ON THE GROUND AND IN THE WATER: ECOSYSTEM-BASED FISHERIES MANAGEMENT IN PRACTICE

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University of Washington
School of Aquatic and Fisheries Sciences
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List Workshop of Abstracts

Keynote Address:

"After the revolution, you have to govern well …" Can we deliver on the great promises of the Ecosystem Approach?

Dr. Jake Rice
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The Ecosystem Approach is now accepted as a centrepiece of policy in almost all regional, national, and international jurisdictions. Management agencies are now calling on their scientific and technical advisors for guidance on what should be being done that is different and better than management under the "non-ecosystem" approach that has been displaced. However, neither the requests for advice themselves nor the responses of advisors to the requests have been consistently well formed and reciprocally useful. This talk will take a broad look at this situation, seeking opportunities to improve practice in the short term, as well just increase knowledge and precaution in the long term.
The talk will consider all four components of an ecosystem approach to management: taking account of environmental forcing on exploited resources, ensuring sustainability of the full footprint of marine fisheries and not just the direct effects of fishing on the target species, making governance more inclusive, and integrating policy and management across industry sectors in the sea. In each case the talk will consider first what are the major changes associated with moving to an ecosystem approach, then in what aspects has progress been particularly successful and where has it has lagged. The nature of the impediments in the latter cases will be highlighted. After the four components of an ecosystem approach have been reviewed, the impediments to progress will be looked at collectively. Several generalizations will be extracted and supported.

THEME 1: TOOLS FOR ECOSYSTEM-BASED FISHERIES MANAGEMENT: APPLICATIONS AND EXPERIENCES

Ecosystem Based Fisheries Management: Broad Concepts and Thoughts on Application

Dr. Rod Fujita
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One way to characterize Ecosystem Based Fisheries Management is as a process of improving the match between reality and the representations of reality (conceptual models) that drive management. It is also a process of aligning management measures with improved ecological understanding. The scientific basis of fisheries management has evolved over the years, from a belief that the seas were inexhaustible to the concept that the main driver of fish productivity is the number of spawners. Fisheries management is successfully incorporating ecological insights into the drivers of fish productivity, for example through the identification and protection of Essential Fish Habitat under the 1996 Sustainable Fisheries Act. In many cases, the importance of protecting other ecosystem attributes, such as the production of forage, for the purpose of conserving biodiversity has become clear and actionable. Thus, the legal and regulatory mechanisms that are currently in place appear to be capable of incorporating new insights into what controls fish productivity, and also changing social values with respect to the importance of protecting biodiversity. But are these mechanisms optimal, and will they be adequate for incorporating a new set of ecological insights without precipitating crises or the need for draconian measures? The scientific challenge associated with transitioning to EBM seems clear - to represent the reality of fish productivity more accurately by accounting for the numerous ecological factors that control productivity, and for the fact that these factors vary in time and space on multiple scales. The management challenges include: how can we tell when a new insight into an ecological driver is ready to be applied to management? How can we create incentives for improved understanding? Above all, what is our management stance with regard to ecological insight and information – do we hedge harvests to manage risk associated with the possibility that improved understanding of fish productivity and biodiversity may show that we are being too aggressive? Or do we continue to rely on existing conceptual models and management measures unless it becomes clear to everyone that they misrepresent reality to an unacceptable degree?

An Assessment of Fisheries Management Strategies in Alaska Relative to the Goals of Ecosystem Approaches to Management

Dr. Anne B. Hollowed
Senior Scientist, Alaska Fisheries Science Center
NOAA-Fisheries

In 2004, the North Pacific Fishery Management Council (NPFMC) prepared a Programmatic Supplemental Environmental Impact Statement (PSEIS) that adopted a precautionary management policy that was designed to accelerate ecosystem-based management principles. Many of the provisions of this policy adhere to the goals that have been identified by national and international panels charged with developing frameworks for implementing Ecosystem Approaches to Management (EAM). The performance of the NPFMC approach is evaluated using an Integrated Fisheries Risk Assessment Method for Ecosystems (IFRAME). The IFRAME approach synthesizes information from stock assessments and ecosystem indicators to provide a comprehensive evaluation of the status of the Bering Sea Aleutian Islands ecosystem. The IFRAME assessment is used to assess the impacts of changes in management resulting from implementation of the American Fisheries Act, Steller sea lion protection measures, revisions to overfishing definitions and other plan amendments by comparing risk scores in 1997 to 2007.

