Latin American Journal of Aquatic Mammals
www.lajamjournal.org
Online ISSN: 2236-1057

To eat or not to eat: ingestion and avoidance of fecal content from communal latrines of *Lontra longicaudis* (Olfers, 1818)

Izabela Laurentino[†], Rafael Sousa[‡], Gilberto Corso[‡] and Renata Sousa-Lima[‡,§,*]

[†]Programa de Pós Graduação em Ciências Biológicas, Centro de Biociências, Universidade Federal do Rio Grande do Norte, Avenida Senador Salgado Filho 3000, Candelária, 59078 970 Natal RN, Brazil
[‡]Departamento de Biofísica e Farmacologia, Centro de Biociências, Universidade Federal do Rio Grande do Norte, Avenida Senador Salgado Filho 3000, Candelária, 59078 970 Natal RN, Brazil
[§]Departamento de Fisiologia e Comportamento, Centro de Biociências, Universidade Federal do Rio Grande do Norte, Avenida Senador Salgado Filho 3000, Candelária, 59078 970 Natal RN, Brazil
*Corresponding author: sousalima.renata@gmail.com

Article Info

Manuscript type	Article
Article history	
Received	29 March 2019
Received in revised form	16 May 2019
Accepted	27 May 2019
Available online	30 September 2019
Keywords: Neotropical otter, diet, feces, nutrient cycling, infection, disease	
Responsible Editor: Federico Riet Sapriza	
Citation: Laurentino, I., Sousa, R., Corso, G. and Sousa-Lima, R. (2019) To eat or not to eat: ingestion and avoidance of fecal content from communal latrines of *Lontra longicaudis* (Olfers, 1818). *Latin American Journal of Aquatic Mammals* 14(1): 2-8. https://doi.org/10.5597/lajam00248	

Abstract: Communal latrines have important biological and ecological roles for the latrine builder species and for other taxa that visit these sites and use feces to obtain nutrients and microorganisms that aid in digestion of compounds hard to process. Nonetheless, coprophagous animals must deal with the costs associated with parasites and other pathogens present in latrines. Parasites and pathogens are found in Neotropical otter latrines. This species is carnivorous and uses latrines for territorial marking. The objective of this study was to identify vertebrate species associated with otter latrines and species that use feces as food resource. Latrines were monitored with camera traps on a monthly basis in 24-hour cycles. We recorded nine species of vertebrates, including birds, reptiles and mammals, visiting the latrines. Feeding dependency from latrines in the Atlantic Forest may not be related to periods of low food availability (dry season). Visitors that ate at the latrines do not have the same feeding habits as otters. The assumption that mammals would avoid ingesting disease-loaded feces from latrines did not hold, since two mammal species did. We speculate these mammals might be more resistant or less susceptible to pathogens found in otter feces.

Resumo: Latrinas grupais tem uma função biológica e ecológica importante para as espécies que as constroem e para espécies que visitam estes locais e usam as fezes para obtenção de nutrientes e microrganismos que ajudam na digestão de compostos secundários de difícil processamento. Porém, animais coprófagos têm que lidar com custos associados a parasitas e outros patógenos presentes nas latrinas. Parasitas e patógenos são encontrados em latrinas de lontras Neotropicais. Essa espécie carnívora usa suas latrinas para depósito de excrementos e para marcação química de seus territórios. O objetivo deste estudo foi identificar quais vertebrados se associam a estas latrinas e as usam como fonte alimentar. Latrinas foram monitoradas com armadilhas de vídeo mensalmente em ciclos de 24 horas. Nove espécies de vertebrados foram registradas, dentre elas aves, répteis e mamíferos. A dependência dos visitantes às latrinas não é relacionada a períodos com menor disponibilidade de alimento (estação seca). Espécies visitantes que se alimentam nas latrinas não tem os mesmos hábitos alimentares que as lontras. Assumir que outros mamíferos evitariam se alimentar de fezes nas latrinas por perigo de doenças não está correto. Porém, as visitas se limitaram a duas espécies de mamíferos que podem ser resistentes ou menos susceptíveis a doenças encontradas em fezes de lontras.

