



Conference Findings

The following conference “findings”—128 of them—were developed during the conference discussion sessions. Wording was refined by the session chairs and rapporteurs at the conference, and reported on the last day of the conference.

A “finding” was defined as “a legislative, regulatory, or policy change, or idea for improvement identified by session participants as a priority for advancing fishery management and sustainability. A finding could be an endorsement of a regional idea for consideration as a best practice across multiple regions; a modification to the Magnuson-Stevens Act (MSA), other law or policy, to improve an outcome, to remove an existing impediment, or establish a new management tool; a regulatory strategy or implementation guidance to improve an outcome under existing MSA requirements; and/or change in behavior or process needed to improve fisheries management.”

The findings are listed as they were presented at the Managing Our Nation’s Fisheries 3 conference. They are not in priority order and are not intended to reflect or imply consensus among the panelists, and may therefore be complementary or contradictory.

Session 1 Findings: Improving Fishery Management Essentials

TOPIC 1: ANNUAL CATCH LIMIT SCIENCE AND IMPLEMENTATION ISSUES, INCLUDING MANAGING “DATA-LIMITED” STOCKS

- Consider multi-year minimum stock size thresholds and annual catch limit (ACL) framework
- Phase in ACL changes
- Constrain large inter-annual changes in ACLs
- Do not base overfished determination on single year estimate
- Allow and provide guidance for using the mixed stock exemption
- Use management strategy evaluation to evaluate the performance of harvest control rules
- Provide better guidance on setting ACLs for transboundary stocks where no international treaty exists and only U.S. removals are known

DIFFERENT TOOLS AND STRATEGIES FOR MANAGING RECREATIONAL FISHERIES

- Eliminate hard quotas managed in-season for recreational stocks. Adjust pre-season input controls (e.g., bag limits, seasons) to stay within ACL (based on numbers of fish, not poundage)
- Manage with long-term mortality rates for more stability (e.g. eliminate wide fluctuations in catch limits)

ASSESSMENTS AND DATA-POOR STOCKS

- Prioritize assessment of target stocks over non-target stocks
- Set minimum data quality standards for stock assessment
- Do not require ACLs for data-poor stocks
- Improve data-poor assessment methods
- Consider default buffer (e.g., 75 percent maximum fishing mortality threshold)
- More than one indicator species in a complex leads to better estimate of stock status

TOPIC 2: REBUILDING PROGRAM REQUIREMENTS AND TIMELINES

- Revise rebuilding time requirements
- Always set T_{MAX} equal to T_{MIN} plus one mean generation

- Set exploitation rates less than F_{MSY} and rebuilding will occur naturally over time
- Refine and include the mixed stock exception in the Magnuson-Stevens Act (MSA); harvest of one species at its optimal level may result in overfishing another stock, only if strict criteria are met
- Stocks later determined to have never been overfished should no longer be subject to rebuilding requirements
- Replace the term “overfished” with “depleted” (status may not be due to excessive fishing)

MODIFY MSA TO PROVIDE FLEXIBILITY

- Establish a standardized process for reviewing rebuilding progress
- Maintain an existing rebuilding plan when minor changes occur in estimated T_{TARGET}
- Address social and economic issues (e.g., “possible” to “practicable”)
- Extend annual species exemption to short-lived species
- Allow a transboundary exemption when a significant proportion of the stock is outside U.S. jurisdiction
- Increase the frequency and quality of stock assessments and rebuilding analyses and incorporate ecosystem dynamics; recognize limitations of science
- Don’t chase noise: Assessments and projections will always be uncertain; develop smoothing strategies to provide stability
- Utilize management strategy evaluation tools to evaluate stock rebuilding approaches
- Develop harvest control rules that incorporate rebuilding provisions; early investments increase the probability of success

TOPIC 3: INTERNATIONAL FISHERIES MANAGEMENT: LEVELING THE PLAYING FIELD

INTERNATIONAL COOPERATION AND ASSISTANCE

- Help developing countries build fishery management and enforcement capacity
- Support immediate adoption of appropriate target and limit reference points by regional fisheries management organizations (RFMOs)
- Environmental nongovernmental organizations should continue to leverage compliance with RFMO conservation measures (e.g. through supply chains)

COMBAT IUU FISHING

- Increase support for at-sea and in port monitoring and enforcement
- Broaden trade sanctions domestically and within RFMOs to address non-compliance
- Implement stricter imported seafood labeling requirements in the U.S. market
- Ratify Port State Measures Agreement
- Amend MSA to change “vessels” to “vessel” in the illegal, unreported and unregulated certification section

PROMOTE MEASURES TO REDUCE OVERCAPACITY

- Fishery rationalization (e.g., catch shares)
- Restrict national subsidies for fuel and vessel construction
- Limit vessel numbers by RFMO member states

COMMUNICATION AND STAKEHOLDER ENGAGEMENT

- Improve communication among U.S. delegations across tuna RFMOs (e.g. Western and Central Pacific Fisheries Commission, Inter-American Tropical Tuna Commission, International Commission for the Conservation of Atlantic Tunas)
- Maximize participation of fishermen and other stakeholders in U.S. RFMO delegations

OTHER FINDINGS

- Consider a national sustainable seafood certification program
- RFMOs should consider transfer effects when developing conservation and management measures
- RFMOs should adopt measures that reward compliance (e.g. quota allocations)

Session 2 Findings: Advancing Ecosystem-Based Decision Making

TOPIC 1: ASSESSING ECOSYSTEM EFFECTS AND ADAPTING TO CLIMATE CHANGE

- Evaluate ecosystem productivity change
- Evaluate effectiveness and utility of closed/fixed areas
- Engage across disciplines and increase coordination between National Marine Fisheries Service (NMFS), Councils, Science Centers, stakeholders, other governmental agencies
- Increase reliance on industry while shifting Councils' roles in evaluating effectiveness
- Consider broad range of ecosystem services
- Build capacity throughout the fishery management system to use new tools to advance ecosystem-based decision-making
- Establish ecosystem Scientific and Statistical Committee at the Council level.
- Invest in ecosystem-based management (i.e., advancing scientific models, training staff) and identify and remove impediments to the transition from single-species to ecosystem-based management

ASSESSING ECOSYSTEM EFFECTS AND INTEGRATING CLIMATE CHANGE

- Address the root causes of climate change, as MSA is a limited tool and addresses mainly symptoms
- Increase coordination between and across jurisdictions to address changing species distribution and ecosystem change (Regional Councils, states, and international)

PRECAUTIONARY AND ADAPTIVE MANAGEMENT

- Flexibility to respond to spatial, allocative and distributional effects of climate change
- Address rebuilding requirements when environmental conditions may be a predominate factor in a stock's decline
- Assess barriers to adaptation (fishing communities and fish stocks)
- Utilize a precautionary approach for developing/emerging fisheries
- Recognize and manage in response to ecosystem productivity change
- Develop a comprehensive national plan and tools which facilitate development of regional management strategies
- Incorporate environmental trigger mechanism to initiate management action/measure
- Evaluate effectiveness and utility of closed/fixed areas
- Modify reference points as climate changes (precautionary vs. recalibrating maximum sustainable yield [MSY])
- Endangered Species Act: Base listings on actual trends rather than projected trends of climate change
- Assess the efficacy of the National Ocean Policy as a vehicle to address climate change

INTEGRATED ECOSYSTEM ASSESSMENTS

- Integrate Integrated Ecosystem Assessments and all component models into management process
- Derive less data and resource intensive tools for use in management process
- Develop ecosystem models, tools and assessments at a regional level that:
 - Synthesize existing data from non-fishing sources and incorporate socio-economic as well as ecosystem parameters
 - Respond to changing parameters
 - Predict future ecosystem states
 - Provide short- and long-term guidance
 - Account for cumulative impacts of climate change
- Develop decision support tools that allow councils to develop responses to a wide range of uncertainty (such as management strategy evaluation)

TOPIC 2: FORAGE FISH MANAGEMENT

- No changes to MSA are necessary to sustainably manage forage fish
- Establish a new National Standard to ensure adequate forage base
- Require explicit consideration of the impact of forage fish to the ecosystem and fishing communities to inform optimum yield (OY) and ACL decisions
- Prohibit new forage fisheries until scientific and management evaluation are conducted
- Define forage at the Regional Council level
- Use threshold harvest control rules to adopt ecologically-based reference points

- Implement real time data collection to inform adaptive management
- Require scientists to provide managers with an index of key forage species abundance
- Establish an ecosystem Scientific and Statistical Committee at the Council level
- Invest in ecosystem-based fisheries management

BEST PRACTICES

- Improve inter-jurisdictional collaboration and coordination on forage fish management.
- Use meta-analysis/global studies and rules of thumb as a starting point in discussions for forage fish management or as a guide in data poor situations
- Advance tools and develop methodologies to:
 - Evaluate tradeoffs between uses of forage
 - Account for the needs of predators when doing stock assessments and ACLs;
 - Estimate the varying and complex economic value of forage fish;
 - Measure localized depletion; and
 - Evaluate effects of climate change on forage

TOPIC 3: INTEGRATING HABITAT CONSIDERATIONS: OPPORTUNITIES AND IMPEDIMENTS

- Consider a National Standard for habitat: “Minimize adverse impacts on essential fish habitat (EFH) to the extent practicable”
- Build partnerships to achieve landscape and ecosystem level habitat improvements
- Improve understanding of relationships between habitat and productivity to support identification and evaluation of tradeoffs
- Resolve status of artificial substrates with regard to EFH designation
- Establish a timeline for improving the scientific basis for designation of EFH for key species and habitats
- Maintain and strengthen the EFH designation process by developing objectives and metrics for successful habitat protection
- Define “essential” habitat more broadly
- Shift interpretation of EFH from single-species to multispecies and ecosystem focus
- Set measurable conservation objectives and utilize a “common currency” to evaluate adverse and cumulative impacts
- Identify priority habitats that benefit fisheries, focus habitat research
- Provide guidance on “minimize to the extent practicable adverse impacts...caused by fishing” and consider relationship to OY
- Strengthen EFH consultation process and ensure compliance with and effectiveness of existing laws and recommendations
- Develop a long-term, standardized process for monitoring and evaluating habitat to es-

establish a baseline, assess long term impacts, and support rapid response to non-fishing habitat impacts

- Provide tools other than spatial closures for addressing adverse impacts from fishing

Session 3 Findings: Providing for Fishing Community Stability

TOPIC 1: RECREATIONAL AND SUBSISTENCE FISHERY CONNECTIONS

- Idea to be replicated/expanded: Scientists can learn much more from fishing community via greater use of cooperative research. This promotes buy-in, empowers fishermen, and can be more cost-effective
- Fishermen want to be involved with data analysis as well—provides legitimacy to the process and helps build trust
- Councils and NMFS need new creative communication strategies and investments to reach, engage, and support underrepresented fishermen’s participation in process
- Goals specific to each sector and stakeholder group need identification, early in the process, to customize development of a suite of fishery management strategies
- Allocations are not “permanent.” Need to be more proactive in routine review and modification as needed. Decisions should be left to the regions, and creative solutions may result from constructive dialog between sectors
- Recreational and subsistence considerations need higher priority in fishery management policy choices, and in other policy arenas that affect fisheries (e.g., alternative energy)
- Define subsistence fishing in the MSA, and expand recognition of tribes and indigenous people engaged in subsistence fishing
- Qualitative information vs. quantitative. Need more thought/guidance on how to utilize both in fishery management decisions
- Need better data. Target ledger-type submissions and other data collections as condition of access/use of a public trust resource

TOPIC 2: INTEGRATING COMMUNITY PROTECTION, JOBS EMPHASIS, AND DOMESTIC SEAFOOD QUALITY ASSURANCE

- Create, modify and promote financial tools and training to support small and community-based borrowers (e.g., NOAA Fisheries Finance Program, California Fisheries Fund)
- Resolve institutional impediments to fisheries commerce (e.g., establish central registry to facilitate lending; improve aquaculture permitting process)
- Link ecosystem-based management scales to fisheries management and governance (e.g. revise National Standard 3 [management unit])
- Link fishery participation to stewardship obligation
- Need policy statement on devolving governance
- Preserving the past is not always the best path forward

- Diversify Council management actions to accommodate differences between small and large-scale operators (e.g., mobility of fleet, business models, supply needs)
- Anchor quota in communities (utilize ecosystem-based management, Community Fishing Associations)
- Devolve more responsibilities and accountability to communities and industry, engage in science via cooperative research
- Elevate and promote best practices; become a learning organization (e.g. state examples, Fisheries Improvement Projects, National Fish & Wildlife Foundation funded projects)
- Modify Council process to improve participation of small-scale and community sectors
- Cooperative research results needs to be more fully incorporated into management
- Recognize certification of U.S. fisheries that meet the 10 MSA national standards
- Need end-end streamlined regulatory process for aquaculture
- Wild harvest and aquaculture, more similar than different, both needed to meet supply needs, attain economic objectives

TOPIC 3: ASSESSMENT AND INTEGRATION OF SOCIAL AND ECONOMIC TRADEOFFS

- MSA needs to incentivize response to challenges, population growth, climate change, globalization, and budget cuts
- MSA needs to complement other ocean users and relevant statutes that affect fisheries management, such as Endangered Species Act, Clean Water Act
- Give full consideration to impacts from other uses/users for marine resources (non-fisheries)
- MSA should explicitly promote use of adaptive management approaches, particularly for data-poor species where the precautionary approach limits information on stock performance under higher catch rates
- Need to define, identify sideboards and metrics of elements of OY; redefine OY/MSY relationship to no longer be one direction, and social, economic and non-economic values could allow OY to be above MSY
- Expand socioeconomic analysis requirements to include economic value and non-market value quantification
- Trade-off analysis requires giving higher priority than other disciplines for acquiring additional capacity in social scientists including anthropologists, sociologists, and economists at Councils, regional offices and/or externally
- Facilitate cooperation and partnerships with states, local governments, and other agencies
- Improve engagement with competing sectors in scoping process
- Develop mitigation plans to reduce impacts on communities due to management actions

- Reform MSA confidentiality provisions, access to data from public trust resource users while protecting sensitive information

ALLOCATIONS

- MSA mandate for Councils to consider review of recreational and commercial allocations every {x} years after scoping allocations based on a set of objective guidelines
- NOAA standardized methods on how to review allocations
- Improve NOAA support for allocation reviews (contracted analysts/economists)



Reactions Panel Summary

The conference concluded with a presentation of the concurrent session findings to a panel of distinguished and influential persons in the fisheries management arena. This “Reactions Panel” was asked to provide their initial reactions to the conference conclusions, including their views on the merits of the recommendations, the feasibility of acting on the findings, and ways to improve or clarify the conclusions.

Reactions Panel Summary

Bonnie McCay, Board of Governors Distinguished Service Professor, Rutgers University

SOCIO-ECONOMIC ACADEMICS PERSPECTIVE

We are often reminded that fisheries are a classic case of the tragedy of the commons and thus are in need of governance. However, governance goes beyond simply government, as reflected in the innovations of the Magnuson Act (MSA) and the highly participatory regional fishery management process, where government officials as well as citizens have a voice in fisheries management. A strong message of this conference has been the importance of public/private partnerships, co-management, and community-based initiatives: a “communing of the commons,” as Barton Seaver put it, or a recognition of the roles of humans in natural systems, including response to change. “If we can destroy, we can restore and heal.”



Management mistakes are often the result of reduced capacity to adapt to change, or arise from a loss of access by those dependent on resources—those with useful knowledge who are in a position to be stewards. The issue of access for economic, social, and cultural purposes is another strong theme of the conference. As we continue to rebuild stocks, we need to ask whether our biological successes have resulted in acceptable economic, social, and cultural outcomes, including fair and equitable access.

The United States is unique and fortunate in having legislation, such as National Standard 8, that explicitly brings communities into the framework of fishery management. Determining the implementation and effectiveness of these provisions raises questions. Do the goals of stock conservation and rebuilding under National Standard 1 take precedence over National Standard 8? How can we improve the assessment and consideration of community impacts in management decisions? Does our strong preference for the best available science create a bias for quantitative biological and economic values and relatively large-scale fisheries and communities? Can the MSA better acknowledge the role and currency of qualitative data and the experience-based knowledge of fishermen?

The emergence of community-based initiatives in marketing, management, and cooperative research, such as risk pools, community-supported approaches, and permit banks is a testimony to the cooperative social roles of local leaders, non-governmental organizations, foundations, governments, and communities: the “comedy of the commons.” MSA reauthorization should consider the recurring emphasis at this conference on decentralization of fishery management authority, and should recognize and encourage localized initiatives. A local approach can help protect smaller communities from the adverse effects of market-based management systems and can encourage ecosystem-based approaches at the appropriate small scale. MSA language regarding limited access privilege programs could be improved to make them less onerous and more conducive to local, cooperative, community approaches.

In closing, fishery management should move towards a more local approach with a serious focus on emerging challenges that calls for innovation and action at multiple scales—from the very large, such as response to climate change—down to the very small: the fishing crews and families, the seafood businesses, and local communities that are on the front line of trying to cope, adapt, and innovate.

Bob Hayes, General Counsel of the Coastal Conservation Association and the Center for Coastal Conservation

RECREATIONAL FISHING INDUSTRY PERSPECTIVE

The word “recreation” has been more prevalent at this conference than at any other Managing Our Nation’s Fisheries conference, and has appeared more times this week than it appears in the Magnuson Act. This is a direct result of the leadership of Eric Schwaab, Sam Rauch, and others at the National Marine Fisheries Service. There have been many analogies this week to “tsunamis” on the horizon—looming changes in fisheries management. Two significant changes to consider are demographics and budgets.

Regarding demographics, many in the “baby boomer” generation are about to retire, many of them to coastal areas. Although not all retirees will take up recreational fishing, many will. An expanding retirement community, combined with general population growth, will likely add to the pressures on our resources and our Federal fisheries management system.

Budgets have been shrinking and spending has been curtailed, a situation that is not likely to change dramatically in the near future. There will likely be an increase in inflation that will reduce what can be done with already limited funds.

From the perspective of recreational fisheries and with a changing landscape in this country, I would like to offer the following solutions.

We should enhance state management of our fishery resources. There are many stocks that are not directly managed by the Federal government, and this model could be expanded. The time has come to ask who should manage our fisheries. Many species occur primarily in state waters, and yet are unnecessarily subject to the statutory requirements of the Magnuson Act.

The Magnuson Act has largely focused on commercial fisheries for decades, and is only recently beginning to consider the unique role of recreational fisheries. Prevalent thinking for years has been that recreational fisheries were largely state-managed and would not become part of the Federal process. Today, many recreational fisheries are overencumbered with regulations and policies that were shaped with commercial fisheries in mind.

Prescriptive management requires good data and good data collection systems, for recreational fisheries are expensive. Trying to improve data collection by simply redesigning or renaming sampling programs without significantly increasing available funds is futile; a fool’s errand. Recreational fisheries are increasingly held accountable for more detailed information and restricted by quotas, while Federal budgets for increased sampling are slow in coming or do not yet exist. You have to manage to the data you have.

Allocation is currently frozen. Not allocations between commercial gear types or geographic areas; these types of negotiations are relatively common. Allocations between recreational and commercial fishery sectors are in need of review and are often neglected because they are difficult to negotiate without substantial disagreement and deliberation. Therefore, the Magnuson Act should be revised to require routine review and potential revision of recreational and commercial sector allocations.

Lee Crockett, Director of Federal Fisheries Policy, Pew Charitable Trusts

ENVIRONMENTAL NON-GOVERNMENTAL ORGANIZATIONS PERSPECTIVE

First, we should take stock and not lose sight of the conservation successes of the Magnuson Act. Since 2000, 32 stocks have been fully rebuilt and the number of stocks subject to overfishing has been cut in half since National Marine Fisheries Service started publishing the status of stocks. Clearly, we have made substantial progress since rebuilding requirements were added to the act in 1996 and with the annual catch limit requirements of 2006. These successes should not be forgotten as we consider Magnuson Act changes that build on these successes rather than undercut them.



A recurring theme of the conference has been a call for flexibility, particularly in regard to stock rebuilding requirements. It is unclear what is meant by flexibility. Many of the examples put forward this week can be accomplished through policy guidance or modifications to National Standard 1 guidelines. There was a good deal of flexibility in the Magnuson Act prior to 1996, flexibility that allowed stocks to remain depleted and overfishing practices to go unchecked. Flexibility often means lengthy and delayed rebuilding plans. It can be argued that the Magnuson Act already provides considerable flexibility when many of rebuilding targets are in excess of 50 years and the average rebuilding time across all depleted stocks is 19 years.

What is lost in the discussion is the economic and environmental costs of delayed rebuilding. According to National Marine Fisheries Service, the economic benefit of rebuilding all depleted stocks is 32 billion dollars and 500,000 jobs per year. The environmental costs of depleted stocks include increased vulnerability to natural population fluctuations and climate change.

In conclusion, we should build on our successes. The environmental community is supportive of many recommendations we heard this week, including decreased reliance on single-species management, and increased protections for habitat and forage species. As fisheries and resources adapt to climate change, we should take a precautionary approach to the development of new fisheries. We need to change our “fish first and ask questions later” philosophy. Our oceans and the fish in them are a public resource. There is widespread support for the conservation of ocean resources. We all want abundant fish, sustainable fisheries, and vibrant oceans.



Stephanie Madsen, Executive Director of the At-Sea Processors Association

COMMERCIAL FISHING INDUSTRY PERSPECTIVE

Representing commercial fisheries from around the U.S. is a daunting task. Having participated in all three national conferences, it has been interesting to note that this year's conference has not emphasized a strong need for changes to the Magnuson Act. This is not a reflection on the productivity of this conference, but a finding that things are working well and perhaps we need to focus on existing provisions that are not fully utilized or are still in need of implementation. Many of the findings would not require a statutory change and could be addressed through policy or regulatory mechanisms. A good suggestion from the conference is to study these findings through the lens of the “three i’s”: intent, interpretation, and implementation.

The economic environment we live in will require us to do more with less. We need to take a hard look at costs: not just to government agencies, but also to stakeholders, communities, and the public. Additional requirements designed to force action, such as the recommendations to establish a National Standard on habitat or to require expanded socioeconomic analyses, should be carefully reviewed because the benefits may not outweigh the costs. These are worthy goals, but existing provisions present the means to achieve them without the burden of costly requirements.

It will become increasingly important to find cost-effective mechanisms to address data and research needs. Cooperative research and management efforts have been discussed and recommended this week, and yet the Magnuson Act already provides the authority for this important tool, and there are examples of effective implementation in Alaska and other areas. It is not about a loss of governmental authority, but rather a cost-effective shared burden with industry for data collection, monitoring, and reporting.

Regional Fishery Management Councils should be in the practice of identifying objectives when recommending fishery policies and programs. Calls for program reviews have been made this week, but the efficacy of a program can be hard to assess if there are not clearly established objectives. The old saying is true, “if you don't know where you are going, any path will get you there.”

A strong theme this week has been a call for more responsive and adaptive management in the face of changing environments. However, our regulatory process is cumbersome and in need of streamlining if we are truly going to have an adaptive system. Streamlining our management regime is a challenge because it is difficult to simplify management actions without limiting public input and/or disenfranchising stakeholders.

We have also heard a call for an MSA certification process. Fishery certifications have proven useful, but they come at a high cost and can have limited benefits to a fishery if the certification does not garner wide support from processors and buyers and meet the needs of customers. With limited resources, it would be better to invest in enhanced stock assessment efforts. Assessments are at the core of fishery management.

In closing, we need to maintain the ability to manage in response to regional differences, and we need to align our expectations with the economic realities we are facing.

Ed Johnstone, Policy Representative for the Quinault Indian Nation

INDIGENOUS PEOPLE PERSPECTIVE

Indigenous people have had a difficult history and are proud to participate in the conference and to have a role in the process. The rights and responsibilities the tribes have today are the result of hard fought battles, forward thinking organization, and mutual support between tribes. Coordination and support continue to be one of the keys to maintaining tribal and subsistence opportunities. Subsistence fisheries should have a high priority when setting fishing policy because those communities are not catching fish for sport or for profit, they are fishing to survive. Too often, a gauntlet of fisheries is allowed to proceed ahead of a subsistence fishery that is curtailed to meet management objectives.

