

Acc #

Job Report

R.P. Hofstetter,  
Marine Biologist

Project No. MO-1-D-2 Date 1 August 1960

Project Name: Oyster Reef Development and Protection.

Period Covered: 1 January 1959 - 30 June 1960 Job No. B-2

Survey of Experimental Oyster Plots

Objectives: (1) To determine the value of mudshell as material for oyster reef construction; (2) To study growth and survival of oysters on mudshell pads.

Procedures: Three artificial reefs were constructed in Galveston Bay by placing mudshell pads on firm mud bottom. No oysters were planted; natural spatfall provided the only source of seed oysters.

Samples were collected at intervals to study growth and density of the oyster populations. Observations and collections of associated reef organisms were made. Physical factors, such as silting, sinking, and shifting of the shell mats were noted.

Findings: Reef construction was started in September 1958. Three mudshell mats of varying thickness were planted at selected locations by means of a drag-line. The total quantity of shell planted during this period was 7120 cubic yards: 1,870 cubic yards on Reef #1; 5,000 cubic yards on Reef #2; and 250 cubic yards on Reef #3. The mudshell was purchased from local shell companies through the State Board of Control for twenty cents a cubic yard, delivered and placed on location. The total cost was \$1,424.00

Initial plantings were not sufficient to construct the reefs to proposed dimensions. Therefore, additional plantings were made during February and March 1959. The second planting totaled 16,000 cubic yards: 7,000 cubic yards on Reef #1 and 9,000 cubic yards on Reef #2. No additional shell was planted on Reef #3. The mudshell was again purchased through the State Board of Control from local shell companies but the price had risen to one dollar and thirty cents a cubic yard. The total cost during this period was \$20,800.00.

Reef #1 (Figure I-A) was constructed on a semi-firm mud bottom in four to five feet of water. Initial plantings in 1958 were placed along the north and south edges of the proposed area, leaving a gap in the center. Plantings in 1959 were continued along the south edge without attempting to connect the two original deposits. Therefore, the reef consists of one small section to the north and a larger section to the south. The total area is approximately five acres. The shell pad has an average thickness of one foot, but a definite crest extends along both sections of the reef. The total quantity of shell planted was 8,870 cubic yards, and the total cost was \$9,474.00.

Reef #2 (Figure I-B) was constructed on a mud bottom in six to seven feet of water. Initial plantings in 1958 were made along the southwest section of the proposed area; plantings in 1959 were continued to the northeast. The total area covers approximately ten acres with a narrow strip separating the two plantings. The shell pad has an average thickness of eighteen inches without any

appreciable crest. The total quantity of shell planted was 14,000 cubic yards at a cost of \$12,700.00.

Reef #3 (Figure I-C) was constructed on a sandy mud bottom in four to five feet of water. The shell was spread unevenly resulting in a series of ridges and pockets covering an area of approximately one-quarter acre. The total quantity of shell planted was 250 cubic yards. The total cost was \$50.

Check samples were collected in November and December, 1958 but standard population sampling was not started until January 1959. A standard bushel of 2700 cubic inches was tonged from each reef, and all live oysters over five millimeters in length were measured. Measurements were taken from the tip of the beak to the tip of the bill along the right valve. Spat under five millimeters in length were noted but no attempt was made to determine numbers present.

Length-frequency histograms of the oyster populations on the three reefs are shown in Figure II. It should be noted that these graphs represent populations on the 1958 plantings only. Information on the 1959 plantings is not adequate for presentation in this report.

The peak set in 1958 occurred during August, a few weeks prior to the shell plantings. All three reefs, however, received a moderate set of spat. Maximum growth during the first twelve months was 55-60 millimeters and the average growth was 35-40 millimeters.

Spatfall in 1959 was observed from June through September with a peak setting period in August. Reefs #1 and #2 received a moderate set in June and possibly in August-September. Reef #3 appeared to have received an abundant set in August-September.

Spatfall in 1960 began in April or May but a peak set had not occurred at the end of the project year. The 1960 spat began to appear on the reefs in small numbers during June.