Introduction

Latrines or defecation spots are places where multiple conspecifics repeatedly leave their excrements. This behavior occurs in many mammal species: primates (Irwin *et al.*, 2004; González-Zamora *et al.*, 2012), rodents (Piñero *et al.*, 2012), marsupials (Ruibal *et al.*, 2011), large herbivorous mammals (Fragoso, 1994; Lamoot *et al.*, 2004; Wronski and Plath, 2010), and carnivores (Gorman and Trowbridge, 1989; Jordan *et al.*, 2007) including two semi-aquatic species, the giant river otter (Leuchtenberger *et al.*, 2012) and the Neotropical otter (this study).

Communal latrines have important biological and ecological roles for the latrine builder species (González-Zamora *et al.*, 2012) such as: information center for intra- and interspecific communication (Gorman and Trowbridge, 1989; Larivière, 1999; Jordan *et al.*, 2007), reproduction (Ruibal *et al.*, 2011; Barja *et al.*, 2011), defense against predators (Jordan *et al.*, 2007; Barja *et al.*, 2011), and prevention of intestinal parasite re-infestation (Lamoot *et al.*, 2004).

Animal excrement deposits also represent an important resource for vertebrates other than the latrine-builder species (Leuchtenberger *et al.*, 2012). Coprophagous species benefit from the acquisition of nutrients specially during less productive periods (Livingston *et al.*, 2005; Solano-Ugalde, 2005; Campos *et al.*, 2011) and of microorganisms that aid in digestion of chemical compounds present in their diet (Campos *et al.*, 2011) but are more susceptible to diseases from pathogen and parasite loaded feces (Weinstein *et al.*, 2018). Opossums, rodents, and some birds are known to visit and forage in raccoon latrines (Page *et al.*, 1999; Logiudice, 2001) which are loaded with partially digested seeds that attract omnivorous and granivorous species and insectivorous lizards preying on insects feeding on the feces. Latrines should be less attractive to taxa that present different diet from the builder species as the contents may have little food value for these species. Inasmuch, species that use resources from heterospecific communal latrines must deal with a tradeoff between foraging gains and costs of diseases (Weinstein *et al.*, 2018).

The Neotropical otter, *Lontra longicaudis* (Olfers, 1818), is a semi-aquatic mustelid (Order Carnivora) that inhabits continental freshwater habitats as well as brackish waters in marine estuaries (Blacher, 1987). The species is distributed from northeastern Mexico to Uruguay and Argentina, east of the Andes (Emmons and Feer, 1997). Although Neotropical otter's morphology attests to its adaptation to an aquatic life it is still dependent on terrestrial habitats to rest, give birth and care for its young (Waldemarin and Colares, 2000; Carvalho-Junior, 2007). These otters feed mostly in water and prey upon aquatic (fish, shrimp, mollusks) and terrestrial (birds) species (IL and RS, pers. obs.). The species is classified as piscivorous within its family (Mustelidae) although its feeding habit varies with local prey availability (Pardini, 1998; Quadros, 1998) and can be either a generalist or a specialist prioritizing some species of fishes and crustaceans (Uchôa *et al.*, 2004). This species' communal latrines are conspicuous (Kasper *et al.*, 2008) and potentially call the attention of other species. Parasites and pathogens are also found in Neotropical otter latrines (Vieira *et al.*, 2015).

Giant otter latrines are sampled to study diet (Rosas *et al.*, 1999; Ribas *et al.*, 2012) and the removal of items by other taxa may bias results from these studies (Livingston *et al.*, 2005; Norris and Michalski, 2010). Therefore, we monitored Neotropical otter latrines to test: 1) if these sites attract heterospecifics that use fecal matter as food resource during periods of low food availability (dry season); 2) if those species have similar feeding habits as the latrine-builder; and 3) if vertebrate species that are susceptible to contamination by fecal pathogens differ in the way they use the resources present in those places from vertebrates that are less susceptible to disease. Assuming that contamination is highest for other mammals, we predict that 1) the number of visitors using Neotropical otter latrines during the dry season is higher than during the rainy season; 2) visitors that use fecal content as food are mostly carnivorous or omnivorous; and 3) mammals do not ingest fecal content, but other visitors do.

Materials and Methods

The study area comprises a stretch of 2 m along the margins of the Boa Cica River in municipality of Nísia Floresta (06°05'37.45"S; 35°07'58.57"W), within the Bonfim Guaraíras Environmental Protection Area in the state of Rio Grande do Norte, Brazil (research authorized by ICMBio 32910-12 and Animal Ethics Committee 079.006/2018).

