

2005 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR
AMERICAN EEL
(Anguilla rostrata)

Prepared by:

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AMERICAN EEL
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I. Status of the Fishery Management Plan

<u>Year of plan's adoption:</u>	1999
<u>Management unit:</u>	Migratory stocks of American Eel from Maine through Florida
<u>States with a declared interest:</u>	Maine through Florida, including District of Columbia, Potomac River Fisheries Commission
<u>Active committees:</u>	American Eel Management Board, Plan Review Team, Technical Committee, Stock Assessment Subcommittee, and Advisory Panel.

II. Status of the Stock

Current stock status for American eel is poorly understood due to limited and non-uniform stock assessment efforts and protocols across the range of this species. Reliable indices of abundance of this species are scarce. Limited data from indirect measurements (harvest by various gear types and locations) and localized direct stock assessment information are currently collected.

Although eel have been continuously harvested, consistent data on harvest are often not available. Harvest data is often a poor indicator of abundance, because harvest is dependent on demand and may consist of annually changing mixes of year classes. Most of the data collections were of short duration and were not standardized between management agencies. Harvest data from the Atlantic coastal state (Maine to Florida), indicate that the harvest has declined after a peak in the mid-1970s. Annual eel catch ranged from 913,251 lbs. to 3,626,936 lbs. between 1970 and 2000. The lowest harvest (between 1970 and 2004) was 898,459 lbs., which occurred in 2001. Because fishing effort data is unavailable, however, finding a correlation between population numbers and landings data is problematic.

As stated in Section 2 of the FMP, the purpose of this management effort is to reverse any local or regional declines in abundance and institute consistent fishery-independent and dependent monitoring programs throughout the management unit.

In 2003, declarations from the International Eel Symposium (AFS 2003, Quebec City, Quebec, Canada) and the Great Lakes Fisheries Commission (GLFC) highlighted concerns regarding the health of American eel stock. Available data points to decreasing recruitment, combined with localized declines in abundance. This information is cause for concern and represents an opportunity for cooperation with other entities such as the GLFC to preserve the American eel stock.

The first benchmark stock assessment for American eel is due to be reviewed by the American Eel Management Board in early 2006.

III. Status of the Fishery

American eel currently support important commercial fisheries throughout their range. Fisheries are executed in rivers, estuaries, and ocean. Commercial fisheries for glass eel/elver exist in Maine, South Carolina, and Florida (though in South Carolina and Florida, no commercial glass eel/elver landings were recorded in 2004), whereas yellow/silver eel fisheries exist in all states/jurisdictions with the exception of Pennsylvania and the District of Columbia.

The commercial eel fisheries in Maine (both glass eel/elver and yellow/silver) have declined since 1998 because of legislation and/or poor market conditions. In 1999, emergency legislation was passed, which instituted a limited entry system for the glass eel/elver fishery, reduced the amount of gear a harvester could use, and decreased the length of the season; fishing effort was reduced by at least 79%. In addition, the market for glass eels declined in 1999, and has remained poor. Harvesters were paid \$10-\$15/pound for glass eels in 1999 and \$25/pound in 2000 compared to upwards of \$300/pound in 1998. The price paid for yellow and silver eels in Maine also has declined since 1999 from \$3-\$4/pound to \$1.25-\$1.75/pound. Harvesters report that the low prices are due to eels being aquacultured in Canada.

Commercial:

Commercial landings decreased from the high of 1.8 million pounds in 1985 to a low of 649 thousand pounds in 2002. Landings in 2004 totaled 921,896 pounds. The states of New Jersey, Delaware, Maryland, Virginia, and North Carolina each landed over 100,000 pounds of eel, and together accounted for 88% of the coastwide commercial total landings in 2004.

Recreational:

Few recreational anglers directly target eel. Hook and line fishermen, for the most part, catch eel incidentally when fishing for other species. The NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), which has surveyed recreational catch in ocean and coastal county waters since 1981, shows a declining trend in the catch of eel during the latter part of the 1990's. According to MRFSS¹, 2004 recreational total catch was 112,001 fish, which represents a slight decrease in number of fish from 2003 (156,381 fish). New Jersey and Delaware combined represented 40% of the recreational American eel catch, and New York and Delaware combined represented 62% of the recreational American eel harvest in 2004. About 79% of the eel caught were released alive by the anglers in 2004 (MRFSS 2004 total recreational harvest was 23,442 fish). Eel are often purchased by recreational fishermen for use as bait for larger gamefish such as striped bass, and some recreational fishermen may catch eels and then utilize them as bait.

