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SHORT COMMUNICATION

Feeding habits of ocelot (*Leopardus pardalis*) in Southern Brazil

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Introduction

The ocelot, *Leopardus pardalis* (Linnaeus, 1758), has a widespread distribution throughout the American continent, occurring in open environments, rainforests, flood plains, and coniferous forests (Emmons and Feer 1997). Ocelots have nocturnal activity peaks (Crawshaw and Quigley 1989; Emmons 1987, 1988; Ludlow and Sunquist 1987; Maffei et al. 2005), which, according to Emmons (1987) would be associated with the activity of their prey. Studies have often shown opportunistic feeding habits for ocelots (Ludlow and Sunquist 1987) related to the high consumption of small-bodied mammals below 1 kg in weight (Emmons 1987, 1988; Ludlow and Sunquist 1987). Diet choice plays a fundamental role in felid biology (Crawshaw 1992) and felids play an important role as top predators in the regulation of prey populations in Neotropical ecosystems (Terborgh 1990).

Studies addressing this theme are urgent in the case of the Araucaria Pine Forest (Lucherini et al. 2004), given the high level of degradation of this environment (Lange and Jablonski 1981). *L. pardalis* is a vulnerable species according to the Brazilian checklist of endangered species (Chiarello 2005). The goal of the present study is to provide qualitative and quantitative data regarding the diet of *L. pardalis* in this environment.

The present study was carried out in an approximately 700 ha forest remnant. This region is situated within the domain of the Araucaria Pine Forest with an interface with the Natural Grassland. The study area is located in the Bugre district, municipality of Balsa Nova, Eastern Paraná (25°29′S and 49°39′W). Its vegetation includes secondary forests, primary forests that have been altered by selective logging and natural grasslands. The terrain is very rugged, with altitudes between 935 and 1145 m above sea level. The climate in the region is described as mesothermic, constantly humid and with mild summer, with annual precipitation of 1600 mm and average annual temperature of 18 °C.

Fecal samples of *L. pardalis* were collected between February of 2002 and March of 2005 from all the vegetational formations in the study area. Feces were identified based on the monitoring of defecation sites using camera traps, associated tracks, and their characteristic length and diameter, with unidentifiable samples being discarded (see Villa-Meza et al. 2002; Wang 2002). Collected samples were dried and processed in the laboratory, where the items were separated (hard parts, nails, fangs, teeth) and were later identified using specimens previously deposited in scientific

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collections. The presence of each food item was quantified in all fecal samples to provide its frequency of occurrence (FO), reported as a percentage of the total number of fecal samples. An estimate of the minimum number of consumed individuals was provided by counting claws, teeth, and mandibles in each fecal sample. This number was used to provide the percent of occurrence (PO) in the diet of the ocelot (see Konecny 1989; Wang 2002). The mass of the consumed prey was estimated based on the means presented by Redford and Eisenberg (1999) for the identified items. This allowed to estimate the biomass ingested by these animals (estimated biomass = average prey weight × number of individuals in the fecal samples) (Wang 2002). Arthropod fragments and plant material in the feces were not quantified (see Villa-Meza et al. 2002).

A total of 42 fecal samples were analyzed, from which 24 food items were distributed among 100 occurrences (Table 1). Mammalia accounted for most of the animals eaten by *L. pardalis* (FO = 100%; PO = 78%), followed by Aves (FO = 38%; PO = 16%) and Squamata (FO = 12%; PO = 5%). Among mammals, the smallest prey (<100 g) were the most frequently consumed (FO = 76%; PO = 51%). The prey with body mass >1000 g were the second most consumed (FO = 50%; PO = 15%), followed by prey of intermediate mass (100–1000 g) (FO = 12%; PO = 5%). Terrestrial mammals were the most commonly consumed (FO = 98%; PO = 60%; consumed biomass = 36.5%), although arboreal mammals were also significantly recorded and contributed most biomass (FO = 41%; PO = 17%; consumed biomass = 63.6%). An analysis based on the estimate of consumed biomass showed the great importance of the consumption of *Alouatta clamitans* (38.3%) and Rodentia (30.6%), particularly the species *Sphiggurus* sp. (25.1%). The Xenarthra represented the third most-consumed biomass (16.3%), followed by Artiodactyla (14.5%).

The high occurrence of mammals in the diet of *L. pardalis* was also recorded by other authors, including some specialization in this type of prey (Bisbal 1986; Chinchilla 1997; Emmons 1987, 1988; Facure and Giaretta 1996; Konecny 1989; Ludlow and Sunquist 1987; Mondolfi 1986; Wang 2002). Similarly, other studies have shown similar percentages of birds consumed by *L. pardalis* (Emmons 1988; Mondolfi 1986), indicating some degree of importance in its diet. The consumption of squamates has also been reported in the literature, although often in lower proportions (Chinchilla 1997; Emmons 1987, 1988; Ludlow and Sunquist 1987). However, in Mexico, Villa-Meza et al. (2002) indicated that the lizard *Ctenosaura pectinata* (Wiegmann 1834) was the most important food item of *L. pardalis*, together with mammals.

