



# Local community-based approach for sustainable management of artisanal fisheries on small islands



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## ABSTRACT

Socio-economic development of small island fishing communities is greatly dependent on local coastal and marine resources. Illegal fishing and aggressive practices in insular ecosystems lead to over-exploitation and environmental deterioration. Moreover, a lack of scientific data increases uncertainty and prevents adequate monitoring of marine resources. This paper focuses on the integration of a local fishing community into decision-making processes with the aim to potentiate artisanal fishing on the Island of Tenerife (the Canary Islands). The aim is to preserve both the marine ecosystem and promote the socio-economic development of traditional Cofradías (local fisher communities).

A qualitative methodological framework, based on participatory problem-solution trees and focus groups, was implemented to identify the main obstacles impeding the sustainable development of the artisanal fishing sector on the island. Collective proposals with policy implications are also discussed.

The community involved identified four main issues that are causing an unsustainable island fishery: 1) Overexploitation; 2) Poor self-management of Cofradías and commercialisation problems; 3) Fisher individualism and low co-management strategies, and 4) Illegal fishing increase vs. artisanal fishing decline. Results show the required policy enhancements to tackle those issues with, for instance, the creation of marine protected areas, the promotion of a common islander vision, and an increase in participatory research projects between scientists and fishers. Participants also revealed the necessity to adapt existing regulations to local specificity to reduce the gap between policy makers and local community.

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## 1. Introduction

Global marine fisheries are in decline, they began to decrease in the late 1980s (Watson and Pauly, 2001). Across regions, average recruitment capacity has declined at a rate approximately equal to 3% of the historical maximum per decade (Britten et al., 2016) due to environmental changes and chronic overfishing. Three main related causes are maintaining this negative trend (Kooiman and Bavinck, 2005): a) the collapse of fish stocks caused by the degradation of aquatic ecosystems; b) fishing overcapacity, and c) deficient fisheries management.

Climate change is also an important issue due to its impact on biodiversity and local socioeconomic systems. The precise impacts and direction of climate driven change for particular fish stocks and

fisheries are uncertain (Allison et al., 2009), but some regions are more vulnerable than others due to the fragility of their ecosystems (Walther et al., 2002; Hoegh-Guldberg et al., 2007) and their low capacity to develop adaptation strategies (Barnett, 2001).

Impacts on island fisheries might be more severe due to the social, economic and environmental vulnerability of these types of territories (Briguglio, 2003). In these regions, factors such as aggressive fishing practices and inadequate fisheries management might increase impacts and contribute to the decline of both marine biodiversity and socio-economic activity (Burke et al., 1994; Marsh et al., 2004; Shepherd et al., 2004).

In the Canary Islands region, there is a lack of systematic scientific data on fish distribution, mortality and recruitment. The absence of reference indicators about the status of stocks constitutes an important source of uncertainty. Moreover, this may lead to incomplete diagnosis and therefore, to the development of inadequate policies, which: a) do not solve the problems, and b) create social disagreement and conflicts among stakeholders.

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According to Santamaría et al. (2014), the information available is not sufficient to support the design of a sustainable strategy for the Canary Islands' artisanal fisheries.

Given this condition of high vulnerability and lack of data, the implementation of actions focused on the integration of different types and sources of knowledge into policy making processes is an asset (Corral-Quintana et al., 2016; Raymond et al., 2010). Additionally, local knowledge can provide valuable qualitative information related to planning and management alternatives (Pereira and Quintana, 2009; Van der Sluijs et al., 2008). In fact, local fisher communities have been handling marine resources for centuries without quantitative data instead using inherited traditional knowledge (Corral et al., 2015; González and Quintana, 2016; Gupta and Singh, 2011; Srivastava, 2010). The usefulness of integrating local knowledge into fisheries planning and management practices or strategies has been highlighted by several scientists during the last few decades (Mackinson and Nottestad, 1998; Davis and Wagner, 2003; Johannes, 1998; Johannes et al., 2000; Olsson & Folke, 2001; Hamilton et al., 2012; Hauzer et al., 2013).

Traditional fishing knowledge on the Canary Islands, as in the rest of Spain, is channelled through traditional fisher groups called *Cofradías*. These relevant social actors maintain artisanal fishing practices, but they have been declining for several years (Castro and Hernández-García, 2012; Chuenpagdee, 2011). There are several reasons for this decline such as the displacement of fishing families from the coast due to the construction of tourism infrastructure, the impossibility of using traditional beaches to land catch and the destruction of fishing grounds due to the establishment of tourist resorts (Pascual, 2004).

The main objective of this paper is to contribute to developing more efficient fishing policies focused on the conservation of artisanal fishing on the island of Tenerife. The paper presents a community-based process designed to generate socially robust knowledge (Gibbons, 1999) with policy implications. Assisting the community to produce robust knowledge that applied to environmental and fishing policies might produce implications to a more sustainable fishing in Tenerife.

