



## Management of a marine protected area for sustainability and conflict resolution: Lessons from Loreto Bay National Park (Baja California Sur, Mexico)

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### ARTICLE INFO

#### Article history:

Available online 30 July 2009

### ABSTRACT

The Loreto Bay National Park was established to protect the area's ecosystems from habitat destruction and overexploitation. However, the park has not met two of its primary goals: recovery of commercially valuable fish populations and their sustainable use by stakeholders. Based on evidence from the literature, dialogue with stakeholders, a literature review on using recreational fees for marine protected area (MPA) management, and an economic valuation survey, we provide practical guidelines for addressing factors hindering the park's success. These include: 1) the implementation of management based upon ecosystem science, and rigorous monitoring of park ecosystems, 2) increased communication among stakeholder groups, outreach and education, and 3) a re-organization of the park's administrative structure that would allow for more efficient use of funds. Our results also suggest that the park entrance fee could be raised to support these proposed improvements.

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### 1. Introduction

The Gulf of California, a narrow strip of sea between the Baja California peninsula and mainland Mexico, is an ecologically unique and highly productive ecosystem [1–5]. The Gulf, also known as the Sea of Cortez, is home to one-third of the world's marine mammal species, as well as approximately eight hundred fish species [6]. It supports many important commercial and recreational fisheries [7]. In the early 1990s, the marine and coastal habitats in the Bay of Loreto, located in the southern Gulf of California (Fig. 1), began to noticeably deteriorate and it was recognized that commercially important fish populations were decreasing in number [8], due to over-fishing and fishing practices destructive to the marine habitat [9–12]. In response to concern about this decline as well as several years of petitioning by local communities, tourists, scientists, and the international conservation community, the Mexican government established the 2056 km<sup>2</sup> Loreto Bay National Park (LBNP), which covers Loreto Bay's coastline, islands, and sea (Fig. 1). The park was formally

established in 1996, while the management plan, which is reviewed and revised every five years, was not finalized until 2000 [13]. Although fishing methods that had a high impact on the area's habitat, such as bottom trawling, are banned in the park's waters, other forms of commercial and recreational fishing are still allowed. As a result, fish populations continue to decline within the park [12,14].

The LBNP exemplifies the challenges faced by managers of marine protected areas (MPAs) worldwide. Although MPAs have received wide attention as potentially useful approaches to recover and sustain exploited marine resources, their management is often impeded by pressure placed on managers by different stakeholder groups, which frequently resist restrictions imposed on the use of the resources [15,16]. In this paper, we examine the challenges that have arisen in Loreto Bay, and discuss potential mechanisms to improve management of the LBNP so that conflicts among different stakeholders are minimized. An overview of the LBNP is presented, including a description of how Loreto's marine resources are used, a description of the park's management plan and administration, and the current ecological and socioeconomic situation in the park. We describe the issues that currently prevent the success of the park and the causes of these issues, as well as propose a number of local-level solutions based upon dialogue with stakeholders, literature on recreational user fees for MPAs, and an economic valuation survey. We conclude with some general suggestions for conflict resolution that could be implemented in other MPAs facing similar challenges worldwide.

