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Research Letters

Participative mapping of cultural ecosystem services in Pedra Branca State Park, Brazil

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ABSTRACT

Many studies have identified the benefits conferred to urban citizens by the relationship with protected natural areas, but in Brazil, with many important urban green areas, studies about how these benefits are perceived and managed are still quite rare. This study aimed to evaluate the immaterial benefits of Pedra Branca State Park, the largest urban park in Brazil, located in Rio de Janeiro, the second most populous Brazilian city. Using participative GIS procedures, we mapped and assessed the perception of 68 users, among visitors, residents and park staff, about seven cultural ecosystem services: aesthetic values, social relations, recreation & ecotourism, knowledge systems & educational values, cultural heritage, cultural diversity, spiritual & religious values. Results indicated that the park offers significant immaterial benefits to respondents, with aesthetic values and recreation & ecotourism being the most frequently perceived. Differences in perceptions between the three groups of users were found. Possible implications of these results for park management, mainly visitation and conflicts with residents and neighbors, are discussed.

Introduction

With 54% of global population living in cities (United Nations, 2015), the world is undergoing a rapid process of urbanization (Bratman et al., 2015) with strong implications for human health (Brown et al., 2014). In Brazil, 84% of the population live in cities (IBGE, 2010) and the expectation is an increase in this proportion in the next years as in the rest of the world (United Nations, 2015). As the urbanization expands at the expense of natural spaces, which are in turn of strategic importance for the quality of life, people spend less time in regular contact with natural environments resulting in poor health and decrease in well being (Chiesura, 2004; Brown et al., 2014; Bratman et al., 2015).

In the urban context, the importance of natural areas to the physical and mental health of inhabitants has been

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demonstrated in many works (ex. Godbey et al., 1992; Chiesura, 2004; Brown et al., 2014), from descriptive studies to those with a strong statistical approach such as Maas et al. (2006), who evaluated the relationship between well-being and the proportion of green areas, and Bratman et al. (2015), who pointed out the benefits of nature experience on affect and cognition. Other studies have shown the relevance of PA's, in general, to the protection of cultural, historical, and existential values of a population (Fadini, 2005). More introspective benefits can also be associated with such areas, including a sense of challenge and privacy, as well as scenic beauty and cultural heritage (Chiesura, 2004).

According to Trzyna (2014), urban PA's may have distinguished functions in relation to those placed in more remote areas, for example, they offer more opportunities tolearn about nature and sustainability, contribute to green infrastructure in the cities and they are able to raise awareness on nature conservation where more than 70% of people in Americas, Europe and Oceania live now. It is expected that good experiences in these areas may contribute to adherence of a growing urban population to the protection of the whole PA system, by "building a culture of conservation among citizens" (Wright and Matthews, 2015).

The many benefits of PA's, including the urban ones, were highlighted during the 2014 World Park Congress, when well-being was attributed to green areas and made this one of its main themes for discussion and improvement through the coming decade, emphasizing the need of making more explicit the cultural and natural services related to nature and PA's.

In the metropolitan region of Rio de Janeiro, where 12 million of people live in 19 municipalities, PA's represent ca. 16% of the territory (Scarano, 2014). They are strongly embedded in the minds of the population and used in daily activities, although most people are probably unaware of the formal recognition of these areas as parks or other PA category. In 2012, one of these PA's, Tijuca National Park, was declared a World Heritage Site by UNESCO's committee (Trzyna, 2014).

These PA's have also great biodiversity value – they protect important fragments of the highly threatened Atlantic Forest biome, one of the five biodiversity hotspots of the world (Myers et al., 2000). They host endemic and threatened species, as four mammals included in IUCN's global Red list and 11 in the regional list (Scarano, 2014) and are receiving species reintroduction initiatives (Cid et al., 2014). The magnificent scenario besides cultural, recreation and sport opportunities related to these areas are important factors in the choice of Rio de Janeiro as the host of world class events – Pan American Games (2007), Rio +20 (2012), World Cup (2014) that culminates with 2016 Olympic Games (Scarano, 2014).

In this context, the Pedra Branca State Park, the largest urban park in Brazil, occupying part of 17 neighborhoods and 10% of the total municipal area assumes a great conservation and social importance. On the other hand, due to the same complex context, the park faces a large array of pressures derived from to a disorderly and rapid urbanization as documented for other urban PA's (see Trzyna, 2014). Some activities that are in conflict with management expectations persist for a long time within the park, like housing, small agricultural practices, mining, and the use of clandestine water catchments (Guimarães and Pelin, 2015), some of them difficult to address. As a consequence of the complex context, conflicting visions emerge from different groups, such as park managers, visitors and local residents, adding many challenges for management decision related to rights over land, public use and natural exploitation, for instance (Palomo et al., 2011).

The understanding and valuation of perceptions and needs of the different stakeholders is an inescapable means of reaching culturally acceptable solutions that are longer lasting and effective (Gonçalves and Hoeffel, 2012), yet preventing the societal sense of cognitive isolation of protected areas (Stoll-Kleemann, 2001). In order to qualify management decisions is recommended that park managers, especially those who work in complex areas must be aware of emotions, values and attitudes that shape an individual's perceptions (Guimarães and Pelin, 2015) and the associated collective.

In the context of territorial planning and management, needs, knowledge and expectations of people can be revealed by a participative approach to promote their incorporation into the decision-making processes (Rambaldi et al., 2006), by many techniques (ex. Malleret-King et al., 2006). Public Participatory Geographic Information Systems (PPGIS) is being used to investigate the benefits of urban parks (Brown et al., 2014), national park management plan (see Palomo et al., 2011) and landscape values and ecosystem services (ES) through individual perceptions and preferences (Brown et al., 2011). This method also aids in the appreciation of the immaterial benefits related to cultural ES. For example, Raymond (2009) quantified and mapped the spatial distribution of natural capital and 31 ecosystem services (as listed by Millennium Ecosystem Evaluation) in Murray-Darling Bay, Australia, based on people's perceptions. PPGIS were also applied to the establishment of natural corridors, identification of socioecological hotspots, and the evaluation of potential benefits of urban green areas (as investigated by Brown et al., 2014).

In this study, the immaterial benefits associated with seven cultural ES in the Pedra Branca State Park were evaluated using the PPGIS approach. More specifically, it was analyzed the differences in perception between users groups, the correlation between ES services as well as the degree of spatial overlap between areas where people perceive cultural services and those areas proposed by the park management to be used and visited.

Materials and methods

Study area

Pedra Branca State Park (Fig. 1) encompasses 12,500 ha, all of which are above 100 m, and harbors the highest peak in the city of Rio de Janeiro, also named Pedra Branca, at 1.024 m.a.s.l. The park is an important fragment of Atlantic Forest, from which remains only 12% of the original cover. Due to its conformation, it plays important roles in climate regulation and ecosystem function in the region (INEA, 2013). Located in a region under a rapid urbanization process (INEA, 2013), it harbors beautiful views, waterfalls, rivers, dams and forest trails, offering opportunities for recreation and (eco)tourism (Guimarães and Pelin, 2015) – ca. 36.000 visitors are registered per year (INEA, 2013).

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