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Relationship Between Mackerel Catches,
Water Temperature, and Vessel Velocity during
USA Spring Bottom Trawl Surveys in SAS-6

by

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Abstract

Relationships between mackerel catches, water temperatures and vessel velocity were examined for USA bottom trawl surveys.

Introduction

Mackerel distribution and swimming speed are related to water temperature (Anderson and Almeida, 1976; Olla et al., 1976). Sette (1950) suggested that 7-8°C water constitutes the lower tolerance limit. It is possible that some of the variability observed in survey mackerel catches can be explained by temperature. The purpose of this paper is to determine if any apparent relationship existed between the size and frequency of mackerel catches and bottom temperatures during past USA spring bottom trawl surveys and also to examine the effect of vessel velocity on catch.

Methods

Catches (weight and number) of mackerel and bottom water temperatures from all stations sampled in strata 1-25 and 61-76 (Figure 1) during 1968-76 USA spring bottom trawl surveys were compared by regression analysis. Comparisons were made for each survey and for all years combined. A total of 420 station catches and temperatures were included in the analyses.

Vessel velocity over bottom was available only for stations in the Georges Bank area in 1976. Regression analysis of catch, temperature and vessel velocity were performed to examine possible relationships.

Results and Discussion

Scattergram plots showing the number and magnitude of mackerel catches in relation to bottom temperature over all years (Figures 2-3) indicate that catches were taken at temperatures of 4-14°C. There appeared to be no obvious relationship between temperature and size of catch.

The plot of stations where no mackerel were caught vs. temperature (Figure 4) generally reflects temperature conditions during the time of the surveys, with the greatest proportion of stations having bottom temperatures of 4-6°C. Temperatures at stations ranged from 1 to 16°C.

The plot showing the number of station catches containing mackerel in relation to temperature (Figure 5) indicated as did Figures 2-3, that catches were well distributed between 5-13°C with no pronounced preferences except slightly at the two extremes of the temperature range.

Mackerel catches (weight) at 10 stations in the Georges Bank area in 1976 were compared with temperature and vessel velocity. There was no significant relationship between velocity and catch, but there was a highly significant relationship ($P < .005$, $r = .95$) between catch and temperature at those stations. The two largest catches were taken at virtually the lowest vessel speeds (2.6-2.8 knots).

Literature Cited

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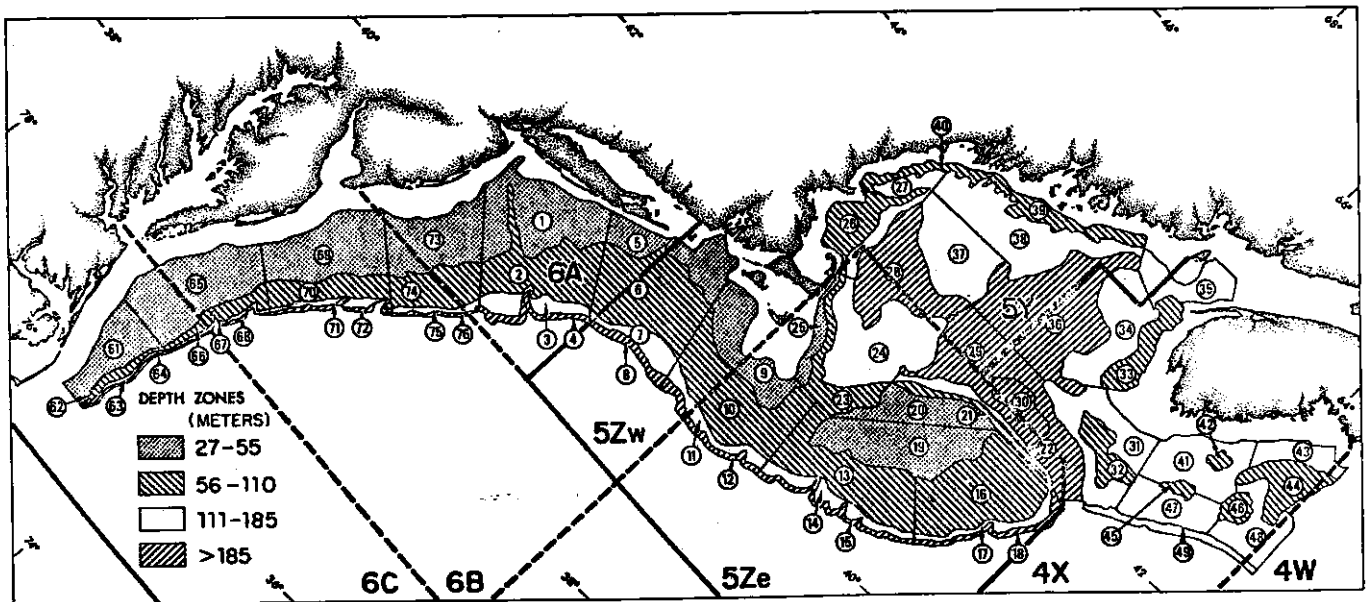


