

The reptile hunter's menu: A review of the prey species of Laughing Falcons, *Herpetotheres cachinnans* (Aves: Falconiformes)

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Abstract. *Herpetotheres cachinnans* is a Neotropical falcon species found in a variety of forested to semi-open habitats from Mexico to Argentina. Despite *H. cachinnans* being known to consume a variety of prey types, snakes comprise the majority of its diet in terms of taxonomic richness and frequency. Here, we present a detailed review about prey records of *H. cachinnans*. A total of 122 prey records were compiled from 73 literature references and authors' records. Snakes were the most common prey, with 94 records (77%). Analysis of 24 stomach contents (from literature and author's records) show that 71% contained remains of at least one snake, and 62.5% had snakes exclusively. A snake-based diet seems to be uncommon in raptors, and *H. cachinnans* is the only one presenting such degree of diet specialization in the Neotropics.

Key words: diet, falcon, predation, raptors, snake-specialist.

Introduction

Herpetotheres cachinnans (Linnaeus, 1758) is a wide-ranging raptor species, inhabiting tropical and subtropical zones from southern Mexico to northern Argentina, in a variety of habitat types such as forest edges, riverine woodlands, savannas and secondary forests (White et al. 1994, Skutch 1999, Ferguson-Lees & Christie 2001).

The scientific name of the Laughing Falcon is a masterpiece of biological knowledge produced by two authors who, curiously, have never seen it alive. Its specific name is Latin (from *cachinnare*, to laugh aloud, to guffaw) (Jobling 2010), and was proposed by Linnaeus (1758), based on Rolander's observations, referring to the impressive disturbance call of this species, which has been described as "maniacal laughter" (Ridgely et al. 2001) or "demented guffaws of laughter" (Restall et al. 2007). Its generic name, proposed by Vieillot (1817), is Greek (from *herpeton*, a reptile and *theras*, a hunter) (Jobling 2010) and refers to the diet of this species, which has long been known to be based on reptiles, mainly snakes (Azara 1802, Spix 1824). The latter observation, however, was the basis of a great variety of myths (del Techo 1896, Gregório 1980).

Few natural history studies document the diet of *H. cachinnans* (Parker 1990, 1991, Specht et al. 2008, Miller et al. 2010, Parker et al. 2012). How-

ever, there is a good deal of anecdotal information published in old monographs (e.g. Spix 1824), short notes (e.g. Pough 1964, Laurencio 2005, Costa et al. 2009), or in "gray" literature (e.g. Skutch 1993). Many of these sources are hard to obtain and/or were published in languages other than English, and therefore a large part of the available information is not readily accessible to the international scientific community.

Here we review published records on the diet of *Herpetotheres cachinnans* in addition with original data for the purpose of summarizing all accessible information in a single article. We also investigate whether *H. cachinnans* is a specialized snake-eater or if snakes are only one of its many prey types.

Material and methods

For a detailed literature review about prey records of Laughing Falcons we conducted searches in the following online databases: *Google Scholar*, *JSTOR*, *Science Direct*, *Scielo*, *Scopus* and *Web of Knowledge*. We also searched 18th to early 20th century ornithological publications available at the Biodiversity Heritage Library (<http://www.biodiversitylibrary.org>, accessed on June 2013), the complete issues of the journals *Ararajuba/Revista Brasileira de Ornitologia* and *Herpetological Review* (not covered by the databases above mentioned) and in at least one main ornithological reference (generally field guides) from every country where the species is known to occur

(e.g. Dickey & von Rossem 1938, Haverschmidt 1968, del Toro 1971, Stiles & Skutch 1989, Sick 1997, Ridgely et al. 2001, Restall et al. 2007). All citations in each reference found were subsequently pursued and this process was repeated until we could find no more citations for Laughing Falcons. When doing the literature review, we considered as primary records those clearly obtained by the author(s) of the references that have been consulted, and as secondary records those that clearly or supposedly were based on another (not cited) source. A search in the *Wikiaaves* photographic database (<http://www.wikiaaves.com>) was also made using available filters for photographic records of *H. cachinnans* eating/hunting.

