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Human dimensions information needs of fishery managers in the Laurentian Great Lakes

Nadine Heck^{a,b,*}, Richard C. Stedman^b, Marc Gaden^{c,d}

^a Institute of Marine Sciences, University of California, Santa Cruz, CA, USA

^b Department of Natural Resources, Cornell University, Ithaca, New York, USA and Human Dimensions Research Unit, Department of Natural Resources, Cornell University, Ithaca, New York, USA

^c University of Michigan, Ann Arbor, Michigan, USA

^d Great Lakes Fishery Commission, Ann Arbor, Michigan, USA

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ABSTRACT

Fishery management is increasingly moving towards ecosystem-based approaches that integrate ecological and human dimensions of fisheries. Studies on the human dimensions (HD) of fisheries have increased in recent years. A gap, however, remains between the nature of available information and the information needed by fishery managers. Our paper addresses this gap for the Great Lakes fisheries. We explicitly explored information needs of fishery managers to better reconcile the supply and demand of HD information. Our study finds that managers need HD information in particular to demonstrate the achievements of management goals and to address management issues. In addition, understanding the purpose and timing of information is important in order to provide timely and relevant information as fishery managers identify distinct information needs for planning, decision-making, and evaluation of management. Fishery managers in our study were particularly interested in direct and indirect economic values of the fisheries as well as values, beliefs, attitudes, and behaviors of users. Interviewed managers were not only interested in the status quo of these factors but also wanted to understand what influences and shapes them. In addition, fishery managers would like to understand the contribution of fisheries to ecosystem services in the basin including cultural values. Our interviews did not detect interest in information on long-term HD trends or the explicit need for interdisciplinary studies. Such information, however, would be critical to understand and predict changes in the human dimensions of the fisheries and to develop management strategies to cope with these changes.

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Introduction

Fishery management is increasingly moving towards ecosystem-based approaches that conceptualize fisheries as social-ecological systems (Berkes et al., 2002; Caddy and Cochrane, 2001; Hilborn, 2007; Norse, 2010; Salomon et al., 2011; Urquhart et al., 2011) (Fig. 1). Fishery managers thus need to consider both the fish resource and the people using it and must also confront the inherent unpredictability of human behavior in addition to the unpredictability of the fishery resource itself (Arlinghaus et al., 2013; Arlinghaus, 2006; Carpenter, 2002; Coll et al., 2013; Haapasaari et al., 2012). Management success or failure is therefore usually determined at least as much by social and institutional factors as ecological ones (Decker et al., 2001; Fulton et al., 2011; Hunt et al., 2013; Mascia, 2003).

Information on the human dimensions (HD) is thus essential to manage fisheries. Understanding stakeholder perceptions, beliefs, and attitudes, for example, can help managers develop relevant

management practices, identify and reduce conflicts among user groups, and understand and predict attitudes towards fisheries and management regulations (Caddy and Cochrane, 2001, McClanahan et al., 2006a). The collection of local ecological knowledge can add to the understanding of fish resources and ecosystems that is needed for decision-making processes (Hall-Arber and Pederson, 1999; Maurstad and Sundet, 1998; Neis et al., 1999; Neis and Felt, 2001). Assessing the economic and social importance of fisheries to local culture, heritage, and quality of life in coastal communities helps to predict how communities might be affected by changes in these fisheries and to identify adaptation strategies (Pacific Fishery Management Council, 2005; Symes and Phillipson, 2009; Urquhart et al., 2011).

At the same time, the availability of information on human dimensions does not necessarily mean that managers will use the information. Fishery managers and decision-makers, in fact, might not perceive research outcomes as “useful” if it does not meet their explicit information needs (De Young et al., 2008; Lahsen and Nobre, 2007; Sarewitz et al., 2000). Information needs of a particular audience, such as fishery managers, can depend on multiple factors including the motivation to receive new information, the intended use of the information (e.g., decision-making, problem solving), the characteristics of

* Corresponding author at: Department of Natural Resources, Cornell University, Ithaca, New York, USA.

E-mail address: nheck@ucsc.edu (N. Heck).

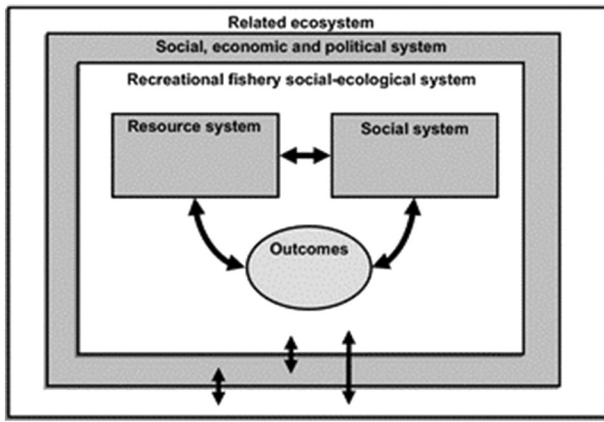


Fig. 1. General coupled social–ecological system of recreational fishing. (Source: Hunt et al., 2013).

information users and organizations, and the social, political, and economic importance attached to the desired information (Okwu et al., 2011; Paisley, 1968; Rouse and Rouse, 1984; Mulvaney et al., 2014). Explicit information needs are thus context-sensitive and constantly evolve in response to changes and uncertainties in environmental, social, and political conditions (Devadason, 1996; Jacobs, 2003; McClanahan et al., 2006b; Okwu et al., 2011; Pollnac et al., 2001).

