

**TESTIMONY OF
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ASSISTANT ADMISTRATOR
NATIONAL MARINE FISHERIES SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
ON
NOAA’S FISHERY SCIENCE: IS THE LACK OF BASIC SCIENCE COSTING JOBS?
BEFORE THE
COMMITTEE ON NATURAL RESOURCES
SUBCOMMITTEE ON FISHERIES, WILDLIFE, OCEANS AND INSULAR AFFAIRS
U.S. HOUSE OF REPRESENTATIVES

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Chairman Fleming and members of the Subcommittee, thank you for the opportunity to testify before you today on the question, “NOAA’s Fishery Science: Is the Lack of Basic Science Costing Jobs?” My name is Eric Schwaab and I am the Assistant Administrator for Fisheries, within the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce. The National Marine Fisheries Service (NMFS) is dedicated to the stewardship of living marine resources through science-based conservation and management, and the promotion of healthy ecosystems. As a steward, NMFS conserves, protects, and manages living marine resources to ensure functioning marine ecosystems and recreational and economic opportunities for the American public.

NOAA’s fishery science adds value to our Nation’s fisheries and can lead to increased opportunities for businesses and the employment they generate. National Standard 2 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) mandates that all fisheries conservation and management measures must be based upon “the best scientific information available” (16 U.S.C. 1851(a)(2)). While there are challenges in securing data of sufficient accuracy, precision and timeliness so as to understand and respond maximally to changing conditions, on balance, science based management leads to improved productivity and sustainability of fisheries and fishery dependent businesses.

I will begin by describing the elements of fisheries science, focusing primarily on fish stock assessments, to explain current efforts. I will talk about the importance of the different types of data we use, how they contribute to stock assessments, and how stock assessments are used to advise fisheries managers. Fisheries science is a data-intensive endeavor, and NMFS and our management partners have always focused on getting the most data, and the highest priority, highest quality data, by fully utilizing the funding Congress has provided for us to do this vital work. This funding and the work it supports enable us to sustain and enhance our fisheries. Further, either reducing funding levels or retreating from the mandates of the Magnuson-Stevens

Act, as amended, will hurt our fisheries and reduce the economic benefits they provide to coastal communities.

I also note that NMFS has a broad and diverse science enterprise that supports not only fisheries management but also habitat and protected species programs. NMFS's science is necessary to implement the Magnuson-Stevens Act, Endangered Species Act, and Marine Mammal Protection Act. Sound science is needed to ensure that target fishery species, endangered species and marine mammals and their habitats are conserved. Scientific understanding and effective management decisions are essential to efforts to maintain or recover species to healthy and ecologically-sustainable levels. Through this understanding and management, fisheries will be sustainable, and activities like energy development and national security actions will proceed appropriately and consistent with relevant legislative mandates. Quality information will allow management to meet conservation objectives while also ensuring optimal levels of economic activity that can be sustainably supported by the resource.

Marine fisheries, such as salmon in the Pacific Northwest and cod in New England, have been vital to the prosperity and cultural identity of coastal communities in the United States for hundreds of years. As of 2009, our most recent complete estimate, U.S. commercial and saltwater recreational fisheries supported 1.4 million full and part-time jobs – including local jobs that cannot be outsourced – and generated \$166 billion in sales impacts.¹ Sustainability of our Nation's fisheries takes continual effort to monitor fisheries and update scientific information. With continued Congressional support, NMFS will continue to make substantial progress toward science-based, effectively managed, and economically viable commercial and recreational fisheries that will benefit coastal communities and the U.S. economy both today and for generations to come.

The elements and data requirements of fisheries science

Fishery science provides information needed to define and attain sustainable and valuable fisheries. Without high quality fishery science, we cannot be confident that the Nation is attaining optimum yield from its fisheries, or that we're preventing overfishing and harm to ecosystems and fishing communities. Attaining optimum yield requires an investment in information about fish stocks, their fisheries and their ecosystems. The United States has a clear legislative mandate to achieve sustainable fisheries, based on a strong regulatory structure in association with the Regional Fishery Management Councils. NMFS is committed to generating the best fishery science to implement this program. We are international leaders in fishery science, at the forefront of rebuilding overfished stocks and preventing overfishing, efforts that are beginning to pay off in many coastal communities. Today, we know more about our fish stocks than ever before, and it is vital that our science not regress, as this would inevitably lead to declines in our stocks and a loss in the economic and social values they provide.

