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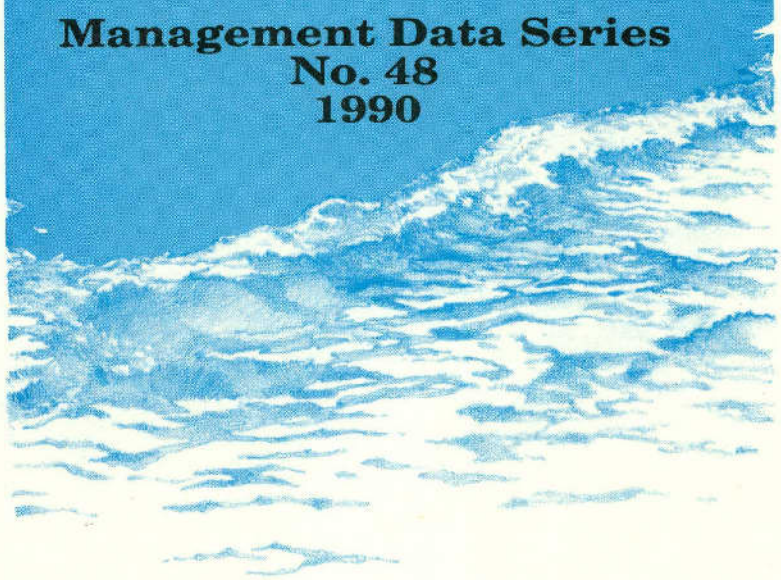

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ABSTRACT

The Eastern oyster (Crassostrea virginica) was commercially harvested from Corpus Christi Bay until 1959, after which most reefs were non-productive. Reasons for the demise of oyster populations in Corpus Christi Bay are unknown, but may be related to increased salinities. Re-establishment of an Eastern oyster population in Corpus Christi Bay may be possible through stocking of oysters from other bays. The purpose of this study was to compare growth and survival of Eastern oysters from six Texas bay systems held in Corpus Christi Bay. Eastern oysters from Galveston, Matagorda, San Antonio, Aransas, Nueces (Corpus Christi Bay system), and South Bays were maintained in cages in Corpus Christi Bay for 153 days. Final results suggest no statistically significant differences in survival or mean total length among bay systems. South Bay oysters exhibited significantly higher growth rate than San Antonio and Aransas bay oysters at 56 and 153 days respectively. Results suggest no distinct advantage in stocking Eastern oysters from bays other than the Corpus Christi Bay system.

INTRODUCTION

Oysters have occupied their current niche for some 350 million years while undergoing little evolutionary change (Longwell and Stiles 1970). Fossil evidence suggests oysters were one of the most predominant inshore inhabitants of the Atlantic coasts of North America and Europe (Yonge 1960). However, overharvesting, pollution, poorly managed cultivation practices, general habitat loss and other anthropogenic factors have contributed to the oyster's decline (Longwell and Stiles 1970).

The Eastern oyster (Crassostrea virginica) is commercially harvested from public reefs in most bay systems along the Texas gulf coast. Galveston, Matagorda and San Antonio Bays contain about 93% of the public reefs. No commercially harvestable reefs exist south of Nueces Bay except in South Bay, and these reefs constitute < 1% of the commercial landings (Quast et al. 1988).

Corpus Christi Bay once supported a commercial Eastern oyster fishery. However, commercial landings steadily declined until most reefs were non-productive by 1959 (Martinez 1963, 1964). Reasons for the demise of the populations in Corpus Christi Bay are unknown. Persistent salinity levels exceeding 25 o/oo (attributed to reduced freshwater inflow), inadequate substrate, and overfishing may have been contributing factors.

Current management practices used to restore depleted oyster fisheries range from harvest restrictions and artificial reef construction strategies to re-seeding programs which supplement local populations. Additionally, transplanting adults for spawning purposes has been used to enhance larval recruitment (Malinowski and Whitlatch 1988). Mortality studies in Aransas Bay utilizing tray-held oysters from other Texas bays suggested that South Bay oysters had greater survival rates but those data were not statistically analyzed (Hofstetter et al. 1966, Hofstetter 1967). Previous studies designed to evaluate the re-establishment of oysters in Corpus Christi Bay have been inconclusive. One study suggested the possibility of successful re-establishment, while another resulted in total mortality of test oysters (Martinez 1963, 1964). However, oysters in these studies were not exposed to similar conditions prior to study initiation. If Eastern oysters from Corpus Christi Bay are unable to survive in harvestable numbers because of environmental conditions present in the bay, it may be possible to repopulate the bay by stocking animals preadapted to conditions similar to those found in Corpus Christi Bay. Oysters in the lower Laguna Madre and South Bay tolerate salinities > 40 o/oo (Breuer 1962). These oysters may be able to adapt to conditions in Corpus Christi Bay.

The purpose of this study was to determine if Eastern oysters from other Texas bay systems, especially South Bay, might be suitable for restocking Corpus Christi Bay. Specific study objectives were to compare growth and survival of Eastern oysters from six Texas bay systems held in Corpus Christi Bay.

MATERIALS AND METHODS

Eastern oysters were collected by dredge or hand from Galveston, Matagorda, San Antonio, Aransas, Nueces (Corpus Christi Bay system) and South Bays during summer 1988. About 200 specimens were collected from each bay system and transported on ice to the Perry R. Bass Marine Fisheries Research Station near Palacios, Texas. Oysters were allowed to warm to room temperature before being placed in a 4,000-l saltwater tank system where they remained up to 3 weeks. Unfiltered Matagorda Bay water, flowed through the system using a submersible pump (Model A-01, Fritz Aquaculture, Dallas, Texas), provided a food source. Temperature and salinity were monitored daily using a mercury glass thermometer and a salinity-conductivity-temperature meter (Model 33, Yellow Springs Instrument Company, Yellow Springs, Ohio), respectively.

