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DIET OVERLAP AND PREY SIZE OF TWO OWLS IN THE FOREST-STEPPE ECOTONE OF SOUTHERN ARGENTINA

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Resumen. – Solapamiento dietario y tamaño de presa de dos Strigiformes en el borde del bosque templado austral en Argentina. – Analizamos las dietas de la Lechuza de campanario (*Tyto alba*) y del Tucúquere (*Bubo magellanicus*) en el ecotono entre los bosques occidentales templados de *Nothofagus* y la estepa árida oriental en el noroeste de la Patagonia argentina. Estudiamos el grado de similitud dietaria y comparamos el tamaño de presa consumida por las dos especies. El trabajo de campo se realizó durante dos estaciones reproductivas (2001-2003). Identificamos 1145 presas en 638 egagrópilas de lechuza, y 910 presas en 380 egagrópilas de Tucúquere. Ambos Strigiformes tuvieron dietas dominadas por roedores sigmodontinos con proporciones variables de otras presas (liebres, aves y artrópodos). El solapamiento trófico fue muy alto (0,903). El peso medio de las presas vertebradas fue 44,5 g para la lechuza, y 47,0 g para el Tucúquere. Al comparar con otros estudios realizados sobre estos dos Strigiformes, encontramos que el Tucúquere en nuestra área de estudio consumió menor cantidad de presas de gran tamaño (e.g., lagomorfos) que en otras regiones. Atribuimos esto a la gran diversidad y abundancia de roedores sigmodontinos de tamaño medio en el ecotono.

Abstract. – We analyzed the diets of Barn Owls (*Tyto alba*) and Magellanic Horned Owls (*Bubo magellanicus*) in the ecotone between the western temperate *Nothofagus* forests and the eastern arid Patagonian steppe in northwestern Argentine Patagonia. We studied the degree of dietary similarity and compared prey size consumed by the two owl species. Field studies were conducted during two breeding seasons (2001-2003). We identified 1145 prey from 638 Barn Owl pellets, and 910 prey from 380 Magellanic Horned Owls pellets. Both owls had diets dominated by sigmodontine rodents with variable proportions of other prey (hares, birds and arthropods). Trophic overlap was very high (0.903). Mean vertebrate prey weight was 44.5 g for Barn Owls, and 47.0 g for Magellanic Horned Owls. In our study area, Magellanic Horned Owls consumed fewer large-sized prey (e.g., lagomorphs) than in other regions, probably due to the high diversity and abundance of medium-sized sigmodontine rodents in the ecotone. *Accepted 15 September 2005.*

Key words: Diet overlap, prey size, *Tyto alba*, *Bubo magellanicus*, ecotone, northwestern Patagonia.

INTRODUCTION

Barn Owls (*Tyto alba*) and Horned Owls (*Bubo* spp.) are sympatric in different parts of their distribution, and represent a suitable model to study the partition of resources. They share similar habitats, are small mammals predators and both have nocturnal habits, although Horned Owls have also crepuscular activity (Bruce 1999, Marks *et al.* 1999). The feeding ecology of Barn Owls have been compared with different *Bubo* species throughout their range, e.g., Eagle Owl (*Bubo bubo*) in Europe (Zamorano *et al.* 1986), Great Horned Owl (*B. virginianus*) in North America (Knight & Jackman 1984), and Magellanic Horned Owl (*B. magellanicus*) in Chile (Jaksic & Yáñez 1980, Iriarte *et al.* 1990). These owl species show

important differences in weight among them, ranging from the approximately 300 g of the Barn Owl to the more than 3000 g of the Eagle Owl (Bruce 1999, Marks *et al.* 1999), and many empirical studies have frequently demonstrated some kind of segregation by prey size between Barn and Horned owls (e.g., the publications mentioned above).

Barn and Magellanic Horned Owls are sympatric in southern Argentina and Chile, where they are distributed along the Andes south to Tierra del Fuego (Bruce 1999, Marks *et al.* 1999). In northwestern Patagonia, they share the same foraging and nesting habitats, and both have diets dominated by small mammals, showing apparently a great dietary overlap. The diet of each of these owl species has been studied separately in Argentine Patagonia (Donázar *et al.* 1997, Travaini *et al.* 1997, Trejo & Grigera 1998, Pillado & Trejo 2000, Sahores & Trejo 2004, Trejo & Ojeda 2004), but there are no studies comparing diets in the same spatial and temporal context.

