

IMPROVEMENTS AND INNOVATIONS IN FISHERY MANAGEMENT AND DATA COLLECTION

HEARING

BEFORE THE

SUBCOMMITTEE ON OCEANS, ATMOSPHERE,
FISHERIES, AND COAST GUARD

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED FOURTEENTH CONGRESS

FIRST SESSION

MAY 20, 2015

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED FOURTEENTH CONGRESS

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WEDNESDAY, MAY 20, 2015

U.S. SENATE,
SUBCOMMITTEE ON OCEANS, ATMOSPHERE, FISHERIES,
AND COAST GUARD,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to notice, at 2:34 p.m. in room SR-253, Russell Senate Office Building, Hon. Marco Rubio, Chairman of the Subcommittee, presiding.

Present: Senators Rubio [presiding], Ayotte, Sullivan, Booker, Nelson, and Markey.

OPENING STATEMENT OF HON. MARCO RUBIO, U.S. SENATOR FROM FLORIDA

Senator RUBIO. I will call this hearing to order, and I want to thank everyone for being here. The Ranking Member, Senator Booker, is on his way. When he comes, if we are in the middle of our testimony, we will cut to his opening statement.

The issues we were just talking about a moment ago under the jurisdiction of the Subcommittee are of great importance, not just to my state of Florida, but quite frankly the entire country.

Both commercial and recreational fishermen contribute significantly to the national economy, employ millions of Americans, and provide subsistence for all 50 states and abroad.

It is because of the industry's importance that fisheries elicit robust emotions. This nation has a rich history of fishermen and the strong proudness that accompanies both commercial fishermen, charter fishermen, and recreational anglers alike.

I, myself, am a recreational fisherman. In fact, I was out there on Sunday. We did OK. I, like many others, enjoy my time on the water, and as a Floridian, my family and I have long enjoyed the seafood provided by our commercial fishing industry.

The need for timely and accurate fish stock assessments is a goal for everyone, but more so for those who base their livelihoods and their pastimes by what they are able to catch and when.

In Florida and along the Gulf, there is one fish that has garnered a lot of attention, and while this hearing is not about the Red Snapper, I would be remiss if I did not mention the importance of the species.

Americans travel from across the country to be able to fish Red Snapper, both in the Gulf of Mexico and in the South Atlantic, but unfortunately, this year, Federal Red Snapper season in the Gulf is only 10 days long. This represents absolutely no improvement over last year's season of 9 days.

The ability to fish Red Snapper in the Atlantic has not fared much better, with only 3 weekends open last season.

The economic benefits associated with both commercial and recreational fishing from my home state cannot be understated. I fully understand both interests, and that is why I am reintroducing the Florida Fisheries Improvement Act.

After spending most of the last Congress receiving stakeholder input, the ideas presented in this legislation are what I believe are needed to improve fishery management in the Gulf of Mexico and South Atlantic regions. I look forward to continuing to work on this important issue for Florida.

Like many of the stakeholders in the Gulf and South Atlantic, I was disappointed that we were not able to move this legislation forward in the last Congress, and I think we share that same goal in this new Congress, finding the best path forward that protects both the commercial and recreational fishing industries.

The legislation I will reintroduce today represents a delicate balance achieved only through cooperation by all stakeholders. However, movement forward on any issue related to fisheries requires both bipartisan and bicameral agreement.

Support by all stakeholders and both parties in both chambers will be required for any legislation regarding fisheries to move forward and be signed into law.

Yesterday's statement of administrative policy opposing the House NMFS reauthorization underscores the complexities of fishery management. However, there is one thing that all the stakeholders have consistently agreed with, and that is that sound fishery management can only be achieved with sound and timely data collection.

That is why I have chosen to have our first hearing to discuss the importance of data collection. In the age of advancements in technology, how can we better innovate for more accurate and comprehensive assessments is the question before. I believe those who rely on our oceans' bounty want a more precise assessment of our fisheries.

Today, we will hear from witnesses on advancements made to do exactly that. I am pleased to have Dr. Kathryn Sullivan with us today. She and her team play a huge role in our Nation's fisheries. I look forward to hearing more about NOAA's advancements.

Are you ready for your opening statement?

Senator BOOKER. Just about, sir.

Senator RUBIO. I was just wrapping up. Again, I want to thank you for being here, Dr. Sullivan, and others who will join us throughout this hearing on an issue of data that is so critical to management of our fisheries.

With that, I turn it over to the Ranking Member, Senator Booker.

**STATEMENT OF HON. CORY BOOKER,
U.S. SENATOR FROM NEW JERSEY**

Senator BOOKER. First of all, I apologize, Dr. Sullivan, for being late. However, I knew my Chairman and wing man on a lot of issues would cover for me a little bit. I am just grateful to be here, especially for this subject which I know is very important to both Senator Ayotte and Senator Rubio as we deal with our oceans.

I am happy about the subject matter as well, improvements and innovations in fishery management and data collection. I think it is important to shine a spotlight on some of the amazing work that is being done today, it is work that encourages me, from the development of electronic monitoring and electronic reporting systems, to the ongoing efforts to improve the quality and quantity of fishery data we collect and how to analyze it.

As I talk to many people involved in our multi-billion industries in New Jersey, both recreation and commercial, one of the biggest concerns often involves the access to reliable data.

I also have an issue that has been important to me for some time, which is the issue of bycatch, and I am excited that some of these methods in new data collection processes will allow us to limit that number.

Everybody knows that bycatch is the non-targeted fish and ocean wildlife that often results from our fishing industry that causes the death of millions of sea turtles, whales, dolphins, and other marine mammals. It harms our oceans, wastes important food resources, and damages the economic success of our fisheries. Due to the lack of data, the level of the problem even here is unknown.

New Jersey is home to at least two fisheries that should be in my opinion a model for the rest of the industry in regards to catch monitoring in general and the bycatch problem.

I am proud that the Atlantic Swordfish and Tuna Long Line Fishery, which has several active vessels in Barnegat and Cape May, New Jersey, is installing some impressive technology, electronic monitoring, especially.

These cameras and other related tools harness technology to monitor bycatch limits for Bluefin Tuna without the need for costly at sea observers. The Fisheries Service is funding this program for participating boats starting June 1.

I encourage the Service to extend this type of 21st Century monitoring solutions. I am glad we have an opportunity to talk about it today. I see the immediate benefit for the State of New Jersey.

I want to thank you, Chairman, again, and I look forward to hearing from our witnesses in general, and especially Dr. Sullivan.

Senator RUBIO. Thank you, Senator Booker. Dr. Sullivan has served as the Under Secretary of Commerce for Oceans and Atmosphere and NOAA's Administrator since March of 2014, having served as Acting Administrator since February 2013.

She previously served as Assistant Secretary of Commerce for Environmental Observation and Prediction, and Deputy Administrator. In 1993, she was appointed NOAA's Chief Scientist, where she oversaw numerous issues, including fisheries biology.

She also holds an impressive resume with NASA, and has the distinction of being the first American woman to walk in space.

Dr. Sullivan, thank you for being here, and we look forward to your testimony.

**STATEMENT OF DR. KATHRYN D. SULLIVAN,
UNDER SECRETARY OF COMMERCE FOR OCEANS
AND ATMOSPHERE AND ADMINISTRATOR,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,
U.S. DEPARTMENT OF COMMERCE**

Dr. SULLIVAN. Thank you, Mr. Chairman, Ranking Member Booker, Senator Ayotte. I appreciate the invitation to testify before you today about fisheries data and how we are innovating and improving our data collection methodologies.

As you said, the management of our fisheries is vital to the Nation's economy. Fisheries contribute \$199 billion per year to the U.S. economy and support 1.7 million jobs.

NOAA is an acknowledged international leader in fishery science and management. Our domestic fisheries are managed more sustainably today than ever before. At the end of 2014, of the 469 stocks and stock complexes NOAA manages, only 26 were on the overfishing list and just 37 on the overfished list. These are both all time low figures. We have also rebuilt 37 stocks since 2000.

These are numbers we should all be proud of. This success is made possible by the strong tools Congress has provided to manage fisheries, by the commitment of fishermen and other partners to the cause, and by the world class science that informs our decision-making.

However, we also recognize clearly that not every fishery has seen such success. That is why we strive relentlessly to improve the data and analysis our science enterprise uses to inform management.

Fishery science is a difficult, highly technical field that requires collaboration, continuous feedback, and constant innovation. There are three pillars required to produce quality science. We often refer to these as the "ABCs of stock assessment," abundance, biology, and catch.

Long term monitoring of fish abundance is an indispensable input to stock assessments. Standardized repetitive fishery independent surveys covering the extensive geographic range of a fish stock are the best way to track long-term trends.

The NOAA fleet conducts some of these surveys, but we also augment our effort with cooperative surveys performed by industry, academic, and state government partners. We also often use chartered commercial vessels and employ local fishermen who provide critical local knowledge of the regions' stocks and fisheries.

Data on fish biology are collected to learn about longevity, growth, reproduction, movement, and other factors. With age data, we are able to apply more complex and sophisticated stock assessment models that provide better information on changes in abundance over time, on mortality rates caused by fishing, and more precise forecasts of future changes in potential annual catch limits.

Finally, catch monitoring programs strive to measure the total amount of catch. We obtain landed catch information, largely in partnership with the states and the marine fisheries commissions

through a national network that continuously collects data and makes this available to stock assessment scientists and managers.

Recreational fisheries are, of course, also a significant component of the total catch, and NOAA has made a substantial effort to monitor those fisheries and incorporate these data into stock assessments.

As noted earlier, we are constantly working to improve our methods for collecting these data. One area of particular focus is indeed new technologies. For instance, we are making progress in assessing and implementing electronic technologies that can result in greater efficiency and reduce the burden and costs to fishermen, while still providing the catch data needed for sound management.

We are assessing vessel monitoring systems, electronic log books, and video cameras as data collection methods. Such technologies have the potential to increase the quantity of data to lower costs, to reduce the time for data entry, to improve the quality of data analysis, and again, to lower the time and money burdens that recordkeeping and reporting place on fishermen.

We are also working to develop new and innovative approaches to surveying fish stock abundance in hard to survey areas. For example, we are funding a multi-year research project with an academic partner to explore the use of towed camera arrays for surveying reef fishes in both the Gulf of Mexico and the Pacific Islands. If proven effective, this approach could dramatically increase the effectiveness and efficiency of our reef fish surveys.

Another example is NMFS scientists are engaged with academic partners to improve methods for surveying Atlantic sea scallops. The system is being evaluated, including one from Woods Hole and another from University of Massachusetts, both camera systems in that case.

These are just a few of the many steps we are taking to explore new and innovative ways to collect the information needed to inform successful management of our nation's fisheries. This is an effort that requires intense scientific rigor and continued investment. It also must be a collaborative effort between the Federal and state governments, industry, academia, and our other partners.

The quality of our scientific advice has been a major reason why the United States has become a world model of responsible fisheries management. This is not to say that we cannot continue to improve the scientific guidance we provide. We will indeed continue to invest significant energy and resources, and to work with our partners to improve both our data quality and our collection methods.

Thank you again, Senator, for the opportunity to testify today. I appreciate the Committee's interest in exploring innovative approaches to data collection, and I look forward to continuing to work with all of you to further improve the vitality of our Nation's fisheries.

[The prepared statement of Dr. Sullivan follows:]

PREPARED STATEMENT OF DR. KATHRYN D. SULLIVAN, UNDER SECRETARY OF
COMMERCE FOR OCEANS AND ATMOSPHERE AND ADMINISTRATOR, NATIONAL
OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE

Good afternoon, Chairman Rubio, Ranking Member Booker, and Members of the Subcommittee. Thank you for the opportunity to testify before you today on improvements and innovation in fisheries data collection. My name is Dr. Kathryn Sullivan, and I am the Under Secretary of Commerce for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration (NOAA). NOAA is dedicated to the stewardship of living marine resources through science-based conservation and management, and the promotion of healthy ecosystems. As a steward, NOAA conserves, protects, and manages living marine resources to ensure functioning marine ecosystems and recreational and economic opportunities for the American public.

NOAA is an acknowledged international leader in fishery science, rebuilding overfished stocks, and preventing overfishing. Our domestic fisheries are more sustainably managed than ever before, and this is directly because of the world class science that informs our decision-making. Our recent report to congress on the Status of U.S. Fisheries outlines our progress showing that overfished stocks and overfishing are at all-time lows. 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.

Our progress in making fisheries management more effective is based on the principle that management is based on sound science. 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 we face challenges to securing accurate, precise, and timely data for stock assessments, on balance, our science-based management has consistently proven to provide better resource management than without this advice. This has, in turn, led to improved productivity and sustainability of fisheries and fishery-dependent businesses. In some fisheries, particularly the Northeast, the science has indicated the need to rebuild stocks but uncertainty in the science has confounded finding exactly the level of fishery restrictions needed to accomplish that rebuilding. In other fisheries, particularly in the Southeast, the large numbers of stocks exceed our current capacity to deploy surveys and conduct assessments of the status of these stocks. The quality and extent of our stock assessment enterprise has room for growth.

Sustainability of our Nation's fisheries is based on continual monitoring of fish catch and fish stock abundance. Because this data-intensive endeavor is costly, NOAA and our partners have always focused on getting the most of the highest-priority and highest-quality data by fully using the funding Congress has provided for this vital work. This funding and the work it supports enables us to sustain and enhance our fisheries. NOAA continues to make substantial progress toward improving the quality of the science available to effectively manage commercial and recreational fisheries, benefiting coastal communities and the United States (U.S.) economy both today and for generations to come. We greatly appreciate the increased funding that Congress has provided to make U.S. fishery management, and its preeminence worldwide, possible.

Today, I will discuss how our fisheries science is conducted and how this science underpins and provides for good management. In particular, I will focus on methods we use to collect the data, what types of data are collected, how these data are used in fishery management, and the importance of our partners in our collection of data. I will also describe some of the recent advances we have made in our science.

How fishery surveys are conducted—including through the use of Federal vessels, charter vessels, or through other cooperative arrangements

Long-term monitoring of fish abundance provides an indicator of the abundance of stocks over time, and as such are invaluable inputs to stock assessments. Abundance data tell us the number or weight of a particular stock of fish in the ocean. Information on fish abundance is best obtained from standardized, fishery-independent surveys covering the extensive geographic range of the fish stocks. The average catch rate of fish typically is measured using standardized methods at hundreds of sampling locations over the range of a suite of fish stocks. A diversity of conventional survey methods is employed, including bottom, mid-water, and surface trawls; longlines; gillnets; and traps, as appropriate for the particular target, habitat, and region. In addition, our surveys incorporate state-of-art technology, including various sonars and optical systems to survey reef fish in the Southeast and Atlantic sea scallops in the Northeast. 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. In some cases, fishery-dependent data from fishermen's logbooks can be statistically processed to provide additional indicators of trends in fish abundance.

NOAA surveys in support of fish stock assessments are conducted in every region. In this Fiscal Year, 48 directed fish surveys and 19 supporting surveys will be conducted in support of fish stock assessments. These surveys are conducted on NOAA fishery survey vessels and on NOAA-owned small boats, as well as on chartered commercial fishing vessels, state-owned boats, and UNOLS (university-owned) ships.

NOAA fishery survey vessels are a key source of fisheries-independent data. Seven ships in the NOAA fleet conduct many of the cruises to survey fish abundance. The fleet includes four new Dyson-class vessels with state-of-the-art technological capabilities, with a fifth vessel in this class becoming available in 2015. The timing of these cruises, survey designs, and sampling methodologies are adapted to the specific region and stocks.

We augment NOAA vessel surveys with cooperative surveys involving industry, academic, and state government partners. These surveys commonly use chartered commercial vessels and employ local fishermen, who provide critical local knowledge of the region's stocks and fisheries. The surveys conducted using chartered vessels provide important data streams from regions and time periods when NOAA ships are not available. For example, since the 1970s, the National Marine Fisheries Service (NMFS) line office of NOAA has conducted its primary groundfish surveys in the Bering Sea, Gulf of Alaska, and the Pacific coast by chartering local fishing vessels of suitable characteristics to work with NMFS scientists on board, using standardized sampling gear and strict statistical protocols to collect the data to support some of our most valuable fisheries. In the Northeast, NMFS charters a commercial vessel from the region for the annual surf clam and quahog survey. In some surveys, the chartered fishing vessels may be partially funded through research set-asides or other forms of cooperative research. These collaborative surveys provide valuable data and enhance communication between assessment scientists and fishermen. Other surveys are conducted on commercial fishing vessels with universities (*e.g.*, the NEAMAP or Northeast Area Marine Assessment Program with the Virginia Institute of Marine Science), and state agencies (*e.g.*, the Maine-New Hampshire Surveys Inshore Groundfish Trawl Survey with the Maine Department of Marine Resources and New Hampshire Fish and Game Department).

NOAA also charters state vessels for some surveys. State vessels are generally smaller than the NOAA vessels, and can operate in shallower near-shore and estuarine areas. This is particularly important for providing data on stocks that occur in these habitats. For example, the Southeast Area Monitoring and Assessment Program (SEAMAP), is a collaboration dating back to 1977 involving NMFS, the Gulf States Marine Fisheries Commission, and the states bordering the Gulf of Mexico. Through funds transferred to the Commission and individual states via grants and cooperative agreements to conduct the surveys, SEAMAP provides much of the fisheries-independent data used in Gulf of Mexico stock assessments.

How landings and other harvest-related data are gathered and used

The catch monitoring programs strive to measure total catch, or the amount of fish removed through fishing. 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. One component—landed catch information—is obtained by monitoring commercial landings, largely in partnership with the states and the marine fisheries commissions. In some Alaskan fisheries, where the catch is processed at sea, fishery observers provide catch data. Observers also conduct at-sea monitoring of bycatch and collect information on discards in numerous fisheries in all regions.

NMFS has a strong partnership 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-managed 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.

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 Program and the Fisheries Information Networks have also been working together to develop and implement information management architectures that will enable comprehensive access to commercial and recreational landings data 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 the success of implemented fishery management regulations.

Fisheries observers are trained biologists placed on board commercial fishing and processing vessels, and catch monitors/observers also collect data at some shoreside processing plants. They are a reliable and unbiased source of data on the actual at-sea performance of commercial fisheries. They collect data on bycatch, enabling accurate estimations 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 stocks remain healthy and their interactions with fisheries are minimized, so that harvest opportunities are affected as little as possible. In FY 2013, NMFS logged nearly 81,000 observer days in 48 fisheries and employed 917 contracted observers. The observer programs were supported by a combination of government funds and industry funds.

Recreational fisheries are a significant, and sometimes the dominant, component of the total catch, particularly in the Gulf of Mexico and South Atlantic regions. NMFS has made a substantial effort to monitor those fisheries and incorporate data from recreational fisheries into fish stock assessments, and is applying new and improved methods for estimating total catch by the millions of recreational saltwater anglers nationwide. These new methods are being used to collect data as part of NMFS' Marine Recreational Information Program.

Types of biological data collected and how the data are used for management purposes

Data on fish biology are collected to learn about fish longevity, growth, reproduction, movement, and other factors. 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. This provides important information about fluctuations in productivity and recruitment of new fish into the stock.

The sources of fish biology information are diverse, with important information coming from NMFS monitoring programs, academic studies, cooperative research, and other programs. Some important sources are fisheries-dependent, which provide key demographic information about the fish that are removed from the populations by fishing. For example, fisheries observers and dockside monitors take observations (e.g., length, weight, sex, and maturity) and collect otoliths (ear bones) from fish. The otoliths and their growth rings (similar to the annual growth rings in trees) are analyzed in on-shore laboratories. This suite of information provides important data for stock assessment models, and is vital for tracking changes in stock dynamics. Biological data are also collected on NMFS fishery-independent surveys where it can be matched to environmental data collected on those surveys. Other sources of data on fish biology include cooperative research and academic studies. Waiting to get these age data is one of the factors that adds time between conducting a survey and updating the assessment using the whole, longer time series of catch, abundance, and biological data.

How stock assessments are conducted

All of the data discussed here provide the inputs for stock assessments. Passage of the Magnuson-Stevens Fishery Reauthorization Act in 2006 resulted in the need for more timely stock assessments to ensure overfishing has ended, to set Annual Catch Limits that prevent overfishing, and to track progress toward rebuilding overfished stocks.

NMFS manages over 450 stocks, 199 of which have been identified for inclusion in the Fish Stock Sustainability Index (FSSI). These Fish Stock Sustainability Index stocks include those of high economic value, high profile, and/or significant social value (*e.g.*, recreationally important). NOAA Fisheries conducts approximately 185 stock assessments each year, including annual and biennial updates for important stocks and periodic or first time assessments for other stocks. Approximately 80 assessments are conducted on Fish Stock Sustainability Index stocks annually. For the purpose of tracking performance, an assessment is considered to be adequate if it meets a specified level of rigor and if it is no more than 5 years old. Stocks without quantitative assessments have Annual Catch Limits set through alternative methods (*e.g.*, averages of recent catches). The overall Fish Stock Sustainability Index score—which tracks our knowledge about the stocks and our progress in ending overfishing and rebuilding overfished stocks—has increased by 96 percent since 2000. That substantial increase shows that investment in both science and management improves the sustainability of fisheries.

Assessment Process—Typically a major “benchmark” stock assessment involves two sets of workshops culminating in a peer-reviewed assessment. These workshops are open to the public, and constituents are encouraged to participate. The first workshop typically focuses on data—specifically the catch, abundance, and biology data used to calibrate the assessment models. Agency and university researchers, fisheries management council representatives, and partners get together to summarize and evaluate data sources, collection methods, reliability, approaches to data processing, and applicability of data for population modeling. Through a collaborative process, the workshop participants develop recommendations on which data inputs to include in assessments. Participation by fishermen is extraordinarily important, because their fishing practices and on-the-water observations of fish behavior help scientists correctly interpret factors such as patterns in fishery catch and effort.

The second workshop is held to calibrate the mathematical computer model, which analyzes input data to estimate changes in the stock over time, as well as the influence of fishery harvests on the stock. NOAA has several standardized models available that it maintains. These models use sophisticated statistical approaches for dealing with data gaps and uncertainties, blending available data, and forecasting results with appropriate confidence intervals. Conceptually, this is similar to NOAA’s National Weather Service dynamic models, which use multiple observations to calibrate complex atmospheric models that predict the weather. Even though fish stock assessments operate on much longer time scales than weather models—months and years rather than hours and days—they similarly combine and incorporate many different complex observations into a holistic picture of the situation. NOAA scientists run assessment models with inputted abundance, biological, and catch data, which gives us the information to develop a stock assessment report that forms the basis for a catch limit.

Independent external scientists review the stock assessment report and evaluate the quality of the assessment. They may conclude that the science is sound, recommend changes to improve the stock assessment, or, in some cases, reject some or all of the attempted analyses in the assessment. The peer-review process provides fishery managers and constituents with confidence in the integrity of assessments and assurance that they represent the best scientific information available. The Magnuson-Stevens Act affirms 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 respective Councils. NMFS is collaborating with the Councils and their Scientific and Statistical Committees as each Council works to implement regionally relevant protocols for peer reviews and to strengthen the role of Scientific and Statistical Committees in providing fishing level recommendations.

Stock Assessment Quality—In addition to the peer review of assessments, NMFS is working to improve the quality of the data and analyses used in stock assessments. This is vital for maintaining and enhancing the accuracy and precision of our stock assessments and the credibility of the management actions that depend on them.

The Agency complies with the requirements of the Information Quality Act, including OMB's guidance on transparency and balanced review of the influential science that is conducted. The Agency has also updated its Magnuson-Stevens Act National Standard 2 Guidelines, which provide guidance on the scientific integrity of information used for the conservation and management of living marine resources.^{1 2}

NMFS has also embarked on a systematic process of science program reviews to identify strengths, weaknesses, and opportunities for improvement. These reviews will be repeated on a five-year cycle. The process began in FY 2012, with every NMFS Science Center and the Office of Science and Technology conducting a comprehensive strategic review of their programs. Now in our fourth year of reviews, the Agency has successfully completed reviews of the data collection and fish stock assessment programs in the Science Centers and the Office of Science and Technology. NMFS is now conducting reviews of its protected species science programs in FY2015.

How Federal fishery surveys and assessments are prioritized

Surveys are prioritized and scheduled to ensure data are available on a timely basis to support scheduled assessments. However, most surveys are repeated either annually or biennially to ensure a time-series is available for stock assessments. A short time series is difficult to use in assessment models unless the survey is capable of providing estimates of absolute abundance, rather than relative changes in abundance which is most common. Note also that most surveys collect data on multiple species. For example, bottom trawl surveys in the Northeast simultaneously collect data on all 20 stocks in the Multispecies Groundfish assemblage, as well as numerous other species. Even highly specialized surveys provide information on stocks other than the target stock. For example, the annual scallop dredge surveys are used to provide abundance data needed for scallop stock assessments, and they also provide data on yellowtail flounder that is used in the latter's assessment.