Two video-camera traps (®Bushnell Trophy Cam 8MP) were installed, one on each side of 2-m stretch of land flanked by the river at the same height and angle, sampling continuously (24 hours ON) between January and December 2018. These two traps covered the area of five latrines of Neotropical otters (Figure 1). Video-trapped animals were identified to the species level and their feeding behavior observed based on the images. The number of visits per species was counted as well as the number of times Neotropical otters were registered defecating (see Table 1).

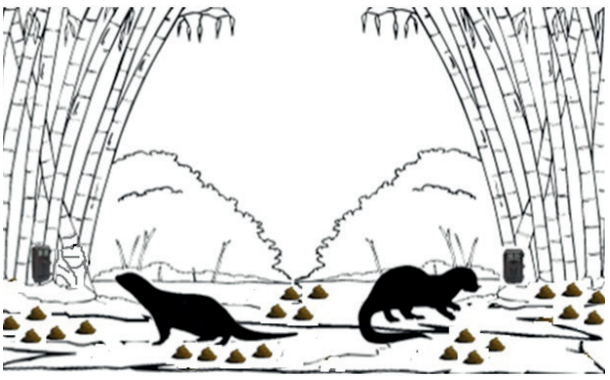

Figure1. Schematic of the study site showing the placement of the video-camera traps and the position of the five Neotropical otter latrines. Images were modified from Fotosearch.com, Depositphotos.com and Smartkids.com

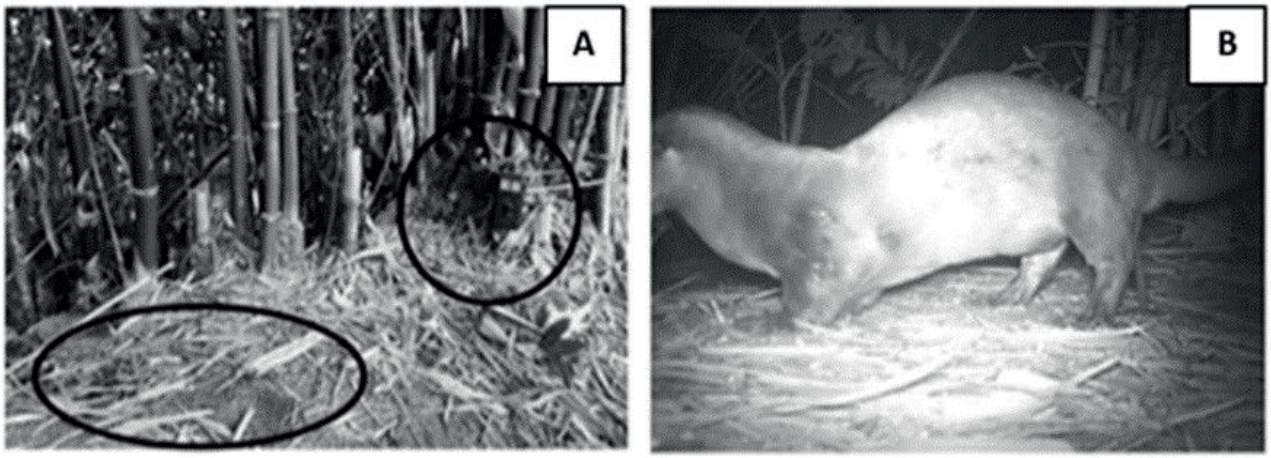

Figure 2. A: Video-camera trap (top circle) and latrine (bottom ellipse); B: video-captured Neotropical otter defecating.

Results

The estimated prevalence of defecation was 62% (the number of observed fecal deposits divided by the total number of records). Figure 2 shows the position of one of the latrines and the camera trap (Figure 2A) and one otter defecating on the latrine (Figure 2B).

Figure 3 shows the number of detections of otters per month defecating and/or scent marking in the communal latrine in 2018. Scent marking behavior and feces deposition in communal latrines is seasonal, higher in the dry season (dry and rainy season defined according to Molion and Bernardo, 2000) (df = 1; χ^2 = 5.24; p-value = 0.022). Nonetheless, not all visitors consumed fecal matter at the latrines. The number of coprophagous visits was plotted along the months and, contrary to fecal deposition by otters, showed no seasonality (df = 1; χ^2 = 2.35; p-value = 0.12).

