154 How many is too much? A methodological approach to determining climbing carrying capacity. The case of Margalef Site – Serra de Montsant Natural Park - Spain

Estela Inés Farías-Torbidoni[1], Serni Morera-Carbonell[2], Víctor Dorado-Martínez[1], Ricardo M. Nogueira-Mendes[3], David Itúrria[4], Montserrat Sola[4], [1]National Institute of Physical Education of Catalunya (INEFC). University of Lleida, Spain. [2]Freelance Consulter, Spain. [3]National Institute of Physical Education of Catalonia (INEFC). University of Lleida. Spain. / CICS.NOVA, NOVA FCSH., Portugal. [4]Parc Natural de la Serra de Montsant. Departament de Territori i Sostenibilitat. Generalitat de Catalunya., Spain

Introduction

Protected areas (PA) are key territories for protecting biodiversity while also providing opportunities for human-environment interactions through recreation and tourism, activities that have generally grown all over the world. Over the last three decades, due to the improvement of materials, techniques, and methods of physical preparation, one of the recreational/sports use that has increased considerably in PA has been Climbing that has reached unpredictable popularity and technical levels, increasing pressure and impacts over natural and fragile environments.

The Montsant Natural Park, located in the westernmost of the Catalan Pre-littoral range, within the Priorat region, is a special rocky territory with five differentiated climbing areas among which Margalef´s stands out by being a well known internationally climbing spot with over 1500 routes. This PA that occupies 9.242 hectares, received nearly 166.000 visits in 2020, of which almost 55% concentrated in Margalef area (Farías, Morera & Dorado, 2019).

To manage visitation and nature conservation, several carrying capacity frameworks have been developed over the last decades considering all its environmental, social, and economic factors but only a few attempts have been made to operationalize this concept and to transform it into a management tool (Manning 2002). This paper aims to present an adaptation of Cifuentes's Touristic Carrying Capacity (Cifuentes,1992), widely applied in the context of trails, to the climbing routes.

Methods

Data collection was done by field observation, survey, literature review considering the Physical (PCC), Real (RCC), and Effective (ECC) carrying capacities, included a discussion group based on the following steps:

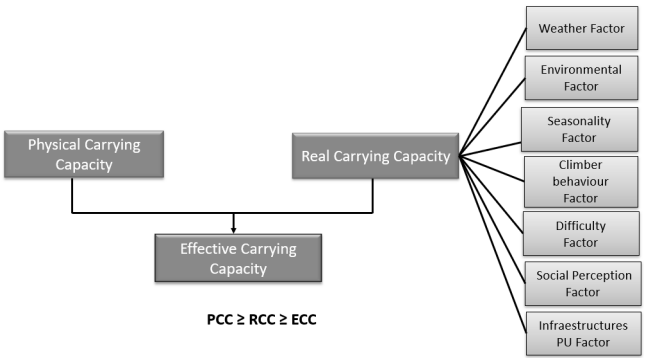
1. Design of an initial proposal for the theoretical calculation of the tourist freight capacity based on Cifuentes (1992) with special relevance in the identification of reducing factors.
2. Validation of the methodological proposal through a group of discussion that includes climbers and government responsible and PA managers
3. Checking of the data initially proposed through ad hoc fieldwork
4. Calculation of tourist carrying capacity for zones or management units and comparison with the available flow data.

Correction factors were considered from the number of routes, the average duration of the activity, maximum parking areas up to the average climbing grade available by climbers. In total seven factors were considered to calculate the Real Carrying Capacity (Figure 1a).

Results

From a global point of view, the tourist carrying capacity analysis results of Margalef shows a PCC of 4803 climbers/day, a value that is reduced to 183 (RCC) after the application of all reductions factors considered and reached a final number of 140 climbers/day in terms of ECC. Annually, Margalef carrying capacity should be 51.039 climbers, a number that was globally surpassed by 9349 climbers during 2019. Field data from automatic counters shows that this is especially critical since climbing is nor constant throughout the year neither throughout the different management units, with Eastern week and late fall carrying capacity being largely exceeded (Figure 1b).

a



b

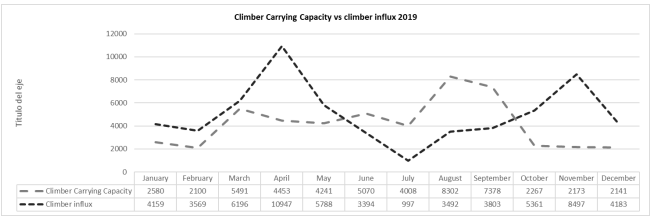


Figure 1. a) Detail methodology and reduction factors. b) Rock climbing management units Carrying Capacity vs Climber use (2019)

Conclusions

In general, the applied methodology has shown adequate to define the Effective Carrying Capacity of climbing in Margalef, being able to identify not just global values, but also critical moments due to seasonal variations that are quite common within outdoor/sport activities in the region. Selected correction factors have proved effective to deal with all major concerns of climbing in the PA being also well accepted by climbers, managers, and government agencies.

Finally, it is also important to note that this work is initial and limited since it is mainly based on theoretical aspects and it is the first time that is applied per complete (including the effective carrying capacity) for rock climbing practice. Nevertheless, it's a starting point that was well acknowledged by all stakeholders. The proposed approach can be used for future development and incorporate ecological and natural values as reduction factors if need. Taking into account the desired monitoring and follow-up evaluation of the proposed methodology, management of climbing and climbers within the park should be fully effective.

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