REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR **BLUEFISH** ***(Pomatomus saltatrix)***

2003 FISHING YEAR

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I. Status of the FMP

ASMFC's member states adopted the FMP for the Bluefish Fishery in October, 1989 and the Secretary of Commerce approved it in March, 1990. This unique FMP, the result of a joint effort by the ASMFC and the Mid-Atlantic Fishery Management Council (MAFMC), represents the first management plan jointly developed by an interstate commission and a Federal Fishery Management Council.

ASMFC and MAFMC approved Amendment 1 to the FMP in October, 1998 and the Secretary of Commerce partially approved the Amendment on July 29, 1999. The member states were responsible for implementation of the management measures contained in the Amendment prior to January 1, 2000. On July 26, 2000 the National Marine Fisheries Service published the final rule to implement the measures contained in the Amendment. The goal of the Amendment is to conserve the bluefish resource along the Atlantic coast. Five objectives have been adopted:

1. Increase understanding of stock and fishery.
2. Provide highest availability of bluefish to U.S. fishermen; while maintaining, within limits, traditional uses of bluefish
3. Provide for cooperation among the coastal states, the various regional marine fishery management councils, and federal agencies involved along the coast to enhance the management of bluefish throughout its range.
4. Prevent recruitment overfishing.
5. Reduce the waste in both the commercial and recreational fisheries.

States with a declared interest in the bluefish FMP include all member states except Pennsylvania and the District of Columbia. Management issues are addressed through the ASMFC Bluefish Management Board and the MAFMC Coastal Migratory Species Committee. ASMFC Bluefish Technical Committee provides technical advice, a joint ASMFC-MAFMC Technical Monitoring Committee conduct annual plan monitoring and framework adjustment recommendations, and the ASMFC Stock Assessment Subcommittee handled stock assessment issues.

II. Status of the Stock

The 2003 update on the status of the stock indicated that fishing mortality rates on bluefish peaked in 1987 at 0.718 and have continued decline to 0.184 in 2002. This assessment indicated that the stock was overfished but overfishing as not occurring (Lee 2003). The 2002 fishing mortality rate for bluefish was below the 2003 and 2004 targets, 0.41 and 0.31, respectively. This assessment indicated that the status of the stock was improving as of 2002 to a level close to the biomass threshold. Specifically in 2002 the total stock biomass was estimated at 113.64

million pounds or 96% of the biomass threshold relative to Amendment 1 overfishing definitions.

A stock projection was conducted using a fishing mortality rate of 0.184 (Lee 2003). Projection results indicated that the bluefish stock would increase from an estimated biomass of 129.36 million pounds in 2003 to 165.85 million pounds in 2004 and 207.78 million pounds in 2005. This biomass had an associated yield of 34.215 million pounds in 2004.

The ASMFC conducted a bluefish stock assessment to evaluate and revise the surplus production model currently used to annually assess the status of the bluefish stock and investigate alternative methods to evaluate the stock. The assessment was submitted to the SARC for review in June 2004. Due to time constraints, the committee was not able to look at alternative methods to evaluate the stock. Dr. Andy Cooper is also working on an assessment of the bluefish stock through a grant from Rutgers University. He took emergency leave for a several months but is now back working on the assessment and hopes to be complete by the end of the calendar year. The ASMFC technical committee will work with Dr. Cooper in his efforts.

The Bluefish technical committee developed a revised surplus production model which was presented to the SARC review panel in June 2004. The revised model was identical to the previous surplus production model, except that the recreational CPUE was modified. The SARC rejected the results for the following reasons: (i) the recreational catch rate series contains a severe bias attributable to incorrect handling of the live-release data, (ii) the NEFSC data used as an index of fishable biomass represent only 0- and 1-group bluefish, (iii) residuals in the commercial catch rate data show strong autocorrelation, indicating model mis-specification, (iv) the model is too sensitive for the population growth parameter *r*.

III. Status of the Fishery

Commercial bluefish landings, which had declined by over 34% to 10.3 million pounds in 1989, increased to 13.7 million pounds in 1990 and then dropped to the lowest value in the time series 7.1 million pounds in 1999. In 2000 and 2001, landings increased to approximately 8.0 and 8.7 million pounds, respectively. The 2003 commercial landings were 7.2 million pounds or 12% below the 1994-2003 average. NY, NJ, and NC, accounted for the majority of the commercial landings in 2003.

The recreational bluefish catch declined steadily from a 1986 value of 30.4 million fish to 3.7 million fish in 1999, the lowest value in the time series. The 2000 and 2001 recreational catches increased to 4.9 and 6.7 million fish, respectively. New Jersey, New York, and Connecticut had the highest recreational landings 3.5, 2.6, and 2.0 million pounds, respectively.

