

**REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN FOR SHAD AND RIVER HERRING  
(*Alosa spp.*) FOR THE 2017 FISHING YEAR**



Shad & River Herring Plan Review Team

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**Approved October 2018**

**REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN FOR  
SHAD AND RIVER HERRING (*Alosa spp.*)**

**I. Status of the Fishery Management Plan**

<u>Date of FMP Approval:</u>	October 1985
<u>Amendments:</u>	Amendment 1 (April 1999) Amendment 2 (August 2009) Amendment 3 (February 2010)
<u>Addenda:</u>	Technical Addendum #1 (February 2000) Addendum I (August 2002)
<u>Management Unit:</u>	Migratory stocks of American shad, hickory shad, alewife, and blueback herring from Maine through Florida
<u>States With Declared Interest:</u>	Maine through Florida, including the Potomac River Fisheries Commission (PRFC) and the District of Columbia
<u>Active Boards/Committees:</u>	Shad & River Herring Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Plan Review Team, Plan Development Team

The 1985 Fishery Management Plan (FMP) for Shad and River Herring was one of the very first FMPs developed at the ASMFC. Amendment 1 was initiated in 1994 to require and recommend specific monitoring programs to inform future stock assessments—it was implemented in October 1998. A Technical Addendum to Amendment 1 was approved in 1999 to correct technical errors.

The Shad and River Herring Management Board (Board) initiated Addendum I in February 2002 to change the conditions for marking hatchery-reared alosines; clarify the definition and intent of *de minimis* status for the American shad fishery; and modify and clarify the fishery-independent and dependent monitoring requirements. These measures went into effect on January 1, 2003.

In August 2009, the Board initiated Amendment 2 to restrict the harvest of river herring (blueback herring and alewife) due to observed declines in abundance. The Amendment prohibited commercial and recreational river herring fisheries in state waters beginning January 1, 2012, unless a state or jurisdiction has a sustainable fishery management plan (SFMP) reviewed by the Technical Committee and approved by the Board. The Amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish the potential future stock reproduction and recruitment.” Amendment 2 required states to implement fishery-dependent and independent monitoring programs. SFMPs have been approved by the Management Board for Maine, New Hampshire, Massachusetts, New York, and South Carolina (Table 1).

In February 2010, the Board initiated Amendment 3 in response to the 2007 American shad stock assessment, which found most American shad stocks at all-time lows. The Amendment requires similar management and monitoring as developed in Amendment 2 (for river herring). Specifically, Amendment 3 prohibits shad commercial and recreational fisheries in state waters beginning January 1, 2013, unless a state or jurisdiction has a SFMP reviewed by the Technical Committee and approved by the Board. The Amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish the potential future stock reproduction and recruitment.” Catch and release only fisheries may be maintained in any river system without an SFMP. SFMPs have been approved by the Board for Massachusetts, Connecticut, the Delaware River Basin Fish Cooperative (on behalf of New York, Delaware, New Jersey, and Pennsylvania), PRFC, North Carolina, South Carolina, Georgia, and Florida (Table 1). All states and jurisdictions are also required to identify local significant threats to American shad critical habitat and develop a plan for mitigation and restoration. All states and jurisdictions habitat plans have been accepted and approved.

**Table 1. States with approved sustainable fishery management plans (SFMPs) for river herring or shad. Includes year of Board approval and year the Board approved the updated<sup>1</sup> SFMP.**

<b>State</b>	<b>River Herring SFMP</b>	<b>Shad SFMP</b>
<b>Maine</b>	Approved (2010, 2017)	
<b>New Hampshire</b>	Approved (2011, 2015)	
<b>Massachusetts</b>	Approved (2016)	Approved (2012)
<b>Connecticut</b>		Approved (2012, 2017)
<b>Rhode Island</b>		
<b>Pennsylvania</b>		Approved* (2012, 2017)
<b>New York</b>	Approved (2011, 2017)	Approved* (2012, 2017)
<b>New Jersey</b>		Approved* (2012, 2017)
<b>Delaware</b>		Approved* (2012, 2017)
<b>PRFC</b>		Approved (2012, 2017)
<b>Maryland</b>		
<b>Virginia</b>		
<b>North Carolina</b>		Approved (2012, 2017)
<b>South Carolina</b>	Approved (2010, 2017)	Approved (2011, 2017)
<b>Georgia</b>		Approved (2012, 2017)
<b>Florida</b>		Approved (2011, 2017)

\*Delaware River Basin Fish and Wildlife Management Co-op has a Shad SFMP, though Delaware and New Jersey are only states that have commercial fisheries. All states have recreational measures, with limited to no catch in the upper Delaware River (New York & Pennsylvania).

<sup>1</sup> SFMPs must be updated and re-approved by the Board every five years.

## II. Status of the Stocks

While the FMP addresses four species: two river herrings (blueback herring and alewife) and two shads (American shad and hickory shad)—these are collectively referred to as shad and river herring, or SRH.

The most recent *American shad stock assessment report* (ASMFC 2007) identified that American shad stocks are highly depressed from historical levels. Of the 24 river-specific stocks of American shad for which sufficient information was available, 11 were depleted relative to historic levels, 2 were increasing, and 11 were stable (but still below historic levels). The status of 8 additional stocks could not be determined because the time-series of data was too short or analyses indicated conflicting trends.

Taken in total, American shad stocks do not appear to be recovering. The assessment concluded that current restoration actions need to be reviewed and new efforts need to be identified and applied. These include controlling fishing rates, improving dam passage, stocking, and habitat restoration. There are no coastwide reference points for American shad. There is no stock assessment available for hickory shad. A benchmark stock assessment was initiated in 2017 to analyze American shad stock status, with expected completion in 2019.

