

JOB REPORT

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Project Name: Studies of the Blue Crab Populations of the Texas Coast
Period Covered: January 1, 1963 to December 31, 1963 Job No. 5

Population Studies of the Blue Crab, Callinectes sapidus Rathbun, in the Aransas Bay System

Abstract: In 1963, blue crabs were 80 per cent less abundant in 10-foot trawl samples than in 1961 and 15 per cent less abundant than in 1962. The sampling device best suited for sampling sub-adult crabs in 1963 was the bar-seine. The 60-foot seine was least selective in terms of size. Female crabs of sub-adult and adult sizes outnumbered males by 14 per cent and 9 per cent, respectively. Salinities have increased 75 per cent since 1961, and commercial crab landings have decreased 50 per cent.

Objectives: To determine the population and seasonal abundance of the blue crab in the Aransas Bay System.

Procedure: Sampling for blue crabs was conducted with minnow seine, otter trawl, and bar seine. All habitat types were sampled (Figure 1).

Monthly collections were made up of four 20-foot otter trawl samples, eight 10-foot trawl samples, four minnow seine samples, and two bar seine samples.

The minnow seine used was 60 feet long and 6 feet deep, with a bag near the center. The mesh was three-fourth of an inch stretched. The bar seine was 6 feet wide and constructed of one-half of an inch stretch mesh. The 20-foot trawl was made of 1 1/2 inch stretch mesh and the 10-foot trawl was made of 1 1/4 inch stretch mesh with an inner liner of one-half of an inch stretch mesh in the cod end.

All crabs taken by these methods were checked for external parasites, measured, and sexed. Water temperature was measured with a centigrade thermometer. Turbidity was determined with the use of a U. S. Geological Turbidity Scale, and salinity was measured with specific gravity hydrometers and Knudsen's Hydrographic Tables.

Findings and

Discussion: Samples catches, by gear, are plotted in Figures 2 - 5. Catch sex ratios are presented in Figures 6 and 7. Figure 8 shows the length frequency distribution of the total monthly catch. Commercial landings for the last four years beginning in 1960 are found in Figure 9. Table 1 contains crab catch by gear and by station for 1962 and 1963. All entries, except for the 60-foot seine, represent semi-monthly samples made near the first and fifteenth of the month.

When catch per unit of effort is mentioned, it shall mean one 15-minute pull with the otter trawls, one 500-foot drag with the bar-seine, or one 150 by 30-foot drag with the 60-foot seine. The 60-foot seine covers about one-tenth of an acre per drag.

Station descriptions are tabulated below.

Station Description

<u>Station</u>	<u>Gear</u>	<u>Depth</u>	<u>Bottom Type</u>	<u>Vegetation</u>	<u>Location</u>
1	10-ft. trawl	10-12 ft.	Gray mud	<u>Gracilaria</u>	Aransas Bay, Mkr. 60
2	10-ft. trawl	11-12 ft.	Gray mud	<u>Gracilaria</u>	Aransas Bay, Mkr. 37
3	10-ft. trawl	4-5 ft.	Gray mud	<u>Gracilaria</u>	Mouth of Mission-Copano Bay
4	10-ft. trawl	5-6 ft.	Gray mud	<u>Gracilaria</u>	Mouth of Aransas Bay
1	20-ft. trawl	11-12 ft.	Gray mud	<u>Gracilaria</u>	Aransas Bay
2	20-ft. trawl	4-5 ft.	Gray mud	<u>Gracilaria</u>	Mesquite Bay
1	6-ft. bar seine	1-3 ft.	Gray mud and sand	<u>Diplanthera</u>	Mission Bay
1	60-ft. seine	1-3 ft.	Gray mud and sand	<u>Diplanthera</u>	Mission Bay
2	60-ft. seine	1-3 ft.	Gray mud and sand	<u>Diplanthera</u>	Port Bay
3	60 ft. seine	1-3 ft.	Gray muddy sand	<u>Diplanthera</u>	Copano Bay
4	60-ft. seine	1-3 ft.	Gray mud, sand and shell	<u>Diplanthera</u>	Aransas Bay

Ten-foot trawl catch data goes back to 1960 (Figure 2) with the exception of 1961. When trawl catch per unit of effort for those years was compared, it was found that in 1960 crabs were very abundant while in 1962 and 1963 crabs were less abundant. In 1960, the catch per drag in 10-foot trawl samples was 5.68, in 1962 it was 2.02, and in 1963 it was 1.25. In 1962, crabs were 65 per cent less abundant than in 1960, and in 1963 there was an additional 15 per cent decline. This later decline compared with a 15 per cent decline in rainfall from 1962, indicates a good correlation exists between crab abundance and rainfall (Project MF-R-5, Job No. 6, 1964). In 1962 and 1963, Station 1 was almost void of crabs (Table 1). At station 2 there was an increase in total crabs taken in 1963. Station 3 and 4 for the two years (Table 1) accounted for the largest percentage of crabs caught in 10-foot trawl samples. Too few crabs were taken to consider catch differences in 10-foot trawl catch by station between 1962 and 1963. It should be noted, however, that in both 1962 and 1963, secondary bay stations 3 and 4 were more productive than primary bay stations 1 and 2 (Figure 1).

Twenty-foot trawl samples in 1963 decreased in crab catch 90 per cent, yet 10-foot trawl samples show little difference. This indicates that there were fewer crabs in 1963 and that the major portion of the crab population was located in secondary bays (Table 1).

In 1963 (Table 1, Figure 4), 60-foot seine samples contained the most crabs while in 1962 the 20-foot trawl caught more. Of the four 60-foot seine stations, Station 2 was the most productive in 1962 (Figure 1, Table 1). It was also productive in 1963, but Station 4 showed a greater catch. The catches at Stations 1, 2, and 3 remained about the same during both years. Two peaks of crab abundance (Figure 4) occurred in 1962 and 1963 at about the same time. However, the seine catch increased by 50 per cent in 1963.

The 1963 bar-seine catches were less than in 1962. There were peaks of abundance in March of both years (Figure 3). These peaks were of crabs in the 10-40 mm size range. Toward the end of each study year a small peak of juvenile crabs was noted (Figure 3). This would indicate an extended spawning period with two spawning peaks.

Gear comparison shows that the 60-foot seine catch (Figure 4) most nearly resembles the total commercial catch (Figure 6). The 6-foot bar seine, while not sampling the entire population size range, did sample the juvenile crab population quite well.

The 20-foot trawl (Table 1) was more efficient than the 60-foot seine in 1962 but caught few crabs in 1963. It appears that the population may have moved out of primary deep water areas and into secondary and tertiary areas. This is further substantiated by 10-foot trawl station differences previously mentioned.