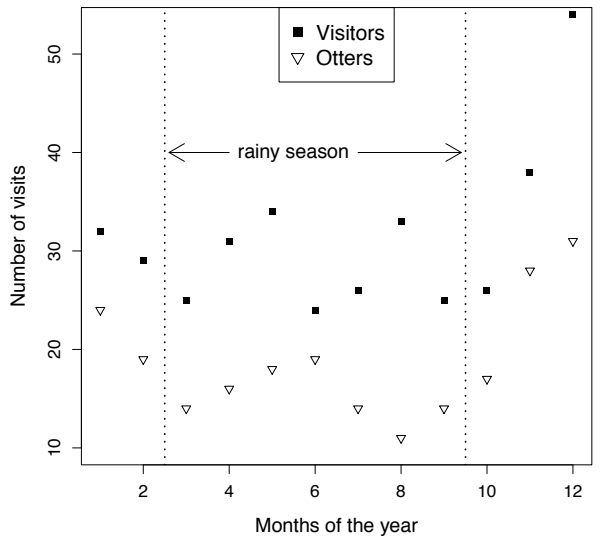

Figure 3. Number of otter defecating and scent marking visits (empty triangles) and visits where individuals consumed fecal matter from the latrines (black squares) at communal latrines of Neotropical otters, *Lontra longicaudis*, at a 2-m stretch along the Boa Cica River, municipality of Nísia Floresta/RN, Brazil.

Accounting for visits that used the communal latrines for food and those who did not, we counted nine species of vertebrates video-trapped, mostly birds (n = 209), followed by mammals (n = 112) and reptiles (n = 56) (Table 1 and Figure 4).

Contrary to our prediction, carnivorous or omnivorous visitors ate at latrines as much as other individuals with different food habits (insectivorous and herbivorous) (df = 1; χ^2 = 2.30; p-value = 0.129) and mammals ingested as much fecal content as other taxa, showing no particular avoidance (df = 1; χ^2 = 1.12; p-value = 0.29). Nonetheless only two species of mammals ingested feces: *Didelphis albiventris* and *Rattus norvegicus* (Table 1).

Discussion

Neotropical otters visit the study site throughout the year but defecate and scent-mark more during the dry season, that coincides with the reproductive period for the species (Cheida *et al.*, 2006). Nonetheless, there was no seasonality in the consumption of feces by visitors in the sampled latrines, which shows that visitors use resources from these sites throughout the entire year. These visitors could bias studies about otter diet since some remove and others add items to these latrines (by also defecating on site).

A similar study with the giant otter (*Pteronura brasiliensis*) in the Pantanal biome (Leuchtenberger *et al.*, 2012) observed 29 vertebrate species visiting the latrines of giant otters. Despite differences in the habitat (our work was done in the Atlantic forest and the other study was in the seasonally-flooded Pantanal) and the distance between the two areas (around 2900 km), we remarkably had a high species overlap. In our study we observed two birds: *Tigrisoma lineatum* and *Aramides saracura*; the first was also observed in the latrines of Pantanal while the second was not, but another species of the same genus, *Aramides cajanea*, was registered there.

