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Maritime ecosystem-based management in practice: Lessons learned from the application of a generic spatial planning framework in Europe

Lene Buhl-Mortensen [a,*], Ibon Galparsoro [b], Tomás Vega Fernández [c,d], Kate Johnson [e], Giovanni D'Anna [c], Fabio Badalamenti [c], Germana Garofalo [d], Julia Carlström [f], Joanna Piwowarczyk [g], Marijn Rabaut [h], Jan Vanaverbeke [h,i], Cor Schipper [j], Jan van Dalfsen [j], Vassiliki Vassilopoulou [k], Yiannis Issaris [k], Luc van Hoof [l], Ellen Pecceu [m], Kris Hostens [m], Marie Louise Pace [n], Leyla Knittweis [o], Vanessa Stelzenmüller [p], Valentina Todorova [q], Valentina Doncheva [q]

[a] Institute of Marine Research, Bergen, Norway
[b] AZTI, Pasaia, Spain
[c] CNR-IAMC, Castellammare del Golfo, Italy
[d] CNR-IAMC, Mazara del Vallo, Italy
[e] Heriot-Watt University, Orkney, Scotland, UK
[f] AquaBiota Water Research, Stockholm, Sweden
[g] Institute of Oceanology Polish Academy of Sciences, Sopot, Poland
[h] Ghent University, Ghent, Belgium
[i] Royal Belgian Institute of Natural Sciences, Brussels, Belgium
[j] Deltares, Delft, The Netherlands
[k] Hellenic Centre for Marine Research, Athens, Greece
[l] IMARES, Wageningen, The Netherlands
[m] ILVO, Oostende, Belgium
[n] Ministry for Sustainable Development, the Environment and Climate Change-Fisheries Resource Unit (MSDEC-FRU), Ghammieri, Marsa, Malta
[o] Department of Biology, University of Malta, Msida, Malta
[p] Thünen-Institute of Sea Fisheries, Hamburg, Germany
[q] Institute of Oceanology – Bulgarian Academy of Sciences, Bulgaria

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ABSTRACT

A generic framework (FW) for the monitoring and evaluation of spatially managed areas (here defined as marine areas subject to a planning and management regime) was developed and tested in nine marine areas of 13 European countries under the EU funded project MESMA (Monitoring and Evaluation of Spatially Managed Areas). This paper describes the lessons learned in the use of the FW and draws conclusions for its future use and development. The selected case studies represented diverse spatial scales, management status and complexity, ranging from sub-national areas to entire national coastlines, and large offshore regions. The application of the FW consisted of seven steps: starting with (i) context setting and (ii) gathering of relevant ecosystem information, human activities and management goals; it continues with (iii) indicator selection and (iv) risk assessment; and the final steps considers the (v) analysis of findings and (vi) the evaluation of management effectiveness, to end up with (vii) the revision and proposal of adaptation to current management. The lessons learnt through the application of the FW in the case studies have proved the value of the FW. However, difficulties rose due to the diversity of the nature and the different stages of development in planning and management in the case study areas; as well as, limited knowledge on ecosystem functioning needed for its implementation. As a conclusion the FW allowed for a flexible and creative application and provided important gap analyses.

1. Introduction

Environmental policies are increasingly emphasizing the need for a holistic approach to marine resource management. Such a management approach needs to address the increasing amount of

* Corresponding author.
E-mail address: lenebu@imr.no (L. Buhl-Mortensen).

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anthropogenic pressures on marine environments as well as conflicts between multiple users competing for space and resources. Thus, the need for an 'ecosystem-approach' has been advocated widely since its adoption as an integral concept of the Convention on Biological Diversity at the Earth Summit in Rio de Janeiro in 1992 [1,2].

Ecosystem-based management has been defined as: The comprehensive integrated management of human activities, based upon the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems and thereby achieving sustainable use of goods and services and maintenance of ecosystem integrity [3]. Consequently a number of recent European legislations have been issued with the aim of achieving the maintenance of good environmental status (GES) through the sustainable use and conservation of marine biodiversity (e.g. the Habitats Directive [4], Integrated Maritime Policy [5], the Mediterranean Regulation [6,7], the Water Framework Directive [8] and more recently, the Marine Strategy Framework Directive [9]. A much-advocated tool to progress from the traditional fragmented single sector management approach to an ecosystem-based approach is the concept of place based management such as Marine Spatial Planning (MSP) [10,11]. MSP has the potential to improve decision making by providing a framework to analyse competing human activities and managing their impact on the marine environment, and as such is one of the core concepts of the EU Sustainable Development Strategy [12,13].