The most recent benchmark *river herring stock assessment report* (ASMFC 2012) indicated, of the 24 river herring stocks for which sufficient data were available to make a conclusion, 23 were depleted relative to historic levels and one was increasing. The status of 28 additional stocks could not be determined because the time-series of available data was too short.

Estimates of coastwide abundance and fishing mortality could not be developed because of the lack of adequate data. The “depleted” determination was used instead of “overfished” because of the many factors that have contributed to the declining abundance of river herring, which include not just directed and incidental fishing, but likely also habitat issues (including dam passage, water quality, and water quantity), predation, and climate change. There are no coastwide reference points.

The river herring stock assessment was updated in 2017 (ASMFC 2017) with additional data from 2011-2015, and indicates that river herring remain depleted at near historic lows on a coastwide basis. Total mortality estimates over the final three years of the data time series (2013-2015) are generally high and exceed region-specific reference points for some rivers. However, there are some positive signs of improvement for some river systems. Total mortality estimates for 2 rivers have fallen below region-specific reference points during the final three years of the data time series. No total mortality estimates were below reference points at the end of the 2012 stock assessment data time series. Of the 54 stocks for which data were available, 16 experienced increasing abundance trends, 2 experienced decreasing abundance trends, 8 experienced stable abundance and 10 experienced no discernable trend in abundance over the final 10 years of the time series (2006-2015).

### **III. Status of the Fisheries**

Shad and river herring formerly supported the largest and most important commercial and recreational fisheries throughout their range. Historically fishing took place in rivers (both freshwater and saltwater), estuaries, tributaries, and the ocean. Although recreational harvest data are scarce, presently most harvest is believed to come from the commercial industry. Commercial landings for these species have declined dramatically from historic highs. Details on each fishery are provided below:

#### **AMERICAN SHAD:**

Total combined river and ocean commercial landings decreased from a high of 2.36 million pounds in 1985 to a low of 1.4 million pounds in 1999, but increased in 2000 to 1.8 million pounds. The 2005 closure of the ocean-intercept fishery (phase out began in 2000) has substantially lowered the total coastwide landings of American shad. The total landings reported in compliance reports from individual states and jurisdictions in 2017 were 398,278 pounds, a 67% increase from landings in 2016 (239,067 pounds) (Table 2). Bycatch landings accounted for approximately 8% of the total commercial landings of American shad in 2017.

In 2017, landings from North Carolina and South Carolina accounted for 22% and 44% of the commercial fishery removals, respectively. The remainder of the directed landings came from Connecticut, New Jersey, Delaware, Virginia, and Georgia. In 2017, New Hampshire, Massachusetts, Rhode Island, New York, Pennsylvania, District of Columbia and Florida reported no directed shad harvest in their state compliance reports. Maryland commercial fishermen are permitted a two fish per day allowance of dead American shad for personal use; no sale is permitted. Landings from Virginia and PRFC are attributed to limited bycatch allowances for American Shad.

Substantial recreational shad fisheries occur on the Connecticut (CT and MA), Delaware (NY, PA and NJ), Susquehanna (MD), Santee and Cooper (SC), Savannah (GA), and St. Johns (FL) Rivers. Shad recreational fisheries are also pursued on several other rivers in Massachusetts, District of Columbia, Virginia, North Carolina, South Carolina, and Georgia. Tens of thousands of shad are caught by hook and line from large East Coast rivers each year, but only a few states gather harvest information from creel surveys. Actual harvest (catch and removal) may amount to only about 20-40% of total catch, but hooking mortality could increase the total recreational fishery removals substantially. Several comprehensive angler use and harvest surveys are planned or have been recently completed. In January 2007, the Management Board suspended the requirement to monitor the recreational fishery until the stock assessment had been completed and a template for creel surveys had been developed.

Since 2009, recreational harvest data from the Marine Recreational Information Program (MRIP) are generally not provided for American shad. This is a result of the MRIP survey design, which focuses on active fishing sites along coastal and estuarine areas and is unsuitable for capturing inland harvest. In previous years the proportional standard error (PSE) has ranged from 0-100. However, Massachusetts, North Carolina, South Carolina and Florida reported American shad recreational harvest estimates for 2017 (Table 3).

## HICKORY SHAD:

In 2017, North Carolina, South Carolina, and Georgia reported directed commercial hickory shad landings; New York, New Jersey and North Carolina reported bycatch landings. North Carolina accounts for a vast majority of the landings with 97% of total landings. 2017 coastwide commercial and bycatch landings totaled 76,643 pounds, representing a 23% decrease from 2016 landings (100,079 pounds) (Table 2). Recreational harvest was only reported in North Carolina, totaling 22,410 pounds.

## RIVER HERRING (BLUEBACK HERRING/ALEWIFE COMBINED):

Commercial landings of river herring declined 95% from over 13 million pounds in 1985 to about 700 thousand pounds in 2005. Recent commercial landings continue to increase, despite North Carolina implementing a no-harvest provision for commercial and recreational fisheries of river herring in coastal waters of the state in 2007. In 2016, river herring landings were reported from Maine, New Hampshire, New York, and South Carolina. Landings in 2017 totaled 2.4 million pounds, 18% more than the 2016 landings of 1,970,893 pounds (Table 2). There was no estimated recreational harvest of river herring in 2017.

