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Short communication

Inventory and comparative evaluation of seabed mapping, classification and modeling activities in the Northwest Atlantic, USA to support regional ocean planning

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ABSTRACT

Efforts are in motion globally to address coastal and marine management needs through spatial planning and concomitant seabed habitat mapping. Contrasting strategies are often evident in these processes among local, regional, national and international scientific approaches and policy needs. In answer to such contrasts among its member states, the United States Northeast Regional Ocean Council formed a Habitat Working Group to conduct a regional inventory and comparative evaluation of seabed characterization, classification, and modeling activities in New England. The goals of this effort were to advance regional understanding of ocean habitats and identify opportunities for collaboration. Working closely with the Habitat Working Group, we organized and led the inventory and comparative analysis with a focus on providing processes and tools that can be used by scientists and managers, updated and adapted for future use, and applied in other ocean management regions throughout the world. Visual schematics were a critical component of the comparative analysis and aided discussion among scientists and managers. Regional consensus was reached on a common habitat classification scheme (U.S. Coastal and Marine Ecological Classification Standard) for regional seabed maps. Results and schematics were presented at a region-wide workshop where further steps were taken to initiate collaboration among projects. The workshop culminated in an agreement on a set of future seabed mapping goals for the region. The work presented here may serve as an example to other ocean planning regions in the U.S., Europe or elsewhere seeking to integrate a variety of seabed characterization, classification and modeling activities.

1. Introduction

Marine spatial planning initiatives are being conducted across the globe to reduce conflicts in human uses of coastal and offshore ocean environments (Collie et al., 2012). An ecosystem-based approach to marine spatial planning is essential for achieving resource conservation and management goals across geographic boundaries (McLeod and Leslie, 2009; Samhouri et al., 2014), and requires knowledge of both human uses and ecological characteristics in order to prioritize activities (Crowder and Norse, 2008; Halpern et al., 2008; Baker and Harris, 2012; Menzel et al., 2013). Maps of natural resource distribution are essential tools for spatial planning in the terrestrial and marine realms. However, high resolution mapping of marine resources has only recently been possible at relatively broad scales. Recent advances in marine mapping technology have led to a proliferation of marine resource characterization, modeling and classification techniques (Brown et al., 2011).

Although there have been recent efforts to map marine resources on a global scale (e.g., Halpern et al., 2012; Harris and Whiteway, 2009), most active marine spatial planning initiatives that utilize resource maps have taken place at regional or finer scales (Collie et al., 2012). It is at these scales that the political mechanisms needed to implement marine spatial plans are cohesive. For example, within the European Union, the Marine Strategy Framework Directive, Common Fisheries Policy and Thematic Strategy for Marine Protection provide the policy to implement spatial management and the framework to integrate marine resource data to support regional planning goals (EC, 2008). Similarly, Australia has developed bioregional plans for each of its four bioregions to improve the way decisions are made under the

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Environment Protection and Biodiversity Conservation Act 1999 (Australian Government, 2013). In the U.S., the National Ocean Policy (Obama, 2010) provides the framework for a regional approach to ocean planning by designating 9 regional planning zones and encouraging independent plan development in each of these (NOC, 2013). Within these national frameworks, smaller entities have implemented marine spatial plans, such as the Scottish National Marine Plan (Marine Scotland, 2013), the Massachusetts Ocean Plan in the U.S. (MA EOEEA, 2009) and in English waters, plans for 10 areas designated by the Marine Management Organisation, two of which are already complete (DEFRA, 2014). Although resource characterizations at these fine scales may be more robust because the study areas are smaller and thus logistically easier to map, the fine scale plans can limit broad applicability of the data by considering only observations within political boundaries. Taking a more regional approach can eliminate these "artificial" political boundaries that do not relay ecological information.

The Northeast Regional Ocean Council (NROC) is a United States state–federal partnership that seeks to find and implement solutions to New England's most pressing regional coastal and ocean issues such as climate change/adaptation, energy siting, and fisheries management. The NROC domain includes the member states of Connecticut, Rhode Island, Massachusetts, New Hampshire, Maine, and Vermont and the state and federal waters in the Northwest Atlantic (Fig. 1). Transboundary ocean planning issues addressed by NROC in the Gulf of Maine involve close coordination with Canadian Maritime provinces as well. NROC's support for ocean planning includes comprehensive commercial fishing activity maps, recreational boating surveys, and creation of a Northeast Ocean Data Portal with data viewer and interactive thematic maps (www.northeastoceandata.org). Further, NROC has created several working groups to more fully understand issues in the region and to work with constituents toward effective and efficient regional collaboration. Seabed classification and mapping together is one such topic.