Understanding fishery managers' information needs and how they would use new information is thus critical to produce information that managers perceive as “useful” and are likely to incorporate in the decision-making process. Equally important is the inclusion of managers in the entire research and information-identification process as doing so heightens the perceived relevance and usefulness of new information (Carpenter, 2002; Johannes, 2002; McNie, 2007; Ruddle, 1996). Our study addressed these points for the human dimensions of the Great Lakes fisheries. Based on interviews, we identified fishery managers' views on the role of human dimensions for the management of the fisheries, elicited their explicit HD information needs, and identified why they seek this kind of information. The aim of the project was to improve understanding of HD information needs and their value to fishery management across the Great Lakes. To achieve this aim, our study centered on the following questions:

- (1) What is the role of human dimensions in the management of the Great Lakes fisheries?
- (2) What kinds of HD information do managers seek to improve fishery management?
- (3) What drives fishery managers' HD information needs?

Methods

Study site: the Great Lakes fisheries

The Great Lakes fisheries consist of commercial, recreational, and tribal fisheries in five connected lakes (Superior, Huron, Michigan, Erie, and Ontario) (Gaden et al., 2012). Multiple contemporary ecological and social trends in the basin affect fish resources and fishing activities in the basin. Examples are climate change (Cline et al., 2013, 2014; Farmer et al., 2015), nutrient pollution (Michalak et al., 2013; Scavia et al., 2014), and the spread of pathogens and aquatic invasive species (Bain et al., 2010; Kelly et al., 2013; Kilian et al., 2012). Social and economic trends include a decline in the fishing charter boat industry (Lichtkoppler et al., 2015), a decline in commercial and recreational fishing license sales (e.g., Freedman, 2013; Meyerson, 2014), reduced annual harvest (Hudson and Ziegler, 2014), in addition to demographic changes such as net out migration from the region and an aging

population (Méthot et al., 2015). Based on the complexity of these trends, fishery managers need to understand human–environment interaction in the basin, and integrate human dimensions into management and decision-making (Decker et al., 2012).

Acknowledging this need for information on human dimensions, the Great Lakes Fishery Commission developed a HD research theme in 2002 to foster research in this area (Dobson et al., 2005). Based on this theme, the GLFC has funded multiple HD research projects as listed on the GLFC website <http://www.glfrc.org/research/rcr.php> (e.g., Lupi, 2008; Dobson, 2006; Riley, 2007; Stedman, 2015; Lauber et al., 2014). Fishery managers were not engaged in the development of the HD research theme and did not necessarily utilize research findings (Heck et al., 2015). To address this point, we conducted this study to develop an update of the HD research theme that explicitly addresses the information needs of fishery managers themselves. We anticipate that managers will perceive research outcomes based on this research theme as useful and utilize research findings that address their particular information needs.

Data collection

We conducted 38 face-to-face semi-structured interviews with fishery managers throughout 2012 to elicit their information needs. The participant pool included members of the Council of Lake Committees (a body of senior managers from all Great Lakes state, provincial, and tribal jurisdictions), members of technical committees (a body of field-level biologists), federal officials, and Great Lakes Fishery Commission staff. All Council of Lake Committees members participated and our interviewees represented all Great Lakes fisheries jurisdictions, from Canada and the United States. We conducted 19 interviews during the Lake Committee meetings in Windsor, Ontario, March 20–24th, 2012. In addition, we interviewed 19 managers face-to-face at their place of work between April 26th and May 24th, 2012.

We used a semi-structured interview guide to ensure that all interviewees answered the same general set of questions while still allowing the researchers to explore each interviewee's unique perspective. Interviews lasted between 40 and 70 min. We assured participants that we would treat their comments as confidential and would not attribute any comment to them individually in any report or publication. The study was approved by the Cornell Institutional Review Board, Protocol No. 1101001927.

Each interview consisted of two parts. The first part focused on fisheries management goals and issues to detect the role, if any, of human dimensions information in fishery management. The second part investigated specific human dimensions information needs and how fishery managers would use the identified information.

Data analysis

With the participants' consent, interviews were audio recorded and transcribed. We analyzed the interviews using computer software (Atlas.ti 7), a software package for qualitative data analysis. Consistent with steps pretested by Miles and Huberman (1984), interview data were first “pattern coded” to identify broad themes (Auerbach and Silverstein, 2003), contexts, and relationships, and then “open coded” to sort sentiments in detail (Strauss and Corbin, 1990a) line by line, and finally “cluster coded” to reconstitute the detailed codes into more general themes that emerged through the open coding process (Strauss and Corbin, 1990b; Thomas, 2006). Two professors in the Department of Natural Resources at Cornell University with extensive expertise in human dimensions of fisheries cross-checked the codes to increase the reliability of the codes and the coding process. We included interview excerpts to provide evidence and the essence of the perspectives yielded through the interviews. In addition to this qualitative analysis, we calculated frequencies for each code using IBM SPSS 22.0.

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