

Job Report

Thomas L. Heffernan
Marine Biologist

Project No.. MO-R-5 Date: September 15, 1964
Project Name: Survey of Oyster Populations and Associated Organisms
Period Covered: January 1, 1963 to July 1, 1964 Job No. 6

Survey of Oyster Diseases
in Aransas Bay

Abstract: Mortalities among oysters (Crassostrea virginica) in Aransas Bay were surveyed by use of tray-held oysters at two locations. Live and gaping oysters found during the study were fixed in Zenker's Fixative and shipped to Dr. J. G. Makin of Texas A & M University for disease analysis. Field data collections and Dermocystidium marinum checks were made by personnel of the Texas Parks and Wildlife Department.

Three distinct mortalities appeared during the study period of January 1963 through June 1964. These occurred in March-May 1963, October-December 1963, and in April-June 1964. The mortality in March, April, and May 1963 depleted the original stock of oysters at both stations. In August 1963, the stations at Pintail Reef and Half Moon Reef were restocked with 2,000 oysters each. The two subsequent mortalities had depleted this stocking by June 1964.

Dermocystidium marinum checks made throughout the study period showed relative low incidence ratings during mortality periods and did not indicate that D. marinum was the primary mortality agent.

Identification and information pertaining to the mortality agent will be presented in a later report by Dr. J. G. Mackin.

Objectives: To study a controlled population of oysters through microscopic analysis; to determine disease organisms present in Aransas Bay and their effect upon oysters.

Procedure: Two permanent platform structures were constructed near Pintail and Half Moon Reefs. The platforms were equipped with racks and hoists to handle ten trays each containing approximately 200 oysters.

Oysters were checked at monthly intervals during the period from January through July 1963, when mortalities depleted the stock. Each platform was restocked in August 1963 and sampled weekly through June 1964.

Dead boxes (oysters which had died and opened with the meat missing or decomposed) and gapers (oysters which were slightly opened with meat in good condition or oysters in weakened condition, allowing liberal valve movement) were removed from each tray, counted and measured. One live oyster was also removed from each tray at each sampling. Gapers and live oysters were brought into the laboratory at Rockport and processed for Dermocystidium marinum analysis. After removal of posterior gut sections from the live oysters and gapers, the meats were placed in Zenker's Fixative for a period of 18 to 24 hours. After fixing, the meats were then washed in tap water for 24 to 36 hours or until yellow coloration of the

meats were removed. Meats were then placed in 70 per cent isopropyl alcohol and shipped to Texas A & M University for slide preparation and analysis.

Dermocystidium marinum data were obtained at the Rockport laboratory and mailed with the field data for each sample to Dr. Mackin for comparison with slide analysis.

Findings and

Discussion: Tables 1 and 2 show the basic field data obtained during each sample for Pintail Platform and Half Moon Platform.

Mortalities shown in field checks for 8/16/64 on Pintail Platform and 8/26/63 on Half Moon Platform are attributed to transplanting and culling shock. Both platforms were restocked with oysters obtained from Copano Bay in an area where salinities and temperatures coincided with the platform areas. Sampling indicated that the oysters were not infected with D. marinum when stocked.

Population Structure: All of the 2,000 oysters placed at each platform was measured at the time of restocking in August 1963.

Pintail Platform oysters at time of restocking ranged in size from 24 mm to 91 mm. The largest percentage of this population was in the 69 mm size group and the average size of the population was 59.29 mm.

Half Moon Platform stock oysters had an average size of 56.52 mm with the highest number in the 59 mm group. Size range extended from 21 mm to 97 mm.

Group comparisons of the stock oysters to size groups of dead oysters removed during the study showed an increase in average size to 68.04 mm with the largest number in the 79 mm group for Pintail Platform. Half Moon Platform oysters showed an increase in average size to 70.39 mm with the largest number of oysters in the 70 mm group. These figures indicate an average increase in size of 10 mm during the study period from August 1963 through March 1964. New growth was noted immediately after the platform restockings until late October when mortalities begin to occur in significant numbers. In November and early December no growth was observed. Late December checks showed recent growth on approximately 90 per cent of the survivors which continued until March 1964 when the die off began to recur.

Meat conditions observed during the study period were fair to good. A few of the oysters developed the thin watery appearance characteristic of D. marinum infection but the general condition for the population was not below that of normal healthy oysters observed during previous studies in the Aransas Bay area. There was no marked deterioration of body tissue in live or gaping oysters. Generally, an infected oyster had a weak muscle contraction allowing free movement of the valves. This was followed by gaping and then death. Microscopic examination of fresh gapers showed no apparent difference in condition from that of freshly opened live oysters, which in October and November were only of fair quality. It was noted that new growth decreased with the increase of mortality.