**Table 2. Shad and river herring total commercial fishery removals (directed landings and bycatch<sup>1</sup>, in pounds) provided by states, jurisdictions and NOAA Fisheries for 2017.**

	River Herring	American Shad	Hickory Shad
Maine	*	*	*
New Hampshire	*	0	0
Massachusetts	0	0	0
Rhode Island	0	0	0
Connecticut	0	42,192	0
New York	*	*	*
New Jersey	*	8,732	*
Pennsylvania	0	0	0
Delaware	0	5,589	0
Maryland	0	0	0
D.C.	0	0	0
PRFC	0	10,273	0
Virginia	0	1,810	4
North Carolina	0	92,769	73,675
South Carolina	658,526	183,162	*
Georgia	0	44,967	2,086
Florida	0	0	0
<b>Total Directed</b>	<b>2,383,220</b>	<b>377,411</b>	<b>76,527</b>
<b>Total Bycatch</b>	<b>18,110</b>	<b>12,135</b>	<b>116</b>
<b>Total</b>	<b>2,401,330</b>	<b>389,546</b>	<b>76,643</b>

\*Values not shown due to confidential data

<sup>1</sup> Available information on shad and river herring bycatch varies widely by state. Estimates may not capture all bycatch removals occurring in state waters.

**Table 3. Recreational harvest estimates for American shad in 2017 (in pounds) provided by states and MRIP.**

State	American Shad Harvest	Source of Estimates
Massachusetts	2,042	MRIP
North Carolina	7,276	Recreational creel surveys on the Roanoke, Tar, Neuse, and Cape Fear rivers
South Carolina	6,545	Creel surveys and mandatory reporting for recreational gill netters
Florida	347	Access point creel survey on St. Johns River
<b>Total</b>	<b>16,210</b>	

#### **IV. Status of Research and Monitoring**

Under Amendment 2 (2009) and Amendment 3 (2010), fishery-independent and fishery-dependent monitoring programs became mandatory for select rivers. Juvenile abundance index (JAI) surveys, annual spawning stock surveys (Table 4), and hatchery evaluations are required for select states and jurisdictions. States are required to calculate mortality and/or survival estimates, and monitor and report data relative to landings, catch, effort, and bycatch. States must submit annual reports including all monitoring and management program requirements, on or before July 1 of each year.

In addition to the mandatory monitoring requirements stipulated under Amendments 2 and 3, some states and jurisdictions continue important research initiatives for these species. For example, Massachusetts, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and USFWS are actively involved in shad restoration using hatchery-cultured fry and fingerlings. All hatchery fish are marked with oxytetracycline marks on otoliths to allow future distinction from wild fish. During 2017, several jurisdictions reared American shad, stocking a total of 26,647,458 American shad, an increase of 13% from the 23,535,342 shad stocked in 2016 (Table 5).

#### **V. Status of Management Measures**

All state programs must implement commercial and recreational management measures or an alternative program approved by the Management Board (Table 1). The current status of each state's compliance with these measures is provided in the Shad and River Herring Plan Review Team Report (enclosed).

Shad and river herring are currently managed under Amendments 2 and 3. In 2009 the Board approved Amendment 2, which was initiated in response to concerns over river herring stock. The amendment prohibits commercial and recreational fisheries in state waters beginning January 1, 2012, unless a state or jurisdiction submits a sustainable fishery management plan and receives approval from the Board. SFMPs for river herring have been approved by the Management Board for Maine, New Hampshire, Massachusetts, New York, and South Carolina (Table 1).

**Table 4. American shad and river herring passage counts at select rivers along the Atlantic coast in 2017. This table includes only fish passage counts required by Amendments 2 and 3.**

State/River	Shad	River Herring
<b>Maine</b>		
Androscoggin	1	49,923
Saco	3,727	44,929
Kennebec	213	289,188
Sebasticook	64	3,547,091
Penobscot	3,868	1,256,061
St. Croix		157,750
<b>New Hampshire</b>		
Cocheco		28,926
Exeter		*
Oyster		4,492
Lamprey		35,920
Taylor		**
Winnicut		0
<b>Massachusetts</b>		
Merrimack	62,848	91,616
<b>Rhode Island</b>		
Gilbert Stuart	72,461	
Nonquit	8,647	
Buckeye Brook	8,241	
<b>Connecticut River</b>		
Holyoke Dam	537,249	875
<b>Pennsylvania</b>		
Schuylkill (Fairmont Dam)	1,297	
<b>Pennsylvania/Maryland/Delaware</b>		
Susquehanna (Conowingo)	16,248	65
Susquehanna (Holtwood)	3,208	
Susquehanna (Safe Harbor)	2,011	
Susquehanna (York Haven)	62	
<b>South Carolina</b>		
St. Stephen Dam	46,522	369,539
<b>Total 2017</b>	<b>761,385</b>	<b>5,876,375</b>
Total 2016	540,917	5,514,890
Total 2015	611,368	3,825,435
Total 2014	426,073	3,031,753
Total 2013	776,162	2,922,985
Total 2012	205,928	2,493,322

\*Fish counter malfunction due to sea lamprey inundation.

\*\*Fishway operated but not monitored.

Note: Passage numbers on Susquehanna River are cumulative and listed in ascending order of passage mile with Conowingo being nearest the river's mouth.



