Proceedings of the Mid-Atlantic Fishery Management Council's Habitat-Ecosystem Workshop

Virginia Beach, VA
December 13-14, 2010

Edited by David Packer

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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EXECUTIVE SUMMARY

The Mid-Atlantic Fishery Management Council's (MAFMC's) Habitat-Ecosystem Workshop was held December 13-14, 2010 in Virginia Beach, VA. The workshop was organized by the MAFMC in partnership with the NMFS Office of Habitat Conservation, the NMFS Office of Science & Technology, and the NMFS Northeast Regional Office. Participation and attendance at the workshop reached nearly 100 people, with participants from the MAFMC, NOAA, New England and South Atlantic Fishery Management Councils (NEFMC, SAFMC), Atlantic States Marine Fisheries Commission (ASMFC), states, regional governance bodies (governors' regional association, Mid-Atlantic Regional Council on the Ocean [MARCO]), environmental organizations, fishing industry, and the public. The one and a half day workshop featured 27 presentations grouped by three panels (policy/management, science, and stakeholder), with each panel designed to identify the roles of the individual attendees, beginning with introductory talks followed by technical presentations and panel discussions. Topics were identified to advance collective efforts to enhance, protect, and restore habitats and ecosystems, with extensive discussions on new policies (the President's National Ocean Policy), broader perspectives (ecosystem approaches based on regional priorities), new tools (coastal and marine spatial planning, integrated ecosystem assessments), and new partnerships (related to ocean energy, national marine sanctuaries, etc.).

The goal was to identify projects and opportunities for the MAFMC to move toward the forefront in utilizing the latest habitat and ecosystem science, policy, and management to provide healthy mid-Atlantic fisheries. The primary target for the discussions was the Council membership, who obtained perspective from the presentations on what is available from the various offices, programs, research, etc. that will help the Council to do its job better. The workshop established and strengthened partnerships to extend these benefits to other mid-Atlantic activities with shared interests, beginning with NOAA, other federal and state agencies, environmental and industry NGOs, and constituents. Because coastal and marine resources and the habitats that support them are important to many groups in the mid-Atlantic region for many reasons, the Council will use its specific role in the fishery management process to forge broader discussions about coastal and marine ecosystems, current and projected human activities, and the full array of resource management approaches and tools available to improve habitat and ecosystem health in the mid-Atlantic.

The primary outcome of this workshop was to identify proposed projects and actions for the Council to implement which more fully incorporate habitat science, ecosystem-based fishery management, and coastal and marine spatial planning into the Council's management efforts. Each speaker identified what they saw as the next steps in developing possible proposals and projects with Council involvement, and the panel discussions helped to reiterate and highlight those ideas. Below are the top recommendations from each of the three panels.

Top Recommendations from the Policy/Management Panel

- The MAFMC should review the National Ocean Policy for opportunities with the nine priority objectives.
- Continue/expand these discussions to include groups/issues not represented at this workshop, and learn from other efforts elsewhere; pursue opportunities for other sectors/groups to share roles as host, convener, and facilitator. Identify pilots and opportunities for specific action to fulfill the intent established at this workshop, using existing resources.
- Invest in the process and context of essential fish habitat (EFH) reviews with a view beyond the MAFMC's immediate Magnuson-Stevens Act (MSA) regulatory requirements to designate EFH in its fishery management plans (FMPs). Continue discussing coastal and marine spatial planning (CMSP).
- Participate in the NOAA Deep-Sea Coral (DSC) Research and Technology Program's northeast/mid-Atlantic research priorities workshop/fieldwork planning for 2013-15. Exercise MSA discretionary authority to designate DSC protection zones, use EFH and habitat areas of particular concern (HAPCs) as tools for DSC management, and designate a primary point of contact for coral-related issues. Monitor bycatch and habitat impacts of fishing on DSCs.
- Work with regional NOAA/NMFS Restoration Center (RC) staff in their regional prioritization efforts to identify priority watersheds and waterbodies for habitat restoration; work with regional RC staff and local partners in the mid-Atlantic to develop funding proposals and projects of mutual interest to the Council and RC; explore the possibility of becoming a formal partner with the RC in response to their FY 2012 solicitation for partnerships; work with the RC to develop outreach products that address the importance of habitat restoration for federally managed species; advocate the importance of assessing and understanding the link between nearshore and estuarine habitats, diadromous fish species, and federally managed species.
- Develop a regional Marine Protected Area (MPA) network for the mid-Atlantic, and once formed, integrate MPAs with the Integrated Ocean Observing System (IOOS) and work with the North American MPA Network (NAMPAN) to develop "condition reports" for the sites. Partner with the National MPA Center

(NMPAC) to continue/complete ocean mapping of human uses/activities in the mid-Atlantic. Take advantage of training opportunities on adaptation to climate change, developing MPA networks, CMSP, etc. offered by NMPAC and NOAA's Office of National Marine Sanctuaries. Take advantage of the NMPAC's information clearinghouse on MPA resources and databases to help inform the Council's work on spatial management.

- Coordinate with the National Ocean Service and NMFS to convene a workshop on canyon/seamount habitat in the mid-Atlantic/New England regions to assess the status of resources, state of knowledge, threats, and conservation alternatives available through the MSA and other authorities; support surveys/research to address questions regarding the diversity, distribution, and abundance of species living in canyon/seamounts.
- Become familiar with the state Coastal and Estuarine Land Conservation Program (CELCP) leads in the region and funding opportunities under the program; review state CELCP plans to identify shared priority habitats/landscapes; contact state CELCP leads to share information on additional fisheries priority habitat.

Top Recommendations from the Science Panel

- NMFS and MAFMC should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments; NMFS habitat and stock assessment scientists should work together with fishery managers to initiate demonstration projects that incorporate habitat data into stock assessment models.
- Maintain the dialogue between NMFS and the Council to develop science products that meet the needs of the Council; e.g., develop/update the 5-year research priorities submitted to the NMFS Science Center Directors reflecting ecosystem/habitat science needs identified by the Council or improve the protocol for providing Northeast Fisheries Science Center (NEFSC) habitat-science support to the MAFMC.
- The Council should continue to seek recognition on the Regional Planning Body, participate to the fullest extent possible in the CMSP process, and work with state/local partners in protecting fish habitat.
- The MAFMC should evaluate options for the designation of spatial management units as the basis for development of integrated management plans for defined ecoregions.
- Better connect science/management activities of the Chesapeake Bay Fisheries Goal Team, ASMFC, and MAFMC.
- Convene a NOAA habitat mapping consortium/meeting, organized by the NOAA North Atlantic Regional Team and hosted by the NMFS/NEFSC James J. Howard Marine Sciences Laboratory, and include representatives of the NOAA Chesapeake Bay Office (NCBO), MAFMC, NEFSC, etc.
- Improve communication pathways/networks to include all sectors with influence over land and marine habitats and develop better visualization tools describing ecosystems, their inter-relationships, and the specific outcomes that can result from applying ecosystem approaches to management; fully integrate modeling, observations, research, and monitoring to facilitate scenario testing and tradeoff discussions.
- Establish the resilience of the ecosystem and keystone populations in the ecosystem as the goal of ecosystem science/management in the mid-Atlantic. Encourage government and academic scientists to openly collaborate with the fishing community to perform the science required to identify processes in the mid-Atlantic ecosystem that promote the resilience of keystone populations and ecosystem.
- Establish a research set-aside program focused on the goals of ecosystem science and management.
- Educate the public and stakeholders about the complexity of the mid-Atlantic ecosystem.

Top Recommendations from the Stakeholder Panel

- In partnership with MARCO, compile GIS information on offshore areas, and share habitat information, particularly on the submarine canyons; exchange data/information through the online MARCO Mapping and Planning Portal; coordinate on developing management objectives and creating the Mid-Atlantic's Regional Planning Body and defining roles for the Fishery Management Councils; continue discussions of enhanced mechanisms for MAFMC participation in MARCO processes in order to incorporate the needs of the commercial/recreational fishing communities.
- The MAFMC Science and Statistical Committee's Ecosystem Subcommittee should provide the MAFMC with scientific advice to support/inform development of the Council's ecosystem level goals/policies; identify/describe scientific advice that the MAFMC could use to address/incorporate ecosystem structure/function in its FMPs and quota specification process to ensure the Council's management practices effectively account for ecological sustainability; describe scientific information that the MAFMC could consider so as to anticipate/respond to shifts in ecological conditions/processes in its management programs; summarize what other regions/countries are doing to incorporate EBFM principles in their management

plans/programs; describe how ecosystems principles could be used by the MAFMC in the long-term to evolve its single/multi-species FMPs into a regional EBFM plan.

- Coordinate development of EBFM approaches and habitat issues with adjacent Fishery Management Councils, states, and ASMFC, and hold workshops. All parties should participate in the Department of Interior's North Atlantic and South Atlantic Landscape Conservation Cooperatives.
- However, the MAFMC should carefully consider the tradeoffs of adopting EBFM and CMSP approaches compared to current fisheries management approaches, and understand and prepare for some of the needed changes to organizational structure before embarking on EBFM.
- Utilize the EFH Omnibus Amendment developed by the NEFMC/MAFMC as a policy vehicle for expanded habitat protection and a process that provides public input for decision-making.
- The SAFMC will share its existing EFH policy statements, and the MAFMC/SAFMC should collaborate on developing or linking future ecological models where species may overlap jurisdictions; the SAFMC will also cooperate on including updated information for future South Atlantic Fishery Ecosystem Plan revisions for mid-Atlantic managed species occurring in south Atlantic waters.
- The Councils/regions should share information on activities and policies pertaining to offshore energy development, marine aquaculture, and marine habitat identification and conservation for diadromous species.
- Conduct a regional CMSP process that is open and transparent and based on sound science.
- Interview remaining "old-time" fishers to piece together a picture of what once was in order to protect what we have and restore what we've lost in terms of fish, invertebrates, and hard bottom habitats; protect/restore those hard bottom habitats and focus not on the substrate but on the growth that provides habitat.
- Recognize that cold water azooxanthellate corals are important to fish populations wherever they now occur or did occur, including all shallow/deep waters, and are highly vulnerable to physical disturbance of any kind, so they need to be identified/protected via the MSA's discretionary authority. Strongly consider transportable reef units sited in areas with abundant growth to gather natural set corals for later transplant.
- The ASMFC and MAFMC should strengthen communication between their habitat program staff and committees; identify projects for funding by the Atlantic Coastal Fish Habitat Partnership, Southeast Aquatic Resources Partnership, and other National Fish Habitat Partnerships; develop joint habitat educational materials; collaborate on essential fish habitat designations; develop and adopt common habitat policies (i.e., Resolution 89-IV); partner to build on existing efforts to develop a coast-wide fish habitat Geographic Information System.

As the national and regional habitat-ecosystem initiatives outlined in this workshop move forward, the Council is also impelled to move forward on these issues. The workshop showed opportunities the Council can pursue across a wide spectrum of agencies, venues, and disciplines. Some of the opportunities will be easily achievable while others present longer-term commitments; some involve working with existing programs to identify data and research needs for the mid-Atlantic region and may build on the Council's existing initiatives, particularly those involving ocean governance and ecosystem management. The Council has already taken the initiative of incorporating ecological considerations into their current fishery management plans and is beginning the transition into ecosystem management by appointing an Ecosystem Subcommittee of the Council's Scientific and Statistical Committee. The Ecosystem and Ocean Planning Committee of the MAFMC will be taking the next steps by categorizing the opportunities presented in this workshop and developing a list of priorities and an action plan for consideration by the full Council.

INTRODUCTION

Thomas B. Hoff, Senior Ecologist, Mid-Atlantic Fishery Management Council, Dover, DE

This Habitat-Ecosystem Workshop was proposed by the Mid-Atlantic Fishery Management Council's (Council) new Executive Director, Dr. Chris Moore, in August of 2010. His proposal originated in discussions he had with Tom Bigford, Chief, Office of Habitat Conservation/Habitat Protection Division, and Dr. Moore's interest in re-invigorating the Council's work on habitat and ecosystem issues.

As a result, the Council staff worked closely with National Marine Fisheries Service (NMFS) staff in the Region and Headquarters to design an ecosystem workshop that had a broad agenda and a number of invited participants. The workshop was designed with the understanding that coastal and marine resources and the habitats that support them are important to many groups in the mid-Atlantic region for a variety of reasons and furthermore that the Council could use its specific role in the fishery management process to forge broader discussions about coastal and marine ecosystems, current and projected human activities, and resource management approaches and tools available to improve habitat and ecosystem health.

The workshop was developed around 27 presentations over 1½ days. Specific workshop topics were identified to advance collective efforts to enhance, protect, and restore habitat and ecosystems including new policies (the President's National Ocean Policy), broader perspectives (ecosystem approaches based on regional priorities), new tools (coastal and marine spatial planning, integrated ecosystem assessments), and new partnerships (related to ocean energy, coastal managers, national marine sanctuaries, offshore aquaculture, or others). The presentations were grouped into panels designed to generate discussion and allow for Council interaction with the panelists. The panels included policy/management, science, and stakeholder. Nearly 100 people participated in or attended the workshop. Participants completed an evaluation questionnaire and most respondents stated they were very satisfied with the workshop. Numerous respondents advocated for an additional workshop with additional agencies involved. One of the most telling pieces of feedback came from a senior agency scientist who felt the workshop was "the most useful meeting I participated in all of 2010."

A primary outcome of this workshop was to identify proposed projects and actions for the Council to implement which more fully incorporate habitat science, ecosystem-based fishery management, and coastal and marine spatial planning into the Council's management efforts. Each speaker was encouraged to identify what they saw as the next steps in developing possible proposals and projects with Council involvement, and the panel discussions helped to reiterate and highlight those ideas. Those steps are highlighted in the box that begins each speaker's paper in this report.

In his wrap-up statements for this workshop the Council Chairman, Rick Robins, charged the Ecosystem and Ocean Planning Committee to provide the blueprint to move the Council forward on habitat-ecosystem issues. That Committee will meet in February 2011 with that sole intent. They will review the evaluation questionnaires, prioritize the speaker's suggestions, decide whether to hold another workshop, and provide guidance on projects for possible Council involvement.

WELCOME AND INTRODUCTORY REMARKS

Gene Kray, Chair, Mid-Atlantic Fishery Management Council/Ecosystem and Ocean Planning Committee, Dover, DE

Good afternoon. It is my distinct pleasure to welcome you to the first Mid-Atlantic Fishery Management Council Habitat and Ecosystem Workshop. My name is Gene Kray and I chair the Ecosystem and Ocean Planning Committee for the Council. When I was first appointed to the Council in 2003 this Committee was called the Habitat Committee. Shortly thereafter we saw the need to expand the breadth of what we were doing and it became the Ecosystem Committee. Two years ago we saw the focus widening again and it became The Ecosystem and Ocean Planning Committee. You could say that the title of the committee evolved, somewhat like what Steve Murawski said with his colleagues when he described the ecosystem approach to fishery management as an "evolution not a revolution".

We believe that we are now at a time when the science and policy issues are ready to be explored and to see how they can come together for the benefit of the various species that we manage, as well as our stakeholders in this process. The major purpose of this workshop is to convene with our partners at the National Oceanic and Atmospheric Administration (NOAA), the Atlantic States Marine Fisheries Commission (ASMFC), the Councils to the north and south of us and our stakeholders to develop a road map for the Council to follow as we look at our fishery management plans. There are obviously many questions to be addressed: Should we look at what can be accomplished in the short-term (one to three years), or as my distinguished colleague Tom Hoff describes it, "picking off the low hanging fruit?" The answer to that is yes. It has been suggested that we might look at summer flounder, since of all of the mid-Atlantic species, we believe that it is the most data rich and likely to be the most susceptible to man's impacts in the estuaries that we manage. We shall see. We of course hope that we select a species or grouping of species that we can use as a stepping stone in our plans for all of our managed fisheries in the long-term.

Another question might be: How much and what kind of data do we need and who can help us with this approach? We hope to have an answer to that question at the conclusion of this workshop.

This workshop was planned as an opportunity for the Council to engage in a discussion with the panelists and the Council. As you can see we have a very robust agenda. As time is available we will invite questions or comments from the public.

I want to thank our steering committee for all of their efforts in putting the plans for this workshop in place. Their names are listed in the agenda. There were many hours of conference calls, emails and individual phone calls involved in this process. I also want to thank our distinguished speakers and panelists who are going to guide our thinking as we deliberate and debate the issues that will provide the Council with clear direction as to how we can incorporate ecosystem-based principles and considerations into our fishery management plans.

Finally I want to thank our Chairman, Rick Robins and Executive Director, Chris Moore for their vision and support in giving us the tools to make this workshop happen.

In conclusion, I want to point out that a summary of these proceedings will be published in a "Technical Memo" by NOAA and will be available to all participants and guests attending this workshop before we put the plans in place for the second workshop on Habitat and Ecosystems in the spring or summer of 2011.

OVERVIEW OF THE NATIONAL OCEAN POLICY AND COASTAL AND MARINE SPATIAL PLANNING FRAMEWORK

Jessica Kondel, Acting Regional Coordinator, NOAA/Coastal and Marine Spatial Planning Program, Silver Spring, MD

On July 19th, 2010, President Obama acted upon the final recommendations of the Ocean Policy Task Force and signed an Executive Order adopting a new National Policy for the Stewardship of the Oceans, Our Coasts, and the Great Lakes. This is truly a historic moment for our oceans as for the first time in our nation's history we have a comprehensive National Ocean Policy.

America's rich and productive coastal regions and waters support tens of millions of jobs and account for a significant portion of the national economy. They also host a growing number of commercial, recreational, scientific, energy, and security activities, and provide a wealth of natural resources and ecological benefits. Human uses of the ocean are expanding at a rate that challenges our ability to manage significant and often competing demands.

To counter the increased demands for our ocean and coastal resources, we need a more integrated, comprehensive, ecosystem-based, flexible, and proactive approach to planning and managing uses and activities. Without this, we risk more user conflicts, increased costs and delays from planning and regulatory inefficiencies, and the potential loss of critical economic, ecosystem, social, and cultural services for present and future generations. While many existing permitting processes for the ocean, coasts, and the Great Lakes include aspects of coordinated planning, most focus solely on a limited range of sector-by-sector, statute-by-statute management tools and outcomes.

To facilitate making comprehensive ecosystem-based management of our ocean, coast, and Great Lakes resources a reality, the President's Executive Order accomplishes four important things:

1. For the first time, establishes a National Ocean Policy for the Stewardship of the Ocean, Coasts, and Great Lakes, including a set of overarching principles to guide ocean management decisions.

2. Creates an interagency National Ocean Council (NOC) formed of 27 federal entities, to provide sustained, high-level, and coordinated attention to advance the National Ocean Policy.

3. Prioritizes nine key categories for action that seek to address the most pressing challenges facing the ocean, our coasts, and the Great Lakes.

4. Establishes a flexible Framework for effective Coastal and Marine Spatial Planning (or CMSP) to address conservation, economic activity, user conflict, and sustainable use of ecosystem services.

At present, we regulate human activities in our oceans, coasts, and Great Lakes at the federal level with over 140 statutes, regulations, and policies. New regulation is not the answer. Instead, we have to change our approach to recognize that there is only one ocean, and that we need to learn to use it without using it up.

The National Ocean Policy and ecosystem-based CMSP do not create new layers of bureaucracy, instead, they call for coordination among existing management regimes to ensure that community stakeholders can participate in managing their own coasts in a fair and open forum. By requiring government agencies to work together to engage stakeholders, we will grow toward fair and open management so that all stakeholders can have a seat at the table to participate fairly in planning.

Because no two regions are exactly alike, there is not a one-size-fits-all recipe for CMSP. Each region and its stakeholders will have the opportunity and responsibility to tailor the process, ensuring that all interests and ocean, coastal, and Great Lakes users are adequately represented. This bottom-up approach will ensure that CMSP serves and responds directly to community needs. The nine Regional Planning Bodies (RPBs) established under the National Ocean Policy are designed to mirror the geography of ocean, coast, and Great Lakes ecosystems and existing regional governance structures, so that communities can work together toward developing solutions that make sense for issues they share in common with one another.

The National Ocean Policy and its CMSP Framework envision a regionally-based, collaborative planning process in which key agencies and stakeholders have a meaningful voice and responsibility in identifying goals and objectives for their regional waters and in designing a CMS Plan that allows the desired assortment of uses that reflects those goals. Stakeholder and public participation will occur throughout the development of regional CMS Plans. As a result, when a project is proposed and considered in light of the regional CMS Plan, many of the stakeholder and public concerns have already been addressed. The NOC will also provide guidance and oversight of regional CMSP initiatives.

The underpinning of the National Ocean Policy and the CMSP Framework is science. We have data and information, but not all of it is accessible or in a useable format for CMSP. The solution is better integration which will require governments, industries, academics, and others to partner together to 1) identify priorities for research in a coordinated fashion; 2) explore decision support tools to assess trade-offs associated

with managing for multiple uses and conserving the ability of ecosystems to sustainably produce services; and, 3) begin development of national and regional information systems and data portals to assist with CMSP. This will include ensuring nationally consistent derived data products from region to region. Scientific data and information generated by the Fisheries Management Councils (FMCs) will be an important part of the national and regional information systems designed to support CMSP decision-making.

As veterans of a similar process, the experienced voice of the FMCs will bring immediate depth to the CMSP process, which is why the CMSP Framework recognizes that their involvement in CMSP is critical. In addition to their expertise and science, FMCs also have statutory authority to develop management and protection measures for fisheries, habitat, and corals. These authorities will also help define the roles that FMCs play in CMSP. NOAA supports and encourages the eight FMCs to continue to actively consult with the existing regional governance organizations and work with state partners and other regional groups on the potential organization and membership of RPBs. The Framework directs the NOC to prepare guidance for RPBs in meeting these consultative requirements which has not yet been developed. Ultimately, the RPB will apply this guidance to determine the best outcome for their particular circumstances. NOAA will be actively involved in the development of this guidance given its relationship to and understanding of FMCs and their processes under the Magnuson-Stevens Fisheries Conservation and Management Act (MSA).

As we move forward with the implementation of CMSP some questions remain. However, what we do know is that CMSP will facilitate sustainable economic growth in coastal communities by providing greater efficiencies and predictability for economic investments in ocean and coastal-based businesses. This should result in reduced costs and conflicts among competing uses. CMSP should also improve ecosystem health and services by better planning human uses together with the conservation of important ecological areas (areas of spawning, breeding, and feeding), areas of rare or functionally vulnerable marine resources, and migratory corridors. CMSP will also provide opportunities for community and citizen participation in transparent planning processes that will determine the future of the ocean, coasts, and Great Lakes.

Key Question: Pennsylvania is listed as a mid-Atlantic state and has representation on the MAFMC. Would it be imperative that Pennsylvania be included as part of the Regional Planning Bodies (RPBs)?

Answer: The RPB would likely need representation from all of the states to qualify as an RPB.

Key Question: Will the MAFMC be a member to the RPBs?

Answer: The MAFMC and other Councils will not be direct members at this point. The RPBs will be required to establish coordination mechanisms with the relevant Councils. The Councils will have a consultative role in the process. The MAFMC has requested a seat on the staff, working group, and Executive Board levels of the Mid-Atlantic Regional Council on the Ocean (MARCO), since existing regional structures may be the foundation for RPBs.

Key Question: If the decisions from the MAFMC are inconsistent with the RPB, what happens?

Answer: The MAFMC would be required to notify the RPB. A dispute resolution mechanism has yet to be determined. RPB's will not usurp existing authorities.

Key Question: When will the RPB's be in place?

Answer: The National CMSP Workshop is expected to be in May, and the RPBs should form soon after that.

POLICY/MANAGEMENT PANEL

CONNECTING OPPORTUNITIES IN THE MID-ATLANTIC

Pat A. Montanio, Director, NOAA/National Marine Fisheries Service, Office of Habitat Conservation, Silver Spring, MD

Major Recommendations

- The MAFMC should review the National Ocean Policy for opportunities with the nine priority objectives. The strategic action plans for each objective are available in mid-2011 at: <http://www.whitehouse.gov/blog/2011/01/24/open-comments-ntl-ocean-policy-strategic-action-plans> offer entrees into regional ecosystem protection and restoration, ecosystem-based management, coastal and marine spatial planning, and other national coastal and ocean priorities. Our regional discussions should help us identify opportunities for success in the mid-Atlantic and beyond. Similarly, we have much to learn from other efforts elsewhere.
- This workshop highlighted many NOAA programs with potential connections to managing the mid-Atlantic regional ecosystem. Let us commit to working with other workshop attendees and others not present but who share our interests. Other federal agencies, each state, the private sector (industry and environmental groups), separately and through joint efforts, offer opportunities to leverage and succeed.

"Overfishing was the challenge of the 20th century; the challenge for the 21st century will be habitat degradation," according to Dr. Robert Diaz from the Virginia Institute of Marine Science. More specifically, our challenge is to maintain suitable coastal and marine habitats not only for healthy fisheries but also for other ecosystem services – recreation, water quality, shoreline protection – all while ocean uses and stressors are increasing and our fiscal resources are limited. Besides our historic roles, our evolving portfolio extends to offshore energy, invasive species, and climate change; the latter includes sea level rise and ocean acidification. These challenges implore us to preserve, restore, and improve habitat conditions so the mid-Atlantic can provide the full range of economic and societal benefits.

The National Ocean Policy offers a fresh reminder of the complex web of statutes, regulations, and policies that govern the use of our coasts and oceans. The growing number of groups and partnerships offer new opportunities to improve natural resource management through coordination and collaboration. We are fortunate to have this workshop, hosted by the Mid-Atlantic Fishery Management Council and attended by so many partners, which will serve as a valuable step forward for the mid-Atlantic regional ecosystem.

A review of statutes, threats, and opportunities reveals the importance of joining forces for our common interests. Partnerships offer opportunities to leverage our assets, including expertise and funds. In the mid-Atlantic we have a strong assemblage of state, federal, and joint efforts that offer the promise of greater collaboration. Existing and new opportunities cover the full sweep of NOAA capabilities (many also presenting at this workshop) and extend to other agencies and the private sector. We will be strongest by moving forward together.

This workshop serves as a timely introduction for us, our agencies, and our shared objectives. The National Ocean Policy offers one umbrella under which we can and must rally. Individual efforts in coastal management, fishery management, energy, transportation, environmental protection, and other arenas are now expected to intersect, perhaps even merge. No one agency or group has been vested with a lead. No one partner can succeed alone. It is our collective responsibility to organize and plan for shared success. I also look forward to continuing these discussions. I hope others among us will consider hosting the next chapter in this effort. Sharing those roles will remind us that these discussions, and all benefits from our success, extend beyond the MAFMC and fishery management. We have a real opportunity to improve the management of – leading to improving the condition of – our shared mid-Atlantic ecosystem.

NATIONAL PERSPECTIVES ON THE MAFMC'S HABITAT/ECOSYSTEM APPROACHES

Thomas E. Bigford, Chief, NOAA/National Marine Fisheries Service, Office of Habitat Conservation/Habitat Protection Division, Silver Spring, MD

Major Recommendations

- Continue and expand these discussions to include groups and issues not represented at the December 2010 workshop in Virginia Beach, including protected resources, state coastal programs, defense, telecommunications, and ocean energy.
- Pursue opportunities for other sectors or groups to share the roles as host, convener, and facilitator so the MAFMC need not carry an undue burden and their issues are not perceived as receiving undue attention. As two options, consider the opportunity to work with ASMFC's Habitat Committee on a joint meeting in April 2011 and any options to partner with the Mid-Atlantic Regional Council on the Ocean (MARCO).
- Identify pilots for specific action in 2011 to fulfill the intent established at the Virginia Beach workshop, using existing knowledge, staff, and funds as we shift from business as usual to an ecosystem approach.

The December 13-14, 2010, workshop convened by the MAFMC represents an unprecedented opportunity to push beyond traditional fishery management and toward regional management of multiple sectors in a shared ecosystem. The December workshop represents one step toward President Obama's aspirations in his July 2010 National Ocean Policy (NOP). An increased emphasis on ecosystem approaches echoes several goals of that NOP and will also position the MAFMC to apply the latest fishery management techniques. Working together in an unprecedented partnership, other industries, agencies, and groups with interests in mid-Atlantic waters and coasts can expect a more robust and collaborative arena than seemed possible before the President's policy changed expectations. The Council must be commended for its earnest first step: now each participant and others wishing to join must accept the challenge and help us move collectively toward a more integrated, ecosystem-based approach to managing mid-Atlantic waters and resources. Elsewhere around the nation's coasts, the MAFMC's vision and its far-reaching trust in fellow ecosystem managers mark an encouraging step toward a new ocean management regime.

