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REPORT OF

WORKSHOP ON CHESAPEAKE BAY FISHERIES STATISTICS

Fredericksburg, Virginia

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Center for Environmental and Estuarine Studies
University of Maryland

Chesapeake Research Consortium

Tidal Fisheries Division
Tidewater Administration
Maryland Department of Natural Resources
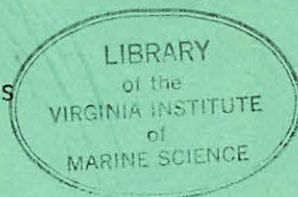
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THE BLUE CRAB FISHERIES IN THE CHESAPEAKE BAY
PROBLEMS AND APPROACHES

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INTRODUCTION

Regulations of the blue crab (<u>Calinectes</u> <u>sapidus</u>) fishery in the Chesapeake Bay have been based on empirical reasoning involving biological, economic, political and sociological considerations. These regulations cover licensing, size and sex limits, quotas, seasons, and gear restrictions. They are designed to promote utilization of the resource for near maximum production, a reasonable economic return from adequate catch per unit of effort, and orderly fishing to minimize conflicts between units and types of gear.

Biological-Environmental Data Needs

The need for some of the present regulations has never been examined in a comprehensive study of the population dynamics of the blue crab in the Chesapeake Bay. How the population would react to changes in fishing effort, to alterations in the minimum size limit, to changes in gear types and mesh sizes, could be estimated with one type of yield assessment model. For that model it is necessary to have estimates of the biological characteristics of the stock, such as growth, mortality and recruitment rates, as well as records of fisheries yield over time. The effect of changing effort could be assessed with a model utilizing catch and effort data alone, requiring accurate records of landings and effort, by month, gear and geographic region.

Studies to provide estimates of growth, mortality and recruitment rates need to be carefully planned and executed by research scientists. Monitoring of the juvenile segment of the crab population provides an assessment of the strength of each year class at a time just prior to its recruitment to the fishery. The

availability of estimates of the number of crab recruits is an exception to
the general rule that for most species the number of recruits is ususally
unknown. In those cases, yield must be expressed as the yield per recruit.
This assumes that recruitment rate does not vary significantly from year to
year. But wide fluctuations in abundance that have occurred in the 100-year-
old blue crab fishery deny a constancy of recruitment. Evidence is accumulating
that environmental variables are highly correlated with variations in landings,
suggesting that the density-independent mortality coefficient is large. If this
is true, changes in fishing intensity should not affect levels of recruitment.

The study of the influence of environmental variables on year-class
strength, and subsequently on yield, requires a time series of data, consisting
of landings and lagged environmental variables. Juvenile abundance estimates
may be used instead of landings. The selection of environmental variable should
be based on their known or expected effects on critical stages of the blue crab
life history.

The primary objective for monitoring stock levels, by obtaining catch and
effort data from the fisheries and making juvenile crab abundance surveys, should
be to obtain data for yield assessment studies. These data will provide the
background information needed for rational management of the blue crab fishery.
Monitoring of the stock by juvenile sampling surveys should be continued in
Maryland and Virginia.

The value of a yearly crab abundance prediction to the commercial fishermen,
processors and shippers and to management agencies is unknown. Ideally, industry
would modify its activities if predictions and the success of fishing were highly
correlated. Over the long term, since 1956, landings were within 5% of the
predictions. Recently, within the last four years, landings have differed from
predictions by significant amounts.

It is important to recognize that the predictions are not the primary objective
of juvenile abundance surveys, and that they are based on the observed relationships
between current and historical juvenile abundance and commercial landings data.
Explanations must be sought for the apparent successes and failures of predictions,
explanations for the causes of fluctuations in abundance. Predictions could be
de-emphasized if they are shown to be of little value to the blue crab industry
for planning. They are of scientific interest because deviations require inter-
pretation, and they have publicity value.

