Informational Report 3
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IMPROVING NET GAINS

DATA-DRIVEN INNOVATION FOR AMERICA'S FISHING FUTURE

Fishing Data
INNOVATION
TASKFORCE

OVERVIEW

Rebounding U.S. fisheries provide our nation with an exciting moment of opportunity. In the past, declining stocks put fishermen out of work, kept recreational anglers off the water, and deprived seafood businesses and consumers of American-caught product. But after years of bipartisan reforms and sacrifice by fishermen willing to think long term, many depleted stocks are rebounding and fisheries-related employment is on a steady upward march.[1]

Our challenge now is to unlock the full potential of healthier American fisheries. We need to ensure that recreational anglers can enjoy the benefits of rebuilding fisheries through increased access. Commercial fishermen should see their bottom line improve as they meet growing demand for sustainable seafood. Grocery stores and restaurateurs should have the opportunity to provide high-quality product that meets consumer demand for local and fully traceable seafood. And we need to improve our ability to respond quickly and effectively to changing ocean conditions. We can do all these things with accurate, precise, timely and readily accessible data.

The modernization and streamlining of fishery information systems is a critical fisheries challenge facing the incoming Trump administration and 115th Congress. It will be pivotal in determining not only whether we can sustain our progress in returning U.S. fisheries to health, but also whether we can unlock the full potential of this vital natural resource. There is broad agreement that attention focused here will benefit both fishing businesses and consumers, and help ensure a healthy resource into the future. Our taskforce was established with the goal of promoting efforts to meet this information challenge. This report reviews progress to date, assesses the experiences of fisheries stakeholders, considers best practices from elsewhere, and makes recommendations for how the National Marine Fisheries Service can work with partners to move us forward.

[1] National Marine Fisheries Service. 2016. Fisheries Economics of the United States, 2014. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-F/SPO-163.

WHY STREAMLINE FISHERY INFORMATION SYSTEMS?

The United States has one of the most advanced and successful fishery management systems in the world. In 2015, almost 500 federally managed stocks produced 9.7 billion pounds of seafood valued at $5.2 billion, and 61 million saltwater recreational fishing trips landed 351 million fish.[2] The United States is a major player in global fisheries, which are highly traded for processing and consumption. In addition to ranking third among wild-capture fishing nations,[3] we are the world's largest importer of fish and seafood ($20.5 billion in 2014) and its fourth-largest exporter ($6.3 billion).[4]

Yet despite our position of global leadership on ocean fisheries, many of the information systems and practices upon which our fishermen, anglers, managers, scientists, consumers, and seafood buyers rely are built using technology and practices that are outdated. Only by bringing fishery information systems and practices into the 21st century will we secure the economic and associated societal benefits that healthy fisheries can deliver, including:

- **Stronger Seafood Businesses**, with information systems that support the efficiency and competitiveness of American businesses regionally, nationally and abroad.
- **Improved Recreational Access**, through real-time data that provide managers with alternatives to strict, inflexible season and bag limits.
- **Better and More Timely Science**, by quickly and accurately generating the information needed to support commercial and recreational fishing, and ensuring that management and businesses can adapt effectively to changing environmental and market conditions.
- **Government Efficiency**, by eliminating the costs resulting from duplicative, costly systems and processes and increasing transparency and trust with user groups and the public.

[2] National Marine Fisheries Service. 2016. Fisheries of the United States, 2015. U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2015.
[3] United Nations Food and Agriculture Organization. 2016. World fisheries production, by capture and aquaculture, by country (2014). Fisheries and Aquaculture Department database.
[4] Agriculture and Agri-Food Canada. 2015. Inside the United States – The Fish and Seafood Trade. Market Access Secretariat Global Analysis Report.

“Recreational anglers are invaluable partners”

MICHAEL CHRISTOPHER
Managing Director
Elemental Methods

Millions of Americans enjoy recreational saltwater angling, yet there is a growing consensus that management often doesn’t meet their needs. Managers require data from recreational anglers, but existing approaches, including access-point intercept surveys and telephone surveys to capture catch data, are not always effective or trusted by recreational stakeholders.

“The advent of smartphone technology offers a powerful tool to capture reliable recreational data,” explains Michael Christopher, Managing Director at Elemental Methods. “Well-designed applications can allow anglers to easily report outcomes of their recreational fishing trips, such as species caught/released, length, weight, release condition, and GPS location, in close to real time.”

“Programs such as iSnapper, iAngler and Tails n’ Scales have been used by state governments to capture recreational data for fisheries management. As the prevalence of these technologies grow, the amount of catch data captured by such self-reporting programs has the potential to surpass the volume of data from traditional federal and state programs. It is essential that information systems are capable of integrating data collected by self-reporting applications to reliably augment and enhance data collected through traditional survey methods.”

