

The influence of river depth and length of riparian vegetation on the presence of capybaras (*Hydrochoerus hydrochaeris* Mones & Ojasti, 1986)

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Abstract

This study aims to assess the influence of river depth and length of riparian vegetation in the presence of capybaras (*Hydrochoerus hydrochaeris*) in fluvial environments. The study was carried out in the Rosario River, State of Rio Grande do Sul, Brazil. An 8.2 km extension of each bank was divided into 41 points of 200 meters each, totaling 82 points and 16.4 km. The occurrence of capybaras, the depth of the river and the length of the riparian vegetation were evaluated in these points. The presence of capybaras was correlated with river depth, but not with length of riparian vegetation.

Keywords: capybara, presence/absence, habitat conditions, rivers.

Resumo

Este estudo visa avaliar a influência da profundidade do rio e o comprimento da mata ciliar, na presença de capivaras (*Hydrochoerus hydrochaeris*) em ambientes de rios. O estudo foi realizado no Rio Rosário, Rio Grande do Sul, Brasil. Os 8,2 Km de cada margem foram divididos em 41 pontos de 200 metros cada, com um total de 82 pontos e 16,4 km. Nesses pontos, foram registrados a ocorrência da espécie, a profundidade do rio e o comprimento da mata ciliar. A presença de capivaras foi correlacionada com a profundidade do rio, mas não com o comprimento da vegetação ciliar.

Palavras-chave: capivaras, ausência/presença, condições de habitat, rios.

Introduction

The greatest rodent in the planet, the capybara (*Hydrochaerous hydrochaeris* Linnaeus, 1766) has a wide distribution in South America, being

found from Colombia and Venezuela to the Buenos Aires province, in Argentina (MONES & OJASTI, 1986), including most of Brazil. In the state of Rio Grande do Sul, they are found throughout the state, being recorded mostly in the coastal plains (SILVA, 1994).

The species is known to inhabit flood-plain areas, an environment characteristic of subtropical and tropical areas such as the Pantanal, the Amazon Plain and the lake region in Rio Grande do Sul (QUINTANA & RABINOVICH, 1993). Moreover, it also inhabits areas of riparian vegetation and regions with a high anthropogenic influence, many times being considered a pest (MOREIRA & MACDONALD, 1997; FERRAZ *et al.*, 2007; VERDADE & FERRAZ, 2001). The groups vary from two to more than 50 individuals, with the average size of these groups being eight to 18 animals (FEDERICO & CANZIANI, 2005). The measures of the territory of the capybara from five to 16 hectares and is composed of foraging areas, water bodies and dry shelters (HERRERA & MCDONALD, 1989). The diet of capybara is almost exclusively composed of angiosperm species that vary seasonally and can be found all over the habitat of capybara (FORERO-MONTAÑA *et al.*, 2003). Most of the food resources of capybaras are semi-aquatic/aquatic, but they can also feed on cultivated species such as corn, sugar-cane, pumpkin, rice, beans and other vegetables (FERRAZ *et al.*, 2007).

According to Alho (1986), corn is one of the most acceptable food resources when capybaras are in captivity, being also one of the most consumed by the species in wild environments. However, Ferraz *et al.* (2007) argued that the presence of capybaras can be associated with areas with sugar-cane and pasture, which are basically used as food supply. According to Ferraz (2004), the presence of water is useful for foraging in open areas such as flood-plains, as well as in other ecosystems, such as forests. For the capybaras, water is also useful for many other needs beside food, becoming an important resource for the species (OJASTI, 1973; HERRERA & MACDONALD, 1989; FERRAZ, 1999). Considering that capybaras are usually observed living in open fields and that this is the main habitat of the species, this study aims to evaluate the influence of river depth and length of riparian vegetation on the presence of the species in this kind of environment.

