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Research article

Management effectiveness evaluation in protected areas of southern Ecuador

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ABSTRACT

Protected areas are home to biodiversity, habitats and ecosystem as well as a critical component of human well-being and a generator of leisure-related revenues. However, management is sometimes unsatisfactory and requires new ways of evaluation.

Management effectiveness of 36 protected areas in southern Ecuador have been assessed. The protected areas belong to three categories: Heritage of Natural Areas of the Ecuadorian State (PANE), created and funded by the State, Areas of Forest and Protective Vegetation (ABVP), created but no funded by the State, and private reserves, declared and funded by private entities.

Management effectiveness was evaluated by answers of managers of the protected areas to questionnaires adapted to the socio-economic and environmental characteristics of the region. Questions were classified into six elements of evaluation: context, planning, inputs, processes, outputs and outcomes as recommended by IUCN. Results were classified into four levels: unsatisfactory, slightly satisfactory, satisfactory and very satisfactory.

The PANE areas and private reserves showed higher management effectiveness levels (satisfactory and very satisfactory) than ABVP areas, where slightly satisfactory and unsatisfactory levels prevailed. Resources availability was found as the main reason behind this difference. The extension, age and province of location were found irrelevant. Outputs, inputs and processes require main efforts to improve management effectiveness. Improving planning and input in the PANE areas and inputs and outcomes on ABVP areas is necessary to obtain a similar result in all areas.

1. Introduction

Protected areas are the cornerstone of biodiversity, habitats (Craigie et al., 2010; Pandit et al., 2015; Venter et al., 2014) and ecosystem services conservation (Coad et al., 2008; Geldmann et al., 2015; Klein et al., 2007; Naidoo et al., 2006; Rodrigues, 2006; Scharlemann et al., 2010). In 2012, a total of 130,709 protected areas of various types were established globally, covering 24,236,479 km^2 of terrestrial (67%) and marine (33%) habitats (IUCN and UNEP-WCMC, 2012).

Protected areas are impacted by unprecedented global losses of biodiversity, habitats and ecosystem services mainly due to pressure from human activities (Craigie et al., 2010; Geldmann et al., 2014, 2013; Laurance et al., 2012; Zhang et al., 2016). Thus, management and effectiveness evaluation of protected areas are key factors for long-term sustainability (Joppa et al., 2013). Management effectiveness evaluation in protected areas is carried out in over 100 countries using over 50 different tools (e.g. approximately 5% of the world's protected areas have been evaluated so far) (Leverington et al., 2010). Evaluations have often been carried out because protected area founders (typically governments and non-government organizations) want to find out whether their investments in management have had the expected outcome.

The International Union for Conservation of Nature (IUCN) has developed a framework for assessing management effectiveness. This allows to develop specific evaluation methodologies for a particular location with a global and consistent approach

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(Hockings, 2003; Hockings et al., 2006). In this framework, management effectiveness is evaluated by questionnaires answered by managers of protected areas. The questionnaires measure management inputs and outputs of protected areas to assess the strengths, weaknesses and management needs (Mascia et al., 2014).

The concept of protected area has evolved during the last decades. They are now considered not only important from an ecology point of view (Calado et al., 2016; Chape et al., 2005), but also as a critical component of human well-being (Bonet-García et al., 2015; Romagosa et al., 2015) and a generator of leisure-related revenues to sustain local economies (Ervin et al., 2010; Nyaupane and Poudel, 2011). Protected areas are the focus of increasing recreational and tourism interest and they are prime destinations for nature-based tourism due to their unique biological, natural and cultural features (Whitelaw et al., 2014). Protected areas constitute an important component of the global tourism industry (Nyaupane and Poudel, 2011). They were a key attraction for over 20% of the 990 million world tourists in 2011 (Buckley, 2009).

Developing countries in Southeast Asia, Africa and South America, have among their priorities the reduction of poverty and the supply of food and commodities to their citizens. Thus, in many cases, the conservation of protected areas is not a top priority for some governments (Satumanatpan et al., 2014). However, developing a tourism industry based on protected areas presents a golden opportunity for developing countries to grow their economy. For instance, Ecuador has excellent conditions to become an important tourist destination while protecting its ecosystems. It is one of the most biodiverse countries in the world and much of its territory makes up some of the 34 global hotspots (Myers et al., 2000).