After acclimatization, about 50 Eastern oysters from each bay were transported on ice to Corpus Christi Bay on 29 June 1988. The remaining oysters from each bay were retained in the holding system. Each individual oyster was placed in a numbered 10 x 15-mm nylon bag of 6-mm mesh. Five oysters from each bay system were then placed into each of five replicate cages. The cages consisted of 35 X 35-mm plastic milk crates with a 6-mm mesh cover. The study site was in close proximity to historical Alto Vista reef (Figure 1). The cages were secured to the 4600 building pier on Ocean Drive, Corpus Christi, Texas. Each cage was suspended about 1 m from the substrate to reduce sediment buildup and allow for tidal fluctuations. Following a 2-week acclimation period, all dead oysters were replaced from the surplus in the holding system. The study was initiated 12 July 1988.

Growth and mortality were monitored every 12-21 days for 153 days. Total shell length for each individual was determined by measuring from the beak of the right valve to the furthest point on the shell margin. Temperature and salinity were measured every sampling period.

A repeated measures analysis of variance (ANOVA) was used to test for differences in total shell length of oysters among bay systems (Sokal and Rohlf 1981). During the course of the study, one cage was lost at day 56 due to vandalism and two were lost at day 72 from the effects of hurricane Gilbert on 14-16 September 1988. Therefore, two data sets were analyzed to maximize statistical power. One data set included all cages to day 56 (first cage lost), while the second set analyzed data from the two cages that remained at study termination.

Total shell length was regressed against time and the heterogeneity of slopes was tested to determine if differences existed in shell growth rates among bay systems (Sokal and Rohlf 1981). Percent survival was calculated for each cage and bay. Log likelihood ratio G test using maximum likelihood ratio statistics was used to test for significance in survival between bay systems (SAS Institute Incorporated 1985). Log likelihood ratio of all pairwise comparisons was performed. G values of all comparisons were compared to Table 15 of Sokal and Rohlf (1981); G values > 8.6 were significant. For all analyses, probability of 0.05 was used as test significance criteria.

At the end of the study all surviving oysters were examined for Perkinsus marinus using methods of Mackin (1962). A Spearman rank correlation (r) analysis was performed to determine if there was a relationship between the magnitude of Perkinsus marinus infection and growth or survival (Sokal and Rohlf 1981).

RESULTS

No difference in mean total shell length of Eastern oysters from six Texas Bay systems were found in four cages from study initiation through day 56 ($F_{5,56}$=0.56, P=0.73) or in two cages from study initiation through termination ($F_{5,17}$=0.69, P=0.64) (Tables 1 and 2). Appendix A contains mean (± SD) shell length presented by cage and day with univariate F-statistics (Table A.1) and raw data (Table A.2).

Growth rates for South Bay were significantly different from San Antonio Bay oysters (t=2.05, P=0.04) at day 56 (day first cage was lost) (Table 1, Figure 2) and from Aransas Bay (t=0.64, P=0.01) at 153 days (Table 2, Figure 3). Growth comparisons (Y-intercepts) at study termination further suggested that Matagorda Bay oysters were larger than Galveston (t=-2.11, P=0.04) and South Bays (t=-1.97, P=.04) throughout the study (Table 2). However, growth rates were similar for Matagorda, South and Galveston Bay oysters (Table 2).

There were no statistically significant differences in survival among bay systems at day 56 (X^2 = 8.68, df= 5, P = 0.12) or day 153 (X^2 = 7.23, df=5, P= 0.30). However, at day 42, South Bay oysters exhibited significantly higher survival than Galveston, Nueces and San Antonio Bays (X^2 = 12.96, df=5, P= 0.02) (Table 3). Survivals by cage are presented in Appendix B Table B.1.

The incidence of Perkinsus marinus infection in oyster mantle and rectum tissue examined at study termination was 100% in each bay system. No significant correlation was observed between the concentration in the mantle on growth (r=0.35, P=0.49) or survival (r=-0.11, P=0.84). Similarily, no significant correlations were found between concentrations in the rectum on growth (r= -0.20, P=0.70) or survival (r=-0.27, P=0.60).

Mean surface water temperatures and salinities were 30.7 C and 36.2 o/oo up to day 56, and 25.8 C, and 36.4 o/oo up to day 153. Surface water temperatures and salinities ranged 12.0-33.3 C and 30-40 o/oo, respectively (Table 4).

DISCUSSION

Results of this study suggest there is no distinct advantage in stocking Eastern oysters from bay systems other than Corpus Christi (Nueces Bay). However, sample size was small and the study was conducted for only 6 months,

which may not be sufficient to distinguish all the environmental effects on the oysters (e.g. winter temperatures). Fouling organisms such as barnacles, sea squirts, and mussels may not have had time to attach to the oysters. These organisms could affect survival by competing for food and possibly cause a differential mortality rate among the different groups of oysters. Although all survivors were infected with Perkinsus marinus, oysters were not examined prior to study initiation. Therefore, any observed mortalities cannot be positively attributed to Perkinsus infection.

The differences in survival at day 42 could be attributed to handling procedures. Oysters from all bay systems except South Bay were collected by dredging. South Bay oysters were hand collected. Those oysters collected by dredging may have been under more stress thus causing a higher initial mortality rate.

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Table 1. Mean (± SD) total shell lengths (mm), growth rates (slope) and percent survival of Eastern oysters from six Texas bays held in four cages in Corpus Christi Bay for 56 days. Slope and Y-intercept values followed by a different letter in a column are significantly different ($P < 0.05$).

Bay	Mean total length		Slope	Y-intercept	% Survival N
	Day 0	Day 56			
Aransas	63.66 ± 13.37	70.40 ± 11.52	2.12 AB	59.71 A	75 15
Galveston	65.70 ± 14.31	71.55 ± 12.66	1.86 AB	62.45 A	45 9
Matagorda	67.69 ± 11.29	73.61 ± 10.03	1.99 AB	64.05 A	65 13
Nueces	67.64 ± 6.26	75.09 ± 7.12	2.43 AB	63.16 A	55 11
San Antonio	67.77 ± 11.06	72.92 ± 8.21	1.76 B	64.70 A	65 13
South	65.32 ± 12.43	78.12 ± 13.17	4.14 A	58.17 A	95 19

Table 2. Mean (± SD) total shell lengths (mm), growth rate (slope) and percent survival of Eastern oysters from six Texas bays held in two cages in Corpus Christi Bay for 153 days. Slope and Y-intercept values followed by a different letter in a column are significantly different ($P < 0.05$).