These glimpses of a new era reflect other recent activities. As examples, the emphasis by NOAA/NMFS on habitat science in 2009-2010 inspired publication of the Habitat Assessment Improvement Plan in 2010 and culminated in the first-ever National Habitat Assessment Workshop in St. Petersburg, Florida in May 2010 (published as NOAA Technical Memorandum NMFS-F/SPO-112 in November 2010). Bracketed around that effort has been encouraging work on an "integrated ecosystem assessment" (IEA) synthesis and analysis of natural and socio-economic factors related to regional ecosystem management goals. Again reflecting direction in the NOP, IEAs promise to infuse habitat into population dynamics debates, with the potential to increase the utility of models used to manage marine resources for harvest and other ecosystem benefits. And the National Fish Habitat Action Plan, represented regionally by the Atlantic Coast Fish Habitat Partnership, offers a fresh approach to resource management with an emphasis on habitat and a marked de-emphasis on conventional spatial boundaries. Talk about regional approaches to coastal and marine spatial planning offer a unified frame for combining these efforts, again reflecting the NOP and benefitting many who are working in the mid-Atlantic. Finally, to ease our transition into this new paradigm, we have the 2010 release of the draft "Coastal and Marine Ecological Classification Standard" (CMECS) developed by NOAA and NatureServe as a new national standard to classifying coastal and marine spatial systems, including those in the mid-Atlantic of special interest at the December workshop. The NOAA/NMFS Northeast Fisheries Science Center (NEFSC) is already applying CMECS conventions to its data holdings in Hudson Canyon. These renewed commitments to regional collaborations, uniform standards, and visions offer the prospect of achievements and successes that previously would not have been possible.

While much of the group enthusiasm exhibited at the December workshop was unprecedented, it was clear that like-minded individuals have been shifting toward these ecosystem approaches for some time. For example, it was encouraging to hear frequent reference to "Ecosystem-based Fishery Management for the Northeast Continental Shelf" (FS-2010-02) as a fundamental change from traditional fishery management to integrated plans for discrete, spatially explicit, ecological regions. Obviously, practitioners in the northeast already have realized the logic and inevitability of this transition from species-based management to a more holistic space-based approach.

I applaud continued efforts in these directions and with broader groups of regional resource managers. I encourage us as individuals and the respective agencies, industries, and resources we represent to push onward. We have much to do in 2011!

These important steps toward a promising future will require our immediate and focused attention. New staff and funds are unlikely, so we need a collective commitment to shift existing resources from past approaches to our new vision. This transition will not come swiftly, but it is inevitable. We can ease the process by reflecting new ecosystem approaches in our stock assessments, essential fish habitat (EFH) identifications and designations, and other efforts and by partnering with those groups who specialize in our priority needs, e.g., coastal and ocean observations in support of regional ecosystem management by the Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS).

HABITAT PRIORITIES AND COUNCIL OPPORTUNITIES FROM A NOAA/NMFS REGIONAL PROGRAM

Peter Colosi, Assistant Regional Administrator, NOAA/National Marine Fisheries Service, Northeast Regional Office, Habitat Conservation Division, Gloucester, MA

Major Recommendations

- Invest in the process and context of essential fish habitat (EFH) reviews. Do so with a view beyond the MAFMC's immediate Magnuson-Stevens Act regulatory requirements to designate EFH in its fishery management plans. View it as an investment. While designation will help us manage habitat impacts associated with fishing gear and waterway development activities, it is also an opportunity for the Council to expand into an ecosystem-based design for EFH designations that can benefit fishery management. This can result in more accurate and precise application of EFH in fishery management in terms of the ecological drivers of productive capacity of fish resources. In this regard, this Council could be one of the first to incorporate ecosystem-based components into its EFH work. It can expand our influence with more precision and focus for fishery management, and result in greater influence in the consideration for living marine resource conservation among the various interests in the ocean development arena and the broader ocean use discussion.
- Continue discussing coastal and marine spatial planning (CMSP). NMFS is in this discussion also and will continue partnering with you. We in the Northeast Regional Office (NERO) are involved with the Mid-Atlantic Regional Council on the Ocean (MARCO), the Northeast Regional Ocean Council (NROC), Ocean Special Area Management Plan (Ocean SAMP) coordination with states, and soon will be involved in the Ocean Policy Task Force Regional Planning Bodies for CMSP. It is our job and yours to integrate fish and the longstanding history of fisheries into the considerations of CMSP and the development of marine spatial planning tools.
- It's the Council's insight that counts when framing its habitat agenda. Stay grounded in the perspective of your mandates, and see what opportunities there are for the Council to better manage fishery resources for a healthy fishing industry.

The NMFS Northeast Regional Office is pleased to be a part of this workshop. We're here to discuss NERO Habitat's profile and share ideas on how the Council may utilize "habitat" to do its job of managing fishery resources within the setting of broader ocean utilization. As one of the charges of the workshop, NMFS NERO hopes to help identify opportunities for the MAFMC to utilize the latest habitat and ecosystem science, policy, and management to provide healthy mid-Atlantic fisheries. This is fitting because the living marine resources and the habitats that support them are important to a wide range of stakeholders in the mid-Atlantic. In this respect, the Council is to be commended for the genesis of this forum. It has long been resourceful and innovative, and it recognizes the broader ocean use community and its influences on fisheries.

Who is the NMFS/NERO Habitat Conservation Division?

The Habitat Division is among a suite of NMFS/Northeast Regional Office programs such as Protected Resources, Sustainable Fisheries, Grants, and Statistics that cover the northeast U.S. coast from Maine through Virginia. Collectively these programs carry out NMFS's strategic goals. The Habitat Division portfolio is comprised of the three broad areas of habitat fishery management, habitat protection, and stewardship/engagement.

Habitat fishery management

This is the Habitat Division section that guides the Council in incorporating the characterization of essential fish habitat (EFH) in the development of fishery management plans for federally managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." The EFH designations are utilized in fishery management plans to address and minimize habitat impacts on EFH caused by fishing gear through pertinent management measures that are established by regulation. These, in concert with fishery catch and effort measures help to manage fish stocks at sustainable levels of harvest and productivity.

The Habitat Division integrates its EFH work into the work of both the MAFMC and New England Fishery Management Council (NEFMC). The Division is a member of various Council committees, and helps coordinate habitat and science integration into Council efforts. The Division advises Council committees on the consultations we undertake on development projects. Periodically the Division provides services and products such as EFH training, a non-fishing

habitat impacts primer, and EFH assessment tools and resources.

Habitat protection

Habitat Protection involves marine coastal and waterway development activities. This is where the Division brings our Council EFH designations forward to consult with federal and state permitting agencies to assure that we avoid and minimize habitat impacts to NOAA trust resources. Consultation actions include hydropower, navigational dredging, coastline infrastructure, energy development (e.g., hydrokinetic turbines), deep water port facilities, etc. Notable examples include working with the NOAA Chesapeake Bay Office and other agencies on preventing the introduction of non-native Asian oysters into Chesapeake Bay, and the protection of 100 acres of cobble habitat for juvenile cod in Winthrop Bay, Massachusetts from dredging. Some of our primary statutes include the Magnuson-Stevens Act, Endangered Species Act, Marine Mammal Protection Act, the Fish and Wildlife Coordination Act, and the National Environmental Policy Act.

Our consultations require the permitting agencies to characterize and evaluate proposed actions with respect to disturbance and impact to EFH. We then issue conservation recommendations to the permitting agency that are designed to protect EFH and other living marine resources. The permitting authorities with whom we consult include the U.S. Army Corp of Engineers, the U.S. Fish and Wildlife Service, the Bureau of Energy Management Regulation and Enforcement (BOEMRE), the Federal Energy Regulatory Commission (FERC), the EPA, Coast Guard, and the states.

On a side note, there is a nice history here of the Division's association with the MAFMC where we have raised issues concerning development actions that posed a threat to the fishery resources of the Council and to the recreational and commercial fishing industry. We are glad to see a resurgence of this interest from the Council's Ecosystems and Ocean Planning Committee, the same Committee that gave rise to this forum. This resurgence of coordination is particularly relevant considering the increased interest in ocean renewable and traditional energy development. A key in this arena is project siting that would be done in such a manner as to preserve traditional fisheries and ecosystem integrity for fish resources amidst the competing societal needs for broad ocean use. (This, of course, has been a driver for astute marine spatial planning.)

Stewardship/engagement

This represents a significant expansion in the Division's portfolio, and is generally where the Division steps outside its regulatory role to engage in the many collaborative discussions that can set the structures for ocean use and marine spatial planning. The Division must be involved in order to be conversant and to remain relevant.

There are many forums that the Habitat Conservation Division is participating in, including forums involving energy development in the northeast. For example, BOEMRE is conducting collaborative task force discussions for ocean-based wind power facilities siting and development across our region, and recently the governors of New York, Delaware, Maryland and New Jersey have signed a joint consortium for the promotion of energy development which will stimulate proposals for new marine energy projects.

There are also regional councils on ocean management, e.g., the Mid-Atlantic Regional Council on the Ocean (MARCO) and the Northeast Regional Ocean Council (NROC). Several of the northeastern states have developed or are in the process of developing ocean special area management plans, and with the recent release of the National Ocean Policy, there will be more collaborative ocean based forums.

The long-standing collaborative aspects of our fish-based forums in the northeast round out the stewardship forums which are available for engagement. The Atlantic States Marine Fisheries Commission (ASMFC) and the more recent Atlantic Coastal Fish Habitat Partnership (ACFHP) are good examples of stewardship opportunities in which many of us here in this workshop have long been engaged.

Key Question: With respect to the consultation process, do you see opportunities for the Council to strengthen its influence on projects which impact fisheries?

Answer: The Council has the ability to consult with NMFS under EFH and Magnuson statutes. There are examples in New England where the Army Corps of Engineers has denied permits based on Council involvement. NMFS Northeast Regional Office personnel are willing to provide support to the Council and work with the Council to identify and inform them of projects which may impact fisheries.

Key Comment: Brian Hooker, of the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), recommended direct and/or informal engagement between BOEMRE and the Council as offshore energy issues move forward.

NOAA'S APPROACH TO DEEP-SEA CORAL RESEARCH AND MANAGEMENT IN THE MID-ATLANTIC REGION

Chih-Fan Tsao, Thomas F. Hourigan, David Packer, NOAA/National Marine Fisheries Service, Office of Habitat Conservation, Silver Spring, MD

Major Recommendations

- Participate in the Deep-Sea Coral Research and Technology Program's northeast/mid-Atlantic research priorities workshop and fieldwork planning for 2013-15. The Council's participation is critical to ensure the fieldwork informs the Council's management needs. The workshop is planned for spring 2011.
- Exercise discretionary authority to designate deep-sea coral protection zones. The New England Fishery Management Council (NEFMC) is actively exploring the use of the MSA Section 303(b) authority to designate deep-sea coral zones for its fisheries, including those in areas that are managed cooperatively with the MAFMC, so this effort can be precedent-setting.
- Use essential fish habitat (EFH) and habitat areas of particular concern (HAPCs) as tools for deep-sea coral management. Several fishery management councils in the U.S. have designated biogenic habitats, such as deep-sea coral and sponge areas, as EFH and HAPCs. This is a tool at the Council's disposal for use in managing fishing impacts and ensuring consultation on potential non-fishing impacts on deep-sea coral and sponge habitats.
- Monitor bycatch and habitat impacts of fishing. Strengthened monitoring of fishing impacts will help fine-tune management measures designed to reduce gear interactions with corals.
- To enable effective and efficient collaboration between MAFMC and NOAA on these and other deep-sea coral endeavors, it would be beneficial for the Council to designate a primary point of contact for coral-related issues.

What are deep-sea corals?

The National Oceanic and Atmospheric Administration (NOAA) defines structure-forming deep-sea corals as any colonial, azooxanthellate corals generally occurring at depths below 50 m that provide vertical structure above the seafloor that can be utilized by other species. These include both deep reef-building stony corals (e.g., *Lophelia pertusa*), as well as individual branching colonies of corals (e.g., gorgonians and black corals). Found in all U.S. regions, these complex structures provide habitat for rich and diverse fish and invertebrate communities, including commercially important species. Because deep-sea corals are slow-growing, they are vulnerable to physical damage, especially damage caused by mobile bottom-tending gear.

Like deep-sea corals, sponges too can grow at a high density to form complex habitat and support benthic communities. Therefore, deep-sea sponges are included in the scope of NOAA's research and management efforts for deep-sea corals.

What does NOAA do to study and manage deep-sea coral ecosystems?

In 2010, NOAA released a "Strategic Plan for Deep-Sea Coral and Sponge Ecosystems: Research, Management, and International Cooperation." The plan describes goals, objectives and approaches that will guide NOAA activities over the next 10 years to further deep-sea coral science and conservation.

A central component of these activities is the Deep Sea Coral Research and Technology Program (DSCRTP), authorized by the Magnuson-Stevens Fisheries Conservation and Management Act (MSA Sec. 408). The program's mission is to provide sound scientific information needed to conserve and manage deep-sea coral ecosystems. The DSCRTP received its first funding in FY 2009 and currently supports three-year fieldwork operations in two U.S. regions at a time. The fieldwork efforts are developed in consultation with the regional Fishery Management Councils and typically include locating, mapping, and characterizing deep-sea coral habitats (e.g., using multibeam technologies and groundtruthing with remotely operated vehicles [ROVs] or submersibles) along with research to understand their ecology and document associated species. The DSCRTP is planning to conduct deep-sea coral fieldwork in the northeast U.S., including the Mid-Atlantic and New England Fishery Management Council regions, in 2013-15. Additionally, the DSCRTP funds smaller, non-fieldwork projects throughout the U.S. every year, and these projects range from developing computer models that predict suitable habitats for deep-sea corals, to analyzing fisheries data and thereby pinpointing locations of high coral bycatch.

In addition to the DSCRTP, many NOAA programs and offices engage in a variety of activities relevant to deep-sea corals. For NMFS Northeast Fisheries Science Center has been characterizing the benthic environment in and around Hudson Canyon since 2001. Also, NMFS is assisting with the New England Fishery Management Council's ongoing effort

to develop alternatives to designate deep-sea coral protection zones, using the discretionary authorities under MSA Section 303(b). Moreover, NOAA's Office of Ocean Exploration and Research is partnering with the Department of the Interior's Bureau of Ocean Energy Management, Regulation and Enforcement (formerly Minerals Management Service) and the U.S. Geological Survey (USGS) in a 2010-13 study to explore and study several mid-Atlantic canyons with an emphasis on deep-sea corals.

Further reading

Implementation of the Deep-Sea Coral Research and Technology Program 2008–2009. Report to Congress. February 2010.
<http://www.habitat.noaa.gov/pdf/pub_deep_coral_report_2010.pdf>

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< http://coris.noaa.gov/activities/deepsea_coral/>

Lumsden S.E., Hourigan T.F., Bruckner A.W., Dorr G. (eds.). 2007. The State of Deep Coral Ecosystems of the United States. NOAA Tech. Memo. CRCP-3. Silver Spring, MD.
< http://coris.noaa.gov/activities/deepcoral_rpt/>

Key Question: Please explain more about biomedical research on deep-sea corals? For research and production, are deep-sea corals being harvested?

Answer: Researchers are interested in deep-sea corals potentially because of special disease-fighting compounds that they may contain. Scientists are investigating the ability to replicate these compounds in the lab for both deep-sea corals and sponges. Right now the research is in its infancy, being conducted by a research team at Harbor Branch, FL. If in the future they will be commercially harvested, there should be a fishery management plan in place, which is the approach the South Atlantic and Pacific Islands Fishery Management Councils have taken.

Key Question: Do each of the NMFS Science Centers have their own multi-beam sensors and other equipment?

Answer: No, resources are limited, so some work is done by and on charter boats.

Key Question: Do we have both presence and absence information for corals in the northeast?

Answer: We only have presence information. We know little about those habitat characteristics which allow for suitable colonization and growth.

Key Question: If the Council were to consider adding deep-sea coral protection under the discretionary provisions of the MSA, would it be possible to utilize the information from the USGS study in the northeast prior to the 2013 and 2015 research cruises?

Answer: If requested for protection, the location and other information about deep-sea corals would be compiled by the DSCRTP and presented to the Council. This information would then available for the Council to utilize, and the deep-sea coral research team will work with the Council to meet this objective if it is the Council's wish.

Key Question: Are deep-sea corals acting as habitat for fisheries species, and is our gear affecting them?

Answer: Studies show differing degrees of habitat function in different regions. For example, in Alaska, 80% of commercially important rockfish species were observed in association with deep-sea corals. Other studies have shown a correlation between deep-sea corals and fisheries species. The current theory is that at the minimum, deep-sea corals provide complex habitat, and fish like complex habitat, but further research is needed to discern the specifics of this relationship. If the ecological relationships, locations, and gear impacts to deep-sea corals are a priority for the Council, it was recommended to the Council that they indicate these topics as research priorities to the Science Centers.

Key Question: Has funding been identified to continue research on deep-sea corals in the canyons?

Answer: The current plan is to provide approximately $800,000 per year for 3 years in FY13-15 for the mid-Atlantic and New England regions, depending on the budget.

Key Question: Have you conducted a study to determine the accurate age of the coral colonies?

Answer: While studies are limited in the northeast region, recent research conducted in the Pacific Islands found colonies up to 4,000 years old. In the south Atlantic region gold corals have been found that are up to 2,000 years old.

Key Question: How do you study coral distribution, bycatch, and impacts to corals from fishing?

Answer: Bycatch monitoring is one way to identify impacts to corals. Trawl surveys conducted by Science Centers also provide valuable information. Some reef-forming corals are identifiable in multibeam maps, but non-reef forming corals often do not show up. These non-reef forming corals are often found in relatively featureless areas, so it is critical that we identify their locations and distributions as well.

NOAA/NMFS'S HABITAT RESTORATION PRIORITIES IN THE MID-ATLANTIC

John Catena, Northeast Regional Supervisor, NOAA/National Marine Fisheries Service, Office of Habitat Conservation/Restoration Center, Gloucester, MA

Major Recommendations

- Participate with regional Restoration Center staff in our regional prioritization efforts to identify priority watersheds and waterbodies for habitat restoration.
- Work with regional Restoration Center staff and local partners in the mid-Atlantic to develop funding proposals and projects of mutual interest to the Council and the Restoration Center.
- Explore the possibility of becoming a formal partner with the Restoration Center in response to our FY 2012 solicitation for partnerships.
- Advocate the importance of assessing and understanding the link between nearshore and estuarine habitats, diadromous fish species, and federally managed species.
- Work with the Restoration Center to develop outreach products that address the importance of habitat restoration for federally managed species.

Introduction

Habitat restoration is a major tool that NOAA/NMFS uses to address the loss or degradation of fishery habitat. This presentation provides an overview of the NOAA/NMFS Restoration Center habitat restoration priorities in the mid-Atlantic region.

Restoration Center programs

NOAA/NMFS's Restoration Center manages a number of programs to restore fishery habitat throughout the United States. The goals of these programs are to rebuild fishery habitat lost to adverse impacts caused by wetland filling, diking, dam construction and other forms of development, oil spills, erosion, and other causes of degradation; to increase and sustain fish populations; and to increase public stewardship by engaging local citizens in habitat restoration. NMFS provides funding and technical assistance to carry out a wide array of habitat restoration activities to accomplish these goals. However, we look to the local community to carry on and sustain the activities once we have completed a project.

NOAA/NMFS's Community-based Restoration (CRP) and Open Rivers Initiative (ORI) Programs provide funds and technical assistance to local, state, and regional organizations for habitat restoration projects through national and regionally competitive solicitations that run throughout the course of the year. Project proposals are evaluated on the basis of their technical merit, feasibility, cost-effectiveness, and benefits to NOAA trust resources. We seek to leverage additional funding and stewardship through collaboration with other major funding organizations. Funding amounts for projects can vary from $50,000 to more than $500,000 per project. A major cornerstone of our CRP and ORI programs is collaboration through national and regional partnerships. We have established formal three-year partnerships with a number of national and regionally-based organizations to assist us in funding and implementing projects. These partnerships take advantage of NOAA/NMFS's and our partner's technical and administrative strengths and can streamline the application and funding process for local grant recipients. Typically the Restoration Center works with the national or regional partner to identify, fund, and oversee the implementation of habitat restoration projects that meet the particular partner's and NOAA/NMFS's goals. These partnerships are highly successful in leveraging both additional funding and technical expertise from both our formal partners and from other local, state, and regional organizations. Those national and regional partnerships relevant to the Northeast include Chesapeake Bay Trust, American Rivers, Trout Unlimited, Gulf of Maine Council on the Marine Environment, Restore America's Estuaries, The Nature Conservancy, and Fish America Foundation.

NOAA/NMFS received nearly $167 million from the American Reinvestment and Recovery Act (ARRA) in 2009 to restore coastal habitat and help jump start the economy by supporting thousands of jobs. In the northeast region we awarded $35 million to 11 projects in nine states from Maine to Virginia which were selected through a nationally competitive request for proposals. Funding amounts for these projects ranged from $750,000 to $10.6 million. ARRA funds have allowed the Restoration Center to implement larger scale projects in the northeast and other regions where we have not had that opportunity in the past and allowed for a much quicker transition to on the ground implementation as grant recipients did not have to search for multiple sources of funds to complete their projects. The selected ARRA projects address fish passage and dam removal, tidal wetlands restoration,

oyster restoration, and eelgrass restoration. For example, NOAA/NMFS is working with the Maryland Department of Natural Resources and American Rivers to restore fish passage to the Patapsco River in Maryland. Just over $4 million was provided to remove the Union and Simkins dams, with dam removal completed in 2010. Additional funding from this ARRA grant is now being used to monitor the ecological and physical responses to the dam removals and to design the removal of the Bloede dam, which is the first blockage on the river. Completion of these projects will open passage to 25 miles of mainstem habitat in the river and an additional 374 miles of habitat in tributaries to the Patapsco.

NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) seeks to restore natural resources injured by oil spills and hazardous waste discharges. The Oil Pollution Act of 1990 and the Comprehensive Environmental Response, Cleanup and Liability Act (or "Superfund" law) authorizes NOAA and other natural resource trustee agencies to claim damages for injuries to natural resources and to use those funds to restore the injured natural resources. In general, the program assesses and quantifies injuries to natural resources, seeks damages for those injuries from the responsible parties, implements restoration, and monitors progress to ensure restoration goals are met. Throughout the northeastern U.S. there are approximately 100 active sites where NOAA is working with co-trustees to assess injuries and restore injured natural resources. For example, NOAA, the U.S. Fish and Wildlife Service, and the states of Pennsylvania, Delaware, and New Jersey recently approved a $24 million settlement for the Athos oil spill which occurred in the Delaware River in 2004. These funds will be used for a variety of projects to restore fish passage, wetlands, degraded shorelines, and waterfowl habitat throughout the Delaware estuary.

Regional restoration priority activities

In the northeastern U.S., the Restoration Center funds and carries out a variety of habitat restoration projects to address degraded fishery habitat under the different programs described above. However, of primary importance in the mid-Atlantic region are projects to restore diadromous fish, tidal wetlands, and shellfish resources. Diadromous fish restoration projects in the mid-Atlantic typically target alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), and American eel (*Anguilla rostrata*). Projects to restore these resources include dam removals, structural fish ladders, and other forms of fish passage including rock ramps and fish by-pass channels. Removal of un-wanted, obsolete dams that no longer serve a useful societal purpose is the Restoration Center's priority. However, in those situations where removal is not feasible, construction of other means of fish passage can be an acceptable alternative. All of these methods are intended to restore access to historic spawning and rearing habitat for these species. Thousands of blockages in rivers and streams throughout the region have been identified as one of the primary limiting factors to the successful restoration of these species. In addition to restoring access to historic spawning and rearing habitat, dam removal projects can also provide other ecological benefits such as improving water quality, restoring a more natural discharge of sediment, and improving resident fish and benthic invertebrate populations. Beyond their ecological benefits, dam removals can also remove a financial and safety liability for the local property owner, which often is a local municipality.

Tidal wetland restoration projects in the mid-Atlantic typically consist of reconnecting tidal hydrology to formerly impounded or filled wetlands and constructing "living shorelines" in areas experiencing wetland loss due to erosion and/or subsidence. Fill removal projects typically consist of excavating filled areas, regrading to intertidal elevations, planting native intertidal wetland vegetation, and creating tidal channels to connect the restored wetland to the adjacent waterbody. Living shoreline projects are a technique that has largely been used in the Chesapeake Bay region, but has also been employed in a limited fashion in other parts of the mid-Atlantic. The technique is an alternative, more ecologically friendly means of controlling shoreline erosion and minimizing further loss of shoreline habitat and degradation of the immediate nearshore habitat. Traditional hardened structures along the shoreline; e.g., seawalls, bulkheads, and rock revetments cause an abrupt transition in ecological zones and diminish the natural ecological value of a shoreline. Specifically, they increase loss of intertidal habitats, decrease the diversity and quality of habitats on both sides of the structure, and impede those natural processes that are necessary and beneficial for healthy aquatic ecosystems. Conversely, living shorelines typically use a combination of sand, intertidal wetland vegetation, and rock sills to maintain stability for the newly created intertidal shoreline. The goal is to retain much of the wind, tide, and storm-related wave protection of a hard structure, while maintaining some of the ecological values of natural shorelines.

Shellfish restoration in the mid-Atlantic is largely focused on oyster restoration with some limited efforts focused on hard-clam restoration on Long Island. NOAA/NMFS's oyster restoration funding consists of relatively large scale efforts in the Chesapeake Bay, working closely with the states of Maryland and Virginia. Limited funding for oyster restoration has also gone to other parts of the region including the Hudson-Raritan estuary and Delaware Bay. Techniques used to enhance local oyster populations is to create oyster reefs by planting oyster or other available shell to create a substrate for natural settlement of oyster spat. In

addition, funds are used to plant oyster "spat on shell" on oyster reefs where natural spawning populations are limited. Oyster restoration is a key priority for the Restoration Center in the mid-Atlantic because of the precipitous decline this resource has experienced relative to historic levels and the high ecological value oysters provide to the ecosystem, including serving as a habitat for other benthic and fish species and their ability to improve water quality.

To improve the Restoration Center's selection and performance of projects in order to ensure we are spending our limited funding in the most cost-effective manner, we are embarking on two new efforts. We are working across the region to develop geographic priorities for our fish passage, wetland, and shellfish restoration projects; i.e., identifying those watersheds and water bodies throughout the region where we believe our funding will have the most significant impact. Currently we are selecting and funding projects on an opportunistic basis in response to a number of request for proposals (RFPs) that are issued throughout the year. The goal of the prioritization effort is to assist us in geographically targeting our funding in a more strategic manner such that we are spending our funds to have the greatest benefit for NOAA trust resources. We are currently working with partners in the Chesapeake Bay region to identify the highest priority fish passage blockages throughout that region's watersheds. This effort will result in a list of priority diadromous fish passage projects and priority watersheds in the region.

Another effort to improve project selection and performance is the development of a regional integrated monitoring program. While we have been providing funds to monitor the ecological response to our restoration projects, we have not been doing so in a consistent fashion nor have we been feeding the results of those monitoring efforts in a consistent fashion back into program performance. The goals of the regional monitoring program are to assess project quality, assess the project's ecological effectiveness, improve future project implementation, address questions of regional significance and regional performance, and develop an information base to drive future priorities. For each of our project types a regional network of sites is being established that will be monitored in a consistent manner to address regionally important questions, the results of which will be integrated back into the program to influence program priorities and project selection and to improve restoration techniques.

Key Question: What organizations does the Restoration Center partner with?

Answer: The Restoration Center often works with the Army Corps of Engineers. Recently, the Restoration Center worked with the Corps on impacts to oysters in Chesapeake Bay.

Key Question: How are the size and cost of restoration projects determined?

Answer: In instances of damage remediation, settlements are determined through the damage assessment process. Damage is typically quantified through estimates of the acreage or populations impacted. The restoration project is then scaled to match the injury to the resource. The cost of the project is then calculated.

SUPPORTING MID-ATLANTIC HABITAT AND ECOSYSTEM PRIORITIES THROUGH THE NATIONAL SYSTEM OF MARINE PROTECTED AREAS

Lauren Wenzel, National MPA System Coordinator, NOAA/National Ocean Service, National Marine Protected Areas Center, Silver Spring, MD

Major Recommendations

- *Developing a regional MPA network for the mid-Atlantic*. The MPA Center is working to support regional coordination and networks of MPAs as resources permit through training and small grants. Networks can help protect a wide range of habitats needed by species at different life stages, and can provide opportunities for partnerships and sharing of resources. For example, Friends of Rookery Bay National Estuarine Research Reserve is leading an effort to develop a regional MPA plan for the southeast that will establish common priories and actions. A similar type of effort could be undertaken for the mid-Atlantic.
- *Conducting "condition report" workshops for selected MPAs.* The MPA Center has been working with the North American MPA Network (NAMPAN), a cooperative effort among MPA agencies in the U.S., Canada, and Mexico, to develop a "report card" format on MPA conditions, based on the Conditions Reports used by the Office of National Marine Sanctuaries. NAMPAN is interested in extending this effort to the Atlantic Coast, and is interested in identifying potential partners who wish to develop condition reports for their sites as both a monitoring and a communications tool.
- *Mapping human uses of the ocean*. The MPA Center has developed a participatory GIS methodology to map 30 major human activities across three sectors (industrial and military, fishing, and non-consumptive). These maps will contribute to improved management and planning for MPAs and other approaches to coastal and marine spatial planning. The MPA Center has completed human use mapping for some states, and is interested in partnering in the mid-Atlantic region to continue and complete ocean use mapping.
- *Integrating MPAs with the Integrated Ocean Observing System (IOOS)*. The MPA Center is working with the national IOOS program and its regional associations to identify issues for coordination between these two national systems, including how MPAs can be used as platforms for ocean monitoring, the range of observing and monitoring requirements at MPAs, and the ocean monitoring parameters and processes most important to monitoring environmental changes at the national scale. The MPA IOOS Task Team is interested in identifying key monitoring parameters for MPAs at the regional scale, and ways in which climate change monitoring can be better incorporated into regional and national observing systems.
- *Providing training*. The MPA Center has established a partnership with the Office of National Marine Sanctuaries (ONMS) to bring the international training expertise of the ONMS to a domestic audience. ONMS and MPA Center have the capacity to provide training on adaptation to climate change, developing MPA networks, coastal and marine spatial planning, and other topics.
- *Providing an information clearinghouse on MPA resources*. The MPA Center hosts several databases on MPAs and spatial management, including the MPA Inventory and the de facto MPA Inventory (includes areas conserved for reasons other than conservation, such as safety zones). The MPA Inventory is currently being expanded to include more data on MPA resources and authorities. This information is readily accessible, and can help inform the MAFMC's work on spatial management.

