

Job Report

Henry Compton and Eddie Bradley
Marine Biologists

Project No.: MS-R-5 Date: April 24, 1964
Project Name: A Study of Texas Shrimp Populations
Period Covered: January 1, 1963 to December 31, 1963 Job. No. 10

Biological Survey of the Commercial Shrimp and Associated Organisms of Area 20 in the Gulf of Mexico

Abstract: Information in this report is based on data from 85 trawl samples producing a total of 7,551 brown shrimp, 1,732 white shrimp, 123 pink shrimp, 9 seabobs, 3,027 specimens of non-commercial shrimp of eight species, and 607 squid of two species.

June, part of the closed season, was the month of heaviest movement of under-sized browns through the sampled area. During periods of abundance this species was below legal size.

White shrimp were most abundant during the winter months; but economically too small for practical harvest in January, and probably during the latter part of December.

Most of the few pinks caught were taken in February.

With the exception of seabobs, the commercial species showed a large rise in abundance over the catch of 1962. Commercial landing statistics by unit effort showed a production abundance rise in 1963 in agreement with the findings of this report. Most of the non-commercial species of shrimp common to the area sampled increased in abundance in 1963.

Hydrographic conditions, specifically salinity and temperature, remained practically constant with those found in 1962.

Objectives: To determine the decapod and stomatopod crustaceans present in the area, their seasonal distribution, abundance and size, emphasis to be placed on the commercial species of the family Penaeidae. To record and evaluate associated organisms sampled and hydrographic factors pertinent to the ecology of the area.

Procedure: Regular stations were set up for weekly samples in the inshore Gulf off Port Aransas, Texas, in depths of 2 to 17 fathoms. The area, as mapped in Job No. B-2A, Project M-R-6, Project Report, 1960-1961, Marine Fisheries Division, Texas Game and Fish Commission, lies in the center of the U. S. Fish and Wildlife Service Statistical Area 20.

Daytime sampling was accomplished from the 38-foot department shrimp boat Goby using a 42-foot flat otter trawl of 2-inch stretch mesh spread by 6-foot doors. Duration of each sample was 30 minutes. Length-frequency sheets were completed for all crustaceans, both commercial and non-commercial.

Detailed information sheets were used for other organisms.

Hydrographic data at time of sampling were obtained with a Kemmerer water bottle. Water temperature was taken on board with a centigrade thermometer calibrated in tenths of degrees; salinity was determined in the laboratory with hydrometers.

Findings and Discussion: Shrimp Study: Commercial Species Decapoda

Brown shrimp, Penaeus aztecus Ives:

7,551 shrimp	2,971 males	39 per cent
	4,580 females	61 per cent

During the summer, undersized brown shrimp were moving from the bays through the inshore Gulf into the deeper water habitat offshore. Movement began in May and extended through November, with June the peak migration month. The average number of shrimp per sample for 1962-1963 is shown in Figure 1.

The brown shrimp catch curves for 1962 and 1963 indicate a larger generation and a later offshore movement in 1963 (Figure 1). About 3,000 more brown shrimp were taken in 1963.

Within the limits of the survey, 8 to 14 fathoms comprised the area most productive of migrating browns. These shrimp, particularly during the peak abundance periods, were mostly below the legal count of 65 headless per pound - 108 mm or 4 1/4 inches in total length. In Figure 2, the length-frequency distribution of the population* is graphed monthly by per cent, shaded histograms representing males; unshaded, females. Because December samples were not collected off Port Aransas, samples from off Port Mansfield were used.

In Figure 2, shrimp to the left of the arrow are undersize; to the right, legal. Browns entered the sampling area in May in the 83-93 mm size range, and through September a sizable part of the population consisted of shrimp below the legal size. The closed season during June and July protects these shrimp for later harvest from offshore waters at a desirable economic size. Since browns move out of the bays at a small size and through the inshore Gulf in waves seeking deeper water, some undersize shrimp are always present. In October samples did produce a large number of legal size shrimp.

Overall sex ratio favored females. In May, June, and July females constituted the largest percentage of all size groups. Through fall, as migration from the bays dropped off, males equaled or outnumbered females below a size of 138 mm. Throughout the year males inshore were very scarce above this size. See Figure 2. There apparently exists some definite relation between sex and mortality, growth, or rate and/or time of movement through the inshore Gulf. Information on sex percentages in the offshore portion of the populations, and differential growth by sex, are needed to understand these relations.

* Presumes 42-foot trawl catches represent sizes present.

White Shrimp, Penaeus setiferus (Linnaeus):

1,732 shrimp	778 males	45 per cent
	954 females	55 per cent

Whereas brown shrimp taken in the sampling area represent only a transient population, large through the summer months, white shrimp are restricted to the area inside of 20 fathoms. Outside of some adult movement to and from the bays in the early months of the year, white shrimp complete their life cycle within the inshore Gulf. Depths of greatest abundance extended from 4 to 7 fathoms.

Compared to 1962, over twice the number of whites were taken in 1963. They were most abundant in January-February and October-November. Lack of a December sample unfortunately leaves a blank in connecting the periods. Abundance is graphed in Figure 1 and shows some erratic features but less variance than in the curve for 1962. A summer abundance peak represents ripening shrimp.

Length-frequency distributions in Figure 3 show that only in January were appreciable numbers of whites undersize (below the legal count of 65 headless per pound - 112 mm or 4 and 7/16 inches in total length). The December samples from Port Mansfield were graphed to show legal size at this time. The January 2, 1964, sample off Port Aransas demonstrates the presence of large numbers of undersize shrimp in the area on this date. These shrimp probably moved in between the middle and last third of December, as supported by records of previous years. A closed season to seven fathoms from December 16 to January 31 was instigated to protect these small shrimp.

A very rough growth rate of one-half millimeter per day is indicated from the January mode of 103 mm to the May mode of 163 mm.

Overall sex percentage favored females which also dominated the larger size ranges, but to a lesser extent than noted in the brown shrimp. During periods of greatest abundance of undersize shrimp, as in January, females greatly outnumbered males in the lower ranges. Apparently, females migrate out of the bays either at a smaller size or at an earlier date than the males.

Samples began to produce ripe whites in late April; by July 75 to 95 per cent of the females were ripe. No ripe females were taken after August.

Pink shrimp, Penaeus duorarum Burkenroad:

123 shrimp	55 males	45 per cent
	68 females	55 per cent

Pinks were most abundant in February with the 6 to 8 fathom zone being most productive. Compared with the number taken in 1962, almost six times as many were caught in 1963. Area 20 is not particularly productive of pink shrimp, although some of the inland bays feeding this area produce pink shrimp in commercial abundance in the spring.

Seabobs, Xiphopenaeus krøyeri (Heller):

9 shrimp	6 males	67 per cent
	3 females	33 per cent

All were taken in January in four fathoms. There was a large drop in abundance from 1962 when numbers were taken in February and March.

Information from commercial statistics:

In Figure 4 commercial interview shrimp data compiled by the U. S. Fish and Wildlife Service are graphed for six years (1958-1963) to show trends of the Gulf catches from the Louisiana border to the Rio Grande. The poundage is in heads-off weight for the combined catch of all three commercial shrimps. Monthly poundage was divided by the number of 24-hour periods fished. It should be noted that this interview information gives the only accurate estimate of the shrimp catch from the Texas Gulf but does not reflect the total poundage landed in Texas ports.

Generally speaking, for any year, the months of July, August, and September produce the peak of that year's brown shrimp catch, while production peaks of white shrimp are reached in October and November. The rest of the year is a mixture of species, favoring a dominance of browns in the catch.

Of the six-year period, the years 1959, 1960 and 1963 were most productive. This was apparently due to increased numbers of brown shrimp, although winter white shrimp catches in 1963 contributed greatly to the total catch. A rather marked cyclic situation can be seen in the graphs. This is especially apparent in white shrimp catches using the months of October, November, and sometimes December as reference. Poundage per day fished rises from around 470 pounds in 1958 to 800 pounds in 1960 and from 600 pounds in 1961 to 800 pounds in 1963. A cyclic rise in browns from 1958 through 1960 is also clear, less so for the succeeding years.

Shrimp Study: Non-commercial Species

Rock shrimp, Sicyonia dorsalis (Kingsley):

376 shrimp	152 males	40 per cent
	224 females	60 per cent

This species was most abundant in June, contrary to the situation found in 1962 when large numbers were caught in August (Figure 5). The number for 1963 was far below the 2,229 shrimp taken the previous year. Actually, rock shrimp are more common in water depths beyond the limits of the sampling area, and in the fringe area of 12 to 16 fathoms their occurrence is probably periodic. Females were ripe in July and August.

Rock shrimp, Sicyonia brevirostris (Stimpson):

18 shrimp	7 males	39 per cent
	11 females	61 per cent

This larger rock shrimp was caught occasionally throughout the year. Comparative samples south off Port Isabel produced most from the 8 to 10 fathom zone. Ripe females were taken in September.

Jackass shrimp, Trachypeneus similis Smith:

1,201 shrimp	39 males	3 per cent
	1,162 females	97 per cent

Compared with the catch in 1962, about three times as many shrimp were caught. They were most abundant in February and March and in 8 to 14 fathoms. These enter the commercial bait catch from the Gulf through spring to some extent. The graph of abundance in Figure 5 shows comparison with 1962. As

these shrimp are common in the sampling area, as well as offshore, the indicated abundance rise has validity.

