

Vision 2020 (v2.0): **Charting a Course for the Future of** **U.S. Marine Fisheries**

Final Report of the
Marine Fisheries Advisory Committee
(Update of MAFAC Vision 2020 Report)



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Foreward

The Marine Fisheries Advisory Committee (MAFAC) advises the Secretary of Commerce on all living marine resource matters under the purview of the Department of Commerce. MAFAC members evaluate and assess national programs, recommend priorities, and provide their views on future directions. MAFAC members have a wide range of expertise, including commercial and recreational fishing, aquaculture, seafood processing, seafood marketing and sales, consumer interests, coastal communities, and environmental advocacy. MAFAC was established in 1970 to serve as a federal advisory body, complying fully with the Federal Advisory Committee Act.

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Executive Summary

In September 2006, the Assistant Administrator of NOAA's National Marine Fisheries Service (NOAA Fisheries) asked the Marine Fisheries Advisory Committee (MAFAC) to prepare a report on the desired future state of U.S. marine fisheries, a report that created "...in clear, simple, non-jargon language, a stakeholders' consensus on the desired future state of domestic and international fisheries." That report was completed in 2007 and has been updated in 2012. This vision document provides a brief overview of the current trends throughout NOAA's program area and, based on these trends and findings, provides summary recommendations to be undertaken by the Department of Commerce and/or NOAA as appropriate in order to achieve a desired state of fisheries and other marine resources by 2020.

Sustainable Commercial and Recreational Fisheries

In order to achieve fully recovered, sustainable commercial and recreational fisheries, a variety of actions need to be taken. These include the flexible implementation of catch share programs, where appropriate; increasing the number of status determinations on stocks; and improving the science and data used in fisheries management. NOAA should be mindful of fisheries and fishery complexes important to both commercial and recreational fisheries, as well as developing innovative ways to address commercial and recreational fishery management challenges.

Science and Technology

Accurate and timely data on harvest and stock status will remain an integral part to successful fisheries management in the United States. It will require robust investment in science and technology programs, and implementation of state-of-the-art data-gathering technologies across the commercial and recreational sectors. A focus should remain on cooperative research and bycatch reduction. Harvest efficiencies and habitat protection should be integral to research efforts across the board.

Protected Resources

The protection of threatened and endangered marine species will remain a challenge until adequate science and resources exist to (1) prevent the unnecessary listing of species due to unknown risks, (2) provide a full understanding of the threats to at-risk species and their interaction with fisheries, and (3) make management decisions aimed to delist a species. In addition, NOAA Fisheries should work with its federal and state partners to improve the regulatory process associated with species protection, including listing decisions, consultations, and interactions with fishery management decisions.

Habitat Conservation

Habitat conservation plays a key role in fisheries management and in the conservation of marine and coastal resources in general. NOAA should increase its investment in the designation of essential fish habitat (EFH) and address water quality issues and wetland loss in key estuaries across the country. This includes learning more about the functional relationship between habitat types and fish productivity and the impact of inland activities on critical estuarine habitats.

Aquaculture

Given the seafood trade deficit that exists in the United States, we must prioritize advancement of a domestic, environmentally-sound aquaculture industry to produce safe and healthy seafood. This effort should include establishing a regulatory framework for federal waters, addressing permitting challenges, and increasing financial support to the industry. In addition, NOAA should provide comprehensive monitoring and enforcement to safeguard wild stocks and minimize environmental impacts.

Enforcement

NOAA and its Office of Law Enforcement should continue efforts to improve the effectiveness of its programs and relationships with fishermen – all to ensure fair, accurate, and cost-effective enforcement across the board. This will require a continued commitment from NOAA and the development of state-of-the art monitoring technologies.

Seafood Safety and Inspection

Consumer demand for safe seafood will only continue to grow as seafood consumption increases. Therefore, NOAA should expand its commitment to communicate the benefits of seafood consumption and strengthen seafood safety through improved inspection, enforcement, research, outreach, and education.

Changing Oceans

The potential impacts from changing ocean conditions include sea level rise, ocean acidification, and ocean warming. NOAA must fully understand the extent of these changes and their potential impacts on fisheries and other coastal and marine resources, as well on the socioeconomic impacts to fishery stakeholders and the fishery management process. This will require an adequate investment in research and a robust adaptive management framework to maintain sustainable marine ecosystems and the protection of coastal communities dependent on those resources.

Ocean Governance

In order for NOAA to be as successful as possible in the management, conservation, and protection of living marine resources throughout the Exclusive Economic Zone, its status must be strengthened through enactment of an organic act that clarifies its mission and strengthens the execution of its functions. It will also be necessary to fully meet the demands for additional data and science necessary to support ecosystem-based management and establish itself as an unequivocal source of unbiased, peer-reviewed scientific information.

Program Area 1: Sustainable Commercial and Recreational Fisheries

The U.S. commercial and recreational fishing sectors depend upon the long-term sustainability of fishery resources and their ecosystems. Commercial fishing provides a healthy source of food to society at large. In addition, commercial fishing is a unique way of life for many families, and is a distinct culture throughout the coastal United States. In 2011, U.S. commercial fishermen landed 9.9 billion pounds of fish and shellfish, valued at \$5.3 billion, an increase over 2010 of 1.63 billion pounds (19.7 percent) and more than \$769 million.¹ The U.S. seafood industry combined—including the commercial harvest sector, seafood processors and dealers, seafood wholesalers and distributors, importers, and seafood retailers—supported approximately one million full- and part-time jobs and generated \$116 billion in sales impacts, \$32 billion in income impacts, and \$48 billion in value added impacts.²

Marine recreational fishing is also an economic powerhouse. According to NOAA Fisheries,³ in 2009 there were approximately 11 million recreational anglers across the United States who took 74 million saltwater fishing trips around the country. These anglers spent \$4.5 billion on fishing trips and \$15 billion on durable fishing-related equipment. These expenditures contributed \$50 billion in sales impacts to the U.S. economy, generated \$23 billion in value added impacts, and supported over 327,000 job impacts.

RELATED TRENDS AND FINDINGS:

Many measures are required to continue rebuilding efforts.

Recent landings by U.S. commercial and recreational fisheries are 61 percent of the long-term potential yield.⁴ To maximize the sustainable harvest of fisheries, current efforts to rebuild stocks must continue and efforts to reduce, or control and account for, bycatch and mortality must be encouraged and increased. In addition, harvest and landing data need to be improved to account for all mortality. Fisheries, where possible, may be rationalized to help maintain sustainability and protect the stakeholders and communities. All these measures will be required to achieve optimum yield by 2020.