NMFS collects the data required for stock assessments through both fishery-independent observations, such as surveys of fish abundance, and through fishery-dependent observations,

¹ National Marine Fisheries Service. 2011. Fisheries Economics of the United States, 2009, available at http://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2009.html.

such as data collected by fishery observers and vessel trip reports provided by fishermen. In FY 2011, this capability will be primarily supported through the Expand Annual Stock Assessments budget line which is funded at \$53.4 million. Other significant contributions to the total stock assessment effort include Survey and Monitoring, Fisheries Statistics, Fishery Information Networks, Observer Programs, and others. In addition, NMFS utilizes NOAA Office of Marine and Aviation Operation's Fishery Survey Vessels as a primary platform for many of its stock assessment data collection activities. As part of the FY 2012 President's Budget, NOAA is seeking to increase the Expand Annual Stock Assessment budget by \$15 million, while at least maintaining funding from other contributing budget lines. This funding will improve assessments for high priority stocks; update assessments for stocks more frequently; and, conduct fishery-independent surveys to enable assessment of more stocks, including data poor stocks, 3-5 years from now. This funding will help verify that overfishing is no longer occurring and allow optimum catch levels to be set to support the sustainability and economic viability of fish stocks.

The stock assessment process is generally considered to include both data collection and the analysis of that data by fishery scientists. Data for fishery science is based generally on three core components: *fishery catch* from fishery monitoring programs, *fish abundance* from fishery-independent surveys, and *fish biology*. By tracking these three components over time and incorporating these data into stock assessment models, scientists can estimate range and abundance of stocks, calculate maximum sustainable yield, determine whether overfishing has been occurring or whether the stock has declined into an overfished state, and can forecast a sustainable level of catch, which provides the foundation for setting annual catch limits in accordance with law. Because fish stocks and their fisheries are broadly distributed throughout state, national, and international zones, the monitoring programs needed to provide these data are geographically extensive. Finally, the amount and quality of data available are used to estimate degrees of uncertainty that can inform assessments and the level of risk associated with various management actions.

Fishery catch information strives to measure total catch. One component is obtained by monitoring commercial landings, largely in partnership with the states and the marine fishery commissions. This landed catch information is augmented by at-sea monitoring of bycatch and information on discards collected by fishery observer programs. For recreational fisheries, NMFS' Marine Recreational Information Program is applying new and improved methods to the difficult challenge of estimating total catch by the millions of recreational anglers nationwide. Rarely are fishery catch monitoring programs focused on single species or fisheries; instead they are generally designed to monitor multiple species and fisheries over large geographic areas.

NMFS has relied heavily on its partnerships with the states and the interstate marine fisheries commissions to conduct efficient and cost-effective monitoring of commercial landings and recreational catches. The federally-funded Fisheries Information Networks have provided a means through which NMFS has been able to work collaboratively with its partners to design and implement well-integrated data collection programs that meet the management needs of both state and federally-managed fisheries. Cooperative regional programs such as the Atlantic Coastal Cooperative Statistics Program, the Gulf Fisheries Information Network, the Pacific Fisheries Information Network, the Pacific Recreational Fisheries Information Network, the

Western Pacific Information Network, and the Alaska Fisheries Information Network have worked effectively to eliminate unnecessary overlaps, standardize data elements and collection methods, and improve the timeliness of data processing, statistical analysis, and dissemination of catch statistics to all partners. Much of the commercial landings and recreational catch data is actually collected, processed, and managed by state agency personnel in accordance with procedures developed in collaboration with NMFS. Continued funding of the Fisheries Information Networks will be crucial for maintaining our current capabilities for monitoring commercial and recreational catches. The House Appropriations Committee mark up of the FY 2012 Commerce, Justice, Science and Related Agencies Appropriation bill includes a 30 percent cut from the FY 2011 spend plan in funding for the Fisheries Information Networks, which would considerably reduce the effectiveness of these programs.

