Fishery Management Report No. 35b of the

ATLANTIC STATES MARINE FISHERIES COMMISSION

Addendum I

To Amendment 1 and Technical Addendum #1 to the Interstate Fishery Management Plan for Shad and River Herring

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Addendum I to Amendment 1 and Technical Addendum #1 to the Interstate Fishery Management Plan for Shad and River Herring

INTRODUCTION

Amendment 1 to the Interstate Fishery Management Plan (FMP) for Shad and River Herring was approved by the Commission's Shad and River Herring Management Board in April of 1999. Amendment I established a number of fishery-independent and fishery-dependent monitoring programs, as well as stocking and hatchery operations. After a decade of declining commercial landings, these programs were implemented 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 Shad and River Herring Management Board approved Technical Addendum #1 in February of 2000. Technical Addendum #1 modified several technical errors and provided clarification of several monitoring requirements in Tables 2 and 3 of Amendment I. The proposed changes in Addendum I supersedes the requirements described in Technical Addendum #1.

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. 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 and implemented by the states by **January 1, 2003**.

STATEMENT OF THE PROBLEM

Hatchery Marks **(Amendment I, *Section 3.5.1.1 and 3.5.1.3*)**

The Chesapeake Bay Program's OTC Marking Task Force petitioned the Shad and River Herring Management Board to modify the hatchery-marking program in Amendment I. The OTC Marking Task Force assigns several different combinations of unique marks to each hatchery-restoration program. These unique marks allow the programs to determine the stocking site or river of release. Some programs use the marks to determine known age fish to validate aging techniques. The unique marks were initially assigned to detect strays from other river systems and to determine the river of origin for hatchery-reared fish caught in the ocean intercept fishery, but studies have shown that straying is minimal. The OTC Marking Task Force requested the removal of wording "unique marks" from the document because there are several new shad hatchery programs and not enough unique combinations of oxytetracyclene (OTC) marks to distribute among the new and future hatchery programs. Instead, the OTC Marking Task Force recommends that the language for shad hatchery-marking program be modified to encourage "coordination between hatchery programs so that the goals of one program do not interfere with another." Hatchery marks will continue to be distributed in manner that will allow hatchery-restoration programs to determine the stocking site, river of release, and/or known age fish to validate aging techniques.

Table 10 Format Required For Annual State Report **(Amendment I, Table 10)**

Table 10 in Amendment I requires that states with an active alosine hatchery program provide a hatchery evaluation in the Annual State Report. The hatchery evaluation describes the percent wild alosines versus the percent hatchery-reared alosines (*Section 3.5.1.3, Amendment I*). Addendum I removes the specification for comparing wild to *juvenile* hatchery-reared alosines from Table 10. Removing "juveniles" from the hatchery evaluation provides states with the flexibility to screen both adults and juveniles for the hatchery mark.

***De minimis* Status** **(Amendment I, *Section 4.8*)**

Addendum I clarifies the definition of *de minimis* status. In Amendment I, *de minimis* status is based on a state's recreational OR commercial landings and exempts the state from sub-sampling the commercial fishery regardless of which fishery qualified the state for this status. This addendum eliminates recreational *de minimis* status because currently the data for total coastwide recreational landings is inaccurate and incomplete. Under Addendum I, a state can qualify for *de minimis* status based on its commercial landings and qualifies for an exemption from sub-sampling the commercial fishery.

Recovery of Visibly Marked Animals **(Technical Addendum #1, Table 2)**

Addendum I removes "Recovery of visibly marked animals" from Table 2, which summarizes the fishery independent monitoring programs. Table 2 of Technical Addendum #1 lists the recovery of visibly marked animals as a requirement for only five states, the original intent was for all states to report the recovery of visibly marked animals. Removing this requirement from Table 2 does not eliminate the obligation to make this report.

