

JOB REPORT

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Project Name: Studies of the Texas Shrimp Populations

Period Covered: January 1, 1962 through December 31, 1962

Job No.: 3

A Study of the Juvenile Shrimp Populations, Penaeus aztecus and Penaeus setiferus, of Galveston Bay

Abstract: One hundred and twenty three samples were collected producing 3,085 white shrimp and 3,703 brown shrimp. Juvenile brown shrimp entered the bay in three waves in April, July and August. Young whites entered in three waves in July, August and September. The brown shrimp was the more abundant species. Samples produced about one-third as many brown and white shrimp as those of 1961 and about one-tenth as many as those of 1960.

Temperatures followed the normal seasonal trend, except for the freeze in January and a six degree centigrade decline in March.

The reduced amount of rainfall and river flow this year resulted in the higher bay salinities than in 1960-61.

Objective: To sample the juvenile shrimp populations of Galveston Bay with various collecting devices in an effort to determine the seasonal abundance, size, and movement of these shrimp as related to the environmental conditions. Data collected were compared to 1960 and 1961 data.

Procedures: The original shrimp stations sampled in 1960 and 1961 were checked semi-monthly, near the first and fifteenth of each month. (See figure 1). Tertiary stations, two to three feet in depth, were checked with a 6-foot pull seine of one-fourth inch mesh. Secondary stations, four to six feet, and primary stations, deeper than six feet, were checked with a 10-foot trawl of 1 1/4 inch mesh with a one-fourth inch mesh liner. The seine was pulled from the back of a skiff and the trawl was pulled by an inboard boat. All samples were quantitative as the nets were pulled fifteen minutes at a regulated speed, thus they covered approximately the same area each time samples were collected. Occasionally day and night samples of 15 minute duration were made with a 20 foot trawl of 1 1/2 inch mesh in the areas of the bay worked by the commercial shrimp fleet. Night samples were collected in the same general vicinity within twelve hours of the day samples.

All shrimp or a representative aliquot from each sample were measured in millimeters from the tip of the rostrum to the tip of the telson. If all shrimp were not measured, the remainder were counted or the total number was calculated. All measurements were recorded on a standard length-frequency form and station sheet along with pertinent hydrographic and climatological data. Trawl and seine samples were combined and the total numbers of each type shrimp graphed by five millimeter intervals. The quantity of shrimp per catch was graphed in percentages for more detailed analysis.

Findings:

Penaeus aztecus (Ives)

Brown shrimp first appeared in the samples in April when the first of three waves of post larval shrimp entered the bay. (See figure 2). This first group of young shrimp entered the tertiary areas at a mean size of 28 millimeters. This group constituted the major crop of brown shrimp in Galveston Bay in 1962. These shrimp, growing at the rate of 0.9 mm per day, began to move into the secondary areas at a mean size of 40 mm. After reaching 70 mm they moved into the primary bay. Here they remained until July when, after reaching 95 mm, they moved gulfward. Two minor groups entered the nursery areas in July and August. Some shrimp remained in all three bay areas until December, when sampling was secured.

Abundance graphs, figures 3 through 5, show these periods of influx of juvenile shrimp. As in the past two years, May was the month that juvenile shrimp were most abundant at the tertiary stations. (Figure 3). Two minor peaks of abundance occurred in September and November. Although the samples show a 30 per cent increase over the 1961 post larval population, there was a 50 per cent decrease from the 1960 population.

Shrimp were most abundant in July in the secondary bay samples which was a month later than in 1961 and two months later than 1960. (Figure 4). There were two minor peaks of shrimp in the secondary bays in October and December. Secondary bay samples indicated a 60 per cent decrease in the shrimp population from 1961 and a 90 per cent decrease from 1960.

As in 1960, the primary bay peak of abundance of brown shrimp was May, however in 1961 the peak was in June. A second smaller peak of shrimp appeared in October. Primary bay samples showed an 88 per cent decrease in the population from 1961 and a 92 per cent decrease from 1960.

Although the brown shrimp appeared to be the most abundant commercial species in the bay this year, the magnitude of the catch per unit of effort for all sample stations was about one-third of the 1961 catch and one-tenth of the 1960 catch.

Twenty foot trawl samples, collected from June through November, indicated the commercial bait shrimpers were harvesting 70 to 90 millimeter shrimp. Table 1 shows the results of these samples. Night samples, showed no significant difference in catch, from day samples, except in October, when they produced a larger catch than the day samples. The average size of shrimp caught at night was 85 mm.

Penaeus setiferus (Linnaeus)

White shrimp were found in the bay all seasons of the year, but were more abundant in late summer and fall. (See figure 6). Whites caught during the winter and early spring were thought to be stragglers from last years crop and were probably part of the summer spawning stock. The first group of post larval shrimp appeared in the tertiary bay samples in July at a mean size of 33 millimeters. These shrimp grew at the rate of 1.6 millimeters per day and began to move into the secondary bays in late July at a mean size of 48 millimeters. There they remained until they reached 70 millimeters in August and then moved into the primary bay. By the time they reached 115 millimeters, they were moving gulfward. Two additional waves of post larval shrimp entered the nursery bays in August and September. Shrimp remained in the bay into December.

Abundance graphs, figures 7 through 9, show these periods of influx of juveniles. August through November were months of greatest abundance of young white shrimp in the tertiary bays. (Figure 7). This years peak months of abundance coincided with the 1961 peak but was two months later than the peak in 1960. Due to the continuous recruitment of post larval shrimp during the fall of 1962, the abundance graph for the tertiary stations shows an almost constant peak from September through November. Samples showed a 30 per cent decrease in the post larval white shrimp samples from 1961 and a 50 per cent decrease from 1960.

Secondary samples showed three peaks of shrimp, with the October and December waves being the most abundant. (Figure 8). The catch was 40 per cent below the 1961 catch and 95 per cent below the 1960 catch.

White shrimp entered the primary bay in August and some were still there in December. (Figure 9). The primary bay samples were 96 per cent below the 1961 samples and 99 per cent below the 1960 samples.

The magnitude of the white shrimp catch per unit of effort for all sample stations was about one-third of the 1961 catch and one-tenth of the 1960 catch. This drop in abundance of the white shrimp can partially be explained by the reduced amounts of rainfall and river flow entering the bay, and the subsequent rise in salinities.

Twenty foot trawl samples, Table 2, indicated two major groups of white shrimp were harvested by commercial shrimpers during open season. The first group, at the opening of the season, produced many under count white shrimp in the catches. The shrimp began to reach legal count size, 115 millimeters, by September. These larger shrimp remained in the bay through October. The cooler weather in November began to move the shrimp out of the nursery areas and toward the Gulf, causing many under count shrimp to again appear in the commercial catches. Night samples indicated few white shrimp moved at night. The average size of shrimp caught at night was 115 millimeters.

Hydrographic and Climatological Conditions (Figure 10)

Temperatures followed the normal seasonal trend, except for the severe freeze in January and a 6 degree temperature drop in March. There was no evidence that the freeze hurt the bay shrimp population, as the majority of the shrimp by that time had moved offshore into the Gulf. Small brown shrimp first appeared in the tertiary bays in April when the water temperature averaged 15 degrees centigrade and small whites appeared in July when the water temperature averaged 31.5 degrees centigrade. Both brown and white shrimp began their gulfward migration when the water temperature dropped below 20 degrees centigrade in November.

Bay salinities were higher than normal this year due to the lack of rainfall and reduced amount of fresh water flowing into the bay. The higher salinities were particularly critical in the spring and summer when shrimp entered the nursery areas. When young brown shrimp entered the nursery grounds, the salinities there averaged 12 parts per thousand, and when the young white shrimp entered, the salinities averaged 9.5 parts per thousand. The higher salinities were no doubt more suitable to the brown shrimp. It seemed possible that young white shrimp might have moved further up creeks and bayous in an attempt to find more suitable salinities. However, a collecting trip in July up Middle Bayou, adjoining Mud Lake, disclosed no large concentrations of shrimp; though seine samples were collected every one-fourth mile up the bayou until the limits of salt water intrusion was reached.

Commercial Landings

Bait shrimping this year was not confined to any particular part of the bay, although the pressure in secondary bay areas, such as Clear Lake, was tremendous. This was thought to be due to the number of small shrimp boats and skiffs that were capable of working in these shallow, protected bays when the young bait size shrimp congregate before moving into the primary bay. The biological samples reflect this tremendous fishing pressure in the great decrease in number of shrimp per sample taken in the primary bay. There was an 8 per cent drop between the tertiary and secondary bays and a 71 per cent drop between the secondary and primary bays. Figure 11, is a graph of the 1962 Galveston Bay bait shrimp landings furnished by the U. S. Fish and Wildlife Service.

During open shrimp season, August 15th to December 15th, more shrimp boats were observed working in the Galveston bay than during the same season in 1960 or 1961. There were reports that many of these boats harvested thousands of pounds of shrimp that were not recorded in the commercial shrimp landings, as upon reaching port the shrimp were immediately loaded on trucks and transported to Louisiana. Figure 12, shows the 1962 preliminary commercial shrimp landings for Galveston Bay, also furnished by U. S. Fish and Wildlife Service. Table 3 compares these landings with the 1961 commercial landings.

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Area M-2

TABLE I
(Brown Shrimp)
Shrimp Summary of 20 Foot Trawl Samples

Date	Number Shrimp Caught	Number Samples	Number of Undercount Shrimp	Percent of Shrimp of Undercount Size	Average Count	Average Size MM
June 15, 1962	220	1	220	100 %	55	98 mm
July 1, 1962	120	1	108	90 %	56	98 mm
July 15, 1962	-	-	-	-	-	-
Aug. 1, 1962	437	1	433	99 %	78.0	88 mm
Aug. 15, 1962 (Day)	48	3	47	96 %	129	78 mm
(Night)	36	1	36	100 %	72	93 mm
Sept. 1, 1962 (Day)	80	2	80	100%	116	68 mm
(Night)	11	2	11	100%	81.0	93 mm
Sept. 15, 1962 (Day)	16	3	16	100 %	116	83 mm
(Night)	4	1	4	100 %	116	83 mm
Oct. 1, 1962 (Day)	13	1	13	100 %	116	63 mm
(Night)	132	1	132	100 %	116	78 mm
Oct. 15, 1962	112	1	112	100 %	67.7	93 mm
Nov. 1, 1962	6	1	6	100 %	116	80 mm

TABLE 11
(White Shrimp)