NMFS' National Fisheries Information System Program has provided a mechanism for cross-regional collaboration and sharing of ideas on how best to improve the timeliness, quality, and accessibility of commercial and recreational fishery catch information. The Fisheries Information System Program has been working to continue to develop electronic dealer reporting programs and electronic logbook reporting programs to provide more timely and accurate updates on commercial landings. The Fisheries Information System and the Fisheries Information Networks have also been working together to develop and implement information management architectures that will eventually allow comprehensive access to complete and up-to-date state and federal catch statistics within each region, as well as at the national level. Cooperative efforts are now also focused on improving quality management of catch data collection programs through enhanced reviews and evaluations of the current procedures for quality assurance and quality control. Improving the timeliness, accessibility, and quality of catch information is extremely important to facilitate the work of fishery managers in monitoring fishing performance.

Fisheries observers are trained biologists placed on board commercial fishing and processing vessels, as well as in some shoreside processing plants. They are the most reliable, unbiased source of data on the actual at-sea performance of commercial fisheries. They collect data on bycatch, enabling accurate estimation of total mortality, a key component of stock assessment modeling. In some fisheries, they provide data on catches. They also provide high-quality data on interactions with protected species. This information is important to ensure that protected species remain healthy and their interactions with fisheries are minimized so that harvest opportunities are affected as little as possible. In FY 2010, NMFS logged over 68,000 observer days in 45 fisheries.

Fish biology information is most diverse in its sources, with important information coming from NMFS monitoring programs, academic studies, cooperative research and other programs. The outcome of these activities is vital information on fish longevity, growth, reproduction, movement, and other factors needed to calibrate fish stock assessment models. The biological information we collect includes age data for many of our most important stocks. With the addition of fish age data, we are able to apply more complex and sophisticated stock-assessment models that provide better information on changes in fish abundance over time, more direct information on fish mortality rates caused by fishing, and more precise forecasts of future changes in fish abundance and potential annual catch limits.

Fish abundance information is best obtained from standardized, fishery-independent surveys covering the extensive range of the fish stocks. The average catch rate of fish typically is measured at hundreds of sampling locations over the range of a suite of fish stocks. These surveys are repeated, typically annually, to measure the change in catch rate over time, which is the cornerstone information of the fishery assessment models. When possible, NOAA vessels conduct these surveys to achieve the highest degree of standardization and to simultaneously collect the broadest range of associated habitat, ecosystem and environmental data. In some regions, the primary platforms for the surveys are chartered fishing vessels that may be partially funded through catch set-asides or other forms of cooperative research. Where fishery-independent surveys are not feasible, such as for open ocean tunas, or have not been funded, NOAA uses catch rates from the fishery as a proxy approach. Compared to fishery-independent surveys, this approach provides a lower level of confidence of standardization over time, because changes in commercial or recreational landings can be influenced by factors other than abundance, such as market forces or changes in regulations.

NMFS partners with states in conducting some of our surveys, particularly in coastal waters. The state vessels are generally smaller than the NOAA vessels, and can operate in shallower, nearshore and estuarine areas. This is particularly important for providing data on stocks that occur in these important habitats. For example, the Southeast Area Monitoring and Assessment Program, commonly known as SEAMAP, is a collaboration dating back to 1977 involving NMFS, the Gulf States Marine Fisheries Commission, and the states bordering the Gulf of Mexico. SEAMAP provides much of the fisheries-independent data used in Gulf of Mexico stock assessments, and is funded at \$5.1 million in FY 2011. These funds are transferred to the Commission and individual states via grants and cooperative agreements to conduct the surveys. There are numerous other surveys conducted by, or in partnership with, states that provide data to NMFS for stock assessments.

