Atlantic States Marine Fisheries Commission

DRAFT ADDENDUM XXVI TO AMENDMENT 3 TO THE AMERICAN LOBSTER FISHERY MANAGEMENT PLAN; DRAFT ADDENDUM III TO THE JONAH CRAB FISHERY MANAGEMENT PLAN

Harvester Reporting and Biological Data Collection

This draft document was developed for Management Board review and discussion. This document is not intended to solicit public comment as part of the Commission/State formal public input process. However, comments on this draft document may be given at the appropriate time on the agenda during the scheduled meeting. Also, if approved, a public comment period will be established to solicit input on the issues contained in the document.

ASMFC Vision Statement: Sustainably Managing Atlantic Coastal Fisheries

October 2017

Public Comment Process and Proposed Timeline

In January 2017, the American Lobster Management Board initiated an addendum to improve harvest reporting and biological data collection in the American lobster fishery. This draft Addendum seeks to utilize the latest technology to improve reporting, collect greater effort data, increase the spatial resolution of harvester reporting, and advance the collection of biological data offshore. This document presents background on the Atlantic States Marine Fisheries Commission, the addendum process and timeline, a statement of the problem, and management measures for public consideration and comment. Given the Jonah crab fishery is jointly managed by the Lobster Board and reporting requirements in the two fisheries mirror one another, this addendum proposes changes to the reporting and biological sampling requirements in both the lobster and Jonah crab fisheries.

The public is encouraged to submit comments regarding the proposed management options in this document at any time during the addendum process. The final date comments will be accepted is **Month, Day 201X at 5:00 p.m**. **EST.** Comments may be submitted by mail, email, or fax. If you have any questions or would like to submit comments, please use the contact information below.

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February-October 2017	Draft Addendum for Public Comment Developed
October 2017	Board Reviews Draft and Makes Any Necessary Changes
November 2017 – January 2018	Public Comment Period Including Public Hearings
February 2018	Management Board Reviews Public Comment, Selection of Management Measures, Final Approval of Addendum XXVI
TBD	Implementation of Provisions in Addendum XXVI

Executive Summary

Recent management action in the Northwest Atlantic, including the protection of deep sea corals, the declaration of a national monument, and the expansion of offshore wind projects, have highlighted deficiencies in the current lobster and Jonah crab reporting requirements. These include a lack of spatial resolution in harvester data and a significant number of fishermen who are not required to report. As a result, efforts to estimate the economic impacts of these various management actions on the lobster and Jonah crab fisheries have been hindered and states have been forced to piece together information from harvester reports, industry surveys, and fishermen interviews to gather the information needed. In addition, as the lobster and Jonah crab fisheries continue to expand offshore, there is a greater disconnect between where the fishery is being prosecuted and where biological sampling is occurring. More specifically, while most of the sampling occurs in state waters, an increasing volume of lobster and Jonah crab are being harvested in federal waters. The lack of biological information on the offshore portions of these species can impede effective management.

The Board initiated Lobster Draft Addendum XXVI/Jonah Crab Draft Addendum III to improve harvester reporting and biological data collection in state and federal waters. The goals of this addendum are to: 1) utilize the latest technology to improve reporting; 2) increase the spatial resolution of harvester data; 3) collect greater effort data; and 4) advance the collection of biological data offshore.

The Draft Addendum includes three issues. The first issue asks what percentage of harvesters should be required to report in the lobster and Jonah crab fisheries. The Addendum recommends, but does not require, the implementation of electronic reporting by the states as a cost-effective method to increase harvester reporting. The second issue asks whether the data elements currently collected should be expanded to collect a greater amount of information on the lobster and Jonah crab fisheries. The third issues asks how, and at what resolution, spatial information should be collected. In addition, the addendum provides several recommendations to NOAA Fisheries, including implementation of 100% federal harvester reporting, creation of a fixed-gear VTR form, and expansion of a biological sampling program offshore.

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1.0 Introduction

The Atlantic States Marine Fisheries Commission (ASMFC) has coordinated the interstate management of American lobster (*Homarus americanus)* and Jonah crab *(Cancer borealis)* from 0-3 miles offshore since 1996 and 2015, respectively. American lobster is currently managed under Amendment 3 and Addenda I-XXIV to the Fishery Management Plan (FMP). Jonah crab is managed under the Interstate Fishery Management Plan and Addenda I-II. Management authority in the Exclusive Economic Zone (EEZ) from 3-200 miles from shore lies with NOAA Fisheries. The management unit for both species includes all coastal migratory stocks between Maine and Virginia. There are ten states which regulate American lobster and Jonah crab in state waters and regulate the landings of lobster in state ports.

The Board initiated this addendum to improve harvester reporting and biological data collection in state and federal waters. Through Lobster Addendum X (2007) and the Jonah Crab FMP, states are required to implement, at a minimum, 10% harvester reporting and 100% dealer reporting. In addition, states are required to complete fishery dependent and independent biological sampling, such as sea and/or port sampling. For lobster, states are also required to conduct a fishery-independent survey, such as an annual trawl survey, a ventless trap survey (VTS), or a settlement survey. *De minimis* states are exempt from the biological sampling requirements in the lobster and Jonah crab fisheries.

Recent management action has highlighted several deficiencies in the data collection requirements for lobster and Jonah crab. One of the foremost deficiencies is the lack of spatial information collected. While harvesters are required to report the statistical area in which they fish, this information is too coarse to respond to the increasing number of marine spatial planning efforts which require fine-scale data. Another concern is that not all fishermen are required to report landings to either the state or NOAA Fisheries. Currently, only 10% of lobster and crab permit holders in Maine are selected to submit landings reports each year and vessels which are only issued a federal lobster permit are exempt from Vessel Trip Reports (VTRs). Given that roughly 83% of lobster is landed in Maine and the fishery continues to move further offshore, the lack of harvester reporting in these areas results in data gaps in the fishery. Deficiencies in the collection of biological data were also highlighted in a January 2016 report by the American Lobster Technical Committee (TC) which noted that while inshore waters are adequately sampled, little biological sampling occurs offshore. This is a growing problem as, due to species shifts and a decline of the inshore population, an increasing percentage of lobster is being harvested from federal waters and the Jonah crab fishery is primarily conducted offshore.

This Addendum seeks to address these issues by improving the resolution and quality of data collected in the lobster and Jonah crab fisheries. The goals of this addendum are to: 1) utilize the latest technology to improve reporting; 2) collect greater effort data; 3) increase the spatial resolution of harvester reporting; and 4) advance the collection of biological data offshore.

2.0 Overview

2.1 Statement of Problem

Recent management action in the Northwest Atlantic, including the protection of deep sea corals, the declaration of a national monument, and the expansion of offshore wind, have highlighted the fact that current harvester reporting requirements do not provide the level of information needed to respond to management issues. Furthermore, while the lobster fishery continues to move further offshore and the Jonah crab fishery is primarily conducted in federal waters, the majority of biological data is collected inshore. This disconnect hinders effective management of the two species. The Board initiated this addendum to improve harvester reporting and biological data collection in state and federal waters. The management measures in this addendum are intended to utilize the latest technology to improve the spatial resolution of harvester data, increase the collection of fishery effort data, and promote the collection of biological data offshore.

2.2 History of Reporting Requirements for American Lobster

American lobster is currently managed under Amendment 3 and its subsequent addenda. Amendment 3, which was finalized in 1997, required states to, at a minimum, maintain their current reporting and data collection programs. At the time of implementation, the Atlantic Coastal Cooperative Statistics Program (ACCSP) was still being developed and data collection standards had not been completed for lobster. As a result, action to specify monitoring and reporting requirements was deferred until completion of a coastwide statistics program by ACCSP.

By 1999 data collection standards for ACCSP were nearly complete and Addendum I (1999) established data collection guidelines in the lobster fishery. Importantly, while it encouraged states to adopt monitoring and reporting standards, state agencies were not required to make any changes to their current reporting system. It wasn't until Addendum VIII (2006) that a consistent set of reporting requirements were implemented in the lobster fishery. Specifically, states were required to collect trip-level data from at least 10% of the lobster fishery. This included information on landings (i.e: catch in pounds) and effort (i.e: trap hauls, soak time, number of trips, total traps set, number of traps fished per trip). All dealers were required to report lobster landings, by weight, on a trip level basis. States were also required to implement fishery dependent data programs, such as sea sampling and port sampling, to collect information on lobster length, sex, and cull status.

2.3 Current Reporting Requirements

2.3.1 State Reporting Requirements

American Lobster

Addendum X (2007) outlines the current reporting requirements in the lobster fishery. These requirements build upon those established in Addendum VIII and ensure that the collection programs meet ACCSP standards. For catch reporting, Addendum X requires at least 10% harvester reporting, with the expectation of 100% harvester reporting over time, and 100% dealer reporting. All states have implemented 100% harvester reporting, with the exception of Maine which has 10% harvester reporting (Table 1). Harvester reports are required to include information such as vessel number, trip start date, statistical area, number of traps hauled, number of traps set, pounds of lobster harvested, and trip length. Dealer reports are required to include information on the species landed, the pounds harvested, the state and port of landing, market grade, and price per pound.

Addendum X also requires biological sampling from fishery independent and dependent sources. States are required to conduct sea sampling to characterize commercial catch and collect data on length, sex, v-notch, egg-bearing status, discards, cull status, and traps sampled. Port sampling is also required to collect information on length, sex, cull status, and market category. Sufficient sea sampling can replace port sampling. In addition, Addendum X requires states to implement fishery-independent sampling programs, with each state conducting either an annual trawl survey, a ventless trap survey (VTS), or a settlement survey. The VTS is designed to sample lobster habitats which may not be accessible to a trawl survey and provides information regarding the abundance of sub-legal lobsters (<53mm CL). Settlement surveys provide information on the youngest life stages of lobster (Stages IV and V). Several states carry out multiple fishery-independent sampling programs including Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (Table 1). *De minimis* states (currently Delaware, Maryland, and Virginia) are not required to complete the biological collection programs prescribed in Addendum X.

Table 1: Harvester reporting, dealer reporting, and biological data collection programs for American lobster. New Hampshire and New York's trawl surveys are conducted in conjunction with Maine and Connecticut, respectively. *De minimis* states are not required to implement biological data collection programs.

	De Minimis Status in 2016	% Dealer Reporting	% Harvester Reporting	Sea Sampling	Port Sampling	Trawl Survey	Ventless Trap Survey	Settlement Survey
ME		100%	10%	✓		✓	✓	✓
NH		100%	100%	✓	✓	✓	✓	✓
MA		100%	100%	✓		✓	✓	✓
RI		100%	100%	✓(none in 2016)	✓	✓	✓	✓
CT		100%	100%	✓(none in 2016)		✓		✓
NY		100%	100%	✓	✓	✓		
NJ		100%	100%	✓		✓		
DE	✓	100%	100%			✓		
MD	✓	100%	100%	✓		✓		
VA	✓	100%	100%					
NOAA Fisheries		100%	VTR if permitted for another species	✓	✓	✓	*	

**NOAA supports ventless trap surveys through grants.*

Maine 10% Harvester Reporting

Maine currently requires 10% harvester reporting; however, this sampling is stratified by state fishing zone (Zones A through G) and license class (Table 2). More specifically, within each combination of zone and license class, a proportion of harvesters (i.e. 10%) are annually selected to complete trip reports. All Maine lobster license holders, except those chosen the previous year, are included in the annual random draw, including licenses that had no landings the previous year and permits that are required to submit VTRs. Those permit holders that are required to submit VTRs do not submit duplicate reports to the Maine harvester logbook, but continue to report only through the VTR process.

Table 2: Maine license classes in the lobster and crab fishery.

License Class	Abbreviation	Description
Class I	LC1	No crew
	LCO	No crew, permit holder over 70 years old
Class II	LC2	1 crew
	LC2O	1 crew, permit holder over 70 years old
Class III	LC3	2 crew
	LC3O	2 crew, permit holder over 70 years old
Student	LCS	Student license
<18 License	LCU	Commercial license for those under 18 years old
Tribal	various	Native American affiliation
Non-Commercial	LNC	Recreational permit
Non-resident	various	Not a resident of Maine

Jonah Crab

Under the Jonah Crab FMP, participation in the directed Jonah crab fishery is tied to a lobster permit. As a result, the FMP extends the reporting requirements in the lobster fishery to the Jonah crab fishery. This means that states are required to implemented 100% mandatory dealer reporting and 100% harvester reporting; however, jurisdictions that currently requires less than 100% of harvesters to report in the lobster fishery are required to maintain, at a minimum, their current programs and extend them to Jonah crab. Harvester reports must include a unique trip ID, vessel number, trip start date, NMFS statistical area, traps hauled, traps set, pounds landed, trip length, soak time, and target species. Dealer reports must include a unique trip ID, species landed, quantity landed, state and port of landing, market grade and category, areas fished, trip length, and price per pound.

In addition, the Jonah Crab FMP states that, at a minimum, state and federal agencies shall conduct port/sea sampling to collect information on carapace width, sex, discards, egg-bearing status, cull status, shell hardness, and crab parts, where possible. The FMP also encourages states to extend current fishery-independent lobster surveys to Jonah crab.

2.3.2 Federal Reporting Requirements

For many federally permitted fisheries, catch information (including species caught and discarded, gear quantity, fishing location, and depth) is collected on a trip-level basis through Vessel Trip Reports (VTRs). However, a federal lobster permit does not contain a federal reporting requirement. This means that if a vessel is issued a federal lobster permit and that vessel has no other federal permits, the vessel is not required to fill out a VTR. As a result, a portion of the lobster and Jonah crab fleet which fishes in federal waters is not required to submit landings reports. This portion varies spatially, with a smaller percentage reporting in nearshore waters of the Gulf of Maine (GOM) and a higher portion reporting in Southern New

England (SNE) and the Mid-Atlantic. For example, only 10% of all Maine federal permit holders and 3% of the total Maine lobster fleet report through VTRs. In statistical area 514 (Massachusetts coast), 25% of permits report with VTRs. This percentage increases with distance from shore as roughly 63% of the lobster fleet which fishes in statistical area 537 (south of Cape Cod) reports through VTRs and 98% of the fleet in statistical area 515 (near Hague line) reports with VTRs. A high portion of vessels (95%) hailing from New Jersey through Virginia submit VTRs.

The NMFS Northeast Fisheries Science Center also conducts a bottom trawl survey which has collected data on lobster and Jonah crab abundance since the 1960's (Table 1). The bottom trawl survey is conducted twice a year, in the spring and fall, and extends from the Scotian Shelf to Cape Hatteras, including the GOM and Georges Bank (GBK). The survey uses a random sampling design and stratifies the survey area by depth. Data from the bottom trawl survey has been consistently incorporated into the lobster stock assessments and provides important information regarding Jonah crab abundance offshore.

2.5 Deficiencies with Current Harvester Reporting

2.5.1 Spatial Resolution of Data

Recent management actions have highlighted serious data deficiencies in the lobster and Jonah crab fisheries. These deficiencies have hindered the ability to effectively manage the resource, respond to the growing use of marine spatial planning, and assess the status of the offshore populations.

One of the largest deficiencies is the lack of spatial information collected in the two fisheries. While harvester reports are required to indicate statistical area fished, information regarding Lobster Conservation Management Areas (LCMAs) (see Appendix 1) or depth are not consistently collected (Table 3). This can hinder lobster management as a single statistical area can span multiple LCMAs, each of which has a unique set of regulations. For example, statistical area 521 spans LCMAs 1, 2, 3, and Outer Cape Cod (OCC), each of which has a different combination of lobster gauge size requirements. Furthermore, the coarse resolution of data collected by statistical area makes it difficult to determine potential impacts to the fisheries from fine-scale marine spatial planning in the Northwest Atlantic. As an example, recent action to protect deep-sea corals in GBK and the GOM required information on the magnitude of lobster and Jonah crab fishing in specific areas in order to calculate potential economic impacts. Without this fine scale spatial information, impacts to the lobster and Jonah crab fisheries had to be estimated by piecing together information from harvester reports, industry surveys, and fishermen interviews. Moreover, as the ocean continues to be divided between user groups, the lack of spatial resolution in harvester data collected has impeded the ability to accurately assess impacts to the lobster and Jonah crab industries.

Another deficiency is the lack of data collected on the depth at which the lobster and Jonah crab fisheries takes place. Recent management actions, including the establishment of a national monument, have considered a series of options which differ by depth. Given that information regarding the depth of fishing activity is not consistently collected among the states (Table 3), it is challenging to respond to these management actions and illustrate potential economic consequences to the lobster fishery. This situation is made worse by the poor spatial resolution of the data.

Table 3: Data components collected in current harvester reports along the coast.

	Reports Submitted	Trip Length	# Of Crew	Traps Hauled	Active Traps Fished	Soak Time	Depth Fished	Stat Area	LCMA	Lat/ Long	Distance from Shore	Port Landed	Pounds Landed	Dispo-sition	Avg. Traps Per Trawl
ME	Monthly	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓		✓
NH	Monthly	✓		✓	✓	✓		✓				✓	✓		✓
MA	Monthly	✓	✓*	✓	✓	✓		✓	✓			✓	✓	✓	✓*
RI	Quarter	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	
CT	Monthly	✓	✓	✓	✓	✓		✓				✓	✓	✓	
NY	Monthly	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
NJ	Monthly	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	
Federal VTR	Weekly or Monthly*	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓		✓

* Massachusetts collects information on number of crew and average number of traps per trawl through an annual recall survey.

2.5.2. Percentage of Harvester Reporting

In addition to the lack of spatial resolution of harvester data, the percentage of harvesters reporting, in some areas, limits the ability to assess trends in the fisheries. Addendum X requires a minimum of 10% harvester reporting in the lobster fishery and this baseline requirement is extended to the Jonah crab fishery. Importantly, the expectation at the time was that all states would eventually implement 100% harvester reporting. Currently, Maine is the only state which has not implemented 100% harvester reporting and this is largely due to the size of the fishery. For context, more trips are taken by Maine lobstermen each year than the combined number of trips taken for all species in the states of New Hampshire, Rhode Island, Connecticut, New York, New Jersey, Delaware, South Carolina, and Georgia. As a result, expanding the Maine harvester reporting program to all lobster and Jonah crab fishermen could cost the state an additional $500,000 a year, under current paper reporting methods. Furthermore, not all federally licensed lobstermen are required to submit harvester reports as those vessels which only have a lobster permit are not required to complete VTRs.

The lack of 100% harvester reporting in Maine and in federal waters means that assumptions must be made about the activity of the lobster and Jonah crab fisheries. While 100% dealer reporting along the coast provides information on the total amount of lobster and Jonah crab landed in each state, it is not always clear where these lobster and Jonah crab are caught and what level of effort is required to harvest them. Moreover, information regarding the effort and location of catch from those harvesters which do report must be assumed to be representative of the whole Maine fishery. Given Maine accounts for over 80% of lobster landed in the U.S. and the offshore portion of the lobster fishery in SNE is becoming increasingly scrutinized as lobster abundance continues to decrease inshore, the scaling of a sub-sample of data to the whole fishery may be of concern.

In order to assess the effectiveness of the 10% harvester reporting requirement, the Board tasked the Technical Committee (TC) with determining a statistically valid sample of harvester reporting. A statistically precise sample of harvester reporting is needed to accurately scale up a subset of trip level reports to the full fishery. In their October 2017 report to the Board, the TC recommended 100% harvester reporting in the lobster and Jonah crab fisheries to accurately account for all trap hauls and the spatial extent of effort. Given the scale of the Maine fishery, the TC recommended that this 100% harvester reporting be achieved through electronic reporting, as this reduces the administrative burden on the state. In the interim, the TC did find that the current 10% harvester reporting in Maine is sufficiently precise, in large part due to the immense size of the Maine lobster fishery. Moreover, analysis showed that 10% harvester reporting results in a low coefficient of variation, a statistical measure of precision, for metrics such as trap hauls and landings (Figure 1). Furthermore, the scaling landings reported by the sub-sample of harvesters to the entire Maine fishery fell within the 95% confidence interval of state-wide dealer landings. This suggests that 10% harvester reporting is representative of the whole Maine fishery.

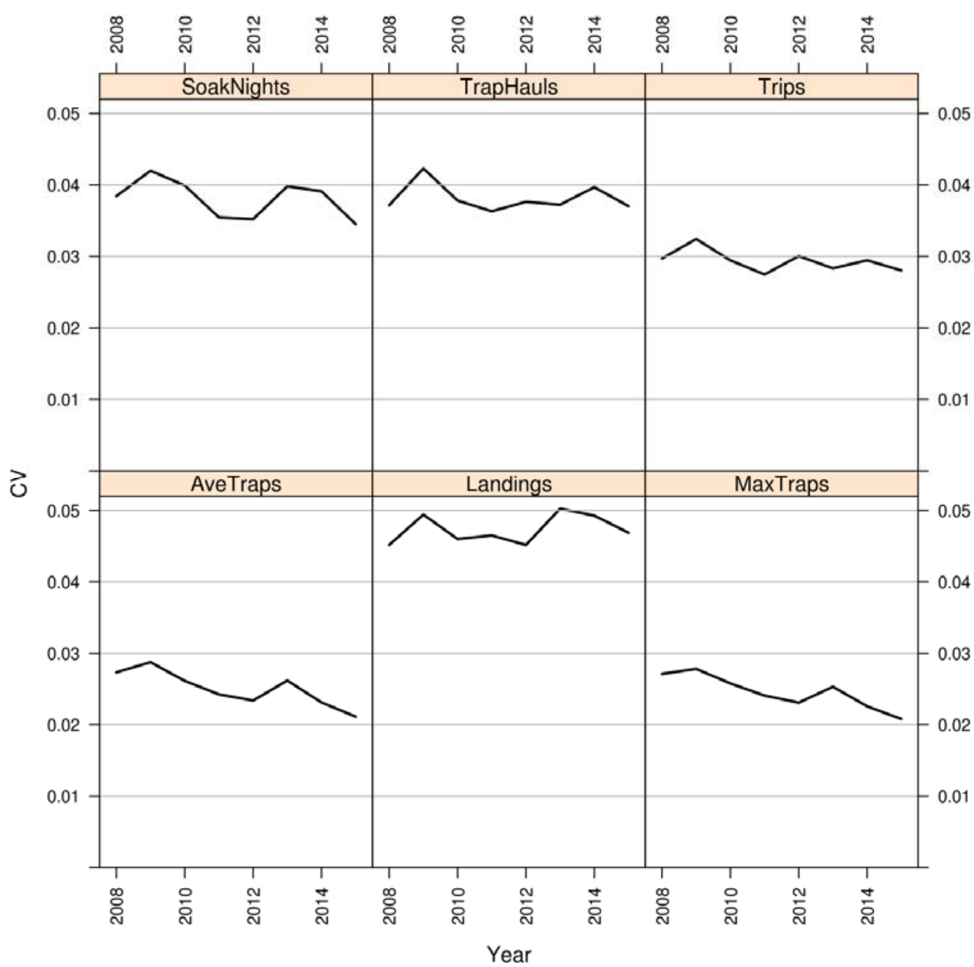

Figure 1: Calculated CVs from harvester data (pooled across license types), by year, for various reporting fields. For all metrics, the CVs are below 0.05 meaning the 10% reporting achieves CV’s below 5% for all metrics considered.

While the TC did conclude that 10% harvester reporting is sufficiently precise, improvements could be made under the current level of harvester reporting to increase the precision and tracking of harvester behavior. Through their analysis, the TC concluded that sampling efforts by states which do not require 100% harvester reporting are best served if they focus on those permit classes which contain a large number of vessels and have a higher variance in landings. This optimized sampling allocation, rather than a proportional sampling allocation, improves the statistical precision of the harvester reporting program while maintaining the current workload of the state. As an example, in Maine the TC found that latent licenses (those licenses with no landings reported for the year) are being oversampled, creating inefficiencies and a lower statistical precision. By evaluating the number of vessels in a license class, the standard deviation of landings, and relative sampling costs, the TC found an optimal sampling approach would place greater sampling effort on active LC1, LC2, and LC3 permits and less effort would be allocated to latent and recreational permits (Table 4). A comparison of the CV's between Maine's current proportional and optimal allocation is shown in Figure 2.

Table 4: A comparison of the current proportional 10% harvester reporting in Maine versus the optimal allocation of reporting recommended by the TC. Licenses for individuals 70 years and older were combined into one license type (LCO). Tribal and non-resident licenses were not included in the analysis due to the small number of these licenses.

Licenses Type and Status	Current Proportional Reporting		Optimal Allocation of Reporting		
	# Vessels	% of Licenses	Allocation %	# Vessels	% of Licenses
LC1 Active	41	9.2%	8.4%	44	9.87%
LC1 Latent	70	15.3%	4.0%	21	4.58%
LC2 Active	190	11.4%	36.4%	188	11.26%
LC2 Latent	20	13.0%	2.7%	14	9.09%
LC3 Active	100	8.2%	28.2%	146	11.97%
LC3 Latent	4	10.3%	1.8%	10	25.64%
LCO Active	30	8.1%	7.6%	40	10.75%
LCO Latent	14	8.3%	1.7%	9	5.36%
LCS Active	36	7.3%	5.0%	26	5.26%
LCS Latent	27	8.1%	2.5%	13	3.90%
LCU Active	3	9.7%	0.4%	3	9.68%
LCU Latent	1	7.7%	0.3%	2	15.38%
LNC	114	6.4%	1.0%	6	0.34%

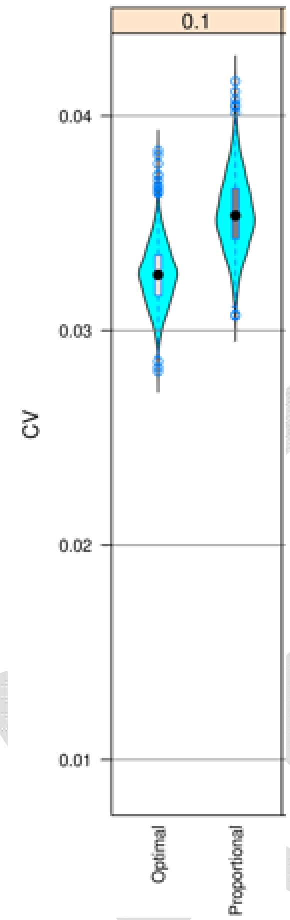

Figure 2: Comparison of CVs for trap hauls with optimal sampling (left side) vs. proportional sampling (right side) under 10% harvester reporting. The black dots represent the mean while the width and length of the shape represents the distribution of the data.

2.6 Deficiencies in Current Biological Data Collection Programs

In a January 2016 report to the Board, the TC stated that while current biological collection programs are sufficient to characterize catch in states waters, the resolution of biological data is lacking in federal waters. Currently, states administer a suite of biological sampling programs (i.e. sea sampling, port sampling, VTS, larval surveys, trawl surveys) to assess the status of the lobster and Jonah crab stocks; however, much of this effort is contained to state waters or takes place in nearshore waters which are accessible via a day trip. Table 5 and Appendix 2 show the location and depth of trawl surveys and VTS used in the 2015 American Lobster Stock Assessment. While the surveys span a broad length of the coast, most state trawl surveys do not extend past the 12 mile territorial sea boundary. The deepest trawl survey is the NEFSC Bottom Trawl Survey which samples depths up to 365m. While NOAA Fisheries has an extensive fishery dependent observer program, the lobster and Jonah crab fisheries have not historically been considered a sampling priority.

Table 5: Location and depth of trawl surveys and ventless trap surveys by jurisdiction.

		Location	Depth
Trawl Surveys	**ME-NH Inshore Trawl Survey**	Downeast Maine to New Hampshire	4 strata: 5-20 fathoms, 21-35 fathoms, 36-55 fathoms, > 56 fathoms out to the 12 mile territorial limit.
	MA Trawl Survey	Cape Ann to Buzzards Bay	6 strata: 0-30ft, 31-60ft, 61-90ft, 91-120ft, 121-180ft, 191ft-12 mile territorial boundary
	RI Trawl Survey	Narragansett Bay, Rhode Island Sound, Block Island Sound	6 strata; Narragansett Bay: 10-20ft, >20ft; RIS/BIS: 10-30ft, 30-60ft, 60-90ft, 90-120ft, >120ft
	CT-NY Trawl Survey	Groton, CT to Greenwich, CT in both CT and NY waters	4 strata: 0-9m, 9.1-18.2m, 18.3-27.3m, and 27.4+ m
	NJ Trawl Survey	Sandy Hook, NJ to Cape Hemlopen DE	18-90ft
	NEFSC Bottom Trawl Survey	Scotian Shelf to Cape Hatteras	7 strata: <9m, 9-18m, >18-27m, >27-55m, >55-110m, >110-185m, and >185-365m.
Ventless Trap Surveys	**ME VTS**	SAs 511, 512, 513 excluding estuaries of Kennebec and Penobscot Rivesr	3 strata: 1-20m, 21-40m, 41-60m
	NH VTS	SA 513 excluding Great Bay, Piscataqua River, and Hampton Harbor	3 strata: 1-20m, 21-40m, 41-60m
	MA VTS	SA 514, 538 excluding the southwest corned of Cape Cod Bay, Vinyard Sound, and Nantucket Sound	3 strata: 1-20m, 21-40m, 41-60m
	RI VTS	539 state waters of Narragansett Bay and Block Island Sound	3 strata: 1-20m, 21-40m, 41-60m

The dearth of biological sampling offshore is a growing concern given the increasing portion of lobster which is being harvested outside of state waters. In 1998, 87% of lobster harvested in SNE were from the inshore portion of the stock; however, by 2011, a greater portion of lobster (55%) were harvested from the offshore portion of the stock than the inshore portion (Figure 1). A similar trend can be seen in the GOM where the percentage of trips occurring at distances greater than 3 miles from shore has increased from 13% in 2008 to 20% in 2015. This issue is further compounded by the fact that the Jonah crab fishery is primarily conducted in federal waters.

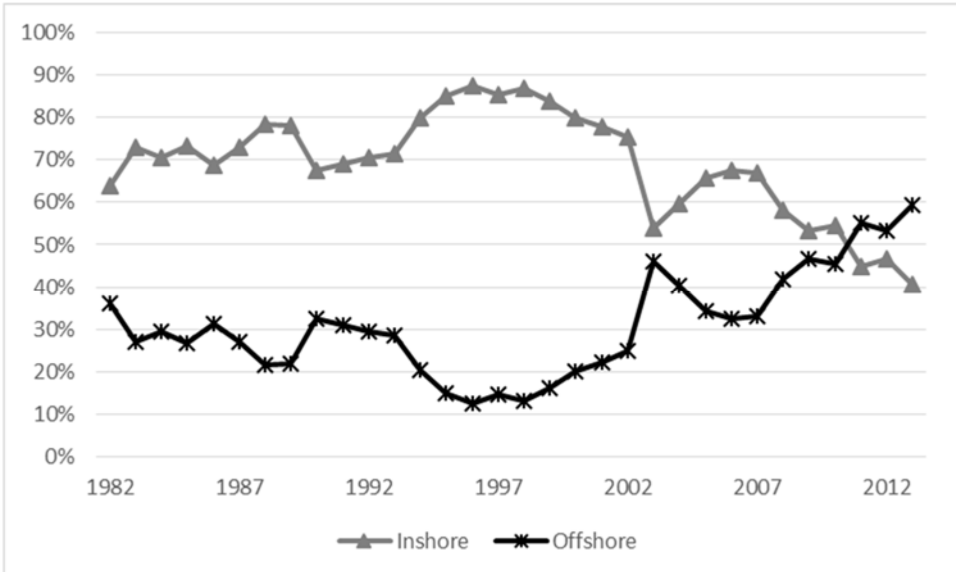

Figure 1: Percentage of landings in SNE occurring in the inshore and offshore fishery. The inshore fishery is defined as landings from statistical areas 538, 539, 611, 612, 613, 614, 621, 625, 631, and 635. The offshore fishery is defined as landings from statistical areas 533, 534, 537, 615, 616, 622, 623, 624, 626, 627, and 632.

2.6.1 External Biological Data Collection Programs

Given financial and geographic constraints on sampling conducted by states, external institutions have begun to implement their own fishery dependent sampling programs in order to collect greater information on the lobster and Jonah crab fisheries. One example of this is the Commercial Fisheries Research Foundation (CFRF), a non-profit foundation which conducts collaborative fisheries research projects. Established by commercial fishermen, CFRF collaborates with industry members to collect biological data and support fisheries research. One of the programs conducted by CFRF has been their On-Deck Data Program, through which participating commercial lobster and/or Jonah crab vessels conduct at-sea sampling during specified trips each month. The On-Deck Data application randomly selects trawls to sample throughout a trip and fishermen collect biological information on carapace length/width, sex, shell disease, presence of eggs, v-notching, shell hardness, and disposition. Participating vessels also deploy ventless traps which expand the spatial extent of the state's ventless trap programs to areas further offshore. In addition, participating vessels collect Jonah crabs to determine maturity status. Currently, 17 vessels participate in the CFRF program. As of August 2017, 97,913 lobster and 39,493 Jonah crab have been sampled. Biological information collected from CFRF was incorporated into the 2015 American Lobster Stock Assessment.

The geographic range of the CFRF program stretches from New Hampshire to New Jersey. Table 6 shows specific statistical areas in which CFRF participating vessels sample as well as the magnitude of sampling in those areas. The largest amount of sampling occurs in statistical areas 537 and 539 (south of Cape Cod and Rhode Island) with additional sampling occurring in GBK (statistical areas 525 and 526) and offshore GOM (statistical areas 464 and 512). Limited levels of sampling occurs off of Long Island (statistical area 613) (Table 6).

Table 6: The geographic distribution of CFRF lobster and Jonah crab sampling, by statistical area, as of September 6, 2017. Data provided by CFRF.

Statistical Area	Commercial Lobster Sessions	Ventless Lobster Sessions	Lobsters Sampled	Commercial Jonah Crab Sessions	Ventless Jonah Crab Sessions	Jonah Crabs Sampled
464	38	5	3,939	11	1	951
465	10	9	1,552	4	0	129
512	40	27	5,179	10	0	440
515	15	21	1,306	4	0	128
522	1	0	83	0	0	0
525	113	24	3,483	64	16	5,323
526	48	21	2,970	19	16	2,005
537	335	342	17,954	86	64	7,729
539	739	1073	43,295	365	102	18,568
561	25	2	2,666	27	0	1,006
562	107	168	9,135	30	40	2,575
613	36	50	1,756	10	24	805
616	76	137	6,357	2	0	173
622	5	2	392	3	2	797
626	1	0	12	0	0	0

2.6.2 Identification of Data Gaps In Offshore Sampling

In order to provide guidance on where additional biological sampling efforts should be conducted in the lobster fishery, the TC reviewed the spatial distribution of various sampling efforts, including sea sampling, port sampling, and CFRF data programs, in relation to current landings. The TC set a baseline sampling threshold of 3 samples from each statistical area in each season. This threshold was identified as, for statistical areas which do not meet this baseline in the stock assessment, data is borrowed from other statistical areas. Results of the analysis showed that 13 statistical areas did not meet the 3-sample baseline in both 2015 and 2016, and an additional 17 statistical areas did not meet this sampling baseline in 2015 or 2016 (see Appendix 3, Table 1). Many of these statistical areas are found in GBK and some are found in SNE. Statistical areas the TC noted as high priority for increased sampling (based on high landings and low sampling) included 522, 525, 526, 561, and 562 in GBK, and 616 in SNE. In addition, the TC's analysis noted the variance in federal sampling through the Standardized Bycatch Reporting Methodology (SBRM) program from year to year as well as the critical role which CFRF plays in collecting biological samples. More specifically, the SBRM program assigned 619 sampling trips to the lobster fishery in 2015 but less than 50 sampling trips in 2016. Further, if the CFRF program did not exist, an additional 2.77 million pounds of lobster caught in GBK and SNE would not be sampled.

2.7 Atlantic Large Whale Take Reduction Team

The Atlantic Large Whale Take Reduction Team (ALWTRT) was established in 1996 in order to reduce the risk of serious injury and death of large whales due to entanglement in commercial fishing gear. The Take Reduction Plan (TRP), which was first published in 1997, specifies gear modifications and restrictions, such as weak links, gear markings, and seasonal prohibitions on locations where traps can be set.

A critical component of the TRP is the co-occurrence model, which pairs information regarding the distribution of whales and commercial fishing gear to predict areas where whales may be prone to entanglement. In May 2016, a subset of the ALWTRT met to discuss deficiencies in the collection of fishing effort data as it pertains to the co-occurrence model. To this end, the ALWTRT identified specific data elements which would inform the co-occurrence model but are not consistently collected by the states and NMFS. These include information regarding the number of traps per trawl, number of vertical lines, length of vertical lines, rope gauge, weight of traps, and buoy configuration. In April 2017, the ALWTRT met to consider ways to collect fishery effort data independent of the states. An outcome of that meeting was the potential development and implementation of an annual recall survey which would be sent to fishermen to collect information regarding fishing activity and gear used per month. Currently, the ALWTRT is developing this annual survey; information being considered for collection in that survey include the color of the buoy line and buoy, the weight of each trap, the number of traps per trawl, the buoy configuration, the buoy line diameter, the weight of anchor lines, and general fishing areas. The survey is still under development and it is expected the survey would be implemented December 2018 or thereafter.

This addendum provides an opportunity to proactively address some of the data needs of the ALWTRT; however, much of the information requested by the ALWTRT is more specific than what is typically required in a harvester trip report. Furthermore, state trip reports are often used for multiple species, limiting the ability to specifically ask questions regarding lobster gear configurations. There may be an opportunity to collaborate on the collection of some data (i.e. traps per trawl, number of endlines), particularly if electronic reporting is pursued by the states.

2.8 Reporting Work Group

Recognizing the need to assess current data collection in the lobster and Jonah crab fisheries, the Board established a Reporting Work Group to discuss data deficiencies and ways to improve them. The Work Group, which met in September 2016, was comprised of state agency staff, TC members, Board members, federal representatives, ACCSP staff, and ASMFC staff. As a part of their discussion, the Work Group developed five goals for harvester reporting.

1) Improve the spatial resolution of harvester reporting
2) Utilize the latest technology to improve and increase reporting
3) Collect greater effort data in harvester reports
4) Define inshore vs. offshore areas in the lobster fishery
5) Proactively address data concerns of the ALWTRT

In order to achieve these goals, the Work Group compiled a list of recommendations (Table 7). The recommendations were categorized as short-term (less than 1 year), intermediate (1-2 years), and long-term (greater than 2 years). The short-term recommendations sought to maximize commercial harvester reporting under the current framework and provide a uniform set of definitions for inshore vs. nearshore vs. offshore areas. The intermediate recommendations intended to build upon the existing reporting programs by requiring increased harvester reporting and the collection of additional data components. The long term recommendations sought to incorporate new technology into the lobster fishery in order to efficiently and effectively report landings, monitor compliance, and identify critical areas for the lobster fishery. These goals and recommendations provided a basis for the development of this addendum.

Table 7: Recommendations from the Lobster Reporting Work Group on ways to improve reporting in the lobster fishery.

Short Terms Recommendations
-Maximize ME's 10% harvester reporting by only including commercial license holders who have actively fished in the past two years
-Defined the inshore fishery as 0-3 miles, the nearshore fishery as 3-12 miles, and the offshore fishery as >12 miles
Intermediate Recommendations
- Require 100% active harvester reporting for all state and federally permitted lobster license holders; for resource limited jurisdictions unable to achieve 100% harvester reporting, at a minimum, states should require reporting from a statistically valid sample of harvester reporting
- Add the following data components to current harvester reporting coastwide: number of trap hauls, soak time, catch disposition, gear configuration, number of vertical lines, LCMA, depth
- Further delineate NMFS statistical areas on harvester trip reports
Long Term Recommendations
- Establish an electronic swipe-card system for harvester and dealer reports
- Incorporate VMS or another locator beacon to all lobster vessels
- Establish an electronic fixed-gear VTR for all federal permit holders

2.9 Status of the Stocks

American Lobster

The 2015 peer-reviewed stock assessment report indicated a mixed picture of the American lobster resource, with record high stock abundance throughout most of the GOM and GBK and record low abundance and recruitment in SNE.

The assessment found the GOM/GBK stock is not overfished and not experiencing overfishing. GOM and GBK were previously assessed as separate stock units; however, due to evidence of seasonal migrations by egg-bearing females between the two stocks, the areas were combined into one biological unit. While model results show a dramatic overall increase in stock abundance in the GOM/GBK, population indicators show young-of-year estimates are trending downward. This could indicate a potential decline in recruitment and landings in the coming years.

Conversely, the assessment found the SNE stock is severely depleted. Recruitment indices show the stock has continued to decline and is in recruitment failure. The inshore portion of the SNE stock is in particularly poor condition with surveys showing a contraction of the population. This decline could impact the offshore portion of the stock if it is dependent on recruitment from inshore areas.

Jonah Crab

Jonah crab are distributed in the waters of the Northwest Atlantic Ocean primarily from Newfoundland, Canada to Florida. The life cycle of Jonah crab is poorly described, and what is known is largely compiled from a patchwork of studies that have both targeted and incidentally documented the species. Female crab (and likely some males) are documented moving inshore during the late spring and summer. Motivations for this migration are unknown, but maturation, spawning, and molting have all been postulated. It is also widely accepted these migrating crab move back offshore in the fall and winter. Due to the lack of a widespread and well-developed aging method for crustaceans, the age, growth, and maturity of Jonah crab is poorly described. As a result, the status of the Jonah crab resource is relatively unknown and no range wide stock assessment has been conducted.

2.10 Status of Commercial Fishery

American Lobster

The American lobster fishery has seen incredible expansion in landings over the last 40 years, with coastwide landings rising from roughly 39 million pounds in 1981 to over 158 million pounds in 2016. Ex-vessel value in 2016 set a new record at over $660 million. Much of this increase can be attributed to high landings in the GOM, and in particular, the state of Maine; since 1981, Maine lobster landings have risen over 500% from 22.6 million in 1981 to 131.9 million in 2016. In contrast, landings in states such as Connecticut and New York have dramatically decreased from their peak in the 1990s. In 1996, New York lobster landings were 9.4 million pounds but in 2016, only 218,354 pounds were landed in the state. A similar trend can be seen in Connecticut. These rapid decreases in landings are the result of several factors including warming waters, increased predation, and continued fishing pressure.

Jonah Crab

Historically, Jonah crab was taken as bycatch in the lobster fishery; however, in recent years a directed fishery has emerged causing landings to rapidly increase. Throughout the 1990's, landings fluctuated between approximately 2 and 3 million pounds and the overall value of the fishery was low. In the early 2000's landings began to increase with over 7 million pounds landed in 2005. By 2014, landings had almost tripled to 17 million pounds and a value of nearly $13 million dollars. This rapid and recent increase in landings can be attributed to an increase in the price of other crab (such as Dungeness), creating a substitute market for Jonah crab, as well as a decrease in the abundance of lobsters in SNE, causing fishermen to supplement their income with Jonah crab. Today, Jonah crab and lobster are considered a mixed crustacean fishery in which fishermen can target lobster or crab at different times of the year based on slight gear modifications and small shifts in the areas in which the traps are fished. While the majority of Jonah crab is harvested as whole crabs, fishermen from numerous states, including Maine, New York, New Jersey, Delaware, Maryland and Virginia land claws.

3.0 Management Options

This section proposes to replace Section 4.1 of Addendum X to American Lobster Amendment 3 and Section 3.4.1 of the FMP for Jonah Crab. The intent of these management options is to improve harvester reporting and biological data collection.

3.1 Dealer and Harvester Reporting

The following outline the requirements for dealer reporting in the lobster and Jonah crab fisheries.

1. There is 100% mandatory dealer reporting. Dealer reports include: unique trip ID (link to harvester report), date, species, quantity (lbs), state and port of landing, areas fished (NMFS stat area), price per pound, and market grade and category.
2. There is a two-ticket system for dealer and harvester reports. This is used to provide verification between the two landings information. Harvesters report trip data and catch estimates (in pounds) and dealers report landing weights (in pounds).
3. Harvester and dealers are required to report standardized data elements for each trip on a monthly basis.
4. Permit holders are linked to federal vessel or individual permit/license level reporting for lobsters using ACCSP protocol (http://www.accsp.org/cfstandards.htm).
5. ACCSP stores lobster landings information.

3.1.1 Electronic Reporting

This document considers increases in the percent of active harvester reporting in the lobster and Jonah crab fisheries (see *Issue 1*). Given increases in harvester reporting under the current methodology (ie: paper reports) may result in large costs to some states, it is highly recommended that states implement electronic reporting. Electronic reporting represents a cost effect method to collect data as it reduces the need for staff to convert paper reports into an electronic format. Furthermore, electronic reporting provides the flexibility to collect expanded data elements. This could be particularly important given the ALWTRT is currently considering an annual survey to collect information on gear configurations and electronic reporting may provide an opportunity to streamline some of these data collection. At present, electronic reporting is not widely used throughout the lobster and Jonah crab fisheries. In Massachusetts, 24% of lobster-only permit holders (i.e. permit holders who do report through VTR) submit harvester reports electronically. In Rhode Island, 56% of state-only permit holders report electronically. No lobster fishermen in Maine, which has roughly 6,000 license holders, or Connecticut report electronically.

Should states implement electronic reporting, it is recommended that states use the SAFIS application eTrips, or eTrips Mobile, given this platform can be implemented at little to no cost to the states or fishermen, it is approved by GARFO as a platform to submit eVTRs, and there is a well-established working relationship between ASMFC and ACCSP. States may choose to use an electronic reporting platform other than eTrips; however, this platform must implement the ACCSP Data Standards and be compatible with the eTrips Application Programming Interface (eTrips API), in order for the data to be seamlessly consolidated with other sources.

States wishing to use a different platform may submit a proposal to the Board which outlines why the state is pursuing a different electronic reporting platform and demonstrates that the platform meets the reporting requirements of this Addendum. Furthermore, states must demonstrate that the alternative electronic reporting platform can accommodate the large scale of the lobster fleet. Proposals must be reviewed and approved by the Board.

Issue 1: Percent Harvester Reporting
This issues asks what the minimum percentage of harvester reporting should be in the lobster and Jonah crab fisheries. States are encouraged to use electronic reporting as a cost-effective method to increase harvester reporting. Section 3.1.1. outlines the requirements for electronic reporting. For this addendum, an active harvester is defined as an individual who landed lobster and/or Jonah, in any amount, during the past two calendar years

<u>Option A: Minimum 10% Harvester Reporting (Status Quo)</u>
Under this option, at least 10% of active commercial harvesters in the lobster and Jonah crab fisheries are required to report trip level landings, with the expectation of 100% harvester reporting over time. States which currently require greater than 10% harvester reporting are required to maintain that higher level of reporting.

<u>Option B: Maintain Current Harvester Reporting Effort and Allocate Reporting Through an Optimal Approach</u>
Under this option, states which currently have 100% harvester reporting are required to maintain this level of reporting. States which have less than 100% harvester reporting are required to maintain, at a minimum, their current effort associated with harvester reporting and distribute reporting across an optimal, rather than a proportional, allocation. For example, an optimal allocation scheme based on license class in Maine would use the percentages below. It is expected that states will work towards 100% harvester reporting over time through the use of electronic reporting.

Licenses Type and Status	Allocation %
LC1 Active	8.4%
LC1 Latent	4.0%
LC2 Active	36.4%
LC2 Latent	2.7%
LC3 Active	28.2%
LC3 Latent	1.8%
LCO Active	7.6%
LCO Latent	1.7%

LCS Active	5.0%
LCS Latent	2.5%
LCU Active	0.4%
LCU Latent	0.3%
LNC	1.0%

Option C: 100% Harvester Reporting

Under this option, 100% of active commercial harvesters in the lobster and Jonah crab fisheries are required to report trip level landings. States which currently require less than 100% active commercial harvest reporting may phase-in the higher level of reporting over 5 years, such that in year 1 there is a minimum requirement of 20% active commercial harvester reporting; in year 2 there is a minimum requirement of 40% active commercial harvester reporting; in year 3 there is a minimum requirement of 60% active commercial harvester reporting; in year 4 there is a minimum requirement of 80% active commercial harvester reporting; and in year 5 there is 100% active commercial harvester reporting.

Issue 2: Harvester Reporting Data Components

This issue asks what data elements must be collected in harvester reports. Options B and C are not mutually exclusive, meaning the Board can chose Option B, Option C, or Options B and C.

Option A: Status Quo

Harvester trip-level reports must include: a unique trip ID (link to dealer report), vessel number, trip start date, location (NMFS Statistical Area), number of traps hauled, traps set, species, quantity (lbs), and trip length. Soak time is also required on Jonah crab harvester reports. For clarification, 'traps set' means the total number of traps that are in the water for a permit holder, including traps that were hauled and re-set as well as traps which are in the water but were not hauled.

Option B: Expanded Data Elements

In addition to the data components listed in Option A, trip-level harvester reports must include an expanded set of data elements. These include depth (most common depth fished at during trip), bait type, and soak time. States which conduct an annual recall survey in the lobster/Jonah crab fishery can collect information on bait type through this survey, instead of on trip-level reports. Currently, all states collect information regarding soak time so this option would codify this ongoing practice in the lobster fishery. Option B is not mutually exclusive from Option C, meaning the Board can implement both Options B and C.

Option C: Expanded Data Elements Regarding Gear Configuration

In addition to the data components listed in Option A, trip-level harvester reports must include an expanded set of data elements focused on gear configuration. These include number of traps per trawl (most common during trip), and number of buoy lines (total number of buoy lines in the water). The intent of this option is to proactively address some of the data needs of the ALWTRT. States which conduct an annual recall survey in the lobster/Jonah crab fishery can collect information on number of traps per trawl and number of buoy lines through this survey, instead of on trip-level reports. Option C is not mutually exclusive from Option B, meaning either or both Options B and C can be chosen.

Issue 3: Spatial Resolution of Harvester Data

This issue asks how, and at was resolution, spatial data in the lobster and Jonah crab fisheries should be collected. Currently, harvesters report by NMFS statistical area; however, this resolution is too coarse to respond to on-going marine spatial planning efforts including offshore wind projects and coral protection zones. Option E can be chosen in combination with Option A, B, C, or D. This allows for a specification of the spatial resolution of harvester reporting along with the development of an electronic tracking pilot program.

<u>Option A: NMFS Stat Area (Status Quo)</u>

Under this option, harvesters will continue to report their fishing location by NMFS statistical area on harvester reports.

<u>Option B: NMFS Stat Area and LCMA</u>

Under this option, harvesters will report both the NMFS statistical area and LCMA in which they fish on harvester reports.

<u>Option C: NFMS Stat Area and Distance from Shore</u>

Under this option, harvesters will report both NMFS statistical area and distance from shore on harvester reports. Distance from shore will be categorized as 0-3 miles from shore, 3-12 miles from shore, or greater than 12 miles from shore. This option allows managers to separate landings between the inshore, nearshore, and offshore fisheries.

<u>Option D: 10 Minute Squares</u>

Under this option, harvesters will report their fishing location based on 10' squares which divide the North Atlantic coast. The intent of this option is to provide more fine-scale data on where the fishery is occurring. This will allow managers and states to better estimate the economic impacts of marine spatial planning activities on the lobster and Jonah crab fisheries. See Appendix 4 for a figure of 10 minute squares along the Atlantic coast.

<u>Option E: Electronic Tracking</u>

The intent of this option is to pursue electronic tracking in part, or all, of the lobster and Jonah crab fisheries. As a first step, a one year pilot program will be established to test electronic tracking devices on lobster and/or Jonah crab fishing vessels. Given the variety of vessels and the spatial distribution of the fishery (both in distance from shore and breadth along the coast), the pilot program will allow multiple tracking devices to be tested in various conditions to identify which device(s) are applicable to the lobster and Jonah crab fisheries.

To design and implement the pilot program, a Subcommittee of Board members, PDT members, industry, and law enforcement will be convened. Fishermen interested in participating in the program will be identified through state agencies and industry associations.

Ideally, fishermen from different states, fishing grounds, and with varying boat sizes will participate in the pilot program. Multiple technologies can be tested when conducting the pilot program; however, the systems must have a fast ping rate (at least 1 ping every minute) and be a low cost to fishermen. In particular, the Subcommittee, during their review and consideration of various technologies, should analyze the costs associated with the electronic tracking systems. The PDT recommends that specific technologies be explored, including solar powered devices and tracking through the eTrips Mobile application, given that these are generally low cost technologies with fast ping rates.

Success of the tracking technology will be evaluated by looking at the ease of compliance (or non-compliance), ability to determine trap hauls from steaming, industry feedback, cost-per fisherman, and law enforcement feedback. Following the one year pilot program, results of the program (including successes, challenges, and participant perspectives) will be presented to the Board. At that time, the Board may decide, through Board action, to end the pilot program, extend the pilot program for another year, or consider adoption of electronic tracking devices in part, or all, of the lobster and Jonah crab fisheries. Should the Board consider adoption of electronic tracking in part, or all, of the fisheries, a second round of public comment will be held.

Option E can be chosen in combination with Options A, B, C, or D.

3.2 Fishery Dependent Sampling

Non *de minimis* states are required to conduct fishery dependent sampling in the lobster and Jonah crab fisheries. This sampling allows for the collection of biological data on the fisheries and the data is incorporated into stock assessment models. States are required to conduct, at a minimum, 10 sea and/or port sampling trips per year in the lobster and Jonah crab fisheries, collectively. This minimum sampling requirement is meant to be a baseline and is not representative of the total populations. States which comprise greater than 10% of coastwide landings in either the lobster or Jonah crab fisheries should conduct additional sampling trips complementary to their level of harvest. For example, if a state comprises 20% of coastwide lobster landings, they should conduct 20 sea and/or port sampling trips per year in the lobster/Jonah crab fishery. Sufficient sea sampling can replace port sampling. If a state is unable to complete the required number of sampling trips in the lobster and/or Jonah crab fisheries, they must notify the Board during Annual Compliance reports as to why the sampling trips were not completed and outline future efforts to conduct sampling trips.

3.2.1 Port Sampling

The following outlines the requirements of port sampling.

1. In order to characterize lobster commercial catch, the following data elements must be collected: length, sex, v-notched, egg bearing status, cull status. In addition, the following data elements are recommended for collection in the lobster fishery, but not required: tissue for genetic or toxicity analysis, stomach contents for food habit assessments, gonads for maturity schedule data.

2. In order to characterize Jonah crab commercial catch, the following data elements should be collected, where possible: carapace width, sex, discards, egg-bearing status, cull status, shell hardness, and whether landings are whole crabs or parts.
3. The number of port sampling trips, as well as the number of lobster/Jonah crab sampled, will be reported in Annual State Compliance Reports.

3.2.2. Sea Sampling

The following outlines the requirements of sea sampling.

1. In order to characterize lobster commercial catch, the following data elements must be collected: length, sex, v-notch, egg bearing status, cull status, fishing location (NMFS Statistical Area, and total trawls or traps sampled. In addition, the following data elements are recommended for collection, but not required: tissue for genetic or toxicity analysis, stomach contents for food habit assessments, gonads for maturity schedule data.
2. In order to characterize Jonah crab commercial catch, the following data elements should be collected, where possible: carapace width, sex, discards, egg-bearing status, cull status, shell hardness, and whether landings are whole crabs or parts.
3. The number of sea sampling trips, as well as the number of lobster/Jonah crab sampled during sea sampling will be reported in Annual State Compliance Reports.

3.3 Fishery Independent Sampling

Non-de minimis states are required to conduct at least one of the following fishery dependent surveys each year in the lobster fishery: an annual trawl survey, a ventless trap survey, and/or a young-of-year survey. States should expand fishery-independent surveys to collect information on Jonah crab, including size distribution, sex composition, ovigerous condition, claw status, shell hardness, and location information.

4.0 Compliance

If the existing lobster and Jonah crab management plans are revised by approval of this draft addendum, the American Lobster Management Board will designate dates by which states will be required to implement the addendum. A final implementation schedule will be identified based on the management tools chosen.

5.0 Recommendations for Actions in Federal Waters

The management of American lobster and Jonah crab in the EEZ is the responsibility of the Secretary of Commerce through the National Marine Fisheries Service. The Atlantic States Marine Fisheries Commission recommends that the federal government promulgate all necessary regulations in Section 3.0 to implement complementary measures to those approved in this addendum. In addition, ASMFC recommends the following be adopted in federal waters:

- <u>Establish a harvester reporting requirement for lobster-only federal permit holders</u> – There is currently no federal permitting requirement attached to a federal lobster permit. One of the deficiencies identified in this Addendum is that not all lobster and Jonah crab harvesters are required to complete trip level reports. This impedes effective management of the stock as it is unclear where lobster and Jonah crab are being harvested and what effort is associated with the catch. As ASFMC works to improve harvester reporting and data collection, it is recommended that NOAA Fisheries establish a harvester reporting requirement for all federal lobster permit holders to the level approved by the Board or higher. This percentage of federal harvester reporting should be achieved in all statistical areas, in particular those in the GOM where the number of federal lobster permit holders who do not report with VTRs is highest.

- <u>Creation of a fixed gear VTR for federal permit holders</u> – As identified by the Reporting Work Group, one of the major hurdles in federal lobster reporting is that a single VTR form is used by a wide variety of gear types. This limits the amount of information that can be collected and creates confusion on how specific data elements apply to the lobster fishery. ASMFC recommends that a fixed-gear VTR form be established to fulfill the data needs specific to these fisheries, including information on soak time, number of hauls, and total gear in water.
- <u>Implementation of a targeted lobster sampling program in federal waters</u> – As outlined in Section 2.6 of this Addendum, the biological sampling programs currently conducted in federal waters are insufficient to characterize commercial catch or understand the biological conditions of the offshore stock. This is particularly concerning given an increasing portion of the lobster fishery is being executed in federal waters. ASMFC recommends NOAA Fisheries support a targeted biological sampling offshore program offshore. Appendix 3 outlines recommendations from the TC for a sampling program in offshore waters, including areas where future sampling efforts should be focused.

6.0 References

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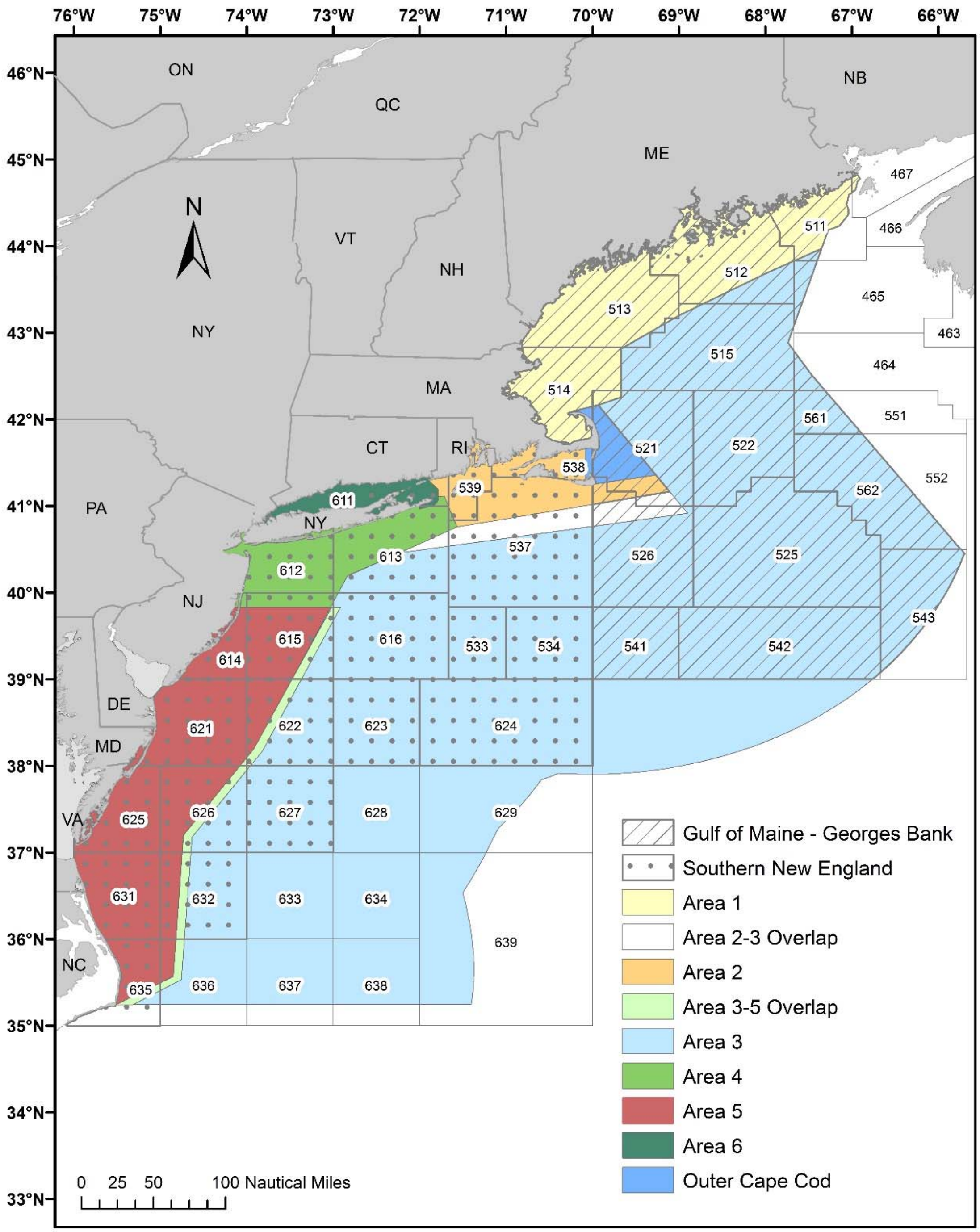
Appendix 1: American Lobster Biological Stocks and Lobster Conservation Management Areas.



Appendix 2: Maps of Trawl Surveys Conducted by Jurisdictions

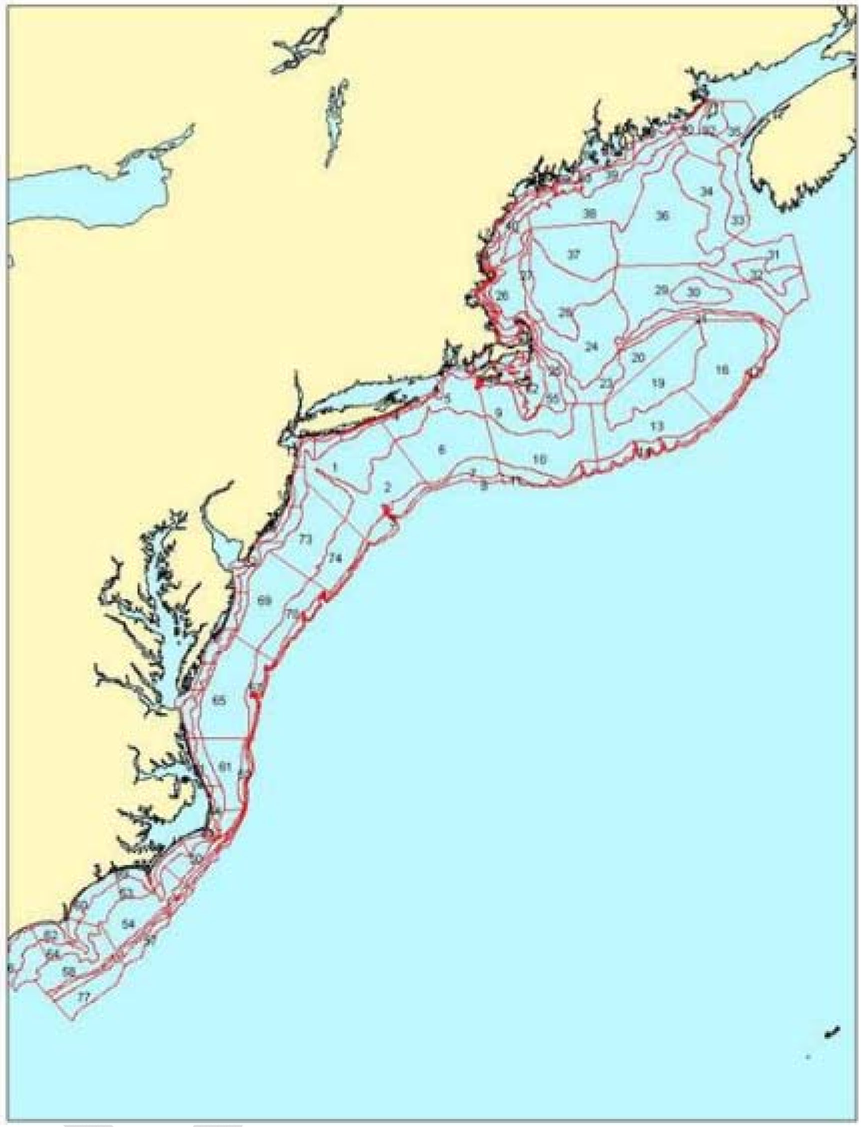


Figure 1: Map of area sampled by the NEFSC Bottom Trawl Survey. The survey is stratified by depth (<9m, 9-18m, >18-27m, >27-55m, >55-110m, >110-185m, >185-365m) and stations are randomly selected within each strata. (Source: NEFSC)

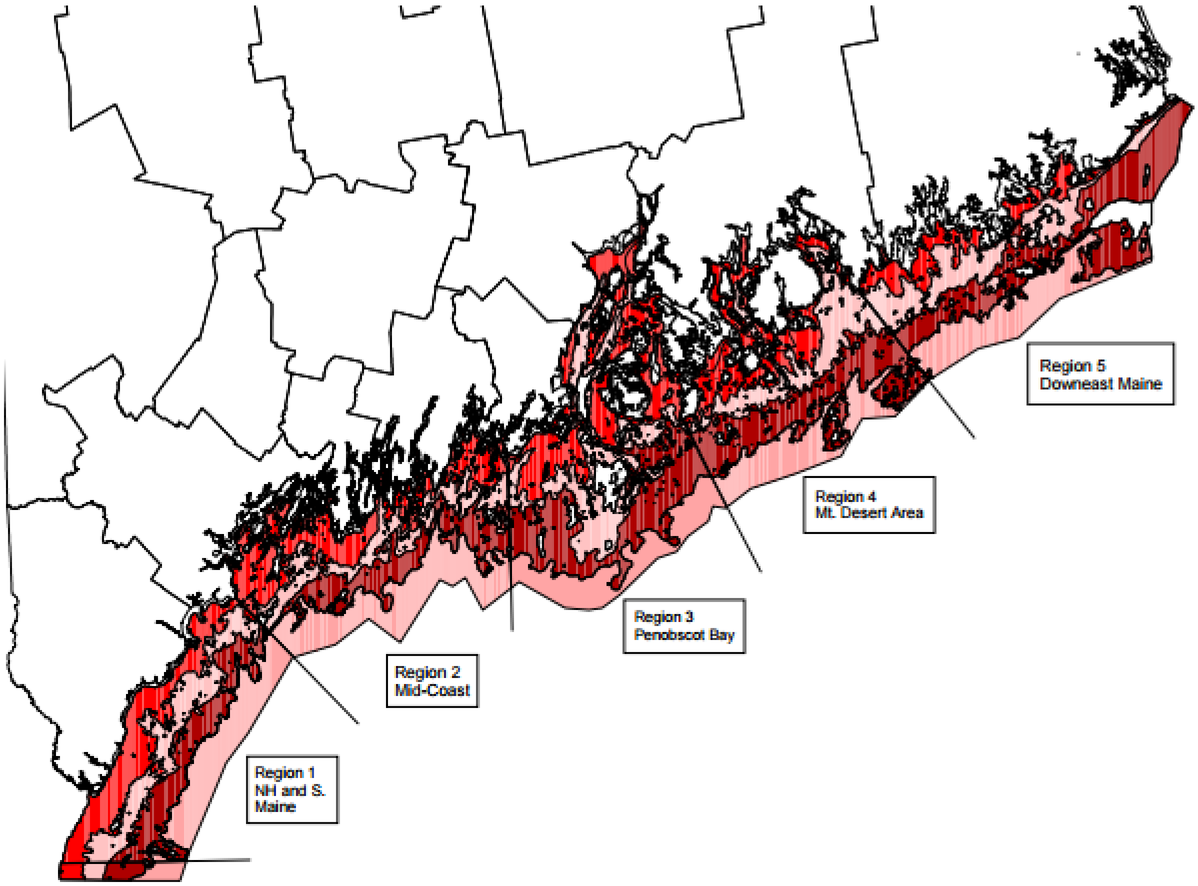


Figure 2: Map of area sampled by the Maine-New Hampshire Inshore Trawl Survey. The survey samples five regions and is stratified by four depth strata (5-20 fathoms, 21-35 fathoms, 36-55 fathoms, and greater than 56 fathoms to the 12 mile line). (Source: ME DMR)

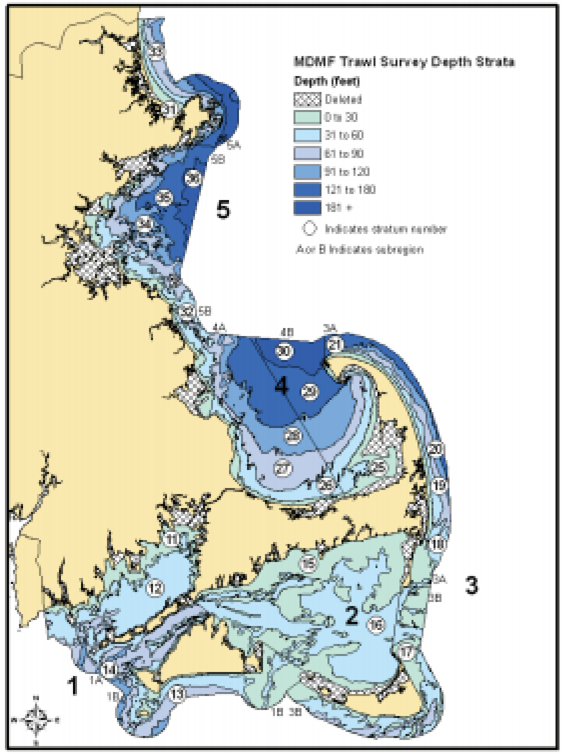


Figure 3: Location of the Massachusetts Trawl Survey. The survey is stratified based on five regions and six depth zones (0-30ft, 31-50ft, 61-90ft, 91-120ft, 121-180ft, >181ft out to 12 mile line). (Source: MA DMF)

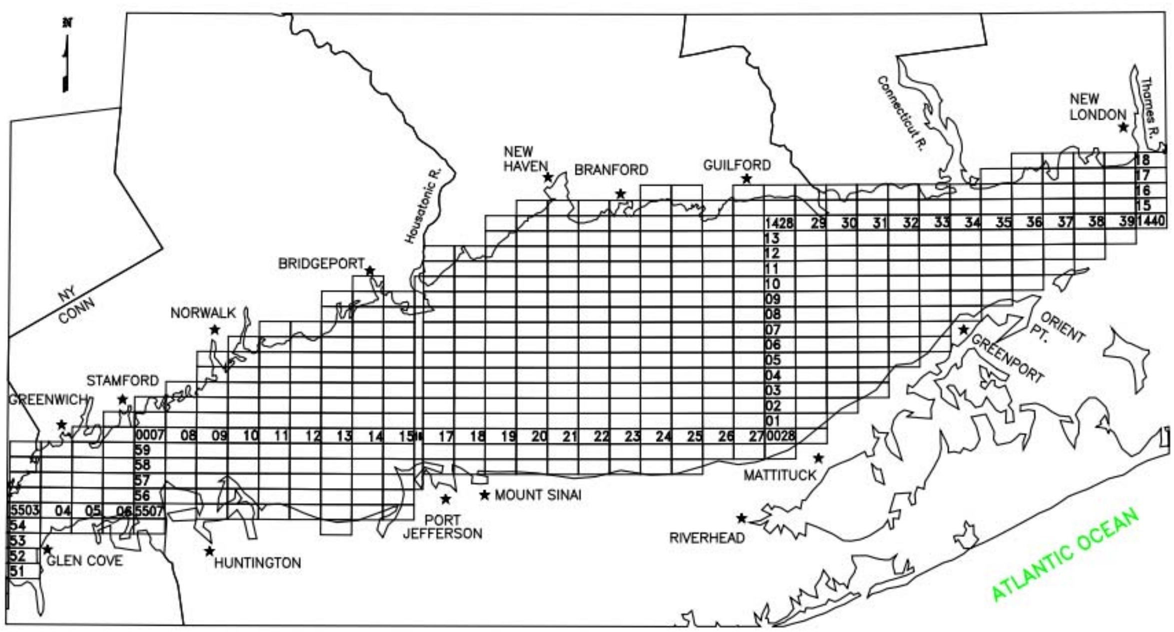


Figure 4: Connecticut – New York trawl survey grid. Each sampling site is 1x2 nautical miles with the first two digits representing the row number and the last two digits representing the column number. (Source: CT DEP)

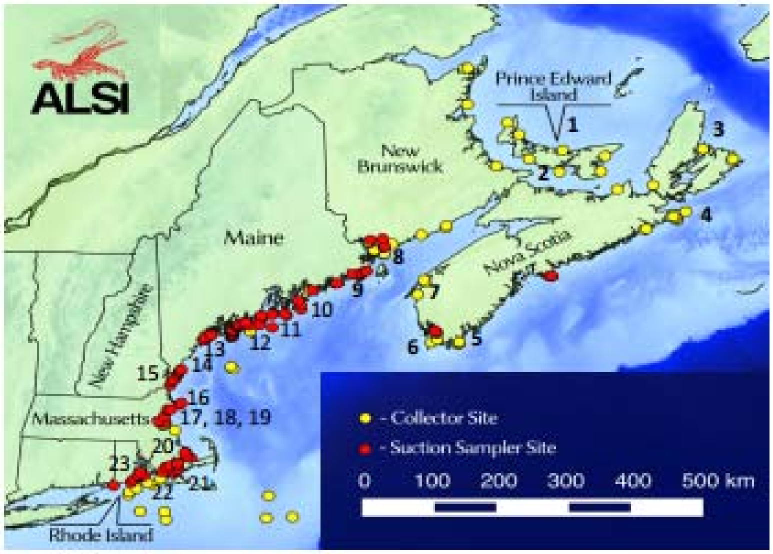


Figure 5: Locations sampled as a part of the 2015 American Lobster Settlement Index. Sites span New Brunswick, Canada down to Rhode Island. (Source: ALSI)

Appendix 3: Offshore Biological Sampling Program for American Lobster

The following comprises excerpts of the TC's October 2017 report to the Board and highlights data needs in the offshore lobster fishery. It is intended to provide guidance on where data gaps exist and how they can be addressed.

Problem Statement: In recent years the lobster fishery has expanded offshore; however, limited biological sampling occurs in these areas. This impedes the effective assessment and management of these offshore lobster fisheries.

Sampling Program: The TC recommends a federal, targeted lobster biosampling program offshore. It is recommended that this program be independent of the Standardized Bycatch Reporting Methodology (SBRM) sampling to ensure adequate sampling of federally-permitted vessels. The sampling frame should include all federally-permitted vessels, not just vessels with VTR requirements and should, at a minimum, randomize vessel selection. The program should be stratified by statistical area. In statistical areas in overlapping waters, state and federal programs should coordinate to ensure complementary sampling programs and increased efficiency to meet the needs of the assessment.

Baseline Sampling Threshold: The TC recommends that offshore sampling programs collect the minimum number of samples needed to meet the assessment gap-filling threshold. More specifically, the TC recommends a baseline sampling threshold of 3 samples from each statistical area (with lobster landings) per quarter and year. Statistical areas with lobster landings will be identified from the last year of landings data in the most recent stock assessment. Given that the 3-samples per statistical area/quarter/year is a minimum threshold, sampling should appropriately increase in statistical areas with high lobster harvest.

Location of Sampling: The TC recommends offshore sampling programs in much of GBK and parts of SNE. Through analysis which assessed current sampling efforts by stat area, including port sampling, sea sampling, federal SBRM sampling, and CFRF sampling, the TC identified data gaps in the lobster fishery. Sampling holes were prioritized by the magnitude of landings from that statistical area. Table 1 illustrates the results of this analysis, with statistical areas ordered by landings. Statistical areas with the greatest need for increased sampling include 522, 525, 526, 561, 562, and 616. More specifically, four of these statistical areas (522, 525, 526, and 616) do not meet the minimum sampling threshold is three out of the four quarters.

Table 1: Statistical areas by quarter which did not meet the minimum recommended threshold of 3-samples in 2015 and/or 2016. Samples include both port and sea sampling, as well as sampling by SBRM and CFRF. Statistical areas are ordered by magnitude of landings, with areas of high landings at the top of the table.

StatArea	Season	# Port and Sea Samples 2015	# Port and Sea Samples 2016	# Years 3-Sample Threshold Not Met
525	4	9	2	1
525	3	7	2	1
562	1	1	3	1
526	4	21	2	1
522	2	1	0	2
522	3	20	0	1
522	1	1	0	2
616	3	5	1	1
561	4	14	1	1
525	1	3	1	1
561	2	2	5	1
515	4	5	2	1
623	3	0	0	2
515	3	2	3	1
521	1	0	0	2
612	1	4	2	1
465	2	4	0	1
537	1	0	1	2
526	2	5	2	1
616	4	8	1	1
611	2	1	6	1
623	4	0	0	2
623	2	0	0	2
465	3	0	0	2
616	1	2	0	2
526	1	7	1	1
538	4	0	0	2
611	1	0	0	2
538	1	0	0	2
611	4	0	1	2

Type of Sampling: The TC recommends sea sampling as the preferred sampling method as it provides information on discarded lobsters in addition to landed lobsters, which are characterized by port sampling. Port sampling should be considered a secondary sampling method that is used during poor sampling conditions (i.e. winter) or if there is limited funding. Both sex and length data are of primary importance when conducting a sampling program as they are critical for characterizing sex ratios and size composition.

Revisiting of Sampling Priorities: Given the on-going shifts in effort in the lobster fishery, the TC recommends that an evaluation be conducted on a regular basis to determine where landings are occurring in the fishery and associated sampling holes. This evaluation should be conducted during each stock assessment (5 year basis). Intermittently, the success of sampling programs at achieving current goals can be assessed through annual compliance reports.

Appendix 4: Atlantic Coast with 10 Minute Square Grid

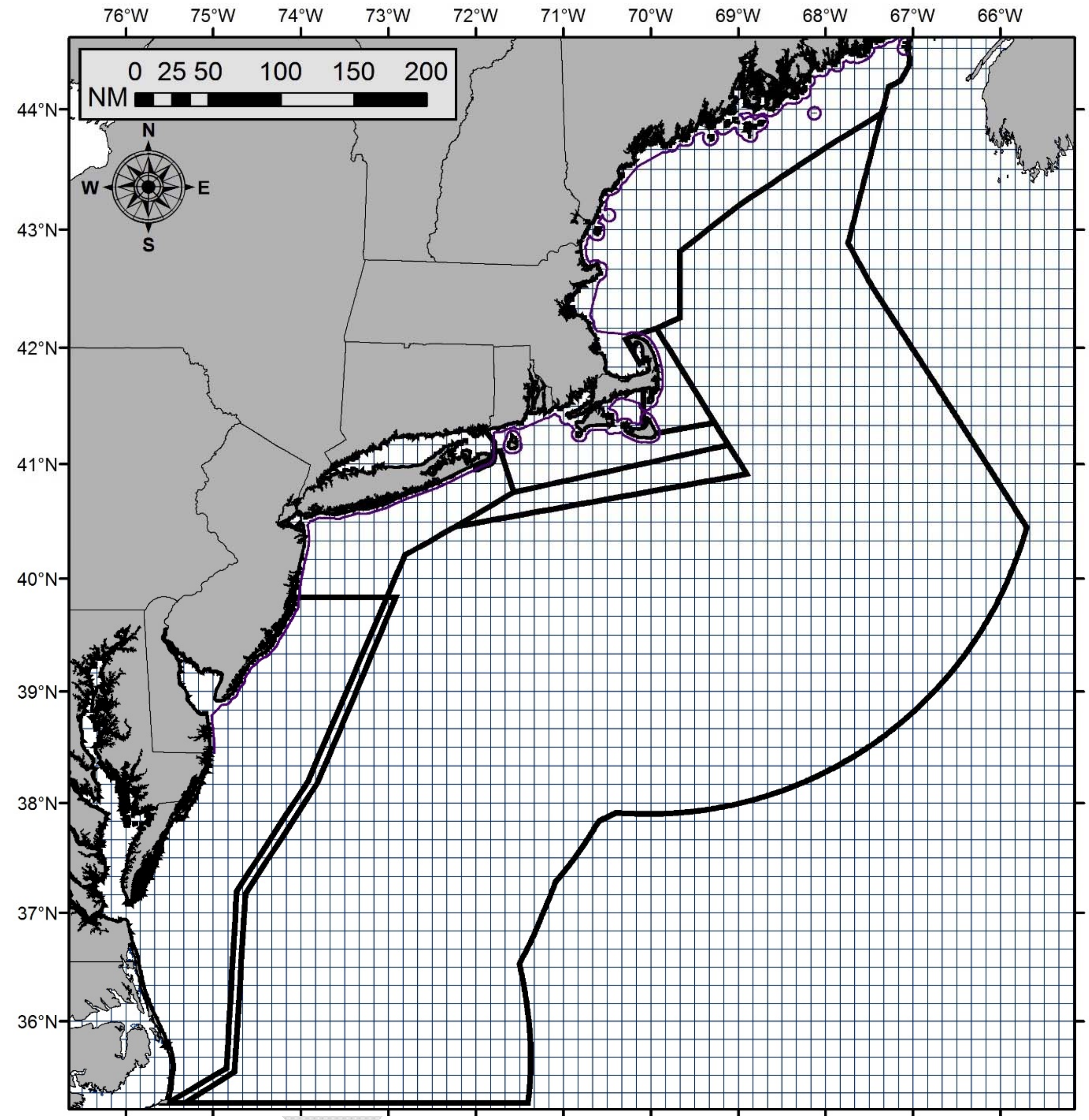


Figure 1: 10 minute squares along the Atlantic coast with outlines of the LCMAs.

Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: American Lobster Management Board

FROM: American Lobster Technical Committee

DATE: October 8, 2017

SUBJECT: Harvester Reporting and Biological Sampling in the Lobster Fishery

The Technical Committee (TC) was tasked with evaluating the current 10% minimum harvester reporting requirement as well as identifying biological sampling gaps in the lobster fishery. The purpose of these tasks is to help inform Draft Addendum XXVI, which the Board initiated in January 2017. The report is split into three sections: 1) Executive Summary; 2) Lobster Harvester Reporting Analysis; and 3) Biological Sampling Gaps.

1. Executive Summary

Harvester Reporting

The TC was tasked with identifying a statistically valid sample of harvester reporting in the lobster fishery. This task was prompted by the fact that, while Addendum X implemented a minimum of 10% harvester reporting with the expectation that states will eventually implement 100% harvester reporting in the lobster fishery, Maine continues to require 10% of harvesters to fill out logbooks. Given that Maine accounts for the vast majority of lobster landings (>80%), this has prompted questions about the efficacy of 10% harvester reporting.

Overall, the TC provides the following conclusions and recommendations to the Board.

- To best characterize the US lobster fishery, the TC supports 100% harvester reporting to accurately account for all trap hauls and the spatial extent of the effort. In conjunction, the TC recommends states, in particular Maine, move towards electronic reporting given that the scale of the Maine lobster fishery (~6,000 licenses and more than 265,000 trips annually) may make the current paper logbooks inefficient and cost prohibitive for 100% reporting. Reporting programs that sample less than 100% of harvesters should be reviewed every three to five years to verify the adequacy of the program.
- In the interim, the TC finds the current 10% harvester reporting to be sufficiently precise to track trends in the lobster fishery. The TC finds the 10% reporting achieves CVs below 5% for all metrics considered and is accurate relative to dealer landings. The TC does note that the statistical precision of the current reporting sub-sample is, in large part, due to the immense size of the lobster fishery. As a result, changes in the number of license holders, particularly decreases, may lower the precision of the current reporting scheme and require sampling a larger portion of the fishing fleet.

- Although the TC finds that the current level of 10% harvester reporting is acceptable, the analyses indicate that latent licenses are being oversampled creating inefficiencies and lower precision in the current system of sub-sampling. Using past data, patterns in variability, and current Maine Harvester Logbook Program effort, the TC proposes an optimized sampling approach, rather than a proportional one, to ensure the program is spending the greatest effort on active permits in the fishery. More specifically, under this optimal allocation, greater sampling effort is placed on active LC1, LC2, and LC3 permits and less effort is allocated to some latent efforts or recreational permits. Additional sampling is also allocated to latent LC3 permits as there is currently a trend for these licenses to become active. This improves the statistical precision of the harvester reporting program by focusing effort on permits who actively participate in the fishery.

Biological Sampling

Recent biological data (2015-2016) were reviewed to identify gaps in the current lobster sampling program and provide recommendations on increased biosampling in the fishery. Data reviewed included sea sampling and port sampling by state agencies and NOAA Fisheries (i.e. the Standardized Bycatch Reporting Methodology (SBRM) observer program), as well as additional sea samples from the Commercial Fisheries Research Foundation (CFRF). Samples for each season/stat area/year (i.e., stratum) were compared to the landings from the respective stratum for the last year of available data in the 2015 benchmark stock assessment (2013).

Overall, the TC provides the following conclusions and recommendations to the Board.

- The greatest gaps in biological sampling occur in LCMA 3, including offshore Gulf of Maine and Georges Bank. 13 stat area and quarter combinations did not meet the threshold (3 samples per stratum) for combined sea and port sampling during both 2015 and 2016 while an additional 17 stat area and quarter combinations did not meet the threshold in one of the two years.
- The TC recommends that NOAA Fisheries implement a lobster biosampling program independent of the Standardized Bycatch Reporting Methodology (SBRM) sampling to ensure adequate sampling of federally-permitted vessels. The sampling frame should include all federally-permitted vessels, not just vessels with VTR requirements.
- The TC recommends collecting a minimum of 3 samples from all stratum with landings to meet the assessment threshold and avoid gap-filling. When less than 3 samples are available for a stratum in the assessment, data are borrowed from similar strata as a proxy.
- Sea samples are preferred over port samples because they provide information on discarded lobsters in addition to landed lobsters.

2. Lobster Harvester Reporting Analysis

Problem Statement

In February 2007, Addendum X under Amendment 3 to the ASMFC Lobster Fishery Management Plan was approved to increase and improve the data collection in the US lobster fishery. In response to the Addendum, all states except Maine developed 100% harvester data programs to collect catch and effort data. Contained within Addendum X, was the minimum requirement for 10% of harvesters to report trip level catch and effort data (logbooks). The Lobster Technical Committee (TC) reviewed the efficacy of this 10% harvester reporting in a March 2007 report, but the analysis was primarily completed using available Connecticut harvester data as a proxy for the larger fishery in Maine, where data were not available. Ten years later, the Board has asked the TC to revisit the 10% requirement because it is still being used by the State of Maine. Specifically, the Board tasked the TC with identifying a statistically valid sample of harvester reporting. This document revisits the TC's 2007 review regarding the representative nature of sub-sampling catch and effort data in the Maine lobster fishery using available Maine Dealer data and Harvester Logbooks.

Background

Maine's fishery has nearly 6,000 commercial lobster license holders selling to approximately 300 dealers completing more than 265,000 dealer transactions or trips. Historically, Maine's landings were collected on a voluntary basis with dealers reporting monthly, while a sub-sample of effort data was collected through port and sea sampling programs. In 2004, Maine instituted mandatory monthly reporting at the dealer level. Prior to 2004, it was estimated that landings were underestimated by 25-35% (Wilson et al. 2004). In 2007, when the Addendum X was approved, the State of Maine did not have a mandatory trip level data collection program for catch or effort. In 2008, Maine implemented a 100% Dealer Reporting Program at the trip level for landings, but, with nearly 6,000 licenses, the cost to implement a 100% Harvester Logbook Program using traditional paper logbooks was too high. Addendum X allowed for at least 10% of harvesters reporting through logbooks with the expectation of 100% reporting in time. Since 2008, Maine's Harvester Logbook Program has been collecting catch and effort data from 10% of each Maine license type in each of Maine's seven fishing zones (see below).

The original 2007 TC analysis was based on the Connecticut lobster fishery, which was (and still is) much smaller than Maine's with several hundred commercial license holders as compared to several thousand in Maine. Connecticut implemented mandatory trip level reporting by harvesters and dealers in the 1980s. This two-ticket system was deemed ACCSP compliant and provided a check and balance for catch and effort information. Connecticut was the model on which the TC recommended all states adopt similar reporting standards. The 2007 TC report used 1997 and 2003 Connecticut harvester data for annual landings and trap hauls as a proxy for the Maine fishery. The choice of those two years reflected when resource conditions were favorable (1997) and poor (2003). Using the Connecticut data, the TC determined that 30% was the optimal target for a statistically valid sample for landings and trap hauls, but due to financial constraints, 10% was adequate.

The original intent of Addendum X was for all harvester reporting to be at 100% coverage of the active harvesters when financially and logistically possible. With Maine Dealer Reporting Program data available for 2008-2016 and Harvester logbook data available for 2008-2015, the TC was asked to revisit the efficacy analysis using Maine data to determine if 10% harvester reporting in Maine is sufficiently precise for characterizing and tracking harvester behavior.

Description of existing sampling programs

Since 2008, the Maine Harvester Logbook Program has been using a stratified random 10% sample of harvesters to produce a representative dataset of Maine harvesters. More specifically, fishermen are categorized by their license type and fishing zone, and 10% of harvesters from each combination of license type and zone are selected to report for the upcoming calendar year (more information below). All Maine lobster license holders, except those chosen the previous year, are included in the annual random draw, including licenses that had no landings the previous year and permits that require Federal Vessel Trip Reports (VTRs). Vessel selection for the coming year is based on their license type from the previous year. Thus, the final proportion of vessels across license types is not exactly 10% because vessels may change license types and enter or leave the fishery over this two-year period. Those permit holders that are required to submit VTRs do not submit duplicate reports to the Harvester Logbook Program but continue to report only through NMFS's VTRs. To complete the data set of all licenses selected, the VTR permits selected as part of the annual 10% process were added to the Maine harvester logbook dataset.

Between 650 and 700 harvesters are chosen annually. All reports are submitted on paper, fax or email. The Harvester Logbook Program enters about 30,000 records annually. A record is a line of data for each trip or monthly "did not fish" entry. If a harvester is selected and does not submit the required logbooks, his license cannot be renewed the next year.

Current Stratification: licenses and zones

The license types are based on age (<18 years old, 18-70 years old, and > 70 years old) and number of unlicensed crew allowed to work on the boat in addition to the captain (none, 1, or 2) (Table 1). There are a few license types that were excluded from below analyses including tribal licenses and non-residential licenses. Apprentice licenses are not required to report and were also excluded. Maine has seven lobster management zones, A-G (Figure 1).

Table 1. Maine lobster license types and descriptions.

License Type	Description
LC1	Lobster/Crab Type 1, no crew
LCO	Lobster/Crab Type 1, >70
LC2	Lobster/Crab Type 2, one crew
LC2O	Lobster/Crab Type 2, >70
LC3	Lobster/Crab Type 3, two crew
LC3O	Lobster/Crab Type 3, >70
LCS	Lobster/Crab Student
LCU	Lobster/Crab Under Age 18
LNC	Lob/Crab Non-Commercial
NLC1	Non-resident Lobster/Crab, Type 1
NLC2	Non-resident Lobster/Crab, Type 2
NLC3	Non-resident Lobster/Crab, Type 3
NLCU	Non-resident Lobster/Crab, <18
various	Tribal Lobster/Crab

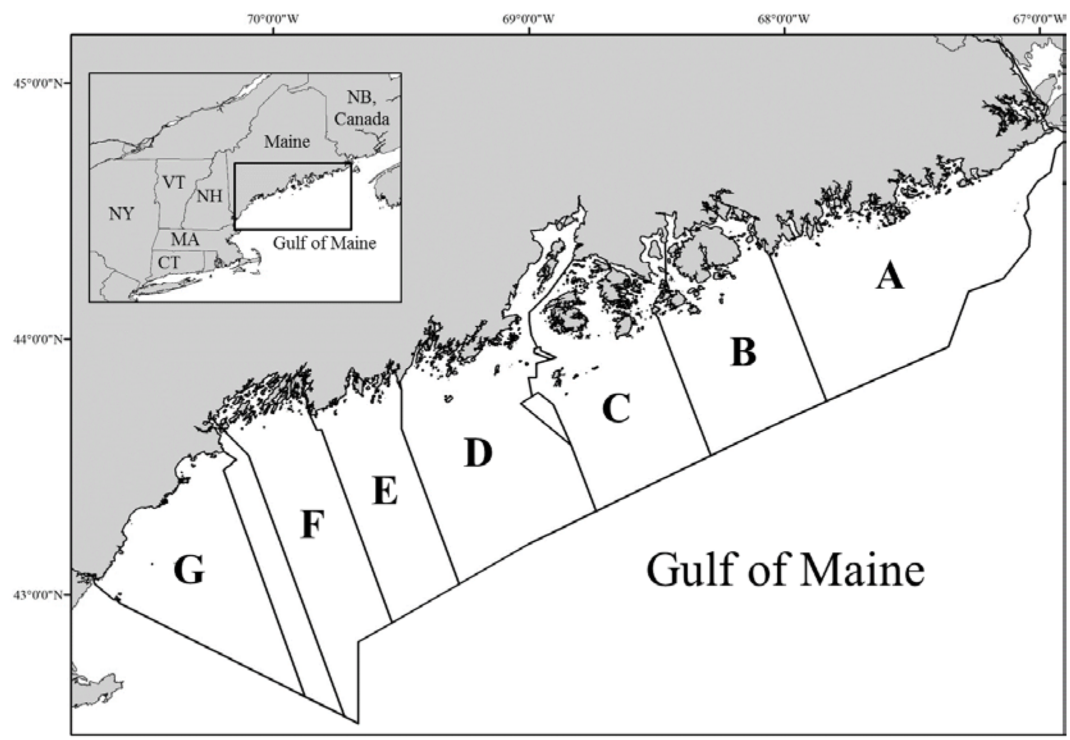

Figure 1. Map of Maine Lobster Management Zones in Area 1.

Objectives

1. Evaluate the precision of the current 10% reporting in Maine and assess the metrics provided by the Harvester Logbook Program.

2. Evaluate the benefits of a higher percentage of harvester reporting in Maine.
3. Evaluate methods and benefits of optimizing the current Harvester Logbook Program to improve precision and efficiency, particularly looking at the stratification and allocation of harvester reporting among license holders.

Statistical Validity of 10% Harvester Reporting

Using only the harvester data from 2008 – 2015, the coefficient of variation (CV) was calculated for six different metrics from the harvester reports: number of trips per year, number of trap hauls per year, total landings, total soak nights, average number of traps in the water, and maximum number of traps in the water for the year. A CV is a measure of variability from the mean and can be used to determine the precision of results; a lower CV means less variation and greater statistical confidence. Data were first aggregated to vessel levels and then merged with the license data to assign license types to each vessel. Stratified CVs were then calculated, treating license type as strata.

CVs tended to be low and stable across all six variables (Figure 2). The CV for landings was highest, being just below 0.05 with trap hauls and soak nights both averaging around 0.04 and number of trips averaging around 0.03. CVs for average number of traps and max number of traps were both below 0.03 and declined across the time series.

We also examined the CVs for these six variables by license type (Figure 3). CVs for all metrics averaged below 0.1 and were stable for LC2 and LC3 licenses, with LC1 vessels averaging around 0.1. CVs for LCS, LCO, LCU, and LNC licenses were typically higher and much more variable across years, probably due to both variability of fishing activities and smaller sample sizes.

Finally, we examined the accuracy and precision of the current harvester reporting by comparing estimates of total landings to dealer landings. Using the harvester data, we calculated the total landings and 95% confidence intervals for each year and plotted them against the total landings by year as reported in the dealer data (Figure 4). The two data sets compare admirably well with most mean harvester-based landings estimates being at or slightly below total dealer landings. Harvester confidence intervals (CIs) were about 10% of the mean estimate, varying from +/- 6 to 12 million pounds across years. Only in 2009 did the estimated CI for harvester landings (70.8 +/- 6.9 million pounds) not encompass the actual value of dealer-reported landings (81.2 million pounds).

Conclusions for 10% validity

We evaluated the current system and found that the 10% harvester reporting with the current stratification is producing data with low and stable CVs over time for the metrics of total annual trap hauls, total soak nights, trips, average traps hauled per day, and maximum traps in the water. When the metrics are calculated for each license type, the CVs are higher but the three license classes that encompass most of the fishery (LC1, LC2, and LC3) had CVs 10% or lower. The licenses types with higher CVs have fewer permit holders (e.g. LCU) or high variability in fishing status (e.g. LCO). Overall, the 10% harvester reporting seems to be producing a sufficiently precise representation of the Maine fishery.

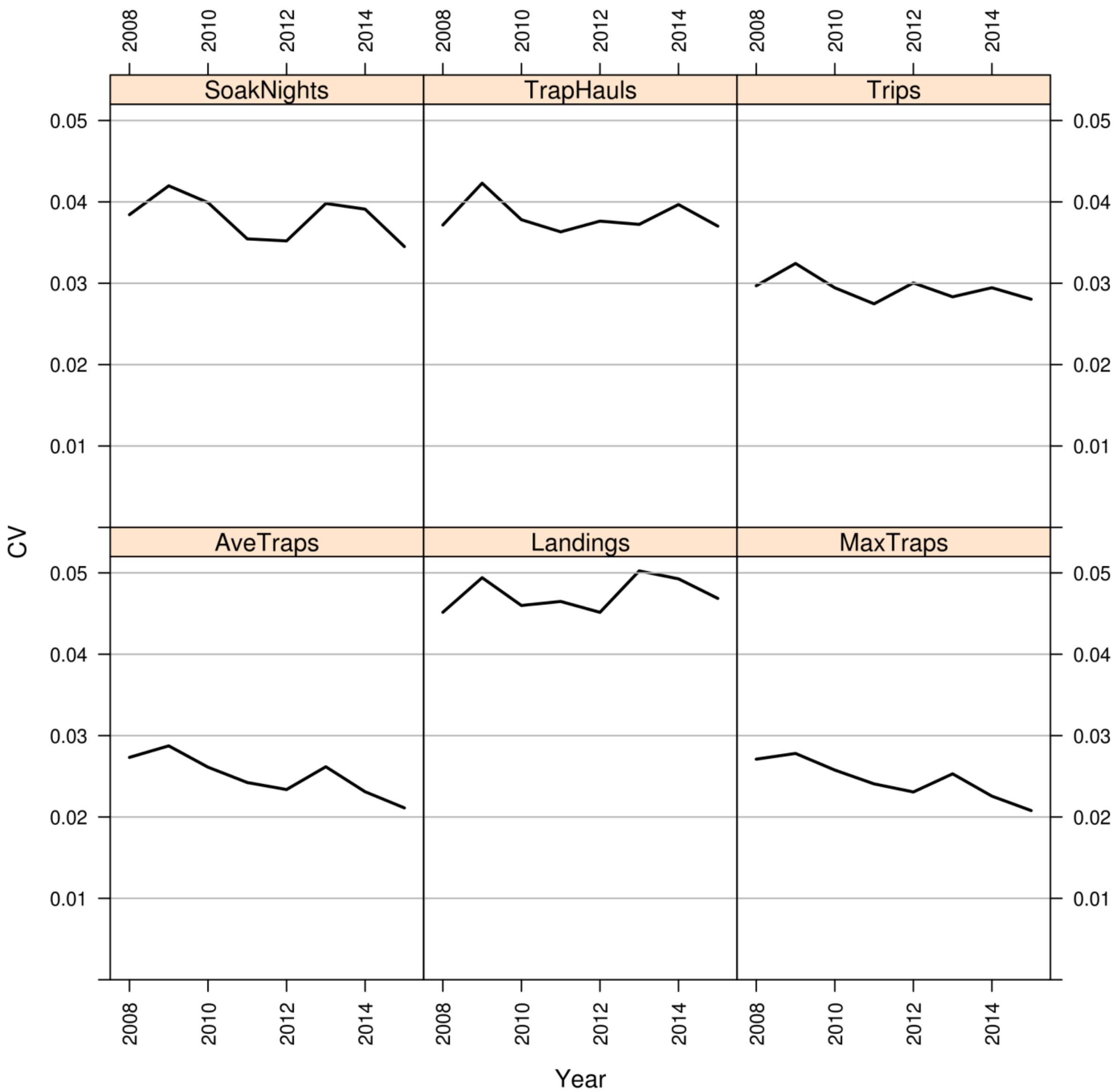

Figure 2. Calculated CVs from harvester data (pooled across license types), by year, for various reporting fields.

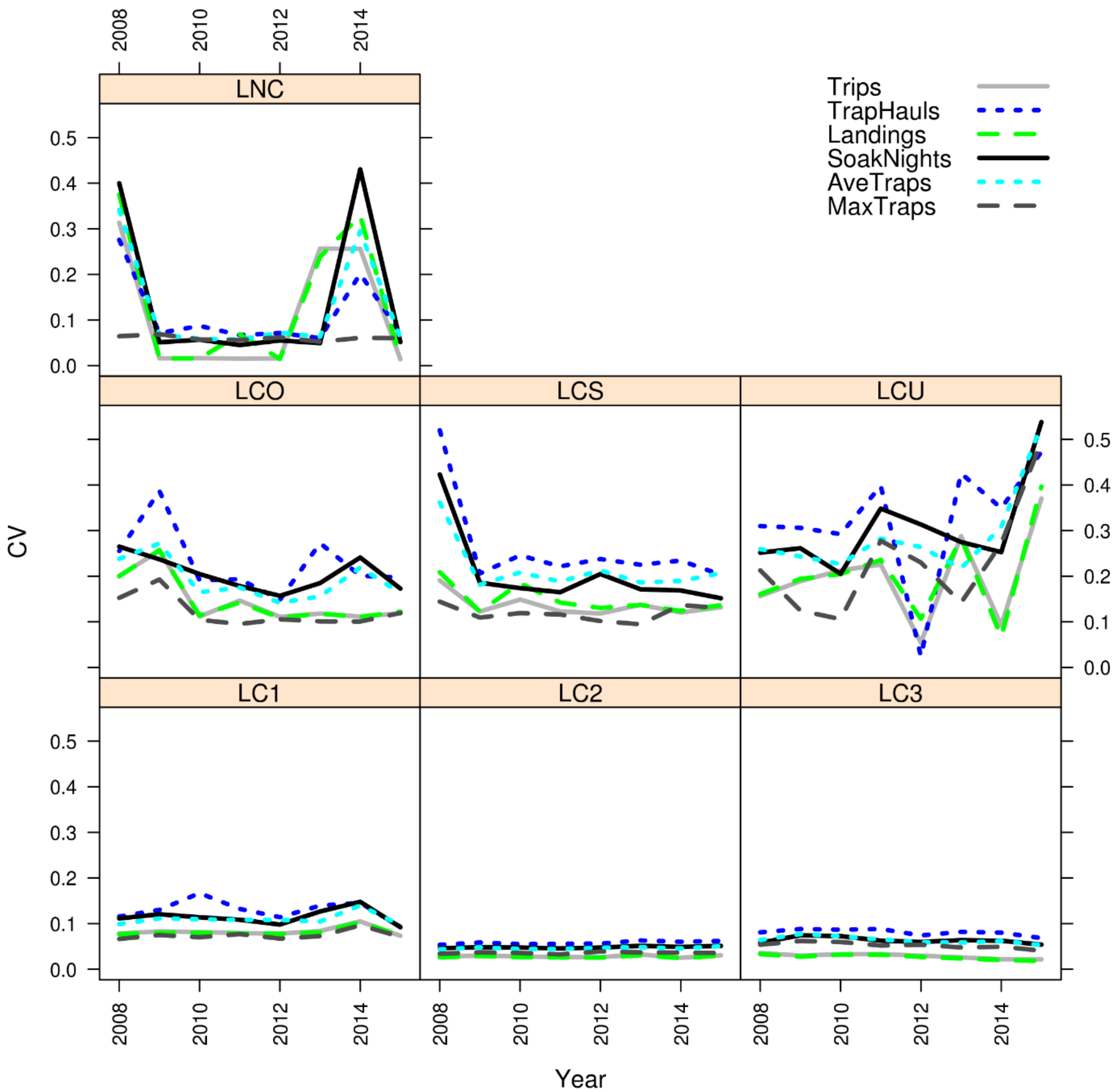

Figure 3. Time series of calculated CVs by license type across reporting fields.

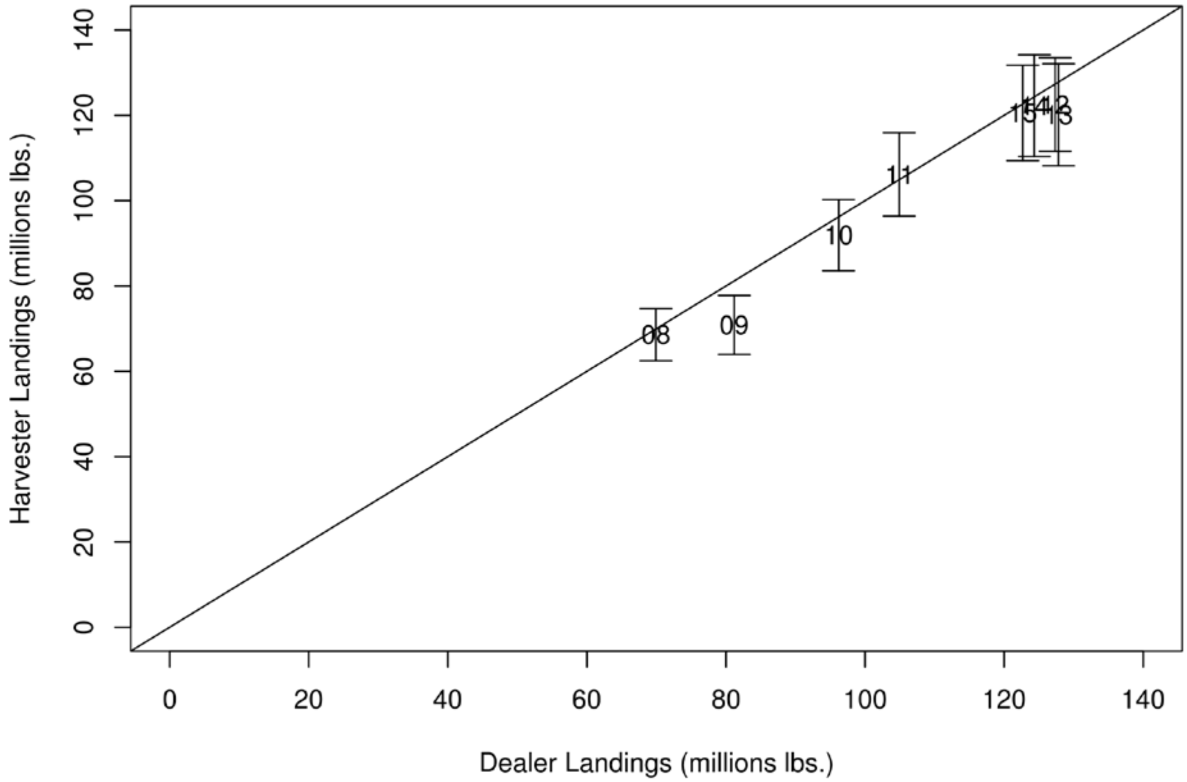

Figure 4. Harvester-estimated total landings (+ / - 95% CI) compared to dealer-reported landings. 2008 – 2015. Digits represent landings year. The diagonal line is the 1:1 proportional line.

Analyzing Potential Benefits of Increasing the Minimum Percentage of Harvester Reporting
Next, the TC evaluated potential benefits of increasing the percentage of harvester reporting in the Maine lobster fishery, particularly looking at the resulting CVs. The TC examined the effect of increasing the percentage of harvester reporting from 10% through 50%, in 10% intervals through bootstrapping CVs for trap hauls from the Maine harvester logbook data. Increasing sampling effort decreased trap haul CVs from around 0.035 at 10% proportional reporting to 0.012 at 50% proportional reporting (Figure 5). Reported CVs from bootstrapping are probably biased slightly high, particularly for higher reporting levels, as the bootstrapping procedure is necessarily resampling with replacement where actual harvester reporting would be selecting vessels without replacement. Overall, the TC notes that all of the CVs for 10% through 50% harvester reporting are quite low and small improvements in the CVs may come at large expenses to the state.

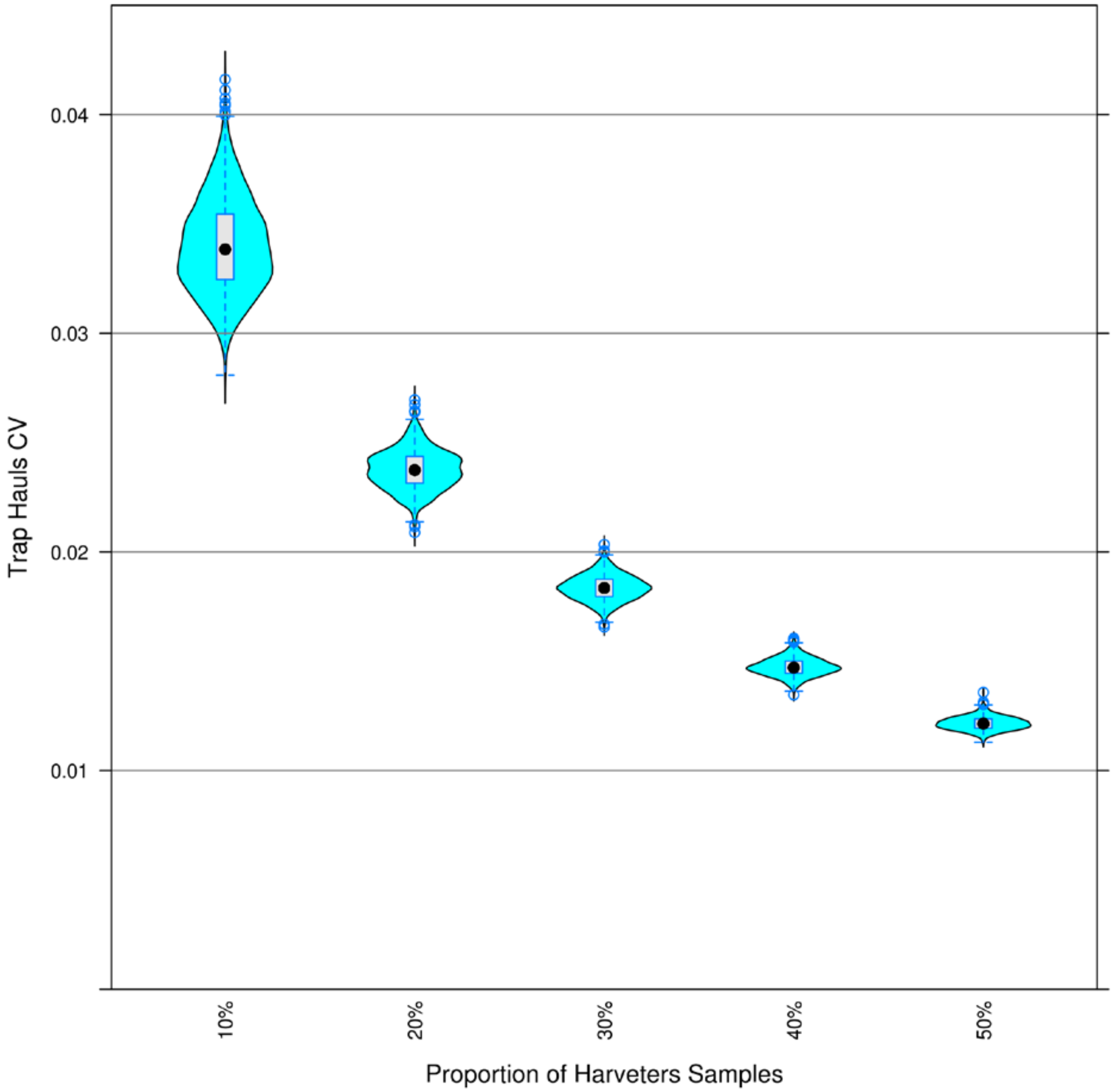

Figure 5. Comparison of trap haul CVs with proportional sampling under 10 – 50% harvester reporting.

Methods to Improve Harvester Reporting Under Current 10% Minimum Requirement
While the CVs that result from 10% harvester reporting are low, there may be ways to improve the precision of the estimates from harvester data or increase the efficiency of the system. To this end, the TC investigated what factors are important in explaining the variation in trap hauls and landings in the Maine lobster fishery and what method of allocating harvester reporting across permit holders results in a lower CV.

Evaluation of License Stratification

Generalized linear models (GLMs) were used to evaluate characteristics (factors) that might explain variation in metrics of interest from Maine's lobster fishery, and thus be beneficial to incorporate into a stratification scheme. The characteristics used in the current stratification, license type and zone, were included in the models in addition to license status (i.e., active vs latent) and year. License status was included in models as it is expected to have an effect on metrics and is an indication of future status. Proportionally, license status tends to be relatively stable over time (Figure 6), but some harvesters did change status between selection and reporting years (Figure 7). Due to these observed changes, latent licenses cannot be perfectly predicted and, therefore, cannot be excluded from selection as they contribute to the distribution of metrics.

License types were divided between license statuses during selection year (e.g., LC1 active and LC1 latent). Year was included in models to determine if variation in metrics is due to a year effect and if allocation should be based on data from a subset of years or all data combined. An interaction between license type and status and zone was included in GLMs to evaluate if licenses should be stratified by license type and status and zone combinations. Metrics evaluated included trap hauls from the harvester logbook data and landings from dealer data. Since dealer data includes 100% of landings, we used this dataset when examining factor effects on landings. However, since dealer data does not include effort information, we had to use the harvester dataset to examine factor effects on trap hauls.

License types for harvesters 70 and older (LCO, LCO2, LCO3) were combined into one license type. Non-resident and tribal licenses were dropped from the analysis due to small numbers of these licenses. Recreational licenses were also dropped from the analysis due to much smaller trap limits (5) than most commercial licenses (800) and because recreational harvesters do not sell their catch to dealers. Latent licenses were determined by assuming that any license that did not sell landings to dealers did not fish during the year.

A negative binomial GLM was used for total annual trap hauls by license. The delta-lognormal method (Lo et al. 1992) was used to evaluate characteristics' effects on two different processes, a binomial GLM to evaluate effects on license status during the reporting year and a normal GLM to evaluate effects on the distribution of annual landings on the log scale by active licenses. Comparison of GLMs was made based on Akaike information criterion (AIC) and relative percent deviance explained by the model. Lower relative values of AIC and higher relative percent deviance explained indicate better model fit. These criteria are used to measure the quality of one model against another when predicting a data set.

The negative binomial GLM estimating trap hauls with an interaction between license type and status and zone resulted in the lowest AIC (Table 2). Percent deviance explained and AIC were very similar among models with license type and status, but deteriorated for all models without license type and status. These results indicate that license type and status are the best predictors of trap hauls among the factors evaluated and additional factors provide little information in estimating trap hauls.

Model-generated estimates of annual trap hauls varied by license type and status, with nearly all (85%) direct comparisons being significantly different (for example, LC1 active compared to LC1 latent) (Table 3).

The normal GLM estimating landings from active licenses with a year effect and an interaction between license type and status and zone resulted in the lowest AIC and highest percentage of deviance explained (Tables 4, 5). Similarly, the binomial GLM estimating reporting status with an interaction between license type and status and zone produced the best results. Adding year and zone to the models only resulted in marginal improvements, at best, suggesting that these characteristics add relatively little information when compared to the models with only license type and status as a factor.

Conclusions for evaluation of stratification

Given the similar results from models estimating trap hauls from harvester logbook data and landings from dealer data, stratifying harvesters for selection based on license type and status is a reasonable balance between statistical power (i.e., marginal increase in AIC) and logistics (i.e., stratification by one characteristic as opposed to a combination of two or more). Including year provided little, if any, improvement to models and supports the use of the full data set for allocating reporting requirements. Including zone also results in relatively little improvement compared to license type and status. However, the potential need to develop estimates by lobster management zone for spatial characterization justifies some allocation to ensure data are available from across zones. Samples within license type and status could be allocated post-stratification proportional to the licenses in each zone.

Table 2. AIC and percent deviance explained for negative binomial GLMs using harvester logbook data.

Model	AIC	Percent Deviance Explained
Trap Hauls~Year+License Type and Status*Zone	70,307	20.83
Trap Hauls~License Type and Status*Zone	70,304	20.81
Trap Hauls~License Type and Status+Zone	70,314	19.76
Trap Hauls~License Type and Status	70,343	19.18
Trap Hauls~Zone	71,353	1.51
Trap Hauls~Year	71,368	0.10
Trap Hauls~1	71,359	NA

Table 3. Differences in annual trap hauls between commercial license type and status. An asterisk indicates a significant difference (p<0.05) and a blank indicates no significant difference.

	LC1 Active	LC1 Latent	LC2 Active	LC2 Latent	LC3 Active	LC3 Latent	LCS Active	LCS Latent	LCU Active	LCU Latent	Over 70 Active	Over 70 Latent
LC1 Active												
LC1 Latent	*											
LC2 Active	*	*										
LC2 Latent	*	*	*									
LC3 Active	*	*	*	*								
LC3 Latent		*	*	*	*							
LCS Active	*	*	*	*	*	*						
LCS Latent	*	*	*	*	*	*	*					
LCU Active		*	*	*	*		*	*				
LCU Latent	*		*	*	*	*			*			
Over 70 Active		*	*	*	*		*	*		*		
Over 70 Latent	*	*	*	*	*	*		*	*		*	

Table 4. AIC and percent deviance explained for normal GLMs using dealer data.

Model	AIC	Percent Deviance Explained
log(landings)~Year+License Type and Status*Zone	51,555	48.56
log(landings)~License Type and Status*Zone	52,450	46.61
log(landings)~License Type and Status+Zone	52,545	46.25
log(landings)~License Type and Status	54,034	42.82
log(landings)~Zone	65,948	6.35
log(landings)~Year	66,753	3.18
log(landings)~1	67,529	NA

Table 5. AIC and percent deviance explained for binomial GLMs using dealer data. Reporting status is active or latent two years after the initial license type and status used as a factor in the model.

Model	AIC	Percent Deviance Explained
Reporting Status~Year+License Type and Status*Zone	21,322	40.92
Reporting Status~License Type and Status*Zone	21,317	40.92
Reporting Status~License Type and Status+Zone	21,356	40.56
Reporting Status~License Type and Status	21,410	40.39
Reporting Status~Zone	35,499	1.11
Reporting Status~Year	35,849	0.13
Reporting Status~1	35,891	NA

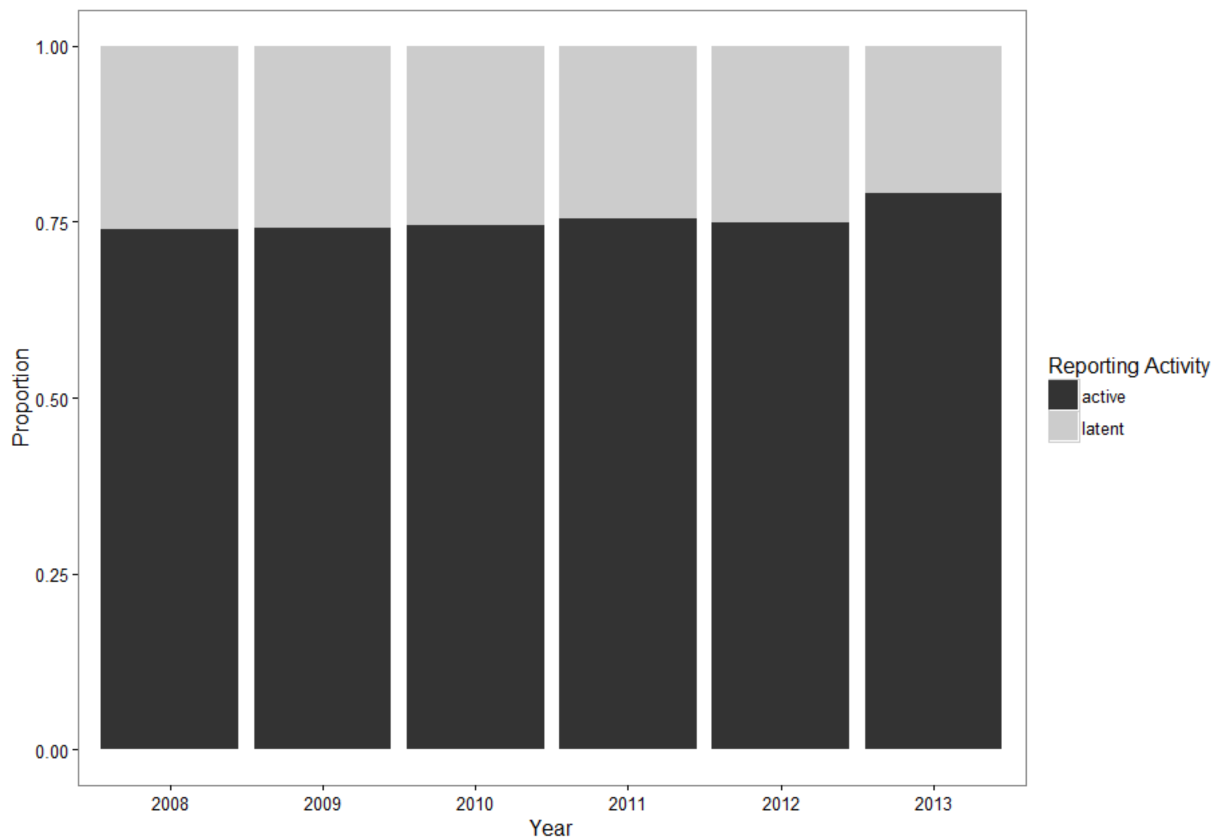

Figure 6. License reporting status (i.e. two years later) by year from the Maine dealer data.

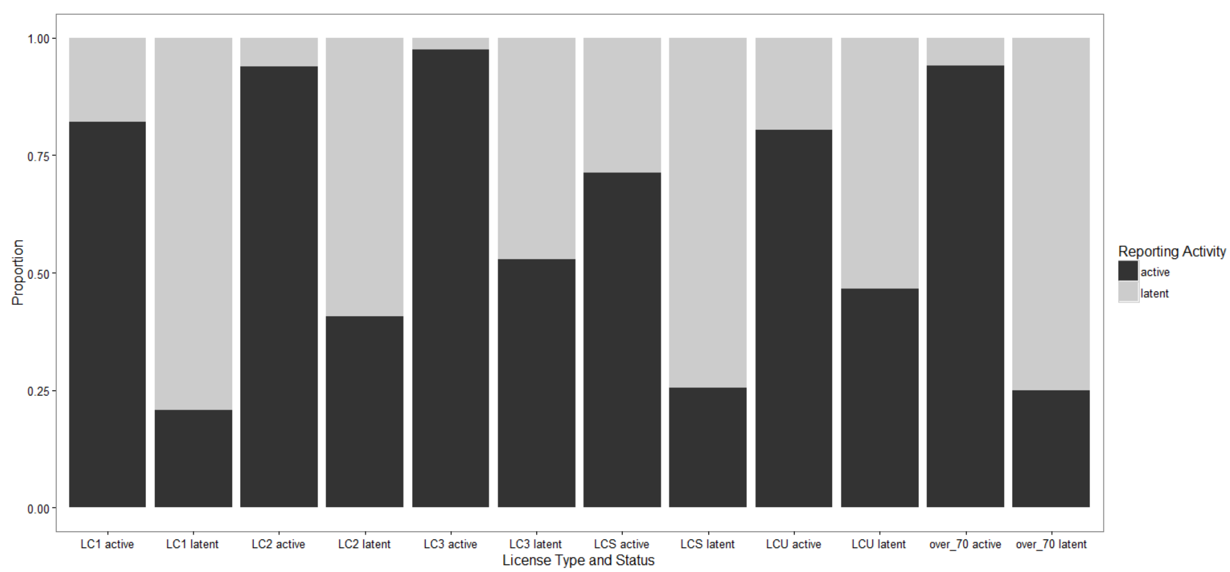

Figure 7. License reporting status (i.e. two years later) by license type and status during potential selection year as determined from the Maine dealer data.

Optimal Allocation for Current Harvester Logbook Program

The final part of this analysis looks to optimize the current harvester reporting program in Maine. One problem with harvester reporting is that many licenses are not actively fishing in a given year, and, thus, a portion of the harvester reporting resources are being assigned to such latent licenses. The sampling of latent licenses occurs because vessels are selected for reporting in the coming year based on the license type they purchased in the previous year, thus incurring a 2-year lag between the basis for selection and actual reporting.

Table 6 shows the sampling history of Maine's Harvester Reporting from 2008 – 2015 by license type and status in the same year. Vessels selected for reporting but with no reported landings are considered latent. Total number of vessels selected for reporting ranged from 744 in 2008 to 650 in 2015. Across all years, most vessels selected to report were active LC2 (30.5%), followed by recreational permits (LNC, 18.6%), active LC3 permits (14.0%) and latent LC1 permits (11.0%). Notably, most selected LC1 permits were latent but most selected LC2 and LC3 permits were active. The total number of LC1 and LC2 permits declined over these years while the number of LC3 permits increased. The large number of latent permits being sampled, particularly for LC1, suggests that efficiency in harvester reporting could be gained by taking a vessel's history of status (active or latent) into account when selecting vessels for coming years.

Table 6. Number of vessels selected to submit harvester reports by license type and status (active vs latent status was determined based on dealer data).

License Class	Status	2008	2009	2010	2011	2012	2013	2014	2015	Ave % of all reporting vessels
LC1	Active	63	62	63	53	50	47	47	48	7.80%
	Latent	90	91	79	88	61	75	62	65	11.00%
LC2	Active	256	200	241	233	216	193	184	167	30.50%
	Latent	15	17	26	10	22	16	15	13	2.40%
LC3	Active	86	77	70	94	92	108	119	128	14.00%
	Latent	1	4	2	2	6	4	7	6	0.60%
LCO	Active	30	33	40	37	35	40	39	41	5.30%
	Latent	20	15	8	10	24	19	19	18	2.40%
LCS	Active	28	26	28	31	26	37	34	33	4.40%
	Latent	19	11	9	13	18	15	18	14	2.10%
LCU	Active	6	7	8	1	5	6	3	2	0.70%
	Latent	0	1	2	1	1	0	0	1	0.10%
LNC	NA	130	123	141	141	140	127	111	114	18.60%
Total		744	667	717	714	696	687	658	650	100.00%

It is possible to optimize the allocation of sampling resources in a stratified survey, if certain characteristics of the strata are known (Cochran 1977). The optimal allocation of effort across strata can be calculated as:

$$p_L = \frac{(NumVessels_L * \ sdPar_L * \ \sqrt{Cost_L})}{\sum(NumVessels_L * \ sdPar_L * \ \sqrt{Cost_L})}$$

Where L is a given license type and status, p_L is the proportion of all sampled vessels to be drawn from a license type, $NumVessels_L$ is the number of vessels in a license type, $sdPar_L$ is the standard deviation of the parameter to be optimized for a license type, and $Cost_L$ is the cost (effort) associated with sampling a vessel from a license type. Thus, a license type and status will be sampled more heavily if it contains a larger number of vessels, has a higher standard deviation, and a lower sampling cost.

For this analysis, we treat the combination of license type and status (active vs latent) as our sampling strata, based on the prior evaluation of stratification, and calculated an optimal allocation of sampling resources across license type and status, based on each of our six variables. Management zone was excluded from the analysis for simplicity and because it was found to be of minor importance in describing the variability in trap hauls and landings in the above GLM analysis. The number of vessels in each license type and status was taken from license and dealer data in 2015, as there were clear shifts in the numbers of licenses and license status across years. Standard deviations for each of the six variables were derived from harvester data and calculated across all years as sampling of some combinations of license types and status were not sufficient in some years to get stable estimates, and there were no trends for these values to change across time. The time lag in the system was modeled by calculating the standard deviations from the harvester data, matched to a vessel's license and status from two years earlier. The cost of harvester reporting for each license type and status was based on the number of records for each from harvester data, again averaged across all years, assuming this is a suitable proxy for the amount of time that Maine DMR staff spend entering data and providing support for a reporting vessel. The same two-year lag was applied to costs by matching the number or records from a license with its license type and status two years prior. Also, for the calculation of vessel costs, vessels with less than 12 reports in a year were assumed to have filed 12 reports that year (monthly) and corrected accordingly.

The resulting number of vessels of each license type can then be calculated as:

$$n_L = \frac{\sum(p_L * Cost_L)}{Cost_{total}}$$

Where n_L is the number of vessels selected from license type L and $Cost_{total}$ is the total amount of resources available for sampling. Under this scenario, we assumed that the total number of reports that Maine DMR staff would be able to process remained constant, so $Cost_{total}$ was fixed at the number of reports the harvester reporting program handled in 2015. Using these estimates of number of vessels in each license type and status, standard deviations of variables, and costs of monitoring vessels, we calculate the appropriate number of vessels in each license type and status that should be reporting.

