Gulf of Maine Area Census of Marine Life	
Project Leads	The Gulf of Maine Area Census of Marine Life (GoMA) is an integrated, binational program consisting of American and Canadian teams. During the initial mapping phase, this effort was led by co-PIs Lewis Incze (U.S.) and Peter Lawton (Canada).
Geographic Extent	Maps the Gulf of Maine and surrounding area, including the Scotian Shelf, Georges Bank, adjacent slope sea, and the western New England Seamounts
Timeframe	1963-2003
Methods	Uses data from NMFS NEFSC Bottom Trawl Survey
Targeted Sectors	
Partners	A full list of contributors is available here: http://www.gulfofmaine-census.org/about-us/contributors/
Objectives	• Provide interactive maps of species distribution and abundance by season, year, and decade. Mapping historical fish distribution patterns and management practices helps shed light on the effectiveness of current management efforts and strategies.
Resources	Available at: http://www.gulfofmaine-census.org/data-mapping/visualizations/interactive-distribution-maps/

Massachusetts Ocean Plan	
Project Lead	Massachusetts Office of Energy and Environmental Affairs
Geographic Extent	http://www.mass.gov/eea/docs/eea/oceans/ocean-planning-map.pdf
Timeframe	The Massachusetts Oceans Act required development of a comprehensive ocean management plan, with a draft plan submitted by June 30, 2009, and a final plan promulgated by December 31, 2009.
Methods	Statewide workshops and presentations inviting the public to provide feedback on the plan's goals, key issues and concerns; general approaches to plan development; and existing science and data regarding ocean resources and uses.
Targeted Sectors	
Partners	Industrial Economics, Inc.; Massachusetts Department of Marine Fisheries; The Massachusetts Ocean Partnership
Objectives	• Set forth the Commonwealth's goals, citing priorities and standards to ensure the effective stewardship of our ocean waters. • Identify and protects critical resources. • Support the development of sustainable uses, renewable energy, and necessary infrastructure. • Establish measures that minimize conflict between existing uses and new uses. • Provide a foundation for ongoing study and evolving management of the ocean environment.
Resources	Available at: http://www.mass.gov/eea/ocean-coastal-management/mass-ocean-plan/draft-plan-technical-reports-and-planning.html

New Hampshire and Southern Maine Ocean Uses Atlas	
Project Leads	NOAA Marine Protected Areas Center; University of New Hampshire Coastal Response Resource Center
Geographic Extent	State and federal waters off the coast of New Hampshire and southern Maine
Timeframe	
Methods	Spatial data on ocean use patterns were gathered from regional ocean experts through a participatory Geographic Information System (GIS) process in a workshop environment.
Targeted Sectors	Nearly 30 types of uses spanning three categories: non-consumptive, fishing, and industrial and military uses
Partners	
Objectives	• Integrate data into the Environmental Response Management Application (ERMA) for visualization and data assimilation. ERMA offers a mapping interface to access a wide range of environmental and administrative spatial information important for emergency response actions.
Resources	Available at: http://www.mpa.gov/dataanalysis/atlas_nhsm/

Rhode Island Ocean Special Area Management Plan	
Project Lead	Rhode Island Coastal Resources Management Council
Geographic Extent	The Ocean SAMP study boundary includes approximately 1,500 square miles of portions of Block Island Sound, Rhode Island Sound, and the Atlantic Ocean. The study area includes both state and federal waters and abuts the state waters of Massachusetts, Connecticut, and New York.
Timeframe	
Methods	The fisheries chapter of the RI Ocean SAMP was developed through a process that drew upon the input of fishermen, scientists, managers, and other stakeholders.
Targeted Sectors	The study focused on the following topics: Ecology, Fishing, Wildlife & Habitats, Recreation & Tourism, Cultural & Historic Resources, Infrastructure, Marine Transportation, Physical Environment, Policy & Governance, Global Climate Change, and Marine Spatial Planning.
Partners	University of Rhode Island Coastal Resources Center; Rhode Island Sea Grant
Objectives	• Foster a properly functioning ecosystem that is both ecologically sound and economically beneficial. • Promote and enhances existing uses. • Encourage marine-based economic development that meets the aspirations of local communities and is consistent with the state's overall economic development needs and goals, including offshore renewable energy infrastructure. • Build a framework for coordinated decision-making between state and federal management agencies.
Resources	Available at: http://seagrant.gso.uri.edu/oceansamp/ URI Coastal Resources Center, *et al.* 2010. *Rhode Island Ocean Special Area Management Plan*. Chapter 5: Commercial and Recreational Fisheries and Appendix B. Fisheries Activity Maps: Methods and Data Sources.