Table 2 provides bluefish commercial landings and recreational catch comparisons.

IV. Status of Assessment Advice

The most recent quantitative stock assessment was conducted by the ASMFC Bluefish Technical Committee. This assessment used the dynamic population model (ASPIC) tuned to the NMFS

inshore survey and the recreational catch-per-unit of effort from 1981 to 2003. The major source of uncertainty in this assessment was the lack of reliable data to characterize the state of abundance in the offshore portion of the stock. The assessment was reviewed and then rejected by the SARC review panel. The following research recommendations were given by the SARC panel:

1. The mortality of bluefish released by anglers is a key parameter because of the large proportion now released alive, and should be the subject of a more detailed investigation. This should include effect of any potentially significant factors such as fish size, sex, method of capture, and season.
2. Recreational catch rate is important, so the data should be collected in a manner that allows analysis of changes in angler behavior, composition, technology, or other factors that influence both the statistical distribution of individual catch rate and changes in catchability over time.
3. An assumption of constant catchability in recreational catch rates is likely to give an optimistic view of the state of the stock unless there has been a significant increase in less efficient anglers over time, and must remain an issue of concern that needs to be addressed externally to the model, through a more comprehensive analysis of recreational catch data.
4. Catch rate and survey indices should both continue to be used for assessment purposes, if possible. However, models other than a catch rate index should at least be considered.
5. Terceiro (2003, Fishery Bulletin 101, pp. 653-672) has done much of the groundwork needed to develop a recreational catch rate abundance index. Poisson quasi-likelihood may be the simplest error model to apply. If possible, all trips should be used, and targeting should be allowed for as factor in the GLM.
6. Catches should not be presumed to be exact, but can be fitted through some likelihood function for discrepancies between observed and estimated catch in the population model. The likelihood can use the standard error of the catch estimate.
7. There is a need for an integrated analysis of the many different research surveys for juvenile bluefish. The surveys cover different regions using different gear types and provide data on 0- and 1-group bluefish. It is recommended that serious consideration be given to convening a workshop to evaluate: 1) the quality of the individual data sets; 2) the potential ability of the surveys to index bluefish abundance at age in the areas surveyed; 3) coherence of trends in localized surveys with trends in nearby stations of the larger scale surveys; and 4) methods for 14 standardizing and combining data from small-scale intensive surveys with large-scale less spatially intensive surveys, to give improved indices of recruitment. Such a workshop would require consolidation of raw survey data from the different surveys into common databases.
8. Care should be taken when using a GLM index approach that information relevant to changes in stock size is not mistakenly removed. A better approach might be to integrate the GLM into a population model.
9. Reducing fishing mortality to allow the abundance indices to increase could provide useful information on the productivity of the stock. A much improved assessment may be obtained when a recovery has taken place.

10. Age composition data should be collected to allow continued development of fully age-structured assessment models, particularly in light of the unusual selectivity patterns estimated from earlier catch-at-age analyses.
11. Stock assessment methods applied to bluefish elsewhere in the world should be evaluated for applicability to the NE US situation.
12. Pending ability to apply full age-structured methods, the use of partially age-structured methods such as the Collie-Sissenwine model is recommended to allow explicit incorporation of survey estimates for 0- and1-group fish, so estimating the contribution of recruitment to annual production. This would require that the commercial fishery and recreational catches and cpue be disaggregated into recruits and older fish. The effect of poor data on discards of young bluefish in the commercial fishery on such an analysis requires evaluation.
13. Global search algorithms (e.g. genetic algorithms) should be used for parameters if an ASPIC model is used in future.
14. Maturity gives need to be constructed and presented in future assessments.
15. As the current assessment has been rejected, and the status of the stock is unknown, the total allowable landings specification should continue at current value.
16. The feasibility of using tagging studies to estimate mortality, selectivity and movements, as well as to determine tag retention, should be investigated.

Some general recommendations were also given by the SARC committee to all of the species reviewed at the 39th SARC:

1. It was clear to the panel that, for at least black sea bass and bluefish, and likely other stocks too, some data series were not being included in evaluations of stock status. It was therefore recommended strongly that attempts be made to extract as much information as possible from all series considered appropriate for each stock using, for example, a GLM or GAM approach to combine the various surveys and gear types into a standardized index. This objective could be initiated through convening a workshop at which State and Federal scientists could debate many such data series and the appropriateness and ways of combining them.
2. A checklist of standardized diagnostics output should be developed for assessment scientists and working groups to make reviews easier. The checklist would cover much of the output already presented in assessment 15 documents, such as residual and observed-expected plots. Other diagnostics, even if not included in the assessment documents, could be prepared for reviews. The following should be included where appropriate:

- observed and expected plots of survey, catch rate and size/age compositions;
- re-runs of maximum likelihood fits from random parameter start positions to ensure that the final parameter fit is not a local maximum;
- tests of more and less parsimonious versions of a model, providing test statistics for the exclusion/inclusion of parameters;
- retrospective analyses, to test the predictive capability of a model.
- parameter estimate standard errors and correlation matrix (or a cutdown version if there is a large number of parameters);
- autocorrelations and cross-correlations of residuals for time-series models to give indications of model problems and possible improvements.