We added two original data: the first is a field record made by GZ in Matozinhos, Minas Gerais, Brazil (19°33'S, 44°04'W), when a Laughing Falcon was observed preying on a *Sibynomorphus* cf. *mikanii* (Schlegel, 1837) (Serpentes: Dipsadidae) in October 2001; the second is based on the crop and gizzard contents of a single female specimen collected by BFM in the Rio Pandeiros, Januária, Minas Gerais, Brazil (15°40'S, 44°38'W) on 18 December 2011. The specimen contained in its crop a specimen of *Taeniophallus occipitalis* (Jan, 1862) (Serpentes: Dipsadidae) and remains of an unidentified specimen of Lancehead (*Bothrops lutzi* (Miranda-Ribeiro, 1915) or *B. moojeni* Hoge, 1966) (Serpentes: Viperidae) in its gizzard. Both snake remains and the raptor (CFL-CO-46) were deposited in the collection of the Universidade Federal de Viçosa – Campus Florestal.

To test the hypothesis that *H. cachinnans* is a specialized snake-eater, we gathered quantitative data about its diet. We collated all “stomach contents” records (crop and gizzard contents) we could find for this species from literature in addition to the contents cited above from one specimen. A high prevalence of snakes in the crop/gizzard per animal would indicate a specialized data.

Results

Together with authors' records presented above, 73 references (articles, books and photographs) to prey items of *H. cachinnans* were compiled (some with more than one prey recorded), 57 with primary and 16 with secondary records. Most primary records constitute opportunistic observations or collections of a single falcon. The exceptions are the studies by Parker (1990, 1991), Enamorado Guzmán & Arévalo Orrego (1992), Specht et al. (2008) and Miller et al. (2010), all observations from nest monitoring (including prey items being taken to nestlings or found at nests).

Primary records comprise 55 identified species/subspecies preyed on by *H. cachinnans*: one centipede, two lizards, 47 snakes, three birds, one rabbit and one fish. An additional 59 prey records could only be identified to genus or class level: insect larvae (1), centipedes (1), anurans (2), lizards

(6), snakes (39), “reptiles” (3), birds (1), bats (1), rodents (3), “mammals” (1), and fish (1). These data are summarized in Figure 1 and detailed in Table 1.

As commented before, secondary records provide general information, apparently not referring to observations of their authors, but repeating information from other articles, field guides, etc. They usually describe *H. cachinnans* feeding exclusively on reptiles (mainly snakes) (e.g. Azara 1802, Carriker 1910), although some add amphibians, rodents, birds, fish and insects to its diet (e.g. D'Orbigny 1835-1847, Cabanis 1848, Salvin & Godman 1904, Ferguson-Lees & Christie 2001).

During our review we were able to locate literature references to 23 stomach contents analyzed for this species, in addition to our own record cited above. Two stomachs (8.3%) were empty (Voous 1969); one (4.2%) contained insect larvae (Schubart et al. 1965); one (4.2%) contained chilopod and lizard remains (Bangs & Noble 1918); three (12.5%) contained remains of unidentified reptiles (Schubart et al. 1965); two (8.3%) had a snake together with the remains of centipedes (Taczanowski 1884) or a rodent (Howell 1857); the other 15 stomachs (62.5%) contained exclusively snakes (Spix 1824, Wagler 1824, Sclater 1860, Kerr 1892, Penard & Penard 1908, Travassos & Teixeira de Freitas 1942, Friedmann & Smith 1950, Schubart et al. 1965, Voous 1969, Wetmore 1965, Szazima & Abe 1991, Padial et al. 2003, this study). Therefore, 17 (71%) of stomach contents analyzed contained remains of at least one snake.

Discussion

Despite Laughing Falcons being recorded to eat a variety of prey types, from centipedes to fish, snakes comprised by far the majority of their diet in terms of taxonomic richness and frequency (Skutch 1999, Miller et al. 2010, Parker et al. 2012, this study). In addition to being present in the majority of stomach contents analyzed in the literature, snakes can comprise up to 100% of the prey (Enamorado Guzmán & Arévalo Orrego 1992). The percentage is higher in mature forests (99.5%) than in farming landscapes (73.2%), perhaps due to a decrease in absolute abundance of snakes in human-altered habitats – a hypothesis that remains untested (Parker et al. 2012). It is interesting to note that the only species of fish consumed and identified to species level is an eel-like species.