**Table 5. Stocking of Hatchery-Cultured Alosines in State Waters, 2017.**

State	American Shad	Alewife
<b>Maine*</b>		
<b>Massachusetts</b>		
Merrimack River	4,191,054	0
Nashua River	641,325	0
Charles River	232,569	0
<b>Rhode Island</b>		
Pawcatuck River	583,364	
Pawtuxet River	623,310	
<b>Pennsylvania</b>		
Susquehanna River	3,787,554	
Lehigh River	434,454	
Schuylkill River	361,391	
<b>Delaware</b>		
Nanticoke River	1,369,300	
<b>Maryland</b>		
Choptank River	2,933,000	0
<b>District of Columbia</b>		
Potomac River	368,400	
<b>Virginia</b>		
James River	1,880,000	
<b>North Carolina</b>		
Neuse River	440,161	
Roanoke River	2,741,462	
<b>South Carolina</b>		
Edisto River	88,458	
Wateree River	1,352,184	
Broad River	2,441,555	
<b>Georgia</b>		
Altamaha River		
Oconee River	788,015	
Ocmulgee River	868,371	
Ogeechee	521,531	
<b>Total</b>	<b>26,647,458</b>	<b>0</b>

\*Maine: Only river herring are of wild origin are stocked as adult pre-spawning individuals on the Androscoggin, Kennebec and Union Rivers

In 2010, the Board approved Amendment 3, which was initiated in response to concerns over shad stocks. The Amendment requires similar management and monitoring as developed in Amendment 2, specifically the development of a SFMP for any jurisdiction that will maintain a commercial or recreational fishery after January 1, 2013 (with the exception of catch and release recreational fisheries). SFMPs for shad have been approved by the Management Board for Massachusetts, Connecticut, the Delaware River Basin Fish Cooperative (on behalf of New York, Delaware, New Jersey, and Pennsylvania), PRFC, North Carolina, South Carolina, Georgia, and Florida (Table 1).

States are required to update their SFMP every five years. In 2017, states reviewed their current SFMPs and, made changes based on fishery performance or observations (e.g., revise the sustainability targets) where necessary. At minimum, states updated the data for their commercial and/or recreational fisheries and recommended the current sustainability measures be carried forward in the next plan. The Board has reviewed and approved updated SFMPs for all states except the Massachusetts SFMP for shad.

## **VI. Prioritized Research Needs**

### **Fishery-Dependent Priorities**

#### ***High***

- Expand observer and port sampling coverage to quantify additional sources of mortality for alosine species, including bait fisheries, as well as rates of bycatch in other fisheries to reduce uncertainty.<sup>2</sup>

#### ***Moderate***

- Identify directed harvest and bycatch losses of American shad in ocean and bay waters of Atlantic Maritime Canada.

#### ***Low***

- Identify additional sources of historical catch data of the US small pelagic fisheries to better represent earlier harvest of river herring and improve model formulation.

### **Fishery-Independent Priorities**

#### ***Moderate***

- Develop demersal and pelagic trawl CPUE indices of offshore river herring biomass.

### **Modeling / Quantitative Priorities**

#### ***High***

- Conduct population assessments on river herring, particularly in the south.<sup>3</sup>
- Analyze the consequences of interactions between the offshore bycatch fisheries and population trends in the rivers.
- Quantify fishing mortality for major river stocks after ocean closure of directed fisheries (river, ocean bycatch, bait fisheries).

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<sup>2</sup> A prior statistical study of observer allocation and coverage should be conducted (see Hanke et al. 2012).

<sup>3</sup> A peer reviewed river herring stock assessment was completed in 2012 by the ASMFC.

- Improve methods to develop biological benchmarks used in assessment modeling (fecundity-at-age, sex specific mean weight-at-age, partial recruitment vector/maturity schedules) for river herring and American shad of both semelparous and iteroparous stocks.
- Improve methods for calculating M.

### ***Moderate***

- Consider standardization of indices with a GLM to improve trend estimates and uncertainty characterization.
- Explore peer-reviewed stock assessment models for use in additional river systems as more data become available.

### ***Low***

- Develop models to predict the potential impacts of climate change on river herring distribution and stock persistence.

## **Life History, Biological, and Habitat Priorities**

### ***High***

- Conduct studies to quantify and improve fish passage efficiency and support the implementation of standard practices.
- Assess the efficiency of using hydroacoustics to repel alosines or pheromones to attract alosines to fish passage structures. Test commercially available acoustic equipment at existing fish passage facilities. Develop methods to isolate/manufacture pheromones or other alosine attractants.
- Investigate the relationship between juvenile river herring/American shad and subsequent year class strength, with emphasis on the validity of juvenile abundance indices, rates and sources of immature mortality, migratory behavior of juveniles, and life history requirements.
- Develop an integrated coastal remote telemetry system or network that would allow tagged fish to be tracked throughout their coastal migration and into the estuarine and riverine environments. UPDATE: currently available for American shad but not in use due to tagging mortality
- Continue studies to determine river herring population stock structure along the coast and enable determination of river origin of catch in mixed stock fisheries and incidental catch in non-targeted ocean fisheries. Spatially delineate mixed stock and Delaware stock areas within the Delaware system. Methods to be considered could include otolith microchemistry, oxytetracycline otolith marking, genetic analysis, and/or tagging.<sup>4</sup>
- Validate the different values of M for river herring and American shad stocks through shad ageing techniques and repeat spawning information.
- Continue to assess current ageing techniques for river herring and American shad, using known-age fish, scales, otoliths, and spawning marks. Conduct biannual ageing workshops to maintain consistency and accuracy of ageing fish sampled in state programs.<sup>5</sup>
- Summarize existing information on predation by striped bass and other species. Quantify consumption through modeling (e.g., MSVPA), diet, and bioenergetics studies.

