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**THE NEOTROPICAL OTTER *Lontra longicaudis* FEEDING HABITS IN A
MARINE COASTAL AREA, SOUTHERN BRAZIL**

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Abstract: The feeding habits of *Lontra longicaudis* have been studied in several areas in South America. In Brazil, the studies are concentrated on the species' feeding habits in fresh water ecosystems. Different authors reported the use of marine waters by *L. longicaudis*, although fresh water ecosystems were found to be the main environment providing food for this species. In the Environmental Protection Area of Anhatomirim in Southern Brazil, the marine environment proved to be the main feeding habitat for *L. longicaudis*. Fish and crustaceans are the main prey groups. Four fish families were identified and the Scianidae represents 85% of the prey. Intensive use of the coastal areas and lack of knowledge on the otters' use of these environments can compromise its conservation in Santa Catarina coastal habitats.

The Neotropical otter *Lontra longicaudis* (OLFERS, 1818) has a large distribution in Latin America, occurring in Central and South America and has its austral limit in northern Argentina (CHEHEBAR, 1990). Studies on the Neotropical otters' diet remain fragmented and generally have been carried out in fresh water ecosystems (OLÍMPIO, 1992; BLACHER and SOLDATELLI, 1996; HELDER and ANDRADE, 1997; PARDINI, 1998; UTRERAS et al., 1998; SPINOLA and VAUGHAN, 1998; QUADROS and MONTEIRO-FILHO, 2001). In Brazil, although there are records of the species' occurrence in coastal marine areas (BLACHER, 1987; SCHMIDT, et al., 2000; ALARCON and SIMÕES-LOPES, 2003), it is a general belief that the sea is a displacement area for the Neotropical otter, which concentrates its feeding habits mostly in fresh water environments.

Despite recent efforts to evaluate the conservation status of this species (WALDEMARIN et al., 1998; MEDINA-VOGEL, 1998) and the methodologies for standardising research on its distribution in Brazil (H. Waldemarin, pers. comm.), the Neotropical otter remains in the category of “data deficient” on the Red List of Threatened Species (IUCN, 2003), and in the category of “threatened by extinction”, on the Tropical Database on Species (BDT, 2003). The species is considered “near threatened” on the Brazilian List of Threatened Species (IBAMA, 2004).

The aim of the present document is to report on a study of the Neotropical otters' feeding habits in a coastal marine area in Southern Brazil.

This study was carried out in the Environmental Protection Area of Anhatomirim (APA), located in Governador Celso Ramos district, Santa Catarina, southern Brazil. (Fig.1). The APA has a total area of 4,750ha, from which 3,080ha are part of the Northern Bay of the Santa Catarina Island. The coastal zone is characterized by rocky coasts, sandy beaches, and small protected bays. The Northern Bay of the Santa Catarina Island has a high deposition of organic matter, and its average depth is approximately 6 to 8 meters, reaching up to 10 meters in the deepest sites.

The climate of the region is mesothermic humid, without a defined dry season. The temperature varies between 12-14 °C in the winter and 24-26 °C in the summer. The rain is abundant and well distributed throughout the year, with a more humid period in the summer and a dryer period during the winter. The annual average rainfall is 1,467 mm.

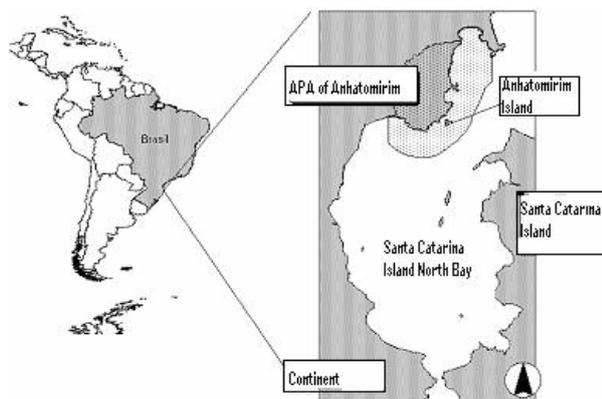


Figure 1. Geographical localization of the Environmental Protection Area (APA) of Anhatomirim, Southern Brazil

In order to study the diet of the otters, spraint analysis was the method selected. Samples of otters' spraints were collected between May and July of 2000, and in April of 2001, in an area of 11 km along the APA coastal zone. Each spraint sample was collected and stored in paper bags. In the laboratory the samples were dried at 200°C and the prey contents remaining in the samples were separated per taxonomic class. The otoliths and other remains were identified by specialists from the Federal University of Santa Catarina, and by comparison with a reference collection of aquatic organisms.