Stock assessments are prioritized and scheduled regionally through discussions between the Councils and NMFS Regional Office and Science Center staffs. Priorities are established by evaluating the commercial importance of a stock, the age and quality of the existing stock assessment, and biological characteristics of the stock. Schedules are usually set annually on a three-year rolling basis, and are posted online.³ NMFS is in the process of implementing a prioritization scheme nationally, which will provide a transparent, need-based approach to assessment prioritization. NMFS released a draft in 2014, and expects this system to go operational during FY16.

The amount and quality of data has a direct effect on the accuracy and precision of the stock assessment result. For example, an economic study in Alaska showed that maintaining annual frequency of surveys, rather than slowing to biennial surveys, allowed for rapid detection of increases in stock abundance and tens of millions of dollars in added value of the catch. As the Agency moves towards implementing the new fish stock assessment prioritization protocol, NOAA Fisheries will be able to improve assessments for fishery management.

How socio-economic data are collected and used

NMFS' socio-economic data collection program directly supports Agency efforts to identify management options that achieve conservation objectives while minimizing impacts to fishery participants. These efforts result in a management strategy that is consistent with the long-term sustainability of the resource as well as the fishery and fishing communities. Underpinning this capability are the economic and sociocultural data collection programs and surveys that provide the information base for meeting statutory mandates for cost-benefit analysis and social impact assessments of regulatory actions (e.g., fishing ground closures, gear prohibitions, effort reductions, catch quotas, etc.). On the commercial side, economic questions are added to logbook programs, observer programs, and permit programs to provide cost-effective survey vehicles in a number of fisheries. This information is used to help estimate the economic value of those fisheries. In other commercial fisheries, NMFS relies upon one-time surveys that are updated periodically but, ideally, within three to five years depending upon survey type. In terms of recreational fisheries, NMFS routinely collects expenditure data from saltwater anglers every five years and conducts occasional surveys of for-hire operations, as well as other angler sur-

¹As published in the *Federal Register* Vol 78, No 139 on July 19, 2013

²Further information on the National Standard 2 is available at https://www.st.nmfs.noaa.gov/science-quality-assurance/national-standards/ns2_revisions

³See <http://sedarweb.org/> for an example in the southeast region.

veys deemed essential for assessing the economic effects of regulations on this group of stakeholders.

In addition to supporting the required management assessments for implementing stewardship regulations, the socio-economic data are increasingly used to support integrated analyses. For example, BLAST (Bioeconomic Length-structured Angler Simulation Tool) is a fully integrated and dynamic decision support tool for assessing the benefits associated with recreational fishing management options, including changes in bag limits, season length, and rebuilding plans. A key feature of the model is that it integrates recreational fishing behavior with age-structured stock assessment models, enabling NMFS to realistically project future economic and biological conditions. This ecosystem approach to fisheries management provides insight into the short- and long-run effects of alternative fisheries policy on both the economic and biological health of important recreational fisheries.

Socio-economic analyses are then used to evaluate the societal impacts of management options, which enables fishing regulations to be developed that meet requirements to sustain fish stocks while minimizing impacts to employment and economic benefits. The Agency is also working to develop improved methods for balancing the prevention of overfishing while providing for fishing opportunities.

Has the new recreational statistics data program been fully developed and implemented, and does the program meet the goals envisioned by Congress?

Under the Marine Recreational Information Program, revised methods were developed that are being incorporated 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. An improved estimation method was developed and implemented in 2012 to provide more accurate 2004–2011 recreational catch statistics for the Atlantic coast and Gulf of Mexico. In addition, a new sampling design for the Atlantic and Gulf on-site surveys of angler catch was implemented in 2013. These revised recreational data sets have already been incorporated into stock assessments.

The Marine Recreational Information Program has also been working with Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and our state partners—including Florida, North Carolina, New York, Massachusetts, and Louisiana—to develop and test new methods that use angler registries to survey anglers for production of trip estimates. Following completion of major pilot efforts in calendar years 2012 and 2013, a new, more targeted mail-based Fishing Effort Survey design that will replace the coastal household telephone survey has been implemented as a benchmarking effort alongside the telephone survey. The new mail survey was initiated in early March 2015, and will provide estimates of shore and private boat recreational fishing trips for the Atlantic and Gulf coasts. A transition plan has been developed that outlines the most appropriate way to shift to the new mail survey in a way that ensures the sustainability of our living marine resources while minimizing impacts on management and assessment activities. The transition plan lays out a detailed 3-year approach that outlines the necessary steps and activities needed to align the trip estimates produced with the new mail survey with the legacy estimates from the telephone survey in a common currency. This alignment, or calibration, will ensure a smooth transition to the new survey method, while taking the necessary time and effort to properly incorporate new estimates into the science and management processes. During the transition period, fishery management agencies will continue to use effort and catch estimates based on the current phone survey data as the best available science to effectively manage the health of fish stocks and marine ecosystems.

The Marine Recreational Information Program and our partners are also developing and testing a number of other possible improvements to the current suite of surveys, including:

- Implementing electronic reporting and conducting pilot projects to improve sampling for validation in the Southeast Headboat Survey.
- Pilot testing of electronic logbook reporting with dockside validation for the Alaska, North Carolina, and South Carolina Charterboat fisheries.
- Completing pilot projects to test improved survey designs that reduce sources of potential error and improve survey coverage in Washington, Oregon, and California, and Atlantic highly migratory species, and working to implement the survey design improvements based on the pilot results.
- Development and testing of new survey methods and improved designs that will enhance data collection and catch statistics in Hawaii, Puerto Rico, and the Virgin Islands.

- Working with the States and the Councils in the Southeast to develop and test supplemental survey designs that will provide more precise and timely estimates of catch for rare event and pulse fisheries such as Gulf red snapper and South Atlantic snapper-grouper complex species.
- Working with the fishery information networks in 2015 and 2016 to develop Regional Implementation Plans that will identify regional partners' preferred survey designs and priorities for investment in additional sampling to improve precision, timeliness, and coverage and supplemental specialized fishery needs.

Recently, NOAA announced that the Agency is committed to working with the National Research Council to conduct an independent review of the Marine Recreational Information Program. The new assessment will provide an objective, independent analysis of our work in responding to the recommendations from the National Research Council's 2006 Review of Recreational Fisheries Survey Methods, which were incorporated into Federal law as part of the Magnuson-Stevens Reauthorization Act. It will also detail our progress in meeting our commitments to Congress and the recreational fishing community to address these issues through a process that is scientifically sound, statistically robust, collaborative and transparent. We expect the National Research Council review to commence in late 2015 and to take approximately a year to complete.

How can new technologies help fishery managers achieve better and more timely information for management purposes?

NMFS is continually striving to improve and augment its processes, methods, and programs for commercial fishery data collection and analysis. We recently completed Electronic Technology Implementation Plans for all regions which identify where technologies can best support fisheries management in each region. For FY 2016, the President's Budget Request includes an additional \$7 million for Electronic Monitoring and Reporting. We are making progress in assessing and implementing electronic technologies that can result in greater efficiency and reduce fishermen's burden and costs—while still providing the fishery data we need to manage. Progress has been slow due to limited funds—this request will speed work in partnership with industry towards these shared goals.

While electronic monitoring will not replace observers, it is possible that electronic monitoring can provide more flexibility for some fishermen where use of this technology makes sense (*e.g.*, relatively low bycatch/single species fisheries). We are assessing all options, including vessel monitoring systems, electronic logbooks, and video cameras. Electronic technologies have the potential to increase the quantity of data; lower costs and reduce the time for data entry; improve the quality of data analysis; and lower the economic and time burden on fishermen for compliance with recordkeeping and reporting regulations.

Electronic reporting may be the most ripe for improving efficiency and timeliness in the short term. Paper forms, manual data entry, and other legacy processes still exist. For example, in the Gulf of Mexico, commercial landings data are collected in cooperation with the five Gulf States and the Gulf States Marine Fisheries Commission, and are used to track progress toward reaching the Annual Catch Limits of managed stocks. By shifting from paper dealer reports, submitted semi-monthly, to electronic dealer reporting, submitted weekly, timelier data are generated to more accurately project when a fishery will reach the Annual Catch Limit. This will enable commercial fishermen to more efficiently plan their fishing activities, and reduce the risks of exceeding an Annual Catch Limit.

Two fisheries in the Bering Sea-Aleutian Islands Groundfish Fishery Management Plan in Alaska currently employ video compliance monitoring. The technical requirements for these applications are relatively simple; for example, they do not involve complex requirements for species identification or measurements. Under Amendment 80, video monitoring is used by about half of the vessels in the Alaska head and gut catch processor and pollock catcher processor fleets to meet the regulations that ensure that no pre-sorting activities occur prior to observer sampling. The regulations for Amendment 91 to this Fishery Management Plan contain the second electronic monitoring requirement that NMFS has implemented in Alaska. Amendment 91 created Chinook salmon prohibited species catch limits on the Bering Sea pollock fishery for the first time. To monitor the Chinook salmon limits, NMFS is striving for a census, or a full count, of Chinook salmon bycatch in each haul by a catcher/processor and each delivery by a catcher vessel. A camera located in the observer sampling station provides views of all areas where salmon could be sorted from the catch as well as the secure location where salmon are stored, thus allowing observers to comprehensively monitor the salmon bycatch while still performing their other required duties.

Other means of electronic monitoring, including the use of digital video cameras, are currently being transitioned to operations in Alaska, the West coast and New England. For example, NMFS—in cooperation with the Pacific States Marine Fisheries Commission and the Pacific Fishery Management Council—will implement video monitoring in the West Coast Groundfish Trawl fishery. The Agency is in the process of implementing region-specific video monitoring programs cooperatively with industry partners. Cooperatively developing electronic monitoring systems with local fishermen who work in the affected fisheries is key to ensuring that the systems being developed are practical and will reliably and efficiently provide the needed data. The program's goal is to implement a blended mix of electronic and fishery observer monitoring to provide more cost-effective and timely reporting of fish catches. Electronic monitoring is also being tested in the New England groundfish fishery and Alaska small boat/fixed gear sector for implementation in 2016 and 2018, respectively.

NMFS is also striving to conduct more surveys using a number of 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, and collecting the data is only the first step toward an assessment. Optical and sonar sensors produce huge volumes of data, and NMFS is just beginning to work on methods to process these data types and bring the results into our assessments. In the future, these technologies will enable greater efficiency and increased accuracy and precision for our assessments, but these benefits will take some years to be realized. The FY16 President's Budget requests a \$2.8 million increase for our Next Generation Stock Assessments. Next Generation Stock Assessments incorporate ecosystem information (*e.g.*, climate, predator-prey dynamics) and use advanced sampling technologies (*e.g.*, remote sensing, digital imaging)—to give us a better view of what is happening in the ocean as well as to the stock.

NMFS also expects to develop new and innovative approaches to surveying fish stocks in hard-to-survey areas. For example, we are funding a multi-year research project with an academic partner to explore the use of towed camera arrays for use in surveying reef fishes in the Gulf of Mexico and Pacific Islands. If feasible, shifting to this approach would dramatically increase the effectiveness and efficiency of our reef fish surveys—meaning more science for the dollar. In another example, NMFS scientists are engaged with academic partners to develop improved methods for surveying Atlantic sea scallops. This includes the Woods Hole Oceanographic Institution's towed camera technology and the University of Massachusetts' dropped camera system that uses video stills on scallop beds for analysis.

What are the challenges to ensuring NMFS ability to collect abundance data for stock assessments?

There are a number of challenges to collecting abundance data for stock assessments. First is the ability to understand the relationship between fish stocks and the environment and determining how that will impact future stock distribution and abundance. Given the impacts of climate change on ocean and coastal conditions, it is becoming more challenging to predict future stock distribution and productivity using historical datasets. This makes ocean "process" studies increasingly important. We are conducting climate vulnerability assessments for major fish stocks in each region, launching focused research to better understand and respond to climate impacts on fisheries in the Northeast region, and finalizing the NOAA Fisheries Climate Science Strategy to provide the blueprint for providing the climate-related information needed for effective Agency decisions regarding fisheries and protected species in a changing world. Expanded funding requested in a variety of budget lines in NOAA's FY 2016 budget is a start toward filling key information needs and responding to growing climate-related impacts on living marine resources and the people, businesses and communities that depend on them. The second challenge is finding ways to sample hard-to-survey bottom types such as coral reefs. The Agency continues to dedicate funding and expand its partnerships to conduct research on advanced sampling technologies, such as acoustic and video surveys, which can help collect data in these areas.

In conclusion, the quality of scientific advice provided to management has been a major reason the United States has become a model of responsible fisheries management. Direction provided by the Magnuson-Stevens Act has been crucial to NOAA's scientific program. However, this is not to say that we cannot continue to improve the scientific guidance we provide and we are continuing to invest significant energy and resources and work with our partners to modernizing our data collection.

Thank you again for the opportunity to discuss fisheries data collection programs. I appreciate both your own, and the Committee's, interest in exploring innovative approaches to data collection, and I look forward to continuing to work with all of you to further improve the vitality of our Nation's fisheries. I am available to answer any questions you may have.

Senator BOOKER [presiding]. Thank you very much. I want to recognize the Ranking Member of the overall committee, Senator Nelson, who has just arrived. Before we start questioning, I just want to see if Senator Nelson might have any opening comments he might want to make, or do you want some time to settle in, sir?

Senator NELSON. Just to say that we have one of the best government employees in front of us. She is here to protect the fish. That is a good thing for a lot of us.

Senator BOOKER. I have been in lots of hearings with you, sir, and I have never heard you lavish such praise on an individual, so I will make sure I go down and not only introduce myself afterwards but get her autograph.

Senator Rubio, you have questioning first. Mr. Chairman.

Senator RUBIO [presiding]. Thank you very much. I appreciate your testimony. Dr. Sullivan, it is important we convey boating safety as Americans begin their summer plans and head to our coastal waters. There was a report recently. I live in South Florida. The number of boating incidents there have been problematic. Although weather conditions can change quickly, our forecasting has progressed and is a reliable tool for deciding when to venture out and when to stay docked.

Knowing the Red Snapper season is limited to specific days, that could be unsafe for boating. Has the agency considered a more flexible season depending on the weather?

Dr. SULLIVAN. Senator, we do take and can take such factors into account, and we share your concern that fishermen first and foremost make sure they get out and come home safely.

The start date, of course, is a known date, so that is a stable point for them to attempt to arrange their efforts around, but we can extend or reopen the season if conditions warrant it.

Just to cite two examples, we did that in the aftermath of the *Deepwater Horizon* bill in 2010, and to the specific point that you are making, in 2012, when the season fell in a period of particularly severe weather, we did it again then.

Senator RUBIO. I also hear a lot of growing concern among stakeholders, especially with the Gulf of Mexico, that NOAA is not providing sound data, leading to a general sense of agency mistrust.

I wanted to give you the opportunity to address the claims that some make that NOAA is poorly managing this fishery and what steps are you taking to quell those concerns?

Dr. SULLIVAN. We are taking a number of steps, but if I may comment just a bit on perspective. The snapper management plan, the data show clearly, is working. It is hard won progress, but that stock is rebuilding. We just added three million pounds of quota over this last year, for example. The quota this year is as high as it has ever been since the stock came under management.

We are sensitive to the concerns and the loss of confidence that questions about data can engender, and we will be and we always are working continually to improve and augment our data collec-

tion, the transparency of our processes, the accessibility to fishermen and other stakeholders of the assessment process and the science that is going into that. We will not relent on those efforts.

Senator RUBIO. We also received criticism from some that NOAA does not accept third party data, sometimes from programs that even receive Federal funding, such as the electronic monitoring program, that will hopefully occur this season in the Gulf.

How do the councils decide what data to accept and what data not to accept, and what guidance does the agency offer to fishermen who would like to be more proactive in data collection?

Dr. SULLIVAN. Thank you for that question. Whatever the source of data that is a candidate for the stock assessment, it has to undergo a very high standard of peer review. That is levied on every source of data, no matter who it may be.

As you have been pointing out, these are really critical data that go to critical decisions that affect people's livelihoods, so every input must meet the highest possible standards. That applies to my guys, too, by the way. There are instances in every council periodically where NMFS data does not make the cut in the peer review process.

There are instances where the Fisheries Service's model is placed in competition with a third party's model to underpin the stock assessment, and the third party model is evaluated as being superior. Haddock in the Northeast is an example of that.

It is the scientific peer review process which again starts with an open data call, third-party data are in fact commonly accepted, and with respect to individual fishermen hoping to have some of their information more consistently used or have a better chance of being used, my encouragement would be to partner with the academic scientists to help make sure the methods that you are using to collect those data really are the best practice methods.

Senator RUBIO. Finally, nearly 3 years ago, Congress passed the Billfish Conservation Act of 2012, which put in place important conservation measures prohibiting the sale of several threatened Pacific caught billfish in the United States. The Billfish Conservation Act mirrors the same prohibitions for Atlantic billfish that have been in place for years.

The National Marine Fisheries Service issued an advance Notice of Proposed Rulemaking on the 4th of April 2013 to receive comments on the proper implementation of this law. Since that time, however, over 2 years later, the agency still has not moved forward in the rulemaking process. What is the status of this rulemaking?

Dr. SULLIVAN. I have not read the text of that bill, Senator, but my understanding with respect to the rulemaking process is that a proposed rule, the next step in that chain, is currently being drafted.

And that at least one key source in the long time between the advance notice and the proposed rule stems from what we discovered to be pretty tricky implementation around how do you implement an exemption from the law for a certain subset of domestic fisheries while not violating other provisions of the statute and not falling afoul of United States trade obligations.

Senator RUBIO. Thank you very much. Senator Booker?

Senator BOOKER. Thank you, Mr. Chairman. Dr. Sullivan, on the topic of fishery and data collection, I have a real big New Jersey specific concern. The National Science Foundation for the second year in a row is funding a proposed study, and I know you are familiar with it, the Lamont Doherty Earth Observatory and Rutgers University joint study about the ocean bed in very, very fertile fishery grounds off the New Jersey coast.

The study is designed to profile the ocean floor through the use of seismic air guns that will send 250 decibel sound blasts into the fishery grounds every five seconds, 24 hours a day, for 30 consecutive days this summer.

For the second straight year, the New Jersey Department of Environmental Protection has informed the Office for Coastal Management that it has serious concerns with their project's effect on our state's coastal resources, specifically the amount of harmful impacts of seismic blasting on marine mammals, fisheries, marine ecosystems, all up and down our coast, which again is a multi-billion dollar source of economic activity for the State of New Jersey.

For the second straight year, OCM has disallowed New Jersey its right to a proper consistency review. New Jersey, of course, feels that for the second straight year, OCM is putting the interests of this study and its particular timing over and above the legitimate concerns of the State of New Jersey.

New Jersey has furnished OCM with a list of measures that would make the study less harmful. NJDEP has asked the National Science Foundation to engage in a mediation regarding the study and these mitigation measures.

Your voice could be very helpful in this. I am wondering if you could commit staff from your office to really encourage and facilitate a meaningful mediation process between NJDEP and the National Science Foundation to attempt to address New Jersey's concerns.

Dr. SULLIVAN. I appreciate your concern, Senator, and have tracked this issue through the two-year cycle. We, of course, have no authority from within NOAA to actively prohibit that seismic survey, and our scientific judgment with respect to the marine mammals is that while there was some prospect of disrupting some of their behavior, we found no grounds to presume or believe there would be injury or mortality, in which case we would have a stronger leader.

We have required that the survey ship have observers aboard, an employee who is monitoring, to make sure mammals are not within a safety zone that has been defined, and that they will be required to cease their surveying if mammals do encroach into that region to minimize those impacts and keep within the limits of the incidental harassment authorization that we have provided.

We have been closely engaged with NSF throughout this process, and of course, do not make that agency's decisions for them. We will certainly stay closely engaged with both your DEP and your staff and to the degree that is possible with the Science Foundation.

Senator BOOKER. I guess my frustration—I am not a scientist or doctor. None of my degrees have three letters, all BA, MA, things

like that. I defer to what scientists tell me. I have a lot of frustration because the information we are getting is changing.

For example, the seismic study proponents had to apply for an incidental harassment authorization from the National Marine Fisheries Service, and NMFS is compelled by law to give public notice of this application, including the most salient fact, and that is the number of marine mammals, as you mentioned before, that will be potentially harassed by the proposed seismic blasting.

This information has changed. In its public notice, NMFS told the public there would be 1,323 marine mammals that would be harassed by this blasting, including 800 bottlenose dolphins.

Just last week, the science is changing, and the understanding of its impact on their own numbers that they are turning in are suddenly growing in a pretty large proportion. Their authorization for seismic blasting to harass over 18,000 mammals, including 12,000 bottlenose dolphins, that is a massive increase. They issued an authorization now asking to harass more animals, a lot larger than the original estimation of 1,323. Now they are up to 18,000 mammals that will be affected. This is just new information as of last week.

These revised numbers are based upon science from the Marine Mammal Commission. The Commission told the NSF that the error was of such magnitude that the NSF had undermined the public review process that was established.

If this science seems to be changing in terms of the impact of this, I guess I am wondering if you could at least commit to me to exploring the re-noticing, because the notice the public got was based upon a fraction of the numbers of marine wildlife harassment.

I am wondering if you would commit to exploring the re-noticing of this permit application with the correct numbers of marine mammals to be harassed, so at least the public in a democratic process could have the right methodology that they are relying on, and that my constituents can adequately review and comment upon this application.

Dr. SULLIVAN. Senator, I will certainly commit to look into that change from the Marine Mammal Commission's input. That is news to me. I had not seen those numbers. I would ask that you let me reserve any subsequent commitment until I have had the chance to review that fresh data that came in, but I will certainly review that.

Senator BOOKER. Thank you. Thank you, Mr. Chairman.

Senator RUBIO. Thank you. Senator Nelson?

**STATEMENT OF HON. BILL NELSON,
U.S. SENATOR FROM FLORIDA**

Senator NELSON. Thank you, Mr. Chairman. First of all, Dr. Sullivan, thank you for your public service. I really meant what I believe.

Picking up on what Senator Booker just said on the harassment of marine mammals with seismic testing, I wish the Administration, not in your Commerce Department or in your bailiwick of NOAA, but the Department of Interior would stop harassing us about wanting to drill for oil off our coasts.

Fortunately, in their 5 year plan, they kept it off our respective coasts. If you are not going to be doing drilling for oil, why should there be seismic testing? I will just leave it at that.

I do want to ask you about dolphins, another matter, about their health. We just had an oil spill off Santa Barbara. Five years ago, we had that awful *Deepwater Horizon* spill. We are finding that science is telling us that linked to that *Deepwater Horizon* spill in the Gulf, it is a contributing factor to an unusually high number of bottlenose dolphin deaths in the Gulf.

Do you have any direct familiarity with this science, and can you speak to that?

Dr. SULLIVAN. NMFS is a party to some of those investigations. I am not directly familiar with the specific study that just came out. I have not had a chance to review it in detail.

Senator NELSON. For the record, Mr. Chairman, I would like to say and just insert in the record Dr. Teri Rowles, a veterinarian, and one of the 22 contributing authors of a paper, "NOAA's Marine Mammal Health and Stranding Response Program," she is the head of that, was charged with determining the causes of the unusual mortality events.

What she found out is in the Gulf's dolphin population, they are having significant adrenal gland effects, adrenal insufficiency. They are challenged when pregnant. The cold temperatures are a big challenge. Their increased susceptibility to infections, primarily bacterial pneumonia, leading to lung injury, and their immune function is affected.

I just want to get that in the record, and we can explore that later at an appropriate time with one of the scientists themselves.

Thank you, Dr. Sullivan.

Senator RUBIO. Thank you, Senator Nelson. Senator Ayotte?

**STATEMENT OF HON. KELLY AYOTTE,
U.S. SENATOR FROM NEW HAMPSHIRE**

Senator AYOTTE. I want to thank the Chair and Ranking Member. Dr. Sullivan, thank you for being here today. As you know, New Hampshire's small fleet is suffering under NOAA's regulations. In fact, on April 23, 2015, NOAA announced a final rule implementing Framework Adjustment 53 to New England's ground-fish management plan. Framework Adjustment 53, ultimately, cut cod catch limits by 75 percent from 2014 levels.

Seventy-five percent in one year. Then when I look back over the course of 5 years, the total cut is 95 percent. I do not know a business that could take a 95 percent cut and continue to operate.

As you know, this is a very important business, I mean family business, hard working, small fishermen who really care about not only the fishery but also they make a very noble living.

I am trying to understand because the statute says not only do you look at the strength of the fishery, but you also have to look at the economic impact to those who are making their living on the water and have a strong tradition of doing so.

How do we justify that, going 75 percent in one year and then 95 percent over 5 years?

Dr. SULLIVAN. Cod is an absolutely iconic species in this country and especially in your region, Senator. We do care deeply about the

fishery and about the communities that depend on it. We are gravely concerned about this stock. The assessment since 2011 show consistently it is only at about 3 percent of its total biomass. We are actually concerned about its capability to recover at this point.

That is the driving factor in what has driven these limits. We are obliged by law—both standards apply, but we are obliged by law to set catch limits that ensure we do not have overfishing occurring on a stock, and with a stock that is at just 3 percent of its biomass, that is a drastically low number.