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<sup>4</sup> Genetic research currently underway in combination with otolith chemistry.

<sup>5</sup> River herring ageing workshop occurred in 2013.

- Refine techniques for tank spawning of American shad. Secure adequate eggs for culture programs using native broodstock.

### **Moderate**

- Determine the effects of passage barriers on all life history stages of American shad and river herring. Conduct studies on turbine mortality, migration delay, downstream passage, and sub-lethal effects. UPDATE: Recent studies have been conducted by T. Castro-Santos of UMass.
- Evaluate and ultimately validate large-scale hydroacoustic methods to quantify river herring and American shad escapement in major river systems.
- Conduct studies of egg and larval survival and development.
- Conduct studies on energetics of feeding and spawning migrations of American shad on the Atlantic coast.
- Resource management agencies in each state shall evaluate their respective state water quality standards and criteria and identify hard limits to ensure that those standards, criteria, and limits account for the special needs of alosines. Primary emphasis should be on locations where sensitive egg and larval stages are found.
- Encourage university research on hickory shad.
- Develop better fish culture techniques, marking techniques, and supplemental stocking strategies for river herring.

### **Low**

- Characterize tributary habitat quality and quantity for Alosine reintroductions and fish passage development.
- States should identify and quantify potential shad and river herring spawning and nursery habitat not presently utilized, including a list of areas that would support such habitat if water quality and access were improved or created, and analyze the cost of recovery within those areas. States may wish to identify areas targeted for restoration as essential habitat.<sup>11</sup>
- Investigate contribution of landlocked versus anadromous produced river herring.

## **VII. Plan Review Team (PRT) Recommendations**

### ***De Minimis Status***

A state can request *de minimis* status if commercial landings of river herring or shad are less than 1% of the coastwide commercial total. *De minimis* status exempts the state from the sub-sampling requirements for commercial and recreational catch for biological data. The following states have met the requirements and requested continued *de minimis* status in 2017:

- Maine (American *shad*)
- New Hampshire (American shad and river herring)
- Massachusetts (American shad)
- Florida (American shad and river herring)

### **State Compliance**

All states with a declared interest in the management of shad and river herring have submitted reports and have regulations in place that meet the intent of the requirements of the Interstate Fisheries Management Plan for Shad and River Herring. Virginia has also submitted a separate bycatch report in accordance with the provisions of their limited bycatch program.

The PRT notes several issues encountered in their review of the state compliance reports:

1. Several states did not report on all monitoring requirements listed under Amendments 2 and 3 (see PRT Report Table). A few states have consistently been missing the same information from compliance reports for the past few years (CT, NY) These states should take note of the required monitoring programs that were not reported and make a concerted effort to report all monitoring programs in future compliance reports. The most common omissions were: characterization of other losses, variance, characterization of recreational harvest, length and age frequency, and degree of repeat spawning.
2. In each of their compliance reports, states and jurisdictions that share monitoring should indicate which jurisdiction is responsible for the required monitoring, in lieu of not including the information. In addition, separate reports could be sent for each state or jurisdiction.
3. At a minimum, each section of the compliance report should be addressed by stating there are no changes from the previous report, instead of omitting these sections altogether. Additionally, if data from required monitoring is provided in a separate file, the compliance report should also indicate what data was provided.

Additionally, the PRT acknowledges that the Board is aware of inconsistencies between the FMP requirements and some approved state SMFPs. In October 2017 the Technical Committee (TC) and PRT identified rivers open to shad or river herring harvest without an SFMP and/or monitoring for that river; though Amendments 2 and 3 require all states and jurisdictions to submit SFMPs for systems that remain open to commercial and recreational harvest. The TC is in the process of developing proposed improvements to the FMP to resolve these issues.

### **PRT REVIEW OF SHAD AND RIVER HERRING ANNUAL COMPLIANCE REPORTS**

In accordance with the Shad and River Herring Fishery Management Plan, the states are required to submit an annual compliance report by July 1<sup>st</sup> of each year. The Plan Review Team reviewed all state reports for compliance with the mandatory measures in Amendments 2 (River Herring) and 3 (American shad). Table 6 provides important information on each state's fisheries, monitoring programs, and compliance issues pertaining to the 2017 fishing year.

