

Committee on Resources

Subcommittee on Fisheries Conservation, Wildlife and Oceans

Statement

Testimony

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Research Program on Bluefish/Striped Bass Population Dynamics

By

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I'd like to thank Chairman Saxton and members of the subcommittee for the opportunity

to speak this morning at the hearing on reauthorization of the Atlantic Striped Bass Conservation Act. My comments will focus on a fishery research program that relates to the Atlantic Striped Bass Conservation Act--the Population Dynamics of Bluefish and Striped Bass. This effort has been authorized and funded for the past three years with support from this subcommittee, and was developed in response to industry concerns that bluefish abundance along the east coast has declined and that interactions with striped bass may have contributed to this decline.

Background

In 1997, Congress expressed concern over the decline in abundance of bluefish stocks along the Atlantic coast of the U.S. This decline has been attributed to a variety of factors ranging from competition with other species, to dwindling forage species and unusual migratory pathways. On October 8th 1997, Rutgers University and the National Marine Fisheries Service convened a workshop to identify near- and long-term information and research needs to determine the potential factors that govern the population dynamics of bluefish stocks. Workshop participants included a diversity of individuals representing many institutions such as academe, industry, federal and state government, and regional fishery management councils. The results of the workshop provided the framework for a request for proposals in 1998, 1999, and 2000. Six primary areas of study were identified that merited investigation. These are listed below along with specific mechanisms in each category that were proposed to account for fluctuations in bluefish abundance.

- **Recruitment dynamics**

Determine if the perceived decline in bluefish abundance is due to variability in recruitment.
Determine if changes in oceanographic conditions are responsible for changes in the effective spawning area for bluefish.

- **Predator-prey interactions**

Determine if the adult bluefish population is controlled by fluctuations in availability of their prey species. Determine if overwinter conditions of bluefish and their environment affect survival. Determine if the perceived decline in bluefish recruitment is due to a decline in the abundance of their prey.

- **Stock (genetic) structure and demography**

Determine if the population of bluefish from Maine to Florida is one population (unit stock).

- **Habitat Use**

Determine if the perceived decline in bluefish abundance is due to a decline in suitable habitat. Determine if young-of-year bluefish are estuarine and/or nearshore dependent.

- **Reproductive biology**

Determine if the perceived decline in bluefish abundance is due to a decline in reproductive fitness. Determine if the time of spawning has an effect on recruitment success.

- **Stock Assessment**

Draw upon the best information currently available on bluefish in the five thematic areas listed above, as well as any other pertinent information, to assess the current status and trends in the abundance of bluefish along the Atlantic coast.

Thematic areas developed at the 1997 workshop continue to guide research efforts for 2000. Proposals that address additional mechanisms also receive consideration.

All proposals are sent out to disciplinary experts for mail review, principal investigators have an opportunity to prepare a written rebuttal of mail reviews, and a peer review panel is convened to evaluate and rank the proposals. Proposals are evaluated on the basis of technical merit, responsiveness to the RFP, importance and tractability of the question(s) asked, and qualifications and relevant experience of key personnel. I'd like to note that the program involves some of the top fishery biologists along the Atlantic coast.

Current projects include:

Empirical Modeling of Bluefish Population Fluctuations: Interactions Among Bluefish, Striped Bass, and Forage Species, *Anne Richards, Center for Environmental and Estuarine Studies, University of Maryland*

Recruitment of Young-of-Year Bluefish: Patterns, Pulses, and Processes in the Chesapeake Bay Estuarine System, *Edward Houde and David Secor, Center for Environmental and Estuarine Studies, University of Maryland*

Influence of Coastal Oceanography on Habitat Use and Recruitment Success of Bluefish (*Pomatomus saltatrix*) in New Jersey, *Ken Able, Institute of Marine and Coastal Sciences, Rutgers University*

Recruitment of Spring- and Summer-Spawned Bluefish: Genetic Structure, Cohort Identification, and Relative Contribution to the Adult Stock, *David Conover, Marine Sciences Research Center, State University of New York at Stony Brook*

Impact of Prey Abundance and Size Structure on Growth of Spring- and Summer Spawned Juvenile Bluefish in the Hudson River Estuary: An Individual-Based Modeling Approach, *Francis Juanes, University of Massachusetts, Amherst*

Successful investigators are expected to publish results in a peer-reviewed journal and participate in outreach meetings designed to present research results to fishery scientists, managers, and industry groups. One such outreach meeting was held in October, 1999, in association with the annual meeting of the Atlantic States Marine Fisheries Commission. At this meeting, an afternoon was devoted to presentation of research results by the principal investigators to the fishery management community.

