SYMPOSIUM SUMMARY
ISSUES AT THE FORE IN THE LAND OF MAGNUSON AND STEVENS
BEVAN SERIES ON SUSTAINABLE FISHERIES
APRIL 24-25, 2014
SYMPOSIUM CO-CHAIRS: DAVID ARMSTRONG AND ANDRE PUNT
SESSION AND PANEL CHAIRS
Session 1: Penny Dalton and Margaret Spring
Session 2: Andre Punt
Congressional Staffer Panel: John Henderschedt
Session 3: Merrick Burden
Keynote Speaker: Chairman Doc Hastings
Session 4: Tim Essington and Dave Fluharty
Closing Panel: John Henderschedt
Student Note-takers: S1 Beth Phillips, S2 Megsie Siple, S3 Peter Kuriyama, S4 Emma Hodgson
Over all Symposium Organization: Dave McGowan
(Please visit the symposium website, http://depts.washington.edu/donbevan/ for a complete list of the agenda, speakers, profiles, sponsors, steering committee members, and you-tube links to the entire video recording)

OVERVIEW OF THE SYMPOSIUM: The Magnuson-Stevens Act (MSA) is the Nation's premier law governing fisheries conservation and management. Since its inception in 1976, the Act has been amended as the Sustainable Fishery Act in 1996, and most recently as the Magnuson-Stevens Reauthorization Act in 2006; in each instance, substantial changes were made to correct, clarify and expand initial provisions of the MSA. Ten National Standards guide planning and implementation. The requirement for reauthorization provides opportunity to examine the effectiveness of a myriad provisions intended to curb overfishing, reduce bycatch, and sustain communities, among many goals.

It is timely that a symposium focused on MSA be held since the Act is now being reviewed for reauthorization, and Senate and House committees are actively engaged in hearing perspectives from diverse stakeholders that will guide language intended to preserve effective aspects of the act, correct policies and procedures given the National Standards, and sharpen process and procedure used by Regional Councils in their planning and implementation of the Act.

The Bevan Series on Sustainable Fisheries, now in its 14th year at the School of Aquatic and Fishery Sciences in partnership with the School of Marine and Environmental Affairs, UW, is a proper venue to host a symposium focused on MSA. Following from a national event, Managing Our Nation's Fisheries 3 in spring 2013, the Bevan-MSA symposium encouraged many stakeholders, including fishery scientists, managers, policy analysts, students, NGOs, Tribes, and Industry, to voice their views on what works, what's vague, what's detrimental, and what's missing from MSA. Summaries that follow focus on issues, lessons, and experience drawn from West Coast and North Pacific fisheries, with National context used to provide broader

The University of Washington has a rich legacy in the land of Magnuson-Stevens. The School of Fisheries and Aquatic Sciences and the School of Marine and Environmental

Affairs have produced outstanding leaders in the fields of marine science and policy, and they have built and maintained valuable partnerships with NOAA Fisheries via the Northwest and Alaska Fisheries Science Centers, with the Seattle-based fishing industry, and with NGOs engaged in fisheries policy. That role and those relationships will continue into the future.

Session 1- MSA: Evolution to Revolution in U.S. Fishery Management

The first session of the Symposium focused on the history and politics of the Magnuson-Stevens Fishery Conservation and Management Act, summarizing how the law has evolved from its enactment almost forty years ago to the present. Speakers identified key changes in societal, environmental and scientific understanding and perspectives that have shaped this unique and increasingly successful regime for the conservation and management of U.S living marine resources.

Bud Walsh: Early years of the Magnuson–Stevens Fishery Conservation and Management Act of 1976

Bud Walsh served as counsel to U.S. Senator Warren Magnuson on the Senate Commerce Committee from 1972 to 1977, during initial Congressional action on the Magnuson-Stevens Act. Quoting Truman, *"There is nothing new in the world except the history you haven't read,"* Walsh discussed historical precedents, contemporary political issues, and the central players involved. He highlighted the contributions of numerous University of Washington graduates besides Senator Magnuson and himself, including Don Bevan, Lee Alverson, and Wib Chapman. Walsh also provided a more detailed analysis of the early years.

Following World War II, fisheries around the globe expanded, spurred by destroyed croplands, the fact that seafood was an inexpensive and high-protein food source, conversion of military shipyards to build fishing vessels, use of sonar to improve catch efficiency, and refrigeration. Harvests grew rapidly from 20 to 80 million metric tons. The need for international action became part of the U.S. debate on the Law of the Sea, but calls for extending fisheries jurisdiction were at odds with national security interests in maintaining free transit for military vessels. The U.S. pursued an international fisheries approach with limited success, supporting open high seas, regional fishery management organizations (RFMOs), and bilateral agreements with other nations – such the ex-USSR who were at the time visibly fishing off New England coasts.

In the early 1970s, more than 6,800 foreign-flag vessels engaged in fishing in our coastal oceans, New England fish stocks were in trouble, U.S. fishermen could not get business loans, and some states (e.g. Maine and Oregon) had extended state jurisdiction up to fifty miles offshore. In addition, the World Court upheld Iceland's 50-mile limit for cod. In 1973, Senator Magnuson introduced the first legislation to extend U.S. jurisdiction to 200 miles – with opposition from the State and Defense Departments and the distant water tuna fishing fleet. While the bill had bipartisan support, it did not include management provisions.

In 1975, legislation was reintroduced in both houses of Congress and a bipartisan group of Senate and House staff began work on a comprehensive national regime to manage

fisheries. The goal was to create a science-based system that was "bottom-up" rather than "top-down" and then-NOAA Administrator Bob White suggested that regional councils would allow democratic representation without undermining competition. Walsh drafted the law's national standards based on various suggestions as a way to balance state and local council interests with the need to ensure national consistency. When the bill was considered on the Senate floor, an amendment to delay its implementation was modified and withdrawn and the bill passed the Senate by a wide margin. House and Senate members then conferenced to resolve outstanding differences and, despite continuing Ford Administration and tuna industry concerns, the Magnuson-Stevens Act was signed into law in April 1976.

After leaving the Commerce Committee, Walsh became the second NOAA Deputy Administrator in 1978, giving him direct responsibility for implementing the new national fishery management system. One immediate concern was the tripling of the New England fleet while politicians and the industry discouraged efforts to impose catch or trip limits. Foreign seafood companies could still gain access to U.S. fishery resources through governing international agreements or investing in developing fisheries – particularly important to Alaska Senator Stevens. U.S. onshore and at-sea processing capacity was limited and Stevens was concerned that ownership requirements regarding citizenship would hinder North Pacific industry development. U.S. fishermen contracted with foreign processing vessels for at-sea delivery of fish, or so-called "joint ventures." These operations angered domestic processors, prompting a request to Walsh from Senator Magnuson to address the situation and later a Magnuson-Stevens Act amendment was added to establish priority for U.S. processors.

Summing up his ten-year initial involvement, Walsh concluded that it was an amazing experience that relied on many individuals, resulted in a unique government system that is working, but requires substantial resources and scientific research. Although the law may need refinement today, it was done well and the current wellbeing of U.S. fisheries is a tribute to the system that it created.

Penny Dalton: Congress, councils, courts and sustainable fisheries

The next speaker, Penny Dalton served as a professional staff member on the Senate Commerce Committee covering fishery issues from 1986 through 1999. Her presentation looked at the basics of federal fishery legislation and examined developments in national laws and policy from the 1980s through early implementation of the Sustainable Fisheries Act (SFA).

U.S. fishermen increased their catches by 60% between 1980 and 1994 and achieved full Americanization of the harvesting sector by 1991. During this period, environmental organizations became more engaged in fishery issues and the Council process. While initial efforts focused on establishing the new management regime and 36 fishery management plans were in place by 1996. In contrast to steady and conservative progress in Alaska fisheries, stock concerns continued to increase in New England and the first northwest salmon stock, Snake River sockeye, was listed under the Endangered Species Act in 1991. The primary emphasis of the 1990 reauthorization was on international issues, including U.S. sanctions on nations engaged in large-scale driftnet fisheries and inclusion of highly migratory tuna species under the Magnuson-

Stevens Act. Congressional leaders included Senators Kerry, Stevens and Inouye and Representatives Studds and Young.

Although Pacific fisheries faced a variety of challenges, Congressional activity was driven in large part by the unfolding New England groundfish disaster. By 1987, the New England Council and NOAA Fisheries were at an impasse over the system's inability to halt overfishing and restore stocks. In 1991, the Conservation Law Foundation and NOAA resolved a lawsuit by negotiating a consent decree that called for rebuilding cod and yellowtail flounder in five years and haddock in ten years. Withstanding a legal challenge by industry, the consent agreement still could not stop the decline and groundfish landings were down to 65,000 metric tons by 1993. At Senator John Kerry's urging, Commerce Secretary Brown declared New England groundfish a fishery resource disaster and assigned $30 million in emergency appropriations to assist rebuilding.

New England developments illustrate the respective roles of three interacting spheres of action in the federal fishery management process. First, Congress enacts and amends fishery management laws of which the Magnuson-Stevens Act is the most comprehensive. While not directly focused on fisheries, several other statutes also affect the process (e.g. National Environmental Policy Act, Endangered Species Act, Marine Mammal Protection Act, Regulatory Flexibility Act, Administrative Procedures Act). Second, NOAA Fisheries and the eight Regional Fishery Management Councils are tasked with carrying out the law and developing management plans. NOAA has overall responsibility for implementation, generating regulations and guidelines to integrate applicable federal requirements and providing funding and support to the Councils who take the lead on management plans. Third, the courts are charged with interpreting Congressional intent and ensuring that NOAA does its job in carrying out the law. Court decisions may provide the impetus for revising the law and the Magnuson-Stevens Act has been amended frequently as illustrated by the SFA.

The SFA was the culmination of a four-year, bipartisan process over two Congresses that built on at least 15 hearings in the House and Senate. Bills were marked up and reported out by both the Senate Commerce and House Resources Committees and passed by both houses. Driven by a fragile North Pacific agreement, the Senate version was ultimately enacted into law in 1996. Key amendments focused on four areas:

- Overfishing and rebuilding provisions capped harvests at maximum sustainable yields and mandated development of overfishing criteria, rebuilding plans, and an annual overfishing report.
- Habitat protections included identification of essential fish habitat, measures to reduce fishery impacts, and NOAA consultation on other actions affecting habitats.
- Bycatch reduction was addressed by a new national standard to minimize bycatch and bycatch mortality, and reporting and management measures were required.
- Fishing community concerns were tackled through new national standards to protect safety at sea and fishery dependent communities, a moratorium on individual fishing quota systems (IFQs), disaster relief and capacity reduction provisions, and calls for several National Research Council reports to assess next steps.