¹ MRFSS Data for American Eel are unreliable. 2004 Proportional Standard Error (PSE) values for recreational harvest in Connecticut, New York, New Jersey, Delaware, Maryland, and North Carolina are 100, 74.1, 100, 47.3, 83.5, and 100, respectively.

Current Commercial Regulations by State as of November 2005*

<u>State</u>	<u>Size Limit</u>	<u>License/Permit</u>	<u>Other</u>
ME			
NH	6"	Commercial saltwater license and coastal harvest permit, monthly reporting	
MA	6"	Commercial permit, monthly reporting	Nets, pots, spears, and angling only. Each of 52 coastal towns has its own regulations.
RI	6"	Commercial fishing license required for the sale of American Eel	
CT	6"		
NY	6"	License required to sell	Various gear restrictions
NJ	6"	License Required	Various gear restrictions
PA	6"	No commercial fishery	
DE	6"	License Required	Commercial fishing in tidal waters only
MD	6"	License required in tidal waters, limited entry, mandatory monthly reporting	Allowance of 25 eels less than 6 inches daily for commercial purposes
DC	6"	No commercial fishery	
PRFC	6"		
VA	6"	License with two-year delayed entry system, mandatory monthly reporting	Mesh size restrictions on eel pots
NC	6"	Standard Commercial Fishing License for all commercial fishing	Mesh size restrictions on eel pots
SC	6"	Permits by gear and area fished, mandatory monthly reporting, license for all commercial fishing and sale	Various gear restrictions
GA	6"	Personal commercial fishing license and commercial fishing boat license, harvester/dealer reporting required	Various gear and area restrictions
FL		Permit if using horseshoe crabs as bait	
* For specifics on licenses, gear restrictions, and area restrictions, please contact the individual state.			

Current Recreational Regulations by State as of November 2005**			
<u>State</u>	<u>Size Limit</u>	<u>Possession Limit</u>	<u>Other</u>
ME		50 eels/person/day	
NH	6"	50 eels/person/day	Coastal harvest permit needed if taking eels other than by angling, monthly reporting required
MA	6"	50 eels/person/day	Nets, pots, spears, and angling only Each of 52 coastal towns has its own regulations
RI	6"	50 eels/person/day	
CT	6"	50 eels/person/day	
NY	6"	50 eels	Possession for use as bait ONLY; 14" maximum size in the Hudson and East Rivers
NJ	6"	50 eels/person/day	
PA	6"	50 eels/person/day	Gear restrictions, Regulation of bait dealers
DE	6"	50 eels/person/day	Two trap limit
MD	6"	No creel limit in tidal areas, 25 eel limit in non-tidal areas	
DC	6"	10 eels/person/day	Five trap limit
PRFC	6"	50 eels/person/day	Gear restrictions
VA	6"	50 eels/person/day	Recreational license, two pot limit, mandatory annual catch report, mesh size restrictions on eel pots
NC	6"	50 eels/person/day	Gear restrictions, noncommercial special device license, allowed two eel pots under Recreational Commercial Gear license
SC	none	none	Gear restrictions, two pot limit
GA	none	none	Harvest using minnow seines is prohibited
FL	none	none	Gear restrictions, mesh size restrictions ensure that harvested eels are minimum 12" long
** For specifics on licenses, gear restrictions, and area restrictions, please contact the individual state.			

IV. Status of Research and Monitoring

The FMP requires States/jurisdictions with a declared interest to conduct an annual young-of-the-year survey for the purpose of monitoring annual recruitment of each year's cohort. The FMP does not require any research initiatives in participating states/jurisdictions. Nonetheless, several research needs have been identified for American eel to further understand the species' life history, behavior and biology. Research needs for American eel include:

High Priority

- Documentation of the commercial eel fishery should be more accurate so that our understanding of participation in the fishery and the amount of directed effort could be known.
- A stock assessment committee should identify the best stock assessment methods for American eel.
- Investigate, develop, and improve technologies for American eel passage upstream and downstream at various barriers for each life stage. In particular, investigate low-cost alternatives to traditional fishway designs for passage of eel.
- A coast wide sampling program for American eel should be formulated using standardized and statistically robust methodologies.
- Regular periodic stock assessments and establishment of sustainable reference points for eel are required to develop a sustainable harvest rate in addition to determining whether the population is stable, decreasing, or increasing.

