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SHORT-COMMUNICATION

Diet of the Spectacled Owl (*Pulsatrix perspicillata*) in Zapotillo, southwestern Ecuador

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ABSTRACT: We describe the diet of the Spectacled Owl (*Pulsatrix perspicillata*) based on the collection and analysis of pellets between 20 to 24 December 2016, from a reproductive territory located in Zapotillo, southwestern Ecuador. Mammals were the main food source of the species, accounting for 80% of the identified prey items and 94% of the biomass. Other taxonomic groups, such as amphibians, reptiles and crabs were also identified. Based on our results and the existing observations, *P. perspicillata* consumed a big amount of arboreal prey or those that are located at medium height within the forest. This may be due to their hunting habits, the abundance of available prey or a combination of both. Our observation is the first to document the diet of the subspecies *P. perspiciliata chapmani*, and increases scarce knowledge about the trophic ecology of this species.

KEY-WORDS: owls, pellets, prey, trophic ecology, tropical dry forest.

One of the most important natural history observations to understand the ecology of a species is the knowledge of its diet, especially the taxonomy of the ingested prey (Pardiñas & Cirignoli 2002, Cadena-Ortiz *et al.* 2011). Knowing the diet of a species helps to determine, among other aspects, its intra and interspecific relationships (Marti *et al.* 1993). Nevertheless, study of the trophic ecology of birds faces methodological limitations, such as the difficulty in identifying the consumed prey (Rosenberg & Cooper 1990) and in nocturnal species, their stealth behavior and difficulty of detection, further complicate this type of research (Karr *et al.* 1990).

The level of knowledge about owls (Strigidae) in the Neotropics and even more so in Ecuador remains low (Enríquez *et al.* 2006, Freile *et al.* 2012, 2017), although there is information about their distribution and habitat, information on the ecological aspects such as behavior and trophic niche are deficient (Cadena-Ortiz *et al.* 2013).

Pulsatrix perspicillata (Latham, 1790) is distributed from southern Mexico and Central America, to northern Argentina (König & Weick 2008). In Ecuador it is distributed in the lowlands to the east and west of the Andes, primarily under the 1000 m a.s.l. (Ridgely & Greenfield 2001, Freile *et al.* 2017). With two subspecies, *Pulsatrix perspicillata chapmani* (Griscom, 1932) occupies west of the Andes, and *Pulsatrix perspicillata perspicillata* (Latham, 1790) occupies the east of the mountain range (McMullan & Navarrete 2017). This species inhabits the dense rainforest, savanna forests, and tropical dry forest, as well as areas with scattered trees, coffee plantations, and forest galleries (Holt *et al.* 2017). These authors suggest that their populations are numerous, but there is scarce information on their abundance, population ecology, and behavior. The Spectacled Owl is a species with nocturnal activity, although it can occasionally be found on cloudy days, where it usually rests on leafy trees at banks of streams or near bodies of water, at medium height with dense foliage (König & Weick 2008).

Knowledge about the diet of *P. perspicillata* is mentioned in some field guides (*e.g.*, Stiles & Skutch 1989, Sick 1993, König & Weick 2008), on the online database (Holt *et al.* 2017), and report data of prey published in Panama (Voirin *et al.* 2009), Brazil (Carvalho *et al.* 2011), and Ecuador (Cadena-Ortiz *et al.* 2013, Daza *et al.* 2017). There is a single detailed study based on pellets of the Mexican subspecies *P. perspicillata saturata* (Silva *et al.* 1997), but information is lacking for the rest of its distribution. However, the subspecies of our study, *P. perspicillata chapmani*, is distributed throughout the Caribbean from Costa Rica, eastern Panama to Colombia, western Ecuador and northwestern Peru (Holt *et al.* 2017). This subespcies lacks detailed studies and only occurrence records are available (Voirin *et al.* 2009,

Cadena-Ortiz *et al.* 2013).

In this study, we present information on the diet of *P. p. chapmani* in southwestern Ecuador, based on the analysis of pellets in a reproductive territory. The purpose of this study was to identify its main prey in pellets in the tropical dry forest and thus, widen the knowledge about its diet. This is the second detailed study on the trophic ecology of this species and the first of the subspecies *P. p. chapmani*.

We collected pellets from a breeding territory of *P. p. chapmani* located in Zapotillo, southwest of Ecuador (4°07'S; 80°20'W, 481 m a.s.l.), between 20 to 24 December 2016, corresponding to the dry season (Maldonado 2002). The nest of a family, composed by two adults and one fledgling (Fig. 1A), was located in a *Ficus* sp. tree, about 4.5 m height in an area with steep slopes and a few meters from a ravine with permanent water. The type of forest corresponds to dry semi-deciduous forest (Cueva & Chalán 2010). The forest is patchy with discontinuous clearings, natural or induced, and the presence of isolated trees. Characteristic species of this type of vegetation are Ceiba (*Ceiba trichistandra* (A. Gray) Bakh.), Guayacan (*Tabebuia chrysantha* G. Nicholson), Laurel (*Cordia macrantha* Chodat), and Pretino (*Cavanillesia platanifolia* (Bonpl.) Kunth), among others (Fig. 1B) (Cueva & Chalán 2010).