Fig. 1. US bottom trawl survey sampling strata in ICNAF SA 5-6.

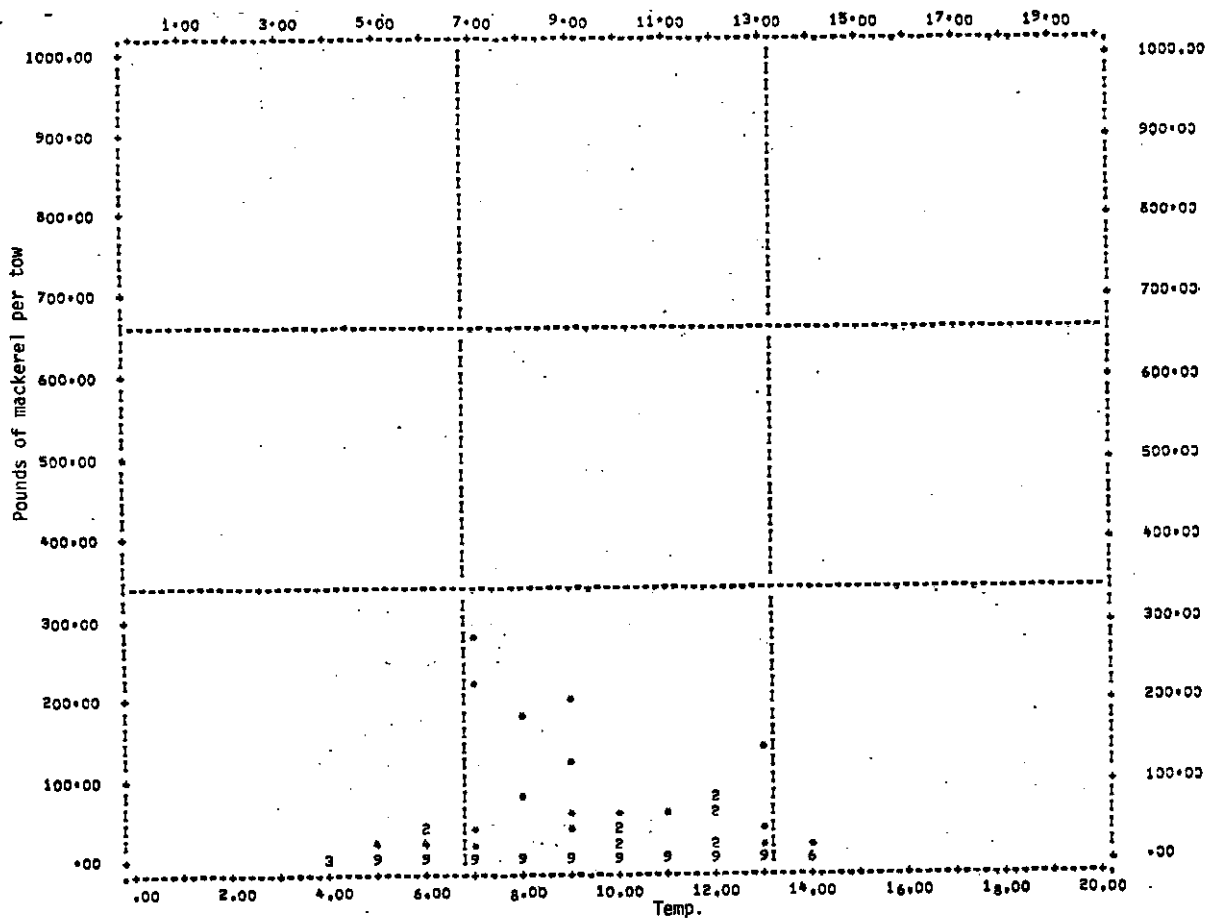


Fig. 2. Scattergram showing size (in pounds) and frequency of mackerel survey catches at different bottom temperatures: * signifies 1 tow, 9 signifies 9 or more.

