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Invited feature

Marine spatial planning in practice

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ABSTRACT

Multiple competing uses of continental-shelf environments have led to a proliferation of marine spatial planning initiatives, together with expert guidance on marine spatial planning. This study provides an empirical review of marine spatial plans, their attributes, and the extent to which the expert guidance is actually being followed. We performed a structured review of 16 existing marine spatial plans and created an idealized marine spatial plan from the steps included in recent expert papers. A cluster analysis of the yes/no answers to 28 questions was used to ordinate the 16 marine spatial plans and to compare them with the idealized plan. All the plans that have been implemented have a high-level government mandate and the authority to implement spatial planning vested in existing institutions. Almost all the plans used data with clear criteria for data inclusion. Stakeholders were included in almost all the plans; they did not participate in all stages of the planning process but their roles were generally clearly defined. Decision-support tools were applied inconsistently across plans and were seldom used dynamically over time. Most spatial planning processes did not select specific outcomes, such as preferred use scenarios. Success is defined inconsistently across plans; in half the cases there are no metrics of success with reference benchmarks. Although monitoring is included in the majority of plans, only in some cases do monitoring results feed back into management decisions. The process of marine spatial planning had advanced in that some of the more recent plans were developed more quickly and contain more desirable attributes than earlier plans. Even so, existing marine spatial plans are heterogeneous—there are essential ingredients, but no single recipe for success.

Editor's note on invited feature article

The intensification of human uses of the complex spatial mosaic of coastal resources has prompted widespread discussion about how to appropriately manage the simultaneous need to conserve coastal resources as well as allow essential uses. It has become apparent that spatially explicit environmental planning for coastal zones would be highly desirable as an approach to find a balance of these two aims. To assess progress that has been taking place across the world in coastal spatial planning, the Ecosystem Science and Management Working Group established by the US National Oceanographic and Atmospheric Administration surveyed current status and approaches being applied throughout the worlds' coasts. The Working Group's findings are reviewed in the Invited Feature Article in this issue of ECSS. Collie et al. convey a sense of the wide diversity of topics and sites to which a spatially explicit approach has been applied, as well as make evident that the idea of spatial planning, although highly promising, is in its early stages of application, and much further information and time will be needed to confirm its potential utility to address the diverse conservation and management issues arising from the accelerating use of coastal environments.

1. Introduction

Human activities in the marine environment are increasing in number, intensity, and distance from shore. When not appropriately

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sited and managed, these activities can cause user conflicts across space and time and, reduce the capacity of ecosystems to provide valued services (Crowder et al., 2006; Douvere, 2008). In response to these pressures, marine spatial planning is gaining increasing popularity and priority in many parts of the world (Foley et al., 2010; Lubchenco and Sutley, 2010). In many respects an expansion of coastal zone management to areas further from shore, marine spatial planning is also one way to implement ecosystem-based management, because it provides a framework to explicitly integrate the management of multiple human activities. As such, marine spatial planning can reduce the risk of unsustainable cumulative or aggregate effects on the marine environment while at the same time improving conservation and ecosystem health. Marine spatial planning achieves these outcomes by identifying conflicts among uses and threats that uses may pose to ecosystem health, and develops mechanisms to reduce the conflicts and manage the threats through improved policies, management measures, and governance (Ehler and Douvere, 2009; Halpern et al., 2012).

To date, marine spatial plans (MSPs) have often been motivated by the emergence of a new use of the ocean that threatens to displace existing uses. For example, in many parts of the United States, the catalyst has been growing interest in developing offshore renewable energy. Several coastal states have developed MSPs, some of which extend into federal waters, thereby involving numerous state and federal agencies in the planning process. The U.S. Interagency Ocean Policy Task Force recommended Coastal[1] and Marine Spatial Planning as one of its nine priority objectives (CEQ, 2010). The final recommendations of the task force included a set of seven goals for MSP and 12 guiding principles to achieve these national goals.