The analysis of the pellets was performed in the laboratory, where we measured the length and width of each pellets with a Stainless Hardened digital caliper (precision ± 0.01 mm), and dry mass using a Sartorius LA-230P precision balance. We analyzed the pellets and separated the elements according to their identification and quantification (Marti *et al.* 2007).

The analyzed material in pellets was separated according to the taxonomic groups to which they belonged and later classified at the species level. The minimum number of individuals consumed (MNI), was determined by counting homologous mandibles and discarding the other skeletal remains to avoid recounting (Manning & Jones-Jr. 1990), except for *Hypolobocera aequatorialis* (Ortmann, 1897) (Decapoda) which was identified by carapace remains. To calculate the biomass, the average mass of the species consumed was multiplied by the MNI of the species (Herrera & Jaksic 1980). The different food components were identified using available guides (Brito *et al.* 2016, Torres-Carvajal *et al.* 2016, Ron *et al.* 2017) and comparisons were made with reference material deposited in the Museum of the Escuela Politécnica Nacional (MEPN).

The nine pellets samples were of the following sizes: length (mean = 44 mm, range = 34 – 59 mm), width (mean = 21 mm, range = 13 – 33 mm), mass (mean = 4.3 g, range = 2.4 – 8.5 g). There were 15 prey items belonging to four taxonomic classes: Mammalia (3 sp.), Reptilia (1 sp.), Amphibia (1 sp.) and Malacostraca (1 sp.), (Table 1). The body mass of prey varied from *Stenocercus puyango* Torres-Carvajal, 2005 (Reptilia) (13 g) to *Proechimys decumanus* Thomas, 1899 (Mammalia) (285 g).

Mammals were recorded in 100% of the dissected pellets and were the main prey group, both in the minimum number of individuals consumed (80%) and in biomass (93.6%) (Fig. 2). The consumption of amphibians, reptiles, and crustaceans was similar. The most consumed species was the rodent *Rhipidomys leucodactylus* (Tschudi, 1845) and the marsupial *Marmosa simonsi* Thomas, 1899, with six and five individuals respectively (Table 1). For biomass, species that contributed most was *R. leucodactylus* with 53.6%. The absence of birds and invertebrates in their diet is striking,

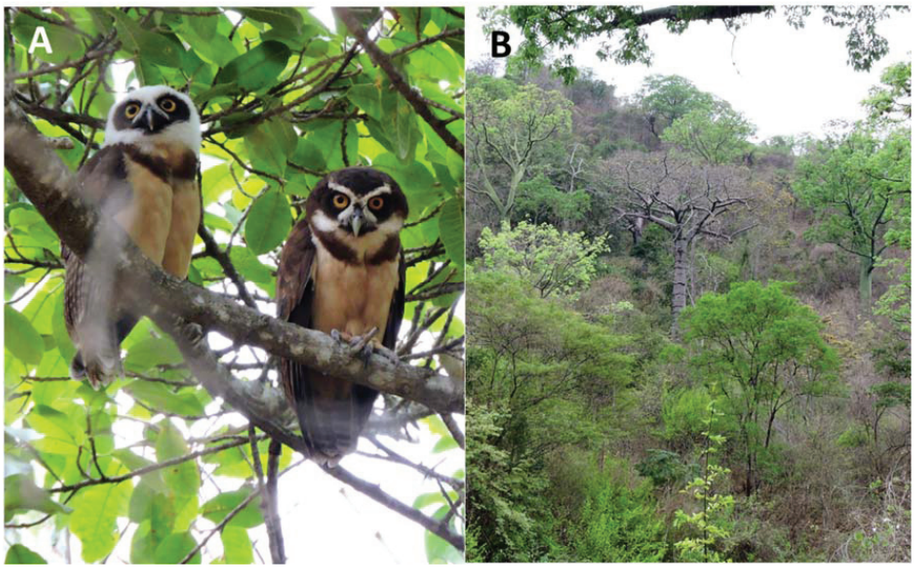

Figure 1. Young (left) of Spectacled Owl *Pulsatrix perspicillata chapmani* next to an adult (right), in Zapotillo, southwestern Ecuador (**A**). Typical ecosystem where the study of the diet of the Spectacled Owl was carried out (**B**). Photo author: A. Orihuela-Torres.

except the observation of *H. aequatorialis* (Decapoda).

According to previous information published on the diet of *P. perspicillata* (Stiles & Skutch 1989, Sick 1993, Silva *et al.* 1997, König & Weick 2008, Holt *et al.* 2017), their main prey are mammals. This is further corroborated by our findings, in which mammals contributed almost all the biomass (93.6%). One of the most abundant prey items was *M. simonsi* (MNI = 33.3%, B = 22%), a nocturnal marsupial with arboreal habits (Rossi *et al.* 2010, Astúa 2015). This genus, belonging to the family Didelphidae, is very common in the diet of *P. perspicillata* (Silva *et al.* 1997, König & Weick 2008, Holt *et al.* 2017). The other most abundant species was *R. leucodactylus*, a rodent of nocturnal and arboreal habits (Tribe 2015, Tirira 2017), which contributed with 53.6% in biomass. The only mammalian prey species with primarily terrestrial habits was the Pacific Spiny Rat *P. decumanus* (Tirira 2017).

