STATE Texas

DATE July 1, 1951

# OYSTER INVESTIGATION
# QUARTERLY REPORT

From: April 1, 1951 to July 1, 1951

Biologist: Robert H. Parker

Boat: Narwhale

Crew: Saturnino Garcia

## INTRODUCTION

This investigation has been designed to search out the reasons for the decline in oyster production during the past few decades, and to find means of rehabilitating the industry on the Texas coast. Experiments have been carried out to find new methods for increasing the size and rate of growth of oysters. A preliminary survey of the local bays was made for a good commercial source of edible clams.

## STATUS OF THE PROJECT AT TIME OF LAST REPORT

Ecological and hydrographical data had been taken from reefs of nearby bays at least from once to twice a week, with an attempt to get hydrographical data from Long Reef, Aransas Bay, at least once a week. Random samples of the oyster population from all reefs were taken to determine their general appearance, gonadal condition and feeding. Also samples of all organisms associated with a natural reef were collected so as to determine the exact composition of the reef. Spat collectors were set out on live reefs in Aransas, Mesquite and Copano Bays. Three hundred and fifty barrels of oyster seed were planted in front of the Marine Laboratory for an experimental reef.

## AREA WORKED ON

Routine collections of oyster reef material were made in Aransas, Copano, Redfish, Carlos, and Mesquite Bays. Clam investigations were carried out chiefly in Aransas Bay near Mud Island, Redfish Bay, and Lydia Ann Channel. Long, Lap, Cedar, and

Copano Reefs were those on which most of the survey work was carried out. High winds prevented working any considerable distance from the laboratory.

## ACTIVITIES
## (Oysters and Clams)

Ecological and hydrographical data were obtained from reefs of nearby bays whenever weather permitted. These data consisted of plankton samples, water samples for salinity, turbidity and pH, and weather observations on water temperature, current, wind direction, and wind velocity.

Again, random samples of the oyster population from all the reefs were taken to determine their general appearance, gonadal condition and feeding. A special attempt was made to obtain plankton samples containing oyster larvae, so as to get a quantitative and qualitative record of oyster spatfall.

Considerable work was carried out in the laboratory, on devising means of stimulating growth in oysters, and finding some means to identify without any doubt, the oyster larvae of this coast. Experimental work was also carried out on identifying the larvae of the other common mollusks of the bay and Gulf.

A survey of the clam resources was initiated in order to determine the feasibility of developing an industry locally. This involved testing various methods of obtaining the clams, which are buried several inches in the mud of deeper bay waters, obtaining plankton samples from places suspected of being clam beds, and determining the population of clams in those areas surveyed.

Oyster mud shell was planted in front of the Marine Laboratory in order to stiffen the bottom. Altogether about 115 yards of shell were distributed over about a two acre plot, utilizing the boat K.T., the barge Manta, and four crewmen.

## OTHER ACTIVITIES

Considerable time was spent in assimilating and compiling the data for the drift card survey of the currents of the Gulf of Mexico as carried out by the Texas Game, Fish and Oyster Commission. All returns were plotted in relationship to previously plotted returns by other agencies, and in relation to the wind direction at time of dropping. This project is now being handled by Mr. E. D. McRae.

The author also attended the local meetings of the Texas Academy of Science, and participated in an open house for the public.

## BIOLOGICAL DATA ACCUMULATED

Since this is the final report for the author, all data accumulated during his stay here will be assimilated and prepared for use of those interested in the oyster project. Most of this data will be in the form of graphs and charts, since the time covered by this investigation is too short to formulate many conclusions.

So far as the period covered by this report (April through June), a short resume can be given concerning the status of the oyster project. Out of 70 oysters opened and checked throughout the period only one was not very milky. The rest were all furiously spawning, although 95% of the oysters were also fat, evidently feeding, and in very good shape.

Temperature of the water ranged from 17.1°C. on April 13, in Corpus Christi Bayou, Redfish Bay to 29.3°C. on May 28, near Long Reef, Aransas Bay. Generally throughout the latter half of April and all of May and June, the temperature of the water stayed above 23°C. Salinities ranged from 29.4 in the Intracoastal Canal, Aransas Bay on April 12, 1951 up to 34.9 on the 14 and 21 of May off Mud Island, Aransas Bay. The salinities have seldom dropped below 32 in any of the bays, and the average salinity is still 33.5 which is nearly Gulf salinity. The salinities for the whole period are plotted on graphs and given on charts, as well as temperatures, pH's, and turbidities.

Fouling organisms are still present in much smaller numbers than last year, with barnacles, mussels and algae being the predominant predators. Thais is still missing from the oyster reefs, although they were found in some abundance in trawl drags from Lydia Ann Channel.

There seems to be an evident increase of Gulf organisms, uncommon to the bays, especially in Copano, and Aransas Bays. Of note, were several species of brittle starfish, Astropecten starfish, Dosinia discus shells, cockle shells, scallops, Portunid crabs, live olive shells, Brotula barbata (a Gulf fish), and many Ostrea equestris or Gulf oyster.

In pursuance of the clam investigation, several methods of obtaining the clams were tried out; namely, oyster dredges, a small shell dredge, 10 and 28 foot otter trawls, and by using oyster tongs. None of these methods were successful in obtaining more than two or three clams at any one time, and most of the time no clams were gotten at all. The commission is now in the process of obtaining a special clam dredge from Rhode Island, and the author's boatman is also constructing a special clam dredge from a small oyster dredge frame. It was quite evident that the dredge must be heavy, have a long chain bag, and be able to dig at least 4-6 inches.

Many areas in Aransas Bay show evidence of a large clam population by the presence of many clam boxes, quite a few only recently dead. These were noticed principally on Long Reef near the Intracoastal Canal, Big and Corpus Christi Bayous into Redfish Bay, and on the shores of Mud Island and St. Joseph's Island. However, live clams were only obtained in waters surrounding Mud Island and at the entrance of Big and Corpus Christi Bayous.

## Oyster and Shellfish Laboratory Experiments

Twelve glass tanks of approximately 32 liter capacity were set up on a laboratory table containing the following organisms:

Tank I. Nine oysters, aerated only, a chemical fertilizer added once a week, in this case VHPF, containing all elements.

Tank II. Oysters (nine), aerated only, various ground meals added. At present time using Menhaden meal, have used corn and oat meal, and cottonseed meal.

Tank III. Nine oysters, aerated only, Rose fertilizer added (contains fish, bone, and blood meal), all dead now, so tank empty.

Tank IV. Nine oysters, aerated only, salt water added from time to time to maintain level of tank. Control.

Tank V. Nine oysters, unfiltered running water (salt), control.

The above five tanks were utilized to test the affect of various fertilizers upon oysters in aerated water only. They were numbered, then cleaned and measured once a month. Fertilizer is added once a week.

Tank VI. Edible clams, filtered running water (salt), outgoing water filtered through small plankton net in order to filter out clam larvae. Clams now all dead.

Tank VII. Disc and wedge shells, filtered running salt water, outgoing salt water filtered through small plankton net to filter out larvae. All dead now.

Tank VIII. Mussel shells, filtered running salt water, outgoing salt water filtered through plankton net to catch larvae. All dead now.

Tank IX. Cockle shells, filtered water, outgoing water filtered through plankton nets to catch larvae. All dead now.

Tank X. Oysters, filtered running salt water, outgoing water filtered through plankton nets to catch larvae. Still running, although nets are not hooked up.

These last five tanks were set up to collect the larvae of the predominant bay mollusks. Since size is the only practical criteria for determination between the different larval mollusks, this method of filtering water in which only one species of mollusk was present was thought practical to obtain definite specimens of each species. Oyster larvae were obtained by this method, but no other larvae were gathered before the plankton nets rotted through.

