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STUDY OF THE SOUTHERN QUAHOG (Mercenaria campechiensis Gmelin) IN TEXAS WATERS

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ABSTRACT

Small groups of quahogs (Mercenaria campechiensis Gmelin) from a natural bed in West (Galveston) Bay were held in trays or boxes in Galveston Bay and the lower Laguna Madre to study growth and mortality.

Few mortalities occurred among quahogs held in trays in mid-Galveston Bay from fall, 1964 until spring, 1965. Complete mortality at one station in May was caused by predation from stone crabs (Menippe mercenaria) and conchs (Thais haemastoma). All quahogs at the other station died in June after salinities dropped below ten parts per thousand. Mortality among quahogs in boxes at the natural bed in West Bay was 30 per cent from June through December, with a peak mortality rate in August.

Initial mortalities among quahogs in boxes at two stations in the Laguna Madre were high (49% and 56%) and total mortality from April through November was above 90 per cent. At the third station, however, initial mortality was low (1%) and total mortality was 17 per cent.

Size range of the quahogs indicated that most were at least three years old with only 13 per cent two years old or less. Little or no growth was observed among the older quahogs.

Dermocystidium marinum infections were found among the quahogs. Infections were very light and the per cent infected was very low.

INTRODUCTION

In Texas, the southern quahog or hard clam (Mercenaria campechiensis Gmelin) has been reported from Galveston and Aransas Bays with worn, dead shells along all the Gulf beaches (Pulley, 1952). Hildebrand (1954) reported live shells on the Diplanthera and Thalassia flats in Aransas and Corpus Christi Bays. Parker (1959) listed Mercenaria as one of the two pelecypods which best characterized the "high salinity bay margin" environment. He found live quahogs in Aransas Bay and dead shells in Mesquite Bay and San Antonio Bay. Hoese (1960) reported that the "infauna of Mesquite Bay in 1956-57 was composed largely of a Mercenaria campechiensis - Chione cancellata community." Complete mortality occurred in spring 1957 due to low salinity. Breuer (1962) reported a few specimens from South Bay and the lower Laguna Madre.

The quahog has not been harvested commercially to any great extent from Texas waters. Breuer (op. cit.) reported a commercial harvest in South Bay "before the dumping of spoil from the Brownsville Ship Channel dredging." Small quantities of quahogs from West Bay were dredged and sold by one commercial fisherman in 1965 (W. R. More, personal communication).

In spite of its present limited value, the quahog is a potentially commercial mollusc in the more saline bay areas. This study was initiated to provide preliminary information on the survival of the quahog in selected areas of Galveston Bay and the lower Laguna Madre.

DESCRIPTION OF AREAS

Galveston Bay

Quahog stations were established at Switchover and Hanna oyster platforms in the mid-Galveston Bay area and at a natural quahog bed in West Bay (Figure 1). The Switchover station was located on an artificial oyster reef near the western shore in seven feet of water. The Hanna station was located in seven feet of water at Moody's Pass on Hanna Reef at the mouth of East Bay. Average monthly salinities during the study period (October, 1964 - June, 1965) ranged from 12.3 ppt to 23.6 ppt at Switchover and 16.1 ppt to 23.2 ppt at Hanna, with higher salinities occurring in the fall, lower salinities in spring. The West Bay station was located on a shallow flat (two to three feet water depth) between two small islands off the south shore. Bottom sediment consisted of sandy mud and shell fragments with an oyster shell layer about eight inches below the surface. Vegetation, consisting chiefly of shoal grass (Diplanthera wrightii) was most abundant in late summer. Salinities ranged from 20.2 ppt to 34.7 ppt during the June - December study period.

Laguna Madre

Quahog stations were established at Laguna Vista, Three Islands and Port Mansfield (Figure 1). Water depth was three feet at Laguna Vista and Three Islands; four feet at Port Mansfield. Bottom sediment consisted of sand at Laguna Vista, firm mud at Three Islands and firm mud with shell at Port Mansfield. Shoal grass (Diplanthera wrightii) was sparse at Laguna Vista, dense at Three Islands and Port Mansfield. Salinities during April-November ranged from 33 ppt to 42 ppt at Laguna Vista, 32 ppt to 46 ppt at Three Islands and 29 ppt to 49 ppt at Port Mansfield.

