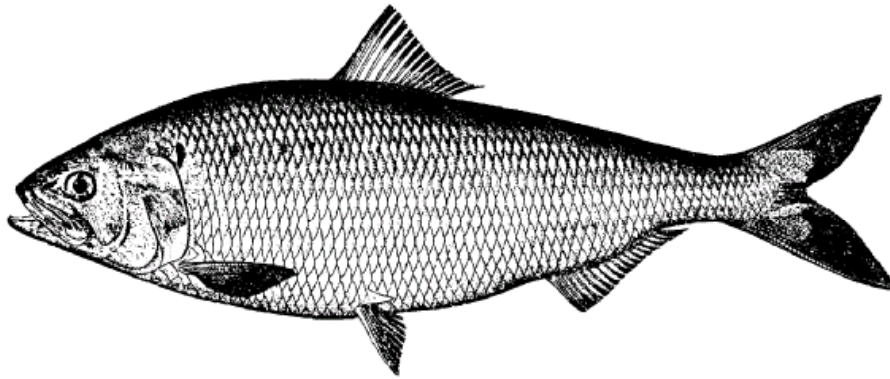


REVIEW OF THE
INTERSTATE FISHERY MANAGEMENT PLAN FOR
SHAD AND RIVER HERRING
(*Alosa sp.*)
2001 FISHING YEAR



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Prepared by

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REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN FOR THE AMERICAN SHAD AND RIVER HERRING (*Alosa sp.*) FOR 2001

I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	October, 1985
<u>Amendments:</u>	Amendment I (April 1999)
<u>Addenda:</u>	Technical Addendum #1 (February 9, 2000)
<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
<u>Active Boards/Committees:</u>	Shad & River Herring Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Plan Review Team

In 1994, the Plan Review Team and the Management Board determined that the original 1985 Fishery Management Plan (FMP) was no longer adequate for protecting or restoring the remaining shad and river herring stocks. As a result, Amendment I was adopted in October 1998 (completed April 1999).¹ Amendment I focuses on American shad regulations and monitoring programs, but also requires States to initiate fishery-dependent monitoring programs for river herring and hickory shad in addition to current fishery-independent programs. Such monitoring programs will seek to improve data collection and stock assessment capabilities. Furthermore, Amendment I contains specific measures to control exploitation of American shad populations while maintaining the status quo in the other Alosine fisheries. The amended goal of the FMP is to protect, enhance, and restore East Coast migratory spawning stocks of American Shad, hickory shad, and river herrings in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass. The Plan further specifies four (4) management objectives as follows:

- 1) Prevent overfishing of American shad stocks by constraining fishing mortality below F_{30} ,
- 2) Develop definitions of stock restoration, determine appropriate target mortality rates and specify rebuilding schedules for American shad populations within the management unit,
- 3) Maintain existing or more conservative regulations for hickory shad and river herring fisheries until new stock assessments suggest changes are necessary, and
- 4) Promote improvements in degraded or historic alosine habitat throughout the species' range.

¹ ASMFC, 1999. Amendment I to the Interstate Fishery Management Plan for Shad & River Herring. April, 1999. Washington, D.C. 76 pp.

In the fall of 1999, the Technical Committee reviewed both state annual reports and fishing recovery plans. In doing so, the Technical Committee compiled a report, which identified a number of technical errors that required correction and/or clarification to Tables 2 and 3 of Amendment I. Upon review by the Shad and River Herring Management Board, the Board concurred with the Technical Committee's report and suggested that a technical addendum be developed to address modifications to the states' fishery dependent and independent monitoring program for American shad.

II. Status of the Stocks

While the FMP addresses four species including American shad, Hickory shad, Alewife, and Blueback herring, lack of comprehensive and accurate commercial and recreational fishery data for the latter three species make it difficult to ascertain the status of these stocks. A stock assessment for American shad was completed in 1997 and submitted for peer review in early 1998 based on new information and Management Board recommended terms of reference. The 1998 assessment estimated fishing mortality rates for nine shad stocks and general trends in abundance for 13 shad stocks. The next stock assessment update to be externally peer reviewed is scheduled for 2003.