Bay	Mean total length		Slope	Y-intercept	% Survival	N
	Day 0	Day 153				
Aransas	64.00 ± 15.40	70.67 ± 12.50	0.67 A	64.85 AB	30	3
Galveston	60.67 ± 18.50	70.67 ± 14.01	0.95 AB	59.07 B	30	3
Matagorda	70.20 ± 14.92	76.20 ± 13.77	0.67 AB	70.93 A	50	5
Nueces	64.60 ± 5.98	75.40 ± 10.92	1.11 AB	63.56 AB	50	5
San Antonio	68.00 ± 6.38	74.25 ± 4.19	0.73 AB	67.54 AB	40	4
South	63.33 ± 8.60	79.89 ± 10.34	1.78 B	62.48 B	90	9

Table 3. Survival in Eastern oysters maintained in Corpus Christi Bay, Texas by sampling day and chi-square approximations of log likelihood ratio tests between bay systems. A pair-wise comparison of the log likelihood (G) ratio test was performed on day 42, counts followed by unlike letters are significantly different ($P < 0.01$).

	Number of oysters surviving at sample day									
Bay	0	21	42[A]	56[B]	72[C]	92	111	126	141	153
Aransas	25	20	19[XY]	14	6	4	4	3	3	3
Galveston	25	14	11[Y]	9	3	3	3	3	3	3
Matagorda	25	16	16[XY]	13	8	6	6	5	5	5
Nueces	25	17	14[Y]	11	5	5	5	5	5	5
San Antonio	25	15	14[Y]	13	7	7	6	4	4	4
South	25	24	24[X]	18	10	10	10	9	9	9
chi-square		9.70	12.96	8.68	5.53	3.80	2.64	7.23	7.23	7.23

A Initial N = 25.
B Initial N = 20 due to 1 cage loss.
C Initial N = 10 due to 3 cage losses.

Table 4. Surface water temperatures and salinities of Corpus Christi Bay at the cage study location.

Day	Temperature (C)	Salinity (o/oo)
0	31.6	36
21	31.4	35
42	33.3	40
56	26.3	34
72	28.9	30
92	23.6	38
111	25.0	38
126	25.3	38
141	16.0	35
153	12.0	40

Figure 1. Study location in Corpus Christi Bay.

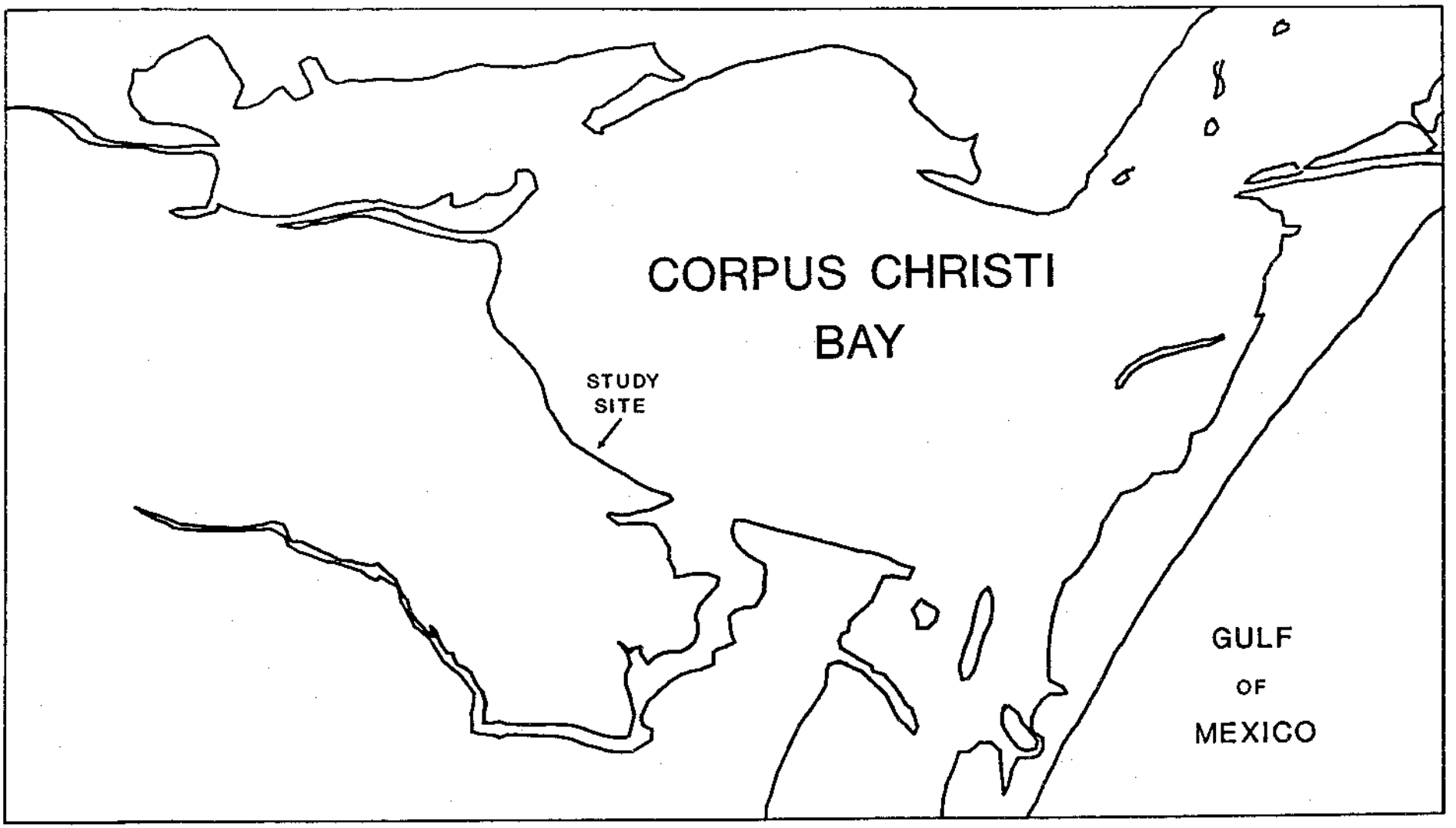

CORPUS CHRISTI
BAY
STUDY
SITE
GULF
OF
MEXICO

Figure 2. Mean total length (mm) of Eastern oysters held in Corpus Christi Bay for 56 days.

