



Final Summary Report of the MAFAC Coastal Resilience Working Group

November 2017

Table of Contents

Executive Summary	2
Introduction.....	4
Task 1. Creation of an ad-hoc Resilience Working Group.	5
Task 2. Comment on the Draft Habitat Enterprise Strategic Plan, especially Goal 3 on resilience, and provide specific suggestions on priorities.	6
Task 3. Address how aquaculture can increase the resilience of stocks, ecosystems, and communities.....	7
Task 4. Develop recommendations to fill gaps in the existing scientific and socio-economic data to expedite the analysis of data and to forecast changes over time.....	8
Task 5. Suggest effective communication strategies to provide forecasts of environmental changes and impacts to key fisheries audiences, stakeholders, and communities.....	9
Task 6. Develop new tools and evaluate existing tools and strategies for Council and other management processes (State, Commission, and Secretarial) to consider implementing to increase resilience in fisheries.	10
Appendix A: MAFAC Comments on the NOAA Fisheries Service Habitat Enterprise Strategic Plan for 2016 to 2020	
Appendix B: Aquaculture-based tools to enhance fisheries resiliency during climate change	
Appendix C: Best approaches and future needs to prepare fishing communities and fishing-dependent sectors for the impacts of climate change	
Appendix D: Climate Communications Report	
Appendix E: Examples of Fisheries Management Framework/Inseason Management Actions that allow a more nimble response to changes in fisheries	
Appendix F: Data to Support Adaptive Management	

Executive Summary

The Marine Fisheries Advisory Committee (MAFAC) is pleased to present the findings and recommendations of our Ad Hoc Resilience Working Group.

Resilience is defined as, “*an ability to recover from or adjust easily to misfortune or change.*” Throughout American history, the one constant is change. The National Oceanic and Atmospheric Administration (NOAA) knows this very well. Indeed, understanding and predicting changes in climate, weather, oceans, and coasts is NOAA’s first mission objective.

As the leading steward of our Nation’s living marine ecosystems and resources, NOAA plays a significant leadership role in enhancing the resilience of America’s coastal communities to change. This includes measures to sustain their commercial and recreational fisheries, protected resources, ecosystems, and coastal economies.

One of the important ways that NOAA facilitates resilience in communities is by providing information, resources, analyses, and assistance in understanding the changes in weather patterns and climate and the effects they have on living marine resources. Fishing communities face many variables that can create “feast and famine” cycles. Some change is gradual, while some is sudden. Dramatic weather events, such as hurricanes, typhoons, and tsunamis, can cause sudden and catastrophic changes to our coastlines, coastal economies, and the surrounding ecosystem. Yet, equally important, slower changes can also have significant, and potentially devastating, economic consequences.

For example, the “warm blob” in the North Pacific and the Gulf of Alaska (GOA) began in 2014 and continued through 2016. Warmer water temperatures speed up the metabolism of Pacific cod (*Gadus macrocephalus*), leading them to need to eat more; yet the warmer ecosystem produces less food. The result is increased natural mortality and reduced recruitment of Pacific cod. Alaska fishermen historically produce roughly 16 percent of the global cod catch. In 2016, and Pacific cod accounted for 12 percent of the volume and 11 percent of the value of Alaska’s fish harvests. The 2017 summer bottom trawl survey suggested a 71 percent decline in GOA cod abundance since 2015, and an 83 percent decline since 2013. In 2018, quotas are predicted to drop by more than 80 percent due to the warm blob.

On the east coast, Atlantic mackerel (*Scomber scombrus*) historically supported a robust US and Canadian migratory small pelagic fishery in the 1960s and 1970s (up to 800,000 MT at its peak); the US fishery extended from Cape Hatteras to the Canadian border. From the early 1990s through the early 2000s, a robust stock assessment led to government support and approximately \$30 million investment in new construction, including plant and vessel upgrades in Cape May, NJ, New Bedford and Gloucester, MA. Since the highest landings of 60,000 MT with ex-vessel value of \$50 million in 2006, catches have slowly declined through 2012, and are now less than 5,000 MT. Recent post-mortem assessments show that thermal habitat has shrunk to a near non-existent extent, historic spawning areas off Long Island, NY, south shore have disappeared, egg

and larval surveys are absent any sign of mackerel, and Canadian scientists are reporting similar collapse.

