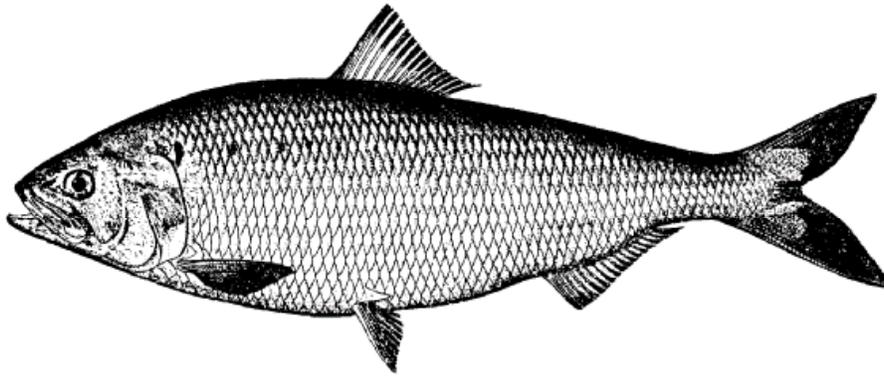


2001 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR
SHAD AND RIVER HERRING
(Alosa sp.)



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Prepared by

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

I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	October, 1985
<u>Amendments:</u>	Amendment 1 (October 1998)
<u>Management Unit:</u>	Migratory stocks of American shad, Hickory shad, Alewife, and Blueback 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 1 was adopted in October 1998 (completed April 1999).¹ Amendment 1 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 1 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 1 to the Interstate Fishery Management Plan for Shad & River Herring. April, 1999. Washington, D.C. 76 pp.

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). Combined landings from Connecticut, New York, New Jersey, Delaware, Virginia, North Carolina and South Carolina accounted for 95% of the commercial harvest in 2000, with 44% coming from the Carolinas. 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 2000 were similar to 1999 comprising 685,045 pounds, or about 38% of the coastwide total. Ninety percent of ocean landings were reported by only five states - NJ, DE, VA, NC, and SC.

Substantial shad sport fisheries occur at least on the Connecticut (CT and MA), the Hudson (NY), the Delaware (PA and NJ), the lower Susquehanna (MD), the Cooper (SC), the Savannah (SC/GA), and the St. Johns (FL). Shad sport fisheries are also pursued on several rivers in MA, NC and VA. In 2000, recreational creel limits ranged from zero (RI, PA-Susquehanna, MD, VA, DC) to 10 fish per day. The exception in 2000 being South Carolina, which was found out-of-compliance with no limits. After South Carolina submitted a conservation equivalency plan, the Board found South Carolina in compliance during October of 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.

In 2000, Connecticut reported 2,358 American shad caught of which 967 (41%) were harvested (but all were presumed dead). Delaware Basin states estimated the sport harvest of shad in 2000 as 15,000 fish. Their partial creel survey showed a catch rate of 3.76 shad per trip in 2000 compared to 1.05 in 1995. The 1995 creel survey on the Delaware reported 83,141 shad caught and 16,387 fish kept (20%). Maryland and VA allow no sport harvest of shad but report substantial fishing activity in major rivers, especially the lower Susquehanna. South Carolina surveyed the Cooper River fishery in 2000 and reported a catch of 7,253 shad of which about 6,100 (84%) were harvested. Florida reported 8,814 shad caught (harvest unknown) in the St Johns River sport fishery in only a 6-mile stretch of river.

Table 1. Reported Commercial Landings (lbs.) of American Shad in 2000 (includes EEZ and incidental catch).

State	River/Bay	Ocean	Totals
ME	0	0	0
NH	0	5,942	5,942
MA	0	268	268
RI	0	17,315	17,315
CT	160,000	500	160,500
NY	139,741	25,580	165,321
NJ	121,431	135,676	257,107
DE	51,877	119,180	171,057
PA	0	0	0
PRFC	1,508	0	1,508
DC	0	0	0
MD	0	19,337	19,337
VA	0	162,402	162,402
NC	186,980	110,907	297,887
SC	414,869	88,938	503,807
GA	53,144	0	53,144
FL	800	0	800
Totals	1,130,350	686,045	1,816,395
Percent	62%	38%	

HICKORY SHAD:

Georgia, Maryland, North Carolina, Rhode Island and Virginia all reported hickory shad commercial landings in 2000. North Carolina reported the highest landings with 92,566 pounds including 16,528 pounds from offshore. In 2000, the coastwide commercial landings for hickory shad were 111,105 pounds. This is similar to the 1999 total preliminary landings of 112,140 pounds.

MRFSS² indicates that in 2000 the recreational harvest of hickory shad was 4,932 fish which represents an 89% decrease from 1999 (44,566 fish). The MRFSS report indicates that all of this catch came from Rhode Island, however, Delaware and North Carolina separately reported an additional 5,917 hickory shad taken from their waters. Thus, at a minimum, sport catch of this species in 2000 was about 10,800 fish.

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 2000, six states reported total herring landings of 1,252,238 pounds, mostly from Maine, North and South Carolina. These data are considered incomplete, as several states did not report river herring landings for 2000.

According to MRFSS³, 2000 recreational harvest was 264,990 fish, or 84,074 pounds, which represents an increase in number of fish from 1999 (31,554 fish) and in the weight from 1999 (220 pounds). Recreational landings have increased significantly since 1999. Landings from Rhode Island accounted for 81 % of recreational landings in 2000. While data on the recreational fishery for hickory shad is sparse, catch and release recreational fisheries have been reported to take place in DC and Maryland.