Area M-2

Date	Number Shrimp Caught	Number Samples	Number of Undercount Shrimp	Percent of Shrimp of Undercount Size	Average Count	Average Size MM
Aug. 1, 1962	159	1	50	31 %	34	133 mm
Aug. 15, 1962	285	3	104	40 %	58	113 mm
(Day)	26	1	0	0	21	143 mm
(Night)						
Sept. 1, 1962	61	2	33	54 %	38	118 mm
(Day)	12	2	9	75 %	96.5	88 mm
(Night)						
Sept. 15, 1962	8	3	0	0	26	153 mm
(Day)	12	1	2	16%		
(Night)						
Oct. 1, 1962	6	1	2	33 %	36.9	118 mm
(Day)	36	1	17	47 %	44.0	113 mm
(Night)						
Oct. 15, 1962	5	1	0	0	17.6	143 mm
(Day)						
(Night)						
Nov. 1, 1962	228	1	155	68 %	53	113 mm
(Day)						
(Night)						
Nov. 15, 1962	150	1	115	77 %	115	98 mm
(Day)						
(Night)						

TABLE III

Commercial Shrimp Landings for Galveston Bay
(Data furnished by U. S. Fish and Wildlife Service)

	<u>1961</u>	<u>1962</u>
Bait Shrimp Production	1,339,707	1,250,850
Brown shrimp landings (Hds. off)	342,600	513,022
White shrimp landings (Hds. off)	2,417,900	2,116,594

Figure 1

Galveston Bay Shrimp Sample Stations

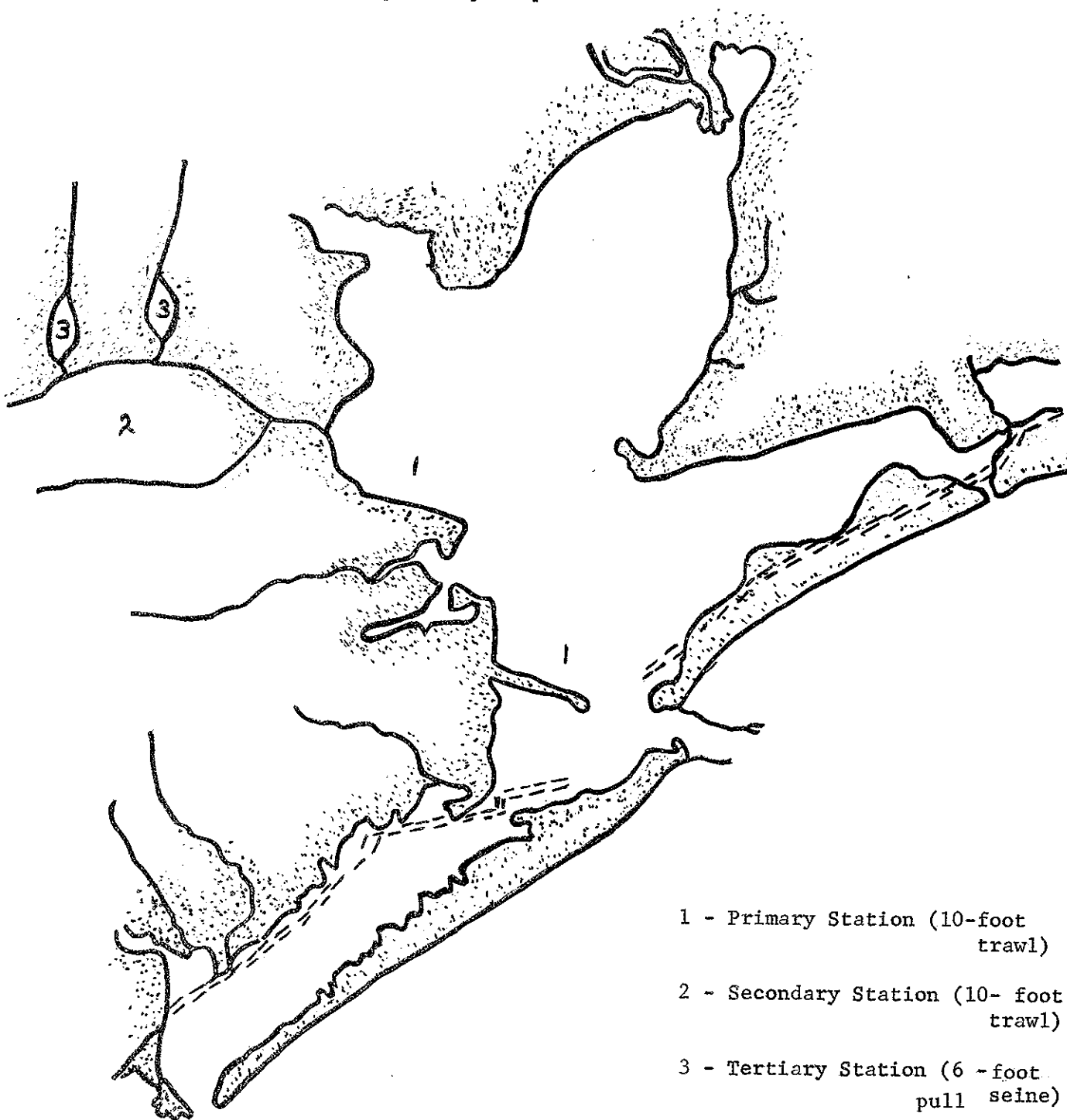


Figure 2

Composition of the Brown Shrimp Populations 1962

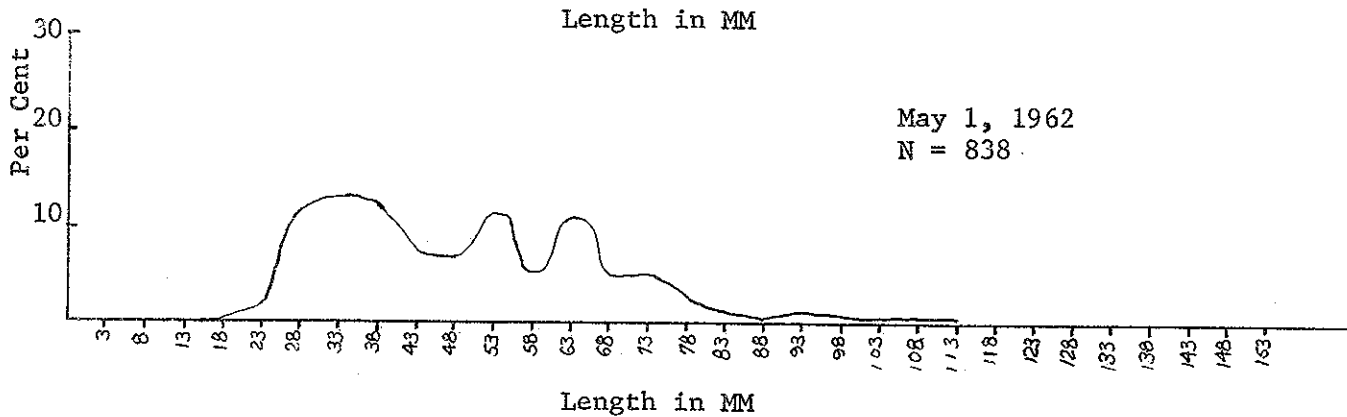
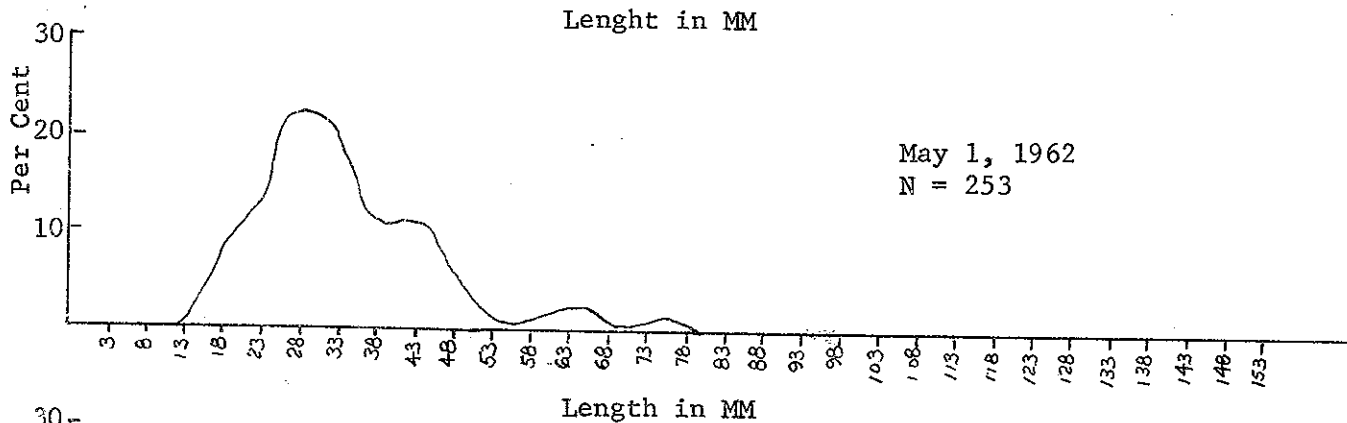
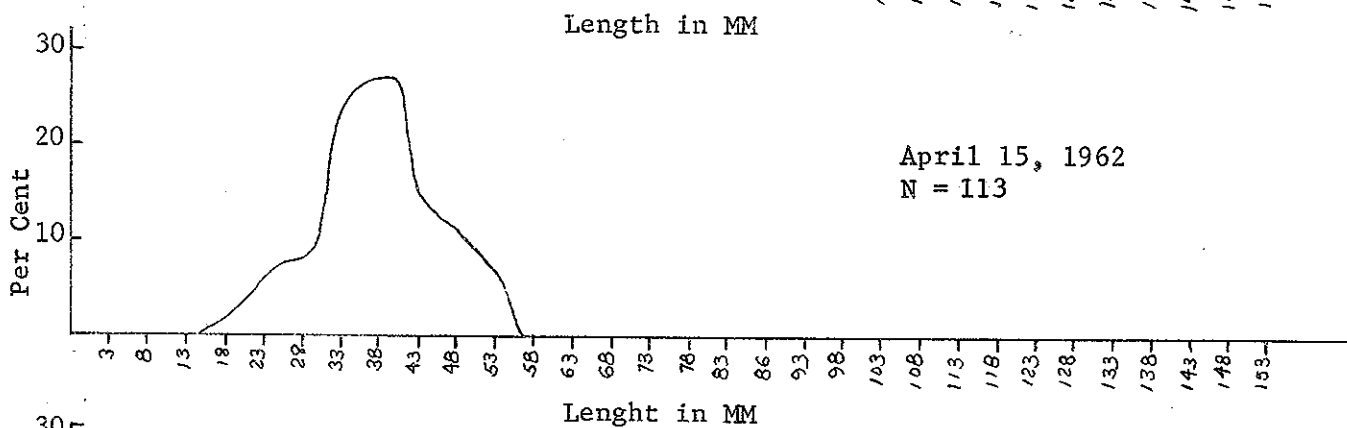
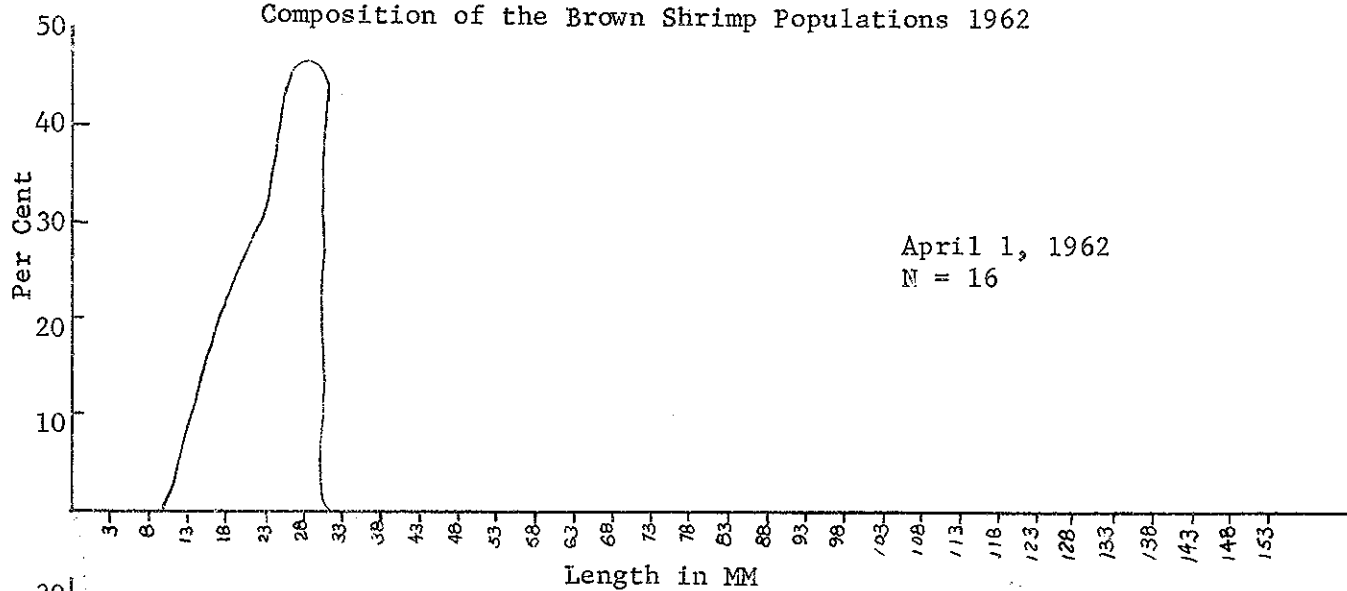