“Recreational anglers are anxious, and literally demanding, an opportunity to contribute to the management of federal and state fisheries. Information systems and processes must evolve to harness their enthusiasm and take full advantage of the data they collect to deliver better science and management.”

THE PROBLEM

Two key features of America's fishery management system are its federated structure and the strength of its conservation mandates. Many would agree that these traits have been pillars of our success: devolving decision-making authority to the regional level has helped make management responsive to local needs, while strong conservation mandates are keeping fish stocks healthy and productive now and into the future. However, these two features are also central to the growing fishery information system challenges that we face.

The need to meet the conservation mandates that have brought our fisheries back from the brink has driven demand for more accurate, precise, timely, and readily accessible data. For example, catch limits must be set based on "the best scientific information available," often depending on a stock assessment built using an array of data streams. Catch limits and other management measures must be implemented by capturing and utilizing catch data in as close as possible to real time. And the rules must be enforced, both at sea and at the dock, through some combination of human and electronic systems.

Our decentralized structure has been one of several factors that have complicated our ability to meet these needs efficiently and effectively. At the regional and national levels, we have been saddled with an array of legacy data collection and management systems, practices and policies that prevent us from taking full advantage of modern technology and other tools to deliver better science, business and management products. These include:

INADEQUATE DATA AVAILABILITY: Despite strong interest from fishermen and managers alike in modernizing monitoring and reporting systems, fishery data remain slow to compile, incomplete, expensive and often inaccurate. Human onboard observers remain more prevalent in US fisheries than electronic monitoring systems, and most reporting continues to be done on paper forms. This represents a missed opportunity in many fisheries to ensure that scientists, managers and enforcement authorities have access to the quality and timely fishery-dependent data that they need. For example, in the New England groundfish fishery, coverage rates were reduced to just 14% after the observer cost burden was transferred to industry, further exacerbating concerns about compliance and the integrity of fishery-dependent data for the stock assessment process. Improved use of technology and increased efficiency could allow for increased coverage and reduced costs. In recreational fisheries, catch is largely based on survey data, compiled sometimes months after

fishing activity has occurred. Delays and inaccuracies in Marine Recreational Information Program data have led to repeated recreational overages in the Gulf of Mexico red snapper fishery, and the limitations of existing data collection systems and practices present a huge obstacle for those interested in designing better alternatives for anglers.[5]

OUTDATED AND FRAGMENTED DATA MANAGEMENT SYSTEMS: Regional data management systems have grown organically over the last forty years, as managers and IT staff have digitized historic data sets and reacted to new demands from the law, the public, and fishery participants. This ad hoc evolution means that data management systems have not always been built to meet the needs of users in accordance with best practices, are often incompatible with each other, and in many instances haven't kept pace with technological advances that have transformed how data are used, stored and organized in other industries. Data cannot easily be compared across gears, sectors, and regions because data are coded and captured differently depending on how they are collected. Most states and regions have their own distinct codes for species and gear, and there may be no code or timestamp that allows managers to match a logbook to an observer report for the same trip. If data are difficult for managers and fishermen to access, they can be even more difficult to access publicly. In early 2016 Congress found that NOAA's per request cost of complying with Freedom of Information Act requests was "uniquely high within the Department [of Commerce] and throughout the federal government."

LEGACY SYSTEMS NOT DESIGNED TO MEET CURRENT OBJECTIVES: In many instances, systems that were originally designed to meet a specific need remain narrowly focused on that task rather than being integrated into a system that meets the full suite of government and stakeholder objectives. In some instances this is true across government functions, for example where an enforcement program is missing the opportunity to capture data that could be valuable to scientists. It is also apparent in the context of interface with industry. Buyers and processors generally create duplicate systems, and fishermen often have to fill out duplicate or triplicate forms. Once data enter the government system, it may not be accessible to the fishermen themselves, for whom such data could often be helpful in their businesses. Historic and legal concerns about confidentiality and proprietary business information continue to have a chilling effect on data access, sometimes even to those

[5] A recent Government Accountability Office report highlighted challenges relating to recreational fisheries data. See: Government Accountability Office. 2015. Recreational Fisheries Management: The National Marine Fisheries Service Should Develop a Comprehensive Strategy to Guide Its Data Collection Efforts. GAO-16-131, a report to congressional requesters.

Fostering cooperation between state, regional and federal entities

MIKE CAHALL
Director
Atlantic Coast Cooperative Statistic Program (ACCSP)

The Atlantic Coast Cooperative Statistic Program (ACCSP) is demonstrating how closer coordination across jurisdictional lines can produce dependable and timely fishery statistics for all users.

