

OYSTER STUDIES 1970

Project CO-2-1

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ABSTRACT

Annual death rates among one to five year-old oyster stocks at tray stations ranged from 24 to 45 per cent, representing an increase in mortality among the older stocks over that recorded in the previous year and an above average mortality for one-year old oysters. Labyrinthomyxa marina infections were primarily responsible.

Oyster spat setting was again erratic with abundant sets only in mid-Galveston and upper East Bays. Survival of the spat was poor. Consequently no substantial increase in market oyster stocks was expected in the near future.

The oyster harvest was over 200,000 barrels, approximately 16 per cent larger than that of the previous season.

INTRODUCTION

Galveston Bay has been the center of Texas coast oyster production for a number of years. The large oyster harvests from the estuary have been possible because of an abundant supply of oysters subject to an intensive fishery. For these reasons, surveillance of oyster stocks on major public beds has been advisable to detect changes which might affect, or be affected by the fishery.

Major phases of the study include (1) a continual monitoring of the growth and mortality of known stocks of oysters, with particular emphasis on pathogens; (2) a survey of the distribution and infection incidence of the primary pathogen, Labyrinthomyxa; and (3) a sampling program to record changes in spat, seed and market oyster stocks on representative reefs in the Galveston Bay system as an aid in determining present and future harvest potential.

This report summarizes data collected during 1970.

METHODS

The disease monitor stations at Hanna and Switchover Reefs (Figure 1) consisted of wooden platforms containing a lift system to handle a number of oyster trays. The Hanna station was stocked with survivors of three age groups (1965, 1966 and 1967 year classes) carried over from the previous

All oysters were held in vinyl-coated metal trays with hardware cloth tops. Stations were visited monthly; dead oysters were removed and measured; gaper tissues were cultured in fluid thioglycollate medium containing the antibiotics Mycostatin and Chloromycetin to determine Labyrinthomyxa incidence. Live oysters were measured (height) at quarterly intervals.

Reef samples consisted of one standard bushel (2,150 cubic inches) of uncultured oysters dredged from ten public reefs (Figure 1) at monthly intervals. Live oysters were culled and measured (height) in groupings of 25 millimeters designated as spat (1-25 mm), seed (26-50 mm), sub-market 51-75 mm), small market (76-100 mm), medium market (101-125 mm), and large market (126-150 mm). Samples were grouped into winter, spring, summer and fall quarters.

Ten market oysters from each sample were cultured in fluid thioglycollate medium to determine Labyrinthomyxa infection. The incidence was reported on a scale ranging from negative (0), very light (0.5), light (1.0) moderate (3.0), to heavy (5.0).

RESULTS

Oyster Mortality Study

Monthly death rates among the 1966 and 1967 oyster groups began to increase in May (Table 1). Peak death rates among the older groups occurred in August or September but deaths were relatively high throughout the summer, coinciding with increased salinity and temperature (Table 2). As salinity and temperature values decreased in October, the monthly death rate among all four groups declined.

Annual death rates of 33.9-45.6 among the older oyster groups (at Hanna Reef) were higher in 1970 than in 1969 when they ranged below 20 per cent. Although deaths among the 1969 group were relatively low, the rate was much

infected with Labyrinthomyxa throughout most of the year with little difference between low death and high death periods. Gapers from the 1969 group did not show infections until July, immediately preceding the high death period. This group had been uninfected when stocked in April and similar oysters remaining on Bart's Pass (the collection site) did not show infections throughout the year. They evidently became susceptible to Labyrinthomyxa infection after exposure to an area with a history of continual infection. At the time of peak deaths the oysters were slightly over one year old.

Reef Population Trends

Oyster spat setting throughout the bay was generally delayed until September (Table 3) but the West Bay (Confederate Reef) peak setting appeared to have taken place in June. No sets were observed in the upper bay (Scott's and Beezley's). The most abundant set was observed at mid Red Fish Bar decreasing noticeably at the eastern (Bart's Pass) and western (Todd's Dump) sectors. East Bay sets were most abundant in the upper bay (Frenchy's) and lower bay (Hanna) stations.