Lobster Pot Gear Configurations in the Gulf of Maine	
Project Lead	Maine Lobstermen's Association
Geographic Extent	Gulf of Maine
Timeframe	Meetings and interviews were conducted in 2010 and 2011.
Methods	The MLA collected gear sketches from 115 lobstermen who documented the individual components and rigging of both the lobster gear bottom and surface systems. Documentation of the bottom system included size, weight and ballast of lobster traps; type, brand and size of ropes; and specific methods of connecting these components together. Documentation of the surface system included the number, type and size of flotation devices; type, brand and size of ropes; and methods of connecting surface system components. Characterizing each area's fishery included a discussion of local environmental conditions (tides, currents, and bottom habitat); length of the active fishing season; average number of nights between hauling traps (soak time); number of traps tied together to form a trawl; number of buoy lines (also known as endlines); average vessel size; and number of crew members.
Targeted Sectors	Maine lobstermen were the primary focus of the study; however, New Hampshire and Massachusetts lobstermen were also included.
Partners	
Objectives	• Document for the first time the range of fixed-gear lobster fishing methods in the Gulf of Maine. • Provide new data and illustrations on how lobster trap gear is configured and deployed by season and location. • Fill a major gap in our understanding of the characteristics of trap gear. • Help fishery managers better understand the fishery and evaluate the relative impacts of potential regulatory changes involving lobster gear. This publication is also a tool for further engaging lobstermen in constructive dialogue about the kinds of gear and fishing methods that may pose the lowest risk to whales from rope entanglements.
Resources	Available at: http://mainelobstermen.org/pdf/Lobster_Gear_Report.pdf

Mapping Working Waters	
Project Lead	Island Institute
Geographic Extent	Gulf of Maine, with a focus on waters off the Maine coast
Timeframe	Completed in 2012, this project asked participants about fishing patterns over the past 10 years. Some historical fishing areas were also captured.
Methods	One-on-one and small group interviews with fishermen were used to document community fishing areas.
Targeted Sectors	Commercial fisheries
Partners	
Objectives	• Map community activities, with a particular focus on commercial fishing and other, currently undocumented activities. • Gather data on location, intensity, and seasonality of uses. • Document place names at sea, and the story behind these names. • Provide map products and data to all participants for their own use. • Protect individual information while creating aggregated data products that can be shared publicly. • Contribute resulting data to Maine Coastal Atlas, NERACOOS and other appropriate organizations, publications and systems. • Explore participatory GIS methods for Maine's user groups.
Resources	Available at: http://www.islandinstitute.org/mappingworkingwaters.php

Effort Distribution and Catch Patterns Adjacent to Temperate MPAs	
Project Lead	National Marine Fisheries Service
Geographic Extent	Northeast region
Timeframe	1991-1993; 2001-2003
Methods	Vessel locations were available from logbooks; vessel monitoring system (VMS) data from many of the largest vessels; and observer records.
Targeted Sectors	Otter trawl
Partners	
Objectives	• Evaluate the spatial distribution of otter trawl fishing effort and catches resulting from the imposition in 1994 of year-round and seasonal groundfish closed areas off the Northeastern USA.
Resources	Murawski, S. A., Wigley, S. E., Fogarty, M. J., Rago, P. J., and Mountain, D. G. 2005. “Effort distribution and catch patterns adjacent to temperate MPAs”. *ICES Journal of Marine Science*, 62: 1150-1167.

