Marine Protected Areas

A discussion with stakeholders in the Gulf of Maine

Summer & Fall 2001

Prepared by: Tracey Morin
Michael Connor
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Preface

To further the mandate of Executive Order 13158, the Marine Protected Areas (MPA) Center of the National Oceanic and Atmospheric Administration (NOAA) asked the New England Aquarium and the Massachusetts Institute of Technology (MIT) Sea Grant Program to facilitate a dialogue among members of the public and stakeholders who are interested in clarifying the role of and need for MPAs in the Gulf of Maine. This dialogue consisted of a two-stage process.

In the first stage of the process, the facilitators canvassed the public and stakeholders about their views on current management of the Gulf of Maine resources as well as their thoughts on existing and potential MPAs in this region. Members of the public, whether they be individuals, organizations, business owners, concerned citizens from the Gulf of Maine region or visitors from the mid-West, were encouraged to share their thoughts and ideas on how MPAs affect their use of and appreciation for the natural and cultural aspects of this region.

To allow for broad participation, ideas and thoughts were captured through public meetings and a virtual forum. Public meetings were held in Bar Harbor, Maine and Boston, Massachusetts in September 2001 to set the stage for this evolving, collaborative process. Meeting participants expressed ideas through oral and written comments. An on-line forum, available throughout the summer and early fall, provided another opportunity for members of the public and stakeholders to share their thoughts on MPAs in the Gulf of Maine.

In the second stage of this collaborative process, the facilitators organized a workshop held in Portland, Maine in October 2001 to provide greater depth and continuity of stakeholder involvement. Using information from the public meetings and on-line forum, the New England Aquarium and MIT Sea Grant College Program facilitated discussions that were focused on the role of and need for MPAs in the Gulf of Maine and ways to increase stakeholder participation in the designation and management of MPAs. This report summarizes the discussions and was presented to the NOAA National Marine Protected Area Center.

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Executive Summary

To further the regional discussion about marine protected areas (MPAs) in the Gulf of Maine, NOAA's National MPA Center asked the New England Aquarium and the Massachusetts Institute of Technology (MIT) Sea Grant College Program to host a number of forums in the Gulf of Maine. These forums were designed to give stakeholders the opportunity to learn about on-going activities related to MPAs and to advise NOAA and other federal and state agencies on possible future initiatives regarding MPAs in the Gulf of Maine. The purpose of this report is to present the National MPA Center with a summary of the forums and a set of specific recommendations for future action.

To set the stage for these public forums, the New England Aquarium hosted an online town meeting during the summer of 2001. Over fifty comments and perspectives were exchanged on this online forum. Two public forums in the fall provided additional opportunities for stakeholders and the general public to exchange information and thoughts on MPAs. At the first forum, held at the College of the Atlantic in Bar Harbor, Maine on September 24, over seventy-five stakeholders gathered to discuss their views on MPAs in the Gulf of Maine. The second forum, held at the New England Aquarium in Boston, Massachusetts on September 25, brought together another forty-five individuals for a lively, knowledgeable discussion about MPAs. Finally, at a workshop in Portland, Maine on October 9 and 10, a focused group of thirty-three stakeholders built on discussions from the previous forums to develop specific recommendations for NOAA's National MPA Center.

The two-day workshop was designed to engage participants in small and large group discussions focused on topics that emerged from the earlier public and virtual forums. The first topic of discussion was current and potential problems in the Gulf of Maine and the extent to which MPAs, in general, could be used to address them. In the second discussion session, participants developed a list of core elements that may be considered when assessing the effectiveness of existing MPAs. Drawing on their individual experiences and knowledge, the group evaluated how three existing MPAs in the Gulf of Maine compared with this list of core elements. Specific recommendations for improving each of these three types of MPAs were highlighted. The most lively, and perhaps the most productive, discussion focused on the possible directions for any MPA process following the workshop. Particular attention was paid to identifying ways to enhance stakeholder participation in this future process. From discussion at the workshop, six specific recommendations for NOAA's National MPA Center emerged. Further discussion of these recommendations follows. The action items below each recommendation are not statements of consensus from the workshop, but do present a variety of ways that the National MPA Center can fulfill each recommendation.

Present a consistent message to all stakeholders about MPAs and the National MPA Center

With interest in marine protected areas increasing in the Gulf of Maine, a number of often confusing and sometimes conflicting messages about MPAs and MPA initiatives reach stakeholders from multiple sources. MPAs have been characterized sometimes as a tool whose primary or even sole purpose is to manage fish stocks and at other times as a tool for addressing

a suite of environmental problems simultaneously. This has led to misunderstanding, confusion, and suspicion among stakeholders about NOAA's position on MPAs in the Gulf of Maine.

Stakeholders at the workshop suggested that NOAA, as the lead agency for MPAs, develop a consistent message about MPAs in the Gulf of Maine. To maintain consistency within it's own agency, NOAA must create a message that describes the interrelationships and overlap between MPAs (National Ocean Service) and fisheries management (National Marine Fisheries Service). It was recommended that the message give stakeholders a general understanding of MPAs in the Gulf of Maine. Stakeholders emphasized the need to clarify the definition and goals of MPAs in the Gulf of Maine and to articulate the potential benefits and risks of implementing MPAs. Stakeholders suggested that the definition of MPAs include both natural and cultural resources. In addition, it is important that the message has a clear objective. Stakeholders are reluctant to spend their time on general discussions or processes that do not have clear objectives. It was recommended that NOAA communicate the single message to all stakeholders by taking advantage of the extensive outreach networks that are already in place. Local organizations and agencies can be asked to distribute the message to their existing email lists and mailing lists. Most of these organizations and agencies have newsletters and/or web sites that could carry a brief summary of this message.

Action items:

- Develop a consistent message specific for the Gulf of Maine that includes the following components: goals for MPAs, definition of MPAs, presentation of potential benefits/risks of MPAs, and timeline for overall MPA process.
- Create a message that describes the interrelationships and overlap between MPAs (National Ocean Service) and fisheries management (National Marine Fisheries Service).
- Present this consistent message to federal and state agencies and stakeholder organizations for dissemination to other stakeholders.
- Publicly announce this message.

Coordinate efforts of federal, state, and local agencies

As geographically defined regions in the ocean, marine protected areas can cross a number of jurisdictional boundaries. Local, state and federal authorities often overlap in the ocean. In addition, one MPA may encompass resources or specific uses that are managed by different agencies. Efforts are often disconnected among these agencies and across political lines. Stakeholders have expressed that there is a need to coordinate such efforts in any MPA initiative. Coordination of agency activities would lead to a more comprehensive approach to ocean management and might reduce the replication of research projects and data collection efforts.

Action items:

- Encourage agencies and councils to promote discussion of MPAs within existing procedures (i.e. New England Fishery Management Council, Gulf of Maine Council on Marine Environment, Atlantic States Marine Fisheries Commission).
- Establish an Executive Order 13158 Implementation Team for the Gulf of Maine region. It is crucial that this Implementation Team include representatives from all federal, state, and local agencies that have some responsibility for managing marine and coastal resources in the Gulf of Maine.
- Involve state agencies in federal agency planning for MPAs.
- Improve communication between the Gulf of Maine Council on the Marine Environment's Habitat Committee and the New England Fishery Management Council's Subcommittee on MPAs.
- Coordinate MPA efforts with Canadian agencies.

Enhance participation by stakeholders in MPA processes

Involving stakeholders in resource management has been identified as a useful way to reduce user conflict, encourage sustainable use of the resource, and improve acceptance of management decisions. For stakeholders to be involved, they must be integrated into the process. Integration involves full participation in every stage of the process. Traditional forms of participation, such as public meetings and hearings, have been criticized for giving participants only a few minutes to share their comments. They do not allow participants to engage in a continuing dialogue and learn from one another.

Although there is general agreement among stakeholders that they should be involved in the MPA process, there has been debate over the stage of the process in which they should begin participating. Some stakeholders have expressed that they want to be involved before any policy proposals have been made so that they can help shape the proposals. Other stakeholders, however, would rather get involved after a proposal has been made by an agency with authority for implementation. They prefer to participate in a process with well-defined objectives and the possibility for implementation. Although there is disagreement about the appropriate time to involve stakeholders, there is general agreement that all relevant stakeholders must be allowed to fully participate at some stage in a MPA process.

Action items:

- Organize a one-day multi-stakeholder discussion at the Maine Fishermen's Forum. This may include a presentation by MPA practitioners and users from other parts of the United States and around the world so that stakeholders can get a firsthand account of how MPAs have performed and how other stakeholders have been affected by MPAs. (Workshop participants felt that this full-day discussion should occur at the Forum in 2003.)
- Identify specific users and individuals who are interested in or concerned about MPAs in the Gulf of Maine.

- Broaden scope of stakeholders to include charter boat fishermen, wastewater dischargers, oil and gas developers, representatives from sand and gravel mining, shippers, yachters, Canadian agencies, divers, other users.
- Present stakeholders with a specific plan for how MPAs might be applied in the Gulf of Maine including specific objectives for each type of MPA.

Ensure that individual MPAs address specific problems and further the goals for the Gulf of Maine

Marine protected areas are one type of management tool that has been developed to counteract certain threats to the marine environment. Stakeholders have expressed concern that MPAs are not being promoted to address specific threats and problems. In a discussion on threats to resources in the Gulf of Maine, workshop participants identified problems that MPAs could address: loss of representative habitats, unsustainable fisheries, adverse impacts to habitat, by-catch, and threats to biodiversity. However, each of these problems is general. It is important to note that there seems to be consensus that MPA policy should focus on specific problems in specific sites that are not being addressed by other programs or policies.

Participants emphasized that some of the problems that they identified may be addressed by tools other than MPAs. For instance, MPAs are only one of the many tools available to address fisheries management problems. Depending on the circumstances, MPAs may or not be the appropriate tool to address a particular fisheries problem. However, there seems to be consensus that MPAs are the only tool available for preserving biodiversity. It is important to fit each problem with the appropriate management tool, program, or policy.

Action items:

- Utilize best scientific information and knowledge of users to identify specific problems in the Gulf of Maine.
- Identify specific problems that should be addressed by MPAs (i.e. areas of reduced biodiversity).
- Evaluate whether existing MPAs meet overall goals.

Support coordination of scientific information and local knowledge

More scientific research is necessary to characterize current conditions in the Gulf of Maine, to identify problems and threats to Gulf of Maine resources, and to develop effective management strategies. Stakeholders highlighted specific areas that require more study. In addition to supporting new research, NOAA, as the lead MPA agency, should be compiling information on the Gulf of Maine that already exists. This information should be compiled in a Geographic Information System (GIS) format so that stakeholders and researchers can easily access it.

