

# Comparing Webshare services to assess MTB use in protected areas

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## Introduction

Natural parks are the majority of protected areas in Portugal, since most areas with high conservation value have resident populations. Like in other countries, the number of users seeking these territories for recreational activities is growing, but monitor and management resources are limited. With no reliable monitoring schemes, the construction of the Nature Sports Chart (CDN), which is a legal document that determines which sports activity can be done, where and when in each park, has proven to be difficult. In those 2 parks for which it has been done, recourses are not enough to make sure users comply with it, leading to several management and user conflicts.

One of the growing activities is mountain biking (MTB) that leads to two major types of impacts: environmental (e.g. biodiversity and biomass losses, soil compaction, etc. (Marion e Wimpey 2007) and social, e.g. safety (Cesseford 2003), trespassing, among others.

The increasing use of webshare services provided Nogueira Mendes *et al.* (2012) with a method that proved to be promising when tested as a way to monitor MTB in Arrábida, Portugal, without the need for many resources. This study, intends to test the applicability of this same method to the Sintra-Cascais Natural Park (PNSC), using and testing the results from other webshare services.

## *Study area*

The PNSC (with 14 583 ha), created in 1994 has the highest resident density of protected areas in Portugal due to its location within Lisbon metropolitan area. It has a wide variety of ecosystems, some of them with high value, included in Natura 2000 Network. The CDN of the PNSC published in 2008, which is being revised, currently offers 7 trails for mountain biking. Despite the CDN, all involved stakeholders (park managers and local authorities, mountain bikers, dwellers and other users) understand that the reality of what happens with MTB in this park is quite different. They report a number of conflicts, including illegal tracks and trespassing, mostly related to the excessive behaviours of some users, that requires immediate action.

## Methods

Two webshare services were chosen to systematically download all the tracks uploaded by PNSC mountain bikers using global positioning system (GPS). This allowed the comparison between the results given by each website and to assess their complementation. One is GPSies, which being the first one to be available in Portugal has the highest number of users. The second one is Wikiloc, which is more recent and with less functionalities. On both sites MTB was the activity targeted among all the existing ones.

In GPSies, queries with a five km of search radius were made to ten localities distributed all along the park to ensure that all submitted tracks were downloaded. In Wikiloc, only four localities were chosen, since it was enough to find all tracks uploaded for the study area. Due to the differences between GPSies and Wikiloc available data a comparison was made only for the searches done on the villages of Sintra and Cascais (the municipalities main centres).

The tracks were downloaded in two formats: “.gpx” associated with the tracks topology and “.kml” that includes several attributes (e.g. user and track name, total distance, total climbing, etc.) for later analysis.

All downloaded tracks were converted into shape-files using GIS software that allowed the elimination of duplicate results for each dataset. Final results were then plotted against the PNSC limits and the park zonation plan, allowing understanding the extension of the network of trails used for MTB in PNSC, and detecting management conflicts. Both datasets were compared (using the raster calculator in ArcGIS 10.2) through a fishnet grid of 50x50 m allowing to quantify the use of MTB in the study area by the number of tracks that crosses each grid.

## **Results**

A total of 1 998 tracks were obtained from GPSies, for the study area, representing a total of 52 350.74 km, with an average of 41.88 km per track.

The comparison between GPSies and Wikiloc for Sintra and Cascais villages has shown that GPSies has many more tracks uploaded than Wikiloc (417 vs 214), which translates in a much higher number of km (17 676,41 vs 8 467,10). Even so, the mean distance per track is very close for both webshare services (42.39 km vs 39,57 km) and in line with the entire GPSies dataset.

The fishnet comparison shows that both datasets share 87% of the grid (each cell is used or not used in the same way), 3% of cells are only used on Wikiloc against 10% on GPSies.