Quarterly changes in oyster size groups at the ten sample stations are shown in Table 4. All size groups except spat and seed declined in abundance in Confederate Reef (CR) samples from spring through winter. This was believed due to Thais predation and Labyrinthomyxa infection. Although market oysters were not abundant in samples collected prior to the beginning of the season, a sizeable hand-dredge fishery was observed. The boats initially concentrated in the area of the sample station but soon moved to the opposite (western) side of the reef crest. Oysters were confined to a relatively narrow strip close to the reef crest in shallow water.

Oysters of any size groups were scarce at upper bay stations. Scott's Reef (SR) oysters consisted of the older market stock while Beezley Reef (BR) oysters were young (one-year old). Scott's Reef samples were typically covered by "mud mats" formed by polychaete and amphipod tubes. This covering may have prevented spat setting. However, Beezley Reef samples did not contain "mud mats" and setting did not occur there either.

At East Bay stations, seed and sub-market stocks increased only in Frenchy Reef samples (FR) while market oyster stocks remained at low levels at both Frenchy's and Moody's (MR) Reefs. In spite of the limited supply of market oysters indicated by the samples, a light hand dredge fishery was observed at Frenchy's Reef. Oysters other than spat were scarce in all samples taken at Hanna Reef (HR) and, in spite of the relatively abundant spat set in late summer, no increase in seed stock occurred. Possibly Thais and/or Menippe predation may have been a factor. However, a localized dredge fishery developed along the "Bull Hill" section of the reef approximately 2000 yards west of the sample station. One sample collected in this area in December consisted of approximately 50% market stock with no spat and few seed oysters.

Seed oyster stocks increased in samples from North Red Fish (NRF) and South Red Fish (SRF) during the fall, decreased at Bart's Pass (BP) and showed little change at Todd's Dump (TD). Sub-market stocks decreased at all stations but market oysters generally increased in fall samples. The increase was most noticeable at Bart's Pass as oysters from a relatively heavy 1969 set reached minimum legal size. Consequently the reef was fished moderately by commercial dredge boats during the season.

Labyrinthomyxa Infection

The incidence of Labyrinthomyxa infection among Red Fish Bar oysters was highest at South Red Fish (Table 5), remaining above epidemic level (2.0) from July through November. Infected oysters were not found at Bart's Pass throughout the year although oysters from this reef transplanted to the Switchover mortality station near Todd's Dump became infected by summer.

In upper Galveston Bay, the incidence among Scott's Reef oysters was light with maximum infection detected in May or June. No market oysters were available at Beezley Reef in Trinity Bay.

Infection incidence was generally light at the East Bay stations (no market oysters were sampled at Hanna Reef). The highest incidence was found among West Bay oysters at Confederate Reef in June, dropping sharply in July and remaining low until November.

Infection incidence did not follow the pattern often observed in other years with spring peaks followed by early summer lows and late summer highs. The typical early summer drops occurred at different times and maximum incidence did not necessarily coincide with high salinity and temperature (Table 6). Above normal temperature in November and December favored an increase in incidence at most stations.

The Oyster Fishery

Much of the Galveston Bay harvest was dredged from South Red Fish Reef where the majority of the commercial fleet worked throughout the season. North Red Fish Reef and the adjoining Humble "A" Lease area also contributed heavily to the harvest. Bart's Pass was not fished as extensively as anticipated, possibly because the majority of the oysters were very close to the minimum size limit (3 inches).