Length frequency distributions (Figure 8) for the entire sample catch in 1963 shows the population structure by month. From this it was learned that crabs over 4 inches occurred in samples mainly from May through November. Commercial landings (Figure 9) show a similar picture of market size crabs from a peak occurring in March on through November. Fluctuations in commercial landings (Figure 9) throughout the year is correlated well with fluctuations in abundance of market sized crabs (Figure 8) in study samples.

Comments: Osborn (1961-62) found that near Port Isable and Port Mansfield megalops crabs were very abundant in the Gulf surf in the fall of 1961. This abundance was followed by an increase in the number of juvenile crabs in the Lower Laguna Madre. In 1962, Osborn (op. cit.) noted that megalops were almost absent in the surf and that juveniles in the bay were only 10 per cent as abundant as during the previous year. Johnson (1963) took increased numbers of megalops in the Gulf and juveniles in the bay. Osborn (1961-62) noted that although megalops were scarce in the surf in 1962, sponge crabs were abundant in and near the passes. Johnson (1963) reported that salinity in the lower Laguna Madre was higher in 1963 than in 1962. Since no commercial fishery exists in that area, these data seem to indicate that shortages of crabs are not primarily due to overfishing but that juvenile crabs may fail to survive in the bays during periods of high salinity or that survival of larvae in the Gulf is a critical factor.

No larval samples were secured from the Gulf surf near Aransas Bay. If, however, the same trends reported by Osborn (1961-62) hold true for the entire lower Texas coast, then there was good correlation between the abundance of megalops in late 1961, the commercial landing (Aransas area) of 1 million pounds in 1962, the scarcity of megalops in 1962 and the 50 per cent reduction in Aransas area commercial landings in 1963.

Pearson (1948) found that it was physical factors which affected crab abundance in the Chesapeake Bay area. Salinities in the Gulf of Mexico have remained relatively the same since 1960 yet salinities in the bays have increased 75 per cent. Pearson believed that the salinity in Chesapeake Bay near the spawning grounds was a critical factor in crab survival. Because of the high salinities in the Aransas area in 1962 and low crab landings in 1963, it is felt that salinity is also a major factor influencing crab survival in Texas waters. If this is true, 1964 should have fewer pounds of crabs landed than in 1963.

It was found (Costlow and Bookhout 1959) that larval development of the blue crab was greatest in salinities of 21.1 to 31.1 ppt. This would indicate that in drought years when salinities are about 30 ppt in the bays and inshore gulf, conditions would not be conducive to larval crab growth and would explain the absence of crab larvae in Osborn's samples in 1962.

It could be that there was a poor spawn in 1962 but this would be difficult to determine at such a late date. In order to verify success of spawn in the future and correlate megalops crab abundance with commercial and study samples it is necessary to enact studies on post-larval crabs coming into the bays.

Because fluctuations in climatic conditions in the Aransas area seem to affect changes in crab abundance any restrictions on taking crabs would be unwise. To put restrictions on a renewable fishery, and to assume it would insure increased crab abundance, would be erroneous as seen in the Chesapeake Bay Fishery (Pearson 1948). As to the question of protecting the sponge crab, Pearson (1948) found "there was no correlation between the number of sponge crabs and their progeny", indicating no need to restrict their capture.

The commercial crab catch in the Aransas area will probably fluctuate as physical factors fluctuate. In years of low salinity (0-20 ppt), a good temporary fishery could be established (Figure 9). In years of high salinity (30-50 ppt), it is doubtful that a fishery could be sustained.

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Figure 1. Crab sample stations in the Aransas Bay Area