III. Status of the Fisheries

American shad, hickory shad, and river herring formerly supported important commercial and recreational fisheries throughout their range. Fisheries are executed in rivers, estuaries, and oceans. Although recreational harvest data are scarce, most harvest is believed to come from the commercial industry. Commercial landings for all these species have declined dramatically from historic highs. Following is a summary of fisheries by species:

AMERICAN SHAD:

Total combined river and ocean commercial landings decreased from a high a 2,364,263 pounds in 1985 to a low of 1,390,512 pounds in 1999, but increased in 2000 to 1,816,979 pounds (Table 1). Total commercial landings in 2001 were 1,587,007 pounds (Table 1). Combined landings from New York, New Jersey, Delaware, Virginia, North Carolina and South Carolina accounted for 88% of the commercial harvest in 2001. No directed shad harvest was reported for Maine, New Hampshire, Massachusetts, Pennsylvania, District of Columbia, or Florida.

Shad landings from ocean waters (directed and incidental) in 2001 were higher than those in 2000, comprising 715,418 pounds, or about 45% of the coastwide total. Only five states – RI, NJ, DE, VA, and SC - harvested ninety-two percent of the ocean landings.

Substantial shad sport fisheries occur at least on the Connecticut (CT and MA), the Hudson (NY), the Delaware (NY, PA and NJ), the Santee and Cooper (SC), Savannah (GA), and the St. Johns (FL) River. Shad sport fisheries are also pursued on several other rivers in MA, NC, SC, GA, and VA. In 2001, recreational creel limits ranged from zero (RI, PA-Susquehanna, DE, MD, VA, DC) to 10 fish per day (NC, SC, FL). The exception to this is the Santee River in SC, which is permitted to have a 20 fish per day creel limit due to the approval of a conservation

equivalency in 2000. Tens of thousands of shad are angled from large East Coast rivers each year but detailed creel surveys are generally not available. Actual harvest (catch and keep) may amount to only about 20-40% of total catch but hooking mortality could boost this “harvest” value substantially. Several comprehensive angler use and harvest surveys are planned.

Table 1. Reported Commercial Landings (lbs.) of American Shad in 2001 (includes EEZ and incidental catch)².

State	River/Bay	Ocean	Totals
ME ³	0	476	476
NH	0	1,254	1,254
MA ³	0	1,051	1,051
RI	0	67,854	67,854
CT ⁴	56,483	189	56,672
NY	101,405	31,245	132,650
NJ	96,138	174,018	270,156
DE	202,098	83,775	285,873
PA	0	0	0
PRFC	4,977	0	4,977
DC	0	0	0
MD ⁵	0	8,871	8,871
VA ⁶	0	242,381	242,381
NC	139,246	11,839	151,085
SC	215,198	92,465	307,663
GA	56,044	0	56,044
FL	0	0	0
Totals	871,589	715,418	1,587,007
Percent	55%	45%	

In 2001, MRFSS⁷ reported that Maine caught 1,661 American shad, of which 0 were harvested. Rhode Island also reported a catch of 20,998 fish but harvested 0 fish. MRFSS also reported the following: Massachusetts harvest 1,326 fish (total catch was 3,405), New York harvested 18,185 fish (total catch was 46,068), New Jersey harvested 14,383 fish, and Maryland harvested 1,226 fish (total catch was 41,859). A creel survey was conducted on the Roanoke River in North Carolina in 2001. American Shad harvest during the creel survey was 0 and fewer than 10 fish were reported as caught and released. A creel survey of the Cooper River in South Carolina reported a total catch of 5,915 fish. Of this total, approximately 27% of the catch (1,597 fish) was released. Florida completed a creel survey of the St. Johns River recreational shad fishery in

² Unless indicated otherwise, the landings used in this table comes from the 2001 Annual State Reports.