There was no definite break in the length-frequency histograms to distinguish the 1958 set from the 1959 set. However, by the end of the project year the average length of the 1958 set was estimated at 40-55 millimeters and the average length of the 1959 set was estimated at 30-45 millimeters. Maximum length was 100 millimeters on Reef #2, 75 millimeters on Reef #1, and 65 millimeters on Reef #3.

Population density varied from reef to reef and from month to month. Much of the variation can be attributed to sampling techniques. The shell pads consisted of rather loose layers of shell with only the top crust supporting oysters. Tonging sampled not only this living crust but the underlying shell as well. Thus, a bushel sample did not necessarily represent the surface layer alone.

Reef #1 and Reef #2 contained populations of similar density. Variations in density were greater from month to month than from reef to reef. Reef #3 supported a population with a density consistently lower than that on Reef #1 or #2. This low density was caused in part by silt which settled in the pockets and along the edges. Siltation was not excessive and did not damage the reef base, but it was sufficient to decrease the effectiveness of the shell as cultch material.

Oyster populations on the experimental pads were smaller than those on some natural reefs. This was due primarily to the high percentage of fine shell in the 1958 plantings. The shell fragments attracted small numbers of spat and the

survival rate was low. Even the larger shells appeared less attractive than clean oyster shell. This offered a distinct advantage rather than a disadvantage since excessive overcrowding and clustering were seldom observed.

Comparisons between the 1958 plantings and the 1959 plantings were not made. Check samples were collected from time to time on the 1959 plantings, but no regular population samples were taken. These plantings received a moderate spat set in 1959, and good growth was noted. Even though the shell was planted well in advance of the setting period, it remained effective as cultch for the oyster spat.

The shell at first had a "salt-and-pepper" appearance because of the dark mud balls mixed in with the white shell. After a short time the shell pads lost this distinctive pattern and assumed the brownish coloration of a natural reef as numbers of micro-organisms populated the shells. Larger reef organisms quickly made their homes among the shells. Sessile organisms such as barnacles, mussels, and bryozoans were among the first to make their appearance. Mud crabs and annelids became common inhabitants. A summary of collected organisms is presented in Table 1. It can be considered as a partial, not complete, record of organisms associated with oysters on the experimental pads.

Aside from light siltation on Reef #3, the experimental plantings were stable at the end of the project year. That is, there was no evidence that the shells were sinking into the bottom or scattering out over the surface. Continued growth of the oysters should further increase the stability of each reef.

Comments: The experimental reefs have been found to be productive and stable, and have shown few characteristics which are not also characteristics of natural reefs. Such plantings could be useful in expanding the oyster resources in Texas waters. However, total cost for the three reefs was \$22,224.00 or approximately \$1,480.00 per acre. This cost is too high to permit a wide-scale program of shell plantings. Other avenues should be explored to discover better means of utilizing shell in furthering oyster production. One such avenue is the encouragement of the mudshell industry to undertake industry sponsored plantings. Another avenue might be the encouragement of the oyster industry to replant oyster shell which is presently a wasted by-product of the shucking plants.

Prepared by R.P. Hofstetter,

Marine Biologist

Accepted by

Howard T. Lee  
Howard T. Lee

Date

21 February 1961

Table 1

Invertebrates Collected on the Experimental Reefs  
January 1959 - June 1960

Organisms	Reef		
	1	2	3
Coelenterata			
Hydroids (Unidentified)	C	C	C
Platyhelminia			
Polyclad (Unidentified)	R	R	R
Annulata			
Nereids (Unidentified)	A	A	A
Arthropoda			
Barnacles			
<u>Balanus improvisus</u>	A	A	A
<u>Balanus eburneus</u>	R	-	-
Amphipods (Unidentified)	C	C	C
Decapods			
Macrurans			
<u>Palaemonetes</u> sp.	R	R	R
Brachyurans			
<u>Panopeus herbstii</u>	C	C	R
<u>Eurypanopeus depressus</u>	A	A	A
<u>Rhithropanopeus harrisi</u>	R	R	C
Mollusca			
Pelecypods			
<u>Brachidontes recurvus</u>	A	C	A
<u>Congeria leucophaeta</u>	R	-	C
<u>Mulinia lateralis</u>	R	R	-
<u>Rangia cuneata</u>	R	-	R
<u>Diplothyra (Martesia) smithii</u>	-	R	-
Gastropods			
<u>Odostomia</u> sp.	C	C	C
<u>Polinices duplicata</u>	R	-	-
<u>Crepidula plana</u>	R	R	-
Nudibranch			
Dorid (Unidentified)	C	C	C
Bryozoa			
Chilostomata (Unidentified)	A	A	C