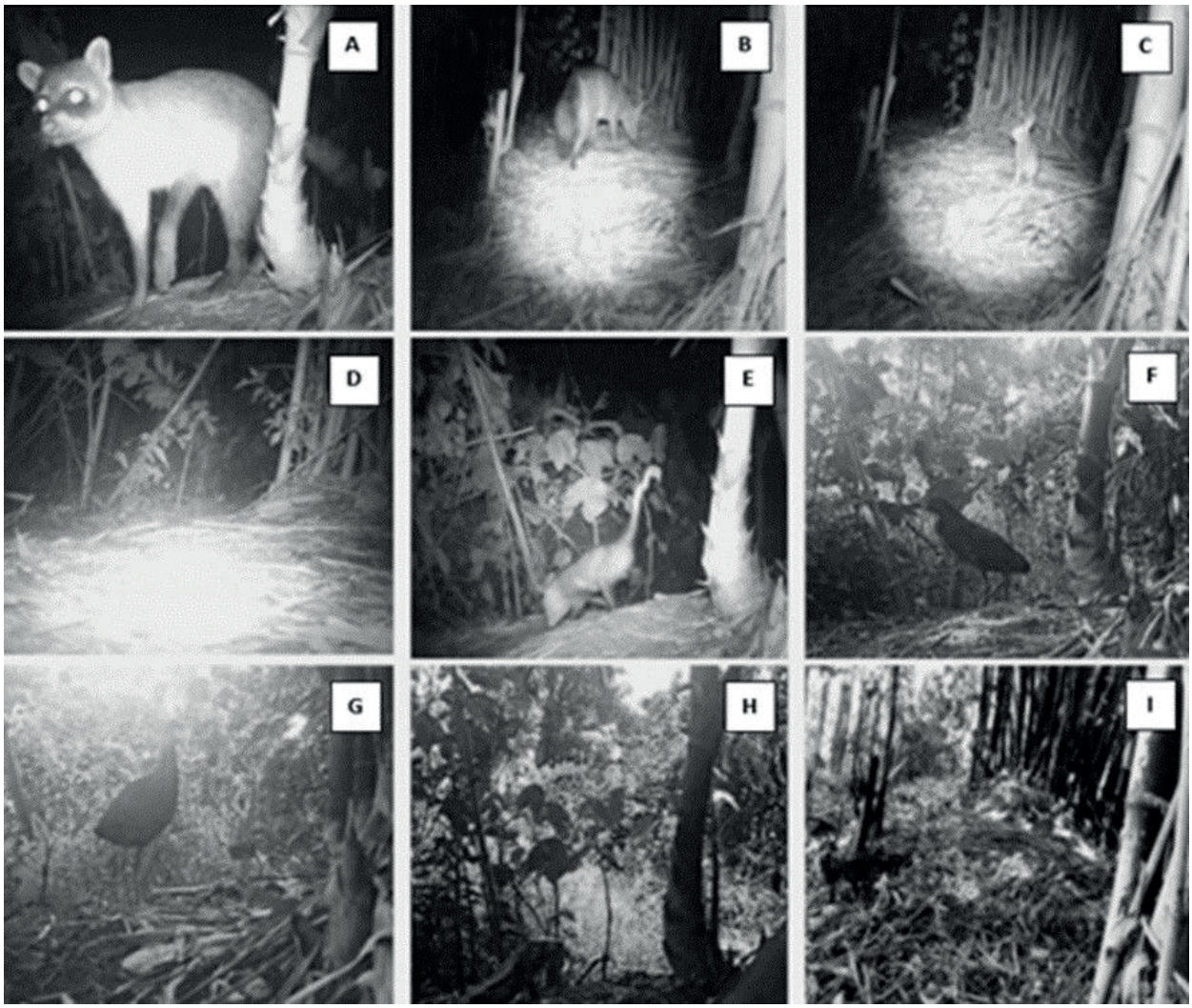

Figure 4. Examples of video-captures of visitor species registered at the study site both during the day and at night at the communal latrines of Neotropical otters, *Lontra longicaudis*, along the Boa Cica River, municipality of Nísia Floresta/RN, Brazil: A – *Procyon cancrivorus*; B - *Cerdocyon thous*; C – *Sylvilagus brasiliensis*; D - *Rattus norvegicus*; E - *Didelphis albiventris*; F – *Tigrisoma lineatum*; G – *Aramides saracura*; H – *Tupinambis teguixin;* I - *Iguana iguana*.

Comparing the reptiles, we observed two species: *Iguana iguana* and *Tupinambis teguixin*; the first is also present in the Pantanal study along with another *Tupinambis* species: *T. merianae*. We have registered five mammal species, but only one is common in both studies: the canid *Cerdocyon thous*. Moreover, the Pantanal presents higher biodiversity than the Atlantic forest. In fact, the Boa Cica River is a fragment of the Atlantic forest that has suffered a strong anthropogenic impact. Therefore, biodiversity of mammals and birds is severely affected in our study area when compared with the Pantanal, and the similarity in the visitors' fauna highlights the importance of these communal latrines as food resource (Figure 5).

Our results reveal that feeding dependency in the Atlantic Forest is not seasonal and may not be related to less productive periods (dry season) or shortage of food and be related to feeding preferences of these visitor species. Also, contrary to our original hypotheses, visitors that ate at the latrines do not have the same feeding habits as otters. Insectivorous species (*e.g. Aramides saracura*) are using the latrines for feeding but they might not be necessarily consuming fecal matter and might instead be preying on the invertebrate fauna associated with the latrines. Even herbivorous species, such as the iguana, are thought to be consuming feces from latrines to acquire important nutrients (*e.g.* calcium, Campos *et al.*, 2011).