Tank XI. Eleven oysters in running salt water, all between 4.00 and 5.40 cms long, testing rate of growth for small oysters.

Tank XII. 12 oysters in running salt water, all between 5.67 and 6.83 cms long, Hyponex chemical fertilizer added once a week to test rate of growth of young oysters when a fertilizer has been added.

The results of these experiments are indefinite so far, since they have not been operating over a long enough period. One experiment, however, appears to be significant, and that is the one involving the growth rate of small oysters with and without a chemical fertilizer added. The tank with the fertilizer added produced twice as much growth in the same period of time for two measurings than did the tank without fertilizer. The figures for these two tanks are reproduced below. All oysters are measured and numbered in indelible paint.

Tank XI.

| Date Measured: | April 27, 1951 | May 15, 1951 | June 9, 1951 |
|---|---|---|---|
| Measurements: | 5.35 cms. | 5.37 cms. | 5.42 cms. |
| | 5.15 | 5.18 | 5.19 |
| | 5.34 | 5.41 | 5.46 |
| | 5.32 | 5.32 | 5.32 |
| | 5.30 | 5.37 | 5.41 |
| | 4.95 | 5.00 | 5.01 |
| | 4.60 | 4.65 | 4.66 |
| | 4.00 | 4.00 | 4.00 |
| | 4.20 | 4.30 | 4.36 |
| | 5.40 | 5.60 | 5.65 |
| | 4.90 | 4.90 | 5.00 |
| Totals: | 54.51 | 55.10 | 55.48 |
| Difference | ----- | plus .59 | plus .38 |

This tank showed steady but not excessive growth over the two months period.

Tank XII.

| Date Measured: | April 27, 1951 | May 15, 1951 | June 9, 1951 |
|---|---|---|---|
| Measurements: | 5.97 cms. | 6.21 cms. | 6.26 cms. |
| | 5.70 | 5.77 | 5.77 |
| | 6.45 | 6.46 | 6.56 |
| | 5.85 | 5.92 | 5.92 |
| | 6.22 | 6.32 | 6.35 |
| | 5.80 | 5.80 | 5.82 |
| | 5.67 | 5.67 | 5.75 |
| | 6.83 | 6.96 | 6.97 |
| | 6.30 | 6.44 | 6.60 |
| | 6.32 | 6.66 | 6.69 |
| | 6.36 | 6.35 | 6.43 |
| | 6.71 | 6.72 | 6.74 |
| Totals: | 74.18 | 75.28 | 75.86 |
| Difference: | ----- | plus 1.10 | plus .58 |

The oysters in this tank grew almost twice as much as the oysters in Tank XI at each measuring; however, the oysters must be measured each month for at least a year, before any definite conclusion may be reached. It may be, that oysters of different sizes have different growth rates.

These oysters in tanks that were aerated only gave conflicting results, as the oysters in aerated water only grew much more in the same period than those applied with different types of fertilizer and had running water only. For the most part, the addition of fertilizer to tanks that were aerated only produced excessive mortality. This does not mean, however, that the experiment should be discontinued, as several things could have caused the death of the oysters or perhaps the concentration of fertilizer was too heavy.

The experiment on the identification of mollusk larvae was not successful, due chiefly to the rotting of the plankton nets, two weeks after they were attached to the siphons, and the inability to obtain more mollusk specimens, after the original population died. We did manage to obtain oyster larvae which were photographed through the microscope, but the photographs were not good enough to make identification exact. If possible these experiments should all be continued and improved.

## Assimilation of Oyster Data from March, 1950 through June, 1951

Since no definite conclusions can be reached with the material on hand so far, most of the data will be put in chart and graph form to make it easily assimilated by whomever takes over the oyster investigation.

Hydrographic Data for Long Reef, 1950 - 1951

| Date | Salinity | Water Temperature | Turbidity | Wind | pH |
|---|---|---|---|---|---|
| 3-20-50 | 22.3 | 17.5°C. | 93 | N.E. | 8.8 |
| 3-24-50 | 22.3 | 20.0 | 95 | E. | 8.7 |
| 4-12-50 | 24.2 | 22.2 | 97 | E. | 8.4 |
| 4-18-50 | 24.6 | 21.7 | 98 | E. | 8.7 |
| 5-1-50 | 24.1 | 25.9 | 98 | S.E. | 8.8 |
| 5-15-50 | 24.9 | 26.5 | 98 | N.E. | 8.8 |
| 5-18-50 | 24.3 | 27.2 | 98 | S.E. | 9.3 |
| 6-13-50 | 24.7 | 29.0 | 95 | S.E. | 8.0 |
| 6-16-50 | 24.7 | 28.5 | 94 | S.E. | 8.3 |
| 6-28-50 | 26.0 | 29.5 | 92 | S.E. | 8.2 |
| 7-7-50 | 28.1 | 28.7 | 97 | S.E. | 8.1 |
| 7-11-50 | 28.7 | 29.2 | 95 | S.E. | 8.3 |
| 8-7-50 | 35.3 | 29.3 | 93 | S.E. | 8.1 |
| 9-13-50 | 33.7 | 29.2 | 97 | S.E. | 8.3 |
| 9-19-50 | 33.8 | 28.7 | 99 | S.E. | 8.5 |
| 9-27-50 | 32.3 | 25.6 | 98 | N.E. | 8.3 |
| 10-6-50 | 32.7 | 25.9 | 99 | E. | 8.4 |
| 10-10-50 | 33.3 | 24.3 | 98 | N.E. | 8.3 |
| 10-20-50 | 31.6 | 22.2 | 94 | N.W. | 8.5 |
| 11-7-50 | 33.8 | 9.0 | 96 | E. | 8.3 |
| 1-15-51 | 34.2 | 14.4 | 95 | N.E. | 8.08 |
| 2-5-51 | 33.4 | 7.3 | 93 | S. | 8.22 |
| 2-6-51 | 32.9 | 9.4 | 53 | S. | 7.82 |
| 2-27-51 | 32.4 | 19.8 | 93 | S. | 8.20 |
| 3-7-51 | 33.1 | 21.2 | 89 | S. | 7.82 |
| 3-21-51 | 32.6 | 14.2 | 97 | W. | 7.96 |
| 3-30-51 | 29.1 | 17.5 | 92 | S. | 8.00 |
| 4-10-51 | 31.6 | 21.0 | 95 | S. | 8.03 |
| 4-17-51 | 31.0 | 20.6 | | E. | 8.10 |
| 5-2-51 | 33.2 | 23.3 | | E. | 8.08 |
| 5-8-51 | 33.7 | 22.0 | | N.E. | 7.86 |
| 5-28-51 | 33.8 | 29.3 | | S. | 8.20 |
| 6-6-51 | 33.0 | 28.9 | | S. | 8.16 |

These figures also appear on a graph of all the hydrographical data from Long Reef, Aransas Bay. There appears to be some correlation between pH, turbidity, and salinity; but data should be kept on these factors for several more years before any definite correlation can be seen.