**Table 6. Summary of PRT Review of 2017 State Compliance Reports.**

	<b>2017 STATE HIGHLIGHTS</b>	<b>STURGEON BYCATCH</b>	<b>UNREPORTED INFORMATION AND COMPLIANCE ISSUES</b>
<b>MAINE</b>	<ul style="list-style-type: none"> <li>- 2017 was an unusually dry year with moderate drought conditions in summer and fall, which complicates emigration through hydropower stations in the fall; number of post-spawn adults was likely impacted by low flows and repeat spawning rates are thus expected to drop.</li> <li>- 72 shad passage mortalities were noted, representing a total fishway mortality of 3.2%, which is similar to past years.</li> <li>- River herring spawning stock runs were below average on the Androscoggin while the Sebasticook, Kennebec, Saco, and St. Croix rivers were all above average.</li> <li>- Comparing the JAI CPUE to past years, shad CPUE was above average in the Upper Kennebec, Merrymeeting Bay, Cathance River, and Eastern River but below average in other rivers. Alewife CPUE was above average in the Eastern River but at or below average for all other river systems. Blueback herring CPUE was above average in the Cathance River but at or below average in all other river segments.</li> </ul>	<ul style="list-style-type: none"> <li>- No losses of Atlantic or shortnose sturgeon reported in fisheries or during monitoring in 2017</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>
<b>NEW HAMPSHIRE</b>	<ul style="list-style-type: none"> <li>- JAI calculation in 2017 for shad was not feasible as the survey did not capture any. Relative abundance of blueback herring in the 2017 JAI was the highest encountered since 2007.</li> <li>- One American shad returned in NH coastal rivers in 2017, to the Oyster River. The return of river herring had generally been increasing since 2006, but 2017 saw a return of just 69,338 fish.</li> </ul>	<ul style="list-style-type: none"> <li>- No losses of Atlantic or shortnose sturgeon reported in fisheries or during monitoring in 2017</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>
<b>MASSACHUSETTS</b>	<ul style="list-style-type: none"> <li>- MRIP estimated positive recreational harvest for the first time since 2006.</li> <li>- Shad broodstock taken from Connecticut River rather than Merrimack River.</li> <li>- New regulations for river herring enacted creating standards for opening spawning runs to sustainable harvest (no runs opened in 2017).</li> <li>- Sampling of the RI-based small mesh bottom trawl fishery ended in 2017 due to lack of funding.</li> <li>- Three census counting stations were added in 2017 to expand state-wide river herring monitoring efforts</li> </ul>	<ul style="list-style-type: none"> <li>- No losses of Atlantic sturgeon reported in fisheries or during monitoring in 2017</li> </ul>	<ul style="list-style-type: none"> <li>- No mention of the development of American shad juvenile abundance monitoring program for the Merrimack River.</li> </ul>

**Table 6. Summary of PRT Review of 2017 State Compliance Reports.**

<p><b>RHODE ISLAND</b></p>	<ul style="list-style-type: none"> <li>- No significant changes in monitoring, regulations, or harvest in 2017.</li> <li>- The JAI on Pawcatuck River produced highest geometric mean (0.49) since 2007.</li> <li>- A total of 331 American Shad passed through the fishway in 2017, most since 2002</li> <li>- In 2017, 583,364 American shad fry were stocked in the Pawcatuck River and 623,310 into the Pawtuxet River.</li> <li>- River herring run counts in 2017 were; Gilbert Stuart (72,664), Nonquit (8,647), and Buckeye Brook (8,241). All returns lower than in 2016, Nonquit lowest since 1999.</li> </ul>	<ul style="list-style-type: none"> <li>- Zero Atlantic sturgeon observed by the NOAA Fisheries Observer Program in 2017.</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>
<p><b>CONNECTICUT</b></p>	<ul style="list-style-type: none"> <li>- Preliminary 2017 landings are 42,192 pounds (9,309 fish) of American shad from drift gillnets through harvester catch reporting.</li> <li>- Shad spawning population relies on a few age classes and low rates of repeat spawners.</li> <li>- Passage of 536,675 shad at Holyoke.</li> </ul>	<ul style="list-style-type: none"> <li>- A total of 15 sturgeon (species unclassified) reported caught and released by shad fishermen in 2017.</li> </ul>	<ul style="list-style-type: none"> <li>- Estimate of other commercial losses reported by weight instead of length and age.</li> <li>- Directed recreational shad harvest not characterized due to limited budget and staff. No creel survey conducted in 2017.</li> <li>- No sources of river herring loss listed.</li> <li>- No age or length frequency, sex ratio, degree of repeat spawning, or annual mortality rate provided for river herring.</li> </ul>
<p><b>NEW YORK</b></p>	<ul style="list-style-type: none"> <li>- A subsample of scales were aged, and ages of remaining samples were generated using age-length key.</li> <li>- Aging shad is a high priority in future, with effort going to aging 2003-2015 samples.</li> <li>- 7,575 pounds of river herring harvest landed in Hudson River.</li> <li>- American shad spawning stock survey sex ratio was 55:45 (M:F)</li> <li>- YOY index for American Shad was 3.02. 2017 marks the third consecutive year below the recruitment failure limit. The 2017 blueback herring YOY index continues a slightly declining trend while the Hudson Alewife index is variable, but increasing.</li> </ul>	<ul style="list-style-type: none"> <li>- No data collected, shad fishery remains closed.</li> </ul>	<ul style="list-style-type: none"> <li>- No data for commercial or recreational “other loss” of river herring is available.</li> <li>- No river herring recreational creel survey conducted in 2017.</li> </ul>
<p><b>NEW JERSEY</b></p>	<ul style="list-style-type: none"> <li>- American shad mean CPUE for the Ocean Trawl Survey were down significantly in 2017 (0.18) as compared to 2016 (1.72).</li> <li>- The COOP report, submitted by Delaware, contains NJ’s data from the Delaware River.</li> </ul>	<ul style="list-style-type: none"> <li>- No sturgeon were reported as bycatch in the 2017 coastal fishery.</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>