3. Assumptions and errors should be tested through simulation, where possible. Information should be presented testing the sensitivity of the results to important assumptions and errors in each assessment.
4. Some sort of simple method needs to be developed to allow managers to assimilate risks and uncertainty in the assessments, such as decision tables. Decision tables require a definition of the decision that needs to be made and some indication of the costs resulting from the interaction between the management decision and the state of nature. Scientists and managers must collaborate in developing these tools.
5. Recreational catches are always estimated with sampling error, and this error should be included in assessment models.

V. Status of Research and Monitoring

Many states, NMFS, and SEAMAP conduct fishery-independent surveys. Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Virginia, North Carolina, and South Carolina use trawls to monitor adults and juveniles. New Hampshire, New York, Maryland, and Virginia conduct haul seine surveys. North Carolina also initiated a survey of Pamlico Sound in 2001 utilizing multiple mesh gill nets. Year class strength is monitored through the NMFS autumn trawl survey.

The NEFSC fall offshore index was explored as a possible indicator of offshore abundance of bluefish by Mark Gibson and Najih Lazar. However, the bluefish catches in the offshore survey were low and the survey showed no significant trend and high variance for the 1974-2001 period.

Commercial landings information is collected by most states through dealer or fisherman reporting programs, and fishermen in the EEZ are required to report their landings to the NMFS. North Carolina and Virginia is the only state that significantly samples bluefish commercial fisheries to determine the size and age composition of the catch. Recreational harvest is monitored by the Marine Recreational Fisheries Statistics Survey.

VI. Status of Management Measures and Issues

The FMP allows a commercial quota and recreational harvest limit to reduce fishing mortality. Both are adjusted annually by the Commission and Council by the specification setting process that is detailed in Amendment 1. Amendment 1 provides a series of permitting and reporting requirements for the commercial and for hire fisheries.

Amendment 1 limits the commercial fishery to 17% of the total allowable landings each year through a commercial quota intended to maintain the traditional uses of bluefish and protect the stock from a rapid increase in commercial harvest. However, the commercial quota can be increased to 10.5 million pounds if the recreational fishery is not anticipated to land their entire allocation for the upcoming year. The overall commercial quota is divided into individual state-by-state quotas based on historic landings from 1981-1989.

The Technical Monitoring Committee is responsible for reviewing the best available data and recommending an annual commercial quota and recreational possession limit. Based on the

latest stock assessment information and the rebuilding schedule contained in Amendment 1 the Technical Monitoring Committee recommended a total allowable landings (TAL) of 30.85 million pounds for 2005. The Committee recommends to establish a 10.50 million pound commercial quota and a recreational harvest limit of 20.35 million pounds for 2005.

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

These states or jurisdictions are required to comply with the provisions of the Bluefish FMP: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Potomac River Fisheries Commission, Virginia, North Carolina, South Carolina, Georgia, and Florida.

The following are specific FMP compliance requirements:

Each state must restrict the possession of bluefish by anglers to not more than fifteen fish per day, or have an ASMFC-approved equivalent conservation program (Table 4).

Each state must restrict its commercial fishery to the quota adopted under procedures specified in the FMP.

The final compliance criteria include:

Monitoring requirements for the commercial fishery
Commercial and party/charter vessel permitting requirements
Dealer permitting requirements
Annual compliance reporting

In 2003, Rhode Island failed to submit the state's compliance report to ASMFC.

The Chair of the Plan Review Team has reviewed the states' compliance and is recommending that each state be found in compliance with respect to implementing the recreational bag limit and limiting their commercial fishery to their state quota.

VIII. Prioritized Research Needs

*These research needs will be re-assed and incorporated with the recommendations of the 39th SARC review panel over the next year.

1. Size and age composition of the fisheries by gear type and statistical area should be collected.

2. Commercial and recreational landings of bluefish should be targeted for biological data collection wherever possible.

3. Increase intensity of biological sampling of the NER commercial and coastwide recreational fisheries.

4. Initiate research on species interactions and predator/prey relationships

5. A scale-otolith age comparison study needs to be completed for bluefish

6. Explore alternative methods for assessing bluefish, such as length-based and modified DeLury models.

7. Measures of CPUE under different assumptions of effective effort should be evaluated to allow evaluation of sensitivity of results.