Material and methods

The study area consisted of the banks of the Rosario River, in the locality of Passo do Rosário, south of the Municipality of Santiago, State of Rio Grande do Sul, southern Brazil (Figure 1). An 8.2 km extension was delimited on both margins of the river, totaling 16.4 km. Each of those

areas was divided into 41 sampling points of 200 meters each one to evaluate the occurrence of the *H. hydrochaeris*. The river depth and the length of the riparian vegetation (which comprised a perpendicular line in relationship to the river course) were measured in all 41 sampling points. Indirect records of capybaras were also sampled, such as footprints and feces.

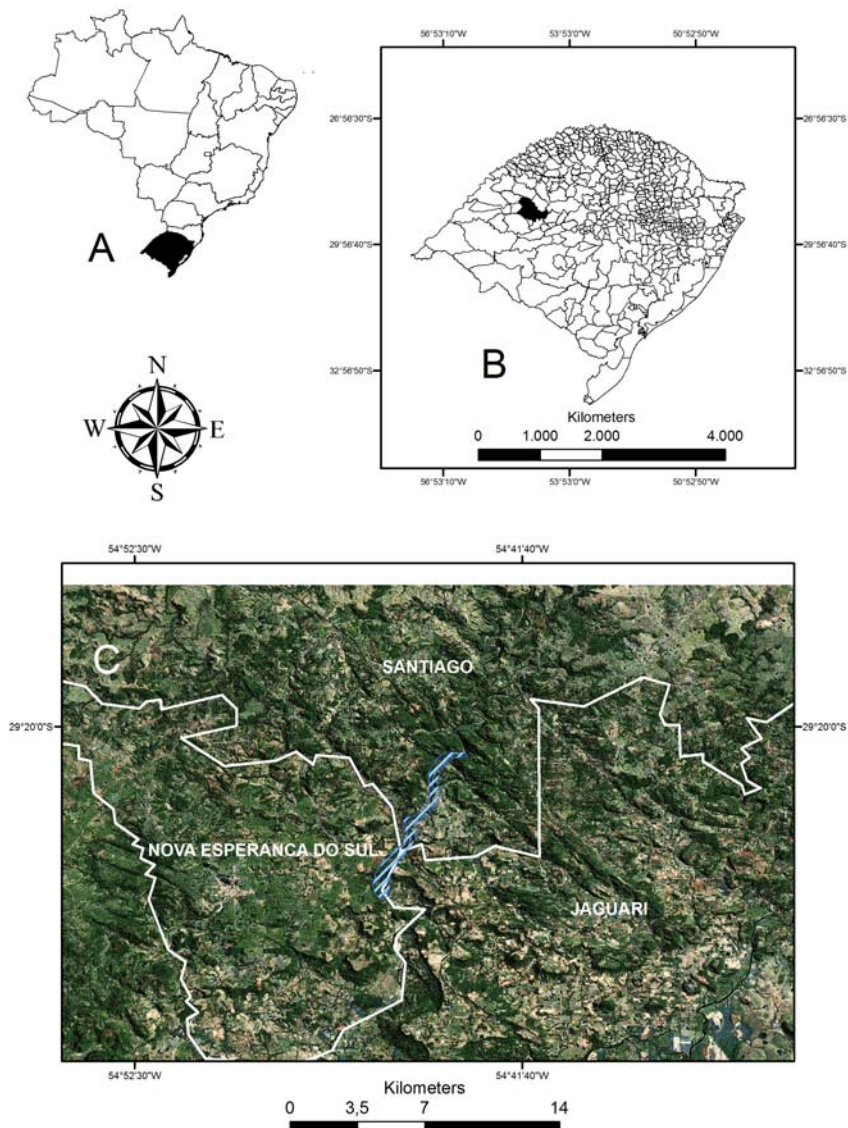


Figure 1. Location of the study area ($29^{\circ}23'01.03''S$ and $54^{\circ}44'41.28''W$) in the dotted area.