IV. Status of Research and Monitoring

Under Amendment 1 (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 1 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 1, 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. In addition, States were required to submit State recovery/fishing plans by July 1, 1999. All States had their plans approved by January 1, 2000 in order to implement Amendment 1.

In addition to the mandatory monitoring requirements stipulated under Amendment 1, some states/jurisdictions continue important research initiatives for these species. For example, Maine, Pennsylvania, Maryland, Virginia, North Carolina and USFWS are actively involved in shad restoration using hatchery-cultured fry and fingerlings. All hatchery fish are marked with

² MRFSS data for Hickory Shad is uncertain. The proportional standard error for Rhode Island during 2000 is 68.8. No data was recorded for the other states along the eastern seaboard. The PSEs for Connecticut, Delaware, and Rhode Island during 1999 are 40.8, 86, and 56.3 respectively.

³ MRFSS data for River Herring is uncertain. The proportional standard errors (PSEs) for Rhode Island, New York, and Maine during 2000 are 52.9, 71.7, and 99.6 respectively. The PSE for Connecticut during 1999 is 100. No data was recorded for any other state during 1999.

multiple oxytetracycline marks on otoliths to allow future distinction from wild fish. In 2000, these jurisdictions cultured, marked and stocked a total of almost 43 million American shad and 15.5 million hickory shad (Table 2).

Table 2. Stocking of Cultured American and Hickory Shad in 2000.

Jurisdiction	Rivers	No. Stocked	Notes
Maine	Kennebec	3,375,000	
	Androscoggin	530,000	
	Sebasticook	500,000	
	Saco	259,000	
	Medomak	146,000	
Pennsylvania	Susquehanna	9,461,000	
	Schuylkill	536,000	
	Lehigh	447,000	
Delaware	Nanticoke	91,000	(from Pennsylvania)
Maryland	Potomac	3,100,000	(from USFWS)
	Choptank	360,000	(DNR - +5.63 M hickory)
	Patuxent	350,000	(DNR - +8.24 M hickory)
	Nanticoke	120,000	(DNR - +1.38 M hickory)
	fingerlings	430,000	(DNR - +220 K hickory)
Virginia	James	7,750,000	(includes USFWS)
	Chickahominy	1,160,000	
	Pamunkey	8,740,000	(includes Pamunkey Tribe)
	Mattaponi	4,500,000	(includes Mattaponi Tribe)
North Carolina	Roanoke	1,000,000	
TOTALS		42,855,000	+15,470,000 hickory shad

The success of fish passage facilities in effectively mitigating barriers to fish migration is encouraging. Table 3 illustrates the number of American shad passing select dams during 2000.

TABLE 3. American Shad Fish Passage Counts at Select Dams – 2000.

State	River	Site	Number of American Shad	Trend
Maine	Androscoggin	Brunswick	88	Stable
	Saco	Head-of-tide	1,323	Decrease
New Hampshire	Exeter		163	Increase
	Lamprey		7	
Massachusetts	Merrimack	Essex Dam	72,781	Increase
	Connecticut	Holyoke	225,042	Stable
Rhode Island	Pawcatuck	Potter Hill	608	Decrease
Pennsylvania	Lehigh	Easton	2094	Decrease
		Chain	645	Increase
Maryland/PA	Susquehanna	Conowingo	163,331	Increase
Virginia	James	Boshers Dam	375	Increase
South Carolina	Santee	St. Stephens	592,000	Increase

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 1 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 1.

In addition, the Management Board voted to phase out all ocean intercept fisheries for American shad within 5 years of Amendment 1 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 1.

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.

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 coastal intercept fisheries (including bycatch fisheries). Methods to be considered could include otolith microchemistry, oxy-tetracycline otolith marking and/or tagging.
5. Determine the stock/recruitment relationship for American shad and river herring stocks.
6. Identify pheromones or other chemical substances used by American shad to locate conspecifics. Develop methods to isolate or manufacture these chemicals and use them to attract shad into fish passage facilities to improve fish passage and efficiency.
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.

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

In 2000, except for the South Carolina creel limit noted above, all states were in compliance with Amendment #1 to the Shad and River Herring Fishery Management Plan (See Attached Table 4). During the 2000 fishing season South Carolina lacked a 10 fish recreational creel limit within all state waters, but took equivalent conservation action for 2001 and future years which was approved by the Management Board. The states of Florida, Pennsylvania, District of Columbia, Potomac River Fisheries Commission, Massachusetts, New Hampshire, and Maine meet the standards for *de minimis* as defined in Amendment #1. Their landings for 2000 were less than 1% of coastwide commercial and recreational landings. To date, only Massachusetts and New Hampshire have Board approved *de minimis* status in the Shad fishery.

VIII. Recommendations of Plan Review Team

1. All State and Federal agencies should implement the requirements and recommendations of Amendment 1 including specific concerns presented to the Management Board in the PRT report on state compliance.
2. In reviewing the fishery management plan and the state annual compliance reports, the PRT and Technical Committee are recommending several minor changes to Technical Addendum #1 and Amendment I. The specific recommendations can be found in the document entitled "Recommended Changes to Technical Addendum #1 and Amendment I."