The extensive revision of Magnuson-Stevens Act made by SFA required new guidelines, regulations, and management plan changes that swamped the management system. The number of Federal Register notices grew from 623 regulatory notices in 1995 to 1000 in 2000. In addition, Congressional policy discussion and legislative action on fisheries continued, including the American Fisheries Act that was attached to a funding law in 1998. Fisheries-related litigation increased substantially and, more importantly, NOAA Fisheries initially lost a significant portion of those cases and was criticized in court decisions.

In 1999, Dalton became NOAA Fisheries Director and worked with NOAA Deputy Under Secretary Scott Gudes and former NIST Director Ray Kammer to assess the situation. Kammer identified a number of issues: a seven-fold increase in open court cases; more than 100 governing laws and executive orders; 11 levels of government review; old environmental impact statements and incomplete endangered species listings inviting litigation; and a budget shortfall of almost $200 million annually. NOAA Fisheries was able to begin to address the problems and received a much larger budget ($816 million) in 2001 to support that effort. Among Dalton's lessons learned were the need for integrated programs that clearly define each partner's role, engaged constituents, investments in good people and good science, and well-justified budgets.

Margaret Spring: Magnuson Stevens Act 1999-2006: A National Framework for Success (The Northwest Model—Turning the Corner on Overfishing)

Margaret Spring served as counsel to the Senate Commerce Committee from 1999 to 2007. Her presentation revisited the eight years she worked on the Magnuson-Stevens Act and its evolution from SFA implementation to the 2006 reauthorization and today's rebuilding success. The 2006 law represented considerable work by a large number of people who helped get it finally signed and "over the goal line," including UW alumni Frank Lockhart, Matt Paxton, Todd Bertoson, and Heather Ludemann.

The reauthorization process had two major phases. In the first phase, a number of SFA-mandated National Research Council reports were released, including an important 1998 report on the Northeast Groundfish Fishery that concluded strong science-based management actions were warranted, noting that without such discipline, there are long term losses in both economic and environmental wealth. This was co-authored by a number of UW affiliates or faculty, including Ray Hilborn, Ana Parma, and Elizabeth Clarke, now of NWFSC . In addition, the NRC produced an important report, "Sharing the Fish" which provided a roadmap to addressing concerns about the impacts of individual fishing quotas (IFQs). Armed with these reports as background, the Committee initiated activities similar to today's process of assembling bills, editing language and getting feedback. Committees held field hearings and talked to constituents about regional challenges to develop a nationally unified approach. Then, many of the fishery management issues Dalton described began to become apparent and major national shifts and crises diverted attention to important national crises and political transitions – the 2000 Bush v Gore presidential election, September 11 and the anthrax scare, a 50-50 split in control of the Senate, and a major government reorganization with creation of the Department of Homeland Security.

While these developments delayed action on Capitol Hill, implementation of the SFA, which was still a young law, continued and provided Congress further insight as time went on. Among the early lessons from the SFA and American Fisheries Act (enacted around the same time) were that: time and resources were necessary to implement new laws and prevent litigation; fishery performance was not improving, particularly in New England, despite "plans" to end overfishing; boom and bust cycles disrupted communities and recovery and could not substitute for proactive planning; the value of buyouts was questionable; and the North Pacific co-management approach offered national promise. A focus on improving domestic fishery management also placed a spotlight on poor international management, specifically the failure of regional fishery management organizations to end illegal, unreported or unregulated fishing or curb bycatch of species managed or protected under US law – which in turn placed restrictions on U.S. fisheries.

The more complex second phase began after the national scene settled down and there was time to evaluate the hearing testimony and implementation experience. In addition, the Appropriations Committees took action to request a National Academy of Public Administration report and provide funds to deal with disasters, buyouts, and the American Fisheries Act. At a hearing in 2002, NOAA Fisheries Director Bill Hogarth asked for a "time out" that changed the scale and nature of the approach to legislation – he committed to focus on dealing with litigation, making the Councils work and fully implementing SFA to prevent overfishing, restore overfished stocks, reduce capacity, implement measures to monitor bycatch and protect essential fish habitat. Hogarth needed time and a little space, so the Committee took a step back to let NOAA and the Councils get to work and see what they could achieve.

Meanwhile, the U.S. Commission on Ocean Policy, which included fishery experts within its members, completed 18 site visits, 16 public meetings and heard from 450 witnesses around the country. The Commission released its findings in 2004, reigniting the fisheries legislative discussion for first-ever Commerce Committee "Co-Chairs" Stevens and Inouye. Similar to the Pew Commission, the U.S. Commission confirmed the goals of SFA, and supported the move toward ecosystem-based management, expanded use of dedicated access privileges (e.g. IFQs), more public representation, decreased overcapitalization, a strengthened role for science, gear technology to address bycatch, habitat protection, and improved enforcement and international compliance. In its report and testimony, the Commission reinforced differences between East Coast and West Coast approaches, highlighting the North Pacific management model as showing that better performance was possible. It also emphasized the need for international compliance to prevent foreign fleet actions from undermining the effectiveness of domestic law.

The timeout encouraged four factors leading to the successful 2006 reauthorization. First, the economic hardship from stock declines finally brought the New England delegation together with Senators Stevens and Inouye to end overfishing. The rebuilding timeline discussion was dwarfed by the problem of chronic overfishing – which had become a regional and national embarrassment. Second, there was bipartisan leadership and experience, embodied by Senator Stevens, within the Congress, the two Commissions, NOAA and the Councils to bridge major change points and differences. Third, the White House and Congress aligned on goals and funding for

implementation. Fourth, the West Coast model showed the possibilities and provided a blueprint for a new national approach. In December 2006, the Senate and House passed the 2006 reauthorization with the following major changes agreed to by unanimous consent:

- Annual catch limits (ACLs) were required to be enforceable with accountability measures to finally end overfishing and rebuild stocks.
- Individual fishing quotas and cooperative management were authorized using the Alaska cooperatives as a model and setting specific criteria consistent with the 1999 National Research Council study.
- The approval process for fishery management plans was streamlined and improved to clarify decision-making authority and encourage administrative efforts to mesh it with the National Environmental Policy Act process.
- Bycatch and habitat provisions focused on improving implementation by working through the Councils, updating bycatch reduction requirements and programs, promoting cooperative research, and authorizing the community fisheries habitat restoration program.
- The stage was set for better recreational fishery data and a national registry, in the absence of state action, to obtain improved survey data.
- A Magnuson-Stevens Act Fund was established to match public and non-public sources and meet unfunded needs.
- A new set of provisions to improve international enforcement and compliance using the mechanism of the Driftnet Enforcement Act to identify and impose sanctions on nations participating in IUU fishing or excessive bycatch of protected or endangered species.

The last words come from Senator Stevens:

> *"We have to find some way to have these concepts applied to the high seas, especially illegal, unreported and unregulated activities… The future of the fishing capabilities of every nation depends on finding some way to not abuse the fisheries on the high seas."*

Sam Rauch: U.S. Fisheries Management Today

Sam Rauch began his career as a Justice Department lawyer defending the government against fisheries lawsuits. He noted that SFA provided managers with tools and incentives to improve management but ambitious deadlines did not allow enough time to address entrenched agency issues. In 2004, he moved to NOAA after helping turn their win-loss litigation record around. He served as the Acting NOAA Fisheries Director for two years working with the Hill to negotiate and embrace the 2006 reauthorization. Today he is Deputy Director of NOAA Fisheries. Focusing on the current status of U.S. fisheries management, Rauch organized his talk around four general principles.

1. The Magnuson-Stevens Act is a phenomenal success and continues to work today – even in New England. In the last two years, commercial fishermen landed a record 9.6 billion pounds of seafood valued at $5.1 billion. Fisheries supported 1.7 million jobs and added 200,000 jobs to the 2010 economy in the midst of a difficult recession. On the environmental side, NOAA manages about 538 fish

stocks and 9% are subject to overfishing. Eighty-three percent of stocks are healthy and 17% are overfished. The law has realized the goals that Congress set out for domestic management while achieving environmental sustainability.

2. We have ended overfishing – a quest that is both an environmental and economic achievement and now serves as a marketing tool for U.S. fishermen. The 2006 reauthorization required that ACLs be put in place by 2010 and, unlike the missed deadlines of the SFA, all but three were done. Much of the phenomenal effort came from the Councils, making amendments to about 40 plans to put the measures in place. While the ACLs should end excessive harvests, stocks cannot be taken off the overfishing list until their status is proven by stock assessments. It is also important to recognize that many fisheries are not managed under the Magnuson-Stevens Act, rather they fall under state or international jurisdiction.
3. This is a process not a point estimate; fisheries management is an adaptive process. Fish stocks come and go based on recruitment patterns, and controlling biomass is not as important as setting the rate of fishing mortality and monitoring it. At any given time, an assessment may indicate that a stock is overfished, but variability in year class strength, recruitment, and natural systems require an adaptive approach. Case in point is New England where they have experienced numerous cycles of overfishing, serial depletion and stock switching in groundfish fisheries over time. Yet despite this history, in 2008, the region was on track to stock recovery until 2012 when the Gulf of Maine was the warmest ever observed and an entire cod year class was lost. Fishing may not have caused the latest crisis, but fishermen face 70% or greater reductions in cod catch limits.
4. Success requires investment in science and in time (e.g. the Council process) and may require sacrifice of short-term economic gain to achieve uncertain long-term ecological and economic benefits. Trends toward better management and more accountability comes at a cost. At one point, the annual NOAA Fisheries budget reached almost $1 billion but it is now closer to $800 million due to sequesters, rescissions and other budget restrictions. Generally, more sophisticated programs provide better management but require greater scientific and regulatory effort. We face difficult decisions on whether costs should be borne by the taxpayer or by fishermen. If we sacrifice science, monitoring, enforcement and regulatory capacity to declining budgets, the management process must be prepared to deal with greater uncertainty.

Looking at management changes, the most important new requirement in 2007 was for an annual measure to ensure that overfishing does not occur through ACLs. Because Congress allowed a phase-in until 2010, the Councils were successful in meeting the deadline and there was no spike in litigation. Today, although there still are about 100 cases each year, the pace of litigation seems to be slowing and federal lawyers prevail more often. The second most significant change made in 2007 was a small one – requiring Councils to operate under the optimum yield limits set by their Scientific and Statistical Committees. In 1997, the main SFA driver was the ten-year rebuilding requirement; now with ACLs in place, rebuilding becomes less important, because ACLs generate a precautionary need to avoid overfishing. Another important element in 2007 was the resolution of the catch share issue, recognizing that it works well in some fisheries but not in others. Two large programs have been established since 2007 – West Coast groundfish and an innovative sector program in New England.