While sophisticated stock assessments provide information on what changes have occurred in fish abundance, they do not tell why these changes occurred. For this, NMFS seeks to augment our fish assessments with habitat studies, fishery oceanography, ecosystem investigations and other programs to explain why changes have occurred and improve forecasts of long-term and short-term fishery available yield and holistic ecosystem impacts.

It is important to note here that protected species surveys (marine mammals and threatened and endangered species) are also important, as a paucity of information on these species can lead to conservative assumptions regarding fishery interactions, which can lead to restrictions on fisheries.

Stock assessments, uncertainty buffers, and management advice

From 2005 to 2010, NMFS had the data and capacity to assess an average of 95 stocks each year. With this level of assessment activity, NMFS is not able to provide adequate assessments for all of the 500 plus stocks in U.S. Fishery Management Plans, but is able to provide regular assessments for the most important stocks. Assessment activity is distributed to address the most important needs to the extent possible. Some important stocks have been assessed every one to

two years, while several other stocks that had not been previously assessed were assessed for the first time during this six-year period. Of the 500 plus managed stocks, 230 have been identified as members of the Fish Stock Sustainability Index. These Fish Stock Sustainability Index stocks constitute over 90 percent of U.S. commercial landings. For the Fish Stock Sustainability Index stocks, NMFS has been able to increase the number with adequate assessments from 119 in 2005 to 132 in 2010. For the purpose of tracking performance, an assessment is considered to be adequate for five years after its most recent update. All of these 132 adequate assessments meet this criterion. The overall index score, which tracks our knowledge about the stocks, as well as progress in ending overfishing, ensuring stocks are not overfished, and rebuilding stocks has increased by 63 percent since 2000. That substantial increase shows that investment in both science and management results in sustainable fisheries.

Uncertainty is inherent in all fish stock assessments. Because fish abundance surveys and fishery monitoring programs have sampling error, fish stock assessment models are simplifications of all the complex processes occurring in nature. Neither ecosystem studies nor advanced technology surveys can eliminate this uncertainty completely. To address this uncertainty when setting fishery catch targets, fishery managers typically include a buffer between the overfishing limit and the target for allowable catch. The objective is to lower the probability that the overfishing limit will be exceeded, while not overly restricting fishing opportunities. The size of this buffer depends on the degree of uncertainty in the assessment result and the degree to which the Council's Fishery Management Plan seeks to avoid overfishing. For example, if the plan calls for no more than a 45 percent chance that overfishing would occur, then a stock with a highly uncertain assessment would have a larger buffer than would a stock with a more precise assessment. Investments in more and better assessment data reduce uncertainty, and thus reduce the size of the buffer without increasing the chance of overfishing. This in turn allows for greater fishing opportunities and improved economic benefits. Conversely, reduced investment in assessments will lead to either increased uncertainty and lower catch limits or greater risk of overfishing.

To ensure that we provide fishery managers with the best available science, NMFS includes extensive peer reviews as a component of our stock assessment processes. The peer review process provides fishery managers and constituents with confidence in the integrity of assessments and assurance that they represent the best available science. The Magnuson-Stevens Act clarifies that such peer reviews are a valuable part of the management process. The Regional Fishery Management Councils' Scientific and Statistical Committees use the peer reviewed stock assessment results as the basis for providing fishing level recommendations to their Fishery Management Councils. NMFS is working with the Regional Fishery Management Councils and their Science and Statistical Committees as each Council works to implement regionally relevant protocols for peer reviews and to expand the role of the Science and Statistical Committee in providing fishing level recommendations.

Provision and allocation of survey vessel time

The provision and allocation of survey vessel time for conducting our fish surveys is a particularly important issue. Surveys provided by NOAA survey vessels are the primary sources

of fisheries-independent data used to monitor stock abundance and are augmented by chartered commercial vessels for some surveys.