The ACCSP was established in 1995 to address deficiencies in the data available for fisheries management along the Atlantic coast. These included incompatibilities between state and federal data systems, a lack of standardized trip-level catch and effort reporting by partner agencies, lack of universal permit and vessel registration data, and a general need for more and better data to support new requirements in fisheries management.

Since its inception, ACCSP has helped foster an improved atmosphere of cooperation among its partners. It has succeeded in establishing coast-wide fisheries data standards that all program partners have agreed to adopt. By establishing and maintaining data collection standards and providing a data management system that incorporates state and federal data, ACCSP ensures that the best available statistics can be used for fisheries management.

“Challenging old ways can be very hard,” says ACCSP Director Mike Cahall. “We have found that building consensus solutions among all agencies has been a very effective way to overcome these obstacles.”

parties who the privacy restrictions were designed to protect. These redundancies and missed opportunities reduce overall cost-effectiveness, accuracy and performance. Reviews conducted by NMFS of data collection and management systems in each region note how seriously data stewardship is taken by agency scientists. But reviewers also note some serious gaps, as in this example from the Pacific Islands region's review:

> Current data management and information flow is complicated by multiple hardware and software systems, dispersed offices, and blurred lines of responsibility for data analysis and sharing as mission shifts require new lines of information flow. In some cases, there seem to be problems with the accessibility of data housed both within [the regional science center] and by partner organizations.[6]

While the demands for data continue to rise, NMFS's budget has been highly constrained and remains below 2010 levels. Without a concerted effort to improve the information systems that drive America's fisheries, NMFS will fail to capitalize on the performance gains and efficiencies that improved information infrastructure can deliver. Agency systems will not be able to handle new data streams from industry and citizen scientists. Obligations to support anglers and industry in an era of fiscal constraint will be compromised. And NMFS will risk falling behind other agencies, many of which have prioritized information system improvements under successive administrations.[7]

[6] Pacific Islands Fishery Science Center. 2013. Review of Information for Fishery Stock Assessments. Prepared by Gordon Tribble, USGS Pacific Island Ecosystems Science Center.

[7] See, for example: Office of Management and Budget. 2005. Memorandum for the Heads of Executive Departments and Agencies on Improving Public Access to and Dissemination of Government Information and Using the Federal Enterprise Architecture Data Reference Model. M-06-02 from Clay Johnson, III.

AREAS OF PROGRESS

The National Marine Fisheries Service and partners have initiated or facilitated a number of promising reforms to start addressing these challenges. Building upon and scaling up these efforts is one key way to make progress.

- Regional 'fishery information networks' have long sought to lead collaborations across jurisdictional lines to improve data quality and timeliness for use in fisheries management. For example, the Pacific Fisheries Information Network (PacFIN) has been operational since 1981. On the Atlantic Coast, the implementation of an Atlantic Coastal Data Warehouse, and near universal electronic dealer data collection, are examples of important progress these regional programs have spearheaded or helped facilitate.

- In 2013 NMFS issued a policy directive on electronic technologies and fishery-dependent data collection,[8] followed by a "guidance and best practices" document for integrating electronic monitoring and electronic reporting (EM and ER) in federal fisheries.[9] These steps from agency leadership to encourage adoption of new technologies and share best practices have been important in catalyzing progress on EM and ER in a number of regions.

- In 2013, NMFS began regular program reviews of data collection and management in each region to maintain the agency's standard of world class science. Experts from within and outside the agency review key programs annually on a five year cycle, and make recommendations to improve integration, identify best practices, and share successes and challenges within the agency's science enterprise. These reviews have identified challenges with lack of funding, personnel, and the need for improved data management infrastructure and are being used by the agency to drive planning and priorities.

- The North Pacific and Pacific regions, and the Atlantic Highly Migratory Species Management Division, have made progress in implementing electronic technology in commercial fisheries management. Considerable effort has been made in Alaska to identify key roles and responsibilities for industry, stakeholders, managers and scientists and involve all parties in the design of an

[8] National Marine Fisheries Service. 2013. Policy on Electronic Technologies and Fishery-Dependent Data Collection. U.S. Department of Commerce, NMFS Policy Directive 30-133.
[9] National Marine Fisheries Service. 2013. NMFS Guidance and Best Practices for EM and ER. U.S. Department of Commerce.

electronic monitoring program to meet management objectives. In the Pacific, the Council is building on successful pilots to implement electronic monitoring for all sectors of the West Coast groundfish fleet. And the Atlantic Highly Migratory Species Management Division has deployed EM to monitor Atlantic bluefin tuna bycatch in the pelagic longline fishery. In all cases, the goal is improved and more cost-effective data for management and enforcement.