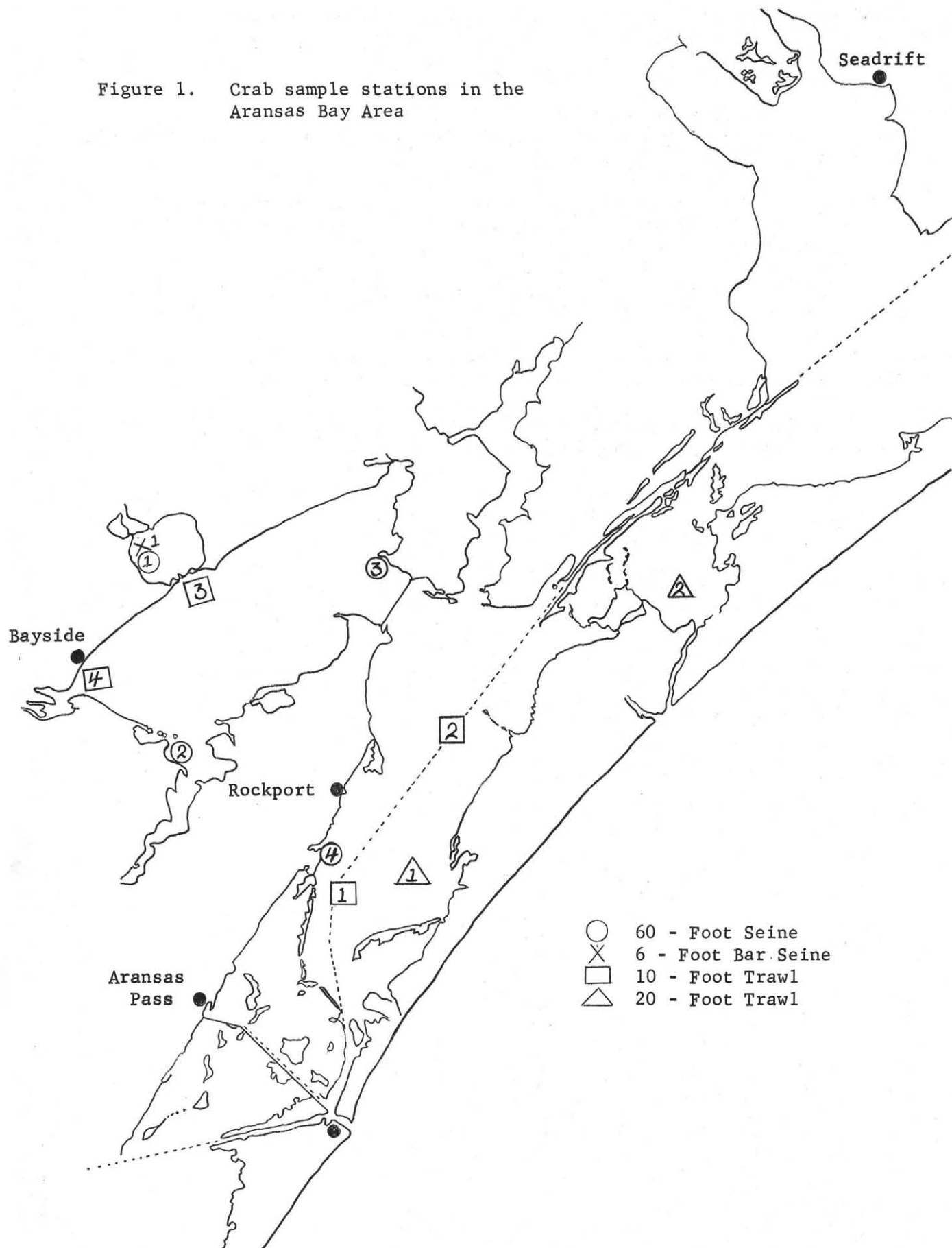
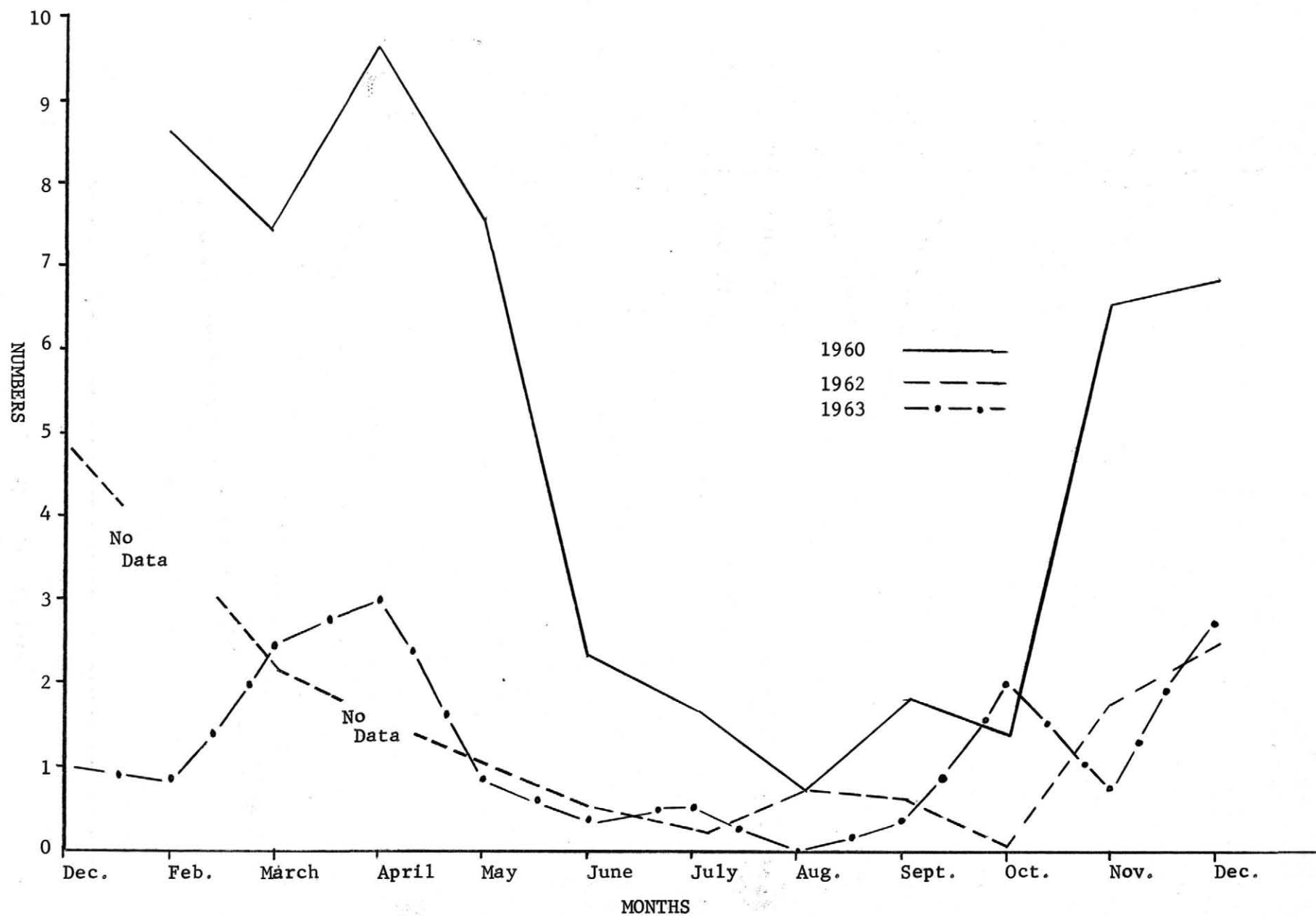


Figure 2: A comparison of monthly crab catch per unit effort between 1960, 1962, and 1963 in 10 foot trawl samples. 1 unit of effort = 1 15 minute trawl.



(560)

-8-

Figure 3: A comparison of crab catch in 6-foot bar seine samples in 1962 and 1963
1 unit of effort = 1 500' drag with seine

