

# First observations of the diet of the Pearl Kite (*Gampsonyx swainsonii magnus*) in southwestern Ecuador

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**ABSTRACT:** We describe the diet of Pearl Kite (*Gampsonyx swainsonii magnus*) by pellet analysis collected in an active nest in southwest Ecuador in May 2018. Reptiles were the most consumed taxonomic group both in frequency of occurrence (FO = 46.4%) and in biomass (B = 59.8%), followed by birds (FO = 33.9% and B = 38.3%) and insects (FO = 19.6% and B = 1.8%). Our results showed Pearl Kite as a generalist raptor but with a higher consumption of reptiles, which is according with previous studies in other areas where other subspecies inhabit, despite this subspecies showed a higher consumption of birds. Despite the low sample size, this study is interesting as it is the first one on the diet of the Pearl Kite for Ecuador and also for this subspecies. Basic studies on the trophic ecology of Neotropical raptors such as this are needed. For this reason we encourage further studies to fill existing gaps in knowledge and improve effective long-term conservation strategies.

**KEY-WORDS:** pellets, prey, raptor, reptiles, trophic ecology, tropical dry forest.

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## INTRODUCTION

Knowing the trophic ecology of a species is important not only to understand the ecology of the species itself, but also to understand the ecology of the community (Lewis *et al.* 2004). In addition to helping researchers understand trophic niches and how they relate to community structure, studying raptor diets can provide valuable information about prey distribution, abundance, behaviour, and vulnerability (Geng *et al.* 2009). Neotropical region is one of the areas with the highest diversity of raptors worldwide (Ferguson-Lees & Christie 2001), however the knowledge about many aspects of the ecology of this group is scarce (Freile *et al.* 2014, Monsalvo *et al.* 2018), even for other biological aspects. One of them is the Pearl Kite (*Gampsonyx swainsonii*), a small raptor that inhabits dry forests and arid regions of Central and South America (van Dort *et al.* 2010). Three subspecies are recognized, *G. s. leonae* distributed in southwestern El Salvador, south Honduras, west Nicaragua, Costa Rica and Panama, north and east Colombia through Venezuela and Trinidad to Guyana and Suriname, south to northeastern Ecuador and Brazil north of Amazon River; *G. s. magnus*

distributed in west Ecuador and northwestern Peru; *G. s. swainsonii* distributed in Brazil south of Amazon River to east Peru, north and east Bolivia, Paraguay and N Argentina (Bierregaard-Jr. & Kirwan 2018). Unlike many other Neotropical raptors, Pearl Kite is favoured by deforestation (Ferguson-Lees & Christie 2001) and, consequently, it is expanding its range of distribution in recent decades, mainly in Central America, southeast of Brazil and Ecuador (Bierregaard-Jr. & Kirwan 2018).

Despite being a fairly common raptor in most areas where it lives, it is surprising the lack of detailed studies on its trophic ecology. This raptor is considered a specialist in the capture of small lizards (Ferguson-Lees & Christie 2001), most of these data had been gathered in field observations or partial diet studies carried out in Central America or northern South America, and are restricted to the subspecies *G. s. swainsonii* and *G. s. leonae* (Martínez 1998, Ffrench 2012, Koski *et al.* 2015, Martínez-Araya & Gastezzi-Arias 2016, Pineda *et al.* 2016, Araya-Céspedes & Carvajal-Sánchez 2017, Herrera & Acosta-Burgos 2018, Bierregaard-Jr. & Kirwan 2018). As long as we know, nothing has been published to date about the diet of *G. s. magnus*.

In this survey we describe the diet of the Pearl Kite

*Gampsonyx s. magnus* in southwestern Ecuador, based on the analysis of pellets collected from a single active nest.