METHODS

At the Switchover and Hanna stations in Galveston Bay, quahogs were placed in vinyl-coated trays resting on bottom. At all other stations, quahogs were held in cedar-wood boxes 28 inches long, 15 inches wide and 5 inches deep, with a hardboard bottom and a top of 1/2 inch galvanized hardware cloth. The boxes were set on bottom, filled with sediment and fastened to a marker.

All quahogs used in the studies were collected from West Bay. Quahogs used in the tray stations were held in a live box at the Seabrook Laboratory dock for one month before stocking. Quahogs at the West Bay station were collected and stocked on the same day. Those used in the Laguna Madre stations remained out of water for 48 hours before stocking. Quahogs were stocked at the Laguna Vista station first; those stocked at Three Islands and Port Mansfield were held in the Arroyo Colorado one extra day.

Stations were visited at approximate monthly intervals; quahogs were measured along the anterio-posterior axis with calipers, dead quahogs were removed and, in Galveston and West Bays, gaper tissues were cultured in fluid thioglycollate medium for Dermocystidium infection. Tray stations, containing 25 quahogs, were established in October, 1964 and discontinued in June, 1965. The West Bay station was established in June with 200 quahogs and discontinued

in December. The Laguna Madre stations, each containing 100 quahogs, were operated from April through November.

RESULTS

Galveston Bay

From fall 1965 through early spring 1966, quahogs at the two tray stations in mid-Galveston Bay survived well in a salinity range of 14.7 to 23.6 ppt (Table 1). In May, however, a complete kill was found among the quahogs at the Hanna station. Stone crabs (Menippe mercenaria) were common in the tray and broken shells indicated that they had been feeding upon the quahogs. At the same time, oyster drills (Thais haemastoma) were abundant and may also have been feeding upon the quahogs although this could not be verified. At the Switchover station, all quahogs died in late May and early June. At the onset of mortality (May 21st) salinity was 17.4 ppt. In June, when most of the mortalities occurred, the salinity dropped to 9.7 ppt and ranged below 12 ppt during the month. No predation was observed and mortality was attributed to low salinity.

Total mortality among quahogs at the West Bay station, from June through December, was 29.4 per cent with a peak monthly death rate of 8.7 per cent in August (Table 2). Higher death rates during July, August and September coincided with higher salinities and higher water temperatures. Since the boxes were not examined during October and November, monthly mortality rates for the period October through December were based upon calculated deaths per day. It is quite possible that most of the mortality during that period occurred in a short period of time and the monthly rates are therefore doubtful. However, mortalities during this period were substantially less than those which occurred during the summer months.

Laguna Madre

Initial mortalities among quahogs at the Three Islands and Port Mansfield stations were 56 per cent and 49 per cent, respectively, while mortality at the Laguna Vista station was 1 per cent (Table 3). Subsequent mortalities at Three Islands and Port Mansfield were higher in May, dropping noticeably in June. At all three stations, a seasonal late summer mortality occurred with a peak in August (corresponding to the August peak in West Bay). The summer mortality rates at Three Islands and Port Mansfield were similar but the mortality rate at the Laguna Vista station was much lower; slightly below that among quahogs at the West Bay station. Total mortality during the period was 96 per cent and 94 per cent at Three Islands and Port Mansfield but only 17 per cent at Laguna Vista, less than the total mortality (30 per cent) at West Bay.

Growth

Quahogs in the West Bay study averaged 88.6 mm in length (93 mm mode) in June with a range of 39 mm to 121 mm. In December, the average length of the surviving quahogs was 88.3 mm, modal size 93 mm, and the range from 42 mm to 123 mm. In the Laguna Madre study, only ten small quahogs (40-68 mm) at the Laguna Vista station were measured. From June to August, the average length increment was 0.8 mm. No growth was noted after August 13.

Dermocystidium

Quahog gapers collected from the Switchover station in June were routinely cultured in thioglycollate medium for determination of Dermocystidium. Out of four gapers collected, two were found to be infected (one contained a light infection, the other a very light infection). In both cases, the cells were well enlarged and stained blue with iodine. During July, August and September, 20 live quahogs from the natural bed in West Bay and one quahog gaper from the box station were cultured. The single gaper contained a very light infection with well enlarged, blue-stained cells. Of the twenty live quahogs, three were found to contain very light infections, ten were negative and seven contained small, dark-stained cells of doubtful nature. Although Dermocystidium - like organisms have been reported from the northern quahog (Mercenaria mercenaria), similar organisms have not been found in the southern quahog (Ray, 1954).

