

# Social Carrying Capacity at a Brazilian Protected Area

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## Introduction

The modern societies reencounter the nature's social representation in protected areas. Thus, there is a new enchantment with natural environments and concepts' redefinition (Borrie 2012). According to this social archetype, the protected areas assume this main goal of biological diversity protection and ecosystems process maintenance (Dudley 2008). But even the most conscious visitors leave marks of their presence.

A possible management action to protect resources and improve the visitor experience is to limit the number of visitors by calculating the social carrying capacity. This concept it refers to the number of visitors that can be accommodated in a protected area at the same time ensuring a satisfactory experience (Boullón 1997).

The objective of this paper is to present the social carrying capacity of a high visited site in a Brazilian Park.

## Methods

### *Study area*

The Serra da Tiririca State Park (PESET) is a protected area of Rio de Janeiro State (Brazil). The Atlantic Rainforest occupies a mountain range and so, the PESET's topography is very diverse. The Itacoatiara Rock (IR) is 233m height (Cova & Pimentel 2013). It is one of the Park's visitation hot spots and the belvedere at the top has an area of approximately 1179m<sup>2</sup>. The number of visitors is rising year by year and it has been observed an increase in their numbers due to international events as Soccer World Cup and the next Olympic Games.

### *The People-at-one-time methodology and the Interviews*

The People-at-one-time (PAOT) methodology was adapted from Manning et al. (1995) and Zacarias et al. (2011). An area with the largest circulation of visitors was chosen on IR. This area was photographed and measured with Garmin GPS unit. Then a series of five images was created simulating visitors increasing amounts (from 0, 15, 30, 45 to 60 people - Figure 1). From March to August 2015, 374 interviews were carried out. Visitors were chosen in a non-probabilistic sample. The interviewees were asked to rate how much the amount of people showed in photos, would affect the quality of their visit, on a Likert scale that varied from (+ 4) to (- 4) and included a neutral point (0). After the end of the interviews, the average scores for each photo were used to produce a norm curve (Jackson 1965) where the neutral point is the minimum acceptable condition by visitors and therefore, the PAOT of the area.



**Figure 1.** *The five created images for PAOT methodology. (a) The belvedere provided by Itacoatiara Rock with no one; (b, c, d, e) Manipulated images showing 15, 30, 45 and 60 people respectively in an area of 377 m<sup>2</sup>*

## Results

The PAOT found in this research, was about 28 persons related to a 377m<sup>2</sup> area, as showed in the images presented to the interviewed visitors. To get the PAOT for all the IR's area, it was necessary to extrapolate the result for 1179m<sup>2</sup> which is the total area where visitors normally are concentrated to appreciate the view provided by the belvedere. The obtained number was about 88 visitors at the same time at IR's top.

## Discussion

It was observed that visitor satisfaction tends to decline when the number of people increases. This result corroborates with the study of Manning et al. (1995), made in Arches National Park in the United States, where the social norm curve is also decreasing. Despite the high score given to the photo with anyone, an average of 30% of respondents argued that this picture did not look nice for different reasons, as to convey a sense of loneliness or danger, but also considering it unfair because other people should have the opportunity to visit the site. This result is according to the one shown in a survey on a beach in Portugal (Zacharias et al. 2011). In this study the image with no one visitor received a score of -0.5 in contrast to the notes more than four times higher than the picture with 50 people. It is expected that these results

serve as a theoretical basis to argue with these visitors that the Park's staff should control the number of people to protect the environment and maintain or improve visit's quality. Management of the number of visitors is a priority action for the current administration.

## Conclusion

It is the first time in Brazil that a scientific research uses the PAOT methodology. This proved easy to apply and generated concise and relevant results. The number of visitors found that could be at the same time in IR with minimum impacts on visitor's perception was about 88 people in relation to the study area and also to the average estimated time for the visit. However, as there are times with higher number of visitors, such as early morning and late afternoon, there is a tendency of these periods become more problematic for the management of this indicator. It is suggested that the Park's management apply the social carrying capacity found in this study in order to improve the quality of the visit but also to minimize the physical and biological impacts. However, this correlation has to be yet established by the trail physical impact data.



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