Senator AYOTTE. Here is the problem. You are also obliged by law to think about the economic impact, and thinking about this hearing on data today, I think it is so important, and in fact, the concern that I know our fishermen have is what kind of data is being used to make these dramatic cuts, that, frankly, I do not know how any business could sustain, never mind these small businesses.

The Northeast Seafood Coalition, the largest representative group of ground fishermen in New England, they took an unprecedented step recently in April, filing a petition that says they have no confidence in the stock reports in New England groundfish, and their specific focus in this letter is “We are conveying our no confidence because the latest assessments and report status of Gulf Maine cod does not remotely match what fishermen we have seen on the water over the past year.” They outline what they have seen.

In this letter, they call for a blue ribbon commission, and one that would engage in not only what NOAA is doing, but really looking at GAO and the National Research Council, making sure that the underlying causes of assessment failures are accurate and we are getting the right data.

As we look at this, what is it that we can do to restructure what happens to ensure that stock assessments take all the information into account and match what our fishermen are seeing on the water?

It seems to me that this is a very, very important issue, and as I understand it, scientists in New England rely entirely on observer data, which is extremely costly for the results obtained, and should we look at a different model.

How can we ensure that there is more participation by those that are on the water all the time, love the water, and want to sustain the fishery—the fishermen.

Dr. SULLIVAN. A few points, Senator. First, it is not correct that the assessment relies only on observer data. It relies on the independent repetitive standardized surveys that I mentioned before, which creates an index of stock abundance.

Think Dow Jones Industrial Index. Using an index like the Dow Jones is one of the ways that we all can know something about the general health or illness of the stock market, which might at times be quite at odds with the health or illness of any given stock.

Both the index and point observations can be important. The index is important. Landings data, biology data that I referred to in my remarks again, some obtained by NMFS itself, some by contracts and grants with universities in the New England area, some

by contracts and arrangements with fishermen in the New England area, those are an input as well.

With respect to the observations out on the water, we do respect those. With respect to cod specifically, cod are known to school in very large aggregations, and when they aggregate that way, it becomes easier to catch the fish, and that can give sometimes a false impression, sometimes a false impression.

Senator AYOTTE. I do not want to interrupt you because I know my time is going, but would you object to a blue ribbon panel of scientists looking at this assessment?

Dr. SULLIVAN. We subject our assessment processes to independent review all the time, and have no fear of subjecting it to independent review.

Senator AYOTTE. Even if it was an examination by the National Research Council and the GAO, you would not object to that?

Dr. SULLIVAN. We have had them done by those bodies before.

Senator AYOTTE. I appreciate it. This is really important, as you know. I do not want these great businesses to go out of business, and it is a great tradition in New England. It is very important. These fishermen and women work incredibly hard, and they are a big part of sustaining not only our tradition, but I think appreciating local food and appreciating what we can get from the water.

I hope that we can work on this data issue and also understand what these quotas are doing to these small fishermen. Thank you.

Dr. SULLIVAN. Thank you, Senator.

Senator RUBIO. Senator Markey?

STATEMENT OF HON. EDWARD MARKEY, U.S. SENATOR FROM MASSACHUSETTS

Senator MARKEY. Thank you, Mr. Chairman, very much, and thank you for all your good work. My mother was a Sullivan and she said Sullivans were very intelligent people, and I think you are proving that here today.

Dr. SULLIVAN. My cousins always support me.

Senator MARKEY. There is no question, hanging in the Massachusetts state legislature, right in the chamber, is the Sacred Cod. That is the symbol of the state, the Sacred Cod. Things are changing. We cannot deny part of it is climate. There were temperature readings off the Massachusetts coast in January, 21 degrees above normal.

Cod like cold water. Part of this is their fins, too, you just have to deal with the reality of how warm the water is getting off our coast. That is climate change, it is heating up, and that is a factor.

Even with that, we know the fishermen are suffering. We have a perfect storm of events which are hitting us. It makes it more difficult to keep peace between the Federal regulators and the fishermen. It is just an ongoing effort to ensure that the groundfish stocks are assessed properly.

I guess my question to you is what actions is NOAA taking to ensure that the changes in technology for stock assessments incorporates the input of fishermen? You want the most modern technology but you also want the best input from the fishermen. Just give us a sense of how that works in the maximum extent, so we

are educating the fishermen with regard to what is happening out there.

Dr. SULLIVAN. I have a long crib sheet, Senator, of different projects and technologies that we are working with on a number of fronts. There are Smartphone apps, cameras and video systems, sonars, fixed moorings and autonomous vehicles that can lower the cost of getting straight data.

As you know, I am sure, we are even instrumenting lobster traps to collect oceanographic data, so to an increasing degree, whether it is on traps or mobile fishing gear, working with our academic and fishermen partners to try to gain some data about the oceanography itself, which will help us figure out what these other factors are that we are seeing in very different degrees.

Fishing pressure is clearly just one part of the story right now. Management today has to account for other factors like these that you are mentioning in ways that have not only never been needed before, but they have never actually been possible before.

Fish move where the temperature gradients are, changing ocean conditions of all sorts, from acidification to nutrient load to temperature change to food they depend on. You get skinny quill that do not have much fat to them and you get less healthy salmon pollock, for example. Subtle little changes to our eyes, but big in terms of the productivity and recruitment of a fish stock.

Then the rise or fall of one species in a stock, again, as I know you are aware, very often has domino consequences on other stocks that sometimes goes up to the regional scale.

It is a much more complex working arrangement than we have had to grapple with before. We are all trying to work through that together, and as Senator Ayotte said and as you referred to, that strains the relationships between the folks that want to fish and are making their living there and the challenge of making sure we can do that for decades and decades yet to come.

Senator MARKEY. There is no question, big changes are happening up there. The cod are voting with their fins and the lobster are voting with their claws, as they start moving, things change, and a lot of it is still not fully understood.

I wrote you in January with a number of questions about the unscheduled stock assessment update that was done last year for the Gulf of Maine cod. I think your answers to those questions are helpful to the hearing we are having today, and I ask that a copy of your full response be included in the record at this point.

Senator RUBIO. Without objection.

[The information referred to follows:]

UNITED STATES DEPARTMENT OF COMMERCE
Washington, DC, January 29, 2015

Hon. EDWARD J. MARKEY,
United States Senate,
Washington, DC.

Dear Senator Markey:

Thank you for your letter requesting information regarding the 2014 update to the Gulf of Maine cod stock assessment and the associated interim measures reducing opportunities to fish for cod. Detailed responses to the questions listed in your letter are enclosed.

I appreciate your interest in this matter and your continued leadership on these issues. If you have any questions, please contact Amanda Hallberg Greenwell, Direc-

tor of the National Oceanic and Atmospheric Administration's Office of Legislative and Intergovernmental Affairs, at (202) 482-4981.

Sincerely,

KATHRYN D. SULLIVAN, PH.D.,
*Under Secretary of Commerce
 for Oceans and Atmosphere.*

Enclosure

RESPONSES TO QUESTIONS FROM JANUARY 5, 2015, LETTER FROM SENATOR MARKEY
 AND SENATOR WARREN

1. It is our understanding that the stock assessment update was unscheduled and was conducted outside of the established procedure for conducting such updates. What factors caused NOAA to initiate the unscheduled stock assessment update? Why did NOAA choose to conduct this update in a way that did not follow the normal procedure for stock assessment updates?

- The update originated when the Gulf of Maine cod stock was chosen as a test case for an ongoing Northeast Fisheries Science Center (Science Center) project to improve the scientific information needed for management by conducting more, and more frequent, stock assessment updates.
- The Gulf of Maine cod stock was selected because it is a particularly complex stock assessment, so a process that would work for this stock would likely work for the rest of the stocks we assess. The updated assessment used the 2012 and 2013 catch and survey data that were collected after the benchmark was conducted.

2. It also our understanding that stakeholders were not notified of the pending update until the results were announced in August 2014. After NOAA decided to update the stock assessment, why did it choose not to include representatives of the fishing industry, outside experts, or other stakeholders in the process before announcing the results of the assessment? Additionally, we have heard concerns that releasing the results of the update information before it was peer reviewed could have biased, or at least created the perception of bias, in the peer review process. Why did NOAA choose to release this information before it was peer reviewed? In addition to releasing a summary of the results before they were peer-reviewed, NOAA did not release the actual draft report until two weeks later after the results were announced. Please explain this delay.

- On August 1, 2014, we shared what we had learned about the increasingly grave condition of the Gulf of Maine cod stock with the New England Fishery Management Council (Council) and asked for help in arranging a peer review before the information was used for management. The public was able to participate during the Council's peer-review process, as is always the case.
- On August 4, 2014, a representative from the Science Center participated in the Council's Groundfish Committee Meeting to answer questions from Council members and the industry about the assessment update. At that time, we announced that we would release the full assessment document as soon as we had a mechanism for the peer review. The Science Center communicated that until a peer review was completed, the assessment results had no standing and should not be used as a basis for management.
- On August 15, 2014, the Science Center and Council finalized a plan to conduct a peer review and the full assessment document was released to the public. Assessment documents for peer review are usually made publicly available prior to the review meeting. This is done to allow the public to understand assessment results and is unlikely to result in any bias.

3. Did NOAA consider including the Gulf of Maine cod assessment update in the July meeting of the Northeast Regional Stock Assessment Workshop so the Stock Assessment Review Committee (SARC) could review the update? If not, why not?

- No. The final meeting of SARC 59 (July 15-18, 2014) occurred while the update was still being developed. Even if the update had been available at the time, SAW/SARC assessments are scheduled 1 to 2 years in advance and peer reviewed by scientists contracted through the Center for Independent Experts. As required under our agreement with the Center for Independent Experts, the contracts for the peer-review scientists include specific language relative to the stocks to be reviewed and the Terms of Reference for each review.

- The peer-review process for the Gulf of Maine cod assessment update was consistent with the process we hope to adopt for all updates. An Assessment Oversight Panel convened on August 22, 2014, to finalize guidance to the peer review chair. A peer-review panel consisting of a subset of the New England and Mid-Atlantic Scientific and Statistical Committees met August 28–29, 2014, to conduct the peer review. Both meetings were open to the public by teleconference.
4. It is our understanding that this stock assessment update was part of an effort by NOAA to provide more timely information to aid the fisheries management process. How does NOAA intend to incorporate the feedback received from this stock assessment update and the process through which it was conducted to improve the transparency and scientific credibility of future efforts to provide more timely stock assessment updates?
- The North East Fisheries Science Center (NEFSC) has a Stock Assessment Efficiency Initiative that is intended to produce more frequent assessment information while also allowing for important work to improve that information. We are working with the National Marine Fisheries Service (NMFS) Greater Atlantic Regional Fisheries Office, and both the New England and Mid-Atlantic Fishery Management Councils as well as the Atlantic States Marine Fisheries Commission to implement the initiative, as some aspects of it require support from these partners (better timing for information, using common data structures, understanding the information requirements, and ensuring effective Terms of Reference for reviews). Subsequent to the Gulf of Maine cod update, the New England Fishery Management Council requested similar updates for 20 groundfish stocks. We will be conducting those updates in September 2015, using review and documenting procedures outlined in the efficiency initiative.
 - The NEFSC is developing a science plan to guide Center activities for the next 3–5 years. During the process, we have gathered input directly from our major external stakeholders and partners to use in drafting the plan. Improved stakeholder communication and engagement is among priorities identified so far. New activities are under development to implement those improvements, including re-institution of the Trawl Survey Advisory Panel and a fresh look at how stakeholders can participate in cooperative and collaborative research with NEFSC researchers.
5. The interim rule issued in November cites the following three reasons for the interim closures: reducing fishing mortality, protecting areas where the Gulf of Maine cod stock is located, and “protecting areas of likely cod spawning activity.” We have heard concerns about the way spawning closures are defined, including the scientific basis for these particular closures. Please clarify which areas, if any, were closed solely for spawning purposes, and the scientific rationale for these closures.
- The spawning-related closure measures are based on information assembled by the Closed Area Technical Team for the Council’s Omnibus Habitat Amendment 2, information from the Industry Based Survey, Massachusetts Division of Marine Fisheries research, and scientific literature (this information includes cooperative research).
 - We did not implement any seasonal interim closure areas solely for spawning protection.
 - The areas we identified as high in cod mortality frequently overlapped with spawning areas because, as stated in the interim rule, “there is a strong correlation between high cod catch and spawning activity.”
 - It is difficult to pinpoint spawning activity spatially and temporally, so we used broad, large areas when considering spawning-related areas to provide more spawning protection.
6. The interim rule includes trip limits, an effort control measure used under the previous management system. What was the conservation rationale for reinstating this control measure in the current sector system? Did NOAA analyze the impact on discards that trip limits would have? If not, why not and will this be done in the future?
- The trip limit is intended to discourage vessels from targeting Gulf of Maine cod when fishing outside of the seasonal closure areas. We set the limit at 200 pounds based on our analysis of past fishing practices in the areas that would remain open. Our analysis showed that if past fishing practices continued in a similar way, this limit would likely not affect approximately 75 percent of the trips in the remaining open areas.

- We did analyze the impacts of discards. When comparing the interim measures with and without trip limits, we estimated that including trip limits would reduce Gulf of Maine cod catch (landings and discards) by 20 metric tons and reduce groundfish revenue by 2 percent. We determined the reduction in mortality outweighed the economic impact of implementing the trip limit.
 - We looked at alternative measures such as reducing the overall quota (an output control measure currently utilized with the current sector system) but determined it would be difficult administratively to do in such a short time period. In addition, it could raise equity concerns depending on whether a sector already caught its quota or not.
7. The interim rule includes broad stock area closures that will also impact fishermen targeting other species like pollock and redfish. Did NOAA consider alternative management measures to these area closures? If so, what were they and why were they not adopted? If alternatives were not considered, why not?
- We implemented these measures to better ensure the protection of Gulf of Maine cod and to monitor and account for cod caught in the Gulf of Maine.
 - We considered a different area limitation previously considered by the Council, but it was not feasible to implement its observer coverage and vessel monitoring reporting requirements. Also, in response to public comment, we considered modifying the single broad stock area measure to provide vessels more flexibility. However, the alternatives considered either dramatically increased cod discards, or presented enforcement hurdles that were too difficult to overcome.
 - Available information indicates that vessels overall are currently catching similar amounts of pollock and redfish as they did last year at this time.
8. At-sea monitoring and fisheries observers are critical aspects of managing the Northeast groundfish fishery. Given the interim rule's likely impact on the number of fishing trips, has NOAA considered making changes to shift resources and prioritize coverage of areas in ways that can provide further help in the management of cod and other groundfish species? NOAA has also sponsored a number of pilot projects for electronic monitoring, including one run by the NEFSC that concluded this spring. Given the current cod situation, how might electronic monitoring be utilized to help fishermen and managers meet monitoring needs in the future? What are NOAA's plans for incorporating electronic monitoring into the management of the New England fisheries?
- If fishing effort drops dramatically, we will increase the coverage rates on sector fisheries in the New England groundfish fishery to make sure that we maintain thorough, representative sampling. We will maintain, if not increase, statistical standards for precision, given resources available and potential regulatory constraints.
 - In the upcoming fishing year we are conducting a trial using electronic monitoring (EM) in at least one groundfish sector. The trial is intended to evaluate the cost and quality of data collected under an operational Electronic Monitoring program with that collected under the current at-sea monitoring program. We will further develop Electronic Monitoring depending on results of that evaluation and other future evaluations that inform our regional implementation planning efforts. Our support for electronic monitoring in New England is subject to the availability of funds (please see our FY 2015 President's Budget Request for \$4.0 million to support Electronic Monitoring and Reporting).
9. The Massachusetts groundfish industry has faced incredible economic challenges in the last few years. To maintain a viable fishing industry across Massachusetts, diversifying what is caught and marketed will be critical. Recent Saltonstall-Kennedy grants in New England have supported some of the important work needed for developing redfish and dogfish markets. Has NOAA engaged the industry to identify existing barriers to targeting alternate species and possible solutions for overcoming them? If not, what are NOAA's plans to do so?
- NOAA Fisheries Greater Atlantic Regional Administrator convened a Northeast Groundfish Economic Coordinating Committee with a goal of creating additional opportunities for the groundfish fleet.
 - At a November 2013 meeting, the Committee expressed an interest in exploring possible reasons for why the quota for many groundfish species is not being fully harvested. In response, we collaborated with the Committee and the Gulf of Maine Research Institute to organize two industry workshops in 2014. The

first focused on identifying possible constraints on fishing, and the second focused on exploring ideas and options to reduce these constraints.

- We also continue to work with the industry through the sector operations plans to find ways to allow access to plentiful stocks. There is an ongoing experimental fishery to determine if vessels can target haddock in the year round Georges Bank closure areas without impact to stocks of concern. We also are working with sectors to try and provide additional flexibility to better target redfish.
10. How will the results and impacts of the interim rule be used by NOAA to evaluate the Framework 53 adjustment that the New England Fishery Management Council recently adopted and is in the process of finalizing?
- At the request of the Council, we implemented interim measures for fishing year 2014 because if fishing were allowed to continue under the annual catch limit, without any additional measures, the likelihood of ending overfishing and rebuilding the stock in future years would have been greatly reduced.
 - The interim measures were implemented to reduce fishing mortality on Gulf of Maine cod, provide additional spawning protection, and keep the stock on a rebuilding trajectory until the Council developed more permanent measures in Framework 53 for fishing year 2015 and beyond.
 - Once the Council submits Framework 53 to us, we will review the action for consistency with the Magnuson-Stevens Fishery Conservation and Management Act, particularly with respect to whether the proposed measures would end overfishing and successfully contribute to rebuilding the stock.

11. Potential vessel buyout or buyback from \$11.0 million disaster funds. Has NOAA set a timeline for this consideration? How has latest cod stock assessment and management changes impacted the development of this possible program? What does NOAA Fisheries intend to do if an agreement cannot be used in regards to a vessel buyout or buyback?

- NMFS has not set a timeline for when a potential buyback or buyout must be completed. The spending plan for the disaster funds was developed through consensus with the New England marine fisheries agency state directors. In the discussions regarding the portion of the disaster funds set aside for buyback program development, we have discussed on numerous occasions that so long as progress continues on a potential program, a deadline is not necessary.
- We have had discussions with both state directors and fishermen on the question of how changes in cod stock status and management may have changed the desire for a buyback program. These discussions have not resulted in a conclusive answer. Some have indicated that the changes in cod have heightened the need for a disaster-related buyback, others have provided the opposite view.
- We have stated, since the inception of the initial consensus spending plan, that if a buyback program could not be developed, the \$11.0 million set aside for the program would be discussed further with state directors to consider how best to use the funds. This continues to be our position.

Senator MARKEY. One of my questions asked how NOAA intends to incorporate feedback received during the stock assessment update to improve the transparency and scientific credibility of future efforts to provide more timely stock assessment updates.

You responded saying that from input you have received directly from major external stakeholders and partners, improved stakeholder communication and engagement is among the priorities identified so far.

What are the new activities that you are undertaking to ensure that stakeholders can participate in cooperative and collaborative research?

Dr. SULLIVAN. Senator, we have been looking at the time line and procedures that we go through to announce open data calls, make sure we are getting those out to all of the different stakeholders.

We are looking at reinstituting the Trawl Survey Advisory Panel, and we are taking a fresh look at how stakeholders can participate in cooperative and collaborative research broadly across the Service but in particular with our Northeast Fisheries Science Center.

Senator MARKEY. Explain to the Committee, if you could, how does electronic monitoring play into the totality of this picture going forward in terms of interacting with fishermen, giving some confidence that the numbers are accurate?

Dr. SULLIVAN. There are a variety of different electronic monitoring and electronic reporting tools and each can play different roles in this challenge. Right now there are 29 electronic reporting and four electronic monitoring programs actively in place.

We have asked for an increase in our Fiscal Year 2016 budget of \$7 million to try to move electronic monitoring techniques into two new groundfish fisheries in the Gulf and West Coast.

In a nutshell—if you wish a more exhaustive answer for the record, we would be happy to provide it. In a nutshell, where electronic monitoring like cameras and video will probably work best will be in single species, low or zero discard fisheries, so the fish you see coming in over the fantail are unequivocally the fish that are being kept, where there is very low incentive for discard. That is probably where they will work best. That is where we have seen them proving most effective, both in U.S. fisheries and Canadian fisheries.

How they may be able to relieve effort on fishermen or make NOAA processes more efficient in mixed species and in stock complexes, we are gathering biological data about the fish, as I mentioned before.

It is also important to improving the stock assessment methodology. I suspect the story will be more complicated there, and I would have lower expectations that electronic technologies would completely replace at sea observers.

Senator MARKEY. The Federal Government has been paying for actual physical observation, and as that money gets pulled back, there has to be a substitute, and electronic monitoring just has to be given the priority. It has to be given the funding so there is some confidence on the part of fishermen that the numbers are real.

I just urge you to do all you can in order to provide that additional source of information. Otherwise, this fight will just continue. Thank you, Mr. Chairman.

Senator RUBIO. Thank you. Senator Nelson?

Senator NELSON. Do you have confidence in electronic monitoring?

Dr. SULLIVAN. We are the trust and verify guys. That is the scientific process. We are setting up protocols and pilots with fishermen and industry partners in every region to examine these techniques, to confirm how they work, to calibrate them, and before, again to the trust and confidence issue, we would switch over to some new technique, we need to both know its accuracy and precision performance, and we need to be able to relate how the new measurement relates to the old measurement.

We have all seen this in our own lives when you buy a new thermometer and it reads slightly different than your old thermometer,

you are not sicker than you were yesterday, the thermometers have a little different reading. We need to be able to calibrate those differences.

Senator NELSON. When will you draw a conclusion?

Dr. SULLIVAN. We will draw conclusions technique by technique and fishery by fishery, and that is the work that is underway now. We have a national strategy for electronic monitoring. We issued this year six regional implementation plans. As I mentioned to Senator Markey, we have requested a small increase in our Fiscal Year 2016 budget to accelerate those efforts.

Senator RUBIO. Senator Booker?

Senator BOOKER. Thank you very much. Dr. Sullivan, I have no Sullivan's in my family, just in case you are curious.

Dr. SULLIVAN. We can lend you some.

Senator BOOKER. I would like that a lot. I wrote a letter to NOAA in March regarding the emergency recommendations from the Mid-Atlantic Fishery Management Council on recreational catch limits for the blueline tilefish.

Since then, the South Atlantic Fishery Management Council has recommended to NOAA an one fish per vessel per day recreational limit, not only within its own jurisdictional boundaries, but throughout the Mid-Atlantic and New England regions as well.

I am sensitive, very sensitive to the importance of protecting against overfishing. This recommendation is highly irregular, and I am concerned it may have severe impacts on New Jersey recreational fishers.

As NOAA works to implement an interim rule based on the best available science, can you help ensure that the recreational catch limits are measures that would curb rather than close the fishery while the Mid-Atlantic Fishery Management Council develops their own long-term management plan?

Dr. SULLIVAN. I will have to probe the administrative mechanics out a little more carefully, Senator, before I can give you a definitive answer, and let me apologize that our response to your letter has been delayed by this added complexity of the other Council's inputs.

We are looking at the new inputs in the context of your letter and the earlier request from the Atlantic Council. I will be happy to get you a more detailed answer back on that.

Senator BOOKER. For the sake of time, I have one more question, but I can submit it to the record. I see Mr. Sullivan is settling in right now. I will take this time to embarrass him that his daughter just got accepted to the best university in the United States of America, outside of New Jersey, which is Stanford University. How he raised a Stanford woman, I do not know. It must be to his wife's credit.

Senator MARKEY. Can I also say, it further reinforces what my mother said, the Sullivans are a very——

[Laughter.]

Senator SULLIVAN. We are related, are we not? It was all due to my wife.

Senator RUBIO. Senator Sullivan, are you ready for your questions?

Senator SULLIVAN. I am going to take a minute, if I can, Mr. Chairman.

Senator RUBIO. Do jump in.

Senator BOOKER. I will try to go through this as quickly as possible. The Prescott grant program was enacted in 2000 to help defray the high costs of recovery and rehabilitation of marine mammals, including participants in the Marine Mammal Stranding Network. The Prescott program allows eligible Stranding Network participants to use the funds not only for marine mammal recovery and treatment, but also for the collection of scientific data from live and dead animals.

My understanding is some of this data is valuable not only to marine mammal research but also to NOAA fish scientists. That is really important. They can tell a lot about the changes in the range, the abundance, the importance of fish species, from dolphins and other marine mammals that they have eaten.

As important as a standard these network activities are, I was surprised to learn that NOAA consistently requests decreases in appropriations for the Prescott grants, which seemed to my staff and me as sort of counterintuitive.

For Fiscal Year 2016, you have requested a decrease of \$1.9 million. For Fiscal Year 2015, you requested a decrease of \$2.5 million. For Fiscal Years 2013 and 2014, you requested a decrease of almost \$4 million, and the termination of this program.

Can you clarify for me where NOAA is in terms of support for what I perceive as a very important program?