Action items:

- Develop a database of MPAs in the Gulf of Maine that includes scientific information available for each MPA.
- Identify gaps in scientific information for existing MPAs.
- Clarify existing authorities and the specific MPAs for which they are responsible.
- Promote long-term monitoring.
- Support habitat mapping.
- Examine socioeconomic impacts of implementing MPAs (e.g. fishery closures).
- Encourage ecosystem research (e.g. trends, reproductive areas, changing food webs).
- Collate a summary of MPA projects around the world.

Expand on methods of outreach

Outreach refers to the dissemination of information and educational materials on a particular topic or policy. Traditional methods of outreach, like announcements in newspapers and the Federal Register, have been criticized for not reaching all of the stakeholders relevant to a MPA process. Stakeholders at the workshop and at the forums expressed the need for NOAA to expand on traditional methods of outreach. As the mode of outreach affects whether or not information gets to stakeholders, the timing of outreach efforts matters. Stakeholders stated that there are times during the day and throughout the year when they are more likely to pay attention to outreach efforts. Stakeholders, particularly fishermen, offered alternative modes for getting information from NOAA and other agencies to affected stakeholders and preferred times for dissemination.

Action items:

- Utilize a combination of outreach methods including newsletters, newspapers, emails, phone calls, information at public places, NOAA news radio, and the Coast Guard station.
- Disseminate information when convenient for stakeholders (e.g. in winter for fishermen, during school breaks for academic researchers).
- Organize a 2-3 hour presentation for fishermen at the Maine Fishermen's Forum. (Workshop participants felt that this presentation should be made at the Forum in 2002.)
- NOAA representative should go to communities throughout New England with information about MPA initiative (e.g. at monthly meetings of local organizations; at docks; at council meetings).
- Design and administer qualitative social science survey that collects information on stakeholder perception of MPAs.

I. Introduction

This report presents NOAA's National MPA Center with six recommendations for future action that evolved during facilitated discussions among stakeholders in the Gulf of Maine during the summer and fall 2001. In the following sections, the format and content of these discussions will be presented in detail. In Section II, the formats for the three different modes of discussion are presented. The particular modes of discussion include an online town meeting, *public* forums, and a workshop. In Sections III and IV, summaries of the discussions at the public forums and at the workshop are presented. Section V concludes the report with the six recommendations for NOAA's National Center for MPAs.

II. Forums for Stakeholder Participation

A series of public forums was held in the Gulf of Maine to address an issue that has received wide attention in recent years—marine protected areas (MPAs). MPAs have been defined in a number of ways; yet, no one definition has been fully supported. There is a general understanding that MPAs are delineated areas in the marine or coastal environment that have some sort of legal or regulatory provisions governing their use. Yet when MPAs are looked at in particular regions, where resources and users are specific to the area, MPAs are not so easily defined. Complications arise because the delineation of areas involves a number of responsible agencies and users. The jurisdictions of these agencies and the areas in which users work or recreate often overlap. Agencies follow different mandates and may have conflicting missions, augmenting the challenge to create appropriate legal or regulatory provisions for specific sites. Developing policies that govern use in a public resource adds to the complexity.

In May 2000, President Clinton issued Executive Order 13158 (E.O.) to strengthen and expand the system of marine protected areas (MPAs) in the United States, defined in the E.O. as "any area of the marine environment that has been reserved by Federal, State, territorial, tribal or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." Since marine protected areas in the United States fall under the authority of many different agencies and levels of government, one of the major goals of the E.O. is to coordinate efforts in a comprehensive system of MPAs that will conserve the natural and cultural heritage of the U.S. The E.O. calls for the following specific actions: (1) Departments of Commerce and Interior will develop and maintain a national list of MPAs in U.S. waters; (2) Departments of Commerce and Interior will develop and maintain a MPA web site; (3) a Marine Protected Areas Advisory Committee will be formed to provide advice on a national system of MPAs; (4) Federal agencies, including NOAA and NMFS, will avoid causing harm to resources in MPAs through their activities; and (5) NOAA will create a National MPA Center in Washington, D.C.

As one of its main responsibilities, the National MPA Center must encourage coordination among state and federal agencies that have authority over establishing and managing MPAs. The National MPA Center has spent much of its first year sponsoring stakeholder meetings in two particular regions of the United States: the Pacific Coast and the

Gulf of Maine. The MPA Center has supported such meetings to ensure that stakeholders have the opportunity to participate fully in discussions to establish, manage, and monitor MPAs in their region. As part of this effort, the National MPA Center asked the New England Aquarium and the Massachusetts Institute of Technology (MIT) Sea Grant College Program to organize and host a number of forums in the Gulf of Maine region.

Virtual Forum

In July 2001, the New England Aquarium hosted an online town meeting where participants exchanged over fifty comments and perspectives about marine protected areas in the Gulf of Maine. Discussions on the forum touched on issues of the availability of scientific information, characteristics of sites in the Gulf of Maine that should be protected, and the objectives for using MPAs as a management tool. To view all of the comments exchanged in the online discussion, see the New England Aquarium's MPA website at www.neaq.org/community/forums.

Over one hundred flyers advertising all three forums in which the public could participate, including the virtual forum, were mailed to environmental organizations, local user groups, and university programs. To reach additional stakeholders, messages were posted on a number of recreational fishing chat rooms, phone calls were made and follow-up information was faxed to forty local fishing organizations, and emails were sent to area dive clubs.

Public Forums

Public forums were held in Bar Harbor, Maine on September 24 from 4:30 to 7:00pm and in Boston, Massachusetts on September 25 from 4:00 to 7:00pm. The first forum, at the College of the Atlantic in Bar Harbor, Maine, brought together over seventy-five stakeholders to discuss what they think about MPAs in the Gulf of Maine. At the second forum, held at the New England Aquarium in Boston, Massachusetts, an additional forty-five individuals came together for a knowledgeable discussion about MPAs. These lively, yet civil, discussions were facilitated by the New England Aquarium and the MIT Sea Grant College Program and lasted for the full time allotted in each location. The main topics of discussion included outreach to affected communities, MPAs as part of a holistic management tool, the goals for management of the Gulf of Maine, the selection process for new MPA sites, and recommended next steps for NOAA's

National MPA Center. Overall, forum participants seemed to agree that any process for establishing new MPAs should be slow, a holistic management approach should be followed, and the focus should be on problems in the Gulf of Maine--not on available management tools.

Workshop

To refine ideas that were raised on the virtual forum and at the public forums, the New England Aquarium and the MIT Sea Grant College Program facilitated a two-day workshop at the Holiday Inn-Portland West in Portland, Maine on October 9 and 10. Participation was open to all interested individuals. The thirty-three participants represented numerous interests and viewpoints, including social and natural scientists, federal and state officials, recreational and commercial fishermen, a whale watch operator, an interested citizen, and environmental advocates (Appendix A: Workshop Participants). Before the workshop, each participant was provided with a summary of the public forums, a workshop agenda, and a background document entitled "Draft Background Notes for Consideration of Marine Protected Areas in the Gulf of Maine." This paper provided participants with an up-to-date critical summary of technical information relevant to the design of MPAs in the Gulf of Maine (Appendix B: Background Notes).

The workshop was organized around three main discussion topics. Discussions took place in both large and small groups. For small group discussion, participants were divided into groups of 7-8 people. To allow for a diversity of interests to be present in each small group discussion, workshop organizers developed a seating plan before the event. Each small group discussion was facilitated by one of the workshop organizers. Although discussion topics were provided, participants guided the direction of the discussions. During discussions, participants evaluated current and potential problems in the Gulf of Maine and the extent to which MPAs can be used to address them, developed a list of core elements that may be considered when assessing the effectiveness of existing MPAs, and outlined possible directions for future MPA processes in the Gulf of Maine.

In the week following the workshop, participants were emailed workshop evaluation forms. On the evaluation form, we asked participants to rank the following seven statements on a 5-point scale (5-Completely Agree; 4-Generally Agree; 3-Neutral; 2-Generally Disagree; 1-Completely Disagree):

Statement 1. Workshop met my expectations.

Statement 2. Overall workshop was well-organized.

Statement 3. Workshop format provided a well-balanced mix of full group discussions and break-out sessions.

Statement 4. Overall workshop facilitation was good.

Statement 5. Break-out sessions were well-facilitated.

Statement 6. Facilities and food were appropriate.

Statement 7. Workshop length was appropriate.

Six participants responded. Overall, respondents expressed satisfaction with the workshop logistics (e.g. facilities, length of meeting, format of discussions). A couple respondents noted that the workshop provided opportunities to further the discussion of MPAs in the Gulf of Maine, to connect stakeholders, and to help stakeholders clarify their own views on MPAs. Several respondents expressed frustration with the vagueness of the workshop objectives. Respondents offered several recommendations for improving the workshop:

- Include a more diverse pool of stakeholders in discussions.
- Develop proposals prior to initiating stakeholder discussions.
- Encourage NOAA to use its staff, institutional experience, and resources to facilitate a process designed to meet the objectives of Executive Order 13158.

III. Summary of Public Forums' Discussion

The following is a list of topics that were discussed and associated comments that were mentioned at the MPA public forums at the College of the Atlantic in Bar Harbor, Maine on September 24 and the New England Aquarium in Boston, Massachusetts on September 25. Because there was a large overlap in the topics discussed at both sites, the summaries have been combined. Recommendations are not consensus statements of all participants.

Outreach:

There was general agreement with the principle that an MPA effort should involve significant outreach to all affected communities. Building trust is crucial to any management process, and trust is built by talking to the interested population. Ultimately, this issue needs to be developed by the community. There was suspicion from some fishermen that MPAs would be a tool to force fishermen out of certain areas.

Recommendations:

1. Take the time to do the job right. Proceed slowly. Keep a dialogue going.
2. More outreach is necessary. Use the following ways to communicate with fishermen: National Oceanic and Atmospheric Administration (NOAA) radio, newspapers, at fishing organization meetings (e.g. Massachusetts Fishermen's Partnership). Add other stakeholders (e.g. charter boat fishery, wastewater dischargers, oil development, sand and gravel, shipping industry, yachters, others who value the Gulf of Maine).
3. A meaningful process will include stakeholders as participants in finding answers.
4. Stakeholders should be at every meeting. It is important to get the entire group at each meeting.
5. Visit stakeholders at the community level, particularly in winter when fishermen are available to meet.

MPAs as Part of Holistic Management of the Gulf of Maine:

There was general agreement that any MPA plan must be part of a holistic plan for managing the Gulf of Maine. The Ocean Conservancy has looked at over 300 existing managed

sites and determined that there is no comprehensive protection of the marine environment in the Gulf of Maine. Managers from Massachusetts also suggested that their existing sites are more piecemeal and need to be evaluated as to whether they meet their original goals.