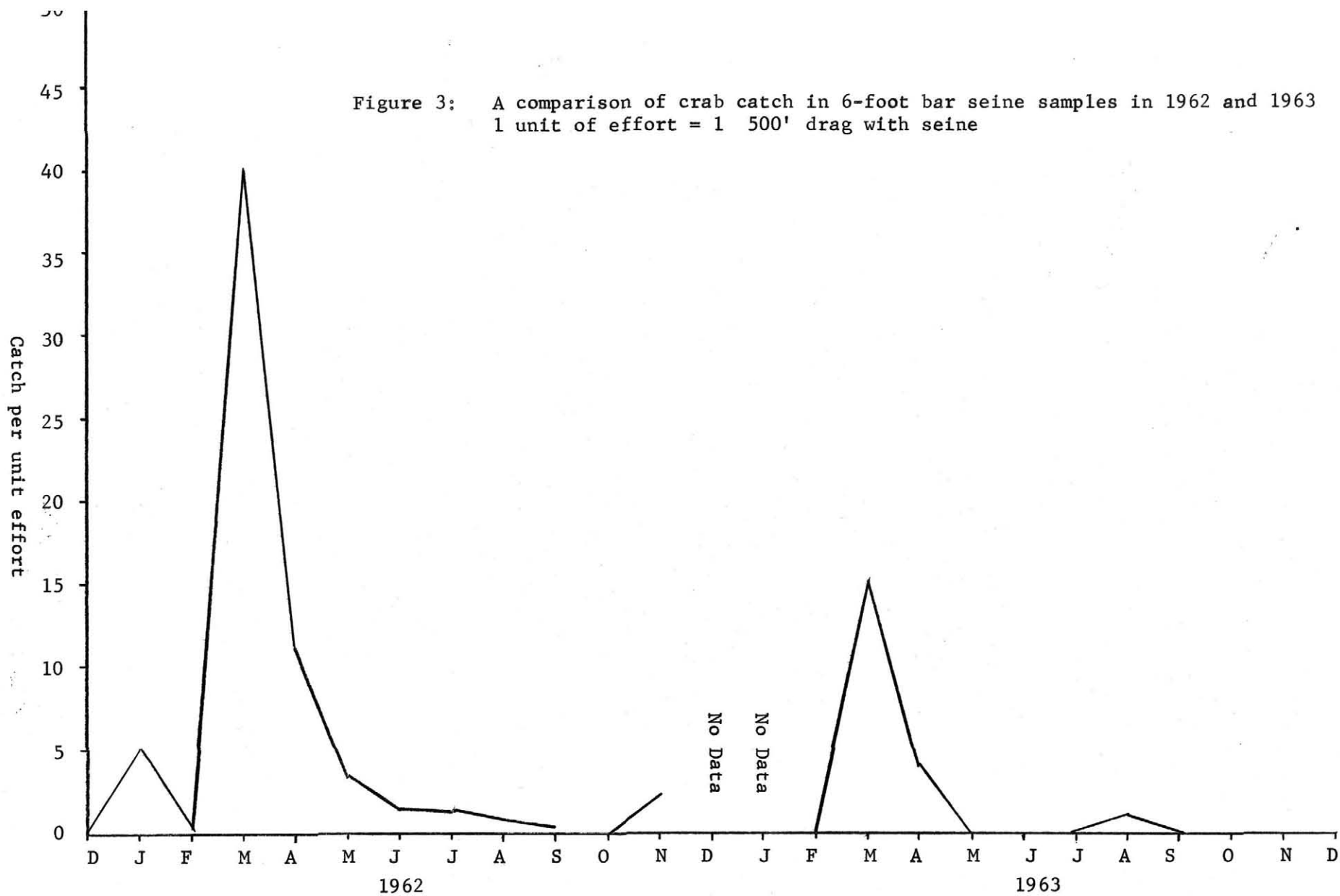


Figure 4: A comparison of monthly crab catch per acre in 1962 and 1963 in 60 foot seine samples

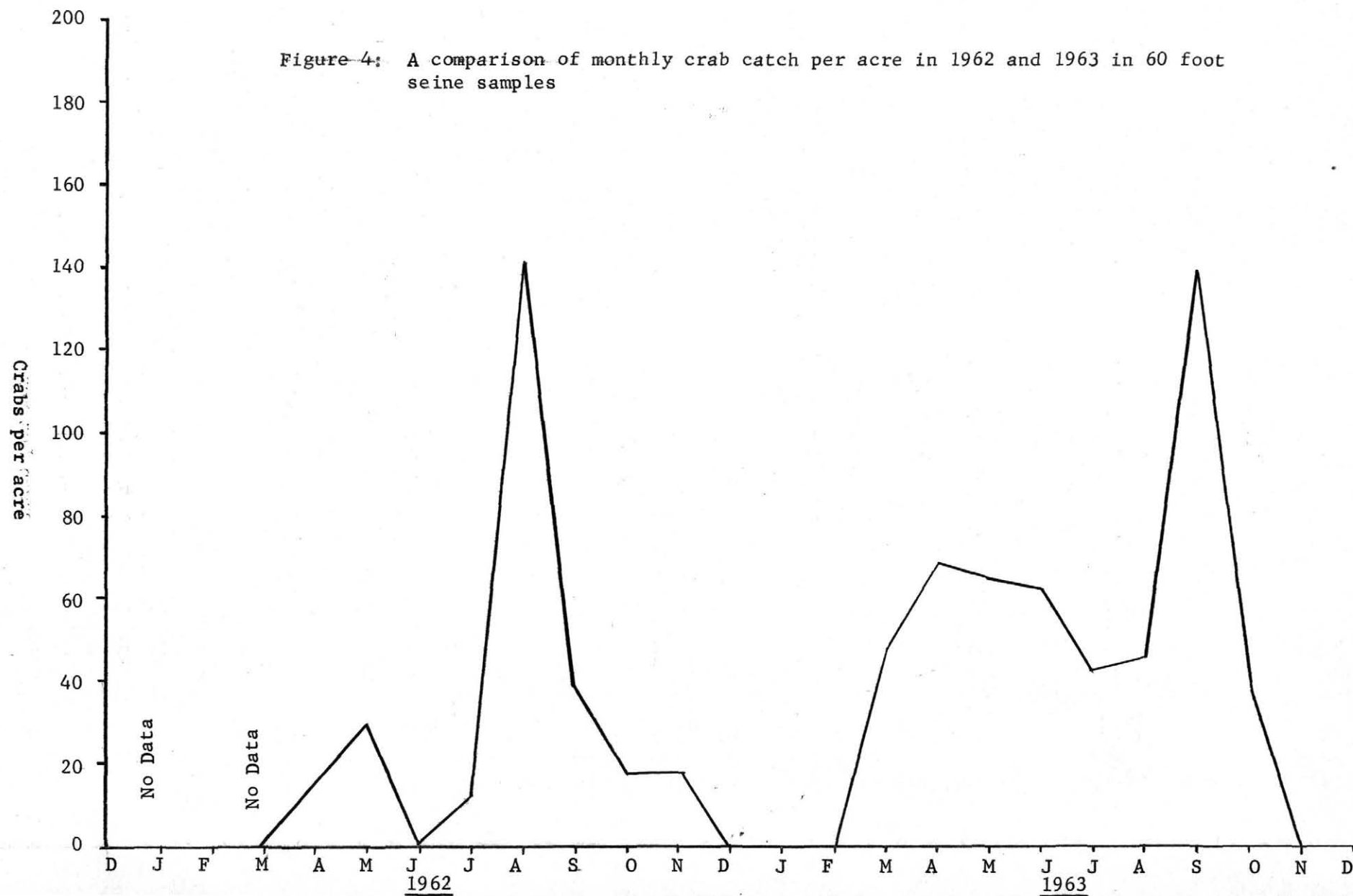


Figure 5: A comparison of monthly crab catch in 1962 and 1963 in 20 foot trawl samples.
1 unit of effort = one 15 minute trawl.

