



# Integrating stakeholder perceptions and preferences on ecosystem services in the management of coastal areas



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## ARTICLE INFO

### Article history:

Received 14 June 2016

Received in revised form

7 November 2016

Accepted 10 November 2016

### Keywords:

Stakeholders' priorities

Integrated management

Artisanal fisheries

Tourism

Marine conservation

Central Chile

## ABSTRACT

The consideration of stakeholders' perceptions and preferences on different ecosystem services, identifying potential conflict areas, is essential for operationalizing integrated management plans. In the central coast of Chile, several traditional fishing resources are overexploited and conflicts between users might arise with the increasing demand of both traditional and new uses. The principal groups of users in coastal areas were characterized in order to generate information that advances towards integrative approaches in the region. Face-to-face surveys to fishermen, tourists and permanent residents were conducted in six coastal sites to identify what these groups value the most, assessing at the same time if differences in perceptions and use might suggest future conflicts between users associated to coastal planning. Participants had to prioritize a list of coastal attributes associated with ecosystem services. Results show variability in prioritization of coastal attributes amongst groups of users, however, variability across sites was low. Fishermen showed a tight economic and cultural dependency on provisioning services; however, their general perception was of decreasing catches and a shift to less valued resources and habitat structuring species as traditional ecosystem services deteriorate. Tourists and residents had the most homogenous perceptions, and agreed on the prioritization of intangible services, such as the quietness and scenery of the coast. Nevertheless, deterioration of the environment was perceived as relevant by the inhabitants of the study area, reflecting a potential conflict between the current increase in tourist influx and resource demand. Therefore, increasing recreational use needs to be managed, ensuring the resilience of the traditional fisheries and adopting effective actions that should encompass wider ecosystem objectives. However, the real challenge for integrated management is the incorporation of intangible values in conservation objectives.

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## 1. Introduction

Understanding the relationship between humans and the environment is crucial to advance towards a more sustainable world (Collins et al., 2011). Management of human activities aims to achieve long-term ecosystem health that in turn provides the ecosystem services on which people rely (Rosenberg and McLeod, 2005). Therefore, management needs to deal with both the ecological and social aspects of resource exploitation. However, often stakeholders' priorities are overlooked in management plans, targeting mainly the biophysical or economic components

(Costanza et al., 1997; Leslie and McLeod, 2007), and only recently researchers and decision makers have begun to acknowledge the importance of understanding society perceptions to anticipate their likely responses to new regulation measures (Gelcich and O'Keeffe, 2016). In fact, our ability to manage social-ecological systems has been in part limited by the slow incorporation of stakeholders' perceptions in decision-making (Fulton et al., 2011). This tendency is reflected in the management of marine ecosystems, where the current challenge is to effectively integrate the biophysical and the socioeconomic components of the system (Bennett et al., 2015; Fletcher, 2007). While there is a tradition of bio-economic studies in the marine realm (e.g., Barbier, 2012; Sumaila et al., 2011), the integration of the social component is in general a pending task (but see Arkema et al., 2015; Cárcamo et al.,

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2014; Klain and Chan, 2012).

In this context, there is a need to generate knowledge on human perceptions of marine ecosystems, and integrate it in marine resources management (Bennett et al., 2015; Leslie and McLeod, 2007; Simpson et al., 2016). The concept of ecosystem services (MEA, 2005) allows the integration of ecology and society as it relates ecological concepts with human perception (Granek et al., 2010). The challenge is to identify places and processes that people value to subsequently identify their supporting ecosystem components, which at the end is translated into ecosystem services as a common language for scientists, managers and society at large (Kremen and Ostfeld, 2005; Simpson et al., 2016). This exercise will help managers identify conflicts between human use and the provision of ecosystem services (Hicks et al., 2013; Kappel et al., 2009). It also provides information on potential conflicts between different groups of users, a critical aspect to be addressed by decision-makers to guarantee the diversity of users (Bennett et al., 2015). The explicit consideration of stakeholders' perceptions and preferences can also identify agreement areas (Hicks et al., 2013), which is key for providing solutions to overexploitation of natural resources (Castro et al., 2011). Finally, perceptions are important not only because they reflect what people value, but also because they help determine behaviour and compliance (Gelcich et al., 2009; Hicks and Cinner, 2014).