Mortality: Oyster mortalities in Aransas Bay began rising steadily in March and April 1963. By May and June, the test oysters in the platforms and their associated reefs, Pintail and Half Moon, had suffered extensive losses. Pintail Reef was completely void of any Crassostrea virginica although a sizeable population of Ostrea equestris had appeared during the same period of the C. virginica die-off.

Average daily mortality is shown in Table 3 for Pintail Platform and in Table 4 for Half Moon Platform. These data were obtained by dividing the number of dead and gaping oysters found during a sample by the number of days between

samples and are presented in monthly units. The increase in mortality at Pintail Platform is shown in Table 3 by the increasing daily mortality beginning October 1, 1963, gradually building up to the peak of 36 dead per day from November 5 through November 12.

Half Moon Platform daily mortalities presented in Table 4 show the buildup beginning October 15, 1963, reaching its peak of 39 dead per day between November 5 through November 7.

Percentages of survivor mortality are also shown in Table 3 for Pintail Platform and in Table 4 for Half Moon Platform. These figures are based upon the number of dead and gaping oysters found during each sample, forming the percentage of oysters that died since the previous check.

Dermocystidium marinum Incidence Data: Tables 6 and 7 show incidence ratings for Pintail and Half Moon Platforms, respectively. Dermocystidium marinum ratings were of sufficient intensity to account for some mortalities during April and May 1963, but thereafter the incidence declined below significant intensity.

Hydrographic and Climatological Data: Two years of drouth conditions have increased Aransas Bay salinities beyond the optimum for oyster survival and reproduction.

Total precipitation recorded from January through December 1963 was 25.32 inches, approximately forty per cent below normal. Recordings for January 1964 through June 1964 showed a total of 7.99 inches. Monthly recordings are shown in Table 5.

Temperature and salinity recordings taken at each platform check are shown in Tables 3 and 4 for comparison with mortality percentages. Salinities during the entire study period have been above normal in Aransas Bay ranging from 28 to 42 parts per thousand. A comparison of salinity recordings with mortality numbers and percentages indicates no apparent correlation. However, there appears to be a correlation between the mortalities and temperatures.

In December 1963, mortalities decreased significantly when temperatures fell below 20 degrees Centigrade and recurred in April 1964 when temperatures reached 20 degrees and above. This peak mortality occurred within a temperature range of 20-25 degrees Centigrade and indicates the mortality causative agent is active only during warm weather. It has not been shown in the field survey that there is a maximum temperature at which the disease is not active, as the Spring mortalities have depleted oyster stocks for two consecutive years.

Prepared by: Thomas L. Heffernan
Marine Biologist

Robert P. Hofstetter
Project Leader

Ernest G. Simmons
Regional Supervisor

Approved by:

Jerrance R. Leary
Coordinator

Table 1.

Oyster Mortalities at Station I - Pintail Platform

<u>Date</u>	<u>No. Live Taken</u>	<u>No. Dead Found</u>	<u>No. Gapers Found</u>	<u>Days Since Last Check</u>
1-9-63	10	32	5	14
2-6-63	10	14	10	28
4-3-63	10	126	4	56
5-15-63	10	211	25	42
6-18-63	18	262	0	33
	Stock depleted 6-18-63			
8-13-63	Restocked with 2030 live oysters			
8-16-63	0	88	23	3
8-22-63	10	7	0	6
8-29-63	10	7	1	7
9-4-63	10	2	0	6
9-10-63	10	2	0	6
9-16-63	10	5	0	6
9-23-63	10	4	0	7
10-1-63	10	5	3	8
10-8-63	10	10	8	7
10-15-63	10	28	2	7
10-22-63	10	20	10	7
10-30-63	10	153	42	8
11-5-63	10	110	67	6
11-12-63	10	156	97	7
11-19-63	10	120	53	7
11-29-63	10	164	56	10
12-3-63	10	7	67	4
12-17-63	9	14	3	14*
1-2-64	9	9	4	14*
1-20-64	9	2	3	18*
2-14-64	10	4	0	25*
3-5-64	9	7	0	20*
3-18-64	4	0**	0	13*
4-9-64	4	6	0	22*
4-27-64	4	35	12	18*
5-2-64	4	44	41	5
5-11-64	4	116	15	9
5-18-64	1	32	5	7
5-26-64	4	7	0	8
6-4-64	6	3	1	8
	<u>237</u>	<u>1174</u>	<u>521</u>	

* Delay in sample interval due to weather conditions.

