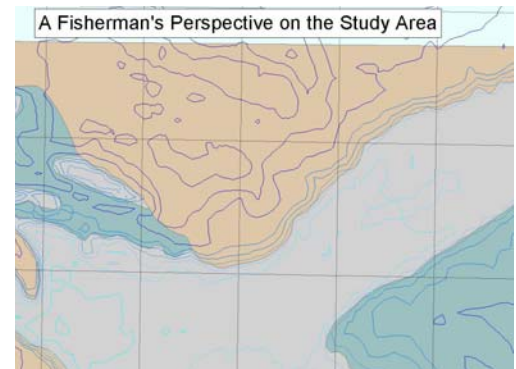
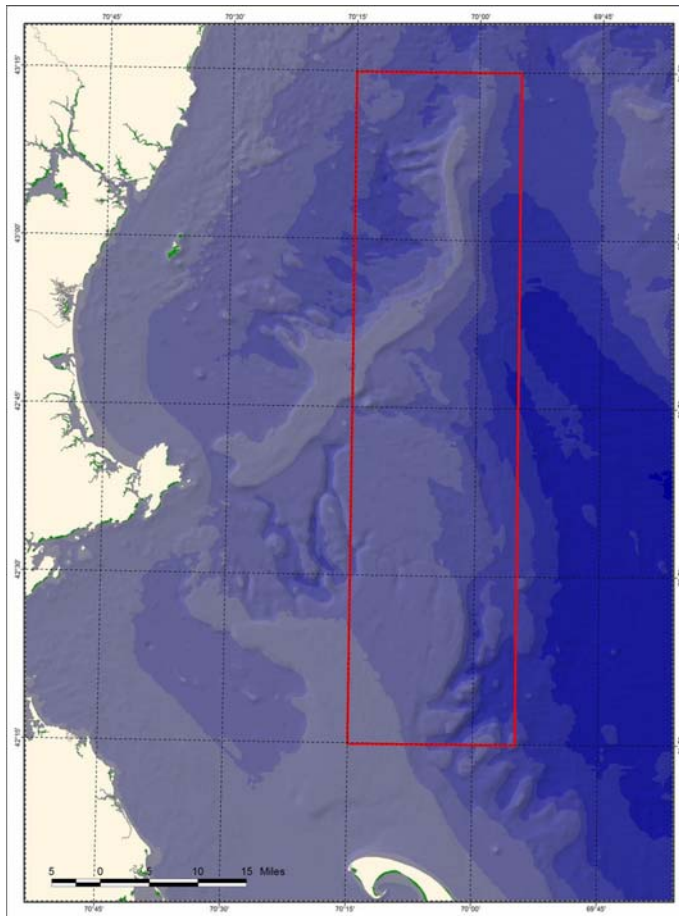


WESTERN GULF OF MAINE AREA CLOSURE: INVESTIGATORS' MEETING SUMMARY

CRITICAL RESEARCH THEMES AND INITIATIVES TO BETTER UNDERSTAND THE BIOLOGY, ECOLOGY, & OCEANOGRAPHY OF CLOSED AREAS



1km MODIS imagery for Chlorophyll and SST for day 201/2001

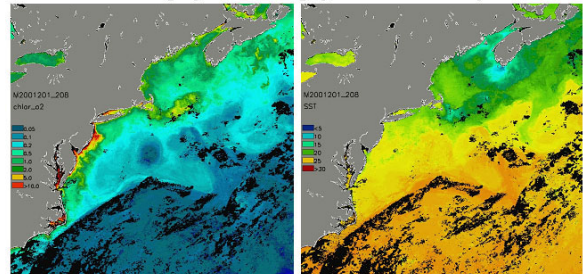


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Introduction

In recent years, research activities on Jeffreys Ledge and in the Western Gulf of Maine Closure Area have increased substantially. Consequently, Andy Rosenberg at the University of New Hampshire (UNH) and Ray Grizzle at UNH's Jackson Estuarine Laboratory saw an opportunity to advance the understanding of closed area biology, ecology and oceanography by sharing information and exploring possible collaboration among the investigators currently working in the Western Gulf of Maine Closure Area. They approached the Northeast Consortium with a request to sponsor an investigators' meeting that aimed to:

- ◆ Share information about research activities on Jeffreys Ledge and the Western Gulf of Maine Closure Area.
- ◆ Explore opportunities for collaboration or other coordinated activities among investigators.

The Northeast Consortium was pleased to support the meeting, which brought together over thirty researchers from the fields of ocean engineering, physical and biological oceanography, fisheries biology, and ecosystem analysis, with nearly ten commercial fishermen and fishing industry representatives actively engaged in cooperative research. The Northeast Consortium encourages and funds cooperative research, linking commercial fishermen and researchers, and central to its mission is the integration of fishermen's knowledge with scientific research. The meeting summarized here was an important step in jointly identifying and building research strategies on closed areas in the Gulf of Maine.