Maine Coastal Atlas & Maine Coastal and Marine Research Database	
Project Lead	Maine Coastal Program
Geographic Extent	
Timeframe	
Methods	Compiles existing spatial data and research.
Targeted Sectors	Categories could include, but are not limited to: Biological Studies; Geological Studies; Physical Studies; Socio-Economic Studies; Port and Infrastructure Studies; and Oceanographic Studies.
Partners	
Objectives	• Display coastal and marine spatial data for reference purposes. • Facilitate statewide sharing of information and project data. • Foster collaboration on research related to Maine's coastal waters and beyond.
Resources	Available at: http://www.maine.gov/spo/coastalatlas/

Identifying Offshore Space Use Conflicts	
Project Lead	MIT Sea Grant; UMass Boston Urban Harbors Institute; Industrial Economics, Inc.
Geographic Extent	East and West coasts of the U.S.
Timeframe	
Methods	Interviewing individuals and holding regional stakeholders' meetings as part of a project funded by the Bureau of Ocean Energy Management.
Targeted Sectors	
Partners	
Objectives	• Learn from current ocean users how energy development on the Outer Continental Shelf (OCS) might impact existing uses • Plan how to avoid, minimize or mitigate potential ocean use conflicts.
Resources	St. Martin, K. and M. Hall-Arber, 2008. "The Missing Layer: Geo-technologies, Communities, and Implications for Marine Spatial Planning" *Marine Policy* 32: 779-786.

An Atlas-Based Audit of Fishing Territories, Local Knowledge, and the Potential for Community Participation in Fisheries Science and Management	
Project Lead	Dr. Kevin St. Martin (Rutgers University); Dr. Madeleine Hall-Arber (Massachusetts Institute of Technology)
Geographic Extent	Maine, New Hampshire, Massachusetts
Timeframe	
Methods	This project created maps which involved analyses of NMFS data sets and development of a GIS-based methodology to depict fishing communities and their territories. This revealed a spatial clustering of fishing trips by peer groups of fishermen. The potential of these novel maps relative to fisheries management appeared obvious to not only fishermen to whom they were presented (e.g., those interested to maintain rights to particular fishing grounds) but, in subsequent presentations, to fisheries scientists and managers (e.g., those interested to integrate "human dimensions" into management). Fifty-seven interviews were conducted with fishermen in ports from Chatham, MA, to Port Clyde, ME. Those interviewed discussed the nature of fishing communities, the areas upon which they most depend, their knowledge of these locations, and their ideas for management.
Targeted Sectors	Commercial fisheries, organized by gear type
Partners	
Objectives	• Document those areas and resources upon which fishing communities in the Northeast most depend. An atlas of maps were produced that make clear "who to ask" when proposing a collaborative research project grounded in a specific location, or who would be most impacted by a particular area-based management initiative. Maps were designed to complement a participatory research process where community researchers took them into fishing communities and used them to interview fishermen, who subsequently amended them. They were also used to assess the nature of fishing communities' territories, their local environmental knowledge, and their propensity to work cooperatively with fisheries scientists and managers. The interview process gave texture and meaning to each community's territory.
Resources	

Additional prior efforts include:

- Scallop Mapping in Maine, Penobscot East Resource Center
- Gloucester fishing activity on Stellwagen Bank, Northeast Seafood Coalition

NROC Commercial Fishery Mapping Project

George Lapointe[1], Nick Battista[2], Azure Cygler[3], Rachel Schmookler[4], Nick Napoli[5], John Weber[5]

1 – George Lapointe Consulting, 2 – Island Institute, 3 – University of Rhode Island, 4 – Applied Science Associates, 5 – Northeast Regional Ocean Council

