

# Profiling MTB users' preferences within protected areas through Webshare services

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## *Introduction*

Recreational use of protected areas (PA) is increasing worldwide demanding for better knowledge and strategies in order to fulfil the mission of these territories regarding their conservation objectives and social and economic goals. A common strategy that usually results in less management and user conflicts offers a network of recreational facilities, normally through trails or footpaths and interpretation centres, but not all recreational or PAs are equipped with these facilities. In those cases with special emphasis on areas close to or within large residential areas, informal use may expand to the whole territory. Even where a good network of suitable trails for recreational activities exists, informal use can easily lead to conflicts. Profiling user's preferences might help managers and decision makers design a proper offer of outdoor activities. Knowing what people like to do could avoid strategic errors, by offering to local users and visitors the minimum satisfaction regarding their motivations and expectations. Nogueira Mendes *et al* (2012) used a webshare service to collect data regarding spatial use of Mountain Biking (MTB) on Arrábida Natural Park (PNArr) in Portugal, suggesting further work to test if these web resources could be used to monitor recreational activities within protected areas. This study intends to test if this Voluntary Geographical Data could be used to profile average bikers preferences in order to better understand and better manage MTB within these territories.

## *Study Area*

The study area includes the property limits of Arrábida's World Heritage Nomination Site, which is located in Lisbon Metropolitan Area, 45 minutes away from Lisbon and that includes the total area of (PNArr). This area is characterized by a high diversity of Mediterranean habitats due to its singular location and geology, with small mountains, valleys and plateaus making it a mountain biking paradise for local users.

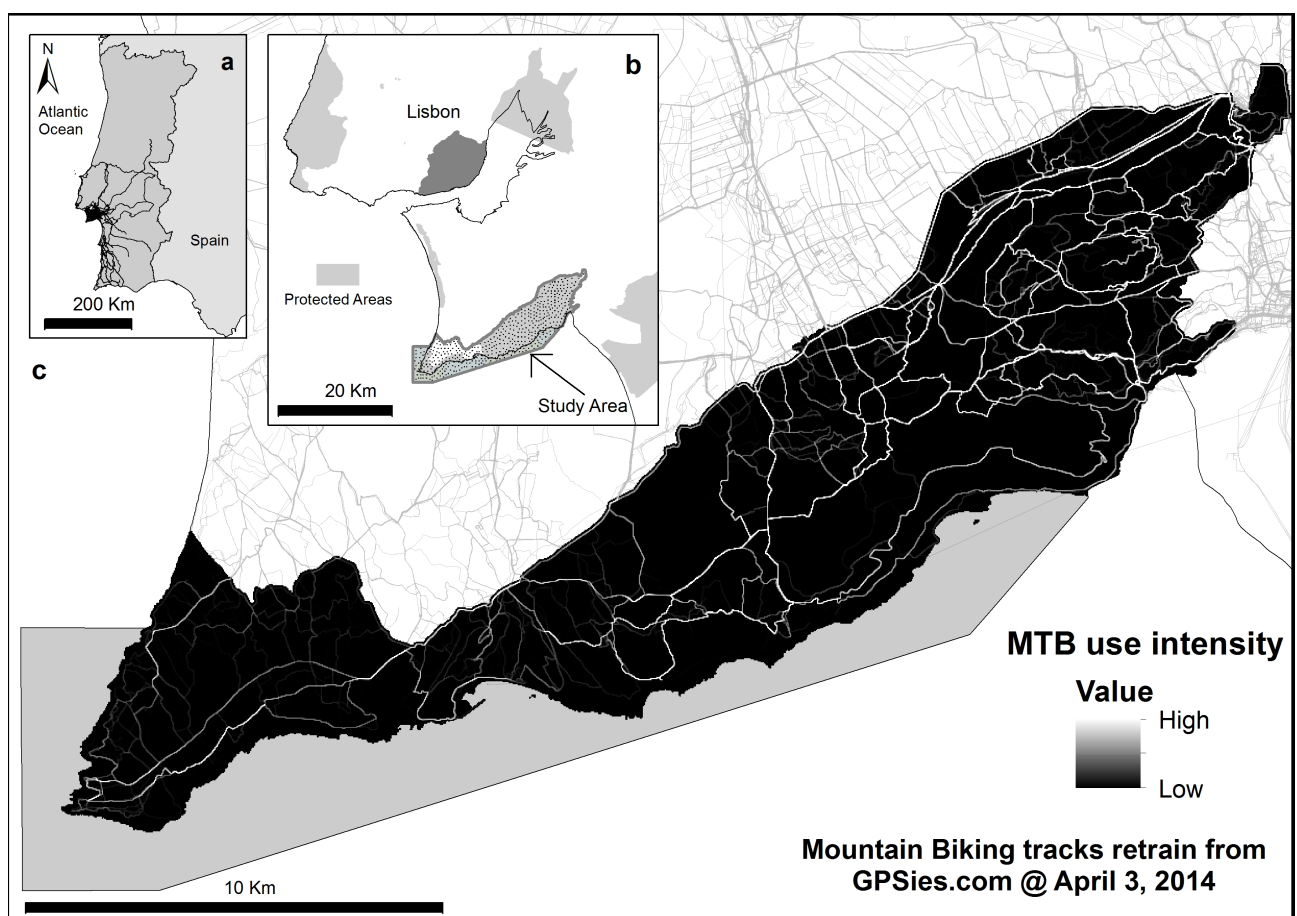
Currently all involved managers of this territory, Natural Park Authority, local Municipalities and the Association of Setubal's Region Municipalities are committed to build a recreational offer that could accommodate and hold both the actual demand and a most probably future increase of use.

