2000 REVIEW OF THE FISHERY MANAGEMENT PLAN FOR ATLANTIC MENHADEN
(Brevoortia tyrannus)

Prepared by:

The Atlantic Menhaden Plan Review Team

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I. Status of the Fishery Management Plan

The 1992 Revision of the 1981 FMP was approved at the 1992 Annual Meeting of the ASMFC. Management authority is vested in the states because the vast majority of landings come from state waters. There is a single stock which migrates along the Atlantic coast. All Atlantic coast states except Pennsylvania have declared an interest in the menhaden management program. The ASMFC menhaden management program operates under the direction of the Atlantic Menhaden Board (AMB), with technical and advisory expertise provided by the Atlantic Menhaden Advisory Committee (AMAC). The goal of the FMP is "to manage the Atlantic menhaden fishery in a manner that is biologically, economically, and socially sound while protecting the resource and its users." The 10 objectives of the FMP include use of the best scientific information as the basis for regulations, support for high quality habitat, maintenance of the stock, optimum utilization, public education, product research, maintenance of the long-term database, improvement of data collection, enhancement of the Captains Daily Fishing Report, and promotion of cooperative research.

The fishery is currently managed on the basis of an annual review of three specific items conducted by AMAC each spring: 1) status of the stock and fishery, 2) evaluation of requests for allocations by states for harvest under Internal Waters Processing (IWP) arrangements, and 3) state management actions which may affect the fishery. Following its review, the AMAC sends a report to the AMB, which reports to the ISFMP Policy Board. The ASMFC forwards the Board's IWP recommendations directly to the Governors of states which apply for allocations. Amendment 1 to the 1992 FMP is currently in development.

II. Status of the Stock

The status of the stock is considered to be healthy, with 9 age classes represented in 1999 (ages 0-8). Natural mortality is estimated to be M = 0.45. Overall fishing mortality (F) for 1999 was estimated to be 0.74 (for ages 1-8), with age-specific values ranging from F = 1.06 (age 2 and older) to F = 0.016 for age-0. Recruitment to age-1 was good to excellent from the mid-1970's to the late 1980's. Estimates of recruitment to age-1 have declined since 1990, with the three-year running average of 2.0 billion fish for 1997-99 at the minimum acceptable level. Average estimated spawning stock biomass (mature females) for 1997-99 was 53,800 metric tons (mt), over three times the minimum level (17,000 mt) considered acceptable by the FMP. The updated estimate for 1997 (86,800 mt) is the largest value estimated since 1962, and is comparable to the spawning stock biomass estimate for 1958 (88,700 mt), which produced the largest number of age-1 recruits (15.1 billion age-1 menhaden) on record. Maximum spawning potential (MSP) during 1997-99 averaged 9.4%, a level more than three times the minimum provided for in the FMP (exceeds the 75th percentile for 1955-99). Since recruitment to age-1, spawning stock

biomass, and MSP are all based on virtual population analysis (VPA) results, and VPA values for the most recent years are the least reliable, these figures must be considered as preliminary estimates. Age composition of fish in the 1999 reduction landings coastwide (numbers of individual fish) was age-0 (4%), age-1 (17%), age-2 (61%), age-3+ (17%). The South Atlantic "summer" fishery was dominated by age-1 and age-2 menhaden (99%), while the Chesapeake Bay "summer" fishery was composed primarily of age-2 fish (72%) (Smith et al. 2000). Reduction landings from the Mid-Atlantic area were predominantly age-3 menhaden (59%). No reduction landings of menhaden were recorded from the Gulf of Maine last year.

III. Status of the Fishery

The 1999 harvest for reduction was 171,200 mt, about 30% below the 1998 level of 245,900 mt, and about 39% below the average of the five previous years (279,600 mt). This level of landings exceeds (falls below) the trigger level of 250,000 mt established in the 1992 FMP. This decrease was expected due to the consolidation of the two Virginia processing plants into one operation and a reduction in the number of fishing vessels from 20 to 13 in the Virginia fleet (AMAC 2000).