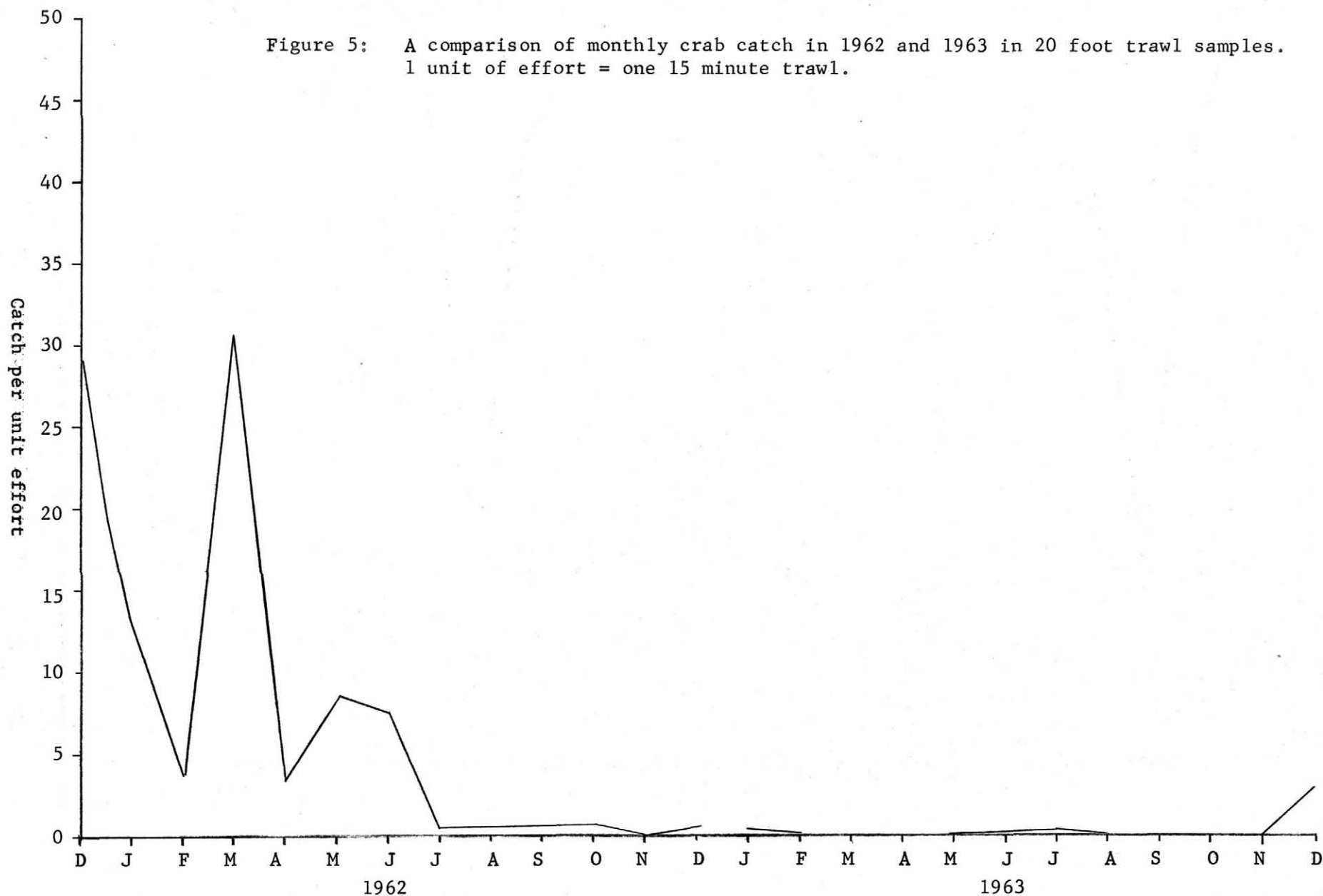


Figure 6: Total combined catch comparison male to Female 1963

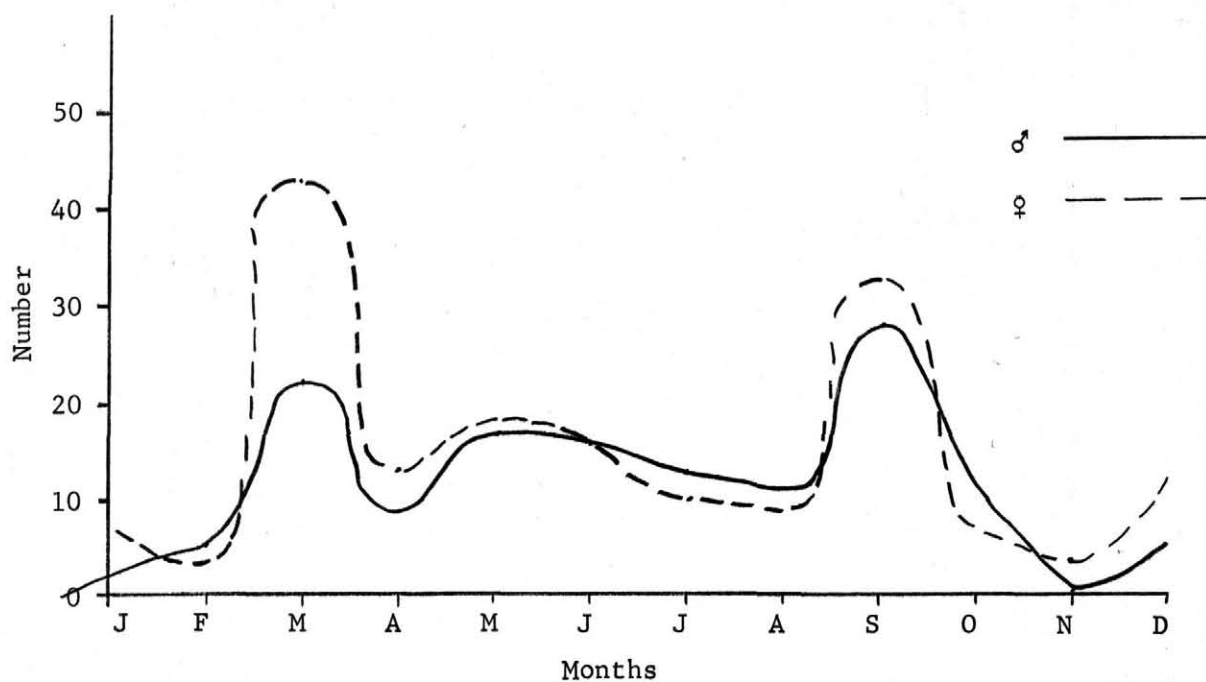


Figure 7: Sex ratio of crabs caught over 4 inch width

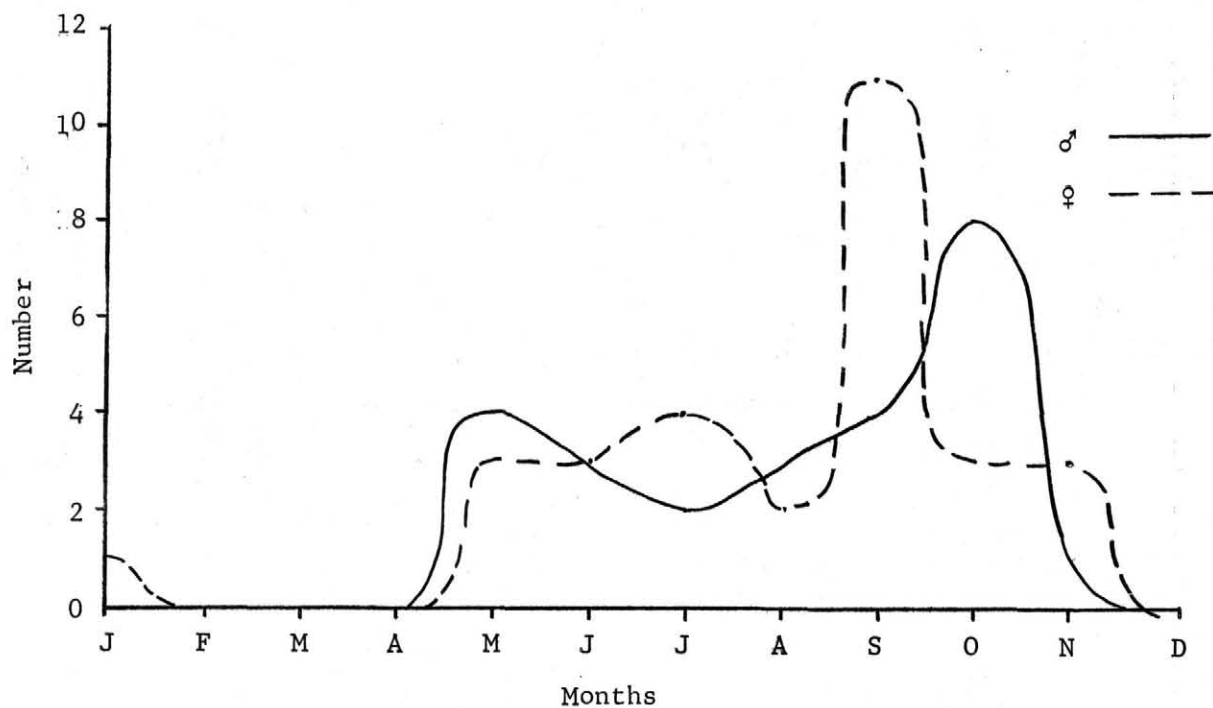


Figure 8: Monthly Width Frequency Distributions