The impacts of Hurricanes Harvey, Irma, and Maria have been severe for many coastal communities in the U.S. In Puerto Rico and the U.S. Virgin Islands, these impacts have been catastrophic. After 70 days from the passing of these hurricanes, both jurisdictions were still at or below 50% power production. This catastrophic event was tragic, affecting every aspect of life for the Island residents and for both private and public sectors. Given the extent of the destruction, most of the infrastructure and services need rebuilding. This provides NOAA a unique opportunity to build resiliency into Puerto Rico and the USVI's reconstruction of the coastal communities and the fisheries sectors.

In addition, man-made factors, such as the Deepwater Horizon disaster, increasing levels of agricultural chemical runoff, and the recent release of Atlantic salmon into the Pacific Northwest cause changes to the marine environment that must be identified, studied, and recovered from, so that the ecosystems and economies remain resilient.

Once changes in resources or their availability has been identified, it is important for fisheries management to be adaptive, efficient, and flexible. This is equally true for conservation measures as well as those that provide economic opportunity to fishing activities. Streamlining regulatory and management processes is needed to bring a balance between the Magnuson-Stevens Act conservation and economic mandates to maintain sustainable fisheries while maximizing economic opportunity for our fishing communities. First and foremost, fishing communities are dependent on the harvest and processing activities which supply the economic lifeblood and provide jobs.

If our fishing communities are to be resilient they must be able to furnish the essential economic drivers necessary to support its inhabitants. New aquaculture activities may mitigate wild fisheries reductions in some cases, but not if it takes over a decade to obtain the necessary permits for operations to get underway. In many cases, wild fisheries could still be the center pole for the communities' economic engine. But to achieve this end, management practices must allow for the development of economic opportunity when necessary conservation measures are met.

After studying the work that NOAA currently performs to enable resilient communities and economies, MAFAC has identified several recommendations that should guide your overall policymaking to achieve resiliency goals. In addition, each of our tasks, described further in this report, have their own recommendations specific to their focus topic. The overall recommendations by MAFAC to the Secretary of Commerce are that:

- NOAA empower communities to establish and maintain resiliency plans by making funding sources available and supporting nationwide implementation of planning efforts.
- NOAA foster and implement best-practices and robust resiliency policies and plans for restoring fishing communities in the Caribbean region that can serve as a model for

nationwide implementation. Place a priority on establishing best-practices in fishery and marine resource resiliency in Puerto Rico and the U.S. Virgin Islands. NOAA should work with the territorial and local governments, Caribbean Fishery Management Council, industry businesses, and non-governmental organizations.

- NOAA continue to develop new tools and evaluate existing tools and strategies for Council and other management processes (State, Commission, and Secretarial) to consider and provide for dynamic, adaptive management action respond to climate driven and other changes in fisheries.
- NOAA consider its resiliency goals on an ongoing basis, taking into account technological progress, additional scientific information, and the changing needs of our communities.
- Many of these ongoing ecosystem changes can only be avoided with substantial reductions in atmospheric carbon dioxide emissions. NOAA should continue to explore opportunities for reducing risks borne by fishing communities from the impacts of climate change. Ocean warming and acidification, reduced oxygen, and extreme weather events that are increasing in intensity and frequency are having impacts on fishing communities.

In addition to the work NOAA already performs to support resilient economies and communities, these enhancements will enable better outcomes in achieving resiliency goals. Of course, the work we perform here in America can be viewed as part of solutions that are likely, if properly designed and implemented, to be replicated around the globe. True conservation of living marine resources requires work toward enabling a more resilient world, and the United States should continue to lead the way in providing the example for others to follow. MAFAC would like to be kept involved as NOAA's plans are adjusted.