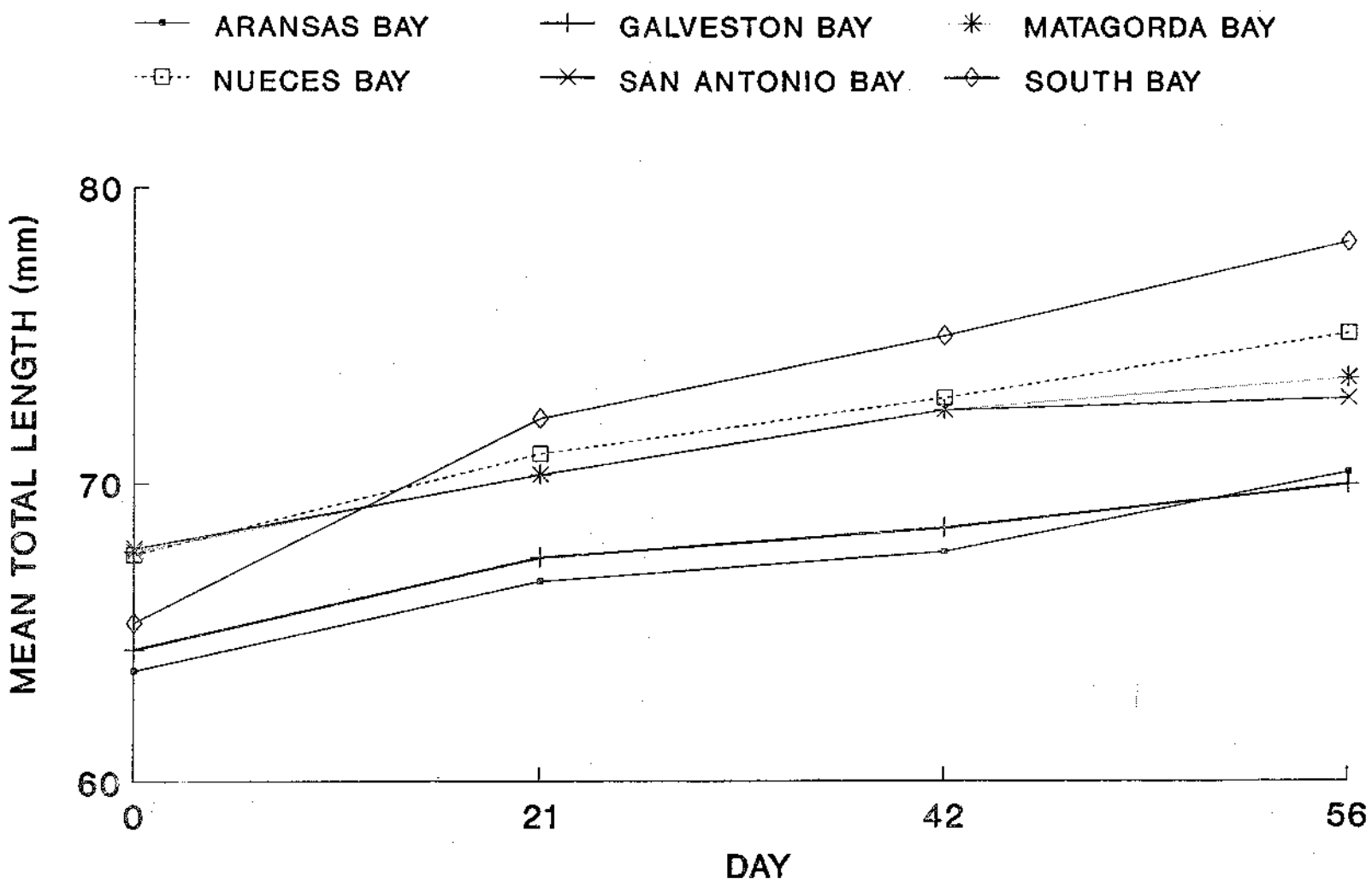
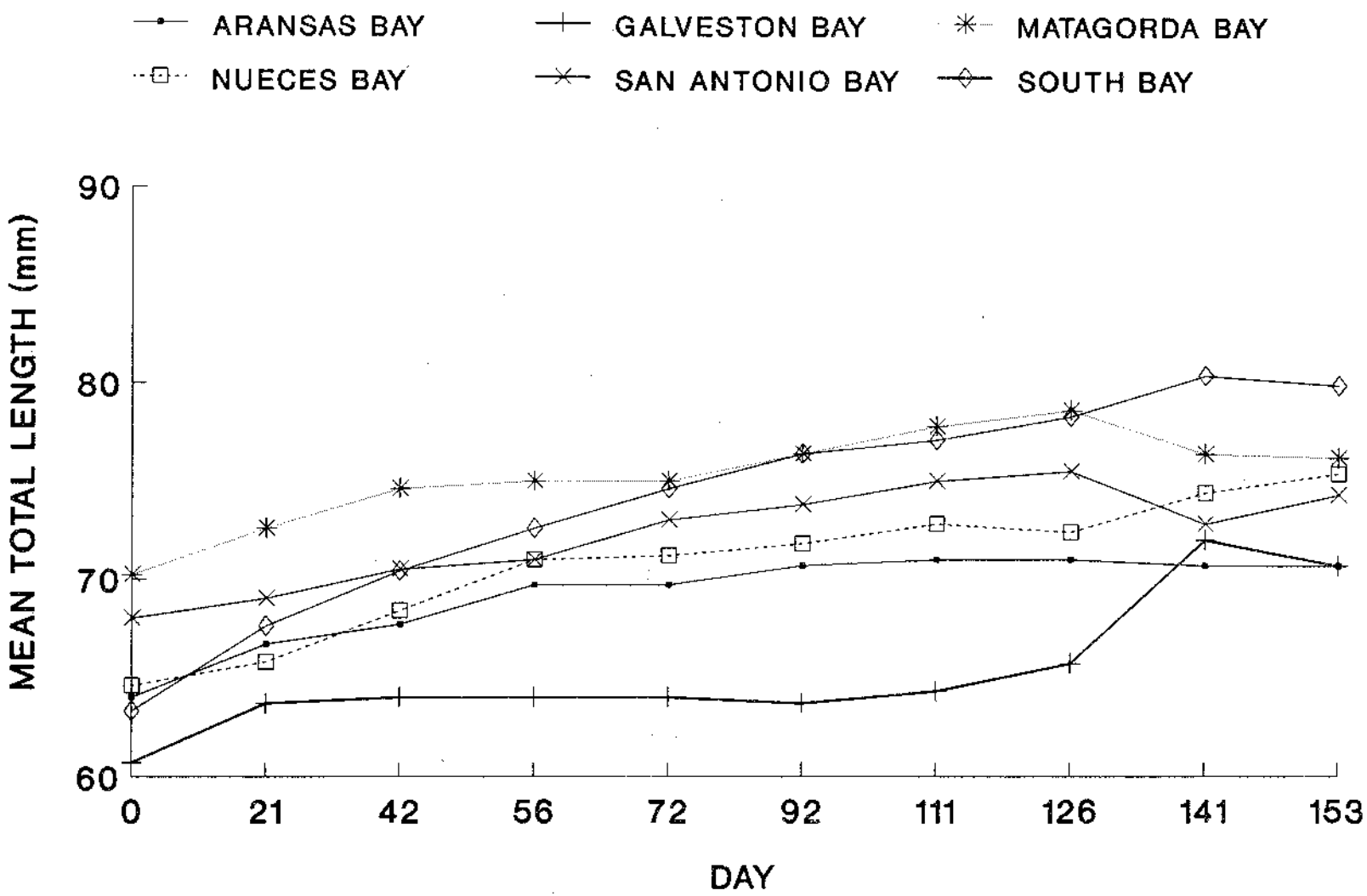