The National System of Marine Protected Areas (MPAs) is authorized by Executive Order 13158 to "develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems and the Nation's natural and cultural resources." The national system was formally established with the completion of the "Framework for the National System of Marine Protected Areas of the United States of America" in November 2008, and the first sites joined the system in April 2009. It provides a mechanism for MPA programs across all levels of government to work together toward common conservation objectives. The system currently includes 254 federal, state and territorial MPAs covering an area of 175,000 square miles and will expand over time through an annual nomination process. In all, the system includes sites in 31 states and territories, plus additional offshore areas under federal jurisdiction; 4% of U.S. waters (0-200 nautical miles, including estuarine areas and the Great Lakes) are covered by the national system sites and every major ecoregion in the U.S. is represented in the national system. The national system has three goals: conserving and managing natural heritage, conserving and managing cultural heritage, and the sustainable production of marine resources.

As noted in the Framework, marine areas in the U.S. are threatened by "coastal and offshore

development, overfishing, a changing climate, natural events, and other sources, straining the health of marine ecosystems and the Great Lakes. Impacts to these intricately balanced environments include declining fish populations, degradation of…. vital habitats, threats to rare or endangered species, and loss of artifacts and resources that represent the diverse cultural heritage of the United States. The effects of these losses are significant and jeopardize the social and economic fabric of the nation." These threats are also present in the mid-Atlantic, together with the pressure for a wide range of existing and emerging ocean uses. MPAs are an important tool for conserving resources in the face of these pressures, and the national system can help existing MPA programs work together more effectively.

The majority (65%) of the total area of the national system is in either uniform or zoned multiple use sites that allow a variety of human activities, including fishing and other extractive uses. In contrast, about 27% of the area of the national system is considered no-take and prohibits the extraction or significant destruction of natural or cultural resources. Papahanaumokuakea Marine National Monument, a zoned no-take site that has eleven no-take zones covering approximately 44,000 square miles, makes up nearly all of the no-take area in the national system. Less than 1% of U.S. waters overall are no-take.

The National System of MPAs was established to both strengthen and expand protection of marine resources through MPAs. The system is working to support existing federal, state, and territorial MPA programs through technical assistance, training, and a new partnership with the National Fish and Wildlife Foundation to provide MPA Partnership Grants to national system members to work together on common conservation priorities. The national system will also support the protection of marine resources by informing decisions about the establishment of new MPAs by providing data, information and tools on ecologically important areas and human uses of the ocean. These efforts will be coordinated with the U.S. Ocean Policy, including the Coastal and Marine Spatial Planning Initiative.

In the mid-Atlantic, the national system contains 43 sites, with 34 sites managed by federal agencies; New Jersey, Maryland, and Virginia have nine state-managed sites in the system. The MAFMC and NMFS have nominated four MPAs under the Tilefish Management Plan to be members of the national system – Lydonia Canyon, Norfolk Canyon, Oceanographer Canyon, and Veatch Canyon. These are expected to become members of the national system in early 2011. The MPA Center has committed, through the Chesapeake Bay Executive Order, to work with the mid-Atlantic states to identify their interest in mapping ocean uses, and to continue to support existing MPA programs through the national system of MPAs.

Key Question: What are the main hurdles faced by MPAs?

Answer: There is a perception that MPAs are automatically no fishing or no take areas, but we know that's not the case. MPAs are set aside for a specific purpose, which does not always include bans on fishing. For example, an MPA with fishing access was recently created for tilefish. Only about 1% of MPAs in the U.S. are no take.

Key Question: Is there a resource for education and outreach on MPAs?

Answer: The MPA program has sponsored an edition of *Current*, a magazine for marine educators, and would be happy to share it.

NOAA'S NATIONAL MARINE SANCTUARY PROGRAM: OPPORTUNITIES TO SUPPORT MID-ATLANTIC AND NEW ENGLAND CANYON AND SEAMOUNT HABITAT CONSERVATION

Reed Bohne, Northeast and Great Lakes Regional Director, NOAA/National Ocean Service, Office of National Marine Sanctuaries, Savannah, GA

Major Recommendations

- The National Ocean Service and NMFS will coordinate with MAFMC and other interested organizations to convene a workshop on canyon and seamount habitat in the mid-Atlantic and New England regions to assess the status of resources, state of scientific knowledge, resource threats, and conservation alternatives available through the Magnuson-Stevens Fishery Conservation and Management Act, National Marine Sanctuaries Act, and other authorities.
- Support and encourage surveys and research to address fundamental questions regarding the diversity, distribution, and abundance of species living in canyon and seamount features in the mid-Atlantic and New England regions.

Recently there has been increasing interest in protecting and conserving the rich and diverse biological resources found in the submarine canyons and seamounts off the mid-Atlantic and New England coasts. The area which corresponds generally with the jurisdiction of the MAFMC is being evaluated for special protection under the Magnuson-Stevens Fishery Conservation and Management Act and other authorities. In 2009, the Governors of New York, New Jersey, Delaware, Maryland and Virginia addressed the importance of protecting these submarine features through their work under the Mid-Atlantic Regional Council on the Ocean (MARCO). A recent MARCO report noted:

> The varied ocean habitats of the mid-Atlantic region support a rich diversity of marine life. Some of the most remarkable ocean habitats in the mid-Atlantic region are its submarine canyons. These canyons are located 70-100 miles offshore along the edge of the continental shelf, and vary in size and length with some as deep as 10,000 feet and as large as the Grand Canyon. The canyons are physically complex with outcrops, steep slopes, varying substrates, and support a rich diversity of marine life… One of the Mid-Atlantic Regional Council on the Ocean's (MARCO's) goals is to ensure that key ocean habitats of the mid-Atlantic are protected from activities that threaten their sensitive and unique features, marine populations, and ecological processes.

In addition to the Magnuson-Stevens Act, NOAA offers opportunities to consider comprehensive protection, conservation, and management of areas such as canyon and seamount features through the National Marine Sanctuaries Act (NMSA). Established in 1972, national marine sanctuaries are designated to protect those areas of the marine environment which are considered to be of special national significance.

The Office of National Marine Sanctuaries currently manages 14 separate sites ranging in size from less than a square mile to over 139,000 square miles. Each sanctuary is governed by individual site regulations adopted to address the specific resources and threats of that particular site. While some sanctuaries focus primarily on shipwrecks or even particular species, all sites develop a management plan tailored to the specific resource conditions and needs of the area. Each management plan addresses the fundamental elements in support of NOAA's trustee responsibilities to conserve, protect, and enhance the biodiversity, ecological integrity, and cultural legacy within each sanctuary area. These key elements include: resource protection programs; science to understand ecological processes and monitor and predict change; education and outreach activities for national, regional, and local audiences; and, a strong commitment to local community and civic engagement in ocean governance at each national marine sanctuary.

Advisory Councils

Every sanctuary has established an Advisory Council comprised of citizens representing the diverse interests of the community whether they are recreational, commercial, scientific, educational, or business oriented. The Councils advise and help guide ongoing sanctuary management and future plans as devised through the sanctuary management plan process. Like the Fishery Management Councils the sanctuary Advisory Councils ensure that the interests of the stakeholders are well represented, and that they have an independent and influential voice in both the management of sanctuary resources and the decisions affecting relevant conservation policies and practices.

Advisory Councils have been particularly active in the last few years in advocating for expansions of a number of existing sanctuaries. They have encouraged NOAA and their Congressional representatives to consider boundary expansions at the Gulf of the Farallones, Cordell Bank, Thunder Bay, and the Monitor sanctuaries. Other federal, state, local and non-governmental interests have proposed new sanctuary areas in many regions of the country. In the mid-Atlantic region the Sanctuary Program is evaluating proposals that have been submitted for a possible site in the Chesapeake Bay, and a site or sites that protect mid-Atlantic canyon areas.

Mid-Atlantic and New England canyon and seamount proposal

In 2010, a request to consider mid-Atlantic and New England canyon and seamount areas for possible sanctuary designation was submitted to NOAA by seventeen marine scientists predominantly from northeast and mid-Atlantic universities. The request identified fifteen submarine canyons from Norfolk Canyon in the mid-Atlantic north to Heezen Canyon off Georges Bank in New England. They also listed four New England seamount features further offshore for consideration. The letter emphasized that:

> Today we recognize how extraordinary and vulnerable these canyons and seamounts are and recent marine spatial planning efforts have highlighted these areas for protection. As human uses of the sea expand ever deeper, we suggest it is time to again consider the inclusion of submarine canyons and seamounts off the northeast United States in the network of National Marine Sanctuaries.

In response to the letter, NOAA Administrator Jane Lubchenco encouraged the scientists to work closely with the New England and Mid-Atlantic Fishery Management Councils and further stated that:

> Your letter specifically recommends that NOAA's Office of National Marine Sanctuaries (ONMS) and National Marine Fisheries Service (NMFS) collaborate to consider these potential areas. I fully support this recommendation. ONMS staff will continue to work with NMFS in evaluating your proposal. They will inform you as to the next steps regarding whether to initiate more formal and public consideration of canyons and seamounts as potential locations for sanctuary designation, fishery closures, or other actions.

Sanctuary review and recommendation

The procedures for designating new National Marine Sanctuaries are described in regulations (15 CFR Part 922) implementing the provisions of the National Marine Sanctuary Act. The regulations specify the steps required to list an area for potential consideration and the extensive process which follows the provisions of the National Environmental Policy Act for public review and evaluation prior to designation. NOAA has not at this time made a decision to list the New England and mid-Atlantic canyons and seamounts described in the request as a potential area or areas for sanctuary designation. As indicated in the letter from NOAA Administrator Lubchenco, preliminary consultations within the Agency to evaluate the merits of protections through the Sanctuaries Act or Magnuson-Stevens Act have been initiated. NOAA intends to work closely with the New England and Mid-Atlantic Fishery Councils, MARCO, the academic community, and non-governmental interests to assess the appropriate measures necessary to ensure that the valuable and vulnerable resources of canyon and seamount communities are properly conserved.

The President's National Ocean Policy establishes a framework for comprehensive and coordinated approaches to supporting ecosystem protection and restoration in areas such as the submarine canyons of the mid-Atlantic region. These features have been highlighted in recent marine spatial planning efforts for the region. NOAA plans to integrate assessment of these habitats with the emerging regional coastal and marine spatial planning initiatives in partnership with MARCO to consider use of possible sanctuary or fishery authorities for improved conservation of canyon resources.

Key Question: When there is a petition or request for a sanctuary designation, what is the usual timeline?

Answer: Once it's been formally initiated, it typically takes 4-6 years to complete the process and bring a sanctuary online. The procedures for sanctuary creation are currently being reevaluated, and that process needs to play out before any new areas will be considered.

Key Question: What is the status of the Monitor National Marine Sanctuary?

Answer: The Monitor National Marine Sanctuary has had initial scoping meetings for potential expansion. There are suggestions to encompass other shipwrecks in the area. If an expansion is enacted, it would be completed as a separate process in addition to the standing Monitor National Marine Sanctuary plan. That expansion would not be part of the ongoing National Environmental Policy Act (NEPA) process to update the current Monitor National Marine Sanctuary plan. The Sanctuary Program would consult with the Council at the very beginning of the process for considering expansion, particularly if there were impacts to fisheries.

Key Question: What are the differences between designating protections through the Magnuson-Stevens Act or as a sanctuary? Does the Council have the final say in the Sanctuaries Act for developing fishing regulations?

Answer: The Magnuson-Stevens Reauthorization Act provides a number of tools to accomplish the goals of the protected area. The main distinction is that under the Sanctuaries Act all activities that may impact the resources can be managed and regulated. Also, programmatically there is permanence to a sanctuary – through dedicated staff, educational programs, research, and enforcement. These can act to supplement the authorities in the Magnuson-Stevens Act. The final authority for fishing regulations would lie with the Secretary of Commerce, so the sanctuaries work with the Councils early and often to avoid elevation.

Key Question: Regarding the proposal to initiate the process for establishing a sanctuary in Chesapeake Bay, what is the timeframe and where is the proposed area?

Answer: The proposal identified Mallows Bay on the Potomac, as a number of WWI vessels were sunk there. This is the largest concentration of shipwrecks in the U.S. The process is in the beginning stages; the Sanctuary Program has not yet formally initiated the process.

CONNECTING STATE COASTAL LAND CONSERVATION PRIORITIES WITH FISHERY HABITAT CONSERVATION PRIORITIES

Elaine Vaudreuil, Manager, NOAA/National Ocean Service, Office of Ocean and Coastal Resource Management, Coastal and Estuarine Land Conservation Program, Silver Spring, MD

Major Recommendations

- MAFMC staff and NMFS regional habitat conservation should get to know the state Coastal and Estuarine Land Conservation Program (CELCP) leads in the region. Their contact information can be found at: < http://coastalmanagement.noaa.gov/land/media/celcpstateleadcontacts.pdf>
- Council staff should review state CELCP plans to identify shared priority habitats or landscapes, and, if desired, contact state CELCP leads to share information on additional fisheries priority habitats, if not addressed in the plan.
- CELCP staff should notify the MAFMC and NMFS regional offices of funding opportunities under the program.

The objective of this presentation is to give the Council an overview of the Coastal and Estuarine Land Conservation Program (CELCP) and identify potential connections between fishery habitat conservation priorities and habitats or areas that have been identified as priorities by coastal states for long-term conservation. Coastal states and Fishery Management Councils are likely to have a lot of common habitat interests in coastal watersheds and estuaries, from tidal and forested wetlands to vegetated shoreline buffers. This presentation identifies ways the MAFMC may engage with the CELCP.

Overview of the Program

•The purpose of the CELCP is to protect lands with significant ecological, conservation, recreational, historic, and aesthetic values or lands that are threatened by conversion, giving priority to those projects that can be effectively managed and protected, have significant ecological value, are under imminent threat of conversion, and mitigate the impacts of coastal population growth

•The CELCP was established in 2002 and transitioned from an earmarked to a fully competitive program in 2007.

• The Program received $20 million in FY 2010 appropriations and the President's budget request for the CELCP for FY 2011 is $25 million.

•Since its inception, the Program has funded more than $200 million in conservation projects in 28 states and territories, protecting a total of more than 50,000 acres.

•Projects can vary significantly in the types of habitats or features they protect. They frequently feature tidal and freshwater wetlands, dunes or barrier islands, large forested coastal tracts, vegetated shoreline buffers, habitats suitable for restoration, waterfront open space and/or access for non-motorized watercraft, etc.

How the Council might get involved with the Program

•Get to know a state's priorities for coastal land conservation – read their CELCP plan.

•Get to know a state's CELCP lead. Contact the state CELCP lead if you'd like to discuss, coordinate; or, if the plan is in draft, submit comments.

•If you have a property or area in mind, contact the CELCP lead to understand the state's process for nominating projects and find out if there might be a public entity or non-governmental organization (NGO) partner interested in pursuing the project.

•Consider writing letters of support for project proposals that support the Council's habitat conservation priorities.

Key considerations for participating

A variety of key considerations for participating in CELCP acquisition projects include the timeline for project proposals and funding (in a typical year), the requirement for willing seller transactions only, and public ownership and permanent protection of lands acquired through the Program for long-term conservation. Additional information on the detailed requirements for acquisition projects (and information for potential project applicants) can be found on the CELCP website at <http://coastalmanagement.noaa.gov/land/> under the links for "Funding Opportunities" and "For Recipients."

Key Question: What is the annual funding level?

Answer: The Program receives $80-100 million in proposed projects; of that, they typically are able to fund $20-25 million.

POLICY/MANAGEMENT PANEL DISCUSSION WITH COUNCIL

Rapporteur: **Joe Nohner,** NOAA/National Marine Fisheries Service, Office of Science & Technology, Silver Spring, MD

Summation

The discussion focused on specific actions the MAFMC could take to ensure sustainable fish populations and a robust fisheries economy, emphasizing the significance of EBFM and habitat to achieving these goals. In the current funding environment, it is necessary to weigh future benefits against current needs carefully. The MAFMC should be strategic in supporting and collaborating to maximize benefits at both time scales. In order to influence the production of priority science for the Council and provide the tools necessary for improved EBFM and habitat conservation, there were a number of recommendations from the discussion.

It was suggested that the Council identify key decision processes. The Council was advised to begin writing letters on behalf of projects which were beneficial to the Council's interests. Lou Chiarella (NMFS/Northeast Regional Office, Habitat Conservation Division; speaking for Peter Colosi), advised that this strategy has been a successful strategy for the NEFMC. The NEFMC, for example, tends to write letters for large conservation and restoration projects that would have significant beneficial impacts. It would also be possible to write letters raising concerns about projects which pose a threat to fisheries resources. Lou Chiarella offered to be a point of contact for information on such projects should the Council request it, and offered to provide information on projects which come to his attention or those which the Council expresses interest in.

It was also recommended that the Council build upon activities and processes which they already utilize. For example, it was recommended that designation and consultations for EFH and habitat areas of particular concern (HAPCs) is an area in which the Council could have more input through letters to the NMFS Regional Office (Lou Chiarella).

One suggestion was prioritizing the inclusion of habitat information into stock assessments and to factor habitat limitations into fisheries management. The suggestion built upon the observation that habitat condition is generally decreasing, and thus population baselines and predictions may be overestimates. In order to account for considerations such as this, stock assessments which include habitat-specific life history rates (e.g.; mortality, growth), habitat-specific sampling protocols (e.g., refining estimates based on habitat type), and other improvements to the understanding about how habitats and ecosystems affect population dynamics should be a priority for the Council. By highlighting these science needs and incorporating available habitat information, the Council might better maximize fisheries production.

Offshore habitat issues were highlighted as a broad and growing concern. After the presentation on deep-sea corals and comments from the audience, it was clear that more information about the distribution of corals in both nearshore and offshore environments was needed. The impacts of corals and other structures on fish communities, fish population dynamics, and ultimately fisheries productivity require more study.

In the short term, it was recommended that the Council utilize partnerships with the various management and science groups throughout the region for collaboration in new projects, collecting and synthesizing information, and leveraging existing funds to accomplish the habitat and ecosystem science objectives of the Council. Such collaborations, built upon mutual interests within the same geographic area, are rare but necessary. In the long term, it was recognized that the Council should identify and support the development of new resources to implement ecosystem-based management and habitat conservation.

A recurring point in the discussion was that habitat conservation, marine protected areas, and other ecosystem based fishery management approaches should and do focus on providing sustained, productive fisheries and jobs based off of those fisheries.

Conclusions

•The panel recommended that the Council identify decision processes in NMFS management and express their support for projects which align with the Council's objectives. Possible examples for such decisions are the identification of key areas for restoration and EFH or HAPC consultations.

•The panel recommended that the Council write letters on behalf of projects of interest. Lou Chiarella, NMFS/Northeast Regional Office, offered to provide information on projects which could be targeted for Council support.

SCIENCE PANEL

NMFS HABITAT ASSESSMENT IMPROVEMENT PLAN (HAIP) – AN OVERVIEW

Thomas Noji, NOAA/National Marine Fisheries Service, Northeast Fisheries Science Center, Director, James J. Howard Marine Sciences Laboratory, Highlands, NJ

Major Recommendations

- NMFS, along with the Fishery Councils, should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments.
- NMFS habitat and stock assessment scientists should work together with fishery managers to initiate demonstration projects that incorporate habitat data into stock assessment models, perhaps focusing on well-studied species.

The National Marine Fisheries Service published in 2010 a new planning document, the "National Marine Fisheries Habitat Assessment Improvement Plan" (HAIP). Through this Plan, NMFS establishes the framework to coordinate its diverse habitat research, monitoring, and assessments and to guide the development of budget alternatives and increased support for habitat science. The HAIP was written by a team of scientists from NMFS headquarters offices and Science Centers. It represents input from a variety of NMFS staff engaged in habitat science, stock assessments, and resource management at the six Science Centers and Regional Offices, the Office of Science and Technology, the Office of Habitat Conservation, and science program managers at each Science Center.

The goals of the HAIP are to:

•assist NOAA in developing the habitat science necessary to meet the mandates of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act and the economic, social, and environmental needs of the nation;

•improve our ability to identify EFH and HAPCs;

•provide information needed to assess impacts to EFH;

•reduce habitat-related uncertainty in stock assessments;

•facilitate a greater number of "Marine Fisheries Stock Assessment Improvement Plans" (SAIPs);

•contribute to assessments of ecosystem; and

•contribute to ecosystem-based fishery management (EBFM), integrated ecosystem assessments (IEA's), and coastal and marine spatial planning (CMSP).

Habitat can be characterized and described by the physical, chemical, biological, and geological components of the ocean environment. Habitat science is the study of relationships among species and their environment. Habitat science is not synonymous with ecosystem science, but habitats form the structural matrix of ecosystems, and an understanding of geospatial associations of species and their habitats can be one of the first steps in producing integrated ecosystem assessments. Notably, habitat science has received relatively little programmatic support compared to that received for other major disciplines (e.g., stock assessment science), and yet habitat information is needed in almost every NOAA program.

A habitat assessment is the process and the products associated with consolidating, analyzing, and reporting the best available information on habitat characteristics relative to the population dynamics of fishery species and other living marine resources. Indicators of the value and condition (or status) of habitat can be developed through a habitat assessment by understanding the relationships between habitat characteristics, the productivity of fishery species, and the type and magnitude of various impacts.

The HAIP defines three Tiers of Excellence for Habitat Assessments:

Tier 1 – Assess habitat associations for all life stages of Fish Stock Sustainability Index (FSSI) stocks using existing data.

Tier 2 – Upgrade habitat assessments to a minimally acceptable level for all FSSI stocks and life stages, which will require new or expanded data collection and research initiatives. This effort includes the production of habitat maps, determination of habitat-specific biomass or abundance, consideration of temporal and spatial variability in habitat use, and development of habitat theory and proxies to apply to data-poor stocks.

Tier 3 – Determine habitat-specific vital rates by life stage to quantify relationships between habitats and fishery production. This effort explicitly incorporates habitat and ecosystem considerations into stock assessments, develops habitat sensitivity and recovery indices to improve risk assessments and plans for protection and restoration, and develops baselines for IEA's.

From the HAIP questionnaires, NMFS scientists, resource managers, and Science Center program managers identified the following as major obstacles to producing and using credible habitat assessments:

•lack of habitat-specific abundances;

•insufficient staff to collect, process, analyze, and model habitat data;

•insufficient research on environmental effects;

•insufficient research on multispecies effects; and

•lack of habitat-specific biological information.

Key Question: The MAFMC created an Ecosystem Subcommittee, and one of the long-term terms of reference is identifying how we might transition toward EBFM. Eventually there is going to be the question of data needs and identifying the process for obtaining data. How can the Council work with the NEFSC on the prioritization side and what specific opportunities are there for the NEFSC to have more interactions with managers?

Answer: It's important to have more meetings like this and to make sure these dialogues and discussions continue as various levels. Having these sorts of forums is very important because you get the right people in the room; but it's even more important to follow up with some tangible actions. The fact that the Council changed the name of the Subcommittee is good because the Council recognizes that "habitat" in its most complex form becomes "ecosystem." The ecosystem is a matter of scale; the ecosystem approach really does begin with the aggregation of habitat information. Also, some of the programs and funding mechanisms at certain levels need to be well coordinated and we're seeing that within NOAA; for example, when you see the nine priorities of the Nation Ocean Policy. These are well coordinated in some larger programs, but that coordination doesn't stop at the federal level and some of that has to go down to the state and community levels also.

NMFS SCIENCE IN SUPPORT OF NEW MANAGEMENT INITIATIVES: PERSPECTIVES FROM HEADQUARTERS

Ned Cyr, Director, NOAA/National Marine Fisheries Service, Office of Science & Technology, Silver Spring, MD

Major Recommendations

- NMFS supports an ecosystem-based approach to fisheries management, and seeks to develop and provide tools to accomplish this goal. NMFS strongly encourages the efforts of the MAFMC to build an ecosystem approach and recommends maintaining a dialogue to develop science products that meet the needs of the Council. One potential mechanism to accomplish this would be to develop and update the 5-year research priorities submitted to the NMFS Science Center Directors reflecting ecosystem and habitat science needs identified by the Council.
- NMFS supports the Council's acknowledgement of the importance of marine, estuarine, and riverine habitat to fish stocks and their ecosystems, and recommends a renewed effort to work with state and local partners in protecting fish habitat.
- NMFS recommends that the Council continue to seek recognition on the Regional Planning Body and that the Council participates to the fullest extent possible in the coastal and marine spatial planning process in order to maximize its impact on the process.

NMFS supports both traditional and new scientific approaches to providing sustainable fisheries and ecosystems. By incorporating ecosystem and climate change information into fisheries science, NMFS seeks to provide more accurate information for the resources we have the responsibility to manage. The National Ocean Policy helps to guide NOAA and NMFS science, and the Priority Objectives are highly relevant to the MAFMC. The Priority Objectives highlight a renewed emphasis on ecosystem-based fisheries management (EBFM). Given these objectives and the guidance of the Magnuson-Stevens Reauthorization Act, there is a need to determine how fisheries science and management fits into EBFM through Coastal and Marine Spatial Planning (CMSP). NMFS Science addresses these questions to support improved fisheries management support.

The cornerstone science product for NMFS management is the stock assessment. Across all Fishery Management Councils, NMFS needs to increase the number of stock assessments, reduce uncertainty in assessments, and incorporate ecosystem considerations into those assessments. The Stock Assessment Improvement Plan (SAIP) provided an inventory and analysis of stock assessments to determine needs going forward, and identified Tier 3 stock assessments as the goal for all fish stocks. Tier 3 stock assessments utilize equilibrium or non-equilibrium production models aggregated both spatially and over age and size. This inclusion of spatial and habitat information in stock assessments is important to minimize uncertainty and maximize accuracy. The number of stocks for which NMFS has produced an adequate assessment is increasing in large part due to the creation and use of the Expand Annual Stock Assessments (EASA) budget line. With $51 million in FY11, the EASA budget has increased the number of stocks with adequate assessments to nearly 140. This funding also supports research programs underpinning stock assessments such as Fisheries and the Environment (FATE), habitat assessments, and advanced sampling technology to improve surveys.

The application of EBFM will yield better fisheries science and management by accounting for the cumulative impacts of multiple concurrent factors such as pollution, coastal development, overharvest, predator-prey dynamics, and other ecosystem factors. NMFS has developed the integrated ecosystem assessment (IEA) framework to improve the study and management of the resources in the entire ecosystem. Science needs for EBFM include ocean observing systems, systematic reporting on the status of marine and coastal ecosystems through IEAs, ecosystem research plans which link human activities to ecosystems, and decision support tools that support adaptive approaches to human ecosystem uses. Successful EBFM will enable NMFS to restore fish populations, control invasive species, maximize ecosystem services, and restore species and the habitats upon which they depend.

The Ecosystem Principles Advisory Panel, which convened as a result of the 1996 Magnuson-Stevens Reauthorization Act, concluded that conservative single species management is the starting point from which to move toward EBFM. The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 builds toward the EBFM goal through the implementation of annual catch limits (ACLs). ACLs rely on reliable and accurate stock assessments, fisheries-independent surveys, and advanced technology to improve or enable surveys in untrawlable habitat. Improving NMFS's technical capacity

maximizes the accuracy of assessments and ACLs. These improvements enable the Councils to achieve the goal of setting ACLs as close to the Allowable Biological Catch (ABC) as possible without risking overfishing. It is important to include ecosystem considerations such as available habitat and impacts to reproduction and population dynamics in assessments and predictions for fisheries production.

Functioning habitat is essential to supporting a robust and healthy ecosystem, and is critical for successful fisheries. NMFS is focusing on providing improved and more usable habitat science to improve stock assessments, inform CMSP, and aid in the siting of renewable energy, aquaculture, and Marine Protected Areas. It is essential to have better information on the quantity, quality, and impact of fish habitat. The Habitat Assessment Improvement Plan (HAIP) is analogous to the SAIP, and is a plan to build resources for a habitat assessment and monitoring program to complement and support improved fisheries science. The HAIP and the National Habitat Assessment Workshop identified a number of habitat science goals, including funding pilot projects, prioritizing habitat assessment needs, improving the quality and usefulness of habitat assessments, and producing stock assessments that utilize habitat science. The long-term goal is to develop stock assessments with habitat data, tying species specific rates of production to habitat. Such improvements would result in greater accuracy and precision, providing increased confidence in ACLs, and benefitting the fisheries that we manage.