Quantitative support tools to implement EBM

Dr. Villy Christensen
Associate Professor, Fisheries Centre
University of British Columbia

We have by now developed ecosystem models for implementation of EBM for at least two decades. The tools have reached a state where they are capable of replicating the ecosystem history and make plausible predictions of how the systems may react to environmental change as well as to human impact. The models are being very widely applied by scientists, and they have a strong impact on … science. Yet, when we evaluate how much impact ecosystem modeling has had on EBM it is a wanting story. Are we dealing with the questions that are relevant for management, and are we communicating the science in a manner that is effective when it comes to informing the decision-making process? We have reflected on those questions for a while, and in consequence taken two major steps to (1) further develop the modeling approaches, and (2) rethink how we communicate and use the model as decision-support tools. To this end, we emphasize development and implementation of protocols for coupling models across platforms, allowing climate, hydrographic, NPZ, fisheries, effort, MSE-frameworks, social choice, legal framework, a.o. models to communicate during runs. Further, we use decision-support methodologies to facilitate the direct exploration of alternative future scenarios without having the scientist in the driver seat. For this, we have developed visualization technologies that combine the underlying scientific models with 3D gaming technology and simple decision-support interfaces. Or, in short, we've made a scientific version of 'Finding Nemo'.

MPAs and ecosystem based fishery management: issues of scale, perspective and coordination

Dr. Lisa Wooninck
Regional Resource Protection Specialist
NOAA Monterey Bay National Marine Sanctuary

Ecosystem-based fishery management (EBFM) has moved from concept to promising application, with marine protected areas (MPAs) functioning as tools for maintaining old growth age structure, viable fish habitat, critical food web connections, and ecosystem resilience. The United States has a long history of MPAs (n = 1689) for fishery or conservation/biodiversity purposes, implemented by hundreds of agencies with little coordination and integration. Insights for this disorganized approach to spatial management are drawn from the collection of MPAs on the west coast (n = 269). Lack of clear mechanisms for intra and interagency coordination across multiple objectives, and mismatches in spatial and temporal scale have contributed to the disorganization. Solutions for optimizing use of MPAs for EBFM include early and frequent interagency collaboration; use of integrated ecosystem assessments (IEA) to identify trade-offs among uses, complimentary objectives, and adaptive management strategies; and adoption of appropriate scales to enhance co-management, stewardship, and ecosystem function.

Tools to support EBFM and their implementation in Australia

Dr. Tony Smith
EBFM Research Stream Leader,
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EBFM was adopted as a policy goal by all Australian fishery management jurisdictions in the early part of the current century. Considerable impetus for this arose from strong environmental legislation that required periodic audit of fishery performance against key ecological criteria. The scientific challenge has been to develop the tools to support this policy process, essentially to mobilise existing information in support of decision making. Key areas of focus have included the development of ecological indicators, ecological risk assessment, and whole of fishery management strategy evaluation. In all these areas, methods have ranged from qualitative through to quantitative. The Australian experience with developing and applying these tools will be described, and links with policy and management processes (such as harvest strategies and bycatch management) briefly outlined. Key remaining gaps include relatively simple methods to evaluate economic and social risks associated with management decisions.

Emerging approaches for ecosystem-based management on forage species, taking account of the need for recovery of top predators

Dr. Andrew J. Constable[1,2]
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CCAMLR is widely recognised as a progressive international Commission with a primary responsibility for the conservation of the Southern Ocean marine ecosystem. In its convention and established practice it has the attributes of a regional fisheries management organisation, has been able to deliver a precautionary approach to fisheries management and has been leading the development of benchmarks for best-practice in ecosystem-based management. Its recent successes are in developing and implementing a system for fisheries to avoid significant adverse impacts on vulnerable marine ecosystems. This talk will summarise the developments in managing the krill fishery, which include the precautionary approach for maintaining higher target stock levels to provide for krill predators, establishment of spatial management to avoid localised impacts on predators, and the CCAMLR Ecosystem Monitoring Program (CEMP), which was originally designed to distinguish between the effects of fishing and natural change. It will then examine the challenges facing the full implementation of the ecosystem approach for krill fisheries, including climate change impacts, monitoring in a feedback management system, and the regulatory requirements for the krill fishery. Lastly, the paper will explore emerging approaches for tactically using ecosystem data and models in a decision framework.