Dr. SULLIVAN. We certainly do value that function and we have very much valued the contributions that the Prescott partners have made over the years. In the face of the tough budget times we are all navigating through, we all have to sometimes make some tough choices, and in this area, what we have looked at doing is trying to sustain the core Service function that NOAA provides for the aggregation of that. Many, I would say probably most of those networks are very effective private fund raisers and leverage money very well. They will continue to do that, we hope and believe, but the amount of funding we can support them with each year is just very tight. They are not decisions we make lightly.

Senator BOOKER. Dr. Sullivan, thank you. Mr. Chairman, thank you for the latitude.

Senator RUBIO. Senator Sullivan?

STATEMENT OF HON. DAN SULLIVAN, U.S. SENATOR FROM ALASKA

Senator SULLIVAN. Thank you, Mr. Chairman. I want to thank the Ranking Member as well for his nice help this morning, appreciate that very much.

Dr. Sullivan, great to see you again. I have a number of questions that I wanted to cover. First, I wanted to start with the North Pacific observer program, which I think you are very familiar with.

I know you recognize in Alaska—I like to refer to us as the super power of America's seafood/fishing industry. As you know, we harvest over half of all fish in the United States, coming from the waters off the coast of Alaska. It is critically important for my con-

stituents, and a huge employer as well, really important industry for coastal communities.

One of the issues we have had, I understand how important the observer program is, but the way in which particularly with smaller vessels, smaller crews, how having an actual physical observer on the boat can cause all kinds of issues, can cause bunk space issues. I have talked to fishermen in Alaska who actually have to share bunk space with an observer, believe it or not.

Are we making any progress with regard to using in camera systems as opposed to having observers on every vessel? It is a huge issue in my state.

My understanding, and I might be wrong on this, is other regions of the country have had kind of hardship waivers that relate to small boats with regard to observers, and yet we have not seen any of that in Alaska, where I think if there is a fleet that has actually been impacted by this, it is the Alaska fleet.

Can you comment on any of those issues, please?

Dr. SULLIVAN. Certainly, and it is good to see you again also, Senator. I am not familiar with the distribution of hardship waivers elsewhere through the NMFS regions. I will have to get back to you on that.

Senator SULLIVAN. OK.

Dr. SULLIVAN. With respect to trying to proceed to electronic monitoring and electronic reporting systems, we are working on that. As I said earlier, we have now a national strategy. We have a regional implementation plan, including one that covers Alaska.

We have requested a small increase in funds in our Fiscal Year 2016 budget aimed at trying to accelerate the testing, validation and calibration of these systems so that we can determine to what degree can we rely on them, to what degree could they completely replace a human observer, in what instances can they not replace altogether an observer but ease the burden in various ways.

We are keenly aware of the concerns of the small boat fleet and the Alaska fleet specifically. We will continue to advance these technologies as rapidly as we can within available resources.

Senator SULLIVAN. "As rapidly" is the key issue. Again, it is a huge issue with our fleet. I think there are a lot of people who are starting to lose patience on it. I think we have the technology to move forward with regard to the electronic monitoring, and we want to be working closely with you on that.

You and I have discussed national ocean policy previously. I am somebody who thinks that looks like another regulatory burden with regard to our fleet. Do you have anticipated costs with regard to the national ocean policy obligations?

The other thing that I think is important for you to be able to lay out for this committee, where in the statute does NOAA have the ability to take these very valuable resources in terms of your authorizing statute and conduct a pretty broad-based regulatory system with regard to national ocean policies?

I might be wrong, but I do not believe it has been approved or authorized by the Congress.

Dr. SULLIVAN. Senator, with respect, I would disagree with the characterization that the national ocean policy is a regulatory regime. The policy directed all of us Federal agencies to more clearly

and efficiently align and augment our efforts across our boundaries, remove some of the seams, that we frankly had heard from constituents in coastal zones were annoying and pernicious.

With respect to NOAA's specific activities, the activities that we laid out in the matrix of what elements of the mandates and work that we currently do under existing authorities are pertinent to these aims of being more coherent in the Federal families' work in the coastal zone.

With respect to NOAA, the activities that we would count as pertinent to national ocean policy are ones that are long-standing, underway for many years and decades, and clearly aligned to our existing authorities. They do not in our case come with regulatory hammer or trigger of any sort.

Senator SULLIVAN. Mr. Chairman, do I have time to ask one more question? It is kind of an important issue.

Dr. Sullivan, I wanted to actually ask one final question and it involves the Endangered Species Act, and what is an increased incidence—I have seen this both as Alaska's attorney general and a DNR commissioner there.

What we refer to in Alaska as Federal agencies listing species, what is called "climate based listings." It goes something like this, where there is a healthy species in Alaska, there is no sign of a decline in the species numbers, yet based on modeling, on climate change, Federal agencies are now saying well, we know that species looks healthy right now, there is no physical decline in the species, which by the way is required by the EAS to list a species, and yet we are looking at climate forecasts in the future that will have an impact on these species, so based on a computer modeling, we are going to list the species anyway.

As you can imagine, in the only Arctic state in America, we have big issues with regard to climate based listings. (A) I do not think they abide by the law, but (B) they seem limitless. What species in Alaska, if you are going to predict modeling and climate change 10, 20, 30, 40 years from now, could not be listed under a model that does not require species to actually physically be declining?

Do you think that species can be listed solely on the basis of computer models when there is no evidence of physical, actual physical decline under the Endangered Species Act?

If you do, show me the provision in the Endangered Species Act that allows that kind of listing.

Dr. SULLIVAN. We have had this discussion before and you have put that question to me before, Senator. I have fallen short of my IOU to go do that homework and look at the statute more carefully.

My understanding from my best experts is at least with respect to identifying threatened species, that a physical decline trigger is not required by the statute. I will rewrite my homework assignment and be sure I get back to you on that one.

Senator SULLIVAN. It is just not NOAA. It is a lot of the Federal agencies. As you can imagine, it is a huge concern in my state because you put big critical habitat destinations around these species, which limit all kinds of activity. It seems like it is a limitless approach to listing species that is not based on the law.

Thank you, Mr. Chairman.

Senator RUBIO. Thank you. Thank you for your testimony today, Dr. Sullivan. I want to ask the other panel to move forward now, but I wanted to thank you for being here today and the time you have given us.

Our second panel is Mr. Robert Beal, who is the Executive Director of the Atlantic State Marine Fisheries Commission, which was authorized by Congress in 1942, and is comprised of 15 Atlantic coast states.

Mr. Brett Fitzgerald is the Executive Director of the Snook and Gamefish Foundation, which has played a leading role in Smartphone technology that allows anglers to record catches.

Dr. Steven A. Murawski is a Professor and Peter Betzer Endowed Chair of Biological Oceanography at the University of South Florida. It is a position he has held since 2011.

I want to welcome all of you here. You will each have about 5 minutes for your opening statements. Your full statements will be included in the record of the hearing.

With that, I will begin with you, Mr. Beal. Thank you for being here.

**STATEMENT OF ROBERT BEAL, EXECUTIVE DIRECTOR,
ATLANTIC STATES MARINE FISHERIES COMMISSION**

Mr. BEAL. Good afternoon, Chairman Rubio, Ranking Member Booker, and members of the Subcommittee. I am Robert Beal. I am the Executive Director of the Atlantic States Marine Fisheries Commission.

The 15 Atlantic coastal states formed the Commission in 1942 to cooperatively manage their shared marine resources.

It is a pleasure to appear before the Subcommittee today to comment on the critical need for reliable fisheries data and opportunities for improvement.

The foundation of U.S. marine fisheries management is strong science. The Commission relies on quality data to support its 26 fishery management programs. Sustainable management and stakeholder confidence rely on accuracy, reliability, and timeliness of data.

Given the Atlantic coastal fishery resources provide billions of dollars of economic activity, hundreds of thousands of jobs, as well as food and recreation, it is essential for resource managers to seek innovative methods and approaches to collect and utilize fisheries data.

Over the past two years alone, the Commission has conducted nine benchmark stock assessments that provide population assessments to support future decisions. The Commission completed the first coast-wide benchmark black drum stock assessment, which enabled us to move from unknown stock status to a determination that found the stock is not overfished and overfishing is not occurring.

Due to the availability of robust data on a regional scale, the stock benchmark assessment shifted from coast-wide assessment to a regional assessment, providing a more accurate reflection of local differences, life history characteristics, and selectivity patterns.

Last, improved data and assessment capabilities yielded a much improved and more credible Atlantic menhaden assessment, estab-

lishing the foundation for the Commission to move forward with development of ecologically based reference points.

These are just three examples of advancements that the Commission has been able to make due to availability of robust science.

Stock assessments today are growing in complexity as managers grapple with the fact that fishing pressures is only one part of the story. Stock distribution shifts to changing water temperature, habitat degradation, and hypoxia must also be considered.

On the East Coast, the Commission has been at the forefront of developing innovative approaches to assess and manage fishery resources. Our Atlantic Menhaden Board is in the process of developing reference points that balance menhaden's ecological role with the needs of harvesters.

The Commission's horseshoe crab management program is the first to use the adaptive resource management model to balance the competing needs of threatened migratory shore birds, horseshoe harvesters, and the biomedical community to set annual specifications.

Unfortunately, due to decreases in funding, the annual horseshoe crab survey has been discontinued for the last two years.

The Commission along with the Atlantic Coastal Cooperative Statistics Program, ACCSP, is working hard to make data collection and management more nimble, creative, and efficient. ACCSP is a cooperative state-Federal marine fisheries data collection program that integrates data from multiple state and Federal sources into a single data management system to meet the needs of the fishery managers, scientists, and the fishing industry.

ACCSP has created a system called "SAFIS," Standard Atlantic Fisheries Information System. SAFIS currently includes approximately 5.6 million dealer reports, 1.3 million trip records, and over 10,000 volunteer angler records.

As part of SAFIS, they have developed four standardized electronic reporting tools that can be used by the partners. The first is electronic dealer reporting. This is a web-based application to allow dealers to enter electronic reports, and the data is directly loaded into the ACCSP database.

The second is a single trip reporting system, another web-based application, that provides the ability to collect the same data as the electronic dealer reporting, however, the harvester and dealer report data on the same form and simultaneously creates both of the report.

Electronic trip reporting or eTRIPS, is a web-based application that compiles catch and effort data from harvesters, and similar to eDR, this allows interactive reports to be made to illustrate the progress and history of catch and effort. This is also available on a mobile version through ACCSP.

The final tool developed by SAFIS is volunteer recreational logbooks, which you will hear more about later.

The SAFIS applications I just mentioned are available through ACCSP partners at no cost. It is estimated that SAFIS results in as much as \$10 million in cost avoidance for our member states for data management and software development, and avoidance of up to \$3 million in annual ongoing maintenance.

Another important tool to better understand fisheries and their use by recreational anglers is NOAA's Marine Recreational Information Program. Since 2007, NOAA Fisheries has made significant improvements in recreational data collection. While the current program is a vast improvement over previous estimates, there is still work to do.

In 2016, the catch estimate portion of the MRIP will be transferred over to the states. This survey requires person to person interaction on the docks and other fishing sites to identify catch and effort recreational anglers. Based on the experience in other parts of the country, state conducts has resulted in greater improvement in data quality, better sense of involvement by participating states, and more confidence in the data by the anglers.

Beginning in 2016, all states, Maine to Florida, will be conducting this survey individually at the state level.

The second development in NOAA Fisheries is the transition of the effort survey from a land line phone survey to a mail survey. Previously, this was all estimated through a random digit dialing in coastal communities. This approach had a number of shortcomings, including decline in response rates to telephones in increasing proportions to households that only used cell phones.

Recently completed pilot studies show mail surveys are a much better tool for capturing fishing effort by increasing response rates, reaching a broader population of anglers, and improving response accuracy.

In closing, timely and accurate fishery data and independent data are essential to the success of fisheries management in the United States. The Commission, ACCSP, and our state and Federal partners are committed to seeking innovative and cost effective approaches to address our data collection and management needs.

We stand ready to assist you and the members of the Subcommittee in any way we can to further our shared objective of effectively and sustainably managing Atlantic Coast fisheries resources.

[The prepared statement of Mr. Beal follows:]

PREPARED STATEMENT OF ROBERT BEAL, EXECUTIVE DIRECTOR, ATLANTIC STATES
MARINE FISHERIES COMMISSION

Chairman Rubio and Members of the Subcommittee,

I am Robert Beal, Executive Director of the Atlantic States Marine Fisheries Commission (Commission). The Commission is a management entity comprised of the 15 Atlantic coast states, five of which are represented on this Subcommittee. The Commission provides a forum for interstate cooperation on marine fisheries that cross state borders and thus cannot be adequately managed by a single state. Congress authorized the Commission in 1942, and granted us management authority over Atlantic striped bass in 1984 with the Atlantic Striped Bass Conservation Act. Congress then expanded our management authority to include all Commission fishery management plans with the Atlantic Coastal Fisheries Cooperative Management Act (Atlantic Coastal Act) in 1993.

I commend the Chairman and the Subcommittee for recognizing the importance of robust data in fisheries management. Data, both fishery-dependent (catch and effort) and fishery-independent (collected through scientific surveys), provide the basis for marine fisheries management in the United States. Over the past two years alone, the Commission has conducted nine benchmark stock assessments that provide population estimates that will be the basis for management of these species for years to come. The black drum assessment, which was the first coastwide assessment for this species, enabled us to move from an unknown stock condition to one

that was found to be not overfished nor experiencing overfishing. Data for this assessment included commercial landings extending all the way back to the early 1900s. Due to the availability of robust data at the regional scale, the tautog benchmark assessment shifted from a coastwide assessment to a regionally based assessment of this locally-resident species, providing a more accurate reflection of regional differences in life history characteristics and harvest patterns, as well as reducing the risk of overfishing. Lastly, improved data and assessment capabilities yielded a much improved and more credible Atlantic menhaden assessment, establishing the foundation for the Commission to move forward with the development of ecologically-based reference points to manage the menhaden resource. These are just three recent examples of what can be achieved when we have access to timely and accurate fisheries data. With another 23 species that fall under the Commission's purview, the ultimate success of these programs, in terms of sustainable management and stakeholder confidence, lies in the accuracy, reliability, and timeliness of the data we use to inform our stock assessments and decision making. Without quality and timely data, we cannot successfully manage America's fisheries.

Given that Atlantic coastal fishery resources generate billions of dollars of economic activity and hundreds of thousands of jobs in our coastal communities, as well as food and recreation, it is essential for resource managers to seek innovative methods and approaches collect and utilize fisheries data.

Evolving Management, Increasing Data Demands

Stock assessments today are growing increasingly complex as managers grapple with the fact that fishing pressure is only one part of the story. Stock distribution shifts due to changing water temperatures, habitat degradation, and hypoxia need to be considered. Further, we are just beginning to understand how the rise or fall of one stock can impact other stocks or ecosystems at the regional scale. Until recently, management measures that account for other factors outside fishing pressure were simply not possible.

On the East Coast, the Commission has been at the forefront of developing innovative approaches to assess and manage fishery resources. Our Atlantic Menhaden Board is in the process of developing ecological reference points that balance menhaden's role as a forage species with its use by reduction fisheries and bait harvesters. The Commission's horseshoe crab management program is the first to incorporate ecosystem principles, such as shorebird and horseshoe crab abundance levels, to set annual harvest levels for horseshoe crabs of Delaware Bay origin. Red knots, the shorebird that most relies on horseshoe crab eggs for food, was listed as threatened under the Endangered Species Act in 2014. The Commission's management program, which uses Adaptive Resource Management (ARM) to set annual specifications, was cited as one of the main reasons red knot was not listed as endangered. Unfortunately, the ARM Framework's utility is currently threatened due to funding shortfalls that have curtailed the conduct of the Horseshoe Crab Trawl Survey in 2013 and 2014. Data derived from the Survey are a critical component of the ARM Framework as it is the only long-term source of adult abundance indices. Both are excellent examples of how the Commission and the states can adaptively respond to stakeholder demands to address predator/prey interactions and ecological services. Neither effort, however, can be accomplished without robust data. As funding to critical data sets diminishes, so too does our ability to respond innovatively to increasing management challenges.

Current Data Collection Programs and the Role of New Technologies in Improving the Management Process

With regards to how new technologies can help fishery managers achieve better and more timely information, the Commission, along with the Atlantic Coastal Cooperative Statistics Program (ACCSP), is working hard to make data collection and management more nimble, creative, and efficient.

Atlantic Coastal Cooperative Statistics Program

ACCSP is a cooperative state-federal marine fisheries statistics data collection program that integrates data from multiple state/federal sources into a single data management system to meet the needs of fishery managers, scientists, and the fishing industry. ACCSP was established to be the principal source of fishery-dependent information on the Atlantic coast. ACCSP provides data for a number of fisheries management purposes. These include: fishery management plans, dealer reporting compliance; quota and compliance monitoring; stock assessments; landings history and trends (*e.g.*, track past commercial catch levels by state, revenue data by vessel); fishery characterizations; catch-per-unit-effort indices; and fishery participant information. ACCSP is housed within the Commission but functions separately. The

Commission is a founding partner of the ACCSP, and provides administrative and logistical support services to ACCSP.

In 2003, ACCSP created the Standard Atlantic Fisheries Information System (SAFIS), an online electronic reporting system designed to meet the increasing need for real-time commercial landings data. In 2004, NOAA Fisheries Northeast Region (now the Greater Atlantic Regional Fisheries Office or GARFO), adopted SAFIS for federally permitted seafood dealers, encompassing dealers from Maine to North Carolina. Over time, the use of SAFIS has expanded throughout the Northeast (implemented from Maine to Connecticut), the Mid-Atlantic (New York, New Jersey, and Delaware) and South Atlantic (South Carolina and Georgia) to become the de-facto dealer reporting system. Also, as part of the ongoing NOAA Fisheries Data Visioning projects, there is a renewed commitment to improve the linkages between Federal data collection efforts and ACCSP.

SAFIS can be deployed to its partners at no direct cost. It is estimated that SAFIS results in as much as \$10 million in cost avoidance for our member states for data management and software development, and up to \$3 million in annual ongoing maintenance. To date, SAFIS includes over seven million records available for managers for quota monitoring and compliance. At the end of February 2015, this included approximately 5.6 million dealer reports, 1.3 million trip records, and over 10,000 volunteer angler records.

Where electronic reporting has been comprehensively deployed, much of the need for more timely and accurate data in dealer and fisherman reporting has been resolved. Agencies that are using the system are better able to manage quotas and perform compliance monitoring. Improved data on the activities of individual license holders will make the creation and management of limited entry fisheries, when desired by the states, much more timely and accurate. The standardization of coding has greatly reduced the amount of time needed to create the consolidated data sets that are needed for larger scale management and assessment activities.

However, many agencies are still using a mixture of conventional (paper) reporting and electronic reporting, significantly limiting the ability to provide accurate, real-time data for management purposes since paper reports can take several months or longer to receive and process. While they are in process, it's necessary for managers to estimate catch that is reported on paper. This can lead to errors that can negatively impact fisheries and the fishing industry.

In 2010, ACCSP launched a completely revised version of SAFIS to address user needs for a faster, more flexible application. Some of the major enhancements and associated benefits include:

- Up-to-date information on species caught and their impact on fisheries and quotas
- Confidential access to data-of-record by harvesters and dealers
- Access to state and Federal reporting requirements through online data entry that eliminates duplicative reporting to state and Federal agencies and prevents double counting.
- Integrated highly migratory species reporting
- Automatically generated pricing information
- Flexibility in creating favorites (*e.g.*, species, gears, fishermen, dealers, and disposition)
- Management tools to facilitate maintenance of partner-owned data such as participants, online permits, and vessels.

These benefits are further confirmed by ACCSP's program partners:

"Without ACCSP, MA DMF would be hard-pressed to collect comprehensive, trip-level data in the manner that it does. This information is used in multiple ways to characterize the fisheries that occur in Massachusetts, and is a critical piece in the management process. Previously, information was collected only about specific fisheries, and it wasn't always done in a standardized way. Now the information is comprehensive, standardized, and it is also available to all other program partners as well."

—Tom Hoopes, Chair of the ACCSP Operations Committee and Program Leader for the Management Information Systems and Fisheries Statistics Program of MA DMF

"ACCSP has created applications that allow state and Federal partners to feed fisheries-dependent data into a single repository with all data being held to the same standards. Additionally, all data housed by ACCSP is subject to quality assurance and quality control protocols. These features allow managers to query

fishery-dependent data on a coast-wide basis and provide a certain level of confidence in the data being used which is essential for coastwide and regional stock assessments.”

—*Nicole Lengyel, Chair of the ACCSP Biological Review Panel and the Bycatch Prioritization Committee and Principal Biologist with RI DFW*

Initially developed as a dealer reporting system, SAFIS has grown to include five distinct applications to gather commercial and recreational information. These five applications (eDR, e-1 Ticket, eTRIPS, eLogbook, and SMS) function independently, but all are maintained within the same database and share standards and codes that are ACCSP-compliant. Below is a description of each of the SAFIS applications, as well as the partners that are implementing the application as of February 2015.

1. Electronic Dealer Reporting (eDR)

The electronic dealer reporting application was the first application developed and implemented. eDR is a web based application that allows dealers to enter an electronic dealer report. Fields that must be entered for a completed report include harvester, port, date landed, time landed, date purchased, vessel number, species, disposition, gear, quantity, and price. When reports are completed electronically an interactive report can be made to view progress and history of landings. It was first launched by GARFO for Federal fisheries. This application is also employed by Maine, New Hampshire, Massachusetts, Rhode Island (the first state to implement eDR), Connecticut, New York, Delaware, and New Jersey.

2. Single Trip Ticket Reporting (e-1Ticket)

e-1Ticket is a web-based application providing the ability to collect all of the same data collected through a 2-ticket system (eDR), however the harvester and dealer report data on a single form and simultaneously create a dealer report. e-1Ticket combines elements of both trip (vessel and/or harvester) and dealer reporting into a single application that emulates the standard practice in the southeast. South Carolina, Georgia, and NMFS—SE are currently employing the e-1Ticket application.

3. Electronic Trip Reporting (eTRIPS)

eTRIPS is a web-based application that compiles catch and effort data from harvesters. Trip reports, or logbooks in some fisheries, provide catch and effort data from a permitted fishing entity (harvester or a business) or a single vessel. Trips may be categorized as commercial or for-hire (party/charter).

This application allows harvesters to create trip reports after entering in the required fields in the trip, effort, and catch categories. Similar to the eDR application, interactive reports can be made to illustrate progress and history of catch and effort. eTRIPS was developed to meet the complex needs of collecting catch and effort data from harvesters. This application is now employed by Massachusetts, Rhode Island, Connecticut, New York, and New Jersey.

In 2014, ACCSP developed a mobile version of eTrips which is run on tablet computers which is currently used in Rhode Island. This handheld application greatly reduces the reporting burden on harvesters, improves data accuracy, and results in timelier reporting.

“From a stock assessment point of view, DFW is optimistic that the discard data generated from the new mobile application would fill a gap for party and charter boat discard data which is currently not collected. And lastly, captains would like more efficiency in data reporting and the ability to report online as opposed to paper. Most of the party and charter boat captains in Rhode Island have Federal vessel trip requirements. Everyone sees the mobile application as a good first step to allowing them to report that data online, meet Federal requirements, as well as giving DFW more timely access to the data. Overall, better data, better decisions.”

—*John Lake, Principal Biologist with the Rhode Island Division of Fish and Wildlife Marine Fisheries*

4. Voluntary Recreational Logbooks (eLogbook)

eLogbook was first developed as a part of the Striped Bass Bonus Program in New Jersey. This application is a powerful way to empower anglers in the data collection process. eLogbook formulates summaries of information on all species caught by the angler. This application is now employed by Massachusetts, Rhode Island, New York, Connecticut, and Delaware.

5. SAFIS Management System (SMS)

SMS is a web-based application providing administrative tools to SAFIS administrators for management of information such as user accounts, participants, or permits. It is often used to monitor quotas.

How Are the Data Used?

SAFIS data are used to support fisheries stock assessments and management activities. Since 1995, ACCSP has contributed data to over 30 stock assessments along the Atlantic coast. During 2014, the Data Team provided landings and biological data for use in a number of benchmark stock assessments, including American lobster, black drum, red drum, red snapper and gray triggerfish, and South Atlantic shrimp stocks.

ACCSP data have also been used to:

- Compile commercial landings data for NOAA Fisheries annual publication of *Fisheries of the United States*.
- Supply annual summaries of Eastern oyster landings for Maryland for 2010–2013 for use by the Louisiana Legislative Auditor
- Respond to media inquiries on the number of active harvesters and the average age of the harvesters; determining the socioeconomic impacts of various management and industry regulations; and Chesapeake Bay-specific commercial landings for use in the film “Life on the Edge: America’s Atlantic Coast.”
- Provide aggregated trip data by geographic zone to the Bureau of Ocean Energy Management to inform discussions on the potential siting impacts of wind energy farm projects off the Atlantic coast.
- Compile market values of Atlantic striped bass for Maryland, Virginia, and North Carolina for an Environmental Defense Fund report.