Research Results

Modeling Bluefish Fluctuations: Interactions among Bluefish, Striped Bass, and Forage Fish (Anne Richards, National Marine Fisheries Service)

The purpose of this project was to answer questions about possible interactions among populations of bluefish, striped bass and their forage species (particularly menhaden). This is a data mining effort or statistical analysis and modeling of time series (historical landings) data on these species. The data sources include commercial and recreational fishery landings as well as scientific surveys that are used to estimate abundance. An analysis of landings data has been completed; and the analysis of abundance data is still underway. Results from the landings analysis include:

- Bluefish landings are negatively correlated with striped bass landings 4 years previous
- Striped bass landings are negatively correlated with bluefish landings 2 years previous
- Bluefish landings show both positive (5 years previous) and negative (12 years previous) correlation with menhaden landings
- Striped bass landings showed a negative correlation with menhaden landings 6 years previous.

Biological interpretation of these results is difficult because many factors in addition to abundance affect landings (e.g. amount of fishing effort, environmental fluctuations). However, the analyses show that there are statistically definable relationships between the landings time series, and that the patterns in the landings statistics are not random. Our next step is to analyze the abundance data to look for more direct evidence of biological interactions at the population level.

Comparison of Habitat Use by Juvenile Bluefish between Chesapeake Bay Sub-estuaries and Maryland's Coastal Bays (David Secor and Ed Houde, Chesapeake Biological Lab, U. Maryland)

Bluefish spawn from late winter to summer over a broad area of the Atlantic coast from the Carolinas to New England. Young fish that eventually contribute to fisheries may originate from different geographic regions and may utilize different habitats as they grow towards harvestable size. This project was designed to provide fisheries managers with an evaluation of sources of young bluefish and habitat types that they

utilize as nurseries in the Chesapeake region. This project compares Chesapeake Bay, Delmarva coastal bays, and the coastal ocean adjacent to Delmarva. The contribution to the Atlantic population by bluefish reared in nurseries in the Chesapeake region apparently varies from year to year in response to different environmental conditions. To date, the PIs have conducted surveys (trawling and beach seining) of young-of-the-year bluefish in Chesapeake Bay and its tributaries, and in Assawoman and Chincoteague Bays. Diets, growth rates, and abundance in the Bay, the coastal bays, and coastal ocean are being analyzed and compared. Water quality, habitat and feeding conditions are being monitored. Secor and Houde also have estimated dates of hatching for young bluefish, from which the area of origin is inferred. Novel chemical analyses are used to distinguish past environmental histories of bluefish and relative utilization of ocean vs. estuarine environments.

Specific findings useful for management and policy:

- Evaluate of essential components of juvenile bluefish nurseries (e.g., diets and feeding conditions, habitat structure and water quality)
- Determine whether bluefish in the Chesapeake region preferentially use estuaries, coastal embayments or the coastal ocean during the juvenile stage. Recent studies in NJ and VA suggest that the coastal ocean nurseries may be most important
- Investigate the origins, timing of production, and habitat use. Juvenile bluefish migrate from ocean waters to inshore nurseries in two major pulses, one in late spring and a second in late summer. Annual changes in the timing and magnitude of these pulses may explain annual variability in survival of young fish and their potential contributions to the harvestable stock

Information from the Secor and Houde project will contribute meaningfully to management needs for bluefish that are becoming increasingly region-specific and dependent upon knowledge of critical habitats along the Atlantic coast.

Habitat Use by Young-of-the-Year Bluefish: Are Ocean Beaches Important? (Ken Able and Philip Rowe, Institute of Marine and Coastal Sciences, Rutgers University)

While it has long been known that young-of-the-year (YOY) bluefish are composed of multiple spawning groups utilizing estuarine nurseries, their use of alternative habitats is not well understood. In recent years (1995-1999), analysis of extensive data from the NJ Department of Environmental Protection, U.S. Army Corps of Engineers, and Rutgers University Marine Field Station have established that ocean beaches and the nearshore coastal ocean are also important habitats for YOY bluefish in the Mid-Atlantic Bight. The data suggest that multiple cohorts of YOY bluefish are variably abundant on ocean beaches and that the summer-spawned cohort may be a dominant component in some years. Local spawning of summer-spawned bluefish can be quite common in the nearshore coastal waters of New Jersey based on collections of small, recently hatched larvae. Their subsequent distribution may be influenced by local hydrography. However their contribution to recruitment to the adult population is poorly known. As a result of tagging experiments, movements of YOY bluefish on ocean beaches may be quite extensive and their growth is comparable to those YOY utilizing estuarine habitats. Transition to a diet of mainly fish by YOY using ocean beaches was at a similar size as compared to published accounts on YOY using estuaries.

