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What is the best available science? A comparison of marine scientists, managers, and interest groups in the United States

Erika Allen Wolters [a, *], Brent S. Steel [b], Denise Lach [c], Daniel Kloepfer [d]

[a] School of Public Policy, Oregon State University, 301 Gilkey Hall, Corvallis, OR 97330, USA
[b] School of Public Policy, Oregon State University, 300E Gilkey Hall, Corvallis, OR 97330, USA
[c] School of Public Policy, Oregon State University, 300D Gilkey Hall, Corvallis, OR 9730, USA
[d] Ohio State University, Building 19, The Ridges, Room 231, 1 Ohio University, Athens, OH 45701, USA

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ABSTRACT

In recent years there have been calls among decision makers, interest groups, citizens, and scientists alike for the use of the "best available science" when making environmental policy and managing natural resources. The assumption is that including scientists and the best available scientific information will improve the quality of complex policy decisions. Others have argued, however, that science and scientists are just one source of expertise concerning environmental management and increasing involvement will not necessarily lead to better policy. We report on a study examining the attitudes and orientations of marine scientists, resource managers, and interest group representatives concerning factors that may affect scientific credibility, the credibility of scientific research produced by various organizations, and perceptions of the ability of certain groups to understand scientific research. Using national random sample surveys and interviews of marine scientists, marine managers, and interest groups involved in marine policy issues conducted in 2011, we examine indicators of scientific credibility, data, research and reputation; the ability of scientists to communicate findings; and the role of scientists in the policy process. Further, we explore what factors contribute to credible science, the credibility of the science produced by various organizations, and the scientific literacy of various policy actors.

1. Introduction

The role of scientists in policy formation is inherently conflicted. Scientists, often slated to be the messengers of unbiased information, are torn between reporting on their research and recommending policies based on their findings. In this mode of report only, scientists avoid the public eye and instead are only a conduit of information. However, many feel scientists are arguably the most qualified to draw conclusions and recommendations from their research but in doing so they open themselves up to scrutiny as to the motivations and credibility of their research.

Looking specifically at marine and coastal policy, this paper illustrates some significant variables constituting credible science, what organizations produce credible science and who is best qualified to understand scientific research for use in the policy process by surveying people most engaged in marine and coastal policy: scientists, managers, and interest groups. Findings suggest that there are several variables that go into creating credibility (particularly quality of methodology and scientific data and information proffered), including intangibles that cannot be measured, however discredit on any one variable leads to the potential loss of all credibility. The paper also finds that there is general agreement that scientists are the most qualified to understand scientific findings but prefer to communicate to other scientists than resource managers, interest groups, the public, etc. These findings, along with information about credible research organizations, indicate that scientists generally are hesitant to stress communication to people outside of their field and that the quality of the work is of primary importance. Thus, it may take some effort to encourage scientist to become more engaged in marine and coastal policy formation.

* Corresponding author.
E-mail addresses: Erika.wolters@oregonstate.edu (E.A. Wolters), bsteel@oregonstate.edu (B.S. Steel), Denise.Lach@oregonstate.edu (D. Lach), kloepfer@ohio.edu (D. Kloepfer).

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1.1. Background

Current perspectives on the proper role of science and scientists in the policy process are potentially related to how science is defined and understood. In this traditional model, an outgrowth of positivism, the role of scientists is to provide relevant expertise about scientific data, theories, and findings that others in the policy-making process can use to make decisions, not to make the decisions themselves or to be advocates of particular policy positions (Lackey, 2007). Further, scientists are to avoid direct policy advocacy or involvement that can lead to a loss of credibility. Blockstein notes that maintaining credibility is important among scientists because "like virginity, credibility can be lost only once", thus scientists may be loathe to recommend policies as it can be perceived as advocacy (2002, p.92). In this traditional model, science is respected as autonomous from policy making, thus having a special authority in environmental management because of its independence and its power to interpret the world. This "separatist" role for scientists further reinforces credibility by solidifying the line between science and policy, science and management. Therefore, in this role, scientists ideally are removed from management and policy and serve as experts or consultants only; called upon as the need arises and as policy-makers, managers, and the public require (Lackey, 2007).