## *Material and Methods*

The main dataset used in this study was collected from GPSies.com, one of the oldest and more popular free webshare services based on a WebGIS. By April 3<sup>rd</sup> 2014 it held over 54.000 GPS tracks from Portugal reaching a total of 300.000.000 km. Each track is classified within 32 different activities such as hiking, climbing, mountain biking, horse riding, among others that are organized in six categories of which “By Wheel” represents 55% of the total kilometres, uploaded by GPSies users with 172.937.766 km of routes in Portugal.

GPSies queries were configured to ensure that all uploaded tracks were in a radius of 25 km from Palmela, using selective tracks’ length to limit each query to less than 250 tracks. Within this website, if the query results in a higher number, only the latest 250 results are listed and available to be downloaded.

Each subset was retrained in .gpx and .kml files and then converted into shape files and analysed in a GIS environment, using ESRI® ArcGIS™ 10.2 ArcInfo. Following the methodology proposed by Nogueira Mendes *et al* (2012) spatial analysis was carried out by overlaying a fishnet square grid of 25 m on the tracks dataset to determine the intensity and spatial use on Mountain biking in Arrábida. Finally the result was converted into a binary raster (0 = no MTB v.s 1 = MTB track) and the same grid was used with the Land Use / Land Cover Map of Continental Portugal (that follows the CORINE Land Cover nomenclature) to identify the most attractable land-cover classes for this activity within the study area through a raster calculator analysis.



**Figure 1** - Mountain Biking tracks retrain from GPSies on April 3 2014. (a) Portugal mainland; (b) Lisbon Metropolitan Area and surrounding Protected Areas; (c) Study area.

## *Results and Analysis*

The total dataset downloaded from GPSies consisted of 4.431 tracks of which 2.479 crossed the study area. A closer analysis suggests that other 47 tracks were not consistent with this study's objective, either because the track obtained included several bicycle rides or several topological errors and erratic track points that extended the track length to absurd distances. The main reason for these errors is due to the fact that submitted information is 100% voluntary, and includes data noise. The final dataset included 2.432 tracks submitted from October 2006 to April 2014 by 378 identified users that upload 2.145 tracks, the last 286 anonymous. Over 55% of users uploaded more than 1 track up to a maximum of 169 (a clear example of a more committed user). The number of tracks submitted per year raised from 4 in 2006 to 594 in 2011 (at the same time that smartphones with assisted GPS antenna were becoming popular in Portugal) with an increase rate of 222% if compared to 2010. Uploading of tracks dropped in 2012 to 574 and to 425 in 2013. In the first trimester of 2014 only 80 tracks were submitted. This could be due to the dispersion of other web-services similar to GPSies like, Strava, Endomondo and others that offer a stronger community feeling or other added values like personal training and medicals advice.

The average length of Arrábida MTB rides is 47,7 km, maximum distances included North/South crossing rides from Lisbon to cape Sagres, in Algarve for example (reaching over 200 km) but that just intersected the study area. 98% of the analysed tracks were within distances of up to 100 km of which 57,15% were done inside of the study area, even if 76,89% of the rides started in the surroundings locations. Regarding land-cover classes heterogeneous agricultural areas (13.21%), forests (22.52%) and scrub and/or herbaceous vegetation associations (35.20%) are the top 3 favourite land uses used in Arrábida for MTB.

## *Conclusions*

Comparable to what it has been tested with other activities such as geocaching (Nogueira Mendes, *et al* 2013) voluntary geographical data can provide important clues regarding how the territory is being used, making it a valuable tool for management of outdoor activities within recreational and PA. In this case, average preferences in terms of distances and favourite trails of MTB users of Arrábida could be inferred and could be used to design an official trails' network that could regulate this high impact activity. Further analysis could be performed with these datasets to confirm pavement preferences for example, and if results are consistent in other PAs.

As any other web based resource, gathering geographical data from these services should be done carefully since quick shifts and massive trends on internet use can be very fast. While in Portugal GPSies is still a very popular service (with about 125 new tracks for mountain biking per week) in other countries there might be other services with the same popularity level. Nevertheless searching the web is always a good starting point in terms of recreational uses monitor. If people usually do it, it is most likely that someone has posted it on the web.

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