Turning to future trends and challenges, traditional thinking was that fishery removals were the principal driver for sustainability – if you cut fishing, the stocks would grow. Now more external drivers are being recognized, such as climate change that could be a boon for some fisheries and bad for others. Pollution and oil spills are major concerns. What will the long-term impacts of Deepwater Horizon be on the productivity of Gulf fish stocks? Ecosystem dynamics are a major future issue with NOAA and the Councils are embracing ecosystem-based management for the most part. Among the concerns that must be addressed are the impacts of forage fish harvests on marine food webs, loss of fish productivity from dredging operations and the increasing rate of loss of coastal wetlands.

The growth of other fishery sectors will be yet another challenge. Recreational fisheries rival the economic value of commercial fisheries on a national scale and far exceed them in some areas such as the Gulf of Mexico. In many sport fisheries, removals are much larger than commercial landings, but are not as obvious because catches are taken by thousands of small boats rather than a few large commercial vessels. The Magnuson-Stevens Act was designed primarily for commercial fisheries and recreational fisheries are difficult to manage. One example is the concern created by the shortening of the recreational season for Gulf red snapper as the stock was rebuilt. Similarly, the Magnuson-Stevens Act is limited in its application to subsistence fisheries that are central in regions such as Alaska, the Northwest and the Pacific island territories. It also does not comprehensively address the growing interest of U.S. consumers in seafood as a healthy food source and its growing reliance on seafood imports grown in foreign aquaculture. Fishing is global business and environmental sustainability is a global issue. One final thought is that an important export is not necessarily limited to fish products, but also includes the Magnuson-Stevens management regime and its emphasis on sustainability, science, and profitability.

Session 1 Question and Answers:
Wally Pereyra (Arctic Storm) noted that as efforts were being made to create the Magnuson-Steven Act, there were reports that predated it - including the seminal "Stratton Commission report"; what role did they play in setting the stage for MSA? Bud Walsh responded that Senator Magnuson and others were concerned about lack of attention being paid to ocean policy. To encourage more attention, they created the first Ocean Commission through democratic processes and headed by Dr. Stratton, head of MIT. One of many recommendations was the creation of NOAA to bring together federal ocean and atmospheric scientific capability (including NWS) and give more clout to analysis of ocean policy. The Commission recommended the Coastal Zone Management Act, but avoided the question of extended fisheries jurisdiction because of defense and national security concerns. Fisheries were a chip to be traded, not a major focus.

Kate Wing (KW Consulting) wondered why the regional fishery management council boundaries are where they are? Why are there three Councils on East Coast and one on West Coast? Bud Walsh stated 'I guess "I just did it"; I sat with fisheries service and needed to draw boundaries with closely grouped regions so it worked.' Sam Rauch was unsure how the structure came about, but we can now look at large marine ecosystems. It's ironic that fish stocks map similarly to Council boundaries. Fisheries are unique to each region – for the most part. Penny Dalton commented that it was at least partly

political. If you look at the number of people and states on the East Coast and at the obligatory number of people for each state, you end up with a huge number of seats for each Council unless you have more of them. The size of each Council was a concern. Finally, Margaret Spring stated that because now there are all these bills to move seats around (every Congress) because fish are moving around. When Councils are make decisions, some states with a large fishery are not represented. We continue to deal with this because of need for representation for each state/fishery.

Usha Varanasi (NOAA NWFSC, Retired). Raised three questions on behalf of students enrolled in her Ocean and Coastal Law class) The first question was that Sam said we are managing 538 species – does that mean we are managing them all and not leaving any unmanaged? Sam Rausch responded that the MSA only covers federal fisheries and states handle fish in state waters. We catch more than 538 species in federal fisheries but mostly incidentally and at low levels. Of the 538 species, only about 200 are truly significant for environmental or economic reasons. Coverage varies year to year based on council decisions, but not every species is covered.

Usha's second questions was whether climate change impact on fish stocks are included in models now? Sam Rauch stated that ideal this was the case, at least for climate change (pollution included in natural mortality). Putting climate change into an ecosystem-based management model is hard – how to model climate change? The problem isn't desire but ability to do this. As it becomes more of a factor and becomes more important, we will get better at accounting for it in models.

Usha's third questions was whether we going to expand MSA to include international fisheries or will it be covered in another arena? Margaret Spring responded that we recognized that established RFMOs should be strengthened in 2006 and that would prompt stronger international management. She knew of no additional legislation; the law doesn't affect national management in other EEZ's – that is unaddressed. Bud Walsh commented based on his tuna experience, the US has no jurisdiction, no way to get leverage, within by putting pressure on government. Adequate data is hard to get because it is not shared with Commissions. How can we manage when no data arrive on time, when China needs protein and is building vessels to come get tuna? It's a big capacity problem with purse seiners (limited number). What's being done? Environmental groups (post 'dolphin safe labels') realized that the way to discipline fishermen is to create funnel points. Access at market (grocery store) – don't sell this type of fish (e.g., tuna caught using FAD's) – has become a very real tool, but is probably not enough.

Mike Szymanski (Fishermens Finest Inc.) asked if the National Standards 1-10 be read as priorities ranked by importance or co-equal and hence whether we are drifting away from interpreting them as individual or co-equal mandates? Sam Rauch stated that some standards conflict and are not in order, but #1 is interpreted to be preeminent and #2 is second. Beyond that they are largely co-equal. Safety of life at sea is a strong driver. Margaret Spring noted that some of the rankings come from court decisions and were not always agreed upon but now are clearer. National Standard 9 on bycatch is high up on the list as a top concern – implementation is challenging but without addressing bycatch you end up overfishing

Dave Loughlin, (Seaport Corporation, Kirkland) has observed a decline in per capita consumption of seafood over last 5 years. While it is growing internationally, consumption has declined here. Sam Rauch noted that this is concerned from the NMFS perspective. The FDA says including fish in healthy diet (2 meals/week) and to some extent, promoting seafood is promoting sustainability of it. There are some issues with production – stability of quotas – if they bounce around in any given year – huge abundance one year vs. big cutbacks the next, it is hard to develop consumer confidence and familiarity with product as compared to a stable agriculture product. We can increase consumer demand by increasing stability and trust in the product. Penny Dalton stated that labeling is another issue; there is no uniform process and a lot of independent groups. It might be helpful for NOAA to take a leadership role on seafood certification. Another problem is that big pollution events (e.g., Deepwater Horizon) create concerns that work against developing consumer confidence in the product. Margaret Spring stated that in terms of confusion, 97% of US Fisheries are yellow or green on seafood watch cards so it's not bad. Seafood has always confused people on how to cook it at home (vs. restaurants). Finally, Bud Walsh noted that global production of seafood has stayed the same (capture), not growing. Growth projected by FAO is in aquaculture. Countries are developing a middle class, have capacity to buy canned tuna/shrimp and, as a result, cost increases. The middle class in the U.S. has not gained much buying power compared to China and consumers are not buying fish as a staple. Fundamental economics, they agree it's healthier, but now more expensive. Labeling schemes are not really effective, if you ask the consumer what's the most important aspect of decision making – it's price.

Congressional Staff Member Panel Discussion

Panelists:
Jean Flemma, a Senior Policy Advisor to the Democratic Staff of the House Committee on Natural Resources
Bob King, a Legislative Assistant in the Office of U.S. Senator Mark Begich
Nicole Teutchel, a Legislative Assistant in the Office of U.S. Senator Maria Cantwell
Dave Whaley, a Professional Staff Member with the House Committee on Natural Resources
Moderated by **John Henderschedt**

The Magnuson-Stevens Act expired in 2013, initiating discussion of reauthorization of the Act and debate about what aspects of the Act should remain intact, what should be changed, and what should be added. At the time of the symposium, reauthorization discussion drafts from Congressman Hastings and Senators Begich and Rubio had been circulated and drawn comment. Building on the retrospective themes of the previous panel and presentations, congressional staffers Jean Flemma (House Resources), Bob King (Office of Senator Mark Begich), Nicole Teuchel (Office of Senator Cantwell), and Dave Whaley (House Natural Resources) offered their thoughts and observations regarding the reauthorization of the Magnuson-Stevens Act (MSA). Specifically, they were asked to address three related themes:

- How did we get here? - *From their unique perspectives, what short and onger-term processes and dynamics have led to the discussion of MSA reauthorization in 2014?*
- What is on the table and who is at the table? – *How are stakeholders engaging and what are their interests? What elements of the MSA are stakeholders most*

interested in preserving or changing? How do interests and concerns expressed by stakeholders in Alaska and the Pacific Northwest compare with those expressed at a national level and in different regions?; and

- Where do we go from here? – *What are possible timelines and mileposts going forward? How can conflicting interests among stakeholders be balanced and resolved? What are the prospects for reauthorization in the future should it not get accomplished during the present congress?*

How did we get here?

The longer term consideration of how we've gotten to this point of anticipation for reauthorization of the MSA focuses our attention not only on the legislation coming out of the Senate, as was discussed by the previous panel, but by efforts in the House of Representatives as well. Particular credit went to Congressmen Studds and Young, who worked closely to get earlier Magnuson legislation passed, and it was noted that those unified, cooperative efforts were followed by markedly divergent paths of implementation of the Act in various regions.

Now, eight years having passed since the most recent MSA implementation and appropriation authorization having expired, there are mixed views on the need and urgency for a new bill. Appropriations continue despite the expiration, any many believe that the Act, as currently drafted, is in little need of change. Still, both Congressman Hastings and Senator Begich have stated that the time has come to reauthorize the Act, and a number of recent processes have informed the development of draft bills from the House and Senate Committee leadership.

Outside of Congress, the eight Regional Fishery Management Councils and NOAA Fisheries hosted Managing Our Nation's Fisheries 3, a national conference that examined what's working, what's not working, and how the MSA might be improved through reauthorization. That conference generated 128 finding for improvements to fisheries management, including numerous recommended changes to the MSA. There are other sources that informed the development of the discussion drafts including the National Academy of Sciences Report: 'Evaluating the Effectiveness of Fish Stock Rebuilding Plans
in the United States', recommendations from the Marine Fisheries Advisory Committee, and input from the Council Coordination Committee, a group consisting of all eight regional fishery management council chairs, vice chairs, and executive directors.

Over the previous three years, the House Resources Committee held nine hearings and heard from 79 witnesses, including representatives of the Administration, regional fishery management councils, states, commissions, and a wide variety of stakeholders. The Senate Subcommittee on Oceans held four hearings in addition to several listening sessions throughout the State of Alaska.