** Three trays lost from rack during heavy seas. Count after recovery showed 38 oysters unaccounted for.

Totals for period of August 1963 through June 1964.

Table 2

Oyster Mortalities at Station II, Half Moon Platform

<u>Date</u>	<u>No. Live Taken</u>	<u>No. Dead Found</u>	<u>No. Gapers Found</u>	<u>Days Since Last Check</u>
1-9-63	10	10	0	14
2-6-63	10	8	0	28
4-4-63	10	40	0	57
5-15-63	10	122	6	42
6-12-63	10	77	1	28
7-10-63	20	231	1	28
<hr/>				
8-19-63	Restocked with 2,034 live oysters			
8-26-63	10	71	2	7
9-4-63	10	2	0	7
9-10-63	10	0	0	6
9-16-63	10	6	0	6
9-23-63	10	3	2	7
10-1-63	10	1	1	8
10-8-63	10	2	0	7
10-15-63	10	3	2	7
10-22-63	10	15	9	7
10-30-63	10	58	16	8
11-5-63	10	69	34	6
11-12-63	10	185	91	7
11-19-63	10	140	65	7
12-3-63	10	320	106	14*
12-17-63	10	24	3	14*
1-2-64	10	13	6	14*
1-20-64	10	12	4	18*
2-14-64	10	13	2	25*
3-5-64	10	17	0	20*
3-18-64	6	2	0	13
4-13-64	6	21	16	26*
4-27-64	6	133	46	14
5-2-64	6	48	60	5
5-11-64	6	123	12	9
5-18-64	1	15	5	7
5-26-64	6	13	4	8
	<hr/>	<hr/>	<hr/>	
	227	1309	486	

* Delay in check interval due to weather conditions.

Totals for period of August 1963 through May 1964.

Table 3

Pintail Platform

Mortality Rates and Hydrographic Conditions

<u>Date</u>	<u>No. Dead and Gapers</u>	<u>No. Days Between Checks</u>	<u>Sal.</u>	<u>Temp.</u>	<u>Av. Daily Mortality</u>	<u>% Mortality Found at Each Check</u>
8-16-63	111	4	38.7	29.9	27.75	5.47
8-22-63	7	6	39.7	29.1	1.17	.42
8-29-63	8	6	39.9	30.0	1.33	.42
9-4-63	2	6	41.3	30.3	.33	.11
9-10-63	2	6	39.6	31.1	.33	.11
9-16-63	5	6	39.7	29.5	.83	.27
9-23-63	4	7	41.6	27.7	.57	.22
10-1-63	8	8	41.2	24.6	1.00	.44
10-8-63	18	7	38.3	26.4	2.57	.98
10-15-63	30	7	-	25.2	4.28	1.68
10-18-63	15	3	-	25.6	5.00	.86
10-22-63	30	4	38.9	23.9	7.50	1.73
10-30-63	195	8	38.8	24.8	24.38	11.54
11-5-63	177	6	38.0 *	22.0	29.50	11.92
11-12-63	253	7	37.6	20.7	36.14	19.49
11-19-63	173	7	36.8	20.2	24.71	14.12
11-29-63	220	10	36.2	13.1	22.00	26.04
12-3-63	74	4	33.7	13.0	18.50	12.03
12-17-63	17	14	34.0	8.5	1.21	3.20
1-2-64	13	16	32.6	8.7	.81	2.81
1-20-64	5	18	31.5	11.7	.28	1.20
2-14-64	4	25	32.3	13.7	.16	.99
3-5-64	7	20	31.7	14.7	.35	1.80
3-18-64	0	13	29.6	19.3	.00	.00
4-9-64	6	22	28.3	19.2	.27	Recount
4-27-64	47	18	32.0	25.2	2.61	14.24
5-2-64	85	5	30.0	25.7	17.00	30.47
5-11-64	131	9	30.4	27.2	14.56	68.95
5-18-64	37	7	30.2	25.7	5.28	62.71
5-26-64	7	8	29.6	27.8	.88	33.33
6-4-64	4	8	30.3	24.8	.50	40.00