While stocks continue to rebuild, there are still those for which status has yet to be determined.

While U.S. fisheries management has made great strides to eliminate overfishing and to rebuild overfished stocks, significant challenges remain. For 2011, NOAA Fisheries reviewed the 537 individual stocks and stock complexes that were managed within 45 federal fishery management plans nationwide. Determinations of both overfishing and overfished status could be made for

¹NOAA Fisheries, 2012. [Fisheries of the United States, 2011](http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus11/index). Office of Science and Technology. August 2012. <http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus11/index>.

² NOAA Fisheries, 2010. *Fisheries Economics of the U.S., 2009*. Office of Science and Technology. https://www.st.nmfs.noaa.gov/st5/publication/econ/2009/US_ALL_Econ.pdf

³ NOAA Fisheries, 2010. *Fisheries Economics of the United States, 2009*. U.S. Dept. Commerce, NOAA Tech. Memo, NMFS-F/SPO-118, 172p. https://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2009.html.

⁴ NOAA Fisheries, 2009. *Our living oceans. Report on the status of U.S. living marine resources, 6th edition*. U.S. Dept. Commerce, NOAA Tech. Memo, NMFS-F/SPO-80. 369 p.

202 stocks and complexes (37.6 percent of all managed stocks). An additional 75 stocks or stock complexes have either a known overfishing determination or a known overfished determination.⁵

Catch Share programs are an increasingly used management tool.

Catch share programs have been used in U.S. federal fisheries since 1990. Programs have been implemented in the Mid-Atlantic, Alaska, Florida, the Gulf of Mexico, New England, and the West Coast, each managed by their respective fishery management councils. The NOAA Catch Share Policy, effective in 2010, provides guidance and direction for future catch share programs as a fishery management tool to build and maintain sustainable and prosperous U.S. fisheries and healthy ocean ecosystems. Catch shares are an economic tool that has led to success in some offshore fisheries, but catch share implementation can be undermined by independent ecological problems such as fish stock declines associated with changing ocean conditions. Although there is now an overarching policy, the transition from traditional management to catch share programs has proven problematic in some regions.

In the United States, catch shares may be helping to eliminate overfishing and achieve annual catch limits. In addition, some catch share programs help commercial fishermen maximize the prices they are paid for their product. Catch share programs may also improve fishermen's safety, in that they may choose to fish when weather is best. However, not all commercial fisheries are suitable for management by catch share programs, and some fisheries, in different regions of the country, oppose the implementation of catch share programs.

For certain catch shares, some of which have been in place for 20 years, there has been significant financial investment made by those who participated in the fishery since the quota system was created, by those who continue to fish, by those who entered into the fishery by purchasing or leasing privileges, and by those who chose to exit the fishery. Any regulatory changes in fisheries currently managed by catch share systems may have highly disruptive social and economic effects.

Annual catch limit requirements of Magnuson-Stevens Act may need improved processes to achieve its goals.

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act amended the MSA to include new requirements for annual catch limits (ACL) and accountability measures (AM) and other provisions regarding preventing and ending overfishing and rebuilding fisheries. To guide implementation of these requirements, the National Standard 1 Guidelines were updated in 2009. National Standard 1, codified at 50 C.F.R. 600.310, relates to the optimum yield (OY) of a fishery, and states that "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry." As of 2012, all federal fishery management plans have been amended to implement ACLs and AMs to end and prevent overfishing.

Based on experiences gained from implementing the ACLs and AMs over the past several years, stakeholders identified issues regarding the application of National Standard 1 that warrant review and possible revision. These issues include:

⁵ NOAA Fisheries, 2012. *Annual Report to Congress on the Status of U.S. Fisheries-2011*. U.S. Department of Commerce, NOAA, NOAA Fisheries, Silver Spring, MD. <http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm>

- In some fisheries, implementation of the NS1 guidance has resulted in reductions in catch. However, questions have been raised about the relationship between ACLs and the objective of achieving the optimum yield (OY) for a fishery.
- Management of mixed-stock fisheries is challenging, because some stocks are relatively more abundant or are more or less susceptible to overfishing than others. However, some ACL and rebuilding requirements for certain species have prevented fishermen from accessing the full potential of healthy stocks.

As a result, an Advance Notice of Proposed Rulemaking was published in May 2012 to consider the revision of National Standard 1 Guidelines, a process that will engage fishermen and managers into the future.

The marine recreational fishing sector will stabilize and be on a recovery path as the economy improves and as science provides the foundation to better manage access opportunities.

Recreational fishing continues to be one of the most popular outdoor sports. Ten million anglers took nearly 69 million saltwater trips in 2011.⁶ Better management of recreational fishing depends on dramatic improvements in the timeliness and accuracy of recreational harvest data, supported by technological innovations. Technological innovations will also assist the survival rate in catch and release fisheries. This should be closely monitored to quantify how successful release techniques are, and how frequently used, especially as related to barotrauma. The value of fisheries to the growing recreational fisheries sector goes beyond the measurable economic value, because of the role fishing and fish play in enhancing health and quality of life benefits to fishermen and their families, communities, and social networks with whom they may share fish.

As depleted stocks rebuild, managers will face new challenges.

As the requirements of the MSA are implemented and overfished stocks rebuild, it is hoped these stocks will expand and reoccupy habitats in their historic range. This dynamic may result in new conflicts with fisheries targeting other stocks, including bycatch and dead discards of the rebuilding stock in other fisheries. In recreational fisheries, individual fish should weigh more as stocks rebuild, resulting in greater pounds of harvest with the same bag limit and season. This can lead to the need to shorten seasons and reduce bag limits even as there is strong evidence that the stock is rebuilding.

As a result, managers will be pressured by both commercial and recreational sectors to allow increased catches as soon as possible. This will be coupled with the desire for increased economic activity. However, models that establish rebuilding plans may fail to predict the extent and location of these new management challenges. Managers are left scrambling to respond with few tools and an inability to respond quickly.

International Regional Fisheries Management Organizations (RFMOs) fail to implement necessary conservation measures.