While current efforts indicate a process and a timeline that are similar to that of previous reauthorizations, others believe that a traditional ten year cycle suggests that reauthorization in 2016 may be more realistic and appropriate. Many harvesters, processors, stakeholders, and NGOs have said that no change is necessary - "just change the date" is an oft-heard remark.

What is on the table, and who is at the table?
The debate over when to reauthorize the Act and what the contents of that bill should be is characterized by significant regional views of the success in the implementation of the 2006 reauthorization in general, and the mandates of National Standard 1 in particular. Some feel that provisions to end overfishing, rebuild stocks, and elevate the role of the SSC in establishing harvest limits, attributes largely reflective of the process in place for many years in the North Pacific, have been quite successful and critical to the sustainable management of our fisheries. Others point to the fact that some regions do not have access to the same amount of data or enjoy the same capacity for frequent stock assessments as do others. It is argued that guidelines for implementation of National Standard 1 following the 2006 reauthorization in data-limited and data-poor situations have led to the establishment of buffers that unduly constrain harvests and negatively impact coastal communities.

The solution to these challenges, as reflected in varying degrees in both the House and Senate discussion drafts, is more regional flexibility. How that flexibility is defined and implemented is subject to debate. While there is general acknowledgement that rebuilding timelines must ultimately reflect the life history of the overfished species, setting harvest limits above acceptable biological catch as identified by the SSCs is significantly more controversial, as many are concerned that such flexibility will result in backsliding from the progress made in the 2006 reauthorization.

It was suggested that the meaning of "flexibility" varies by region, and that the need for flexibility is heard most often from regions where the most difficult management decisions have to be made. The challenge is finding the appropriate balance between avoiding undue impacts on coastal communities and managing at an adequate level of precaution. One of the fundamental solutions to this challenge is to increase funding for data collection and assessments, but opinions vary among members of Congress about how that should be achieved. In any case, they all hear loud and clear from many regions about the cost of the lacking data.

Specific measures to account for the role of forage fish in the ecosystem are in the current Senate discussion draft, although it was indicated during the panel that this may not be the case in future iterations. Much work has gone toward the implementation and development of ecosystem-based fisheries management, and considerations such as forage fish management in the next reauthorization represents a logical outgrowth of that progress. That said, establishing measures to take ecosystem-based management to the next level through legislation is difficult due to the complicated nature of the topic.

The fact that litigation of measures implemented through the 2006 MSA reauthorization skyrocketed and the concern that ecosystem-based fisheries management topics in general, and forage fish consideration in particular, might serve as a "litigation hook," were offered as factors that informed a decision to not include them in the House draft.

The 2006 MSA mandated a study of the impacts of ocean acidification on marine resources, and there has been significant funding for the collection of data on ocean acidification. Now what is required is the time and capacity to figure out what these impacts mean to managed stocks and coastal communities that rely on them.

Addressing these and larger climate issues, such as how councils can fold the impact of climate change into their decision-making, require more science, and the solution may have more to do with resources than with legislation. Again, however, interpretation and acceptance of the existence and extent of climate impact varies across regions and members of Congress.

The issue of habitat remains a focus among the NGO community, and often with an emphasis on protecting fish habitat from non-fishing impacts, such as those associated with energy development and the siting of platforms. Our knowledge of habitat and its relationship to productivity is limited, however. These uncertainties have led to identification of essential habitat for many species on a presence/absence basis, making much of the ocean essential fish habitat. While science is needed to improve our knowledge of habitat function, this area of research has not attracted attention as a funding priority.

Allocation review, which is included in the current Senate discussion draft, is another issue that reflects regional differences. The topic is getting the most attention (and support) in the Gulf of Mexico region among the for-hire and private recreational angler communities. While the issue is "out there" and acknowledged in the draft, there is also a recognition that a great deal of work has gone into addressing allocation issues throughout the regions, and members of Congress are inclined to largely defer to the councils on the issue.

Issues of subsistence, and the consideration of impacts in the council's decision-making process, was one of the top concerns voiced during the listening sessions held in Alaska. There was expression by those advocates of the need for stronger subsistence and tribal representation on the council. The issue is a challenging one - to ensure that councils consider impacts on subsistence - but councils already do that to a large extent. Nonetheless, MSA impacts on subsistence users throughout the regions, and particularly in Alaska and the Western Pacific, is a big issue, as is the avoidance of unintended consequences to the ongoing effectiveness of the councils.

The importance of access and transparency in the council process is reflected in language in the House discussion draft requiring meeting transcripts and web-streaming of meetings. This is largely focused on some regions rather than others. Inclusion of SSC meetings along with those of the councils in the language mandating better access reflects the heightened role of the science advisors that emerged from the 2006 reauthorization.

Questions remain as to whether NOAA Fisheries has met the 2006 mandate to streamline the application of the National Environmental Policy Act for actions taken under authority of the MSA. Both the House and Senate discussion drafts contain language that would move that process forward. There is not agreement, however, that the MSA and NEPA are duplicative, and many stakeholders would be concerned with a solution that says that MSA addresses everything that currently needs to be done under NEPA.

The House draft requires implementation of measures related to fisheries under the ESA through the councils, ensuring the preservation of their authority to manage stocks and fisheries throughout their range.

In terms of international fisheries, there is interest in blocking imports from countries that are not comporting to RFMO policies. There is an IUU bill that attempts to harmonize international requirements and ensure that US fishermen are not disadvantaged by the fact that they fish to higher regulatory and conservation standards than may be the case in other countries.

There is interest among both House and the Senate members in ensuring that councils have the resources and authority necessary to implement electronic monitoring - a tool that shows promise in collecting more data at a lower cost - reflecting a desire to address the concerns of small-boat fishermen who cannot afford to pay for having a human observer on board their vessel. The question is how to promote the use of electronic monitoring while leaving it to the councils to decide how it is best implemented in their respective regions, and how to ensure that the data collected meet the needs of both the councils and of NOAA Fisheries. The discussion of electronic monitoring extends beyond the use of cameras on boats, and include new innovations such as iSnapper and other innovations for creating low-cost data streams.

Where do we go from here?
There is some optimism that reauthorization can be achieved during this Congress, and it was pointed out that the most recent two MSA reauthorizations occurred late in the sessions of an election year. An advantage of reauthorizing the MSA during this Congress is the certainty of the playing field; the current committee chairs on both the House and Senate side will retire at the end of the year and the interests and motivations of incoming chairs to reauthorize the MSA are unknown.

Others pointed out that there is still a lot that needs to be worked out, and that we will need to take a long look at the language of a bill for reauthorization. While it is good to move the ball forward if possible, there is no urgency in doing so.

A new Senate discussion draft reflecting comments received on the current one is planned for this summer.

Session 2 – The Big Lift: Ending Overfishing and Ensuring Accountability

National Standard 1 (NS1) requires that overfishing be prevented and optimum yield be achieved, and National Standard 2 requires conservation and management measures be based on the best available science. The basis for the scientific advice on which management decisions relevant to NS1 are the stock assessments conducted by scientists involved in the Council process, the harvest control rules used to translate the outcomes of stock assessments into the quantities used to set ACLs, and the rebuilding analyses developed for stocks declared to be overfished.

Overfishing is defined as the catch exceeding the Overfishing Limit (OFL) or the fishing mortality rate exceeding the fishing mortality limit on which the OFL is based. Stocks are declared to be overfished when they are depleted to below their Minimum Stock

Size Thresholds (MSST, usually half of the estimate of the biomass at which MSY is achieved, B_{MSY}). Two main control rules are used to calculate the reference points on which management advice for catch levels are based: (a) the control rule which sets the OFL, and (b) the Acceptable Biological catch (ABC) control rule which accounts for uncertainty in assessments. The Annual Catch Limit (ACL) is a limit set by management, but the ACL cannot exceed the ABC.

The desire to end overfishing for all species may be in conflict with National Standard 8 regarding economic impacts on fishing communities, especially when the species subject to overfishing has little economic value relative to the fishery as a whole. Setting ABC below OFL to account for scientific uncertainty has economic consequences for fishing communities. The speakers in this session focused on technical aspects related to supporting Councils to achieve NS1 and NS8, how well the current system is working, and policy changes which might facilitate achieving the national standards. The talks in this session and the subsequent discussion focused on how to increase 'flexibility' yet still achieve the goals of the MSA.

The lead speaker in the session, **Richard (Rick) Methot** from NOAA Fisheries outlined the biological basis for sustainable fisheries, emphasizing that there is a range of target biomass levels at which expected long-term yield could approach the limit of biological productivity, but within that range higher biomass levels were likely to lead to greater long-term catch rates, less fluctuations in catches, less ecosystem impacts, and a buffer against uncertainty. Rick also outlined various reasons why overfishing could occur including managers not heeding scientific advice, in-season controls failing to prevent the catch from exceeding the OFL, and scientific uncertainty about the OFL itself. Rick expanded the concept of scientific uncertainty to include long-term shifts in the ecosystem and climate.

Rick noted that currently the definition of overfishing does not consider the extent to which the OFL is exceeded and that considering whether overfishing is occurring in a multi-year sense would be more robust. Furthermore, he indicated that phasing in new science (for example, setting the ACL for a year to the sum of 70% of that for the previous year and 30% of that calculated from an assessment) could protect stocks from becoming overfished while avoiding large changes in ACL. However, prior to adoption, such rules should be tested, ideally using Management Strategy Evaluation (MSE). Rick emphasized the need for more frequent assessments and intensive management for main target stocks, especially when fishing mortality is close to the limits, while management of non-target stocks for which fishing mortality is low relative to targets could be less intensive. He also identified the wide range of fishing mortality rates currently experienced by fish stocks and the difficulties that would be encountered in separating target from non-target stocks.

In relation to mixed-stock fisheries, Rick highlighted the possibility of retaining assessed stocks in complexes, instead of removing them from the complex and managing them separately. He also noted that fishery-wide Optimum Yield (OY) and economic analyses could be used to understand how a spread of achievable fishing mortality rates across target and non-target stocks in a mixed-stock fishery could provide best overall OY as well as sufficient protection for less productive stocks.

The second speaker in the session, **Ana Parma** from the Centro Nacional Patagónico in Argentia, gave a summary of the report by the National Research Council Committee which was tasked to analyze the effects of the MSA mandate to rebuild overfished stocks. She focused on the outcomes of rebuilding plans, and the effects of uncertainty and environmental conditions, although the report covered several other topics.