Hydrographic Data for Aransas Bay 1950 - 1951

| Date | Reef | Salinity | Water Temperature | Turbidity | Wind | pH |
|---|---|---|---|---|---|---|
| 3-9-50 | Spaulding | 24.1 | 14.3 | 92 | N.E. | 8.7 |
| 3-20-50 | Bird | 24.3 | 18.1 | 85 | N.E. | 6.7 |
| 3-22-50 | Bird | 25.9 | 18.4 | 95 | N.E. | 8.5 |
| 3-24-50 | 2 x 4 | 21.7 | 20.1 | 94 | N.E. | 8.5 |
| 4-12-50 | Bird | 27.5 | 23.8 | 95 | E. | 8.4 |
| 4-18-50 | Bird | 24.3 | 21.5 | 97 | N.E. | 8.6 |
| 5-1-50 | Bird | 25.5 | 26.5 | 98 | S.E. | 8.3 |
| 5-15-50 | Bird | 26.2 | 26.0 | 97 | N.E. | 8.6 |
| 5-18-50 | Bird | 24.8 | 27.1 | 97 | S.E. | 9.3 |
| 5-18-50 | 2 x 4 | 23.9 | 27.5 | 98 | S.E. | 9.2 |
| 5-31-50 | Bird | 25.3 | 28.4 | 99 | E. | 8.9 |
| 5-31-50 | Spaulding | 27.1 | 28.3 | 96 | E. | 8.7 |
| 6-5-50 | Bird | 25.2 | 29.3 | 95 | E. | 7.7 |
| 6-13-50 | Bird | 25.1 | 28.7 | 95 | S.E. | 8.2 |
| 6-13-50 | Spaulding | 26.2 | 28.5 | 80 | S.E. | 8.3 |
| 6-16-50 | Bird | 24.9 | 28.2 | 95 | S.E. | 8.3 |
| 6-28-50 | Bird | 25.7 | 29.4 | 94 | S.E. | 8.3 |
| 7-7-50 | Bird | 28.4 | 28.9 | 95 | S.E. | 8.2 |
| 7-12-50 | Bird | 29.6 | 30.3 | 96 | S.E. | 8.2 |
| 8-7-50 | Bird | 33.2 | 28.8 | 96 | S.E. | 8.1 |
| 8-10-50 | Spaulding | 34.5 | 29.2 | 95 | E. | 8.2 |
| 9-12-50 | Bird | 32.9 | 29.0 | 100 | E. | 8.4 |
| 9-13-50 | Spaulding | 34.2 | 28.2 | 97 | S.E. | 8.4 |
| 9-19-50 | Bird | 34.1 | 28.5 | 98 | S.E. | 8.9 |
| 9-27-50 | Bird | 32.9 | 25.6 | 97 | N.E. | 8.3 |
| 10-6-50 | Bird | 33.0 | 25.4 | 94 | E. | 8.3 |
| 10-11-50 | Bird | 33.7 | 25.5 | 97 | N. | 8.4 |
| 12-5-50 | 2 x 4 | 33.6 | 18.3 | 95 | N.W. | 8.1 |
| 12-7-50 | Bird | 32.4 | 9.0 | 91 | E. | 8.3 |
| 12-8-50 | Spaulding | 34.4 | 10.6 | 96 | S.W. | 8.1 |
| 12-14-50 | Deep | 34.6 | 26.5 | 95 | S.E. | 8.2 |
| 12-15-50 | Hall's | 34.6 | 17.3 | 96 | S.E. | 7.9 |
| 1-15-51 | Bird | 32.4 | 14.2 | 96 | N.E. | 7.97 |
| 1-18-51 | Broomstick | 33.95 | 16.1 | 98.2 | N.E. | 8.25 |
| 1-23-51 | Beacon #108 | 34.0 | 16.3 | 97.0 | N. | 7.90 |
| 2-5-51 | Marker #31 | 31.5 | 6.0 | 98.5 | | 8.02 |
| 3-7-51 | Bird | 31.95 | 22.4 | 81.0 | S. | 8.01 |
| 3-27-51 | Allan's Bight | 35.35 | 18.8 | 97.0 | S. | 7.98 |
| 3-28-51 | Lab. Claim | 32.7 | 20.2 | 95.0 | N. | 8.01 |
| 3-30-51 | Bird | 28.9 | 17.6 | 95.2 | S. | 8.10 |
| 4-2-51 | Lab. Claim | 32.55 | 19.4 | 94.0 | N. | 8.01 |
| 4-3-51 | Lab. Claim | 32.10 | 19.6 | 94.7 | S.E. | 8.00 |
| 4-4-51 | Lab. Claim | 32.3 | 20.2 | 95.5 | S. | 8.03 |
| 4-9-51 | Fulton | 32.6 | 19.9 | 84.8 | S. | 8.00 |
| 4-12-51 | Marker #60 | 29.4 | 19.9 | 78.0 | N. | |
| 4-13-51 | Marker #59-63 | 32.7 | 18.1 | 87.7 | S. | 8.00 |
| 4-18-51 | Marker #60-68 | 33.8 | 20.6 | | | 8.10 |
| 4-18-51 | Mud Island | 34.4 | 21.1 | | S. | 7.91 |

Hydrographic Data for Aransas Bay 1950 - 1951 (contd.)

| Date | Reef | Salinity | Water Temperature | Turbidity | Wind | pH |
|---|---|---|---|---|---|---|
| 4-18-51 | Mud Island | 34.4 | 21.1 | | S. | 7.91 |
| 4-23-51 | Lab. Claim | | 24.0 | | S. | 8.00 |
| 5-2-51 | East of Red Beacon | 32.8 | 23.15 | | E. | 7.33 |
| 5-4-51 | Mud Island | 33.2 | 25.5 | | S. | 8.11 |
| 5-9-51 | Marker #55 | 34.5 | 24.1 | | S. | 8.01 |
| 5-14-51 | Mud Island | 34.9 | 24.9 | | S. | 8.00 |
| 5-21-51 | Blind Pass | 34.9 | 26.1 | | S. | 8.10 |
| 5-22-51 | North Mud Island | 32.4 | 26.0 | | S. | 8.11 |

Hydrographic Data for Copano Bay 1950 - 1951

| Date | Salinity | Water Temperature | Turbidity | Wind | pH |
|---|---|---|---|---|---|
| 3-16-50 | 20.1 | 16.8 | 95 | N. | 8.7 |
| 6-1-50 | 24.2 | 28.1 | 96 | E. | 8.8 |
| 6-15-50 | 23.6 | 28.4 | 84 | S.E. | 8.2 |
| 6-15-50 | 23.8 | 28.8 | 92 | S.E. | 8.3 |
| 7-12-50 | 27.4 | 28.6 | 94 | S.E. | 8.2 |
| 8-10-50 | 32.3 | 28.8 | 96 | E. | 8.1 |
| 9-26-50 | 33.5 | 25.6 | 97 | N. | 8.2 |
| 10-2-50 | 34.7 | 28.0 | 98 | N.E. | 8.3 |
| 12-11-50 | 36.7 | 11.9 | 85 | S.W. | 8.1 |
| 1-3-51 | 37.1 | 14.2 | 74 | N.W. | 8.3 |
| 1-22-51 | 34.4 | 12.4 | 91 | N.E. | 8.0 |
| 3-21-51 | 37.2 | 15.6 | 97 | None | 8.0 |
| 3-30-51 | 33.7 | 19.0 | 88 | S. | 8.0 |
| 4-24-51 | 32.3 | 23.6 | | S. | 8.1 |
| 5-4-51 | 33.8 | 24.8 | | S. | 7.9 |
| 5-29-51 | 32.9 | 28.3 | | S. | 8.2 |

