MTB monitoring in Arrábida Natural Park, Portugal

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Introduction

Recreation activities in protected areas are increasing worldwide, demanding additional and better monitoring to provide clear management strategies. Protected and classified areas in Portugal are no exception to this trend. Nevertheless, contrary to what happens in several countries where nature/ecotourism is a well-established touristic product with proper monitoring and developing strategies, little is known regarding this phenomenon in Portugal. The potential of these territories for tourist and recreational activities is enormous, but like all resources it needs to be fully known and understood in order to be properly managed.

Study area

The Arrábida Natural Park (figure 1), located within the Lisbon Metropolitan Area (near 2,5 million inhabitants), is facing a growing pressure from recreation mainly due to open-air activities like trekking, Mountain Biking (MTB) or Geocaching. Although "Sports Nature Plans" are mandatory by law since 1999, it doesn't exist for this protected area yet, due to lack of information and well-defined systematic methodologies. Like in all other protected areas in Portugal, there are no official gates or main entrances to the park, which is already densely populated, making the assessment of tourists and visitors influxes a challenging task.

Material and methods

To fulfill this information gap, a sampling strategy was designed to collect direct and indirect data regarding MTB activity. During nearly two years, MTB has been surveyed using a TRAFx™ fixed counter logger on one of the most intensively used trails (Moinhos Trail), in order to characterize the number and seasonal presence of mountain bikers. In order to study the spatial distribution of this activity, we also collected data from GPSies.com, a sharing WebGIS platform that allows uploading, searching and collecting GPS tracks from all over the world. Collected GPS tracks were then converted into shape files and analyzed in a GIS project, using ESRI® ArcGIS™ 10.0 ArcInfo.

While counter loggers collect direct data counting the population of users that pass by it, GPSies.com and other web share services data represent only the bikers that want to share their tracks. Nevertheless, due to the large amount of collected tracks, this indirect method should be able at least to identify all trails and paths used in MTB rides.

Results and analysis

Counter logger

Counter results, from a total of 13815 hour of observation periods (from August 2010 to May 2012), have shown that Sunday mornings are by far the busiest period for MTB rides, with average counts being twice of Saturdays (180 and 95 respectively) and 7 to 8 times more than regular working days. Maximum counts have reach 137/h, 317/day (May 2011) and 790/week (October 2011 – with a national holiday on a Wednesday), quite above the overall average numbers for the same periods. On average for the entire sampling period, 58.65 counts per day were registered.

This daily and weekly pattern is constant all year, with the pattern of seasonal differences similar to other open-air activities. Spring, summer and early fall months are more used than winter. Rain, wind and extreme temperatures are the environmental factors that seem to have more influence on this activity in Arrábida Natural Park.

GPSies.com tracks

Search queries on GPSies.com were made on 29 May 2012 for each municipality within the park area, being restricted to a distance up to 25 km from it and just to MTB tracks. Each query returned the 250 newest tracks uploaded to this service, limiting the time window for each dataset. After the elimination of duplicates, the 750 GPS tracks downloaded (uploaded from 11th February to 28th May 2012), resulted in 338 individual tracks, 186 (55%) of which crossed the park limits.

The 186 tracks included in the analyzed dataset reached a total accumulated distance of 9530 Km, of which 49% were within the park area. Spatial analysis from GPSies.com tracks was carried out by overlaying a fishnet square grid of 25, 50 and 100m on the tracks dataset, in order to obtain the number of tracks per grid unit. Each result was then compared with the official road and paths network using the same method. Fishnet cell sizes were chosen to accommodate GPS spatial errors, which can vary up to 15/20 meters depending on atmospheric conditions, especially on tracks collected by assisted GPS cell and smartphones. As expected, results were more accurate on the smaller grid being the processing time the only inconvenient for this choice.

The spatial analysis has shown a non-random spatial distribution of MTB activity, highlighting four major findings: Moinhos Trail, where the counter logger was installed, is the most used trail of the Park; 44% of the analyzed tracks originate from, or go to, the surrounding municipalities on bike; 85% of the 25 m grid cells that are intersected by the analyzed tracks are within the official road and paths network; illegal trails and paths include the following situations: full protection areas, connections and shortcuts between regular trails and paths and private property trespassing.

