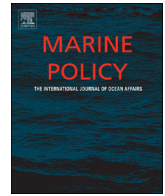




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A matter of scales: Does the management of marine recreational fisheries follow the ecosystem approach to fisheries in Europe?

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ABSTRACT

European policy-makers are increasingly aware of the ecological and socioeconomic relevance of marine recreational fisheries (MRF), but there are still gaps in the information needed to achieve sustainable management. How is the current management of European MRF performed? Is it promoting the Ecosystem Approach to Fisheries (EAF)? The management of MRF in Europe was reviewed by analyzing how different European regulations align with the EAF in different geographic and administrative scales. Text mining tools were used to identify key concepts and analyze the text of legal regulations on MRF in the European Union (EU), Portugal, Spain and the United Kingdom (UK). Also, the Ecosystem Fisheries Legal Assessment (EFLA) framework was used to assess the alignment of the regulations with the EAF. The number of regulations about MRF in Spain and Portugal is higher than in the UK and the EU, probably because the relative higher importance of regional regulations in Spain and Portugal, and the limitations imposed to recreational fishers in marine protected areas (MPAs). The lack of specific regulations on MRF in the EU, and open-access in the UK for recreational fishers, except for Atlantic salmon *Salmo salar*, explain their lower number of regulations. The EFLA framework showed that the European public policies on MRF follow the EAF principles. Enough attention is paid to ecological components, but socio-economic sustainability could be improved. However, policy efficiency could be lower than expected because potential institutional misfits derived from the eventual confluence of different spatial scales.

1. Introduction

1.1. Marine recreational fishing in Europe

Marine recreational fishing is an important and popular leisure activity in most coastal areas around the world, with high number of participants and significant economic and social impacts. In Europe it is estimated that around nine million Europeans engage in marine recreational fisheries (i.e., 1.6% of the total European Union (EU) population), resulting in 78 million fishing days, generating six billion euros in new capital annually and millions of related jobs [1]. A similar

pattern of the socioeconomic importance of recreational fishing is observed in other developed countries (e.g., [2,3] and is estimated to be increasing rapidly in developing countries [4,5]). There is also increasing evidence on the potential importance of recreational fishing, with estimated catches for particular areas and species of similar magnitude to those reported for the commercial fishing sector (e.g., [6–8]).

Despite recent improvements [9,10], many of the EU fisheries resources remain below levels that are capable of producing maximum sustainable yield, and with exploitation rates above the scientifically recommended [11–13]. A number of these stocks are shared across

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neighboring countries and captured by the commercial and recreational sectors, causing additional challenges in their management, e.g., in the case of Atlantic cod *Gadus morhua* [1,14,15]. In addition, there is a growing perception on the need to take into account indirect impact from recreational fisheries in the ecosystems (e.g., on the food webs, habitats structure, etc.) [16–19].

Despite their importance, Marine Recreational Fisheries (MRF) have been traditionally neglected in favor of commercial fisheries when it concerns to both data collection efforts to obtain information about the activity and management. In many European countries, specific and detailed information about both the economic and biological effects of MRF is still insufficient to support adequate fisheries management [1,8,20]. With the growing interest that has been observed for MRF in recent years, the EU has been calling for more regular and adequate information on the activity of marine recreational fishers to better manage the shared fisheries resources and meet the interests of the various players in the fisheries landscape [21]. Member States are now required under the Data Collection Framework (DCF) to routinely report on annual recreational catches and releases for Atlantic bluefin tuna *Thunnus thynnus*, Atlantic cod, Atlantic salmon *Salmo salar*, European sea bass *Dicentrarchus labrax*, European eel *Anguilla anguilla*, and elasmobranchs to improve the assessment and management of these species [22,23]. However, there are still many gaps in the understanding, assessment, and management of this sector in European waters [1,20].

1.2. The ecosystem approach to marine recreational fisheries

Implicitly or explicitly, the majority of the recently implemented instruments of relevance to fisheries promote an approach to fisheries giving more attention to the ecosystem [24]. The term “Ecosystem Approach to Fisheries” (EAF) was adopted by the FAO Technical Consultation on Ecosystem-based Fisheries Management held in Reykjavik in 2002. The term “approach” indicates that the concept outlines a way of considering ecosystem considerations into traditional fisheries management [25,26].

