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Understanding the science-policy interface: Case studies on the role of information in fisheries management

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ABSTRACT

Case studies of the Canada Department of Fisheries and Oceans (DFO), Northwest Atlantic Fisheries Organization (NAFO), and the Food and Agriculture Organization of the United Nations (FAO) highlighted factors influencing scientific communication that are contingent on the characteristics of the many dynamic and iterative science-policy interfaces among decision-makers, scientists, and other stakeholders. Direct observations of 15 scientific and management meetings coupled with interviews with 78 scientists and managers revealed aspects of the information pathways, i.e., production, communication, and use of scientific information in these organizations. Unique features of decision-making and information use enable the production of credible, relevant, and legitimate information in each organization, including trade-offs in these attributes to support fisheries governance objectives. For instance, defined processes for producing scientific advice embedded in fisheries management authorities, such as DFO and NAFO, ensure uptake of information in decision-making. As a boundary organization, FAO bridges science and policy-making groups among its member countries. The demand for scientific advice, policy development, and trade aspects are primary drivers in the information pathways. However, organizational aspects such as dispersed units and inadequate communication persist as barriers to information flow. Across the geographic scales of the three organizations, stakeholders apart from government scientists and policy-makers, e.g., the fishing industry, non-governmental organizations (NGOs), and the public, are increasingly involved in the information pathways. Insights about the information pathways can equip the organizations to evaluate or modify practices to increase the uptake of information in decision-making as fisheries management issues and considerations become more complex.

1. Introduction

Scientific information in some jurisdictions with well-assessed fisheries has been assimilated into fisheries management decisions to address the declines in fish populations and catches, biodiversity, and associated livelihoods. However, there are numerous instances where use of available information in fisheries management and policy-making contexts to mitigate problems is not obvious (Costello et al., 2012; FAO, 2014e; Holmes and Lock, 2010; Worm et al., 2009). Questions about information use (or non-use) have been considered from two perspectives. First, limited use of scientific information by governments in policy- and decision-making is attributed to impediments with information flow at the science-policy interface (Dicks et al., 2014; Lalor and Hickey, 2013; Soomai et al., 2013). Second, the role that scientific information plays in policy-making and decision-making processes is rarely described; information is commonly viewed as implicit in these processes and it is often not recognised as playing a critical and unequivocal function in its own right (MacDonald et al., 2016).

The limited visible profile of the functions of available scientific information within policy and decision-making communities and the lack of understanding of such information use is not unique to fisheries management. Increasingly, questions about information use are being raised and examined in the context of evidence-based policy-making where decisions are expected to be made based on the available scientific information (Gluckman, 2013; MacDonald et al., 2015; Nursey-Bray et al., 2014; Nutley et al., 2007). At the same time, international commitment to strengthen communication at the science-policy interface and to enhance evidence-based decision-making at all jurisdictional levels has also intensified (UNGA, 2012; UN DESA, 2013).

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This paper empirically examines the role(s) of scientific information in the science-policy interface in decision-making for fisheries management in three governmental organizations: the Canada Department of Fisheries and Oceans (DFO), the Northwest Atlantic Fisheries Organization (NAFO), and the Food and Agriculture Organization of the United Nations (FAO) (Soomai, 2015). This research reveals the multidimensional processes at the science-policy interface by which scientific information is produced, communicated, and considered in policy decisions, and the enablers and barriers to this activity. Insights from the existing literature on decision-making and information use set the context for the study. The findings can equip fisheries governmental organizations, among other organizations, to evaluate or modify practices to increase the uptake of information in decision-making. The new knowledge can enable interested stakeholders to determine the most appropriate entry point to introduce evidence and to participate in decision-making processes.