Figure 8 shows the optimal allocation proportions as calculated specifically based on each of our six harvester variables (trips, trap hauls, soak nights, max traps, landings, and average traps hauled per day). Proportional allocations were distributed similarly across the various license types for each of the six variables examined, with active LC2 and LC3 usually getting the highest proportions of the allocations, the exception being the number of trips, which would allocate additional effort to the recreational vessels. Latent vessels were consistently allocated less sampling effort than active vessels across license types. The similarity in allocation distributions for the different metrics suggests that optimally allocating sampling based on one variable is likely to perform reasonably well for many of the other metrics of potential interest.

Because it is not simple to optimize allocation simultaneously for multiple variables, we used the optimal allocation proportions for trap hauls in this analysis, as this is a variable that is particularly important to track from harvester reporting. Table 7 shows a comparison between the current proportional sampling design and potential optimal sampling design, based on the 2015 harvester data. LC2_Active and LC3_Active both have a large number of vessels, and high standard deviations but high numbers of records submitted each year (cost) and so make up >60% of vessels sampled under optimized sampling. LC3_Latent vessels have a small number of licenses and low number of records but comparably high variances and, thus, are also prioritized under optimized sampling. Conversely, recreational permits represent the largest type of licenses but have a low standard deviation so are sampled less under optimal sampling (114 vessels under proportional sampling vs 6 vessels under optimal sampling). Similarly, latent permits tend to be sampled less (LC1_Latent: 70 vessels under proportional sampling vs 21 vessels under optimal sampling). Because the optimization tends to shift sampling effort to license types with higher costs for monitoring and we are using a fixed cost, the total number of vessels selected for reporting would go down from 650 for proportional sampling to 522 for optimal sampling. It is noteworthy that, of the factors determining the proportions in optimal allocation, the number of vessels and standard deviation of the data are well defined. However, the cost associated with sampling a vessel, based on # records submitted/year, could be better refined, which would change the allocation of sampling.

Using this optimal allocation across licenses and status, we bootstrapped CVs for our six variables of interest from harvester reporting data and compared the results to bootstrapped CVs from proportionally allocated harvester reporting (Figure 9). Optimizing allocation for trap hauls only marginally decreased estimated CVs, from 0.035 to 0.032, compared to proportional allocation. Similarly, CVs decreased marginally from proportional sampling for landings (from 0.047 to 0.041). CVs for soak nights were similar but more variable for optimal sampling. Conversely, CVs for number of trips, average traps, and max traps were also more variable but increased marginally with the mean CV for number of trips increasing from 0.026 to 0.037. Based on the optimal allocation for other variables (Figure 8), these observed increases in CVs and increased variance of the CVs are probably the result of decreasing sampling and small sample sizes for student (LCS) and recreational (LNC) licenses. Although the optimized allocation had mixed results for different metrics, the trap haul variable is the highest priority variable and can only be characterized by harvester reports and this approach improves the precision.

Since the goal of Addendum X was to achieve 100% harvester reporting, incrementally if necessary, we examined the interaction between increasing overall sampling effort and optimal allocation of vessel selection. For this analysis, we bootstrapped the CV of annual trap hauls, allowing the total cost of sampling to vary and thus the total percentage of vessels sampled to increase from 20 - 50%. Similar to increasing the percentage of vessels sampled, increasing sampling effort resulted in decreased CVs with optimally-allocated vessel selection modestly outperforming proportional sampling (Figure 10). However, bootstrapped CV were also ~20% less variable under optimal allocation than proportional allocation, suggesting that future estimates could be more both more precise and consistent.

It is important to recognize that the above analysis on optimal allocation is preliminary and that additional work would be appropriate before implementing this methodology for the State of Maine. In particular, averaging across allocations that were optimized for different variables may be able to further improve the performance across all variables with minimal loss in precision to individual variables. Addition collaboration with the State of Maine could also better quantify the effort costs of monitoring different license classes, making for better cost estimates and further improving the cost estimates used in the allocation.

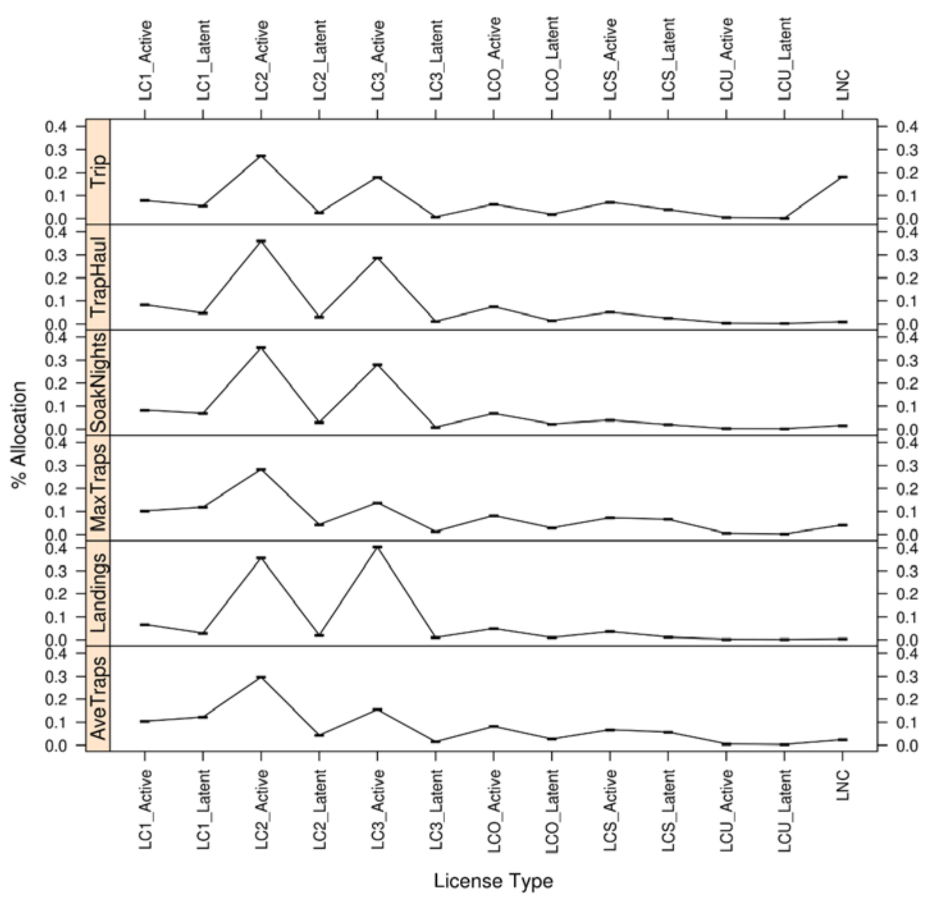

Figure 8. Optimal allocation of vessels for 2015 across license type and status, based on different harvester parameters.

Table 7. For each license type and status, the total number of licenses in 2015, mean annual cost to sample each vessel (i.e., average number of harvester reports by vessel by year), the standard deviation of annual trap hauls, the number of vessels and % of licenses sampled under current 10% system, and, under the proposed optimal allocation scheme, the % of the total sampling effort, # of vessels selected, and % of all licenses in that type selected. Data here are based on a two-year lag, where vessel selections were made in 2013 for the 2015 reporting year.

				Current 10% Reporting		Optimal Allocation		
License Status	**Total # Licenses**	**# Records / Year**	**SD TrapHauls**	**# Vessels**	**% of licenses**	**Allocation**	**# Vessels**	**% of licenses**
LC1_Active	**446**	**52.9**	**8,034**	**41**	**9.2%**	**8.4%**	**44**	**9.87%**
LC1_Latent	**459**	**37.8**	**3,157**	**70**	**15.3%**	**4.0%**	**21**	**4.58%**
LC2_Active	**1669**	**78.6**	**11,344**	**190**	**11.4%**	**36.4%**	**188**	**11.26%**
LC2_Latent	**154**	**41.5**	**6,684**	**20**	**13.0%**	**2.7%**	**14**	**9.09%**
LC3_Active	**1220**	**95.1**	**13,242**	**100**	**8.2%**	**28.2%**	**146**	**11.97%**
LC3_Latent	**39**	**13.0**	**9,941**	**4**	**10.3%**	**1.8%**	**10**	**25.64%**
LCO_Active	**372**	**50.6**	**8,523**	**30**	**8.1%**	**7.6%**	**40**	**10.75%**
LCO_Latent	**168**	**16.7**	**2,427**	**14**	**8.3%**	**1.7%**	**9**	**5.36%**
LCS_Active	**494**	**27.1**	**3,085**	**36**	**7.3%**	**5.0%**	**26**	**5.26%**
LCS_Latent	**333**	**17.5**	**1,826**	**27**	**8.1%**	**2.5%**	**13**	**3.90%**
LCU_Active	**31**	**38.5**	**5,067**	**3**	**9.7%**	**0.4%**	**3**	**9.68%**
LCU_Latent	**13**	**21.0**	**6,396**	**1**	**7.7%**	**0.3%**	**2**	**15.38%**
LNC	**1790**	**18.0**	**141**	**114**	**6.4%**	**1.0%**	**6**	**0.34%**
Total Vessels				**650**			**522**	

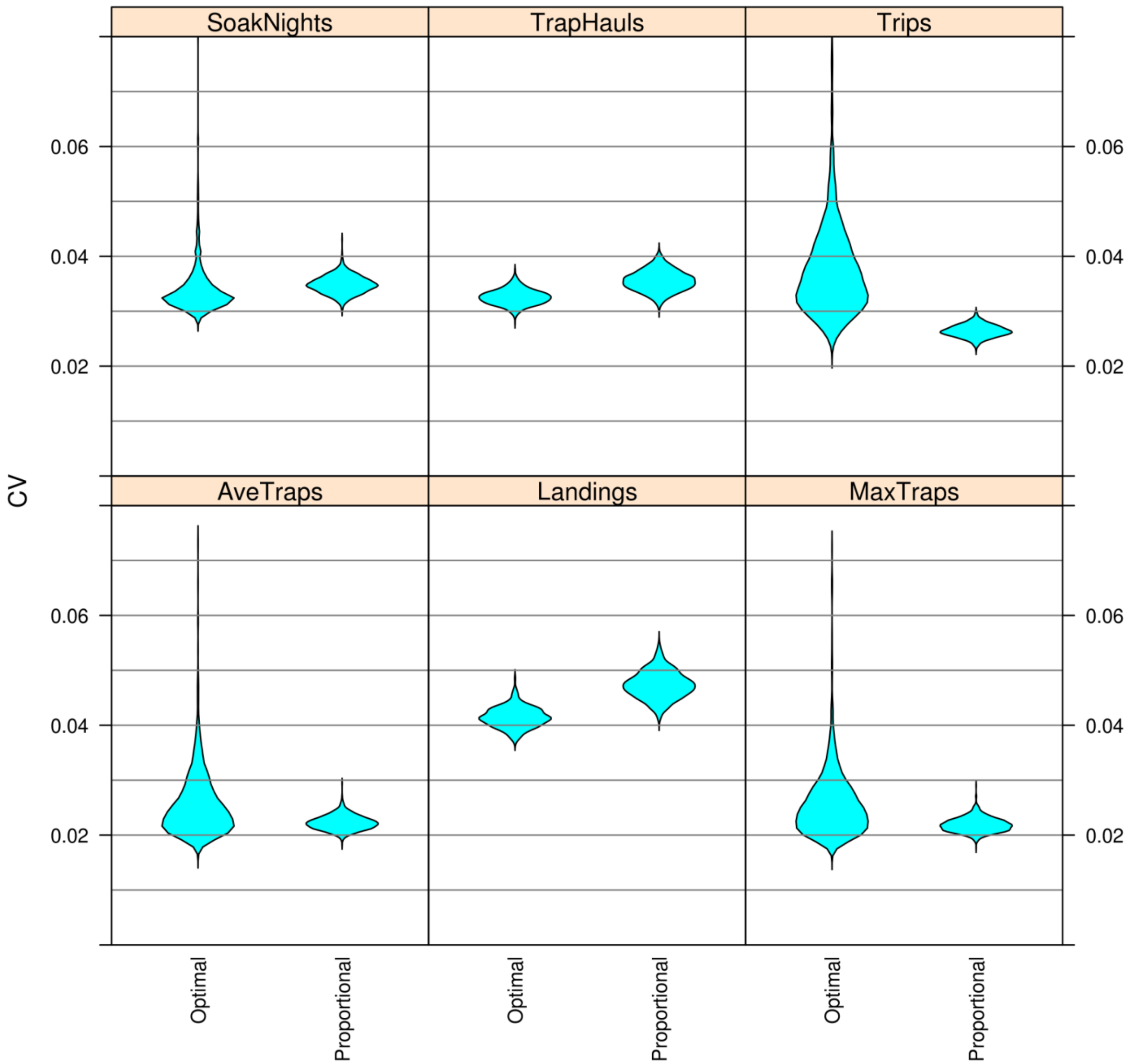

Figure 9. Bootstrapped distributions of CVs under current proportional allocation and optimal allocation based on trap hauls, assuming current sampling effort.

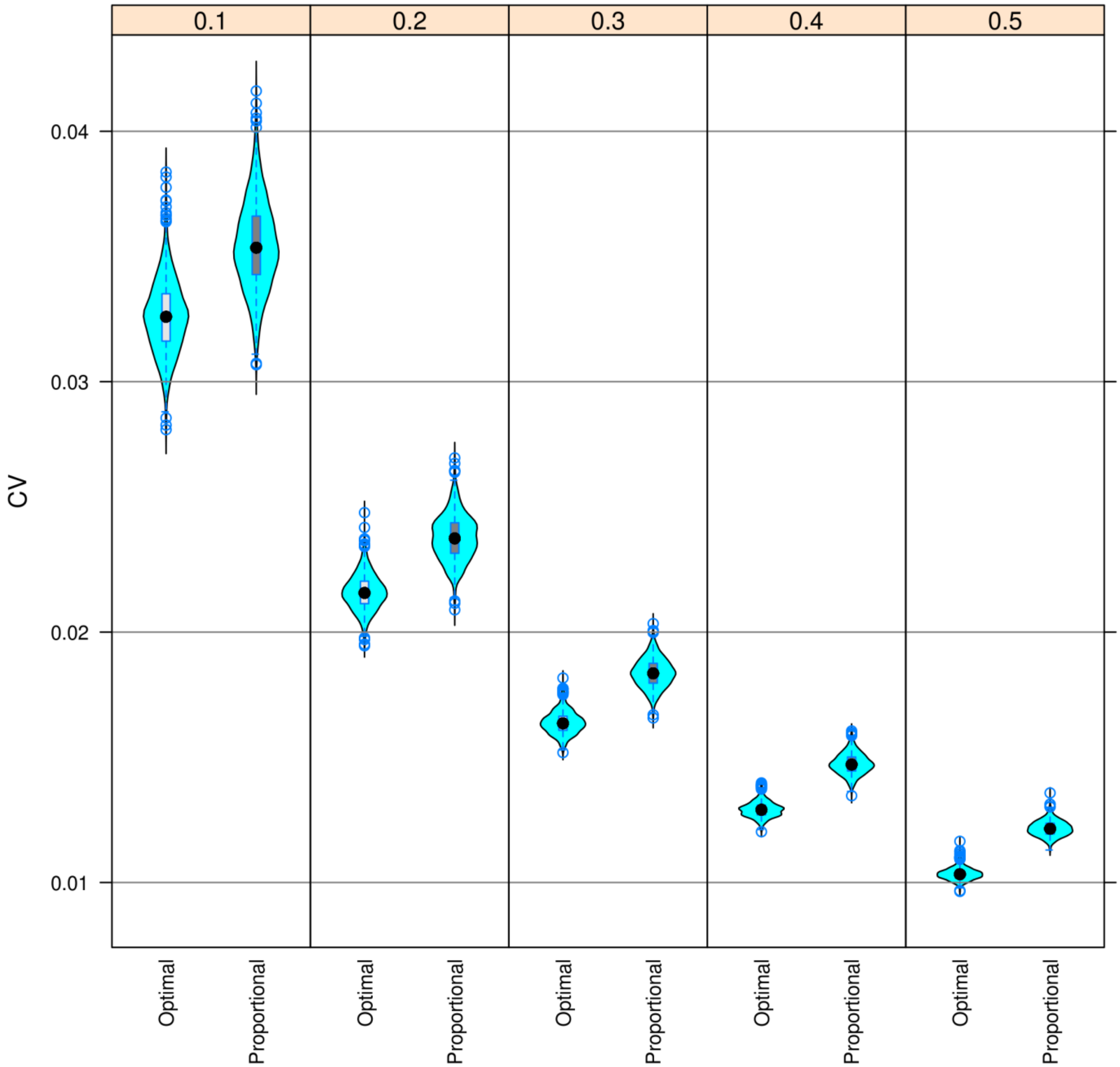

Figure 10. Comparison of Trap Haul CVs with optimal vs proportional sampling under 10 – 50% harvester reporting

Overall summary and Recommendations

To best characterize the US lobster fishery, the TC believes 100% harvester reporting is preferable to accurately account for all trap hauls and the spatial extent of the effort. Given the scale of the Maine lobster fishery with nearly 6,000 licenses and more than 265,000 trips annually, collecting this large amount of data with paper reports is challenging and inefficient. As a result, the TC recommends the state move towards electronic reporting.

The 2007 TC analysis on reporting levels using Connecticut's 100% coverage of harvester reports of their smaller fleet as a proxy for Maine's larger fishery indicated that 30% reporting was necessary to minimize the CV's of trap hauls in the Maine fishery. Addendum X found compromise with 10% minimum reporting level and required stratification by license class and Maine lobster zone. Tasked to revisit the 2007 conclusions and recommendations, the current TC analyses support a change of recommendations. The TC determined, due to the large scale of the Maine lobster fishery and subsequent large sample sizes, that 10% reporting is statistically significant and achieves CVs below 5% for all metrics considered. The expanded harvester data for total landings is statistically accurate when compared to the total dealer landings. Increasing the percentage of reporting between 10% and 100% provides marginal benefit to precision of the estimates.

Although the TC finds that the current level of 10% is statistically sufficient, the analyses identify that latent licenses are being oversampled creating inefficiencies and lower precision in the system of subsampling. The TC confirms the use of Maine license class as an appropriate stratification using zones for spatial coverage, but determined that active or latent status should be incorporated into the stratification. Using past harvester and dealer data, patterns in variability, and current Maine Harvester Logbook Program costs, the TC proposes an optimized sampling approach, rather than a proportional one, to assure the program is spending the greatest effort on active permits in the fishery but does not disregard the unpredictable latent permits in the system that also contribute to landings and effort.

3. Biological Sampling Gaps

Recent biological data (2015-2016) were reviewed to identify gaps in the current lobster sampling program and provide recommendations on increased biosampling in the fishery. Data reviewed included sea sampling and port sampling by state agencies and NOAA Fisheries (i.e. the Standardized Bycatch Reporting Methodology (SBRM) observer program), as well as additional sea samples from the Commercial Fisheries Research Foundation (CFRF). Both sex and length data are of primary importance during sampling as this data is used to characterize the catch sex ratio and size composition. Port samples can only be used to characterize size composition and sex ratio of landed lobsters, while sea samples with disposition codes (i.e., discarded or retained) can be used to characterize size composition and sex ratio of all lobsters caught (discards and landings). However, sea sampling is generally more expensive.

All biological samples were assigned to stat area, quarter, and year (i.e., stratum) of collection, the current level of detail used to characterize catch in the stock assessment. For port sampling, a sample is one vessel or one walk down the dock, depending on the sampling program. For sea sampling, a sample is all data collected by a sampler for a day within a stat area. Sample sizes were compared to the landings from the respective stratum for the last year of available data in the 2015 benchmark stock assessment (2013). Strata were filtered to those that accounted for at least 100,000 pounds of landings to determine the most important strata. Strata with sample sizes less than three were identified as strata that need increased biological sampling. A threshold of three samples was used as, during the previous stock assessment, stat areas which did not meet this number required gap-filling. Moreover, when the threshold number of samples was not available for a stratum in the assessment, data were borrowed from similar strata as a proxy. Collecting at least three samples from strata should reduce or eliminate the need to gap-fill biological data in future assessments, in turn, reducing data uncertainty in the assessments.

Results of the analysis indicate that the majority (>90%) of the fishery is sufficiently sampled, particularly inshore GOM which is well covered by the states except in the winter (Tables 8-9, Figures 11-12). Nineteen stat area and quarter combinations did not meet the sampling threshold for sea sampling (i.e, biological data on total catch) during both years, while an additional twenty five stat area and quarter combinations did not meet the threshold in one of the two years (Table 8). Figure 12 shows sea sampling coverage. Thirteen stat area and quarter combinations did not meet the threshold for combined sea and port sampling (i.e., landing biological data) during both years, while an additional seventeen stat area and quarter combinations did not meet the threshold in one of the two years (Table 9). Figure 12 shows combined sea and port sampling coverage. Much of the gaps in sampling are in LMA3 (offshore Gulf of Maine and George's Bank). Many stat area and quarter combinations met the threshold in 2015, but did not meet the threshold in 2016 due to a change in sampling effort in the SBRM observer program. This highlights the dependence of many stat area and quarter combinations (particularly those in the George's Bank region) on SBRM observer sampling. The fishery is also dependent on CFRF sampling, particularly in years when there are fewer SBRM sea days allocated to the lobster fishery. CFRF sampling is contingent on grant funding and, therefore, could be discontinued if that funding is not available. Without CFRF sea sampling, an additional eight stat area and quarter combinations would not have met the sample size threshold during both years (Table 10). Notably, in the absence of CFRF sampling, much of offshore SNE falls below our sampling threshold (Figure 13), which would make it more difficult to track this stock which is rapidly changing.

Recommendations

- The TC recommends that NOAA Fisheries implement a lobster biosampling program independent of the Standardized Bycatch Reporting Methodology (SBRM) sampling to ensure adequate sampling of federally-permitted vessels. The sampling frame should include all federally-permitted vessels, not just vessels with VTR requirements (this change in the SBRM sampling frame is currently being considered at the Council level) and should, at a minimum, try to randomize vessel selection. The program should be stratified by statistical area. In statistical areas in overlapping waters, state and federal programs should coordinate to ensure complementary sampling programs and increased efficiency to meet the needs of the assessment.
- The TC recommends collecting the minimum number of samples to meet the assessment threshold (3) and avoid gap-filling from all stat area/quarter/years with landings. Stat areas with landings should be identified based on data from the most recent stock assessment. Importantly, the number of samples should be appropriate to characterize landings in the stat area/quarter/year; sample sizes should increase for

areas with a high volume of landings. See Figures 11-13 for guidance on stat area and quarter combinations that have not met this threshold over the last two years.

- Sea samples are preferred over port samples because they provide information on discarded lobsters in addition to landed lobsters. However, port samples should be collected if sea sampling is not feasible (e.g., not enough funding, poor sampling conditions – winter, reluctant cooperation).
- As fishing effort continues to shift, this evaluation will need to be updated on a regular basis to identify priority sampling areas in the fishery. Stock assessments provide an optimal time for this evaluation as landings by stat area are updated and sampling data is compiled. Annual compliance reports also provide an opportunity to evaluate the success and implementation of current sampling recommendations.

Table 8. Sea sample size by stat area, quarter, and year for strata that accounted for at least 100,000 pounds of landings in 2013.

		N Sea Samples	
Stat Area	Quarter	2015	2016
525	4	8	1
464	3	41	2
525	3	7	1
526	3	18	2
561	3	56	1
562	1	1	1
526	4	20	0
522	4	7	0
464	1	14	2
522	2	1	0
465	4	9	2
522	3	20	0
464	2	2	1
522	1	0	0
525	2	10	1
616	3	5	0
561	4	10	0
525	1	2	0
561	2	1	3
515	2	11	2
515	1	7	2
515	4	1	0
623	3	0	0
515	3	1	1
616	2	4	0
521	1	0	0
561	1	3	2
612	1	4	0
465	2	3	0
537	1	0	1
526	2	2	0
464	4	5	2
616	4	8	0
611	2	1	6
623	4	0	0
465	1	4	0
623	2	0	0
465	3	0	0
616	1	2	0
526	1	4	0
538	4	0	0
611	1	0	0
538	1	0	0
611	4	0	1

Table 9. Combined port and sea sample size by stat area, quarter, and year for strata that accounted for at least 100,000 pounds of landings in 2013.

		N Port and Sea Samples	
Stat Area	Quarter	2015	2016
525	4	9	2
525	3	7	2
562	1	1	3
526	4	21	2
522	2	1	0
522	3	20	0
522	1	1	0
616	3	5	1
561	4	14	1
525	1	3	1
561	2	2	5
515	4	5	2
623	3	0	0
515	3	2	3
521	1	0	0
612	1	4	2
465	2	4	0
537	1	0	1
526	2	5	2
616	4	8	1
611	2	1	6
623	4	0	0
623	2	0	0
465	3	0	0
616	1	2	0
526	1	7	1
538	4	0	0
611	1	0	0
538	1	0	0
611	4	0	1

Table 10. Sea sample size by stat area, quarter, and year without CFRF sea samples included for strata that accounted for at least 100,000 pounds of landings in 2013.

		N Sea Samples	
Stat Area	Quarter	2015	2016
562	3	50	0
537	3	15	2
537	4	4	1
525	4	5	0
562	4	18	0
464	3	37	0
525	3	7	0
526	3	18	0
539	3	6	0
561	3	55	0
562	1	0	0
526	4	20	0
522	4	7	0
464	1	12	0
522	2	1	0
465	4	6	0
522	3	20	0
464	2	1	0
562	2	10	0
522	1	0	0
525	2	8	0
616	3	0	0
561	4	8	0
525	1	0	0
561	2	0	0
515	2	10	0
515	1	7	0
539	2	2	0
515	4	1	0
623	3	0	0
515	3	1	0
616	2	2	0
521	1	0	0
561	1	3	0
612	1	4	0
465	2	3	0
537	1	0	1
526	2	2	0
539	4	1	0
464	4	2	0
616	4	4	0
611	2	1	6
623	4	0	0
465	1	4	0
623	2	0	0
465	3	0	0
616	1	0	0
539	1	0	0
526	1	0	0
538	4	0	0
611	1	0	0
538	1	0	0
611	4	0	1

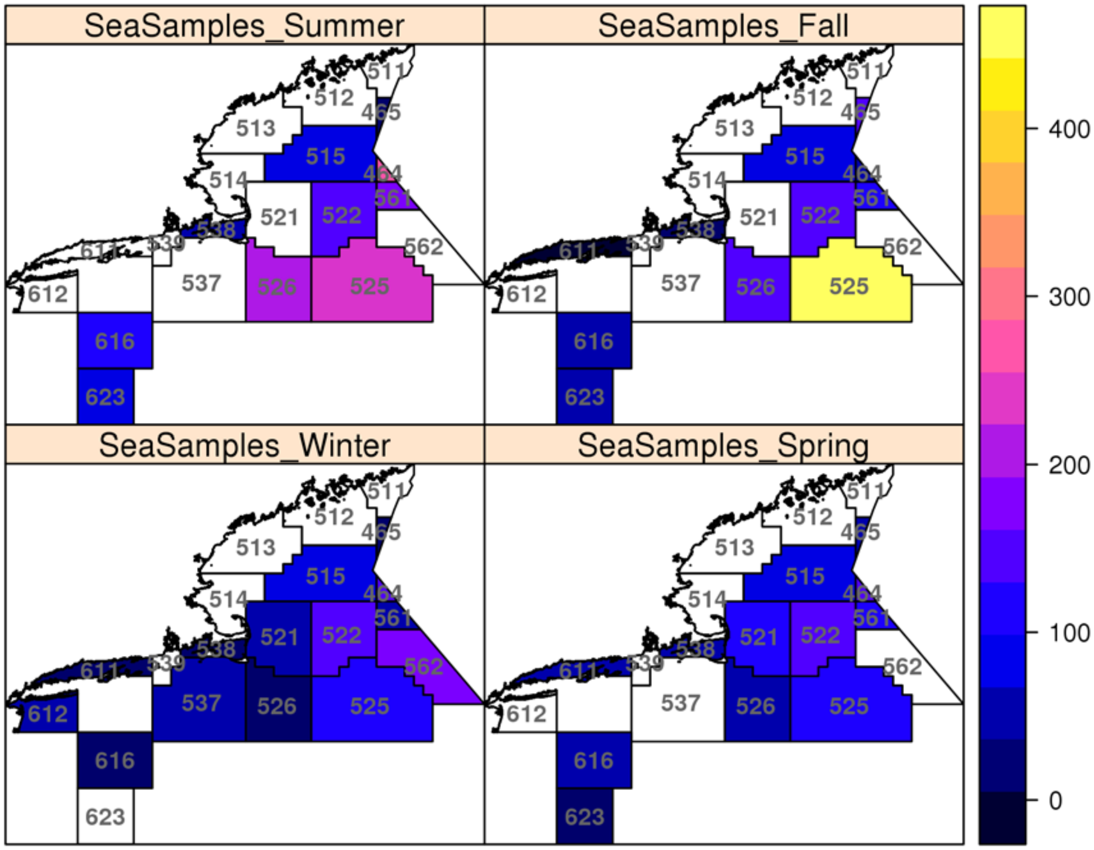

Figure 11. Coverage of sea sampling from 2015-2016 by stat area and quarters that accounted for at least 100,000 pounds of landings in 2013. The color scale indicates pounds landed in 2013 for stat area and quarters with inadequate sea sampling (n<3) during at least one year over that span. Any stat area and quarter combinations in white had at least three samples collected for both 2015 and 2016.

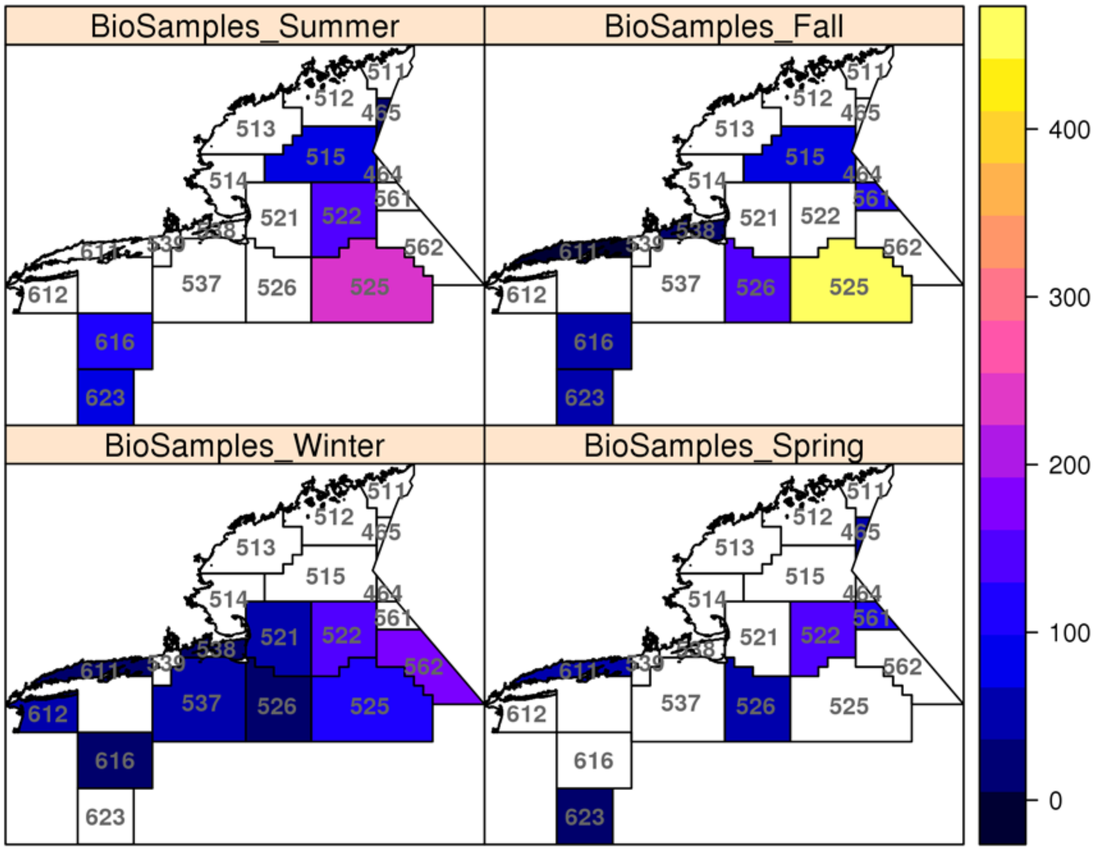

Figure 12. Coverage of biosampling (port and sea samples combined) from 2015-2016 by stat area and quarters that accounted for at least 100,000 pounds of landings in 2013. The color scale indicates pounds landed in 2013 for stat area and quarters with inadequate sea sampling (n<3) during at least one year over that span. Any stat area and quarter combinations in white had at least three samples collected for both 2015 and 2016.

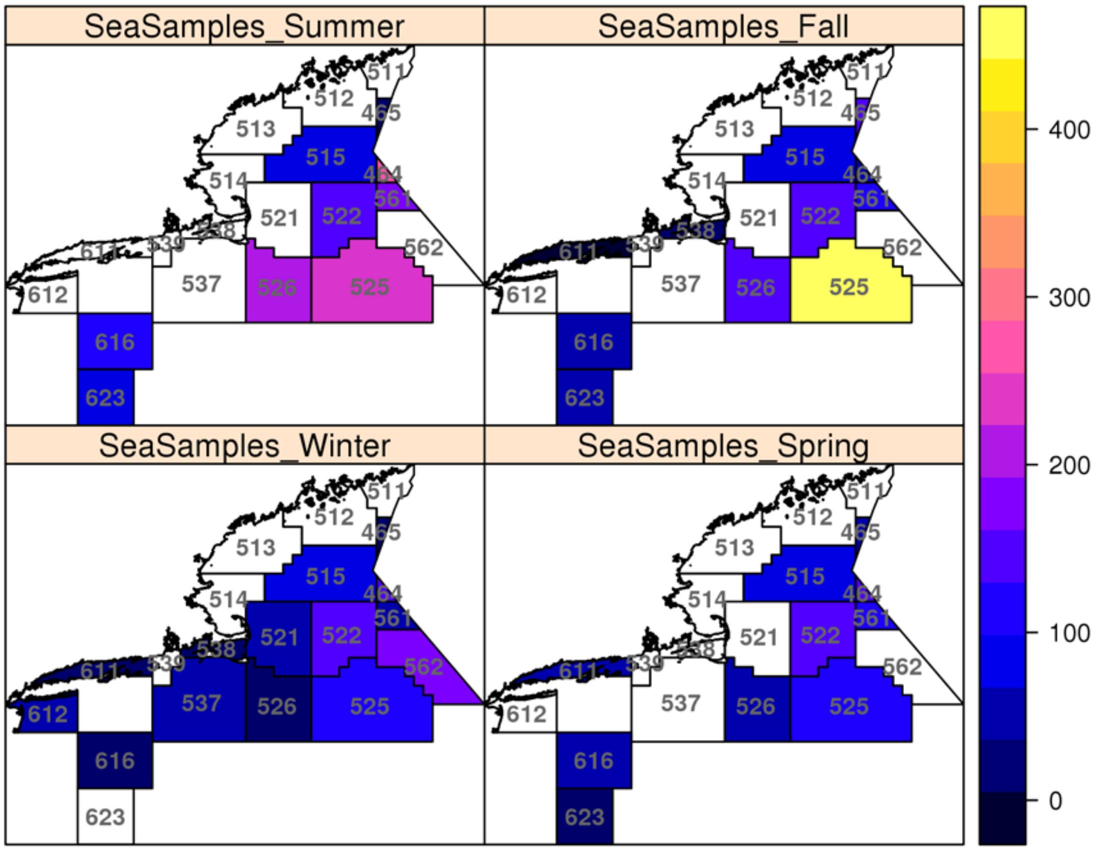

Figure 13. Coverage of sea sampling without CFRF sea samples from 2015-2016 by stat area and quarters that accounted for at least 100,000 pounds of landings in 2013. The color scale indicates pounds landed in 2013 for stat area and quarters with inadequate sea sampling (n<3) during at least one year over that span. Any stat area and quarter combinations in white had at least three samples collected for both 2015 and 2016.

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2017 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN

FOR AMERICAN LOBSTER
(*Homarus americanus*)

2016 FISHING YEAR

Prepared by the Plan Review Team

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2017 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR AMERICAN LOBSTER (*Homarus americanus*)

***This document covers fishery activities in 2016 as well as trap reductions which took place ahead of the 2017 fishing year*.**

1.0 Status of the Fishery Management Plan

Year of ASMFC Plan's Adoption:	Amendment 3 (1997)
Framework Adjustments:	Addendum I (1999) Addendum II (2001) Addendum III (2002) Addendum IV (2003) Addendum V (2004) Addendum VI (2005) Addendum VII (2005) Addendum VIII (2006) Addendum IX (2006) Addendum X (2007) Addendum XI (2007) Addendum XII (2008) Addendum XIII (2008) Addendum XIV (2009) Addendum XV (2009) Addendum XVI (2010) Addendum XVII (2012) Addendum XVIII (2012) Addendum XIX (2013) Addendum XX (2013) Addendum XXI (2013) Addendum XXII (2013) Addendum XXIII (2014) Addendum XXIV (2015)
Management Unit:	Maine through North Carolina
States with a Declared Interest:	Maine through Virginia (Excluding Pennsylvania and DC)
Active Committees:	American Lobster Management Board, Technical Committee, Lobster Conservation Management Teams, Plan Development Team, Plan Review Team, Advisory Panel

2.0 Status of the Fishery

2.1 Commercial Fishery

The lobster fishery has seen incredible expansion in landings over the last 40 years. Between 1950 and 1975, landings were fairly stable around 30 million pounds; however, from 1976 – 2008 the average coastwide landings tripled, reaching 92 million pounds in 2006. Landings have continued to increase over the last decade, reaching a high of 158 million pounds in 2016 (Table 1). The largest contributors to the 2016 fishery were Maine and Massachusetts with 83% and 11% of landings, respectively. Landings, in descending order, also occurred in New Hampshire, Rhode Island, New Jersey, Connecticut, New York, Maryland, Delaware, and Virginia. The ex-vessel value for all lobster landings in 2016 was $666.7 million, the highest value on record for the American lobster fishery.

Table 2 shows the break-down of commercial landings by Lobster Conservation Management Area (LCMA). Area 1 has historically had the highest landings and accounted for 80% of total harvest between 1981 and 2012. This is followed by LCMA 3 which accounted for 9% of total landings between 1981 and 2012. Yearly trends in Table 2 show that while landings have generally increased in LCMA 1, they have decreased in LCMA's 2, 4, and 6. Landings by LCMA are updated through each benchmark stock assessment.

Landings trends between the two biological stocks have also changed, as a greater percentage of lobster are harvested from the Gulf of Maine/Georges Bank (GOM/GBK) stock. In 1997, 26.3% of coastwide landings came from the Southern New England (SNE) stock. However, as the southern stock declined and abundance in the Gulf of Maine increased, this percentage has significantly changed. In 2000, only 15.6% of landings came from the SNE stock and by 2006, this declined to 7%. In 2016, approximately 2.1% of coastwide landings came from the SNE stock.

2.2 Recreational Fishery

Lobster is also taken recreationally with pots, and in some states, by hand while SCUBA diving. While not all states collect recreational harvest data, some do report the number of pounds landed recreationally and/or the number of recreational permits issued. In 2016, New Hampshire reported 8,281 pounds of lobster harvested recreationally, representing 0.14% of total landings in the state. New York reported 2,433 pounds of lobster harvested recreationally in 2016, representing 1.1% of state landings. Massachusetts reported the highest value of recreational catch at 212,112 pounds, representing 1.17% of total state landings. This was harvested through traps and by hand while diving. Connecticut and Rhode Island do not collect information on the number of pounds recreationally harvested but did issue 254 and 532 recreational lobster licenses, respectively.

3.0 Status of the Stock

The 2015 peer-reviewed stock assessment report indicated a mixed picture of the American lobster resource, with record high stock abundance throughout most of the GOM/GBK and record low abundance and recruitment in SNE (Table 3).

The assessment found the GOM/GBK stock is not overfished and not experiencing overfishing. GOM and GBK were previously assessed as separate stock units; however, due to evidence of seasonal migrations by egg-bearing females between the two stocks, the areas were combined into one biological unit. While model results show a dramatic overall increase in stock abundance in the GOM/GBK, population indicators show young-of-year estimates are trending downward. This indicates a potential decline in recruitment and landings in the coming years.

Conversely, the assessment found the SNE stock is severely depleted and in need of protection. Recruitment indices show the stock has continued to decline and is in recruitment failure. The inshore portion of the SNE stock is in particularly poor condition with surveys showing a contraction of the population. This decline is expected to impact the offshore portion of the stock, which is dependent on recruitment from inshore.

Both the Technical Committee and the Peer Review Panel highlighted the need for management action in SNE. Specifically, the Panel recommended close monitoring of the stock status along with implementing measures to protect the remaining lobster resource in order to promote stock rebuilding.

The next stock assessment is scheduled for 2020.

4.0 Status of Management Measure

4.1 Implemented Regulations

Amendment 3 established regulations which require coastwide and area specific measures applicable to commercial fishing (Table 4). The coastwide requirements are summarized below.

Coastwide Requirements and Prohibited Actions

- Prohibition on possession of berried or scrubbed lobsters
- Prohibition on possession of lobster meats, detached tails, claws, or other parts of lobsters by fishermen
- Prohibition on spearing lobsters
- Prohibition on possession of v-notched female lobsters
- Requirement for biodegradable “ghost” panel for traps
- Minimum gauge size of 3-1/4”
- Limits on landings by fishermen using gear or methods other than traps to 100 lobsters per day or 500 lobsters per trip for trips 5 days or longer
- Requirements for permits and licensing
- All lobster traps must contain at least one escape vent with a minimum size of 1-15/16” by 5-3/4”
- Maximum trap size of 22,950 cubic inches in all areas except area 3, where traps may not exceed a volume of 30,100 cubic inches.

Amendment 3 to the Interstate Fishery Management Plan for American Lobster (December 1997)

American lobster is managed under Amendment 3 to the Interstate FMP for American Lobster. Amendment 3 establishes seven lobster management areas. These areas include the: Inshore Gulf of Maine (Area 1), Inshore Southern New England (Area 2), Offshore Waters (Area 3), Inshore Northern Mid-Atlantic (Area 4), Inshore Southern Mid-Atlantic (Area 5), New York and Connecticut State Waters (Area 6), and Outer Cape Cod (OCC). Lobster Conservation Management Teams (LCMTs) comprised of industry representatives were formed for each management area. The LCMTs are charged with advising the Lobster Board and recommending changes to the management plan within their areas.

Amendment 3 also provides the flexibility to respond to current conditions of the resource and fishery by making changes to the management program through addenda. The commercial fishery is primarily controlled through minimum/maximum size limits, trap limits, and v-notching of egg-bearing females.

Addendum I (August 1999)

Establishes trap limits in the seven lobster conservation management areas (LCMAs).

Addendum II (February 2001)

Establishes regulations for increasing egg production through a variety of LCMT proposed management measures including, but not limited to, increased minimum gauge sizes in Areas 2, 3, 4, 5, and the Outer Cape.

Addendum III (February 2002)

Revises management measures for all seven LCMAs in order to meet the revised egg-rebuilding schedule.

Technical Addendum 1 (August 2002)

Eradicates the vessel upgrade provision for Area 5.

Addendum IV (January 2004)

Changes vent size requirements; applies the most restrictive rule on an area trap cap basis without regard to the individual's allocation; establishes Area 3 sliding scale trap reduction plan and transferable trap program to increase active trap reductions by 10%; and establishes an effort control program and gauge increases for Area 2; and a desire to change the interpretation of the most restrictive rule.

Addendum V (March 2004)

Amends Addendum IV transferability program for LCMA 3. It establishes a trap cap of 2200 with a conservation tax of 50% when the purchaser owns 1800 to 2200 traps and 10% for all others.

Addendum VI (February 2005)

Replaces two effort control measures for Area 2 – permits an eligibility period.

Addendum VII (November 2005)
Revises Area 2 effort control plan to include capping traps fished at recent levels and maintaining 3 3/8" minimum size limit.

Addendum VIII (May 2006)
Establishes new biological reference points to determine the stock status of the American lobster resource (fishing mortality and abundance targets and thresholds for the three stock assessment areas) and enhances data collection requirements.

Addendum IX (October 2006)
Establishes a 10% conservation tax under the Area 2 trap transfer program.

Addendum X (February 2007)
Establishes a coastwide reporting and data collection program that includes dealer and harvester reporting, at-sea sampling, port sampling, and fishery-independent data collection replacing the requirements in Addendum VIII.

Addendum XI (May 2007)
Establishes measures to rebuild the SNE stock, including a 15-year rebuilding timeline (ending in 2022) with a provision to end overfishing immediately. The Addendum also establishes measures to discourage delayed implementation of required management measures.

Addendum XII (February 2009)
Addresses issues which arise when fishing privileges are transferred, either when whole businesses are transferred, when dual state/federal permits are split, or when individual trap allocations are transferred as part of a trap transferability program. In order to ensure the various LCMA-specific effort control plans remain cohesive and viable, this addendum does three things. First, it clarifies certain foundational principles present in the Commission's overall history-based trap allocation effort control plan. Second, it redefines the most restrictive rule. Third, it establishes management measures to ensure history-based trap allocation effort control plans in the various LCMAs are implemented without undermining resource conservation efforts of neighboring jurisdictions or LCMAs.

Addendum XIII (May 2008)
Solidifies the transfer program for OCC and stops the current trap reductions.

Addendum XIV (May 2009)
Alters two aspects of the LCMA 3 trap transfer program. It lowers the maximum trap cap to 2000 for an individual that transfers traps. It changes the conservation tax on full business sales to 10% and for partial trap transfers to 20%.

Addendum XV (November 2009)
Establishes a limited entry program and criteria for Federal waters of LCMA 1.

Addendum XVI: Reference Points (May 2010)
Establishes new biological reference points to determine the stock status of the American lobster resource (fishing mortality and abundance targets and thresholds for the three stock assessment areas). The addendum also modifies the procedures for adopting reference points to allow the Board to take action on advice following a peer reviewed assessment.

Addendum XVII (February 2012)
Institutes a 10% reduction in exploitation for LCMAs within Southern New England (2, 3, 4, 5, and 6). Regulations are LCMA specific but include v-notch programs, closed seasons, and size limit changes.

Addendum XVIII (August 2012)
Reduces traps allocations by 50% for LCMA 2 and 25% for LCMA 3.

Addendum XIX (February 2013)
Modifies the conservation tax for LCMA 3 to a single transfer tax of 10% for full or partial business sales.

Addendum XX (May 2013)
Prohibits lobstermen from setting or storing lobster traps in Closed Area II from November 1 to June 15 annually. Any gear set in this area during this time will be considered derelict gear. This addendum represents an agreement between the lobster industry and the groundfish sector.

Addendum XXI (August 2013)
Addresses changes in the transferability program for Areas 2 and 3. Specific measures include the transfer of multi-LCMA trap allocations and trap caps.

Addendum XXII (November 2013)
Implements Single Ownership and Aggregate Ownership caps in LCMA 3. Specifically, it allows LCMA 3 permit holders to purchase lobster traps above the cap of 2000 traps; however, these traps cannot be fished until approved by the permit holder's regulating agency or once trap reductions commence. The Aggregate Ownership Cap limits LCMA fishermen or companies from owning more traps than five times the Single Ownership Cap.

Addendum XXIII (August 2014)
Updates Amendment 3's habitat section to include information on the habitat requirements and tolerances of American lobster by life stage.

Addendum XXIV (May 2015)
Aligns state and federal measure for trap transfer in LCMA's 2, 3, and the Outer Cape Cod regarding the conservation tax when whole businesses are transferred, trap transfer increments, and restrictions on trap transfers among dual permit holders.

4.2 On-Going Management Action

In May 2016, the Board initiated draft Addendum XXV to address the poor condition of the SNE stock by lowering fishing mortality and increasing egg production. At their May 2017 meeting, the Board approved a 5% increase in egg production, to be achieved through gauge size changes, season closures, and trap reductions, and tasked the LCMTs with developing proposals. At the August 2017 meeting, the Board decided not to move forward with Addendum XXV for management use at the current time. After reviewing TC input, which found only one out of the five proposals put forth by the LCMTs to be sufficient to achieve the 5% increase in egg production, the Board decided not to approve the Draft Addendum. Some members felt the proposed measures did not go far enough to protect the stock, while others were concerned the majority of LCMT proposals would not achieve the required 5% increase in egg production. Others believed significant reductions have already occurred in the fishery and no further action was needed. Ultimately, the Board decided to establish a Workgroup to discuss ways to manage SNE lobster in light of changing environmental conditions. Discussions by the workgroup, and subsequent recommendations to the Board, will occur this fall.

At its January 2017 meeting, the Board initiated Draft Addendum XXVI to improve harvester reporting and biological data collection in state and federal waters. This was prompted by recent management action in the Northwest Atlantic which highlighted several data deficiencies in the lobster fishery, including the poor spatial resolution of harvester data, the fact that not all lobstermen are required to report landings, and the lack of biological data collected offshore. The PDT continues to develop the management alternatives for this addendum and is expected to present a draft document to the Board in late 2017 or early 2018.

In response to signs of reduced settlement in the GOM/GBK stock, the Board initiated Draft Addendum XXVII in August 2017 to increase the resiliency of the stock. To this end, the Draft Addendum considers the standardization management measures in the GOM/GBK stock. A draft of Addendum XXVII will be developed over the coming months and be considered for public comment in 2018.

5.0 Ongoing Trap Reductions

Addendum XVIII established trap reductions in LCMA 2 and 3. The intention of this Addendum was to scale the size of the SNE fishery to the size of the resource by prescribing a series of trap reductions in LCMAs 2 and 3. Specifically, a 25% reduction in year 1 followed by a series of 5% reductions for 5 years were established in LCMA 2; a series of 5% reductions over five years were established in LCMA 3. The second year of reductions took place ahead of the 2016 fishing year and affect trap allocations in the 2017 fishery. Per Addendum XVIII, states with fishermen in Areas 2 and 3 are required to report on the degree of consolidation that has taken place. In total, 6,781 traps were retired in Area 2 and 8,008 traps were retired in Area 3. Trap reductions by jurisdiction can be found in Table 5. It is important to note that trap reductions also occur as the result of trap transfers as, per Addendum XIX, there is a 10% conservation tax on partial business transfers.

6.0 Fishery Monitoring

Addendum X requires states to conduct sufficient biological sampling to characterize commercial catch. Specifically, it requires states weight sampling intensity by area and season to match the 3-year average of the area's seasonal commercial catch. This volume of sampling, however, well exceeds current state budgets for lobster biological sampling. Addendum X also requires states to conduct 100% mandatory dealer reporting and at least 10% reporting of active harvesters. Table 6 describes the level of reporting and sampling by each state.

Overviews of the states' port and sea sampling are below. Several states, including Rhode Island and Connecticut, did not complete sea sampling trips in 2017; however, both states noted staffing limitation and budget constraints. In particular, Connecticut noted an attrition in the staff at CT Marine Fisheries Program without the ability to fill these vacancies. A couple states commented that there are issues identifying fishermen for sea sampling trips. This is in part due to a decrease in the number of active fishermen in SNE, and in part due to a lack of cooperation on the part of fishermen to take state samplers out on their boats. States reported that fishermen are wary of the management implications of participating in sea sampling programs, making it difficult to identify fishermen for this program.

- Maine: Completed 168 sea sampling trips aboard 146 boats from 65 different ports. In total, 237,525 lobsters were sampled from 37,241 traps. Maine suspended its port sampling program following the 2011 sampling year.
- New Hampshire: Sampled 9,564 lobsters during 20 sea sampling trips and 1,200 lobsters through 12 port sampling trips.
- Massachusetts: Conducted a total of 71 sea sampling trips and 45,130 lobsters in LCMA's 1, 2, and OCC. No port sampling was conducted.
- Rhode Island: Conducted 6 port sampling trips and sampled 1,167 lobsters. No sea sampling was conducted by the state due to staffing and budget constraints.
- Connecticut: No sea sampling or port sampling trips were conducted in 2016.
- New York: Staff conducted 10 sea sampling trips in 2016 and sampled 1,693 lobsters. NY also inspected 2 vessels through port sampling and sampled 355 lobsters. In addition, the state conducted 9 market sampling trips, evaluating 282 lobsters.
- New Jersey: Conducted 5 sea sampling trips and sampled 3,710 lobsters.
- Delaware: No sea sampling or port sampling trips were conducted in 2016.
- Maryland: Conducted 2 sea sampling trips and sampled 542 lobsters.
- Virginia: No sea sampling or port sampling trips were conducted in 2016.

7.0 Status of Surveys

Addendum X also requires fishery independent data collection by requiring statistical areas be sampled through one of the following methods: annual trawl survey, ventless trap survey, or young-of-year survey. *De minimis* states are not required to conduct biological sampling of their lobster fishery.

7.1 Trawl Surveys

Maine and New Hampshire: The Maine-New Hampshire Inshore Trawl survey began in 2000 and covers approximately two-thirds of the inshore portion of Gulf of Maine. The spring portion of the survey completed 122 tows and sampled 30,041 lobsters. Spring survey abundance indices increased from 2015, particularly in statistical area 513 and 511. The fall survey completed 83 tows and sampled 24,835 lobsters. Fall survey abundance indices slightly decreased from 2015, with the exception of sublegal lobsters in statistical area 511 which increased (Figure 2).

Massachusetts: The Division of Marine Fisheries conducts spring and autumn bottom trawl surveys in the territorial waters of Massachusetts. Only data collected from the autumn portion of the inshore trawl survey is used to calculate lobster relative abundance indices. In the GOM, relative abundance indices have generally increased over the last decade. In contrast, relative abundance indices in SNE remain low with the most recent values near or below the time series median (Figure 3).

Rhode Island: The RIDFW Trawl Survey program conducted seasonal surveys in the spring and fall. In 2016, 44 trawls were conducted in both the spring and fall. Spring 2016 mean CPUEs were 0 and 0.14 for legal and sub-legal lobsters, respectively. Fall 2016 CPUE were 0.05 for legal lobsters and 1.00 for sub-legal lobsters. All abundances were low except for the fall sub-legal abundance which showed a slight increase in 2015 and 2016 (Figure 4).

Connecticut and New York: Juvenile and adult abundance are monitored through the Long Island Sound Trawl Survey (LISTS) during the spring (April, May, June) and the fall (September and October) cruises. The spring 2016 lobster abundance index (geometric mean = 0.33 lobster/tow) was the second lowest in the time series but similar to the 2013-15 indices (0.44, 0.45, 0.31, respectively). The fall 2016 index (0.02) ranked lowest in the time series, joining all indices since 2005 as collectively the lowest in the 33-year time series (Figure 5).

New Jersey: An independent Ocean Trawl Survey is conducted from Sandy Hook, NJ to Cape May, NJ each year. The survey stratifies sampling in three depth gradients, inshore (18'-30'), mid-shore (30'-60'), offshore (60'-90'). The mean CPUE, which is calculated as the sum of the mean number of lobsters per size class collected in each sampling area weighted by the stratum area, increased from 2015 to 2016 for all three size classes (Figure 6).

7.2 Young of Year Index

Several states conduct young-of-year (YOY) surveys to detect trends in abundance of newly-settled and juvenile lobster populations. These surveys attempt to provide an accurate picture of the spatial pattern of lobster settlement. States hope to track juvenile populations and generate predictive models of future landings.

Maine: In 2000, settlement surveys were expanded to cover all seven of Maine's lobster management zones (LMZ) in order to create a statewide index of settlement. Settlement surveys in 2016 continued to show low values in all statistical areas sampled (Figure 7). Survey index values were below the average in all statistical areas.

New Hampshire: New Hampshire Fish and Game (NHF&G) conducted a portion of the coastwide American Lobster Settlement Index (ALSI). In 2016, a total of 20 juvenile lobsters were sampled from three sites, 19 of which were deemed older juveniles and one which was a YOY. Figure 8 depicts the CPUE of lobsters for all NH sites combined, from 2008 through 2016. For each of these four indices, CPUE shows a general upward trend to a time series high in 2011, with sustained low levels from 2012 through 2016.

Massachusetts: Annual sampling for early benthic phase/juvenile (EBP) lobsters was conducted from August to September in 2015. Sampling was completed at 21 sites spanning 7 regions in Massachusetts coastal waters. Data for all sites were used to generate annual density estimates of EBP lobster and other decapod crustaceans. In 2016, densities of YOY lobsters were relatively low compared to the time series average in all sampling location (Figure 9). In LCMA 1, there were no YOY lobsters found in two of the five locations (South Shore and Cape Cod Bay). In 2016, there were no YOY lobsters found in the Vineyard Sound sampling location.

Rhode Island: For 2016, the YOY Settlement Survey (Suction Sampling) was conducted at a total of six fixed stations with twelve randomly selected 0.5-meter quadrats sampled at each survey station. Average site abundance of lobster at suction sampling sites has generally declined since the mid-1990's with a time-series low in 2011 (Figure 10). The 2016 YOY settlement survey index was 0.31 YOY lobster/m^2.

Connecticut: The CT DEEP Larval Lobster Survey in western Long Island Sound (WLIS) was discontinued in 2013. Alternative monitoring data are available for the eastern Sound (ELIS) from the Millstone Power Station entrainment estimates of all stages of lobster larvae. Both programs show a decline in abundance following the 1999 die-off (Figure 11).

7.3 Ventless Trap Survey

To address a need for a reliable index of lobster recruitment, a cooperative random stratified ventless trap survey was designed to generate accurate estimates of the spatial distribution of lobster length frequency and relative abundance while attempting to limit the biases identified in conventional fishery dependent surveys.

Maine: The Maine Ventless Trap Survey changed strategies in 2015 and 2016 to cover more area by eliminating the vented traps at each site. This change allowed the survey to double the number of sites with ventless traps and increase the sampling coverage spatially to 276 sites. Traps were set during the months of June, July, and August. The survey catches 90% sub-legal lobsters. The stratified mean was calculated for each area using depth and statistical area. Overall, there were increases the number of sub-legal and legal lobsters caught in 2016, compared to the previous year (Figure 12).

New Hampshire: Since 2009, NHF&G has been conducting the coastwide Random Stratified Ventless Trap Survey in state waters (statistical area 513). A total of six sites were surveyed twice a month from June through September in 2016. Catch per unit effort (stratified mean catch per trap haul) from 2009 through 2016 is presented in Figure 13. The highest catch values of the time series were recorded in 2015 and 2016.

Massachusetts: The coast-wide ventless trap survey was initiated in 2006 and expanded in 2007 with the intention of establishing a standardized fishery-independent survey designed specifically to monitor lobster relative abundance and distribution. The survey was not conducted in 2013 due to a lack of funding; however, starting in 2014 the survey has been funded with lobster license revenues and will continue as a long-term survey. Relative abundance of sub-legal (< 83 mm CL) and legal-sized (≥ 83 mm CL) lobsters for Area 514 (part of LCMA 1) is shown in Figure 14 as the stratified mean CPUE. The mean CPUE in 2016 was the second highest observed at 6.44 and was above the time series average of 4.99. Legal sized lobsters comprised roughly 10% of catch over the survey's time series.

Figures 15 and 16 show the time series of relative abundance (stratified mean CPUE) for sub-legal (<86 mm CL) and legal-sized (≥ 86 mm CL) lobsters in the southern MA region (Area 538 and northern Area 537; part of LCMA 2). The average catch of sub-legal lobsters was higher than the catch of legal-sized lobsters, and generally declined from 2006 through 2010 (the original time series). The spatial extent of the survey area was expanded in 2011 to include deeper waters outside Buzzards Bay, where thermal conditions are more tolerable. This expansion in survey area necessitates that the data from 2011 onwards be treated as a new survey index. In 2016, sublegal CPUE in the original survey area rebounded from low values in 2014 and 2015 and was above the time series average (Figure 15). The CPUE of legal sized lobsters also increased in 2016 and was the highest observed in the time series at 0.50. In the expanded survey area, the CPUE of sub-legal lobsters was the highest observed in the 5-year time series at 3.0 (Figure 16). The CPUE of legal sized lobsters was also the highest observed in the time series at 0.67.

Rhode Island: In 2016, the Ventless Trap Survey was conducted during the months of June-August over 18 sampling sites. A total of 3,482 lobsters were collected from 830 traps. All sampling was conducted in LCMA 2, NMFS Statistical Area 539. In general, the CPUE of legal lobsters has increased since 2014 while the CPUE of sub-legal lobsters has remained steady since 2010. The mean CPUE Index values for 2016 were 0.24 and 3.04 per trap for legal and sub-legal lobsters, respectively (Figure 17).

8.0 State Compliance

States are currently in compliance with all required biological management measures under Amendment 3 and Addendum I-XXIV; however, the PRT notes that Connecticut and Rhode Island did not conduct any sea sampling, as specified in Addendum X. Both states noted staffing and budget constraints as contributors to the lack of sampling.

9.0 De Minimis Requests

The states of Virginia, Maryland, and Delaware have requested *de minimis* status. According to Addendum I, states may qualify for *de minimis* status if their commercial landings in the two most recent years for which data are available do not exceed an average of 40,000 pounds. Delaware, Maryland, and Virginia meet the *de minimis* requirement.

10.0 Regulatory Changes

Maine made the following changes to lobster regulations in 2016

- Based on a referendum of Chebeague Island lobster license holders and a recommendation from the island limited entry committee, Maine DMR adopted regulations to remove Chebeague Island from the island limited entry program.
- Based on a referendum of Swans Island lobster license holders and a recommendation from the interim island limited entry committee, Maine DMR adopted regulations to add Swans Island to the island limited entry program, with a base number of licenses of 72.
- DMR adopted regulations to require any individuals fishing in a zone other than their declared zone to have a secondary tag in their trap for the purpose of enforcing the requirement to fish a majority of their traps in their declared zone.
- DMR adopted regulations to expand the existing lobster and crab harvesting closure in the Penobscot River in order to protect public health due to the risk of mercury contamination.
- Statutes were amended to modify the entry system for lobster licenses to provide additional time for students to convert to a commercial lobster license, and improve the methodology by which the calculation for entry off the waiting lists in limited entry zones is conducted.

Massachusetts DMF made the following amendments to its lobster related regulations:

- Amended 322 CMR 4.00 and 12.00 to adopt the relevant provisions of the Atlantic Large Whale Take Reduction Plan (as amended in 2015).
- Amended 322 CMR 6.00 to prohibit the on-the-water possession and setting of non-trap structures designed to attract lobsters.
- Amended 322 CMR 6.00 to implement the LMA2 trap reduction schedule.
- Amended 322 CMR 7.00 to allow the transfer of offshore lobster trap permits with a federal trap allocation.
- Amended 322 CMR 7.00 to allow the issuance of new offshore lobster trap permits for LMA2 provided an existing federal lobster trap allocation is held.

11.0 Enforcement Concerns

- Maine Marine Patrol continues to look for solutions to fishermen utilizing untagged sunken trawls in an effort to exceed the trap limit and stop Patrol from inspecting gear at sea.
- MA took action to suspend a commercial lobster permit for 3 months due to violations of the size limit, v-notch, and egger rules. A commercial lobster permit was also revoked

due to theft and molestation of lobster gear owner by another individual, violation of protected species regulations (weak links), and improperly marked fishing buoys.

- RI noted concerns about the ability for enforcement to determine whether lobsters came from a lobster trap associated with a lobster trap allocation, or a trap targeting a different fishery (e.g. rock crab, black sea bass) operated by an individual with a lobster trap allocation.
- NY noted several enforcement challenges that occurred in 2016, including fishermen having traps in the water during a season closure, traps which have no trap tags, have multiple undersized vents, or inoperable escape panels, and several cases of undersized lobsters.

12.0 Research Recommendations

The following research recommendations are from the 2015 Stock Assessment and were compiled by the Lobster TC and Stock Assessment Subcommittee.

- ***Ventless Trap Survey***- Calibration work is needed to determine how catch in ventless trap surveys relates to catch in the bottom trawl surveys. It is likely that at low densities, when trawl survey indices have dropped to near zero, ventless trap surveys will still catch lobsters due to the attractive nature of the gear and the ability to fish the gear over all habitat types. Conversely, it is possible that trawl surveys may be able to detect very high levels of lobster abundance, if trap saturation limits the capacity of the ventless traps. Ventless traps may be limited in their ability to differentiate between moderately high and extremely high abundance, and calibration with bottom trawl surveys may help to clarify how catchability might change with changes in lobster density.
- ***Maturation and Growth -*** Increases in water temperatures over the past several decades have likely resulted in changes to size at maturity and growth patterns. Maturity data currently used are more than 20 years old. Changes in size at maturity will subsequently affect growth, since female molting frequency decreases after reaching sexual maturity. It is critical to collect updated information on maturity and growth in order to appropriately assign molt probabilities to lobsters.
- ***Stock Connectivity -*** There is need for a comprehensive large scale tagging study to examine stock connectivity between the GOM and GBK. Historical tagging studies demonstrate movement from the inshore GOM to locations east of Cape Cod in the inshore portions of GBK, and from inshore areas east of Cape Cod to inshore GOM. What is lacking is a tagging study of lobsters in the fall/winter on GBK proper, prior to seasonal migrations which occur in the spring. This information would be extremely valuable to help complement other data used to justify the combination of the GOM and GBK stock and to confirm the connectivity of the GOM and GBK.
- ***Temperature –*** Given the importance of temperature in the life history of lobster, techniques should be developed to incorporate environmental data into population modeling.

- ***Post-Larval Settlement –*** There is a need to examine post-larval settlement dynamics in relation to the movement and re-distribution of spawning stock. Habitat suitability models for spawning stock and settling post-larvae should be developed.
- ***Natural Mortality –*** Methods should be explored to determine age or length-varying natural mortality, as well as looking at more rigorous ways of determining time-varying natural mortality for lobster. These may be driven by climactic shifts and changing predator fields.
- ***Shell Disease -*** With the high prevalence of shell disease in the SNE stock, particularly in ovigerous females, some exploration of the potential sub-lethal effects of disease should be examined. These effects could include negative impacts to larval quality, fecundity issues in females who need to re-direct physiological resources to dealing with the disease, and male sperm quality

13.0 Plan Review Team Recommendations

The following are issues and recommendations the Plan Review Team would like to raise to the Board:

- The PRT recommends the Board approve the *de minimis* requests of DE, MD, and VA.
- The PRT notes an increase in the number of enforcement concerns reported by the states in their compliance reports. The PRT recommends improved enforcement of lobster management measures, especially the at-sea enforcement of trap limits. For areas which rely on permit specific trap limits as the primary metric for management, marine patrol enforcement needs to have a greater presence, particularly as trap reductions take place in LCMAs 2 and 3. In addition, greater enforcement efforts need to be directed offshore.
- The PRT recommends increased biological sampling, particularly offshore, as the spatial distribution of the fishery changes.
- The PRT recommends research is conducted to update growth and maturity data. Given the increase in water temperature over the last several decades, the TC believes it is likely that there have been changes to size at maturity and growth patterns which are not captured in the current data.
- The PRT recommends the Board investigate the best way to quantify effort in the lobster fishery. Through Amendment 3 and subsequent addenda, the Board has largely managed effort in the lobster fishery through trap allocations. However, the effectiveness of trap allocations to reduce effort is confounded by their ambiguous relationship to trap hauls and the expansion of the Jonah crab fishery. Monitoring the true level of effort in the lobster fishery (whether than be through the number of permits, trap allocations, or trap hauls) will provide the Board with much needed information regarding fishery trends, particularly as stock conditions change in the GOM/GBK and SNE.
- In addition to the tagging studies noted above by the TC and SASC, the PRT recommends investigating the connectivity between the offshore portion of SNE and GBK. Catch in the offshore portion of SNE had remained fairly stable and may indicate some biological relationship with GBK.

14.0 Tables

Table 1. Landings (in pounds) of American Lobster by the states of Maine through Virginia.
C= confidential data

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total
1981	22,631,600	793,400	11,220,500	1,871,067	1,010,800	890,200	593,700	55,700	63,200	2,200	39,132,367
1982	22,730,100	807,400	13,150,900	2,254,930	1,094,100	1,121,600	846,300	90,700	64,800	4,700	42,165,530
1983	21,976,500	1,310,560	12,421,000	5,020,895	1,854,000	1,207,500	769,900	56,700	86,500	600	44,704,155
1984	19,545,600	1,570,724	14,701,800	5,064,760	2,011,600	1,308,100	927,700	103,800	98,900	17,400	45,350,384
1985	20,125,000	1,193,881	16,295,100	5,080,163	1,676,000	1,240,900	1,079,600	118,500	82,300	1,100	46,892,544
1986	19,704,400	941,100	15,057,600	5,513,831	1,656,100	1,407,100	1,123,000	109,000	57,700	1,000	45,570,831
1987	19,747,800	1,256,170	15,116,800	5,217,300	1,735,591	1,146,700	1,397,100	84,100	49,900	1,000	45,752,461
1988	21,738,800	1,118,900	15,866,312	4,758,990	2,053,800	1,779,890	1,557,300	66,200	23,000	300	48,963,492
1989	23,368,800	1,430,400	15,444,300	5,725,641	2,096,900	2,345,051	2,059,600	76,500	17,500		52,564,692
1990	28,068,238	1,658,200	17,054,434	7,258,175	2,645,800	3,431,111	2,198,867	68,300			62,383,125
1991	30,788,646	1,802,035	16,528,168	7,445,170	2,674,000	3,128,246	1,673,031	54,700			64,093,996
1992	26,830,448	1,529,292	15,823,077	6,763,085	2,439,600	2,651,067	1,213,255	21,000			57,270,824
1993	29,926,464	1,693,347	14,336,032	6,230,855	2,177,022	2,667,107	906,498	24,000			57,961,325
1994	38,948,867	1,650,751	16,094,226	6,474,399	2,212,000	3,954,634	581,396	8,400			69,924,673
1995	37,208,324	1,834,794	15,755,840	5,363,810	2,536,177	6,653,780	606,011	500	2,855		69,962,091
1996	36,083,443	1,632,829	15,323,277	5,579,874	2,888,683	9,408,519	640,198		28,726	1,252	71,586,801
1997	47,023,271	1,414,133	15,087,096	5,766,534	3,468,051	8,878,395	858,426	648	34,208	2,240	82,533,002
1998	47,036,836	1,194,653	13,277,409	5,618,440	3,715,310	7,896,803	721,811			1,306	79,462,568
1999	53,494,418	1,380,360	15,533,654	8,155,947	2,595,764	6,452,472	931,064			6,916	88,550,595
2000	57,215,406	1,709,746	15,802,888	6,907,504	1,393,565	2,883,468	891,183			311	86,804,071
2001	48,617,693	2,027,725	12,132,807	4,452,358	1,329,707	2,052,741	579,753			19	71,192,803
2002	63,625,745	2,029,887	12,853,380	3,835,050	1,067,121	1,440,483	264,425	551			83,087,146
2003	54,970,948	1,958,817	11,385,049	3,474,509	671,119	946,449	209,956	2,831	22,778		71,683,639
2004	71,574,344	2,097,396	11,295,474	3,064,412	646,994	996,109	370,112	15,172	14,931	13	90,074,957
2005	68,729,861	2,556,232	9,879,983	4,343,736	713,901	1,154,470	369,264	5,672	39,237	21,255	87,813,611
2006	72,662,294	2,666,344	10,966,322	3,749,432	792,894	1,242,601	470,877	3,315	26,349	28,160	92,608,588
2007	63,959,191	2,468,811	10,143,301	3,268,075	568,696	716,300	680,392	5,918	6,128	26,765	81,843,577
2008	69,863,132	2,567,031	10,597,614	3,528,445	426,292	712,075	632,545	4,884	32,429	17,701	88,382,148
2009	81,175,847	2,985,166	11,781,490	3,174,618	451,156	731,811	179,740	6,067	30,988	21,472	100,538,355
2010	95,506,383	3,658,894	12,768,448	3,258,221	432,491	813,513	641,556	4,574	30,005	16,345	117,130,430
2011	104,693,316	3,917,461	13,717,192	2,513,255	191,594	344,232	627,077	C	C	C	126,066,050
2012	125,759,424	4,236,740	14,917,238	2,932,388	236,846	275,220	919,260	C	C	C	149,336,623
2013	127,773,264	3,822,844	15,738,792	2,149,266	133,008	248,267	660,367	C	C	C	150,621,935
2014	124,440,799	4,939,310	15,060,352	2,387,321	141,988	216,630	526,367	C	C	C	147,805,965
2015	122,212,133	4,716,084	16,418,796	2,879,874	158,354	146,624	445,195	C	C	C	147,037,850
2016	130,844,773	5,773,909	17,939,236	2,259,876	226,426	218,355	352,085	C	C	C	157,672,465

Table 2. Estimated lobster landings (in pounds) by lobster conservation management area (LCMA)* (*Source, ASMFC Lobster Data Warehouse*). This table can only be update in years when stock assessment reports are being conducted.

Coastwide Estimated Lobster Landings (lbs) by Lobster Conservation Management Area (LCMA)*								
Year	**LCMA 1**	**LCMA 2**	**LCMA 3**	**LCMA 4**	**LCMA 5**	**LCMA 6**	**LCMA OCC**	**Grand Total**
1981	32,369,320	527,284	4,321,500	441,478	115,653	1,220,159	134,327	39,129,721
1982	32,123,750	1,656,479	4,961,680	622,674	99,093	1,359,058	163,105	40,985,839
1983	32,826,685	2,958,366	5,645,179	633,254	71,804	2,428,633	198,448	44,762,369
1984	29,862,411	2,978,985	6,409,741	795,180	135,652	2,704,070	208,832	43,094,871
1985	31,590,759	2,992,330	5,853,851	964,043	170,998	2,273,337	261,929	44,107,247
1986	30,080,507	3,081,903	5,829,275	1,084,282	125,969	2,362,128	298,747	42,862,811
1987	30,682,754	3,219,900	5,357,273	1,473,841	98,486	2,378,765	276,250	43,487,269
1988	32,362,492	3,259,336	5,132,943	1,666,439	85,142	3,195,208	295,985	45,997,545
1989	36,800,166	4,175,114	5,450,786	2,232,935	106,126	3,735,250	352,155	52,852,532
1990	41,720,481	4,374,062	8,783,629	2,431,198	237,410	4,250,654	581,447	62,378,881
1991	43,648,773	4,140,145	8,537,053	2,096,138	115,020	4,393,986	740,267	63,671,382
1992	39,055,380	3,795,367	7,124,248	1,448,866	77,854	4,362,551	738,026	56,602,292
1993	40,962,969	3,772,494	6,773,992	1,597,447	89,495	3,968,663	938,486	58,103,546
1994	51,597,880	5,602,507	5,684,252	554,367	26,013	5,738,398	848,181	70,051,598
1995	49,771,715	4,960,453	5,008,551	962,077	45,054	8,564,325	1,000,609	70,312,784
1996	47,992,628	4,880,328	4,896,782	978,376	52,758	11,705,439	852,532	71,358,843
1997	58,016,197	5,324,775	5,549,295	1,162,862	36,623	11,650,701	849,126	82,589,579
1998	56,187,841	5,273,463	5,043,939	1,534,067	41,963	10,575,143	797,019	79,453,435
1999	65,375,535	6,938,658	6,166,601	1,346,509	77,621	8,331,142	739,904	88,975,970
2000	69,265,611	5,651,160	5,436,618	1,123,486	53,364	3,802,880	765,801	86,098,920
2001	57,531,942	3,862,054	5,525,209	762,408	55,537	3,013,551	611,242	71,361,943
2002	73,607,600	3,445,004	5,483,983	442,425	14,838	2,230,869	786,137	86,010,856
2003	63,005,041	1,110,534	6,978,808	423,583	17,394	1,448,011	804,355	73,787,725
2004	80,448,651	1,184,942	6,722,671	480,203	93,270	1,534,130	993,689	91,457,556
2005	76,240,627	1,464,433	7,442,771	457,275	54,181	1,673,396	966,787	88,299,470
2006	80,846,400	1,853,505	7,588,539	516,130	59,928	1,840,308	1,048,051	93,752,862
2007	70,862,089	1,430,836	6,375,646	617,978	56,866	1,263,648	1,132,991	81,740,055
2008	78,914,865	1,168,921	6,124,979	440,108	322,916	920,951	1,127,422	89,020,163
2009	91,133,844	1,051,241	6,960,119	488,792	308,212	896,594	1,256,201	102,095,002
2010	106,458,701	1,022,528	7,955,472	522,037	184,409	966,505	1,209,482	118,319,134
2011	116,042,515	730,889	7,890,340	488,977	148,587	306,079	1,244,299	126,851,685
2012	138,762,843	627,051	8,111,396	782,684	154,455	286,215	1,223,279	149,947,922
Grand Total	1,886,148,973	98,515,048	201,127,121	31,572,119	3,332,690	115,380,746	23,445,109	2,359,521,806

*Landings data are not collected by LCMA in all states. To separate landings by LCMA, NMFS statistical areas are placed into a single LCMA. For a complete description of how estimates are completed contact Megan Ware, at mware@asmfc.org

Table 3. Threshold reference points with stock status variables for lobsters in each stock area. (Source: 2015 Benchmark Stock Assessment).

Variable	GOM	GBK	GOM/GBK	SNE
Effective Exploitation				
Effective exploitation threshold	0.54	1.83	0.5	0.41
Recent effective exploitation (2011-2013)	0.48	1.54	0.48	0.27
Effective exploitation below threshold?	YES	YES	YES	YES
Reference Abundance (millions)				
Abundance threshold	52	0.8	66	24
Recent abundance (2011-2013)	247	1.57	248	10
Abundance above threshold?	YES	YES	YES	NO

Table 4. 2016 LCMA specific management measures

Mgmt Measure	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	OCC
Min Gauge Size	3 1/4”	3 3/8”	3 17/32 ”	3 3/8”	3 3/8”	3 3/8”	3 3/8”
Vent Rect.	1 15/16 x 5 3/4”	2 x 5 3/4”	2 1/16 x 5 3/4”	2 x 5 3/4”	2 x 5 3/4”	2 x 5 3/4”	2 x 5 3/4”
Vent Cir.	2 7/16”	2 5/8”	2 11/16”	2 5/8”	2 5/8”	2 5/8”	2 5/8”
V-notch requirement	Mandatory for all eggers	Mandatory for all legal size eggers	Mandatory for all eggers above 42°30’	Mandatory for all eggers in federal waters. No v-notching in state waters.	Mandatory for all eggers	None	None
V-Notch Definition[1] (possession)	Zero Tolerance	1/8” with or w/out setal hairs[1]	1/8” with or w/out setal hairs[1]	1/8” with or w/out setal hairs[1]	1/8” with or w/out setal hairs[1]	1/8” with or w/out setal hairs[1]	State Permitted fisherman in state waters 1/4” without setal hairs Federal Permit holders 1/8” with or w/out setal hairs[1]
Max. Gauge (male & female)	5”	5 ¼”	6 3/4”	5 ¼”	5 ¼”	5 ¼”	State Waters none Federal Waters 6 3/4”
Season Closure				April 30-May 31[2]	February 1-March 31[3]	Sept 8-Nov 28[4]	February 1-April 30

[1] A v-notched lobster is defined as any female lobster that bears a notch or indentation in the base of the flipper that is at least as deep as 1/8”, with or without setal hairs. It also means any female which is mutilated in a manner that could hide, obscure, or obliterate such a mark.

[2] Pots must be removed from the water by April 30 and un-baited lobster traps may be set one week prior to the season reopening.

[3] During the February 1 – March 31 closure, trap fishermen will have a two week period to remove lobster traps from the water and may set lobster traps one week prior to the end of the closed season.

[4] Two week gear removal and a 2 week grace period for gear removal at beginning of closure. No lobster traps may be baited more than 1 week prior to season reopening.

Table 5: Trap allocations, transfers, and reductions as required by Addendum XVIII for LCMA 2 and 3 fishermen. Trap reductions for MA, RI, and CT in LCMA 2 include state, federal, and dual permit holders. Number of traps retired includes traps retired due to the 10% conservation tax on trap transfers.

	Jurisdiction	# of Trap Allocated (For 2017 Fishing Year)	# of Traps Transferred	# of Traps Retired (from 2016 to 2017 Fishing Year)
LCMA 2	**MA**	33,730	2,126 (traps transferred to MA) 1,140 (traps transferred out of MA)	1,746
	RI	83,259	1,748	4,562
	CT	3,935	0	238
	NOAA (ME, NH, NY, NJ)	3,345		235
LCMA 3	**NOAA**	128,910	10,485	8,008

Table 6. 2016 sampling requirements and state implementation. All states have 100% active harvester reporting except for Maine which has 10% harvester reporting. Sufficient sea sampling can replace port sampling. *De minimis* states (denoted by *) are not required to conduct biological sampling of their lobster fishery.

State	100% Dealer Reporting	10% Harvester Reporting	Sea Sampling	Port Sampling	Ventless Trap Survey	Settlement Survey	Trawl Survey
ME	✓	✓ (10%)	✓		✓	✓	✓
NH	✓	✓	✓	✓	✓	✓	✓ (w/ ME)
MA	✓	✓	✓		✓	✓	✓
RI	✓	✓	None in 2016	✓	✓	✓	✓
CT	✓	✓	None in 2016			✓	✓
NY	✓	✓	✓	✓			✓ (w/ CT)
NJ	✓	✓	✓				✓
DE*	✓	✓	None in 2016				✓ (no lobsters encountered)
MD*	✓	✓	✓				✓
VA*	✓	✓	None in 2016				

15.0 Figures

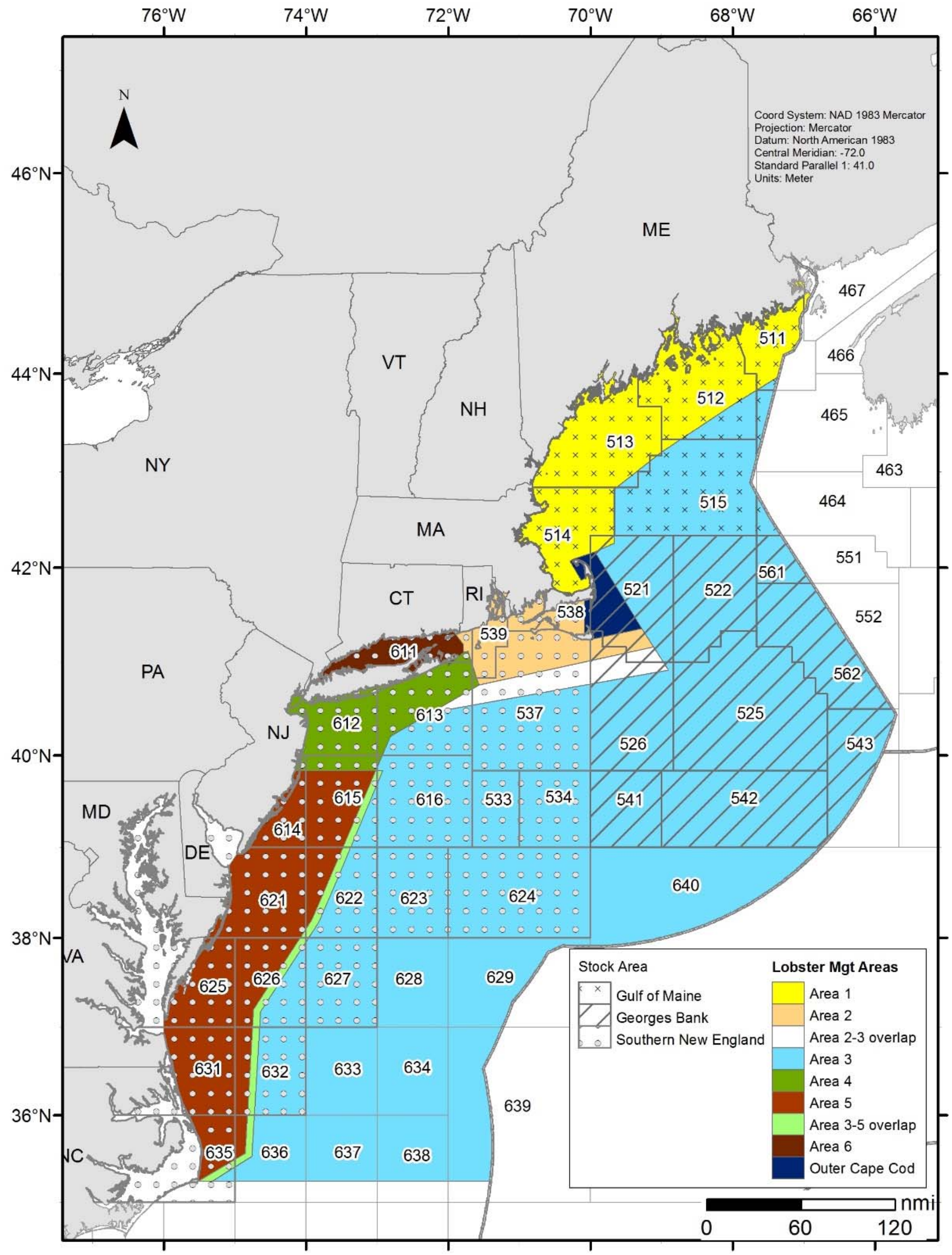


Figure 1: Lobster Conservation Management Areas (LCMAs) and stock boundaries for American lobster.

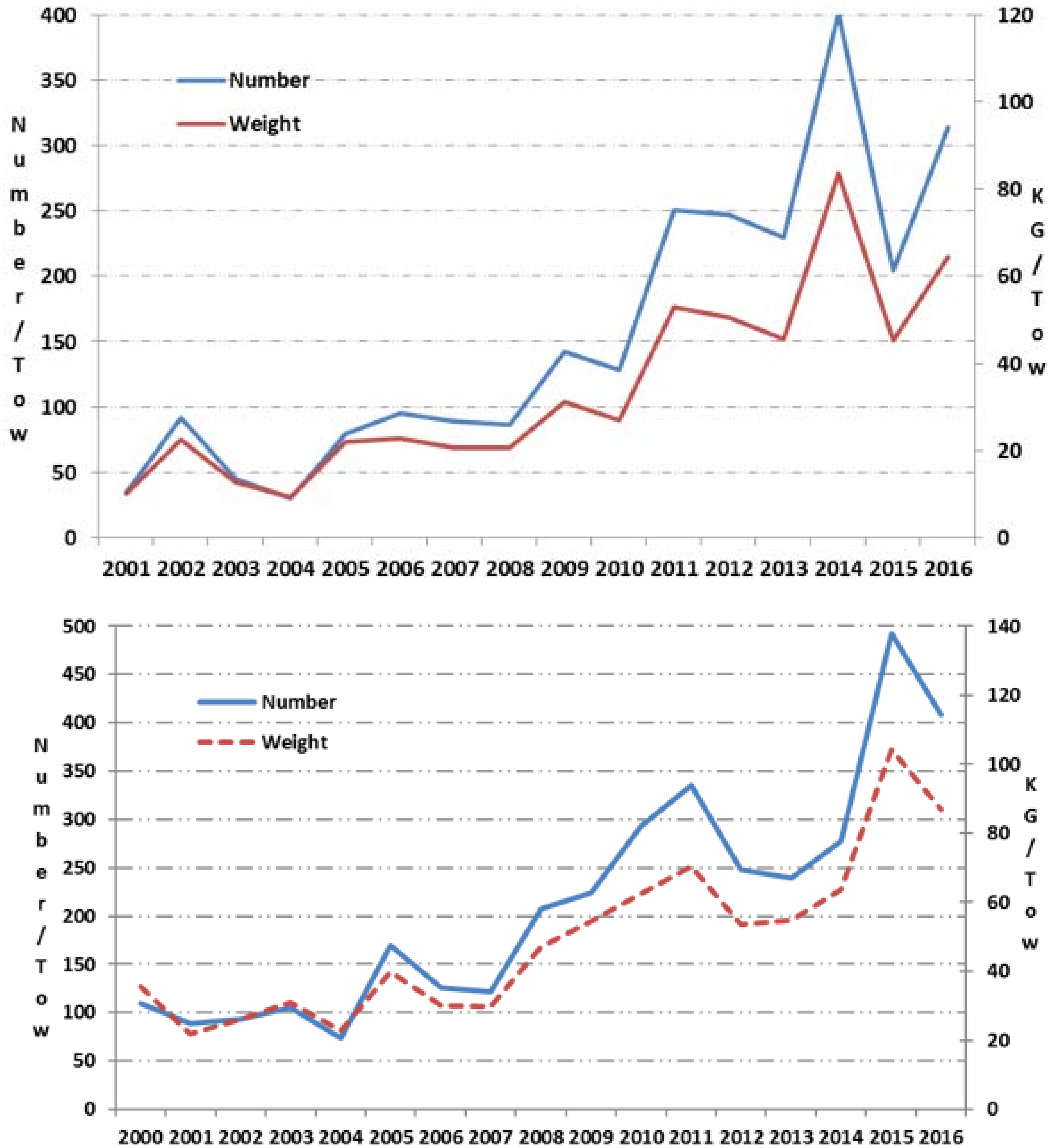


Figure 2: Maine-New Hampshire survey abundance indices for lobster, 2001-2016. Results of the spring survey are on the top and results from the fall survey are on the bottom.

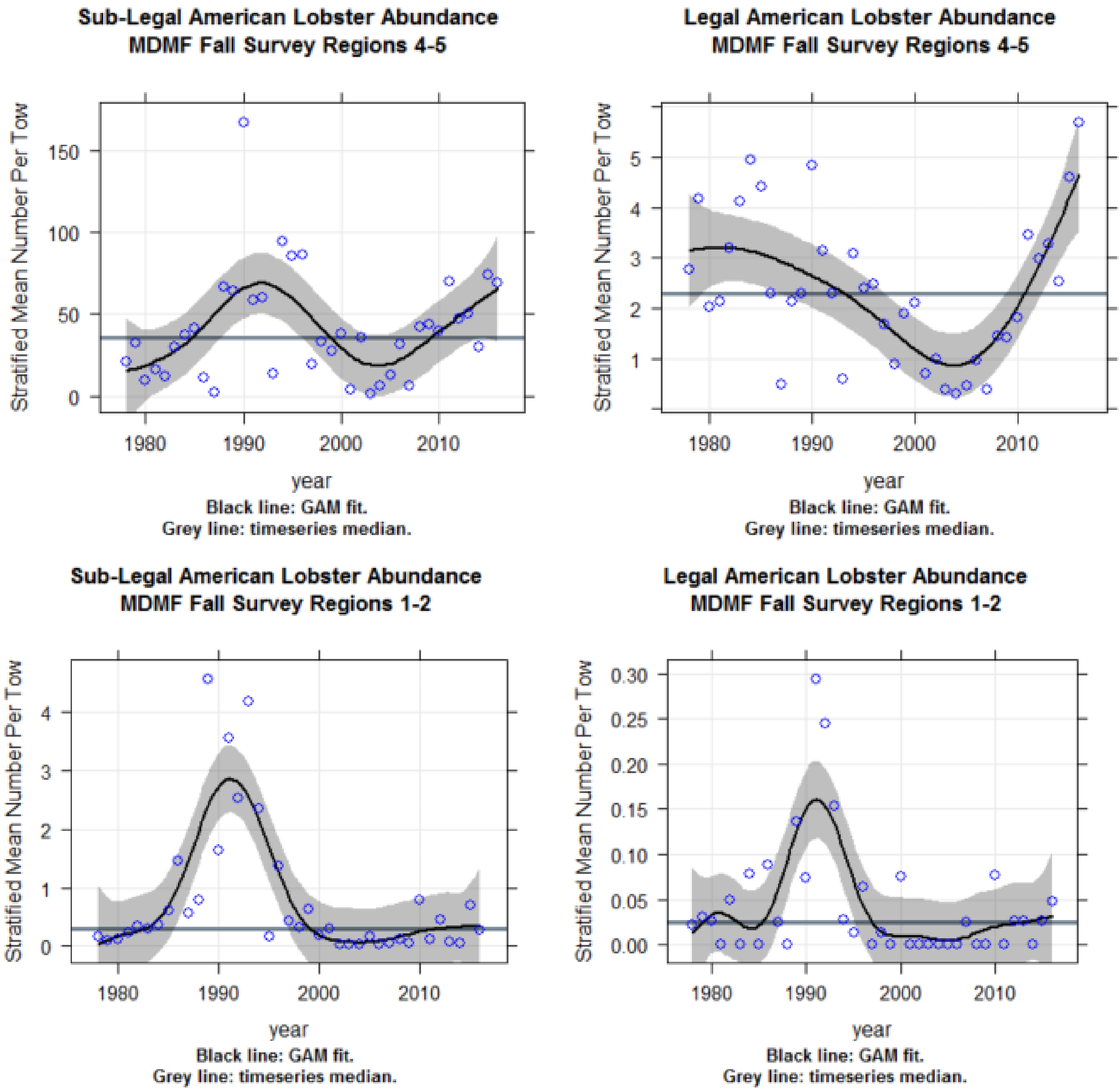


Figure 3: MADMF Fall Trawl Survey sub-legal and legal indices from 1978-2016. The top charts are from Gulf of Maine and the bottom charts are from Southern New England. For reference, Regions 4 and 5 are located off of Cape Ann and in Cape Cod Bay. Regions 1 and 2 are located along the southern portion of the Cape and Islands, as well as Buzzards Bay.

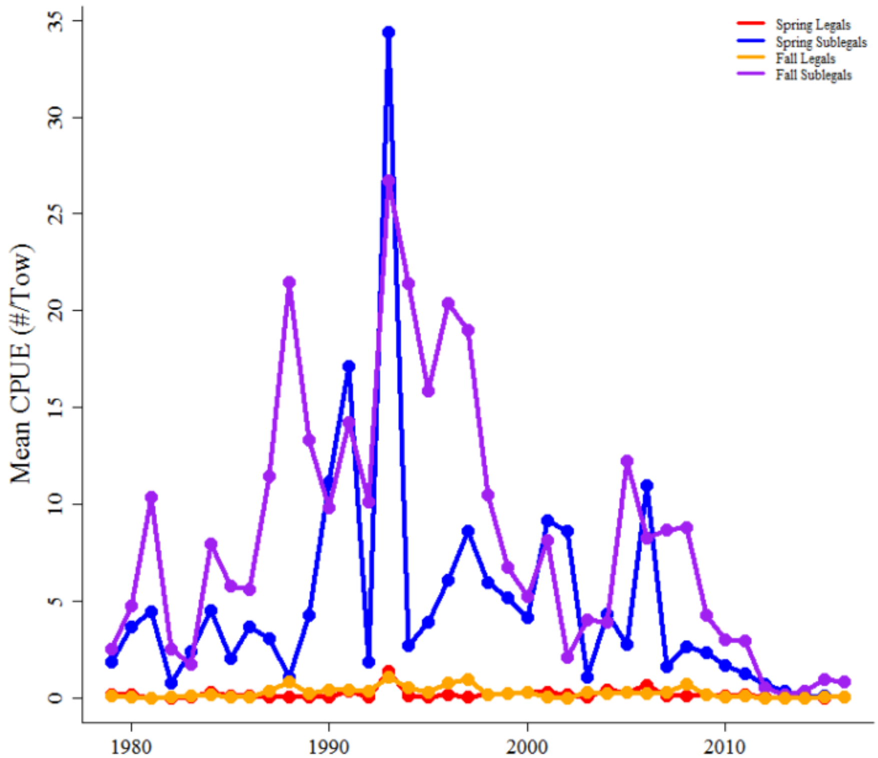


Figure 4: RIDFW Seasonal (Spring and Fall) Trawl lobster abundances. CPUE is expressed as the annual mean number per tow for sub-legal (<85.725mm CL) and legal sized (>=85.725mm CL) lobsters.

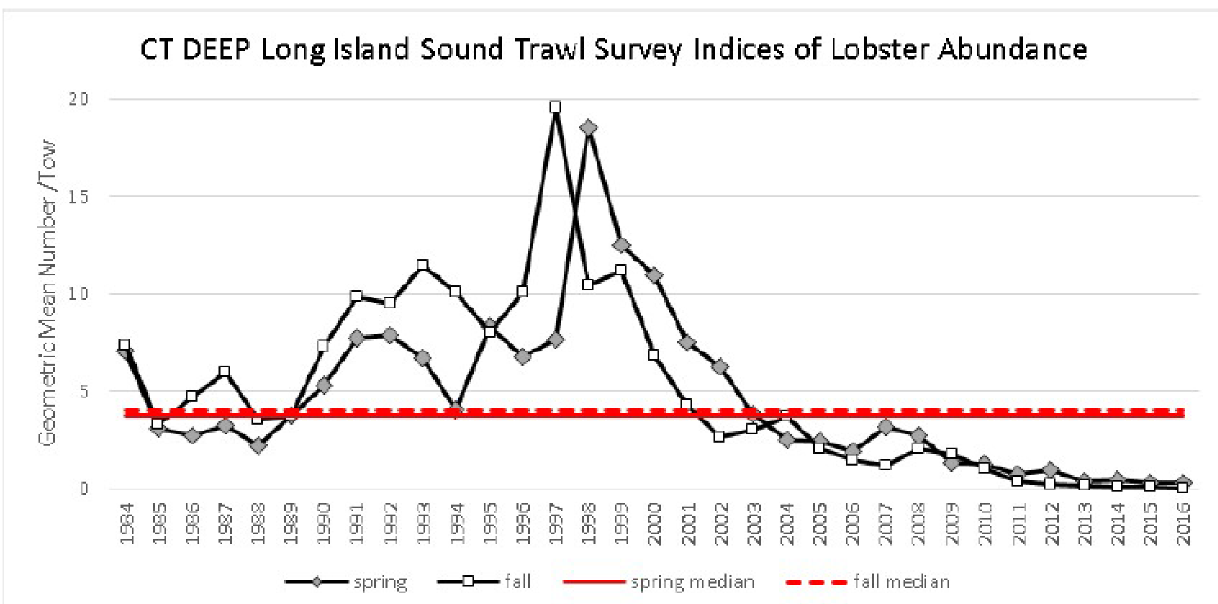


Figure 5: Results of the Long Island Sound Trawl Survey during spring (April-June) and fall (September-October) within NMFS statistical area 611.

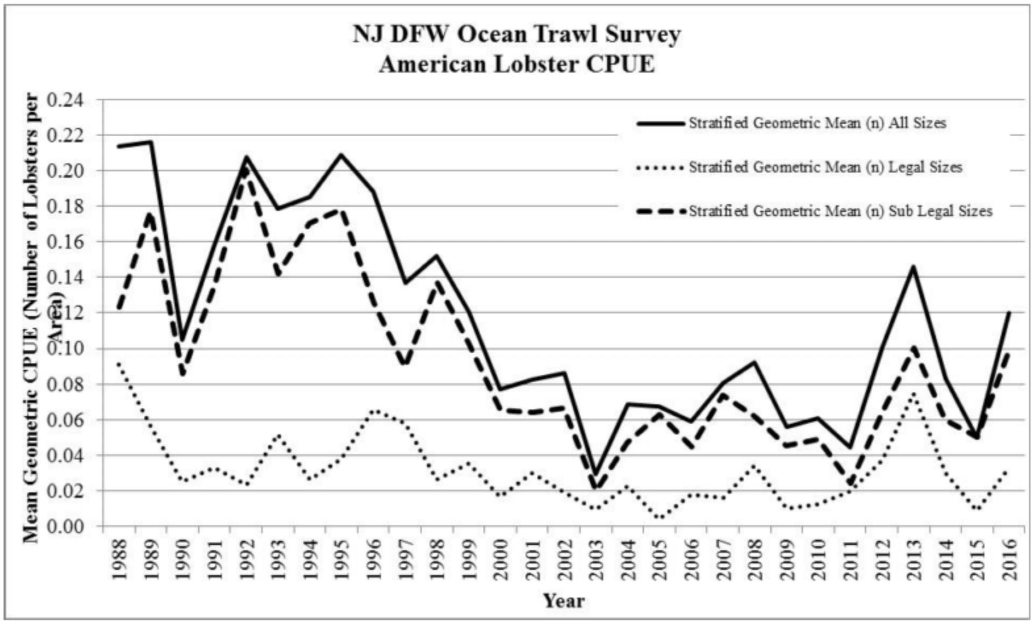


Figure 6: Stratified mean CPUE of all lobsters collected aboard the NJDFW Ocean Trawl Survey. The survey stratifies sampling in three depth gradients, inshore (18’-30’), mid-shore (30’-60’), offshore (60’-90’). The mean CPUE was calculated as the sum of the mean number of lobsters per size class collected in each sampling area weighted by the stratum area.

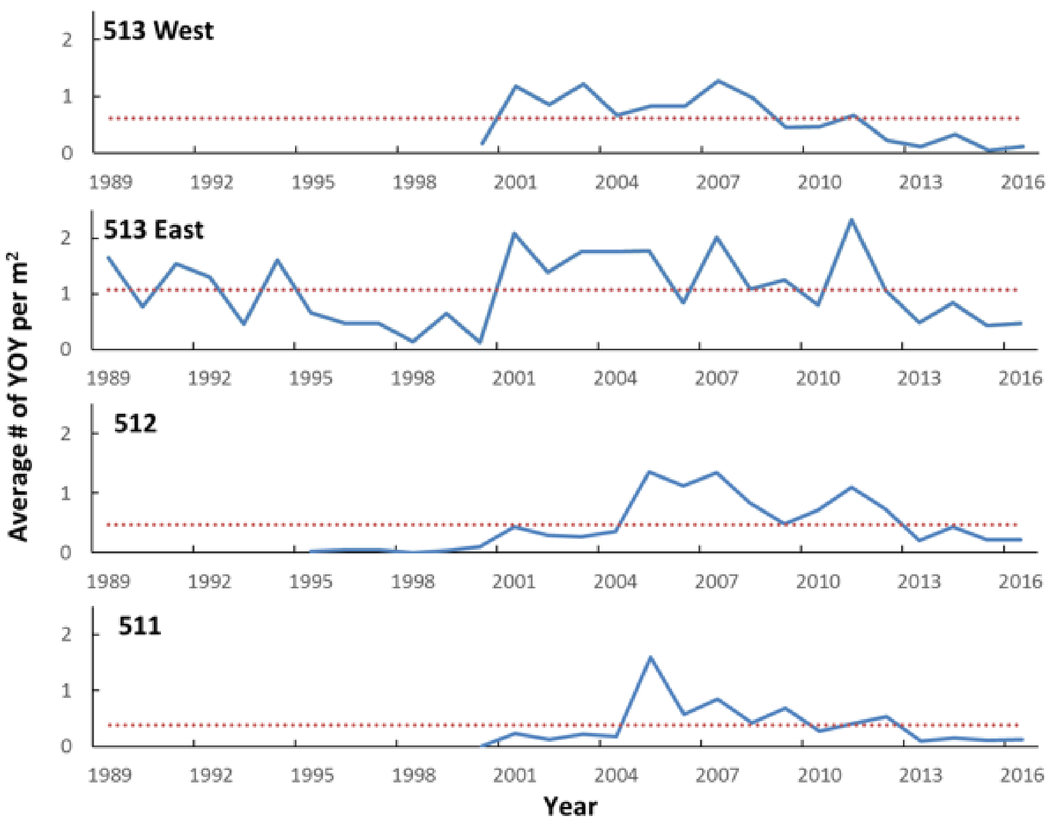
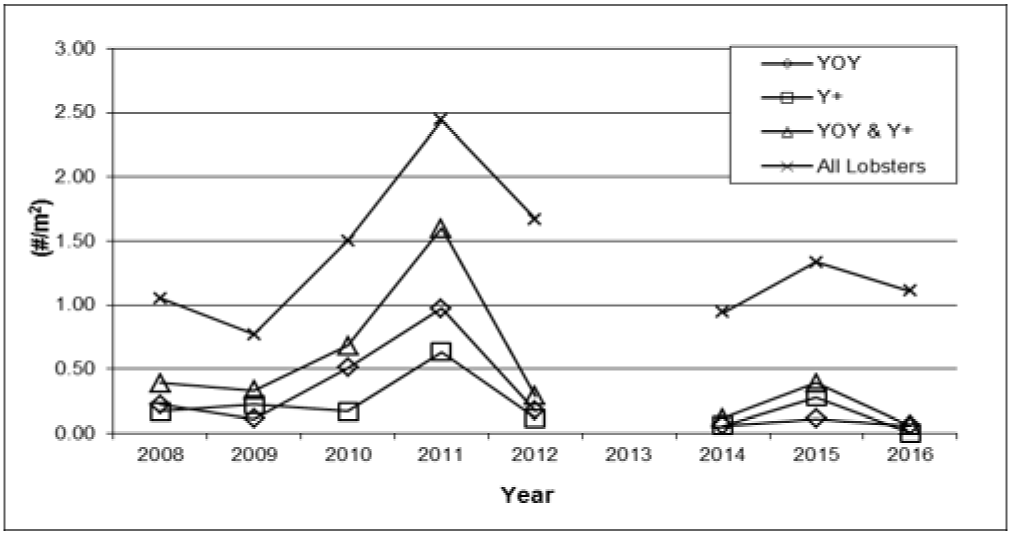


Figure 7: Settlement survey index for each statistical area in Maine (1989-2016).



* No samples collected in 2013

Figure 8: Catch per unit effort (#/m2) of YOY, Y+, and YOY/Y+ combined and all lobsters during the American Lobster Settlement Index, by location, in New Hampshire, from 2008 through 2016.

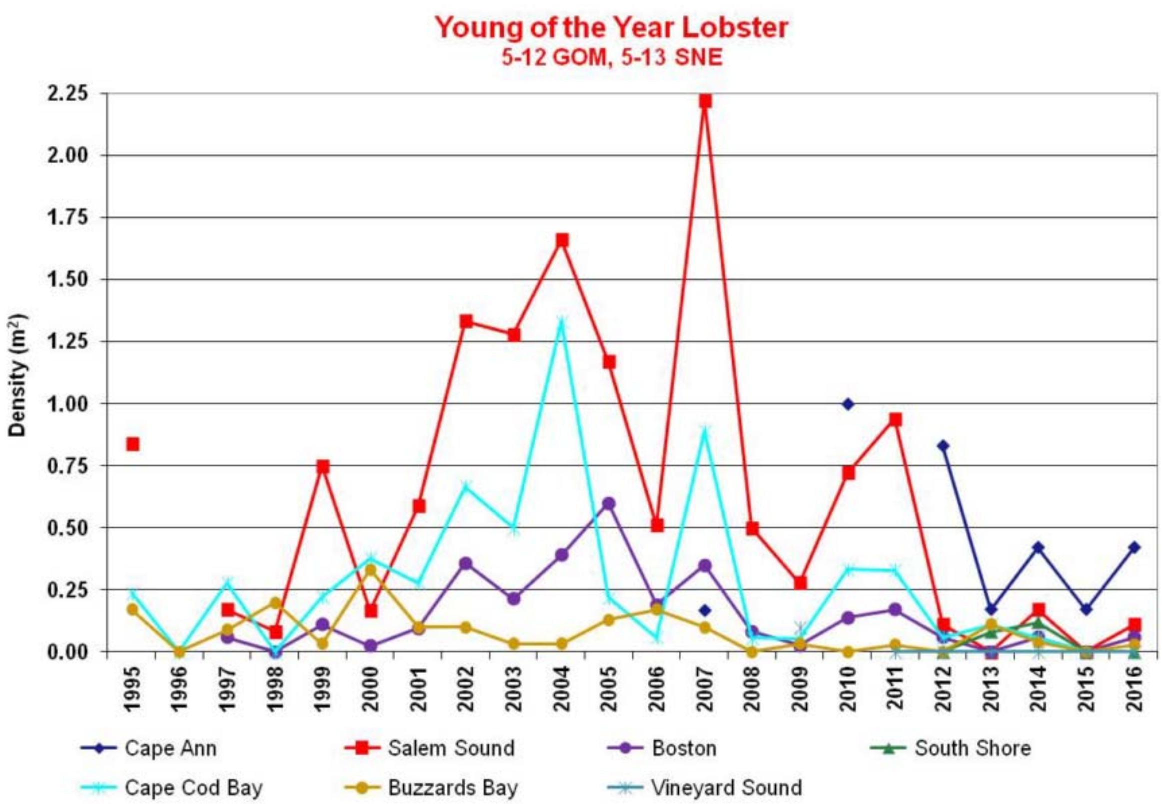


Figure 9: Young-of-year lobster density in seven Massachusetts regions; LCMA 1 – Cape Ann, Salem Sound, Boston, South Shore, Cape Cod Bay, LCMA 2 - Buzzards Bay, Vineyard Sound.

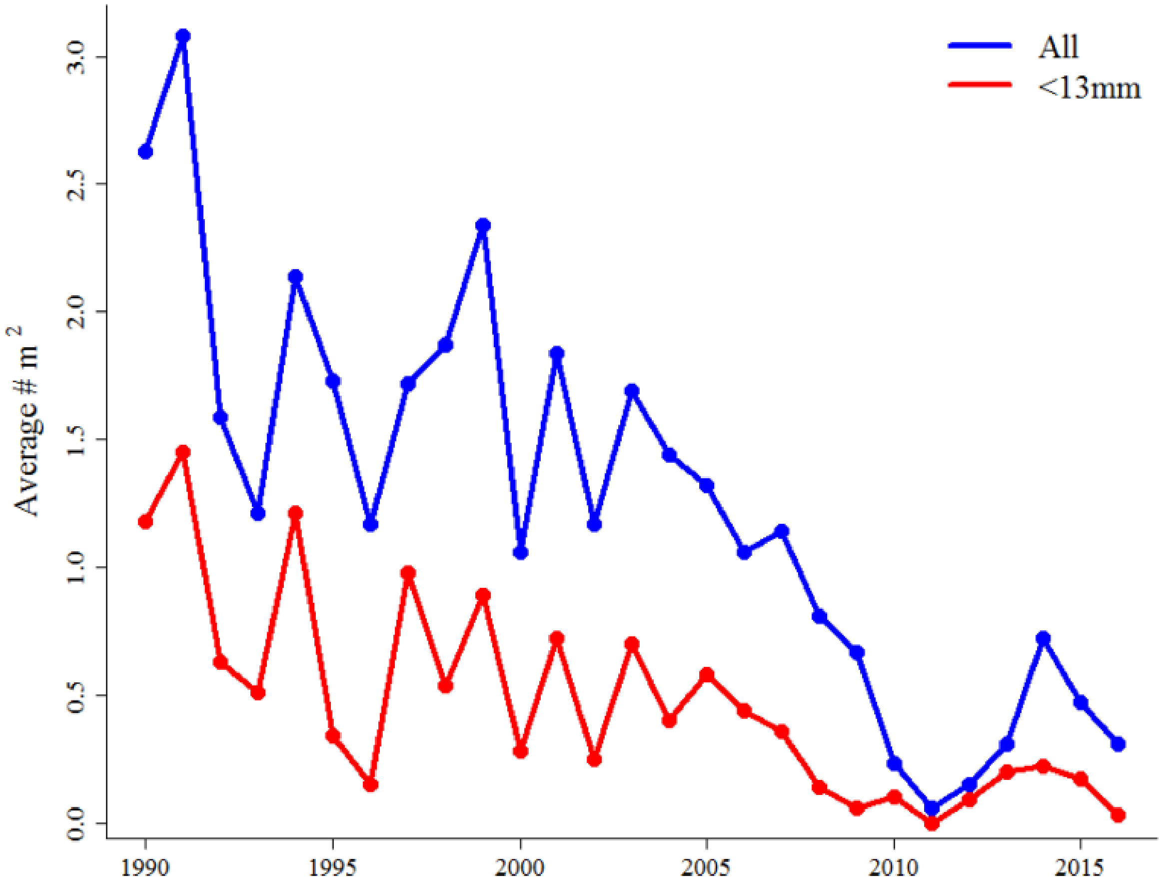


Figure 10: Average abundance of American lobster in Rhode Island suction sampling sites. Abundances are presented for lobsters less than or equal to 13mm (blue) and all lobster collected in sampling (red).

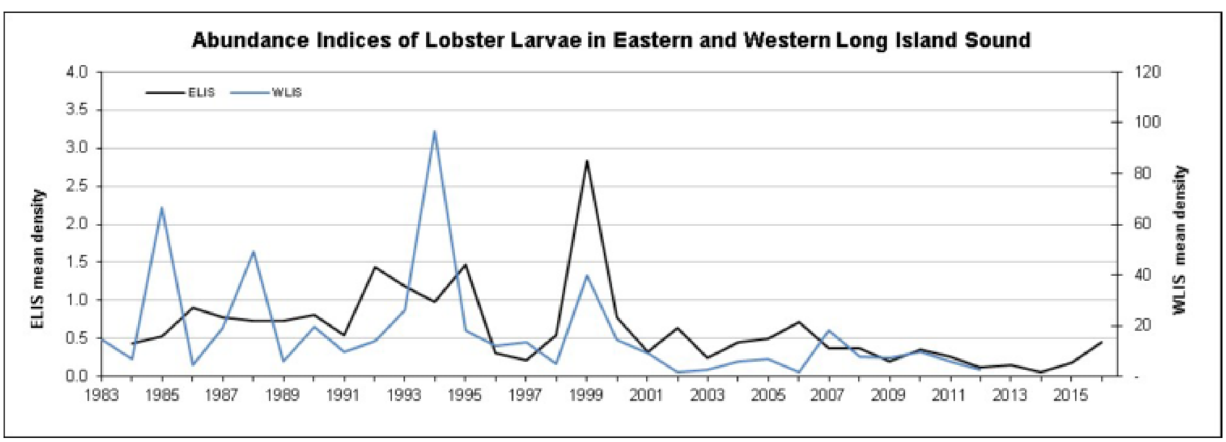


Figure 11: Abundance indices of lobster larvae from the Connecticut DEEP Larval Lobster Survey in western Long Island Sound and from the Millstone Power Station entrainment estimates in eastern Long Island Sound. The Connecticut DEEP survey was discontinued in 2013.

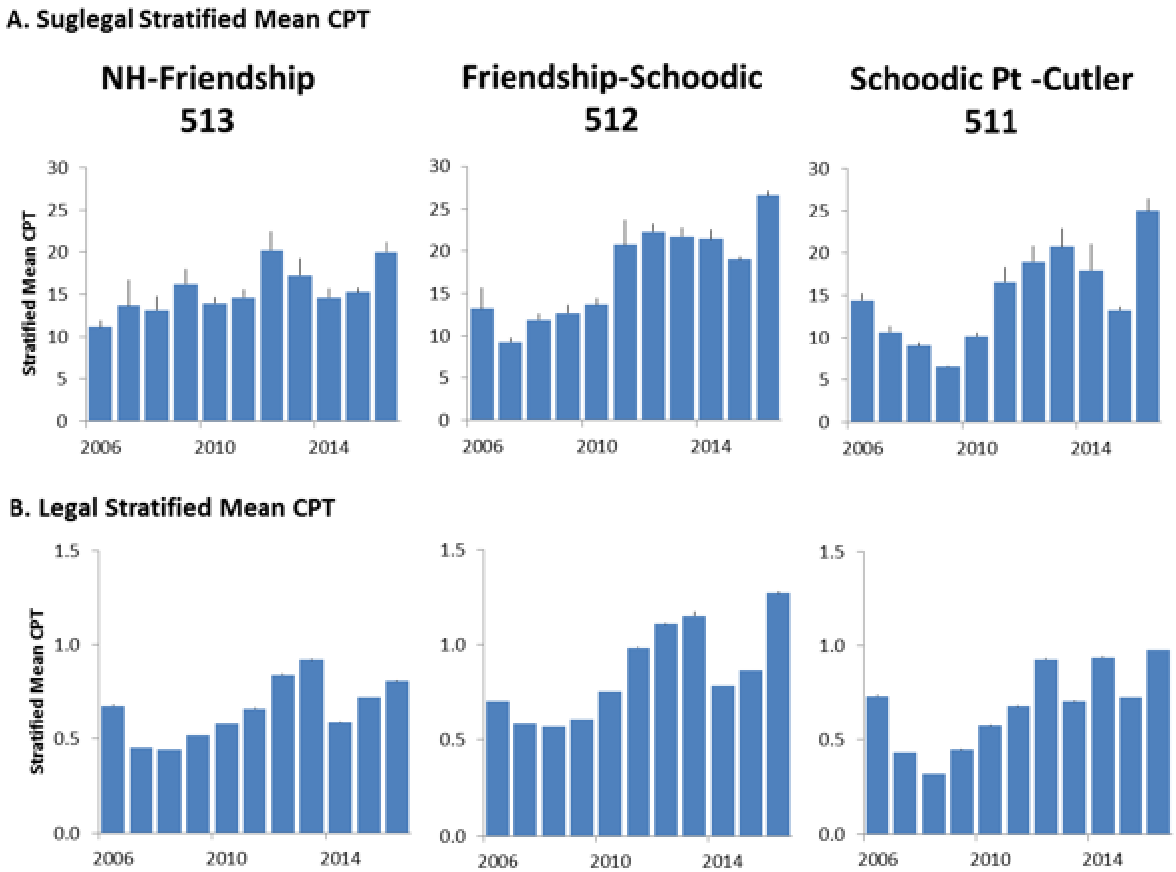


Figure 12: CPUE stratified mean for both sublegal and legal lobsters from Maine's Ventless Trap survey, 2006-2016, by statistical area. Only ventless traps were included in the analysis.

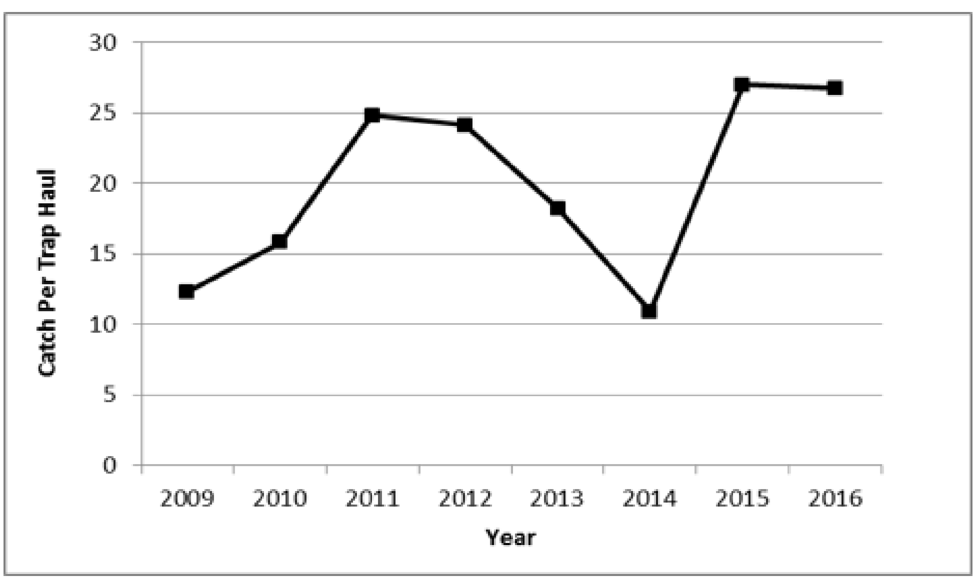


Figure 13: Stratified mean catch per trap haul, for all lobsters captured during the coast-wide random stratified Ventless Trap Survey in New Hampshire state waters from 2009 through 2016.

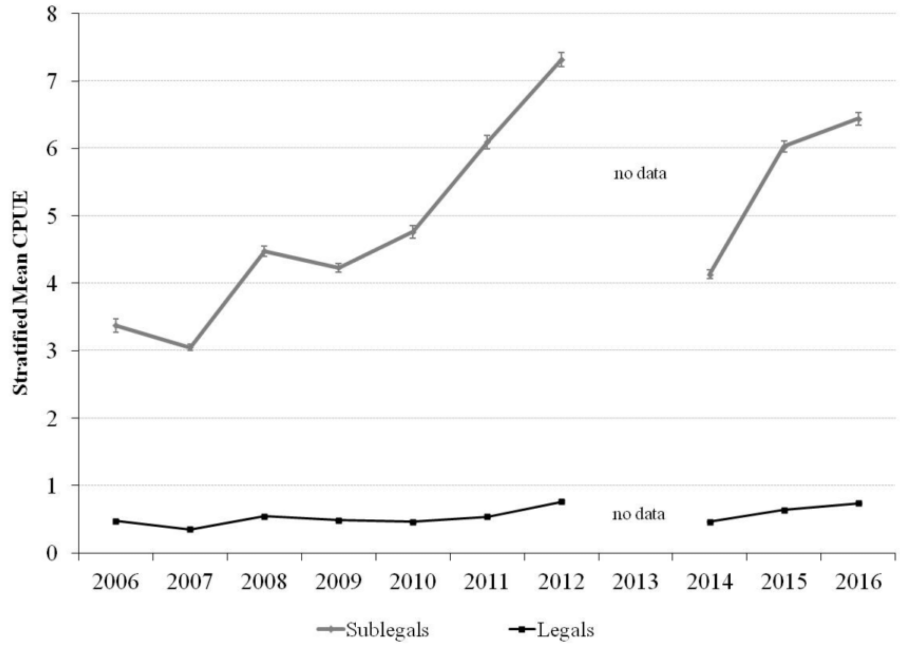


Figure 14: Stratified mean catch per trap haul (±S.E.) of sublegal (< 83 mm, grey line) and legal (≥ 83 mm, black line) lobsters in NMFS Area 514 from MADMF ventless trap survey. The figure includes lobsters from both the vented and ventless traps in the survey.

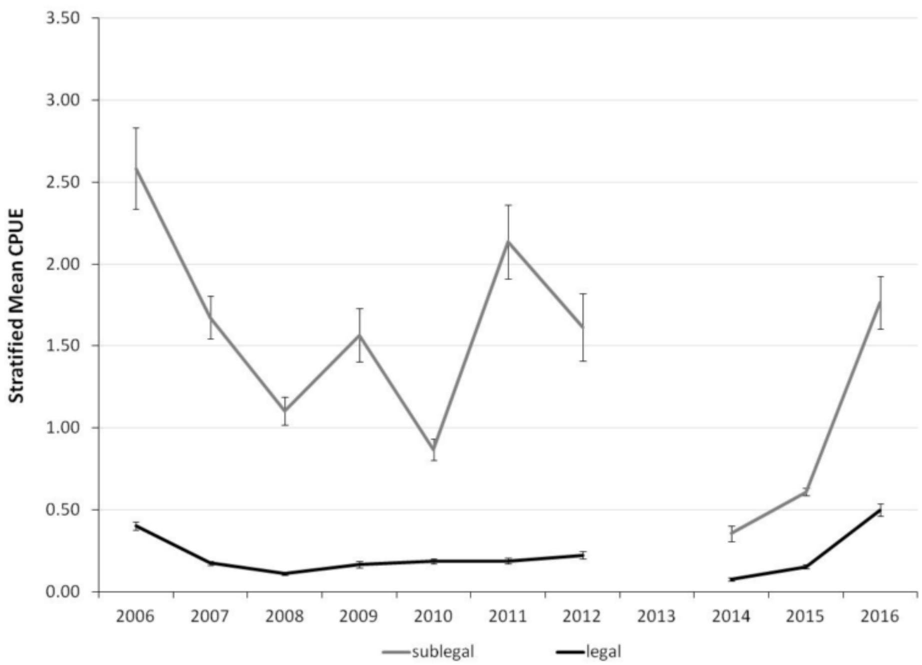


Figure 15: Stratified mean catch per trap haul (±S.E.) of sublegal (< 86 mm, grey line) and legal (≥ 86 mm, black line) lobsters in Area 538 and northern 537 (2011-2014) from MADMF ventless trap survey. The break in the time series from 2010 to 2011 and the subsequent dashed lines illustrate when the survey was expanded (starting in 2011), which should be interpreted as a new time series relative to the 2006-2010 time period. The figure includes lobsters from both the vented and ventless traps in the survey.

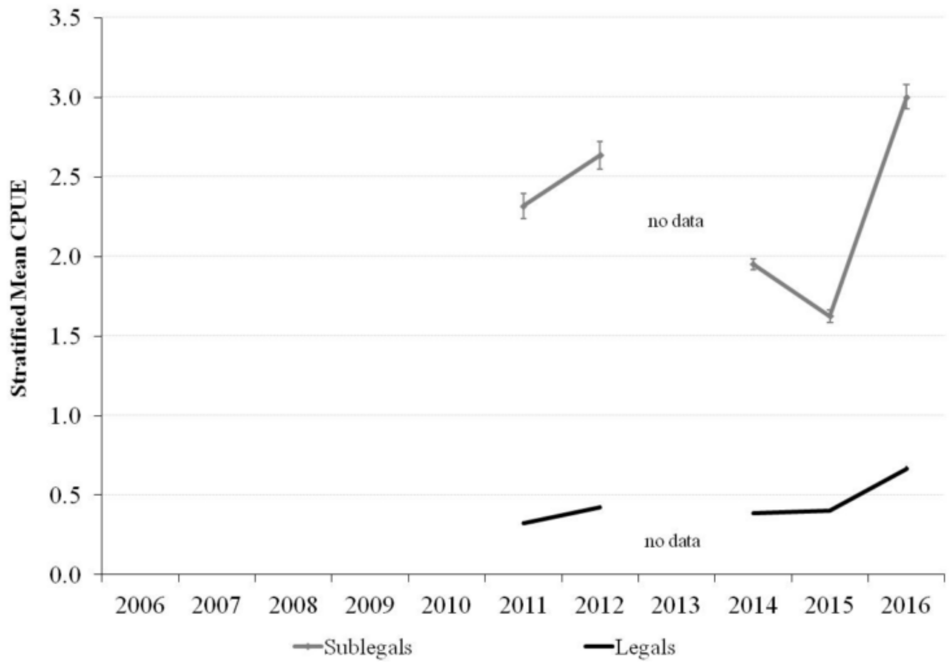


Figure 16: Stratified mean catch per trap haul (+/- S. E) of sublegal (<86 mm, grey line) and legal (>=86 mm, black line) lobsters in the expanded MA SNE survey area, which includes NMFS Area 538 and the northern portion of Area 537. The figure includes lobsters from both the vented and ventless traps in the survey.

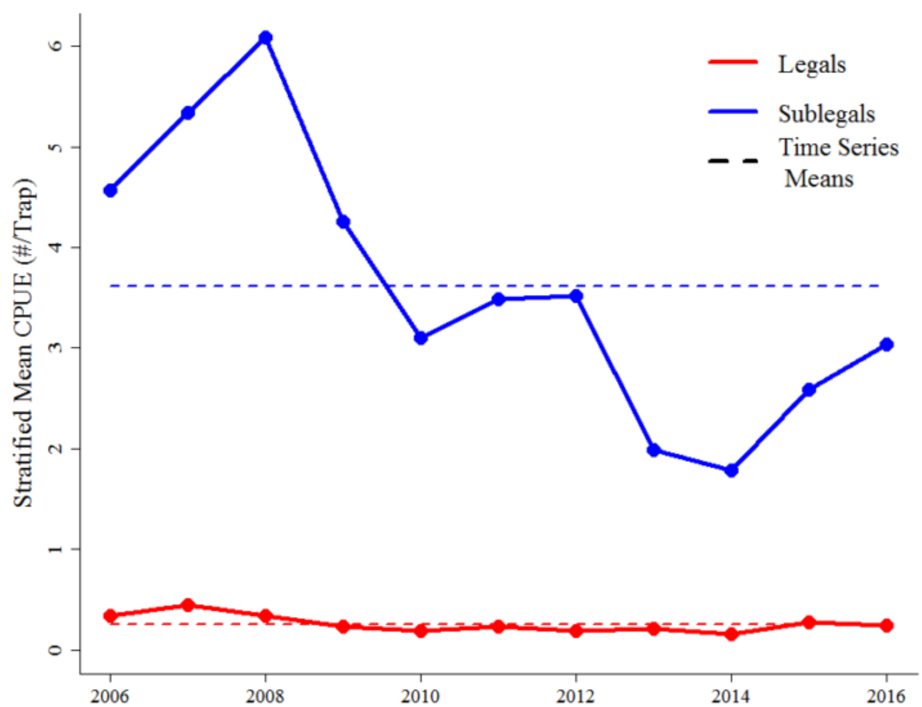


Figure 17: Stratified mean catch (#) per trap-haul for sublegal (<85.725 mm CL) and legal-sized (>=85.725mm CL) lobsters from RIDEM ventless trap survey. The figure includes lobsters from both the vented and ventless traps in the survey.