The following section describes the study area as well as the framework applied and in section 3, the results are discussed. Finally, section 4 establishes some conclusions and recommendations for further research.

## 2. Material and methods

### 2.1. Study area

The Canary Islands archipelago is located in the Northeast Atlantic Ocean, approximately 110 km from the northwest coast of Africa. The archipelago is located in the path of the Canary Current, where deep waters are cold and nutrient-rich and have a key role in stimulating primary productivity. Inhabited by a large number of endemic and migrant species, the Canary Current is a unique ecosystem of global significance, and rich in fishery resources (Popescu and Ortega, 2013). Specifically, Tenerife is the island with the highest number of native flora species of the Canaries (476 spp. = 68% of total) (Francisco-Ortega et al., 2009), and the waters around Tenerife constitute an important habitat for cetaceans (Carrillo et al., 2010).

Fishing activity in Tenerife is coastal artisanal (for small pelagic species, crustaceans, demersals and molluscs), several methods of fishing are used, ranging from artisanal inshore fishing to recreational marine fishing, which includes spear-fishing and angling.

Inshore Canarian fish fauna includes 217 species from 67 families (Dooley et al., 1985). More than 60% of catches include sardine (*Sardina pilchardus*), sardinella (*Sardinella aurita*, *S. maderensis*),

anchovy (*Engraulis encrasicolus*), chub mackerel (*Scomber japonicus*) and horse mackerel (*Trachurus* sp.). Other species include tuna (e.g. *Katsuwonus pelamis*), coastal migratory pelagic fish, hakes (*Merluccius merluccius*, *M. senegalensis*, *M. poli*), a wide range of demersal finfish, cephalopods (*Octopus vulgaris*, *Sepia* sp., *Loligo vulgaris*) and shrimps (*Parapenaeus longirostris*, *Penaeus notialis*) (Popescu and Ortega, 2013).

Fishing activity in the Canary Islands region, and lastly in Tenerife, is regulated under a set of European, national and regional policies and laws. It is a complex regulatory system in which several regulations and competences between administrations are overlapped. The Ministry of Agriculture, Livestock, Fisheries and Waters and the Ministry of Agriculture, Food and Environment controls the exterior national waters and regulates the use of fishing methods, periods, specific areas of closure, target species and capture quotas.

The Canary Island government has the responsibility to regulate fishing management in each island and, in addition, it is responsible for implementing the European Common Fisheries Policy (CFP) in inland waters, aimed to manage fishing fleets and preserve fish stocks. Concretely, this administration is responsible to authorise the undertaking of fishing activities, regulate fishing gear, mark out fishing zones, set exclusion periods and activity timetables, establish authorised species and minimum sizes, and keep an official register of activities. But according to a review of the Canary islands fisheries management plans (Uriarte et al., 2014), there is an incomplete strategy to minimise impacts on Canary Islands' fishery through: i) limiting fishing effort; ii) limiting catches; iii) limiting the use of some gears in some areas; iv) authorisation of fishing areas; v) implementation of closed fishing areas as marine protected and artificial reefs areas; vi) implementation of authorised and closed fishing areas for harvesting; and vii) limiting the recreational fishing activity in some areas. The fact that this strategy is not fully developed in the island stresses the importance of involving local groups and other stakeholders, which is the purpose of this research (see Fig. 1).

As an example, the definition of marine reserves on the island of Tenerife has been characterized by the presence of historical conflicts between local groups that have made impossible the establishment of these figures of protection (Rodrigues Henriques, 2013). This has not happened on other islands, as there are marine reserves in La Palma, Lanzarote and El Hierro with positive results for both the ecosystem and the fishing community (Tuya et al., 2006).

Cofradías represent the primary fishing group in the island and all professional fishers are members of Cofradías. There are several differences between them related to economic incomes, work force and fleet capacity. These differences impact on their capacity to access fish stock. Each Cofradía sells their catches at their respective authorized port, where particular consumers buy fish directly while different small companies distribute to restaurants of the island.

The fishing fleet in Tenerife shows a high social and economic dependency on small-scale fishing, but these practices are in decline according to an analysis by the public administration as a consequence of several major factors (PIOT, 2011):

The Canarian artisanal fishing fleet (vessels of less than 12 m long) has been in decline since 1990 (Fig. 2). The number of vessels, the total gross tonnage, and the engine power have been reduced by ca. 60%, with a severe fall since 1990 (Popescu and Ortega, 2013).

Recreational and illegal fishing activities increase pressure on coastal and marine resources, but official statistics are not available. Nevertheless, the number of fines and reports have increased over recent years.

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