



Knowledge users' perspectives and advice on how to improve knowledge exchange and mobilization in the case of a co-managed fishery



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ABSTRACT

Environmental scientists have long been frustrated by the difficulties involved in transferring their research findings into policy-making, management, and public spheres. Despite increases in scientific knowledge about social-ecological systems, research has consistently shown that regulators and stakeholders draw on tacit, informal, and experiential knowledge far more than scientific knowledge in their decision-making. Social science research in the fields of knowledge exchange (KE) and knowledge mobilization (Kmb) suggest that one of the major barriers to moving knowledge into practice is that scientists fail to align their communication strategies with the information-seeking behaviours and preferences of potential knowledge users. This article presents findings from in-depth qualitative research with government employees and stakeholders involved in co-managing Pacific salmon fisheries in Canada's Fraser River. We investigate how members of these groups access, view, and use scientific information, finding both similarities and differences. Members of both groups express a strong interest in academic science, and self-report using scientific information regularly in their work and advocacy. However, the two groups engage in different information-seeking behaviours, and provide notably different advice to academic scientists about how to make research and communication more relevant to potential users. For example, government employees focus on the immediate applications of research to known problems, while stakeholders express greater concern for the political context and implications of scientific findings. We argue that scientists need to "go where the users are" in the behavioural and intellectual sense, and tailor their communications and engagement activities to match the habits, preferences, and expectations of multiple potential user groups. We conclude with recommendations on how this may be done.

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1. Introduction

Surveys have shown that university-based environmental scientists want their research to have a real impact on policies and practices (e.g., Singh et al., 2014). In reality, however, the barriers to moving potentially useful research into policy-making, management, and public spheres are high. While politicians, resource managers, and stakeholders routinely express a keen interest in scientific research and findings, numerous studies have found that these groups rely far more on tacit, informal, and

experiential knowledge than scientific knowledge in their opinion-formation and decision-making (e.g., Pullin et al., 2004; Sutherland et al., 2004; Roux et al., 2006; Fazey et al., 2006; Cook et al., 2010; Cvitanovic et al., 2014; Ntshotsho et al., 2015).

Understanding this disjuncture has become a key focal point of social science-based studies of "knowledge exchange" (KE) and "knowledge mobilization" (Kmb). These concepts have different origins but similar emphases, with KE emerging from the business management and environmental science literatures, while Kmb has been used primarily in the fields of education and social policy (Provencal, 2011; Fazey et al., 2012). Both are based on a (loosely) sociological approach to investigating knowledge movement and application. This approach conceptualizes knowledge as being

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intimately connected with social relationships, processes, and rituals. For instance, it used to be assumed that knowledge moved in a linear way from generators to users, who were separated by a clear division of labour, primarily via scientific publications (Atkinson-Grosjean, 2006: 19). In contrast, KE/KMb research looks at how people actually create, seek out, interpret, and elect to use (or not use) scientific knowledge and information – processes that are far more complex and varied than presumed by the linear model. This research has shown that knowledge typically moves in a non-linear fashion, involving iterative back-and-forth exchanges among researchers and networks of potential users who bring their own values, interests, and priorities to the table (Greenhalgh and Wieringa, 2011; Nutley 2013). Social relationships and their outcomes, such as trust, reputation, and mutual understanding among a wide variety of actors, are therefore important contributors to knowledge movement and uptake. Based on observations such as these, KE/KMb researchers conceptualize knowledge as an ongoing process rather than a thing or commodity that can be readily transferred or delivered to others (Shields and Evans, 2008; Reed et al., 2014: 342). This has led some scholars to criticize the peer-reviewed scientific paper – long the staple of communication within the scientific community – as being too static, formal, and “final” in its summary-style presentation, to really connect with non-scientists who see knowledge first and foremost as an ongoing process of providing evolving possible answers to difficult social-ecological questions (e.g., Jasanoff, 2003; Callon et al., 2009).