Hosted by the Northeast Consortium, Cooperative Institute for New England Mariculture and Fisheries (CINEMAR) and the University of New Hampshire, the meeting was held on October 30, 2003 at the Browne Center in Durham, NH. CINEMAR was established to provide regional leadership and integration for research, development, education, and outreach for issues of resource use, management, and preservation in New England's waters. The hosts recognize the importance of the closed area questions to a broad spectrum of fisheries stakeholders and believe that anything that can advance our understanding of how closed areas function will be of great benefit to resource conservation and productive fisheries.

Investigators' Meeting and its Product

Over forty investigators in attendance reviewed the current status in the fields of ocean mapping, habitat analysis, fisheries and ecosystem function – what do we know and what do we need to know – and examined exhibits on new measuring and monitoring technology, before breaking into small groups to identify and flesh out the critical research themes and priorities within three general topic areas: Fisheries Biology; Fishing and Stock Rebuilding; Habitat Mapping and Monitoring; and Biological Oceanography and Ecosystem Modeling.

Summaries of the discussion from each of the small groups were presented in plenary for review and comment by other participants. Below is the meeting summary for each of the topic areas.

Fisheries Biology: Fishing and Stock Rebuilding

Research Theme 1 – Ecosystem Function Changes

- Determine relationship between abundance of gelatinous zooplankton to fish abundance and feeding.
 - Can patterns in fish larvae and recruitment be characterized?
- Interpret food habits database for Western Gulf of Maine.
 - What can we find out about current feeding habits?
- Evaluate changes in feeding energetics over time.
- Define key indicators of ecosystem function.
 - Are they different inside and outside the closure area?
 - What is the effect of fishing?

Research Theme 2 – MPA Effectiveness

- Verify that increasing abundance in the closed area can repopulate other areas.
- Determine the exchange of fish inside and outside the closure area.
- Find out how much time the different life stages of a species spends inside the closure area.
- Verify that the size of the reserve is appropriately matched to the movements of the species.

Research Theme 3 – Habitat and Quality/Population Dynamics

- Resolve the impacts of land use.
- Reveal characteristics of high quality habitat for different life stages.
 - Is it a factor of substrate or some other feature?
- Determine the relationship between habitat characteristics and vital rates.
- Answer whether the presence or absence of fishing gear affect spawning success.
- Observe whether there are differences in juvenile recruitment and survival to the habitat inside and outside the closed area.

Research Theme 4 – Fish Behavior and Stock Recovery

- Understand the organizing behavior for spawning.
 - How does it relate to recovery?
- Determine if the behavior of the predators and behavior of prey affect recovery.
- Study the repopulation of depleted areas.
 - How does repopulation occur?

- Indicate the typical behavior of spawning fish.
 - Is the typical behavior changed in the presence of fishing gear?

Participants in the Fisheries Biology Small Group:

Jim Dochterman, Wells National Estuarine Research Reserve
 David Goethel, F/V *Ellen Diane*, Reporter
 Jenn Greene, University of New Hampshire, Jackson Lab, Note-taker
 Pingguo He, University of New Hampshire, Ocean Process Analysis Lab
 Hunt Howell, University of New Hampshire, Zoology Department
 Peter Kendall, F/V *Miss Alicia*
 Craig McDonald, Stellwagen Bank Marine National Sanctuary
 Andy Rosenberg, University of New Hampshire, Facilitator
 Olivia Rugo, Massachusetts Fishermen’s Partnership

Habitat Mapping and Monitoring

Research Theme 1 – General

- Address the need to establish a common definition of what a “habitat map” is in connection with the term bathymetry, backscatter, sidescan, multibeam, videography, etc.
- Establish a connection between biology and habitat.
- Find a common area to share research questions and existing /past projects so scientists will not ask for funding for the same project currently taking place.
 - Will this encourage more collaboration among projects?
- Base much of further work on a comparison of the inside verses the outside of the Closure Area.
- Create a framework or strategy to define an area that will be mapped.

Research Theme 2 - Technology

- Identify the key questions that will dictate where to map further and how it will support those goals.
- Collaborative parties need to clarify specific questions to help direct research that will be valuable on a long-term scale.
- Identify the spatial scale most needed when gathering multibeam/bathymetry data.
- Establish strategies for mapping.
- Identify cost effective ways to map the area.
 - Should the focus specifically be on collecting side scan data or other acoustic techniques?
- Create a central place for habitat data as a shared resource.
- Identify areas that should be mapped with high resolution.

Research Theme 3 - Biology

- Define maps that focus on fish.
- Focus on the relationships between biological data in the water column and physical data on the bottom.
- Define what is meant by “fish habitat.”
 - Where does a fish’s habitat start and end?
- Focus primarily on fish spawning when mapping.
- Define a system of protocols to define an area.