**Table 6. Summary of PRT Review of 2017 State Compliance Reports.**

<p><b>PENNSYLVANIA</b></p>	<ul style="list-style-type: none"> <li>- No commercial or recreational harvest of American Shad is permitted within the Susquehanna River basin. Commercial harvest of hickory shad, alewife and blueback herring is prohibited in any state water, and recreational harvest of river herring was prohibited in 2017.</li> <li>- In general, spawning stock showed a 1:0.7 (M:F) sex ratio, and slight increases in mean total length and mean age over 2016.</li> <li>- 89% of recovered juvenile American Shad in 2016 were found to be of hatchery origin.</li> <li>- No juvenile Hickory Shad, Blueback Herring or Alewife collected in haul seine efforts from 2002 to 2017. Haul seining for juvenile indices only carried out at one of the two sites in 2017 due to a reduction in operating budget and the realigning of grant funds.</li> <li>- No Hickory Shad or Blueback Herring available for collection at the West Fish Lift at Conowingo Dam.</li> </ul>	<ul style="list-style-type: none"> <li>- No sturgeon have been reported using the fish passage structures on the Susquehanna River.</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>
<p><b>DELAWARE COOP</b></p>	<ul style="list-style-type: none"> <li>- ASMFC approved a new SFMP for Delaware River Basin in 2017.</li> <li>- Commercial landings in Delaware Bay/Estuary declined in 2017 as compared to 2016.</li> <li>- Lewis Haul Seine completed 93rd year of sampling; 2017 was 9th highest in CPUE since survey began in 1925</li> <li>- No estimation of recreational angler use/harvest for shad in Delaware Basin in 2017.</li> <li>- YOY relative abundance in NJ’s upper tidal beach seine survey (14.35 shad/haul) was 4th highest since survey began in 1980.</li> <li>- The COOP continued the YOY shad beach seine survey in non-tidal reaches of Delaware River, but did move to a GLM index value for the primary 3 sampling sites.</li> <li>- Electrofishing efforts in Lehigh River improved, ranking 3rd overall since survey began in 1996.</li> <li>- Review of 2017 SFMP’s five indices and benchmarks suggest 2017 results are within acceptable levels.</li> </ul>	<ul style="list-style-type: none"> <li>- Four Atlantic sturgeon were reported as bycatch in Delaware Bay in 2017.</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>
<p><b>DELAWARE (NANTICOKE)</b></p>	<ul style="list-style-type: none"> <li>- 37 YOY shad collected in Nanticoke River haul seine efforts, a slight decrease from 2016 (33).</li> <li>- Electrofishing CPUEs increased (37.3) from 2016 (27.0).</li> <li>- The percentage of six year old female shad increased from 2016.</li> <li>- An estimated 1.3 million American shad fry were stocked in Nanticoke River tributaries.</li> </ul>	<ul style="list-style-type: none"> <li>- No voluntary or anecdotal reports of Atlantic sturgeon reported as bycatch in Nanticoke River in 2017</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>



**Table 6. Summary of PRT Review of 2017 State Compliance Reports.**

<p><b>MARYLAND</b></p>	<ul style="list-style-type: none"> <li>- Abundance estimates in Susquehanna River (both creel survey and logbook data) were similar to 2016, with both years still below values seen in early 2000s.</li> <li>- For the first time since 2009, no late juveniles were stocked.</li> <li>- Above average adult shad abundance estimates in Potomac River</li> </ul>	<ul style="list-style-type: none"> <li>- No sturgeon reported taken since the fishery closed in 2005.</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>
<p><b>DISTRICT OF COLUMBIA</b></p>	<ul style="list-style-type: none"> <li>- No marked American shad fry released in 2017.</li> </ul>	<ul style="list-style-type: none"> <li>- No sturgeon reported captured in 2017.</li> </ul>	<ul style="list-style-type: none"> <li>- DOEE has no direct estimate of any other losses occurring in any of the shad and river herring fisheries in the District of Columbia.</li> <li>- No ages calculated to conduct mortality or survival estimates.</li> </ul>
<p><b>POTOMAC RIVER FISHERIES COMMISSION</b></p>	<ul style="list-style-type: none"> <li>- Closed to the direct harvest of American shad since March, 1982.</li> <li>- American Shad restoration target for the Potomac River (31.1) was exceeded for the seventh year in a row (44.6 in 2017).</li> <li>- The YOY geometric mean index for American shad decreased slightly from 3.84 in 2016 to 3.79 in 2017. The alewife index stayed at zero; the blueback herring index increased to 0.63.</li> <li>- 77% of the bycatch landings were classified as “roe shad”</li> <li>- USFWS collected and kept 2,412 American shad for the Van Dyke Hatchery program; Maryland DNR kept an additional 1,677 American shad for broodstock.</li> </ul>	<ul style="list-style-type: none"> <li>- No Atlantic sturgeon were reported captured in the Potomac River in 2017.</li> </ul>	<ul style="list-style-type: none"> <li>- No length or age information provided for the American shad bycatch fishery.</li> <li>- Variances for juvenile indices are not provided. Available in the Maryland report.</li> </ul>
<p><b>VIRGINIA</b></p>	<ul style="list-style-type: none"> <li>- Fisheries independent data collection continued on the Chickahominy River in 2017 to address data limitations for adult spawning stock and juvenile abundance.</li> <li>- A monitoring program was started on the Rappahannock River to track adult spawning abundance using staked gillnets.</li> <li>- Biological data was collected from area pound nets in the Chesapeake Bay and Rappahannock River to track biological metrics.</li> <li>- For the past two years the number of gill net trips permitted to keep American Shad bycatch has increased.</li> </ul>	<ul style="list-style-type: none"> <li>- One Atlantic Sturgeon was caught in the York River.</li> </ul>	<ul style="list-style-type: none"> <li>- Age composition not reported for river herring bycatch monitoring from pound nets in upper western Chesapeake Bay Scientific permit collections.</li> <li>- Number of gill net trips permitted to keep American Shad bycatch has increased for past 2 years (Page 3, Sec b.) Table 5 does not provide the same information.</li> </ul>