Introduction

The Marine Fisheries Advisory Committee (MAFAC, the Committee) advises the Secretary of Commerce on all aspects of living marine resources under the jurisdiction of the Department of Commerce. Established in 1970, MAFAC members evaluate and assess national programs and priorities and provide recommendations and direction to the Department and NOAA. MAFAC members possess a wide range of expertise in various aspects of marine resources, including commercial and recreational fishing, aquaculture, seafood processing, distribution, marketing, and sales, consumer interests, fishing community resilience, and protected resources. MAFAC operates pursuant to the Federal Advisory Committee Act.

In October 2015, the Assistant Administrator for NOAA Fisheries requested that MAFAC advise them on how they can best meet fishing community resilience needs with respect to resources,

habitat, and socio-economic resiliency. In response to this request, MAFAC created an ad-hoc Resilience Working Group to examine the issues requested. The Committee decided to divide the analysis into tasks, the first of which was the creation of the Committee itself, and five tasks examining specific issues of import to resilience. Each task was led by a Committee member and had extensive participation by multiple members of the Committee. Some of the tasks also invited participation by members of the Climate and Marine Resources Task Force and the Aquaculture Task Force with requisite knowledge and expertise in the task objective. Each task produced a report of their findings and recommendations to be considered and discussed by the Committee for formal submission to NOAA.

The six tasks are listed below and described in further detail later in this report:

- Task 1. Creation of an Ad-Hoc MAFAC Resilience Working Group.
- Task 2. Comment on the Draft Habitat Enterprise Strategic Plan, especially Goal 3 on resilience, and provide specific suggestions on priorities.
- Task 3. Address how aquaculture can increase the resilience of stocks, ecosystems, and communities.
- Task 4. Develop recommendations to fill gaps in the existing scientific and socio-economic data to expedite the analysis of data and to forecast changes over time.
- Task 5. Suggest effective communication strategies to provide forecasts of environmental changes and impacts to key fisheries audiences, stakeholders, and communities.
- Task 6. Develop new tools and evaluate existing tools and strategies for Council and other management processes (State, Commission, and Secretarial) to consider implementing to increase resilience in fisheries.

Each of the five main tasks that examined specific issues (tasks 2 through 6) produced final reports covering their task topic. Over the past two years, as each task was completed, the full Committee reviewed, provided comments and changes, and approved each of these reports. They are attached as appendices to this report. These full reports contain more detail and specificity on each tasks work, findings, and recommendations.

Task 1. Creation of an ad-hoc Resilience Working Group.

The first task was the Committee's decision, made on October 14, 2015, to create the ad-hoc Resilience Working Group under our Strategic Planning, Budget, and Program Management Subcommittee and dividing the work into five work tasks (tasks 2 through 6).

Task 2. Comment on the Draft Habitat Enterprise Strategic Plan, especially Goal 3 on resilience, and provide specific suggestions on priorities.

This task examined NOAA's Draft Habitat Enterprise Strategic Plan for 2016 to 2020, especially its Goal 3, which focused on resilience.

Because of the time constraints on providing NOAA with review of their draft plan, MAFAC held a special, noticed meeting and approved the findings and comments of this task on November 9, 2015 and transmitted them to NOAA on November 12, 2015 (Appendix A).

WORK PERFORMED

This task group examined NOAA's draft Habitat Enterprise Strategic Plan and provided comments on the ambitious scope of the plan and its specific goals. It stressed the importance of increasing consideration of socio-economic considerations of coastal communities.

The task group supported Goal 1 of the Plan, "Conserve Habitat for Managed Fisheries and Protected Resources," and commented that NOAA needs to work with many stakeholders, including governmental and regulatory bodies at local, tribal, interstate compact, and international levels to achieve protections for critical coastal habitats. It specifically recommended that NOAA continue its stated Objective 2, 3, and 4, which focus on fish passage, riverine habitat, and protection of corals.

The task group supported Goal 2 of the Plan, "Restore NOAA Trust Resources Impacted by Oil and Other Hazardous Substance Releases." The group felt that this goal is very important in light of expansion of energy production sites and supported public involvement in the decision-making process. Finally, with respect to this Goal, the task group supported settling 22 pending NRDA cases, ensuring that full restoration is included in the settlements, so that restoration measures could begin.

