A GIS Database of Existing Coastal and Marine Protected Areas, Conservation Zones, and Restricted Fishing Areas in the Gulf of Maine

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I. Introduction

There are many different types of protected and regulated areas in the Gulf of Maine. While many of these areas share conservation goals and seek to protect the same types of marine resources, there is no centralized map or database providing a comprehensive overview of these areas. Instead, information is scattered and unorganized. As part of the Gulf of Maine Marine Protected Areas (MPAs) Project, a GIS database of existing coastal and marine protected areas, conservation zones, and restricted fishing areas in the Gulf of Maine has been produced. This database complements other data layers in progress, such as fish assemblages and surficial geology. It will act as a powerful analytical tool that will assist a range of users in evaluating the role of existing protected areas and determining the location of future sites. Database attributes for each site include name, type of designation, jurisdiction, location, size, year established, legislation, ownership, specific regulations, and IUCN protection category. With this information, users can form a better understanding of the range and scope of regulated areas in the Gulf of Maine. The database is constructed so that the user can select parameters, conduct analyses, and form conclusions according to his or her own specific needs. The GIS data will be available on the internet and can also be viewed on a series of hard copy maps. This project was completed in partnership with the Center for Marine Conservation, the Department of Fisheries and Oceans Canada, the New England Aquarium, and the Marine Policy Center of the Woods Hole Oceanographic Institution.
II. Definition and Background on Marine and Coastal Protected Areas, Conservation Zones, and Restricted Fishing Areas

As defined by the World Conservation Union (IUCN), a marine protected area is “any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.” Due to the broad scope of this definition and the diversity of protection levels within the study area, it was decided that information would be collected for a wide range of areas, including coastal and marine protected areas, conservation zones, and restricted fishing areas. Data were gathered and mapped for state/provincial parks, national parks, offshore fishing closures, wildlife management areas, national wildlife areas, and other regulations that seek to protect a discrete area in the marine environment. The purpose of the project was not to narrow the definition of a “marine protected area,” but to provide a broad range of related information to assist users in understanding and analyzing the many different types of areas protected by governments in the Gulf of Maine.

The following types of regulations and site objectives were not included in the database:

- Areas closed or regulated for human health purposes
- Quota management tools for fishing
- Emergency measures
- Fishing gear conflict regulations
- Fishing regulated mesh areas
- Broad regulations that do not apply to a specific coastal/marine area
- Regulations that are not designed to protect species, habitats, or parts of the marine ecosystem.
III. Methods

Study Area

The study area was expanded beyond the Gulf of Maine proper to include important offshore fishing closures on George’s Bank. Water portions extend from Cape Cod north through the Bay of Fundy and east to include George’s Bank, Brown’s Bank and the western Peninsula of Nova Scotia up to Halifax. The study area also includes land which lies adjacent to or touches salt water. Jurisdictions which lie in the study area include Massachusetts, New Hampshire, Maine, New Brunswick, Nova Scotia, U.S. federal offshore areas, and Canadian offshore areas (Figure 1).

Data Collection

The GIS database was created by collecting existing data from various sources around the Gulf of Maine, as no comprehensive database existed prior to the project. Data were organized according to marine components, such as fishery regulations, sanctuaries and coastal lands (areas touching the coast), including, for example national/ state parks and wildlife refuges. Due to the scope of the project, data collection was limited to primarily federal and state/provincial information. Only some Canadian non-governmental sites were included, with limited information as to attributes. Local and private sites were not included, but can easily be added at later stages when time and resources are available. GIS information was collected in various formats from government organizations responsible for managing particular designations. Identifying data sources and obtaining relevant information was one of the project's greatest challenges.

Data Limitations

Because there were so many different sources of GIS data in the Gulf of Maine, information on protected areas was fragmented and at times inconsistent. In some instances, GIS information was simply not yet available. For example, the state of Massachusetts maintains a comprehensive state-wide GIS system, while much of the information for New Hampshire is still in the process of being converted to GIS format. Inconsistencies in data availability thus made it difficult to produce a complete Gulf of Maine database.

Differences in data formats also posed challenges for the project. Some information was received in point form and some as polygons. For some areas, such as the Western Gulf of Maine Cod Closure, information was not yet in electronic form and had to be mapped using coordinates. Differences in data format may make it difficult to conduct some spatial analyses and compare different types of sites.

