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ORIGINAL ARTICLE

Geographic distribution and food habits of *Leopardus tigrinus* and *L. geoffroyi* (Carnivora, Felidae) at their geographic contact zone in southern Brazil

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The objective of this study is to define the geographic distribution of *Leopardus tigrinus* and *L. geoffroyi* in one of the few regions of South America where they co-occur, the state of Rio Grande do Sul (RS), in southernmost Brazil. We compiled 133 records for both species and constructed a distribution map, which shows sharp geographic segregation between them. *Leopardus tigrinus* was found to be associated more with forested ecoregions in the northern part of the state, while *L. geoffroyi* records were mainly associated with open habitats of the Pampas biome in southern RS. We present data on the diet of these two species that indicate trophic niche separation between them in this region of geographic contact. Our results thus suggest that these species exhibit ecological partitioning with respect to habitat and prey, and that these factors may influence the observed pattern of limited spatial overlap in this region.

Keywords: contact zone; distribution; diet; Neotropical felids

Introduction

Leopardus tigrinus (oncilla) and *L. geoffroyi* (Geoffroy's cat) are small Neotropical cats whose distributions are essentially parapatric. Co-occurrence of these species has been recorded in only a few regions of South America, including southern Brazil, Bolivia, Paraguay and northern Argentina (Nowell & Jackson 1996; Sunquist & Sunquist 2002) (Figure 1). Very little is known about the extent of geographic contact between these species in areas of overlap, or their ecological relationships in putative regions of sympatry. In Brazil, co-occurrence has only been recorded in the southernmost state of Rio Grande do Sul (RS), which was the focus of a preliminary analysis of their spatial overlap based on a compilation of data from sources such as museum records and roadkills (Eizirik et al. 2006). That study suggested that they exhibit a segregated distribution in the state, with *L. tigrinus* mostly restricted to the north and *L. geoffroyi* to the south and west. The geographic overlap between the two distributions appeared to be narrow and restricted to the central area of the state. This spatial segregation was hypothesized to derive from ecological aspects such as an association of each species to different habitats or prey (Eizirik et al. 2006). This hypothesis was not further assessed.

To test whether this pattern of spatial segregation is robust to additional sampling, the survey for geographic records of these species in the region needs extending, with assessment of ecological characteristics that may play a role in maintaining this separation. These include habitat associations and prey. Neither of these characteristics has been assessed for these species in a region of apparent sympatry. Although large-scale analyses indicate that *L. tigrinus* seems to be more associated with forested areas, and *L. geoffroyi* mostly occurs in open habitats (Nowell & Jackson 1996; Nowak 1999), there seem to be exceptions to these patterns (e.g. Ximenez 1975; Johnson & Franklin 1991; Olmos 1993; Oliveira 2011).

Likewise, dietary studies of these species are insufficient to address this problem. Although several studies have described the diet of *L. tigrinus* and *L. geoffroyi* using stomach contents and/or faecal samples (Gardner 1971; Ximenez 1982; Johnson & Franklin 1991; Olmos 1993; Facure & Giaretta 1996; Novaro et al. 2000; Wang 2002; Manfredi et al.

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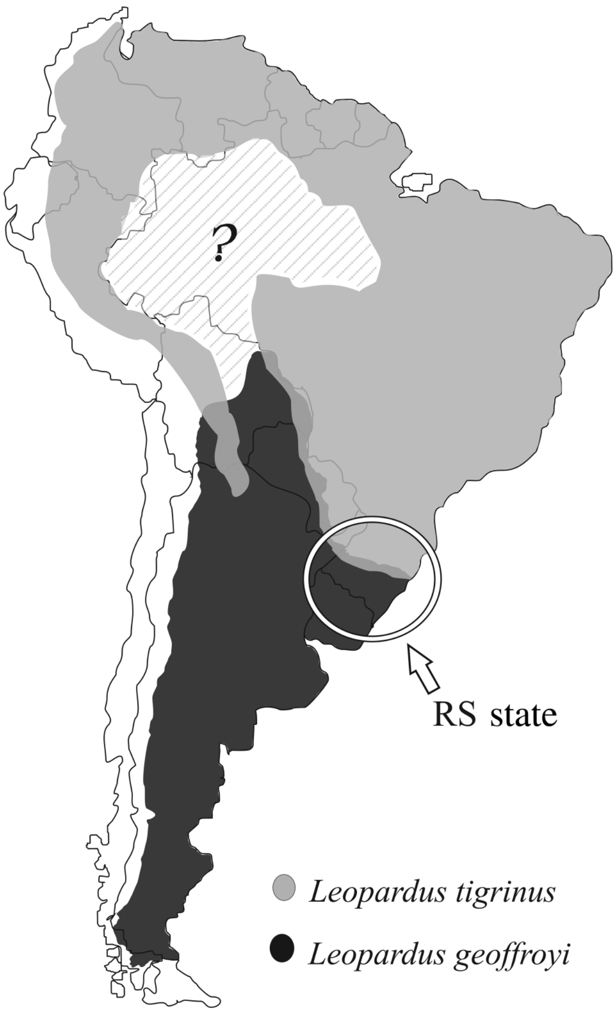

Figure 1. Map of the geographic distribution of *L. tigrinus* (in gray) and *L. geoffroyi* (in black) in South America (modified from Nowell & Jackson 1996; Sunquist & Sunquist 2002; Oliveira 2004). The circle outlines Rio Grande do Sul, the study area where the contact zone has been defined; the hatched area with a question mark indicates that the continuity of the *L. tigrinus* distribution through the Amazon region is presently uncertain.

2004; Canepuccia et al. 2007; Bisceglia et al. 2008; Sousa & Bager 2008), most of them did not address both species at the same time, and none focused on their food habits in areas of geographic proximity.

To refine the map of their geographic contact zone and to evaluate if these species are associated with different ecoregions, we compiled a dataset of *L. geoffroyi* and *L. tigrinus* localities in RS. We also investigated the diet of these cats in this area, based on the analysis of gastrointestinal contents.

Materials and methods

Sample collection

Our dataset of geographic occurrences for *L. tigrinus* and *L. geoffroyi* in RS incorporates most of the information compiled by Eizirik et al. (2006), but we include only records obtained since 1990 so as to assess the current distribution more precisely. We also removed one recent record (from Rio Grande municipality) whose reliability was considered dubious by those authors. To this database, we added 58 new records from: (1) specimens deposited in Brazilian museums; (2) specimens captured or killed in farm areas and recorded by environmental law enforcement agencies; (3) road-killed specimens; and (4) captive individuals with known geographic origin. The total sample comprises 133 records, including 60 *L. tigrinus* from 46 municipalities, and 73 *L. geoffroyi* from 36 municipalities (Table 1 and Appendix).

Due to the different sources of records included in this study, the precision of our locations varied from exact geographic coordinates to the level of the municipality. In the latter case, we assigned the individual's location to central coordinates of the municipality. The geographic coordinates in decimal degrees were obtained and standardized with GPS TRACKMAKER (Ferreira Júnior, O.: http://www.trackmaker.com).

