2002 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR **AMERICAN EEL** ***(Anguilla rostrata)***

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I. Status of the Fishery Management Plan

Year of plan's adoption:	1999
Management unit:	Migratory stocks of American Eel from Maine through Florida
States with a declared interest:	Maine through Florida, including District of Columbia, Potomac River Fisheries Commission
Active committees:	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 2001) 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.

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, Connecticut, South Carolina, and Florida (though in Florida no commercial glass eel/elver landings were recorded in 2001), 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:
Coastwide commercial landings for American eel have declined dramatically from historic highs. Commercial landings decreased from the high of 1.8 million pounds in 1985 to a low of 886 thousand pounds in 2001. Landings from Maryland, Virginia and Delaware combined accounted for 52.5% of commercial landings in 2001, with 38.8% coming from Maryland and Virginia. The Potomac River Fisheries Commission reported combined landings (2001) for Maryland and Virginia equivalent to 213,440 pounds.

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 MRFSS[1], 2001 recreational harvest was 34,869 fish, which represents an increase in number of fish from 2000 (25,843 fish). New York, Georgia, Delaware and New Jersey together represented 81% of the recreational American eel landings in 2001. About one half of the eel caught are released alive by the anglers. 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.

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:

1. 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.
2. A stock assessment committee should identify the best stock assessment methods for

[1] MRFSS Data for American Eel is uncertain. The proportional standard errors (PSEs) New York and Virginia during 2000 were 92.2 and 99.9 respectively. No data was recorded for the other states along the eastern seaboard.

American eel.

3. 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.
4. 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.
5. 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.
6. 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.
7. A coast wide sampling program for American eel should be formulated using standardized and statistically robust methodologies.
8. 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.
9. Assess characteristics and distribution of eel habitat and value of habitat with respect to growth and sex determination.
10. Age at entry of glass eel into estuaries and fresh waters should be examined.
11. Location and triggering mechanism for metamorphosis from leptocephalus to eel should be examined.
12. 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.
13. 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.
14. Economics studies are necessary to determine the value of the fishery and the impact of regulatory management.
15. Examination of the mechanisms for exit from the Sargasso Sea and transport across the continental shelf.
16. 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.
17. 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.
18. Migratory routes and guidance mechanisms for silver eel in the ocean should be examined.
19. Examine the mode of nutrition for leptocephalus in the ocean.
20. Provide analysis of food habits of glass eel while at sea.
21. 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.

Completed Research Needs
Workshop on aging and sexing techniques should be considered to increase the accuracy of data collected in coastwide sampling program.
Reference: ASMFC. 2001. Proceedings of the Workshop on Aging & Sexing American Eel. ASMFC Special Rep. n. 72.

Additional Un-Prioritized Research Needs
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

V. Status of Management Measures and Issues

The FMP requires 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 September 1, 2001)

The States of New Hampshire, Massachusetts, Pennsylvania, South Carolina, Georgia, and Florida have been declared de minimis states and continue to meet such criteria. Their landings for 2000 and 2001 are well below the standard for *de minimis* of less than 1% of coastwide commercial landings for 2000 and 2001. The District of Columbia has also requested *de minimis* status as the District does not allow commercial fishing for any fish species within its

jurisdiction and therefore did not have any landings for American eel in 2001. Commercially caught fish from areas outside the District may not be landed within the District.

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. The District of Columbia did not implement a YOY abundance survey in 2001, meaning that the jurisdiction of Washington, DC is not fully and effectively implementing the requirements of the American eel FMP. The American Eel Management Board accepted a proposal from the District of Columbia to conduct the required annual YOY survey beginning in 2003.

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	N	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. All States/jurisdictions should implement the requirements and recommendations of the FMP for American eel.
2. The PRT recommends that the Management Board consider recommendations of the ICES Working Group on Eels.
3. The PRT recommends that d*e minimis* criteria should be reevaluated in light of data availability.
4. The PRT expresses continuing concern over the lack of CPUE data. The PRT notes that CPUE may be difficult to estimate given fishery practices such as stock piling of harvest and holding activities. Reporting of CPUE may also be complicated by the level (i.e. lifestage) at which data is collected by states.