

American Fisheries Society

137th Annual Meeting, September 2-6, 2007



AFS Symposium:

Tangled Roles, Logjams, & Snarled Nets:

How to Implement Integrated Ecosystem-Based Management in Fisheries

Room: Golden Gate A2
Thursday, September 6, 2007
8:00am – 5:00pm

Program Guide & Schedule

San Francisco, California

Thinking downstream and downcurrent;
Addressing uncertainty and unintended consequences in fish and fisheries

Sponsors:

AFS Socioeconomic Section & Sea Grant Fisheries Extension Section;
Northeast Consortium; and
California & Alaska Sea Grant Extension Programs.

Organizers:

Troy Hartley, University of New_Hampshire/Northeast Consortium;
Carrie Pomeroy, California Sea Grant; and
Torie Baker, Alaska Sea Grant



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TANGLED ROLES, LOGJAMS, & SNARLED NETS: *How to Implement Integrated Ecosystem-Based Management in Fisheries*

Recent national policy reviews (e.g., U.S. Ocean Commission, Pew Ocean Commission, and Canada's Ocean Strategy) and a growing scientific consensus have called for integrated, ecosystem-based management (EBM) with greater communication and coordination among terrestrial, coastal and marine planners and managers. "Thinking downstream and downcurrent," the theme of the American Fisheries Society annual meeting, reflects this emerging challenge for fisheries professionals to think in a holistic and cross-disciplinary way to harmonize and coordinate research and management actions. Integrated EBM requires effectively bridging diverse types of knowledge, jurisdictions, geography, cultural perspectives, power structures, scales, and other dimensions that can facilitate or inhibit communication and coordination networks. Thus, *how* do we put integration into practice?

This 1-day symposium will focus on this question through a series of keynote presentations, contributed papers and posters. Integrated EBM in fisheries has meant different things to different people and in spite of growing efforts to unify the theory and practice of EBM, there remain many independent EBM initiatives in fisheries, a lack of practical guidance on how to implement integrated management, and diverse applied and social science research on integrated EBM in fisheries. Thus as would be expected, the papers and posters consist of multiple disciplinary perspectives and research methods, and consider examples from many places, including the marine coastal mainland U.S., the Great Lakes, the Canadian Maritimes and British Columbia, Puerto Rico, and New Zealand.

Papers organized in three sections address elements of human-ecosystem interaction, planning and management strategies and their evaluation, and tools for integrated EBM in fisheries. The symposium moderators, presenters, and audience will work to identify common threads throughout the day. The final wrap-up discussion will seek to clarify both critical research needs and practical lessons learned from these examples of innovation and real world experiments in integrated management.

Section I: People & Fisheries Ecosystems.

Society, communities and people shape ecosystems and vice versa. Section I explores the human dimensions of EBM, historically, currently, and as EBM will be practiced in the future. The keynote address examines the environmental and cultural evolution of human-ecosystem interactions in fisheries systems. Through examples from New Zealand, Alaska, California, and the U.S. Gulf and East Coasts, and using diverse research methods and strategies, oral presentations discuss the socio-economic impacts of current regulatory tools, the adaptability of fisheries and communities, and the attitudes and opinions among fisheries stakeholders toward integrated EBM strategies. Collectively, these papers provide participants an opportunity to consider the social, cultural and economic features and linkages central to integrated EBM and identify challenges and accomplishments of a holistic and inter-disciplinary approach to the human dimensions of fisheries ecosystems and EBM.

KEYNOTE: Cultivating Capture Fisheries: Learning from Ten Millennia of Cultures Adapting to Pacific Coastal Marine Ecosystems. Courtland L. Smith, Oregon State University, Corvallis, OR.

Fishery management has been built on an agricultural model emphasizing cultural preferences for maximizing productivity and achieving stability. Cultural strategies of the past show adaptive capacity, resilience, and flexibility are keys to survival. Native American cultures that depended on fishing are known to have occupied

the Pacific coast since the early Holocene. Cultural adaptations suggest considerable adaptive capacity and resilience. Settlers to the Pacific coast established fishing communities for the purpose of trading abundant marine and riverine resources domestically and internationally. These communities thrived most when there was growth in resource productivity and stability in markets. Preferences for production and stability led to the introduction of agricultural production thinking to fisheries management. The result has been decline, hardship, and lost opportunities. This experience shows that sustainable fishery management and preferences for stability are short-term ideas that need rethinking in designing approaches to ecosystem-based management.

Section I Presentations:

Human Dimensions of New Zealand's Individual Quota System's First Twenty Years: Lessons for North America. Christopher M. Dewees, CA Sea Grant, University of California, Davis.

A random sample of 62 Auckland, New Zealand fishermen and fishing businesses were tracked since implementation of a comprehensive individual quota system in 1986. Changes in business practices, attitudes, and perceptions of benefits and problems were collected with in-person interviews in 1987, 1995, and 2006. The primary changes and issues observed included consolidation of quota by vertically-integrated companies, implementation of strategies by quota owners to add value to catches, increased conflicts over resource allocation between commercial and recreational fishermen, settlement of Maori treaty claims within the ITQ system, and innovative approaches to co-management. A majority of the interviewees consistently identified conservation as a primary benefit of the system and difficulty of entry as a primary system problem. During 2006 a sample of Nelson region new (since 1995) entrants were also interviewed to document their experiences. The results of this longitudinal study illustrate the importance of establishing goals or a vision for the fishery upfront before designing the details of the individual quota system. Fishery outcomes in New Zealand appear to be determined by a combination of the management scheme details and external environmental and economic variables.