Most importantly for our purposes, KE/KMb research emphasizes the role that knowledge users play in determining outcomes of knowledge mobilization (Young et al., 2013; van Stigt et al., 2015). Rather than being passive consumers of knowledge and information, knowledge users actively compare claims to one another, to personal and collective experiences, and to other ways of knowing such as local and traditional knowledge (Boswell, 2008; Hulme, 2015). If a claim is accepted as useful and valid, knowledge users may nonetheless apply it in ways that are far removed from the original intent of the researchers (Goldman et al., 2011). As such, most KE/KMb researchers acknowledge that the lines between scientific and non-scientific forms of knowledge are often blurred in the real world of applications and use, and that this is not necessarily a bad thing (Shanley and Lopez, 2009; Adams and Sandbrook, 2013). Scientific knowledge can empower groups that have been traditionally marginalized or silenced by giving them another vocabulary to articulate their positions, while exposure to other ways of knowing can give scientists important means of feedback and “question generation” for future research (Berkes, 2009). These observations are at the core of recent calls for the “co-production” of scientific findings that involve close collaboration among scientists and potential users at all stages of research (e.g., Armitage et al., 2011; Reed et al., 2014).

The emphasis placed on social processes and mutual understanding in the KE/KMb literature suggests that one of the major barriers to successfully mobilizing academic science is the failure of scientists to understand the behaviours, preferences, and viewpoints of potential users of their knowledge, which contributes to missed social and intellectual connections (van Stigt et al., 2015). In this article, we present findings from interviews conducted with government employees and stakeholders involved in the co-management of Pacific salmon fisheries in Canada's Fraser River system. These interviews contained both closed- and open-ended questions about the importance of scientific information for respondents' work and advocacy, where and how they seek out scientific information, and what advice they would give academic scientists to make their research and communication activities more applicable and relevant. We use the findings from these interviews to provide recommendations to academic scientists looking to better align their research with the

behaviours, preferences, and expectations of multiple knowledge user groups.

2. The case

The Fraser River is one of Canada's most intensely-fished rivers, and has a history of conflict among user groups (Nguyen et al., 2016). Winding 1375 km through the mountainous province of British Columbia (BC), it meets the Pacific Ocean near the metropolis of Vancouver. Three fishing sectors targeting adult migrating Pacific salmon (*Oncorhynchus* sp.) occur in or near the Fraser River: commercial, recreational, and First Nation, all with different catch allocations and restrictions. Regulation of these fisheries is complex (see Cohen, 2012a), involving both the Canadian Department of Fisheries and Oceans (DFO) and the Canada-US bi-national Pacific Salmon Commission (PSC). Once conservation goals have been met, first priority of access is given to First Nations (indigenous) people to harvest for food, social, and ceremonial purposes. Following this, allocations are made to the commercial and recreational sectors, as well as to small-scale First Nation “economic opportunity fisheries” that allow commercial sale.

DFO has a complex mandate that includes promoting economic growth in marine industries, ensuring sustainable harvests and ecosystems, conducting original research, and engaging with stakeholders. The department has a central headquarters in Ottawa, but most decisions about fisheries management occur in regional offices. In the Pacific region, DFO has approximately 460 “science staff”, the majority of whom are involved in stock assessment and monitoring. As of 2012, there were 55 research scientists (holding a PhD) employed in the region, conducting research on a range of topics including fish physiology, genomics, oceanography, aquaculture, and ecosystem dynamics (Cohen, 2012a: 53). DFO scientists are expected to publish in peer-reviewed scientific journals, and many collaborate with academic scientists in major regional universities such as the University of Victoria, Simon Fraser University, and University of British Columbia (Lane, 2000). Despite these resources, scholars have long criticized DFO's slow response to new scientific tools and findings (e.g. Hutchings et al., 1997). Several observers have also lamented declines in science budgets and personnel during the tenure of Canada's Conservative government (2006–2015) which includes the study period (e.g., Canadian Association of University Teachers, 2013).

DFO describes its regulatory approach to Pacific salmon fisheries as being both “science-based” and grounded in “co-management approaches” (DFO, 2012). Co-management is multi-pronged. First, DFO consults directly and continually with First Nation groups using an informal system in which both parties can bring issues to the table for discussion (Cohen, 2012a: 77). Second, DFO maintains advisory boards with other stakeholders, including the Commercial Salmon Advisory Board, the Sport Fish Advisory Board, and the Marine Conservation Caucus (with representatives from ENGOs). Third, in 2004, DFO created Integrated Harvest Planning Committees with representatives from all four groups to review data from the prior season, identify areas of concern, and provide planning advice and recommendations for the upcoming season.

While the number of adult salmon returning to the Fraser River varies each year, recent fluctuations in sockeye salmon (*O. nerka*) have been extreme, including poor returns to spawning groups associated with very low production. This has raised concern among stakeholders and the general public, and in 2009 the Government of Canada convened a Judicial Inquiry presided by retired BC Supreme Court Justice Bruce Cohen to investigate. The Cohen Commission heard from 179 witnesses, including

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