Hydrographic Data for Redfish Bay (California Hole) 1950 - 1951

| Date | Salinity | Water Temperature | Turbidity | Wind | pH |
|---|---|---|---|---|---|
| 3-6-50 | 23.1 | 15.2 | 96 | N.E. | 8.5 |
| 6-8-50 | 29.5 | 28.3 | 96 | S.E. | 8.3 |
| 7-11-50 | 38.4 | 28.3 | 98 | S.E. | 8.5 |
| 8-11-50 | 39.8 | 29.1 | 96 | N. | 8.1 |
| 9-14-50 | 37.7 | 28.1 | 98 | S.E. | 8.4 |
| 10-10-50 | 34.1 | 23.9 | 95 | N.E. | 8.2 |
| 11-22-50 | 34.6 | 19.4 | 95 | W. | 8.2 |
| 12-12-50 | 36.4 | 15.3 | 51 | None | 8.1 |
| 3-8-51 | 31.1 | 21.6 | 96 | S. | 8.0 |
| 4-13-51 | 34.7 | 17.1 | 94 | S. | 8.0 |

Hydrographic Data for San Antonio and Mesquite Bays, 1950 - 1951

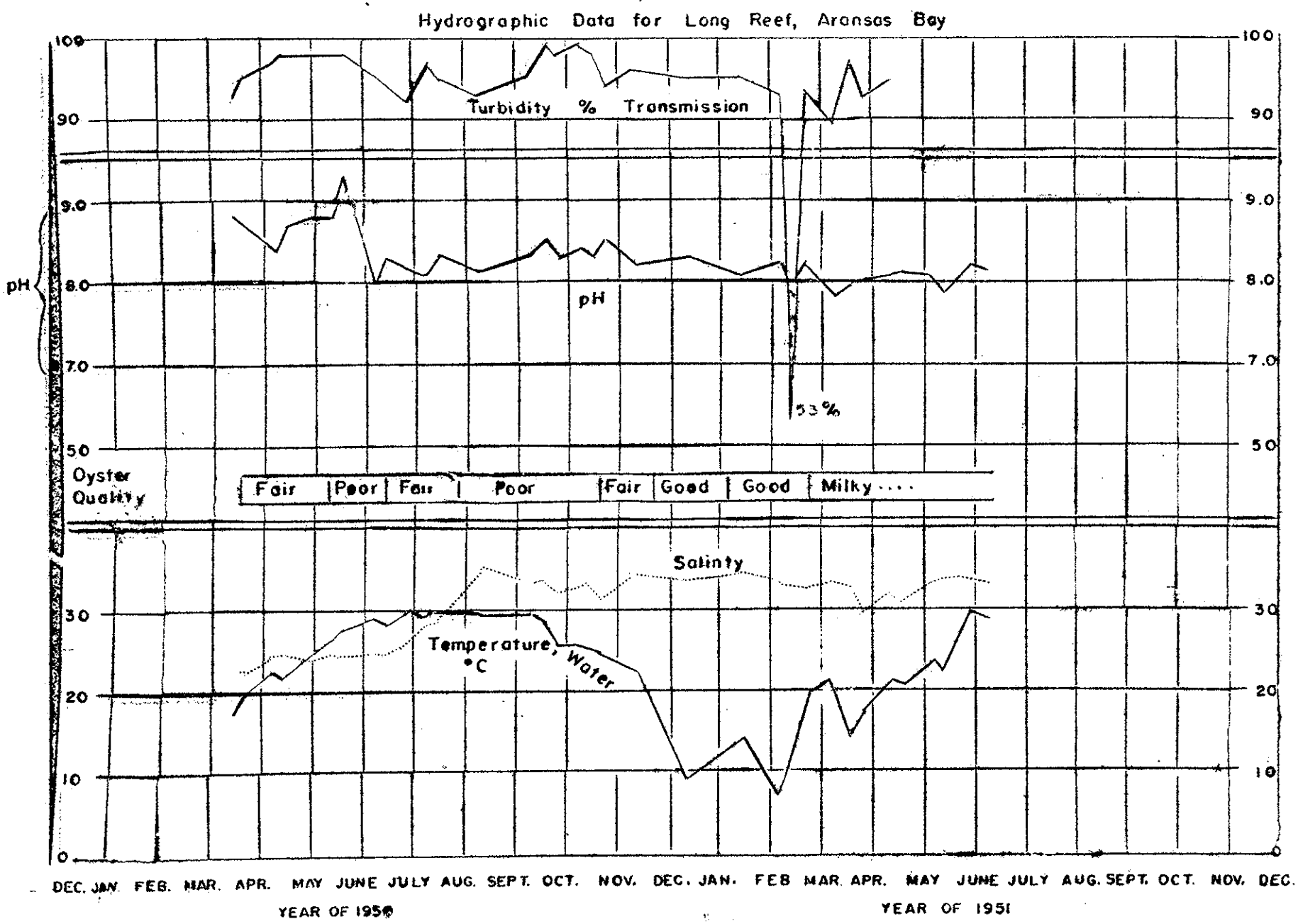
| Date | Reef | Salinity | Water Temperature | Turbidity | Wind | pH |
|---|---|---|---|---|---|---|
| 3-23-50 | Cedar | 24.1 | 22.0 | 86 | S.E. | 8.6 |
| 5-16-50 | Cedar | 24.7 | 26.7 | 97 | E. | 8.6 |
| 5-17-50 | McDowell | 18.3 | 27.8 | 98 | E. | 9.1 |
| 6-27-50 | McDowell | 13.1 | 28.6 | 94 | S.E. | 8.2 |
| 7-7-50 | Cedar | 27.6 | 29.0 | 97 | S.E. | 7.9 |
| 7-13-50 | McDowell | 17.3 | 28.7 | 93 | S.E. | 8.5 |
| 8-9-50 | McDowell | 24.4 | 29.0 | 96 | None | 8.1 |
| 9-25-50 | McDowell | 23.1 | 26.1 | 94 | N.E. | 8.3 |
| 10-9-50 | Panther | 30.4 | 24.1 | 94 | N. | 8.3 |
| 12-13-50 | Cedar | 32.8 | 16.9 | 93 | S.E. | 8.3 |
| 1-16-51 | McDowell | 20.3 | 14.0 | 93 | S.E. | 8.5 |
| 1-25-51 | Cedar | 32.0 | 12.9 | 95 | N. | 8.2 |
| 2-8-51 | Chicken Foot | 28.3 | | 92 | S.E. | 8.0 |
| 3-30-51 | Cedar Dugout | 27.3 | 17.8 | 56 | S. | 8.0 |
| 4-17-51 | Cedar Dugout | 32.1 | 19.6 | | N.E. | 8.5 |
| 5-28-51 | Cedar Dugout | 31.8 | 29.0 | | S. | 8.0 |