The EU funded project MESMA (Monitoring and Evaluation of Spatially Managed Areas) addressed the challenge of an interdisciplinary approach to monitor and evaluate spatially managed areas (SMAs). It suggests a coherent set of tools (concepts, models and guidelines) to support the practical implementation of an ecosystem based management. The MESMA integrated framework (FW) is a key tool that was developed for monitoring and evaluation of SMAs [14] that was tested and evaluated in case studies (CSs). The FW was built on the basis of good practice of ecosystem-based management and lessons learned from existing practical applications for evaluating the success of maritime spatial management [11]. It can be used as guidance in which, step by step, the user applies an indicator based assessment of spatial management plan effectiveness regarding to predefined operational objectives. A detailed and flexible manual has been developed [15] to provide guidance on the application of the FW.

The FW was applied and tested within nine SMAs in Europe, representing different stages of management implementation, and spatial scales. Existing management objectives were identified where they were available. In the absence of objectives, the FW provided guidance on how to define operational objectives. The defined CSs were diverse in nature. Among other, they were differing in population density, socioeconomic settings, human activities and governance settings, and included a variety of marine landscapes from small and highly populated bays and islands, to whole national coastlines and large offshore regions.

One aim of the MESMA Project has been to identify a generic approach to support MSP which cuts across the area differences. The MESMA FW is the result. It was designed as an easy to use tool taking the user step by step through monitoring and assessment to set and subsequently to adapt measures. Synthesis of the experiences gained from the tests is presented here in the different settings of the CSs and the information and actions required at each step of the FW.

The goal of the project has been to gather evidence from all nine CSs however one CS could not be included.

The present research was designed to give response to the following questions:

a) How was the FW a useful starting point for the monitoring and evaluation of an SMA?
b) Did it help to assess or formulate clear management goals and their implementation?
c) Were any FW steps particularly useful or hard to complete?
d) Is the FW suited to specific circumstances of each case study? For example, availability of information, unrealistic input requirements at specific steps of the FW, or an excessive complexity of the assessment?

2. Material and methods

2.1. Case study (CS) area descriptions

The eight case studies (CSs) analysed here are widely distributed across European waters (Fig. 1) and with heterogeneous characteristics. They vary in size from 3500 km^2 (Belgian part of the North Sea) to 1,400,000 km^2 (Barents Sea). They host a variety of different uses by sector and intensity. Their natural environments are diverse as well as the degree of degradation, and pressures they face could be considered as being intense. However, the countries of the CS areas share a common interest in marine planning and management. In some areas management barely exists and regulations to build on are lacking. Others, show advanced integrated management approaches in place, although these tend towards ecosystem protection or recovery objectives. One area (Pentland Firth and Orkney waters) is under immediate pressure of renewable energy development which is driving the marine spatial planning approach there. Table 1 provides a summary of the general case study information and maps are presented as Supplementary material (S1). In the following additional key information characterizing each case study areas, also with respect to the current state of spatial management, are given:

i) Southern North Sea – the Belgian part of the North Sea (BPNS) – BPNS is characterized by a unique complex of sandbanks with several ecologically valuable habitats including gravel beds and biogenic reefs [16]. Despite its small size the area is intensively used for maritime industrial activities including aggregate extraction, fisheries, wind energy, shipping and dredging. Belgium was one of the first countries to introduce MSP, helped by the appointment of a federal Minister for the North Sea in 2002. In March 2014, Belgium approved a legally binding MSP for the BPNS (Royal Decree of 20th March 2014 adopting the MSP).
ii) Pentland Firth and Orkney Waters (PFOW), Scotland – PFOW area is relatively pristine and subjected to several protective designations including: marine Special Areas for Conservation, Special Protected Areas, adjacent coastal Sites of Special Scientific Interest (SSSIs), and National Scenic Areas. Four possible Marine Protected Areas (MPAs) are under study by the Scottish government. Traditional marine activities include fisheries, shipping and tourism/recreation. More recent developments include the reception/processing of North Sea offshore oil production and the research and testing of marine renewable energy (MRE) devices (wave and tide). It is a designated 'Marine Energy Park' (one of the only two in the UK) where intensive MRE development (1.6 GW by 2020) is planned in near-shore waters. The PFOW pilot marine plan is a test bed for the development of regional marine planning in all Scottish waters [17]. The draft for MSP was published in March 2015.
iii) The Barents Sea (BS), Norway – BS is characterized by relatively clean water and an intact marine ecosystem comprising diverse marine habitats and it is home of highly valued species

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