American Lobster and Jonah Crab

Activity level: High

Committee Overlap Score: Low

Committee Task List

- TC – February 1: Complete task evaluating conservation benefits of changes to the minimum and maximum gauge size for Addendum XXVII
- 2020 Benchmark stock assessment
    - TC ≈ March: Data Deadline
    - TC & SAS ≈ May: Data Workshop
- TC – August 1: Annual compliance reports for both American lobster and Jonah crab due

TC Members:
American Lobster: Kathleen Reardon (ME, TC Chair), Joshua Carloni (NH), Peter Clarke (NJ), Colleen Giannini (CT), Jeff Kipp (ASMFC), Kim McKown (NY), Conor McManus (RI), Tracy Pugh (MA), Burton Shank (NOAA), Megan Ware (ASMFC), Angel Willey (MD)
Jonah Crab: Derek Perry (MA, TC Chair), Joshua Carloni (NH), Peter Clarke (NJ), Jeff Kipp (ASMFC), Conor McManus (RI), Allison Murphy (NOAA), Kathleen Reardon (ME), Burton Shank (NOAA), Jeffrey Shields (VA), Megan Ware (ASMFC), Craig Weedon (MD)

SAS Members:
American Lobster: Kim McKown (NY, SAS Chair), Joshua Carloni (NH), Larry Jacobson (NOAA), Jeff Kipp (ASMFC), Conor McManus (RI), Tracy Pugh (MA), Kathleen Reardon (ME), Burton Shank (NOAA), Megan Ware (ASMFC)
Jonah Crab: None

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ASMFC

Atlantic States Marine Fisheries Commission

1050 North Highland Street, Suite 200 A-N

Arlington, VA 22201

October 1, 2017

Dear Commissioners,

I am writing to express my concern over the fate of the blackfish stock along the Atlantic seaboard. As I understand it, the current stock of blackfish is low, and ASMFC has taken measures requiring states to reduce the amount of fish caught, including a 56% coast-wide reduction in the harvest of tautog *(hi-mar.com /2012/01/**blackfish**-new-size-bag-and-season-limits/)*. I do appreciate the efforts taken by your agency to protect the long-term health of the blackfish stock on the Atlantic coast. However, I believe the recreational fishery is threatened by two sources: commercial fishing and an illegal market for live blackfish.

Blackfish habitat is endangered by various types of commercial gear, including pots to capture blackfish and bottom trawls which can cause considerable damage to the environments inhabited by blackfish. Although I recognize that most tautog are caught recreationally, and that commercial fishermen have a right to earn a living, I nonetheless am concerned about the long-term threat to the blackfish stock if damage is done to the off-shore structure where they live. I would encourage your agency to follow the lead of New Jersey and prohibit fishermen from being able to use pots on reefs and wrecks to capture blackfish.

Furthermore, recreational anglers are affected by the illegal harvesting and sale of blackfish. Blackfish are being sold illegally on the black market in New York restaurants, including under-sized, juvenile fish (http://www.dec.ny.gov/press/87575.html). The illegal harvest and sale of tautog is not a new issue, as evidenced by a 2005 report from Stony Brook University where a subcommittee was formed to "address the issue of how most effectively to deal with the rampant illegal harvest of blackfish by fishermen not possessing a commercial foodfish license" (http://www.somas.stonybrook.edu/community/MRAC/ bulletins/Bv14n6s03.html). Some experienced anglers have called for a complete moratorium on the sale of live blackfish, and perhaps that time has arrived, for the sake of the future tautog fishery, as well as for recreational anglers like me who simply enjoy catching blackfish and keeping legally-sized fish for dinner. I would imagine that your agency, in conjunction with law enforcement officials, could work to limit or prevent altogether the illegal sale of live blackfish.

I appreciate your consideration of my letter and look forward to your reply.

Sincerely,

Jeffrey A. Hayes

667 Earl Drive

State College, PA 16803 or via email: jxh34@psu.edu

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION
Fisheries Division
333 Ferry Rd,
Old Lyme CT 06371
Rob Klee, Commissioner

New York State
Department of Environmental Conservation
Division of Marine Resources
205 N. Belle Mead Rd, Suite 1
East Setauket, NY 11733
Basil Seggos, Commissioner

Memorandum

TO: Toni Kerns, Interstate Fisheries Management Program Director
Atlantic States Marine Fisheries Commission

FROM: Justin Davis, Supervising Fisheries Biologist
CT DEEP Marine Fisheries

Gregory Wojcik, Fisheries Biologist
CT DEEP Marine Fisheries

John Maniscalco, Finfish Unit Leader
NY DEC Division of Marine Resources

DATE: October 6, 2017

Long Island Sound Tautog Fishery Options for Draft Amendment 1 to the Tautog FMP

Background

The 2016 Tautog Stock Assessment Update concluded that the Long Island Sound (LIS) tautog stock was overfished and overfishing was occurring. Draft Amendment 1 to the Tautog FMP included regulation options to end overfishing in the LIS tautog fishery (which occurs in both CT and NY state waters). Specifically, the proposed measures, assuming 2018 implementation, provided a 50% probability of achieving the F target by 2021 (three-year time frame), and translated into an estimated 47-50% reduction in annual tautog harvest.

Both CT DEEP and NY DEC held public hearings on Draft Amendment 1 during summer of 2017. At these hearings, members of the public expressed overwhelmingly negative response to the management measures proposed in the Draft Amendment. Adoption of these measures for Long Island Sound would produce severely disjointed tautog regulations within the relatively small NY/CT/RI region. For instance: although recreational anglers in all three areas would be subject to a 16” minimum length limit during the fall (when the majority of tautog angling occurs), LIS anglers would potentially be subject to a one fish bag limit while RI anglers and NY anglers fishing outside of LIS would be subject to six and four fish bag limits, respectively. Such an outcome would subject the LIS for-hire sector to undue economic hardship, as customers would likely make the relatively short drives to ports in adjacent areas to take advantage of higher bag limits. Anglers and businesses fishing from New Jersey would have even more disparate regulations that include higher bag limits (4-6 fish) and a 15” minimum size limit during the fall fishery. In addition, owners of tackle shops frequented by LIS anglers reported that the tautog fishery was directly (through sales of bait and tackle used for tautog) and indirectly (through driving almost all foot traffic into the store) responsible for the majority of their revenue during fall months. Therefore, the substantial curtailing of LIS tautog angling likely to result from adoption of Draft Amendment 1 regulations would also cause tackle shop owners undue economic hardship. Finally, the disjointed regional regulations prescribed by Draft Amendment 1 as currently constituted would create substantial public outreach and enforcement challenges for NY DEC, as NY state waters would be divided between two management regions (LIS and NJ/NY Bight) subject to very different tautog regulations.

CT DEEP and NY DEC also feel that there are strong reasons to reconsider LIS regulations options in Draft Amendment 1 on biological and technical grounds. Despite the overfished/overfishing determination from the 2016 stock assessment update, there are positive indicators for the future condition of the LIS tautog stock, including strong 2013 and 2015 year classes (Figure 1) and a slow but steady increase in biomass since the adoption of more conservative management measures in 2012 pursuant to Addendum VI (Figure 2). Additionally, tautog are a slow-growing, long-lived species; a timeframe longer than that proposed in Draft Amendment 1 (three years) may therefore be more appropriate and realistic to achieve substantial change in the condition of the LIS tautog stock. The calculations underlying the proposed management options in the Draft Amendment relied heavily on data from the Marine Recreational Information Program (MRIP). Recent MRIP estimates of annual recreational tautog harvest in LIS displayed high levels of inter-annual variation (e.g. 31-304% variation in CT during 2013-15) absent changes to prevailing management, calling into question precision of the estimates and therefore the precision of harvest reduction estimates calculated using these data. Additionally, multiple parties raised substantial concerns over the accuracy of MRIP estimates for the for-hire sector during public hearing.

Proposed Management Options

For the reasons detailed above, CT and NY are jointly proposing alternative tautog management measures for LIS for inclusion in Draft Amendment 1. These management options (Attachment 1) propose lower levels of annual harvest reduction (18.4% - 30.5%). It is our strong opinion that these alternative measures will effectively end overfishing of the LIS tautog stock, albeit over a longer time frame, while avoiding the severe socio-economic impacts and enforcement challenges likely to result from adoption of current Draft Amendment 1 management options.

Methods

The options provided include seasonal reductions, possession limit reductions, size limit increases as well as reductions associated with a slot limit (see Attachment 1). Any combinations of reductions between the size, season and creel limits were accounted for using the formula (x+y)-(x*y) where x = the percent reduction associated with season closures and y = the percent reduction associated with size/possession limit reductions.

- <u>Seasonal Adjustment Analysis</u>: harvest reductions achieved by closing days in the season were estimated for options 1, 3 and 5 using harvest-per-day (HPD) rates derived from MRIP (Table 1). HPD rates by wave were estimated using the mean of 2013-15 MRIP harvest estimates, using only intercepts where "area fished" was within LIS. Since both NY and CT fall seasons are open for portions of both waves 5 and 6, harvest estimates for the fall fishery were calculated by aggregating data from both waves.

  All six options provided propose opening for the month of April in NY to create greater regulatory consistency for LIS anglers (CT is currently open during April; see Attachment 1). Very little harvest is expected during April in both states. CT MRIP harvest estimates from wave 2 have been less than 2,000 tautog since 1990. It is estimated that a total of 2,000 tautog will be harvested in April in NY based on MRIP harvest estimates from 2008 - 2011 when the spring season was open (note: the minimum size limit during these years was 14").

  All options assume no changes in the harvest rate of non-compliant fish that are below the current minimum length of 16". MRIP measured lengths (non-imputed) indicate that 19.1% of the harvest was below the current legal minimum size.

Table 1. Harvest-Per-Day Rates

	2013	2014	2015
NEW YORK			
WAVE 5	168	1,036	1,695
WAVE 6	304	196	682
CONNECTICUT			
WAVE 4	71	28	47
WAVE 5	2,980	12,228	4,579
WAVE 6	958	1,319	615

- Size and Possession Limit Analysis: the MRIP sample size of measured tautog in 2013-2015 was a total of 894 fish for both CT and NY (harvested from LIS only). This sample size allowed compilation of a robust length frequency table for use in reduction estimation. The length frequency table was weighted by the MRIP effort estimates in all calculations. Two minimum lengths were evaluated for options 2 and 3: an increase to 16.5” (resulting in an 11.5% harvest reduction) and 17” (31.4% reduction).

  A possession limit reduction from four to three fish was analyzed using combined MRIP harvest data from 2013-2015. There was a total of 220 trips with harvest used in analyses of adjusted creel limits for the spring and fall fishery. The proportion of ‘saved’ fish was converted to number of fish and applied to the total season’s harvest. The CT summer fishery creel limit remains two fish (status quo) for all options. The CT summer season only accounts for 1.6% of the annual LIS harvest.

- Slot Limit Analysis: the methods used to calculate the reduction associated with a harvest slot limit in proposed options 4 and 6, are the same as provided in Draft Amendment 1, Section 4.2.3.3. Since a slot limit will result in an increase in discarded fish, these analyses incorporated the discard mortality rate (2.5%) of fish released above the slot maximum (i.e. the reductions calculated for option 4 and 6 reflect reductions in total removals; harvest + discard mortality).

- Model Projections: all projections used to determine the number of years needed to reach the F target under each option followed the same methodology outlined in the 2016 Tautog Stock Assessment Update. In addition to estimating years needed to reach the F target under each option, we also estimated the probability of reducing F below the F threshold in three years (matching the timeframe prescribed for reaching F target in Draft Amendment 1) and the number of years needed to achieve a 50% probability of reducing F below the threshold. These metrics provide additional information on the timeframes in which each option might be expected to end overfishing of the LIS tautog stock. All model projections assumed equivalent percent reductions to the recreational and commercial fishery.

- Commercial Fishery: The commercial fishery accounts for approximately 10% of annual LIS tautog harvest. Given the relatively minor contribution of commercial harvest, we have chosen not to prescribe commercial regulations for any option at this time. It is our intent that if one of the alternate management options presented in this document is approved for LIS tautog, that the corresponding percent reduction in annual recreational harvest will be applied to the commercial sector (note that, as stated above, model projections assumed these equivalent reductions in commercial harvest). Regulations that achieve the necessary reduction in commercial harvest will be formulated using changes to season length and/or bag limits (length limits for the commercial fishery will be kept consistent with the recreational fishery) and using the same methods described above for reduction estimation in the recreational fishery.

Results

- Annual LIS tautog harvests (recreational + commercial) under the six management options presented here are expected to range from 342.92 mt (31.4% reduction from status quo) to 407.96 mt (18.4% reduction; see Table 2). For comparison, the mean annual harvest during 2013-2015 was 499.95 mt.

TABLE 2 ***OPTIONS***	***1***	***2***	***3***	***4***	***5***	***6***
PERCENT REDUCTION IN HARVEST	20.3%	30.5%	18.4%	27.0%	23.6%	31.4%
PROJECTED HARVEST (STATUS QUO = 499.95)	398.46	347.47	407.96	365	381.96	342.92
PROBABILITY OF BEING UNDER F-THRESHOLD IN 3 YEARS	33%	59%	28%	45%	41%	67%
NUMBER OF YEARS TO ACHIEVE F-TARGET WITH A 50% PROBABILITY	12	8	14	11	10	8
NUMBER OF YEARS REQUIRED TO BE BELOW F-THRESHOLD WITH A 50% PROBABILITY	5	3	7	4	5	2

- Among options presented here, the number of years required to achieve the F target with 50% probability ranged from a low of eight (Options 2 and 6) to a high of 14 (Option 3). For comparison, Draft Amendment 1 measures were designed to achieve the F target with 50% probability in three years.
- Option 4 in this document is a substitute for Option 4 in the original document distributed to the Technical Committee on September 27th. As constituted here, Option 4 still incorporates a harvest slot limit of 16” to 19”, but has substituted reduced fall seasons for the reduced bag limits in the original Option 4. Model projections run under the original Option 4 (16”-19” harvest slot, reduced bag limits, status quo fall seasons, estimated 22.5% harvest reduction) never achieved the F target, but estimated a 50% probability of reaching the F threshold in five years. These results suggested that under a harvest slot limit scenario, a larger harvest reduction was necessary to allow sufficient survival of slot-sized fish in the short-term, such that sufficient fish could recruit to the size classes above the slot and become protected from harvest, thus accelerating stock re-building and allowing the model to eventually reach the F target. The revised Option 4 presented here achieved this goal by elevating harvest reduction from 22.5% to 27%; model projections estimated a 50% probability of reaching the F target within 11 years and a 50% probability of reaching the F threshold in four years. We strongly suspect that the model used for these projections, which uses a 12+ age group as the terminal age class, underestimates the mid- to long-term benefits to stock re-building provided by a harvest slot that reduces F to zero for older age classes of a long-lived fish like tautog. We therefore view the estimates of years-to-F-target/threshold provided for Option 4 as more

conservative than those provided for other options (additionally, slot limit projections incorporated discard mortality while projections under other options did not).

- Multiple options could end overfishing of the LIS tautog stock within short time frames. All options with the exception of Option 3 would achieve the F threshold with 50% probability within five years or less. Options 2 and 6 would provide a 50% probability of ending overfishing within the same three-year timeframe prescribed for reaching the F target within Draft Amendment 1. The probability of ending overfishing of the LIS tautog stock within three years was 33% or greater under each options except Option 3.

Figure 1. Recruitment estimates for LIS region (Fig. 5.2.5 from 2016 Tautog Stock Assessment Update).

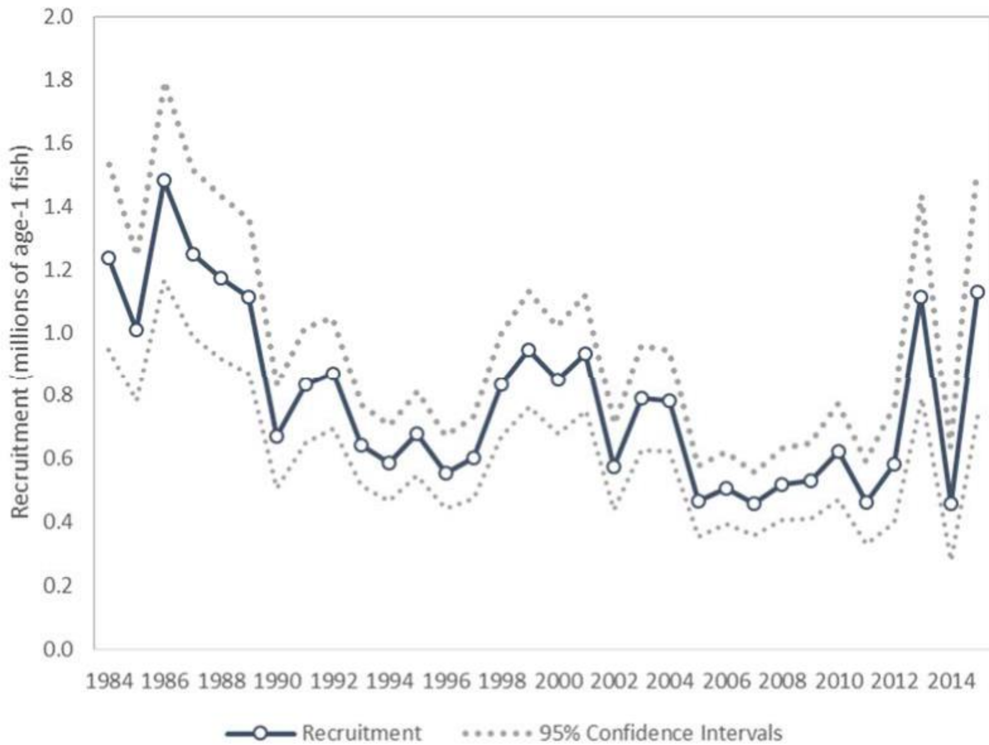
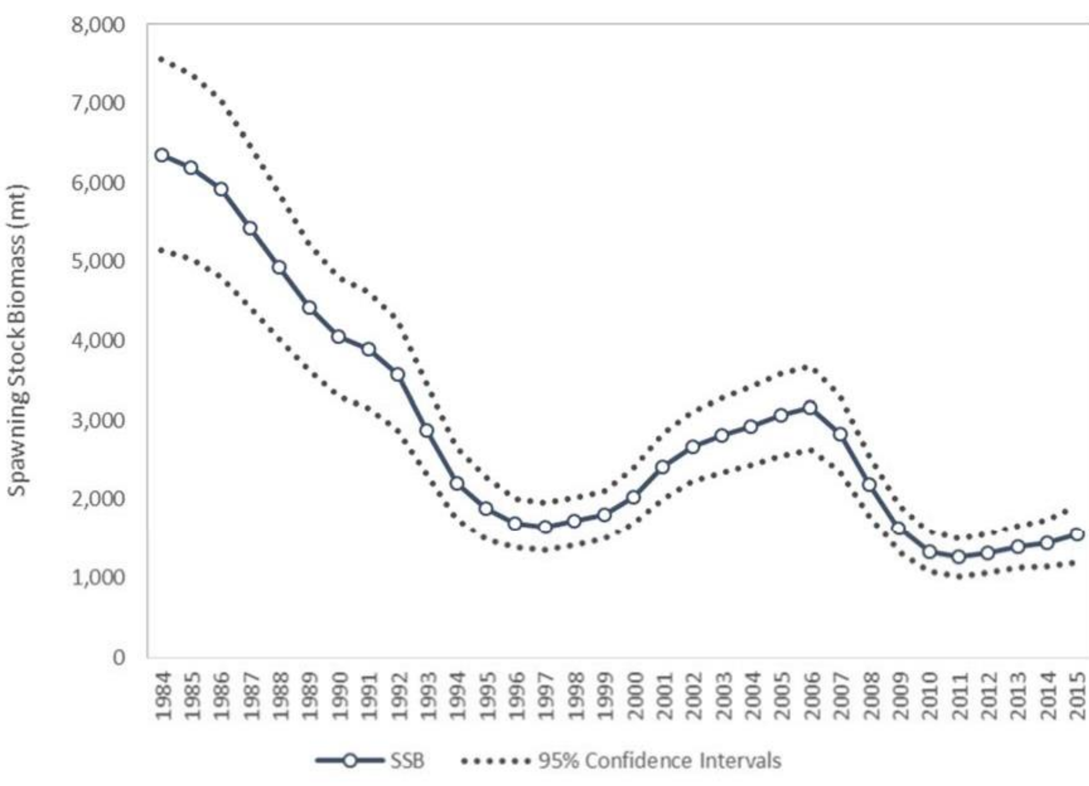


Figure 2. Estimates of spawning stock biomass for the LIS region (Figure 5.2.3 from 2016 Tautog Stock Assessment Update).



Attachment 1, Proposed Options.

Status Quo

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	16”	4	30	0
Summer Season		2	62	0
Fall Season		4	58	71

Option 1 (20.3% Reduction)

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	16”	3 (-1)	30	30 (+30)
Summer Season		2	62	0
Fall Season		3 (-1)	50 (-8)	60 (-11)

Option 2 (30.5% Reduction)

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	17” (+1”)	4	30	30 (+30)
Summer Season		2	62	0
Fall Season		4	58	71

Option 3 (18.4% Reduction)

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	16.5” (+.5”)	4	30	30 (+30)
Summer Season		2	62	0
Fall Season		4	53 (-5)	63 (-8)

Option 4 (27.0% Reduction)

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	16”-19” Slot Limit	4	30	30 (+30)
Summer Season		2	62	0
Fall Season		4	50 (-8)	60 (-11)

Option 5 (23.6% Reduction)

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	16”	3 (-1)	30	30 (+30)
Summer Season		2	62	0
Fall Season		3 (-1)	48 (-10)	57 (-14)

Option 6 (31.4% Reduction)

	Minimum Length	Creel Limit	CT Days Open	NY Days Open
Spring Season	16”-18” Slot Limit	4	30	30 (+30)
Summer Season		2	62	0
Fall Season		4	58	71

TAUTOG: Summary of Management Issues/Options in Draft Amendment 1

1. Options highlighted in green are the approved options through Board Action at the August 2017 Tautog Management Board Meeting
2. Options enclosed in a box have not been addressed through Board Action and will be considered at the October Tautog Board Meeting

2.2 Goals (pg. 48-49)

Option A. Status Quo. Maintain the 1996 Goals

Option B. Revised Goal Statement

2.3 Objectives (pg. 49-51)

Option A. Status Quo: Maintain the 1996 Objectives

Options B-H: Modified Objectives

2.5 Biological Reference Points (pg. 53-54)

Option A. Status Quo - Reference Points can be modified via a Management Document

Option B. Reference Points can be modified via Board Action (i.e., Management Document Not Required)

2.7.1 Fishing Mortality (F) Target (pg. 54-55)

Option A. Status Quo

Option B. Managing to the Regional F Target

Sub-Option B1: No Time Requirement

Sub-Option B2: Board Action within One Year

Sub-Option B3: Board Action within Two Years

Probability of Achieving F Target (pg. 55)

Option A. Status Quo

Option B. 50% Probability of Achieving F Target

2.7.2 F Reduction Schedule (pg. 55-56)

Option A: Status Quo

Option B: Three Years

Option C: Five Years

2.7.4 Stock Rebuilding Schedule (pg. 56)

Option A: Status Quo

Option B. A Stock Rebuilding Schedule can be developed via an Addendum

Option C. A Stock Rebuilding Schedule can be developed via an Addendum, Not to Exceed 10 Years

4.0 Management Program Implementation

4.1 Regional Boundaries (pg. 65-66)

Option A. Status Quo – Coastwide Management

Option B. Regional Management (Four Regions)

Long Island Sound Boundaries (pg. 69)

Sub-Option B1: LIS Boundaries, Montauk Point, NY to Watch Hill, RI

Sub-Option B2: LIS Boundaries, Orient, NY to Watch Hill, RI

4.2.2 MASSACHUSETTS-RHODE ISLAND (starting on pg. 72)

4.2.2.1 MARI Recreational Management Measures (pg. 73)

Option A. Status Quo

Option B. All measures consistent (16", 3 & 4 fish)

Option C. All measures consistent (16", 3 fish)

4.2.3 LONG ISLAND SOUND (starting on pg. 74)

The Following Options have a 50% Probability of Achieving F Target (47.2% or more harvest reduction)

4.2.3.1 LIS Recreational Management Measures (pg. 74-75)

Option A. Status Quo; state-specific reduction

Option B1. Consistent Minimum Size (16") and Possession Limit (1)

Option B2. Consistent Minimum Size (17") and Possession Limit (2)

Option B3. All Measures Consistent (16", 1 fish)

4.2.3.2 LIS Commercial Management Measures (pg. 76)

Option A1. Status Quo

Option B1. Regional Quota

4.2.3.3 LIS Slot Limit for the recreational and commercial fisheries (pg. 76-77)

Option C. 16-18” Slot Limit

4.2.4 NEW JERSEY - NEW YORK BIGHT (starting on pg. 78)

The Following Options have a 50% Probability of Achieving F Target (2% or more harvest reduction)

4.2.4.1 NJ-NYB Recreational Management Measures (pg. 79)

Option A1. Status Quo

Option B1. Consistent Minimum Size (15”) and Possession Limit (4)

Option B2. Consistent Minimum Size (16”)

Option C1. Slot Limit (15-18”) with Consistent Possession Limits (4)

4.2.4.2 NJ-NYB Commercial Management Measures (pg. 80)

Option A1. Status Quo

Option B1. Consistent Minimum Size (15”)

Option B2. Consistent Minimum Size (16”)

Option B3. Commercial Quotas

Option C4: Slot Limit (15-18”)

4.2.5 DELAWARE - MARYLAND – VIRGINIA (starting on pg. 81)

4.2.5.1. DelMarVa Recreational Management Measures (pg. 82)

Option A. Status Quo

Option B. Consistent Possession Limit (4) and Seasons

Option C. Consistent Minimum Size (16”)

Option D. All Measures Consistent (16” and 4 fish)

4.2.5.2 DelMarVa Commercial Management Measures (pg. 82)

Option A. Status Quo

Option B. Adopt recreational measures as commercial measures for DE and MD

4.3 Commercial Quota (pg. 83-84)

Option A. Status Quo

Option B. Commercial Quota Procedures

4.4 Commercial Harvest Tagging Program (pg. 84-86)

Option A. Status Quo

Option B. Implement a Commercial Harvest Tagging Program

4.4.3 Tag Application (pg. 85-86)

Option A. Harvester Application at Harvest or Upon Landing

Option B. Application by Dealer

Tautog

Activity Level: Medium

Committee Overlap Score: Medium (overlap with BERP, Menhaden, Striped Bass, BSB/S/SF)

Committee Task List
• TC – Review the commercial tagging program implementation plans • LEC – Review the commercial tagging program implementation plans • TC – (pending Board action on Draft Amendment 1) Additional review of the management options provided in Draft Amendment 1. • TC - May 1: compliance reports due • TC – Evaluate the 5-year trigger for the benchmark stock assessment

TC Members: Jason McNamee (Chair, RI), Linda Barry (NJ), Sandra Dumais (NY), Scott Newlin (DE), Deb Pacileo (CT), Alexei Sharov (MD), Tiffany Vidal (MA), Katie Drew (ASMFC), Caitlin Starks (ASMFC)
Supporting Technical Personnel: Greg Wojcik (CT), John Maniscalco (NY), Jacob Kasper (UConn)

Spiny Dogfish

Activity level: Low

Committee Overlap Score: Low (SAS overlaps with Atlantic striped bass, BERP)

Committee Task List
• TC – July 1st: Compliance Reports Due

TC Members: Scott Newlin (DE, TC Chair), Russ Babb (NJ), Matt Cieri (ME), Tobey Curtis (NMFS), Jason Didden (MA), Beth Egbert (NC), Michael Frisk (Stonybrook), Matthew Gates (CT), Lewis Gillingham (VA), Greg Hinks (NJDFW), Wilson Laney (USFWS), Paul Rago (NMFS), Eric Schneider (RI), Gregory Skomal (MA), Angel Willey (MD), Kristen Anstead (ASMFC), Max Appelman (ASMFC), Kirby Rootes-Murdy (ASMFC)

SAS Members: Paul Rago (NMFS), Roger Rulifson (East Carolina University), Alexei Sharov (MD), Katherine Sosebee (NMFS), Kristen Anstead (ASMFC), Max Appelman (ASMFC)

Atlantic Herring

Activity Level: Low

Committee Overlap Score: Medium (Menhaden, BERP)

Committee Task List
• TC – Feb. 1: compliance reports due • TC – Summer: Monitor Landings to inform days out • TC – Fall: Monitor GSI Sampling for spawning closures • Matt C. will participate on the Atlantic Herring Stock Assessment Working Group through the SAW/SARC Process.

TC Members: Renee Zobel (NH, Chair), Matt Cieri (ME), Micha Dean (MA), John Lake (RI), Kurt Gottschall (CT), Deirdre Boelke (NEFMC), Madeleine Hall-Arber (CESS)

Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: **Shad and River Herring Management Board**

FROM: **Caitlin Starks, FMP Coordinator**

DATE: **October 3, 2017**

SUBJECT: **Summary of Technical Committee review of shad SFMPs and recommendations to the Board for approval of SFMPs**

Technical Committee Members:
Robert Adams (NY DEC), Mike Bailey (USFWS), Jacque Benway Roberts (CT DEEP), Brad Chase (Chair, MA DMF), Joe Cimino (VMRC)*, Ellen Cosby (PRFC), Mike Dionne (NH F&GD), Phil Edwards (RI DEM), Don Harrison (GA)*, Ruth Haas-Castro (NOAA/NMFS), Eric Hilton (VIMS)*, Chad Holbrook (SC)*, Reid Hyle (FL FWC), Wilson Laney (USFWS), Jeremy McCargo (NC WRC), Genine McClair (MD DNR), Brian Neilan (NJ DF&W), Jim Page (GA)*, Bill Post (SC)*, Ken Sprankle (USFWS), Josh Tryninewski (PA FBC), Holly White (NC DMF)
**Some TC members were only present on one of the two calls to review SFMP updates*

ASMFC Staff: Kirby Rootes-Murdy, Caitlin Starks, Jeff Kipp

The Shad and River Herring Technical Committee met via two conference calls to review the following sustainable fishery management plans (SFMPs) for American shad. On September 11, 2017 the TC reviewed the plan updates for North Carolina, Potomac River Fisheries Commission, Connecticut and a limited bycatch allowance proposal from Virginia. On October 3, 2017, the TC reviewed plan updates from South Carolina and Georgia. Each plan was presented by the respective state's TC member. The presentations were to include the following information: structure of the plan, definition of sustainability, sustainability targets, timeframes for achieving targets, monitoring of the stocks to be conducted, and data to be used for evaluation.

1) Updated North Carolina SFMP

The presentation was given by Holly White. The plan is very similar to NC's previously approved SFMP for shad, with a few changes. The first change is that under the updated plan relative fishing mortality (relative *F*) will be calculated by dividing commercial landings by a hind cast 3-year average of a survey index instead of a centered 3-year average. The second change is that the 25th and 75th percentiles used for sustainability thresholds will remain set for the next 5-year management period. North Carolina requests having recreational and commercial fisheries in all coastal rivers and will use management measures outlined in the plan to maintain fishery sustainability.

The TC expressed concern with the fact that the plan does not include fishery independent monitoring of two coastal rivers (New and White Oak rivers), yet harvest is still allowed to occur in these systems.

The TC recommends that the board approve NC's SFMP, with the following revisions:

- *Include a table summarizing management measures*
- *Alter language in section 3.1 to imply that one or more of the listed potential management measures will be used when management triggers are reached*
- *Add language to show that there are not significant fisheries occurring in unmonitored rivers*

The TC discussed the need for the Board task to task the TC with developing a better protocol for managing river systems that allow harvest without river-specific sustainability parameters, and defining these systems beyond the language in Amendment 3. This seems to be a point of discussion for several states with unmonitored rivers where a fishery may still occur, and may need to be addressed in future plan updates.

The plan was revised and returned to ASMFC staff by September 19th.

2) Updated Potomac River Fisheries Commission SFMP

The presentation was given by Ellen Cosby. The updated SFMP is similar to the previously approved plan. PRFC requests a continued limited commercial by-catch allowance of American shad in the section of the Potomac River under PRFC jurisdiction. The benchmark goal identified in the 2007 Stock Assessment was approved as a restoration target and has been exceeded each year since 2011.

The TC suggested that the plan would need to provide more clarity on the sustainability triggers that would lead to management action, and what measures would be taken in the case that these triggers were reached. Suggestions included using the restoration target as a biomass threshold, where if biomass fell below the threshold for 3 consecutive years a management response would be triggered.

The TC recommends Board approval of this plan contingent on these additions. The plan was revised and returned to ASMFC staff by September 19th.

3) Updated Connecticut SFMP

The presentation was given by Jacque Benway Roberts. The Connecticut SFMP is only for the American shad fishery in the Connecticut River. The plan clearly defines the sustainability metrics and targets, management measures, monitoring program, and data to be used.

Similar to the other plans, the TC recommends that a table summarizing management measures be added to the plan. The TC also recommends language be added to better define what management responses will occur if a trigger is reached.

The plan was revised and returned to ASMFC staff by September 19th.

4) VA limited commercial bycatch proposal
The proposal was presented by Joe Cimino, Virginia Marine Resources Commission (VMRC). The VMRC requests a limited bycatch allowance of American shad. The same conservation measures currently in place will be used for 2018-2022. The VMRC has capped the number of bycatch allowance permits at 30 to control harvest. Permittees must allow biological sampling of their catch to provide data to the Virginia Institute of Marine Science (VIMS).

The TC recommends approval of the plan with the following addition:

- *Add language that indicates that permittees are monitored to ensure they are not targeting shad, and that measures will be taken to prevent permittees from abusing the permit.*

The proposal was revised and returned to ASMFC staff by September 19th.

5) South Carolina updated shad SFMP
The plan was presented by Chad Holbrook, SC Department of Natural Resources. South Carolina's SFMP includes open fisheries for the Pee Dee River Run and the Black, Santee-Cooper, Edisto, Combahee and Savannah Rivers; all other shad fisheries will remain closed. The plan presents sustainability benchmarks, season dates, bag limits and gear specifications for each river. The Black and Combahee Rivers CPUE data are confidential but the CPUE has remained above the benchmark in recent years, along with the other rivers in the plan. Several conservation measures are proposed for various rivers to reduce bycatch of both sturgeon species and shad exploitation. These include stricter commercial and recreational gear restrictions, procedural changes, shifted and/or shortened seasons, reduced bag limits, and license caps.

The TC recommends approval of the SC SFMP with the following changes:

- *Add bullets for future objectives and consideration:*
    - *Consider joint coordination with NC on the Great Pee Dee River similar to what is occurring on the Savannah River (GA)*
    - *Consider ways to develop current juvenile indices to perhaps be used in future updates to the plan.*
    - *Begin discussions with GA to develop consistent management measures for the Savannah River in the event that either state falls below the sustainability benchmark for 3 consecutive years.*
    - *For the next plan review, evaluate potential biological metrics derived from ongoing shad sampling for use as plan benchmarks*
- *Add a column to Table 1 with type of benchmark (fishery-dependent or independent*

The plan was revised and returned to ASMFC staff by October 5th.

6) Georgia updated shad SFMP
The plan was presented to the TC by Don Harrison, GA Department of Natural Resources. The plan requests commercial and recreational fisheries on the Altamaha and Savannah Rivers, and a recreational fishery only on the Ogeechee River. CPUE benchmarks are in place for each river,

and if CPUE falls below a benchmark for 3 consecutive years, GA DNR will establish conservation measures to ensure fishery sustainability. The Satilla and St. Marys are technically open to recreational harvest of shad with the 8 fish bag limit for the state, but shad have not been observed in angler harvest during creel surveys from 2006-2014 on the Satilla, and there is no recreational survey on the St. Marys. Electrofishing surveys for sportfish indicate low abundance of shad on both rivers and thus a recreational fishery on these rivers is not thought to impact the stock.

The TC is concerned with these recreational fisheries, as they do not technically follow the sustainability metric and monitoring requirements of Amendment 3, and the TC feels it should apply the Amendment consistently to all rivers. The TC suggested that GA could specify that these fisheries are catch and release only, however, this would require a change in DNR rules and the state managers feel it is unnecessary as the change would provide no conservation benefit. The TC agreed to address this issue with the Board, but recommends this plan be approved considering the precedent set when other plans were approved regardless of presenting similar inconsistencies with Amendment 3.

The TC recommends approval of GA's SFMP with only the following additions:

- *Add a section for future objectives, including plans for evaluating the addition of biological metrics related to length and age data, and juvenile indices to the next plan update.*
- The GA SFMP was revised and returned to ASMFC staff by October 5th.

7) Other Discussions

Regarding the issue of inconsistency between SFMPs and Amendment 3 requirements, the TC discussed the need to develop language to address rivers where shad and river herring harvest is allowed to occur, but monitoring and sustainability measures are not in place. The TC recognized that as this was the first review of original shad SFMPs following Amendment 3 the opportunity should be taken to address uncertainties in Amendment 3 directives and to consider standardized improvements in the plans.

Commission staff also brought up concern about the current mismatch between SFMPs use of sustainability benchmarks that are not directly tied to the total mortality estimates from either species' benchmark stock assessments or the recent river herring stock assessment update. This disconnect between the stock assessment information and the SFMPs further highlights the need to revamp how SFMPs are evaluated and the standards against which they are reviewed by the TC.

The TC and ASMFC staff will prepare a memo for the Board on these issues, requesting that the TC be tasked with continuing to work on this issue, among other improvements to the management documents. These included incorporating new shad assessment information into Amendments and SFMPs, standardizing metrics, management actions and reporting, clarifying *de minimis* requirements relating to SFMPs, and clarifying data requirements for demonstrating sustainability.

American Shad Sustainable Fishing Plan Update for South Carolina

Prepared by

Bill Post and Chad Holbrook

August 30, 2017

DNR

South Carolina Dept. of Natural Resources

Wildlife and Freshwater Fisheries and Office of Fisheries Management

Updated-ASMFC American Shad Sustainable Fishing Plan for South Carolina

Introduction:

The purpose of this sustainable fisheries management plan is to allow existing shad fisheries that are productive and cause no threat to future stock production and recruitment to remain in place and close all others. Excerpts from the ASMFC 2007 stock assessment for SC's American shad were used in this document (ASMFC 2007). The assessment, which was prepared and submitted to the ASMFC shad and river herring board by SCDNR and the Stock Assessment Subcommittee (SASC), summarizes SC's fisheries for American shad.

American shad (*Alosa sapidissima*) are found in at least 19 rivers of South Carolina (Waccamaw, Great Pee Dee, Little Pee Dee, Lynches, Black, Sampit, Bull Creek, Santee, Cooper, Wateree, Congaree, Broad, Wando, Ashley, Ashepoo, Combahee, Edisto, Coosawhatchie, and Savannah rivers). Many have historically supported a commercial fishery, a recreational fishery, or both, including the Winyah Bay system (primarily the Waccamaw and Pee Dee rivers), the Santee-Cooper system, Ashley, Edisto, Ashepoo, Combahee, Coosawhatchie, and Savannah Rivers (Figure 1).

Figure 1. Map of major South Carolina drainage basins and river systems with American shad (*Alosa sapidissima*) fisheries or historical American shad runs.

Currently, commercial fisheries exist in Winyah Bay, Waccamaw River, Pee Dee, Black, Santee, Edisto, Combahee, and Savannah rivers, while the Sampit, Ashepoo, Ashley, and Cooper rivers no longer support commercial fisheries. With the closure of the ocean-intercept fishery beginning in 2005, the Santee River and Winyah Bay complex comprise the largest commercial shad fisheries in South Carolina. Recreational fisheries exist in the Cooper, Savannah, Edisto, and Combahee rivers, as well as the Santee River Rediversion Canal.

Data for American shad are available to assess trends in fishery and stock status for the following river systems in South Carolina: the Pee Dee run (consisting of Winyah Bay, Waccamaw and Great Pee Dee rivers), Santee River, Cooper River, Edisto River, Combahee River, and Savannah River. Additional data for the Savannah River are provided by Georgia Department of Natural Resources (GADNR).

The South Carolina Department of Natural Resources (SCDNR) manages American shad populations and collects fishery-independent and fishery-dependent data for the major shad rivers in the state. SCDNR has collected voluntary landings data by river system since 1979 and instituted mandatory catch and effort reporting in 1998. There are still some gaps in these data, but they provide the broadest temporal and spatial view of American shad stocks in South Carolina. As part of fishery independent sampling, SCDNR also conducted tag-return studies in the gill-net fisheries for several rivers, but these were not used to determine stock status, because in recent years, fishers have grown skeptical that providing tag returns to SCDNR led to new more restrictive changes in the fishery and may lead to future closures. In the past, these studies rotated among rivers and ran 2 to 5 years per river before moving to a different river. However, due to growing concern for the species, SCDNR began conducting this monitoring in multiple "reference" rivers during the shad season. During these studies, SCDNR collected biological information to support other studies (e.g., age, repeat spawning, length and weight data). In some systems, SCDNR also conducted creel surveys (Cooper River and Savannah River), fish counts (Santee River), and young of the year (YOY) sampling (Santee-Cooper system, Pee Dee River, Edisto River, and Savannah River).

This plan primarily draws upon investigations conducted by the SCDNR's Marine Resources Division and Division of Wildlife and Freshwater Fisheries to provide a river-specific assessment of relative stock status for American shad. The general approach to this document was to (1) characterize fisheries by the magnitude and trend of landings data (Catch Per Unit Effort=CPUE) and note if the system still supports a viable fishery and (2) review supporting fishery-dependent and fishery-independent data sets and conduct analyses for each river system when applicable.

Current Regulations:

South Carolina manages its shad fisheries using a combination of seasons, gear restrictions, and catch limits (Appendix 1.) implemented over several management units: Winyah Bay and Tributaries (Waccamaw, Great Pee Dee, Little Pee Dee, Lynches, Black and Sampit rivers); Santee River; Charleston Harbor (Wando, Cooper & Ashley rivers); Edisto River; Ashepoo River; Combahee River; Coosawhatchie River; Savannah River within South Carolina; Ocean Waters; and Lake Moultrie, Lake Marion, Diversion Canal, Intake Canal of Rediversion Canal and all tributaries and distributaries.

The first river-specific commercial regulations for American shad in South Carolina were enacted in 1993 for the Edisto River in response to SCDNR's studies that identified overfishing as a major contributor to a perceived trend of population decline [Act # 343 of the 1992 South Carolina General Assembly].

Beginning with the 1998 commercial shad-netting season, all licensed fishermen are required to report their daily catch and effort to the SCDNR. In 2000, Act #245 of the 2000 South Carolina General Assembly was passed in response to the perceived population status of shad populations in each of the state's river systems supporting an American shad fishery. This Act led to the closure of the commercial gill-net fishery on the Coosawhatchie River and a substantial reduction in potential gill-net fishery effort for other systems supporting small American shad stocks in South Carolina, including the Combahee, Ashepoo, and Ashley rivers (www.dnr.sc.gov).

Significant changes in shad and herring regulations became effective in 2001 with the passage of the Marine Resources Act of 2000, which gave the SCDNR authority to implement a permit program for the State's shad and herring fisheries. All commercial shad and herring fishery license holders were issued permits that could be used to "restrict the number of nets for taking shad…in any body of water where the number of nets or fishermen must be limited…to prevent congestion of nets or watercraft, or for conservation purposes". The number and conditions of permits can be controlled "to designate areas, size and take limits, hours, type and amount of equipment, and catch reporting requirements," and enabled SCDNR to phase out the ocean-intercept fishery by 2005. In addition, a recreational aggregate creel limit of 10 American and hickory shad per person was implemented in all state waters, except for the Santee River in which a 20 fish creel limit was set.

Further proposed restrictions in the previous SFMP document, to address sustainability, were implemented in 2013 and were the first changes in SC's shad fishery since the closure of the ocean-intercept fishery in 2005. These changes (Appendix 3), in concert with changes required by the National Marine Fisheries Service (NMFS) to account for by-catch of sturgeon (Appendix 2), without a doubt, far exceeded by a wide margin, any restrictions imposed on SC's shad fishery to date.

Brief description – Current status of the stocks:

a) Landings:

South Carolina has monitored commercial fisheries for American shad within state waters since 1979. The NMFS landings data before 1979 were collected from major wholesale outlets located near the coast; therefore, it is likely that inland landings were not completely accounted for in these years, since many shad fishermen claim not to sell their catch and keep it for personal consumption. No landings were attributed to the South Carolina ocean-intercept fishery before 1979. SCDNR has landings by system since 1979 for the Atlantic Ocean (i.e., the ocean-intercept fishery), Winyah Bay, Waccamaw River, Pee Dee River, and Santee River. These data were used in the 2007 shad stock assessment by SC and ASMFC. Data collected since 1979 generally include inland landings and should be considered as a separate time series. Those time series begin in 1998 when the mandatory reporting requirement was instituted for the statewide fishery.

There are some discrepancies between SCDNR and NMFS American shad landings. One reason for this is that NMFS uses dealer landings reports for their records; however, many shad fishermen claim not to sell their catch and keep it for personal consumption.

The Cooper River supports an active recreational fishery below the Pinopolis Dam tailrace in the late winter to early spring. SCDNR has conducted a creel survey from 2001 to 2015 to estimate exploitation and catch-per-effort in this recreational fishery. SCDNR also conducted sportfishing creel surveys on the Cooper and Santee Rivers from 1981 to 1982 and 1991 to 1993 in order to evaluate the impact of the Rediversion Canal on these rivers' recreational fisheries (Cooke and Chappelear 1994). These surveys examine the total recreational fisheries on each river for each study period.

Recreational creel surveys were conducted on the Savannah River in the late 1990s by GADNR (1997) and SCDNR (1998 and 1999). Estimates of catch from these surveys varied from year to year largely due to dramatically different flow conditions, as 1998 was a "flood" year and 1999 a "drought" year. Catch estimates from each of these creel surveys are available in Boltin (1999); however, the year-to-year estimates were highly dependent on the impacts of the river flow on the recreational fishery. In 1997, no additional information on the flow was reported. Due to requirements of Amendment 3 to ASMFC's shad and river herring fishery management plan, SCDNR conducted creel surveys beginning in 2011, however, due to the deteriorating wing wall at the New Savannah Bluff Lock and Dam, recreational fishing is no longer permitted at this location.

b) Fishery Independent Indices:

Spawning stock:

Fishery-independent CPUE data were collected using 12.7 cm stretch mesh drift gill nets for the years 1994 - 2015. In the past, as approved by Amendment 1 of ASMFC's shad and river herring fishery management plan (FMP), these studies rotated among rivers and ran 2 to 5 years per river before changing river systems. However, due to growing concern for the species, SCDNR began conducting this monitoring on multiple "reference" rivers during the season. During these studies, SCDNR collected biological information to support other studies (e.g., age, repeat spawning, length and weight data).

Juvenile Surveys:

Trawl sampling studies were conducted for juvenile American shad in the fall of 1985 in the Edisto River and Winyah Bay using 4.9 and 7.6 m otter trawls. Sampling in the Edisto River occurred from September through November with 32 trawls that caught two American shad. Winyah Bay sampling took place October and November. Nineteen trawls over five stations yielded three American shad. Data were also collected from another SCDNR trawl project in the Santee River where 15 juvenile American shad and 30 juvenile blueback herring were collected. These programs were discontinued after a single sampling season. However, due to growing concerns to prove sustainability, SCDNR began yearly sampling for YOY in 2009 in some systems and 2010 in others. In addition, YOY sampling in the Santee Cooper Lake System occurred as part of yet another SCDNR study in 2008.

c) Fishery Dependent Indices:

Historical commercial shad landings from NMFS are available for South Carolina back to 1880 with the highest reported landings occurring in 1896 (304,819 kg). NMFS reporting agents compiled landings recorded before 1979. Landings data are available for 11 years between 1880 and 1926 with a range of 94,349 to 304,819 kg and a mean of 188,615 kg. Beginning in 1927, a continuous data stream of landings is available to the present, except for the 1940s (WWII). Landings generally declined from the late 1800s throughout the twentieth century reaching a low in the 1970s, with annual landings averaging 16,477 kg from 1973 to 1976.

With the onset of mandatory reporting in 1998, South Carolina shad fishermen were required to report effort and landings data. In 2000, 2,727 commercial shad fishing trips were reported to SCDNR. The number of reported trips generally decreased from 2000 to 2015 with 1,281 trips taken in 2015. Nearly all fishermen (>95%) have submitted at least one monthly report since 2000, while only 60 to 70 percent report some catch (SCDNR records). It is likely that the ocean-intercept fishery closure in 2005 contributed to the decrease in landings from the 2004 amount of 170,212 kg.

With the closing of the ocean-intercept fishery in 2005, the Santee River and Winyah Bay now constitute the largest remaining commercial shad fisheries in South Carolina with Santee River landings comprising 58 percent and Winyah Bay landings 38 percent of the 2005 statewide total. In 2015, shad trips in Winyah Bay complex and Santee River accounted for 35 percent and 46 percent of the total shad trips, respectively.

d) Other: none

e) Fisheries Closed in the previous plan

a. Waccamaw River (Bull Creek to North Carolina border)
b. Ashley River
c. Charleston Harbor
d. Wando River
e. Ashepoo River

Fisheries requested to be Open (Commercial and Recreational):

a. Pee Dee River run (Winyah Bay, Waccamaw, and Pee Dee River)
b. Black River
c. Santee Cooper System
d. Edisto River
e. Combahee River
f. Savannah River

f) Sustainability

Systems with "sustainable fisheries" are defined as those that demonstrate shad stocks could support a commercial and / or recreational fishery that will not diminish potential future stock reproduction and recruitment. Data used, in most cases, are landings (CPUE) that occurred since the 2007 stock assessment (i.e. after 2004). Sustainability for SC rivers is determined by catch trends (both using fishery-independent and fishery-dependent data), and in some cases, juvenile abundance. In addition to these, as part of requirements of Amendment 3, SC already imposed several gear restrictions, cap limits, and changes to the legal fishing season. Furthermore, in response to the National Marine Fisheries Service (NMFS), SC further restricted the fishery to account for and limit the by-catch of sturgeon in the shad fishery. In 2013, statewide gear restrictions were implemented (Appendix 2). These restrictions, while resulting in an 88% reduction of by-catch of Atlantic and shortnose sturgeon, also no doubt led to more protection for adult shad during spawning runs. Sustainability targets have been developed by using fishery-dependent data (landings/CPUE) and/or fishery-independent data collected since the last year of data included in the stock assessment and using the 25th percentile of the annual mean (Table 1).

Pee-Dee River Run (Winyah Bay, Waccamaw to Bull Creek, and Pee Dee River)

In order for American shad to enter the Pee Dee River, they must first swim through the Winyah Bay and the lower most portion of the Waccamaw River. Therefore, SCDNR will refer to this as the Pee Dee River Run of shad. There is little doubt some shad continue up the Sampit and Waccamaw Rivers, but those rivers/river segments are not being considered in this sustainability option and were closed to fishing in 2013 (Figure 2).

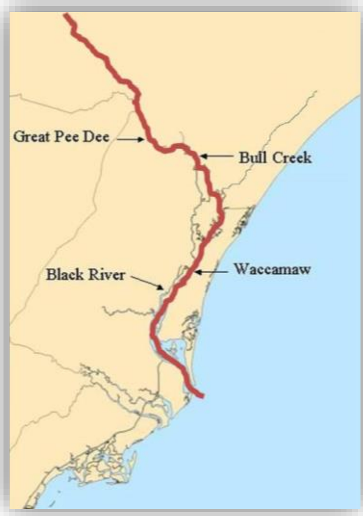

Figure 2. Map of the Winyah Bay system highlighting the "Pee Dee run" of shad

SCDNR uses both fishery-independent and fishery-dependent data to justify the continued existence of this fishery. The 2007 stock assessment concluded "that, overall, these shad stocks have remained stable or increased slightly since the late 1970s." More recent catch rates (kilogram of shad captured in a 92m. net fished for one hour) also indicate a stable trend (Figure 3). In fact, during the 2011 fishing season, fisheries were suspended twice for two weeks at a time, due to the excess of shad at the local fish markets. SCDNR also conducts fishery-independent sampling in the Waccamaw River using gear comparable gear (92m. floating/drift gill net with 12.7 cm. stretch mesh) and observed similar catch rates (CPUE=kg. of shad/92m. net/1 hr.). SCDNR will continue this sampling on an annual basis.

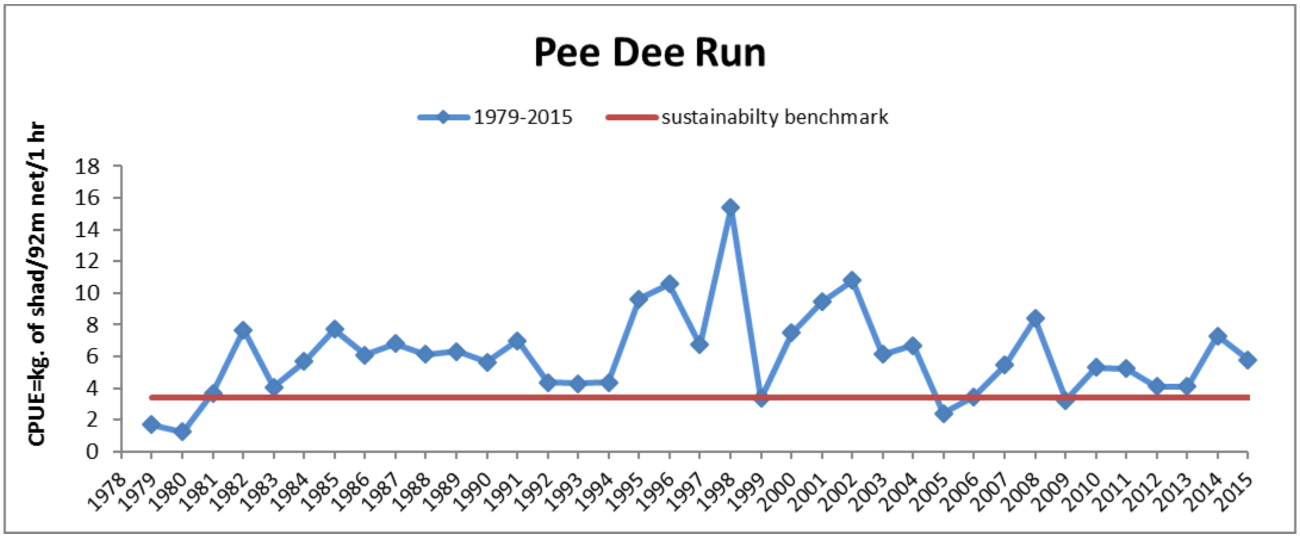

Figure 3. Commercial catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Pee Dee run

Beginning in 2010, SCDNR also collected YOY shad from this system during the summer outmigration. Shad with lengths ranging from 77-137mm were collected using electro-fishing gear. Catch rates (CPUE=number of shad caught per hour) were equal to 31.28. This was also somewhat comparable to efforts from another SCDNR survey conducted in 2008 which yielded a CPUE of 47 for American shad. However, during this study, more sites were used over a broader reach of river during this project and unfortunately, due to ongoing budget cuts, sampling for this project was discontinued. However, YOY sampling is consistent with results from 2010 and will continue on an annual basis.

SC requests to maintain this fishery at current levels with annual monitoring to occur as mentioned. The Pee Dee run is considered by SCDNR to be sustainable at current levels and with newly passed regulation changes, migrating shad should receive additional protection which will only help the sustainability of the species. The approved sustainability benchmark of 3.41 was developed by using the 25th percentile of the annual mean for CPUE's for the last ten years. If the CPUE's fall below the sustainability target for three consecutive years, management action will be taken. Potential management actions are gear restrictions, season changes, catch limits, or closure.

Black River

The 2007 stock assessment concluded “This relatively small river is perceived to have undergone significant American shad stock declines over the past 25 years.” More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data (2000-2015) suggest that while catches are low, they remain consistent and, given the low effort, appear to be stable in more recent years. Currently, the Black River commercial shad fishery consists of only 2 fishermen and neither fisherman depends on their catch for commercial purposes. Because the number of fishers decreased since 2011, landings data for this river are confidential are not provided in this plan. However, it should be noted, catch rates for this river did not fall below the approved sustainability benchmark. Additionally, the Black River remains an undammed river with low flow rates which pale in comparison with those from the dammed Santee River (5912 cfs) or Pee Dee River (11,267 cfs) for the same time series.

SC requests to maintain this fishery at reduced levels. The Black River run of shad is considered by SCDNR to be sustainable at lower levels and with newly passed regulations, migrating shad should also receive additional protection. If catch rates (CPUE= kg. of shad/ 92m net fished for 1 hr.) for the Black River run commercial fishery fall below 0.97 three consecutive years, changes by SCDNR to the commercial regulations will be implemented. This sustainability benchmark was developed by using the 25^{th} percentile of the annual mean for CPUE’s for the last ten years. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Regulatory changes mentioned earlier, greatly affected fishing effort and gear used in the Winyah Bay System Rivers. These changes may be responsible for the perceived increase in catch rates in recent years. In any event, SC believes current restrictions (shortened season, allowable nets reduced by 90%, restrictions on recreational netters gear, 50% reduction for recreational anglers limit, and ultimately capping the fishery at current levels) in combination with those required statewide by NMFS for the incidental by-catch of sturgeon, will provide adequate protection for spawning shad for years to come.

Santee Cooper System

Santee River

SCDNR has both fishery-independent and fishery-dependent data to justify the continued existence of this fishery. The 2007 stock assessment concluded “that the Santee River American shad stock in the Santee River benefited greatly from the Rediversion project.” Catch rates (CPUE), used in the assessment, indicated a stable if not increasing trend. More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data suggest that those trends continue (Figure 4). As mentioned earlier, during the 2011 fishing season, fisheries were suspended twice for two weeks at a time, due to the excess of shad at the local fish markets.

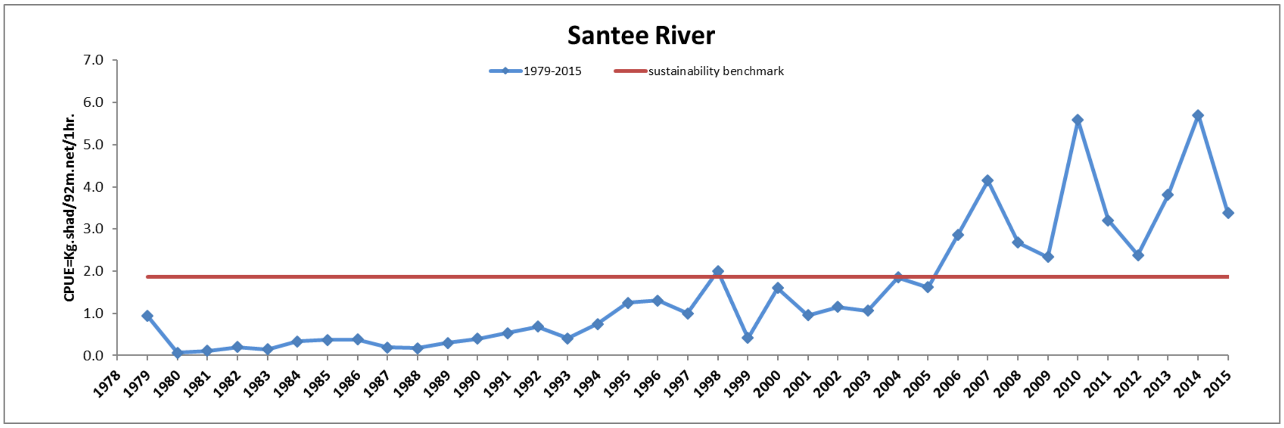

Figure 4. Commercial catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Santee River.

SCDNR also conducts fishery-independent sampling in the Santee River using comparable gear (92m. floating/drift gill net with 12.7 cm stretch mesh) to provide trends of abundance for the spawning stock. Catch rate (CPUE=# of shad/92m. net/1 hr.) data for this sampling (2008-2015) is included in Figure 5.

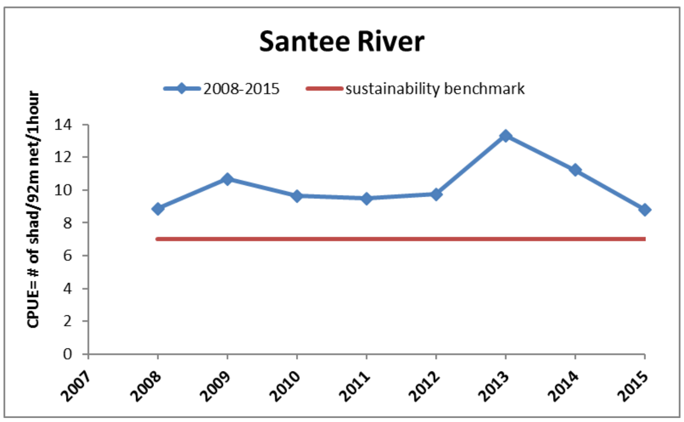

Figure 5. Fishery-independent catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Santee River.

SC requests to maintain the Santee River fishery at current levels with annual monitoring to occur as mentioned. This run is considered by SCDNR to be sustainable at current levels and with new regulations, migrating shad should receive additional protection. SC proposes that a catch rate sustainability benchmark of 1.8 (kg. of shad/92m net fished for 1 hr.) be used to manage the Santee River commercial shad fishery. In addition, fishery-independent sampling catch rates (CPUE) for the Santee River must not fall below 7. These sustainability benchmarks were developed by using the 25th percentile of the annual mean for CPUE's for the last ten years or in the case for the fishery independent data all available data. If catch rates or CPUE's fall below the sustainability targets for three consecutive years, management action will be taken. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Cooper River

No commercial fisheries exist on the Cooper River by SC regulation. However, there is a recreational fishery that exists below Pinopolis Dam. SCDNR conducts annual creel surveys to assess catch rates in this fishery. The Cooper River fishery is concentrated near Pinopolis Dam from the sanctuary line (0.2 km downstream of the dam) to about one km downstream of the dam. Since the fishery season is relatively short (about two months) effort and catch-per-unit-effort were estimated daily to increase precision. Data collection, consisting of either angler surveys, effort estimates, or both were conducted for virtually all days during each year's study period, which was defined subjectively by angler presence and manpower availability. During survey periods, a creel clerk interviews shad fishermen as they land their boats. An average of 6 hours of survey periods are conducted during daylight hours. Creels take place during these time periods because it was determined these were times when the most effort was being exhibited. Effort estimates consists of counting boats in the fishery, which is virtually entirely visible from the Pinopolis Dam, several times daily; this estimate assumes that the maximum daily count equals total daily effort. Catch rate (CPUE=#shad caught in 1 hour) data from these surveys has been collected, beginning in 2000, and is used to manage the fishery. CPUE for 2015 equaled 2.09, this is consistent with previous 4 years (Figure 6).

SC requests to maintain this fishery at current levels with annual monitoring to occur as mentioned. The Cooper River run is considered by SCDNR to be sustainable at current levels. SC proposes that an sustainability CPUE benchmark of .66 (25^{th} percentile of the annual mean of CPUEs for all years) be used to manage the Cooper River recreational shad fishery. If CPUEs for Cooper River recreational fishery fall below .66, three consecutive years, changes by SCDNR to the recreational regulations will be considered. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

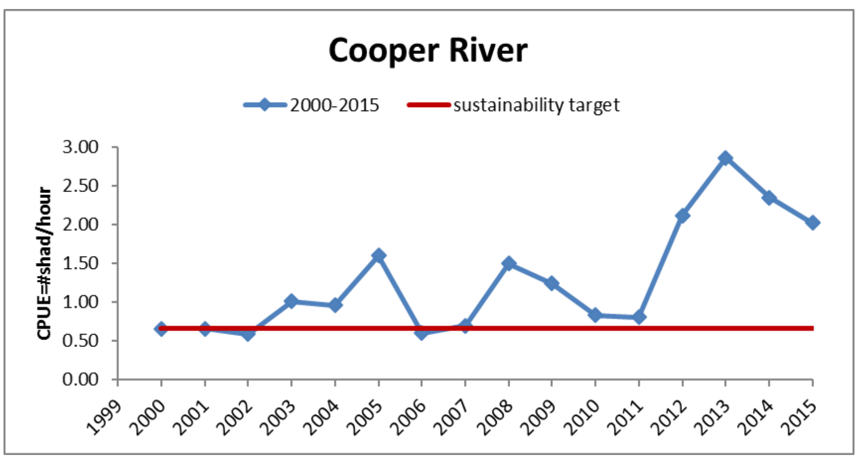

Figure 6. Annual catch per unit effort (# of shad per hr.) and sustainability target for the Cooper River recreational shad fishery.

Edisto River

The 2007 stock assessment concluded "that recent estimates of commercial CPUE have been very low for the Edisto River for time series (1979 to 2005) and average for 13 of the last 15 years, but have rebounded a bit since 1997." More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data suggest that while catches are low, they remain consistent (Figure 7). In addition, the ACE Basin Rivers (Ashepoo, Combahee, and Edisto) have been under "drought" conditions for the majority of recent years. In fact, the average flow during those years was 1453 cfs. This is extremely low considering in "normal" years, flows are ~ 4,500 cfs. Also, the Edisto River is SC's longest undammed river and flows are considerable lower from those of the Santee River (5912 cfs) or Pee Dee River (11,267 cfs) for the same time series.

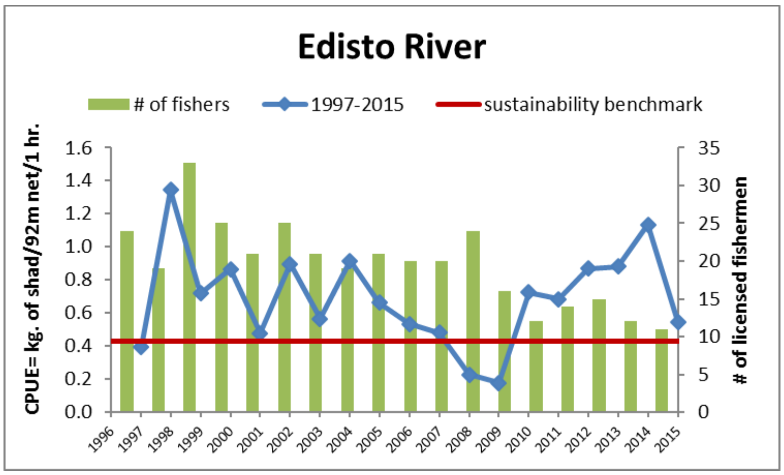

Figure 7. Commercial catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Edisto River.

SCDNR collected fishery-independent data only for the years for years 1994-1998. During these years, shad were captured using a 92m. floating/drift gill net with 12.7 stretch mesh. Catch rates (CPUE=kg. of shad/92m. net/1 hr.) remained relatively consistent for these years. SCDNR tried to duplicate this effort in 2006 and 2007. Unfortunately, due to copious incidental catches of Longnose gar (*Lepisosteus oseus*), sampling was discontinued. These fish were encountered during each sampling trip which made catching shad problematic. When numerous gar became entangled, the net became very inefficient at catching shad. The average catch rate for gar for the sampling periods was 4.86 fish per 92 m net per hour.

SC requests to maintain this fishery at reduced levels with annual monitoring to occur as mentioned. The Edisto River run of shad is considered by SCDNR to be sustainable at lower levels in combination with new regulation changes, migrating shad should receive additional protection. If catch rates (CPUE= kg. of shad/ 92m net fished for 1 hr.) for the Edisto River run commercial fishery fall below 0.43 three consecutive years, changes by SCDNR to the commercial regulations will be implemented. This sustainability benchmark was developed by using the 25th percentile of the annual mean for CPUE's for the last ten years. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Regulatory changes in 1993 and 2000 mentioned earlier greatly affected fishing effort and gear used in the ACE Basin (Ashepoo, Combahee, and Edisto) rivers. These changes may be responsible for the perceived increase in catch rates in recent years. In any event, SC believes current restrictions coupled with 2013 regulatory changes (shortening the season, cutting allowable nets by 80%, restrictions on recreational netters gear, reducing the recreational anglers limit by 50%, and ultimately capping the fishery at current levels) and in combination with those required statewide by NMFS for the incidental by-catch of sturgeon, will provide adequate protection for spawning shad for years to come.

Combahee River

The 2007 stock assessment concluded “This relatively small river is perceived to have undergone significant American shad stock declines over the past 25 years.” More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data suggest that while caches are low, they remain consistent in the most recent years (Figure 10). Currently, the Combahee commercial shad fishery consists of only 1 fisherman and he doesn’t use the catch for commercial purposes. Because the number of fishers decreased since 2011, landings data for this river are confidential are not provided in this plan. However, it should be noted, catch rates for this river did not fall below the approved sustainability benchmark. In addition, the ACE Basin Rivers (Ashepoo, Combahee, and Edisto) have been under “drought” conditions for the majority of recent years. In fact, the average flow during those years was 182 cfs. This is extremely low considering in “normal” years, flows are ~ 600 cfs. Also, the Combahee River remains an undammed river and flows are extremely low compared with those from the Santee River (5912 cfs) or Pee Dee River (11,267 cfs) for the same time series.

SCDNR collected fishery-independent data for the years for years 1993and 1999. During these years, shad were captured using a 92m. floating/drift gill net with 12.7 stretch mesh. Catch rates (CPUE=kg. of shad/92m. net/1 hr.) were .27 for 1993 and 0.21 in 1999. Like the Edisto River sampling, copious incidental catches of Longnose gar (*Lepisosteus oseus*), led to the termination of sampling efforts. These fish were encountered during each sampling trip which made catching shad extremely problematic. When numerous gar became entangled, the net became very inefficient for catching shad.

SC requests to maintain this fishery at reduced levels. The Combahee River run of shad is considered by SCDNR to be sustainable at lower levels and with new regulations, migrating shad should receive additional protection. If catch rates (CPUE= kg. of shad/ 92m net fished for 1 hr.) for the Combahee River run commercial fishery fall below 0.53 three consecutive years, changes by SCDNR to the commercial regulations will be implemented. This sustainability benchmark was developed by using the 25th percentile of the annual mean for CPUE’s for the last ten years. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Regulatory changes in 1993 and 2000, mentioned earlier, greatly affected fishing effort and gear used in the ACE Basin (Ashepoo, Combahee, and Edisto) rivers. These changes may be responsible for the perceived increase in catch rates in recent years. In any event, SC believes current restrictions coupled with 2013 changes (shortening the season, cutting allowable nets by 90%, restrictions on recreational netters gear, reducing the recreational anglers limit by 50%, and ultimately capping the fishery at current levels) and in combination with those required statewide by NMFS for the incidental by-catch of sturgeon, will provide adequate protection for spawning shad for years to come.

Savannah River

Because the Savannah River occurs in both SC and GA and as part of new ASMFC mandates required in Amendment 3 to the shad and river herring fishery management plan, annual shad monitoring for this system is a cooperative effort between SCDNR and GADNR. Combined, fishery-independent and fishery-dependent data are available to justify the continued existence of this fishery. The 2007 stock assessment concluded “Over the past century, the magnitude of shad landings from the Savannah River has declined tenfold although the CPUE data available since 1979 indicates some stability in the current level of exploitation at a level much reduced compared to historical production.” Catch rates (CPUE), used in the assessment, indicated a stable trend. More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data from SC suggest that those trends continue (Figure 8). Catch rates for GA fishermen are available, but due to confidentiality agreements, are not supplied in this document. However, between the years 2001-2015, fishermen caught no fewer than 25kg of shad per trip.

During the 2010-2015 seasons, GADNR conducted fishery-independent sampling for adult American shad in the Savannah River at the New Savannah Bluff Lock and Dam (NSBL&D), near Augusta, GA (~RKM 302). Shad were collected during their spawning migration (March, April, and May) using electro-fishing gear. Catch rates (CPUE= # of shad/hour) for 2015 were 480.6. This is an increase from CPUE’s of 269.5 that were observed in 2010. This sampling will continue on an annual basis to better assess the abundance of spawning stocks in the Savannah River.

SCDNR also conducted a creel survey of recreational fishermen, at NSBL&D in 2011, 2012, 2013. Sampling was structured similarly to the Pinopolis Dam creel on the Cooper River, SC. However, due to logistical problems, staff was unable to start the creel until well into the shad season. This, unfortunately, led to incomplete angler catch data for those seasons. Creel sampling continued on an annual basis, however, due to the deteriorating wing wall at the NSBL&D, recreational fishing is no longer permitted at this location.

SC and GA request to maintain this fishery at current levels with annual monitoring to occur as mentioned. The Savannah River run is considered by SCDNR and GADNR to be sustainable at current levels and with imposed regulation changes in 2013 taking hold, migrating shad should receive additional protection, which will only help the sustainability. Additionally, before the 2011 season, GA implemented new regulations to protect spawning shortnose sturgeon. This regulation moved the upper commercial boundary downstream approximately 103 rkm. In an effort to protect sturgeon and also remain consistent in a shared border river, SC passed similar regulations. These regulations provide ~136 more river kilometers of additional spawning habitat for shad unobstructed by commercial gear.

SC proposes that a sustainability benchmark for CPUE (kg. shad/92m. net/fished for 1 hr.) of 1.1 be used to manage the Savannah River shad fishery. GA proposes that a sustainability benchmark for CPUE (Kg. shad/trip) of 25.5 be used to manage the Savannah River shad fishery. If either SC or GA falls below the proposed benchmark three consecutive years, changes by SCDNR and GADNR commercial regulations will be considered. These sustainability benchmarks were developed by using the 25th percentile of the annual mean for CPUE's for the last ten years, or in GA's case, all available data. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

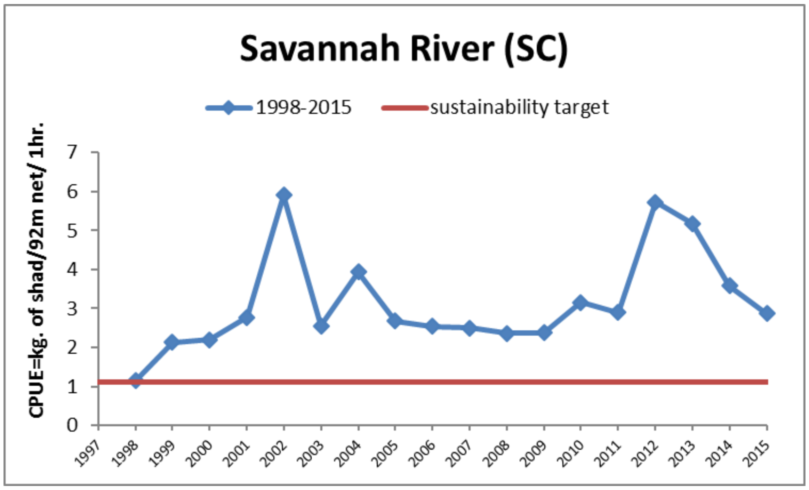

Figure 8. SC's annual commercial catch-per-unit-effort (CPUE) of American shad and sustainability target for the Savannah River.

Table 1. Sustainability values and triggers.

Index	Survey	Benchmark Value	Years included in index	Management trigger
Pee Dee River Run	Fishery dependent	3.41 kg/ 92 m net/hr.	1979-2015	3 consecutive years below benchmark
Black River	Fishery dependent	0.97 kg/ 92 m net/hr.	2000-2015	3 consecutive years below benchmark
Santee-Cooper Rivers Complex	Fishery dependent	1.8 kg/ 92 m net/hr.	1979-2015	3 consecutive years below benchmark
Santee-Cooper Rivers Complex	Fishery independent	7.0 shad/ 92 m net/hr.	2008-2015	3 consecutive years below benchmark
Santee-Cooper Rivers Complex	Fishery dependent	0.66 shad/hr.	2000-2015	3 consecutive years below benchmark
Edisto River	Fishery dependent	0.43 kg/ 92 m net/hr.	1997-2015	3 consecutive years below benchmark
Combahee River	Fishery dependent	0.53 kg/ 92 m net/hr.	1998-2015	3 consecutive years below benchmark
Savannah River	Fishery dependent	1.1 kg/ 92 m net/hr.	1998-2015	3 consecutive years below benchmark

g) Adaptive Management

SCDNR will continue to monitor fish passage, commercial fisheries, and recreational landings in SC rivers. In addition, fishery independent sampling to assess spawning adults and juvenile abundance will continue annually.

If collected data indicates changes in exploitation or decreasing abundance in juveniles, action will be taken by SCDNR. These actions may include increasing days for escapement, limiting seasons, etc. In the event these actions are not successful in reversing negative trends, SCDNR would then be forced to close those fisheries.

Several recommendations were included for SC as part of the stock assessment for American shad. They are highlighted in the following:

Commercial Landings and Effort

1. Increase compliance with mandatory catch and effort reporting from commercial fishery, particularly in the Santee River, Winyah Bay system, Savannah River, and Edisto River

2. Continue the “volunteer CPUE” series to compare with CPUE series developed from comprehensive mandatory reporting database

3. Input volunteer commercial catch and effort from field reports into digital format so raw data are available for future analysis

4. Collect age, length, weight, and spawning history information from shad caught in commercial fisheries in the Santee River, Winyah Bay system, Savannah River, and Edisto River

5. Age validation study of American shad from South Carolina rivers (especially, Santee River, Winyah Bay system, Savannah River, and Edisto River)

Tagging

1. Continue monitoring of river systems (Santee River, Waccamaw River and Edisto River) on rotating basis (yearly rather than a three year schedule)

2. Improve tagging study design (e.g., develop high-reward design, telemetry studies to get estimates of migration abortion, double tagging study to estimate tag loss, and tag-mortality study) to improve relative exploitation estimates

3. Conduct tagging studies for duration of shad migration and continue to collect effort information from sampling collections (e.g., soak time, net length, and mesh size) to permit development of CPUE calculations

Creel Surveys

1. Continue to conduct creel surveys in rivers with notable recreational fisheries (Savannah River and Cooper River); if necessary, conduct creel surveys on a rotating basis

Fish Passage

1. Develop species specific upstream and downstream passage efficiency at all rivers with priority given to Santee-Cooper system dams

2. Develop species specific counts at Pinopolis fish lock on the Cooper River

Juvenile Abundance Index

1. Investigate juvenile abundance on at least one river (e.g., Santee River, Waccamaw River, or Edisto River)

General

1. Collect environmental covariates (tidal stage, flood stage, flow rate, water temperature, cloud cover, water clarity, annual precipitation, etc.) to aid development of CPUE indices

SC has since implemented all suggested recommendations and in some cases exceeded them, with the exception of those at the Pinopolis fish lock. A fish counter system will be installed at that site by spring 2018. Nevertheless, SC continues sampling as part of ASMFC/ACFCMA funded work or by utilizing other SCDNR funding sources. Furthermore, with the dissolution of Anadromous Fish Conservation Act funds, SCDNR was forced to be creative in order to meet requirements of Amendment 3. To complete all mandated goals annually, personnel from other areas and funding sources have been used. Once these funds expire it is anticipated SCDNR will simply not have adequate personnel to complete this work. Additionally, to date SCDNR has had ~60% cut from the operating budget and is expecting future cuts. If a reduction in force (RIF) is implemented and project personnel are affected, SCDNR will not be able to meet these requirements.

Additional recommendations

Several recommendations were suggested and added to this plan by the Shad and river herring Technical Committee, these include:

- Consider joint coordination with NC on the Great Pee Dee River similar to what is occurring on the Savannah River (GA).
- Consider ways to develop current juvenile indices to perhaps be used in future updates to the plan.
- Consider discussions with GA to develop consistent management measures for the Savannah River in the event that either state falls below the sustainability benchmark for 3 consecutive years.
- In the future, consider using biological metrics, where available, as an additional benchmark for all State indices.

References

ASMFC (Atlantic States Marin Fisheries Commission). 2007. American shad stock assessment peer review report. Washington, D.C.

Appendix 1.

Summary of South Carolina Shad Laws by Water or Fishery Area

SECTION 50-5-1506. Zones, seasons, times catch limits, size limits, methods, and equipment for taking shad.

In addition to other provisions of law, the following provisions govern seasons, times, methods, equipment, size limits, and take limits in commercial fishing for shad in the waters of this State specified below:

(a) Black River, Great Pee Dee River, Little Pee Dee River, Lynches River, Waccamaw River from Big Bull Creek to Winyah Bay, Winyah Bay, and all tributaries and distributaries thereto as follows:

(i) Pee Dee River and tributaries above U.S. Highway 701 and Black River:

(1) Season: January 15 through April 15;

(2) Times: noon Monday through noon Saturday;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(ii) Remainder of Winyah Bay system including all of Big Bull Creek and Waccamaw River with tributaries below the entrance of Big Bull Creek:

(1) Season: January 15 through April 1;

(2) Times: Monday noon to Saturday noon, local time;

(3) Methods and equipment: No restriction provided drift nets of not more than nine hundred feet in length are allowed in Waccamaw River between Butler Island and U.S. Highway 17 during lawful times;

(4) Size and take limits: No limits.

(b) Santee River below Wilson Dam including the Rediversion Canal below St. Stephen Dam, North Santee River and Bay, South Santee River, and all tributaries and distributaries thereto as follows:

(i) Rediversion Canal from St. Stephen Dam seaward to the seaward terminus of the northern dike of the Rediversion Canal:

Season: No open season;

(ii) Rediversion Canal from the seaward terminus of the northern dike of the Rediversion Canal seaward to Santee River:

(1) Season: January 15 through April 15;

(2) Times: 7:00 a.m. to 7:00 p.m. local time, Tuesday and Thursday;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(iii) Wilson Dam seaward to U.S. Highway 52 bridge:

Season: No open season.

(iv) U.S. Highway 52 bridge seaward to S.C. Highway 41 bridge:

(1) Season: January 15 through April 15;

(2) Times: 7:00 a.m. to 7:00 p.m. local time, Tuesday and Thursday;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(v) S.C. Highway 41 bridge seaward:

(1) Season: January 15 through March 15;

(2) Times: Monday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(c) Wando River and Cooper River seaward to the U.S. Highway 17 bridges, Charleston Harbor, Ashley River, and all tributaries and distributaries thereto as follows:

(i) Tailrace Canal from Wadboo Creek to the Jefferies Power Plant:

Season: No open season.

(ii) Cooper River from Wadboo Creek to U.S. Highway 17:

Season: No open season.

(iii) Ashley River seaward to its confluence with Popper Dam Creek:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

(iv) Remainder of the Charleston Harbor system:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

(d) Edisto River Estuary, Edisto River, North and South Branches (Forks) of the Edisto River, and all tributaries and distributaries thereto as follows:

(i) Above U.S. Highway 15 bridge:

(1) Season: February 1 through March 30;

(2) Times: Tuesday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(ii) Seaward of U.S. Highway 15 bridge and above U.S. Highway 17 bridge:

(1) Season: February 1 through March 30;

(2) Times: Tuesday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(iii) Seaward of U.S. Highway 17 bridge:

(1) Season: February 1 through March 30;

(2) Times: Wednesday noon to Friday midnight, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(e) Ashepoo River and all tributaries and distributaries thereto as follows:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

(f) Combahee River and all tributaries and distributaries thereto as follows:

(i) Tributaries and distributaries, except main stems of Salkehatchie Rivers:

Season: No open season.

(ii) Main river including main stems of Salkehatchie Rivers:

(1) Season: February 1 through March 15;

(2) Times: For anchored nets, Tuesday noon to Friday noon, local time; for driftnets, Monday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(g) Coosawhatchie River and all tributaries and distributaries thereto as follows:

Season: No open season.

(h) South Carolina portions of Savannah River and all tributaries and distributaries thereto as follows:

(i) Main river below U. S. Highway 301 and above U. S. Interstate Highway 95:

(1) Season: January 1 through April 15;

(2) Times: 7:00 a.m. Wednesday to 7:00 p.m. Saturday, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(ii) Tributaries and distributaries above U.S. Interstate Highway 95 bridge:

Season: No open season.

(iii) Seaward of U.S. Interstate Highway 95 bridge.

(1) Season: January 1 through March 31. Taking or attempting to take shad with anchored nets is prohibited at all times in the Savannah River's Little Back River, Back River and the north channel of the Savannah River downstream from the New Savannah Cut;

(2) Times: 7:00 a.m. Tuesday to 7:00 p.m. Friday, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(i) Atlantic Ocean territorial sea as follows:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

Appendix 2. Proposed statewide changes to SC's shad fishery to account for by-catch of sturgeon

	Existing regulation	Proposed change	Benefit
Recreational			
Gear restrictions			
Gill nets	1 net w/ lengths up to 300yds	1 net w/ length not exceeding 100 ft.	Limits the length of net a recreational angler using commercial gear can use.
Commercial			
Gear restrictions			
All rivers	10 nets per licensee allowed	5 nets per licensee allowed	Cuts available nets by 50%
*Edisto River	10 nets per licensee allowed	2 nets per licensee allowed	Cuts available nets by 80%
*Combahee River	10 nets per licensee allowed	1 nets per licensee allowed	Cuts available nets by 90%
Procedure change			
All rivers	Must check each net once every 24 hrs.	Must check each net **twice** during 24hrs.	Reduces risk of potential mortality for captured sturgeon.
Area restrictions			
Savannah River	Fishing allowed I-95 to spirit creek	Fishing allowed I-95 to Hwy 301	Restricts fishing on ~110 rkm of potential sturgeon spawning habitat.
Season changes			
Winyah Bay and Tributaries (includes Waccamaw and Great Pee Dee Rivers)			Moves the legal season up two weeks, allowing for fewer nets during the sturgeon spawning migration.
Pee Dee River and tributaries above Hwy. 701, Waccamaw River and tributaries above entrance of Big Bull Creek	Feb. 1 - Apr. 30	Jan. 15 - Apr. 15	
Remainder of Winyah Bay system	Feb. 1 – Apr. 15	Jan. 15 - Apr. 1	
Santee River			Moves the legal season up two weeks, allowing for fewer nets during the sturgeon spawning migration.
Hwy. 52 bridge seaward to Hwy. 41 bridge	Feb. 1 - Apr. 30	Jan 15 - Apr 15	
Hwy. 41 bridge seaward	Feb. 1 - Mar. 31	Jan 15 - Mar 15	
Edisto River			Restrictions as a result of ASMFC's shad sustainability plan will shorten the season to 6 weeks.
Above U.S. Hwy. 17 bridge	Jan. 15 - Apr. 15	Feb. 1 - Mar. 15	
Seaward of U.S. Hwy. 17	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	
Combahee River			Restrictions as a result of ASMFC's shad sustainability plan will shorten the season to 6 weeks.
Main river, including main stems of Salkehatchie Rivers	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	

*** Restrictions as a result of ASMFC's state sustainability plan.**

Appendix 3. Proposed changes to shad fisheries in the Edisto and Combahee Rivers.

	Existing regulation	Proposed change	Benefit
Recreational			
Gear restrictions			
Edisto River			
Gill nets	1 net w/ lengths up to 300yds	1 net w/ length not exceeding 100 ft.	Limits the length of net a recreational angler using commercial gear can use.
Hook and line	10 shad per day creel	5 shad per day creel	Decreases the amount of shad legally kept by 50%.
Combahee River			
Gill nets	1 net w/ lengths up to 300yds	1 net w/ length not exceeding 100 ft.	Limits the length of net a recreational angler using commercial gear can use.
Hook and line	10 shad per day creel	5 shad per day creel	Decreases the amount of shad legally kept by 50%.
Commercial			
Gear restrictions			
Edisto River	10 nets per licensee allowed	2 nets per licensee allowed	Cuts available nets by 80%
Combahee River	10 nets per licensee allowed	1 nets per licensee allowed	Cuts available nets by 90%
License cap			
Edisto River	No limit	Only licensees that purchased a license during the last 5 years will be eligible to remain in the fishery with no new licenses issued	Allows current fishermen to fish, does not allow for additional exploitation, and caps the fishery.
Combahee River	No limit	Only licensees that purchased a license during the last 5 years will be eligible to remain in the fishery with no new licenses issued	Allows current fishermen to fish, does not allow for additional exploitation, and caps the fishery.
Season changes			
Edisto River			
Above U.S. Hwy. 17 bridge	Jan. 15 - Apr. 15	Feb. 1 - Mar. 15	Shortens the season to 6 weeks
Seaward of U.S. Hwy. 17	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	Shortens the season to 6 weeks
Combahee River			
Main river, including main stems of Salkehatchie Rivers	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	Shortens the season to 6 weeks

ASMFC American Shad Sustainable Fishing Plan for Georgia

Submitted by

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Introduction:

The purpose of Georgia's sustainable fisheries management plan for American shad is to allow the continuation of existing American shad fisheries in Georgia rivers where it has been determined continuation of fishing will not adversely impact the Atlantic Coast American shad stock. This plan is submitted to fulfill requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management).

Management of American shad in Georgia is shared between the Georgia Department of Natural Resources' (GADNR) Wildlife Resources Division's Fisheries Management Section (FMS) and GADNR's Coastal Resources Division (CRD). The river complex utilized by fish stocks defines Georgia's management units. Historically, all of Georgia's Atlantic-slope rivers supported a commercial fishery for American shad (Fig. 1). However, in recent years, commercial landings of American shad have been reported from only two (Altamaha and Savannah) of these five rivers. Recreational shad fisheries exist only at the New Savannah Bluff lock and dam (NSBL&D) on the Savannah River and in the Ogeechee River. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure greatly reduced the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery. There have been no reports of commercial landings from the Satilla or St. Marys rivers since 1989.

During 2010, the Georgia Board of Natural Resources adopted new commercial shad fishing rules based on a recommendation from GADNR. These changes modified the temporal and spatial components of the commercial shad fishing efforts along Georgia's Atlantic-slope rivers, both to provide the basis for American shad sustainability plans and to address shortnose sturgeon bycatch issues. Following these changes, the St. Marys and Satilla rivers were officially closed to commercial shad fishing. The Ogeechee River commercial shad fishery was also closed prior to the 2014 commercial shad season due to lack of participation during the 2012 and 2013 seasons and to reduce concerns of potential sturgeon bycatch issues. These three rivers will remain closed to commercial American shad fishing.

Georgia's Commercial American Shad Fisheries

The commercial shad (American and hickory) season is open each year from January 1 to March 31. Drift and set gill nets with mesh sizes of at least 4-½ inches (stretch mesh) are legal gear in the Altamaha and Savannah Rivers. Shad fishermen are required to possess a letter of authorization (LOA) in conjunction with a commercial fishing license to fish in Georgia's commercial shad fishery. These LOA's were adopted in 2015 because Georgia has a general commercial fishing license that doesn't specify the targeted fishery. Since inception, the LOA's have increased information about participation in Georgia's commercial shad fishery.

The Altamaha River is open to commercial shad fishing from the U.S. Hwy 1 Bridge (rkm 183) downstream to the Atlantic Ocean (Fig. 1). Including the waters of its major tributaries, this is an area approximately 347 rkm, or 65% smaller than previously open to commercial shad fishing. The Altamaha River is open Monday through Friday below and Tuesday through Saturday above the Seaboard Railroad bridge crossing (Fig. 1). The Altamaha River supports the state's largest commercial shad fishery and is Georgia's largest watershed, draining 37,192 km2. The Altamaha is formed by the confluence of the Oconee and Ocmulgee rivers and flows for approximately 220 kilometers to the Atlantic Ocean. The main stem Altamaha is free of dams for the entire length of the river; however, dams are located upriver on both tributaries. Drift and set gill nets are the gear types used to commercially fish for shad throughout the river. Most full-time commercial fishermen focus their efforts in the lower 60 kilometers of the river. Drift nets are the most prevalent gear type in the lower river, whereas set nets are the more prevalent gear type in the upper river (upstream of the City of Jesup).

The Savannah River is open to commercial shad fishing from the U.S. Hwy 301 Bridge (rkm 192) downstream to the Atlantic Ocean, an area approximately 103 rkm or 35% smaller than previously open to commercial shad fishing (Fig. 1). The Savannah River is open from Tuesday through Friday east of the I-95 Bridge and Wednesday through Saturday west of the I-95 Bridge (Fig. 1). The Savannah River drains a watershed of approximately 17,022 km2 and forms the boundary between Georgia and South Carolina. The first barrier to upstream migration on the Savannah River is the NSBL&D located at river km 301, just south of Augusta, Georgia. American shad once passed through this dam via lockage, but in recent years the U.S. Army Corps of Engineers (USACE) has declared the facility unsafe to operate, so fish are not being passed through the lock at this time. The NSBL&D is now a true migration barrier and is the uppermost reach of the American shad migration in the Savannah River. The USACE is currently overseeing the Savannah Harbor Expansion Project which has mitigation plans to install a migratory fish passage at the NSBL&D. After installing this migratory fish passage, the NSBL&D will not be a migratory barrier to the American shad run and American shad will be able to access further upriver habitats above the NSBL&D. The upper commercial fishing boundary is approximately 109 rkm below the NSBL&D, thus fish reaching this point have escaped the commercial fishery. Above the NSBL&D are three dams located from river km 333 to river km 355. Both drift and set gill nets are used to commercially fish for shad throughout the river. Most of the commercial activity takes place in the lower reach of the river and drift gill nets are the primary commercial gear used east of the I-95 Bridge. A recreational fishery does exist in the tail waters of the NSBL&D. However, the USACE's closing public access to the locks outer wall, significantly decreased the recreational fishery at this site.

Georgia's Recreational American Shad Fisheries

Small-scale recreational fisheries for American shad still exist in the Savannah and Ogeechee rivers. Georgia has a statewide 8 shad (American and/or hickory) recreational daily creel limit. Recreational shad fisheries exist only at the NSBL&D on the Savannah River and in the Ogeechee River. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure eliminated the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery. Georgia has periodically conducted recreational creel surveys on the Ogeechee River specifically targeting the recreational shad fishery. The most recent of those was completed in 2015. The creel survey estimated that 463 American shad were harvested with a total harvest weight of 473 Kg. Anglers also released 27 American shad and zero hickory shad were harvested by anglers.

Numerous recreational creel surveys have been conducted on the Altamaha and Satilla rivers in recent years and American shad have never been observed in angler harvest. While the GADNR does not have any recreation creel survey data for the St. Marys River, there has never been any evidence or reports of anglers incidentally capturing American shad.

Landings

Reported commercial landings of American shad are available from the National Marine Fisheries Service and the State of Georgia through CRD, which has recorded river-specific landings since 1962. In 2001, Georgia instituted a mandatory reporting system that requires an individual record (trip-ticket) to be completed at the time of sale for each catch sold to a seafood dealer. Data collected includes the river of capture, type of gear, total net soak time, etc. Numbers of wholesale dealers processing shad have declined over time, and from 2010 to 2013 there were less than 3 dealers that purchased shad from commercial fishermen. Due to the low number of dealers and corresponding confidentiality agreements, commercial landings data obtained from trip-tickets on the Altamaha and Savannah rivers during 2010-2013, along with the 2014 Savannah River commercial landings data, must be excluded from reports (Fig. 2).

The GADNR has conducted periodic recreational creel surveys on the Ogeechee River since 1986 to estimate harvest and catch-per-unit-effort (CPUE). The number of American shad caught per hour of fishing time has varied from a low of 0.2 shad/hour in 1986 and 2010 to a high of 0.75 fish/hour in 2015. It is important to note that flow conditions can have a significant impact on angler catch rates in this fishery. Total effort and fish harvested has ranged from a high of 2,210-angler hrs and 1,053 shad harvested in 1996 to a low of 620-angler hrs in 2015 and a low of 10 shad harvested in 2000. Effort data from the last five creel surveys has averaged 1,148-angler hrs and total shad harvested has averaged 424 fish.

Recreational creel surveys were conducted on the Savannah River in the late 1990s by the GADNR (1997) and South Carolina Department of Natural Resources (1998 and 1999). Estimates of catch from these surveys varied from year to year, largely due to dramatically different flow conditions. Catch estimates from each of these creel surveys were provided by Boltin (1999).

Fishery Dependent Indices

Reported American shad landings from the Altamaha River reached a high of 471,700 lbs in 1968 and then declined for several years. Landings averaged approximately 299,000 lbs during 1962-1969 and approximately 130,000 lbs during 1970-1979. Reported Altamaha River shad landings peaked in 1987 at 193,469 lbs and again in 1995 at 121,811 lbs (Fig. 2). During 1980-2000, total reported shad landings averaged 89,739 lbs. Since 2000, total reported shad landings have averaged around 34,776 lbs. Landings for the last ten years have averaged approximately 37,437 lbs. Savannah River landings data was supplied to the SCDNR and will be combined with their landings data and reported in the South Carolina sustainability plan.

Since 2000, commercial shad fishing effort has been quantified based on total number of reported commercial trips. The highest recorded statewide effort was 860 commercial fishing trips for the Altamaha River in 2000 (Fig. 3). During 2000-2005, commercial fishermen averaged approximately 420 trips/yr in the Altamaha River, while during the 2006-2015 period commercial fishermen averaged approximately 264 trips/yr. Effort data for the Savannah River was supplied to SCDNR and will be combined with their effort data and reported in the South Carolina sustainability plan.

Fishery Independent Indices

GADNR has utilized gill net surveys to generate population size and exploitation rate estimates for American shad through mark and recapture efforts in the Altamaha River since 1982 and CPUE since 1986. The American shad population was also estimated in 1967.

Adult shad electrofishing surveys were initiated in 2010 on the Ogeechee (Fig. 4) and Savannah (Fig. 5) rivers in preparation for future monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (Shad and River Herring ISFMP). GADNR staff conducts these surveys twice a month for three months during the spawning immigration. Since 2010, the Ogeechee River adult shad electrofishing surveys have averaged around 15 shad per hour, and the Savannah River adult shad electrofishing surveys have averaged around 300 shad per hour. The reason that the Savannah River electrofishing catch rates are much higher than the

Ogeechee River catch rates is because the electrofishing samples on the Savannah River are concentrated immediately below the NSBL&D. The Ogeechee River is undammed and electrofishing samples are not concentrated below a migration barrier so efforts are much less effective.

GADNR estimated juvenile American shad abundance from trawl surveys on the Altamaha River during 1982-1991 and the Ogeechee River during 1982-1985. Juvenile catch rates could not be correlated to estimated spawning populations nor future adult spawning return rates, so juvenile sampling ceased after 1991. However, GADNR reinstated a juvenile sampling program utilizing a 50-ft seine in 2010 on the Altamaha, Ogeechee, and Savannah rivers in preparation for future monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Shad and River Herring ISFMP. Seine mesh size and site locations are standardized. GADNR staff annually sample 3-6 sites/river twice a month from July-September. Since 2011, the Altamaha, Ogeechee, and Savannah River juvenile shad geometric means have averaged around 24.2, 7.9, and 7.6 shad per seine haul, respectively (Fig. 6). No juvenile sampling was completed in 2013 due to high water. The decrease in juvenile shad sampled on the Ogeechee and Savannah Rivers from 2014 to 2015 should be attributed to water level issues and changes in manpower of the monitoring staff, and not a true depiction of a decrease in juvenile shad abundances.

Sustainable Fisheries

Table 1. Management Benchmarks and Triggers

River System	Index	Years Included in Index	Benchmark Value	Benchmark Level	Management Trigger
Altamaha (commercial & recreational)	Gillnet CPUE Index	1983-2015	1.11 shad/ft-hr	25th percentile	3 consecutive years below the benchmark
Savannah (commercial & recreational)	Commercial Gillnet CPUE Index	2001-2015	9.03 kg shad/trip	25th percentile	3 consecutive years below the benchmark
Ogeechee (recreational)	Electrofishing CPUE Index	2010-2015	3.7 shad/hr	25th percentile	3 consecutive years below the benchmark

Altamaha River

GADNR has produced annual Lincoln-Peterson population estimates and exploitation rates from a tagging study that was initiated in 1982. Adult American shad are captured via gill nets in the lower section of the Altamaha River and tagged with a T-bar anchor tag produced by Floy Tag & Mfg, Inc. Tagging efforts are conducted on Saturday, Sunday, or Monday each week of the commercial shad season that runs from January 1 through March 31. These days were chosen because the commercial fishery is closed in different portions of the river on these days, thus allowing the fish to naturally disperse before potential recapture by commercial fishermen. Before the start of the season, 500 tags are randomly assigned values of $4, $10, $50, or $100. Two percent of the tags receive a $100 value, 3% are $50, 20% are worth $10, and 75% worth $4. Tag values are not printed on the tag. Upon capturing a tagged fish, commercial fishermen are required to remove tags and mail them into GADNR to receive the monetary award. GADNR keeps record of the number of fish tagged (M) and recaptured (R) and then utilizes reported commercial landings data to produce the total number of fish captured (C). In an effort to account for non-reported commercial landings and produce a more accurate estimate of "C", GADNR conducted a roaming creel survey from 1982-1992. After the 10-year creel survey was completed, GADNR staff developed a statistically based formula to account for non-reporting. From 1993 to present, "C" is calculated by entering the total reported commercial drift net landings into the formula "C"=(2.322x10-6+0.214/Reported Landings)-1.

From 1982 to present, the estimated size of the adult American shad population in the Altamaha River has ranged from a low of 70,396 shad in 1990 to a high of 560,023 fish in 2014

(Fig. 7). After 1996, estimated shad abundance declined for six consecutive years, through 2002, before showing a moderate rebound through 2006. The population estimates decreased again through 2010. However, the 2011 mark and recapture efforts revealed a sharp increase in American shad abundance with a population estimate of 277,824 fish. This upward trend peaked in 2014 at 560,023 which is the highest population estimate in the time series. Population estimates have averaged around 236,000 American shad in the Altamaha River American shad run for the last ten years.

Trends in GADNR tagging CPUE data appear to be like those observed in GADNR's mark and recapture population estimates (Fig. 8) and have ranged from a low of 0.59 shad/ft-hr in 2005 to a high of 3.66 shad/ft-hr in 1998 (Fig. 9). CPUE, for the last ten years, has averaged 2.4 shad/ft-hr in the Altamaha River American shad run.

From 1982 through 1992, exploitation rates estimated from recaptures of tagged fish averaged 43.63%, which was often above the previous 40% maximum sustainable yield recommended by ASMFC in the Addendum to Amendment 1, before declining to present levels (Fig. 7). Since 1990, the exploitation rates have been below ASMFC's recommended 40% maximum sustainable yield. From 1993-2003, exploitation of American shad averaged 26.1%, ranging from 17.7% to 33%. From 2004-2010, exploitation of American shad averaged 19.7%, ranging from 13.7% to 23.6%. On January 1, 2011, new commercial regulations went into effect that closed approximately 65% of the Altamaha River system. This change resulted in a decrease in exploitation rates. Following these new regulations, from 2011-2015, exploitation of American shad averaged 11.5%, ranging from 8.6% to 12.7%. Total exploitation has averaged around 16%, for the last ten years, for the Altamaha River American shad run. As an additional measure to ensure the conservation of this stock, an American shad stocking program was initiated in 2014. American shad are annually stocked above migration barriers in an attempt to re-establish shad in section of the Oconee and Ocmulgee rivers.

Juvenile sampling on the Altamaha River was initiated in 2010, and 291 juvenile shad were collected in 12 seine hauls utilizing a combination of two 50-ft bag seines (one with ½-inch mesh and one with 3/8-inch mesh). The resulting geometric mean was 14.6 shad/haul. However, staff observed juvenile shad escaping through both of these nets. Therefore, catch rates would have been higher if a smaller mesh seine had been utilized. Since 2011, GADNR has utilized a 50ft bag seine with ¼-inch mesh to sample juvenile shad. During July 2011, 1,282 juvenile shad were captured in 20 seine hauls with a resulting geometric mean of 26.8 shad/haul. During July 1968, Godwin and Adams (1969) utilized a similar seine to collect juvenile shad and reported an arithmetic mean of approximately 15 shad/haul. Therefore, the CPUE of juvenile shad observed in July 2011 seems to indicate that American shad reproduction is currently at a sufficient level to sustain the population. Since 2011, the Altamaha River juvenile American shad geometric means have averaged around 24.2 shad per seine haul (Fig. 6).

The ASMFC American Shad Stock Assessment Sub-committee (SASC) utilized CPUE data through 2005 from GADNR tagging efforts on the Altamaha River as an indicator that the Altamaha stock was in decline when the 2007 stock assessment was completed. During 2006-2015, CPUE data from GADNR's tagging efforts averaged 2.4 shad/ft-hr, which is 112.4% higher than the average of 1.13 shad/ft-hr observed from 2000-2005 (Fig. 9). This fact, along with the apparent increase in population abundance, decreased exploitation rates, and recent juvenile abundance data, supports the fact that the current fishery appears to be sustainable. In addition, GADNR believes that the changes in the 2011 regulations have allowed sufficient escapement of adults and helped ensured that fishery harvest will not adversely impact the Atlantic Coast American Shad population. Over the years, the attrition of commercial fishermen has also lessened effort and exploitation on American shad in the Altamaha River and even more so on the Savannah River. For example, there were only two commercial shad fishermen on the Savannah River in 2015, and one of these fishermen retired from shad fishing after the 2015 season.

The SASC and TC expressed concerns with utilizing population estimates and exploitation rates generated from annual tagging efforts as stock indicators since GADNR has not studied non-reporting rates, tag loss, tagging mortality, post tagging movements, or repeated the 1980's creel survey to validate the formula that accounts for non-reporting of commercial landings. Instead, the TC recommends using annual CPUE data as a benchmark. Therefore, GADNR continues to monitor the Altamaha stock through a fishery independent gill netting survey to develop annual CPUE data for use as a stock abundance indicator. GADNR utilizes a CPUE benchmark of 75% of the mean for 3 consecutive years. In the last fishery management plan, the TC asked GADNR to consider two potential CPUE benchmark means. The first would utilize the entire time series of data (1983-2011) to calculate the mean, resulting in a benchmark CPUE of 1.11 shad/ft-hr (Fig. 9). The second option was to exclude the first seven years and utilize data from 1993 through 2011 to present and would establish a CPUE benchmark of 1.29 shad/ft-hr. GADNR believes it is more appropriate to utilize the entire time series of data to establish the benchmark CPUE since it encompasses a greater degree of environmental and population variability. The Altamaha shad population has historically shown the capacity to rebound after 7 consecutive years below this benchmark, and historically a benchmark of 1.29 shad/ft-hr would not have triggered action any more frequently than a benchmark of 1.11 shad/ft-hr. If gill netting CPUEs drop below 1.11 shad/ft-hr for 3 consecutive years, GADNR will evaluate commercial fishing regulations and harvest data and consider modifications to the Altamaha fishery to ensure the fishery remains sustainable. In the future, utilization of a juvenile index of abundance may be added once GADNR has collected several years of data to establish a CPUE benchmark appropriate to the Altamaha River. When the 2007 stock assessment was completed, the SASC utilized available data as an indicator that the Altamaha stock was in decline. Since that time, GADNR's relative abundance data from 2005-2015 was 112% higher than observed relative abundance from 2000-2005. This increase, combined with increases in population estimates, decreased exploitation rates, and JIA data all point to healthy and sustainable stock.

The Altamaha River is legally open to recreational harvest of American shad with the statewide limit of 8 fish. However, annual recreational creel surveys that have been conducted for over 20 consecutive years indicate that a recreational fishery does not exist on this river. No American shad harvest has ever been recorded in this angler harvest survey. Since the river is open to commercial fishing, GA DNR proposes utilizing the same sustainability benchmark that is used for the commercial fishery, which is a gill netting CPUE below 1.11 shad/ft-hr for 3 consecutive years.

Savannah River

Historically, the GADNR was not required to collect fishery independent data from the Savannah River. In 2010, the GADNR initiated fishery independent sampling for both adults and juveniles. Adults are sampled via electrofishing below the NSBL&D each spring. Juveniles are sampled in the lower river via seining July-September each year. The SCDNR supplements GADNR's juvenile sampling by utilizing electrofishing gear. The GADNR's fishery dependent and independent data will be combined with data collected by the SCDNR for measuring sustainability.

The Savannah River has a recreational shad fishery and harvest is controlled by a statewide regulation of 8 fish/day. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure eliminated the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery.

The GADNR and SCDNR worked cooperatively to establish a joint benchmark for the Savannah River. The proposed sustainability benchmark is a commercial gillnet CPUE of 9.03 kg shad/trip for 3 consecutive years. This benchmark will be used as a sustainability measure for both the commercial and recreational fisheries.

Ogeechee

The Ogeechee River was officially closed to commercial fishing due to lack of participation and potential sturgeon interactions. There are no plans to re-open the commercial fishery on the Ogeechee River. An American shad stocking program was initiated in 2014 as an additional measure to ensure the conservation of this stock. Adult American shad are monitored via electrofishing and juveniles are sampled with a 50' bag seine.

The Ogeechee River is the second of two rivers in Georgia that has a recreational shad fishery. Recreational harvest on this river is also controlled by the statewide regulation of 8 fish/day. The GADNR initiated an electrofishing survey in 2010 for adult American shad and the CPUE has averaged 14.8 fish/hr over a 7-year period. The GADNR suggest using the 25^{th} percentile for 3 consecutive years as a sustainability benchmark for the recreational fishery. If the adult shad CPUE falls below 3.7 fish/hr for 3 consecutive years, the GADNR would need to establish conservation measures to ensure the sustainability of the fishery.

Satilla and St. Marys Rivers

The Satilla and St. Marys rivers are currently closed to commercial shad fishing and there are no plans to open these rivers.

Technically, the Satilla and St Marys river are open to recreational harvest of shad. However, several recreational creel surveys have been conducted on the Satilla River in recent years (2006-2014) and American shad have never been observed in angler harvest. While the GADNR does not have any recreation creel survey data for the St. Marys River, there has never been any evidence or reports of anglers incidentally capturing American shad. Additionally, annual spring electrofishing surveys targeting sportfish populations indicate that American shad abundance is extremely low in both rivers. In the last 10 years, 1 American shad has been captured in the Satilla River and 3 American shad were captured in the St. Marys River. There is very little chance of incidental angler interactions due to the low abundance of shad in these rivers.

The TC has recommended that the GADNR either develop a sustainable fishing plan for the Satilla and St. Marys rivers or take the necessary action to prohibit the recreational harvest of American shad from those rivers. GADNR disagrees with the TC recommendation. It will be impossible to develop a sustainable fishing plan with any credible metrics for two river systems where American shad are currently at such low abundance as to be functionally absent. A modification of Georgia state law to prohibit the harvest of American shad in the Satilla and St. Marys rivers will result in no demonstrable conservation benefit. Furthermore, the TC did not recommend that the State of Florida take action to prohibit the recreational harvest of American shad from those portions of the St. Marys River subject to the jurisdiction of the State of Florida. Rather than the options recommended by the TC, the GADNR proposes to continue monitoring the fish populations of the Satilla and St. Marys rivers through periodic fishery-independent and fishery-dependent surveys. If these surveys reveal that American shad numbers are increasing and exploitation by recreational fisheries is occurring, GADNR will take the necessary steps to ensure that the harvest in those rivers is not detrimental to American shad conservation efforts along the Atlantic Coast.

A. Adaptive Management

The GADNR will continue to monitor the commercial shad fishery through fishery dependent and independent sampling on the Altamaha and Savannah rivers. Data from the Savannah River will be shared with SCDNR, and the agencies will work cooperatively towards the management of this population.

If three consecutive years of data show that CPUE of adults is decreasing, and/or juvenile abundance is decreasing beyond established benchmark levels, GADNR would evaluate and identify the causes thereof and initiate appropriate actions. Potential actions may include reducing the number of fishing days, modifying season dates, or altering legal fishing gears. In the event, such actions are not successful in reversing negative trends, GADNR would then consider closing the fishery in that river system.

Future Considerations

Georgia will continue to actively pursue effective management strategies that will allow the continued sustainability of our shad fishery. In recent years, fishery managers in Georgia have seen positive trends in our shad populations, particularly in the Altamaha River, which supports our largest shad population and fishery. As previously mentioned, GADNR's relative abundance data in the Altamaha River from 2005-2015 was 112% higher than observed relative abundance from 2000-2005. This increase, combined with increases in population estimates, decreased exploitation rates, and juvenile indices data all point to a healthy and sustainable stock. In an effort to pursue effective shad management beyond traditional data collection efforts, fishery managers will continue conducting various monitoring programs conducted annually since 2010, including juvenile sampling in the Ogeechee, Altamaha, and Savannah Rivers along with conducting electrofishing surveys targeting adults in the Savannah and Ogeechee Rivers. Data from these efforts, which may include length, age, or other biological metrics, may eventually be considered with traditional management benchmarks to inform fishery managers in decision making efforts. Additionally, future considerations may include additional assessments of the impacts of a new fish passage structure at the NSBL&D, should such a structure be developed. Managers will also continue to evaluate the effectiveness of stocking efforts in the Altamaha and Ogeechee, which have been performed annually since 2014, and data from these efforts may also be considered for use in future management decisions. Finally, considerations may be given in the future for collecting genetic samples for analysis of shad stocks in Georgia to better identify and understand stock compilation.

Literature Cited

Godwin, W.F. and J.G. Adams. 1969. Young Clupeids of the Altamaha River, Georgia.

GA Game and Fish Comm., Mar. Fish. Div., Contribution. Ser. No. 15.

Figure 1. Georgia Atlantic-Slope Rivers. The larger lines are the upper boundaries to the commercial American shad fishery and the smaller lines are the boundary lines for different open days of the fishery.

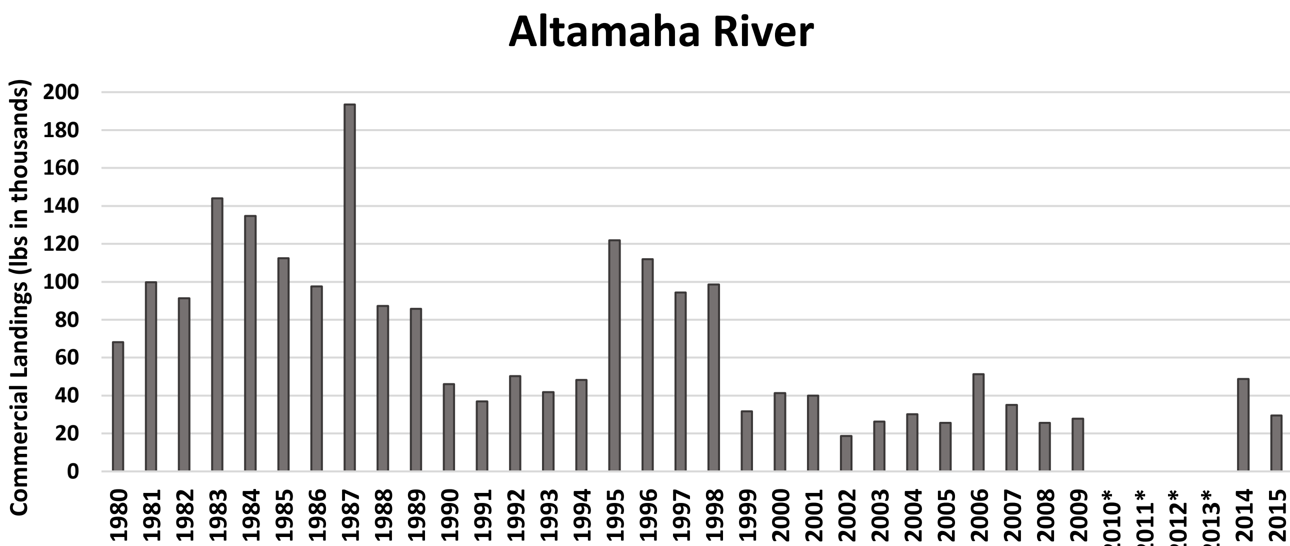

Figure 2. Reported commercial landings, reported by pounds in thousands, of American shad from the Altamaha River, Georgia. Due to confidentiality agreements, data from 2010*-2013* have been excluded.

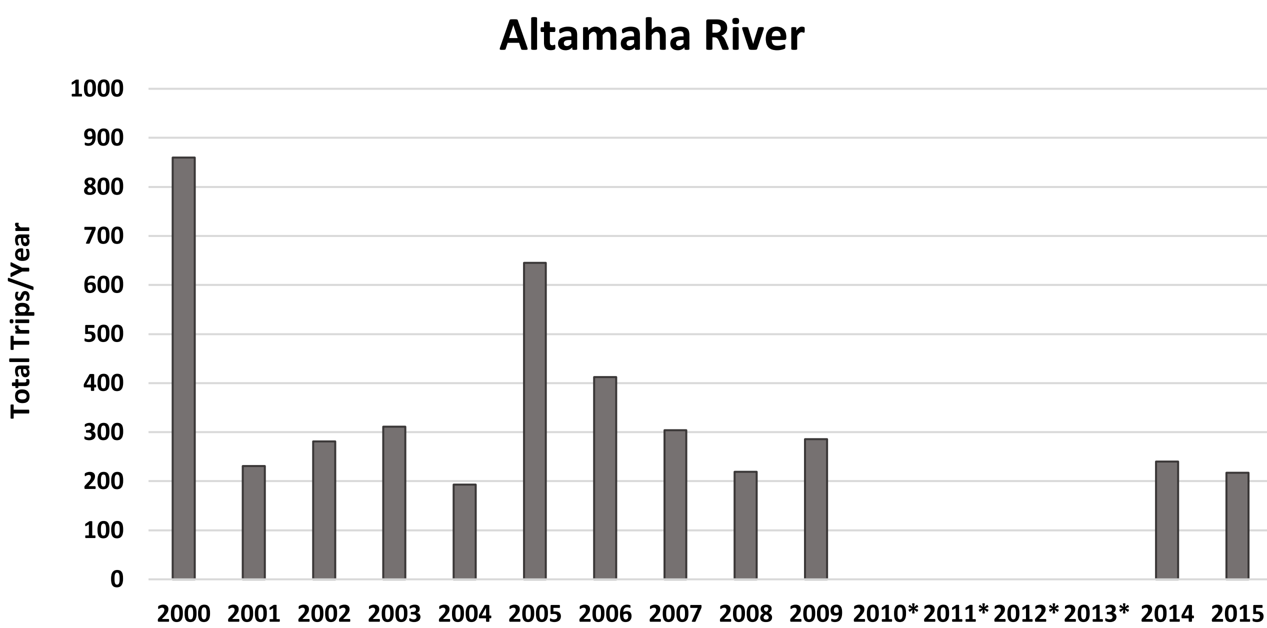

Figure 3. Total commercial fishing effort for American shad in the Altamaha River. Due to confidentiality agreements, data from 2010*-2013* have been excluded.

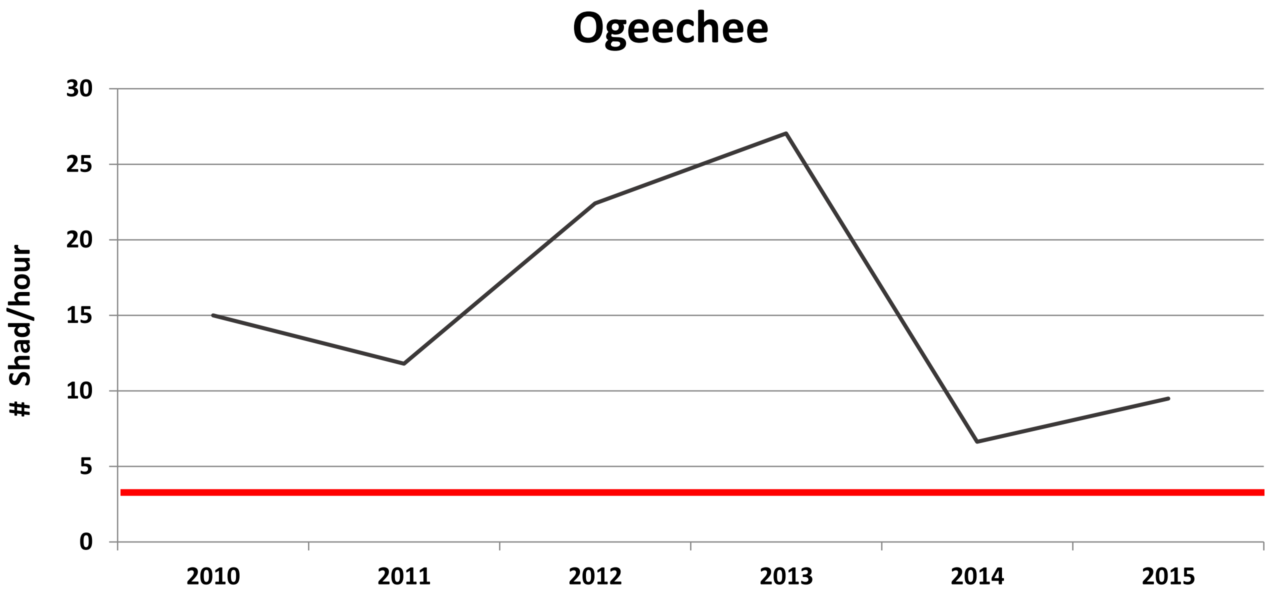

Figure 4. Ogeechee River adult American shad electrofishing CPUE's and the 3.7 shad/hr sustainability benchmark developed by GADNR.

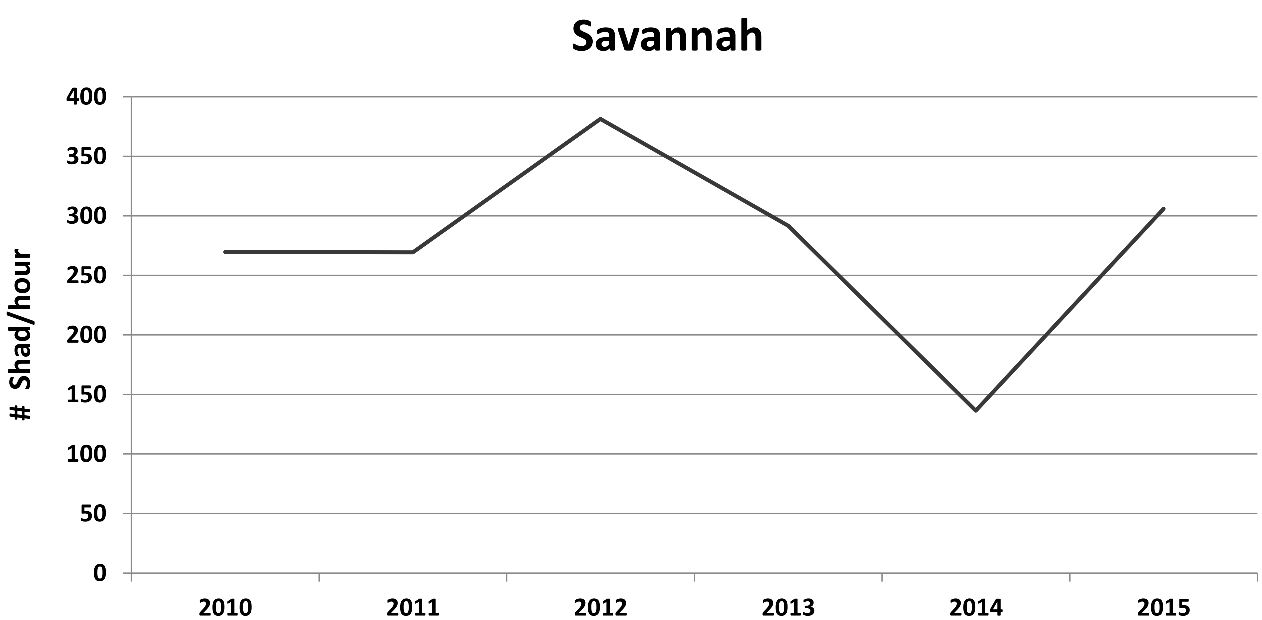

Figure 5. Savannah River adult American shad electrofishing CPUE's collected below the New Savannah Bluff Lock and Dam.

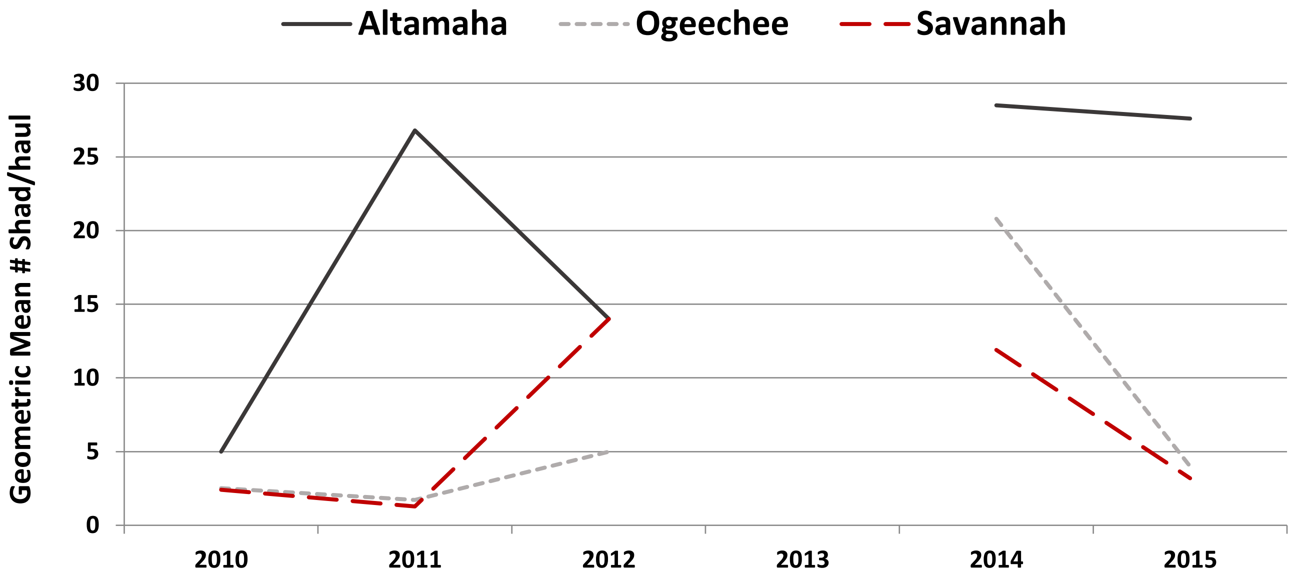

Figure 6. Juvenile American shad sampling program, initiated in 2010, utilizing a 50-ft bag seine on the Altamaha, Ogeechee, and Savannah rivers for monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management).

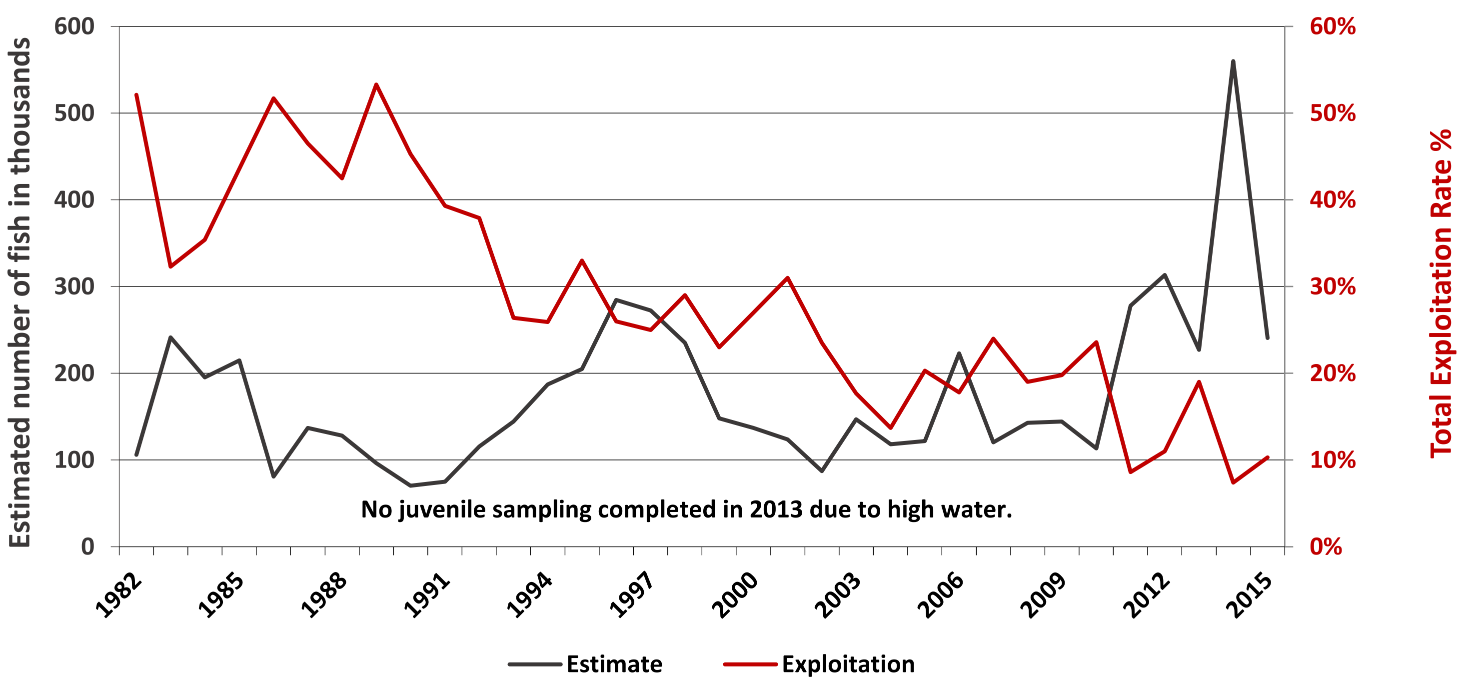

Figure 7. Population estimates and exploitation rates from the Altamaha River American shad run.