³ Landings reported from the NMFS commercial fisheries database, preliminary data from 2001.

⁴ Connecticut reports 56,483 lbs of American shad harvested from the Connecticut River and 189 lbs of American shad caught as bycatch in Long Island Sound. NMFS reports 59,234 lbs of American shad landed in the state of Connecticut.

⁵ Although Maryland reports a total of 8,871 lbs of American shad landed in 2001, NMFS reports 57,381 lbs of American Shad landed in the state of Maryland.

⁶ Virginia reports 242,381 lbs of American shad landed in the ocean fishery, whereas NMFS reports 252,442 lbs of American shad landed in Virginia’s ocean fishery.

⁷ MRFSS Data for American Shad is uncertain. The proportional standard errors (PSEs) for Maine, Maryland, Massachusetts, New Jersey, New York, and Rhode Island are 59, 46.5, 52.7, 64.1, 49.8, and 59.8 respectively.

2001. Florida reported 2,832 shad caught (harvest unknown) in the St. Johns river recreational fishery.

HICKORY SHAD:

Georgia, Maryland, New York, North Carolina, and Virginia all reported hickory shad commercial landings in 2001. North Carolina reported the highest landings with 172,239 pounds including 6,968 pounds from offshore. In 2001, the coastwide commercial landings for hickory shad were 198,479 pounds. This is an increase from the 2000 total preliminary landings of 111,105 pounds.

MRFSS⁸ indicates that in 2001 the recreational harvest of hickory shad was 34,904 fish which represents a substantial increase from 2000 (5,304 fish). The MRFSS report indicates that hickory shad were harvested from the state waters of Connecticut, Delaware, New Jersey, New York, and North Carolina.

RIVER HERRING (BLUEBACK/ALEWIFE COMBINED):

Commercial landings of river herring declined 90% from over 13 million pounds in 1985 to about 1.33 million pounds in 1998. In 2001, six states reported total herring commercial landings of 1,528,417 pounds, mostly from Maine, Maryland, and North Carolina.

According to MRFSS⁹, 2001 recreational harvest was 138,636 fish, or 69,297 pounds, which represents a decrease in number of fish from 2000 (264,990) and in the weight from 2000 (84,074 pounds). Harvest from Rhode Island and Maine accounted for 86% of the recreational harvest in 2001. While data on the recreational fishery for river herring is sparse, catch and release recreational fisheries have been reported to take place in New Hampshire, Massachusetts, Rhode Island, Connecticut, Delaware, Maryland, DC, and Virginia.

IV. Status of Research and Monitoring

Under Amendment I (April 1999), fishery-independent and fishery-dependent monitoring programs are now mandatory for American shad. Juvenile abundance index (JAI) surveys, annual spawning stock surveys, and hatchery evaluations are required for states/jurisdictions specified in the fishery management plan. In addition, Amendment I recommends that JAIs for other alosine species be reported when possible. In February 2000, the Shad Management Board indefinitely deferred the ocean-tagging requirement stipulated by Amendment I, which was to begin in the year 2000 to analyze the mixed stock contribution to ocean landings coastwide.

All States are required to calculate mortality and/or survival estimates, while monitoring and reporting 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 each year.

⁸ MRFSS data for Hickory Shad is uncertain. The proportional standard error for New York during 2001 is 100. The PSEs for Connecticut, Delaware, New Jersey, and North Carolina are 49, 45.6, 47.1, and 44.8 respectively.

⁶ MRFSS data for River Herring is uncertain. The proportional standard errors (PSEs) for Maine, New Hampshire, Massachusetts, Rhode Island, New York, and Maryland are 68.1, 100, 77.7, 71.7, 76.5, and 99.8 respectively.