Other areas fished included Todd's Dump and Switchover Reef, Parallel Reef below Todd's Dump, the Houston Ship Channel spoil banks between Beacons 59 and 67, the artificial reefs (Gaspipe, Triangle and Missing), Frenchy's Reef, the Bull Hill area of Hanna Reef, Bull Shoals or North Hanna, the mid-East Bay Moody's Reef area. Later in the season the artificial reefs in

Trinity Bay (Dry Hole and Tern) were fished along with Lost Reef and the "Little Sun" oil field.

Approximately 200,000 barrels of oysters were reported from the bay during the season (Table 7), an increase of 28,000 barrels over that of the previous season or a 16 per cent increase in production. As in past years a number of out-of-state boats, mostly from Louisiana, participated in the fishery. Louisiana dealers reported over 110,000 barrels of oysters harvested and shipped from Galveston Bay, representing approximately 54% of the total recorded harvest.

DISCUSSION

Spring rainfall on the Trinity River watershed was less than in the previous year and salinity values decreased little. Mortality rates among the older tray station oysters increased well above those observed in 1969, probably associated with an increase in Labyrinthomyxa incidence in a more saline environment. Spatfall was not consistent and spat survival appeared to be poor. Thus seed stock which would ultimately supply the bulk of the harvest in the 1971-72 season showed no consistent increase.

The supply of oysters for the 1970-71 season was good with large reef areas in the mid-bay contributing most of the harvest. As in past years, inconsistent setting, and/or poor survival of the set appear to be prime factors in determining the distribution and quantity of market oyster stocks. Disease among the older oysters, although important, has had less effect upon the harvest than has lack of sets which resulted in depletion of Upper Trinity Bay stocks and low production in East Bay.

