



# Participatory assessment of management measures for octopus vulgaris pot and trap fishery from southern Portugal

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## ABSTRACT

Co-management has shown promising results for the sustainable use of fishery resources. The common octopus (*Octopus vulgaris*) pot and trap fishery in the Algarve (Portugal) holds the potential for implementation of a co-management system. To explore this potential, seven participatory workshops took place between 2014–2015, bringing together 60 participants from 10 fishing associations and 16 fisheries management and research institutions. The exercise resulted in promising outcomes with regards to the possible implementation of a co-management system for the fishery. In the present work an overview of the outcomes of the participatory workshops is given and compared with initiatives worldwide. Among the management actions identified, some have direct impacts on the octopus' life cycle, while all target the same overall objective: to regulate fishing effort. In the informal setting of the workshops, a formal request was developed: the establishment of an annual closed season in the Algarve. This request was taken into consideration by the responsible management institution.

## 1. Introduction

Natural resource management, including fisheries, that follow an exclusively top-down, expert based approach have failed to achieve urgently needed conservation objectives [1,2]. The importance of developing more inclusive and people-oriented approaches is reflected in the increasing numbers of co-management strategies and, stakeholder involvement becoming a key features of European and International fisheries policies [3–5]. Co-management of fisheries can be broadly defined as a strategy where fishers participate in the management process by being involved in the definition of the rules that guide the exploitation of the natural resource [2]. Such power sharing management systems can now be considered a mainstream approach to small-scale fisheries across the developing world, while in Europe, co-management initiatives go back to the 1990's [2,6]. The guiding ideas of co-management include not only the empowerment of stakeholders and sharing of responsibilities between resource users and managers, but also a flexible, context-specific strategy where

knowledge exchange between scientific and local or traditional knowledge is a common feature [7].

In Portugal, co-management strategies in fisheries are in their infancy [8], yet the importance of small scale fisheries in the country is unquestionable, as is the need to experiment with this type of management system [8,9]. With this in mind the “Tertúlias do Polvo” initiative was started by the Fisheries, Biodiversity and Conservation (FBC) group of the Centre of Marine Sciences (CCMAR) in the Algarve region, south of Portugal. The main objective of the project was to create a knowledge sharing space between researchers, fishers and managers towards the sustainable exploitation of the octopus (*Octopus vulgaris*) resource in the Algarve region. The initiative focused on the octopus pot and trap fishery due to its small scale nature and high social and economic importance in the region [8]. The “Tertúlias do Polvo” resulted in seven participatory workshops involving representatives of the commercial fishery, government agencies, research institutions, and other stakeholders. The aims here are to describe the process and present the outcomes of the participatory workshops along with key

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relevant information regarding this fishery in the Algarve. Specifically, several management measures were identified and discussed by the participants during the project. The outcomes are presented here and a detailed analysis is carried out. This analysis is undertaken in two main stages. In a first stage, the management measures are presented and the impact on the octopus' life cycle is analyzed. In the second stage a Strength, Weakness, Opportunities and Threats (SWOT) methodology is employed to assess the management measures. This assessment is based not only on the outputs of the workshops but also on the existing knowledge regarding the impact of similar management measures in other parts of the world.

A detailed description of the participatory process is given, management measures presented and discussed. An overview of the octopus pot and trap fishery, as well as relevant information on the biological features of the target species are provided for context. Finally, general considerations and conclusions are presented.

## 2. Management of the *Octopus vulgaris* fishery

The small scale octopus fishery in the Algarve accounted for a first value sale of 17 million euros in 2015 [10], representing around 50% of the total revenue from the first sale generated by all artisanal fisheries in the region, contributing to positioning *O. vulgaris* as the second most valuable species behind the sardine (*Sardina pilchardus*), for the whole country.

Octopus landings in the Algarve are characterized by substantial variability (Fig. 1). The octopus life cycle, as described by Boyle and Rodhouse [11], comprises the phases of paralarvae, recruitment, growth, mating and spawning, lasting approximately one year overall, and leading to no accumulation of year classes. As a consequence of this type of life-cycle, the high variability of landings in the Algarve has been partially attributed to environmental factors affecting recruitment, with sea surface temperature, rainfall and river runoff associated with high octopus paralarvae mortality rates and subsequent recruitment failure [8,12]. This high variability has resulted in management related conflicts between national fisheries authorities, commercial fishers and scientists over the last 20 years [8].