The tribes have long been proponents of ecosystem-based management approaches and brought the idea to both the Regional Fishery Management Councils and National Marine Fisheries Service ten years ago. Area management, a broad perspective, and local knowledge have been a large part of tribal resource management over long time spans. The tribes are very supportive of maintaining healthy communities, both tribal and non-tribal. We have a shared responsibility to maintain that economy and to manage our stocks for thousands of years.

The tribes strive to ensure that treaty rights are respected and not forgotten. The tribes of the Pacific Northwest have a proud tradition with the Pacific Council where tribal ideas and concerns are considered, where co-management has been a success. This reality did not come easily and it has been a long struggle, but it has been rewarding to see indifference give way to cooperation.

Randy Fisher, Executive Director of the Pacific States Marine Fisheries Commission

INTERSTATE MARINE FISHERIES COMMISSIONS PERSPECTIVE

The Atlantic, Gulf, and Pacific Marine Fisheries Commissions are heavily involved with data programs in support of fisheries management. Interstate Marine Fisheries Commissions are able to lobby Congress and do so in support of funding for the data collection that is critical to management.

The findings from this week's conference indeed imply that the Magnuson Act has been a success and is not in need of major revision. As it has been noted, many of the findings are important improvements that can be implemented under the existing authorities and provisions of the act. Budgets are a major concern from the perspective of the commissions. Prioritizing and implementing these findings will require tradeoffs, and available funding will be a key factor in that process.

An ecosystem approach to fishery management has been a consistent theme and topic this week. In many ways, the Regional Fishery Management Councils are already engaged in ecosystem-based fishery management. However, the specifics of ecosystem-based management are undefined, and the complexities of such a broad perspective make it difficult to implement on land and even more difficult to implement in our oceans.

Regional differences are important because programs that work in one region may not in another. On the Pacific coast, we are lucky to have strong data collection systems in place for recreational fisheries, but discussions with other commissions indicate that similar systems would be difficult to implement in other parts of the country.

Three words come to mind when considering the need to revise the Magnuson Act: creative, committed and compe-



tent. The conference findings have touched on issues that may be best addressed through creative implementation of the existing Act. There is no doubt, as evidenced by the strong work this week, that there are many people committed to fishery management. It is worth noting that the conference has not resulted in a great deal of criticism of National Marine Fisheries Service. At the core of our competency is the quality of our data and the degree to which our data is trusted and supports good decisions. Fishery management is becoming more and more complex and detailed, requiring more and more data to support it. In response, expectations are high and we may not be able to meet them with available resources.



Philip Anderson, Director of the Washington Department of Fish and Wildlife

STATE FISH AND WILDLIFE AGENCIES PERSPECTIVE

There is a stark contrast between this conference and the first two Managing Our Nation's Fisheries conferences of 2003 and 2005. The first two conferences focused more on defending the Regional Fishery Management Council system against a multitude of people who were finding fault in the way fishery management was being done. At this conference, we are on the offensive. We are demonstrating our successes, but more importantly we are looking for ways to improve.

If we leave this conference with a set of findings that can be chosen to best fit regional needs, the conference will have been a huge success.

The states have played a very important role in the regional fishery management system. Washington participates in both the Pacific and North Pacific Council forums. It has been a successful and mutually beneficial partnership.

Several of the findings jump out as an easy choice for improvement. As mentioned earlier, stock assessments are the foundation from which we build our fishery management systems, and increasing the quality and number of stock assessments and developing ways to improve on those stocks that are not data-rich or are unassessed is an obvious improvement. Promoting regimes that reduce overcapacity is imperative, and has been the focus of a West Coast collaboration to implement catch share programs. Coordination between Councils, the Regional Fisheries Science Centers, and the states is particularly important and, as we have learned on the West Coast, takes commitment. If Mr. John Royal, a founding member of the Pacific Council, were here, he would join me in supporting the finding that urges improved international collaboration on forage fish, because John was a strong advocate for better coordination with Mexico on Pacific sardines.

The need to react to climate change and ocean acidification in a timely way is an important finding that will require us to streamline and harmonize our regulatory regimes. It is simply unacceptable that it currently takes 18 months to update harvest specifications for groundfish on the West Coast. It is critical that we find a way to maintain our open and transparent process while adapting our management measures in a more timely fashion. Forage fish management is critical to our success, and fishing must be limited to those instances where we have solid information about those forage fish species and the ecosystem needs of those species before we authorize fisheries, particularly new fisheries.

Despite significant investment and effort, we are losing habitat in the Pacific Northwest faster than we can restore it. Essential fish habitat and its consultation requirements have been largely ineffective at making substantial change. We need to be more effective at influencing those with the regulatory authority to protect, preserve and restore our important habitats.

Finally, as it has been said at this conference that "preserving the past is not always the best path forward." This is true now more than ever. With climate change well on its way, we need to develop ways to anticipate those changes and modify the way we manage. Standing still in the face of climate change will be like standing still on a descending escalator: we will continue to move backward. We can't afford to move backward.

Rick Robins, Chairman of the Mid-Atlantic Fishery Management Council

REGIONAL FISHERY MANAGEMENT COUNCILS PERSPECTIVE

The United States has the strongest fishery management system in the world. We should affirm our core strengths. We have a system that prevents overfishing and consistently rebuilds overfished stocks. Despite these successes, there is lingering sense that U.S. fishermen and fisheries have been vilified. This deserves to be corrected; U.S. fishermen fishing under today's Magnuson Act should stand tall. In a market transformed by globalization, the sustainability of U.S. fisheries needs to be affirmed, and the finding to develop a certification process warrants further exploration.

A recurring theme at this conference has been a call to maintain a big picture perspective, particularly when you consider the strong influence that climate change is likely to have on our fisheries and fishing communities. Our fisheries may be like canaries in a coal mine that we don't operate, but we need to prepare for changing environmental conditions, and we should engage our scientific resources to better understand the vulnerabilities of our ecosystems.

When Council members take their oath of office, they agree to manage fisheries to the greatest overall benefit to the nation. This concept resides explicitly in the definition of optimum yield and lies at the very heart of the Magnuson Act. The concept is broader than biological yield; it includes social, economic, and ecological considerations. It is time to assess whether we are truly achieving the greatest overall benefit to the nation. This week's discussions clearly show an interest in applying greater flexibility, and most agree this can be done through fine-tuning rather than re-writing the Magnuson Act. Collective success in rebuilding stocks indicates that modifications to the current system should preserve its integrity and improve sustainability.

Carefully crafted and targeted flexibility in the Magnuson Act or its implementation could facilitate several important outcomes. Examples offered this week include improving regulatory stability and preventing abrupt disruptions to fisheries by providing more tempered responses to stock assessment results, improving stability in recreational fisheries by managing for a rate of removal and allowing more flexibility in our response to recreational catch estimates, and exploring rebuilding flexibility by gaining a broad consideration of social, ecological, and biological tradeoffs, particularly when ecological forces are impeding recovery. In many cases we have been highly successful at rebuilding stocks when defined by biological terms, but these successes often come at the expense of the economic resilience of our coastal communities.

Many agree that high quality and timely stock assessments are critical to our successful management, but we will need to develop careful strategies in this fiscally-limited environment to ensure we have adequate scientific support.

We need to continue to build on our effective interjurisdictional coordination, not only with the states on domestic fisheries, but also at the international level to ensure positive outcomes for U.S. fisheries operating under the Magnuson Act's gold standard.

There is a growing interest in incorporating ecosystem approaches in fisheries management, but these approaches should be supported through a transparent evaluation of costs, benefits, and tradeoffs, including non-market values.

The U.S. has the strongest fishery management system in the world, and we can make it better. Chef Barton Seaver said, "it's about what we want for dinner." I would add that we need to provide recreational access that sustains a healthy recreational fishing industry and a healthy ecosystem. We need to define and pursue success in terms that result in the management of fisheries to the greatest overall benefit to the nation—not just in biological terms but socially, economically, and ecologically. As strong as the system is, we can improve it by working together to fine-tune the Magnuson Act, its implementation, and our practices.

We can make it better. Let's get started.





Sam Rauch, Acting Assistant Administrator, NOAA

NATIONAL MARINE FISHERIES SERVICE PERSPECTIVE

This has been a successful conference that has been approached by most everyone involved in a professional, constructive, thought-provoking manner. This has resulted in far too many good findings to respond to in the allotted time. Many of the findings do not require any statutory or regulatory changes; they just need to be put into practice. Others require National Marine Fisheries Service to adopt corresponding regulations or policies. And there are a few that may require legislative action. National Marine Fisheries Service intends to meet the challenge head on.

Among the themes we heard this week is the need for sustainability and the wisdom to build on our current successes. The terms “devolution” and “decentralization” have come up several times. These concepts are the hallmarks of the Magnuson Act and the Council process, taking fishery management out of the exclusive hands of the agency and placing it in the hands of the regional Councils, the fishermen, and the states. There may be ways to improve, but incorporating the needs of fishermen and fishing communities through direct participation is something the agency embraces.

We have heard about the need for flexibility in a variety of contexts, but we also heard a call for stability, the notion that without stability we create distrust in the system and we suffer economic loss through our inability to plan. There is tension between being flexible and being responsive to the science while providing stability. This is a challenge, a challenge that the regional Councils address regularly. We need to find a path forward given these seemingly contradictory mandates.

Within the concept of flexibility, we heard a lot about tailoring our management tools to the kind of system we have. Recreational, commercial, and subsistence fisheries have very different needs and challenges. Approaches that work for data-rich species may not work for species with less information, and we need to tailor our management tools accordingly.

Many of this week’s findings can be dealt with through regulation. The agency has been working on our National Standard 1 guidelines. Several of the findings mirror comments and issues submitted to the agency as it begins the process of potentially revising the guidelines. The intent is to take the feedback from this conference and to incorporate the findings as appropriate.

In terms of becoming more adaptive to climate change and achieving a better understanding of the role of forage, we have the regulatory capacity to address these issues, but they will require investment in new decision-making tools and research which may be difficult in this budget climate. It is encouraging that the agency’s requests for additional funds in support of stock assessments have largely been met while many other funds have been reduced. However, we will not likely ever get to a point where we have all of the science our management systems call for. We should address the problem by finding better ways of aligning available science with our management needs, and by exploring cooperative and technological solutions for more cost-effective information collection.

The critical role of healthy habitats and ecosystems in sustainable fishery management was raised several times this week. Tools exist for developing goals and measurable criteria for assessing and adapting to changes, and the agency is interested in working with the Councils on this important issue. But the agency, through fishery regulation, cannot alone address the problem. Habitat protection requires a broad range of stakeholder input and collaboration.

In closing, two of the great achievements of the Magnuson Act are stakeholder engagement and communication. We have a unique system that provides frequent opportunities for public participation, but communities want to be more involved and there is room for growth and improvement. This conference is about shared governance. The agency encourages everyone’s continued participation as these findings are put into practice.

Dave Whaley, Senior Fisheries and Oceans Staff

HOUSE OF REPRESENTATIVES, NATURAL RESOURCES COMMITTEE PERSPECTIVE

It has been a pleasure to see old friends at the conference, and it has been rewarding to meet new people who are getting involved with fisheries management. It was very difficult to decide which of the concurrent conference sessions to attend because there were many good topics and, as evidenced by the many findings, there were excellent deliberations.

It has been difficult to take in all of the findings in a short time, and it will require some time to study the outcomes of this conference and share them with members of Congress. It is great that the conference has generated so many good findings. Chairman Hastings and Senator Begich are interested in looking carefully at these recommendations and in using them as a basis for Magnuson reauthorization.

Some of the findings present difficulties from a legislative perspective. Many of the findings are scientific in nature, and when Congress attempts to address scientific issues statutorily, it doesn't always go well. We will work with the agency on the findings that can be addressed through executive action rather than statute. Other findings represent great ideas, but will be very difficult to put into legislative language. The Magnuson Act provides a desirable regional flexibility, and we need to be careful how legislation is drafted. We don't want to add language that solves one region's problem while creating new problems for other regions.

New mandates have been suggested this week. The Councils have a difficult job with limited resources, and we need to approach new requirements with caution. Mandates can also lead to increased litigation that further burdens the system.

The findings include improvements that are not improvements to the Magnuson Act, but rather to its implementation. As we heard, National Marine Fisheries Service has started a process to review the National Standard 1 guidelines. There are those who feel that Congress should step in and address some issues through legislation. This is a bit of a circular matter where it may be best to allow the agency to revise the guidelines before addressing disagreements through legislation or, conversely, it may be more desirable to make legislative changes in advance of the guideline revisions. Given that these two processes are on different schedules, Congress intends to work closely with the agency as both efforts unfold.

The next hearing scheduled for the National Resource Committee is on data collection. It has been said many times during the conference that with better information comes better management. Funding issues will continue to be a challenge, and it will be important to reduce costs through innovations, efficiencies, and technology.

The panelists this week were asked to share one new idea in their papers and presentations. One issue that has not been addressed this week is the graying of the fleet. We seem to be creating barriers to new fishery participants, and we have policies in place that hinder new vessel construction. If we desire safety and economic efficiency, we need to find long-term ways to bring new participants and new vessels into our fisheries.

Congress is appreciative of recommendations that have come from the conference. We look forward to working through them in greater detail as we approach reauthorization.

Jeff Lewis, Counsel to the Chairman and Majority Leaders of the Senate Committee on Commerce, Science and Transportation

SENATE, COMMERCE SUB-COMMITTEE ON FISHERIES AND OCEANS PERSPECTIVE

The conference has been impressive in many ways, not the least of which is the reasoned and objective way in which the findings were developed and presented. That is not usually the case in the legislative realm. It shows that those in attendance are truly interested making improvements.

Moving new legislation through the Senate can be a difficult task, particularly when substantial changes are pro-



posed. It has been encouraging to hear at this conference that people are in general agreement that the Magnuson Act is working well and that many of the suggested improvements can be initiated through non-legislative means.

It is not possible to speak for the Senate, and the ideas shared today may change, but there are a few items to highlight. Management strategy evaluations that bring stakeholders together in the development of a fishery management program with agreed goals and triggers hold promise, but they are expensive. Also, the smoothing of abrupt changes in harvest levels to minimize disruptive events without compromising our sustainability goals is something we should be working towards. Congressional members are interested in further exploring these improvements.

The finding to develop new tools and strategies for the management of recreational fisheries is interesting and appropriate because we should always be thinking about the commonalities and differences between the segments of a multiuse fishery. However, the development of these tools requires a great deal of information and supporting analyses. Many have expressed the notion that recreational fisheries have been underrepresented in Federal fishery management. Although the Magnuson Act itself clearly recognizes the importance of recreational fisheries and their economic contributions, perhaps the implementation of the Act has had a more commercial focus. Recreational fisheries have been described in greater detail in previous reauthorizations, and there is now a call to complete a similar exercise for subsistence fisheries.

Finally, regarding illegal, unreported, and unregulated harvest at the international level, many of the goals recommended this week are included in bills currently in Congress that explore both “carrot” and “stick” solutions to this significant problem.



Bill Hogarth, Director of the Florida Institute of Oceanography, University of South Florida

ACADEMIA PERSPECTIVE

It has been a pleasure to meet with familiar faces this week and to hear from those in a position to address these recommended improvements. The deliberations this week have confirmed for me that it was wise to retire. Seriously, the Magnuson Act is working, and has been implemented well by NMFS and the Councils. Many of the recommendations are concepts that we attempted to tackle in the last reauthorization. At that time, there was a strong desire in Congress for certainty, certainty in our rebuilding efforts and certainty in ending overfishing.

We have to operate and approach our fisheries as a business, one of the largest in the country. We are not currently doing so, and this is an area for improvement. Commercial fisheries operate for profit, while recreational and subsistence fisheries have different objectives. We should therefore be doing a better job of managing to these unique needs.

New technologies will continue to be an important aspect of fishery management improvements. Fishery monitoring and observing are areas undergoing extensive research today with the potential to advance management. Cooperative research and partnerships will be critical to fishery innovations.

Trust is the key, and it is in short supply. This lack of trust often gets in the way of effective management tools, including catch shares. We have to learn to trust each other and to operate our fisheries as an efficient business to get the most from the available resources.



Poster Abstracts

The Managing Our Nation's Fisheries 3 Conference featured 70 posters spanning all three conference themes: Improving Fishery Management Essentials, Advancing Ecosystem-based Decision Making, and Providing for Fishing Community Sustainability. The posters were displayed for two days, allowing for several opportunities for poster viewing and discussion with presenters. In addition to posters, several Regional Fishery Management Councils and other organizations staffed display booths.

Poster Abstracts

Quantity or Quality—Crew Jobs and Community Benefits as a Function of Fleet Size

RICHARD ALLEN, R.B. ALLEN ASSOCIATES, RHODE ISLAND. RBALLEN63@GMAIL.COM

The Gordon-Schaefer bio-economic model is widely used to illustrate the relationship between fish population dynamics, fishing revenue, fishing costs, and net benefits to society. For the purpose of measuring net benefits to society from a fishery, all inputs are valued at their opportunity cost, which is what they would be worth in their next best use. The standard approach produces the familiar straight line for total fishery costs because opportunity costs don't vary as fishing effort increases. In order to truly understand the dynamics of a fishery, however, including the quality of crew jobs, it becomes necessary to take into account the share system, under which fishing vessel crews are paid a share of the revenue from the catch. Under most share systems, the crew pays part or all of the variable costs of fishing. When the share system is considered, the effective cost and earnings structure facing fishing businesses departs from the classic model. Annual catch limits also change the shape of the yield curve compared to an unregulated fishery. The modification of the usual fishery production function illustrated here does a better job of explaining the trade-off between the number of crew jobs and the quality of those jobs as a function of fleet size when catch limits cap revenues. By looking at costs and earnings in more detail, the loss of economic benefits to communities that occurs with excessive fishing capacity also becomes clear.

Alaska Community Profiles: Delivering Critical Information to Alaskan Coastal Communities

ROB AMES, PACIFIC STATES MARINE FISHERIES COMMISSION; AND CAMILLE KOHLER, RESOURCE DATA, INC.
RAMES@PSMFC.ORG

Developing effective fisheries policies and regulations that consider the importance of fishery resources to fishing communities is challenging because comprehensive and consolidated sources of community-based data have not been available for most regions. To fill this need, Alaska Fisheries Information Network (AKFIN), in collaboration with the Alaska Fisheries Science Center, acquired and processed Alaska commercial, recreational, and subsistence fisheries data along with census demographics data into a comprehensive collection of over 600 pre-calculated annual statistics for each of the 350 selected Alaska communities from 2000 to 2011. These metrics are available to authorized users through an online Oracle Business Intelligence reporting tool, which has allowed social scientists from the Alaska Fisheries Science Center to publish an expanded and updated technical memorandum entitled Community Profiles for North Pacific Fisheries—Alaska. These published community profiles, along with AKFIN's comprehensive collection of community metrics, will assist state and Federal agencies to shape government policy and to evaluate the social and economic impact of existing regulations on these Alaska communities.

The Marine Stewardship Council as a Tool to Recognize and Improve Global Fisheries Management

DAN AVERILL, MARINE STEWARDSHIP COUNCIL DAN.AVERILL@MSC.ORG

The Marine Stewardship Council (MSC) is an independent third party global certification and ecolabel program that has developed a scientifically robust standard and associated methodology, based on inter-

national norms for ecolabel programs. The standard assesses whether fisheries are ecologically sustainable and well managed and is applied equally to all fisheries that voluntarily enter into assessment. It is a market-based program designed to recognize and reward sustainable fishing practices through purchasing decisions. MSC works collaboratively with the fishing industry, seafood businesses, governments, scientific and conservation communities to achieve our mission. Fisheries are assessed by a team of independent scientific experts in a transparent, stakeholder inclusive process, and the work is peer reviewed by independent scientists. If successful, a fishery can make the claim that it is MSC certified. The MSC adopts a rational, consultative process based on the best science available to ensure it consistently reflects global best practice. The program assesses health of the stock, impact on the marine ecosystem and fisheries management and fishing practices, and can be a useful performance evaluation tool to leverage improvements in fisheries.

Several highly migratory species fishery assessments and certifications reside within the MSC portfolio, intersecting with many regional fisheries management organizations across the global landscape, and many fisheries use MSC as a tool to gauge performance. The rigor within the indicators of the MSC standard is designed to capture principles of a) sustainable stock status using reference points, harvest control rules, and rebuilding timelines; b) minimal environmental impact on bycatch, benthos and the ecosystem, and c) an effective overarching management system including eliminating illegal, unreported and unregulated fishing. Over 50 percent of U.S. fisheries are certified as sustainable under the MSC program and products from those fisheries are eligible to use the MSC label in the marketplace. That success in the U.S. helps incentivize fisheries elsewhere to achieve sustainable fishery management practices and exploitation levels already evident in the U.S. The MSC can help level the playing field as an important instrument to promote and achieve consistency, through assessments and certification, in the ecological and management outcomes across the global fishery management landscape.

Community Fisheries Network: Building Capacity for Commercial Fishing Communities

NICK BATTISTA, ED BACKUS, MEGAN MACKEY, STEPHANIE WEBB, AND SUSIE ARNOLD, ISLAND INSTITUTE, MAINE.
NBATTISTA@ISLANDINSTITUTE.ORG

The Community Fisheries Network is a group of 15 community-based fishing organizations and supporting organizations from around the United States that have joined together to address common challenges faced by small-scale fisheries. While the fisheries differ from community to community, members find common ground by sharing information about their work on and off the water, the management challenges they face, and how they can best adapt to change. The goal of the Network is to increase the long-term sustainability of commercial fishing communities by building business-planning acumen, strengthening social networks, and creating economic resilience through expanding markets.

The Network is committed to pursuing “triple-bottom line” community fisheries sustainability strategies, ensuring fisheries are ecologically, economically, and socially sustainable for the long-term. Members agree to operate under these principles, and seek to improve practices to meet the standards. Specific goals include improving or sustaining ecosystem and species health, ensuring equitable access to fishery resources, and improving the economic performance of local fisheries businesses and associated community infrastructure.

As the Network develops a national brand and markets for its fish, the underlying triple bottom line standards and metrics tell a story about how the fish, fishermen, and their community are intertwined. Keeping this story with the fish as it moves through the seafood product chain is a key goal for members.

Successful community based fishing businesses can help coastal communities preserve their working waterfronts. By investing in infrastructure, businesses, communities, deckhands and crew, and by engaging in creative marketing, small scale fisheries across the country can help ensure there is enough revenue crossing the wharves they rely on to ensure the long term sustainability of their communities. The National Marine Fisheries Service can aid in this process by providing much needed guidance on the development of Community and Regional Fishing Associations and associated sustainability plans in catch share programs to

ensure equitable access. In both catch share and non-catch share fisheries, ideas like the Community Fisheries Network present fishermen and fisheries managers with non-regulatory solutions that help improve the health of the ocean ecosystem and sustain fishermen and their communities.

Defining Ecosystem-Based Fisheries Management: Comparisons Between the Mid-Atlantic and New England Fishery Management Councils

INGRID BIEDRON AND BARBARA KNUTH, CORNELL UNIVERSITY. IB49@CORNELL.EDU

Debates about the definition and scope of concepts included with the notion of “ecosystem-based fisheries management” abound. We compared how different stakeholder groups in the New England and Mid-Atlantic regions define ecosystem-based fisheries management (EBFM). We considered how each selected stakeholder group defines EBFM, the content of those definitions, differences in definition between groups, and the extent to which Council decision makers are able to characterize the views of selected stakeholder groups. We used the Coorientation Model to characterize communication processes and understanding between regional fishery management council members, staff, and scientists, commercial and recreational fishermen, and environmental nongovernmental organization leaders in the New England and Mid-Atlantic regions. The Coorientation Model is an approach that can measure the dynamics of the communication exchange and the levels of agreement in values between Council leaders and stakeholders. Approximately 5,500 questionnaires were mailed to selected stakeholders. Two versions of the survey were sent. The first version targets Council members, Council staff, and Scientific and Statistical Committee members and inquired about what survey recipients thought and also asked how the survey recipients thought the other stakeholder groups would respond. The second version targets commercial fishers, recreational anglers, and environmental nongovernmental organization leaders and inquires about what the recipients themselves thought. The question referring to the definition of EBFM asks, “Please indicate to what extent YOU agree or disagree that the definition of ‘ecosystem-based fisheries management (EBFM)’ should include the following concepts?” Commonly selected definition components include: “Considering the interactions between the physical, biological, and human factors that affect the health of fisheries,” and “Protecting and/or enhancing habitat.” Data analysis includes comparisons of stakeholder responses about the definition of EBFM, grouped and displayed visually using charts, graphs, and figures. The findings from this research will provide information to regional fishery management councils regarding what aspects of EBFM stakeholders find most important and how well priorities about EBFM are communicated among stakeholders.

