

Diet of the Short-Eared Owl (*Asio flammeus*) in the Antisana highlands, Ecuador

Dieta del búho orejicorto (*Asio flammeus*) en el páramo de Antisana, Ecuador

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Abstract

The knowledge of the diet of a species is an important element to understand its natural history and ecology, the information about Ecuadorian owls' diet increases progressively. We analyzed $n = 163$ pellets of the short-eared Owl (*Asio flammeus*) collected in the Antisana highlands, north of Ecuador. We found 242 preys of six taxa; the paramo rabbit *Sylvilagus andinus* was the most important prey in terms of frequency (46%) and biomass contribution (78%). The diet of the owl in the Antisana highlands has low diversity, it could be related to individual specialization or the low availability of prey on the 4,000 m; the mammals as preys dominated in frequency and biomass like previous studies.

Keywords: Cricetidae, mammals, pellets, prey, *Sylvilagus andinus*.

Resumen

El conocimiento de la dieta de una especie es un elemento importante para entender su historia natural y ecología, la información sobre la dieta de los búhos ecuatorianos ha ido aumentando paulatinamente. Analizamos $n = 163$ egagrópilas del búho orejicorto (*Asio flammeus*) colectadas en el páramo del Antisana, norte de Ecuador. Encontramos 242 presas correspondientes a seis taxones; el conejo andino *Sylvilagus andinus* fue la presa más importante en frecuencia (46%) y aporte de biomasa (78%). La dieta del búho orejicorto presentó una baja riqueza de especies en el páramo de Antisana, posiblemente relacionada a una especialización individual o a la baja disponibilidad de presas sobre los 4,000 m. Al igual que en estudios previos sobre la dieta de la especie, los mamíferos fueron la presa que dominó en frecuencia y biomasa.

Palabras clave: Cricetidae, egagrópilas, mamíferos, presas, *Sylvilagus andinus*.

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To know the taxonomy of prey is important to establish inter and intraspecific interactions, the role of the predator in its environment and understand its ecology and natural history, the diet of a species could be inferred base on bill form or knowledge of congeners preys, nevertheless the diet may vary due to factors of temporality, geography or availability of prey, even in nearby or similar geographical areas could be individual specialization (Bolnick *et al.* 2003). Despite an increase in publications on owls' diets in recent years (*e.g.*, Cadena-Ortiz *et al.* 2018, Orihuela-Torres *et al.* 2018), the knowledge of natural history for Ecuadorian Strigiformes still low (Freile *et al.* 2017). Only three studies have been done on diet composi-

tion of short-eared owls (*Asio flammeus*) in Ecuador; two from the Galapagos Islands (De Groot 1983, Piedrahita and Wagner 2017) and the other one from Pichincha province (Pozo-Zamora *et al.* 2017). *Asio flammeus* has wide distribution worldwide (König and Weick 2008), in Ecuador occurs along the Andes, principally between 3000 to 4000 masl, in different habitats such as paramo, dry valleys and adjacent to agricultural fields (Freile and Restall 2018).

Here we report the diet of the short-eared owl based on $n = 163$ pellets collected in January and July 2017, and in July 2018, inside tussock of Poaceae grass (Figure 1A) scattered in a small area ca. 20 m², in La Ovejera grasslands (00°31' S, 78°14'



Figure 1. Habitat in the Antisana highlands, Ecuador 4000 masl (A), Short-Eared Owl (B), paramo rabbits principal prey (C) (photo: JB, July 2018).

W, 4050 masl), on the Antisana Ecological Reserve border, Napo Province. During collection we saw short-eared owls flying over us. In one occasion we saw up to six owls close by the grass tufts, which could be a breeding site of short-eared owl family groups (Olsen *et al.* 2019).

Pellets were dried to the environment for c. a week, each one were measured, weighted and manually disintegrated, the bones and arthropod remains were separated, and we determined the minimum number of individuals in the sample by counting the homologous jaw or skull remnants for vertebrates, and elytra, heads and mandibles of arthropods, items found in pellets were identified using literature (Hershkovitz 1962, Voss 2003, Weksler and Percequillo 2011, Ruedas *et al.* 2017, Brito *et al.* 2019) and by direct comparison to specimens deposited at the Instituto Nacional de Biodiversidad (Inabio), the weight of prey species also was taken from Inabio data. For our data and Pozo-Zamora *et al.* (2017) data, we estimate niche breadth using Levins's measure: $B = 1/\sum p_i^2$, where p_i is the proportion of individuals found of prey-item i on the diet, and Levins's standardized niche breadth: $B_{est} = (B - 1)/(n - 1)$, where n is the number of prey-items (Feinsinger *et al.* 1981, Krebs 1999).

