

Science for Marine Spatial Planning – A Symposium

Monday, November 16

9:00 am – 4:30 pm

NOAA Science Center, Silver Spring, MD

Agenda.....	1
Abstracts	3
Northeast	3
Southwest	4
Lunchtime Presentations	6
Southeast and Gulf of Mexico	6
Pacific Northwest	8
Closing Remarks	9
Presenter Biographies	9

Agenda

9:00 - 9:15 WELCOME

Steve Gittings, Office of National Marine Sanctuaries

9:15 – 10:30 NORTHEAST

Craig MacDonald, Stellwagen Bank National Marine Sanctuary, *Moderator*

Leila Hatch, Stellwagen Bank National Marine Sanctuary
Whales, noise and steel at sea

Lindy Johnson, Office of General Counsel for International Law

Greg Silber, National Marine Fisheries Service
Connecting science and international maritime practices

Dave Gouveia, National Marine Fisheries Service
Collaborative science supporting collaborative management

10:45 – 12:15 SOUTHWEST

Mark Monaco, National Centers for Coastal Ocean Science
A Biogeographic Approach to Coastal Assessments and Marine Spatial Planning

Erica Burton, Monterey Bay National Marine Sanctuary
Protecting deep-sea corals on Davidson Seamount

Steve Gaines, University of California Santa Barbara
Decision science for marine spatial planning

Christine Taylor, Minerals Management Service
Visualizing spatial data using a Multipurpose Marine Cadastre Tool

Charlie Wahle, Marine Protected Areas Center
Spatial uses atlas

12:30 – 1:30 LUNCHTIME PRESENTATIONS

Andy Rosenberg, University of New Hampshire and Conservation International
Science, history, and uncertainty in marine spatial planning

Steve Murawski, National Marine Fisheries Service
Marine Spatial Planning: A tool for Implementing Ecosystem Based Management

1:30 – 2:45 SOUTHEAST AND GULF OF MEXICO

Sean Morton, Florida Keys National Marine Sanctuary, *Moderator*

Jim Bohnsack, National Marine Fisheries Service
Multi-agency collaboration on spatial monitoring in the Florida Keys

Bob Leeworthy, Office of National Marine Sanctuaries
Knowledge, attitudes & perceptions of FKNMS zoning strategies

Greg Boland, Minerals Management Service
Spatial planning for energy development in the Northwest Gulf of Mexico

3:00 – 4:15 PACIFIC NORTHWEST

Bill Douros, Office of National Marine Sanctuaries, *Moderator*

Dave Fluharty, University of Washington
The Salish Sea: marine spatial planning and Puget Sound

Rob Jones, Northwest Indian Fisheries Commission
Laying the foundation for marine spatial planning

Terrie Klinger, University of Washington
Managing for change

4:15 – 4:30 CLOSING REMARKS

Sally Yozell, The Nature Conservancy
Looking backward and moving forward in marine spatial planning

Northeast

Whales, noise and steel at sea: science to support the design of spatially-explicit management tools in the Stellwagen Bank National Marine Sanctuary

Leila Hatch and David Wiley, Stellwagen Bank National Marine Sanctuary

The Gerry E. Studds Stellwagen Bank National Marine Sanctuary (SBNMS) is home to many marine species that are protected and/or managed under multiple US statutes, including the National Marine Sanctuaries Act, the Marine Mammal Protection Act, the Endangered Species Act and the Magnuson-Stevens Fisheries Conservation and Management Act. Placed in the middle of Massachusetts Bay, the sanctuary is also a busy place for human commerce. Meeting marine resource protection and management objectives in the SBNMS necessitates characterizing patterns of ecological importance and human activity, and assessing compatibility where and when multiple uses overlap. This talk highlights the use of the sanctuary's long-term database of baleen whale occurrence and supporting habitat data and modeling to shift the Boston Traffic Separation Scheme (TSS) from high to low use whale areas. The goal of this shift was to reduce the co-occurrence of ships and whales, thereby reducing the potential for collisions. We also show how the U.S. Coast Guard's Universal Shipborne Automatic Identification System (AIS) was used to evaluate vessel compliance with the measure. Results from collaborative research in the sanctuary that uses AIS data and data from passive acoustic recorders to characterize the contribution of large commercial vessels to underwater noise in the sanctuary are presented as an example of high-resolution mapping of an environmental stressor. Finally, the implementation of mitigation and monitoring programs associated with the siting of two Liquefied Natural Gas import terminals adjacent to sanctuary waters showcase new tools for dynamic (near real-time) spatial management and environmental impact assessment.