Among the Mammalia, there was a concentration of prey smaller than 100 g, which corroborates the pattern already observed by other authors (Bisbal 1986; Chinchilla 1997; Emmons 1987, 1988; Facure and Giaretta 1996; Konecny 1989; Ludlow and Sunquist 1987; Mondolfi 1986; Wang 2002). This probably reflects the opportunistic foraging strategy of this species (Emmons 1987, 1988; Ludlow and Sunquist 1987), given that rodents are among the most abundant potential prey items in Neotropical forests (Solari and Rodrigues 1997). On the other hand, there was great use of large-bodied mammals as well (>1000 g). The consumption of *Mazama guazoubira* by *L. pardalis* raises doubts regarding its form of retrieval, whether by predation or by consumption of a carcass. Villa-Meza et al. (2002) reported the frequent used of the deer *Odocoileus virginianus* (Zimmermann 1780) and attributed it to carcass consumption. However, Konecny (1989) suggested that *L. pardalis* can indeed subdue animals larger than itself such as *Mazama americana* (Illiger 1811). Ludlow and Sunquist (1987) suggested that these attacks on large-bodied animals could be attributed to adult males, which are approximately 25% larger than adult females.

Some authors have suggested that ocelots are preferentially terrestrial predators (Emmons 1988; Ludlow and Sunquist 1987). The consumption of predominantly arboreal mammals with relatively important ingested biomass (*Gracilinanus microtarsus*, *A. clamitans* and *Sphiggurus* sp.) may indicate some degree of hability of *L. pardalis* to prey on the arboreal stratum. This possibility had already been raised by Cabrera and Yepes (1961). Other studies have also shown the occurrence of essentially arboreal species in its diet: *Alouatta* spp. (Ximenez 1982); *Dryocopus* sp. (Bisbal 1986); *Tamandua mexicana* (Saussure 1860) (Konecny 1989); *Sphiggurus mexicanus* (Kerr 1792), *Potos flavus* (Schreber 1774) and *Iguana iguana* (Linnaeus, 1758) (Chinchilla 1997); *Bradypus variegatus* (Schinz 1825) (Wang 2002); *A. clamitans*, *Brachyteles hypoxanthus* (Khul 1820) and *Cebus apella* (Linnaeus 1758) (Bianchi and Mendes 2007; Miranda et al. 2005). Tewes and Schmidly (1987) reported the attraction of ocelots by playback of prey vocalization. Predation on howlers might reflect the strong vocalizations that are characteristic of this genus, as has been shown in the case of predation attempts by *Spizaetus tyrannus* (Wied 1820) on *A. clamitans* (Miranda et al. 2006).

Although the present study has highlighted the importance of bigger prey, ocelot's diet is most commonly based on small prey. Given that small rodents are the most abundant mammals in Neotropical forests (Solari and Rodrigues 1997), the tendency of feeding on small prey may give ocelots some adaptability to survive in disturbed or patchy environments, where bigger prey are more scarce.

Table 1. Species consumed by *Leopardus pardalis* in a remnant of Araucaria Pine Forest in the State of Paraná, Southern Brazil

Consumed items	No. of feces with the item	FO (%)	*N* of consumed items	PO (%)	Total biomass (g)	% of biomass
MAMMALIA						
Didelphimorphia						
Didelphidae						
Gracilinanus microtarsus (Wagner, 1854)	04	10	04	4	120	0.1
Monodelphis sp.	02	5	02	2	100	0.1
Total Didelphimorpha	06	14	06	6	220	0.2
Primates						
Atelidae						
Alouatta clamitans (Humbolt, 1812)	07	17	07	7	43,050	38.3
Total Primates	07	17	07	7	43,050	38.3
Artiodactyla						
Cervidae						
Mazama guazoupira (G. Fischer, 1814)	01	2	01	1	16,300	14.5
Total Artiodactyla	01	2	01	1	16,300	14.5
Xenarthra						
Dasypodidae						
Dasypus novemcinctus Linnaeus, 1758	04	10	04	4	18,000	16
Dasypodidae N.I.	02	5	02	2	–	
Total Xenarthra	06	14	06	6	18,000	16
Rodentia						
Dasyproctidae						
Dasyprocta azarae Linchtenstein, 1823	01	2	01	1	2700	2.4
Erethizontidae						
Sphiggurus sp.	06	14	06	6	28,200	25.1
Muridae						
Unidentified Muridae (>100 g)	01	2	01	1	250	0.2
Unidentified small Muridae (<100 g)	17	40	36	36	1800	1.6
Nectomys squamipes (Brants, 1827)	02	5	02	2	500	0.4
Holochilus brasiliensis Thomas, 1928	02	5	02	2	460	0.4
Thaptomys nigrita (Linchtenstein, 1829)	01	2	01	1	50	<0.1
Brucepattersonius iheringi (Thomas, 1896)	01	2	01	1	50	<0.1
Oligoryzomys nigripes (Olfers, 1818)	01	2	01	1	40	<0.1
Oligoryzomys sp.	02	5	02	2	80	0.1
Necromys lasiurus (Lund, 1841)	02	5	02	2	100	0.1
Akodon sp.	02	5	03	2	120	0.1
Total Rodentia	37		58	57	34,350	30.6

Table 1. (*continued*)

Consumed items	No. of feces with the item	FO (%)	*N* of consumed items	PO (%)	Total biomass (g)	% of biomass
AVES						
Tinamiformes						
Tinamidae						
Nothura maculosa Temminck, 1815	01	2	01	1	250	0.2
Aves N.I.	15	36	15	15	–	
Total Aves	16	38	16	16	250	0.2
REPTILIA						
Squamata						
Colubridae						
Colubridae N.I.	02	5	02	2	–	
Squamata N.I.	02	5	02	2	–	
Amphisbaenidae						
Amphisbaenidae N. I.	01	2	01	1	100	0.1
Total Squamata	05	12	05	5	100	0.1
OTHERS						
Eggs	01	2	01	1		
TOTAL	–	–	100	100	112,270	100

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