JOB REPORT

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Project Name: Oyster Investigations, Galveston Bay.

Period Covered: January 1958 - June 1959 Job No. B-2

Survey of Oyster Reef Populations

Objective: 1) To determine the changes in the oyster populations on major reefs in Galveston Bay. 2) To study the associated reef organisms with special emphasis on pests and predators.

Procedures: Monthly oyster samples were collected by dredging and occasionally by tonging. The unit volume per sample was one standard bushel. The unculled sample was placed in a box with a capacity of 2160 cubic inches which, for all practical purposes, represented a standard bushel of 2150.4 cubic inches. Large oyster clusters were broken up before they were placed in the box but otherwise, no sorting was done. This procedure was used to gain some idea of the relative density of the oyster population and the character of the reef surface. Since the capacity of the sample dredge closely approximated one bushel, a full dredge load was frequently used as the unit of measure. The slight differences between the two methods did not affect the data.

All live oysters were culled out and measured. Measurements were taken by dividers from the tip of the beak to the tip of the bill and were reported to the nearest centimeter. Although spat less than 0.5 centimeters were counted, it was probable that many of them were overlooked. For this reason such oysters were not included in this data.

Associated reef organisms were collected and identifications made whenever possible. Special attention was given those organisms which were known to be oyster predators or which interfered with the oyster's activity in one way or another.

Findings: Sample stations are indicated in Figure I. Of the three, Todd's Dump (Station 1) was the only reef producing market oysters. Dollar Reef (Station 2) produced few market oysters in past years. The majority of the oyster population on this reef consisted of Ostrea equestris with very few Crassostrea virginicas. The 1957 Trinity River flood killed off the Gulf oyster and the reef was repopulated with C. virginica spat in the late summer and early fall in 1957. Vingtune Reef (Station 3), which had produced a good supply of market oysters in past years, suffered total mortality during the 1957 flood. Like Dollar Reef it was repopulated with spat in fall 1957.

Monthly length-frequency measurements for the three stations are presented in Tables 1, 2, and 3. Figure II presents the same data graphically. Although differences exist at each station the oyster populations have similar trends in spatfall, growth and mortality.

During the winter and early spring 1958, spat from the 1957 set predominated. These oysters appeared to suffer considerable mortality in the late spring and early summer. The population of Vingtune Reef was drastically