The report considered the 85 federally-managed stocks which were declared to be overfished between 1997 and 2011, most of which were declared overfished within four years after the Sustainable Fisheries Act of 1996. The target time to rebuild was set at the maximum of 10 years for 40% of the implemented rebuilding plans (some stocks did not have rebuilding plans). The difference between the target year for rebuilding and the maximum time to rebuild (T_{MAX}) was generally low for New England stocks but target years for rebuilding were often much sooner than T_{MAX} for stocks managed by the Pacific Fishery Management Council. Ana highlighted two cases (winter flounder and yellowtail flounder off Southern New England) in which changes in assessment outcomes led to marked changes in target fishing mortalities when the target time for rebuilding was approaching and rebuilding was slower than expected. She noted that the change for management under standard control rules to rebuild stocks by the selected time can also lead to major changes in allowable fishing mortality and catch.

Based on 55 stocks with sufficient data, Ana noted that changes in assessments mean that 20 stocks now appear not to have been overfished at the time of overfished designation and 10 were actually above $B_{MSY.}$ Of the 35 stocks for which the most recent assessment indicates they were overfished when NMFS declared them overfished, 10 are now rebuilt and 5 are rebuilding while 20 are still below MSST. Management was generally successful in reducing fishing mortality to be below the fishing mortality corresponding to MSY (F_{MSY}), although the timing of when fishing mortality first dropped below F_{MSY} differed regionally. Nine overfished stocks continued to be subject to overfishing even though fishing mortality targets were set at or below 75% F_{MSY} to allow for rebuilding within the maximum time frame. Ana noted that reasons for failing to achieve intended reductions in fishing mortality included ineffectice input controls and lack of accountability measures (before 2007), the impacts of bycatch and stock assessment uncertainty, in particular when later assessments suggest that biomass was overestimated.

Ana identified three key policy changes which might make the rebuilding process more effective: (a) using harvest control rules which integrate 'normal' management and rebuilding provisions (e.g., reductions in target fishing mortality as stocks decrease below the target biomass), (b) adopting control rules which do not have discontinuities such as the '10-year rule' used to set T_{MAX}, and (c) focusing more on meeting fishing mortality targets than on attaining exact schedules for rebuilding biomass by specific years.

The third speaker in the session, **Steve Cadrin** from the University of Massachusetts, reminded the symposium that the aim of most fishery management systems is to manage sustainable fisheries and achieve optimal yield. Steve emphasized that annual catch limits should peform well for avoiding overfishing if catches are accurately monitored, ideally in-season, and individuals are accountable for their catches. However, without accurate catch monitoring and frequent stock assessments, a system based on ACLs is unlikely to prevent ovefishing and can lead to lost yield. Steve noted

that it is well known that the catch from mixed stock fisheries in which production is from multiple species will be less than when each species is targetted, and that attempting to optimize the yield from such fisheries will lead to some stocks being above and others below target and perhaps even limit levels.

Steve noted that fisheries are often constrained by the most limiting ("choke") species allocation when catch allocations do not match the mix of species available and this can lead to a substantial loss in yield. He identified several ways to reduce the impact of mixed-species fisheries by managing species catchabilities through transferrability, gear design, time-area regulation, risk pools, and bycatch avoidance. However, there is no guarantee that any of these solutions will work in any given case.

Steve drew some policy-related conclusions based on his experiences in the New England region, in particular that catch limits should not be required for fisheries that do not have reliable annual catch estimates or that catch monitoring is not sufficient to support in-season management. He noted that alternative management approaches such as closed areas and size limits may be more effective in these cases. Steve also noted that there is a 'mixed stock exception' in the current NS1 guidelines which exempts stocks from MSY-based harvest rate limits and removes the need to rebuild overfished stocks. However, as currently drafted this exception has not been applied. Steve recommended that the mixed stock exception be made operational and available to Councils.

The final speaker in the session, **Chris Anderson** from the School of Aquatic and Fishery Sciences, UW, introduced the concept of ecosystem-based business and the implications of this concept for management of federally-managed species. Chris noted that although fishery participation in Alaska and off the west coast is declining, revenues from fishing in both regions is increasing, and emphased that a focus on harvesters alone substantially understates the value the post harvest sector generates for soceity.

Chris noted that MSA is structured around stock status and catch limits for individual species, but that ecosystem-based businesses depend on multispecies fisheries so that production within any one fishery is from multiple species, and vessels participate in multiple, separately managed fisheries. Involvement in multiple fisheries is the norm off the west coast and Alaska, and this implies that changes to one management plan can have flow-on effects on other fisheries, including those outside of the region with the management plan that changed.

Chris highlighted that underfishing (fishing mortality rates well below that corresponding to MSY) is a significant problem for fishing businesses. Underfishing is common off Alaska and the west coast, for reasons including precaution when setting catch limits and the effects of limiting species. Chris estimated the value of unharvested catch limits as approximately $50 million in the west coast limited entry trawl fishery and $300-500 million in the BSAI (Bering Sea Aluetian Islands).

Chris noted that the mixed-stock exception is an existing element of MSA implementation designed to address limiting species, and should be a norm if the aim is to achieve optimum yield. However, 'deliberate overfishing' might elicit a negative public response, given the recent focus to reduce levels of overfishing. He recommended

that a future MSA make explicit reference to healthy fisheries requiring healthy industries, that fisheries are a source of food and provide livelihoods for communities. He also recommended that the term "overfishing" be restricted to fisheries, not individual stocks, failing to achieve OY due to excessive harvest. In addition, this multispecies notion of OY could account for trophic relationships of the type valued by ecosystem-based management. The value of catch shares and cooperatives was emphasized as ways to maintain healthy fisheries and preserve incentives to avoid waste while achieveing multispecies OY.

Chris argued the fact that ecosystem-based businesses participate in multiple fisheries has implications for how management changes are analyzed, because National Standard 8 requires assessment of costs and benefits across fisheries, as well as the tools needed in the MSA to manage them. Multifishery participation reduces harvester risk exposure from natural, management and market fluctuations. He recommended that the MSA should be modified to ensure that business activity across fisheries is better monitored, and to facilitate improved coordination with state fisheries and among Councils. In common with Rick Methot, he noted the value of multi-year catch limits, particularly for volatile species.

Panel Discussion: The discussion following the presentations involved the four speakers as well as **Trevor Branch** (SAFS, University of Washington), **Dan Holland** (Northwest Fisheries Science Center) and **David Witherell** (North Pacific Fishery Management Council).

The discussion session started with each panelist highlighting their top finding from the presentations. Chris Anderson highlighted the tremendous value lost due to quotas not being fully utilized, and that addressing this should a priority. Steve Cadrin followed up this comment by noting that Congress should specify what they mean by optimum yield for fisheries, in contrast for stocks, and Rick Methot noted that taking an economic perspective is needed as US fisheries management moves towards a broader ecosystem perspective. Ana Parma emphasized that management can only work by regulating fishing mortality and that it is impossible to dictate when exactly a fished population will rebuild. Trevor Branch concurred, and noted that problems arise when rebuilding targets are fixed but changes to stock assessments can lead to marked changes in the perception of the stock. He recommended that stocks should be managed so that catches do not fluctuate as much as they do under the current implementation of the Act. Dan Holland noted that the mixed stock exception may not be as important as before, especially given the ability to implement catch share programs that create incentives to change catch composition. However, it may be useful to allow multi-year TACs, deemed value systems and flexibility in aggregation limits for cooperatives, and risk pools to make it more feasible for individual fishermen to balance catch with catch privileges. Finally, Dave Witherell noted that current rebuilding plans focus almost exclusively on reducing fishing mortality when in fact all aspects of the fishery and its impacts should be considered, including habitat limitations.

The discussion was then opened to the audience.

Paul MacGregor (At-sea Processors Association) asked how 'choke' species could be dealt with. Rick responded that some of the ideas raised during the talks could help to address the matter, but given that species are often caught together, even approaches

such as the mixed stock exception have limits. Steve emphasized that management is developing incentives to avoid bycatch (see Session III for more information), but that fishers who are able to avoid choke species should not be penalized for doing so.

Anne Hollowed (NOAA, AFSC) questioned Chris Anderson's focus on making the mixed stock exception the standard, suggesting that it means defining 'value' in purely economic terms. Chris responded that OY does pertain to economics, and that the issue to address is what are the target and non-target species and that the mixed stock exception should not pertain to target species. Steve noted that leaving some non-target species below B_{MSY} should not be considered unacceptable. Rick concluded the discussion on this point by noting that management should be looking for a mix of harvest rates among species and not to push everything to the limit.

Selina Heppell (Oregon State University) agreed with Chris that NS1 does require consideration of economic value. However, she reminded the symposium that some non-target species may be ecologically important even if it not economically important, and that even knowing which species are vulnerable is often difficult. Rick responded that the management system depends on detecting which species are vulnerable, and Steve emphasized that MSA is not designed to protect all species, and that Acts such ESA are a backstop to prevent extinction and, to some degree, preserve ecosystem function

Dave Fluharty (UW School of Marine and Environmental Affairs) reminded the symposium that even if all "surplus" biomass was harvested, there is no guarantee that there will be a market for the catch. Chris agreed that this was certainly an issue.

George Hunt noted that fisheries models tend to assume a constant environment and hence that expectations of the future are based on what has been seen in the past, even though the environment is changing. Dan reminded the symposium that environmental changes do not necessarily only lead to reductions in population size and agreed with George that account potentially needs to be taken of environmental changes. Ana noted that the impacts of variable environments make achieving biomass targets on a chosen schedule even more difficult and reiterated her view that rebuilding plans should focus on achieving fishing mortality targets.

David Somes highlighted that some stocks off the west coast are shared between the US and neighboring countries. Steve responded that NS3 requires that stocks be managed across their ranges, which implies a need to consider this issue.

John Stein highlighted the importance of knowing the genetic structure of populations and that this is important information for effective management and that in several cases we lack this information. Trevor agreed, noting that stock assessment and stock structure studies are needed, and emphasized the need for adequate funding for both stock assessment and broader ecological studies.

Frank Lockhart asked how Chris and Steve's recommendations could be implemented. Steve responded that there is a need to triage the recommendations and identify those which have broadest support.

Session 3: West Coast Implementation Experience

The passage of the 2006 reauthorization of the Magnuson-Stevens Act brought with it the requirement that Councils use ACLs to prevent overfishing. The 2006 revision to the MSA implemented what was commonly known as the "Alaska model" of fisheries management which has historically used precautionary annual catch limits as a means of preventing overfishing and hedging against uncertainty. The result has been robust fisheries and generally healthy fish populations. Shortly after the passage of the Sustainable Fisheries Act (SFA) in 1996, the PFMC (Pacific Fishery Management Council) began to set a course which eliminated overfishing and began to rebuild depleted stocks. Many overfished groundfish stocks under PFMC jurisdiction have been declared rebuilt and groundfish populations are increasing.