The aims of this study were to: (1) analyze the diet of these raptors in an ecotonal region of northwestern Patagonia; (2) examine the degree of dietary similarity; and (3) compare prey size consumed by the two owls in the context of other studies conducted in Chile and other Patagonian localities.

STUDY AREA

The Andean region of southern Argentina south of 39ºS shows a distinctive west to east precipitation gradient (> 3000 mm to 100 mm annual rainfall), which in turn determines a marked vegetation gradient. Cold-temperate forests dominated by southern beech (*Nothofagus* spp.) cover the western mountain slopes (1000-3000 mm rainfall), whereas a steady transition from open forests to grassland give way to scattered grass-shrub steppes to the east (Mazzarino *et al.* 1998). Between 40-42ºS, in the ecotone between forests and steppe (500-1000 mm rainfall), vegetation consists of a mosaic of grasslands (*Festuca pallescens*, *Stipa* spp.), dispersed low bushes (*Discaria articulata*, *Berberis buxifolia*, *Adesmia boronoides*, *Mulinum spinossum*), with scattered patches of ciprés de la cordillera (*Austrocedrus chilensis*). Radal (*Lomatia hirsuta*), maitén (*Maytenus boaria*), and laura (*Schinus patagonicus*) are accompanying tree species. Climate is cold-temperate (8ºC mean annual temperature), with highly seasonal precipitation concentrated in winter (Paruelo *et a*l. 1998) and strong westerly winds. This transitional zone has been historically affected by natural (mostly fires) and human-related (intentional fires and grazing) disturbances, which in combination determine the current physiognomy of the area (Schlichter & Laclau 1998).

METHODS

Field studies were conducted from September to March during two breeding seasons (2001-2002 and 2002-2003) in an area of approximately 2800 km^2 (40º45'-41º18'S, 70º48'-71º13'W), located in the forest-steppe ecotone in Río Negro Province, northwestern Patagonia. Diet of both species was studied by analyzing pellets collected under known perches or nests in eight localities separated by a distance of at least 5 km so that they belonged to different pairs. We located 6 pairs of Barn Owls and four of Magellanic Horned Owls. In two localities, we found overlapping territories of each of the two owl species (see Appendix 1).

All pellets were dissected using standard techniques (Marti 1987). Small mammals bone remains were identified by the use of specific keys (Pearson 1995). Other remains (bird feathers and bones, arthropod exoskeletons) were identified by comparison with reference collections. Prey were determined to species or morphospecies (in the case of arthropods). Prey weight estimates (adult individuals,

except in the case of European hares) were derived from data in the literature (Fiora 1933, Contreras 1975, Pearson 1983; Salvador 1988, 1990), and from our own records. A weight of 2 g was arbitrarily assigned to each arthropod species. Our results are expressed as a percentage of total prey and as a percentage of total biomass. Food-niche breadth (FNB) were calculated using Levins´(1968) equation: FNB = $1 / \hat{\imath} P_{ij}^{2}$, where P_i is the proportion of the i^{th} prey category of species *j*. For comparison among raptors with different number of prey categories, a standardized niche breadth value (FNBs) was also calculated as follows: FNBs = (FNB – 1) / (n – 1), where is the number of prey categories (Levins 1968). We used Pianka´s index (Pianka 1973) to compare dietary overlap, $O = \hat{\imath} p_i q_i / (\hat{\imath} p_i^2 \hat{\imath} q_i^2)^{1/2}$, where p_i is the frequency of a prey type in the diet of one species, and q_i is the frequency of the same prey type in the diet of the other species. This index yields values from 0 (no overlap) to 1 (complete overlap). Geometric mean weight of prey in the diet was calculated by summing the products of the numbers of individual prey items with their natural log weight and dividing by the total number of prey items used in the calculation. As a potential source of variation in our data included differences among territories, we divided prey into the following categories: rodents, hares, birds, and arthropods. Then we compared localities by means of χ^2 goodness-of-fit tests (Zar 1996).

RESULTS

We identified 1145 prey items from 638 Barn Owl pellets and 910 prey items from 380 Magellanic Horned Owl pellets. Diets of Barn Owls included 22 genera (12 mammal, 6 bird, and 4 arthropod genera), and diets of Magellanic Horned Owls included 30 genera (11 mammal, 4 bird, and 15 arthropod genera) (Table 1).