**Table 6. Summary of PRT Review of 2017 State Compliance Reports.**

<p><b>NORTH CAROLINA</b></p>	<ul style="list-style-type: none"> <li>- Seasonal reductions in the American Shad commercial fishing season in Albemarle Sound continued because of triggers met in the SFMP in 2014.</li> <li>- American shad landings were approximately 30% higher than 2016.</li> <li>- The JAI for blueback herring (3.75) was above 2016, the only year in the time series where no blueback herring were caught. The alewife JAI (0.84) was above 2016 (.38) but below the time series average (~2.50).</li> <li>- Age analysis for 2016 river herring were not included in the 2016 compliance report due to staff turnover and prioritizing aging for the 2017 River Herring Stock Assessment Update. Thus, age analysis for both 2016 and 2017 is included in this report.</li> <li>- A total of 456 and 523 (225 and 243 aged) blueback herring samples, and 773 and 1,337 (310 and 346 aged) alewife samples were obtained from four contracted Chowan River pound net fishermen in 2016 and 2017 respectively.</li> <li>- A total of 73,675 pounds of hickory shad were harvested, a 25% decrease in pounds landed as compared to 2016.</li> </ul>	<ul style="list-style-type: none"> <li>- 72 Atlantic sturgeon observed or reported from Albemarle Sound: 30 via DMF observer data (all released alive), and 42 via DMF IGNS (2 fatalities).</li> <li>- 9 Atlantic sturgeon reported captured via onboard observers within the Pamlico Sound, Pamlico, Neuse and Cape Fear River Areas.</li> <li>- In the Cape Fear River, DMF observers recorded 0 Atlantic sturgeon interactions. DMF IGNS captured one Atlantic sturgeon, released alive.</li> <li>- Observer trips the Pamlico and Neuse rivers recorded 4 Atlantic sturgeon.</li> <li>- DMF IGNS captured 5 Atlantic sturgeon in the Pamlico Sound, Pamlico, Pungo, and Neuse Rivers, all released alive.</li> </ul>	<ul style="list-style-type: none"> <li>- Due to budgetary constraints Recreation Commercial Gear License harvest data has not been collected since 2008.</li> </ul>
<p><b>SOUTH CAROLINA</b></p>	<ul style="list-style-type: none"> <li>- No management actions were triggered due to any benchmark exceedances during the 2017 fishing year.</li> <li>- Total estimated commercial landings of American shad reported through NMFS was 183,162 pounds (100% in-river).</li> <li>- Observed sex ratios for American shad for the Santee River was 2.1 females per male and 1.3 females per male for the Waccamaw. The female-skewed sample ratios are most likely due to the marketability of females vs. males.</li> <li>- The sustainability benchmark of 0.050 for blueback herring in the Santee Cooper was not exceeded in 2017 (<math>u = 0.030</math>).</li> <li>- The 3 year running average harvest blueback herring on the Pee Dee River (547 kg) did not exceed the benchmark (1,000 kg).</li> </ul>	<ul style="list-style-type: none"> <li>- Atlantic sturgeon: 66 total from Carolina DPS.</li> <li>- Shortnose sturgeon: 30 total. 19 from the Santee River and 11 from Winyah Bay.</li> </ul>	<ul style="list-style-type: none"> <li>- None</li> </ul>

**Table 6. Summary of PRT Review of 2017 State Compliance Reports.**

<p><b>GEORGIA</b></p>	<ul style="list-style-type: none"> <li>- Commercial American shad landings were 41,009 pounds on the Altamaha and 3,958 pounds on the Savannah River.</li> <li>- The population estimate of American shad in the Altamaha River in 2017 was 236,080 shad, a 6% increase from 2016.</li> <li>- The male:female sex ratio of American shad harvested was 1:5.8 from the Altamaha River; 1:12.3 for the Savannah River.</li> <li>- The 5 year running average CPUE for the Savannah River in 2017 (36.62) was above the sustainability benchmark (25.5).</li> <li>- Geometric means of YOY sampling decreased for all three rivers.</li> <li>- Savannah River American shad electrofishing catch rate decreased 45% from 2016 rate.</li> </ul>	<ul style="list-style-type: none"> <li>- On 24 trips on the Altamaha, GADNR observed incidental capture of 1 Atlantic and 2 shortnose sturgeon.</li> <li>- Shad fishermen reported 10 Atlantic and 14 shortnose sturgeon captured on the Altamaha.</li> <li>- Zero sturgeon captures were observed or reported for the Savannah River.</li> </ul>	<ul style="list-style-type: none"> <li>- Did not collect age data for the Savannah River in 2017 but will resume doing so in 2018.</li> </ul>
<p><b>FLORIDA</b></p>	<ul style="list-style-type: none"> <li>- No commercial fishery exists for shad or river herring.</li> <li>- There is no recreational harvest of river herring.</li> <li>- Total estimated American shad catch was 879 fish in Mullet Creel area and 589 in Puzzle Lake Creel area. The Puzzle Lake Creel survey documented a 75% decrease in American shad harvest from 2016. 2017 was an exceptionally dry year and Florida’s biologist suggests the lack of access to traditional American shad fishing grounds accounts for this substantial decline in catch.</li> <li>- 314 American shad and 27 blueback herring were caught during ninety electrofishing transects on the St. Johns River. These numbers represent significant decreases from 2016 but exceptionally low water in the sampling area required the use of an airboat with assumed reduction in sampling gear efficiency.</li> <li>- The YOY index in the St. Johns River was the highest in the time series (74.21).</li> </ul>	<ul style="list-style-type: none"> <li>- No netting is allowed for shad, so no sturgeon bycatch is expected.</li> </ul>	<ul style="list-style-type: none"> <li>- None. Biological data was not provided in the report, but in a separate spreadsheet.</li> </ul>