Spatial distribution and association with ecoregions

To visualize their pattern of distribution in different ecoregions of the state, the coordinates of individual records were plotted onto RS vegetation maps using ARCVIEW 3.2 (ESRI, Redlands, CA, USA). The vegetation map (IBGE 1993) was based on the classification produced by IBGE (1986, 1992) (Figure 2), and comprises two main vegetation categories: the grassland formations that predominate in the southern half of the state and the forested vegetation covering most of its northern half. The grassland formations include two specific regions: steppe and steppical savanna. Within the steppes, three main categories are distinguished by the density of shrubby and arboreal vegetation: arboreal steppe, park steppe and grass steppe. Given our small sample size at the local level, in our analyses we merged the three steppe types into a single operational category. The forested formations included the ecoregions of dense and mixed ombrophilous forests, and deciduous and semideciduous seasonal forests. Also due to limited sample size, we merged the dense and mixed ombrophilous forests into a single category. In addition to these predominant formations, two intermediate regions with mixed herbaceous, shrubby and arboreal vegetations were considered: (i) the pioneer formations in the coastal portion of the state, which is covered with vegetation in constant succession; and (ii) the ecological tension areas concentrated in the central portion of the state, and characterized by the interpenetration of

Table 1. Summary of *Leopardus tigrinus* and *L. geoffroyi* records used in the analyses of geographic distribution, including those previously published by Eizirik et al. (2006) and those obtained in this study.

	Type of record						
	Museum collection	Roadkill	Captive	Capture by rural owner	Killed by rural owners	Others	Total
L. tigrinus							
Eizirik et al. (2006)	7	12	6	3	0	1	29
This study	6	13	7	2	1	2	31
Total	13	25	13	5	1	3	60
L. geoffroyi							
Eizirik et al. (2006)	7	17	9	3	1	9	46
This study	6	15	4	2	0	0	27
Total	13	32	13	5	1	9	73

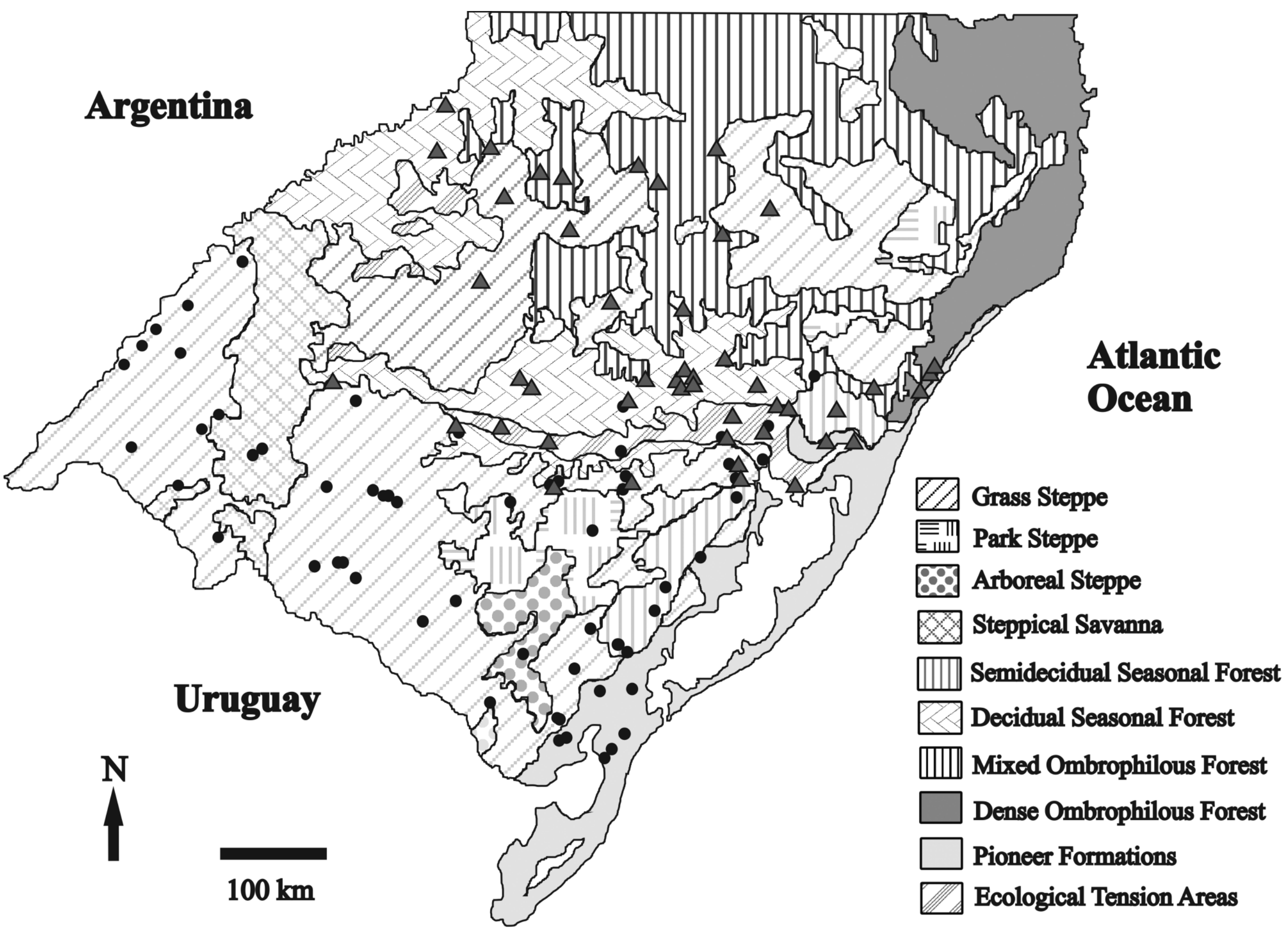

Figure 2. Distribution of the geographic records obtained for *L. tigrinus* (gray triangles) and *L. geoffroyi* (black circles) relative to the recognized ecoregions of Rio Grande do Sul state, southern Brazil.

different floras such as steppe and deciduous seasonal forest.

To remove potential noise in the dataset induced by some records with inexact geographic origin, for this analysis we only considered individuals with precise coordinates and those originating from municipalities contained in a single ecoregion. Therefore, this reduced sample included a total of 39 and 46 records of *Leopardus tigrinus* and *Leopardus geoffroyi*, respectively (Appendix). To evaluate the categories that were associated with each of the species, differences in species and ecoregion associations were analyzed using chi-square tests, followed by a residual analysis.

Analysis of food habits

Some of the individuals that were found dead on roads or farms and were included in the spatial analysis had intact digestive tracts that were used to evaluate diet. We collected the entire digestive tract (including stomach, intestinal and rectal contents) from all available animals, totaling 13 *L. tigrinus* and 17 *L. geoffroyi*. This constitutes the largest sample of this type of material (allowing more in-depth dietary analysis relative to feces) that has so far been surveyed for these cats (e.g. Ximenez 1982; Novaro et al. 2000).

The digestive tract contents were washed and sieved (mesh width 0.8 mm) under running water to separate the undigested material: teeth, jaw fragments, other bones, hair, nails, scales, bird feet, beaks, feathers, plant material and in some cases the entire bodies of prey. Only contents derived from vertebrate prey were included in analyses, as this is commonly viewed as the main source of nutrition for felids (e.g. Sunquist & Sunquist 2002), and these items allowed for more precise identification. The retrieved items were initially sorted into broad taxonomic categories such as mammals, birds, reptiles, amphibians, and fish; and then identified as precisely as possible. For mammalian prey items, taxonomic decisions and nomenclature followed Wilson & Reeder (2005) and Weksler et al. (2006).

