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The interaction triangle as a tool for understanding stakeholder interactions in marine ecosystem based management

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ABSTRACT

Expectations about ecosystem based management (EBM) differ due to diverging perspectives about what EBM should be and how it should work. While EBM by its nature requires trade-offs to be made between ecological, economic and social sustainability criteria, the diversity of cross-sectoral perspectives, values, stakes, and the specificity of each individual situation determine the outcome of these trade-offs. The authors strive to raise awareness of the importance of interaction between three stakeholder groups (decision makers, scientists, and other actors) and argue that choosing appropriate degrees of interaction between them in a transparent way can make EBM more effective in terms of the three effectiveness criteria salience, legitimacy, and credibility. This article therefore presents an interaction triangle in which three crucial dimensions of stakeholder interactions are discussed: (A) between decision makers and scientists, who engage in framing to foster salience of scientific input to decision making, (B) between decision makers and other actors, to shape participation processes to foster legitimacy of EBM processes, and (C) between scientists and other actors, who collaborate to foster credibility of knowledge production. Due to the complexity of EBM, there is not one optimal interaction approach; rather, finding the optimal degrees of interaction for each dimension depends on the context in which EBM is implemented, i.e. the EBM objectives, the EBM initiator's willingness for transparency and interaction, and other context-specific factors, such as resources, trust, and state of knowledge.

1. Introduction

Expectations about ecosystem based management (EBM) differ due to diverging (disciplinary) perspectives. Many definitions of EBM exist (e.g. [53,2,15]), and "they invariably share a number of common characteristics", such as "broadening stakeholder involvement" and dealing with "multiple simultaneous drivers or 'pressures' on ecosystems" ([65]:682). This article uses the scientific consensus statement on EBM, which defines EBM as "an integrated approach to management that considers entire ecosystems, including humans" ([60]:1). Hence, comprehensive, effective and balanced EBM requires detailed understandings of not only environmental processes, but also ethical, social and economic processes [11].

Three characteristics pertaining to a holistic, integrated EBM approach render it a particularly complex process. First, EBM is about sustainability, meaning that management objectives should include social, economic and ecological concerns, requiring trade-offs. The exact needs and challenges, e.g. whether objectives and measures focus more on ecosystem health, economic opportunities or human well-being, or a combination thereof, depend on the place and time of implementation [54]. Second, EBM deals with different ecosystems as well as institutional settings, requiring multi-level governance [58,76]. Ecosystems are complex and often do not match existing policy scales (e.g. [15]). A mismatch of scale in ecosystem analyses can result in policy recommendation that are not meaningful to policy makers and impacted communities [11]. Furthermore, such inconsistencies can lead to institutional ambiguity and pose limitations to building effective multi-level decision making structures for EBM [95]. Third, EBM requires cross-sectoral coordination and the integration of sectoral concerns and management. Fisheries, shipping, oil and gas activities, MPAs, and tourism are all activities managed by different sectoral approaches. EBM initiatives have to build institutional linkages with sectoral governance arrangements to avoid conflicts or overlap [76].

Due to the holistic nature and complexities, EBM questions give rise to high scientific and political uncertainties as well as high and

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diverging stakes. EBM has many faces in how it can be implemented [86], i.e. there is not one single answer nor only one EBM implementation path to such complex problems, and more science cannot necessarily close the existing knowledge gaps (e.g. [22,16]). Rather, each individual situation requires context-specific trade-offs between ecological, economic and social sustainability criteria, based on an understanding of its institutional and political setting, local dynamics and context-dependent cultural constructs of the environment [9,11]. The complexities due to the high uncertainties [84] and stakes reinforce the need for decision makers, scientists and other actors to interact with each other [94,98,16,82], calling for approaches such as "post-normal science" [28,36,92], or risk communication [47,68,49,80,56]. The authors argue that implementation of EBM requires tailor-made, integrated interaction processes between the different stakeholder groups.

This article analyses the importance of interactions between stakeholder groups in marine EBM processes, and identifies three dimensions and spectra of these interactions. The "interaction triangle" supports the analysis of the context-specific nature of EBM, and can help with the evaluation of past and the planning of future EBM processes. The presented approach can give direction to policy makers, scientists, and other actors working on applied EBM research questions, in setting up context-specific interaction structures for these EBM processes. The authors strive to raise awareness of the importance of interaction between three stakeholder groups and argue that choosing appropriate degrees of interaction between them in a transparent way can make EBM more effective in terms of the three effectiveness criteria salience, legitimacy, and credibility [62].