Through a Cod's Eye: Exploring the Social Context of Alaska's Bering Sea Groundfish Industry. Emilie Springer, University of Washington, Seattle, WA.

As federal fisheries in the North Pacific consider the notion of eco-system based management; it is essential to investigate how fishermen and their communities—both place-based and occupational—will be influenced by foreseeable transitions to the industry. The Bering Sea (BSAI) groundfish industry exhibits complex social systems, defined by both local communities (i.e. Dutch Harbor, Alaska) and virtual groupings of people (i.e. deckhands on hook-and-line catcher vessels). Fishing vessels converge from communities across the west coast and Alaska with different expectations, intentions and needs. An effort to identify and understand the goals, motivations and variable dependency on the fisheries resources through the process of personal interviews with fishermen can help clarify the assorted socio-economic circumstances to management institutions. The Pacific cod fishery is a useful paradigm for understanding the broader community of Bering Sea fishermen because individuals participate by means of many gear-types, each of which are also suited to participate in other Bering Sea industries: pollock, crab and Bristol Bay salmon.

Fleet Dynamics in the California Current Ecosystem: Implications for Ecosystem-Based Fishery Management. Cynthia J. Thomson, NOAA Southwest Fisheries Science Center, Santa Cruz, CA.

Ecosystem concepts such as diversity, interconnectedness, resilience, and temporal and spatial variation apply to human as well as non-human components of the ecosystem. This paper demonstrates the relevance of these concepts to understanding commercial fishing behavior. Data on effort, landings, ex-vessel revenues and prices in 33 commercial fisheries in the California Current Ecosystem are used to highlight major fishery trends during 1981-2006. Case studies involving comparative analysis across fisheries, time periods and geographic areas are used to demonstrate how fisheries adapt to changes in economic, regulatory and environmental conditions, as well as factors that facilitate or impede such adaptation. Adaptation is affected not only by fishery-specific conditions (e.g., regulatory regime, ex-vessel prices, harvesting costs, versatility of vessel operations) but also by economic and social trends in the larger society. An important first step in ecosystem-based fishery management is to establish goals. Different goals may imply different visions of how fisheries should be conducted and

managed. A basic understanding of fishery dynamics is important for anticipating potential behavioral adaptations to ecosystem management and for encouraging those adaptations that are consistent with the societal goal.

Attitudes and Opinions of Fishery Management Stakeholders Towards an Ecosystem Approach to Management. Kristy Wallmo, NOAA Fisheries, Silver Spring, MD, and Brad Gentner, Gentner Group Consulting.

In 2005 the National Marine Fisheries Service conducted a survey of fisheries stakeholders on the Gulf and East Coasts of the United States seeking their views on ecosystem based management (EBM) of fisheries resources. The survey asked a series of attitude and opinion questions along with general environmental literacy and demographic questions of a random sample of 7,850 fisheries stakeholders, stratified by region. Stakeholders include non-governmental organizations involved in marine issues, recreational anglers, any person that had signed up at the New England, Mid-Atlantic, South Atlantic or Gulf fishery management council meeting, any person that had contacted any council for information, and commercial fishing permit holders in any of those four regions. This presentation will summarize the findings of this survey effort across several Likert scale questions focusing on ecosystem management issues. Stakeholders were asked to list their level of agreement with statements ranging from the complexity of EBM, to the economic and social impacts of EBM, to the potential stock conservation benefits of EBM. Additionally, respondent demographic profiles and general level of respondent environmental literacy will be used to describe the stakeholders surveyed.

Section II: The Practice of Integrated Management.

Marine and fisheries management, like the management of other public goods and natural resources, can be considered the public process of identifying, understanding, and selecting trade-offs in societal and ecosystem values, interests and services. Section II describes and empirically examines the current state of best practices in integrated coastal, marine and ocean EBM. The Keynote frames the section by reviewing current U.S. federal efforts to advance integration, and discussing the challenges integrated EBM faces. The papers that follow present cutting edge examples of best practices in integrated EBM in fisheries and include program evaluation or empirical research findings. The cases grapple with complex ecological-human trade offs, ecosystem interactions (e.g., between marine and freshwater ecosystems), and strategies for assessing the human component and governance of EBM.

KEYNOTE: What is Being Done to Implement Best Management Practices in NOAA and Other Federal Agencies in the US: An Independent Critique. David L. Fluharty, University of Washington, Seattle, WA.

Based on the existing mandates for resource research, management and protection expressed in national ocean commission reports, NOAA is endeavoring to satisfy these mandates and to take into account the informal but strong recommendations as well as other demands. The NOAA Science Advisory Board established an external review of NOAA's efforts to implement an ecosystem approach across line offices. Based on that report and other advice, NOAA has developed a regional collaboration approach for integrated ecosystem assessments, hazard resilient coastal communities, and integrated weather and climate. In addition, NOAA is supplying significant backbone to the national efforts to establish integration across the federal governments in partnership with tribal, state, local, environmental and user representatives. If fully implemented, how far does this approach accomplish an ecosystem approach to management? Independent review indicates a strong positive result should such policies be followed with critical constraints found in maintaining agency leadership, obtaining full funding for the direct and indirect management and research efforts necessary to accomplish the goals, and coalescence of environmental and user groups behind this effort. The success of these efforts, according to theory, relies strongly on educational outreach and involvement.

Section II Presentations:

Bras d'Or Lakes Collaborative Environmental Planning Initiative: Communication Networks in Canadian Integrated Management. Troy W. Hartley and Alesia N. Read, University of New Hampshire, Durham, NH.