Portions of this report were taken from 2001 State annual reports, the ASMFC FMP for Shad and River Herring, the ASMFC report *American shad and Atlantic Sturgeon Stock Assessment Peer Review: Terms of Reference and Advisory Report*

In addition, States were required to submit State recovery/fishing plans by July 1, 1999. All States plans to implement Amendment I were approved by January 1, 2000.

In addition to the mandatory monitoring requirements stipulated under Amendment I, some states/jurisdictions continue important research initiatives for these species. For example, Maine, Pennsylvania, Delaware, New Jersey, Maryland, Virginia, North Carolina and USFWS are actively involved in shad restoration using hatchery-cultured fry and fingerlings. All hatchery fish are marked with multiple oxytetracycline marks on otoliths to allow future distinction from wild fish. During 2001, several jurisdictions from Maine to North Carolina (including USFWS) reared larval and fingerling American shad, stocking a total of 35,259,954 in 16 drainages (Table 2). Also, Maryland DNR reared and stock 5.1 million hickory shad into three Maryland rivers.

Table 2. Stocking of Cultured American and Hickory Shad in 2001.

Jurisdiction	Rivers	No. Stocked	Notes
Maine	Kennebec	1,496,584	
	Androscoggin	308,596	
	Sebasticook	618,879	
	Saco	313,560	
	Total	2,737,619	
Pennsylvania	Susquehanna	5,510,184	
	Schuylkill	490,901	
	Lehigh	675,625	
	Total	6,676,710	
Delaware	Nanticoke	89,376	(from Pennsylvania & Maryland)
New Jersey	Raritan	105,410	(from Pennsylvania)
Maryland	Potomac	3,333,773	(from USFWS)
	Choptank	47,500	(DNR -- + 1,178,674 hickory)
	Patuxent	478,591	(DNR -- + 1,454,514 hickory)
	Nanticoke		(DNR -- + 2,460,068 hickory)
	Total	3,844,673	5,093,256 hickory shad
Virginia	James	9,264,468	(from VA & USFWS)
	York	10,472,698	(from VA, USFWS, Pamunkey, & Mattaponi tribes)
	Total	19,737,166	
North Carolina	Roanoke	2,069,000	
TOTALS		35,259,954	

Portions of this report were taken from 2001 State annual reports, the ASMFC FMP for Shad and River Herring, the ASMFC report *American shad and Atlantic Sturgeon Stock Assessment Peer Review: Terms of Reference and Advisory Report*

TABLE 3. American Shad Fish Passage Counts at Select Dams – 2001.

State	River	Site	Number of American Shad	Trend
Maine	Androscoggin	Brunswick	26	Decrease
	Saco	Head-of-tide	2,570	Increase
New Hampshire	Exeter		42	Decrease
	Lamprey		6	Stable
Massachusetts	Merrimack	Essex Dam	76,717	Increase
	Connecticut	Holyoke	273,220	Increase
Rhode Island	Pawcatuck	Potter Hill	774	Increase
Pennsylvania	Lehigh	Easton	4,740	Increase
		Chain	2,057	Increase
Maryland/PA	Susquehanna	Conowingo	204,514	Increase
South Carolina	Santee	St. Stephens	165,875	Decrease

V. Status of Management Measures

All state programs must implement commercial and recreational management measures or an alternative program as approved by the Management Board. The current status of each state's compliance with these measures is provided in Section VII of this report (See Table 4).

As noted in Section I, the Management Board determined that the original Plan and its lack of mandatory measures were insufficient for protecting and restoring Alosid stocks along the East Coast. Accordingly, the 1985 fishery management plan was amended in 1999. The Plan Development Team developed Amendment I to expedite recovery of American shad populations and maintain current regulations in the hickory shad and river herring fisheries.