A - Abundant, present in all samples.  
 C - Common, present in small numbers in most samples.  
 R - Rare, occasional in some samples

Figure I-A: Location of Experimental Reef #1, Galveston Bay

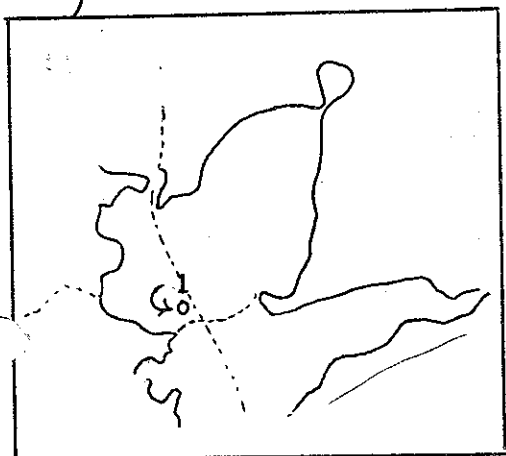
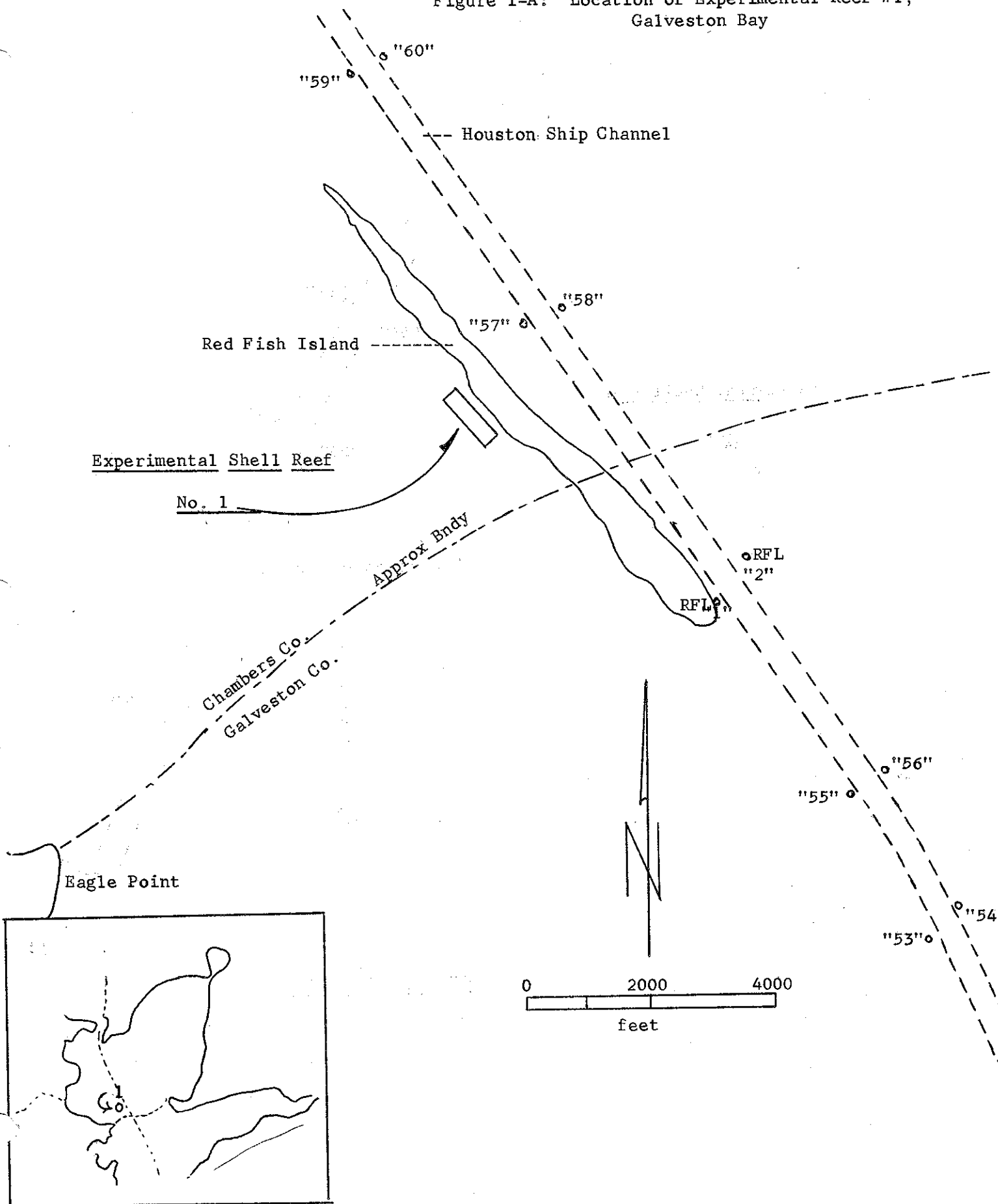