Nominal effort (vessel-weeks) in 1999 decreased 13% from 437 vessel weeks last year to 382 vessel weeks. This represents the second lowest level of effort recorded for the Atlantic menhaden reduction fishery since the mid-1950's. This decline in effort was anticipated due to the recent industry consolidation but was exacerbated due to adverse weather conditions during the height of the fishing season (AMAC 2000). A total of 15 vessels landed menhaden during the 1999 season; the small purse seine vessels from the Gulf of Maine did not fish for menhaden in 1999. Two shoreside plants operated in 1999, one in Beaufort, North Carolina; and one in Reedville, Virginia. The Chesapeake Bay fishery again dominated the landings. The bait fishery has become increasingly more important from North Carolina to New England. Landings from the bait fishery are estimated at about 35,927 mt for 1999, or 17.3% of the total Atlantic menhaden landings.

IV. Status of Assessment Advice

The Atlantic menhaden resource is assessed each spring prior to the annual AMAC review meeting. The most recent assessment was performed by the NMFS Population Dynamics Team in March 2000 and was reviewed (internally) by AMAC in April 2000. A Murphy Virtual Population Analysis (VPA) is used to assess menhaden. Possible sources of uncertainty in the assessment include the accuracy of the bait landings, the absence of abundance indices for juveniles as well as adults (multi-age), and the application of a coastwide assessment to answer questions of stock abundance in subareas (i.e. Chesapeake Bay). The assessment was peer reviewed in November 1998, and a report is available (SAR No. 99-01). Some of the major recommendations from the review were: 1) examine and evaluate the number of samples per catch; 2) evaluate the feasibility of multispecies assessment techniques; 3) examine various

fishery-independent data sources as tuning indices for the VPA; 4) monitor reproductive parameters; 5) conduct yield-per-recruit and spawning stock biomass-per-recruit analyses and develop estimates of biological reference points ($F_{0.1}$, $F_{threshold}$, F_{MAX}) be developed for future assessments; 6) examine alternatives to the Ricker spawner-recruit relationship; and 7) investigating the precision of the VPA results and management trigger variables using error estimates associated with the catch-at-age data and catch curve analyses.

V. Status of Research and Monitoring

The Population Dynamics Team of the NMFS Laboratory in Beaufort, North Carolina has the principal research and monitoring responsibility for the Atlantic menhaden fishery. Their monitoring and analytic work is expected to continue. Several states have improved their juvenile monitoring programs, which include data on menhaden. The industry continues to cooperate by providing set-by-set data through the Captains Daily Fishing Reports (CDFRs). The NMFS Population Dynamics Team personnel are entering current year and historical (since 1985) CDFR data into a database for analysis. A bait fishery sampling program has been conducted since 1994 in Massachusetts, New Jersey, Virginia, and North Carolina. Some differences in age composition between bait and reduction catches have been noted, but sample sizes are small. NMFS personnel continue to gather samples and analyze age composition of bait samples from along the Atlantic coast for possible future inclusion in the catch-at-age matrix.

VI. Status of Management Measures and Issues

There are no regulatory recommendations stemming from the FMP. ASMFC staff is continuing to compile an updated list of state-by-state management measures pertaining to menhaden, including a listing of waters closed to menhaden purse seine fishing.

VII. Current State-by-State Implementation of FMP Compliance Requirements as of June 1, 2000

There are no regulatory compliance requirements in the 1992 Atlantic Menhaden FMP.

VIII. Recommendations of FMP Review Team

General

In light of the recent poor recruitment and declining population numbers, a more thorough examination of the population status is being conducted annually (Vaughan and Smith 2000). The menhaden "Fact Sheet" should be revised following the development of Amendment 1, and it should be published next year. University researchers are urged to evaluate use of coastal power plant impingement data as a possible means to estimate young-of-the-year abundance.

This issue is being addressed by the ASMFC Management and Science Committee which will then forward a report to the ISFMP Policy Board.

