

New ecosystem approach: Space vs. species

Fishermen are keen observers of nature. A successful fishing trip depends on knowing where the fish are at different times and how changes in the environment affect the ebb and flow of various species over time.

These rhythms reflect the dynamics of the broader ecosystem of which fish are a part and how they are affected by natural and human-related changes.

For some time now, there has been a movement to bring a broader range of ecosystem considerations into fisheries management. The adoption of concepts such as “essential fish habitat” is one manifestation of this trend.

The momentum toward an ecosystem perspective increased recently when President Obama signed an executive order implementing a new National Ocean Policy. The policy establishes ecosystem-based management (EBM) as its guiding principle.

This change is coming and we need to be ready for it.

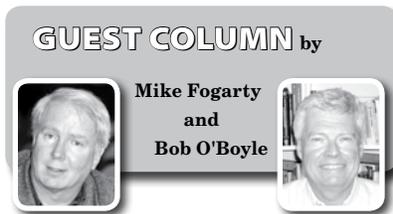
EBM explained

Virtually all definitions of marine EBM share at least three common elements:

- A commitment to establishing spatial management units based on ecological rather than political boundaries;
- A consideration of the relationships among the various parts of the ecosystem and the physical environment; and
- The recognition that humans are an integral part of the ecosystem.

The dimension of EBM that deals specifically with fishing is ecosystem-based *fishery* management. As members of the New England Fishery Management Council’s Scientific and

Statistical Committee, we have worked with our colleagues to help define what this might look like in the Northeast. We are working in consultation with the Mid-Atlantic council, the Atlantic States



Marine Fisheries Commission (ASMFC), and stakeholder groups.

The scientific underpinnings of the overall approach have been developed by the Ecosystem Assessment Program of the Northeast Fisheries Science Center. Together, we are trying to make sure that the approach we develop toward ecosystem-based fishery management can be fully integrated into the more comprehensive EBM framework.

This framework will consider not only fishing but also factors such as pollution, shipping, energy production, and how these issues affect the marine ecosystem and fishing itself (see Figure 1 at right). Many fishermen rightfully feel these issues should be taken into account.

Fewer management plans

Currently, the New England and Mid-Atlantic councils and ASMFC administer nearly three-dozen separate fishery management plans.

One of the fundamental ways in which ecosystem-based fishery management will differ from more traditional approaches is in the development of integrated management plans for entire ecological regions rather than for individual species/stocks by themselves.

As a result, ecosystem-based fishery management will consolidate the number of individual fishery management plans and

replace them with substantially fewer place-based plans.

Because the idea of developing management strategies using ecological boundaries is so central to the concept of EBM, it’s worth explaining some of what goes into deciding how to choose spatial management areas. Spatial is the term we use to mean “geographic space.”

Marine ecosystems are shaped by a number of factors, including:

- The basic physical geography of the seabed;
- Ocean currents and other features such as frontal zones and tidal mixing areas;
- Distinctive water mass characteristics based on temperature and salinity; and
- The amount of food coming in at the base of the food web, usually in the form of microscopic plants called phytoplankton.

Each of these factors plays an important role in how fish are distributed in the ocean, what types of marine life are found together, and, ultimately, where fishermen fish.

Ecological areas

Taking these considerations into account, we’ve been able to statistically define areas that have similar characteristics that might be useful in defining potential ecological management areas.

We basically found that there are four major areas: Western-Central Gulf of Maine; Eastern Gulf of Maine-Scotian Shelf; Georges Bank-Nantucket Shoals; and Middle-Atlantic Bight (see Figure 2).

But we also found that there are important subareas nested within these large-scale units. Specifically, the area right at the edge of the continental shelf where the water depth drops off rapidly is a special region for a number of reasons.

And we found that the immediate nearshore areas in both the Middle-Atlantic Bight and the Gulf of Maine have special features that set them apart from the nearby shelf areas.

Therefore, we have proposed that parts of the shelf break and the

Ecosystem-based fishery management involves development of integrated management plans for entire ecological regions rather than for individual species/stocks.

immediate nearshore areas be given special consideration even though they are part of the larger adjacent shelf regions.

We know, for example, that deepwater corals are concentrated at the shelf break and in other deeper areas and that many marine mammals are found in the vicinity of the persistent frontal region at the shelf-slope front.

Similarly, there are important concentrations of fish, as well as many types of fish, in shallow waters. Further, these nearshore environments are subject to a broader range of human impacts such as pollution and coastal development, so it makes sense to enact special management considerations for these areas.

The final choices of management areas will, of course, rest with the councils and ASMFC. It's also important to stress that, however we define the spatial units, fish and other marine life move across boundaries and this has to be taken into account in management.

Fishing patterns

We also have mapped the time spent by vessels from different ports, the gear types used, and vessel sizes to understand how well these natural ecological boundaries match the human ecology revealed by fishing patterns.

Spatial considerations also allow us to relate fishermen and fishing communities to the fishing grounds and resources on which they depend. We

found that fishing patterns often do reflect the boundaries of the areas we have identified and that fishermen seem to pick up on the important ecological features of these areas.

Mapping out the areas that are important to marine animals – from fish and shellfish to whales – and to the fishing industry not only provides a basis for developing integrated management plans for ecological regions but also for identifying and protecting areas important to fishing and marine life against other competing spatial uses of the ocean and coasts. This will be a critical issue in ecosystem-based management and marine spatial planning.

If we can agree on the best spatial areas for management, we can determine the production potential for fish and shellfish in each area and how much we can sustainably harvest.