There was also general agreement that MPAs are just one tool for managers to use, and it will be important to evaluate their use in the context of all other regulations. There was a difference of opinion as to what agencies should manage MPAs. Some felt it was outside the realm of fisheries management agencies. Others felt that we didn't need another agency to deal with all the existing agencies working in the Gulf of Maine. Some felt we could best meet our goals by simply making existing tools (other than MPAs) work.

There was also a concern about local versus regional control. How can small, local fishermen compete with corporate trawlers from out of state? Can MPAs be constructed in such a way to consider issues of equity?

Recommendations:

1. In considering MPAs, the appropriate jurisdictions need to be clarified. Who is going to be responsible for integrating management into the local process?
2. Focus should be on using the most appropriate management tools to solve agreed upon problems in the Gulf of Maine, rather than implementing MPAs.

Gulf of Maine Management Goals:

There was general agreement that any discussion about MPAs needed to consider what the overall goals were for the Gulf of Maine and the specific goals associated with each individual decision. A frequent comment from fishermen was that resource protection is an important issue for everyone who uses the Gulf of Maine, that fishermen in the Gulf of Maine appreciate the ecosystem, and that they are not the ones to blame for resource failure.

Among the proposed goals were protection of

- environment,
- community,
- sustainable fisheries,
- balanced ecosystem,

- non-commercial species and features (e.g. tree coral, clay pipes),
- habitat,
- biodiversity,
- reference areas (non-impacted sites), and
- unknown impacts.

MPA Selection Process:

There was some discussion of specific MPA ideas that arose during the course of the Public Forums. While some believed it is necessary to understand the entire Gulf of Maine system before designating MPAs that achieve goals, others felt there were some other approaches that might work before the entire system was developed. These possible approaches included:

- Consider setting up distinct regions that either allow or prohibit aquaculture.
- Set aside long-term sites to monitor and learn from.
- Choose sites where no one fishes now, but did so many years ago. (Others felt that historical fishing sites that are no longer used may not be the best sites to put in MPAs—we need to find where the fish are now.)
- Consider first areas that we know a lot about (e.g. Stellwagen Bank, Georges Bank).
- New MPAs should not single out certain gear types.

Recommendations:

1. MPAs should be under constant periodic review with sunset provisions.
2. MPAs need to be decided on a case-by-case basis.
3. Potential MPA sites need to be defended—why protect this site in this particular way?
4. NOAA should present a specific set of proposals, i.e. lines on a map, to which stakeholders could respond.
5. The effectiveness of existing MPAs in the region should be reviewed.

What Should NOAA Do?

There were two different approaches suggested for NOAA. One group felt that NOAA should lead a process for comprehensively looking at MPAs as a management tool, that it should

explicitly state how it was going to carry out the Executive Order, and be explicit with the public as to its process. Several people expressed concern about where the ability to implement policy lies. They argued that only government agencies have the authority to make policies about ocean resources, and that a federal or state mandate would make the process meaningful.

The alternative opinion argued that NOAA should not take the process out of the hands of the stakeholders, but should work with the public to develop a consensus approach.

Recommendations:

There are specific information needs in order to develop MPAs that will require NOAA funding. These include:

- Assessment of the effectiveness of existing Gulf of Maine MPAs,
- Summary of MPA experience in other parts of the world,
- Habitat mapping,
- Socioeconomic impact assessment studies,
- Scientific research, and
- Mediation assistance.

IV. Summary of Workshop Discussion

The workshop in Portland, Maine on October 9 and 10 consisted of three main discussion sessions. Each of the sessions was introduced by a workshop facilitator and then opened for discussion in either small break-out groups or full group discussions. Summaries of each of the three sessions are presented below.

Session #1: Discuss problems that exist in the Gulf of Maine and if MPAs can and should be used to address them.

At the public forums in Bar Harbor, ME and Boston, MA, some participants expressed strong feelings that MPAs should be used to address specific problems—they should not simply be established because an agency has the authority to do so. This issue then became the first topic for discussion at the workshop. In other words, the participants were asked if there are problems that MPAs can address in the Gulf of Maine. In a brainstorming session, participants in five break-out groups contributed to the following list of existing and potential problems in the Gulf of Maine that MPAs can be used to address: habitat conservation, biodiversity, habitat restoration and recovery, managing fisheries and other extractive uses, marine mammal protection, transboundary and migratory species, damage to ecosystem from military testing (i.e. acoustics), marine debris, public access, ship strikes (i.e. oil spills, whale strikes), dredge disposal, cultural resources, minerals extraction, oil and gas development, data collection and analysis, public safety, conflicting uses, wilderness areas, artificial reefs, preservation of local communities, beach renourishment, and aquaculture sites.

Facilitators refined this list of problems into five goals for establishing and managing MPAs in the Gulf of Maine region:

(1) To preserve representative habitats

(2) To manage sustainable fisheries

(3) To minimize adverse effects on habitat

(4) To minimize bycatch

(5) To preserve biodiversity

After debate among the larger group of participants, it was generally agreed upon that not every MPA will be established in order to fulfill all of the above goals and not every MPA will be able

to achieve every one of these goals once established. Instead, this list of goals illustrates the breadth of reasons for which MPAs may be established in the Gulf of Maine. These broad goals implicitly suggest that MPAs are not limited to being a tool for fisheries management.

While identifying some of the issues and problems that MPAs can address, break-out group participants discussed some of the needs that must be considered in order for MPAs to address these issues. The following list is not a consensus statement, but rather a presentation of the variety of needs discussed by workshop participants. There is a need for:

(1) MPAs to be part of a holistic approach that is integrated, coordinated and adaptive, and based on consideration of ecological function
(2) A policy or legal mandate that supports MPAs as a tool for protecting biodiversity
(3) Funding to support research studies in both the social and natural sciences
(4) Enforcement of regulations and policies
(5) A coherent and consistent definition of MPAs for the Gulf of Maine
(6) Lasting protection as called for in Executive Order 13158

Session #2: Discuss what roles specific MPAs play in meeting goals.

In the Gulf of Maine, several MPAs already exist, yet the efforts to manage these areas are largely disconnected. In an effort to look more comprehensively at MPAs in the region, participants were asked to identify existing MPAs and discuss how consistent these sites are with meeting overall MPA goals. A matrix of over seventy-five MPA sites was given to participants to provide a sense of the types of existing MPAs and the agencies responsible for managing each of them. Some workshop participants said that many of the sites listed in the matrix did not meet the definition of MPAs as stated in Executive Order 13158: "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." Dumpsites, outfall pipes, and federal and state temporary fishery closures were supplied as examples of sites that may not provide lasting protection. Some workshop participants were reluctant to discuss specific MPAs and whether or not they were achieving goals because these participants did not feel that they have in-depth knowledge of or first-hand experience with all of the sites on the list. Nevertheless, there was general agreement that enough participants had knowledge of selected sites to discuss this topic in a large group setting.

Before evaluating specific MPAs, participants discussed overall goals for a MPA program. Participants developed a list of core elements for MPA programs. Potential elements include: monitoring program that includes periodic evaluation and reporting, protection of ecological integrity, clear legal authority, involvement of local community in MPA management, coordination of responsible agencies within the MPA, long-term commitment for the site, coverage of a variety of geographic regions and habitats, and broad management goals.

Examples from three different types of MPAs in the Gulf of Maine were identified for the group discussion: Wells National Estuarine Research Reserve (NERR), Year-round Fishery Closures (Closed Areas I and II and Western Gulf of Maine Closure), Stellwagen Bank National Marine Sanctuary. First, participants discussed reasons for the establishment of each type of MPA. Then they identified areas that need improvement in order for each type of existing MPA to be consistent with overall goals of an MPA. General agreement among workshop participants for the reasons for establishment and some areas of improvement for each of the three types of MPAs is as follows:

Wells National Estuarine Research Reserve

Reason for establishment: to support and promote research and education in estuaries

Areas for improvement: Enhanced legal authority, improved coordination among agencies, expanded geographic coverage—more subtidal focus

Year-round Fishery Closures

Reason for establishment: to reduce fishing mortality on groundfish stocks in Closed Areas I and II and the Western Gulf of Maine closure

Areas for improvement: Protection of ecological integrity, improved coordination among agencies, consideration of broader goals

Stellwagen Bank National Marine Sanctuary

Reason for establishment: to protect natural and cultural resources and ecological integrity of resources

Areas for improvement: More outreach, enhanced legal authority, community participation, improved coordination among agencies

Session #3: Discuss possible directions for this process after the workshop and ways to enhance stakeholder participation in the process

As noted earlier, this workshop was part of a series of public meetings designed to give stakeholders an opportunity to shape a process regarding MPA management and establishment in the Gulf of Maine region. Although stakeholder participation has been identified as an essential component of marine resource management, identifying and engaging stakeholders can be a challenging task. In this break-out session, participants were asked to think about what ways the process should proceed and how stakeholders can be better integrated into this process.

Participants' interests seemed to peak in this session. Because each break-out group followed a different path during the discussion, a number of interesting and useful suggestions were made for future MPA initiatives in the Gulf of Maine. A summary of each group's discussion is highlighted below.

Group 1 *(Facilitator: Tracey Morin)*

Discussion in this break-out group focused on two potential MPA initiatives. For the first initiative, the group suggested that key concepts from this workshop should be used to inform a vision statement developed by NOAA's National MPA Center. The vision should include a list of goals for MPAs, a definition of the term, a description of what MPAs can do, and a timeline. The group agreed that the National MPA Center should disseminate this vision to agencies and other stakeholders. It was noted that NOAA representatives should personally present this vision statement to stakeholders at local community meetings. For a second initiative, the working group suggested that MPAs be implemented and managed through existing management mechanisms, such as the Fishery Management Council and the Atlantic States Marine Fisheries Commission. Proposals could be presented to a council and follow the council's standard procedures. The benefit of working through existing mechanisms is that they are already in place and they have procedures for establishing and managing MPAs. It was noted that these existing mechanisms are one option for establishing and managing MPAs and should be used in combination with other management options.

Group 2 *(Facilitator: Carolyn Steve)*

Discussion in this break-out group centered on specific actions for improving coordination among agencies and involvement of stakeholders. The group agreed that the MPA Center needs to clearly state its objectives to the public. The Center must also clarify the definition of MPAs. Some members of the group recommended that the definition include a

classification scheme for MPAs, such as that set forth by the IUCN World Commission on Protected Areas. To enhance coordination among agencies and stakeholders, the group suggested that the National MPA Center set up a Regional Coordinating Center for the Gulf of Maine. With a full-time staff, this Center would work with federal, state, and local agencies in the Gulf of Maine to accomplish the objectives outlined by the National MPA Center. In collaboration with agencies and stakeholders, the Regional Center would develop a Strategic Plan that includes proposals for candidate MPA sites. To improve participation of stakeholders, the break-out group suggested a number of ways to communicate with specific stakeholder communities.