In each of the 82 sampling points, the riparian vegetation was measured in a straight line from the river bank to areas where there was low vegetation (abandoned areas of cultivation), pasture or crop fields. The river depth was measured five meters from the bank in the middle of all sampling points. The number of capybaras recorded in each point was confronted with the measurements for river depth and length of riparian vegetation. This analysis was accomplished with a simple logistic regression (ZAR, 1999). All tests were conducted with the software Biostat 5.0 (AYRES *et al.*, 2007), and had significance level of 95%.

Results and discussion

From the 82 sampling points, there were 41 records of capybaras, with 18 records on the right river bank and 23 on the left one, that was evidenced only by footprints and feces. The river banks of the Rosario River have shrub or arboreal vegetation, some pasture areas and aquatic plants, which are the main source of food for the capybaras (OJASTI, 1973; HERRERA & MACDONALD, 1989; ARTEAGA & JORGENSON, 2007). According to the analysis conducted here, the riparian vegetation is more present on the left bank (Table 1 and Figure 2b). Moreover, in many areas along the river, the length of preserved native vegetation does not match the minimum size established by the Brazilian Federal Law (4.771/65). The food resources of capybaras may have been replaced by cultivated species. One of the main crops in the studied area is corn, cultivated in areas surrounding the river banks, which may be considered an available and abundant food resource for these animals.

Apparently, not only the presence, but also the abundance of capybaras, is regulated by the availability of food resources along the river, mainly the ones related with the crop fields (Verdade & Ferraz, 2006; Ferraz *et al.*, 2009).

Table 1. Average values of the 41 points in each bank sampled for length of riparian vegetation and river depth.

Variable	Right Bank (meters)	Left Bank (meters)
Length	17.56	46.98
Maximum Length	177	50
Minimum Length	12	0
Depth	2.36	2.24
Maximum Depth	4.54	5.78
Minimum Depth	0.6	0.7

Ferraz *et al.* (2003) argued that capybaras are considered pests to the corn fields near to forest fragments, indicating that the latter areas serve as shelters and, mainly, food resources for the species. However, in the Rosario River, this pattern is not present, with the length of riparian vegetation being irrelevant as a food resource for the capybara. A test of logistic regression indicated a positive and significant relation between the presence of capybaras and river depth (Table 2 and Figure 3d). The greatest average depth was found in the right bank (Table 1 and Figure 2a), which also displayed a greater depth in almost all of the points in relation to the left one (Figure 1a). According to Pereira & Eston (2007), the capybaras search for shelter in water or in areas of forest when in captivity, where there is no threat. Human hunting is the only threat to capybaras, especially in the open fields between the areas of forest, which apparently are used in the search for food. Thus, the river becomes an area of protection and the depth of the Rosario River becomes an important environmental factor.

Table 2. Logistic regression results from the variables river depth and length of riparian vegetation and presence/absence of capybaras in the study area. The asterisk shows the positive relation between the variable and the presence of capybaras.

	Left Bank			Right Bank		
	Z	P	Standard error	Z	P	Standard deviation
Length	1.7854	0.0742	0.0149	0.275	0.7833	0.0278
Depth	3.3209	0.0009*	0.4753	2.8229	0.0048*	0.3248

There is a variation in depth along the river banks within the study area and also throughout the months, with a greater average depth along the right bank, but even the shallowest depth along the right bank is deep enough for a capybara to dive and escape of the danger. In captivity, newly-captured capybaras spend many hours inside the water tanks during the day (NOGUEIRA *et al.*, 2004) for their protection. Both the wild and captivity, the capybaras use their capacity to remain submersed for several minutes to escape predators, the river habitats need a minimum depth to allow such behavior.

This kind of protection can be extended to resting areas, as seen in MONES & OJASTI (1986). Areas covered by water can provide resting areas, exemplified by rocks situated in the middle of the river, which might difficult the action of hunters and allow the young capybaras, or even adults, to rest during the day. Throughout the study, several capybaras were seen

on rocks near to wells, where they seek shelter when in the presence of people. The river banks are interpolated by areas of cultivation, livestock and riparian vegetation, making these rodents only go to these banks when they need food or rest.