Dietary data were analyzed by assessing the frequency of occurrence (FO) of each item, as well as its relative frequency (RF). The former is the proportion of samples in which a particular item has been found, and is obtained by dividing the number of samples that contain that food item by the total number of samples. The relative frequency of a dietary item is calculated as its proportion of occurrence relative to the total number of identified items; it is obtained by dividing the number of times a particular item has been recorded by the total number of items (including multiple occurrences per item).

For the identified mammalian prey items, we also estimated the ingested biomass. The weight of each mammalian prey species was calculated from the mean weight of 15 specimens randomly captured in different areas of RS (all specimens were deposited in the zoological collection of the "Museu de Ciências Naturais da Universidade Luterana do Brasil – MCNU". The contribution (in percent) of each mammalian prey species to the total biomass (relative biomass – RB) was combined with the frequency of occurrence and the relative frequency (calculated only for the mammalian items) to evaluate the importance of each prey in the diet of *L. tigrinus* and *L. geoffroyi*, using the index of relative importance: IRI = (%RF + %RB) FO% (Pinkas et al. 1971). The differences between the two diets were assessed with chi-square tests.

Results

Spatial distribution

Leopardus tigrinus records were restricted to the central-northern region of RS, while those of *L. geoffroyi* were restricted to the central-southern area (Figure 2). A single record was a geographic outlier relative to this pattern, involving an individual of *L. geoffroyi* from the municipality of Canela, in the central-northern portion of the state. The simultaneous occurrence of both cat species was recorded in only eight municipalities located in the central part of the state: Cachoeira do Sul, Eldorado do Sul, Guaíba, Pantano Grande, Porto Alegre, Santa Cruz do Sul, Santa Maria and Triunfo (Appendix).

Association with ecoregions

The distribution of records with respect to the different ecoregions of RS showed both species occurring in all of them, except for the steppical savanna, where only *L. geoffroyi* was recorded, and for the ombrophilous forests, with only *L. tigrinus* records. In spite of the overlap in several of the ecoregions, the overall frequency of occurrence was markedly different between the species. Forested formations were the main ecoregions associated with *L. tigrinus* records (58.97%), compared to grassland formations (20.51%), pioneer formations (10.26%) and ecological tension areas (10.26%). In contrast, *L. geoffroyi* records were predominantly associated with grassland formations (63.04%), followed by records in pioneer formations (21.74%), forested habitats (10.87%) and transitional areas (4.35%) (Figure 3). A chi-square test followed by a residual analysis indicated a significant differentiation in their occurrence among ecoregions ($\chi^2 = 33.09$, d.f. = 6, $p < 0.001$), with a positive association between *L. tigrinus* and deciduous seasonal and ombrophilous forests, and *L. geoffroyi* being significantly associated with steppes ($p < 0.05$). Considering only the two main vegetation categories, i.e. grasslands (steppe/savanna) and forests, the two cat species differed significantly in their ecoregion association ($\chi^2 = 23.40$, d.f. = 1, $p < 0.001$).

Food habits of the oncilla and Geoffroy's cat

In diet, mammals were by far the main prey taxa of both species. They were present in all samples, and represented mostly by rodents (Table 2). Birds were recorded for both species, with a higher frequency of occurrence in the *L. tigrinus* sample. Amphibians, reptiles and invertebrates were present at very low frequencies, with the former recorded only for *L. geoffroyi*. Plants were observed in almost all *L. tigrinus*

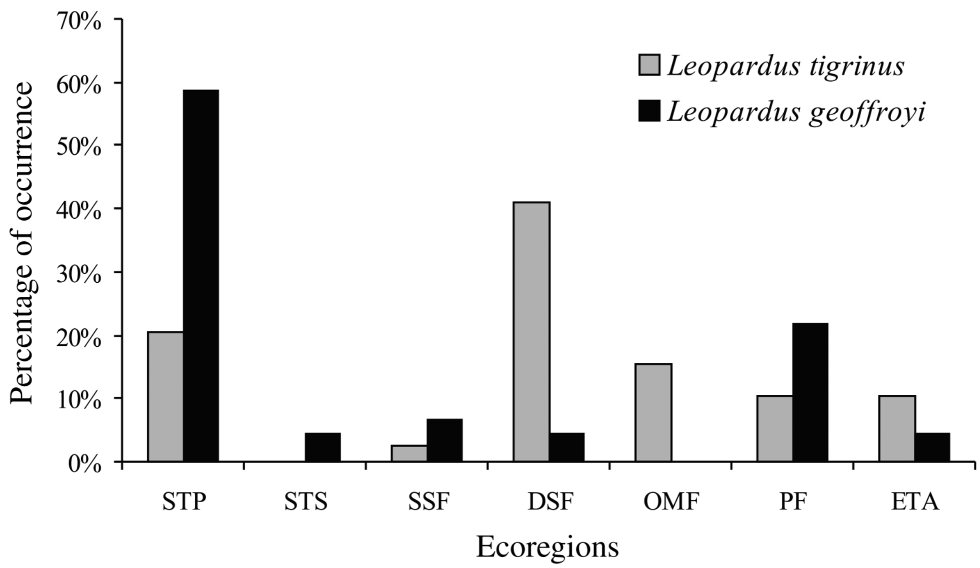

Figure 3. Frequency of occurrence of *Leopardus tigrinus* and *L. geoffroyi* records in the seven ecoregions used in this study. Note: STP = steppe, STS = steppical savanna, SSF = semideciduous seasonal forest, DSF = deciduous seasonal forest, OMF = ombrophilous forest, PF = pioneer formations and ETA = ecological tension areas.

samples (92.31%) and at a lower frequency for *L. geoffroyi* (70.59%).

There were significant differences in the prey spectrum of the two cat species ($\chi^2 = 40.38$, d.f. = 18, $p < 0.005$). Among the mammals, five taxa were found exclusively in the *L. tigrinus* diet: *Delomys dorsalis*, *Sooretamys angouya*, *Oxymycterus* sp., *Rattus rattus* and *Monodelphis* sp., while *Calomys* sp. and *Holochilus brasiliensis* were found only in the diet of *L. geoffroyi* (Table 2). The mammalian prey items that were shared also showed different relative frequencies for the two cats. While *Akodon* sp., *Mus musculus* and *Oligoryzomys* sp. were predominantly consumed by *L. tigrinus*, *Cavia* sp. was almost exclusively consumed by *L. geoffroyi*. In spite of the low number of records for birds, reptiles and amphibians, a suggestive segregation could be noted for these classes, with Columbiformes, Cuculiformes and Tinamiformes being found exclusively in the *L. tigrinus* diet, and Gruiformes, Passeriformes and Anura found only in the *L. geoffroyi* diet (Table 2).

There was also a significant differentiation in the diets of the cats with respect to prey body size ($\chi^2 = 6.74$, d.f. = 1, $p < 0.01$), with *L. tigrinus* preying more often on smaller species (<100g) than *L. geoffroyi* (Table 3, Figure 4). In the diet of *L. tigrinus*, small mammals occurred in higher frequency (81%) but contributed less (46%) to the total biomass consumed than larger mammals. The contrary was found in *L. geoffroyi* where larger species made up 50% of the mammalian prey but contributed over 90% to the total biomass consumed. The index of relative importance (IRI) indicated that the mammalian prey that most contributed to the diet of *L. tigrinus* were *Oligoryzomys* sp., *Akodon* sp. and *Rattus rattus*, while *Cavia* sp., *Holochilus brasiliensis* and *Oligoryzomys* sp. were the main prey items consumed by *L. geoffroyi* in our sample (Table 3).