Although the United States has management authority for several highly migratory species (HMS), most are managed cooperatively by RFMOs. The performance of RFMOs is uneven

⁶ NOAA Fisheries, 2012. [Fisheries of the United States, 2011](http://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus11/03_recreational2011.pdf). Office of Science and Technology. August 2012. http://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus11/03_recreational2011.pdf

with regard to effective management of stocks under their jurisdiction. This unevenness affects the United States in several ways. First, because the United States imports a significant amount of seafood, any mismanagement of stocks on the high seas will ultimately reduce the amount of seafood available for American consumers. Second, because consumers often do not distinguish between poorly managed fisheries overseas and well-managed fisheries in the United States, domestic fishing companies and fishermen can be unfairly accused of inadequate commitment to sustainability. Finally, when total harvest reductions are necessary to effectively improve the health of these stocks, U.S. fishermen are frequently required to significantly reduce harvests without similar measures being adhered to by foreign fishing fleets.. The United Nations and RFMOs themselves are considering means to make the international management of highly migratory fish stocks more effective.

SUMMARY RECOMMENDATIONS

To achieve sustainable fisheries, MAFAC recommends the following:

- NOAA Fisheries should strategically invest in increasing the number of stocks for which status can be determined based on their importance to commercial and recreational fisheries.

With regard to the implementation of catch share programs, MAFAC recommends:

- NOAA should not require the use of catch shares in any particular fishery or sector, but may promote and encourage the careful consideration of catch shares as a means to achieve the conservation, social, and economic goals of sustainable fishery management.
- In the proposed development of any new catch share program, NOAA and the Councils should specify sufficient catch share design characteristics during the scoping phase for a proposed FMP or amendment, so that stakeholders can understand the potential impacts. During the development of a catch share program, regional councils should consider provisions that address potential future reallocation of the quota and new entrants.
- For those individual quota fisheries already implemented, NOAA should proceed deliberately in the consideration of any regulatory changes to existing programs. Issues such as initial allocation, accumulation limits, transferability provisions, and restrictions on ownership are often highly controversial.
- Adequate resources should be secured to ensure appropriate accountability and enforcement of catch share programs, along with robust stock assessments needed to manage catch share programs.
- Frequently, agreements regarding program elements are reached based on extensive discussion and compromise within the industry. NOAA should consider the history of the development of each quota/catch share plan before initiating proposed regulatory changes.
- Periodic evaluation of the effectiveness of individual catch share programs should be undertaken to determine the effect on stock sustainability, community resilience, and past, present, and future participants.

To implement Annual Catch Limits, MAFAC recommends:

- NOAA should more fully address economic and social considerations in the establishment of OY, and more clearly describe the relationship between ACLs and OY.

- NOAA should take further action to address how OY should be specified in order to balance the multiple considerations in mixed stock fisheries and prevent denying access by fishermen to healthy stocks.
- NOAA should re-examine whether scientific uncertainty and management uncertainty result in excessive constraints in setting annual catch targets.

To support recreational fishing, MAFAC recommends:

- Sale of recreationally caught fish is a form of commerce and should be prohibited at state and federal levels.
- Emphasis must be placed on increasing the effectiveness of the Marine Recreational Information Program (MRIP) with close consideration given to the Registry and issues with data quality. The intent is to avoid the potential loss of valuable fishing opportunities.
- There should be continued effort to establish quality communications infrastructure between NOAA and the recreational fisheries community.
- Fishery management plans may include an analysis of quota transfer between recreational and commercial sectors and the incorporation of market mechanisms where appropriate.
- Efforts should be directed to more fully assess the less easily quantified social and cultural values of participation in recreational fisheries to fishermen, families, and communities.
- There needs to be continued socioeconomic study on a regional basis regarding the net benefits to the nation of recreational fishing.
- Regulation should be based on sound science and management of recreational fishing and should be informed by a better understanding of fishermen's behavior in response to various management tools.
- NOAA should consider shifting recreational management to be based on the number of fish caught in contrast to number of pounds caught, where appropriate.

To rebuild stocks, MAFAC recommends:

- NOAA should improve rebuilding models and increase their ability to advise managers regarding range extensions and conflicts with other fisheries.
- NOAA should develop best practices for managing stocks while they are rebuilding and incorporate them into new tools and strategies that are shared through new training for fisheries scientists and fisheries managers.
- NOAA Fisheries should consider the role of underutilized species to meet current domestic demand after considering biological, ecological, socioeconomic, and technological implications.

To support international RFMOs, MAFAC recommends:

- All fisheries, domestic and international, should be effectively managed to sustain long-term optimum yields.
- NOAA should provide assistance to RFMOs to promote sustainable stocks using available political, economic, and other strategic tools to ensure other countries successfully implement the recommendations of RFMO scientific staff.

Program Area 2: Science and Technology

RELATED TRENDS AND FINDINGS:

Accurate and timely data on harvest and stock status play a crucial role in fishery management.

Fisheries managers require high-quality, timely catch data, reliable fisheries-independent data, and well-supported predictions about species status and abundance. Presently, fishery managers and stakeholders are deeply concerned that the timeliness and accuracy of harvest (catch) and stock status data are insufficient to produce successful outcomes for fisheries management. However, the current investment in data is disproportionately low relative to the societal value of the resources under NOAA's stewardship. Inadequate funding for research and data collection hinders our understanding of the impacts of changing ocean conditions, and challenges our ability to manage commercial and recreational fisheries and aquaculture.

Technological innovations provide cost-effective tools for improving sustainable fisheries management, solving many of our current management challenges.

Many commercial and recreational fishermen use increasingly sophisticated technology during fishing operations to help obtain information to improve management, reduce bycatch, and minimize habitat impacts caused by fishing. Each of these technological applications can enhance operational efficiencies and conservation objectives through cleaner fishing and minimizing fishing gear impacts on the environment.

Electronic equipment common in the wheelhouse includes state-of-the-art sonar equipment to locate target species, computer logbooks to provide real-time catch reporting and historical catch information, and electronic net sensors to provide location data for nets on the ocean floor. Vessel monitoring systems (VMS) relay information about a vessel's location via satellite and are used to enforce management area closures. Video monitoring through mounted on-deck cameras is being studied as an alternative to placing observers onboard vessels, allowing for greater cost effectiveness and in some cases improved data quality. With the implementation of catch share systems, more human observers have been placed aboard vessels. The percentage of the fishery catch actually observed varies throughout the nation, as does whether the cost of an observer program is paid by vessel owners or by NOAA.

Cooperative research provides important contributions to fisheries science and technology.

NOAA science is strengthened through intra- and inter-agency coordination of science and technology programs, partnerships with universities and other marine research entities, and cooperative research with fishermen. In recent years, cooperative research involving NOAA Fisheries, the fishing industry, universities, and the private sector has produced fishing gear innovations to increase retention of target species, minimize bycatch and mortality of non-target species, and reduce impact of fishing gear on ocean habitat. In addition, NOAA Fisheries is increasing its efforts to assist projects that outfit fishing vessels with acoustic or video equipment that enhances stock assessment capabilities, as well as ocean monitoring equipment.