Figure I-B  
Location of Experimental Reef #2  
Galveston Bay

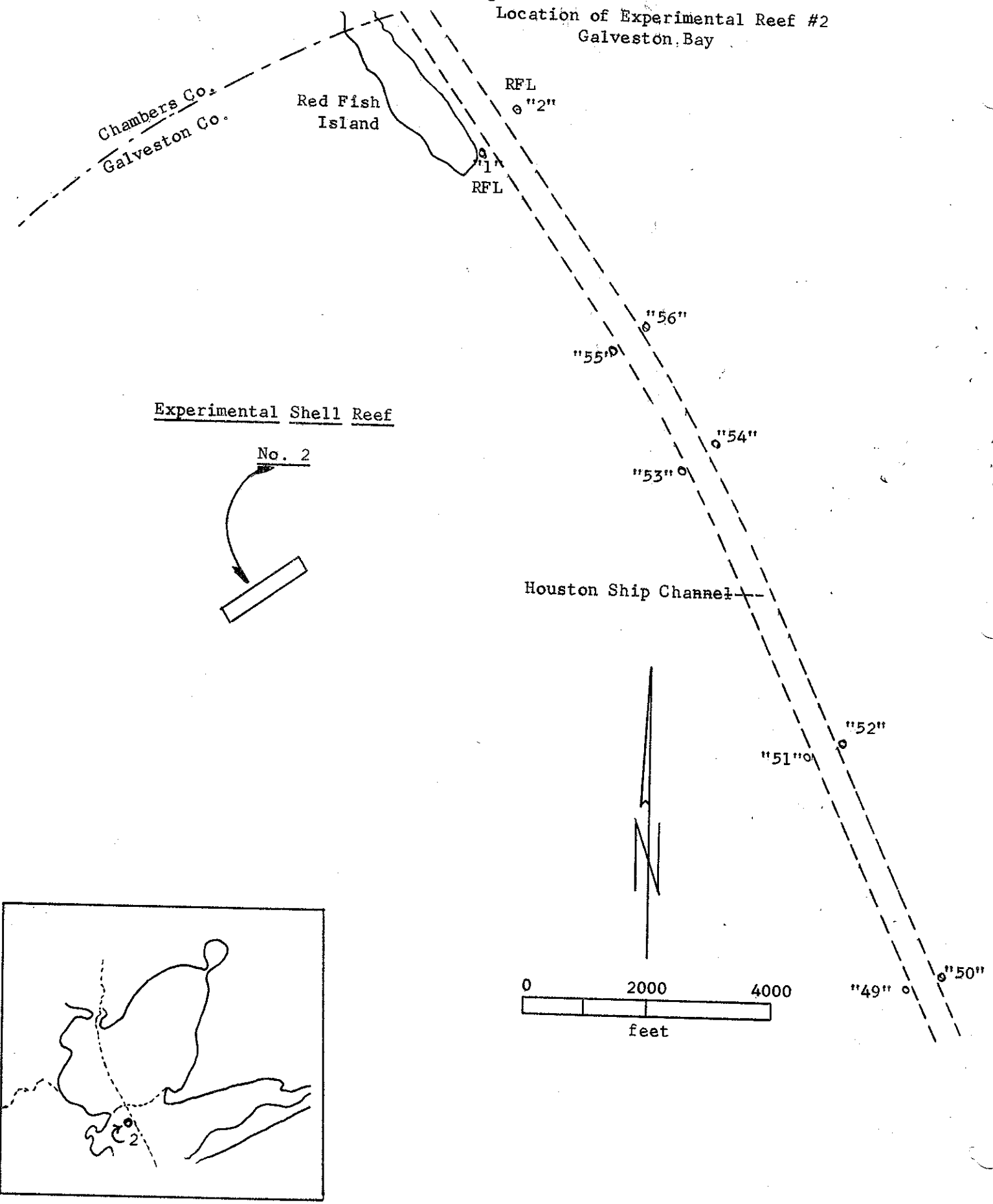


Figure I-C