A second, emerging model challenges this first model, not so much on the authority of scientific information, but on the proper roles for research scientists in policy and management (Kay, 1998). This emerging "integrative" model-also called "post-normal science"-calls for personal involvement by individual research scientists in bureaucratic and public decision making, providing expertise and even promoting specific strategies that they believe are supported by the available scientific knowledge (Ravetz, 1987; Steel and Weber, 2001). This model suggests that scientists should not hesitate to make judgements that favour certain management alternatives, if the preponderance of evidence and their own experience and judgement moves them in certain practical directions (Steel et al., 2003). Funtowicz and Ravetz (1999) have articulated this model by stating that textbook knowledge is no longer sufficient, scientists can and must also draw from the applicability of their findings and to recognize that complex scientific problems don't always have only one solution, indeed they may not have any solution. These two approaches suggest very different perspectives, not only on the role of science and scientists in policy processes and management, but also on what would constitute a credible scientist and credible science, with the traditional model focussing more on basic science, and the latter more focused on what we might call "engaged science." This study examines scientist, interest group and natural resource manager's attitudes about what constitutes scientific credibility in the context of marine policy and management. More specifically, we report on a study examining the attitudes and orientations of marine scientists, resource managers, and interest group representatives concerning factors that may affect scientific credibility, the credibility of scientific research produced by various organizations, and perceptions of the ability of certain policy relevant groups to understand scientific research. Using national random sample surveys and interviews of marine scientists, marine managers, and interest groups involved in marine policy issues conducted in 2011, we ask what about what factors contribute to credible science, the credibility of the science produced by various organizations, and the scientific literacy of various policy actors.

We will first provide a brief historical overview of the role of science and scientists in marine policy, followed by a review of factors that may affect the credibility of science and scientists using the normal–post normal models discussed above. Finally we will present results from surveys of marine scientists, representatives of marine interest groups, and marine resource managers conducted in 2011. We conclude by discussing the policy implications of the study results for involving science and scientists in the policy process.

1.2. Role of science in marine policy

Scientists' roles and their scientific input have not been integrated into the U.S. marine policy-making process with consistent success, although there are positive strides being made within the National Oceanic and Atmospheric Administration (NOAA). Specifically, in 2004 NOAA began to transform their management practices with an ecosystem approach in their 2004 Strategic Plan (McFadden and Barnes, 2009). This approach adds an emphasis on stakeholder involvement and collaboration among all interested parties. Fischer (2000) accentuates this need for citizen participation because it gives meaning to democracy, it contributes normatively to the legitimation of policy-making, and it can contribute to professional inquiry.

Because marine ecosystems are such complex environments there have been multiple attempts by the National Research Council, the U.S. Commission of Ocean Policy and many academic researchers to advocate for the use of science and scientists input when creating marine policies (National Research Council 1994, National Research Council, 1995; Boesch, 1999, Hiscock et al., 2003; Peterman, 2004; U.S. Commission on Ocean Policy, 2004; Frid et al., 2006, Flecther, 2007; Levin et al., 2009; Stojanovic et al., 2009; Link et al., 2012). The highly technical nature of marine ecosystems and the recent push for more meaningful citizen involvement within natural resource policy-making, places this debate squarely within the realm of the democracy–technocracy quandary. The technocracy–democracy quandary is a focus on the duelling relationship between the role of technical scientific information and public participation in policymaking, which will be discussed in the literature review below.

Recent literature has been in favour of some sort of involvement for scientists in marine policy formation. Flecther (2007) argues that the role of scientists in marine policy-making should be clear in intent; he suggests they must not specifically make policy decisions themselves but only used to inform policy-makers. Stojanovic et al. (2009) take this suggestion further and say that policy objectives must be led by science-based observations. Finally, Levin et al. (2009, p. 0023) make the most direct suggestion and propose that we begin to use "integrated ecosystem assessments" (IEAs) as a framework for organizing science in order to inform decisions in marine EBM [Ecosystem-based Management] at multiple scales as across sectors. IEAs are important because they bring together policy makers, resource managers, scientists and stakeholders in order to identify specific ecosystem objectives and threats in the initial scoping process. IEAs attempt to integrate many different forms of physical, biological, and socioeconomic data in order to create policy (Levin et al., 2009). Another suggestion made by Peterman (2004) that could potentially change the role of science in marine policy-making is that managers should not put low weight on scientific research because of uncertainty compared to economic and social factors, where uncertainties also exist.

One suggested way to better involve science and scientists in the policy-making process is to implement ecosystem-based management (EBM), which is a much more holistic approach than past management strategies. The general principles of EBM consist of: 1) the necessity to address multiple spatial and temporal scales between ecological and social systems while also considering stakeholder groups, 2) the need to take into consideration the linkages