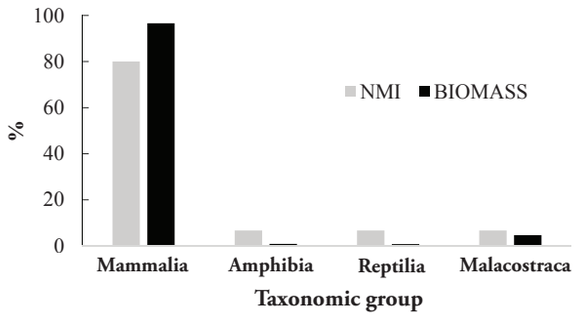

Figure 2. Minimum number of individuals consumed (MNI%) and biomass consumed (B%) in the diet of *Pulsatrix perspicillata chapmani* in a breeding territory of Zapotillo, southwestern Ecuador.

In Mexico, Silva *et al.* (1997) showed a greater intake of *P. perspicillata* for a semi arboreal rat (*Tylomys nudicaudus* Peters, 1866). It appears that *P. perspiciliata* hunts preferentially over arboreal prey or prey located in the middle stratum of the forest (Silva *et al.* 1997), although it can occasionally hunts terrestrial prey. Additional studies will be required to determine if this intake can be attributed to hunting habits, the availability

Table 1. Composition of the diet of *Pulsatrix perspicillata chapmani* in a breeding territory of Zapotillo, southwestern Ecuador. The mass of each species is shown (Mass, in g), the number of individuals and their percentage (MNI, in %), the total biomass in grams and the percentage (Biomass, in %).

Taxa	Mass (g)	MNI (%)	Biomass (%)
Mammalia		12 (80)	1487 (93.6)
Didelphimorphia			
Didelphidae			
Marmosa simonsi	70	5 (33.3)	350 (22.0)
Rodentia			
Cricetidae			
Rhipidomys leucodactylus	142	6 (40)	852 (53.6)
Echyimidae			
Proechimys decumanus	285	1 (6.7)	285 (18.0)
Amphibia		1 (6.7)	14 (0.9)
Anura			
Hylidae			
Trachycephalus quadrangulum	14	1 (6.7)	14 (0.9)
Reptilia		1 (6.7)	13 (0.8)
Squamata: Sauria			
Tropiduridae			
Stenocercus puyango	13	1 (6.7)	13 (0.8)
Malacostraca		1 (6.7)	75 (4.7)
Decapoda			
Pseudothelphusidae			
Hypolobocera aequatorialis	75	1 (6.7)	75 (4.7)
Total		**15**	**1589**

of prey, or a combination of both. Voirin *et al.* (2009) reported the attack of *P. perspicillata* on a *Bradypus variegatus* Schinz, 1825 (Mammalia) when it descended to the ground to defecate. These attacks are not common in owls, as they usually swallow their whole prey and therefore do not consume prey greater than their own body mass (Marti 1974). However, it evidences that the species effectively exploits every opportunity to get food.

The absence of birds and insects in our study may be biased due to the small sample size. Although, we found a small proportion of crustaceans, similar to those reported in other studies (Silva *et al.* 1997, König & Weick 2008, Holt *et al.* 2017). As far as we know, the record of the anuran *Trachycephalus quadrangulum* (Peters, 1867) constitutes the first evidence of amphibian consumption within the diet of the Spectacled Owl.

In the two specific reports on the diet of *P. perspicillata* in Ecuador (Cadena-Ortiz *et al.* 2013, Daza *et al.* 2017), only reptiles are documented. In our study, reptiles were represented by *S. puyango*, a common species in the tropical dry forest of southwestern Ecuador (Yánez-Muñoz *et al.* 2016). A report of the diet of its congener *Pulsatrix melanota* (Tschudi, 1844) in Ecuador showed differences in the diet of these species, in this case, only arthropods appeared in the stomach contents (Cadena-Ortiz *et al.* 2011). However, the sample sizes were small in these reports and are unable to represent the changes in diet due to the availability of food throughout the year, the breeding and non-breeding season and other environmental conditions.

Although the study by Silva *et al.* (1997) was carried out in Mexico on another subspecies (*P. perspicillata saturata*), in another season (rainy season) and with a small sample size (19 pellets), it showed important similarities with our study. In both cases, mammals were the main prey and Didelphidae played an important role in their diet, constituting themselves as a potential prey for this nocturnal raptor throughout its range of distribution.

Owing to the limited knowledge about owls in the Neotropics (Enríquez 2017), this type of study is of particular importance, as it will allow us to understand the role of these cryptic species in their environment, and to better understand how organisms interact. Trophic ecology is a fundamental element to understand this complex and important group of birds and contribute to their conservation.

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