Along the coast of Chile humans have traditionally relied on marine resources, supported by one of the most productive ecosystems in the world (Rivadeneira et al., 2010). However, several traditional resources are currently overexploited (Gelcich et al., 2010) and conflicts between multiple uses might arise as human demands for marine resources are increasing, coastal uses diversify, and an empowered society demands for the conservation of marine ecosystems. The central coast is, without doubt, the most frequently visited place by Chileans that escape from urban areas including the country capital and largest city, Santiago. This coast offers a rural environment and provides space for recreational activities, including sea-based activities, as well as “sun and sand” tourism (de Juan et al., 2015). Despite tourism can be generally perceived as a threat to the conservation of ecosystems, due to unsustainable uses of natural resources, it might also represent an opportunity for engaging people in conservation, as recreational activities allow to directly experience the benefits provided by ecosystems (Daniel et al., 2012). However, this recreational use, which is rapidly growing in central Chile, is not considered by traditional approaches to management of co-existing coastal artisanal fisheries. Coastal management in Chile is currently focused on a single-sector and site management, a situation exemplified by fisheries that are regulated under a target resources-oriented system (Gelcich et al., 2010). Therefore, the incorporation of social values into a wider, comprehensive approach is critical in the region.

In order to advance towards an integrated management of our coasts in the near future, there is an urgent need to increase our understanding on what different groups of users value the most. Several ecosystem services can be valued in economic or biological quantitative terms, like provisioning services. In contrast, the “intangible value of ecosystems”, defined by the Millennium Ecosystem Assessment as the “non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences” (MEA, 2005) are diffuse or ambiguous (Gee and Burkhard, 2010). Therefore, a series of attributes (e.g., scenic beauty or clean waters) that directly or indirectly represent intangible values and that could be easily identified by coastal users were proposed. The goal of this study is to gain information on the preferences of different stakeholders that is central to find a balance between the conservation of

ecosystems and the multiple human uses in coastal areas. To address this general goal, the following specific objectives were defined: 1) to characterise the groups of users that would benefit from the conservation of coastal ecosystems in sites of variable environmental context; 2) to understand what people value the most to inform conservation actions supported by users; and 3) to assess if differences in perception of the coastal environment might imply conflicts between users.

## 2. Materials and methods

### 2.1. Research setting

This study focuses on three stakeholder types: tourists, artisanal fishermen, and other coastal residents. No indigenous communities are settled in the study area. The small-scale artisanal fisheries in Chile include divers and coastal gatherers that target reef fish, and subtidal and intertidal benthic invertebrates and kelp. The exploitation of benthic resources is regulated by a dual management system. On one side, the Territorial Use Right in Fisheries regime (locally known as “Management Areas for the Exploitation of Benthic Resources”, hereafter management areas) assigns portions of the seabed to fishermen associations that have the exclusive right to exploit economically important benthic resources, following quotas proposed by the fishermen, and approved by the Undersecretary of Fisheries (Gelcich et al., 2010). On the other side, outside the fisheries management areas there is a de facto open access regimen regarding quotas for benthic resources of the artisanal fisheries, although there are other regulations (e.g., minimum legal size, reproductive bans, prohibition to gather the highly valued gastropod *Concholepas concholepas*).

Currently, traditional (artisanal) fishing coexists with increasing demands for recreational space along the Chilean coast (Cornelius et al., 2001; Godoy et al., 2010). In the central coast, that concentrates the highest population density, most fishery villages receive a large influx of visitors, particularly in summer (December–March) (Cornelius et al., 2001). Consequently, tourism might be a major contributor to the income of residents and therefore to the local economy. However, residents that are not involved in fishing activities have not been included in previous studies in the region and there is almost no information on their activities, and even less on their perceptions about the coasts and seas. There were no recent reliable sources of data on fixed population and annual influx of visitors in the study area, but broad estimations indicate that permanent residents might range between 2000 and 10,000 persons, while annual visitors might surpass the fixed population.

The present study was conducted in the central coast of Chile (32–34°S), in six villages where small-scale artisanal fisheries coexist with high touristic demand: Las Cruces, El Quisco, Quintay, Laguna Verde, Maitencillo and Los Molles (Fig. 1). This fraction of the coast was considered as representative of central Chile (29–35°S) as fishing and tourism dominate coastal uses. The tourism sector in these sites is mainly domestic and most visitants travel from nearby cities to spend weekends and holidays in a second-home or in a rented house. Tourism is a major contributor to the income of residents and therefore to the local economy.

### 2.2. Surveys

Surveys were conducted in the six study sites (Fig. 1) during the austral summer-autumn in 2014, and targeted artisanal fishermen, permanent residents and tourists. In each site, participants included 100 tourists, 50 residents and 15–20 fishermen, a sample size that aimed to represent the heterogeneity between sites and groups. The lower sample size for fishermen was linked to a small

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