Oyster Dredge Tow Time Comparison

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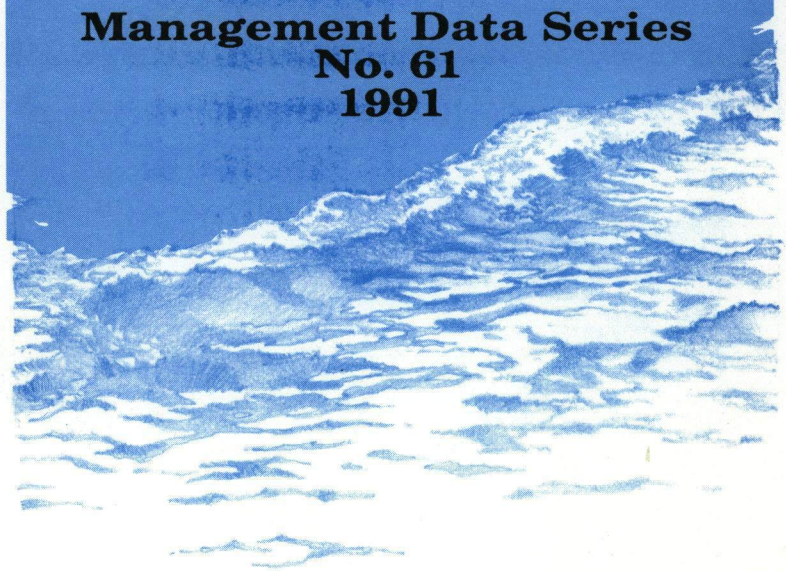

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ABSTRACT

Relative abundance of market Eastern oysters (Crassostrea virginica) collected in 0.5 minute tows was compared to relative abundance of market oysters collected in five 1.0 minute tows at ten historical oyster reef sites in Galveston Bay. Analyses revealed that multiple 0.5 minute tow relative abundance indices for market oysters should provide better estimates than estimates from multiple 1-minute tows.

INTRODUCTION

Eastern oysters (Crassostrea virginica) are the second most valuable commercial fishery and third largest by landings in Texas; most oysters are harvested from Galveston Bay (Matlock and Hofstetter 1986, Osburn et al. 1987). The Texas Parks and Wildlife Department (TPWD) began monitoring Eastern oyster abundance in Galveston Bay in the early 1950's (Hofstetter 1977). Since initiation of oyster monitoring, several changes in sampling gear and procedures have been implemented (Doerzbacher and Meador 1989). From 1976-85, in addition to regular scheduled stations, five 1.0 minute tows were made at each of ten sites in the Redfish Bar area of Galveston Bay prior to opening of the oyster season to estimate oyster abundance for the upcoming season (Hofstetter 1988). Current sampling procedures utilize one 0.5 minute tow at 56 randomly selected reef sites. Justifications for use of 0.5 minute tow times are detailed in Doerzbacher and Meador (1989). The objectives of the present study are to 1) compare catch of market oysters (>75 mm) in 0.5 minute tows to catch in five 1.0 minute tows and 2) determine if interpretation of the data is affected.

MATERIALS AND METHODS

Samples were taken at ten historical oyster reef sites on Redfish Bar in Galveston Bay (Figure 1). Each site was sampled on four separate days between 23 November to 3 December 1987. Oyster samples were collected with a 9-tooth Louisiana-style oyster dredge (49.5 cm wide, 24.1 cm high with a 35.6 cm deep bag) with a capacity of about 35.2 l. At each site, two 1.0 minute tows, one 0.5 minute tow, and then three 1.0 minute tows were collected in parallel adjacent transects. Market oysters were counted from each tow. Four reefs were eliminated from analyses because no market oysters were caught in either 1.0 minute or 0.5 minute tows (Table 1).

Abundances of market oysters in 0.5 minute tows and five 1.0 minute tows were compared using the G-test of goodness of fit for single classification frequency distributions which compares actual frequencies to expected frequencies (Sokal and Rohlf 1981). The statistics were computed as

$$G = 2 \sum^{a} f_i \ln (f_i/\hat{f}_i)$$

where

f_i = actual frequencies;

$\hat{f}_i$ = expected frequencies;

a = number of classes.

A correction factor was applied to the G-statistics as suggested by Sokal and Rohlf (1981) for cases where a = 2. The correction factor was computed as $q = 1 + 1 / 2n$ where n = sample size. The G-statistics were divided by the correction factors to give adjusted G-statistics.

For this study each $\hat{f}_i$ was calculated using the expected ratio of abundances between five 1.0 minute tows and one 0.5 minute tow of 10:1. G-statistics were calculated for all reef sites where market oysters were caught and for all sites combined.

RESULTS

Of the six reef sites used in the analyses, three had significantly larger proportions of market oysters in the 0.5 minute tows than expected (Table 2). Differences between 0.5 and 1.0 minute tows were most significant ($P < 0.01$) for sites with the highest catch rates of market oysters. For all reef sites combined, 0.5 minute tows caught significantly more oysters than the expected 10:1 ratio.

DISCUSSION

The high variability of oyster sampling is apparent as indicated by reef sites that revealed no significant differences from expected ratios. Doerzbacher and Meador (1989) also found high variability in their sampling. However, analyses reveal that relative abundance indices from five 1.0 minute tows may be under-estimated (biased low) for market oysters. Doerzbacher and Meador (1989) hypothesized dredges may be filling to capacity before the end of 1.0 minute tows causing the dredge to become inefficient for the remainder of the tow. The present study supports Doerzbacher and Meador's (1989) finding that 0.5 minute tows are more sensitive to oyster abundances than 1.0 minute tows. Relative abundance indices from multiple 0.5 minute tows should provide better estimates than estimates from multiple 1.0 minute tows for market oysters. Therefore, 0.5 minute tows should be used to monitor relative abundance of Eastern oysters in TPWD routine monitoring programs.