The task group supported Goal 3 of the Plan, "Increase Resilience of Coastal Ecosystems, Communities, and Economies through Habitat Conservation." It again stressed the need for cooperation at various levels of government due to the interjurisdictional nature of the ecosystems to be conserved. It commented that communities are dependent on healthy coastal habitats and that restoration should enhance the ability of these coastal communities to continue to drive their local economies through both commercial and recreational activities.

The task group supported Goal 4 of the Plan, "Invest in Staff Development and Improve the Impact of People, Programs, and Services," and noted that a well-qualified and informed workforce is essential to achievement of the Plan's goals.

FINAL TASK RECOMMENDATIONS

MAFAC discussed and adopted the specific recommendations described above and submitted them to NOAA as consensus comments on the draft Habitat Enterprise Strategic Plan.

In addition, MAFAC supported increasing coastal resiliency as a necessary component of NOAA Fisheries Service's objectives and goals. It is important to alert and adapt the Nation's activities and communities to changes that occur due to ocean and coastal challenges and threats, such as disasters – both natural and man-made. It is also important to consider the socio-economic effects that occur due to a failure to achieve and maintain coastal resiliency, as well as the socio-economic adjustments that our important coastal fishing communities need to make due to natural and unavoidable changes to the environment.

In addition, MAFAC recommended to NOAA that the Committee continue to be involved in the review of the plan, including tracking and evaluating its implementation and any challenges that arise.

MAFAC adopted these recommendations (Appendix A) on November 9, 2015 and submitted them to NOAA before the comment deadline.

Task 3. Address how aquaculture can increase the resilience of stocks, ecosystems, and communities.

This task examined the many possibilities associated with improving resilience in stocks, ecosystems, and communities by the use of different tools and techniques based around marine aquaculture. In a changing environment, marine aquaculture can improve economic and ecological resilience in fishing communities, businesses, and the surrounding ecosystem.

Aquaculture provides an alternative/augmentation to traditional wild-capture fishing, which can enhance the recovery of stocks under stress as well as provide economic benefit to fishing communities. Communities under stress can implement aquaculture as an adjunct, or even a replacement, for participation in wild-capture fisheries. In addition, aquaculture can propagate specific species under stress that augment the natural ecosystem. Aquaculture also has the potential to reduce the impacts of ocean acidification by culturing and augmentation of natural aquatic plants that reduce the levels of acidic components of seawater. Finally, culturing and propagation of specific species that are resistant to more acidic seawater can improve the ecological resilience of the ecosystems in which they are used as an augmentation.

MAFAC approved the final report for this work at its November 2016 meeting (Appendix B).

WORK PERFORMED

The members of this task working group collaborated on a research paper entitled “Aquaculture-

based tools to enhance fisheries resiliency during climate change.” In this paper, they draw upon extensive existing documentation (referenced), including academic research, fishery management plans, and commercial research to examine the benefits of the expanded use of aquaculture to enhance economic and ecological resilience. They examined impacts of environmental change on the oceans, and provided case studies of stock enhancement as well as successful commercial aquaculture operations.

FINAL TASK RECOMMENDATIONS

MAFAC advised NOAA that aquaculture practices and activities can improve economic and ecological resiliency in fishing communities through:

1. Provision of employment alternatives and maintenance of critical fisheries-related infrastructure such as working waterfront, processing, and distribution capacity.
2. Increasing fishery yield through hatcheries and responsible stock enhancement to ensure robust populations and sustainable harvests in the face of changes to the natural habitat and variability in stock recruitment.
3. Restoring essential fish habitat (adding vertical structure) and stabilizing shorelines in the face of sea level rise by constructing oyster reefs, planting submerged vegetation, and installing commercial culture gear.
4. Mitigating acidification impacts with extensive seaweed culture and the use of buffered seawater in hatcheries.
5. Breeding selected lines of acidification-resistant corals and shellfish.

Task 4. Develop recommendations to fill gaps in the existing scientific and socio-economic data to expedite the analysis of data and to forecast changes over time.