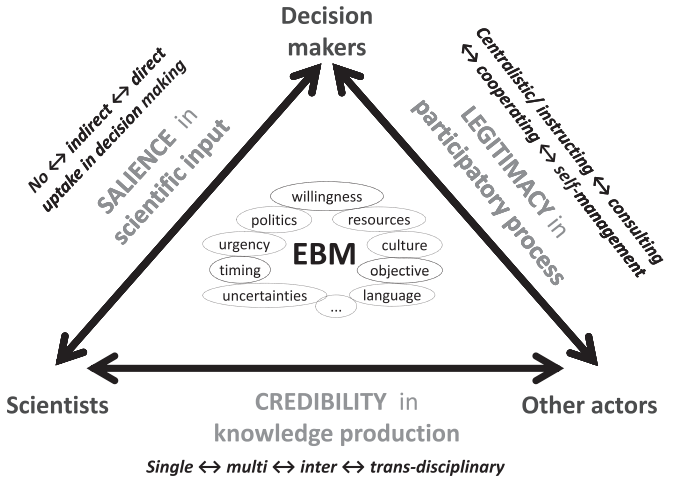

Fig. 1. The EBM triangle of interaction, specifying an interaction spectrum (outside, black) for each of the three dimensions (grey). Encircled inside the triangle, examples of context specific factors.

Our study is grounded on an interdisciplinary literature review covering and combining the fields of participatory knowledge production, inter- and transdisciplinarity, boundary work, role of science in decision making, and uncertainty and risk.

The article is structured as follows: The next section presents the interaction triangle, illustrating the three dimensions to be considered in the interaction between stakeholder groups in EBM processes, explaining their importance and spectra, i.e. their potential range/ degrees of interaction to choose from, depending on the specific EBM context. Context specific factors that determine how much interaction might be appropriate are then illustrated. The final section concludes with recommendations for effective EBM.

2. The interaction triangle in EBM processes

The "interaction triangle" consists of three dimensions, representing interaction pathways between (A) decision makers and scientists, (B) decision makers and other actors, and (C) scientists and other actors (Fig. 1). Each interaction dimension contributes to the process quality of dealing with an EBM challenge. To highlight the key focus and importance of each interaction dimension, each dimension is designated to one particular management effectiveness criterion: (A) salience in scientific input, (B) legitimacy in participatory processes, and (C) credibility in knowledge production (Table 1 adapted, based on Mitchell et al. [12,62]).

The relative importance of the three interaction dimensions can vary per situation, depending on different context specific factors, e.g. including formulation of the objective, time horizon, spatial scale, and available budget (examples are shown inside the interaction triangle, Fig. 1). Furthermore, it should be noted that the three dimensions and how they affect the EBM effectiveness criteria (Table 1) are interrelated. For example, increased credibility of the knowledge production process improves the chances for salient scientific input, thus relating directly to the interaction dimension between scientists and decision makers. Ultimately, higher credibility due to a better quality of the knowledge base and mutual trust is also expected to result in higher legitimacy, more compliance and thus more effective EBM.

The interaction triangle illustrates the interaction dimensions between three stakeholder groups, their potential contribution to management effectiveness, and the potential ranges of the interactions. Key to reaching consensus about the degree of interaction is transparency about the chosen strategies (and limitations) to engage in the interaction processes. The authors emphasize, though, that "transparency is no panacea, […] it cannot alone initiate transformative change, but will work in conjunction with other practices and outcomes of governance" ([31]:7), namely the three stakeholder interaction dimensions, developed here, to foster salience, legitimacy, and credibility of EBM.

Table 1
Three requirements for EBM, modified, based on [62,12], with key question and issues to consider.

	Key question	Issues to consider
Salience	Is knowledge relevant for the decision or policy in question?	Does the knowledge provided fit into the policy challenge behind the question? Was the knowledge presented at the appropriate scale for decision/policy-making? Does the scale and timing of information meets the needs of decision makers?
Legitimacy	Has the process been fair and open to perspectives from representative stakeholders?	Did all stakeholders have an equal/balanced amount of resources (in terms of time, budget, access to information or other) during the participatory process? Does the decision making process show a preference for certain types of data or information?
Credibility	Is knowledge true or technically adequate in its handling of evidence?	Has the knowledge been produced according to the scientific standards? Is the methodology appropriate? Was the appropriate expertise (different disciplines) applied when producing the knowledge? What is the quality of data/information? Are procedures transparent?