Location of Experimental Reef #3, Galveston Bay

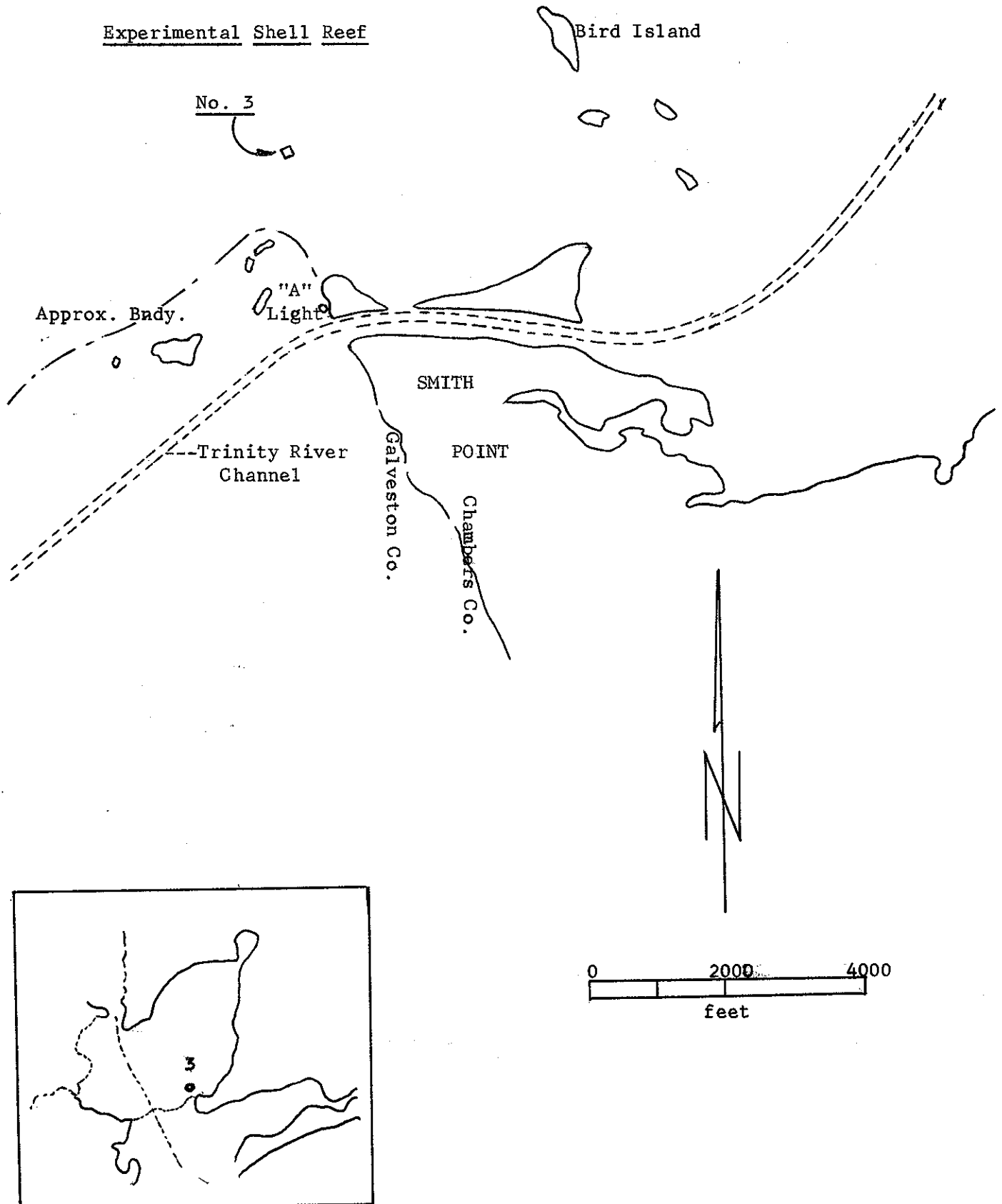


Figure II

Length frequency of