Most of the principles and conceptual elements of an EAF are already included in several arrangements, agreements, conventions, codes, etc., of direct or indirect relevance to fisheries, e.g., the encouragement of ecosystem protection by the conservation of biodiversity, of habitats and of natural variability, the reduction of the impacts of fishing on a multispecies basis under a precautionary approach, or the promotion of adaptive governance within clear boundaries and jurisdictions. These instruments span from the 1982 UN Convention on the Law of the Sea, to the 1995 FAO Code of Conduct for Responsible Fisheries, and its International Plans of Action, and from the 1971 Ramsar Convention, to the 1992 Convention on Biological Diversity (CBD), the 1995 Jakarta Mandate on Marine and Coastal Biological Diversity, the 2001 Conference on Responsible Fisheries in the Marine Ecosystem, and the 2002 World Summit on Sustainable Development, among others [27].

During the past two decades, renewed interest for a more ecological approach to fisheries has emerged inter alia in Australia, with the application of the Ecologically Sustainable Development (ESD), in the North Pacific, the Northeast Atlantic, and the Antarctic [24]. The EU policies are also aligning with international dynamics for the implementation of the EAF by focusing on the need to consider trade-offs among environmental, social, economic and objectives explicated to interested stakeholders for a better decision-making process [28]. When setting priorities for the EAF, policy makers need to pay careful attention to transboundary fish stocks, small-scale fisheries and coastal areas. For example, Buhl-Mortensen et al. [29] designed a framework to monitor and assess spatially managed areas in nine marine areas of 13 European countries. The framework follows several steps to operationalize EAF and improving “traditional management” by considering the local context, the data collection of relevant ecosystem information,

human activities and management goals, the selection of indicators, and the development of a risk analysis with the evaluation of management effectiveness.

In relation to the EAF applied to MRF, it is important to highlight that MRF are often given low priority to other marine uses [30,31]. This arises in part because the data-poor environment in which MRF is still managed in Europe, in many cases with limited access to reliable information on long-term and current catches and effort, and on economic and social values [20]. The lack of consistent, coherent and stable sources of information on MRF and the confluence of access of marine recreational fishers with other users of European marine ecosystems jeopardizes the implementation of the EAF to MRF [20]. Furthermore, the meaning of some of the principles of the EAF still remain elusive for many scientists because the need to develop active transdisciplinary approaches, and in consequence they are difficult to apply for managers and policy-makers dealing with MRF. In consequence, there is a need to 1) recognize the impacts of MRF on the ecosystems; 2) develop a standardized collection of information on the ecological, biological, social and economic dimensions of MRF; and 3) provide a set of clear objectives to implement EAF-policies to MRF. Otherwise, the operationalization of the EAF in MRF will remain as a big challenge for policy-makers, marine recreational fishers and other stakeholders [17].

1.3. Objective of this study

A critical review of the current management of MRF in Europe is presented by analyzing how different European regulations on MRF align with the EAF in different geographic and administrative scales. The text of the legal regulations on MRF in the EU and in a selection of Member States have been analyzed, and tested the Ecosystem Fisheries Legal Assessment (EFLA) framework proposed by Castillo et al. [32] to assess their proximity with EAF principles.

In recent years policy-makers have been reacting to the certainty that there is growing need to improve long-term sustainability of complex Socio-Ecological Systems (SES) like MRF by a wiser use of scientific advice, by considering fisheries impacts in an ecosystem context, integrating different administrative levels, or by incorporating bottom-up management approaches [33–35]. Therefore, in a context of increasing use of European marine ecosystem services that is leading to cumulative conflicts between groups of stakeholders [20,36], this study will allow to know if MRF are currently managed in Europe as part of a socio-ecological system aiming for ecological and socio-economic sustainability.

2. Materials and methods

2.1. Case studies

Legal regulations on MRF in Europe published by public administrations of the EU and by national and regional administrations of Portugal, Spain and the United Kingdom (UK) have been analyzed in this study (Fig. 1). These countries have been selected because they cover a broad latitudinal gradient: from the North (the UK) to the South (Portugal and Spain) of Europe. Furthermore, a relevant European socio-political-environmental gradient (from the Atlantic to the Mediterranean) have also been included in the analysis. Moreover, a wide range of differences will be considered in relation to (1) fisher's access, i.e., from countries with high rates of recreational fishers in relation to their population like the UK to countries with lower rates, such as Spain [1]; (2) cultural and other motivations for practicing marine recreational fishing, e.g., while in the UK and other countries of northwest Europe (e.g., Ireland, France and Norway), catch and release is a conservation and aesthetic measure with an increasing practice, in Portugal and Spain it is a minority option because most fishers consume their catches [20,37]; and (3) the number and types of regulations, e.g., from countries with few regulations and restrictions, like the UK [38], to

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