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STOCK - RECRUITMENT RELATIONSHIP OF SPOT (*LEIOSTOMUS XANTHURUS*) FROM THE CHESAPEAKE BAY

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INTRODUCTION

Spot (Leiostomus xanthurus) are an important commercial and recreational species. The area of greatest abundance and center of the Atlantic commercial fishery extends from the Chesapeake Bay region to South Carolina (Dawson 1958; Mercer 1987). The commercial catch fluctuates widely from year to year (Joseph 1972; Mercer 1987) with no long term trend indicated (Joseph 1972). This is not unusual for a fishery consisting primarily of one or two age classes (Pacheco 1962; O'Reilly 1990). Since the early 1960's, the commercial landings in the South Atlantic have exceeded those from the Chesapeake Bay region (Mercer 1987), emphasizing the need for effective management strategies.

Regional and state management of the stock depends upon an understanding of the annual recruitment and its associated variability. Recruitment of spot to the Chesapeake Bay is characterized by large interannual variations (Joseph 1972) derived from both biotic and abiotic factors. The relationship between the adult, spawning population and the recruitment of post-larvae and juveniles to the Chesapeake Bay is not known. This report examines the relationship between the commercial harvest of spot in Virginia and juvenile abundances within the Chesapeake Bay, and provides a first approximation of a Ricker spawner-recruit relationship.

MATERIALS & METHODS

Commercial landings of spot from Virginia were obtained from the Virginia Marine Resources Commission (VMRC) for 1973-1989. Landings from pound nets were used exclusively in the following

analysis because 1) a large percentage of the catch was from pound nets, 2) the location and number of pound nets from one year to the next is consistent when compared with other types of fishing gear used, and 3) the commercial harvest (2+ fish) was considered representative of the adult, spawning population.

A juvenile index was computed from data collected by the Virginia Institute of Marine Science (VIMS) Juvenile Trawl Survey (C. Bonzek, pers. comm.). The index was computed from a geometric mean based on the catch per unit effort (CPUE) within a biological year ($April_{(t)}$ - $March_{(t+1)}$) and represents a measure of recruitment to the Chesapeake Bay.

A Ricker stock-recruitment curve was fitted to the data for 1979-1989. Only these years were used due to different gear types and sampling schedules of the VIMS Juvenile Trawl Survey (1973-1978). The constants (A and B) in the Ricker equation:

$$R = A * S * \exp(-B*S)$$

where R = Recruitment (juveniles)
S = Spawners (pound net harvest)

were determined by plotting the ln(R/S) versus S. Additionally, simple linear regression techniques were applied to the data. All stock-recruitment relationships were examined on biologically relevant time scales (i.e., $R_{(t)}$ and $S_{(t+1,2)}$; $S_{(t)}$ and $R_{(t+1)}$). Pound net harvests for one and two years later were used because O'Reilly (1990) found the commercial catch to be dominated by age I and II spot, and age II spot are the principle spawners (Mercer 1987).

RESULTS

The juvenile index as a predictor of pound net harvests one and two years later was not significant ($F=0.01$, $P=0.934$, $R^2=0.1\%$; $F=0.10$, $P=0.759$, $R^2=1.4\%$, respectively). Likewise, pound net harvest as a predictor of juvenile recruitment the following year was also not significant ($F=1.18$, $P=0.303$, $R^2=10.5\%$).

The Ricker curve for pound net harvest (year=t) and juvenile recruitment (year=t+1) shows much variability (Figure 1).

DISCUSSION

The relationship between stock, using the VA pound net harvest, and the recruitment of juvenile spot to the Chesapeake Bay is tenuous. No significant relationship between the two could be found. This is not unusual, given that most of the interannual variation in recruitment to the Chesapeake Bay is thought to be controlled by environmental factors occurring during the early life history stages (Joseph 1972).

Nevertheless, the relationship between spawners and recruits is necessary to fully comprehend recruitment variability. From this study, the spawning population appears to account for approximately 10% of the variation in recruitment of spot to the Chesapeake Bay. The remainder of the variation is attributed to environmental factors, particularly the transport of spot larvae from offshore spawning grounds to the mouth of the Chesapeake Bay (Norcross and Bodolus 1991). Examination of these environmental

factors is currently being investigated by this author as a doctoral research project.