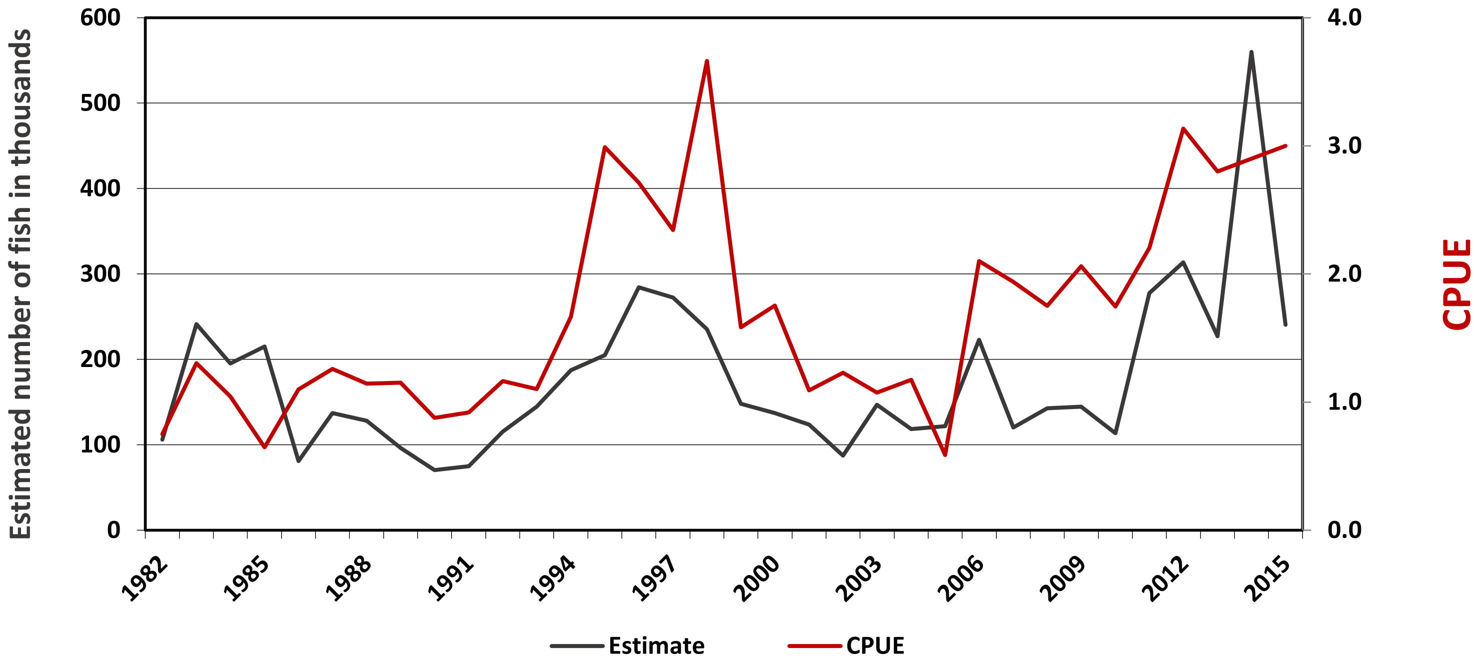

Figure 8. Altamaha River fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and population estimates from GADNR mark and recapture efforts.

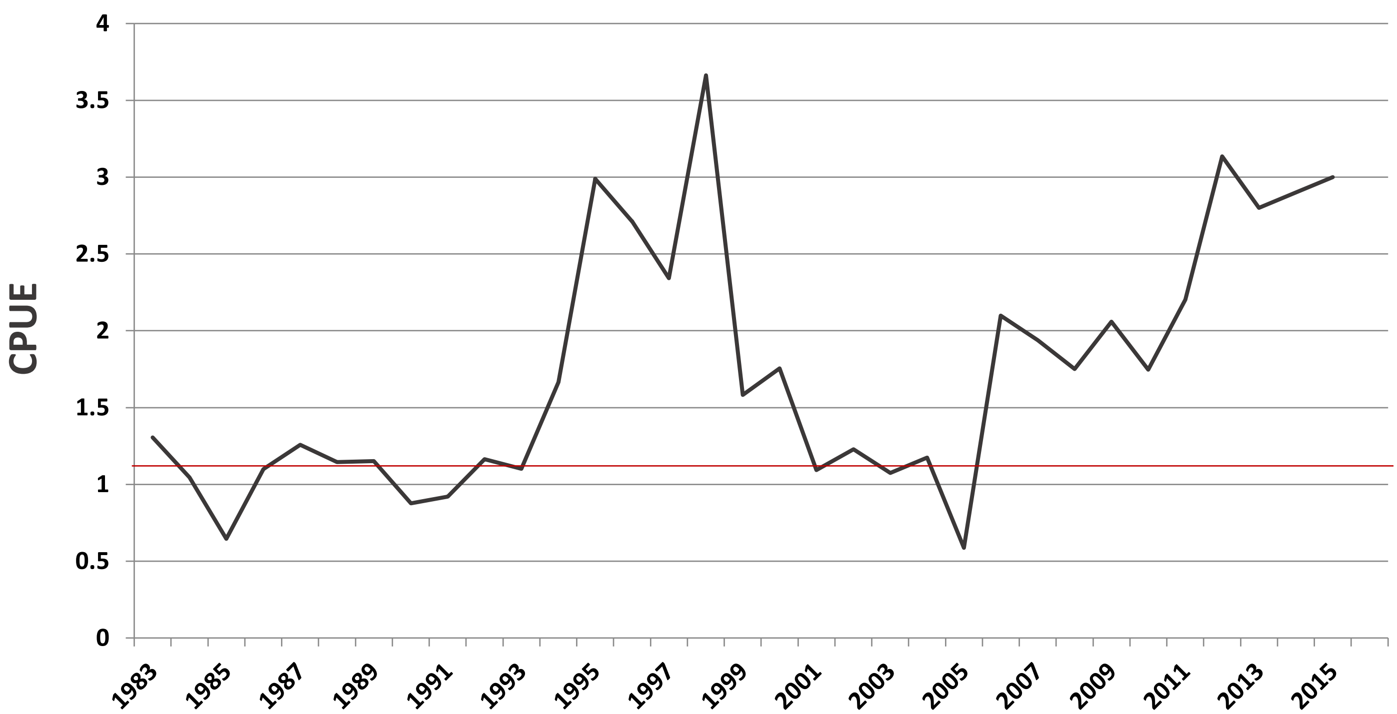

Figure 9. Altamaha River fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and the 1.11 shad/ft-hr benchmark developed from GADNR gill-net tagging data.

Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: Shad and River Herring Management Board

FROM: Caitlin Starks, FMP Coordinator

DATE: September 25, 2017

SUBJECT: Technical Committee and Plan Review Team Comments to the Board Regarding Inconsistencies in SFMPs with Amendments 2 and 3

During the Shad and River Herring TC's review of the SFMP updates to be presented to the Board for approval, and the PRT's development of the 2017 FMP Review, a general issue was identified by both groups regarding consistency of SFMPs with Amendment 3. In several SFMP updates that are up for approval or have already been approved by the Board, there are cases where states allow rivers to stay open to recreational harvest of shad, but the management and/or monitoring of these rivers is not consistent with the requirements outlined in Amendment 3.

For example, North Carolina's updated SFMP explains that the New and White Oak rivers are open to recreational fishing and there is a small commercial bycatch of shad, but no fishery-independent surveys for shad are conducted in these rivers. The rationale is that these are non-spawning rivers and there is no evidence of significant harvest in these areas, so an open fishery should not negatively affect the stock.

In Georgia, recreational harvest of shad is allowed in the St. Marys and Satilla rivers with the statewide 8 fish bag limit, but these rivers do not have sustainable fishing plans. Georgia's updated SFMP explains that developing a sustainable fishing plan with any credible metrics for two river systems where American shad are currently at such low abundance as to be functionally absent would be impossible, and to modify Georgia state law to prohibit the harvest of American shad in the Satilla and St. Marys rivers will result in no demonstrable conservation benefit.

Florida's updated SFMP was approved in May, but it also does not include sustainability metrics or monitoring of the St. Marys River where it falls within Florida's jurisdiction, though there is an open recreational fishery.

Amendment 3 to the Shad and River Herring FMP states: "States and jurisdictions shall submit a sustainable fisheries management plan for those systems that will remain open to recreational fishing. Catch and release fishing will be permitted on any system." The amendment also defines sustainable fisheries as "those that demonstrate their stock could support a commercial and/or recreational fishery that will not diminish the future stock reproduction and

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recruitment." Under these definitions it is clear that for any river to have an open shad fishery, it must be demonstrated that the stock can support a fishery that will not diminish the future stock. The TC and PRT feel that without monitoring these fisheries cannot be proven sustainable. A majority of states have processed shad and river herring plans with this understanding of that Amendment 3 language.

The TC and PRT feel it is necessary to address the inconsistencies between the SFMPs and Amendment 3, and provide guidance on how to manage rivers without data or sustainability parameters. However, the TC did not expect that a precedent was set with the previous SFMPs that have been approved given the level of information provided in draft plans and the perceived uncertainty in Amendment 3 language. Further, the TC recommends that a clearer definition of how to approach management for rivers with low abundance and harvest should be developed prior to future updates.

In addition to the inconsistency between the SFMPs and Amendment 3 in terms of required monitoring and defined sustainability parameters, the TC also identified that the SFMPs use a wide variety of metrics to define sustainability but generally do not incorporate the recommended benchmarks in the 2007 benchmark stock assessment of American shad. The group feels that the SFMPs and the TC review process could be improved by standardizing the requirements for SFMPs and metrics used. It will also be beneficial to consider incorporating any new information coming out of the upcoming 2019 stock assessment for shad.

The TC requests that the Board task the TC with meeting in person to develop proposed improvements to Amendments 2 and 3 with regard to the following items:

- Management and monitoring of rivers with low abundance and harvest of shad and river herring
- Standardization of SFMP requirements: content, metrics, and management responses to triggers
- Incorporation of stock assessment information into SFMPs and discussion on the timeline for renewing plans
- Clarification of *de minimis* requirements as they pertain to SFMPs
- Review of the number of years of data are required before developing a SFMP

Shad and River Herring

Activity level: High

Committee Overlap Score: Moderate (American Eel TC, Atlantic Sturgeon TC, Striped Bass TC)

Committee Task List

• Benchmark Stock Assessment (due 2019)
  ○ TC ≈ January 15: Data Deadline
  ○ TC & SAS ≈ February: Data Workshop
  ○ SAS ≈ August: Methods Workshop
• TC – July 1: Compliance Reports Due

TC Members: Bradford Chase (MA, TC Chair), Jacque Benway-Roberts (CT), Michael Brown (ME), Ellen Cosby (PRFC), Mike Dionne (NH), Phillip Edwards (RI), Ruth Haas-Castro (NOAA), Don Harrison (GA), Eric Hilton (VA), Reid Hyle (FL), Jeff Kipp (ASMFC), Wilson Laney (USFWS), Jeremy McCargo (NC), Genine McClair (MD), Larry Miller (USFWS), Johnny Moore (DE), Brian Neilan (NJ), Derek Orner (NOAA), Bill Post (SC), Ray Rhodes (SC), Ken Sprankle (USFWS, TC Vice Chair), Joseph Swann (DC), Josh Tryninewski (PA), Holly White (NC)

SAS Members: Michael Bailey (USFWS, SAS Chair), Michael Brown (ME), Kiersten Curti (NOAA), Ben Gahagan (MA), Edward Hale (DE), Jeff Kipp (ASMFC), Kevin Sullivan (NH)

To: ASMFC Horseshoe Crab Management Board
Date: 9/26/2017

I have been collecting, supplying and returning Limulus that are used in the production of Limulus Amebocyte Lysate for over 40 years. None of my Limulus are ever used as bait. All of my crabs are marked and returned to the estuary where they were collected. I have cooperated and worked with state, regional and federal regulators in order to educate and inform them of my activities. I file monthly "Trip Level Reports" with the Massachusetts Division Of Marine Fisheries. These "confidential" (Under Chapter 130 Massachusetts General Law) catch reports include my permit #, the date that I fished, what time I went out, how long I fished, where I fished (MA is divided into over 325 specific areas), what port I fished from, what method I use to catch, how many crabs I collected, how many male, how many female, permit number of who I delivered them to etc. Having been supplying and returning biomedical crabs, in the same area for decades, my reports indicate that there is no shortage of Limulus. There is no increase in time or effort to collect the same # of crabs year after year. This indicates a very sustainable fishery in every respect. Right now, today, there are tens of thousands of shed Limulus shells washed up all over the shoreline of Pleasant Bay and the Bay bottom is also covered with tremendous numbers of recently shed Limulus shells.

I have been a member of the ASMFC Advisory Panel for Horseshoe Crabs, from the state of Massachusetts since the creation of the AP. When Limulus were first being discussed as a species to be regulated by the ASMFC it was going to be an American Eel/Horseshoe Crab advisory group because at the time Limulus were primarily thought of as bait for Anguilla rostrata. It soon became evident that very few members of the public wanted to discuss eels but many people wanted to talk about the Horseshoe Crab. The two species are now regulated independently by the ASMFC.

Every state from Florida to Maine is different. Certainly New England states vary in climate and fauna from the southern coastal states. Being from Massachusetts I see different behavior exhibited by species that are found elsewhere along the Atlantic coastline. When we at ASMFC speak of the Limulus fishery along the eastern coast of the US the "rufa" species of Red Knots is perpetually entwined in the discussion. South of New York has generally been considered as the area most noted for the northern migration of shorebirds. Cape Cod, where I live, is considered more of a southern migration staging area. We do have a healthy shorebird migration in the Spring but apparently not to the extent of our southern neighbors.

I, like many people, am a bird enthusiast. I very much enjoy recording video of shorebirds and songbirds and I have many dozens of hours of digital recordings that are very helpful in identifying different avian species and what they are feeding on. It is in July and August when I see the greatest numbers of migratory Red Knots here on the elbow of Cape Cod. They are primarily flocking and feeding on juvenile Blue Mussels (*Mytilis edulis*). The Knots are on their way back from the arctic breeding grounds and heading toward their southern habitat where food is plentiful. Red Knots often fly to the southern tip of South America although some groups stay along the southern coast of the US during our winter.

I am writing this in order to respond to the draft of the AP Conference call that we had on September 21, 2017. My comments will touch on just a few studies that I find interesting and informative. There is much literature available that touches on the diet of Red Knots and Limulus. On the following pages I am going to include a few quotes and references regarding diet of Horseshoe Crabs and Red Knots starting with the quote from USFWS from 2001:

- "**Economic Assessment of the Atlantic Horseshoe Crab**" prepared and published by the U.S. Fish and Wildlife Service in 2001 stated:

  "Scientists remain uncertain whether the presence of horseshoe crab eggs is essential to the viability of shorebird populations or whether these populations would find substitute food sources if horseshoe crab eggs became unavailable. In addition little evidence exists indicating whether shorebirds which feed on horseshoe crab eggs have greater reproductive success as a result."

At some point the sentiment expressed in the above statement has changed. It is now commonly stated as fact that Red Knots (rufa) absolutely require horseshoe crab eggs in order to reach their nesting sites in the arctic tundra. All of the other subspecies of Red Knots travel the world north to south, from the west coast of the USA, to Great Britain, Siberia, Australia, New Zealand, Africa and elsewhere. None of them rely on Limulus eggs to survive. All eat a widely varied diet of invertebrates.

Away from Delaware Bay, Red Knots (rufa) feed primarily on molluscs and bivalves:

- *"The prey of Georgia coast red knots were dwarf surf clams (Mulina lateralis), and knots in South Carolina fed mainly on coquina clams (Donax variabillis). Food resources available to knots on the Virginia coast where knot densities were highest, were blue mussels (Mytilus edulis)".* (**Brian Harrington and Winn 2001**)

Brian Harrington, author of "**Flight of the Red Knot**" (no relation to Jay Harrington) documented thousands of Red Knots feeding on blue mussels (Mytilis edulis) in Pleasant Bay (Cape Cod) in 2008 and 2009. That feeding behavior, on Cape Cod, has also been observed and documented every year since then up until last year 2016.

Interestingly on the Red Knots' return to South America for the winter, around the shores of Tierra del Fuego, Brian Harrington again notes that:

- *"Mussels are the knots dietary staple of the season."* (**Food For Flight**).

- *"For the Knots, bivalves are among the most satisfying of delicacies. The birds' digestive systems have evolved accordingly, becoming exceptionally well suited for processing shellfish. Some other shorebirds find the shells of their prey indigestible and have to regurgitate them in pellets… The Red Knot is more fortunate:when it swallows mussel* *spat or a surf clam, it's gizzard grinds shell along with everything else and the waste passes through the entire digestive tract. "* **(P. 36 The Flight of the Red Knot, Brian Harrington)**

Horseshoe Crabs *(Limulus polyphemus*) are voracious predators often competing for the same prey that shorebirds, ducks, geese *and* humans depend on.

In 1948 Harry Turner of the Woods Hole Oceanographic Institute published his report "Propagation of the Soft Shell Clam". Turner reported that *"One adult Limulus eats about one square foot of moderately seeded soft shell clams in a day."* Turner also showed that a single three inch Limulus, held in a tank, ate 99 out of 100 one half inch soft shell clams within a period of 72 hours.

While crabs are adaptable, omnivorous and opportunistic feeders their chemoreceptors are finely tuned to locate their favorite prey, bivalves. I would like to note some research of the dietary habits of Limulus:

- *"Crab guts were literally stuffed with an average of nearly 400 blue mussels, Mytilus edulis averaging 6.3 mm in length."* **(Botton and Haskin, 1984)**

- *" Bivalves comprised the vast majority of the ingested food during all seasons. As many as 465 nut clams, (Nucula proxima), 166 surf clams, 230 razor clams (Ensis directus) and 230 dwarf tellins (Tellina agilis) were found in individual crabs."* **(The American Horseshoe Crab, Harvard University Press 2003)**

- ***"****Similar to crustaceans in appearance, the horseshoe crab, Limulus polyphemus, is a significant predator of the soft-shell clam. It will also eat hard clam seed up to the 5/8 inch range (15 mm). Horseshoe crabs burrow under the sediments to find their prey.* ***(Gef Flimlin, Marine Extension Agent, New Jersey Sea Grant Marine Advisory Service; Brian F. Beal, Assistant Professor of Marine Ecology, University of Maine of Machias)***

When the AP discusses the fact that well over 30 million large horseshoe crabs live around Delaware Bay I find it surprising that a fishery commission never discusses the effect and implications of Limulus feeding on bivalves and other extremely important species. Multiply the stomach contents of a single Limulus (above) times 30 plus million animals and you are talking about billions of shellfish being consumed on a daily basis. For instance; if in one day every horseshoe crab consumed 400 blue mussels that would be over 12,000,000,000 in one single day. I do not believe that every Limulus is suddenly going to gorge on mussels exclusively but I just use that as an example of the effect that tens of millions of Limulus are having on their ecosystem. That fact that Limulus is a voracious predator should be acknowledged and incorporated by ASMFC regulators.

I have read a study, done in the mid-Atlantic region, in which shorebirds *(not Red Knots)* were held in captivity and fed a diet of Limulus eggs or alternatively worms. The shore birds that ate the worms put on weight much faster than the birds that were fed Limulus eggs.

Having an older brother who lives in Kodiak, AK I am reminded of the story of the decline of the Steller Sea Lion populations in the Gulf of Alaska and the Aleutian Islands. Many attributed the decline to the overfishing of Pollock even though Pollock stocks were in very good shape. Fishing was banned for years. Pollock stocks soared while the Steller's numbers continued to decline. It was later determined that Pollock was not a fish that provided enough nutrition for the Sea Lions and that the Pollock were decimating the herring population on which the Stellers traditionally thrived. Many references to that issue can be found online.

None of these anecdotes/stories that I am relating have any definitive relationship to the Limulus / Red Knot discussion. I do think that it is worth opening up a dialogue about the possibility that the relationship of Limulus to shorebirds may need to be expanded.

I have been extremely fortunate to spend much of my life observing the interactions of life in the natural world. It is often the case that when a person, such as myself, comments on my observations they are considered "anecdotal" because they have not been "peer reviewed". I believe that other members of our AP feel that their observations are considered anecdotal as well.

Thank you for your time and for the opportunity to express some of my thoughts as a member of the HSC Advisory Panel.

Sincerely,

Jay Harrington

ASSOCIATES OF
CAPE COD
INCORPORATED

Specialists in Endotoxin and Glucan Detection

10 OCT 2017

Atlantic States Marine Fisheries Commission
1050 N. Highland St.
Ste. 200
Arlington, Virginia 22201

RE: Response to proposed use of confidential data in ARM and Stock Assessments.

Dear Commissioners,

Associates of Cape Cod, Inc. (ACC) has participated in a catch and release fishery of horseshoe crabs (HSC) in the New England region for well over 40 years. Although ACC does not participate in the Delaware Bay biomedical collection, we do have a strong contingent interest in management of this proximal east coast fishery. ACC shares the desire for a healthy and sustainable population of HSC's, however, we are deeply concerned about the proposals that may compromise or remove the protection of confidential company data that is protected by law. ACC is the smallest company in this segment and we rely upon the confidentiality of the fishery data since we compete against much larger corporations, and sharing of that data would put us at a competitive disadvantage.

Conservation efforts surrounding the bait industry have reduced overall harvest of the animal but mortality remains at 100% and is orders of magnitude greater than the biomedical mortality. The biomedical industry has a greater than 40 year history of being a catch and release fishery. Current research indicates that the impact of a biomedical fishery is minimal to the animals, and data from the ASMFC clearly demonstrates that the biomedical catch and release fishery has a very small impact on overall mortality.

A periodic review of the biomedical mortality is supported, but the data does not support that a change in strategy is needed at this time. The bait industry is the leading cause of mortality and should be regulated accordingly as is currently done. To require the biomedical mortality data to be included in the ARM when it is such a small percentage of the number of crabs harvested will not add real value to the ARM. While this may seem inconsequential at first glance, the risks do not outweigh the benefit. The risks involved in including the biomedical data in the ARM process is as follows:

A. The variable data could require quotas for the biomedical industry based on output from unreliable estimates of red knot populations. If biomedical harvest were to be limited, this poses a direct impact to human health. The horseshoe crab blood is used specifically to make LAL, which is a product used to detect life threatening bacteria in any vaccine, medicine, or medical device that enters a human body. There is no alternative that is as

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reliable or accurate, and to prevent this product from being manufactured could directly affect the availability of vaccines, drugs, diagnostics or medical devices. There are times when an unanticipated increase in LAL production is needed, such as during pandemics and outbreaks like those in our recent past. Examples are bird flu, swine flu and measles. To establish quotas on the biomedical harvest when the mortality estimates are so minimal is irresponsible.

B. The release of biomedical data in the Delaware Bay region as an aggregate may not in theory compromise the confidentiality of those biomedical facilities, but in reality it would do just that. The companies in that region are not created equal and the data, even as an aggregate, would give telling data from the main source company in the Delaware Bay region. This would by default, make the data available to the other companies as each company could mathematically determine the competitor's information based on what came out of the Delaware Bay region and vice versa.

Review of harvest data over the past 14 years indicates that conservation efforts have reduced overall harvest rates and that overall harvest and related mortality is well below the thresholds set by the ASMFC and individual states that often opt for a more conservative approach to quota management.

The majority of BMPs formalized in 2011, including live release, had been in practice for decades in some instances. Our operations are widely scrutinized by local, state and federal authorities, as well as US and international regulators, customers, and internal quality control. We take our current reporting responsibilities very seriously, and have performed to expectations.

Conclusion:

Associates of Cape Cod, Inc. commends the efforts of the horseshoe crab ARM subcommittee and the fine work done in an effort to stabilize populations of both the horseshoe crab (HSC) and red knot in the Delaware Bay region. The relationship between the biomedical facilities and fisheries managers is longstanding and productive. Over 40 years of conservation efforts have proven to be effective. Given the data, it would be reasonable to conclude that the biomedical fisheries are of little, if any, impact. Therefore, a change to the ARM and /or stock assessments that can potentially release confidential information and increase the risk of possible negative impact to an industry that provides such a vital and important product is unwarranted. I do appreciate your attention to this most important matter and ask that this material is available for the annual meeting in October.

Best regards,

Brett Hoffmeister
LAL Production Manager

Horseshoe Crab

Activity level: High

Committee Overlap Score: Low (SAS overlaps with BERP)

Committee Task List

- TC/SAS – All Year: Benchmark stock assessment
  - SAS & TC - January/February: Data Workshop
  - SAS – March and May: in-person Assessment workshops
  - SAS – January-August: data collection, analysis, report writing
  - TC – July: review benchmark assessment report
  - SAS – August: 3 day Peer Review Workshop
  - SAS Chair – October: Present the stock assessment to the Board
- TC – March 1st: Annual compliance reports due
- ARM & TC – Fall: Annual ARM model to set Delaware Bay specifications, review red knot and VT trawl survey results

TC Members: Rachel Sysak (NY, TC Chair), Lindsey Aubart (GA), Tiffany Black (FL), Gregory Breese (USFWS), Jeff Brunson (SC), Jeff Brust (NJ), Joanna Burger (Rutgers), Ellen Cosby (PRFC), Jeffrey Dobbs (NC), Steve Doctor (MD), Adam Kenyon (VA), Mike Millard (USFWS), Scott Olszewski (RI), Derek Perry (MA), Steve Poland (NC), Linda Stehik (NMFS), Chris Wright (NMFS), Jordan Zimmerman (DE), Kristen Anstead (ASMFC), Michael Schmidtke (ASMFC)

SAS Members: John Sweka (USFWS, SAS Chair), Jeff Brust (NJ), Jeffrey Dobbs (NC), Michael Kendrick (SC), Scott Olszewski (RI), David Smith (USGS), Rachel Sysak (NY), Richard Wong (DE), Kristen Anstead (ASMFC), Michael Schmidtke (ASMFC)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

OCT - 6 2017

Atlantic States Marine Fisheries Commission
1050 N. Highland Street, Suite 200 A-N
Arlington, VA 22201

RE: Request for complementary rebuilding measures for dusky sharks

Dear Coastal Sharks Management Board Members:

On April 4, 2017, NOAA's National Marine Fisheries Service (NMFS) published its final rule for Amendment 5b to the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP) (82 FR 16478). The primary purpose of Amendment 5b is to end overfishing and rebuild dusky sharks (*Carcharhinus obscurus*), consistent with the most recent stock assessment update completed in 2016. This stock assessment update estimated that a mortality reduction of 35 percent is necessary to rebuild the stock by the year 2107, and a 12 percent reduction is needed to end overfishing. The final measures are described in the attached table. Additional background and details on Amendment 5b can be found on the HMS website at: http://www.nmfs.noaa.gov/sfa/hms/.

NMFS is requesting assistance from the states and the ASFMC in contributing to the rebuilding of the dusky shark stock, which is a shared resource across state and Federal waters. Specifically, we request consideration of the following measures that would complement the Amendment 5b measures:

1. Assist with outreach and education, including providing links to NMFS educational materials (e.g., new "shark endorsement" training video for recreational permit holders, species identification placards, etc.) on each state's fisheries agency website.
2. Collaborate with the NMFS HMS Management Division to develop best practices for the handling and release of sharks caught when fishing from the shoreline.
3. Require non-offset, corrodible circle hooks in state hook and line fisheries (recreational and commercial) that target sharks.
4. Require fishermen to maximize gear removal, as safely as possible, when releasing sharks.
5. Develop cooperative research opportunities with NMFS to improve data collection on sharks caught (including landings and discards) in state water fisheries. This includes, but is not limited to, cooperating in the Federal shark research fishery.

NMFS determined that the recreational and commercial fishery management measures listed in the attached table would end overfishing and rebuild the dusky shark stock. However, these measures only apply to federally-permitted HMS vessels fishing in federal or state waters. They do not apply to state-permitted vessels fishing in state waters or anglers fishing from shore. Dusky sharks range from Massachusetts to Texas, from nearshore (within state waters) to offshore pelagic waters. The immature portion of the stock, in particular, is largely distributed in nearshore state waters (refer to the revised HMS updates to essential fish habitat designations for dusky sharks found here: http://www.nmfs.noaa.gov/sfa/hms/documents/fmp/am10/index.html). In order to conserve the dusky shark stock throughout its range, it would be optimal for these management measures to more fully apply within state waters as well as Federal waters.

We look forward to discussing this request with you at the ASMFC's October meeting. If you have questions, please contact Karyl Brewster-Geisz (karyl.brewster-geisz@noaa.gov) or Tobey Curtis (tobey.curtis@noaa.gov). We appreciate your support in this matter.

Sincerely,

Margo Schulze-Haugen
Division Chief
Highly Migratory Species Management

Attachment

Final Management Measures in Amendment 5b to the 2006 Consolidated Atlantic HMS FMP

Recreational Measures	**Final Management Measures**
Permit Requirements and Outreach	*Effective January 1, 2018* Require HMS permit holders fishing for sharks recreationally to obtain a shark endorsement, which requires completion of an online shark identification and fishing regulation training course, plus additional recreational fisheries outreach.
Circle Hook Requirement	*Effective January 1, 2018* Require the use of non-offset, non-stainless steel circle hooks by all HMS permit holders with a shark endorsement when fishing for sharks recreationally south of 41° 43' N latitude (near Chatham, Massachusetts - the northern extent of the dusky shark's U.S. Atlantic range), except when fishing with flies or artificial lures.
Commercial Measures	**Final Management Measures**
Shark Release Protocol	*Effective June 5, 2017* Fishermen with an Atlantic shark limited access permit with pelagic longline gear onboard must release all sharks not being retained using a dehooker or cutting the gangion less than three feet from the hook as safely as practicable.
Additional Training Requirements	*Effective June 5, 2017* Require completion of a shark identification and fishing regulation training course as a new part of all Safe Handling and Release Workshops for HMS pelagic longline, bottom longline, and shark gillnet vessel owners and operators.
Outreach and Fleet Communication Protocol	*Effective June 5, 2017* Increase dusky shark outreach and awareness through development of additional outreach materials, and require HMS pelagic longline, bottom longline, and shark gillnet vessels to abide by a dusky shark fleet communication and relocation protocol.
Circle Hook Requirement	*Effective January 1, 2018* Require the use of circle hooks by all HMS directed shark permit holders using bottom longline.

American Eel

Activity level: Low

Committee Overlap Score: Medium (SAS overlaps with BERP, Atlantic herring, horseshoe crab)

Committee Task List
• January 2018: Ageing workshop for state ageing labs • TC – June/July: Annual review of any aquaculture proposals that are submitted • TC – September 1st: Annual compliance reports due

TC Members: Tim Wildman (CT, TC Chair), Lindsey Aubart (GA), Kimberly Bonvechio (FL), Bradford Chase (MA), Ellen Cosby (PRFC), Sean Doyle (DC), Robert Eckert (NH), Sheila Eyler (USFWS), Alex Haro (USGS), Carol Hoffman (NY), Michael Kaufmann (PA), Wilson Laney (USFWS), Todd Mathes (NC), Patrick McGee (RI), Jennifer Pyle (NJ), Troy Tuckey (VIMS), Andrew Watson (SC), Keith Whiteford (MD), Gail Wippelhauser (ME), Jordan Zimmerman (DE), Kristen Anstead (ASMFC), Kirby Rootes-Murdy (ASMFC)

SAS Members: Jeffrey Brust (NJ, SAS Chair), Bradford Chase (MA), Matt Cieri (ME), Sheila Eyler (USFWS), Laura Lee (NC), John Sweka (USFWS), Troy Tuckey (VIMS), Keith Whiteford (MD), Kristen Anstead (ASMFC), Kirby Rootes-Murdy (ASMFC)

Atlantic Coastal Cooperative Statistics Program
1050 N. Highland Street, Suite 200A-N | Arlington, VA 22201
703.842.0780 | 703.842.0779 (fax) | www.accsp.org

ACCSP Integrated Reporting Workshop Report

May 11th, 2017

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Contents

Draft Integrated Fishery Reporting Workshop Report, 5 September 2017

Executive Summary

The Atlantic Coastal Cooperative Statistics Program (ACCSP) held an Integrated Fisheries Reporting (IFR) workshop to initiate development of the business rules needed to create an ACCSP standard for IFR and to define requirements for incorporating these rules into the Standard Atlantic Fisheries Information System (SAFIS). IFR is a fishery reporting method that utilizes a single unique trip identifier for all reports associated with the given trip, provides a single reliable source for all data and maximum use of automatic quality control and assurance. Thus data reported by fishers, commercial dealers, dockside samplers and fisheries observers would be easily associated together. These changes will result in improved fisheries data systems for management and stock assessments and dramatically reduce data analysis and quality control associated with linking disparate reports together.

The workshop was opened by Eric Schwaab, National Fish and Wildlife Foundation and former NOAA Fisheries Assistant Administrator, who emphasized that IFR will improve data timeliness and accuracy, thus helping to build trust in the data among both management and industry users. Subsequent presentations included a synthesis of previous integrated reporting work, an overview of integrated reporting efforts outside the USA, and an update on implementation of the Fisheries Dependent Data Visioning (FDDV) project of the Greater Atlantic Region. Part of the FDDV project will be the implementation of a Trip Management System (TMS), which will drive the effort to integrate reporting for the Greater Atlantic Region.

Following the presentations, the group determined that TMS was a logical starting point for the development of an integrated reporting solution capable of meeting all ACCSP partners' needs. The consensus was that the TMS and FDDV conceptual plan should be the launching point for workshop discussions and development.

Workshop participants discussed issues associated with implementing integrated reporting, including: duplicate reporting requirements, confidentiality, trip definition, regulatory changes, and the need to adapt to circumstances in individual jurisdictions. The workshop also provided a platform to advance the discussion of current modules for the trip, dealer, biological sampling, and observers/bycatch, and expanded future business modules for the vessel monitoring system (VMS), electronic monitoring (EM), private recreational angler, and cooperative research.

Recommendations for achieving IFR in the SAFIS redesign process include:

- Accounting for the wide variety of current reporting scenarios
- Flexibility in trip identification creation
- Minimizing duplication of collected data elements
- Following existing ACCSP standards for access and confidentiality
- Creating a flexible design to accommodate future modules

This report will be used to establish a timeline and guide the implementation of IFR in the SAFIS redesign. The incorporation of unique trip identification is a critical step in IFR implementation and providing the capability for multiple sources to generate this unique trip identification will enable a more functional and flexible reporting system. Workshop participants also identified reducing duplicative reporting as a critical need. An overview of the report will be given to the ACCSP Coordinating Council in Fall 2017.

Acronym List

API	-	Application program interface
CF_ID	-	SAFIS participant identification for commercial fishermen
CTR	-	Complete trip report
DW	-	Data Warehouse
ER	-	Electronic reporting
EM	-	Electronic monitoring
eVTR	-	Electronic vessel trip report
FDD	-	Fishery dependent data
FDDV	-	Fishery Dependent Data Visioning – project of GARFO and NEFSC to modernize FDD systems
GPS	-	Global positioning system
IFR	-	Integrated fishery reporting
IR	-	Integrated reporting (synonymous with IFR)
NEFOP	-	Northeast Fishery Observer Program
PTNS	-	Pre-trip notification system
SAFIS	-	Standard Atlantic Fisheries Information System
TMS	-	Trip management system
VMS	-	Vessel monitoring system
VTR	-	Vessel trip report

Introduction

Fisheries-dependent data have been collected by both federal and state fisheries management agencies for decades and, up until a little over twenty years ago, most data were collected independently by those agencies. Beginning with the formation of the ACCSP in 1995, fisheries-dependent data collection efforts on the Atlantic coast began to systematize. Program Partners developed coastwide data standards and then the Data Warehouse to provide centralized storage of data contributed by partners. With advances in both web based and database technologies, the Program built data collection tools in collaboration with partner agencies, which were packaged into the Standard Atlantic Fisheries Information System (SAFIS). SAFIS collects, processes and disseminates fisheries-dependent data that are consistent across the Atlantic coast.

SAFIS applications are rapidly evolving in response to new technologies, particularly in the handheld mobile arena. This evolution, in combination with the changing requirements of partner agencies and constituents, has precipitated the need for a redesign of the system. The SAFIS redesign offers the opportunity to develop and implement IFR at the same time.

Pursuit of Integrated Reporting

One of the longstanding, unresolved issues with fisheries-dependent data collection efforts, across both federal and state agencies, is the problem of linking catch data from a fishing trip with either the landings data reported by the dealer to whom the catch is sold, or the biological/observer data that may be collected during or at the end of the trip. Improving the relationship between individual trip records will help to reduce reporting errors and allow for more timely, accurate data, which in turn can help management, science and stock assessments as well as the fishing industry. Furthermore, other data sets collected independently, such as those provided by vessel monitoring systems (VMS) or electronic monitoring, need to be integrated more efficiently with trip data.

Starting in 1994, certain federally-permitted harvesters were required to report their fishing activities on a pre-printed paper form, or vessel trip report (VTR), which contained a unique identification (ID) number. The ID number on the report, in theory, would then be passed on to the dealer to be included with the dealer's report so that the two data sets could be integrated after they were collected. Similarly, samplers or observers on trips would do the same.

Electronic Technologies and Integrated Reporting

Even with today's advanced technologies, this process is still largely being used for fisheries-dependent data collection. The continued reliance on manual data entry, error-checking and trip matching means that data are not as accurate and timely as they could be.

Federal fisheries-dependent data managers have been exploring ways to improve the data collection and management using electronic technologies for some time, identifying integrated reporting as a critical component of plans to improve fisheries-dependent data. Likewise, an integrated reporting solution was identified as a priority during the functional-requirements-gathering phase of the SAFIS redesign. Along with other state and federal plans, these initiatives provide an opportunity to develop and implement a flexible integrated reporting component into SAFIS that can be used by all ACCSP partners. This workshop helped define the scope of a solution by identifying and addressing potential issues or impediments to implementation. All workshop definitions, participants and presentations are contained in Appendices 1, 2, and 3, respectively.

Methods

The workshop planning team created a terms of reference document to identify the core concepts and objectives of the workshop. Those were:

- Review background and the current state of affairs (work to date), and confirm that process is on target. In particular, need input and confirmation from non-federal partners.
- A Trip Management System (TMS) solution has already been developed conceptually by the NE Region. Consider using that as a starting point and develop further.
- Define the scope of the solution.
- Identify and attempt to address issues or impediments to implementation.
- Identify core business rules/requirements.
- Review and consider future potential fisheries-dependent data collection modules (e.g. EM, dealer-to-dealer transactions, traceability), both federal and state, and possible need to interact with those eventually.
- Provide a report of findings and recommendations.

The report entitled *FIS Integrated Reporting Research & Design Project*, initiated by NOAA Fisheries employee Mark Brady, coupled with regional federal data visioning project reports on the Atlantic coast, formed the bulk of the background material for review. The Atlantic States Marine Fisheries Commission (ASMFC) Spring Meeting week was the preferred timing for the workshop as it allowed managers and others to attend. Individuals were selected to participate in the workshop based on a range of expertise. Several are members of various ACCSP technical committees.

Presentations highlighted the importance of an integrated reporting framework, summarized work previously accomplished in the USA and internationally, and described the Greater Atlantic Regional Fisheries Office (GARFO) and Northeast Fisheries Science Center (NEFSC) IFR plans based on their data visioning process.

After the presentations, participants identified impediments to IFR implementation for each existing reporting module - trip, dealer, biological and observer/bycatch. Workshop participants then broke into smaller discussion groups for each reporting module to attempt to address the identified issues.

Finally, future modules that might affect how an integrated fisheries reporting solution is designed – such as VMS, electronic monitoring (EM), and product traceability– were considered as well.

Results

GARFO and the NEFSC have already developed, in concept, an integrated reporting solution for federal fisheries data collection in the northeast: the Trip Management System (TMS). Given that GARFO/NEFSC has committed to working with ACCSP to develop an integrated reporting solution as part of the SAFIS redesign, it is incumbent upon ACCSP to explore options that build upon the proposed TMS concept. The TMS, which will be first developed in the Greater Atlantic Region, integrates various components of the trip report, exchanges information among various databases, e.g. VMS, pre-trip notification system (PTNS), observer data, dealer reports, and trip reports, in an integrated system.

As described by Barry Clifford in his presentation (Appendix 3), a TMS would operate autonomously, communicating with all of the current data collection modules (trip, dealer, biological and observer/bycatch) and potentially others like VMS. As trips are declared or initiated, a record is generated in the TMS by the harvester (either directly or via VMS), capturing important attributes such as vessel identifier, fishermen identifier and trip date. Reports submitted from other sources, such as a dealer buying from that vessel/fishermen, or an observer working on that trip, can then use that record, and its unique identifier, to link the records together.

Workshop participants were asked whether GARFO and NEFSC's TMS integrated reporting solution would be a logical place to start in terms of devising an integrated reporting solution to meet the needs of all ACCSP partners. The consensus was that the GARFO/NEFSC conceptual plan provided a template for workshop discussions and future IFR development.

Data Modules in ACCSP Integrated Fishery Reporting System

Data components of the integrated fishery reporting system were separated into four initial modules: trip, dealer, biological, and observer/bycatch. Workshop participants identified additional modules that may be incorporated into the system in the future including EM, GPS, and traceability data.

The ACCSP integrated fishery reporting system design will be flexible enough to accommodate additional modules in the future, all of which will be linked with the existing modules using the unique trip identifier. As is the case with ACCSP's current suite of data systems and products, all data modules in the integrated fishery reporting system will adhere to federal and state confidentiality rules.

Trip Module

The trip report is a record of a fishing trip or event and includes most importantly the trip date and vessel/harvester permit identifiers. In addition, trip reports usually include information about the catch (species and quantity) as well as the effort, gear, and location of fishing.

Commercial trips often indicate which dealer the catch is sold to. For more in-depth information about standard data elements for this module, as well as the others that follow, see the Atlantic Coast Fisheries Data Collection Standards. The audience for the trip report includes harvesters, dealers, state and federal managers, samplers, and observers. Trip reports are housed both in SAFIS and the Data Warehouse.

Integrating the Trip Module

Ideally harvesters would generate a TRIP ID electronically either before, during or shortly after the conclusion of the trip. This might be done either by the harvester or via the VMS upon trip declaration.

Federal and state rules might differ in terms of the information required of harvesters to generate a record in the TMS, and those differences would be accommodated. For example, while a federal trip entry requires the vessel permit identifier, a state trip entry in the TMS would require the state permit identifier.

Furthermore, if no vessel is used during the trip, this might be recorded as occurring from shore. Other special cases, such as multiple trips occurring on the same day, carring, or the co-mingling of the catch from multiple trips, and trips offloaded at multiple ports would all require careful consideration. Recording trip type would be important, particularly in terms of associating a dealer record, and how to handle recreational sales that occur in some jurisdictions from for-hire trips. If a trip is only declared in the TMS with no associated catch information, harvesters would need to easily identify that record later in the TMS to be able to associate and add their catch data.

Critical issues with respect to the trip module that were raised by workshop participants are included in the Table 1.

Table 1: Trip module issues and suggested solutions as reported by Workshop Small Group

Issue	Solution
No vessel for identification (i.e. shore fishing)	Need valid fisherman identification link to TMS
Split permit trips	With properly identified vessel, link permit information to data management system during processing
Moving port on a trip	Turn report into two trips <u>or</u> add a sub-trip identifier
Discards on next trip (regulatory requirement)	Add a disposition code for this circumstance
Carring (practice of aggregating catch from multiple trips (catch co-mingled from multiple gears, fishing events, fishermen))	List sale disposition rather than catch disposition

Personal sale (individuals or restaurants)	Refer to the Recreational Technical Committee for suggested standards solution
Vessel takes two trips in one day	Unique trip identifier for each trip
International trips	None suggested
States that require legislative action to implement electronic reporting	Build integrated reporting system to allow ongoing non-electronic reporting until states make needed changes
Move to electronic reporting hampered by lack of broadband access	Build integrated reporting system to allow ongoing non-electronic reporting until broadband access is upgraded or focus on data transmission by cell signal (which does not need signal strength needed for voice or video

Dealer Module

This module refers to the report made by dealers. The dealer report provides the market and grade distinctions and landed weight of the species sold by the harvester, as well as the price paid for the landed catch. It can also provide important information depending on the species landed and jurisdiction, such as area fished or port of landing.

In a two-ticket reporting scenario, this report is submitted independently of the trip report submitted by harvesters, whereas in a one-ticket reporting scenario, commonly used in the southeast, the dealer collects and submits the trip information along with the dealer information on a single report.

Most of the dealer information generated on the Atlantic coast is submitted to SAFIS in near real time or up to a week after it was generated. In some cases, the dealer information is submitted instead directly to the Data Warehouse. The data are used by a variety of stakeholders, including the dealers themselves; the harvesters from whom they purchase; federal and state managers, and biologists; academic researchers; the media; and the general public.

Integrating Dealer Report with Existing Trip Report

Perhaps the most complicated piece to the TMS is the integration of a dealer report. Conceptually, if a trip is already declared, and a TRIP ID is already generated for a particular vessel or permit holder in the TMS, regardless of the source, the dealer would have the ability to select that trip to associate the landings report with it. In some instances, the dealer might initiate a report by swiping a harvester card. The swipe application would then have to negotiate the trip integration if a single ticket was not warranted.

To match their reports with existing declared trips in the TMS, dealers would require access to a list of declared trips by vessel or permit holder. A list could allow dealers or other harvesters that are also dealers, to "shop" the TMS and take advantage of the information contained. Workshop participants suggested developing a "consent" process for the harvester, likely as part of the permit management module of SAFIS, which would indicate to the TMS that a harvester's trip info may be accessed by dealers. The consent process could be tailored in many ways, such as for a range of explicit dates, or that only specific dealers have access as opposed to all.

Additionally, the consent process might incorporate the notion of intent, where a harvester actually indicates to which dealer he/she intends to sell to when the trip is declared. This solution could also be used for the release of data in the traceability process, providing value-added incentive. Harvesters would have the ability to revoke their consent to a given dealer, and would likely need to renew their agreement periodically. If consent is not given, then the dealer would not have access to that harvester's trip information in the TMS and would instead generate a new TRIP ID in the TMS that could be used for pre- or post-matching, depending on the timing of other submissions.

TRIP ID Generation by Dealers

If the report is not initiated via a swipe application, or the dealer does not find a suitable trip in the TMS, then a TRIP ID could be generated as part of the dealer report. This may also include having to accommodate the manual transfer of a pre-generated TRIP ID from legacy paper forms or for entry in external programs such as the Bluefin software. Validation rules could also be developed to minimize mistakenly reusing a TRIP ID, or one initiated from another state. Regardless, a record would be entered in the TMS indicating how integration was handled, if at all, and the type and quality of match tracked to help with post-processing.

Certain fishing industry practices will warrant the need for additional flexibility. For instance, the catch from a trip might be sold to more than one dealer, which means that the TMS would need to allow multiple dealers the ability to use the same TRIP ID. Conversely, catch from multiple trips can be co-mingled and sold together in one transaction, and the TMS would need to handle this scenario as well.
Critical issues with respect to the dealer module raised by workshop participants are included in the Table 2.

Table 2: Dealer module issues and suggested solutions as reported by Workshop Small Group

Issue	Solution
Reporting Timeliness (Multiple TRIP ID could be created)	TRIP ID generation directly proportional to the quality of match (i.e. the sooner the generation, the better the match). TRIP ID ideally generated prior to sale by harvester and dealer pre-matches record to that.

Pre-matching of TRIP ID cannot occur	• Swipe card or manual transfer can be used • Format of TRIP ID could include a set of codes within the TMS record • Validation process for when a match doesn't make sense (e.g. FL trip matched to a ME dealer record). • Qualifiers are entered along with the TRIP ID when created to identify the source and confidence level of match, Use "match" confidence codes (e.g. perfect, manual, fuzzy).
Harvester report does not exist prior to the dealer transaction	Inform the dealer during the creation of the report that no TRIP ID exists to be matched to, and that a new TRIP ID should be generated.
Paper reporting	Program partner enters electronically and rely on partner to match or fuzzy matching.
File upload submissions (i.e. Bluefin)	Rely on manual entry of TRIP ID or fuzzy matching.
Data isn't submitted to SAFIS	Rely on fuzzy matching in Data Warehouse.
Dealer selecting matching Trip ID without violating confidentiality	• Develop "consent" process for the harvester for the release of necessary data elements to one or more dealer(s), either on a trip-by-trip basis or for a range of trip dates. • This data agreement could also be used for data release with respect to traceability, a value-added encouragement. • Harvesters would have the ability to revoke their consent and may need to renew their agreement periodically.
Single Trip for Multiple Dealer Reports	Each dealer report uses the same TRIP ID
Multiple Trips for a Single Dealer Report	Multiple TRIP ID's associated with one dealer report
Product that is carred or trucked (commingling of trips' product)	Might need to be an orphan trip. Pooling TRIP IDs, the utility of this will need to be further discussed

Biological Sampling Module

This module refers to the data collected and reported by biological samplers who are Program partner employees or contractors. This involves the dockside and at-sea sampling of individual fish to collect biological parameters of a trip's catch. Currently, the information generated on the Atlantic coast is maintained by Program partners, a portion of which is submitted to ACCSP and stored in the Data Warehouse. In the future, more of this information could be submitted in near real time to the biological module in SAFIS. The data users are mainly the scientists who collect or use the data, as well as state and federal managers.

At a minimum, the data collected include species, sample type, sample data, and unit of measure. Currently, biological data are generally only collected from commercial or for-hire trips. In the future, it may also be collected from private recreational trips.

Integrating Sampling Report

Partner agencies would also have the need to link their biological sampling data to the original trip through a newly developed TMS. In most cases, this would be done after the trip was declared or even submitted in full to SAFIS, either through direct trip-by-trip submissions in near real time or after the fact. However, it is conceivable that biological sampling reports may, in rare cases, be submitted before any other modular data. Similar to circumstances in which the dealer is creating that initial record, processes would be required to manage the matching of these data sets as they are added.

Critical issues with respect to the biological sampling module raised by workshop participants are included in the Table 3.

Table 3: Biological sampling module issues and suggested solutions as reported by Workshop Small Group

Issue	Solution
Link in cases of mandatory trip reporting and if trip exists (pre-matching)	Match biological data to existing trip in TMS, if it exists.
Link in cases of non-mandatory reporting or trip does not exist.	Allow for TRIP ID creation in TMS by the sampler, but only if the trip does not exist. Would need to qualify these TMS records differently as they could be permanently "orphaned" records, or without a true trip record to match to. This means parameters normally collected and stored with a trip record (e.g. area, gear, etc.), may not be available.

Observer / Bycatch Module

The observer report is a record of an observed trip made by a fishery observer or at-sea monitor. A fishery observer collects data about catch (numbers, sizes, biological samples, protected species interactions, etc.). At-sea monitors are more narrowly focused on monitoring catch and compliance with regulations, e.g. discarding at sea. For this report and module, the data in the observer/bycatch module will include catch monitoring and compliance data; biological sampling from observer trips will be included in the biological sampling module.

Data from observers are currently stored at the Northeast Fisheries Science Center and Southeast Fisheries Science Center. When the Integrated Reporting project is implemented, these data will be linked to other trip data through the trip management system and unique trip identifier.

Integrating Observer Report

Partner agencies would also have the need to link their observer data to the original trip through a newly developed TMS, and in most cases, this would be done after the trip was declared or even submitted in full to SAFIS, either through direct trip-by-trip submissions in near real time or after the fact. However, it is conceivable that observer data may be, in rare cases, submitted before any of the other modular data. Similar to circumstances where the dealer is creating that initial record, comparable processes would be required to manage the matching of these data sets as they are added.

Critical issues with respect to the observer/bycatch module raised by workshop participants are included in the Table 4.

Table 4: Observer/bycatch module issues and suggested solutions as reported by Workshop Small Group

Issue	Solution
Confidentiality of observer reports	Work with federal partners to disseminate information to observer/bycatch monitoring programs
Need for automation in data entry, QA/QC, and the use of automation to reduce duplication is a challenge for observers and at-sea monitors	Ensure that the IFR system incorporates elements that address these issues to the extent possible.
Need for "one-touch" data entry (including automated length and weight collection, and reducing duplicative auditing)	Design data entry equipment to accept peripherals for length, weight, etc.
Report data elements need better definition (see list in Appendix 2)	Refer to the Bycatch Prioritization Committee for consistency and clarity

Future Modules

A module for geographic location data could be created using VMS or other geographic location tracking systems data. Incorporation of VMS geographic location data could be possible when these data are made available for uses other than law enforcement compliance. Potential uses could include location data linked to trip, biological, and observer data to geographically mark and link these data types. A module for EM data (imagery) could be added if SAFIS is used for data collection and EM data is stored within the Data Warehouse. A module for product traceability was discussed and could be added if consistent data standards are developed for such a system.

Summary of Recommendations for Achieving IFR in SAFIS Redesign

Timeliness of TRIP ID Generation

Building upon the GARFO/NEFSC conceptual design of a TMS, it would appear the timeliness of the unique identifier or TRIP ID generation and how it is handled under the multitude of reporting scenarios on the Atlantic coast is probably the most important piece of the process when considering an integrated reporting solution. In an ideal world, the TRIP ID would be generated electronically by the harvester before or during the trip, and integrating the other components would involve searching for and selecting that trip and then associating that trip to the follow-on report. Workshop participants felt the longer it takes to match a module's data to a trip, the more likely today's standard of "fuzzy matching" will be required. However, not all trips along the Atlantic coast operate and are reported in that fashion, and thus a new solution should take into consideration the wide variety of reporting scenarios that exist. Furthermore, the solution might also be built with future data modules in mind, such as electronic monitoring, traceability, or GPS files.

Flexibility of TRIP ID Generation

Ultimately, it is recommended that a newly developed TMS be flexible enough to handle TRIP ID generation from multiple sources, not only from the harvester but also from the dealer if that trip has yet to be declared. TRIP ID generation might also be available to agency biologists and observers as well as by VMS services. This would mean the TMS would play an important role in deciphering who is submitting a report in addition to whether that report is intended to declare a trip or to be matched to another one, and it would have to be flexible enough to accommodate the multitude of reporting conditions that occur on the Atlantic coast. The TMS would also have to function with all the different systems and software applications that currently interface with SAFIS, such as the Bluefin software, eDealer, eTrips, etc. A TMS that functions this way then plays a very important role not only in a pre-processing mode where data modules are matched in real time as they are submitted, but also in a post-processing mode where data are matched after the fact, not only within SAFIS, but potentially within other repositories such as the Data Warehouse. A system that provides that flexibility gives each partner the ability to use the system as it sees fit. Furthermore, as the partner's data collection needs evolve, a flexible TMS can meet those changing needs.

Minimizing Duplication of Collected Data Elements

One important concept, regardless of the order of submissions, would be minimizing the duplication of overlapping data elements, such as trip date and vessel/permit holder identifier. Perhaps this could be accomplished by locking those common data elements and making them unchangeable downstream, in their respective modules, once established in the TMS.

Access and Confidentiality

Another overarching question had to do with access or credentials to the system. Everyone agreed that a SAFIS account would be required in all cases, with partner agencies having administrative access to enter a report under each of the modules as well as the ability to access all TMS information for matching purposes, if necessary. The TMS will be an integral component of the redesigned SAFIS and will not require log in. Integrating the TMS into SAFIS makes this task relatively straightforward.

Flexible design for Future Modules

The last portion of the workshop was spent discussing potential "future" modules, and two were identified that might be worthy of integrating through a newly developed TMS. The first was location monitoring services over and above the VMS technology that is currently in use in some federal fisheries, such as GPS tracking applications. The second was EM or electronic monitoring. In each case, it is plausible these data sets would be submitted independently, either by the harvester or partner agency and would require similar processes as the already established modules to be integrated into the reporting system. By following a particular formula, a flexible TMS can take on new modules as they develop.

Conclusion

The general overall concept of a newly developed TMS wrapped into the redesign of SAFIS is relatively clear. The autonomous service would be linked to and dependent on other portions of SAFIS, and would be the core nexus to most fishery-dependent report submissions, both commercial and recreational. It would orchestrate, through specific business rules, how those submissions are matched to the original trip either before, during or after the trip is completed, regardless of which submission is received first. Although this solution would not completely eliminate the need for post-matching, having a source record in the TMS for all modular submissions should make the process more efficient and accurate, particularly if those reports are made electronically and in near real time.

Next Steps

Implementing integrated fishery reporting will take time, investment, and clear communication and implementation planning. Initial steps forward include:

1) Communication about report

This report will be disseminated to ACCSP partners and others interested in data modernization. This will include a briefing to the ACCSP Coordinating Council at the next meeting following completion of the report. The report will also be posted on the ACCSP website, and a summary will be included in the next ACCSP newsletter.

The report will be made available to the NOAA Fisheries Electronic Reporting Professional Services Group and other relevant groups to make them aware of the effort and to get feedback on the report and the integrated fishery reporting concept.

The report will also be shared with other data modernization efforts such as the Greater Atlantic FDDV[1] team and the Net Gains[2] steering committee.

2) Planning meeting

To continue the work on the ACCSP Integrated Fishery Reporting effort, the workshop steering committee, other ACCSP staff, and selected system designers will meet as needed in Fall 2017 to map out the steps needed to implement the project. This will include discussion of:

a. Software and hardware needed for IFR
b. Design the implementation process in a way that allows program partners to implement when it is feasible and possible in their jurisdictions
c. Further development of the four reporting modules (dealer, trip, biological sampling, and observer/bycatch
d. Other topics

[1] http://s3.amazonaws.com/nefmc.org/FDDV-Presentation-NEFMC-June-2017.pdf
[2] http://www.pcouncil.org/wp-content/uploads/2017/05/InfoRpt3_netgainsreport_JUNE2017BB.pdf

Appendix 1: Definitions

Carring – The aggregation of catch from more than one trip for storage and subsequent sale.

Electronic Technology(ies) (ET)[3] – Any electronic tool used to support catch monitoring efforts both on shore and at sea, including electronic reporting (e.g., e-logbooks, tablets, and other input devices) and electronic monitoring (Vessel Monitoring Systems, electronic cameras, and sensors onboard fishing vessels).

Electronic Monitoring (EM)[4] – The use of technologies – such as vessel monitoring systems or video cameras – to passively monitor fishing operations through observing or tracking. Video monitoring is often referred to as EM.

Electronic Reporting (ER)[5] – The use of technologies – such as smart phones, computers, and tablets – to record, transmit, receive, and store fishery data.

Fuzzy Matching – The use of non-automated techniques to match various data sources from one trip without the use of a unique trip identifier occurring during post processing.

Global Positioning System (GPS)[6] - global navigation satellite **system** that provides geolocation and time information to a **GPS** receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more **GPS** satellites.

Integrated Fishery Reporting System (IFR)[7] – A fishery reporting designed according to the following principles:

- All reporting for a single trip is done on a single report or the logical equivalent.
- Use the same trip ID codes in all subsystems.
- Rather than depend on redundancy, use the single, most reliable source for each data item.
- Prevent errors first, look for those that remain, and correct them.
- Determine the predominant source of errors and address those first.

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[3] http://www.nmfs.noaa.gov/op/pds/documents/30/30-133.pdf
[4] http://www.nmfs.noaa.gov/op/pds/documents/30/30-133.pdf
[5] http://www.nmfs.noaa.gov/op/pds/documents/30/30-133.pdf
[6] https://en.wikipedia.org/wiki/Global_Positioning_System
[7] FIS Integrated Reporting Research and Design Project report

Match Based Reporting[8] - Match Based Reporting is the reporting method currently in use throughout NMFS. It is based on the assumptions listed above. Its primary architectural feature is the matching of trips across data streams after the trips have occurred, based on data that was reported by humans. This design feature makes Match Based Reporting unnecessarily complex and error prone.

Traceability[9] - the ability to trace and follow fish and fish products through all stages of production, processing, and distribution.

Vessel Monitoring Systems (VMS)[10] - VMS is a satellite surveillance system primarily used to monitor the location and movement of commercial fishing vessels in the U.S. Exclusive Economic Zone (EEZ) and treaty areas. The system uses satellite-based communications from onboard transceiver units, which certain vessels are required to carry. The transceiver units send position reports that include vessel identification, time, date, and location, and are mapped and displayed on the end user's computer screen.

[8] Integrated Reporting: Motivation, Definition, and Implementation (M. Brady)
[9] Modified from FAO - ftp://ftp.fao.org/fi/DOCUMENT/COFI/cofift_13/5e.pdf
[10] http://www.nmfs.noaa.gov/ole/about/our_programs/vessel_monitoring.html

Appendix 2: Workshop Participant List

Donna Bellais, Gulf States Marine Fisheries Commission
Mike Cahall, ACCSP
Julie Califf, Georgia Department of Natural Resources
Karen Cannell, ACCSP Contractor
John Carmichael, South Atlantic Fishery Management Council
Barry Clifford, NOAA Fisheries, Greater Atlantic Regional Office
Alex DiJohnson, ACCSP
Erika Feller, National Fish and Wildlife Foundation
Matt Gates, Connecticut Department of Energy and Environmental Protection
Dave Gloeckner, NOAA Fisheries Southeast Fisheries Science Center
Karen Holmes, ACCSP
Fiona Hogan, New England Fishery Management Council
Tom Hoopes, ACCSP Contractor
Stephanie Iverson, Virginia Marine Resources Commission
Heather Konell, ACCSP
Erin Kupcha, NOAA Fisheries, Northeast Fisheries Science Center
George Lapointe, ACCSP Contractor
Rich Malinowski, NOAA Fisheries, Southeast Regional Office
Amy Martins, NOAA Fisheries, Northeast Fisheries Science Center
Ian Miller, NOAA Fisheries, Highly Migratory Species Division
Josh Miller, NOAA Fisheries, Northeast Fisheries Science Center
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Nico Mwai, ACCSP
Joe Myers, ACCSP
Jennifer Ni, ACCSP
Ali Schwaab, ACCSP
Eric Schwaab, National Fish and Wildlife Foundation
Karen Sender, NOAA Fisheries, Pacific Islands Fisheries Science Center
Julie Defilippi Simpson, ACCSP
Rob Watts, Maine Department of Marine Resources
Anna Webb, Massachusetts Division of Marine Fisheries
Geoff White, ACCSP
Jackie Wilson, NOAA Fisheries, Highly Migratory Species Division
Coleby Wilt, ACCSP
Elizabeth Wyatt, ACCSP

Appendix 3: Workshop Presentations

ACCSP Integrated Reporting Workshop - Overview

Eric Schwaab, Vice President of Conservation Programs
National Fish and Wildlife Foundation

Hawksbill sea turtle

Start with Why……

Why Integrate Fisheries Data?

- **Better Science** – Generate better information to protect fish stocks and support fisheries sustainability.
- **Better Business** - Promote the efficiency, competitiveness and productivity of fishing businesses - - regionally, nationally and abroad.
- **Better Management** - Improve the efficiency and effectiveness of fisheries management activities of government agencies at state, regional and national scales.
- **Improved Transparency** - Better engage all stakeholders proactively and positively into the US fisheries management system.
- **A Better Fishing Future** - Prepare fishing businesses, regulators and constituents to adapt effectively to environmental change.

NATIONAL FISH AND WILDLIFE FOUNDATION NFWF

The current state of fisheries-dependent data collection and management:

Large number of federal, state, and regional fisheries data management systems

Within individual systems, data are collected from multiple sources

RESULT → Reduced effectiveness, efficiency and credibility of the results

Trust in the data = trust in the decisions

"It's a fairly archaic system. And there's a lot of consternation about the lack of good data being used to make decisions that affect watermen."[1]

The Virginian-Pilot
PilotOnline.com

"They'll send people down to the docks to do random sampling surveys of our catches, and that's what they use as data to make decisions. In the meantime, we have daily fishing vessel trip reports that we all have to fill out and it's not getting used."[2]

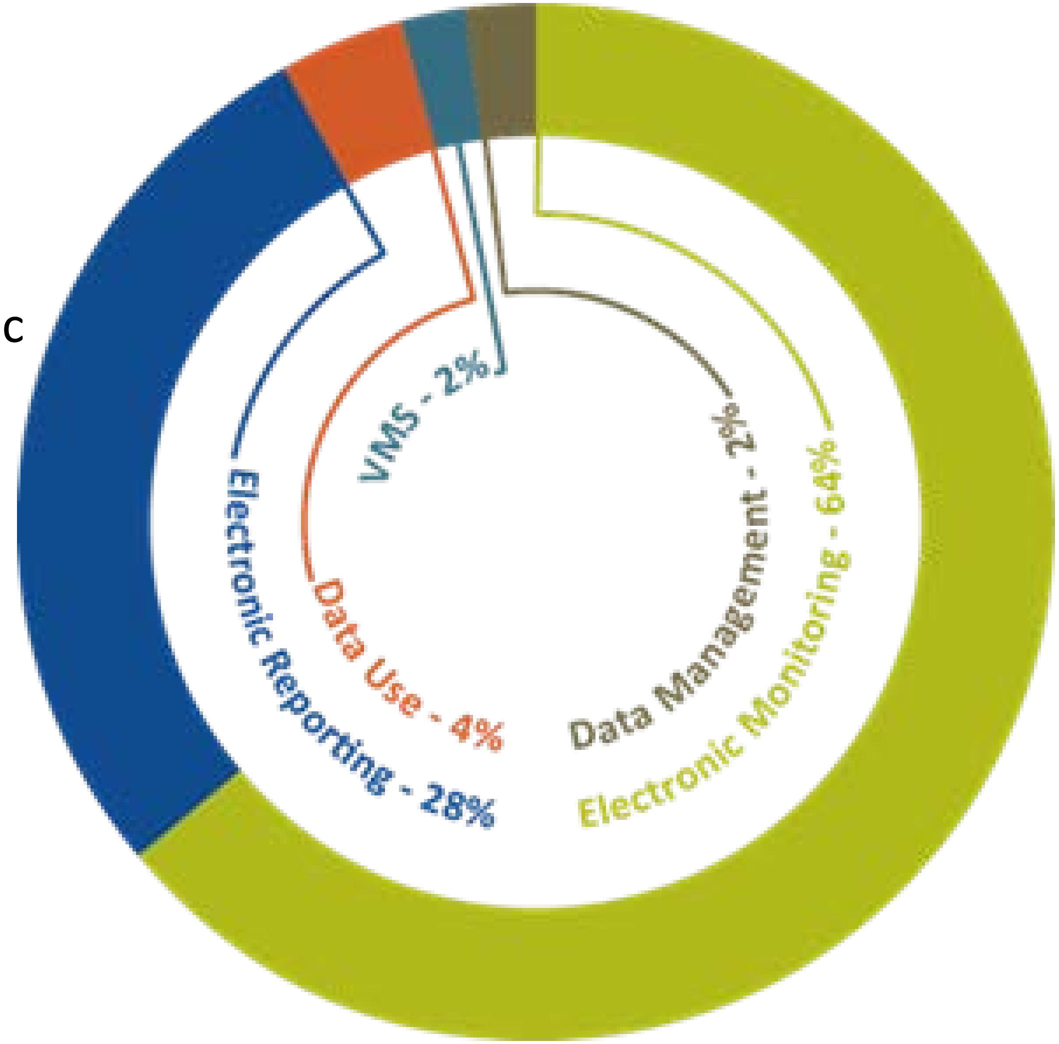
"I agree with the charter captains. They provide real-time data that is extremely useful, and it's not being used."[3]

Quotes from "*How many fish are really in the ocean? Some congressmen think federal fisheries can do a better job of finding out*" by Lee Tolliver, Virginian-Pilot

NATIONAL FISH AND WILDLIFE FOUNDATION NFWF

NFWF Interest in Fisheries Data

- Fisheries Innovation Fund
- Electronic Monitoring and Electronic Reporting appropriations
- Fisheries Improvement Program
- Support for "Net Gains"



Fishery data technology projects funded through the FIF and EMR Grants programs (2010-2016).

NFWF

In 2017, NFWF will use its Fisheries Innovation Fund to…

- Promote full utilization of Annual Catch Limits and minimize bycatch
- Support improvements to recreational fisheries conservation and management

In 2017, NFWF will use its Electronic Monitoring and Reporting Fund to…

- Implement E-technologies in data collection
- Improve data management, integration and utility
- Address key data uses

Overall goal - Integrate fisheries-dependent data

- Improved accuracy and timeliness for science
- Better management solutions – access, quota monitoring and use
- Facilitates business planning, efficiency and performance
- Government efficiency
- Builds trust among users

Terms of Reference

- Review background and confirm process is on target
- Define the scope of the solution
- Identify and attempt to address issues
- Define the core business rules of the solution
- Consider other future potential Fisheries Dependent Data (FDD) collection modules (e.g. EM, dealer-to-dealer transactions, traceability), both federal and state, and possible need to interact with those eventually.

Integrating reporting allows us to…

- Limit human data entry → reduce the reporting burden
- Expedite data collection
- Eliminate fuzzy matching of reports→ reduce errors, increase timeliness
- Enhance traceability of data
- Streamline/simplify the process→ make it easily understandable for all user groups

Key steps - Many data collection tools & systems in place…

- But need a way to connect these together in order to make data most useful! → Integrated Reporting
- Must proceed through an inclusive process and fully consider user needs
- Builds on the work already underway, including process, tool and technology improvements in use in particular fisheries and regions

Elements of Success

- Interagency alignment
- Agreement on technical requirements
- A PLAN for achieving full scale integration
- Resources for execution
- Communications of the plan, progress and outcomes

Major challenges

- **Cost –** Ensuring investment at regional and national scales, including initial costs, to move forward
- **System Design** - Striking the right balance between a common national architecture and local program development and execution
- **System Ownership** - Continue to promote broad ownership among scientists, managers, fishermen and users
- **Data Confidentiality** - Addressing data confidentiality requirements and concerns while promoting transparency
- **Unique Recreational Data Issues** - Bringing recreational catch data to a higher and comparable level of performance
- **Managing Transitions** - Transitioning data streams in a scientifically useful way – Need for some side by side overlap periods; Retain or build adequate checks in the system to retain enforcement utility; Ensure continued efficient science access to representative biological samples

Recommendations

- **Confirm a National Vision** - Build on the case for improved fisheries data systems as a component of a broader national environmental data modernization effort.
- **Establish Broad Ownership** - Promote regional and national system ownership among managers, scientists, fishermen and other users.
- **Create a Technology Solutions Framework** - Establish clear criteria for national architecture; development and shared awareness of modular, regionally based components; interoperability.
- **Build on Progress to Date**- Highlight and replicate successful pilots, models, best practices and tools within the context of a national architecture.
- **Address Policy Issues –** Confirm balance between confidentiality and access; authorities to participate and share data;
- **Identify Resources Needed** – Dedicate new attention to national leadership and a national architecture supported by multiple stakeholders.

NATIONAL FISH AND WILDLIFE FOUNDATION NFWF

Questions or Comments?

Eric Schwaab
Vice President, Conservation Programs
Phone: 202-595-2475
Eric.Schwaab@nfwf.org

Coral reef

Caribou

American avocet

NFWF

Integrated Reporting: How Did We Get Here and Where Are We Going?

Tom Hoopes

ACCSP Contractor

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

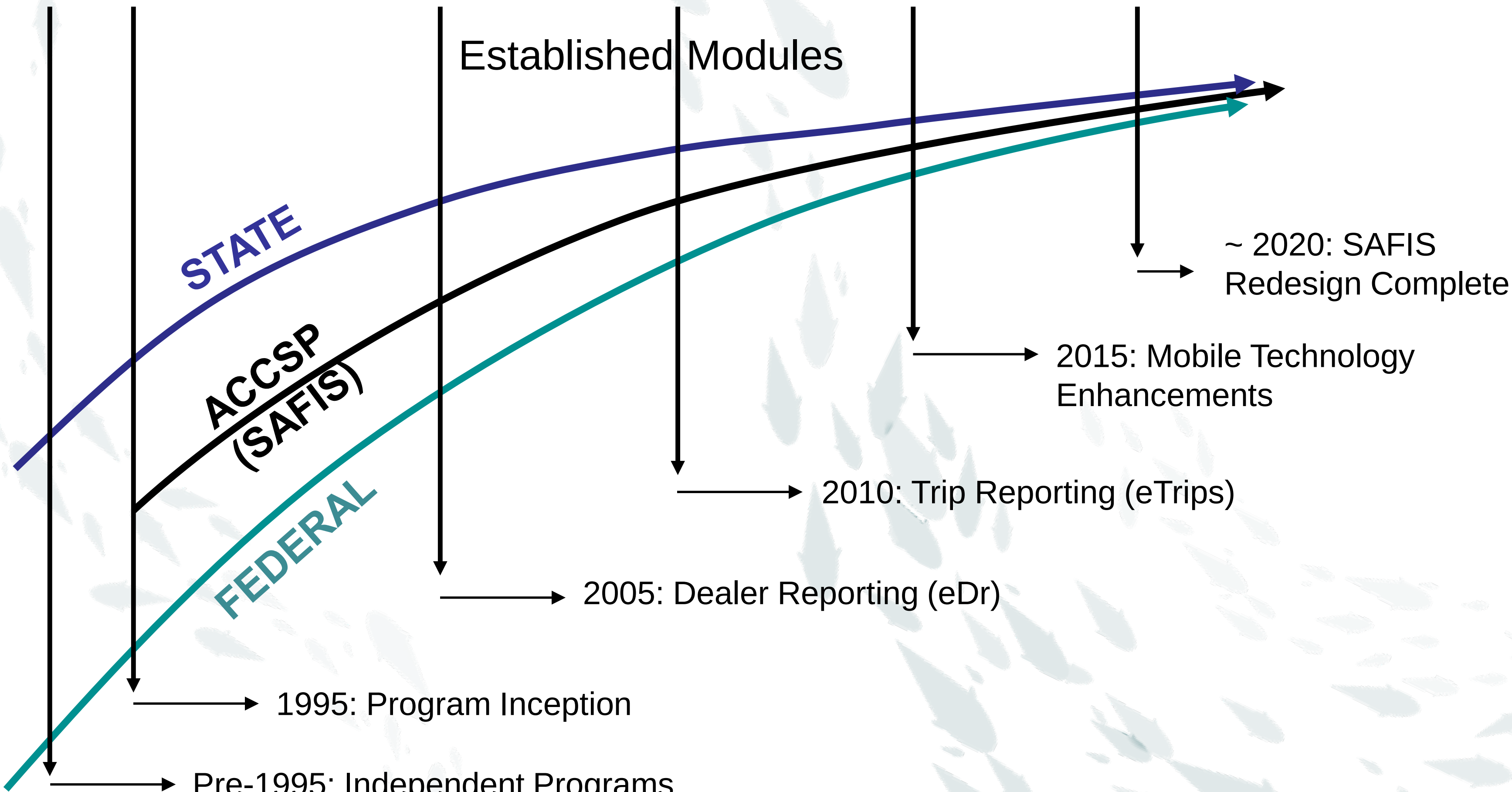
Integrated Reporting Presentation Overview

ACCSP
Good Data, Good Decisions

- Provide Background – Fishery Dependent Data Collection (FDDC) on Atlantic Coast
- Confirm Problem & Definition of Integrated Reporting
- Converging Data Needs, Both Established & Future
- Lay Out the Intended Goals of the Workshop
- Begin Group Discussion After Presentations by George and Barry

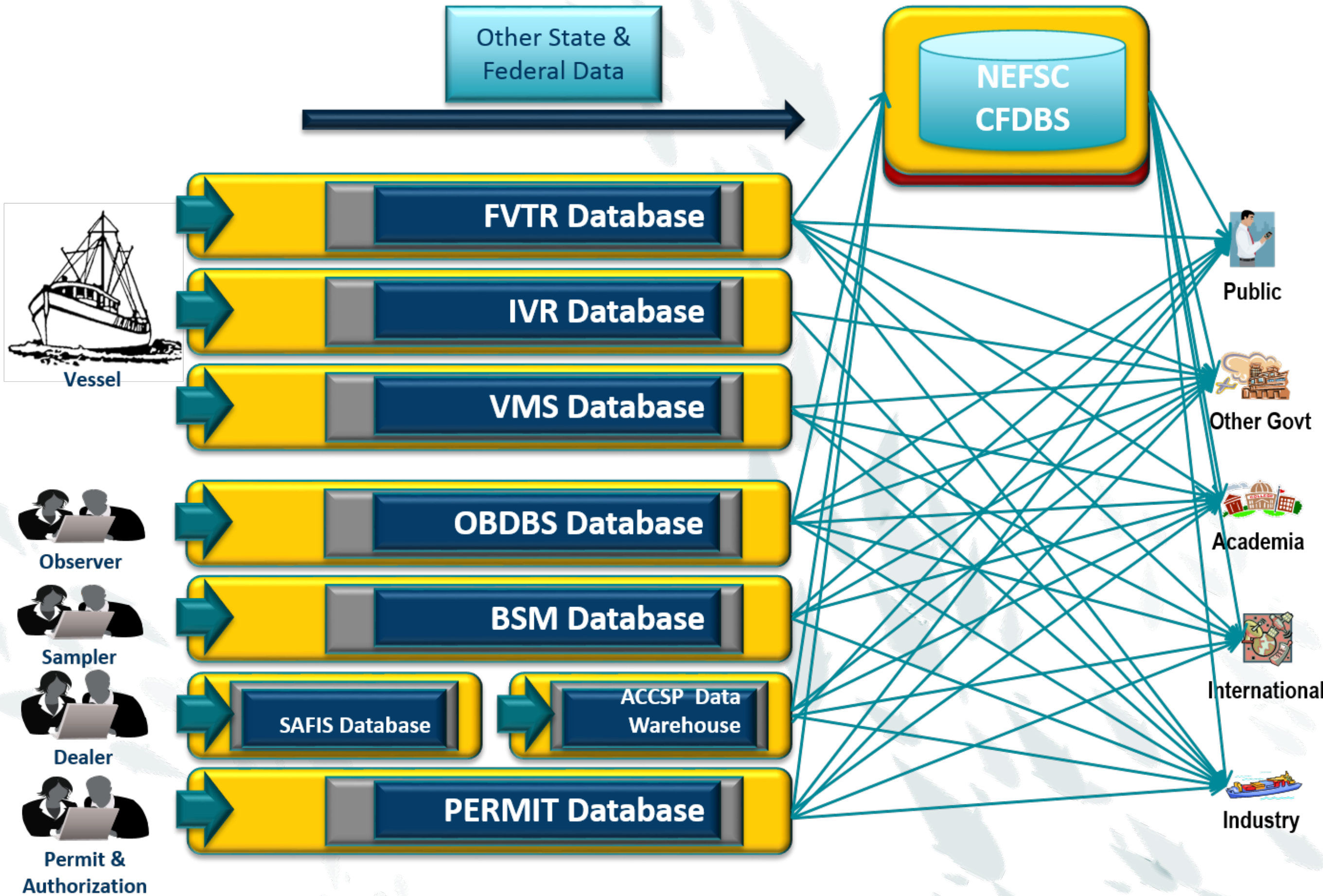
Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Integrated Reporting
FDDC on Atlantic Coast



Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Integrated Reporting
Established Fed Modules



Source: NOAA Fisheries

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Integrated Reporting
Key Issues

ACCSP
Good Data, Good Decisions

1. Lack of integrated data
2. Redundant reporting of many data elements
3. QA/QC protocols require excessive manual intervention and as a result cannot be fully implemented for all data
4. Duplicate data sets/tables and processing protocols for similar tasks and analysis
5. Not all data are available in a timely manner

Source: NOAA Fisheries

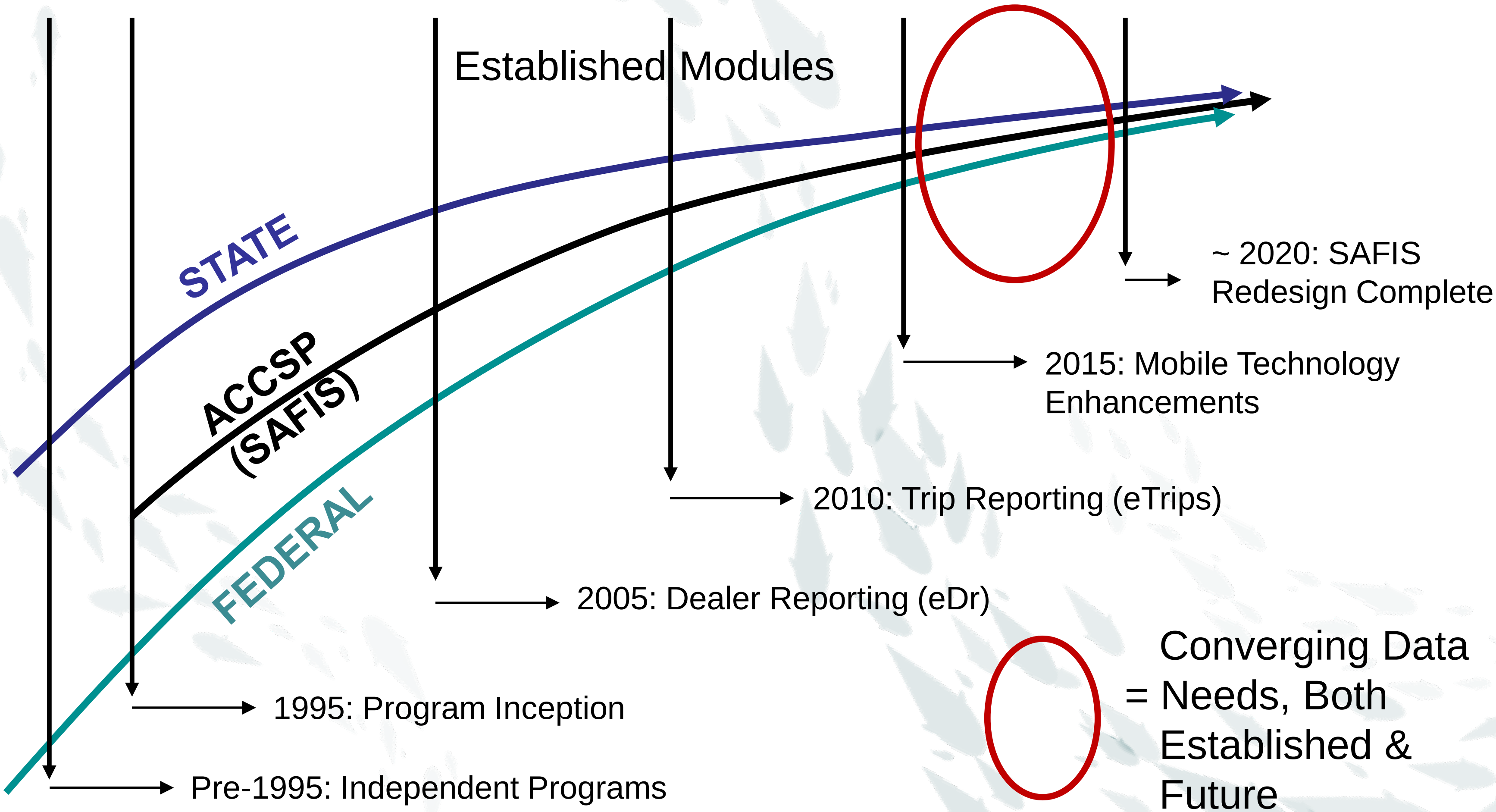
Integrated Reporting Definition

Ideally:

- All reporting for a single trip is done on a single report, or the logical equivalent.
- Use the same TRIP ID code(s) in all subsystems.

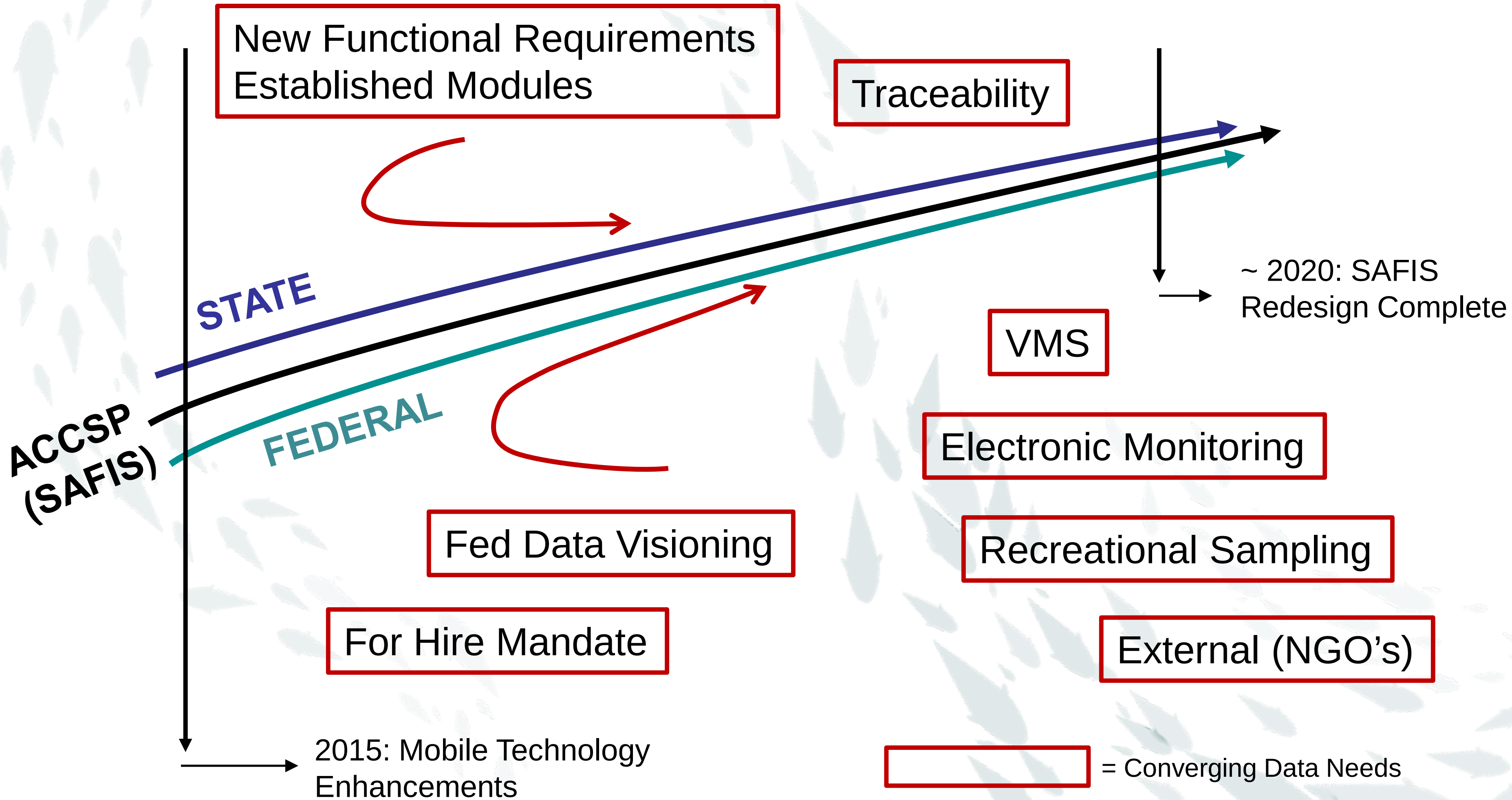
- Other definitions included in Workshop materials.

Integrated Reporting
FDDC on Atlantic Coast



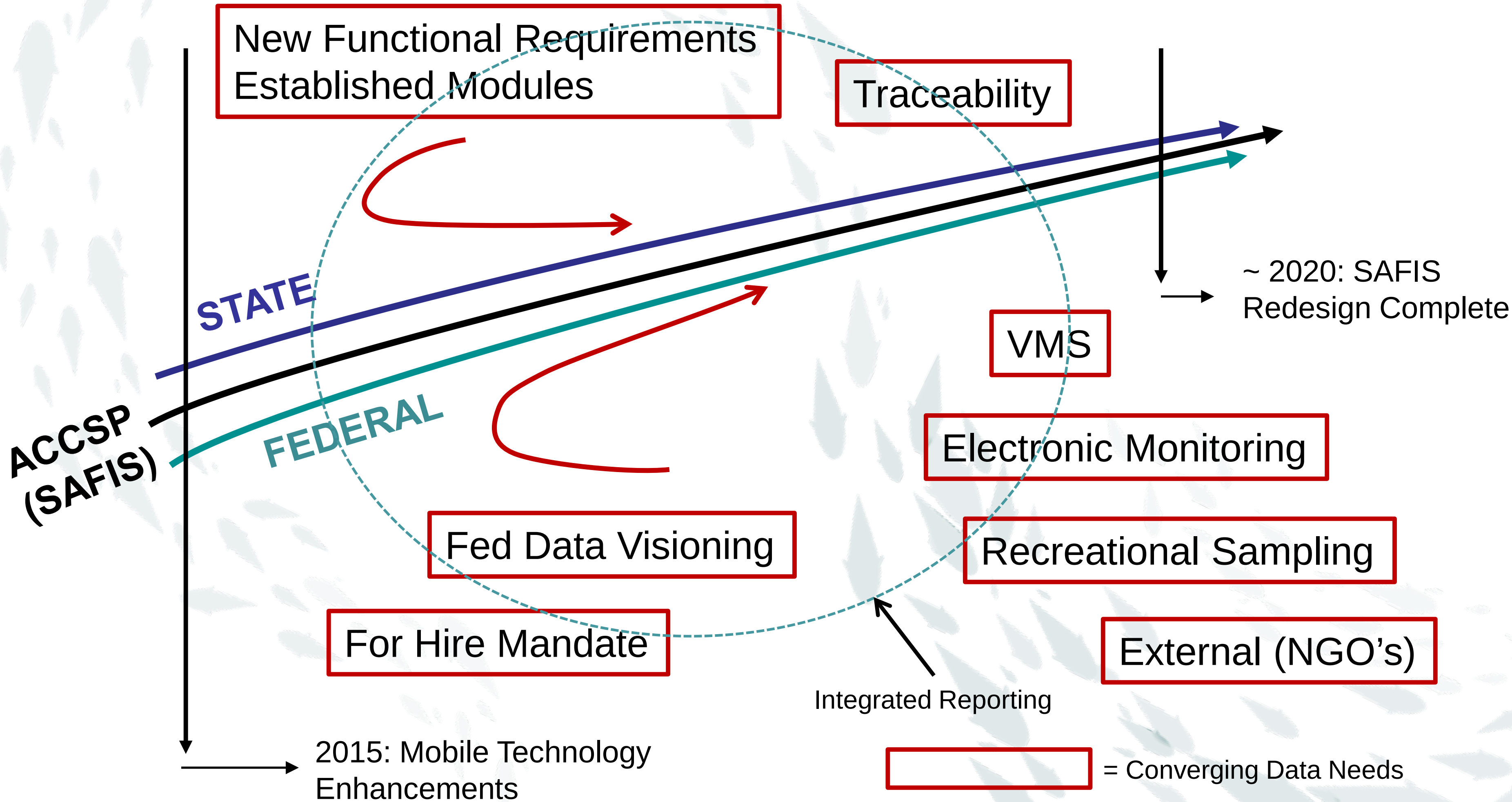
Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Integrated Reporting
FDDC on Atlantic Coast



Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Integrated Reporting
FDDC on Atlantic Coast



Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Integrated Reporting Workshop Goals

After Presentations by George & Barry:

- Come to consensus on overall scope of solution
- Identify and address impediments to implementation (by Established module)
- Define core business rules
- Identify and discuss Future potential data systems (modules)

Integrated Reporting outside the Atlantic Coast

George Lapointe
George Lapointe Consulting

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Not much out there!

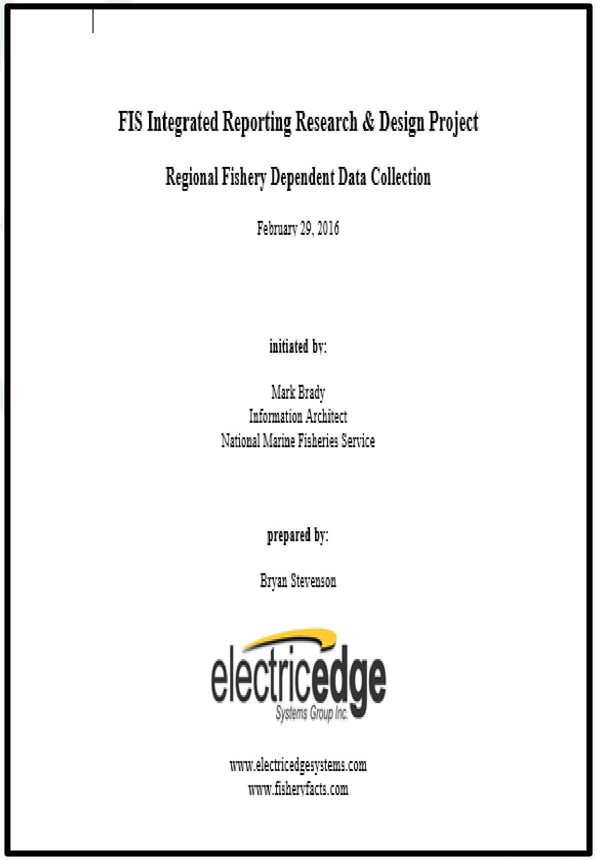
Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Different ideas about what integrated fishery reporting is

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

NMFS Integrated Reporting Efforts

ACCSP
Good Data, Good Decisions


FIS Integrated Reporting Research & Design Project

Regional Fishery Dependent Data Collection

February 29, 2016

initiated by:

Mark Brady
Information Architect
National Marine Fisheries Service

prepared by:

Bryan Stevenson

electricedge
Systems Group Inc.

www.electricedgesystems.com
www.fisheryfacts.com

- All reporting for a single trip is done on a single report
- Use the same trip ID codes in all subsystems
- Rather than depend on redundancy, use the single most reliable source for each data item
- Prevent errors first, look for those that remain, and correct them
- Determine the predominant source of errors and address those first
- Limit human reporting, especially when it involves trip matching data
- Make accurate reporting easy. Make inaccurate reporting difficult.
- Simplicity
- Integrated reporting is all electronic
- Utilize existing technology infrastructure

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

ACCSP
Good Data, Good Decisions

What success might look like

- One-touch reporting
- Verifiable real-time data
- Technology that performs and is widely available
- Increased data access
- Business and government reap efficiency dividends
- Organizational effectiveness

Our vision is to be the principal source of fisheries-dependent information on the Atlantic coast through the cooperation of all program partners.

Canada

- Automatically generated hail out number (Unique trip ID)
  - Hail In notification
  - Observer data
  - Fishing log
  - Dockside data
  - Quota status report

New Zealand

- Linking fields that in combination will provide a unique identifier for each fishing event.
    - Location (lat/lon),either generated automatically by the electronic reporting tool, or entered manually from another source
    - Time
    - Date
    - Vessel identifier (unique legal number attached to each vessel)
- Future proofing for additional information sources
    - Electronic catch reporting by fishers
    - Automated geospatial reporting from vessels by e,g, AIS, VMS
    - EM

Australia

ACCSP
Good Data, Good Decisions

- **Wholesale redesign of system architecture and data capture programs over next four years**
- **Aim – data integration by design rather than back end processes**
- **Preference for an output control model, specifying the data needed and format. Under new architecture:**
  - **Process that either allows for automatic integration of data sets i.e. a common key, or for integrated design**
  - **Allow for industry to work with third party providers to design systems that work for their businesses while at the same time getting the information needed for management.**

South Africa

- OLRAC – private company that has an ER system
  - Approved eVTR vendor in Greater Atlantic region
  - When asked about integrated reporting capability; the replay -“ the items listed below and far more”
  - Review of materials doesn’t demonstrate IFR

European Union

ACCSP
Good Data, Good Decisions

- **Regional DataBase -** ICES CIEM
- **Framework for the collection, management and use of data in the fisheries sector**
  - Electronic reporting - ✓
  - Electronic completion and transmission - ✓
  - Integrated reporting, integration of data - X

NOAA FISHERIES

Greater Atlantic Regional Fisheries Office

Northeast Fisheries Science Center

Fishery Dependent Data Visioning Project

Barry Clifford

May, 2017

Source: www.visualphotos.com

Outline for today:

- Background
- Vision recommendations
- Collaboration with ACCSP and States
- Accomplishments
- What are we doing?
- What will this achieve?
- Example of how this works
- Challenges
- Next steps

Background

<u>Comprehensive Data Needs & Requirement Analysis</u>:

- All stakeholders affected by NEFSC/GARFO data
- All sources of fishery dependent data

<u>Internal & External Interviews</u>:

- 180 individuals
- 17 NMFS offices and branches
- 13 states, 2 Councils & 2 Commissions
- 3 NGOs
- Harvesters, industry reps, and dealers

The Vision Recommendations

- Focus on data streams
- Build flexible systems that can adapt to changing needs, uses, and technology
- Implement vessel electronic data collection in all fisheries
- Reduce redundant data collection and processing
- Improve data quality and timeliness
- Improve access to data

Integration with ACCSP and States

- FDDV and ACCSP's modernization efforts moving forward together
- Goal is a data structure that can support both Federal and State data
- Improvements to data systems will benefit all users:
  - More complete and comprehensive fisheries data
  - Consistent and reliable data products
  - Easier and standardized data access
  - Timely availability of trip level data
  - Efficient use of resources

What have we accomplished?

- interviews and initial vision document
- requirements analysis
- developed high level system design
- designed business process models
- developed high level implementation plan
- designed data validation services
- clarified vision project (phased approach)
- preparing to move into the development phase

What are we doing?

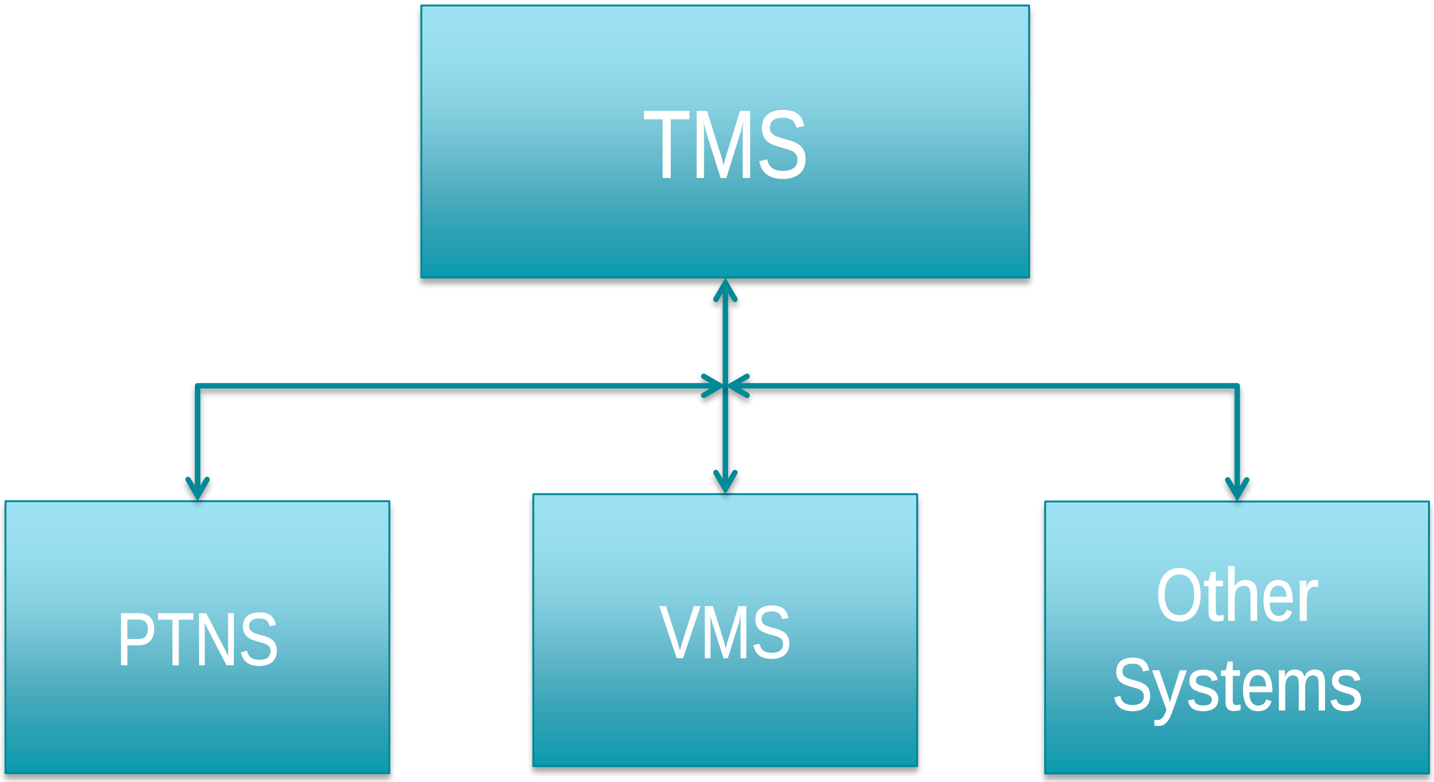
- First change is the adoption of the Trip ID
  - Integrate system components electronically

- Trip ID will be generated by the Trip Management System (TMS)
  - TMS is much more than a Trip ID generator
  - TMS is the brains of the system
  - TMS will exchange information with PTNS, VMS, NEFOP, VTR & Dealer databases as well as other system components as needed

What will this achieve?

- Trip ID will serve to integrate the various individual collection programs
- Integration will provide a more complete, accurate, timely and accessible data set
- Reduce and eliminate data redundancy and inefficiencies
- Lessen burden to industry by reducing reporting systems
- Develop a modernized database structure
- Create a system that is adaptable and flexible

Example Depiction



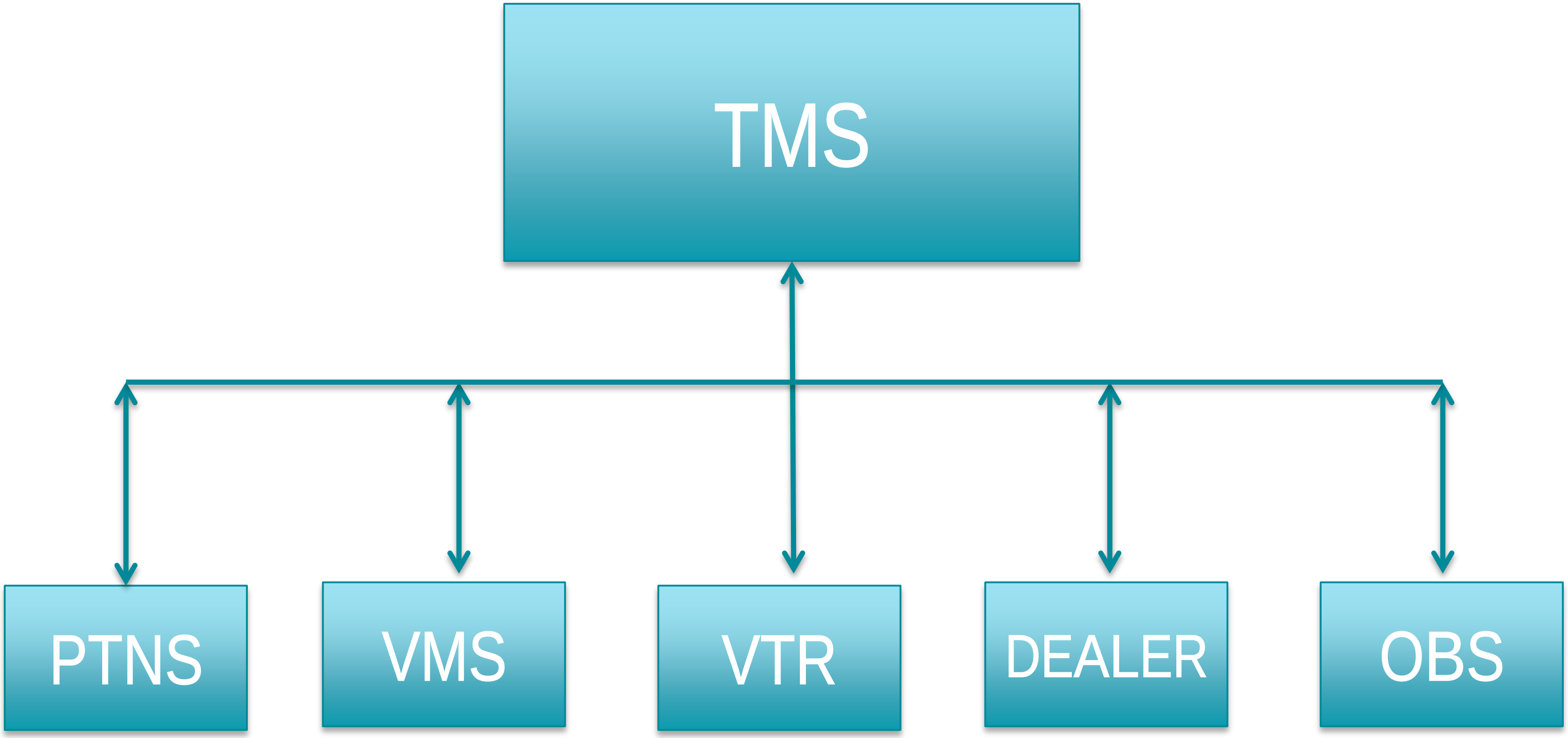
Example of how it works

- a vessel operator decides to fish:
  - access web-based TMS user interface
  - record the intent to fish (declaration)
    - will serve to fulfill existing PTNS requirements
    - will fulfill VMS declaration requirements
    - other pre-trip requirements
  - a unique Trip ID is generated and associated with all data submitted for that trip

Example of how it works - continued

- Trip ID is integrated into the eVTR
- Trip ID is integrated into the Observer record
- Trip ID will be pushed to dealers identified on that VTR as having bought catch
- Trip ID will be pushed to other associated data streams

Example Depiction



Impediments to Implementation

- Examples of challenges in the Trip ID
  - propagating Trip ID to dealers while ensuring confidentiality
  - eVTR
    - Required
    - reporting frequency
  - offload of multiple trips during single offload event
  - the use of trucks and consignment houses
  - incorporating Trip ID into proprietary dealer reporting applications

Where do we go from here?

- Assembled a project team to design and build TMS
- Assembled a project team to develop methods to propagate the Trip ID to all trip level activities
- Hired two developer/programmers
- Next up is the design of how TMS, PTNS, VMS, eVTR will be integrated
- Identify in what scenarios we can first implement the Trip ID
- Identify issues requiring Council input and guidance

Conforming Changes

- Examples:
  - TMS requires regulatory action
  - Required eVTR
  - eVTR Reporting frequency
  - Multi-trip offloads

Integration

- Unique identifier?
- Single reporting application?

- Eliminate redundancy
- Achieve efficiencies
- Automate Trip ID propagation

Questions?

Greater Atlantic Regional Fisheries Office

Northeast Fisheries Science Center

barry.clifford@noaa.gov

978-281-9148

Atlantic Coastal Cooperative Statistics Program
1050 N. Highland Street, Suite 200A-N | Arlington, VA 22201
703.842.0780 | 703.842.0779 (fax) | www.accsp.org

TO: ACCSP Coordinating Council

FROM: ACCSP Operations and Advisory Committees

With regard to the FY18 proposal to ACCSP from the Mid-Atlantic Fishery Management Council entitled, *Evaluating Angler Perception, Handling Practices, and Maltreatment of Smooth Dogfish in the Mid-Atlantic Recreational Rod-and-Reel Fishery*, the Committees do not recommend the project for funding for the following reasons.

1) The project would not directly address Program priorities. The primary objective of the project is to generate a recreational discard mortality rate estimate for smooth dogfish. While an accurate discard mortality rate is a valid fisheries research concern and needed for stock assessment, the data collected would not address ACCSP's core priorities to collect catch and effort, biological, or bycatch information.

2) There are concerns about the proposed study design and methods, notably the small number of dogfish to be tagged (n=10). The project is unlikely to provide a scientifically robust discard mortality estimate, and overall project goals may not be achieved. Also, posting an angler survey to an online forum may not result in a sufficient response rate or produce diverse responses truly representative of the recreational fishery.

Atlantic States Marine Fisheries Commission

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MEMORANDUM

October 10, 2017

To: **Atlantic Sturgeon Management Board**

From: **Max Appelman, Fishery Management Plan Coordinator**

RE: **Status of Incidental Take Permits for Atlantic Sturgeon by State**

In 2012, Atlantic sturgeon was listed under the Endangered Species Act (ESA); the Gulf of Maine Distinct Population Segment (DPS) was listed as threatened, and the New York Bight, Chesapeake Bay, Carolina and South Atlantic DPSs as endangered. Individuals or fisheries planning to conduct an otherwise lawful activity resulting in the "take" (i.e., harass, harm, pursue, wound, kill, trap, capture, collect, etc.) of Atlantic sturgeon, whether or not deliberate, must possess a permit to perform that activity (nmfs.noaa.gov). Specifically, Section 10(a)(1)(B) of the ESA allows NOAA Fisheries to issue Incidental Take Permits (ITPs) to non-Federal commercial fisheries for the incidental take of Atlantic sturgeon. These permits also help to both improve monitoring of and reduce the amount of Atlantic sturgeon bycatch in commercial fisheries along the Atlantic coast.

As requested, states were surveyed for the status of Section 10(a)(1)(B) ITPs, including what gear types or fisheries the ITPs apply to and the rationale for the current status of the permit. Survey results are summarized in Table 1 and key points are described below:

- Gill net, otter trawl, and commercial shad fisheries are the primary gear types and fisheries identified in ITPs received, pending or being developed for Atlantic sturgeon.
- ITPs are being developed for multiple ESA-listed species which has prolonged development.
- Insufficient data or resources has limited some states ability to effectively develop an ITP for Atlantic sturgeon.
- Several ITPs received, pending and being developed, include implementation of data collection programs to improve understanding of Atlantic sturgeon distributions and bycatch, and to reduce interactions.
- Some states are not pursing an ITP because they have had few (or zero) documented interactions with Atlantic sturgeon in its commercial fisheries in state waters or have implemented regulations in its fisheries that minimize interactions with Atlantic sturgeon (e.g., closed areas/seasons and gear restrictions).

M17-104

Table 1. Status of Endangered Species Act Section 10(a)(1)(B) Incidental Take Permits for Atlantic sturgeon, by state. Source: Atlantic Sturgeon Board Administrative Commissioners and members of the Atlantic Sturgeon Technical Committee.

State	Received, Pending, Developing	Gear/Fishery	Status Rationale
ME	N/A	N/A	Little to no interaction with Atlantic sturgeon in state fisheries.
NH	N/A	N/A	One fishery interaction with Atlantic sturgeon since 1980s.
MA	N/A	N/A	No problems with Atlantic sturgeon bycatch in state water fisheries.
RI	Developing	Trawl, Gill Net	Joint ITP for sturgeon, sea turtles and whales. Analysis regarding spatio-temporal sturgeon distribution and bycatch estimates are being explored.
CT	N/A	N/A	Atlantic sturgeon interactions reduced via implementation of gear restricted areas for otter trawls and sink gill net fisheries.
NY	Developing	Trawl, Gill Net	Provided funding to expand observer coverage through NOAA and NEFOP for state-only permit holders to improve bycatch data.
NJ	Developing		
PA	N/A	N/A	No interactions with Atlantic sturgeon in state water fisheries.
DE	Developing	Gill Net	Draft Atlantic sturgeon ITP is undergoing internal review.
MD	N/A	Gill Net, Pound Net, Fyke, Pots	Working on a conservation plan for various fisheries, but have insufficient data and resources to complete an ITP application in the near-term.
DC	N/A	N/A	No Atlantic sturgeon sightings in DC waters in over 30 years.
PRFC	N/A	N/A	
VA	Pending	Gill Net	Joint ITP for Atlantic sturgeon and sea turtles and including the implementation of an observer program to improve Atlantic sturgeon bycatch estimates.
NC	Received	Anchored Gill Net	10-year permit expiring July 2024.
SC	Pending	Shad Fishery	Application includes bycatch data demonstrating that changes in the shad fishery have reduced sturgeon bycatch.
GA	Received	Shad Fishery	
FL	N/A	N/A	

Atlantic Sturgeon

Activity level: Low

Committee Overlap Score: Medium (SAS overlaps with BERP, Atlantic striped bass)

Committee Task List
• TC – October 1st: Annual compliance reports

TC Members: Ian Park (DE, TC Chair), Lisa Bonacci (NY), Heather Corbett (NJ), Ellen Cosby (PRFC), Dewayne Fox (DSU), Greg Garman (VCU), Jeanne-Marie Havrylkoff (FL), Amanda Higgs (NY), Eric Hilton (VIMS), Chris Kalinowsky (GA), Wilson Laney (USFWS), Christine Lipsky (NMFS), Michael Loeffler (NC), Luke Lyon (DCMF), Elizabeth Miller (SC), Steve Minkkinen (USFWS), Marta Nammack (NMFS), Bill Post (SC), Ray Rhodes (College of Charleston), Brian Richardson (MD), Tom Savoy (CT), Eric Schneider (RI), David Secor (UMCES), Chuck Stence (MD), Gail Wippelhauser (ME), Kristen Anstead (ASMFC), Max Appelman (ASMFC), Katie Drew (ASMFC)

SAS Members: Laura Lee (NC, SAS Chair), Michael Celestino (NJ), Kiersten Curti (NEFSC), Jared Flowers (NC), Dewayne Fox (DSU), Edward Hale (DE), Amanda Higgs (NY), David Kazyak (USGS), Michael Loeffler (NC), Bill Post (SC), Eric Schneider (RI), David Secor (UMCES), Kristen Anstead (ASMFC), Max Appelman (ASMFC), Katie Drew (ASMFC)

Atlantic States Marine Fisheries Commission

Business Session

October 18, 2017; 1:15 – 2:15 p.m.
October 19, 2017; 11:30 a.m. – Noon

Norfolk, VA

Draft Agenda

The order in which these items will be taken is subject to change;
other items may be added as necessary.

October 18

1.	Welcome/Call to Order (*D. Grout)*	1:15 p.m.
2.	Committee Consent • Approval of Agenda • Approval of Proceedings from May 2017	1:15 p.m.
3.	Public Comment	1:15 p.m.
4.	Review and Consider Approval of 2018 Action Plan **Action**	1:20 p.m.
5.	Elect Chair and Vice Chair **Action**	2:00 p.m.
6.	Recess	2:25 p.m.

October 19

1.	Consider Final Approval of Northern Shrimp and Tautog Amendments **Final Action**	11:30 a.m.
2.	Resolutions Committee Report	
3.	Consider Non-compliance Recommendations (If Necessary) **Final Action**	11:45 a.m.
4.	Other Business/Adjourn	12:00 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk VA; 757.627.4200

Vision: Sustainably Managing Atlantic Coastal Fisheries

ATLANTIC STATES MARINE FISHERIES COMMISSION

Draft 2018 Action Plan

Approved by the AOC for Business Session Review on October 18, 2017

Goal 1 – Rebuild, maintain and fairly allocate Atlantic coastal fisheries

Goal 1 focuses on the responsibility of the states to conserve and manage Atlantic coastal fishery resources for sustainable use. Commission members will advocate decisions to achieve the long-term benefits of conservation, while balancing the socio-economic interests of coastal communities. Inherent in this is the recognition that healthy and vibrant resources mean more jobs and more opportunity for those that live along the coast. The states are committed to proactive management, with a focus on integrating ecosystem services, socioeconomic impacts, habitat issues, bycatch and discard reduction measures, and protected species interactions into well-defined fishery management plans. Fishery management plans will also address fair (equitable) allocation of fishery resources among the states. Understanding global climate change and its impact on fishery productivity and distribution is an elevated priority. Improving cooperation and coordination with federal partners and stakeholders can streamline efficiency, transparency, and, ultimately, success. In the next five years, the Commission is committed to making significant progress on rebuilding overfished or depleted Atlantic fish stocks.

Strategies to Achieve Goal

1.1 Manage interstate resources that provide for productive, sustainable fisheries using sound science.

American Eel
Task 1.1.1 – Continue to monitor state compliance with provisions of Addendum IV. Assist states in implementing and monitoring yellow eel quotas in 2018 if triggered.

Task 1.1.2 – Consider management response to the 2017 assessment update findings specific to allocations and quotas, if necessary.

Task 1.1.3 – Continue to work with Law Enforcement Committee (LEC) on monitoring poaching and illegal sale of glass eels.

Task 1.1.4 – Develop Memorandum of Understanding on management and scientific collaboration with Great Lakes Fishery Commission, U.S Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Canada Department of Fisheries and Oceans (DFO).

Task 1.1.5 – Monitor and respond, if necessary, to the classification of eel under the Convention on the International Trade of Endangered Species (CITES) and the International Union of Conservation of Nature (IUCN) Red List.

Task 1.1.6 – Through the Technical Committee, review life cycle survey in the State of Maine to estimate incremental survival across life stages. Review any additional state life cycle survey proposals. Update the young-of-the-year index with 2017 data.

Evaluate monitoring efforts to identify gaps in and the value of existing surveys for assessment and management use.

Task 1.1.7 – Through Technical Committee, review state aquaculture proposals as submitted.

Task 1.1.8 – Monitor fishery for consistency with management program and state compliance.

American Lobster and Jonah Crab

American Lobster

Task 1.1.9 – Finalize and implement Addendum XXVI to improve harvester reporting and biological data collection in state and federal waters.

Task 1.1.10 – Finalize and implement Addendum XXVII to consider the standardization of management measures in the Gulf of Maine/Georges Bank stock.

Task 1.1.11 – Develop a strategy for management of the Southern New England stock that considers the record low abundance of the stock, preserves a functional portion of the fishery, and acknowledges the effects of climate change.

Task 1.1.12 – Initiate the 2020 Benchmark Stock Assessment.

Task 1.1.13 – Continue to work with the Law Enforcement Subcommittee and states to improve enforcement of management measures and develop a strategy for offshore enforcement.

Task 1.1.14 – Coordinate and monitor trap tag production and distribution.

Task 1.1.15 – Continue to work with NOAA Fisheries to ensure consistency between regulations in state and federal waters, particularly in regards to season closures implemented through Addendum XVII and trap banking provisions in Addendum XXII.

Task 1.1.16 – Update lobster landings and trap tag databases and monitor lobster landings and effort patterns.

Task 1.1.17 – Monitor fishery for consistency with management parameters and state compliance.

Jonah Crab

Task 1.1.18 – Monitor relevant research projects to determine remaining data deficiencies and promote collaborative research between the states, NOAA Fisheries, and industry.

Task 1.1.19 – Monitor fishery for consistency with management program and state compliance. Continue to work with NOAA Fisheries to ensure consistency between regulations in state and federal waters.

Atlantic Herring

Task 1.1.20 – Work in collaboration with Northeast Fisheries Science Center (NEFSC) to complete a benchmark stock assessment. Consider management response to the assessment findings in conjunction with New England Fishery Management Council (NEFMC), if necessary.

Task 1.1.21 – Set specifications for 2019 and beyond based on new assessment information. Set Area 1A specifications for 2019.

Task 1.1.22 – Monitor and participate in activities of the NEFMC and the Mid-Atlantic Fishery Management Council (MAFMC) regarding complementary FMP actions, including but not limited to ecosystem-based fisheries management (EBFM), Amendment 8 issues, and river herring bycatch avoidance program. Consider complementary action where necessary (See Task 1.2.6).

Task 1.1.23 – Conduct meetings as necessary to establish state effort control (days-out) programs for Areas 1A and 1B.

Task 1.1.24 – Monitor fishery for consistency with management program and state compliance.

Atlantic Menhaden

Task 1.1.25 – Monitor state implementation of Amendment 3.

Task 1.1.26 – Continue work with the Technical Committee and Biological Ecological Reference Points Working Group to develop ecosystem reference points based on Board-defined goals and objectives (See Task 2.4.1).

Task 1.1.27 – Initiate the 2019 benchmark stock assessment.

Task 1.1.28 – Monitor the 2018 episodic events set aside quota, if necessary, and set the 2019 fishery specifications.

Task 1.1.29 – Monitor fishery for consistency with management program and state compliance.

Atlantic Striped Bass

Task 1.1.30 – Complete the 2018 benchmark stock assessment, which will include fleet- and sex-specific analyses, as well as regional models, and consider management response, if necessary.

Task 1.1.31 – Monitor fishery for consistency with management program and state compliance.

Atlantic Sturgeon
Task 1.1.32 – Consider management response to the 2017 benchmark stock assessment, if necessary.

Task 1.1.33 – Monitor state and federal activities in response to an Endangered Species Act (ESA) listing of Atlantic sturgeon, including 5-year status review.

Task 1.1.34 – Monitor fishery for consistency with management program and state compliance.

Bluefish
Task 1.1.35 – Collaborate with the MAFMC to initiate the development of an amendment to address allocation.

Task 1.1.36 – Collaborate with NEFSC to complete an operational stock assessment, pending availability of updated Marine Recreational Information Program (MRIP) estimates. Consider management response to the assessment findings in conjunction with MAFMC, if necessary.

Task 1.1.37 – Review specifications for 2019 in cooperation with the MAFMC.

Task 1.1.38 – Monitor fishery for consistency with management program and state compliance.

Coastal Sharks
Task 1.1.39 – Establish specifications for 2019 and beyond in coordination with NOAA Fisheries Highly Migratory Species Division.

Task 1.1.40 – Monitor and consider development of complementary management actions as needed.

Task 1.1.41 – Monitor activities of NOAA Fisheries and HMS with regards to coastal shark management actions for consistency.

Task 1.1.42 – Monitor stock assessment results for sandbar and mako sharks and provide technical committee recommendations for a management response, if necessary.

Task 1.1.43 – Monitor fishery for consistency with management program and state compliance.

Horseshoe Crab

Task 1.1.44 – Establish the 2019 specifications using the Adaptive Resource Management (ARM) Framework and quota allocation methodology.

Task 1.1.45 – Engage federal stakeholders, the biomedical community, and shorebird interest groups to secure long-term funding to support data collection for use in the ARM Framework, including the Horseshoe Crab Benthic Trawl Survey (See Task 6.2.3).

Task 1.1.46 – Engage the biomedical community in finding a solution regarding confidential data use in order to enhance stock assessments and scientific advice for management.

Task 1.1.47 – Finalize the 2018 benchmark stock assessment that includes individual assessments of regional populations and biomedical data, where appropriate, and consider management response, if necessary.

Task 1.1.48 – Monitor red knot listing under the ESA.

Task 1.1.49 – Monitor fishery for consistency with management program and state compliance for both the bait and biomedical industries.

Northern Shrimp

Task 1.1.50 – Finalize the 2018 benchmark stock assessment and consider management response to the assessment findings, if necessary.

Task 1.1.51 – Establish specifications for the 2018/2019 season. Consider industry test tows to collect biological data, if necessary and as resources allow.

Task 1.1.52 – Implement Amendment 3 as appropriate given the stock status of northern shrimp.

Task 1.1.53 – Monitor fishery for consistency with management program and state compliance.

Shad and River Herring

Task 1.1.54 – Initiate the 2019 American shad benchmark stock assessment.

Task 1.1.55 – Monitor the activities of NOAA Fisheries regarding the ESA status review of river herring; respond if necessary.

Task 1.1.56 – Monitor management activities of the NEFMC and the MAFMC including, but not limited to, shad and river herring catch caps and bycatch avoidance programs (See Task 1.2.6).

Task 1.1.57 – Review products of the River Herring Technical Expert Working Group and consider for management use.

Task 1.1.58 – Review and update American shad habitat plans as required by Amendment 3, if necessary.

Task 1.1.59 – Monitor fishery for consistency with management program and state compliance.

South Atlantic Species

Atlantic Croaker

Task 1.1.60 – Conduct analyses to explore and potentially update the annual Traffic Light Analysis (TLA) to include additional indices or age composition information.

Task 1.1.61 – Monitor fishery for consistency with management program and state compliance.

Black Drum

Task 1.1.62 – Monitor fishery for consistency with management program and state compliance.

Cobia

Task 1.1.63 – Implement the Cobia FMP and work with the South Atlantic Fishery Management Council (SAFMC) and NOAA Fisheries to ensure complementary regulations between state and federal waters.

Task 1.1.64 – Monitor activities of the SAFMC to ensure consistency between state and federal management programs.

Task 1.1.65 – Collaborate with the SouthEast Data Assessment and Review (SEDAR) to conduct the Stock Identification Workshop in preparation for the 2019 Benchmark Stock Assessment.

Task 1.1.66 – Collaborate with SEDAR to initiate the 2019 benchmark stock assessment.

Task 1.1.67 – Monitor fishery for consistency with management program and state compliance.

Red Drum

Task 1.1.68 – Monitor fishery for consistency with management program and state compliance.

Spanish Mackerel

Task 1.1.69 – Review annual report from North Carolina concerning Addendum I to the FMP. Consider changes to the management program, if necessary.

Task 1.1.70 – Monitor activities of the SAFMC to ensure consistency between state and federal management programs.

Task 1.1.71 – Monitor fishery for consistency with management program and state compliance.

Spot

Task 1.1.72 – Conduct analyses to explore and potentially update the annual TLA to include additional indices or age composition information.

Task 1.1.73 – Monitor fishery for consistency with management program and state compliance.

Spotted Seatrout

Task 1.1.74 – Monitor fishery for consistency with management program and state compliance.

Spiny Dogfish

Task 1.1.75 – Review established specifications for 2019/2020.

Task 1.1.76 – Participate in annual stock status update, as needed.

Task 1.1.77 – Monitor fishery for consistency with management program and state compliance.

Summer Flounder, Scup, and Black Sea Bass

Summer Flounder

Task 1.1.78 – Continue development of the Comprehensive Summer Flounder amendment, considering changes to commercial management in coordination with MAFMC.

Task 1.1.79 – Finalize regulations for 2018 recreational fishery.

Task 1.1.80 – Review 2019 specifications in collaboration with the MAFMC.

Task 1.1.81 – Collaborate with NOAA Fisheries and NEFSC to finalize the 2018 benchmark stock assessment, including a sex-specific stock assessment modeling approach; consider management response, if necessary.

Task 1.1.82 – Monitor fishery for consistency with management program and state compliance.

Scup

Task 1.1.83 – Collaborate with NOAA Fisheries and NEFSC to finalize the 2018 operational stock assessment, pending availability of updated MRIP estimates, and consider management response if necessary.

Task 1.1.84 – Finalize regulations for 2018 recreational fishery.

Task 1.1.85 – Review 2019 specifications in collaboration with the MAFMC.

Task 1.1.86 – Monitor fishery for consistency with management program and state compliance.

Black Sea Bass

Task 1.1.87 – Collaborate with NOAA Fisheries and NEFSC to finalize the 2018 operational stock assessment, pending availability of updated MRIP estimates, and consider management response if necessary.

Task 1.1.88 – Finalize and implement an addendum to consider recreational fishing measures for 2018 and beyond.

Task 1.1.89 – Collaborate with the MAFMC to initiate a Black Sea Bass Amendment.

Task 1.1.90 – Monitor fishery for consistency with management program and state compliance.

Tautog

Task 1.1.91 – Implement management measures and commercial harvest tagging program as required by Amendment 1.

Task 1.1.92 – Monitor fishery for consistency with management program and state compliance.

Weakfish

Task 1.1.93 – Continue to develop the 2019 stock assessment update.

Task 1.1.94 – Monitor fishery for consistency with management program and state compliance.

Winter Flounder

Task 1.1.95 – Review the 2018 GARM stock assessment for inshore winter flounder stocks and consider management response in coordination with NEFMC and the Greater Atlantic Regional Fisheries Office (GARFO), if necessary.

Task 1.1.96 – Continue to monitor federal common pool landings and regulations.

Task 1.1.97 – Monitor fishery for consistency with management program and state compliance.

1.2 Strengthen state and federal partnerships to improve comprehensive management of shared fishery resources.

Task 1.2.1 – Participate on the Regional Fishery Management Councils and committees regarding matters of mutual interest.

Task 1.2.2 – Participate on the NRCC and SEDAR Steering Committee to set state/federal management and assessment priorities.

Task 1.2.3 – Work with the Regional Fishery Management Councils and NOAA Fisheries to improve alignment between state and federal fishery management programs.

Task 1.2.4 – Work with NOAA Headquarters and regional leadership to improve alignment of state/federal budget priorities.

Task 1.2.5 – Collaborate with NOAA Fisheries and the Secretary of Commerce to ensure the transparency and integrity of the Atlantic Coastal Fisheries Cooperative Management Act (Atlantic Coastal Act) provisions are preserved.

Task 1.2.6 – Continue to work with NEFMC and MAFMC on evaluating and mitigating shad and river herring bycatch (See Task 1.1.22 and 1.1.55).

Task 1.2.7 – Continue to work with NEFMC on habitat amendments and impacts to the American lobster and Jonah crab fisheries.

Task 1.2.8 – Seek opportunities to collaborate with NOAA Fisheries as it conducts ESA status reviews for Atlantic sturgeon and river herring.