In general, fecal consumption by mammals, limited to two of the five mammalian species captured on video, did not significantly differ from other taxa. Therefore, Neotropical otter communal latrines are an important food resource that cycles back into the Atlantic Forest community of vertebrates and invertebrates, as shown by the visual representation of this food web (Figure 5).

The usage of such sites can be explored further to address the questions about which items are removed (or added)

Table 1. List of the species video-trapped in communal latrines of *Lontra longicudis* along a 2-m stretch along a the margins of the Boa Cica River in 2018. (Trophic guild: HER = herbivorous, INS = insectivorous, CAR = carnivorous and OMN = omnivorous).

Video Records																
Species Common name	Trophic guild	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Percentage of visits with feces ingestion	Percentage of visits without feces ingestion	Total
		Season														
		Dry		Rainy							Dry					
Birds																
Aramides saracura Wood Rail	INS	21	11	09	11	15	08	12	14	11	07	22	25	48.1%	38.9%	166
Tigrisoma lineatum Heron	CAR	03	02	05	04	03	05	03	05	04	03	02	04	11.0%	12.0%	43
Reptiles																
Iguana iguana Iguana	HER	02	04	03	05	03	02	01	07	02	04	03	06	15.7%	5.4%	42
Tupinambis teguixin Gold tegu	OMN	-	02	01	02	-	01	01	01	01	-	02	03	0%	8.4%	14
Mammals																
Cerdocyon thous Crab-eating fox	OMN	-	-	01	02	01	-	-	-	01	-	-	01	0%	3.6%	06
Procyon cancrivorus Raccoon	CAR	01	02	-	-	01	01	02	-	-	02	01	02	0%	7.1%	12
Sylvilagus brasiliensis Wild rabbit	HER	-	-	-	-	-	-	-	-	-	-	-	07	0%	4.2%	07
Didelphis albiventris Opossum	OMN	04	06	05	04	07	05	06	04	05	07	06	04	20.0%	12.6%	63
Rattus norvegicus Rat	OMN	01	02	01	03	04	02	01	02	01	03	02	02	5.2%	7.8%	24
Total by Month		32	29	25	31	34	24	26	33	25	26	38	54	55.7%	44.3%	377

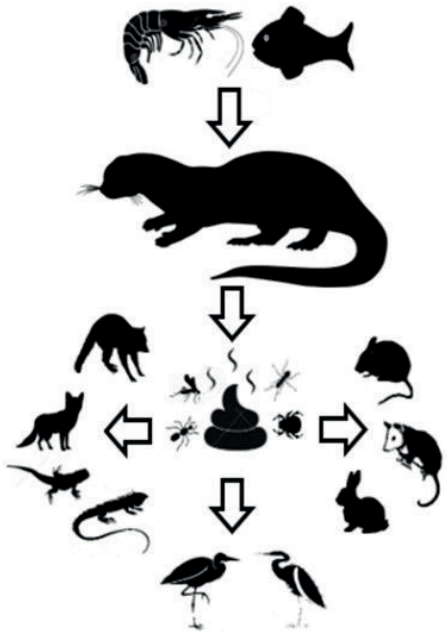

Figure 5. Visual representation of the food web in communal latrines of *Lontra longicaudis*. Images were modified from Supercoloring.com; Canstockphoto.com and Dreamstime.com

to the latrines and how the nutritional value of the items removed complete the visitors' diet. Visitors' contamination and susceptibility to parasites found in the latrines are also of interest and may reveal how these ecological interactions influence the distribution of species in space and time (Weinstein *et al.*, 2018).

Acknowledgements

We thank all the friends that helped in the field and Samara Almeida for suggesting this study. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES and Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq provided funding for this research. We also appreciate the comments of the reviewers that improved the quality of this work.

References

Barja, I., Silván, G., Martínez-Fernández, L. and Illera, J.C. (2011) Physiological stress responses, fecal marking behavior, and reproduction in wild European pine martens (*Martes martes*). *Journal of Chemical Ecology* 37(3): 253-259. https://doi.org/10.1007/s10886-011-9928-1

Blacher, C. (1987) Ocorrência e preservação de *Lutra longicaudes* [*sic*] (Mammalia: Mustelidae) no litoral de Santa Catarina. *Boletim Fundação Brasileira para a Conservação da Natureza* 22: 105-17.

Campos, Z., Leuchtenberger, C., Desbiez, A.L.J. and Mourão, G. (2011) *Iguana iguana* (Green iguana). Coprophagy. *Herpetological Review* 42(4): 604-605.