Figure 2 - (Continued)

Composition of the Brown Shrimp Populations 1962

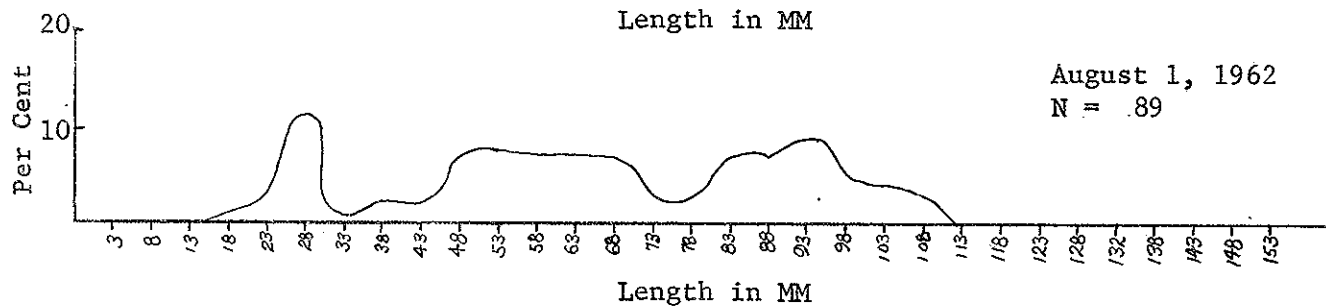
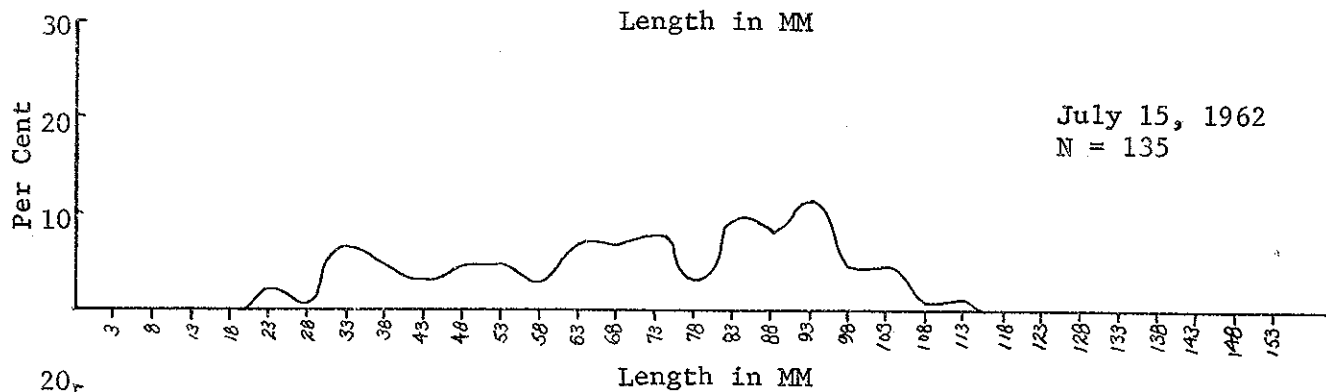
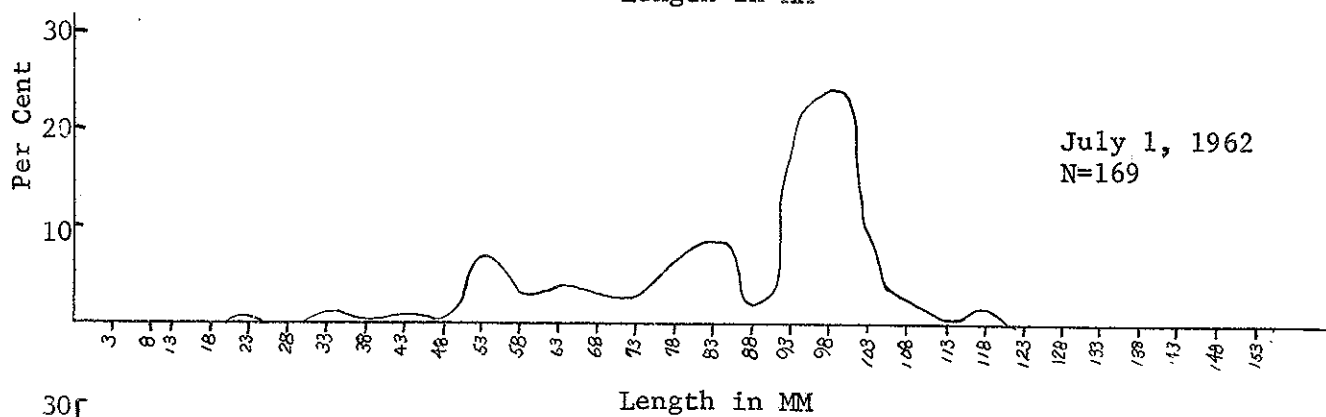
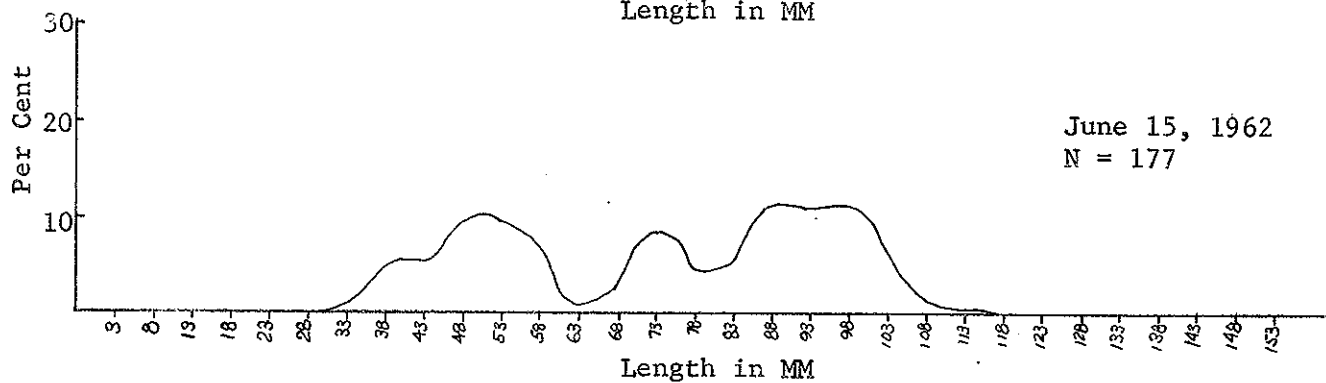
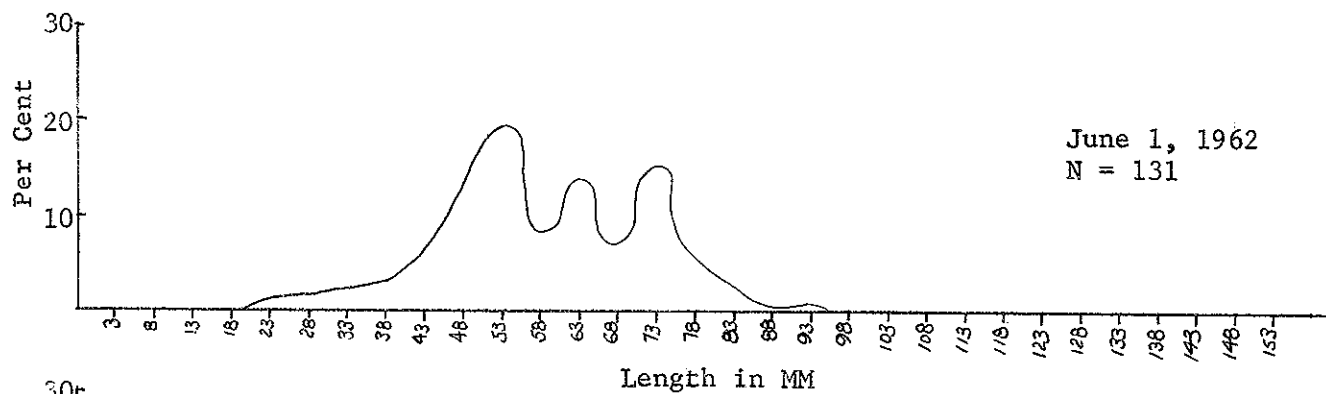