Technology is integral to NOAA Fisheries' science program.

NOAA's science mission is significantly enhanced through expanded use of satellite imaging, VMS, integrated ocean observing systems, acoustic surveys, Seagliders, and GIS mapping and assessment.

- Satellite imaging assists ocean observation and is an increasingly important tool for assessing fish and marine mammal stocks, identifying “bycatch hotspots,” and mapping sensitive habitat.
- An integrated ocean observing system (IOOS) provides continuous, real-time observations that include acoustic readings to determine fish and marine mammal migrations and optical technologies to monitor ecosystem health. This technology will improve fishery survey work and can also be used to characterize the seabed.
- Autonomous underwater vehicles (AUVs) and Seagliders, are small, free-swimming vehicles that are extremely energy efficient and can be deployed for months at a time to record oceanographic measurements traditionally collected by research vessels, but at much less expense.
- GIS mapping and assessment technology allows managers to understand potential interactions and impacts of multiple ocean uses on specific ocean habitats and resources.

SUMMARY RECOMMENDATIONS

To improve accurate and timely catch data in fisheries management, MAFAC recommends:

- NOAA should increase its funding for research into improving stock assessments in every budget cycle.
- NOAA's investment in timely, reliable data and predictive modeling capacity for living resource management should increase to match the societal value of the living resources under NOAA's stewardship.

To improve harvest efficiencies and habitat protection, MAFAC recommends:

- NOAA should prioritize implementation of technological innovations that increase fishing efficiency and timely data reporting while decreasing fishing impacts on habitat and non-target species.
- The regulatory process should be streamlined to allow for the ability to switch to more species-specific and habitat-friendly gear types.
- NOAA Fisheries and the commercial fishing industry should continue to develop industry partnerships such as its Cooperative Research Programs and Bycatch Reduction Engineering Programs.
- Onboard electronic/video observing and reporting of catch should be implemented as soon as possible and, in the interim, NOAA should implement a uniform policy and pay for the cost of observers aboard vessels at sea. In fact, greater investment in video observation may reduce costs of on-board observers, resulting in an overall cost savings for NOAA.

To expand cooperative research, MAFAC recommends:

- NOAA should strengthen its science partnerships with other agencies, universities, marine research entities, and fishermen.

- For at-sea research needs, NOAA should consider contacting the commercial fishing fleet to use vessels as platforms and to retain commercial fishermen in the project design, implementation, and execution, as appropriate.

To assess ocean conditions, MAFAC recommends:

- Congress must adequately fund NOAA Fisheries' science and technology programs, in order to increase: protection and conservation of marine living resources, understanding of the ocean environment, effective fisheries management, and benefits for fishermen and fishing communities.

Program Area 3: Protected Resources

RELATED TRENDS AND FINDINGS:

The conservation of marine turtles in U.S. waters and on U.S. beaches continues to be jeopardized by activities in other nations and on the high seas.

Cooperative gear research and innovative fishing gear modifications hold the potential to reduce incidental take of marine turtles. However, sea turtle protection in U.S. waters alone is insufficient to ensure species recovery. Although international treaties, agreements, and national laws protect marine turtles, harvest of eggs and adults and incidental capture in fishing gear continue to threaten recovery worldwide. Meanwhile, better information about biology, distribution, population status, and threats allows revised U.S. recovery plans to focus on effective management efforts.

There are numerous current and emerging threats to coral species with few management tools able to effectively protect against these threats.

Coral reefs around the world are threatened by myriad conditions, some related to ocean warming (e.g., disease and bleaching), others related to coastal pollution (e.g., algal smothering and sedimentation), and still others the result of overharvest of herbivorous fish. In addition, ocean acidification is an emerging potential threat that requires further study. Stressed corals are less resilient and slower to recover from natural disturbances.⁷ Current and future petitions to list coral species as threatened or endangered in U.S. waters will require intense effort to determine the status of many poorly studied coral species.⁸ Furthermore, traditional ESA recovery and protection processes, including consultation on and regulation of the potential effects of fishing of coral species, may be inadequate to protect corals from pollution, sedimentation, ocean warming, and acidification.

⁷ Bellwood, D.R., Hughes, T.P., Folke, C., and Nystro, M. 2004. Confronting the coral reef crisis *Nature* 429 (24 June 2004). | Climate Change, Human Impacts, and the Resilience of Coral Reefs. Hughes, T.P., Baird, A.H., Bellwood, D.R., Card, M., Connolly, S.R., Folke, C., Grosberg, R., Hoegh-Guldberg, O., Jackson, B.C., Kleypas, J., Lough, J.M., Marshall, P., Nystro, M., Palumbi, S.R., Pandolfi, J.M., Rosen, B., Roughgarden, J. 2003. *Science*, Vol. 301 (15 August 2003).

⁸ NOAA Proposes Listing 66 Reef-building Coral Species under the Endangered Species Act. Press Release, November 30, 2012. <http://www.nmfs.noaa.gov/stories/2012/11/82corals.html>.

The pace of new finfish species listings is accelerating with 10 species listed since 2000 and many more under consideration.

As a group, the Pacific salmonids face threats related to dams, water diversions, depleted flows, inaccessible habitat, land uses that degrade habitat, entrainment, disease, and genetic issues. Potential recovery actions have complicated social and economic costs. At the same time, experimental dam removals are showing strong potential for salmon recovery. Other listed finfish species declined from overfishing historically, but now face threats from incidental catches, habitat loss, dams and water control structures, and flow alterations.

The primary human-related threats facing marine mammals have changed over the past 100+ years.

Intentional killing (e.g., to reduce depredation on fish) and over-harvesting (for oil, meat, or pelts) account for the population declines that resulted in threatened or endangered status for most of the marine mammals currently listed. More recently, incidental take (bycatch, ship impacts) and habitat degradation have become major human-related threats facing marine mammal populations.

Number of protected species managed by NOAA, and the costs of management, is increasing.

The number of marine species listed as endangered or threatened species continues to rise, and with each new listing comes new management responsibilities pursuant to the Endangered Species Act (ESA). Choosing the correct taxonomic or population unit for evaluation is challenging and contentious, and the trend has been to split species into smaller and smaller units (e.g., a single pod of killer whales, AT1, is listed as a depleted population stock under the Marine Mammal Protection Act). In addition, as threats to some species increase, and as their populations decline, there is an increased likelihood of citizen petitions proposing new listings, and litigation over those petitions. Conversely, few species reach the point of delisting. As a result, implementation of the ESA becomes increasingly expensive. As citizen suits and court orders eventually lead to additional species conservation mandates, and assuming that budgets remain steady or decline, ESA implementation will require an increasingly large percentage of the overall NOAA budget.