Initiated in 1999 the Eastern Scotian Shelf Integrated Management (ESSIM) Initiative has been called Canada's first integrated ocean management pilot that extends from the coastal region to the 200-mile offshore limit under Canada's Oceans Action Plan. The Bras d'Or Lakes Collaborative Environmental Planning Initiative (CEPI) is a coastal watershed management initiative and the most advanced pilot within the ESSIM area. CEPI is developing a watershed management plan and facilitating its implementation through integrating industry best practices, traditional ecological knowledge, Western science, community involvement, and principles of sustainable development. Through a case study, participant interviews, and a communication network questionnaire, the characteristics of the existing communication network supporting CEPI in 2007 is being analyzed and mapped. How connected are participants? What communication roles (e.g., gate-keepers, bridgers, liaisons) are participants playing? What challenges and opportunities exist for promoting integration through the communication network? The findings demonstrate the context in which integration is most successful. The presentation concludes with guidance to enhance communication, coordination and harmonization of coastal, marine and fisheries management actions.

People in the Aleutian Islands Fishery Ecosystem Plan and Process. Jennifer Sepez, NOAA Alaska Fisheries Science Center, Seattle, WA.

The Aleutian Islands Fishery Ecosystem Plan is a proactive strategic policy and planning document initiated as a pilot project by the North Pacific Fishery Management Council. The Aleutians are a sparsely populated archipelago in far western Alaska that is usually subsumed within the Eastern Bering Sea Large Marine Ecosystem. Each year, about 40 million pounds of fish are commercially harvested from the ecosystem, which is also home to protected marine mammals and birds, U.S. military installations, and is on the main shipping lanes between North America and Asia. During the fishery ecosystem planning process, the team grappled with 3 basic issues related to humans in the ecosystem; 1) public participation/community representation in the planning process, 2) the role of non-economic human dimensions such as history and traditional knowledge in the planning document, and 3) the integration of human dimensions into the indicators/risk assessment framework that was selected for the analysis. The approaches adopted represent compromises made between the ideal of full integration of natural and social sciences and the realities of producing an effective, timely, and practical plan within existing structures of governance and science.

Human & Ecological Tradeoffs: Adopting Ecosystem Based Management Principles for Anadromous Salmon (genus *Oncorhynchus*) in Canada's Pacific Region. K. D. Hyatt, J. Irvine, B. Riddell, R. Lauzier, and M. Stockwell, Fisheries and Oceans Canada, Nanaimo, BC.

Canada's Department of Fisheries and Oceans (DFO) manages Pacific salmon as an important biological, cultural and economic resource. International conventions and new legislation require DFO to develop ecosystem based management (EBM) procedures that recognize the impacts of ecosystems on salmon and of salmon on ecosystems. DFO development of an EBM framework for salmon involves several guiding principles: (1) Salmon are keystone species linking marine and freshwater ecosystems. (2) Salmon EBM involves management of feedback loops that influence ecosystem linkages, ecosystem-scale productivity and biodiversity. (3) Declines of salmon or co-evolved species such as bears may disrupt ecosystem linkages and regional biodiversity. (4) Salmon ecosystem effects have a more pervasive influence in freshwater than in marine systems. (5) EBM approaches to harvest must consider more than just the number of salmon required to "seed" the next generation. (6) Salmon management involves increasingly complex objectives missing from traditional harvest management and stock assessment frameworks. Development of an effective EBM framework to sustain the salmon-and-habitat complex represents an enormous but surmountable challenge.

Marine-Freshwater Linkages: Strategies for Addressing Upstream Watershed Issues for Estuarine Management in Puerto Rico. Katherine L. Smith, Cathy Pringle, and Merryl Alber, University of Georgia, Athens, GA.

Application of ecosystem based management at a scale that includes upstream watershed considerations in coastal management has proven difficult to implement, often as a result of jurisdictional and institutional considerations. The effects of upstream water shortages and water diversions on downstream estuarine and coastal systems, however, have motivated coastal managers to examine strategies for addressing upstream watershed issues. Similar studies are needed for the management of Puerto Rico's estuaries which have received relatively little attention and are vulnerable to watershed-level threats. To address this need, we examine the legal and institutional framework for management of Puerto Rico's estuaries. Specifically, we focus on how coastal managers address upstream watershed issues within this framework. We conclude with a summary of how upstream watershed issues have been addressed by coastal managers in other regions and draw conclusions on how coastal managers in Puerto Rico could better address upstream watershed issues. Improved coordination on coastal and watershed management is a crucial step towards effective ecosystem based management of Puerto Rico's coasts and dependent fisheries.

Toward a Bi-National Governance Structure for American Eel Management. John M. Dettmers, Great Lakes Fishery Commission, Ann Arbor, MI, Robert B. MacGregor, Michigan Dept of Natural Resources, Max Stanfield and Peter C. Thompson, Fisheries and Oceans Canada, Chris Goddard and Dale Burkett, Great Lakes Fishery Commission, and Steve LaPan, NY Dept of Environmental Conservation.