Discussion

Spatial distribution of the oncilla and Geoffroy's cat in RS

The segregated geographic pattern of *L. tigrinus* and *L. geoffroyi* in RS state suggested by Eizirik et al. (2006) was corroborated by the expanded dataset presented here, with few municipalities recording the co-occurrence of these species, all located in the central area of the state. Our results reinforce the view that RS comprises the northern boundary of the *L. geoffroyi* distribution in Brazil, as well as the southern boundary of the *L. tigrinus* geographic distribution (Oliveira 1994; Nowell & Jackson 1996; Sunquist & Sunquist 2002). The contact zone between these two species was restricted to the central zone of the state, and is mapped more precisely with the database compiled here. Only one record expanded the occurrence of *L. geoffroyi* beyond this central region. As this involved a captive specimen (see Appendix), it is possible that its geographic origin may be erroneous. Therefore, additional evidence is needed to confirm the occurrence of *L. geoffroyi* north of the central area of RS.

Table 2. Comparison of abundance, frequency of occurrence (FO) and relative frequency (RF) of prey items recorded in the digestive tract contents of specimens of *Leopardus tigrinus* and *L. geoffroyi* killed on roads or farms in Rio Grande do Sul state, Brazil.

	L. tigrinus ($n = 13$)			*L. geoffroyi* ($n = 17$)		
Taxa	*n*	FO (%)	RF (%)	*n*	FO (%)	RF (%)
Mammalia	35	100	81.39	31	100	75.61
Cricetidae						
Akodon sp.	6	30.77	13.95	3	11.76	7.32
Calomys sp.	–	–	–	3	17.65	7.32
Delomys dorsalis	1	7.69	2.33	–	–	–
Holochilus brasiliensis	–	–	–	6	17.65	14.63
Oligoryzomys sp.	10	46.15	23.25	6	29.41	14.63
Sooretamys angouya	2	15.38	4.65	–	–	–
Oxymycterus sp.	3	15.38	6.97	–	–	–
Muridae						
Rattus rattus	5	15.38	11.62	–	–	–
Mus musculus	4	15.38	9.30	1	5.88	2.44
Caviidae						
Cavia sp.	1	7.69	2.33	7	35.29	17.07
Didelphidae						
Monodelphis sp.	1	7.69	2.33	–	–	–
Unidentified mammals	2	15.38	4.65	5	29.41	12.19
Aves	7	46.15	16.28	7	29.41	17.07
Columbidae	1	7.69	2.33	–	–	–
Columbina talpacoti	1	*	*	–	–	–
Cuculidae	1	7.69	2.33	–	–	–
Unidentified	1	*	*	–	–	–
Rallidae	–	–	–	2	11.76	4.88
Laterallus sp.	–	–	–	2	*	*
Passeriformes	–	–	–	3	11.76	7.32
Unidentified Furnariidae	–	–	–	1	*	*
Thamnophilidae						
Thamnophilus ruficapillus	–	–	–	1	*	*
Unidentified passeriform	–	–	–	1	*	*
Tinamidae	1	7.69	2.33	–	–	–
Unidentified Tinamidae	1	*	*	–	–	–
Unidentified birds	4	30.77	9.30	2	11.76	4.88
Reptilia	1	7.69	2.33	2	5.88	4.88
Sauria (Lacertilia)	–	–	–	2	5.88	4.88
Scincidae						
Mabuya dorsivittata	–	–	–	1	*	*
Anguidae						
Ophiodes sp.	–	–	–	1	*	*
Serpentes						
Unidentified snake	1	7.69	2.33	–	–	–
Amphibia	–	–	–	1	5.88	2.44
Unidentified Anura	–	–	–	1	5.88	2.44
Total invertebrates	–	7.69	–	–	17.65	–
Total plants	–	92.31	–	–	70.59	–

Note: *FO and RF were calculated for the group.

Differential distribution among RS ecoregions

The map indicates that the geographic zone where *L. tigrinus* and *L. geoffroyi* come into contact is characterized by the interpenetration of different vegetation types. This central area of the state is in the region of transition between the two main types of environment in RS: the southern pampas and the northern forests. The distribution of records in different ecoregions is consistent with the previous information on the large-scale habitat preferences of each species (Nowell & Jackson 1996; Nowak 1999; Sunquist & Sunquist 2002), with *L. tigrinus* mainly associated with forested habitats, and *L. geoffroyi* with grassland formations. In spite of this overall pattern, some *L. tigrinus* records were from areas of steppe, while some *L. geoffroyi* records were from forested habitats (deciduous and semideciduous forests). The use of forested habitats was reported for *L. geoffroyi* by

Table 3. Comparison of the biomass of mammalian prey consumed by *Leopardus tigrinus* and *L. geoffroyi* based on digestive tracts collected in Rio Grande do Sul (RS) state, Brazil.

		Leopardus tigrinus ($n = 13$)			*Leopardus geoffroyi* ($n = 17$)		
Taxon	MEW (g) ± *SE*	*n*	Σ weight (g)	IRI	*n*	Σ weight (g)	IRI
<100g							
Calomys sp.	9.26 ± 0.55	–	–	–	3	27.78	214
Mus musculus	10.40 ± 0.67	4	41.60	220	1	10.40	23
Oligoryzomys sp.	24.30 ± 1.79	10	243.00	2000	6	145.8	773
Akodon sp.	26.26 ± 2.66	6	157.56	819	3	78.78	156
Monodelphis sp.	31.95 ± 5.73	1	31.95	36	–	–	–
Delomys sp.	44.40 ± 1.40	1	44.40	41	–	–	–
Oxymycterus sp.	58.06 ± 4.09	3	174.18	283	–	–	–
Sooretamys angouya	87.40 ± 7.16	2	174.80	237	–	–	–
>100g							
Rattus rattus	112.06 ± 9.44	5	560.30	695	–	–	–
Holochilus brasiliensis	198.00 ± 22.81	–	–	–	6	1188.00	873
Cavia sp.	435.33 ± 38.94	1	435.33	202	7	3047.31	3340
Total biomass consumed		33	1863.12		26	4498.07	

Note: MEW = mean estimated weight, IRI = index of relative importance.