Connecting science and international maritime practices

Lindy Johnson, Office of General Counsel for International Law

Greg Silber, National Marine Fisheries Service

Addressing the issue of vessel collisions ("ship strikes") with the highly endangered North Atlantic right whale provides a quintessential case study of marine spatial planning. Ship strikes are the species' greatest known source of human related mortality. The team that worked on this issue went through a methodical and comprehensive process to determine how best to reduce this threat. By relying on spatial analysis of whale distribution, behavior, and natural history, as well as vessel traffic occurrence and density, and other features, the team divided the U.S. east coast into three areas. Multiple approaches for risk reduction in the various areas were analyzed and the NMFS Ship Strike Reduction Strategy was developed. One element of the Strategy is to address ships' operations. There are now four measures directed at ship strikes of right whales that have been adopted by the International Maritime Organization, a Specialized Agency of the United Nations that addresses international shipping issues, in addition to a number of domestic actions. The IMO measures have been implemented and now appear on international charts. First, a measure adopted before development of the Strategy was the establishment of two mandatory ship reporting systems off the east coast. These systems alert mariners they are entering an area where there is a high density of whales, some precautionary actions that they may take to avoid a ship strike, and the latest known locations of the whales. It also allowed for the development of information on which to base other risk reduction measures. Second, in a collaborative effort between NOS, Stellwagen Bank National Marine Sanctuary and NMFS Protected Resources, the east-west lanes of the Boston Traffic Separation Scheme (TSS) were amended and narrowed, thus reducing the overlap between the ships and whales. Third, a consequential amendment was made to the north-south lanes of the Boston TSS to further reduce whale/ship overlap. Finally, a recommended, seasonal area to be avoided was established in Great South Channel, a major feeding area for right whales. This case study, plus the lessons learned, can serve as a model to address other problems in U.S. waters.

Collaborative science supporting collaborative management
Dave Gouveia, National Marine Fisheries Service

The Protected Resources Division of NOAA's National Marine Fisheries Service, Northeast Regional Office (NMFS) and NOAA's Stellwagen Bank National Marine Sanctuary (Sanctuary) have enjoyed a rich history of collaborative science endeavors that has led to several collaborative management and education and outreach programs. Through creative solutions to address limited research funding, the two NOAA line offices identified mutual needs to help accomplish their respective missions and creatively pooled funding to develop and implement several research plans that have led directly to new and innovative management concepts to protect endangered whales and bolster education and outreach efforts. These collaborative efforts are demonstrated through the development and implementation of the Whale SENSE Program and humpback whale digital acoustic recording tag (DTAG) research. The Whale SENSE Program is a voluntary, educational whale watching program developed by NMFS and Sanctuary staff and staff from the Whale and Dolphin Conservation Society to promote responsible whale watching. The humpback whale DTAG research efforts conducted by Sanctuary staff and its partners provided invaluable scientific support toward NMFS' development and implementation of a sinking groundline requirement for all trap/pot fisheries along the Atlantic Coast.

Southwest

A Biogeographic Approach to Coastal Assessments and Marine Spatial Planning
Mark E. Monaco, Center for Coastal Monitoring and Assessment

NOAA's Center for Coastal Monitoring and Assessment and the Office of the National Marine Sanctuaries have completed or have underway marine biogeographic assessments to support multiple management requirements at eleven national marine sanctuaries. An overall biogeographic assessment framework is implemented at each site along with site specific analyses to define, understand, and couple the physical and biological characteristics of the region. Along the north and central California coast, assessments have been conducted to define the biogeography of marine species found within and adjacent to Monterey Bay, Gulf of the Farallones, and Cordell Bank National Marine Sanctuaries in support of a joint management plan review. The effort focused on defining significant biological areas based on spatial and temporal patterns of fishes, macroinvertebrates, marine mammals, and seabirds. Multivariate analyses of NMFS's shelf trawl surveys identified five species assemblages. The assemblages were organized along bathymetric gradients with some species groups displaying affinities for discrete deep-water areas and others for multiple depth strata. Seabird communities found within the sanctuaries were dominated in number and biomass by seasonally resident, non-breeding species. At the Channel Islands National Marine Sanctuary, the biogeographic assessment was designed to evaluate a suite of boundary expansion options relative to the existing sanctuary boundary in support of marine spatial planning. Each potential boundary alternative was ranked based on an optimal area index derived from biological and physical parameters. Results included defining which boundary alternative(s) provided the greatest diversity of species relative to the total area of protection. At all sanctuary sites, geospatial analyses defined biologically significant areas that support place-based management actions.