FIGURE I

Job B-2 Sample Station Locations

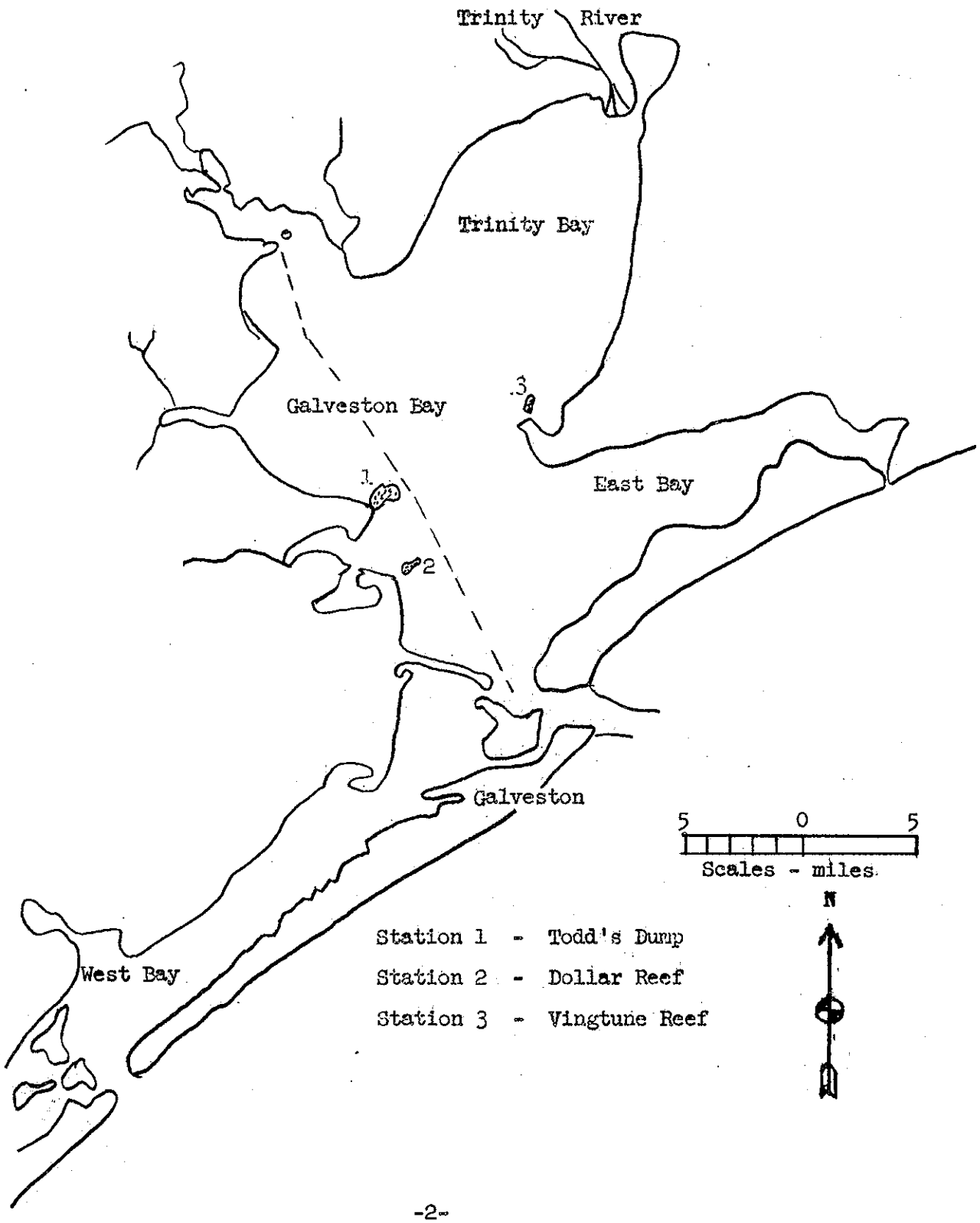

TABLE 1

Station 1 (Todd's Dump)

Length-frequency Measurements of Oysters

Length (Cm.)	Number Per Bushel											
	(1958)											
	J	F	M	A	M	J	J	A	S	O	N	D
1	285	330	298	120	11	58	15		8		26	
2	282	316	342	194	124	50	50		12		26	
3	132	148	147	130	168	83	99		37		52	
4	48	48	57	74	105	63	116		66		70	
5	16	21	22	42	38	40	66		72		102	
6	16	26	29	30	17	25	31		53		82	
7	22	20	27	22	18	21	30		25		44	
8	19	19	34	15	20	21	27		12		20	
9	14	10	11	6	11	16	16		7		15	
10	6	6	13	6	2	10	2		3		6	
11	6	2	6	2	3	4	1		2		1	
12	2	1	2	1	2	0	1		2		1	
13	1	0	1	1	1	0	0		0		0	
14	0	0	0	1	0	1	0		0		0	
15	0	0	0	0	0	1	1		0		0	
T	849	947	989	666	520	393	455		300		445	

	(1959)					
	J	F	M	A	M	J
1	3			4	2	
2	14			23	12	
3	27			31	25	
4	66			54	45	
5	114			77	82	
6	90			94	82	
7	26			70	58	
8	21			23	21	
9	5			6	8	
10	1			3	2	
11	4			1	0	
12	0			0	0	
13	0			0	0	
14	0			1	0	
15	0			0	0	
T	371			387	337	

TABLE 2

Station 2 (Dollar Reef)
Length-frequency Measurements of Oysters

Length (Cm.)	Number Per Bushel (1958)											
	J	F	M	A	M	J	J	A	S	O	N	D
1	150	116	76	58	7	273	116		107	341	189	61
2	405	357	358	290	86	65	255		146	137	169	126
3	195	233	279	382	124	94	150		118	93	83	64
4	81	142	116	232	97	102	125		112	78	57	53
5	17	44	37	86	41	58	73		113	54	93	79
6	3	5	9	22	17	16	30		69	29	52	79
7	1	0	1	4	4	4	2		6	10	21	55
8	0	0	0	0	0	4	1		0	3	0	20
9	0	1	0	0	0	1	0		0	1	0	3
10	0	0	0	0	0	0	0		0	0	0	1
T	852	898	876	1074	376	617	752		653	746	664	541

	(1959)					
	J	F	M	A	M	J
1	79			15		4
2	186			111		66
3	91			77		74
4	49			38		34
5	53			81		44
6	61			113		69
7	30			80		53
8	5			24		14
9	1			11		4
10	0			2		1
11	0			0		1
T	555			552		364