Females were ripe in March. Because of the extreme sexual dimorphism in size displayed by this species and in the absence of suitable sampling gear for the small males, all below 65 mm in length, it is uncertain what exact sex percentage exists.

Trachypeneus constrictus (Stimpson):

44 shrimp	3 males	7 per cent
	41 females	93 per cent

This species was most abundant in the 4 to 6 fathom zone; about 8 times as many were caught as in the previous year. For the first time males were taken, all under 67 mm in length, displaying marked size difference by sex, perhaps common to members of the genus.

Mantis shrimp, Squilla empusa Say:

1,234 shrimp	504 males	41 per cent
	730 females	59 per cent

The common sea-louse was most abundant in February and March and in the 8 to 12 fathom zone, about 4 times as abundant as in 1962. During the above months, most of the females were ripe. In Figure 5, 1963 abundance is graphed in comparison with 1962. This species for two years has followed closely the abundance pattern for T. similis.

Mantis shrimp, Squilla lijdingi (Holthuis):

22 shrimp	7 males	32 per cent
	15 females	68 per cent

Abundance of this species was down by about 75 per cent from 1962. Again, dealing in small numbers and with a shrimp that is apparently not abundant, yearly differences are probably due to sampling factors rather than population characteristics. Some of the females were ripe in February.

Mantis shrimp, Squilla neglecta (Gibbes):

131 shrimp	53 males	40 per cent
	78 females	60 per cent

These were most abundant in February-March and July-August and in the 4 to 8 fathom zone. They display a rather odd abundance pattern as follows:

1960	- 53 samples	- none
1961	- 90 samples	- 96 shrimp
1962	- 90 samples	- none
1963	- 85 samples	- 131 shrimp

Lysiosquilla scabricauda Lamarck:

One 82 mm female was caught in six fathoms in June.

Common Invertebrates other than Crustacea:

Common Red Squid, Loligo pealii Le Sueur:

246 specimens

This squid was most abundant from March through August, generally in the 8 to 14 fathom zone.

White Squid, Lolliguncula brevis Blainville:

361 specimens

This species was most abundant from August through the end of the year, during which time the smallest specimens (30 mm mantle length) were taken.

In Figure 5, L. brevis and L. pealii are graphed together to show 1962/1963 abundance. The fall peak represents mainly the small white squid, common also to the bays. The larger red squid is more or less confined to the Gulf.

Of other invertebrates, only the sea liver, a soft coral, Renilla mulleri was common, usually being taken in every trawl in varying degrees of abundance. No particular distribution was noted. Common echinoderms were Astropecten antillensis, Astropecten cingulatus, and Luidia clathrata. Other invertebrates taken occasionally have been noted in previous reports and do not warrant comment.

Hydrography: Average bottom temperature and salinity are graphed by month in Figure 6. In comparison with 1962, 1963 showed little change.

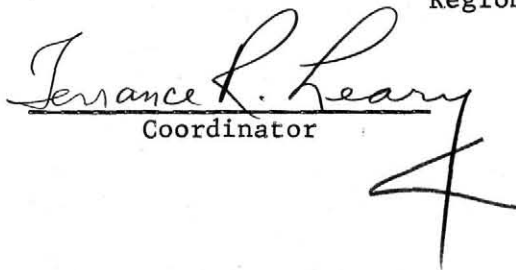
Prepared by: Henry Compton and Eddie Bradley
Marine Biologists

Alan Moffett
Project Leader

Ernest G. Simmons
Regional Supervisor

Approved by:

Terence R. Leary
Coordinator



Bibliography

- Hildebrand, H. H. 1954. A study of the brown shrimp (Penaeus aztecus Ives) grounds in the western Gulf of Mexico. Publ. Inst. Mar. Sci. Univ. Tex. 3 (2): 233-266.
- Miner, R. W. 1950. Field Book of Seashore Life. G. P. Putnam's Sons, New York.
- United States Fish and Wildlife Service, United States Bureau of Commercial Fisheries. 1958 - 1963.
Gulf Coast Shrimp Catch by Area and Depth - Interview Data. Through the appreciated courtesy of Mr. Orman H. Farley, Supervisor Fishery Reporting Specialist.

(150)