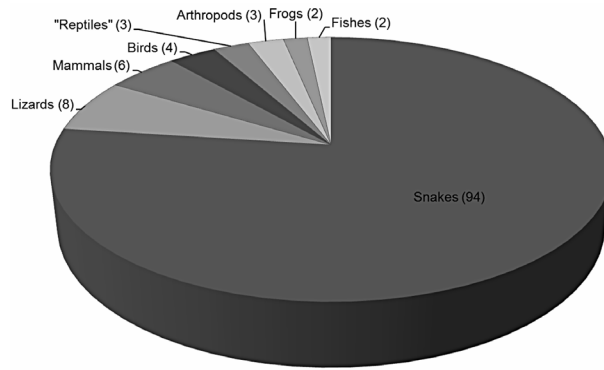


Figure 1. Number of primary records (n = 122) compiled from 73 references presenting prey items of *Herpetotheres cachinnans*, identified to species level or not. See Table 1 for detailed information.

Table 1. Prey consumed by *Herpetotheres cachinnans* recorded by primary sources. Habit information based on Dixon et al. (1993), Savage (2002), Bartlett & Bartlett (2003), Campbell & Lamar (2004) and HCC personal observations. Photos from *Wikiaves* (WA #) can be accessed by adding their number in the end of the address www.wikiaves.com/#. For example, www.wikiaves.com/1171280 (aq.- aquatic, arb.- arboreal, fly.- flying, fos.- fossorial, semiarb.- semiarboreal, ter.- terrestrial, AR- Argentina, BO- Bolivia, BR- Brazil, CR- Costa Rica, GT- Guatemala, GY- Guyana, EC- Ecuador, NI- Nicaragua, PA- Panama, PE- Peru, SR- Suriname, SV- El Salvador, VE- Venezuela).

Prey	Habit	Locality	Country	Reference
ARTHROPODS				
Chilopoda				
<i>Scolopendra gigantea</i>	ter.	Bellavista	PE	Bangs & Noble 1918
Unidentified centipedes	ter.		PE	Taczanowski 1884
Hexapoda				
Unidentified larvae	-	Rio Maranhão, Goiás	BR	Schubart et al. 1965
VERTEBRATES				
Amphibians				
Unidentified Anura	-	Jorupe	EC	Miller et al. 2010
Unidentified Anura	-	San Isidro del General	CR	Skutch 1993
Reptiles				
Lizards				
Anguidae				
<i>Ophiodes intermedius</i>	ter.	Reserva El Bagual	AR	Di Giacomo 2005
Iguanidae				
<i>Iguana iguana</i>	arb.	El Angolo	PE	Miller et al. 2010
Teiidae				
Unidentified teiid	ter.	El Angolo	PE	Miller et al. 2010
Unidentified lizards				
1	-	Xavantina, Mato Grosso	BR	Schubart et al. 1965
2	-	Rio Mearim, Maranhão	BR	Schubart et al. 1965
3	-	San Isidro del General	CR	Skutch 1993
4 (seven unidentified lizard species)	-	Tikal National Park	GT	Parker et al. 2012
5 (<i>Stenocercus</i> or <i>Leiocephalus</i> ?)	-	Bellavista	PE	Bangs & Noble 1918
Snakes				
Boidae				
<i>Boa constrictor imperator</i>	semiarb.	Tikal National Park	GT	Parker 1990, Enamorado Guzmán & Arévalo Orrego 1992, Parker et al. 2012
Colubridae				
<i>Chironius grandisquamis</i> ¹	semiarb.	Tikal National Park	GT	Parker 1990
<i>Coluber mentovarius</i>	semiarb.	Tikal National Park	GT	Parker 1990
<i>Drymarchon corais</i>	ter.	Tikal National Park	GT	Parker 1990, Enamorado Guzmán & Arévalo Orrego 1992, Parker et al. 2012

Continued on next page

Table 1. (continued)