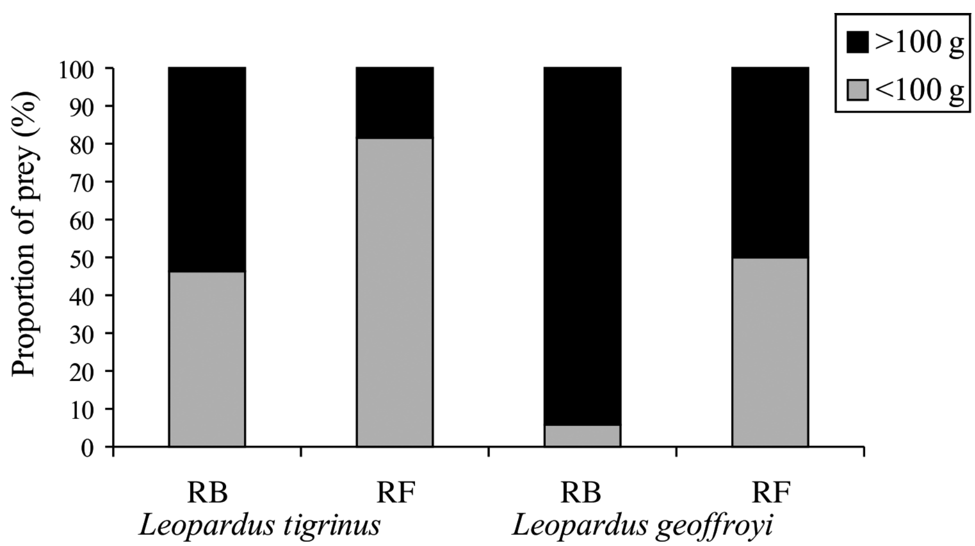

Figure 4. Relative frequency (RF) and relative biomass (RB) of mammalian food items ingested by *Leopardus tigrinus* and *L. geoffroyi*, based on an estimate of average weight of each mammalian prey species. Gray bars represent the proportion of prey of less than 100 g mass; black bars depict the values for prey of above 100 g mass.

Johnson & Franklin (1991) and Manfredi et al. (2006), while *L. tigrinus* has been reported in open biomes such as the Brazilian Caatinga and Cerrado (Ximenez 1982; Olmos 1993; Oliveira 1994, 2011). Both species seem to have some ecological plasticity with respect to habitat, with documented use of habitats greatly altered by deforestation, agriculture, ranching and planting of exotic trees (e.g. Oliveira 1994; Eizirik et al. 2006). We cannot assess in detail the degree to which these species can successfully occupy and exploit atypical habitats (i.e. forests for *L. geoffroyi* and grasslands for *L. tigrinus*) since our analysis was performed at the level of ecoregions, which are often internally heterogeneous. Given its relevance to understanding the ecology of these species, this problem should be the target of future, in-depth studies, focusing on fine-scale assessments of habitat utilization by these felids.

Comparative food habits

The dietary data indicate that small mammals, especially rodents, are the main items consumed by both species. This agrees with previous data for *L. geoffroyi* at different field sites in Argentina and Brazil (Novaro et al. 2000; Manfredi et al. 2006; Bisceglia et al. 2008; Sousa & Bager 2008) as well as from Gardner (1971), Facure & Giaretta (1996), and Wang (2002) for *L. tigrinus* in Costa Rica and in the Atlantic forest of southeastern Brazil. However, other studies documented different prey taxa as the main dietary items of these cats, especially in the case of *L. geoffroyi*. Johnson & Franklin (1991) found that European hares (*Lepus europaeus*) were the main prey of *L. geoffroyi* in southern Patagonia, and Manfredi et al. (2006) and Canepuccia et al. (2007) reported *L. geoffroyi* populations in Argentina to include large aquatic birds as important prey items. These variations in the main prey of *L. geoffroyi* suggest trophic adaptability of this species, which seems to be able to adjust its predatory behavior to exploit locally abundant food resources (Manfredi et al. 2004; Canepuccia et al. 2007; Pereira et al. 2012). Likewise, similar adaptability seems to be present in *L. tigrinus*, as Ximenez (1982) and Olmos (1993) documented reptiles rather than small mammals as the main prey items of this species in areas of xeromorphic vegetation in northeastern Brazil. The dietary composition of both species may be more influenced by the relative availability of different prey taxa associated with their preferred habitat than to a strong prey specialization in either of them.

The specific mammalian prey taxa that appeared at high frequencies for each species in some cases are related to the habitat type associated with each felid. Taxa recorded only in the *L. tigrinus* diet, such as *Sooretamys angouya* and *Delomys dorsalis*, are mainly associated with forested environments, while groups such as *Calomys* sp., *Cavia* sp. and *Holochilus brasiliensis*, recorded mostly in the *L. geoffroyi* diet, are predominantly associated with wet grasslands (Emmons & Feer 1997; Nowak 1999; Weksler et al. 2006). The same pattern was observed for one lizard species (*Mabuya dorsivittata*) identified in the diet of *L. geoffroyi*, which is also a species predominantly associated to open vegetations (Lema 2002).

Finally, the diets of these cat species in RS also differed in the size of the most consumed prey. Our results fit the pattern suggested in previous studies, in which the body size of predators is correlated to that of their prey (e.g. Chinchilla 1997). In this case, *L. tigrinus* is smaller (1.75–3.47 kg) and *L. geoffroyi* is larger (2.2–7.8 kg) (Sunquist & Sunquist 2002), a pattern that correlates well with the mass of their main prey items (see Table 3 and Figure 4).

Ecological processes influencing spatial segregation

Our results demonstrated a strongly segregated distribution of *L. tigrinus* and *L. geoffroyi* at their geographic contact zone, which may be attributed to adaptation to different habitat types and/or preference for different prey items. In addition to these distinct ecological preferences, reciprocal exclusion due to direct competition between the two species at their contact zone may also occur. Considering these possibilities, we can postulate that this strong pattern of geographic segregation may be attributed solely to intrinsic differences in resource use determined by morphological and/or physiological limits and optima, or to a combination of historically evolved ecological differences with an active segregation of the species to produce distinct patterns of resource use. The extent to which these cats are partitioned in relation to resource use and/or directly compete for similar resources in their areas of sympatry is still uncertain. It may be expected that in-depth analyses will shed further light onto the interactions between these felids, thus contributing to improving our understanding of the historical and current processes that shape their geographic distribution at continental and local scales.

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References

Bisceglia SBC, Pereira JA, Teta P, Quintana RD. 2008. Food habits of Geoffroy's cat (*Leopardus geoffroyi*) in the central Monte desert of Argentina. J Arid Environ. 72(6): 1120–1126.

Canepuccia AD, Martinez MM, Vassallo AI. 2007. Selection of waterbirds by Geoffroy's cat: effects of prey abundance, size, and distance. Mamm Biol. 72(3):163–173.

Chinchilla FA. 1997. La dieta del jaguar (*Panthera onca*), el puma (*Felis concolor*) y el manigordo (*Felis pardalis*) (Carnivora: Felidae) en el Parque Nacional Corcovado, Costa Rica. Rev Biol Trop. 45(3):1223–1229.

Eizirik E, Indrusiak CB, Trigo TC, Sana DA, Mazim FD, Freitas TRO. 2006. Refined mapping and characterization of the geographic contact zone between Oncilla and Geoffroy's cat in southern Brazil. Cat News. 45:8–11.

Emmons LH, Feer F. 1997. Neotropical rainforest mammals, a field guide. 2nd ed. Chicago (IL): The University of Chicago Press.

Facure KG, Giaretta AA. 1996. Food habits of carnivores in a coastal Atlantic Forest of southeastern Brazil. Mammalia. 60(3):499–502.

Gardner AL. 1971. Notes on the little spotted cat, *Felis tigrina oncilla* Thomas in Costa Rica. J Mammal. 52(2): 464–465.