## METHODS

On May 2018, we located an active nest of Pearl Kite in the municipality of Zapotillo, province of Loja, southwest of Ecuador (4°19'35"S; 80°13'20"W, 244 m a.s.l.). The breeding territory was located in a semideciduous dry tropical forest, characterized by discontinuous, natural or induced glades, and the presence of isolated trees (Cueva & Chalán 2010). The nest was a basket made of loose twigs about 25 cm in diameter at a height of 4 m in a Barbasco (*Piscidia carthagenensis*), and in which there were two fledglings (Fig. 1).

To determine the diet, pellets were collected from the ground under the active nest. Pellets were analysed in the laboratory of the University of Loja (Ecuador). Each pellet was measured with a digital calliper ( $\pm 0.01$  mm) and weighed with a precision balance Sartorius LA-230P ( $\pm 0.01$  g). The identification of prey remains found in each pellet followed Orihuela-Torres *et al.* (2017).

The number of prey was calculated as the number of individuals based on the presence of unique structures, such as elytra of arthropods, jaws of reptiles, feathers and bones of birds, while other parts were not used to avoid double counting (Manning & Jones 1990). To calculate the biomass of birds not identified, we rely on the size of the bones that were of a medium-sized bird. For each prey

and groups consumed, frequency of occurrence (FO) was calculated as the number of individuals of each kind of prey divided by the total number of prey (Formoso *et al.* 2012, Orihuela-Torres *et al.* 2017), and biomass consumed (B) multiplying the average body mass of each prey species by the number of total individuals consumed (Orihuela-Torres *et al.* 2018). Both indexes were shown as a percentage to facilitate comparison. For the calculation of biomass, we used the average mass of each prey species from *Instituto Nacional de Biodiversidad* (INABIO) collection in Quito, Ecuador (<https://www.inabioecuador.bio/ufl/collections/>). The content obtained as remains of birds, insects and reptiles were quite fragmented, therefore it could not be deposited in collections and receive a voucher number. However, this material may be used for teaching purposes and will also be provided to interested researchers.

## RESULTS

A total of 25 pellets were collected and showed the following measures: length (mean = 20.67 mm, SD = 4.76 mm, range = 15.83–29.27 mm), width (mean = 11.82 mm, SD = 3.12 mm, range = 8.5–17.64 mm), mass (mean = 0.44 g, SD = 0.26 g, range = 0.2–1.2 g). We found 56 prey from at least seven species belonging to three different classes: birds (2 spp. at least), reptiles (3 spp.), and insects (1 family). Prey mass varied from 1 g (Carabidae) to 30 g (*Iguana iguana* juvenile). Reptiles were



**Figure 1.** Nest of Pearl Kite (*Gampsonyx swainsonii magnus*) with one of the two fledglings, in Zapotillo, southwestern Ecuador.

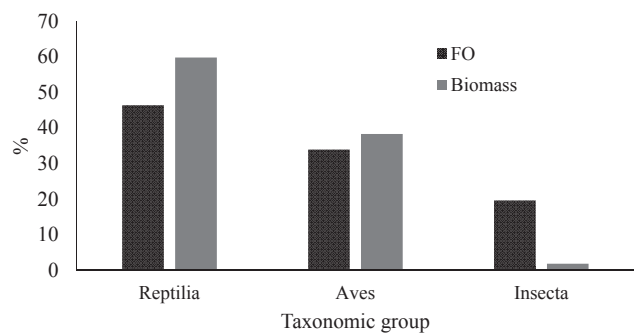
the main prey both in frequency of occurrence (46.4%) and in biomass consumed (59.8%, Fig. 2). Second in rank were birds (FO: 33.9% and B: 38.3%), and then insects (FO: 19.6%, and B: 1.8%). At the species level, Knobbed Pacific Iguana (*Microlophus occipitalis*) was the most abundant prey both in frequency of occurrence (39.3%), as in biomass consumed (47.3%). Although most birds could not be identified at species level, they appeared in a large percentage of the pellets (76%). Carabids also showed a high frequency of occurrence (19.6%), in 32% of pellets, however their contribution in biomass was scarce (1.8%) (Table 1).