Figure 2 - (Continued)

Composition of the Brown Shrimp Populations 1962

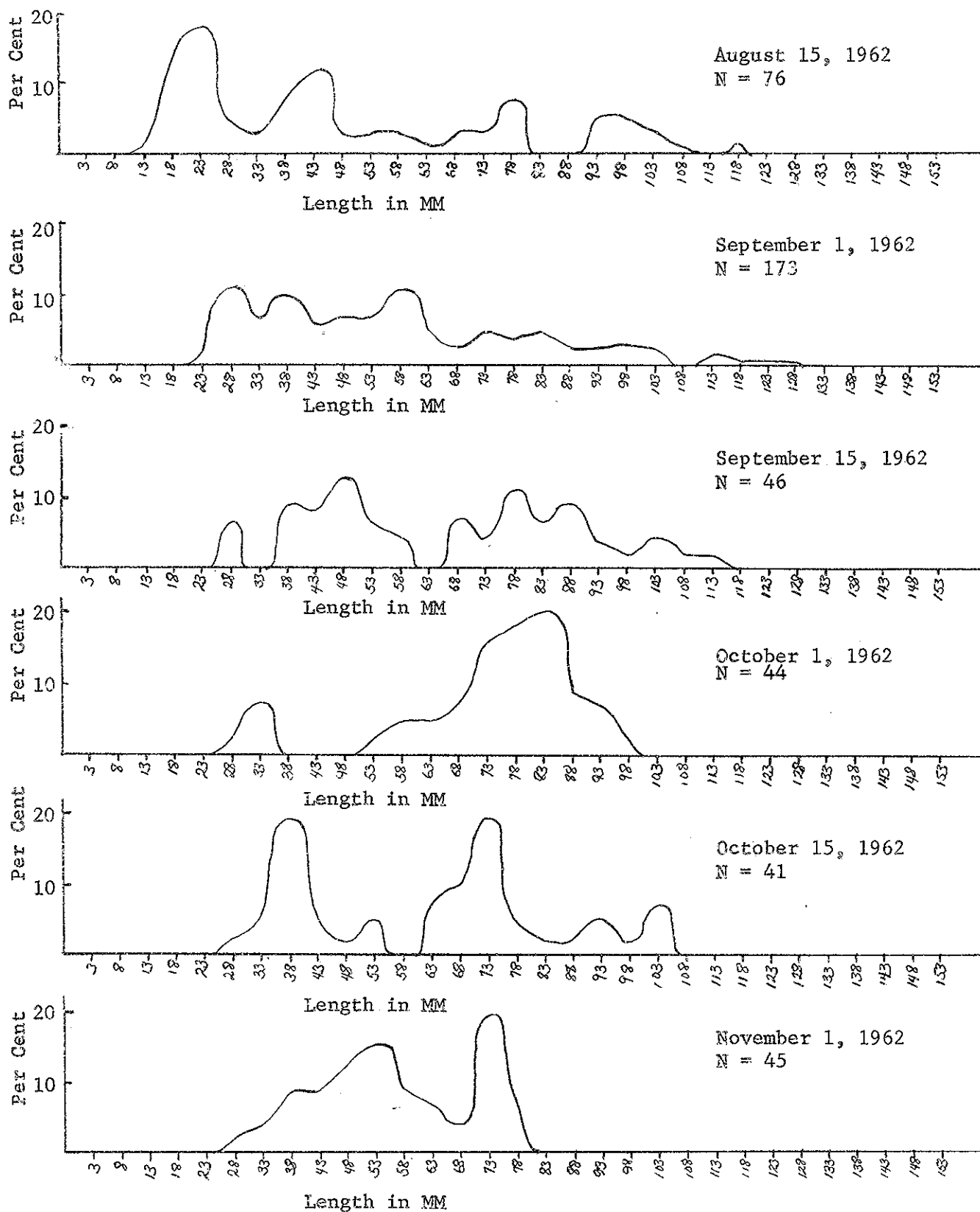


Figure 2 - (Continued)

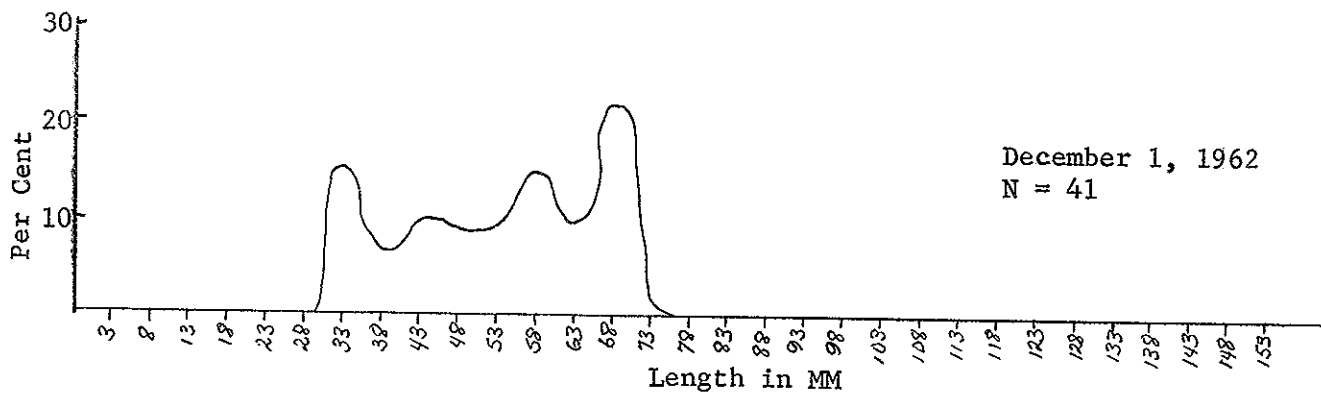
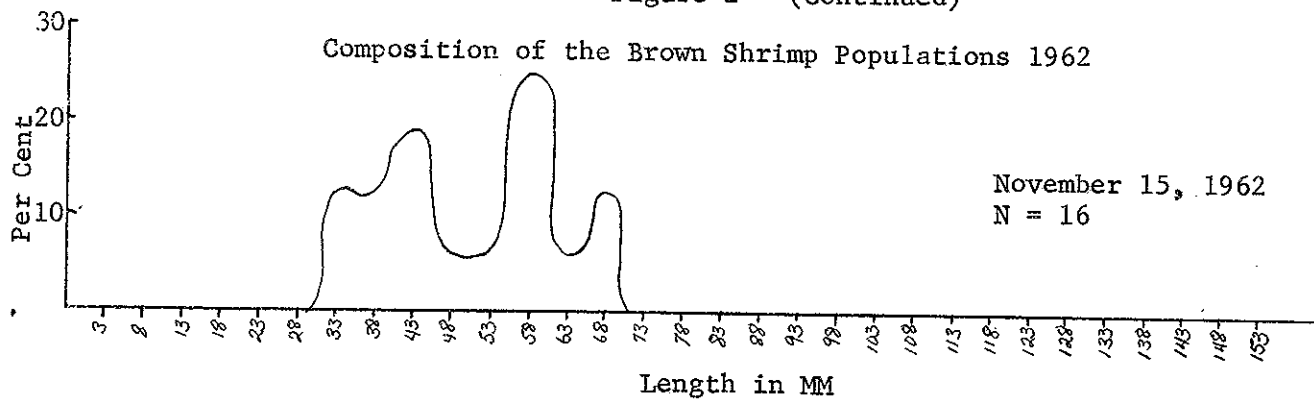


Figure 3

Tertiary Station
Abundance of Brown Shrimp

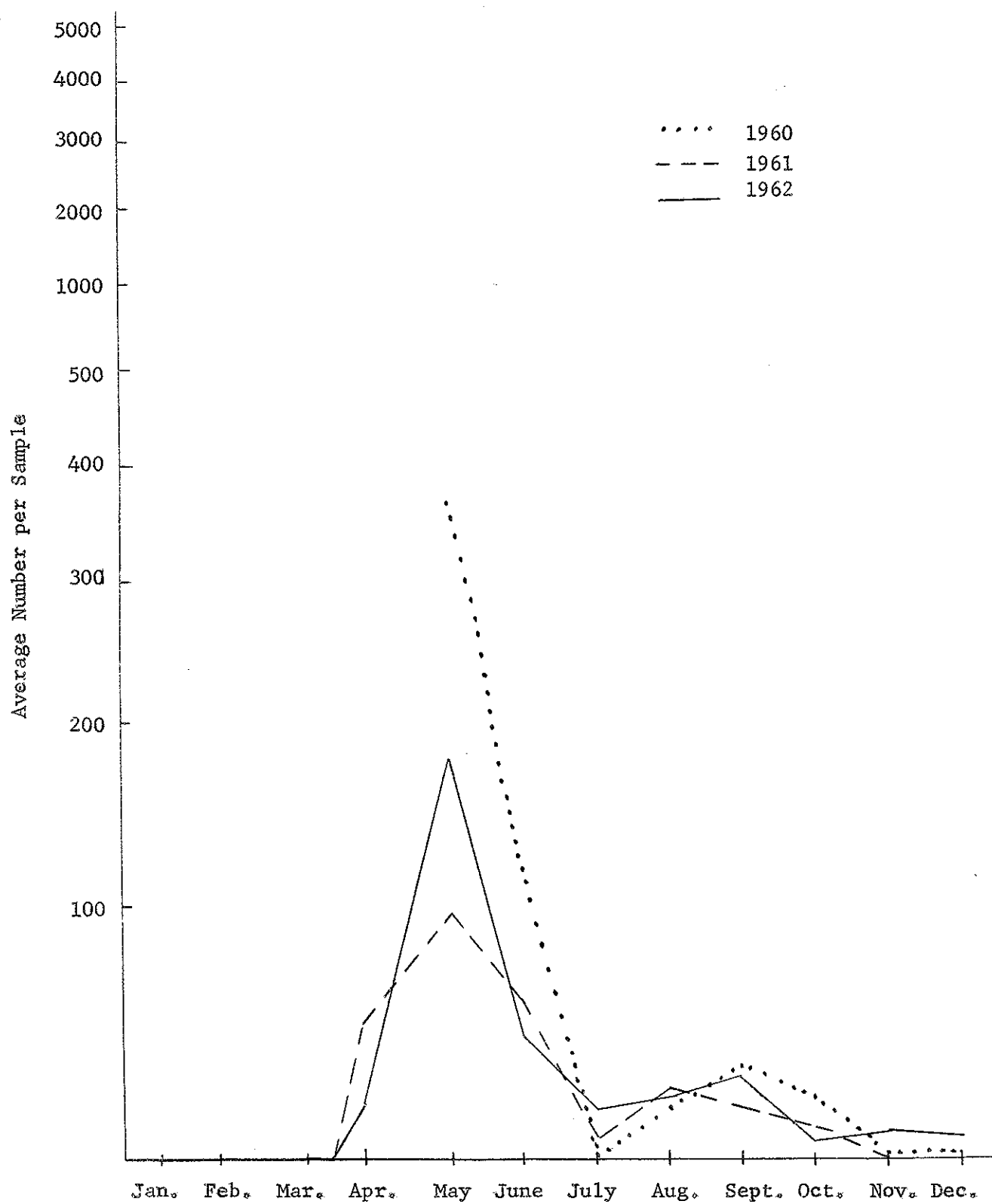


Figure 4.