This task was charged with identifying the best approaches and future needs to prepare fishing communities and fishing-dependent sectors for the impacts of climate change. Impacts of climate change have typically focused on coastal community infrastructure threats due to sea level rise, storm surge, coastal flooding, and changes in historical rainfall patterns and levels. There are many case studies of community planning processes to adapt to these types of threats; however, there are few examples of fishing community planning processes that address the specific climate change impacts for these stakeholders. Fishing communities can be impacted when there are changes to the resources they are dependent upon, due to a variety of changing ocean conditions.

While there is growing information on the impacts of changing climate on ocean conditions and marine resources, there is little information on where, when, and how these changes will impact different fishing communities and fishing sectors, and how to prepare for and respond to these changes.

MAFAC approved the final report for this work at its August 2017 meeting (Appendix C).

WORK PERFORMED

Following a May 2016 workshop called “Advancing Resilient Fishing Community in a Changing Climate: Challenges and Opportunities” that discussed resiliency planning, the task group focused on the processes by which fishing communities discussed and assessed their resilience to changing ocean issues. Members of the task group conducted interviews with practitioners that facilitated and conducted structured community processes in six different communities around the U.S. to discuss social and economic challenges, risks, and planning for resilience in coastal communities. Specific questions were asked during teleconferences with the practitioner, two members of the task group, and one member of NOAA. The results of the interviews were compiled and resulted in constructive recommendations for ways to assist and encourage other fishery communities to conduct resiliency planning processes.

FINAL TASK RECOMMENDATIONS

MAFAC advised NOAA that the following actions should be considered when pursuing NOAA’s resiliency goals:

1. NOAA should prioritize and provide funding for adaptive planning for fishing-dependent sectors, including the initial community plans and the maintenance and updating of these plans.
2. A practitioner’s guide and training course should be created by NOAA to improve the effectiveness of the planning process.

Task 5. Suggest effective communication strategies to provide forecasts of environmental changes and impacts to key fisheries audiences, stakeholders, and communities.

This task identified the weather, environmental, and fishery information products that are most needed or useful to stakeholders and NOAA “customers” and the best methods to convey the information to increase its access, delivery, and use. MAFAC approved the final report for this work at its August 2017 meeting (Appendix D).

WORK PERFORMED

This task working group developed and conducted a survey that was broadly distributed to stakeholders via the Internet to assess concerns, types of information most necessary, and the best methods of communication to reach the target audience. In accordance with the Paperwork Reduction Act (PRA), the survey met the requirements of NOAA’s pre-approved customer

service survey format, and was approved by the Office of Management and Budget (Control Number 0648-0342).

Even though the survey was conducted for a limited time on the Internet, this initial effort to query NOAA's customers was well received. Time constraints did not allow an exhaustive outreach and consequently some constituencies, such as those with limited Internet connectivity, were not as well represented as hoped.

The report goes into specific detail on respondents and survey results concerning priority interests and best formats for data and suggestions for future efforts.

FINAL TASK RECOMMENDATIONS

MAFAC recommended the following to NOAA:

1. NMFS should review the results of the survey in detail to identify specific priorities and gaps in communications by sector and region.
2. Once identified, these specific needs and hypothesized conclusions should be verified by additional targeted surveys or user-accessible data collection efforts. Stakeholder-preferred strategies of outreach and delivery should be used to increase participation amongst sectors and increase credibility of post-survey analysis.
3. Using findings from survey efforts, NMFS should measure and track the effectiveness of communications considerate of multiple levels of understanding of information and the diversity of purpose and sector. NMFS should also integrate relevant strategies in tool development.

Task 6. Develop new tools and evaluate existing tools and strategies for Council and other management processes (State, Commission, and Secretarial) to consider implementing to increase resilience in fisheries.

This task group was charged with identifying mechanisms and tools that are currently available to fishery managers to enable more agile and adaptive fishery management actions that were effective or could be strengthened. Acknowledging the breadth of this issue, the work was broken into two separate areas of focus. One focused on specific examples of successful application of management tools and techniques that have enabled agile and dynamic management of marine ecosystems (Appendix E), and the other focused on the data needed to make sound decisions (including more real-time data) (Appendix F).