- In the Gulf of Mexico, the Council is moving to a unified electronic reporting system for recreational for-hire boat logbooks. A pilot project that equipped Gulf headboats with vessel monitoring systems and tablet technology to report catch in real time, and in exchange gave participants the flexibility to fish for snapper and grouper year-round, showed enormous promise. During two years on the water, all participants were able to manage their operations to stay within quotas, and precise catch data was transmitted to state agencies in real time. Fishery Management Plan amendments are now pending in the Gulf Fishery Management Council that could extend the headboat pilot model to the region's entire for-hire fleet.

- A user-centered data visioning process is a best practice for data system design and a key first step. NMFS' Greater Atlantic Regional Fisheries Office and Northeast Fisheries Science Center, in partnership with the Gulf of Maine Research Institute and the University of Massachusetts' School for Marine Science and Technology, undertook a data visioning process in 2014 that engaged stakeholders in identifying a comprehensive set of data and information needs. That vision is informing an implementation program underway through 2017. NMFS' Northwest Fisheries Science Center undertook a user-centered data visioning process for the west coast groundfish catch share fishery. This public-private partnership between NWFSC and design firm IDEO, supported by a grant from the Gordon and Betty Moore Foundation, helped enable changes that reduced catch reporting time from weeks to days.

A VISION FOR THE FUTURE

A future is within reach where fishery information systems become a powerful driver of productivity, innovation and performance for managers and industry alike. There is a clear path for legacy systems to be updated, repurposed and integrated with user needs at the center of the process. We are optimistic that user-centered design, underpinned by an improved management infrastructure, can establish information as a strategic asset and operational priority for NMFS; one that increasingly lies at the center of its decision-making.

The specific challenges faced by NMFS in streamlining fishery information systems are unique. But in many important respects they are also analogous to the challenges faced by other government agencies struggling with legacy systems – whether it be the shift by Veterans Affairs to electronic medical records, the Census Bureau's reimagining of its 2020 survey, or the National Archives' push to more effectively catalogue and make available its collection. In each case, a system powered by user-centered design emerged from reforms focused on Policy, Product, People and Process. We recommend the new administration, with support from Congress, prioritize the acceleration of similar reforms at NMFS.

POLICY: NMFS leadership has an important role to play in reviewing and reforming national policy to catalyze the streamlining of fisheries information. Policies should consistently seek to promote user-centered data as a core feature of fisheries management, ensuring that data are available, discoverable and useable to the greatest extent possible for business, innovation, science and management.

PRODUCT: It is vital that information systems evolve to more effectively meet the needs of a broader range of users. Open, secure architecture and clear data and performance specifications are the building blocks for effective product design. These features will support information access, increased accuracy, flexible uses and innovative, cost-effective tool development by managers and stakeholders alike.

PEOPLE: User-centered data systems will only emerge through the leadership of expert agency staff and management partners (including states, interstate organizations and Regional Councils), through cooperation with private sector partners, and via the involvement of users themselves through stakeholder consultation and participation in design and co-development. The work and involvement of these individuals must be resourced and supported, and individual roles and accountability for systems and data quality must be clarified and clear.

PROCESS: User-centered design processes have the potential to improve efficiency and allow new paradigms to emerge. As fishery information products improve, they must be accompanied by more efficient and effective integration processes to ensure their potential is realized.

WHAT SUCCESS MIGHT LOOK LIKE

ONE-TOUCH REPORTING

Whether it is monitoring data, reports from dealers, information from fishing vessels, or data shared by private anglers, fishermen are able to enter data once and send it to all the appropriate authorities with one touch. Standardized data formats, unique trip identifiers, and well-designed information management systems allow fishermen to seamlessly meet the needs of states, NMFS, and regional data aggregators. Data validation and auto-filled fields from electronic sensors (such as weights from dealer scales, and vessel locations from AIS, VMS or other GPS devises) help improve accuracy, reduce data entry time, and speed up reporting.

VERIFIABLE REAL-TIME DATA

As fisheries information is captured, it is quickly validated and integrated into data that informs management decisions. Managers, recreational anglers and commercial operators all know in close to real time how much of their quota has been fished and how much remains. Smart management decisions to prevent overfishing, increase access and maximize economic gains can be made with confidence.