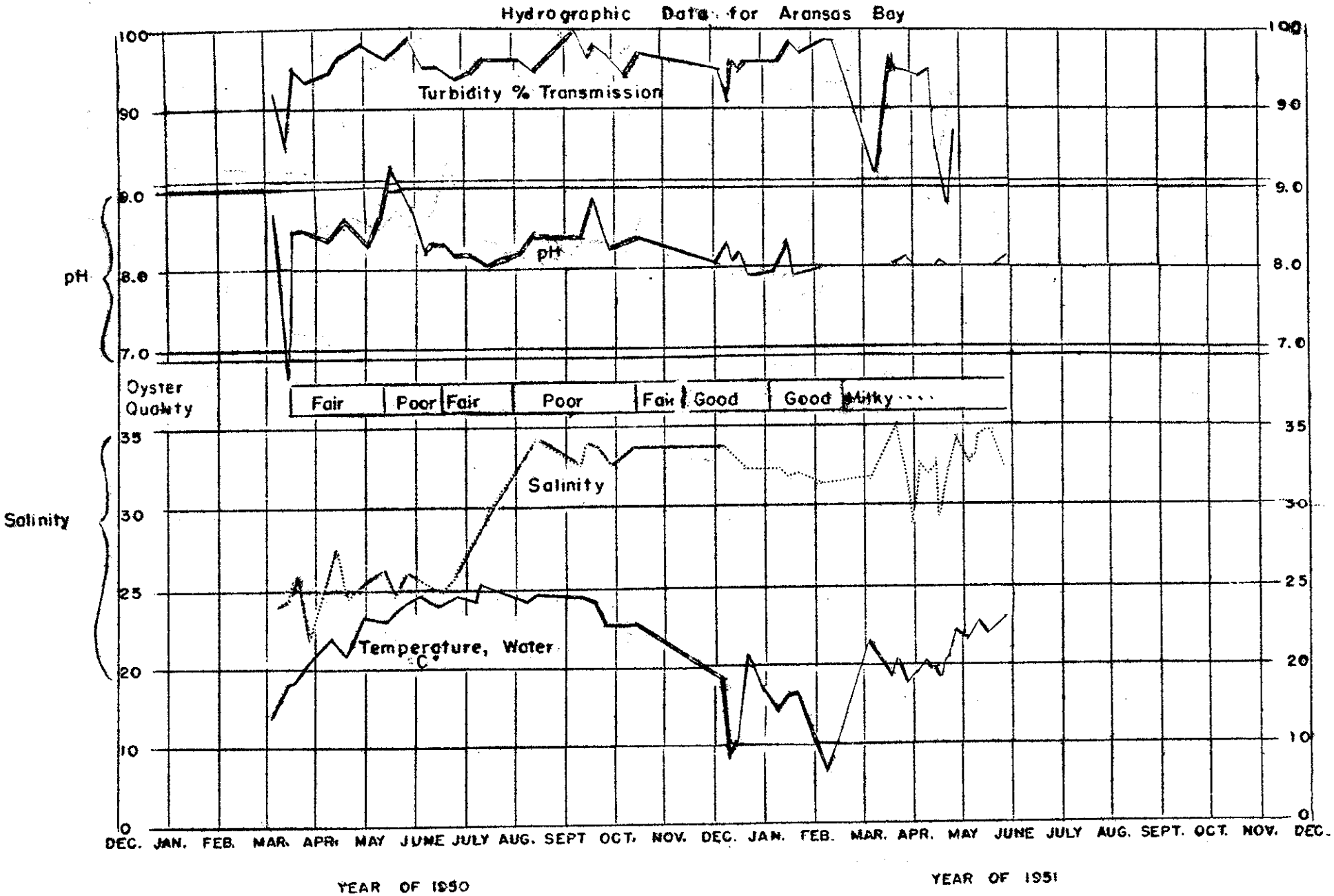
These tables are graphed in the proceeding pages, and also include the quality or condition of the oyster samples taken when the hydrographic data was obtained. There appears to be some correlation between the fluctuations of salinity, turbidity and pH. Whenever the salinity dropped or increased suddenly so did the pH and in several instances the turbidity. This is best illustrated in the graph of Long Reef data. The graphs of pH and turbidity are remarkably similar, especially in June, July, September and October of 1950, and February, March of 1951. During February through June 1951, the salinity curve follows that of temperature rather closely. This shows even better for the graph of hydrographic data for Aransas Bay, March through June.

In all cases, it was observed that oyster quality did not improve until the high level of salinity was reached and remained at comparably high level. It may be possible that before the oysters could grow and improve in quality, they had to adapt to this higher salinity. It would be interesting to see what would happen to the oyster quality if the salinity was abruptly lowered for a long period of time.

## Plankton Analysis

A qualitative and quantitative analysis of the plankton samples obtained at every station was made. Since the time was limited for examining each sample, one cubic centimeter of concentrated plankton was examined instead of the whole sample. Mr. E. D. McRae has been given the samples obtained by the author


Hydrographic Data for Long Reef, Aransas Bay
Turbidity % Transmission
pH
53%
Oyster Quality
Fair
Poor
Fair
Poor
Fair
Good
Good
Milky....
Salinty
Temperature, Water °C
100
90
9.0
8.0
7.0
50
30
20
10
0
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
YEAR OF 1950
YEAR OF 1951


Hydrographic Data for Aransas Bay
Turbidity % Transmission
pH
pH
Oyster Quality
Fair
Poor
Fair
Poor
Fair
Good
Good
Milky
Salinity
Salinity
Temperature, Water °C
100
90
9.0
8.0
7.0
35
30
25
20
10
0
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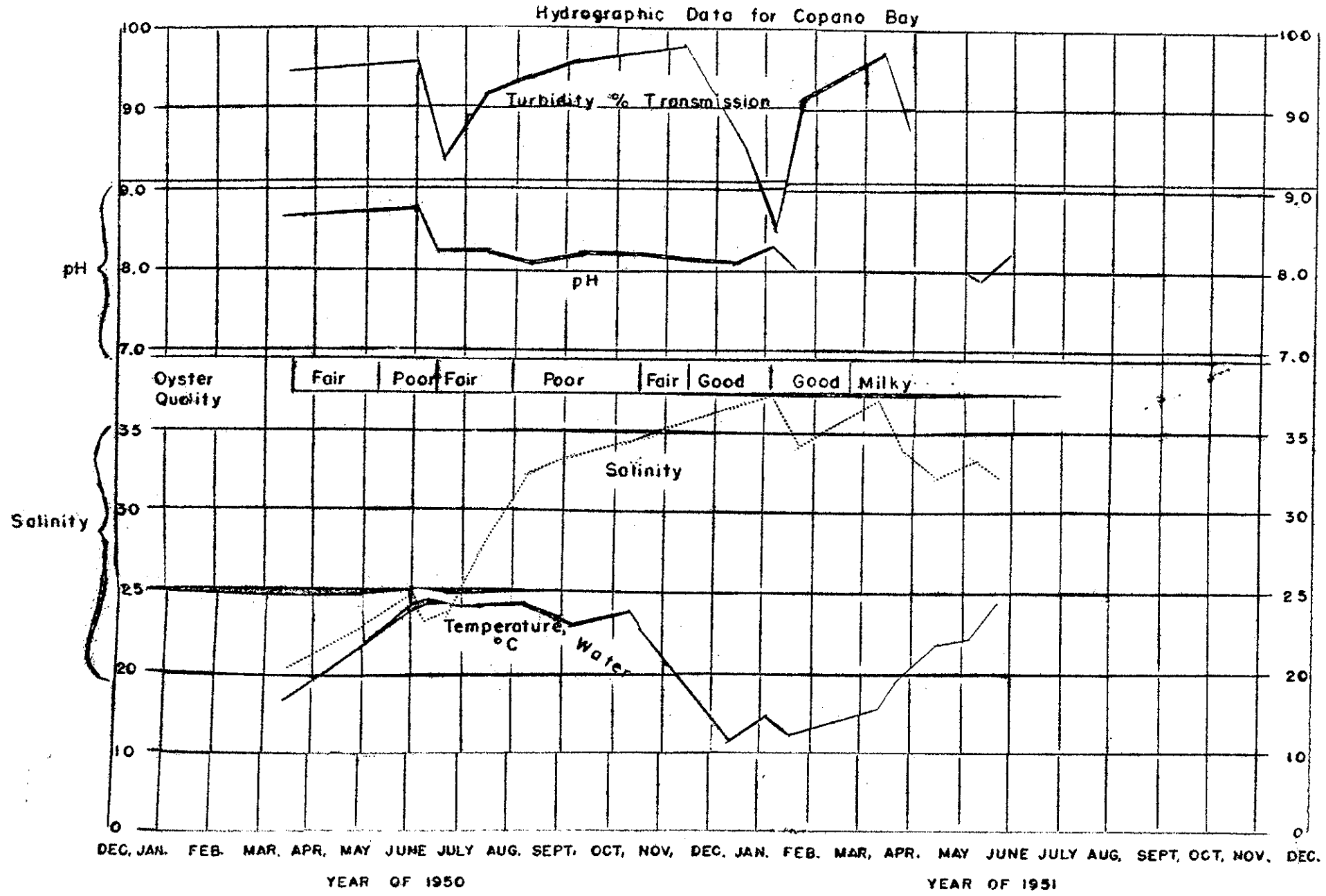
YEAR OF 1950
YEAR OF 1951