Managers face difficult choices between protecting listed species and avoiding fishery closures.

As listed species numbers increase, so too does the risk that fisheries interacting with those species will face seasonal or area closures, to avoid jeopardy to the protected species. Closures, however, prove highly controversial due to their harmful economic consequences.

The regulatory burden can fall disproportionately on fisheries when protected species threats are macro-level oceanic changes.

Some of the increase in listed species will, inevitably, be attributable to macro-level oceanic changes associated with climate change, sea level rise, and ocean acidification. In some cases (e.g., sensitive and rare coral or estuarine species), these problems may serve as the overwhelming reason for listing a species as endangered or threatened. Once listed, even though fishery interactions with that species might account for only a small percentage of the overall impact to a species, the limitations on take of the species, and the need to avoid jeopardizing the continued existence of a listed species could require a fishery to bear the burden of increased regulation or even closures, despite the limited contribution of the fishery to the overall problem.

Aquaculture can play a role in protected species management.

As species become rarer, and as listed species face extinction, additional intervention may be necessary, such as the increased use of hatcheries or captive breeding. For example, NOAA is currently considering whether to list the queen conch as a threatened or endangered species; yet this species is already the subject of aquaculture research.

The regulatory process surrounding listed species can be slow and burdensome.

Stakeholders, such as scientists needing research and enhancement permits and others requesting incidental take authorization, have at times complained that the regulatory process is slow and burdensome, even for beneficial conservation biology-oriented efforts. NOAA Fisheries scientists are among those whose research and conservation activities have been delayed or derailed by an overly burdensome and at times capricious permit process. In May 2012, the U.S. Fish and Wildlife Service (USFWS) entered into an unprecedented agreement with the Florida Fish and Wildlife Commission (FWC) pursuant to Section 6 of the ESA. One aspect of that agreement allowed state-issued permits to satisfy federal legal requirements as well, thereby streamlining the regulatory process and reducing the workload burdens for both the government and the regulated community.

SUMMARY RECOMMENDATIONS

To manage protected resources, MAFAC recommends:

- NOAA should increase and emphasize research on protected species, distribution, population status, and threats in order to prevent listings due to a lack of science.
- NOAA should partner with federal and state agencies to remove structures and restore habitats and freshwater flows essential for the recovery of anadromous species listed as threatened and endangered.
- Absent statutory changes, the staffing and budget for protected resources must increase.
- NOAA should focus its protected resources work on achieving recovery of listed species.
- NOAA should strive to keep the total number of protected species stable, or declining, by increasing the rate of delisting currently listed species and decreasing the rate of listing new species.
- NOAA Fisheries should vigorously continue its proactive measures to prevent species from becoming imperiled. These measures include increased research in cooperative gear development and innovative fishing gear modifications to reduce bycatch and incidental take of protected species to improve avoidance, release mortality, and increase habitat protection, enhancement, and restoration.
- NOAA Fisheries should increase transparency and scientific rigor in the selection of appropriate marine mammal conservation units for consideration under the ESA in order to avoid either over- or under-protection.
- NOAA Fisheries should educate the regional public about newly listed species, to increase awareness and help the public and stakeholders better understand regulatory decisions (*e.g.*, fisheries closures) that may follow.
- To the extent possible, NOAA Fisheries should avoid regulating a fishery if the real cause of the problem is elsewhere. However, if the ESA forces this result, NOAA Fisheries should use the opportunity to educate the public on how inaction and regional

and global climatological threats are having real and immediate impacts to people and their local economies.

- NOAA Fisheries scientists in the Office of Protected Resources should increase their interaction with aquaculture scientists to determine criteria and threshold conditions under which industry techniques could be used in proactive conservation aquaculture initiatives to benefit protected resources.
- NOAA should clarify the potential role of aquaculture in species recovery and provide criteria for identifying the threshold conditions to consider hatchery and captive breeding interventions.
- To reduce the permitting workload for the Office of Protected Resources, and to ease the regulatory process for stakeholders, NOAA Fisheries should pursue agreements with agencies from coastal states (such as the cooperative agreement between the USFWS and FWC in Florida) and seek ways to streamline the process for obtaining necessary permits or completing consultations.
- NOAA should put more effort into removing species from the endangered list (*e.g.*, sperm whales), where appropriate, to highlight ESA successes.

Program Area 4: Habitat Conservation

RELATED TRENDS AND FINDINGS.

Essential Fish Habitat plays an important role in fisheries conservation

Ensuring the availability of suitable fish habitat is an essential part of maintaining healthy fish populations and should be considered an integral component of effective fisheries management. NOAA has a particularly important role in leading the nation's efforts to conserve coastal, marine, and riverine habitat, which are among some of the most biologically rich and economically valuable areas on Earth. The Magnusson- Stevens Act recognizes the importance of habitat and directs NOAA and the fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. Once essential fish habitat (EFH) has been designated, NOAA uses its authority to minimize the impacts of activities that threaten to alter, damage, or destroy these habitats. EFH is one of NOAA's primary, yet underutilized, tools for conserving fish habitat. EFH is intended to recognize habitat that is most important for the productivity, and therefore sustainability, of fish populations and distinguish it from all habitats potentially used by the species.

The importance of scientific information for effective habitat management was contemplated in the development of the Magnuson-Stevens Act, which called for Councils to organize information on the habitat requirements of managed species using a four-tier approach, ranging progressively from basic information about the distribution of a species (Level 1) to habitat-specific production rate information (Level 4). The vast majority of EFH designated to date uses Level 1 information. While EFH identified with Level 4 information would represent the most important for the productivity of a species and allow managers to readily incorporate habitat into fishery management plans, it is the least available information. Level 4 designations are rare,

which hinders NOAA's ability to persuade, via coordination and consultation, other state and federal agencies to modify potentially impactful actions.

Water quality and sustainable practices on land will grow in importance.

The connection between the ocean and land reaches far beyond the coastline. The health of the ocean depends in part on the health of its estuaries, which in turn depend on the water quality of freshwater flows. As a result, activities on lands that alter freshwater quality and the quantity and timing of freshwater flows can have substantial effects on coastal estuaries and the ocean. In addition, implementation of the Clean Water Act, which regulates watershed pollution, continues to move slowly, while also growing increasingly complicated. While point source pollution can be regulated through permit conditions, there are greater difficulties regulating non-point source pollution, and it requires greater creativity, especially for agricultural pollution.