Eight fisheries survey vessels, including four new Dyson-class vessels, conduct the majority of these fishery-independent surveys. A ninth vessel, the *Miller Freeman*, was recently removed from service due to numerous mechanical failures and declining safety. These vessels conduct dozens of surveys each year; however, this number is in decline. NOAA's Office of Marine and Aviation Operations' (OMAO) base-funded days at sea for the overall NOAA fleet have declined from approximately 200 days per ship (average FY 2004 – FY 2006) to as few as 153 days per ship in FY 2010 (maximum operating tempo for NOAA vessels is 235 days at sea). In 2008, NOAA vessels conducted 56 surveys for fish assessments, protected species assessments, and supporting studies. Only 40 surveys were conducted in FY 2010, and 40 are planned to be conducted in FY 2011. Primary factors contributing to the reduction of capacity for the NOAA fleet include: changing composition of the fleet including new more sophisticated fisheries survey vessels with improved scientific capabilities; higher personnel costs associated with staffing, safety and regulatory requirements, and increased fuel and maintenance requirements, especially for aging vessels.

Since 2007, NMFS has provided programmatic funds, called "Program Funded Days" to the NOAA fleet, so that critical surveys could be sustained. Additional funds have been provided for charter commercial vessels to conduct surveys for which NOAA vessels were not available or not appropriate. In FY 2011, NMFS will spend over \$8 million on chartered surveys, using funds that otherwise would have been used to increase the pace and quality of stock assessments including investments in advanced technology. Some surveys have been shortened in length, limiting their effectiveness, and in other cases surveys have been cancelled altogether.

This decreased survey time ultimately results in stock assessments that include estimates with a higher uncertainty, which must be considered by fishery managers when establishing annual catch limits to avoid overfishing as required by the Magnuson-Stevens Act. This could lead to more conservative annual catch limits. In uncertain situations, lower catch levels decrease the possibility of overfishing, thereby increasing long-term economic opportunity from a sustainably managed resource. Even if a stock is stable, without sea time to collect enough updated data on stock abundance and distribution, stock assessments cannot verify this stability without high uncertainty. An increased utilization rate for the fleet will result in more frequent and/or extensive fishery surveys, leading to updated stock assessments and increased confidence in establishing annual catch limits. NOAA is currently identifying several options for increasing days at sea, because a robust NOAA fleet directly benefits our coastal communities and increases fishery-related jobs. To reiterate, the FY 2012 President's Request to the Expand Annual Stock Assessments budget, an increase of \$15 million, will support fishery-independent surveys to enable assessment of more stocks.

Cooperative research

Another valuable source of fisheries-independent data is cooperative research. The agency's cooperative research provides both targeted survey data and opportunities for hands-on, face-to-face interactions between fishermen and scientists from NMFS, other management agencies and

academia. Cooperative research is essential to leveraging the knowledge, tools, techniques, skills, and experiences that fishermen possess that would otherwise be unavailable to our scientists. It also fosters better understanding and increased acceptance of our science by these vital stakeholders. In FY 2011, Congress provided over \$16 million in funds for cooperative research, including: \$10.1 million to the National Cooperative Research Program and \$6 million for cooperative research activities from the National Catch Share Program.

Regional cooperative research priorities are established collaboratively among the NMFS Science Centers and Regional Offices, Regional Fishery Management Councils, interstate Commissions, state fishery management agencies, academia, and interstate stakeholders in accordance with the cooperative research priorities in Section 318 of the Magnuson-Stevens Act. The agency's cooperative research portfolio corresponds on a regional basis to the respective Regional Fishery Management Council multi-year research priority plans. These plans are Regional Fishery Management Council functions under Section 302(h)(7) of the Magnuson-Stevens Act, which requires the Regional Fishery Management Councils, in conjunction with their Science and Statistical Committees, to develop multi-year research priorities for fisheries, fisheries interactions, habitats, and other areas of research that are necessary for management purposes every five years.

Since NMFS's cooperative research program is designed to complement NMFS's base monitoring programs, most of the activities generate information that is not collected by agency assets. Improvements in the data available for management, including from cooperative research, allow for greater confidence in stock assessment estimates and less need to reduce allocations to protect against uncertainty.