- Inform stakeholders through mailings, email, videos, film, internet, and radio.
- Seek input from stakeholders on how the process should be shaped and what they want to protect.
- Expand outreach to landside conservation groups and the public at large.
- Identify and define fishing communities.
- Utilize a number of venues to outreach to fishermen such as the Maine Fishermen's Forum and local fishing docks.

Group 3 *(Facilitator: Judy Pederson)*

It is challenging to discuss MPAs in the Gulf of Maine without a clear definition of the term. This group began the break-out discussion by going over currently used definitions of MPAs, such as that drafted at the Gulf of Maine Council on the Marine Environment Workshop in 1997: any area of the intertidal or subtidal terrain together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation to manage and protect part or all of the enclosed environment. Members of this break-out group then created their own working definition for MPAs: an area governed by specific regulation or authority with specific boundaries and definable and measurable goals to be achieved by the MPA (e.g. diversity, fishing). MPAs are one of a series of tools and techniques to address problems using best available, agreed upon science. When this concept of defining MPAs was presented to all workshop participants, some participants recommended using the definition of MPAs already stated in Executive Order 13158.

After drafting a working definition, this group worked out a specific process for NOAA to follow for a future MPA initiative. The process entails getting information out to stakeholders through a variety of means including newsletters, newspapers, emails, phone calls, and exhibits at public places. This information would make a case for MPAs and describe the value of MPAs to stakeholders. Current MPAs would be described and the term MPA would be defined. During the outreach effort, a list of specific users and individuals would be identified and meetings would be held in their local communities. At different times in the process, different stakeholder groups will be brought together in the same forum to engage in dialogue. State and federal agencies would be involved throughout the process and would serve as coordinating mechanisms. For instance, the Gulf of Maine Council on the Marine Environment would help to define the vision, develop an action plan, and draft a Marine Habitat Strategy. The Atlantic States Marine Fisheries Commission Council for Habitat Coordination and related committees in NOAA would also contribute. In addition, NOAA should establish a regional working group that has representatives from all of these state and federal agencies as well as users and other individuals. However, members of the workshop break-out group noted that the formation of this group be delayed as it may be too early to establish such a working group at this time. For now, the group suggested that a coordinating committee meet on a biannual basis.

To bring interested individuals and users together, the workshop break-out group suggested that specific recommendations on a particular problem be proposed. The group offered the Florida Keys Dry Tortugas marine reserve establishment process as an example for successful MPA processes. The break-out group defined such a process in four steps: (1) identify a problem, (2) develop a proposal with a specific timeline, (3) form a working group, and (4) develop a number of alternative management options. The break-out group suggested that this process must also include monitoring and enforcement.

Group 4 *(Facilitator: David Shaw)*

Discussion in this break-out group centered on recommendations in two areas: stakeholder process and agency collaboration. Although the group was unable to develop a recommendation for a complete stakeholder process in the available time, several important points emerged.

- It is necessary to engage stakeholders in the process of policy development rather than to attempt to "sell" a previously developed policy to stakeholders.
- The stakeholder process should move from general considerations to specific planning and choices.
- Efforts should be made to recruit a core of stakeholders who will commit to continuing participation.
- The process used in design of the Florida Keys National Marine Sanctuary (where a working group of 25 individuals participated on a continuing basis) may not be a direct model for the Gulf of Maine because of the Gulf's greater size and complexity. However, the general approach might be useful, if working groups were created for various biogeographical sub-units within the Gulf of Maine.

The break-out group agreed that agency collaboration is essential to the design and implementation of MPAs or other integrated management approaches. Agency collaboration in the area of research should be emphasized.

- Every MPA should be viewed as an experiment and appropriate data collected, analyzed and interpreted to determine the outcome of the experiment.
- The quality and duration of research associated with existing MPAs should be improved and the necessary resources should be made available.
- Reporting on MPA-related research should be more timely.

Group 5 *(Facilitator: Mike Connor)*

Discussion in this break-out group focused on three particular recommendations for future initiatives. First, the group felt that a diverse group of stakeholders should be brought together for a discussion at the Maine Fishermen's Forum. The break-out group was not sure if such a discussion should be arranged for this year. When this idea was presented to all workshop participants, participants seemed to agree that in order to engage stakeholders in a meaningful dialogue, stakeholders need to be equipped with more information about MPAs and MPA initiatives in the Gulf of Maine. For that reason, it was suggested that NOAA, in collaboration with stakeholders, make a 2-3 hour presentation at the Maine Fishermen's Forum in 2002. The full day discussion should be organized for the Maine Fishermen's Forum in 2003. In another

related discussion topic, this break-out group discussed the possibility of meeting with and interviewing stakeholders in their communities. The group noted that because of the need to cover a large area (from Maine to Rhode Island), this task would be resource intensive. The third topic of discussion focused on the need for agencies to coordinate their actions. For instance, it was suggested that state agencies be included in meetings of federal agencies. It was also suggested that the Gulf of Maine Council on the Marine Environment form a joint committee with the New England Fishery Management Council.

V. Conclusion

In public discussions throughout the summer and fall 2001, Gulf of Maine stakeholders expressed an interest in NOAA's efforts to implement Executive Order 13158. Although stakeholders represent a variety of interests and viewpoints, all seem to share a commitment to the future of a sustainable Gulf of Maine. There are several areas on which there seem to be general agreement. Several recommendations for NOAA's National MPA Center were identified during forum discussions. The following recommendations received general support at the forums:

- Present a consistent message to all stakeholders about MPAs and the National MPA Center
- Coordinate efforts of federal, state, and local agencies
- Enhance participation by stakeholders in MPA processes
- Ensure that individual MPAs address specific problems and further the goals for the Gulf of Maine
- Support coordination of scientific information and local knowledge
- Expand on methods of outreach

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Background Notes for Consideration of

Marine Protected Areas in the Gulf of Maine

These notes were prepared by the New England Aquarium and the MIT Sea Grant College Program with financial support from the Harold Whitworth Pierce Charitable Trust and the National Oceanic and Atmospheric Administration.

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Introduction

Marine protected areas (MPAs) are attracting wide attention in the search for management tools which can simultaneously conserve the oceans' biodiversity, facilitate the sustainable use of renewable resources from the sea, and maintain the cultural and historical values associated with past and current human use of the marine environment. Several MPAs already exist in the Gulf of Maine and efforts are underway both in Canada and the United States to determine whether MPAs can contribute further to society's goals for these rich and valuable waters.

These background notes seek to aid those efforts by providing an up-to-date critical summary of technical information relevant to the design of MPAs in the Gulf of Maine environment. They also set the context of that technical information in the design process with a discussion of the interrelated roles of science and values in MPA design. These notes are not an attempt to exhaustively review of scientific studies of the Gulf of Maine. The literature describing such studies is voluminous and excellent general reviews already exist (among others: Backus and Bourne, 1987; Wallace and Braasch, 1997; Weibe et al., 2001). Finally, these notes include a selected bibliography of scientific and technical papers, a list of web sites with information about MPAs, and a preliminary list of MPAs in the Gulf of Maine.

For the purposes of these notes we define the Gulf of Maine inclusively as the marine environment landward of the continental shelf break between Cape Cod, Massachusetts and Cape Sable, Nova Scotia. Thus we include the Bay of Fundy and Georges Bank within the area under consideration. We adopt the definition of an MPA given in U.S. Executive Order 13158 (see: www.mpa.gov), "any area

of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein" and note the similarity to the definition formulated by the World Conservation Union, "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, and historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Kelleher, 1999). We also adopt the term "marine reserve" as used in a recent US National Academy of Sciences/National Research Council report on MPAs (NRC, 2001) to indicate MPAs in which all or essentially all human disturbances are prohibited.

Interest in MPAs stems in large part from recognition that single-species fisheries management and other traditional marine management techniques have often failed to conserve biodiversity, protect essential habitat or ensure the continuation of sustainable commercial, artisanal or recreational fisheries. MPAs together with other integrated and multi-species management approaches are offered by some, in part, as a sort of "insurance policy" to protect against management failures. Although MPAs are a relatively new idea and still in early planning stages in many localities, several have already been established, some with notable success. However, support for MPAs is far from universal. Resource user groups are legitimately concerned that they could be adversely affected, if MPAs are established without consideration for their needs and values.

Interest in establishing MPAs in the Gulf of Maine reflects the ecology, economics, culture, and history of region and the surrounding states and provinces. The Gulf (and, especially, Georges Bank within it) is a highly productive ecosystem which historically has supported major commercial fisheries for cod, haddock, lobster, and scallops. Commercial fishing continues to be an important economic element in coastal communities around the Gulf even though the allowable catches of cod, haddock and most other finfish are at present diminished. The Gulf of Maine is also an integral part of the culture and aesthetics of the region. Recreational and commercial fishing, sailing, the history of New England whaling, the modern activity of whale watching–these and other maritime practices and images all contribute to the way of life and sense of place in the New England States and Maritime Provinces which border the Gulf of Maine.

A number of MPAs already exist in the Gulf of Maine (Figure 1 and the list beginning on page 51 of these notes). Perhaps the most widely known is the Stellwagen Bank National Marine Sanctuary. This 2200 km^2 MPA was established in 1992 and covers a mostly sandy bank extending between Cape Cod and Cape Ann in Massachusetts Bay. While the only activity banned in the Stellwagen Bank sanctuary by the legislation which created it is the extraction of sand and gravel, other restrictions can be imposed through management plans which are issued periodically. To date fisheries management on Stellwagen Bank has been deferred to the New England Fisheries Management Council. In the Gulf of Maine three

units in the National Estuarine Research Reserve (NERR) System provide substantial protection to coastal locations and thus most closely fit the definition of marine reserve given earlier. These are the Waquiot Bay NERR near Falmouth on the south shore of Cape Cod, the Great Bay NERR within the complex embayment of the Piscataqua River near Portsmouth, New Hampshire, and the Wells NERR in southern Maine. Numerous seasonal and year-round fisheries closures in the Gulf of Maine are in some respects the functional equivalent of MPAs although their permanence is less secure and their focus is limited to fisheries. Since the mid-1990s year-round closures have excluded all fishing gears except lobster pots and mid-water trawls from large areas of Georges Banks and Nantucket Shoals and seasonal closures have reduced fishing pressure on additional areas. A large number of other smaller MPAs and MPA-like management arrangements also exist within the Gulf of Maine. For instance Massachusetts has established a network of Ocean Sanctuaries which provide substantial protection to areas under state jurisdiction. A draft partial inventory of MPAs in the Gulf of Maine begins on page 51 of these notes; a complete inventory is being assembled by NOAA's Office of Marine Protected Areas and will be made available on the World Wide Web at www.mpa.gov.