The Community Development Quota Program: Developing Sustainable Communities in Western Alaska

AGGIE BLANDFORD, WESTERN ALASKA COMMUNITY DEVELOPMENT ASSOCIATION. ABLANDFORD@WACDA.ORG

The Western Alaska Community Development Quota (CDQ) Program is widely viewed as one of the most successful rural development programs ever undertaken in Alaska. The CDQ program does not depend on direct government funding for its programs and activities; rather, the six nonprofit organizations that make up the program are sustained by their ability to harvest a small percentage of the fishery resources of the Bering Sea.

Established by the North Pacific Fisheries Management Council in 1992, this innovative Federal community and economic development program provides its sixty-five eligible communities with roughly ten percent of many of the Bering Sea and Aleutian Islands’ harvestable fish stocks.

The goal of the CDQ Program is to encourage fisheries-related economic development in rural Western Alaska communities, helping to build the infrastructure required to support long-term participation in the fishing industry.

For over twenty years, residents of Western Alaska, through six nonprofit CDQ entities or community coalitions, have implemented the CDQ Program in an effort to overcome the geographic isolation, heavy reliance on subsistence activities, high cost of living, high unemployment, and limited economic opportunities

that make this area one of the most economically-challenged in the United States. In working to fulfill their mission, the CDQ organizations have created jobs, infrastructure and opportunity in some of the nation's most geographically isolated and economically depressed communities.

The CDQ entities work both independently and through partnerships to generate revenues from the Bering Sea and Aleutian Islands commercial fisheries, which make it possible to invest in community, human, and economic capital. By balancing these investments, eligible communities are provided the right mix of resources and assets to achieve future economic sustainability, giving residents more control over their economic future.

This poster presentation will highlight some of the successes realized through the CDQ Program, illustrate the tremendous impact of CDQ investments, programs, and jobs on the 27,700 residents who inhabit the 65 western Alaska Coastal communities included in the program, and address some of the ways the CDQ entities are responding to the ongoing and future challenges faced by Western Alaska.

The Partnership for Mid-Atlantic Fisheries Science

ELEANOR BOCHENEK AND ERIC N. POWELL, RUTGERS UNIVERSITY. BOCHENEK@HSRL.RUTGERS.EDU

The Partnership for Mid-Atlantic Fisheries Science (PMAFS) is a multi-state, multi-institutional partnership formed in 2008 that combines the commercial and recreational fishing industries with the expertise of leading academic institutions in the Mid-Atlantic region. PMAFS is the first and only organization of its kind in the Mid-Atlantic and was formed primarily to address the most urgent scientific issues limiting successful management of fisheries in the Mid-Atlantic region. Much of the science undertaken by PMAFS is directly applicable to solving the most important impediments limiting the stock assessment programs of finfish stocks. PMAFS is currently focusing their efforts on summer flounder (*Paralichthys dentatus*) and black sea bass (*Centropristis striata*). A Board of Trustees was formed that consists of commercial and recreational fishing industry leaders from New York and New Jersey. The Board oversees the partnership. A Science Director was selected from an academic institution. A Science Advisory Committee was appointed by the Board and consists of academic and National Marine Fisheries Service scientists and representatives from important fisheries management groups including the Mid-Atlantic Fishery Management Council and Atlantic States Marine Fisheries Commission. The Science Advisory Committee met and set priorities for the 2009 and 2010 research programs. The fishing industries obtained Federal appropriations totaling one million dollars in each of two years to fund the Advisory Committee priorities. Seven research projects were funded in the first year addressing summer flounder management and stock assessment issues. In Year 2, seven projects were funded that address both summer flounder and black sea bass management and stock assessment issues.

Assessing Catch Share Results

KATE BONZON AND KENT STRAUSS, ENVIRONMENTAL DEFENSE FUND. KBONZON@EDF.ORG

The 2010 State of World Fisheries and Aquaculture report estimates more than 80 percent of global fisheries are fully or over exploited. Decades of overfishing and poor fishery mismanagement have had negative impacts on fishermen and our oceans including job loss, stock depletion, habitat damage and even on-the-job death. Also, jeopardized is the food security of billions of people worldwide. However, there are a growing number of examples where effective management has prevented these issues by aligning fishermen's economic interests with ensuring biologically robust fish stocks (e.g. catch shares). A recent study of 15 North American catch share fisheries reveals that when carefully designed and implemented, these programs result in environmental, economic and social improvements. Impacts include higher revenues, a reduction in discarded fish, improved safety for fishermen on the job and greater economic and employment stability. This presentation, *A Turning Tide for America's Fisheries*, will discuss the results of this analysis and examine how well-designed and implemented fishery management programs can address environmental, social and economic concerns using examples of fisheries that have transitioned from traditional management to catch shares.

Community Fisheries Action Roundtable: Industry Participation for Social Learning

JENNIFER BREWER, EAST CAROLINA UNIVERSITY; CARLA GUENTHER AND ROBIN ALDEN, PENOBSCOT EAST RESOURCE CENTER. BREWERJ@ECU.EDU

Research demonstrates that public participation in environmental decision making can increase understanding of diverse worldviews and knowledge bases, public faith in governance institutions, and compliance with resulting rules. Concerns linger around costs, polarization and decreased legitimacy in cases of poorly executed processes, and the ability of newly empowered groups to gain political leverage over others. If participants in public processes can bracket their personal experience to better assess other viewpoints, establishing mutual respect and understanding through civic debate, they are more likely to maximize public benefits from their involvement and minimize corresponding risks. This is “multiple-loop” social learning, social change undertaken through collective discussion and interaction. A capacity-building workshop program aims to foster such learning within the Maine fishing industry. In social contexts removed from the norms of daily life and the frustrations of past fishery management confrontations, harvesters acquire knowledge and skills that facilitate more strategic and productive engagement in formal and informal decision processes. Key learning moments include suspension of longstanding assumptions and recognition of tradeoffs. Evidence indicates corresponding changes in industry attitudes and actions. Case material draws on participant observation and interview data, analyzed using grounded theory as a standard qualitative social science method.

Managing for Sustainability: Full Catch Accountability in New England and Beyond

GILBERT BROGAN, AMANDA KELEDJIAN, AND ERIC BILSKY, OCEANA. GBROGAN@OCEANA.ORG

The Magnuson-Stevens Act (MSA) mandates that the National Marine Fisheries Service (NMFS) implement measures to establish Annual Catch Limits (ACLs) with corresponding Accountability Measures (AMs) as the primary means to control catch and end overfishing across U.S. fisheries. Additionally, all fisheries must employ a Standardized Bycatch Reporting Methodology (SBRM) and minimize bycatch. To date, very few Fisheries Management Plans successfully implement robust catch monitoring and reporting. Without representative information about catch, fisheries managers are unable to control mortality and prevent overfishing while achieving Optimum Yield.

Oceana advocates improving the quality of catch monitoring and reporting for the dual purposes of stock assessment and catch management. Robust monitoring must track all catch (including bycatch) from all sectors, including from different fleets and different regions that affect the same stock. Effective catch monitoring programs will produce accurate data for use in developing stock assessments, setting ACLs, administering AMs, and improving long-term fishery productivity. These modern monitoring programs can create sustainable and more abundant fisheries.

Oceana has conducted advocacy, including litigation, to compel NMFS to improve catch monitoring. Because of these efforts, the Northeast Region SBRM is being redeveloped to establish a rational approach to setting coverage levels which will improve assessments and the management of both target and non-target catch. In the New England groundfish catch share fishery, a Court ruling established that effective monitoring is essential to the administration of this fishery. NMFS must demonstrate that the catch monitoring program would provide reliable data for in-season management of the fishery.

Accurate estimates of bycatch are essential for understanding the full scope of fishing mortality. Oceana recommends an approach that enables NMFS to reliably count everything that is captured, cap the amount of allowable catch, and control fishing to ensure catch does not exceed these caps. Once established in New England, we suggest that such an approach can and should be developed and implemented in other U.S. fisheries to improve catch management in other regions.

Utilizing State Management to Comply with MSA Requirements

KARLA BUSH, NICOLE KIMBALL, AND BRAD ROBBINS, ALASKA DEPARTMENT OF FISH AND GAME. KARLA.BUSH@ALASKA.GOV

The Magnuson-Stevens Reauthorization Act of 2006 expanded the requirements for fishery management plans (FMPs) to include provisions intended to prevent overfishing through the use of annual catch limits (ACLs). This poster focuses on recent revisions to two FMPs under the jurisdiction of the North Pacific Fishery Management Council: the FMP for Bering Sea/Aleutian Islands King and Tanner Crab and the FMP for the Salmon Fisheries in the Exclusive Economic Zone off the Coast of Alaska. The crab and salmon FMPs are unique in that management of these two fisheries in Federal waters is delegated to or shared with the state of Alaska.

The crab FMP establishes a state/Federal cooperative management regime that defers many aspects of crab fisheries management to the state. For crab stocks, the ACL is set equal to the acceptable biological catch (ABC) and the ABC control rule is a function of the scientific uncertainty in the estimate of the overfishing level and any other specified scientific uncertainty. The state sets harvest limits in the directed crab fisheries and takes into account any scientific uncertainty not already accounted for in the ABC. The existing state process for setting harvest limits was recognized by the North Pacific Council as a more clearly defined, flexible, and precautionary method of incorporating additional uncertainty in order to meet National Standard 1 (NS1) Guidelines.

The geographic scope of the salmon FMP was recently amended using an alternative approach to satisfy NS1 requirements. Salmon fisheries are managed by the state throughout Alaska using an escapement and abundance based system with real-time monitoring and inseason management actions to control catch and prevent overfishing. The revisions to the FMP serve to facilitate continued state management of salmon fisheries by avoiding the creation of a dual Federal and State management structure and reaffirming that commercial and sport salmon fishery management is delegated to the state in accordance with the Pacific Salmon Treaty and other Federal law. With this action, the Council acknowledged that salmon warrant an alternative approach, per the NS1 Guidelines, to best control catch, prevent overfishing, and achieve optimum yield.

Evaluating Methods for Setting Annual Catch Limits for Data-Limited Stocks

TOM CARRUTHERS, MURDOCH MCALLISTER, AND CARL WALTERS, UNIVERSITY OF BRITISH COLUMBIA. T.CARRUTHERS@FISHERIES.UBC.CA

The requirements for science-based catch limits for most federally-managed fish species in the U.S., combined with the large number of data-limited stocks, has spurred an emerging field of methods for setting annual catch limits for data-limited stocks. The purpose of this research is to simulate and evaluate the performance of different data-limited methods and management approaches, including 15 that have been adopted or recommended for use in U.S. fishery management plans, 10 alternative approaches and six reference methods. Management strategy evaluation is a cost-effective approach to testing these methods. MSE also provides an opportunity to better understand the trade-offs among management objectives for any given management approach and to quantify the value of various types of information and data to the accuracy of model outputs.

In total, 31 methods are applied to six “case study” stocks exemplifying a range of life-histories, exploitation scenarios, and relevant management approaches. Each method is simulated 10,000 times for each stock over a 30 year time period. Performance of the different methods is evaluated in terms of preventing overfishing, rebuilding overfished populations, relative yield, depletion over time, and sensitivity to a credible range of error in user inputs.

Preliminary results indicate that many data-limited methods currently in use in U.S. fisheries management that rely mainly on historical catch do not perform well in preventing overfishing and avoiding or recover-

ing from an overfished condition. These methods perform particularly poorly when starting from depleted conditions (e.g. less than 50 percent biomass at maximum sustainable yield). In contrast, methods that rely more on current abundance than on historical catch perform markedly better in preventing overfishing and avoiding or recovering from an overfished condition. The performance of different methods also does not change markedly under different life-history scenarios.

Sea Grant and Alternative Marketing of Seafood—Helping to Build Fishing Community Resiliency in Challenging Times

ERIC CHAPMAN AND JOSHUA STOLL, NEW HAMPSHIRE SEA GRANT AND NMFS. ERIK.CHAPMAN@UNH.EDU

Fishing community resiliency depends on their ability to adapt to dynamic and unpredictable ecosystems, management, and markets. One way fishermen can adapt is to develop alternative or value-added markets for their products that captures the value of their catch before it leaves fishing communities. Alternative marketing has also helped fishermen organize, enabling them to participate in cooperative research and management and produce fine scale economic data that has not been readily available before. These efforts have gained traction in fishing communities as they also achieve a range of other social and environmental goals. As a result, interest in these forms of marketing from fishermen, fishery scientists, managers and fishing communities has been widespread. Despite its potential, there are a variety of technical barriers, risks, and overarching questions about the long-term viability of alternative marketing. In particular, these business models require that fishing communities develop skills and expertise in new areas such as processing, distribution, handling, pricing, and marketing of seafood. In many cases, permits, licenses, insurance, new relationships, and careful business planning are required. For fishermen and others in fishing communities, this is often a brand new skill-set and business setting, and developing businesses without these capacities runs the risk of losing money and missing business opportunities; an outcome that many fishing communities simply cannot afford. Sea Grant is playing a critical role in helping fishing communities meet some these challenges by providing training, access to new technologies and facilitating new partnerships. Inspired by Sea Grant's ongoing commitment to a safe and sustainable seafood supply, burgeoning demand from coastal communities, and alignment with broader NOAA objectives, direct and alternative marketing is an important and timely topic for fishermen and fishing businesses as well as an opportunity for partnership. Crosscutting a multitude of stakeholders and disciplines, alternative marketing is of economic and social significance to constituents; it represents a unique opportunity for Sea Grant and NOAA to engage with stakeholders; and it has the potential to inform and be informed by management and policy decisions.

Measuring Social and Economic Indicators in Northeast U.S. Fisheries and Fishing Communities

PATRICIA CLAY, NOAA/NMFS. PATRICIA.M.CLAY@NOAA.GOV

Over the past several years the Social Sciences Branch of the National Marine Fisheries Service, Northeast Fisheries Science Center has been developing indicators to track the social and economic performance of fisheries. Indicator development has focused on the following topics: fishery performance, vessel costs, and community vulnerability. The Fishery Performance Indicators cover five theme areas: financial viability, distributional outcomes, stewardship, governance, and well-being. These theme areas were developed in a year-long process involving literature searches, stakeholder meetings, and an academic workshop. Vessel Cost Indicators cover variable and fixed costs related to fishing, including: trip costs; the costs of repair, maintenance, upgrade, and improvements; business costs; and crew payments. We also use cost information to calculate net revenue and profitability indicators. Community Vulnerability Indicators are grouped in three categories: social vulnerability, gentrification pressure, and fishing dependence. The Social Sciences Branch has implemented new regional-level data collection efforts to support indicator development, including an annual cost survey, a vessel owner survey, and a crew survey. We have already published initial reports on the fishery performance indicators based on secondary data. Reports for fishery performance and annual cost indicators based on new survey data will be prepared after data are audited and analyzed. A publication is also being developed on community vulnerability indicators.

Marine Resource Education Program for Fishermen in the Southeast Fisheries Region

ALEXA DAYTON, BOB GILL, AND DUANE HARRIS, GULF OF MAINE RESEARCH INSTITUTE. ADAYTON@GMRI.ORG

The Gulf of Mexico, South Atlantic and Caribbean Fishery Management Councils look to their many advisory panels for advice and recommendations, but broad constituent participation is also an extremely important part of the fishery management process. All too often, commercial and recreational fisheries constituents feel intimidated or remain unclear on best ways they can contribute, and feel the science underlying the management process is difficult to absorb and understand. In response, fishermen have sought additional ways of obtaining foundational knowledge necessary to navigate fishery data and understand how this data is used in management.

The Gulf of Maine Research Institute is collaborating with partners from the three regions to develop and implement a multi-day Fishery Science & Management Education Program for commercial and recreational fishermen, modeled after the highly successful New England Marine Resource Education Program. This education enables fishermen and others to participate productively in the fisheries management process, and leads to improved cooperation and trust between fishermen, scientists and managers. Fundamentally, a co-learning approach is used in this program, where program developers, program participants and program presenters all learn from one another through their interactions and collaborations.

The strength of the Marine Resource Education Program model is that it is “for industry by industry”. Extension of the model to the Southeast fisheries region has mirrored this, and draws upon local fishing industry representatives to serve as leaders in regional implementation, and building long-term capacity within the region. The curriculum has been developed by a Steering Committee—consisting of 18 industry members who represent a balanced mix of fishing effort types, gear types and regions—and is tailored to the region’s fisheries, fishing communities, and management practices. Program presenters have been drawn from local and regional Federal agencies and provide a unique opportunity for scientists and managers to communicate with fishermen in a neutral setting, build trust, and overcome barriers to cooperation.

The Steering Committee will meet annually to guide evolution of content for future workshops, and also recommend new workshop locations throughout the three regions, to ensure a broad reach and best possible accessibility.

Empirical Move-on Rules to Inform Fishing Strategies: A New England Case Study

DANIEL DUNN ET AL., DUKE UNIVERSITY. DANIEL.DUNN@DUKE.EDU

Increasingly, fisheries are being managed under catch quotas that are often further allocated to specific permit holders or sectors. At the same time, serious consideration is being given to the effects of discards on the health of target and non-target species. Some quota systems have incorporated discard reduction as an objective by counting discards (including unmarketable fish) against the overall quota. The potential effect of the introduction of a quota system that includes accountability for discards on the fishing strategies employed by fishermen is enormous. This is particularly true for multispecies fisheries where healthy and depleted stocks co-exist; resulting in a trip’s catch being applied to very large and very small stock quotas simultaneously. Under such a scenario, fishermen have a strong incentive to minimize (i) catch of low-quota or ‘choke’ stocks, (ii) regulatory discards due to minimum size limits and (iii) catch partially consumed by predators. ‘Move-on’ rules (i.e. event-triggered, targeted, temporary closure of part of a fishery when a catch or bycatch threshold is reached) have been employed in a variety of fisheries. However, their efficacy has been limited by a lack of empirical analyses underpinning the rules. Here, we examine the utility of spatiotemporal autocorrelation analyses to inform ‘move-on’ rules to assist a sector of the New England Multispecies Fishery to reduce discards and maximize profits. We find the use of empirical move-on rules could reduce catch of juvenile and choke stocks between 27 and 33 percent, and depredation events between 41 and 54 percent.

FishSmart: Using Technology to Create Access

RUSSELL DUNN AND DANIELLE RIOUX, NOAA/NMFS. RUSSELL.DUNN@NOAA.GOV

FishSmart is a NOAA-funded, angler-led program to improve the survival of fishes released by anglers. This collaborative effort is focused on developing fishing techniques, tackle, and management approaches to reduce catches of fish that need to be returned to the water and improve the survival of fish that are released.

FishSmart has spurred and highlighted innovation, research, and management consideration of devices and practices to counter barotrauma, a condition deep water fish suffer from when brought to the surface quickly. Barotrauma involves the rapid expansion of gasses in a fish's body which can cause significant tissue damage and impaired swimming ability, resulting in mortality or increased rates of predation. In part, due to this phenomenon, high post-release mortality rate estimates are applied in the stock assessment process.

High post-release mortality rates can contribute to reduced access for fishermen when stock status is assessed. The FishSmart program is innovating to counteract barotrauma, while simultaneously encouraging research on the survival of descended fish and broadly promoting the importance of proper handling and release of fish to maximize survival. The initiative has led to reconsideration of how release mortality is handled in some fisheries and a recently initiated examination of NOAA Fisheries scientific approach to release mortality. Through this program there is the possibility to produce real conservation gains and improved science, which could result in improved survival and ultimately greater fishery access.

An Ecosystem Approach to Fisheries Management: A Voluntary Environmental Management System Approach to Fisheries Practices in a Large Marine Ecosystem Framework

FRANK GABLE AND DANIEL DICKINSON, FLORIDA GULF COAST UNIVERSITY. FGABLE@FGCU.EDU

This study/poster addresses international aspects of fisheries sustainability as part of the Large Marine Ecosystem modular approach. Consideration is given to consensus-based voluntary environmental management systems (VEMS) as an adaptive management aspect of fishing practices being integral strategic parts of marine ecosystems. A VEMS is a unique means or tool for managing the impacts of a fisheries enterprise's activities on the marine environment.

For sustainability planning and implementing environmental protection measures, the VEMS provides a structured approach. A VEMS integrates environmental management quality at various scales into an organization's everyday operations as well as its long-term planning. A VEMS is an important "ecosystem consideration" component of the Large Marine Ecosystem approach as it is intended to lead toward improved valuation assessments and movement to sustainability of vulnerable resources. The fisheries practice VEMS is meant to promote dialogue on VEMS being a scientifically based tool ("best scientific information available standard") for ecosystem-oriented management of living marine resources.

Avoiding No-Win Management Scenarios Through Development of Bycatch Reduction Devices in Alaska

JOHN GAUVIN, ALASKA SEAFOOD COOPERATIVE; JOHN GRUVER, UNITED CATCHER BOATS ASSOCIATION.
GAUVIN@SEANET.COM

Bycatch management of Alaska groundfish fisheries must balance large scale commercial fisheries with interests of subsistence users and small-scale commercial and recreational users of the bycatch species. The North Pacific Fishery Management Council (NPFMC) is diligently addressing salmon and halibut bycatch in groundfish fisheries, but solutions often involve difficult and non-productive tradeoffs. This is because traditional bycatch management tools typically reduce efficiency and create potential for leaving large amounts of groundfish un-harvested. Use of closed areas has proven problematic because the degree of spatial overlap between groundfish and bycatch species is highly variable. Once in place, closure regulations take years to modify and in some cases have actually resulted in closures of areas where bycatch rates

would be much lower than the areas left open to fishing. Implementation of hard bycatch caps administered through cooperatives has created strong incentives for bycatch minimization and hotspot avoidance. Nevertheless, when spatial and temporal overlap between bycatch and target species is strong, attainment of the bycatch cap before groundfish total allowable catches can be inevitable. In an attempt to create potentially better outcomes or at least a different set of tools in the toolbox, the Alaska groundfish industry and National Marine Fisheries Service's Resource Assessment and Conservation Engineering Division have successfully partnered to develop and systematically test bycatch reduction devices. Resulting excluders are now widely used, with demonstrated bycatch escape rates of 25 percent to 42 percent for Chinook salmon by pollock trawlers and up to 60 percent to 80 percent escapement of halibut for flatfish and cod trawlers. Loss rates of target species are less than one percent with use of salmon "excluders" in pollock fishing and loss rates of target catch range from 10 percent to 20 percent in cod and flatfish fisheries. These devices are proving to be critical tools to help industry manage its bycatch under the NPFMC's hard caps, incentive plan agreements, and rolling hotspot bycatch management programs.

How the Sustainability of Reduction Fisheries is Being Assessed and Addressed and Suggestions for Moving Forward

TESS GEERS, NEW ENGLAND AQUARIUM. TGEARS@NEAQ.ORG

Much attention has been given to forage fish science and management in recent years. In particular, it has been noted that forage fish fisheries, which are primarily destined for reduction to fishmeal and fish oil, may require different management measures than those traditionally used to manage wild-capture fisheries. This is a result of their vital role in the food web, as well as their unique life-history characteristics. In this review we have identified the main management requirements for forage fish fisheries and questions that can be used to address a reduction fishery's sustainability, including: accounting for predator needs through reduced catch limits as well as spatial management, incorporating stock fluctuations due to climate variability (e.g., El Niño/La Niña, decadal oscillations, etc.), evaluating the economic value of the fish as wild prey versus their value as feed, use of real-time management, and implementation of precautionary harvest strategies. Precautionary harvest strategies are particularly important given the lack of adequate stock assessments for many of these species, due to their short-lived nature and a dearth of resources for monitoring and assessing the stocks. Furthermore, we have looked at how various non-governmental organizations working in the sustainable seafood sphere address reduction fisheries in their assessments of wild-capture fisheries, and also to what degree reduction fisheries management is addressed in assessments of aquaculture species. In general, we found that non-governmental organizations do account for the role of forage fish in the ecosystem, but the majority does not ask detailed questions regarding how forage fish are managed. We conclude with a list of questions that we believe should be the basis for any evaluation of reduction fishery sustainability.

