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RESEARCH ARTICLE

A COMPARATIVE STUDY OF NEOTROPICAL OTTER SHELTERS FOR THREE DIFFERENT ENVIRONMENTS

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ABSTRACT

This work is a description and comparative analysis of otter shelters for three distinct environments, a freshwater lake, a coastal island, and a river. The original disposition of the rocks favors the formation of semi-closed internal environments, sometimes connected, and frequently divided in compartments. The structure created and the disposition of the internal and external spaces appears to be important in determining the comfort of the animal as related to temperature and ventilation. Otter conservation along the coastal region of Santa Catarina state depends on the conservation of the Atlantic Rain Forest.

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INTRODUCTION

The importance of the availability of dens related to the presence of otters has been pointed out by several researchers (Carvalho Junior, 2016; Pardini and Trajano, 1999). The way the animal can utilize these environments can be very complex, including the use of emerged and submerged entries. The interior includes underground galleries connecting two or, sometimes, three rooms (Carvalho-Junior et al., 2010). Otter shelters description can be found in literature (Damasceno et al., 2021). However, comparative studies of Neotropical Otter shelters have not been done before. From these results, it is possible to define an otter habitation pattern associated with the habitat type and the environmental variables involved.

MATERIALS AND METHODS

For each habitat, marine, lake, and river, a shelter was selected to to obtain a detailed internal description.

The location was determined with a GPS Garmin. The number and location of the emerged and submerged entries were defined for each shelter. One shelter is selected to monitor the air, water, and internal shelter temperatures. Temperatures are obtained monthly for a period of 48 hours, in which every 6 hours the data is collected and monitored at 06:00, 12:00, 18:00, and 24:00 hours. A rowing boat, photographic camera, tape measure, torches and diving equipment are used to visit and study the areas.

RESULTS

Figure 1 shows the shelters, with measurements, for each area of study, Peri Lake, Macacos Mountains and Porto Belo Island. The height of the internal rooms vary from 1.25 to 1.60 m, with widths between 3.25 and 3.70 m, and lengths from 3.50 to 6.40 m for the shelters located at the Peri Lake and Porto Belo Island. At the Macacos Mountain location, heights were below 1 meter, but with widths and lengths like the one found in the other study areas.

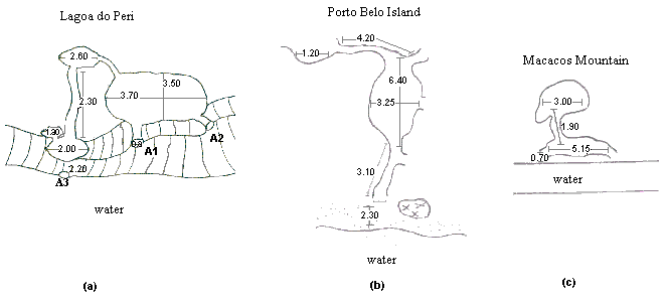

Figure 1. Spatial organization of Neotropical Otter shelters. (a) Peri Lake; (b) Porto Belo Island; and (c) Macacos Mountain. A1, A2: Entrance above water level. A3: Submerged entrance. The drawings are not to scale. Measures are in centimeters

The external area of the shelters is covered by Atlantic Forest. Temperature inside the shelter tends to follow the path of the solar radiation, achieving its maximum during summer and decreasing throughout the winter. The difference between maximum and minimum temperature through the year is 8 °C at 6:00 hs, 6.2 °C at 12:00 hs, 9.5 °C at 18:00 hs and 9.5 °C at 24:00 hs. The internal area is spacious, with height that can allow a person to stand inside comfortably. The combination of various small entrances with the internal space is important for the thermal regulation of the shelter. The air heated during the day flows by natural convection into the cave through the openings. At the end of the day, the external temperature decreases, and the flow reverts. The cold air gets into the shelter and refreshes the environment. During the night, the heat stored at the floor of the cave and at the rocks themselves keep a mild temperature inside the shelter. Part of the heat is transferred out of the shelter, especially from the openings above, which work as natural ventilation and prevent the excessive heating of the shelter.

CONCLUSION

The disposition of the rocks favors the formation of semi-closed internal environments, sometimes connected, and frequently divided in compartments. All shelters present several emerged and submerged entrances. The roots and a thick layer of humus work together to fill space left by the rocks. The interaction between the geological structure and the vegetation, guarantee a protected environment against rain, wind and cold. This also results in an environment with a very low luminosity. The study areas are in a humid subtropical climate, where factors such as air circulation and shade are of fundamental importance. The shade, provided by the forest, results in a reduction of the incident energy that enters through the lateral and superior openings. The shape and the internal arrangement of the shelter reflect on the levels of shading. The rock formation is of great thickness and has small openings. During summer, the wind decreases the internal temperature of the shelter through a process of natural cross-ventilation through several openings. The fresh air enters through the lower openings and exits through the upper openings. External cold air gets inside while the warm air exits through the upper openings which work as thermal chimneys. Otter conservation along the coastal region of Santa Catarina state depends on the conservation of the Atlantic Forest. The stratification of the forest, together with the high density of epiphytes, represents an important contribution to the formation of safe environments for the otter.

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