IBGE. 1986. Levantamento de recursos naturais, Vol. 33, Folha SH.22 Porto Alegre e parte das Folhas SH.21 Uruguaiana e SI.22 Lagoa Mirim: geologia, geomorfologia, pedologia, vegetação, uso potencial da terra. Projeto RadamBrasil – Fundação

Instituto Brasileiro de Geografia e Estatística (IBGE), Rio de Janeiro, Brazil.
IBGE. 1992. Manuais técnicos em geociências n°1: Manual técnico da vegetação Brasileira. Fundação Instituto Brasileiro de Geografia e Estatítica (IBGE), Departamento de Recursos Naturais e Estudos Ambientais, Rio de Janeiro, Brazil.
IBGE. 1993. Mapa de Vegetação do Brasil. (1:5.000.000) Rio de Janeiro, Fundação Instituto Brasileiro de Geografia e Estatística, IBGE/IBDF.
Johnson WE, Franklin WL. 1991. Feeding and spatial ecology of *Felis geoffroyi* in Southern Patagonia. J Mammal. 72(4):815–820.
Lema T. 2002. Os répteis do Rio Grande do Sul: atuais e fósseis – biogeografia – ofidismo. Porto Alegre (Brazil): EDIPUCRS.
Manfredi C, Lucherini M, Canepuccia AD, Casanave EB. 2004. Geographical variation in the diet of Geoffroy's cat (*Oncifelis geoffroyi*) in pampas grassland of Argentina. J Mammal. 85(6):1111–1115.
Manfredi C, Soler L, Lucherini M, Casanave EB. 2006. Home range and habitat use by Geoffroy's cat (*Oncifelis geoffroyi*) in a wet grassland in Argentina. J Zool. 268(4):381–387.
Novaro AJ, Funes MC, Walker RS. 2000. Ecological extinction of native prey of a carnivore assemblage in Argentine Patagonia. Biol Conserv. 92(1):25–33.
Nowak rm. 1999. Walker's mammals of the world. Vol. 1. 6th ed. Baltimore (MD): The Johns Hopkins University Press.
Nowell K, Jackson P. 1996. Wild cats: status survey and conservation action plan. Gland (Switzerland): IUCN.
Oliveira TG. 1994. Neotropical cats – ecology and conservation. São Luís (Brazil): EDUFMA.
Oliveira TG. 2004. The oncilla in Amazonia: unraveling a myth. Cat News. 41:27.
Oliveira TG. 2011. Ecologia e conservação de pequenos felinos no Brasil e suas implicações para o manejo [PhD Dissertation]. Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil.
Olmos F. 1993. Notes on the food habits of Brazilian Caatinga' carnivores. Mammalia. 57(1): 126–130.
Pereira JA, Walker RS, Novaro AJ. 2012. Effects of livestock on the feeding and spatial ecology of Geoffroy's cat. J Arid Environ. 76:36–42.
Pinkas I, Oliphant MS, Iverson ZL. 1971. Food habits of albacore bluefin, tuna and bonito in California waters. CA Dep Fish Game Bull. 152:1–350.
Sousa KS, Bager A. 2008. Feeding habits of Geoffroy's cat (*Leopardus geoffroyi*) in southern Brazil. Mamm Biol. 73(4):303–308.
Sunquist M, Sunquist F. 2002. Wild cats of the world. Chicago (IL): The University of Chicago Press.
Wang E. 2002. Diets of ocelots (*Leopardus pardalis*), margays (*L. wiedii*), and oncillas (*L. tigrinus*) in the Atlantic Rainforest in southeast Brazil. Stud Neotrop Fauna Environ. 37(3):207–212.
Weksler M, Percequillo AR, Voss RS. 2006. Ten new genera of Oryzomyine rodents (Cricetidae: Sigmodontinae). Am Mus Novit. 3537:1–29.
Wilson DE, Reeder DM. 2005. Mammal species of the world: a taxonomic and geographic reference. 3rd ed. Baltimore (MD): The Johns Hopkins University Press.
Ximenez A. 1975. *Felis geoffroyi*. Mamm Species. 54:1–4.
Ximenez A. 1982. Nota sobre felidos neotropicales VIII: Observaciones sobre el contenido estomacal y el comportamiento alimentar de diversas especies de felinos. Rev Nord Biol. 5(1): 89–91.

Appendix. Records of *Leopardus tigrinus* and *L. geoffroyi*, with the municipality of origin and the geographic coordinates in decimal degrees.

Leopardus tigrinus

Municipality of Origin	RHA	Latitude	Longitude	Year	Type of record	Reference	Institution/contact
Arroio do Meio	X	−29.32	−51.90	2003	ROD	Eizirik et al. (2006)	E. Pedó
Arroio do Meio*	X	−29.36	−51.97	2004	ROD	This study	C. B. Kasper
Arroio do Sal	X	−29.46	−49.84	2006	ROD	This study	J. K. Mähler Jr.
Arroio do Sal	X	−29.57	−49.95	2005	ROD	This study	C. E. Rovedder, M. Repenning e T. S. Silveira
Barão*	X	−29.38	−51.49	1996	MUS	This study	MZMCT708
Bom Princípio	X	−29.46	−51.35	2007	ROD	This study	P. Colombo
Cachoeira do Sul	X	−29.84	−53.03	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul
Cachoeira do Sul*		−30.19	−52.96	2005	CAP	This study	Zoo Cachoeira do Sul
Cachoeira do Sul*		−30.19	−52.96	2005	CAP	This study	Zoo Cachoeira do Sul
Cachoeira do Sul*		−30.19	−52.96	2002	MUS	This study	FZBRS - MCN3054/A. Senra
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul
Carazinho*	X	−28.26	−52.87	2005	CRO	This study	Zoo Municipal de Passo Fundo
Caseiros	X	−28.20	−51.53	2002	ROD	This study	R. Schmidt
Colinas*	X	−29.39	−51.87	2006	ROD	This study	C. B. Kasper
Cruz Alta*	X	−28.64	−53.61	2008	ROD	This study	J. Stolz
Cruzeiro do Sul*	X	−29.51	−51.98	2006	PIC	This study	Kasper et al. (2007a)
Derrubadas*	X	−27.25	−53.85	1991	CRO	Eizirik et al. (2006)	—
Derrubadas*	X	−27.25	−53.85	2006	PIC	This study	Kasper et al. (2007b)
Dom Pedro de Alcântara	X	−29.41	−49.86	2003	ROD	Eizirik et al. (2006)	I. P. Coelho
Eldorado do Sul	X	−30.03	−51.40	1997	ROD	This study	T. R.O. Freitas, J. Silva, F. Bitencourt
Erechim*		−27.63	−52.27	2004	CAP	This study	Zoo Sapucaia do Sul
Erval Seco*		−27.55	−53.50	1996	ROD	Eizirik et al. (2006)	C. B. Indrusiak
Esmeralda*	X	−28.05	−51.18	1992	MUS	This study	FZBRS - MCN3007/A. Velho, S. Rocha
Estância Velha*		−29.65	−51.19	2004	CAP	This study	Zoo Sapucaia do Sul
Estrela*	X	−29.51	−51.92	1995	CAP	Eizirik et al. (2006)	Zoo Sapucaia do Sul
Forquetinha*		−29.35	−52.22	2006	KRO	This study	E. Pedó
Garibaldi*		−29.25	−51.64	1995	CAP	Eizirik et al. (2006)	Zoo Particular Maison Forestier, Seagram
Garibaldi*		−29.25	−51.64	1995	CAP	Eizirik et al. (2006)	Zoo Particular Maison Forestier, Seagram
Getúlio Vargas*	X	−27.85	−52.19	2004	CRO	This study	IBAMA
Guaíba*	X	−30.18	−51.44	1995	ROD	Eizirik et al. (2006)	P. Ott
Guaporé*		−28.97	−51.91	1994	CAP	Eizirik et al. (2006)	Zoo Sapucaia do Sul
Guaporé*		−28.97	−51.91	1998	ROD	This study	L. Pinto
Humaitá*	X	−27.55	−53.97	1998	CAP	Eizirik et al. (2006)	Mini-Zoo Humaitá
Ibarama	X	−29.38	−53.22	1999	MUS	Eizirik et al. (2006)	FZBRS - MCN3056/E. Behr
Ibarama*	X	−29.42	−53.16	1999	MUS	Eizirik et al. (2006)	UFSM - MPB189/S. Cechin, K. H. Toscan, L. O. M. Giasson
Viamão	X	−30.25	−51.00	2003	ROD	This study	M. F. Correa
Machadinho*		−27.59	−51.67	2000	MUS	Eizirik et al. (2006)	FZBRS - MCN3053/J. A. da Rosa
Maquine*		−29.62	−50.25	2002	ROD	Eizirik et al. (2006)	M. A. Perotto
Montenegro*	X	−29.70	−51.51	1997	ROD	Eizirik et al. (2006)	L. F. Brutto
Nova Esperança do Sul*		−29.40	−54.82	1999	MUS	Eizirik et al. (2006)	UFSM - MPB186/P. R. Vielmo
Nova Santa Rita*	X	−29.86	−51.27	2007	ROD	This study	C. B. Kasper
Novo Hamburgo*		−29.74	−51.05	2006	MUS	This study	FZBRS - MCN(NE308)
Palmeira das Missões*		−27.92	−53.39	1996	ROD	Eizirik et al. (2006)	D. A. Sana
Pantano Grande*	X	−30.18	−52.37	2001	MUS	This study	FZBRS - MCN(NE367)
Porto Alegre*		−30.03	−51.22	1993	MUS	Eizirik et al. (2006)	FZBRS – MCN2493/M. I. Burger
Restinga Seca	X	−29.72	−53.52	2002	ROD	Eizirik et al. (2006)	J. K. Mähler Jr.
Rolante	X	−29.65	−50.58	2001	ROD	This study	J. Marinho
Santa Cruz do Sul*	X	−29.61	−52.39	1996	ROD	Eizirik et al. (2006)	D. A. Sana
Santa Cruz do Sul*	X	−29.61	−52.39	1997	ROD	Eizirik et al. (2006)	T. Breier
Santa Cruz do Sul*	X	−29.61	−52.39	2004	CAP	This study	Arca de Noé, Criadouro Conservacionista, Morro Reuter
Santa Maria*		−29.78	−53.80	2004	CAP	This study	Arca de Noé, Criadouro Conservacionista, Morro Reuter
Santo Antônio da Patrulha	X	−29.88	−50.68	1999	MUS	Eizirik et al. (2006)	FZBRS - MCN3030