The $n = 163$ pellets collected were of the following sizes: length (mean = 46.4 mm, range = 24.3 - 79.2 mm), width (mean = 17.7 mm, range = 15.6 - 20.4 mm), dry weight (mean = 3.2 g, range = 1 - 6 g). Measurements were similar to those previously reported for three temperate Andean forests in Ecuador (Pozo-Zamora *et al.* 2017). The mean number of prey items/pellet was 2.5 ± 2.6 (range 1 - 6). In the 163 pellets of short-eared owl we found 242 prey items grouped in only six taxa, five mammals was 92% of the prey and the rest was beetles (Order Coleoptera). The breeds of paramo rabbits (*Syl-*

vilagus andinus) was the most important prey (Figure 1C) in terms of biomass and frequency (Table 1). Niche breadth of *A. flammeus* in Antisana highlands, 4050 masl, with six prey items in 163 pellets, showed low values ($B = 2.72$; $B_{est} = 0.34$) also the values of three temperate Andean forests, $\bar{x} = 2868$ masl, with 22 prey items in 52 pellets (Pozo-Zamora *et al.* 2017) ($B = 6.76$; $B_{est} = 0.27$).

The short-eared owl in highlands and temperate Andean forests has B_{est} lower than 0.60, which means a predator specialist (Krebs 1999), with narrow trophic niche (Jaksic 1989). However the absence of items previously reported in the diet of short-eared owl in our data, such as birds (e.g., Diéguez 1996, Martínez *et al.* 1998, Baladrón *et al.* 2014, Torres *et al.* 2014, Pozo-Zamora *et al.* 2017, Piedrahita and Wagner 2017), suggests further specialization in our locality or individual specialization (Bolnick *et al.* 2003).

We found a positive correlation between the mass of the prey and its frequency in the pellets (Pearson test $r = 0.77$; $t = 2.43$; $df = 4$; $P = 0.07$), which suggests a specialization of the owl for capturing large prey, with which they obtain more biomass with less effort. The two prey of greater biomass (*S. andinus* and *Phyllotis haggardi*) also predominate in frequency on the owl diet. *Sylvilagus andinus* reproduces all year round (Vallejo 2017) and have high density in Ecuadorian highlands (García *et al.* 2016), being a permanent source of food for raptors. Our biomass dominance of *S. andinus* was agreed with Pozo-Zamora *et al.* (2017), and it was also the main prey of variable hawk (*Geranoaetus polyosoma*) in our same study area (De Vries *et al.* 2014).

Due to the absence of studies of mammalian densities in our study area, we still cannot define whether the short-eared

Table 1. Composition of the diet of Short-Eared Owl (*Asio flammeus*) based on $n = 163$ pellets, collected in the Antisana highlands, Ecuador, in January and July 2017, and in July 2018.

Taxa	Mass (g)	Number of individuals	%	Biomass	%
RODENTIA					
Cricetidae					
<i>Akodon mollis</i>	15	4	2	60	1
<i>Phyllotis haggardi</i>	20	93	38	1860	19
<i>Microryzomys altissimus</i>	16	12	5	192	2
<i>Thomasomys</i> sp.	12	3	1	36	0
LAGOMORPHA					
Leporidae					
<i>Sylvilagus andinus</i> (breeds)	70	111	46	7770	78
COLEOPTERA					
	1	19	8	19	0
TOTAL		242		9937	

owl's foraging behavior would be opportunistic (when it ingests the prey in the same relative abundances of its environment) or selective (when it ingests some or all of the prey in different proportions to those present in the hunting area) (Jaksic 1989); but the studies on the short-eared owl diet in South America were agreed with the dominance of mammals as prey (Rau et al. 1992, Martínez et al. 1998, Cirignoli et al. 2001, Baladrón et al. 2014, Torres et al. 2014). Remains the necessity of long term studies and samples in more locations along the distribution of the owl, to elucidate patterns and have a better characterization on the diet of this owl in Ecuador.

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