Prey	Habit	Locality	Country	Reference
<i>Drymobius margaritiferus</i>	ter.	Tikal National Park	GT	Parker 1990, Enamorado Guzmán & Arévalo Orrego 1992, Parker et al. 2012
<i>Lampropeltis triangulum</i>	ter.	Tikal National Park	GT	Enamorado Guzmán & Arévalo Orrego 1992
<i>Leptophis ahaetulla marginatus</i> ²	arb.	Reserva El Bagual	AR	Di Giacomo 2005
<i>Leptophis ahaetulla praestans</i>	arb.	Tikal National Park	GT	Parker 1990
<i>Leptophis</i> sp.	arb.	Tikal National Park	GT	Enamorado Guzmán & Arévalo Orrego 1992
<i>Oxybelis</i> sp.	arb.	Tikal National Park	GT	Enamorado Guzmán & Arévalo Orrego 1992, Parker et al. 2012
<i>Oxybelis aeneus</i>	arb.	San Isidro del General	CR	Skutch 1993
<i>Spilotes pullatus</i>	arb.		CR	Skutch 1946
Dipsadidae				
<i>Apostolepis assimilis</i>	fos.	Rio Verde, Goiás	BR	Sazima & Abe 1991
<i>Clelia clelia</i>	ter.	Tikal National Park	GT	Parker 1990
<i>Coniophanis</i> sp.	ter.	Tikal National Park	GT	Parker 1990
<i>Conophis lineatus</i>	ter.	Tikal National Park	GT	Parker 1990
<i>Erythrolamprus aesculapii</i>	ter.	Alanje, Chiriqui	PA	Wetmore 1965
<i>Imantodes cenchoa</i>	arb.	Tikal National Park	GT	Parker 1990
<i>Leptodeira septentrionalis polysticta</i>	arb.	Tikal National Park	GT	Parker 1990
<i>Liophis jaegeri coralliventris</i> ³	ter.	Reserva El Bagual	AR	Di Giacomo 2005
<i>Liophis lineatus</i> ⁴	ter.		GY	Quelch 1891 <i>apud</i> Chubb 1916, Penard & Penard 1908
<i>Liophis poecilogyrus</i>	ter.	Reserva El Bagual	AR	Di Giacomo 2005
<i>Liophis</i> cf. <i>reginae</i>	ter.		SR	Voous 1969
<i>Ninia sebae</i>	ter.	Tikal National Park	GT	Parker 1990
<i>Oxyrhopus clathratus</i>	ter.	Itatiaia, Rio de Janeiro	BR	Eduardo A. Ferreira (WA 1149998)
<i>Oxyrhopus guibei</i>	ter.	Brasília, Distrito Federal	BR	Thiago T. Silva (WA 1143360, WA 1143361)
<i>Oxyrhopus guibei</i>	ter.	Matozinhos, Minas Gerais	BR	Specht et al. 2008
<i>Oxyrhopus</i> cf. <i>guibei</i>	ter.	Rio Verde, Goiás	BR	Sazima & Abe 1991
<i>Philodryas olfersii</i>	arb.	Reserva El Bagual	AR	Di Giacomo 2005
<i>Philodryas olfersii</i>	arb.	Miranda, Mato Grosso do Sul	BR	Alex Castilho (WA 1065315)
<i>Philodryas olfersii</i>	arb.	Abre Campo, Minas Gerais	BR	Leonardo R. Miranda (WA 523798, 489695)
<i>Philodryas</i> cf. <i>olfersii</i>	arb.	Santo Amaro, Bahia	BR	Osmar Borges (WA 1153820, WA 1153821)
<i>Philodryas patagoniensis</i>	ter.	Estação Ecológica de Itirapina, São Paulo	BR	Motta-Junior et al. 2010
<i>Philodryas psammophidea</i>	ter.	Estrada de Ferro Noroeste do Brasil	BR	Travassos & Teixeira de Freitas 1942
<i>Philodryas viridissima</i>	arb.		SR	Voous 1969
<i>Pliocercus dimidiatus</i>	ter.	Limon, Limon Province	CR	Pough 1964
<i>Rhadinaea decorata</i>	ter.	Tikal National Park	GT	Parker 1990
<i>Sibon satori</i>	arb.	Tikal National Park	GT	Parker 1990
<i>Sibynomorphus</i> cf. <i>mikanii</i>	semiarb.	Matozinhos, Minas Gerais	BR	This study
<i>Taeniophallus occipitalis</i>	ter.	Rio Pandeiros, Minas Gerais	BR	This study
<i>Thamnodynastes hypoconia</i>	semiarb.	Reserva El Bagual	AR	Di Giacomo 2005
<i>Xenodon merremii</i>	ter.	Rio Novo, Minas Gerais	BR	Costa et al. 2009
<i>Xenodon rabdocephalus mexicanus</i>	ter.	Tikal National Park	GT	Parker 1990
Unidentified colubrid/dipsadid	-	Beni	BO	Padial et al. 2003
Unidentified colubrid/dipsadid	-	Apiacás, Mato Grosso	BR	Roberto Seckendorff (WA 1171280)
Unidentified colubrid/dipsadid ("cobra-cipó")	-	Xavantina, Mato Grosso	BR	Schubart et al. 1965