River banks with forests could serve as resting places as well, and this could be relevant for the presence of capybaras, whereas forests serve as shelter for the species in plain areas.

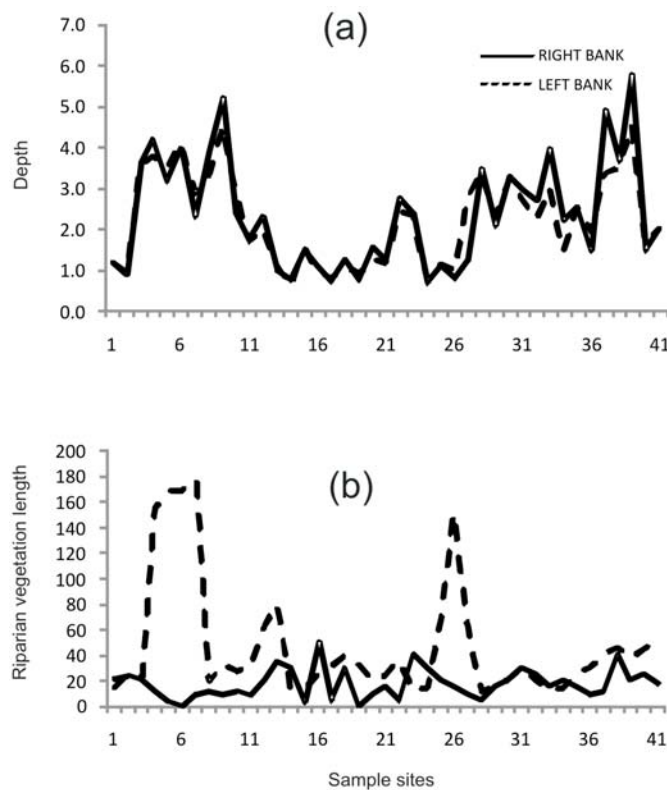


Figure 2. Comparison between the two banks along all of the studied points, in relation to depth of river (a) and length of riparian vegetation (b). The dashed lines represent the left bank and the solid ones, the right bank.

To Ferraz *et al.* (2007), the presence of capybaras is more associated with areas of sugar cane cultivation and pastures, both used as food resource. It is also associated with forest fragments, possibly adjacent to agricultural areas, enabling foraging behavior. Another factor that can influence the use of these forests is the possibility of function as foraging areas when there is a lack of food. The capybara can search for eatable species in the sub-grove vegetation.