The sample of prey from Barn Owls was dominated by rodents, which comprised 96.6% of prey numbers, and 96.2% of biomass. Four rodent species (*Loxodontomys micropus, Abrothrix longipilis*, *Reithrodon auritus*, and *Oligoryzomys. longicaudatus*) accounted for 53.6% of prey numbers. In terms of total biomass, the most important prey in diets of Barn Owls was *Ctenomys haigi*. Barn Owls consumed only Passeriformes except for one Eared Dove (*Zenaida auriculata*). All arthropods consumed by Barn Owls were coleopterans.

In contrast, Magellanic Horned Owl diets included only 69.9% rodents in numbers (74.1% by biomass), with the balance made up of birds, and arthropods. For Magellanic Horned Owls, the most consumed rodent species (45.9 % of total prey) were *Abrothrix longipilis, Loxodontomys micropus*, *Reithrodon. auritus*, and *Eligmodontia morgani*. In term of biomass, the most consumed prey were European hares (*Lepus europaeus*). Magellanic Horned Owls consumed, in addition to Passeriformes, wild geese (*Chloephaga* sp.), Southern Lapwing (*Vanellus chilensis*) and California Quail (*Callipepla californica*). Scorpions and spiders made up 13.5% of all arthropods eaten, the rest were coleopterans.

FNB and FNBs were respectively, 10.1 and 0.34 for Barn Owls, and 12.8 and 0.29 for Magellanic Horned Owls. Pianka´s index was 0.903, indicating a substantial trophic overlap between the two owls.

There were no significant differences in the diet of Barn Owls among localities (χ^2 = 10.6, df = 15, $P > 0.05$). There were significant differences in the diet among localities (χ^2 = 382.6, df = 9, $P < 0.05$) for Magellanic Horned Owls, showing a greater intraspecific variation within this species.

The geometric mean weight of prey captured by Barn Owls and Magellanic Horned Owls was 41.9 g and 21.5 g (the latter low value was due to the high consumption of

TABLE 1. Prey composition of diets of Barn and Magellanic Horned owls in northwestern Patagonia. Prey frequencies are expressed as percentage of total prey numbers (%TP) and as percentage of total biomass (%B). Weights of prey are taken from the literature and from our own records.

Prey	Weight (g)	Barn Owl			Magellanic Horned Owl		
		N	%TP	%B	N	%TP	%B
TOTAL MAMMALS		1112	97.1	99.1	663	72.9	93.3
Lepus europaeus	300.0	6	0.5	2.9	27	3.0	19.2
Abrothrix longipilis	24.6	159	13.9	6.3	127	14.0	7.4
Abrothrix xanthorhinus	20.0	103	9.0	3.3	31	3.4	1.5
Chelemys macronyx	66.8	36	3.1	3.9	17	1.9	2.7
Geoxus valdivianus	26.0	8	0.7	0.3	2	0.2	0.1
Oligoryzomys longicaudatus	33.0	117	10.2	6.2	55	6.0	4.3
Eligmodontia morgani	17.5	93	8.1	2.6	75	8.2	3.1
Euneomys sp.	85.0	28	2.5	3.8	3	0.3	0.6
Irenomys tarsalis	41.3	22	1.9	0.2	-	-	-
Loxodontomys micropus	57.6	190	16.6	17.7	119	13.1	16.2
Phyllotis xanthopygus	58.0	46	4.0	4.3	14	1.5	1.9
Reithrodon auritus	80.0	148	12.9	19.1	97	10.7	18.4
Ctenomys haigi	146.2	90	7.9	21.3	25	2.7	8.7
Unidentified rodents	54.7	66	5.8	5.8	71	7.8	9.2
TOTAL BIRDS		11	1.0	0.8	21	2.3	6.6
Chloephaga sp.	500.0	-	-		1	0.1	1.2
Callipepla californica	205.0	-	-		2	0.2	1.0
Vanellus chilensis	298.0	-	-		6	0.7	4.2
Zenaida auriculata	145.9	1	0.1	< 0.1	-	-	-
Upucerthia dumetaria	45.0	1	0.1	0.1	-	-	-
Elaenia albiceps	15.5	1	0.1	< 0.1	-	-	-
Phytotoma rara	45.9	-	-		1	0.1	0.1
Turdus falcklandii	82.5	1	0.1	0.1	-	-	-
Phrygilus sp.	22.6	1	0.1	0.4	-	-	-
Diuca diuca	27.2	5	0.4	0.2	-	-	-
Unidentified passeriforms	55.1	1	0.1	0.1	1	0.1	0.1
Unidentified birds	139.5	-	-		10	1.1	3.3
TOTAL ARTHROPODS		22	1.9	0.1	226	24.8	1.1
Nemesiidae	2.0	-	-	-	15	1.7	0.1
Gnaphosidae	2.0	-	-	-	1	0.1	< 0.1
Unidentified spiders	2.0	-	-	-	4	0.4	< 0.1
Bothriurus sp.	2.0	-	-	-	7	0.8	< 0.1
Nyctelia rotundipennis	2.0	-	-	-	2	0.2	< 0.1
Plathestes sp.	2.0	-	-	-	4	0.4	< 0.1
Emmalodera sp.	2.0	-	-	-	6	0.7	< 0.1
Scotobius allaticollis	2.0	-	-	-	2	0.2	< 0.1
Unidentified tenebrionids	2.0	-	-	-	1	0.1	< 0.1
Cylydrorhinus birabeni	2.0	-	-	-	8	0.9	< 0.1
Cylydrorhinus spp.	2.0	-	-	-	17	1.9	0.1
Unidentified curculionids	2.0	-	-	-	12	1.3	0.1
Cnemalobus sp.	2.0	-	-	-	8	0.9	< 0.1