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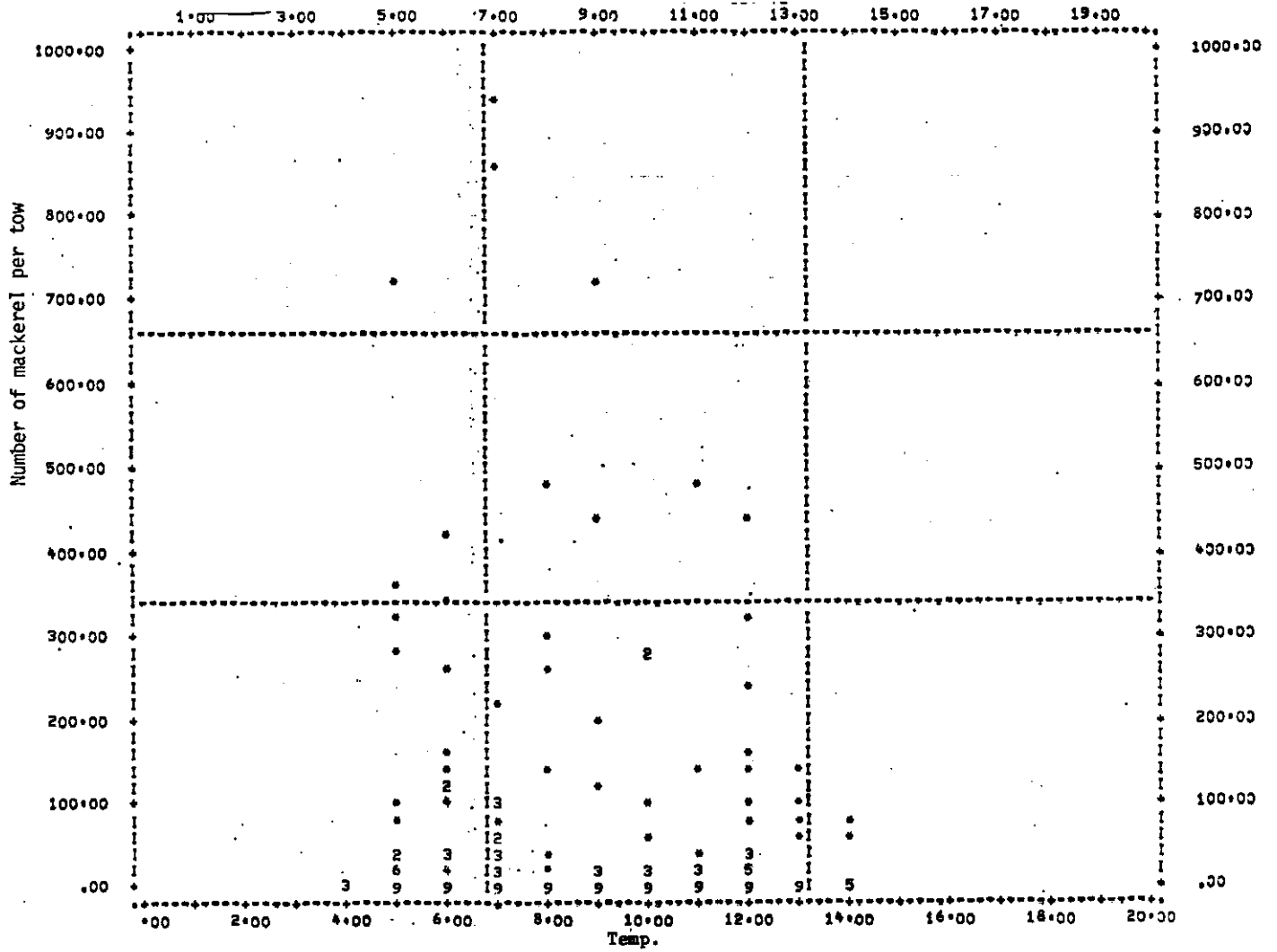


Fig. 3. Scattergram showing size (in weight) and frequency of mackerel survey catches at different bottom temperatures: * signifies 1 tow, 9 signifies 9 or more.