Marine Recreational Information Program

NMFS is now implementing the new Marine Recreational Information Program, which has been designed based on the recommendations of the National Research Council's 2006 review of the Marine Recreational Fishing Statistical Survey. NMFS is developing and testing new survey methodologies to improve the accuracy, geographic resolution and timeliness of recreational fishing catch and effort data. These improvements are necessary to support successful management of fisheries with Annual Catch Limits and Accountability Measures. The President's FY 2012 budget request includes an increase of \$3 million to begin implementing improvements developed through the Marine Recreational Information Program.

NMFS currently develops recreational fishery catch estimates for the Gulf and Atlantic coasts via three ongoing surveys. The coastal household telephone survey generates information on angler trips. The access point angler intercept survey provides data on catch per trip. The results of these two surveys are combined to generate catch estimates for shore and private boat angling modes. The for-hire survey and the access point angler intercept survey are utilized to provide estimates for the for-hire (charter and head boat) mode. The Marine Recreational Information Program is developing revised methods that are being phased in over the next two years to substantially reduce sources of error and improve the accuracy of effort and catch estimates based on a combination of telephone, mail and access point surveys. Currently, the Marine Recreational Information Program is implementing a new design-unbiased method to

retrospectively estimate catch statistics from the Marine Recreational Fishing Statistical Survey for data from 2004 to the present. Next winter, the program will implement an improved sampling design for access point surveys that will further reduce the potential for error. These revised methods have been developed by a team of NMFS and independent survey experts and, as with all changes to our survey methods, have been subject to independent peer review. The same team, in collaboration with Pacific Recreational Fisheries Information Network and state natural resource agencies, has also reviewed survey methods in use in California, Oregon and Washington, and has recommended survey design improvements to address potential sources of error in those surveys. The states will be testing these recommendations with the Marine Recreational Information Program support over the next two years.

In addition, NMFS implemented the National Saltwater Angler Registry Program in 2010 and has developed new survey designs for estimating fishing effort that are based primarily on sampling from lists of registered anglers who fish from shore or private boats or from lists of registered for-hire boats and their operators. The new registry-based approach will replace the coastal household telephone survey and upgrade the for-hire survey. NMFS expects that implementation of the new fishing effort surveys will begin in 2011. These changes address the highest priority findings of the National Research Council's 2006 review of our current survey methods.

The potential for in-season management of recreational fisheries

Improving the timeliness of catch estimate delivery that could support active, in-season tracking and management of recreational catch is a significant challenge. The Marine Recreational Information Program will continue to use sample survey methods to estimate recreational catch for private boat and shore fisheries. Currently, preliminary estimates of catch for these surveys for the Atlantic and Gulf coast fisheries are available for 45 days following a two-month sampling period. In March 2011, NMFS conducted a workshop with key management partners and stakeholders to assess needs for more timely catch estimates and the tradeoffs associated with improving data timeliness. The key outcomes of the workshop are posted at: <http://www.countmyfish.noaa.gov/workshop/Data%20Timeliness%20Workshop%20Key%20Outcomes%20FINAL.pdf>. A final report and recommendations for improving timeliness of recreational catch estimate delivery, and for improving methods for forecasting in-season catches, will be completed by late summer. During the workshop, managers expressed a need to shorten sampling periods from two months to one month for at least some portions of the year on the Atlantic and Gulf coasts. The President's Budget Request for FY 2012 includes an increase of \$3.0 million for the Marine Recreational Information Program, of which \$2.0 million is targeted at shortening sampling intervals for the Atlantic and Gulf coasts to address this need.

The Marine Recreational Information Program is also developing electronic trip reporting methods for the for-hire fisheries. Electronic reporting, when mandated and strictly enforced and supplemented with independent validation, would enable near real-time tracking of the catch of the charter and headboat sector. Of the funding increase requested for FY 2012, \$1.0 million is targeted at implementing electronic for-hire trip reports in the Southeast and Northeast Regions.