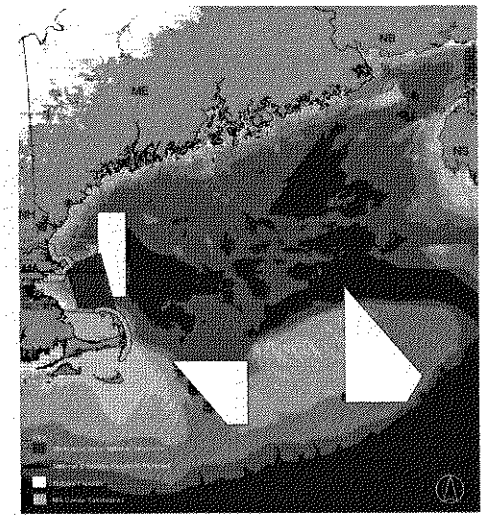

Figure 1. Selected MPAs in the Gulf of Maine: white, year-round fisheries closures; black, National Estuarine Research Reserves; dark grey, Stellwagen Bank National Marine Sanctuary; light grey, Massachusetts Ocean Sanctuaries. A color version appears on the back cover.

A considerable literature exists describing processes which have been used in the design and implementation of MPAs in various parts of the world and recommending design approaches for future use (among others: Kelleher, 1999; NRC, 2001). These recommendations emphasize the need to approach the design process systematically, with participation of the public and all interested stakeholders and in light of the best available scientific information. Specific management needs and goals should be

agreed upon. If MPAs can contribute to these goals, then criteria for MPA selection should be articulated. Only then should the contentious task of proposing MPA boundaries and usage limitations begin.

Designing and implementing a successful set of MPAs in the Gulf of Maine will be a complex and difficult task that will require great attention to both the ecological and other natural forces which shape the Gulf of Maine environment and to the cultural, social, and economic values of the people of the region which shape the political context in which environmental management must operate. To put the matter bluntly, MPAs in the Gulf of Maine will fail if the designers don't get the science right, or equally, if they don't get the politics right. Neither will be easy. Getting the science right will require finding the best available information, critically evaluating its reliability, and, where necessary, providing mechanisms for obtaining new, additional or continuing data and adapting MPA design based on that information. Getting the politics right will require making MPA design an open process in which all voices are heard and respected and in which all stakeholders receive enough benefits to feel that the implementation of MPAs advances their interests. Given the complexity of MPA design and implementation, it is unlikely that initial plans will be fully optimal; it will be prudent to establish adaptive management plans which allow for improvement and revision based on experience.

The Benthic and Pelagic Environments

In considering MPAs in the Gulf of Maine benthic environments have received more attention than pelagic ones. There are several reasons why this is so.

- Most generally, benthic environments are geographically fixed by the location and character of the substrate making them relatively easy to identify and delineate for regulatory purposes. In contrast pelagic environments are more ephemeral, responding to current shifts and water mass movements on many time scales.
- The benthic environment is the site of greater economic activity than the pelagic. In the Gulf of Maine, the important commercial fisheries are for bottom-fishes and benthic organisms (cod, haddock, scallops, lobster) while the pelagic environment provides fewer target stocks (principally swordfish).
- The benthic environment is subject to habitat disturbance and destruction from human activities including sand and gravel mining, petroleum development, trawling, dredging, and pipeline and cable laying.

However, substantial reasons also exist for considering pelagic environments.

- Many marine species, including most of those that are commercially important, have pelagic life stages.

- Pelagic environments may be the site of a set of adverse impacts including pollutant exposure, entanglement with fishing gear, disturbance by noise, and others.

Habitat-based and Fisheries-based Approaches to MPA Design

Efforts to organize environmental information for MPA design for the Gulf of Maine can be grouped into two broad categories. The first, which we refer to here as the "habitat-based" approach begins by assembling geological, physical and chemical data. By mapping data on sediment character, water depth, currents, etc. it should be possible to infer the distribution of habitat types and identify potential MPA sites. In contrast, the "fisheries-based" approach begins with the largely biological database used in traditional fisheries management and attempts to add additional data needed for MPA design.

Examination of the MPA literature indicates that the fisheries-based approach has often been used by fisheries managers and others who are primarily concerned with using MPAs as a fisheries management tool. The habitat-based approach has been used more frequently by conservationists and others concerned with using MPAs to conserve biodiversity and protect endangered species. This division is not surprising; when fisheries management is the primary goal, fisheries information is a logical starting point from which other environmental data can be added as needed. When broader issues such as biodiversity are primary, it is logical to begin with a very broad environmental view. The two approaches actually have much in common; for instance both must focus strongly on identifying key habitats and to be successful, both must be ready to move beyond a pre-determined logical framework to consider important local information. In the MPA design process the choice between the two approaches can become a politically sensitive issue, if it is perceived that adoption of either approach means that a particular group (conservation, fisheries management) has captured the design process. Our goal is not to recommend one of these approaches over the other, but to examine the characteristics of each. Another division, closely related to the fisheries-based, habitat-based distinction, is over the question of whether it is better to design MPAs starting from those already existing or to use ecological and other scientific considerations as the major starting points in MPA design.

A very broad and comprehensive application of the habitat-based approach is contained in four volume analysis titled "A Global Representative System of Marine Protected Areas" (Kelleher et al., 1995). This work offers an explicit set of criteria for the selection of MPAs to conserve marine biodiversity on a global scale; it does not consider local needs or socio-economic values. The main body of the work divides the world ocean into 18 biogeographic regions within which major existing MPAs are identified and new representative MPAs are proposed. Within the Eastern Temperate Subdivision of the

Northwest Atlantic, this analysis recognizes the "Acadian" zone, which is equivalent to the Gulf of Maine as defined here and proposes a new MPA for the mid-coastal Maine area (Mondor et al., 1995):

> "This site includes a scenic fjord-like coastline with a wide diversity of marine habitats including estuarine, coastal and marine communities. High primary productivity is evidenced by algal and kelp populations and significant fisheries. Seabirds and shorebirds nest and feed in the area, while waterfowl, especially common eiders, winter in the area. Several islands serve as gray seal haulouts. Endangered species include bald eagles, humpback and right whales and shortnose sturgeons."

The process of environmental subdivision and analysis leading to this proposal was systematic and methodical, considering the major biogeographic factors which determine the biological and ecological character of the region. Given the global scope of the analysis, the detail with which each region was examined was necessarily limited. With the analysis focused on broad trends, it is inevitable that some fine scale characteristics and features were overlooked. Perhaps the greatest value of this analysis is its breadth. It offers a unitary look at the world ocean and, from a single set of criteria, suggests an MPA in the Gulf of Maine which could contribute to a representative set of MPAs which, together, contribute to the conservation of biodiversity.

"Seascapes" is a more focused application of the habitat-based approach to MPA selection in the Canadian portion of the Gulf of Maine being made by the World Wildlife Fund-Canada (Day and Roff, 2000). The primary focus of Day and Roff is the development of a habitat-based methodology for the selection of representative MPAs in the seas surrounding Canada. This report includes as an example of the application of their method, its use on the "Scotian Shelf-Bay of Fundy" which these authors define as including the portion of the Gulf of Maine within Canadian jurisdiction. To classify marine environments, seascapes considers several factors including: whether an environment is estuarine, coastal or marine; geographic range; seasonal air and water temperature; degree of sea-ice cover; segregation between the pelagic and benthic realms; the vertical segregation within the pelagic and benthic realms; mixing and wave action; and character of benthic substrate. Neither of these habitat-based analyses considers social, economic, or cultural aspects of MPA design. The authors note the problem of finding adequate biogeographic data to carry out their classification scheme. Auster et al., (2001) based on data from the Gulf of Maine have proposed that species distribution data collected for traditional fisheries management may be used as proxies for the distribution of seafloor habitats.

An extension of the seascapes methodology for the classification of marine environments in the Gulf of Maine is being made by a collaboration between the World Wildlife Fund and the Conservation Law Foundation (CLF). This effort will cover the portion of the Gulf of Maine under U.S. jurisdiction and adjacent waters of Narragansett Bay and Block Island Sound to the south. Sediment data character is

a key input for this approach. The low resolution of sediment characterization over much of the Gulf of Maine may be a limiting factor. CLF expects to consider soicio-economic and cultural values in a stage of MPA design subsequent to habitat classification by the seascapes approach.

Much of the impetus for the consideration of MPAs in fisheries management using the fisheries-based approach comes from recognition of failures of traditional fisheries management techniques to consistently set effort and catch levels which ensure sustainable fisheries. The dramatic declines since the 1960s in the commercial fisheries of the Gulf of Maine and especially Georges Bank have made it clear that more consistently effective management approaches are essential.

Commercial fisheries resources in the Gulf of Maine have been important since the seventeenth century. Important species include demersal fishes (cod, haddock, and flatfishes), pelagic fishes (herring, mackerel, swordfish, and tuna) and invertebrates (scallops and lobster) (Serchuk et al., 1994). The annual catch has varied tremendously (Mayo et al., 1992). From 1930 to 1960 the fishery was pursued mainly by U. S. fishers and was relatively stable. During the early 1960s fishing effort rose about four fold with the arrival of high seas fishing fleets of several nations. Although the details vary with species, the outline is similar: catches first rose and then fell sharply. For cod 11,000 t were landed in 1960; by 1966 the figure was 53,000 t, but by 1973 it had fallen to 6,000 t (Serchuk et al., 1994). In 1977 the U. S. and Canada each extended their fisheries jurisdiction to 200 nautical miles, effectively excluding the fishing fleets of other nations. Under U. S. and Canadian management the landings first rose (57,000 t of cod in 1982) but then fell. By the mid 1990s many fisheries stocks in the Gulf of Maine were at severely depressed levels. It is unclear what combination of overfishing, habitat alteration (for instance by trawling and dredging), natural cycles, or other factors were responsible for this situation. It is also unclear if some once-important commercial stocks can ever recover or whether prolonged heavy exploitation has altered ecological relationships leading to species replacement (Garrison and Link, 2000).

In 1994 U.S. fisheries managers established two areas on Georges Bank and a third to the southwest, off Nantucket Island totaling 17,000 km^2 and closed year round to all fishing gear capable of retaining groundfish (effectively, all fishing methods except lobster pots and mid-water trawls). The history of these closures is complex (Fogarty and Murawski, 1998). Although they were designed to conserve particular stocks (haddock and yellowtail flounder), their impact has been much broader (Murawski et al., 2000). Effectively MPAs were created which have contributed to increases in stocks of groundfish and scallops. The effect on fisheries due to MPA creation is obscured by the fact that other significant fisheries restrictions were imposed at about the same time in both the U.S. and Canadian portions of the Gulf of Maine. Overall the greatest year-round protection was given to bivalve mollusks (including scallops) and the shallow-sedentary assemblage of fishes (flounders, skates and others) and less protection to migratory age groups of cod and haddock. Murawski and colleagues (2000) conclude:

"Closures of large portions of Georges Bank have proved to be an important element leading to more effective conservation of numerous resource and nonresource species, despite selection of the closed areas on the basis of seasonal spawning grounds of haddock and the distribution of the yellowtail flounder...in southern New England. In the future, factors other than fishing mortality reduction, including optimal placement to enhance larval production and to protect nursery areas and spawning concentrations, may well influence the selection of closed-area boundaries."

