



Quality of tourist beaches of northern Chile: A first approach for ecosystem-based management



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ABSTRACT

Tourism focused on the “3Ss” (sun, sand and sea) has increased sharply in recent decades, which has subsequently led to the modification of natural areas of sandy beaches with the implementation of relevant infrastructure to meet the requirements and demands of beach users. Although the development of infrastructure and tourist services has increased for the beaches in northern Chile associated with coastal urban centers, these beaches have not implemented strategies to evaluate and help guide sustainable use. We used different indices to describe the seven state tourist beaches of the Región de Coquimbo. For most of the beaches, based on the Conservation Index (CI) and the Recreation Index (IR), a priority use of an “intensely recreational” character was recommended because of the low potential for conservation. Similarly, most of the beaches showed high levels of urbanization (IU). According to the Beach Quality Index (BQI), the quality of the beaches was assessed at an intermediate level. The application of these indices identified shortcomings in the levels of tourism infrastructure and security offered to users. The function of beaches to protect against natural events was extremely poor, likely because of changes to the beach dune ridges. The incorporation of assessment tools that integrate different indicators to help organize information, prioritize actions, and facilitate decision-making in the sustainable management of tourist beaches is strongly recommended for northern Chile.

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1. Introduction

Growing demands of the tourism industry in recent decades have generated intense coastal development, which has become a major threat to coastal ecosystems, particularly for the sandy beaches (Davenport and Davenport, 2006; Gheskiere et al., 2004; Lozoya et al., 2011; Miller, 1993; Onofri and Nunes, 2013; Palomino de Dios et al., 2011; Williams and Micallef, 2009). The tourist product called the “3Ss” (sun, sand and sea) has been established as an economic activity with increasingly demanding users (Hall, 2001; Moreno and Amelung, 2009; Rangel-Buitrago et al., 2013). To meet this demand, the tourism industry responded with a full implementation aimed at meeting the requirements and comforts of these users (Houston, 2008; Onofri and Nunes, 2013; Papageorgiou, 2016), including the installation of infrastructure and providing greater access and various services such as

security, cleaning, and hospitality, which lead to the intervention and modification of natural areas. As a result of the intensive use of beaches, the physical and ecological processes and the natural services provided are altered (Botero and Diaz, 2009; McLachlan et al., 2013), which threaten the use of beaches as natural, recreational and aesthetic resources (Ariza et al., 2010; Breton et al., 1996; Botero et al., 2013; Felix et al., 2016; Jędrzejczak, 2004; Kenchington, 1993; Klein et al., 2004; Schlacher and Thompson, 2012). In addition to these changes, the effects of human actions caused by population growth, economic development and global climate change on sandy beach ecosystems worldwide are documented in various studies (Defeo et al., 2009; Harris et al., 2015; Kelly, 2014; Roig-Munar et al., 2012; Schlacher et al., 2008; Watson et al., 1996). These actions jeopardize the functioning of natural processes in coastal ecosystems, causing deterioration or total loss for most.

Given the multifunctionality of sandy beaches (James, 2000; Lucrezi et al., 2016), its management needs an integrative view that incorporates “the connections between land, air, water and all living things, including people, their activities and institutions”, as

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it is integrated into the ecosystem approach (EA) (Farmer et al., 2012). For marine ecosystem, the current international policies promote the generation of strategies to implement the principles of EA under a model of sustainable development (Arkema et al., 2006; Borja et al., 2016; Curtin and Prellezo, 2010; Sardá et al., 2014a). Although the implementation of this approach has not been easy because of the many obstacles encountered, many examples show that Ecosystem-based Management (EBM) is viable despite the complexity of the information required, the lack of long-term evidence and the high costs involved and that different options are available to advance continuous improvement (Aswani et al., 2012; Katsanevakis et al., 2011; Levin and Möllmann, 2015; Levin et al., 2009; Tallis et al., 2010).

In this context, the European project FP7-KnowSeas (more details in www.msfd.eu) developed the Ecosystem-Based Management System (EBMS) that defines “a standardized process for applying EA principles by ensuring the inclusion of essential components, such as participation, planning and decision making, and by promoting accountability and quality assurance to achieve management objectives” (Sardá et al., 2014a). More recently, Sardá et al. (2015) introduced the Ecosystem-Based Management System for beaches (EBMS-beaches) as a formal standard framework that adds aspects not considered in the traditional beach management by implementing the EA to the management of public goods, changing from the view of beaches from bathing places, to beach environments. The EBMS-beaches is based on three pillars to facilitate this process: Management, Participation, and Information. An essential requirement for proper environmental management is the collection and comprehensive analysis of data based on scientific advice, as well as the development of tools to gather information (McNie, 2007; Melville, 2010; Szaro et al., 1998). The information pillar must provide easy to use tools to facilitate the flow of information in the decision-making process that are based on a platform of accessible indicators for use at any time (Sardá et al., 2015).