Positive Reviews from Industry on Electronic Reporting

In the fall of 2012, ACCSP brought together harvesters, dealers, and fisheries managers to better understand the potential pros and cons of electronic reporting. Electronic reporting by harvesters and dealers clearly has its advantages. Fisheries managers have access to more timely data, allowing them to better monitor catch and more closely manage quotas. Scientists benefit from more detailed and precise data. Lastly, law enforcement officers can more easily track regulatory compliance.

The first initiative of the ACCSP-convened group was to design a survey, which was distributed from December 1, 2012 to July 14, 2013, to collect attitudes and opinions on electronic reporting systems through the eyes of industry.

“Fishermen and data managers both appear to have strong opinions on electronic reporting programs, so this project was begun to describe those opinions and better understand their basis.”

—John Carmichael, Project Lead and Science and Statistics Program Manager for the SAFMC

Overall, the survey illustrated there are significant benefits to harvesters and dealers no matter how they report electronically. The survey question with the most compelling set of responses was: “If you have experience with electronic reporting, please share with us the key advantages.” After reviewing nearly 2,000 responses, it became evident industry members too thought there were huge advantages to electronic reporting, including:

- *Reduces stress* by eliminating the need to search for old paper reports. Data are easily accessible and readily organized to quickly print out landings records for the purpose of business planning and tax preparation.
- *Increases confidence in reporting*. Once a fishing report has been entered, users immediately receive a confirmation of submitted information to verify data input and keep for their records.
- *Ensures reliability* by flagging conspicuous errors before report submission, allowing users (harvesters and dealers) to correct them.
- *Provides a measure of security* since inputted data are stored on external servers in the event an inputter’s personal computer crashes. As one respondent said, “It’s a great feeling knowing my data are backed up in a database.”
- *Allows for quick data entry*. Data are saved in the system so that when you go back in to enter new report information, you don’t have to reenter basic information. As one respondent said, “All of my information is already saved into my favorites. All I do is enter the date, species, pounds, and hit save and I am

done!” Also, each state and Federal system is designed to gather the information that is relevant to your area, so there is no unnecessary data entry.

- *Provides convenience* since it can be done anywhere (from home or while in the field). As one respondent said, “I report at the end of each day so there is no need to scramble to get a paper report done all at once. Doing an ‘all-at-once’ paper report requires gathering all the slips from the week, which can be quite insane.” SAFIS is the only web-based electronic reporting system that is available from any computer and can be used without downloading additional software.
- *Improves efficiency and is economical*, freeing up time for harvesters and dealers to conduct their businesses.

Improving the Marine Recreational Information Program

Another important tool to better understand fisheries and their use by recreational anglers is NOAA Fisheries’ Marine Recreational Information Program (MRIP). Recognizing the need for better recreational effort data, NOAA Fisheries commissioned an independent review of its recreational fishing survey in 2006 through the National Research Council (NRC). One year later, Congress required NOAA to implement the study’s recommendations, including the creation of a national saltwater angler registry. While the resulting Marine Recreational Information Program (MRIP) was a vast improvement over previous estimates, there is still work to do to further improve the program and the data it provides. Two recent developments have the potential to significantly improve the accuracy of, and stakeholder confidence in, recreational fishing effort and landings estimates. The first development involves transitioning conduct of the catch estimate portion of MRIP known as the Access Point Angler Intercept Survey (APAIS) to all of the Atlantic states.

APAIS is one of the most crucial components of estimating recreational catch and discards. It requires person to person interaction on docks and other fishing sites to identify catch and effort of recreational anglers. The Atlantic coast remains the only area in the continental U.S. where the APAIS angler interviews are still conducted by MRIP’s contractors. Shifting APAIS to the states in the Gulf of Mexico has resulted in substantial improvements in data quality, a better sense of involvement by the participating states, and more confidence in the results by the interviewed anglers.

Beginning in 2016, all coastal states from Maine through Georgia will transition to conducting APAIS to collect information on marine recreational fishing catch and effort data in their own waters. Over the past decade several states (*e.g.*, Maine, New Hampshire, Massachusetts, North Carolina, South Carolina and Georgia) have successfully improved data quality, and stakeholder confidence in that data, through greater state involvement with APAIS contractors.

Based on these successes, the states, through ACCSP and the Commission, approved a plan to transition to state conduct of APAIS in 2016. The plan details the transition from the current NOAA Fisheries contractor to ASMFC/ACCSP and state conduct of the APAIS. Under this plan, NOAA Fisheries will retain primary accountability for APAIS and will be responsible for survey design, catch and effort estimation, and public dissemination. The Commission and ACCSP will act as the central coordinators of the state-conducted APAIS and will be responsible for data entry, compilation, quality control/quality assurance, as well as formatting and delivering intercept data to NOAA Fisheries. States will oversee and manage field collection, which will be conducted by state or Commission employees in accordance with APAIS standard data collection protocols.

NOAA Fisheries is also transitioning parts of the effort survey it administers from a landline phone survey to mail survey. In the past, MRIP has estimated effort through the Coastal Household Telephone Survey (CHTS), which randomly targets households with landlines in coastal counties. As you can imagine, this methodology has a number of shortcomings, including declining response rates to household telephone surveys generally and the increasing proportion of households that only use cell phones. Recently completed pilot studies indicate mail surveys are a much better tool for capturing recreational fishing effort by increasing response rates, reaching a broader population of anglers, and improving response accuracy. The pilot studies also found the new survey resulted in considerably higher estimates of fishing effort, which in turn will result in correspondingly higher estimates of catch. What this means is that once the new survey is ready for implementation, which will take two to three years in order to align the new estimates with the historical data series, there could be significant stock assessment and management implications. In order to develop the most appropriate way to transition from historical to improved survey designs, NOAA Fisheries has formed a Transition Team, composed

of representatives from the Regional Councils, Interstate Commissions, and state partners, to design an implementation plan for the new mail survey.

In order to assess MRIP's progress in addressing the NRC's 2006 recommendations, the MRIP Executive Steering Committee, of which the Executive Directors of the three Interstate Commissions are members, is pleased that a new NRC review is scheduled to be conducted next year. It is my hope the review will find MRIP's accomplishments, including changes to APAIS administration and the effort survey, are vast improvements from its predecessor, the Marine Recreational Fisheries Statistics Survey. While these improvements have been a long time in coming, they represent time well spent in ensuring recreational fishing and effort estimates are accurate and best meet the needs of fisheries scientists, managers, and the angling public.

In closing, timely and accurate fishery-dependent data, in conjunction with robust fishery-independent data, are essential to the success of marine fisheries management in the United States. The Commission, ACCSP, and our state and Federal partners are committed to seeking innovative and cost-efficient approaches to address our data collection and management needs. We stand ready to assist you and the members of this subcommittee in any way we can to further our shared objective of effectively and sustainably managing Atlantic coast fishery resources.

Senator RUBIO. Thank you. Mr. Fitzgerald?

**STATEMENT OF BRETT FITZGERALD, EXECUTIVE DIRECTOR,
SNOOK AND GAMEFISH FOUNDATION**

Mr. FITZGERALD. Thank you very much, Chairman Rubio and Ranking Member Booker, staff members. My name is Brett Fitzgerald. I am the Executive Director of the Snook and Gamefish Foundation. I live in Lake Worth, Florida.

I was asked to kind of tell the story of our Angler Action Program, which is a recreational data collection system, in the hopes that might help shed some light on the progress toward innovations in fish reporting.

In 2010, as Senator Rubio knows, Florida dealt with a historical event that led to temperature drops that had an impact on a lot of wildlife, including gamefish and specifically of our interest, snook.

Biologists asked us to see if we could figure out what fishermen in Florida were catching when they were targeting snook to see if they could get a handle on the population.

Based on that ask from them, we got together with scientists from Florida's Wildlife Commission, Texas Parks and Wildlife, there were some NOAA scientists that contributed as well, and a lot of fishermen, and developed a logbook system where snook fishermen could record what they were catching at that time.

It was kind of a rudimentary process. It was just a paper process based on an old logbook system, and we built a website that corresponded so they could transpose their data.

After a year's time, we had enough snook directed data, and an interim stock assessment was done, and we were asked to provide our data to the state. That data was used in the stock assessment, particularly in the released/discarded fish data, the location and size of the fish that were released.

We were asked to continue the program, which we did, and the next year a full stock assessment was done and the data was asked for again, and the data was used again for the state level stock assessment.

To our knowledge, that is the first and only recreational database that was developed outside of a state and used at that level.

We were asked to expand to other species and improve the technology, so we did expand, and we now collect data on all fish, freshwater, saltwater, and we have the capability of collecting data on a national scale.

The website itself, the input process has improved and been revised several times, and now anglers can log directly to that system on the website in the same way they did, or they can use a variety of Smartphone apps that feed into the system.

The original app was called “iAngler,” and that was designed as a full trip reporting system, the information and data fields that again we designed with scientists and biologists guiding us along. From there, we developed another level of technology, a sister app, called “iAngler-lite,” that is designed with a function where they can record live fish by fish to kind of hone in the precision, and we have also created some affiliate programs and partnered up.

Guy Harvey Outpost saw the value in what we were doing and they made what is called a “skin of our app,” which essentially allows them to have the guts of our app but their brand over top of it, so they could help tell the story and help collect data and contribute to the process.

Here in this area, a group called Chesapeake Catch, four or five recreational groups, who worked closely with Maryland DNR to develop a sister affiliate here that also adds data into the Angler Action Program. Maryland was very forthcoming with how they were going to use that data specifically by species and what data points they would use. They are off to a great start in collecting data here in the Chesapeake area.

We have also developed a full tournament management system initially for the purpose to just access that segment of fishermen that might not have been used to the idea of reporting catches, but that is turning out to be a very strong database in itself, and through that, we have partnered with CCA, one of the largest conservation groups, fishing conservation groups, in the country. We will be running their STAR tournament in Florida throughout this year, which they expect to have 5,000 anglers.

Again, introducing more people, and the ultimate goal of changing the culture of recreational anglers participating in stock assessments in any way that we can.

Toward the idea of making sure our data is valid, I believe FWRI secured the funding from NOAA, but they have started an independent analysis through the University of Florida. It is about a 4-year study, the first year has been done, and in this past year, they looked at catch rates compared through our Angler Action Program to the MRIP dockside surveys.

When you look at areas where we have a number of anglers reporting and you look at the species most commonly reported, which were snook, red drum, and spotted sea trout, the data compares very favorably, so that is a great step in the right direction toward making sure our data is valid and useful.

We do have goals for this beyond fisheries management with the understanding that is what we are here to talk about today, but we hope to also use this data to help advance things like habitat mapping or keeping track of foreign fish species and things like that, but ultimately, like I said, we are just trying to lead toward

a cultural shift and a change in mentality, both from fishery managers and anglers as well to kind of come together and make sure we help each other solve the problems the best we can.

[The prepared statement of Mr. Fitzgerald follows:]

PREPARED STATEMENT OF BRETT FITZGERALD, EXECUTIVE DIRECTOR,
SNOOK AND GAMEFISH FOUNDATION

Good afternoon Chairman Rubio, Ranking Member Booker, and members of Committee. Thank you for giving me the opportunity to provide testimony regarding innovations in data collection for recreational fisheries. My name is Brett Fitzgerald, I am a former paratrooper in the U.S. Army Special Forces, lifelong recreational angler and currently Executive Director of the Snook and Game Fish Foundation that was created in 1989 through the visionary work of William Mote of Mote Marine Laboratories in Sarasota, FL. In my tenure as Executive Director for the Snook and Gamefish Foundation I have guided the organization to play a leading role in smart-phone technology to make anglers part of the data collection process for management of fisheries.

For this hearing, I was asked to discuss the Foundation's innovative Angler Action Program (AAP), which is used in recreational angler data collection and is showing signs of improving angler confidence in both the decisions that fishery managers make as well as the data and assessments those decisions are based on.

In Florida and South Texas, snook is a prized fishery that drives coastal fishing and tourism economies. Snook are hard fighting fish comparable to striped bass on the Atlantic Coast and salmon on the Pacific Coast. In 2010, the Florida Wildlife Research Institute (FWRI), the scientific arm to the State of Florida's Fish and Wildlife Commission, faced a crisis in the snook fishery due to a historic cold event lasting several days that dropped water temperatures well below the range for snook to survive as far south as Everglades National Park on the southern most peninsula of mainland Florida. Thousands of fully mature snook perished, many of which were critical spawners to the preservation of the species. In that difficult time, Florida snook anglers were asked to help provide personal fishing data through the AAP. Today, after being used in two Florida state snook stock assessments and on deck to be used in a third this year, the AAP has grown into a network of tools that can collect recreational angler data for any species of fish, anywhere in the Nation (and beyond). While the AAP is continuously evolving based on the needs of fishery managers and ever improving technology, the story of how the AAP has grown can shed light upon how it might be better used in the near future to assist fishery management at a national level.

Back in 2010, Jim Whittington, a lead snook biologist for FWRI, inquired whether the Snook & Gamefish Foundation (SGF) could inform his team on what snook anglers were catching after the weather event passed. There was a need to understand how badly the snook population was impacted by the extended cold. It was an easy ask for passionate anglers who were equally concerned. Because the snook harvest season was placed into emergency closure by the Florida Fish and Wildlife Conservation Commission (FWC), the challenge of collecting timely, precise data meant the current angler dependent surveys that monitored caught and kept snook through boat ramp surveys could not meet the immediate need.

Under the guidance of biologists from FWRI, the Parks & Wildlife Department of Texas, independent statisticians and SGF volunteers, the first generation of the AAP was created. This first data collecting tool was based largely on a previously successful "log book program" that FWRI had been using as part of a longitudinal study of a select panel of snook anglers. The AAP, it was agreed, needed to be more streamlined, easier for anglers to use, provide real-time data, and of course satisfy certain specific data needs. Those specific needs included data fields such as the size and distribution of released fish, general location of catch, time spent fishing, and others. Anglers were asked to record their information on a sheet of paper (to eliminate memory bias) then enter data at a new website, www.angleraction.org, which had corresponding data fields where anglers could easily transpose information from their paper record to the computer.

By the end of that first summer, thousands of snook directed fishing hours were logged into the system. Shortly thereafter, FWRI completed an interim snook stock assessment and the AAP data was requested.

FWRI scientist Dr. Robert Muller, who is in charge of Florida's fish stock assessments, found immediate use for certain data fields. "The distribution of snook released, and the size of those fish, was particularly helpful," Dr. Muller noted. This particular information, he continued, is not included in the current fishery depend-

ent survey models, and therefore answered questions that previously were not addressed.

Participating snook anglers were elated that their data collecting efforts were helpful in such short notice. For our part, SGF worked diligently to ensure anglers not only provided accurate data, but kept expectations tempered when it came to application of data. The message that was handed down from FWRI was clear: This is a new concept, be patient, and don't expect the AAP to be a tool used to conduct a "snook census." Rather, anglers should continue to log trips so the AAP data can be applied where it can help, and supplement the current models to aid in improving overall stock assessment accuracy.

SGF, whose mission is to support the protection and preservation of current fish populations for future generations by facilitating coordination between anglers, researchers, and policy makers, kept busy keeping participating anglers informed and on track. Messaging highlighted the importance of things like accurate data, consistent reporting of "zero catch trips," and most importantly, the cultural shift that recreational anglers need embrace to become part of the answer in ensuring fisheries are well managed and abundant. Volunteer anglers seemed to take pride in knowing that they participated in a "first ever" event—a database created by recreational anglers that was directly applied to a state level stock assessment.

12 months later, AAP data was once again tapped when a follow-up snook stock assessment was completed. Around this time, SGF was asked if the volunteer survey could be expanded to other game fish. Scientist and fishery survey experts particularly noted that the discard data of catch and release fishing captured by the AAP was extremely helpful, and biologists wanted to know if it could be applied to other species. To accomplish this, the AAP needed upgrades—anglers needed a faster, easier way to input data.

SGF consulted with scientists and studied options for mobile smart device logging such as the new Texas-based iSnapper. SGF then facilitated a group of biologists, anglers, programmers and other fishery experts to address the primary question, 'How can the AAP maintain its scientific integrity yet add new technology (and the inherent biases of fishery surveys) into the equation?'

Little did we know at the time that Snook and Game Fish Foundation was on the cutting edge in processes of e-survey design (and upgrades)—SGF brings in scientists/managers (mostly on loan from FWRI), fishing captains, recreational anglers, and programmers to help design the changes/upgrades so that the AAP satisfies as many needs as possible without accidentally introducing biases that limit fishery managers utilizing the AAP for management decisions.

Current state of the AAP

The number of loggers in Florida has grown, as has geographic distribution and available platforms for anglers to participate. Anglers are able to continue logging in the original format (writing information down then transposing directly to the website), or they have a variety of mobile smart device applications which allow more immediate data input. The first generation AAP mobile application, iAngler, is designed to capture whole trip information at the completion of a fishing trip. Recently a new mobile app, iAngler-lite, was developed with the intent to allow anglers to enter fish "real time." Anglers are able to start a fishing trip then quickly snap a photo of caught fish and enter data essential to fishery managers—a process that literally takes seconds to complete. Both iAngler versions are trending towards a more comprehensive tool for anglers where they can already weather, tides, and specific locations to improve their angling skill and collect useful information for science. We foresee both versions continuing to evolve as they're scrutinized by anglers and scientists in the effort to design platforms with expanding functional value for both.

The value of AAP data has reached outside the state of Florida as well. In the Chesapeake region, a handful of fishing groups organized a program called "Chesapeake Catch," an AAP affiliate program which includes a mobile smart device application. Now anglers in that region can log catch data into the AAP in the same manner as Florida anglers. The data is flagged in the database so local agencies can perform analysis and use data accordingly. The Maryland Department of Natural Resources (MD DNR) has committed to using AAP data provided by Chesapeake Catch anglers in a variety of specific ways. Not surprisingly, discard information is the primary draw for scientists. Dr. Joseph W Love (MD DNR) reported that "The Chesapeake Catch [mobile smart device] app works great and I look forward to using it and promoting it in the future." Several species of concern were noted directly for analysis, including Atlantic Croaker, Red Drum, Spotted Sea Trout, Shad, Yellow Perch, Spot, and of course Striped Bass.

With over \$200,000 invested in refining angler self-reporting apps (much of which provided through funding by the Repass Foundation and the National Fish and Wildlife Foundation), the Snook and Gamefish Foundation has begun to work with multiple partners to skin the AAP to suit specific purposes. For example, Guy Harvey Outpost, which has a strong sense of conservation ethos, offered to contribute directly to the AAP by creating a branded “skin” of the iAngler-lite app. The Snook and Gamefish Foundation designed, tested and recently launched the iGhoFish mobile smart device app which is now promoted globally through Guy Harveys Outposts. This will add a new level of data collection which will help to fortify our database as a data reference point to validate stock assessment conclusions and management decisions related to discard mortality in fisheries.

The network of AAP affiliates will likely grow as regions across the country recognize the functional use of self-reported data and the AAP continues to represent an established, trusted source for data collection.

SGF also recognized the preponderance of fishing tournaments as a source of opportunity for self-reporting. Not only are fishing tournaments themselves a potential source of data, they also create an avenue of communication to a sector of recreational anglers who might not otherwise hear about programs like the AAP. To maximize opportunities in this arena of angling, SGF once again called upon a well-rounded team to design and develop a tournament management system that would familiarize tournament anglers with the process of self-reporting. With funding from the Fleming Family Foundation, the iAngler-Tournament system was created.

iAngler-Tournament was originally designed to facilitate the cultural change of electronic self-reporting to experienced anglers. Quite simply, that change means that fishing public trust natural resources should include a conservation ethic to assist with reliable information to best manage fisheries and that it can be done with relatively little effort. Surprisingly, the tournament management and data collecting system has proved to be wildly popular. Managing tournaments can be a laborious labor of love for committed fishing groups across the country and i-Angler-Tournament has streamlined that process. As well, with the unique dataset provided through tournaments, even more resolution at the “per-fish” level is generated with highly accurate size, location, and time of catch information provided (with time-stamped images of each catch). Because of the iAngler-Tournament data is not designed as a voluntary survey in the same manner of the AAP and affiliated apps and brings a host of new potential biases, the data is flagged in the database so future analysis can be contemplated by stock assessment analysts as to the usefulness of the reference point in full stock assessment analysis. SGF sees this type of data becoming very useful in arenas other than stock assessment analysis, such as functional habitat mapping and prey/predator geospatial relationships.

Finally and most importantly, the Coastal Conservation Association (CCA), one of the largest private recreational fishing organizations in the country, has partnered with SGF in Florida to use the AAP platform for their forthcoming STAR tournament projected to include over 5000 anglers across the state in the first year alone. CCA-Florida Star will bring awareness of the importance of self-reporting to legions of anglers and at the same time do incredible service to conservation of the state’s fisheries by embracing a catch and photo release e-reporting tournament system.

The additional functionalities and partnerships of the AAP and expanded format has not decreased the value of the data. In fact, FWRI called for AAP data to be used in the upcoming snook stock assessment, and the expansion to other species of fish is on track to provide helpful data in other fisheries. FWRI’s Dr. Muller provided some details to that point:

“In Florida, the three most popular fish caught by recreational anglers, spotted sea trout, red drum, and snook, all have slot limits and snook has either a six or seven month closure depending on the coast. This means that each year many fish are released. National Oceanic and Atmospheric Administration’s (NOAA) Marine Recreational Information Program (MRIP) estimates the numbers of fish harvested and released, but creel samplers at the dock cannot measure a fish that was released. Further, adding an observer to a flats boat is not feasible either. Therefore, having anglers record the size of fish caught in the Angler Action Program is invaluable. Assessment biologists want to know the size and ages of fish removed from the population and, with so many fish being released, the length data from the AAP lets us quantify how many legal-sized fish were released as well as how many under-sized fish and how many over-sized fish were released. Data from the AAP has been used in two recent snook stock assessments and will be used in another assessment later this year.”

As AAP data carves out a niche in Florida's stock assessment process, biologists and scientists who supported the program continue to pursue methods of ensuring validity of the data. No individual from the science community has provided more guidance and leadership than Dr. Luiz Barbieri of FWRI. Dr. Barbieri's consistent messages of encouragement to SGF and our volunteers, measured with doses of tempered expectations and patience, have been extremely valuable. His understanding of the complexity of stock assessments at the state and Federal level have allowed the AAP to grow in such a way that, so far, we have not inadvertently introduced any biased information, which might invalidate the project.

In his pursuit of capturing the best available data, Dr. Barbieri and his staff coordinated funding which allowed an independent third party to begin some much needed analysis of the AAP database. The University of Florida's Fisheries and Aquatic Sciences lab, directed by Dr. Robert Ahrens, was tapped with the task of data analysis. Funding was to allow for a multi-year analysis of data, focusing on a variety of data applications and functions. The first year of analysis, led by graduate student Ryan Jiorle, was recently completed and a summary of results were shared at the FWRI headquarters in St. Petersburg, Florida in April 2015. The first year of analysis focused on comparing catch rates of AAP volunteers to those in the MRIP survey.

Jiorle's results suggested that in areas where AAP logging has gained a foothold among anglers, the data compares very well to MRIP data for the most commonly logged species. Jiorle noted, "Most of the saltwater fishing trips reported through the AAP targeted three specific species: common snook, spotted seatrout (*Cynoscion nebulosus*), and red drum (*Sciaenops ocellatus*). While there is not nearly as much data on the many other species fished for in Florida, the amount of information regarding these three species of fish still provides valuable information for *their* assessment.

"When considered at appropriate spatial levels, AAP data for these three species provide similar mean catch-per-trip values (*i.e.*, average number of fish caught in a single fishing trip) to those of MRIP's survey. These "catch rates" are very important metrics for the assessment of fisheries, and analysis of the AAP database has shown that there is potential for these electronic, self-reporting programs to provide representative information for recreational fisheries—provided there is sufficient coverage across the spatial region in question."

Jiorle's analysis supported Dr. Muller's comments regarding the value of discard data by AAP volunteers. "One of the largest advantages for these electronic, self-reporting programs is the ability to provide extensive information on discarded (released) fish. The MRIP survey is conducted from land, and it is difficult for the interviewers to obtain information on fish that were released at sea. However, many recreational fisheries are "catch and release" fisheries, meaning most if not all fish are discarded by the angler. Because electronic self-reporting programs allow recreational fishers to keep track of fish as the catches happen, they can provide the number, species, lengths, weights, and locations of fish caught and released (the latter being unavailable from the MRIP survey). These novel pieces of information that are possible to gather under a program like the AAP would provide large contributions to fisheries stock assessments.

"Another advantage of an electronic, self-reporting program is the ability to collect sufficient information for very rare species. Certain species have so few fishers targeting them that a sampling-style program like MRIP does not adequately cover them. However a program that theoretically allows all of those trips to be reported represents a large advantage for the assessment of those rare fish populations."