TABLE 1. Continued.

Prey	Weight (g)	Barn Owl			Magellanic Horned Owl		
		N	%TP	%B	N	%TP	%B
Barypus sp.	2.0	-	-	-	13	1.4	0.1
Unidentified carabids	2.0	-	-	-	3	0.3	< 0.1
Aulacopalpus sp.	2.0	9	0.8	< 0.1	67	7.4	0.3
Bolborhinum sp.	2.0	6	0.5	< 0.1	42	4.6	0.2
Allidiostoma sp.	2.0	-	-	-	3	0.3	< 0.1
Megatopa sp.	2.0	1	0.1	< 0.1	1	0.1	< 0.1
Unidentified scarabeids	2.0	1	0.1	< 0.1	4	0.4	< 0.1
Polynoncus sp.	2.0	-	-	-	1	0.1	< 0.1
Unidentified elaterids	2.0	-	-	-	1	0.1	< 0.1
Unidentified coleopterans	2.0	2	0.2	< 0.1	4	0.4	< 0.1
Unidentified lepidopterans	2.0	1	0.1	< 0.1	-	-	-
Unidentified insects	2.0	2	0.2	< 0.1	-	-	-
NO. PREY ITEMS	1145				910		
NO. PELLETS	638				380		

arthropods), respectively. Considering only vertebrate prey (which allows comparisons with other studies), mean weight was 44.5 g for Barn Owls, and 47.0 g for Magellanic Horned Owls. Both species captured prey in a broad range of size categories (15.5–300.0 g for Barn Owls and 17.5–500.0 g for Magellanic Horned Owls).

DISCUSSION

Barn and Magellanic Horned owls showed a high degree of dietary overlap in the ecotone of northwestern Patagonia, although some differences were noted. Both species are top sigmodontine rodent predators, although Magellanic Horned Owls present a greater intraspecific variation and a higher dietary diversity. Moreover, in this specific habitat, they preyed on the same array of species of similar size, even though the mean prey size of Magellanic Horned Owl was slightly larger. Mean prey size (considering only vertebrate prey) consumed by both Barn and Magellanic Horned owls correspond to a medium-sized sigmodontine rodent (45 g). This is coincident with mean prey size of Barn Owls in the temperate Neotropics (estimated as 45.1 g by Marti *et al.* 1993). However, differences in mean prey weight found in this study was negligible when compared with differences found in other studies (considering only vertebrate prey), e.g., 29.9 g and 80.3 g for Barn and Magellanic Horned owls, respectively, in southern Chile (Iriarte *et al.* 1990), or 95.0 g and 123.1 g, respectively, in central Chile (Jaksic & Yáñez 1980). Even in a more arid area in northwestern Patagonia, mean vertebrate prey weight was 36.5 g for Barn Owls (Travaini *et al.* 1997) and 103.4 g for Magellanic Horned Owls (Donázar *et al.* 1997). Considering all this, the values found in this study are certainly due to an unusually low mean prey size for Magellanic Horned Owls, with low consumption of larger available prey. However in other localities, Magellanic Horned Owls consume larger quantities of larger prey (e.g., lagomorphs, *Rattus rattus*, *Abrocoma bennetti*, see references listed above). Despite the apparent abundance of *L. europaeus* in the area (7 individuals/ha, Novaro *et al.* 1992), the proportion of juvenile lagomorphs in Magellanic