I. INTRODUCTION

Marine spatial planning should be based on information about current ocean uses to minimize conflict and give decision makers accurate data from which decisions can be made. In the Northeast US, the **Northeast Regional Ocean Council (NROC)** was established in 1995 to coordinate planning for new ocean activities in a coordinated, regional way. Recognizing that planning done in an *ad hoc* process led to mistrust, conflict, and a "first come, first served" feel, NROC conducted characterizations of current ocean uses to guide future decision making. This included (1) commercial fishing (including for hire vessels); (2) ports and shipping; (3) ocean energy; (4) recreational boating; (5) aquaculture; and (6) natural resource characterizations, (e.g. birds, mammals, fish).

The objective of the **NROC Commercial Fishery Mapping Project** is to (1) provide maps of commercial fishing activity based on Vessel Monitoring System (VMS) and Vessel Trip Report (VTR) data; (2) describe available information on spatial use data for other important fisheries (e.g. American Lobster); and (3) make recommendations on future work to improve spatial use characterization data for use by decision makers.

II. APPROACH

VMS and VTR data were obtained from the **National Marine Fisheries Service**, with time and permit numbers removed to protect confidentiality. VMS data were available from 2006-2010 for the groundfish, monkfish (excluding Mid-Atlantic vessels), scallop, Atlantic herring, and surf clam/ocean quahog fisheries. VTR data were available from 1997 to 2010 for many federally permitted fisheries.

Preliminary VTR and VMS based maps were used at meetings in New England to (1) inform people of the project and likely products; (2) solicit comments on the accuracy of the maps; (3) solicit input on information missing from the maps; and (4) solicit input on information to produce maps for other fisheries.

III. RESULTS

a. VMS MAPS

Raw VMS data points (**Figure 1**) were too dense to discern patterns of fishing activity. VMS Point Density maps were produced for the groundfish (**Figure 2**), monkfish, scallop, herring, and surf clam/ocean quahog fisheries. A composite VMS Point Density map was produced by combining data for these fisheries to show broad patterns of spatial use by commercial fisheries.

VMS point density maps:

i. do not allow delineation of vessel speed to segregate steaming/ transit time from fishing, areas of very slow speed, or locally important areas that do not show up as higher use areas (yellow, orange, or red) from a regional perspective;

ii. are available for only five fisheries;

iii. are available for only five years (2006-2010).

b. VTR MAPS

VTR data were available for most species from 1997 to 2009. Data were available by 10 minute squares and were classified into trip number and various catch levels based on information on fisheries and discussions with fishermen. Groundfish VTR records for number of trips (**Figure 3**) and catch (**Figure 4**) are shown to illustrate VTR maps.

VTR maps:

i. show broad trip and catch spatial patterns, e.g. inshore/offshore or north/south;

ii. are limited because of precision errors in recording fishing location;

iii. are available for many fisheries or species;

iv. are available for a longer period of time.

IV. OTHER MAPS

The project also compiled maps for other fisheries such as tuna (**Figure 5**) to begin mapping commercial fishing patterns for fisheries not well represented by VMS or VTR.

V. DISCUSSION

Characterization of commercial fishing activity using VMS and VTR data provide maps useful for regional ocean planning efforts and other uses, to understand where fisheries occur. However, caution should be used to:

a. use maps for broad characterizations, recognizing that detailed local, site specific characterization is needed;

b. recognize that VTR and VMS data are available for relatively short, recent time frames and that understanding of historic fishing patterns are important to consider;

c. recognize that some important fisheries in the northeastern U.S. (e.g. American lobster) are not adequately covered by VTR or VMS.

To improve maps of commercial fishing activity available for regional ocean planning, future work recommendations include:

a. Separate steaming/transit activity from fishing activity for VMS maps.

b. Delineate locally important fishing areas that show up as lower use on regional VMS maps.

c. Produce a composite VTR map of as many fisheries as possible to show regional spatial patterns of commercial fishing.

d. Develop ways of mapping fisheries that are not well represented spatially with VTR or VMS reports (e.g. American lobster and tuna).

e. Map past fishing patterns to demonstrate spatial area variation over time.