Secondary Station
Abundance of Brown Shrimp

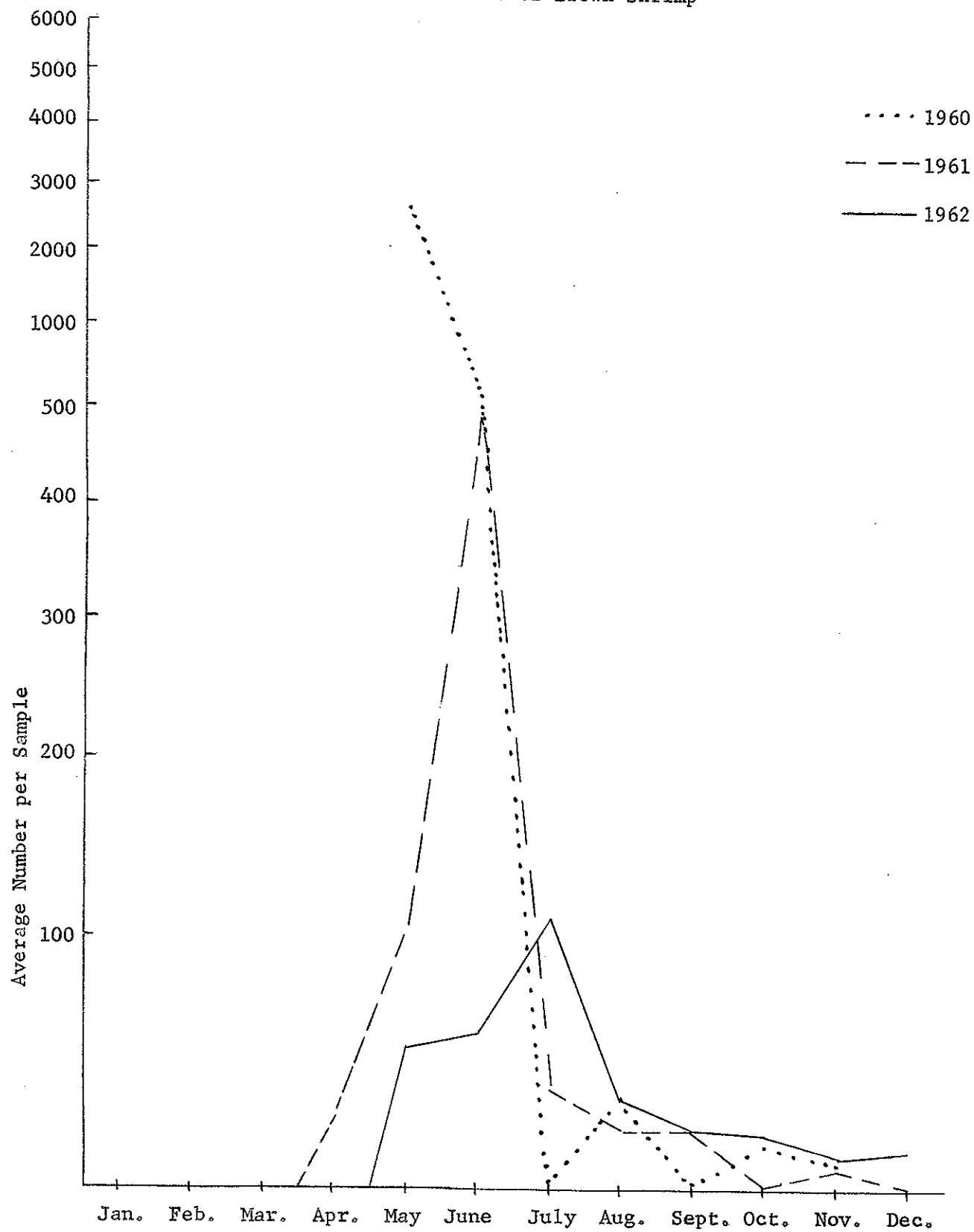


Figure 5

Primary Bay
Abundance of Brown Shrimp

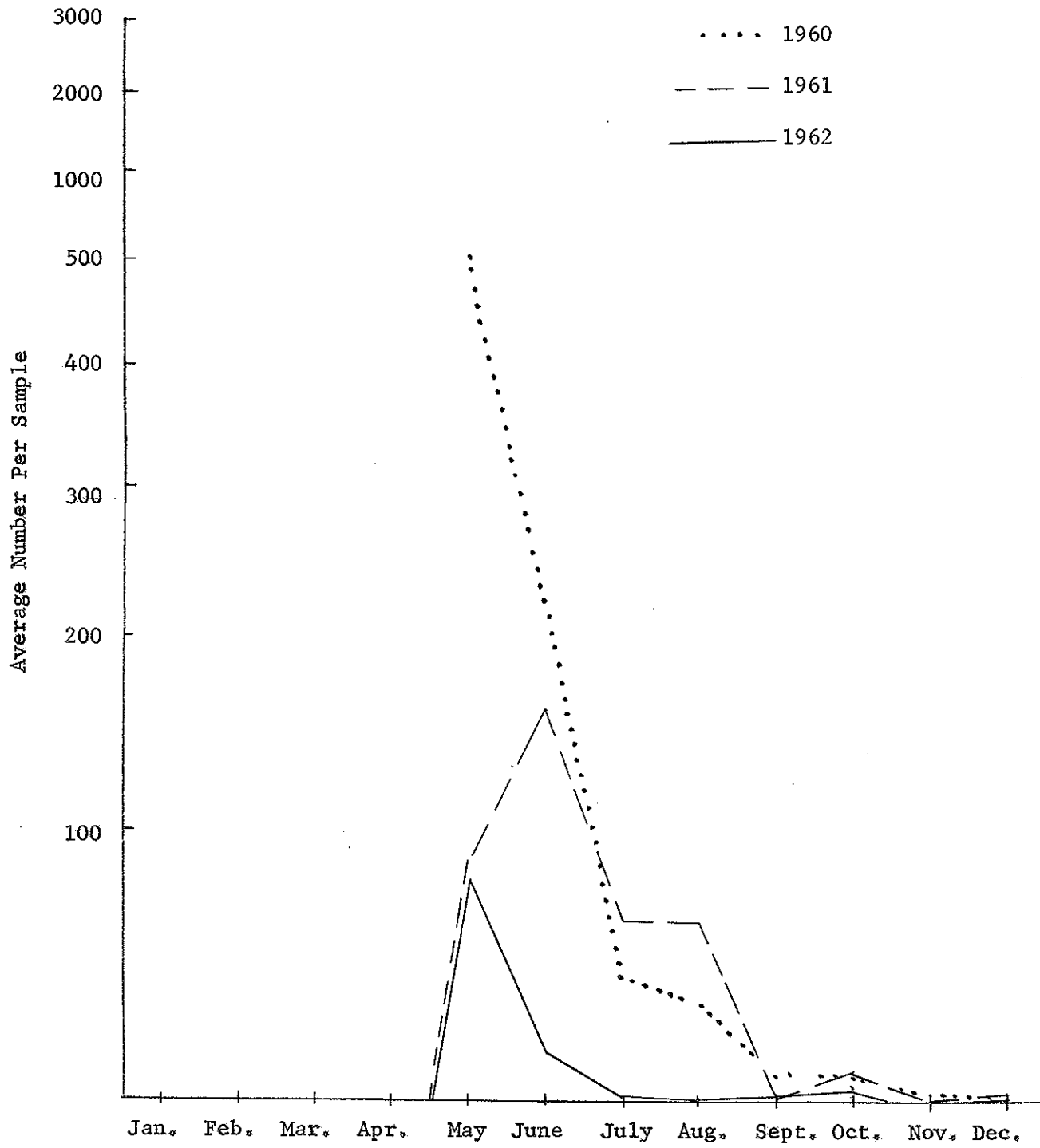


Figure 7