TABLE 3

Station 3 (Vingtune Reef)
Length-frequency Measurements of Oysters

Length (Cm.)	Number Per Bushel (1958)											
	J	F	M	A	M	J	J	A	S	O	N	D
1	1515	1833	1184	1039	511	206	48	32		95		87
2	701	2082	1391	1949	1102	394	219	242		69		92
3	125	285	336	496	284	88	97	326		205		81
4	26	48	74	116	33	12	12	55		142		134
5	2	10	8	17	5	1	3	5		32		138
6	0	0	0	3	0	0	0	0		5		46
7	0	0	0	0	0	0	0	0		0		13
8	0	0	0	0	0	0	0	0		0		2
9	0	0	0	0	0	0	0	0		0		0
10	0	0	0	0	0	0	0	0		0		0
T	2369	4258	2993	3620	1935	701	379	660		548		593

The salinity pattern in Galveston Bay during 1958-59 was chiefly influenced by run-off on the Trinity River. Such run-off was at a peak during the spring floods both in 1958 and 1959. As flooding continued, other areas were affected and salinities throughout the bay decreased. Because of the spoil banks along the east side of the Houston Ship Channel from Morgan's Point to Red Fish Bar, Trinity River water was delayed in reaching the west shore. Middle Galveston Bay-West and the Lower Bay were the least affected.

In September 1958 Tropical Storm "Ella" caused locally heavy rainfall in the secondary drainage areas and salinities were reduced along the west shore. Later, rainfall in the Trinity River drainage basin caused flooding on the river. These flash floods were less severe and of shorter duration than the spring floods, but salinities were reduced throughout the bay once again.

In 1959 the spring flood on the Trinity River was also accompanied by flooding on secondary streams. Salinities, which had increased during the relatively dry fall and winter, were again reduced. An increase in the local rainfall tended to keep salinities low well into summer.

No temperature pattern was found for different bay areas. Hence, only monthly ranges in temperature are given. The coldest months were January, February and December. Temperature ranges were somewhat greater during these months and probably reflected the sudden changes caused by the winter northers.

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TABLE 3 Cont'd

Station 3 (Vingtune Reef)
Length-frequency Measurements of Oysters

Length (Cm.)	Number Per Bushel (1959)					
	J	F	M	A	M	J
1	34	41			24	
2	130	125			121	
3	99	93			97	
4	133	112			91	
5	88	114			73	
6	24	50			45	
7	3	14			21	
8	0	6			2	
9	0	0			0	
10	0	0			0	
T	511	555			474	

reduced in numbers and that on Dollar Reef experience a similar, but less severe, loss. Flooding on the Trinity River may have been partially responsible. Although not as severe as the 1957 spring flood, flood waters in 1958 reduced salinities throughout the bay. Much of the mortality can be attributed to predation. Blue crabs were known to be abundant at all stations and mud crabs were plentiful. At Dollar Reef the conch Thais haemastoma and small stone crabs were common.

By summer 1958 the surviving seed oysters from the 1957 set still comprised the dominant age group. The modal length at Stations 1 and 2 was four centimeters. At Vingtune Reef the modal length remained fairly stationary at two centimeters. Poor growth at this station was no doubt due to the fresh water from the Trinity River.

A slight spatfall was noticeable at Todd's Dump and Dollar Reef in June 1958. No spat set occurred at Vingtune Reef during this period. In the fall 1958 spat became the dominant group at Dollar Reef. Recent spat were evident at Vingtune Reef but were still scarce at Todd's Dump. These findings compare well with the observed spat set for each station (See Job B-4).

In late fall and early winter 1958 bi-modal peaks were evident at Stations 2 and 3. The modal length of the 1957 seed oysters ranged between three and five centimeters and that of the 1958 spat was one centimeter. Growth rates of the 1957 seed on Todd's Dump were similar to those on Dollar Reef but the 1958 spat appeared to suffer mortality.

During the winter months the 1957 seed reached a modal length of four to six centimeters. The 1958 spat also increased in length with a modal size of two centimeters. Oysters on Dollar Reef grew better than those on Todd's Dump or Vingtune Reef.

Spring 1959 brought forth an increase in mortality. As in the preceeding spring, such mortalities could be blamed on flooding and predation. At Vingtune Reef the 1957 seed experienced the most damage while the 1958 crop fared very well. Both groups appeared to be equally affected at Dollar Reef. Little change was observed at Todd's Dump.