Climate change poses a serious threat to fisheries. Climate change may impact fisheries through changes to fish habitats, stock locations and dynamics, fishery allocations, communities and economies relying on fisheries, increased threats to vulnerable species, changing use and efficacy of protected habitats, and increased threats from invasive species. Studies suggest that the sea level could rise in the mid-Atlantic by as much as 0.3 m by end of the century, altering productive habitats. The National Climate Service Set (NCS) was established to provide scientific information addressing the causes of these problems. Specifically, the NCS's objectives are improved understanding of the changing climate system, integrated assessments of current and future states of the climate, mitigation and adaptation choices supported by climate science, and a climate-literate public that understands vulnerabilities to a changing climate and makes informed decisions. NMFS science seeks to build from NCS data products by determining how climate change will impact the fisheries NMFS manages. A recent study in the northeast, sponsored by NMFS's FATE program, identified changes in the distribution of populations for 24 of 36 species. Species shifted their distributions northward and down in the water column, presumably as a response to ocean warming. Critical issues facing NMFS include how to incorporate information such as this into stock assessments, how to conduct assessments differently to address shifts in populations or resources, and how to consider this information in management.

Integrated Ecosystem Assessments (IEAs) are the cornerstone tool for NOAA's implementation of EBFM. IEAs are a synthesis and quantitative analysis of information on relevant physical, chemical, ecological and human processes in relation to specified ecosystem management objectives. An IEA is a means to put a framework to EBFM approaches, allowing us to begin to quantify priorities for ecosystem and discern tradeoffs for different management decisions. Contingent upon FY11 funding, the northeast shelf IEA will conduct a region-wide stakeholder scoping session, work with Fishery Management Councils, industry, non-governmental organizations, and others to incorporate and prioritize objectives to implement an EBFM approach. Through this process, IEAs develop a means to bring ecosystem considerations into management responsibilities.

NMFS must balance current and future fisheries management needs. Increasing the number of days-at-sea funded by NOAA for stock assessments is a top priority in accomplishing NMFS's core science objectives. In 2011, NMFS may need to repurpose significant funds to mitigate declining survey days-at-sea. In addition to these surveys, the NMFS Office of Science and Technology supports about $8 million annually in projects that develop a deeper understanding of marine fisheries and the ecosystems that support them. NMFS is investing in new techniques for stock and habitat assessments to increase the efficiency, accuracy, and precision of science provided to fisheries managers. Developments in advanced sampling technology enable assessments in hard-to-sample habitats and increase the efficiency of current surveys. FATE's research puts such information in the context of environmental variability and addresses environmental impacts to productivity. The Comparative Analysis of Marine Ecosystem Organization further develops these ecosystem considerations, investigating ecosystem dynamics and building predictive models to inform decisions. Through the Ocean Acidification program and collaborations with the National Climate Service, NMFS seeks to build context and understanding for long-term challenges facing fisheries management. NMFS science seeks to utilize both cutting edge ecosystem science and traditional stock assessment science to address current management objectives, supporting a move toward improved ecosystem-based fisheries management.

Key Question: Where are the funding sources for marine mammal work, and what about sea turtles?

Answer: There are other funding lines which are addressing marine mammals, and there's quite a robust research program. For sea turtles, there's recently been a National Research Council (NRC) study on sea turtle

population assessment methods; what we're trying to do is support some research on assessment methods that are closely tied to what the NRC recommendations were. Basically we're trying to base our assessments more on at sea surveys rather than beach surveys as has been traditionally done, which was one of the major recommendations coming out of the NRC.

Key Question: It appears that a considerable amount of time, funds, and staff are going toward studies and "paper" products, rather than addressing such pressing issues as sea level rise. More consideration should be given to being proactive with these priorities, and coming up with actual mitigation strategies and practical solutions, and towards better utilizing funding and resources.

Answer: It's always a balancing act. We're trying to balance our core science of doing and supporting stock assessments versus emerging issues. Climate change is something that we're going to have to deal with; it's inevitable. With climate change, it can either be addressed through mitigation or adaptation. NMFS does not deal with the mitigation aspects of climate change, but NMFS is concerned with adaptation and if we know that sea level rise or climate change is going to affect habitats then we have to take that into account in terms of our scientific assessments and management. We're already losing habitat to sea level rise in other areas; we may also see that in the mid-Atlantic quite soon so we can't afford to get too far behind on those issues. But point well-taken about the need to balance between/among priorities.

Key Question: Discuss the uses of regional observing systems such as Integrated Ocean Observing System (IOOS) and the Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS).

Answer: Typically when climate scientists talk about observing systems they're talking about the global systems; for example, the global CO_2 observing networks, the Argo profile floats in the deep ocean, etc. But the information that comes from the global observing networks may not help us regionally. We need to know how it's going to affect us here in the mid-Atlantic, what's it going to do to circulation, to sea level rise, etc., that's where the regional observing systems are going to be effective and feed into our science.

Key Question: Why was EBFM left out of the last reauthorization of the Magnuson-Stevens Act?

Answer: The challenge with EBFM is developing operational frameworks that fully account for all of our ecosystem processes, and that is a difficult thing to do. Some examples: the Ecosystems Principles Advisory Panel made a recommendation to develop fisheries ecosystems plans for all the Fishery Management Councils, there is the IEA framework, there are a number of different frameworks or approaches that one could use. If we're eventually able to migrate toward one of those approaches, there could be more comfort in terms of putting EBFM explicitly into the Magnuson-Stevens Act.

SPATIAL CONSIDERATIONS FOR ECOSYSTEM-BASED MANAGEMENT ON THE NORTHEAST U.S. CONTINENTAL SHELF

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Major Recommendations

- We recommend that the MAFMC evaluate options for the designation of spatial management units as the basis for development of integrated management plans for defined ecoregions. The proposed ecological units cleanly delineate the main area of responsibility of the council in the Mid-Atlantic Bight although for some migratory species under council authority, coordination with other management authorities (notably the ASMFC and the NEFMC) will be necessary. A transition strategy can be defined that first adopts place-based management as the ultimate goal for the Council and then begins to assess how existing management plans can be adjusted to accommodate broader ecosystem objectives. These extended plans would then ultimately be absorbed into a fully integrated Ecosystem-Based Management Plan for the Mid-Atlantic Bight.

The recent signing of an Executive Order establishing a new National Ocean Policy for the nation lends special urgency to adopting the basic tenets of ecosystem-based management: 1) a commitment to establishing spatial management units based on ecological rather than political boundaries; 2) consideration of the inter-relationships among the parts of the ecosystem and with the physical environment; and, 3) the recognition that humans are an integral part of the ecosystem. To address this first need, we assembled a set of physiographic, oceanographic, and biotic (lower trophic level) variables to identify ecological production units on the northeast U.S. continental shelf. The physiographic variables considered in this analysis include bathymetry and surficial sediments. The physical oceanographic and hydrographic measurements include satellite-derived estimates of sea surface temperature, annual temperature span, and temperature gradients. We also employed ship-board estimates of surface and bottom temperature and salinity in spring and autumn based on NEFSC research vessel surveys. The biotic measurements considered include satellite-derived estimates of chlorophyll *a* and primary production, and chlorophyll gradients. Temperature and chlorophyll gradients are included to identify frontal zone positions.

We employed a principal components analysis (PCA) to examine the multivariate structure of the data and as a prelude to classification of ecological production units. We then used a K-means cluster analysis on the principal component scores to define our spatial units. We identified seven major cluster units. The clusters represent major ecological production units on the shelf including (1) Eastern Gulf of Maine-Scotian Shelf, (2) Western-Central Gulf of Maine, (3) Inshore Gulf of Maine, (4) Georges Bank-Nantucket Shoals, (5) Intermediate Mid-Atlantic Bight (6) Inshore Mid-Atlantic Bight and (7) Continental Slope (Cape Hatteras to Georges Bank). These spatial units are considered to be open and interconnected, reflecting oceanographic exchange and species movement and migratory pathways.

We can further consolidate some ecological subareas to reflect movement patterns of exploited species from both the shelf-break region and the immediate nearshore regions to the adjacent shelf areas. These regions would then be considered special zones associated with the adjacent shelf regions. We can further retain the option for special management considerations to be implemented in both nearshore and shelfbreak areas in a nested array to reflect the distribution of ecologically sensitive species, areas of high biomass and species richness, and the confluence of multiple human use patterns in nearshore regions. Following this approach, we specify four major ecological zones including (1) the Western-Central Gulf of Maine, (2) the Eastern Gulf of Maine-Scotian Shelf, (3) Georges Bank-Nantucket Shoals, and (4) the Mid-Atlantic Bight. For mapping purposes we have included estuaries and embayments with the nearshore regions but note that it may be desirable to identify these areas separately as yet another nested layer in the overall spatial structure.

Consideration of the place of humans in fishery ecosystems and its implications for shaping spatial management units is no less important in devising

effective strategies for EBFM and for gaining acceptance of this concept within fishing communities. The connection between humans and the geography of the sea has been well documented in the northeastern United States, providing important perspectives on how we might integrate the human dimension into spatial management within the general context of EBFM. To assess general concordance between our proposed ecological subregions and human use patterns (with a focus on fishing activity), we mapped the distribution of fishing effort by vessel size, gear type, and port of origin. The observed distribution patterns reflect important social considerations on how, when, and where fishers operate as well as constraints imposed by logistical factors and management requirements. Not surprisingly, small vessels with more limited fishing ranges are often characterized by distribution patterns predominately in one of the proposed ecological units. Increasing vessel size and mobility is reflected in more spatially diverse fishing patterns and occupation of multiple ecological subunits. We find that fishing patterns also often follow major boundaries of our ecological subunits, reflecting topographical and productivity features that are often not represented by more conventional stock areas used under present management regimes.

An analysis of operational fishery units defined by species catch composition, seasonal and spatial fishing patterns, and gear type also finds strong correspondence between the proposed ecological subunits and the spatial extent of these fishing assemblages. The confluence between ecological structures related to productivity patterns and spatial fishing strategies does suggest the potential utility of the ecoregions defined in this study as management units for EBFM.

These considerations hold important implications not only for defining potential management units for EBFM but for identifying both ecologically important areas and regions of critical importance for fishing communities. Decisions in marine spatial planning will hinge on demonstrating the importance of spatially defined regions of joint human and ecological concern.

In conclusion:

• ecological subunits of the northeast continental shelf can be effectively defined based on physiographic, oceanographic, and lower trophic variables;

•the number and size of the major spatial management units ultimately chosen will involve tradeoffs involving interchange among areas (smaller units involve more interchange);

• hierarchical spatial management structures can be defined to reflect distribution of vulnerable species, biomass and biodiversity, human use patterns, and management requirements; and

•these mapping exercises highlight areas of importance to fisheries and can be used to represent fisheries interests in marine spatial planning.

Key Question: Is the idea to change our management plans from different areas and instead come up with fewer plans based on spatial management units?

Answer: The idea is to actually build on the plans and establish a different framework; right now we're pretending these things are separate and they're really not in many ways. There have been tremendous advances in management and stock assessment methodologies that help us to understand many of the vulnerabilities of many species, and we should take advantage of that and build it into what we're doing. But, if we're going to do EBFM, it's important to remember that the properties of the ecosystem are not the same thing as the properties of its parts. Right now we're trying to manage the properties of its parts and pretending that they're not interacting and that there are no connections among them. Looking at it from an ecosystem point of view means we're trying to re-establish this whole concept from a different perspective and move it forward. So what's being done now is simply incomplete, and going forward it should be done in a way that's simpler and takes advantage of ecosystem properties that are more stable and predictable than all the individual parts. We want to take advantage of that greater stability so as to have greater predictability and starting from that higher level, and then ultimately we'll have to make allocation decisions based on a species basis because that, of course, is what really makes a difference to the fishers.

Key Question: Place-based management may be simple for benthic species, but how will it work for species like spiny dogfish that has a wide distribution and crosses many of the proposed management areas/units, and simultaneously may also have inter-annual variation in its distribution?

Answer: That's an important and critical issue. There are many species that move through the different areas, but without minimizing the difficulties, we do know a lot about their spatial and temporal distribution through our NEFSC surveys, through commercial fishing vessel trip reports, etc. So it is possible to use that information and apportion the amount of time the species spends in the different areas and also figure out how much production they're both contributing to and removing through predation. There is a certain amount of year-to-year variation we have to live with when we manage them on a stock basis; for example, recruitment. But looking at the broader patterns of the distribution and the times and places where these species are using the data from the commercial fisheries and our NEFSC surveys, there's a lot to go on and we can begin to get an idea of how we could apportion the production among the different parts.

Key Question: You say the choice of the actual spatial management units is the prerogative of the management agencies. This will sooner or later lead to realignment of Council responsibilities by state and/or by species. How will changing the management scheme work?

Answer: In this talk there is a transition strategy that tries to address this issue. The idea is to take baby steps and for a while we'll stay with what we have but then begin to look at connections between the species and stocks that we manage both within a management plan and between management plans and look for interactions among them that we need to take into account. Whether they're fishery interactions with their bycatch problems that aren't fully being resolved now or whether it's biological interactions like predator/prey interactions, those will be taken into account. We'll also begin to lay a firm foundation in terms of looking at climate influences and environmental influences in a systematic way. That's already being done in part in some of the management plans but we want to do it in a more systematic way. This will get people more comfortable with the idea that ultimately we're going to manage in terms of ecological units instead of stock units, and that's where we're ultimately headed.

STRENGTHENING SCIENCE TO IMPROVE HABITAT PROTECTION AND RESTORATION IN CHESAPEAKE BAY

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Major Recommendations

- Explore opportunities to better connect the science and management activities of the Chesapeake Bay Fisheries Goal Team, Atlantic States Marine Fisheries Commission, and MAFMC.
- Convene a NOAA habitat mapping consortium/meeting, organized by the NOAA North Atlantic Regional Team and hosted by the NMFS/NEFSC James J. Howard Marine Sciences Laboratory, including representatives of the NOAA Chesapeake Bay Office (NCBO), MAFMC, NEFSC, Hudson River National Estuarine Research Reserve, The Nature Conservancy, and others.
- Improve communication pathways and networks to include all sectors with influence over land and marine habitats and develop better visualization tools describing ecosystems, their inter-relationships, and the specific outcomes that can result from applying ecosystem approaches to management.
- Fully integrate modeling, observations, and research to facilitate scenario testing and tradeoff discussions.

The Chesapeake Bay is the nation's largest estuary and its network of streams, creeks, and rivers hold tremendous ecological, cultural, economic, historic, and recreational value for the region and its citizens. But the Bay and its tributaries remain in poor health, with polluted water, stressed populations of fish and shellfish, degraded habitats and landscapes lost to development. The health of the Bay is closely linked to the health of the Atlantic coastal region where the interplay of estuarine, coastal, oceanic, and atmospheric processes shape the Northeast Continental Shelf Large Marine Ecosystem (<http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=53:lme7&catid=41:briefs&Itemid=72>). Protection and restoration of critical Chesapeake Bay habitats such as tidal wetlands, marshes, shorelines, forests, submerged aquatic vegetation (SAV), open water, oyster reefs, beaches and dunes, and islands directly influences the health and productivity of Atlantic coastal living resources. This is particularly true for fishery resources with life histories that require and/or utilize both estuarine and oceanic habitats, including menhaden, striped bass, American eel, river herring, shad, horseshoe crab, spiny dogfish, flounder, bluefish, and black sea bass.

On May 12, 2009 President Obama issued Executive Order 13508 on Chesapeake Bay Protection and Restoration, declaring the Chesapeake Bay a "national treasure" and ushering in a new era of federal leadership, action, and accountability. The purpose of the Executive Order is "to protect and restore the health, heritage, natural resources, and social and economic value of the nation's largest estuarine ecosystem and the natural sustainability of its watershed." The Executive Order directed federal agencies to define environmental goals for the Chesapeake Bay, develop a strategy to protect and restore the watershed, and design and implement annual action plans to achieve meaningful environmental outcomes. The strategy reflects an unparalleled effort by the federal government to restore clean water, recover habitat, sustain fish and wildlife, conserve land, increase public access, expand citizen stewardship, develop environmental markets, respond to climate change and strengthen scientific knowledge. To implement this strategy, the NOAA Chesapeake Bay Office (NCBO) is supporting six important elements to strengthen science:

1. Providing habitat characterization and assessment.
2. Understanding fisheries status and trends.
3. Improving observational platforms and real-time monitoring.
4. Delivering data tools and applications.
5. Enhancing models and ecosystem forecasting.
6. Implementing Ecosystem Approaches to Management.

Providing habitat characterization and assessment

NCBO is collecting, processing, and analyzing multi-beam bathymetry, side-scan sonar, video, and sediment grab data to create benthic habitat characterization spatial data products to support native oyster restoration, essential fish habitat, and other resource assessments and management (<http://www.chesapeakebay.noaa.gov/acoustic-seafloor-mapping>). Bathymetric differences can be used to evaluate oyster reef morphology and to compare the utility of different reef materials. Habitat characterization surveys will serve as a spatial baseline for monitoring the performance of oyster reef restoration projects and help establish benchmarks on which other restoration projects can be evaluated.

Understanding fisheries status and trends

NCBO manages a multispecies fisheries science program aimed at improving knowledge of single species and ecosystem level dynamics as they relate to fisheries management. This program considers the cumulative impacts on fisheries from various sources, including multiple factors such as pollution, coastal development, harvest pressure, predator/prey and other ecological relationships, and watershed management. Recent studies funded through this program have considered the impact of mycobacteriosis on striped bass and quantified the contribution of the Chesapeake Bay as a nursery for the coastal menhaden stock.

NCBO is also considering emerging issues such as the possible ecological impacts of non-native blue catfish which could be affecting Bay and coastal species such as blue crab, shad, and river herring.

In addition, NCBO is working with the Smithsonian Environmental Research Center to quantify fish utilization of natural and restored shoreline and shallow water habitats, including different types of shoreline armoring (<http://www.cop.noaa.gov/stressors/resourcelanduse/current/msrp.aspx>).

Improving observational platforms and real-time monitoring

NCBO operates and maintains the Chesapeake Bay Interpretive Buoy System (CBIBS), a network of nine buoys along the mainstem of Chesapeake Bay and selected tributaries (<http://www.buoybay.org>). The buoys provide real-time weather and water observations for use by scientists, managers, and citizens. CBIBS is also a component of Chesapeake Bay Observing System and the Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS).

NCBO is also working with partners to enhance ecosystem forecasting capabilities in the Chesapeake Bay including harmful algal blooms and hypoxia. In addition, sensors are being tested and deployed on buoys to detect movements and migrations of fish species, including Atlantic sturgeon. This technology should prove particularly useful when a buoy is deployed at the mouth of Chesapeake Bay in the spring of 2011.

Delivering data tools and applications

NCBO is developing an Oyster Data Tool which is a geo-referenced oyster data base that enables spatial visualization of all facets of oyster management (population surveys, harvest, disease, bathymetry, habitat, and restoration activities). The tool allows managers to pull up information for a given oyster bar/project using their web browser to display the data on maps and generate reports. For example, the tool allows temperature, salinity, and bathymetry data to be overlaid on a map with oyster restoration and disease data. This integration and visualization of data will help make decisions on targeting of new restoration and facilitate evaluation of past projects. The vision is to expand this database to include information on a range of other species and restoration activities.

Enhancing models and ecosystem forecasting

The Chesapeake Bay Fisheries Ecosystem Model (CBFEM) is a trophic model of the Chesapeake Bay developed using Ecopath with Ecosim (EwE) software. The model helps scientists and others understand the Chesapeake Bay ecosystem. Explorations using CBFEM have focused on interactions between menhaden and striped bass (and other predators), potential effects of hypoxia on fisheries species, and the habitat-mediation effects of submerged aquatic vegetation on blue crab stocks.

The Chesapeake Atlantis Model (CAM), currently under development, is based on the Atlantis software developed by the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO). This model is an approach for conducting formal management strategy evaluation — a simulation that accounts for tradeoffs in performance across a range of management objectives. CAM will incorporate spatially explicit information about the biological, geochemical, and physical forcings of the Bay and its tributaries, the effects of different user groups, and dynamically tracks the interaction of these factors over time. This modeling approach allows exploration of the ecosystem effects of environmental changes, policy options, and management strategies. For example, CAM will help project scenarios such as the likely ecosystem effects of eelgrass loss or loss/gain of marsh habitat, increasing/decreasing nutrient input, and increasing population size along the coasts of the Chesapeake.

Implementing ecosystem approaches to management

In 2006, NCBO published "Fisheries Ecosystem Planning for Chesapeake Bay" (<http://chesapeakebay.noaa.gov/images/stories/pdf/FEP_FINAL.pdf>) to provide strategic guidance for ecosystem-based approaches to fisheries management and information on the function and structure of the Chesapeake Bay ecosystem. This comprehensive planning document and prototype fisheries ecosystem plan (FEP) was developed in response to key recommendations by the NMFS Ecosystem Principles Advisory Panel. The FEP describes components of the Chesapeake Bay ecosystem and formulated recommendations for management and research required to develop EBFM plans.

Since then, NCBO has helped form a new Sustainable Fisheries Goal Implementation Team (Fisheries GIT) under the Chesapeake Bay Program. This new group marks the first time that fisheries

management has been an official part of the Chesapeake Bay Program's management structure. There were groups in the past that coordinated fisheries management baywide, but they were only loosely affiliated with the CBP, leaving the impression that they were still primarily state-by state efforts. The Fisheries GIT is composed of the state fisheries managers from around the Bay and is currently chaired by the director of the NCBO. The Fisheries GIT draws together a diverse group of managers and scientists to improve management and recovery of oysters, blue crab, menhaden, striped bass, and alosines. It focuses on advancing EBFM by using science to make informed fishery management decisions that cross state boundaries and improve regional fishery management collaboration. Institutions represented on the Fisheries GIT include the NCBO, Virginia Marine Resources Commission, Maryland Department of Natural Resources, Potomac River Fisheries Commission, Atlantic States Marine Fisheries Commission, District of Columbia Division of Fish and Wildlife, and MAFMC.

Current priorities of the Fisheries GIT include improving the communication between land use planning and decision-making and fisheries managers to reduce impacts to fish and habitat.

Key Question: Is blue channel catfish considered an invasive species, and for oysters, is the restoration focus on native oysters or Asian oysters?

Answer: Yes, the blue channel catfish is considered invasive because it was introduced in the James and Rappahannock Rivers as a trophy sportfish in the 70s and 80s and it's moved into other tributaries of the Bay. For oysters, the policy decision was to retain the focus on native oyster restoration and not introduce Asian oysters.

Key Question: How far reaching are your efforts to stem farm runoff, paper mill runoff, etc. into the Bay from the upper watersheds?

Answer: EPA is the lead for water quality in the Bay and under the President's Executive Order, the focus on water quality improvement has become much more rigorous. Implementing the provisions of the Clean Water Act that deal with establishing loads for the watersheds and allocating those loads for the upper watershed states have been done and now those states have developed Watershed Implementation Plans (WIPs) for implementing the load reductions.

Key Question: How do we fill in data gaps and proceed with effective management of non-commercial species? Also, what about species like oysters that are critical not only as a commercial species, but they're also a keystone ecological species?

Answer: The first question involves work on habitat characterization and species utilization; we are trying to fill in the data gaps on those non-commercial species. We would eventually like to include more EBFM in Chesapeake Bay, including the spatial component, but right now we're focused more on indices of ecosystem health and that's the tool we're using. For oysters, theoretically, the re-establishment of successful oyster reefs that are kept in sanctuary or kept for their ecological value and not commercially exploited – we will see a change in species diversity and ultimately better understand the ecological services those species provide for higher up the food chain. Overall, this shows why we might want to move toward spatial management because the reality is that there's too much that can fall between the cracks, and when we have management plans aimed at individual species we don't have strict rules that tell us when you need to have a management plan for an individual species. But if you move towards EBFM where you have a component of spatial management, then we have a way of protecting other parts of the ecosystem and can do it in a way that both meets the needs of protecting harvested species so that we have greater sustainability for them but also focus on biodiversity that would protect a much broader spectrum of the ecosystem.

HABITAT SCIENCE AT THE NORTHEAST FISHERIES SCIENCE CENTER

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Major Recommendations

- Incorporate more habitat information in the fisheries management process.
- Prioritize species and habitats whose management would benefit most from additional habitat-specific information.
- Establish an improved protocol for providing Northeast Fisheries Science Center habitat-science support to the MAFMC.

The James J. Howard Marine Sciences Laboratory began operations in 1961 as the Sandy Hook Marine Laboratory directed by Dr. Lionel A. Walford, and was part of the Department of the Interior's Bureau of Sport Fisheries and Wildlife. The laboratory was incorporated into the new National Oceanic and Atmospheric Administration (NOAA) within the U.S. Department of Commerce in 1970. Facilities at the Howard Laboratory include an extensive seawater system capable of providing up to 350 gallons per minute. The seawater system supports research in 11 seawater labs and a 32,000 gallon aquarium, with a focus on growth, feeding, reproduction, migration, and other life habits and behavior of coastal marine species. A control room contains computers for configuring, controlling and monitoring the lighting and seawater systems. Several dedicated laboratory suites are available to support research on analytical chemistry, trace-metal chemistry, organic chemistry, and microbiology. Further, the Howard Laboratory houses the Lionel A. Walford Library, which is noted for its extensive collection of fisheries-related archives and journals.

Most of the NOAA staff at Sandy Hook is part of the Northeast Fisheries Science Center's Ecosystems Processes Division (EPD). The mission of the Division is to understand the effects of environmental variability and human disturbances on fish and shellfish productivity relative to habitat, with a focus on the Northeast Shelf. Our job is to conduct ecosystem-based research and assessments of living marine resources, to promote the recovery and long-term sustainability of these resources, and to generate social and economic opportunities and benefits from their use.

The Division operates through four branches. The Oceanography Branch conducts studies on the physical environment and plankton populations in order to understand how these ecosystem components influence the distribution and abundance of fish and shellfish. The Coastal Ecology Branch focuses on assessing the condition of habitats important for these living marine resources. The Behavioral Ecology Branch elucidates important ecological processes and habitat requirements of fish in all life history stages. The Marine Chemistry Branch focuses on understanding biogeochemical effects of habitats on fish and uses chemical methods for stock identification.

The Division's current research priorities are:

•effects of climate change, ocean acidification, and human activities (e.g., renewable energy production) on coastal habitats and fisheries;

•coastal and marine spatial planning including mapping and assessment of fish habitat condition;

•habitat-dependent processes and fish life histories in support of resource management modeling.

Major initiatives currently being conducted by the Division include:

•lead of a 5-year climate research plan;

•one of only three Centers of Expertise for ocean acidification;

•GIS habitat mapping to create a habitat atlas for northeast coastal and marine ecosystems;

•broad-scale habitat investigations at the Hudson Canyon and on Georges Bank;

•ecological investigations on summer flounder, winter flounder, and other species;

•deep-sea coral surveys and ecology; and

•habitat modeling with foci on the synthesis of diverse sets of data to describe both pelagic and benthic habitats in support of fisheries stock assessment and management.

The Division provides several services to local, regional, national, and also international clients. For example, we work with community groups on shellfish restoration, with the New England and Mid-Atlantic Fishery Management Councils on the designation of essential fish habitat, with other federal agencies on the threats to deep-sea coral communities, and with North American and European partners on the effects of climate change. Our research is conducted through field monitoring and surveys from the northern tip of Maine to Cape Hatteras, NC, as well as through field and laboratory experiments and analyses of environmental samples.

Most of Ecosystems Processes Division's permanent staff of about 50 researchers, technicians, and support personnel are located at Sandy Hook, with

other staff located at laboratories in Narragansett, RI and Woods Hole, MA. In addition, every year the Division engages volunteers, academic interns, and contract employees to assist us with our research.

For more information about the Ecosystems Processes Division and research activities, please contact the Division Chief, Dr. Thomas Noji, Thomas.Noji@noaa.gov. Also, please see our public websites:

<http://sh.nefsc.noaa.gov> for the James J. Howard Marine Sciences Laboratory;

<http://www.nefsc.noaa.gov/epd> for the EPD;

<http://www.nefsc.noaa.gov> for the NEFSC.

Key Question: Does your scientific assessments consider predation on, as well as natural mortality of, eggs and larvae, for example?

Answer: We would consider those factors that affect mortality rates as critical components of the habitat and that would include the environmental variables that cause predator-prey overlap, the structural features that influence the interaction strengths, and the nature of those predators. So we do include species interactions when we talk about habitat. We've looked at this before at the scale of an estuary and examined predator-prey interactions and actually tried to quantify mortality in winter flounder. It could be done offshore but it's expensive to do. It could be done in process studies that focused on key spawning grounds in order to understand them from a process point of view and then how variability within the environment; e.g., climate change, and finer scale local forcing could affect those processes and lead to inter-annual variability.

Key Question: Is there a way that the results of your research can lead to an action plan that could, for example, bring a managed species back or rebuild a stock to a more sustainable level for harvesting?

Answer: There's the decision-making that goes beyond the science. Our job is to provide the best science that we can and any science advice and information as requested.