Regulatory Recommendations

The joint technical and advisory committee (AMAC) has concluded that the stock should be considered healthy, and that no additional restrictions should be imposed on the fishery. The AMAC also addressed concerns about the concentration of the reduction purse seine fishery in Chesapeake Bay, recommending that Amendment 1 provide for reducing closed areas in the ocean to provide alternative fishing areas outside Chesapeake Bay. In its 1998 review, the independent peer review panel concluded that significant changes should be made to both the management structure and the annual review process, in addition to recommending that some type of quota-based management system be instituted. **All of these issues are being addressed through the amendment process, therefore the PRT makes no recommendations for additional regulatory action at this time.**

Amendments

Amendment 1 to the current plan is in development. The initial Public Information Hearings were conducted in late summer of 1999. A second round of hearings will be scheduled for early to late summer of 2000 to review the first draft of the amendment. Plan approval could occur as early as the fall of 2000.

AMAC recommended in 1998 that an addendum be prepared to address the following issues: 1) reformatting the current FMP to follow the current approved ISFMP outline; 2) update the Habitat section; and 3) to evaluate the trigger levels in light of changes in the fishery. These will be addressed in Amendment 1 instead.

Research and Monitoring Recommendations (number in parentheses reflects relative ranking with 1 being the highest priority)

1. Evaluate effects of selected environmental factors on growth, survival and abundance of juvenile and adult menhaden, particularly in Chesapeake Bay and other coastal nursery areas.

   Develop and test methods for estimating size of recruiting year-classes of juveniles using fishery-independent survey techniques (ongoing research).

   Determine how loss/degradation of critical estuarine and nearshore habitat affects growth, survival and abundance of juvenile and adult menhaden abundance.

   Monitor landings, size, age, gear, and harvest area in the reduction and bait fisheries, and determine age composition by area. Enhance biostatistical sampling of bait samples in purse seine fisheries for Virginia and New Jersey to improve stock assessment.

   Study the ecological role of menhaden (predator/prey relationships, nutrient enrichment,

oxygen depletion, etc.) in major Atlantic coast embayments and estuaries.

The feasibility of estimating yearclass strength using biologically stratified sampling design should be evaluated. The efforts could be supported by process studies linking plankton production to abundance of young menhaden (need resources).

2. Evaluate use of coastal power plant impingement data as a possible means to estimate young-of-the-year menhaden abundance.

   Monte Carlo simulations should be conducted to evaluate precision of VPA (need resources).

   Alternative measures of effort, including spotter pilot logbooks, trip length, or other variables, should be evaluated. Spotter pilot logbooks should be evaluated for spotter plane search time, GPS coordinates, and estimates of school sizes observed by pilots.

   Re-evaluate menhaden natural mortality, by age and response to changing predator population sizes.

3. Determine the effects of fish diseases (such as ulcerative mycosis and toxic dinoflagellates) on the menhaden stock (ongoing research).

   Determine the effects of regulations on the fishery, the participants and the stock.

   Growth back-calculation studies should be pursued to investigate historical trends in growth rate. The NMFS has an extensive data base on scale growth increments which should be utilized for this purpose.

4. Monitor fish kills along the Atlantic coast and use the NMFS Beaufort Laboratory as a repository for these reports.

5. Develop bycatch studies of menhaden by other fisheries.

6. Periodically monitor the economic structure and sociological characteristics of the menhaden reduction industry.

Identified Management Issues

Make annual prediction for the Atlantic coast fishery.

Analyze vessel catch records.

Research Needs Identified as Being Met

References

Atlantic Menhaden Advisory Committee. 2000. Atlantic Menhaden Management Review, 2000. Report to the Atlantic Menhaden Management Board. June 2000. 18 pp.

Smith, J.W., et al. 2000. Forecast for the 2000 Gulf and Atlantic menhaden purse-seine fisheries and review of the 1999 fishing season. Report of the NMFS Population Dynamics Team, Beaufort, NC. 8 pp.

Vaughan, D.S. and J.W. Smith. 2000. Supplemental Analysis of the Status of the Atlantic Menhaden Stock. Report to the Atlantic Menhaden Advisory Committee, ASMFC. 41 pp.