DISCUSSION

High mortalities among quahogs at Three Islands and Port Mansfield indicated conditions unsuitable for the establishment of a quahog population. Initial mortalities were suggestive of handling losses; both groups were stocked one day later than the Laguna Vista quahogs but were held in the Arroyo Colorado during the interim. However, since all three groups were held out of water for 48 hours during transportation from West Bay, handling losses would be expected to be equally high among the Laguna Vista group. Other factors contributing to the environment at the stations appear to be responsible. The relatively low mortalities at the Laguna Vista station indicate a suitable environment for survival of adult quahogs. Bottom plantings of juvenile and adult quahogs in the Laguna Vista area would be of interest.

Seasonal summer mortalities among quahogs at the West Bay station and at the three Laguna Madre stations possibly represented the effects of disease, but probably were due to adverse environmental conditions. Since the boxes were placed on, rather than in, the bottom in shallow water, they were subject to higher temperature ranges. Menzell and Sims (1962) reported cumulative mortalities of over 50 per cent from spring through summer (in Florida waters) which could not be accounted for by predation. They suspected high water temperatures in July and August accompanied by very low daytime tides as the cause of death.

Very little growth was exhibited among the quahogs, probably because of the relatively large size. Belding (1931) found that yearly length increments (among M. mercenaria) in Massachusetts waters were 5 mm or less among quahogs 80-100 mm in length compared to 20-25 mm among quahogs 20-40 mm long. Menzell (1961) found that the southern quahog in Alligator Harbor, Florida, grew faster than the northern quahog with an average increase in shell length from 16.5 mm initial size to 54.3 mm the first year and to 74.2 mm the second year. If these (Florida) rates can be applied to West Bay quahogs, only 2 per cent of the stock were about one year old, 11 per cent were two years old and the rest (87 per cent) were three years old, or older.

Quahogs examined in July were spawning or ready to spawn. However, no juvenile quahogs were found during the year (although a few had been collected in the winter 1964). Carriker (1961) found that the distribution of hard clam sets (M. mercenaria) in Little Egg Harbor, New Jersery, did not coincide entirely with that of the adults. Perhaps quahog sets in West Bay were concentrated beyond the limits of the adult bed. Menzell (1961) stated that 100 per cent of the juvenile quahogs in unprotected beds in Florida waters were killed by predation,

chiefly by the blue crab (Callinectes sapidus). Predation of juvenile quahogs may be a limiting factor in West Bay.

The most valuable quahog sizes are "little necks", 35-55 mm long and "cherry stones", 55-75 mm long (Belding, 1931). These groups comprised only 13 per cent of the West Bay population; the bulk of the quahogs were the larger, less desireable "chowder clams". Under such conditions, development of a regular commercial fishery would not be practical. More information on the abundance, distribution and survival of juvenile quahog stages will be needed.