The Algarve region (southern Portugal) represents one of the most important regions for octopus fishing in the country, not only in terms of fleet size and volume of landings, but also because the octopus fishery is an important source of employment and a traditional component of the local and national diet [8,9]. The Algarve has the largest fleet dedicated to fishing octopus nationwide, with 765 fishing licenses issued in 2015 [10], distributed among nine ports which are represented by 15 fishing associations (Fig. 2).

Monthly octopus landings are recorded and stored in national databases for statistical purposes by the management authorities. During the last 16 years, the daily landing average by boat in Algarve

was 211.5 kg/day/boat, with summer months recording the lowest average (180.1 kg/day/boat), while winter and spring averages were greater (249.4 kg/day/boat and 219.9 kg/day/boat respectively) [13,14]. The number of vessels recording landings also exhibits a seasonal pattern, with a maximum in winter (705) and a minimum in summer (605). Prices at first sale (national standardized auction – DOCAPESCA, <http://www.docapesca.pt/en.html>) show an annual average of 4.1 €/kg, with the lowest price during the autumn (3.7 €/kg). This strong seasonality in landings and the fast life cycle of the species has put an enormous pressure on user groups, management bodies and researchers [8,13,15]. The management approach has not changed significantly since 1987, when the main national fishing regulation was published [15]. The basic input control focuses on fishing effort limitations, namely the numbers of traps allowed per boat, and technical characteristics of the traps, while output control is limited to a minimum legal weight (750 g).

In order to find appropriate management solution for the octopus fishery there is a need to understand the life cycle and population dynamics of this resource and also to learn from cephalopod management experiences from other latitudes [14,16,17]. Pierce et al. [18] provides an in-depth review of cephalopod fishery management strategies around the world, concluding that worldwide efforts show no consensus with regard to both management objectives and assessment methods. The authors presented an overview of cephalopod fishery management for four European countries, showing part of the complex interactions among public bodies in the policy-making process. Importantly, the interaction between the short life cycles of cephalopods and environmental variability have been identified by experts as a major factor hampering the achievement of sustainable management [19]. The assessment of management strategies for cephalopods is scarce in the scientific literature. Jouffre [20] analyzed minimum landing size and closed seasons for *Octopus cyanea* in Senegalese waters, while Narvarte et al. [21] compared *Octopus tehuelchus* abundance in open areas and marine protected areas in northern Patagonia (Argentina). Fernández-Rueda and García-Flórez [22] presented an assessment of management strategies for *O. vulgaris* in north-west Spain. Leite et al. [23] described the ecology of *Octopus insularis* and its implications for management in north-east Brazil, and proposed a management plan for the species in the area. Benbow et al. [24] and Oliver et al. [25] described the effects of a temporary octopus closed season in south-west Madagascar. Hoshino et al. [26] carried out a study for two short-lived species and suggested that management of such resources requires a flexible, adaptive framework that responds rapidly to a changing environment, although such schemes have never been put in practice. In most circumstances, the objectives of managing a resource such as *O. vulgaris* implies a fast response since the species exhibits a highly flexible life cycle capable of responding quickly to different levels of fishing pressure [11,14,18].

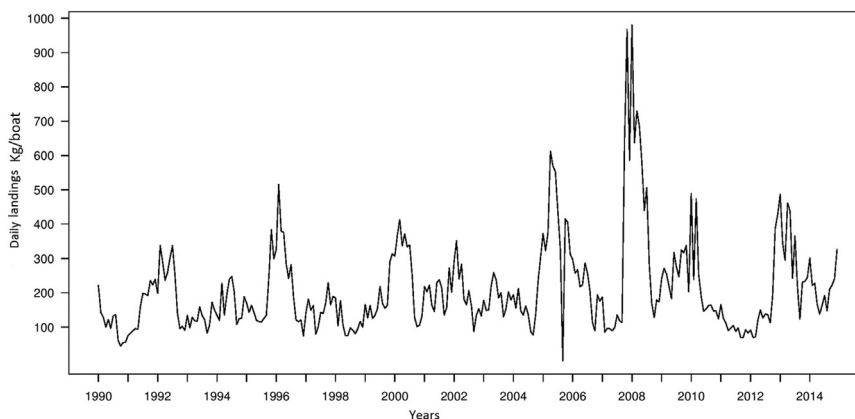


Fig. 1. Daily landing (kilograms per boat) of *Octopus vulgaris* caught in the Algarve, south of Portugal, using traps and pots. Source: [13]

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