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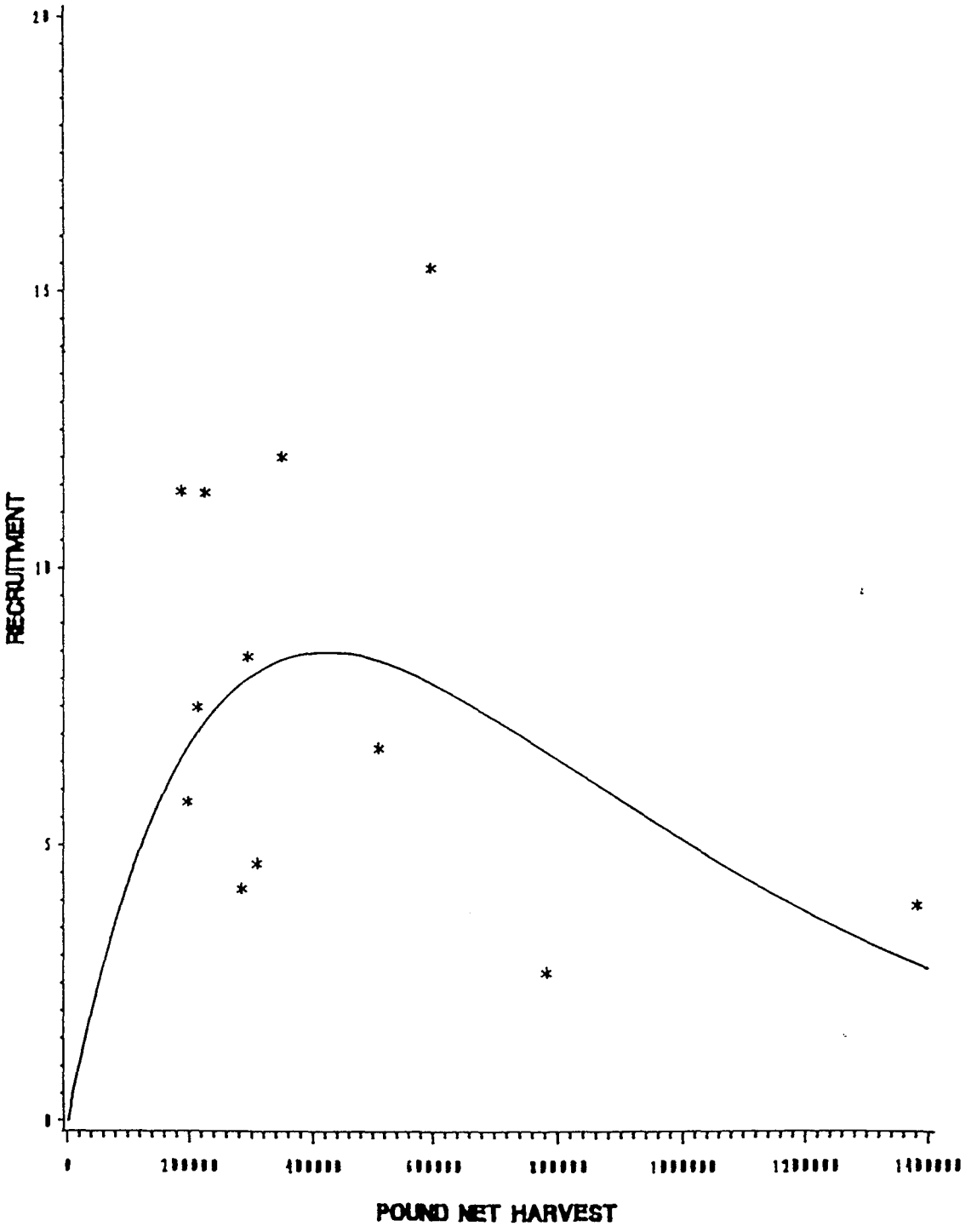

Figure 1. Ricker stock-recruitment curve for Virginia pound net harvest (year=t) and juvenile recruitment (year=t+1) from 1979 to 1989.