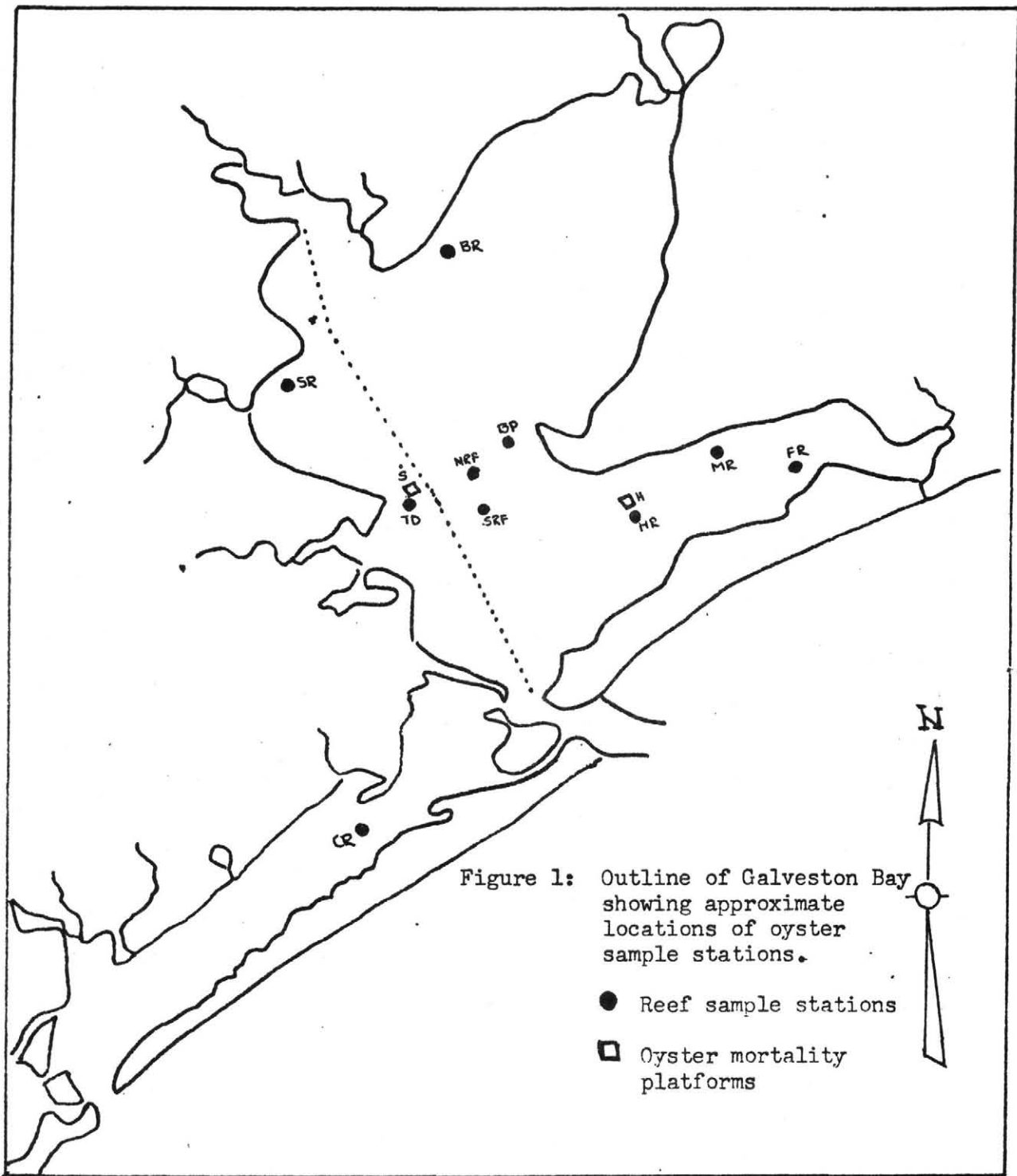


Table 1: Monthly mortality rates (%) among four year-class oyster groups at Switchover and Hanna Reef tray stations in Galveston Bay during 1970

MONTH	MORTALITY RATE (%)			
	1965 Class *	1966 Class *	1967 Class *	1969 Class ***
1	0.3	0.4	0.3	
2	1.0	0.4	0.9	
3	.0	0.7	1.3	
4	1.0	1.5	2.0	0.1
5	1.2	3.0	4.4	0.2
6	3.1	7.2	7.6	0.9
7	9.2	9.9	10.7	1.8
8	9.3	13.7	13.6	7.7
9	14.5	10.3	12.5	9.9
10	1.7	2.7	2.8	3.4
11	1.7	0.9	1.6	2.6
12	1.8	0.9	1.0	0.5
Annual Mortality (%)	33.9	41.8	45.6	24.3

* 1965, 1966 and 1967 year-classes at Hanna Reef only
 *** 1969 year-class at Switchover Reef only.

Table 2: Monthly salinity and water temperature values at Hanna and Switchover stations in 1970

Month	Salinity (o/oo)		Temperature (oC) (Average)
	Hanna Reef	Switchover	
1	21	20	9
2	22	20	12
3	19	19	16
4	13	13	18
5	14	13	22
6	20	17	27
7	21	21	29
8	24	22	30
9	23	22	27
10	17	17	20
11	22	18	16
12	23	22	16

TABLE 3: Peak setting period and relative abundance of oyster spat at Galveston Bay stations in 1970

Station	Peak Setting Month	Relative Abundance*
Beezley	None	0
Scott Reef	None	0
Todd's Dump	7	20
N. Red Fish	9	500
S. Red Fish	10	200
Bart's Pass	9	30
Frenchy's Reef	9	400
Moody's Reef	9	150
Hanna Reef	9	300
Confederate Reef	6 (?)	200

*Relative abundance is the maximum number of spat per bushel sample encountered during, or immediately after, the peak setting period. Numbers have been rounded off.

