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Management on the Move: Making EBM and MSP More Dynamic

Ocean environments, ocean life, and ocean users are often highly mobile, but most ocean management techniques are not. This mismatch leads to ocean management that is, at times, ineffective, inefficient, or both. An emerging management approach – “dynamic ocean management” – could change that. Dynamic ocean management uses techniques that change in space and time, reflecting the actual or predicted movements of ocean life and ocean users rather than relying on traditional static measures such as fixed boundaries or seasons.

This dynamic approach has the potential to narrow the spatial and temporal scope of regulations and thus reduce the social impacts of regulations (e.g., managers would close a portion of a fishing ground rather than an entire fishery to avoid exceeding bycatch limits). Most applications of dynamic ocean management to date have involved the fishing and shipping industries. But there is the potential to expand the approach to regulation of alternative energy sources (including wind, solar, and tidal energy), oil and gas production, military operations, and even mobile marine protected areas. For instance, observations of marine mammals in an area could trigger holds on military training exercises, tidal power generation, or seismic exploration for oil and gas. [For more information on current and potential applications, see the references at <https://www.openchannels.org/literature-library-top-lists/top-15-dynamic-ocean-management>.]

Implementation of dynamic ocean management comes with tremendous information needs, however. Managers need to obtain and act on near real-time information on ocean ecosystems and users, then communicate changing management measures to those users. Dynamic ocean management is emerging now because recent advances in remote sensing, animal tracking, ship tracking, species distribution modeling, and mobile communications are enabling the rapid collection, transmission, and analysis of data. [See this month’s [EBM Toolbox](#) for a more in-depth overview of some of the new tools making dynamic ocean management possible.] One of the next hurdles dynamic ocean management needs to overcome is the development and acceptance of new legal instruments that would allow for rapid changes in management measures. In many cases, new legislative authority that focuses on outcomes (e.g., bycatch limits) rather than process (e.g., seasonal closures) will be needed. [For a deeper discussion of legal issues with dynamic ocean management implementation, see Hobday et al. 2014.]

MEAM spoke with two dynamic ocean management experts to learn more about how this new management approach relates to ecosystem-based management (EBM) and marine spatial planning (MSP) and ways marine conservation and management practitioners can start to make their work more dynamic. Alistair Hobday is a principal research scientist with Australia’s Commonwealth Scientific and Industrial Research Organisation (CSIRO) and is based in Hobart, Tasmania. Sara Maxwell is an assistant professor in the Department of Biological Sciences at Old Dominion University in Norfolk, Virginia, US. [Another dynamic ocean management expert Daniel Dunn of Duke University gives an overview of enabling technology in this month’s [EBM Toolbox](#).]

MEAM: So how does dynamic ocean management relate to EBM and MSP? Does it replace these types of management systems or integrate into them?

Hobday: Dynamic ocean management extends the “toolbox” of EBM and MSP. It can be considered an alternative to static spatial management approaches, particularly when the ocean conditions and species of interest are dynamic (i.e., move in space and time). Static management approaches (e.g., marine protected areas) may penalize ocean users by the MPAs’ being too large and covering areas where at times a species of interest is not above some threshold of concern. Alternatively, static areas can be too small, penalizing the species by allowing risk-causing activities in areas we would prefer to protect. The dynamic approach allows the appropriate area to be selected for the time period of interest. Consistent with EBM and MSP, dynamic ocean management can utilize a range of data - from simple biological information through to social and economic information.

Maxwell: Dynamic ocean management does not replace EBM, MSP, or adaptive management – rather, it is an additional tool to implement them. Within the adaptive management framework, dynamic management is applied at the Implementation stage (see figure below, from Maxwell et al. 2015). For example, if managers are deciding what parts of a species habitat to protect (e.g., defining core protected habitat using habitat modeling) in the Adjust and Access phases of adaptive management, dynamic management comes into play by regularly determining where that core protected habitat is using decisions made earlier in the adaptive management process.

Integration of dynamic ocean management with adaptive management. From Maxwell et al., 2015.

MSP has traditionally made trade-offs between competing interests by treating the marine realm as static. Dynamic management allows for consideration of the oceans’ variability.