WHAT MAKES SOME PARTS OF THE OCEAN STICKY TO FISH? OCEAN OBSERVING FOR MARINE HABITAT SCIENCE AND ECOSYSTEM MANAGEMENT

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Major Recommendations

- Establish the resilience of the ecosystem and keystone populations in the ecosystem as the goal of ecosystem science and management in the Mid-Atlantic Bight. This is a different goal than the central goal of single species fisheries management which is to maximize the abundance of exploitable stocks. Preserving resilience requires managing variance and diversity rather than maximizing the mean. Resilience is provided by different forms of "storage." For single species populations this storage takes the form of habitat and age class diversity. For ecosystems it is provided by species diversity and the functional redundancy that results from it. Identifying and managing the diversity of habitats and the connections between them that promote resilience to ecosystem keystone populations and others that provide functional redundancy to the ecosystem is central to ecosystem based management.
- The physical and biological data required for space based ecosystem science and management are spatially fine-grained but regional in extent. For water column features it must also be very fine-grained in time. These kinds of data are expensive to collect and there appears to be a lot of redundancy in the data collection and analyses being performed in the region. The Council needs to strongly encourage open data and information sharing along with collaborative monitoring efforts in the region. The regional Integrated Ocean Observing System (IOOS) is providing a great deal of information about critical pelagic processes. A collaborative, well-organized effort to identify the bottom data available; to merge it, identify the gaps, and then to systematically address those gaps needs to be strongly encouraged by the MAFMC. These data should be merged with the regional IOOS into an open access portal(s).
- A research set-aside program focused on the goals of ecosystem science and management needs to be established in the region. While there are other parties with stakes in the ecosystem, the fishing community has the most extensive practical ecological knowledge of the ecosystem. Government and academic scientists should be encouraged to openly collaborate with the fishing community to perform the science required to identify processes in the Mid-Atlantic Bight ecosystem that promote the resilience of keystone populations and the ecosystem as a whole.
- Education of the public and stakeholders about the complexity of the ecosystem is absolutely critical for effective ecosystem management.

Marine organisms have evolved in an aqueous environment, with a high viscosity, high heat capacity, and solute concentrations similar to those in the spaces of their living cells. The organisms are exposed to motions and environmental conditions in the sea that are dramatically slower and less variable than similar motions and conditions in the atmosphere. Furthermore, since the density of seawater is only slightly less than the density of living tissues, drag rather than gravity is the dominant force controlling movements in the sea. The oceans are inhabited by nearly neutrally buoyant organisms that grow in direct contact with the "hydrosphere" throughout life cycles that usually include egg and larval stages a few millimeters long and adults with body sizes that can range from 10's of centimeters to meters. Rates of metabolism, growth, survival, dispersal, and reproduction in marine organisms are tightly coupled to many scales (millimeters to 1000s of kilometers; seconds to decades) of variability in the water column as well as the seabed as the organisms make the dramatic habitat transitions usually required to complete their life cycles. In contrast, early development in most terrestrial animals is internal (or external, as well as aquatic in amphibians and some insects), and juveniles and adults are exposed to the atmosphere over a range of body sizes an order of magnitude smaller than marine organisms. Terrestrial organisms are largely constrained to two spatial dimensions by gravity and have evolved elaborate mechanisms to decouple metabolism and other physiological rates from the short-term variability of the atmosphere. Despite these profound differences we often use terrestrial frameworks to think about and investigate the ways marine organism use and are affected by their habitats. We treat seascapes as analogues of landscapes; as two-dimensional matrices of habitat patches with slow spatial dynamics. We use our own experiences as terrestrial organisms inhabiting

landscapes to draw inferences about the constraints seascapes impose on the forms and ecologies of marine organisms, often overlooking the dynamic water column processes that define habitats even for organisms strongly associated with the seabed. Further, even when we do recognize that the vital rates of marine organisms and dynamics of their populations are strongly regulated by the ocean's "hydrosphere", the absence of data describing the dynamics and structure of the water column at ecologically relevant space-time scales has made it difficult to consider the ocean's fluid explicitly in the design and analyses of relationships between species and their habitats in the sea.

Now, however, the state-of-the-art Integrated Ocean Observing System (IOOS) monitors and models the physical and primary production dynamics of the ocean at the broad spatial scale as well as the fine time scales required to understand the ways water column processes affect the vital rates of marine organisms and dynamics of their populations. IOOS is an intergovernmental/interagency effort focused on the development of ocean observing and forecasting systems. IOOS themes range from public health and safety to marine operations and natural resource conservation. As part of the U.S. IOOS program, partners in the mid-Atlantic region along the U.S. east coast have developed a regional scale ocean observing network. The footprint of the Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS; <http://www.maracoos.org/>) stretches along 1000 km of coastline from Cape Hatteras, NC to Cape Cod, MA and offshore to the continental shelf break. MARACOOS uses a multi-platform approach to characterize the fine scale structure and dynamics of the coastal ocean. The platforms include U.S. and foreign satellites in space, a network of high-frequency (HF) radars deployed along the shore, and a fleet of robotic gliders flying beneath the ocean's, surface (<http://rucool.marine.rutgers.edu/index.php/COOL-Data/COOL-Data.html>). Satellites provide time series maps of surface temperature, chlorophyll-A, and other ocean color products describing light absorption and backscatter. Ensemble clustering is applied to the satellite information to objectively identify and visualize water masses and the surface fronts between them. The HF radar network provides hourly surface current measurements from the edge of the continental shelf into estuaries. These current measurements can be processed to show near-real time and statistical forecasts of horizontal surface flows, upwelling and downwelling dynamics, and the evolution of surface fronts. Robot gliders that carry sensors measuring temperature, salinity, chlorophyll-A, and particle backscatter describe seasonal to inter-annual changes in the vertical structure of the ocean. Satellite, HF radar, and glider data are assimilated into an ensemble of numerical circulation models (UMD-HOPS, NYHOPS, ROMS) that are evaluated by comparing model realizations to field measurements. MARACOOS data and model forecasts provide spatially and temporally explicit descriptions of the physical forcing, flows of materials, and primary productivity that structures and regulates the Mid-Atlantic Bight ecosystem. In addition to an extensive data archive, MARACOOS makes these data freely available in real time via Internet portals managed by trained operational oceanographers. Developments in high speed wireless communications and Internet infrastructure now permit real time virtual collaboration between marine habitat and ecosystem ecologists in the field and operational oceanographers with expertise in IOOS data streams and forecasts. Access to IOOS data and expertise allows ecologists to easily consider processes in the water column as well as on the seabed in studies of the life history processes that ultimately determine recruitment and the dynamics of populations of ecologically and economically organisms in the Mid-Atlantic Bight ecosystem.

Over the past six years we have been developing an approach to integrate IOOS remotely sensed data and short-term model forecasts into regional scale habitat studies. Our approach has included the development of distribution based habitat models for resource species that are also ecologically important in the mid-Atlantic ecosystem, as well as adaptive surveys designed to measure habitat specific distributions and life history processes rates for these species. We are nearing completion of a NOAA Fisheries and the Environment (FATE) funded project in which we have used multivariate and single species modeling to evaluate the power of IOOS data to describe distributions of organisms with different vertical habitat preferences in the mid-Atlantic region using abundance data collected on NEFSC center bottom trawl surveys. In analyses targeted at species important in the Mid-Atlantic Bight food web, we have found that our models, built using remotely sensed surface measurements, explain more of the abundance variation for pelagic species (longfin inshore squid and butterfish, ~73%) than demersal species (spiny dogfish and summer flounder, ~50%). However, bottom habitat variables (e.g., rugosity and depth) and surface pelagic features measured by IOOS remote sensing (e.g., surface fronts, vertical and horizontal current velocities) were equally important for all species, while *in situ* shipboard measurements of water column stability and structure were more useful for modeling pelagic species. All species were associated with specific surface current flows, regions of upwelling, and/or surface fronts identified with IOOS remote sensing, indicating that pelagic processes affecting energy costs of movement, prey production, and prey aggregation influenced distributions of the animals regardless of their vertical habitat preferences. We found that most of our IOOS-informed habitat models had greater explanatory power and out-of-sample prediction capabilities than previously published models built using the same analytical technique, but without the benefit of access to IOOS data streams.

We have begun to extend our IOOS-informed habitat studies in two directions. In one project recently funded by the NOAA/NEFSC Cooperative Network we are collaborating directly with members of the Garden State Seafood Association to use the ecological knowledge of fishers to refine our habitat models in an effort to develop tools to reduce the bycatch of butterfish in the longfin inshore squid fishery. The goodwill required for this close collaboration between the fishing industry, government, and academic scientists was developed in IOOS regional association meetings that serve as "neutral ground" for many stakeholders with diverse and sometimes competing interests in the services of the ecosystem. In another project we are using archived IOOS data along with NEFSC bottom trawl survey data for summer flounder adults and NEFSC Marine Resources Monitoring, Assessment, and Prediction (MARMAP) summer flounder survey data for eggs to identify the characteristics of their spawning grounds in the mid-Atlantic region. Our preliminary analyses indicates that autumn spawning may be concentrated outside the mouths of several large estuaries where processes of nutrient enrichment from estuarine outflows and coastal upwelling, high phytoplankton productivity, and processes of particle concentration along water mass convergences may create pelagic habitats promoting the survivorship and growth of summer flounder larvae. Furthermore we have been using MARACOOS assimilative circulation model nowcast and short-term forecasts to adaptively route surveys investigating habitat quality for fish larvae. On these cruises we have collected large numbers of summer flounder larvae that appear, based on estimates of larval age and particle tracking in surface currents measured with HF radar, to be derived from a specific spawning ground identified in the analysis of summer flounder spawning grounds described above. While this study is still in its infancy, we believe our IOOS-informed approach that combines regional scale habitat analysis and modeling with adaptive process based field studies will allow us to develop broad scale habitat models that couple ontogenic habitats and important life history processes for this and other species in the mid-Atlantic region. This is just the kind of approach required for effective space-based ecosystem management.

We believe our IOOS-informed approach to habitat science will be most useful for the development of tactical tools for ecosystem assessment and management. There are several pathways toward the development of habitat science in the service of ecosystem management in the region. The first of these is to develop single species models focused on ecosystem keystone species indentified in ecosystem modeling efforts in the northwest Atlantic (e.g., Link et al. 2008, 2010). The rationale behind this approach is that the identification and conservation of habitats maintaining the resilience of ecosystem keystone populations should be translated across a level of ecological organization to promote the resilience of the ecosystem as a whole. By resilience we mean the tendency of populations and ecosystems to return relatively rapidly to healthy states after significant perturbation (see Levin and Lubchenco 2008). One potential flaw with this approach is that rapid changes in climate are producing rapid changes in the distributions of animals, particularly in regions of faunal transition like the Mid-Atlantic Bight (see Nye et al. 2009; Sorte et al. 2010). If this is the case the identity of ecosystem keystones may also be changing and thus approaches targeted at a few individual species could fail to meet the goal of promoting ecosystem resilience. What is most intriguing about our study of summer flounder spawning grounds is that the hydrographic processes and structures we have identified that may promote nutrient enrichment, concentration, and larval delivery are the same "ocean triad" of processes that appear to define important spawning grounds for pelagic species in the eastern Pacific Ocean and Mediterranean sea (see Bakun 1996; Agostini and Bakun 2002). Thus we may be able to shift focus from habitat studies of individual keystone species toward investigations of "keystone habitats" where physical and biological processes in the water column and on the seabed promote the survival of critical life history stages of many species rather than just a few. This habitat processes-based approach will be essential if the ecosystem is changing rapidly due to climate change. But no matter what approach we take, habitat science in support of ecosystem assessment and management will require close, honest and open collaboration between physical and chemical oceanographers, habitat ecologists and ecosystem scientists, as well as fisherman who, arguably, have the most intimate and practical understanding of the ecosystem as a whole.

Further reading

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Key Question: For harvestable species that co-occur in time and space with bycatch: with all your habitat analyses, can you come up with a risk analysis to actually target areas or habitat in both time and space that will allow fishers to maximize harvest of the harvestable species but avoid the bycatch? For example, while fishing for squid, many fishermen know when and where to fish certain areas in order to avoid the bycatch of butterfish.

Answer: This is a difficult problem but we're trying as much as possible to be practical about this and to learn from the fishermen; first, what habitat is from the fisherman, then what is possible because the overlap between butterfish and squid is remarkable when you handle the trawl data. But we recognize the value of using the fishermen's knowledge as they have been on the ocean every day and they're good ecologists, so we want to introduce them to the data, sit in the room with them, maybe go out on the boat with them, and actually sit down and try to tackle this problem together. Our current research approach might not work but there are other approaches having to do with real-time reporting or the autocorrelation between catches, bycatches, and time and space that would be appropriate. But we'll all learn from each other and I think that the relationships that we develop will useful for other projects in the future.

SCIENCE PANEL DISCUSSION WITH COUNCIL

Rapporteur: **David Packer,** NOAA/National Marine Fisheries Service, Northeast Fisheries Science Center, Ecosystems Processes Division, James J. Howard Marine Sciences Laboratory, Highlands, NJ

Key Question: We do have some opportunities both on a large scale and local scale for incremental steps toward EBFM – can you discuss those starting points toward progress?

Answer: We start with internal capacity. This goes back to organizational dynamics – getting familiar with what others are doing in your Agency is a first step. And within NOAA over the years a lot of what you've heard about integrated coastal ocean mapping, for example, has gone a long way towards bringing various parts of the Agency together. The various technical capabilities of the Agency are starting to come together, in the context of cross-Agency integration/coordination, and as the technology improves we can apply some of these capabilities across our missions so that we can start to develop products that are useful to a wide variety of applications. But also it's as simple as identifying a time and place for some of this capacity that exists within NOAA in the mid-Atlantic to get together and talk about some of the projects we might do together. In other words, bring together the various capabilities of the Agency across its major line offices, not just NMFS, but the National Ocean Service, National Weather Service, etc. and perhaps hold a workshop that pulls together all this capacity and do a little more hands on match-up of the mapping capability and the survey capability, etc.

But in addition, the single biggest change is for us to say that ultimately we're going to have management plans for ecological regions. We want to replace single species or stock management plans with integrated plans for ecological regions, which alone would put us on the path toward EBFM. It's not a simple process. The basic outcome is that there are a range of nested spatial and temporal scales that are important in terms of the ecology of these systems and we're trying to define the larger scales first as potential management units. So, you have a handful of areas that you develop an integrated management plan for – but then within that recognize that there's much finer and richer spatial detail that you're going to want to take into account. John Manderson's presentation gives some nice examples of finer scale oceanographic processes that are quite important to the ecology of the region. The NEFSC has tried to lay out one possible roadmap for actual implementation. It's a starting point for a discussion which will be shaped and melded by the needs of the Councils. EBFM is coming, and we must start laying the groundwork now, and get ahead of the curve.

Key Question/Comment: I agree that some habitats are indeed essential and these habitats will be essential for a lot of species, but what is never clarified is: when are they essential? There are key times when these fish use these habitats, and it's generally predictable. This is important, for example, for the bycatch issue: if you could tell us or map when and where to fish or not to fish in order to avoid the bycatch, that would be a powerful tool. So, one step that may be helpful in terms of going from single species management to EBFM is that whenever a Center scientist does a stock assessment, for example, they then also do a visual simulation map of the general migratory patterns of that stock or species throughout the year and, if also possible, from larvae to adult. This becomes your best representation of how that fish migrates in the region throughout the year, and you then do that for the other stocks in the region and eventually overlap them all. Thus, taking a single species assessment and overlapping that with another or other single species assessments so you can visualize those species interactions both spatially and temporally would be very useful.

Answer: Essentially what you're saying is that you need those products that would help you do your jobs better, so the better we can identify those products, the better we can tinker with our various models and visualizations – the latter is essentially what you are describing. Visualizations which can take you from static maps and written text that describe the status of the stocks to true interactive maps that could better show the spatial and temporal movements of species. It's not true ecosystem evaluation, it's more like a multispecies approach, but it's a good beginning, and it is important because the fisheries themselves, of course, also operate on spatial and temporal scales. The challenge for us is to come up with these kinds and types of products that would help you, and we've already started working on producing these types of products: some are prototypes, some are under development, some are being researched, and some are just ideas at this point in time.

Key Question: The take home message, particularly from Mike Fogarty's presentation, appears to be that the most important step we can take here is to lay the groundwork for spatial management units, and it appears that we already have the tools to do that now. It's just a matter of directing staff to make it a priority as a Council. The question is: why

aren't we doing that? Can Mike Fogarty share what steps the New England Fishery Management Council (NEFMC) is already taking in this regard?

Answer: First, Rick Robins has been very proactive in establishing a new Ecosystem Subcommittee within the MAFMC's Science and Statistical Committee (SSC), and that's an important step forward. In the NEFMC, their SSC was asked to develop a white paper for the NEFMC on ways to go forward toward EBFM. This was presented in November, 2010 to the NEFMC and it will be published in Commercial Fisheries News; the latter will get the information about how to move toward EBFM more into the hands of the fishing community. In addition, the NEFSC web page has a new website (<http://www.nefsc.noaa.gov/ecosys/>) about ecosystem considerations that's really geared toward getting this information into the hands of stakeholders. But from the NEFSC's point of view, the MAFMC, NEFMC, and the ASMFC are all our "clients" and we provide them with the scientific underpinning to all this. The NEFSC wants to be in a position to meet the requests and needs from both Councils and the Commission. But to reiterate, the bottom line is that the spatial issue is really at the heart of all of this.

Key Comment: The white paper that's being referenced is a product of a workshop held by the NEFMC's SSC. That will be reviewed and considered by the MAFMC's Subcommittee of the SSC as they begin to provide the Council with advice. But if that is really the essential forward step needed to advance EBFM, and that's the consensus of the SSCs from both Councils, then that is going to require a coordinated approach because now you're really getting into spatial management and obviously there's going to be a lot of details that have to be considered, not simply in the context of the MAFMC's SSC or the MAFMC itself, but in a broader context. So I would anticipate that type of advice to be coming out of the MAFMC's Subcommittee as they go through their terms of reference.

STAKEHOLDER PANEL

PERSPECTIVES FROM THE MID-ATLANTIC REGIONAL COUNCIL ON THE OCEAN (MARCO)

Greg Capobianco, Director, Ocean and Great Lakes Program, New York State Department of State, Albany, NY

Major Recommendations

- Compile GIS information on offshore ocean areas, and share specific information on habitats that we have a mutual interest in protecting, particularly the offshore canyons. The exchange of data and information through the online MARCO Mapping and Planning Portal will help to coordinate regulatory and planning activities based on the best available science, and will help identify information gaps.
- Coordinate on developing overarching management objectives and a path forward for the creation of the Mid-Atlantic's Regional Planning Body, and defining roles for the two Fishery Management Councils.
- Continue discussions of enhanced mechanisms for MAFMC participation in MARCO processes in order to incorporate the needs of the commercial and recreational fishing community into our future work.

Increasing national attention is being paid to the need for broader partnerships and more comprehensive approaches to protect our ocean ecosystems. The Governors of the mid-Atlantic states (NY, NJ, DE, MD, VA) created the Mid-Atlantic Regional Council on the Ocean (MARCO) to improve regional coordination among the five states to address shared ocean issues that cross our borders, to avoid unintentional conflicts across state lines, and to create more reliable regulatory processes. The creation of MARCO is intended to respect and not duplicate important efforts already underway through existing interstate partnerships in the region. Rather than focus on a specific geographic area or management issue as those partnerships do, MARCO is a regional collaboration that seeks to address the ocean environment across all five states as a whole ecosystem, through the principles of ecosystem-based management.

The "Mid-Atlantic Governors' Agreement on Ocean Conservation," which created MARCO, identified initial priorities for collaborative action among the five MARCO states. MARCO continues to be led by a core team of state leads from the coastal management programs, known as the MARCO Management Board, who are responsible for advancing these priorities. The MARCO Management Board is focusing primarily on two of the priorities identified in the Governors' Agreement, and has added a third priority. For each priority, one of the MARCO Management Board members will lead the formation of a state-federal work group and the development of a work plan to advance the priority area in 2011-2012.

The first MARCO priority is to coordinate the protection of important habitats and sensitive and unique offshore areas on a regional scale. The mid-Atlantic region is home to areas – like the offshore canyons – that provide the critical underpinnings for the health of the ocean ecosystem and support our commercial and recreational fisheries. MARCO's current focus in the area of habitat protection is coordination and collection of information that will help identify the best ways to protect the attributes that make these habitats unique. Working with federal partners and other organizations, we have developed an online portal that displays geospatial information to aid in identifying regionally-important habitats. Over time, we will add to and refine the portal's underlying data, and develop new portal applications that can be used by MARCO, other decision makers, and the public.

To protect important habitats, the states will identify the impacts that impair ecosystem function, and then identify the appropriate regulatory tools to ensure those impacts are avoided. Through MARCO we will be seeking the engagement of federal entities and stakeholders with an interest in the canyons, to ensure that we leverage all existing resources and authorities, and take the holistic perspective that ecosystem-based management requires. The MARCO management board has followed with great interest the work of the New England Fishery Management Council to protect canyon habitats in the northwest Atlantic. Eventual protection measures in the mid-Atlantic will build from the regulatory authority of NMFS and the two Fishery Management Councils, as well as the states' authority through the Coastal Zone Management Act and the states' coastal management programs.

The second MARCO priority is to support the sustainable development of renewable energy in offshore areas. Given the state of technology, most commercial development interest in offshore renewable

energy focuses on wind. Siting offshore wind projects in a responsible way, however, requires understanding the potential impacts on the environment as well as on existing uses, like commercial and recreational fishing, and refining regulatory processes accordingly. In particular, we are seeking a more regionally consistent and compatible approach to the collection of information, through the development of shared survey and monitoring protocols. Through MARCO we also plan to develop standards for the siting of offshore wind turbines that will apply region-wide. The collection of information on existing uses and the development of siting standards will likely be of interest to NMFS and the MAFMC, given the possible effects of wind development on commercial and recreational fishing.

The federal government also is interested in advancing a regional framework that will address habitat protection and renewable energy development goals. This past summer, President Obama initiated a national framework for coastal and marine spatial planning (CMSP) that is regionally-driven, with oversight provided by new "Regional Planning Bodies," or RPBs. The constitution of these RPBs will include state, federal, and tribal representatives. It is most likely that MARCO will play a strong, influential role in coordinating the mid-Atlantic states' involvement in the work of the Mid-Atlantic Regional Planning Body. MARCO states already have been involved in developing plans for potential funding in Fiscal Year 2011 that would have advanced CMSP and provided additional support for stakeholder outreach.

Because of the significance of the new federal ocean framework and its relevance to MARCO's habitat and energy priorities, the MARCO Management Board has added CMSP as a new work priority for MARCO. The online MARCO Mapping and Planning Portal, one of the first collaborative products that has resulted from MARCO and the first such portal produced by a regional ocean partnership, is one of the key tools that will help advance CMSP in the mid-Atlantic. Made possible by financial support from the Virginia Coastal Zone Management Program and collaboration with state and federal agencies and other partners, the portal allows state, federal, and local decision-makers and the public to map and analyze regional ocean and coastal data. Developing the portal is the first step in collecting and analyzing the data necessary for making informed decisions on habitat protection and energy development through CMSP.

The MARCO Management Board values the input of the fishing community and is keenly interested in developing mechanisms for NMFS and the MAFMC to engage in MARCO activities and products. In June of 2009, the MARCO states hosted the first Mid-Atlantic Governors' Ocean Summit, held in lower Manhattan. This Summit combined an official release ceremony for the Governors' Agreement with a day-long set of meetings that brought together state and federal agency partners to immediately begin conversations on advancing the four priorities. In December of 2009 the MARCO states convened some of the region's key stakeholders to discuss the Governors' Agreement and to generate positive momentum and commitments for action. Following on these meetings and subsequent conversations, the MARCO Management Board has identified a number of recommendations and opportunities for enhanced partnership with the MAFMC and NMFS, as described above.

Key Question: MARCO seems poised to provide regional structure that could influence regional planning. Do you envision a role for regional fishery management organizations such as the MAFMC and ASMFC?

Answer: There certainly could be a role for fishery management bodies, with a structure that improves regional efforts rather than adding a layer of duplication. Right now MARCO is focusing on the full range of ocean uses and users. Wind power has our immediate attention since that new industry could affect existing stakeholders within and adjacent to the mid-Atlantic region.

Key Question: With respect to membership, were adjacent states such as North Carolina asked to join MARCO? If not partners, could others serve as close partners?

Answer: Virginia's coastal program approached North Carolina to share information but in the end North Carolina was not included. Through other means, such as regional and coast-wide fishery management organizations, North Carolina does have an active voice. Connections to adjacent states, north and south, and organizations are crucial to our success. We need to maintain open lines of communication between regions. To improve the prospects of success, MARCO should consult with the states, councils, interstate commission, and other interested, regional partners before any actions are taken.

START BY DOING WHAT'S NECESSARY; THEN DO WHAT'S POSSIBLE; AND SUDDENLY YOU ARE DOING THE IMPOSSIBLE – FRANCIS OF ASSISI

Jason S. Link, NOAA/National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole Laboratory, Woods Hole, MA, and Chair, Ecosystems Subcommittee, MAFMC /Science and Statistical Committee

Major Recommendations

- Work with the MAFMC (especially the Council's Ecosystems and Ocean Planning Committee) to provide the MAFMC with scientific advice to support and inform the development of the Council's ecosystem level goals, objectives, and policies.
- Identify and describe scientific advice that the MAFMC could use to address and incorporate ecosystem structure and function in its fishery management plans and quota specification process to ensure that the Council's management practices effectively account for ecological sustainability.
- Describe scientific information that the MAFMC could consider so as to anticipate or respond to shifts in ecological conditions (e.g., climate change and other externalities) or processes in its management programs.
- Summarize what other countries and regions are doing to incorporate ecosystem-based fishery management principles in their management plans and programs.
- Describe how ecosystems principles could be used by the MAFMC in the long-term to evolve its single-species and multi-species fishery management plans into a regional ecosystem-based fishery management plan.

Sometimes there's a perception that doing ecosystem-based fisheries management (EBFM) is too intractable, is too ill-defined, and is too difficult to attempt. What I note here is that there are obvious steps that can be taken as we move towards such implementation. There is a clear need to transition from how we manage fisheries now, to an intermediate step, to a fuller, more, integrated system perspective. It is recognized that the MAFMC has well over a dozen fishery stocks to manage (and many more if coordination with the NEFMC and ASMFC is considered). Currently they are managed in a group of half a dozen or so plans, but the individual stocks are essentially not managed with any explicit consideration of ecological, environmental, habitat or related such concerns. Most stocks are being managed classically via the typical fisheries advice (fishing mortality instantaneous rate and biomass) and effectively in isolation from other stocks. The goal is to have management of all such stocks considered simultaneously, for a given spatial area, and cognizant of the effects of other ocean-use sectors on fisheries and the effects of fisheries on other ocean-use sectors. This would be done with a fully integrated and coordinated set of factors in one, ecosystem-based plan for an appropriate region.

Yet it is recognized that to meet current mandates while moving towards the more "systemic" approach will require a transition set of plans. One way to do this transitional step is to consider a set of significant issues affecting related stocks and then attempt to develop plans that have a broader range of considerations for species as they interact. These proposed plans would contain joint management recommendations as coordinated for appropriate groups of stocks rather than treating those stocks in isolation (even if under the same plan cover). Here I provide several examples of such issues that could be addressed.

As the title of this talk, quoted from St. Francis, implies, we need to start with what is necessary. The following lists some proposed issues that have been identified as germane, needed by the MAFMC to provide the best management of these stocks available, and potentially useful for the mid-Atlantic region to move towards EBFM. The issues presented here are meant to be exemplary and by no means represent the full range of factors that should be considered, but likely are some of the more prominent issues facing the stocks and this region for which the MAFMC is responsible. The example issues are also linked to those stocks that are known or strongly suspected to be affected by them:

•evaluate any potential effects of climate for all MAFMC managed stocks;

•evaluate any potential effects of predatory removals on mackerel, longfin inshore and northern shortfin squid, butterfish;

•evaluate and identify specific/localized habitat requirements for black sea bass, scup, tilefish, Atlantic surfclam, ocean quahogs, and summer flounder;

•explore areas/regions/features of interest for all stocks; and

•explore tradeoffs among full system and total fisheries production potential for all stocks.

It is clear that these example issues are important. But that begs the question: can we possibly do anything about them in the near future? That is, are there any

data, tools, or approaches that are available *now* that can help to address these issues? The answer is yes.

For instance, to evaluate any potential effects of climate we can use what are mainly empirical approaches from the NEFSC bottom trawl survey and observer data, along with some Intergovernmental Panel on Climate Change (IPCC) downscaling, extended stock assessment models (ESAMs), and bio-physical models that are extant. To evaluate any potential effects of predatory removals we can apply a wide range of ESAMs, minimal realistic models (MRMs), and multispecies (MS) models. To evaluate and identify specific/localized habitat requirements, we can use a range of habitat models and empirical studies, particularly as they are informed by fisher observations. To explore areas or regions or features of interest, we can employ coastal and marine spatial planning (CMSP), additional types of habitat models, the ecosystem status report (ESR), and continue to hold interactive, focused stakeholder workshops. To explore tradeoffs among full system and total fisheries production potential, we can utilize information in the ESR, employ management strategy evaluation (MSE) approaches using aggregate, food web, and end-to-end models, and hold focused stakeholder workshops. The point being that the scientific and informational capacity is extant to begin to address these issues. Further, the organizational and governance structures may admittedly need to adapt to these novel streams of information, but we can largely utilize existing structures and processes to begin to transition towards addressing these EBFM issues.