ARANSAS BAY
GALVESTON BAY
MATAGORDA BAY
NUECES BAY
SAN ANTONIO BAY
SOUTH BAY
MEAN TOTAL LENGTH (mm)
80
70
60
0
21
42
56
DAY

Figure 3. Mean total length (mm) of Eastern oysters held in Corpus Christi Bay for 153 days.


ARANSAS BAY
GALVESTON BAY
MATAGORDA BAY
NUECES BAY
SAN ANTONIO BAY
SOUTH BAY
MEAN TOTAL LENGTH (mm)
90
80
70
60
0
21
42
56
72
92
111
126
141
153
DAY

Appendix A: Total length data from Eastern oysters held in Corpus Christi Bay.

Table A.1. Mean (± SD) total shell lengths (mm) and sample size (N) by cage of Eastern oysters from six Texas bays held in Corpus Christi Bay including F-statistics for all bays and cages by sample day.

Day	Bay	Cage 1	2	3	4	5
0	Aransas	67.50 ± 15.26	66.33 ± 12.74	65.50 ± 17.69	63.67 ± 5.51	62.75 ± 10.14
	(N)	(5)	(5)	(5)	(5)	(5)
	Galveston	51.50 ± 13.43	73.25 ± 7.32	71.75 ± 11.84	66.67 ± 10.12	46.00 ± 0.00
	(N)	(5)	(5)	(5)	(5)	(5)
	Matagorda	57.50 ± 16.26	74.75 ± 9.53	71.25 ± 21.75	80.00 ± 9.90	71.33 ± 6.66
	(N)	(5)	(5)	(5)	(5)	(5)
	Nueces	66.00 ± 3.46	65.25 ± 6.08	66.60 ± 7.02	55.50 ± 9.19	70.25 ± 6.40
	(N)	(5)	(5)	(5)	(5)	(5)
	San Antonio	75.20 ± 10.06	67.00 ± 10.44	62.40 ± 10.14	79.25 ± 5.85	69.25 ± 9.91
	(N)	(5)	(5)	(5)	(5)	(5)
	South	56.75 ± 9.64	62.00 ± 9.13	65.00 ± 9.62	68.80 ± 7.05	75.50 ± 17.44
	(N)	(5)	(5)	(5)	(5)	(5)
F-statistic		$F_{5,56}$=0.27, P = 0.9569				
21	Aransas	66.40 ± 13.85	71.50 ± 7.59	64.80 ± 16.48	65.50 ± 6.45	66.50 ± 4.95
	(N)	(5)	(5)	(5)	(5)	(5)
	Galveston	56.00 ± 11.31	71.67 ± 8.08	74.25 ± 13.05	67.00 ± 8.54	66.00 ± 19.80
	(N)	(5)	(5)	(5)	(5)	(5)
	Matagorda	66.75 ± 11.35	76.75 ± 8.81	65.67 ± 12.50	75.67 ± 11.01	71.50 ± 6.36
	(N)	(5)	(5)	(5)	(5)	(5)
	Nueces	70.50 ± 13.08	67.50 ± 5.97	71.33 ± 6.66	70.00 ± 17.78	74.33 ± 5.03
	(N)	(5)	(5)	(5)	(5)	(5)

Table A.1. (Cont'd.)