Protecting deep-sea corals by including Davidson Seamount in the Monterey Bay National Marine Sanctuary
Erica J. Burton and Andrew P. DeVogelaere, Monterey Bay National Marine Sanctuary

The distribution of deep-sea corals on the Davidson Seamount was characterized during several research cruises in partnership with government, academic, and non-profit institutions. Intriguing scientific findings, including high quality images, of the seamount's biological community generated numerous public presentations, peer-reviewed publications, extensive print and television media coverage, several web sites, an agency promotional poster, as well as an award-winning interactive CD. As a result of growing public interest, the potential for protecting Davidson Seamount arose during the management plan review process for the Monterey Bay National Marine Sanctuary (MBNMS). After receiving input from a focus group of stakeholders and experts, the MBNMS Advisory Council voted to pursue inclusion of the Davidson Seamount in the MBNMS through the National Marine Sanctuaries Act. Sanctuary status would increase national opportunities for research and education on deep-sea corals and limit extraction of corals from the Davidson Seamount. The Pacific Fishery Management Council supported protection of the seamount habitat through inclusion in the MBNMS, and recommended protection under the Magnuson-Stevens Act as a preferred alternative for groundfish Essential Fish Habitat. NOAA Fisheries Service published a final rule

prohibiting fishing with bottom contact gear deeper than 3,000 feet at Davidson Seamount. In 2008, the MBNMS boundary expanded to include Davidson Seamount prohibiting take, disturbance, injuring or possessing any sanctuary resource deeper than 3,000 feet. Consultation and partnering with scientists, managers, the public, and other stakeholders was critical throughout this process.

Decision Science for Marine Spatial Planning
Steve Gaines, University of California, Santa Barbara

Marine Spatial Planning is inherently about managing ocean uses to minimize conflicts and maximize synergies. Most scientific attention in MSP focuses on the data needed to characterize ocean uses and impacts. We believe a more crucial bottleneck to progress is often the lack of rigorous, explicit and practical approaches for making science based decisions about tradeoffs among diverse human uses in both data poor and data rich settings. To meet this need, I will discuss the emerging application of well-developed theory from economics to explore ecosystem tradeoffs in spatial uses of the sea.

Oceans provide a wealth of ecosystem services to people ranging from the provision of seafood to recreation to pathways for shipping of goods to emerging sources of energy to the regulation of earth's climate. Some patterns of alternative human uses create conflicts. Decisions to resolve these conflicts can create winners and losers depending on how people value the different services oceans provide. If management deals with such tradeoffs implicitly or ignores them all together, there is little hope of making efficient choices.

I will explore how explicit tradeoff analysis as part of the decision making process may provide a range of benefits including: minimizing conflicts before they occur, reducing suboptimal management decisions, forecasting the range of "optimal" combinations of ecosystem services, identifying institutional and regulatory bottlenecks to optimal decisions, and identifying critical science needs for more effective management. I will draw on ongoing (implementation of MPA networks) and emerging (siting of wave energy farms) planning efforts to illustrate the concepts.

Visualization of Spatially Explicit Habitat and Species Data in Support of Renewable Energy Project Proposal Evaluations: a use case for the Multipurpose Marine Cadastre Tool
Christine Taylor, Minerals Management Service

Applications for wave and tidal energy projects along the West Coast of the United States have recently increased in both state and federal waters. The National Oceanic and Atmospheric Administrations' (NOAA) National Marine Fisheries Service (NMFS) is collaborating with NOAA Coastal Services Center (CSC) and the Minerals Management Service (MMS) to visualize these energy project boundaries along with authoritative source data layers where NMFS' has jurisdictional responsibility. NMFS' Authoritative source data layers, including gray whale migratory routes, pinniped haul-out and rookery areas, habitat areas of particular concern, essential fish habitat, and marine protected areas have been shared with MMS and CSC for inclusion in a decision support tool. The Multipurpose Marine Cadastre (MMC) tool is a marine information system for U.S. waters. The MMC is a project co-lead by MMS and CSC which contains core marine cadastral information such as maritime boundaries and limits, subsoil and seabed boundaries, marine managed areas; as well as other regionally-specific data in support of planning, management, and conservation of marine spaces. Providing physical and biological information in a publically available, interactive, geo-spatial tool is a goal shared by NMFS and the MMC team. Collaboration between the two NOAA programs and MMS to integrate California wave and tidal energy project information into the Multipurpose Marine Cadastre (<http://www.csc.noaa.gov/mmc>) encourages the growth of the renewable energy industry in an environmentally responsible manner. It is hoped that developers, regulators, scientists, and resource users find this approach useful in identifying marine resources that must be considered in licensing and permitting processes. This presentation demonstrates the utility of visualizing multiple types of spatial data ranging from biological and physical habitat, to shipping fairways and marine protected areas as part of large scale planning and decision making processes. This presentation will go over the Multipurpose Marine Cadastre Tool, and the specific use case presented above.