8. Initiate fisheries dependent and independent sampling of offshore populations of bluefish during the winter months

9. Conduct research to determine the timing of sexual maturity and fecundity of bluefish.

10. Work should continue on catch and release mortality.

11. Any archived age data for bluefish should be aged and used to supplement NC DMF keys in future assessments.

12. Conduct research on oceanographic influences on bluefish recruitment.

13. Study tag mortality and retention rates for ALS dorsal loop and other tags used for bluefish.

14. A coastal surf-zone seine study needs to be initiated to provide more complete indices of juveline abundance.

15. Test the sensitivity of the bluefish assessment to assumptions concerning age-varying M, level of age 0 discard, and the selection pattern.

16. Scientific investigations should be conducted on bluefish to develop an understanding of the long term, synergistic effects of combinations of environmental variables on various biological and sociological parameters such as reproductive capability, genetic changes, and suitability for human consumption.

17. Studies on the interactive effects of pH, contaminants, and other environmental variables on survival of bluefish.

TABLE 1. Estimated number of bluefish caught and the estimated number of bluefish landed by marine recreational fishermen each year, 1981 to 2003.

State	Catch (‘000)	Landing (‘000)
1981	31,261	23,888
1982	27,220	23,724
1983	30,137	24,884
1984	26,508	20,798
1985	22,474	19,246
1986	30,411	24,441
1987	27,603	21,076
1988	13,365	9,905
1989	18,637	13,600
1990	16,446	11,365
1991	18,292	11,943
1992	11,440	7,158
1993	9,925	5,725
1994	11,920	5,768
1995	10,494	5,168
1996	9,521	4,205
1997	12,574	5,413
1998	9,204	4,202
1999	11,488	3,682
2000	16,260	4,897
2001	20,412	6,663
2002	15,217	5,300
2003	14,679	5,888
Average	18,063	11,693

TABLE 2. Bluefish Commercial Landings and Recreational Catch (thousands of pounds) for the period of 1981 to 2003.

Year	Comm.	Rec.	Total	% Comm.
1981	16,454	95,288	111,742	15
1982	15,430	83,006	98,436	16
1983	15,799	89,122	104,921	15
1984	11,863	67,453	79,316	15
1985	13,501	52,515	66,016	20
1986	14,677	92,887	107,564	14
1987	14,504	76,653	91,157	16
1988	15,790	48,222	64,012	25
1989	10,341	39,260	49,601	21
1990	13,779	30,557	44,336	31
1991	13,581	32,997	46,578	29
1992	11,477	24,275	35,753	32
1993	10,122	20,292	30,414	33
1994	9,495	15,541	25,036	38
1995	8,004	14,306	22,310	36
1996	9,295	11,746	21,041	44
1997	9,063	14,302	23,366	39
1998	8,253	12,334	20,588	40
1999	7,093	8,253	15,346	46
2000	7,983	10,605	18,588	43
2001	8,686	13,230	21,916	40
2002	6850	11,371	18,221	38
2003	7,239	13,961	21,200	34
Average	11,275	38,182	49,457	23

Source: NMFS General Canvass and MRFSS data.

TABLE 3. State-by-state commercial bluefish quotas for 2003 based on a coastwide quota of 10.5 million pounds and 1981-1989 NMFS General Canvass Data.

State	1981-89 Total	%	Quota
ME	858,177	0.6685	70,193
NH	532,032	0.4145	43,523
MA	8,621,803	6.7167	705,254
RI	8,739,090	6.8081	714,851
CT	1,625,500	1.2663	132,962
NY	13,330,736	10.3851	1,090,436
NJ	19,018,645	14.8162	1,555,701
DE	2,410,900	1.8782	197,211
MD	3,853,253	3.0018	315,189
VA	15,248,930	11.8795	1,247,348
NC	41,154,504	32.0608	3,366,384
SC	45,161	0.0352	3,696
GA	12,205	0.0095	998
FL	12,912,995	10.0597	1,056,269
TOTAL	128,363,931	100.000	10,500,011

TABLE 4. Status Of Bluefish Fishery Management Plan Implementation by States in 2003.

State	Recreational Limit	Recreational Size Limit	Commercial Trip Limit	Commercial Open Season
ME	3			
NH	10			7/1 – 9/30
MA	10		5,000 lb/day	
RI	10			
CT	10		500 lb/day	4/15 – 12/31
NY	10			Gear Specific
NJ	15			Gear Specific
DE	10		Gear Specific	Gear Specific
MD	10	8”		
PRFC	10			
VA	10			
NC	15[1]			
SC	10			
GA	15[2]	12” FL		
FL	10	12” FL	7,500 lb/day	

1 Only 5 greater than 24”

2 Recreational Season from 3/16 to 11/30