Fishery Access Strategies to Support Ecosystem-Based Management

CARLA GUENTHER AND ROBIN ALDEN, PENOBSCOT EAST RESOURCE CENTER, MAINE; JENNIFER BREWER, EAST CAROLINA UNIVERSITY. CARLA@PENOBSCOTEAST.ORG

Fishermen, fishery managers, academics, and non-governmental organizations agree that single-species systems of fishery management are not working. Illegal leasing of fishing rights, decades-long waiting lists, and "boxed-in fishermen" are just a few of the many problems identified at a licensing policy workshop held by Penobscot East Resource Center and Maine Sea Grant in 2012. In addition, today's licensing systems present a significant obstacle to the transition away from single species management and toward an ecosystem-based fishery management approach that protects biodiversity and resilience.

In 2012, Penobscot East and Maine Sea Grant gathered ideas and insights on this problem from Maine fishermen and fishery leaders and thinkers from New England, Atlantic and western Canada, California and Alaska. Together these experts began to frame a new approach to licensing coastal fisheries; one that could

help relieve some of the problems facing today's fisheries while at the same time facilitating the transition toward ecosystem-based fishery management.

The underlying concept for this licensing system is to create a system that enables adaptive access to multiple fisheries based on a denomination that could be called stewardship credits—credits that would be accumulated by individual, owner-operator fishermen learning, doing, and sharing the practices of sound stewardship, on the water and in their communities. Credits would qualify individual fishermen to obtain endorsements on a state-issued, multi-purpose commercial fishing license. The state license would qualify a fisherman to obtain one or more endorsements issued by a state, regional, or local fisheries management body (depending on which scale of governance was most suited to a given fishery). An endorsement from the appropriate governing body, would permit a fisherman to commercially harvest a managed or emerging, living, ocean resource.

Framing the Message about Seafood: Outcomes of a Conference About Communicating Seafood Safety

DORIS HICKS ET AL., UNIVERSITY OF DELAWARE SEA GRANT, LORI PIVARNIK, RHODE ISLAND COOPERATIVE EXTENSION; KEN GALL, NEW YORK SEA GRANT; DR. MICHAEL MORRISSEY, OREGON STATE UNIVERSITY; PAM TOM, CALIFORNIA SEA GRANT; AND STEVE OTWELL, UNIVERSITY OF FLORIDA. DHICKS@UDEL.EDU

The Framing the Message About Seafood conference represented the first time that a very diverse group of stakeholders convened to discuss the information that has been presented to the public on seafood health benefits and risks in a format designed to specifically explore and identify alternative approaches to reduce confusion and misinformation. It was remarkable that a consensus was reached on an alternative approach that could be readily translated to an existing Web-based resource.

The Seafood Health Facts Website is designed to be a comprehensive resource on seafood products for healthcare providers and practitioners and their patients. It is also intended to be a resource for consumers to obtain objective information on seafood products. The information on this site is organized by topic and includes resources for seafood nutrition and the benefits of seafood consumption, seafood safety and the risks associated with certain types of seafood, a comparison of the risks and benefits of seafood consumption, and the seafood supply in the U.S. It is also organized to provide different types of resources appropriate for different groups of people. The educational materials and other resources for each of the seafood and health related topics are organized into three different sections based on their usefulness for: the general public; healthcare professionals; and scientific publications for all groups. Customize Your Seafood Consumption Information: Based on the consensus that was reached during Framing the Message About Seafood conference a new web tool was developed for the Seafood Health Facts Website. This tool is designed to help consumers determine whether they are eating the right amount of seafood based on current dietary recommendations, and what (if any) specific food safety advice may pertain to them based on where they get their seafood and other issues such as sustainable fisheries.

Guidance on Electronic Technologies and Fishery-Dependent Data Collection

MARK HOLLIDAY ET AL., NOAA; JOSHUA STOLL, PRESENTER. MARK.HOLLIDAY@NOAA.GOV

Monitoring is an important component of fisheries management and with annual catch limits and accountability measures in place, the demands for fishery dependent data for the agency's science and management use will continue to rise. The implementation of fisheries management regulations that require near real time monitoring of catch by species at the vessel level have challenged the traditional methods of self-reporting, on-board observers and dockside monitoring. There has been growing concern that the current trend in catch monitoring in the United States is neither economically sustainable nor meeting the needs for quality, timeliness and coverage across fisheries, regions, or regulations. Recognizing these issues, NOAA Fisheries in partnerships with Regional Councils and the fishing industry is developing policy and technical guidance that will support and encourage the adoption of electronic technology solutions for fishery-dependent data collection programs, where feasible. Electronic technologies include the use of vessel monitoring systems, electronic logbooks and the use of video cameras for electronic moni-

toring. The goal is to achieve a more cost-effective and sustainable approach to fishery-dependent data collection, and take advantage of the range of current/emerging electronic technologies. This poster provides information about the process for evaluating electronic technologies and technical guidance on its implementation.

Sustainable Seafood in the U.S.—What Challenges Remain?

JENNIFER ISE AND SEEMA BALWANI, NOAA. JENNIFER.ISE@NOAA.GOV

In the United States seafood market, consumers are increasingly looking for sustainable seafood options, as evidenced in part by the proliferation of various environmental organizations' sustainable seafood purchasing guides. Retailers and restaurants are responding and taking steps to meet the demand by adopting some of these guides as a basis for their seafood purchases. Eco-labels, such as the Marine Stewardship Council, are another basis upon which consumers and retailers are making their seafood decisions. While eco-labels provide consumers with a clear and quick indication that the product meets specific criteria, and producers using the label can gain a market advantage, third party verification programs can be costly and time-consuming. With various eco-labels and seafood recommendation guides, consumers can feel confused and frustrated.

The Magnuson-Stevens Act (MSA) contains strong provisions that incorporate the three key factors of sustainability – ecological, economic, and social—into fisheries management. As a result, U.S. fisheries are managed under some of the most rigorous regulations in the world, particularly when combined with other U.S. laws. In contrast, many of the consumer guides for sustainable seafood are based solely on ecological factors, disregarding the economic and social.

When consumers learn that the MSA addresses the three aspects of sustainability, they often feel reassured and seek to buy U.S. harvested seafood. Unfortunately, at markets and restaurants, they can have a hard time finding out where seafood products were harvested. Labels with country- and/or fishery-of-origin are difficult to find. In order to have these, systems are needed that trace seafood through the supply chain and verify product claims.

These market challenges are increasingly affecting fulfillment of MSA goals—U.S. fisheries that provide benefits to the nation through food, jobs, and revenue. Innovative models, such as Trace & Trust, Gulf Seafood Trace, and FishTrax, are emerging around the country to connect seafood consumers with U.S. suppliers. In what ways can NOAA work more with other agencies, non-governmental organizations, and industry to help support efforts that will better identify U.S. seafood options for consumers?

Challenges to Leveling the Playing Field: A Case Study of Mitigating False Killer Whale Impacts in the Hawaii-Based Tuna Longline Fishery

ASUKA ISHIZAKI, WESTERN PACIFIC FISHERY MANAGEMENT COUNCIL. ASUKA.ISHIZAKI@NOAA.GOV

The Magnuson-Stevens Act (MSA) requires compliance with other applicable laws, including the Endangered Species Act and Marine Mammal Protection Act (MMPA). Fisheries are frequently impacted by requirements to comply with domestic environmental policies, presenting a disadvantage in leveling the playing field in the international arena. The Hawaii-based tuna longline fishery has faced new challenges in recent years with false killer whale interactions.

False killer whales are distributed worldwide in tropical to temperate waters. Depredation by false killer whales and other cetaceans on longline fisheries is common around the world and is a significant problem to fishers due to the economic loss experienced as a result of these events. Occasionally, false killer whales become hooked or entangled if they are not successful in avoiding the gear. Research to develop technological solutions has thus far been unsuccessful in developing effective long-term solutions.

The occasional interactions with false killer whales have become a challenging issue to the Hawaii-based tuna longline fishery in recent years, as National Marine Fisheries Service (NMFS) estimates that the annual number of interactions exceeds the potential biological removal, a level thought to be sustainable to

the long-term health of the false killer whale population in the area. Under requirements of the MMPA, NMFS initiated the False Killer Whale Take Reduction Plan process in 2010 to develop strategies to reduce the interactions.

At issue are the timeline for developing a plan and the lofty implementation goals set forth under the MMPA. According to the process, the Take Reduction Team must develop a draft plan within six months of convening, with a short-term goal of reducing take below potential biological removal within six months of the plan's implementation. As a result of these constraints to the process, the resulting Take Reduction Plan includes measures to reduce serious injuries that count against the fishery by requiring gear modification and to reduce interactions within the target management area under the Take Reduction Plan by closing large portions of the U.S. Exclusive Economic Zone around Hawaii. However, the Take Reduction Plan process failed to develop measures to reduce depredation events, a solution that would simultaneously reduce impacts on false killer whales and provide economic benefits to U.S. fishers to help them survive in an increasingly competitive and unlevel playing field against international fisheries.

Bottom Communities in the Mid-Atlantic Bight

ROMAN JESIEN AND ARLO HEMPHILL, MARYLAND COASTAL BAYS PROGRAM. RJESIEN@MDCOASTALBAYS.ORG

The coastal ocean off the Delmarva (Delaware, Maryland, Virginia) peninsula has supported a variety of fisheries for over 300 years. This area of the Mid-Atlantic Bight ranges from sand swept beaches along the shore to the canyons along the continental slope, which are the Pleistocene remnants of the great eastern rivers. Ocean depth is up to 200 m, and the bottom is primarily a mix of sand ridges and muddy hollows, with infrequent hard bottom formed from low relief rock outcrops, or compact sediments of biological origin. The area is in the midst of major population centers that heavily use the coastal waters for recreation, transportation, food production and, of late, power generation. Anthropogenic impacts have resulted in decreases in bottom relief from decades of bottom trawling along with enhancement of relief from centuries of shipwrecks, and more recently, attempts at artificial reef construction. We present a summary overview of the biological communities that are associated with the various bottom types found here with special emphasis on natural hard bottom. These natural and some artificial structures support valuable recreational and commercial fishery resources that far outweigh their areal makeup of the bottom. The overview is meant to encourage managers and researchers to strongly consider these habitats in future planning agendas.

Climate Change, Thermal Habitat Dynamics, Habitat Coverage Bias and Food Web Dynamics with Special Reference to Keystone Forage Species in the Mid-Atlantic Bight

JOSH KOHUT ET AL., RUTGERS UNIVERSITY. KOHUT@MARINE.RUTGERS.EDU

Two important considerations for ecosystem-based fishery management are habitat and predator-prey relationships. The Mid-Atlantic Bight experiences some of the largest seasonal fluctuations in water temperature and other features defining marine habitats. As a result, many mobile ectotherms in the region are migratory, behavioral thermoregulators. Many track their thermal niche envelopes across the ecosystem using productive shallow coastal habitats to the northwest as summer feeding/nursery grounds and overwintering in deeper offshore habitats near the shelf break. Atlantic butterfish (*Peprilus triacanthus*) and longfin inshore squid (*Doryteuthis pealeii*) are short lived, pelagic species central to the Mid-Atlantic Bight food web that exhibit migratory thermoregulation. Recent changes in climate are causing spatial and temporal expression of thermal niches in the ocean to change.

Changes in spatial and temporal expression of thermal niches in the Northwest Atlantic have the potential to confound population estimates based on surveys conducted during fall and spring transition periods that don't sample the entire ecosystem, creating habitat coverage bias that may be systematic under a climate change scenario. Large scale forces changing quantity and quality of thermal habitat could also affect

the fundamental processes regulating populations. We are developing approaches to parameterize thermal niche models based on fundamental principles of metabolism and thermal ecology. We are projecting these models and thus habitats in space and time at the scale of the whole ecosystem using hydrodynamic models. We are using these projections as tools to account for habitat coverage bias in traditional surveys, design cooperative industry based surveys for behavioral thermoregulating species, and understand mechanistic relationships between habitat and population dynamics including modulation of density dependent mechanisms of population regulation by habitat dynamics.

We are developing our analyses and models using an “open source” collaborative approach. Our working group, Open Ocean, has been formed to collectively move from inception of ideas through delivery of evaluated products. It includes partners with expertise in physical oceanography, ecosystem science, and assessment science from government, academia, and the fishing industry. We believe that our collaborative approach of sharing responsibility of developing best available science with expert ecosystem users is required for effective management of marine ecosystems.

Successful Rebuilding of Bristol Bay Red King Crabs and Current Management Under an Annual Catch Limit Control Rule that Incorporates Uncertainty

GORDON KRUSE AND JIE ZHENG, UNIVERSITY OF ALASKA; DIANA STRAM, NORTH PACIFIC FISHERY MANAGEMENT COUNCIL. GORDON.KRUSE@ALASKA.EDU

The Bering Sea and Aleutian Islands crab fisheries management plan (FMP) provides for a state/Federal cooperative regime that defers most crab fishery management to the state of Alaska with Federal oversight. After peak landings in 1980, the red king crab fishery in Bristol Bay was closed in 1983 because of stock collapse. In the ensuing decade, small harvests and additional fishery closures associated with depressed stock status prompted a reappraisal of the management strategy. A length-based population model was developed to provide improved stock assessments for setting annual total allowable catches (TACs). A management strategy evaluation revealed that a harvest strategy, which included a stair-stepped harvest rate of 10 to 15 percent of mature males and a threshold for effective spawning biomass below which no fishing is permitted, provides for relatively high long-term yield, greater stability in yield, fewer fishery closures, and higher effective spawning biomass. This strategy for setting TACs was adopted by the State of Alaska in 1996; at the same time the North Pacific Fishery Management Council amended the groundfish FMP to include crab bycatch caps and area closures protecting sensitive crab habitats. The stock responded well to these conservation measures and has been rebuilt since 2003. Over 1996-2008, abundance of legal-sized males increased by 58 percent, mature males doubled, and mature female abundance and effective spawning biomass tripled. The stock remains healthy today, although it is now experiencing a declining trend owing to lack of recent above average year classes. A sharp reduction in fishing capacity, after implementation of an individual fishing quota program in 2005, substantially improved fishery profitability. Other recent FMP changes include revised overfishing definitions using a five-tier system based on the level of available information for any given stock and establishment of annual catch limits (ACLs) implemented in 2008 and 2011, respectively. ACLs are set equal to the annual biological catch based on a control rule that accounts for a level of risk of overfishing (P^*) corresponding to scientific uncertainty in the overfishing limit. The Council selected $P^* = 0.49$ (i.e., 49 percent chance of overfishing), recognizing that additional buffering to account for outside-of-model scientific uncertainty is accomplished by the State of Alaska during the annual TAC-setting process.

Implementing Sector Management in New England's Groundfish Fishery

JONATHAN LABAREE, GULF OF MAINE RESEARCH INSTITUTE. JLABAREE@GMRI.ORG

In 2010, New England's groundfish fishery began operating under sector management, an output-based management system under which communities formed harvesting cooperatives—called sectors—that receive an annual allocation of groundfish stocks. The poster presents the key design elements of the sector

system.

Establishing and maintaining durable sectors is essential to sustaining New England's groundfish communities. To that end, Gulf of Maine Research Institute (GMRI) provided technical assistance to 14 of the 16 active sectors, helping them draft and submit by-laws, rosters, operational rules, harvesting plans, and environmental assessments.

Sector management required a new level of monitoring, including dockside and at-sea monitoring, to verify stock area, discards and landings. GMRI convened a group of industry, nonprofit, and NOAA leaders to design the dockside monitoring program and strategize on how to implement cost-effective and accurate at-sea monitoring.

With sector management now well established, GMRI is focusing on organizational and business development for the sectors, reducing the costs of sector management, and improving data collection and monitoring. We also engage in cooperative research to test and develop industry-developed gear modifications to increase species and size selectivity.

History of the Magnuson-Stevens Act and National Standard 1 Guidelines

DEBRA LAMBERT ET AL., NATIONAL MARINE FISHERIES SERVICE. DEB.LAMBERT@NOAA.GOV

Marine fisheries management in the United States is primarily governed by the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The overarching principles of the MSA is that fisheries should not jeopardize the capacity of a fish stock to produce maximum sustainable yield (MSY), and that overfished stocks (i.e., biomass is too low) should be rebuilt to the level that will support MSY. To address these challenges, the eight Regional Fishery Management Councils and NOAA Fisheries use National Standard 1 (NS1) of the MSA and its associated guidelines as their primary resource. The MSA and the NS1 guidelines have been revised a number of times to address ongoing challenges in fisheries management, including ending and preventing overfishing and rebuilding depleted fish stocks. Here we briefly recap the basis and history of the MSA and the National Standard 1 guidelines with regard to provisions to prevent overfishing, achieve optimum yield, and rebuild overfished stocks and highlight some of our major accomplishments.

Northeast Regional Ocean Council Commercial Fishery Mapping Project

GEORGE LAPOINTE ET AL., CONSULTANT. GEORGELAPOINTE@GMAIL.COM

The Northeast Regional Ocean Council, a New England planning organization, mapped commercial fishing activity for use in future ocean planning. The Commercial Fishing Mapping Project used vessel trip report (VTR) and vessel management system (VMS) data, filtered to protect confidentiality, to produce maps of commercial fishing activity in New England. Preliminary maps were used for stakeholder engagement to verify mapping information, add information missing from VTR and VMS based maps, and to ask questions about past fishing patterns.

VMS based maps show great promise in accurately portraying spatial use patterns for selected commercial fisheries (Atlantic herring, Northeast groundfish, scallop, monkfish, and surf clam/ocean quahog). VTR data exists for many more fisheries but are limited to broad patterns of fishing activity, e.g. inshore and offshore. Future work includes separation of transit/steaming time from fishing for VMS maps and development of mapping approaches for fisheries that are not well represented by VTR or VMS data, most notably the American lobster fishery.

The maps provide accurate information about commercial fishing activity to use in future decisions about ocean uses. Future ocean use planning will minimize conflicts when based on accurate, publicly available information about current uses.

United Nations Food and Agricultural Organization Framework Assessment of U.S. Management Systems

THOR LASSEN, OCEAN TRUST; MICHELLE WALSH, NMFS. TJLASSEN@OCEANTRUST.ORG

NOAA has often stated that “fisheries managed under the Magnuson-Stevens Fishery Conservation and Management Act are sustainable” but has not provided a program to formally document its sustainability and distinguish U.S. managed seafood products in the marketplace.

Ocean Trust with the support and cooperation of the Gulf States Marine Fisheries Commission and NOAA Domestic Fisheries Division are exploring a framework evaluation process and pilot assessment of Federal and state management conformance to the United Nations Food and Agriculture Organization’s (FAO) Ecolabelling Guidelines for Marine Capture Fisheries.

The initiative builds upon recent “Science & Sustainability Forums” conducted with participation from leading fishing nations and scientists which concluded that fisheries sustainability is best defined by management systems, not snapshots of the stock status or fishing levels at any given point in time or of one fishery in isolation, but rather by the capacity of the system to respond to changes in stock levels or impacts via management measures in all fisheries under its jurisdiction.

The pilot assessment framework process we present is based on the 2010 FAO Draft Evaluation Framework to Assess the Conformity of Public and Private Ecolabelling Schemes with the FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries, which provides benchmarking indicators to validate U.S. management systems conformity with the FAO Guidelines for ecolabelling and subsequent potential designation of the sustainability of U.S. managed fisheries.

Our approach is to evaluate the management and stock assessment process, identify gaps between Federal/state systems and FAO criteria, and develop recommendations for consideration by NOAA, Regional Councils and state managers. The pilot conformance assessment describes Applicable Statute(s) as well as regulations and guidelines that apply to Federal and state fisheries, followed by a discussion section on major stocks that illustrates how fisheries are managed. We then assess conformance with FAO criteria for sustainable fisheries, identify gaps, and provide recommendations to address those areas of non- or low-conformance.

We view this exercise as a very significant initial step for improving fishery management systems and providing a process to systematically document the sustainability of U.S. managed fisheries.

Communicating Seafood Sustainability from the Gulf Coast: a Two-Pronged Approach

RENE LEBRETON AND KATIE SEMON (PRESENTER), LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES; JULIANNA MILLER, AUDUBON SOCIETY; AND ALEX MILLER, GULF STATES MARINE FISHERIES COMMISSION. RLEBRETON@WLF.LA.GOV

Pressure on seafood buyers to demonstrate that the seafood they are sourcing is “sustainable”, has created an influx of sustainability models and programs. This has created an increased amount of pressure on government fishery management agencies to provide communications and assurances to the supply chain with limited budgets and staff. Louisiana Department of Wildlife and Fisheries is working on two approaches to help fill this communication void by providing a transparent source of data on our fisheries and to provide a third-party level of confidence to the buyers of our seafood.

1. One of the key projects the Gulf Coast states are embracing is a “Gulf Watch” website. This would be similar to the NOAA FishWatch website, but would emphasize those species managed at the state level—species not currently covered by the federally managed species on FishWatch. This site will be a transparent resource of information for buyers and consumers to make educated decisions about our fisheries.
2. The second key project is to combine efforts with the Audubon Nature Institute to develop a program

that can verify if a fishery is in conformance to the United Nations Food and Agriculture Organization's (FAO) Code of Conduct for Responsible Fisheries. This project will also utilize the concept of fishery development plans for those fisheries with challenges to conformance or for those fisheries where the market only requires a fishery development plan—not full certification.

The Audubon Nature Institute is a conservation organization with a strong reputation on the Gulf Coast, and will lend third-party credibility to this program. This program will be made available to any Gulf Coast fishery and will highlight the strengths of the major Gulf Coast fisheries and indicate areas that need improvement to conform to the FAO Code of Conduct for Responsible Fisheries—a balanced/accurate view of Gulf Coast fisheries.

Integrating Habitat Conservation into Sustainable Fishery Management: Recommendations from the NOAA Habitat Blueprint Symposium at the 142nd Meeting of the American Fisheries Society

TERRA LEDERHOUSE AND KAREN ABRAMS, NOAA HABITAT OFFICE. TERRA.LEDERHOUSE@NOAA.GOV

In 1996, Congress added the “essential fish habitat” (EFH) provisions to the Magnuson-Stevens Act (MSA) in recognition of the decline of fish habitat that threatened our nations’ sustainable fisheries. Since 1996, NOAA and the regional fishery management councils have identified EFH for more than 1,000 species, designated over 100 habitat areas of particular concern, and protected over 700 million acres of EFH from the impacts of fishing. Despite these accomplishments, habitats essential for healthy fisheries are still at risk, many fish stocks are not meeting biomass targets, and fishery scientists and managers struggle to effectively demonstrate a link between specific habitat improvements and fishery productivity.

The NOAA Habitat Blueprint is a new strategy to address the growing challenge of coastal and marine habitat loss and degradation, increase the effectiveness of NOAA’s habitat programs to achieve sustainable and abundant fish populations, recover threatened and endangered species, and protect coastal and marine areas and habitats at risk. To advance this effort, NOAA hosted a symposium on the NOAA Habitat Blueprint at the 142nd Annual Meeting of the American Fisheries Society on August 22nd, 2012 in St. Paul, Minnesota. Panelists included representatives of NOAA, the Councils, and other non-government organizations who discussed the impediments to applying existing habitat conservation authorities in MSA to achieve fishery goals, options for developing habitat conservation objectives for fishery managers, and recommendations for implementing such objectives.