One of the simpler ways to begin the implementation of such a transition would be to develop joint plans that have coordinated and modified information. For instance, to evaluate any potential effects of climate one could develop and use adjusted biological reference points (BRPs) and associated risk analyses (RAs) that consider the effects of potential or realized environmental effects on stocks as they influence the estimation of standard decision criteria. Similarly, to evaluate any potential effects of predatory removals, one could additionally consider using adjusted BRPs and RAs that have been estimated while being cognizant of species interactions. To evaluate and identify specific or localized habitat requirements, one could perhaps develop habitat reference points (Hab RPs/SASI) or similarly adjusted BRPs and RAs for stocks conditioned upon habitat considerations. To explore areas or regions or features of interest, one could utilize refined MSPs, extant environmental impact assessments (EIAs), or various zoning (of ocean uses) approaches. To explore tradeoffs among full system and total fisheries production potential, ultimately one would need a coordinated fisheries ecosystem plan or ecosystem-based fisheries management plan (FEPs/E-BFMPs) that would be the document from which the MAFMC's goals and priorities would not only be stated, but used as the source for implementation. Obviously, executing such an implementation strategy is going to take time, many iterative steps, and will not be without its challenges. Yet doing so is in fact now quite feasible and the tools to do so are already in existence. That is arguably the main point of this short communiqué; that, although challenging, we can start taking steps to implement EBFM.

The MAFMC has already signified its intent to do so via the Ecosystems and Ocean Planning Subcommittee and a comparable supporting Subcommittee of the SSC. The terms of reference for the SSC's Ecosystem Subcommittee are provided in the "Major Recommendations" box, above; the point is that the MAFMC is demonstrating progressive thinking in instituting these groups. Furthermore, it is quite a positive development that by doing what is necessary and possible, we may end up doing what was heretofore thought impossible.

Key Question: How much time would be involved in progressing from where we are now to the more complex and promising ecosystem management approaches?

Answer: Some approaches can be implemented now or very soon. A key factor in fishery management is the MAFMC's annual management priorities. A regional approach could establish agreement to balance options and establish priorities. I understand that's a central product of this workshop.

Key Question: Where are we in terms of the sophistication of our understanding of predator-prey relationships?

Answer: The NEFSC has an enormous database on that subject and are beginning to consolidate it into a useful form. As an example of one application – we can now consider predator consumption by a given managed species, such has *Loligo* squid, and consider that function as another "fleet" in assessment models. We have a lot less data for consumption by mammals and birds.

DISCOVERING REEF: POSSIBILITIES OF ACCELERATED AND PERMANENT REEF FISH RESTORATION

Captain Monty Hawkins, Owner/Operator, Party Boat Morning Star, Ocean City, MD

Major Recommendations

- Interview remaining old-timers to piece together a picture of what once was. Insights will highlight the need to protect what we have and restore what we've lost. Listen attentively and use charts dating to the era for perspectives on:
  - species that once fouled nets and hooks but are now rare, e.g., deadman's sponge;
  - fish populations that have moved from inshore habitats to offshore, with similar impacts on fleet movements and effort and be vigilant for shifts over the years and decades; e.g., extirpation of red hake within 20 nautical miles of shore, white marlin was once caught 4 to 8 miles out and now 60 is caught plus miles, and scup having been a major fishery but now has been absent for 40 years; and
  - insights from fishing techniques and navigation devices used to indicate former reef footprint, even use of rudimentary equipment like a weighted grapple on steel cable to locate rocky patches by feel.
- Protect remnant hard bottom habitats either with paper protections/regulations or with large boulders.
- When contemplating an action to protect or restore habitat, focus not on the substrate but on the growth that provides habitat. Any rock will work fine – concrete rubble too. Eventually, engineered concrete units to maximize fishery production in a given area could be built.
- Strongly consider transportable reef units sited in areas with abundant growth to gather natural set corals for later transplant.
- Recognize that cold water azooxanthellate corals are important to fish populations wherever they now occur or did occur, including all waters.
- The term "high energy environment' is a scapegoat. There are many corals growing in 25 feet of water and fantastic assemblages in 40 feet of water in the Mid-Atlantic Bight.

As a party boat captain, my observations of fine-scale habitat change are in no way reflected in current habitat science for the region. Absent fishing, reef-fish abundance would be determined by reef-habitat abundance. A clear baseline for habitat restoration can be developed from both historical accounts and current recreationally and commercially important fish abundances on remnant habitats.

Our challenge is to leave a legacy of improved habitat and vastly improved fisheries. Though many have already thrown in the towel, we know structured habitat with vertical relief is valued by many mid-Atlantic stocks. It's very simple to replicate; just roll rocks off a barge.

Recent discussions about the mid-Atlantic ecosystem, prompted by the MAFMC but not limited to fishing, offer glimpses of new approaches to these old problems. Fishers' observations should be considered when industry brings telecommunication cables and wind turbines to these waters.

Anecdotes are always and forever insufficient. I encourage you to view video evidence presented to the Council's Ecosystem Committee, including:

•Nick Caloyianis reef footage: <http://www.youtube.com/watch?v=G3nGYeXvkxE&feature=related>; YouTube keyword search: Mid-Atlantic Reef Natural Reef.

•Monty Hawkins video from 2004: <http://www.youtube.com/watch?v=n77WF9XQRJM&feature=related>; YouTube keyword search : Common Seafloor Habitats.

•Video Presentation to MAFMC Ecosystem Workshop December 14, 2010: <http://www.youtube.com/watch?v=-cMC8JVa2Bk>; YouTube keyword search: Maryland Corals or Nearshore Reef MAB.

Those videos and other information demonstrate that:

•cold water azooxanthellate corals reefs exist in near-shore shallow waters of the Mid-Atlantic Bight;

•those reefs are clearly essential fish habitat (EFH), though these reefs and reef species have yet to be considered as such;

•though classed as non-reef forming, clearly these cold water corals do form reef and vital reef habitat for federally managed species;

•stern-towed fishing gears have physical impacts to mid-Atlantic habitats that decrease the reef footprint and diminish ecosystem services, including fish production;

•our continued lack of understanding about these habitats and reef ecology will prevent true reef fish restoration;

•the importance of seafloor habitat restoration must be recognized; present restoration priorities involving

coastal wetlands and estuaries are important too, but habitat issues extend across the continental shelf and beyond; and,

•we must replenish reef habitat if we expect to rebuild stocks. Management based on catch-restrictions alone cannot recreate historical abundances of fish.

Reef protection, restoration, and manufacture can create reef fish abundances beyond any known historical value. Amazing success awaits.

Key Question: From your observations in the mid-Atlantic, can you offer any comments on threats warranting our special attention?

Answer: Chemicals may be an issue but we need to consult an expert. Tires remain a concern since even those deployed as ballasted structure for artificial reefs can break free from the reef and destroy bottom habitat until removed, often by cash-strapped state marine fisheries agencies. While the tire reef experiment failed, hard surfaces can attract corals and other settling animals.

Key Question: Could artificial reefs improve regional ecosystem health?

Answer: Perhaps. There are strong arguments on both sides of that question. There is more reef fishing now than in the recent past, sometimes attributed to the addition of artificial reefs to shelf waters. There are seven licensed sites: two in Maryland waters and five in the adjacent federal zone, and there are more tautog now than a decade or so ago. Although it seems logical that bottom trawlers and dredgers would avoid rock or reefs to conserve their gear, observations support some concern that bottom-tending gear has flattened some areas. Corals and other habitat types are now evident as remnants of what could have been more diverse habitats. Restoring those areas could be vital to rebuilding some species, especially habitat-dependent populations of red hake and black sea bass.

REGULATORY REQUIREMENTS THAT EXCEED OUR KNOWLEDGE OF THE OCEAN ENVIRONMENT AND THE IMPACT ON THE PUBLIC

Greg DiDomenico, Executive Director, Garden State Seafood Association, Trenton, NJ

Major Recommendations

- Be wary of how CMSP may duplicate fishery management under the Magnuson-Stevens Act. We needn't recreate processes that work well.

The Garden State Seafood Association is concerned that aspects of Coastal and Marine Spatial Planning may ultimately undermine domestic fisheries management. Congress created the Magnuson-Stevens Fishery Conservation and Management Act (MSA) in 1976 to manage U.S. marine fishery resources within the EEZ and throughout the range of a given managed species (See 16 U.S.C. 1801 et seq.). It is unclear to members of the commercial fishing industry how federally-approved fishery management plans, developed by regional Fishery Management Councils and approved by the Secretary of Commerce will be considered should these plans be deemed inconsistent with the principles of CMSP. The councils are actively working to address CMSP issues within their jurisdiction, including gear usage, habitat impacts, time/area closures, by-catch, and the need to conserve marine resource populations for the longer term, including protected and harvested species plus their habitat. These efforts must not be frustrated by an expanded bureaucracy that complicates the open regional council planning process with a separate dispute resolution process that may dilute scientific information serving as the basis for management decisions.

The National Ocean Council (NOC) would be the commanding entity regarding final decisions on regional plan consistency, plan compliance, dispute resolution, and any associate penalties for non-compliance. The NOC will be advised by a governance body that could be susceptible to political pressures which reward those entities with seats on the national committee.

While GSSA agrees with many characteristics of a national CMSP program, we are especially concerned with adopting an ecosystem-based approach. That approach has in recent years become politically correct and fashionable yet never implemented. In fact, aggressive efforts failed to include a mandatory requirement in the 2006 MSA reauthorization. The legitimate reasons for that failure form the basis of our opposition, namely: the concept is overly broad, sufficient scientific information to meet measurable objectives is lacking, and the idea is often connected to the precautionary principle, which is also poorly supported by information.

First, ecosystem-based management is not clearly defined in the CMSP, the National Ocean Policy, or the Interim Report of the Interagency Ocean Policy Task Force even though it constitutes a core component of both programs. There are many references to EBM requirements and broad-based EBM principles but no clear definition. Thus, constituents are left to their own perceptions regarding how the Administration intends to use CMSP and EBM to: manage and regulate the protection of key species that are critical to ecosystem function and resiliency; improve species adaptation; achieve healthier and more productive environments; and restore, protect, and maintain protected species populations, ecosystems, and biological diversity. In some examples of EBM the intent is to manage the ecosystem to the microbial level. In other instances, resources such as protected species are given greater consideration and support than harvested species. The inability of Congress and agencies to manage all resources based on the same principles cuts squarely against the argument for a formal, balanced, science-based EBM plan. Thus, we have little faith the EBM approach embodied in the CMSP will address needed changes but simply be more of the same dysfunction.

Second, the CMSP contains many references regarding the need for sound science as the basis for EBM but offers little in the way of an actual plan to inform decision-making. Arguably, the lack of scientific information and funding required to procure it has frustrated similar efforts in the past. The only attempt to address the gathering of scientific information is contained in the CMSP work plan which allows for the Regional Planning Body to consult with scientists and technical experts about myriad topics but apparently with little understanding of the scope, timing, and cost of these data needs.

Based on the timelines provided in the CMSP work plan and the lack of additional funding we believe regional planning will prevail even as CMSP efforts proceed. Also, there is no specific funding mechanism provided in the CMSP to enable state/federal agencies to conduct the necessary scientific research to support the plan. Thus, they are left to do more with less yet also support a new complicated system that is supposedly "built on this foundation of sound science." From an industry perspective the math is simple – less

money for science means less data, less data means more precaution, more precaution means less fishing, less fishing means fewer jobs, less revenues, and less food harvested by domestic fishermen resulting in increased seafood imports and an unbalanced trade deficit. The expansive concept of EBM and lack of scientific information (and funding for scientific research) leads to our final concern – the application of the precautionary approach as the guide for decisions where adequate data are lacking. The precautionary approach fosters a disincentive for managers to seek, secure, and spend manpower and funding to gather scientific data if conservative decisions can be made simply by invoking precaution. This should not be the guiding doctrine of the CMSP.

CMSP documents suggest we already have "…vast stores of natural and social science information about ocean, coastal and Great Lakes ecosystems and their uses." Despite this apparent wealth of science we continue to struggle with current efforts to manage marine resources absent basic scientific information. The condition of hundreds of finfish, marine mammal, and sea turtle stocks are unknown and regional Fishery Management Councils are now required to meet new MSA scientific standards with little new information. GSSA wonders: How a new layer of government with greater data requirements will perform if the necessary scientific information is currently missing at the most basic levels of resource management?

Key Question: How do the topics discussed at this workshop relate to coastal and marine spatial planning? Are we discussing the right topics with the appropriate people?

Answer: Collectively we are not doing CMSP now but we are touching on similar issues both individually in our own arenas and together as a group. No mandates have been surrendered but roles could shift. New industries are adding complexity and new partners may bring new ideas. Heavy government representation at this workshop needs to be balanced with more speakers from other sectors, including states and industries.

PREPARATION MEETS OPPORTUNITY FOR MID-ATLANTIC HABITAT CONSERVATION

Jay Odell, The Nature Conservancy, Mid-Atlantic Regional Program, Richmond, VA

Major Recommendations

- Near-term: The Essential Fish Habitat Omnibus Amendment that is being jointly developed by NEFMC and MAFMC provides a policy vehicle for expanded habitat protection and a process that provides for substantial public input as decisions are shaped and made. Additionally, the Councils have a new tool under the Magnuson-Stevens Act (Section 303(b)(2)), discretionary authority to protect deep-sea corals that urgently need protection. It is likely that the mid-Atlantic region contains substantial cold water coral resources at depths as shallow as 15 meters, in addition to those well documented offshore of Maryland (e.g., *Astrangia poculata* and new records for *Leptogorgia virgulata*). These habitats are well known to support high densities of MAMFC managed species such as black sea bass and tautog. Regardless of depth, deep-sea coral habitats are highly vulnerable to physical disturbance of any kind and their damage and loss has potentially serious and difficult to reverse ecological and economic impacts. Conversely, their identification and protection would provide lasting benefits.
- Long-term: A regional CMSP process can help the ocean use and conservation sectors to more precisely develop their individual and shared goals and subsequently develop a plan that best meets multiple objectives. It should be no surprise that, despite stereotypes, fishermen and environmental groups have many common interests. Some valuable and important ocean use sectors such as sand mining, shipping, transportation, and energy development can be sustained in severely degraded ocean ecosystems, but biodiversity conservation, fishing, and some forms of tourism cannot. A CMSP process that is conducted openly and transparently and based on sound science can provide managers with choices for better alignment of human uses with their most ecologically and socio-economically compatible places to provide lasting benefits for people and nature.

National context

Marine resource use sectors such as fishing, offshore energy development, recreation, sand and gravel extraction, tourism, and shipping are economic engines that support coastal communities and our Nation. The U.S. ocean economy provides more jobs and more economic output than the entire farm sector (USCOP 2004). Ocean management today is divided among over 20 different federal agencies that oversee more than 140 different and often conflicting and competing laws affecting marine resources (Crowder et al. 2006), with many additional state and local authorities and laws. As a result, our ocean is managed sector-by-sector, with little attention to trade-offs between management choices made by separate agencies and cumulative impacts to coastal and marine ecosystems and resource users.

On June 12, 2009, President Barack Obama released a memorandum affirming that "the United States needs to act within a unifying framework under a clear national policy, including a comprehensive, ecosystem-based framework for the long-term conservation and use of our (ocean, coast, and Great Lakes) resources." The Interagency Oceans Policy Task Force (IOPTF) subsequently developed a draft national ocean policy with coastal and marine spatial planning (CMSP) as a foundation for a "comprehensive, integrated, ecosystem-based approach that addresses conservation, economic activity, user conflict, and sustainable use."

Mid-Atlantic context

After extensive public engagement including six regional listening sessions that drew over 1,900 people and collection and review of about 5,000 written comments, the IOPTF issued final recommendations. On July 19, 2010 President Obama issued an Executive Order that established the first ever National Policy for Ocean Stewardship, adopting the recommendations, including a national CMSP framework (CEQ 2010). The CMSP framework calls for Regional Planning Bodies (RPB) to create and implement CMS Plans for the mid-Atlantic and eight other regions. These developments and several other factors have combined to create extraordinary enabling conditions for significant advances in mid-Atlantic habitat conservation and ecosystem-based management approaches.

The mid-Atlantic has the most abundant and easily developed offshore wind energy resources in the U.S. (NWF 2010) and energy companies have been intensively working with mid-Atlantic states and the federal Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) for the last few years to identify potential development areas. A large scale build-out of offshore wind energy in this region may provide significant benefits but also poses ecological and socio-economic risks that will need to be carefully considered and mitigated as appropriate. The need for new state and federal policy, institutional capacity, data and methods to address planning and

management for a new industrial ocean use was a major driver for the new National Ocean Policy and CMSP, and for the formation of the Mid-Atlantic Regional Council on the Ocean (MARCO). MARCO was initiated by Coastal Zone Management Program Directors and other key staff and formed by agreement of the Governors of Virginia, Maryland, Delaware, New Jersey, and New York in June 2009. The five states agreed to work together to identify regional goals and to take actions that address the mid-Atlantic region's most pressing ocean conservation and management challenges (MARCO 2009).

For over three decades, MAFMC has used its authorities under the Magnuson-Stevens Fisheries Conservation and Management Act (MSA) to manage the region's recreational and commercial fisheries in federal waters. This work included evaluation of stock assessment and fishery data and setting harvest rules, seasons, and allocations to meet the individual and shared goals of states. The combined efforts of NMFS, MAFMC, and others have led to considerably better understanding of ecosystem structure and function, accumulated over the years and documented in fishery management plans and other documents. Implementation of the new overharvest provisions provided when the MSA was reauthorized in 2006 by MAFMC has begun, to good effect; based on legal definitions, overfishing is not occurring in any MAFMC managed stock and most stocks are not overfished. It should however be noted that the quantity and quality of available information for all MAMFC managed "forage" species (smaller pelagics such as *Ilex* and *Loligo* squid, Atlantic mackerel, and butterfish) is insufficient to determine whether these populations are overfished. This problem – lack of adequate funding for stock assessment and analysis for federally managed species, is not unique to the mid-Atlantic region.

During most of the past decade, the MAFMC was not perceived as being proactive or effective relative to habitat conservation concerns. However, with new leadership for both staff and Council, the MAFMC has recently demonstrated substantially increased attention to the critical role of habitat in supporting fisheries production and protecting it from fisheries impacts, as provided for or required under the MSA. In addition to this very encouraging development, the Council is also now facilitating dialogue between diverse stakeholders about new approaches to improving ecosystem health in the mid-Atlantic.

For over a decade science and policy experts have pointed to the urgent need for a more holistic, ecosystem-based approach for ocean management, but the transition from theory to practice has been slow. The fragmentation of ocean management agencies at both state and federal levels has been an impediment to progress, and in particular the division of the expertise and regulatory authority held by habitat/coastal zone and fisheries management agencies has been problematic. Therefore, the growing communication between MARCO and MAFMC, a recent resolution by MAFMC in support of MARCO and their plans for collaboration in a CMSP context offer hope for creation of an operational framework for ecosystem-based management in the mid-Atlantic region. Successful implementation of regional CMSP pursuant to the new National Ocean Policy will require strong leadership by representatives of the regional Fishery Management Councils along with state and federal agencies, tribes, and local governments.

There are strong incentives and benefits for federal Fishery Management Council representatives to help lead the RPBs responsible for CMS Plan development. New uses of the ocean such as offshore wind energy development or aquaculture could potentially reduce access to traditional fishing areas and such conflicts and impacts may be avoided or minimized through a CMSP process. It has often been noted by fishers and others during fishery management plan amendment processes that although non-fishing impacts to fisheries resources (e.g., coastal habitat loss and damage) reduce populations of harvest species and fishing opportunity, fishery management entities such as MAFMC have very little ability or authority to regulate and abate such impacts. A robust CMSP process may provide a new venue for highlighting and addressing these concerns – managing the mid-Atlantic as one place as opposed to separately, use by use.

New data and tools

Effective CMSP and ecosystem-based management approaches require multiple map layers indicating or estimating the distribution of valuable ecological and socio-economic resources as well as the distribution and intensity of current and future human uses of coastal and marine resources. Ideally, these data should describe and predict human interactions with coastal and marine ecosystem features in places (latitude and longitude), depths and times (i.e., four dimensions). Although there are substantial unmet data needs (e.g., marine mammal and sea bird migration paths, benthic habitat maps), ocean stakeholders and resource managers in the northeast region of the U.S. are fortunate to have substantial CMSP data and modeling resources currently available or in development.

The Northeast Fisheries Science Center (NEFSC) has led efforts to collect spatially referenced data on the distribution, abundance, and trophic dynamics of marine resources for over four decades and in the last several years made those data available in diverse formats, developed ecosystem state condition indicators, and created spatially explicit models to predict regional scale ecosystem responses to management choices (e.g., Fogarty 2005; EAP 2009; Smith and Link 2010; Link et al. 2010). Other federal agencies including the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service (USFWS) and BOEMRE have also produced a wealth of CMSP

relevant data, and their efforts are ongoing. If plans to produce an Integrated Ecosystem Assessment (IEA) are implemented, the IEA would provide a huge leap forward in understanding the region's ecological structure and function to inform and improve CMSP and ecosystem-based management processes (Levin et al 2009). Recently, new collaborations between NEFSC and Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS) staff are leveraging real time integrated ocean observing system data to produce some of the first pelagic habitat models that predict the spatial and temporal locations of critical spawning areas and other ecosystem features (see John Manderson's presentation, above).

Protection of deep-sea corals is a particular concern for conservation organizations and others, yet they are in general very poorly mapped. However NOAA's Office of Habitat Conservation in partnership with other federal partners and academics has recently made substantial progress in compiling and interpreting existing information that will be very useful for modeling coral distribution and focusing upcoming surveys (Packer et al. 2007). While these data are almost entirely restricted to deep water near and within the shelf-slope break, limited video survey data reveals extensive coral patch habitats adjacent to the Maryland coast, extending seaward from less than ten miles off the beach (see Monty Hawkins's presentation, above). High resolution acoustic or video surveys have not yet been conducted to test the hypothesis that similar nearshore coral patch habitat occurs adjacent to other mid-Atlantic states, but it seems unlikely that it would be restricted to Maryland.

The Nature Conservancy recently completed a marine ecoregional assessment for the northwest Atlantic, from Cape Hatteras, NC to the Bay of Fundy. This assessment is intended to support CMSP and regional ecosystem-based management (EBM). In order to support and advance these goals, this assessment integrates information about multiple species and their habitats from many different federal, state and academic sources. The results summarized in the report include maps and data on concentrations of high biodiversity and critical species-specific areas for refuge, forage, and spawning, and also some of the limited available spatial data for human uses such as shipping lanes, port facilities, and fishing effort. This assessment is designed to be used by diverse stakeholders to inform diverse decisions, and to be freely available online for public use (Greene et al 2010).

Organizing and summarizing the large amount of available information and data to make good decisions requires robust decision support tools (DST), particularly if diverse stakeholders are to be engaged in the planning process. One example of a DST is the Swept Area Seabed Impact (SASI) model developed by NEFMC staff and partners to support habitat conservation decisions made pursuant to the ongoing Essential Fish Habitat Omnibus Amendment (see Chris Kellogg's presentation, below). The Mid-Atlantic Regional Council on the Ocean (MARCO) recently developed the online Mid-Atlantic Mapping and Planning Portal to allow state, federal, and local decision-makers and the public to visualize, query, map, and analyze ocean and coastal data (see Greg Capobianco's presentation, above). To fully support a CMSP process, the portal will need to evolve to include more sophisticated decision support features, including the ability for ocean users and managers to create spatial management scenarios and evaluate how well they meet goals held by diverse ocean resource stakeholders (Fox et al 2010).

Progress will be made through partnerships – collaborative projects that take advantage of the complementary skills, resources, and world-views held within academia, diverse government agencies, ocean stakeholders, and non-profits. The coincidence of all the factors noted above provide an urgent opportunity to learn from history, to leverage past efforts and to move forward with new coordinated science and policy to help ensure that the public's coastal and marine habitats continue to support life and produce the material and aesthetic goods and services that people want and need for generations to come.

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Key Question: How can we balance state and federal rights in regional ecosystem management?

Answer: We have a mix of approaches represented at this workshop, a mix that might offer examples of the complex nature of our challenge. MARCO is a regional body comprised only of states. That approach might be more appropriate than a national body such as the National Ocean Council. There are other arenas such as energy that might warrant other management structures.

ATLANTIC STATES MARINE FISHERIES COMMISSION HABITAT PROGRAM, ECOSYSTEM APPROACHES, AND COLLABORATION OPPORTUNITIES

Wilson Laney, Coordinator, Department of the Interior/U.S. Fish and Wildlife Service, South Atlantic Fisheries Coordination Office, Raleigh, NC

Patrick A. Campfield, Science Director, Atlantic States Marine Fisheries Commission, Arlington, VA

Major Recommendations

The ASMFC and MAFMC should:

- Strengthen communication between their habitat program staff and committees.
- Hold joint meetings and workshops focused on EBFM.
- Identify projects for funding by the Atlantic Coastal Fish Habitat Partnership, Southeast Aquatic Resources Partnership, and other National Fish Habitat Partnerships.
- Develop joint habitat educational materials.
- Collaborate on essential fish habitat designations.
- Develop and adopt common habitat policies (i.e., Resolution 89-IV, revisit and update).
- Partner to build on existing efforts to develop a coast-wide fish habitat Geographic Information System.

The Atlantic States Marine Fisheries Commission (ASMFC or Commission) was formed by the 15 Atlantic coast states in 1942 and subsequently chartered in 1950 as an Interstate Fisheries Management Commission by Congress, in recognition that fish do not adhere to political boundaries. The current mission of the Commission is "to promote the better utilization of the fisheries, marine, shell and anadromous, of the Atlantic seaboard by the development of a joint program for the promotion and protection of such fisheries, and by the prevention of physical waste of the fisheries from any cause." The Commission's vision is "healthy, self-sustaining populations for all Atlantic coast fish species or successful restoration well in progress by the year 2015." The Commission serves as a deliberative body, coordinating the conservation and management of the states' shared nearshore (within three miles of shore) fishery resources – marine, shell, and anadromous – for sustainable use. Commission authority, aside from that provided in the initial congressional charter, derives largely from the Atlantic Striped Bass Conservation Act (1984), and the Atlantic Coastal Fisheries Cooperative Management Act (1993). The latter Act mandated that the Secretary of Commerce in cooperation with the Secretary of Interior "...shall develop and implement a program to support the interstate fishery management efforts of the Commission." The program was mandated to include activities to support and enhance state cooperation in: collection, management, and analysis of fishery data; law enforcement; *habitat conservation* [emphasis added]; fishery research, including biological and socioeconomic research; and fishery management planning. For detailed information regarding the ASMFC Habitat Program, including resolutions, documents from the Habitat Management Series, and other materials, visit the ASMFC web site at <http://www.asmfc.org/>.

Atlantic States Marine Fisheries Commission Habitat Program

The Commission's Habitat Program originated in 1980 with formal resolutions adopted to address habitat-related issues (Stephan et al. 1999, see Appendix 1 of that document for complete text of all resolutions). The initial resolution dealt with harmful estuarine impacts of chlorine use in sewage treatment operations, requesting review of federal and state policies. For the next decade, additional resolutions addressed habitat issues such as ocean dumping (1987, 1993), oil spills (1989), federal Fishery Management Council habitat policies (1989), toxic materials in artificial reefs (1990), dam construction (1993) and federal legislation protecting estuarine habitat (1993).

Habitat was included inconsistently in fisheries management planning done under the Interstate Fisheries Management Program (Stevenson 1997). While many of the early Fishery Management Plans (FMPs) contained useful biological and life history data, they lacked specific habitat information and habitat management recommendations. The initial striped bass (Maryland Department of Natural Resources, Tidal Fisheries Division 1981) and river herring (ASMFC 1985) management plans were the first to significantly address habitat. Since 1990, plans include more specific habitat-related information and recommendations. The winter flounder FMP (Howell et al. 1992) and horseshoe crab FMP (Schrading et al. 1998) are the only Commission FMPs to include

habitat-related compliance criteria which member states are obligated to implement under the Atlantic Coastal Fisheries Cooperative Management Act.

The Commission's Habitat Program was further refined with the development of a formal habitat policy through passage of Resolution 89-VI (see Stephan et al. 1999, page 24). The resolution acknowledges that the ASMFC "recognizes the need for a cooperative effort to address critical habitat issues effecting the health of marine resources," and resolved that the ASMFC "...supports the efforts of the Mid-Atlantic Fishery Management Council to implement and refine an acceptable and effective model habitat policy and intends to participate in a cooperative effort to share the document with other Councils for discussion and eventual consolidation into a single, unified Council habitat document." A Habitat Committee (HC) was appointed by the Commission Chair in December, 1991. The HC was charged with the development of program goals and objectives. These centered on two goals: policy formulation and analysis, and communication and education, which were contained in an Initial Statement of Policy and Activities, Habitat Program (ASMFC 1992). Habitat provisions within FMPs were further refined through the publication of guidance for the preparation of FMP habitat sections and source documents (Stephan et al. 1998), and the Habitat Program's initial Strategic and Management Plan (Stephan et al. 1999). The first Habitat Coordinator for the program was hired as a part-time position beginning in 1993 (Stephan et al. 1999).

Current guidance for the ASMFC Habitat Program is contained in the Habitat Program Five-Year Strategic and Management Plan, 2009-2013 (ASMFC 2009; also available on the ASMFC web site). The current mission of the HC is "to work through the Commission, in cooperation with appropriate agencies and organizations, to enhance and cooperatively manage vital fish habitat for conservation, restoration, and protection, and to support the cooperative management of Commission managed species (ASMFC 2009)." Program components consist of the Habitat Committee appointed by the Commission chairman, an Artificial Reef Committee, and a staff Habitat Coordinator (currently vacant). Although the initial HC membership included Commissioners and limited federal agency and Fishery Management Council representatives, the current HC membership consists of representatives from the fifteen member states, representatives from five key federal agencies (Army Corps of Engineers, Environmental Protection Agency, U.S. Fish and Wildlife Service, NMFS, and National Ocean Service), and two non-governmental organizations (Environmental Defense Fund and The Nature Conservancy). The HC reports to the Commission's Interstate Fisheries Management Program Policy Board.