## DISCUSSION

The diet of Pearl Kite in Zapotillo (SW Ecuador) corresponding to the subspecies *Gampsonyx s. magnus*, was in accordance with previous occasional data recorded for the other two Pearl Kite subspecies, placing this raptors as generalist, but consuming mainly reptiles (Martínez 1998, Koski *et al.* 2015, Martínez-Araya & Gastezzi-Arias 2016, Pineda *et al.* 2016, Araya-Céspedes & Carvajal-Sánchez 2017, Herrera & Acosta-Burgos 2018). The consumption of birds in our study seems much more common than previously reported (*e.g.*, Bierregaard-Jr. & Kirwan 2018). Several hypothesis could explain this results, *i.e.*, plasticity in foraging behaviour

and prey selection due to a higher local prey abundance (Morrison *et al.* 2008), or adaptation of this subspecies to consume more birds than the others subspecies. But due to the small sample size of our study we cannot support statistically any conclusion.

In this sense the composition of the diet would confirm the preference of this raptor for foraging in open habitats where it would find a higher abundance of reptiles such as *M. occipitalis* (Chávez-Villavicencio *et al.* 2018). Likewise, this statement is supported by the presence of birds related to open habitats and bushes such as the Saffron Finch (*Sicalis flaveola*) (Ridgely & Greenfield 2001).



**Figure 2.** Frequency of occurrence (FO) and biomass consumed (B) in percentage of the diet of Pearl Kite (*Gampsonyx swainsonii magnus*) in a breeding territory of Zapotillo, southwestern Ecuador.

**Table 1.** Diet composition of the Pearl Kite (*Gampsonyx swainsonii magnus*) in a breeding territory of Zapotillo, southwestern Ecuador. The number of individuals consumed of each species is shown (*n* ind.), frequency of occurrence (FO) in percentage (%), the total biomass consumed (Biomass, in g) and the percentage (Biomass, in %).

Class/Order/Family/Species	<i>n</i> ind.	FO (%)	Biomass (g)	Biomass (%)
<b>Reptilia</b>	<b>26</b>	<b>46.4</b>	<b>362</b>	<b>59.8</b>
<b>Squamata</b>				
<b>Iguanidae</b>				
<i>Microlophus occipitalis</i>	22	39.3	286	47.3
<i>Iguana iguana</i> (juvenile)	1	1.8	30	5.0
<i>Polychrus femoralis</i>	1	1.8	22	3.6
<b>Phyllodactylidae</b>				
<i>Phyllodactylus reissii</i>	2	3.6	24	4.0
<b>Insecta</b>	<b>11</b>	<b>19.6</b>	<b>11</b>	<b>1.8</b>
<b>Coleoptera</b>				
<b>Carabidae</b>	11	19.6	11	1.8
<b>Birds</b>	<b>19</b>	<b>33.9</b>	<b>232</b>	<b>38.3</b>
<b>Passeriformes</b>				
<b>Emberizidae</b>				
<i>Sicalis flaveola</i>	2	3.6	28	4.6
Medium-sized birds	17	30.4	204	33.7
<b>Total</b>	<b>56</b>	<b>100</b>	<b>605</b>	<b>100</b>

Raptors are very important components in the ecosystems, since they can be used as bioindicators or key species for community monitoring, in addition to providing important ecosystem services (Donázar *et al.* 2016). Currently there are large gaps in knowledge of basic aspects of raptor ecology in the Neotropics (Buechley *et al.* 2019) such as the composition of diet, phenology and reproduction, home range or even population sizes. Basic information like this study is necessary to complete these gaps, but since the diet varies depending on factors such as sex, age, habitat and season (Beeston *et al.* 2005) it is necessary that this knowledge be completed throughout the distribution area, as well as replicated during different seasons and by age classes. By improving our knowledge of the trophic ecology of these magnificent birds at the top of the food chain, we will be able to propose effective long-term conservation strategies.

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