Harvest-Effort Estimates

The Maryland Department of Natural Resources (MDNR) has instituted a new
and innovative approach in making estimates of catch and effort of blue crabs
in Maryland portions of the Chesapeake Bay and the Maryland oceanside bays.
The system is based upon a monthly random sample survey of individual licensed
crabbers. For each month, estimates of catch are produced by gear type, river
system, and market category (#1 male, #2 male, female, mixed, soft and peeler).
The system has eliminated past suspected underestimation of harvest. Monthly
estimates of fisherman effort in terms of man-days, man-hours, amount of gear
fished, and number of times gear was fished are also produced from the survey.
The present survey includes catch estimates by the recreational licensed crabbers
as well as by commercial crabbers, though catch by non-licensed recreational
crabbers is still not estimated. This unreported catch is potentially quite
large. A catch by 100,000 people of 3 bushels per year, would mean an unreported catch
of 13,000,000 pounds per year; an amount equal to approximately one-third the
total annual catch reported in Virginia. In order to accurately estimate this
component of the harvest, it would be necessary either to license all persons
fishing for crabs in the Bay, or to include blue crabs in the annual National
Marine Fisheries Service sportfishing survey.

MDNR is well pleased with the mechanics and results of this type of harvest
estimate system. It is thus proposed that the survey be expanded to include
the entire Chesapeake Bay and the Virginia oceanside bays. However, implementation
of this system in Virginia would require basic changes in several present practices.
First, individual reporting of catch to a regulatory agency has never been required
in Virginia for any species. Because of resistance by watermen and the public
alike to breaking this long tradition, it is possible that mandatory reporting
of individual catch would have to be legislated, with revocation of license as
the consequence of non-reporting. Second, this type of system requires fairly
advanced automated data processing (ADP) capabilities that at present don't exist
for the Virginia Marine Resources Commission (VMRC). A system such as this could
possibly be conducted with the ADP power provided by a relatively inexpensive micro-
computer, but because licensing files tend to be large, would best be conducted by
access to a mainframe computer. Such a Bay-wide system could be conducted using
the ADP power already available to MDNR, possibly under the auspices of a bi-state
statistics working group which would have access to the license files of both

states. Required sample sizes could be reduced if it were possible to differentiate between truly commercial and semi-recreational crabbers among those individuals holding commercial licenses. This could be done by simply including a question on the license application asking how many days per week the person crabbed during the preceeding year (or plans to crab during the current year if he did not previously hold a license).

Because of the need to manage species based on biological rather than political boundaries, such interstate agreements are certainly desirable, and will become absolutely necessary with the recent striking of residency require-ments. Failure to institute similar harvest estimate systems for both states will result in vastly different types of estimates, which would not reflect the true contribution of each state to the Bay's blue crab fishery.

The cost of the Maryland random sample survey is approximately $300 to $400 per month, the bulk of which is the cost of mailing questionnaires and postage pre-paid return envelopes. It is reasonable to think that these costs would be approximately double under a similar Bay-wide survey.

Economics Data Needs

The economics are, of course, what actually drives the commercial portion of any fishery. Managers must therefore have knowledge of present, past, and possible future market conditions. Two basic types of data are necessary in monitoring the economics of the blue crab fishery in the Bay. These are 1) a monthly average price by market category paid by all crab houses; and 2) a once yearly measure of gross operations by these houses including information such as; the number of employees, overhead and fixed costs, variable costs, and if possible revenue figures. These measures, combined with harvest-effort estimates, provide the necessary data points for input to models which will yield estimates for economic optimization of harvest. These data will also yield measures of value of the fishery, effects of the fishery on the communitites involved, and the relation of the fishery to industry in the rest of the region and the state.

Sociological Data Needs

The major function of sociological data in making fishery management decisions involves the need to balance the desires of different user groups.

Data needs include the relative numbers of individuals involved, their
relative amounts of catch and how these catches are distributed in time and
space. These Bay-wide estimates of relative use by different groups would be
a direct consequence of implementation of the proposals made for Harvest-Effort
estimates.