The panelists concluded that many opportunities exist for fishery managers to act now to strengthen habitat conservation to achieve sustainable fisheries:

1. NOAA should work with the Councils to develop strong, actionable objectives for some habitat-dependent fish stocks.
2. NOAA can work immediately with the Councils on ecosystem-based fishery management plans.
3. Stronger procedures for Council engagement in key EFH consultations will help NOAA achieve its objectives for sustainable fisheries.
4. A potential reauthorization of the Magnuson-Stevens Act would offer opportunities for NOAA and the Councils to improve their habitat authorities and adapt to the growing number of challenges faced by our nation’s fisheries.

Fisheries Management Policies and Their Effects on Safety in the Commercial Fishing Industry

JENNIFER LINCOLN AND GUNNAR KNAPP, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH. JLINCOLN@CDC.GOV

Background: Studies from many countries have suggested that fisheries management may affect fishing safety. However, there has been relatively little systematic analysis of how fisheries management affects safe-

ty or the extent to which changes in management can make fishing safer or less safe. This poster outlines some of these effects.

Methods: To better understand the relationship between fisheries management and fishing safety, the Food and Agriculture Organization of the United Nations and the U.S. National Institute for Occupational Safety and Health are cooperating in an international effort to document the relationship between fisheries management and fishing safety to provide practical guidelines for fisheries managers and safety professionals. International case studies were collected and reviewed for evidence to four hypotheses of how fisheries management policies could affect safety.

Results: Each case study provided evidence supporting at least one of the hypotheses. The review of the case studies resulted in establishing the following:

1. a conceptual framework, terminology and hypotheses about the relationship between fisheries management and fishing safety;
2. a review of the evidence provided by the international case studies with respect to these hypotheses;
3. a review of other evidence in the published literature supporting these hypotheses;
4. preliminary recommendations for fisheries managers and safety professionals about how they can help make commercial fishing safer; and
5. suggestions for important areas for future research.

Conclusions: Fishery management is a complex challenge. Managers must attempt to balance multiple objectives, under significant uncertainty, with limited resources. We recommend that safety professionals and fisheries managers take practical steps and acknowledge the relationships we have outlined and then take steps which may help to save lives and reduce injuries to fishermen.

Designing and Implementing Annual Catch Limits for North Pacific Groundfish and Crab Stocks

PATRICIA LIVINGSTON ET AL., NOAA ALASKA FISHERIES SCIENCE CENTER. PAT.LIVINGSTON@NOAA.GOV

The Alaska Fisheries Science Center provides the main stock assessment support to the North Pacific Fishery Management Council for Bering Sea/Aleutians and Gulf of Alaska groundfish and for some Bering Sea/Aleutian Islands crab stocks. Stock assessment scientists have been instrumental in the development of the groundfish and crab tier systems, which define harvest control rules that vary according to the type of information available. A number of changes have occurred in these tier systems in order to meet the annual catch limit requirements of the Magnuson-Stevens Act. In addition, vulnerability assessments have been used to guide the assignment of species/complexes to the ecosystem component management category. Different methods have been evolving for dealing with uncertainty and data poor complexes; some of these approaches will also be highlighted.

Private Bycatch Contracts Reduce Chinook Salmon Bycatch in the Pollock Fishery

STEPHANIE MADSEN AND ED RICHARDSON, AT-SEA PROCESSORS ASSOCIATION (SPONSOR), SMADSEN@ATSEA.ORG

Amendment 91 to the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan limits Chinook salmon bycatch in the Bering Sea pollock fishery. The regulations implement an innovative approach to controlling Chinook bycatch in that a limit on the number of Chinook that may be caught incidentally each year is combined with an incentive agreement and performance-standard requirement designed to minimize Chinook bycatch to the extent practicable in all years.

Pollock Conservation Cooperative member companies operate vessels designed to catch and process Bering Sea pollock. The regulations motivated the Pollock Conservation Cooperative member companies to create Chinook bycatch quotas at the individual vessel level through private contracts. Primary incentive-agreement components include: (1) data gathering, monitoring, reporting, and information sharing; (2)

identification of bycatch avoidance areas; and (3) fishing-area prohibitions for vessels with poor Chinook bycatch performance. Additional components include: (1) an A-season closed area of approximately 755 square nautical miles on the northern flank of the Bering Canyon; and (2) a set of conditional, B-season closed areas of approximately 1,295 square miles along the outer Bering Sea shelf.

The year 2011 was the first for the program. An examination of trawl locations in space and time and the bycatch performance of the Pollock Conservation Cooperative vessels shows that the vessels changed their fishing locations to avoid Chinook bycatch. A salient feature of this change was for vessels to locate fishing away from the outer margins of the shelf initially. Depending on the locations of pollock schools, any movement of fishing to deeper water was accomplished via a deliberate, slow, and cautious progression; evidence of local Chinook concentrations in deep water generally caused vessels to move back to shallow grounds. In addition, very little fishing was located near the bycatch avoidance areas. An evaluation of vessel bycatch performance indicated a very uniform distribution of performance during the 2011 A-season. In contrast to prior years, there were no poor-performance outliers in the distribution (no right-hand tail), and the distribution coefficient of variation, which is a normalized measure of dispersion, was reduced by roughly half under the Amendment 91 program as compared to the 2008-2010 A-seasons.

Education Tax Credits: New Money for Marine Mammal Research in Alaska

STEPHANIE MADSEN AND ED RICHARDSON, AT-SEA PROCESSORS ASSOCIATION (SPONSOR). SMADSEN@ATSEA.ORG

The member companies of the Pollock Conservation Cooperative own and operate catcher-processor vessels that catch pollock in the Bering Sea off Alaska. The Pollock Conservation Cooperative member companies pay a Fishery Resource Landings Tax based on the value of the pollock catch. The Alaska Education Tax Credit Program provides a tax credit to businesses that make contributions to Alaska universities and accredited nonprofit colleges for research and educational purposes. Since 2000 Pollock Conservation Cooperative member company contributions of about \$2 million to the University of Alaska have supported more than 25 marine mammal research projects while contributions to Alaska Pacific University have funded the development of a Marine Biology Program with a focus on marine mammal research. Project cooperators include the Alaska SeaLife Center, the Aleut Community of St. Paul Island Tribal Government, the National Marine Mammal Laboratory, Oregon State University, the Prince William Sound Science Center, the University of British Columbia Marine Mammal Research Unit, and the University of Washington School of Fisheries and Aquatic Sciences.

Projects have investigated Steller sea lions, northern fur seals, harbor seals, and Biggs' killer whales over an area from California through the Pribilof, Aleutian, and Commander Islands. Research has focused on marine mammal predators, foraging ecology, prey diets and nutrition, the effects of persistent organic pollutants, and the potential for competition with groundfish fisheries for prey. An unexplained megafaunal collapse that began during the 1970s and extended throughout much of the northern North Pacific Ocean and southern Bering Sea motivated many of the projects. Important accomplishments include the development of an implantable life-history tag used to investigate marine mammal predation, and the deployment of data loggers on pollock fishing vessels to evaluate the potential for fishing-induced declines in pollock abundance. New projects for 2013 include the estimation of sea lion vital rates in the Commander Islands based on mark and re-sight data collected during 2000-2012, and satellite-tagging of killer whales in the western Aleutian Islands to determine foraging locations and diving behavior near sea lion rookeries.

Educating Teachers and Youth about Sustainable Seafood: A Place-Based Model for Understanding Connections Between Your Community and Ocean Resources

KIM MARSHALL AND MICHELLE WALSH, NOAA/GEORGE MASON UNIVERSITY. KIM.MARSHALL@NOAA.GOV

NOAA Fisheries will present a new model for educating the public about key concepts of ocean literacy by providing a professional development opportunity for K-5 teachers centered around the fundamental

concepts needed to understand the ecological, social, and economic elements involved in fisheries sustainability. NOAA Fisheries staff forged partnerships with educators from the Maryland State Department of Education, Montgomery County Public Schools, and a local conservation organization to align the Ocean Literacy Principles and Concepts with local curriculum and state environmental literacy standards, helping teachers and students make connections “from the schoolyard to the ocean” through place-based, hands-on lessons. Teachers are brought through the fundamentals of ocean science leading up to an understanding of ocean resource sustainability and how it is managed through NOAA Fisheries. Workshop facilitators use striped bass as a model to connect concepts and provide continuity among workshop modules from the physical and chemical properties of the ocean, adaptations for life in the ocean, ocean ecosystems, gathering and using data, human impacts and mitigations (such as for marine debris/derelict fishing gear), and ocean stewardship, including making seafood choices. Pre and post assessment data and positive partner feedback prove this new model to be a very effective way to promote ocean literacy and seafood sustainability through public schools.

Maine Coast Fishermen’s Association: Building a Fishery for our Future

BEN MARTENS, MAINE COAST FISHERMEN’S ASSOCIATION. BEN@MAINECOASTFISHERMEN.ORG

The Maine Coast Fishermen’s Association (MCFA) is a fishermen led non-profit organization that identifies and fosters ways to restore the fisheries of the Gulf of Maine and sustain Maine’s iconic fishing communities for future generations.

The fishermen who formed MCFA came together in response to years of mismanagement and the reduction of fish stocks within the Gulf of Maine. They saw their way of life at risk of disappearing forever. Together, MCFA provides a voice for fishermen fishing in the Gulf of Maine at the regulatory bodies that govern New England fisheries, and facilitates building strong fishing businesses in the face of changing regulations and a changing environment.

For more than 300 years Maine’s fishing industry and their communities have been the foundation of our cultural identity. Preserving our shared marine heritage requires vibrant communities with a foundation based on strong fishing businesses and healthy fish stocks. Our member fishermen are predominantly groundfish fishermen, but Maine’s small-boat fleet cannot rely on groundfish alone. Many fishermen also fish for shrimp, scallops, urchins, tuna, elvers, whiting and lobster and their individual business plans are as diverse as the harbors they come from.

Through the guidance from the fishermen, MCFA has developed and continues to support the Maine Coast Community Sector. It has also supported the development of Port Clyde Fresh Catch, an industry-led local processing facility and the first in the region community-supported-fishery that directly supports fishermen. Projects also include a National Fish and Wildlife funded risk pool, which is currently being developed in response to the massive allocation cuts in New England, and on-going business planning to ensure successful businesses in an ever changing economy.

As stewards of the marine ecosystem, MCFA fishermen promote and advocate for a healthy Gulf of Maine resource while balancing the needs of our fishing communities. MCFA works to achieve these goals through advocacy, education, outreach, and collaborative research projects.

Cooperative Marine Fisheries Statistics Program

ANN MCELHATTON, ATLANTIC COASTAL COOPERATIVE STATISTICS PROGRAM. INFO@ACCSP.ORG

The Atlantic Coastal Cooperative Statistics Program doesn’t just store fishery-dependent data through the Data Warehouse, but is also a robust data collection program. In the past ten years, through the Standard Atlantic Fisheries Information System, almost 500,000 records have been collected from fishermen, harvesters, dealers, and anglers. These real-time records, not only provide the ability to monitor fisheries, but are also integrated into the Data Warehouse for more comprehensive stock assessments and, ultimately—

fishery management decisions.

Two Atlantic Coastal Cooperative Statistics Program program partners that have illustrated success using the Standard Atlantic Fisheries Information System have been the Maine Department of Marine Resource Management and the Massachusetts Division of Marine Fisheries.

Beginning in January 2008, the Maine Department of Marine Resource Management began collecting mandatory trip level dealer reporting. For the first time detailed data were collected on all of Maine's commercial fisheries. The objective of this project has been to continue with the implementation of the comprehensive dealer reporting regulation in Maine for all 680 dealers that buy directly from harvesters. In the past five years the project has shown to be vital for monitoring changes in fisheries, providing knowledge of fleet characteristics, and ensuring accurate communications to NOAA Fisheries and Atlantic States Marine Fisheries Commission about Maine landings. This data collection is one of the best ways to monitor the health of Maine's fisheries.

Beginning in 2010, the Massachusetts Division of Marine Fisheries embarked on a new project to achieve a goal common of all program partners—to collect comprehensive, standardized trip-level catch and effort data from all commercial permit holders. This project to collect standardized comprehensive fishery-dependent data from both dealers and harvesters creates improvements in data quality, quantity, and timeliness. Although this project only covers the activities of Massachusetts commercial harvesters, it does include the harvest of species which are managed regionally, such as lobster, striped bass, scup and sea bass. Thus regional management bodies such as the Atlantic States Marine Fisheries Commission benefit from having comprehensive fishery-dependent data from Massachusetts.

Fisheries Monitoring Roadmap

SARAH MCTEE ET AL., ENVIRONMENTAL DEFENSE FUND. SMCTEE@EDF.ORG

Fishery management goals that require accurate accounting of annual catch levels are increasing the need for robust fishery-dependent data. Limited financial resources to support fisheries monitoring underscore the importance of cost efficiency and transparency in the use of government funds and industry fees. Fisheries managers and industry stakeholders interested in optimizing the economics of their monitoring programs are encouraged to evaluate tools currently used to meet monitoring objectives, explore how those tools can be best utilized optimized, and determine the appropriateness of new or additional monitoring approaches, including electronic monitoring and electronic reporting tools.

Modifying a fishery monitoring program to include new sources of data or data collection tools can require regulatory revisions, changes in personnel, and the development of new infrastructure. Understanding the scope of change required and communicating those needs to relevant stakeholders, is critical to planning and successfully implementing a monitoring program. The Fishery Monitoring Roadmap is an attempt to assist managers and stakeholders in these processes. Composed of five complementary sections, the "Roadmap" includes: (1) a step-by-step process for evaluating, designing and implementing a fishery monitoring program; (2) a matrix to help identify data needs and an assessment of the ability of monitoring tools to meet those needs; (3) an outline of practical considerations and trade-offs of various monitoring tools; (4) a list of relevant references and resources; and (5) case studies to demonstrate how similar fisheries are implementing different monitoring tools.

As fishery managers and stakeholders look to new and emerging technologies to meet fishery monitoring and data needs, it is important to recognize that incorporating electronic monitoring or electronic reporting into a fishery monitoring program is a multi-step process that must be tailored to the specific needs of the fishery, fleet and often vessel. The Fishery Monitoring Roadmap helps stakeholders understand differences between monitoring tools, and match tools with clearly identified management and monitoring goals, ultimately allowing for the optimization of fishery monitoring programs.

Rebuilding Pacific Coast Groundfish Stocks: Management Successes and Challenges

STACEY MILLER AND JIM HASTIE, NOAA NORTHWEST FISHERIES SCIENCE CENTER. STACEY.MILLER@NOAA.GOV

Community resilience is often characterized as a system's vulnerability to a specific environmental change, event or hazard, and its adaptive capacity to cope and/or adapt. Social vulnerability is comprised of the demographic and socioeconomic characteristics of populations that may affect responses to change, events, or hazards. In an effort to identify fishing communities that may be vulnerable to environmental or fishery regulation changes, NOAA Fisheries is developing social vulnerability indicators for coastal fishing communities in five regions within the U.S. including the northeast, southeast, Pacific coast, Alaska and Hawaii. Place-level data from the U.S. Decennial Census, American Community Survey, NOAA Fisheries and state fish and wildlife agencies, as well as a variety of additional sources, are included in a factor analysis to create indicators of social vulnerability, gentrification vulnerability, and fishing engagement and reliance. This poster will highlight the approach as applied to fishing communities located along the west coast of the U.S. including a description of regional-specific data, observed changes in socio-economic vulnerability in Pacific coast communities between 2000 and 2010, and future research and data needs. Results from the analysis are anticipated to be incorporated into the California Current Integrated Ecosystem Assessment as well as used to inform social impact assessments in fishery management.

Assessing the Impacts of Climate Change in a Coupled Socio-Ecological System: The Case of Atlantic Surfclams

DAPHNE MUNROE ET AL., RUTGERS UNIVERSITY SHELLFISH RESEARCH LAB. DMUNROE@HSRL.RUTGERS.EDU

The Atlantic surfclam (*Spisula solidissima*) fishery lands 22,000 metric tons annually, which in 2008 netted \$39 million, making it one of the most valuable single species commercial fisheries in the U.S. Since 1997, populations from southern inshore regions of the clam's range have experienced significant mortality events co-incident with warm bottom water temperatures (reaching 21-24°C in September). Resulting changes in population distribution have major implications for the clam fishery. The processes underlying and consequences of this shift are being investigated using a multi-disciplinary approach that integrates physical oceanography, biology, socio-economics and anthropology.

Larval connectivity among fished clam populations along the Mid-Atlantic Bight is being studied using a physical fluid dynamics model (Regional Ocean Modeling System, or ROMS) by oceanographers at Rutgers University. This larval connectivity is of integral importance to how these populations will respond over time to changing climate and future fishery pressures.

Biological impacts of changing bottom water temperature are being addressed through individual-based metapopulation models. This is a collaborative effort between scientists at Old Dominion University, the Haskin Shellfish Research Lab, the Gulf Coast Research Laboratory, and Virginia Institute of Marine Science. These models will provide insight into the mechanisms behind ongoing changes in clam distribution and allow for prediction of possible future changes in distribution and biological parameters for the fishery.

Economic experiments are being used to examine how changes in the distribution of the fished stock may alter decisions around where to fish. This component of the project is being run through University of Massachusetts Amherst and will identify ways the changing environmental conditions influence individual and collective behavior in the fishery.

The social and cognitive processes involved in making management decisions are being studied by anthropologists in the Department of Human Ecology at Rutgers University. This group is examining the nature of managerial responses to changes in the fishery, economics, surfclam biology and oceanography—a key coupling mechanism between natural and human elements of the system.

This diverse and comprehensive approach will ultimately provide guidance for a proactive approach to management for Atlantic surfclams in the face of climate-driven shifts in distribution.

Collecting Data for Social and Economic Indicators in the Northeast U.S. Fisheries and Fishing Communities: Methods and Approaches

LOU NADEAU ET AL., EASTERN RESEARCH GROUP. LOU.NADEAU@ERG.COM

National Marine Fisheries Service's (NMFS) Northeast Science Center's Social Science Branch in Woods Hole, Massachusetts is currently implementing a set of three surveys of fishing crew and owners in the Northeast Region (New England and Mid-Atlantic). These surveys provide for the ongoing collection of social and economic data related to fisheries and their communities (a separate poster provides details on the development and nature of those measures). The three surveys cover the collection of socioeconomic data from fishing crew, socioeconomic data from vessel owners, and annual fishing business and operational costs from vessel owners. Although data to support some performance indicators are already routinely collected by NMFS, these surveys fill in the gaps and allow the Social Science Branch to collect trend data needed for more thorough analysis of changes in the fisheries, including impacts from changes in management regimes. This poster will provide details on (1) how the Social Science Branch translated the performance indicators into data elements on a survey, (2) the methods and approach being used to collect data in the field, and (3) the current status of the data collection efforts.

Assessing the Vulnerability of Fish Stocks to Climate Change

MARK NELSON ET AL., NMFS HEADQUARTERS. MARK.NELSON@NOAA.GOV

Climate change is already impacting fishery resources and the communities that depend on them. Environmental changes have been implicated in shifting distributions and altered abundances of fish stocks in many marine ecosystems. These impacts are expected to intensify in the future, increasing the need to understand which fishery resources are the most vulnerable to environmental change. We have developed a tool for conducting a rapid vulnerability assessment for a large number of stocks to create an index of relative vulnerability. The index can help fishery managers identify high vulnerability stocks and more effectively target limited research and assessment resources on stocks of highest concern. The vulnerability assessment integrates climate forecasts, species distributions, and species life history characteristics to estimate relative vulnerability across stocks. The methodology was created for use on data rich and data poor stocks; integrating quantitative information when available, and extrapolations from related species combined with expert opinion when quantitative data is lacking. The methodology includes an index of data quality which provides a gap analysis of future research needs. Pilot tests have found the methodology to be robust across temperate and tropical ecosystems.

Marine Outreach and Education U.S. Virgin Islands Style (MOES-VI)

LIA ORTIZ, MRAG AMERICAS, INC. LIA.ORTIZ@NOAA.GOV

NOAA's Coral Reef Conservation Program (CRCP) identifies fishing impacts, land-based sources of pollution, and climate change as the top three stressors of coral reefs within the 7 states, territories, and commonwealths of the U.S., including U.S. Virgin Islands (USVI). Federal and local resource managers recognize the need for building community awareness and capacity to participate in natural resource management to mitigate these threats. To address these needs, a series of projects have been developed under the brand of Marine Outreach and Education USVI Style (MOES-VI). The MOES-VI initiative consists of several projects, including: (1) The Marine Environmental Community Awareness Project assessing local community awareness gaps of marine environment topics and management, led by the local fishing associations (2) The Commercial Fishers' Training Module and Fishing/Boating License Project aimed at building commercial fisher knowledge of fisheries management rules and regulations, a collaboration between CRCP and USVI Division of Fish and Wildlife and Division of Environmental Enforcement; and (3) The development of a USVI Communications, Outreach and Education Strategic Plan (2015-2020) which entails (A) engaging the fishing community through implementing focus group meetings and interviews to

determine the communication, outreach and education needs specific to coral reef and fisheries management and conservation; and (B) strategizing to the identified needs with aim to build upon and complement efforts in the other MOES-VI projects. Together, these MOES-VI projects will serve as a foundation for building community ownership of sustainable fisheries management and conservation, while strengthening community relationships. These projects are in different states of implementation and collaborators include the NOAA-CRCP, NMFS-Southeast Regional Office, Caribbean Fishery Management Council, USVI Department of Planning and Natural Resources, University of the Virgin Islands Center for Marine and Environmental Sciences, Puerto Rico Sea Grant, The Nature Conservancy, St. Croix Commercial Fishermen's Association, St. Thomas Fishermen's Association and VI Network of Environmental Educators.

Factors Affecting Management Uncertainty in U.S. Fisheries

WESLEY PATRICK, NOAA. WESLEY.PATRICK@NOAA.GOV

Marine fisheries management is often based on a system of target and limit reference points, which contain significant amounts of scientific and management uncertainty that fishery managers must address. In the United States, these target and limit reference points are based on the annual catch limit (ACL) framework (i.e., overfishing level \geq acceptable biological catch (ABC) \geq ACL \geq annual catch target (ACT)). Within this framework, scientific uncertainty is accounted for in the setting of the ABC, while management uncertainty is accounted for in the setting of the ACT. Scientific uncertainty has been widely addressed since 2009, when the ACL framework was described in the National Standard 1 Guidelines. However, few researchers have examined management uncertainty, except in a theoretical context. Our research goes beyond the theoretical by taking a closer look at 17 U.S. fisheries, describing variations in management uncertainty among management regimes, and identifying potential factors that account for these differences. We found that a manager's ability to keep a fishery at or under the ACL can vary substantially among fisheries depending on the fishery sector (i.e., commercial, recreational, etc.), the management regime, the frequency of landing reports, and the degree to which target change from year to year. Lastly, our research shows that unless management uncertainty is accounted for, overages of the ACL can commonly occur and even result in overfishing.

Innovations for Community-Based Fisheries in Kodiak, Alaska

THERESA PETERSON AND KELLY HARRELL, ALASKA MARINE CONSERVATION COUNCIL. THERESA@AKMARINE.ORG

Commercial fisheries are an essential economic, social and cultural component of Alaska's coastal communities. However, fresh approaches are needed to ensure viable opportunities for local fishermen given the complex challenges that fishing communities face. We highlight two innovative, triple-bottom line initiatives that foster small-scale fisheries, community sustainability and long-term conservation in Alaska.

The first project is in partnership with the Alaska Jig Association and the Community Fisheries Network and aims to capitalize on a new entry-level opportunity for Kodiak's low-impact jig fleet. In recent years, fishery managers created a set aside that allows the fleet to stair-step up to 6 percent of the total allowable catch for Pacific cod in the Gulf of Alaska. Jigging has low capital requirements and offers the opportunity to diversify fishermen's portfolios and generate income to facilitate entry into other fisheries. However, with cod prices extremely low, this forward-thinking regulatory measure needs to be solidified with market-side improvements to generate greater economic and social benefits. Our project leverages the fishery's assets including its local fleet of owner-operators, low ecosystem impact, and potential to produce high quality seafood products. We report on our approach to transform the jig fishery into a higher-value enterprise by working with the fleet to create a community fishing organization, develop best handling practices, and generate appreciation in the market for the strong conservation performance and social benefits of the fishery.