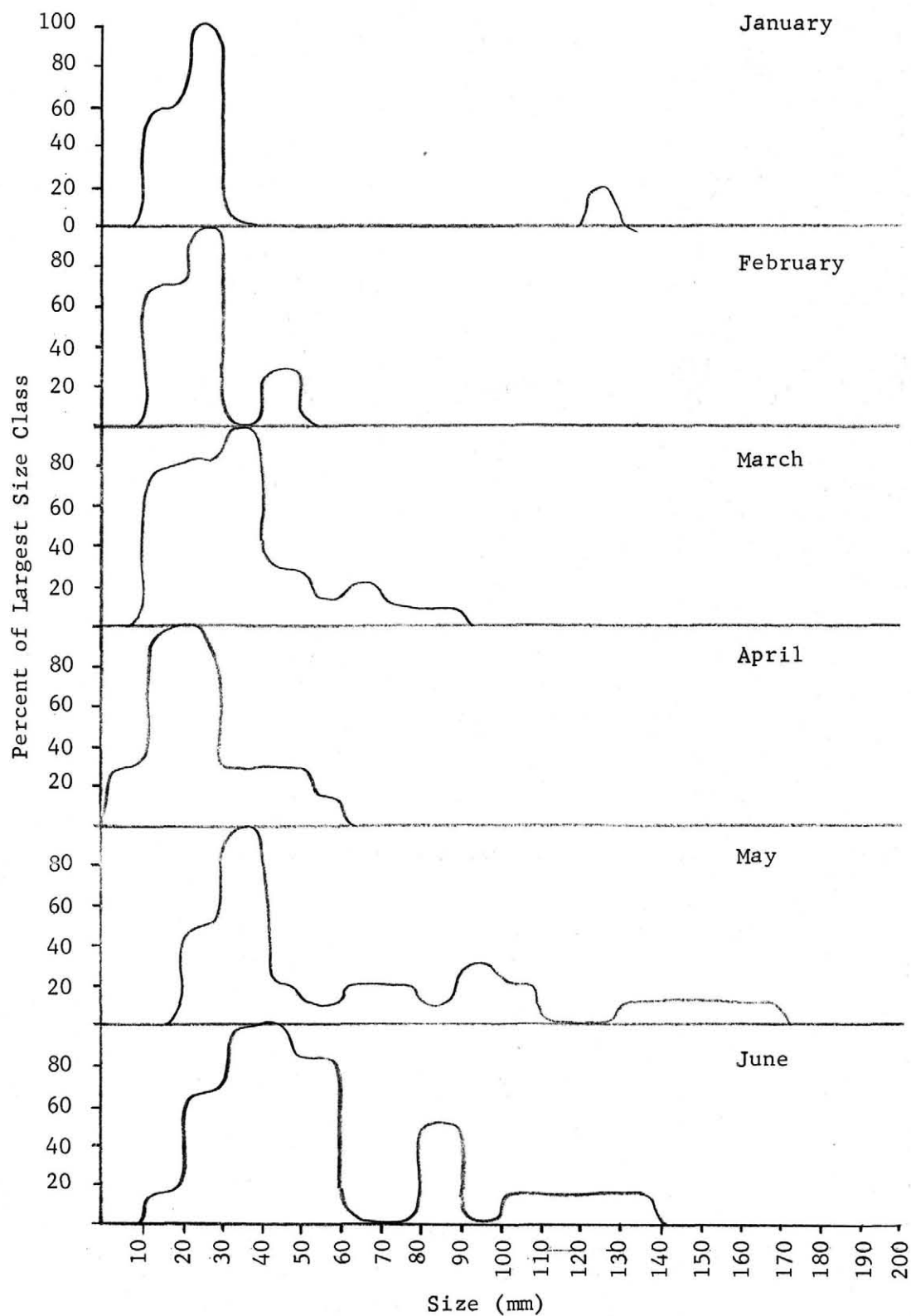


Figure 8 Continued: Monthly Width Frequency Distributions

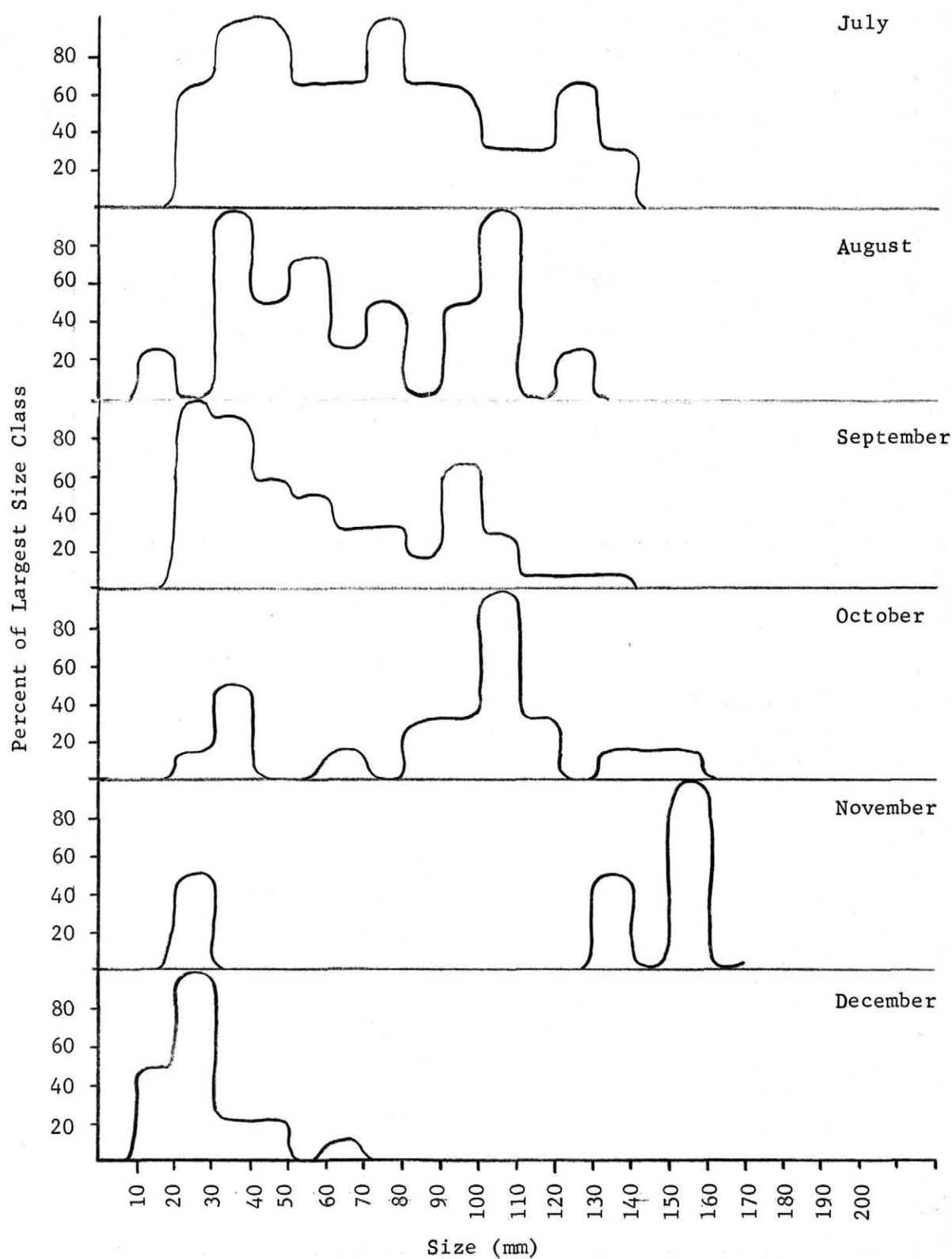


Figure 9: A comparison of Commercial Monthly Landings 1960, 1961, 1962, and 1963 from the Aransas Bay Area