(*Continued*)

Appendix (Continued).

Municipality of Origin	RHA	Latitude	Longitude	Year	Type of record	Reference	Institution/contact
Leopardus tigrinus							
Santo Antônio da Patrulha	X	−29.88	−50.47	2002	ROD	Eizirik et al. (2006)	V. Andrade, J. da Silva
São Francisco de Paula	X	−29.45	−50.58	2000	PIC	Eizirik et al. (2006)	R. Marques
São José das Missões	X	−27.78	−53.12	2008	MUS	This study	ULBRA - MCNU1596/F. Peters
Sarandi*	X	−27.93	−52.90	2001	ROD	Eizirik et al. (2006)	J. K. Mähler Jr.
Rondinha	X	−27.85	−52.91	2006	ROD	This study	M. B. Martins, G. Vinciprova
Soledade*	X	−28.82	−52.53	2002	MUS	Eizirik et al. (2006)	FZBRS - MCN(NE240)/E. Vélez
Triunfo*		−29.86	−51.55	1992	CAP	Eizirik et al. (2006)	E. Eizirik
Triunfo		−29.92	−51.77	2005	CAP	This study	Zoo Sapucaia do Sul
Leopardus geoffroyi							
Alegrete*		−29.77	−55.78	2006	MUS	This study	FZBRS - MCN(NE303)
Alegrete	X	−29.85	−55.92	1998	PIC	Eizirik et al. (2006)	C. B. Indrusiak
Alegrete	X	−29.92	−55.45	1999	MUS	This study	FZBRS - MCN3031/G. Pontes, M. B. Martins
Alegrete	X	−29.98	−55.53	2001	ROD	This study	T. R.O. de Freitas, J. Marinho
Arroio Grande*		−32.13	−52.93	2003	CAP	Eizirik et al. (2006)	Zoo Sapucaia do Sul
Arroio Grande*		−32.13	−52.93	2002	ROD	Eizirik et al. (2006)	F. D. Mazim
Arroio Grande	X	−32.28	−52.88	2004	KRO	Eizirik et al. (2006)	F. D. Mazim, J. B. G. Soares
Arroio Grande	X	−32.30	−52.93	2003	ROD	Eizirik et al. (2006)	F. D. Mazim, J. B. G. Soares
Bagé*	X	−31.33	−54.10	1995	MUS	Eizirik et al. (2006)	FZBRS - MCN2840
Bagé	X	−31.18	−53.83	2008	ROD	This study	F.D. Mazim
Barra do Ribeiro	X	−30.34	−51.42	2002	ROD	This study	C. B. Indrusiak
Caçapava do Sul	X	−30.37	−53.35	1996	ROD	Eizirik et al. (2006)	E. Eizirik
Cachoeira do Sul*		−30.19	−52.96	1994	ROD	Eizirik et al. (2006)	E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	ROD	Eizirik et al. (2006)	E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul*		−30.19	−52.96	1994	CAP	Eizirik et al. (2006)	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul*		−30.19	−52.96	2005	CAP	This study	Zoo Cachoeira do Sul, E. Salomão
Cachoeira do Sul	X	−30.22	−53.02	1994	ROD	Eizirik et al. (2006)	D. A. Sana
Camaquã	X	−30.82	−51.74	1997	ROD	Eizirik et al. (2006)	L. Veronese
Canela*		−29.35	−50.78	2004	CAP	This study	Zoo Sapucaia do Sul
Canguçu*		−31.38	−52.67	2003	—	Eizirik et al. (2006)	C. B. Indrusiak
Capão do Leão	X	−31.88	−52.64	2008	ROD	This study	C. B. Kasper
Cerrito*	X	−31.72	−52.80	2003	—	Eizirik et al. (2006)	C. B. Indrusiak
Cristal	X	−31.05	−52.03	2004	MUS	This study	FZBRS - MCN3064/G. A. Bancke
Dom Pedrito	X	−30.89	−55.02	2004	ROD	This study	F. D. Mazim
Dom Pedrito*	X	−30.98	−54.67	1991	MUS	Eizirik et al. (2006)	FZBRS – MCN2516/J. C. Dotto
Dom Pedrito	X	−30.88	−54.84	2007	MUS	This study	MCNU 895/F. B. Peters
Dom Pedrito	X	−30.89	−54.84	2007	MUS	This study	MCNU 896/F. B. Peters
Eldorado do Sul*	X	−30.07	−51.49	1994	ROD	Eizirik et al. (2006)	P. Ott
Eldorado do Sul*	X	−30.07	−51.49	1994	ROD	This study	D. A. Sana
Encruzilhada do Sul*		−30.61	−52.67	2005	CAP	This study	Quinta da Estância Grande
Guaíba*		−30.18	−51.44	2006	ROD	This study	E. Borsato
Herval*	X	−31.98	−53.52	2003	—	Eizirik et al. (2006)	C. B. Indrusiak
Itaqui	X	−28.87	−56.08	2002	ROD	Eizirik et al. (2006)	F. Michalski
Itaqui	X	−29.09	−56.39	2000	MUS	Eizirik et al. (2006)	UFSM - MPB192/E. R. Behr, L. Giasson
Itaqui	X	−29.17	−56.45	2008	ROD	This study	J. Koenemann
Itaqui	X	−29.35	−26.57	2009	ROD	This study	J. Koenemann
Itaqui*		−29.23	−56.15	2000	MUS	This study	FZBRS - MCN(NE092)
Jaguari	X	−29.55	−54.68	2000	MUS	Eizirik et al. (2006)	UFSM - MPB193/R. Zachia
Pantano Grande	X	−30.16	−52.37	1994	ROD	Eizirik et al. (2006)	E. Salomão
Pantano Grande*		−30.27	−52.38	1998	CRO	Eizirik et al. (2006)	T. C. Trigo
Pelotas	X	−31.52	−52.47	2006	ROD	This study	F. D. Mazim