Table 1. (continued)

Prey	Habit	Locality	Country	Reference
Unidentified colubrid/dipsadid		Coronel Xavier Chaves, Minas Gerais	BR	Francisco Assis Rodrigues (WA 464421)
Unidentified colubrid/dipsadid	-	Jacareacanga, Pará	BR	Lourenço David (WA 1165924)
Unidentified colubrid/dipsadid	-	Tibagi, Paraná	BR	André Penteado (WA 760211)
Unidentified colubrid/dipsadid	-	Maricá, Rio de Janeiro	BR	Luiz Moschini De Souza (WA 1153124)
Unidentified colubrid/dipsadid		Cabixi, Rondônia	BR	José Silva (WA 888097)
Unidentified colubrid/dipsadid		Chupinguaia, Rondônia	BR	Luciano Faria (WA 658389)
Unidentified colubrid/dipsadid		Chupinguaia, Rondônia	BR	Fernando Araujo (WA 571132)
Unidentified colubrid/dipsadid	-	Joinville, Santa Catarina	BR	Vilde Florencio (WA 1068343)
Unidentified colubrid/dipsadid	-	Guaratinguetá, São Paulo	BR	Rafael Moreira (WA 633336)
Unidentified colubrid/dipsadid	-	Rio Claro, São Paulo	BR	Geraldo Panucci (WA 1061293)
Unidentified colubrid/dipsadid	-	Santa Fé do Sul, São Paulo	BR	Eric Gallardo (WA 1014137)
Unidentified colubrid/dipsadid	-	São José dos Campos, São Paulo	BR	Sérgio Coutinho Jr. (WA 583943)
Unidentified colubrid/dipsadid	-	El Angolo	EC	Miller et al. 2010
Elapidae				
<i>Micrurus diastema sapperi</i> ⁵	fos.	Tikal National Park	GT	Parker 1990, Enamorado Guzmán & Arévalo Orrego 1992
<i>Micrurus fulvius</i>	fos.			Ferguson-Lees & Christie 2001
<i>Micrurus lemniscatus carvalhoi</i> ⁶	fos.	Rio Verde, Goiás	BR	Sazima & Abe 1991
<i>Micrurus nigrocinctus nigrocinctus</i> ⁷	fos.	Isla Boca Brava	PA	Du Val et al. 2006
<i>Micrurus nigrocinctus zulinensis</i> ⁸	fos.	Tikal National Park	GT	Parker 1990
<i>Micrurus pyrrhocryptus</i>	fos.	Reserva El Bagual	AR	Di Giacomo 2005
<i>Micrurus</i> sp.	fos.	Tikal National Park	GT	Parker 1990, Parker et al. 2012
<i>Micrurus</i> sp.	fos.	El Recreo	NI	Brattstrom 1955, Howell 1957
Unidentified elapid	fos.	El Angolo	EC	Miller et al. 2010
Viperidae				
<i>Agkistrodon bilineatus</i>	ter.	Tikal National Park	GT	Parker 1990
<i>Atropoides mexicanus</i> ⁹	ter.	Tikal National Park	GT	Parker 1990, Enamorado Guzmán & Arévalo Orrego 1992
<i>Bothriechis schlegelii</i>	arb.	Parque Nacional Carara	CR	Laurencio 2005
<i>Bothrops asper</i>	ter.		CR	Sasa et al. 2009
<i>Bothrops asper</i>	ter.	Tikal National Park	GT	Parker 1990, Parker et al. 2012
<i>Bothrops jararaca</i> ¹⁰	ter.	Bahia	BR	Wagler 1824
<i>Bothrops</i> sp.	ter.	Rio Pandeiros, Minas Gerais	BR	This study
<i>Bothrops</i> spp. ¹¹	ter.	San Isidro del General	CR	Skutch 1993
<i>Crotalus durissus</i>	ter.	Matozinhos, Minas Gerais	BR	Specht et al. 2008
<i>Crotalus durissus</i>	ter.	Lagoinha, São Paulo	BR	Michel Cezar (WA 177285)
<i>Porthidium</i> sp. ¹²	ter.	Tikal National Park	GT	Parker 1990
Unidentified snakes				
1	-	Lower Picomayo	BO	Kerr 1892
2	-	Aquidauana, Mato Grosso do Sul	BR	José P. Júnior (WA 462103)
3 (fangs, vertebrae and scales)	-	Matozinhos, Minas Gerais	BR	Specht et al. 2008
4	-	Rio Novo, Minas Gerais	BR	Costa et al. 2009
5	-	San Isidro del General	CR	Skutch 1993
6	-		EC	Sclater 1860
7	-	Jorupe	EC	Miller et al. 2010
8	-	Tikal National Park	GT	Enamorado Guzmán & Arévalo Orrego 1992
9 (four specimens)	-	-	GY	Penard & Penard 1908
10				
11	-		PE	Taczanowski 1884
12	-		SR	Haverschmidt 1962