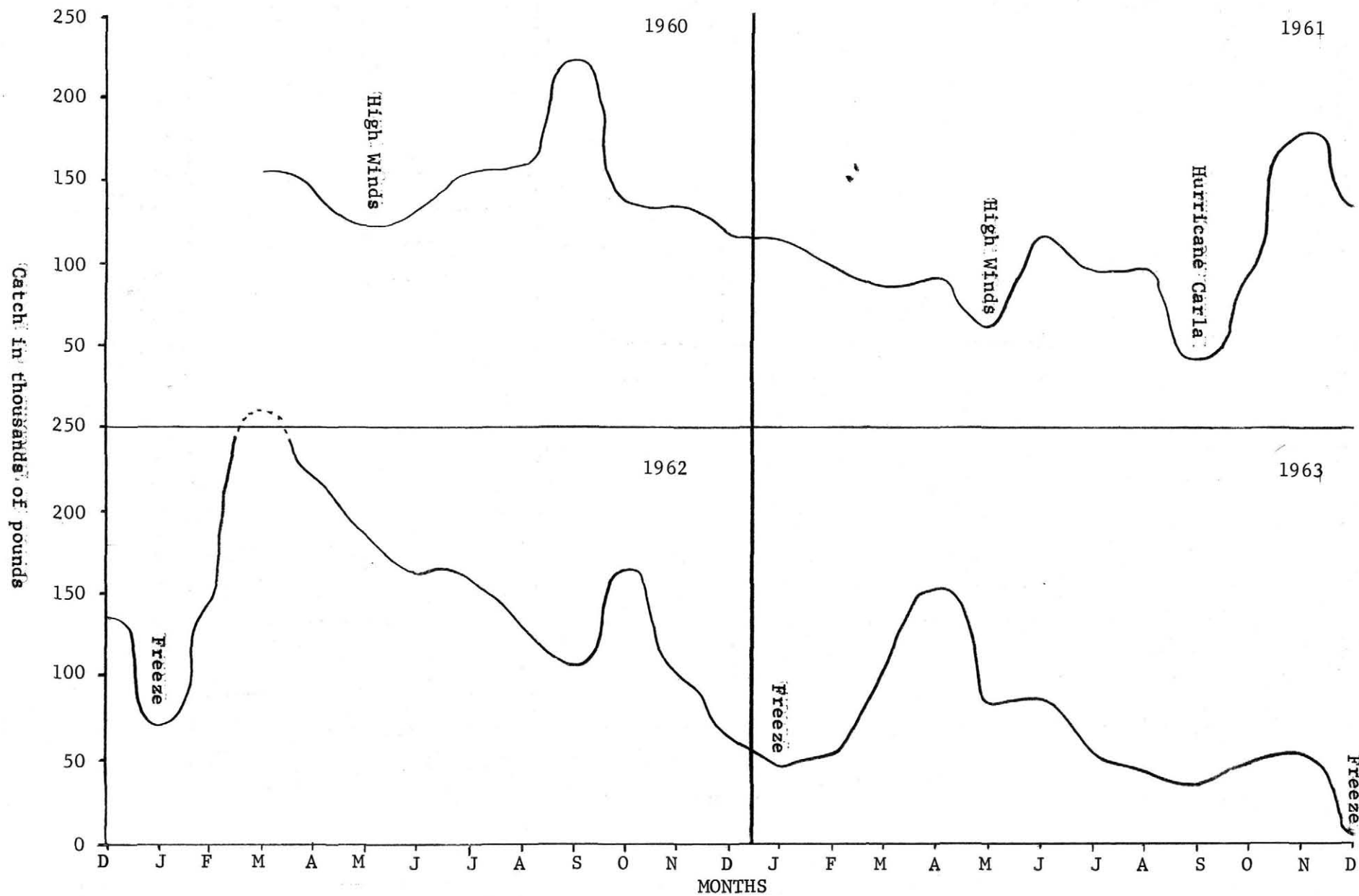


Table 1: Semi-Monthly Crab Catch by Gear in Aransas Area in 1962-1963

Day 1962	10-foot trawl								20-foot trawl				6-foot bar seine			60-foot seine		
	1st 1*	2*	3*	4*	15th 1*	2*	3*	4*	1st 1*	2*	15th 1*	2*	1st 1*	15th 1*	1*	2*	3*	4*
January		0	5	8	-	-	3	8	-	-	21	4	5	0	-	-	-	-
February	-	-	-	-	-	-	-	-	0	3	3	7	0	-	0	-	0	-
March	-	-	-	-	-	0	0	6	1	13	77	-	-	40	0	0	0	0
April	-	-	-	-	-	-	-	-	-	-	0	6	18	4	3	0	0	-
May		-	1	1		-	-	-	2	5	2	2	2	4	3	3	1	4
June		2	1	0		1	0	1	2	1	11	0	1	1	0	-	0	0
July	0	0	0	2	0	0	0	0	0	0	0	0	0	2	1	3	-	0
August	0	1	4	0	0	0	0	0	1	0	-	-	0	1	1	20	0	36
September	1	0	0	0	0	0	1	2	0	2	0	0	0	-	0	7	5	0
October	0	0	0	0	0	0	0	1	0	2	0	0	0	-	0	7	0	0
November	0	0	3	1	0	4	4	2	0	0	0	0	1	3	-	17	7	-
December	0	0	4	2	2	9	6	7	0	0	0	0	-	-	0	0	-	-
Total	1	3	18	13	2	14	14	27	6	26	114	19	27	55	8	57	13	40
1963																		
January	0	0	4	2	1	0	1	0	0	0	0	2	0	-	0	0	0	-
February	0	0	4	0	0	0	0	3	1	0	0	0	0	-	0	0	0	0
March	-	-	-	-	1	2	5	2	0	0	-	-	20	10	4	19	0	1
April	0	0	11	1	-	-	-	-	0	0	-	-	8	0	2	6	2	20
May	0	0	0	0	0	3	3	1	0	0	0	0	0	0	3	8	0	16
June	0	0	0	0	0	1	1	1	-	-	0	1	0	-	1	13	2	10
July	0	0	1	2	0	1	0	0	1	0	2	0	0	0	1	2	0	15
August	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	0	14
September	0	0	0	1	0	0	0	2	0	0	0	0	0	0	1	3	6	48
October	0	0	0	1	0	0	1	2	0	-	0	0	0	-	1	7	5	3
November	0	0	2	1	-	-	-	-	0	0	-	-	0	0	0	0	0	0
December																		
Total	1	10	22	8	2	7	11	11	2	6	2	3	28	12	15	61	15	127

NOTE: All crossed out spaces mean no sample made due to: 1. Weather, 2. Road Conditions, 3. Boat in Maintenance, 4. Lost or Torn Gear.

Blocked out spaces in 1962 mean no station.

* Station Numbers

In Figure 2, a comparison between male and female crabs collected in all methods of sampling is shown. It was found that females exceeded males during all months. In April, which was the period when crabs reached a peak of abundance, females made up 78 per cent of the sample collected.

Stations sampled with the 60-foot seine were inconsistent in catch from month to month. This could be attributed to extremely low tides which made the usual seining locations difficult to sample. However, most of the time, the samples indicate a similar trend in abundance. Figure 2 shows monthly catch of crabs per 60-foot seine haul. Figure 3 shows monthly catch of crabs per 20-foot shrimp trawl. These samples were taken in areas where the commercial shrimp fleet was working and these areas were not usually productive crab areas.

Trammel net and drag seine stations were usually located in areas where crabs were not present due to damage caused to nets by crabs; consequently, only a few crabs were taken by nets. Size range and mode are shown in Table 1 when enough crabs were caught to determine each. Juvenile crabs dominated the catch for 10 months out of the year.