Spatial uses atlas

Charlie Wahle, Marine Protected Areas Center

--Abstract to be inserted after symposium--

Lunchtime Presentations

Science, history, and uncertainty in marine spatial planning

Andy Rosenberg, University of New Hampshire and Conservation International

--Abstract to be inserted after symposium--

Marine Spatial Planning: A tool for Implementing Ecosystem Based Management

Steve Murawski, National Marine Fisheries Service

Def. EBM: Ecosystem-based management (EBM) is an approach that provides a comprehensive framework for marine and coastal resource decision making. In contrast to individual species or single issue management, EBM considers a wider range of relevant ecological, environmental, and human factors bearing on societal choices regarding resource use. The characteristics of EBM include being: (1) geographically specified, (2) adaptive in its development over time as new information becomes available or as circumstances change, (3) taking into account ecosystem knowledge and uncertainties, (4) recognizing that multiple simultaneous factors may influence the outcomes of management (particularly those external to the ecosystem), and (5) it strives to balance diverse societal objectives that result from resource decision making and allocation. Additionally, because of its complexity and emphasis on stakeholder involvement, the process of implementing EAM needs to be (6) incremental and (7) collaborative.

Coastal and marine spatial planning (CMSP) can provide a framework for implementing cross-sectoral management that has eluded ocean governance systems in the past. In order to be an implementing tool for EMB (as defined above), CMSP needs to be established in a governance framework that is collaborative vertically among governmental decision makers and horizontally among various sectoral stakeholder interests. The critical element will be the degree that planning entities implementing CMSP will do so in a comprehensive (generic) manner – as opposed to a topical approach (e.g., CMRP for renewable energy siting). The President's Ocean Policy Task Force memorandum to federal agencies of 12 June, 2009 outlines an expectation that CMSP will be fashioned in a way that enables cross linkages among sectors and governments (state, regional, tribal, federal) and sharing of appropriate technical information. NOAA has a long history of supporting spatial management consistent with its individual mandates (e.g., sanctuaries, coastal zone management, fisheries, protected species). In fact, regulatory compliance with NEPA and coastal zone consistency requires cumulative impacts on ecosystems and people be considered in decision making. Finding ways to coordinate NOAA's management authorities, with those of other federal agencies – in ways that do not cede authorities of the implementing regulations - is the key governance question for CMRP. Dispute resolution models when conflicting mandates oppose are in active consideration by the OPTF.

Supporting proactive CMSP requires decision support tools including visualization, valuation, scenario analysis and forecasting (e.g., the potentially disruptive influences of climate change). Supporting these tools requires integration of spatially explicit data on bathymetry, oceanography, benthic habitats, nekton distribution and abundance, and the variety of human use and provisioning services. Integrating these data in a 4-dimensional rendition suitable for decision makers is an enormous technical challenge.

Southeast and Gulf of Mexico

Effective multi-agency collaboration improves spatial monitoring in the Florida Keys

Jim Bohnsack, National Marine Fisheries Service

Successful marine spatial planning requires measuring impacts of management interventions at small and large, ecosystem-level, spatial scales. The rich Florida coral reef seascape is managed by multiple state and federal agencies, including the Florida Keys National Marine Sanctuary (FKNMS), State of Florida, National Park Service (NPS), Fish and Wildlife Service, the DOC, and two federal Fishery Management Councils (SA and GOM).

Replicated zones, different regulations, and varied management histories offer a unique opportunity to assess management planning effectiveness using ecosystem-based and adaptive management approaches. Key problems are that no single agency has sufficient resources to monitor the whole system and different agencies have used different sampling methods which often are not comparable.

In a collaborative effort, NOAA (SEFSC, NMFS and FKNMS, NOS), Florida Fish and Wildlife Commission (FWRI), the University of Miami (UM-RSMAS), and the National Park Service (NPS) have adopted a single standardized, non-destructive, fishery-independent visual approach using stationary circular plots to collect data on species composition, total abundance, size distributions, and habitat usage. This approach is optimized by using two-stage, random stratification based on depth, habitat type, management zone, and region. By combining efforts, agencies get more data, increase their efficiency, and provide significantly more precise estimates of population abundance and other parameters than previously possible. These data can be used to assess individual species, communities, and management impacts at multiple spatial scales. Monitoring in the Florida Keys and Dry Tortugas over the last decade shows highly significant increased population abundance and size of exploited species in no-take reserves. Impacts of marine reserves, hurricane disturbance, and fishery regulations on reef fish communities and dynamics were also detected.

Note: a 107 page peer reviewed manual, released in November 2009, is now available at <http://www.nature.nps.gov/publications/NRPM>.

Reference: Brandt, M.E., N. Zurcher, A. Acosta, J.S. Ault, J.A. Bohnsack, M.W. Feeley, D.E. Harper, John Hunt, T. Kellison, D.B. McClellan, M.E. Patterson, S.G. Smith. 2009. A Cooperative Multi-agency Reef Fish Monitoring Protocol for the Florida Keys Coral Reef Ecosystem. Natural Resource Report NPS/SFCN/NRR—2009/150. National Park Service, Ft. Collins, CO. 107 p.