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## Loreto Bay National Park

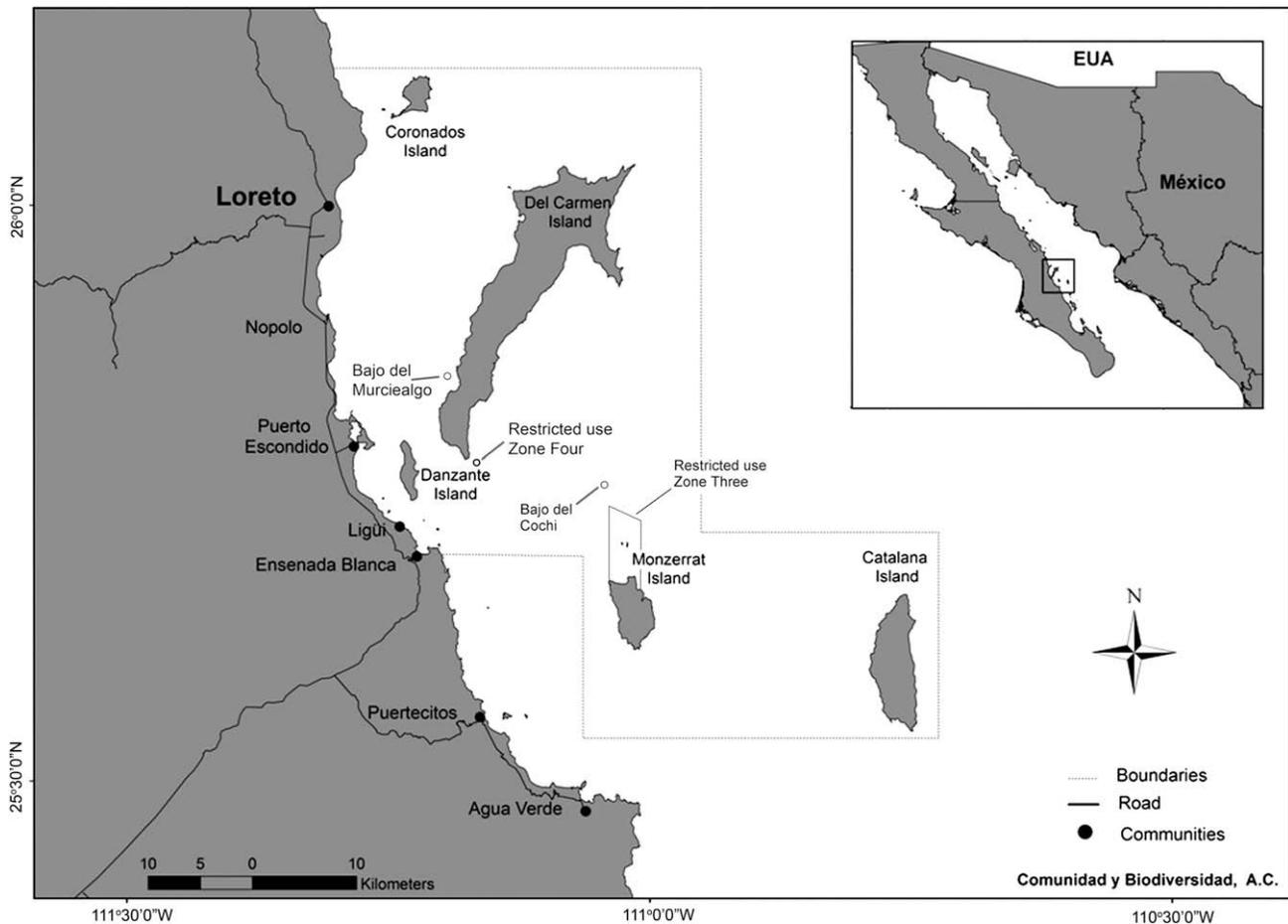


Fig. 1. Map of Loreto Bay, indicating the Loreto Bay National Park boundaries, the seamounts that make up the park's Protection Zones (Bajo del Cochi Bajo del Murciealgo), boundaries of restricted use Zones Three and Four, and the towns and islands included inside or adjacent to the park.

## 2. Context: Loreto Bay National Park

### 2.1. The use of marine resources at the LBNP

The town of Loreto (population 12,000) (Fig. 1) is home to 80% of the human population of the LBNP [7]. Loreto's economy depends on fishing in three capacities: subsistence fishing for personal consumption, commercial fishing by local fishers for sale in local, national, and international markets, and recreational sport fishing, mostly by foreign visitors [7]. Some individuals engage in multiple types of fishing activities. For example, *pangueros*, local fishing boat captains who take tourists on fishing excursions, often practice commercial fishing in the winter when the demand for sport fishing services is low (R. López-Espinosa, LBNP Management Authority, personal communication). Many commercial fishermen also practice subsistence fishing (K. Stamieszkin, personal observation). In 2001, it was estimated that 1176 residents of Loreto (approximately 10% of the population) fished for a living, making up 12 cooperative societies and more than 15 organized markets for the commercial sale of fish, as of 2001 [7].

Commercial and subsistence fishing are common in much of coastal Baja California, but recreational fishing centers around specific locations. Loreto is world-renowned for its sport fishing and historically has been one of the most visited locations by sport anglers in the Gulf of California [15]. In the 1950s the first sport fishing lodge was opened in Loreto [9,17], paving the way for

a small-scale industry that continues to bloom [7,15]. Today, there is a number of charter fishing companies, as well as numerous individual *pangueros* [7]; in 2007, approximately 3936 visiting anglers fished in the LBNP (R. López-Espinosa, LBNP Management Authority, personal communication). Sport fishing and its associated services bring a large profit into Loreto's economy each year, making fish populations offshore of Loreto an important economic resource for the local population [7]. Although no specific information was found on the contribution of sport fishing to the Loreto economy, it is considered that the region's economy currently depends heavily on sport fishing [11].

The LBNP is also an important ecological resource. Commercially fished bony fish such as grouper, snapper and jack spawn on islands, exposed rocky reefs and seamounts, like those found within the LBNP (Fig. 1), making those geologic features of biogeographical significance [18]. Larger pelagic species of billfish, tuna and dorado, often targeted by sport or commercial fishers, reproduce at the mouth of the Gulf of California [19–21] and then migrate north to feed, aggregating around topographic features such as the seamounts [22] (Fig. 1) protected from fishing pressure in the LBNP (Table 1).

### 2.2. Management plan and zoning of the LBNP

The park's management plan uses zoning of the land and sea within the park's bounds to achieve its main goal: "To define and

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