Figure I

Average Monthly Abundance

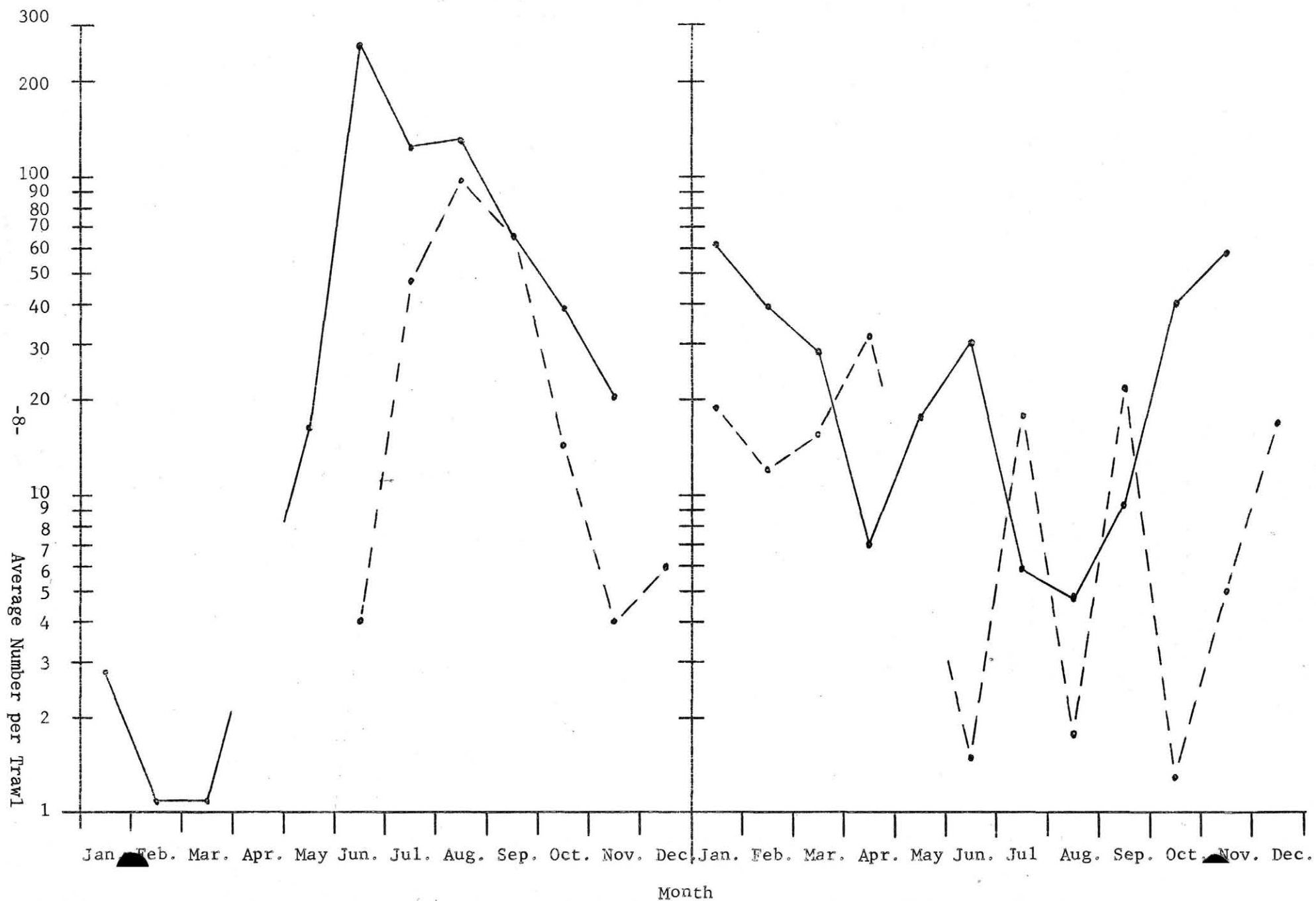
Brown Shrimp 1962 ---

1963 —

White Shrimp

1962 ---

1963 —



Brown Shrimp
Size Plotted on 3 and 8 Mid-Points of 5 MM
Intervals

Male
Female

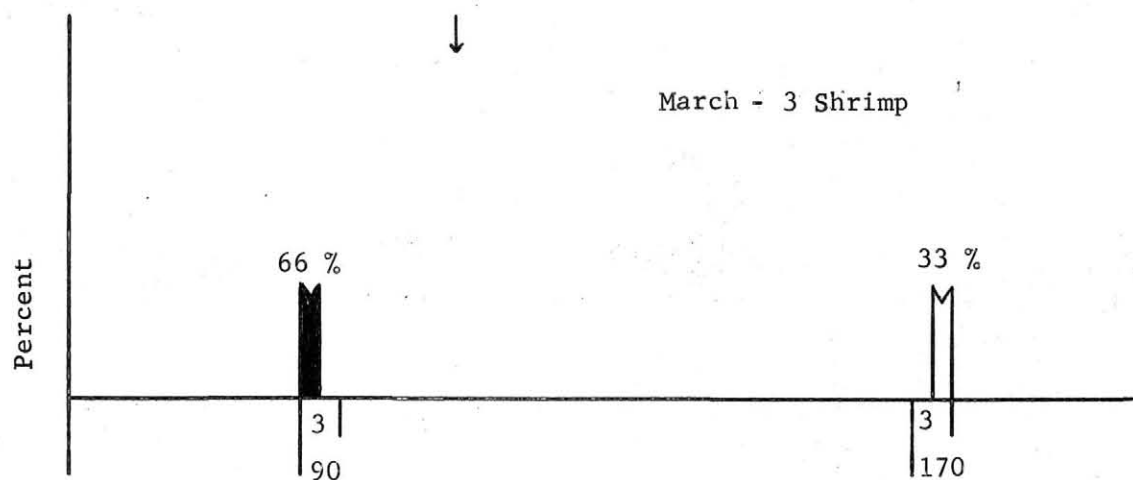
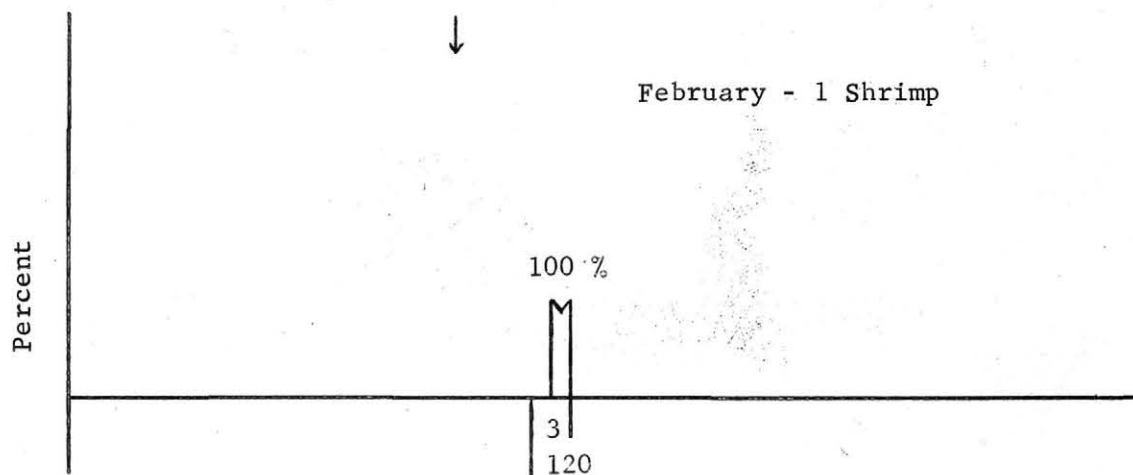
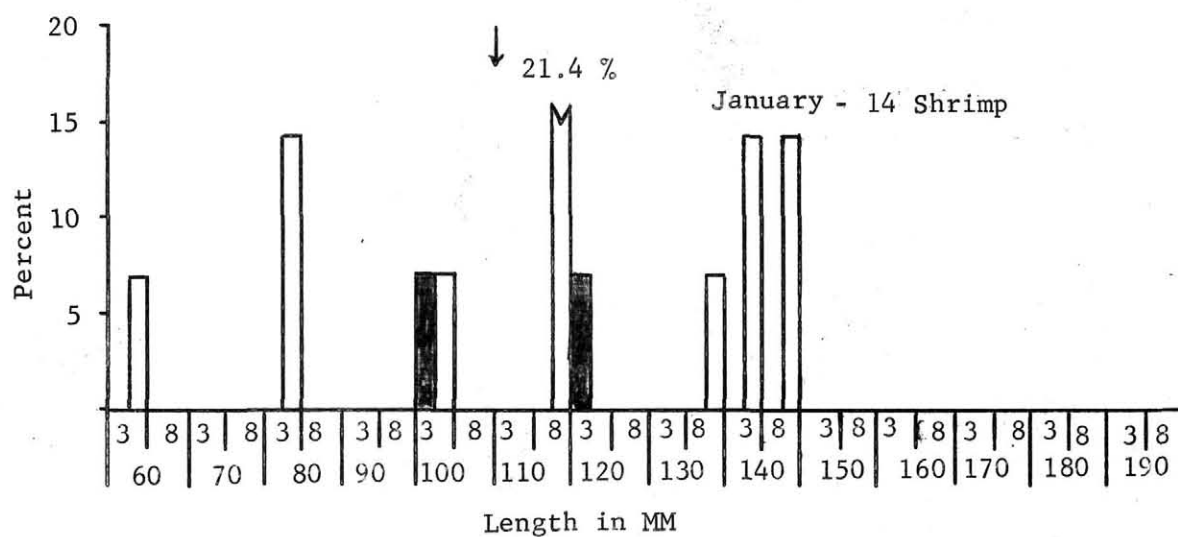