Reconciling the habitat-based and fisheries-based approaches may be difficult because, at least for some stakeholders, they reflect differing priorities and values about protecting biodiversity and managing fisheries. All participants will need to show patience, trust, and respect, if this and similar difficulties are to be overcome.

The Role of Ecological Theory

MPAs are in essence marine habitats in which human-caused disturbances are managed. Clearly, ecology and other sciences which have much to say about how individuals and communities utilize their habitats and respond to disturbance can provide information valuable in designing MPAs. In recent years a substantial body of writing has examined ecological relationships as they apply to MPA design. An excellent introduction to this literature can be found in papers from two symposia published as journal special issues (*Ecological Applications*, 8(1) Supplement, 1998; *Bulletin of Marine Science*, 66(3), 2000) and in a recent National Research Council report on MPAs (NRC, 2001). Reaching agreement on whether or not a particular MPA is successful can be facilitated by prior agreement on goals and the specific metrics to be used for establishing whether those goals are met. However, it should also be noted that, while ecology may be able to tell us how to design better MPAs, it will never tell us when an MPA design is good enough. "Good enough" is a question of values, not science.

A portion of the scientific literature deals with ecological considerations in the design of MPAs for reefs, where habitats and communities often change abruptly (at the reef edge). Such work may be less valuable for MPA design in the Gulf of Maine where changes tend to occur over extended gradients (of water depth, temperature, currents, bottom composition, etc.) than studies directly focused on the Gulf of Maine and similar environments. Another important consideration is that, since species differ in life histories and the ways they use habitat, almost any change in MPA design will affect different species in differently.

"How big should MPAs be?" is one of the most discussed questions in MPA design and one about which ecological theory has much to say (e.g., Folke et al., 1998; Mangel, 1998; Kramer and Chapman, 1999; Agardy, 2000; Walters, 2000). Beyond the obvious facts that larger MPAs tend to offer

greater protection and that large mobile species (e.g., cetaceans) range over larger areas than smaller, sessile species, ecological considerations may suggest ways to obtain greater increases in protection from smaller increases in MPA size. Carr and Reed (1993) and Allison et al. (1998) have noted that patterns of population replenishment for marine organisms vary with respect to the distance of propagule dispersal and the number of propagule sources supporting a particular local population. Consequently, providing protection for a particular population requires consideration not only of the habitat requirements of adult organisms, but other life stages including larvae which support the population. Detailed information emerging about the geographical and temporal requirements for reproductive success by commercially important stocks in the Gulf of Maine (e.g., Page et al., 1999) makes it possible to translate ecological theory into specific MPA criteria and proposals. Two important ideas emerge from these and other studies. The first is that MPA size per se may be less important than the ability of the protected habitat to support the species to be protected. In effect, quality and quantity of protected habitat are both important. Second, for species which are or may become depleted, it is desirable to protect at least some of the highest quality habitat since this is the range into which the species are most likely to contract during depletion.

All thoughtful writers about the use of ecological theory in MPA design agree that our understanding of ecological relationships is insufficient to reliably predict how MPAs will function and that the only sensible course is to gather the best information now available and to include plans for further gathering of essential information in the design of every MPA (among others: Allison et al., 1998). It is prudent to expect surprises and to plan for them by having adaptive management strategies in place. Finally, it is also widely agreed that the existence of information gaps does not justify inaction; it is usually best to proceed on the basis of the available information in ways that allow for management changes as better information becomes available.

Economic Considerations

In addition to the information that the natural sciences can bring to MPA design, the social sciences can also provide useful information. Most of the social science research on MPA design has been done in the field of economics. Farrow (1996) examines a variety of linkages between natural science and economics. He suggests using benefit-cost analysis to determine whether the economic benefits of MPAs justify the costs that they impose on society. In the Gulf of Maine, as in all marine environments, it is challenging to quantify these benefits and costs. Although estimates of benefits and costs can be easily derived for goods and services that are traded in the market, such as fish, whale watch excursions, or boats, not all goods and services are traded in the market. Goods and services having no market value include biodiversity, areas that provide habitat or protection from predation, currents that

disperse larvae, or the value that one places on keeping a species from extinction. Limited knowledge and uncertainty about these ecological goods and services increase the complexity of estimating their values. Nevertheless, economists have developed a variety of techniques to estimate these values including contingent valuation, hedonic pricing and the travel cost method. Application of these techniques to MPAs has been limited throughout the world. In the Gulf of Maine, only a handful of studies has used these methods to estimate benefits or costs of marine resources (Hoagland and Meeks, 2000; Day, 1987).

Tisdell and Broadus (1989) apply benefit-cost analysis to the problem of selecting the optimal size of a marine reserve. In their theoretical example, the area in the reserve that provides the greatest net benefit is the socially optimal size and this area need not be the largest area. The challenges of using benefit-cost analysis are highlighted, including uncertainty of the natural world and difficulty of calculating non-market benefits and costs. Yet, in spite of the challenges, Tisdell and Broadus suggest that benefit-cost analysis can be a powerful economic tool since it considers both the values associated with conserving an area and the benefits foregone by restricting access to it.

Another limitation to benefit-cost analysis is its failure to consider distributional impacts associated with implementing a MPA. Benefit-cost analysis helps to identify the resource management alternative that will provide maximum benefit to the members of society as a whole. Economists have recognized that it is also important to determine which segments of society will benefit from MPA implementation and who will have to pay the costs of protection (Dixon et al., 1993). Recent attention has been given to examining the potential social and economic impacts of a MPA on different user groups before a site is implemented or even proposed. During the identification of potential sites for marine reserves in the Florida Keys National Marine Sanctuary and the Channel Islands National Marine Sanctuary, user groups such as fishermen, divers, charter boat operators were consulted about where and how they spend their time on the water. Information gathered from these users revealed how different users would be impacted by various management alternatives. In addition to providing information about economic impacts, consultation with user groups also uncovered potential social impacts of establishing marine reserves. Such impacts may affect cultural and historical ties to an area, resource use behavior, or even safety of resource users. In the Gulf of Maine, attention in this area has focused on the fishing industry. In particular, the Social Science Advisory Council to the New England Fishery Management Council has initiated studies that have investigated social and economic impacts of a variety of fishery management alternatives.

Many economists have applied economic models to examine how fishing closures can be used as a fishery management tool (Sumaila, 1998; Polacheck, 1991; Holland and Brazee, 1996; Hannesson, 1998; Holland, 2000). These models have incorporated ecological factors, such as migration rate of

species in and out of the closed area, dispersal rates, stock recruitment relationships and different age classes, into economic analysis. Many of these models rely on existing knowledge and will improve as knowledge about ecological systems improves.

Although these models provide useful insights into potential reactions of the fishing industry to closed areas and the effects on biomass inside and outside reserves, this information cannot be applied to all regions. Each of the models has assumptions that are specific to the region and species studied. Only Holland (2000) models a fishery in the Gulf of Maine (multispecies groundfish). He presents the results of a series of simulations for Georges Bank and the Gulf of Maine that calculate the changes in annual catches, revenues, and spawning stocks under various reserve scenarios. His model is unique because it includes a spatial component that examines how fishing effort would be redistributed after reserve designation. Although Holland emphasizes that the model results should not be considered predictions because of assumptions and simplifications which were made in order to make the model tractable, the work leads to three important conclusions.

- Within each MPA scenario, the effects of closure vary substantially among species. Even when the overall harvest is increased, some species may be negatively affected.
- Depending on the location of MPAs, the effects on portions of the fishing fleet from various ports can be dramatically different. Even when the overall revenue to the fleet is increased, some ports may experience declines.
- Creation of MPAs can be expected to result in shifts in fishing effort toward unprotected stocks and locations. Any attempt to understand the full effects of MPAs must include consideration of such shifts.

Impacts of MPAs on industries other than fishing have received little attention in the economic literature. A few studies have looked at how protected areas impact tourism based communities (Dixon, 1993; Dixon et al., 1993). Even fewer studies have looked at the economic impacts of MPAs on other activities such as shipping, whale watching or oil and gas drilling.

As our understanding of ecological relationships is far from perfect, so too is our understanding of the economic impacts of designating MPAs. However, economists and other social scientists have begun to pay closer attention to marine protected areas and the body of research on this topic continues to grow. Economists agree with natural scientists that it is best to use available information to make decisions that allow for adaptation as better information becomes available.

Summary and Conclusions

These notes consider the applicability of marine protected areas (MPAs) for the Gulf of Maine by examining the scientific basis for their use and the relationship of that information to the policy and value

questions which must be addressed before MPAs can be implemented. A number of MPAs already exist in the Gulf of Maine. These include the Stellwagen Bank National Marine Sanctuary, three units in the National Estuarine Research Reserve System, several year-round fisheries closures and numerous other areas with various levels and permanence of protection.

Designing and implementing a successful set of MPAs in the Gulf of Maine will be a complex and difficult task that will require attention to both the ecological and other natural forces which shape the Gulf of Maine environment and to the cultural, social, and economic values of the people of the region which shape the political context in which environmental management must operate. Efforts to organize environmental information for MPA design for the Gulf of Maine can be grouped into two broad categories. The first, which we refer to here as the "habitat-based" approach uses geological, physical and chemical data to infer the distribution of habitat types and identify potential MPA sites. In contrast, the "fisheries-based" approach uses the largely biological database from traditional fisheries management and adds additional data needed for MPA design. In recent years a substantial body of writing has examined ecological relationships as they apply to MPA design. This body of applied ecological theory can be combined with detailed scientific data from the Gulf of Maine to give predictions about how specific MPA designs would perform. Socio-economic factors also influence MPA performance and these can also be studied and modeled. However, our knowledge in these and all other relevant areas is imperfect; it is prudent to expect surprises and to plan for them by having adaptive management strategies in place. Some research and monitoring have been carried out to determine the impact of the current MPAs on fisheries management and the promotion of biodiversity. However, such studies are sometimes little more than irregular monitoring and are frequently confounded by other fisheries management changes which have occurred at about the time of MPA creation. Greater attention should be given to the planning, execution and interpretation of scientific studies (in both the natural and social sciences) in order to understand the actual effects of MPAs in the Gulf of Maine.

Finally, it should be noted that, while science may be able to tell us how to design better MPAs, it will never tell us when an MPA design is good enough. "Good enough" is a question of values, not science.