Specific findings useful for management and policy:

- The coastal ocean and ocean beaches are Essential Fish Habitat for multiple cohorts of YOY bluefish.
- Summer-spawned individuals may preferentially use ocean habitats and thus they are undersampled in estuarine surveys.
- From these results, it appears that any attempt to manage bluefish populations must include consideration of coastal ocean habitats.

Recruitment of Spring and Summer-Spawned Bluefish: Genetic Structure, Cohort Identification, and Relative Contribution to the Adult Stock (David Conover, Marine Sciences Research Center, SUNY-Stony Brook)

This study aims to determine the number of independent spawning stocks of bluefish that exist along the U.S. East Coast. The PIs also seek to show how the offspring produced by these different stocks contribute to the catch of adult fish along different parts of the East Coast. Such information is vital because fisheries must be managed on a stock-specific basis. Unexpectedly, we have found very strong indications of stock differentiation among bluefish from the South Atlantic Bight (SAB) vs. the Mid-Atlantic Bight (MAB) based on molecular genetic differences. Rather than two stocks associated with the well-known spring and summer-spawning seasons, the data suggest the existence of a resident, early spring-spawning SAB stock that is distinct from a migratory stock that spawns in the SAB in late spring and in the MAB in summer. Within the MAB, where the bulk of bluefish are landed, there continues to be very strong evidence of a recent shift in recruitment of young fish. In the past, most of the young fish entering the adult population were products of the spring spawning season (the rule in the 1970s and 80s). Now it appears that the production of young fish from the spring spawning season has declined and more young fish are entering the population from the summer spawning season (e.g., summer-spawned juveniles dominated the '92, '94, '97, '98, and '99 recruitment indices).

Specific findings useful for management and policy:

- Currently, all Atlantic coast bluefish are managed as a unit stock, but data suggest that there may be at least two stocks along the U.S. Atlantic coast
- Findings will help determine whether the decline in bluefish is due to poor recruitment of young from different spawning stocks
- Improved knowledge of the age and growth of young bluefish

All of the above information is vital to the development of management plans for bluefish

Impact of prey abundance and size-structure on growth of spring- and summer-spawned juvenile bluefish in the Hudson River estuary: an individual-based modeling approach (Francis Juanes, U. Massachusetts-Amherst)

There are large interannual differences in young-of-the-year (YOY) bluefish growth during the estuarine and nearshore stage. Additionally, summer-spawned bluefish growth rates appear to be more variable than spring-spawned bluefish growth. The cause of this variability is unknown. This is a new project entering its first field season in 2000. The goal of the proposed research is to build an individual based predation model for YOY bluefish in the Hudson River estuary. The PIs will investigate factors that influence size-structured

predator/prey interactions to identify potential causes of growth rate variability in YOY bluefish. Specific objectives are to:

- Evaluate the effect of variation in density of prey on bluefish growth
- Quantify the effect of variation in size distribution of prey on bluefish growth
- Assess whether variation in prey densities and/or size distributions affect growth of spring- and summer-spawned bluefish cohorts differently; and 4) determine if bluefish growth is density dependent.

Future Directions

The Research Program on Bluefish/Striped Bass Population Dynamics is now entering its third year of operation. Since its inception, projects have been awarded to primarily the same group of principal investigators. In an effort to bring some new ideas forward, and to ensure the responsiveness of the program to industry and management needs, the Steering Committee has recommended the following actions:

- Project awards made in 2000 will be the final funding for the existing projects
- Another workshop will be held to present results of studies to date and to review research priorities in response to management information needs
- A new project that addresses industry concerns on predator-prey dynamics between bluefish and striped bass is proposed to begin
- Research results will be published in a special journal issue or periodical
- Research results will continue to be disseminated at suitable meetings of the fishery management community (e.g., ASMFC, Mid-Atlantic FMC)

Thank you again for the opportunity to brief the committee on this research effort. I'll be pleased to address any questions you may have at this time.

Follow-Up Address

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