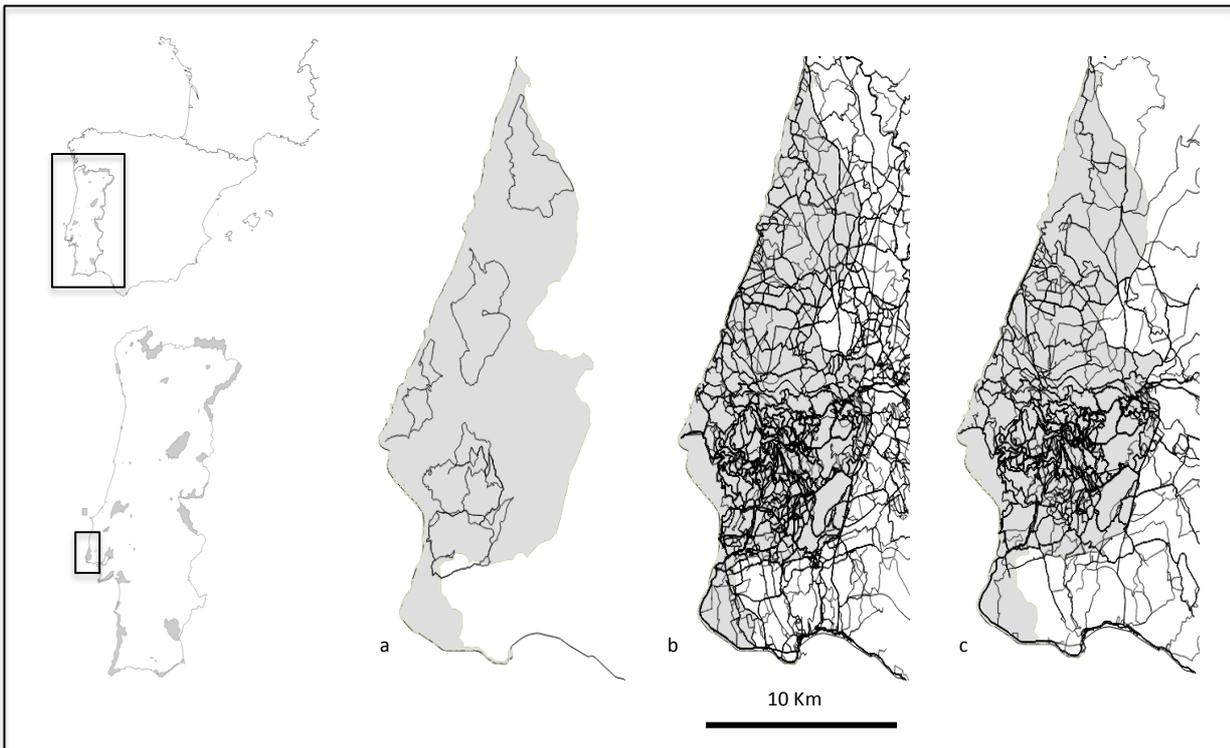


Fig. 1. Comparison of the mountain biking tracks in Sintra-Cascais Natural Park: (a) offered by the Nature Sports Chart Plan; (b) with those obtained with GPSies and Wikiloc (c), for Sintra and Cascais datasets.

## Conclusions

The 7 independent trails offered by the PNSC's CND for mountain biking are not at all an offer that satisfies the pressure of this activity in the park. In fact, a dense web of trails, sometimes opened by mountain bikers themselves is being used. This web crosses not only roads where it causes no trouble but also some habitats and sensitive areas where it should not be, showing that management measures are needed.

The differences between results from both webshare services are probably due to GPSies popularity within this activity. Being older and with more users, results in more tracks uploaded and with higher resolution than Wikiloc. Both data sources have proven to be valid for MTB monitoring in PNSC, since they both represent well the spatialization of this activity in the park, without the need of many resources. That being said, GPSies provided more resolution, almost all trails and paths found on Wikiloc are also available on GPSies, making the use of this last one enough on its own to track MTB in the study area. For other activities and/or protected areas this might not be the case.

Results from the fishnet grid analysis confirm these findings, stating GPSies as the best webshare service to gather information for future management actions to be set by the park authority with the commitment of all involved stakeholders.

## **Acknowledgements**

This paper presents research results of the Strategic Project of e-GEO (PEstOE/SADG/UIo161/2011) Research Centre for Geography and Regional Planning funded by the Portuguese State Budget through the Fundação para a Ciência e Tecnologia.

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