The second project is Alaska Marine Conservation Council's Catch of the Season, an annual Community Supported Fishery program that features Kodiak Tanner crab. This social enterprise delivered over 10,000 lbs. of crab within Alaska in 2013 to about 250 households, seven restaurants, and Princess Tour's lodges.

Local, conservation-minded fishermen catch the crab for the program and get a price bonus for participating, and proceeds benefit Alaska Marine Conservation Council's work to sustain healthy working waterfronts. The program is building valuable connections between our fishing communities and consumers, restaurants chefs, and businesses. Through a product they can connect to, awareness is being generated about the benefits of local seafood and the important role of community-based fishermen in sustaining our coastal economies and providing stewardship of our marine ecosystems.

Measuring Success of Regional Fisheries Management Goals and Objectives: A Retrospective Analysis of Stated Goals and Objectives

PATRICIA PINTO DA SILVA, NMFS; ARIEL BAKER (PRESENTER), RUTGERS; AND GEORGE LAPOINTE, GEORGE LAPOINTE CONSULTING. PATRICIA.PINTO.DA.SILVA@NOAA.GOV

Most Regional Fishery Management Councils have not yet crafted a clear vision—or a set of objectives—for measuring management success in their regions. To inform these processes as they emerge and to illustrate what have been the main stated goals of each Council, we conducted a retrospective analysis of the principal regulatory documents of each Council since 1977 when the Magnuson-Stevens Act was implemented. For each of the eight management councils, we identified all of their fishery management plans [FMPs] (and associated amendments), and coded and analyzed selected FMPs stated goals and objectives, with a particular focus on the social and economic goals. Key fisheries in each region were selected based on the number of participants and ex-vessel revenue. This list was then modified through a series of informal interviews with Council staffs, NOAA science and policy personnel, and others having specific knowledge about the FMPs in each region. Using Atlas Ti qualitative data analysis software, we created hierarchical trees of each fishery to enable analysis and comparison. Our initial results indicate that a similar core set of goals exist throughout the U.S. However, in many cases, fisheries goals and objectives conflict both within, and among, fisheries in the region. Our conceptual maps offer a springboard for ongoing discussions about regional visioning efforts.

Help Spread the Word: U.S. Seafood is Sustainable

REBECCA REUTER ET AL., NOAA/NATIONAL MARINE FISHERIES SERVICE. REBECCA.REUTER@NOAA.GOV

In today's dynamic and at times complicated seafood culture, U.S. fishers are challenged with being competitive in the marketplace and U.S. seafood consumers are confused about how to buy seafood. Once on land, fishers, who have responsibly harvested U.S. seafood, are challenged with marketing their seafood products to help consumers understand that their product meets their demands for healthy, safe and sustainable seafood. Developing innovative marketing strategies that educate the consumer is imperative to the economic success of U.S. fishers and the communities that support them. NOAA Fisheries is finding ways to help fishers and their communities figure out ways to connect their products with consumer demands and help demystify seafood choices. Staff at NOAA Fisheries are developing outreach and educational materials that help spread the word that U.S. seafood is safe, sustainable and healthy. Materials, written in plain language, promote the relevance and importance of the work that NOAA Fisheries conducts to help communities throughout the Nation spread consistent messages such as U.S. Seafood is Sustainable. Activities through Fishwatch.gov, seafood festivals, educational curricula, professional development and getting involved with locavore or foodie movements are a few ways that NOAA Fisheries is providing tools to encourage economic stability in our communities while preserving an important part of our cultural heritage.

The Alaska Deep-Sea Coral and Sponge Initiative: A Research Program to Support Management of Coral and Sponge Habitats

CHRIS ROOPER ET AL., NOAA ALASKA FISHERIES SCIENCE CENTER. CHRIS.ROOPER@NOAA.GOV

Deep-sea coral and sponge habitats are widespread throughout most of Alaska's marine waters. In some places, such as the western Aleutian Islands, these may be the most diverse and abundant deep-sea coral and

sponge communities in the world. In 2012 the Alaska Fisheries Science Center initiated a three-year field research program in the Alaska region funded by the Deep Sea Coral Research and Technology Program to better understand the location, distribution, ecosystem role, and status of deep-sea coral and sponge habitats. A series of projects were designed to fill information gaps relevant to ongoing management needs in Alaska. Two projects to be highlighted in the poster presentation include an effort to model coral and sponge distribution in the Aleutian Islands and corresponding fieldwork to groundtruth the model, as well as a study that examines the relative benefits in terms of fish growth, recruitment and density of coral and sponge habitats relative to other habitats in the Gulf of Alaska. To date, the modeling study has resulted in maps for the Aleutian Islands predicting the probability of coral and sponge occurrence, the relative density of coral and sponge and a prediction of coral diversity. Preliminary results of the second study have indicated differences in density in commercially important rockfish in different habitats. The results of both these studies will provide data to support management decisions regarding coral and sponge habitat in all Alaskan regions.

Managing “Data-Limited” Stocks Under Catch Limits in the Western Pacific Region: Approach and Challenges

MARLOWE SABATER, WESTERN PACIFIC FISHERY MANAGEMENT COUNCIL. MARLOWE.SABATER@NOAA.GOV

The Reauthorization of the Magnuson-Stevens Act in 2006 had significantly changed the way Regional Fishery Management Councils deal with managing the U.S. fisheries through implementation of annual catch limits (ACLs). Stock and output control-based approaches like ACLs pose problems for fisheries that are multi-gear, multi-species and spatially diverse by nature. The National Standard 1 Guidelines of the National Marine Fisheries Service is reliant on the existence of maximum sustainable yield for stock managed under ACLs. This provides very little guidance for reef fishes that has very few stock assessments in which the overfishing limit, a critical component of the ACL process, is based upon. Biological reference points that determine stock status are lacking for most of the species. Managing stocks that are data deficient proved to be a big challenge. This presentation outlines the approach that the Western Pacific Regional Fishery Management Council took in specifying ACLs for reef fishes in the U.S. Pacific island state and territories. Gaps and challenges were identified and recommendations are provided to enhance management of reef fish stocks under a catch limit system.

The Introduction of the Integrated Ecosystem Assessment Approach to Gulf of Mexico Management

MICHAEL SCHIRRIPA, NOAA SOUTHEAST FISHERIES SCIENCE CENTER; CLAUDIA FRIESS, OCEAN CONSERVANCY; AND REBECCA ALLEE, NOAA. MICHAEL.SCHIRRIPA@NOAA.GOV

Integrated ecosystem assessments (IEAs) are an emerging management tool designed to provide decision support needed for moving toward an ecosystem approach to management. The Regional Fishery Management Councils are ideal clients for the introduction of IEA products, especially management strategy evaluations, given their statutory responsibility to make trade-off decisions regarding the Nation's fishery resources that take into account the protection of marine ecosystems. Current fisheries management is set up to process information derived from single species stock assessments that often do not take into account species interactions or environmental factors. Such an approach makes the IEA process particularly useful to improve management. IEAs are intended to be complimentary to traditional single species approaches. One way to introduce managers and stakeholders to IEAs is to present IEA products to the Councils and their Scientific and Statistical Committees alongside traditional stock assessment results. With this in mind, the Gulf of Mexico IEA Program is joining the thirty-third Southeast Data Assessment and Review (SEDAR 33) process in the assessment of Gulf of Mexico gag grouper by introducing several ecosystem models, including Ecopath with Ecosim and OSMOSE, that will be run in parallel with models employing single species approaches. Our broad objectives are to (1) introduce the Gulf of Mexico IEA Program to the Scientific and Statistical Committees (Standing and Ecosystem) of the Gulf of Mexico Fishery Management Council; (2) provide support to the single species assessment of gag via the SEDAR process; and (3) provide ecosystem considerations to the specified management options that the single species assessment is

not capable of producing and to establish the Gulf of Mexico IEA as a regular part of the SEDAR process. Results from both the IEA and SEDAR will be presented to the Scientific and Statistical Committees for generating scientific fishery advice to the Gulf Council. The gag IEA will serve as a pilot or proof of concept study to demonstrate the capabilities of the IEA to the Gulf Council and stakeholders in the Gulf of Mexico region and to get them to think about management strategy evaluations they would like to see to help them evaluate trade-offs between alternative management strategies and to inform adaptive management.

Bringing the Fish Back: An Evaluation of U.S. Fisheries Rebuilding Under the Magnuson-Stevens Act

BRAD SEWELL ET AL., NATURAL RESOURCES DEFENSE COUNCIL. BSEWELL@NRDC.ORG

Congress amended the Magnuson-Stevens Fishery Conservation and Management Act in 1996 to require that overfished ocean fish stocks be rebuilt in as short a time period as possible, not to exceed 10 years, with limited exceptions. As part of evaluating the success of these requirements, Natural Resources Defense Council examined population trends of all U.S. ocean fish stocks that were subject to the requirements and for which sufficient information was available to assess rebuilding progress. Out of these 44 fish stocks, almost 65 percent can currently be considered rebuilding successes: 21 have been designated rebuilt (and have not been determined to again be approaching an overfished condition) or have exceeded their rebuilding targets, and 7 have made significant rebuilding progress, defined as achieving at least 50 percent of the rebuilding target and at least a 25 percent increase in abundance since implementation of the rebuilding plan. This success rate demonstrates that the Federal law has been generally successful in rebuilding fish stocks. Our analysis also showed areas of concern, including (a) gaps in the application of the rebuilding requirements, such as with respect to stocks that are not federally managed, of “unknown” population status, or internationally managed; (b) certain regions, such as New England, the South Atlantic, and the Gulf of Mexico, with significant proportions of stocks showing a lack of rebuilding progress; and (c) continued overfishing during rebuilding plans. We also found that rebuilding fish stocks confers substantial benefits. For example, estimated average annual 2008–2010 dockside revenues from commercial landings of the 28 U.S. fish stocks that have been rebuilt or are demonstrating significant rebuilding progress totaled almost \$585 million, which is 92 percent higher (54 percent when adjusted for inflation) than dockside revenues for these stocks at the start of rebuilding. Many of the rebuilt and rebuilding stocks also have significant economic benefits associated with recreational catch.

NOAA Fisheries' Marine Recreational Improvement Program

LEAH SHARPE ET AL., NOAA FISHERIES. LEAH.SHARPE@NOAA.GOV

The Marine Recreational Information Program, or MRIP, is the new way that NOAA Fisheries is collecting and reporting recreational fishing catch and effort data. Working with scientists, managers, fishermen and others, MRIP is making significant improvements to virtually everything we've done in the past. MRIP plays a critical role in sustainably managing our ocean resources by providing estimates of fishing activity that are both accurate and trusted. In this poster we will go over how recreational catch estimates fit in the overall stock assessment and fisheries management process, the types of surveys used in estimating our nation's recreational catch, the various changes being implemented in the new MRIP program, and our plans for future improvements. NOAA Fisheries is working to ensure the long term sustainability of our nation's fisheries and MRIP is a key element in meeting that goal.

Best Practices for Forage Fish Management

GEOFF SHESTER ET AL., OCEANA. GSHESTER@OCEANA.ORG

The current management regime for commercial forage fish fisheries generally fails to balance harvests against the beneficial ecological role of forage species. Forage fish (e.g., herring, anchovies, squid, sardines, etc.) are clear examples of species valuable both as direct landings and as prey for larger fish species and marine wildlife. Fishing pressure on forage fish can have a disproportionate ecological effect relative to fishing

other species. These interactions are further complicated by natural fluctuations in forage fish abundance, caused by complex and often unpredictable relationships with oceanic conditions.

Optimum yield, as defined in the Magnuson-Stevens Act (MSA), requires fishery managers take into account the protection of marine ecosystems, and is based on maximum sustainable yield as reduced by relevant economic, social, or ecological factors. Here we discuss these factors in the context of forage species, and propose both short and long-term strategies for integrating ecological considerations and socioeconomic trade-offs into harvest control rules, focusing on Pacific sardine as a case study. We highlight the practical limitations of the current management context, and propose ideas for advancing an Ecologically Sustainable Yield approach that accounts for predator requirements and food web dynamics.

In addition to an Ecologically Sustainable Yield approach for the management of existing forage fish fisheries, best practices include protecting forage species before new fisheries develop. While there are many forage species not currently subject to commercial exploitation, the increasing global prices of fish meal and fish oil are likely to make new fisheries profitable in the future. Given the ecological importance of forage species, a precautionary approach can prevent unintended consequences to other fisheries, communities and ecosystems. We provide an overview of available pathways to proactively prevent new fisheries from developing on currently unmanaged forage species under current statute and guidelines, with examples from the Pacific and North Pacific regions. Yet changes to the MSA could facilitate comprehensive solutions that prevent new fisheries from developing on forage species unless and until scientific criteria are met.

The International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean

SARAH SHOFFLER AND GERARD DINARDO, NOAA SOUTHWEST FISHERIES SCIENCE CENTER. SARAH.SHOFFLER@NOAA.GOV

The goal of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC) is to advance fishery science of North Pacific tuna and tuna-like fishes through cooperation and collaboration among interested parties. It is an inter-governmental organization with members from coastal states and fishing entities of the region and coastal states and fishing entities with vessels fishing for highly migratory species in the region. Unlike regional fisheries management organizations, ISC is supported completely by in kind contributions from participants' organizations, not through specific government funding. Most ISC work has focused on stock assessments of North Pacific stocks, including Pacific bluefin tuna, swordfish, striped marlin, albacore tuna, and recently some sharks. Stock assessments are collaborative and depend on member commitments to provide not only the required data but also qualified scientists to conduct the assessments. Present challenges the ISC faces in providing the best available science information to fishery managers include the identification and adoption of biological reference points by the Western and Central Pacific Fisheries Commission.

First Stewards: Coastal Peoples Address Climate Change

SYLVIA SPALDING AND MICAH MCCARTY, WESTERN PACIFIC FISHERY MANAGEMENT COUNCIL. SYLVIA@LAVA.NET

Climate change is occurring rapidly, creating an urgent need for the world to make use of indigenous ways of adapting and maintaining the resiliency that has served ancient coastal cultures for thousands of years. That was the message delivered by the indigenous coastal people of the United States and the U.S. Pacific Islands when they gathered July 17-20, 2012, in Washington, D.C., where their unified voices called for action on climate change.

The First Stewards Symposium: Coastal Peoples Address Climate Change was convened to create a mechanism for the indigenous people to engage with governments, non-governmental agencies and others to help mitigate and adapt to climate change. The very fabric of indigenous societies is threatened by overdevelopment of coastlines; alteration of freshwater streams and lakes; destruction of life-giving watersheds and reefs; and the decline of marine and terrestrial species. These have been exacerbated by climate change,

creating astonishing changes in coastal natural systems that indigenous cultures are witnessing.

A resolution drafted by the newly incorporated First Stewards and sent to President Obama requests formal recognition of the coastal indigenous people and their expertise in understanding and adapting to changes in their natural systems. The resolution asks for the Federal government to “consult with our tribal governments and indigenous communities for guidance in all policies that affect our way of life and to support our management efforts, which will strengthen America’s resiliency and ability to adapt to climate change.”

Because native communities continue to subsist off of the lands and live by the natural seasonality of fish, sea mammals, birds, animals, and plants, they depend upon the integrity and continued existence of healthy ecosystems and are vulnerable to climate change. Relying upon their traditional ecological knowledge and ancestral wisdom of adaptability and resilience are keys to their survival and identity. These methodologies include returning to and promoting traditional practices to ensure food stocks and natural resources continue to be available. Non-indigenous communities and climate change initiatives can benefit from the knowledge and methodologies of indigenous communities, which can serve as a tool to help the nation adapt to climate change.

How Leading by Example Can Exacerbate International Conservation Problems: A Bio-Economic Analysis

STEPHEN STOHS AND SARAH SHOFFLER, NOAA SOUTHWEST FISHERIES SCIENCE CENTER. STEPHEN.STOHS@NOAA.GOV

Unilateral domestic regulations to protect endangered species from commercial fisheries impacts may exacerbate the conservation problems they were intended to mitigate. The transfer effect describes how a domestic regulation to conserve transboundary target or protected populations can lead to a transfer of effort from U.S. harvesters to foreign harvesters. Because of the transfer effect, also described as a “trade leakage” or “spillover effect,” we cannot predict a priori whether unilateral domestic regulations will increase or decrease the global level of overfishing or protected species interactions on a transboundary stock. Regulation of U.S. Pacific swordfish fisheries (*Xiphias gladius*) intended to limit interactions with endangered leatherback turtles (*Dermochelys coriacea*) provides an example.

Endangered leatherback sea turtles are sometimes caught as bycatch in commercial Pacific swordfish fisheries, including rare event bycatch in the Hawaii and California swordfish fisheries. The population ranges of leatherback sea turtles and swordfish extend outside the 200 mile Exclusive Economic Zone limits of the U.S. and other Pacific Rim nations across the Pacific basin, with a high degree of overlap creating opportunity for leatherback-swordfish fishery interactions. The U.S. has regulated the swordfish fisheries in Hawaii and California to address Endangered Species Act requirements to protect the endangered leatherback turtles; however, commensurate regulations have not been imposed on non-U.S. commercial Pacific swordfish fisheries. The Theory of the Second Best suggests that it is impossible to predict a priori whether the effect of unilateral domestic regulation will be to increase or to decrease the global level of protected species interactions.

A two-sector bioeconomic model of swordfish catch and endangered sea turtle interactions in the U.S. domestic and foreign Pacific swordfish fisheries describes effects of unilateral domestic regulation to reduce endangered sea turtle interactions as potential implications of the Theory of the Second Best. The model assumes sea turtle interactions are an intrinsic production externality in both U.S. domestic and foreign sector fisheries. The analysis demonstrates that unilateral domestic regulation of the swordfish fishery intended to reduce interactions with endangered sea turtles may reduce U.S. swordfish fisheries’ competitive advantage in production while increasing the global level of sea turtle interactions in Pacific swordfish fisheries.

Has the New England Commercial Fishing Industry Gone to the Dogs?

JAMES SULIKOWSKI, UNIVERSITY OF NEW ENGLAND. JSULIKOWSKI@UNE.EDU

Commercial fishing directly or indirectly supports over 200,000 jobs in New England, generating over \$10 billion in revenue. Despite this importance, the industry is in perilous times. A disaster was declared for the 2013 fishing year as many important groundfish populations have failed to respond to restrictive management measures over the last five years. Concern over the poor condition of these stocks and that the biomass declines could worsen, additional reductions in fishing pressure have been implemented. Atlantic cod quotas (*Gadus morhua*), historically one of the most commercially important fish in New England, have been hit especially hard by these new reductions, with some regions experiencing additional cuts of over 70 percent when compared to the quotas of the 2012 fishing season. In contrast, spiny dogfish, *Squalus acanthias*, populations have exhibited fourfold increases in biomass over this same time frame. This small coastal shark is thought to be benthic in nature, make coordinated long distant, coast wide, seasonal migrations in large packs, and have a diet consisting of a mix of vertebrate and invertebrate prey items. However, we present data from several integrated studies to support hypotheses that are divergent to many of these common paradigms. We suggest that: 1) this shark has a more active vertical movement pattern that prevents representative sampling during trawl surveys used for stock assessment purposes; 2) this shark's horizontal movement patterns are more regional; 3) stomach content and stable isotope data suggests dogfish are more piscivorous than once thought; and 4) cod and dogfish sit at the same trophic level and thus are in direct competition for resources within this ecosystem. These collective results indicate that a larger dogfish population (currently estimated at 1,000,000 metric tons) has the potential to negatively impact this ecosystem, and in part, may help explain why cod (and possibly other groundfish) stocks have failed to rebound despite drastic reductions in fishing pressure.

Using Indicators to Discover the Effects of Catch Shares on Fishing Communities

JILL SWASEY AND SUZANNE IUDICELLO, MRAG AMERICAS. JILL.SWASEY@MRAGAMERICAS.COM

The Measuring the Effects of Catch Shares (<http://catchshareindicators.org/>) project posted its first round of results for catch share programs in the U.S. Northeast and on the West Coast in Spring 2013. The methodology arose from workshops where fishermen and fishing community stakeholders posed numerous questions about these programs. Analysis of information from the private sector, university scientists, government agencies and multiple jurisdictions is organized to answer key questions about effects of these two catch share programs on fishermen, fish stocks, fishing businesses, and fishing communities. The issues addressed through these key questions, though focused on the NE and WC programs, have broad applicability to measure changes in other catch share fisheries. The project does not advocate for or against catch shares, but provides objective, neutral data. The five-year project uses a collaborative approach to gather and rigorously analyze the best available data on economic, social, ecological, and administrative conditions and trends, comparing years before and during the catch share programs. Indicators for these key questions directly relate to the conference theme of fishing community sustainability. Select examples include:

- have fleetwide catches stayed within quotas?
- have discarding practices changed?
- has quality of fishery data changed with changes in observer coverage?
- have economic and social effects on local communities changed?
- are fishing vessels participating in a different mix of fisheries?
- has the efficiency of fishery management changed?

Poster viewers will be able to query the project web site to see the first of numerous periodic reports on the indicators.

Assessing the Impacts of Community Protection Measures in Catch Share Programs

MARYSIA SZYMKOWIAK, UNIVERSITY OF DELAWARE. MARYSIA@UDEL.EDU

The efficiency gains realized under rights-based management programs in fisheries may have negative socioeconomic impacts on some communities. Less efficient operators will likely sell or lease their shares (legally-revocable privileges) to more efficient operators, increasing efficiency across the fishery. However, the exodus of these operators could mean a loss of associated employment for crews, dockside workers, processors, etc., with a potential multiplier effect across the community. According to economic theory, there is an opportunity cost associated with having less efficient operators remain in the fishery when their labor could be reallocated to other sectors of the economy. However, in isolated coastal communities with few alternative employment opportunities the benefits of this reallocation would likely not be realized.

Regulators often seek to balance efficiency gains and the potentially negative impacts on communities of rights-based management by modifying or restricting the ways in which fishermen can utilize their allocations. For example, quota shares may be allocated based on vessel class or geographic location, with limited transferability between the categories. There are, however, tradeoffs associated with these modifications, in terms of the losses in potential economic efficiency gains expected from fuller rights. Therefore, the two sides of these modifications have to be evaluated: the costs (as decreases in potential efficiency gains) and the benefits (for the relevant operators and associated communities).

Evaluating the effects of these modifications necessitates first describing the counterfactuals, which may be: 1) the status quo without the program, 2) a rights-based program with full property rights characteristics, or 3) a “standard” rights-based program (one which only includes the limits on rights designated under national legislation). For example, it may be that the rights-based program would not have been implemented without the modification.

This study delineates several common modifications to rights-based management programs. It provides the theoretical background on how they can affect the rights of the quota holders and the capacity of the market to achieve economic efficiency. A framework for evaluating the potential costs and benefits of these modifications for participants and communities is presented. Finally, some preliminary results of an application of this methodology are presented.

Catalyzing Industry to Drive Fishery Improvements

BRANDON TIDWELL, DARDEN RESTAURANTS; MEGHAN JEANS, NEW ENGLAND AQUARIUM. BTIDWELL@DARDEN.COM

In 2011, Darden Restaurants made a commitment, through the Clinton Global Initiative, to rebuild troubled fisheries by supporting three fishery improvement projects (FIPs) in three years and catalyzing industry support of improvement efforts. This ambitious commitment is supported by a cooperative alliance of seafood buyers, producers, suppliers, fishery managers, scientists, community members, and conservation NGOs working together to improve fisheries. An evolving tool for sustainability, improvement projects rely on multi-stakeholder support and utilize the market power of the private sector to incentivize positive change in wild fisheries and aquaculture operations. But what is the value of supply chain engagement and what role can industry play in these multi-stakeholder efforts? Moreover, what impact is being made and how can companies be assured that their FIP commitment is making a difference? Darden will share its approach to FIPs and aquaculture improvement projects focusing on its collaborative relationship with the New England Aquarium and other NGOs; the criteria developed to inform FIP engagement opportunities; the challenges and successes experienced in their first FIP commitment in the Gulf of Mexico snapper/grouper fishery; and the business case for industry support of fishery and aquaculture improvement projects.