Horned Owls' diet is much lower than in the other studied areas, being 15.8% in central Chile (Jaksic & Yáñez 1980), 17.3% in southern Chile (Iriarte *et al.* 1990), and 15.3 % in arid northwestern Patagonia (Donázar *et al.* 1997). Jaksic *et al.* (1981) concluded that Barn and Magellanic Horned owls exhibited low food-niche overlap in central Chile because of the larger size of the Magellanic Horned Owl, which allows this owl to prey on the heavier small mammal available (particularly on lagomorphs), and perhaps also because of different hunting habitats and activity times. A possible explanation to the low consumption of lagomorphs in our study area may be interpreted as opportunistic convergence on abundant resources. Such a high trophic overlap (> 90%) could suggest potential competition for food when in situation of reduced availability of trophic resources. Jaksic & Marti (1984) proposed that a predator can consume small-sized prey (rodents or arthropods) when these are very abundant or vulnerable. Unfortunately we don't have quantitative data on small mammal abundance in the sites where the diet was studied. The only estimations available are those of Pearson (1995) and Pearson & Pearson (1982) who sampled various localities in the forest-steppe ecotone in northern Patagonia and found a small mammal fauna rich in diversity and abundance in medium- to small-sized sigmodontine rodents. Those authors attributed this to the heterogeneous habitats and to the overlap in this transitional zone of two distinct biotas, that is the flat and dry Patagonian steppe and the wet *Nothofagus* forests (Johnson *et al.* 1990). Magellanic Horned Owls being more generalist predators seem to take advantage in this ecotone of abundant medium-sized rodents.

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REFERENCES

Bruce, M. D. 1999. Family Tytonidae (Barn Owls). Pp. 34-75 *in* del Hoyo, J., A. Elliott, & J. Sargatal (eds.). Handbook of the birds of the world. Volume 5: Barn-owls to hummingbirds. Lynx Edicions, Barcelona, Spain.

Contreras, J. R. 1975. Características ponderales de las aves del Parque Nacional Nahuel Huapi y regiones adyacentes. Physis Sec. C (Buenos Aires) 34: 97-107.

Donázar, J. A., A. Travaini, O. Ceballos, M. Delibes, & 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.

Fiora, A. 1933. El peso de las aves. Hornero 5: 174-188.

Iriarte, J. A., W. L. Franklin, & W. E. Johnson. 1990. Diets of sympatric raptors in southern Chile. J. Raptor Res. 24: 41-46.

Jaksic, F. M., H. W. Greene, & J. L. Yáñez. 1981. The guild structure of a community of predatory vertebrates in central Chile. Oecologia 49: 21-28.

Jaksic, F. M., & C. D. Marti. 1984. Comparative food habits of *Bubo* owls in Mediterranean-type ecosystems. Condor 86: 288-286

Jaksic, F. M., & J. L. Yáñez. 1980. Differential utilization of prey resources by Great Horned Owls and Barn Owls in central Chile. Auk 97: 895-896.

Johnson, W. R., W. L. Franklin, & J. A. Iriarte. 1990. The mammalian fauna of the northern Chilean Patagonia: a biogeographical dilemma. Mammalia 54: 457-469.

Knight, R. L., & R. E. Jackman. 1984. Food-niche relationships between Great Horned Owls and Common Barn Owls in eastern Washington. Auk 10: 175-179.

Levins, R. 1968. Evolution in changing environments. Princeton Univ. Press, Princeton, New Jersey.

Marks, J. S., R. J. Cannings, & H. Mikkola. 1999. Family Strigidae. (Typical Owls). Pp. 76-151 *in* del Hoyo, J., A. Elliott, & J. Sargatal (eds.). Handbook of the birds of the world. Volume 5: Barn-owls to hummingbirds. Lynx Edicions, Barcelona, Spain.