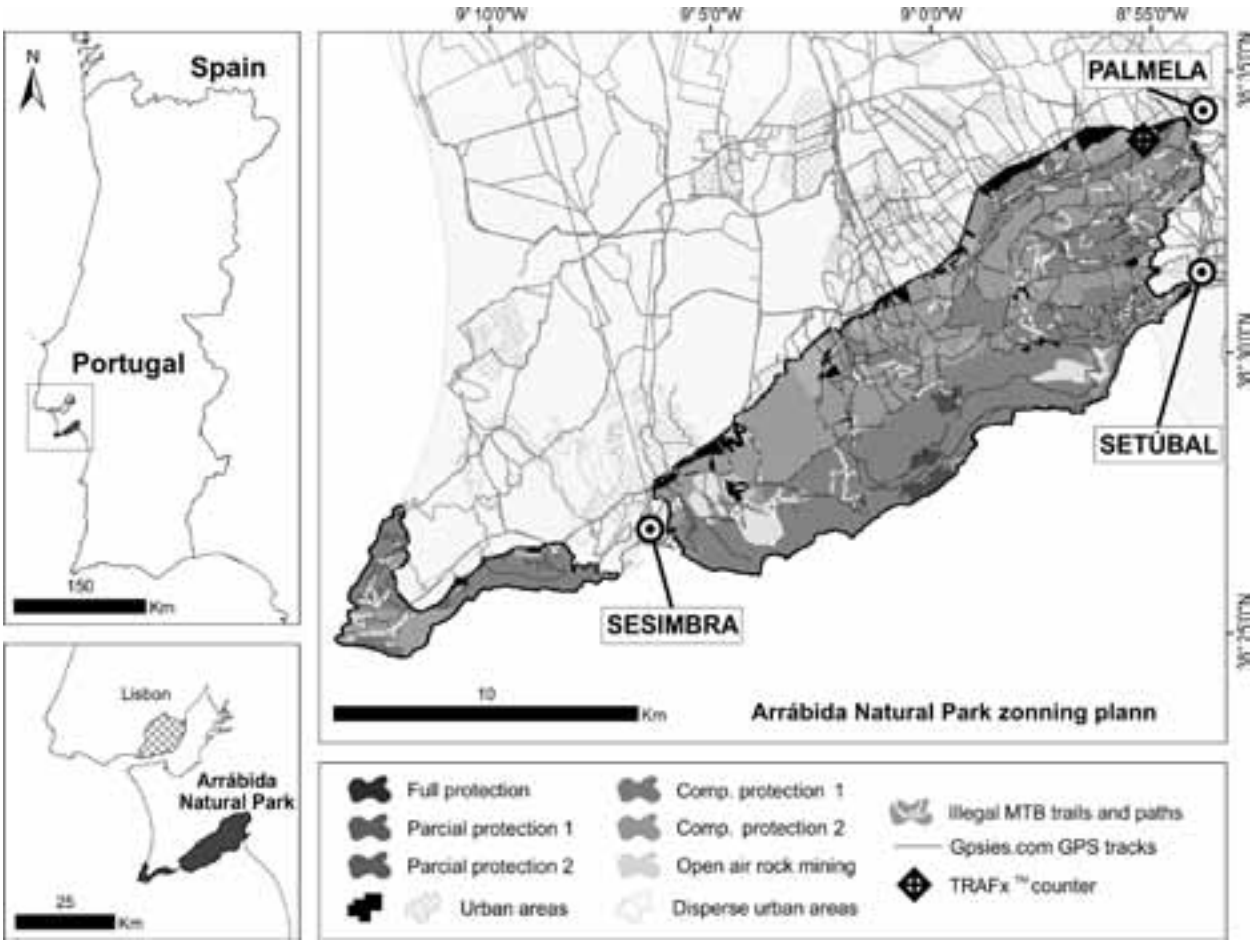

Figure 1. Arrábida Natural Park showing the zoning plan, trails and paths used by MTB riders. White lines represent MTB trails and paths that are not included in the official road and paths network, and that might configure illegal tracks.

Conclusions

Final results of this study provides the park authority and other stakeholders with the first insights of the MTB activity within Arrábida Natural Park, setting up a reference condition for further monitoring and carrying capacity evaluation. The large number of users and their varied proveniences demonstrates the high attraction of Arrábida for its trails and paths. It also shows that most users prefer to ride the official trails and paths network, limiting the illegal use to specific areas and reduced number of bikers, suggesting that this problem could be solved with proper park patrols and education actions.

Further work should be made on GPS tracks web share services, in order to understand if these datasets can be used as a new monitoring source, or if these can be used to profile average bikers preferences, in order to provide to MTB users offers that respects conservation goals and constraints.