Providing preliminary catch estimates to managers more frequently during fishing seasons, and improving models for projecting catch from such preliminary data, may enable managers to more confidently track or project recreational catch and consider in-season adjustments to prevent significant overharvest of catch limits, or to re-open fisheries that closed before annual catch limits were reached. In some cases, including fisheries with short open seasons or limited catch, such in-season capability will be difficult to achieve with sample survey methods, regardless of any efforts to shorten sample periods. In these cases, the Regional Fishery Management Councils may apply tools consistent with the National Standard 1 guidelines to prevent catch from exceeding catch limits, potentially triggering subsequent reductions in recreational sector catch limits. Such tools include setting catch targets at levels below the catch limits that are proportionate to the management uncertainty associated with the timing of the availability of catch estimates or setting multi-year catch limits with periodic adjustments to management measures in response to monitored catch over time. By improving the timeliness of our current estimates and applying the management tools available, NMFS and the Regional Fishery Management Councils can work together to maximize recreational opportunities while preventing overfishing.

Effect of 2007 amendments to the Magnuson-Stevens Act on domestic fisheries

The 2007 amendments to the Magnuson-Stevens Act have had a significant impact on fisheries management. A key element of these amendments is the requirement that the Regional Fishery Management Councils specify annual catch limits to prevent overfishing for all fisheries experiencing overfishing by 2010, and for all fisheries by 2011. NMFS has been working hard to acquire the necessary data, conduct the stock assessments, and work with the Regional Fishery Management Councils and their Scientific and Statistical Committees to specify and put in place the required annual catch limits. NMFS and the fishermen it serves have benefited considerably from the funding we have received from Congress to meet these challenging requirements.

NMFS strives to provide as up-to-date stock assessments as possible. Fish assessments and their forecasts of potential fishery yield are not unlike weather forecasting. In both cases, complex natural forces cause fluctuations, which require monitoring and periodic forecast updates to avoid getting “stale” and to remain highly relevant. Just as a two-week old weather forecast can still tell you whether it is winter or summer, an old stock assessment can still have the average conditions about right even as it loses track of subsequent fluctuations. However, old stock assessments do not capture recent trend information, such as whether the stock is on a rebuilding plan or is collapsing. The best interval between assessment updates depends upon many factors including the degree of natural fluctuations for that stock, the value of the fishery and intensity of fishing activity, whether the stock is on a rebuilding plan, is overfished or undergoing overfishing, and other factors. In 2012, NMFS will deploy a comprehensive stock assessment prioritization strategy to ensure agency resources and efforts are directed to those stocks whose assessments are most in need of updating, or which are the highest priority for a new assessment.

For the 40 stocks that were subject to overfishing in 2010, the average age of the assessment was 2.6 years. Further, of the 20 stocks that have been on the overfishing list since 2000, the average age of their assessments was approximately 3.5 years, versus 1.8 years average age for the other stocks on the list. Similarly, for the 48 stocks that were overfished in 2010, the average age of

the assessment was 2.0 years. Of the 13 stocks that have been on the overfished list since 2000, the average age of their assessments was also approximately 3.5 years, versus 1.4 years average age for the other stocks on the list.

However, it is clear that there are stocks for which NMFS does not have adequate assessments. NMFS fully intends to make more progress in assessing these stocks, especially those identified as high priority, and there is some potential for gains through greater efficiency in the assessment process. However, fishery science is a data-intensive and labor-intensive endeavor, and making substantial improvements will require additional resources for data acquisition and analysis. In addition, NMFS is striving to conduct more surveys using advanced sampling technologies that can achieve higher standardization and, in some cases, can directly measure fish abundance at each survey location, not just a standardized catch rate. With such information, NMFS will be able to provide more precise and accurate assessments sooner. At present, these technologies are still in the developmental phase. In the future, they will enable greater efficiency and increased accuracy and precision for our assessments, but these benefits will take some years to be realized.

Rather than resulting in unnecessarily reduced harvest levels, management under annual catch limits is in fact rebuilding stocks and leading to better and more sustainable harvests. For example, the 26 stocks and stock complexes in the Alaska groundfish fisheries have long been managed under annual catch limits. None of these stocks is overfished or subject to overfishing, and all are at abundance levels that support the long term optimum yield from the fishery.