Because each data source contained its own set of attributes, much work was done to fill information gaps and make certain each site had a standard information set. Specific
information, such as site regulations, year established, and legislation responsible for designation was, at times, extremely difficult to obtain. All levels of government, individual sites, and even field personnel had to be contacted to collect the necessary attributes (a complete list of those we contacted is included in the appendix to this report). Categorizing specific regulations for each site was also challenging, as regulations often differ in their scope and objectives. (A brief explanation of each specific regulation category is included in the “Data Attributes” section of this report). In sum, locating and obtaining information about each site was the most time-consuming part of constructing the GIS database.

Finally, the assignment of IUCN categories to protected areas was at times problematic. For many sites, the regulations and actual level of protection did not always correspond to management objectives associated with the type of site (e.g. state park, National Wildlife Refuge). In an effort to be consistent with previous IUCN category designations, we have relied on the following literature as a guide:


**Processing GIS Data**

The GIS data was processed using ESRI's ArcView software. The majority of the data was received in ArcInfo export file or ArcView shape file format by various means: email, ftp, CD-ROM or floppy diskette. One exception was the federal offshore areas, which were created from lists of coordinates that defined the boundaries. Processing of the data involved selecting the appropriate protected areas from the data provided by the various agencies, deleting the existing attributes, reprojecting the data into a standard projection, and compiling the data into the themes as listed in this report. The attribute data was initially recorded in a spreadsheet and then exported in a database format and linked to the GIS data.

**Data Attributes**

In addition to a GIS component, a standardized set of attributes is provided for each site. This information allows the user to better understand the nature of each site and make
comparisons among different types of protected areas. Information in the following categories is available for each protected area recorded in the GIS database:

**Name:** name of site.

**Designation:** indicates the type of designation (e.g. national park, state beach) corresponding to the data layers described on page 9.

**Jurisdiction:** indicates the jurisdiction (state/province or federal) in which the site is located. From this information, the user can search sites by specific state. Some U.S. sites have overlapping jurisdictions (e.g. they are located in both state and federal waters).

**Size:** total size of site in acres.

**Year Established:** the year the protected area was formally established or, in cases of seasonal fishery and gear closures, the year the protected area went into effect.

**Legislation Created:** indicates the law, act or statute by which the site was designated.

**Ownership:** the jurisdiction (state/provincial or federal) that has authority over a specific site. Some sites have more than one level of ownership.

**Managing Organization:** the organization that manages and regulates the specific site.

**Specific Regulations:** a series of regulatory categories were generated and assigned to each site to enable the user to better understand their level of protection and conservation objectives. It is beyond the scope of the project to describe every regulation associated with a site in detail. However, basic categories based on prohibitions were constructed so that the user can determine the types of regulations assigned to a particular site. In many instances, a site has several different types of regulations. The specific regulatory categories are as follows:

1.1 Commercial Fishing Year Round Closure / Restrictions
Coastal /offshore multi-species or species-specific year-round closed or restricted area.

1.2 Commercial Fishing Seasonal Closure / Restrictions
Coastal /offshore multi-species or species-specific seasonal closed or restricted area.

1.3 Gear-Specific Year-Round Closure / Restrictions
Coastal /offshore year-round closed or restricted area whose purpose is to regulate the use of certain gear types.

1.4 Gear-Specific Seasonal Closure / Restrictions
Any coastal /offshore seasonally closed or restricted area whose purpose is to regulate the use of certain gear types.
2. Recreational Fishing Closure / Restrictions
Any coastal/offshore area that is closed to recreational fishing or for which there are significant restrictions pertaining to take and size limit of catch. The requirement of a state license is not considered a “recreational fishing restriction.”

3. Boating Closure / Restrictions
Any coastal or offshore area that either prohibits boating or imposes restrictions on vessel type, size and access. If boating is not permissible due to natural inaccessibility or the absence of a boat launch, this category was not assigned.

4. Development (mining, aquaculture, oil rigs) Closure / Restrictions
Any area that prohibits or restricts on-site development pertaining to activities such as mining, aquaculture, and oil rigging (excluding housing development). The requirement of a license to permit development activities is not considered a “restriction.”

5. Disturbance of Wildlife Restrictions: moving, touching, harassing wildlife sites (nesting, feeding, breeding) and/or species
Any area which imposes restrictions prohibiting the disturbance of wildlife and their essential habitat, including areas which comply with federal, state or provincial wildlife protection regulations.