Research Theme 4 – Data Source

- Use Fishermen’s knowledge as a source of data.
- Create habitat maps showing where fish have been located, and at what depth, as a resource for fishermen to locate fish more effectively.
 - Would this be helpful in connection with rolling closures?
- Fishermen would appreciate the creation of habitat maps that break down the closure area into a grid with locations marked where fish are commonly found.
- Have fishermen point out on a map where in the closure area they have found fish and use that information to locate areas for additional research.

Research Theme 5 – Habitat Monitoring

- Make both short-term and long-term habitat monitoring high priorities.
- Identify the key metrics that should be measured.
- Continue monitoring temporal variabilities.
- Identify key areas for intensive monitoring.
- Develop monitoring programs that answer the research questions being asked.
- Link this program to other monitoring programs, specifically GoMOOS.
- Help fishermen by deploying a buoy in the region with a map showing how vertical parameters, such as bathymetry, temperature, chlorophyll-a, and biological data would be helpful for analysis.
- Place a GoMOOS buoy in the region to extend the current ocean observation research going on in the Gulf of Maine.

Participants in the Habitat Mapping and Monitoring Group:

Amy Holt Cline, University of New Hampshire, Note-taker
Rollie Barnaby, University of New Hampshire Cooperative Extension
Bradley Barr, NOAA National Marine Sanctuary Program, Facilitator and Reporter
Ken Ekstrom, MIT Sea Grant
Cliff Goudey, MIT Sea Grant
Ray Grizzle, University of New Hampshire, Jackson Lab
Bob Hannah, Gloucester fishermen

Rebecca Jones, University of New Hampshire, Ocean Process Analysis Lab
Bill Lee, *F/V Ocean Reporter*
Mashkoo Malik, University of New Hampshire, Center for Coastal & Ocean Mapping
Craig Mavrikis, *F/V Marion Mae*
Larry Mayer, University of New Hampshire, Center for Coastal & Ocean Mapping
Megan Tyrrell, Massachusetts Coastal Zone Management
Alan Vangile, *F/V Special K*
Larry Ward, University of New Hampshire, Jackson Lab

Biological Oceanography and Ecosystem Monitoring

Research Theme 1 – Biodiversity & Ecosystem Function: How does biodiversity affect ecosystem function as measured by production, biomass, resilience and living marine resources?

- Study processes that affect recruitment, feeding, predation, growth, and production in spatially complex habitats vs. simpler habitats. Complexity here refers to both biological and physical heterogeneity, since the two are not completely separable.
- Compare the in and out of the protected area (but the group cautions that simple in/out comparisons suffer from a lack of replication or control).
 - What could be some of the reasons why processes differ in and out of the protected area?
 - Would a study that focuses on processes have a better chance of being transferable to other areas?
- Perform a “state” of the system assessment and consider what it might have been like and how it got forced to its present condition, which is the starting point of new studies.
 - What would it take to force it to another state (either “richer” or “poorer”) in terms of diversity, production, resilience, and the specific production of living marine resources?
- Decide what the scope of an ecosystem study should be in this area.
 - What can be realistically accomplished?
 - What study scale is appropriate for all approaches or levels of detail?
 - How does the topography affect small-scale circulation that affects larval settlement, propagule dispersion, micro-scale habitats (including shear, chemistry, particulate deposition and resuspension)?
 - Nest a high-resolution circulation model within the bigger Gulf of Maine circulation that sets the scene for water type and condition, sources of larvae, and changes over seasonal, annual and longer time periods.
 - Could existing models be used at the study site to know what is there, how it is affected by the local circulation (e.g., turbulence and density structure), and how these distributions interact with the biota to affect feeding rates?

- Resolve the level of detail and understanding that is necessary to answer the closed area ecosystem questions.
 - What are the compositions, abundances and vertical structures of phytoplankton, zooplankton and other particulates for suspension feeders and small predators?
 - What are the roles of microbial populations in chemical processes and as prey?
 - What are the trophic interactions?
 - How does life history pertain to settlement?
 - What is the true diversity of the place?
 - What information can we learn about small cod, from transition juveniles up to 10cm and beyond?
 - Are there small-scale circulations, and what are their retention characteristics, boundary layer flows and turbulence patterns?
 - What are the metabolic requirements and other rate processes?
 - How do carbon and dissolved chemical fluxes occur in the varied zones?

Research Theme 2 – Social/Economic Analysis

- Include social and economic interactions with the rest of the ecosystem model, no matter how small the study area may be (closed areas have a special association with social concerns, especially on Stellwagen Bank).
- Establish experiments that are particularly suited to closed areas
 - What happens when you remove a species from the system?
 - What is the function of closure?
 - What is the closure telling us about human impacts?
 - What is the function of landscape heterogeneity (e.g., from 3-D structural effects down to the level individual rocks) in sustaining ecosystem function and production?
 - What ecological functions can an MPA conserve or restore?