Steps towards EBFM in New Zealand's Fisheries

Dr. Rosie Hurst
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The first major steps towards EBFM in New Zealand started with the introduction of the 200 nm EEZ in 1978 and the introduction of the Quota Management System (QMS) in 1986. The QMS reduced overcapacity in inshore fisheries and allowed for managed expansion of deepwater capacity through quota restrictions on target and bycatch fish species. Currently, 96 species spread over 628 fish stocks are managed under this system. Key challenges have included collecting sufficient information to assess and manage such a large number of stocks, particularly low information stocks, and effectively managing multispecies inshore fisheries where each of a large number of co-occurring stocks have separate quotas. Management of other parts of the ecosystem affected by fishing is being addressed through legislation and a variety of initiatives relating to fisheries management and the reduction of impacts of fishing on biodiversity, the benthic environment and protected species). Major challenges associated with implementation of such initiatives include development of environmental standards, balancing of ecosystem-based management and fishery utilisation objectives, developing appropriate management forums with key stakeholders, and obtaining sufficient relevant scientific and fishery information to inform management decisions. Some examples of recent progress are presented, including the management of a fishery with MSC certification, a management procedures approach for setting sealion bycatch limits in the squid fishery, seamount closures, benthic protection areas, and the development of a benthic impacts strategy.

Progress towards an Ecosystem Approach to Fisheries in Europe

Dr. Simon Jennings
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I review the environmental, social and economic performance of the Common Fisheries Policy (CFP) at the scale of the Regional Advisory Council (RAC) areas based on analyses conducted by the ongoing project 'Indicators for fisheries management in Europe'. In all the RAC areas considered, the high level objectives of the CFP and the aspirations to integrate ecosystem concerns have proved difficult to meet. In some areas data needs are inadequate to assess environmental, social and economic performance, but the gap between data needs and capacity for data collection will be much reduced if fleet capacity was matched to the productivity of the resources and if the present decreases in exploitation rate that are seen in some RAC areas can be maintained. A major impediment to progress towards an Ecosystem Approach to Fisheries (EAF) is that the environmental, social and economic objectives of the CFP are known to be incompatible over the short-term; and yet there is no consistent or pre-agreed guidance about how trade-offs among objectives should be made to overcome this incompatibility.

Implementing EBFM in the U.S. Atlantic

Dr. Jason Link
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Northeast Fisheries Science Center, NOAA-Fisheries

Globally we have decidedly moved from the what's, when's and why's to the how's of implementing EBFM. As we get down to brass tacks, it will important to remember four things. First, where along the gradient of processes and approaches are we operating (particularly to address a specific issue)? Second, what type of scientifically-based management advice is needed (i.e., heuristic, tactical or strategic)? Third, given the array of tools now available—regardless of data availability, information gaps, uncertainty, and similar such things—we can and should start attempting EBFM. Finally, some allowance should be made for an integrated, systemic view so as to coordinate among biota, processes, fisheries, and the broad range of tradeoffs that need to be addressed when considering EBFM, and certainly for multi-sector considerations for EBM. Keeping those things in mind, in this presentation I will present examples and cases studies from the NEUS LME showing: those types of problems where an EBFM is effectively requisite; what tools, particularly ecosystem and multispecies models, we are now employing and developing; how we have engaged our stakeholders; how we are beginning to utilize a systemic perspective for managing LMRs in our ecosystem; novel products and deliverables that have helped to convey EBFM related concepts; how this information has been received and taken up in our very formal management process; and how we are adapting organizationally to address these new opportunities. I'll conclude by attempting to provide some pithy and inspirational quotes that affirm that we can do EBFM, in many ways are now attempting to do so, and that we need to escalate the rate at which we do so for improved fisheries management.

Identifying themes and goals for Ecosystem Based Fishery Management in the Hawaiian Archipelagic Marine Ecosystem Research (HAMER) plan.

