# The Chesapeake Bay Fisheries A Scientific Perspective

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# REPORT OF

# WORKSHOP ON CHESAPEAKE BAY FISHERIES STATISTICS

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# THE CHESAPEAKE BAY FISHERIES
# A SCIENTIFIC PERSPECTIVE

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## ABSTRACT

Fisheries science plays a dual role in support of management of living marine resources. A fisheries scientist is an advisor to a local, state, regional, national or international fisheries management or regulation agency, providing scientific information on the living marine resource to the agency so that informed decisions may be made. As such, scientific data, analyses, and information can have a significant impact on the socio-economic wellbeing of major segments of the population, as well as on the viability of the fishery stock. This information must be drawn from critical scientific analyses of data, the output from field assessment programs, catch statistics, and mathematical models of varying degrees of sophistication. All aspects of fisheries science, whether advisory or research, rely heavily on the level of catch and effort emanating from the fishery itself. Without firm information on the magnitude of the catch, the effort, and biological information on the catch (age, size, sex) the scientist can not provide the manager with sound recommendations, and the manager must make decisions based upon "spongy" data. The results of the decision are often hidden in the noise of the poor data, and therefore, the consequences of the action may never be known.

## AN OVERVIEW

Recent summaries on the fisheries of the Chesapeake Bay have been prepared by Cronin (1979) and Rothschild (1981). These papers provide a historic perspective of the fisheries, their species, magnitude, and some problems. Rothschild (1981) discusses many of the problems related to inadequate information about the fisheries of the Bay, and is in part responsible for crystallizing the thoughts that resulted in this workshop. You will hear today from various speakers about the problems related to catch statistics on the oyster, clam, blue crab and finfish fisheries of the Bay. I do not intend to scoop their presentations, and so will direct my comments to the catch statistics needs of the scientists both in the roles as advisor and as researcher.

A fishery is like a large tube with recruitment occurring at one end, and, out through several holes at the other, mortality due to pollution or fishing or from natural causes such as starvation, predation or climatic fluctuations. The job of the management agency is to balance the tube so that the rate at which recruitment flows in through one end and out the holes of the other is balanced, hopefully to maintain a steady catch and maintainance of recruitment. The unenviable job of the scientists is to recommend to the manager the appropriate angle at which to hold the pipe so that the flow out the lower end equals the flow into the upper end.

## DATA NEEDS

The scientist, in the role of advisor and researcher, requires data and information both on recruitment and mortality. Generally speaking, actual measurements can be made of recruitment, as stock assessments of juvenile stages allow estimates to be made. These types of data generally include abundance, distribution, size, age, sex, and food habits. Further estimates can be made from the distribution and abundance of spawning adults, by sex and stage. All of the above data and the subsequent information generated therefrom are collected by field measurements by scientists.

Recruitment estimates require an analysis of the adult or spawning stock size. The more density dependent the stock, the more dependent recruitment becomes upon it. Here begins a problem. Estimates of stock size are often best made from commercial or recreational catch data.

Several types of catch data are needed both to improve the recruitment estimates and to measure the flow from the various mortality outlets. These include total catch by species, by waterbody (for example river system or mainstem bay), and by gear type (including a breakdown of recreational vs. commercial). Catch should be by size, age, sex.... and the level of effort expended to generate the catch. Catch per unit of effort is the holy grail of fisheries science.

## CASE HISTORIES

Perhaps the best way to exemplify the problem is through case histories encountered in the Commonwealth of Virginia during the last five years.

Commercial landings of striped bass Morone saxatilis peaked in the mid-Atlantic region in 1974 and have declined since. This was not too surprising as the striped bass or rockfish has exhibited several cyclic periods of abundance and paucity since the early 1950's. Consequently, most scientists were not alarmed by the decline during the mid 1970's, as it was expected that a dominant year class would be produced either in 1976 or 1977. This did not occur, however, and the population, as reflected in the commercial landings, has continued to decline through the present.