American eels have declined in large portions of their North American range. In both the US and Canada, the species has been considered for listing under relevant endangered species legislation. Declines in the St. Lawrence River and Lake Ontario are so severe that current eel recruitment is < 1% of that in the 1980s, necessitating immediate action to restore depleted American eel populations. Given this significant decline and the role of many North American governments in American eel management, such a recovery effort will be most effectively achieved through a coordinated, bi-national management framework. In the Great Lakes/St. Lawrence River region, the Great Lakes Fishery Commission was asked by partner jurisdictions to facilitate development of a bi-national framework to foster recovery of the species. Key components of the recovery strategy include prioritized research needs to inform management, integrated approaches to reduce human-induced mortality, and specific goals to increase access to suitable freshwater habitat. We outline a multi-jurisdictional management approach and discuss how, as this framework matures, incorporation of a larger ecosystem approach that includes the Atlantic coastal regions of the US and Canada would establish a true bi-national governance structure to facilitate recovery and sound management of this important species.

***Section III: EBM Tools:
Filling Information, Knowledge & Institutional Gaps.***

Additional tools and creative ways of using existing tools are needed for integrated EBM to truly succeed, particularly as fishermen, scientists and managers face increased variability and uncertainty from climate change, global economic markets, socio-economic transitions in fishing and coastal communities, and funding constraints. Section III presents additional new and innovative tools of integrated EBM in fisheries. The Keynote lays the groundwork for the EBM needs and challenges forthcoming and uses two examples of promising innovations – collaborative gear conservation engineering research and international governance capacity. The papers that follow provide rich examples of efforts to build capacity among stakeholders, design and implement collaborative research and rapid community assessment tools, conduct stakeholder research prioritization and planning for EBM, and apply software tools for modeling, planning and decision support.

KEYNOTE: Bridging Disciplinary Gaps for Ecosystem Science through Collaborative Research, Advanced Technologies and Education. Steven X. Cadrin, NOAA/University of Massachusetts, Dartmouth, MA.

Ecosystem-based management requires the technical support of interdisciplinary science. Unfortunately, fisheries and aquatic sciences have diverged into many separate disciplines, and institutional gaps are difficult to bridge. Some traditional approaches and recent developments in fisheries offer promising examples of integrating information and knowledge from diverse perspectives. Fishery scientists often work in collaboration with fishermen, and such ‘cooperative research’ is currently drawing attention as a tool for ecosystem science. Continued success in fishing is the result of understanding the ecosystem. Fishermen are keenly aware of the physical environment, including weather patterns, hydrography and natural cycles on multiple time scales. They also monitor ecological processes such as habitat preferences, feeding patterns and competitive relationships. The partnership of fishermen and scientists couples the ecosystem perspective of fishermen with the expert disciplines of scientists. One common interest of fishermen and scientists from many disciplines is the application of advanced technologies to learn about fish behavior, performance of fishing gear and the influence of the environment. For example, hydroacoustic technology can be applied to a wide range of applications: locating and enumerating diverse biota from plankton to whales; monitoring movement of the water column or tagged fish; measuring the geometry and behavior of fished trawls; or mapping habitat. The shared investment in common technology is a conduit for communication and interaction among oceanographers, ecologists and fishermen. Education systems should also promote collaborative approaches to confronting ecosystem challenges, including objective research with fishermen and interdisciplinary studies. Institutional gaps are an impediment to ecosystem science but can be bridged through collaboration, technology and education.

Section III Presentations:

Marine Resource Education Project (MREP): Integrating Perspectives toward EBM. Laura Taylor Singer, Gulf of Maine Research Institute, Portland, ME.

It has been widely acknowledged that the complex system of fisheries science and management is difficult for many fishermen and others to navigate. Fishermen attending fishery management council meetings, serving as advisors to the management processes, or partnering in collaborative research, require baseline information to be effective in their roles. The complexity of science and management information is only confounded under an Ecosystem-Based Management (EBM) structure. In addition to information challenges, there are cultural differences among those interested in fisheries management. Often, the issues that arise in a management setting are based on a lack of understanding and trust. In New England, the Marine Resource Education Program (MREP) was created by fishery activists in the region to address these issues. The curriculum, tailored specifically for fishermen and relevant stakeholder groups, covers two topic areas: a three-day Fishery Science Module, followed by a three-day Fishery Management Module. MREP has become a recognized training program for fishermen, managers, scientists and environmentalists in the region and nationally. As the number of stakeholders increase under EBM, it will be important to look to successful models such as MREP to find solutions to gaining a greater understanding and bridging perspectives among participants in the process.

Understanding Management Impacts and Each Other: Improving coastal fishing community profiles through collaborative research. Flaxen Conway, Oregon Sea Grant, Oregon State University, Corvallis, OR; Leesa Coob, Port Orford Ocean Resource Team, and Christina Package, NOAA Fisheries.

When the Magnuson Act was amended in 1996 by the SFA, NS 8 stated that management measures shall take into account “the importance of fishery resources to fishing communities in order to provide for the sustained participation... and to... minimize adverse economic impacts on such communities.” The SFA defines fishing communities as “substantially dependent on or engaged in the harvest or processing of fishery resources...to meet the economic needs of...(industry) in a community.” Therefore, it’s important to know how human communities function is a part of the ecosystem and to measure impacts of ecosystem management on human communities. Although long awaited and appreciated, the “short” community profiles recently completed by

NMFS are limited as they are based on existing data sources. Decision-makers struggle to make decisions without understanding potential socioeconomic impacts of management policies because to understand impacts “long” profiles must be done. Financial and other constraints limit NMFS from creating long profiles and require bridges across knowledge, cultures, power structures, and other barriers. This paper presents an innovative 12-month collaboratively-designed research project that used peer/community researchers for obtaining critically-needed, scientifically defensible data (“fishing community perceptions”) that can be used to create long profiles of three fishing communities in Oregon.