Carvalho-Junior, O., Ed. (2007) *No rastro da lontra brasileira*. Bernuncia, Florianópolis, Brasil.

Cheida, C.C., Nakano-Oliveira, E., Fusco-Costa, R., Rocha-Mendes, F. and Quadros, J. (2006) Ordem Carnivora. Pages 231-276 *in* Reis, N.R., Peracchi, A.L., Pedro, W.A. and Lima, I.P. (Eds) *Mamíferos do Brasil*. Editora UEL, Londrina, PR, Brazil.

Emmons, L.H. and Feer, F. (1997) *Neotropical rainforest mammals: a field guide*. University of Chicago Press, Chicago, USA. 396 pp.

Fragoso, J.M.V. (1994) *Large mammals and the community dynamics of an Amazonian rain forest*. Ph.D. Thesis. University of Florida, FL. 212 pp.

González-Zamora, A., Arroyo-Rodríguez, V., Oyama, K., Sork, V., Chapman, C.A. and Stoner, K.E. (2012) Sleeping sites and latrines of spider monkeys in continuous and fragmented rainforests: implications for seed dispersal and forest regeneration. *PLoS One* 7(10): e46852. https://doi.org/10.1371/journal.pone.0046852

Gorman, M.L., and Trowbridge, B.J. (1989) The role of odor in the social lives of carnivores. Pages 57-88 *in* Glittleman, J.L. (Ed.) *Carnivore behavior, ecology, and evolution*. Springer, Boston, MA. https://doi.org/10.1007/978-1-4757-4716-4_3

Irwin, M.T., Samonds, K.E., Raharison, J.L. and Wright, P.C. (2004) Lemur latrines: observations of latrine behavior in wild primates and possible ecological significance. *Journal of Mammalogy* 85(3): 420-427. https://doi.org/10.1644/1545-1542(2004)085<0420:LLOOLB>2.0.CO;2

Jordan, N.R., Cherry, M.I. and Manser, M.B. (2007) Latrine distribution and patterns of use by wild meerkats: implications for territory and mate defense. *Animal Behaviour* 73(4): 613-622. https://doi.org/10.1016/j.anbehav.2006.06.010

Kasper, C.B., Bastazini, V.A.G., Salvi, J. and Grillo, H.C.Z. (2008) Trophic ecology and the use of shelters and latrines by the Neotropical otter (*Lontra longicaudis*) in the Taquari Valley, Southern Brazil. *Iheringia. Série Zoologia* 98(4): 469-474. https://doi.org/10.1590/S0073-47212008000400009

Lamoot, I., Callebaut, J., Degezelle, T., Demeulenaere, E., Laquière, J., Vandenberghe, C. and Hoffmann, M. (2004) Eliminative behaviour of free-ranging horses: do they show latrine behaviour or do they defecate where they graze? *Applied Animal Behaviour Science* 86(1-2): 105-121. https://doi.org/10.1016/j.applanim.2003.12.008

Larivière, S. (1999) *Lontra longicaudis*. *Mammalian Species* 609: 1-5. https://doi.org/10.2307/3504393

Leuchtenberger, C., Ribas, C., Magnusson, W. and Mourão, G. (2012) To each his own taste: latrines of the giant otter as a food resource for vertebrates in Southern Pantanal, Brazil. *Studies on Neotropical Fauna and Environment* 47(2): 81-85. https://doi.org/10.1080/01650521.2012.697690

Livingston, T.R., Gipson, P.S., Ballard, W.B., Sanchez, D.M. and Krausman, P.R. (2005) Scat removal: a source of bias in feces-related studies. *Wildlife Society Bulletin* 33(1): 172-178. https://doi.org/10.2193/0091-7648(2005)33[172:SRASOB]2.0.CO;2

Logiudice, K. (2001) Latrine foraging strategies of two small mammals: implications for the transmission of *Baylisascaris procyonis*. *The American Midland Naturalist* 146(2): 369-379. https://doi.org/10.1674/0003-0031(2001)146[0369:LFSOTS]2.0.CO;2

Molion, L.C.B. and Bernardo, S.D.O. (2000) Dinâmica das chuvas no Nordeste Brasileiro. Pages 1334-1342 *in* Anais, *XI Congresso Brasileiro de Meteorologia.* Sociedade Brasileira de Meteorologia, Rio de Janeiro, Brasil. Available at http://www.cbmet.org.br/cbm-files/12-7ea5f627d14a9f9a88cc694cf707236f.pdf