Knowledge, Attitudes & Perceptions of FKNMS Zoning Strategies **Bob Leeworthy, Office of National Marine Sanctuaries**

This study is part of the Socioeconomic Research and Monitoring Program for the Florida Keys National Marine Sanctuary (FKNMS). A baseline study was conducted in 1995-96 of three user groups: commercial fishers, dive shop owners/operators and members of local environmental groups. The study was replicated in 2005-06 and includes 10-year comparisons of socioeconomic/demographic profiles of each user group; sources and usefulness of information; knowledge of purposes of FKNMS zones; perceived beneficiaries of the FKNMS zones; views on FKNMS processes to develop management strategies and regulations; views on FKNMS zone outcomes; views on FKNMS performance; and general support for FKNMS. In addition to new baseline information on FKNMS zones, new baseline information was developed for spatial use, investment and costs-and-earnings for commercial fishers and dive operators, and views on resource conditions for all three user groups. Statistical tests were done to detect significant changes in both the distribution of responses to questions and changes in mean scores for items replicated over the 10-year period. The focus of this short presentation is on user group's attitudes and perceptions of FKNMS zone outcomes. The study addresses Step 9: Monitoring and Evaluating Performance of the Marine Spatial Planning 10 steps.

The Flower Garden Banks and MMS: Thirty Six Years of Effective Marine Spatial Management **Gregory Boland, Minerals Management Service**

The Flower Garden Banks are unique topographic features in the northwest Gulf of Mexico representing the northernmost coral reefs on the continental shelf of North America. They are located in one of the most productive offshore hydrocarbon reserves in the world. As the offshore oil and gas industry matured technologically in the 1960's and early 1970's, interest in the substantial oil and gas reserves at the shelf edge near the Flower Gardens increased. The Minerals Management Service (MMS) (then a part of Bureau of Land Management) began funding baseline studies of topographic features throughout the Gulf of Mexico continental shelf with particular attention on the Flower Gardens. The MMS recognized the Flower Garden Banks as sensitive habitats that required special protective regulations. Leasing stipulations for the banks were first proposed in 1973 and no activity zones implemented in 1974. In addition, the only two lease blocks completely excluded from leasing are those centered on the East and West Flower Garden Banks. In following years, additional protective measures were established including shunting zones and required monitoring studies for early drilling activity in the vicinity. With the demonstration of the effectiveness of the stipulations, individual monitoring project requirements were replaced in

1988 with a regular and on-going monitoring program, now the longest continuous monitoring data set for any coral reef in the world. Since 1994, MMS has jointly funded monitoring at the Flower Gardens with NOAA. The health of the banks' ecosystems has remained extremely high since measurements began with over 50% live coral cover, while coral reefs are in decline in many places elsewhere in the world. In addition to monitoring, research and modeling supported by MMS, NOAA, EPA and others has been used at the Flower Gardens to inform spatial management decisions related to spill notification and response, dispersant use, and siting of pipelines and lightering zones.

Pacific Northwest

The Salish Sea: Marine Spatial Planning and Puget Sound

Dave Fluharty, University of Washington

Efforts to understand, protect and restore Puget Sound since the mid-1980s have provided the scientific underpinnings for current stepped-up efforts to build off the work of the Shared Salmon Strategy and Puget Sound Action Team. Legislation at the state level in 2007 forged the Puget Sound Partnership and gave it significant new planning and funding authority to develop and implement a Puget Sound Action Plan and Restoration Strategy to meet mandated goals by 2020. Present efforts have focused on an ecosystem-based approach to management using tools of Integrated Ecosystem Assessment and modeling. While progress is being made toward implementation of what might be defined as Marine Spatial Planning -- much remains to be done. In addition, two other sub-basin initiatives, the San Juan County Marine Resources Committee's Marine Stewardship Area and the Northwest Straits Initiative present innovative approaches with potential application elsewhere.

Laying the foundation for marine spatial planning

Rob Jones, Northwest Indian Fisheries Commission

The tribes in western Washington have treaty rights to fish that are place-based (i.e. they can only be practiced in a finite geographical region). These rights also confer management responsibility. As such, treaty tribes have been practicing marine spatial planning (MSP) since time immemorial. The four coastal treaty tribes – Makah, Quileute, Hoh, and Quinault – recognize the increasing need for a national MSP framework to resolve issues associated with ever-increasing competing and emerging uses. However, there is considerable work that needs to be done in order to provide the information needed to plan wisely. In recognition of these needs the coastal tribes, state of Washington, NOAA, and USGS have formed a consortium to develop and implement a research and monitoring initiative to improve ecosystem-based management and provide the informational foundation for MSP. We are proposing to fill the gaps in our understanding of a number of ecosystem components through seafloor mapping, biological surveys, and development of data dissemination capabilities. This initiative will provide the basic understanding needed to better comprehend current processes, interactions, and impacts in our area while also ensuring local capacity to continue improving the information that underpins effective MSP.