LITERATURE CITED

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Figure 1. Ten historical reef sites on Redfish Bar in Galveston Bay. 1=Barts Pass; 2=Gas Pipe; 3=East Redfish; 4=Central Redfish; 5=South Redfish; 6=North Redfish; 7=Experimental; 8=Southwest Pass; 9=Switchover; 10=Todds Dump.

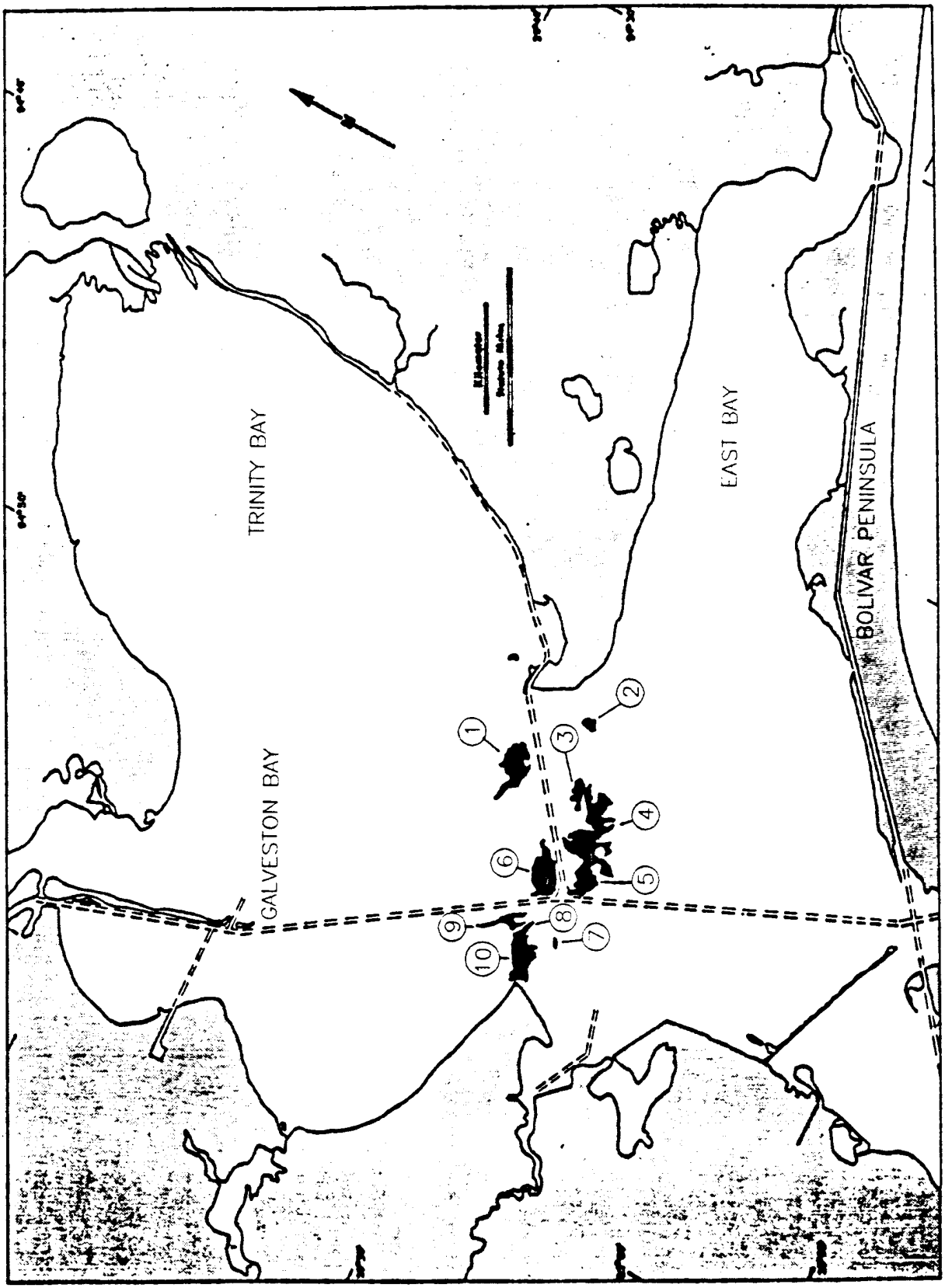
TRINITY BAY
EAST BAY
GALVESTON BAY
BOLIVAR PENINSULA
1
2
3
4
5
6
7
8
9
10

Table 2. Frequencies of market Eastern oysters observed (f_i), frequencies expected (f_i),and associated adjusted G-statistic for comparisons of five 1-minute tows to 0.5 minute tows on historical oyster reef sites in Galveston Bay. NS=not significant.

Location	f_i 1-min	f_i 0.5-min	f_i 1-min	f_i 0.5-min	G-stat$_{adj}$
Barts Pass	171	13	167	17	0.980NS
Gas Pipe	527	91	562	56	20.324**
East Redfish	66	14	73	7	5.491*
Southwest Pass	16	3	17	2	0.841NS
Switchover	341	61	365	37	15.249**
Todds Dump	88	11	90	9	0.457NS
Total combined	1,209	193	1,275	127	32.491**

*P$\langle$0.05
**P$\langle$0.01

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