1.3 Adapt management to address emerging issues.

Task 1.3.1 – Continue to monitor developments related to climate change, ocean acidification, stock distributions, ecosystem services, ocean planning and potential fisheries reallocations.

Task 1.3.2 – Determine next steps in response to the Commission's climate change white paper to address fisheries impacted by climate change.

Task 1.3.3 – Work with NOAA leadership to better understand the impacts to state management programs given the movement toward increased recreational flexibility. Seek ways to address the concerns of the recreational community with regard to Commission-managed and jointly-managed species.

Subtask 1.3.3.1 – Assist in conducting and participate in NOAA Fisheries' 2018 National Recreational Fisheries Summit.

Task 1.3.4 – Consider approval of Risk and Uncertainty Policy for management use (See Task 2.1.13).

Task 1.3.5 – Respond to new MRIP estimates as needed across Commission species management plans.

1.4 Practice efficient, transparent, and accountable management processes.

Task 1.4.1 – Continue to track status of stocks relative to biological reference points to evaluate and drive improvement and results in the Commission's fisheries management process.

Task 1.4.2 – Continue the use of decision documents and working groups to structure Board discussion on complex management decisions and increase transparency of pending board action.

Task 1.4.3 – Continue to focus Board attention on developing clear problem statements prior to initiating management changes.

Task 1.4.4 – Continue to use roll call voting procedures for Commission final actions.

1.5 Evaluate progress towards rebuilding fisheries.

Task 1.5.1 – Conduct annual Commissioner assessment of progress towards achieving the Commission's mission, vision, and goals using an on-line survey. Report findings to the ISFMP Policy Board.

Task 1.5.2 – Continue the use of the annual performance of the stock to evaluate species rebuilding progress. Report findings to the ISFMP Policy Board.

1.6 Strengthen interactions and input among stakeholders and technical, advisory, and management groups.

Task 1.6.1 – Engage American lobster, summer flounder, black sea bass, horseshoe crab, and bluefish advisory panels (APs) in the development of FMPs and Amendments. Solicit state membership of current active APs and appoint new membership where necessary (See Task 5.2.3).

Task 1.6.2 – Continue communication with non-active advisory panels (species in the maintenance mode).

Task 1.6.3 – Integrate non-traditional constituents into Advisory Panels (See Task 5.2.3).

Goal 2 – Provide the scientific foundation for and conduct stock assessments to support informed management actions

Sustainable management of fisheries relies on accurate and timely scientific advice. The Commission strives to produce sound, actionable science through a technically rigorous, independently peer-reviewed stock assessment process. Assessments are developed using a broad suite of fishery-independent surveys and fishery-dependent monitoring, as well as research products developed by a vast network of fisheries scientists at state, federal, and academic institutions along the coast. The goal encompasses the development of new, innovative scientific research and methodology, and the enhancement of the states' stock assessment capabilities. It provides for the administration, coordination, and expansion of collaborative research and data collection programs. Achieving the goal will ensure sound science is available to serve as the foundation for the Commission's evaluation of stock status and adaptive management actions.

Strategies to Achieve Goal

2.1 Conduct stock assessments based on comprehensive data sources and rigorous technical analysis.

Task 2.1.1 – Address data deficiencies and priorities for stocks with limited data or stocks of unknown status. Collect more comprehensive information for data poor stocks in order to transition from problematic to more certain assessment models. Focal areas include sciaenid bycatch data, black sea bass fishery-independent data, menhaden fishery-independent data, river herring at-sea and in-river monitoring, the horseshoe crab trawl survey, improved tautog indices, **spot age data**, black drum biological sampling and fishery-independent monitoring of mature fish, American eel surveys covering all life stages, red drum recreational discard size composition, and **sturgeon bycatch monitoring in state waters**.

Task 2.1.2 – Complete benchmark stock assessments for **Atlantic herring, horseshoe crab, northern shrimp, striped bass, and summer flounder, and initiate assessment for American shad**. Complete operational assessments for bluefish, scup, and black sea bass, assessment updates for **northern shrimp, and spiny dogfish**, and **initiate assessment update for weakfish**.

Task 2.1.3 – Conduct independent peer reviews of the **horseshoe crab, northern shrimp, and striped bass** stock assessments.

Task 2.1.4 – Develop a long-term vision for scientific initiatives within the Commission's next 5-year Strategic Plan, led by the Management and Science Committee (MSC) and Assessment Science Committee (ASC).

Task 2.1.5 – Through the ASC and MSC, develop the long-term stock assessment schedule to prioritize stocks by management need; present tradeoffs to the Policy Board when assessment scheduling changes are requested.

Task 2.1.6 – Track assessment scientists' workloads in order to complete 2017-2018 stock assessments; using the guidance of the ASC, develop new policies and approaches to better match assessment demand with assessment scientists' capacity.

Task 2.1.7 – Through the ASC, design and conduct a Data Best Practices Workshop and expand Fishery-Independent Survey Database to promote efficient assessment report compilation.

Task 2.1.8 – Consult with ASC on red drum stock assessment guidance and provide a road map for improved data collection and future assessment to the South Atlantic Management Board.

Task 2.1.9 – Monitor the progress of cobia research projects and contribute to stock identification workshop in preparation for the 2019 SEDAR stock assessment.

Task 2.1.10 – Serve as members of the American lobster, American shad, Horseshoe Crab, Northern Shrimp, Striped Bass, and Bluefish Technical Committees and Stock Assessment Subcommittees to assist in completion of benchmark assessments and annual assessment updates. Utilize the ASC for guidance with assessment methods as necessary.

Task 2.1.11 – Participate on the Technical Expert Working Group for River Herring and associated subgroups.

Task 2.1.12 – Continue to work with state and federal stock assessment scientists and staff from the Atlantic Coastal Cooperative Statistics Program (ACCSP) to use ACCSP data in the Commission's technical work.

Task 2.1.13 – Through the Risk and Uncertainty Policy Workgroup, develop a Commission policy regarding risk and uncertainty for consideration and approval by the ISFMP Policy Board (See Task 1.3.4).

2.2 Proactively address research priorities through cooperative state and regional data collection programs and collaborative research projects.

Task 2.2.1 – Update the Research Priorities as benchmark assessments are completed and new priorities emerge; distribute Research Priorities to the states, NOAA Fisheries, USFWS, Sea Grant, and university researchers.

Task 2.2.2 – Integrate research priorities into FMP reviews for approval by species management boards.

Task 2.2.3 – Partner with US Geological Survey to identify shared priorities and opportunities for enhanced scientific support to the Commission.

Task 2.2.4 – Participate in proposal reviews for NOAA Fisheries Cooperative Research Programs, Saltonstall-Kennedy, Research Set-Aside, National Fish and Wildlife Foundation (NFWF), ACCSP, MARFIN, and MARMAP, when requested, to evaluate projects and monitor new research activities to promote the states' needs.

> Subtask 2.2.4.1 – Work with federal partners to ensure funded projects are reviewed and communicated to technical committees and boards.

Task 2.2.5 – Communicate with NFWF on shared research priorities and funding opportunities (e.g., fish passage, catch shares). Participate in NFWF proposal reviews for the Fisheries Innovation Fund.

Task 2.2.6 – Participate on the ACCSP's Coordinating Council, Operations Committee, Bycatch Prioritization Committee, Biological Review Panel, Recreational and Commercial Technical Committees, Outreach Committee and Computer Technical Committee.

Task 2.2.7 – Coordinate and implement the Northeast Area Monitoring and Assessment Program (NEAMAP).

> Subtask 2.2.7.1 – Administer funding to conduct 2018 NEAMAP Nearshore Trawl Surveys (Mid-Atlantic, Maine/New Hampshire).

> Subtask 2.2.7.2 – Continue to implement a strategy to identify future funding needs to address annual funding shortfalls for the Mid-Atlantic/Southern New England and Maine/New Hampshire Trawl Surveys.

> Subtask 2.2.7.3 – Support continuation of the NEAMAP Nearshore Trawl Surveys through coordination with survey leads and all NEAMAP committees: NEAMAP Board, Operations, Data Management, Analytical, and Trawl Technical Committees.

> Subtask 2.2.7.4 – Develop the 2018 NEAMAP Operations Plan.

> Subtask 2.2.7.5 – Provide NEAMAP data to coastwide stock assessments; track and demonstrate data use, and report to the ISFMP Policy Board, NEFSC, and Congress; maintain the NEAMAP website as a tool for distributing program information and requesting data.

Task 2.2.8 – Coordinate the South Atlantic component of the Southeast Area Monitoring and Assessment Program (SEAMAP).

> Subtask 2.2.8.1 – Coordinate all research components of SEAMAP-South Atlantic: Coastal Trawl Survey, Coastal Longline Surveys, Pamlico Sound Survey, Reef Fish

Survey, Southeast Regional Taxonomic Center, and the Cooperative Winter Tagging Cruise**.** Coordinate all current workgroups including the Habitat Characterization and Fish Assessment, Data Management, Crustacean, Coastal Trawl Survey, and the Coastal Longline Survey Workgroups.

Subtask 2.2.8.2 – Continue to implement the 2016-2020 SEAMAP Management Plan; track and demonstrate data use for coastwide stock assessments, and report to the South Atlantic Board and Congress; maintain the SEAMAP website hosted by ASMFC.

Subtask 2.2.8.3 – Participate in the expansion of SEAMAP-South Atlantic fishery-independent data coordination and mapping, as resources allow.

Subtask 2.2.8.4 – Coordinate South Atlantic activities with the Gulf and Caribbean components of SEAMAP.

Task 2.2.9 – Continue the Tagging Certification Program and support the use of tagging data in ASMFC stock assessments. Develop tagging registration programs, update and maintain the tagging resource website, link acoustic tagging information to the Atlantic Coastal Tagging (ACT) network website to improve the efficiency and quality of tagging efforts along the coast; secure telemetry tagging data for use in assessments.

Task 2.2.10 – Develop long-term strategy for collecting striped bass tagging data, including funding, administration, and at-sea support.

Task 2.2.11 – Continue to participate in the implementation of improvements to the MRIP, with ASMFC staff serving on Executive Steering Committee, Operations Team, Transition Team, and Angler Registry Team. Report progress to the ISFMP Policy Board, and scientific oversight committees (MSC, ASC).

Subtask 2.2.11.1 – Participate in the MRIP effort survey time series calibration for use in upcoming stock assessments and potential changes to management.

Subtask 2.2.11.2 – Continue to highlight concerns regarding delays in releases of Wave data and final annual estimates.

Task 2.2.12 – Coordinate fish ageing activities among Atlantic coast states and university laboratories in order to provide consistent, accurate age data to stock assessments.

Subtask 2.2.12.1 – Conduct an ageing workshop for American eel to prepare laboratories for providing new age data consistent with historical age data.

Subtask 2.2.12.2 – Conduct an annual Fish Ageing Quality Control Workshop using age sample reference collections for multiple species to maintain consistency among state and university ageing technicians.

Subtask 2.2.12.3 – Distribute to all ageing labs the Atlantic and Gulf coasts fish ageing manual with fish ageing protocols.

Task 2.2.13 – Coordinate the activities of the Committee on Economics and Social Sciences (CESS).

Subtask 2.2.13.1 – Develop and provide basic socioeconomic information for inclusion in fishery management plans, amendments, and addenda.

Subtask 2.2.13.2 – Provide technical recommendations to the social and economic data collection and data management programs of the Commission, **including the development of new ACCSP socioeconomic data standards**.

Subtask 2.2.13.3 – Serve as a steering committee for Commission socioeconomic studies.

2.3 Facilitate stakeholder involvement in research initiatives and the stock assessment process.

Task 2.3.1 – Seek stakeholder input at data workshops during development of stock assessments. Continue to issue press releases calling for new data when assessments begin.

Task 2.3.2 – Promote scientifically sound tagging practices and certification of angler-based tagging programs through the Interstate Tagging Committee.

Task 2.3.3 – Develop outreach materials that highlight opportunities for public engagement in the Commission's fisheries management and stock assessment processes (See Task 5.2.4).

Task 2.3.4 – Track progress and distribute information on citizen science initiatives through the SAFMC, Gulf of Maine Research Institute, and other entities.

2.4 Promote data collection and research to support ecosystem-based management.

Task 2.4.1 – Biological Ecological Reference Points Workgroup: continue to develop ecosystem-based reference points that align with Board-approved management objectives for Atlantic menhaden (See Task 1.1.26).

Task 2.4.2 – Continue to improve multispecies modeling efforts to support single-species assessments, including development of a new multispecies statistical catch-at-age model.

Task 2.4.3 – Identify opportunities to collaborate with state, federal, and university researchers to use existing data collection platforms to inform the Commission's ecosystem models (e.g. diet studies, surveys of spawning and nursery habitats).

Task 2.4.4 – Through the MSC and Climate Change Work Group, track the development of state and federal activities related to climate change and impacts to fisheries (See Task 1.3.1).

Task 2.4.5 – Convene the Fishing Gear Technology Work Group (FGTWG) to evaluate the efficacy of bycatch reduction devices in southern shrimp trawl fisheries to reduce Sciaenid bycatch; conduct FGTWG evaluation of the efficacy of lobster trap design to ensure escapement from derelict gear.

Task 2.4.6 – Participate as members of the Chesapeake Bay Sustainable Fisheries Goal Implementation Team and Forage Fish Workgroup.

2.5 Provide stock assessment training to improve the expertise and involvement of state and Commission staff scientists.

Task 2.5.1 – Conduct **introductory** and advanced stock assessment methods training workshops (See Task 7.3.4).

Task 2.5.2 – Support external stock assessment training opportunities for staff and state scientists.

Goal 3 – Promote compliance with fishery management plans to ensure sustainable use of Atlantic coast fisheries

Fisheries managers, law enforcement personnel, and stakeholders have a shared responsibility to promote compliance with fisheries management measures. Activities under the goal seek to increase and improve compliance with fishery management plans. This requires the successful coordination of both management and enforcement activities among state and federal agencies. Commission members recognize that adequate and consistent enforcement of fisheries rules is required to keep pace with increasingly complex management activity and emerging technologies. Achieving the goal will improve the effectiveness of the Commission's fishery management plans.

Strategies to Achieve Goal

3.1 Develop practical compliance requirements that foster stakeholder buy-in.

Task 3.1.1 – Identify and explore fishery management measures that maximize stakeholder buy-in.

Task 3.1.2 – Evaluate and report on compliance issues associated with newly implemented regulatory measures for cobia, coastal sharks, American lobster, tautog, black sea bass, menhaden, summer flounder, and other ASMFC-managed species as requested.

Task 3.1.3 – Continue working with the Tautog Enforcement Subcommittee to **evaluate the effectiveness of commercial tagging systems and user compliance**.

3.2 Evaluate the enforceability of management measures and the effectiveness of law enforcement programs.

Task 3.2.1 – Work with LEC Coordinator to ensure the input of the LEC throughout the management process on the enforceability of management options proposed in FMPs, amendments, addenda and conservation equivalency proposals.

Task 3.2.2 – Incorporate and reference the revised "Guidelines for Resource Managers" in reviews and evaluations of proposed changes to management programs.

Task 3.2.3 – Report on the enforceability of existing FMPs as part of the annual compliance review for each species.

Task 3.2.4 – Engage and support NMFS and USFWS Offices of Law Enforcement, U.S. Department of Justice and U.S. Coast Guard to facilitate the enforceability of Commission FMPs.

Task 3.2.5 – Exchange information and best practices related to the enforcement of protected and endangered species regulations.

Task 3.2.6 – Annually review and comment on (as needed) NMFS enforcement priorities to ensure they support the enforceability and effectiveness of Commission management programs.

Task 3.2.7 – Review and provide input on enforcement issues associated with American eel or other aquaculture proposals, including offshore aquaculture proposals.

Task 3.2.8 – Through the LEC, monitor changes in stakeholder compliance with state regulations for ASMFC managed species given recent secretarial action.

3.3 Promote coordination and expand existing partnerships with state and federal natural resource law enforcement agencies.

Task 3.3.1 – Provide a forum to promote and facilitate interjurisdictional enforcement operations targeting specific fishery resources (e.g. Atlantic striped bass, tautog, American eel).

Task 3.3.2 – Maintain communications with the law enforcement advisory committees of the regional fishery management councils, interstate commissions, and other conservation organizations to seek opportunities for collaboration and ensure consistent law enforcement strategies.

Task 3.3.3 – Exchange information regarding planned and ongoing enforcement actions and facilitate communications regarding joint efforts that can assist in long-term fisheries enforcement.

Task 3.3.4 – Share enforcement techniques and law enforcement success stories and provide regional training sessions (if resources allow) to enhance law enforcement efficiency along the Atlantic coast.

Task 3.3.5 – Share information and resources for locating and obtaining enforcement related grants.

Task 3.3.6 – Advance the recommendations of the American Lobster Enforcement Subcommittee to enhance cooperative funding and enforcement activities for commercial fisheries in nearshore and offshore waters.

Task 3.3.7 – Review and evaluate inter-agency measures to enhance tracking of fishery shipment and sale across jurisdictional boundaries.

3.4 Enhance stakeholder awareness of management measures through education and outreach.

Task 3.4.1 – Continue to highlight the outcomes of law enforcement investigations (penalties and fines) through various outreach tools (website, social media, press releases, fact sheets).

3.5 Use emerging communication platforms to deliver real time information regarding regulations and the outcomes of law enforcement investigations.

Task 3.5.1 – Report on enforcement issues associated with differing federal, interstate, and state regulations using social media and timely press releases.

Task 3.5.2 – Provide forum for enforcement agencies to display successful development and use of enforcement technologies.

Goal 4 – Protect and enhance fish habitat and ecosystem health through partnerships and education

Goal 4 aims to conserve and improve coastal, marine, and riverine habitat to enhance the benefits of sustainable Atlantic coastal fisheries and resilient coastal communities in the face of changing ecosystems. Habitat loss and degradation have been identified as significant factors affecting the long-term sustainability and productivity of our nation’s fisheries. The Commission’s Habitat Program develops objectives, sets priorities, and produces tools to guide fisheries habitat conservation efforts directed towards ecosystem-based management.

The challenge for the Commission and its state members is maintaining fish habitat in the absence of specific regulatory authority for habitat protection or enhancement. Therefore, the

Commission will work cooperatively with state, federal, and stakeholder partnerships to achieve this goal. The Commission and its Habitat Program endorses the National Fish Habitat Partnership, and will continue to work cooperatively with the program to improve aquatic habitat along the Atlantic coast. Since 2008, the Commission has invested considerable resources, as both a partner and administrative home, to the Atlantic Coastal Fish Habitat Partnership (ACFHP), a coastwide collaborative effort to accelerate the conservation and restoration of habitat for native Atlantic coastal, estuarine-dependent, and diadromous fishes.

Strategies to Achieve Goal

4.1 Identify critical habitat through fisheries management programs and partnerships.

Task 4.1.1 – Review existing reference documents for Commission-managed species to identify gaps or updates needed to describe important habitat types.

Task 4.1.2 – Review and revise species habitat factsheets as new data become available.

Task 4.1.3 – Coordinate artificial reef activities among the Atlantic coast states, and between the Atlantic and Gulf States Marine Fisheries Commissions.

4.2 Educate Commissioners, stakeholders, and the general public about the importance of habitat to healthy fisheries and ecosystems.

Task 4.2.1 – Facilitate coordination and distribution of information for ecosystem-based management activities, and the potential consequences of significant anthropogenic activities on habitats of concern.

Task 4.2.2 – Participate in regional and national habitat meetings and scientific conferences to facilitate increased communication with agencies and programs that have jurisdiction over habitat.

Task 4.2.3 – Publish annual issue of *Habitat Hotline Atlantic*.

Task 4.2.4 – Publish a Habitat Management Series document on **TBD** for ISFMP Policy Board review and acceptance. Identify a subsequent topic (e.g. climate change, sand mining, power plant impingement, innovative wetland restoration techniques).

Task 4.2.5 – Develop outreach materials on the benefits of habitat to fish productivity for non-technical audiences (stakeholders, media, general public).

4.3 Engage local, state, and regional governments in mutually beneficial habitat protection and enhancement programs through partnerships.

Task 4.3.1 – Work with ACFHP to foster partnerships with like-minded organizations at local levels to further common habitat goals.

Task 4.3.2 – Provide stakeholders with the tools to effectively communicate, promote and accomplish habitat protection, restoration, and enhancement programs at the local level.

Task 4.3.3 – Serve as a point of contact and information conduit at the Commission for energy-related issues affecting fish habitat.

Task 4.3.4 – Coordinate the activities of the Fish Passage Working Group (FPWG) to carry out priority tasks as defined by the ISFMP Policy Board. Promote development of effective fish passage approaches and projects through state and federal collaboration.

Subtask 4.3.4.1 – Provide annual updates to the Policy Board on fish passage improvements and current issues including hydropower dam issues. States can use this information when leveraging partnerships to reduce passage impacts.

Subtask 4.3.4.2 – Maintain a coastwide list of passage project priorities.

Subtask 4.3.4.3 – Establish coastwide fish passage targets and add to diadromous species FMPs as amendments/addenda are developed.

Subtask 4.3.4.4 – Continue to develop guidance for state staff for navigating the FERC dam relicensing process, in order to more effectively improve passage in relicensing prescriptions.

Subtask 4.3.4.5 – Respond to state requests for information on fish passage, including FERC relicensing issues, fishway design, and restoration/escapement guidelines.

Task 4.3.5 – Continue to provide coordination support for ACFHP, under the direction of the National Fish Habitat Action Plan (NFHAP) Board.

Subtask 4.3.5.1 – Facilitate communication and outreach with ACFHP partners, overlapping partnerships, and new partners. Develop outreach materials and **update the ACFHP website**.

Subtask 4.3.5.2 – Coordinate the implementation of the 5-year ACFHP Conservation Strategic Plan (2017-2021) and 2-year Action Plan (2017-2018).

Subtask 4.3.5.3 – Support the completion of priority ACFHP Science and Data projects - acquire and analyze fish population, habitat, and human impact data for the Southeast and Northeast using GIS mapping; make results available to Partners for the purpose of strategic coastal habitat conservation.

Subtask 4.3.5.4 – Migrate the Species-Habitat Matrix into an online searchable format for reference and downloading.

Subtask 4.3.5.5 – Assist in obtaining future funding to support ACFHP operations and fish habitat conservation projects.

4.4 Foster partnerships with management agencies, researchers, and habitat stakeholders to leverage regulatory, political, and financial support.

Task 4.4.1 – Provide information or comment on Atlantic coast projects and permits in accordance with ASMFC project review protocol as needed.

Task 4.4.2 – Solicit funding and promote fish habitat research through diverse activities including partnerships, funding opportunities, workshops, identification of research needs and other strategies.

Task 4.4.3 – Identify partnership opportunities and forge additional relationships with organizations – such as non-governmental organizations and the recreational fishing community – to facilitate the promotion of fish habitat through a collaboration of strengths of different stakeholder groups.

Task 4.4.4 – Continue to update the habitat webpages and use social media to connect with regional and local decision makers, and otherwise more effectively disseminate the work of the Habitat Committee.

4.5 Identify mechanisms to evaluate ecosystem health.

Task 4.5.1 – Review habitat program goals and evaluate accomplishments annually.

Task 4.5.2 – Identify important fish habitats for Commission-managed species, and include this information in the 2018 Habitat Management Series document on important habitats.

4.6 Engage in state and federal agency efforts to ensure climate change response strategies are included in habitat conservation efforts.

Task 4.6.1 – As revisions to habitat sections of FMPs are made, include recommendations that account for climate change in fisheries management decisions.

Task 4.6.2 – Identify gaps in state coastal regulatory planning regarding climate change impacts and make recommendations to increase resiliency.

Task 4.6.3 – Increase communication on ecosystem-based management with Commission committees to find overlap with fish habitat related issues.

Goal 5 – Strengthen stakeholder and public support for the Commission

Stakeholder and public acceptance of Commission decisions are critical to our ultimate success. For the Commission to be effective, these groups must have a clear understanding of our mission, vision, and decision-making processes. The goal seeks to do so through expanded outreach and education efforts about Commission programs, decision-making processes, and its management successes and challenges. It aims to engage stakeholders in the process of fisheries management, and promote the activities and accomplishments of the Commission. Achieving the goal will increase stakeholder participation, understanding, and acceptance of Commission activities.

Strategies to Achieve Goal

5.1 Increase public understanding and support of activities through expanded outreach at the local, state, and federal levels.

Task 5.1.1 – Publish bi-monthly issues of *Fisheries Focus*. Continue to reduce mailing/printing costs through greater electronic distribution.

Task 5.1.2 – Use website to promote ASMFC activities to state and federal partners and stakeholders.

Task 5.1.3 – Promote ASMFC through attendance at fisheries-related trade shows and conferences.

Task 5.1.4 – Promote Commission activities regarding recently assessed and/or high profile species, habitat and law enforcement activities, as well as emerging issues such as fishery allocations and shifting populations due to climate change, to a broader constituency through mechanisms such as targeted press releases, informational brochures, webpage highlights and conference/trade show participation.

Task 5.1.5 – Develop and distribute youth-based educational materials designed to increase awareness of fisheries science and understating of fisheries management to key venues (e.g., teacher kits, Eco-camps, charter boat operations, aquatic educators) to help promote marine stewardship and ocean literacy.

Task 5.1.6 – Promote Commission's mission and programs through outreach meetings with various marine policy and marine science graduate programs.

Task 5.1.7 – Participate in the Mid-Atlantic and New England Fishery Management Councils Marine Resource Education Program.

Task 5.1.8 – Explore use of story mapping and photo journaling to better communicate science and management activities.

Task 5.1.9 – Solicit outside sources to develop short video clips of fisheries management and science activities.

Task 5.1.10 – Collaborate with NOAA Fisheries MRIP staff on communicating improvements to MRIP.

5.2 Clearly define Commission processes to facilitate stakeholder participation, as well as transparency and accountability.

Task 5.2.1 – Publish and distribute **2017 Annual Report** to Congress, state legislators, and stakeholders to provide overview of our activities and progress in carrying out the Commission's mission and public trust responsibilities.

Task 5.2.2 – Prepare Stock Assessment Overviews (in layman's terms) for benchmark and stock assessment updates to facilitate stakeholder understanding of the science behind our management decisions. Focal species for 2018 are **Atlantic herring, Atlantic striped bass, horseshoe crab, northern shrimp, and summer flounder**.

Task 5.2.3 – Enhance engagement in advisory panels and through solicitation of new members and increased participation of existing members (See Tasks 1.6.1 and 1.6.3).

Task 5.2.4 – Develop outreach materials that highlight opportunities for public engagement in the Commission's fisheries management and stock assessment processes (See Task 2.3.3).

Task 5.2.5 – Explore the use of quarterly, topic-driven webinars to engage and inform public about current activities (management, science, habitat, and data collection and management).

5.3 Strengthen national, regional, and local media relations to increase coverage of Commission actions.

Task 5.3.1 – Track media communications and coverage through ASMFC-related news clippings and media tracking sheet.

Task 5.3.2 – Conduct annual meeting of Atlantic Coast Fisheries Communication Group, comprised of Public Information Officers from the Councils, states and federal agencies, to share successful tools, identify key media contacts and work cooperatively on joint projects.

Task 5.3.3 – Work with ASMFC technical staff to improve messaging and communication skills with media.

Task 5.3.4 – Work with ASMFC technical staff on developing written content that is targeted for non-technical audiences (stakeholders, media, and the general public).

5.4 Use new technologies and communication platforms to more fully engage the broader public in the Commission's activities and actions.

Task 5.4.1 – Use social media tools to increase ASMFC visibility and improve stakeholder engagement.

Task 5.4.2. – Use website capabilities (e.g., video clips) to promote Fisheries Science 101 webinars, videos of fisheries surveys and state on-the-ground projects.

Task 5.4.3 – Monitor the success of website and social media platforms in reaching broader constituency and effectively communicating ASMFC mission, programs and activities.

Task 5.4.4 – Update website to improve functionality and include new content on ACCSP, cobia, and fisheries management 101.

Goal 6 – Advance Commission and member states' priorities through a proactive legislative policy agenda

Although states are positioned to achieve many of the national goals for marine fisheries through cooperative efforts, state fisheries interests are often underrepresented at the national level. This is due, in part, to the fact that policy formulation is often disconnected from the processes that provide the support, organization, and resources necessary to implement the policies. The capabilities and input of the states are an important aspect of developing national fisheries policy, and the goal seeks to increase the states' role in national policy formulation. Additionally, the goal emphasizes the importance of achieving management goals consistent with productive commercial and recreational fisheries and healthy ecosystems.

The Commission recognizes the need to work with Congress in all phases of policy formulation. Several important fishery-related laws will be reauthorized over the next couple of years (i.e., Atlantic Coastal Act, Magnuson-Stevens Fishery Conservation and Management Act (MSA), Interjurisdictional Fisheries Act, Atlantic Striped Bass Conservation Act, and Anadromous Fish Conservation Act). The Commission will be vigilant in advocating the states' interests to Congress as these laws are reauthorized and other fishery-related pieces of legislation are considered.

Strategies to Achieve Goal

6.1 Increase the Commission's profile and support in the U.S. Congress by developing relationships with Members of Congress and their staff.

Task 6.1.1 – Provide opportunities for in person Commissioner interactions with Members and staff during Meeting Weeks.

Task 6.1.2 – Provide opportunities for the Executive Director to meet with congressional staff on a regular basis.

Task 6.1.3 – Focus interactions on Members of Congress from Atlantic coast states and those that serve on committees of importance to the Commission:

- House and Senate Commerce Justice, Science Appropriations Subcommittees

- House Water, Power and Oceans Subcommittee of the Natural Resources Committee

- Senate Oceans, Atmosphere, Fisheries and Coast Guard Subcommittee of the Commerce, Science, and Transportation Committee

6.2 Communicate the Commission's federal funding needs to Congress and advocate for sufficient appropriations.

Task 6.2.1 – Clearly convey funding needs to congressional staff.

Task 6.2.2 – Justify state needs for federal dollars through social, economic, and ecological benefits.

Task 6.2.3 – Work with Commissioners to identify funding needs and develop a strategy to secure funding for priority programs (Atlantic Striped Bass Conservation Act, Atlantic Coastal Act, Interjurisdictional Fisheries Act Grants, Stock Assessments line item, Federal Aid in Sport Fish Restoration, ACFHP, and Fisheries Information Networks). Seek funding for long-term monitoring surveys including Horseshoe Crab Benthic Trawl, NEAMAP, and SEAMAP (See Task 1.1.45).

Subtask 6.2.3.1 – Restore the Atlantic Coastal Act proportion of the "Regional Councils and Fishery Commissions" appropriation to its historic share.

Task 6.2.4 – Demonstrate the value of the Commission as an effective management entity and resource to Members of Congress and their staffs.

Task 6.2.5 – Provide state-specific perspectives to staff and Members in meetings, especially management successes and challenges.

Subtask 6.2.5.1 – Seek federal funding support for Gulf of Maine lobster research to characterize impacts of environmental changes.

Task 6.2.6 – Contact home state Commissioners before communicating with Members of Congress or Congressional staff to get a local perspective.

Task 6.2.7 – Coordinate with the Gulf, Pacific, and Great Lakes Commissions on policy items of mutual interest including federal funding for fisheries programs. Executive

Directors should continue to provide unified positions on funding and legislative priorities to lawmakers and federal agencies, where appropriate.

6.3 Engage Congress on fishery-related legislation affecting the Atlantic coast.

Task 6.3.1 – Monitor federal legislation affecting the Commission, including policy and annual appropriations bills and develop Commission positions on pending federal legislation, including the Atlantic Coastal Act, Interjurisdictional Fisheries Act , Anadromous Fish Conservation Act , MSA, Federal Aid in Fish Restoration Act, in addition to new legislation addressing emerging issues such as marine national monuments and alternative energy initiatives.

Task 6.3.2 – Update Commissioners on pending congressional actions that may affect fisheries management as appropriate.

Task 6.3.3 – Coordinate with the Legislative Committee and Government Relations firm to identify relevant policy and legislative issues.

Task 6.3.4 – Monitor congressional hearings related to fisheries issues, and testify or provide statements for the record when appropriate.

Task 6.3.5 – Engage Commissioners in the formulation of the Commission's position on federal legislative policy, **including pending MSA reauthorization legislation.**

6.4 Promote member states' collective interests at the regional and national levels.

Task 6.4.1 – Communicate member states' needs to Congress and our management partners.

Subtask 6.4.1.1 – Contact Commissioners before and after congressional meetings.

Subtask 6.4.1.2 – Facilitate opportunities for Commissioners to communicate directly with their Legislators and staff.

Task 6.4.2 – Participate with national organizations and management partners to address issues of mutual interest.

Subtask 6.4.2.1 – Conduct interagency coordination meetings (Memorandum of Understanding) under the Atlantic Coastal Act to improve state-federal partnerships.

Subtask 6.4.2.2 – Continue to serve as an advisor to Marine Fisheries Advisory Committee (MAFAC).

Subtask 6.4.2.3 – Continue to participate as a member on the Marine Fisheries Initiative (MARFIN) panel.

Subtask 6.4.2.4 – Continue to participate with the Association of Fish and Wildlife Agencies.

Task 6.4.3 – Engage congressional delegations to ensure the transparency and integrity of the Atlantic Coastal Act provisions are preserved.

Task 6.4.4 – Engage Administration on policy and funding issues.

Subtask 6.4.4.1 – Communicate state and Commission funding needs to NOAA Fisheries.

Subtask 6.4.4.2 – Develop relationships with the Commerce Secretary and the Assistant Administrator for NOAA Fisheries.

Subtask 6.4.4.2.1 – Meet with Secretary of Commerce and staff to discuss Atlantic Coastal Act noncompliance process.

Subtask 6.4.4.3 – Work with NOAA Fisheries to fund state and regional fisheries programs.

Subtask 6.4.4.4 – Include Delaware Bay Horseshoe Crab Survey in the President's Budget Request to Congress.

Subtask 6.4.4.5 – Increase funding for the Atlantic Coastal Act.

6.5 Promote economic benefits of the Commission's actions (return on investment).

Task 6.5.1 – Provide state-specific economic and jobs statistics related to commercial and recreational marine fishing to lawmakers and staff.

Task 6.5.2 – Use specific examples to show successful management can be linked to economic success and increased jobs.

Task 6.5.3 – Demonstrate the differences between federal and state fishery management tools and the economic benefits of the state management approach.

Goal 7 – Ensure the fiscal stability & efficient administration of the Commission

Goal 7 will ensure that the business affairs of the Commission are managed effectively and efficiently, including workload balancing through the development of annual action plans to support the Commission's management process. It also highlights the need for the Commission to efficiently manage its resources. The goal promotes the efficient use of legal advice to proactively review policies and react to litigation as necessary. It also promotes human resource policies that attract talented and committed individuals to conduct the work of the Commission. The goal highlights the need for the Commission as an organization to continually expand its skill set through training and educational opportunities. It calls for Commissioners and Commission staff to maintain and increase the institutional knowledge of the Commission through periods of transition. Achieving this goal will build core strengths, enabling the Commission to respond to increasingly difficult and complex fisheries management issues.

Strategies to Achieve Goal

7.1 Conservatively manage the Commission's operations and budgets to ensure fiscal stability.

Task 7.1.1 – Monitor, and update as necessary, guidelines for cost effective meeting locations and meeting attendee travel policies.

Task 7.1.2 – Responsibly manage and review, as necessary, the Commission's reserve fund according to the approved investment policy. Review investments annually with the Administrative Oversight Committee (AOC).

Task 7.1.3 – Submit a Certification of Indirect Cost to the Department of Commerce.

Task 7.1.4 – Monitor expenditures on a monthly basis and project variances to ensure complete and timely use of available funds relative to grant cycles. Distribute monthly financial report to Senior Staff.

Task 7.1.5 – Prepare for and work cooperatively with CPA firm to conduct annual audit.

Task 7.1.6 – Continue to provide administrative support to MRIP APAIS program, including human resources and meeting management, grant and financial monitoring, and office space.

Task 7.1.7 – Continue to provide administrative support to the Atlantic Coastal Fish Habitat Partnership (ACFHP), including logistical support for committee meetings and other Partnership activities.

Task 7.1.8 – Review and revise Commission's retirement documents, as necessary, to ensure qualifications for participation in the plans are clearly and accurately defined.

Task 7.1.9 – Develop Commission compensation plan with updated job classifications and salaries based on location.

Task 7.1.10 – Annually review and revise Employee Handbook.

7.2 Utilize new information technology to improve meeting and workload efficiencies, and enhance communications.

Task 7.2.1 – Ensure consistency of software across the Commission and continue to cross-train administrative staff.

Task 7.2.2 – Provide targeted staff training for full use of office equipment and software **with a focus on training new staff on how to access and use electronic tools.**

Task 7.2.3 – Document standards for electronic record retention and develop site map of Commission electronic filing system for internal use, including protocols for document archiving.

Task 7.2.4 – Continue to audit Commission databases to verify contacts and relevant information.

Task 7.2.5 – Review SOPPs annually and revise as necessary.

Task 7.2.6 – Explore the use of available software packages to digitize review and approval of bills received by the Commission.

Task 7.2.7 – Develop a contracts database to track details of multiple Commission contracts.

7.3 Refine strategies to recruit professional staff, and enhance growth and learning opportunities for Commission and state personnel.

Task 7.3.1 – Promote Commission's programs and activities and recruit new talent by conducting seminars to graduate level marine programs.

Task 7.3.2 – Review and revise position descriptions as necessary.

Task 7.3.3 – Review vacancy announcement distribution list and update as necessary.

Task 7.3.4 – Conduct introductory and advanced stock assessment methods training workshops (See Task 2.5.1).

Task 7.3.5 – Facilitate staff participation at national and regional conferences; provide professional training opportunities.

Task 7.3.6 – Conduct a training workshop for ASMFC technical staff on meeting facilitation to help enhance committee productivity and performance.

Task 7.3.7 – Facilitate participation in educational opportunities targeted to specific staff based on job responsibilities.

Task 7.3.8 – Communicate human resources support available to state-based employees.

Task 7.3.9 – Conduct annual meeting with financial advisor to review retirement program performance with staff and provide opportunities for staff to meet individually with financial advisor to match financial goals with investment choices for retirement.

Task 7.3.10 – Engage consultant to better define Commission staff culture and improve staff feedback and performance reviews.

7.4 Fully engage new Commissioners in the Commission process and document institutional knowledge.

Task 7.4.1 – Develop a transition and orientation program to quickly provide background for new Commissioners.

Task 7.4.2 – Update, on an ongoing basis, the Commissioner Manual. Inform Commissioners when the update is substantial.

Task 7.4.3 – Continue to provide orientation materials for new members of Commission supporting committees.

7.5 Utilize legal advice on new management strategies and policies, and respond to litigation as necessary.

Task 7.5.1 – Respond as needed to litigation regarding challenges to Commission FMPs.

Task 7.5.2 – Ensure submission and annual renewal of Conflict of Interest form by Legislative and Governor Appointee Commissioners.

Task 7.5.3 – Continue to work with human resources attorney to ensure all human resources practices are consistent with states laws.

7.6 **Develop 2019-2023 ASMFC Strategic Plan.**

Task 7.6.1 – Engage Commissioners in identifying an approach to develop the next strategic plan.

Task 7.6.2 – Develop the next strategic plan and 2019 Action Plan.

Appendix 1 (new Goal 8) - 2018 Action Plan for the Atlantic Coastal Cooperative Statistics Program (ACCSP)

This plan is intended to provide guidance in achieving the goals of the ACCSP in FY2018 (March 1, 2018 – February 28, 2019). References within this plan are to the ACCSP 2014-2018 Strategic Plan.

Strategies to Achieve Goal

8.1 Manage and expand a fully integrated data set that represents the best available fisheries data.

Task 8.1.1 – Continue to maintain and enhance current data warehouse feeds.

Task 8.1.2 – Initiate populating the biological tables in the Data Warehouse.

Task 8.1.3 – Initiate populating the bycatch data set in the Data Warehouse.

Task 8.1.4 – Monitor and adjust, based on feedback from the end users and research conducted by staff and the Information Systems Committee, the new query interface.

8.2 Continue working with the program partners to improve fisheries data collection and management in accordance with the evolving ACCSP standards within the confines of limited funds.

Task 8.2.1 – Maintain and enhance, based on requirements from the program partners, the Standard Atlantic Fisheries Information System (SAFIS).

Task 8.2.2 – Conduct and enhance MRIP's Access Point Intercept Survey (APAIS) and other related recreational data collection and management systems.

Task 8.2.3 – Continue the collaborative SAFIS redevelopment process, with systems changes and updates consistent with plans developed in prior years.

Task 8.2.4 – Maintain and enhance, in accordance with end user requirements, the lobster trap tag database (LOBSTAH) system.

Task 8.2.5 – Continue to develop and deploy tablet and phone-based versions of SAFIS.

8.3 Explore the allocation of existing Program funds and work with partners to pursue additional funding.

Task 8.3.1 – Continue to manage the funding process in accordance with the Funding Decision Document.

Task 8.3.2 – Through the Operations Committee, continue to track performance of funded projects and revise processes as necessary based on constituent input.

Task 8.3.3 – Maintain strong executive leadership and collaborative involvement among partners at all committee levels.

Task 8.3.4 – Conduct biannual meetings of the Coordinating Council to provide executive level managers with the most up-to-date information and an opportunity to provide direct input into the Program.

Task 8.3.5 – Conduct regular meetings of the technical and policy level committees to review and modify technical standards and make policy recommendations to the Coordinating Council.

8.4 Monitor and improve the usefulness of products and services provided by the ACCSP.

Task 8.4.1 – Monitor metrics and distribute findings throughout year and within the ACCSP Annual Report. Metrics to include are the collection of system usage statistics, user surveys, and data load and availability statistics.

Task 8.4.2 – Maintain a clear line of communications between Program Staff and our constituents. Ensure there is a feedback loop to gauge the success of the Program in meeting the needs of its constituents.

8.5 Collaborate with program partners in their funding processes by providing outreach materials and other support to demonstrate the value of ACCSP products and the importance of maintaining base support for fishery-dependent data collection programs to state partners and their executive and legislative branches as well as to all other partner agencies.

Task 8.5.1 – Continue established outreach processes, including routine automated updates for meetings, changes and/or updates in data and significant events, quarterly newsletters, data sheets detailing the status of the Program, articles in *ASMFC Fisheries Focus*, and the preparation and publication of the Annual Report.

Task 8.5.2 – Maintain a schedule of fisheries related events, reviewing them periodically to identify opportunities to establish or improve stakeholder communications. Appropriate staff will be detailed to these events to ensure that the ACCSP is represented.

Task 8.5.3 – Track various stock assessments, conferences, and other data intensive activities with an eye towards participating as fully as possible. Data will be provided where appropriate. This task would include the presentation of papers or posters in support of Program objectives.

8.6 Support nationwide systems as defined in the MSA.

Task 8.6.1 – Continue to participate in both the Fisheries Information System (FIS) and MRIP, providing resources as appropriate to the various committees of the programs.

Task 8.6.2 – In accordance with the MSA, provide data for the Atlantic coast to the FIS when requested.

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Atlantic States Marine Fisheries Commission

Amendment 3 to the Interstate Fishery Management Plan for Northern Shrimp

Approved by the Section August 31, 2017

Vision: Sustainably Managing Atlantic Coastal Fisheries

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Amendment 3 to the Interstate Fishery Management Plan for Northern Shrimp

Prepared by

Atlantic States Marine Fisheries Commission
Northern Shrimp Plan Development Team

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This is a report of the Atlantic States Marine Fisheries Commission pursuant to the U.S. Department of Commerce, National Oceanic and Atmospheric Administration Award No. NA15NMF4740069.

ACKNOWLEDGEMENTS

Amendment 3 to the Interstate Fishery Management Plan for Northern Shrimp was developed under the supervision of the Atlantic States Marine Fisheries Commission's Northern Shrimp Section, chaired by Mike Armstrong (January 2014-December 2015) and Dennis Abbott (January 2016-present), Massachusetts' Division of Marine Fisheries and New Hampshire's Legislative Appointee Commissioner, respectively. Members of the Northern Shrimp Advisory Panel, chaired by Gary Libby, and the Northern Shrimp Plan Development Team, chaired by Max Appelman of the Atlantic States Marine Fisheries Commission, contributed to the development of this amendment. Considerable support was provided by the Northern Shrimp Technical Committee, chaired by Kelly Whitmore of Massachusetts' Division of Marine Fisheries and Robert Eckert of New Hampshire Fish and Game. Additional contributions came from Robert Beal, Toni Kerns, Tina Berger, Michael Waine and Marin Hawk of the Atlantic States Marine Fisheries Commission. Appreciation is also extended to the many fishermen, representatives of conservation groups and members of the public who have written letters and attended public hearings to express their opinions and contribute ideas.

EXECUTIVE SUMMARY

Amendment 3 consolidates prior amendments (and associated addenda) and recent management decisions into a single document; it is now the comprehensive document for northern shrimp management in state waters.

Statement of the Problem

The northern shrimp resource has experienced recruitment failure in three of the past five years and stock biomass indices have remained at unprecedented lows for five consecutive years. Additionally, as an open access fishery, displaced harvesters from other northeast fisheries has resulted in increased effort in the shrimp fishery. Early season closures occurred in the 2010 and 2011 fishing seasons due to untimely reporting and an overharvest of the target total allowable catch. Furthermore, long term trends in environmental conditions are not favorable for northern shrimp survival in the Gulf of Maine amplifying the need to conserve spawning stock biomass. For these reasons, the Northern Shrimp Section imposed a moratorium on the fishery beginning with the 2014 season.

The potential for increased fishing pressure, coupled with failed recruitment, the lowest abundance indices on record, and unfavorable environmental conditions have resulted in uncertainties in the future status of the northern shrimp resource. To address these uncertainties, an amendment to the Fishery Management Plan was initiated to implement measures to control effort and protect the spawning stock. See *Section 1.0* for additional information.

Description of the Resource, Life History and Habitat Requirements

Water temperature, depth, and sediment type have all been cited as important factors governing shrimp distribution in the Gulf of Maine. Northern shrimp are hermaphroditic, maturing first as males at about 1½ years of age and then transforming to females at about age 3 in the Gulf of Maine. Spawning takes place in offshore waters beginning in late July. Egg-bearing females move inshore in late autumn and winter, where the eggs hatch. Recruitment of northern shrimp is related to both spawning biomass and ocean temperatures, with higher spawning biomass and colder temperatures producing stronger recruitment. Juveniles remain in coastal waters for a year or more before migrating to deeper offshore waters, where they mature as males. The males pass through a series of transitional stages before maturing as females. Some females may survive to repeat the spawning process in succeeding years. The females are the individuals targeted in the Gulf of Maine fishery. See *Section 1.2 and 1.4* for additional information.

Fishery Description

The fishery is predominantly commercial and seasonal in nature, peaking in late winter when egg-bearing females move into inshore waters and terminating in spring under a regulatory closure. Fishing is conducted using otter trawls, although traps are also utilized off the central coast of Maine and trapping effort has increased in recent years. The proportion of catch among the states has been similar between 2003 and 2013, with Maine accounting for 90% of the landings annually, followed by New Hampshire (8%) and Massachusetts (2%), although the

proportion of total catch attributed to Massachusetts and New Hampshire were higher in the 1980's and early-90's.

Annual landings declined from an average of 11,400 metric tons (mt) during 1969-1972 to about 400 mt in 1977, resulting in a closure of the fishery in 1978. The fishery reopened in 1979 and landings increased steadily to over 5,000 mt by 1987. Landings ranged from 2,300 to 6,400 mt during 1988-1995, and then rose dramatically to 9,500 mt in 1996, exceeding the previous high in 1973. Landings subsequently declined from 1997 to 2002, only to increase again between 2003 and 2011, from 1,300 to 6,400 mt, with a slight drop in 2009. After 2011, landings declined and the fishery was closed after the 2013 season and has not reopened, except for small research fisheries in 2015-2017. See *Section 1.3* for additional information.

Goals and Objectives
The goal of Amendment 3 is to manage the northern shrimp fishery in a manner that is biologically, economically, and socially sound, while protecting the resource, its users, and opportunities for participation. The Amendment objectives are designed to support the goal. See *Section 2.0* for additional information.

Specification of the Management Unit
The management unit is defined as the northern shrimp resource throughout the range of the species within U.S. waters of the northwest Atlantic Ocean from the shoreline to the seaward boundary of the Exclusive Economic Zone (EEZ). It is also recognized that the northern shrimp fishery, as defined here, is interstate and state-federal in nature, and that effective assessment and management can be enhanced through cooperative efforts with state and federal scientists and fishery managers.

Definition of Overfishing
Amendment 3 broadens the descriptions of stock status determination criteria to allow for greater flexibility in those definitions, while maintaining objective and measureable status determination criteria to identifying when the stock is overfished. Specifically, Amendment 3 allows for the incorporation of new, peer-reviewed stock status determination criteria (both the methods used to set reference points, and the reference point values), when available, through Section action. See *Section 2.5* for additional information.

Catch and Landings Information
The need for accurate and timely reporting of all catch and landings is imperative for successful monitoring of the fishery and the total allowable catch. Accordingly, all states are required to implement weekly reporting of all daily sales at first point of contact (i.e., dealers, including harvester direct sales to the consumer, i.e., "peddlers"). See *Section 3.1.1* for additional information.

Recreational Fisheries Management Measures No recreational fisheries management measures are included in this amendment.

Commercial Fisheries Management Measures
Amendment 3 management measures are detailed in *Section 4.0*; key measures are summarized below:
Annual fishery specifications – The Section will meet annually during a public meeting to set a hard total allowable catch (TAC), and specify any of the following management measures for the upcoming fishing season through Section action: fishing season, measures for projected season closure, trip limits, trap limits, days out of the fishery, and research set-aside.

TAC Allocation – The coastwide TAC as specified in Section 4.1.1 will be allocated by state with 80% allocated to Maine, 10% allocated to New Hampshire and 10% allocated to Massachusetts. For states with historical trawl and trap fisheries, the state's annual allocation will be divided 87% to the trawl fishery and 13% to the trap fishery.

Quota Reconciliation and Rollovers – At the end of each fishing season, any quota underages by one or more states will be pooled allocated to states with overages to help reconcile any quota overages. Alternatively, the Section has the discretion to roll over any unused quota from the states of New Hampshire and Massachusetts to the Maine quota by a date determined during annual specifications.

Fishing season and projected season closure - The Section may establish a fishing season to occur anytime between December 1 and May 31, and may close the fishery at any time at a public meeting or conference call. The Section has the ability to set a closed season annually up to 366 days (i.e., impose a moratorium). Additionally, the fishery will close when a percentage of the coastwide TAC is projected to have been caught (ranging between 80-95%).

Size sorting grates - It shall be unlawful for any vessel rigged for otter trawling to fish for, land, or have in possession, northern shrimp except by using trawls equipped with either a compound grate or a double-Nordmore grate as described in *Section 4.1.12*.

Mandatory Elements of State Program
States in the management unit must implement the regulations for northern shrimp consistent with the requirements of *Section 4.0*; except a state may propose an alternative management program under *Section 4.4*. See *Section 5.0* for additional information.

Compliance Schedule
Each state must submit an annual compliance report no later than September 30.

Implementation Schedule
States are required to implement the provisions of Amendment 3 by the first day of the next approved fishing season, not including research set-aside fisheries under a moratorium.

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1.0 INTRODUCTION

The Atlantic States Marine Fisheries Commission (ASMFC or Commission), through the coastal states of Maine, New Hampshire, and Massachusetts, is responsible for managing northern shrimp (*Pandalus borealis*) in the Gulf of Maine in state waters (0-3 miles from shore) under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). Management authority in the Exclusive Economic Zone (EEZ, 3-200 miles from shore) lies with the Secretary of Commerce through ACFCMA in the absence of a Federal fishery management plan.

This Amendment consolidates prior amendments (and associated addenda) and recent management decisions into a single document; it is now the comprehensive document for northern shrimp management in state waters of the U.S. Atlantic coast.

1.1 BACKGROUND INFORMATION

1.1.1 Statement of the Problem

Prior to this Amendment, the Gulf of Maine northern shrimp fishery was managed under Amendment 2 (2011) and Addendum I (2012). Amendment 2 implemented a more timely reporting system and expanded the tools available to manage northern shrimp including trip limits, trap limits, and days out of the fishery (i.e., days where it is unlawful to land shrimp). Addendum I refined the annual specifications process and implemented gear-specific total allowable catch (TAC) allocations. However, the northern shrimp fishery and population has experienced significant changes since the implementation of these management documents.

Beginning with the 2014 season, the Northern Shrimp Section (Section) imposed a moratorium on the fishery. The Section considered several factors prior to closing the fishery. Results of the 2013 stock status report indicated that abundance and recruitment indices in the western Gulf of Maine had declined steadily since 2006, and 2012 and 2013 were the lowest on record. Furthermore, long term trends in environmental conditions have not been favorable for northern shrimp survival in the Gulf of Maine amplifying the need to conserve spawning stock biomass. Results of each subsequent stock status report have indicated continued poor trends in biomass, recruitment, and environmental indices which prompted the Section to extend the moratorium each year through 2017. Although short-term prospects for a commercial fishery remain poor, there was a slight improvement in recruitment observed in 2016, although still below average.

Additionally, as an open access fishery, participation is impacted by market demand, season length, and displaced harvesters from other fisheries. For example, substantial changes in other Northeast fisheries (e.g., limited entry and effort restrictions in the Gulf of Maine groundfish fisheries) have resulted in increased effort in the northern shrimp fishery. Also, early season closures occurred in the 2010 and 2011 fishing seasons due to untimely reporting and an overharvest of the target total allowable catch (TAC). Given shrimp biomass has decreased, there are concerns the capacity of the fleet vastly exceeds the resources potential to sustain a viable fishery.

The potential for increased fishing pressure, coupled with failed recruitment, the lowest abundance indices on record, and unfavorable environmental conditions have resulted in uncertainties in the future status of the northern shrimp resource. To address these uncertainties, an amendment to the FMP was initiated to implement measures to control effort and protect the spawning stock.

1.1.2 Benefits of Implementation

Amendment 3 is designed to maintain an efficient management structure that is flexible and encourages public involvement in the management process. It provides mechanisms to improve the Section's ability to effectively assess the status of the resource, and to predict its responses to both changes in environmental conditions and to various management actions.

Specifically, Amendment 3 refines the FMP objectives and provides the flexibility to use the best available information to define the status of the stock and set a hard TAC. The Amendment also implements a state-specific allocation program, accountability measures, and quota rollover provisions to better manage effort in the fishery. Furthermore, the Amendment strengthens catch and landings reporting requirements to ensure all harvested shrimp are being reported, and requires shrimp-directed trawl vessels to use either a double-Nordmore or compound grate system – both designed to minimize the catch of small, presumably male, shrimp. Other changes include specification of a maximum fishing season length, and formalizing fishery-dependent monitoring requirements.

1.1.3 Ecological Benefits

Northern shrimp is an important link in marine food chains, preying on both planktonic and benthic invertebrates, and are in turn consumed by many commercially important fish species, such as cod, redfish, and silver and white hake. Therefore, maintaining a healthy northern shrimp population will contribute to the Gulf of Maine ecosystem. Shrimp will continue to play a role in controlling the populations of its prey, while simultaneously providing fodder for carnivorous vertebrates throughout the Gulf. *Pandalus borealis* diet was well documented by Weinberg (1981). Many species prey on *P. borealis* as a component of their diet (Shumway et al. 1985; Worm and Myers 2003; Savenkoff et al. 2006). Over many years, Wigley, Langton and Bowman from NOAA Fisheries have conducted many predator-prey studies showing the importance of *P. borealis* in the food web of the Gulf of Maine. The consideration of additional regulatory measures, such as regional-based TAC allocations to minimize the potential of exceed the annual TAC coupled with timely reporting procedures, or minimizing the harvest of smaller shrimp through mandatory use of size-sorting grate systems (i.e., double-Nordmore or compound), may improve the population of northern shrimp.

1.2 DESCRIPTION OF THE RESOURCE

1.2.1 Northern Shrimp Life History

The biology of the genetically distinct northern shrimp population (Jorde et al. 2014) in the Gulf of Maine has been studied extensively (Apollonio and Dunton 1969; Apollonio et al. 1986; Haynes and Wigley 1969), and reviewed by Shumway et al. (1985) and Bergström (2000). The species are protandrous hermaphrodites, maturing first as male and then transitioning to female. Ocean temperature has an important influence on northern shrimp in the Gulf of Maine (Apollonio et al. 1986; Richards et al. 1996; Richards et al. 2012).

1.2.1.1 Age and Growth

There is considerable information on growth of the Gulf of Maine northern shrimp stocks (Haynes and Wigley 1969; Apollonio et al. 1986; Terceiro and Idoine 1990; and Fournier at al. 1991). Differences in size at age by area and season can be ascribed to temperature effects, with more rapid growth rates at higher temperatures (Apollonio et al. 1986). Differences in size at age from year to year, and in size at sex transition, have been attributed to both environmental and stock density effects (Koeller et al. 2000, Koeller et al. 2007).

1.2.1.2 Stock Structure, Spawning and Reproduction

The species develop first as males at roughly 2½ years of age and then pass through a series of transitional stages to mature into females at roughly 3½ years of age (Figure 1). Northern shrimp spawn in offshore waters beginning in late July. By early fall, most adult females extrude their eggs onto the abdomen. Egg bearing females move inshore in late autumn and winter, where the eggs hatch (Figure 2). Juveniles remain in coastal waters for a year or more before migrating to deeper offshore waters, where they mature as males. Some females may survive to repeat the spawning process in succeeding years, and may live to be five or perhaps six years old.

Recruitment of northern shrimp is related to both spawning biomass and ocean temperatures, with higher spawning biomass and colder temperatures producing stronger recruitment. Experiments have shown that increased water temperatures, such as the Gulf of Maine is experiencing (Figure 7), can negatively affect the incubation of eggs in ovigerous females resulting in poor egg survival, embryonic development and larval hatching (Brillon et al. 2005).

1.2.1.3 Mortality

Instantaneous natural mortality (M) for this stock has been estimated at 0.25 based on regressions of instantaneous total mortality (Z) estimate from research vessel surveys for 1968-1972 on total effort (Rinaldo 1981). The estimates of Z for 1978 (when the fishery was closed) from the State of Maine survey data was 0.17 (Clark 1982). Therefore it appears that M is low in the Gulf of Maine relative to other northern shrimp stocks, which have been estimated at a range from 0.25-1.0 (Shumway et al 1985). The 45th Northeast Regional Stock Assessment Review Committee suggested that an M at 0.6 was likely more realistic for this population (NEFSC 2007a and 2007b). Additionally, Link and Idoine (2009) have suggested that natural mortality in the Gulf of Maine may be higher than 0.25, based on fish predation data, and more research on this topic is needed. However, while higher values of M are considered more realistic, using a higher constant value for M does not generally alter conclusions about stock status because the increased M scales the entire assessment (ASMFC 2016).

1.2.2 Stock Assessment Summary

The first analytical assessment was completed in 1997 and peer-reviewed at the 25th Northeast Regional Stock Assessment Workshop (NEFSC 1997). In addition to previously used traditional methods of assessing the stock (i.e., landings data, commercial effort and CPUE estimates, indices of abundance, etc.) quantitative tools like the Collie-Sissenwine, or Catch-Survey Analysis (CSA), the ASPIC surplus production, and yield per recruit and eggs per recruit models were introduced and continued to be used to provide guidance for management of the stock.

A benchmark assessment review in 2014 revealed issues with model performance in recent years for the Gulf of Maine northern shrimp (NEFSC 2014). The problems were thought to be due primarily to recent extreme fluctuations in abundance. No models were accepted for use in shrimp assessment and management. The current assessment therefore uses an index-based approach to evaluate the condition of the stock. A benchmark assessment which will explore alternative modeling approaches is expected to be peer-reviewed in 2018.

Since the implementation of Amendment 1 in 2004, stock status for northern shrimp in the Gulf of Maine has been determined via comparison of terminal year estimates of fishing mortality (F) and biomass (B) to F and B-based reference points (i.e., biological reference points, or BRPs). The BRPs defined in Amendment 2 (2011) were developed via the CSA assessment model (Cadrin et al 1999), which was peer-reviewed and accepted for management use in 2007, but was not approved for management use following the 2014 benchmark assessment. Amendment 2 continues to define the BRPs (and values) used to determine stock status for northern shrimp in the Gulf of Maine. However, the northern shrimp stock assessment undergoes a formal scientific peer-review process (i.e., a benchmark) about every five years which may result in revised or different stock status determination criteria.

1.2.2.1 Fishery-Independent Data

Trends in abundance and recruitment, among other stock assessment variables (e.g., early life stage survival) have been monitored using various fishery independent surveys conducted in the Gulf of Maine including the Northeast Fisheries Science Center (NEFSC) autumn bottom trawl survey (since the late 1960’s); the Maine-New Hampshire annual spring inshore trawl survey which has been collecting data in depths greater than 55 fathoms (100 m) since 2003 and have been used in shrimp assessment since 2008; the summer surveys conducted by the State of Maine (discontinued in 1983), and the state-federal summer shrimp survey initiated by the NSTC in 1984 to specifically assess the shrimp resource in the western Gulf of Maine. The state-federal survey is coordinated by the NEFSC and conducted each summer aboard the *R/V Gloria Michelle*. The survey employs a stratified random sampling design and uses gear specifically designed for Gulf of Maine conditions. This survey is considered to provide the most reliable information available on abundance, distribution, population age structure, and other biological parameters of the Gulf of Maine northern shrimp resource (Table 3 and Figure 3).

1.2.3 Present Condition of the Stock

Since no models were accepted for management from the 2014 benchmark assessment, the NSTC currently utilizes an index-based Strict Traffic Light Approach (STLA), developed by Caddy (1999*a*, 1999*b*, 2004) and extended by McDonough and Rickabaugh (2014), to annually assess stock status of Gulf of Maine northern shrimp (ASMFC 2016). The approach categorizes annual values of each index as one of three colors (red, yellow, or green) to illustrate the state of the population, environmental conditions, and fishery. The greater the proportion of green or red in each stacked bar, the further that year's index is in a favorable or unfavorable direction, respectively.

The NSTC has used the STLA to characterize a suite of fishery independent indices including total abundance and biomass estimated from the ASMFC summer shrimp and NEFSC fall surveys, and harvestable biomass, spawning stock biomass, recruitment, and early life survival estimated from the state-federal summer shrimp survey; fishery dependent indices include commercial catch per unit effort (CPUE), price per pound, and annual landings value (price per pound and annual landings values were standardized to 2016 US dollars; www.bls.gov). Environmental indices include predation pressure on Gulf of Maine northern shrimp that was developed for the benchmark assessment (NEFSC 2014; Richards and Jacobson 2016), and several sources of temperature data for the northern shrimp resource area. Trends have been characterized from 1984 to present (Figure 4).

The NSTC also examined a subset of key indicators using the Fuzzy Traffic Light Approach (FTLA; McDonough and Rickabaugh 2014). The FTLA gives a finer view of the classification of each indicator in each year. The NSTC evaluates total biomass, recruit abundance, spawning biomass, harvestable biomass, commercial fishery CPUE, early life survival, predation pressure index, spring sea surface temperature at Boothbay Harbor, Maine, the spring bottom temperature anomaly from NEFSC surveys in shrimp resource areas, and the summer bottom temperature from the state-federal summer shrimp survey (Figure 5 and Figure 6).

Two qualitative stock status reference levels were developed for the traffic light approaches: 1) based on the 'stable period' mean (SPM, 1985-1994), which was the time period used to define the reference points in Amendment 2, and 2) the qualitative status indicator based on the entire time series of observations (i.e., a percentile-based reference level) (ASMFC 16). The 20th percentile of the time series (1984-2016) was considered to delineate an extremely adverse state. For fishery dependent and fishery independent indices, red denotes values at or below the 20th percentile, while green denotes values at or above the SPM. For environmental indices, red denotes values at or above the 80th percentile and green denotes values at or below the SPM. These reference levels are not management triggers, as they are not defined in the ASMFC Northern Shrimp FMP. The levels are used to illustrate the current condition of the stock relative to earlier time periods.

Taken together, the STLA and FTLA indicators demonstrate that the Gulf of Maine northern shrimp stock status continues to be critically poor. Recruitment indices (catch per tow in numbers of 1.5-year old shrimp) for the 2010-2015 year classes are poor and include the three smallest year classes on record. As a result, total biomass, spawning biomass and harvestable biomass have remained at unprecedented lows for five consecutive years. The survival index for the 2015 year class was very high suggesting that an unusually high proportion of the eggs produced in 2015 survived to age 1.5; however recruitment of that year class was weak. The recruitment index increased in 2016 but is still well below the stable period mean (13th lowest value on record).

Trends in the four environmental indicators suggest that conditions have not been favorable for northern shrimp in recent years (Figure 4 and 6). Predation pressure has generally increased since the late 1990s. Sea surface and bottom temperatures were colder in 2015 than in recent years, however an overall rise in temperature since the stable period is evident (Figure 7).

Current harvestable biomass is almost entirely composed of the 2013 year class (ASMFC 2016). Higher survival of the 2013 year class may have reflected reduced fishing effort on the spawning stock. Although the stock remains in critically poor condition, the protection of the 2013 year class and the small increase in recruitment in 2016 could provide a foundation for stock recovery if these year classes survive to spawn successfully. Recruits from the 2015 and 2016 year classes are not expected to reach exploitable size until 2018 and 2019, respectively.

Accepted definitions of stock collapse include a population at 10% of un-fished biomass (Worm et al. 2009) or at 20% of B_{MSY} (Pinsky et al. 2011). Using summer survey biomass indices and the 1984-1993 “stable period” survey mean as a highly conservative proxy for un-fished biomass, the Gulf of Maine northern shrimp stock was considered collapsed during 2012-2015, but was slightly above this threshold in 2016. Using the stable period mean as a proxy for B_{MSY} instead, the stock remained in a collapsed state in 2016.

1.2.3.1 *Peer Review Panel Results from the 58^th SAW*

The northern shrimp stock assessment was peer-reviewed at the 58^th Northeast Regional Stock Assessment Workshop (58^th SAW) in January 2014, and included data through the 2013 summer survey. The SARC reviewed seven terms of references (TOR) for the Northern Shrimp stock assessment processes:

1. Present the Gulf of Maine northern shrimp landings, discards, effort, and fishery-independent data used in the assessment. Characterize the precision and accuracy of the data and justify inclusion or elimination of data sources.
2. Estimate population parameters (fishing mortality, biomass, and abundance) using assessment models. Evaluate model performance and stability through sensitivity analyses and retrospective analysis, including alternative natural mortality (M) scenarios. Include consideration of environmental effects where possible. Discuss the effects of data strengths and weaknesses on model results and performance.
3. Update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY}, SSB_{MSY}, F_{MSY}, or MSY). Evaluate stock status based on BRPs.

4. Characterize uncertainty of model estimates of fishing mortality, biomass and recruitment, and biological reference points.
5. Review the methods used to calculate the annual target catch and characterize uncertainty of target catch estimates.
6. Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made before the next benchmark assessment.
7. Based on the biology of species, and potential scientific advances, comment on the appropriate timing of the next benchmark assessment and intermediate updates.

Resulting in the Panel drafting the following conclusion (NEFSC 2014):

The SARC58 peer review panel concluded that the northern shrimp stock assessment models presented to them were not acceptable to serve as a basis for fishery management advice. Specifically, the SARC58 concluded that shrimp assessment Terms of Reference #2, #3, #4, and #5 were not met. These particular sections are included in this report to document the analyses that were done for the peer review, but they are not recommended by SARC58 as a basis for management."

1.3 DESCRIPTION OF THE FISHERY

1.3.1 Commercial Fishery

Northern shrimp occur in boreal and sub-arctic waters throughout the North Atlantic and North Pacific, where they support important commercial fisheries. In the western North Atlantic, commercial concentrations occur off Greenland, Labrador, and Newfoundland, in the Gulf of St. Lawrence, and on the Scotian Shelf. The Gulf of Maine marks the southernmost extent of its Atlantic range. Primary concentrations occur in the western Gulf where bottom temperatures are coldest. In summer, adults are most common at depths of 90-120 meters (Haynes and Wigley, 1969).

The fishery has been seasonal in nature, peaking in late winter when egg-bearing females move into inshore waters and terminating in spring under a regulatory closure. Table 1 identifies the season length and regulations for the northern shrimp fishery since 1973. Northern shrimp has been an accessible and important resource to fishermen working inshore areas in smaller vessels who otherwise have few options due to seasonal changes in availability of groundfish, lobsters and other species.

The fishery formally began in 1938, and during the 1940s and 1950s almost all of the landings were by Maine vessels from Portland and smaller Maine ports further east. This was an inshore winter fishery, directed towards egg-bearing females in inshore waters (Scattergood 1952). Landings reached a peak of 255 tons in 1945, but then declined into the 1950s and during 1954-1957 no commercial landings of shrimp were recorded (Apollonio et al. 1986).

In the late 1950s, the fishery began to recover due to the efforts of commercial interests in Portland, Maine, and presumably to improving resource conditions. Landings (Table 2) increased to a peak of 12,800 tons in 1969, of which 11,000 tons were taken by Maine vessels. New Hampshire vessels entered the fishery in 1966, but throughout the 1960s and 1970s New Hampshire landings were less than 100 mt. Landings by Massachusetts vessels were insignificant until 1969, but in the early 1970s the fishery developed rapidly, with landings increasing from 14% of the total catch to about 40% in 1973-1975. In contrast to the historical wintertime Maine fishery, these vessels fished continually throughout the year and made significant catches during summer months. Total landings averaged 11,000 tons from 1970-1972 and then declined rapidly until 1977 when only 400 tons were landed. The fishery was closed from mid-May of 1977 to February 1979.

Between 1980 and 1998, landings and effort recovered, and then fluctuated considerably in response to recruitment from several strong year classes, varying from 2,300 tons in 1993 to 9,500 tons in 1996. In keeping with historic trends, the majority of the catch in those years had been taken by Maine vessels (76%), with Massachusetts vessels accounting for most of the remainder (17%). Numbers of participating vessels fluctuated considerably, switching to shrimp trawling if the season's length, shrimp's price and accessibility warranted the effort. After 1998, landings declined, reaching a low of 400 tons in 2002, due to stock declines and management actions (shorter fishing seasons). Landings then increased steadily, peaking at 6,400 tons in 2011. Maine boats landed 87%, Massachusetts 3% and New Hampshire 10% of this total. Eighty-five percent of Maine's landings occurred between Portland and Rockland (inclusive). After 2011, landings declined and the fishery was closed after the 2013 season and has not reopened, except for small research fisheries in 2015-2017.

Size composition collected from catches since the early 1980s indicate that trends in landings have been determined primarily by recruitment of strong year classes. According to indices from the annual state-federal summer shrimp survey, strong year classes include those assumed to have been hatched in 1982, 1987, 1992, 2001, and 2004, which all exhibited 750 or more shrimp per survey tow (Table 3). Conversely, the indices for the presumed 1983, 2000, 2002, 2011, 2012, and 2014 year classes were low, fewer than 20 shrimp per tow. In addition, below-average indices for the 2010, 2013, and 2015 year classes have contributed to the recent, unprecedented six years (2010-2015) of below-average recruitment for the Gulf of Maine shrimp stock.

A wide variety of vessels have been used in the fishery (Bruce 1971; Wigley 1973). The predominant type during the 1960s and 1970s appears to have been side-rigged trawlers in the 14-23 m range. During the 1980s and 1990s, side trawlers either re-rigged to stern trawling, or retired from the fleet. Recently, the shrimp fleet was comprised of lobster vessels in the 9-14 m range that seasonally rig for shrimp fishing, small to mid-sized stern trawlers in the 12-17 m range, and larger trawlers primarily in the 17-24 m range. Otter trawl remains the primary gear employed and is typically chain or roller-rigged, depending on area and bottom fished. There has been a trend in recent years towards the use of heavier, larger roller and/or rockhopper gear. These innovations, in concert with substantial improvements in electronic equipment, have allowed for much more accurate positioning and towing in formerly unfishable grounds, thus greatly increasing the fishing power of the Gulf of Maine fleet.

A shrimp pot fishery has existed in mid-coastal Maine since the 1970s, where in many areas bottom topography provides favorable shrimp habitat that might be too rough or restricted for trawling. The trapped product is of good quality, as the traps target only female shrimp once they have migrated inshore. Maine trappers land fewer small shrimp, and generally are more apt to catch females after egg hatch, than trawlers (ASMFC 2010). As the trap fishery is dependent on the availability of shrimp in a specific area, there is a shorter season for traps than for trawlers. The majority of the shrimp trappers also catch lobster, so shrimp is a supplemental portion of their annual production and income. Maine trapping operations accounted for 4% to 8% of the state's trips from 1987 to 1994 (ASMFC 2000). There is some indication that trap fishing for shrimp has grown in areas such as South Bristol and Boothbay Harbor (mid-coast Maine). According to federal and state of Maine Vessel Trip Reports (VTRs), trappers averaged 12% of Maine's landings during 2001 to 2007, 18% during 2008 to 2011, 9% in 2012, and 6% in 2013. Trapping effort had been increasing in recent years, accounting for 22% of Maine's landings in 2010, but may have been lower relative to trawling in 2011 (17%) and 2012 (9%) because of the early closure of the seasons (ASMFC 2013).

Currently, the Section implements a combination of effort controls including trip limits, trap limits, and days out of the fishery to manage the commercial fishery. The FMP also allows for a research set-aside program (RSA), mandatory reporting requirements integrated through the coastwide Atlantic Coastal Cooperative Statistics Program's (ACCSP) Standard Atlantic Fisheries Information System (SAFIS), and allocation of the total allowable catch (TAC) by gear type with 87% allocated to the trawl fishery and 13% to the trap fishery.

1.3.2 Recreational Fishery

A very limited recreational fishery exists for northern shrimp. This fishery, using traps, has been for personal use and has not been licensed.

1.3.3 Subsistence Fishing

No significant subsistence fisheries for northern shrimp have been identified at this time; however, fishermen reportedly harvest 10 or 20 pounds of shrimp for personal consumption or non-sale distribution on a regular basis.

1.3.4 Non-Consumptive Factors

Some Gulf of Maine shrimp processors have been composting shrimp waste for use as garden fertilizer. There has also been experimentation in Canada with extracting chitin from shrimp for medical purposes, and in Norway with extracting carotenoids for salmon feed (Spencer Fuller, personal communication)

1.3.5 Interactions with Other Fisheries, Species, or Users

1.3.5.1 Other Species

Northern shrimp is an important link in marine food chains, preying on both plankton and benthic invertebrates and, in turn, being consumed by many commercially important fish species, such as cod, redfish, dogfish, and silver and white hake. *P. borealis* diet was well documented by Weinberg (1981). Species that include *P. borealis* in their diet are documented by many authors (Shumway et al. 1985; Worm and Myers 2003; Savenkoff et al. 2006; Link and Idoine 2009; Richards and Jacobson 2016).

1.3.5.2 Other Fisheries

In recent history, the northern shrimp fishery has been prosecuted in the winter months from December through May at a time when many other fishing activities in the Gulf of Maine are marginal or out of season.

Dunham and Mueller (1976) note that in response to shrimp harvest restrictions such as a closed season, most respondents indicated that they would fish for other species. Additionally, most would fish for species they typically target at other times of the year. These included lobster, scallop, or groundfish (mostly redfish, cod, and whiting). During the period this study took place, shrimp stock levels were extremely low, ultimately leading to the closure of the fishery in April 1977. Harvesters responded by spending more time prosecuting fisheries that they had historically participated in. This is indicated by notable increases in the landings for whiting and squid during the period.

Similarly, most shrimp harvesters today fish for other species during the year. However, the ability to switch between fisheries has decreased since the implementation of limited entry and effort restrictions in the northeast multispecies (groundfish) fishery, and Maine's lobster and scallop fisheries.

From a processor's standpoint, plants may switch between shrimp and lobster over the course of a year. However, the facilities and skills of the workers are specialized for the two species so switching can be expensive. Shrimp is highly perishable and proper handling is a requisite for a quality product.

The potential for interaction between mobile gear and fixed gear does exist. If the shrimp fishery begins in December or early January, coastal lobster harvesters have to remove their gear at the end of their season before the mobile gear vessels begin trawling for shrimp. In January through April, the fixed gear (traps) shrimp harvesters must be careful to avoid bottom where trawling gear is fished. Trap harvesters often set in and around hard bottom coves and holes where mobile gear can't reach. During the experimental shrimp fisheries in 2015 and 2016, participants reported an increase in the abundance of lobster gear in traditional shrimp trawl areas, as the lobster industry took advantage of the shrimp fishing moratorium to expand their winter range.

1.4 HABITAT CONSIDERATIONS

1.4.1 Habitat Important to the Stocks

1.4.1.1 *Description of the Habitat*

Northern shrimp has a discontinuous distribution throughout the North Atlantic, North Pacific, and Arctic Oceans. The Gulf of Maine marks the southern extent of this species' range. Water temperature, depth, and sediment type have all been cited as important factors governing shrimp distribution in the Gulf of Maine (Haynes and Wigley 1969; Apollonio et al. 1986; Clark et al. 1999).

1.4.1.1.1 Temperature

The most common temperature range for this species is 0-5˚C (Shumway et al. 1985), but adult northern shrimp have been reported to live in waters from 1.6˚C (Gorbunow 1934; Ingraham 1981) up to around 12˚C (Bjork 1913; Allen 1959), and larvae can tolerate temperatures up to at least 14˚C (Poulson 1946). During the spring, fall, and especially summer months, adult shrimp are most abundant in cold 4-6˚C waters found mainly in the deeper basins (90-180 m) in the southwestern Gulf of Maine (Haynes and Wigley 1969, Apollonio et al. 1986, Clark et al. 2000). Seasonal water temperatures in many areas of the Gulf of Maine regularly exceed the upper physiological limit for northern shrimp. In particular, available habitat is limited to the western region of the Gulf (west of 68˚W) where bottom topography and oceanographic conditions create submarine basins protected via thermal stratification from seasonal warming. In northeastern regions of the Gulf of Maine, bottom waters are not protected from seasonal warming due to continual mixing from intense tidal currents nearer the Bay of Fundy, and large shrimp populations do not persist.

Apollonio et al. (1986) suggest that the northern shrimp resource is expected to be unstable because it is at the southernmost extent of its Atlantic range and is susceptible to environmental influences. Dow (1977) found that abundance is higher with lower sea surface temperatures, and this relationship has since been corroborated by other authors, including Richards et al. (1996). While the manner by which temperature affects recruitment and abundance has not been precisely determined, record high sea surface temperatures during the early 1950s correlate with complete failure of the fishery from 1954-1957 (Clark et al. 2000). Conversely, the cold temperature years of the early to mid-1960s appear to have been very favorable for recruitment, with rapid increases in abundance and record landings from 1969-1972 (Clark et al. 2000). Determining the reason for collapse of the fishery during the 1970s is more problematic as it occurred during a period of warming temperatures combined with high and increasing levels of fishing mortality rate (Clark et al. 2000). In this case, overfishing has been strongly implicated for the collapse, but both factors were likely influential. During the next two decades, significant recruitment events have coincided with normal to below normal spring sea surface temperature anomalies. This stock appears to be one of the few for which previous relationships between environmental influences and abundance trends remained statistically significant when reexamined (Myers 1998). Richards et al. (2012) found an inverse relationship between temperature and recruitment between 1968 and 2011. Recruitment variability increased after 1999, coincident with a shift to a warmer temperature regime. Reproductive output (i.e. spawner biomass) and recruitment were positively correlated over the entire time series, but not related during the most recent and warmer period of 1999-2011.

1.4.1.1.2 Salinity

Northern shrimp have a narrow salinity tolerance (stenohaline) and are restricted to water with moderately high salinities (Allen 1959). Their occurrence has been noted in waters with salinities ranging from a low of 23.4 up to 35.7 (Shumway et al. 1985). Given that average salinity values in the Gulf of Maine are within this range and well above the minimum (e.g., see 2001-2008 data in Deese-Riordan 2009), salinity is not likely to be a limiting factor in the distribution of the species.

1.4.1.1.3 Depth

Northern shrimp are found throughout the range of water depths occurring in the Gulf of Maine, from about 10 meters to over 300 meters (Haynes and Wigley 1969). For most of the year, juveniles and immature males occupy shallower, inshore waters and mature males and females occupy cooler, deeper offshore waters (Apollonio and Dunton 1969; Haynes and Wigley 1969, Apollonio et al. 1986). However, northern shrimp, particularly the females, undertake seasonal migrations related to temperature and their reproductive cycles.

In addition to age and seasonally correlated horizontal migrations, northern shrimp exhibit diel vertical migration in the water column. There is strong evidence that northern shrimp leave the bottom at night and distribute themselves throughout the water column, presumably to feed (Wollebaek 1903; Hjort and Ruud 1938; Barr 1970). Gut contents have been shown to include planktonic crustaceans (Horsted and Smidt 1956). In thermally stratified waters, northern shrimp will migrate up to, but not penetrate the thermocline (Apollonio and Dunton 1969). After spending the night dispersed in the water column, shrimp return to the bottom around dawn where they feed on a wide variety of soft bottom benthic invertebrates (Wienberg 1981).

1.4.1.1.4 Substrate

The winter fishery for northern shrimp extends as far south as the outer arm of Cape Cod and as far north as Jonesport, Maine (D. Schick, personal communication). Figure 8 shows the locations of these basins, mud vs. gravel and bedrock habitats, and average bottom temperatures.

Within its preferred temperature range, northern shrimp most commonly inhabit organic-rich, mud bottoms or near-bottom waters (Wollebaek 1908; Hjort and Rund 1938; Horsted and Smidt 1956; Warren and Sheldon 1968, Haynes and Wigley 1969, Clark et al. 1999). Examples include Cashes Basin, Scantum Basin (D. Schick, personal communication), and the region southeast of Mount Desert Island, Maine (Haynes and Wigley 1969). Anecdotal evidence also suggests there is small populations in deep, cold water pockets in Penobscot Bay (D. Schick, personal communication) and in the Sheepscot River (L. Watling, personal communication).

During the winter and spring, when nearshore and offshore surface waters have cooled to the temperature range of shrimp, the amount of habitat available to adult shrimp increases.

Bigelow and Schroeder (1939) and Wigley (1960) found a direct correlation between shrimp abundance and sediment organic matter content, while Apollonio et al. (1986) argue that temperature, not benthic habitat type, is the most important factor driving the distributional patterns of shrimp.

However, shrimp is not limited to fine sediment substrate and have been observed on rocky substrates (Berkeley 1930; Balsiger 1981). Shrimp are also often associated with biotic or abiotic structures such as cerianthid anemone tubes (Langton and Uzmann 1989) and occasional boulders (D. Schick, personal communication).

1.4.1.1.5 Spawning Habitat

Northern shrimp populations in the Gulf of Maine comprise a single stock (Clark and Anthony 1981) that spawns in offshore waters beginning in late summer (Haynes and Wigley 1969). The precise locations of spawning grounds are not well documented, but it is reasonable to conclude that spawning occurs in offshore summer population centers in deep mud basins in the southwestern Gulf of Maine (Haynes and Wigley 1969; Apollonio et al. 1986). Ovigerous females remain in cold, stratified, bottom waters through the fall until nearshore waters have cooled at which time they begin an inshore migration to release their eggs (Haynes and Wigley 1969; Apollonio et al. 1986, Clark et al. 1999). Female shrimp are thus found in abundance in nearshore waters only during the late winter and spring when coastal waters are coldest (Clark et al. 1999). Inshore migration routes followed by the northern shrimp are not well known, but due to their well-established preference for organic-rich mud bottoms, it has been suggested that female shrimp probably move inshore over muddy substrates and are eventually concentrated in, but not limited to, mud-bottom channels nearshore (D. Schick, personal communication).

After their arrival in nearshore waters, the female shrimp's mature eggs begin to hatch. Hatching occurs as early as February and lasts through April (Haynes and Wigley 1969; Stickney and Perkins 1979), after which time female shrimp return to offshore waters in the western Gulf of Maine. The pelagic larvae are planktotrophic, feeding primarily on diatoms and zooplankton (Stickney 1980). A survey of larval shrimp distribution conducted by Apollonio and Dunton (1969) showed that larvae were abundant almost exclusively within 10 miles of shore. Little is known about the vertical distribution of larval shrimp within the water column. While in the plankton, northern shrimp pass through six larval stages (Berkeley 1930; Stickney and Perkins 1979) before completing a final metamorphosis to a juvenile stage and settling to the bottom in nearshore waters after about 30 to 60 days (Rinaldo 1981). The timing of egg release and larval development rate are temperature-related, with colder water temperatures resulting in slower development (Allen 1959). Thus, the timing of egg release and length of pelagic larval stages may vary from year to year as a result of temperature fluctuations (Koeller et al. 2009).

1.4.1.1.6 Eggs and Larval Habitat

Koeller et al. (2009) suggested that the winter inshore migration of egg-bearing females in the Gulf of Maine may be a behavioral adaptation to delay egg development and bring hatching time closer to the time of spring phytoplankton bloom. While studies of several shrimp populations support the association between spring bloom and shrimp hatching period, there is not a match in the Gulf of Maine stock. Richards et al. (2016) compared shrimp survey and environmental data to elucidate potential mechanisms behind the relationship between cooler temperatures and better northern shrimp recruitment. Rather than assuming time periods important to larval survival, they used a rolling window analysis to reveal environmental conditions (sea surface temperature and/or chlorophyll-a) associated with hatch timing. Chlorophyll-a was negatively correlated with survival during a period about 40 days before median hatch, and again around the time of juvenile settlement. It did not appear that phytoplankton biomass was a controlling factor on survival during the study time series. Hatch period preceded the spring bloom by about two months, aligning more closely (although correlations were not statistically significant) with the smaller winter phytoplankton bloom. Sea surface temperature was negatively correlated with survival during final embryo maturation/early larval stages, and approximately two months after juvenile settlement on the seabed, i.e., lower temperatures were related to higher survival. While the causal mechanism between lower temperature and higher survival remains unclear, knowing the sensitive period should aid further studies. The first sea surface temperature correlation occurs during the coldest time of year, and the authors speculate that northern shrimp metabolism may be optimized for these low temperatures. The other sea surface temperature correlation occurs when bottom temperatures are higher, and the difference between sea surface temperatures and bottom temperatures approaches the annual maxima. Thus, lower than typical temperatures during the late summer, when shrimp are metabolically stressed, may increase survival in those years.

1.4.1.1.7 Juvenile Habitat

Regardless of the mechanisms that influence hatch success, by late summer, nearly all newly metamorphosed juveniles have settled to the bottom in relatively shallow, near-shore areas usually within 10 miles of the coast (Apollonio and Dunton 1969). These immature shrimp remain inshore for up to 20 months as they grow and develop into mature males (Apollonio and Dunton 1969). Relatively little is known about the distribution and habitat requirements of this life history stage. After as little as a year, some juveniles begin to migrate offshore to deeper waters. Eventually, all juveniles will migrate offshore where they will complete their development into mature males around 29-30 months old (Apollonio and Dunton 1969; Haynes and Wigley 1969). Their migration routes and factors triggering migration to deep, offshore, muddy basins are not well known.

1.4.1.2 *Identification and Distribution of Habitat Areas of Particular Concern*

Nearshore waters (out to 10 miles)

Nearshore waters provide habitat for the larval and juvenile stages of northern shrimp. The survival of these early life-history stages is essential to the success of the species. Nearshore habitats are impacted by a myriad of anthropogenic activities including coastal development, pollutant run-off, harbor dredging, etc. The effects of these and other human activities on habitat quality for larval and juvenile northern shrimp are not known at this time.

Deep, muddy basins in the southern region of the Gulf of Maine
Deep, muddy basins in the southwestern Gulf of Maine act as cold water refuges for adult shrimp during periods when most water in the Gulf reaches temperatures that are lethal to this arctic/sub-arctic species. Fluctuations in the oceanographic conditions due to the North Atlantic Oscillation, climate change, or other natural factors may cause warm water to intrude into some of the deep basins in the southwestern Gulf rendering this habitat unsuitable for shrimp and possibly resulting extirpation of local populations.

In addition to naturally occurring environmental changes, bottom otter trawls used to harvest groundfish can impact deep, muddy bottom habitats. Relative to shrimp trawl gear, groundfish trawls are typically fished at higher speeds, have longer sweeps, and may use larger rollers or rockhoppers. The use of mobile fishing gear has been shown to reduce structural complexity of bottom habitats (Auster et al. 1996, NEFMC 2011, and studies referenced therein). Reducing habitat structural complexity could potentially reduce the survival of adult shrimp, which may use biotic and abiotic structures on mud bottoms to avoid predation. Simpson and Watling (2006) suggested that seasonal trawling with shrimp gear on mud bottoms at approximately 100 m depth produced at least short-term changes (<3 months) in macrofaunal community structure, but did not appear to result in long-term cumulative changes.

1.4.1.3 *Present Conditions of Habitats and Habitat Areas of Particular Concern*
Near-shore waters
Near-shore habitats are impacted by a myriad of anthropogenic activities including coastal development, pollutant run-off, harbor dredging, and others. Because detailed maps of inshore habitats occupied by larval and juvenile shrimp are not available, it is not possible to identify the condition of, or specific anthropogenic threats to, these habitats.

Deep, muddy basins
The effects of temperature on shrimp abundance have long been a subject of study, however, more information is required before it is possible to predict the effect of large-scale climatic events (e.g., the North Atlantic oscillation or climate change) on the amount of suitable habitat available to adult shrimp. While the effects of mobile fishing gear on bottom habitats have been a subject of study for over two decades; the long-term impacts of trawling on shrimp habitat in deep, muddy basins is not well understood.

1.4.1.4 *Ecosystem Considerations*
The Commission, NOAA Fisheries, and several Fishery Management Councils have been incorporating Ecosystem-Based Fisheries Management (EBFM) strategies into their fishery management programs. In general, EBFM strategies are adaptive management approaches that are specific to a geographic region, account for environmental influences and uncertainties, and strive to balance diverse ecological, social, and economic objectives.

By developing EBFM strategies, the Commission and its partner agencies are attempting to move beyond the traditional focus on single-species dynamics by considering environmental and human influences on fish populations and their sustainable harvest (e.g., multispecies interactions, climate change, and coastal development). EBFM strives to integrate ecological, social, and economic goals, and engage a diverse group of stakeholders to define problems and find solutions providing mutual benefit.

Although an EBFM strategy has not been developed for northern shrimp, its distribution throughout the Gulf of Maine and importance to the marine food web make it a good candidate for consideration (Link and Idoine 2009). Predator-prey interactions with several demersal finfish species (e.g., Atlantic cod, redfish) exist throughout the northern shrimp range (Worm and Myers 2003; Savenkoff et al. 2006). Given the data requirements necessary to incorporate multi-species interactions appropriately, it would be a challenge to use an EBFM strategy for northern shrimp. However, the Commission's Multispecies Technical Committee and Northern Shrimp Technical Committee continue to work on refining multi-species modeling approaches to be used in future assessments of managed species, including northern shrimp.

1.5 IMPACTS OF THE FISHERY MANAGEMENT PROGRAM

1.5.1 Biological and Environmental Impacts

Amendment 2 and Addendum I provided an extensive list of management tools for managers to regulate the species in a biologically sustainable manner. Despite the number of tools available for management, the fishery has been subject to emergency closures from high catch rates and low allocations, often leading to harvest overages. This is problematic as the fishery has been closed over the past several years due to deteriorating stock conditions exacerbated by warming waters and other environmental factors. If conditions improve and the fishery re-opens, Amendment 3 offers additional management tools to improve the Sections ability to control effort and harvest in the fishery while protecting small shrimp.

First, Amendment 3 refines the catch and landings reporting requirements to ensure that all shrimp caught are being reported in a timely manner. To address harvest overages, Amendment 3 allocates a hard TAC by state and implements payback provisions, or accountability measures, in the event that state exceeds its quota. The intent of this is to provide a fair system that allows access to and allocation of the resource that aligns with historical practices, and to provide an incentive for states to maintain harvest levels within the amount allocated and apply future reductions the following season to protect the stock if the TAC is exceeded. The Amendment provides additional tools in the form of quota rollovers and quota reconciliation to provide additional fishing opportunities within a fishing season or to minimize or eliminate any state-specific quota overages that may occur.

Amendment 3 also requires the use of a second Nordmore grate or comparable size sorting grate system installed in the gear. Currently, shrimp harvesters must use a single Nordmore grate, designed to reduce finfish bycatch. A second Nordmore grate, designed to allow for the release of small shrimp, is used on a voluntary basis, with some success. The draft amendment allows the Section to consider mandating a second Nordmore grate to protect small shrimp.

1.5.2 Social and Economic Impacts

The small ports where shrimp constituted a significant proportion of landings consider fishing an important feature of their economy. It contributes to the overall productivity and total capital flow even if it is not the dominant industry in the community. It is often community members of the small ports who emphasize the importance of maximizing the numbers of jobs rather than maximizing income for a few individuals when choices among regulations are being made. Each of these ports, though, also face gentrification and increased competition for waterfront use.

Both Gloucester and Portland are urban areas that have retained strong support for their fishing industry including working waterfront zoning and fisheries administrators with recognized roles in city government. By a variety of indices, Portland is classified as a primary port and “essential provider.” Gloucester ranks third (behind New Bedford and Portland) in fishing infrastructure differentiation, and low on the gentrification scale.

While the fishing industry in Portsmouth is dwarfed by the tourist industry, the city has retained a small, but complete infrastructure for the industry. When the season was open, shrimp was an essential component of the year’s fishing returns for individual vessels from Rye, Hampton and Portsmouth and for New Hampshire’s fishermen’s cooperative. Furthermore, vessels from Newburyport (Massachusetts) and York (Maine) were shrimp-landing members of the Yankee Fisherman’s Cooperatives, so the shrimp networks clearly extended beyond the borders of states and sub-regions in New England. In several of these small ports, the numbers of vessels capable of shrimp trawling, however, have been severely diminished by their inability to continue groundfish fishing. Where there were eight or nine vessels in the past, now one or two may remain active. With the increases in size and horsepower of lobster boats, there is potential untapped capacity.

The fishermen’s cooperatives lost markets for shrimp, rebuilt them when shrimp returned, only to lose them again when the shrimp season was shortened or closed. When there was an open shrimp season, Portland Fish Exchange held a special Northern shrimp auction. Even now, they provide a landing facility for the shrimp boats, advising them to land in the late afternoon, so the catch can be transported to the Fulton Market in New York by midnight and bought in the morning by those supplying the Asian restaurant markets.

The Northern shrimp fishery is not sufficiently homogeneous to accurately predict and describe the social and economic impacts of Amendment 3 regulations. What might be a minor inconvenience to one diversified multi-vessel owner could be a disaster to smaller single-vessel owner. Furthermore, the actual impacts of regulations are not felt in isolation but are experienced in the larger context of the regulatory and economic environment of each operator and are cumulative over time. While shorter seasons, trip limits and days-out restrictions limit fishing opportunities and landings, the impact of such measures on harvesters depends on what alternatives exist. Such alternatives are determined by the other permits held by the harvester but are also constrained by regulations, weather, and markets. However, if management is successful in ensuring a predictable and sustainable harvest, all sectors will have the opportunity to benefit over time.

Harvesters commonly point out that fishing in the Gulf of Maine has always been cyclical. A typical annual fishing season for harvesters in the smaller ports is to participate in lobster and groundfish fisheries in the spring, summer and fall, and then turn to shrimp fishing in winter (December-May). Additionally, as one of the last open access fisheries in the Gulf of Maine, the shrimp fishery allows harvesters to supplement their income as necessary. It is this ability to freely move in and out of the shrimp fishery in response to the relative availability of shrimp, other commercial species, market demand, the weather, and other factors that makes the shrimp fishery more valuable than the raw landings and income data may suggest. For some harvesters, even a limited shrimp harvest is sufficient to make the difference between financial stability and failure.

Those who formerly fished for shrimp and are still actively trawling for groundfish would most likely return to shrimp fishing if the fishery opened. However, lobster gear has moved into the traditional shrimp trawling grounds during the fishery moratorium and although there are far fewer trawlers than before (due largely to the changes in groundfish regulations), this poses a major challenge to returning to shrimp trawling. Previously, there were agreements among shrimp trawlers and lobster harvesters to keep these traditional grounds open for trawling, but there is less confidence now that those agreements would be honored.

Price depends on the size and quality of the shrimp. The Japanese market pays a premium for larger, raw, frozen-at-sea product often available from Canada, but Japanese dealers will also purchase from the Portland auction when medium to large size, firm shrimp is available. The value of the shrimp landings in Maine in 1998-99 hovered at \$0.96 per pound (Table 4), though in 1997 and 2000, the average price was estimated as \$0.81 and \$0.80 per pound, respectively. Average price per pound of shrimp for 2001 and 2002 was \$0.86 and \$1.07, respectively. Prices dropped precipitously in 2006, averaging \$0.37/lb. In 2009, the season ended with \$0.27/lb prices. However, prices began to recover in 2010 (\$0.54/lb) and 2011 (\$0.75). In 2012, in a shortened season, landings dropped down to 2185 metric tons and the price rose to \$0.95/lb. In 2013, landings were only 255.51 metric tons and the price average for the year was \$1.79. Without an open season, vessels fishing under the RSA program bring in small quantities of shrimp, and the prices can be extraordinarily high for some sales, ranging from \$7-\$10/lb. The Asian restaurant market in New York City creates high demand. The quantity of shrimp available also affects the market. For example, Canadian buyers need sufficient quantity to justify the expense of transporting the product. In 2000 harvesters received \$.65/lb at the dock (\$1.00 if they trucked it to the Portland auction) at the beginning of the season and \$1/lb at the end of the season (\$1.10-1.20 if trucked). Price is also affected by the size of the markets for northern shrimp.

Fluctuations in abundance, size, cost, and seasonal availability also pose significant marketing challenges to the industry. In fact, in 2009, 83% of trap gear respondents and 97% of trawl gear respondents noted that their efforts in shrimp fishing were limited by the market (Moffett & Wilson 2010). This implies that should the market improve (higher prices and quantities sold), additional effort would move into the shrimp fishery as was demonstrated in the 2010 and 2011 seasons when prices rose and participation and effort increased (ASMFC 2010, 2011).

The processing sector is highly vulnerable to variability in supply and unpredictability, whether due to the diminishment of the stock size or as an artifact of regulations. The costs of preparing the facility, engaging labor, and identifying markets is significant, so this sector is less able to reconfigure in the short-term than is the harvesting sector. When shrimp fishing was consistent, there were also a few small-scale processors and a variety of roadside vendors, particularly in Maine. As the short-to-no seasons continued, both the small-scale processors and vendors sold out and/or went out of business.

1.5.3 Other Resource Management Efforts

1.5.3.1 Artificial Reef Development/Management
There are currently no artificial reefs in place in the Gulf of Maine used by the northern shrimp fishery.

1.5.3.2 Bycatch
The Northern Shrimp Section made the fishery a zero bycatch fishery in 1993. The fishery remained a zero bycatch fishery until 2001, when a limited amount of silver hake was allowed as bycatch. Federal multispecies regulations allow for the incidental catch of longhorn sculpin, and combined silver and offshore hake, up to an amount equal to the weight of shrimp possessed onboard or landed, but not in excess of 3,500 lbs (1,588 kg). Those vessel that also have a Federal lobster permit may keep lobster consistent with Federal lobster possession limits in 50 CFR 697.17.

Bycatch reduction improved radically with the advent of the Nordmore grate in the late 1980s. Developed in Nordmore County, Norway, this device is a grating of parallel bars mounted in the extension with an escape hole in the net in front of the grate. Testing of the Nordmore grate system by the NOAA Fisheries-Northeast Region’s Fisheries Engineering Group during 1991 and 1992 proved the grate's effectiveness for the fish assemblage present in the Gulf of Maine. The results showed over 95% loss of finfish by weight and over 95% retention of shrimp (Kenney et al, 1992). The excellent escapement of finfish is seen across the length spectrum for flatfish, with a high percentage of even small flatfish escaping the net. The grate was implemented into the northern shrimp fishery for April and May 1992. Beginning in December 1992, the grate was required for the whole season.

As effective as the Nordmore grate is, an examination of male shrimp length frequency, around 15-20mm carapace length, reveals more shrimp of that size range retained by the cod ends behind the grates. The increased retention of these smaller shrimp is a concern because they are below the target size for shrimp of $\geq$22mm that the current minimum mesh size regulation controls. This indicates that the Nordmore grate may be affecting the mesh selection curve for shrimp in the cod end. Square mesh in the cod end may resolve shifts in selectivity produced by the Nordmore grate as many recent trials have indicated. Trials conducted in the Gulf of Maine by Maine Department of Marine Resources over several years have shown that square mesh of 1-5/8" produces a selectivity curve similar to 1-3/4" diamond mesh, but does release slightly more small shrimp.

A double-Nordmore grate system was tested for reducing the amount of small shrimp caught with the single Nordmore grate. The second grate aids in releasing small shrimp and small fish that the cod end mesh size selection doesn't do very effectively. The Northern Shrimp Section approved the double-Nordmore grate for use in the shrimp fishery in 1999. In 2007, He and Balzano (2007) tested a modification to the double grate system that used a size sorting grid and funnel system in front of the Nordmore grate to minimize the retention of small shrimp. The gear with the funnel increased mean size and reduced counts per pound in 13 of 14 paired 1-hr tows from mid-March and late June 2006. There have also been research trials with various combination grate systems that combine the functions of the two grates in the double grate system into one unit, a compound grate (Pinkham et al 2006).

Documentation of the bycatch/discard problem has occurred through a sea sampling program whereby samplers are placed aboard commercial vessels and all fish caught are recorded, whether they are landed or not. The percentage of bycatch in observed tows declined from almost 50% before the Nordmore grate was required, to about 15% afterward (Richards and Hendrickson, 2006). A more recent study by the Gulf of Maine Research Institute (GMRI) and NOAA at-sea observers documented bycatch in the northern shrimp fishery using a Nordmore grate. Eayrs et al. (2009) found only 2% of the total catch weight was bycatch of regulated species (n=243 hauls), and shrimp comprised greater than 92% of total catch by weight. This is a notable improvement considering that prior to the Nordmore grate bycatch comprised more than half of the total catch by weight (Howell and Langan 1992).

Information on the bycatch of protected species (e.g., marine mammals, sea turtles) can be found in *Section* 7.

1.5.4.3 Land/Seabed Use Permitting
There is no impact of land or seabed use permitting on the northern shrimp fishery.

1.6 LOCATION OF TECHNICAL DOCUMENTATION FOR FMP

1.6.1 Review of Resource Life History and Biological Relationships
Northern shrimp life history information was summarized by Apollonio and Dunton 1969, Haynes and Wigley 1969, Shumway et al. 1985, Apollonio *et al.* 1986, Clark et al. 2000, and Bergstrom 2000.

1.6.2 Stock Assessment Document

Detailed information pertaining to the northern shrimp stock assessment can be found in the 58th Northeast Regional Stock Assessment Workshop report (NEFSC 2014). Annual assessment updates have also been prepared. The 2016 Stock Status Report for Gulf of Maine Northern Shrimp is the most recent report of the ASMFC Northern Shrimp Technical Committee and can be found on the ASMFC website. It is anticipated that the next Benchmark Stock Assessment for Northern Shrimp will be peer-reviewed in 2018.

1.6.3 Social Assessment Documents

The most recent survey of Gulf of Maine northern shrimp harvesters was conducted and published in 2010 by Moffett and Wilson.

1.6.4 Economic Assessment Document

Apart from the information in the Moffett and Wilson (2010) report, no recent studies have been conducted to assess the economic characteristics of the northern shrimp fishery. The most recent information is included in the 1986 FMP (ASMFC 1986).

1.6.5 Law Enforcement Assessment Document

The Commission's Law Enforcement Committee has prepared a document entitled "Guidelines for Resource Managers on the Enforceability of Fishery Management Measures, Second Edition" (2015) which can be used to evaluate the effectiveness of future measures.

1.6.6 Habitat Background Document

The background for habitat of northern shrimp is compiled in *Section 1.4* of this amendment. You can also refer to the 2016 stock status report for Gulf of Maine northern shrimp (ASMFC 2016) for habitat and other environmental condition information.

2.0 GOALS AND OBJECTIVES

2.1 HISTORY AND PURPOSE OF THE PLAN

2.1.1 History of Prior Management Actions

The Northern Shrimp Section, consisting of representatives from Maine, New Hampshire and Massachusetts, is responsible for management based on input from the Northern Shrimp Technical Committee and industry Advisory Panel. This arrangement is one of the longest running instances of interstate cooperation in the history of fishery management in the United States.

In 1972, industry concerns over declining abundance and product quality led to exploration of options for cooperative management. Initial interest centered on curtailing harvest of small, non-marketable shrimp, which led to gear evaluation studies and implementation of a uniform stretched mesh size regulation of 44 mm (1.75 inches) in the body and cod end of the trawl.

The Technical Committee also conducted a series of stock assessments beginning in 1974, which documented that the resource was overfished and that abundance was declining rapidly. As the stock deteriorated further, management became increasingly restrictive, finally culminating in closure of the fishery from May 1977 to February 1979.

In 1979, the Technical Committee prepared and submitted a draft management plan and environmental impact statement for the fishery, which recommended regulatory measures including mesh size limits, closed seasons, catch quotas and statistical reporting. Such regulations were to be implemented by the participating states through the Northern Shrimp Section, and ultimately by the Secretary of Commerce through the Fishery Conservation and Management Act of 1976 (NSSC 1979). A revised plan reflecting public comment was accepted at the November 1979 Section meeting.

In 1981, the State-Federal Fishery Management Program in the Northeast Region was restructured as the Interstate Fisheries Management Program (ISFMP) of the Commission. The Section adopted a "Statement of Policy" which (1) stated its position relative to environmental issues, i.e., that despite natural fluctuations in abundance, the northern shrimp fishery is manageable; and (2) affirmed that it would provide for a continuing management program based on Technical Committee recommendations to maintain and rebuild the stock so as to "assure a viable northern shrimp fishery over time." The Section further stated its intent to allow a fishery through the mechanism of an annual open season, with the following regulatory measures endorsed as appropriate:

1. Gear limitations, conforming to the uniform mesh size regulation (44.5 mm, 1.75 inches stretched mesh in body and cod end);
2. Seasonal limitations, open season to be set within a 183-day window beginning not earlier than December 1 and ending not later than May 31 for any one year;
3. Possession limitations; and
4. Information collection provisions, i.e., determination of participants, dealer and processor reporting, and dockside and sea sampling.

The above measures, and biological and socioeconomic research requirements for management, are embodied in the *Interstate Fishery Management Plan for the Northern Shrimp* (Pandalus borealis *Kroyer*) *Fishery in the Western Gulf of Maine* rewritten from the 1979 version (McInnes 1986). Included is substantial background information on stock assessment and survey data collection methods (Clark and Anthony 1981; Cadrin *et al*. 1999; and others). The FMP remained in effect until the passage of Amendment 1 (2004).

In the mid-1980s, with a resurgence of the resource, the Section was able to implement a gradual extension of the open season for 1982-1985 culminating in the maximum duration allowable for the 1986 and 1987 seasons. With good recruitment and continued moderate levels of exploitation, the Section was able to manage the resource effectively through closed seasons, monitoring resource trends using annual index-based assessments.

In 1993, the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) was enacted, which gave the ASMFC considerably more influence over management of coastal marine resources. ACFCMA obligated individual states to implement ASMFC-approved measures; and it authorized the Secretary of Commerce to declare a moratorium on a state's fishery for failure to comply with ASMFC plan provisions.

During the mid-1990s, effort increased rapidly, and landings reached 9,200 mt during the 1996 season – a level not seen since the early 1970s. The first analytical assessment, completed and peer-reviewed at the 25th Northeast Regional Stock Assessment Workshop (SAW) in July 1997 (NEFSC MS 1997) revealed sharp increases in fishing mortality rates and reductions in biomass in 1996 (Cadrin *et al*. 1999). Subsequent assessments indicated substantially higher levels of fishing mortality rates and sharp declines in stock biomass and recruiting year-class size.

The Section adopted Amendment 1 in 2004 to implement biological reference points to rebuild the resource. Provisions in Amendment 1 helped decrease fishing mortality rates and increase biomass through the use of a soft harvest target (i.e., total allowable catch, or TAC) and closed season. Under Amendment 1, biomass began to recover.

Despite the recovery of the stock, early season closures occurred in 2010 and 2011 because of increases in participation levels in response to good market price. Furthermore, monthly reporting led to short notice of the closures and an overharvest of the target by 28% in 2010 and 59% in 2011. In response to these issues, Amendment 2 was approved in October 2011. In addition to establishing a more timely and comprehensive reporting system, Amendment 2 further expanded the tools available to manage northern shrimp, including options to slow catch rates throughout the season (i.e., trip limits, trap limits, and days out of the fishery). Also, Amendment 2 allowed for the initiation of a limited entry program to be pursued through the adaptive management addendum process. In November 2012, the Section approved Addendum I to Amendment 2 which refined the annual specification process, and allocated 87% of the coastwide TAC to the trawl fishery and 13% to the trap fishery based on historical landings.

Following review of the 2013 stock status report, the Northern Shrimp Section imposed a moratorium on the fishery for the 2014 season. The Section considered several factors prior to closing the fishery in 2014. Northern shrimp abundance in the western Gulf of Maine had declined steadily since 2006 and the 2012 and 2013 survey biomass indices were the lowest on record. Additionally, the stock experienced an unprecedented three consecutive years of failed recruitment (2010–2012 year classes). Subsequent stock status reports (i.e., 2014, 2015 and 2016) indicated continued poor trends in biomass, recruitment, and environmental indices which prompted the Section to maintain the moratorium, each year, through 2017. Winter sampling via selected commercial shrimp vessels has occurred in each year of the moratorium to continue the time series of biological samples collected from the fishery.

2.1.2 Purpose and Need for Action

The purpose of this Amendment is to address long-term scientific, management and policy issues relative to Gulf of Maine northern shrimp fisheries. There is growing concern the management program contained in Amendment 2 and Addendum I may not be appropriate to effectively manage the fishery.

The northern shrimp fishery is currently open access and has experienced significant fluctuations in participation over the last 30 years (Table 5). Interest and participation in the fishery generally increases as the season length or market price increases. However, as shrimp biomass has decreased, concern has been raised over the influx of boats into the fishery when shrimp are available inshore and markets warrant. This concern has led to the suggestion that access to the shrimp fishery should be restricted, however the Section decided not to pursue limited entry in Amendment 3. That said, the Section did maintain its ability to pursue the implementation of a limited entry program through the adaptive management process, and the June 7, 2011, control date established in Amendment 2.

Amendment 2 included BRPs designed to provide managers with a guide to determine if changes in the regulations are necessary – given the current status of the stock – to sustain the resource over time. However, the assessment model for northern shrimp went through peer-review in January 2014 at the 58th Northeast Fisheries Science Center SAW/SARC (NEFSC 2014) and was not approved for management use. Due to the uncertainties raised by the benchmark review, the BRPs contained in Amendment 2 may no longer be applicable to the Gulf of Maine northern shrimp population. Furthermore, Addendum I to Amendment 2 implemented a strict methodology, which requires an estimate of population abundance, for the Technical Committee to follow when recommending a target TAC during annual specification. Accordingly, Amendment 3 broadens the criteria for stock status determination using the best available science and provides a flexible TAC recommendation process for annual specifications while maintaining Technical Committee and Advisory Panel input.

Long-term sustainability of the northern shrimp resource and fishery is highly dependent on the recruitment of year classes into the spawning biomass. In other words, protecting small male shrimp is essential for stabilizing the fishery, as they will inevitably contribute to the spawning biomass as they grow and mature into females. Furthermore, size composition data collected from port samples of fishery landings indicate trends in landings have been determined primarily by recruitment of strong year classes. Size-sorting grate systems (e.g., double-Nordmore grate or a compound grate), which are designed to release small shrimp (and fish) from the trawl net, have proven to reduce counts per pound (i.e., catching only big shrimp means fewer shrimp are needed for a pound of product) (He and Balzano 2007, 2012). The Section approved the use of such systems in the northern shrimp fishery, but did not make it a requirement. However, considering the fishery has experienced six consecutive years of poor or failed recruitment, Amendment 3 requires the mandatory use of these gears to minimize catch of small (male) shrimp and improve resource and fishery sustainability.

2.2 GOAL

The Northern Shrimp Section agrees, despite natural fluctuations in stock abundance, the northern shrimp fishery can be managed. In addition, the management program, which includes recommendations of the Technical Committee and the Advisory Panel, is designed to ensure a viable northern shrimp fishery in the Gulf of Maine over time.

The amendment's goal is to manage the northern shrimp fishery in a manner that is biologically, economically, and socially sound, while protecting the resource, its users, and opportunities for participation.

2.3 OBJECTIVES

The following objectives are selected to support the goal of this amendment:

- Protect and maintain the northern shrimp stock at sustainable levels that will support a viable fishery
- Optimize utilization of the resource within the constraints imposed by natural distribution of the resource, available fishing areas, changing environmental conditions, and harvesting, processing and marketing capacity
- Provide a mechanism for unique state level management of fishing effort
- Maintain the flexibility and timeliness of public involvement in the northern shrimp management program
- Maintain existing social and cultural features of the fishery to the extent possible
- Minimize the adverse impacts the shrimp fishery may have on other natural resources
- Minimize the adverse impacts of regulations, including increased cost to the shrimp industry and the associated coastal communities
- Promote research and improve the collection of information to better understand northern shrimp biology, ecology, population dynamics, and responses to changing environmental conditions
- Achieve compatible and equitable management measures through coordinated monitoring and law enforcement among jurisdictions throughout the fishery management unit

2.4 SPECIFICATION OF MANAGEMENT UNIT

The management unit is defined as the northern shrimp resource throughout the range of the species within U.S. waters of the northwest Atlantic Ocean from the shoreline to the seaward boundary of the Exclusive Economic Zone (EEZ). It is also recognized that the northern shrimp fishery, as defined here, is interstate and state-federal in nature, and that effective assessment and management can be enhanced through cooperative efforts with state and federal scientists and fishery managers.

2.5 DEFINITION OF OVERFISHING

Since the implementation of Amendment 1 in 2004, stock status for northern shrimp in the Gulf of Maine has been determined via comparison of terminal year estimates of fishing mortality and biomass to fishing mortality- and biomass-based reference points (i.e., biological reference points, or BRPs). These management targets, thresholds, and limits are designed to provide managers with a guide to determine if changes in the regulations are necessary, given the current status of the stock, to sustain the resource over time.

The BRPs defined in Amendment 2 were developed via the Collie-Sissenwine Analysis (CSA) assessment model (Cadrin et al. 1999), which was peer-reviewed and accepted for management use in 2007. In 2014, a benchmark stock assessment explored new analytic methods, including a new model and modifications to the accepted CSA model. The benchmark assessment went through peer-review and the approaches were not approved for management use indicating that the current BRPs in Amendment 2 may no longer be applicable to northern shrimp management.

Additionally, the Gulf of Maine northern shrimp stock undergoes a formal scientific peer-review process about every five years which may result in revised or different stock status determination criteria. The next benchmark assessment is expected to be peer-reviewed in 2018. Prior to this Amendment, the Section pursued the adaptive management process (e.g., an addendum which typically requires a minimum of five months from initiation to implementation) to incorporate new stock status determination criteria (overfishing/depleted status) that may result from updated, peer-reviewed science, into the Northern Shrimp FMP. Therefore, the timing of updated survey information, subsequent analysis and peer-review, the addendum or amendment process, and setting annual specifications means that the availability of the best available scientific information could be significantly delayed from entering the management process and responding to changing stock status.

Accordingly, Amendment 3 allows for the incorporation of new, peer-reviewed stock status determination criteria (both the methods used to set reference points, and the reference point values), when available, through Section action. Specifically, Amendment 3 broadens the descriptions of stock status determination criteria contained within the Northern Shrimp FMP to allow for greater flexibility in incorporating changes to the definitions of the maximum fishing mortality threshold (target or limit) and/or minimum stock size threshold (target or limit) as the best scientific information becomes available, while maintaining objective and measureable status determination criteria for identifying when the stock is overfished. Similar actions have been taken with other Commission-managed species’ FMPs (e.g., Addendum XIX to the FMP for Summer Flounder, Scup and Black Sea Bass, and Addendum XVI to the FMP for American Lobster).

This action allows for the incorporation of new, peer-reviewed stock status determination criteria, as soon as it becomes available through the annual specifications process, thus significantly improving the timeliness of incorporating the best available scientific information in the management of northern shrimp. This action does not have a direct influence on fishing effort or fishery removals but instead facilitates use of the most current scientific information available to define the status determination criteria for the stock, so that the stock can be managed to prevent overfishing and managed such that it is not overfished.

The following describes the potential sources of peer-reviewed scientific advice on status determination criteria and the current process of how that scientific advice will move forward in the development of management advice through the Section's annual specification process.

Specific definitions or modifications to the status determinations criteria, and their associated values, would result from the most recent peer-reviewed stock assessments and their panelist recommendations. The primary peer-review processes for Gulf of Maine northern shrimp that may be used are:

- The Northeast Regional Stock Assessment Workshop/ Stock Assessment Review Committee (SAW/SARC) process which is the primary mechanism utilized in the Northeast Region at present to review scientific stock assessment advice, including status determination criteria, for ASMFC- and federally-managed species.
- ASMFC Externally Contracted Reviews with Independent Experts (e.g., Center for Independent Experts - CIE) which is also subject to rigorous peer-review and may result in scientific advice to modify or change the existing stock status determination criteria.

The above list of peer-review entities does not preclude groups from bringing independent stock assessments performed for the Gulf of Maine northern shrimp stock forward to the attention of the Commission. The Commission may recommend that non-Commission reviewed stock assessments pass through either of the peer-review processes above, to ensure that sufficient peer-review of the information occurs before the scientific advice can be utilized within the management process.

The scientific advice provided with respect to status determination criteria could follow three scenarios. First, it is possible that the panelists participating in the peer-review reach consensus with respect to maintaining the current definitions of status determination criteria for northern shrimp. There may be updates to the values associated with those same definitions based on the input of more recent (i.e., additional year's data) or updated information as well; however, the Section is not required to undertake any specific action when this occurs, as using the updated values is implied in this provision of the FMP. In this case the scientific advice can then move forward such that management advice can be developed. Under the second potential scenario for scientific advice, the peer-review recommends changes or different definitions of the status determination criteria, and the panelists reach consensus as to how these status determination criteria should be modified or changed. This scientific advice can move forward such that management advice can be developed. Under these first two potential scenarios, consensus has been reached and therefore the scientific advice moving forward to the Section's management advisory groups should be clear.

The third potential scenario is the peer review scientific advice with respect to the incorporation to status determination criteria are split (consensus is not reached) or uncertain recommendations are provided (weak consensus). The scientific advice provided by the reviewers may be particularly controversial. In addition, the scientific advice may not be specific enough to provide adequate guidance as to how the maximum fishing mortality threshold and/or minimum stock size threshold should be defined or what resulting management advice should be developed from these changes. Under these circumstances, or at any time, the Section may engage their TC to review the information and recommendations provided by the peer-review group. Based on the terms of reference provided to the TC, which may include reevaluation of stock status determination criteria in light of changing environmental conditions, they may prepare a consensus report clarifying the scientific advice for the Section as to what the status determination criteria should be (e.g., modify, change, or maintain the same definitions). At that point the scientific advice on how the status determination criteria should be defined will be clear, and can move forward such that management advice can be developed.

2.6 STOCK REBUILDING PROGRAM

Based on the definition of overfished status as defined in *Section 2.5*, and should the stock biomass go below the threshold as determined by the annual stock assessment, the stock is defined as overfished and the Section is required to take action to recover the stock above the threshold. Based on the definition of overfishing status as defined in *Section 2.5*, and should fishing mortality go above the threshold as determined by the annual stock assessment, overfishing is then occurring and the Section is required to take action to reduce the fishing mortality to the target level. If fishing mortality exceeds the limit level and biomass is less than the threshold level, the Section must act immediately to reduce fishing mortality.

The Section chose not to set specific rebuilding timeframes. It maintains the flexibility to rebuild stocks within a reasonable amount of time. This flexibility is necessary for the Section to manage a species that is volatile and easily affected by change in environmental conditions.

2.7 RESOURCE COMMUNITY ASPECTS

See *Section 1.4.1* for the role northern shrimp play in ecosystem dynamics.

2.8 IMPLEMENTATION SCHEDULE

States are required to implement the provisions of Amendment 3 by the first day of the next approved fishing season, not including research set-aside fishing under a moratorium.

3.0 MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

3.1 SUMMARY OF MONITORING PROGRAMS

In order to achieve the goals and objectives of Amendment 3, the collection and maintenance of quality data continues to be necessary.

Commercial landings by state, month, and gear (trawl vs. trap) were compiled by NOAA Fisheries port agents from dealer reports until the mid-late 1990's, and are available electronically back to 1964. A dealer reporting system became mandatory in 1982 but was repealed in 1991, and NOAA Fisheries began collecting the data again. In 2004, shrimp reporting for federally permitted dealers buying from federally permitted harvesters became mandatory, but "state-only" dealers, mostly in Maine, continued to report voluntarily. Trip level reporting became mandatory for all licensed Maine shrimp dealers in 2008, although "peddlers" selling directly to the public only were not required to have a license, so catches sold in the peddler market were mostly unreported on the dealer side. This was remedied in 2013, and during the next shrimp season, anyone buying shrimp for resale will need to be licensed in Maine and report landings.

In 1994, a Vessel Trip Report (VTR) system was implemented for many federally permitted harvesters and in 1999 (but not implemented until the 2000 season), reporting became mandatory for all shrimp harvesters landing in Maine.

3.1.1 Catch and Landings Information

The need for accurate and timely reporting of all catch and landings is imperative for successful monitoring of the fishery and the TAC, and is a prerequisite for effective implementation of trip limits and days out to slow catch rates.

All states are required to implement weekly reporting of all daily sales at first point of contact (i.e., dealers, including harvester direct sales to the consumer, i.e., "peddlers"). States must require the use of electronic reporting through the Standard Atlantic Fisheries Information System (SAFIS) maintained by the Atlantic Coastal Cooperative Statistics Program (ACCSP). Negative reports (no shrimp were purchased or received during a reporting week) are required. Landing and trip information should be collected consistent with the established ACCSP data elements.

3.1.2 Fishery-Dependent Monitoring

Approximately 2-5% of commercial shrimp landings from Maine, New Hampshire and Massachusetts, have been subsampled for size and sex-stage composition data since the early 1980s (SAW/SARC 58, 2014). These data are essential for annual stock assessment, and subsequent management actions.

The states of Maine, New Hampshire, and Massachusetts are required to collect size and sex-stage composition data from subsamples with a target of at least 2% of commercial landings in that state to inform annual stock assessment.

3.1.3 Biological Information

The ACCSP provides standardized data elements and reporting medium for collected biological data on commercial, for-hire, and recreational fisheries. Biological data for commercial fisheries can be collected through port sampling programs and at-sea observers Refer to the ACCSP Program Design document for details. Priorities and target sampling levels are determined by the ACCSP Biological Review Panel, in coordination with the Bycatch Prioritization Committee.

3.1.4 Social Information

In New England today, there is no consistent, long-term monitoring program focused either on the collection and analysis of social and economic data or on the social and economic impacts of regulatory change. However, there are several steps being taken that may eventually lead to such a program. ACCSP is currently conducting a pilot project for the collection and analysis of such data from a random sample of harvesters involved in summer flounder or blue crab fisheries. Hall-Arber et al. (2001) collected a wealth of information to serve as a baseline for such data collection in New England. A few towns in Maine have, or are in the process of developing, planning processes that include analyses of their fishing industry's current and anticipated needs. Conduct of needed research and analyses identified in this amendment would help place the necessary decision-making on a more objective foundation.

3.1.5 Economic Information

There is very little direct monitoring of economic conditions in the Gulf of Maine northern shrimp fishery for either harvesters or processors. Dealers and processors provide the ex-vessel price paid to boats at the first point of sale through mandatory electronic dealer reporting. After this point there is very little economic monitoring of the processing sector. Much of the New England shrimp production is sold to Canada, Europe and Asia, hence U.S Customs documentation of shipments abroad is available including product form and declared value. Unfortunately, shrimp shipments leaving through a New England port of departure do not necessarily indicate that this domestic product was landed in the Gulf of Maine northern shrimp fishery and further distinction of the product to the species level is not required on Customs paperwork (see *Section 1.5.2* for additional information).

3.1.6 Observer Programs

As a condition of state and/or federal permitting, vessels should be required to carry at-sea observers when requested. The ACCSP has adopted the NOAA Fisheries National Observer Program as the standard for training and certifying at-sea observers. The ACCSP standards for commercial fisheries observer coverage is 5% of total trips for high priority fisheries, or achieving a 20-30% PSE, and 2% of total trips for all other fisheries. These target sampling-levels should be evaluated annually by fishery to determine where the variance stabilizes and to meet desired goals. A minimum set of standard data elements is defined through the ACCSP for biological or bycatch sampling data (refer to the ACCSP Program Design document for details). Specific fish species and fisheries are prioritized for sampling as well as sampling levels through the ACCSP Biological and the Discard Prioritization Committees. The ACCSP is developing a target tracking system to track the number of observed trips so that observer effort may be reallocated as targets are met. Partners should upload minimum data elements to the ACCSP tracking system before the tenth of the month following data collection. The submission timeline will allow two effort reallocations per calendar quarter. ACCSP Partners are encouraged to monitor the tracking system as required to complete targets.

3.2 ANNUAL ASSESSMENT

3.2.1 Assessment of Fishing Mortality Target and Measurement

Fishing mortality estimates for the Gulf of Maine northern shrimp fishery in the past have been generated by two separate models; the Collie-Sissenwine, or Catch-Survey Analysis (CSA), and a surplus production model (ASPIC). The CSA tracked the removals of shrimp using the state-federal summer survey indices of recruits and fully recruited shrimp scaled to total catch in numbers. The surplus production analysis modeled the biomass dynamics of the stock with a longer time series of total landings and several survey indices of stock biomass. The CSA estimates of fishing mortality were used as the primary point estimates for managing the fishery, while the surplus production estimates of fishing mortality were used to corroborate results from the CSA and provide historical perspective. However, in 2014, a benchmark stock assessment explored new analytic methods, including a new model and modifications to the accepted CSA model. The benchmark assessment went through peer-review and the approaches were not approved for management use. As a result, the current BRPs in Amendment 2 may no longer be applicable to northern shrimp management. Accordingly, Amendment 3 provides the flexibility to use the best available information to determine the status of the stock in the event that BRPs are not currently available or are deemed not appropriate for management use (see *Section 2.5* for additional information).

The Northern Shrimp Technical Committee (NSTC) will perform a northern shrimp stock assessment on an annual basis. The Technical Committee and Advisory Panel will meet to review the stock assessment and all other relevant data sources. An annual stock status assessment report will be prepared for the Section in order to make annual adjustments to the management program as necessary. Several primary surveys are examined, including the state-federal summer shrimp survey and the NOAA Fisheries fall ground fish survey. The stock assessment report will include at least landings, effort, and survey indices of abundance, biomass, and recruitment. Estimates of fishing mortality, yield-per-recruit and spawning potential will be provided when possible. If major changes are made to the stock assessment models used in the management process, or the Section requests a higher level of review, the Section may recommend to the ISFMP Policy Board that an external review of the stock assessment be conducted.

3.2.2 Assessment of Annual Recruitment

The mean number per tow of 1.5 year old shrimp from the state-federal summer shrimp survey is used as a proxy for a recruitment index. Although the shrimp are not fully recruited to the survey gear at this age, it appears that this index is a sufficient representative of year class strength from the previous year.

3.2.3 Assessment of Spawning Stock Biomass

The stratified mean weight (kg) per tow of northern shrimp >= 22-mm dorsal carapace length (CL) from the state-federal summer shrimp survey provides the index of spawning stock biomass (SSB). Northern shrimp are protandric hermaphrodites, which start changing from male to female around 2.5 years of age, or 18 to 19 mm CL. The 22 mm dorsal carapace length is used as a cutoff point because at this size most shrimp are sexually mature females.

3.3 BYCATCH MONITORING PROGRAM

The ACCSP will require a combination of quantitative and qualitative methods for monitoring discard, release, and protected species interactions in the northern shrimp commercial. Commercial fisheries will be monitored through an at-sea observer program (see *Section 3.1.5*) and several qualitative programs, including strandings, entanglements, trend analysis of vessel trip and dealer reported data, and port sampling.

3.4 HABITAT PROGRAM

No habitat program is currently defined for the Gulf of Maine's Northern shrimp. Given the high uncertainty in the future prospects for the northern shrimp fishery and the current moratoriums due to the stock collapse, the long-term impacts of the fishery on shrimp habitats are highly uncertain. Current low levels of effort in the fishery likely have neutral or slightly positive habitat effects.