After careful consideration of stock assessment results, peer reviewers' comments, and public opinion, the Management Board voted to address "inriver" or estuarine American shad fisheries differently than oceanic intercept fisheries. Specifically, the Board decided to require states to submit in-river shad restoration plans for stocks under their jurisdiction. For those 7 river systems evaluated in the 1998 stock assessment (Connecticut R., Hudson R., Delaware R., Upper Chesapeake Bay MD, Edisto R., Santee R., and Altamaha R.), states could continue current regulations since overfishing was not detected for those respective stocks. States/jurisdictions must maintain a fishing mortality level at or below F_{30} . Also, reporting of catch and effort data for all Alosine fisheries is now mandatory under Amendment I.

In addition, the Management Board voted to phase out all ocean intercept fisheries for American shad within 5 years of Amendment I implementation. States must comply with a 40% reduction in effort within the ocean intercept fishery by December 31, 2002. States with non-directed harvest of American shad in ocean fisheries can permit the landing of shad bycatch, provided that American shad do not constitute more than 5% of the total landings (in pounds) per trip.

For recreational fisheries, the states voted to implement a 10 fish combined daily creel limit for American and hickory shad. In 2000, South Carolina was found to be out of compliance due to a

lack of creel limits on shad. In October of 2000, the Board approved a 10 fish/day creel limit (combined American and hickory shad) for all waters of South Carolina except the Santee River which will have a 20 fish combined daily limit. Existing or more conservative recreational/personal use regulations for river herring will be maintained under Amendment I.

In addition, the states are required to submit annual reports on harvest and certain required fishery-independent/dependent monitoring programs. Implementation of these programs and reporting schedules is intended to improve future assessments of Alosine populations and permit adaptive management of fisheries as stock recovery is documented.

On February 19th, 2002, the Shad and River Herring Plan Review Team and Technical Committee recommended several changes to both Amendment I and Technical Addendum #1. The Shad and River Herring Management Board approved the changes and directed Commission staff to develop an addendum to both Amendment I and Technical Addendum #1. The proposed changes in Addendum I supersedes the requirements described in Technical Addendum #1. Addendum I changes the conditions for marking hatchery-reared alosines. The addendum clarifies the definition and intent of *de minimis* status for the American shad fishery. It also further modifies and clarifies the fishery-independent and fishery-dependent monitoring requirements in Table 2 and 3 of Technical Addendum #1. These measures will be effective upon approval by the Shad and River Herring Management Board in August of 2002.

VI. Prioritized Research Needs

1. Continue to assess current aging techniques for American shad and river herring, using known age fish, scales, otoliths, and spawning marks. Conduct bi-annual aging workshops to maintain consistency and accuracy of aging fish sampled in state programs.
2. Determine and update biological benchmarks used in assessment modeling (fecundity at age, mean weight at age for both sexes, partial recruitment vector/maturity schedules) for American shad and river herring stocks in a variety of coastal river systems, including both semelparous and iteroparous stocks.
3. Validate the different values of M for shad stocks through verification of shad aging techniques and repeat spawning information and develop methods for calculating M.
4. Determine which stocks are impacted by mixed stock fisheries (including bycatch fisheries). Methods to be considered could include otolith microchemistry, oxy-tetracycline otolith marking and/or tagging.
5. Investigate the relation between juvenile production and subsequent year class strength in American shad with emphasis on the validity of juvenile abundance indices, rates and sources of immature mortality, migratory behavior of juveniles, natural history and ecology of juveniles, and essential nursery habitat in the first few years of life.
6. Identify ways to improve fish passage efficiency using hydroacoustics to repel alosids or pheromones or other chemical substances to attract them. Test commercially available acoustic equipment at existing fish passage facility to determine effectiveness. Develop methods to isolate/manufacture pheromones or other alosid attractants.
7. Develop effective culture and marking techniques for river herring.
8. Develop and implement techniques to determine shad and herring population targets for tributaries undergoing restoration (dam removals, fishways, supplemental stocking, etc.).