Day	Bay	Cage 1	2	3	4	5
	San Antonio (N)	76.00 ± 10.07 (5)	62.50 ± 3.54 (5)	62.33 ± 7.51 (5)	86.00 ± 2.83 (5)	74.00 ± 7.00 (5)
	South (N)	66.20 ± 11.71 (5)	65.20 ± 6.57 (5)	72.40 ± 10.53 (5)	73.60 ± 9.21 (5)	88.00 ± 14.26 (5)
F-statistic		$F_{5,56}$=0.51, P = 0.7696				
42	Aransas (N)	64.60 ± 3.46 (5)	71.00 ± 8.89 (4)	67.40 ± 6.39 (5)	67.25 ± 6.60 (4)	71.50 ± 4.95 (2)
	Galveston (N)	57.50 ± 3.43 (2)	77.00 ± 0.00 (3)	75.50 ± 1.27 (4)	73.50 ± 7.78 (3)	67.00 ± 8.38 (2)
	Matagorda (N)	68.25 ± 1.79 (4)	78.50 ± 9.95 (4)	67.00 ± 2.12 (3)	76.33 ± 11.01 (3)	77.00 ± 7.07 (2)
	Nueces (N)	69.00 ± 12.29 (4)	72.67 ± 4.04 (4)	72.50 ± 9.19 (3)	72.33 ± 17.62 (3)	77.33 ± 4.04 (3)
	San Antonio (N)	77.60 ± 9.39 (5)	65.00 ± 0.00 (2)	65.33 ± 4.16 (3)	88.00 ± 0.00 (1)	76.00 ± 3.46 (3)
	South (N)	69.40 ± 12.22 (5)	67.60 ± 8.08 (5)	77.20 ± 9.68 (5)	77.20 ± 10.52 (5)	88.75 ± 14.68 (4)
	F-statistic	$F_{5,56}$=0.82, P = 0.5419				

Table A.1. (Cont'd.)

Day	Bay	Cage 1	2	3	4	5
56	Aransas (N)	70.50 ± 8.48 (5)	72.33 ± 10.08 (3)	71.60 ± 7.51 (5)	ND	74.00 ± 15.39 (2)
	Galveston (N)	57.50 ± 13.43 (2)	77.00 ± 0.00 (1)	77.50 ± 8.10 (4)	ND	71.00 ± 18.38 (2)
	Matagorda (N)	70.00 ± 10.42 (4)	77.75 ± 9.29 (4)	68.00 ± 12.17 (3)	ND	81.00 ± 1.41 (2)
	Nueces (N)	69.67 ± 11.59 (3)	76.33 ± 2.08 (3)	78.00 ± 8.48 (2)	ND	77.33 ± 4.40 (3)
	San Antonio (N)	78.00 ± 9.35 (5)	66.50 ± 2.12 (2)	65.67 ± 4.04 (3)	ND	76.00 ± 3.46 (3)
	South (N)	72.00 ± 12.41 (5)	69.60 ± 7.30 (5)	81.60 ± 11.82 (5)	ND	87.33 ± 4.16 (4)
	F-statistic	$F_{5,56}$= 1.36, P = 0.2517				
72	Aransas (N)	70.67 ± 9.71 (4)	73.33 ± 6.81 (3)	ND	ND	ND
	Galveston (N)	57.50 ± 13.43 (2)	77.00 ± 0.00 (1)	ND	ND	ND
	Matagorda (N)	70.00 ± 10.42 (4)	77.75 ± 9.29 (4)	ND	ND	ND

Table A.1. (Cont'd.)

Day	Bay	Cage 1	Cage 2	Cage 3	Cage 4	Cage 5
	Nueces (N)	63.00 ± 1.41 (3)	76.67 ± 2.52 (3)	ND	ND	ND
	San Antonio (N)	79.20 ± 7.26 (5)	67.50 ± 0.71 (2)	ND	ND	ND
	South (N)	73.80 ± 13.29 (5)	71.40 ± 7.44 (5)	ND	ND	ND
	F-statistic	$F_{5,17}$= 0.79, P = 0.5734				
92	Aransas (N)	70.50 ± 14.85 (3)	76.00 ± 8.49 (3)	ND	ND	ND
	Galveston (N)	58.50 ± 14.85 (2)	74.00 ± 0.00 (1)	ND	ND	ND
	Matagorda (N)	65.67 ± 9.29 (4)	85.00 ± 9.16 (4)	ND	ND	ND
	Nueces (N)	63.00 ± 1.41 (2)	76.67 ± 2.52 (3)	ND	ND	ND
	San Antonio (N)	79.20 ± 7.26 (5)	67.50 ± 0.71 (2)	ND	ND	ND
	South (N)	73.80 ± 13.29 (5)	71.40 ± 7.44 (5)	ND	ND	ND
	F-statistic	$F_{5,17}$= 0.93, P = 0.4848				

Table A.1. (Cont'd.)

Day	Bay	Cage 1	Cage 2	Cage 3	Cage 4	Cage 5
111	Aransas (N)	71.50 ± 14.85 (2)	76.00 ± 8.49 (2)	ND	ND	ND
	Galveston (N)	58.50 ± 14.85 (2)	76.00 ± 0.00 (1)	ND	ND	ND
	Matagorda (N)	67.33 ± 8.14 (3)	86.00 ± 9.16 (3)	ND	ND	ND
	Nueces (N)	63.00 ± 1.41 (2)	79.33 ± 4.04 (3)	ND	ND	ND
	San Antonio (N)	80.60 ± 6.15 (5)	68.00 ± 0.00 (2)	ND	ND	ND
	South (N)	78.00 ± 17.10 (5)	71.60 ± 9.13 (5)	ND	ND	ND
	F-statistic	$F_{5,17} = 0.94$, $P = 0.4815$				
126	Aransas (N)	62.00 ± 0.00 (1)	75.50 ± 7.78 (2)	ND	ND	ND
	Galveston (N)	60.00 ± 1.14 (2)	77.00 ± 0.00 (1)	ND	ND	ND
	Matagorda (N)	66.00 ± 11.31 (3)	87.00 ± 8.18 (3)	ND	ND	ND
	Nueces (N)	63.50 ± 2.12 (2)	78.33 ± 3.51 (3)	ND	ND	ND

Table A.1. (Cont'd.)