Medium Priority

- Investigate survival and mortality rates of different life stages (leptocephalus, glass eel, yellow eel, and silver eel) to assist in the assessment of annual recruitment. Such research could be aided by continuing and initiating new tagging programs with individual states.
- Evaluate the impact, both upstream and downstream, of barriers on eel with respect to population and distribution effects. Determine relative contribution of historic loss of habitat to potential eel population and reproductive capacity.
- Tagging Programs: A number of issues could be addressed with a properly designed tagging program. These include:
 - Local and regional movement and migration patterns
 - Natural, fishing, and/or discard mortality; Survival
 - Growth
 - Validation of aging method(s)
 - Abundance
 - Reporting rates
 - Tag shedding or tag attrition rate
- Contaminant effects on eel and the effects of bioaccumulation with respect to impacts on survival and growth (by age) and effect on maturation and reproductive success should be researched.
- Investigate: fecundity, length and weight relationships for females throughout their range; growth rates for males and females throughout their range; predator-prey

relationships; behavior and movement of eel during their freshwater residency; oceanic-behavior, movement and spawning location of adult mature eel; and all information on the leptocephalus stage of eel.

- Assess characteristics and distribution of eel habitat and value of habitat with respect to growth and sex determination.
- Triggering mechanism for metamorphosis to mature adult, silver eel life stage with specific emphasis on the size and age of the onset of maturity, by sex. A maturity schedule (proportion mature by size or age) would be extremely useful in combination with migration rates.

Low Priority

- Economics studies are necessary to determine the value of the fishery and the impact of regulatory management.
- The historic participation level of subsistence fishers in wildlife management planning needs to be reviewed, and relevant issues brought forth with respect to those subsistence fishers involved with American eel.
- Examination of the mechanisms for exit from the Sargasso Sea and transport across the continental shelf.
- Mechanisms of recognition of the spawning area by silver eel, mate location in the Sargasso Sea, spawning behavior, and gonadal development in maturation should be researched.
- Age at entry of glass eel into estuaries and fresh waters should be examined.
- Migratory routes and guidance mechanisms for silver eel in the ocean should be examined.
- The degree of dependence on the American eel resource by subsistence harvesters such as Native American Tribes, Asian and European ethnic groups, etc, needs to be investigated.
- Examine the mode of nutrition for leptocephalus in the ocean.
- Provide analysis of food habits of glass eel while at sea.

Completed Research Needs

- Location and triggering mechanism for metamorphosis from leptocephalus to eel should be examined
 - Wang, C.H. and W.N. Tzeng. 2000. The timing of metamorphosis and growth rates of American and European eel leptocephali: a mechanism of larval segregative migration. Fisheries Research 46: 191-205.

V. Status of Management Measures and Issues

The FMP required that all states/jurisdictions conduct an annual young-of-the-year (YOY) abundance survey by 2001 in order to monitor annual recruitment of each year's cohort. In addition, the FMP requires all states/jurisdictions to establish a minimum recreational size limit of six inches and a recreational possession limit of no more than 50 eels per person, including crew members involved in party/charter (for-hire) employment, for bait purposes during fishing.

Recreational fishermen are not allowed to sell eel without a State license permitting such activity. Commercial fisheries management measures stipulate that states/jurisdictions shall maintain existing or more conservative American eel commercial fishery regulations, including gear specification contained in Table 2, for all life stages.

In addition to these mandatory regulations, federal agencies are working to implement the recommendations to the Secretaries as listed in the FMP.

VI. Current State-by-State Implementation of FMP Compliance Requirements (as of November, 2005)

The States of New Hampshire, Massachusetts, Pennsylvania, South Carolina, Georgia, Florida, and the District of Columbia have been declared *de minimis* states and continue to meet such criteria. Their landings for 2003 and 2004 are well below the standard for *de minimis* of less than 1% of coastwide commercial landings for 2003 and 2004.

The PRT reviews state compliance on an annual basis. See Table 1 for current status of state compliance. The annual YOY abundance survey as well as all commercial and recreational management measures for American eel are considered compliance elements in the FMP.

TABLE 1. State Compliance Matrix

ME	NH	MA	RI	CT	NY	NJ	PA	DE	MD	PRFC	DC	VA	NC	SC	GA	FL
Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

NOTE: Y = State/jurisdiction is in compliance
 N = State/jurisdiction is not in compliance

VII. Recommendations/findings of the Plan Review Team

1. The PRT strongly recommends that all states implement mandatory reporting requirements to increase accuracy in estimating state and coastwide landings.
2. The PRT requests that state personnel highlight notable trends in annual reports.
3. The PRT continues to express concern over the lack of data available for states to report landings by life stage.