9. Evaluate and ultimately validate large-scale hydroacoustic methods to quantify American shad escapement (spawning run numbers) in major river systems. Identify how shad respond (attract/repelled) by various hydroacoustic signals.
10. Refine techniques for hormone induced tank spawning of American shad. Secure adequate eggs for culture programs using native broodstock.
11. Characterize tributary habitat quality and quantity for *Alosa* reintroductions and fish passage development.
12. Identify and quantify potential American shad spawning and rearing habitat not presently utilized and conduct an analysis of the cost of recovery.
13. Develop comprehensive angler use and harvest survey techniques for use by Atlantic states to assess recreational fisheries for American shad.
14. Determine the effects of passage impediments on all life history stages of shad and river herring, conduct turbine mortality studies and downstream passage studies.
15. Evaluate additional sources of mortality for shad, including bait and reduction fisheries.
16. Conduct studies on energetics of feeding and spawning migrations of shad on the Atlantic coast.
17. Encourage university research on hickory shad.
18. Conduct studies of egg and larval survival and development.
19. Conduct and evaluate historical characterization of socio-economic development (potential pollutant sources and habitat modification) of selected shad rivers along the east coast.
20. Review studies dealing with the effects of acid deposition on anadromous alosids.
21. Conduct population assessments on river herrings - particularly needed in the south.
22. Quantify fishing mortality (in-river, ocean bycatch, bait fisheries) for major river stocks after ocean closure of directed fisheries.
23. Suggest hard limits and range levels for water quality deemed appropriate and defensible for all alosids.
24. Development of appropriate Habitat Suitability Index Models for alosid species in the fishery management plan. Possibly consider expansion of species of importance or go with the most protective criteria for the most susceptible species.

VII. Current State-by-State Implementation of Compliance Requirements

In 2001, all states were in compliance with Amendment I and Technical Addendum #1 to the Shad and River Herring Fishery Management Plan (See Attached Table 4). New Hampshire continues to meet the standards for *de minimis* status in both the commercial and recreational American shad fisheries. Maine and Massachusetts also continue to meet the standards for commercial *de minimis* status as defined in Amendment I. Their landings for 2001 were less than 1% of coastwide commercial or recreational landings.

VIII. Recommendations of Plan Review Team

1. Several of the states did not report all of the monitoring requirements listed under Amendment I and Technical Addendum #1. The states should take note of the required monitoring programs that were not reported and make concerted effort to report all monitoring programs in forthcoming annual reports. The unreported information can be found in the "Review of State Reports for 2001".

2. The PRT is concerned about the level of detail in several of the state reports for American shad ocean bycatch. As the ocean fishery is phased out over the next few years, ocean bycatch will become a greater source of mortality along the eastern coast. States need to monitor and report on the American shad ocean bycatch in the manner described in Amendment I to the Shad & River Herring Fishery Management Plan. The amendment requires that “states permitting the landing of American shad bycatch must annually document that the 5% trip limit is not exceeded, report the extent and nature of the non-directed fisheries, and total landings of American shad bycatch. There were several states that did not document that the American shad bycatch did not exceed 5% of the total landings (in pounds) per trip. Also, states with an ocean bycatch must subsample the bycatch for size, age, and sex distribution, unless the state qualifies for *de minimis* status. Three of the five states with ocean bycatch have *de minimis* status for the commercial fishery and are exempted from subsampling the bycatch.
3. Rhode Island, New Jersey, Delaware, Maryland, Virginia, North Carolina, and South Carolina all have an ocean-intercept commercial fishery for American shad. As required, each state submitted a proposal for a 40% reduction in effort by December 31, 2002. Some of the states were unable to propose how the state will implement the 100% reduction in effort by December 31, 2004.
4. Amendment I requires each state report to include a harvest and losses table. Many of the state reports omitted this table from their report. Please refer to Amendment I, Table 10 “Format Required for Annual State Report”.
 1. Harvest and losses
 - D. Table 1. Harvest and Loss – including all above estimates in numbers and weight (pounds) of fish and mean weight per fish for each gear type”.