Day	Bay	Cage 1	2	3	4	5
	San Antonio (N)	77.67 ± 2.08 (5)	69.00 ± 0.00 (1)	ND	ND	ND
	South (N)	85.50 ± 11.96 (5)	72.60 ± 8.20 (5)	ND	ND	ND
	F-statistic	$F_{5,17}$= 1.22, P = 0.3406				
141	Aransas (N)	59.00 ± 0.00 (1)	76.50 ± 7.78 (2)	ND	ND	ND
	Galveston (N)	66.00 ± 11.31 (2)	84.00 ± 0.00 (1)	ND	ND	ND
	Matagorda (N)	66.50 ± 16.26 (3)	83.00 ± 5.00 (3)	ND	ND	ND
	Nueces (N)	63.50 ± 6.36 (2)	81.67 ± 8.33 (3)	ND	ND	ND
	San Antonio (N)	74.33 ± 5.13 (3)	68.00 ± 0.00 (1)	ND	ND	ND
	South (N)	87.00 ± 12.91 (4)	75.20 ± 6.76 (5)	ND	ND	ND
	F-statistic	$F_{5,17}$=1.29, P = 0.3126				

Table A.1. (Cont'd.)

Day	Bay	Cage 1	2	3	4	5
153	Aransas (N)	58.00 ± 0.00 (1)	77.00 ± 8.48 (2)	ND	ND	ND
	Galveston (N)	65.00 ± 14.14 (2)	82.00 ± 0.00 (1)	ND	ND	ND
	Matagorda (N)	64.50 ± 13.43 (2)	84.00 ± 7.81 (3)	ND	ND	ND
	Nueces (N)	64.50 ± 3.54 (2)	82.67 ± 5.86 (3)	ND	ND	ND
	San Antonio (N)	75.67 ± 3.79 (3)	70.00 ± 0.00 (1)	ND	ND	ND
	South (N)	90.00 ± 6.24 (4)	73.80 ± 8.44 (5)	ND	ND	ND
	F-statistic	$F_{5,17}$= 1.40, P =0.2729				

ND No data available, cage lost.

Table A.2. Total shell lengths of individual Eastern oysters from six Texas bay systems. (Blank indicates oyster was dead and no measurements taken).

Bay	Cage	Oyster bag number	Length at sample day									
			0	21	42	56	72	92	111	126	141	153
Aransas	1	1522	77	80	81	81	79	81	82	82		
	1	1523	51	55	58	60	60	60	61	62	59	58
	1	1524	65	65	56	64	73	73				
	1	1525	81	81	77	77	77					
	1	1526	47	51	51	51						
	2	1552	60	64	64	68	68	70	70	70	71	71
	2	1553	58	58								
	2	1554	81	81	81	81	81	82	82	81	82	83
	2	1555	61	67	68	68	71	71				
	2	1556	73	74	74							
	3	1583	56	60	62	64						
	3	1584	92	93	96	99						
	3	1585	58	63	63	65						
	3	1586	50	50	54	67						
	3	1587	56	58	62	63						
	4	2941	50	52								
	4	2942	58	64	67							
	4	2943	69	71	72							
	4	2944	64	70	72							
	4	2945	53	57	58							
	5	2971	56	58								
	5	2972	75	78								
	5	2973	51	60								
	5	2974	67	70	75	80						
	5	2975	53	63	68	68						
Galveston	1	1507	61	64	67	67	67	69	69	70	74	75
	1	1508	65	68								
	1	1509	93	93								
	1	1510	42	48	48	48	48	48	48	50	58	55
	1	1511	80	80								

Table A.2. (Cont'd)

Bay	Cage	Oyster bag number	Length at sample day									
			0	21	42	56	72	92	111	126	141	153
Galveston	2	1537	78	77								
	2	1538	86	85								
	2	1539	63	63	64							
	2	1540	73	73	72							
	2	1541	79	79	77	77	77	74	76	77	84	82
	3	1567	82	88								
	3	1568	78	79	79	79						
	3	1569	84	88	88	88						
	3	1570	68	73	74	74						
	3	1571	57	57	61	69						
	4	2926	73	75	79							
	4	2927	55	58	58							
	4	2928	62	68	68							
	4	2929	72	75								
	4	2930	84	84								
	5	2956	73	75								
	5	2957	55	56								
	5	2958	46	52	54	58						
	5	2959	77	80	80	84						
	5	2960	54	55								
Matagorda	1	1512	98	98								
	1	1513	46	51	52	56	56	55	58	58	55	55
	1	1514	69	70	72	73	73	72	73	74	78	74
	1	1515	68	68	69	70	70	70	71	71		
	1	1516	75	78	80	81	81	81				
	2	1542	83	83	86	86	86	93	94	94	88	88
	2	1543	82	84	86	83	83	87	88	89	83	89
	2	1544	72	74								
	2	1545	71	75	77	77	77	75	76	78	78	75
	2	1546	63	65	65	65	65	65				

Table A.2. (Cont'd)

Bay	Cage	Oyster bag number	Length at sample day									
			0	21	42	56	72	92	111	126	141	153
Matagorda	3	1572	52	57	60	62						
	3	1573	68	68								
	3	1574	56	60	60	60						
	3	1576	78	80	81	82						
	3	1577	99	99								
	4	2931	58	60								
	4	2932	60	65	65							
	4	2933	73	75	77							
	4	2934	87	87	87							
	4	2935	62	63								
	5	2961	73	76	82	82						
	5	2962	51	52								
	5	2963	77	78								
	5	2964	71	75								
	5	2965	64	67	72	80						
Nueces	1	1527	80	80	80							
	1	1528	64	64								
	1	1529	64	63	64	64	64	64	64	65	68	67
	1	1530	70	83	83	83	83					
	1	1531	56	56	60	62	62	59	62	62	59	62
	2	1558	66	66								
	2	1559	58	60	62							
	2	1560	63	66	69	78	79	83	83	82	91	87
	2	1561	72	74	77	77	77	79	80	78	79	85
	2	3000	68	70	72	74	74	74	75	75	75	76
	3	1588	77	79	79	84						
	3	1589	58	58								
	3	1590	68	68	68							
	3	1591	67	67	66	72						
	3	1592	63	63								
	4	2946	62	64	70							