The New England Fisheries Management Council is finalizing the Omnibus Essential Fish Habitat Amendment 2 to review and revise Essential Fish Habitat (EFH) designations and develop actions needed to minimize adverse effects of fishing on EFH to address Magnuson Stevens Act Essential Fish Habitat requirements. The Council's evaluation considered the habitat impacts of all type of fishing occurring in federal waters in the Council's area of jurisdiction, not just fishing activities directly managed by the Council.

A major goal of the amendment is to avoid and minimize to the extent practicable the adverse effects of fishing on the seabed. The Council concluded that vulnerability to fishing impacts varies based on habitat characteristics and fishing intensity (NEFMC 2011). Most of the management measures in the draft omnibus EFH amendment are based on identifying specific locations where seafloor habitats are more vulnerable and implementing restrictions in these areas on gear types that have the most severe impacts. Although the total magnitude of adverse impacts has been reduced over time due to reductions in swept area in the multispecies groundfish fishery, this reduction may be rapidly reversed if the more vulnerable seafloor is not identified and protected from gear types that could impact it.

4.0 MANAGEMENT PROGRAM IMPLEMENTATION

4.1 COMMERCIAL FISHERIES MANAGEMENT MEASURES

4.1.1 Annual Fishery Specifications and the Total Allowable Catch

To manage at the biological reference points in *Section 2.5*, the Northern Shrimp Section shall adjust commercial fishery management measures based on Northern Shrimp Technical Committee (NSTC), Advisory Panel, and public input. The NSTC will annually review the best available data which may include, but are not limited to, catch and landing statistics, current estimates of fishing mortality, stock status, shrimp survey indices, assessment modeling results, and target and threshold mortality levels; and recommend a hard TAC to maintain or reach healthy stock status relative to peer reviewed biological reference points, if available.

The Section will meet annually during a public meeting in the fall or early winter to review the Advisory Panel and NSTC recommendations, set a hard TAC that is associated with managing the northern shrimp fishery at the F_{target}, at the $F_{threshold}$, or between the F_{target} and $F_{threshold}$, when possible, and specify any of the following management measures for the upcoming fishing season through a majority vote.

Annual Meeting Specification Options:

a) Quota reconciliation or rollover date (*Section 4.1.2)*
b) Fishing Season (*Section 4.1.3)*
    1. Establish measures for projected season closure (*Section 4.1.3.1*)
c) Trip Limits (*Section 4.1.4)*
d) Trap Limits (*Section 4.1.5*)
e) Days out of the Fishery (*Section 4.1.6*)
f) Research Set Aside (*Section 4.1.2.1*)

The Section may further specify options b-e above by gear type (e.g., trap and trawl) and may establish harvest triggers to automatically initiate or modify any option (except trap limits). Additionally, the Section may make adjustments to the fishing season, trip limits, and days out of the fishery at any time during the fishing season at an in-person meeting or conference call. Meetings are preferable to calls, and conference calls will only be used as needed, most likely for time sensitive specification adjustments

This amendment provides the Section with a suite of management measures that can be modified through adaptive management. *Section 4.6.2* contains a list of management measures that may be implemented anytime throughout the year by the Section. However, adjustment or establishment of any of the measures listed in *Section 4.6.2* must be implemented through the addendum process. See Section 4.6 for a description of how the Section is able to implement adaptive management through the addendum process.

Once the Section approves management measures for the northern shrimp fishery, it is the individual state's responsibility to implement consistent regulations through its state agency.

4.1.2 Total Allowable Catch (TAC) Allocation Program

The coastwide TAC as specified in Section 4.1.1 will be allocated by state with 80% allocated to Maine, 10% allocated to New Hampshire and 10% allocated to Massachusetts. For states with historical trawl and trap fisheries, the state's annual allocation will be divided 87% to the trawl fishery and 13% to the trap fishery.

It is the responsibility of the states to implement appropriate measures to prevent quota overages. All northern shrimp landed will be applied against the state's quota of the vessel's home port, regardless of where the northern shrimp was harvested or landed. Individuals or vessels with commercial permits cannot land northern shrimp in any state that was not allocated a commercial quota. State quota allocations may be revisited at any time through the adaptive management process (*Section 4.5*).

At the end of each fishing season, any quota underages by one or more states will be pooled and proportionately allocated using the state's quota allocation to help reconcile any quota overages. Alternatively, the Section may choose to roll over any unused quota from New Hampshire and Massachusetts to Maine's quota by a date determined during annual specifications.

4.1.2.1 Research Set Aside (RSA) Program

The Northern Shrimp Section may set aside a percentage of the coastwide TAC to help support research on the northern shrimp stock and fishery. The percentage of the TAC will be determined during the annual specifications meeting, and will be deducted from the coastwide TAC before the TAC is allocated according to *Section 4.1.2*. The Section may set a RSA quota when there is no TAC as agreed by the Section, i.e., during years of a moratorium. The research set aside program will be managed by the Northern Shrimp Section and ASMFC.

4.1.2.2 Total Allowable Catch (TAC) Accountability Measures

When the quota allocated to a state is exceeded in a fishing season, 100% of the overage amount will be deducted from the corresponding state in the next fishing season (e.g., 100 pounds overage = 100 pounds payback). States that further allocate quota by gear type may choose how state-wide quota deductions are applied to gear-specific quotas. If the annual TAC is not exceeded, any state-specific overages will be forgiven.

4.1.3 Fishing Season

At the annual specifications meeting, the Section may establish a fishing season to occur anytime between December 1 and May 31. This will be the maximum season length if a fishing season is approved, i.e., the Section may establish a fishing season shorter than, but not longer than that specified.

The Section has the ability to set a closed season annually up to 366 days (i.e., impose a moratorium). The Section may set different seasons for the harvesting and processing sectors of the fishery to accommodate for the lag time of processing shrimp harvested late in the season. The Section may close the fishery at any time at a public meeting or conference call.

4.1.3.1 Projected season closure

The northern shrimp fishery will close when a percentage of the coastwide TAC is projected to have been caught. The exact percent, ranging between 80-95%, and the closure notification period (2-7 days) will be established by the Section during the annual specifications meeting. ASMFC will notify states when the selected percentage of the TAC is projected to be reached, and states must then close their fisheries within the specified notification period.

In projecting the season closure, the NSTC will consider these sources of uncertainty:

1. Future catch rates, which depend on weather, stock availability, catchability, gear type, location, and fishery participation. Catch rates can be expected to be high in January and February and lower in other months, with exceptions.
2. Late reporting. During the 2012 season, reporting compliance improved as the season progressed.
3. Unreported catches due to non-compliance or catches kept for personal use.

4.1.4 Trip Limits

The Section will vote on the start date, duration, and end date of trip limits, with the ability to initiate or modify trip limits during the season. The Section may use harvest triggers to automatically initiate or modify trip limits during the season. The Section may implement trip limits by day, week, or other time based landing limit to control the rate of landings. The Section may establish trip limits based on gear type, and an analysis of historical harvest data. Vessels are prohibited from landing more than the specified amount during a designated trip limit period. Refer to *Appendix 1* for the PDTs preliminary trip limit analysis.

4.1.5 Trap Limits

The Section may set trap limits during the annual specifications meeting. The Section may establish trap limits based on an analysis of historical harvest data. An individual permit holder is prohibited from fishing a number of traps in excess of the trap limit designated by the Section for that fishing year.

All traps fished, or aboard a vessel, must be tagged. A permanent, non-transferable trap tag shall be attached to each trap. Each trap tag shall be color-coded coastwide by fishing year and include the following information: issuing authority, year(s) tag is valid, and permit number. Trap tags must be permanently attached to the trap frame, and clearly visible for inspection. In state waters, the state licensing agency shall be the issuing authority. Each state shall issue tags to its own residents. In cases where license holders do not hold a license in their resident state, the state in which they fish shall issue tags.

4.1.6 Days Out of the Fishery

Days out of the fishery may be implemented to slow catch rates in order to prolong the harvest of the hard TAC, or make shrimp available when demand is greatest. The Section will vote on the start date, number of days out, and days of the week for days out. The Section may initiate or change days out specifications by taking another vote anytime during the rest of the fishing season during a meeting or conference call. All states will take the same days out of the fishery.

Days out during the fishing season are considered closed days, and it is unlawful to land any shrimp from 0001 hours to 2400 hours; and it shall be presumed that any shrimp landed or possessed by harvesters during the closed period were taken during a closed day.

4.1.7 Minimum Mesh Size

It is unlawful to fish for, take, transport or have in possession any northern shrimp on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting or portions thereof, except an accelerator funnel of the size specified in Section 3(c), with an opening less than 1-3/4 inches stretched mesh opening between knots and except that a deflector panel of 1 inch mesh may be used in the cod end behind the second grate in a double grate system. The maximum length of the bottom legs of the bridle of any shrimp trawl shall not exceed 15 fathoms of uncovered or bare wire.

<u>Tolerance</u>. Due to the differences by net manufacturer, mesh measurements and other inherent variables used for enforcement of this regulation, a tolerance of 1/8 inch shall be applied to the average mesh size in the body and wings. No tolerance shall be applied to the mesh size in the cod end.

4.1.8 Fishing Gear

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached, except that a cod end strengthener may be used as specified, and except that an accelerator funnel may be used and must have a mesh size of no less than 1-3/8 inch stretched mesh. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end unless a cod end strengthener is used. Cod end shall mean the terminal portion of an otter trawl, pair trawl, beam trawl, Scottish seine or mid-water trawl in which the catch is normally retained.

4.1.9 Cod End Strengthener

An outer mesh may be used as a cod end strengthener while fishing for northern shrimp. The outer mesh must be a minimum of 6 inches and the outer mesh must be at least three times larger than the size of the inner mesh. The mesh may be single or double twine, and diamond or square in shape. The hanging ratio must be the same as the mesh size ratio. Hanging ratio shall mean the number of meshes in the circumference of the cod end to the number of meshes in the circumference of the strengthener. The mesh size ratio shall mean the number of inner meshes to the number of outer meshes. The outer mesh may only cover the cod end. No chafing gear may be used with a cod end strengthener.

Exception. Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fishery agency.

Method of Measurements. Mesh sizes are measured by a flat wedge-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4.1.10 Mechanical "Shaking" Devices

Mechanical "shakers" have been used to rid smaller shrimp from nets. It shall be unlawful to cull, grade, separate or shake shrimp, aboard any vessel, except by implements operated solely by hand. It is illegal to possess, aboard any vessel, any powered mechanical device used to cull, grade, separate or shake shrimp.

4.1.11 Finfish Excluder Devices

It shall be unlawful for any vessel rigged for otter trawling, to fish for, land or have in possession northern shrimp except by using trawls equipped with finfish excluder devices approved by the same agency that permits such vessels. Such finfish excluder devices (commonly referred to as the "Nordmore Grate System") shall consist of:

- A rigid or semi-rigid grate consisting of parallel bars attached to the frame with spaces between the bars not to exceed 1 inch in width;
- A fish outlet, or hole, in the extension of the trawl forward of the cod end and grate; and
- A webbing funnel installed in front of the grate designed to direct the catch toward the grate to maximize the retention of the shrimp may be used but may not have mesh less than 1-3/8 inch stretched mesh.
- Vessels fishing in the shrimp fishery may not possess regulated groundfish species.

4.1.12 Size Sorting Grate Systems

It shall be unlawful for any vessel rigged for otter trawling to fish for, land, or have in possession, northern shrimp except by using trawls equipped with either a compound grate or a double-Nordmore grate as described below. This provision may be modified via Section action during annual specifications, i.e., an addendum is not required.

The compound grate (Figure 1) is a rigid or semi-rigid planar device referred to as a "compound grate" because it has two different sections of parallel or non-parallel bars oriented vertically (up and down). The top section shall be configured as a finfish excluder device and shall consist of parallel bars attached to the frame with spaces between the bars not to exceed 1 inch in width. A fish outlet, or hole, in the extension of the trawl shall exist forward of the cod end and compound grate. The bottom section will allow the escape of small shrimp and will consist of parallel or non-parallel tapered bars oriented up and down with spacing between bars of $^5/_{16}$ inch to ½ inch. The lower edge of the cod end will be attached to the grate at the juncture between the top section and the bottom section, creating a shrimp outlet similar to the fish outlet described above, that will allow the escape of shrimp that pass through the bars of the bottom section of the grate. The compound grate also has the following optional provisions:

- This grate may be fished “upside down”, that is, with the Finfish Excluder section and outlet on the bottom and the shrimp size separator section and outlet on the top.
- A webbing funnel may be installed in front of the grate designed to direct the catch toward the grate to maximize the retention of the shrimp may be used but may not have mesh less than 1-3/8 inch stretched mesh.

The double-Nordmore setup (Figure 2) is comprised of two separate grates; one of the grates must be a finfish excluder device (commonly referred to as the "Nordmore Grate System") and shall consist of:

- A rigid or semi-rigid grate consisting of vertical parallel bars attached to the frame with spaces between the bars not to exceed 1 inch in width;
- A fish outlet, or hole, in the extension of the trawl forward of the cod end and grate; and
- A webbing funnel installed in front of the grate designed to direct the catch toward the grate to maximize the retention of the shrimp may be used but may not have mesh less than 1-3/8 inch stretched mesh.
- Vessels fishing in the shrimp fishery shall not be allowed to possess regulated groundfish species.

The second grate may be fished in front or behind the Nordmore grate. The second grate shall consist of:

- A rigid or semi-rigid planar device with vertical bar spacing of 7/16 of an inch (tolerance – must be greater than 5/16 inch but less than ½ inch).
- The exit holes to the cod end must be at the top and no more than 10% of the surface area.
- A funnel in front of the second grate designed to direct the catch toward the grate to maximize the escape of small shrimp may be used but may not have mesh less than 1-3/8 inch stretched mesh.

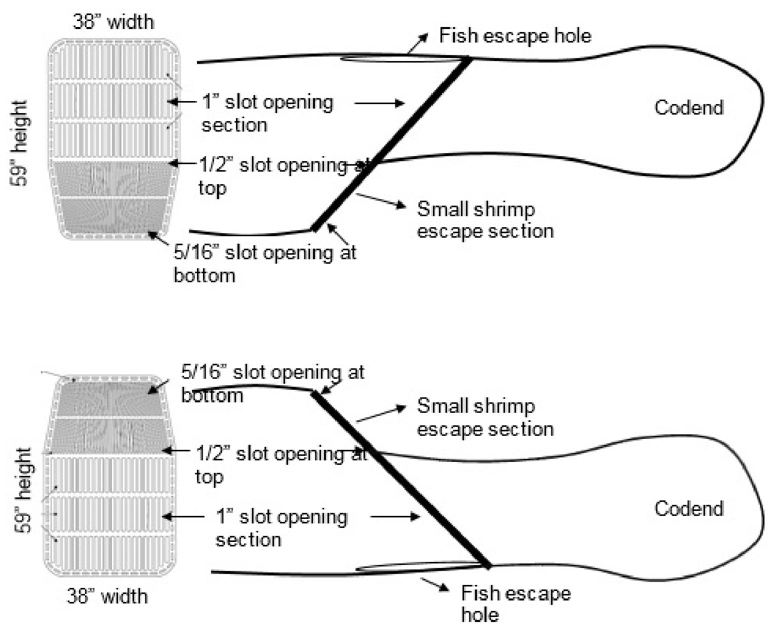

Figure 1. Schematic diagram of the compound size sorting grate to minimize the retention of small shrimp. The top panel diagrams the small shrimp size sorting section of the grate at the bottom (ventral) side of the net. The bottom panel diagrams the small shrimp size sorting section of the grate at the top (dorsal) side of the net.

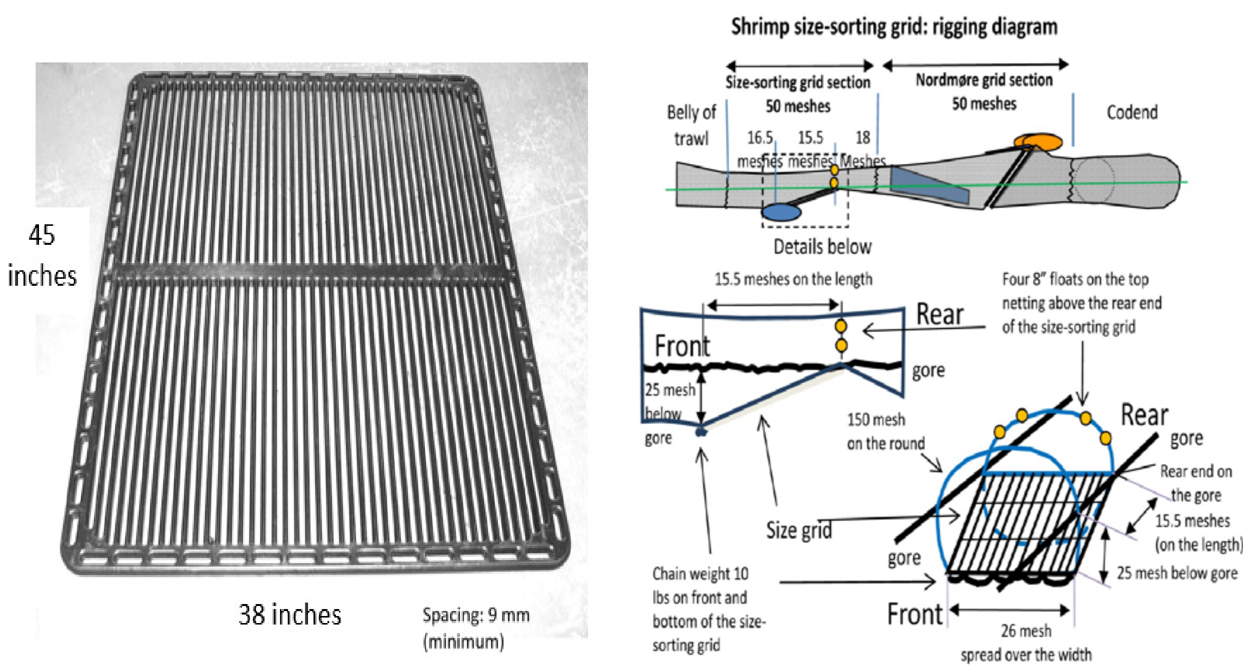

Figure 2. Schematic diagram of the double-Nordmore grate configuration (He and Balzano 2012).

4.2 RECREATIONAL FISHERIES MANAGEMENT MEASURES

No management measures are included for the recreational fisheries as this fishery is very limited, is usually carried out with the recreational lobster trap fishery, and is for personnel use.

4.3 HABITAT CONSERVATION AND RESTORATION

4.3.1 Preservation of Existing Habitat

The New England Fishery Management Council's Omnibus Habitat Amendment 2 will be published later this year, and management measures approved by the Council will be implemented following a public comment period, subject to approval by the National Marine Fisheries Service.

In the draft amendment, shrimp traps would not be restricted by any of the alternatives as there appears to have a low impact on habitat. The shrimp fishery, if available in a given year, typically begins on or around December 1, when many shrimp have already hatched their eggs for the breeding season. Therefore, no particular biological impacts are expected if the management alternatives lead to shifts in the distribution of shrimp trawling effort as the seasonality of the shrimp fishery already controls for impacts on shrimp spawning. While the fishery is open access in terms of participation, it is limited by a total allowable catch, which triggers closure of the fishery once harvested. There are also trip limits, trap limits, and days out which control the rate of harvest within the season. However, because shrimp undergo inshore/offshore migrations seasonally, the distribution of shrimp, and therefore shrimp fishing effort relative to habitat management areas, may vary from year to year.

Shrimp trawls are estimated to have an equivalent impact per unit area swept on vulnerable substrates to groundfish and other trawls. However, the fishery is conducted during a short winter season, often four to six weeks depending on how long it takes to catch the annual quota, and effort tends to occur on softer substrates given the distribution of northern shrimp. Although shrimp fishing may cause some damage to these soft sediment habitats, the short season allows for some recovery during the remainder of the year. Based on these considerations, the Council proposes to exempt shrimp trawl gear from bottom trawling restrictions in the northwestern corner of the Western Gulf of Maine Habitat Closure Area. The shrimp exemption area identified in the draft amendment lies west of Jeffreys Ledge in an area historically, although not recently, used by the shrimp fishery.

Additionally, spring and autumn distributions of northern shrimp appear to have a greater dependence on local temperature conditions as opposed to habitat bottom types. An inshore shift is evident in spring when temperatures are coldest; and data from the state-federal summer survey indicate a very strong preference for bottom temperatures between 4-6˚C, the coldest observed range in the survey region at this time of year (Clark *et al*., 1999). Within this range, the species was found to be most common on fine-grained sediments (Clark et al., 1999). Highest concentrations, however, were clearly defined by the 6˚C isotherm; and to the east of

Cashes Ledge and Jeffreys Bank, where temperatures tended to exceed 6˚C, abundance was observed to decline sharply, even in areas where bottom conditions are favorable.

4.3.2 Habitat Restoration, Improvement, and Enhancement

As indicated previously, temperature appears to be one of the most critical habitat factors in all life stages of northern shrimp.

Changing climate conditions are reshaping ecosystems in ways that affect resources and ecosystem services. With water temperatures in the Gulf of Maine rising at a higher rate (0.03°C per year) than the global mean rate (0.01°C per year) and a clear relationship between northern shrimp population and temperature, habitat restoration may be moot and protection of the remaining population by regulating the fishery may be the only manner to preserve the population with the current climate conditions

4.4 ALTERNATIVE STATE MANAGEMENT REGIMES

Once approved by the Northern Shrimp Section, states are required to obtain prior approval from the Section for changes to their management program in which a compliance requirement is in effect. Other non-compliance measures must be reported to the Section but may be implemented without prior approval from the Section. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show, to the Section's satisfaction, its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.5*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Section and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

4.4.1 General Procedures

A state may submit a proposal for a change to its regulatory program or any mandatory compliance measure under this amendment to the Commission. Such changes shall be submitted to the Chair of the Plan Review Team, who shall distribute the proposal to the Section, the Plan Review Team, the Technical Committee and the Advisory Panel.

The Plan Review Team is responsible for gathering the comments of the Technical Committee and the Advisory Panel, and presenting these comments as soon as possible to the Section for decision.

The Section will decide whether to approve the state proposal for an alternative management program if it determines that it is consistent with the applicable stock status determination criteria, and the goals and objectives of this amendment.

4.4.2 Management Program Equivalency

The Northern Shrimp Technical Committee will review any alternative state proposals under this section and provide its evaluation of the adequacy of such proposals to the Section.

4.5 ADAPTIVE MANAGEMENT

The Northern Shrimp Section may vary the requirements specified in this Amendment as a part of adaptive management in order to conserve the northern shrimp resource. The elements that can be modified by adaptive management are listed in *Section 4.5.2.2*. The process under which adaptive management can occur is provided below.

4.5.1 General Procedures

The Plan Review Team (PRT) will monitor the status of the fishery and the resource and report on that status to the Section during annual specifications, or when directed to do so by the Section. The report will contain recommendations concerning proposed adaptive management revisions to the management program, if necessary.

The Section will review the report of the PRT, and may consult further with the Technical Committee, Law Enforcement Committee (LEC) or the Advisory Panel. The Section may direct the PRT to prepare the documentation necessary to make any changes to the management program.

Should the Section deem that an addendum to the fishery management plan is necessary, the Plan Development Team (PDT) will prepare a draft addendum and shall distribute it to all states for review and comment. A public hearing will be held in any state that requests one. The PDT will also request comment from federal agencies and the public at large. After a 30-day review period, the PDT will summarize the comments and prepare a final version of the addendum for the Section.

The Section shall review the final version of the addendum prepared by the PDT, and shall also consider the public comments received and the recommendations of the Technical Committee, LEC and/or the Advisory Panel; and shall then decide whether to adopt, revise and adopt, or not pursue the addendum.

Upon adoption of an addendum implementing adaptive management by the Section, states shall prepare implementation plans, which describe how the state will carry out the compliance requirements of the addendum, and submit them to the Section for approval, according to a schedule to be contained in the addendum.

4.5.2 Measures Subject to Change

4.5.2.1 Limited Entry – Control Date

This amendment maintains the control date of June 7, 2011, established during the development of Amendment 2. The Section established this control date in the event that development of a limited entry program through the adaptive management process (refer *Section 4.5.1*) is warranted. The intention of the control date is to notify potential new entrants to the fishery that there is a strong possibility they will be treated differently from participants in the fishery prior to the control date. The Section may use historic landings and/or participation criteria for current and past participants as the limited entry system is established.

4.5.2.2 Measures Subject to Change through Adaptive Management

The following measures are subject to change under adaptive management upon approval by the Northern Shrimp Section:

(1) Biological Reference Points can be changed through Section action (no addendum necessary) per *Section 2.5* of this amendment
(2) Rebuilding target and schedule
(3) Gear requirements or prohibitions
(4) Management areas
(5) Harvest set-asides
(6) Limited/controlled entry (including, but not limited to, days-at-sea and ITQs/IFQs and catch shares)
(7) Catch controls (quotas)
(8) Vessel limits
(9) Recommendations to the Secretary of Commerce for complementary action
(10) Research or monitoring requirements
(11) Frequency of stock assessments
(12) Any other management measures included in Amendment 3 that are not subject to annual specification
(13) Vessel monitoring programs

4.6 EMERGENCY PROCEDURES

Emergency procedures may be used by the Northern Shrimp Section to require any emergency action that is not covered by or is an exception or change to any provision in Amendment 3. Procedures for implementation are addressed in the ASMFC ISFMP Charter, Section 6(c)(10) (ASMFC 2016).

4.7 MANAGEMENT INSTITUTIONS

4.7.1 Atlantic States Marine Fisheries Commission and ISFMP Policy Board

The Atlantic States Marine Fisheries Commission and the ISFMP Policy Board are generally responsible for the oversight and management of the Commissions fisheries management activities. The Commission must approve all fishery management plans and amendments thereto, including this Amendment; and make all final determinations concerning state compliance or noncompliance. The ISFMP Policy Board reviews recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.7.2 Northern Shrimp Section

The Northern Shrimp Section was established by the Commission's ISFMP Policy Board and is generally responsible for carrying out all activities under this Amendment. The Section is represented by appointed members from Maine, New Hampshire, and Massachusetts. Each state's delegation consists of the three representatives (commissioners), including the director of the state's marine fisheries agency, a governor's appointee, and a legislative appointee.

The Section is responsible for the management of the northern shrimp fishery and resource through the development and implementation of the Interstate Fishery Management Plan for Northern Shrimp. This responsibility involves soliciting public participation during the development of plan amendments and addenda, as well as during the annual fishery specification process. The Section establishes and oversees the activities of the Plan Review Team and the Technical Committee and appoints relevant and qualified industry representatives to the Commission's Northern Shrimp Advisory Panel. In addition, the Section adjusts and revises the management program under adaptive management and approves state programs implementing the plan amendments and alternative state programs. The Section reviews the status of state compliance with the FMP at least annually and, if it determines that a state is out of compliance, reports that determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.7.3 Northern Shrimp Plan Development/Review Team

The Plan Development Team (PDT) and the Plan Review Team (PRT) are composed of a small group of scientists and managers whose responsibility is to provide all of the staff support necessary to carry out and document the decisions of the Section. The Commission's Northern Shrimp Management Plan Coordinator chairs both teams. The Northern Shrimp PRT is directly responsible to the Section for providing information and documentation concerning the implementation, review, monitoring and enforcement of the FMP. The Northern Shrimp PDT is comprised of personnel from state and federal agencies who have scientific and management ability, and knowledge of northern shrimp. The PDT prepared all documentation necessary for the development of Amendment 3 using the best scientific information available and the most current stock assessment information.

4.7.4 Northern Shrimp Technical Committee

The Northern Shrimp Technical Committee consists of, at a minimum, one representative from each state agency with an interest in the Northern Shrimp fishery and one representative from the National Marine Fisheries Service. Its role is to act as a liaison to the individual state agencies, providing information to the management process and review and recommendations concerning the management program. The Technical Committee reports to the Section. The Section may appoint additional members to the Technical Committee, as needed.

4.7.5 Northern Shrimp Advisory Panel

Consistent with the Commission's Advisory Committee Charter, the Section appoints industry representatives to serve on the Northern Shrimp Advisory Panel. Members of the Advisory Panel are citizens who represent a cross-section of commercial fishing interests and provide guidance directly to the Section concerning the Commission's northern shrimp management program.

4.8 RECOMMENDATIONS TO THE SECRETARY FOR COMPLEMENTARY ACTIONS IN FEDERAL JURISDICTIONS

The Section may make recommendations to the Secretary of Commerce for complementary action in federal waters through the addendum or amendment process. There is no Federal representation on the Section and the Commission and states manage the fishery through the work of the Section. However, much of the fishery occurs in Federal waters and is prosecuted by fishermen with Federal fishery permits. To address this issue, NOAA Fisheries implemented exemptions to the Federal Northeast Multispecies (groundfish) Fishery to allow vessels fishing in Federal waters with gear capable of catching groundfish to participate in the small-mesh northern shrimp fishery. Those exemptions, set forth in 50 CFR 648.80(a)(5), allow vessels fishing in Federal waters with gear capable of catching groundfish to fish with a smaller mesh size when targeting shrimp, than what is allowable for the Multispecies fishery. Participants in the exemption program must also use a Nordmore grate system. Additionally, the exemption sets restrictions on incidental catch of other species such as whiting, hake, and lobster, and restricts participants to shrimping within the seasonal constraints adopted by the Commission.

4.9 COOPERATION WITH OTHER MANAGEMENT INSTITUTIONS

The Section will cooperate, when necessary, with other management institutions during the implementation of this amendment, including the National Marine Fisheries Service and the New England Fishery Management Council. There is no Federal fishery management plan for northern shrimp. Federal regulations exempt Federal groundfish vessels from the groundfish mesh sizes when participating in the shrimp fishery. The exemptions set forth incidental catch restrictions and require the use of a Nordmore grate. See Section 4.8 for additional information.

5.0 COMPLIANCE

Full implementation of the provisions of this Amendment is necessary for the management program to be equitable, efficient, and effective. States are expected to implement these measures faithfully under state laws. The ASMFC will continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. The Section sets forth specific elements states must implement in order to be in compliance with this fishery management plan and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC Interstate Fishery Management Program Charter (ASMFC 2016).

5.1 MANDATORY COMPLIANCE ELEMENTS FOR STATES

A state will be determined to be out of compliance with the provision of this fishery management plan according to the terms of Section Seven of the ISFMP Charter if:

- Its regulatory and management programs to implement *Section 4.0* have not been approved by the Northern Shrimp Section; or
- It fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.5*); or
- It has failed to implement a change to its program when determined necessary by the Northern Shrimp Section; or
- It makes a change to its regulations required under *Section 4.0*, or any addendum prepared under adaptive management (*Section 4.5*), without prior approval of the Northern Shrimp Section.

5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls on shrimp fisheries consistent with the requirements listed throughout *Section 4.0*, except that a state may propose an alternative management program under *Section 4.4*, which, if approved by the Section, may be implemented as an alternative regulatory requirement for compliance.

5.1.1.1 Regulatory Requirements

States are required to implement the provisions of Amendment 3 by the first day of the next approved fishing season, not including research set-aside fisheries under a moratorium. States may not implement any regulatory changes concerning northern shrimp, nor any management program changes that affect their responsibilities under this amendment, without first having those changes approved by the Section.

Each state must submit its required northern shrimp regulatory program to the Commission for approval by the Section. During the period from submission, until the Management Section makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law.

Management measures in the following sections are new or modified; states must implement the criteria within each section in order to be in compliance with Amendment 3:

- *Section 4.1.2: Total Allowable Catch (TAC) Allocation Program*
- *Section 4.1.3: Fishing Season*
- *Section 4.1.12: Size Sorting Grate System*

Once approved by the Section, states are required to obtain prior approval from the Section of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Section but may be implemented without prior Section approval. A state can request permission to implement an alternative to any mandatory compliance measure according to *Section 4.4*. All changes in state plans must be submitted in writing to the Section and to the Commission.

5.1.1.2 Monitoring Requirements

To be considered in compliance with this fishery management plan, all state programs must implement monitoring requirements consistent with *Section 3.1.1* and *Section 3.1.2*.

5.1.1.3 Research Requirements

No mandatory research requirements have been identified at this time. However, elements of state plans may be added to address any needs identified through implementation of Amendment 3.

5.1.1.4 Law Enforcement Requirements

All state programs must include law enforcement capabilities adequate for successfully implementing the jurisdiction's northern shrimp regulations. The adequacy of a state's enforcement activity will be measured by annual report to the ASMFC Law Enforcement Committee and the PRT.

5.1.1.5 Habitat Requirements

No mandatory habitat requirements have been identified at this time. Habitat requirements could be added at any time through adaptive management (*Section 4.5*).

5.1.2 Compliance Schedule

States must implement the provisions of this amendment no later than the first day of the next approved fishing season, not including research set-aside under a moratorium. States may begin implementation prior to this date when approved by the full Commission.

5.2 PROCEDURES FOR DETERMINING COMPLIANCE

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section Seven (ASMFC 2016). The following summary is not meant in any way to replace the language found in the ISFMP Charter.

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the Plan or Amendment must be submitted annually by each state with a declared interest. Compliance with Amendment 3 will be reviewed at least annually. The Section, Policy Board or the ASMFC may request the PRT to conduct a review of Plan implementation and compliance at any time.

The Northern Shrimp Section will review the written findings of the PRT within 60 days of receipt of a State's compliance report. Should the Section recommend to the Policy Board that a state be determined to be out of compliance, a rationale for the recommended noncompliance finding will be included addressing specifically the required measures of Amendment 3 (or subsequent addenda) that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes northern shrimp conservation, and the actions a state must take in order to comply with Amendment 3 (or subsequent addenda) requirements.

The ISFMP Policy Board will review any recommendation of noncompliance from the Northern Shrimp Section within 30 days. If it concurs in the recommendation, it shall recommend at that time to the ASMFC that a state be found out of compliance.

The Commission shall consider any noncompliance recommendation from the ISFMP Policy Board within 30 days. Any state that is the subject of a recommendation for a noncompliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the ISFMP Policy Board, it may determine that a state is not in compliance with Amendment 3 (or subsequent addenda), and specify the actions the state must take to come into compliance.

Any state that has been determined to be out of compliance may request that the Commission rescind its noncompliance findings, provided the state has revised its northern shrimp conservation measures or shown to the ISFMP Policy Board and/or Commission’s satisfaction that actions taken by the state provide for conservation equivalency.

5.3 ANALYSIS OF THE ENFORCEABILITY OF PROPOSED MEASURES

The ASMFC Law Enforcement Committee will, during the implementation of this amendment, analyze the enforceability of new conservation and management measures as they are proposed.

6.0 MANAGEMENT AND RESEARCH NEEDS

6.1 RESEARCH AND DATA NEEDS

Research recommendations from the 58th Northeast Regional Stock Assessment Workshop (58th SAW) are provided below (NEFSC 2014c). In addition to these recommendations, the NSTC emphasizes the importance of continuing the state-federal summer shrimp survey despite the current low abundance of shrimp and the closure of the shrimp fishery from 2014 – present.

- Fishery-Dependent Priorities

  - Improve separator and excluder devices to reduce bycatch and discard of non-targeted species and small shrimp in the shrimp fishery and fisheries targeting other species.
  - Evaluate selectivity of shrimp by traps and trawls.
  - Evaluate commercial fishery sampling design. Increase and/or redistribute sampling of commercial catches as necessary, ensuring appropriate allocation of samples among ports and months, to provide better estimates of size composition.
  - Continue to quantify the magnitude of bycatch of other species in the shrimp fishery by area and season and take steps necessary to limit negative impacts.
  - Better characterize shrimp discards in the shrimp and other small mesh (i.e., herring and whiting) fisheries to provide more accurate estimates of shrimp removals for modeling.
  - Continue sea sampling efforts.

- Fishery-Independent Priorities
  - Evaluate effectiveness of the state-federal summer shrimp survey statistical design, including geographic coverage.
  - Explore ways to sample age-1 and younger shrimp.
  - Verify that state-federal summer shrimp survey tow bottom tending times have been consistent.

- Modeling/Quantitative Priorities
  - Continue research to refine annual estimates of consumption by predators, and include in models as appropriate.
  - Explore explicit inclusion of temperature effects in stock assessment models.
  - Expand the time series of stock and recruitment data using catchability estimates from the production model.
  - Continue examination of methods for age determination to develop the possibility of using age based assessment methods.
  - Develop a bio-economic model to study the interactions between four variables: movements of shrimp, catchability of shrimp, days fished, and market price.
  - Continue to examine values of M. Revisit older work that established M=0.25 (Rinaldo 1973, 1976 and Clark 1981, 1982). Estimate M using various existing methods. Investigate annual and life history variation in M and potential causes.
  - The CSA model requires a parameter that is the ratio of catchabilities for the two age or size classes. Sensitivity analysis on the values used would contribute to a better understanding of model stability. A thorough evaluation of possible methods for improved estimation of this parameter could reduce uncertainty in the assessment.

- Life History, Biological, and Habitat Priorities
  - Investigate application of newly developed direct ageing methods to ground truth assumed ages based on size and stage compositions.

  - Evaluate larval and adult survival and growth, including frequency of molting and variation in growth rates, as a function of environmental factors and population density.
  - Study the effects of oceanographic and climatic variation (i.e., North Atlantic Oscillation) on the cold water refuges for shrimp in the Gulf of Maine.
  - Explore the mechanisms behind the stock-recruitment and temperature relationship for Gulf of Maine northern shrimp.
  - Determine the short and long-term effects of mobile fishing gear on shrimp habitat.
  - Study specific habitat requirements and develop habitat maps for early life history stages.
  - Evaluate effects of potential habitat loss/degradation on northern shrimp.
  - Identify migration routes of immature males offshore and ovigerous females inshore.
  - Evaluate maturation, fecundity, and lifetime spawning potential. Estimates of fecundity at length should be updated and the potential for annual variability should be explored.
  - Examine variability of egg quality with female size and stage over time.
  - Investigate changes in transition and maturation as a function of stock size and individual size and temperature.
  - Investigate diet of northern shrimp for different life history stages.

- Management, Law Enforcement, and Socioeconomic Priorities
  - Explore new markets for Gulf of Maine shrimp, including community supported fisheries.
  - Develop a framework to aid evaluation of the impact of limited entry proposals on the Maine fishing industry.
  - Characterize demographics of the fishing fleet by area and season. Perform comparative analysis of fishing practices between areas.
  - Develop an understanding of product flow and utilization through the marketplace. Identify performance indicators for various sectors of the shrimp industry. Identify significant variables driving market prices and how their dynamic interactions result in the observed intra-annual and inter-annual fluctuations in market price for northern shrimp.
  - Develop a socioeconomic analysis assessing the importance of the northern shrimp fishery in annual activities of commercial fishing.
  - Determine the relative power relationships between the harvesting and processing sector and the larger markets for shrimp and shrimp products.
  - Develop an economic-management model to determine the most profitable times to fish, how harvest timing affects markets, and how the market affects the timing of harvesting.
  - Perform cost-benefit analyses to evaluate management measures.

7.0 PROTECTED SPECIES

7.1 SPECIES PRESENT IN THE AREA

Numerous protected species inhabit the affected environment within the northern shrimp FMP management unit (Table 6). These species are under NOAA Fisheries jurisdiction and are afforded protection under the Endangered Species Act (ESA) of 1973 and/or the Marine Mammal Protection Act (MMPA) of 1972.

Cusk is a NOAA Fisheries "candidate species" under the ESA. Candidate species are those petitioned species for which NOAA Fisheries has determined that listing may be warranted under the ESA and those species for which NOAA Fisheries has initiated an ESA status review through an announcement in the Federal Register. If a species is proposed for listing the conference provisions under Section 7 of the ESA apply (see 50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. As a result these species will not be discussed further in this and the following sections; however, NOAA Fisheries recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed action. Additional information on cusk's candidate listing can be found at http://www.nmfs.noaa.gov/pr/species/esa/candidate.htm.

7.2 SPECIES AND CRITICAL HABITAT NOT LIKELY AFFECTED BY THE PROPOSED ACTION

Based on available information, it has been determined that this action is not likely to affect multiple ESA listed species or any designated critical habitat (Table 6). This determination has been made because either the species (e.g., sea turtles) does not occur in the Gulf of Maine when the fishery operates (i.e., December to May) or there have never been documented interactions between the ESA listed species (e.g., shortnose sturgeon) and the primary gear type (i.e., bottom trawl and trap/pot) used to prosecute the northern shrimp fishery (Epperly et al. 1995a, 1995b, 1995c; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Griffin et al. 2013; Shoop and Kenney 1992; NOAA Fisheries NEFSC FSB 2015, 2016). In the case of critical habitat, this determination has been made because the action will not affect the essential physical and biological features of North Atlantic right whale critical habitat and therefore, will not result in the destruction or adverse modification to this species' critical habitat (NOAA Fisheries 2015a and 2015b).

7.3 SPECIES POTENTIALLY AFFECTED BY THE PROPOSED ACTION

Table 6 provides a list of marine mammal and fish species present in the affected environment of the northern shrimp fishery, and that may also be affected by the operation of this fishery. Of primary concern is the potential for the fishery to interact (e.g., bycatch, entanglement) with these species. To understand the potential risk of an interaction, it is necessary to consider (1) species occurrence in the affected environment of the fishery and how the fishery will overlap in time and space with this occurrence; and (2) data and observed records of protected species interaction with particular fishing gear types. Information on species occurrence in the affected environment of the northern shrimp fishery is provided in this section, while information on protected species interactions with specific fishery gear is provided in *Section 7.4*.

7.3.1 Marine Mammals

7.3.1.1 Large Whales

As provided in *Section 7.1*, North Atlantic right, humpback, fin, sei, and minke whales will occur in the affected environment of the northern shrimp fishery. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; NOAA Fisheries 1991, 2005, 2010, 2011, 2012). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., right and humpback whales) a portion of the population remains in higher latitudes throughout the winter (Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; Khan et al. 2009, 2010, 2011, 2012; Brown et al. 2002; NOAA 2008; Cole et al. 2013; Clapham et al. 1993; Swingle et al. 1993; Vu et al. 2012). Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movements of large whales to foraging grounds in the spring/summer is better understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Mayo and Marx 1990; Kenney et al. 1986, 1995; Baumgartner et al. 2003; Baumgartner and Mate 2003; Payne et al.1986, 1990; Brown et al. 2002; Kenney and Hartley 2001; Schilling et al. 1992). For additional information on the biology, status, and distribution of each whale species refer to: Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; NOAA Fisheries 1991, 2005, 2010, 2011, and 2012.

To further assist in understanding how the northern shrimp fishery may overlap in time and space with the occurrence of large whales, a general overview on species occurrence and distribution in the area of operation for the northern shrimp fishery is provided in Table 7.

7.3.1.2 Small Cetacean

Per Table 6, Atlantic white sided dolphins, long- finned pilot whales, short beaked common dolphins, and harbor porpoise will occur in the affected environment of the northern shrimp fishery (Waring et al. 2014; Waring et al. 2015; Waring et al. 2016). Within this range; however, there are seasonal shifts in species distribution and abundance. To further assist in understanding how northern shrimp fishery may overlap in time and space with the occurrence of these small cetaceans, a general overview of species occurrence and distribution in the area of operation for the northern shrimp fishery is provided in Table 8. For additional information on the biology, status, and distribution of each small cetacean species refer to Waring et al. (2014), Waring et al. (2015), and Waring et al. (2016).

7.3.1.3 Pinnipeds

Per Table 6, harbor, gray, harp, and hooded seals will occur in the affected environment of the northern shrimp fishery. Specifically, pinnipeds are found in the nearshore, coastal waters of the Northwest Atlantic Ocean. They are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35oN) (Waring et al. 2007, 2014, 2015, 2016). To further assist in understanding how the northern shrimp fishery may overlap in time and space with the occurrence of pinnipeds, a general overview of pinniped species occurrence and distribution in the area of operation of the northern shrimp fishery is provided in Table 9. For additional information on the biology, status, and distribution of each species of pinniped refer to Waring et al. (2007), Waring et al. (2014), Waring et al. (2015), and Waring et al. (2016).

7.3.2 Atlantic Sturgeon

Table 6 lists the five DPSs of Atlantic sturgeon that occur in the affected environment of the northern shrimp fishery and that may be affected by the operation of this fishery. The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five DPSs of Atlantic sturgeon have the potential to be located anywhere in this marine range; in fact, results from genetic studies show that, regardless of location, multiple DPSs can be found at any one location along the Northwest Atlantic coast (ASSRT 2007; Dovel and Berggren 1983; Dadswell et al. 1984; Kynard et al. 2000; Stein et al. 2004a; Dadswell 2006; Laney et al. 2007; Dunton et al. 2010; Dunton et al. 2012; Dunton et al. 2015; Erickson et al. 2011; Wirgin et al. 2012; O'Leary et al. 2014; Waldman et al. 2013; Wirgin et al. 2015a and 2015b).

Based on fishery-independent and -dependent data, as well as data collected from tracking and tagging studies, Atlantic sturgeon appear to primarily occur inshore of the 50-meter depth contour (Stein et al. 2004a and 2004b; Erickson et al. 2011; Dunton et al. 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein et al. 2004a and 2004b; Dunton et al. 2010; Erickson et al. 2011). Data from fishery-independent surveys and tagging and tracking studies also indicate that Atlantic sturgeon undertake seasonal movements along the coast. For instance, satellite-tagged adult sturgeon from the Hudson River are found to have concentrated in the southern part of the Mid-Atlantic Bight, at depths greater than 20 meters, during winter and spring, while in the summer and fall, Atlantic sturgeon concentrations shifted to the northern portion of the Mid-Atlantic Bight at depths less than 20 meters (Erickson et al. 2011). A similar seasonal trend was found by Dunton et al. 2010. Analysis of fishery-independent survey data indicated a coastwide distribution of Atlantic sturgeon during the spring and fall; a southerly (e.g., North Carolina, Virginia) distribution during the winter; and a centrally located (e.g., Long Island to Delaware) distribution during the summer. Although studies such as Erickson et al. (2011) and Dunton et al. (2010) provide some indication that Atlantic sturgeon are undertaking seasonal movements horizontally and vertically along the U.S. eastern coastline, there is no evidence to date that all Atlantic sturgeon make these seasonal movements. For instance, during inshore surveys conducted by the Northeast Fisheries Science Center in the Gulf of Maine, Atlantic sturgeon have been caught in the fall, winter, and spring between the Saco and Kennebec Rivers (Dunton et al. 2010; Wipplehauser 2012).

Within the marine range of Atlantic sturgeon, several marine aggregation areas have been identified adjacent to estuaries and/or coastal features formed by bay mouths and inlets along the U.S. eastern seaboard. Depths in these areas are generally no greater than 25 meters (Stein et al. 2004a; Laney et al. 2007; Dunton et al. 2010; Erickson et al. 2011). Although additional studies are still needed to clarify why these particular sites are chosen by Atlantic sturgeon, there is some indication that they may serve as thermal refuges, wintering sites, or marine foraging areas (Stein et al. 2004a; Dunton et al. 2010; Erickson et al. 2011). The following are the currently known marine aggregation sites located within the operational range of the northern shrimp fishery:

- Massachusetts Bay (Stein et al. 2004a);
- and Kennebec River Estuary (Wipplehauser 2012; Whipplehauser and Squiers 2015)

In addition, since listing of the five Atlantic sturgeon DPSs, numerous genetic studies have addressed DPS distribution and composition in marine waters of the Northwest Atlantic (e.g., Wirgin et al. 2012; Wirgin et al. 2015a and 2015b; Waldman et al. 2013; O'Leary et al. 2014; Dunton et al. 2012)[1]. These studies show that Atlantic sturgeon from multiple DPSs can be found at any single location along the Northwest Atlantic coast, with the Mid-Atlantic locations consistently comprised of all five DPSs (Wirgin et al. 2012; Wirgin et al. 2015a,b;Waldman et al. 2013; O'Leary et al. 2014; Dunton et al. 2012; Damon-Randall et al. 2013). Although additional studies are needed to further clarify the DPS distribution and composition in non-natal estuaries and coastal locations, these studies provide some initial insight on DPS distribution and co-occurrence in particular areas along the U.S. eastern seaboard.

7.3.3 Atlantic Salmon (Gulf of Maine DPS)

The wild populations of Atlantic salmon are listed as endangered under the ESA. Their freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, while the marine range of the GOM DPS extends from the GOM (primarily northern portion of the GOM), to the coast of Greenland (Fay et al. 2006; NOAA Fisheries & USFWS 2005). In general, smolts, post-smolts, and adult Atlantic salmon may be present in the GOM and coastal waters of Maine in the spring (beginning in April), and adults may be present throughout the summer and fall months (Baum 1997; Fay et al. 2006; Hyvarinen et al. 2006; Lacroix & Knox 2005; Lacroix & McCurdy 1996; Lacroix et al. 2004; NOAA Fisheries & USFWS 2005; Reddin 1985; Reddin & Friedland 1993; Reddin & Short 1991). For additional information on the on the biology, status, and distribution of the GOM DPS of Atlantic salmon, refer to NOAA Fisheries and USFWS (2005) and Fay et al. (2006). Based on the above information, as the northern shrimp fishery operates in the GOM, it is possible that the fishery will overlap in time and space with Atlantic salmon migrating northeasterly between U.S. and Canadian waters.

[1] Genetic studies did not sample Atlantic sturgeon south of North Carolina.

7.4 INTERACTIONS BETWEEN GEAR AND PROTECTED RESOURCES

Protected species described in *Section 7.1* are all known to be vulnerable to interactions with various types of fishing gear. Available information on gear interactions with a given species (or species group) is provided in the sections below. These sections are not a comprehensive review of all fishing gear types known to interact with a given species; emphasis is only being placed on the primary gear types used to prosecute the northern shrimp fishery (i.e., bottom trawl gear and trap/pot).

7.4.1 Marine Mammals

Depending on species, marine mammals have been observed seriously injured or killed in bottom trawl and/or trap/pot gear. Pursuant to the MMPA, NOAA Fisheries publishes a List of Fisheries (LOF) annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions; 82 FR 3655 (January 12, 2017)). In the Northwest Atlantic, the 2017 MMPA LOF (82 FR 3655 (January 12, 2017) categorizes commercial northeast bottom trawl and Atlantic mixed species trap/pot fisheries as Category II fisheries[2].

7.4.1.1 Large Cetaceans

Bottom Trawl Gear

With the exception of minke whales, there have been no observed interactions with large whales and bottom trawl gear. To date, bottom trawl interactions with minke whales have only been observed in the MMPA LOF Category II northeast bottom trawl fisheries. From the period of 2008-2012, the estimated annual mortality attributed to this fishery was 7.8 minke whales for 2008, and zero minke whales from 2009-2012; no serious injuries were reported during this time (Waring et al. 2015). Based on this information, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the northeast bottom trawl fishery was 1.6 (CV=0.69) whales (Waring et al. 2015). Lyssikatos (2015) estimated that from 2008-2013, mean annual serious injuries and mortalities from the northeast bottom trawl fishery were 1.40 (CV=0.58) minke whales. Based on this information, bottom trawl gear is likely to pose a low interaction risk to any large whale species. However, should an interaction with a large whale occur, serious injury or mortality is possible.

Fixed Fishing Gear (e.g., Trap/Pot Gear)

The greatest entanglement risk to large whales is posed by fixed fishing gear (e.g., sink gillnet and trap/pot gear) comprised of lines (vertical or ground) that rise into the water column. Any line can become entangled in the mouth (baleen), flippers, and/or tail of the whale when the animal is transiting or foraging through the water column (Johnson et al. 2005; NOAA Fisheries 2014; Kenney and Hartley 2001; Hartley et al. 2003; Whittingham et al. 2005a and 2005b). For instance, in a study of right and humpback whale entanglements, Johnson et al. (2005)

[2] Atlantic mixed species trap/pot fisheries include, but are not limited to: crab (red, Jonah, and rock), hagfish, finfish (black sea bass, scup, tautog, cod, haddock, pollock, redfish (ocean perch), and white hake), conch/whelk, and shrimp

attributed: (1) 89% of entanglement cases, where gear could be identified, to fixed gear consisting of pot and gillnets and (2) entanglement of one or more body parts of large whales (e.g., mouth and/or tail regions) to four different types of line associated with fixed gear (the buoy line, groundline, floatline, and surface system lines)[3]. Although available data, such as Johnson et al. (2005), provides insight into large whale entanglement risks with fixed fishing gear, to date, due to uncertainties surrounding the nature of the entanglement event, as well as unknown biases associated with reporting effort and the lack of information about the types and amounts of gear being used, determining which part of fixed gear creates the most entanglement risk for large whales is difficult (Johnson et al. 2005). As a result, any type or part of fixed gear is considered to create an entanglement risk to large whales and should be considered potentially dangerous to large whale species (Johnson et al. 2005).

The effects of entanglement to large whales range from no injury to death (NOAA Fisheries 2014; Johnson et al. 2005; Angliss and Demaster 1998; Moore and Van der Hoop 2012). The risk of injury or death in the event of an entanglement may depend on the characteristics of the whale involved (species, size, age, health, etc.), the nature of the gear (e.g., whether the gear incorporates weak links designed to help an entangled whale break free), human intervention (e.g., the feasibility or success of disentanglement efforts), or other variables (NOAA Fisheries 2014). Although the interrelationships among these factors are not fully understood, and the data needed to provide a more complete characterization of risk are not available, to date, available data indicates that entanglement in fixed fishing gear is a significant source of serious injury or mortality for Atlantic large whales (Table 10; Henry et al. 2016; Waring et al. 2016).

Table 10 summarizes confirmed human-caused injury and mortality to humpback, fin, sei, minke, and North Atlantic right whales along the Gulf of Mexico Coast, U.S. East Coast, and Atlantic Canadian Provinces from 2010 to 2014 (Henry et al. 2016); it is specific to confirmed injury or mortality to whales from entanglement in fishing gear. As many entanglement events go unobserved, and because the gear type, fishery, and/or country of origin for reported entanglement events are often not traceable, the information presented in Table 10 likely underestimates the rate of large whale serious injury and mortality due to entanglement. Studies looking at scar rates for right whales and humpbacks suggests that entanglements may be occurring more frequently than the observed incidences indicate (NOAA Fisheries 2014; Robbins 2009; Knowlton et al. 2012).

As noted in *Section 7.4.1*, pursuant to the MMPA, NOAA Fisheries publishes a LOF annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injurious and mortalities of marine mammals in each fishery. Large whales, in particular, humpback, fin, minke, and North Atlantic right whales, are known to interact with Category I and II fisheries in the (Northwest) Atlantic Ocean. As Sei, fin, and North

[3] Buoy line connects the gear at the bottom to the surface system. Groundline in trap/pot gear connects traps/pots to each other to form trawls; in gillnet gear, groundline connects a gillnet or gillnet bridle to an anchor or buoy line. Floatline is the portion of gillnet gear from which the mesh portion of the net is hung. The surface system includes buoys and high-flyers, as well as the lines that connect these components to the buoy line.

Atlantic right whales are listed as endangered under the ESA, these species are considered strategic stocks under the MMPA (see Table 6). Section 118(f)(1) of the MMPA requires the preparation and implementation of a Take Reduction Plan (TRP) for any strategic marine mammal stock that interacts with Category I or II fisheries. In response to its obligations under the MMPA, in 1996, NOAA Fisheries established the Atlantic Large Whale Take Reduction Team (ALWTRT) to develop a plan (Atlantic Large Whale Take Reduction Plan (ALWTRP or Plan)) to reduce serious injury to, or mortality of large whales, specifically, humpback, fin, and North Atlantic right whales, due to incidental entanglement in U.S. commercial fishing gear[4]. In 1997, the ALWTRP was implemented; however, since 1997, the Plan has been modified; recent adjustments include the Sinking Groundline Rule and Vertical Line Rules (72 FR 57104, October 5, 2007; 79 FR 36586, June 27, 2014; 79 FR 73848, December 12, 2014; 80 FR 14345, March 19, 2015; 80 FR 30367, May 28, 2015).

The Plan consists of regulatory (e.g., universal gear requirements, modifications, and requirements; area- and season- specific gear modification requirements and restrictions; time/area closures) and non-regulatory measures (e.g., gear research and development, disentanglement, education and outreach) that, in combination, seek to assist in the recovery of North Atlantic right, humpback, and fin whales by addressing and mitigating the risk of entanglement in gear employed by commercial fisheries, specifically trap/pot and gillnet fisheries (http://www.greateratlantic.fisheries.noaa.gov/Protected/whaletrp/; 73 FR 51228; 79 FR 36586; 79 FR 73848; 80 FR 14345; 80 FR 30367). The Plan recognizes trap/pot and gillnet Management Areas in Northeast, Mid-Atlantic, and Southeast regions of the U.S, and identifies gear modification requirements and restrictions for Category I and II gillnet and trap/pot fisheries in these regions; these Category I and II fisheries must comply with all regulations of the Plan.

7.4.1.2 Small Cetaceans and Pinnipeds

Bottom Trawl Gear

Small cetaceans and pinnipeds are vulnerable to interactions with bottom trawl gear. Species that have been observed incidentally injured and/or killed by MMPA Category II (occasional interactions) northeast bottom trawl fishery are provided in Table 11 (Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; 82 FR 3655 (January 12, 2017)). Of the marine mammal species listed, short-beaked common dolphins and Atlantic white-sided dolphins are the most frequently observed bycatch in the northeast bottom trawl gear, followed by gray seals, long-finned pilot whales, and Risso's dolphins (Lyssikatos 2015).

In 2006, the Atlantic Trawl Gear Take Reduction Team (ATGTRT) convened to address the incidental mortality and serious injury of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), common dolphins (*Delphinus delphis*), and white sided dolphins (*Lagenorhynchus acutus*) with bottom and mid-water trawl fisheries operating in both the Northeast and Mid-Atlantic regions. Because none of the marine mammal

[4] The measures identified in the ALWTRP are also beneficial to the survival of the minke whale, which are also known to be incidentally taken in commercial fishing gear.

stocks of concern to the ATGTRT are classified as a “strategic stock,” nor do they currently interact with a Category I fishery, it was determined at the time that development of a take reduction plan was not necessary.

In lieu of a take reduction plan, the ATGTRT agreed to develop strategies (ATGTRS) to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero mortality and serious injury rates. The ATGTRS identifies informational and research tasks, as well as education and outreach needs the ATGTRT believes are necessary. The ATGTRS also identifies several potential voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals.

Pot/Trap Gear
Over the past several years, observer coverage has been limited for fisheries prosecuted with trap/pot gear. In the absence of extensive observer data for these fisheries, stranding data provides the next best source of information on species interactions with trap/pot gear. Based on a review of stranding data for small cetacean and pinniped species provided in *Section 7.1*, there are no reports of trap/pot interactions or incidences of serious injury or mortality caused by pot/trap gear with small cetaceans and pinnipeds (see http://www.nmfs.noaa.gov for more information). As a result, trap pot gear is not expected to pose an interaction risk to these species. However, it is important to note, stranding data underestimates the extent of human-related mortality and serious injury because not all of the marine mammals that die or are seriously injured in human interactions are discovered, reported, or show signs of entanglement. Additionally, if gear is present, it is often difficult to definitively attribute the animal’s death to the gear interaction, or if pieces of gear are absent, attribute the death or serious injury to a specific fishery or fishing gear type. As a result, these conclusions should be taken with these considerations in mind, and with an understanding that interactions may occur more frequently than what we are able to detect at this time.

7.4.2 Atlantic Sturgeon

Bottom Trawl Gear
Atlantic sturgeon are known to interact with bottom trawl gear and in fact, since 1989, have been observed in bottom otter trawl gear where the primary species being targeted was Northern shrimp (NOAA Fisheries NEFSC FSB 2015, 2016). To understand the interaction risk between bottom otter trawls and Atlantic sturgeon, there are three documents that use data collected by the Northeast Fisheries Observer Program (NEFOP) to describe bycatch of Atlantic sturgeon in bottom otter trawl and sink gillnet gears: Stein et al. (2004b); ASMFC (2007); and Miller and Shepard (2011); none of these provide estimates of Atlantic sturgeon bycatch by DPS. Information provided in all three documents indicate that sturgeon bycatch occurs in bottom otter trawl gear, with the most recent document estimating, based on fishery observer data and Vessel Trip Report data from 2006-2010, that annual bycatch of Atlantic sturgeon is 1,342 animals (Miller and Shepard 2011; NOAA Fisheries 2013). Specifically, Miller and Shepard (2011) observed Atlantic sturgeon interactions in trawl gear with small (< 5.5 inches) and large (≥ 5.5 inches) mesh sizes. Although Atlantic sturgeon were observed to interact with trawl gear with various mesh sizes, based on observer data, Miller and Shepard (2011) concluded that of

the possible fishing gear types, in general, trawl gear posed less of a mortality risk to Atlantic sturgeon than gillnet gear (i.e., estimated mortality rates in gillnet gear were 20.0%, while those in otter trawl gear were 5.0%); similar conclusions were reached in Stein et al. (2004b) and ASMFC (2007). However, although Atlantic sturgeon deaths have rarely been reported in bottom otter trawl gear (ASMFC 2007), it is important to recognize that effects of an interaction may occur long after the interaction and therefore, until additional studies are conducted, it remains uncertain what the overall impacts to Atlantic sturgeon survival are from trawl interactions (Beardsall et al. 2013). As a result, trawls should not be completely discounted as a form of gear that poses a mortality risk to Atlantic sturgeon. Further, even if an animal is released alive, pursuant to the ESA, any Atlantic sturgeon interaction with fishing gear is considered take.

Pot/Trap Gear:
To date, there have been no observed/documented interactions with Atlantic sturgeon and trap/pot gear (NOAA Fisheries NEFSC FSB 2015, 2016). Based on this information, trap/pot gear is not expected to pose an interaction risk to any Atlantic sturgeon.

7.4.3 Atlantic Salmon

Bottom Trawl Gear
According to the Biological Opinion issued by NOAA Fisheries GARFO on December 16, 2013, NOAA Fisheries Northeast Fisheries Science Center's (NEFSC) Northeast Fisheries Observer and At-Sea Monitoring Programs documented a total of 15 individual salmon incidentally caught on 60,000 observed commercial fishing trips from 1989 through August 2013 (NOAA Fisheries 2013; Kocik et al. 2014). Specifically, Atlantic salmon were an observed bycatch in gillnet and bottom otter trawl gear, with 10 of the incidentally caught salmon listed as "discarded" and five reported as mortalities (Kocik (NEFSC), personal communication (February 11, 2013)[5]. Since 2013, no additional Atlantic salmon have been observed in gillnet or bottom trawl (NOAA Fisheries NEFSC FSB 2015 and 2016). Therefore, the very low number of observed Atlantic salmon interactions in trawl gear over the past 26 years, suggests that interactions with Atlantic salmon are rare events (NOAA Fisheries 2013; Kocik et al. 2014).

Pot/Trap Gear
To date, there have been no observed/documented interactions with Atlantic salmon and trap/pot gear (NOAA Fisheries NEFSC FSB 2015, 2016). Therefore, trap/pot gear is not expected to pose an interaction risk to Atlantic salmon.

[5] The genetic identity of the 15 captured salmon is unknown; however, the NOAA Fisheries 2013 Biological Opinion considers all 15 fish to be part of the GOM Distinct Population Segment, although some may have originated from the Connecticut River restocking program (i.e., those caught south of Cape Cod, Massachusetts).

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9.0 TABLES AND FIGURES

TABLES

Table 1. Management of the Gulf of Maine Northern Shrimp Resource, 1973 – 2017.

Northern Shrimp Section Action Taken	
1973	Provisions for gear evaluation Establishment of studies
1974	Adoption of interim minimum mesh size regulation requiring use of trawls with stretched mesh sizes of not less than 38 mm (1.5 inches) in the body and 44.5 mm (1.75 in) in the cod end.
1975	Establishment of regulations requiring use of trawls with stretched mesh sizes of not less than 44.5 mm (1.75 inches) in the body and cod end (effective October, 1975) Closure of the fishery from July – September, 1975.
1976	Open season from January 1 – May 15, 1976, followed by indefinite closure. Continuation of mesh regulations.
1977	Open season from January 1 – May 15, 1977, followed by indefinite closure. Restrictions of 1977 harvest to 1,600 mt (3.5 million lbs) Continuation of mesh regulations.
1978	Continuation of closure through 1978.
1979	Open season from February 1 – March 31, 1979, followed by indefinite closure. Continuation of mesh regulations.
1980	Open season from February 15 – May 31, 1980, followed by indefinite closure. Continuation of mesh regulations.
1981	Open season from January 1 – May 15, 1981, followed by indefinite closure. Continuations of mesh regulations.
1982	Open season from January 1 – April 15, 1982. Continuation of mesh regulations.
1983	Open season December 15, 1982 – April 30, 1983 with possible 15 day extension with 70 count size limit. Continuation of mesh regulations.

Northern Shrimp Section Action Taken	
1984	Open season December 15, 1983 – April 30, 1984 with a possible extension of 15 days or until count exceeds 70/pound for any one trip. Continuation of mesh regulations.
1985	Open season December 1, 1984 – May 15, 1985. During May, landed count shall not exceed 70/pound or season closed immediately. Continuation of mesh regulations.
1986	Open season December 1, 1985 – May 31, 1986. Continuation of mesh regulations. Two week emergency opening June 8 – June 21 with 70 count maximum.
1987	Open season December 1, 1986 – May 31, 1987. Continuation of mesh regulations. Eliminate mesh size tolerance (1/4 Inch) in cod end by 1988 season.
1988	Full season. December 1, 1987 – May 31, 1988. 1-3/4 inch mesh required, 1/8 inch tolerance in body and wings, 2 inch mesh in cod end in April and May, 1988.
1989	Full season. December 1, 1988 – May 31, 1989. 1/8 inch tolerance in net, no tolerance in cod end. Approved separator trawl used in April and May, 1989.
1990	Full season. December 1, 1989 – May 31, 1990. 1-3/4 inch mesh net with no tolerance. Approved separator trawl must be used December, April and May.
1991	Full season. December 1, 1990 – May 31, 1991. 1-3/4 inch mesh net, separator panel must be 11 inch mesh, quarter to quarter.
1992	Season December 16, 1991 – May 15, 1992. 1-3/4 inch mesh net. No Sunday fishing. Separator trawl December 16, 1991 through March 31, 1992. Nordmore grate April 1, 1992 – May 15, 1992.
1993	Season December 14, 1992 – April 30, 1993. 1-3/4 inch mesh net. No Sunday fishing. Nordmore grate and 11 inch panel required. Exemption to Nordmore grate January – March if bycatch proven to be low.

NORTHERN SHRIMP SECTION ACTION TAKEN	
1994	Season December 1, 1993 – April 15, 1994. 1-3/4 inch mesh net. 15 fathom bare wire bottom legs. Nordmore grate all season, no exemptions. (122 days)
1995	Season December 1, 1994 – April 30, 1995. 1-3/4 inch mesh net. 15 Fathom bare wire bottom legs. Nordmore grate all season, no exemptions. No fishing on Sunday (or Friday as substitute). (128 days)
1996	Full season with one day/week off. Also, trappers to start January 1, 1996. (Review of effort at mid-season?) (152 days)
1997	Season December 1, 1996 – May 27, 1997 with two 5-day and four 4-day blocks off. (156 days)
1998	Season December 8 – 24, 1997; January 1, 1998 – March 15, 1998; April 1, 1998 – May 22, 1998 with weekends off. (105 days)
1999	Season December 15 – 23, January 4 - 26, February 1 – 23, March 1 – 16, April 1 – 28, May 2 – 25 with weekends off. (90 days)
2000	Season January 17, 2000 – March 15, 2000. (59 days)
2001	Season January 9– March 17, 2001, April 16 – 30, 2001. (83 days)
2002	Season February 15 – March 11, 2002. (25 days)
2003	Season January 19 – March 12, 2003 with Saturdays and Sundays off. (38 days)
2004	Season January 19 – March 12, 2004 with Saturdays and Sundays off. (40 days)
2005	Season December 19 – 23, 2004; December 26 – 30, 2004 with Friday and Saturdays off; and January 3 – March 25, 2005, with Saturdays and Sundays off. (70 days)
2006	Season December 12, 2005– April 30, 2006. (140 days)

Northern Shrimp Section Action Taken	
2007	Season December 1, 2006– April 30, 2007. (151 days)
2008	Season December 1, 2007– April 30, 2008. (152 days)
2009	Season December 12, 2008– May 29, 2009. (180 days)
2010	Season December 1, 2009– May 5, 2010* (156 days) *Emergency action taken to close the fishery 24 days early
2011	Season December 1, 2010– February 28, 2011* (90 days) *Emergency action taken to close the fishery 46 days early. TAC set at 4,000 mt.
2012	Trawlers begin January 2 with three landings day per week and trappers begin on February 1 with a 1,000 pounds limit per vessel per day. TAC set at 2,211 mt. *Emergency action taken to close the fishery on February 17
2013	TAC set at 625 mt and allocated 87% to the trawl fishery and 13% to the trap fishery (with 5.44 mt set aside for RSA) and would close when 85% of the TAC in each fishery closed.
2014	Moratorium due to stock collapse; Maine DMR contracted one shrimp trawler to collect samples during the winter
2015	Moratorium; 25 mt RSA for cooperative winter sampling program Four trawlers with a 1,800 lbs/trip limit (sale of catch permitted); five trappers with 10 trap and 100 lbs/week limit (sale of catch not permitted)
2016	Moratorium; 22 mt RSA for cooperative winter sampling program Four trawlers with a 1,800 lbs/trip limit and two trappers with a 40 traps and 600 lbs/week limit. Sale of catch permitted for both trappers and trawlers.
2017	Moratorium; 53 mt RSA for winter sampling 10 trawlers fishing one trip/week for 8 consecutive weeks and a 1,200 lbs/trip limit; five trappers fishing for 8 consecutive weeks with a 500 lbs/week limit and 40 trap limit per vessel

Table 2: U.S. commercial landings (mt) of northern shrimp in the Gulf of Maine, by year (1958–1984, left) or by season (1985–2016, right). Landings by season include the previous December. No shrimp were sold or purchased from cooperative winter sampling in 2014. Landings in 2015 and 2016 are from the RSA Program.

Year	Maine	Mass.	New Hamp.	Total
1958	2.2	0.0	0.0	2.2
1959	5.5	2.3	0.0	7.8
1960	40.4	0.5	0.0	40.9
1961	30.5	0.3	0.0	30.8
1962	159.5	16.2	0.0	175.7
1963	244.3	10.4	0.0	254.7
1964	419.4	3.1	0.0	422.5
1965	941.3	8.0	0.0	949.3
1966	1,737.8	10.5	18.1	1,766.4
1967	3,141.2	10.0	20.0	3,171.2
1968	6,515.2	51.9	43.1	6,610.2
1969	10,993.1	1,773.1	58.1	12,824.3
1970	7,712.8	2,902.3	54.4	10,669.5
1971	8,354.8	2,724.0	50.8	11,129.6
1972	7,515.6	3,504.6	74.8	11,095.0
1973	5,476.6	3,868.2	59.9	9,404.7
1974	4,430.7	3,477.3	36.7	7,944.7
1975	3,177.2	2,080.0	29.4	5,286.6
1976	617.3	397.8	7.3	1,022.4
1977	142.1	236.9	2.2	381.2
1978	0.0	3.3	0.0	3.3
1979	32.8	405.9	0.0	438.7
1980	69.6	256.9	6.3	332.8
1981	530.0	539.4	4.5	1,073.9
1982	883.0	658.5	32.8	1,574.3
1983	1,029.2	508.2	36.5	1,573.9
1984	2,564.7	565.4	96.8	3,226.9

*Season	Maine	Mass.	New Hamp.	Total
1985	2,946.4	968.8	216.7	4,131.9
1986	3,268.2	1,136.3	230.5	4,635.0
1987	3,680.2	1,427.9	157.9	5,266.0
1988	2,258.4	619.6	157.6	3,035.6
1989	2,384.0	699.9	231.5	3,315.4
1990	3,236.3	974.9	451.3	4,662.5
1991	2,488.6	814.6	282.1	3,585.3
1992	3,070.6	289.3	100.1	3,460.0
1993	1,492.5	292.8	357.6	2,142.9
1994	2,239.7	247.5	428.0	2,915.2
1995	5,013.7	670.1	772.8	6,456.6
1996	8,107.1	660.6	771.7	9,539.4
1997	6,086.9	366.4	666.2	7,119.5
1998	3,481.3	240.3	445.2	4,166.8
1999	1,573.2	75.7	217.0	1,865.9
2000	2,516.2	124.1	214.7	2,855.0
2001	1,075.2	49.4	206.4	1,331.0
2002	391.6	8.1	53.0	452.7
2003	1,203.7	27.7	113.0	1,344.4
2004	1,926.9	21.3	183.2	2,131.4
2005	2,270.2	49.6	290.3	2,610.1
2006	2,201.6	30.0	91.1	2,322.7
2007	4,469.3	27.5	382.9	4,879.7
2008	4,515.8	29.9	416.8	4,962.4
2009	2,315.7	MA & NH: 185.6		2,501.3
2010	5,721.4	35.1	506.8	6,263.3
2011	5,569.7	196.4	631.5	6,397.5
2012	2,219.9	77.8	187.8	2,485.4
2013	289.7	18.9	36.9	345.5
2014	0.0	0.0	0.0	0.0
2015	6.1	0.6	0.0	6.7
2016	11.5	0.0	1.8	13.3

* Landings by Season include the previous December.

Table 3: Stratified geometric mean number (abundance) and weight (biomass, kg) per tow and derived indices of northern shrimp from the state-federal summer shrimp surveys (strata 1, 3, 5, 6, 7 and 8). Recruit index is abundance of presumed age 1.5 shrimp. Other derived indices are described in text. YC=year class, EPI=egg production index.

Year	N Tows	Total Abundance	Total Biomass	Recruit Index	Spawner Biomass	EPI millions	YC Survival index	>22 mm* Number	>22 mm Weight (kg)
1984	37	1,152	10.5	18	3.6	0.72		316	3.4
1985	44	1,825	17.7	332	5.7	1.19	496	1,169	11.5
1986	40	1,695	19.6	358	7.2	1.48	287	860	10.0
1987	41	1,533	15.4	342	6.2	1.25	559	854	9.5
1988	41	1,269	12.8	828	2.5	0.52	222	298	3.4
1989	43	1,884	17.0	276	5.0	1.01	274	564	6.1
1990	43	1,623	18.1	142	6.0	1.25	476	1,127	12.0
1991	43	1,256	11.7	482	6.5	1.34	226	657	8.0
1992	45	955	9.4	282	4.3	0.85	565	397	4.8
1993	46	1,157	9.1	757	2.2	0.44	431	250	2.8
1994	43	984	8.7	368	2.3	0.46	664	243	2.7
1995	35	1,449	13.3	292	6.2	1.27	506	628	7.0
1996	32	776	8.8	232	3.1	0.63	294	358	4.0
1997	40	762	7.7	374	2.3	0.48	212	245	2.8
1998	35	583	6.3	134	1.8	0.35	239	170	1.9
1999	42	398	5.8	114	1.5	0.31	1,294	174	1.9
2000	35	808	6.4	450	2.9	0.58	57	283	3.2
2001	36	451	4.3	18	1.7	0.31	1,992	146	1.5
2002	38	1,445	9.2	1,164	2.8	0.54	35	261	2.9
2003	37	564	5.5	11	2.0	0.34	527	173	1.7
2004	35	887	10.3	286	3.1	0.63	5,155	519	5.3
2005	46	3,661	23.4	1,752	9.2	1.89	589	871	10.3
2006	29	9,998	66.0	374	28.4	5.58	15	2,773	29.9
2007	43	887	11.5	28	3.4	0.67	91	412	4.1
2008	38	1,737	16.8	506	5.9	1.22	828	995	10.8
2009	49	1,627	15.4	555	6.4	1.29	391	702	8.5
2010	49	1,373	13.9	475	3.9	0.79	34	413	4.8
2011	47	830	8.6	44	3.0	0.57	8	316	3.2
2012	49	138	2.5	7	0.7	0.15	2	81	0.9
2013	40	27	1.0	1	0.2	0.05	773	24	0.3
2014	46	139	1.7	116	0.3	0.04	17	16	0.2
2015	32	55	1.3	1	0.4	0.08	5,291	41	0.4
2016	41	332	3.8	226	1.1	0.23		103	1.2
Mean	41	1341	11.9	344	4.3	0.86	727	498	5.5
Median	41	984	9.4	286	3.1	0.63	391	316	3.4
1984-93	42	1,435	14.1	382	4.9	1.01	393	649	7.1
Median	43	1,401	14.1	337	5.4	1.10	431	611	7.0

*Would be fully recruited to a winter fishery.

Table 4: Price per pound and value of U.S. commercial landings of northern shrimp in the Gulf of Maine, with inflation adjusted prices and value for 1985–2016. No shrimp were sold or purchased from cooperative winter sampling in 2014. 2015 and 2016 prices and value are from the RSA program.

Price $/Lb	Value $
0.32	1,532
0.29	5,002
0.23	20,714
0.20	13,754
0.15	57,382
0.12	66,840
0.12	112,528
0.12	245,469
0.14	549,466
0.12	871,924
0.11	1,611,425
0.12	3,478,910
0.20	4,697,418
0.19	4,653,202
0.19	4,586,484
0.27	5,657,347
0.32	5,577,465
0.26	3,062,721
0.34	764,094
0.55	458,198
0.24	1,758
0.33	320,361
0.65	478,883
0.64	1,516,521
0.60	2,079,109
0.67	2,312,073
0.49	3,474,351

Season	Price $/Lb	Value $	Price ($/Lb) 2016 dollars	Value ($) 2016 dollars
1985	0.44	3,984,562	0.98	8,927,095
1986	0.63	6,451,206	1.39	14,203,612
1987	1.10	12,740,581	2.33	27,050,235
1988	1.10	7,391,777	2.24	14,990,869
1989	0.98	7,177,659	1.91	13,960,583
1990	0.72	7,351,420	1.32	13,568,350
1991	0.91	7,208,838	1.61	12,725,816
1992	0.99	7,547,941	1.70	12,967,590
1993	1.07	5,038,053	1.78	8,409,229
1994	0.75	4,829,106	1.22	7,840,837
1995	0.90	12,828,030	1.42	20,212,800
1996	0.73	15,341,504	1.12	23,554,470
1997	0.79	12,355,871	1.18	18,521,057
1998	0.96	8,811,938	1.42	13,044,435
1999	0.91	3,762,043	1.32	5,429,959
2000	0.79	4,968,655	1.10	6,923,627
2001	0.86	2,534,095	1.17	3,433,191
2002	1.08	1,077,534	1.44	1,437,056
2003	0.87	2,590,916	1.14	3,378,855
2004	0.44	2,089,636	0.57	2,678,370
2005	0.57	3,261,648	0.70	4,028,047
2006	0.37	1,885,978	0.44	2,253,069
2007	0.38	4,087,120	0.44	4,733,474
2008	0.49	5,407,373	0.55	6,017,089
2009	0.40	2,216,411	0.45	2,481,435
2010	0.52	7,133,718	0.57	7,870,739
2011	0.75	10,625,533	0.81	11,424,359
2012	0.95	5,230,481	1.00	5,479,435
2013	1.81	1,375,788	1.87	1,424,395
2014		0		0
2015	3.49	51,269	3.54	52,049
2016	6.67	195,925	6.67	195,925

http://www.bls.gov/data/inflation_calculator.htm
accessed Sep. 23, 2016.

Table 5: Estimated numbers of vessels in the Gulf of Maine Northern Shrimp fishery by fishing season and state. 2015 and 2016 data are from the RSA.

Season	Maine			Massachusetts	New Hampshire	Total
	Trawl	Trap	Total			
1980			15-20	15-20		30-40
1981			~75	~20-25		~100
1982			>75	~20-25		>100
1983			~164	~25	~5-8	~197
1984			239	43	6	288
1985			~231	~40	~17	~300
1986						~300
1987			289	39	17	345
1988			~290	~70	~30	~390
1989			~230	~50	~30	~310
1990			~220			~250
1991			~200	~30	~20	~250
1992			~259	~50	16	~325
1993			192	52	29	273
1994			178	40	29	247
1995						
1996			275	43	29	347
1997			238	32	41	311
1998			195	33	32	260
1999			181	27	30	238
2000	207	68	265	17	27	304
2001	174	60	234	19	27	275
2002	117	52	168	7	23	198
2003	142	49	191	12	22	222
2004	114	56	170	7	15	192
2005	102	64	166	9	22	197
2006	68	62	129	4	11	144
2007	97	84	179	3	15	196
2008	121	94	215	4	15	234
2009	80	78	158	12 (MA and NH combined)		170
2010	124	112	235	6	15	256
2011	172	143	311	12	19	342
2012	164	132	295	15	17	327
2013	110	72	182	13	14	208
2014	0	0	0	0	0	0
2015	3	5	8	1	0	9
2016	3	2	5	0	1	6

Note that some boats reported both trapping and trawling, and some landed in more than one state.

Table 6. Species protected under the ESA and/or MMPA that may occur in the affected environment of the northern shrimp fishery. Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks[1].

Species	Status[2]	Potentially affected by this action?
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	Endangered	Yes
Humpback whale, West Indies DPS (Megaptera novaeangliae)[3]	Protected (MMPA)	Yes
Fin whale (Balaenoptera physalus)	Endangered	Yes
Sei whale (Balaenoptera borealis)	Endangered	Yes
Minke whale (Balaenoptera acutorostrata)	Protected (MMPA)	Yes
Long-finned pilot whale (Globicephala macrorhynchus)	Protected (MMPA)	Yes
Atlantic white-sided dolphin (Lagenorhynchus acutus)	Protected (MMPA)	Yes
Short Beaked Common dolphin (Delphinus delphis)	Protected (MMPA)	Yes
Harbor porpoise (Phocoena phocoena)	Protected (MMPA)	Yes
Sea Turtles		
Leatherback sea turtle (Dermochelys coriacea)	Endangered	No
Kemp's ridley sea turtle (Lepidochelys kempii)	Endangered	No
Green sea turtle, North Atlantic DPS (Chelonia mydas)[4]	Threatened	No
Loggerhead sea turtle (Caretta caretta), Northwest Atlantic Ocean DPS	Threatened	No
Hawksbill sea turtle (Eretmochelys imbricate)	Endangered	No
Fish		
Shortnose sturgeon (Acipenser brevirostrum)	Endangered	No
Atlantic salmon (Salmo salar)	Endangered	Yes
Atlantic sturgeon (Acipenser oxyrinchus)		
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	Yes
Cusk (Brosme brosme)	Candidate	Yes
Pinnipeds		
Harbor seal (Phoca vitulina)	Protected (MMPA)	Yes
Gray seal (Halichoerus grypus)	Protected (MMPA)	Yes
Harp seal (Phoca groenlandicus)	Protected (MMPA)	Yes
Hooded seal (Cystophora cristata)	Protected (MMPA)	Yes
North Atlantic Right Whale[5]	ESA (Protected)	No

Footnotes to Table 6:

[1] A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).
[2] The status of the species is defined by whether the species is listed under the ESA as endangered (species are at risk of extinction) or threatened (species at risk of endangerment), or protected under the MMPA. Note, marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species in which ESA listing may be warranted.
[3] A final rule was issued on September 8, 2016, revising the ESA listing status of humpback whales (81 FR 62259). Fourteen DPSs were designated: one as threatened, four as endangered, and nine as not warranting listing. The DPS found in U.S. Atlantic waters, the West Indies DPS, is delisted under the ESA; however, this DPS is still protected under the MMPA.
[4] A final rule was issued on April 6, 2016, removing the current range-wide listing of green sea turtles and, in its place, listing eight green sea turtle DPSs as threatened and three DPSs as endangered (81 FR 20057). The green sea turtle DPS located in the Northwest Atlantic is the North Atlantic DPS of green sea turtles; this DPS is considered threatened under the ESA.
[5] Originally designated June 3, 1994 (59 FR 28805); Expanded on January 27, 2016 (81 FR 4837).

Table 7. Large whale occurrence in the area of operation for the northern shrimp fishery. Sources: NOAA Fisheries 1991, 2005, 2010, 2011, 2012; Hain et al. 1992; Payne et al. 1984; Good 2008; Pace and Merrick 2008; McLellan et al. 2004; Hamilton and Mayo 1990; Schevill et al. 1986; Watkins and Schevill 1982; Payne et al. 1990; Winn et al. 1986; Kenney et al. 1986, 1995; Khan et al. 2009, 2010, 2011, 2012; Brown et al. 2002; NOAA 2008; 50 CFR 224.105; CETAP 1982; Clapham et al. 1993; Swingle et al. 1993; Vu et al. 2012; Baumgartner et al. 2011; Cole et al. 2013; Risch et al. 2013; Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; 81 FR 4837 (January 27, 2016); NOAA Fisheries 2015b.

Species	Prevalence and Approximate Months of Occurrence
North Atlantic Right Whale	• Distributed throughout all continental shelf waters from the Gulf of Maine to the South Atlantic Bight throughout the year. • New England waters (Gulf of Maine and Georges Bank regions) = Foraging Grounds (January through October). Seasonally important foraging grounds include: › Cape Cod Bay (January-April); › Great South Channel (April-June); › western Gulf of Maine (April-May, and July-October); › Jordan Basin (August-October); › Wilkinson Basin (April-July); and › northern edge of Georges Bank (May-July). • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern calving grounds. • SAB (Coastal waters from Cape Fear, North Carolina, to 28oN (northeastern Florida) = Calving and Nursing Grounds (mid- November-early April). • Increasing evidence of wintering areas (approximately November – January) in: › Cape Cod Bay; › Jeffreys and Cashes Ledges; › Jordan Basin; and › Massachusetts Bay (e.g., Stellwagen Bank).
Humpback	• Distributed throughout all continental shelf waters of the Mid-Atlantic (Southern New England included), Gulf of Maine, and Georges Bank throughout the year. • New England waters (Gulf of Maine and Georges Bank regions) = Foraging Grounds (March-November). • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern (West Indies) calving grounds. • Increasing evidence of whales remaining in mid- and high- latitudes throughout the winter. Specifically, increasing evidence of wintering areas (for juveniles) in Mid-Atlantic (e.g., waters in the vicinity of Chesapeake and Delaware Bays; peak presence approximately January through March) and Southeastern coastal waters.

Table 7 continued.

Species	Prevalence and Approximate Months of Occurrence
Fin	• Distributed throughout all continental shelf waters of the Mid-Atlantic (Southern New England included), Gulf of Maine, and Georges Bank throughout the year. • Mid-Atlantic waters: > Migratory pathway to/from northern (high latitude) foraging and southern (low latitude) calving grounds; and > Possible offshore calving area (October-January). • New England (Gulf of Maine and Georges Bank)/ Southern New England waters = Foraging Grounds (greatest densities March-August; lower densities September-November).Important foraging grounds include: > Massachusetts Bay (esp. Stellwagen Bank); > Great South Channel; > Waters off Cape Cod (~40-50 meter contour); > Gulf of Maine; > Perimeter (primarily eastern) of Georges Bank; and > Mid-shelf area off the east end of Long Island. • Evidence of wintering areas in mid-shelf areas east of New Jersey Stellwagen Bank; and eastern perimeter of Georges Bank.
Sei	• Uncommon in shallow, inshore waters of the Mid-Atlantic (SNE included), Georges Bank, and Gulf of Maine; however, occasional incursions during peak prey availability and abundance. • Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks. • Spring through summer, found in greatest densities in offshore waters of the Gulf of Maine and Georges Bank; sightings concentrated along the northern, eastern (into Northeast Channel) and southwestern (in the area of Hydrographer Canyon) edge of Georges Bank.
Minke	• Widely distributed throughout continental shelf waters (<100m deep) of the Mid-Atlantic (Southern New England included), Gulf of Maine, and Georges Bank. • Most common in the EEZ from spring through fall, with greatest abundance found in New England waters

Table 8. Small cetacean occurrence in the area of operation of the northern shrimp fishery. Information presented in table is representative of small cetacean occurrence in the Northwest Atlantic continental shelf waters out to the 2,000 meter isobath. Sources: Waring et al. 1992, 2007, 2014, 2015, 2016; Payne and Heinemann 1993; Payne et al. 1984; Jefferson et al. 2009.

Species	Prevalence and Approximate Months of Occurrence
Atlantic White-Sided Dolphin	• Distributed throughout the continental shelf waters (primarily to 100 meter isobath) of the Mid-Atlantic (north of 35°N), Southern New England, Georges Bank, and Gulf of Maine; however, most common in continental shelf waters from Hudson Canyon (~ 39°N) to Georges Bank, and into the Gulf of Maine. • January-May: low densities found from Georges Bank to Jeffreys Ledge. • June-September: large densities found from Georges Bank through the Gulf of Maine. • October-December: intermediate densities found from southern Georges Bank to southern Gulf of Maine. • South of Georges Bank (Southern New England and Mid-Atlantic), low densities found year round, with waters off Virginia and NC representing southern extent of species range during winter months.
Short-Beaked Common Dolphin	• Regularly found throughout the continental shelf-edge-slope waters (primarily between the 100-2,000 meter isobaths) of the Mid-Atlantic, Southern New England, and Georges Bank (esp. in Oceanographer, Hydrographer, Block, and Hudson Canyons). • Less common south of Cape Hatteras, NC, although schools have been reported as far south as the Georgia /South Carolina border. • January-May: occur from waters off Cape Hatteras, NC, to Georges Bank (35° to 42°N). • Mid-summer-fall: occur primarily on Georges Bank with small numbers present in the Gulf of Maine; Peak abundance found on Georges Bank in the autumn.

Table 8 Continued.

Species	Prevalence and Approximate Months of Occurrence
Harbor Porpoise	• Distributed throughout the continental shelf waters of the Mid-Atlantic (north of 35oN), Southern New England, Georges Bank, and Gulf of Maine. • July-September: concentrated in the northern Gulf of Maine (waters < 150 meters); low numbers can be found on Georges Bank. • October-December: widely dispersed in waters from NJ to Maine; seen from the coastline to deep waters (>1,800 meters). • January-March: intermediate densities in waters off NJ to NC; low densities found in waters off NY to Gulf of Maine. • April-June: widely dispersed from NJ to ME; seen from the coastline to deep waters (>1,800 meters).
Long-finned pilot whale	• Long-Finned Pilot Whales • Except for area of overlap (see below), primarily occur north of 42˚N. • Winter to early spring (November through April): primarily distributed along the continental shelf edge-slope of the Mid-Atlantic, Southern New England, and Georges Bank. • Late spring through fall (May through October): movements and distribution shift onto/within Georges Bank, the Great South Channel, and Gulf of Maine.

Table 9. Pinniped occurrence in the area of operation of the northern shrimp fishery. Sources: Waring et al. 2007 (for hooded seals); Waring et al. 2014; Waring et al. 2015; Waring et al. 2016

Species	Prevalence
Harbor Seal	• Primarily distributed in waters from NJ to ME; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, NC (35oN). • Year Round: waters of ME • September-May: waters from New England to NJ.
Gray Seal	• Distributed in waters from NJ to ME. • Year Round: waters from ME to MA. • September-May: waters from Rhode Island to NJ.
Harp Seal	• Winter-Spring (approximately January-May): waters from ME to NJ.
Hooded Seal	• Winter-Spring (approximately January-May): waters of New England.

Table 10. Summary of confirmed human-caused injury or mortality to fin, minke, humpback, sei, and North Atlantic right whales from 2010-2014 due to entanglement in fishing gear. Information presented here is based on confirmed human-caused injury and mortality events along the Gulf of Mexico Coast, US East Coast, and Atlantic Canadian Provinces; it is not specific to US waters only. NOAA Fisheries defines a serious injury as an injury that is more likely than not to result in mortality (visit the NOAA Fisheries website for more information). Source: Henry et al. 2016

Species	Total Confirmed Entanglement: Serious Injury[2]	Total Confirmed Entanglement: Non-Serious Injury	Total Confirmed Entanglement: Mortality	Entanglement Events: Total Average Annual Injury and Mortality Rate (US waters/Canadian waters/unassigned waters)
North Atlantic Right Whale	16	31	8	4.65 (0.4/0/4.25)
Humpback Whale	30	53	8	6.85 (1.55/0/5.3)
Fin Whale	6	1	4	1.8 (0.2/0.8/0.8)
Sei Whale	0	0	0	0
Minke Whale	20	11	16	6.4 (1.7/2.45/2.25)

Table 11. Small cetacean and pinniped species observed seriously injured and/or killed by Category II Northeast bottom trawl fisheries in the affected environment of the northern shrimp fishery. Sources: Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; LOF 82 FR 3655 (January 12, 2107).

Category II Northeast bottom trawl fisheries in the affected environment of the northern shrimp fishery
Harp seal
Harbor seal
Gray seal
Pilot whales (spp)
Short-beaked common dolphin
White-sided dolphin
Harbor porpoise
Bottlenose dolphin (offshore)
Risso’s dolphin

FIGURES

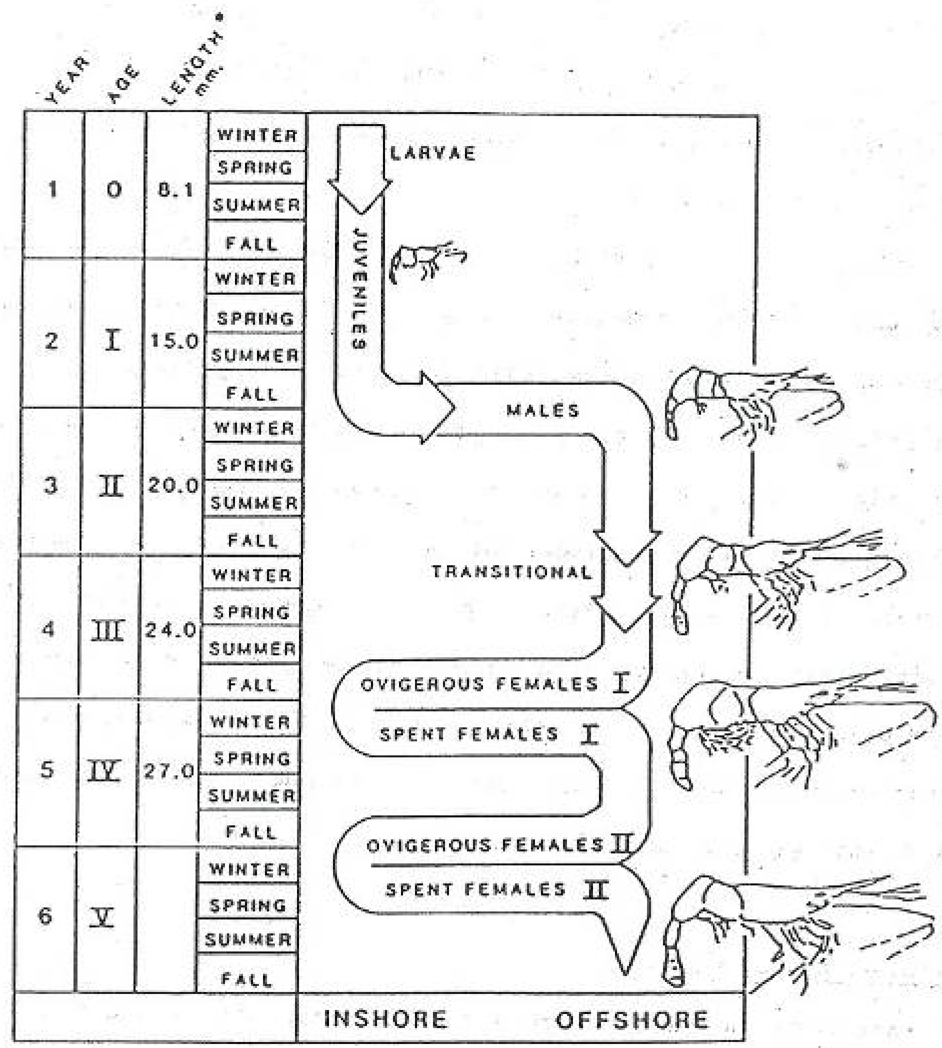

Figure 3. Schematic diagram of the life cycle of *Pandalus borealis* in the Gulf of Maine (modified from Shumway et. al. 1985)

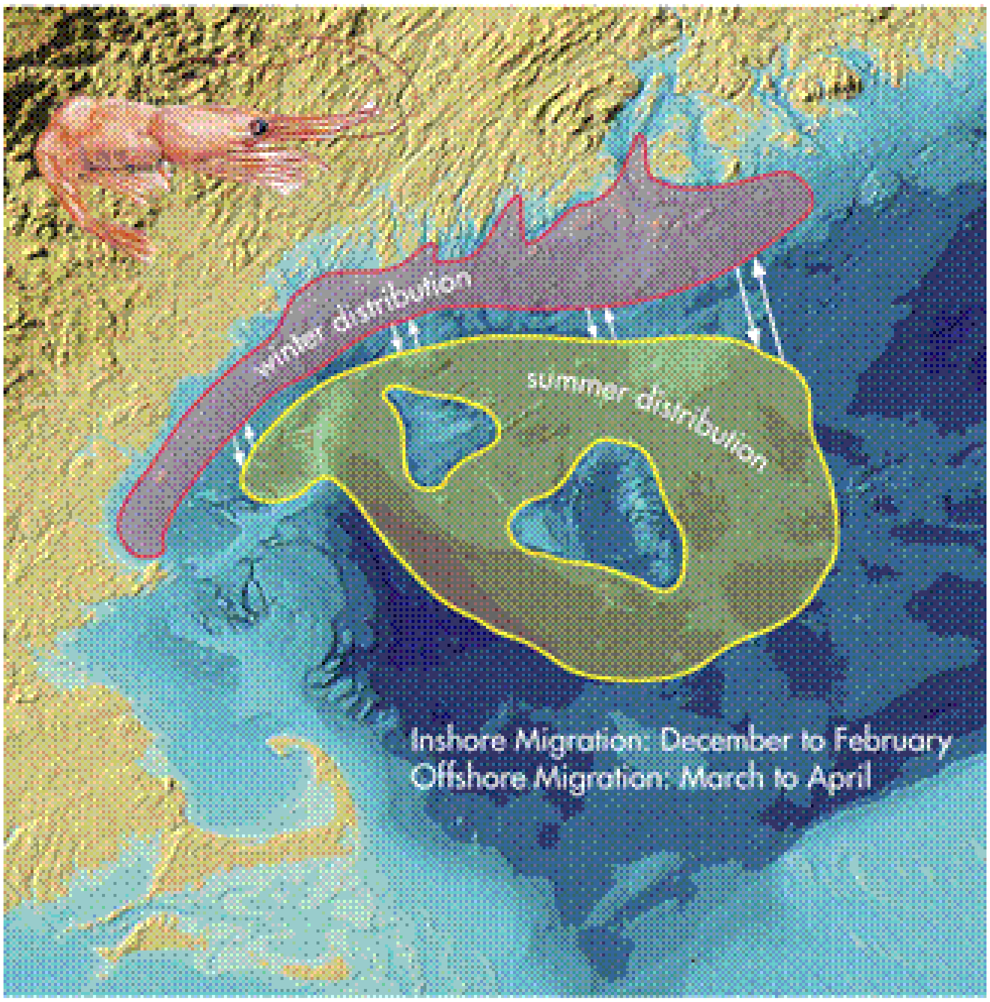

Figure 4. Distribution and migration of adult female shrimp in the Gulf of Maine (Anon. 2006 courtesy of NAMA)

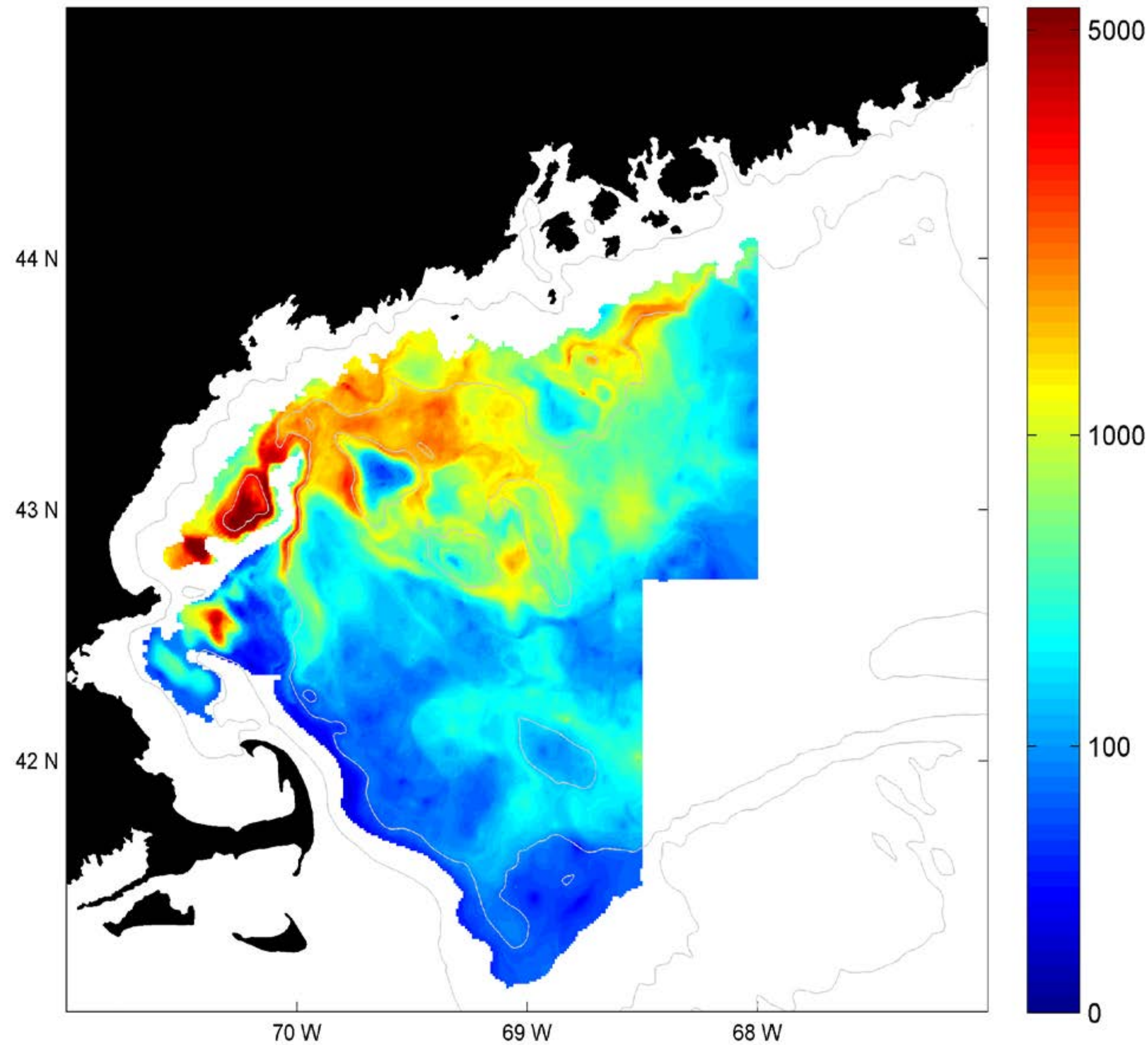

Figure 5. Heat map of average shrimp abundance from the ASMFC summer trawl survey, 1984-2016. Courtesy of Dave Richardson, NEFSC.

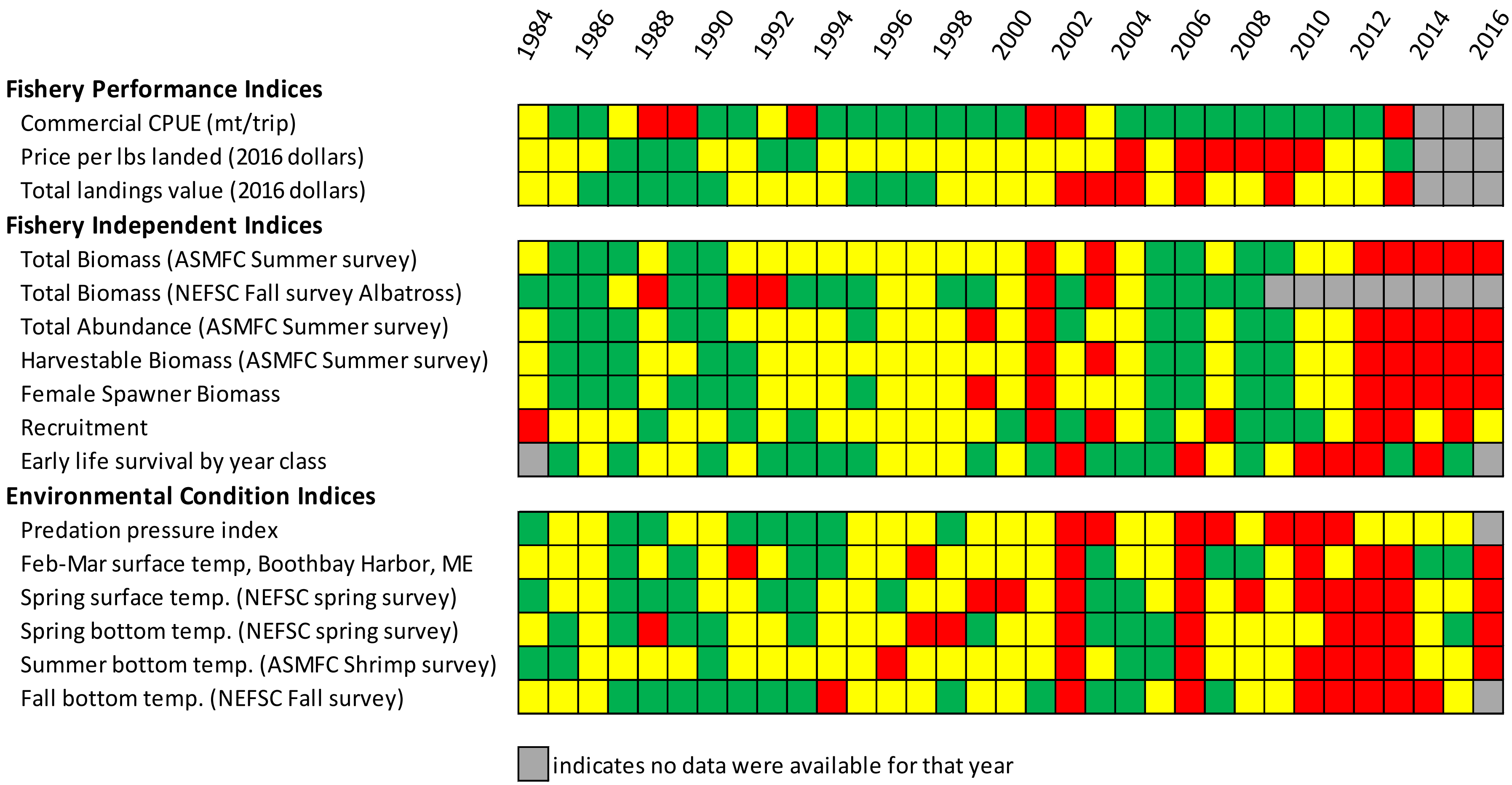

Figure 6: Strict Traffic Light Approach (STLA) results. Red indicates unfavorable conditions or status, yellow indicates intermediate values, and green indicates favorable conditions or status. Source: 2016 Stock Status Update for GOM Northern Shrimp

	Indicator values				Reference levels	
	2013	2014	2015	2016	SPM	20th percentile
Total Biomass	1.0	1.7	1.3	3.8	14.1	5.6
Spawner Biomass	0.2	0.3	0.4	1.1	4.9	1.7
Harvestable Biomass	0.3	0.2	0.4	1.2	7.1	1.7
Recruit Abundance	0.9	116	0.8	226	382	34
Early Life (YC) Survival	773	17	5291		393	57
CPUE (mt/trip)	0.23				0.45	0.40

KEY

- ≥ SPM
- > 20th percentile but < SPM
- ≤ 20th percentile

Figure 7: Recent (2013–2016) Gulf of Maine northern shrimp FTLA indicator values relative to reference levels. RED = at or below 20th percentile of time series; YELLOW = between 20th percentile and stable period (1985–1994) mean (SPM); GREEN = at or above SPM. Source: 2016 Stock Status Update for GOM Northern Shrimp.

	Indicator values				Reference levels	
	2013	2014	2015	2016	SPM	80th percentile
Predator Predation Index	888	1005	890		546	1133
Boothbay Feb-Mar SST	3.9	2.3	1.4	4.1	2.4	3.6
Spring Bottom Temp NEFSC	1.3	0.5	0.1	1.4	0.4	1.3
Summer Survey Bottom Temp	7.1	6.2	5.8	7.2	5.4	7.0

KEY

- ≤ SPM
- < 80th percentile but > SPM
- ≥ 80th percentile

Figure 8: Recent (2013–2016) Gulf of Maine northern shrimp FTLA environmental indicator values relative to reference levels. RED = at or above 80th percentile of time series; YELLOW = between 80th percentile and stable period (1985–1994) mean (SPM); GREEN = at or below SPM. Source: 2016 Stock Status Update for GOM Northern Shrimp.

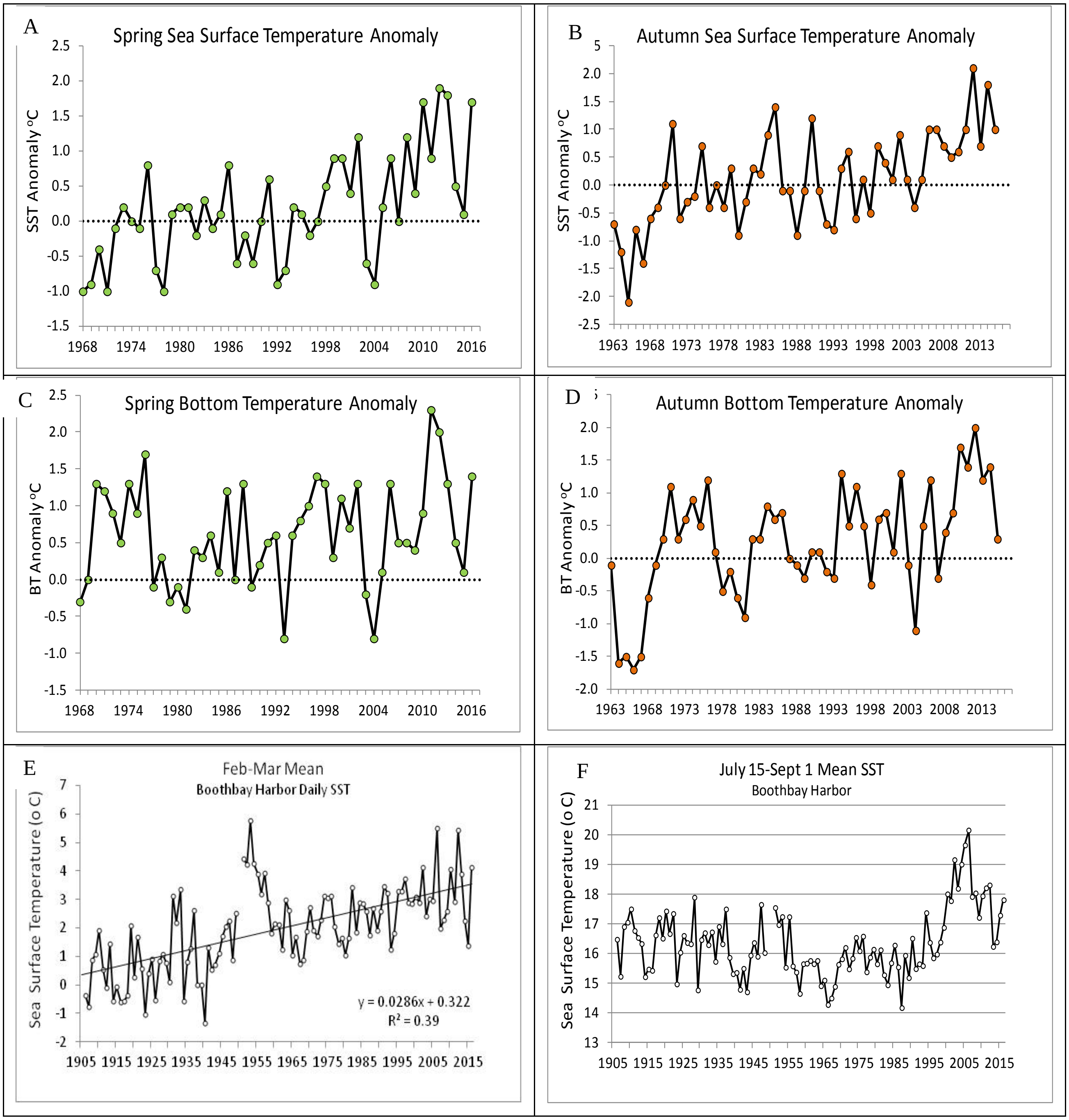

Figure 9. Ocean temperature anomalies in the Gulf of Maine. (A) spring and (B) autumn sea surface temperature anomalies in shrimp offshore habitat areas from NEFSC trawl surveys, 1968–2016 (through 2015 for autumn temperatures). (C) spring and (D) autumn bottom temperature anomalies in shrimp offshore habitat areas from NEFSC trawl survey, 1968–2016 (through 2015 for autumn temperature). (E – F) average sea surface temperature during (E) February–March and (F) July 15–September 1 at Boothbay Harbor, Maine, 1906–2016. Source: 2016 Stock Status Update for GOM Northern Shrimp.

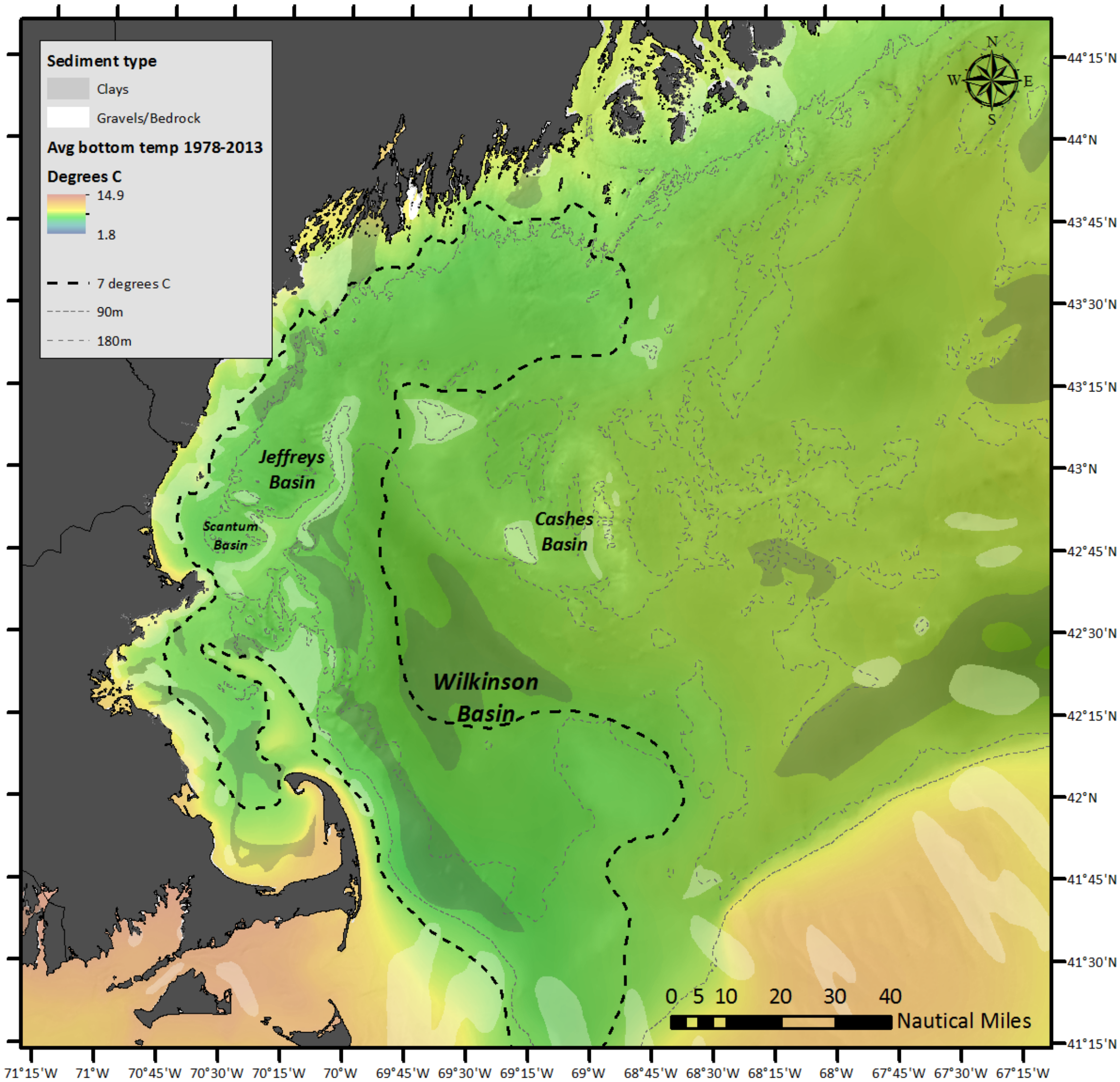

Figure 10. Habitat map for the Gulf of Maine. Colored shading indicates average annual bottom temperature based on the Finite Volume Coastal Ocean Model for the period 1978 to 2013, with the heavy dotted contour line enclosing areas where temperatures were on average below 7 degrees. Grey shaded patches indicate areas of clay or mixed clay sediments, while white patches show areas of gravel or bedrock. Other areas are sand or mixed sand/silt/clay. The light dotted lies show the 90 m and 180 m contours. Shrimp are commonly found between these depths during the spring, summer, and fall months.

10.0 APPENDIX 1

APPENDIX 1.1 Preliminary Trip Limit Analysis

The PDT analyzed trip limit options by vessel catch history and gear type. The PDT developed two methodologies to evaluate trip limits. First, the PDT computed the average trip weight for each individual vessel across all trips taken from 2008 through 2011 fishing years. The PDT also applied a range of trip limits to the 2010 fishery to determine the percentage of trips that would have been impacted.

When the PDT computed average trip weight, vessels that landed zero pounds during the four year time series were excluded from the analysis (n=169). The remaining active vessels (n=249) were placed in a matrix by average pounds landed and vessel size class to determine the percentage of vessels impacted by specific trip limits (see Appendix 1.2) The analysis for the pot fishery was not conclusive as the average pounds landed by 54% of the fleet was less than 100 pounds. Appendix 1.1 provides a breakdown of the vessels by vessel class and poundage category.

Table A.1.1. Percent of trawl vessels impacted by various trip limits based on the average pounds landed by a specific vessel for fishing years 2008 - 2011. Total number of vessels was 249.

Trip Limits (LBS)	% vessels impacted
1000	81.6%
1500	64.3%
2000	40.6%
2500	26.9%
3000	16.9%

The PDT also analyzed trip level data excluding specific vessel catch history. Appendix 1.3 shows the number of trips by state, gear, and vessel size and trip poundage categories for fishing years 2007-2011.

Appendix 1.4 details the average trip weight (pounds) by state, gear, and vessel size class fishing years 2001-2011. The table below is a subset of these results from 2008 to 2011.

Table A.1.2. Average trip weight (pounds) by state, gear, and vessel size class from 2008 to 2011. This analysis excludes vessel catch history and is the average of trip data. Cells marked by an asterisk (*) are confidential data.

State and Gear	Vessel Size Class	2008	2009	2010	2011
Maine Trawl	< 20 FT.			125	*
	21 TO 30 FT.		*	764	*
	31 TO 40 FT.	1,641	1,582	2,130	1,824
	41 TO 50 FT.	2,555	2,453	3,032	2,391
	51 TO 60 FT	3,118	2,997	3,754	3,201
	61 TO 70 FT.	*		*	4,278
	> 70 FT.	5,715	*	6,508	5,039
	ALL VESSELS COMBINED	2,307	2,216	2,744	2,437
Maine Pots	< 20 FT.	*	*	*	245
	21 TO 30 FT.	814	934	1,301	819
	31 TO 40 FT.	1,132	922	1,495	1,108
	41 TO 50 FT.	1,151	993	839	532
	ALL VESSELS COMBINED	1,110	922	1,451	1,043
State and Gear	**Vessel Size Class**	**2008**	**2009**	**2010**	**2011**
New Hampshire Trawl	31 TO 40 FT.	*	*		
	41 TO 50 FT.	2,470	2,497	2,352	2,422
	51 TO 60 FT	2,639	*	3,675	2,853
	61 TO 70 FT.				
	> 70 FT.				
	ALL VESSELS COMBINED	2,488	2,518	2,734	2,539
Massachusetts Trawl	31 TO 40 FT.	*		*	2,148
	41 TO 50 FT.	*	*	1,449	1,992
	51 TO 60 FT				*
	61 TO 70 FT.				
	> 70 FT.				*
	ALL VESSELS COMBINED	1,695	1,660	1,560	2,252

Appendix 1.5 details the impacts of 1,000, 2,000, 3,000, and 4,000 trip limits applied to data from the 2010 fishery. The analysis includes impacts on trawl, trap, and the overall fishery. In 2010, landings would have been reduced overall by 62% if a 1,000 trip limit was in effect. Trawl landings would have been reduced by 66% and trap landings by 47%. Trawlers greater than 60 feet would have been reduced by 83%. Total landings would have been reduced by 12% if a 4,000 pound trip limit was in place for the 2010 fishery.

APPENDIX 1.2. Analysis by vessel catch history, size class, and gear (trawl and pot) across 2008 to 2011 fishing years.

Number of vessels by vessel class and poundage category for the ME, NH, and MA TRAWL fishery based on the 2008 to 2011 average catch per trip

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.	Total Vessels
< = 30 FT. 31		3	3	1							7
TO 40 FT.		6	21	32	28	12	7	2	3		111
41 TO 50 FT.	1	5	6	9	27	17	11	7	8		91
51 TO 60 FT	1			1	2	5	6	3	7		25
61 TO 70 FT.					1		1	1	3	1	7
> 70 FT.					1			2	3	2	8
ALL VESSELS COMBINED	2	14	30	43	59	34	25	15	24	3	249
% of Fleet	0.80%	5.62%	12.05%	17.27%	23.69%	13.65%	10.04%	6.02%	9.64%	1.20%	
% Impacted by Trip Limit Equal to Poundage Category MAX	99.20%	93.57%	81.53%	64.26%	40.56%	26.91%	16.87%	10.84%	1.20%		

Number of vessels by vessel class and poundage category for the ME, NH, and MA POT fishery based on the 2008 to 2011 average catch per trip

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< = 30 FT.	1	4								
31 TO 40	6	7								
FT.	127	33	5	1		1	1			
41 TO 50 FT.										
51 TO 60 FT										
61 TO 70 FT.										
> 70 FT.	134	44	5	1	0	1	1	0	0	0
ALL VESSELS COMBINED	53.82%	17.67%	2.01%	0.40%	0.00%	0.40%	0.40%	0.00%	0.00%	
% of Fleet	27.96%	4.30%	1.61%	1.08%	1.08%	0.54%	0.00%	0.00%	0.00%	0.00%
% Impacted by Trip Limit Equal to										

APPENDIX 1.3. The number of trips by state, gear, and vessel size and trip poundage categories for fishing years 2007-2011.

Number of trips by vessel class and poundage category - N. Shrimp - 2007 MAINE- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
<30 FT.										
31 TO 40 FT.	3	64	153	140	137	127	130	80	155	65
41 TO 50 FT.	3	33	48	74	112	131	146	108	239	224
51 TO 60 FT		4	19	31	55	45	62	50	142	129
> 60 FT.	1	2	4	3	3	0	8	9	19	16
ALL VESSELS COMBINED	**6**	**101**	**220**	**245**	**304**	**303**	**338**	**238**	**536**	**418**

Number of trips by vessel class and poundage category - N. Shrimp - 2008 MAINE- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 30 FT.										
31 TO 40 FT.	17	187	325	330	272	147	88	54	101	28
41 TO 50 FT.	5	59	110	186	242	182	178	118	184	97
51 TO 60 FT	1	12	39	54	76	68	72	52	125	65
> 60 FT.	0	1	4	8	8	4	5	3	14	39
ALL VESSELS COMBINED	**23**	**258**	**474**	**570**	**590**	**397**	**338**	**224**	**410**	**190**

Number of trips by vessel class and poundage category - N. Shrimp - 2009 MAINE- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 30 FT.		*	*	*						
31 TO 40 FT.	7	93	186	182	114	62	64	28	43	10
41 TO 50 FT.	1	37	116	94	86	90	61	50	88	59
51 TO 60 FT	1	16	33	41	61	50	47	29	94	44
> 60 FT.			*	*		*		*	*	*
ALL VESSELS COMBINED	**9**	**146**	**335**	**317**	**261**	**202**	**172**	**107**	**225**	**113**

* Confidential Data

Number of trips by vessel class and poundage category - N. Shrimp - 2010 MAINE- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 30 FT.	5	6	10	5	1					
31 TO 40 FT.	10	134	292	318	283	220	193	105	163	98
41 TO 50 FT.	4	39	101	130	146	134	120	90	200	161
51 TO 60 FT	3	15	29	42	54	53	58	49	138	130
> 60 FT.			1	3	1	8	5	2	28	35
ALL VESSELS COMBINED	**17**	**188**	**422**	**490**	**483**	**407**	**371**	**244**	**501**	**389**

Number of trips by vessel class and poundage category - N. Shrimp - 2011 MAINE- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 30 FT.	*	*	*							
31 TO 40 FT.	10	137	243	341	343	218	152	76	113	20
41 TO 50 FT.	8	71	113	173	230	222	198	117	179	54
51 TO 60 FT		5	24	33	61	72	88	61	105	64
> 60 FT.		5	9	6	11	15	23	30	123	111
ALL VESSELS COMBINED	**18**	**218**	**389**	**553**	**645**	**527**	**461**	**284**	**520**	**249**

* Confidential Data

Number of trips by vessel class and poundage category - N. Shrimp - 2007 MAINE- POT Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40 FT.	100	209	251	165	130	64	40	8	3	
41 TO 50 FT.	7	14	17	9	17	8	2			1
ALL VESSELS COMBINED	**107**	**223**	**268**	**174**	**147**	**72**	**42**	**8**	**3**	**1**

Number of trips by vessel class and poundage category - N. Shrimp - 2008 MAINE- POT Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40 FT.	156	316	293	249	181	101	59	32	25	7
41 TO 50 FT.	8	28	32	38	28	11	5	1	1	
ALL VESSELS COMBINED	**164**	**344**	**325**	**287**	**209**	**112**	**64**	**33**	**26**	**7**

Number of trips by vessel class and poundage category - N. Shrimp - 2009 MAINE- POT Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40 FT.	152	171	180	172	91	30	21	14	6	2
41 TO 50 FT.	14	7	16	11	16	4	1			
ALL VESSELS COMBINED	**166**	**178**	**196**	**183**	**107**	**34**	**22**	**14**	**6**	**2**

Number of trips by vessel class and poundage category - N. Shrimp - 2010 MAINE- POT Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40 FT.	141	301	317	282	278	198	121	68	88	24
41 TO 50 FT.	6	21	14	23	7	1				
ALL VESSELS COMBINED	**147**	**322**	**331**	**305**	**285**	**199**	**121**	**68**	**88**	**24**

Number of trips by vessel class and poundage category - N. Shrimp - 2011 MAINE- POT Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40 FT.	123	348	358	348	181	94	55	25	21	2
41 TO 50 FT.	13	39	22	11	2	1				
ALL VESSELS COMBINED	**136**	**387**	**380**	**359**	**183**	**95**	**55**	**25**	**21**	**2**

Number of trips by vessel class and poundage category - N. Shrimp - 2007 New Hampshire- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 20 FT.										
21 TO 30 FT.										
31 TO 40 FT.			*		*	*				
41 TO 50 FT.		6	27	25	27	20	18	14	36	27
51 TO 60 FT		*		*		*	*	*	*	*
61 TO 70 FT.										
> 70 FT.										
ALL VESSELS COMBINED	0	6	27	25	27	20	18	14	36	27

* Confidential Data

Number of trips by vessel class and poundage category - N. Shrimp - 2008 New Hampshire- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 20 FT.										
21 TO 30 FT.										
31 TO 40 FT.	1			*	*					
41 TO 50 FT.	3	15	17	41	55	51	41	21	32	16
51 TO 60 FT		3	7	6	11	8	11	9	10	4
61 TO 70 FT.										
> 70 FT.										
ALL VESSELS COMBINED	4	18	24	47	66	59	52	30	42	20

* Confidential Data

Number of trips by vessel class and poundage category - N. Shrimp - 2009 New Hampshire- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 20 FT.										
21 TO 30 FT.										
31 TO 40 FT.			*						*	
41 TO 50 FT.		3	13	29	12	10	9	5	17	10
51 TO 60 FT			*	*	*	*	*	*	*	*
61 TO 70 FT.										
> 70 FT.										
ALL VESSELS COMBINED	0	3	13	29	12	10	9	5	17	10

* Confidential Data

Number of trips by vessel class and poundage category - N. Shrimp - 2010 New Hampshire- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 20 FT.										
21 TO 30 FT.										
31 TO 40 FT.										
41 TO 50 FT.	2	16	37	52	53	42	31	15	40	20
51 TO 60 FT	1		3	4	14	19	15	8	37	24
61 TO 70 FT.										
> 70 FT.										
ALL VESSELS COMBINED	3	16	40	56	67	61	46	23	77	44

Number of trips by vessel class and poundage category - N. Shrimp - 2011 New Hampshire- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 20 FT.										
21 TO 30 FT.										
31 TO 40 FT.										
41 TO 50 FT.	1	11	35	52	80	81	60	25	44	18
51 TO 60 FT		3	7	16	22	22	16	28	26	12
61 TO 70 FT.										
> 70 FT.										
ALL VESSELS COMBINED	**1**	**14**	**42**	**68**	**102**	**103**	**76**	**53**	**70**	**30**

Number of trips by vessel class and poundage category - N. Shrimp - 2010 Massachusetts- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40FT			1	2	5		2	1		
41 TO 50 FT.	2	6	8	9	5	3	5	2	1	
>50 FT.										
ALL VESSELS COMBINED	**2**	**6**	**9**	**11**	**10**	**3**	**7**	**3**	**1**	**0**

Number of trips by vessel class and poundage category - N. Shrimp - 2011 Massachusetts- Trawl Fishery

Vessel Size	1 to 100 lbs.	101 to 500 lbs.	501 to 1000 lbs.	1001 to 1500 lbs.	1501 to 2000 lbs.	2001 to 2500 lbs.	2501 to 3000 lbs.	3001 to 3500 lbs.	3501 to 5000 lbs.	> 5000 lbs.
< 40FT		1	4	16	21	15	9	6	6	
41 TO 50 FT.		3	3	6	6	12	7	2	1	
>50 FT.	3		2	3	9	8	8	5	14	3
ALL VESSELS COMBINED	**3**	**4**	**9**	**25**	**36**	**35**	**24**	**13**	**21**	**3**

***All MA 2007, 2008, and 2009 trip level data are confidential**

APPENDIX 1.4. Average trip weight (pounds) by state, gear, and vessel size class from 2001 to 2011.