Over the course of their history, the NPFMC (North Pacific Fisheries Management Council) and PFMC have developed management measures which have become increasingly complex. It is reasonable to assume that fisheries management will continue to become more complex as interests grow to consider a variety of economic, social, biological, and ecological factors. In an era of stable and perhaps declining Federal budgets, the question is who will take on the tasks necessary to address these concerns?

The concept of co-management is one possible pathway for dealing with Federal budget constraints, responding to complex management issues, and continuing to achieve the goal of Optimum Yield from U.S. fisheries. Co-management models have been developed throughout the west coast and Alaska in the form of harvesting cooperatives, risk pools, and through the example of the Northwest Treaty Tribes.

The lead presenters of this session were **Dr. Donald McIsaac** (Executive Director of the PFMC) and **Mr. Chris Oliver** (Executive Director of NPFMC). Both presenters stressed that the MSA, as currently written, provides a very successful framework for making fishery management decisions. The MSA requires a science-based process that uses a suite of tools to achieve successful management, including Limited Access Privilege Programs (LAPPs), ACLs, and requirements to end overfishing and rebuild depleted fish populations. Both Councils have had successes with the existing framework: the PFMC has implemented precautionary sardine harvest policies as an ecosystem protection measure; depleted groundfish stocks under PFMC jurisdiction are rebuilding or have rebuilt; and the NPFMC has a long history of healthy stock populations and economically viable fisheries.

Both Dr. McIsaac and Mr. Oliver touched on areas for improvement, which included streamlining the interaction between the Magnuson-Stevens Act and the National Environmental Policy Act (NEPA). The NEPA requires significant paperwork and process which results in substantial demands on Council resources and causes fishery management decisions to proceed more slowly than necessary. The substantial process and workload associated with the NEPA does not seem necessary given the public process and analytical requirements of the MSA itself. Streamlining the relationship between the MSA and NEPA may be necessary in order to alleviate Council resource constraints, especially when considered alongside Federal budgets that may be declining.

In addition to streamlining the NEPA and MSA processes, Dr. McIsaac and Mr. Oliver indicated that ACLs should allow for some flexibility, especially in cases where stocks

are relatively data poor. Such flexibility may include phasing in catch limits over time or using a suite of tools to address uncertainty associated with data poor stocks rather than relying upon simple catch reductions to respond to uncertainty. Related to ACLs, mandating that rebuilding occur within a 10 year timeframe was seen as arbitrary by both Council directors and it was suggested that it is more reasonable to develop standards that are relevant to the biology of a stock, such as T_{min} (the expected time to rebuild in the absence of exploitation) plus one mean generation time.

Finally, Mr. Oliver discussed the NPFMC's experience with ecosystem-based fishery management (EBFM) and Fishery Ecosystem Plans (FEPs) and the interest of some to add EBFM as a more explicit consideration of the MSA. The NPFMC has experience developing FEPs via the Aleutian Island Plan, and Mr. Oliver stressed that such plans are often limited by a lack of scientific information which makes it difficult to implement some aspects of EBFM. Prescribing metrics, monitoring activities, and regulatory measures would be inappropriate for a variety of reasons. He indicated that the focus of the MSA should be on intended outcomes, rather than specific approaches, and that preservation and enhancement of stock assessments needs to be the highest scientific research priority.

The second presenter, **Dr. Steve Ralston**, described the history of groundfish management in the PFMC. Steve illustrated a timeline that describes the development and implementation of present day management as beginning around the passage of the Sustainable Fisheries Act in 1996. Around this time, the PFMC began to develop measures to conserve groundfish through catch limits, spatial management, and gear requirements; they established sound scientific processes for guiding PFMC decisions; and as a result the west coast groundfish resource has been increasing in size after declining for years.

The PFMC groundfish fishery management plan (FMP) was first established in 1982. It now includes over 90 species, 63 of which are rockfish. Initially, groundfish management suffered from a lack of scientific information and a lack of understanding about the dynamics of west coast groundfish. For example, scientists often used proxies or borrowed information from other regions to establish target harvest levels for west coast groundfish.

The Sustainable Fisheries Act was passed in 1996 and, as a result, reference fishing mortality and target biomass levels were established to determine whether overfishing was occurring and whether stocks were in an overfished state. Around this time researchers discovered that rockfish stocks along the west coast were being fished down from their virgin biomass levels, but they were not reaching equilibrium and were instead steadily declining. Harvest rates were adjusted in response, and the precautionary 40-10 harvest policy (a policy which implements increasingly precautionary catch levels as a stock drops below 40% of the unfished biomass and in principle sets the harvest to zero at 10% of the unfished biomass) was implemented as a measure which managers and researchers hoped would help to arrest the decline of stocks.

Several stocks were declared overfished in the years after the passage of the SFA and the Council began taking steps to conserve and rebuild the overfished stocks. These steps included: developing rebuilding plans; reducing catch limits; the establishment of

spatial management tools (the Rockfish Conservation Area, RCA); trawl footrope restrictions designed to keep trawlers out of rocky habitat for lingcod conservation (later for EFH purposes); and they streamlined the management cycle to be more adaptive and responsive to new scientific information.

Exploitation rates for many stocks were reduced to below 10% and a stock assessment review process was implemented as a way of systematically conducting a transparent peer review process of stock assessments to guide PFMC actions. These steps, in addition to others, effectively established a "wall of science" which created a foundation for PFMC decisions.

Recent activities have been focused on implementing ACLs in a manner that better aligns with species vulnerability to fishing, and implementation of the "trawl rationalization" program in 2010 which reduced bycatch, increased accountability, and placed observers on all trawlers operating in PFMC jurisdiction.

In recent years several species have been declared rebuilt, including lingcod and widow rockfish. Stocks are nearing levels where they will be determined rebuilt, or are showing significant progress including darkblotched, bocaccio, petrale sole, and cowcod.

The third presenter, **Mr. Joe Sullivan**, posed the question, how can the management goal of attaining Optimum Yield be better attained while continuing to conserve stocks? He touched on the tools of harvest shares, including ITQs and harvest cooperatives. He indicated that these tools eliminate the race for fish, which leads to optimization of harvest and processing capacity. He described the history of the Pacific Whiting Conservation Cooperative (PWCC) and how, in 1997, the catcher-processors (C/P) in the PWCC established a private agreement to implement harvest shares in their fishery rather than asking the PFMC to develop an ITQ program for them. This model required that the participants in the Pacific whiting C/P sector collectively agree to certain activities and standards, in addition to sharing the resource to optimize their harvesting activities. The result was the first modern "harvesting cooperative" in the United States, and this model would go on to serve as the foundation for the American Fisheries Act cooperatives which rationalized the Bering Sea pollock industry, in addition to several other fisheries in the North Pacific and the west coast.

The collective nature of the harvesting cooperative allows for the development of sophisticated industry-driven initiatives. The bycatch of salmon in the Bering Sea pollock industry is one example where industry has voluntarily established a system of hotspot management which can respond quickly based on salmon bycatch patterns. The industry went further in establishing the Salmon Incentive Program, which is described as an incentive system that is now incorporated into the pollock cooperative agreement and provides a system of rewards and penalties for reducing salmon bycatch in the pollock fishery. In other words, through the harvest cooperative model, the pollock industry has been able to develop sophisticated tools for reducing salmon bycatch on their own (i.e. outside the Federal regulatory process) while continuing to extract the Optimum Yield of pollock from the Bering Sea.

Similar tools have developed in the Pacific coast IFQ program where the allowable catch levels of some species are very constraining to the harvest of more abundant target

species. These species are allocated at such low levels that A) target species catch levels are constrained, B) market transfers of quota are small and infrequent (if a fisher wants quota they may not find it on the market), and C) the incentive is ultimately to horde quota of these constraining species. As a result, several groups of fishermen along the west coast have established "risk pools" which are a type of harvesting cooperative that is structured around the concept of insurance. Participants in these risk pools contribute their quota to a pool with other risk pool participants and are required to adhere to certain operational provisions of the risk pool (e.g., area management, reporting standards). When constraining species quota is needed by a participant of the pool, that participant is allocated quota from the pool so long as he/she has abided by the terms of that risk pool.

These pools have moved beyond the challenges of harvesting and are now using the structure of the risk pool board to establish provisions for social and ecological objectives. These include community quota banks, privately funded research, and harvester-processor agreements.

It appears that the idea of co-management is more possible than ever given the ability of industry-led cooperative institutions to develop sophisticated tools for addressing a variety of challenges. Such arrangements allow the industry to respond rapidly to goals and objectives established by a Council and to do so without a substantial draw on agency or Council resources.

The fourth set of presentations came from **Mr. Michael Bell** and **Dr. Jodie Toft** of the Nature Conservancy (TNC). Michael and Jodie spoke of the Nature Conservancy's experience in working with groups of fishers along the west coast and in helping them form organization structures and "best practices" for attaining ecologically and economically viable outcomes. Michael indicated that, in his view, co-management is very helpful in organizing local groups of stakeholders and empowering them to take more ownership over management of fishery resources. Such local organizations seem to be better at bringing citizens into the process and bringing in new stakeholders.

The Nature Conservancy's efforts in the west coast groundfish fishery began during the 2005 Pacific Coast Groundfish Essential Fish Habitat Process. TNC's California chapter was aware that many fishers in the Central Coast of California region were looking to get out of groundfish fishing. TNC worked with these fishers to establish 3.8 million acres of conservation while simultaneously offering to purchase their fishing permits. In Michael's experience, the locally-derived proposal was an important factor in being able to come to agreement with the industry.

Subsequent to TNC's purchase of fishing permits, they sought to reactivate that fishing activity by switching those permits over from trawl gear toward longline and trap gear, and by managing that activity through a collective harvesting cooperative structure. They pursued this action through an Experimental Fishing Permit which allocated several tons of groundfish to the experimental fishery. The foundation of the Central Coast "risk pool" was established upon receipt of this Experimental Fishing Permit.

Upon passage and implementation of the Pacific Coast trawl rationalization program, fishers from the community of Morro Bay (with the help of TNC) organized themselves into a harvesting cooperative-like entity that was largely based upon their experience

with the Experimental Fishing Permit. Other fishers further up the coast (Half Moon Bay, Monterey, Fort Bragg) began to associate with the Morro Bay organization and they too formed local fishermen's cooperatives with assistance from TNC. These entities in turn agreed to share their "choke species" (constraining overfished species) in a risk pool. This risk pool establishes fishing practices, reporting protocols, and infrastructure for reporting and improving fishing practices. One piece of infrastructure, eCatch, is a software program that guides spatial fishing activity and helps inform area closures which might be contemplated by the risk pool members.