*In summer 2013, NROC will have maps available at **www.northeastoceandata.org**.*

This will begin a new phase of work to address some of the issues listed above.

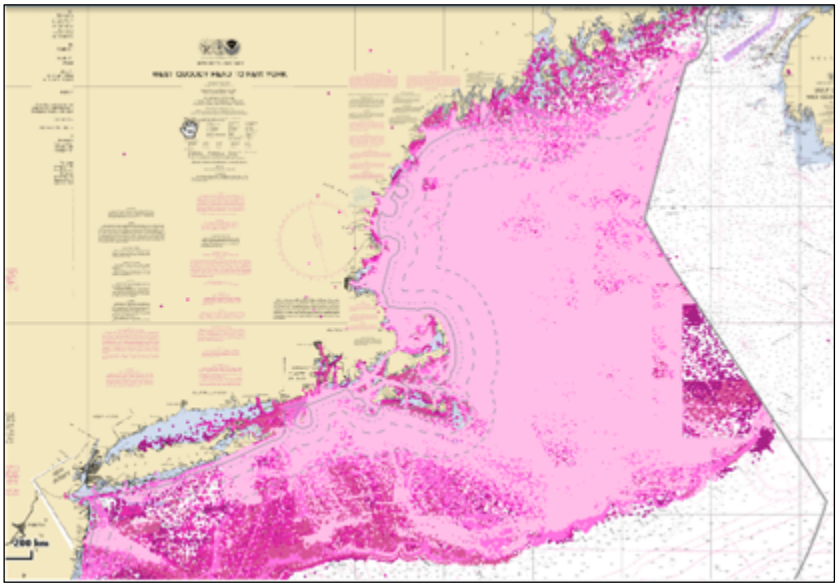

Figure 1: VMS Groundfish, 2006-2010, raw data points

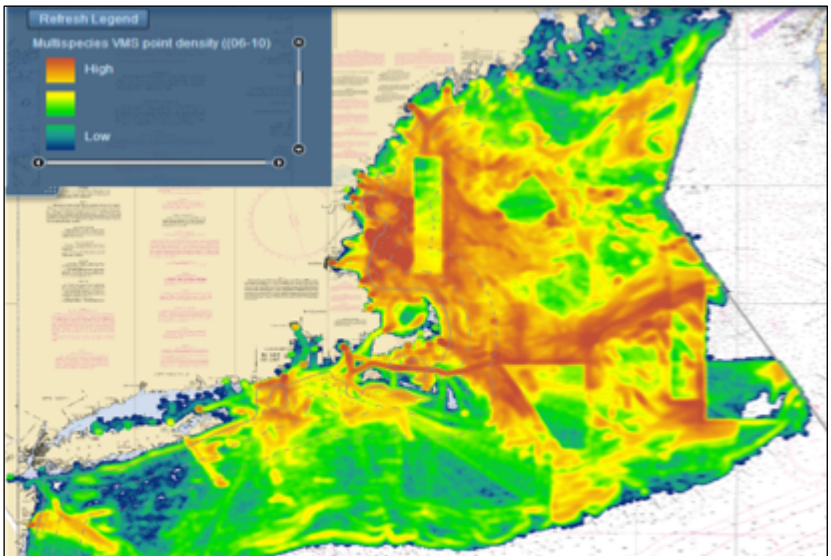

Figure 2: Groundfish VMS, 2006-2010

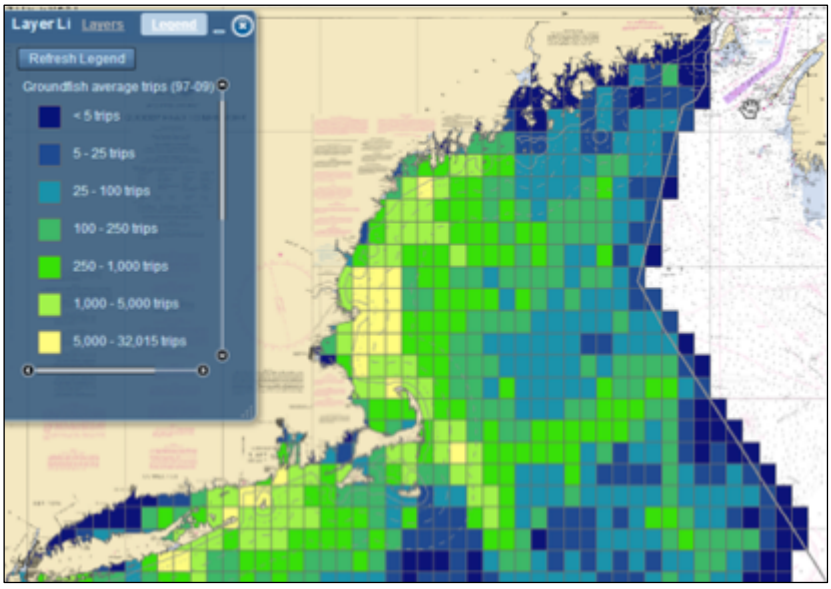

Figure 3: VTR groundfish trips, 1997-2009

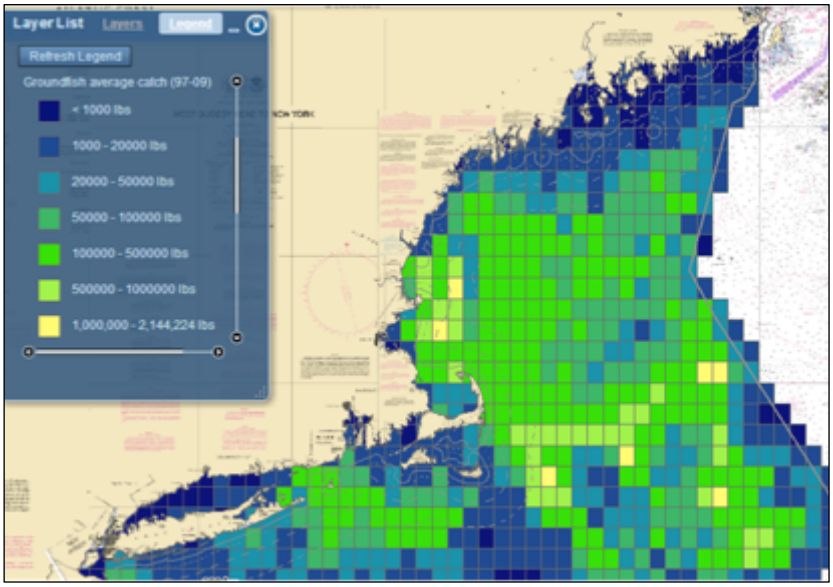

Figure 4: VTR groundfish catch, 1997-2009

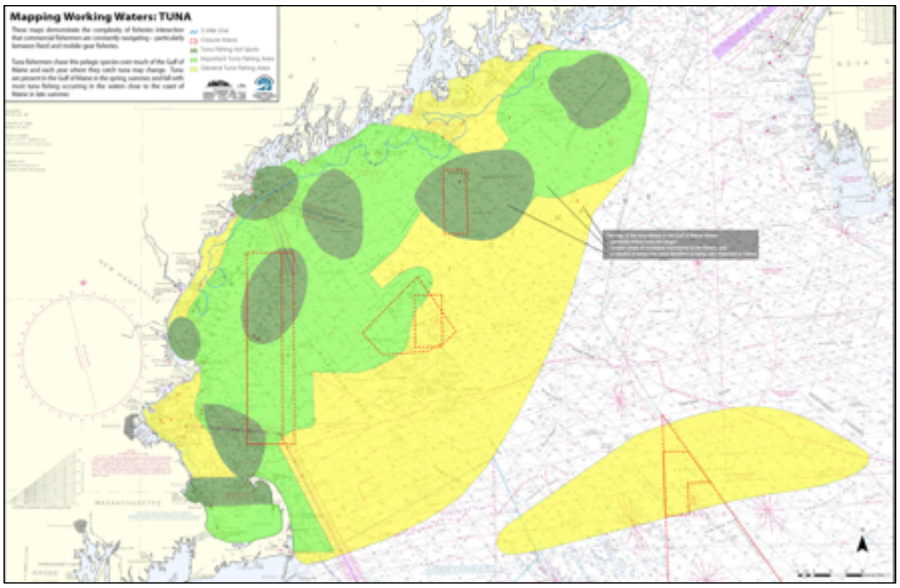

Figure 5: Tuna fishing areas in New England (from Mapping Working Waters project)

NROC mapping fishing activity to reduce offshore use conflicts

HALLOWELL, ME -- The Northeast Regional Ocean Council (NROC) is in the process of mapping commercial fishing and party/charter boat activity in New England waters.

The purpose of the project is to arm the fishing industry with information that will allow it to respond to proposed offshore energy, aquaculture, port, and/or shipping projects, according to George Lapointe, the former commissioner of the Maine Department of Marine Resources who now is working with NROC as a consultant.

"We want a regional perspective on where fishing actually occurs so that when other uses come up, siting can be based on the best available information on fishing activities," he said.

Convened in 2005 by New England state governors, NROC now is a partnership of the region's states and several federal agencies focused on advancing science related to ocean planning.