WORK PERFORMED

The data needs group reviewed trends, reports, and programs that emphasized the importance and need for well-organized data collection efforts; identified consistent tenants of good data collection programs and specific types of historical, real-time, and future data needs; scoped out the challenges for collecting real-time or near real-time data; discussed the importance of augmenting standard data collection programs with citizens' science, community based monitoring, and local and tradition knowledge; provided U.S. and international examples of information systems that were developed to work collaboratively through partnerships with fishermen and other stakeholders; and developed recommendations. These are detailed in Appendix F.

The management tools and techniques group examined options available under applicable laws that have been shown to work successfully to allow responsive and dynamic fisheries management. The best examples involved the use of framework actions that allow certain in-season adjustments, such as a change in retention limits or increases in the allowable catch. The report (Appendix E) noted that the current fishery management plan amendment process is too slow, very expensive, and does not serve conservation goals best while maximizing allowable catch limits. Under a framework approach, each fishery management plan must, through a single amendment,, establish an overall “framework structure” of permissible in-season actions that, once the amendment is effective, can be taken through a simple notice process. This key change results in dramatic increases in agility and responsiveness of fishery managers.

In addition, a robust framework includes a comprehensive accountability structure, including implementing the use of human and electronic observers, electronic reporting, harvesting telemetry, bycatch triggers, and enabling rapid fishery interruptions if target species and/or bycatch targets are estimated to be reached or exceeded.

Finally, a robust framework includes considerations necessary to adapt to changes in the stock status of target and bycatch species. If all species in a complex have improved, annual catch limits can be increased. On the other hand, if a target or any of the bycatch species has declined, additional accountability measures should be able to be implemented to ensure that conservation goals are met. It is also important that managers consider that technological progress and increased scientific information allow for increasing precision in ensuring that targets are met and limits are not exceeded. On an ongoing basis, this technological progress will cause ever-increasing conservation to living marine resources.

FINAL TASK RECOMMENDATIONS

MAFAC recommended to NOAA the following:

A primary goal of improving monitoring, data integration, and data management capabilities should be the speed and timeliness of the integration and incorporation of data from the harvesters and docks to the managers. We recommend that the goals need to provide

management regimes the ability to respond and adapt to real-time changes in fish stocks and landings and achieve efficiencies in agency operations.

Using framework actions supported by better data should reduce regulatory delays and allow obsolete, inefficient regulations to be replaced with nimble and dynamic ones. This would allow fishing communities to take better advantage of opportunities to capitalize fisheries, increase landings, and expand markets for underutilized and under-fished species without triggering overfishing. Increases in understanding of ocean ecosystems, improvements in technology for ocean observations, and interest and engagement by stakeholders, scientists, and others in ecosystem-based fisheries management may also present managers with important opportunities and the wherewithal to anticipate, predict, and respond to dynamic, as well as longer-term, changes in ocean ecosystems. MAFAC recommends that NOAA develop a blueprint for expanding the adaptive management approach through framework actions.

To achieve this, we recommend that the Agency places a priority on implementing the recommendations in MAFAC's recent document, *Abundant Seas: Making the Most of America's Marine Resources* (2016), as well as *Improving Net Gains: Data-Driven Innovation for America's Fishing Future* (2017), which was developed by the Fishing Data Innovation Taskforce. We also recommend that NOAA continue to be mindful of the relevant recommendations in *MAFAC's Vision 2020 (v2.0): Charting a Course for the Future of U.S. Marine Fisheries* (2012). Although progress has been made on some of these recommendations, many remain unfulfilled.

These recommendations continue to be extremely relevant to enable framework and other in-season, agile management options. The agency should continue to foster the development – both inside NOAA as well as with outside entities – of next-generation technologies that improve on existing systems and enable better integration of data collection, analyses, dissemination, and storage processes.

Both at the Agency-wide level, as well as through regional and cross-regional collaborations, implementation of these recommendations will enable more dynamic management of our dynamic fisheries and ecosystems.