Jiorle's analysis did reveal certain data biases. First, for the three species addressed, "the AAP dataset contains a spatial bias towards the central-south Atlantic coast of Florida. A stretch of five coastal counties accounts for half of all of the saltwater fishing trips in the AAP. This same stretch of counties only accounts for 17.6 percent of all saltwater fishing trips surveyed through the MRIP program—which is considered the most extensive recreational fisheries data collection program."

This spatial bias is a very important consideration as the AAP moves forward. Essentially, this finding suggests that in regions where a sufficient number of recreational anglers participate in the AAP, catch rates can validly be compared with MRIP data. The spatial bias issue seems to suggest that a more aggressive approach with angler self-reporting might be warranted. Already states such as Alabama, Mississippi, Louisiana and Florida are moving towards special reef fish permits for anglers pursuing federally managed species. Alabama and Mississippi are also moving toward mandatory e-reporting apps for greater accountability and validation on the precision of MRIP data used for management in those fisheries. It should be noted that the National Marine Fisheries Service has prioritized angler self-report-

ing in their recent Electronic Monitoring and Reporting Regional Implementation Plan released earlier this year.

To be clear though, angler self-reporting is not a silver bullet to fishery data needs, it is a reference point with growing usefulness—an extremely important one being the involvement and rebuilding of trust among anglers in the stock assessment process. Fisheries, particularly those in which barotrauma (the rapid ascent of a fish from depth that causes injuries precluding successful catch and release) require long term, committed investment of funds to ensure the long term sustainability of stocks. A recent bill passed by the House Appropriations Subcommittee on Commerce, Justice, Science, and Related Agencies would invest \$10 million in Fiscal Year 2016 to the Gulf of Mexico alone to ensure appropriate fishery monitoring. The Southeast United States, including the Gulf and Caribbean has more saltwater recreational anglers than any other region and a complexity of natural resources such as reefs, corals and marine mammals that necessitate numerous methodologies to appropriately monitor fish stocks without harming other resources. Yet, the Southeast is the only region in which one fishery science center must service the needs of 3 regional councils (Gulf, South Atlantic, Caribbean) and it has been chronically underfunded to meet demands.

AAP and Future Applications

SGF has come to appreciate the complexities of stock assessments at both the state and Federal level. It is clearly understood that recreational angler data presently suffers from both a less than optimal level of precision for managers to base decisions on as well as the untimely availability of information for managers to make decisions *during fishing seasons*. One might say our fisheries (particularly co-managed state and Federal fisheries) have evolved into “pulse” fisheries where a tremendous amount of fishing activity occurs within weeks. At the same time, data collection systems designed to archive those catches have not evolved to meet the needs of managers. For example, Gulf of Mexico Red Snapper data is collected in two month waves and each wave takes time to be processed and certified—the season comes and goes without managers having any real sense of how many fish were caught.

Without question there is a need for improved recreational data collection. The archival style of data collection that informs long term analysis of U.S. fisheries must be supplemented with real-time information and e-reporting tools for fishery managers to maximize fishing opportunities with the confidence that they are not allowing overfishing and risking the economic stability that long term sustainability provides coastal communities.

To that end, SGF seeks to continue coordinating with NOAA’s scientific community and move forward in providing more precise and timely voluntary recreational angler data. In particular the nexus between app self reporting and defined universes of anglers mandatorily required by states to secure a permit are opening opportunities for ‘mark and recapture’ as well as panel studies to provide essential validation estimates on angler self-reported data. These are immense challenges that will require better cooperation between the states that employ dock-side surveyors and MRIP which provides funding to the states to cover portions of the costs to employ those surveyors.

SGF also recognizes the need for some kind of national standard for electronic self-reporting systems. While there is risk in “farming out” data collection, the growing number of private and state level data collection programs calls for unified guidance. Through our extensive design process, SGF has come to understand that any variance from the standard can potentially introduce a bias—real or perceived—which in either case can cause data to be rendered invalid or damage public perception of the project such that the necessary voluntary participation is extremely difficult to attain. This truth speaks to the value of the AAP affiliate system, which allows participating groups to benefit from systemic design changes that are properly vetted by the AAP design team.

Beyond Stock Assessments

With the understanding that this hearing is focused on using voluntary self-reporting systems to assist with fishery management, SGF also has heard from legions of anglers who hope to see the AAP database used in several other ways, and we would be remiss if we did not mention just a couple of those points. Habitat mapping is a very common theme, and discussions with interested parties have begun, including several counties in Florida who are groping for methods to quantify the money spent on much needed habitat restoration projects. Especially with Restore Act funds becoming available in the Gulf of Mexico, SGF sees the AAP (and iAngler-Tournament system) as vehicles of positive influence in this arena.

Finally, with the recent awareness campaigns focusing on forage fish, SGF sees opportunities to provide functional avenues of contribution from recreational anglers. Successful management of forage (bait) fish is a priority issue for recreational fishers. As the food supply for game fish from tarpon to tuna, the importance of comprehensive management of forage fish is evident. This was a key recommendation in the 2014 Morris-Deal report, "A Vision for Managing America's Saltwater Recreational Fisheries." It is also one of the few marine fisheries issues where there seems to be broad agreement amongst recreational, commercial and conservation organizations. Currently, the very few forage fish that are under Federal fishery management are not managed to meet the needs of predators that depend on them. At the same time, market pressure is increasing to expand industrial fishing for these prey species, which often end up being used as pet food or fertilizer. SGF sees the importance of investing in monitoring and data collection of prey species to provide more and better information on the catch and status of forage species. Electronic self-reporting can allow recreational anglers to play a direct role in this critical management issue. With the understanding that important design changes would be required, AAP-type reporting can provide essential scientific information on prey species, which is needed to guide management of these fish, and ensure enough forage fish are left in the water to meet the food needs of predators that fuel the recreational fishing industry.

The purpose of introducing habitat mapping and increased forage fish protection is to highlight the point that voluntary recreational data will have extensive functional uses as the database grows in size and power. These types of data-driven goals work in concert with the main focus of this testimony, improved fishery management through innovative technologies, especially with the effort to encourage a growing number of anglers to record accurate information.

With these points in mind, there are a few specific items which SGF feels are of particular importance moving forward:

1. Match the funding (\$10 million) secured by the House Committee of Appropriations to invest in data collection in the Gulf of Mexico.
2. Increase the precision of stock assessments by directing NOAA to invest restoration funds towards habitat mapping so a full and complete inventory, rather than an estimate, of habitat for assessed species is finally known.
3. Fund and direct MRIP to return to the one month waves of data collection during peak recreational fishing season from spring to fall, much like was done during the oil spill so managers have information much faster to make important decisions.
4. Currently, the National Research Council (NRC) is conducting a review of MRIP. That Review should be directed to include if and how MRIP can have greater precision in its estimates, possibly a benchmark goal of no greater than +/-10 percent as well as timeliness to meet the management needs of pulse fisheries that require information real-time to maximize fishing opportunities. If the NRC concludes these objectives cannot be met within the paradigm of MRIP they should recommend alternatives to spin-off these much needed improvements.
5. NOAA must be funded and directed with both existing appropriations and oil spill funds to prioritize investments outlined in their regional Electronic Monitoring and Reporting Plans, and these plans should be updated every two years to keep pace with the changing improvements of technology.
6. NOAA must direct the eight regional councils to prioritize Exempted Fishing Permits that use small portions of recreational quota to test new technologies for advancing modern data and management technologies in real world applications so valuable lessons can be learned and rapid improvement for application can be obtained.
7. States should be incentivized to streamline their current fishery data collection systems to meet a minimal level of Federal fishery assessment protocols in order to increase timeliness and avoid the long delays of recalibrating one set of assessment protocols to integrate to different ones.
8. Finally, resources should be dedicated to the design and implementation of a self-reporting system which will allow for more precise and timely assessment of all of our prey species.

Thank you for the opportunity to testify today. I would be happy to answer any questions that you have.

Senator RUBIO. Thank you. I was showing off my snook pictures. Dr. Murawski?

**STATEMENT OF STEVEN A. MURAWSKI, Ph.D.,
DOWNTOWN PARTNERSHIP-PETER R. BETZER ENDOWED
CHAIR OF BIOLOGICAL OCEANOGRAPHY,
UNIVERSITY OF SOUTH FLORIDA**

Dr. MURAWSKI. Thank you. I will show you my pictures later. Chairman Rubio, Ranking Member Booker, and Committee staff, thank you for the opportunity to provide testimony on important issues related to the management of our nation's fisheries.

My name is Steven Murawski, and I am a Professor of Fishery Science at the University of South Florida in St. Petersburg. I appear before you today to discuss innovative technologies and strategies to improve the quality and timeliness of fishery stock assessments, so critical to the management of state, national, and international levels.

My perspectives in providing testimony are twofold, at USF, I have been involved in the development of advanced technologies to assess the abundance of important reef fish species off South Florida.

Commercial and recreational industries there generate tens of billions of dollars annually in economic activity. It is, therefore, of utmost importance that accurate, timely, and credit stock assessments are forthcoming.

Our work is aimed at advancing technologies to fundamentally change the discourse on the status of fish populations as a basis for improving management.

Prior to coming to USF, I retired after 34 years of service at NOAA as the Director of Scientific Programs and Chief Science Advisor for NMFS. I have seen fishery management programs be enormously successful and credible in the eyes of stakeholders.

One clear and unambiguous factor in the success of fishery management programs is they are based on accurate, transparent, and timely stock assessments. Fishery management programs for species like Bering Sea pollock and the Atlantic sea scallop are viewed as successes, not only because they meet their statutory reference points, but that they are profitable and well managed in the eyes of most constituents.

The science supporting these management programs is considered state-of-the-art. It involves both traditional and high technology sampling applications, collaborative research with industry, and probative stock assessments that include continuous quality improvement cycles.

Extending these features to the majority of high profile fisheries in the United States remains a daunting challenge for NOAA and the states, whose fishery science budgets have actually declined significantly in the past half decade.

Today, I want to discuss several features of advanced technology applications that can be useful in improving the scientific basis for fishery management.

Properly designed fishery independent surveys are critical to accurate stock assessments. Traditionally, fishery independent surveys have used a variety of gears, such as small mesh trawls, bait-

ed hooks, and gill nets. However, fishes may be distributed along reefs and in boulder fields where these gears are not deployable.

Increasingly, because of the establishment of the no take marine protected areas, lethal sampling may no longer be allowed in some parts of the stock's range. So-called "untrawlable habitats" represent a considerable and growing challenge in all regions of the United States.

Advanced optical methods combined with acoustics are in my view the best option for enumerating fishes occurring in untrawlable habitats. Advances in camera performance and the availability of low cost components have made the use of video and still cameras a viable option for fish surveys.

There are some developments in the use of towed camera systems to include the joint Woods Hole Oceanographic Institute and NMFS program called HABCAM, and joint USF/NMFS program called C-BASS.

The HABCAM implementation was developed to quantify the abundance of sea scallops in the Mid-Atlantic and Georgia bank regions. This fishery is the most valuable fishery in the United States, and prior assessment techniques used primarily small dredges which had variable catchability and could not be efficiently deployed in rocky habitats.

There were significant ongoing disputes regarding the efficiency of scallop dredges, ranging from 10 to 40 percent efficiency. This question was definitively resolved when advanced camera system sampling was instituted.

The C-BASS system was developed as a towed video system, as a proof of concept for a rapid assessment of the abundance of snappers, groupers, and other important species.

Moving from a proof of concept to a region-wide stock assessment capability requires that a number of issues be resolved, including mapping of habitats, development of robust deployable hardware, and analysis capabilities for literally hundreds of miles of video and still imagery, and exciting possibilities of combining acoustic monitoring methods for the water column with the near bottom camera systems. In case of corral reef fishes, the two sets of technologies are complimentary.

Requirements of the Magnuson-Stevens Act for annual catch limits based on the results of stock assessments imposed a daunting burden to assemble, analyze, and peer review data for inclusion in the management process. The advent of advanced acoustic and optical methods for counting fish offers the opportunity to develop direct estimates of abundance for a wide variety of near bottom species.

Facial recognition and threat detection software originally developed for homeland security and defense applications are precisely the tools that fishery scientists need to process imagery quickly and accurately. Advances in these fields have been rapid as evidenced by a 2014 National Academies of Science workshop supported by NOAA.

Over the years, conservation engineering programs at NMFS and within the states have declined as funding was repurposed to other higher priority programs. However, working with existing ocean engineering programs in academia, NMFS was able to develop stra-

tegic partnerships resulting in both the HADCAM and C-BASS systems.

Using industry, academic and government partnerships thus takes advantage of the skills and focus of each to develop and adapt technologies to real world problems of great practical importance.

A further benefit of such collaboration is the increased credibility of programs can bring in the eyes of the stakeholders.

I encourage Congress and the Administration to see as a priority the collaborative development and incorporation of new technologies in the stock assessment advisory process to sustain and take advantage of the economic and social benefits of our Nation's fisheries.

This is the future of fishery science. Thank you.

[The prepared statement of Dr. Murawski follows:]

PREPARED STATEMENT OF STEVEN A. MURAWSKI, PH.D., DOWNTOWN PARTNERSHIP-
PETER R. BETZER ENDOWED CHAIR OF BIOLOGICAL OCEANOGRAPHY, UNIVERSITY OF
SOUTH FLORIDA

Chairman Rubio, Ranking Member Booker, and Committee members, thank you for the opportunity to provide testimony to this Committee on issues important to management of the Nation's fisheries resources. Today I appear before you to discuss innovative technologies and strategies to improve the quality and timeliness of fishery stock assessments, so critical to supporting fishery management efforts at the state, national and international levels.

My perspectives in providing this testimony are two-fold. For the past 4+ years I have been a professor of Biological Oceanography at the University of South Florida (USF), in St. Petersburg. One of the major projects I have been involved with is the development of advanced technologies to better assess the abundance and habitat requirements of important reef fish species off west Florida (Fig. 1). The commercial and recreational fishing industries and allied businesses there generate 10s of billions of economic activity based on these fisheries. It is of utmost importance that accurate, timely and credible stock assessments of fish stocks supporting these industries be forthcoming. The work of my colleagues, students and institutions with which we partner is aimed at using advanced technologies to fundamentally change the discourse on the status of fish populations as a basis for providing management advice.

Prior to coming to USF, I retired after 34 years of service at NOAA as the Director of Scientific Programs and Chief Science Advisor for the National Marine Fisheries Service. My entire professional life at NOAA was as a fish population dynamicist. I have worked on projects to oversee the provision of stock assessment advice, first in New England and the Middle Atlantic states, then nationally and globally. I have seen fishery management programs be enormously successful and credible in the eyes of the stakeholders. I have also observed conditions when fishery management was not successful and the conditions associated with that lack of success. One clear and unambiguous factor in the success of fishery management programs is that they are based on precise, accurate, transparent and timely stock assessments. Fishery management programs for species such as Bering Sea pollock and Atlantic sea scallop are viewed as successes not only because they meet statutory reference points, but that they are profitable and well managed in the eyes of most constituents. The science supporting these management programs is considered state-of-the-art. It involves high technology applications, collaborative research with industry and probative stock assessment that includes continuous quality improvement cycles. Extending these features to the majority of high profile fisheries in the USA remains a daunting challenge for NOAA and the states whose science budgets have stagnated or declined in the past half-decade or more. Today I want to discuss several features of advanced technology applications that can be useful in improving the science basis for fishery management.

How Many Fish in the Sea?

“. speak to the earth, and it will teach you, or let the fish in the sea inform you”.—Job 12:8

Modern fishery management approaches, such as those regulating Federal fisheries in the USA—as specified in the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA)—are based on two primary tenets: (1) that the fishing mortality rate is kept at or below an objectively-determined maximum limit, and (2) that the stock size be held at a level allowing the attainment of maximum sustainable yield (MSY). This specification of quantitative limits and targets is the hallmark of fishery management throughout the developed and increasingly the developing world (FAO 2014). Through regional, national and international fishery management agreements (*e.g.*, via treaties and Regional Fishery Management Organizations), fishery managers seek to balance short-and long-term social and economic performance of the fisheries with the limits imposed by population sizes and sustainable fishing mortality rates. At the nexus of the science-management interface is the process of conducting fishery stock assessments (Fig. 2; Cooper 2006). Stock assessments can be quite complex (Fig. 2) or relatively simple, depending on the nature of the fishery and quality of information available. In their simplest form they include time series of annual landings and estimates of relative fish abundance indexed by catch per unit of fishing effort (CPUE; Cooper 2006). In their most complex form that may include age-specific catch and CPUE data (*e.g.*, from “fishery-dependent” data sources) as well as one or more sets of age-specific “fishery-independent” abundance indices from statistically designed surveys. These data sources are usually combined into retrospective models estimating trends in fishing mortality and stock sizes at age. A projection step associated with the stock assessment process assesses the annual catches that would be derived based on various policy choices including maintaining the fishing mortality at or below some target level.

Properly designed fishery-independent fish surveys are a key element in providing accurate and precise stock assessments. Fisheries are usually biased towards concentrations of relatively large fishes, occurring at high densities. However, a full picture of the abundance and distribution of a managed stock must include all age groups (including the pre-fishery recruits), and areas that may be relatively large but may contain relatively low fish densities. Traditionally, fishery independent surveys have used gears such as small-mesh trawls (FAO 1982), baited hooks, dredges (for shellfishes), gill nets (of varying mesh) and seine nets (for shallow waters) to develop fishery independent surveys. Where the fishes are widely available to the gears (*e.g.*, haddock caught the trawl survey of the Northeast Fisheries Science Center) these gears provide reliable and relatively precise estimates of the abundance of various ages, for use in retrospective and forecasting parts of stock assessments. However, in many situations, the fishes may be distributed in high-relief habitats such as along reefs and in boulder fields where these gears may not be deployable (*e.g.*, trawls on coral reefs), or where the efficiency of the gear may be low and variable. Also, increasingly, because of the establishment of no-take fishery reserves or other marine protected areas (MPAs) lethal sampling may no longer be allowed for some part of a stock’s range.

So called “untrawlable” habitats thus represent a considerable and growing challenge to providing relatively precise and unbiased estimates of relative (or absolute) abundance for use in fishery stock assessments. For example, areas considered “untrawlable” include tropical reef habitats in the Pacific islands, the Caribbean and Southeast United States (*e.g.*, Fig 4), rock reef areas along the west Coast, in Alaska and the Northeast, and cold water coral areas off all the coasts of the United States. Many important fisheries occur in these areas including, in the case of tropical reef systems, species of snapper, grouper, amberjack and other species of commercial and recreational importance.

To address sampling of “untrawlable” areas, scientists have developed a number of approaches using traditional gears (*e.g.*, vertical longlines and gill nets) and advanced acoustic, visual, and optical methods. For example, visual methods, using divers to count along designated transects or at stationary locations has been applied in tropical reef settings (Bohnsack and Bannerot 1986; Ault *et al.*, 2013). However, without specialized mixed-gas diving methods, they are generally applicable to water depths of <30 m, which may leave considerable viable reef fish habitat unsampled.

Acoustic methods, including the use of ship-based echo sounders, have been used in stock assessments since the 1960s (Trenkel *et al.*, 2011). The integration of echoes off fish schools (Fig. 5) can be calibrated using *in situ* derived target strength (TS) measurements of individual animals to estimate the absolute (and relative) abundance of species that may occur over such untrawlable habitats (Fig. 5). However,

there remains a key issue with acoustic methods in the “dead zone” 1–5 meters above the bottom where reflected acoustic signals off the bottom may obscure fishes located within this band.

Recent Advances in the Use of Optical Systems for Fish Stock Assessments

Apart from the use of visual sighting surveys in relatively shallow waters, advanced optical methods remain the best option for enumerating fishes occurring in untrawlable habitats, especially ones distributed over wide spatial areas and depth zones. The use of video and still cameras has been applied since the 1960s to a variety of situations (Cailliet *et al.*, 1999; Martin *et al.*, 2004; Spencer *et al.*, 2005; Jones *et al.*, 2009; Williams *et al.*, 2010; Mallet and Pelletier 2014). Recent advances in camera performance and availability of low cost components have made the use of video and still cameras a viable option for fish surveys. One of the significant considerations is whether to use towed, tethered (remotely operated vehicles) or autonomous platforms (*e.g.*, Tolimieri *et al.*, 2009; Clarke *et al.*, 2010; Singh *et al.*, 2013) for such studies. The determining factor is the power requirements for the cameras, lights and other instruments onboard the vehicle, as well as the range of the stock being indexed. Current versions of AUVs equipped with video cameras is limited by battery power requirements.

Other approaches to indexing species in untrawlable habitats include the use of fixed location video pods to count the number of animals in a cylinder around the locations of these deployments (Gledhill *et al.*, 2006). These approach, used in the Southeast USA and Pacific Islands, provide relative indices of abundance but may be difficult to calibrate into absolute stock sizes due to the use of bait with an unknown attraction distance as well as the potential to double count fish swimming around such pods.

Two recent developments in the use of towed camera systems include the joint Woods Hole Oceanographic Institute/NMFS program called “HABCAM” (Habitat camera), and the joint University of South Florida/NMFS program called “C-BASS” (Camera-Based Assessment Survey System). I will discuss these systems in some detail as they relate directly to the use of advanced technology in the stock assessment process.

One HABCAM implementation (<http://habcam.whoi.edu/index.html>) was specifically developed in collaboration with NMFS to quantify the abundance of Atlantic sea scallop in the Middle Atlantic and Georges Bank regions (Taylor *et al.*, 2008; Gallagher *et al.*, 2010). This fishery is the most valuable in the United States and assessment techniques used prior to the use of camera systems were primarily small dredges which had variable catchability and could not be efficiently deployed in rocky habitats especially in the Georges Bank area. While behavioral reactions of scallops to the presence of the oncoming HABCAM are not a significant source of bias, discerning alive and dead scallop shells was an issue.

The C-BASS system (Lembke *et al.*, 2013; http://www.marine.usf.edu/cbass/?page_id=2) was specifically built to estimate the abundance of important reef fish species such as snappers, groupers, porgys and amberjacks, in untrawlable hard bottom habitats such as exist along the west Florida shelf (WFS; Figs 1, 3–6). The WFS is largely unexplored, although several multibeam expeditions (*e.g.*, Naar *et al.*, 2007) have developed maps for three of the managed areas (Fig. 1). The Florida Middle Grounds (Coleman *et al.*, 2004) has been explored using divers and ROVs, and is an area of relatively high fish abundance ideal for development studies of towed video technologies (Fig. 4). Working jointly with NMFS, the C-BASS team has developed the C-BASS system (Fig. 3) to allow rapid surveying of the carbonate reef systems typical of the WFS (Fig. 1). Abundance estimates (see steps below) were developed using camera transect data from 2013 and 2014 cruises to the area conducted aboard the R/V *Weatherbird II*, as a “proof of concept” for rapid development of fish abundance measures for stock assessment. The C-BASS work will continue for an additional three years under a grant from the national Fish and Wildlife Foundation to undertake studies of habitat damage as a result of the *Deepwater Horizon* oil spill.

Finfish stock assessments using towed camera systems, pose a number of challenging issues if the estimates from video sampling transects are to be extrapolated to absolute stock sizes. The steps involved in making abundance estimates from “raw” video footage include:

- Estimating fish abundance (numbers of animals viewed per arbitrary sampling unit (per frame, per minute viewed, etc.)
- Calculating the “area swept” (geometry of sampling device)
- Estimating fish density (numbers per area swept, *e.g.*, numbers per meter squared)

- Adjusting for fish avoidance/attraction behaviors (*e.g.*, Stoner *et al.*, 2007)
- Stratifying density by areas of different habitats (*e.g.*, sand, reef, grass flats, etc.) to derive overall abundance estimates

None of these issues is insurmountable and the fact that the C-BASS team was able to develop “proof of concept” estimates of target species absolute abundance demonstrates the utility of the concept in producing timely and accurate fishery-independent data for informing fishery management.

Summary

Requirements of the MSFCMA for annual catch limits based on the results of stock assessments impose a daunting burden to assemble, analyze and peer review data for inclusion in the management process. For many regulated stocks, the use of traditional sampling approaches such as trawls is sufficient to provide accurate fishery-independent data. However, for high relief habitats, such as coral reefs and rocky areas, traditional approaches cannot be effectively deployed in these areas and are thus inadequate to provide necessary information for robust stock assessment. The advent of advanced acoustic and optical methods for counting fish offers the opportunity to develop abundance measures for species inhabiting these regions where none were possible in the past. With the advent of advanced video evaluation techniques (National Academy of Sciences 2015), the process of developing more timely estimates from the imagery means that the system may be capable of enhanced throughput for multiple species simultaneously. For example, the process of converting video imagery into species counts (*e.g.*, Fig. 4) derives estimates for all the species encountered. Thus, efficient biomass estimation may be possible for the reef fish assemblage as a whole, thereby speeding the process of population estimation.

Moving from a “proof of concept” to a region-wide stock assessment capability requires that a number of factors be considered, including the location and spacing of video transects (efficient survey design), as well as developing a robust video interpretation capability. An exciting possibility for region-wide reef fish surveys is combining routine acoustic monitoring (Fig. 5) with near-bottom video using towed or autonomous camera systems. In the case of some reef fishes (*e.g.*, red snapper and amberjack) the two sets of technologies would be complementary.