The ASMFC Habitat Program goals are currently as follows:

•identify important habitat areas for managed species;

•effectively protect, restore, and enhance Atlantic coastal fish habitat through fisheries management programs and partnerships, such as the Atlantic Coastal Fish Habitat Partnership (ACFHP);

•build and support partnerships with fishery and non-fishery management agencies, researchers, and habitat stakeholders to leverage regulatory, political, and financial resources;

•educate ASMFC Commissioners, stakeholders, and the general public about the importance of protecting, restoring, and enhancing habitat to achieve successful fisheries management;

•implement performance metrics to focus efforts and monitor progress of the Habitat Program;

•engage local governments in habitat protection, restoration, and enhancement programs; and,

•promote development of effective fish passage approaches and projects through state and federal collaboration.

The Habitat Program, working through staff and the HC, has achieved significant accomplishments. These include: establishing and supporting the Atlantic Coastal Fish Habitat Partnership (first two projects funded 2010); coordinating artificial reef activities (Artificial Reef Committee); developing a Submerged Aquatic Vegetation Policy (Stephan et al. 1997); preparing Habitat Sections of ASMFC FMPs; staff serving on the South Atlantic Fishery Management Council Habitat and Environmental Protection Advisory Panel and Chesapeake Bay Habitat Suitability Quantitative Ecosystem Team; producing Habitat Source Documents (part of ASMFC Habitat Management Series publications, on web site; e.g., see Greene et al. 2009); producing and distributing Habitat Hotline Atlantic newsletter; hosting numerous workshops; producing other educational materials (accessible from the web site); and establishing an ASMFC Fish Passage Working Group. The latter group arose from an HC sponsored workshop, and has thus far produced a resolution for the Commission on Fish Habitat Connectivity, a Passage Efficiency Policy, and a Layman's Guide to Passage Technology for ASMFC Species.

ASMFC ecosystem-based fishery management

The ASMFC initially became involved in an ecosystem-based fishery management (EBFM) approach to stock assessment through the hosting of a multispecies workshop in 2002 (ASMFC 2003) and through subsequent development of a multispecies virtual population assessment model (ASMFC 2005). The HC also had promoted an ecosystem approach through the habitat sections of FMPs, through the Habitat Management Series reports, and by facilitating the establishment of a National Fish Habitat Partnership (Atlantic Coastal Fish Habitat Partnership).

In 2010, the Interstate Fisheries Management Program Policy Board tasked the ASMFC Management and Science Committee (MSC) with the development of a proposal for formally incorporating ecosystem considerations into the Commission's interstate fisheries management process. The MSC is leading a team comprised of selected Commissioners, the chair of the Multispecies Management Committee, chair of the HC, and chair of the Assessment Science Committee to develop the proposal. The HC was also charged to work with the federal Fishery Management Councils to develop ecosystem approaches for collaboration. To this end, the Commission sponsored an Ecosystem-Based Fishery Management workshop in August, 2010. Workshop objectives were to consider external approaches to EBFM; identify ASMFC ecosystem priorities, determine next steps; and, review and modify the draft EBFM strategy.

The participants received presentations on EBFM approaches employed by the New England Fishery Management Council's Scientific and Statistical Committee, South Atlantic Fishery Management Council, and Chesapeake Bay Program. Participants also conducted exercises to prioritize ASMFC tasks related to EBFM, and reviewed the initial draft goals, objectives, and components of a potential EBFM approach, which employed an example for American shad developed from the existing ASMFC FMP and amendments. This work is ongoing, with priorities and next steps defined into two categories as follows:

Management and Policy

•develop Commission policy regarding ecosystem based approach to fisheries management;

•form a working group of Commission and Council representatives who will work towards developing compatible, cooperative approaches to EBFM; and,

•evaluate implications of how management measures for one species may affect other managed species.

Ecosystem Science

•Improve/adapt data collection and research to support EBFM strategies;

•expand multispecies virtual population analysis (MSVPA) to other suites of predators and prey, and use models to evaluate environmental influences on these species; and,

•describe ecosystem structure and function, habitats, species assemblages, and socioeconomic patterns across the management region.

The draft strategy, revision of which is ongoing, includes three objectives: 1) identify steps to incrementally transition the interstate FMPs to incorporate ecosystem considerations; 2) modify the existing assessment and management process to consider ecosystem effects on stock and fishery dynamics, and also consider fishery effects on ecosystems; and, 3) establish realistic expectations for incorporation of ecosystem principles based on available data, resources, and analytical tools.

The Habitat Committee and ASMFC Habitat Program staff see the opportunity for much future collaboration with the Mid-Atlantic, New England, and South Atlantic Fishery Management Councils as all move forward with measures to conserve, protect, and restore riverine, estuarine, and marine habitats and refine ecosystem-based approaches to fishery management. The ASMFC appreciated the opportunity to participate in the MAFMC's workshop, and anticipates further productive collaborations in the future.

Further reading

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Atlantic States Marine Fisheries Commission (ASMFC). 2003. Linking multispecies assessments to single species management. Atlantic States Marine Fisheries Commission, Washington, D.C. Special Report No. 79: 1-55.

Atlantic States Marine Fisheries Commission (ASMFC). 2005. Multispecies VPA (MSVPA-X) internal peer review terms of reference and panel report. Atlantic States Marine Fisheries Commission, Washington, D.C. Special Report No. 84: 1-12.

Atlantic States Marine Fisheries Commission (ASMFC). 2009. Habitat Program five-year strategic and management plan 2009-2013. Atlantic States Marine Fisheries Commission, Washington, D.C. 7 pp.

Greene, K.E., Zimmerman, J.L., Laney, R.W., Thomas-Blate, J.C. 2009. Atlantic Coast diadromous fish habitat: a review of utilization, threats, and recommendations for conservation and habitat needs. Atlantic States Marine Fisheries Commission, Washington, D.C. Habitat Management Series No. 9: 1-464.

Howell, P., Howe, A., Gibson, M. Ayvazian, S. 1992. Fishery management plan for inshore stocks of winter flounder *Pleuronectes americanus*. Atlantic States Marine Fisheries Commission, Washington, D.C. Fisheries Management Report No. 21: 1-136.

Maryland Department of Natural Resources, Tidal Fisheries Division. 1981. Interstate fisheries management plan for the striped bass of the Atlantic coast Maine to North Carolina. Atlantic States Marine Fisheries Commission, Washington, D.C. Fisheries Management Report No. 1. 329 pp.

Schrading, E., O'Connell, T., Michels, S., Perra P. 1998. Interstate fishery management plan for horseshoe

crab. Atlantic States Marine Fisheries Commission, Washington, D.C. Fishery Management Report No. 32: 1-57.

Stephan, C.D., Goldsborough, W.J., Dunnigan, J.H., Sandifer, P.A. 1997. Atlantic States Marine Fisheries Commission Submerged Aquatic Vegetation Policy. Atlantic States Marine Fisheries Commission, Washington, D.C. Habitat Management Series No. 3: 1-9.

Stephan, C.D., Hughes, P., Nero, L., Goldsborough, B., Dornbusch, P., Laney, W., Newell, A., Bigford T.E., Bellinger, J., Spagnolo, R. 1998. Guidance for the development of ASMFC fishery management plan habitat sections and source documents. Atlantic States Marine Fisheries Commission, Washington, D.C. Habitat Management Series No. 4: 1-15.

Stephan, C.D., Bigford, T.E., Caruso, P., Hughes, P., Newell, A.J., Shipman, S., Atlantic States Marine Fisheries Commission Habitat Committee. 1999. Habitat Program Strategic and Management Plan. Atlantic States Marine Fisheries Commission, Washington, D.C. 32 pp.

Stevenson, D.K. 1997. Habitat information and habitat management recommendations in ASMFC fishery management plans. In: Stephan, C.D., Beidler, K. (eds). Management of Atlantic coastal marine fish habitat: proceedings of a workshop for habitat managers. Atlantic States Marine Fisheries Commission, Washington, D.C. Habitat Management Series No. 2:1-223. pp. 16-29.

Key Question: Fish passage for diadromous species seems like an important part of a regional approach in the mid-Atlantic. What are some key steps?

Answer: We need more and better data so we can improve our models and assessments. We need an inclusive approach to resource management. For example, when managing diadromous species such as river herring, we need a coast-wide approach that includes utility service company personnel. Industry experts can help us develop best practices guidance. One challenge is calculating efficiency; we can count the number passing through a dam but need to know how many arrive at a designated upstream habitat.

Key Question: How can the MAFMC get more involved? Are there roles for others?

Answer: The MAFMC and ASMFC have many shared processes, goals, programs, and constituents. That's probably true for other regional industry sectors. Scarce dollars can be leveraged by them and with others, as the Council and Commission are already doing. This workshop helps to establish a dialog that extends beyond fishery management and toward ecosystem-based approaches. We can also improve education and marketing efforts so the public learns about the value of river herring and the need for action. West coast salmon offers a lofty model. Striped bass is a good success story along the Atlantic coast but hopefully we can improve efforts to restore herring and shad. The Susquehanna system showed an increase followed by a decline in the latter two, perhaps constrained by striped bass predation and offshore bycatch. More work is needed to identify contributing factors. Generally, we need improved information on how each species uses habitat types throughout its life. The network modeling done on blueback herring in North Carolina could inform us. We need to manage on a system-by-system basis; i.e., riverine instead of coastwide assessments. We also need to manage from a riverine perspective or a regional basis as we move offshore.

PROGRESS ON HABITAT CONSERVATION AND ECOSYSTEMS-BASED FISHERIES MANAGEMENT BY THE NEW ENGLAND FISHERY MANAGEMENT COUNCIL

Christopher Kellogg, Deputy Director, New England Fishery Management Council, Newburyport, MA

Major Recommendations

- Carefully consider the tradeoffs of adopting EBFM approaches compared to current fisheries management approaches.
- Understand and prepare for some of the needed changes to organizational structure before embarking on EBFM.
- Coordinate development of EBFM approaches with adjacent Fishery Management Councils, states, and the ASMFC.

The following summary draws largely on the work of Michelle Bachman and the New England Fishery Management Council's (NEFMC's) Habitat Plan Development team in reference to habitat protection measures and on a paper, Ecosystem-Based Fishery Management for New England Fishery Management Council, prepared for the NEFMC by O'Boyle at al. (2010).

The New England Fishery Management Council began its EFH Omnibus Amendment 2 in 2005 with two main goals. The first was to review and update EFH designations for all managed species. Because there is not adequate information on how specific types of habitats or specific habitat locations contribute to the productivity of managed stocks, the EFH descriptions are fairly general. In most cases, the spatial distribution of EFH is based largely on the spatial distribution of the species/lifestage to which the designation applies. As might be expected, there is a high degree of overlap in the EFH designations of the various species managed by the NEFMC.

The second major goal of EFH Omnibus Amendment 2 was to optimize the minimization of adverse effects across fishery management plans (FMPs). This requires both a method for estimating adverse effects, and a strategy for minimizing those effects, which led to the development of the Swept Area Seabed Impact (SASI) model. The SASI model is a geo-referenced analytical tool that estimates the adverse effects (Z) of fishing on seabed structures by combining fishing effort data, seabed substrate and energy data, and gear-specific habitat vulnerability parameters.

Previous EFH evaluations conducted for NEFMC FMP actions were ad-hoc, and could not be compared across plans in a straightforward manner. One important way in which the SASI model improves upon previous adverse effect analyses is to compare the magnitude of adverse effects across different fishing gear types and FMPs. This comparison can be made because all fishing effort is converted into area swept units, regardless of whether trawl, dredge, or fixed gears are being evaluated. In addition, a single range of susceptibility and recovery values were selected to parameterize the model, no matter which gear type was being evaluated, so the magnitude of Z_{∞} estimates can be compared across gears. Also economic values can be incorporated into the model to evaluate the practicability of minimization measures.

The SASI model is scheduled to for a peer review in February 2011.The NEFMC expects to develop and approve EFH designation and impacts minimization alternatives as well as deep-sea coral protection measures in late 2011 as part of the Habitat Omnibus Amendment 2.

Ecosystems-Based Fishery Management and Ecosystems-Based Management

The NEFMC's Scientific and Statistical Committee completed a background paper in November 2010 outlining a strategy to implement EBFM over the next three to five years (O'Boyle et al. 2010). The paper outlines a transition strategy and proposed next steps. As part of the strategy, three approaches to implementing EBFM were identified. The first 'incremental approach' outlines how existing fisheries management plans can be modified to address the needs of EBFM. The second 'holistic approach' provides a broader 'ecosystem basis' for management through employing constraints imposed by overall ecosystem productivity to guide an allocation strategy of species – specific catches. The third 'blended' approach employs multispecies models to inform current stock assessment and management. The implementation strategy starts with the 'incremental' approach, moves through the 'blended approach' and achieves full implementation of the 'holistic approach' within three to five years. The current nine fishery management plans would be replaced by two EBFM plans, one for the Gulf of Maine and the other for Georges Bank.

An EBFM Plan will require the NEFMC to identify 1) areas or "ecosystem production units" that are based upon ecosystem processes that would be the focus of management, including the Western-Central Gulf of Maine, Eastern Gulf of Maine-Scotian Shelf, Georges Bank-Nantucket Shoals, and the Mid-Atlantic Bight

(see presentation by Fogarty et al., above); 2) ecosystem components being impacted by fishing in these area and mitigation of prioritized risks; 3) conceptual and operational objectives including indicators and reference points; 4) management actions to mitigate impacts (specific and cumulative); and, 5) assessment activities to monitor progress against the objectives.

Challenges

The transition to EBFM must acknowledge the on-going requirements of fisheries management while at the same time developing the building blocks for EBFM with full and transparent stakeholder involvement, and consideration of the social values of the marine resources. NEFMC institutions (i.e., processes and procedures) would need to be designed to address the implications of cumulative ecosystem impacts of fishing. Institutional changes required by EBFM depend on the form of EBFM that the NEFMC decides to implement. Some of the many challenges in transitioning to EBFM are:

1. Moving from FMPs defined by species and stocks to biological or socio-cultural definitions of ecosystems.
2. Resolving jurisdictional issues with states and with the MAFMC in the Mid-Atlantic Bight.
3. EBFM may require the NEFMC to consider activities that it does not directly regulate and to broaden public input into its EBFM process.
4. Single species management has led to the establishment of constituents with historical interests in particular fisheries which will heighten the difficulties and the potential disagreements that may arise in setting objectives and making trade-offs. The Council may have to change some of its consultative processes, as well as build on creating a participatory and transparent governance process.
5. Major shifts in management approaches (including the implementation of a number of catch share programs) have required significant changes in the way fishermen and fishing communities operate and relate with the marine environment and with each other.
6. The NEFMC plan development process may be too cumbersome for developing EBFM Plans, making it difficult to include the full range of expertise needed. A number of changes to the NEFMC's plan development process, including to fishery oversight or species committees, advisory panels, plan development teams, the SSC and the SAW or other assessment processes (e.g., Transboundary Resources Assessment Committee or TRAC), are probably needed.
7. Under current national guidelines, reference points such as minimum stock size and maximum fishing mortality thresholds must be defined for each stock to the extent possible and each stock must be managed to achieve these reference points within fixed time periods. It will be necessary to configure ecosystem reference points consistent with these guidelines.

Overall, the implementation of full EBFM in the northeast region has significant consequences for what the NEFMC has to achieve and how it organizes itself to achieve these.

Further reading

O'Boyle, R., Cadrin, S., Georgianna, D., Kritzer, J., Sissenwine, M., Fogarty, M., Kellogg, C., Fiorelli, P. 2010. Ecosystem–based fishery management for New England Fishery Management Council. Paper presented to the NEFMC, November 16, 2010, Barnstable, MA.

Key Question: How are the impact data generated and does this reflect a single year or multiple years? Are they confirmed with groundtruthing?

Answer: The data reflect mean impacts over a three-year time period and are generated by the model based on effort data and habitat vulnerability. The adverse impacts described by the model are qualitative in that the denominator is qualitative.

Key Question: How will the NEFMC's work, or our efforts to manage regional ecosystems more generally, evaluate impacts in terms of Magnuson-Stevens Act National Standard 8 – impacts to communities?

Answer: Communities are important, as represented by a variable inserted by the new social scientists on the NEFMC's SSC.

Key Question: There once was some discussion about opening up some currently closed areas and closing currently open areas. Has that been further discussed?

Answer: Potential action alternatives have not yet reached the NEFMC for action but it is clear our analytical tools will enable the NEFMC to evaluate those types of options. It is generally common knowledge that some of the groundfish closed areas on Georges Bank score low in terms of habitat impacts, suggesting that re-opening those areas might not result in a significant increase in impacts from bottom fishing, for example.

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL HABITAT CONSERVATION, ECOSYSTEM COORDINATION, AND COLLABORATION

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Major Recommendations

- An initial step is sharing the existing EFH policy statements shown below. Other areas include evaluating linking between or collaboration on the development of future ecological models where species may overlap jurisdiction. To further the mutual cooperation, we could also cooperate on including updated information for future South Atlantic Fishery Ecosystem Plan revisions for mid-Atlantic managed species occurring in south Atlantic waters (e.g., bluefish, summer flounder).
- Some timely issues the Councils can continue to share information on is in developing activities and policies pertaining to offshore energy development or marine aquaculture. To expand the broader view of habitat and understanding impacts across regions there may be the opportunity to hold joint workshops on habitat issues with other east coast Councils and the ASMFC.
- One newer opportunity for collaboration may be in respective organization participation in the Department of Interior's North Atlantic and South Atlantic Landscape Conservation Cooperatives depending on the desired focus areas of each region. Finally, an area where regions can also share experiences and policy development is in marine habitat identification and conservation for diadromous species.

The South Atlantic Fishery Management Council (SAFMC), using the Essential Fish Habitat (EFH) Plan as the cornerstone, adopted a strategy to facilitate the move to an ecosystem-based approach to fisheries management in the region. This approach required a greater understanding of the south Atlantic ecosystem and the complex relationships among humans, marine life, and the environment including essential fish habitat. To accomplish this, a process was undertaken to facilitate the evolution of the Habitat Plan into a Fishery Ecosystem Plan (FEP), thereby providing more comprehensive understanding of the biological, social, and economic impacts of management necessary to initiate the transition from single species management to ecosystem-based management in the region.

SAFMC habitat and environmental protection policy

In recognizing that species are dependent on the quantity and quality of their essential habitats, it is the policy of the SAFMC to protect, restore, and develop habitats upon which fisheries species depend, to increase the extent of their distribution and abundance, and to improve their productive capacity for the benefit of present and future generations. For purposes of this policy, "habitat" is defined as the physical, chemical, and biological parameters that are necessary for continued productivity of the species that is being managed. The objectives of the SAFMC policy will be accomplished through the recommendation of no net loss or significant environmental degradation of existing habitat. A long-term objective is to support and promote a net-gain of fisheries habitat through the restoration and rehabilitation of the productive capacity of habitats that have been degraded, and the creation and development of productive habitats where increased fishery production is probable. The SAFMC will pursue these goals at state, federal, and local levels. The Council shall assume an aggressive role in the protection and enhancement of habitats important to fishery species, and shall actively enter federal, decision-making processes where proposed actions may otherwise compromise the productivity of fishery resources of concern to the Council.

EFH and EFH Habitat Area of Particular Concern (EFH-HAPC) designations translated to cooperative habitat policy development and protection

In addition to implementing regulations to protect habitat from fishing related degradation, the SAFMC in cooperation with NMFS actively comments on non-fishing projects or policies that may impact fish habitat. Appendix A of the Comprehensive Amendment Addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region (SAFMC 1998b) outlines the SAFMC's comment and policy development process and the establishment of a four-state Habitat Advisory Panel. Members of the Habitat Advisory Panel serve as the SAFMC's habitat contacts and professionals in the field. Advisory Panel members bring projects to the SAFMC's attention, draft comment letters, and attend public meetings. NMFS,

state and other federal agencies apply EFH and EFH-HAPC designations and protection policies in the day-to-day permit review process. With guidance from the Advisory Panel, the SAFMC has developed and approved EFH policy statements to provide the SAFMC and commenting partners a more rapid response to proposed activities which may impact essential fish habitat.

SAFMC EFH Policy Statements

With guidance from the Advisory Panel, the SAFMC has developed and approved the following habitat policy statements which are available on the Habitat and Ecosystem Section of the SAFMC website:

•Protection and Restoration of EFH from Marine Aquaculture:

<http://www.safmc.net/Portals/0/HabitatPolicies/SAFMCAquaPolicyFinalJune07.pdf>

•Protection and Enhancement of Marine Submerged Aquatic Vegetation:

<http://www.safmc.net/Portals/0/HabitatPolicies/SAFMCSAVPol.pdf>

•Protection and Restoration of EFH from Beach Dredging and Filling:

<http://www.safmc.net/Portals/0/HabitatPolicies/BeachPolicy.pdf>

•Protection and Restoration of EFH from Energy Exploration, Development, Transportation and Hydropower Re-Licensing:

<http://www.safmc.net/Portals/0/HabitatPolicies/SAFMCEnergyPolicyFinal05.pdf>

•Protection and Restoration of EFH from Alterations to Riverine, Estuarine and Nearshore Flows:

<http://www.safmc.net/Portals/0/HabitatPolicies/FlowsPolicy.pdf>

Moving to ecosystem-based management

The SAFMC adopted broad goals for ecosystem-based management to include maintaining or improving ecosystem structure and function; maintain or improving economic, social and cultural benefits from resources; and maintaining or improving biological, economic, and cultural diversity. Development of a regional FEP (SAFMC 2009a) provided an opportunity to expand scope of the original SAFMC Habitat Plan and compile and review available habitat, biological, social, and economic fishery and resource information for fisheries in the south Atlantic ecosystem. The SAFMC views habitat conservation at the core of the move to EBM in the region. Therefore, development of the FEP was a natural next step in the evolution and expands and significantly updates the SAFMC Habitat Plan (SAFMC 1998a), incorporating comprehensive details of all managed species (SAFMC, south Atlantic states, ASMFC, and NMFS highly migratory species and protected species) including their biology, food web dynamics, and economic, and social characteristics of the fisheries and habitats essential to their survival. The FEP presents more complete and detailed information describing the south Atlantic ecosystem and the impact of the fisheries on the environment. This FEP updates information on designated EFH and EFH-HAPCs; expands descriptions of biology and status of managed species; presents information that will support ecosystem considerations for managed species; and describes the social and economic characteristics of the fisheries in the region. In addition, it expands the discussion and description of existing research programs and research needs to identify the biological, social, and economic research needed to fully address ecosystem-based management in the region. The comprehensive scope of the FEP provides the SAFMC source information by fishery, habitat, or major ecosystem in their consideration of actions to address bycatch reduction, habitat conservation, consideration of prey-predator interactions, maintaining biodiversity, and spatial management needs. This FEP serves as a living source document of biological, economic, and social information for all fishery management plans (FMPs). Future environmental assessments and Environmental Impact Statements associated with subsequent amendments to Council FMPs will draw from or cite by reference the FEP.

The Fishery Ecosystem Plan for the south Atlantic region encompasses the following volume structure:

•FEP Volume I – Introduction and Overview of FEP for the South Atlantic Region;

•FEP Volume II – South Atlantic Habitats and Species;

•FEP Volume III – South Atlantic Human and Institutional Environment;

•FEP Volume IV – Threats to South Atlantic Ecosystem and Recommendations;

•FEP Volume V – South Atlantic Research Programs and Data Needs;

•FEP Volume VI – References and Appendices.

Spatial and ecosystem approaches to management

The SAFMC, to conserve species and protect habitat, has employed a wide range of area management actions in the region. Initial gear area regulations include banning the use of fish traps, roller rig trawls, drift gill nets, and bottom long lines (inshore). The SAFMC has also designated Special Management Zones which limit the use of efficient or damaging gear on permitted artificial reefs and more recently established Deepwater Marine Protected Areas which prohibit harvest of all snapper grouper species.

The SAFMC manages coral, coral reefs, and live/hard bottom habitat, including deep-sea corals, through the Fishery Management Plan for Coral, Coral Reefs, and Live/Hard Bottom Habitat of the South Atlantic Region (Coral FMP). Mechanisms exist in the FMP, as amended, to further protect deep-sea coral and live/hard bottom habitats. The SAFMC's Habitat and

Environmental Protection Advisory Panel and Coral Advisory Panel supported proactive efforts to identify and protect deep-sea coral ecosystems in the south Atlantic region. Comprehensive Ecosystem-Based Amendment 1 (CE-BA1) (SAFMC 2009b) established deep-sea coral HAPCs (C-HAPCs) to protect what is thought to be the largest continuous distribution (> 23,000 square miles) of pristine deep-sea coral ecosystems in the world. In addition, the CE-BA1 created areas within the C-HAPC for traditional fishing in limited areas which does not impact deep-sea coral habitat. The CE-BA1, supported by the FEP, also addresses non-regulatory updates for existing EFH and EFH-HAPC information and addresses the spatial requirements of the Final EFH Rule (i.e., GIS presented for all EFH and EFH-HAPCs).

South Atlantic Bight Ecopath Model

The SAFMC worked cooperatively with the University of British Columbia and the Sea Around Us project to develop a straw-man and preliminary food web models (Ecopath with Ecosim) to characterize the ecological relationships of south Atlantic species, including those managed by the SAFMC. This effort was envisioned to help the SAFMC and cooperators in identifying available information and data gaps while providing insight into ecosystem function. More importantly, the model development process provides a vehicle to identify research necessary to better define populations, fisheries, and their interrelationships. While individual efforts are still underway in the south Atlantic (e.g., Biscayne Bay) only with significant investment of new resources through other programs will a comprehensive regional model be further developed.

Building from a habitat to an ecosystem network to support the evolution

Starting with our Habitat and Environmental Protection Advisory Panel, the SAFMC expanded and fostered a comprehensive habitat network in our region to develop the Habitat Plan of the South Atlantic Region that was completed in 1998 to support the EFH rule. Building on the core regional collaborations, the SAFMC facilitated an expansion to a habitat and ecosystem network to support the development of the FEP and CE-BA as well as coordinate with partners on other regional efforts.

These efforts include participation as a member and on the Board of the Southeast Coastal Ocean Observing Regional Association (SECOORA) to guide and direct priority needs for observation and modeling to support fisheries oceanography and integration into the stock assessment process through the SouthEast Data, Assessment, and Review (SEDAR). Cooperation through SECOORA is envisioned to facilitate the following:

•Refining current or water column designations of EFH and EFH-HAPCs (e.g., Gulf Stream and Florida Current).

•Providing oceanographic models linking benthic-pelagic habitats and food webs.

•Providing oceanographic input parameters for ecosystem models.

•Integration of ocean observing system information into the stock assessment process in the south Atlantic region.

•Facilitating ocean observing system collection of fish and fishery data and other research necessary to support the SAFMC's use of area-based management tools in the region including, but not limited to, EFH, EFH-HAPCs, Marine Protected Areas, Deepwater Coral Habitat Areas of Particular Concern, Special Management Zones, and Allowable Gear Areas.

•Integration of ocean observing system program capabilities and research Needs into the South Atlantic Fishery Ecosystem Plan.

•Collaboration with SECOORA to integrate ocean observing system products on the SAFMC's Habitat and Ecosystem Internet Mapping System to facilitate model and tool development.

•Expanding Internet Map Server (IMS) and ArcGIS (Geographic Information System) services will provide permissioned researchers access to data or products including those collected/developed by south Atlantic ocean observing system partners.

In addition, the SAFMC serves on the National Habitat Board and, as a member of the Southeast Aquatic Resource Partnership (SARP), has highlighted the collaboration by including the Southeast Aquatic Habitat Plan and associated watershed conservation restoration targets into the FEP. Many of the habitat, water quality, and water quantity conservation needs identified in the threats and recommendations volume of the FEP are directly addressed by on-the-ground projects supported by SARP. This cooperation results in funding fish habitat restoration and conservation intended to increase the viability of fish populations and fishing opportunities which also meets the needs to conserve and manage EFH for SAFMC managed species or habitat important to their prey.

Initially discussed as a South Atlantic Eco-regional Compact, the SAFMC has also cooperated with south Atlantic states in the formation of a Governor's South Atlantic Alliance. This will also provide regional guidance and resources that will address state and SAFMC broader habitat and ecosystem conservation goals. The Alliance was initiated in 2006. An Executive Planning Team, by the end of 2007, had created a framework for the Governors South Atlantic Alliance. The formal agreement between the four states (NC, SC, GA, and FL) was executed in May 2009. The agreement specifies that the Alliance will prepare a "Governors South Atlantic Alliance Action Plan" which will be reviewed annually for progress and updated every five years for relevance of content. Alliance

mission and purpose is to promote collaboration among the four states, and with the support and interaction of federal agencies, academia, regional organizations, non-governmental organizations, and the private sector, to sustain and enhance the region's coastal and marine resources. The Alliance proposes to regionally implement science-based actions and policies that balance coastal and marine ecosystems capacities to support both human and natural systems.

One of the more recent collaborations is the SAFMC's participation as Steering Committee member for the newly establish South Atlantic Landscape Conservation Cooperative. Landscape Conservation Cooperatives (LCCs) are applied conservation science partnerships focused on a defined geographic area that inform on-the-ground strategic conservation efforts at landscape scales. LCC partners include Department of Interior agencies, other federal agencies, states, tribes, non-governmental organizations, universities and others.