Through the auspices of the Atlantic States Marine Fisheries Commission (ASMFC) a State-Federal fisheries management plan has been drafted for the Atlantic Coast rockfish stock, a significant portion of which requires the careful collection of catch statistics including catch, effort, size, age, and sex of the catch. Recruitment indices have been collected since 1954 by the Maryland Department of Natural Resources and these have been shown by several authors to be good predictors of future commercial catch (Schaefer 1972, Austin and Hickey 1977). These recruitment estimates are a predictor of the potential catch, not the actual catch; in other words, they are a possible indicator of stock size and not necessarily of catch. This was further exemplified in New York in 1974 as Austin and Hickey (1977) predicted an exceptionally large catch for 1974 which never materialized. They hypothesized that the unusually warm fall, with few storms, held the bass off of the beach where they were not susceptible to the normal haul-seine fishery.

During 1979 and 1980 there was a considerable interest in the Commonwealth over the potential ecological (later shown to be economic) impact of the hydraulic escalator dredge on the hard clam fishery. Considerable interest and concern was raised as to the possibility that the highly efficient escalator dredge would take all of the available clams. Existing data on the status or size of the harvest of the stock by Loesch and Haven (1973) suggested that the fishery may already have reached the maximum sustainable yield. Without accurate estimates of effort, however, it was not possible to determine whether or not the possibility for over-fishing really existed. Earlier experimental efforts conducted on the Eastern

Shore by the VMRC suggested that the escalator dredges were indeed capable of reducing the population to a low level very quickly. This estimate was possible only through the requirement of daily reporting of catch and effort as a requirement for the receipt of an experimental permit to operate the dredge.

Of particular importance and difficulty are those stocks that are not resident in the territorial sea or inland waters of the Chesapeake Bay, but spend parts of the year or life cycle in the bay. Most significant, recent, and publicized was the June 1982 problem of the Florida "high-rollers", gill net boats that operated in the Chesapeake Bay for the specific purpose of taking large (10-15 pound) bluefish for foreign export. The outcry from the public was that these four vessels would soon "wipe out" the bluefish population. Preliminary catch estimates and estimates of the maximum sustainable yield (in excess of 100,000,000 pounds) by the draft bluefish management plan of the Mid-Atlantic Fisheries Management Council suggested that this possibility was absurd. It left open, however, the possibility of increased "gold rush" effort in future years, and the potential for "local depletion". Further, the Virginia commercial catch is reported by NMFS to be greater than the recreational. Maryland data however (Williams, Speir, Early and Smith, 1982), suggest the reverse is true. Maryland's survey is probably true and I suspect the same ratios apply for Virginia. This being the case, the bluefish is of greater economic value in Virginia as a recreational species than commercial, yet we have no data to support this supposition. Several management strategies were suggested by the VMRC, but none could assure the demonstration of their effectiveness as the catch reporting system would neither demonstrate nor negate it.

More recently the Virginia Marine Resources Commission has received reports that undersized (less than 12 inches) summer flounder _Paralichthys_ _dentatus_ are being taken in significant numbers in the Virginian territorial sea. The question was posed as to what impact this might have on the stock, both coast-wide and to Virginia. The Code of Virginia indicates that the minimum size for summer flounder is 12 inches, "unless obviously injured or dead". In short, this "dead or injured" clause negates the minimum size regulation, and leaves all summer flounder open to the fishery, both recreational and commercial. Do commercial fisheries in Virginia take significant numbers of undersized summer flounder? What is the magnitude of the problem or the potential impact? We do not know, as the current system reports only catch and, to a lesser degree, effort. No biological data are collected and no size composition of the catch. Consequently, there is no estimate of the percentage of "undersized" fish taken in the fishery.

## CATCH STATISTICS NEEDS

Assessment efforts using recruitment data and stock estimates generated from catch data are necessary for predicting yield both in terms of poundage and the age of maximum yield per recruit. Without catch, effort and mortality data, these predictions are not possible.

Of even greater import to the research scientist is the need for catch (per unit effort) data for ecological, time series, regressive or autoregressive models. Even with accurate estimates of recruitment as the input, the output (generally expressed in adult stock size) requires accurate catch statistics for verification. The predicted catch and the actual catch sometimes show a statistical coherence, but it is often coincidental. Was the predicted catch an estimate of population size, and, due to poor availability, lower; or was the model way off, but the catch a true reflection of the stock size? The current lack of accurate catch and effort data make this choice impossible.