Managing the Threat of Invasive Catfish on Ecologically and Commercially Important Species in the Chesapeake Bay

BRUCE VOGT ET AL., NOAA CHESAPEAKE BAY OFFICE. BRUCE.VOGT@NOAA.GOV

Both blue and flathead catfish are invasive and potentially causing an unbalanced ecosystem in the Chesapeake Bay. Their increasing populations, rapid range expansion, and capacity to consume significant amounts of ecologically and economically native fish species such as menhaden, blue crab and shad raise significant concerns and ecosystem management challenges for fishery managers. These invasive catfish were introduced by humans and they are thriving in a system with high nutrient loading and available prey sources. The NOAA Chesapeake Bay Office funds research on invasive catfish to help further understand their basic biology and potential negative effects on native species and human health. Research findings will help inform management and mitigation strategies. Current research focuses on several topics:

- Estimating the abundance of blue catfish in the James River using a tagging study and mark-recapture analysis. This abundance estimate can verify other estimates, and can be used in ecological models to describe the role and ecological effects of blue catfish in the James River.
- Determining the rate of movement of adult blue catfish between freshwater and estuaries
- Conducting various studies to determine which fish species comprise blue catfish diets, and how diet varies according to certain parameters including specific tributary, season, and size. These results can provide a better understanding of the role of blue catfish in the food web depending on specific location and habitat conditions.
- Estimating predation mortality by blue catfish on anadromous fish species such as American shad and blueback herring. These results can explain the effects of blue catfish on economically important resources in the Bay.
- Evaluating the contaminant levels in blue catfish to determine if encouraging human consumption of blue catfish is a safe management option. This will help determine if promoting human consumption and expanding commercial markets for blue catfish are possible management strategies.
- Developing and analyzing blue catfish growth data to describe their growth patterns. This will allow analysis of blue catfish growth specifically in Bay tributaries, and how patterns may differ among tributaries.

Exploring the Social Side of Fishery Management: Increasing Stakeholder Engagement Through the Use of Social Media Tools and Mobile Technology

AMBER VON HARTEN, SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL. AMBER.VONHARTEN@SAFMC.NET

With the reauthorization of the Magnuson-Stevens Act and the requirements for implementing annual catch limits and other National Standards, fisheries management in the South Atlantic region has developed into a complex set of issues. The fishing stakeholders involved include commercial, for-hire and recreational fishermen, environmental NGOs, and fishery managers and scientists. With such a diverse group of fishing stakeholders, the strategies used for outreach need to be designed to meet the varied needs of those stakeholders.

Traditionally, outreach strategies have focused on printed publications (regulations brochures, pamphlets, and fact sheets), website postings, and formal public hearings throughout the region. However, with the advent of social media and new mobile technology there are new opportunities to expand outreach strategies in more non-traditional platforms.

The South Atlantic Fishery Management Council has initiated a social media outreach strategy using Facebook, focusing on informing and engaging fishing stakeholders in dialogue about fishery management is-

sues, fishery management plan and amendment development, and opportunities for public input. In addition, the Council, in cooperation with NOAA Fisheries, has developed a mobile application (SA Fish Regs) designed to provide easily accessible and up-to-date fishing regulations and other information to both commercial and recreational fishermen. The paper will highlight success stories of engaging a broad range of fishing stakeholders in the Federal management process through the use of social media and increasing understanding of Federal fishing regulations in the region through the use of the SA Fish Regs mobile app.

A Review of Essential Fish Habitat for Pacific Coast Groundfish

WALDO WAKEFIELD, NOAA NORTHWEST FISHERIES SCIENCE CENTER; MARY M. YOKLAVICH, NOAA FISHERIES; CHRISTOPHER G. ROMSOS, OREGON STATE UNIVERSITY; JOSEPH J. BIZZARRO, UNIVERSITY OF WASHINGTON; CURT E. WHITMIRE, NOAA FISHERIES AND MARLENE BELLMAN, NOAA FISHERIES. WALDO.WAKEFIELD@NOAA.GOV

In this poster, we provide an overview of the current review of essential fish habitat (EFH) for 91 species of Pacific coast groundfish. We highlight some of the key products developed for this review and are now available to the public. Initial EFH designations were based on best available data developed from 2002 to 2005; NOAA's National Marine Fisheries Service (NMFS) implemented these designations in May 2006. Beginning in 2010, the Pacific Fisheries Management Council (PFMC), Northwest and Southwest Fisheries Science Centers, and the NMFS Regions initiated the next five-year review for EFH provisions of the groundfish fishery management plan. In Phase I of this process, we compiled and summarized new and relevant information available for the review. Sources of information included published scientific literature and unpublished scientific reports, solicitation of data from interested parties, and the review of previously unavailable or inaccessible data sets. Coast-wide maps were updated for (1) bathymetry and interpreted groundfish habitat types, (2) the distribution and extent of commercial fishing effort (as potential impact to EFH), (3) the distribution and relative abundance of biogenic habitat (i.e., sponges and corals), and (4) spatial management boundaries (as potential mitigation of impacts). This complete body of information, in the form of a written report and supporting Internet data catalog, was presented to the PFMC, its advisory bodies and the public at the Council's September 2012 meeting (Phase I Report: <http://tinyurl.com/ltqq6ma>; online data catalog: <http://tinyurl.com/kwe452v>). NMFS is currently conducting an analysis of the information in the Phase I Report, and will deliver a synthesis to the Council in April 2013. During Phase II, the Council will solicit proposals to modify EFH and Habitat Areas of Particular Concern. If the Council decides to amend EFH, Phase III of the process will begin and may require an amendment to the groundfish fisheries management plan. This five-year review represents a major update of the groundfish habitat assessment for the California Current and will have research and management applications well beyond satisfying the regulatory guidelines associated with EFH.

Marine Protected Areas: Improving Tools to Sustain Marine Ecosystems

LAUREN WENZEL & ROBERT BROCK, NOAA MARINE PROTECTED AREA CENTER. LAUREN.WENZEL@NOAA.GOV

Connecting and strengthening the nation's marine protected area programs can improve their ability to deliver ecological services in light of changing climate and increasing ocean uses. The U.S. has over 1,700 marine protected areas (MPAs), established for diverse purposes ranging from the protection of biological diversity to the protection of commercially and recreationally valuable fish stocks, to the conservation of historic treasures. Approximately 24 percent of U.S. MPAs have sustainable production as their primary purpose, encompassing over 50 percent of MPA area in the U.S. Exclusive Economic Zone. These fishery MPAs span a wide range of levels of protection, from gear restrictions to reduce bycatch to no take areas to protect sensitive habitats or spawning areas. This poster will summarize the current status of U.S. MPAs, sustainable production MPAs, and highlight recent work to enhance MPA effectiveness by managing MPAs within systems and networks, and within the broader context of ocean uses.

Overfishing, pollution, and coastal development have all placed significant stress on the nation's natural and cultural marine resources. Climate change impacts in the ocean are expected to add to these stressors,

affecting the ecological services such as food production, recreation and tourism that humans depend on. Recent collaborative work with Canada and Mexico has focused on developing scientific guidelines for designing MPA networks in light of expected climate change impacts. These guidelines include: 1) protecting species and habitats with crucial ecosystem roles; 2) protecting potential carbon sinks; 3) protecting ecological linkages and connectivity pathways for a wide range of species; and 4) protecting the full range of biodiversity present in the target biogeographic area. Application of these guidelines can help MPA and marine resource managers more effectively use place-based management to address future climate impacts.

Responding to climate change is just one example of how operating as a network can enhance MPA effectiveness. The National Marine Protected Areas Center has established a national system of MPAs to link and strengthen the nation's MPA programs, including Fishery Management Councils. Current focal areas include MPA capacity building, strengthening international linkages, and developing information and tools to manage MPAs within the context of diverse, often competing, ocean uses.

The Marine Resource Education Program: Northeast Fishermen Training as Effective Contributors to Management

JOHN WILLIAMSON, SEAKEEPER CONSULTING AND CHARTER, MAINE. JOHN@SEAKEEPER.ORG

The Marine Resource Education Program (MREP) arose from ongoing conversations among fishermen active in the New England management process. Initiated in 2001 as a pilot based at the University of New Hampshire, an impressive mix of partners from commercial and recreational fisheries, management, science and education came together to craft a curriculum and means of delivery. In 2005 the program was moved to a more permanent administrative base at the Gulf of Maine Research Institute.

By fishermen for fishermen, with over 450 graduates to date, MREP is receiving growing recognition for raising the knowledge-base within the regional community and is serving as a template for similar efforts outside New England. 2012 has seen the successful launch of a Mid-Atlantic MREP as a sister program to New England covering the entire Northeast region; and development of capacity for a Southeast Fisheries MREP under local leadership.

The curriculum has been well tested and continues to evolve to serve the needs of fishermen and relevant stakeholder groups. The core program covers two topic areas: a three-day Fishery Science 100, followed by a three-day Fishery Management 100.

Fishery Science 100 is designed to provide participants with grounding in the science fundamental to management. Participants are provided with basic working knowledge of population biology and the assessment process, including survey sampling techniques, statistical tools, models and their uses. Information presented demonstrates how fishing effort relates to stock assessments and how fishermen's knowledge can be incorporated.

Fishery Management 100 provides an overview of entities which manage commercial fisheries with an emphasis placed on the structure of the Fishery Management Councils and the requirements under the Magnuson-Stevens Act and National Standards. The curriculum covers the components of a management plan, describing the progression of plan development and identifying critical opportunities for participation and input. A role-play exercise simulates a specification-setting negotiation.=

An advanced MREP 200: Introduction to Stock Assessments, is a two-day exploration of the data-labs at the Northeast Fishery Science Center, Woods Hole, featuring hands-on presentations in facilities by key NMFS scientists. The workshop culminates in review of stock assessment models, relating the component parts.

Integrating a Recreational Fishery into a Catch Share Program: An Alaska Case Study

RICHARD YAMADA, CATCH (CATCH ACCOUNTABILITY THROUGH COMPENSATED HALIBUT) PROJECT. RICHARD@CATCHALASKA.ORG

Alaska's commercial halibut fishery has been managed under a catch share program since 1995, known as the Individual Fishing Quota Program. This program permitted and divided the total allowable catch of halibut among commercial fishermen. Prior to allocating commercial catch limits each year, removals of sport harvest, subsistence, bycatch, and wastage are deducted. As sport catch grew in the late 1990s, fisheries managers felt that if sport catch was not controlled, this would bring uncompensated reductions in commercial harvest and jeopardize the economic viability of the commercial halibut fleet.

As the charter fleet was misinterpreted as a quasi-commercial fishing enterprise, guided angler harvest was separated out from the sport harvest and regulated separately. In 2003, in an effort to manage this user group of guided recreational anglers, a guideline harvest level program was implemented. If guided angler harvest did not fall within these recommended levels, more restrictive harvest measures would be recommended for the following year.

In Area 2C (Southeast Alaska) guided harvests exceeded the guideline harvest level from the first year of implementation. This was due in part to an insufficient initial allocation and the lack of understanding regarding the dynamics that determine recreational angler harvest. Without this understanding it was difficult to impossible to set regulations to achieve results with any accuracy.

With the recent decline in halibut stocks and changes in management policies, guided recreational fishing opportunities have declined in Area 2C and are threatened in Area 3A (Southcentral Alaska). A means to transfer allocation between the commercial longline and charter recreational sectors would provide increased fishing opportunities for guided anglers and stability in their regulations.

The results of the CATCH project findings will be the subject of the poster display.



Acronyms and Photo Credits

Acronyms

ABC	acceptable biological catch
ACE	annual catch entitlement
ACT	annual catch target
ACL	annual catch limit
AIS	automatic identification system
AM	accountability measure(s)
ANPR	advance notice of proposed rulemaking
AP	advisory panel
APA	Administrative Procedures Act
ARPA	automatic radar plotting aid
ASMFC	Atlantic States Marine Fisheries Commission
B	biomass
B_{OY}	biomass at optimum yield level
B_{MSY}	biomass at maximum sustainable yield
C	level of catch
CDFW	California Department of Fish and Wildlife
CFA	community fishing association
CFF	California Fisheries Fund
CMSP	coastal and marine spatial planning
CSF	community supported fishery
DAS	days at sea
DMR	(Maine) Department of Marine Resources
EBFM	ecosystem-based fisheries management
EBM	ecosystem-based management
EC	ecosystem component
ECS	ecosystem component species
EEZ	exclusive economic zone
EFH	essential fish habitat
EIS	environmental impact statement
EMS	electronic monitoring systems
EPO	eastern Pacific Ocean
ESA	Endangered Species Act
F	rate of fishing
FACA	Federal Advisory Committee Act
FAO	United Nations Food and Agriculture Organization

FFP	(NOAA's) Fisheries Finance Program
FIP	fishery improvement project
FMC	fishery management council
FMP	fishery management plan
FR	Federal Register
GARM	Groundfish Assessment Review Meeting
GDP	gross domestic product
GIS	geographic information systems
GMFMC	Gulf of Mexico Fishery Management Council
GPS	global positioning system
HAIP	(NOAA) Habitat Assessment Improvement Plan
HAPC	habitat area of particular concern
HLA	Hawaii Longline Association
HMS	highly migratory species
IATTC	Inter-American Tropical Tuna Commission
IEA	Integrated Ecosystem Assessment
IFQ	individual fishing quota
IMO	International Maritime Organization
IOOS	Integrated Ocean Observing System
ITQ	individual transferable quota
IUU	illegal, unreported and unregulated (fisheries)
IFFTF	Lenfest Forage Fish Task Force
LISA	Local Indicators of Spatial Association analysis
MAFAC	Marine Fisheries Advisory Committee
MAFMC	Mid-Atlantic Fishery Management Council
MCA	Marine Conservation Alliance
MFC	Marine Fisheries Commission
MFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MFMT	maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MP	management procedure
MPA	marine protected area
MRIP	Marine Recreational Information Program
MSA	Magnuson-Stevens Act (see MFCMA)
MSB	mackerel, squid, and butterfish
MSC	Marine Stewardship Council
MSE	management strategy evaluation
MSMC	Multispecies Monitoring Committee (New England Fishery Management Council)
MSRA	Magnuson-Stevens Reauthorization Act (see MFCMA)
MSST	minimum stock size threshold
MSVPA-X	Multispecies Virtual Population Analysis
MSY	maximum sustainable yield
NBSRA	Northern Bering Sea Research Area
NEFMC	New England Fishery Management Council

NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NRDC	Natural Resources Defense Council
NS	National Standard
NSC	Northeast Seafood Coalition
NSG	National Standard Guideline
OFL	overfishing limit
OY	optimum yield
PDT	plan development team
PFMC	Pacific Fishery Management Council
POP	Pacific ocean perch
RFMC	Regional Fishery Management Council
RFMO	regional fisheries management organization
ROV	remotely operated vehicle
SAFMC	South Atlantic Fishery Management Council
SASI	Swept Area Seabed Impact model
SAW/SARC	Northeast Regional Stock Assessment Review Workshop
SFA	Sustainable Fisheries Act (see MFCMA)
SSB	Social Sciences Branch (of the NMFS Northeast Fisheries Science Center)
SSB	spawning stock biomass
SSC	Scientific and Statistical Committee
T_{TAC}	target total allowable catch
TAC	total allowable catch
TCRP	Theodore Roosevelt Conservation Partnership
T_{MIN}	The rebuilding timeframe in the absence of all fishing
T_{MAX}	The maximum amount of time allowable for rebuilding under the protocol set forth in the National Standard Guidelines
T_{TARGET}	The target date chosen for rebuilding
TMGC	Transboundary Management Guidance Committee
TRAC	Transboundary Resource Assessment Committee
UVI	unique vessel identifier
VPA	virtual population analysis
VMS	vessel monitoring system
WCPFC	Western and Central Pacific Fisheries Commission
WPFMC	Western Pacific Fishery Management Council
WWF	World Wildlife Fund

Photo Credits

Front section

- Page 8 Donald McIsaac. Photo: Ed Ebusui.
- Page 10 Mike Burner. Photo: Jennifer Gilden.
- Page 11 The plenary session. Photo: Kimberly Ambert.
- Page 13 Chairman Doc Hastings. Official portrait.
- Page 14 Chairman Doc Hastings addresses the conference. Photo: Kimberly Ambert.
- Page 15 Chairman Doc Hastings addresses the conference. Photo: Kimberly Ambert.
- Page 16 Chairman Doc Hastings, Pacific Fishery Management Council Executive Director Don McIsaac, and NOAA Assistant Administrator Eric Schwaab.
- Page 17 Senator Mark Begich. Official portrait.
- Page 18 Diners at the conference's Wednesday night banquet: Dan Wolford, Phil Anderson, Bill Hogarth, Don Hansen.
- Page 19-20 Senator Mark Begich addresses the conference. Photo: Kimberly Ambert.
- Page 21 NOAA Assistant Administrator Eric Schwaab. Photo: Kimberly Ambert.
- Page 22 Larry Simms (top).
- Page 22 Larry Simpson (bottom).
- Page 23 Eric Schwaab. Photo: Ed Ebusui.
- Page 24 Doc Hastings and Eric Schwaab. Photo: Ed Ebusui.
- Page 25 Eric Schwaab and Don McIsaac. Photo: Ed Ebusui.
- Page 26 Barton Seaver. Photo: Kimberly Ambert.
- Page 27 Chesapeake Bay crab, posed for an April 19, 2012 press conference announcing that the number of blue crabs in Chesapeake Bay had tripled over the last five years to the highest total in nearly two decades. The rebound was caused by restrictions on catching female crabs imposed by Virginia and Maryland in 2008, according to Maryland fisheries scientists. Photo: Jay Baker at Annapolis, Maryland. "MarylandGovPics" on Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/kykz5hr>
- Page 28 Barton Seaver, Don McIsaac and Keith Colburn. Photo: Ed Ebusui.
- Page 29 Barton Seaver's book *For Cod and Country*.
- Page 31 Keith Colburn. Photo: Kimberly Ambert.
- Page 32 A dangerous coating of ice on the NOAA Ship *Miller Freeman*. Such icing can affect a ship's stability and cause capsizing. Alaska, Bering Sea. Photo: NOAA NMAO Pacific Marine Center.
- Page 33 *F/V Wizard*. Source: Capt. Keith Colburn (Facebook page).
- Page 34 David Cupka. Photo: Kimberly Ambert.
- Page 35 Rip Cunningham. Photo: Kimberly Ambert.

Page 36 Dorothy Lowman. Photo: Kimberly Ambert.

Session 1

Section title background photo: Rockfish recruits on the top of Cordell Bank National Marine Sanctuary, taken on the first visit ever by NOAA divers (2010). Photo: Greg McFall, NOAA (<http://tinyurl.com/mlxs2p>)

- Page 40 Fishermen with red snapper. Photo: M. Brown.
- Page 41 Black and yellow rockfish (*Sebastes chrysomelas*). California, Channel Islands National Marine Sanctuary. Photo: Claire Fackler, CINMS, NOAA.
- Page 42 Black sea bass. Photo: Ed Killer.
- Page 43 Cabezon motionless on rock. Photo: Lt. John Crofts, NOAA Corps, Point Lobos State Reserve, California.
- Page 44 Guam longline transshipment. Source: Western Pacific Fishery Management Council.
- Page 46 Key Colony sport boats. Photo: Kim Iverson.
- Page 49 North Pacific Fishery Management Council staff Gail Bendixen with halibut. Photo: Chris Oliver.
- Page 51 Tortugas Ecological Reserve, Key West. Photo: National Ocean Service. (<http://tinyurl.com/p3ztsb2>)
- Page 52 Shrimpers. Photo: Kim Iverson.
- Page 54 F/V *Josie*. Photo: Jennifer Gilden.
- Page 55 F/V *Unimak*. Photo: Alaska Fisheries Science Center.
- Page 56 Scamp, *Myxeroperca phenax*. Atlantic Ocean, Southeast U.S. shelf/slope area. 2004. Photo: Andrew David, NOAA/NMFS/SEFSC Panama City; Lance Horn, UNCW/NURC—Phantom II ROV operator (Southeast).
- Page 59 Trawler. Photo: Karla Bush.
- Page 62 Plymouth Harbor, Massachusetts, south shore. New England Region. Source: New England Fishery Management Council.
- Page 64 Trawling operations on the NOAA Ship Delaware II. Atlantic Ocean, Gulf of Maine shelf/slope area, New England region. Photo: Personnel of NOAA Ship Delaware II.
- Page 65 New England Fishery Management Council constituent meeting.
- Page 66 Weathervane scallops. Source: Alaska Scallop Association.
- Page 68 Pike Place Fish Market, Seattle. Photo: “Slideless in Seattle,” Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/k8psbow>.
- Page 69 Lingcod on NOAA trawl survey. Photo: Jennifer Gilden.
- Page 70 Cowcod, 2011 Southern California Hook & Line Survey (NOAA/PSMFC), Channel Islands, California, September 2011. Bo Whiteside, Pacific States Marine Fisheries Commission (on the right holding fish). Photo: NOAA West Coast Region.
- Page 74 Fishing in Hawaii. Photo: Roy Morioka.
- Page 75 Winter flounder. Photo: NOAA.
- Page 76 Speakers Gway Kirchner (Oregon Department of Fish and Wildlife) and Ed Richardson (At-Sea Processors Association). Photo: Kimberly Ambert.
- Page 77 *Voyager* charter boat. Photo: Andy Meizero.
- Page 78 Scallops. Photo: A. Applegate.
- Page 80 Newport, Oregon bayfront. Photo: Jennifer Gilden.

- Page 82 Glassy smooth days make launch work look easy. Photo: Personnel of NOAA Ship *Thomas Jefferson*.
- Page 87 Lifting a boat at the unique port of Port Orford, Oregon. Photo: Ray Gilden.
- Page 88 Dogfish at the dock. Photo: New England Fishery Management Council.
- Page 89 Stonington, Maine, Lobster Coop. Photo: Chris Ford, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/kegfyqo>
- Page 92 “They that go down to the sea in ships 1623 -1923.” The Fishermen’s Memorial at Gloucester commemorating the thousands of fishermen who have lost their lives from this port. Gloucester, Massachusetts. Photo: Nance S. Trueworthy (NOAA).
- Page 93 Atlantic cod. Photo: NOAA.
- Page 94 Atlantic cod. Photo: NOAA (fishwatch.gov).
- Page 95 New England groundfish gear. Photo: New England Fishery Management Council.
- Page 96 Purse seining. Photo: A. Lovewell, New England Fishery Management Council.
- Page 97 Fish in baskets. Photo: L. Steele, New England Fishery Management Council.
- Page 98 Atlantic cod. Photo: NOAA.
- Page 99 Small Northeast groundfish trawler. Photo: NOAA.
- Page 100 Yellowtail flounder. Photo: NOAA.
- Page 101 Lord’s Lobster Fish Market, New Brunswick, Canada. Photo: Ian Muttoo, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/kffzjch>
- Page 102 F/V *Tina Marie* in Portland (ME) Harbor. Photo: Corey Templeton, Flickr Creative Commons. License: CC BY-NC-ND 2.0. <http://tinyurl.com/pkfkz5z>
- Page 104 NOAA Fisheries Research vessel in Morro Bay, California. Photo: Jennifer Gilden.
- Page 105 Midshipman (*Porichthys notatus*) caught on West Coast trawl survey. Photo: Jennifer Gilden.
- Page 108 Sorting crabs. Photo: Mark Fina.
- Page 116 NOAA Northwest Fisheries Science Center survey staff. Photo: NOAA.
- Page 117 Halibut research. Photo: NOAA Northwest Fisheries Science Center (<http://tinyurl.com/l3eoeua>)
- Page 122 Windowpane flounder. Photo: NOAA.
- Page 123 Anglers with wahoo. Photo: Christopher Page.
- Page 124 Between sessions at the Managing Our Nation’s Fisheries conference. Photo: Kim Ambert.
- Page 125 Crescent City, California fishing boat in dry dock. Photo: Ray Gilden.
- Page 129 San Diego fishing vessels. Photo: Jennifer Gilden.
- Page 130 Observer measuring bigeye tuna. Photo: NOAA.
- Page 131 Bluefin tuna. Photo: NOAA.
- Page 132 The Hanalei Dolphin Fish Market, Kaua’i. Photo: Wally Gobetz, Flickr Creative Commons. License: CC BY-NC-ND 2.0. <http://tinyurl.com/m3zbfey>
- Page 133 A green sea turtle in Humpback Whale National Marine Sanctuary, Maui, Hawaii. Photo: Claire Fackler, CINMS, NOS, NOAA.
- Page 134 Bluefin tuna fishing vessel. Photo: NOAA.
- Page 135 Illegally fishing vessel off the coast of Gabon. Photo: NOAA.
- Page 137 The IUU fishing vessel *Taruman* held 143 tons of illegally harvested Patagonian toothfish (Chilean sea bass). Photo: Australian Customs Service.