Oysters On Reefs #1-3 1959

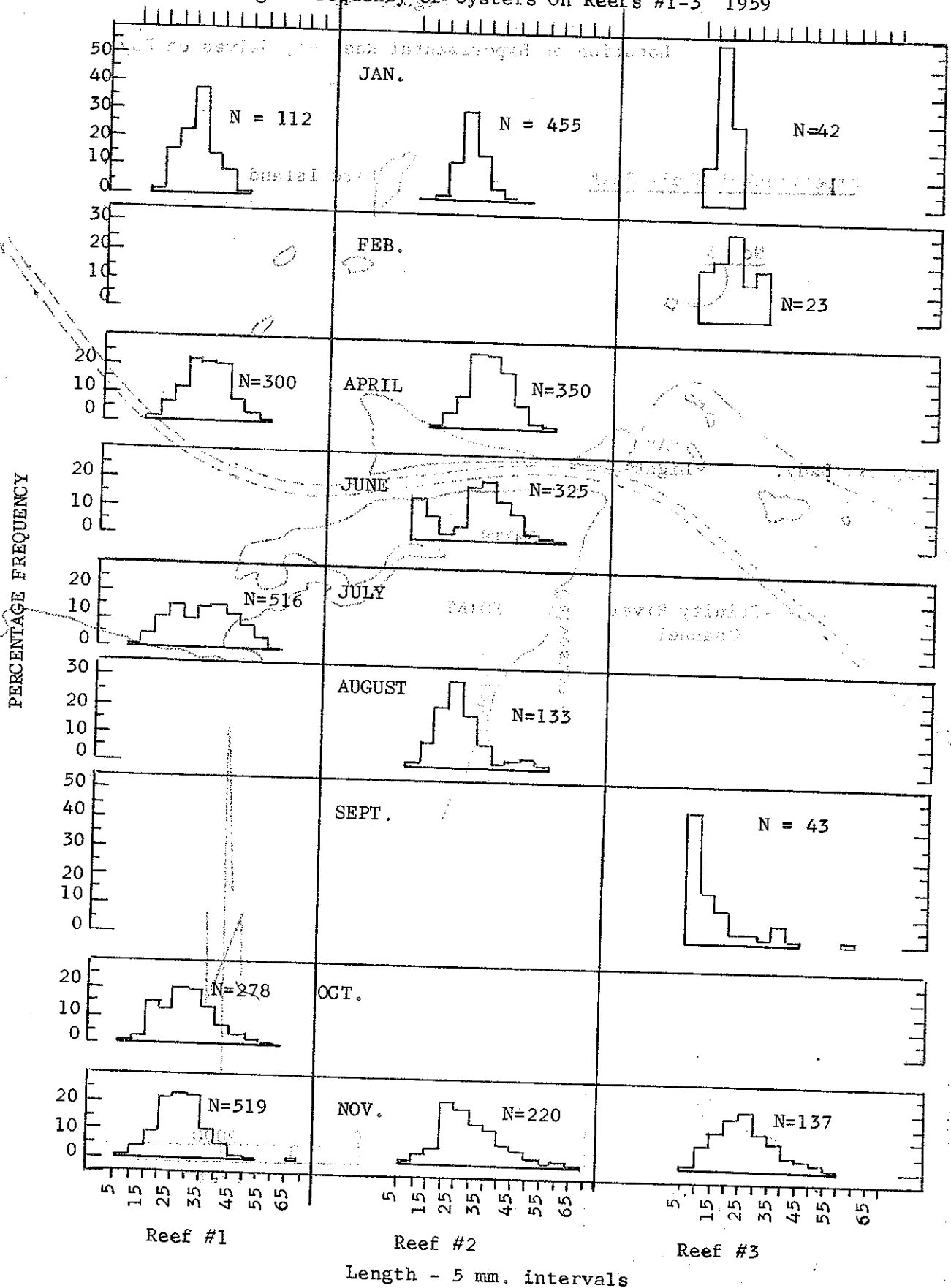
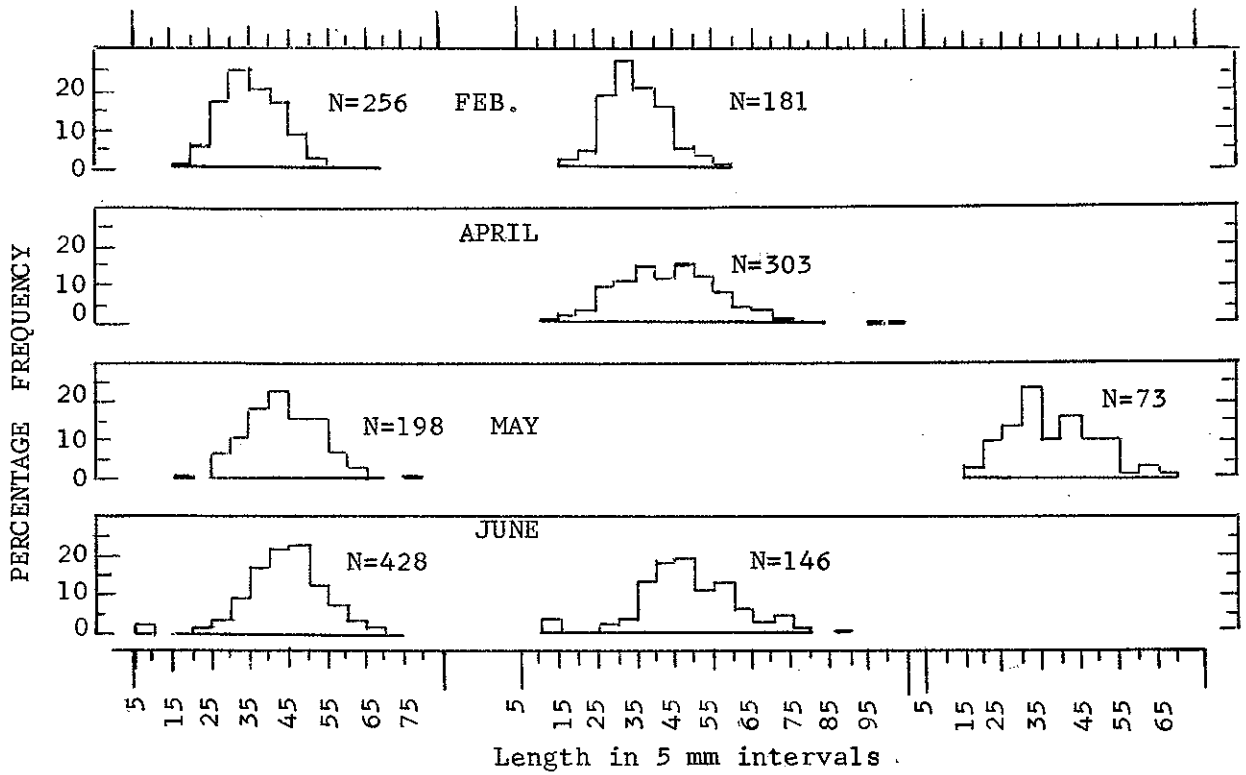




Figure II

Length-Frequency of Oysters on Experimental Reefs #1-3  
During 1959-60



N = Number of oysters per bushel sample.