Average trip weight (lbs) of N. Shrimp Landed - MAINE- Trawl Fishery by Vessel Class

Vessel Size	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
< 20 FT.										125	*
21 TO 30 FT.			*				*		*	764	*
31 TO 40 FT.	565	619	877	1,291	1,175	2,059	2,402	1,641	1,582	2,130	1,824
41 TO 50 FT.	836	992	1,241	2,366	1,772	2,816	3,494	2,555	2,453	3,032	2,391
51 TO 60 FT	965	1,279	1,323	2,968	2,090	3,339	3,867	3,118	2,997	3,754	3,201
61 TO 70 FT.	1,325	*	1,606	*	2,982	*	2,949	*		*	4,278
> 70 FT.	863	*	1,348	*	*	*	*	5,715	*	6,508	5,039
ALL VESSELS COMBINED	739	908	1,127	2,131	1,659	2,741	3,158	2,307	2,216	2,744	2,437

* Confidential Data

Average trip weight (lbs) of N. Shrimp Landed - MAINE- POT Fishery by Vessel Class

Vessel Size	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
< 20 FT.	188	126	*	*	*	*	790	*	*	*	245
21 TO 30 FT.	241	254	499	407	512	745	664	814	934	1,301	819
31 TO 40 FT.	493	448	709	375	1,057	805	1,028	1,132	922	1,495	1,108
41 TO 50 FT.	461	*	816	*	1,041	1,234	1,190	1,151	993	839	532
51 TO 60 FT											
61 TO 70 FT.											
> 70 FT.											
ALL VESSELS COMBINED	456	420	712	364	1,019	809	1,007	1,110	922	1,451	1,043

* Confidential Data

Average trip weight (lbs) of N. Shrimp Landed - New Hampshire- Trawl Fishery by Vessel Class

Vessel Size	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
< 20 FT.											
21 TO 30 FT.											
31 TO 40 FT.	850	512	775	1,050	1,184	*	*	*	*		
41 TO 50 FT.	880	726	1,190	1,685	1,738	1,766	2,953	2,470	2,497	2,352	2,422
51 TO 60 FT	*	*	*		1,639	*	*	2,639	*	3,675	2,853
61 TO 70 FT.											
> 70 FT.											
ALL VESSELS COMBINED	905	669	1,069	1,545	1,631	1,825	2,980	2,488	2,518	2,734	2,539

* Confidential Data

Average trip weight (lbs) of N. Shrimp Landed - Massachusetts- Trawl Fishery by Vessel Class

Vessel Size	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
< 20 FT.											
21 TO 30 FT.											
31 TO 40 FT.	622	428	647	*	1,211	*	*	*		*	2,148
41 TO 50 FT.	677	*	688	774	984	1,161	*	*	*	1,449	1,992
51 TO 60 FT		*	*		*		*				*
61 TO 70 FT.			*	*							
> 70 FT.			*								*
ALL VESSELS COMBINED	645	544	681	803	1,044	1,147	1,196	1,695	1,660	1,560	2,252

* Confidential Data

APPENDIX 1.5 Analysis of trip limit scenarios applied to 2010 northern shrimp fishery data.

Trip Limit Scenarios Applied to 2010 Northern Shrimp Fishery Data*

		2010 Actual			Landings (lbs) with Trip Limit Scenarios if catches were cut off at (lbs)…..				Percent Reduction from Actual if catches were cut off at (lbs)…..			
Trawl gear	Vessel size	No. of Vessels	No. of Trips	Landings (lbs)	1,000	2,000	3,000	4,000	1000	2000	3000	4000
Maine	20-30 ft.	6	27	19,341	16,841	19,341	19,341	19,341	13%	0%	0%	0%
	31-40 ft.	62	1,814	3,867,333	1,653,533	2,737,801	3,311,786	3,581,857	57%	29%	14%	7%
	41-50 ft.	39	1,125	3,410,622	1,073,373	1,934,979	2,526,090	2,898,241	69%	43%	26%	15%
	51-60 ft.	14	569	2,143,507	550,932	1,034,333	1,414,007	1,686,959	74%	52%	34%	21%
	61-87 ft.	4	83	499,191	82,600	162,725	234,614	296,050	83%	67%	53%	41%
Maine Totals		125	3,618	9,939,994	3,377,279	5,889,179	7,505,838	8,482,448	66%	41%	24%	15%
Mass. Totals	31-50 ft.	5	47	81,110	39,674	66,710	79,010	81,110	51%	18%	3%	0%
New Hamp.	41-50 ft.	12	281	724,543	263,051	444,084	551,630	623,894	64%	39%	24%	14%
	51-60 ft.	3	125	459,416	123,415	238,487	324,949	385,520	73%	48%	29%	16%
New Hamp. Totals		15	406	1,183,959	386,466	682,571	876,579	1,009,414	67%	42%	26%	15%
Trawl Totals		145	4,071	11,205,063	3,803,419	6,638,460	8,461,427	9,572,972	66%	41%	24%	15%
Trap gear												
Maine	17-30 ft.	9	126	149,598	91,541	131,058	146,824	150,226	39%	12%	2%	0%
	31-40 ft.	94	1,693	2,531,195	1,307,188	2,046,269	2,347,589	2,456,869	48%	19%	7%	3%
	41-50 ft.	8	73	62,087	49,596	61,887	62,087	62,087	20%	0%	0%	0%
Maine Totals		111	1,892	2,744,763	1,448,325	2,239,214	2,556,500	2,669,182	47%	18%	7%	3%
Trap Totals		111	1,892	2,744,763	1,448,325	2,239,214	2,556,500	2,669,182	47%	18%	7%	3%
Grand Totals (Trawl + Trap)		256	5,963	13,949,826	5,251,744	8,877,674	11,017,927	12,242,154	62%	36%	21%	12%

* 2010 Shrimp season harvester trip report data are preliminary, as of 7/7/11.

Atlantic States Marine Fisheries Commission

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Summer Flounder, Scup, Black Sea Bass Recreational Working Group
Call Summary

October 4, 2017

Recreational Working Group Members: Adam Nowalsky (NJ Commissioner Proxy), Brandon Muffley (MAFMC), John Clark (DE DFW), Peter Clarke (NJ DFW), Matt Gates (CT DEEP), Mike Luisi (MD DNR), Nichola Meserve (MA DMF), Richard Wong (DE DFW), Tiffany Vidal (MA DMF), Bob Ballou (RI DFW), John Maniscalco (NYS DEC), Chris Batsavage (NC DMF)

ASMFC Staff: Kirby Rootes-Murdy, Caitlin Starks

The Black Sea Bass Recreational Working Group (Rec WG) met via conference call to discuss the proposed options in Draft Addendum XXX and make recommendations regarding the options to be included in the document for public comment. The following is a summary of the Rec WG's discussion and subsequent revisions to the Draft Addendum. Please note that **bolded sections** in the following summary indicate revisions made to the Draft Addendum XXX document based on the Rec WG's recommendations.

Following the Board Meeting in August 2017, ASMFC Staff (Staff) further developed the draft addendum based on feedback from the Board. As part of the Board's requested additions to the draft document, preliminary analysis from TC members on 'smoothing' approaches were used to modify harvest information. The following changes were made based on Board feedback to the draft document that was considered by the Rec WG:

- Options 2 and 3 for specifying allocation (In section 3.0 'Proposed Management Program)
  - Inclusion of timeframes with an adjusted NY 2016 (annual) black sea bass recreational harvest estimate modified using a Gaussian Process Regression (GPR) model
  - Inclusion of an allocation timeframe from 2004-2010
  - An additional Sub-Option 2B: revisiting timeframes for setting allocation. This sub-option specified that recreational allocations needed to be revisited with a set number of years (i.e. 3, 5, 7)
- The addition of a no sunset option for the Timeframe for Addendum Provisions (In section 3.1 'Timeframe for Addendum provisions')
- New Option 4: Alternative Allocation Management

Staff presented the preliminary TC work and discussion on two different smoothing approaches. The NY 2016 harvest estimate was presented as modified using the Gaussian Process Regression (GPR) model approach developed by Jason McNamee, under the assumptions that inter-annual changes in harvest should be related and should not change by orders of magnitude from year to year. MRIP data from the entire time series (1981-2016) were evaluated and the GPR was used to create new annual estimates for the entire time series for New York. John Maniscalco developed a different smoothing method based on a ratio of wave 5 to wave 6 harvest during recent "candidate" years, a few options possible depending on which candidate year combos were selected. In considering the two approaches, the TC found merit with both approaches, but at this time was unable to make a formal recommendation on which to use moving forward. The TC is continuing to discuss and develop recommendations for the Board and Council to consider in evaluating and responding to annual harvest estimates. Given the possible different options under the ratio approach, the GPR modified estimate was included in the updated draft addendum presented to the Rec WG. Staff highlighted that the GPR approach smoothed harvest estimates for not only 2016, but the entire time series for NY which meant that prior year harvest estimates were also adjusted (some higher, others lower) but were not included per the Rec WG's request for a smoothed estimate for just New York's wave 6 (November-December) harvest estimate. Without clear guidance at this point on how a smoothing approach should be applied to any particular state, region or coastwide wave or annual harvest estimate, **the Rec WG recommended removing allocation timeframe options that included 2016 harvest estimates**.

Staff then presented the additional allocation timeframe option of 2001-2010 (10 years) per the request from Rob O'Reilly. Black Sea Bass recreational harvest estimates are post-stratified at Cape Hatteras as part of the FMP and the Cape Hatteras break is also used for evaluating harvest within the management unit against the coastwide Recreational Harvest Limit annually. Post-stratified harvest information is unavailable for years prior to 2004. Based on this challenge, Rob O'Reilly suggested the requested timeframe option be adjusted to 2004-2010 (7 years). In considering the adjusted timeframe of 7 years and prior Rec WG recommendation that harvest information from the early 2000s not be used given current changes to the resource's abundance and distribution, the **majority of Rec WG members recommended removing the 2004-2010 timeframe option**. With the two recommendations to remove allocation options that included 2016 and the 2004-2010, the two remaining original timeframe options were 2007-2015 (9 years) and 2012-2015 (4 years). The Rec WG members noted that for consistency and to account for interest from some WG members to include earlier timeframe harvest information**, the group recommended changing the two remaining allocation timeframe options to 2006-2015 (10 years) and 2011-2015 (5 years)**.

Staff then presented on the addition of Sub-Option 2B per Jim Gilmore's request that included options for revisiting the allocation timeframes in 3, 5, or 7 years. Related to this item was the addition of a no sunset option for the timeframe of Addendum provisions. The Rec WG discussed the timing and likelihood of the Board seeking to modify the recreational management program sooner than 5 or 7 years. Additionally, it was made clear that the timeframe of the addendum's provisions (Section 3.1) would necessitate the need to revisit allocation decisions; if there is not a no sunset provision, the addendum will expire and allocation decisions will need to be considered for any new addendum that may continue a similar management program. The group did indicate an interest in having the option for the draft addendum to be allowed to continue for more than 1 year, as some recent addenda to the FMP have limited the implemented management program to only 1 year. In turn the **majority of the Rec WG recommended removing the Sub-Option 2B: revisiting timeframes for setting allocation; removing the 1 year only option (for 2018 only) and the no sunset options from section 3.1, the timeframe of Addendum provisions.** Please note: that for the remaining timeframes still included in this section, the Board will annually have the option to either 1) extend the addendum, 2) revert back to FMP status quo (coastwide measures), or 3) initiate new addendum to create new recreational management program.

In considering other changes to the current draft addendum, the Rec WG revisited the Option 2: State Allocation of the Annual RHL. Based on concerns raised by the group of replicating issues that have arisen under state by state recreational management of Summer Flounder through Conservation Equivalency, the **majority of the Rec WG recommended removing Option 2: State Allocation of the Annual RHL**. Next, the group further discussed Sub-Options 3C (Management measures within a region).

The group expressed concern that current options B & C under Sub Option 3C seemed too similar, with the latter ("C") option's language indicating approach akin to ad-hoc regional management used in recent years. Based on this concern, the **Rec WG recommended removing option C that proposes setting a regional % reduction**. The Rec WG also recommended increasing the potential difference between states within a region under option "B" from 1 to 3 fish and from 15 days to 30 days. <u>The Recreational WG and/or Board will need to provide clearer language for this option in specifying how states within a region may differ in their measures.</u>

Next, Staff presented on a new Option 4 for alternative allocation management (see appendix A). The option was developed in an effort to base allocation decisions on information beyond just MRIP harvest point estimates, such as effort and the angling population that (i.e. catch per angler (CPA) and number of anglers). The option would create two regions that align with the two sub-spatial units modelled in the 2016 benchmark stock assessment (Northern region including New York/Hudson Canyon north to the US-Canadian Border, and Southern region of south of Hudson Canyon/New Jersey-North Carolina north of Hatteras). Each region would have 1 set of uniform management measures. The northern region example measures aim to account for the earlier spring fishery in some states while closing earlier in the fall than has taken place for many northern states in recent years to buffer against volatility in wave 6 harvest estimates; reduce the size limit and adjusting the season to better align with the Federal measures in recent years; and reduce the bag limit to 5 fish to buffer against intercepted trips that may "limit out" and increase the likelihood of high harvest estimates. The southern region example measures would continue to align with federal waters measures, with the new addition of New Jersey to the region following federal measures for the entire year. The example regional measures would likely be a net liberalization in harvest coastwide from 2017 because the estimated increase in northern region harvest would be greater than the estimated decrease in southern region (specifically for the states of Delaware-North Carolina; New Jersey's harvest would increase) harvest. While the example measures in the option would likely increase coastwide harvest, the option would also require states to increase recreational data collection specific to 5 parameters to help with informing the evaluation and management response to annual harvest estimates. This option would also aim to keep management measures in place for multiple years, while tying any changes to recreational management to the next stock assessment. The final goal of both liberalizing measures from recent years while maintaining them for multiple years moving forward would be to improve compliance and provide more stability in the recreational fishery.

The Rec WG discussed the merits of draft option 4. Currently, the draft option doesn't have a specified allocation for each region and it's unclear how they would differ significantly if based on rec CPUE given the stock assessment indicated they are similar. The proposed modifier of CPUE- angler population information based on state license registries data- may present challenges given states such as New York and New Jersey that have free recreational licenses, but that availability of those licenses don't track with the likely angling populations in the states. Some Rec WG members indicated that a better way to make allocation decisions for this new option may be on exploitable biomass by each sub-spatial unit that was modelled in the stock assessment. However, it was noted that the north/south split of exploitable biomass from the 2016 assessment provides a similar allocation as the regional management option for Massachusetts-New York and New Jersey-North Carolina based on 2011-2015 harvest data. A number of Rec WG members noted an interest in trying to collect more recreational data, but also expressed concern over the regional alignment, specifically including New Jersey with the southern region states. One WG member also indicated further discussion and development is needed on establishing a process for evaluating the performance of these measures in future years and how liberalizations/reductions would be determined. Overall, the Rec WG expressed interest in further development of the option, and/or applying parts of the option to the regional management options. However, if it were to be developed further and included in Draft Addendum XXX, approval of the Draft Addendum would need to be delayed, likely to the joint ASMFC/MAFMC Meeting in December. Based on the interest in the option, a majority of the Rec WG supported delaying the approval of Draft Addendum XXX until the joint ASMFC/MAFMC Meeting in December.

Lastly, one Rec WG member recommended another management issue be added to the draft addendum. This item would require states to adopt a rule holding for-hire permit holders/operators responsible for violations of recreational possession or size limits for black sea bass, scup, or summer flounder occurring during a for-hire trip. This was in response to media reports/enforcement actions of two recent incidents of possession limit violations aboard party boats in NY including unclaimed coolers and/or overboard dumping of fish. According to the news reports, the captains only received minor citations (incomplete trip report, unsecured sanitation device) because state law doesn't hold captains responsible for the patrons on their boats "unless DEC officers witness staff taking responsibility for the catch, assisting with the catch." Similar instances of "abandon cooler" incidents lead MA to adopt a rule in 2014 to improve compliance with the recreational rules on for-hire vessels (see Appendix B). The Rec WG member indicated that if this is not specifically included in the draft addendum, that the ASMFC Policy Board should address this issue at their next meeting. Staff indicated that this management issue could be included in the Board's discussion on the Draft Addendum XXX options at the upcoming Board Meeting.

Appendix A.

Option 4: Alternative allocation based recreational management

Recreational management of highly sought after species along the US Mid-Atlantic coast are monitored through NOAA's Marine Recreational Information Program or MRIP. MRIP generates a harvest estimate (Caught-Available Catch fish "Type A" data + Harvested- Unavailable Catch "Type B1" data) that has been used for much of last 15+ years as metric for evaluating recreational removals. In recent years, there has been continual changes to how that recreational harvest and catch data has been calculated, creating challenges in evaluating year to year harvest estimates on the state level relative to management measures. To better evaluate the recreational fishery and improve management decisions on issues such as allocation and access to the resource, a new approach of accounting for participation and fishing effort is needed to address changes in the both resources' distribution and abundance, and the avidity of the angling community targeting black sea bass in the recreational fishery.

In addition to fishery independent survey indices of abundance, the 2016 Black Sea Bass Benchmark Stock Assessment (SAW/SARC 62) incorporated a fishery dependent index of abundance developed from MRIP[1] data (pg 28-30). To account for recreational effort (rather than just positive trips or self-reported directed trips), effort was estimated for a species guild (group of recreational targeted species that are targeted on the same trip). Species associations were evaluated at the regional level (i.e. north region comprised of data from New York-Massachusetts; south region comprised of data from New Jersey- Cape Hatteras, North Carolina). Generally, effort in the northern region increased during the 1980s, rising from less than 1000 intercepted trips in 1981 to over 4000 intercepts by 1990. Effort subsequently leveled off for the years 1990 to 2010 before showing an increase in recent years. Catch Per Angler (CPA) in the northern region remained below 0.25 fish per trip between 1989 and 1998. Over the last decade, recreational catch rates of black sea bass in the northern region have increased significantly, rising from 0.23 fish per trip in 2005 to 1.7 fish per trip in 2015.

For the southern region, from the early 1980s to early 2000s recreational black sea bass effort in the southern region increased more than two-fold, rising from around 3000 intercepted trips per year to a peak of over 9000 intercepts in 2001. Since that time, effort has gradually declined, dropping to approximately 6400 intercepts in 2015. CPA in the southern region follows a similar pattern as the associated effort. CPA increased from around 1.0 fish per trip in early to years to over 3.0 fish per trip by the early 2000s. CPA subsequently dropped by approximately 35% by 2004, and has since varied without trend around 2.0 fish per trip. Recreational black sea bass CPA in the southern region was estimated at 1.74 fish per trip in 2015.

Under this management option, the recreational management of black sea bass from North Carolina (north of Cape Hatteras) to the US/Canadian border will be split into two regions; the

[1] Although the Marine Recreational Fisheries Statistics Survey (MRFSS) was officially replaced by the MRIP in 2012, MRFSS-based raw data files are available through 2015, allowing a continuous time series of MRFSS data for this analysis.

northern region will contain the states of Maine through New York and the southern region will contain the states of New Jersey through North Carolina (North of Cape Hatteras). While the 2016 stock assessment used data primarily from Massachusetts south, the states of Maine and New Hampshire are included in the north region to ensure consistency with future regional measures. All states will agree to the regulations implemented within the region and states will implement consistent regulations to allow for similar recreational management programs within the region. The annual RHL will be allocated to the two regions based on a combination of the recreational catch per angler (CPA) effort data and permit license information to account for angler population/participation on the regional level. The following table outlines the regions, regional allocations of the annual RHL based on CPA & license information, potential 2018-2019 management measures.

Region	2015 CPA by Region (2016 Stock Assessment)	CPA and License Information modifier	2018 Recreational Harvest Limit	Regional Allocation (Percent)	Regional Allocation (number of fish)	Potential 2018-2019 Management Measures		
						Min. Size Limit	**Bag Limit**	**Season**
North: New York-Maine	1.7 fish per trip	X.X per trip	3.66 million pounds	XX%	X,XXX,XXX	13.5 inch	5 fish	5/1-9/30
South: New Jersey-North Carolina*	1.7 fish per trip	.XX per trip;		XX%	X,XXX,XXX	12.5 inch minimum size	7 Fish	5/15-10/31

Management Program

For 2018-2019, the northern region states will implement recreational black sea bass management programs that utilize minimum size limits, maximum possession limits and season lengths in state waters designed to achieve the regional allocation. The southern region states will set their management measures consistent with the federal measures that will apply in both state and federal waters. Northern region states will use management measures such as a minimum size limits (i.e. 13.5 inches), low bag limits (i.e. no more than 5 fish), and a common season to achieve the regional allocation. The common season seeks to account for spring participation for many northern states with an earlier season closure for all northern states in the fall to buffer against late season variability in catch estimates. These measures combined at the regional level will constitute an overall liberalization in harvest (XX% increase) from management measures in recent years and would be maintained for at least two years depending the results of the next black sea bass stock assessment update. To balance this liberalization, northern region states would develop proposals to implement improved data collection from both private anglers and state only permitted for-hire vessels[2] recreationally targeting black sea

[2] Effective March 12, 2018 as federally permitted for-hire vessels are required to submit electronic Vessel Trip Reports (VTRs) electronically and within 48 hours of ending a fishing trip (reporting all trips and all fish). VTRs from

bass. State proposals would need to demonstrate that by the 2020 fishing season, significant improvements in their recreational data collection would be achieved along the following parameters:

1) Biological sampling (length and weight)
2) Reduction in refusal rates of dock side MRIP intercepts/interviews
3) Discard composition information (i.e. discarded due to undersized fish, bag limit, etc.)
4) Reduction in discarding relative to 2010-2015
5) Improved compliance with management measures

Collectively, the states will develop consistent regional management measures for the 2018-2019 fishing seasons that are <u>similar</u> to 2017 measures for state waters. The states of New Jersey through North Carolina North of Cape Hatteras would set their recreational measures consistent with federal waters measures for 2018-2019. This is due to the fishing effort and harvest from these states is primarily focused in federal waters (3-200 miles). As part of draft Addendum XXX, the following process will take place:

November-December 2017: States of New York through Maine will cooperatively develop a set of regional measures to achieve the allocation. These proposals need to quantitatively demonstrate how the regional allocation will be achieved, the coastwide F_{MSY} target will not be exceeded, and an initial timetable for states to address the 5 parameters listed above. The proposals will be due January 15 2018 for the Board's consideration at the 2018 ASMFC Winter Meeting.

December 2017: the Board approves the draft document for public comment. The Commission and Council set the 2018 Black Sea Bass measures for federal waters.

January 15, 2018: Regional Proposals for 2018 Black Sea Bass measures are due for Technical Committee Review.

February 2018: The Board considers draft Addendum XXX for Final Action. If Option 4 is selected, states proposals must develop implementation plans for addressing the 5 reporting parameters by July 1, 2018.

February-April 2018: States of New York through Massachusetts go through implementation process to set 2018 management measures for their state waters.

Review and evaluation of Management Program

The goal of moving away from recent years' annual evaluation of harvest against the RHL is to change the timing of when the performance of measures, the metrics used to evaluate

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federally permitted vessels are required to report all fish kept or discarded (not just fish the vessel is permitted for) and for all fishing-related trips the vessel conducts. http://www.mafmc.org/newsfeed/2017/mid-atlantic-for-hire-vessel-permitting-and-reporting-electronic-only-submission-requirement-starts-march-12-2018 performance of the measures, and as well as the management response. This option seeks to better incorporate information from the 2016 Benchmark Stock Assessment into the management process, improve the experience of angling experience of the recreational community, and improve the reporting of recreational information to better inform management responses to changes in the condition of the resource.

The 2016 Benchmark Stock Assessment specified new Biological Reference Points (BRPs) and catch limits for 2017-2018. An operational assessment update is tentatively scheduled for review in early 2019; depending on the results of that assessment specific to stock status and the BRPs, recreational measures for the states of New York through Maine would next be evaluated and potentially adjusted for 2019. The following evaluation process would occur for 2019*:

- If the coastwide F_{MSY} target is found to be have been exceed, all states must reduce their management measures to achieve the F_{MSY} target. Northern region states would be able to draw on improved data collection from the recreational sector demonstrate how measures will achieve the needed reduction.

-If the coastwide F_{MSY} target is found not to have been exceed, all states may maintain current or similar management measures to achieve the F_{MSY} target.

*If the assessment schedule is delayed, the measures would be evaluated and subsequently adjusted following the assessments' or assessment update's completion.

The regional allocations may be addressed following the next stock assessment but triggered for revaluation through an addendum no later than the 2021 ASMFC Annual Meeting in preparation for the 2022 fishing season (5 years from the 2018 fishing season).

Appendix B. Regulations pertaining to violations onboard Recreational For-Hire Vessels.

<u>Federal Rule (as part of federal component of Summer Flounder, Scup, and Black Sea Bass FMP)</u>

50 CFR §648.145 Black sea bass possession limit.

(c) Black sea bass harvested by vessels subject to the possession limit with more than one person aboard may be pooled in one or more containers. Compliance with the possession limit will be determined by dividing the number of black sea bass on board by the number of persons aboard, other than the captain and the crew. If there is a violation of the possession limit on board a vessel carrying more than one person, the violation shall be deemed to have been committed by the owner and operator of the vessel.

[same language for scup and summer flounder at 50 CFR § 648.128 and 50 CFR 648.106]

<u>Commonwealth of Massachusetts Rule</u>

322 CMR 6.41 (3)

(c) Liability for Violations Onboard For-hire Recreational Vessels. With respect to recreational for-hire fishing operations permitted in accordance with 322 CMR 7.10(5): *Permit Requirements Applicable to For-hire Vessels,* an individual patron, as well as the named for-hire permit holder or for-hire vessel operator, may each be held liable for any violations of recreational size, possession or daily bag limits established at 322 CMR that are attributable to the patron fishing onboard the for-hire recreational fishing vessel. In enforcing this provision, law enforcement officers may exercise their discretion on whether to cite the named for-hire permit holder or for-hire vessel operator for such violations in instances where the best industry practices required by 322 CMR 7.10(5): *Permit Requirements Applicable to For-hire Vessels* have been used on the for-hire vessel.

[“best industry practices” refer to posting rules, giving verbal notice of rules, carrying measuring devices]

Atlantic States Marine Fisheries Commission

DRAFT ADDENDUM XXX TO THE SUMMER FLOUNDER, SCUP, BLACK SEA BASS FISHERY MANAGEMENT PLAN

Black Sea Bass Recreational Management in 2018

This draft document was developed for Management Board review and discussion. This document is not intended to solicit public comment as part of the Commission/State formal public input process. Comments on this draft document may be given at the appropriate time on the agenda during the scheduled meeting. If approved, a public comment period will be established to solicit input on the issues contained in the document.

ASMFC Vision:
Sustainably Managing Atlantic Coastal Fisheries

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1.0 Introduction

This Draft Addendum is proposed under the adaptive management/framework procedures of Amendment 12 and Framework 2 that are a part of the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (FMP). Summer flounder, scup, and black sea bass fisheries are managed cooperatively by the states through the Atlantic States Marine Fisheries Commission (Commission) in state waters (0-3 miles), and through the Mid-Atlantic Fishery Management Council (Council) and the NOAA Fisheries in federal waters (3-200 miles).

The management unit for summer flounder, scup, and black sea bass in US waters is the western Atlantic Ocean from the southern border of North Carolina northward to the US-Canadian border. The Commission's Summer Flounder, Scup, and Black Sea Bass Management Board (Board) approved the following motions on May 10, 2017:

> *Move to initiate an addendum for 2018 recreational black sea bass management with options as recommended by the Working Group and Plan Development Team. Options for regional allocations shall include approaches with uniform regulations (e.g., number of days) and other alternatives to the current North/South regional delineation (MA-NJ/DE-NC) such as those applied for summer flounder, i.e., one-state regions.*

This Draft Addendum proposes alternate approaches for management of the recreational black sea bass fishery for the 2018 fishing year and beyond.

2.0 Overview

2.1 Statement of Problem

The Commission's ISFMP Charter establishes fairness and equity as guiding principles for the conservation and management programs set forth in the Commission's FMPs. In recent years, challenges in the black sea bass recreational fishery have centered on providing equitable access to the resource in the face of uncertain population size, structure, and distribution. In the absence of an accepted peer reviewed stock assessment, biomass estimate, and reference points, the Board and Council had set coastwide catch limits at conservative levels to ensure sustainability of the resource. Coastwide catch limits set from 2010-2016 were largely based on a constant catch approach used to maintain or increase the size of the population based on historical catch data; for 2016, a Management Strategy Evaluation was considered and approved by the Board and Council to increase both the recreational and commercial catch limits. In recent years, fishery independent and dependent information and the 2016 benchmark stock assessment have indicated a much higher abundance of the resource than previously assumed. This presented challenges in both maintaining recreational harvest to the coastwide catch limits as well as crafting recreational measures that ensured equitable access to the resource along the coast.

Starting in 2011, the Board approved addenda that allowed states to craft measures in an aim to reduce harvest to the annual coastwide catch limit while maintaining state flexibility. After a single year of management by state shares, the Board adopted what became officially known as the ad-hoc regional management approach, where the Northern Region states of Massachusetts through New Jersey would individually craft state measures aimed at reducing harvest by the same percent, while the Southern Region states of Delaware through North Carolina set their regulations consistent with the federal waters measures. This approach, while allowing the states flexibility in setting their measures, did create discrepancies in conservation measures that were not tied to any original management plan baseline or goal (e.g., state allocations). Inequities resulted in how much of a harvest reduction states were addressing through their measures, with no accountability for the effectiveness of regulations. Most visibly, the ad-hoc approach did not provide uniformity in measures nor in evaluating harvest reductions.

2.2 Background

The black sea bass recreational fishery is managed on a “target quota” basis. Fifty-one percent of the total allowable landings are allocated to the recreational sector as the coastwide recreational harvest limit (RHL) and forty-nine percent is allocated to the commercial sector through a coastwide quota with each state allocated a percentage based on historical landings data.

From 1996 to 2010, uniform coastwide size, season, and bag limits had been used by the Commission and Council to constrain the recreational fishery to the annual RHL. Over time, the states grew concerned the coastwide regulations disproportionately impacted states within the management unit; therefore, the Board approved a series of addenda which allowed for state-by-state flexibility, first through state shares in 2011 and then through the ad-hoc regional management approach for 2012–2017. The Northern Region states have been subject to harvest reductions in all years except 2012 (liberalization), while the Southern Region states have been largely status quo. Under ad-hoc regional management in 2017, the Board initially allowed for status quo measures for all states, but then responded to the final 2016 harvest estimates by approving a reduction in the possession limit to 5 fish for wave 6 (November 1-December 31) for the states of Rhode Island through New Jersey in May 2017.). In August 2017, after taking into consideration the results of the 2016 benchmark stock assessment, which found the stock is not overfished and overfishing is not occurring, and concern over the uncertainty in the wave 6 harvest estimate for New York, the Board rescinded its previous action establishing a 5 fish possession limit. As a result, states are maintaining their 2016 measures for 2017 (Table 1).

Table 1. State by State Black Sea Bass Recreational Measures for 2017.

State	Minimum Size (inches)	Possession Limit	Open Season
Maine	13	10 fish	May 19-September 21; October 18-December 31
New Hampshire	13	10 fish	January 1-December 31
Massachusetts	15	5 fish	May 20-August 29
Rhode Island	15	3 fish	May 25 - August 31
		7 fish	September 1 - September 21; October 22 - December 31
Connecticut (Private & Shore)	15	5 fish	May 1-December 31
CT Authorized Party/Charter Monitoring Program Vessels		8 fish	
New York	15	3 fish	June 27- August 31
		8 fish	September 1-December 31
		10 fish	November 1-December 31
New Jersey	12.5	10 fish	May 26-June 18
		2 fish	July 1-August 31
		15 fish	October 22-December31
Delaware, Maryland, Virginia, and North Carolina, North of Cape Hatteras (N of 35° 15’N)	12.5	15 fish	May 15-September 21; October 22-December 31

Note: cells are shared to help with table readability and do not indicate regional alignment.

2.3 Description of the Fishery

Black sea bass are a popular recreational fishing target in the mid-Atlantic and southern New England regions. Most recreational harvest of black sea bass occurs in the state waters of Massachusetts through New Jersey when the fish migrate inshore during the spring through summer months.

For much of the last decade, coastwide harvest has exceeded the coastwide RHL (Table 2). In 2016, MRIP data indicate that an estimated 5.19 million pounds of black sea bass were harvested recreationally from Maine through Cape Hatteras, North Carolina, exceeding the 2016 RHL by 2.37 million pounds. In 2016, about 65% of black sea bass harvested were caught in state waters and about 35% in federal waters, although state by state percentage caught varies (Table 3). In recent years, the majority of black sea bass were harvested in New Jersey, New York, Connecticut, Rhode Island and Massachusetts. These five states account for 94% of all black sea bass harvest north of Cape Hatteras in 2016 (Table 4; Figure 1). Additionally, MRIP data indicate that 84% of harvest in 2016 came from anglers on private or rental boats, and 16% came from party/charter boats (Figure 2).

Table 2. Black Sea Bass Recreational Harvest relative to coastwide RHL 2006-2016. **Note**: Coastwide Harvest includes only harvest post-stratified from Cape Hatteras, North Carolina north to the US/Canadian Border

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Coastwide Harvest (mil. lb)	1.78	2.18	2.03	2.56	3.19	1.17	3.19	2.46	3.66	3.79	5.19
Coastwide RHL (mil. lb)	3.99	2.47	2.11	1.14	1.83	1.78	1.32	2.26	2.26	2.33	2.82
Percent of RHL harvested	45%	88%	96%	**225%**	**174%**	66%	**242%**	**109%**	**162%**	**163%**	**184%**

Table 3. Percentage of state by state harvest (in pounds) taken from state vs. federal waters for 2007-2016. Please note: North Carolina is omitted due to post-stratification of harvest north of Cape Hatteras.

Years: 2006-2016	MA	RI	CT	NY	NJ	DE	MD	VA
State Waters (<= 3 MI)	81%	77%	41%	63%	30%	7%	0%	4%
Federal Waters (>3 MI)	19%	23%	59%	37%	70%	93%	100%	96%

Table 4. State-by-state recreational harvest of black sea bass (in numbers of fish), Maine through Cape Hatteras, North Carolina, 2006 through 2016.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Maine						0	0				
New Hampshire					0		3,195	12,283	0	0	0
Massachusetts	149,993	149,434	246,136	430,748	702,138	194,752	519,910	291,678	457,099	342,554	392,239
Rhode Island	67,076	44,024	52,303	35,972	160,427	50,203	102,548	74,727	214,463	233,631	254,704
Connecticut	4,684	23,574	59,751	465	15,682	8,378	110,858	109,807	397,033	330,628	435,624
New York	455,213	409,697	259,511	566,483	543,243	274,473	321,516	353,036	469,150	876,630	1,032,604
New Jersey	690,651	724,591	579,617	583,373	687,451	148,487	734,928	345,337	468,402	310,298	294,312
Delaware	140,931	93,147	22,621	37,345	21,028	42,961	40,141	36,557	23,879	22,899	24,168
Maryland	136,064	38,669	26,429	33,082	36,018	47,445	33,080	29,677	68,469	57,631	79,951
Virginia	105,134	36,152	38,045	114,805	29,718	18,964	4,076	21,295	18,802	38,763	28,913
North Carolina Post-Stratified	28,352	8,517	9,353	3,307	10,850	30,975	3,664	8,002	696	1,920	864

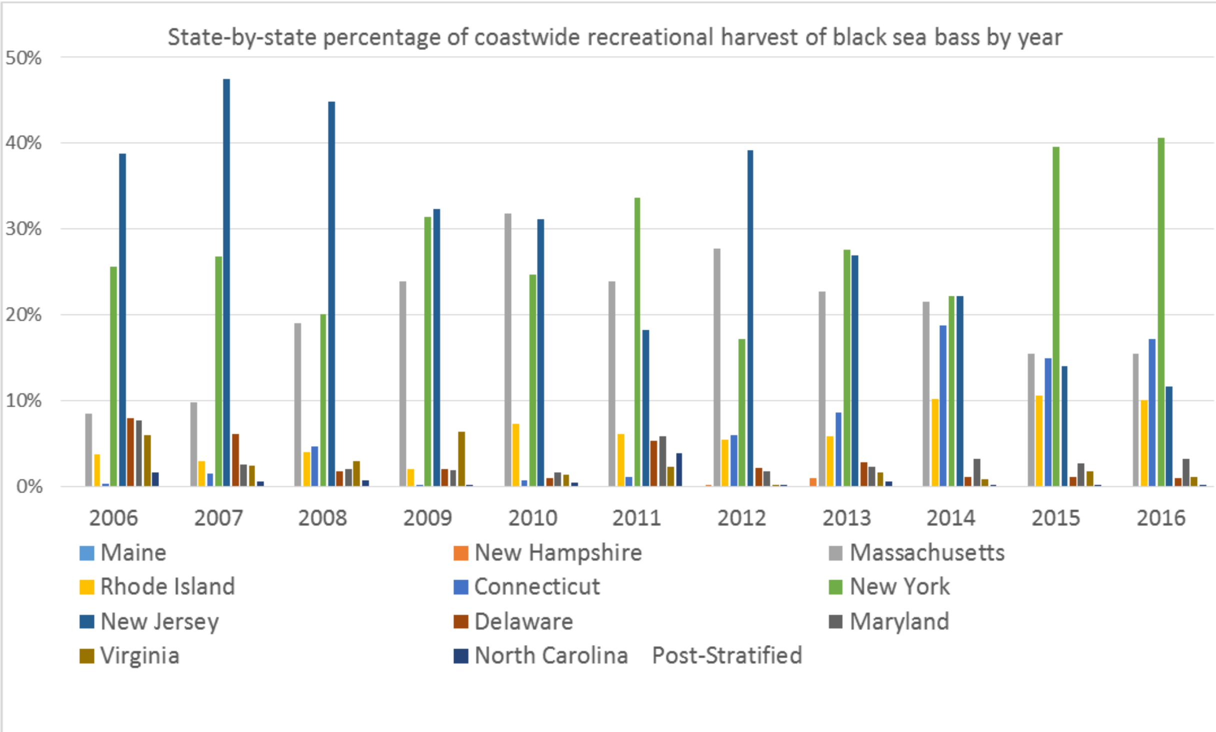

Figure 1. State-by-state contribution (as a percentage) to total recreational harvest of black sea bass (in numbers of fish), Maine through Cape Hatteras, North Carolina, 2006 through 2016.

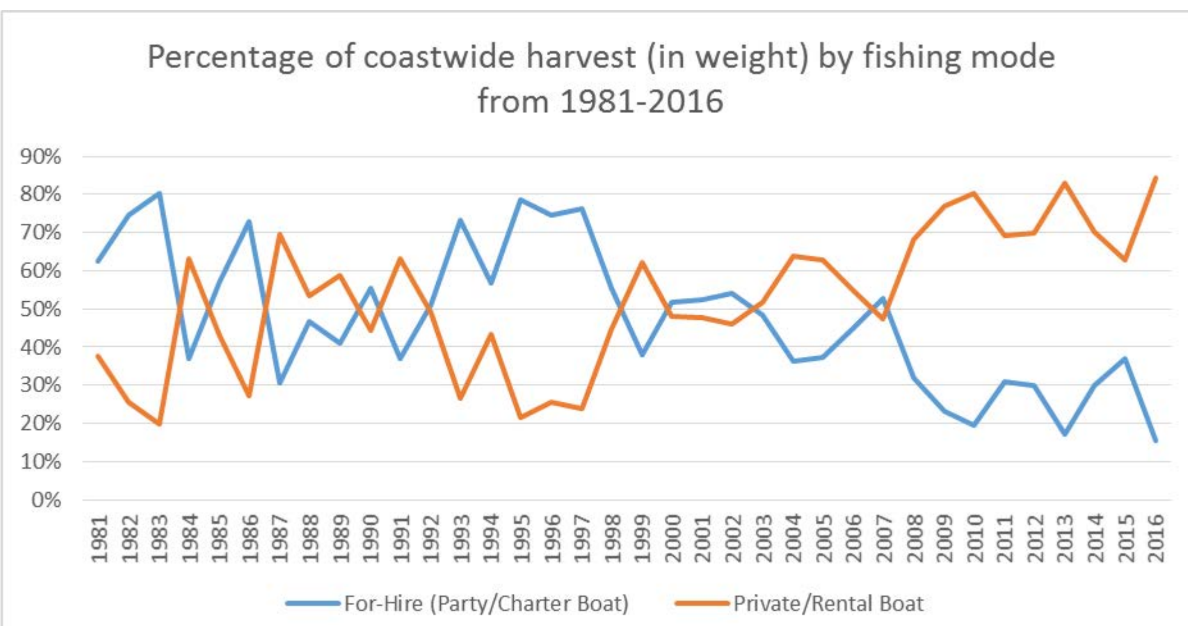

Figure 2. Percentage of coastwide harvest (in weight) by fishing mode from 1981-2016.

2.4 Status of the Stock

The last peer reviewed and accepted benchmark stock assessment was approved in December 2016 (SARC 62). The assessment indicated that the black sea bass stock north of Cape Hatteras, North Carolina was not overfished and overfishing was not occurring in 2015.

For modeling black sea bass north of Cape Hatteras, the stock was partitioned into two sub-units approximately at Hudson Canyon to account for spatial differences in abundance and size at age. The sub-units are not considered to be separate stocks. Based on the assessment modelling, biomass is considered underestimated and the large 2011 year class is dominant in the northern area (north of Hudson Canyon) and less so in the southern area (south of Hudson Canyon). Although the stock was assessed by sub-unit, the combined results were put forth to develop reference points and harvest specifications.

Spawning stock biomass (SSB), which includes both mature male and female biomass, averaged around 6 million pounds from the late 1980's and early 1990's and then steadily increased from 1997 to 2002 when it reached 18.7 million pounds. From 2007 on, the SSB has increased, reaching its highest level in 2015 (48.89 million pounds) (Figure 1). The fishing mortality rate (F) in 2015 was 0.27, below the fishing mortality threshold reference point (F_{MSY} PROXY= F40%) of 0.36. Fishing mortality has been below the F_{MSY} PROXY for the last five years. Model estimated recruitment was relatively constant throughout the time series except for large peaks from 1999 and 2011 year classes. Average recruitment of age 1 black sea bass from 1989–2015 equaled 24.3 million fish with the 1999 year class estimated at 37.3 fish and the 2011 year class estimated at 68.9 million fish.

Based on the stock assessment, the Board and Council set the 2017 RHL at 4.29 million pounds. In light of the projected decline in biomass in 2018, the 2018 RHL is set at 3.66 million pounds, an approximate 15% reduction from the 2017 RHL.

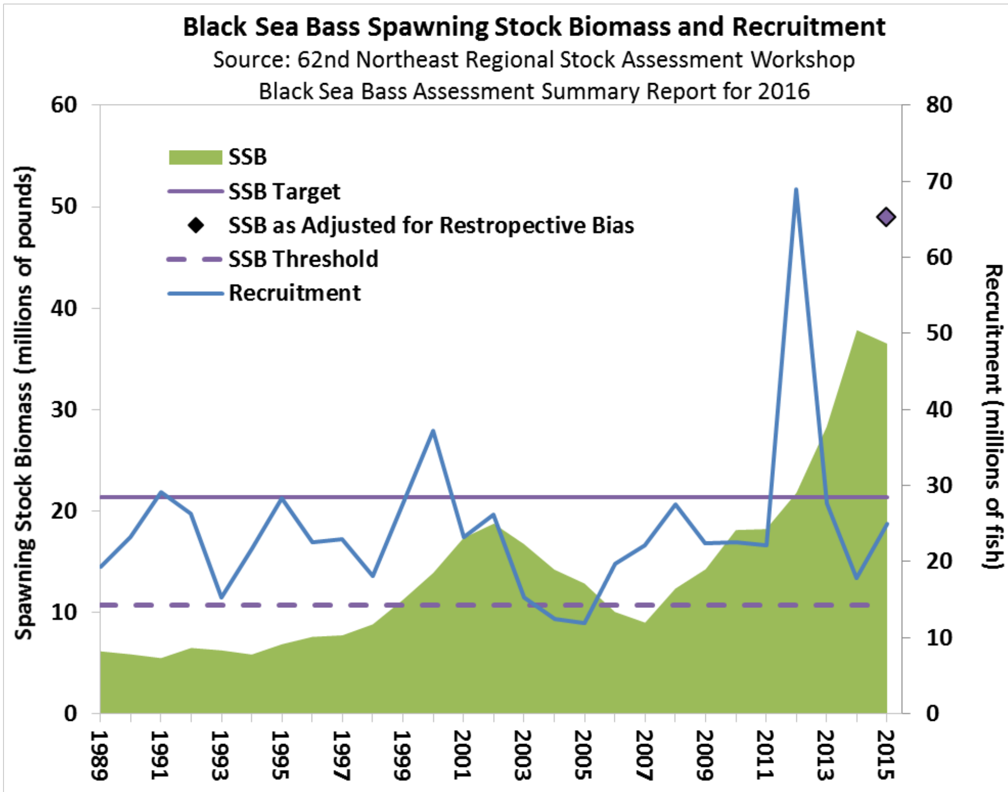

Figure 3. Black Sea Bass spawning stock biomass (SSB) and recruitment at age 0 by calendar year.

3.0 Proposed Management Program

The following options were developed from the Board motion from May 2017. The Black Sea Bass Recreational Working Group provided additional information for the Board to consider in selecting, removing, or further developing the options below. Again, these options can be further modified by the Board.

Option 1: Default Management program

For 2018, a coastwide set of measures (size limit, possession limit, season length) would be specified in both state and federal waters to achieve the 2018 RHL.

Option 2: Regional Allocation of Annual RHL

For 2018, the RHL would be allocated to regions. Each region would be responsible for developing measures that would constrain the harvest to their allocation. States within a regions will develop proposals for the Board to consider for approval no later than the 2018 ASMFC Winter Meeting.

Sub-option 2A: Regional alignment

The following groupings would specify the regional alignment & regional allocation in 2018. (**Note**: Allocation scenarios under the regional alignment and timeframe options are included in Appendix I)

A) **2 Regions**: Massachusetts through New Jersey (North Region); Delaware through North Carolina north of Cape Hatteras (South region). This regional alignment was in place during ad-hoc regional management (2012-2017). They were based on both amount of landings and area of harvest (state vs federal waters).

B) **2 Regions**: Massachusetts through New York (North Region); New Jersey through North Carolina north of Cape Hatteras (South region). This regional alignment is based in part on the results of the 2016 benchmark stock assessment, which indicated different levels of abundance for black sea bass north of Hudson Canyon.

C) **3 Regions**: Massachusetts through New York (North Region); New Jersey as a state specific region (New Jersey Region); Delaware through North Carolina north of Cape Hatteras (South region). This regional alignment is based in part on the results of the 2016 benchmark stock assessment, which indicated different levels of abundance for black sea bass north of Hudson Canyon. As the demarcation line of abundance is not fixed, this regional alignment seeks to allow New Jersey to set state level measures to address spatial variation in size and abundance of black sea bass along the New Jersey coast.

D) **4 Regions**: Massachusetts through Rhode Island (North Region); Connecticut through New York (Long Island Region); New Jersey as a state specific region (New Jersey Region); Delaware through North Carolina north of Cape Hatteras (South region). This regional alignment seeks to create more consistency between neighboring states and shared water bodies.

Sub-option 2B: Timeframes for specifying allocation
Under this specification, harvest data would be used to determine each state's share of the annual RHL. One of the following timeframe options would be used to set harvest allocations:

A) **2006-2015 (10 years)**

B) **2011-2015 (5 years)**

(Note: Allocation scenarios under each regional alignment and timeframe are included in Appendix I)

Sub-option 2C: Management measures within a region

A) **Uniform regulations within a region**: the states within a region must implement a set of uniform management measures (size limit, possession limit, and season length).

B) **Regulatory standard with Conservation Equivalency allowed**: A uniform set of regulations is developed for a region, but states within the region can submit proposals for conservation equivalency regulations, although the management measures are not to differ more than 1" in size limit, 3 fish in possession limit, and 30 days in season length from the regulatory standard.

Option 3: Alternative allocation-based recreational management
See call summary for details

3.1 Timeframe for Addendum provisions

Option 1: 2 years (2018-2019)
The management program outlined in section 3.0 will be in place for 2018. The Board could take action, through a Board vote, to extend the addendum for one year, expiring at the end of 2019. After 2019, measures would revert back to the FMP status quo of coastwide measures.

Option 3: 3 years (2018-2020)
The management program outlined in section 3.0 will be in place for 2018. The Board could take action, through a Board vote, to extend the addendum for up to two years, expiring at the end of 2020. After 2020, measures would revert back to the FMP status quo of coastwide measures.

4.0 Compliance

TBD

Appendix I. Regional Allocation Scenarios

Please note: Harvest from New Hampshire are used in coastwide time series numbers

1) 2 Regions: Massachusetts through New Jersey (North Region); Delaware through North Carolina north of Cape Hatteras (South region).

Table 5. Time Series Option "A" 2006-2015 harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	3,484,442	15,382,763	91%
RHODE ISLAND	1,035,374		
CONNECTICUT	1,060,860		
NEW YORK	4,528,952		
NEW JERSEY	5,273,135		
DELAWARE	481,509	1,519,463	11%
MARYLAND	506,564		
VIRGINIA	425,754		
NORTH CAROLINA	105,636		
Grand Total	16,917,704		

Table 6. Time Series Option "B" 2011-2015 harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	1,805,993	7,740,526	93%
RHODE ISLAND	675,572		
CONNECTICUT	956,704		
NEW YORK	2,294,805		
NEW JERSEY	2,007,452		
DELAWARE	166,437	549,896	7%
MARYLAND	236,302		
VIRGINIA	101,900		
NORTH CAROLINA	45,257		
Grand Total	8,305,900		

2) 2 Regions: Massachusetts through New York (North Region); New Jersey through North Carolina north of Cape Hatteras (South region).

Table 7. Time Series Option "A" 2006-2015 harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	3,484,442	10,109,628	60%
RHODE ISLAND	1,035,374		
CONNECTICUT	1,060,860		
NEW YORK	4,528,952		
NEW JERSEY	5,273,135	6,792,598	40%
DELAWARE	481,509		
MARYLAND	506,564		
VIRGINIA	425,754		
NORTH CAROLINA	105,636		
Grand Total	16,917,704		

Table 8. Time Series Option "B" 2011-2015 harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	1,805,993	5,733,074	69%
RHODE ISLAND	675,572		
CONNECTICUT	956,704		
NEW YORK	2,294,805		
NEW JERSEY	2,007,452	2,557,348	31%
DELAWARE	166,437		
MARYLAND	236,302		
VIRGINIA	101,900		
NORTH CAROLINA	45,257		
Grand Total	8,305,900		

3) 3 Regions: Massachusetts through New York (North Region); New Jersey as a state specific region (New Jersey Region); Delaware through North Carolina north of Cape Hatteras (South region).

Table 9. Time Series Option "A" 2006-2015 harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	3,484,442	10,109,628	60%
RHODE ISLAND	1,035,374		
CONNECTICUT	1,060,860		
NEW YORK	4,528,952		
NEW JERSEY	5,273,135	5,273,135	31%
DELAWARE	481,509	1,519,463	9%
MARYLAND	506,564		
VIRGINIA	425,754		
NORTH CAROLINA	105,636		
Grand Total	16,917,704		

Table 10. Time Series Option "B" 2011-2015 Harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	1,805,993	5,733,074	69%
RHODE ISLAND	675,572		
CONNECTICUT	956,704		
NEW YORK	2,294,805		
NEW JERSEY	2,007,452	2,007,452	24%
DELAWARE	166,437	549,896	7%
MARYLAND	236,302		
VIRGINIA	101,900		
NORTH CAROLINA	45,257		
Grand Total	8,305,900		

4) 4 Regions: Massachusetts through Rhode Island (North Region); Connecticut through New York (Long Island Region); New Jersey as a state specific region (New Jersey Region); Delaware through North Carolina north of Cape Hatteras (South region).

Table 11. Time Series Option "A" 2006-2015 Harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	3,484,442	4,519,816	27%
RHODE ISLAND	1,035,374		
CONNECTICUT	1,060,860	5,589,812	33%
NEW YORK	4,528,952		
NEW JERSEY	5,273,135	5,273,135	31%
DELAWARE	481,509	1,519,463	9%
MARYLAND	506,564		
VIRGINIA	425,754		
NORTH CAROLINA	105,636		
Grand Total	16,917,704		

Table 12. Time Series Option "B" 2011-2015 Harvest in numbers of fish

State	Harvest	Regional Harvest	Percentage Allocation
MASSACHUSETTS	1,805,993	2,481,565	30%
RHODE ISLAND	675,572		
CONNECTICUT	956,704	3,251,509	39%
NEW YORK	2,294,805		
NEW JERSEY	2,007,452	2,007,452	24%
DELAWARE	166,437	549,896	7%
MARYLAND	236,302		
VIRGINIA	101,900		
NORTH CAROLINA	45,257		
Grand Total	8,305,900		

Mid-Atlantic Fishery Management Council
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Phone: 302-674-2331 | FAX: 302-674-5399 | www.mafmc.org
Michael P. Luisi, Chairman | G. Warren Elliott, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: September 26, 2017

To: Council

From: Brandon Muffley, Staff

Subject: Reconsideration of the 2018 Wave 1 Recreational Black Sea Bass Fishery – February 1 – 28 open season

Introduction

The Mid-Atlantic Fishery Management Council (Council) and the Atlantic States Marine Fisheries Commission's Summer Flounder, Scup and Black Sea Bass Management Board (Board) are re-considering a potential opening of the Wave 1 (January/February) fishery in 2018. At their joint meeting in August, the Council and Board considered a couple of options for the 2018 Wave 1 fishery (e.g. open the entire Wave 1 season, open only on weekends during Wave 1) but ultimately did not approve any option. Since the August meeting, Council members have developed an option for the Wave 1 fishery that was not considered by the Council and Board. Specifically, a season from February 1- 28, 2018 with a 15 fish possession limit and 12.5 inch minimum size will be considered by the Council and Board at their respective October meetings. If approved, these measures would be in place for 2018 while the Council and Board consider the implementation of a Letter of Authorization (LOA) program for the 2019 recreational black sea bass Wave 1 fishery.

This memo provides potential black sea bass harvest under different participation scenarios assuming a February 1 – 28 season, 15 fish possession limit and 12.5" minimum size. Based on these estimates, potential implications for the rest of the recreational black sea bass season in 2018 are considered. Information on preliminary 2017 recreational black sea harvest estimates are also provided.

Wave 1 Harvest Projections

The information and analysis used to determine the potential black sea bass harvest for a February 1 – 28 season was the same as that developed by staff when the Council and Board were considering opening the entire Wave 1 fishery at their August meeting[1]. In summary, Vessel Trip Report (VTR) data from federally permitted for-hire vessels from 2013, the last year the Wave 1 fishery was open, was used to generate harvest estimates for the for-hire sector under different levels of for-hire vessel participation. These for-hire estimates were then used to scale the private/rental and shore mode assuming 50% of the harvest would be from the private/rental and shore modes and 50% of harvest would be from the party and charter modes based on an evaluation of the Wave 6 (November/December) catch by mode (note: a subsequent analysis of Wave 2 (March/April) catch produced similar results). This 50/50 harvest ratio was then applied to the various estimates of Wave 1 black sea bass harvest by the for-hire sector in order to scale to entire fishery and develop estimates of total Wave 1 recreational black sea bass harvest (Table 1). The proportion of harvest and average harvest per day for February was then used to determine potential black sea bass harvest estimates for February only in order to evaluate the option under consideration.

Table 1. Estimated 2018 Wave 1 black sea bass harvest by for-hire vessels only, total Wave 1 harvest for all modes and total February harvest for all modes under varying participation levels. Federal for-hire VTR data from 2013 was used to calculate the average number of trips per vessel, average number of anglers per trip and average harvest per angler. MRIP data from 2016 was used to calculate the average weight of harvested black sea bass to convert harvest in numbers of fish to weight in pounds. Harvest estimates that include all modes assume 50% of the harvest from party/charter vessels and 50% from private/rental and shore mode. Information from 2013 is highlighted in grey.

Scenario	Number of Vessels	Number of Trips / Vessel	Ave Number of Anglers / Trip	Avg. Harvest / Angler	Total Wave 1 For-Hire Harvest (lb)	Total Wave 1 Harvest (lb)	Total February Harvest (lb)
1	25	6	26	11.1	88,312	176,623	**64,821**
2	30	6	26	11.1	105,974	211,948	**77,785**
3	39	6	26	11.1	137,766	275,532	**101,120**
4	45	6	26	11.1	158,961	317,922	**116,677**
5	50	6	26	11.1	176,623	353,246	**129,641**
6	55	6	26	11.1	194,286	388,571	**142,606**

Based on this analysis, total recreational black sea bass harvest for a February 1 – 28 season, 15 fish possession limit and 12.5” minimum size limit could range from 64,821 pounds to 142,606 pounds. If participation and effort declines, compared to 2013, total recreational black sea bass harvest in February could be as low as 64,821 pounds, or 1.8% of the 2018 RHL (Scenario 1 in

[1] See the July 12, 2017 staff memo to the Council regarding the 2018 Wave 1 recreational black sea bass fishery found at http://www.mafmc.org/briefing/august-2017.

Table 2). Under a more likely scenario of increasing participation and effort, compared to 2013, total harvest in February could be as high as 142,606 pounds, or 3.9% of the 2018 RHL (Scenario 6 in Table 2).

Implications for Rest of Recreational Black Sea Bass Season

Any catch and harvest that occurs during the 2018 Wave 1 fishery will be accounted for and evaluated against the recreational sector Annual Catch Limit (ACL) and Recreational Harvest Limit (RHL), respectively, along with the entire 2018 recreational black sea bass fishery. In order to constrain recreational catch and harvest and not exceed the ACL and RHL, any black sea bass catch that is "allocated" to the Wave 1 fishery will require adjustments to the rest of the year. The required adjustments for the remainder of the fishing year will depend on the catch and harvest that occurs during Wave 1.

Similar to prior analyses[1], total estimated recreational harvest for a 2018 February Wave 1 fishery under different participation scenarios were evaluated against the currently implemented 2018 RHL in order to determine the reductions needed to the rest of the recreational fishery. In order to evaluate the potential implications of a 2018 February Wave 1 fishery may have on the rest of the year, recreational season reduction examples were developed at the coastwide, regional and/or state level (Table 2).

The reductions provided do not account for any other adjustments that may be needed for the 2018 recreational black sea bass season. Similar to the information provided in the next section, the Council and Board will receive an update on preliminary 2017 recreational black sea bass harvest estimates and projections at their joint meeting in December. Depending on the information available, additional adjustments, either reductions or liberalizations, to 2018 recreational management measures may need to be considered. The reductions and seasonal implications provided in Table 2 only account for the harvest during the 2018 Wave 1 fishery and would be on top of any additional reductions that may be needed to constrain landings to the 2018 RHL.

Table 2. Estimated total 2018 February Wave 1 black sea bass harvest under varying participation levels and their potential implications for the rest of the 2018 recreational black sea bass fishing season at the coastwide, regional or state specific level. The reductions and seasonal implications provided below only account for the harvest during the 2018 Wave 1 fishery and would be on top of any additional reductions needed to constrain landings to the 2018 RHL.

Scenario	Projected Harvest (lb)	Reduction Needed to Rest of Recreational Fishery	Season Implications
1	64,821	1.7%	**Coastwide:** 3 days in either Wv 3 or Wv 5 **Federal/Southern Region:** 2 days in Wv 3 or 2 days in Wv 5 **State Specific:** 1 day Wv 3 in MA; 1 day Wv 4 in NY; 1 day Wv 3 in NJ
2	77,785	2.1%	**Coastwide:** 4 days in either Wv 3 or Wv 5 **Federal/Southern Region:** 3 days in Wv 3 or 3 days in Wv 5 **State Specific:** 1 day Wv 3 in MA; 2 days Wv 4 in NY; 1 day Wv 3 in NJ
3	101,120	2.8%	**Coastwide:** 5 days in either Wv 3 or Wv 5 **Federal/Southern Region:** 4 days in Wv 3 or 3 days in Wv 5 **State Specific:** 2 days Wv 3 in MA; 2 days Wv 4 in NY; 2 days Wv 3 in NJ
4	116,677	3.2%	**Coastwide:** 5 days in either Wv 3 or Wv 5 **Federal/Southern Region:** 4 days in Wv 3 or 4 days in Wv 5 **State Specific:** 2 days Wv 3 in MA; 2 days Wv 4 in NY; 2 days Wv 3 in NJ
5	129,641	3.5%	**Coastwide:** 6 days in either Wv 3 or Wv 5 **Federal/Southern Region:** 5 days in Wv 3 or 4 days in Wv 5 **State Specific:** 2 days Wv 3 in MA; 3 days Wv 4 in NY; 2 days Wv 3 in NJ
6	142,606	3.9%	**Coastwide:** 7 days in either Wv 3 or Wv 5 **Federal/Southern Region:** 5 days in Wv 3 or 5 days in Wv 5 **State Specific:** 2 days Wv 3 in MA; 3 days Wv 4 in NY; 3 days Wv 3 in NJ

2017 Preliminary Recreational Harvest Estimates and Projections

Preliminary Wave 3 (May/June) MRIP catch and harvest estimates were made available on August 18, 2017 and the recreational black sea bass season was open for at least a portion of Wave 3 in all states. Preliminary 2017 estimates indicate the Wave 3 black sea bass harvest is 59% higher in numbers of fish and 38% higher in weight than the 2016 Wave 3 estimates (Table 3). The 2017 estimated Wave 3 harvest in weight is higher in all states, except for CT, when compared to 2016. From 2013 – 2016, Wave 3 accounts for 22.7% of the total recreational black sea bass harvest on average. Assuming a similar proportion for the 2017 Wave 3 harvest or assuming harvest in Waves 4-6 will be similar in 2017 to that observed in 2016 under similar management measures, results in a projected 2017 recreational black sea bass harvest of 5.55 million pounds. The projected preliminary 2017 harvest estimate of 5.55 million pounds is 51.6% higher than the 2018 RHL of 3.66 million pounds.

Table 3. Comparison of the final 2016 and preliminary 2017 Wave 3 (May/June) MRIP recreational black sea bass harvest estimates for the states of MA – VA.

State	2016		2017	
	# of Fish	Weight (lb)	# of Fish	Weight (lb)
MA	162,143	400,846	158,771	431,046
RI	7,477	14,136	51,852	101,605
CT	128,600	276,186	17,972	51,484
NY	0	0	1,297	2,184
NJ	140,641	206,937	460,334	631,460
DE	9,142	12,351	27,448	38,883
MD	14,743	19,865	18,210	26,703
VA	6,288	6,913	10,628	13,385
Total	**469,034**	**937,234**	**746,512**	**1,296,750**

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Lieutenant Governor
Matthew A. Beaton
Secretary
Ronald Amidon
Commissioner
Mary-Lee King
Deputy Commissioner

MEMORANDUM

TO: ASMFC Summer Flounder, Scup, and Black Sea Bass Management Board

FROM: Nichola Meserve, MA Administrative Board Member (Proxy)

DATE: October 11, 2017

SUBJECT: Scup Minimum Mesh Size Requirement and MA Compliance

---

Introduction

The 2016 FMP Review for Scup will disclose that Massachusetts has not implemented bottom trawl minimum mesh size requirements that are fully consistent with the Scup FMP. Specifically, state regulations allow our seasonal small-mesh squid fishery to exceed the scup incidental trip limits for bottom trawl gear using mesh smaller than 5" diamond. Massachusetts Division of Marine Fisheries (DMF) staff made this realization while compiling this year's annual compliance report and reported it therein.

Background

The federal/interstate plan currently mandates a bottom trawl minimum mesh size of 5" diamond when possessing more than 1,000 lbs of scup during November 1–April 30 and 200 lbs during May 1–October 31 (Table 1). These mesh size triggers serve to discourage a directed fishery on scup with small mesh that would cause regulatory discards due to the minimum size (9").

The trawl net minimum mesh size throughout MA is 6.5" throughout the cod-end and 6" throughout the remainder of the net, <u>except</u> for our seasonal small mesh squid fishery, which is authorized a 1 ⅞" mesh size during April 23–June 9 (or longer by Director's declaration; generally a week if at all). This squid fishery season overlaps with our commercial scup season, and we have no rule preventing vessels using small mesh for squid from taking scup at the authorized trawl trip limits.

This was of no consequence until 2002 when DMF began a series of gradual liberalizations to our scup regulations, commensurate with increased and/or underutilized quotas (Table 2). The small mesh squid fishery in particular was allowed sequentially larger trip limits to accommodate the occasional large tow of scup, and thereby reduce regulatory discards.

Request

MA could implement the applicable 1,000-lb and 200-lb scup limits for our small mesh squid fishery, but not without causing some level of discards of scup. The directed squid fishery will occur regardless of the scup allowance, and will have the occasional large bycatch of scup. These fish will be dead whether discarded or landed. Given scup's rebuilt stock status and underutilized coastwide/MA quota, this could be considered unnecessary waste.

Our small mesh squid fishery within state waters is limited in time to April 23–June 9 specifically to avoid the catch of undersized scup, fluke, black sea bass, and squid. Larger, adult scup are generally arriving in state waters during this time to spawn, followed by younger scup as the squid fishery concludes. An extension of the squid season is authorized only if it is determined that continued use of small mesh will not result in large amounts of undersized bycatch. Few squid vessels—those with state permits only— are taking scup at the higher limits in MA waters, because all federally-permitted squid vessels are limited by the federal incidental trip limit for mesh less than 5”. Participation in the state waters small mesh squid fishery requires a limited entry mobile gear permit, and vessels are restricted to 72’ in length.

Because we require large mesh (6.5”) outside of the short squid season, scup landings by otter trawls are minimal due to the escapement of most scup from this larger mesh. Therefore, scup landings in MA can be considered almost exclusively incidental bycatch, either from the small mesh squid fishery or large mesh fluke fishery. In addition to the very conservative mesh regulations, night trawling is prohibited which further conserves scup in state waters. Trawling from a half hour after sunset to a half hour before sunrise is prohibited. It is widely recognized that scup trawling at night is very effective, but has been banned in state waters for over two decades.

DMF’s request to the Board is for a temporary stay on a non-compliance finding until the ASMFC’s Winter 2018 Meeting. In the interim, DMF hopes to develop a conservation equivalency proposal that would allow higher scup limits for state-permitted squid vessels based on the squid fishery’s tight controls and minimal bycatch of undersized scup, and our greater-than-required minimum mesh size the rest of the year and mobile gear night closure. If we are unable to document this by the winter meeting, DMF will proceed with a rule-change to adopt the incidental catch limits prior to commencement of our squid season.

Thank you for your consideration.

Table 1. Scup Minimum Mesh Size and Landings Trigger History

Years		1996	1997-1998	1999-2001	2002-2004	2005-2015	2016-present
Minimum Mesh Size (generalized)		4”	4.5"	4.5"	4.5" or 5"	5"	5"
Incidental Limit (lbs)	Winter (11/1–4/30)	4,000	4,000	200	500	500	1,000
	Summer (5/1–10/31)		1,000	100	100	200	200

Table 2. Summary of MA Scup Possession Limits for the Small Mesh Squid Fishery

Years	Possession Limit During Small Mesh Squid Fishery	Dates	Compliance Issue
1996–2001	100 lbs/day	Apr 23–Jun 9	Compliant with incidental limits
2002–2004	300 lbs/day	Apr 23–Jun 9	Violation of summer incidental limit (100 lbs)
2005–2010	400 lbs/day	Apr 23–Jun 9	Violation of summer incidental limit (200 lbs)
2011–2012	800 lbs/day	Apr 23–Jun 9	Violation of summer incidental limit (200 lbs) and winter incidental limit (500 lbs)
2013–2014	50,000 lbs/trip (WI limit)	Apr 23–Apr 30	Violation of winter incidental limit (500 lbs)
	800 lbs/day	May 1–Jun 9	Violation of summer incidental limit (200 lbs)
2015–2016	50,000 lbs/trip (WI limit)	Apr 23–Apr 30	Violation of winter incidental limit (500 lbs in 2015 and 1,000 lbs in 2016)
	800 lbs/day or 5,600 lbs/week	May 1–Jun 9	Violation of summer incidental limit (200 lbs)
2017	50,000 lbs/trip (WI limit)	Apr 23–Apr 30	Violation of winter incidental limit (1,000 lbs)
	10,000 lbs/week	May 1–Jun 9	Violation of summer incidental limit (200 lbs)

Summer Flounder, Scup, & Black Sea Bass

Activity level: High

Committee Overlap Score: High (Bluefish TC, Tautog TC and SAS, Striped Bass TC and SAS, Horseshoe Crab TC, Menhaden TC, BERP)

Committee Task List

- TC- January: Develop Recommendations on Draft Addendum XXX and finalize recommendations on changing recreational process
- TC – June 1: Compliance reports due for all three species
- TC – July: In person meeting to develop recommendations on 2019 specifications (Coastwide Quota and RHLs) for summer flounder, scup and black sea bass
- 2018 Summer Flounder Benchmark Stock Assessment
  - TC – TBD: Data Deadline
  - TC & SAW Working Group – TBD: Data Workshop
  - SAW Working Group – TBD: Assessment Workshop
- 2018 Scup Operational Assessment **(Under consideration, but not officially scheduled)*
  - TC – TBD: Data Deadline
- 2018 Black Sea Bass Operational Assessment *(*Under consideration, but not officially scheduled*)
  - TC – TBD: Data Deadline

TC Members: Greg Wojcik (CT, TC Chair), Julia Beaty (MAFMC), Joe Cimino (VA), Peter Clarke (NJ), Kiley Dancy (MAFMC), Justin Davis (CT), Steve Doctor (MD), Emily Gilbert (NOAA), Jeff Kipp (ASMFC), John Maniscalco (NY), Jason McNamee (RI), Brandon Muffley (MAFMC), Kirby Rootes-Murdy (ASMFC), Gary Shepherd (NOAA), Caitlin Starks (ASMFC), Mark Terceiro (NOAA), Todd VanMiddlesworth (NC), Tiffany Vidal (MA, TC Vice Chair), Richard Wong (DE)

Summer Flounder SAW Working Group: Jessica Coakley (MAFMC, Chair), Mark Terceiro (NOAA), Jeff Brust (NJ), Chris Legault (NOAA), Jason McNamee (RI), Tim Miller (NOAA), Charles Perretti (CA), Pat Sullivan (NY), Tiffany Vidal (MA)

MEETING OVERVIEW

ISFMP Policy Board Meeting
Thursday October 19, 2017
9:30-11:30 a.m.
Norfolk, Virginia

Chair: Doug Grout (NH) Assumed Chairmanship: 10/15	Vice Chair: Jim Gilmore (NY)	Previous Board Meeting: August 3, 2017
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (19 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 3, 2017

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Executive Committee Report (9:40-9:45 a.m.)
Background • The Executive Committee will meet on October 19, 2017
Presentations • D. Grout will provide an update of the two meetings
Board action for consideration at this meeting • none

5. Update on Non-compliance Decision and Meeting with the Secretary of Commerce (9:45-10:05 a.m.)
Background • The Commission sent a letter to the Secretary of Commerce requesting additional information on the decision to not find New Jersey out of compliance with Addendum XXVIII to the Summer Flounder, Scup, and Back Sea FMP. The Commission also requested a meeting with the Secretary to discuss the Non-Compliance process. • The Commission received two memos and one letter from NOAA and the Secretary (**Briefing Materials**)
Presentations • None

Board discussion for consideration at this meeting

- Discuss next steps

6. Review Risk and Uncertainty Workgroup Progress (10:05-10:20 a.m.)

Background

- Previously, the Risk and Uncertainty Policy Workgroup presented a draft Commission Risk and Uncertainty Policy and were advised by the Board to continue development.
- The Risk and Uncertainty Policy Workgroup was tasked last Annual Meeting with creating a Workshop to walkthrough the Policy using striped bass as an example.

Presentations

- J. McNamee will present the progress to-date the workgroup has made.

Board actions for consideration at this meeting

- None

7. Discuss Recommendation from the Atlantic Herring Section on New England Fishery Management Council Participation in the Atlantic Herring Management (10:20-10:30 a.m.) Possible Action

Background

- The NEFMC has requested to participate on the Atlantic Herring Section. The Herring FMP is a complimentary FMP with the NEFMC.
- The Charter, as it is written, does not allow for Council participation by invitation on Sections. This is only a provision for Boards.
- The Policy Board tasked the Herring Section to discuss the issue and bring a recommendation back to the Board.

Presentations

- R. White will provide the recommendation from the Herring Section.

Board actions for consideration at this meeting

- Determine how the NEFMC should be included in the Commission's management of Atlantic Herring.

8. Discuss Non-compliance in the Charter and Party Boat Sector (10:30-10:40 a.m.)

Background

- Recently there have been violations in the for-hire sector. In some states the Captain of the vessel is not held accountable when anglers on the vessel do not follow fishery regulations.
- Some states have set regulations to incentivize Captains to follow regulations; for example
- *Liability for Violations Onboard For-hire Recreational Vessels. With respect to recreational for-hire fishing operations permitted: Permit Requirements Applicable to For-hire Vessels, an individual patron, as well as the named for-hire permit holder or for-hire vessel operator, may each be held liable for any violations of recreational size, possession or daily bag limits established that are attributable to the patron fishing onboard the for-hire recreational fishing vessel. In enforcing this provision, law enforcement officers may exercise their discretion on whether to cite the named*

for-hire permit holder or for-hire vessel operator for such violations in instances where the best industry practices required: Permit Requirements Applicable to For-hire Vessels have been used on the for-hire vessel.
Presentations • None
Board action for consideration at this meeting • Discuss ways to improve compliance within the for-hire fleet

9. Review White Paper from the Climate Change Working Group (10:40-10:55 a.m.)
Background • The Climate Change Work Group was tasked with developing science, policy and management strategies to assist the Commission with adapting its management to changes in species abundance and distribution resulting from climate change impacts. • In fall of 2016 the Work group met via conference call to brainstorm how to address the Policy Board task. In January 2017 the working group met to make recommendations to include in the white papers to address the Policy Boar task. In May the working group met to continue to develop drafts of science and policy white papers.
Presentations • T. Kerns will present the Working Group White Paper.
Board action for consideration at this meeting • None

10. Standing Committee Reports (10:55-11:05 a.m.)
Background • The Habitat Committee will meet on October 18. • The Atlantic Coastal Fish Habitat Partnership will meet on October 16 and 17. • The Law Enforcement Committee will meet on October 17 and 18.
Presentations • An overview of Habitat Committee and ACFHP meetings will be presented by L. Havel and the LEC meeting will be presented by M. Robson.
Board action for consideration at this meeting • None

11. Discuss the Utility of Reporting Species Technical Committee Assignments (11:05-11:10 a.m.)
Background • The Assessment Science Committee (ASC) recommended the creation of an annual task list for each species, complied annually by Commission staff and the Technical Committee (TC) and/or Stock Assessment Subcommittee (SAS) chairs. • The list will include all current tasks with timelines, assign an activity level for the committee, a committee overlap score based on membership overlap with other TC/SASs, as well as list TC and SAS members and their affiliations.

- At the time of tasking a Committee, the Task List can be projected to help prioritize the task and assign a deadline.

Presentations
- S. Madsen will review an example task list and discuss the Utility of the list.

Board action for consideration at this meeting
- None

12. Review and Consider Committee on Economics and Social Sciences' (CESS) Recommendation on the ISFMP Charter Guidance for CESS Membership (11:10-11:15 a.m.) Action

Background
- The CESS has been working to assign members to Commission-managed species in order to have more socioeconomic background and analyses integrated into management-change documents (e.g. amendments and addenda).
- The CESS currently has many vacancies and would like to fill them to assist with gaps in species' coverage.
- The CESS would like to request a relaxation of the membership requirements outlined in the ISFMP Charter to reach broader pool of volunteers. (**Briefing Materials)**

Presentations
- S. Madsen will review the language in the ISFMP Charter that outlines the CESS membership requirements and present suggested changes. **(Briefing Materials)**

Board action for consideration at this meeting
- Approve the stock assessment schedule

13. Review and Consider Approval of the Assessment Schedule (11:15-11:20 a.m.) Action

Background
- The Shad and River Herring Board will consider changes to the 2018 Shad stock assessment update at the Board meeting on October 17.
- It is recommended the Weakfish benchmark be delayed until 2019 until after the new data from MRIP (calibrated data from the FES and APIS changes) is available.

Presentations
- T. Kerns will present the changes to the assessments

Board action for consideration at this meeting
- Approve changes to the assessment schedule

14. Review Non-Compliance Findings, if Necessary Action

15. Other Business

16. Adjourn

Draft White Paper: Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change

Climate change is already having impacts on the fishery resources the Commission manages. As average temperatures rise, mobile marine species are moving towards the poles and/or deeper water to stay cool. Shifts in the distributions and productivity of stocks can cause ecological and economic disruptions, such as predators become separated from their prey impacting food webs, or fisherman no longer catching a species their livelihood relies on. In the face of climatic shifts, change is likely to be the only constant. Accordingly, managers will need to learn how to respond to and manage these changes. Managers will likely need to focus on sustaining ecological functions, rather than historical abundances. As conditions change, current conservation goals and management objectives may no longer be feasible. Successful climate adaptation will depend not only on adjusting management strategies, but also in reevaluating and revising, as necessary, the underlying conservation goals and objectives of fishery management plans.

The Climate Change Working Group was tasked with developing science, policy and management strategies to assist the Commission with adapting its management to changes in species abundance and distribution resulting from climate change impacts. The following climate adaptation strategies are provided as guidelines to assist Boards and Sections in the management of species impacted by climate change, with a focus on stocks with low biomass and allocation.

A Stepwise Approach

Carrying out effective management strategies in the face of climate change can seem complex. By clarifying a process and demonstrating how the various parts of this process fit together, implementing adaptive management can be less daunting. A generalized framework can break the process down into discrete steps designed to help managers understand how the pieces of the process fit together, and how to recognize when various methods and approaches may be appropriate. *The stepwise approach is detailed in a resource document from the National Wildlife Federation: Climate Smart Conservation* was modified slightly for ability for marine resource management.

Step 1. Define planning purpose and scope. This includes: articulating a purpose; clarifying existing management goals; identifying management targets; specifying a scope and time frame; engaging key stakeholders; and determining resource needs and availability.

Step 2. Assess climate impacts and vulnerabilities. Understanding climate vulnerabilities is crucial for designing effective adaptive management strategies, and the specific components of vulnerability—exposure, sensitivity, and adaptive capacity—can provide a useful framework for linking actions to impacts.

Step 3. Review/revise management goals and objectives. Because goals serve as the basis for subsequent strategies and actions, they should be climate-informed and forward looking. Reevaluation of goals and objectives may either validate their continued relevance, or indicate a need for refinement or modification.

Step 4. Identify possible adaptive management options. What are possible approaches for reducing key climate-related vulnerabilities or taking advantage of newly emerging opportunities? At this stage, a broad array of alternative strategies and actions should be identified, with particular attention to creative thinking in crafting possible management actions.

Step 5. Evaluate and select adaptive management options. The array of possible adaptation options can now be evaluated to determine which are likely to be most effective from a biological/ecological perspective, and most feasible from social and economic perspectives.

Step 6. Implement adaptive management options. Successfully implementing adaptation requires individual leadership as well as institutional commitment and resources, and often depends on engaging diverse partners early on, and emphasizing benefits to multiple sectors of society.

Step 7. Track action effectiveness and ecological responses. Monitoring helps provide context for understanding climate-related impacts and vulnerabilities and for informing adaptive management. Monitoring approaches should be carefully designed to ensure they are capable of guiding needed adjustments in management strategies.

Managements Options for Stocks at Persistent Low Biomass

There are two main questions that should be addressed for stocks with persistent low biomass: 1) what, if any, is an appropriate harvest level, and 2) how many resources should be committed to continue monitoring and managing the species.

Approaches

1. Status Quo: Following the current status quo addresses the first question (appropriate harvest level) but does not address questions related to continuation of monitoring and management. The current harvest strategies include allowing landings that target a rebuilding F with a biomass target based on historic assessment information with the assumption that the stock will eventually respond to a low F. If biomass continues to decline there are two harvest options:
    a. Continue the above scenario with further reductions in F
    b. Put a harvest moratorium in place for a period of time based on the life history of the species

2. Evidence of a Change in Productivity: As with the status quo option, the monitoring and management would be retained at historical levels. The harvest level would be adjusted as reference points are redefined based on evidence the stock will likely not recover to previous biomass targets because of a change in productivity from environmental causes. The reference points will target a sustainable yield from a biomass that is much lower than previously targeted. The actual yield will be much reduced from historic levels, leading to a very small fishery with presumably much fewer participants. This approach may also entail a rebuilding period. The rebuilding period would be reflective of the new reference points based on an expected lowered productivity level of the stock.

3. Evidence the stock has a low to no Productivity; recovery to sustainable levels is highly unlikely

a. Management: A permanent moratorium is put in place or harvest continues until it becomes economically unfeasible. Decision between these options could be based on confidence in prediction of no recovery and consideration of genetic diversity that is often high at the tail end of a species range (Nowack et al., 2013). It may be more beneficial to protect the remaining genetically diverse stock, or it may be more beneficial to allow economic harvest of the species.

b. Monitoring: Determine what level of monitoring would occur: Increased, current, or reduced

4. Management and monitoring cease and harvest does not continue because it becomes economically unfeasible.

Science requirements

Each of the options places great demands on the science. Questions to be answered before choosing among the options would include:

1. What is the mechanism of decline/loss of productivity?
2. What evidence is there that the stock will likely not come back to its former productivity?
3. How is sustainable yield determined and at what level of biomass will a harvest be permitted?
4. Are there ecological/genetic considerations to be considered before taking any of these approaches to manage a stock or population?
5. What are the economic and ecological tradeoffs of continuing to harvest at lower levels vs. a moratorium?

Management Options for Stocks with Changing Spatial Distributions:

1. Maintain current state-by-state or regional allocations.
    - Quota Sharing by fishery or within fishery: Under state-by-state management without quota reallocation it is necessary to allow for transfer of quota between states in order to have a mechanism to respond to changing distributions of stocks. But under regional or coastwide quota management; sharing of quota becomes less important when responding to distributional changes in stocks; although sharing between two regions may still be needed.
    - Add a minimum allocation for states with low quotas or states that are on the edge of stocks that are moving north or south
    - Include an episodic events approach (quota set aside) for species that are moving northward
        - A certain percentage of the coastwide quota would be set aside for use by specified states/regions. The set aside is designed to allow for harvest of fish that episodically move in and out of a region
2. Maintain regional or state-by-state allocations and develop a Commission policy to revisit allocation based on identified triggers (see NMFS Allocation Policy).
    - Triggers could be based on time, an indicator of change, or a threshold of public comment.
        a) For time based triggers, triggers could be a set number of years or could be related to the life history of the species. Allocation reviews may not automatically result in a re-allocation, but they would require the Board to

"revisit" the state or regional allocations periodically and decide whether to initiate management action to change allocation or vote to reaffirm current allocation. Alternatively, the board could include a provision in the FMP where the state or regional allocations would "sunset" on a prescribed date so the Board must initiate management action to either reinstitute current allocation or modify allocation.

- Options for who makes the final decision regarding reallocation could be internal or external to the Commission:
    a) Species management boards know the fishery the best but could be open to strong political pressure from impacted states.
    b) Australia has used independent panels to determine allocations as they can take the pressure off managers and allow fairer compromises. For more information, see section 9.2 in [Morrison and Scott 2014].
- Potential options for adjusting allocations:
    a) Use distribution and abundance data from certain fisheries independent surveys that cover extended geographical areas to help determine the state or regional quota allocation percentages (e.g NEAMAP surveys; NEFSC bottom trawl survey, etc.)
    b) Use a combination of historical allocations and current distribution that adjusts through time: 75% historical allocations years 1-2, 65% historical allocations years 3-4, etc.
    c) Use Management Strategy Evaluation (MSE) to determine allocation using 4 evaluators:
        - Catch distribution
        - Recruitment
        - Productivity
        - Total yield across years
    d) Use it or lose it provisions—revisit a state's quota after X number of years of not utilizing quota.

3. Change management away from state-by-state allocations. Ideas include:
    - Change management from species focus to area focus. Allow for area allocations where industry can be permitted for multiple species at once where they can move from stock to stock as they rise and fall
        - For example- an area could be GOM; species could be lobster, herring, groundfish, menhaden, black sea bass, dogfish, others?
        - Allocations would be set based on the health of the ecosystem overall. Every 1-3 years do assessments on an area to determine what level of harvest is feasible for stocks. Look at more than just species assessment to determine allocations. Also look at ocean environment to help make predictions of the direction of stock levels.
        - This would be a significant change to how we manage stocks
    - Allocation by timeframe (example quarters)

- Quotas could be allocated by seasons and open to all fishermen when the season opened (e.g 4 seasons: spring, summer, fall, winter each with a specified percentage of the quota with equal)
- Seasonal quota could be further broken out by area (e.g. the summer quota could be divided into a northern and southern allocation.

Resources to Assess How Species and Environments are Being Impacted by Climate

The following are potential resources managers could use to determine if a stock has reached a point that necessitates change in a fisheries management strategy to adapt to climate change impacts

- Northeast Fish and Shellfish Climate Vulnerability Assessment developed by NOAA
- Ecosystem status reports/Ecosystem indicators- large scale requires significant resources would need to partner with NOAA
- Ocean Adapt- analysis of changing distributions by NMFS and Rutgers
- NOAA National Center for Environmental Information – hosts and provides public access to archives of climate data
- Stock predictions
    - Climate predictions
    - Species distributions
    - Species abundance (climate velocity)
- Citizen Science—create venue for watermen to report changes they are seeing on the water as an advanced warning to managers.
- Triggers defined by fishermen: seek public input on triggers for when management would adapt due to changes in the resource from climate change

Climate Change Data Availability and Gap Analysis

The Climate Change Working Group was tasked with "developing science, policy and management strategies to assist the Commission with adapting its management to changes in species abundance and distribution resulting from climate change impacts". Work group discussions resulted in a recommendation that stock assessment committees consider including a Terms of Reference to evaluate whether climate change impacts on the species of interest are evident. Climate change recommendations were reviewed by the Commission's Assessment Science Committee (ASC). The ASC supported a process where assessment committees consider including new climate TORs when starting new stock assessments. If a TC/SAS thinks there may be climate impacts on a stock and related analyses are possible, a climate TOR is to be added. If a TC/SAS does not think there are climate impacts, a TOR does not need to be added. TCs will then have the option to include a brief assessment report section describing why climate impact analyses on a stock were not conducted.

Climate change is affecting a number of aspects of the environment which may affect abundance, distribution, and productivity of various species. Besides warming waters, changes to other aspects of the marine environment (such as salinity, pH and currents – Table 1) may also be occurring. To assist the assessment committees in this work, the Climate Change Working Group recommended the creation of a coast wide database summarizing the types of climate related data various state, federal, and university programs collect. The database would not store the actual data, but provide metadata on the programs. I.e., the database would contain a summary of the types of environmental data collected, temporal and spatial aspects of the data, sample design, and contact information. The database would be a central reservoir of information for the species assessment committees to identify and request available climate data appropriate for the species and area of interest. The decision to house the metadata and contact information and not the actual environmental data was to avoid:

- Needing to annually update the data
- duplication of datasets
- adapting the data inappropriately, and
- ensuring the most recent information is used

Development of the database will be a collaborative coast wide effort to ensure all known programs that collect environmental data are included. In addition to the numerous ocean observing buoys, data portals, and state and federal monitoring programs, the database should include power plant monitoring data and smaller-scale programs conducted by counties, towns, and universities for a variety of purposes. The ASC noted that some data sources may need to be converted to usable format.

Two levels of gap analysis will be conducted after development of the environmental metadata database:

1. Review to ensure all known programs that collect environmental data are included
    a. Verify that all appropriate information is included
        i. The review should be conducted by each state and federal agency to assure completeness coordinated by the ASC and reviewed by the MSC.
2. Review the types of environmental data collected and temporal and spatial scale of the information
    a. Determine if there are temporal and/or spatial gaps in data necessary to investigate the effects of climate change on species
        i. Task species TC and SASC for review
    b. Determine relative importance of filling individual data gaps
    c. Prioritize data gap filling and identify strategies to address the important gaps

Table 1. Climate Data Types

- Temperature
    - Annual, seasonal, daily
    - days above threshold (need daily data)

    - timing of ice melt
- Salinity
    - Temporal/spatial changes
    - Temporal/spatial changes of estuarine salt wedge
- pH (ocean acidity)
- Precipitation
    - River currents
    - Temporal/spatial salinity changes
- Wind
    - Changes to local wind patterns
    - Frequency of storm events – spatial and temporal patterns
- Currents
    - Strength and location of local currents
    - Location of basin wide currents (i.e. – Gulf Stream, Labrador currents)
- Global climate measures
    - North Atlantic Oscillation (NAO)
    - Atlantic Multidecadal Oscillation (AMO)

Stock Assessment Terms of Reference – Climate Analyses

The following are Terms of Reference options related to climate for Technical Committees to consider when devising the full set of Terms at the outset of a stock assessment.

- Describe the thermal habitat and its influence on the distribution and abundance of Species X, and attempt to integrate the results into the stock assessment.

- Consider the consequences of environmental factors on the estimates of abundance or relative indices derived from surveys.

- Characterize oceanographic and habitat data as it pertains to Species X distribution and availability. If possible, integrate the results into the stock assessment.

- Evaluate new information on life history such as growth rates, size at maturation, natural mortality rate, and migrations. <u>Explore possible impacts of environmental change on life history characteristics</u>.

- Present the survey data available for use in the assessment, evaluate the utility of the age-length key for use in stock assessment, and explore standardization of fishery-independent indices. Characterize the uncertainty and any bias in these sources of data, including <u>exploring environmentally driven changes in availability and related changes in population size structure.</u>

Explore the spatial distribution of the stock over time, and whether there are consistent distributional shifts.

- Provide best estimate of population parameters (fishing mortality, biomass, and abundance) through assessment models. Evaluate model performance and stability through sensitivity analyses and retrospective analysis, including variation in life history parameters. Include consideration of environmental effects where possible. Discuss the effects of data strengths and weaknesses on model results and performance.

- Update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY}, SSB_{MSY}, F_{MSY}, MSY). Evaluate stock status based on BRPs. If possible, develop alternative MSY-based reference points or proxies that may account for changing productivity regimes.

References:

Pauls, S., C. Nowak, M. Balint, and M. Pfenninger. 2013. The impact of global climate change on genetic diversity within populations and species. Molecular Ecology 22:925-946.

Background

The Atlantic States Marine Fisheries Commission's (Commission) Habitat Committee (Committee), a branch of the Interstate Fisheries Management Program, was developed to identify, enhance, and cooperatively manage vital fish habitat for conservation, restoration, and protection, as well as support the cooperative management of the Commission and jointly managed species.

In 2016 the Committee identified each state's ongoing practices that address climate change impacts, with a focus on state coastal regulatory planning (Appendix A).

This document builds upon the information gathered in 2016, adding new information since the report was produced, as well as identifying gaps in climate change initiatives among states and providing recommendations for the future. It addresses Strategy 4.6, Task 4.6.2 of the 2017 Action Plan:

4.6 Engage in state and federal agency efforts to ensure climate change response strategies are included in habitat conservation efforts.

4.6.2 Identify gaps in state coastal regulatory planning regarding climate change impacts and make recommendations to increase resiliency.

Summary of State Initiatives that Address Climate Change

From the information gathered in 2016, state initiatives were grouped into eight different categories:

1. Established a working group or legislation to reduce carbon output
2. Established a working group or legislation to respond to climate change threats
3. Produced reports on climate change
4. Assesses and monitors the effects of climate change
5. Has mechanisms in place for collaboration among agencies and other organizations
6. Addresses climate change in planning documents
7. Has responded to climate change on the ground
8. Includes climate change in outreach efforts.

Each state[*] has implemented 1 – 8 of the initiative categories listed above. New Hampshire, New York, New Jersey, and Virginia have practices in place that meet all eight categories. A table of each state's practices can be found in Appendix II (also Figure 1). All states address climate change in their planning documents (Initiative 6), at a minimum in their 2015 State Wildlife Action Plans. All but one are also assessing and monitoring the effects of climate change (Initiative 4). This includes habitat distribution and condition, sea level rise, changes in species distribution and abundance, and more. Twelve out of 14 states have produced reports on climate change (Initiative 3), some of which are regularly updated.

[*] Except Delaware – data not available.

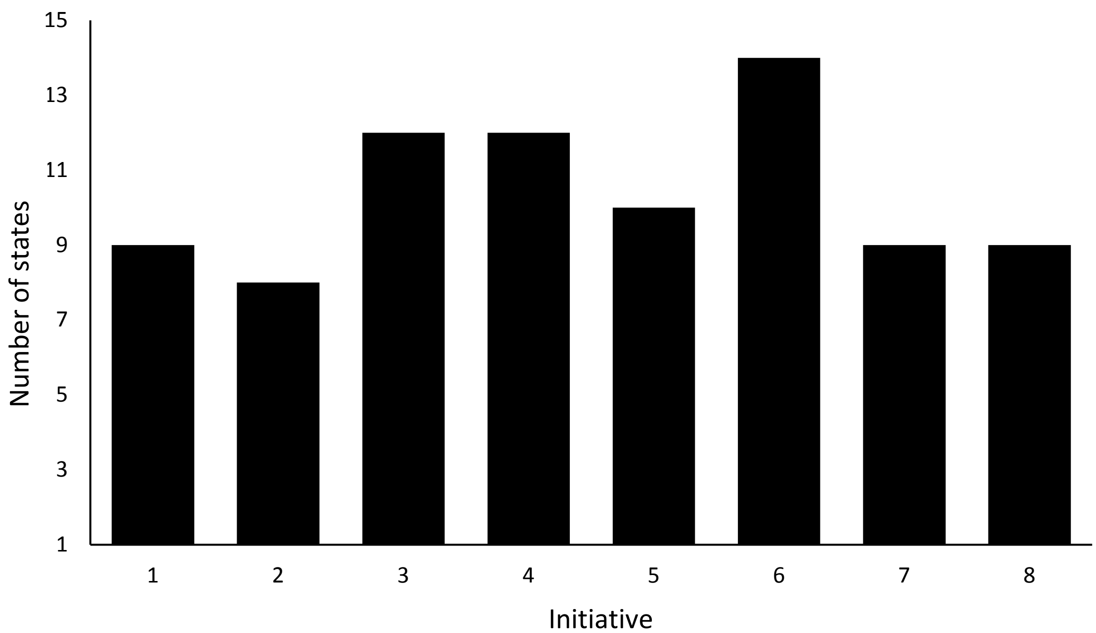

Figure 1. Number of Atlantic coast states carrying out each initiative category. List of categories can be found on page 1.

There is a lot of opportunity regarding initiatives 1, 2, 5, 7, and 8. Only nine of the states have responded to climate change on the ground. Examples of on-the-ground responses that have taken place include installing or working towards offshore wind facilities, encouraging living shorelines during the permitting process, minimizing road crossing impacts on aquatic habitats, and restoring connectivity among habitats. Restoration efforts that promote resiliency, adaptive strategies, and habitat enhancement are also underway. Working groups or legislation to reduce carbon outputs have been created in nine states, and working groups or legislation to respond to climate change threats have been created in eight states. Initiatives range from no action to Maryland's commitment to 100% clean energy by 2050. There is also room for more collaboration and outreach – only ten states work with other agencies or organizations, and nine include climate change in their outreach efforts. Example of outreach that states are conducting include messaging in K-12 and teacher education programs, community preparedness programs, providing guidance on best management practices, and more.

Recommendations

1. Increase renewable energy production.
2. Increase communication, coordination, and collaboration among federal, state, local, tribal, and nongovernmental organizations.
3. Continue monitoring key climate change parameters and sentinels to assess ongoing effects.
4. Promote the development or modification of regulatory mechanisms so that sea level rise and storm surge flooding are factored into development assessments.

5. Analyze long-term datasets to understand the effects of climate change variables on fishery species.
6. Conduct new research to understand the effects of climate change on fish habitats and species.

Additional Literature and Initiatives

Beier, P., D. Behar, L. Hansen, L. Helbrecht, J. Arnold, C. Duke, M. Farooque, P. Frumhoff, L. Irwin, J. Sullivan, and J. Williams (Actionable Science Workgroup of the Advisory Committee on Climate Change and Natural Resource Science). 2015. Guiding principles and recommended practices for co-producing actionable science: a How-To Guide for DOI Climate Science Centers and the National Climate Change and Wildlife Science Center. Report to the Secretary of the Interior: Advisory Committee on Climate Change and Natural Resource Science. Washington, DC. https://nccwsc.usgs.gov/sites/default/files/files/How-to-Guide_Formatted_Aug%2013%202015.pdf

Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS). 2015. Report to the Secretary of Interior. Washington, DC. https://www.eenews.net/assets/2017/08/17/document_cw_01.pdf

Please see Appendix III for NOAA and US Fish and Wildlife Service climate change initiatives.

Appendix I 2016 Report on State Climate Change Initiatives

Background

The Atlantic States Marine Fisheries Commission's (Commission) Habitat Committee (Committee), a branch of the Interstate Fisheries Management Program, was developed to identify, enhance, and cooperatively manage vital fish habitat for conservation, restoration, and protection, as well as support the cooperative management of the Commission and jointly managed species. In 2016 the Committee has been focused on Goal 4 of the current Commission Action Plan: to 'Protect and enhance fish habitat and ecosystem health through partnerships and education.'

This document addresses Strategy 4.6, Task 4.6.2 of the Action Plan:

4.6 Engage in state and federal agency efforts to ensure climate change response strategies are included in habitat conservation efforts.

4.6.2 Identify ongoing practices in the state coastal regulatory planning that address climate change impacts.

It contains information on climate change initiatives, as well as links to documents and websites, as reported by each within the Commission's boundaries. This information is the first step towards identifying gaps and making recommendations for improving coastal preparedness and resiliency to climate change.

Maine

In 2013, the State of Maine established the Environmental and Energy Resources Working Group to identify administrative and strategic opportunities to improve Maine's ability to respond and adapt to changing physical conditions in the environment due to climatic influence. The Working Group was led by the Commissioner of the Department of Environmental Protection, and included the Director of the Governor's Energy Office, and the Commissioners of the Departments of Transportation; Marine Resources; Agriculture Conservation and Forestry; and Inland Fisheries and Wildlife. The report, Monitoring, Mapping, Modeling, Mitigation and Messaging: Maine Prepares for Climate Change, presents current programs and activities and contains 32 recommendations. In general, the recommendations are to continue the interdepartmental cooperation; as well as current monitoring, mapping, modeling, and mitigation activities.

The Department of Environmental Protection's Sustainability Division is developing mechanisms for cross agency partnerships, information sharing, efficiencies, and streamlining. These efforts will provide specific and identifiable tools to assist decision-makers. The Adaptation Toolkit, in development, will aid climate adaptation efforts by providing a centralized source to go to for the information one might need for designing and implementing resiliency practices, as well as information on important regulations and standards to integrate into their project or planning process, and opportunities to connect with state and other engaged practitioners for technical expertise.

In 2015, The Maine Department of Inland Fisheries and Wildlife collaborated with over 150 public and non-profit Conservation Partner groups (including private landowners, conservation organizations, sporting groups, scientists, and governmental agencies) to draft Maine's 2015 Wildlife Action Plan. The Action Plan addresses the full array of Maine's wildlife across all taxa groups and habitats and identifies 378 Species of Greatest Conservation Need and provides species-specific and habitat-based actions to help prevent further species declines over the next ten years. In an effort to understand which of Maine's species and habitats are most vulnerable to climate change impacts, the Department of Inland Fisheries and Wildlife collaborated with the Manomet Center for Conservation Science and other partners on a climate change vulnerability assessment. The report, Climate Change and Biodiversity in Maine: Vulnerability of Habitats and Priority Species, classifies the vulnerability of the species and habitats to climate change.

The Maine Stream Connectivity Work Group and Maine's Aquatic Resources Management Strategy are working to minimize the impacts of road crossings on Maine's aquatic systems, which are becoming stressed by more frequent and severe storms.

The Department of Marine Resources continues to implement a wide range of fisheries research monitoring activities for stock assessments; however, the time series will also be useful for understanding changing environmental conditions.

The Department of Marine Resources has maintained an Environmental Monitoring Program in Boothbay Harbor for over a century. The observations began in March of 1905 and constitutes one of the longest running, continuous series of sea temperature observations for any point on the North American Atlantic Coast. Currently, observations of air temperature, barometric pressure, sea surface temperature, relative humidity, wind speed, and wind direction are recorded at daily intervals.

New Hampshire

The New Hampshire Fish and Game Department (NHFG) is addressing climate change through four different avenues: planning, science, outreach, and communication.

The NHFG's 2015 Wildlife Action Plan (WAP) Update specifically recognized climate change as a risk factor for both habitats and species. Because of this, species and habitat profiles include their sensitivity to climate change-related parameters, and the weighted risk of those species and habitats in regards to impacts such as sea level rise (SLR), changes in precipitation, increased storm activity, changes to air and sea temperature, etc.

The Great Bay National Estuarine Research Reserve (NERR, part of NHFG) continuously monitors salt marsh distribution and condition along with information about the salinity of pore water and marsh elevation. Over time, this information will help inform if and how SLR is impacting salt marsh health at three sites around Great Bay. NHFG also has detailed habitat maps for Great Bay (and will have them for the whole coastal region by next fall). These are considered baseline maps from which to compare future changes. The NERR is also installing a tide gauge in the southern reach of Great Bay to monitor water level over time. The Sea Level Affecting Marsh Migration Model (SLAMM) was run for all of coastal New Hampshire as a part of the WAP, predicting how salt marsh distribution is likely to change under different SLR scenarios and where there is potential for migration. This information was combined with current condition information to determine where the highest quality marsh is likely to migrate, and where restoration opportunities are likely to be valuable in light of potential SLR.

The Great Bay NERR and NH Department of Environmental Services co-chair the Coastal Adaptation Workgroup – a group of outreach professionals that coordinate to bring the best climate-related science to local communities. Much of this revolves around wise planning to protect both natural and built assets. The Great Bay NERR hosts a Climate Summit each spring (topics this year include: living shorelines, presentations about the WAP, fisheries impacts in the Gulf of Maine, impacts on groundwater along the coast, culvert assessment work, dune restoration, city planning case studies, etc.). NHFG is also incorporating climate-related messages into their K-12 and teacher education programs. This summer they will host a teacher training workshop focused on how protected places can be observed to determine climate-related impacts over time; and the NHFG will be hosting an intern who will be developing a volunteer phenology program for the center.

NHFG has two representatives on the Coastal Risks and Hazards Commission, a state wide legislatively-directed commission that was charged with providing guidance and consistent information to state agencies and municipalities on how to assess and prepare for coastal storms, SLR, and increased precipitation. A draft report and recommendations on "Preparing New Hampshire for Projected Storm Surge, Sea-level Rise, and Extreme Precipitation" has been prepared. Because of the recommendations from the report, each state agency is going to be asked to review its rules and regulations in light of the science and recommendations provided by the commission. The legislation is pending now (2016), and if passed would likely go into effect next year (2017).

Additional Links:
The NH Fish and Game Department's Wildlife Action Plan:
http://www.wildlife.state.nh.us/wildlife/wap.html
The State of New Hampshire website: http://www.nh.gov/climate/
The NH Department of Environmental
Services:http://des.nh.gov/organization/divisions/air/tsb/tps/climate/

Massachusetts

In 2008 Massachusetts passed a global warming solutions act to reduce emissions, increase green infrastructure, and to analyze strategies for adapting to predicted changes in climate. The Massachusetts Climate Change Adaptation Report released in September 2011 by the Executive Office of Energy and Environmental Affairs includes an overview of anticipated impacts and key adaptation strategies to increase resilience and preparedness.

Regarding fisheries, Massachusetts sits on the boundary of two biogeographic provinces, the Gulf of Maine and the Mid-Atlantic Bight. The state is already seeing shifts in species range distributions (black sea bass, American lobster, northern shrimp). The Division of Marine Fisheries collects bottom temperature data, every two hours at 60-70 sites across the state. Bottom temperature data is stored in an in-house database containing over 2 million readings dating back as far as 1986 for some sites. The Division of Marine Fisheries also has trawl data back to the 1970's.

In 2007 the mayor of Boston passed an Executive Order Relative to Climate Action, which called for a plan every three years. The first update was produced in 2014 (summary here: http://www.cityofboston.gov/images_documents/Greenovate%20Boston%202014%20CAP%20Update_Summary_tcm3-49733.pdf), and includes a variety of proposals, addressing open space, education, renewable energy, etc.

Rhode Island

In July 2014, the Rhode Island General Assembly approved the Resilient RI Act (RIGL §42-6.2), which formally established the Executive Climate Change Coordinating Council, as well as set specific greenhouse gas reduction targets, and incorporated consideration of climate change impacts into the powers and duties of all state agencies. The Coordinating Council is comprised of Directors and Commissioners from nine state agencies/offices and is supported by an Advisory Board and Science and Technical Advisory Board. It is charged with leading and coordinating state agencies in responding to the challenges posed by climate change in a timely and effective manner, focusing in particular on:

- assessing, integrating and coordinating efforts throughout state agencies to reduce greenhouse gas emissions, strengthen the resilience of communities, and prepare for the impacts of climate change;
- improving our understanding of the effects climate change will have in RI;
- working in partnerships to identify, develop and implement strategies to be better prepared, and reduce risk and losses.

There are several projects underway that will provide information to support future Coordinating Council recommendations. A few coastal related projects include the following. As first step in helping to reduce Rhode Island's greenhouse gas emissions is the completion of the 30 Megawatt Block Island Offshore Wind Project. This will be the first offshore wind project in the country. Located approximately three miles southeast of Block Island, the project which started construction in 2015, is now complete and currently undergoing operational tests. The system is expected to be commercially operational by the end of 2016. The spatial planning and fisheries-related research and monitoring used to guide this work may provide a blueprint for other states and coastal communities.

To assess the effects climate change in Rhode Island the Executive Council's Science and Technical Advisory Board prepared a brief synopsis of the state of knowledge of the following manifestations of climate change: SLR, warming air temperatures, warming water (marine and fresh) temperatures, storm frequency and intensity, biodiversity (changes in species and habitats), and precipitation and inland flooding. The information summarized in this report will assist state agencies, decision-makers, and the public understand the real impacts RI is already experiencing due to a changing climate.

The Coastal Resources Management Council continues work on the Shoreline Change Special Area Management Plan, developing scientifically-based data and tools to aid in coastal hazard adaptation planning. The Management Council has completed revised Shoreline Change Maps for the shout shore communities showing how Rhode Island's shoreline has changed over time due to erosion, and how we might expect it to change in the future. Additional tools and other key resources are available from the website to aid the state and municipalities in supporting sound policy decisions which address coastal erosion, SLR and storm surge inundation problems.

The Department of Environmental Management has also addressed considerations related to climate change throughout the recently updated State Wildlife Action Plan. In short, Wildlife Action Plan reviewed vulnerability assessments for several species of great concern, identified threats to species and their habitats, and proposed actions to reduce these threats. In addition, the Division of Fish and Wildlife's Marine Fisheries Section continues to conduct long-term monitoring programs and collaborate on several local and regional research projects investigating the effects of climate change on managed species and the state's marine resources. State Wildlife Action Plans also have to specifically take into account climate change adaptation. Climate change is primarily in Chapters 1 (species), 2 (habitats), 3 (threats), and 4 (actions to abate threats to species and habitats).

In October 2015, the State Planning Council voted to adopt Rhode Island's new State Energy Plan "Energy 2035" as an element of the State Guide Plan, codifying the Plan as the state's formal long-term, comprehensive energy strategy. The Plan, produced by the Office of Energy Resources in collaboration with the Division of Planning, represents Rhode Island's first data-driven energy planning and policy document. Its vision is to provide energy services across all sectors—electricity, thermal, and transportation—using a secure, cost-effective, and sustainable energy system

In January 2016, the Management Council adopted amendments to Section 145 - Climate Change and Sea Level Rise of the Coastal Resources Management Program to update SLR projections for short-, mid- and long-term timelines of 2035, 2050, and 2100 respectively, as calculated using the current NOAA methodology, and based on the Newport, RI NOAA tide gauge.

In early 2016, OER launched the state's first ever electric vehicle rebate program to support adoption of electric vehicles by Ocean State drivers: Driving RI to Vehicle Electrification (DRIVE). The program made $200,000 available for qualified RI residents interested in purchasing or leasing an electric vehicle to apply for a financial rebate of up to $2,500, based upon vehicle battery capacity. Modeled closely on existing rebate programs offered in other states, DRIVE offers the potential to increase the total number of EVs on RI roadways by 20-35%.

Connecticut

The Connecticut Climate Change Action Plan was initiated in 2005 with the goal of reducing greenhouse gas emissions to achieve regional goals set by the New England Governors/Eastern Canadian Premiers. The Action Plan addresses quantification of benefits and costs of greenhouse gas reductions using existing analytical measures and a newly developed desktop modeling tool developed under the direction of the Environmental Protection Agency (EPA). As the first state to utilize this new tool, Connecticut was able to identify benefits previously not quantified. To successfully meet the requirements of the Action Plan, a Governor's Steering Committee established working committees at both the agency head and staff level to develop, implement, and track progress on recommended actions.

Additional legislation passed in following years, and complementary to the Action Plan, Connecticut adopted California emissions standards; promoted hybrid fuel cars through tax incentives; set efficiency standards for products and appliances; and promoted the purchase of "Connecticut Grown" foods. A Governor's Executive Order requires the state to purchase renewable energy in increasing amounts, leading to 100% clean energy by 2050. Legislation also simplified the permitting process in ways that encourage implementation of 'living shorelines' in place of shoreline armoring.

Additional monitoring programs include:

Long Island Sound Study Sentinel Monitoring for Climate Change: A multidisciplinary scientific approach to provide early warning of climate change impacts to Long Island Sound ecosystems. This program is conducted jointly by EPA Regions 1 & 2, Connecticut Department of Energy and Environmental Protection, New York Department of Environmental Conservation, and several academic institutions.

Connecticut Institute for Resilience and Climate Adaptation: Established in 2013 under the direction of the Department of Energy and Environmental Protection and the University of Connecticut to conduct research, outreach, and education projects as well as guide the development of technologies and regulatory provisions that increase the protection of ecosystems, coastal properties, other lands, and attributes of the state that are subject to the effects of rising sea level.

New York

New York has an Office of Climate Change within the New York Department of Environmental Conservation that coordinates efforts relating to climate change. The New York State Energy Research and Development Authority developed the Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State report that includes the impacts of climate change and recommendations.

New York developed a Sea Level Rise Task Force Report in 2009, which includes impacts and recommendations as well. The report led to the 2014 Community Risk and Resiliency Act. This Act:

1) Incorporates state-adopted SLR projections as regulation by Jan. 1, 2016 (Department of Environmental Conservation) and establishes a new 6 New York Community Risk and Resiliency Part 490, Projected Sea-level Rise (Part 490). Part 490 will establish projections of SLR in three specified geographic regions over various time intervals, but will not impose any requirements on any entity.

2) Adds mitigation of SLR, storm surge, and flooding to Smart Growth Public Infrastructure Policy Act criteria and guidance by Jan. 1, 2017 (Department of Environmental Conservation, Department of State).

3) Models local laws to enhance resiliency by Jan. 1, 2017 (Department of Environmental Conservation, Department of State).

4) Considers SLR, storm surge, and flooding in 19 programs (facility-siting regulations, permits and funding) by Jan. 1, 2017 (Department of Environmental Conservation, Department of State), including a checklist on how to consider SLR, storm surge and flooding in permitting decisions.

5) Requires guidance on implementation of the Community Risk and Resiliency Act and the use of natural resiliency measures to reduce risk by Jan. 1, 2017 (Department of Environmental Conservation, Department of State), considering the ability of natural resiliency measures to provide for storm-related and other benefits.

New York also has guidance on flood risk management standards, culvert sizing, living shorelines, nature-based shorelines, and wetland migration. The Office of Climate Change also has a greenhouse gas emissions initiative, which develops caps, performance standards for CO_2 emissions, Climate Smart Communities programs – certifying communities for climate-friendly actions, greenhouse gas emissions targets, and grants to assist in implementation.

The New York State Energy Research and Development Authority conducts environmental research and analysis and provides technical expertise and support to New Yorkers in order to increase renewable energy usage and efficiency. They are currently studying atmospheric deposition and impacts on natural resources. New York also has a Climate Change Science Clearinghouse, which provides New York State-related climate change data and information to inform decision making.

New York is involved in National Estuary Programs and National Estuarine Research Reserve sites, which conduct research monitoring, the results of which are integrated in all climate change management plans and state wildlife action plans, ultimately affecting how we manage resources. Vulnerability assessments are being conducted – these assess at-risk natural resources and infrastructure, develop adaptation strategies, support low impact development and green infrastructure, and include wetland migration pathway modeling to advise management decisions.

Finally, New York also has monitoring networks (climate sentinel monitoring projects, sediment elevation tables, water quality, is developing wetland rapid assessments, and conducting marsh loss trend assessments). Restoration efforts support habitat connectivity, large scale wetland restoration, and focus on managing threats to trust species.

New Jersey

There are many efforts underway in New Jersey to mitigate and respond to the impacts of climate change including: substantial investment in clean energy initiatives such as renewable energy production from solar, wind, and geothermal sources; improving energy efficiency; and reducing overall energy use and intensity. In addition, the State of New Jersey has taken significant steps in creating climate change-related community preparedness programs with a focus on resiliency and adaptation efforts at the local and state level. These programs involve strong interaction with local governments at the land use planning level as well as efforts to protect critical infrastructure and ecosystems, and new suites of regulations related to the design of buildings, roads, and bridges (www.globalchange.gov).

Following Superstorm Sandy, New Jersey State Departments and Agencies have incorporated resiliency strategy and planning into every aspect of the recovery process in an effort to rebuild better and more resilient than before. Many of these initiatives will serve to make New Jersey more resilient to the adverse effects of future climate change. Among the initiatives are: beach and dune projects, acquisition of properties in repetitive flood loss areas, energy resilience at critical facilities throughout the State, and actions to address emergency fuel – highlighted during Superstorm Sandy by building resilience in fuel supply and distribution. As part of their long-term recovery strategy, New Jersey has committed to rebuilding by focusing on implementing *resilient* infrastructure projects and mitigation opportunities to prevent future damage, and utilizing construction techniques and materials that will better withstand future weather events. The State will continue to leverage existing federal and state resources to pursue these long-term strategic priorities and empower local governments to revitalize their communities. New Jersey has also focused its efforts on future emergency response programs. For more detailed information, please visit the Governor's Office of Recovery and Rebuilding website at http://nj.gov/gorr/.

The continued development of a long-term comprehensive statewide adaptation plan needs to involve the input and action of many parties, including federal, state and local governments; non-governmental organizations; academia; private industry; and the citizens of New Jersey. Safeguarding New Jersey's residents, its built and natural environment, and ensuring that the State continues to grow in a manner that is both sustainable and resilient to the adverse effects of climate change will require adaptation planning. More information on New Jersey's Adapting to a Changing Environment Program is available at http://www.nj.gov/dep/aqes/adapting.html.

Additionally, Rutgers University formed the New Jersey Climate Adaptation Alliance in 2011 (http://njadapt.rutgers.edu). The Climate Adaptation Alliance is described as *"a network of policymakers, public and private sector practitioners, academics, and NGO and business leaders designed to build climate change preparedness capacity in New Jersey…The Alliance is focused on climate change preparedness in key impacted sectors (public health; watersheds; rivers and coastal communities; built infrastructure; agriculture; and natural resources)."* The ultimate goal of this initiative is to assess climate vulnerability and preparedness needs for critical sectors in New Jersey and to develop capacity for response implementation in New Jersey. One of the important products of the Climate Adaptation Alliance was the development of the New Jersey Climate Adaptation Directory. According to the Climate Adaptation Alliance, *"the directory was created to provide resources that assist in guiding practitioners in New Jersey through the adaptation planning process. This directory brings together geographic data, tools, reports, model policies and ordinances, case studies, and current projects focused on evaluating vulnerabilities and developing and implementing climate change adaptation plans and strategies. The resources included are aimed at professionals in a range of fields, including but not limited to infrastructure, public health, emergency management, hazard mitigation, natural resources, economic development, agriculture, and land use planning."* This resource can be found here: http://njadapt.rutgers.edu/resources/climate-adaptation-directory#.

Pennsylvania

Pennsylvania has two separate fish and wildlife agencies: Pennsylvania Fish and Boat Commission and Pennsylvania Game Commission. The state also has the Pennsylvania Department of Environmental Protection, which is primarily regulatory, and the Department of Conservation and Natural Resources that manages the State Parks and Forests.

The Pennsylvania Climate Change Act of 2008 required the Department of Environmental Protection to produce a report on the anticipated climate change impacts in Pennsylvania and also a Climate Change Adaptation Strategy. Both are to be updated every three years. The original reports were produced in 2009 and have both been updated in 2013 and 2015 (http://www.dep.pa.gov/Business/Air/BAQ/AdvisoryGroups/CCAC/Pages/default.aspx#.VyJQWYLD-po). The report addresses freshwater tidal waterfront on page 197. From the report: Pennsylvania has approximately 56 miles of coastline on the Delaware Estuary that is largely freshwater and home to diverse flora and fauna. This includes approximately 1200 acres of freshwater tidal wetlands. Impacts to these habitats include decreased dissolved oxygen concentrations, SLR, and salinity intrusion. The potential for loss of these wetlands is high if accretion rates do not keep up with SLR. There is a low potential for migration due to development. Further discussion on typical climate change impacts and strategies is extensive in these documents.

The Department of Conservation and Natural Resources has developed the DCNR and Climate Change: Planning for the Future document describing climate change's current and projected impacts on the state parks and forests, and their approach to adapt to these impacts. The 2015-2025 Pennsylvania Wildlife Action Plan offers a review of threats posed by climate change. This plan includes species with declining or imperiled populations, or with secure populations, but substantial environmental threats, and their habitats. Among the primary climate change information sources in this plan include the Northeast Climate Science Center (Staudinger et al. 2015), and state documents produced by the Department of Environmental Protection. Climate change is identified as a threat to 29.5% (196 species of a total 664) of the Species of Greatest Conservation Need in the plan, which also discusses vulnerability and associated risk of those species and habitats to climate change (2015-2025 Pennsylvania Wildlife Action Plan, Chapter 3, pp. 29-70 and 95-107). The Plan (Chapter 4, pp 85-101) also includes conservation actions to address climate change, including regional (Staudinger et al. 2015) and national adaptation strategies (National Fish Wildlife Plants Climate Adaptation Partnership 2012).

Maryland

Maryland has developed the Climate Change Maryland website to educate citizens about climate change and the actions that the state is taking to reduce its carbon footprint. This program includes participation from over 12 states agencies. It contains information on the Greenhouse Gas Reduction Plan, which was written in 2012 (and updated in 2015) to address the 2009 Greenhouse Gas Emissions Reduction Act. The Greenhouse Gas Reduction Plan's goals are to reduce greenhouse gas emissions by 25% by 2020 by reducing all sectors' (energy, transportation, agriculture, etc.) carbon footprint. It has more than 150 programs and initiatives to address carbon emissions related to energy, construction, fisheries, forestry, etc.

The state also has a two phase plan to reducing Maryland's vulnerability to climate change. Phase I was published in 2008 and addresses SLR and coastal storms. Phase II was completed in 2011 and focuses on building societal, economic, and ecological resilience.

In 2012 the Climate Change and CoastSmart Construction Executive Order was signed to ensure all new and reconstructed state structures have minimal to no flood risk based on improved planning and construction.

Virginia

The Governor's Commission on Climate Change published A Climate Change Action Plan in 2008, which includes the effects of climate change (on the built environment, insurance, natural systems, etc.), recommendations, and commission deliberations. In December of 2014, the state published Virginia Accomplishments Since the 2008 Climate Action Plan Release. According to the executive summary, Virginia has taken many mitigation and adaptation actions in regards to climate change, but these changes were not necessarily in response to particular recommendations or carried out in a coordinated manner. One year later, in December 2015, the Governor Terence R. McAuliffe's Climate Change and Resiliency Update Commission published the Report and Final Recommendations to the Governor, which includes the top five recommendations to address climate change in the state. These include: i.) establishing a climate change and resilience resource center, ii.) creating a new Virginia bank for energy and resiliency, iii.) establishing a renewable energy procurement target for Commonwealth agencies, iv.) adopting a zero emission vehicle program, and v.) leveraging federal funding to make coastal communities more resilient. During the 2016 legislative session Virginia created the Commonwealth Center for Recurrent Flooding Resiliency, a joint venture of Old Dominion University, the College of William & Mary and the Virginia Institute of Marine Science. With an initial budget allocation of $2 million in state support these institutions will work together to provide critical research, policy, and outreach resources to protect natural resources and create resilient communities across the Commonwealth.

North Carolina

In 2015, the North Carolina Coastal Resource Commission Science Panel completed their five-year update of their 2010 Report and the 2012 Addendum as mandated by the General Assembly in Session Law 2012-202. This update incorporated the most recent science and uses a 30-year projection for SLR. The report emphasized the different rates of SLR across the coast of North Carolina. These differences were attributed to subsidence and the effects of water movements within the ocean itself. The panel recommended that the report continue to be updated every five years.

The 2016 update of North Carolina's Coastal Habitat Protection Plan addresses SLR and climatic changes in several locations with recommendations specifically to the protection of wetlands and buffers to help offset the expected rise. The Source Document for the Coastal Habitat Protection Plan, and the Plan itself, can be accessed at: http://portal.ncdenr.org/web/mf/habitat/chpp/downloads.

The Albemarle-Pamlico National Estuary Partnership, through its 2012-2022 Comprehensive Conservation and Management Plan incorporates climatic impacts throughout, but has three actions focused on climate change and SLR. Two actions address the impacts of SLR and climate change on the regional ecosystem as well as supporting research on adapting to those impacts. The third action supports engaging state, regional, and local governments and assisting them with incorporating SLR and climate change into their planning processes.

Both the North Carolina National Estuarine Research Reserve and the U.S. Fish and Wildlife Service have incorporated significant aspects of SLR and climate change research into their strategic plans. With several extensive National Wildlife Refuge systems on North Carolina's coast and four National Estuarine Research Reserve sites in eastern North Carolina, significant research is being done in those locations. Much of the research deals with hydrologic restoration and the study of wetlands and their mitigating impacts on SLR.

South Carolina

In 2013, the South Carolina Department of Natural Resources compiled a report titled "Climate Change Impacts to Natural Resources in South Carolina." The following two sentences from the report highlight the goal the agency had in writing it: "The Department of Natural Resources is taking a lead role among South Carolina state agencies to advance the scientific understanding of the vulnerability of South Carolina's vital natural resources during an era of changing climate. This will enable the agency, its partners, constituents, and all Palmetto State citizens to avoid or minimize the anticipated impacts while protecting South Carolina's natural resources." The report identifies a number of concerns for the state's natural resources including SLR, ocean acidification, and temperature rise effects. The state has a high proportion of the coastline that is comprised of marshes, barrier islands, and hammock islands. Many of these lands are owned by state and federal entities. The document has various strategies for research and for developing and protecting land to provide for migration.

Other scientists, such as Dr. James Morris from the University of South Carolina, are conducting research evaluating the fate of marshes due to potential SLR. The recent thousand-year rain event in the state and King Tides are raising public awareness of what SLR will probably entail.

Georgia

In Georgia, most of the authority for responding to climate change rests with the local governments. There is not a statewide plan or regulatory measures in place. Their State Wildlife Action Plan, however, does address climate change. With that in mind, there aren't any vulnerability assessments regarding fisheries. NOAA Fisheries Science Centers are working on assessing climate vulnerabilities for many species at the federal level.

Georgia is home to Gray's Reef National Marine Sanctuary, and NOAA is taking a three-pronged approach to address climate change: they are using Gray's Reef as a sentinel site, responding to change through adaptive management, and increasing climate change communication.
Climate change links for Gray's Reef and other National Marine Sanctuaries include:
http://sanctuaries.noaa.gov/science/sentinel-site-program/climate-change-ocean-acidification.html
http://marineprotectedareas.noaa.gov/sciencestewardship/climatechangeimpacts/
http://sanctuaries.noaa.gov/science/sentinel-site-program/grays-reef/climate-change-ocean-acidification.html

Florida

The Florida Fish and Wildlife Commission led a stakeholder summit on Climate Change in 2008. A report was generated in 2009 from this summit entitled "Florida's Wildlife: On the front line of climate change." As a result of this summit and due to the resulting recommendations, the Fish and Wildlife Commission established a Climate Change Oversight Team and developed adaptive strategies to address identified climate change threats to fish and wildlife and their habitats. Climate change considerations have been integrated into Florida's State Wildlife Action Plan, and funding has been provided to aquatic habitat projects supporting climate change adaptive strategies, such as living shoreline projects and regional climate change effects mitigation planning efforts. Funding opportunities for aquatic habitat restoration and enhancement projects supported by the Fish and Wildlife Commission ensure evaluation of climate change adaptation in all project proposals submitted. The state follows guidance in Adapting to Climate Change: A Planning Guide for State Coastal Managers, a 2010 report from NOAA.

The Florida Oceans and Coastal Council published The Effects of Climate Change on Florida's Ocean and Coastal Resources in 2009, and updated the report in December 2010. These reports were written for the Florida Energy and Climate Commission and the residents of Florida. The original report included information on the 2007 Intergovernmental Panel on Climate Change Report, the impacts of climate change on Florida's infrastructure, human health, and economy, the effects of the 'drivers' of climate change, and research priorities, while the update focused on SLR effects and research priorities.

Florida has also worked with partner organizations, such as The Nature Conservancy, to implement projects addressing resiliency and plan for coastal climate change. This has been a key focus of south Florida, which is generally recognized as being one of the most vulnerable regions in the Commission management region to SLR. Partners have developed shoreline resiliency and coral reef teams including the Shoreline Resiliency Working Group and Southeast Florida Coral Reef Initiative, which are focused on assessing and addressing the effects of climate change on coastal habitats. The Governor's South Atlantic Alliance recently sponsored (April 2016) a southeast U.S. Living Shorelines Summit in Jacksonville, Florida, which specifically addressed coastal habitat resiliency in the face of accelerated SLR. This effort has resulted in the development of a number of different regional resources, including a living shoreline training academy, which provides managers and the public with a certification in living shoreline design and implementation.