TECHNOLOGY THAT PERFORMS AND IS WIDELY AVAILABLE

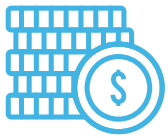
A shift to performance-based standards has enabled service providers to design more effective electronic tools. NMFS and the states have specified the level of performance they require from e-tickets, logbooks, and other technologies, and ceased prescribing system details in regulations or RFPs. NMFS has laid out a blueprint and minimum standards to make data systems work, giving developers the flexibility to innovate and design tools that meet the different needs and use cases of individual sectors and fisheries. Systems work both off and online, and there is always a free or affordable tool to collect the subset of required data.

WHAT SUCCESS MIGHT LOOK LIKE

INCREASED DATA ACCESS

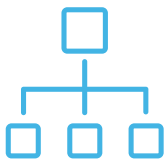
Industry is able to keep copies of their electronic data, just as they keep carbon copies from today's paper systems. They can access and view their data from NMFS after it has been submitted, allowing fishermen to be more effective managers of their businesses and better stewards of the resource. Industry co-ops that pool their data to avoid bycatch hotspots no longer need to build shadow systems reliant on access to NMFS data that are spotty and inconsistent. Rather, system innovations allow businesses to both submit and extract data, including roll-ups of industry activity on a fleet or sector basis. Better data organization makes it easier for NMFS to protect data that are truly confidential, which, in turn, makes it easier and faster for NMFS and the regional Fishery Information Networks to release reports to Councils and the public. Annual and in-season regulations are digital and searchable, allowing any private angler or industry vessel to stay on top of the rules.

BUSINESSES AND GOVERNMENT REAP EFFICIENCY DIVIDENDS



NMFS is doing more with less, as many agency functions are streamlined as a result of improved fishery information systems. Industry is enjoying increased profitability as compliance costs are minimized, and opportunity costs resulting from such causes as management uncertainty buffers and short and inflexible fishing seasons are reduced.

ORGANIZATIONAL EFFECTIVENESS



Clear roles and accountability have been defined across jurisdictions for collecting, managing and disseminating information to meet management objectives. Frequent communication supports trust and collaboration. Well-defined guidelines and procedures for public-private partnerships help leverage and extend the human expertise and financial resources of management agencies.

The Taskforce has identified some specific, concrete steps that can help advance these reforms in the immediate term:

1. The modernization and streamlining of fishery information systems should be identified as a national priority by the incoming NOAA Administrator.

2. NMFS leadership should ensure that all available technology solution opportunities, including public sector expertise (from the U.S. Digital Service and the General Services Administration, including 18F and the Presidential Innovation Fellows Program), as well as private sector partnerships, are fully utilized to meet fishery data modernization goals. A first step should be an external cross-regional assessment that identifies and makes recommendations based on need and best practices.

3. NMFS leadership should release a national data modernization policy – formulated in collaboration with states, interstate organizations, Regional Councils and management partners – which articulates key information system priorities and essential technical guidance, and establishes specific timelines, key roles and responsibilities, and incentives for the achievement of concrete goals with the aim of more effectively serving fishermen and other stakeholders. The policy should include updated directives on the use of electronic technologies in fishery-dependent data collection and improved data infrastructure.

4. Recognizing that an injection of additional resources could both realize enormous long-term budget savings for the agency and deliver an economic boost to the seafood and outdoor recreational sectors, the Administration should propose a data modernization budget initiative.

5. Data confidentiality requirements should be updated to provide clear and consistent guidance; and access to data by participants, and where appropriate the public, should be prioritized.

6. NMFS and state agencies should more directly focus their education and outreach initiatives on the proper use of fishery information systems. This will help ensure that key stakeholders, including fishermen, understand how to use these systems, including how to adapt as products are modernized.

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“System change can be hard, but it can bring huge rewards”

DAVID NAFFIS
Presidential Innovation Fellow
The National Archives

The National Archives now houses an estimated 12 billion records. When David Naffis joined as a Presidential Innovation Fellow, a daunting effort to digitize every one of them was already underway.

“Part of the challenge was that as digitization ramped up, it needed to be wedged into existing, outdated systems,” reflects Naffis. “So much energy was focused on how that could be done that the actual process of digitization was moving incredibly slowly.”

“By front-loading digitization – making the process of getting records online the central focus – we were able accelerate things. And as the benefits of digitization became clearer to a wider circle of stakeholders, more innovative approaches to accommodate conversion emerged.”

“There is always a lot of resistance to change. But by doing the hard work of overcoming barriers to digitization, the Archives has put itself in a far stronger position. It is meeting its mission more effectively by providing far greater public access, achieving substantial cost savings, and freeing up the time of archivists so they can focus on what’s most important. As they anticipate a potential doubling of the number of records they house in the coming years, those gains will be especially critical to their success.”

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