Table 2 shows a comparison of sample catch by gear, station, and month. The most productive station sampled with 10-foot trawl was located in Nueces Bay where 56 juveniles were taken in April (Table 2). During May, crabs were fairly evenly distributed in primary and secondary bays but were relatively abundant in tertiary bays, particularly in Oso Bay. By June, the population had decreased although slightly more crabs were taken in Nueces Bay than at any other location. In August, there was a slight increase at the East Flats Station with a corresponding decrease at other stations. This might indicate movement out of the bays. Further indication of this is the general decrease at all stations in September, October, and November and a total absence at all stations in December (Table 2). The commercial fishery, which was only fair last year (1962), dropped considerably and most commercial houses did not handle any crabs at all in 1963.

Minnow seine stations were productive only in April, May, and June. In April, stations at Portland and Ingleside were barren while those at the East Flats and Shamrock were fairly productive. This situation was reversed in May, but returned to the same pattern in June and July. No crabs were taken in minnow seine samples from August through December.

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January		0	5	8	-	-	3	8	-	-	21	4	5	0	-	-	-	-	
February	-	-	-	-	-	-	-	-	0	3	3	7	0	-	0	-	0	-	
March	-	-	-	-	-	0	0	6	1	13	77	-	-	40	0	0	0	0	
April	-	-	-	-	-	-	-	-	-	-	0	6	18	4	3	0	0	-	
May		-	1	1		-	-	-	2	5	2	2	2	4	3	3	1	4	
June		2	1	0		1	0	1	2	1	11	0	1	1	0	-	0	0	
July	0	0	0	2	0	0	0	0	0	0	0	0	0	2	1	3	-	0	
August	0	1	4	0	0	0	0	0	1	0	-	-	0	1	1	20	0	36	
September	1	0	0	0	0	0	1	2	0	2	0	0	0	-	0	7	5	0	
October	0	0	0	0	0	0	0	1	0	2	0	0	0	-	0	7	0	0	
November	0	0	3	1	0	4	4	2	0	0	0	0	1	3	-	17	7	-	
December	0	0	4	2	2	9	6	7	0	0	0	0	-	-	0	0	-	-	
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February	0	0	4	0	0	0	0	3	1	0	0	0	0	-	0	0	0	0	
March	-	-	-	-	1	2	5	2	0	0	-	-	20	10	4	19	0	1	
April	0	0	11	1	-	-	-	-	0	0	-	-	8	0	2	6	2	20	
May	0	0	0	0	0	3	3	1	0	0	0	0	0	0	3	8	0	16	
June	0	0	0	0	0	1	1	1	-	-	0	1	0	-	1	13	2	10	
July	0	0	1	2	0	1	0	0	1	0	2	0	0	0	1	2	0	15	
August	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	0	14	
September	0	0	0	1	0	0	0	2	0	0	0	0	0	0	1	3	6	48	
October	0	0	0	1	0	0	1	2	0	-	0	0	0	-	1	7	5	3	
November	0	0	2	1	-	-	-	-	0	0	-	-	0	0	0	0	0	0	
December																			
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