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Related Web Sites

www.mpa.gov NOAA MPA Office
www.mcbi.org Marine Conservation Biology Institute
www.nefmc.org New England Fisheries Management Council
www.wellsreserve.org Wells National Estuarine Research Reserve
www.noaa.gov National Oceanic and Atmospheric Administration
www.sanctuaries.nos.noaa.gov
www.nceas.ucsb.edu
www.gumac.org Gulf of Maine Council
www.gulfofmaine.org
www.compasonline.org Communication Partnership for Science and the Sea
www.americanoceans.org American Oceans Campaign
www.atlantisforce.org Atlantic Northwestern Ocean Wilderness
www.oceanconservation.com
www.clf.org Conservation Law Foundation
www.iucn.org The World Conservation Union

Table (following pages). Draft list of Marine Protected Areas (MPAs) in the Gulf of Maine compiled by 1 October 2001hh. This matrix contains many of the state and federal MPAs and identifies the general area, permitted activities and restrictions, closure dates, responsible management agency, responsible enforcement agency, and indicates if monitoring is or was being conducted. The general types listed included parks, reserves, and sanctuaries, special environmental areas, shipping lanes, dredged material disposal sites and state and federal fishing closure areas. Note that some of the rivers that are listed as ME Gear Restriction Areas include rivers above the fall line and may be anadromous fish runs. Abbreviations used are nm (nautical mile), mi (mile), km (kilometer), in (inch), ft (foot), sq (square), min (minimum), max (maximum), so. (southern), no. (northern), USEPA (U.S. Environmental Protection Agency), MA (Massachusetts), ME (Maine), RI (Rhode Island), GOM (Gulf of Maine), ACEC (Area of Critical and Environmental Concern), MA DEM (Massachusetts Department of Environmental Management, MEDMR (Maine Department of Marine Resources), MEP (Massachusetts Environmental Police, NEFMC (New England Fisheries Management Council), NOAA (National Oceanic and Atmospheric Administration), NOS (National Ocean Service), USCG (U.S. Coast Guard), USFWS (U.S. Fish and Wildlife Service), USACE (U.S. Army Corps of Engineers).

Area	Type	General location	Permitted activities	Restrictions
Wells NERR	National Estuarine Research Reserve	Wells, Maine		
Rachel Carson National Wildlife Refuge	National Wildlife Refuge	Near Wells, Maine		
Cross Island National Wildlife Refuge	National Wildlife Refuge			
Nomans Land Island National Wildlife Refuge	National Wildlife Refuge			
Parker River National Wildlife Refuge	National Wildlife Refuge			
Petite Manan National Wildlife Refuge	National Wildlife Refuge			
Pond Island National Wildlife Refuge	National Wildlife Refuge			
Stellwagen Bank National Marine Sanctuary	National Marine Sanctuary	Off Massachusetts Bay from Cape Cod to So. Maine		Sand and gravel mining, drilling, dredging, altering seabed, taking marine mammals, reptiles, birds
Acadia National Park	National Park System	Bar Harbor Maine (northern)		
Dumping Ground	Former disposal site		Not used	Inactive
Boston Lightship Dumping Ground	Former disposal site		Not used	Inactive
Marblehead Light Dumping Ground	Former disposal site		Not used	Inactive
Foul Area and Industrial Waste Site	Former disposal site	23 nm off Boston	Not used	Inactive
Massachusetts Bay Disposal Site	EPA designated disposal site	24 nm off Boston	Clean sediment	Contaminated sediments
Southeast Massachusetts Bay Site	MA disposal site		Clean sediment	Contaminated sediments
Ellisville Harbor ACEC	MA Area of Critical Enviornmental Concern	Plymouth		Those covered by statute, e.g. marshes, eelgrass, etc.

Area	Type	General location	Permitted activities	Restrictions
Herring River Watershed ACEC	MA Area of Critical Enviornmental Concern	Plymouth, Bourne,		Those covered by statute, e.g. marshes, eelgrass, etc.
Inner Cape Cod Bay ACEC	MA Area of Critical Enviornmental Concern	Brewster, Eastham, Orleans, Cape Cod		Those covered by statute, e.g. marshes, eelgrass, etc.
Neponset River Estuary ACEC	MA Area of Critical Enviornmental Concern	Boston, Milton, Quincy		Those covered by statute, e.g. marshes, eelgrass, etc.
Parker River/Essex Bay ACEC	MA Area of Critical Enviornmental Concern	Gloucester, Essex, Ipswich, Newbury, Rowley		Those covered by statute, e.g. marshes, eelgrass, etc.
Pleasant Bay ACEC	MA Area of Critical Enviornmental Concern			Those covered by statute, e.g. marshes, eelgrass, etc.
Rumney Marshes ACEC	MA Area of Critical	Revere		Those covered

	Enviornmental Concern			by statute, e.g. marshes, eelgrass, etc.
Sandy Neck/Barnstable Harbor ACEC	MA Area of Critical Enviornmental Concern	Falmouth, Mashpee		Those covered by statute, e.g. marshes, eelgrass, etc.
Weir River ACEC	MA Area of Critical Enviornmental Concern			Those covered by statute, e.g. marshes, eelgrass, etc.
Wellfleet Harbor ACEC	MA Area of Critical Enviornmental Concern	Wellfleet		Those covered by statute, e.g. marshes, eelgrass, etc.
Weymouth/Hingham Back River ACEC	MA Area of Critical Enviornmental Concern			Those covered by statute, e.g. marshes, eelgrass, etc.

Area	Type	General location	Permitted activities	Restrictions
North Shore Ocean Sanctuary	MA Ocean Sanctuary	State line to off Manchester, MA		
South Essex Ocean Sanctuary	MA Ocean Sanctuary	Manchester to no. Lynn, MA		
Cape Cod Ocean Sanctuary	MA Ocean Sanctuary	Provincetown to Monomoy Island, MA		
Cape Cod Bay Ocean Sanctuary	MA Ocean Sanctuary	Cape Cod Bay (So. Marshfield to Provincetown, MA)		
Cape and Islands Ocean Sanctuary	MA Ocean Sanctuary	Monomoy to RI border, including Martha's Vineyard and Nantucket		
	MA Ocean Sanctuary			
Shipping lanes, separation lanes and precautionary zones to harbors	Shipping lanes	Throughout the Gulf of Maine	Shipping	No fishing, lobstering, unpermitted activities
Cape Cod Bay Critical Habitat Closure Area	Federal threatened/endangered critical habitat	Cape Cod Bay		Dredged material disposal
Massachusetts Water Resources Authority outfall diffusers	Wastewater outfall	9 nm off Boston in MA Bay	Shrimp trawling, ??	No anchoring, trawling, dredging, shellfishing
Androscoggin River	ME gear restricted area*			
Bagaduce River	ME gear restricted area*			
Bond Brook	ME gear restricted area*	Kennebec County		
Damariscotta River	ME gear restricted area*			
Dennys River	ME gear restricted area*	Washington County		
Georges River	ME gear restricted area*			
Kennebec River	ME gear restricted area*	Gardiner/Randolph Bridge		

Area	Type	General location	Permitted activities	Restrictions
Kennebec River	ME gear restricted area*			
Kennebec and Androscoggin Rivers	ME gear restricted area*			
Pleasant River	ME gear restricted area*	Washington County		
Presumpscot River	ME gear restricted area*			
Royal River	ME gear restricted area*	Yarmouth		
Sargentville Harbor	ME gear restricted area*	Hancock County		
Sedgwick Harbor	ME gear restricted area*	Hancock County		
Scheepscot Bay and River	ME gear restricted area*	Lincoln County		
Spruce Creek	ME gear restricted area*	York County		
Boothbay Conservation Area III	ME gear restricted area*			
Newcastle Conservation Area I	ME gear restricted area*			
Wiscasset Conservation Area I	ME gear restricted area*			
Cape Cod South Closure Area	Fisheries closure			
Cashes Ledge Closure Area	Fisheries closure			
Cashes Ledge Closure Area	Fisheries closure			
Closed Area I	Fisheries closure	Georges Bank	Research, federal permit required	Commercial and recreational fishing
Closed Area II	Fisheries closure	Georges Bank	Research	Commercial and recreational fishing
Cod Trip Limit Exemption Area	Fisheries closure			

Area	Type	General location	Permitted activities	Restrictions
Cultivator Shoal Whiting Fishery Exemption Area	Fisheries closure		Gill nets, 3 in.min. mesh size,	
Jeffreys Ledge	Fisheries closure			Nets, trawls, hooks, dredges
George's Bank Closure Area	Fisheries closure	Georges Bank		
GOM Scallop Dredge Fishery	Fisheries closure		Gill nets, 10.5 ft max dredge size	
Great South Channel Critical Habitat Closure Area	Fisheries closure	Great South Channel		
Massachusetts Bay Closure Area	Fisheries closure			
Massachusetts Bay/Stellwagen Bank Area	Fisheries closure			
Mid-Coast Closure Area	Fisheries closure		No scallop vessels	
Nantucket Lightship Closed Area	Fisheries closure			

Northeast Closure Area	Fisheries closure			
Offshore Closure Area	Fisheries closure			
Rolling Closure Area I	Fisheries closure	Rectangular areas along the coast		Nets, trawls, hooks, dredges
Rolling Closure Area II	Fisheries closure	Rectangular areas along the coast		Nets, trawls, hooks, dredges
Rolling Closure Area III	Fisheries closure	Rectangular areas along the coast		Nets, trawls, hooks, dredges
Rolling Closure Area IV	Fisheries closure	Rectangular areas along the coast		Nets, trawls, hooks, dredges
Rolling Closure Area V	Fisheries closure	Rectangular areas along the coast		Nets, trawls, hooks, dredges
Small Mesh Area 1	Fisheries closure		Gill nets	
Small Mesh Area 2	Fisheries closure		Gill nets	
Small Mesh Northern Shrimp Fishery Exemption Area	Fisheries closure		Gill nets, finfish excluder device required	
Western Gulf of Maine Area Closure	Fisheries closure			