Managing for Change

Terrie Klinger, University of Washington

To be effective over the long term, marine spatial planning must allow social and ecological response to changing environmental conditions. This requirement challenges MSP to optimize current use while preserving the resilience of ocean ecosystems. To achieve this, the goals and objectives of MSP must explicitly include the capacity for social-ecological response to environmental change. Human uses cannot be so intense that they constrain response diversity or foreclose options for ecosystem recovery. Nesting scales of management within larger management areas will promote greater response diversity and the use of modules, or discrete scalable units, will spread risk. The impacts of both fast and slow variables must be considered, and the maintenance of ecological processes should be recognized as a primary goal. Collection of spatially-explicit data to inform physical and ecological forecasting is key to achieving these goals.

Closing Remarks

Looking backward and moving forward in marine spatial planning

Sally Yozell, The Nature Conservancy

--Abstract to be inserted after symposium--

Presenter Biographies

Jim Bohnsack, National Marine Fisheries Service

Dr. Bohnsack is Chief of the Protected Resources and Biodiversity Division at the Southeast Fisheries Science Center, Miami (NOAA Fishery Service). He earned a B.S. degree from Tulane University, and M.S. and Ph.D. degrees from the University of Miami. His research has focused on coral reef ecology, artificial reefs, fishery independent assessment methods, ocean ethics, and the application of no-take marine reserves for conservation and maintaining sustainable coral reef fisheries.

Gregory Boland, Minerals Management Service

Gregory Boland is a biological oceanographer with Minerals Management Service (MMS), Department of the Interior at the MMS headquarters office in Herndon Virginia. His interests include coral reef ecology, artificial reef ecology and deep-sea biology (with particular interest in chemosynthetic communities and deep-water corals). He is the MMS lead on benthic community issues and studies for all of the MMS regions including Alaska, Atlantic, Gulf of Mexico and Pacific. Prior to MMS, his background includes ten years each in the private sector and academia.

Erica Burton, Research Specialist, Monterey Bay National Marine Sanctuary

Erica Burton is the Research Specialist for the Monterey Bay National Marine Sanctuary. She works on a variety of marine research issues such as ecosystem characterization, damage assessments, submerged cultural resources, and Sanctuary research permits, providing technical information to decision makers and Sanctuary staff. She recently completed a taxonomic guide to the Davidson Seamount. Erica earned a Master of Science Degree in Marine Science at Moss Landing Marine Laboratories.

David Fluharty, Associate Professor, University of Washington

David Fluharty is an Associate Professor [WOT] School of Marine Affairs and Wakefield Professor of Ocean and Fishery Sciences, University of Washington where he has been employed since 1976. His doctoral degree is from the University of Michigan, School of Natural Resources in the interdisciplinary field of Natural Resource Conservation and Planning. His research and teaching interests are in natural resource policy and management at national and international levels, ecosystem approaches for management of marine resources, watersheds, coastal zones, fisheries, marine protected areas, and regional effects of global climate change. Significant professional activities include: Chair, NOAA Science Advisory Board 2006-; Chair, External Ecosystem Research Team for NOAA-wide Ecosystem Science and Research 2005 - 2006; Advisor of National Center for Ecosystem Analysis and Synthesis [NCEAS] study groups on Marine Protected Areas, Models for Fisheries Ecosystems 2002-2005, and Ecosystem Management Feasibility in Tropical Areas 2006-; Member, North Pacific Fishery Management Council 1994-2003; Associate Editor, Coastal Management Journal; Chair, Editorial Board, Marine Protected Area News and Marine Ecosystems And Management; Member, National Research Council, Study on Evaluation, Design and Monitoring of MPAs and Reserves for the United States; Chair, Ecosystem Principles Advisory Panel 1997-2000 reporting to Congress on Ecosystem-Based Fishery Management.

Steve Gaines, University of California Santa Barbara

Steven Gaines is Director of the Marine Science Institute at UCSB and will be the Dean of the Bren School of Environmental Science and Management beginning in January. He is a marine ecologist who has worked on a wide range of large scale issues in marine conservation including the design of marine protected area networks, the response of marine ecosystems to climate change and sustainable fisheries using market based approaches. He has helped develop several large interdisciplinary research programs including PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans) and the Sustainable Fisheries Group.

Dave Gouveia, National Marine Fisheries Service

David Gouveia is a Supervisory Fishery Biologist with the Protected Resources Division of the National Marine Fisheries Service, Northeast Regional Office located in Gloucester, Massachusetts. In this capacity he is responsible for overseeing and coordinating the Marine Mammal Program for the Northeast Region including field stations located in Orono, Maine, North Kingstown, Rhode Island, and Belle Haven, Virginia. Dave specializes in marine mammal policy and the development and implementation of Federal rulemaking under the Marine Mammal Protection Act.