Figure 2
Brown Shrimp

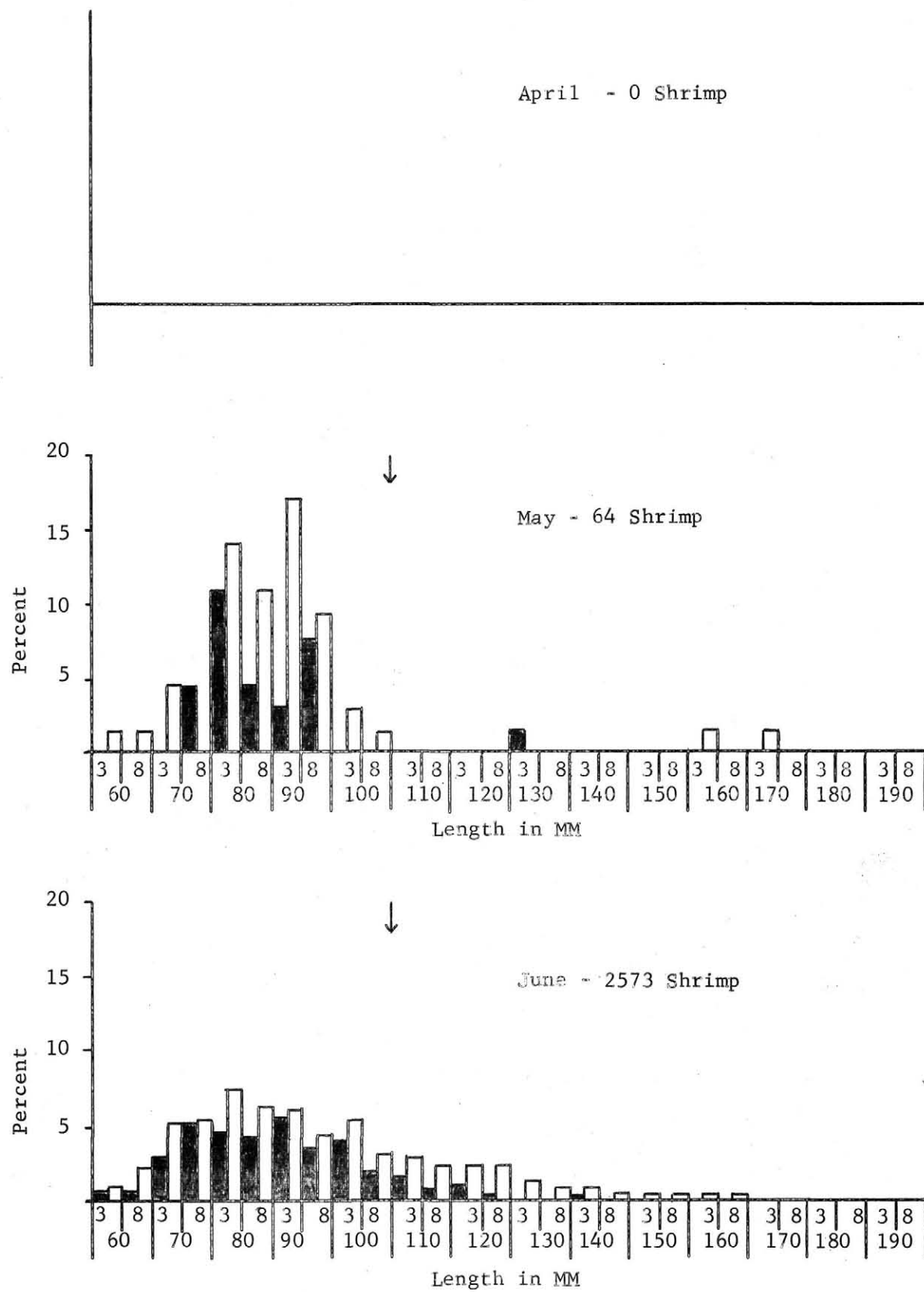


Figure 2

Brown Shrimp

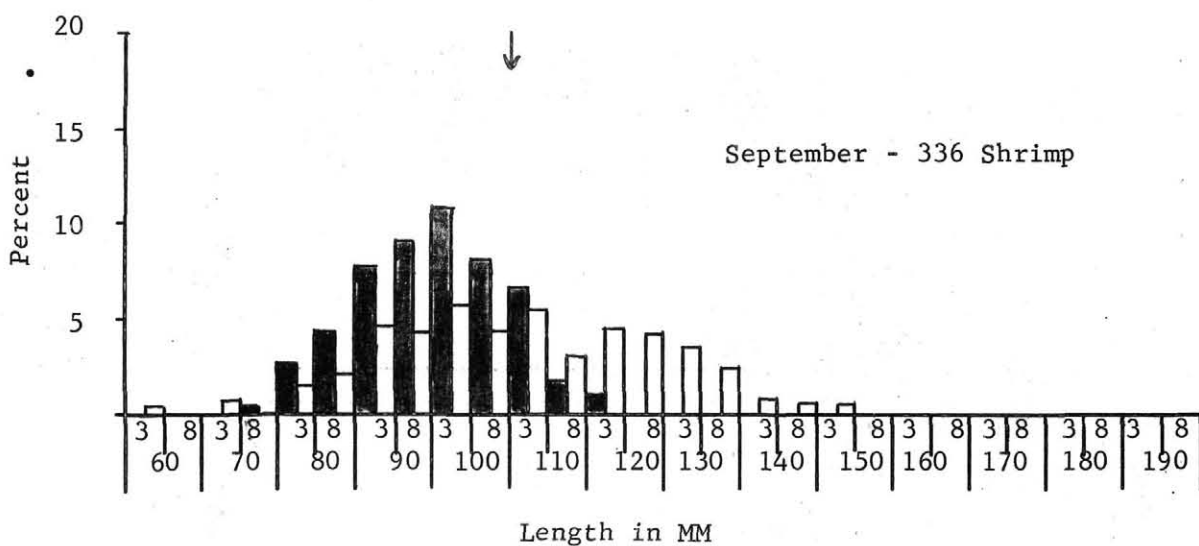
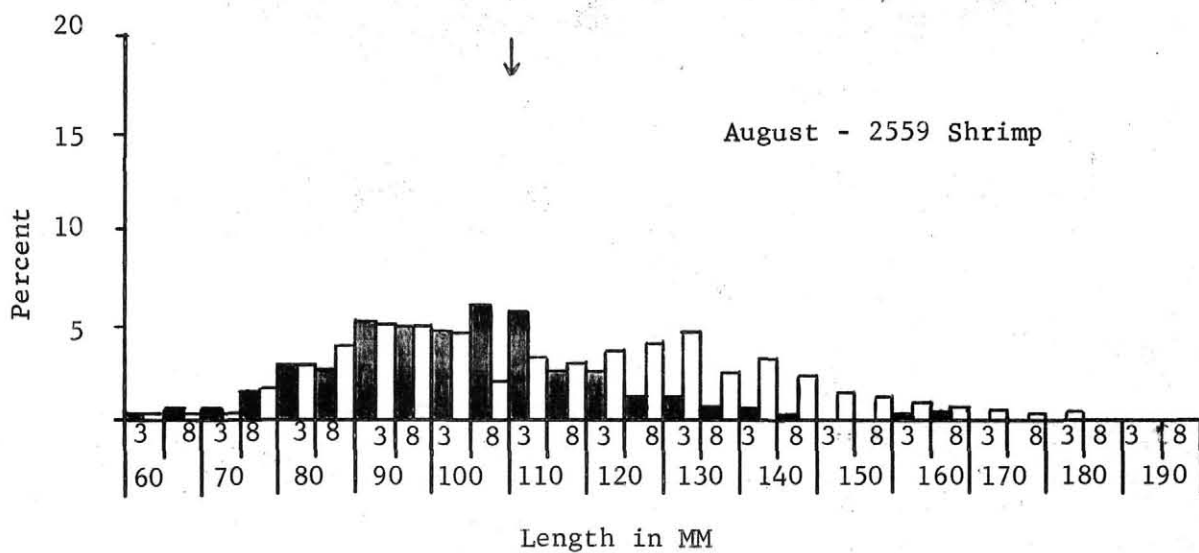
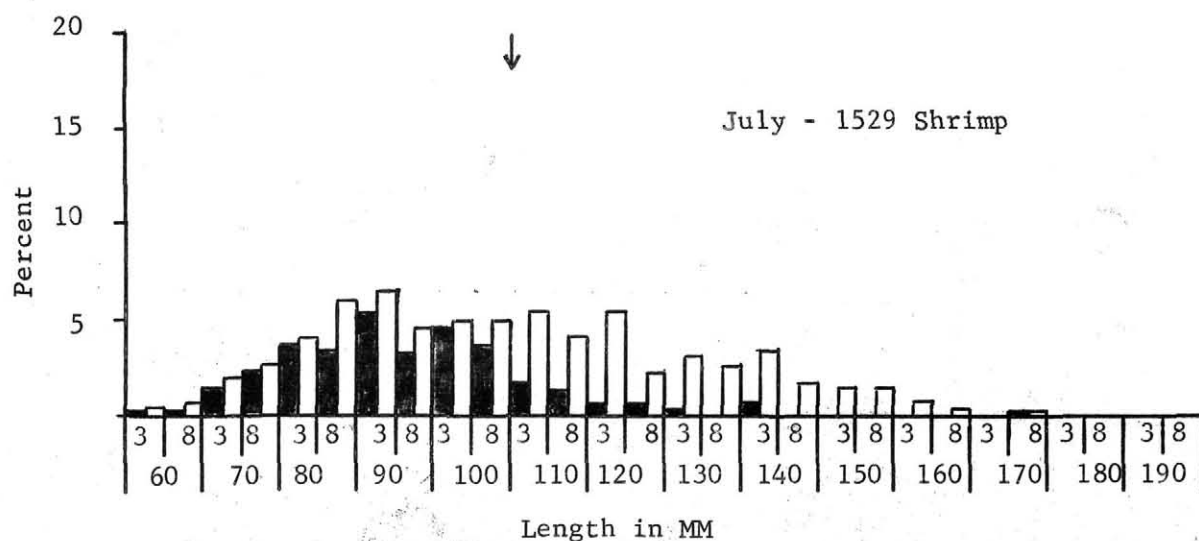


Figure 2
Brown Shrimp

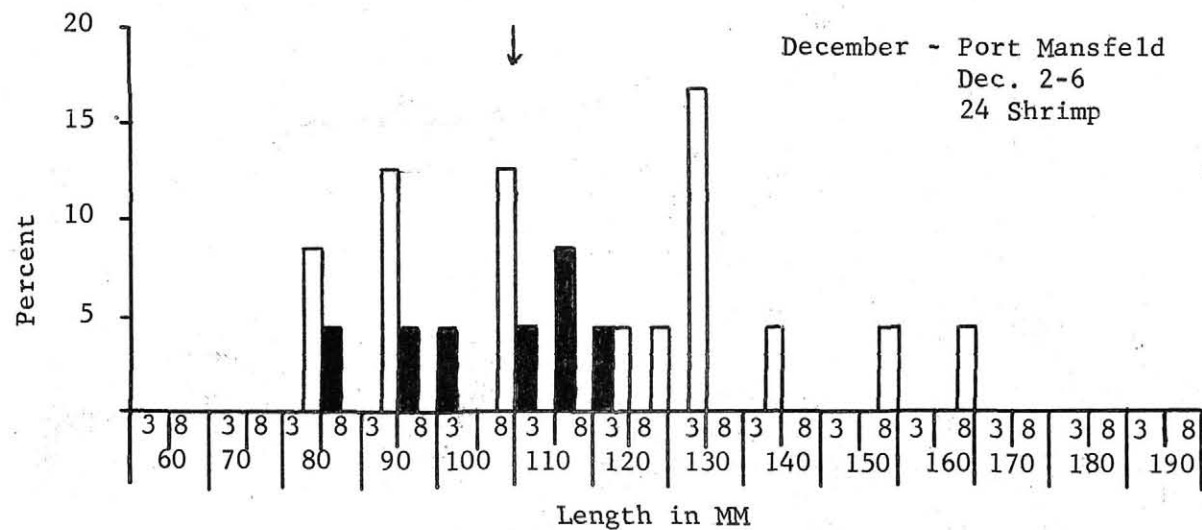
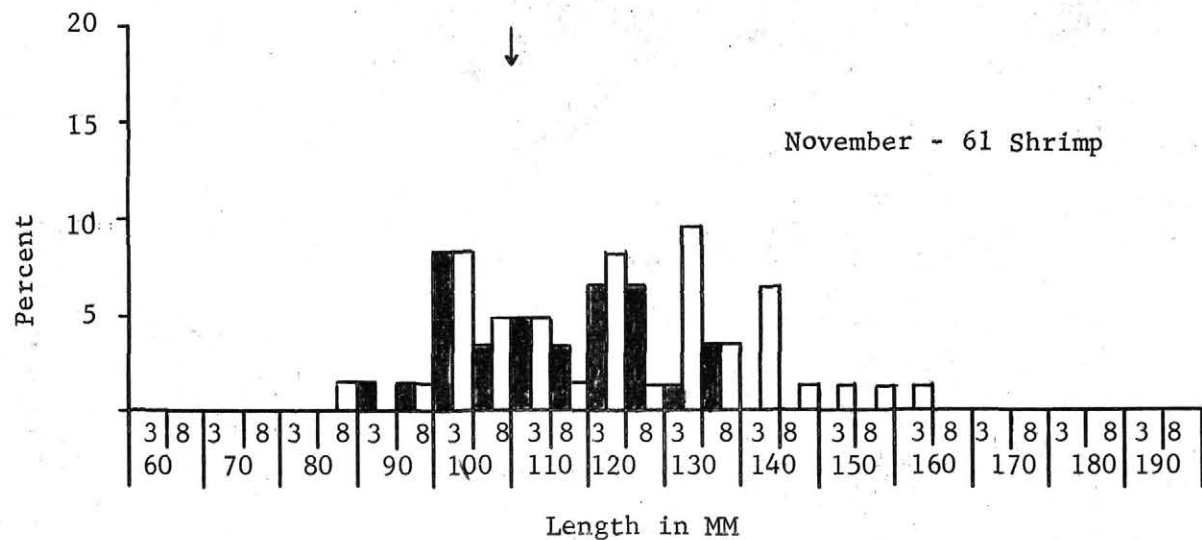
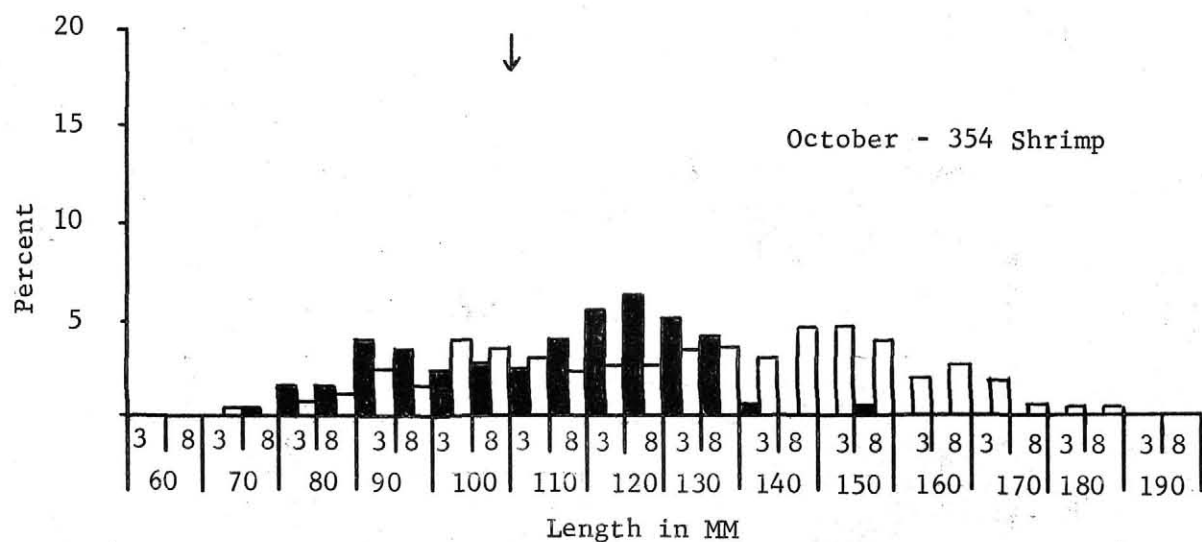