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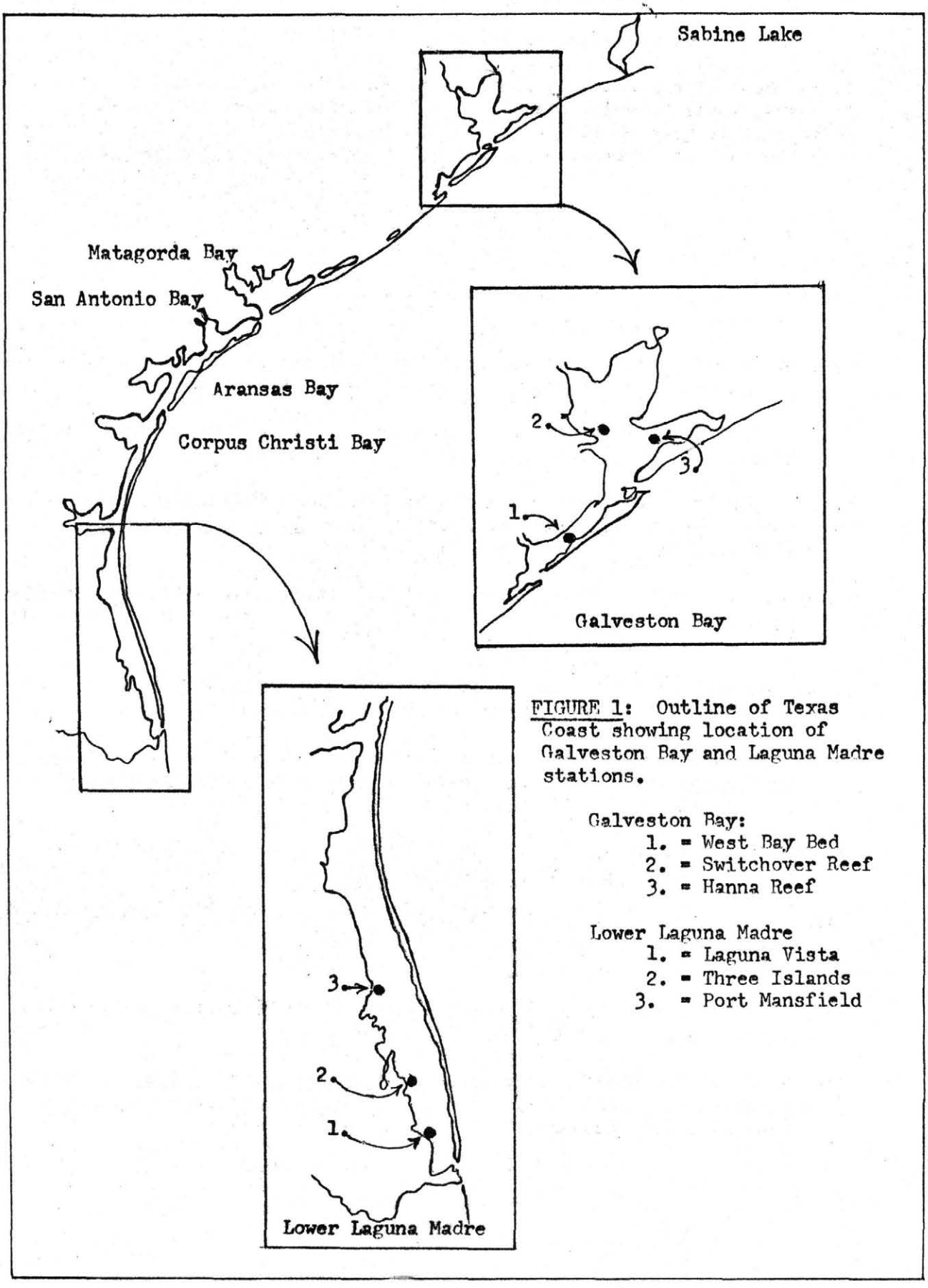

FIGURE 1: Outline of Texas Coast showing location of Galveston Bay and Laguna Madre stations.

Galveston Bay:
1. = West Bay Bed
2. = Switchover Reef
3. = Hanna Reef

Lower Laguna Madre
1. = Laguna Vista
2. = Three Islands
3. = Port Mansfield

Table 1: Monthly mortality rate (%) among quahogs in trays at the Switchover and Hanna oyster platforms in Galveston Bay during the period October, 1964 through June, 1965. Average monthly salinities recorded at the two stations are also shown.

MONTHLY	MORTALITY RATE (%)		SALINITY (°/oo)	
	Switchover	Hanna	Switchover	Hanna
October, 1964	0	0	23.6	21.4
November	-	4.0	22.2	23.2
December	-	-	21.0	19.6
January, 1965	0	0	15.8	18.9
February	0	0	18.7	16.1
March	0	0	16.3	23.0
April	0	0	14.7	17.6
May	8.0	100	18.8	21.1
June	100	0	12.3	16.4

Table 2: Monthly mortality rate (%) among quahogs in boxes in West Galveston Bay (initial stock = 204). Salinity and temperature also shown.

DATE	% MORTALITY*	SALINITY (°/oo)	TEMPERATURE (°C)
June	3.4	20.2	31.3
July	7.1	30.5	33.5
August	8.7	34.7	29.9
September	6.0	33.4	25.4
October	3.2	29.1	-
November	3.3	25.5	-
December	1.4	25.5	-

Total Mortality June-December

29.4

* Mortality rate is the per cent of the survivors at the beginning of a month which died during that month.
No examinations were made during October and November so monthly mortality rates were prorated from final December figures.

Table 3: Monthly mortality rate (%) among quahogs at three stations in the lower Laguna Madre. Initial stock in April was 100 clams at each station.

MONTH	STATION * 1	2	3
April (Initial mortality)	1.0	56.0	49.0
May	0	65.9	74.5
June	1.0	20.0	0.
July	6.1	25.0	30.8
August	7.6	33.3	33.3
September	2.4	16.7	16.7
October	1.2	0	0
November	-	0	0
Cumulative Mortality (April - November)	17.0	96.0	94.0

* Station 1 = Laguna Vista
2 = Three Islands
3 = Port Mansfield