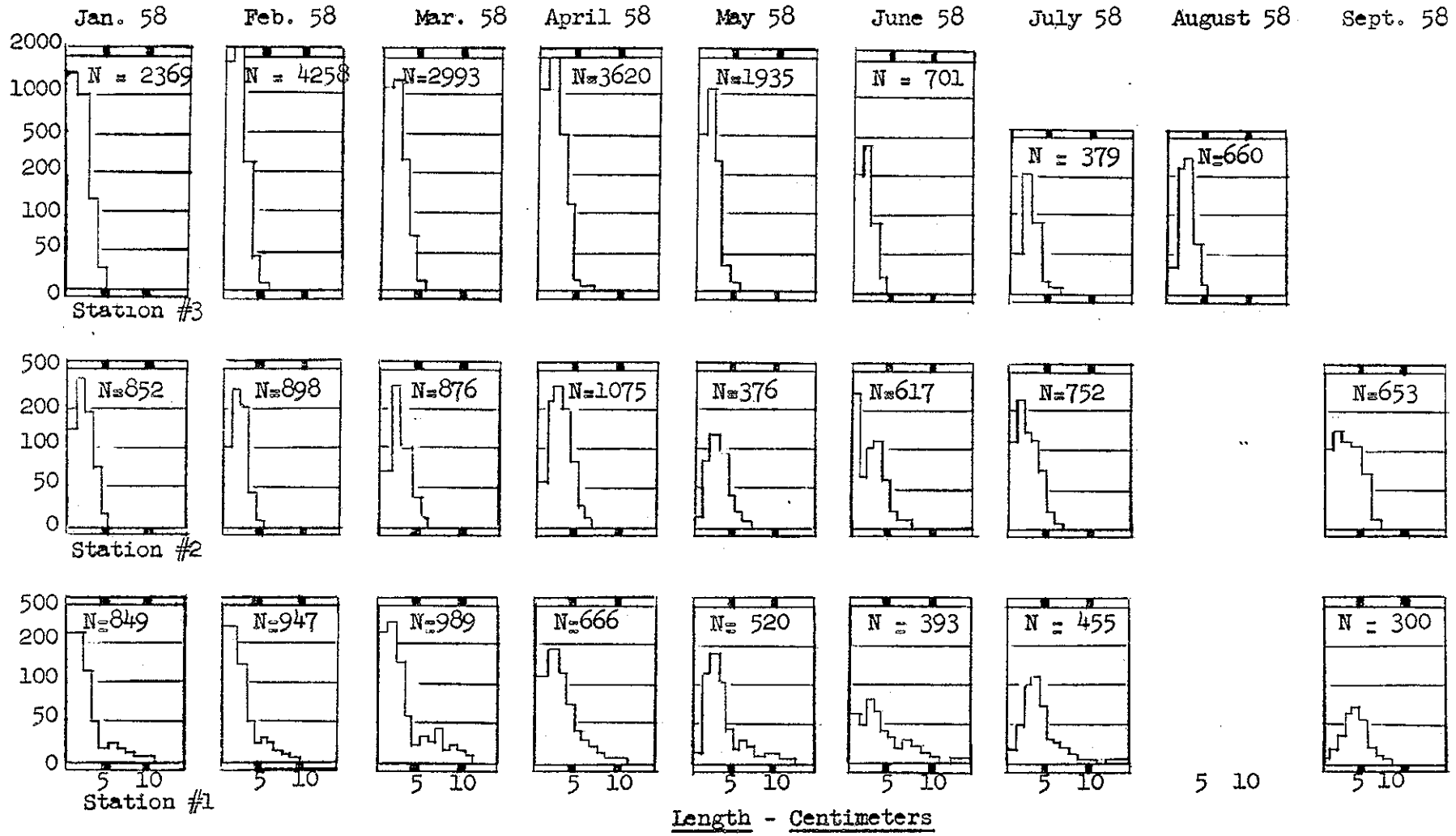

FIGURE II --Length Frequency Measurements of Oysters, Galveston Bay, 1958-59.