Figure 3
White Shrimp

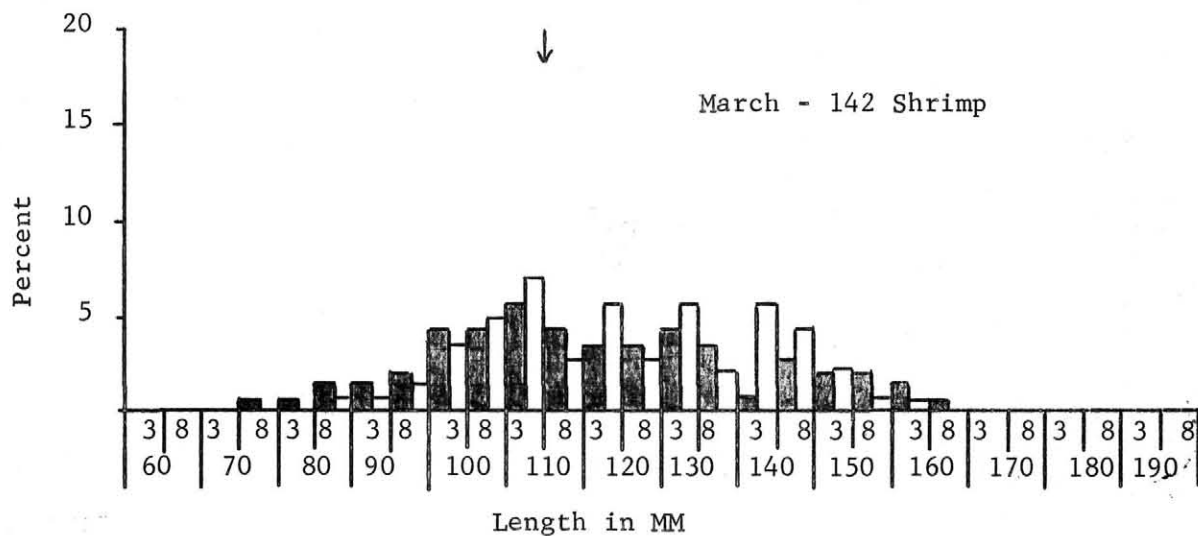
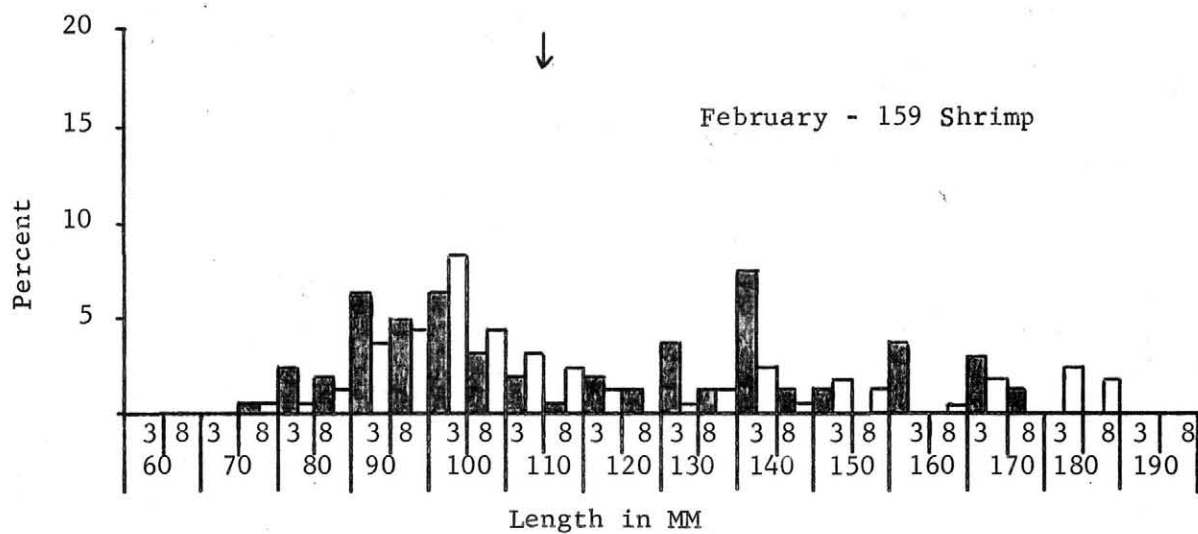
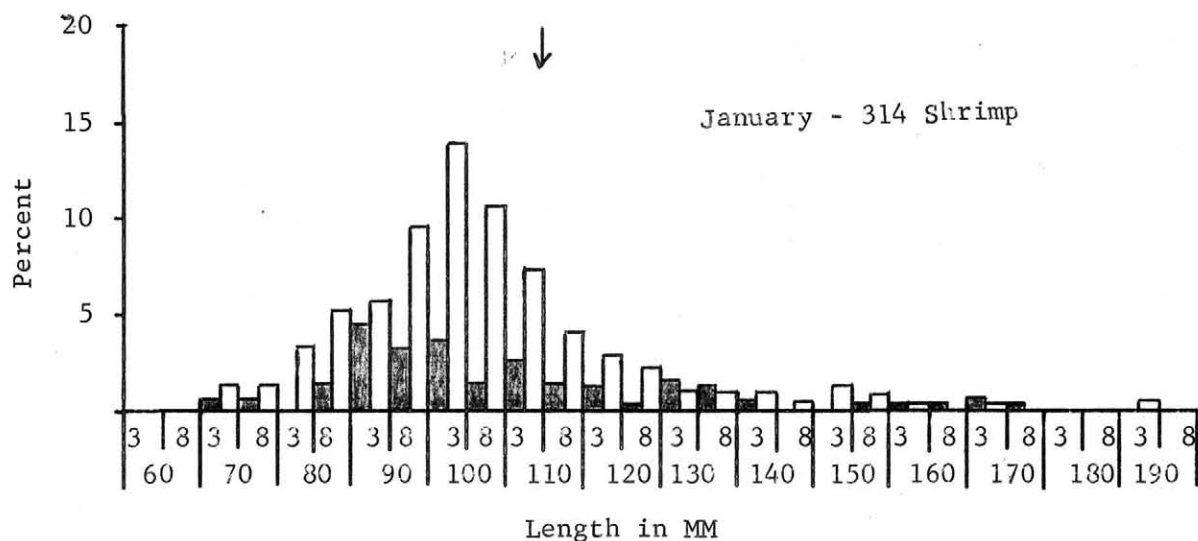
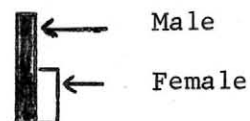