- Page 138 The shark fishery in Taiwan, Province of China is not limited to longlining fleets fishing in international waters; local boats are also landing sharks in Taiwan. Pictured here is a fisher's catch of sharks along with mahi mahi. Photo Credit: Shawn Heinrichs for the Pew Environment Group.
- Page 139 Mountains surrounding Pago Pago Harbor. Tuna boats in port. American Samoa. 2009 February. Photo: Dr. Matt Kendall, NOAA/NOS/NCCOS/CCMA/BGB.
- Page 140 Western and Central Pacific Fisheries Commission meeting. Photo: WCPFC.
- Page 141 The crew of the Coast Guard Cutter *Rush* escorts the suspected high seas drift net fishing vessel *Da Cheng* in the North Pacific Ocean on August 14, 2012. Photo: U.S. Coast Guard.
- Page 142 Regional fisheries management organization regions. Source: Ecowatch.com.
- Page 143 Capt. Diane Durham, commanding officer of Coast Guard Cutter *Rush*, shakes hands with a China Fishery Law Enforcement Command officer after providing documentation and information in the transfer of custody of the suspected high seas drift net fishing vessel *Da Cheng* to Chinese jurisdiction in the North Pacific Ocean Aug. 14, 2012. Photo: U.S. Coast Guard.
- Page 146 Purse seiner. Photo: Western Pacific Fishery Management Council.
- Page 147 IUU fishing vessel. Photo: NOAA.
- Page 148 Fish auction. Photo: NOAA.
- Page 149 United Fishing Agency dock. Photo: Western Pacific Fishery Management Council.

Session 2

Section title background photo: Channels through eelgrass beds in Izembek Lagoon, Izembek National Wildlife Refuge. Photo: Kristine Sowl, U.S. Fish and Wildlife Service.

- Page 152 NOAA Ship *John N. Cobb* in Tracy Arm Fjord during a harbor seal pupping survey, southeast Alaska. Photo: Aleria Jensen, NMFS Alaska Region.
- Page 153 Data loggers are one way to collect information on changes in water level, salinity, temperature, etc. in different water bodies. These data loggers are being installed in the coastal zone to document tidal, seasonal, and yearly changes in hydrology on Kigigak Island. Photo: Melissa Gabrielson, U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge.
- Page 154 Rapporteurs Whitney Tome, Kim Gordon, and Amy Kenney (Fisheries Leadership & Sustainability Forum). Photo: Kimberly Ambert.
- Page 155 Northern fulmars vying to be first in line at the discharge chute, commercial cod longline vessel. Photo: Yolanda Malavear, NMFS Certified Observer.
- Page 156 MONF Session 2. Photo: Kimberly Ambert.
- Page 160 The Sawyer Glacier in Alaska's Tracy Arm Fjord in Tongass National Forest, June 2011. Photo: Peter E. Lee, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/lr182zj>
- Page 161 Smokehouse alderwood and Nass River oolichan (eulachon). Photo: Sam Beebe, Ecotrust. Flickr Creative Commons License CC BY 2.0. <http://tinyurl.com/lx4nanr>
- Page 162 Fishing for King Salmon, Naknek, Bristol Bay, Alaska. Photo: Chris Ford, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/m7fmwc6>
- Page 163 Alaska king crab. Photo: Steve ("aktraildog"), Flickr Creative Commons. License: CC BY-SA 2.0. <http://tinyurl.com/lmwuzg>
- Page 164 1929 fishing boat headed up the Inside Passage, Alaska. Photo: Jenny Pansing, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/kmp5k6z>
- Page 165 Lingcod hiding motionless on a reef. California, Point Lobos State Reserve. Photo: Lt. John Crofts, NOAA Corps.

- Page 166 Sea otter. Photograph courtesy of the U.S. Fish and Wildlife Service, Alaska Image Library
- Page 167 Alaska Brown Bear (*Ursus arctos*), Alaska Peninsula, Katmai area. Photo: Mandy Lindeberg, NOAA/NMFS/AKFSC
- Page 168 Trawl catch of pollock caught during an acoustic trawl survey. Alaska, Stephens Passage. 2004. Photo: David Csepp, NOAA/NMFS/AKFSC/Auke Bay Lab.
- Page 170 Ring of Fire 2002 Expedition. The animals at the top of the chimney are deep-sea octocorals or soft corals (*Octocorallia: Alcyonacea*), and sometimes go by the common name “mushroom coral.” As with other cnidarians, the mushroom coral has stinging cells or nematocysts within its flashy tentacles that are used to capture minute prey. Photo: NOAA.
- Page 172 Bearded seal. Photo: “Smudge 9000,” Flickr Creative Commons. License: CC BY-SA 2.0. <http://tinyurl.com/jwynss9>
- Page 175 Zooplankton: octopus larva. Photo: Matt Wilson/Jay Clark, NOAA NMFS AFSC.
- Page 177 Gulf of Alaska 2004 Expedition. Deep-sea spider crabs, like this one, have long, spider-like legs and are a brilliant red. Photo: Gulf of Alaska 2004. NOAA Office of Ocean Exploration.
- Page 178 Studying groundfish. Photo: Massachusetts Marine Fisheries Institute.
- Page 179 Sorting a trawl catch in the ship wet laboratory. Photo courtesy of Officers and Crew of NOAA Ship PISCES; Collection of Commander Jeremy Adams, NOAA Corps.
- Page 180 South Atlantic Fishery Management Council meeting question and answer session, March 2013. Photo: SAFMC.
- Page 181 Gopher rockfish perched on rock. California, Point Lobos State Reserve. 2005 November 22. Photo: Lt. John Crofts, NOAA Corps.
- Page 186 Kodiak, Alaska. Photo: Karla Bush.
- Page 187 Students listen to information about ocean acidification and climate change presented by NOAA. Photo: U.S. Fish and Wildlife Service, Alaska Region.
- Page 188 Audience, Session 2, Focus Topic 1. Photo: Kimberly Ambert.
- Page 189 Panelists Brad Warren (Sustainable Fisheries Partnership), John Annala (Gulf of Maine Research Institute), and Malin Pinsky (Princeton University). Photo: Kimberly Ambert.
- Page 192 Eulachon collected from Taku Inlet, near Juneau, Alaska. Photo: NOAA.
- Page 193 Researchers with herring caught during an acoustic trawl survey. Photo: David Csepp, NOAA Fisheries.
- Page 194 Sandlance. Photo: Mandy Lindeberg, NOAA/Wikipedia.
- Page 195 Pacific Fishery Management Council meeting. Photo: PFMC.
- Page 197 Traditional fishing in Guam. Photo: Leana Peters.
- Page 198 Shrimper *Lady Danelle*, Key West. Photo: Kim Iverson.
- Page 199 Anchovies schooling. Photo: NOAA SWFSC.
- Page 202 Sardine fishery, cannery and steamer, Greens Landing, ME (Stonington, ME). Archival Photographer Stefan Claesson. Gulf of Maine Cod Project, NOAA National Marine Sanctuaries; Courtesy of National Archives.
- Page 206 F/V *Valiant* in Astoria, Oregon. Photo: Jennifer Gilden.
- Page 208 Stream survey: netting in Young’s Creek at Rooster Rock State Park on the Columbia River, Oregon, 2009. Pictured: Paul Olson, Sean Sol, Dan Lomax. Photo: NOAA Fisheries West Coast.
- Page 209 Humpback whales in North Pass between Lincoln Island and Shelter Island in the Lynn Canal north of Juneau, Alaska. This is a group of 15 whales that were bubble net fishing on 18 August 2007. Photo: Evadb (Wikimedia Commons, Public Domain (<http://tinyurl.com/k4s3x3q>)).

- Page 210 Pacific sardines. Photo: NOAA.
- Page 212 AFSC scientists sort small pelagic fishes from a surface trawl in the Chukchi Sea during Leg 1 of the cruise. Photo: Alex Andrews.
- Page 216 Market squid. Photo: NOAA SWFSC.
- Page 217 Gulf menhaden, St Andrew State Park, Florida, 2011. Photo: “Crabby Taxonomist.” Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/lot4x42>
- Page 218 Menhaden mothership *Carters Creek*. Photo: “Mainsul,” Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/mdacjp7>
- Page 220 The Menhaden fishing industry: Delaware Public Archives sign. Photo: Lee Cannon, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/kg3thcj>
- Page 221 Anhinga dining on unidentified fish, Florida. Photo: Jennifer Gilden.
- Page 222 Researchers inspect survey sample and find herring. Photo: NOAA.
- Page 226 Audience during session 2. Photo: Kimberly Ambert.
- Page 227 Gerrod “Roddy” Smith of the Shinnecock Nation asks a question during session 2. Photo: Kimberly Ambert.
- Page 228 Lee Anderson (Vice Chair, Mid-Atlantic Fishery Management Council) asks a question during session 2. Photo: Kimberly Ambert.
- Page 229 Session 2 Topic 2 speakers David Crabbe (Pacific Fishery Management Council), Geoff Shester (Oceana), Mary Beth Tooley (New England Fishery Management Council), and Julie Morris (Marine Fisheries Advisory Committee). Photo: Kimberly Ambert.
- Page 230 Anchovies trying to escape lunging humpback whale, Port San Luis, California. Photo: Howard Ignatius, Flickr Creative Commons. License: CC BY-NC-ND 2.0. <http://tinyurl.com/mldjwub>
- Page 231 Anchovy swarm in the overhead tank at the Aquarium of the Bay, San Francisco. Photo: Kenny Louie, Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/krd8637>
- Page 234 Redfish Lake, Idaho, source of an imperiled run of sockeye salmon. Photo: Jennifer Gilden.
- Page 235 Wetlands, St. Charles Parish, Louisiana. Photo: Ken Lund, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/m42zdaf>
- Page 236 The Life on the Edge 2004 mission has collected a diverse array of invertebrate life around deep-sea corals. Squat lobsters are just one of the many types of organisms that use deep-sea corals for shelter. North Carolina Continental Slope. Photo: NOAA Photo Library (<http://tinyurl.com/mdl3cxd>).
- Page 237 A white-tip shark (*Triaenodon obesus*). Hawaiian name is *mano lalakea*. Northwest Hawaiian Islands. July, 2004. Photo: Dr. Dwayne Meadows, NOAA. (<http://tinyurl.com/mv28p8k>)
- Page 238 Spruce Creek, Kittery Point, Maine. Photo: “InAweofGod’sCreation.” Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/lyrq9am>
- Page 239 Kelp-covered granite at low tide at Edgar M. Tennis Preserve, Deer Isle, Maine. Photo: Captain Albert E. Theberge, NOAA Corps (Ret).
- Page 242 Zigzag coral (*Madrepora oculata*). Gulf of Mexico, Bright Bank. Photo: NURC/UNCW and NOAA/FGBNMS. (<http://tinyurl.com/l24yofh>)
- Page 244 The lobster’s large claw can crush crabs, clams and fingers. *Homarus americanus*. Atlantic Ocean, offshore Maine. Photo: OAR/National Undersea Research Program. (<http://tinyurl.com/lbgx-mom>)
- Page 248 *Lophelia* bush with squat lobsters, crinoids, an urchin, and a startled fish. North Atlantic. Photo: Bioluminescence 2009 Expedition, NOAA/OER. (<http://tinyurl.com/mcva3pd>)
- Page 249 Darkblotched rockfish. Photo: NOAA Northwest Region.

- Page 250 Black sea bass (*Centropristis striata*) hovering over the reef. Georgia, Gray's Reef National Marine Sanctuary. Photo: Greg McFall, Gray's Reef NMS, NOS, NOAA. (<http://tinyurl.com/kvoqp5h>)
- Page 255 Mountains in the Sea Expedition 2004. A crab strikes an aggressive pose. New England Seamount Chain. Photo: Mountains in the Sea Research Team; the IFE Crew; and NOAA/OAR/OER. (<http://tinyurl.com/kre44fx>)
- Page 256 Elwha River habitat, Washington. Photo: NOAA. (<http://www.habitat.noaa.gov/habitatblueprint/about.html>)
- Page 257 The Russian River watershed has been selected as the first Habitat Focus Area under NOAA's Habitat Blueprint. Photo: NOAA. (<http://www.habitat.noaa.gov/habitatblueprint/russianriver.html>)
- Page 260 Hogfish (*Lachnolaimus maximus*) on reef in Puerto Rico. Photo: NOAA CCMA Biogeography Team.
- Page 261 Rock hind in a sponge in about 20 feet of water. Photo: Chris Coccaro; Bonaire 2008: Exploring Coral Reef Sustainability with New Technologies; NOAA/OAR/OER
- Page 262 George Geiger (former Chair, Mid-Atlantic Fishery Management Council) asks a question in Session 2, Topic 3. Photo: Kimberly Ambert.
- Page 263 Session 2 Topic 3 panelists Buck Sutter (NOAA Fisheries) and Rip Cunningham (Chair, New England Fishery Management Council). Photo: Kimberly Ambert.

Session 3

- Section title background photo: Gloucester Harbor on Cape Ann, "America's Oldest Sea Port." Photo: Steven Davy, Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/m6a7lbv>
- Page 266 CNMI Satawal canoes. Photo: Jack Ogumoro.
- Page 267 Display at Hawaii Fishing and Seafood Festival, 2012. Photo: Western Pacific Fishery Management Council.
- Page 272 Marine education in Guam. Photo: Western Pacific Fishery Management Council.
- Page 273 American Samoa fisherman. Photo: Dave Hamm.
- Page 274 Lummi First Salmon ceremony. Photo: Gary Sims, NOAA West Coast Region. <http://tinyurl.com/jwwoha6>
- Page 275 Fishing in Guam. Photo: Ryan Harvey, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/kxdb4j9>
- Page 276 Fishing on Santa Catalina Island, California. Photo: Zohar Manor-Abel, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/lx9gst5>
- Page 277 Recreational anglers. Photo provided by Ken Franke.
- Page 278 *American Angler*, Point Loma, California. Photo: Flickr user **Mary**. License: CC BY-NC-SA 2.0. <http://tinyurl.com/m5g8pxw>
- Page 279 Angler survey box. Photo: Reed Lakefield, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/kmkvbt7>
- Page 280 Fish in a barotrauma recompression crate. Photo: Florida Sea Grant. Flickr Creative Commons. License: CC BY-NC-ND 2.0. <http://tinyurl.com/kuazuu2>
- Page 281 Rockfish. Photo provided by Mike Nussman.
- Page 282 Family fishing. Photo: Scott Ableman, Flickr Creative Commons. License: CC BY-ND 2.0. <http://tinyurl.com/kj64j7y>
- Page 283 Fishing off the pier, Kitty Hawk, NC. Photo: Randy Pertiet, Flickr Creative Commons. License:

- CC BY 2.0. <http://tinyurl.com/mdrkxqx>
- Page 284 Fishing boat at the Clinton Marina, Connecticut. Photo: “slack12,” Flickr Creative Commons. License: CC BY-NC-ND 2.0. <http://tinyurl.com/lmmhj9u>
- Page 286 Nome, Alaska. Photo: Dave Witherell.
- Page 287 Session 3; Kitty Simonds, Executive Director, Western Pacific Fishery Management Council. Photo: Kim Ambert.
- Page 288 Traditional fishing in Hawaii. Photo: Eric Woo.
- Page 289 Manny Duenas (Western Pacific Fishery Mangement Council) at MONF3. Photo: Kim Ambert.
- Page 292 Westport Charter Association, Westport, Washington. Photo: Jennifer Gilden.
- Page 293 Unalaska fishing boats, Alaska. Photo: Maria Shawback.
- Page 294 Gloucester Fishermen’s Wives Memorial, Massachusetts. Photo: Elizabeth Thomsen, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/l6abhwb>
- Page 295 Spiny lobster (*Panulirus interruptus*). California, Channel Islands NMS. Photo: Claire Fackler, CINMS, NOAA. <http://tinyurl.com/nyh92m2>
- Page 296 Scallops with a watercress chimichurri and herbed spaetzle at Boucherie, New Orleans. Photo: rdpeyton, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/le6vqph>
- Page 297 Lighthouse at Cape Disappointment, Washington. Photo: Jennifer Gilden.
- Page 298 Fishing vessels off the Columbia plume, Washington. Photo: Jennifer Gilden.
- Page 299 Yelloweye rockfish and friends. Photo: Rex Murphy.
- Page 301 Returning from a day of fishing, Louisiana. Photo: Mira John, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/lcu5dcf>
- Page 303 Smith’s Pacific Shrimp, Garibaldi, Oregon. Photo: Jennifer Gilden.
- Page 304 Fishing vessels, Garibaldi, Oregon. Photo: Jennifer Gilden.
- Page 305 Fishing gear, Garibaldi, Oregon. Photo: Jennifer Gilden.
- Page 306 Hauling in squid in Morro Bay, California. Photo: Linda Tanner, Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/ldzod7c>
- Page 307 F/V *San Giovanni*, Monterey Harbor, California. Photo: Jay Galvin, Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/k8eccse>
- Page 308 South Carolina fishing boat. Photo: Shayla Mae, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/l5nvxry>
- Page 309 Fisherman cutting his catch in port at Charlotte Amilie on St. Thomas. Photo: Chuck Kramer, Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/lquz8cp>
- Page 310 University of Florida seminar, sponsored by Darden Restaurants, on Advancing Ethical Practices in Seafood Sourcing, January 2014. Photo: Darden Restaurants.
- Page 312 Frozen shrimp. Photo: Gulf Seafood Institute.
- Page 313 Market-size U.S. Department of Agriculture 103 catfish are ready for harvest on May 1, 2012. This new variety grows faster than other tested catfish. USDA photo by Peggy Greb.
- Page 316 Speaker Larry Band (California Fisheries Fund), Session 3 Topic 2. Photo: Kimberly Ambert.
- Page 317 Biloxi, Mississippi shrimp boats. Photo: Roger Smith, Flickr Creative Commons. License: CC BY-NC-ND 2.0. <http://tinyurl.com/lqzrml5>
- Page 318 Session 3, Topic 2. Photo: Kimberly Ambert.
- Page 319 Bonnie McCay (Rutgers University) asks a question. Photo: Kimberly Ambert.
- Page 320 Fisherman with dolphin fish. Taken circa 1967 in or near Wanchese, North Carolina. Photo:

Jason Garber, Flickr Creative Commons. License: CC BY-NC-SA 2.0. <http://tinyurl.com/mo-5qewh>

- Page 321 Fishing poles lined up along the gunwale of a sport fishing party boat in Carolina Beach, NC. Photo: “Mr. T in DC,” Flickr Creative Commons. License: License: CC BY-ND 2.0. <http://tinyurl.com/l9q3s7e>
- Page 324 Boats at dock. Photo: Jennifer Gilden
- Page 325 Commercial fishing vessel *Fiesta* moored in the foggy bay in the channel of Morro Bay, California. Photo: Mike Baird, Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/l9qrztl>
- Page 326 Fresh bait. Tokeland, Washington. Photo: Jennifer Gilden.
- Page 327 Dogfish in sorting basket. Photo: NOAA Fisheries; Courtesy of Officers and Crew of NOAA Ship PISCES; Collection of Commander Jeremy Adams, NOAA Corps.
- Page 328 Coastal restaurant. Photo: Jennifer Gilden.
- Page 329 Fish and chips. Photo: David Ascher, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/n5snsan>
- Page 330 Family Coastal Restaurant, Sumatra, Florida. Photo: Eleanord43, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/n5hsp37>.
- Page 331 A white-tip shark (*Triagenodon obesus*). Hawaiian name is mano lalakea. Northwest Hawaiian Islands. Photo: Dr. Dwayne Meadows, NOAA/NMFS/OPR.
- Page 333 New Jersey fishing pier. Photo: Dennis Sitarevich, Flickr Creative Commons. License: CC BY-ND 2.0. <http://tinyurl.com/kvtaqp>
- Page 334 Diawa reel (South Atlantic). Photo: Kim Iverson.
- Page 335 Ginger Nappi of Martin Fish Company in Ocean City, Maryland. Photo: Mid-Atlantic Fishery Management Council.
- Page 336 Montauk Harbor. Photo: Lian Chang (“diametrik”), Flickr Creative Commons. License: CC BY 2.0. <http://tinyurl.com/m874v3y>
- Page 337 Men fishing on the Chesapeake Bay at sunset. Photo: Chesapeake Bay Program, Flickr Creative Commons. License: CC BY-NC 2.0. <http://tinyurl.com/o8cp2t8>
- Page 338 A student looks up information about the different types of game fish caught along Virginia’s coast. Photo: Janet Krenn, Virginia Sea Grant. Flickr Creative Commons. License: CC BY-ND 2.0. <http://tinyurl.com/mmhczw>
- Page 340 Speaker Rick Robins (Mid-Atlantic Fishery Management Council) during Session 3 Topic 3. Photo: Kimberly Ambert.
- Page 341 Speakers Jim Martin (Berkley Conservation Institute) and Marty Smith (Duke University) during Session 3 Topic 3. Photo: Kimberly Ambert.
- Page 342 Session Chair Mark Holliday (NOAA Fisheries) and Panelist Shirley Marquardt (Mayor, Unalaska, AK). Photo: Kimberly Ambert.
- Page 343 Zeke Grader (Pacific Coast Federation of Fishermen’s Associations) asks a question during Session 3 Topic 3. Photo: Kimberly Ambert.
- Page 344 Speakers Shirley Marquardt (Mayor, Unalaska, AK) and Jim Martin (Berkley Conservation Institute). Photo: Kimberly Ambert.

Findings and Reactions Panel, Acronyms and Photo Credits

Section title background photo: Coral, Puerto Rico. Photo: NOAA.

- Page 356 Bonnie McCay, Rutgers University. Photo: Kimberly Ambert.
- Page 357 Bob Hayes, Coastal Conservation Association and the Center for Coastal Conservation. Photo: Kimberly Ambert.
- Page 357 Lee Crockett, Pew Charitable Trusts. Photo: Kimberly Ambert.
- Page 358 Stephanie Madsen, At-Sea Processors Association. Photo: Kimberly Ambert.
- Page 359 Ed Johnstone, Quinault Indian Nation. Photo: Kimberly Ambert.
- Page 359 Randy Fisher, Pacific States Marine Fisheries Commission. Photo: Kimberly Ambert.
- Page 360 Phil Anderson, Washington Department of Fish and Wildlife. Photo: Kimberly Ambert.
- Page 361 Rick Robins, Mid-Atlantic Fishery Management Council. Photo: Kimberly Ambert.
- Page 362 Sam Rauch, National Marine Fisheries Service. Photo: Kimberly Ambert.
- Page 363 Dave Whaley, House Natural Resources Committee. Photo: Kimberly Ambert.
- Page 363 Jeff Lewis, Senate Committee on Commerce, Science and Transportation. Photo: Kimberly Ambert.
- Page 364 Bill Hogarth, University of South Florida. Photo: Kimberly Ambert.

Managing Our Nation's Fisheries 3 was sponsored by the Regional Fishery Management Councils, NOAA Fisheries, and the following sponsors.



AT-SEA PROCESSORS ASSOCIATION
Partners for Healthy Fisheries



GORDON AND BETTY
MOORE
FOUNDATION



FISHERIES
Leadership & Sustainability
FORUM

PacificSeafood[®]



GROUND FISH
FORUM 