New Hampshire's Lamprey River **(Technical Addendum #1, Table 2)**

The State of New Hampshire requested the removal of the Lamprey River from Table 2 and the mandatory requirement to perform several fishery-independent monitoring programs on the Lamprey River. New Hampshire has focused its American shad restoration efforts on the Exeter River. Until the shad returns in the Lamprey River are larger, the mandatory monitoring requirements for the Lamprey River will be removed. Amendment I requires states that re-open or establish new inriver or ocean bycatch fisheries to implement the monitoring requirements described in *Section 3.3.3 of Amendment I.*

Hatchery Evaluations **(Addendum I, Table 2)**

Section 3.5.1.3 of Amendment I requires those "states with active hatchery programs for American shad or other alosines shall report annually on hatchery contributions (%wild vs. hatchery)." As new hatcheries come on line and hatchery reared alosids are released to restore river runs, all jurisdictions are required to monitor and report the hatchery contributions to those rivers. Since Technical Addendum #1, both Maine and North Carolina have implemented new hatchery programs for alosines. With the implementation of Addendum I, Maine and North Carolina are added to Table 2 and shall provide a hatchery evaluation in the Annual State Report. Any jurisdiction with a new hatchery program shall provide a hatchery evaluation in the Annual State Report, as required by Amendment I, regardless of whether or not the jurisdiction or river appears in Table 2.

Recreational Fishery Monitoring Requirements **(Technical Addendum #1, Table 3)**

Technical Addendum #1 requires both Maine and New Hampshire to monitor the recreational fisheries for American shad using catch and effort data from Marine Recreational Fishery Statistics Survey (MRFSS). Addendum I changes this requirement to "Monitoring recreational landings, catch, and effort every 5 years." The Technical Committee expressed concern regarding the coverage of MRFSS data for American shad in inland river systems. This change provides consistency between the east coast recreational fishery monitoring requirements and allows the states to choose whether MRFSS data or a recreational creel survey would more accurately describe the recreational fishery in their state.

The Technical Committee also recommended changing the recreational fishery monitoring program for Connecticut. In Technical Addendum #1, Connecticut is required to "biannually monitor recreational landings in Connecticut – age, sex ratio, and fishing effort (hours fished) until annual catch is greater than 1,000 fish." Connecticut's 2000 creel survey estimates 2,358 American shad caught in the recreational fishery. The recreational fishery monitoring requirement for Connecticut will be modified to "monitor recreational landings, catch, and effort every 5 years."

Technical Addendum #1 does not require Massachusetts to monitor the recreational fishery on the Merrimack and Connecticut Rivers, nor does Technical Addendum #1 require Washington, D.C. to monitor the recreational fishery on the Potomac River. Addendum I implements new requirements for Massachusetts and Washington D.C. to "monitor recreational landings, catch, and effort every 5 years."

CHANGES TO AMENDMENT I

The following sections replace the corresponding sections in Amendment I. Section numbers refer to the original section in Amendment I.

3.5 STOCKING AND RESTORATION

Section 3.5.1.1 Culture and Marking

Modern American shad culture techniques have been largely developed and refined since the mid-1970s by the Pennsylvania Fish and Boat Commission (PFBC) for the Susquehanna River restoration program. Using eggs stripped and fertilized from spawning adult shad on many east coast rivers (and the Columbia River), PFBC researchers developed or improved incubation and hatching techniques, first feeds and artificial diets, larval rearing densities, flow and water quality requirements, mass-marking using oxytetracycline, and handling and stocking procedures sufficient to produce 10-20 million shad larvae each year. Pennsylvania and Maryland have also refined techniques for rearing and marking fingerling shad in ponds using artificial and natural diets. One of the high costs associated with culture and stocking programs relates to collection and delivery of eggs. Large-scale programs such as those on the Susquehanna and James rivers may require 15-20 million shad eggs to produce ten million fry. Since spawners are not yet sufficiently abundant in rivers undergoing restoration, these eggs are taken and delivered nightly during spawning seasons from neighboring rivers such as the Delaware, Hudson, and Pamunkey. Strip spawning produces 10,000-30,000 eggs per female and viability averages 60-75%. Of those shad that hatch, 90% or more typically survive to stocking.

In the past few years, the Maryland Department of Natural Resources (MDNR) has successfully used tank spawning techniques for shad which were initially developed for striped bass in cooperation with the University of Maryland's Center for Marine Biotechnology. This method involves use of timed-release hormone implants in gravid fish and free-spawning in tanks over a several day period. An air-lift system delivers eggs to collection boxes for incubation on-site or delivery to distant hatcheries. With individual females providing 50,000- 100,000 eggs, high fertilization rates, and very little labor requirement, fewer adult fish are needed and costs are greatly reduced. This technique has also proven effective for hickory shad - but has thus far been unsuccessful with river herring because of the adhesive nature of their eggs.