The NROC project team is made up of individuals from the Island Institute, Rhode Island Sea Grant, the University of Rhode Island Coastal Resources Center, and Lapointe.

NROC's fisheries mapping project is initially focused on compiling existing data from vessel trip reports and vessel monitoring systems. It also is intent on identifying the limitations of these data such as those caused by fisheries that take place without federal permits.

An important way the project team is dealing with gaps in fishing activity is talking to fishermen, according to Lapointe.

In recent months, NROC staff has been engaging fishermen through informal meetings and working with fisheries managers and scientists to figure out ways to get more fishermen involved.

A number of issues have been raised during these discussions, including the need to describe not only areas of high use but also areas of relatively low use that may be important to smaller harbors or fleets, as well as areas that are used by fishermen to travel to and from fishing grounds.

The need to display information on the maps in a way that protects privacy also has come up, as have ideas for incorporating state data and the fact that fisheries management actions can change where fishermen need to fish.

"Over the next few months, the project team will be holding discussions with fishermen across New England to review draft maps, identify holes in information, discuss ways to fill those holes, and identify other (factors) necessary for interpreting these maps," NROC said in a background memo. "Stakeholders will have a chance to ground-truth and improve how fishing activity is shown."

During NROC's initial informal meetings with industry members, some people have asked how this mapping project differs from past and current mapping efforts tied to ocean energy development in Southern New England and the Gulf of Maine.

The NROC project team said it is applying the techniques that worked for local mapping endeavors to the larger geography of the waters off New England.

Lapointe added that some fishermen fear the information gathered by the mapping project will be used against them. But, he warned that decisions made in a knowledge vacuum are the real threat.

"When people don't know what's going on, it just causes trouble, both for project developers and for fishermen," he said.

Added NROC, "A better understanding of where and when fishing takes place can lead to better decisions in ocean planning and reduce the potential for conflicts with new and traditional ocean uses. This approach can't guarantee that conflicts won't occur because we know that they will occur. But the idea is that future discussions about ocean uses will be based on solid information."

For more details about the NROC ocean mapping project, contact any of the following: Nick Battista by phone at (207) 594-9209 or by e-mail at <nbattista@islandinstitute.org>; Azure Cygler, phone (401) 874-6127, e-mail <azure@crc.uri.edu>; or Lapointe, (207) 557-4970, e-mail <georgelapointe@gmail.com>.

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