Hydrographic Data for Copano Bay
Turbidity % Transmission
pH
pH
Oyster Quality
Fair
Poor
Fair
Poor
Fair
Good
Good
Milky
Salinity
Salinity
Temperature, °C Water
100
90
9.0
8.0
7.0
35
30
25
20
10
0
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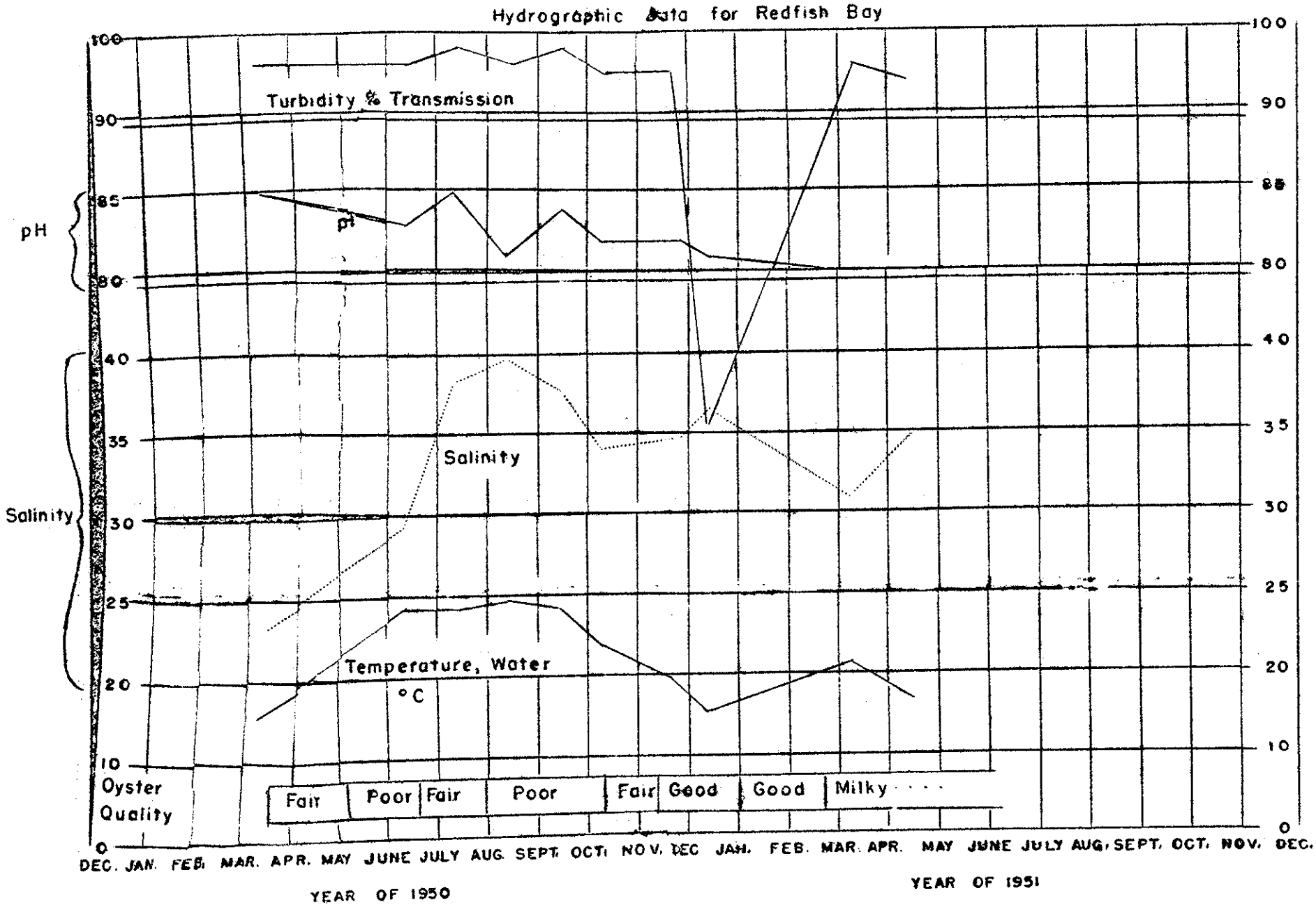
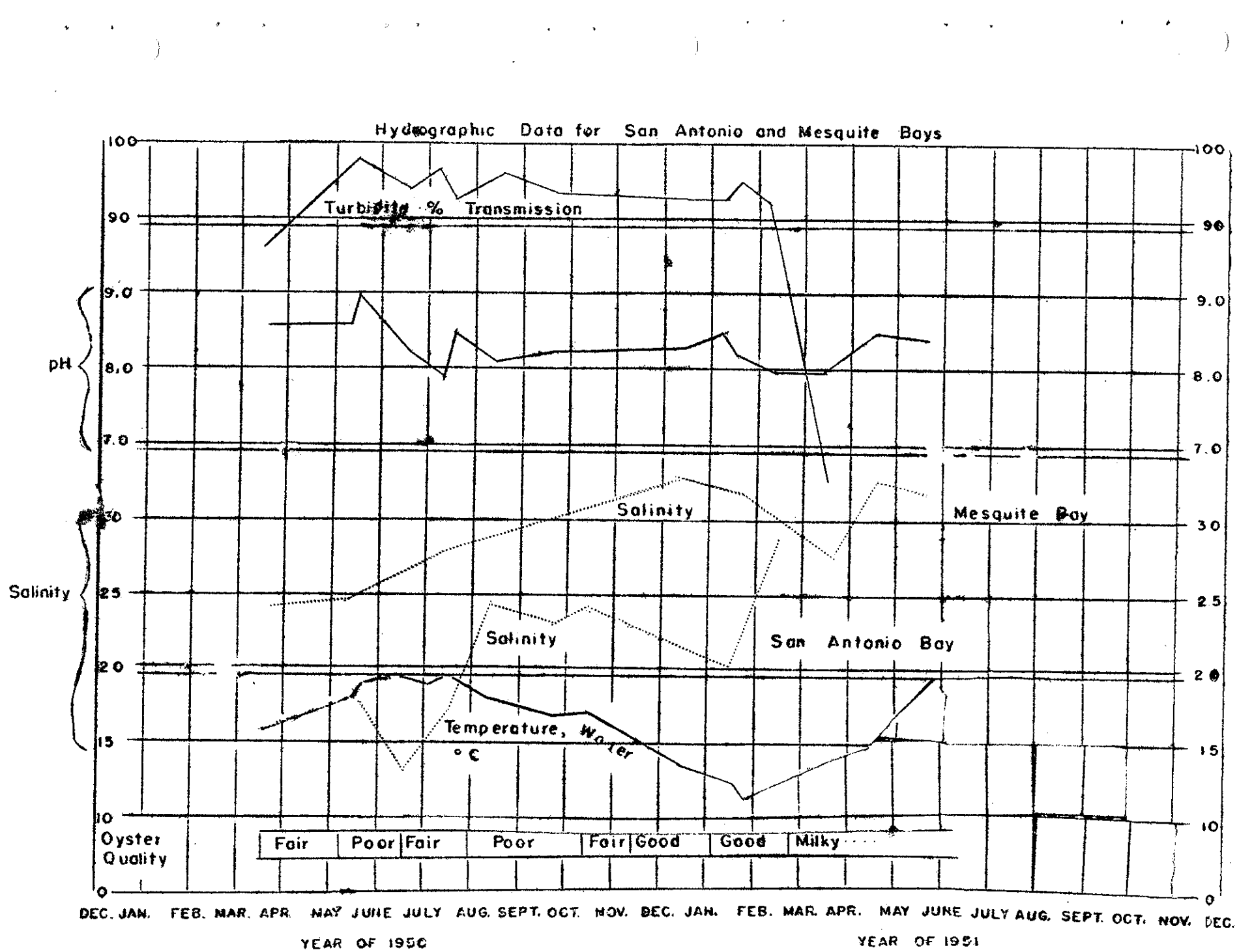
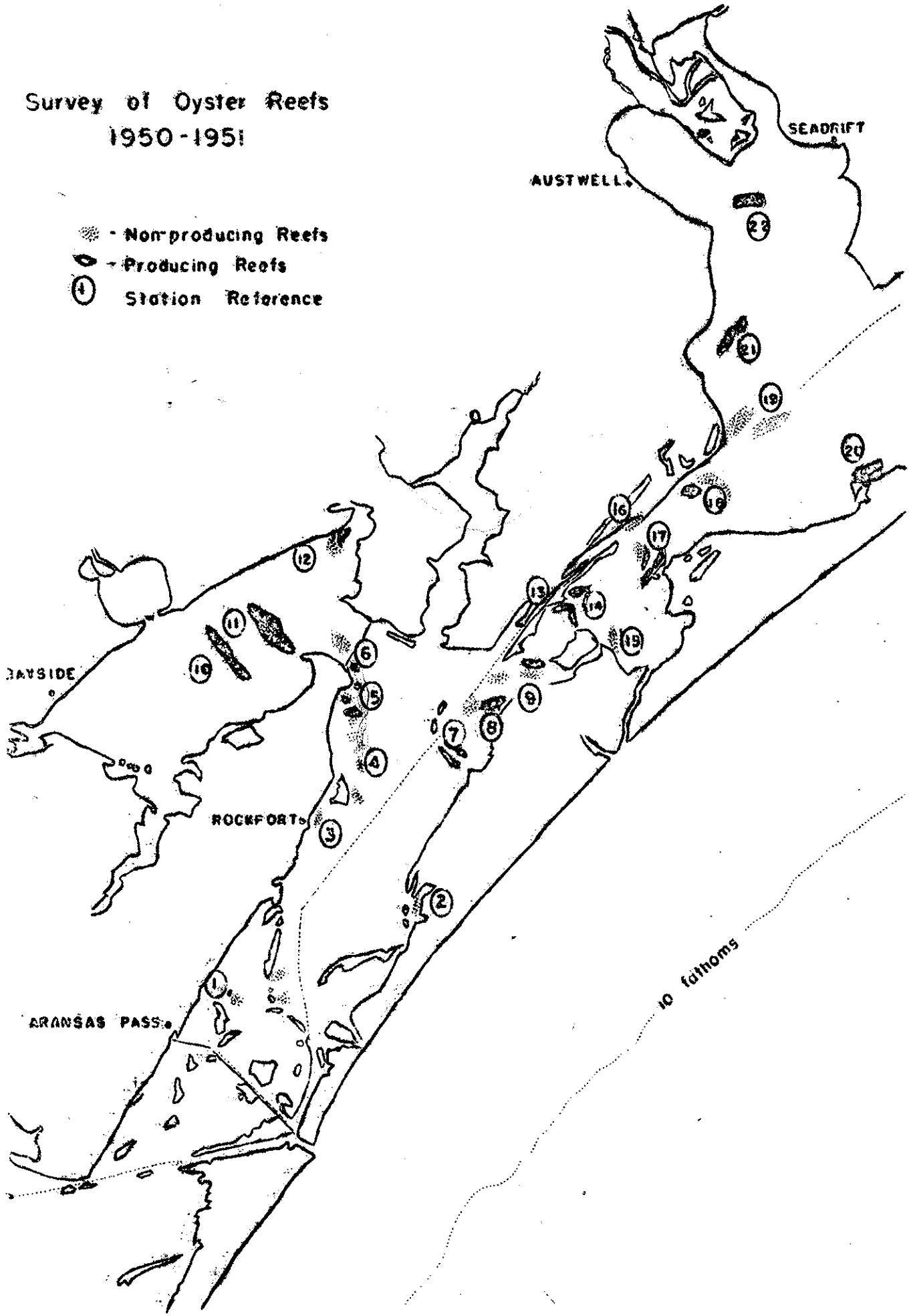