Cultured shad larvae are typically stocked at seven to 22 days of age and carry one to several fluorescent tags on their otoliths. Marking involves a two-four hour immersion in 200 ppm oxytetracycline antibiotic and can be repeated at three-four day intervals. In addition to allowing discrimination between wild and hatchery fish, use of distinct marks has permitted analysis of relative survival or abundance based on egg source, stocking location, time of release or other parameters. Tetracycline marking is 100% effective and the tags appear to stay with the fish throughout their lives. Fish being analyzed for marks must be sacrificed for otolith removal and processing. MDNR has also had success placing binary coded wire tags in fingerling shad.

Section 3.5.1.3 Evaluation

States with active hatchery programs for American shad or other alosines shall report annually on hatchery contributions (% wild vs. hatchery). States in this category shall submit proposals for these evaluations under *Section 5.1.2.1 of Amendment I*, and provide annual reports as per Table 10 of Addendum I and *Section 5.1.2.2 of Amendment I*. States should work in cooperation with appropriate federal or regional programs to coordinate marking and ensure that marking schemes of one jurisdiction do not interfere with program goals of other jurisdictions.

TABLE 10. FORMAT REQUIRED FOR ANNUAL STATE REPORT.

I. HARVEST AND LOSSES

- A. COMMERCIAL FISHERY
  - 1. Characterization of fishery (seasons, cap, gears, regulations)
  - 2. Characterization of directed harvest for all alosines
    - a. Landings and method of estimation
    - b. Catch composition
      - i. Age frequency
      - ii. Length frequency
      - iii. Sex ratio
      - iv. Degree of repeat spawning (estimated from scale data)
    - c. Estimation of effort
  - 3. Characterization of other losses (poaching, bycatch, etc.)
    - a. Estimate and method of estimation
    - b. Estimate of composition (length and/or age)
- B. RECREATIONAL FISHERY
  - 1. Characterization of fishery (seasons, cap, regulations)
  - 2. Characterization of directed harvest
    - a. Landings and method of estimation
    - b. Catch composition
      - i. Age frequency
      - ii. Length frequency (legal and sub-legal catch)
    - c. Estimation of effort
  - 3. Characterization of other losses (poaching, hook/release mortality, etc.)
    - a. Estimate and method of estimation
    - b. Estimate of composition (length and/or age)
- C. OTHER LOSSES (FISH PASSAGE MORTALITY, DISCARDED MALES, BROOD STOCK CAPTURE, RESEARCH LOSSES, ETC.)
- D. TABLE 1. HARVEST AND LOSSES - INCLUDING ALL ABOVE ESTIMATES IN NUMBERS AND WEIGHT (POUNDS) OF FISH AND MEAN WEIGHT PER FISH FOR EACH GEAR TYPE
- E. PROTECTED SPECIES I ATLANTIC STURGEON BYCATCH ESTIMATES

II. REQUIRED FISHERY INDEPENDENT MONITORING

- A. DESCRIPTION OF REQUIREMENT AS OUTLINED IN AMENDMENT 1, TABLE 2
- B. BRIEF DESCRIPTION OF WORK PERFORMED
- C. RESULTS
  - 1. Juvenile indices
    - a. Index of abundance
    - b. Variance
  - 2. Spawning stock assessment
    - a. Length frequency
    - b. Age frequency
    - c. Sex
    - d. Degree of repeat spawning
  - 3. Annual mortality rate calculation
  - 4. Hatchery evaluation (%wild vs. hatchery)

4.8 *DE MINIMIS* STATUS

States that report commercial landings of American shad that are less than 1% of the coastwide commercial total are exempted from sub-sampling the commercial catch for biological data, as outlined in *Section 3.3.3, paragraph 1 of Amendment I.*

CHANGES TO TECHNICAL ADDENDUM #1

The following two tables entirely replace Technical Addendum #1.

TABLE 2. SUMMARY OF MANDATORY FISHERY-INDEPENDENT MONITORING PROGRAMS FOR AMERICAN SHAD.