Building Tools to support EBM in the south Atlantic region

The Council has developed a Habitat and Ecosystem Section of the website:
<http://www.safmc.net/ecosystem/Home/EcosystemHome/tabid/435/Default.aspx>
and, in cooperation with the Florida Wildlife Research Institute (FWRI), developed a Habitat and Ecosystem IMS:
<http://www.safmc.net/EcosystemManagement/EcosystemBoundaries/MappingandGISData/tabid/632/Default.aspx >.
The IMS was developed to support SAFMC and regional partners' efforts in the transition to EBM. Other regional partners include the NMFS Office of Habitat Conservation, other federal partners, south Atlantic states, local management authorities, universities, conservation organizations, and recreational and commercial fishermen. As technology and spatial information needs evolve, the distribution and use of GIS demands greater capabilities. The Council has continued its collaboration with FWRI in the evolution to ArcGIS services initially for essential fish habitat:
<http://ocean.floridamarine.org/SAFMC_EFH/>
and fishery regulations:
<(http://ocean.floridamarine.org/SAFMC_Regulations/>
and is developing ones for a permissioned service for fishery independent research as well one for ocean energy activities in the region (e.g., wind, wave, and current).

Ecosystem-based actions, future challenges, and needs

The SAFMC has implemented ecosystem-based principles through several existing fishery management actions including establishment of deepwater Marine Protected Areas for the snapper grouper fishery, proactive harvest control rules on species (e.g., dolphin and wahoo) which are not overfished, implementation of extensive gear area closures which in most cases eliminates the impact of fishing gear on essential fish habitat, and use of other spatial management including Special Management Zones. Pursuant to the development of the Comprehensive Ecosystem-Based Amendment, the SAFMC is taking an ecosystem approach to protect deepwater ecosystems while providing for traditional fisheries for the golden crab and royal red shrimp in areas where they do not impact deep-sea coral habitat. The stakeholder based process taps in on an extensive regional habitat and ecosystem network. Support tools facilitate SAFMC deliberations and with the help of regional partners, are being refined to address long-term ecosystem management needs.

One of the greatest challenges to the long-term move to EBM in the region is funding high priority research, including but not limited to, comprehensive benthic mapping and ecosystem model and management tool development. In addition, collecting detailed information on fishing fleet dynamics, including defining fishing operation areas by species, species complex, and season, as well as catch relative to habitat, is critical for assessment of fishery, community, and habitat impacts and for SAFMC use of place-based management measures. Additional resources need to be dedicated to expanding regional coordination of modeling, mapping, characterization of species use of habitats, and full funding of regional fishery independent surveys (e.g., Marine Resources Monitoring, Assessment and Prediction [MARMAP], Southeast Area Monitoring and Assessment Program [SEAMAP], and Southeast Fisheries Science Center Southeast Fishery-Independent Survey [SEFIS]) which are linking directly to addressing high priority management needs. Development of ecosystem information systems to support SAFMC management should build on existing tools (e.g., regional habitat and ecosystem GIS and ArcGIS services) and provide resources to regional cooperating partners for expansion to address long-term SAFMC needs.

The FEP and CE-BA complement, but do not replace, existing FMPs. In addition, the FEP serves as a source document to the CE-BA. NOAA should support and build on the regional coordination efforts of the SAFMC as it transitions to a broader management approach. Resources need to be provided to collect information necessary to update and refine our FEP and support future fishery actions including, but not limited to, completing one of the highest priority needs to support EBM: the completion of mapping of near-

shore, mid-shelf, shelf edge, and deepwater habitats in the south Atlantic region. In developing future FEPs, the SAFMC will draw on Stock Assessment and Fishery Evaluation (SAFE) reports which NMFS is required to provide the SAFMC for all FMPs implemented under the Magnuson-Stevens Act. The FEP, serving as the source document for CE-BAs, could also meet NMFS SAFE requirements if information is provided to the SAFMC to update necessary sections.

Further reading

South Atlantic Fishery Management Council (SAFMC). 1998a. Habitat Plan for the south Atlantic region. SAFMC, Charleston, SC.

South Atlantic Fishery Management Council (SAFMC). 1998b. Comprehensive Amendment addressing Essential Fish Habitat in fishery management plans of the south Atlantic region. SAFMC, Charleston, SC.

South Atlantic Fishery Management Council (SAFMC). 2009a. Fishery Ecosystem Plan for the south Atlantic region. Volumes I-V. SAFMC, North Charleston, SC.

South Atlantic Fishery Management Council (SAFMC). 2009b. Comprehensive Ecosystem-Based Amendment 1. SAFMC, North Charleston, SC.

STAKEHOLDER PANEL DISCUSSION WITH COUNCIL

Rapporteur: **Jim Armstrong,** Mid-Atlantic Fishery Management Council, Dover, DE

Key Question: With regards to the The Nature Conservancy's information "portal," will commercial and recreational fishermen's knowledge be incorporated into the model?

Answer: Yes, The Nature Conservancy is partnering with several universities and is developing a stakeholder working group to gather input on the importance of certain areas and address social and economic questions.

CLOSING REMARKS

John Boreman, Chair, Mid-Atlantic Fishery Management Council/Science and Statistical Committee, Dover, DE

Any science-based decision process in fisheries management needs to function with imperfect knowledge with respect to habitat-related information. Managers cannot afford the cost or the time to obtain every relevant piece of information there is about northeast shelf habitats before making judgments about the real or potential impacts of natural and anthropogenic events. Where key knowledge does not exist, a body of theory needs to be developed, much the same way that theory has evolved to support stock assessments (e.g., the von Bertalanffy growth and Ricker stock-recruitment models) — habitat science is lacking in this regard.

Habitat science should take advantage of new sampling and data handling technologies. Sampling tools such as moored and mobile sensor arrays, LiDAR (Light Detection And Ranging) and side-scanning sonar, and pop-up satellite tags can all be integrated with traditional sampling techniques to gain information about the relationship between habitat types and fisheries species productivity. Expanding partnerships between scientists and the fishing industry to sample fisheries species and their local environments is not only useful but necessary; fishermen possess a vast store of knowledge about natural history that scientists need to access and use in their single species, multi-species, and habitat- and ecosystem-based assessments. To support expanding data collection, suitable end-to-end data management architecture is needed to guide how the data are being collected, archived, and used in products useful to fisheries science and management, as well as the public at large.

As the body of theory and new sampling and data handling techniques are being developed, the focus of habitat science and the management it supports should be on what is immediately important to fishery stock assessments. Specifically, habitat effects on fisheries species productivity should be translated into mortality rates that can be readily incorporated into stock assessment models.

Habitat science is currently being conducted by a multitude of government agencies and organizations, so where does the MAFMC fit into the picture? Being on the receiving end of the information being generated by scientists and the fishing industry related to habitat and its relation to fisheries productivity, the MAFMC can serve as a habitat information clearinghouse by focusing efforts on coordinating the development and continually improving the packaging of the information so that it suits fisheries management needs, as is best exemplified by this workshop.

In addition, the MAFMC can support NMFS in its efforts to implement the recently developed Habitat Assessment Improvement Plan, and continue to refine terms of reference for stock assessments as more knowledge is gained about the relationship between habitats and fisheries species productivity. Most importantly, the MAFMC needs to ensure that habitat-(and ecosystems-) based management is undertaken within the existing bounds of scientific knowledge; both management and science need to evolve in tandem.

David H. Wallace, Wallace & Associates, Inc., Cambridge, MD

I would like to discuss two different groups or categories. The first group could be considered as the "regulators," that is, the Councils, ASMFC etc.; in other words, the people who create the policy. They all have to deal with the same problems involving habitat loss, whether natural or man-made, and with trying to go from single species management to multi-species management under EBFM. The latter is a challenge because there is such an enormous lack of knowledge about how such things as predator-prey relationships operate, and how all these species interact with the habitat. For example, I thought it was interesting what John Manderson had to say: that habitat is not just the bottom or bottom structure, but the overlying water as well. I had never considered that before, and I'm sure a lot of other people here today realized what a revelation that was, especially because we're always talking about impacts to the bottom, either natural or man-made.

So, the Councils are attempting to deal with these various habitat issues through closures or through the creation of protected areas. For example, the SAFMC has some very large habitat closures, especially for deep-sea corals. The SAFMC has always been at the forefront of having public participation and getting all the stakeholders to buy into the process. They've done a really good job of bringing together all the stakeholders, and they did this from the bottom up, not from top down management. On the other hand, the NEFMC has a number of habitat closures, and what's interesting is that a number of those closures were not the ones intended, but they were the results of political decisions, and not a biological or habitat decision. That's what happens when you're trying to push the system and trying to make it comply with laws or mandates from Congress.

The second group consists of people like Jason Link, the NMFS scientist, Jay Odell from TNC, an environmental organization, and the fishermen. They are particularly involved in three different issues: habitat, ecosystems, and coastal and marine spatial planning. CMSP doesn't fall under the auspices of the Councils but it's clear that this will have a significant impact on the Council system because it appears that the Regional Planning Bodies may not be the regional governance bodies and there's a good chance that the Councils are not going to have any real participation in this at all. Now, the National Ocean Policy establishes a framework for CMSP that is supposed to address user conflicts. My personal opinion is that conflict resolution is going to come to the fore when the Councils are faced with this notion that they are going to zone the ocean and they won't have any jurisdiction over this. This is going to have a significant impact when fisheries comes into conflict with other forms of ocean usage, especially energy development such as wind farms. So we have this interesting situation, and on a number of occasions today we've talked about trade-offs. The fact of the matter is we need to think about the trade-offs because they are going to be far more extensive than we now realize.

Rick Robins, Chair, Mid-Atlantic Fishery Management Council, Dover, DE

I would like to commend Gene Kray, Tom Hoff and the Steering Committee for planning and assembling such an impressive group of habitat and ecosystems experts to engage the Council in this workshop. I would also like to thank all of the panelists and participants for their presentations and contributions to the dialogue.

It is clear that the workshop has generated a lot of genuine excitement within the scientific community and, more broadly, both excitement and concern in the stakeholder community.

The workshop is extremely timely, for several reasons:

The National Ocean Policy will soon be moving from concept to implementation, resulting in the creation of a Regional Planning Body and vision for the mid-Atlantic region.

Offshore energy development promises to generate a steady stream of future initiatives that will require the Council's proactive and constructive engagement in the Coastal Marine Spatial Planning (CMSP) arena.

Public interest in the management and conservation of offshore marine habitats is growing and involves other management agencies and legislative authorities, as we saw recently with the proposal to consider protecting the offshore seamounts and canyons under the National Marine Sanctuaries Act.

As these national and regional initiatives move forward, it is clear that the Council has an important and expanding role to play with respect to the management of coastal and offshore habitats, and this workshop has revealed opportunities for Council engagement that are both timely and important.

At the same time, the Council has already taken an important first step to incorporating ecological considerations into our current fishery management plans and how to transition into ecosystem management by appointing an Ecosystem Subcommittee of the Council's Scientific and Statistical Committee.

The presentations were informative and thought provoking on a wide range of issues. Rather than recapping them, I would like to focus on next steps. As Pat Augustine reminded us throughout the workshop, actions are more important than meeting summaries. The presentations revealed opportunities that the Council can pursue across a wide spectrum of agencies, venues, and disciplines. Some of these opportunities are easily executed and others represent long-term opportunities and commitments. In a number of cases, we can work with existing programs to identify data and research needs for our region. Many of these opportunities build on the Council's existing initiatives, particularly with respect to ocean governance and ecosystem management. I believe the Council's role within the fast changing context of ocean governance goes well beyond simply describing and identifying essential fish habitat. Our challenges and opportunities associated with ocean governance will inevitably require a broader engagement with other agencies and stakeholders through the Regional Planning Body. Additionally, the scientific and technological developments that were highlighted in this workshop, including the application of fine-scale ocean observations to the management of fisheries interactions and the prospect of a coral assessment for the region, among others, present the Council with a range of opportunities to increase our understanding of the ecological connections between the marine environment, the fisheries that we manage as a Council, and the other activities and interests in the mid-Atlantic.

Finally, in terms of where do we go from here, I would suggest that the Council task the Ecosystem and Ocean Planning Committee with categorizing the opportunities presented in this workshop and developing a list of priorities and an action plan for consideration by the full Council by mid-2011.

PRESENTER BIOGRAPHIES

Thomas Hoff, Senior Ecologist, has worked for the MAFMC for nearly 30 years. He has been responsible for or worked on each of the Council's FMPs and has been the lead for habitat and ecosystem efforts. Prior to working for the Council he spent six years with two environmental consulting firms working on the Hudson River. He has B.S. (Zoology) and M.S. (Ecology) from Pennsylvania State University and a Ph.D. (Marine Studies) from the University of Delaware.

Gene Kray has been on the MAFMC for eight years and has chaired the Ecosystems Committee (now the Ecosystems and Ocean Planning Committee) for much of that time. He is a retired teacher and educational administrator, retiring from West Chester University, PA, in 1995. He has been a recreational fisherman for 65 years.

Jessica Kondel has worked for NOAA for over 10 years in various positions in California and DC, including serving as a NOAA Corps officer, Advisor to the Deputy Under Secretary for NOAA, and Fisheries Management Specialist. Currently she is the Acting Regional Coordinator for NOAA's Coastal and Marine Spatial Planning (CSMP) Program and is responsible for assisting with the NOAA-wide implementation of the CMSP Framework. She is responsible for coordinating NOAA's regional engagement with Regional Planning Bodies and other partners to develop and ultimately implement coastal and marine spatial plans.

Pat Montanio is Director of the NMFS Office of Habitat Conservation and a long-term NOAA employee focused on environmental policy. She oversees the conservation, protection, and restoration of oceanic, coastal, estuarine, and riverine habitats vital to our nation's marine fisheries and coastal economics. Programs include community-based restoration, Open Rivers, essential fish habitat, deep-sea corals, wetlands protection, coral conservation, and NOAA Chesapeake Bay Office. Previously, she held management positions in NOAA's Office of Response and Restoration and Office of Protected Resources. She holds a B.S. (Zoology) from the University of Maryland.

Thomas E. Bigford is Chief of the NMFS/Habitat Protection Division in the Office of Habitat Conservation, Silver Spring, MD. He directs marine, estuarine, and riverine programs to manage the essential fish habitat program, assure fish passage for diadromous species at hydropower and water diversion projects, develop policy for traditional and alternative energy issues, implement wetland policies, streamline permitting and licensing reviews, coordinate policy and science associated with human activities affecting living marine resources, and manage the Agency's coral program. He has 34 years of experience in research, management, and program direction including three years with EPA and 28 years with NOAA (19 years with NOAA headquarters and NOAA NMFS headquarters, and nine years with NOAA regional offices). He holds leadership positions with The Coastal Society and the American Fisheries Society. He has a B.S. (Fishery Biology) from Michigan State University, an M.S. (Zoology/Marine Biology) from the University of Rhode Island, and a Masters in Marine Affairs from the University of Rhode Island.

Peter Colosi is Chief of the NMFS/Habitat Conservation Division, Northeast Region, whose major activities include implementing essential fish habitat provisions and review of coastal development activities in order to protect habitats of living marine resources. His earlier NMFS assignments include seventeen years in fisheries management and later heading up a fishery policy analysis office. He received a B.A. (Biology) form Salem State University and an M.S. (Biology) from Northeastern University.

Fan Tsao, Deep-Sea Coral Research Specialist at the NMFS/Office of Habitat Conservation, coordinates NOAA's research and management activities related to deep-sea corals and sponges, including the implementation of the Deep Sea Coral Research and Technology Program. She has a Masters in Marine Affairs from the University of Washington.

John Catena is the Northeast Regional Supervisor for the NOAA/NMFS Restoration Center in Gloucester, MA. He is responsible for managing NOAA's habitat restoration programs throughout the northeastern U.S. from Maine to Virginia and supervises 15 professional and technical staff. He has been involved in managing, planning, and overseeing habitat restoration projects for over 15 years, with specific experience in the conceptual design, planning, and monitoring of tidal wetland, shellfish, riverine, and anadromous fish restoration projects including fish passage and dam removal projects. He received a B.S. (Marine Science) from the University of South Carolina in 1984 and an M.A. (Marine Affairs) from the University of Rhode Island in 1987.

Lauren Wenzel has worked for the National Marine Protected Areas Center for seven years, and serves as the Coordinator for the National System of Marine Protected Areas. Prior to joining NOAA, she worked on Chesapeake Bay restoration issues for the Maryland Department of Natural Resources. She has a B.A. from

Oberlin College and an M.S. (Natural Resources Policy and Management) from the University of Michigan.

Reed Bohne is Regional Director for the northeast and Great Lakes region of NOAA's Office of National Marine Sanctuaries. He has worked for the sanctuary program for 25 years and prior to his current appointment was Superintendent of the Gray's Reef National Marine Sanctuary in Georgia. He received his B.S. from the College of William and Mary and M.S. from the University of Michigan.

Elaine Vaudreuil manages the Coastal and Estuarine Land Conservation Program with NOAA's Office of Ocean and Coastal Resource Management, and led the development of NOAA's guidelines for this program in 2002. For the past 12 years she has also represented the Coastal Zone Management Program and National Estuarine Research Reserves in NOAA's strategic planning and budget formulation processes and other policy development under the Coastal Zone Management Act. She received a Master of Regional Planning from the University of North Carolina at Chapel Hill, specializing in land use planning and coastal management, and a Bachelor's in Urban and Environmental Planning from the University of Virginia.

Joe Nohner is a Knauss Sea Grant Fellow in the NMFS/Office of Science & Technology. He has been responsible, in part, for the implementation of the Habitat Assessment Improvement Plan and conducting an assessment of estuarine fish habitats for the National Fish Habitat Action Plan. He received a B.S. (Environmental Sciences) from Notre Dame and an M.S. (Aquatic Resources and Management) from the University of Michigan where he developed a GIS-based spawning habitat model for muskellunge.

Tom Noji completed his B.A. in the U.S. and did graduate work in Germany, receiving his Ph.D. (Biological Oceanography) from the University of Kiel in 1987. He worked as an oceanographic researcher at the University of Kiel and at the Institute of Marine Research in Bergin, Norway until 2001, and then became Director of NMFS/NEFSC's James J. Howard Marine Sciences Laboratory, Highlands, NJ and Chief of the Ecosystems Processes Division. He serves on several international, national, and regional advisory committees and has held graduate courses at Rutgers University (NJ). His own research includes oceanic plankton ecology, harmful algal blooms, benthic-pelagic coupling, oceanic carbon pumps, marine biogeochemical cycles, marine contaminant transport, habitat mapping and classification, and effects of broad-scale hydrographic changes on ecosystem processes.

Ned Cyr is Director of the NMFS/Office of Science & Technology. He joined NOAA in 1992. He was an International Affairs Specialist with NOAA's Office of International Interests, a Fisheries Biologist with the NMFS/Office of Protected Resources, Head of the Ocean Science and Living Resources Program of the Intergovernmental Oceanographic Commission of UNESCO, and Chief of the Marine Ecosystems Division in NMFS/Office of Science & Technology. His interests include fisheries oceanography, the effects of climate change on marine ecosystems, ecosystem approaches to fisheries management, the design and implementation of large-scale marine ecological observing systems, and international ocean science. He was Technical Secretary for the Living Marine Resources Panel of the Global Ocean Observing System, and Coordinator of the NMFS Ecosystem Principles Advisory Panel. He received his B.S. from the University of Notre Dame in 1985, and his Ph.D. (Marine Science) from the University of South Carolina in 1991.

Mike Fogarty is the Chief of the Ecosystem Assessment Program at the NMFS/NEFSC Woods Hole Laboratory, MA, where he has worked for 30 years. He received his M.S. and Ph.D. degrees from the University of Rhode Island. He has served on numerous national and international committees including the Global Ocean Observing System Steering Committee, the U.S. Global Ocean Ecosystem Dynamics Program Scientific Steering Committee (Chair 1997-2002), the Comparative Analysis of Marine Ecosystem Organization Scientific Board, and the Scientific and Statistical Committees of the MAFMC (past) and NEFMC (current).

Peyton Robertson has been with NOAA for the past 18 years, working on nonpoint source pollution, monitoring needs, coastal management, and ocean policy. In August 2007, he became the Director of the NOAA Chesapeake Bay Office (NCBO) in Annapolis, working to bring all of NOAA's capabilities to bear on the ecosystem management challenges of the Bay. NCBO provides state-of-the-art science, technical assistance and funding, and outreach and education to advance the restoration of the Chesapeake Bay ecosystem, increasing citizen stewardship throughout the watershed. He has a B.A. (Environmental Science) and a Masters (Urban and Environmental Planning) from the University of Virginia.

John Manderson is a Research Fisheries Biologist for the Ecosystems Processes Division at NMFS/NEFSC's James J. Howard Marine Sciences Laboratory, NJ. His research interests include applications of integrated ocean observing systems to marine habitat ecology and understanding the ways habitat specific processes are translated across spatial scales and levels of ecological organization to affect regional population and ecosystem dynamics. He received his Ph.D. (Natural Resources Conservation) from the University of

Massachusetts, Amherst. He currently serves on the steering committee for the Working Group on the Northwest Atlantic Regional Sea for the International Council for the Exploration of the Sea, as NEFSC liaison to the Mid-Atlantic Regional Association Coastal Ocean Observing System, and on the Science and Technical Committee for the Barnegat Bay Partnership.

David Packer, Marine Ecologist, works for the Ecosystems Processes Division at NMFS/NEFSC's James J. Howard Marine Sciences Laboratory, NJ and is currently on rotational assignment to the NMFS/ Office of Habitat Conservation in Silver Spring, MD. Prior to working for NMFS he worked for several other federal agencies including the National Park Service, National Forest Service, Bureau of Land Management, Smithsonian Institution, and the EPA Chesapeake Bay Program. His current and past research and policy work includes essential fish habitat, deep-sea corals, climate change literacy training, gravel mining in anadromous fish streams, salt marsh restoration, sedimentology, fish-benthos trophic interactions, and mollusk taxonomy. He also provides scientific information/advice to the MAFMC and NEFMC. He has a B.S. (Zoology) from Ohio State University and an M.S. (Oceanography) from the University of Maine.

Greg Capobianco has been with the New York State Coastal Management Program for 20 years working across the marine and Great Lakes districts to implement New York's Significant Coastal Fish and Wildlife Habitats Program. He has served as Project Manager for the New York Ocean and Great Lakes Ecosystem Conservation Council and now serves as Director of the New York Ocean and Great Lakes Program. He helped lead the formation of the Mid-Atlantic Regional Council on the Ocean (MARCO) and continues to serve as principal New York representative to MARCO. Currently he is leading an ocean planning initiative focused on identifying ocean habitats in need of greater protection and developing siting criteria for offshore renewable energy. He received his B.S. (Biology) from SUNY Albany.

Jason Link has been a Research Fisheries Biologist for the NMFS/NEFSC Woods Hole Laboratory, MA, for almost 15 years. He has led the Food Web Dynamics Program for many of those years and has recently helped to form and transitioned to the Ecosystem Assessment Program. Previously he worked on Gulf of Mexico and Laurentian Great Lakes fishery ecosystems. He is an adjunct professor at multiple regional universities and serves on and chairs several national and international working groups, review panels, and committees dealing with fisheries ecosystem issues. He received his B.S. from Central Michigan University and his Ph.D. from Michigan Technological University.

Capt. Monty Hawkins is owner/operator of the party boat *Morning Star*, Ocean City, MD. He has 30 years of party boat fishing experience in the mid-Atlantic and is self-educated. He believes rebuilding the region's reef fisheries is not possible until the role of seafloor habitat, especially its holding capacity and importance to fishery production, is understood and incorporated into management. He is the author of a weekly fish report and has written extensively to the management community.

Greg DiDomenico serves as the Executive Director of the Garden State Seafood Association (GSSA). GSSA is a trade association comprised of commercial fishermen, shore-based processors, commercial dock facilities, seafood markets, restaurants, and various industry support businesses from New Jersey. He has been an advocate for the New Jersey commercial fishing industry for six years. He is currently involved in fishery management plans for the MAFMC and NEFMC, where he acts as liaison between the scientists and fishing industry. He has been involved with the development of numerous scientific proposals involving several fish stocks, testing of alternative gear modifications, developing cooperative research, and has attended numerous stock assessments conducted by the NEFSC. Prior to joining GSSA, he was Executive Director of the Monroe County Commercial Fishermen's Association, where he analyzed fishery management plans for the Gulf of Mexico Fishery Management Council and the South Atlantic Fishery Management Council.

Jay Odell is the Director of The Nature Conservancy's Mid-Atlantic Marine Program. He works with partners to advance efforts to restore and conserve living marine resources, seeking solutions that work for people and nature. Prior to his work at TNC, he spent 13 years with the Washington State Department of Fish and Wildlife helping to lead stock assessments, harvest management, and intergovernmental relations with treaty tribes. He received a B.S. (Biology) from Evergreen State College in 1986 and an M.S. (Wildlife and Fisheries Conservation) from the University of Massachusetts, Amherst in 2003.

Wilson Laney is the South Atlantic Fisheries Coordinator for the U.S. Fish and Wildlife Service and is based at North Carolina State University in Raleigh, NC. He is in his thirtieth year with the US FWS, having worked for 10 years in the Ecological Services Division before moving to Fisheries in 1991. He has been intensively involved in the Atlantic States Marine Fisheries Commission (ASMFC) and South Atlantic Fishery Management Council (SAFMC) processes for nearly 20 years, and currently serves on the ASMFC Habitat, Management and Science, and Interstate Tagging Committees, in addition to a number of Technical Committees and Plan Review Teams. He

serves on six SAFMC committees, including Habitat and Environmental Protection, Ecosystem-Based Management, and Protected Resources. He has a B.S. (Biology) and an M.S. and Ph.D. (Zoology, Marine Science minor) from North Carolina State University.

Christopher Kellogg has worked for the NEFMC for nearly 30 years. He has been responsible for FMPs for groundfish, scallops, herring, and lobster. Currently he is the NEFMC's Deputy Director and supervises its technical staff. Before joining the NEFMC staff, he worked as a resource economist with the Massachusetts Division of Marine Fisheries. He has an M.A. (Economics) from the University of Delaware and an M.S. (Finance) from Brandeis University.

Roger Pugliese is Senior Fishery Biologist with the South Atlantic Fishery Management Council and has over 25 years facilitating development of FMPs ranging from Red Drum to Dolphin and Wahoo to habitat plans for Coral and Live Bottom Habitat and Pelagic Sargassum. He is responsible for the Council's spatial GIS, habitat conservation, and ecosystem coordination efforts and the development of the Council's Habitat Plan, as well as their Fishery Ecosystem Plan supporting their first Comprehensive Ecosystem-Based Amendment. He also serves on the Southeast Coastal Ocean Observing Regional Association (SECOORA) Board of Directors, the South Atlantic Regional Research Plan Development Team, is a member of the South Atlantic Landscape Conservation Cooperative Steering Committee and Southeast Aquatic Resources Partnership (SARP) Steering Committee, chairs the Southeast Area Monitoring and Assessment Program-South Atlantic (SEAMAP-SA) Committee and is a member of the South Atlantic Governor's Alliance Executive Planning Team.

James Armstrong has worked for the MAFMC for eight years. He is staff lead on the bluefish, spiny dogfish, and monkfish FMPs, and is also a GIS analyst and manages the Council's website. Prior to working for the Council he worked for four years as a stock assessment scientist for the North Carolina Division of Marine Fisheries. He has B.S. (Marine Biology) from the University of North Carolina at Wilmington and an M.S. (Fisheries and Wildlife Science) from North Carolina State University.

John Boreman is former Director of the NMFS/Northeast Fisheries Science Center and the NMFS/Office of Science & Technology. Since retiring from the federal government in 2008 he has been a member of the faculty in the Department of Biology at North Carolina State University and an Executive Management Consultant for natural resource agencies and organizations. He is the Chair of the MAFMC's Science and Statistical Committee. He is also serving as 1st Vice President of the American Fisheries Society. He received his B.S. from the SUNY College of Environmental Science and Forestry, and has M.S. and Ph.D. degrees from Cornell University.

David H. Wallace is proprietor of Wallace & Associates, Inc., a firm that has been dealing with fisheries issues for the last 30 years. His experience prior to forming his current company includes the position of Chief Operating Officer of a large vertically integrated fishing and seafood processing company as well as owner and operator of specialized seafood harvesting and processing operations. He is a current member of the Marine Fisheries Advisory Committee and the Marine Protected Areas Federal Advisory Committee. He is the Chair of the NEFMC's Habitat, Ecosystem, and Marine Protected Areas Advisory Panel and a member of the NEFMC's Skate Advisory Panel. He also serves on the MAFMC's Surfclam and Ocean Quahog Advisory Panel. He also served on the MAFMC's Habitat Advisory Committee until it was disbanded. He is a member of the American Fisheries Society and the Society of Naval Architects and Marine Engineers.

Rick Robins was appointed to the MAFMC in 2007 and has served as Chairman since 2008. He has served as an Associate Commissioner with the Virginia Marine Resources Commission since 2004 and chairs the Commission's Crab Management Advisory Committee. He is an avid recreational angler and owns a shellfish processing business on Virginia's Eastern Shore. He received a B.A. (Economics and History) from Washington and Lee University and an M.B.A. from the University of North Carolina at Chapel Hill.

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