Hydrographic Data for Redfish Bay
Turbidity % Transmission
pH
pH
Salinity
Salinity
Temperature, Water
°C
Oyster Quality
Fair
Poor
Fair
Poor
Fair
Good
Good
Milky
100
90
85
80
40
35
30
25
20
10
0
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
YEAR OF 1950
YEAR OF 1951


Hydrographic Data for San Antonio and Mesquite Bays
Turbidity % Transmission
pH
Salinity
Salinity
Mesquite Bay
Salinity
San Antonio Bay
Temperature, Water
°C
Oyster Quality
Fair
Poor
Fair
Poor
Fair
Good
Good
Milky
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
YEAR OF 1950
YEAR OF 1951

# Oyster Investigation Plankton Data

| Date | Location | Method | Oyster Larvae Strt.Hinge | Umbo | Other Organisms |
|---|---|---|---|---|---|
| 10-10-50 | California Hole | 100 Liter | SH-10 | U-0 | Numerous diatoms |
| 10-10-50 | Long Reef | 100 Liter | SH-0 | U-7 | Very few diatoms |
| 10-11-50 | Bird Reef | 100 Liter | SH-209 | U-22 | Very few diatoms |
| 10-20-50 | Long Reef | 100 Liter | SH-2 | U-3 | Few diatoms |
| 11-14-50 | Lydia Ann Channel | 10 minute tow | SH-0 | U-0 | Very heavy diatoms |
| 11-22-50 | California Hole | 5 minute tow | SH-0 | U-0 | Many diatoms, few copepods, no mollusks |
| 12-15-50 | Borrup's Reef | 5 minute tow | SH-0 | U-0 | Few mollusks, copepods and diatoms |
| 1-15-51 | Long Reef | 5 minute tow | ---------- | | Sample crystallized |
| 1-23-51 | Red Beacon | 5 minute tow | SH-0 | U-0 | Many diatoms, few copepods, no mollusks |
| 2-5-51 | Markers #31-82 | 5 minute tow | SH-0 | U-0 | Many protozoa, no mollusks, few diatoms and copepods |
| 3-4-51 | Lab. Claim | 5 minute tow | SH-0 | U-0 | No mollusks, very few diatoms, heavy copepods |
| 3-7-51 | Long Reef | 5 minute tow | SH-0 | U-0 | Many foraminifera and copepods, few mollusks and diatoms |
| 3-8-51 | California Hole | 5 minute tow | SH-4 | U-0 | Few mollusks, diatoms, great many copepods |
| 3-21-51 | Long Reef | 5 minute tow | SH-54 | U-2 | Many mollusks and copepods, few large diatoms |
| 3-21-51 | Copano Reef | 5 minute tow | SH-0 | U-0 | Few mollusks, diatoms, copepods, thin sample |
| 3-30-51 | Long Reef | 5 minute tow | SH-6 | U-0 | Many copepods, few mollusks, diatoms |
| 3-30-51 | Lap Reef | 5 minute tow | SH-0 | U-0 | Diatoms, copepods equal, few mollusks |
| 4-9-51 | Marker #51-53 | 5 minute tow | SH-1 | U-0 | Clams, many diatoms, copepods |
| 4-10-51 | Long Reef | 10 buckets | SH-0 | U-0 | Few diatoms, small sample |
| 4-12-51 | Marker #69 | 5 minute tow | SH-0 | U-0 | No mollusks, heavy diatoms copepods, fish eggs |

# Survey of Oyster Reefs 1950-1951



and will examine the entire sample for additional organisms. A table of the results gained by the author from these samples follows.