Marti, C. D. 1987. Raptor food habits studies. Pp. 57-80 *in* Millsap B. A., K. W. Kline, & D. M. Bird (eds.). Raptor management techniques manual. National Wildlife Federation, Washington, DC.

Marti, C. D., E. Korpimäki, & F. M. Jaksic. 1993. Trophic structure of raptor communities: a three-continent comparison and synthesis. Curr. Ornithol. 10: 47-137.

Mazzarino, M. J., M. Bertiller, T. Schlichter, M. Gobbi. 1998. Nutrient cycling in Patagonian ecosystems. Ecol. Aust. 8: 167-181.

Novaro, A., A. Capurro, A. Travaini, M. Funes, & J. Rabinovich. 1992. Pellet-count sampling based on spatial distributions: a case study of the European hare in Patagonia. Ecol. Aust. 2: 11-18.

Paruelo. J. M., A. Beltrán, E. Jobbágy, O. E. Sala, & R. A. Golluscio. 1998. The climate of Patagonia: general patterns and controls on biotic processes. Ecol. Aust. 8: 85-101.

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

Pearson, O. P. 1995. Annotated keys for identifying small mammals living in or near Nahuel Huapi National Park or Lanín National Park, southern Argentina. Mastozool. Neotrop. 2: 99-148.

Pearson, O. P., & A. K. Pearson. 1982. Ecology and biogeography of the southern rainforest of Argentina. Pp. 129-142 *in* Mares, M. A., & H. H. Genoways (eds.). Mammalian biology in South America. Special Publication Series, Volumen 6. Pymatuning Laboratory of ecology, Univ. of Pittsburgh, Pittsburgh, Pennsylvania.

Pianka, E. R. 1973. The structure of lizard communities. Ann. Rev. Ecol. Syst. 4: 53-74.

Pillado, M. S., & A. Trejo. 2000. Diet of the Barn Owl (*Tyto alba tuidara*) in northwestern Argentine Patagonia. J. Raptor Res. 34: 334-338.

Sahores, M., & A. Trejo. 2004. Diet shift of Barn Owls (*Tyto alba*) after natural fires in Patagonia, Argentina. J. Raptor Res. 3: 174-177.

Salvador, S. A. 1988. Datos de peso de aves argentinas. Hornero 13: 78-83.

Salvador, S. A. 1990. Datos de peso de aves argentinas. 2. Hornero 13: 169-171.

Schlichter, T., & P. Laclau.1998. Ecotono estepa-bosque y plantaciones forestales en la Patagonia norte. Ecol. Aust. 8: 285-296.

Travaini A., J. A. Donázar, O. Ceballos, A. Rodríguez, F. Hiraldo, & 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., & D. Grigera. 1998. Food habits of the Great Horned Owl (*Bubo virginianus*) in a Patagonian steppe in Argentina. J. Raptor Res. 32: 306-311

Trejo, A., & V. Ojeda. 2004. Diet of Barn Owls (*Tyto alba*) in forested habitats of northwestern Argentine Patagonia. Ornitol. Neotrop. 15: 307-311.

Zamorano, E., L. J. Palomo, A. Antúnez, & J. M. Vargas. 1986. Criterios de predación selectiva de *Bubo bubo* y *Tyto alba* sobre *Rattus*. Ardeola 33: 3-9.

Zar, J. H. 1996. Biostatistical analysis. 3rd ed. Prentice Hall, Upper Saddle River, New Jersey.

APPENDIX 1. Localities in the forest-steppe ecotone of southern Argentina where owl pellets were collected.

Localities	Species	Coordinates
San Ramón	Barn and Magellanic Owls	41°03'S, 70°59'W
El Desafío	Barn Owl	41°18'S, 71°06'W
Pipilcura	Barn Owl, Magellanic Owl	40°54'S, 70°48'W
Cooperativa Escuela	Barn Owl	40°58'S, 70°48'W
Bariloche Airport	Magellanic Owl	41°08'S, 71°10'W
Gauchito Gil	Magellanic Owl	41°16'S, 71°13'W
Valle Encantado	Barn Owl	40°45'S, 71°08'W
Rincón de Creide	Barn Owl	40°47'S, 71°07'W