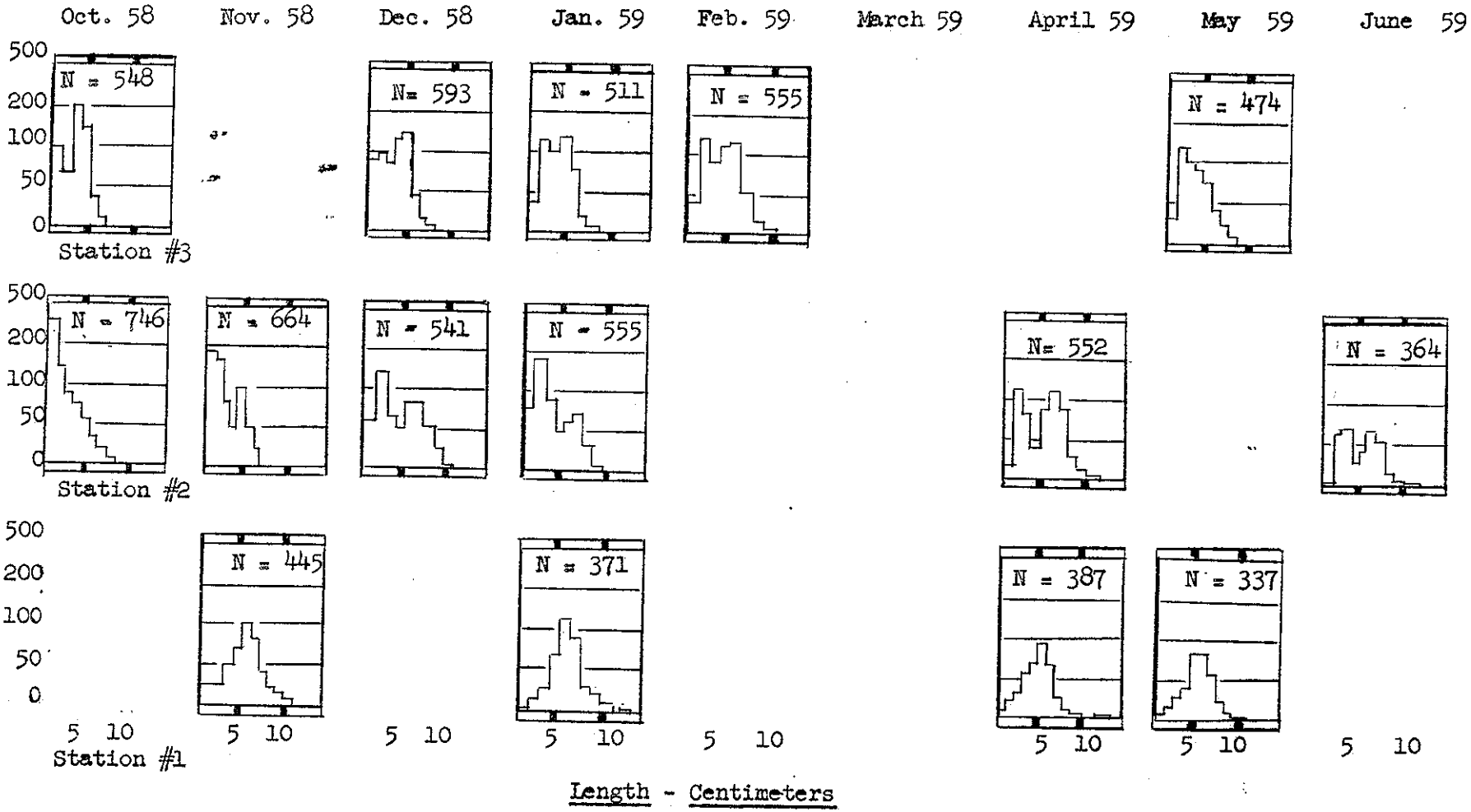

FIGURE II - Length Frequency Measurements of Oysters, Galveston Bay, 1958-59.

Spat from a 1959 set had not appeared at the end of the sampling period. Since conditions were similar to those in 1958 (ie: reduced salinities due to Trinity River floods), a late set could be expected.

By summer 1959 both Vingtune Reef and Dollar Reef contained oysters of market size (9 centimeters). At Vingtune Reef the market crop was too small to justify harvesting. Dollar Reef, however, produced a harvestable amount of oysters and compared favorably with Todd's Dump. In fact, Todd's Dump seemed to be in a period of declining productivity whereas Dollar Reef had a vigorous population suitable for exploitation.