Continued loss of wetlands throughout the United States.

In spite of a mandate under the Clean Water Act for no net loss of wetlands, in the United States marine and estuarine intertidal wetlands, collectively, declined by an estimated 84,100 acres from 2004 to 2009. The loss rate of intertidal emergent wetland increased to three times the previous loss rate between 1998 and 2004.⁹ Degradation of wetlands is one of the main causes of reduced fishery production and a coordinated effort across federal agencies is necessary to address these challenges.

SUMMARY RECOMMENDATIONS:

To conserve habitat and protect water quality, MAFAC recommends:

- In order to realize the full potential of EFH as a fisheries management tool, NOAA should invest in scientific studies that shed light on the functional relationship between habitat types and fish population productivity.
- By 2020 at least 50 percent of EFH designations should be based on Level 3 or 4 information, as described in the regulations.¹⁰ This is information that is available on the growth, reproduction, or survival rates within habitats (Level 3) or habitat-specific productivity (Level 4) of fish species.
- NOAA should continue to provide coastal municipalities with encouragement, and funding or technical expertise, as appropriate, to develop improved technologies for preventing and treating agricultural and urban runoff. In addition, NOAA should engage in greater coordination with the U.S. Environmental Protection Agency as it develops policies and regulations to abide by the Clean Water Act.
- In a coordinated effort with the U.S. Department of Agriculture and the U.S. Environmental Protection Agency, NOAA should engage in selected studies to compare the environmental impacts of terrestrial agriculture on critical estuarine habitats.
- The Federal Government must enforce the Clean Water Act and stop wetland destruction in order to further support the rebuilding and protection of U.S. fisheries.

⁹ Dahl, T.E. 2011. *Status and trends of wetlands in the conterminous United States 2004 to 2009*. U.S. Department of the Interior; Fish and Wildlife Service, Washington, D.C.

¹⁰ 50 CFR Ch. VI (10–1–11 Edition). Part 600, Subpart J (Essential Fish Habitat), Section 600.815 (Contents of Fishery Management Plans). <http://www.gpo.gov/fdsys/pkg/CFR-2011-title50-vol10/pdf/CFR-2011-title50-vol10-sec600-815.pdf>.

Program Area 5: Aquaculture

RELATED TRENDS AND FINDINGS

Aquaculture production will continue to grow.

Global aquaculture increased from 3.9 percent of total food fish production (by weight) in 1970 to 27.1 percent in 2000 and to 45.7 percent in 2008.¹¹ Globally, aquaculture is growing at an average rate of 8.3 percent per year, more rapidly than all other food-producing sectors.

Aquaculture production will soon eclipse the contribution of capture fisheries to the worldwide food supply.

Today, domestic aquaculture provides only 5 percent of U.S. seafood supplies and only 30 percent of that is of marine origin.¹² Foreign aquaculture production composes 55 percent of U.S. fish imports—primarily shrimp, salmon, and tilapia. Total U.S. aquaculture is valued at about \$1.2 billion annually,¹³ representing only 1.2 percent of global fish and shellfish production.

According to the UN Food and Agriculture Organization,¹⁴ global aquaculture production will need to double by the year 2030 to maintain current worldwide per capita fish consumption. A significant expansion in the U.S. aquaculture production of fish and shellfish is needed to meet increasing domestic and international demand and to decrease the U.S. seafood trade deficit.

A robust domestic aquaculture industry could significantly augment U.S. seafood production and would help meet the increasing demand for seafood products. Increased domestic aquaculture production would reduce our reliance on foreign sources of seafood, help reduce our national seafood trade deficit (\$4.8 billion in 2011¹⁵), create jobs, and improve food security. The following considerations should be kept in mind when growing aquaculture production in the United States:

- Domestic aquaculture products are produced under some of the most stringent food-safety and environmental regulations in the world.
- Increased availability of domestically produced aquaculture products will enhance consumer confidence and improve public health.
- The major obstacles to increased production of marine aquaculture products in the United States are permitting and regulatory roadblocks, as opposed to technical or financial challenges.

¹¹ FAO, 2011. *State of World Fisheries and Aquaculture, 2010*. <http://www.fao.org/docrep/013/i1820e/i1820e.pdf>.

¹² Presentation by NOAA's Dr. Michael Rubino at February 2006 Aquaculture America Meeting: Offshore Marine Aquaculture: Building on Policy, Technology and Research.

http://www.lib.noaa.gov/docaqu/presentations/aa_offshorepanel_files/rubino_aa_06.pdf.

¹³ NOAA, 2007. NOAA Ten Year Plan for Marine Aquaculture, NOAA Aquaculture Plan. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, October 2007. http://aquaculture.noaa.gov/pdf/finalnoaa10yr_rweb.pdf

¹⁴ FAO, 2006. *State of world aquaculture 2006*. FAO Fisheries Technical Paper 500. Rome 2006. <ftp://ftp.fao.org/docrep/fao/009/a0874e/a0874e00.pdf>.

¹⁵ NOAA Fisheries, 2012. *Fisheries of the United States, 2011*. Office of Science and Technology. August 2012. <http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus11/index>.

- There is no current legislative authority to grant aquaculture leases for federally managed species in federal waters, preventing aquaculture development outside of state waters and in the Pacific territories where the Exclusive Economic Zone (EEZ) extends to the shore.

SUMMARY RECOMMENDATIONS

To increase the role of aquaculture in the United States, MAFAC recommends:

- The United States must prioritize advancement of a domestic, environmentally sound aquaculture industry for the production of safe and healthy seafood to create jobs and support coastal communities, to strengthen important commercial and recreational fisheries, and to help restore species and habitat.
- NOAA should work with lawmakers to craft legislation establishing a regulatory framework to allow aquaculture leases in federal waters, or establish a workable leasing mechanism through the regional fishery management councils.
- NOAA should work with federal and state partners to identify ways to streamline permitting, eliminate regulatory redundancy and uncertainty, and clarify policies to encourage private investment in sustainable production systems.
- The Department of Commerce and NOAA should implement the priorities of the 2011 department and agency aquaculture policies and establish a national framework for the expansion of sustainable domestic aquaculture.
- NOAA should significantly increase financial resources, including in grant programs and other financial assistance considerations, to match the vision of domestic aquaculture laid out in the Department of Commerce and NOAA policies.
- The domestic aquaculture industry should be eligible for financial and technical support similar to that available to the American agricultural industry.
- NOAA should provide continuous, comprehensive monitoring of marine aquaculture sites to safeguard wild stocks and minimize environmental impacts, enforce existing regulations, and implement regulations that will meet these goals.