Appendix II Summary of Climate Change Initiatives by State

(see Excel spreadsheet – will be incorporated into the document in final form)

Appendix III NOAA and US Fish and Wildlife Service Climate Change Initiatives

NOAA

NOAA Program	Climate Change Initiative Description
Annual NOAA/NCDC State of the Climate Reports	These began in 1991 and can be downloaded from http://www.ncdc.noaa.gov/bams-state-of-the-climate/
NOAA-wide effort	The Third National Climate Assessment (2014). It includes regional chapters, as well chapters for coastal and oceans, ecosystems, and ancillary reports with additional details for some regions and subject areas. http://nca2014.globalchange.gov/report
NOAA Restoration Center, Community-based Restoration Program and Damage Assessment, Remediation and Restoration Program	Restoration project designs consider climate change impacts to both the immediate restoration and long-term stewardship of project sites. E.g., sea level rise impacts
NOAA Restoration Center, Northeast Region	Guidance on flood frequency estimates for resilient infrastructure and stream restoration. The Restoration Center has been studying historical climatic trends in river floods in the Northeast to support the design of fish passage and river restoration projects, and findings have documented increasing flood magnitudes and frequencies in recent decades. They have also developed Planning for Sea Level Rise in the Northeast: Considerations for the Implementation of Tidal Wetland Habitat Restoration Projects (2011)
NMFS Habitat Conservation Division (HCD), Essential Fish Habitat and Hydropower License – Fish Passage Prescriptions	Consider climate change effects on habitats from the action. Includes climate effects on the proposed action that result in adverse effects to habitat
NMFS HCD (GARFO)	Developing a regional climate change guidance document to assist in integrating climate change information in consultation processes
NMFS Office of Habitat Conservation	Climate Smart Habitat Conservation webpage on climate change information with links for Coastal Blue Carbon, addressing sea level rise in salt marsh restoration projects, and other climate-related topics. http://www.habitat.noaa.gov/ourwork/climate.html
NOAA Climate Program Office	U.S. Climate Resilience Toolkit, hosted by NOAA's National Centers for Environmental Information. https://toolkit.climate.gov/. The U.S. Climate Resilience Toolkit includes training materials and guidance documents to assist coastal resource managers in incorporating climate change

	information into new or existing conservation plans. https://coast.noaa.gov/digitalcoast/training/considering-climate-change
NOAA Coral Reef Conservation Program	Competitive grant program providing funding and coordination for external and internal NOAA activities on shallow-water coral reef conservation, including research on ocean acidification and bleaching
NOAA Chesapeake Bay Office	Program contributes to climate change research, monitoring, resiliency, and adaptation, e.g., research on climate change effects on oysters
NOAA Sentinel Site Cooperative in North Carolina and Chesapeake Bay	NOAA works with regional partners and leverages resources on issues related to climate change, including sea level rise and inundation through coordinated data sharing, monitoring, research, local community capacity building, and adaptation support, which includes habitat conservation
National Fish, Wildlife, and Plants Climate Adaptation Strategy	Office of Habitat Conservation contributed to the development of this broad strategy that includes coastal habitat adaptation needs
NMFS Office of Habitat Conservation, Coastal Blue Carbon	General information on coastal blue carbon, with a number of links for further reading on the subject including research and development and protocol standards. http://www.habitat.noaa.gov/coastalbluecarbon.html
NOAA Living Shorelines Guidance	NOAA's living shorelines webpage contains background and technical information on, as well as examples of, living shorelines: https://www.habitatblueprint.noaa.gov/living-shorelines/; NOAA Fisheries Office of Habitat Conservation's Restoration Center website contains information related to living shorelines: http://www.habitat.noaa.gov/restoration/techniques/livingshorelines.html; NOAA guidance on living shorelines can be downloaded here: http://www.habitat.noaa.gov/pdf/noaa_guidance_for_considering_the_use_of_living_shorelines_2015.pdf
NOAA Regional Coastal Resilience Grant Program	Grants program to support regional approaches that build resilience of coastal regions, communities, and economic sectors to the negative impacts from extreme weather events, climate hazards, and changing ocean conditions. https://www.coast.noaa.gov/resilience-grant/
NMFS Saltonstall-Kennedy Grant Program	$10 million competitive grant program to build resilient coastal communities and sustainable marine resources.
NMFS Northeast Region Fishery Science Center, Ecosystems Dynamics and Assessment Program	Program website includes a comprehensive review of climate change effects on the Northeast Continental Shelf ecosystem. https://www.nefsc.noaa.gov/ecosys/
NMFS Climate Science Strategy and Regional Climate Science Action Plans	Informs NMFS science activities (monitoring, research, modeling, and assessments), including tracking current conditions, providing early warnings and forecasts, understanding the mechanisms of climate impacts, and projecting future conditions, evaluating possible options for fisheries management and protected resources conservation in a changing world
NOAA's Earth Science Research Laboratory,	Climate Change Portal, a web interface that users can access and display climate and earth system model output. https://www.esrl.noaa.gov/psd/ipcc/ocn/

Physical Sciences Division (PSD)	
NOAA National Oceanographic Data Center, National Centers for Environmental Information, Ocean Climate Laboratory Team	Provides support for the Northwest Atlantic Regional Climatology webpage, providing high-resolution ocean climatology as part of the NOAA-wide Sustained Marine Ecosystem in Changing Climate Project. https://www.nodc.noaa.gov/OC5/regional_climate/nwa-climate/
NOAA's Office for Coastal Management	In collaboration with The Nature Conservancy and ESRI, NOAA developed the Climate Wizard, a web-based interactive mapping platform which provides access to U.S. and global climate change information including historical and projected temperature and precipitation data using different greenhouse gas emission scenarios for two future time periods. http://climatewizard.org/. Digital Shoreline Analysis System is an ArcGIS-based software package jointly developed by NOAA and the U.S. Geological Survey. The software computes the rate of shoreline change using historical shoreline positions represented in a GIS. https://coast.noaa.gov/digitalcoast/tools/dsas.html. The Digital Coast is a sea level rise projection mapping tool. https://coast.noaa.gov/digitalcoast/tools/slr
The National Ocean Service (NOS) National Center for Coastal and Ocean Science	Ecosystem Effects of Sea Level Rise research program provides a suite of science products to inform coastal managers of local coastal vulnerability and solutions to mitigate flood risk.
NOAA's National Centers for Environmental Information (NCEI)	Arctic Regional Climatology Data. https://www.nodc.noaa.gov/OC5/regional_climate/arctic/

NOAA-Related Publications

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Department of Interior

DOI Program	Climate Change Initiative Description
US Geological Survey (USGS)	Responsible for climate change science leadership within the Department of Interior
USGS Climate Science Centers and National Climate Change and Wildlife Science Center	Work with natural and cultural resource managers to gather the scientific information and build the tools needed to help fish, wildlife, and ecosystems adapt to the impacts of climate change. https://nccwsc.usgs.gov/
US Fish and Wildlife Service (FWS) The Climate of Conservation in America: 50 Stories in 50 States	State-by-state look at how accelerating climate change is impacting or may impact fish and wildlife across America. https://www.fws.gov/home/climatechange/stories505050.html
National Fish, Wildlife and Plants Climate Adaptation Strategy	National, government-wide strategy to safeguard fish, wildlife, plants, and the natural systems upon which they depend. Led by FWS, NOAA, and New York Division of Fish, Wildlife, and Marine Resources. https://www.wildlifeadaptationstrategy.gov/index.php
FWS Climate Change Strategic Plan	Rising to the Urgent Challenge, Strategic Plan for Responding to Accelerating Climate Change. https://www.fws.gov/home/climatechange/pdf/CCStrategicPlan.pdf

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MEMORANDUM

October 10, 2017

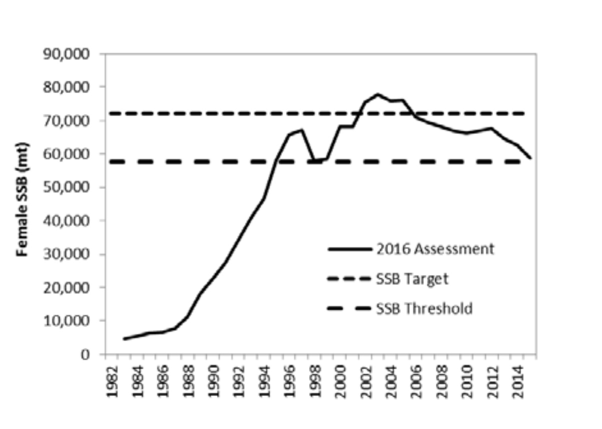
To: **Atlantic Striped Bass Management Board**

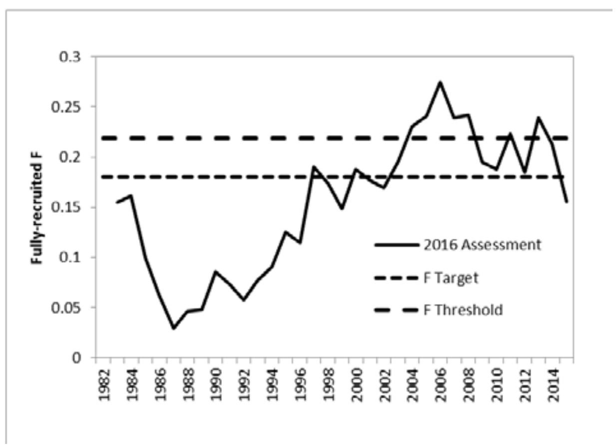
From: **Atlantic Striped Bass Technical Committee and Stock Assessment Subcommittee**

RE: **Request for Board guidance regarding Atlantic striped bass FMP goals and objectives**

Term of Reference #5 for the Atlantic striped bass benchmark stock assessment is "Update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY}, SSB_{MSY}, F_{MSY}, MSY). Define stock status based on BRPs by stock component where possible." As the Technical Committee (TC) and Stock Assessment Subcommittee (SAS) continue their work on the assessment, they request guidance from the Board on the management goals and objectives for this species to facilitate development of biological reference points (BRPs) that best meet those objectives.

The current spawning stock biomass (SSB) threshold for Atlantic striped bass is the estimate of SSB in 1995, and the current SSB target is 125% of that value. The stock is declared overfished when SSB drops below the threshold. The current fishing mortality (F) target and threshold are the F rates that will maintain the population at the SSB target and threshold, respectively, over the long term. Overfishing occurs when F exceeds the F threshold.





The current management plan objectives for Atlantic striped bass were laid out in Amendment 6 to the Fishery Management Plan (FMP) in 2003 and have not been revisited since then. Some Board members have voiced concerns that the current reference points are too conservative for various biological, ecological or socioeconomic reasons, and are restricting fishing unnecessarily. This raises questions about what the objectives and acceptable risk levels of the Atlantic striped bass FMP are and whether they have changed since Amendment 6 was

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implemented. There is a trade-off between preserving SSB and allowing fishing, and determining the best balance between these two parameters is a management-level decision.

Therefore, the TC and SAS requests that the Board provide guidance on the preferred balance between SSB and F, the relative importance of maximizing yield vs. maximizing catch rates or the availability of trophy-size fish, and the acceptable level of risk when it comes to preventing stock collapse. If the Board is able to provide guidance to the SAS by the May Board Meeting, prior to the Assessment Workshop in July 2018, the SAS will be better able to calculate BRPs that reflect the objectives of the FMP. These reference points would be available for management as soon as the assessment and peer review process is complete.

The TC and SAS recognize that this is not a simple request. The Board has the flexibility to develop the necessary guidance however it sees fit, however the TC and SAS recommend the Board consider one or both of the following approaches:

1. A process similar to the Ecosystem Management Objectives Workshop that was convened to develop management objectives for Atlantic menhaden, either through a formal workshop or through meetings of a subcommittee of the Board.
2. A survey for Board members developed by the TC and SAS with specific questions regarding the direction of management and the preferred balance between SSB and F. The Board would review the results of the survey at its February meeting and develop guidance based on those results and Board discussion.

Alternatively, the TC could conduct a full management strategy evaluation (MSE) of potential reference points which would allow the Board to quantitatively evaluate the trade-offs and risk levels associated with different reference points. However, a MSE could not be completed in 2018 and would occur after the assessment is complete and peer reviewed (or the peer review would have to be delayed).

The TC and SAS will provide technical background, as necessary, to facilitate Board discussion throughout this process.

Atlantic Striped Bass

Activity level: High

Committee Overlap Score: Medium (TC/SAS/TSC overlaps with BERP, Atlantic menhaden, American eel, horseshoe crab, shad/river herring)

Committee Task List

• TC – June 15th: Annual compliance reports due
• TC/SASC/TSC – All Year: benchmark stock assessment
  ○ Jan/Feb 2018: Modeling Workshop I
  ○ May 2018: Updated data submission for Assessment through 2017
  ○ July 2018: Modeling Workshop II
  ○ Sept. 2018: Final SASC call/webinar to approve stock status determination
  ○ 1st week of Oct. 2018: All Draft Report components due to staff
  ○ 2nd week of Nov. 2018: Assessment Report due to external peer-review panel
  ○ 1st week of Dec 2018: Peer review

TC Members: Nicole Lengyel (RI, TC Chair), Kevin Sullivan (NH, Vice Chair), Alex Aspinwall (VA), Alexei Sharov (MD), Carol Hoffman (NY), Charlton Godwin (NC), Edward Hale (DE), Ellen Cosby (PRFC), Gail Wippelhauser (ME), Gary Nelson (MA), Heather Corbett (NJ), Jeremy McCargo (NC), Kurt Gottschall (CT), Luke Lyon (DC), Michael Kaufmann (PA), Peter Schuhmann (UNCW), Winnie Ryan, Gary Shepherd (NMFS), Steve Minkkinen (USFWS), Wilson Laney (USFWS), Katie Drew (ASMFC), Max Appelman (ASMFC)

SAS Members: Edward Hale (DE, Chair), Gary Nelson (MA, Vice Chair), Alexei Sharov (MD), Hank Liao (ODU), Justin Davis (CT), Michael Celestino (NJ), John Sweka (USFWS), Gary Shepherd (NMFS), Katie Drew (ASMFC), Max Appelman (ASMFC)

Tagging Subcommittee (TSC) Members: Stuart Welsh (WVU, Chair), Heather Corbett (NJ, Vice Chair), Angela Giuliano (MD), Beth Versak (MD), Chris Bonzak (VIMS), Edward Hale (DE), Gary Nelson (MA), Ian Park (DE), Jessica Best (NY), Carol Hoffman (NY), Gary Shepherd (NMFS), Josh Newhard (USFWS), Wilson Laney (USFWS), Katie Drew (ASMFC), Max Appelman (ASMFC)

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MEMORANDUM

October 10, 2017

To: **South Atlantic State/Federal Fisheries Management Board**

From: **Dr. Louis Daniel and Michael Schmidtke**

Subject: **Cobia Draft FMP Public Hearing Summaries**

In September, 2017, Public Hearings discussing management options of the ASMFC Cobia Draft Fishery Management Plan were held in Virginia, North Carolina (two hearings, one in Hatteras and the other in Morehead City), South Carolina, and Georgia (via webinar). These hearings are summarized below. A full summary of all Public Comment submitted on this document will be made available after the closure of the written Public Comment on October 10, 2017, but prior to the South Atlantic Board Meeting on October 19, 2017.

Enc: Public Hearing Summaries (VA; Hatteras, NC; Morehead City, NC; SC; GA)

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Cobia Draft Fishery Management Plan Public Hearing Summary
Newport News, Virginia
September 12, 2017
11 Attendees

Staff: Dr. Louis Daniel (ASMFC), Joe Cimino (VMRC), Ryan Jiorle (VMRC), Sydney Alhale (VMRC), Alex Aspinwall (VMRC)
Attendees: Wes Blow, Mike Avery, Travis Kemp, Billy Gorham, Charles Meredith, Zack Hoffman.

There were no comments provided on the specific management options presented.

<u>Additional Comments:</u>
Attendees expressed concern about recreational landings estimation methods.

The group also discussed *de Minimis* issues and concerns regarding fish moving in to Maryland waters and the belief that management measures need to be implemented in Maryland.

Mike Avery raised concerns regarding the time to consolidate all the comments and being able to distill those comments for Board review. Dr. Daniel explained that all comments are provided to the Board as received and summarized by staff and that changes to the draft are directed by the Board, not staff.

Wes Blow raised concerns related to the harvest of larger fish and suggested a slot limit or large fish limit in addition to the vessel limits. Mr. Blow also raised concerns over the allocations and felt Virginia was being disadvantaged by the methods presented. VMRC staff and Dr. Daniel explained the reasoning behind the options presented for recreational landings allocation reference periods.

Billy Gorham expressed concerns related to ASMFC involvement in the plan. While there seemed to be general agreement that an ASMFC plan would provide the states with more flexibility to manage their specific fisheries, Mr. Gorham state that any ASMFC involvement should be delayed until after the new stock assessment is completed or full management authority is transferred from the SAFMC to the ASMFC for Cobia. The attendees all appeared to support these comments.

ASMFC Cobia Meeting
Newport News VA
9/12/17

Name	City	email
Louis Daniel	Morehead City	sciaenops1@gmail.com
Wes Blow	N.N.	wesAmy2000@cox.net
Mike Avery	Hampton	mike@averys.net
Travis Kemp	Moyock	Kempbrian@gmail.com
Bill Gorham	Southern Shores	GetBowedUp4@gmail.com
Charles Meredith	Yorktown	Charlesmeredith1@Yahoo.
Zack Hoffman	Seaford	Saltreatedfishing@gmail

VA - Joe Cimino, Ryan Jiorle Sydney Alhale Alex Aspinwall

Cobia Draft Fishery Management Plan Public Hearing Summary
Morehead City, North Carolina
September 20, 2017
9 Attendees

Meeting Staff: Michelle Duval (NC DMF), Chris Batsavage (NC DMF), Anna Beckwith (SAFMC), Steve Poland (NC DMF)
Meeting Participants: Michael Shutak, Joe Smith, Heather, Michelle Holmes, Jacob Krausel

No specific comments addressing the issues of the FMP were made. Several questions were discussed:

- How is discard mortality accounted for? In the assessment via discard mortality rates that are incorporated.
- Reference to 6 fish/vessel seems liberal – what was the consideration for that? So that it would continue to provide opportunity for charter captains (idea of opportunity for clients) and also would provide additional flexibility in applying accountability measures at the Council level to constrain harvest to the ACL.
- Because hurricanes effect harvest, will that be taken into account to affect harvest? Difficult to do in real-time; commission could discuss the possibility of trying to take extreme weather into account.
- Question re: hard quota shares – showed four different reference periods; no background to know what is best? Explained the rationale to try to provide a fair shake to all states within the management unit; trying to capture the different characteristics of the fishery, given the pulse nature and the dependence on environmental conditions; discussed the use of numbers vs. weight.

Cobia Draft Fishery Management Plan

Atlantic States Marine Fisheries Commission
September 20, 2017
North Carolina

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Name	Company/Organization	City, State
Michael A. Shutak	Carteret County News-Times	Morehead City, NC
Chris Batsavage	NCDMF	
Joseph W. Smith	NMFS retired	MHC, NC
Michelle Holmes	Public	" "
Jacob Krause	NCSU	MHC, NC
Anna Beckwith	SAMFC	MHC, NC.

Cobia Draft Fishery Management Plan Public Hearing Summary
Hatteras, North Carolina
September 21, 2017
22 Attendees

Meeting Staff: Dr. Michelle Duval (NC DMF), Anna Beckwith (SAFMC)
Attendees: Justin Lott, William Gorham, Chris Hickman, Melba Milak, Keith Wilson, Ernie Foster, Rick Carton, Will Smith, Cameron Whitaker, Jerry Shicks, Justin Revere, Aaron, Tommy, Jeff Oden, Rick Scarborough, Steve Hussey, Aaron Kelly, three others.

Recreational Season and Allocation Options:
Mr. Rick Caton indicated that no options were acceptable and we should go back to the old rules of 2 fish at 33".

Mr. Bill Gorham suggested no ASMFC management until ASMFC receives sole management authority. He raised concerns over fish moving in to Maryland and the impacts to the current recreational allocation. He supported Option 2 for the soft allocation and felt Sub-Option a (3-year landings reference period) was the best option for years for allocation for North Carolina. Mr. Gorham also commented on maintaining the current commercial harvest levels but raised concerns over discards after any commercial closure.

Nine additional commenters supported Option 2 (recreational harvest target evaluated over multiple years).

Additional Comments:
A general discussion revolved around estimates of catch and a basic mistrust of the past several years of high estimates. Most attendees believe the weights and numbers of fish are overinflated based on their experience on the water.

Participants indicated that no samplers came to Hatteras docks during the peak fishing of May and June and suggest that the numbers were "manufactured". Several suggested that MRIP is intended for more commonly encountered species and not pulse fisheries like cobia.

Attendees provided their on-the-water observations that cobia populations have increased significantly over the past several years.

There was frustration and anger expressed over the small amount of poundage allocated to the commercial fishery, several questions were asked regarding how the allocation split (92% recreational, 8% commercial) was established by the SAFMC.

Participants questioned why the commercial fishery was closed just prior to the fall king mackerel fishery (where the majority of bycatch occurs), and noted that there are fewer commercial fishermen now than in the past. (It was noted that NMFS is trying to incorporate state waters/non-federal dealer reported harvest, which makes up a substantial amount of harvest).

Participants questioned why management could not revert back to the previous 33-inch FL and 2 fish/person bag limit because they felt the fishery was not broken and did not need fixing.

Participants questioned why the Florida east coast sub-zone quota could not be added to the Atlantic migratory group cobia ACL; it was explained that even if the Florida sub-quota could be added back to the existing Atlantic migratory group quota there would still have been an overage (additional research efforts to further define the stock boundary were described).

Participants noted that the fishery changes every year; sometimes the fish show up early, sometimes they do not show up until very late in the season. Some years there are a lot of small fish, and other years there are more big fish.

There were many questions regarding how Option 2 might work and how seasons and vessel limits would be set for each state; it was explained that each state would have to develop its seasonal measures to be submitted to ASMFC for review/approval. It was explained that the 36-inch FL minimum size limit, 1 fish/person bag and 6 fish maximum vessel limit would be the limits within which each state could establish its season. It was noted the evaluation timeframe would allow for changing conditions in the fishery.

Attendees asked if a state's season could be kept open if the fish did not show up when expected, or weather prohibited harvest. It was explained that this would require real-time monitoring, which is difficult under existing recreational data collection programs. Alternatives such as logbooks, catch cards and reporting apps were discussed.

Participants asked what proportion of harvest was attributed to the charter sector. It was noted a small proportion (information presented to the SAFMC regarding harvest by mode was displayed for participants).

Questions were asked regarding how could the accuracy and precision of the private boat estimates be increased; pilot projects under way by the SAFMC to develop a private angler electronic permit and reporting app were described.

Cobia Draft Fishery Management Plan

Atlantic States Marine Fisheries Commission
September 21, 2017
North Carolina

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Name	Company/Organization	City, State
Justin Lott	NCDMF-MP	
William Gorham	RCF	Right here NC
Chris Hickman		Hatteras, NC
[illegible]	NCWU	Hatteras, NC
Keith Wilson		Hatteras, NC
Ernie Foster	Albatross Fleet	" "
Rick ~~[illegible]~~ Caton	Captain Sid Charters	Hatteras, NC
[illegible]		Buxton/NC
[illegible]	Hang-On Charters	
Will Smith	BAK BAR	Hatteras, NC
Cameron Whitaker	Tradition Fishing	Hatteras
Jerry Stiles	Calypso Fishing	Hatteras NC
Justin Revere	Hatteras Fishing Adventure	Hatteras
[illegible] Aaron	Right Line	Hatteras
Tommy [illegible] III		Hatteras,
Jeff Caton	Slash Creek	Hatteras
Rick Scarborough	Speck-Tackler	Buxton NC
[illegible]	Pelican's Boat	Hatteras NC
[illegible]	Meat hog fishing	Nags head/NC
Aaron Kelly	Rock Solid Fishing.	Kill Devil Hills NC
Anna Beckwith	SAMFC	MHC, [illegible]
Michelle Duval	NCDMF	

Cobia Draft Fishery Management Plan Public Hearing Summary
Georgia Webinar
September 25, 2017
6 Attendees

Meeting Staff: Michael Schmidtke (ASMFC), Pat Geer (GA CRD), Spud Woodward (GA CRD), Kathy Knowlton (GA CRD),
Meeting Participants: Lee Southard, Nathan Alexander

<u>Issues Related to South Atlantic Fishery Management Council (SAFMC) Framework 4: Recreational Size Limit, Recreational Bag Limit, Recreational Vessel Limit, Commercial Size Limit, and Commercial Possession Limit</u>
All of the above issues were presented in the Draft Fishery Management plan with 2 options: Option 1 of no ASMFC policy on the issue and Option 2 of an ASMFC policy that matches the SAFMC's Framework 4. Comments on all such complementary measures are summarized below.

Lee Southard stated support of Option 2 (complementary management) for both the Commercial Size and Possession Limit options.

<u>Recreational Season and Allocation Options:</u>
Lee Southard stated support of Option 2 with Sub-Options d and f (State-by-state recreational harvest target allocations based on the 5-year/10-year average landings reference period evaluated over a 3-year timeframe)

Nathan Alexander stated support of Option 2 (State-by-state recreational harvest target allocations) Sub-Options b-d (5-year, 10-year, or 5-year/10-year average landings reference period) with some preference for d (5-year/10-year average landings reference period) and Sub-Option e (2-year landings evaluation timeframe). Mr. Alexander stated that 3 years may be too long of a timeframe without re-evaluation to respond to problems in the fishery.

<u>*De Minimis* Options:</u>
Nathan Alexander stated support of a *de minimis* program but does not have a strong preference for Option 2 versus Option 3. Mr. Alexander did express support for Sub-Option b (allowing *de minimis* states the choice to match an adjacent or nearest non-*de minimis* state).

<u>Additional Comments:</u>
Lee Southard expressed concern with the current stock definition of Atlantic Migratory Group cobia, stating that Georgia fishers have to wait until cobia migrate from Florida to the north

before that fishery can occur, thus they should be considered a single stock across the Florida-Georgia border. He referenced work done in South Carolina that supports this conclusion. He also stated that the cobia fishery in Georgia is primarily executed in federal waters.

Nathan Alexander stated concern with Georgia's lack of a cobia fishery in 2017 due to a federal closure before the season effectively began. Mr. Alexander stated that due to migratory patterns and weather conditions, the cobia fishery in Georgia is only able to operate over a short period of time, resulting in relatively low annual landings compared to other states further north. However, due to the Georgia fishery's occurrence in federal rather than state waters, Georgia's fishery closes during federal closures while states with much larger fisheries primarily in state waters are able to continue harvesting cobia.

Cobia Draft Fishery Management Plan Public Hearing Summary
Charleston, South Carolina
September 26, 2017
15 Attendees

Meeting Staff: Michael Schmidtke (ASMFC), Robert Boyles (SC DNR), Dr. Malcolm Rhodes (ASMFC)
Meeting Participants: Richard Moore, John Carmichael (SAFMC), Tanya Darden (SC DNR), Mike Collins (SAFMC), Mel Bell (SC DNR), Mark Brown (SAFMC), Jim Reed, Andrew Petersen (Bluefin Data), Amy Dukes (SC DNR), Rusty Hudson, Michelle Duvall (NC DMF), Doug Haymans (GA CRD)

<u>Issues Related to South Atlantic Fishery Management Council (SAFMC) Framework 4: Recreational Size Limit, Recreational Bag Limit, Recreational Vessel Limit, Commercial Size Limit, and Commercial Possession Limit</u>
All of the above issues were presented in the Draft Fishery Management plan with 2 options: Option 1 of no ASMFC policy on the issue and Option 2 of an ASMFC policy that matches the SAFMC's Framework 4. Comments on all such complementary measures are summarized below.

Mark Brown expressed support for Option 2 for both commercial options.

Amy Dukes expressed concern for the lack of a vessel permit option for the commercial fishery. With the current wording of "2 fish per license holder", this would require multiple trip tickets to be written for cobia caught on the same trip.

<u>Recreational Season and Allocation Options:</u>
Mark Brown expressed support for Option 2 with Sub-Options c and e (state-by-state recreational harvest targets based on landings from a 10-year average reference period evaluated over a 2-year time period).

Richard Moore expressed support for Option 2 with Sub-Option c and e.

Jim Reed expressed support for Option 2 with Sub-Options c and e. Mr. Reed also expressed concern with the use of data from the Marine Recreational Information Program as the sole method for tracking recreational harvest.

<u>*De Minimis* Options:</u>
No specific comments were made in reference to *de minimis* options.

Additional Comments:

Mark Brown expressed concern with potential delay or disruption of implementation by states whose fisheries may be reduced by this Management Plan. Present Commissioners explained the interstate cooperation and accountability inherent to a Commission plan that, if the FMP is approved, would motivate all states to implement measures in a timely manner.

Cobia Draft Fishery Management Plan

Atlantic States Marine Fisheries Commission
September 26, 2017
South Carolina

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Name	Company/Organization	City, State
Malcolm Rhodes	ASMFC	Charleston, SC
Richard Moore		Charleston, SC
John Carmichael	SAFMC	Charleston SC
Tanya Darden	SCDNR	Charleston SC
Mike Collins	SAFMC	C'ston SC
Mel Bell	SCDNR	
Mark Brown	SAFMC SC	Mt. Pleasant SC
Jim Reed	~~SAF~~ REC/INDUSTRY	MT PLEASANT
Andrew Peterson	Bluefin Data	Baton Rouge, LA
Amy Dukes	SCDNR	Chas. SC
[illegible]		
Michelle Duval	NC DMF	
Michael Schmidtke	ASMFC	Arlington, VA

Atlantic States Marine Fisheries Commission

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MEMORANDUM

October 10, 2017

To: **South Atlantic State/Federal Fisheries Management Board**

From: **Black Drum Technical Committee**

Subject: **Black Drum TC Review of Maryland Proposal**

In September, 2017, the Black Drum Technical Committee (TC) met via conference call to review a proposal from the state of Maryland that would reopen Maryland's commercial fishery for black drum in Chesapeake Bay. After discussion outlined in the attached Call Summary, the TC finds that reopening of this historic fishery would not likely lead to overfishing of the stock. **Therefore, the TC recommends that the Board considers approval Maryland's request to reopen their commercial black drum fishery in Chesapeake Bay.** To improve data used to assess stock status, the TC recommends Maryland conduct biological monitoring of black drum caught by Maryland's commercial fishery in Chesapeake Bay.

Enc: Black Drum TC Sept 29, 2017, Call Summary

M17-103

Atlantic States Marine Fisheries Commission

Black Drum Technical Committee

Call Summary

September 29, 2017
9:30 -11:00 a.m.

Technical Committee: Harry Rickabaugh (Chair) (MD), Jordy Zimmerman (DE), Ryan Jiorle (VA), Chris Stewart (NC), Chris McDonough (SC), Ryan Harrell (GA)

ASMFC Staff: Mike Schmidtke, Jeff Kipp

1) **Welcome & Introductions**

2) **Review of MD Proposal**

- Harry Rickabaugh presented Maryland's proposal to re-open their commercial fishery in Chesapeake Bay. This fishery was historically executed until the late 1990s, when the state of Maryland closed the fishery to conduct a tag and release program that collected life history, migration, and recreational harvest data. After the program was completed, the fishery was not reopened, as it was not considered a high-priority fishery. While the closure was in effect, in 2013, the Atlantic States Marine Fisheries Commission approved the interstate FMP for Black Drum, which required states to maintain current management measures, continuing Maryland's commercial closure in the Chesapeake Bay.

- Maryland is proposing to reopen the Chesapeake Bay commercial black drum fishery with a ten fish per vessel per day harvest limit and a 28 inch minimum total length size limit, equating to an effective daily trip limit of approximately 500 pounds.

- TC Discussion

    - Jordy Zimmerman confirmed some details of the proposal and asked if this proposal would apply to all gears. Harry replied that the proposal would apply to all gears, but realistically this fishery would be mostly pound nets with some hook and line.

    - Chris McDonough asked what monitoring would be conducted. Harry replied that normal commercial monitoring requirements would apply for black drum.

- Chris McDonough asked about comparability to the Virginia commercial fishery. Ryan Jiorle and Chris M discussed the Virginia fishery, in which there is a small directed commercial fishery executed primarily from the Eastern Shore in which black drum are caught via gill nets, pound nets, or hook and line. In Virginia, any commercial license holder can harvest up to one black drum per day, and with an additional permit, black drum larger than a minimum size limit may be harvested without a possession limit.

- Ryan offered to provide data from Virginia's biological monitoring program as supportive material for Maryland's proposal.

- The group discussed the timeframe of the fishery. Although the fishery would legally be open year-round, due to seasonal movements of black drum, this fishery would typically executed about 4-6 weeks per year. Black drum typically spawn before entering Maryland's portion of Chesapeake Bay, so this fishery likely would not catch spawning females.

- Jordy asked about the number of fishermen that would participate. Harry replied that no specific license would be required, but gill nets would be cost-prohibitive for this fishery (they wouldn't catch many black drum due to maximum size restrictions on Atlantic striped bass caught in gill nets) and the pound net fishery in Maryland is capped with limited entry (and is actually shrinking).

- The group discussed potential levels of dead discards. Harry commented that current monitoring efforts show minimal dead discards in the Maryland pound net fishery. The group discussed the potential for death due to overcrowding, but agreed that this was not likely for this fishery.

- Chris M asked about the level of black drum bycatch during the moratorium in the Bay. Harry replied that the pound net fishery starts in May-June, typically catching Atlantic croaker, menhaden, or other migratory fish, but may see 1-5 black drum in a net.

- The group discussed the current market for black drum and potential for this fishery to reach levels seen before the closure. Several group members agreed that black drum are not heavily valued for market such that pound net fishermen would change their behavior, particularly with a ten fish bag limit. Jordy commented that this fishery would occur near the end of the Delaware fishery, in which 45 cents per pound is a typical price for black drum. Jordy commented that as is, the black drum market can quickly become oversaturated, driving the price per pound down. Adding Maryland harvest may increase this oversaturation, resulting in lowered demand

and shortened effective seasons for this fishery. Harry commented that while the Maryland commercial Chesapeake Bay black drum fishery was operating without restriction, average annual landings were about 11,500 pounds, and the fishermen were typically good about monitoring the market. Due to the difficulty of handling large black drum, commercial fishers typically do not want to handle these fish unless they can sell them for a decent price.

  - The group discussed the potential for biological monitoring of this fishery. Harry commented that biological sampling of pound nets is already conducted for other species in Maryland, so adding black drum to the species sampled could be looked into. Jordy suggested that fish could be bought directly from the fishery to more easily identify catch location.

****The Black Drum TC recommends that the Maryland proposal to reopen their commercial black drum fishery in the Chesapeake Bay be approved, as reopening of this historic fishery would not likely lead to overfishing of this stock. The TC further recommends that biological monitoring of black drum caught in this fishery be conducted to collect information such as size, age, etc.****

3) **Other Business/Adjourn**

- Jeff Kipp commented that the next benchmark stock assessment for black drum is scheduled for 2020. Jeff and Mike Schmidtke will review data since the last assessment to summarize progress that has been made on research recommendations. This summary will help inform the TC on whether to recommend, on a later call, keeping the assessment as currently scheduled or delaying until more information is collected.

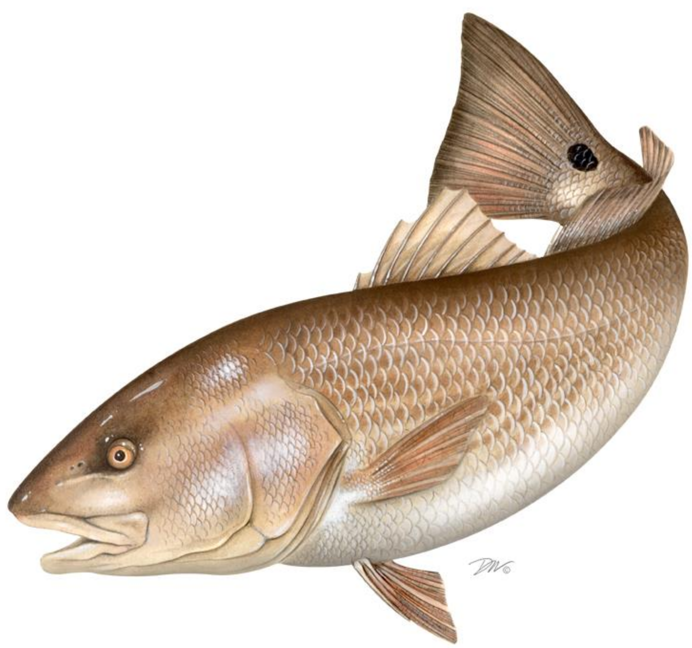
4) **Black Drum FMP Review** (Black Drum PRT)

- The Black Drum PRT reviewed state compliance with the Black Drum FMP for 2016. Their recommendations are found in the 2017 Black Drum FMP Review.

**2017 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR**

**RED DRUM
(*Sciaenops ocellatus*)**

2016 FISHING YEAR



The Red Drum Plan Review Team
Steve Arnott, South Carolina Department of Natural Resources
Lee Paramore, North Carolina Division of Marine Fisheries
Roger Pugliese, South Atlantic Fishery Management Council
Ray Rhodes, College of Charleston
Michael Schmidtke, Atlantic States Marine Fisheries Commission, Chair

Table of Contents

I. Status of the Fishery Management Plan

Date of FMP Approval:	Original FMP – October 1984
Amendments:	Amendment 1 – October 1991 Amendment 2 – June 2002 Addendum 1 – August 2013
Management Areas:	The Atlantic coast distribution of the resource from New Jersey through Florida Northern: New Jersey through North Carolina Southern: South Carolina through the east coast of Florida
Active Boards/Committees:	South Atlantic State/Federal Fisheries Management Board; Red Drum Technical Committee, Stock Assessment Subcommittee, Plan Development Team, Plan Review Team, South Atlantic Species Advisory Panel

The Atlantic States Marine Fisheries Commission (ASMFC) adopted an interstate Fishery Management Plan (FMP) for Red Drum in 1984. The original management unit included the states from Maryland to Florida. In 1988, the Interstate Fisheries Management Program (ISFMP) Policy Board requested that all Atlantic coastal states from Maine to Florida implement the plan's recommended management regulations to prevent development of northern markets for southern fish. The states of New Jersey through Florida are now required to follow the FMP, while Maine through New York (including Pennsylvania) are encouraged to implement consistent provisions to protect the red drum spawning stock.

In 1990, the South Atlantic Fishery Management Council (Council) adopted a FMP for red drum that defined overfishing and optimum yield (OY) consistent with the Magnuson Fishery Conservation and Management Act of 1976. Adoption of this plan prohibited the harvest of red drum in the exclusive economic zone (EEZ), a moratorium that remains in effect today. Recognizing that all harvest would take place in state waters, the Council FMP recommended that states implement measures necessary to achieve the target level of at least 30% escapement.

Consequently, ASMFC initiated Amendment 1 in 1991, which included the goal to attain optimum yield from the fishery over time. Optimum yield was defined as the amount of harvest that could be taken while maintaining the level of spawning stock biomass per recruit (SSBR) at or above 30% of the level which would result if fishing mortality was zero. However, a lack of information on adult stock status resulted in the use of a 30% escapement rate of sub-adult red drum to the off-shore adult spawning stock.

Substantial reductions in fishing mortality were necessary to achieve the escapement rate; however, the lack of data on the status of adult red drum along the Atlantic coast led to the adoption of a phase-in approach with a 10% SSBR goal. In 1991, states implemented or maintained harvest controls necessary to attain the goal.

As hoped, these management measures led to increased escapement rates of juvenile red drum. Escapement estimates for the northern region of New Jersey through North Carolina (18%) and the southern region of South Carolina through Florida (17%) were estimated to be above the 10% phase-in goal, yet still below the ultimate goal of 30% (Vaughan and Carmichael 2000). North Carolina, South Carolina, and Georgia implemented substantive changes to their regulations from 1998-2001 that further restricted harvest.

The Council adopted new definitions of OY and overfishing for red drum in 1998. Optimum yield was redefined as the harvest associated with a 40% static spawning potential ratio (sSPR), overfishing as an sSPR less than 30%, and an overfishing threshold as 10% sSPR. In 1999, the Council recommended that management authority for red drum be transferred to the states through the Commission's Interstate Fishery Management Program (ISFMP) process. This was recommended, in part, due to the inability to accurately determine an overfished status, and therefore stock rebuilding targets and schedules, as required under the revised Sustainable Fisheries Act of 1996. The transfer necessitated the development of an amendment to the interstate FMP in order to include the provisions of the Atlantic Coastal Fisheries Cooperative Management Act.

ASFMC adopted Amendment 2 to the Red Drum FMP in June 2002 (ASMFC 2002), which serves as the current management plan. The goal of Amendment 2 is to achieve and maintain the OY for the Atlantic coast red drum fishery as the amount of harvest that can be taken by U.S. fishermen while maintaining the sSPR at or above 40%. There are four plan objectives:

- Achieve and maintain an escapement rate sufficient to prevent recruitment failure and achieve an sSPR at or above 40%.
- Provide a flexible management system to address incompatibility and inconsistency among state and federal regulations which minimizes regulatory delay while retaining substantial ASMFC, Council, and public input into management decisions; and which can adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by area.
- Promote cooperative collection of biological, economic, and sociological data required to effectively monitor and assess the status of the red drum resource and evaluate management efforts.
- Restore the age and size structure of the Atlantic coast red drum population.

The management area extends from New Jersey through the east coast of Florida, and is separated into a northern and southern region at the North Carolina/South Carolina border. The sSPR of 40% is considered a target; an sSPR below 30% (threshold level) results in an overfishing determination for red drum. Amendment 2 required all states within the management unit to implement appropriate recreational bag and size limit combinations needed to attain the target sSPR, and to maintain current, or implement more restrictive, commercial fishery regulations. All states were in compliance by January 1, 2003. See Table 1 for state commercial and recreational regulations in 2015.

Following the approval of Amendment 2 in 2002, the process to transfer management authority to ASMFC began, including an Environmental Assessment and public comment period. The final rule became effective November 5, 2008. It repeals the federal Atlantic Coast Red Drum Fishery Management Plan and transfers management authority of Atlantic red drum in the exclusive economic zone from the South Atlantic Fishery Management Council to the Atlantic States Marine Fisheries Commission.

The Board approved Addendum I to Amendment 2 in August 2013. The Addendum revised the habitat section of Amendment 2 to include current information on red drum spawning habitat and life-stages (egg, larval, juvenile, sub-adult, and adult). It also identified and described the distribution of key habitats and habitats of concern.

II. Status of the Stocks

The 2017 Red Drum Stock Assessment and Peer Review Report indicate overfishing is not occurring for either the northern or southern stock of red drum (ASMFC 2017). The assessment was unable to determine an overfished/not overfished status because population abundance could not be reliably estimated due to limited data for the older fish (ages 4+).

Northern Region (NJ-NC)

Recruitment (age 1 abundance) has varied annually with a large peak occurring in 2012 (Figure 1). The trend in the three-year average sSPR indicates low sSPR early in the time series with increases during 1991 – 1997 and fluctuations thereafter (Figure 2). The average sSPR has been above the overfishing threshold ($F_{30\%}$) since 1994, and at or above the target ($F_{40\%}$) since 1996, except during one year (2002). Fishing pressure and mortality appear to be stabilized near the target fishing mortality. The average sSPR is also likely above the target benchmark.

Southern Region (SC-FL)

Recruitment (age 1 abundance) has fluctuated without apparent trend since 1991 (Figure 1). A high level of uncertainty exists around the three-year average sSPR estimates for the southern region. While the 3-year average sSPR estimate in 2013 was above both the target ($F_{40\%}$) and the overfishing threshold ($F_{30\%}$), indicating that overfishing is not occurring, the high level of uncertainty around this estimate indicates that this conclusion should be considered with extreme caution (Figure 2).

III. Status of the Fishery

Total red drum landings from New Jersey through the east coast of Florida in 2016 are estimated at 2.18 million pounds (Tables 2 and 3, Figure 3). This is roughly 624,000 pounds more than was landed in 2015. 2016 total landings also are above the previous ten-year (2007-2016) average of 1.96 million pounds. The commercial and recreational fisheries harvested 4% and 96% of the total, respectively. The southern region includes South Carolina through Florida's east coast, while the northern region includes New Jersey through North Carolina. In 2016, 80% of the total landings came from the southern region where the fishery is exclusively recreational, and 20% from the northern region (Figure 4).

Coastwide commercial landings were low this year, but show no long-term temporal trends. In the last 50 years, landings have ranged from approximately 54,000 pounds (in 1997) to 440,000 pounds (in 1980, Figure 3). In 2016, red drum were commercially landed only in Maryland, Virginia, and North Carolina (Table 2). Coastwide commercial harvest decreased from 80,946 pounds in 2015 to 78,784 pounds in 2016, with 98% harvested by North Carolina. Historically, North Carolina and Florida shared the majority of commercial harvest, but commercial harvest has been prohibited in Florida under state regulation since January 1988. South Carolina also banned commercial harvest and sale of native caught red drum beginning in 1987, and in 2013 Georgia designated Red Drum Gamefish status, eliminating commercial harvest and sale.

In North Carolina, a daily commercial trip limit and an annual cap of 250,000 pounds with payback of any overage constrain the commercial harvest. Unique to this state, the red drum fishing year extends from September 1 to August 31. In 2008, the Board approved use of the fishing year to monitor the cap. During the 2009/2010 and the 2013/2014 fishing years, North Carolina had overages of 25,858 pounds and 12,753 pounds, respectively. The commercial harvest for each following fishing year remained well below the adjusted cap allowance, providing sufficient payback.

Recreational harvest of red drum peaked in 1984 at 1.05 million fish (or 2.6 million pounds; Tables 3 and 4). Since 1988, the number has fluctuated without trend between 250,000 and 760,000 fish (800,000 to 2.7 million pounds; Figures 3 and 5). Recreational harvest increased from 426,302 fish (1.5 million pounds) in 2015 to 566,291 fish (2.1 million pounds) in 2016. The 2016 harvest is greater than the 10-year average (2007-2016) for recreational harvest in numbers (527,193) and pounds (1.8 million). Florida anglers landed the largest share of the coastwide recreational harvest in numbers (65%), followed by Georgia (13%), South Carolina (11%), and North Carolina (10%).

Anglers release far more red drum than they keep; the percent of the catch released has been over 80% during the last decade (Figure 5). Recreational releases show an increasing trend over the time series that has plateaued from around the early 2000s to the present. The proportion of releases in 2016 was 82% (versus 84% in 2015), and the overall number of fish released was 3.2 million in 2016 (Figure 5, Table 5). It is estimated that 8% of released fish die as a result of being caught, resulting in an estimated 206,840 dead discarded fish in 2016 (Table 5). Recreational removals from the fishery are thus estimated to be 773,131 fish in 2016 (Figure 6).

IV. Status of Assessment Advice

Current stock status information comes from the 2017 stock assessment (ASMFC 2017) completed by the ASMFC Red Drum Stock Assessment Subcommittee (SAS) and Technical Committee (TC), peer reviewed by an independent panel of experts through ASMFC's desk review process, and approved by the South Atlantic State-Federal Fisheries Management Board for use in management decisions. Previous interstate management decisions were based on the last coastwide assessment, SEDAR 18 (SAFMC 2009), and prior to 2009, decisions were based on regional assessments conducted by Vaughan and Helser (1990), Vaughan (1992, 1993, 1996), Vaughan and Carmichael (2000). Several states have also conducted state-specific assessments (e.g., Murphy and Munyandorero 2009; Takade and Paramore 2007). South Carolina is currently performing a state-specific stock assessment of red drum.

The 2017 stock assessment uses a statistical catch at age (SCA) model with age-specific data for red drum ages 1 through 7+. This model is similar to that used in the 2009 assessment, with data updated through 2013. Data from 1989-2013 were included from the following sources: commercial and recreational harvest and discard data, fishery-dependent and -independent biological sampling data, tagging data, and fishery-independent survey abundance data.

The Peer Review Panel considered the use of an SCA model appropriate given the types of data available for red drum. For the northern region, the Review Panel agreed that the model was informative of age 1 – 3 abundance and exploitation rates, but not for older age groups. The model was also found to be informative of annual trends in sSPR and the 2011 – 2013 average sSPR. For the southern region, the Review Panel agreed that estimates of age 7+ fish seemed to be more consistent with the population biology, leading to a large fraction of biomass being unavailable to exploitation. For both regions, most of the sSPR is contained within the larger, fully mature, age 7+ fish, thus even a small increase in fishing mortality on older red drum (due to harvest or other factors) could quickly lead to a decrease in sSPR and overfishing.

V. Status of Research and Monitoring

No monitoring or research programs are annually required of the states except for the submission of a compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2017 reports.

<u>Fishery Dependent Monitoring</u>

- Delaware DFW -- Commercial monitoring through mandatory logbook reports.
- Maryland DNR – Commercial pound nets sampled bi-weekly in the Chesapeake Bay from late spring through summer (2016 n=0). Only three of the 24 years of sampling exceeded 20 fish, and no red drum were encountered in ten of the survey years. Licensed charter boat captain logbooks are monitored for red drum captures (2016: 55 caught, 19 harvested).
- PRFC -- Red drum are harvested incidentally in the commercial pound net and haul seine fisheries. The mandatory commercial harvest daily reporting system, which collects harvest and discards/releases, reported zero red drum released in 2016.
- Virginia MRC –Volunteer anglers have participated since 1995 in the Virginia Game Fish Tagging Program (2016: 1,801 fish tagged, 96 reported recaptures). Carcasses collected through the Marine Sportfish Collection Project since 2007 (2016 n=2).
- North Carolina DMF – Commercial cap monitored through trip ticket program; commercially-landed red drum sampled through biological monitoring program since 1982 (2016: 365 fish measured, primarily gill net).
- South Carolina DNR –State finfish survey conducted in January and February (2016 n=155 caught and 47 harvested, mean catch rate: 1.69 red drum/targeted angler hour). Charter

Vessel Trip Reporting (2016 caught: 46,604; release rate: 94.1%). SC Marine Game Fish Tagging Program studies movement patterns, growth rates, and release-mortality rates (in 2016 fish tagged: 2,766; recaptured: 238). Tournament and freezer fish programs (2016 n=17).

- Georgia CRD – Age, length, and sex data collected through the Marine Sportfish Carcass Recovery Project (2016 n=352 red drum).
- Florida FWC –8,087 trip interviews in 2016 collected data on total-catch rates and sizes (through MRIP).
- NMFS – Length measurements and recreational catch, harvest, release, and effort data are collected via the Marine Recreational Information Program.

Fishery Independent Monitoring

- New Jersey DFW – Five annual nearshore trawl surveys conducted since 1988, in January/February, April, June, August, and October. Length and weight data, and catch per unit effort (CPUE) in number of fish per tow and biomass per tow recorded for all species. Only two red drum were caught in entire time series (single tow, 2013).
- North Carolina DMF - Seine survey since 1991 produces age-0 abundance index (2016 n=712; CPUE of 5.93, increase from 2015 CPUE of 4.88). Gill net survey in Pamlico Sound since 2001 characterizes size and age distribution, produces abundance index, improves bycatch estimates, and studies habitat usage (2016 CPUE of 3.29, above long-term average). Longline survey since 2007 produces adult index of abundance and tags fish (2016 n=246; CPUE below long-term average at 3.41 fish per set).
- South Carolina DNR – Estuarine trammel net survey for subadults (2016 CPUE below 10-year average). Electrofishing survey in low salinity estuarine areas for juveniles/subadults (2016 CPUE below 10-year average). Inshore bottom longline survey for biological data and adult abundance index (808 tagged, 128 sampled for age in 2016). Genetic sub-sampling and tagging conducted during these three surveys.
- Georgia CRD – Estuarine trammel net survey for subadult biological data and abundance index (2016, both areas n=89). Estuarine gill net survey for young-of-year (YOY) biological data and abundance index (2016 both areas n = 508). Bottom longline survey for adult biological data and abundance index (2016 n = 181).
- Florida FWC-FWRI – Two seine surveys in northern Indian River Lagoon (IRL) and lower St. Johns River (SJR) for YOY (< 40 mm SL) abundance indices (2016 CPUE less than 2015). Haul seine survey in these areas and southern IRL for subadult index (2016 CPUE slightly higher than 2015). Age and length data collected during surveys.

VI. Status of Management Measures and Issues

Fishery Management Plan

Amendment 2 was fully implemented by January 1, 2003, providing the management requirements for 2010. Requirements include: recreational regulations designed to achieve at least 40% sSPR, a maximum size limit of 27 inches or less, and current or more stringent commercial regulations. States are also required to have in place law enforcement capabilities adequate to successfully implement their red drum regulations. In August 2013, the Board approved Addendum I to Amendment 2 of the Red Drum FMP. The Addendum revises the habitat section of Amendment 2 to include the most current information on red drum spawning habitat for each life stage (egg, larval, juvenile, sub-adult, and adult). It also identifies the distribution of key habitats and habitats of concern, including potential threats and bottlenecks.

De Minimis Requests
New Jersey and Delaware requested *de minimis* status through the annual reporting process. While Amendment 2 does not include a specific method to determine whether a state qualifies for *de minimis*, the PRT chose to evaluate an individual state's contribution to the fishery by comparing the two-year average of total landings of the state to that of the management unit. New Jersey and Delaware each harvested zero percent of the two-year average total landings. *De minimis* status does not exempt either state from any requirement; it may exempt them from future management measures implemented through addenda to Amendment 2, as determined by the Board.

VII. Implementation of FMP Compliance Requirements for 2016
The PRT finds that all states have implemented the requirements of Amendment 2.

VIII. Recommendations of the Plan Review Team
Management and Regulatory Recommendations

< Consider approval of the *de minimis* requests by New Jersey and Delaware

< Support a continued moratorium of red drum fishing in the exclusive economic zone.

Prioritized Research and Monitoring Recommendations (H) =High, (M) =Medium, (L) =Low

Stock Assessment and Population Dynamics

< Implement surveys (e.g. logbooks, electronic methods, etc.) in each state throughout the management unit to determine the length composition (and age data, if possible) of recreational discards (B2) of red drum. This information has been highlighted as the single largest data gap in previous assessments. (H)

< Further study is needed to determine discard mortality estimates for the Atlantic coast, both for recreational and commercial gears. Additionally, discard estimates should examine the impact of slot-size limit management and explore regulatory discard impacts due to high-grading. Investigate covariates affecting discard mortality (e.g., depth, size, seasonality), and explore methods of determining *in situ* mortality (as opposed to tank studies) and mitigating mortality (e.g. gear types, handling methods, use of descending devises on adults). (H)

< Improve catch/effort estimates and biological sampling from recreational and commercial fisheries for red drum, including increased intercepts of night fisheries for red drum. (H)

< Expand biological sampling based on a statistical analysis to adequately characterize the age/size composition of removals by all statistical strata (gears, states, etc.). (H)

< Each state should develop an on-going red drum tagging program that can be used to estimate both fishing and natural mortality and movements. This should include concurrent evaluations of tag retention, tagging mortality, and angler tag reporting rates. The

importance of each state's tagging data to the assessment should be evaluated, including analysis of historical tagging data to determine if existing and historic recreational data sources (e.g., tagging) can be used to evaluate better B2 selectivities. (H)

- Establish programs to provide on-going estimates of commercial and recreational discard mortality using appropriate statistical methods. Discard estimates should examine the impact of slot-size limit management and explore regulatory discard impacts due to high-grading. (M)
- Evaluate the broader survey needs to identify gaps in current activities and provide for potential expansion and/or standardization between/among current surveys. (M)

Biological

- Explore methods to effectively sample the adult population in estuarine, nearshore, and open ocean waters, such as in the ongoing red drum long line survey, and to determine the size, age and sex composition of the adults. (H)
- Continue genetic analyses (i.e, SC DNR analyses) to evaluate stock structure and mixing and temporal changes in genetic composition of the red drum population and other applications. (H)
- Refine maturity schedules on a geographic basis. Thoroughly examine the influence of size and age on reproductive function. Investigate the possibility of senescence in female red drum. Archive histological specimens across sizes to look for shifts in maturity schedules and make regional comparisons. Standardize histology reading methods of slides across states conducting such studies. (For reference, see SEDAR 44-DW02). (H)
- Determine habitat preferences, environmental conditions, growth rates, and food habits of larval and juvenile red drum throughout the species range along the Atlantic coast. Assess the effects of environmental factors on stock density/yearclass strength. Determine whether natural environmental perturbations affect recruitment and modify relationships with spawning stock size. (H)
- Continue tagging studies to determine stock identity, inshore/offshore migration patterns of all life stages (i.e. basic life history research). Specific effort should be given to developing a large-scale program for tagging adult red drum. (M)
- Fully evaluate the effects and effectiveness of using cultured red drum to facilitate higher catch rates along the Atlantic coast. (M)
- Conduct a tagging study using emerging technologies (i.e., acoustic tagging, satellite tagging, genetic tags) to evaluate stock mixing and identify movement of sub-adult fish transitioning to maturity. (M-L)
- Otolith microchemistry analysis should be considered for exploring links between sub-adult estuarine habitats and adult stock structure. (L)

Social (Unless otherwise indicated, the collection of sociological and/or economic data, also sometimes collectively described as "socioeconomic data," would be based on ACCSP standards.)

- Encourage the NMFS to fund socioeconomic add-on questions to the recreational fisheries survey that are specifically oriented to red drum recreational fishing. (H)

- States with significant fisheries (over 5,000 pounds) should periodically (e.g. every five years) collect socioeconomic data on red drum fisheries through add-ons to the recreational fisheries survey or by other means. (H)
- Using a human dimension analysis perspective, explore Atlantic red drum historical catch-release trends and explanatory factors such as the possible impacts of changes recreational fishing technology and/or angler behavior on red drum catchability and selectivity over time. (H)
- Conduct applied research to evaluate the various projected (forecasted) social impacts on red drum fishery stakeholders of possible regulatory options (e.g. changing minimum sizes, etc.). (M)

Economic

- Perform new analyses, using available secondary data and other information in established models, to estimate the economic impacts (e.g. sales, jobs, income, etc.) of recreational red drum fisheries related activities at the state and regional level including "for-hire sector" (e.g. hiring a fishing guides). (H)
- Where appropriate, encourage individual member states to conduct studies to project and evaluate the estimated comparable net economic values associated with current and possible future regulatory regimes that could impact red drum recreational anglers including those preferring catch and release fishing. (M)
- Using benefit-cost analysis protocols, project the estimated the public sector oriented net economic values over a time (e.g. ten years or more) for various cultured red drum stocking scenarios. (M)
- Encourage the NMFS to periodically conduct special surveys and related data analysis to determine the economic and operational characteristics of the "for-hire sector" targeting red drum especially fishing guide oriented businesses in the South Atlantic states. (M)

Habitat

- Identify spawning areas of red drum in each state from North Carolina to Florida so these areas may be protected from degradation and/or destruction. Explore relationships between spawning activity (e.g. spawning sounds) and environmental parameters (e.g. temperature). (H)
- Identify changes in freshwater inflow on red drum nursery habitats. Quantify the relationship between freshwater inflows and red drum nursery/sub-adult habitats. (H)
- Determine the impacts of dredging and beach re-nourishment on red drum spawning and early life history stages. (M)
- Investigate the concept of estuarine reserves to increase the escapement rate of red drum along the Atlantic coast. (M)
- Identify impacts of water quality, environmental, and ecosystem changes on red drum stock dynamics for potential incorporation into stock assessment models. (M)
- Quantify relationships between red drum production and habitat and implications for future management planning. (L)

- Determine methods for restoring red drum habitat and/or improving existing environmental conditions that adversely affect red drum production. (L)

IX. References

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X. Figures

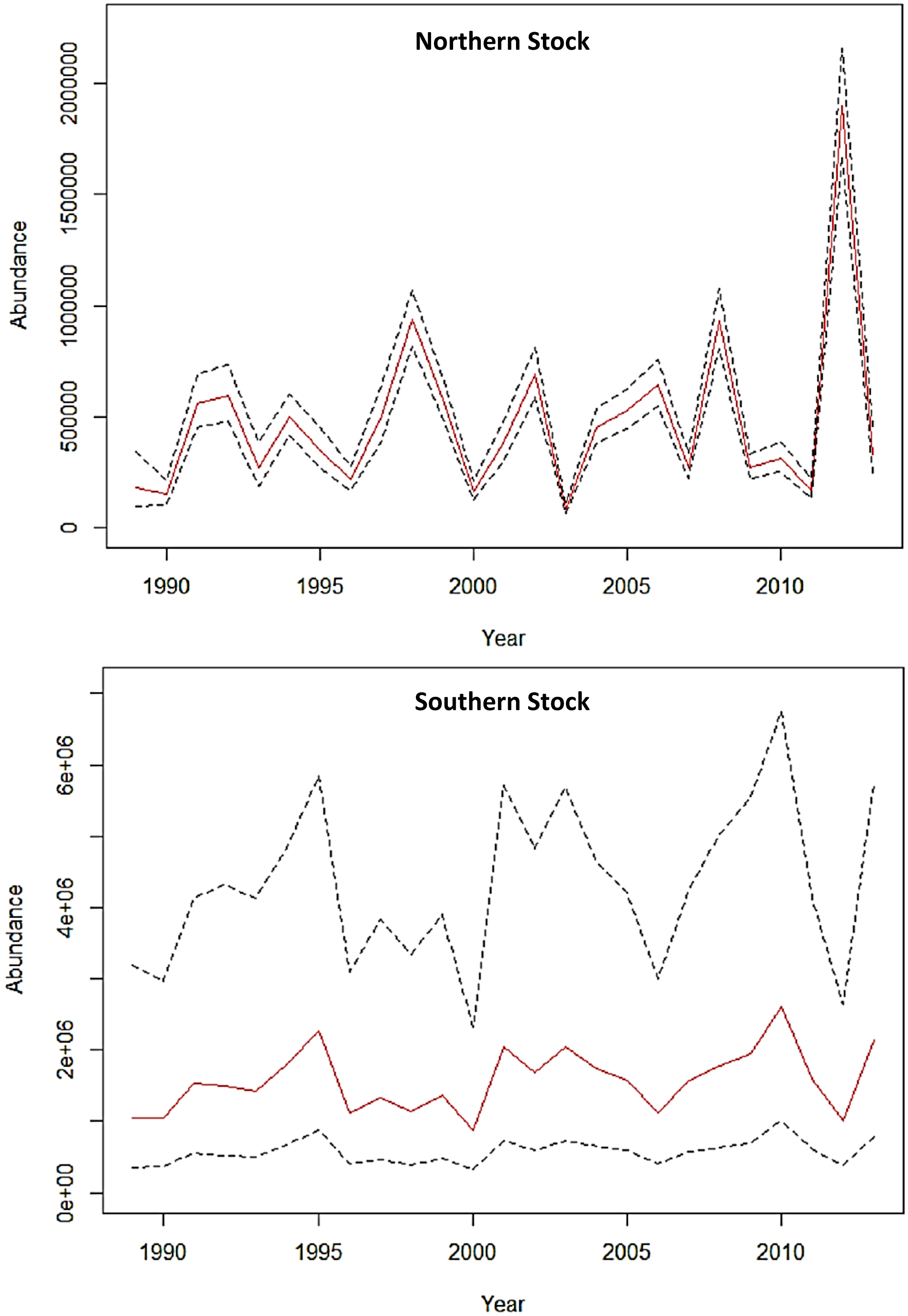


Figure 1. Predicted recruitment (age-1 abundance, red lines) with 95% confidence intervals (dashed black lines) for the northern (top) and southern (bottom) regions (Source: ASMFC 2017).

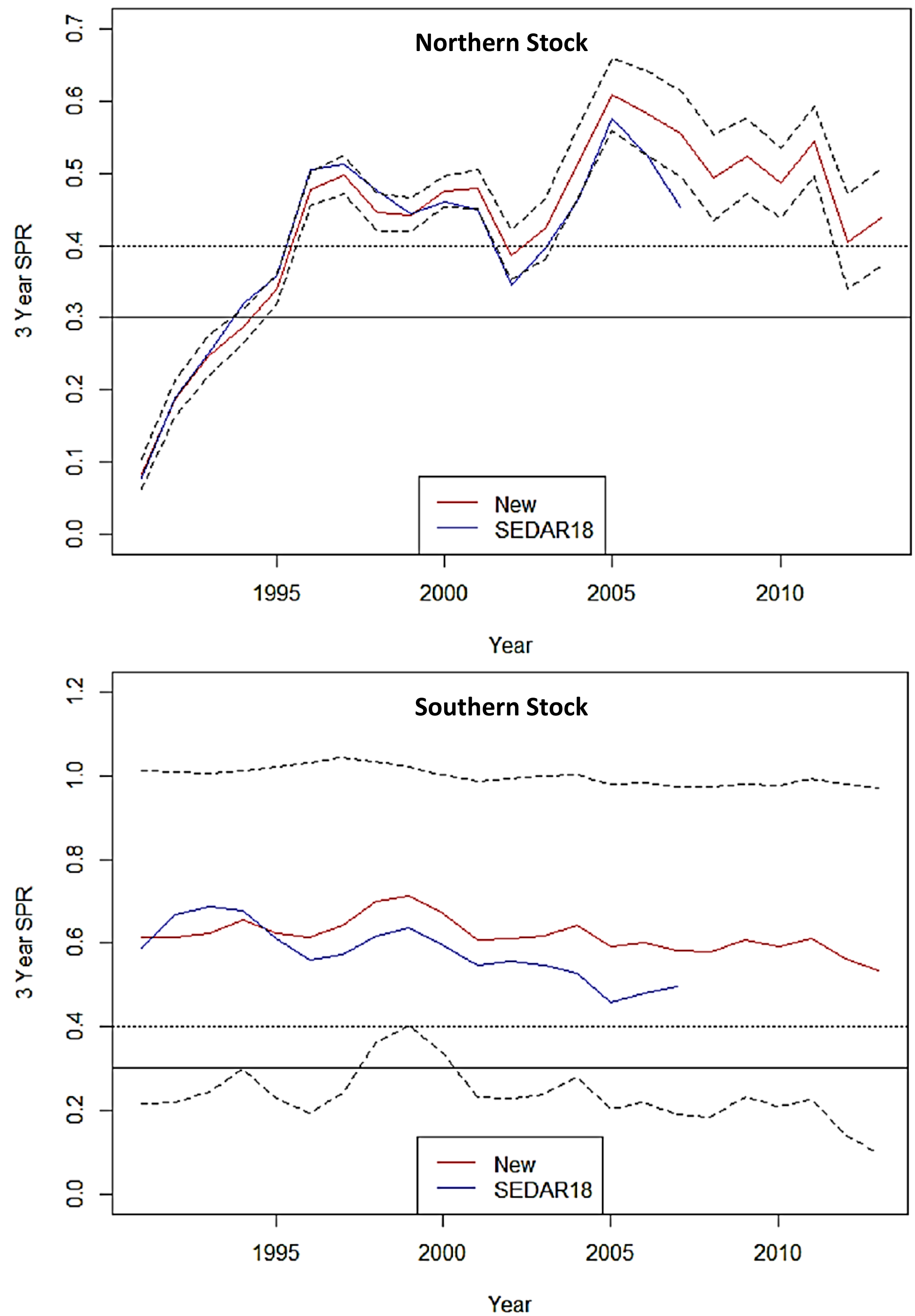


Figure 2. Three year average sSPR (red lines) for the northern (top) and southern (bottom) stocks with 95% confidence intervals (dashed black lines). Point estimates from the previous benchmark assessment (SEDAR18) are included for comparison. The target sSPR (dotted black line) is 40% and the threshold sSPR (solid black line) is 30% (Source: ASMFC, 2017)**.**

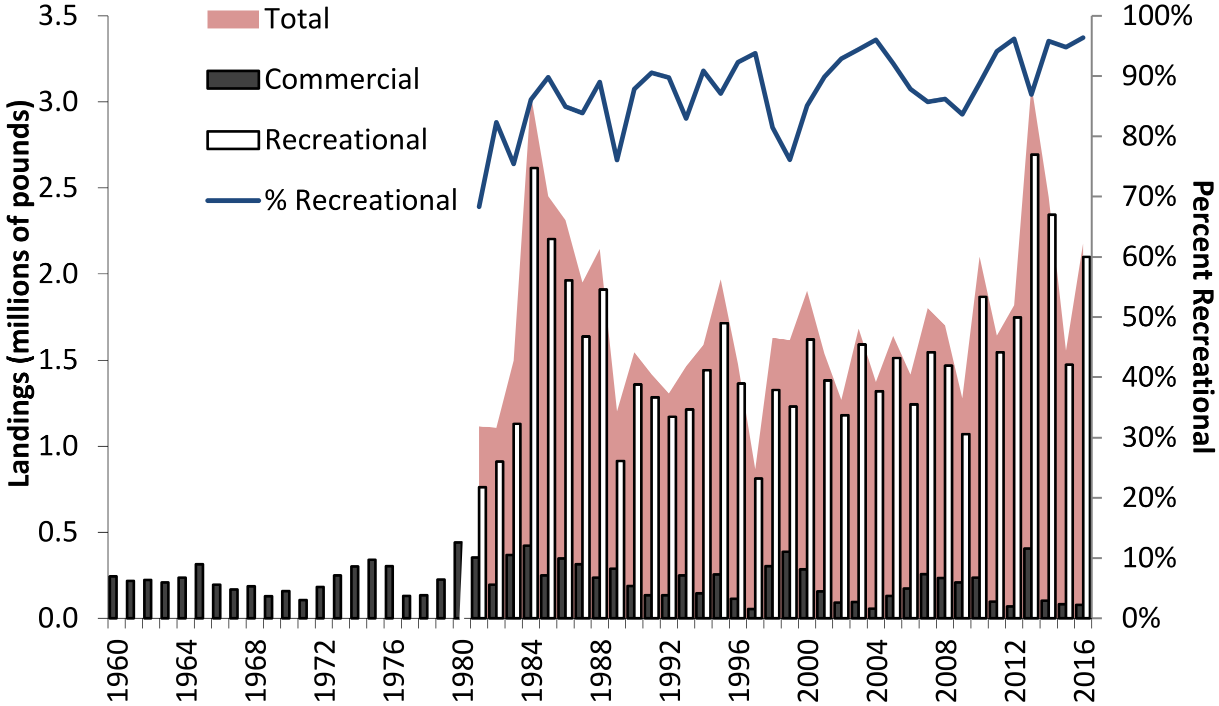


Figure 3. Commercial and recreational landings (pounds) of red drum. Recreational data not available prior to 1981. See Tables 2 and 3 for values and data sources.

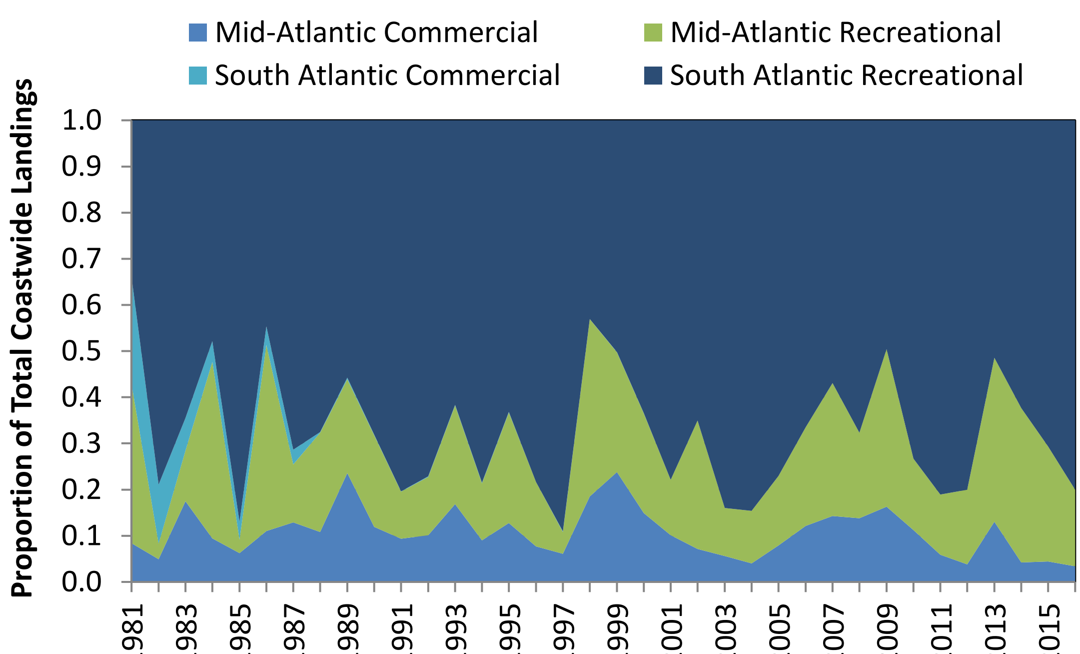


Figure 4. Proportion of regional, sector-specific landings to total coastwide landings (pounds). See Tables 2 and 3 for data sources.

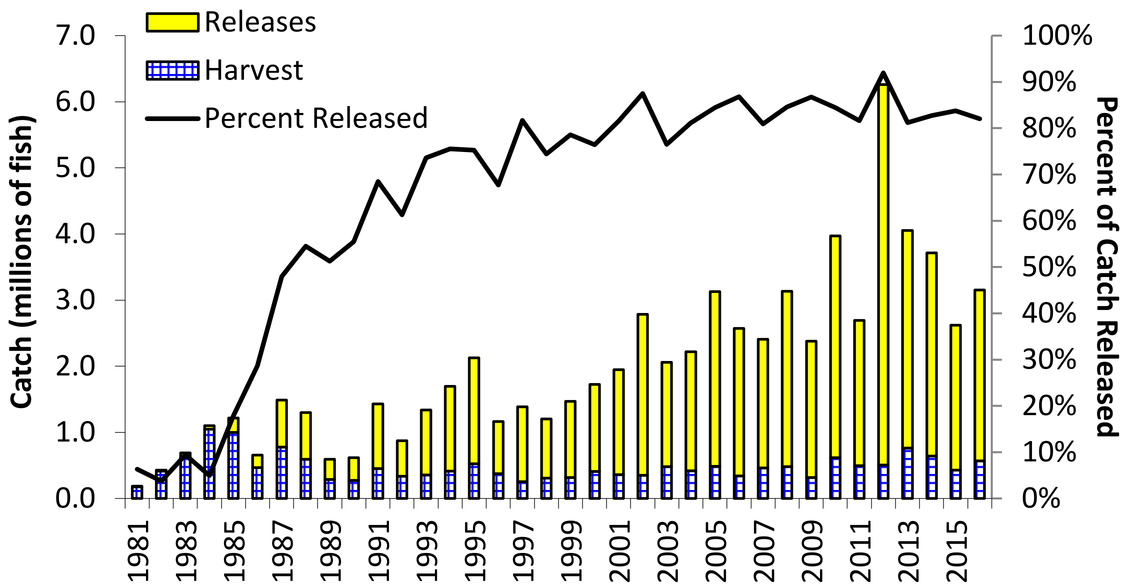


Figure 5. Recreational catch (harvest and alive releases) of red drum (numbers) and the proportion of catch that is released. See Tables 4 and 5 for values and data sources.

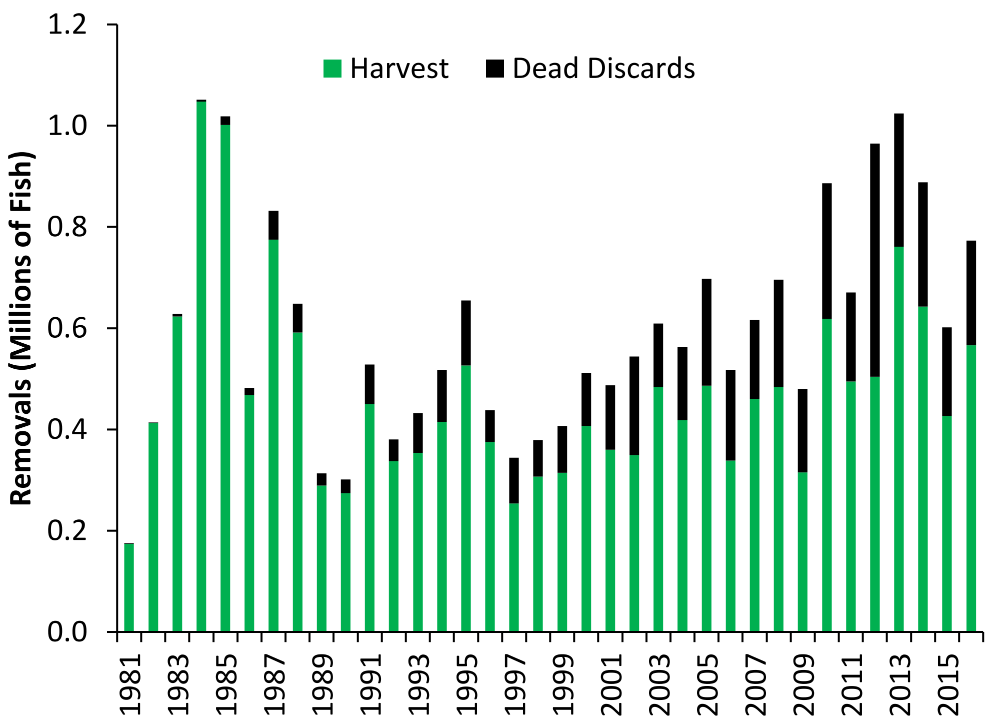


Figure 6. Recreational removals (harvest and dead discards) of red drum (numbers). Dead discards are estimated by applying an 8% discard mortality rate to alive releases. See Tables 4 & 5 for values and data sources.

XI. Tables

Table 1. Red drum regulations for 2016. The states of New Jersey through Florida are required to meet the requirements in the FMP; states north of New Jersey are encouraged to follow the regulations. All size limits are total length.

State	Recreational	Commercial
NJ	18" - 27", 1 fish	18" - 27", 1 fish
DE	20" - 27", 5 fish	20" - 27", 5 fish
MD	18" - 27", 1 fish	18" - 25", 5 fish
PRFC	18" - 25", 5 fish	18" - 25", 5 fish
VA	18" - 26", 3 fish	18" - 25", 5 fish
NC	18" - 27", 1 fish	18" - 27"; 250,000 lb harvest cap with overage payback (150,000 lbs Sept 1- April 30; 100,000 lbs May 1-Aug 31); harvest of red drum allowed with 7 fish daily trip limit; red drum must be less than 50% of catch (lbs); small mesh (<5" stretched mesh) gill nets attendance requirement May 1 - November 30. Fishing year: September 1 – August 31.
SC	15" - 23", 3 fish. Gigging allowed March-November	Gamefish Only
GA	14" - 23", 5 fish	Gamefish Only
FL	18" - 27", Northern Region- 2 fish; Southern Region- 1 fish	Sale of native fish prohibited

Table 2. Commercial landings (pounds) of red drum by state, 1981-2016. (Source: personal communication with ACCSP, Arlington, VA, for years prior to 2016 and State Compliance Reports for 2016, except as noted below.)

Year	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
1981					200	93,420	808	261	258,374	353,063
1982					1,700	52,561	2,228	251	139,170	195,910
1983			100		41,700	219,871	*	1,126	105,164	367,961
1984					2,600	283,020	3,950	1,961	130,885	422,416
1985					1,100	152,676	3,512	3,541	88,929	249,758
1986			1,000		5,400	249,076	12,429	2,939	77,070	347,914
1987					2,600	249,657	14,689	4,565	42,993	314,504
1988			8,100	2	4,000	220,271	20	3,281	284	235,958
1989			1,000	86	8,200	274,356	165	3,963		287,770
1990			29	86	1,481	183,216		2,763		187,575
1991			7,533	3,808	24,771	96,045	1,475	*		133,632
1992			1,087	196	2,352	128,497		1,759		133,891
1993			55		8,637	238,099		2,533		249,324
1994			859		*	142,169	32	2,141		145,201
1995			6		2,992	248,122		2,578		253,698
1996			215		*	113,338		*		113,553
1997			22	4	*	52,502	*	1,426		53,954
1998	*		336		6,456	294,366	*	672		301,830
1999	*		504	186	10,856	372,942	*	1,115		385,603
2000	*		843	10	11,512	270,953	*	707		284,025
2001	*		727	191	4,905	149,616		*		155,439
2002	*		1,161	285	7,361	81,370		*		90,177
2003	*		631	47	2,716	90,525		*		93,919
2004	*		12		638	54,086		*		54,736
2005	*	33	37	51	527	128,770		*		129,418
2006	*	*	8	2	2,607	169,206		*		171,823
2007			6678	58	6,372	243,658		*		256,766
2008			*	69	4,585	229,809		*		234,463
2009	*		*	157	8,315	200,296		*		208,768
2010			*	22	3,634	231,828		*		235,484
2011				3	4,369	91,980		*		96,352
2012	*		347	81	2,609	66,519				69,556
2013	*	0	3,121	268	28,766	371,949				404,104
2014	*	0	298	3	11,999	90,647				102,947
2015	0	0	*	0	664	80,282				80,946
2016	0	0	*	0	1,807	76,977	0	0	0	78,784

* Notes: PRFC landings from agency reporting program; * indicates confidential landings.

Table 3. Recreational landings (pounds) of red drum by state, 1981-2016. (Source: personal communication with MRIP for years prior to 2016, state compliance reports for 2016)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			4,370	347,939	31,519	50,230	9,442	317,963	761,463
1982					37,511	340,686	52,150	480,676	911,023
1983			3,018	51,299	109,540	222,691	67,298	675,924	1,129,770
1984				1,285	1,160,539	183,282	294,583	976,971	2,616,660
1985					70,677	1,532,316	185,887	414,176	2,203,056
1986			754,161	145,517	31,594	498,586	173,837	360,725	1,964,420
1987				44,332	200,729	913,639	250,795	227,222	1,636,717
1988				9,030	451,974	1,050,049	385,860	12,507	1,909,420
1989			2,348	27,236	214,849	396,771	127,245	146,064	914,513
1990			2,679		302,994	631,819	161,712	258,569	1,357,773
1991			5,635	30,582	108,268	284,290	337,207	516,999	1,282,981
1992				55,324	109,134	411,484	198,751	396,555	1,171,248
1993				45,505	266,459	282,614	328,245	290,930	1,213,753
1994				3,684	192,060	314,632	353,616	578,412	1,442,404
1995				66,270	405,620	417,595	300,337	525,231	1,715,053
1996				1,512	204,556	396,394	164,756	596,483	1,363,701
1997				1,810	39,077	296,155	129,836	345,390	812,268
1998				34,861	591,428	129,619	84,348	487,091	1,327,347
1999				92,794	326,303	103,777	166,630	540,310	1,229,814
2000				95,596	316,029	93,043	228,965	885,447	1,619,080
2001				51,890	132,578	188,198	155,854	853,714	1,382,234
2002		860	15,154	155,212	182,225	103,831	170,572	551,128	1,178,982
2003				57,213	118,808	449,399	234,865	729,446	1,589,731
2004				32415	124,264	312,569	296,777	566,508	1,332,533
2005				7,624	239,694	298,600	177,169	788,993	1,512,080
2006		2,064		21,039	251,735	160,760	143,699	636,742	1,216,039
2007				209,248	305,664	152,190	197,510	674,463	1,539,075
2008				72,510	236,744	254,305	244,594	652,613	1,460,766
2009				148,573	286,702	165,874	125,499	343,359	1,070,007
2010				40,323	281,587	451,144	319,427	776,346	1,868,827
2011					212,245	441,833	229,214	662,811	1,546,103
2012	0	396	26,788	27,422	238,310	368,445	107,368	978,727	1,747,456
2013	0	7,153	6,367	411,236	676,050	236,887	129,279	1,226,481	2,693,453
2014	0	0	0	221,280	598,166	242,371	154,332	1,129,663	2,345,812
2015	0	0	0	29,339	154,496	269,787	97,690	922,065	1,473,377
2016	0	0	0	9,682	230,473	144,859	153,368	1,560,972	2,099,354

Table 4. Recreational landings (numbers) of red drum by state, 1981-2016. (Source: personal communication with MRIP for years prior to 2016, state compliance reports for 2016)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			601	49,630	15,054	27,319	6,323	75,244	174,171
1982					16,445	160,760	30,757	204,401	412,363
1983			2,413	32,940	81,528	104,806	56,854	344,513	623,054
1984				1,457	108,787	129,547	258,188	549,381	1,047,360
1985				0	22,077	530,110	183,837	265,185	1,001,209
1986			12,804	28,139	17,501	193,188	102,279	113,440	467,351
1987				2,186	61,100	522,420	138,062	51,225	774,993
1988				4,311	142,626	287,916	147,042	9,542	591,437
1989			1,014	12,007	62,359	127,492	51,557	34,748	289,177
1990			1,279	0	33,149	118,666	76,304	44,280	273,678
1991			2,745	17,119	38,658	125,833	162,802	102,727	449,884
1992				13,275	23,593	112,534	83,861	104,265	337,528
1993				14,005	49,493	119,189	105,710	65,140	353,537
1994				1,378	28,953	129,515	134,214	120,938	414,998
1995				3,665	88,593	202,430	134,915	96,927	526,530
1996				572	36,746	130,649	60,251	146,823	375,041
1997				1,920	8,749	129,022	39,041	75,235	253,967
1998				13,070	114,638	46,509	24,929	107,982	307,128
1999				12,425	64,739	44,069	67,283	126,180	314,696
2000				22,603	61,618	37,217	94,144	191,070	406,652
2001				6,967	23,142	61,420	90,376	177,633	359,538
2002		275	5,521	49,795	42,541	41,190	90,993	119,010	349,325
2003				13,607	25,481	162,484	122,259	159,331	483,162
2004				5,005	30,017	107,803	138,893	136,728	418,446
2005				2,766	51,807	130,655	105,655	195,550	486,433
2006		468	6,362	12,665	55,714	48,703	68,813	145,860	338,585
2007				46,405	66,789	72,261	113,237	161,427	460,119
2008				20,847	50,809	119,471	133,107	159,246	483,480
2009				38,670	57,543	70,326	68,857	79,635	315,031
2010				11,076	64,024	172,708	194,826	175,828	618,462
2011	995				45,143	161,503	106,962	180,001	494,604
2012		296	17,869	28,149	52,948	121,068	45,766	238,191	504,287
2013		1,686	2,134	124,156	164,217	97,387	73,826	297,527	760,933
2014	0	0	0	53,545	116,921	103,892	91,764	275,536	641,658
2015	0	0	2	7,792	36,704	106,620	48,172	227,014	426,304
2016	0	0	0	3,510	56,166	62,816	74,702	369,097	566,291

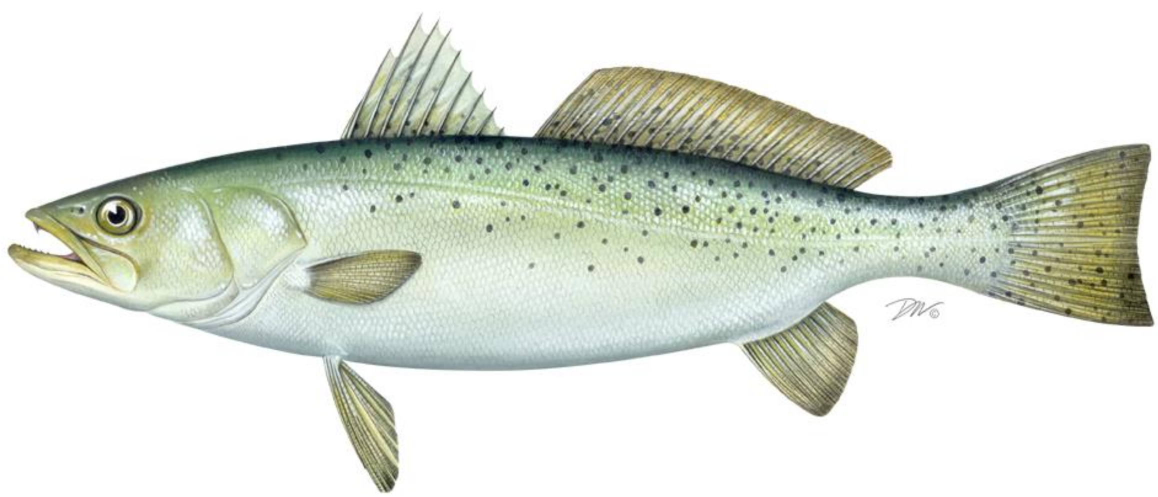
Table 5. Recreational alive releases and dead discards (numbers) of red drum by state, 1981-2016. Dead discards are estimated based on an 8% release mortality rate. (Source: Source: personal communication with MRIP for years prior to 2016, state compliance reports for 2016)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total	Dead Discards
1981					2,230	417		9,042	11,689	935
1982						2,496	3,377	10,172	16,045	1,284
1983					1,866	6,751	1,417	54,723	64,757	5,181
1984					2,931	0	4,232	47,196	54,359	4,349
1985				1,115		16,688	6,315	193,399	217,517	17,401
1986				7,595		24,018	56,045	100,095	187,753	15,020
1987					18,499	82,595	234,676	377,959	713,729	57,098
1988				3,958	24,874	269,176	177,319	233,988	709,315	56,745
1989			2,918	7,038	7,566	42,824	71,162	172,303	303,811	24,305
1990			0	934	12,452	102,611	156,263	68,667	340,927	27,274
1991			4,432	14,461	121,178	99,968	92,803	645,773	978,615	78,289
1992	301			15,383	60,230	46,269	128,066	284,893	535,142	42,811
1993				50,434	182,301	146,324	140,386	465,656	985,101	78,808
1994				10,684	107,662	324,706	146,039	691,261	1,280,352	102,428
1995				33,560	164,520	362,844	356,618	683,706	1,601,248	128,100
1996				2,424	35,752	176,517	71,983	500,374	787,050	62,964
1997		2,571		109,754	259,570	175,772	22,736	560,559	1,130,962	90,477
1998			2,768	93,660	199,701	84,274	33,882	481,009	895,294	71,624
1999			2,148	232,893	247,146	87,776	18,586	565,981	1,154,530	92,362
2000			1,458	196,541	203,967	94,050	129,190	693,152	1,318,358	105,469
2001				30,365	238,552	221,045	249,892	850,044	1,589,898	127,192
2002		1,388	18,412	801,239	640,857	142,931	168,902	663,879	2,437,608	195,009
2003		731	2,935	43,379	75,561	430,052	272,897	748,765	1,574,320	125,946
2004				33,777	181,252	438,173	141,972	1,006,814	1,801,988	144,159
2005				28,351	378,541	493,595	334,521	1,405,967	2,640,975	211,278
2006		875	12,357	185,859	510,264	539,936	136,306	847,269	2,232,866	178,629
2007				110,566	416,352	436,797	225,985	758,684	1,948,384	155,871
2008		75	217	236,787	658,887	552,217	313,743	889,550	2,651,476	212,118
2009			14,754	178,396	429,776	751,123	167,704	521,659	2,063,412	165,073
2010			2,182	28,580	635,876	786,452	483,650	1,414,115	3,350,855	268,068
2011				61,330	207,697	664,291	213,781	1,051,143	2,198,242	175,859
2012	0	5,873	280,000	2,503,237	1,533,006	543,618	90,237	799,428	5,755,399	460,432
2013	0	407	2,207	220,305	654,030	673,377	198,722	1,541,541	3,290,589	263,247
2014	0	41	273	114,305	383,421	635,152	285,770	1,648,723	3,067,685	245,415
2015	0	0	774	25,835	334,510	571,433	168,338	1,094,215	2,195,105	175,608
2016	0	0	15,414	49,819	825,046	337,852	160,031	1,197,342	2,585,504	206,840

2017 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR

SPOTTED SEATROUT
(Cynoscion nebulosus)

2016 FISHING YEAR



The Spotted Seatrout Plan Review Team
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I. Status of the Fishery Management Plan

Date of FMP Approval:	Original FMP – October 1984
Amendments:	Amendment 1 – November 1991 Omnibus Amendment to Spanish Mackerel, Spot, and Spotted Seatrout -- August 2011
Management Area:	The Atlantic coast distribution of the resource from Maryland through the east coast of Florida
Active Boards/Committees:	South Atlantic State/Federal Fisheries Management Board; Spotted Seatrout Plan Review Team; South Atlantic Species Advisory Panel

The Atlantic States Marine Fisheries Commission (ASMFC) adopted the Fishery Management Plan (FMP) for spotted seatrout in 1984. The ISFMP Policy Board approved Amendment 1 to the FMP in November 1991. In August 2011, the South Atlantic State/Federal Management Board approved the Omnibus Amendment to the Spanish Mackerel, Spot, and Spotted Seatrout FMPs, bringing the Spotted Seatrout FMP under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (Act, 1993) and the ASMFC Interstate Fishery Management Plan Charter (1995). The states of Maryland through Florida have a declared interest in the species.

The goal of the management plan is "to perpetuate the spotted seatrout resource in fishable abundance throughout its range and generate the greatest possible economic and social benefits from its harvest and utilization over time." Plan objectives include:

1. Attain optimum yield over time.
2. Maintain a spawning potential ratio of at least 20% to minimize the possibility of recruitment failure.
3. Promote conservation of the stocks to reduce inter-annual variation in availability and to increase yield per recruit.
4. Promote collection of economic, social, and biological data required to effectively monitor and assess management efforts relative to the overall goal.
5. Promote research that improves understanding of the biology and fisheries of spotted seatrout.
6. Promote harmonious use of the resource among various components of the fishery through coordination of management efforts among the various political entities having jurisdiction over the spotted seatrout resource.
7. Promote determination and adoption of standards of environmental quality and provide habitat protection necessary for the maximum natural protection of spotted seatrout.

The Omnibus Amendment added the following objectives to support compliance under the Act:

1. Manage the spotted seatrout fishery by restricting catch to mature individuals.
2. Manage the spotted seatrout stock to maintain sufficiently high spawning stock biomass.
3. Develop research priorities that will further refine the spotted seatrout management program to maximize the biological, social, and economic benefits derived from the population.

Management measures include a minimum size limit of 12 inches in total length (TL), with comparable mesh size regulations in directed fisheries, and data collection for stock assessments and monitoring of the fishery. All states with a declared interest in spotted seatrout (MD-FL) have implemented, at a minimum, the recommended minimum size limit. In addition, each state has either initiated spotted seatrout data collection programs or modified other programs to collect improved catch and effort data. Table 1 provides the states' recreational and commercial regulations for spotted seatrout through 2015.

II. Status of the Stock

A coastwide stock assessment of spotted seatrout has not been conducted, given the largely non-migratory nature of the species and the lack of data on migration where it does occur. Instead, state-specific age-structured analyses of local stocks have been performed by several states. These stock assessments provide estimates of static spawning potential ratio (SPR), a measure of the effect of fishing pressure on the relative spawning power of the female stock. The FMP recommends a goalof 20% SPR. South Carolina and Georgia have adopted this goal while North Carolina and Florida have established a 30% and 35% SPR goal, respectively.

Spotted seatrout stock assessments have been conducted in individual states. Assessments in North Carolina, which included data from 1981-1997, and Georgia, which included data from 1986-1995, both indicated that female SPR was below the 20% goal in the terminal year (Zhao and Burns 2001, Zhao *et al.* 2001). A more recent assessment was performed in Georgia in 2002; however, it remains unpublished due to questionable results attributed to data deficiencies and changing methodologies.

North Carolina completed a peer reviewed stock assessment, which included data from 1991-2008 and included all spotted seatrout caught in North Carolina and Virginia (Jensen 2009). The assessment indicated that SPR has been below 20% in recent years. Jensen (2009) recommended management measures be implemented to account for recent increases of recreational fishing and discard mortality and to maintain a sufficiently large spotted seatrout population to buffer against future cold stun events. Based on this assessment, North Carolina approved a state FMP for spotted seatrout in April 2012.

A peer-reviewed stock assessment of spotted seatrout in Virginia and North Carolina waters was completed in 2014, incorporating data from 1991-2013 (NCDMF 2014). Results suggest that the age structure of this stock expanded during the last decade; however, there was a sharp decline in recruitment after 2010. Similarly, spawning stock biomass (SSB) declined after a peak in 2007. These declines may be attributed to cold stun events. In 2012, SSB exceeded the currently defined threshold, suggesting the stock is not overfished. Additionally, fishing mortality is below the threshold, suggesting the stock is not experiencing overfishing.

The South Carolina Department of Natural Resources packaged several state-specific assessments into a report in 2001, though these were not peer reviewed. The initial assessment covering 1986-1992 indicated that female SPR was just above the 20% goal in the terminal year (Zhao and Wenner 2001), leading to a minimum size limit increase and a creel limit reduction. A more recent assessment was conducted for the period 1981-2004 (de Silva, Draft 2005). Two modeling approaches were used, and both models indicated that the current SSB is below the requirement to maintain 20% SPR.

Florida conducted separate stock assessments for the northern and southern populations on their Atlantic coast. Average transitional SPR estimates during 2007-2009 were 0.67 in the northern region and 0.45 in the southern region (Murphy et al. 2011), leading to some relaxation in Florida's management of the resource (Table 1). A new statewide assessment is currently underway; completion is scheduled for December. This assessment includes stock synthesis models constructed for each of Florida's four management regions (NW, SW, NE, and SE).

III. Status of the Fishery

Spotted seatrout is regularly caught both commercially and recreationally from Maryland through the east coast of Florida. In South Carolina, spotted seatrout has been declared a gamefish and can only be taken by recreational means. Landings from states north of Maryland are minimal and/or inconsistent from year to year. All catch estimates in this section include those in the management area only (MD-FL). Total recreational landings have surpassed total commercial landings every year since recreational landings were first recorded in 1981 (Figure 1). In 2009, recreational landings totaled more than five times commercial landings. A coastwide (VA, NC, and SC) winter mortality event in 2000/2001 likely contributed to the sudden decline in commercial and recreational landings in 2001 and 2002.

Commercial Fishery

Commercial harvest statistics were obtained from the Atlantic Coastal Cooperative Statistics Program (ACCSP) for years prior to 2016 and from state compliance reports for 2016. Atlantic coast commercial landings of spotted seatrout (1960-2015) have ranged from 156,000 pounds to 1.38 million pounds (Figure 1). Historically, commercial landings primarily came from North Carolina and Florida, with Virginia, South Carolina, and Georgia accounting for a small portion of the total. From 1960 to 1976, annual commercial landings of spotted seatrout averaged 1.07 million pounds, followed by a decline due to increased regulation and possible declines in abundance. Significant changes to regulations include the 1987 designation of spotted seatrout as a gamefish in South Carolina, and the 1995 prohibition on the use of entangling nets in

Florida's coastal waters. From 2007 to 2016, commercial landings averaged approximately 339 thousand pounds. North of Florida, variability in annual harvest was typical and paralleled the climatic conditions of the preceding winter and spring. In 2016, commercial landings totaled 295,419 pounds, a 68% increase from 2015. North Carolina, Florida, and Virginia accounted for 86%, 8%, and 6% of the total commercial landings, respectively.

Recreational Fishery
Recreational harvest statistics were obtained from the Marine Recreational Information Program (MRIP) for years prior to 2016 and from state compliance reports for 2016. Over the last 33 years, recreational catch of spotted seatrout (kept and released) has shown an upward trend, increasing from 1.1 million fish in 1981 to a peak of 8.8 million fish in 2012. In 2016, recreational catch totaled 7.3 million fish, a 29% increase from 2015 (Figure 2). Recreational harvest has remained relatively stable throughout the time series with an average of 1.3 million fish. Recreational harvest in 2016 was 1.1 million fish (a 115% increase from 2015), with North Carolina (34%) and Florida (30%) responsible for the largest shares. Due in part to recreational size and creel limits and closed seasons, as well as the encouragement of catch and release practices, the percentage of caught fish being released has increased throughout the time series, with the most recent 10-year average (2007-2016) at 82%. In 2016, the release percentage declined from the time series maximum (91%) to 85%. Rod and reel is the primary recreational gear, but some spotted seatrout are taken by recreational nets and by gigging, where these methods are permitted. Most recreational fishing is conducted from private boats and the majority of the catch is taken from nearshore waters.

IV. Status of Assessment Advice

A coastwide stock assessment of spotted seatrout has not been conducted and the Plan Review Team (PRT) does not recommend that one be completed due to the life history of the fish and the availability of data. Several states have performed age-structured analyses on local stocks, and recent stock assessments provide divergent trends on the status of the species. The 2005 stock assessment in South Carolina indicated an increasing population trend but a status level that is still below target spawning stock biomass levels (de Silva 2005). The 2014 North Carolina and Virginia stock assessment showed declines in recruitment since 2010. The PRT supports the continuation of state-specific assessments, yet recognizes the difficulty most states face to attain sufficient data of assessment quality and personnel who can perform the necessary modeling exercises.

The lack of biological and fisheries data for effective assessment and management of the resource was recognized in the 1984 FMP and continues to be a hindrance. Some states are increasing their collection of biological and fisheries data, which will provide insight on stock status over time.

V. Status of Research and Monitoring

In addition to commercial and recreational fishery-dependent data collected and/or compiled through the NMFS Fisheries Statistics Division, some states have implemented fishery-independent or additional fishery-dependent monitoring programs.

Maryland

MD DNR samples commercial pound nets weekly in the Potomac River and Chesapeake Bay from May through September (2016 n=1, 625 mm TL).

A few juvenile spotted seatrout are encountered in the coastal bays seine survey and the Chesapeake Bay blue crab trawl survey, indicating seatrout utilize these areas as nursery habitat (2016 seine n=4, trawl n=35).

Virginia

The VMRC Biological Sampling Program collects commercial and recreational fishery-dependent biological data. In 2016, the VMRC collected 863 commercial lengths and weights, determined the sex of 264 individuals, and aged 226 individuals. In 2016, the VMRC collected lengths and sex of 49 recreationally caught seatrout.

North Carolina

Commercial fish houses are sampled monthly for fishery-dependent length, weight, and age data. Very little variation is seen throughout sampling years. In 2016, gill nets were responsible for 90% of the catch, with beach seines accounting for 4% and gigs for 4%.

A fishery-independent Estuarine Trawl Survey is conducted to measure annual juvenile recruitment for many species. The Catch per Unit Effort (CPUE) index for the current 10-year time series has not shown significant trends in CPUE over that time span, although CPUE has declined in every year since the most recent peak in 2012. The CPUE of age-0 spotted seatrout for 2016 was 0.72±0.22 fish per tow, the lowest recorded during the previous 10-year period.

A fishery-independent gill net survey is conducted to measure age composition and develop indices of age 1+ abundance for many species. Seatrout age 1+ abundance index varies very little annually, averaging 0.56±0.06 seatrout per set, but low CPUEs in 2011 and 2015 correspond to known cold stun mortality events. The CPUE of adult spotted seatrout for 2016 was 0.58±0.09 fish per set.

The NCDMF Age Lab ages otoliths collected from several fishery-dependent and independent sources. A total of 457 spotted seatrout were aged by otoliths in 2016 with a maximum age of 5 and a modal age of 1.

South Carolina
The State Finfish Survey collects fishery-dependent catch, effort, and length data from private boat anglers in January and February. In 2016, 23% of 106 interviewed parties primarily targeted spotted seatrout (2016 n=141, mean catch rate of 5.9 fish per targeted fishing hour).

A mandatory trip reporting system for the charter boat fishery has been in place since 1993. In 2016, 810 (6%) interviewed trips targeted seatrout (2016 mean catch rate of 1.18 fish per targeted fishing hour).

The Freezer Drop-Off and the Fishing Tournament programs gather biological information like size, sex, maturity, and age. In 2016, these programs gathered biological information from 81 spotted seatrout.

South Carolina conducts two fishery-independent data collection programs. The Trammel Net Survey covers 7 monthly and 2 quarterly strata. Spotted seatrout is consistently one of the top three most abundance species encountered. The 2016 statewide mean CPUE was similar to 2015 and above the long-term average. The Electrofishing survey covers 5 monthly strata, and catches relatively low numbers of mostly YOY seatrout. Statewide catch rate by the electrofishing survey have been low since 2010, and were the second lowest on record in 2016.

Georgia
A Marine Sportfish Carcass Recovery Program collects recreational fishery-dependent size and age data (2016 n=2,343 spotted seatrout, average length of 384 mm, 264-622 mm range).

The Marine Sportfish Population Health Study trammel net survey samples monthly from September to November since 2003 in the Wassaw and Altamaha Sounds to collect fishery-independent age- and sex-specific estimates of relative abundance (2016: Wassaw average length 353 mm; Altamaha 343 mm). Gillnet sampling also occurs through this study, often encountering seatrout (2016: Wassaw average length 312 mm; Altamaha 329 mm).

Florida
Fishery-dependent sampling includes commercial trip-ticket information and biostatistical sampling of commercial and recreational catch. A voluntary angler logbook program was implemented in 2002 to record lengths of spotted seatrout released alive by anglers. In 2011, this program changed to a 'postcard' program, enlisting anglers encountered during MRIP angler intercept interviews.

A juvenile finfish monitoring program is conducted in the northern Indian River Lagoon (since 1990) and in the estuarine St. Johns, St. Marys, and Nassau Rivers (since 2001). Florida also conducts a 183-m haul seine survey in the Indian River (since 1997) and northeast Florida (since 2001). YOY abundance in 2016 was the highest observed since the time series maximum in 2009 (2016: 465 YOY lengths measured). Recent relative adult abundance (>200 mm SL) has declined in the northeast region since 2009 but has shown recent increases in the southeast region with 2016 abundance being the highest since 2011 and the fourth-highest in the time series (2016: 460 adult lengths measured).

VI. Status of Management Measures and Issues

Changes to State Regulations
In 2016, Georgia implemented a minimum size increase from 13 inches TL to 14 inches TL.

De Minimis Requests
A state qualifies for *de minimis* status if its previous three-year average combined commercial and recreational catch is less than 1% of the previous three-year average coastwide combined commercial and recreational catch. Those states that qualify for *de minimis* are not required to implement any monitoring requirements, as none are included in the plan.

The states of New Jersey and Delaware request continuation of *de minimis* status. The PRT notes these states meet the requirements of *de minimis*.

VII. Implementation of FMP Compliance Requirements for 2016

The PRT notes that all states have met the compliance requirements.

VIII. Recommendations of Plan Review Team

Management and Regulatory Recommendations

- Consider approval of *de minimis* requests by New Jersey and Delaware.
- Maintain observer coverage in states that have a commercial fishery for spotted seatrout.

Prioritized Research Recommendations

High Priority

- Conduct state-specific stock assessments to determine stock status relative to the plan objective of maintaining a spawning potential of at least 20%.
- Collect data on the size or age of spotted seatrout released alive by anglers and the size or age of commercial discards.
- Research release mortality and how this changes with factors such as season, habitat (e.g., depth, temperature, salinity), fish life history (e.g., size, age) and fishing methods (e.g., gear types).
- Monitor the size, age and reproductive condition of recreationally harvested fish (e.g. freezer drop off and tournament monitoring programs).
- Research into links between spawning activity, environmental conditions, trophic interactions and recruitment.
- Continue work to examine the stock structure of spotted seatrout on a regional basis (e.g., genetics, use of advanced tagging techniques).
- Research effects of winter severity on the population.
- Utilize telemetry technology to better understand life history characteristics.

- Conduct additional research on the significance of age-specific fecundity changes (i.e., environmental impacts on spawning output of population)
- Develop state-specific juvenile abundance indices.

Medium Priority

- Identify essential habitat requirements.
- Initiate collection of social and economic aspects of the spotted seatrout fishery.

IX. References

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X. Figures

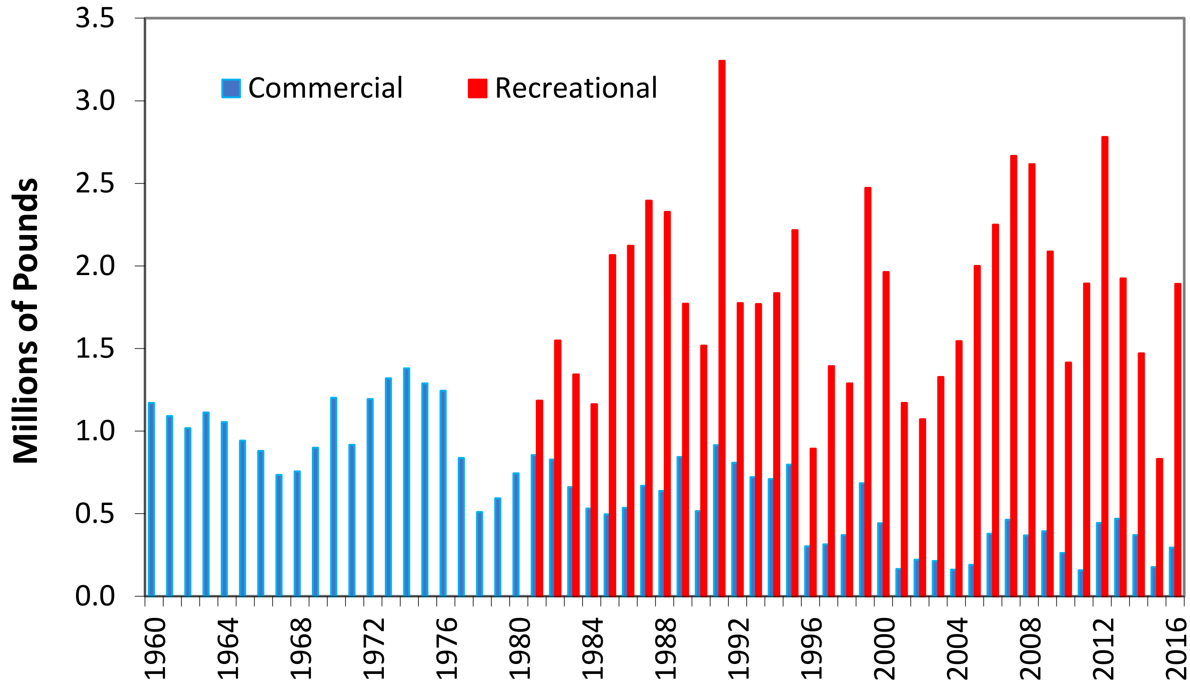

Figure 1. Commercial landings (1960-2016) and recreational landings (1981-2016), in pounds, from Maryland to Florida (See Tables 2 and 4 for values and sources). Recreational data not available prior to 1981.

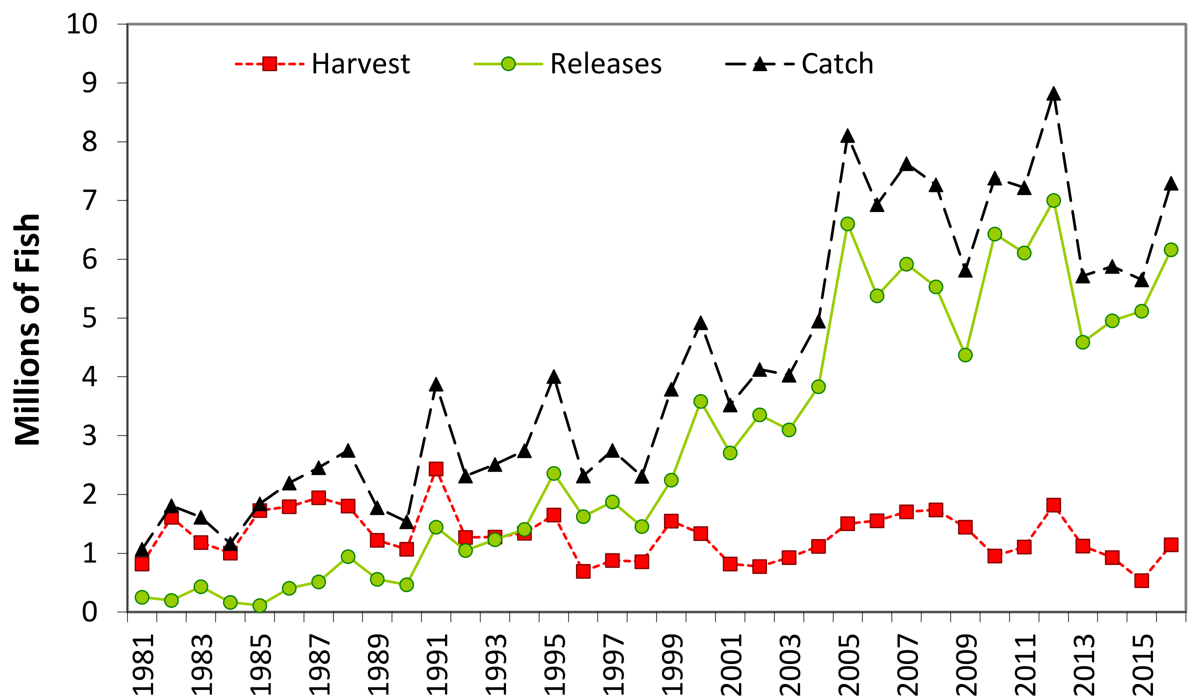

Figure 2. Recreational catch, harvest, and releases (numbers), 1981-2016, from Maryland to Florida (See Tables 3 and 5 for values and sources).

XI. Tables

Table 1. Summary of state regulations for spotted seatrout in 2016.

State	Recreational	Commercial
New Jersey	13" TL; 1 fish	Gill net, trawl, and pound net: 13"; 100 lb/vessel/day possession and bycatch limit; seasonal closures; monthly reporting. Trawl and gill net mesh size restrictions. Hook & line fishermen must follow rec limits.
Delaware	12" TL	12" TL
Maryland	14" TL; 4 fish	14" TL. 150 lb limit per day or trip (whichever is longer). Trawl and gill net mesh size restrictions.
PRFC	14" TL; 10 fish	14" TL
Virginia	14-24" TL; 1 fish >24" allowed; 5 fish; closed season March-July.	14" TL; pound nets/seines allowed 5% by weight less than 14". Hook & line fishermen must follow rec limits. Quota: 51,104 lbs (Sept-Aug). After 80% reached, 100 lb/vessel/day possession and bycatch limit.
North Carolina	14" TL; 4 fish	14" TL; 75 fish limit. Unlawful to possess or sell Friday 12:00am-Sunday 12:00am.
South Carolina	14" TL; 10 fish. Gig March-Nov.	Gamefish status since 1987; native caught fish may not be sold.
Georgia	14" TL; 15 fish	14" TL; 15 fish. BRD requirement for trawl; gear mesh regulations.
Florida	15-20" TL slot; 1 fish >20" allowed; northeast 6 fish; northwest 5 fish; south 4 fish; hook & line/cast net only.	15-24" TL; Season varies by region; 75 fish limit or 150 fish limit with two or more licensed fishermen on board; hook & line/cast net only.

Note: A commercial fishing license is required to possess spotted seatrout for sale in all states with a fishery.

Table 2. Commercial landings (pounds) of spotted seatrout by state, 1981-2016 (Source: ACCSP for years prior to 2016 and State Compliance Reports for 2016). Starred boxes represent confidential data.

Year	MD	VA	NC	SC	GA	FL	Total
1981		4,000	113,304	268	629	736,026	854,227
1982		3,400	83,847	1,944	4,994	732,278	826,463
1983		4,400	165,360	4,479	5,795	481,535	661,569
1984		3,000	152,934	2,374	4,348	367,541	530,197
1985		8,302	109,048	1,770	7,149	369,756	496,025
1986		18,500	191,514	12,214	8,691	304,523	535,442
1987		13,300	315,380	11,941	10,739	317,367	668,727
1988		15,500	296,538	486	9,110	315,989	637,623
1989		18,500	451,909	33	10,577	362,082	843,101
1990		21,435	250,634	945	5,942	236,466	515,422
1991	98	21,200	660,886	18	7,391	225,573	915,166
1992	364	10,395	526,271	17	11,310	259,095	807,452
1993	24	38,033	449,886		8,550	224,072	720,565
1994	30	44,636	412,358		5,112	247,651	709,787
1995	*	28,722	574,296	7	8,482	184,121	795,628
1996	14,961	4,476	226,580		7,501	48,254	301,772
1997	15,688	*	232,497		7,897	57,316	313,398
1998	*	21,774	307,671		*	41,556	371,001
1999	36,365	38,513	546,675		*	61,802	683,355
2000	*	19,918	376,594		*	45,392	441,904
2001	24,754	3,773	105,714		*	30,234	164,475
2002	*	*	175,555		*	44,655	220,210
2003	*	5,310	181,462		*	27,168	213,940
2004	342	*	130,961		*	29,605	160,908
2005	2,410	21,448	129,601		*	36,762	190,221
2006	*	28,529	312,620		*	36,687	377,836
2007	*	40,719	374,722		*	46,838	462,279
2008	290	43,512	304,430		*	20,887	369,119
2009	*	26,350	320,247		*	46,297	392,894
2010	*	20,870	200,822		*	39,374	261,066
2011	640	17,315	75,239		*	63,592	156,787
2012	*	116,767	265,016			61,676	443,460
2013	*	42,086	367,610		*	58,288	467,984
2014	*	90,051	242,245		*	37,710	370,006
2015	*	7,942	128,752			39,226	175,920
2016	66	18,283	253,965	*	0	23,105	295,419

Table 3. Recreational harvest (numbers of fish) of spotted seatrout by state, 1981-2015 (Source: MRIP for years prior to 2016 and State Compliance Reports for 2016).

Year	MD	VA	NC	SC	GA	FL	Total
1981			30,037	20,934	189,080	576,847	816,898
1982			112,023	849,634	226,758	426,378	1,614,793
1983			91,956	121,940	325,655	645,120	1,184,671
1984			90,262	95,281	114,403	700,876	1,000,822
1985			263,878	347,851	251,764	866,162	1,729,655
1986	7,507	82,671	270,867	477,136	401,490	550,591	1,790,262
1987	29,295	17,415	320,977	392,329	439,782	744,330	1,944,128
1988	20,769	288,705	420,115	355,547	389,276	331,709	1,806,121
1989	151,986	66,033	181,149	174,011	448,767	198,617	1,220,563
1990	20,416	67,939	251,088	113,160	368,787	249,824	1,071,214
1991	17,995	69,032	316,895	438,502	1,204,116	385,817	2,432,357
1992	3,235	30,091	333,990	200,030	338,175	363,238	1,268,759
1993	7,038	103,131	206,523	222,144	463,702	274,118	1,276,656
1994	33,511	115,025	457,636	139,551	337,965	255,216	1,338,904
1995	19,198	90,838	325,927	223,751	607,095	381,884	1,648,693
1996	35,765	46,098	151,380	137,530	171,676	148,571	691,020
1997	19,951	92,725	256,719	111,576	167,287	228,096	876,354
1998	13,620	34,623	294,501	125,038	197,293	189,621	854,696
1999	2,112	138,492	410,321	101,260	655,407	241,096	1,548,688
2000	1,634	90,135	250,450	219,740	486,673	288,443	1,337,075
2001		13,447	182,124	63,452	309,487	250,987	819,497
2002		16,303	197,484	84,777	271,357	206,310	776,231
2003	2,091	102,484	106,415	123,027	425,993	169,587	929,597
2004	0	68,409	284,902	188,798	340,625	234,235	1,116,969
2005	1,954	22,062	586,561	271,810	242,281	379,546	1,504,214
2006	4,860	43,530	565,042	230,326	378,587	331,145	1,553,490
2007	0	159,244	531,614	160,601	576,633	277,858	1,705,950
2008		103,880	654,435	155,022	641,948	181,744	1,737,029
2009	7,933	22,635	608,790	124,078	506,551	171,666	1,441,653
2010	3,146	17,417	195,065	101,053	384,077	251,455	952,213
2011	3,058	247,736	215,922	66,207	289,950	286,501	1,109,374
2012	6,032	125,627	500,522	234,921	526,604	427,469	1,821,175
2013	0	55,151	369,265	126,351	237,551	335,547	1,123,865
2014	4,755	46,524	234,045	77,669	256,068	308,133	927,194
2015	4,870	9,043	87,396	106,216	162,772	164,248	534,545
2016	2,813	66,559	388,544	90,768	252,561	345,514	1,146,759

Table 4. Recreational harvest (pounds of fish) of spotted seatrout by state, 1981-2015 (Source: MRIP for years prior to 2016 and State Compliance Reports for 2016).

Year	MD	VA	NC	SC	GA	FL	Total
1981			63,037	14,808	138,719	967,921	1,184,485
1982			120,045	588,999	177,846	660,296	1,547,186
1983			96,359	138,442	323,888	784,532	1,343,221
1984			39,862	116,118	141,307	866,077	1,163,364
1985			288,088	509,552	234,705	1,032,343	2,064,688
1986	4,960	64,393	328,440	587,570	440,774	695,168	2,121,305
1987	22,512	38,495	366,443	592,612	491,317	883,708	2,395,087
1988	36,630	460,377	390,835	448,472	536,960	453,064	2,326,338
1989	184,318	112,345	259,726	277,488	608,009	328,337	1,770,223
1990	39,059	121,135	282,873	174,844	423,814	475,045	1,516,770
1991	34,753	121,604	472,396	628,010	1,449,854	534,372	3,240,989
1992	7,802	56,685	508,760	227,211	430,947	543,492	1,774,897
1993	12,801	201,561	307,151	268,055	586,425	392,827	1,768,820
1994	26,763	175,185	679,996	183,344	412,393	357,442	1,835,123
1995	31,464	148,543	478,673	247,986	667,379	642,669	2,216,714
1996		77,270	197,260	171,728	196,487	249,898	892,643
1997	32,963	261,912	311,890	163,771	242,505	380,275	1,393,316
1998	37,189	61,888	444,441	151,718	262,897	329,793	1,287,926
1999		290,694	690,606	146,277	916,860	428,061	2,472,498
2000	2,972	195,544	385,191	267,296	565,904	545,201	1,962,108
2001		26,733	213,439	58,884	369,084	502,254	1,170,394
2002		28,882	274,101	111,954	302,558	353,692	1,071,187
2003	3,495	218,061	145,936	140,277	502,278	316,279	1,326,326
2004	0	138,841	379,779	168,232	383,501	473,294	1,543,647
2005	5,491	55,901	664,012	339,212	271,586	663,908	2,000,110
2006	10,272	107,770	821,982	291,373	445,026	572,273	2,248,696
2007	0	380,281	879,306	277,514	616,213	512,806	2,666,120
2008		239,743	1,005,548	242,942	773,069	353,317	2,614,619
2009	9,006	44,761	954,845	174,894	598,647	305,129	2,087,282
2010	7,254	30,176	407,534	140,321	424,960	404,576	1,414,821
2011	4,664	550,157	403,517	116,979	353,472	464,863	1,893,652
2012	10,257	226,556	817,551	388,105	518,663	819,009	2,780,141
2013		126,291	649,158	228,014	282,362	637,881	1,923,706
2014	10,633	84,838	433,978	111,194	283,282	546,335	1,470,260
2015	10,972	14,661	148,926	161,394	179,911	314,993	830,857
2016	4755	128685	691277	137615	332704	596569	1,891,605

Table 5. Recreational releases (number of fish) of spotted seatrout by state, 1981-2015 (Source: MRIP for years prior to 2016 and State Compliance Reports for 2016).

Year	MD	VA	NC	SC	GA	FL	Total
1981			0	5,522	36,853	209,059	251,434
1982			0	8,007	17,645	171,093	196,745
1983			16,579	32,860	12,038	367,881	429,358
1984			30,173	44,436	16,174	76,346	167,129
1985			16,578	6,409	22,917	66,960	112,864
1986	13,639	28,606	19,792	115,315	189,798	35,646	402,796
1987	0	30,070	136,104	130,253	176,415	41,391	514,233
1988	26,999	148,934	74,818	78,568	182,628	431,665	943,612
1989	52,859	11,977	82,909	54,279	167,025	187,406	556,455
1990	4,874	23,435	84,235	35,223	114,624	203,439	465,830
1991	21,811	40,550	169,921	51,415	369,972	789,779	1,443,448
1992	701	19,855	139,616	97,813	192,261	597,254	1,047,500
1993	0	65,605	149,744	92,101	146,665	780,573	1,234,688
1994	32,466	243,463	207,262	220,941	125,421	574,629	1,404,182
1995	157,530	327,643	277,896	194,996	327,835	1,074,703	2,360,603
1996	51,594	165,169	153,051	107,691	63,585	1,081,893	1,622,983
1997	4,826	168,964	98,377	89,147	61,148	1,449,278	1,871,740
1998	49,460	74,569	73,024	151,935	100,059	1,005,443	1,454,490
1999	7,082	152,120	253,442	92,792	160,801	1,577,378	2,243,615
2000	4,805	264,550	90,070	368,332	547,765	2,310,491	3,586,013
2001		110,308	194,982	38,709	365,140	1,995,635	2,704,774
2002		136,265	385,162	147,962	357,953	2,326,420	3,353,762
2003	0	207,270	131,619	314,642	737,730	1,707,957	3,099,497
2004	10,493	257,996	260,877	277,553	610,325	2,413,742	3,831,650
2005	2,603	192,091	1,058,921	461,021	642,398	4,245,920	6,604,170
2006	24,953	82,935	594,955	543,560	808,986	3,315,836	5,377,901
2007	2,331	362,809	848,682	572,330	1,038,992	3,094,164	5,919,308
2008		366,566	880,560	734,227	720,738	2,830,240	5,532,833
2009	30,381	171,028	1,213,526	398,971	915,301	1,641,702	4,371,480
2010	107,017	550,118	1,684,872	407,228	742,215	2,937,411	6,429,003
2011	7,685	1,214,620	1,916,249	279,969	552,123	2,141,212	6,111,858
2012	55,183	428,540	1,646,512	817,017	1,029,479	3,025,556	7,003,849
2013	8,382	291,091	1,427,410	600,607	321,461	1,939,475	4,592,077
2014	26,438	404,329	960,570	389,338	773,940	2,399,792	4,955,415
2015	73,379	481,859	1,776,280	392,765	398,418	1,997,168	5,120,261
2016	41,885	1,653,352	1,789,836	481,406	552,279	1,628,300	6,161,800

South Atlantic Board

Activity level: Moderate

Committee Overlap Score: Moderate (Tautog TC and SAS, Horseshoe Crab TC, Bluefish TC, Weakfish SAS)

Committee Task List
• Atlantic Croaker TC ≈ February: Provide recommendations on Traffic Light Analysis changes • Spot PRT ≈ February: Provide recommendations on Traffic Light Analysis changes • Black Drum TC – Spring: Review 2014 benchmark stock assessment research recommendations and make recommendation for 2019 stock assessment • Red Drum SAS - Spring: Develop assessment roadmap and update ASC on progress • Atlantic Croaker TC - July 1: Compliance Reports Due • Red Drum TC – July 1: Compliance Reports Due • Atlantic Croaker TC – August 1: Update Traffic Light Analysis • Spot PRT – August 1: Update Traffic Light Analysis • Black Drum TC – August 1: Compliance Reports Due • Spot PRT – November 1: Compliance Reports Due

TC Members:
Atlantic Croaker: Chris Mcdonough (SC, Chair), Kristen Anstead (ASMFC), Dawn Franco (GA), Michael Greco (DE), Ryan Jiorle (VA), Wilson Laney (USFWS), Joseph Munyandorero (FL), Jennifer Pyle (NJ), Harry Rickabaugh (MD), Jason Rock (NC), Michael Schmidtke (ASMFC), Dan Zapf (NC)
Black Drum: Harry Rickabaugh (MD, Chair), Dustin Addis (FL), Brian Neiland (NJ), Ryan Harrell (GA), Ryan Jiorle (VA), Jeff Kipp (ASMFC), Chris Mcdonough (SC), Chris Stewart (NC), Jordan Zimmerman (DE)
Red Drum: Ryan Jiorle (VA, Chair), Steve Arnott (SC), Michael Greco (DE), Chris Kalinowsky (GA), Jeff Kipp (ASMFC), Wilson Laney (USFWS), Genine McClair (MD), Lee Paramore (NC), Roger Pugliese (SAFMC), Jennifer Pyle (NJ), Michael Schmidtke (ASMFC)
Spot (PRT): Dawn Franco (GA), Ryan Jiorle (VA), Adam Kenyon (VA), Chris Mcdonough (SC), Harry Rickabaugh (MD), Michael Schmidtke (ASMFC), Dan Zapf (NC)

SAS Members:
Atlantic Croaker and Spot: Chris Mcdonough (SC, Chair), Kristen Anstead (ASMFC), Mary Fabrizio (VA), Dawn Franco (GA), Jeff Kipp (ASMFC), Laura Lee (NC), Joseph Munyandorero (FL), Harry Rickabaugh (MD), Michael Schmidtke (ASMFC)
Black Drum: Joe Cimino (VA), Ryan Jiorle (VA), Jeff Kipp (ASMFC), Chris Mcdonough (SC), Scott Newlin (DE), Jordan Zimmerman (DE)
Red Drum: Steve Arnott (SC, Chair), Carolyn Belcher (GA), Angela Giuliano (MD), Ryan Jiorle (VA), Jeff Kipp (ASMFC), Lee Paramore (NC), Michael Schmidtke (ASMFC)