The population figures do not indicate the quality of the oysters. Each reef produced oysters quite disimilar in many respects. For example, oysters on Vingtune Reef were thickly clustered. This was especially noticeable after the 1958 spat set. Under these crowded conditions the older oysters grew long and thin, and their shells were usually thinner than those on the other reefs. Dollar Reef produced broad, single oysters with thick, well-cupped shells. Many of the Dollar Reef oysters developed scalloped bills during the winter 1958-59. Such oysters would be excellent for the half-shell trade but, unfortunately, the reef has been considered polluted for a number of years and harvesting is not permissible. Todd's Dump oysters tended to grow in clusters but commercial harvesting prevented the development of large clusters. Most of the oysters were well shaped with thick shells and were very suitable for the market.

Associated reef organisms are listed in Table 4. Since collection methods were limited to dredge and tongs, all organisms commonly associated with a reef habitat were not included. A notable example was the blue crab. Although none were taken in the samples, an abundance of crabs was known to exist in each area.

The most abundant organisms were barnacles, bryozoans and mussels. The barnacle Balanus improvisus was present in large numbers at all stations, but the larger Balanus eburneus was found only occasionally. Mussels, Brachidontes recurvus, were common at all stations; but those on Dollar Reef were generally smaller and fewer in number. The largest clusters were found at Vingtune Reef. Encrusting bryozoans were common at all stations. There were at least two species present but identifications were not made.

The conch Thais haemastoma was found only at Dollar Reef where it was present at all times except during the winter months. The conch population appeared to have increased in 1959 over that observed in 1958, and the individuals were larger.

The stone crab Menippe mercenaria occurred only at Dollar Reef. Small crabs were abundant in late winter and early spring but had disappeared by summer. This was true both in 1958 and in 1959. Petrolisthes armatus was also common in fall and early winter but absent in spring and rare in summer. The activity of both organisms may have been influenced by salinity. Both are high salinity forms and would be expected to move out of an area when the salinity was reduced.

Eurypanopeus depressus was the most abundant mud crab at all stations. Panopeus herbstii was less common, especially at Vingtune Reef. At this station Rhithropanopeus harrisi was more commonly found. It is possible that R. harrisi also occurred at other stations and, due to its small size, was overlooked.

TABLE 4

Associated Reef Organisms

Organism	Station		
	Sta. 1	Sta. 2	Sta. 3
Porifera			
Cliona sp.	R	C	-
Coelenterata			
Hydroids (Unidentified)	C	C	C
Platyhelmia			
Polyclad worm (Unidentified)	C	C	C
Annulata			
Polychaeta			
Nereids (Unidentified)	C	C	C
Polydora	C	C	C
Serpulids	R	C	-
Arthropoda			
Cirripedia			
Balanus improvisus	C	C	C
Balanus eburneus	R	R	R
Malacostraca			
Isopods (Unidentified)	R	-	-
Amphipods (Unidentifed)	C	C	C
Decapods			
Macrura			
Palaemonetes sp.	C	C	-
Anomura			
Petrolisthes armatus	-	C	-
Clibinarius sp.	C	C	-
Brachyura			
Menippe mercenaria	-	C	-
Eurypanopeus depressus	C	C	C
Panopeus depressus	C	C	C
Rhithropanopeus harrisi	-	-	C
Mollusca			
Pelecypoda			
Mulinia lateralis	-	-	R
Rangia sp.	-	-	R
Congeria leucophaeta	-	-	R
Brachidontes recurvus	C	C	C
Martesia sp.	R	C	-
Gastropoda			
Crepidula plana	-	R	-
Odostomia sp.	C	C	-
Thais haemastoma	-	C	-
Nudibranchia			
Dorid (Unidentified)	C	C	C
Bryozoa			
Chilostomata (Unidentified)	C	C	C

R - Rare, few individuals in samples;
C - Common, many individuals in samples;
(-)- Not found in samples

Boring organisms were present only at Todd's Dump and Dollar Reef. The boring sponge Cliona was common Dollar Reef living in the old, dead shells. It was rare at Todd's Dump and was never found on exposed surfaces. Usually, it was not observed until oyster clusters had been broken apart since the most common habitat was between the shells of adhering oysters. The boring clam Martesia was common at Dollar Reef, but living individuals were rare at Todd's Dump.

Annelids were plentiful on all reefs living in the cracks and crevises. The mudworm Polydora was observed at all stations but was not abundant. Other organisms, although prominent in the reef habitat, had little effect on the activity of the oyster.

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