Norris, D. and Michalski, F. (2010) Implications of faecal removal by dung beetles for scat surveys in a fragmented landscape of the Brazilian Amazon. *Oryx* 44(3): 455-458. https://doi.org/10.1017/S0030605309990809

Page, L.K., Swihart, R.K. and Kazacos, K.R. (1999) Implications of raccoon latrines in the epizootiology of *Baylis ascariasis*. *Journal of Wildlife Diseases* 35(3): 474-480. https://doi.org/10.7589/0090-3558-35.3.474

Pardini, R. (1998) Feeding ecology of the Neotropical river otter *Lontra longicaudis* in an Atlantic Forest stream, south-eastern Brazil. *Journal of Zoology* 245(4): 385-391. https://doi.org/10.1017/S0952836998008024

Piñero, F.S., Garrido-García, J.A. and Soriguer, R.C. (2012) Dung beetles (Scarabaeidae, Coleoptera) of latrines of the Iberian endemic rodent *Microtus cabrerae* (Rodentia: Cricetidae: Microtinae) at Sierra de Segura (S. Iberian Peninsula). *Boletin de la Asociación Española de Entomología* 36(3-4): 451-455.

Quadros, J. (1998) *Aspectos da ecologia de* Lontra longicaudis *(Olfers, 1818) em uma área de Floresta Atlântica de Planície, Município de Itapoá-SC.* M.Sc. Thesis. Universidade Federal do Paraná, Paraná, Brazil. 71 pp.

Ribas, C., Damasceno, G., Magnusson, W., Leuchtenberger, C. and Mourão, G. (2012) Giant otters feeding on caiman: evidence for an expanded trophic niche of recovering populations. *Studies on Neotropical Fauna and Environment* 47(1): 19-23. https://doi.org/10.1080/01650521.2012.662795

Rosas, F.C., Zuanon, J.A. and Carter, S.K. (1999) Feeding ecology of the giant otter, *Pteronura brasiliensis*. *Biotropica* 31(3): 502-506. https://doi.org/10.1111/j.1744-7429.1999.tb00393.x

Ruibal, M., Peakall, R. and Claridge, A. (2011) Socio-seasonal changes in scent-marking habits in the carnivorous marsupial *Dasyurus maculatus* at communal latrines. *Australian Journal of Zoology* 58(5): 317-322. https://doi.org/10.1071/ZO10040

Solano-Ugalde, A. (2005) Observaciones de coprofagismo por parte de *Aramides cajanea* (Rallidae: Aves) em el Refugio de Vida Silvestre Curú, Puntarenas. *Zeledonia* 9(1): 33-34.

Uchôa, T., Vidolin, G.P., Fernandes, T.M., Velastin, G.O., and Mangini, P.R. (2004) Aspectos ecológicos e sanitários da lontra (*Lontra longicaudis* Olfers, 1818) na Reserva Natural Salto Morato, Guaraqueçaba, Paraná, Brasil. *Cadernos da Biodiversidade* 4(2): 19-28.

Vieira, F.P., Alves, M.D.G., Martins, L.M., Rangel, A.L.P., Dubey, J.P., Hill, D. (2015) Waterborne toxoplasmosis investigated and analysed under hydrogeological assessment: new data and perspectives for further research. *Memórias do Instituto Oswaldo Cruz* 110(7): 929-935. https://doi.org/10.1590/0074-02760150262

Waldemarin, H.F. and Colares, E.P. (2000) Utilisation of resting sites and dens by the Neotropical river otter (*Lutra longicaudis*) in the south of Rio Grande do Sul State, Southern Brazil. *IUCN Otter Specialist Group Bulletin* 17(1): 14-19.

Weinstein, S.B., Moura, C.W., Mendez, J.F. and Lafferty, K.D. (2018) Fear of feces? Tradeoffs between disease risk and foraging drive animal activity around raccoon latrines. *Oikos* 127(7): 927-934. https://doi.org/10.1111/oik.04866

Wronski, T. and Plath, M. (2010) Characterization of the spatial distribution of latrines in reintroduced mountain gazelles: do latrines demarcate female group home ranges? *Journal of Zoology* 280(1): 92-101. https://doi.org/10.1111/j.1469-7998.2009.00643.x