Program Area 6: Enforcement

The NOAA Office of Law Enforcement is responsible for carrying out more than 35 federal statutes, including the Magnuson-Stevens Act, Endangered Species Act, Marine Mammal Protection Act, National Marine Sanctuary Act, and Lacey Act. The agency's jurisdiction spans more than 3 million square miles of open ocean, more than 85,000 miles of U.S. coastline, the country's 13 National Marine Sanctuaries, and its Marine National Monuments. It is also responsible for enforcing U.S. treaties and international law governing the high seas and international trade.

RELATED TRENDS AND FINDINGS

There is a lack of trust by the fishing industry in NOAA enforcement.

Although fishing regulations are complex, in some regions, in at least the past decade, NOAA has appeared overly rigid and inconsistent in its interpretation and application of provisions of

regulations. This has contributed to a sense of lack of trust by the fishing industry in NOAA enforcement. It will take more than a year or two for this perception to change.

A 2010 Inspector General report evaluated the current state of NOAA's enforcement program.

In a Final Review of NOAA Fisheries' Enforcement Programs and Operations (U.S. Department of Commerce, Office of Inspector General, September 2010), multiple complaints from the commercial fishing community were confirmed to have a legitimate basis in fact regarding discriminatory and inconsistent enforcement of fishery violations and imposition of fines and penalties throughout the nation. The Inspector General (IG) also reported that NOAA had taken multiple measures to improve its fisheries enforcement program with needed transparency and accountability. These include the following immediate actions and longer-term strategies::

- Improvement of NOAA leadership and management in enforcement and litigation.
- High-level review of all proposed charges for alleged violations and of all settlements by the General Counsel for NOAA.
- Development and implementation of new penalty policies and better internal financial controls.
- A plan to provide greater outreach to fishermen and fishing communities.

NOAA has undertaken numerous steps in response to the IG's report. In April 2012, NOAA released its National and Division Enforcement Priorities for 2012. This report was a follow-up to the National Enforcement Summit in August 2010. Although national priorities remain the same (to support sustainable fisheries and safe seafood, and to support healthy marine and coastal species and habitat), the report reflects significant regional differences as to which regulations and statutes should take precedence in enforcement efforts.

With the increase in catch share programs and other complicated fisheries management plans, the need for fair, efficient, and reliable enforcement will be important.

Stakeholders will need to have confidence in enforcement practices in order to buy into new management plans. Because of the complicated nature of these new programs, the penalties for violations need to be carefully measured. Enforcement will need to be able to answer stakeholders' question in a timely and accurate manner, and effective and efficient enforcement mechanisms (including electronic systems) must be developed. NOAA's enforcement division needs to have the trust of all stakeholders that it is operating in an evenhanded and equitable way.

SUMMARY RECOMMENDATIONS

*To improve **enforcement** of fisheries management laws and regulations, MAFAC recommends:*

- NOAA should recommit to changing the perceived culture of unfairness in some Law Enforcement divisions in the agency and also commit to restoring integrity to its enforcement procedures. Regional administrators could be instrumental in providing a positive interactive environment between ocean resource users and enforcement personnel.
- NOAA should commit agents to be involved in the regional fishery management councils and outreach into the fishing communities, and build upon the positive changes being implemented by the agency.

- Change takes time, and continued commitment to improvement in enforcement is needed across future administrations to effect lasting change.
- In order for limited access privilege programs and other management tools to work in achieving sustainability, NOAA Enforcement needs to develop cost-effective and dependable electronic monitoring programs.
- Enforcement should provide reliable and timely answers to regulatory questions and reach out to stakeholders by relaxing penalties for first-time offenses that lack intent.

Program Area 7: Seafood Safety and Inspection

RELATED TRENDS AND FINDINGS

Consumer demand for safe fish and shellfish continues to grow.

Consumers must have confidence in the safety, quality, and labeling of seafood products worldwide. Although global marine capture fisheries have plateaued at approximately 80 MMT, global fish consumption has doubled since 1973.¹⁶ This trend is most apparent in countries with rapid growth in population and income. Fish and shellfish provide 25 percent of protein in developing countries, but only 13 percent in developed countries.

Seafood consumption is increasing in the United States on a per capita basis.

In 2011, Americans consumed 15.0 pounds of seafood (edible meat) per person, a slight reduction from the 10-year average of 16.0 pounds per person. However, the per capita use of all edible and industrial fishery products in 2011 was 67.7 pounds, up 4.1 pounds compared with 2010. Increased public awareness of the health benefits of seafood and fish oil in the diet will likely maintain this trend.¹⁷

SUMMARY RECOMMENDATIONS

To meet seafood demand, supply, and safety, MAFAC recommends:

- NOAA should continue to document and communicate the wide array of public health benefits of seafood.
- NOAA should seek commitments from industry and governments worldwide to strengthen seafood safety programs and ensure accurate labeling.
- NOAA should support cooperative international food safety and policy initiatives efforts through the United Nations/World Health Organization's Codex Alimentarius.
- NOAA should support the Federal Government's free trade policies for seafood and aggressively seek to eliminate tariff and non-tariff trade barriers through the World Trade Organization and through bilateral and multilateral agreements.

¹⁶ International Food Policy Research Institute, 2003. *Fish to 2020: Supply and Demand in Changing Global Markets*. <http://www.ifpri.org/sites/default/files/publications/oc44.pdf>

¹⁷ NOAA Fisheries, 2012. *Fisheries of the United States, 2011*. Office of Science and Technology. August 2012. http://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus11/08_percapita2011.pdf

- NOAA should enhance seafood safety and human health through improved inspection, enforcement, research, outreach, and education.

Cross-Cutting Area 1: Changing Oceans

RELATED TRENDS AND FINDINGS

Climate change is leading to changing ocean conditions and negative impacts on estuarine environments.

For fisheries managers, global climate change presents an especially challenging problem because of rising sea levels, ocean acidification, ocean warming, and subsequent effects on coastal estuaries. It has been reported that fish populations are shifting with temporal zones and in some cases moving toward the poles.^{18,19} In the United States, as fish populations shift, the management of those species under the regional fisheries management councils can become increasingly challenging.²⁰ The future extent of these spatial shifts is currently unknown, as are the potential impacts on fishing communities. In addition, the acidity of the world's ocean has increased over the past century and this change in ocean chemistry may be affecting organisms with calcium carbonate exoskeletons and associated ecosystems.²¹ Determining which of the physical and biological effects in the marine environment are likely to have the largest socioeconomic impacts on commercial and recreational fisheries will be important in guiding research resources to their most efficient use and will aid in developing an adaptation and mitigation strategy.