Furthermore, managing ecosystems and conducting spatial planning in the context of climate change is a formidable challenge. Applying a flexible means of implementing management such as dynamic management allows managers to incorporate changes in marine environments into management plans.

MEAM: Can you give some examples of actual situations where EBM or MSP have become more dynamic?

Hobday: We recently reviewed nine examples where dynamic ocean management is used, eight of which were related to fisheries (see Lewison et al. 2015). For example, in the Eastern Australian longline tuna fishery, areas closed to limit bycatch were originally static (i.e., all waters south of a certain latitude). Since 2003, habitat areas of bycatch species have been identified every two weeks during the fishing season. Over time, managers have started using more complex boundaries that more closely match ocean habitats. In 2008, 88% of prediction reports delivered to managers led to direct management action (i.e., changing the location of boundaries) compared with only 28% in 2003.

Maxwell: For a non-fisheries example, on the US East Coast, NOAA regularly conducts aerial surveys for Atlantic right whales. When three or more whales are encountered in a region, a ‘dynamic management area’ is created for 15 days. To reduce ship strikes, ship captains are asked to either avoid these areas altogether or reduce speeds

while transiting the areas. Similarly, off Cape Cod in the northeastern US, acoustic sensors are used to detect the presence of right whales in shipping lanes. When a whale is detected, vessels are asked to reduce speeds in the channel to reduce ship strike mortality.

MEAM: What are some feasible, near-term steps current EBM and MSP efforts can take to make their management systems more dynamic?

Hobday: In most cases, dynamic ocean management has been implemented in response to a crisis – such as the proposal to close a very large area to manage the risk of some activity. I have three main suggestions for managers thinking about proactively making their management systems more dynamic:

- Start by holding scoping meetings with stakeholders to discuss the benefits and limitations of dynamic ocean management in a particular system. This way you can focus on developing the best fitting dynamic ocean management scheme. But remember that these schemes do not have to be perfect to start with, since making adjustments is a feature of the management approach. In the case of the east Australian longline tuna fishery, improvements to model quality and performance were made each year between 2003 and 2012 then the same model has been used since then.
- While the focus is often on the technical development of a dynamic management approach (such as developing a model to predict where a species might be in each month of the year), the remaining steps – decision-making, implementation, and enforcement – are also critical. Work with specialists in information delivery, managers who will be making decisions, and agencies responsible for enforcement to ensure the regulatory and governance arrangements are also going to be suitable.
- The major cost of developing habitat models is the initial data collection. But for many high profile species (e.g., sharks, turtles, seabirds), sufficient tracking data may already exist to develop a habitat model. Obtaining this information can be difficult, but you can often find networks for sharing this sort of information.

Maxwell: One critical step to implementing dynamic management is to determine where incentives for dynamic management may exist to make it of interest to stakeholders, and which species/systems it may be advantageous for. Dynamic management will work particularly well with species (or species' life history stages) that tend to be highly aggregated and predictable, whether they are moving over large or small spatial scales. For example, in the New England scallop fishery, yellowtail flounder are a quota-managed bycatch species to which dynamic management has been applied. With assistance from University of Massachusetts Dartmouth School of Marine Science and Technology, fishermen have found that the location of yellowtail flounder the previous day is a good predictor of where they will be the next day. This has resulted in the fishery staying below its yellowtail flounder quota for several years in a row, allowing for scallop fishing across the entire season. It is important to note that applications of dynamic need not be complex. Reduction of yellowtail flounder bycatch in the scallop fishery utilizes fishermen-supplied bycatch information, email, and simple addition and is still an example of a remarkably successful dynamic management approach.

For more information

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Learn more about dynamic ocean management

- Check out the dynamic ocean management session at Ocean Sciences 2016 in New Orleans, Louisiana, US (21-26 February 2016): Dynamic Ocean Management: Managing at Finer Scales for Mobile Ocean Resources <https://agu.confex.com/agu/os16/preliminaryview.cgi/Session9332>
- Find key publications, including examples of dynamic ocean management in action, at <https://www.openchannels.org/literature-library-top-lists/top-15-dynamic-ocean-management>.

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