Participants in the Biological Oceanography and Ecosystem Modeling Group:

Holly Abeels, University of New Hampshire, Jackson Lab, Note-taker

Jeb Byers, University of New Hampshire, Zoology Dept.

Ann Bucklin, University of New Hampshire, Ocean Process Analysis Lab

Andy Cooper, University of New Hampshire, Natural Resource Dept.

Mark Dowell, University of New Hampshire, Ocean Process Analysis Lab

Lew Incze, University of Southern Maine, Bioscience Research Institute, Facilitator and Reporter

Les Kaufman, Boston University

Jamie Leff, University of New Hampshire

Elizabeth Methratta, Northeast Fisheries Science Center

Rob Robertson, University of New Hampshire, Resource Economics & Development

Jeff Runge, University of New Hampshire, Ocean Process Analysis Lab

Elizabeth Soule, Boston University

Conclusion and Next Steps

This workshop was spawned from informal discussions about the number of scientists and fishermen actively conducting research in the general area of the Western Gulf of Maine Closure Area (WGOMCA) and Jeffreys Ledge. The result was a very productive workshop that emphasized the relationship between fishermen and scientists, and culminated in a summary of important needs with respect to future research. Closed areas have become a major tool for managers and others seeking to re-build depleted fish populations. However, much remains to be learned about their effectiveness, particularly with respect to how they should be designed and maintained. These are complex topics and they involve many stakeholders. This workshop was intended as a first step in sharing information and setting the stage for future collaborations that will address relevant issues for one of the largest closed areas in the Northeastern US.

The hosts for the workshop, the Northeast Consortium and the UNH/NOAA Cooperative Institute for New England Mariculture and Fisheries, fund several projects discussed at the opening session of the workshop. The mission of both these agencies is broader than the WGOMCA. Hence, the workshop fits within the broader missions of both agencies and both are potential funding sources for future projects that hopefully will spring from the workshop. The present document is offered as a summary of those topics that the participants deemed most pressing for future collaborative research involving fishermen, scientists, and others concerned with understanding how closed areas function and how they can be improved.

Attachment I

WESTERN GULF OF MAINE AREA CLOSURE: INVESTIGATORS' MEETING AGENDA

October 30, 2003

The Browne Center, Seminar Building
(603)868-1772

Objectives:

- *Share information about research activities on Jefferys Ledge and the Western Gulf of Maine Area Closure*
- *Explore opportunities for collaboration or other coordinated activities among investigators*

9:30 – 10:00am Coffee & Registration (Display and exhibits available)

10:00 – 10:20am Welcome & Introductions (Andy Rosenberg)

PRESENTATIONS:

10:20 – 10:50am *Multibeam mapping in the Western Gulf of Maine Closure Area.*
Larry Mayer, University of New Hampshire.

10:50 – 11:20am *Habitat recovery in closed areas.*
Craig McDonald, Stellwagen Bank National Marine Sanctuary.

11:20 – 11:50am *An ecosystem-level study of the Western Gulf of Maine Closure Area.*
Ray Grizzle, University of New Hampshire.

12noon – 12:30pm **Working Lunch**

12:30 – 1:00pm Display and exhibits

- *Passive Acoustic Applications in Marine Fisheries.*
Cliff Goudey and Ken Ekstrom, MIT Sea Grant and Rodney Roundtree, UMass Dartmouth.
- *Video Equipment and Research in the Gulf of Maine.*
Bill Lee, F/V Ocean Reporter, and Cape Ann Fisheries Institute.

1:00 – 1:30pm *The potential effects of fishing activities on ecosystem processes in the Western Gulf of Maine Closure Area.*
Elizabeth Methratta, Northeast Fisheries Science Center.

BREAK OUT SESSIONS

1:30 – 1:45pm Andy Rosenberg: Objectives & Overview of Breakout Sessions

1:45pm – 3:30pm	Habitat Mapping & Monitoring	Fish Biology: Fishing & Stock Rebuilding	Ecosystem Modeling	Biological Oceanography: 1° & 2° Production
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PLENARY

3:30 – 4:30pm Report out from break out sessions

3:30 – 3:15pm Habitat mapping and monitoring

3:15 – 4:00pm Fish biology

4:00 – 4:15pm Ecosystem modeling

4:15 – 4:30pm Biological oceanography

4:30 – 5:00pm Discussion: What opportunities exist for collaboration and/or coordination across topic areas? Next steps. (Andy Rosenberg)

5:00pm Thank you and Closing (Andy Rosenberg)

Attachment II

WESTERN GULF OF MAINE AREA CLOSURE: INVESTIGATORS' MEETING

Final Participants List

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