Table 1. (continued)

Prey	Habit	Locality	Country	Reference
13	-		SR	Voous 1969
14	-	Cantaura	VE	Friedmann & Smith 1950
15	-	Fundo Pequario Masaguaral	VE	Mader 1981
Unidentified Reptiles				
1 (vertebrae and scales)	-	Xavantina, Mato Grosso	BR	Schubart et al. 1965
2 (small reptiles)	-		SV	Dickey & von Rossem 1938
3	-	Tikal National Park	GT	Enamorado Guzmán & Arévalo Orrego 1992
Birds				
Phasianidae				
<i>Gallus gallus</i>	ter.		GY	Quelch 1891 <i>apud</i> Chubb 1916
Tyrannidae				
<i>Hirundinea ferruginea</i>	fly./arb.	Matozinhos, Minas Gerais	BR	Specht et al. 2008
Tytonidae				
<i>Tyto alba</i>	fly./arb.	Matozinhos, Minas Gerais	BR	Specht et al. 2008
Unidentified birds				
1	-	Tikal National Park	GT	Enamorado Guzmán & Arévalo Orrego 1992, Parker et al. 2012
Mammals				
Chiroptera				
Unidentified bats	fly./arb.	Minas Gerais and Bahia	BR	Sick 1997
Lagomorpha				
Leporidae				
<i>Sylvilagus brasiliensis</i>	ter.	Matozinhos, Minas Gerais	BR	Specht et al. 2008
Rodentia				
Cricetidae				
<i>Calomys</i> sp. ¹³	ter.	Matozinhos, Minas Gerais	BR	Specht et al. 2008
Unidentified rodents	-	Tikal National Park	GT	Parker et al. 2012
Unidentified rodent (head and foreparts)	-	El Recreo	NI	Howell 1957
Unidentified Mammals				
1		Xavantina, Mato Grosso	BR	Schubart et al. 1965
Fish				
Synbranchidae				
<i>Synbranchus marmoratus</i>	aq.	Reserva El Bagual	AR	Di Giacomo 2005
Unidentified fish	aq.	Tikal National Park	GT	Parker et al. 2012