Dr. Frank A. Parrish
Research Fishery Biologist
Pacific Islands Fisheries Science Center, NOAA Fisheries

A collaborative initiative to identify ecosystem science priorities for the Hawaiian Archipelago was undertaken by regional Federal, State and academic institutions. Fishery science was one aspect of a range of science priorities to understand the archipelago's marine physical and biological environments, their dynamics and their interactions with human beings as a single connected system leading toward improved resource management. The plan outlines an integrated set of themes that uses the Hawaiian Archipelago as an exceptional natural laboratory to address emerging ecosystem issues. Few regions on the planet have the isolation, spatial structure, and research history that are needed to evaluate ecosystem dynamics and function at this scale. The six themes identified as mutually important and relevant to existing and anticipated future management needs in Hawaii included; indicators of change, biodiversity, connectivity, human interactions, resilience, modeling and forecasting.
The plan has been reviewed by an independent panel of ecosystem experts and the themes have been used as the basis of the Papahanamokuakea National Marine Monument science plan. As of yet there is no designated funding for the plan so it currently serves as a framework for the regions interagency research activities and as a basis to integrate with emerging national science initiatives such as CAMEO.

THEME 2: Who's in charge here? Overcoming regulatory barriers to implementation

Ecosystem-based Fishery Management at the Pacific Fishery Management Council: Perspectives from the Front Line

Dr. Donald McIsaac
Executive Director
Pacific Fishery Management Council

Marine fishery regulations in place within United States waters of jurisdiction are developed as required by the Magnuson – Stevens Act and other applicable law. The Regional Fishery Management Councils have been described as the "front line" of this process, as it is in this public decision making forum that new ideas, concepts and scientific information are thoroughly analyzed in the context of potentially changing existing regulations or fishery management policy. On the West Coast, true implementation of a systematic and routine ecosystem-based approach to fishery management decision making needs to occur formally in the Pacific Fishery Management Council (Pacific Council) forum. The Pacific Council is interested in formalizing ecosystem based fishery management via a Fishery Management Plan for at least two reasons: (1) to improve the fishery management performance of the existing four Fishery Management Plans and (2) to include fishery management capabilities for species and habitat not listed in the existing Fishery Management Plans. The Pacific Council does not currently operate within strict single species blinders; several examples of elementary ecosystem-based decision making exist. The Pacific Council has proposed a methodical process to develop an over-arching Ecosystem-based Fishery Management Plan. Barriers to developing this formal Fishery Management Plan, and hence ecosystem-based fishery management off the West Coast in true practice, include lack of funding and clear interpretations of potentially conflicting Magnuson Stevens Act §303 requirements.

Shifting baselines, constant focus: integrating an ecosystem approach into everyday management

Dr. Diana Evans
Fisheries Analyst
North Pacific Fishery Management Council

To get buy-in from all stakeholders, implementation of an ecosystem approach needs to be a gradual rather than a radical change. Trigger events jumpstart new perspectives on resource management, and over a relatively short time, once-innovative ideas get grandfathered into fishery management as standard operating procedures. The Regional Fishery Management Council structure facilitates progressive change, both due to its rotating membership of decisionmakers and the role of stakeholders and the public in the Council process. Specific tools that have been used by the North Pacific Fishery Management Council in recent years to incorporate an ecosystem approach are evaluated for their effectiveness and their feasibility of implementation and enforcement. These include management policy changes, marine zoning, analytical requirements, advisory groups, and a fishery ecosystem plan.

Management, Ecosystems and Ecosystem-based Management of Fisheries in the Gulf of Mexico

Dr. James H. Cowan, Jr.
Professor, Department of Oceanography and Coastal Sciences
Louisiana State University

The Gulf of Mexico is one of the worlds 64 Large Marine Ecosystems, but it is comparatively small and geographically closed relative to many of the other LMEs. That said, it is complex ecosystem; it contains both tropical and subtropical waters and habitats including herbaceous marshes, mangroves and reefs, two distinct zoogeographic provinces, and high a freshwater surplus in the western half of the basin owing to Mississippi River discharge. I use this complexity and historical fisheries data as a backcloth to pose 3 questions to workshop participants: 1) does Ecosystem-based Fisheries Management = Ecosystem-Based Management?; 2) are changes (improvements?) in existing ecological baselines requisite to success?; and 3) if the answer to either 1 or 2 is yes, does the added complexity of ecosystem restoration change the metrics and time course of implementation, and expectations of management outcomes? Further, I am not ashamed to admit that if I knew the answers to these questions, I would not be asking for answers.