It can be observed, that oyster larvae were present in plankton samples up to October 20, 1950 and were absent until March 8, 1951. This may indicate that there is no oyster set for about 4-1/2 months. This is equal to that period when oysters are in season here and that they are usually of pretty good quality. This year (1951) the oysters were milky as early as late February, but larvae did not appear until March 8.

Other mollusk larvae were observed as late as December 15, 1950, even though the water temperature had dropped below 10°C. Other mollusks did not appear in the plankton samples until March 7, 1951, a day before the oyster larvae were observed. By this time the water temperature had climbed above 20°C. the supposed lower limit for oyster reproduction.

## Survey of the Oyster Reefs

Although no concentrated survey of the oyster reefs of the coast as a whole had been made, there was some attempt to get an idea of the abundance of oysters and production capacity of the local reefs and a few reefs in San Antonio Bay. A map of these areas surveyed is contained in this report. This map shows those reefs which are non-producing and those which can produce live oysters in some quantity. There are numbers for each station surveyed, which can be used to refer to the data given below.

1. California Hole - Redfish Bay - No oysters left where state claim was planted, however, good oysters were food off the claim to the Northeast.

2. Allan's Bight - Aransas Bay - A few small patches of oysters found at the entrance, but none on the oyster claim planted there several years ago.

3. Marine Laboratory Claim - Aransas Bay - Planted 360 barrels of seed oysters and 165 yards of shell. Shell all swept up on shore, have never found live oysters on it.

4. Peanut, 2 x 4, Broomstick Reefs, Fulton Beach - Aransas Bay - A few live oysters, but not enough to be commercially feasible.

5. Hall's and Borrup's Reefs, Fulton Beach - Aransas Bay - These two reefs still have good commercial potentialities, and are used extensively by Fulton oyster tongers.

6. Entrance to Copano Bay - Aransas Bay - A small reef on the south west end of the causeway produced quite a few commercial

sized oysters. This was located on the south side of the oil dock channel. An old reef surveyed on the northeast side of the causeway had no live oysters at all, although a lot of shell.

7. Long Reef - Aransas Bay - The biggest commercial oyster reef in Aransas Bay so far as tonging is concerned, too shallow for dredging.

8. Bird Reef - Aransas Bay - Planted claim has very few live oysters left on it; however, a little to the northeast of the GFOC claim there is a sizeable reef of fair-sized oysters, although not in commercial quantities.

9. Spaulding Reef - Aransas Bay - GFOC claim is now under a foot of mud. No oysters could be found on claim, although some oysters were found on firm bottom, east of claim.

10. Copano Reef - Copano Bay - Good source of seed oysters in the past, now oysters of commercial size for tonging.

11. Lap Reef - Copano Bay - Fair source of seed oysters, oysters here smaller than on Copano Reef, and much more fouled.

12. Turtle Pen Flats - Copano Bay - GFOC claim covered with foot of mud, some mud oysters scattered. Northeast of claim a small bed of large mud oysters.

13. Cedar Dugout - Carlos Bay - Good reef of large-sized oysters, very little fouled, although reef is too shallow for dredging it should be a good source for commercial tongers.

14. Cedar Reef - Mesquite Bay - Extensive shell reef, but very little live stuff on it. A few small oysters taken from north side of channel, and a large number of large oysters taken from the east edge of the GFOC claim on the south east end of Cedar Reef.

15. Bull Haul Reef - Mesquite Bay - No live oysters on this reef at all, although at one time was a good commercial source.

16. Sundown Bay - Landlocked intracoastal canal - no live oysters.

17. Ayres Reef and Ayres Dugout - Mesquite Bay - Good commercial source of oysters in Ayres Dugout, although very deep. Ayres Reef has a few small oysters, and is very shallow.

18. Chicken-foot Reef - Mesquite Bay - Small but excellent supply of oysters in about 3 feet of water. A small shell reef east of the main reef did not produce any live oysters.

19. Entrance to San Antonio Bay from the Landlocked Intracoastal Canal - San Antonio Bay - No oysters on either side of canal, although extensive dead shell beds.

20. Panther Point - San Antonio Bay - Small reef, but good source of commercial oysters.

21. Dagger Reef - San Antonio Bay - Fair-sized reef, but oysters small and far between, still not commercially important.

22. McDowell Reef - San Antonio Bay - Small reef, but very good source of oysters for commercial tongers.

This survey is not complete for the bays shown on the map, but the major reefs and those used by the commercial oyster men are sketched in. There may be small clumps of live oysters in other parts of Copano, Carlos and Mesquite Bays which the author has missed, and the major part of San Antonio Bay remains to be surveyed. One thing is evident, of late, that many of the reefs which two years ago were thought to be dead, now are producing good-sized oysters.

UTILIZATION OF TIME

| Project | Biologist Hours | Crew Hours |
|---|---|---|
| Oyster Investigation (Field) | 118 | 118 |
| Oyster Investigation (Laboratory) | 360 | |
| Oyster Shell Planting | | 136 |
| Clam Investigation (Field) | 50 | 50 |
| Clam Investigation (Laboratory) | 16 | |
| Quarterly Reports | 40 | |
| Public Relations | 47 | |
| Drift Card Survey | 18 | |
| Texas Academy of Science | 5 | |
| Marine Products | 16 | |
| Total | 670 | 304 |

SUMMARY

1. All but one of the oysters examined during this quarter were very milky, and evidently spawning at a very high rate. They were also fat, and most contained a good crystalline style, so were feeding as well.

2. Generally, throughout the quarter the temperature of the water remained above 23°C; the salinity seldom dropped below 32 p/m and averaged about 33.5 in the nearby bays; and the pH remained between 7.9 and 8.1. Winds were high, 25-30 miles per hour throughout most of the period, which prevented

extensive collecting.

3. Foulding organisms still present in much less numbers then last year, although beginning to increase slightly. No Thais on the oyster reefs yet.

4. There is an evident increase of Gulf organisms, particularly mollusks and echinoderms in the surrounding bays. This is probably due to the continued high salinity.

5. A clam investigation was instigated with a survey of possible beds, and various methods for obtaining clams in large numbers.

6. Several oyster and shellfish experiments were initiated including: the determination of the affect of adding commercial fertilizers to oyster cultures in order to hasten growth and an experiment to contrive means of obtaining true samples of the larvae of the various local mollusks. Only one experiment was moderately successful, that of adding commercial chemical fertilizer to a tank of oysters in running salt water. The oysters in this tank consistently showed more growth than those in a similar tank without fertilizer.

7. Oyster data from March, 1950 through June, 1951 was compiled, tabulated and graphed with a few remarks as to any significant data.

8. An analysis of all the plankton samples taken by the author was made and data tabulated.

9. A map of the oyster reefs surveyed thus far was drawn up and a description of each station given.

10. Other activities carried out were: the assimilation and plotting of the drift card data belonging exclusively to the Texas Game, Fish and Oyster Commission, the participation in an open house for the public of South Texas, and the attendance of the local meeting of the Texas Academy of Science.