The California Fishing Communities Project: Collaboration to Build Information and Awareness for Ecosystem-Based Management. Caroline Pomeroy, CA Sea Grant, Watsonville, CA, Melissa Stevens, UC Santa Cruz, and Cynthia J. Thomson, NOAA Southwest Fisheries Science Center.

The recent shift toward ecosystem-based fishery management (EBFM) that engages a broader range of stakeholders has greatly expanded the need for accurate, contextualized information to sustain fisheries as integrated ecological and socio-economic systems. The need for human dimensions information, including how fishery participants and communities respond to and are affected by environmental, regulatory, economic and social variability and change, is particularly acute. The general lack of data has made it very difficult to accurately describe, explain and predict fishery management outcomes for fisheries and fishing communities, and has led to unintended consequences for the biophysical and human components of fishery systems. The “Fishing Communities Project” is a collaborative effort that integrates fisheries social science and fishermen’s local knowledge to address these challenges. Using a rapid assessment approach, we are working with fishing community members in selected California ports to identify and determine a) the role of diverse factors in observed fishery trends of the past 25 years, and b) how these have affected fishery infrastructure and viability in those communities. This paper describes the project’s rationale and methodology, and provides a case study example to illustrate how fishery participants’ knowledge can be engaged to build information critical to EBFM.

Pooling Talents of Multiple Disciplines for Ecosystem Management (FISHER Initiative): Better a Tidepool than a Cesspool. Madeleine Hall-Arber, MIT Sea Grant, Cambridge, MA and David Bergeron, Massachusetts Fishermen’s Partnership.

Tidepools are a microcosm of marine ecosystems, but they may also be analogous to the group of scientists and other fisheries stakeholders currently moving towards ecosystem management. Tidepool inhabitants must adapt to rapid and radical changes in their environment. So too must the scientists and other fisheries stakeholders adapt to working with a broad range of disciplines and interests if they are to begin to understand the interactions of the elements comprising an ecosystem—and avoid slipping into a dark and noxious cesspool of simplistic explanations. The Massachusetts Fishermen’s Partnership’s Fishermen’s Initiative for Scientific Habitat and Ecosystem Research (FISHER) has drawn together oceanographers, gear technologists, social scientists, fishermen, fish scientists and others to collaborate in an effort to establish a foundation for understanding ecosystems. FISHER began with a focus on sand lance on Stellwagen Bank as a keystone species in this environment. Three plenary meetings have been held and a fourth is planned to report project findings and encourage cross-disciplinary interaction. This paper will explore both what has worked well for FISHER and what constraints impinge on this model of a multidisciplinary approach to marine ecosystem analysis and its potential application to ecosystem management.

Tools for Coastal-Marine Ecosystem-Based Management. Susan Crow, PlaceMatters, Denver, CO and Sarah Carr and Patrick J. Crist, NatureServe.

A variety of software tools exist to help policymakers and managers implement ecosystem-based management (EBM) in coastal watersheds and marine environments. For example, existing tools can help predict ecosystem response to disturbances, select optimal conservation or restoration areas, visualize development impacts and resource-uses on ecosystems, collect local knowledge about resources, and facilitate stakeholder polling on management alternatives. With support from the David and Lucile Packard Foundation, PlaceMatters and NatureServe have partnered to identify opportunities and barriers to integrating technologies for land use

planning and ecosystem-based management. PlaceMatters is engaged in an initiative (www.placematters.org) to identify innovative multi-disciplinary tools and approaches that will be implemented and evaluated in coastal community projects. NatureServe coordinates the Ecosystem-Based Management Tools Network (www.ebmtools.org), an international alliance of tool developers, practitioners, and training providers supporting EBM implementation in coastal and marine environments. A primary Network goal is facilitating multi-sector efforts through integrated use of software tools for marine ecosystem modeling, land use planning, and conservation decision support. This presentation will introduce existing EBM tools, highlight case studies where tool applications have integrated diverse sectors (e.g. fisheries management, marine conservation, land use planning and coastal water quality), and provide additional EBM resources information for managers and scientists.

Posters

The accompanying poster session is an integral component of the symposium. These rich examples of experiments in integrated EBM in fisheries will provide valuable opportunities to expand on themes identified during the oral presentations and stimulate networking and discussion among symposium participants.

Alaska's Local Advisory Committee System: Enshrined Bottom-Up Public Activism in Ecosystem-based Management Since 1959. Torie Baker, AK Sea Grant, Cordova, AK.

Established at statehood, Alaska's Boards of Fisheries and Game Local Advisory Committee system is a deeply rooted public venue enjoining Alaska's natural resources regulatory process and Alaskan residents. Advisory Committee purposes outlined in enabling legislation include: developing and evaluating regulatory proposals, and making recommendations to appropriate boards; providing a local forum for fish and wildlife conservation and use dialogue, including matters relating to habitat; advising appropriate regional councils; and consulting with individuals, organizations, and agencies. Located in 81 committees, each committee is a collection of locally-elected resource users and experts on the surrounding area. Meetings are public, are generally attended by management staff, and committee representatives enjoy prescribed standing at Board meetings in relaying local residents' perspectives, reactions, and recommendations for management plans. Much of Alaska's conservation management philosophy, implementation and successes to date are directly linked to the long standing activism of AC system participants. As the Alaskan regulatory landscape changes, this venerable Alaskan model of public engagement is evolving and its history instructive. This presentation will discuss AC system structural evolution and its importance and potential compatibility for engaging the Alaskan public in implementation of federal and state ecosystem-based management programs.