Why Does It Take So Long to Implement EBFM?

Dr. David Fluharty
Associate Professor, School of Marine Affairs
University of Washington

Within the fisheries scientific community there is general agreement that Ecosystem Based Fishery Management is the direction to go. While there remains a justifiable scientific debate over what an EBFM might entail the fact that fishery management takes place in an ecosystem context and that we need to respect that fact is critical. The question is why it takes so long to develop a common understanding of EBFM is the topic of this discussion. I examine the precursors to the 1996 Congressional mandate to identify EBFM principles and the subsequent implementation through the US regional fishery management council process. To be certain, there is many a slip between the cup and the lip, however, I offer that significant progress is being made in some regions and that other regions are poised to engage when resources are made available.

Policy, risk and money – EBFM in Australian Commonwealth Fisheries

Dr. Nick Rayns
Executive Manager, Fisheries Management Branch
Australian Fisheries Management Authority

The Australian government has for almost 20 years managed its fisheries within a legal framework of pursuing ecologically sustainable development. It has concurrently stated that output controls are the preferred management method. From 1991 to 2005 the pursuit of both was slow. The reasons for this were an absence of government policy that placed boundaries around acceptable catch/effort levels, no identified cost-effective means of assessing the ecosystem impacts of fishing, a reluctance by the Australian Fisheries Management Authority (AFMA) to act contrary to the position of industry and the Australian government not accepting responsibility for having historically granted too many fishing concessions. While the drivers of change pre-date 2005, from that year until 2008 the fishing industry and fisheries management were transformed. The confluence of applying an affordable ecological risk assessment methodology, a government harvest strategy policy with a target of maximum economic yield and a government sponsored structural adjustment program were the tools of transformation. The result has been a more ecologically sustainable fishery for commercially fished species and a smaller, more profitable industry with a reduced ecological footprint. However, while important advances have been made key steps remain to be taken in 2009-2011. The focus is now on the benthic, community and cumulative impacts of fishing on the marine environment, moving the last major fisheries to output controls and ensuring management settings retain the benefits of recent structural adjustment. This in turn has required some change in skill-sets at AFMA, industry having to engage in increasingly complex fishery assessments and a reconsideration of the regulatory regime in place for Commonwealth fisheries.

Theme 3: Communities and Governance: Social, Research and Legal Systems for EBFM

Administrative Law and Mandates for Ecosystem-Based Fisheries Management

Prof. Josh Eagle, J.D.
Assistant Professor of Law
University of South Carolina School of Law

Most discussions of ecosystem-based fisheries management (EBFM) center on questions such as: Will EBFM produce better results than more traditional approaches to fisheries management? Or, is EBFM scientifically and economically feasible? Perhaps because these discussions have taken place in science and policy fora, there has been very little conversation about EBFM within the context of law. Although one can argue that Federal and State agencies could implement EBFM to some extent without changes to existing statutes, it is clear that most of those statutes were not designed to mandate or facilitate EBFM. Thus, there is probably a need for new or amended laws. EBFM presents some typical and some not-so-typical challenges with respect to statutory design. While many EBFM principles, e.g., adaptive management and the consideration of a broad range of impacts, lead toward the conclusion that statutes must be vague in order to be effective, statutory vagueness creates its own set of problems, most notably the possibility that the statute might not actually lead to EBFM. In this presentation, I will provide a brief overview of the relationship between legislatures, agencies, and courts in the implementation of environmental law. Then, I will explore the trade-offs among different approaches to the design of law meant to guide implementation of EBFM.