Tertiary Station
Abundance of White Shrimp

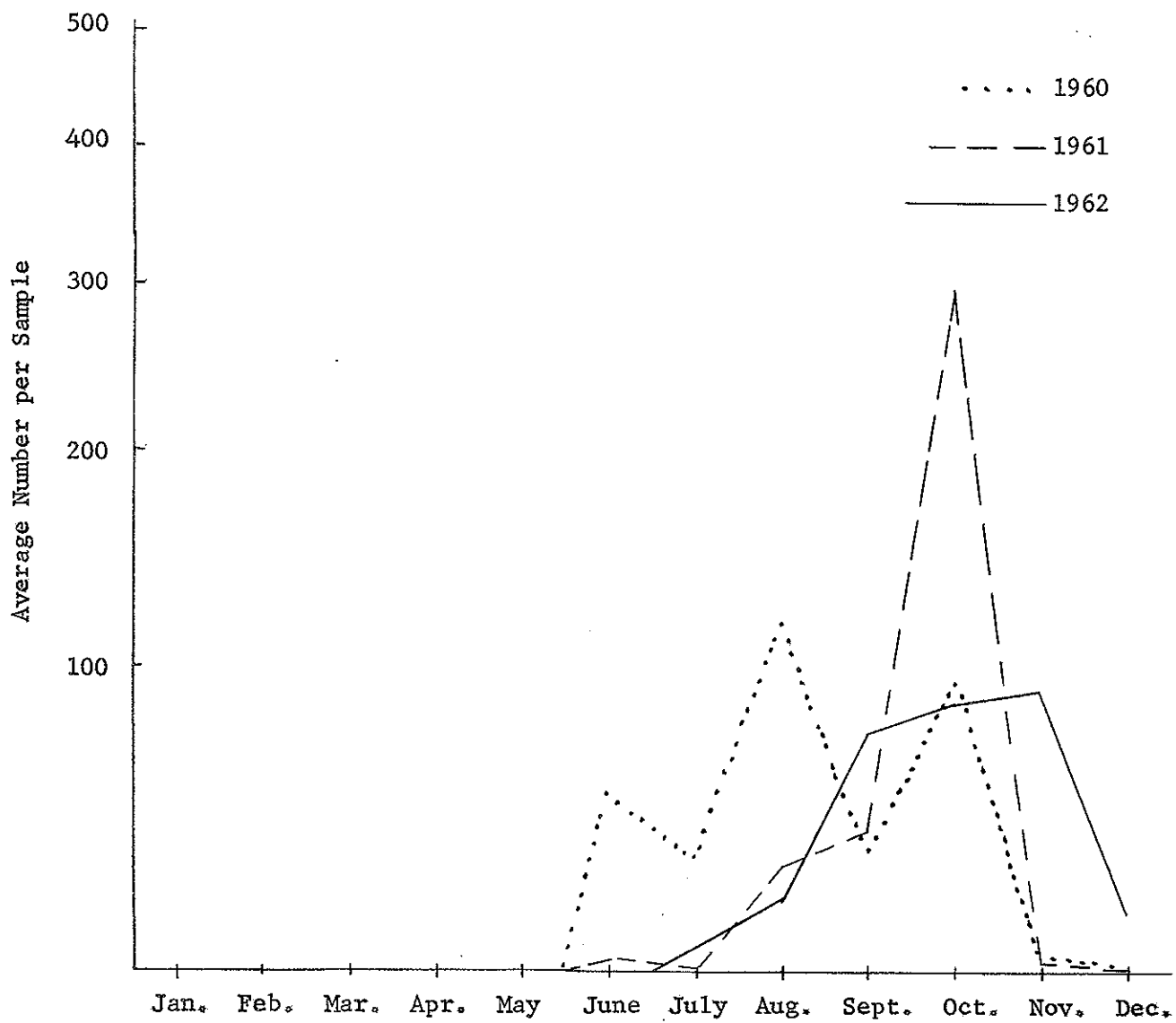


Figure 8

Secondary Station
Abundance of White Shrimp

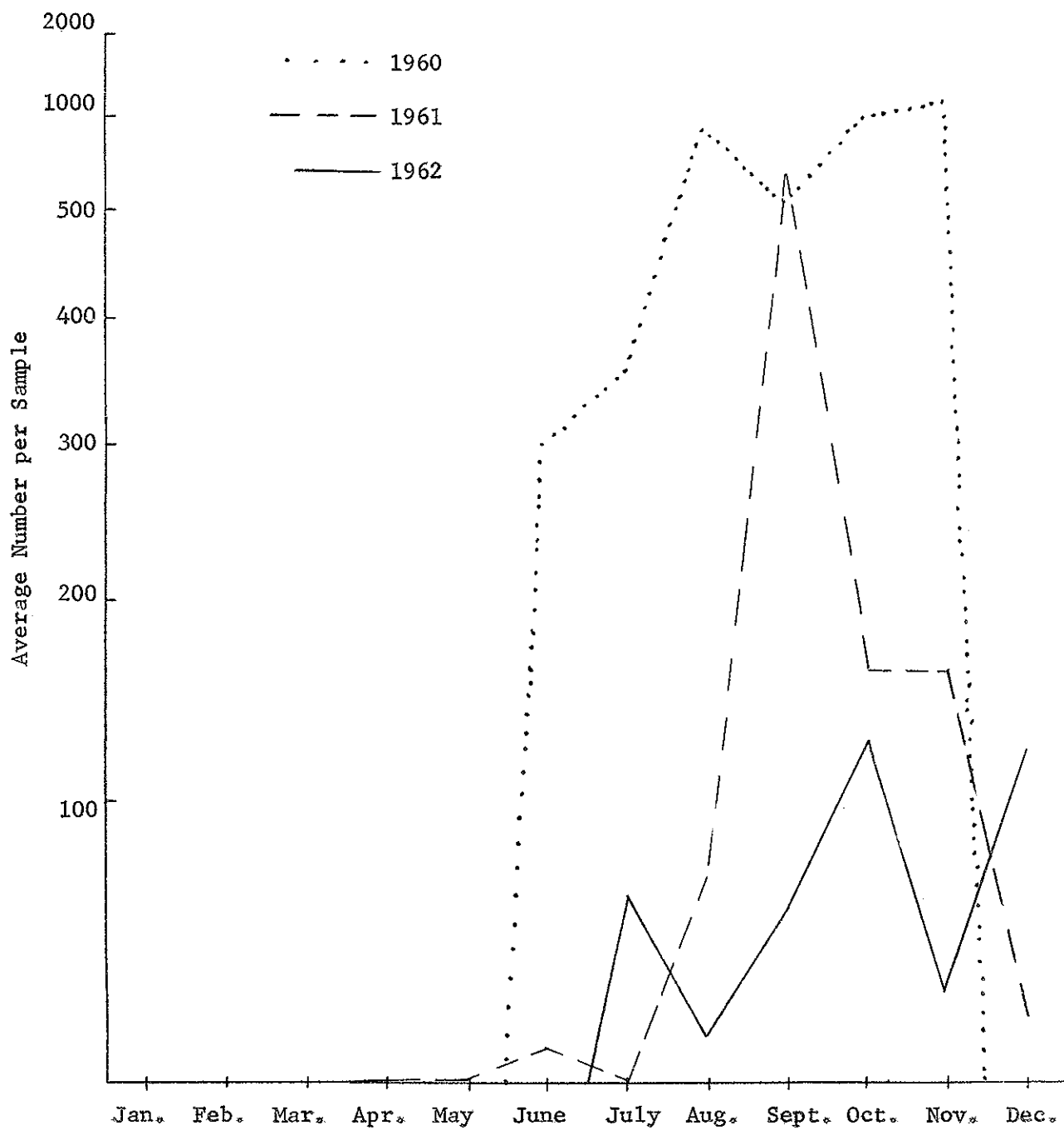


Figure 9.