STATE	SYSTEM	SAMPLING PROGRAM (ANNUAL UNLESS OTHERWISE NOTED)
Maine	Androscoggin & Saco Rivers	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • Hatchery Evaluation
New Hampshire	Exeter River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates
Massachusetts	Merrimack River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates
Rhode Island	Pawcatuck River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates
Connecticut	Connecticut River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM)
New York	Hudson River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM)
	Delaware River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM)
New Jersey	Delaware River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM)
Pennsylvania	Susquehanna River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM) • Hatchery Evaluation
	Lehigh River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • Hatchery Evaluation
	Delaware River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM)

TABLE 2. SUMMARY OF MANDATORY FISHERY-INDEPENDENT MONITORING PROGRAMS FOR AMERICAN SHAD (CONTINUED).

STATE	SYSTEM	SAMPLING PROGRAM (ANNUAL UNLESS OTHERWISE NOTED)
Delaware	Delaware River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates
Maryland	Upper Chesapeake Bay	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM) • Hatchery Evaluation
D.C.	Potomac River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates
Virginia	James, York, and Rappahannock Rivers	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • JAI: Juvenile abundance survey (GM) • Hatchery Evaluation
North Carolina	Albemarle Sound and its tributaries, Tar-Pamlico, Neuse, and Cape Fear Rivers	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates • Hatchery Evaluation
South Carolina	Santee-Cooper system, Eidsto River, Winyah Bay and tributaries (Waccwnaw and Pee Dee Rivers)*	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates * State may elect to sample these systems on a rotational basis (i.e., one system evaluated per year)
Georgia	Altamaha River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates
Florida	St. Johns River	• Annual spawning stock survey and representative sampling for biological data • Calculation of mortality and/or survival estimates

TABLE 3. SUMMARY OF MANDATORY FISHERY-DEPENDENT MONITORING PROGRAMS FOR AMERICAN SHAD.

STATE	SYSTEM	SAMPLING PROGRAM
Maine	Inriver	• Monitor recreational landings, catch and effort every 5 years.
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch.
New Hampshire	Inriver/coastal	• Monitor recreational landings, catch and effort every 5 years.
Massachusetts	Merrimack River and Connecticut River	• Monitor recreational landings, catch, and effort every 5 years.
Connecticut	Connecticut River	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years.
Rhode Island	Pawcatuck River	• Monitor recreational catch and effort every 5 years.
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.
New York	Hudson River	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years.
	Delaware River	• Monitor recreational landings, catch, and effort every 5 years. (Cooperative effort between New Jersey, New York, Pennsylvania, and Delaware)
New Jersey	Delaware River and Bay	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years. (Cooperative effort between New Jersey, New York, Pennsylvania, and Delaware)
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.
Delaware	Delaware River and Bay	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years. (Cooperative effort between New Jersey, New York, Pennsylvania, and Delaware)
	Nanticoke River Chesapeake Bay tributary (upstream portion)	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years.
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.

TABLE 3. SUMMARY OF MANDATORY FISHERY-DEPENDENT MONITORING PROGRAMS FOR AMERICAN SHAD (CONTINUED).

STATE	SYSTEM	SAMPLING PROGRAM
Pennsylvania	Delaware River	• Monitor recreational landings, catch, and effort every 5 years. (Cooperative effort between New Jersey, New York, Pennsylvania, and Delaware)
Maryland	Inriver	• Monitor recreational landing, catch, and effort every 5 years.
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.
D.C.	Potomac River	• Monitor recreational landings, catch, and effort every 5 years.
Virginia	Inriver	• Monitor recreational landings, catch, and effort every 5 years
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.
North Carolina	Albemarle Sound and its tributaties, Tar-Pamlico, Neuse, and Cape Fear Rivers	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.
South Carolina	Edisto River, Santee River, Winyah Bay and its tributaries (Waccwnaw and Pee Dee Rivers)	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch, and effort every 5 years. * State may elect to sample these systems on a rotational basis (i.e., one system evaluated per year)
	Atlantic Ocean	• Mandatory reporting of catch (numbers and weight and effort form commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Participate in Ocean landings stock composition study.
Georgia	Ogeechee	• Mandatory reporting of catch (numbers and weight and effort form commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landing, catch, and effort every 5 years.
Florida	St. Johns River	• Mandatory reporting of catch (numbers and weight) and effort from commercial fisheries; subsamples shall indicate size, age, and sex composition of catch. • Monitor recreational landings, catch and effort every 5 years.