bubo virginianus* en el Lago Cardiel, departamento Lago Buenos Aires, provincia de Santa Cruz. *Boletín Científico APRONA* 26:17–21.

MONSERRAT, A.L., M. FUNES, AND A. NOVARO. 2005. Respuesta dietaria de tres rapaces frente a una presa introducida en Patagonia. *Revista Chilena de Historia Natural* 78:425–439.

NABTE, M.J., S.L. SABA, AND U.F.J. PARDIÑAS. 2006. Dieta del Búho Magallánico (*Bubo magellanicus*) en el desierto del monte y la Patagonia Argentina. *Ornitología Neotropical* 17:27–38.

ORTIZ, P.E., R. GONZÁLEZ, P. JAYAT, U.F.J. PARDIÑAS, S. CIRIGNOLI, AND P. TETA. 2010. Dieta del Búho Magallánico (*Bubo magellanicus*) en los Andes del noroeste Argentino. *Ornitología Neotropical* 21:591–598.

PARDIÑAS, U.F.J., P. TETA, G. D'ELIA, AND E.P. LESSA. 2011. The evolutionary history of sigmodontine rodents in Patagonia and Tierra del Fuego. *Biological Journal of the Linnean Society* 103:495–513.

PARUELO, J.M., A. BELTRÁN, E. JOBBÁGY, O.E. SALA, AND R. GOLLUSCIO. 1998. The climate of Patagonia: general patterns and controls on biotic processes. *Ecología Austral* 8:85–101.

PEARSON, O.P. 1995. Annotated keys for identifying small mammals living in or near Nahuel Huapi National Park or Lanín National Park, southern Argentina. *Mastozoología Neotropical* 2:99–148.

TETA, P., C. PANTI, A. ANDRADE, AND A. PEREZ. 2001. Amplitud y composición de la dieta de *Bubo virginianus* (Aves: Strigiformes) en la Patagonia noroccidental Argentina. *Boletín de la Sociedad Biológica de Concepción, Chile* 72:131–138.

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

———, M. KUN, M. SAHORES, AND S. SEIJAS. 2005. Diet overlap and prey size of two owls in the forest-steppe ecotone of southern Argentina. *Ornitología Neotropical* 16:539–546.

Received 13 March 2012; accepted 2 July 2012
Associate Editor: Vincenzo Penteriani