TABLE 4: Average number of oysters per bushel sample collected each quarter at Galveston Bay stations during 1970

Station	Quarter	Number of Oysters in Each Size Group					
		SP	S	SuM	SM	MM	LM
TD	W	3	20	28	22	1	0
	SP	2	11	23	17	5	0
	S	17	20	24	19	4	1
	F	9	22	22	29	4	1
NRF	W	13	54	60	32	2	0
	SP	13	39	50	28	4	0
	S	307	31	45	31	2	0
	F	49	67	49	38	5	0
SRF	W	15	46	47	24	5	1
	SP	5	30	44	30	6	1
	S	96	40	66	42	8	0
	F	82	97	46	37	8	1
BP	W	22	140	103	12	2	0
	SP	12	89	112	22	3	0
	S	20	25	103	38	2	0
	F	9	23	75	54	3	0
FR	W	6	24	8	9	5	1
	SP	2	16	14	4	4	1
	S	135	8	18	7	3	1
	F	161	45	21	13	3	0
MR	W	0	15	13	12	3	0
	SP	1	7	12	6	2	1
	S	56	9	12	6	4	1
	F	69	26	17	15	4	0
HR	W	9	40	3	0	0	0
	SP	0	6	1	2	0	0
	S	118	1	0	3	0	0
	F	97	3	0	0	0	0
BR	W	0	7	2	0	0	0
	SP	0	4	5	0	0	0
	S	1	1	4	0	0	0
	F	0	1	5	1	0	0
SR	W	0	0	0	2	2	1
	SP	0	0	0	2	3	1
	S	0	0	0	2	2	2
	F	0	0	0	2	2	1
CR	W						
	SP	44	90	34	30	8	0
	S	175	55	7	15	10	2
	F	54	101	6	3	4	1

TABLE 5: Incidence of Labyrinthomyxa infection among market oysters at eight reef stations in Galveston Bay during 1970

Month	Station							
	SR	TD	NRF	SRF	BP	MR	FR	CR
1		0.4	1.4	1.4	0.0	0.8	0.1	
2	0.4	1.4	1.3	0.2	0.0	0.0	0.2	
3	0.0	0.8	0.8	1.8	0.0	0.1	0.3	
4	-	1.3	1.7	1.6	0.0	0.4	0.1	
5	1.4	0.6	1.4	0.8	0.0	1.2	0.0	
6	1.3	2.0	1.6	1.4	0.0	0.0	0.1	3.1
7	0.1	1.2	0.8	2.6	0.0	0.2	0.1	1.0
8	0.9	1.1	2.5	2.2	0.0	0.0	0.0	-
9	0.1	2.0	0.9	2.6	0.0	1.9	0.0	1.8
10	-	1.7	1.9	2.0	0.0	0.7	0.0	1.6
11	0.3	1.8	2.6	2.1	0.0	0.2	0.1	2.5
12	0.4	0.8	2.0	1.5	0.0	0.9	0.7	2.6

TABLE 6: Monthly salinity and water temperature values at ten reef sample stations in Galveston Bay during 1970

Month	Salinity (‰)										Temperature (°C) (Average)	
	BR	SR	TD	NRF	SRF	BP	FR	MR	HR	CR		
1			22	22	21	19	18	19	22			9
2	17	18	20	18	18	16	20	19	22			12
3	2	17	18	17	17	16	22	19	19			16
4	2	11	14	13	13	11	12	12	18			23
5	6	11	12	11	11	8	11	13	12			24
6	11	12	17	17	17	12	17	11	22	19		27
7	12	18	22	22	22	17	16	17	19	30		28
8	12	20	22	24	24	22	20	18	19	-		30
9	16	18	22	22	22	18	18	18	22	33		28
10	13	17	19	19	19	17	11	12	17	24		21
11	14	16	16	17	17	12	12	10	22	22		15
12	12	19	22	22	22	17	18	19	24	23		19

Table 7: Oyster harvest in barrels from Galveston Bay during the 1970-71 season

<u>Month</u>	<u>Harvest in Barrels (Figures Rounded)</u>
November *	37,000
December	52,500
January 71	39,800
February	27,800
March	22,800
April	22,200
<u>TOTAL</u>	<u>201,100</u>

* Season opened on November 15th.