Leila Hatch, Marine Ecologist, Gerry E. Studds Stellwagen Bank National Marine Sanctuary

Dr. Leila Hatch is a Marine Ecologist at the Gerry E. Studds Stellwagen Bank National Marine Sanctuary where she focuses on characterizing human-induced underwater noise, assessing impacts of noise on marine animals, and the design of mitigation and monitoring programs to address those impacts. Dr. Hatch began working at the sanctuary in 2006 after a fellowship with the US House of Representatives' Resources Committee. She received a doctoral degree from Cornell University in Evolutionary Biology, where her research focused on baleen whale molecular genetics and acoustic behavior. Prior to her graduate work, Dr. Hatch participated in international whale and dolphin research programs focused on understanding both basic behavioral ecology and impacts to populations associated with human activities (i.e., whale-watching, vessel traffic, low-frequency active sonar, active acoustic research sources etc.).

Lindy Johnson, Office of General Counsel for International Law

Lindy S. Johnson works in the General Counsel's Office for International Law. She received her Bachelor's degree from Michigan State University, her Masters' degree in Sea-Use Law from the London School of Economics, and her JD from Tulane Law School. Lindy has long worked on issues pertaining to international shipping and wrote a book titled, Coastal State Regulation of International Shipping. Her mantra for those working in NOAA is that if you aren't making a difference every day for the betterment of the oceans, then you are not doing your job.

Rob Jones, Northwest Indian Fisheries Commission

Rob Jones is the Coastal Program Coordinator for the Northwest Indian Fisheries Commission which serves twenty treaty tribes in western Washington. He is staff for the Olympic Coast Intergovernmental Policy Council. He is also the Chair of the Pacific Fishery Management Council's Groundfish Management Team.

Terrie Klinger, Associate Professor, University of Washington

Terrie Klinger is Associate Professor of Marine Affairs at the University of Washington. She serves as Chair of the Olympic Coast National Marine Sanctuary Advisory Council, Governor's Appointee to the Northwest Straits Commission, and Science Advisor to COMPASS. She is a principal in the Center for Ecology of Changing Oceans at Friday Harbor Laboratories and a lead author of the Puget Sound Partnership's Science Update.

Bob Leeworthy, Office of National Marine Sanctuaries

Dr. Leeworthy is currently the Chief Economist for the Office of National Marine Sanctuaries within the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS) located in Silver Spring, Maryland. Dr. Leeworthy came to NOAA in 1985 as a National Sea Grant Fellow from Florida State University and was Leader of NOS's Coastal and Ocean Resource Economics Program from 1986 to 2007. Dr. Leeworthy designed and has been overseeing implementation the Socioeconomic Research and Monitoring Program for the Florida Keys National Marine Sanctuary since 1998.

Mark Monaco, Acting Director of NOAA's Center for Coastal Monitoring and Assessment

Dr. Mark Monaco has been conducting marine biogeographic assessments for the past 20 years to support natural resource management information needs and evaluate the efficacy of marine zoning actions. He is currently the Acting Director of NOAA's Center for Coastal Monitoring and Assessment located in Silver Spring, MD. His current research activities include defining ecological linkages between marine protected areas in the US Caribbean and evaluating the ecological relevancy of proposed additional national marine sanctuary sites in American Samoa.

Steve Murawski, National Marine Fisheries Service

Dr. Steve Murawski is currently the Director of Scientific Programs and Chief Science Advisor of the National Marine Fisheries Service. In this capacity he supervises the six regional Fisheries Science Centers and the NMFS headquarters Office of Science and Technology. He also serves as NOAA's Ecosystem Goal Team lead, NOAA's member of the Joint Subcommittee on Ocean Science and Technology, and is NOAA's member of the Ocean Policy Task Force's implementation sub-group.

Andrew Rosenberg, University of New Hampshire and Conservation International

Dr. Andrew Rosenberg is Senior Vice President for Science and Knowledge for Conservation International and a Professor in the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire where, prior to April 2004, he was dean of the College of Life Sciences and Agriculture. From 2001-2004, he was a member of the U.S. Commission on Ocean Policy and continues to work with the US Joint Ocean Commissions Initiative.

Prior to coming to UNH Dr. Rosenberg was the Deputy Director of NOAA's National Marine Fisheries Service from 1998-2000, the senior career position in the agency. As Deputy Director he dealt with policy decisions on science and resource management issues nationwide as well as the administration of the agency. He was a principle agency spokesperson before Congress, the public and technical audiences. Before becoming NMFS Deputy Director, Dr. Rosenberg was the NMFS Northeast Regional Administrator. He negotiated and implemented the recovery program for New England fisheries, reversing overfishing and resource declines on George's Bank as well as other areas for groundfish and scallop fisheries. He worked to develop and implement marine mammal recovery programs and endangered species protections throughout the northeast. Dr. Rosenberg served as the U.S. representative in several international fishery management organizations including NAFO, NASCO and on the delegation to FAO and other UN meetings.

