

FRUIT OCCURRENCE IN THE DIET OF THE NEOTROPICAL OTTER, *Lontra longicaudis*, IN SOUTHERN BRAZILIAN ATLANTIC FOREST AND ITS IMPLICATION FOR SEED DISPERSION

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ABSTRACT: The Neotropical otter has been described as insectivorous and piscivorous-carnivorous. We registered the presence of fruit remains in the scats of the Neotropical otter and developed an analysis about the occurrence and importance of fruits in its diet. This study was carried out from September 1995 to March 1997 in Reserva Volta Velha, an Atlantic Forest area in south Brazil. Otter scats were collected along rivers, washed, dried and analyzed. Seeds found in scats were identified by comparison with a reference collection and their viability was tested in germination ground plots. Fruit collectors helped studying the availability of these fruit species during seven months. A total of 202 scats were collected but only six (3%) presented fruit remains. Identified seeds from only four scats indicated that otters ate three fruit species: *Marlierea tomentosa* (Myrtaceae), *Manilkara subsericea* (Sapotaceae) and *Pouteria lasiocarpa* (Rubiaceae). The availability results indicate that all three are abundant fruit species in the study area, specially the former. In the germination experiments all seeds of *M. tomentosa* germinated (n=16). Considering the daily movement pattern of the Neotropical otter, and the high germination rate of *M. tomentosa*, it is possible that the Neotropical otter is a seed disperser for this plant species in the study site.

RESUMEN: Presencia de frutos en la dieta de la nutria, *Lontra longicaudis*, en la Mata Atlántica del sur de Brasil y su implicancia en la dispersión de semillas. La nutria, *Lontra longicaudis*, ha sido descrita como insectívora y piscívora/carnívora. Constatamos la presencia de restos de frutos en esta especie y analizamos la importancia de los frutos en su dieta. Este estudio fue realizado entre septiembre 1998 a marzo 1997 en la Reserva Volta Velha, una zona de Mata Atlántica en el sur de Brasil. Los excrementos de la nutria fueran recolectados a lo largo de diferentes ríos y posteriormente limpiados, secados y analizados. Las semillas encontradas fueron identificadas por comparación con una colección de referencia, su viabilidad fue probada por germinación. Recolectores de frutos estudiaron la disponibilidad de los diferentes frutos durante siete meses. Solo seis (3%) de 202 muestras recolectadas contenían restos de frutos. Las semillas identificadas de cuatro muestras indican que las nutrias se alimentan de los frutos de tres especies: *Marlierea tomentosa* (Myrtaceae), *Manilkara subsericea* (Sapotaceae) y *Pouteria lasiocarpa* (Rubiaceae). Los resultados de disponibilidad indican que las tres especies de frutos encontradas son abundantes en el área de estudio, en especial la primera de ellas. En los estudios de germinación, todas las semillas de *M. tomentosa* germinaron (n=16). Considerando los patrones de movimiento diario de la nutria y el alto grado de germinación de *M. tomentosa*, es posible que esta especie sea un dispersor de semillas de estas plantas en el área de estudio.

Key-words: Atlantic Forest, carnivory, frugivory, *Lontra longicaudis*, Lutrinae, Neotropical otter, seed dispersal, *Marlierea tomentosa*, Myrtaceae, southern Brazil.

Palabras clave: Mata Atlántica, carnivoría, frugivoría, *Lontra longicaudis*, Lutrinae, nutria, dispersión de semillas, *Marlierea tomentosa*, Myrtaceae, sur del Brasil.

INTRODUCTION

The original description of the components of the Carnivora order named the group based on their feeding habits, essentially carnivore. Nowadays it is known that this is an aspect of the trophic niche that applies to some of the species included in this order, but not to all of them (Gittleman, 1989). In fact among the carnivore families represented in Brazil (Canidae, Procyonidae, Mustelidae, and Felidae) only the wild cats remain strictly carnivorous and specialized hunters (Kitchener, 1991). Species from the other three families present a more varied diet, including vegetal items which are mainly fruits (Dietz, 1984; Charles-Dominique et al., 1981; Bisbal, 1986; Facure and Monteiro-Filho, 1996; González del Solar et al., 1997, and references therein). Despite the varied diet, the Neotropical otter has been described as piscivorous-carnivorous (Spinola and Vaughan, 1995; Quadros, in press) and insectivorous (Pardini, 1998). Recently, we registered the presence of remains of fruits in its scats and carried on an analysis about the occurrence and importance of fruits on its diet. Additionally, we developed a study to estimate the absolute availability of these fruit species in the study site to test the hypothesis of opportunistic fruit consumption by the Neotropical otter.