Figure 3
White Shrimp

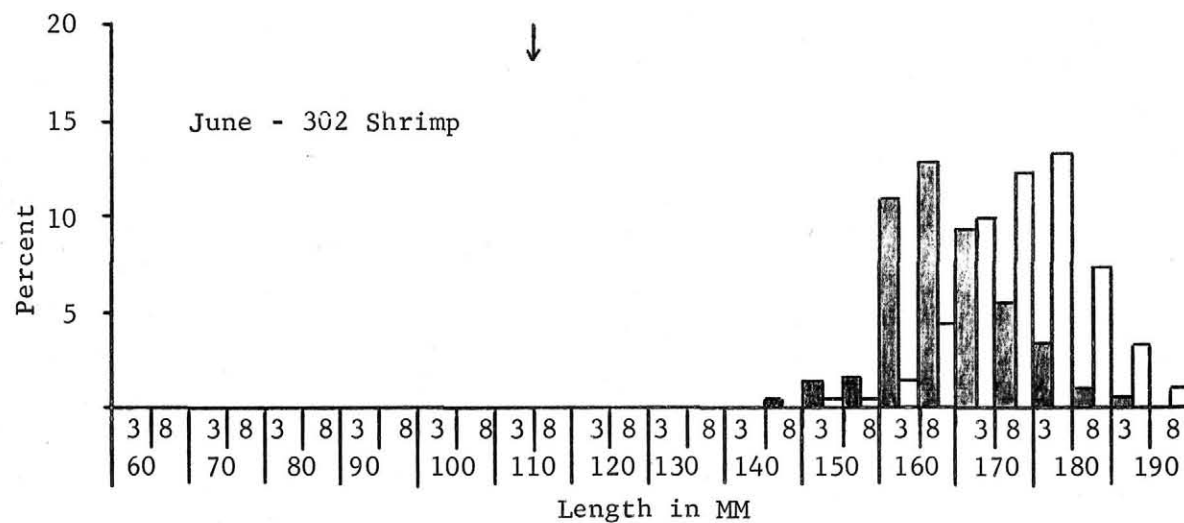
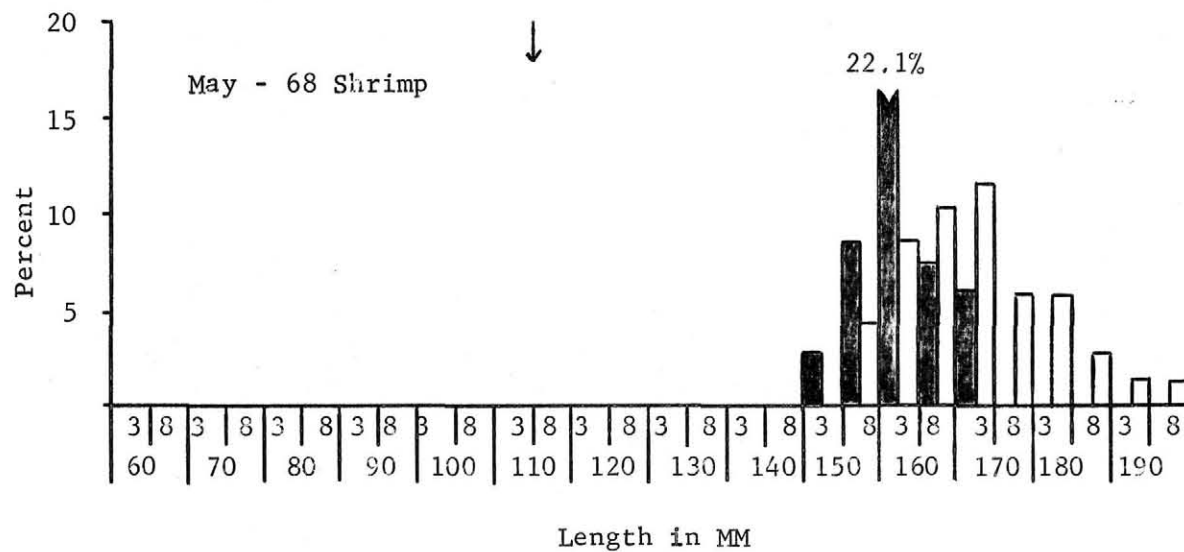
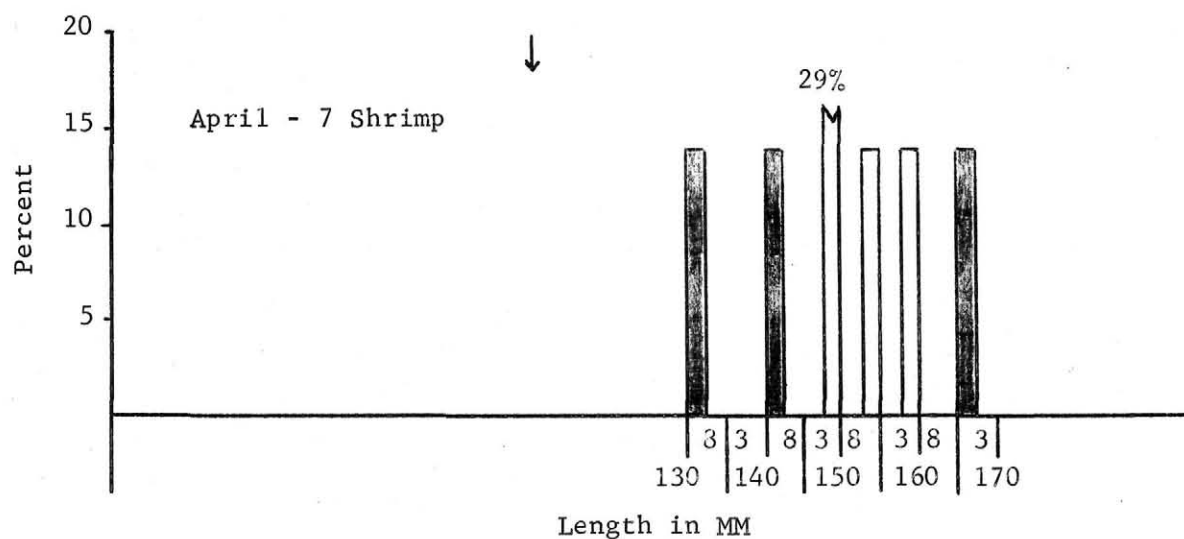


Figure 3
White Shrimp

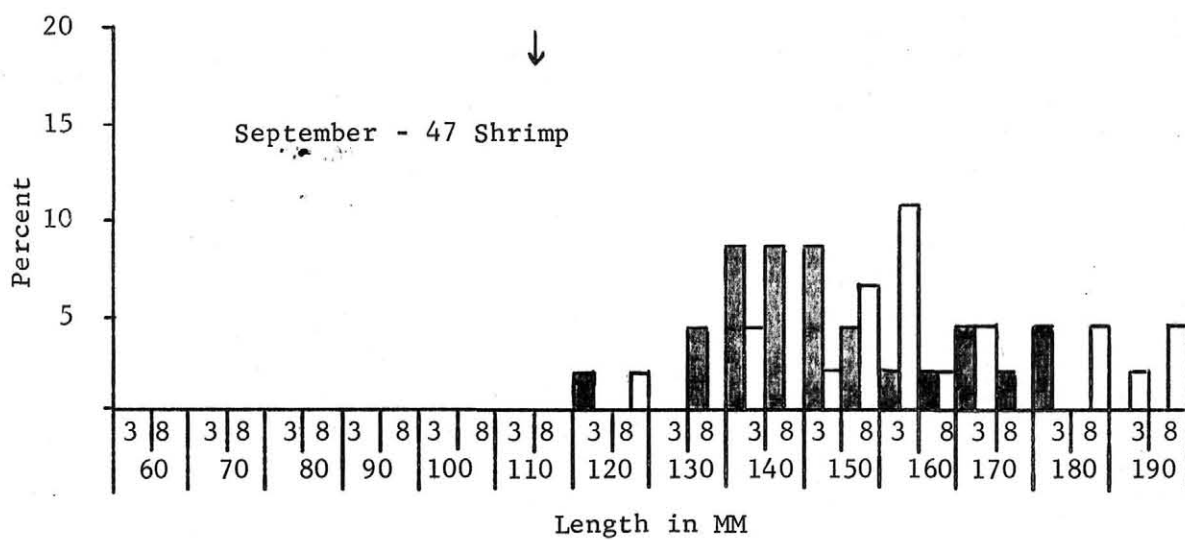
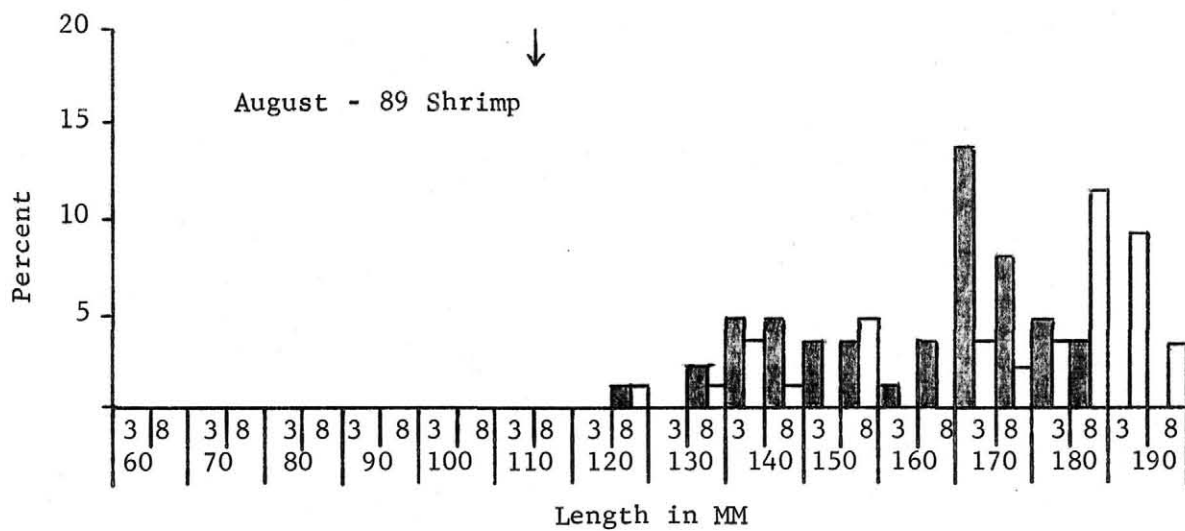
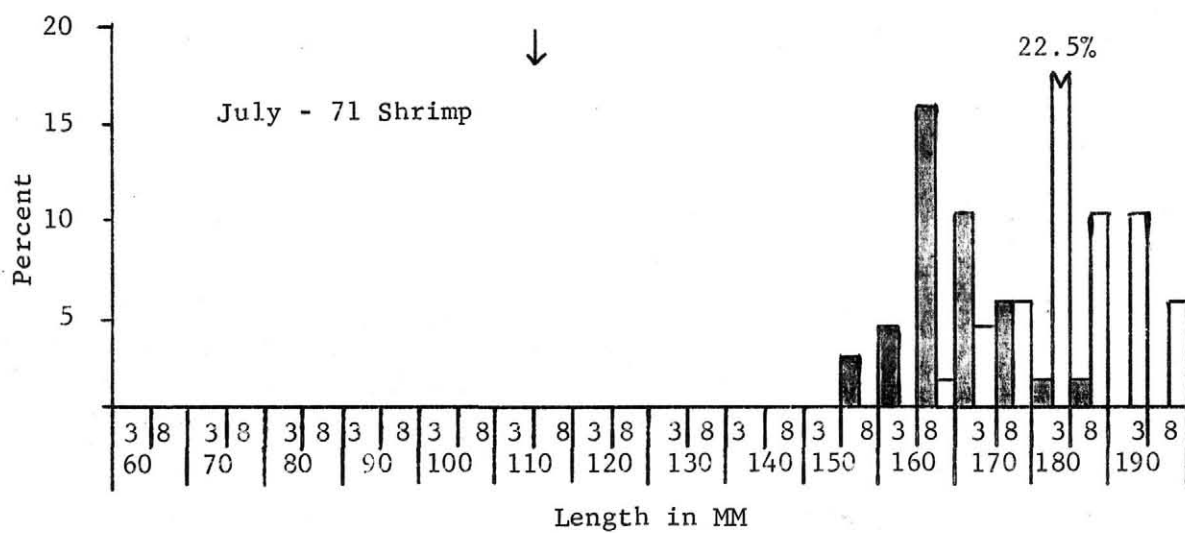