While the development of new vehicles capable of imaging reef fishes enables a new stock assessment paradigm, one of the important ingredients is a precise accounting of the physical area of the various habitat types in the region of interest. Having high resolution multibeam bathymetric maps allows the use of highly efficient stratified designs with sampling intensity disproportionately allocated to areas of likely high reef fish abundance. With less than 5 percent of the WFS mapped, this represents a significant impediment to the use of the new technology for such surveys.

The examples of the adoption of new technologies to address old or particularly thorny stock assessment problems illustrates a few important points. First, over the years, conservation engineering programs at NMFS and within the states have declined as funding was re-purposed for other, higher priority programs. However, working with existing ocean engineering programs in academia, NMFS was able to develop in strategic partnerships both the HABCAM and C-BASS systems that hold great promise for transitioning to operational system status. Using industry, academic, government partnerships thus takes advantage of the skills and focus of each of the partners to develop and adapt technologies to real-world problems of great practical importance. A further benefit of a robust collaborative technology development capability is the increased credibility such programs can bring in the eyes of the stakeholders. The HABCAM effort in particular has proved its worth in this regard. Last, any sampling method, be it trawls, baited lines, acoustics or optics, has certain biases in terms of what species are encountered, and at what sizes. Rigorous evaluation of the inherent biases of new “disruptive” technologies, as well as traditional methods is now possible using new generation technologies and analysis tools. I encourage Congress and the Administration to see as a priority the collaborative development of approaches to evaluate and implement new technologies into the process of providing stock assessment advice to sustain and take full advantage of the economic and social benefits of our Nation’s fisheries.

Thank you for your attention, and I will answer your questions to the best of my ability.

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ATTACHMENTS

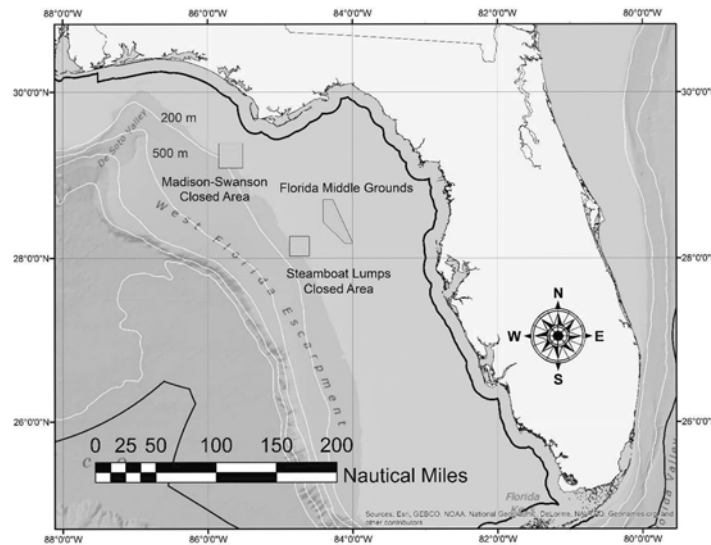


Figure 1. Map of the continental shelf off Florida. The broad, relatively shallow area off west Florida is termed the West Florida Shelf (WFS). Three fishery management controlled access areas are plotted (pink).

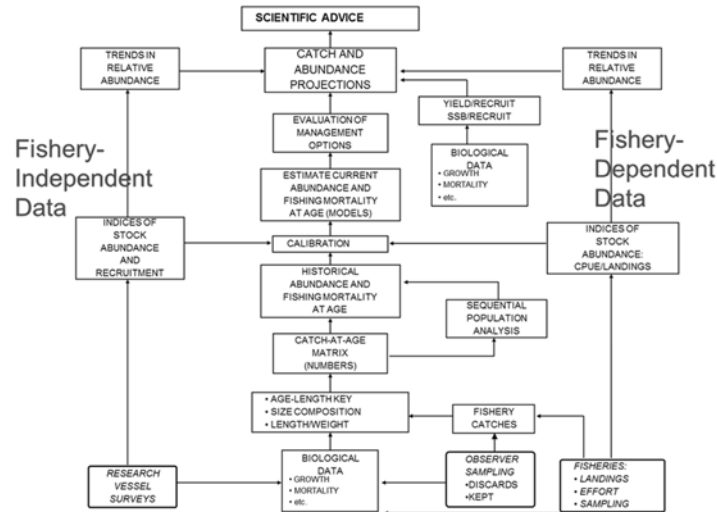


Figure 2. Process control diagram of steps involved in an idealized fishery stock assessment. The process uses both fishery-dependent data and fishery-independent data to estimate trends in population size, recruitment and fishing mortality rates.

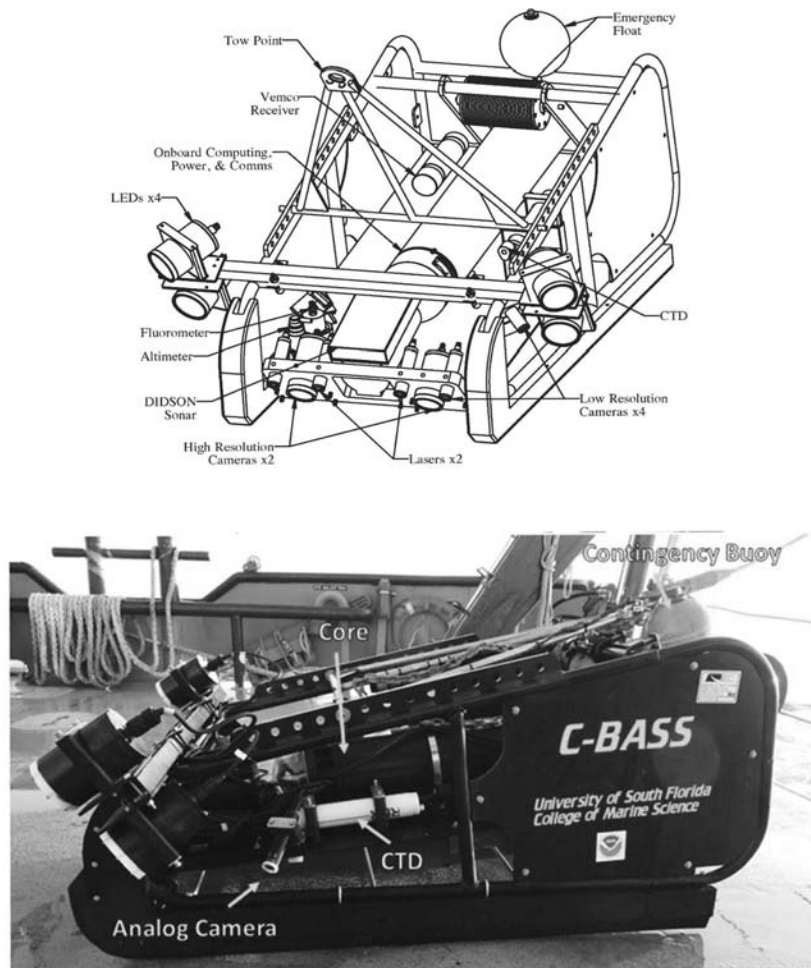


Figure 3. Schematic (top) and actual views of the Camera-Based Assessment Survey System (C-BASS) towed camera vehicle, illustrating the placement of cameras and other instruments.

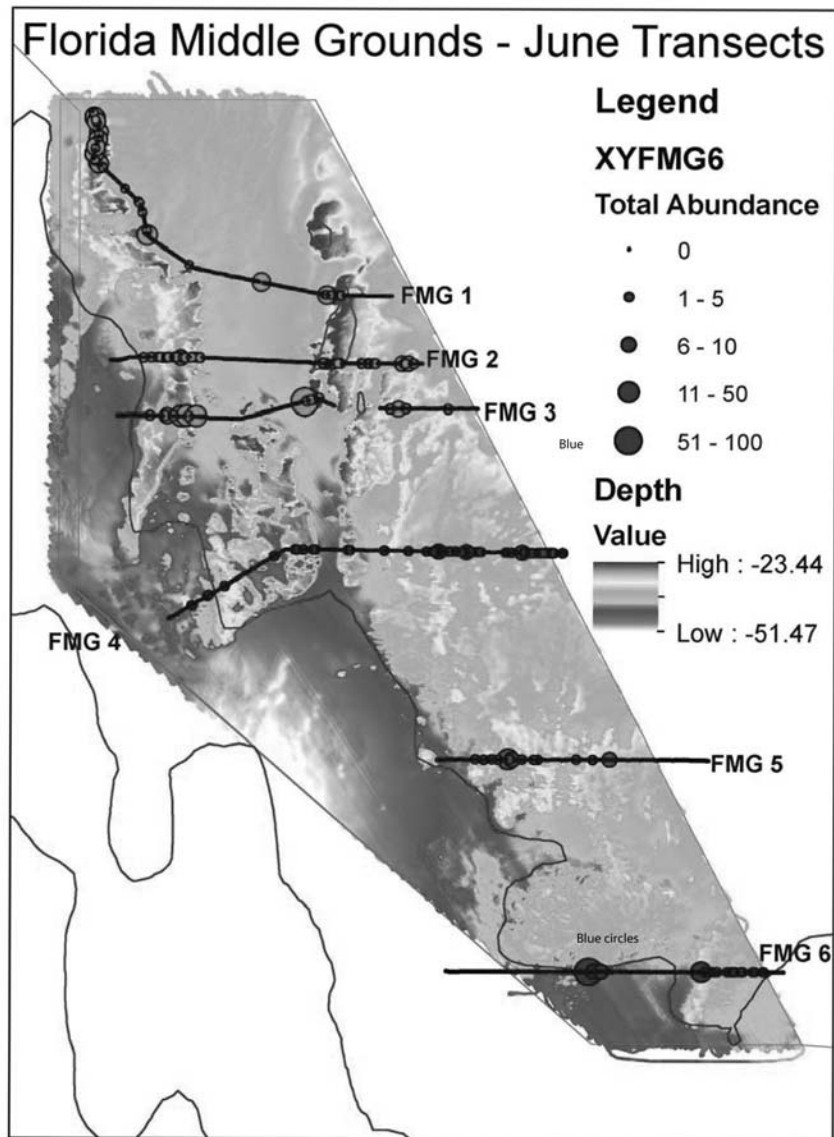


Figure 4. High resolution bathymetry (colored areas) and the abundance of fishes sighted in C-BASS transects during June, 2013 in the Florida Middle Grounds. The blue circles represent the absolute number of fish observed in one minute video segments along each transect conducted.

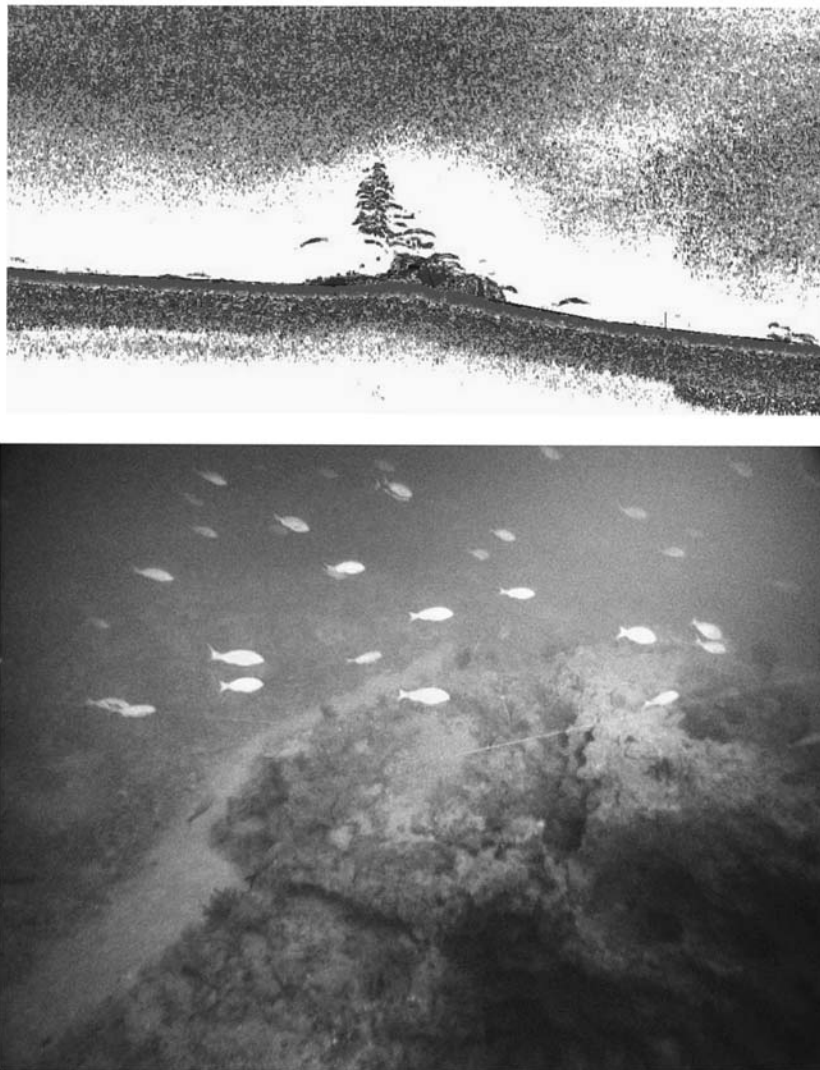


Figure 5. Top, an EK-60 sonar image of a school of red snapper imaged in the Madison-Swanson fishery closed area. Identity of the fish was established with C-BASS imagery. Bottom, a school of vermillion snapper imaged with the C-BASS towed camera system on the west Florida shelf.



Figure 6. Image of an amberjack observed in 2014 on the west Florida shelf.

Senator RUBIO. Thank you. Thank you for your testimony. I think I have a general question for all three panelists. Obviously, the information about real time data coming from the fishermen, the recreational fishermen, and others themselves is exciting. How do we get more people to participate in it?

To be honest, not year round, but I am busiest these days, but I was pretty active in the past in fishing, but I was not familiar, for example, with some of the apps that are available.

Mr. Fitzgerald, how are we making people aware of the existence of all this, and what incentives do people have to become a part of it?

Mr. FITZGERALD. Thank you. Part of the process here of getting the word out, to this point, to answer your question, it has been mostly word of mouth. We are very cognizant of the danger of overstating what we have here and trying to get ahead of ourselves, pulling anglers in before we knew we had something that would actually be used.

As you heard Dr. Sullivan testify, the vetting process for data is thorough. We felt pretty comfortable in the State of Florida because we had their assistance in building it and designing it the whole way. We have kind of had to really keep ourselves patient as far as the outreach goes, but we have reached that point where it is time to come out.

To that point, we have designed this program to not just be an effective way to manage fish stocks, but it is also a very powerful personal logbook.

All these data fields that they are looking for science-wise, there is also other data fields that an angler can enter in. Because it is

set up and they all coordinate and it is extremely flexible and powerful, so they have now this personal logbook they can use to their benefit to help improve their fishing skills.

That is some of the ways we have worked on it.

Senator RUBIO. Dr. Murawski?

Dr. MURAWSKI. Recreational fishing is the 80/20 problem, 20 percent of the fishermen account for 80 percent of the catch. In traditional programs, they were sampled as frequently as the occasional angler. I think we need to find programs that split the difference here, make sure we sample the universe of participants, but target the avid anglers, the ones that really account for most of the damage, with programs that can be more user push rather than pulling the data from them in sort of what I would call passive sampling programs.

If we can get over the issue of well, my high precision data are going into this database and I do not know how they are going to be used, my experience with avid anglers is they are more than willing to tell you about the fish they are interested in catching and have caught. I think there is a sweet spot for using new technology to enable that.

Senator RUBIO. Mr. Beal?

Mr. BEAL. I was going to make similar comments to Dr. Murawski's, getting the word out really has not been a problem. Recreational fishermen are coming to us asking for these tools for individual reporting, volunteer reporting.

I think once they are confident that these data are used and has value in stock assessments and management, I think even more of them will come forward and be happy to participate.

I think as Dr. Murawski was saying, we need to calibrate the expectations a little bit of what this data will be used for. It is very good at characterizing catch compositions, species and size of those species. It is good at discard composition, as Mr. Fitzgerald recommended or suggested. Areas fished and a number of other things.

I think we need to control the expectation to some degree and let recreational anglers know that this self reported data needs to supplement the programs and surveys that are ongoing.

If the more avid and more successful anglers are the ones that are first to report, that may not represent the general angler, the weekend warrior folks, the guys that do not catch a fish, like myself.

We need to make sure we are characterizing the whole fishery with these volunteer angler surveys before they are as valuable for use in total catch and total effort estimates.

Senator RUBIO. I have heard some people say, and it has not been my experience, but some people say people will manipulate the data, that they think somehow it can influence how open the season will be or how many days they will get and so forth. My sense of it is the reverse, people exaggerating what they have done, add inches and so forth to the catch.

My point is it is an interesting tool, that kind of brings the 21st century to what people are already doing, and obviously, we would have to work with some local agencies to create incentives.

Just a couple of things, just kind of brainstorming, one is I do think much like the Nielsen ratings work on television and so forth, there are people that are selected because they fit a demographic profile that provides a representative sample, and you could have specific individuals that we know are out there and catching.

I think the charter industry could be a part of that as well, these charter captains, to the extent some of them are still in business in some places, it has been tough, but they can be a big part of the puzzle as well.

Maybe this exists already in some parts of the country, but the ability to go somewhere on line at a real time level and kind of identify what other people are reporting, and gives you an indication of what you should be trying to catch, what is in season you can catch, and even locations, which people guard very jealously. The location aspect is something that would be useful for the recreational fishermen, but would also have application potentially for our agencies that are trying to learn as much as they can.

It is a very exciting and innovative way to kind of bring 21st century technology to something people have been doing for a long time.

My only other concern, and probably this is taken care of once you get into coverage, but in a lot of these places, you do not have great phone coverage when you are out there. I guess this is downloaded, I guess in your case, Mr. Fitzgerald, put on the app but ultimately feeds once you get access?

Mr. FITZGERALD. That is right. If you are outside a cell phone range, the app is loaded into the phone, so it functions and runs, you just cannot synchronize it back to the database until you come back into signal. That works. It is an issue for the tournament app, but that is the way it works for that one as well.

Senator RUBIO. Thank you. Senator Booker?

Senator BOOKER. Thank you very much, Mr. Chairman. Mr. Beal, we were sort of on this subject already, but I would love to throw this question out there and see if anything bites. That pun is about the best I will get today.

Beginning in 2016, the Atlantic Coast states will begin conducting the access point angler intercept survey to collect information on marine recreational fishing catch and other data in their own waters. The survey, which is a component of the larger marine recreational information program, has been administered by NOAA Fisheries through a third party contractor.

Over the past decade, several states have successfully proved their recreational catch and effort data quality and stakeholder confidence in this data, as we have been talking about. Based on the successes we are seeing, the states through the Atlantic States Commission, approved a plan to transition to states conducting the survey.

The question, Mr. Beal, for you is what do you see as the advantages of this change, and if there are, what are the pitfalls of the change as well?

Mr. BEAL. Thank you. There are a lot of advantages. I think it is definitely the right direction to move. The Gulf states are conducting the access point angler intercept survey, and they have

been doing that for a number of years. The Gulf states have shown the results have been great.

Along the East Coast, Maine, New Hampshire, Massachusetts, as well as North Carolina, South Carolina, and Georgia, have been conducting their angler intercept surveys for a number of years. The rest of the states through this plan that you mentioned are following suit at the beginning of next year, 2016.

The biggest advantage is just the familiarity of the state personnel with their fisheries. They know where the fishermen are, they are familiar with the fishermen, they know the sites within the state that have active fishermen. They know when folks are coming back from trips. The other side of that is the fishermen are familiar with the state personnel.

As you mentioned, there is a third party contractor doing a lot of the surveys now. The fishermen, it has been shown, they are much more comfortable commenting to someone with a New Jersey DEP logo on their shirt than they would be somebody with an RTI contracting agency. Nothing against that group. It is just removed from the state.

The familiarity both ways is probably the biggest advantage, and then that familiarity sort of breeds comfort and confidence in that data. The third step will be as the survey comes on line within the states, the states will be able to work with NOAA Fisheries and the marine recreational information program, and tweak the survey to some degree to meet their state needs. They are not as able to do that through a third party contractor.

I think just the sort of local nature of this data collection is going to improve things quite a bit. The pitfall or the potential pitfall might be that NOAA has indicated that they are more than willing to work with the states right now, remain flexible, and they want to hear the state ideas on how to improve the program, I think the only pitfall may be maintaining that flexibility and interaction with NOAA Fisheries.

The other pitfall that the states are frankly worried about is funding. NOAA Fisheries has committed to a funding level to allow the states that conduct this survey to collect the same level of samples that they are able to complete in 2015.

The fear is we should be fine for 2016, but in future years, if that funding decreases or degrades over time, will the sample size degrade over time, or also if that funding is held constant over time, the price of doing business increases and the per sample price goes up over time, as all things do, is the level of survey and level of interaction the states are going to be able to have with the fishermen, is that going to decrease as well.

I think overall there are a lot more positives than negatives to this approach. I think it is the way to go, we just need to keep an eye on things in the future, and as the survey evolves, I think the states will see better results from them.

Senator BOOKER. Thank you. That is very helpful. In the one minute I have remaining, I just want to get back to this problem I have begun to appreciate over this last year, and have begun to read more about, which is the problem of bycatch. You guys heard me talking about this in the opening remarks that I had.

I am wondering if any of you can speak to how self reporting and the ability to have instant access to fishery data bases can help expand our understanding of this problem and help reduce the bycatch levels.

Mr. FITZGERALD. I will say that one of the biologists in the last round of upgrades we did, that was a tournament app, that was going to provide them now species specific, very exact, precise location and size of fish that were targeted in these tournaments and caught, and she was extremely excited to find out—it was worded a little bit differently because it is not bycatch in that sense, but it was competing predators in the area, and then what other prey species, some fish that are both prey species and are caught by recreational anglers.

It is going to help give them an idea of what geospatial areas they are sharing and what habitats they are sharing in relation to their interaction with anglers. Like I said, it is worded a little bit differently but it is coming to the same solution, the same answers, of what fish and what predators and what prey species are occupying the same place at the same time.

Dr. MURAWSKI. Thank you for the question. My personal experience is that self reported bycatch information is virtually worthless, and particularly—

Senator BOOKER. Do not mince words, tell me exactly how you feel.

[Laughter.]

Dr. MURAWSKI.—particularly in a regulatory context. I think as Dr. Sullivan indicated, there are, however, technologies like video cameras and other things, particularly when the fish come over the side one at a time, that can be quite good in terms of verification, and a number of experiments have been conducted and actually completed. Those seem to be cost-effective. They rely on processing that video after the fact, but that is much more efficient and much more cost effective than it is sending an observer with one fisherman, for example. It is not very cost effective.

In that regard, there is a lot of hope that we can get better reporting through these advanced technology methods.

Senator BOOKER. Mr. Beal?

Mr. BEAL. I will go very quick. There are a number of active bycatch avoidance programs in the Northeast. ASMFC is actively trying to rebuild river herrings in a number of river systems up and down the East Coast. Unfortunately, there is some level of bycatch in small mess fisheries in New England.

There is an active monitoring program where if a fisherman is out catching sea herring and he happens to catch some river herring, he reports that, the rest of the fleet is notified of that bycatch event. They avoid those areas in the future.

I think those types of models and quick turn around on reporting and characterization of catch is going to help a lot in avoiding some of these species that are characterized as “chock species,” species that are limiting other fisheries, in the future. I think there is a lot of potential there as well.

Senator BOOKER. Mr. Chairman, thank you very much. Thanks for this first chance to lead a hearing together, I appreciate it.

Senator RUBIO. Thank you. I want to thank all of you for being here, thank you for being part of this panel. My hope is that today's discussion is going to move the ball forward on building a dialogue between all the parties on fishery management.

We must find a way to continue the tradition of those whose livelihoods are dependent on the water and those who enjoy these natural treasures. As I said, for millions of people around the country, some people do it for a living, for some, it is a way of life, it literally is why they work, other than feeding their families, the ability to go out and enjoy the lifestyle.

I know people who move to certain areas simply to have access to it. I personally know people who live in South Florida despite high real estate prices and traffic because they want to be 30 minutes away from being able to go out.

This matters to a lot of people and certainly has a tourist impact as well in many communities, and beyond that, there are commercial fishermen who make their living off this.

We are establishing data that in essence is limiting people's ability to go out and do this. We have an obligation to make sure it is as up to date as possible.

I am excited that as we move forward technology is allowing recreational fishermen and potentially commercial ones as well to contribute toward a better understanding of our stock assessments.

The hearing record is going to remain open for about two weeks, and during this time senators are going to be asked to submit any questions they might have for the record, so what I would ask of the witnesses is if you do receive questions, that you would submit those answers as soon as possible in order for the record to be available for us as we move forward.

With that, I want to thank you all for being here, and the hearing is adjourned.