In addition to the risk pool function, the Morro Bay example has also led to the development of the "Morro Bay Community Quota Fund" which is designed to purchase and hold fishing assets for the benefit of Morro Bay. This fund, made up of fishers and community leaders from Morro Bay, acquire fishing quota and lease it to local fishers at rates that are generally below market rates.

Jodie discussed TNC's marine scientific research along the west coast that has been done in partnership with various commercial fishing groups from California and Washington. One study examined the habitat impacts of trawling. This study found some interesting results including: scour marks from trawl doors last at least one year in the area studied; they observed minimal topographic structure impacts from trawling in the area studied; they did not observe impacts to invertebrate densities in the areas trawled; and witnessed no changes in infaunal invertebrate composition.

Dr. Toft also discussed research being done in the RCA. One question that is being asked is in regards to the relationship between the RCA and the ITQ program and how the two contribute towards achieving conservation objectives. The research being done to answer this question includes work to examine and better measure species hotspots. It is hoped that this type of information can help to inform decision making processes.

Additional work that was discussed covered the topic of gear modifications and the establishment of a risk pool off the Washington coast. TNC in Washington has partnered with fishers out of Ilwaco, as well as UW faculty and students, to engage in collaborative research with a key project being the development of traps to fish lingcod while excluding/avoiding overfished rockfish in the area.

The last presentation of this session was from **Mr. David Sones** of the Makah tribe in Washington. David covered the history of tribal fishing activity and access, beginning with the cessation of land and half of fishing resources in the 1850s. He discussed the problems the treaty tribes historically had in accessing fish from oceans and streams and how this ultimately led to the "Boldt decision" which affirmed the treaty right of tribes to access half of the fisheries resources in the area. He further discussed the difficulty the treaty tribes have had in being recognized in legislative processes, but in the 1980s were given a seat on the PFMC.

David described the co-management role that the treaty tribes have with the state of Washington and with the Federal government and how they have had to come together with other entities to deal with some difficult resource issues, such as salmon management and the decline of Pacific groundfish stocks. He described the difficulties in managing for some of these issues, especially when habitat degradation and other non-fishing factors are driving stocks downward (i.e. salmon). Historically, the tribes

understood the connection man had with the natural environment and made decisions accordingly. He stressed that to have fishery resources for future generations that conservation must come first.

David predicted that the future of fisheries management is ecosystem-based fishery management. Considering fisheries in this context means that a holistic view that takes into account a wide body of scientific literature is necessary, and that we must continuously monitor the state of the environment. Other future issues that David covered included the need to consider transboundary issues, the need for the west coast treaty tribes to continue to be able to select their own representation on the PFMC, and that the MSA process is superior to the NEPA process in terms of public engagement.

Panel discussion: Mr. John Bundy (Glacier Fish Company) asked the TNC representatives whether fishing operations along the Central California coast that have partnered with TNC can be profitable on their own. In other words, it appears that many of the fishing operations in the area are subsidized by TNC and there is some question about whether the Nature Conservancy/California fisher model can stand on its own. Michael indicated that this question is still being addressed, but that fishers do see economic advantages. For instance, being a member of the risk pool allows fishers to fish confidently, and the members of California organizations have begun forming marketing arrangements to better market their product.

Mr. Eric Olsen (Yukon Delta Fisheries Development Association) asked about the west coast trawl ITQ program and how it appears that the fishers that originally had the lowest catch of overfished species in turn received some of the smallest allocations of those overfished species and whether there was a plan to remedy that situation. Don indicated that the initial allocations of overfished species were not based on a reward system (i.e. reward those with lower bycatch), but were instead designed to allocate those fishing privileges in a way that took need into account. In other words, fishers off the northern coast of Washington need more of a particular overfished species—such as yelloweye rockfish--than fishers off the central coast of California, where it is easier to avoid yelloweye rockfish because they are at a much lower level of abundance. The intention was to align allocations in a way that took regional differences into account.

Ms. Dorothy Lowman (fisheries consultant) asked a question regarding the concept of a risk pool and the idea that fishermen were unwilling to give up or sell their weak stock quota. It was asked whether members of a risk pool would be willing to sell their quota to fishers outside the risk pool. Joe described the risk pool process which includes regular meetings and an assessment of whether risk pool participants forecast their need for their overfished species quota. At some point in the year, if a risk pool decides that they might need less than their entire overfished species quota, they can elect to transfer that quota to other fishers outside the risk pool.

Ms. Lisa Pfeiffer (Northwest Fisheries Science Center) asked a question regarding risk pools and the RCA, and whether the terms of a risk pool are more restrictive on fishermen within those risk pools compared to fishermen outside the pools. Joe indicated his belief that the activities of a risk pool and the function of the RCA overlap quite a bit. A risk pool is in the position of improving what the RCA was set up to do, but to do some of it better. The research activities that the risk pools are engaged in might

end up showing that the fish taken outside of these closed areas have very little impact upon stocks that benefit from spatial measures such as the RCA.

Mr. John Henderschedt (Fisheries Sustainability and Leadership Forum) asked how a fishery management council could ensure that co-management entities and private arrangements (such as risk pools or harvest cooperatives) provide analysis that illustrates the benefits and drawbacks of such agreements. Joe indicated that the NPFMC has been doing a fine job in accomplishing this by: A) establishing standards, but B) having a heavy hammer behind it. The Council's role is to establish management goals and it should also establish reporting standards. These reporting standards facilitate a dialog between private industry and the Council. Without a formal rule-making process, the standards and reporting protocols allows for a dialog that leads to action on the part of the fishing industry. If the Council determines that a private arrangement of some kind is not achieving desired outcomes, the Council can always step in and mandate specific activities through a Council action and a NMFS implementing rule.

Ms. Margaret Spring (Monterey Aquarium) asked a question regarding the development and implementation of catch limits in Pacific groundfish and how that was going. She indicated that one of the purposes of the ACL requirement in the MSA was that it should lead to improvements in catch accounting, which in turn improves fishery management. She asked whether this was indeed transpiring. Don indicated that the PFMC has had a good number of assessments before and after 2007 and indicated that he has not detected a significant increase in the number of assessments before and after the implementation of the ACL provisions. Steve indicated that there is a requirement that overfished stocks be assessed in each cycle and that – because the PFMC had several overfished species – that this has dominated much of the assessment process. It is not clear that the ACL provisions have improved the number of stock assessments.

Dr. George Hunt (UW School of Aquatic and Fishery Sciences) referred to the management of "prohibited species" in the North Pacific and the philosophical discussion the SSC of that Council has about whether managing their catch through quota transfers is the best way of managing, or whether minimizing their catch is a better goal. The assumption is that managing catch through ITQs will lead to maximizing catch. Joe indicated that in no way was he intending his presentation to mean that tradeable quota of depleted species should mean maximizing their catch of those depleted species up to the quota (rather than minimizing their catch of these species regardless of the amount of quota). He indicated that a better question is to address the tension between attaining the Optimum Yield of target species while minimizing the catch of overfished and rebuilding species. The right answer is a balance of the two. He indicated that regardless of where the balance is struck that developing a quota market for many types of constraining species would be inappropriate (salmon management and the cultural value of that species for example). Don spoke to the example of the Pacific coast with halibut management. He indicated that initially there were fears that bycatch of halibut in the west coast trawl fishery would shut down the fishery. He indicated that this has not transpired, and that establishing quota of these constraining ("choke") species has incentivized catch reduction behavior that has resulted in catch of these stocks coming in much lower than the total amount of quota available. The idea that establishing quota for overfished

species will lead to catching as much as possible has not transpired for constraining stocks.

Session 4: Ecosystem-based approaches to management

The promise of more holistic ecosystem-approaches to fisheries management are not fully realized in most jurisdictions, although incremental progress in adopting ecosystem principles has been made. U.S. fisheries are generally among the top performing in terms of the extent to which principles of ecosystem based fisheries management are being applied. The goal of session four was to enlist a wide range of opinions from diverse stakeholders on how EBFM can be adopted more fully in the U.S.

Dave Fluharty presented results from an extensive exploration of the state of ecosystem-based science applied to U.S. fishery management, particularly focusing on the breadth and types of activities that NOAA fisheries have engaged in to foster EBFM decisions. He notes there is no strict legal mandate for EBFM, but the sustainable fisheries act does require the application of best available science. He concludes that NOAA's science enterprise is strong, particularly in natural science and oceanography. In contrast, social science for EBFM is more limited. At the level of fishery councils, demand and use of ecosystem-science is highly variable, which reflects in part differences in the main drivers of ecological and social systems among regions. He suggests that a prioritized needs assessment of ecosystem-based inputs into management will strengthen the application of EBFM.

Anne Hollowed illustrated advances made in the North Pacific to highlight the need to start thinking about forecasting long term changes due to climate change and human population density. The Alaska Fishery Science Center provides a considerable amount of technical background information regarding the state of the North Pacific ecosystems, the status and trends of key indicators, and are engaging in a variety of modeling exercises to provide advise that will contribute to improved management strategies. They are taking advantage of the fact that certain species seem to be more important in the ecosystem than others, so that detailed studies on the sensitivity of those "key" species to climate, fishing, and other drivers can be used to make inferences about ecosystem sensitivities. They are moving towards a longer term goal of switching from monitoring indicators to modeling projections, similar to what the U.S. weather service provides, to provide up-to-date short and long term forecasts that can be used directly in council management decisions.

Tony Smith showed the innovative ways that Australian fisheries have approached the problem of ecosystem-based management, by embedding it directly in their fisheries planning. One key distinction between the U.S. and Australian model is that the latter relies less on legal statutes that are prescriptive, which gives broad flexibility to develop and apply novel tools. Since the 2000's, the CSIRO (Commonwealth Scientific and Industrial Research Organisation) has invested in developing risk-based tools to characterize ecological risk from fishing activities, and therefore the degree of precaution that is needed. Specifically, a series of screening processes is used, designed to build in increasing levels of precaution at the more course screening levels. In some cases this leads to counter-intuitive outcomes. For instance, even though the northern Prawn fishery has high rates of bycatch, the risk analyses indicates that bycatch levels are very likely sustainable (do not push non-target species beyond biological limits).

Coupling risk assessment with management strategy evaluation, CSIRO is able to evaluate risk of different management approaches across a range of management objectives. He noted that fishery management does not exist in a social bubble, and that social movements can dictate fishery management decisions, even if those movements are contrary to scientific guidance.

Stephanie Madsen provided the perspective of the fishing industry. There is commonly confusion about the models, tools, and concepts used to guide EBFM management decisions. This confusion leads to a lack of trust and fear among the fishing industry. She stressed the need to communicate the science clearly. She also noted that the fishing industry – the captains on the water – often have the best sense about ecosystem changes that are occurring. She suggests improving engagement with this local knowledge will enhance the science used to guide fishing policy. Importantly, stakeholders support science based processes, but the process needs to be transparent and needs to engage with stakeholders.