Dr. Rosenberg's scientific work is in the field of population dynamics, resource assessment and resource management policy. He holds a B.S. in Fisheries Biology from the University of Massachusetts, an M.S. in Oceanography from Oregon State University and a Ph.D. in Biology from Dalhousie University. He was on the faculty of Imperial College of Science and Technology in London for six years and was the Deputy Director of the Renewable Resources Assessment Group, and internationally known quantitative analysis and policy group. He is currently the President of MRAG Americas, a consulting company with offices in Florida, Massachusetts and is a member of the Board of Directors of MRAG, a London-based international marine resource consultancy.

Gregory K. Silber, National Marine Fisheries Service

Since 1997 Dr. Silber has served as the Coordinator of Recovery Activities for Endangered Large Whale Species for the Office of Protected Resources, National Marine Fisheries Service/NOAA. Prior to that he was the Deputy Scientific Program Director at the U.S. Marine Mammal Commission (1992 – 1997) and the Executive and Scientific Director of the environmental organization Friends of the Sea Otter in Monterey, California (1990 – 1992). He received his Master's degree from San Jose State University's Moss Landing Marine Laboratories where his thesis work focused on social and vocal behavior of humpback whales in Hawaii. His Ph.D. is from the University of California at Santa Cruz; his dissertation research was on the highly endangered Gulf of California harbor porpoise. Throughout the 1980s, he conducted or participated in research on whales and dolphins in Hawaii, the high Arctic (Beaufort Sea and eastern Canadian Arctic), the Aleutian Islands, Mexico, California, and the U.S. East Coast. He has published over 30 peer-reviewed and popular articles on whales and dolphin ecology, behavior, and conservation. His research interests include behavior and ecology of dolphins and large whales, marine mammal acoustics, and reducing the threats of human activities on cetaceans.

Christine Taylor, Minerals Management Service

Christine is currently the Lead Physical Scientist and acting Branch Chief for MMS's Mapping and Boundary Branch in Herndon Virginia. She and her staff focus their efforts on cadastre map and boundary products for leasing areas of the outer continental shelf for oil, gas, minerals, and renewable energy products. They also create specialized maps for MMS' 5-year plan, provide statistical and communications graphics, assist with Renewable Energy map products, and provide funding and project management along with the CSC for the Multipurpose Marine Cadastre tool. She has spent 19 years as a mapping and GIS professional, 16 of which were with NOAA.

Charlie Wahle, Marine Protected Areas Center

Dr. Charlie Wahle is a marine ecologist with extensive experience working at the interface between science and policy of marine conservation and protected areas. Dr. Wahle is the Senior Scientist for the National Marine Protected Areas Center. Prior to joining the MPA Center, he served as NOAA's liaison to three key interagency marine conservation initiatives: the U.S. Coral Reef Task Force, the Invasive Species Council, and the national MPA initiative. From 1993 to 1999, he led the national programs for science, education, and conservation policy for the National Marine Sanctuaries Program and the National Estuarine Research Reserves Systems at NOAA headquarters in Silver Spring, Maryland. Prior to joining NOAA, Dr. Wahle developed and managed a marine research and teaching laboratory on the New Jersey coast for Lehigh University. He has conducted extensive field research on Caribbean coral reefs and mid-Atlantic coastal ecosystems. An elected Fellow of the American Association for the Advancement of Science (AAAS), Dr. Wahle earned his doctorate in ecology and evolution from the Johns Hopkins University in Baltimore, Maryland, and a bachelor's degree in aquatic biology from the University of California at Santa Barbara.

Sally Yozell, The Nature Conservancy

Sally Yozell is the Regional Director for Marine Conservation for the Nature Conservancy's Eastern U.S Division. She is currently overseeing an integrated science-based marine ecological assessment of the Northwest Atlantic Ocean. She also coordinates the Conservancy's marine activities in 15 coastal states and is taking site based conservation projects and scaling them regionally. Projects include the implementation of marine spatial planning, adaptation strategies for climate change, market based solutions for fisheries conservation, and strategies to protect and restore shellfish, and other important marine habitats. Last year Ms Yozell served on President Obama's Transition Team helping to develop his agenda for the National Oceanic and Atmospheric Administration, (NOAA). She previously served as the Deputy Assistant Secretary at NOAA, where she established several new federal programs including the Coral Reef Protection program, the Ocean Exploration program and the Marine Protected Areas programs. She was a Vice President at Battelle Memorial Institute, a scientific research and technology consulting organization with one of the largest applied marine science laboratories in the nation. In 1998 she served as the Executive Director of the National Ocean Conference. She also worked for Senator John Kerry as his Deputy Legislative Director and Environmental Legislative Assistant. She is the Chairperson for the Stellwagen Bank National Marine Sanctuary Advisory Council. Ms. Yozell holds a Masters in Public Administration from the John F. Kennedy School of Government at Harvard University and a Bachelor of Arts from the University of Vermont.