Primary Bay
Abundance of White Shrimp

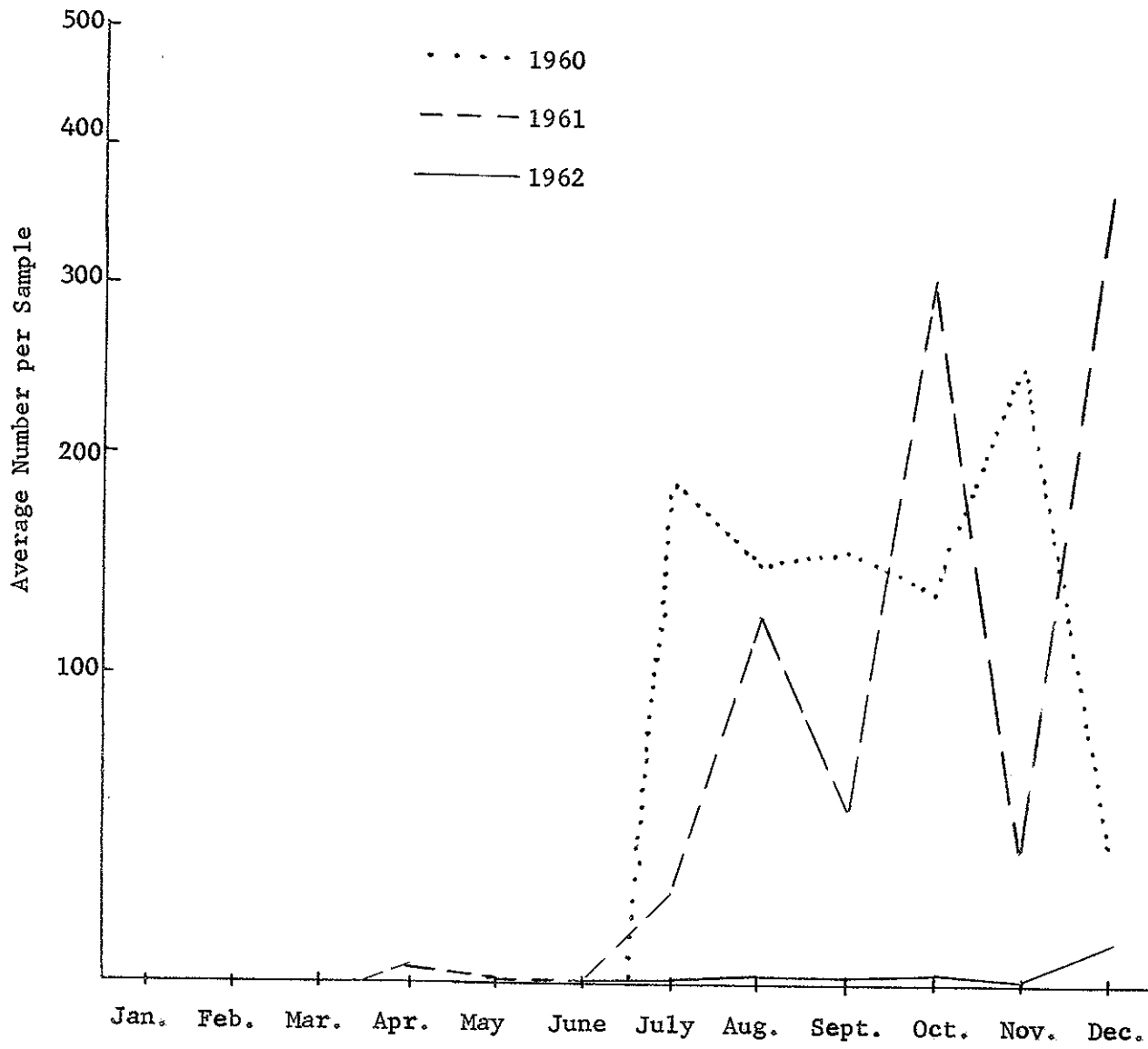


Figure 6
Composition of the White Shrimp Populations 1962

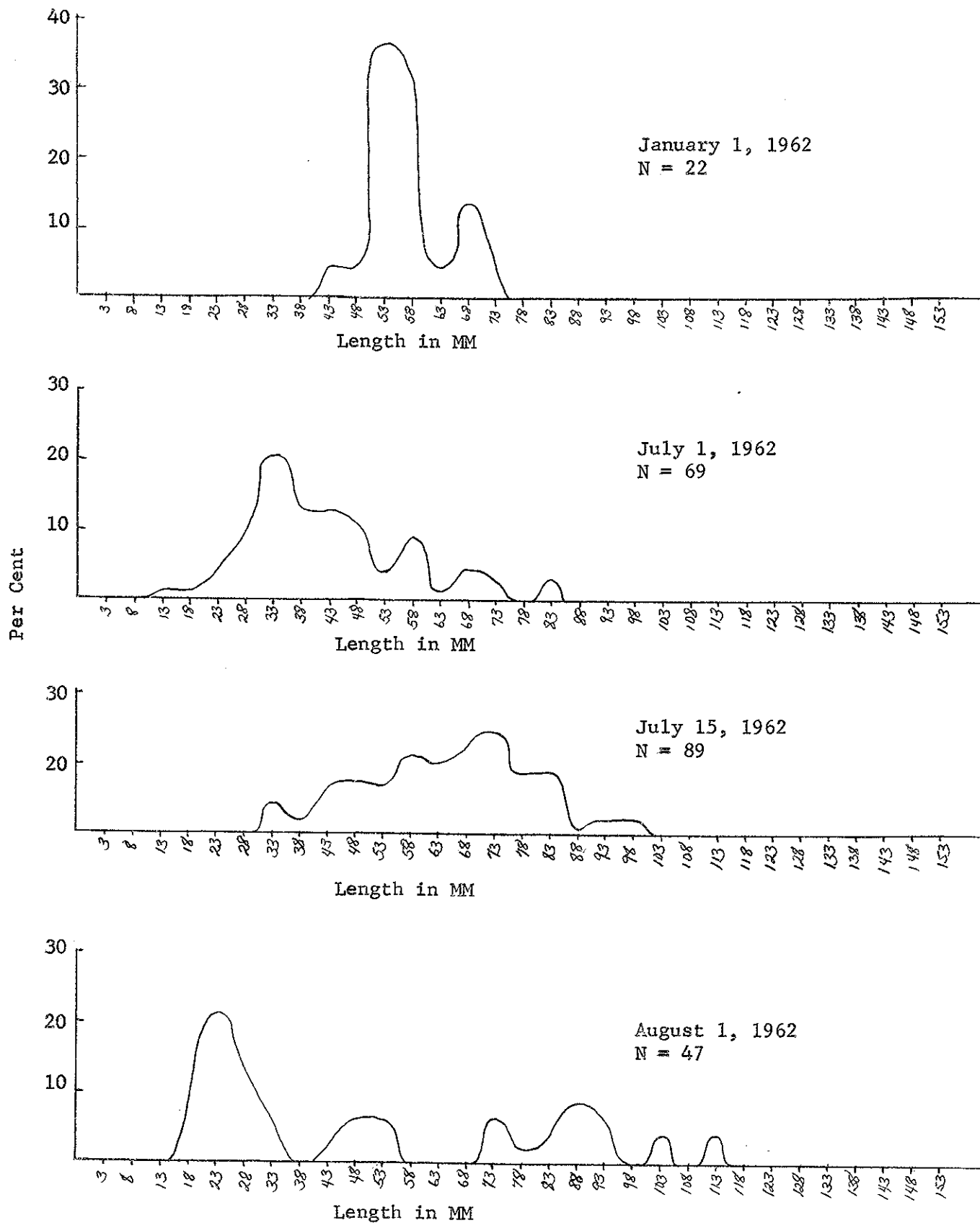


Figure 6 (Con't.)

Composition of the White Shrimp Population 1962

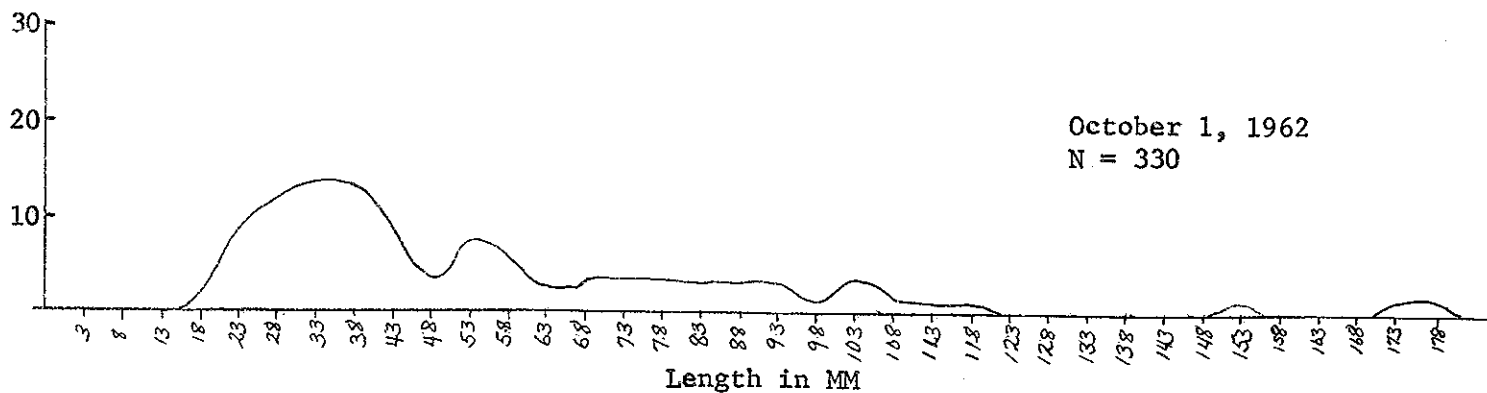
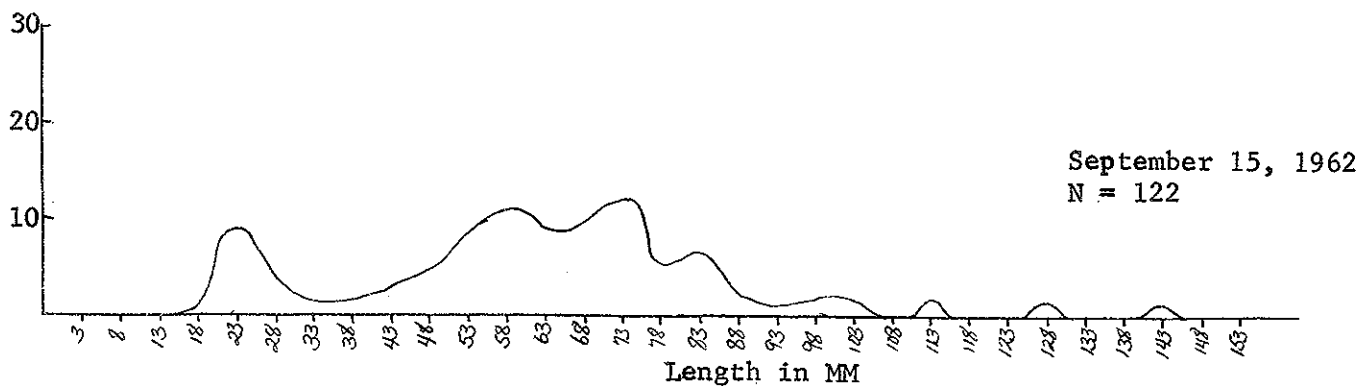
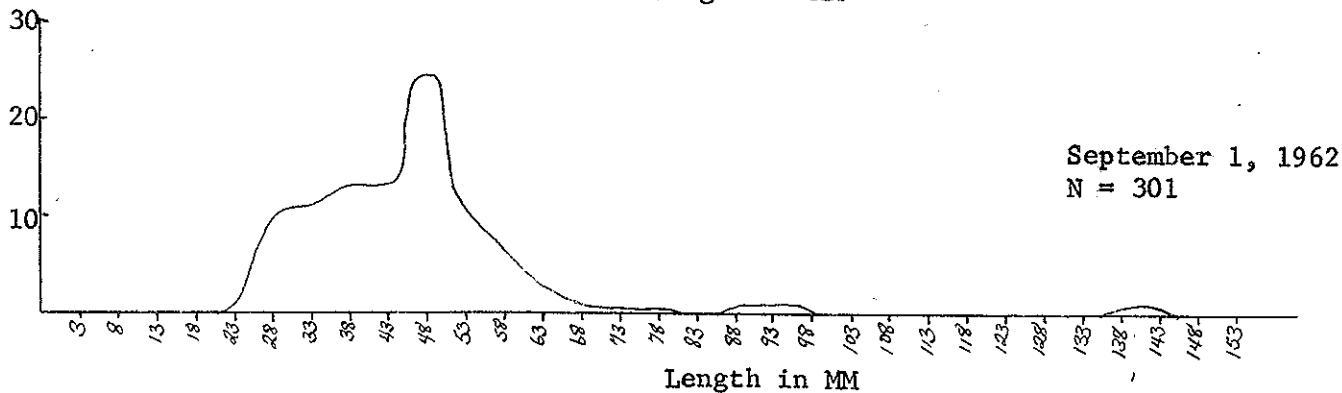
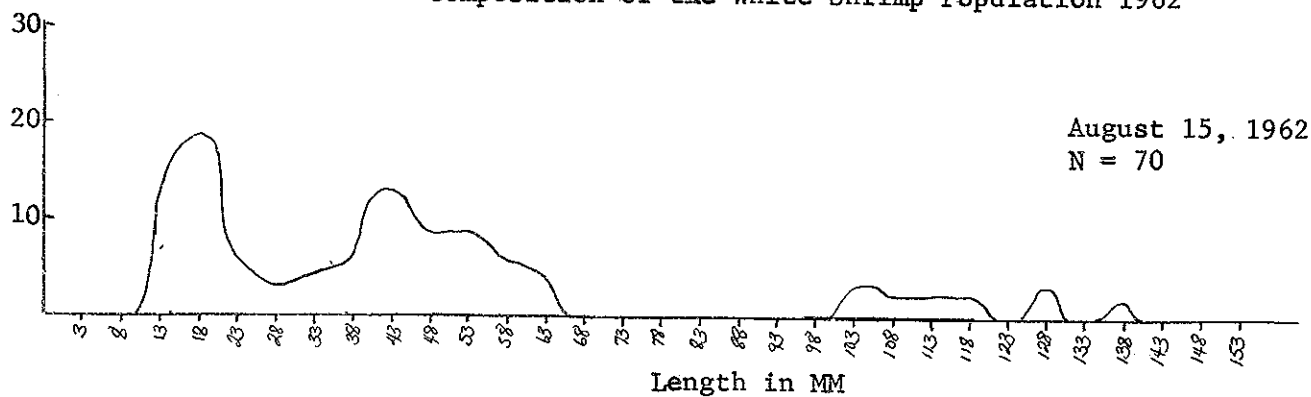


Figure 6 (Con't.)