1. Cited as *Chironius scurrulus*. We update the species identification to *C. grandisquamis*, the only *Chironius* known to Guatemala (Dixon et al. 1993).
2. Cited as *Leptophis ahaetulla*. We update the identification to *L. a. marginatus*, the only subspecies of *L. ahaetulla* known to Argentina (Albuquerque 2008).
3. Cited as *Liophis jaegeri*. We update the identification to *L. j. coralliventris*, the only subspecies of *L. jaegeri* known to Argentina (Dixon 1987).
4. Cited as *Dromicus lineatus*. We update the identification following Curcio et al. (2009).
5. Cited as *Micrurus diastema alienus*. We update the identification to *M. d. sapperi*, the subspecies known to the region of Tikal, according to Campbell & Lamar (2004, map 9).
6. Cited as *Micrurus lemniscatus*. We update the identification to *M. l. caralloi*, the subspecies expected to occur in Goiás (Campbell & Lamar 2004, map 33).
7. Cited as *Micrurus nigrocinctus*. We update the identification to *M. n. nigrocinctus*, the subspecies known to western Panama (Campbell & Lamar 2004, map 24).
8. Cited as *Micrurus nigrocinctus divaricatus*. We update the identification to *M. n. zulimensis*, the subspecies known to Guatemala (*M. n. divaricatus* is restricted to Honduras) (Campbell & Lamar 2004, map 24).
9. Cited as *Porthidium nummifer*. We update the identification to *Atropoides mexicanus* following Campbell & Lamar (2004, map 41).
10. Cited as *Bothrops leucostigma*, synonym of *B. jararaca* (McDiarmid et al. 1999). There is a record by Spix (1824), probably based on the same prey and predator cited by Wagler (1824), but naming the snake as *Bothrops fuscatus*, a *nomen nudum*.
11. Some Costa Rican species current in the genera *Atropoides*, *Bothriechis*, *Cerropidion* and *Porthidium* were also named as *Bothrops* by several previous authors (Savage 2002).
12. *Porthidium nasutum* is the only species of the genus expected to occur at Tikal (Campbell & Lamar 2004, map 87), but at that time *Atropoides mexicanus* (recorded at Tikal) was also included in *Porthidium* (Campbell & Lamar 2004).
13. Cited as *Calomys callosus*, which, in Brazil, occurs in the state of Mato Grosso do Sul (Bonvicino et al. 2008). Three species of *Calomys* are known to Minas Gerais, sometimes in sympatry (*C. cerqueirai*, *C. expulsus*, *C. tener*) (Bonvicino et al. 2010), leading us to adopt no species identification in our list.

Twelve species/subspecies of pit vipers (Viperidae) and coral-snakes (Elapidae) were recorded as prey of Laughing Falcons. Resistance to snake venom is not proved for this species, but its hunting behavior allied with thick and concave scales in the tarsi and feet may protect it against snake bites (Parker 1990, DuVal et al. 2006).

Herpetotheser cachinnans is a taxonomic generalist regarding the snake prey it chooses. It eats virtually any species of snake of small to medium size, with the longest prey recorded measuring about 120 cm (Miller et al. 2010). This lack of specialization is also shared with its Old World ecological counterpart, the Sort-toed Snake Eagles (*Circaetus gallicus*) (Gil & Pleguezuelos 2001).

A snake-based diet seems to be uncommon in birds of prey. To our knowledge, only *H. cachinnans* presents such high degree of diet specialization in the Neotropics. Hawks of the genus *Leucopernis* also prey frequently upon snakes in the Neotropics (Thiollay 1994), but snakes rarely comprise more than 50% of the prey ingested, at least for *L. albicollis*, the best studied species in the genus (Draheim et al. 2012). In the Old World, the six species of Snake-eagles in the genus *Circaetus* (Accipitriformes), and the six species of Serpent-eagles (*Spilornis*) are also highly specialized on snakes (Thiollay 1994, Ferguson-Lees & Christie 2001), but detailed prey data is not available for most species. This is a clear example of convergent evolution, because these species are not closely related, belonging to distinct orders (see Hackett et al. 2008 for the non-monophyly of the broadly defined Falconiformes). On the other hand, some raptor species popularly acknowledged as being voracious snake-eaters, such as Secretarybirds (*Sagittarius serpentarius*), feed mainly on large ground insects and rodents (Ferguson-Lees & Christie 2001).

Data summarized here reinforces that Laughing Falcons are specialized snake-eaters but much remains to be known about their diet and foraging behavior, especially because of the lack of long-term quantitative studies. Differences on the composition of the diet of this species between forested and non-forested habitat also needs to be investigated taking into account the availability of prey in both habitats.

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