(*Continued*)

Appendix (Continued).

Leopardus tigrinus

Municipality of Origin	RHA	Latitude	Longitude	Year	Type of record	Reference	Institution/contact
Pelotas*		−31.57	−52.36	2006	ROD	This study	F. D. Mazim
Piratini	X	−31.61	−53.24	2004	ROD	This study	F. D. Mazim
Porto Alegre*		−30.03	−51.22	2000	MUS	Eizirik et al. (2006)	FZBRS - MCN3023
Quaraí*		−30.27	−56.18	1998	CRO	Eizirik et al. (2006)	D. A. Sana, F. Trierveiler, C.B. Indrusiak, T.C. Trigo
Quaraí*		−30.27	−56.18	1998	CRO	Eizirik et al. (2006)	D. A. Sana, F. Trierveiler, C. B. Indrusiak, T.C. Trigo
Rio Grande	X	−31.88	−52.31	2004	ROD	Eizirik et al. (2006)	T. R. O. de Freitas, J. Stoltz
Rio Grande*	X	−32.03	−52.12	2000	PIC	Eizirik et al. (2006)	C. B. Indrusiak
Rio Grande	X	−32.36	−52.50	2004	ROD	This study	F. D. Mazim
Rio Grande	X	−32.44	−52.55	2000	ROD	Eizirik et al. (2006)	T. Trigo, C. Trigo, M. Andrade, A. Scherer
Rio Grande	X	−32.44	−52.55	2000	ROD	Eizirik et al. (2006)	T. Trigo, C. Trigo, M. Andrade, A. Scherer
Rio Grande	X	−32.44	−52.55	2000	ROD	Eizirik et al. (2006)	T. Trigo, C. Trigo, M. Andrade, A. Scherer
Rio Pardo	X	−29.58	−52.24	2000	ROD	This study	T. C. Trigo, A. P. Brandt
Rosário do Sul*		−30.25	−54.92	1990	MUS	Eizirik et al. (2006)	FZBRS – MCN2558/J. C. Dotto
Santa Cruz do Sul*	X	−29.61	−52.39	1993	CAP	Eizirik et al. (2006)	Zoo Sapucaia do Sul
Santa Maria	X	−29.83	−53.77	2000	MUS	Eizirik et al. (2006)	FZBRS - MCN(NE193)/L. Cabral
Santana do Livramento	X	−30.70	−55.83	2009	ROD	This study	J. Koenemann
São Borja	X	−28.43	−55.62	2002	ROD	Eizirik et al. (2006)	C. B. Indrusiak
São Gabriel	X	−30.26	−54.52	1998	PIC	Eizirik et al. (2006)	C. B. Indrusiak
São Gabriel	X	−30.26	−54.52	1998	PIC	Eizirik et al. (2006)	C. B. Indrusiak
São Gabriel	X	−30.32	−54.38	2002	ROD	Eizirik et al. (2006)	F. Michalski
São Gabriel	X	−30.36	−54.32	2002	ROD	Eizirik et al. (2006)	F. Michalski
São Leopoldo*	X	−29.76	−51.15	2004	CAP	This study	Zoo Sapucaia do Sul
São Lourenço do Sul*		−31.25	−52.13	2000	CAP	Eizirik et al. (2006)	Zoo Sapucaia do Sul,
São Lourenço do Sul*		−31.25	−52.13	2004	CRO	This study	CETAS Universidade Federal de Pelotas
São Lourenço do Sul*		−31.25	−52.13	2004	CRO	This study	CETAS Universidade Federal de Pelotas
Triunfo*		−29.86	−51.55	1999	VIS	Eizirik et al. (2006)	C. B. Indrusiak
Uruguaiana	X	−29.97	−56.56	1998	PIC	Eizirik et al. (2006)	C. B. Indrusiak

Notes: Asterisks indicate a geographic information only at the level of municipality; geographic coordinates were estimated for the central point of each municipality. Underlined municipalities indicate the localities from which digestive tracts were collected and included in the dietary analysis (samples here include only 28 of the 30 specimens analyzed because one *L. tigrinus* stomach was collected from an individual from Santa Catarina, north of Rio Grande do Sul, but adjacent to the focal study area, and one *L. geoffroyi* stomach lacks the information on the municipality within Rio Grande do Sul); municipalities in bold share occurrence of both cat species.
Acronyms: RHA - Records included in habitat analysis. Types of records: ROD – Roadkill, CAP – Captive, CRO - Captured by rural owners, KRO - Killed by rural owners, PIC – Picture, VIS – Visualization, MUS – Museum. Institutions: FZBRS – MCN / Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul, UFSM – MPB / Mostra Permanente de Biologia da Universidade Federal de Santa Maria, MZMCT / Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), ULBRA – MCNU / Museu de Ciências Naturais da Universidade Luterana do Brasil (ULBRA), IBAMA / Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis.

References

Eizirik E, Indrusiak CB, Trigo TC, Sana D, Mazim FD, Freitas TRO. 2006. Refined mapping and characterization of a geographic contact zone between two Neotropical cats, *Leopardus tigrinus* and *L. geoffroyi* (Mammalia, Felidae). Cat News. 45: 8–11.

Kasper, Feldens MJ, Mazim FD, Schneider A, Cademartori CV, Grillo HCZ. 2007a. Mamíferos do Vale do Taquari, região central do Rio Grande do Sul. Biociências, Porto Alegre. 15(1): 53–62.

Kasper CB, Mazim FD, Soares JBG, Oliveira TG, Fabian ME. 2007b. Composição e abundância relativa dos mamíferos de médio e grande porte no Parque Estadual do Turvo, Rio Grande do Sul, Brasil. Revista Brasileira de Zoologia. 24(4): 1087–1100.