Further, an understanding of the size and age composition of the catch is required for accurate predictive models. Case in point is the Atlantic croaker prediction model (Norcross and Austin 1981) which predicts available adult croaker (commercial catch) as a function of winter temperature and VIMS juvenile trawl survey data (recruitment estimates). The model more accurately predicts smaller year class catches than periods when there are several large year classes. From the information on the size distribution in pound net catches during the 1950's (Massman and Pacheco 1960), it appears that small year classes are exploited for only one or possibly two years; whereas the large year classes are exploited for three, four or even five years. How then does one partition the catch in the model over a five year period if it predicts only the size of each year class?

## RECOMMENDATIONS

The recommendations for improving catch statistics in the oyster fishery are covered comprehensively by Haven and Krantz (this volume), and by Van Engle, Bonzak and Dintaman (this volume) for the blue crab. Merriner and Speir have addressed the problems and recommendations for finfisheries. The following are the data needs of the research scientists both in providing an advisory role to management and in conducting basic research where the output is expressed in stock size.

- o Catch data by species are needed as an expression of the effort by gear type.
- o Particularly, catch and effort data by the recreational fishery are needed.
- o In addition to the current practice of reporting catch by gear and location, breakdown of the age, size, and sex of the catch is also important. Not only is the sex of the species important but also the stage of maturity of spawning stage. This would allow an estimate of the impact of fishing on juveniles and on the spawning stock when on the spawning ground.
- o The most sophisticated and indepth data obtainable are of little value, however, if they sit squirreled away in various notebooks in the states along the Atlantic Coast and Chesapeake Bay. Collection of all the above data must be disseminated rapidly through the use of computers.
- o Methods of reporting data both in terms of catch and effort by gear type, water body or biological data must be standardized between the two states. While Maryland has gone to an apparently streamlined method for collecting blue crab catch and effort data, it may be that Chesapeake Bay-wide reporting will no longer be possible with two systems using different criteria. This may not be possible in practice as even gill nets are different between the states. How does one compare CPUE in monofilament vs. nylon nets? Never-the-less, an effort must be made.

The needs have been expressed, to provide a realistic management regime in the Chesapeake Bay. This will require additional resources from the already extended state coffers. It may appear that now is not the time to advocate expanded programs. However, if we wait until the appropriate economic senario exists, it may be too late.

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# THE CHESAPEAKE BAY FISHERIES SOCIO-ECONOMIC PERSPECTIVE

by

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The Chesapeake Bay Fishery is a composite of two dynamic, intricately linked systems; a common property biological system and a human system containing both commercial and recreational fishermen. During the early history of the Bay, the productivity of the biological system provided a resource sufficient for all. As various natural and man-induced stresses were placed upon the biological system, reducing its productivity, conflicts emerged between and within the various groups. These conflicts expressed the consequences of a common resource and stressed the need for the development of rational management. Efforts were initiated to understand the biological system and to select measures which would reduce the stresses that contributed to the resource decline. Most measures available to management indirectly protect the resource by regulating access to the resource. Seasonal limitations, gear restrictions and catch quotas are some examples. Since management measures are usually directed at limiting the time or the way people can harvest the resource, resource managers are really people managers. Since it is people that we are really regulating, it behooves us to have an understanding of the human system aspect of the Chesapeake Bay Fishery as well as the biological.

In this paper, the discussion on human system of the Bay fishery is directed at the commercial industry. This should not be interpreted to mean that the recreational fishery is of little or no significance, it is not. The economic and harvest consequences of head and charter boats for example is of major importance. A substantial amount of fish are harvested by these activities and needs to be included in the population dynamics of a species. In addition, the economic interplay between the recreational and commercial industries is perhaps an integral factor to the survival of many participants. The recently completed sport fishing survey (Williams, et al. 1982) and the near completed mid-atlantic recreational striped bass study (Norton, 1982) are examples of efforts which will provide answers to some of the many questions. But, more work is needed on the significance of of recreational fishing and should be done if the development of rational resource