NMFS is confident that, in the long run, these amendments will enable us to rebuild stocks, increase yields, and provide the economic benefits and employment that robust stocks can sustain. High quality fisheries science is vital for attaining these results. More timely and more precise estimates of abundance of targeted populations will enable better assessments, better management and ultimately better and, importantly, more sustainable profits to the fishing industry. Conversely, the loss of support for fisheries science and corresponding support for fishery management activities would have a very deleterious effect on the fisheries sector.

The Magnuson-Stevens Act calls for annual catch limits in all fisheries such that overfishing does not occur. This is a forward-looking, proactive approach to preventing overfishing and providing a clear indication of the target management level for the fishery. Various forms of catch quotas, which are basically annual catch limits, have been used successfully for decades in the implementation of some fishery management plans. With imprecise stock assessments and catch monitoring, we can never be completely certain that overfishing will not occur, even with annual catch limits. However, the probability that overfishing will occur can be calculated, which can inform socio-economic analyses of the trade-off between the confidence in preventing overfishing versus the amount of foregone short-term fishing opportunity needed to achieve this confidence. One of the greatest challenges is in the data-poor fisheries where assessments are not yet possible. Here, NMFS is working on alternative approaches that provide preliminary determination of catch levels that will prevent overfishing.

Concluding remarks

NMFS has made significant progress in improving the status of fish stocks. We recognize that robust data collection and stock assessments and responsive management programs are vital to rebuilding overfished stocks and strengthening economies. Of the 84 stocks determined to be overfished between 2000 and 2010, 36 stocks are no longer overfished. Of the 76 stocks determined to be subject to overfishing in the same time period, 36 stocks are no longer subject to overfishing. In addition, 23 stocks have been rebuilt over this same time period. For fisheries subject to overfishing, the Regional Fishery Management Councils and NMFS have taken final actions to end overfishing and put annual catch limits in place. The Regional Fishery Management Councils and NMFS are also on track to meet the 2011 deadline to have annual catch limits included in fishery management plans for all managed stocks. NOAA's FY 2012 budget request includes \$7.6 million for NMFS to support the establishment, monitoring, and compliance of annual catch limits, and \$5.6 million for the Regional Fishery Management Councils to set, evaluate, and revise annual catch limits and associated regulatory measures to end overfishing. One of the top priorities for use of the \$15 million requested increase to Expand Annual Stock Assessments in FY 2012 will be to update assessments for stocks listed as overfished or subject to overfishing to verify that overfishing has ended.

In the Pacific Northwest, lingcod was designated as overfished in 1999, with overfishing occurring for several years. A variety of restrictions ended lingcod overfishing in 2005, and the stock was rebuilt several years ahead of schedule. Atlantic sea scallops were once severely overfished, but with cooperation from scallop fishermen the stock was rebuilt in 2001 and is now the top-valued fishery in the United States. Compared to the 1990-1999 time period when scallops were overfished, New England scallop fishermen are now sustainably harvesting an additional 17.5 million metric tons per year and ex-vessel revenues have increased by \$93 million annually.²

NMFS has estimated that if all stocks were rebuilt and harvested at their maximum sustainable yield, this could increase ex-vessel value by as much as \$2.2 billion, which would generate \$31 billion in sales impacts and support 500,000 jobs across the broader economy. Sustaining the science to understand stock dynamics and document stock status is paramount to reaching these goals.

The July/August 2011 issue of *Sport Fishing* contains two "Bright Spots" articles touting the benefits of eleven different conservation efforts that enabled stocks to recover from periods of low abundance. These range from flounder to salmon to billfish; from the Pacific Northwest, to the Gulf of Mexico, to the Northeast.

Ending overfishing, rebuilding stocks and managing on a sustainable basis using sound science will have real benefits to the fishing and the communities that depend on fishing for employment.

Thank you again for the opportunity to discuss NMFS's fishery science. We are available to answer any questions you may have.

² National Marine Fisheries Service, Office of Science & Technology, Annual Commercial Landings Statistics, available at http://www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html.