Establishing a Process to Achieve Integrated, Multi-use Ocean Management in Massachusetts.

Verna Delauer, COMPASS, University of New Hampshire, Durham, NH.

The Massachusetts Ocean Partnership Fund (MOPF) is an emerging public/private initiative advancing innovative ocean management in Massachusetts. MOPF's members include fisheries and coastal resource managers, natural and social scientists, not-for-profit organizations, and representation from ocean-dependent industries. MOPF's long-term goal is to ensure that Massachusetts develops and implements a workable, integrated multi-use ocean management plan by 2012 that: integrates management across uses/sectors, resources and agencies; reflects input from an intensive public process; gains the support of major affected groups and organizations; adapts to changing ecological and political conditions; and supports sustainable marine industries *and* ecosystem stewardship more effectively than the current management system. The ocean management plan will reflect the best available natural and social science, user group needs, gaps in our science knowledge-base and bottlenecks to policy change. MOPF's short-term goal is to facilitate diverse stakeholders building a common vision for ocean management. By June, a strategic plan and a science plan will prioritize science issues and research needs and address the tools and resources needed to apply science to policymaking. The benefits

and challenges of an inclusive and transparent planning process and the resources needed to achieve such goals will be presented.

Challenges in Analyzing Potential Social Impacts of Ecosystem- and Area-Based Management Measures in the North Pacific: Recent Lessons Learned in Spatially Oriented Analytic Approaches.
Michael A. Downs, EDAW, Inc., San Diego, CA.

EDAW recently completed a series of comprehensive baseline North Pacific fishing community profiles for Unalaska/Dutch Harbor, Akutan, King Cove, and Kodiak, Alaska and is now in a second phase of this work, developing parallel information for Sand Point, Adak, St. George, and St. Paul, Alaska under the sponsorship of the North Pacific Research Board and the North Pacific Fishery Management Council. This work, building upon other recent efforts, including those of the Alaska Fisheries Science Center, has attempted, in part, to link aspects of community engagement and dependency to fisheries resource utilization on a spatial basis to allow for an assessment of the potential differential distribution of impacts among and within communities resulting from ecosystem- and area-based management measures. The communities involved each presented unique challenges to this type of analysis, based on widely ranging forms of engagement through varying local fleet, processing, and support service sector composition as well as overall community socioeconomic and sociocultural characteristics. Common to all of these communities, however, were difficulties with fishery specific data adequacy and accessibility. This paper summarizes our research, several of the lessons learned, and explores alternative approaches to community-linked data collection and analysis to support ecosystem-based management initiatives.

Putting life into ecosystem-based management theory: tools to help meet multiple management objectives in marine biodiversity and fisheries. Zach Ferdana, Mike Beck, Caitlyn Toropova
The Nature Conservancy, Seattle, WA.

Ecosystem-Based Management (E-BM) considers the cumulative impacts of different sectors and is intended to help bridge the gap between different management objectives that have traditionally been considered individually. The transition from concept to decision-making and application is complicated and the path to its realization is unclear. We provide a planning framework example of how to use decision support tools to take spatial information on biodiversity and fishery production into multi-objective planning framework to put life into E-BM theory. Conservation planning and fisheries modeling can be incorporated into an integrated approach illustrated here by utilizing information on ecosystems, habitats, and species in a portion of the Northern California Current. Within this framework we will demonstrate the use of the two most widely used decision support tools for biodiversity conservation and fisheries objectives, Marxan and Ecopath with Ecosim respectively. This is one of the first examples where both tools are used to provide initial planning solutions that fulfill multiple management objectives. If we are to realize Ecosystem-Based Management in our planning efforts one practical and powerful way is to take a multiple objective approach, making information and analyses transparent to decision makers and advancing integrated tools.

Bioeconomic Models Reborn for Ecosystem Based Management of Fisheries. Brad Gentner, Gentner Group Consulting, Silver Spring, MD.

There is a deep literature on bioeconomic models of fisheries. As the name implies, these models link the biological and human components of the ecosystem. As a result, recently there has been renewed interest in this modeling technique in the context of Ecosystem Based Management (EBM) of fisheries resources. These models are data intensive and much work needs to be done to make them complex enough to truly represent an ecosystem. This paper will examine the various model structures and the data needs of these types of models. Examples will include work done with summer flounder (*Paralichthys dentatus*) in Maryland coastal bays focusing on water quality and incorporating both a commercial and recreational fisheries. Another example will include the ecosystem general equilibrium modeling technique linked to an economic computable general equilibrium model of the ecosystem supporting Stellar sea lions (*Eumetopias jubatus*).

Fishing Crew Data: Impacts of and Remedies for the Lack of Systematic Collection of Fishing Crew Member Data. Marcus Hartley and Jonathan King, Northern Economics, Inc., Anchorage, AK.

Northern Economics, Inc. recently completed a study documenting the impacts created by the absence of information on participation by fish harvesting crew members in Alaska fisheries. The study documented how that the absence of a systematic data collection system limits the ability of fishery managers to measure and project the impacts of both internal and external changes that affect the fisheries, precludes harvesting crew members from participating in assistance programs, and hampers the ability of community leaders to summarize the importance of fishing to their local economy. The study also examined ways that fishing crew member data collection in Alaska could be improved and the potential obstacles to implementing an improved system. Given that the lack of crew member data collection systems in fisheries around the US, issue and study has broad practical implications.

Human Use Patterns and Impacts: The Missing Link in the Design and Management of Marine Protected Areas. Lisa Krigsman, Charles Wahle, Robert “BJ” Atanasio, and Sarah Fischer, NOAA National MPA Center, Monterey, CA, and Lance Morgan, Marine Conservation Biology Institute.