Area	Dates closed	Responsible Agency	Enforcement	Monitoring	Size
Cultivator Shoal Whiting Fishery Exemption Area	10/1-6/14	NEFMC	USCG		
Jeffreys Ledge	5/1-5/31	NEFMC	USCG		
George's Bank Closure Area	5/1-5/31	NEFMC	USCG		
GOM Scallop Dredge Fishery	5/31-11/30	NEFMC	USCG		
Great South Channel Critical Habitat Closure Area	4/1-6/30	NEFMC	USCG		
Massachusetts Bay Closure Area	12/1-2/28(29)&4/1-5/31	NEFMC	USCG		
Massachusetts Bay/Stellwagen Bank Area	1/1-1/31	NEFMC	USCG	Limited	
Mid-Coast Closure Area	9/15-5/31	NEFMC	USCG		
Nantucket Lightship Closed Area	1/1-12/31	NEFMC	USCG		
Northeast Closure Area	8/15-9/13	NEFMC	USCG		
Offshore Closure Area	11/1-5/31	NEFMC	USCG		
Rolling Closure Area I	3/1-3/31	NEFMC	USCG		
Rolling Closure Area II	4/1-4/30	NEFMC	USCG		
Rolling Closure Area III	5/1-5/31	NEFMC	USCG		
Rolling Closure Area IV	6/1-6/30	NEFMC	USCG		
Rolling Closure Area V	10/1-11/30&2/1-2/28(29)	NEFMC	USCG		
Small Mesh Area 1	11/16-7/14	NEFMC	USCG		
Small Mesh Area 2	7/1-12/31	NEFMC	USCG		
Small Mesh Northern Shrimp Fishery Exemption Area	5/31-11/30	NEFMC	USCG		
Western Gulf of Maine Area Closure	1/1-12/31	NEFMC	USCG		
Wells NERR		ME and NOAA			
Rachel Carson National Wildlife Refuge		USFWS			
Cross Island National Wildlife Refuge		USFWS			
Nomans Land Island National Wildlife Refuge		USFWS			

Area	Dates closed	Responsible Agency	Enforcement	Monitoring	Size

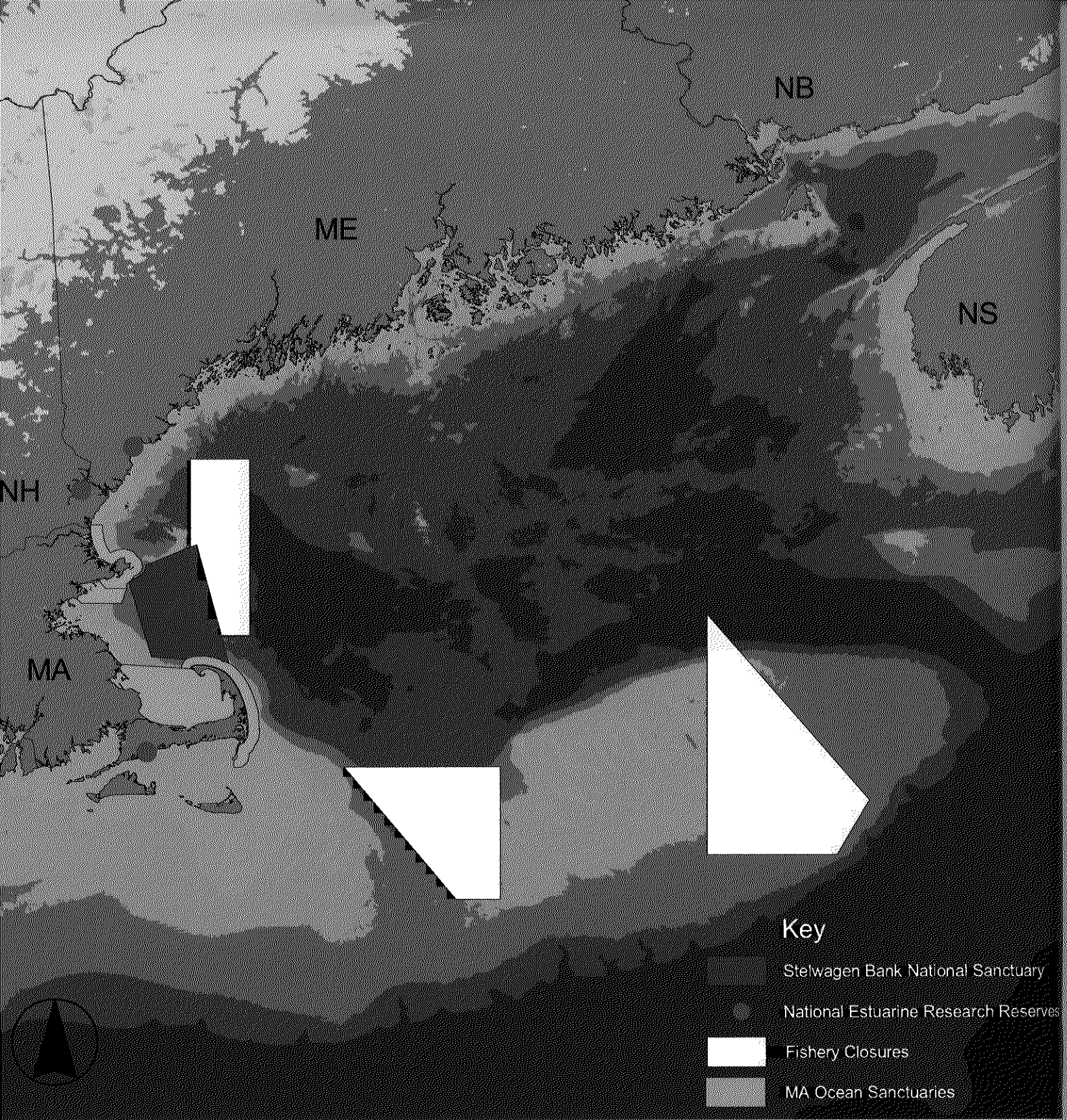
Parker River National Wildlife Refuge		USFWS			
Petite Manan National Wildlife Refuge		USFWS			
Pond Island National Wildlife Refuge		USFWS			
Stellwagen Bank National Marine Sanctuary		NOAA NOS	USCG	Limited	10 km no of Cape Cod
Acadia National Park					
Dumping Ground		USEPA, USACE		None	
Boston Lightship Dumping Ground		USEPA, USACE		None	
Marblehead Light Dumping Ground		USEPA, USACE		None	
Foul Area and Industrial Waste Site	1/1-12/31	USEPA, USACE		Past, limited	2 sq. mi.
Massachusetts Bay Disposal Site	1/1-12/31	USEPA, USACE		Occasional	2 sq. mi.
Southeast Massachusetts Bay Site		MA DEM		Long-term	
Ellisville Harbor ACEC		MADEM	MEP	None	
Herring River Watershed ACEC		MADEM	MEP	None	
Inner Cape Cod Bay ACEC		MADEM	MEP	None	
Neponset River Estuary ACEC		MADEM	MEP	None	
Parker River/Essex Bay ACEC		MADEM	MEP	None	
Pleasant Bay ACEC		MADEM	MEP	None	
Rumney Marshes ACEC		MADEM	MEP	None	
Sandy Neck/Barnstable Harbor ACEC		MADEM	MEP	None	
Weir River ACEC		MADEM	MEP	None	
Wellfleet Harbor ACEC		MADEM	MEP	None	
Weymouth/Hingham Back River ACEC		MADEM	MEP	None	

Area	Dates closed	Responsible Agency	Enforcement	Monitoring	Size
North Shore Ocean Sanctuary		MADEM	MEP	None	Low tide to ~3 nm
South Essex Ocean Sanctuary		MADEM	MEP	None	Low tide to ~3 nm
Cape Cod Ocean Sanctuary		MADEM	MEP	None	Low tide to ~3 nm
Cape Cod Bay Ocean Sanctuary		MADEM	MEP	None	Cape Cod Bay
Cape and Islands Ocean Sanctuary		MADEM	MEP	None	Low tide to ~3 nm
Shipping lanes, separation lanes and precautionary zones to harbors	1/1-12/31	USCG	USCG	None	
Cape Cod Bay Critical Habitat Closure Area	1/1-5/15	NOAA NMFS	USCG		
Massachusetts Water Resources Authority outfall diffusers	1/1-12/31			Long-term, extensive	
Androscoggin River		ME DMR			
Bagaduce River		ME DMR			
Bond Brook		ME DMR			
Damariscotta River		ME DMR			
Dennys River		ME DMR			
Georges River		ME DMR			
Kennebec River		ME DMR			
Kennebec River		ME DMR			

Kennebec and Androscoggin Rivers		ME DMR			
Pleasant River		ME DMR			
Presumpscot River		ME DMR			
Royal River		ME DMR			
Sargentville Harbor		ME DMR			
Sedgwick Harbor		ME DMR			
Scheepscot Bay and River		ME DMR			
Spruce Creek		ME DMR			

Area	Dates closed	Responsible Agency	Enforcement	Monitoring	Size
Boothbay Conservation Area III		ME DMR			
Newcastle Conservation Area I		ME DMR			
Wiscasset Conservation Area I		ME DMR			
Cape Cod South Closure Area	12/1-2/28(29) & 4/1-5/31	NEFMC	USCG		
Cashes Ledge Closure Area	7/1 -10/31	NEFMC	USCG		
Cashes Ledge Closure Area	11/1-11/30	NEFMC	USCG		
Closed Area I	1/1-12/31	NEFMC	USCG	Limited	
Closed Area II	1/1-12/31	NEFMC	USCG	Limited	
Cod Trip Limit Exemption Area	10/1-4/30	NEFMC	USCG		
Cultivator Shoal Whiting Fishery Exemption Area	10/1-6/14	NEFMC	USCG		
Jeffreys Ledge	5/1-5/31	NEFMC	USCG		
George's Bank Closure Area	5/1-5/31	NEFMC	USCG		
GOM Scallop Dredge Fishery	5/31-11/30	NEFMC	USCG		
Great South Channel Critical Habitat Closure Area	4/1-6/30	NEFMC	USCG		
Massachusetts Bay Closure Area	12/1-2/28(29)&4/1-5/31	NEFMC	USCG		
Massachusetts Bay/Stellwagen Bank Area	1/1-1/31	NEFMC	USCG	Limited	
Mid-Coast Closure Area	9/15-5/31	NEFMC	USCG		
Nantucket Lightship Closed Area	1/1-12/31	NEFMC	USCG		
Northeast Closure Area	8/15-9/13	NEFMC	USCG		
Offshore Closure Area	11/1-5/31	NEFMC	USCG		
Rolling Closure Area I	3/1-3/31	NEFMC	USCG		
Rolling Closure Area II	4/1-4/30	NEFMC	USCG		
Rolling Closure Area III	5/1-5/31	NEFMC	USCG		
Rolling Closure Area IV	6/1-6/30	NEFMC	USCG		

Area	Dates closed	Responsible Agency	Enforcement	Monitoring	Size
Rolling Closure Area V	10/1-11/30&2/1-2/28(29)	NEFMC	USCG		
Small Mesh Area 1	11/16-7/14	NEFMC	USCG		
Small Mesh Area 2	7/1-12/31	NEFMC	USCG		
Small Mesh Northern Shrimp Fishery Exemption Area	5/31-11/30	NEFMC	USCG		
Western Gulf of Maine Area Closure	1/1-12/31	NEFMC	USCG		



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