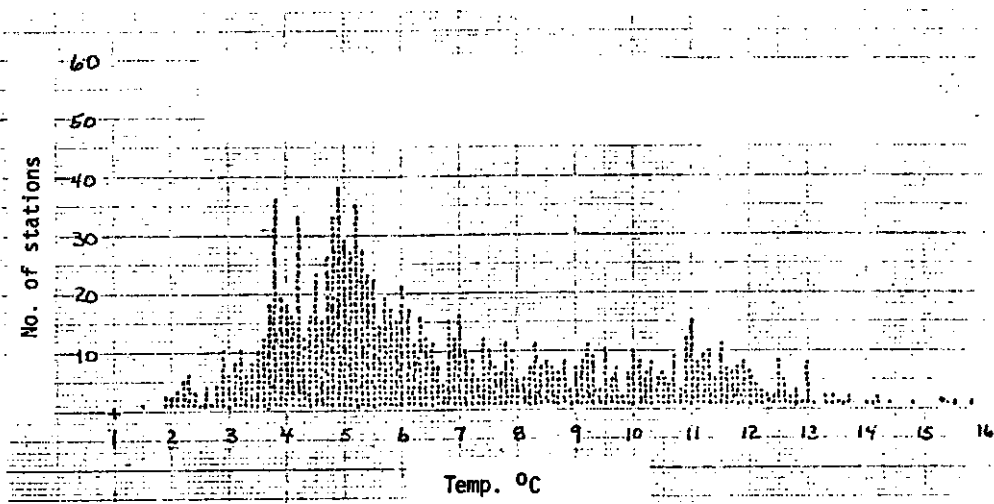


Fig. 4. Number of stations according to bottom temperature where no mackerel were caught during spring surveys in strata 1-25, 61-76.

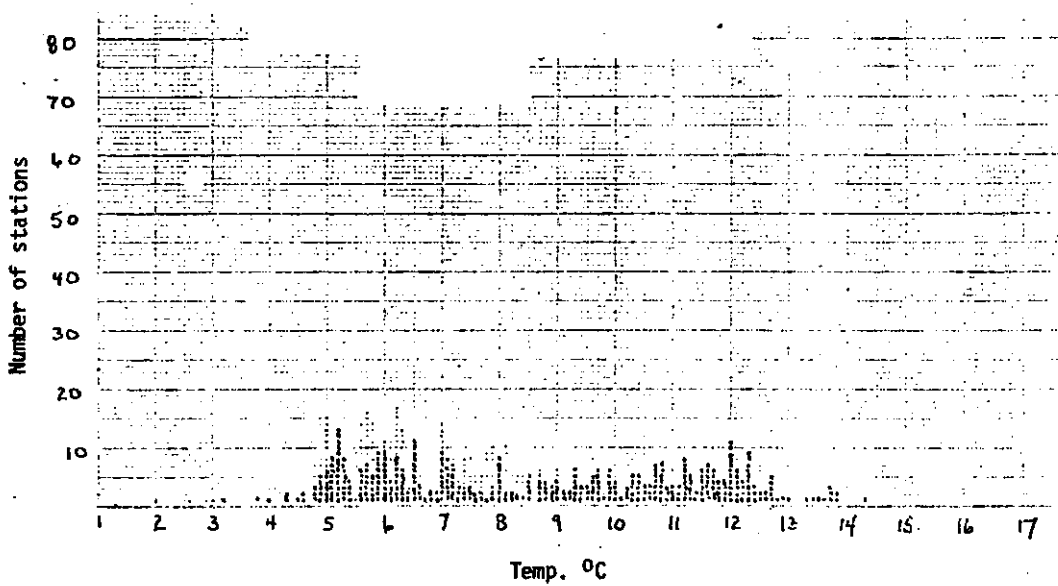


Fig. 5. Number of stations according to bottom temperature where mackerel catches were made during spring surveys in strata 1-25, 61-76.