Marine protected areas (MPAs) attempt to minimize human impacts on the ocean by managing the spatial and temporal pattern of human uses. In spite of the fundamental role of human use patterns in the design and management of MPAs, we often know remarkably little about how, when, where, and with what effects people use the ocean. To address this critical gap and support effective science-based ecosystem management, NOAA’s MPA Center and the Marine Conservation Biology Institute are collaborating on aspects of a multi-faceted effort to document and understand the patterns and impacts of human use of ocean areas along the west coast. The Human Use Patterns and Impacts (HUPI) project has three interactive components: Creating an Ocean Uses Atlas integrating existing and new information to map patterns of human use across key sectors; Assessing the potential impacts of those uses on ecosystems; and Assessing the potential for incompatibilities among different ocean uses, either as directly or indirectly through environmental modifications. The results of the HUPI project are intended to inform ongoing MPA planning efforts including California’s Marine Life Protection Act effort, and NOAA’s West Coast Pilot project: a regional initiative to design an effective national system of MPAs.

Ecosystem Based Fisheries Management: Using All The Help We Can Get. Jed Moore, Oregon State University, Corvallis, OR, Flaxen D.L. Conway, OR Sea Grant, Gil Sylvia and Selina Heppell, Oregon State University, and Jennifer Bloeser, Pacific Marine Conservation Council.

As fisheries management strives to incorporate entire ecosystems into decision making processes, a lack of important information becomes apparent, particularly in our understanding of marine species’ life histories, abundance trends, and ecosystem level impacts. Cooperative Fisheries Research (CFR) brings together fisheries stakeholders and researchers, with the goal of producing timely and scientifically valid data by utilizing the strengths and resources of each participant. Our study used both questionnaires and ethnographic interviews to gain insight into CFR projects that have taken place in California, Oregon, and Washington. Over the last 15 years CFR has expanded fisheries research capacity, and involved experienced fishermen and researchers in monitoring, ground-truthing, and research projects to better understand and track the fluctuations inherent in marine ecosystems. Along with its benefits, CFR does come with its own types of challenges. Our research has found that while CFR projects do face a broad range of challenges, some challenges are common to most projects. Through our study we seek to make the collective experiences of past CFR participants available to present and future CFR participants to further aid West coast and national efforts to bridge the diverse perspectives and spatial scales involved in implementing truly Integrated Ecosystem-Based Fisheries Management.

Humboldt Bay Ecosystem-based Management Program and Subtidal Habitat Goals Project. Susan Schlosser, CA Sea Grant, Eureka CA, and Moira McEnespy and Sheila Semans, State Coastal Conservancy.

California Sea Grant is coordinating an Ecosystem-Based Management Program for Humboldt Bay, with funding and technical assistance from the State Coastal Conservancy and NOAA's Coastal Services Center. It is well recognized that ecosystem-based management (EBM) is needed to holistically address coastal watersheds, bays/estuaries, marine fisheries and their interactions. The project goal is to build an appropriate regional resource conservation framework to support EBM, to identify priority topics that would produce information for phased implementation of an EBM program, and to recommend a strategy to establish and maintain a Humboldt Bay Ecosystem database. In addition marine and estuarine data will be collected to support development of subtidal habitat goals, which will provide the underpinning for future restoration projects and will enable more coordinated "land to sea" resource management. This project challenges resource managers, stakeholders, scientists, and other interested parties to focus their attention on local priority issues in an EBM approach. A participatory process will allow and encourage issues of greatest importance to be discussed, solutions envisioned, and ideally a practical solution reached or proposed. The process, goals, and expected products of the program will be presented following an introduction to the resources and people of the Humboldt Bay Ecosystem.

FishTank: Creating Linkages among New England's Diverse Fishing Communities. Laura Taylor Singer, Gulf of Maine Research Institute, Portland, ME

Historically divided by gear conflicts, home-port, and cultural heritage, fishermen in New England are realizing that they are losing by not working together. The *FishTank* initiative is an effort to cross these cultural differences and develop a community forum to discuss concerns, resolve conflicts informally, provide a thoughtful source of comment on proposed regulatory initiatives, and work proactively to develop more effective management institutions in the Gulf of Maine. The *FishTank* initiative is beginning to bear fruit in the form of a better-educated fishing community, development of new leadership capacity, and linkages among diverse interests throughout the Gulf of Maine. *FishTank* is simple: bring a small but thoughtful group of diverse fishermen together on a regular basis...allow them to set a common agenda...provide food and a provoking fisheries topic...gently facilitate the discussion. The resulting growth of trust among a divided community and the realization of the power of acting together have potential to address the formidable challenges of sustaining the Gulf of Maine fishery ecosystem and the community that depends on it. Integrated Ecosystem-based Management will require forums such as *FishTank* that bring folks together and facilitate an open and honest dialogue to form a common set of management goals.

Implementing ecosystem-based recovery programs for freshwater species at risk in southern Ontario. Shawn K. Staton, Fisheries and Oceans Canada, Burlington, Ontario.