This paper proposes a methodology to assess the management effectiveness of 36 protected areas in southern Ecuador. Also, it aims to identify protected area management strengths and weaknesses and test whether management effectiveness is impacted by the type of area, extension, age and location of the protected area. Thereby, this paper is intended to improve the management effectiveness of protected areas in southern Ecuador.

2. Materials and methods

2.1. Study area

In this paper, 36 protected areas in southern Ecuador (Fig. 1) were studied. Six areas belong to the Heritage of Natural Areas of the Ecuadorian State (Patrimonio de Areas Naturales del Estado, PANE, in Spanish). 23 areas belong to Areas of Forest and Protective Vegetation (Áreas de Bosque y Vegetación Protectora, ABVP, in Spanish) and seven are private reserves. The PANE areas were declared so and owned by the State and are managed by a public entity that funds them. PANE areas belong to one of the four subsystems of the National System of Protected Areas, run by the Ecuadorian State. The ABVP areas are created by the State but may have different owners: public, private or public-private entities and communities. Most belong to private owners and do not have a public entity that manages and funds them. Private reserves are declared and owned by private agencies that fund their management.

The southern region of Ecuador has an extension of 27,113 km^2 and 1,144,471 inhabitants. From west to east, the provinces of El Oro (coast), Loja (Andes) and Zamora Chinchipe (Amazon) are located within this region. Loja is the largest with an area of 11,100 km^2 (400–3000 masl), followed by Zamora Chinchipe (10,454 km^2, 1000–3000 masl), and El Oro (5792 km^2, 0–3600 masl). The population density differs in each province. El Oro has the highest density (90.77 inhab./km^2; 600,659 inhabitants), followed by Loja (38.26 inhab./km^2; 448,966 inhabitants) and Zamora Chinchipe (7.3 inhab./km^2; 91,376 inhabitants).

The southern Ecuador holds diverse ecosystems: island and marine-coastal areas, mangroves, dry forests, rainforests (pacific, montane and amazonic), moors, sandstone plateaus and semi-natural ecosystems, such as traditional policrops. It also overlaps two world biodiversity hotspots: Tumbes-Chocó-Magdalena and Tropical Andes (Mittermeier et al., 2005; Myers et al., 2000) and is home to 22 Important Bird Areas (IBA) (Birdlife International, 2005).

2.2. Methodology

The methodology used to evaluate management effectiveness in the three types of protected areas (PANE, ABVP and private reserves) was based on those proposed by the IUCN (Hockings et al., 2000), Stolton et al. (2003) and Ervin (2003). A modified version of the questionnaire proposed by Stolton et al. (2003) was used. This questionnaire was adapted to the socio-economic and environmental characteristics of the region. The questionnaire (Table 1) included 38 multiple choice questions classified into six elements of evaluation: context (14), planning (8), inputs (4), processes (5), outputs (5), and outcomes (2). Each question had four possible answers. The interviewee was only allowed to choose one answer and each answer was assigned a score from 0 to 3. A score of 0 represented the worst management effectiveness and 3, optimal effectiveness. Six management effectiveness evaluation indices were calculated as a percentage of the maximum possible score. The management effectiveness score was calculated as the average of the six evaluation management effectiveness indices, following Hockings et al. (2000), Stolton et al. (2003) and Ervin (2003). Senior staff, usually high level managers, of 36 protected areas were interviewed from January to March 2012. Usually, these senior staff had degrees in forestry.

The six management effectiveness evaluation indices and the management effectiveness scores were interpreted according to the scale suggested by Ulloa and Tamayo (2012). This interpretation classifies the results into four categories based on the percentage of the maximum possible score: <25%, unsatisfactory; 25–50%, slightly satisfactory; 50–75%, satisfactory; 75–100%, very satisfactory. Unsatisfactory indicates that the protected area has no guaranty of long-term permanence. Slightly satisfactory means that the protected area is highly vulnerable to the confluence of external factors and its permanence is not guaranteed in the long-term. Satisfactory indicates that the protected area has deficiencies which prevent an effective management, but the management objectives are partially met. Very satisfactory indicates that the permanence of the protected area is guaranteed and management objectives are fully meet.

2.3. Statistical analysis

SPSS version 20 software was used to calculate the coefficient of determination (R^2) among extension, age, province of location and management effectiveness scores. SPSS was also used to carry out ANOVA tests. The latter determines whether there are significant differences between groups and allows drawing conclusions about management effectiveness.

3. Results and discussion

3.1. Management effectiveness scores by type of area

Fig. 2 shows the results in management effectiveness. The highest values (average ± standard deviation) in management