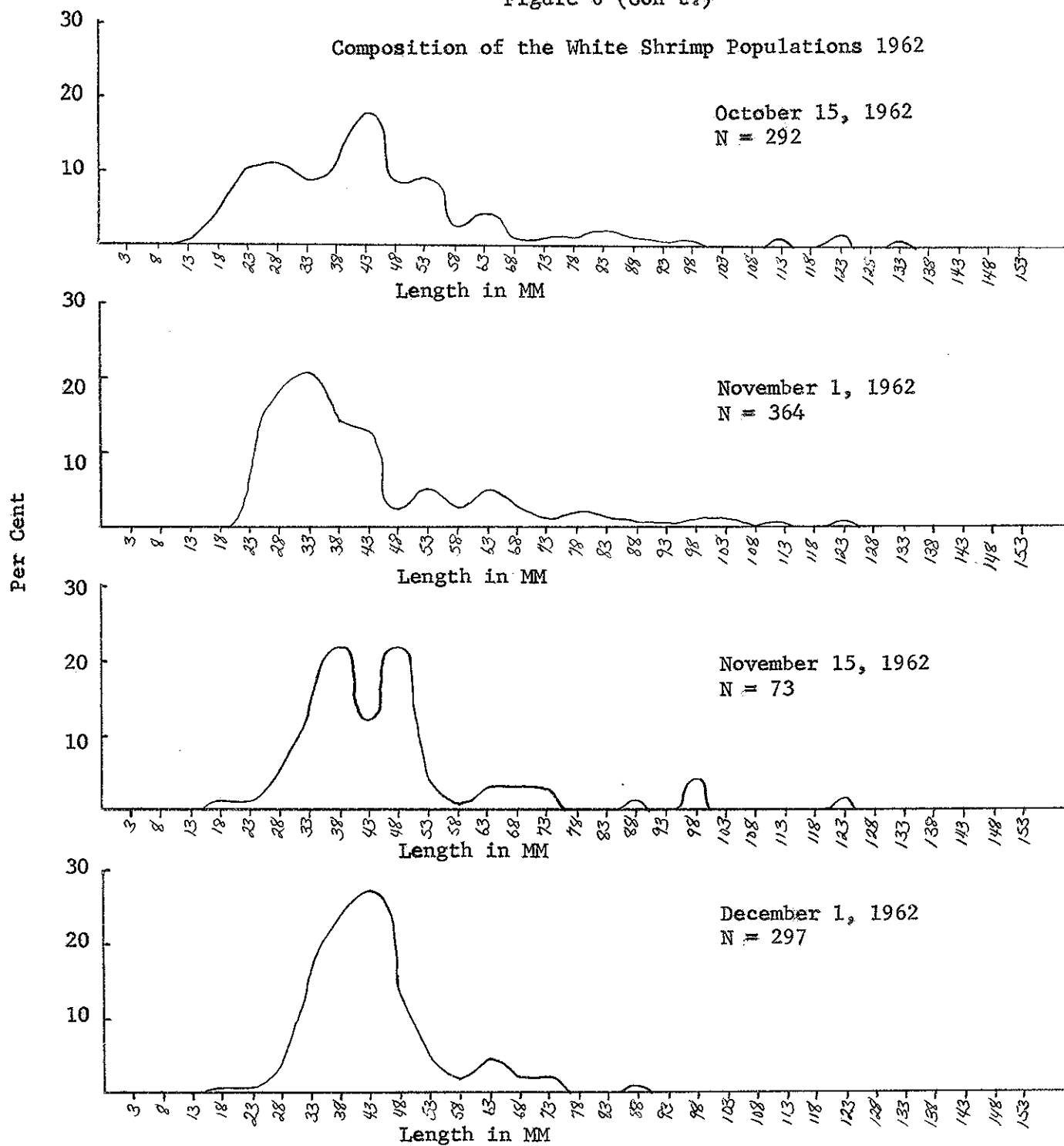
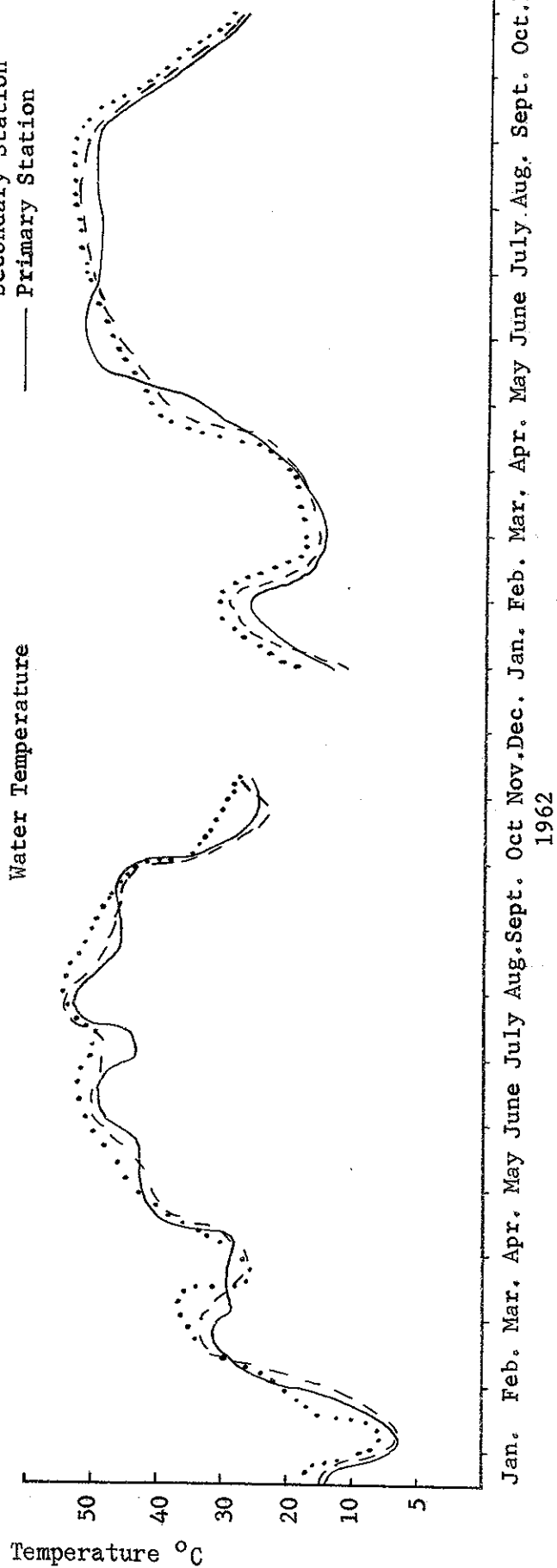


Figure 10
Hydrographic Data

Water Temperature



Salinity

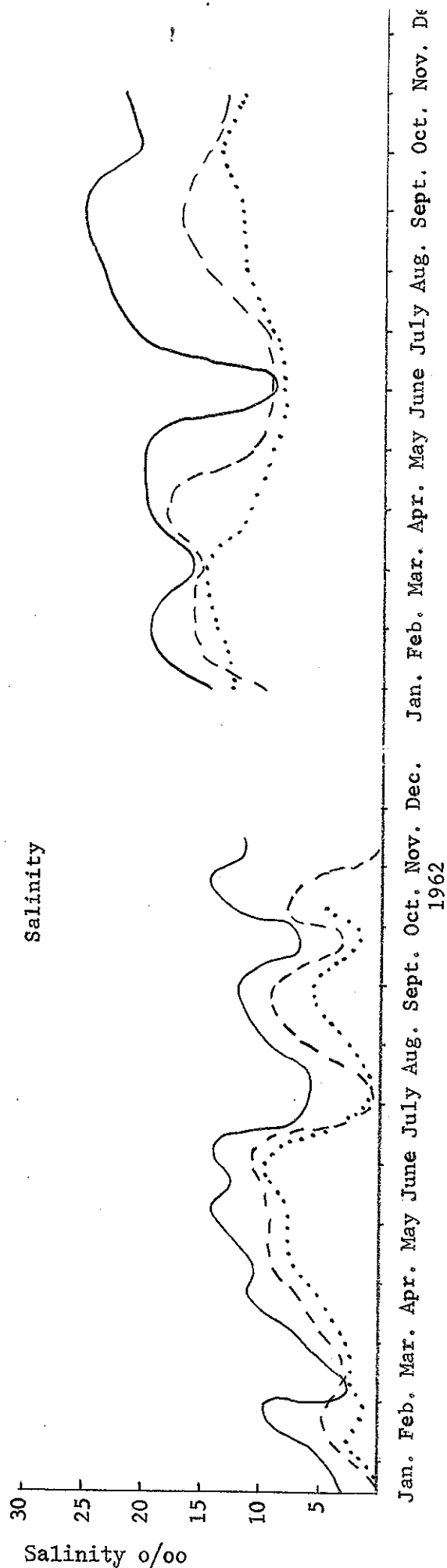


Figure 11

Galveston Bay - Bait Shrimp
Production for 1962.

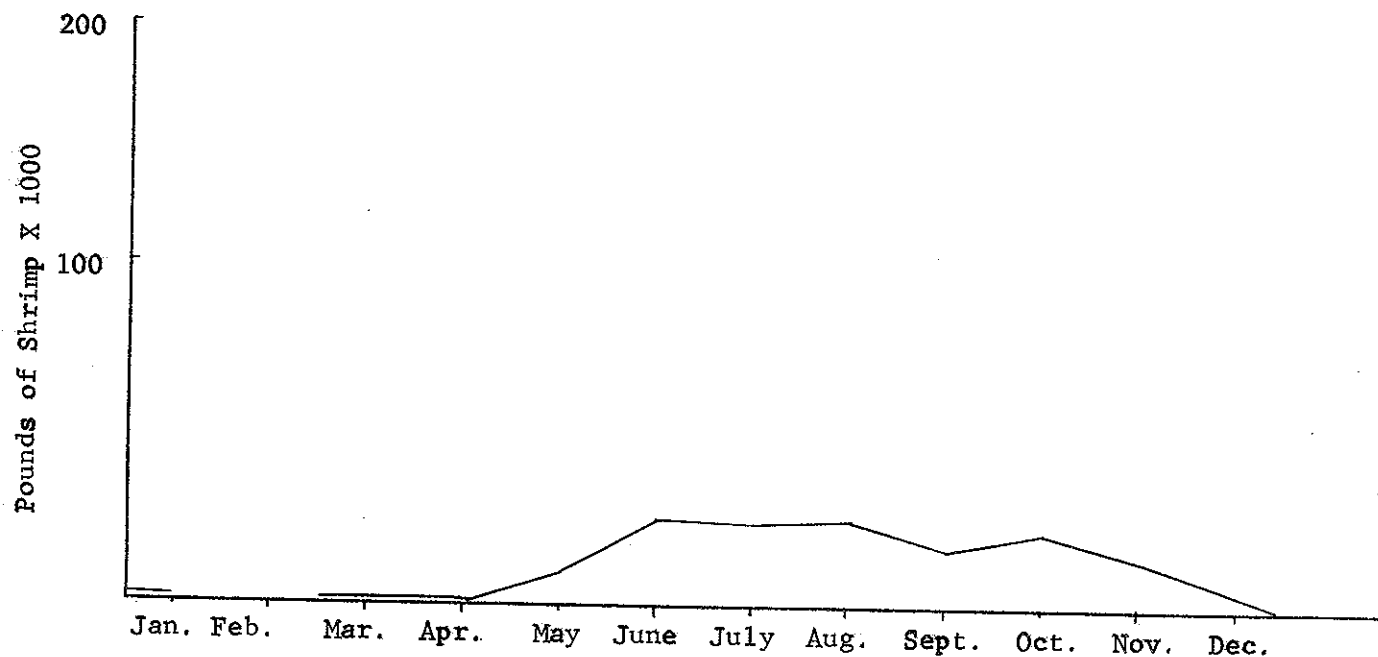


Figure 12

Galveston Bay Commercial Shrimp
Production for 1962