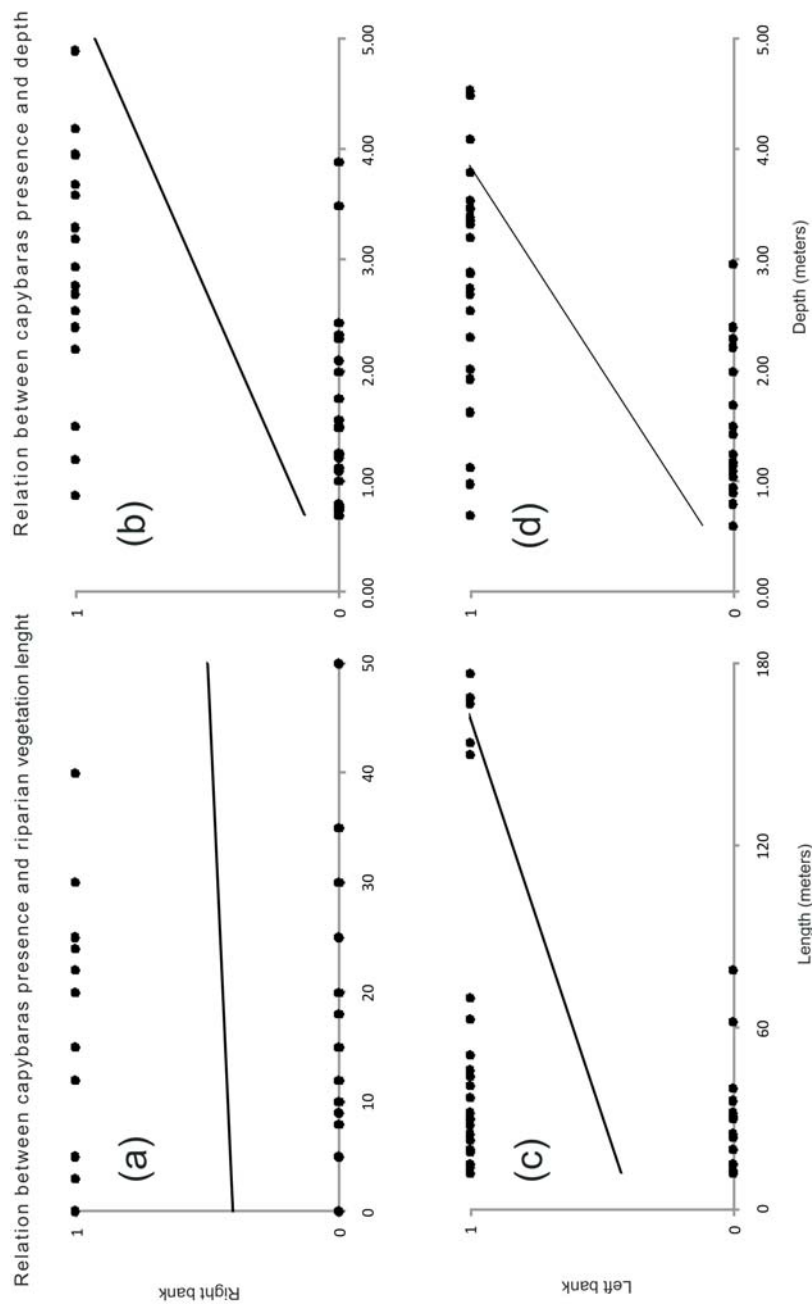


Figure 3. The relation between the presence of capybaras and length of riparian vegetation and river depth in the two river banks (a) presence/length for the right bank; (b) presence/depth for the right bank and (c) presence/length for the left bank and (d) presence/depth for the left bank.

Conclusion

Despite great open fields being the favorite habitat of capybaras, they can also live in more restricted sites, such as forest-covered river banks, where they obtain protection and can reproduce. With high reproduction rate and good adaptation to different environments, this species can remain in these areas, but in this kind of environment the capybara will probably have a smaller population or one that is fragmented in subgroups. Forested banks can be used as resting places, but that is not frequent, since capybaras are targeted by hunters who use these areas to surprise the animals. As an alternative, that specie seek shelter inside the river, forcing the hunters to use boats in some cases. Even so, the water is still a safe option against this threat, whereas the rocks in the middle of the river allow the animals to rest and be safe due to the depth of the river.

The Rosario River, apparently, offers the necessary resources for the survival of capybara: water bodies and areas of pasture. However, the last one is restricted to small fields along the river bank that are designed for the cattle access to the water of the river, enabling the capybara population to grow, due to limited access. The growing capybara population in Rio Grande do Sul requires more directed research, mainly at their population dynamic as a group, beyond studies about the use of river areas.

In highly anthropogenic environments, the availability of food is a resource that influences the distribution of capybaras in small areas. Thus, this can be an important regulator of the occurrence of individuals and groups, as well as of the size of the groups, in fluvial environments. Whereas study area is in a mountainous region, there are few locations of pasture or even livestock areas for the species to use as resource. The crop fields, generally comprised of corn, are attacked by capybaras to compensate the scarcity of food in the lotic environment.

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