6. Hunting Closure / Restrictions
Any area that prohibits hunting of any kind is considered a closed area. Any area that imposes restrictions on the hunting of specific species is considered a restricted area. The requirement of obtaining a hunting license, obeying hunting season restrictions, and observing public proximity safety regulations is not considered a “restriction.” If hunting is not permissible due to spatial restrictions and high public use, this category was not assigned.

7. Research Restrictions
Any area which does not permit or restricts on-site research activities, denying permits to interested parties.

8. Dumping/ Discharge of Wastes or Waste Water Restrictions
Any area which prohibits the dumping or discharge of waste, including “pack it out” public use areas. Areas equipped with dumping stations from which waste is transferred regularly are not considered “restricted.”

9. Human Access Closure / Restrictions
Any area which entirely or partially prohibits human access either for health, safety or wildlife protection reasons. Partially closed areas may include areas with designated “no public access” sections to protect wildlife nesting sites. Public use areas, such as state parks, that are seasonally closed or unstaffed are not considered “closures” under this definition.

**IUCN Protection Category:** the World Conservation Union (IUCN) has developed a classification system for MPAs based on their management objectives. The system is intended to guide protected area managers in designating specific sites. The protection categories are as follows:
I. Strict Protection (i.e. Strict Nature Reserve/Wilderness Area)
II. Ecosystem Conservation and Recreation (i.e. National Park)
III. Conservation of Natural Features (i.e. National Monument)
IV. Conservation Through Active Management (i.e. Habitat/Species Management Area)
V. Landscape/Seascape Conservation and Recreation (i.e. Protected Landscape/Seascape)
VI. Sustainable Use of Natural Ecosystems (i.e. Managed Resource Protected Area)

Data Layers

The GIS data has been organized into themes to assist the user in distinguishing between different types of coastal and marine protected areas, conservation zones, restricted fishing areas, and other regulated areas. Organizing information into different layers reduces map clutter and makes it easier to compare and analyze different sites. Data has been divided into themes based on the following types of designations:

1. National Marine Sanctuaries: Stellwagen Bank
2. Federal Fishing Closures: National Marine Fisheries Service, Department of Fisheries & Oceans
3. National Estuarine Research Reserves
4. National Wildlife Refuges
5. Federal/National Parks
6. Right Whale Critical Habitats
7. Canada Wildlife Service Sites: Migratory Bird Sanctuary, National Wildlife Areas
8. Areas of Critical Environmental Concern
9. State Ocean Sanctuaries
10. State/Provincial Parks: parks, forests, reservations, beaches
11. State Marinas & Piers
12. State Fishing Restrictions: mobile and fixed gear regulations
13. State Complimentary Harbor Porpoise Closures
14. State/Provincial Wildlife Management Areas
15. State Wildlife Sanctuaries
16. State Historic Sites
17. State Public Reserved Lands
18. State Marine Conservation Areas
19. Maine’s State Essential Habitat for Endangered Species
20. Canadian Non-governmental Sites
IV. Conclusions and Recommendations

The GIS database is the first attempt to organize and spatially represent coastal and marine protected areas, conservation zones, and restricted fishing areas in the Gulf of Maine. However, it is important to recognize that this database is not a finished product, but a work progress. Because regulations constantly change and more protected areas are expected to be designated in the near future, the GIS database must be updated on a regular basis. In particular, there will be a need to update offshore fishing regulations, which are more likely to change than more static coastal state and federal protected areas. There is also a need to add local government and private sites to the database in both the U.S. and Canada, as well as non-government organization sites (e.g. Audubon Society, Nature Conservancy) in the U.S., as Canada already has these sites compiled in point form with limited attributes. Finally, a candidate site layer should be added to allow the user to include these sites on the map in examining the future of protected areas in the Gulf of Maine. A site roster is included in the Appendix to: Brody, Samuel. 1998. Report # 3, An Evaluation of the Establishment Processes for Marine Protected Areas in the Gulf of Maine: Understanding the Role of Community Involvement and Public Participation.

The GIS database demonstrates a collaborative approach to collecting, storing, and portraying information about protected areas. Continued maintenance and development of the database will enable interested parties to better assess the existing level of marine resource protection in the Gulf of Maine. By analyzing and graphically displaying information, users of the system can determine the commonalities and differences among sites, see where protection measures overlap, and make conclusions about the level of resource protection across jurisdictional boundaries. When combined with other data layers, the GIS database will act as a tool to assist decision makers in locating future protected areas. A centralized database providing the location and extent of existing resource protection will make it easier for decision makers to designate future sites that contribute to a network or system of protected areas in the Gulf of Maine.
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