The samples were analyzed according to the relative frequency of occurrence $[Ni/Nf \times 100]$ and percentage of occurrence $[Ni/ni \times 100]$; where Ni corresponds to the number of occurrences of a particular prey item, Nf to the total number of spraints analysed, and ni to the number of occurrences of all items. To complement the description based on the presence/absence of items, two other methodologies were utilized, the area (point method) and the mass (weight) of the spraints samples. Each sample was spread on a paper of 10cm² area (corresponding to 100%), and the food remains found were separated and weighed.

A total of 476 spraints were collected, and 129 were analysed according the relative frequency of occurrence and percentage of occurrence, while 59 according to the mass (area) and weight methods.

The prey remains found in the samples contained scales, otoliths and fish spines, mammalian bones, teeth and fur, exoskeleton of insects, crabs and clams. According to the analysis of the samples, the fish and crustaceans are the main food source for the Neotropical otter in the APA marine coastal zone, constituting 67% and 28% of its diet, respectively, according to the percentage of occurrence (Table1). Mammals, molluscs, and insects were the less numerous taxonomic groups. Fish was also a predominant group according to the relative frequency of occurrence, being present in 83.7% of the samples analysed.

Table 1. Food items identified in *L. longicaudis* spraint samples

Taxonomic Groups	Ni	FOi (%)	POi (%)
Fish	108	83,7	67
Crustaceans	46	35,6	28
Mammals	4	3	2,5
Molluscs	2	1,5	1,2
Insects	1	0,78	0,6

Ni = Number of occurrence; FOi = Frequency of occurrence; POi = Percentage of occurrence

The results obtained from the mass and area methods coincide with the results from the frequency and percentage of occurrence, confirming the dominance of fish and crustaceans as the otters' main prey items. Fish is represented on average 87% of area and 5.4g of weight per sample, followed by the crustaceans with 51.6% area and 1.6g. Insects were not analyzed by this method (Table 2).

Table 2. Average, maximum and minimum weight and area of *L. longicaudis* food items for 69 spraint samples

Taxonomic Groups	Area (%)			Weight (g)		
	minimum	average	maximum	minimum	average	maximum
Fish	0,02	87,23	100	0,02	5,4	15
Crustaceans	0,02	51,6	100	0,02	1,6	5,32
Mammals	0,50	3,2	5	0,05	0,13	0,10
Molluscs	0,25	0,36	0,50	0,11	0,1	0,15

Among the 112 otolith remains found, 82 were identified as belonging to 10 different fish species, distributed in four families (Table 3). The *Scianidae* family represented 85% of the identified otoliths, and *Stellifer rastifer* was the most frequent species (52%), followed by *Micropogonias furnieri* (14 %). Other species differed little in their relative percentages and are less representative in these samples.

Table 3. Fish species identified in *L. longicaudis* spraint samples (n=129)

Family	Species	n of otoliths
Scianidae	<i>Stellifer rastifer</i>	42
	<i>Micropogonias furnieri</i>	12
	<i>Paralanchurus brasiliensis</i>	8
	<i>Larimus breviceps</i>	4
	<i>Umbrina corioide</i>	2
	<i>Cynoscion jamaicensis</i>	2
Serranidae	<i>Diplectrum radial</i>	4
	<i>Diplectrum formosum</i>	2
Carangidae	<i>Chloroscombus crysurus</i>	4
Gadidae	<i>Genidens genidens</i>	2

The Portunidae represented 30% of the crustaceans' remains in the spraint samples and it was the only family identified in this group. The clams present in the spraints were very small (> 1.0 cm), and were not considered as otters' prey. However, through interviews with two local inhabitants, there is testimony of cases where otters were observed eating mussels next to aquaculture areas in the bay. Remains of sea oyster *Crassostrea rizophorae* were found inside one of the otters' burrows, apparently in frequent use.

Among the mammalian remains, *Rattus sp.* was the only species identified. Amphibians, reptiles and birds were not present in the samples, and the insects were present in only one sample and could not be identified.

In APA, marine fish and crustaceans together constitute 95% of the Neotropical otter diet according to the percentage of occurrence. Nevertheless this otter species inhabits freshwater (rivers) and terrestrial environments (ALARCON and SIMÕES-LOPES, 2003), these constitute less important environments for feeding, as fresh water preys were not identified in the spraints in the APA region.

The otters' practice of attacking the fishnets was confirmed by local fishermen, through interviews conducted during the study. This activity was mentioned as it disrupted the fishermen's productivity. According to them, the otters attack the fishnets which are placed close to the rocky coasts in low depths, damaging the nets, mostly eating the body of fish, and leaving the remaining head behind.