Finally, rising sea levels and subsidence are having a visible impact on estuarine environments around the United States, albeit at different rates.²² For example, rates of sea level rise are increasing three to four times faster along portions of the U.S. Atlantic coast than globally.²³ Natural tidal marsh accretion is not keeping pace with sea level rise, causing a loss of marsh and estuarine ecosystems, which serve as nurseries for many marine species and are vital to many recreational and commercial fisheries.

Changing conditions in the Arctic will focus attention on development of both fishery and non-fishery resources.

As of September 2012, Arctic sea ice appeared to have reached its minimum extent for the year of 3.41 million square kilometers (1.32 million square miles). This is the lowest seasonal minimum extent in the satellite record since 1979 and reinforces the long-term downward trend

¹⁸ Nye JA, Link JS, Hare JA, Overholtz WJ, 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. *Mar Ecol Prog Ser* 393:111-129

¹⁹ Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. M.L. [Cambridge University Press](http://www.cambridge.org/9780521864661), Cambridge, UK, 976 pp

²⁰ Link, Jason S; Nye, Janet A; Hare, Jonathan A., 2011. Guidelines for incorporating fish distribution shifts into a fisheries management context. *Fish & Fisheries*. Dec2011, Vol. 12 Issue 4, p461-469.

²¹ National Research Council, 2010. *Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean*. Washington, DC: The National Academies Press, 2010.

²² E. Robert Thieler, Jeff Williams, Erika Hammar-Klose, 2009. National Assessment of Coastal Vulnerability to Sea-Level Rise. Woods Hole Field Center, Woods Hole, MA <http://woodshole.er.usgs.gov/project-pages/cvi/> (last update, Aug 2009).

²³ Sallenger, Jr., A.H., Doran, K.S., & Howd, P.A., 2012. Hotspot of accelerated sea-level rise on the Atlantic coast of North America. *Nature Climate Change*. (2012) doi: 10.1038/nclimate1597.

in Arctic ice extent.²⁴ Recent models indicate an accelerating decline in the summer sea ice during the 21st century, with the potential loss of ice by 2037.²⁵ This potentially drastic change will have an impact on the management of the resources in the Arctic, including fisheries management. For example, the North Pacific Fishery Management Council has already declared the EEZ waters in the Arctic Ocean under their jurisdiction as closed to commercial fishing. If fish stocks in the Aleutian Islands continue a northward extension of their range into Arctic waters, and the Arctic is closed to commercial fishing, portions of these fish stocks would potentially remain unharvested. Changes in the Arctic may allow for fisheries development and non-fishery resource development by 2040 and will require planning to support environmental sustainability.

SUMMARY RECOMMENDATIONS

To understand changing oceans and estuaries, MAFAC recommends:

- NOAA needs to fully understand the effects of changing oceans and rising sea levels on the ocean, fish and other marine organisms, habitat, and the marine environment and plan for future adaptation needs.
- Changing ocean conditions will inherently require an adaptive management approach, with periodic reevaluation and adjustment as necessary to maintain sustainable marine ecosystems and protect coastal communities dependent on these resources.
- These issues, and especially any efforts at mitigation and adaptation, cannot be left to a disconnected set of local solutions. Regional, national, and international planning and management is needed.
- NOAA should fully understand the socioeconomic impacts of changing oceans and sea level rise on commercial and recreational fisheries in order to guide research activities.
- NOAA Fisheries, in coordination with regional fishery management councils, should develop an approach for managing fish stocks that may shift across council jurisdictions.
- NOAA should ensure habitat conservation programs are adequately funded and allow for sea level rise adaptation.

Cross-Cutting Area 2: Ocean Governance

RELATED TRENDS AND FINDINGS

NOAA's status as the nation's premier ocean agency must be strengthened.

NOAA Fisheries is responsible for the management, conservation, and protection of living marine resources within the U.S. Exclusive Economic Zone (waters 3 to 200 miles offshore) mission. In 2004, a presidentially appointed Commission on Ocean Policy released *An Ocean Blueprint for the 21st Century* with recommendations stemming from the first comprehensive review of ocean policy in 35 years. One of the recommendations in the report was that, to improve ocean governance, NOAA's role as the nation's lead civilian ocean agency should be

²⁴ National Snow and Ice Data Center, September 19, 2012

²⁵ Wang, M., and J.E. Overland, 2009. [A sea ice free summer Arctic within 30 years?](#) *Geophys. Res. Lett.*, 36, L07502, doi: 10.1029/2009GL037820

solidified through the enactment of a NOAA organic act that codifies the agency's establishment within the Department of Commerce, clarifies its mission, and strengthens execution of its functions.

Demands will increase for additional data and science necessary to support ecosystem-based management.

Based on the current trend, ecosystem-based approaches to management will be the norm and not the exception by 2040. The ecosystem-based management approach is defined as management that is adaptive, geographically specified, takes account of ecosystem knowledge and uncertainties, considers multiple external influences, and strives to balance diverse societal objectives. It must be based on high-quality and reliable scientific data. For ecosystem-based management to succeed, a significant expansion in the type and quantity of data collected and analyzed must occur. Furthermore, timely accessibility by managers to these new and different kinds of high-quality data is critical to success.

In addition, humans are components of the ecosystems they inhabit and use. Their actions on land and in the oceans measurably affect ecosystems, and changes in ecosystems subsequently affect humans. Understanding and modeling this cycle of sustainability of fisheries and ecosystems at an acceptable level of certainty requires a much broader understanding of appropriate and effective science than has been encompassed by traditional, single-species fishery management. Using these tools, techniques, and ecosystem indicators, as well as programs such as marine spatial planning, NOAA Fisheries and state and regional management partners will simultaneously be considering multiple objectives and ocean uses, identifying risk factors and uncertainty, and forecasting the cumulative environmental impact of policy choices.

SUMMARY RECOMMENDATIONS

To improve ocean governance, MAFAC recommends:

- By 2020, NOAA's role as the nation's lead civilian ocean agency should be solidified through the enactment of a NOAA organic act that codifies the agency's establishment within the Department of Commerce, clarifies its mission, and strengthens execution of its functions.
- Ecosystem-based management, including assessments that integrate both habitat protection and multi-species interactions, should be the norm and not the exception for U.S. fisheries management. Adequate funding must be appropriated in order for this to be achieved.
- NOAA should establish itself as an unequivocal source of unbiased peer-reviewed scientific information.