MATERIAL AND METHODS

The study was conducted from September 1995 to March 1997, in the Volta Velha Reserve, a protected area from Atlantic Forest of the northeastern coastal plain of Santa Catarina State, southern Brazil. Scats were collected monthly along three rivers: Saí-Mirim, Braço do Norte and Volta Velha. The collected samples were washed by flowing water in a nylon net (mesh = 0.5mm), let dry in fresh air and then checked for its contents. Otters lick themselves and ingest their own hairs during fur maintenance activities. The presence of these hairs in scats was the most confident characteristic to identify fecal samples as otter scats. During scat analysis, seeds could be found and were identified by comparison with a reference collection made ad hoc. These seeds were planted on the ground to check its viability. During germination experiments, under natural conditions, weather parameters, such

as light, temperature and air relative humidity, were not artificially regulated. Percentage of seed germination was calculated as follows: [(number of seeds that germinated / total number of seeds placed to germinate) x 100]. An estimation of the environmental availability of the fruit species whose seeds were found in otter scats was made in the studied rivers, from September 1996 to March 1997. This sampling period was chosen because, according to Inoue et al. (1984), this is a comprehensive fruiting period considering the target species. The availability of fruits was measured monthly, in three sample trees of each target species, with one collector per tree, summing up nine collectors. The collectors measuring 0.50 m² or 0.75m² were made of a thin nylon net and were placed hanging under branches of target fruit trees. The collected fruits were identified by comparing them with a reference collection made ad hoc, and the number of fruits of each target fruit tree per area of collector that would fall on the ground to be available to otters was estimated. The crown diameter of each fruit tree was eyeballed to calculate the respective crown area. With the mean number of fruits per area of collector and the mean crown area, it was possible to calculate the mean number of fruits available per crown area of each target fruit species. Additionally, eight sections of the Braço do Norte river, five sections of the Saí-Mirim river and one section of the Volta Velha river were chosen at random, each section measuring 100 m. The length of each section was defined arbitrarily. The number of trees of each target fruit species, on both margins, that could be seen from the middle of the river, was counted along these sections. With the mean number of fruits available per crown area of each target fruit species and the mean number of trees per 100 m, it was possible to calculate the mean number of fruits that were available per 100 m of the studied rivers. The equation can be resumed as follows: (mean number of fruits per collector area x mean area of the crown) x (mean number of trees per 100 m) = mean number of fruits available per 100 m of river margins.

The obtained data (fecal samples and collected fruits) were analyzed according to four seasons: summer (December to February; warm and wet), autumn (March to May; warm and wet), winter (June to August; cold and wet) and spring (September to November; warm and wet).

RESULTS

Six (3%) of the 202 fecal samples collected had fruits remains. In four of the six scats it was possible to identify three fruit species: in

the spring, *Marlierea tomentosa* Camb. (Myrtaceae) was found in two scats, and *Manilkara subsericea* (Mart.) Dubard. (Sapotaceae) was found in one scat; *Pouteria lasiocarpa* (Mart.) Radlk. (Rubiaceae) was found in one scat in the winter. Percentage of seed germination data shows that *M. tomentosa* (n=16 seeds) had 100% of germination, while *M. subsericea* (n=1) and *P. lasiocarpa* (n=3) did not germinate. The estimate of fruits availability shows that *M. tomentosa* had 5395 fruits/ 100 m and its fruiting period occurred during the spring and summer. It was not possible to measure *P. lasiocarpa* and *M. subsericea* availability, mainly because *P. lasiocarpa* is a plant species with long lasting indehiscent fruits that grow, mature and keep hanging on the mother-plant for a long period; and *M. subsericea* had its fruit collectors destroyed by storms during its fruiting period.

DISCUSSION

According to Herrera (1989) frugivory is a widely recognized phenomenon among carnivores, and the richness of consumed species depends on the season and on the level of anthropic influence in the environment. Hulme (1993) suggests that fruits may be considered sessile prey, that is, for a predator, fruits are prey of maximum catchability. Spinola and Vaughan (1995) show that the Neotropical otter presents a common response among other big and medium sized carnivores, that is, the availability of prey depends more on the ability of capturing them than on their relative abundance (Schoener, 1971). The presence of fruits in the diet of otters, although apparently uncommon, had already been cited by Delaki, et al. (1988), who reported the consumption of three fruit species, mainly in the summer (17,36% of collected fecal samples), by the European otter, *Lutra lutra*, in Greece. In the present study, the Neotropical otter consumed fruits of *M. tomentosa*, for which the estimated environmental availability was high; and of *M. subsericea* and *P. lasiocarpa*, which are plentiful and presented an abundant fruit production (data not measured) during the spring

and summer of the studied period (pers. obs.). This consumption could be assumed to be due to the high availability of this resource and its maximum catchability, regardless of the other more frequent items in its diet (fish and crustaceans). This suggests that the consumption of these fruits by *L. longicaudis* is opportunistic and complementary to its diet. Despite the fact that the daily movement patterns of the Neotropical otter are not known in the study area, in other areas otters move long distances (Melquist and Hornocker, 1983). Thus it is possible that seeds ingested by otters in one place may be transported in its digestive tract many kilometers, until the defecation site. Combining the high vagility of the otter, the displacement from the mother-plant and the percentage of seed germination, it is plausible to assume that the Neotropical otter in the study area may be acting as a disperser of *M. tomentosa*. Extending the conclusions to other areas or to the other ingested fruits would require more research.

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