[Whereupon, at 4:03 p.m., the hearing was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARCO RUBIO TO DR. KATHRYN D. SULLIVAN

Question 1. As I've discussed many times in this Committee, my region of the country has historically received far less than its fair share of funding for fisheries data collection, particularly on recreational fisheries. Given the hundreds of thousands of fisheries-related jobs in the Gulf and South Atlantic, how does this budget reflect the tremendous need for improved fisheries data collection in Florida and the rest of the southeast in particular?

Answer. The sustainability of our fish stocks depends on continual monitoring of fish catch and abundance, which is a data-intensive and costly endeavor. Providing adequate scientific data collection under a limited budget is an area where our Fisheries Science Centers excel. Funding increases over the past years have improved our stock assessment enterprise. NOAA Fisheries' budget funds fishery-dependent and fishery-independent data collection, as well as ecosystem data collection, among other scientific research meant to inform management. As described in the hearing, data collection includes research cruises, fisheries observer data, commercial and landings data collection, as well as recreational fisheries surveys and sampling.

NOAA Fisheries' Fisheries Research and Management funding, including data collection, surveys, and assessments are distributed to the six Fisheries Science Centers and the Office of Science and Technology. Generally, the Southeast Fisheries Science Center receives higher levels of funding than the other regions in recognition that this Center covers a large area and supports three Fishery Management Councils (South-Atlantic, Gulf of Mexico, and Caribbean). Please note the table is not representative of all scientific funding or all of the funds that the Science Centers receive, but shows an approximate comparison of the Southeast Center to other Centers for base fisheries science and stock assessment related funding.

Fisheries Research and Management Sub-activity
FY 2015 Base Funding Plan by Science Center

Science Center	Amount (\$M)
Northeast	\$27.4
Southeast	\$30.8
Northwest	\$22.5
Southwest	\$19.4
Alaska	\$36.3
Pacific Islands	\$13.0

Specific to recreational fishing surveys, NOAA Fisheries is spending \$21 million in FY 2015, including \$12 million for base survey funding and \$9 million for the Marine Recreational Information Program (MRIP). Of the total \$21 million, \$8.6 million is being spent on conducting surveys in the Gulf of Mexico and South Atlantic regions. The majority of these funds are passed to the Gulf and South Atlantic states through grants and the Fisheries Information Networks. In addition, MRIP has provided \$724,000 to fund several projects and initiatives in the South Atlantic and Gulf region in FY 2015 meant to improve recreational data collection, including \$20,000 towards Florida red snapper survey design support. NMFS recognizes the important recreational fishing industry in the Southeast, and will continue to prioritize the region in its efforts to expand data collection for data-poor and recreational stocks.

Over the past decade, NOAA Fisheries has made improvements and investments in improving its fishery-independent sampling programs in the Southeast. The infor-

mation collected by these programs will become more valuable over time, because the surveys will track fluctuations in stock abundance, allowing an improved understanding of stock status and sustainable harvest levels, thereby improving the scientific information being provided to managers. Recent innovations in data collection in the Southeast region include pilot studies in electronic reporting, improvements in methods for sampling un-trawlable habitats, as well as the use of passive acoustics to locate spawning aggregations of reef fish. These advancements should improve our data collection and surveys of important recreational reef fish, such as red snapper.

Question 2. As you know, the right whale, which inhabit the Atlantic Ocean, have been under protection since 1935. The protection of this species falls under NOAA. Could you please provide this Committee an accounting for the most recent Fiscal Year for the monies spent on right whale protection and recovery, including any external monies? Please describe the budget and spending planning process as it relates to right whale monies, and specifically, the extent to which input is sought from the external research community.

Answer. NOAA Fisheries spent \$8.3 million in FY 2014 and will spend \$8.4 million in FY 2015 on right whale recovery. Of these totals, approximately \$6.8 million in FY 2014 and \$6.9 million in FY 2015 was used to reduce ship strikes; reduce right whale entanglement in fishing gear; monitor and assess populations through activities such as aircraft and vessel surveys, passive acoustic detections and analysis; and maintain the sightings database and photo-identification catalog. The remaining funds (\$1.5 million in FY 2014 and \$1.5 million in FY 2015) were awarded to the states through cooperative grants for additional aerial surveys, habitat research, entanglement reduction efforts, disentanglement, recovery implementation, and enforcement (*e.g.*, Joint Enforcement Agreements).

NOAA Fisheries is responsible for the conservation and management of a number of species, including the western North Atlantic right whale, which is protected under the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). In support of NOAA Fisheries' right whale conservation and recovery efforts, a portion of its annual right whale spending is devoted to ongoing assessment and monitoring of the depleted population, including various vessel- and aircraft-based studies to monitor abundance, trends in abundance, demographics (*e.g.*, number of calves born each year), and whale occurrence and distribution. Annual funding is provided for ongoing work to recover and analyze (*e.g.*, to determine cause of death) dead and stranded whale carcasses; disentangle whales from commercial fishing gear; provide contracts for survey observers; and salaries to administer these programs. Cutting edge work, in collaboration with scientists external to NOAA Fisheries, using underwater listening devices to detect right whale vocalizations is also a major component of NOAA Fisheries' efforts to quantify right whale occurrence and distribution and changes in distribution. Annual inter-agency funding is also provided for various programs to reduce human threats to right whales (*e.g.*, *Mandatory Ship Reporting systems*).

NOAA Fisheries biologists work closely with a number of researchers in Federal and state agencies, academic institutions and non-profit organizations. On an annual basis, a substantial portion of right whale funds go directly to state agencies that operate various right whale conservation programs; researchers in these agencies provide advice to NOAA Fisheries on the development, funding, and implementation of these programs. NOAA Fisheries also provides the annual base funding to non-profit and academic researchers conducting studies or curating data (*e.g.*, the photo-identification catalog and sightings database) that are the foundation for ongoing right whale conservation programs. NOAA Fisheries scientists collaborate with academic and non-profit researchers in securing external funding to develop new technology (underwater gliders, unmanned aerial systems) which are being incorporated into data collection. These collaborations help inform planning decisions.

As required by section 117(d) of the MMPA (16 U.S.C. § 1386(d)), NOAA Fisheries hosts a number of Scientific Review Groups (<http://www.nmfs.noaa.gov/pr/sars/group.htm>), including a Group constituted for U.S. east coast and Gulf of Mexico marine mammal stocks (which includes the North Atlantic right whale). These Groups consist of individuals with "expertise in marine mammal biology and ecology, population dynamics and modeling, commercial fishing technology and practices, and stocks", and are expected to advise NOAA Fisheries on matters regarding:

- Population estimates and the population status and trends of marine mammal stocks;
- Uncertainties and research needed regarding stock separation, abundance, or trends, and factors affecting the distribution, size, or productivity of the stock;

- Uncertainties and research needed regarding the species, number, ages, gender, and reproductive status of marine mammals;
- Research needed to identify modifications in fishing gear and practices likely to reduce the incidental mortality and serious injury of marine mammals in commercial fishing operations; and
- The actual, expected, or potential impacts of habitat destruction, including marine pollution and natural environmental change, on specific marine mammal species or stocks, and for strategic stocks, appropriate conservation or management measures to alleviate any such impacts.

This input, in turn, helps shape funding decisions. A number of highly experienced researchers working on right whales are members of the east coast and Gulf of Mexico Scientific Review Group.

To address existing research and management needs and priorities, it is important to periodically review these needs and priorities to further the efforts of NOAA Fisheries to effectively manage right whales and meet the mandates of the ESA and MMPA. NOAA Fisheries, in consultation with its Atlantic Large Whale Take Reduction Team, has identified research needs and priorities for right whales, as well as other ESA-listed species and non-listed marine mammals protected under the MMPA. Team members include representatives of Federal agencies, each coastal state which has fisheries which interact with the species or stock, appropriate Regional Fishery Management Councils, interstate fisheries commissions, academic and scientific organizations, environmental groups, and all commercial and recreational fisheries groups and gear types which incidentally take the species or stock.

As a resource to our partners, including state agencies, fishery management organizations, non-profit organizations, scientists, academic institutions, and the fishing industry, NOAA Fisheries posts updated research needs and priorities that may assist our partners in the development of proposal ideas when funding opportunities arise. These priorities are updated annually and can be found at these links: *Research Needs for Right Whale Biology*; and *Research Needs for Commercial Fishing Gear*.

Since 2002, NOAA Fisheries has funded seven workshops related to commercial fishing gear modifications to address commercial fishing interactions with right whale and other large whale species. One of these workshops, co-hosted in 2004 with the Marine Mammal Commission, included members of the right whale research community. Ideas and suggestions from these workshops resulted in numerous funding opportunities. Related to this, a workshop involving a number of members from the right whale research community will be convened in fall 2015 to develop models to integrate visual and passive acoustic whale detection methods.

In addition, external researchers routinely provide input, for example:

- By providing comments, including recommendations regarding studies needed, during public comment periods on various proposed rules and related Environmental Impact Statements. In the last few years, this has included proposed rulemaking involving the establishment of critical habitat for right whales (80 FR 9313; February 20, 2015); and a number of measures to reduce the threats of ship collisions with whales (73 FR 60173; December 10, 2008) and entanglement in commercial fishing gear (79 FR 36586; June 27, 2014).
- Through the work of the *North Atlantic Right Whale Recovery Plan Southeast U.S. Implementation Team* (SEIT). Members of the SEIT are selected based on their “professional expertise or experience in the areas of conservation or biology of right whales or threats to right whales which result in the incidental mortality and serious injuries of right whales”; including those actively engaged in right whale research.

Question 3. What percentage of your budget that goes to stock assessments goes to cooperative research?

Answer. The FY 2015 Enacted budget provided \$12.0 million for Cooperative Research, including \$2.6 million for Northeast Cooperative Research at the Northeast Fisheries Science Center, \$2.9 million for Southeast Cooperative Research at the Southeast Fisheries Science Center, and \$6.5 million for National Cooperative Research, which is divided among the Science Centers and also supports competitive grant proposals from the different regions.

In the FY 2016 Budget request, \$163.3 million is requested for the Fisheries Data Collections, Surveys and Assessments PPA, of which \$12.1 million or 7.4 percent of this PPA is specifically for Cooperative Research. In addition, NMFS provides support for other cooperative science activities beyond the Cooperative Research Program. For example, many Saltonstall-Kennedy grants fund cooperative research ac-

tivities. NOAA scientists also frequently collaborate with universities, coastal states, fishermen, and the industry when collecting data or performing research cruises; however, the funding levels vary on a project by project basis.

Question 4. In your testimony, you state the NOAA fishery survey vessels includes four new Dyson-class ships “with state-of-the art technological capabilities.” How many days at sea will these ships spend in the areas most needed—for example, the South Atlantic where we are still awaiting a red snapper stock assessment?

Answer. Of the four Dyson-class ships, one works entirely in Alaskan waters, one covers the west coast, one covers the Atlantic coast north of Cape Hatteras and the fourth is dedicated to working the Gulf of Mexico and Atlantic coast south of Cape Hatteras. The draft sailing plan for FY16 has each of these ships averaging 217 days at sea in support of fisheries stock assessments and research. NOAA ships of other classes are scheduled to sail an additional 957 days at sea supporting fisheries stock assessments and research.

NOAA’s Southeast Fisheries Science Center based in Miami supports fisheries assessments in the Gulf of Mexico, the Atlantic coast south of Cape Hatteras and the U.S. Exclusive Economic Zones in the Caribbean. Of the total days at sea on NOAA ships devoted to fisheries stock assessments and research, 460 days, or 25 percent of the total are for the Southeast Center. Additional sampling at sea is provided aboard chartered vessels, and vessels owned by our academic and state partners. The exact mix of charter and NOAA ship time that supports each of the six fishery science centers depends on regional requirements and the partnerships and availability of suitable charter vessels in each region.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER F. WICKER TO
DR. KATHRYN D. SULLIVAN

Question 1. Fishermen around the Gulf of Mexico are concerned that the Marine Recreational Information Program (MRIP) lacks timeliness and accuracy and is not designed to monitor short seasons, such as the Red Snapper season in the Gulf. For this reason, the State of Mississippi is implementing a mandatory recreational red snapper data collection program designed to count all of the red snapper that are landed in the State with a 1–2 day reporting lag in most instances. What are you doing to assure that the new information collected by Mississippi and other Gulf States is factored into your decision making process as soon as possible?

Answer. Over the past year and a half, MRIP has supported and co-organized, with Gulf FIN (Fisheries Information Network), three workshops to facilitate the development, design and testing of supplemental surveys that can be integrated into the general survey programs to improve the usefulness of red snapper and other reef fish catch estimates for state and Federal managers. This year, pilot surveys are being implemented in Florida (year 1), Alabama (with MRIP funding-year 2), Mississippi (year 2), and Texas (with MRIP funding-year 1). Currently, NOAA Fisheries is not using data collected from these pilot surveys because the survey designs are preliminary, have not been peer reviewed or certified for use, and have not been benchmarked or calibrated against existing surveys used for setting catch limits. Once these necessary steps are taken NOAA Fisheries will seek independent peer review and certification of the successful supplemental survey designs and will work with the Gulf FIN partners to develop a means to integrate data collected by certified supplemental surveys with the general MRIP survey data for use in stock assessments and management decision-making.

Question 2. Given that MRIP is not designed to monitor short seasons like the 10 day red snapper season in the Gulf of Mexico, is it worth developing a completely separate survey apart from the Marine Recreational Information Program (MRIP) for offshore pulse fisheries?

Answer. First, it should be recognized that the 10 day season only applies to Federal waters of the Gulf of Mexico. Seasons in States’ waters, which is where most red snapper are recreationally taken, are much longer (e.g., the 2015 season in Florida waters is 50+ days long, while the season in Texas waters is 365 days). Next, as noted above MRIP is working cooperatively with the Gulf States to develop, test, and review supplemental survey designs that can be integrated into the general MRIP survey program to provide more timely and precise estimates of short season reef fish fisheries. Once successfully piloted and independently peer reviewed, these supplemental survey designs can be certified by MRIP and would become eligible for NOAA Fisheries technical and funding assistance for implementation as part of the MRIP suite of certified survey designs.

Question 3. As recreational anglers have come to better understand the data collection process and how it can affect fishery management, they are more interested than ever in providing specific information on their effort and harvest. How do you plan to take advantage of this increased interest in participation by this user group to provide for more accurate and timely data collection?

Answer. Many anglers have expressed to us a desire to directly report their fishing activity in a diary or electronic reporting application. MRIP evaluated such “opt-in” surveys in a *2010 Workshop*. A key conclusion of that workshop was that anglers who volunteer (self-select) to submit catch information are not representative of the angling population generally. Therefore their catch data cannot simply be expanded to the entire angler population to generate accurate catch estimates—such an effort would result in biased estimates that cannot be used in management decision making.

MRIP has continued to explore ways in which anglers can report catch data to the MRIP partners in ways that can provide usable, statistically valid data. For example, several of the supplemental red snapper survey pilot designs referred to in the first question are testing angler reporting designs and technologies such as iAngler and iSnapper. This is a promising area of survey research that we intend to continue to develop, and MRIP is currently supporting a study through Texas A&M to evaluate the use of these electronic tools.

Question 4. The Gulf Council reduces the recreational red snapper catch limit by 20 percent because the catch data system does not provide timely data to accurately predict when that catch limit will be reached. If the recreational fishing community, the Gulf Council, and NOAA could develop a more timely and accurate recreational catch data system, would that allow the Council to increase the recreational season by up to 20 percent or even develop a better alternative than a single short derby season for anglers?

Answer. The Gulf Council established the 20 percent buffer in response to a 2014 court ruling requiring the Council and NOAA Fisheries to take additional action to better constrain recreational catches to the catch limit which had been significantly exceeded for several years. The intent of this 20 percent buffer is to reduce the likelihood recreational fishermen will exceed their catch limit if we underestimate catch in a given year.

Because each state sets its seasons of varying lengths, which are different from the season in Federal waters, it is extremely difficult to accurately predict the amount of catch that will occur in the fishery. As a result, more timely and accurate catch data alone would not likely support elimination of the buffer. Better coordination of state water regulations, on the other hand, is critical to reducing the current management uncertainty which led to the court case and the buffer.

The current catch data system does not limit the Council's ability to develop a better alternative to the short season in Federal waters. For example, the Council is currently considering providing the states greater flexibility to tailor recreational red snapper management to local needs and objectives while meeting Gulf-wide conservation goals through a regional management strategy. NOAA Fisheries continues to assist the Council, states and stakeholders as they explore these and other alternatives to the status quo.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARCO RUBIO TO
ROBERT BEAL

Question. In your testimony you state “many agencies are still using a mixture of conventional (paper) reporting and electronic reporting, significantly limiting the ability to provide accurate, real-time data for management purposes since paper reports can take several months or longer to receive and process.” What do you think it will take to modernize the various agencies to move to an all-electronic system?

Answer. *Commercial Reporting*

On the East Coast, the Atlantic Coastal Cooperative Statistics Program (ACCSP) has played a lead role in enabling the states and Federal Government to implement electronic reporting via its Standard Atlantic Fisheries Information System (SAFIS). In 2004, NOAA Fisheries' Greater Atlantic Regional Fisheries Office mandated electronic dealer reporting through SAFIS. With funding from NOAA Fisheries, ACCSP developed technology to allow many resource strapped state agencies to leverage this work and integrate their own data collection into SAFIS. Since then, we have seen a marked increase in electronic reporting at the Federal and state level throughout the Atlantic.

All state agencies from Maine to South Carolina (with the exception of North Carolina) are currently using SAFIS in one way or another. North Carolina uses a

different comprehensive electronic reporting system. Federally-permitted dealers in the Greater Atlantic and Southeast Regions are required to report electronically through SAFIS. Electronic commercial trip reporting is accomplished through SAFIS's eTRIPS, a web-based application that compiles catch and effort data from commercial fishermen. This application is now employed by Massachusetts, Rhode Island, Connecticut, New York, and New Jersey. Commercial vessel reporting in the Greater Atlantic Region is available but not required. In the Southeast Region, electronic reporting has been piloted but has not been implemented. Reporting requirements for federally-licensed commercial harvesters and dealers, as well as charter and headboat operators, are set by NOAA Fisheries in coordination with the fishery management councils and regional offices.

Recreational Reporting

State and Federal recreational data collection is conducted through NOAA Fisheries' *Marine Recreational Information Program* (MRIP) with assistance from the states. Much of the discussion at the May 20 hearing focused on voluntary electronic reporting through mobile applications. This type of reporting is a useful supplement to MRIP data, but should not replace it because the data are not representative of all recreational catch and therefore not suited to estimate total harvest. I would note ACCSP has developed Voluntary Recreational Logbooks (eLogbook), which is used by Massachusetts, Rhode Island, New York, Connecticut, and Delaware.

Recommendations

The Commission and its member states share the Committee's desire to move toward universal implementation of electronic reporting for commercial fisheries on the Atlantic coast. And while tremendous strides have been made over the past ten years, much is left to accomplish, not the least of which is the states' ability to secure resources to complete the transition. This includes updating technologies and extensive training to the commercial fishing industry.

Commercial Reporting

NOAA is now examining its electronic reporting policy for all marine fisheries under its jurisdiction. In policy guidance published May 2013, NOAA announced it will work with stakeholders to develop a new policy on the use of electronic technology for fishery-dependent data collection. The Atlantic States Marine Fisheries Commission (ASMFC) supports this approach.

Building electronic reporting technology and implementing the corresponding policies is a complicated, regionally unique process. Often, states lack the resources and authority to accomplish a coastwide solution on their own, and are much more likely to adopt them if they are successful at the Federal level. A concerted effort to adopt mandatory electronic reporting requirements in Federal fisheries will make the methods and resources available to state agencies to use as well. We urge NOAA Fisheries to devote the resources needed and to continue to work closely with ASMFC and ACCSP to develop solutions that work at the state and Federal level.

Recreational Reporting

MRIP is implementing a new mail-based methodology to collect recreational effort data, transitioning away from landline phone survey. We believe the mail-based survey is the best and most logical way to move forward. Recently completed pilot studies indicate mail surveys are a much better tool for capturing recreational fishing effort by increasing response rates, reaching a broader population of anglers, and improving response accuracy.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARCO RUBIO TO BRETT FITZGERALD

Question 1. It is evident your program has a lot of potential to provide recreational harvest data and it is clear from your testimony that anglers are excited about the ability to play a part in fishery data. Specifically, you note "the cultural shift that recreational anglers need [to] embrace to become part of the answer in ensuring fisheries are well managed and abundant." Do you think a program like yours can be successfully incorporated into management? What has been NOAA's response to your program?

Answer. The very short answer is yes, and Florida, the Fishing Capital of the World, has proven the concept can and does work within their fishery management system. But in truth, the answer is slightly more complicated, starting with your reference to the necessary "cultural shift."

Over the past few years, the Snook & Gamefish Foundation (SGF) has explored different ways to engage anglers—educating them about the importance of participating in a voluntary data collection system that is guided by state (and hopefully soon federal) fishery managers, but owned and operated by fishermen.

Without any direct support from the state of Florida or any other agency, SGF took to speaking at fishing clubs, stores seminars in West Marine, and any other venue with anglers who might listen. We sent original stories out to our members and newsletter subscribers. And we spoke directly to anglers at a captain's meetings in select fishing tournaments.

What we found was that regions in Florida where we were able to directly engage anglers now produce enough angler data to be statistically significant when comparing the most targeted species of Angler Action Program (AAP) users to NOAA data. In other words, when anglers were made aware of what the data could do (as well as the powerful personal log book it is for the individual angler), we were able to recruit enough anglers to provide significant data.

SGF has used the recent status of largemouth bass in the United States as a positive example. Only four decades ago, popular fishing culture dictated that most "keeper" bass ended up on a stringer and in the fryer at home. Today, the opposite is true—largemouth bass are almost exclusively a catch and release fishery. This is an example of a complete reversal of angler attitude. (In fact, the AAP database started collecting fresh water data in 2012. That year, only two bass were logged in the AAP as "harvested." Over 99 percent were released.)

So the first qualifier—angler buy in, or the culture shift—has been proven to be attainable. With direct support from state agencies, NOAA, and the fishing industry, SGF is extremely confident that we can exponentially increase our awareness campaign, and expand the effective geographic range of angler participation.

As stated, angler data not only can be incorporated into fishery management models, it already has. In Florida, AAP data has been used in the last two Snook stock assessments. Florida's Fish and Wildlife Research Institute (FWRI) has two stock assessments in progress that are using AAP data again—another Snook assessment, and the 2015 red drum assessment. Further, FWC has gone on record stating that the AAP and iAngler mobile application systems as a significant source of data for the management of species that do not have formal stock assessments (specifically barracuda, which has become a species of concern among Florida anglers).

To move forward and progress beyond Florida's management, the AAP requires more angler participation as well as continued 'buy in' and support from state and Federal agencies.

These two requirements have a significant effect on each other. Anglers need to feel that the data is being used, or they won't continue to participate. Conversely, without sufficient angler participation the data does not carry enough statistical weight to be useful.

One important point needs to be made. In your above statement, you mention recreational "harvest data." It is vital that anglers, managers, and policy makers understand that at this time, the most powerful data from the AAP project has been the RELEASE (discard) data—the ones we let go. The size distribution, frequency, condition of the fish upon release, and general location of the discards is data that is sorely missing in the current management models, and right now the AAP is the only proven method of obtaining that data from recreational anglers. And the AAP has potential to collect that data in high volumes, with a high degree of accuracy.

Question 1a. What has been NOAA's response to the program?

Answer. Fishery management, as we all now know, is far more complex than most citizens could possibly guess. When SGF started the AAP project, NOAA was not clearly in our sights as a potential data 'client.' Our goal was to collect data on snook for the State of Florida.

Once we achieved a measure of success, we did approach NOAA about partnering and providing AAP data. Admittedly, we at SGF did not know as much about Federal fishery management at that time as we do now. There also was absolutely no precedent for successful partnerships at this level. Understandably, NOAA's overall response was quite tempered.

SGF's counter response was to continue working with the state of Florida, establish a history of functional partnerships in the area of data collection, and come back around to NOAA once we have established success at home.

The timing of your hearing and this questioning couldn't be better. That NOAA has had a tepid response to SGF's AAP in the past is acceptable—we might not have been ready for them either. But now we are—we've proven that we are willing to work with fishery scientists. We are willing and capable of managing the database, as well as being the face of recreational angler participation in fishery management. We've established that we are not attempting to 'take over' fishery man-

agement, just support and supplement current models and/or contribute to making adjustments where improvement can be made. Finally, we've developed a highly effective fishing tournament management system that steers anglers into logging data, a key step towards establishing the cultural shift we seek.

The Angler Action Program works in Florida because FWRI actively participated in a partnership with SGF and found ways to make it work. The result is a partnership that allows recreational anglers to feel as though they are a part of a more accurate management plan.

SGF strongly feels that it is time anglers and managers find a similar functional relationship at the Federal level, which will require NOAA to actively work with recreational anglers through a program such as the AAP.



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