One of the challenges facing large countries with diverse coastal economies (e.g. US, Canada, Australia) is finding the correct balance between "top–down" prescriptive planning frameworks and the "bottom–up" development of regional plans that are more likely to be tailored to the local socioeconomic and ecological conditions (Sievanen et al., 2011). Several recent publications have distilled the lessons learned from prior MSPs to generate a set of best practices to guide more efficient development of future MSPs (Ehler and Douvere, 2009; Beck et al., 2009; Gold et al., 2011; Halpern et al., 2012). Despite the usefulness of these recipes, the publications acknowledge that not all steps will apply to all regions, and that a "one-size-fits-all" approach could be counterproductive. In fact, there is disagreement about what constitutes a MSP per se as opposed to coastal zone management, marine protected area networks, and government frameworks to support marine spatial planning.

The purpose of this article is to contrast the current set of experiences around the world with the formulaic guidance on how to conduct marine spatial planning. The formulaic process can seem daunting with the demands on knowledge, time, and money—demands that may dissuade prospective users. We ask (1) Whether the formulaic recipes are being followed? (2) If not, are there repeated patterns of deviation from the structured process? (3) What are the potential consequences of omitting certain parts of the formulaic process? To answer these questions, we conducted a detailed review of 16 existing MSPs from around the world (Table 1, Fig. 1). Each MSP was reviewed with a set of 42 questions in seven categories. This study was originally conducted by the Ecosystem Sciences and Management Working Group to advise the US National Oceanographic and Atmospheric Administration in the development of its MSP program (NOAA SAB, 2011). Here we summarize the main findings of the study and contrast our empirical results to the steps of the structured marine spatial planning process presented in the literature.

[1] In the US the word "Coastal" includes spatial planning in the Laurentian Great Lakes.

2. Methods

The Ecosystem Sciences and Management Working Group conducted a structured review of marine spatial planning efforts from around the world. The set of case studies was deliberately broad to include various spatial scales, social and economic contexts, and governance structures. Criteria for the selection of each spatial plan were: (1) the plan included multiple objectives; (2) implementation of the plan included use of spatially explicit measures; and (3) the plan was complete and had been implemented or it was ready for implementation. In addition, as a collection, the selected plans also had to: (4) be representative of all of the plans known to have been developed to date; and (5) span a diverse range of spatial scales.

Each plan was reviewed with a set of 42 questions organized into seven categories (number of questions in each category is in parentheses):

A. Objectives (3);
B. Scope (8);
C. Authority (4);
D. Data (3);
E. Participants (8);
F. Tools and Decision Support (9);
G. Monitoring and Performance Measures (7).

The full list of questions (NOAA SAB, 2011, Appendix 1) is a checklist for the development of a MSP. The case study reviews were completed initially by one of the co-authors based on information available from the published plan and other source documents that were available at the time of our study. Each case study was then reviewed by a local expert (i.e. a plan author or involved scientist) to fill-in answers that were not apparent from the source documents and for general quality control. This process provided consistency across plans and a measure of expert review.

We first analyzed the responses to characterize the set of existing MSPs, and to examine whether particular combinations of plan

Table 1
List of marine spatial plans included in this study.

Number	Marine spatial Plan	Abbreviation
1	Barents Sea, Norway	BAR
2	German Exclusive Economic Zone	GER
3	Baltic Sea Action Plan	BAL
4	Wadden Sea Plan	WS
5	Netherlands	NL
6	Belgium Part of the North Sea	BEL
7	Shetland Isles	SI
8	Canada Oceans Act (ESSIM and Beaufort Sea IOMP)	CAN
9	Massachusetts Ocean Management Plan	MA
10	Rhode Island Ocean Special Area Management Plan	RI
11	Maryland Oyster Management Plan	MD
12	St. Kitts and Nevis	SKN
13	California Marine Life Protection Act	CA
14	Hawaii Ocean Resources Management Plan	HI
15	China Marine Functional Zoning	CN
16	Great Barrier Reef Marine Park Zoning Plan	GBR