Table 4

Half Moon Platform

Mortality Rates and Hydrographic Conditions

<u>Date</u>	<u>No. Dead and Gapers</u>	<u>No. Days Between Checks</u>	<u>Sal.</u>	<u>Temp.</u>	<u>Av. Daily Mortality</u>	<u>% Mortality Found at Each Check</u>
8-26-63	73	6	38.3	28.3	12.2	3.62
9-4-63	2	7	42.0	29.6	.31	.10
9-10-63	0	6	40.2	31.4	0.00	0.00
9-16-63	6	6	39.3	28.9	1.00	.31
9-23-63	5	7	39.3	27.3	.71	.26
10-1-63	2	8	38.6	23.3	.25	.11
10-8-63	2	7	38.3	28.0	.28	.11
10-15-63	5	7	38.7	25.4	.71	.27
10-27-63	24	7	38.9	25.7	3.43	1.29
10-30-63	74	8	38.6	24.8	9.25	4.05
11-5-63	103	6	38.0	22.1	17.17	5.92
11-12-63	276	7	37.7	20.0	39.43	16.96
11-19-63	205	7	38.1	22.2	29.28	15.29
12-3-63	426	14	34.3	13.0	30.43	37.83
12-17-63	27	14	31.1	7.5	1.93	3.91
1-2-64	19	16	33.2	9.1	1.18	2.91
1-20-64	16	18	31.8	12.3	.89	2.65
2-14-64	15	25	31.6	13.5	.60	2.60
3-5-64	17	20	32.6	14.2	.85	3.07
3-18-64	2	13	30.2	19.2	.15	.38
4-13-64	37	26	29.6	21.0	1.42	7.12
4-27-64	179	14	29.2	24.2	12.78	37.53
5-2-64	108	5	29.2	25.7	21.60	36.99
5-11-64	135	9	29.3	27.7	15.00	66.85
5-18-64	20	7	29.5	26.2	2.86	46.51
5-26-64	17	8	29.6	27.2	2.12	77.27

Table 5

Aransas Bay Area Monthly Precipitation Recordings in Inches

January	.40	January	.96
February	4.41	February	2.62
March	.23	March	1.44
April	.22	April	.33
May	.15	May	1.19
June	6.65	June	<u>1.45</u>
July	.39	TOTAL	7.99
August	.96		
September	5.48		
October	2.46		
November	1.31		
December	<u>2.66</u>		
TOTAL	25.32		

Table 6

Dermocystidium marinum Incidence

Date of Sample	<u>Pintail Platform</u>		% Infection of Live Oysters
	D. m. Incidence Live	Gapers	
1-9-63	1.95	2.40	80
2-6-63	.10	.30	20
4-3-63	.65	1.83	40
5-15-63	.70	2.70	70
6-18-63	.85	.87	80
8-16-63		.02	
8-29-63	0.00	0.00	0
9-4-63	.20	0.00	40
9-10-63	0.00	0.00	0
9-16-63	0.00	0.00	0
9-23-63	0.00	0.00	0
10-1-63	.60	.30	20
10-8-63	.05	0.00	10
10-15-63	0.00	0.00	0
10-18-63		1.50	
10-22-63	.60	0.00	40
10-30-63	.05	0.00	10
11-5-63	.65	.33	40
11-12-63	0.00	.56	0
11-29-63	.40	0.00	30
12-3-64	.10	0.00	10
12-17-63	0.00	0.00	0
1-2-64	0.00	0.00	0
1-20-64	0.00	0.00	0
2-14-64	-	-	-
3-5-64	-	-	-
3-18-64	0.00	0.00	0
4-9-64	0.00	0.00	0
4-27-64	1.12	.81	50
5-2-64	.50	0.00	20
5-11-64	0.00	.50	0
5-18-64	0.00	1.00	0
5-26-64	0.00	0.00	0
6-4-64	0.00	0.00	0

Table 7

Dermocystidium marinum IncidenceHalf Moon Platform

Date of Sample	D. m. Incidence		% Infection of Live Oysters
	Live	Gapers	
1-9-63	2.05	0	90
2-6-63	.70	0	70
4-5-63	1.75	0	90
6-12-63	2.10	.50	100
7-10-63	2.15	1.80	80
8-8-63	1.00	5.00	100
8-14-63	.70	0	100
8-26-63	.25	.25	40
9-4-63	.15	0	30
9-10-63	.15	0	30
9-16-63	0.00	0	0
9-23-63	0.00	0	0
10-1-63	.25	0	30
10-8-63	.05	0	10
10-15-63	0.00	0	0
10-22-63	.10	1.00	10
10-30-63	.05	0	10
11-5-63	.40	.57	40
11-12-63	0.00	.17	0
12-3-63	.10	0	20
12-17-63	.05	0	10
12-31-63	0.00	0	0
1-20-64	-	-	-
2-14-64	-	-	-
3-5-64	0.00	0.00	0
3-18-64	0.00	0.00	0
4-13-64	.08	.08	10
4-27-64	.83	.05	50
5-2-64	0.00	0.00	0
5-11-64	0.00	0.00	0
5-18-64	0.00	0.00	0
5-26-64	0.00	0.00	0