Table A.2. (Cont'd)

Bay	Cage	Oyster bag number	Length at sample day									
			0	21	42	56	72	92	111	126	141	153
Nueces	4	2947	58	60								
	4	2948	53	56	56							
	4	2949	87	90	91							
	4	2950	49	52								
	5	2976	61	69	75	75						
	5	2977	74	84								
	5	2978	84	84								
	5	2979	71	75	75	75						
	5	2980	75	79	82	82						
South	1	1532	79	79	80	83	88	97	98	100	104	97
	1	1533	44	49	51	55	55	53	54	54		
	1	1534	56	63	69	71	72	76	77	79	78	85
	1	1535	60	65	66	66	69	70	71	73	76	80
	1	1536	67	75	81	85	85	89	90	90	90	88
	2	1562	58	64	64	67	71	75	77	77	79	82
	2	1563	69	72	72	74	75	74	75	76	74	71
	2	1564	51	58	58	62	64	60	62	65	78	72
	2	1565	60	60	65	65	65	65	62	63	64	62
	2	1566	70	72	79	80	82	82	82	82	81	82
	3	1593	50	55	61	61						
	3	1594	67	72	78	84						
	3	1595	63	77	80	85						
	3	1596	76	83	87	87						
	3	1597	69	75	80	91						
	4	2951	61	61	63							
	4	2952	62	67	72							
	4	2953	70	78	78							
	4	2954	76	79	82							
	4	2955	75	83	91							
	4	2981	63	71	72	86						
	5	2982	100	105	107	107						

Table A.2. (Cont'd)

Bay	Cage	Oyster bag number	Length at sample day									
			0	21	42	56	72	92	111	126	141	153
South	5	2983	90	95								
	5	2984	76	84	84	84						
	5	2985	63	92	92	92						
San Antonio	1	1517	73	74	76	78	78	79	80	80	80	80
	1	1518	74	74	77	77	77	74	76	76	73	73
	1	1519	63	63	64	64	70	75	76	77	70	74
	1	1520	75	78	81	81	81	79	80	80		
	1	1521	91	91	90	90	90	91	91	91		
	2	1547	79	79								
	2	1548	65	65								
	2	1549	60	60	65	68	68	63	65			
	2	1550	62	65	65	65	67	67	68	69	68	70
	2	1551	86	89								
	3	1578	64	70	70	70						
	3	1579	78	78								
	3	1580	50	55	62	62						
	3	1581	60	62	64	65						
	3	1582	60	61								
	4	2936	81	84	84							
	4	2937	78	78								
	4	2938	86	87								
	4	2939	72	72								
	4	2940	86	88	88							
	5	2966	56	66	72	72						
	5	2967	79	79	78	78						
	5	2968	68	68								
	5	2969	74	77	78	78						
	5	2970	88	88								

Appendix B. Survival data from Eastern oysters held in Corpus Christi Bay.

Table B.1. Survival (number) by cage of Eastern Oysters held in Corpus Christi Bay.

Bay	Cage	Number of live oysters at sample day									
		0	21	42	56	72	92	111	126	141	153
Aransas	1	5	5	5	5	4	3	2	1	1	1
	2	5	5	4	3	3	3	2	2	2	2
	3	5	5	5	5	ND	ND	ND	ND	ND	ND
	4	5	5	4	ND	ND	ND	ND	ND	ND	ND
	5	5	5	2	2	ND	ND	ND	ND	ND	ND
Galveston	1	5	5	2	2	2	2	2	2	2	2
	2	5	5	3	1	1	1	1	1	1	1
	3	5	5	4	4	ND	ND	ND	ND	ND	ND
	4	5	5	3	ND	ND	ND	ND	ND	ND	ND
	5	5	5	2	2	ND	ND	ND	ND	ND	ND
Matagorda	1	5	5	4	4	4	4	3	3	3	2
	2	5	5	4	4	4	4	3	3	3	3
	3	5	5	3	3	ND	ND	ND	ND	ND	ND

Table B.1. (Cont'd.)

Bay	Cage	Number of live oysters at sample day									
		0	21	42	56	72	92	111	126	141	153
Matagorda	4	5	5	3	ND	ND	ND	ND	ND	ND	ND
	5	5	5	2	2	ND	ND	ND	ND	ND	ND
Nueces	1	5	5	4	3	3	2	2	2	2	2
	2	5	5	4	3	3	3	3	3	3	3
	3	5	5	3	2	ND	ND	ND	ND	ND	ND
	4	5	5	3	ND	ND	ND	ND	ND	ND	ND
	5	5	5	3	3	ND	ND	ND	ND	ND	ND
South	1	5	5	5	5	5	5	5	5	4	4
	2	5	5	5	5	5	5	5	5	5	5
	3	5	5	5	5	ND	ND	ND	ND	ND	ND

Table B.1. (Cont'd.)

Bay	Cage	Number of live oysters at sample day									
		0	21	42	56	72	92	111	126	141	153
South	4	5	5	5	ND	ND	ND	ND	ND	ND	ND
	5	5	5	4	4	ND	ND	ND	ND	ND	ND
San Antonio	1	5	5	5	5	5	5	5	5	3	3
	2	5	5	2	2	2	2	2	1	1	1
	3	5	5	3	3	ND	ND	ND	ND	ND	ND
	4	5	5	2	ND	ND	ND	ND	ND	ND	ND
	5	5	5	3	3	ND	ND	ND	ND	ND	ND

ND No data available, cage lost.

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