Figure 3

White Shrimp

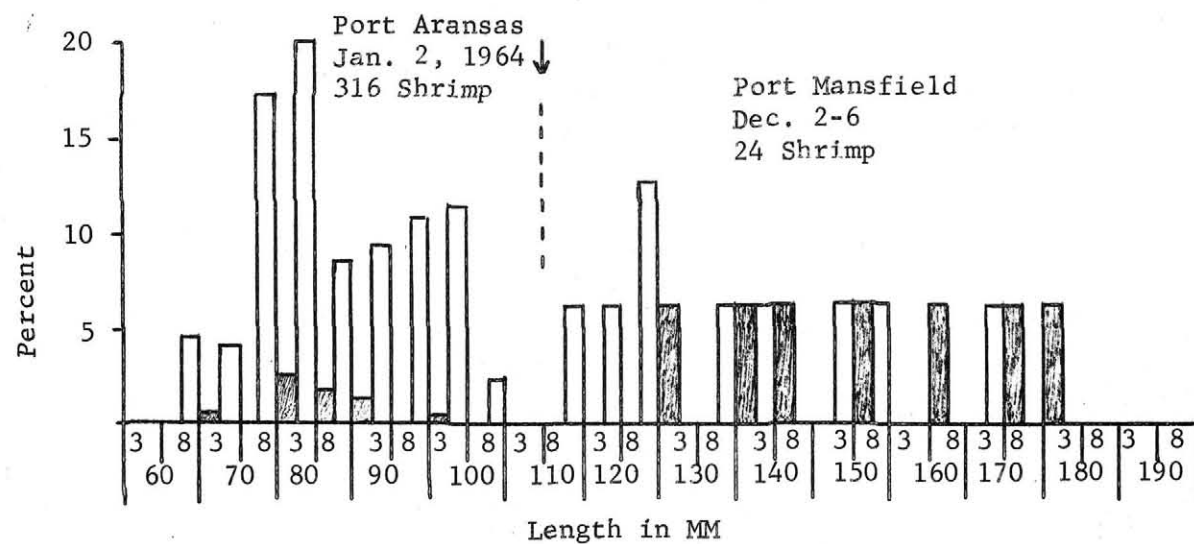
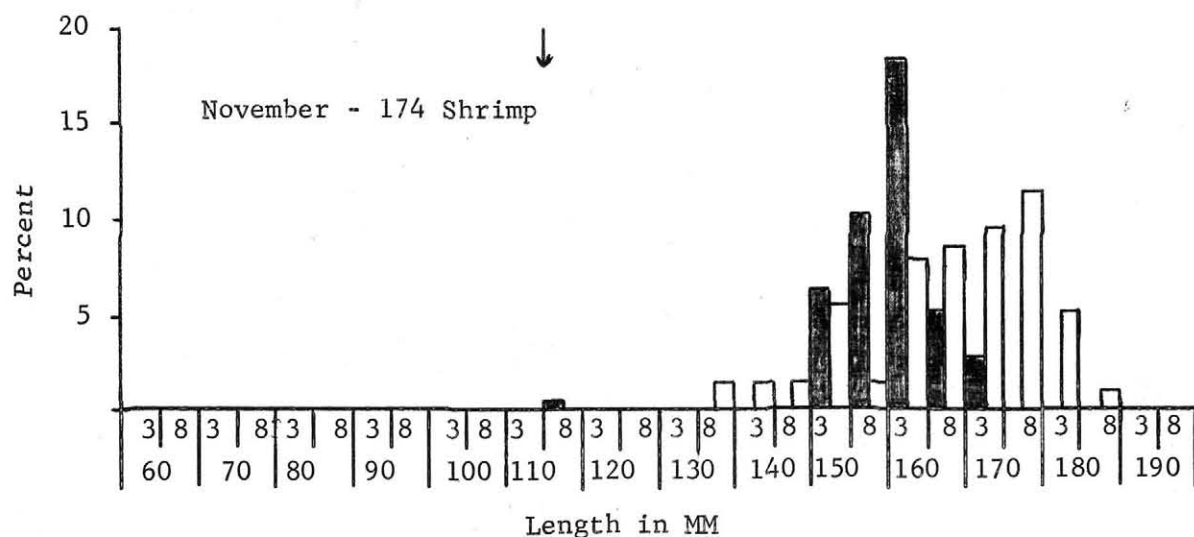
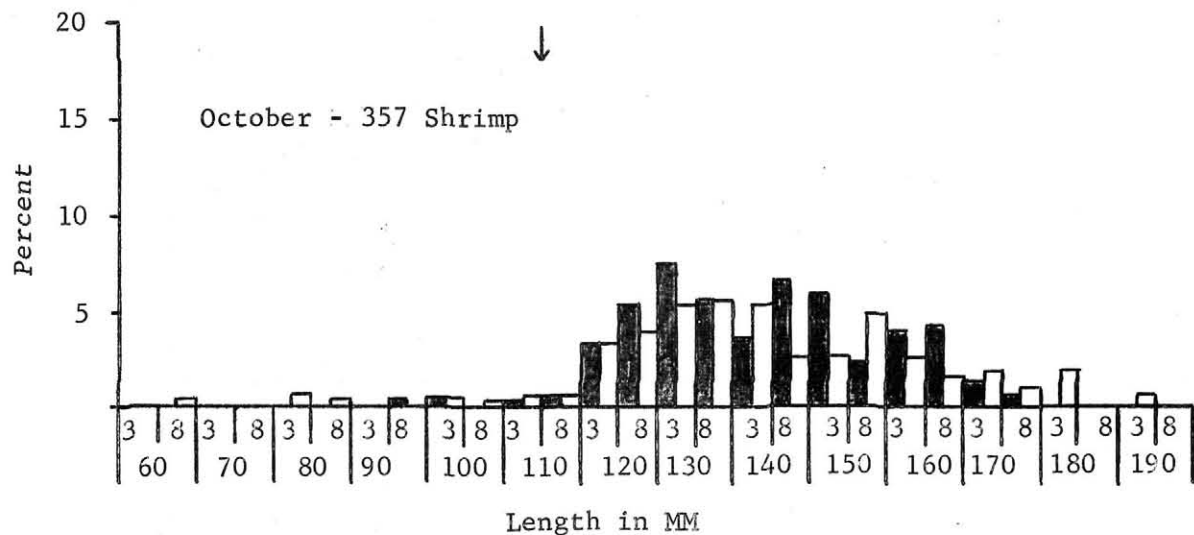


Figure 4
Commercial Shrimp Catch from Gulf off Texas Coast
Graphed in Heads-off Pounds per 24-Hours Fishing
Effort