Recovery planning efforts for the conservation of freshwater biodiversity in Canada have been focused on the watersheds of southwestern Ontario which support the highest diversity of fish and freshwater mussel species at risk (SAR) in the country. To ensure the preservation of aquatic biodiversity in the region, an aquatic ecosystem approach to recovery planning is underway within the Sydenham, Thames, Grand and Ausable Rivers as well as the Essex-Erie region. The implementation of recovery strategies addressing priorities for stewardship, research & monitoring, and public awareness approaches is occurring throughout these drainages by individual recovery teams and action groups. To achieve effective recovery programs, cooperation is required from a diverse mix of provincial, federal, and municipal agencies as well as NGOs, landowners and other stakeholder groups. Central to these projects are active stewardship programs directed across watersheds to reduce identified threats and improve habitat conditions for populations of SAR. Progress on recovery actions by individual recovery teams will be highlighted with particular emphasis on some of the most successful approaches.

TIME SCHEDULE

Thursday Sept 6th	Tangled Roles, Logjams & Snarled Nets: HOW to Implement Integrated Ecosystem-Based Management in Fisheries	
8:00	ID # 1040	Introduction: Troy Hartley, University of New Hampshire/Northeast Consortium
8:20		KEYNOTE: Cultivating Capture Fisheries: Learning from Ten Millennia of Cultures Adapting to Pacific Coastal Marine Ecosystems. Courtland L. Smith, Oregon State University, Corvallis, OR.
8:40	1026	Human Dimensions of New Zealand's Individual Quota System's First Twenty Years: Lessons for North America. Christopher M. Dewees, CA Sea Grant, University of California, Davis
9:00	1042	Through a Cod's Eye: Exploring the Social Context of Alaska's Bering Sea Groundfish Industry. Emilie Springer, University of Washington, Seattle, WA.
9:20	1045	Fleet Dynamics in the California Current Ecosystem: Implications for Ecosystem-Based Fishery Management. Cynthia J. Thomson, NOAA Southwest Fisheries Science Center, Santa Cruz, CA.
9:40	1046	Attitudes and Opinions of Fishery Management Stakeholders Towards an Ecosystem Approach to Management. Kristy Wallmo and Brad Gentner, NOAA Fisheries, Silver Spring, MD.
10:00	BREAK	
10:20	1027	Wrap-up Discussion of Section I and Introduction to Section II: Carrie Pomeroy, CA Sea Grant
10:40		KEYNOTE: What is Being Done to Implement Best Management Practices in NOAA and Other Federal Agencies in the US: An Independent Critique. David L. Fluharty, University of Washington, Seattle, WA.
11:00	1032	Bras d'Or Lakes Collaborative Environmental Planning Initiative: Communication Networks in Canadian Integrated Management. Troy W. Hartley and Alesia N. Read, University of New Hampshire, Durham, NH.
11:20	1037	People in the Aleutian Islands Fishery Ecosystem Plan and Process. Jennifer Sepez, NOAA Alaska Fisheries Science Center, Seattle, WA.
11:40	1033	Human & Ecological Tradeoffs: Adopting Ecosystem Based Management Principles for Anadromous Salmon (genus <i>Oncorhynchus</i>) in Canada's Pacific Region. K. D. Hyatt, J. Irvine, B. Riddell, R. Lauzier, and M. Stockwell, Fisheries and Oceans Canada, Nanaimo, BC.
12:00	LUNCH	
1:20	1041	Marine-Freshwater Linkages: Management of Puerto Rico's Estuarine Fishes Across Ecological and Jurisdictional Boundaries. Katherine L. Smith, Cathy Pringle, and Merryl Alber, University of Georgia, Athens, GA.
1:40	1025	Toward a Bi-National Governance Structure for American Eel Management. John M. Dettmers, Great Lakes Fishery Commission, Ann Arbor, MI, Robert B. MacGregor, Michigan Dept of Natural Resources, Max Stanfield and Peter C. Thompson, Fisheries and Oceans Canada, Chris Goddard and Dale Burkett, Great Lakes Fishery Commission, and Steve LaPan, NY Dept of Environmental Conservation.

2:00		Wrap-up Discussion of Section II and Introduction to Section III: Torie Baker, AK Sea Grant
2:20	1030	KEYNOTE: Bridging Disciplinary Gaps for Ecosystem Science through Collaborative Research, Advanced Technologies and Education. Steven X. Cadrin, NOAA/University of Massachusetts, Dartmouth, MA.
2:40	1038	Marine Resource Education Project (MREP): Integrating Perspectives toward EBM. Laura Taylor Singer, Gulf of Maine Research Institute, Portland, ME.
3:00		BREAK
3:20	1268	Understanding Management Impacts and Each Other: Improving coastal fishing community profiles through collaborative research. Flaxen Conway, Oregon Sea Grant, Oregon State University, Corvallis, OR; Leesa Coob, Port Orford Ocean Resource Team, and Christina Package, NOAA Fisheries.
3:40	1269	The California Fishing Communities Project: Collaboration to Build Information and Awareness for Ecosystem-Based Management. Caroline Pomeroy, CA Sea Grant, Watsonville, CA, Melissa Stevens, UC Santa Cruz, and Cynthia J. Thomson, NOAA Southwest Fisheries Science Center.
4:00	1031	Pooling Talents of Multiple Disciplines for Ecosystem Management (FISHER Initiative): Better a Tidepool than a Cesspool. Madeleine Hall-Arber, MIT Sea Grant, Cambridge, MA and David Bergeron, Massachusetts Fishermen's Partnership.
4:20	1024	Tools for Coastal-Marine Ecosystem-Based Management. Susan Crow, PlaceMatters, Denver, CO and Sarah Carr and Patrick J. Crist, NatureServe.
4:40		Wrap-up Panel Discussion: Common Themes & What's Next? Troy Hartley, University of New Hampshire/Northeast Consortium

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