2. Insights from previous studies on the science-policy interface and information use

The science-policy interface is a complex phenomenon but in its simplest form it can be characterised by communication between information production (science) and information use (policy) (Ascher et al., 2010; Liverani et al., 2013; Mitchell, 2010; van den Hove, 2007). The interface encompasses many social processes related to policy- and decision-making. Understanding the role of scientific information is particularly challenging given the complexities of modern societal and environmental issues. Governments' use of information is often grounded in a range of internal and external factors related to institutional and organizational aspects, the characteristics of the actors involved in policy processes, or characteristics of the information itself (Head, 2016; Likens, 2010; Mitchell et al., 2006; Mol, 2008). Uptake of fisheries scientific information into management advice by governmental organizations may be influenced by governance models, political regimes, the geographic region, information management cultures of science and management domains, and personal and institutional interests and values of multiple stakeholders (Cochrane, 2002; Cossarini et al., 2014; Delaney and Hastie, 2007; Hastie, 2008; Soomai et al., 2011; Wilson, 2009). The level of technical details in scientific information provided as advice and the degree of scientific uncertainty can influence government decision-making and public engagement in policy-making (Dankel et al., 2012; Hauge, 2011; Rosenberg, 2007; Wardekker et al., 2008). Decision-making extends beyond the interaction of government scientists and policy-makers and involves other stakeholders including resource users, NGOs, and the public; these groups often exist as networks (Clark et al., 2011; Hartley and Glass, 2010; Irvine, 2009; Soomai et al., 2013). Additionally, scientific knowledge interacts with other types of knowledge, e.g., local knowledge, and may compete with other kinds of information, including that from economic and social sciences, in decision processes (Cicin-Sain and Knecht 1998; McNie, 2007). With a global trend towards ecosystem-based management to balance diverse societal objectives with fisheries management, fisheries publications by governmental and non-governmental organizations (NGOs) have become even more prolific and more interdisciplinary (Garcia et al., 2003; Levin et al., 2009; UN, 1972, 1992). Political agendas and attempts to maintain the neutrality of science can also affect information flow at the interface (Guston, 2001; Koetz et al., 2011; Pielke, 2007; Sarewitz, 2014). Such diverse factors can create opportunities or challenges for the communication of scientific information to policy-makers and its use upon receipt.

Many models and perspectives on decision-making and information use assume evidence-based policy-making and describe a linear or science-based interface and a collaborative or participatory approach (Bremer and Glavovic, 2013; Bulkeley, 2005; Knol, 2010; Sarewitz and Pielke, 2007; Stojanovic et al., 2009; Young et al., 2013). The pathway(s) of information in policy-making can follow an "ideal" or linear process as researchers ask the relevant questions, plan and conduct research, and then disseminate the scientific advice directly to the policy-maker (Glasziou and Haynes, 2005; Knott and Wildavsky, 1980; Landry et al., 2001; Weiss, 1979). Alternatively, in an "enlightenment model," the links between research and policy are less direct as information accumulates over time and permeates gradually into the policy process (Weiss, 1977). Nutley et al. (2007) describe an iterative process where information flows in a continuum between direct (instrumental) use of scientific information for immediate problem-solving and indirect (conceptual) use where information serves an "enlightenment" purpose over time. Three attributes of information, i.e., credibility, relevance (or salience), and legitimacy, typify information use in the science-policy interface models (Cash et al., 2003; Koetz et al., 2011; Mitchell et al., 2006; Sarkki et al., 2014, 2015).

In-depth studies, as described in this paper, provide empirical evidence of the characteristics of the science-policy interface, particularly with regard to the range of factors and models that have been defined above. Studies on the role of information are becoming more important to organizations where funding for research is quite limited and accountability for information production is needed (EIUI, 2016).

3. Methods

Data were gathered in three-month periods during which interviews were conducted and meetings were observed in each of DFO, NAFO, and FAO between September 2013 and July 2014. DFO is the lead federal agency responsible for developing and implementing national fisheries policies and programs in Canada (DFO, 2016b). NAFO is an intergovernmental fisheries science and management body for the Northwest Atlantic region (NAFO, 2016). FAO, a specialized agency of the United Nations, is the foremost global fisheries management organization providing neutral advice to its members (FAO, 2016a). These governmental organizations operate at different jurisdictional levels but their activities are also inter-related. Canada as a Contracting Party to NAFO is represented by DFO. Similarly, DFO is the official contact organization for Canada as a member country of FAO. The three governmental organizations are prolific producers of fisheries scientific information that is published primarily as grey literature, i.e., published by the organizations themselves and not by a commercial publisher (GreyNet, 2016).

Four specific questions were addressed in each organization: (1) What are the drivers in producing, communicating, and using marine fisheries information by the organizations? (2) What are the information management strategies of the organizations, particularly with regard to communication? (3) What are the institutional and social enablers and barriers in the organizations to scientific information use at the science-policy interface? and (4) Who are the actors in the information pathways and what are the information behaviours (e.g., information seeking and sharing) of the various actors in each organization?

Seventy-eight interviews of scientists and decision-makers in the three organizations (Table 1) were conducted using a semi-structured questionnaire that consisted of open-ended questions to obtain information in the four areas listed above. The research within DFO focused on the DFO-Maritimes region (DFO-MR), the administrative region of DFO on the Atlantic coast. Research within NAFO focused on the participation of Canada as a Contracting Party to NAFO. The research primarily involved government scientists