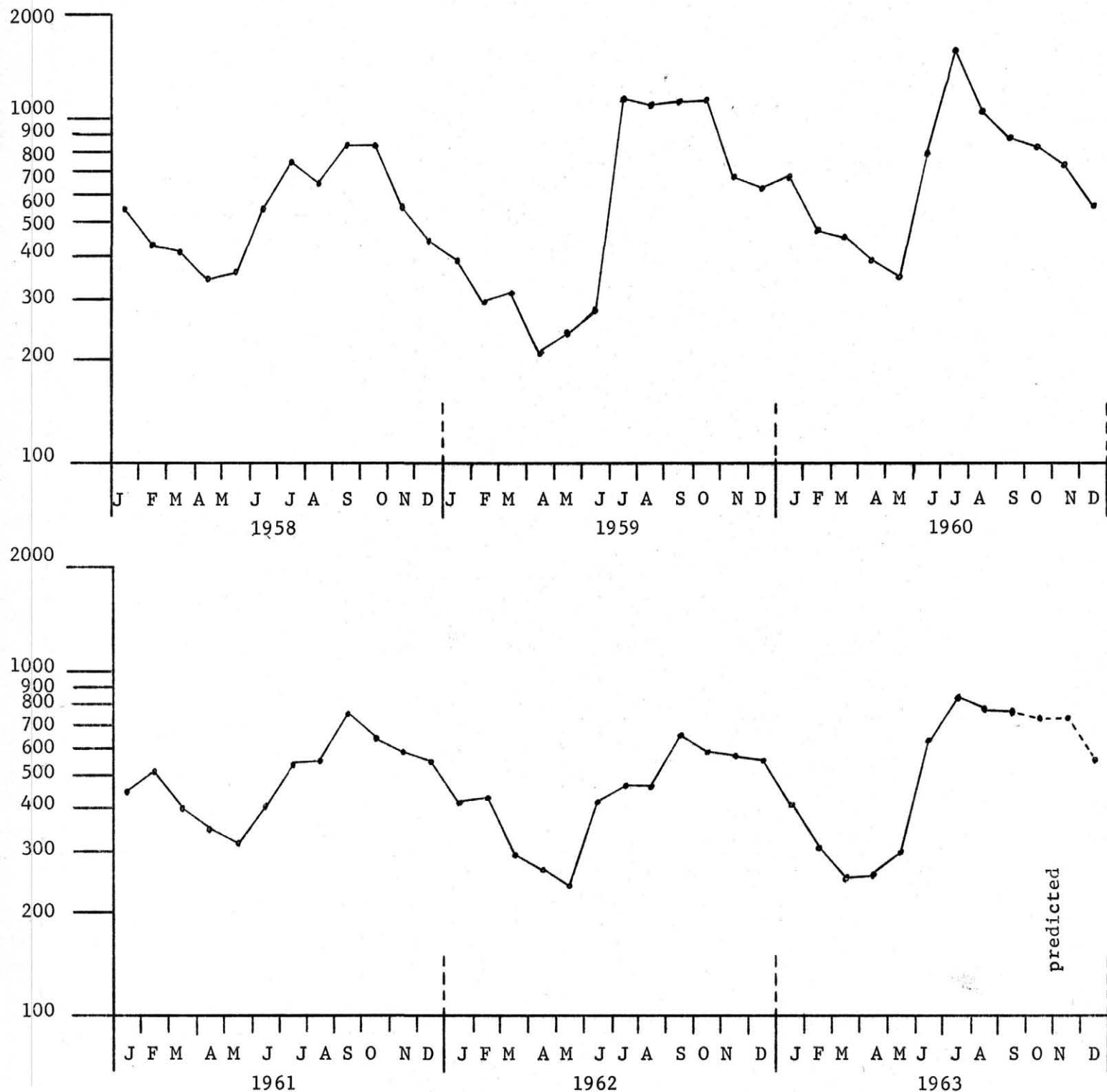


Figure 5

Non-Commercial Species Graphed in Average Number Per Trawl

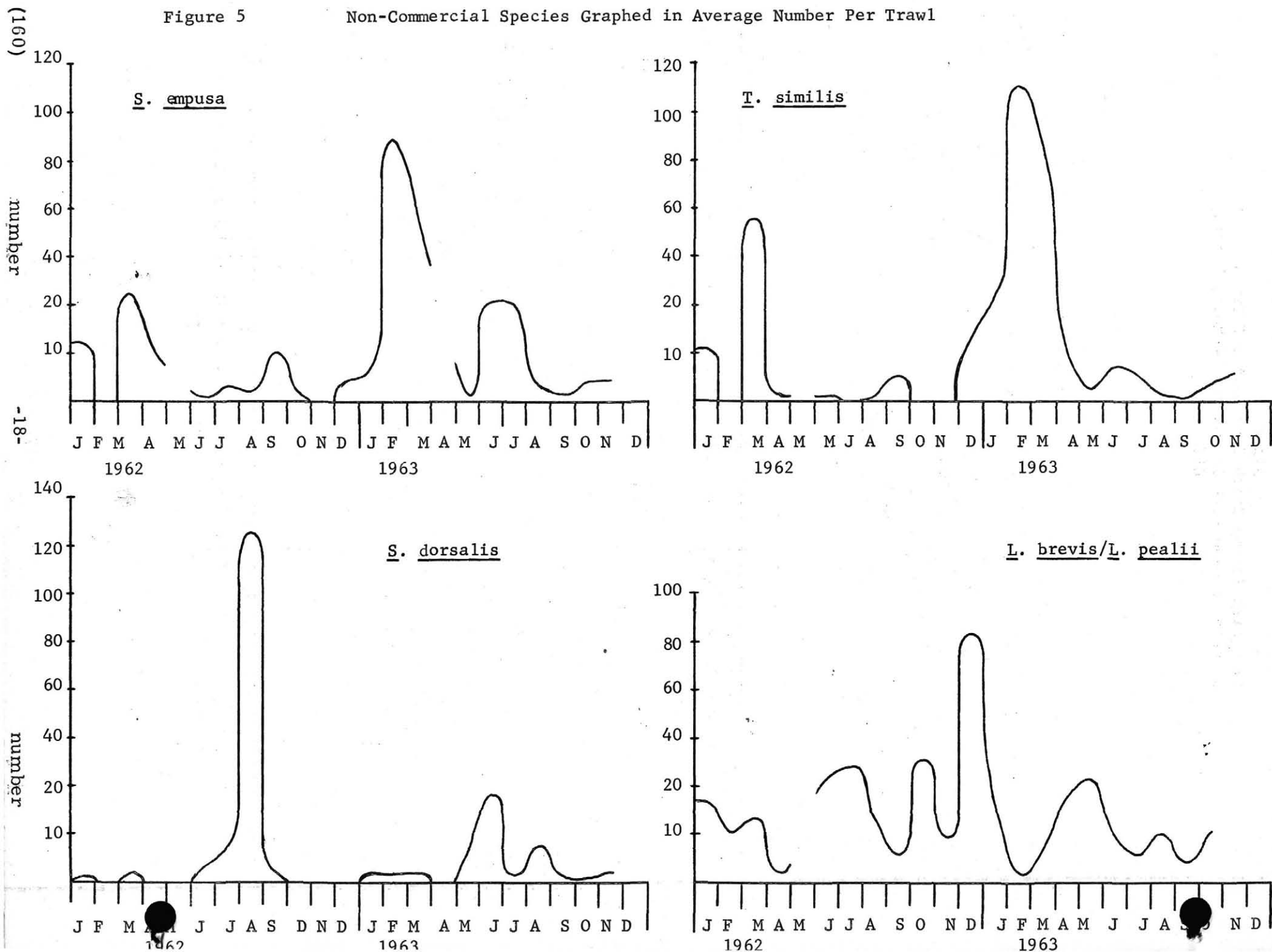
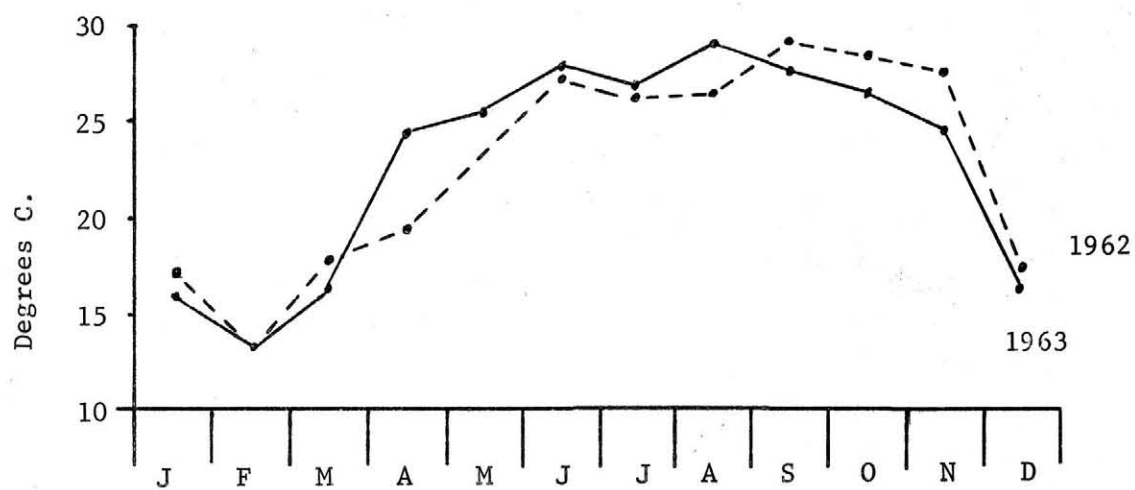


Figure 6

Bottom Samples
Average Monthly Temperature



Average Monthly Salinity