Multiple independent seabed classification and modeling projects have been completed or are in progress in the Northeast region, ranging from academic studies (e.g., Zajac et al., 2013) to resource-inventory habitat mapping (e.g., NEFMC, 2011) to siting studies for renewable energy (e.g., LaFrance et al., 2010). Even though these activities occur in neighboring, adjacent and sometimes overlapping study areas, each is designed to address a different research, management or policy objective. NROC recognized the potential for and value of coordination if these activities could be aligned or related using a common framework of regional ocean management goals. To these ends, NROC

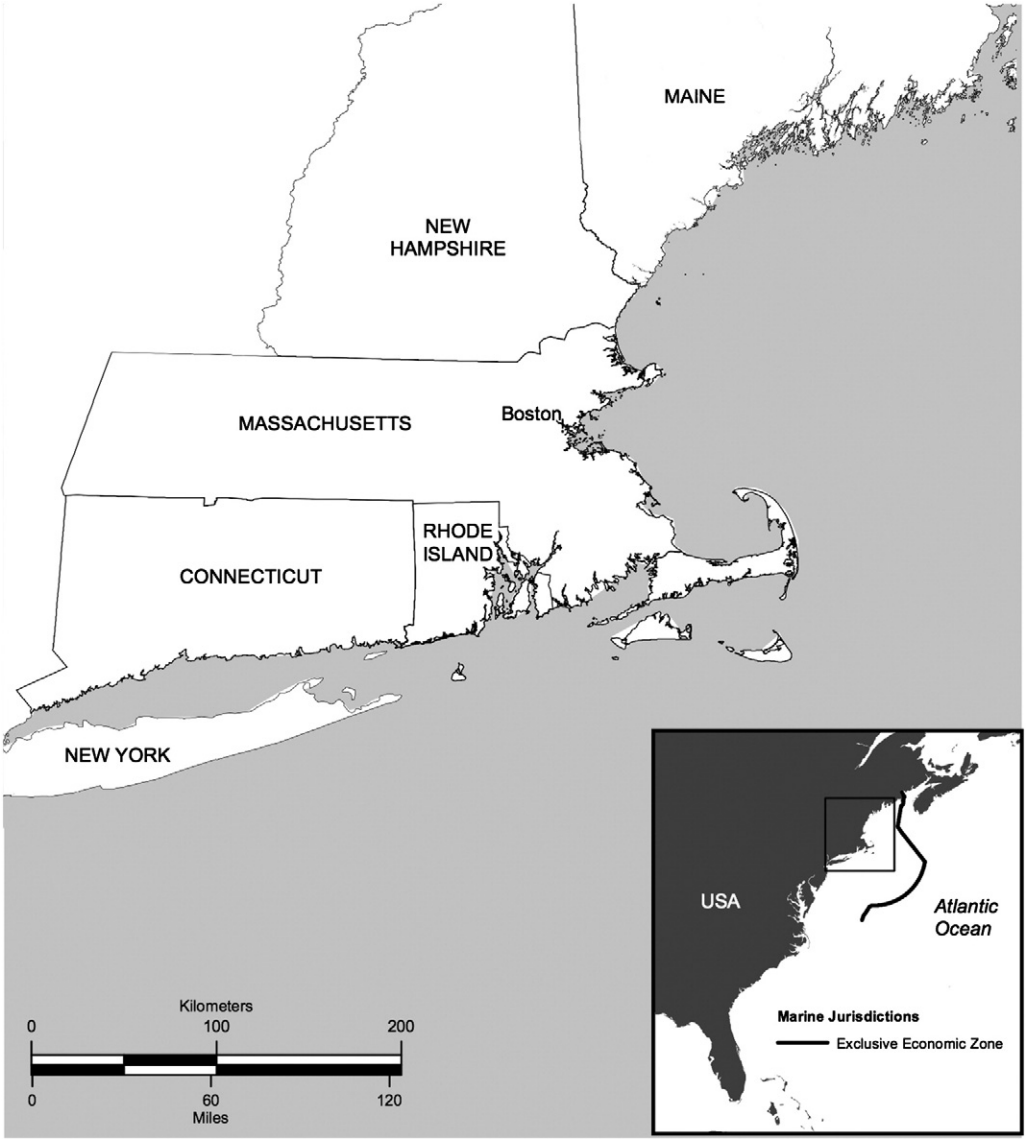

Fig. 1. Location map of the study domain for the Northeast Regional Ocean Council's Habitat Working Group — the Northeast USA.