Applying ecosystem-based management in Puget Sound: Including the human element

Dr. Mary Ruckelshaus
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Northwest Fisheries Science Center, NOAA-Fisheries

Definitions of ecosystem-based management (EBM) abound, but all point to the need to include humans in framing the problem and outlining strategies to achieve system objectives. There is a rich history of including humans in science underpinning fishery management (e.g., humans as mortality agents and decision makers adjusting effort), but such experience in broader ecosystem-based approaches is much sparser. An EBM effort in Puget Sound—The Puget Sound Partnership—is charged with ensuring the sustainability of 'thriving natural and human systems' in the region. The Partnership is incorporating human well-being into design of a system-wide recovery approach; and has produced the first iteration of its "Action Agenda", a roadmap outlining its 6 human and natural system goals and priority near-term strategies to achieve those objectives. I will give examples illustrating how results from ecosystem models of marine food webs and ecosystem services produced by nearshore habitats can support development of indicators and strategies for the EBM effort in Puget Sound.

Scaling up, scaling down: Linking community-based stewardship to the needs of fishery management

Dr. Selina S. Heppell
Associate Professor, Department of Fisheries and Wildlife
Oregon State University

The best examples of "ecosystem-based management thinking" and on-the-ground action are illustrated by the initiatives of local communities and small cooperatives. Efforts like the designation of the Port Orford Stewardship Area show the power of cooperative thinking by individuals who depend on their local resources and know the local conditions best. Not surprisingly, these "bottom-up" efforts are small in spatial scale, relative to the California Current Large Marine Ecosystem, and small in influence, relative to the coastwide decision making of the Pacific Fisheries Management Council. How can we better connect local monitoring and conservation efforts to the assessment and management needs of the west coast? There are pragmatic limitations to "scaling up" local information on processes that may be highly variable in space and time, or even irrelevant at the system-wide scale, despite their importance to local fisheries. However, issues of scale and relevance have been discussed and often successfully dealt with by ecologists and economists for decades. If properly collected and documented, small scale information on physical, biological, and economic conditions can contribute to our chosen path towards ecosystem-based management, without requiring a massive re-tooling of current assessment efforts. Meanwhile, large scale management needs can be made more relevant to local communities through better communication and acknowledgement of local conditions. Information sharing of survey results and data on biophysical processes and system connectivity can be made available to scientists and fishermen working in specific areas. Creativity and collaboration is essential – stewardship and data gathering must be incentive-based, with reasonable allocation of resources and assurance that individual efforts will lead to improvements in science-based management that truly considers local data and variability. The key is finding ways to link our local efforts and make better use of the information we have and could gather with limited resources, with careful consideration of rigor in the integration of local data.

Concluding Remarks:

The future of EBFM and Fisheries Management

Dr. Ray Hilborn
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University of Washington

There are three obvious steps that many jurisdictions are adopting as part of EBM. First and foremost is to reduce fishing mortality rates on single species to values that are as low or lower than would produce single species MSY. Second is avoiding by-catch of threatened, and endangered species. Third is prohibition of bottom contact gear such as trawls and dredges in sensitive habitats such as corals. Other steps that seem to be widely accepted include consideration of ecosystem wide impacts of fisheries regulations, that may lead to much more spatial zoning and potentially protection of forage species. These moves can be seen as a rather minor modification of single species management and not a major shift in perspective.

We can construct a dichotomous straw-man contest between static equilibrium single species models and a dynamic non-equilibrium view of ecosystems and ecosystem management. In this context the question arises regarding the extent to which agencies should rely on ecosystem models. It is hard to imagine using ecosystem models in a prescriptive way unless there was consensus on the ecosystem objectives sufficiently well defined to actually be prescriptive. I suspect that over the next decade the ecosystem models will be used more to guide and potentially adjust single species reference points. Perhaps the greatest challenge of an ecosystem view to the single species machinery is the reliance of many single species reference points on the concept of unfished equilibrium that almost universally ignores trophic interactions. As more ecosystems rebuild under lower fishing mortality rates ecosystem model suggest that to achieve limit biomass reference points on all species the loss of sustainable yield will be great, perhaps exceeding 50% of potential yield. How do societies choose between alternative "configurations" of ecosystems such as groundfish dominated vs invertebrate dominated?

Some interesting issues of EMB, perhaps because of their controversial nature, is explicit recognition that fishing communities are part of the ecosystem, the potential for planned depletion of some species to enhance the productivity of other species, and moving to much smaller scale management of less mobile species.