Selina Heppell reviewed whether the MSA provides adequate protection for vulnerable species and habitats. She stated that waiting until species qualify for ESA listing before taking action is not only irresponsible management, but also inefficient management because once applied, ESA status greatly diminishes management flexibility. She noted that the national standards give broad provisions for habitat protection, bycatch reduction, and protection of forage fish upon which predators may rely. Although adding specific provisions to accommodate these concerns may make the Act overly broad and ineffective, she stated that there is a need for more guidance and resources for research and the development and implementation of management strategies to accommodate.

Tim Essington reviewed the types of activities that U.S. fisheries management are currently engaged in, and the elements of EBFM that are not at the forefront of current U.S. fisheries management. He concluded that proper trade-off analysis and cumulative impact assessment are rarely considered. He used the example of trade-off analysis generated by fishing forage fish, to suggest that one solution to making inroads is to distill the complexity of natural systems into simple and robust rules of thumb. For example, trade-offs between fishing forage fish and fishing their predators are relatively small (on average), when fishing forage fish at moderate rates, less than MSY levels. He also suggested that trade-offs likely depend on forage fish abundance, whereby greater protection is warranted to protect dependent predators when forage fish are scarce, but little or no protection may be needed when forage fish are abundant .

Closing Panel – Outlook for Policy, Regulatory, and Legislative Change

Panelists:

Merrick Burden - Merrick is the Executive Director of the Marine Conservation Alliance and President of the North Pacific Fisheries Research Foundation. Prior to taking his post at MCA, Merrick served as the Senior Fisheries Economist for the Environmental Defense Fund and as a Senior Analyst with the Pacific Fishery Management Council. Some of Merrick's recent work has focused on the consideration of risk and scientific uncertainty in the context of the National Standard 1 implementation guidelines, and deep sea coral conservation and management in the Bering Sea.

Rod Fujita - Rod is a Senior Scientist at the Environmental Defense Fund. He has worked in fisheries management for over 25 years, with a focus on the design and implementation of catch shares and marine protected areas, first in the U.S. and more recently internationally, with projects in Mexico, the Caribbean, the Coral Triangle, and the European Union. Rod also serves as a Visiting Fellow at Stanford University's Woods Institute for the Environment, where he conducts research on emerging marine conservation issues including data limited stock assessment, managing for ocean tipping points and resilience, the characterization and control of cumulative impacts, and the development of new asset classes and markets for ecosystem services.

Steve Joner – Steve has worked as a fishery biologist, manager and advisor for the Makah Tribe for more than 35 years. During that time he has managed tribal fisheries for salmon, halibut, groundfIsh and shellfish as well as recreational fisheries. He is active in the Pacific Fishery Management Council process and has been on a number of committees including the Trawl Individual Quota Committee. He currently serves on the Council's Groundfish Advisory Panel. He was active in negotiating the US - Canada hake/whiting treaty and serves on the US - Canada Whiting Joint Management Committee.

Dorothy Lowman - Dorothy is an appointed member of the Pacific Fishery Management Council representing the State of Oregon and currently serves as that council's chair. As a fisheries consultant Dorothy works with both industry and environmental organizations on fisheries management issues in both the Pacific and North Pacific regions. Prior to her appointment to the Pacific Council, Dorothy served on the Council's Trawl Individual Quota Committee as well as on the Secretary of Commerce's Marine Fisheries Advisory Committee. Earlier this year, Dorothy led a national workshop on the implementation of electronic monitoring of fisheries.

André Punt - André is Professor and Director at the University of Washington School of Aquatic and Fisheries Sciences. His work focuses on providing quantitative scientific advice for fisheries management, including methods for assessing fish and marine mammal populations, risk analysis methods, and management strategy evaluation.

John Stein - John is the Director of the NOAA Northwest Fisheries Science Center and is an affiliate professor at the University of Washington's School of Fisheries and Aquatic Sciences and in the Department of Environmental and Occupational Health Services. John oversees the work of more than 360 staff members at several facilities in Washington and Oregon. The Science Center's work informs the management of federal marine resources and protected species and leads the development of new approaches to ecosystem modeling and response to climate impacts such as ocean acidification.

Moderated by **John Henderschedt**

The closing panel focused on the outlook for policy, regulatory, and legislative change. Panelists were asked to consider how things that they heard, learned, and debated throughout the two days of the symposium resonate with their view of the future, not only as it relates to the reauthorization process that will continue to unfold over the

coming months, but looking further into the future and across the spectrum of management tools and authorities.

The summary of this panel discussion synthesizes the comments and observations of the six panelists on the following topics: ecosystem-based fisheries management; fisheries science; co-management; international engagement; and future leadership in fisheries science and management.

Several panelists expressed their strong belief that the MSA is a success. It was noted that the evolution of the MSA through reauthorization is a case study in successful adaptive management. The Act is implemented, its performance is monitored and evaluated, and that evaluation informs the next, hopefully improved, iteration. The adaptive nature of the MSA was addressed in the scientific context as well, and it was noted that we should always think of the MSA as a process rather than a point estimate. This adaptive approach requires investment not only in that process, but in the science that supports it as well.

The MSA has provided a context for successful management of US fisheries, and no other nation can lay similar claim to its achievement of ending overfishing. Like the Bevan Symposium itself, the MSA allows us to identify and study challenges, then find workable solutions, and the existence of the "council family" is a component of our process that supports cooperative and adaptive decision-making.

It was noted that we need to broaden our definition of fisheries management to include both capture and captive fisheries; the science of cultivating fish has made significant advancements, and we need to embrace every aspect of seafood productions and management.

The theme of EBFM was woven through much of the discussion. It was noted that while there is broad acceptance of the value and importance of adopting EBFM principles, this does not necessarily imply a need to manage to goals that differ from those to which we are presently managing. The role of MSA reauthorization in moving the implementation of EBFM forward was similarly questioned.

The challenge of managing mixed stocks in the context of EBFM was noted as well. Determining the relative vulnerability and resilience of single stocks to more aggressive fishing pressure is difficult, and managers have not demonstrated an ability to find that balance. Given the fact that ecosystem resilience relies on functional redundancy and complementarity, the use of catch shares, transferability, and co-management strategies may represent means by which fisheries can yield great value while limiting or reducing removals. A move away from managing for maximum sustainable yield toward a "pretty good yield" may improve ecosystem resilience without significant cost to the fishery.

Understanding the attributes and interrelationships of individual species in a mixed-stock context is only part of the challenge. There is also a need to understand the function of whole ecosystems. Since managers can control only fishing mortality, it is important to mitigate drivers that impact stock productivity. New markets that value a broad range of ecosystem services may provide a pathway to greater ecosystem productivity.

Ending overfishing as a means to stock rebuilding has been extremely successful, but there are other drivers representative of changes in ecosystem productivity that are independent of fishing mortality. The questions of how we respond to a changing climate and how we improve our knowledge of habitat are key.

Looking forward, it is important to find more pragmatic and scientifically appropriate means to prevent overfishing and manage for uncertainty. There is a tendency under our current guidelines to write policy as if science is perfect when we should, instead, interpret and respond to scientific implications in a more holistic manner.

It was noted that we should be careful to not over-invest in EBFM science and technology, and to consider the question of what we really need to understand. If we can count the fish, do we truly need to know what its dietary requirements are and what is its maturity schedule? Simple control rules and constant mortality strategies can yield good results, even in a complex ecosystem. This point was countered with the observation that while it is important to know how many fish there are, it is also essential to understand the genetic structure of stocks.

The value and importance of the "wall of science", a clear separation of science and policy, was noted. It is a source of integrity of the science and of the management decisions it informs. The important thing, however, is that it is possible, and essential, to communicate across that wall, so while policy-makers should not be questioning the science, science does not tell the policy-makers what to do, and there needs to be a science/policy feedback loop in order to implement EBFM.

The development of control rules that allow Science and Statistical committees to "read off the graph" and help councils understand how ecosystem signals translate into management decisions are an important next step in operationalizing EBFM. There is growing interest in using management strategy evaluation to find simple, straightforward management approaches despite, and perhaps because of, the complexity of the ecosystem.

While successful, the council process is not fast, and the National Environmental Policy Act drew criticism as one of the major causes of this dynamic. With an increasing likelihood that managers will need to respond quickly to climate-driven changes in the ecosystem, the panelists spoke to the value of co-management, an approach that has been used by the Makah tribe out of necessity for many years, as a strategy for more timely and effective response to management challenges. It was noted that rationalization, the creation of individual fishing privileges, cooperatives, and risk pools, creates an operating environment that is supportive of co-management.

Getting to a place where new co-management solutions are attainable more quickly may require a cultural shift in the council process from a "top-down" orientation to "bottom-up," and the development of a deeper trust in the process among stakeholders. We often look to fishers to adapt to new regulations and conditions, but councils have less incentive to think differently and to innovate new approaches to management.

The use of performance standards rather than prescriptive regulations is another important step in the advancement of co-management. Despite the value of moving co-management forward, panelists questioned the importance and necessity of attempting to do so through MSA reauthorization and noted the opportunity to address many challenges through modification of existing implementation guidelines.

International engagement and cooperation is critical to fisheries management success at home and abroad. Scientific collaborations offer mutually beneficial expansion of knowledge and capacity, and there is value and benefit in doing what we can to export the success of fisheries management in the US. While it is hard to imagine exporting the operational components of our system, one that requires huge institutional and scientific investment, to nations that have little or no catch data, no stock assessments, and no meaningful enforcement, there are high level principles and lessons learned – the importance of harvest limits, the value of harvest privileges, etc. – that can be exported and then adapted to be institutionally appropriate and culturally relevant.

In thinking about future leadership, the panel identified a number of ways in which traditional boundaries must, and will, be crossed. There is a need to train natural scientists to understand the policy implications of their work, and visa versa. Lines between the natural and social sciences can, and should be blurred in a manner that promotes better listening and greater trust among disciplines. Interdisciplinary approaches in which the scientist serves as interpreter in framing challenging questions will benefit the decision-making process as well.

By way of conclusion, and circling back to earlier comments regarding the application of EBFM and use of co-management approaches, it was noted that the MSA has traditionally focused on maximum sustainable and optimum yield – concepts that we understand and for which we are accustomed to managing. We are now moving into an age of greater complexity and uncertainty. Future leaders will understand and use management strategy evaluation and other scenario-based decision tools that we can understand and utilize in policy development. And if the implementation of those policies relies on the success of a stakeholder-driven process, then the communication of that science in a clear and transparent manner will be of the utmost importance.