We also can determine the distribution of other marine animals that need special protection, as well as critical habitats and more, and fold these considerations into an overall management plan for the ecological regions.

There is far less chance of important issues falling through the cracks using the integrated spatial management plan approach than under the current network of unconnected management plans for a large number of individual species or groups of species.

We have provided the basic elements of a strategy building on this spatial

framework to the New England council through the Scientific and Statistical Committee. We also have shared this information with both the Mid-Atlantic council and ASMFC. All of these management bodies are now considering the adoption of an ecosystem-based approach.

Mike Fogarty
Bob O'Boyle

Mike Fogarty is the chief of the Ecosystem Assessment Program of the Northeast Fisheries Science Center. He is affiliated with several universities and institutions in the Northeast as an adjunct faculty member and serves on a number of national and international boards and committees.

Bob O'Boyle has been a member of the New England Fishery Management Council's Scientific and Statistical Committee since fall 2007. Before that, he worked for 31 years in Canada's Department of Fisheries and Oceans (DFO). In his last decade at DFO, he was heavily involved in the design and implementation of an ecosystem approach to management on Canada's East Coast. He is president of Beta Scientific Consulting Inc., which undertakes a wide range of projects in support of ocean resource management.

More information on the ecology of Northeast marine waters and on ecosystem-based management is available online at <www.nefsc.noaa.gov/ecosys>.



The source.
Read. Respected. Real.



Figure 1. Examples of some important ecosystem services (blue icons), stressors (red), adverse effects (yellow), and issues of special concern (green) that will be considered in Ecosystem-Based Management on the Northeast U.S. Continental Shelf (adapted from image by Barbara Ambrose, National Coastal Data Development Center).

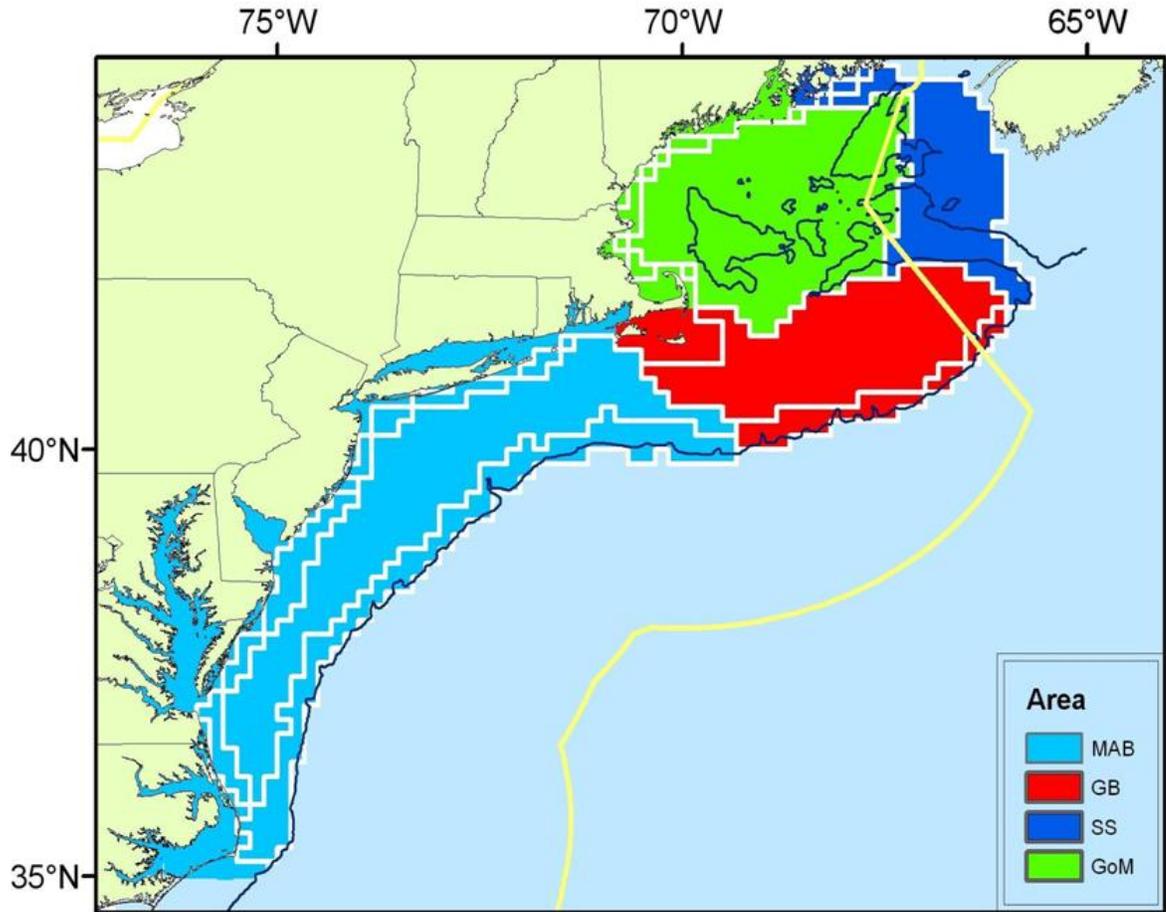


Figure 2. Possible spatial management units (1) Western-Central Gulf of Maine (GoM) (2) Eastern Gulf of Maine-Scotian Shelf (SS), (3) Georges Bank-Nantucket Shoals (GB) and (4) Middle-Atlantic Bight (MAB). White lines indicate boundaries between areas, including the designation of special areas at the edge of the continental shelf and in the immediate nearshore areas of the Middle-Atlantic Bight and the Gulf of Maine.