One of these tools is the Beach Quality Index (BQI) that evaluates the services and facilities that are provided to the user, the environmental and ecological status of a beach, and the protection beaches provide in response to natural events (Ariza et al., 2010, 2012a; 2012b). The BQI index is proposed as a scorecard for beach management to identify problems in function at a disaggregated level, set goals to improve these functions, and implement management practices according to the characteristics of beaches, in addition to facilitating comparisons among them (Sardá et al., 2014b). The information obtained from integrators such as these indices can provide a good starting point in places in which EBM has not been implemented.

In Latin America, research on beach management has only received more attention in the last decade (Barragán, 2001), with efforts concentrated on the generation of indices to assess the state of the beaches (Botero et al., 2015; Cendrero and Fisher, 1997; Cendrero et al., 2003; Cervantes and Espejel, 2008; Espejel et al., 2007; González et al., 2014; McLachlan et al., 2013; Rangel-Buitrago et al., 2013; Seeliger and Kjerfve, 2001). Brazil, Mexico and Colombia are leading the efforts to improve management of tourist beaches and are among the 11 countries participating in the Red Iberoamericana PROPLAYAS, which is composed of specialists focused on the design and implementation of methodological tools and practical applications for the integrated management of beaches (Botero et al., 2013, 2015). In Chile, incorporating management tools for beaches with a vision toward sustainable development began in 1994 with the establishment of a law on the environment that was applicable throughout the country (Ley de Bases del Medio Ambiente) (Paskoff and Manriquez, 1999) and a national policy on coastal uses (Política Nacional de Usos del Borde Costero, PNUBC).

The goal of PNUBC is systemic management that seeks to harmonize the many activities that occur on the coast, with beaches as one of the primary areas of application (Alvial and Reculé, 1999; Pattillo, 1997). The PNUBC is operated by regional commissions (Comisión Regional de Uso del Borde Costero, CRUBC), chaired by the regional Governor (the highest political authority of each region in Chile) and composed of representatives of the various public services related to the coastal interface, with the primary mission to “promote a sustainable coastal development” (Resolución del Gobierno Regional de Coquimbo No. 1446 of February 28, 2013) that facilitates the application of principles and indicators based on the philosophy of Integrated Coastal Zone Management framework (ICZM) and EA (Barragán, 2001; CRUBC, 2005). However, as suggested in a review on Chilean coastal legislation by Barragán et al. (2005), these committees focused their efforts on the zoning of the coastal strip, with the management of beaches receiving little attention.

Chile has an extensive coastline over 4000 km in length from north to south with beaches and resorts of various features, providing space for tourism and recreation (Jaramillo, 2001; Canihuante, 2005). Because of the temperate climate, most of the sandy beaches demanded by the “3Ss” of the tourism industry are in northern Chile (Paskoff and Manriquez, 1999). The Region de Coquimbo, with approximately 400 km of coastline, received 135,706 tourists from January to March 2014 (INE, 2014), and these tourists focused on the sandy beaches that occupy approximately 25% of this coast. The beaches of the municipalities of Coquimbo and La Serena are one of the most popular tourist destinations in the region, primarily because of the suitable beaches for relaxing, swimming and water sports along the extensive coastline (González and Morales, 2011; Loyola, 2012). Despite the attraction of these beaches, the quality of the beaches or the services offered to users has not been evaluated under an EA that incorporates the various functions of the beaches (Canihuante, 1998; Cornejo, 2009). The beaches of these municipalities include a wide range of beaches with different characteristics; with some adjacent to large urban centers that offer various facilities to the users and with some in areas away from urban centers that retain some natural characteristics (González et al., 2014). The hope is that the beaches in areas with the highest levels of urbanization perform highly in the assessment of recreational functions and that for those beaches farther away from urban centers, the assessment is better for natural functions and protections provided.

We evaluated the condition and quality of beaches in a highly touristic area in northern Chile with the main objective of identifying strengths and weaknesses resulting from the current model of coastal development. Although the evaluation was exploratory this could help systematize future management plans and prioritize actions for urbanized touristic beaches using the ICZM framework. Therefore, for the beaches that continue to preserve most of the natural characteristics, the feasibility of continuing with the current model of development can be assessed and the decision-making process optimized for local municipalities and government bodies that aim for sustainable development of the coast of Chile.

2. Materials and methods

2.1. Study area

Seven open-access, sandy beaches on the central coastal strip of the Cuarta Region de Coquimbo in northern Chile were studied (Fig. 1). The beaches are embedded in protected bays with different extensions and different levels of urbanization (González et al., 2014). In Coquimbo, near the municipalities of Coquimbo and La Serena, the shared demand for tourism is high because of the

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