The feeding habits of *L. longicaudis* in the coastal marine environment presented similar patterns when compared to the species' diet in freshwater ecosystems. In APA, the fish constitute the dominant prey group, reaching similar indices (83.7% Tab. 1) to those of other studies carried out with the same species in rivers, lagoons, and a dam in South America (CARVALHO, 1990; BLACHER and SOLDATELLI, 1996; HELDER and ANDRADE, 1997; PARDINI, 1998; QUADROS and MONTEIRO-FILHO, 2001; GORI et al., 2003).

The crustaceans are commonly cited as the second main prey group for *L. longicaudis* (HELDER and ANDRADE, 1997; PARDINI, 1998; QUADROS and MONTEIRO-FILHO, 2001), with some exceptions, where it can appear as the dominant group (OLIMPIO, 1992; SPINOLA and VAUGHAN, 1998) or absent (KASPER et al., 2004). According to KASPER et al. (2004), the absence of crustacean in otters' spraints in a river system in southern Brazil is related to the low index of crustaceans' occurrence in the area. In APA the crustaceans represent the second most frequent taxonomic group (35%), reaching an average of 51% of area in the spraints. The high percentage of crustaceans in the samples, as a result from using the area (point) method, could be explained due to the size of the exoskeleton remains found in the spraints.

Other prey groups such as amphibians, clams, mammals, and insects appeared in low frequency in APA, matching the results of other studies carried out in freshwater environments (OLIMPIO, 1992; HELDER and ANDRADE, 1997; PARDINI, 1998; QUADROS and MONTEIRO-FILHO, 2001). Although remnants of birds were absent in the spraint samples, two local inhabitants confirmed their observations of an otter attacking a rail (*Aramides sp.*) nest in a mangrove area.

The abundance of specific fish species or family as prey items in spraints of Neotropical otters has been reported elsewhere (HELDER and ANDRADE, 1997; PARDINI, 1998; QUADROS and MONTEIRO-FILHO, 2001; GORI et al., 2003; KASPER et al., 2004).

PARDINI (1998), GORI et al. (2003) and KASPER et al. (2004) carried out seasonal studies on the diet of *L. longicaudis* and the prey availability. The authors identified a richness of species amongst the otters' prey up to 7, having suggested that the preys' ability to escape as the main factor influencing the prey selection by the otters. In the present study, *Stellifer rastifer* appears as the main prey species, followed by *Micropogonias furniere*. Both species belong to the Scianidae family, and are considered of high commercial importance in this area (AGUIAR et al., 1994). *Stellifer rastifer* is more abundant in the winter and spring seasons (RIBEIRO et al., 1999), while *Micropogonias furniere* is abundant only in the winter (AGUIAR et al., 1994). According to MARTINS-JURAS et al. (1987), in CLEZAR et al. (1998) species of the *Scianidae* family are known to rely on estuarine waters for their reproduction and growth. The Northern Bay of the Santa Catarina Island is characterized by calm waters and receives a large amount of streams and rivers' water.

In accordance with the data found for the two aforementioned fish species, it is reasonable to assume that their predominance in the diet of *L. longicaudis* is associated with the fishes' seasonality, as well as sedentary habits. On the other hand,

to have a more complete set of results, it is necessary to develop further research on the otters' feeding habits during the other seasons, and also it is necessary to evaluate the prey's availability in the locality.

The patterns of use of the marine habitat by *L. longicaudis* in Santa Catarina are still not very well understood. The definition of coastal areas where the species are present would appear crucial to their conservation. Knowledge on the otters' diet in marine ecosystems and the factors affecting their prey, including the impacts caused by the fishing activities and intensive exploration of the coastal zones in Santa Catarina could be gained through further studies in these clearly defined areas.

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RÉSUMÉ

Les habitudes alimentaires de la loutre à longue queue ont été étudiées dans plusieurs régions d'Amérique du Sud

Au Brésil, les études réalisées se concentrent sur le régime alimentaire en eau douce. Différents auteurs relatent l'utilisation du milieu marin par *L. longicaudis*, bien que l'espèce obtienne ses ressources trophiques

essentiellement du milieu dulçaquicole. Dans l'aire protégée d'Anhatomirim, au sud du Brésil, le milieu marin s'avère être le principal lieu de prospection alimentaire de *L. longicaudis*. Elle y consomme majoritairement des poissons et des crustacés. Quatre familles de poissons ont été identifiées, dont les *Scianidae*, qui représentent 85% des proies. Une exploitation intensive de la zone côtière, ainsi qu'un manque de connaissances sur l'utilisation de l'environnement marin par la loutre peuvent compromettre le maintien de l'espèce sur la côte de Santa Catarina.