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Review

The 'responsiveness gap' in RFMOs: The critical role of decision-making policies in the fisheries management response to climate change

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ABSTRACT

The impacts of climate change, owing to their potentially vast reach and scale, embody a critical challenge for fisheries management organizations. We conduct a systematic literature review to present an overview of how the peer-reviewed academic literature recommends fisheries management frameworks should respond to the climate change-driven uncertainty, vulnerability and risk facing resource bases. Our review identifies 21 different potential management responses. Adaptive management was the most commonly identified strategy, with institutional capacity development and input/output controls also frequently cited. We contrast our findings with illustrative cases characterizing management practice and outcomes in RFMOs, and argue that the ability of RFMOs to implement the climate change mitigation strategies identified in our review is a function of an organization's decision-making rules. We argue that consensus-based decision-making policies limit adaptiveness, and that a 'responsiveness gap' exists between consensus and majority-based decision-making frameworks. This gap will become more evident, and increase in importance, as the impacts of climate change shift from potential to kinetic. Considering that decision-making rules in RFMOs are unlikely to change, we argue that increased analytical effort concentrated on institutional contexts and member state interest complexes may promote adaptive management, expediting the pace at which scientific recommendations and findings inform policy and practise in RFMOs.

Contents

1. Introduction

Increasing atmospheric CO_2 concentrations resulting from anthropogenic emissions will influence abiotic characteristics of

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the marine environment in coming decades (Hoegh-Guldberg and Bruno, 2010). Shifting ocean temperatures and increased acidity are commonly identified as important manifestations of climate change, as these characteristics directly influence biological components of the marine environment (Walther et al., 2002; Roessig et al., 2004; Perry et al., 2005; Hays et al., 2005; Harley et al., 2006; Occhipinti-Ambrogi, 2007; Hoegh-Guldberg and Bruno, 2010). Impacts from climate change have been identified, theorized or projected at the individual (Pankhurst and Munday, 2011), population (MacKenzie et al., 2012), community (Suikkanen et al., 2013) and ecosystem levels (Doney et al., 2012), raising concerns over ecosystem stability (Brose et al., 2012) and production of marine goods and services (Blanchard et al., 2012). Species range shifts (Perry et al., 2005; Engelhard et al., 2014), and increased uncertainty over resource statuses (Howell et al., 2013), have also been identified as repercussions of climate change. Considering that marine fisheries are critical sources of income and protein around the world (McClanahan et al., 2015), that they been subject to overcapacity in the global fleet (Arnason et al., 2009), and that many commercial stocks are overexploited (Pitcher and Cheung, 2013; FAO, 2016), fisheries management organizations must effectively respond to climate-driven resource concerns if resource statuses are to be maintained or improved.

Concern over the sustainability of marine living resources extends to the high seas (White and Costello, 2014). Defined by the United Nations Convention on the Law of the Sea (UNCLOS) as the area outside the 200 nautical mile Exclusive Economic Zones (EEZs) afforded to coastal states, the high seas represent approximately 15% of global fisheries landings (Sumaila et al., 2015). States interested in high seas marine living resources, if party to UNCLOS, are required to cooperate with other states interested in resource exploitation to ensure that high seas resources are conserved and exploited sustainably.

Regional Fisheries Management Organizations (RFMOs) are the formal organizations enabling and coordinating this cooperation outside of domestic EEZs. Management of high seas resources is complicated by several factors, including resource remoteness and problems associated with the management of common-pool resources. For example, states may carry out unauthorized exploitation in the convention areas of RFMOs they are not members of, with little recourse available to RFMOs (e.g. NAFO, 1981). Relatedly, since RFMO membership is open to any state interested in exploiting marine living resources in the organization's convention area, RFMOs must have the ability to accept new members and establish terms for their sustainable exploitation of resources (Miller, 2007). Further complicating management, RFMO member states may have positions or interests that contradict or oppose the stances and interests of other member states (Brooks, 2013). Opposing resource management stances can easily complicate management reform, particularly when RFMOs employ consensus-based decision-making rules. Solutions to these issues are not readily apparent or easily applied, and inherently characterize fisheries management at the regional level. These challenges partially explain why RFMOs have not always achieved their goals of conservation and optimal use (Cullis-Suzuki and Pauly, 2010; Gjerde et al., 2013).

Climate change also creates substantial problems for RFMOs. In addition to the projected impacts noted above, the precise impact of climate change on the marine environment is uncertain, with this uncertainty creating risk and heightening vulnerability of resource bases (Miller et al., 2010), many of which are already overexploited (Pitcher and Cheung, 2013). This uncertainty, vulnerability and risk must be effectively mitigated by RFMO management frameworks for resource stability to be ensured.

Combined, the projected impacts of climate change on marine resources, and the governance challenges associated with high seas fisheries management create a challenging management environment. We attempt to understand how these complicating factors overlap by gathering the literature identifying the strategies and approaches available to fisheries management frameworks to respond to the challenges created by a changing climate, and then reviewing key results for their implications for RFMOs. Our study contributes four main insights: the study (1) serves to broadly characterize the ongoing discussion of the fisheries management response to climate change, and (2) promotes discussion on the utility of the predominantly suggested approaches to risk, uncertainty and vulnerability management in fisheries governance during climate change. Furthermore, we (3) identify sources and instances of friction between ideal management contexts (as indicated by our review) and those employed at the regional level to demonstrate that the potential solutions to the impacts of climate change may face previously unexamined barriers. Finally, we (4) forward an alternative approach to improve policy uptake in RFMOs that make decisions by consensus.

Substantial research has investigated how fisheries management organizations should prepare for, and respond, to the challenges presented by climate change. While a variety of management options have been forwarded, their uptake has been heterogeneous, with reformative measures often applied protractedly. The insights of this study, and subsequent recommendations, will help move the discussion of fisheries management solutions to climate change challenges towards pragmatic, adaptive frameworks that improve the likelihood that RFMOs achieve their goals of conservation and optimal use.

2. Materials and methods

We conducted a literature search by using the multidisciplinary search engines 'Web of Science' and 'Scopus'. We used three levels of search filtering (Fig. 1), to return literature focusing on

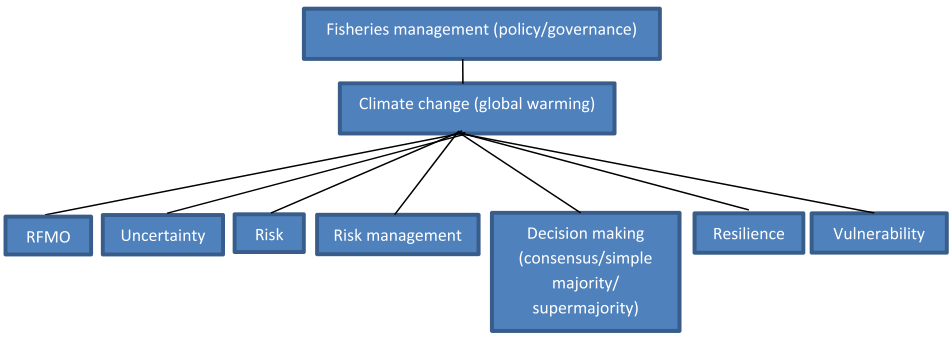

Fig. 1. Keywords used in the literature search process.