Acc# 2155

Job Report

William R. More and Alan W. Moffett
Marine Biologists

Project No.: MC-R-3 Date: September 15, 1965

Project Name: Studies of the Blue Crab Populations of the Texas Coast

Period Covered: January 1, 1964 to December 31, 1964 Job No.: 2

Population Studies of the Blue Crabs of the Galveston Bay System

Abstract: Abundance peaks of small blue crabs, Callinectes sapidus, were found in the samples in February, July, and December.

Rough estimates of crab growth were made by tracing modal size progressions based on 60-foot seine data.

Crab landings during 1964 were 91 per cent higher than those reported in 1963.

Tagging studies are discussed and recommendations for improving the sampling program are offered.

Objectives: To study the blue crab populations of the Galveston Bay System, and to determine the seasonal abundance and movements of the crabs as related to environmental conditions. To determine the spawning success and fishing pressure.

Procedures: All blue crabs, Callinectes sapidus and Gulf crabs, C. danae contained in samples were sexed and measured, in carapace width, (distance between the tips of the lateral spines) in millimeters.

Sampling gears included: (1) a 6-foot bar seine of 1/4 inch bar mesh; (2) a 10-foot trawl of 1 1/4 inch stretch mesh with a 1/4 inch bar mesh cod end; and (3) a 60-foot seine of 3/8 inch bar mesh.

The bar-seine was used semi-monthly in two shallow tertiary bays and five shoreline marshes. A sample was collected by dragging the bar seine 500 feet behind a boat or by hand. At two shoreline stations it was impossible to pull the bar seine 500 feet, so the distance pulled was converted to 500 feet. Ten-foot trawl samples were collected semi-monthly in one secondary and two primary bay areas. The duration of each trawl was 15 minutes. The 60-foot seine was pulled 100 feet at each station.

Hydrographic and meterological data were collected at each station.

Commercial crab samples were collected monthly at two crab houses on the Bolivar Peninsula. Data on sex, maturity stages, sizes, and areas of capture were noted.

Petersen disc tags were applied to all crabs (118 mm wide or over) caught in the samples. The tagging procedure was described by Moffett and More (1964).

The stations are shown in Figure 1 and a description of each is presented in Table 1.

Findings &
Discussion:

Seasonal Occurrence and Growth

Monthly average blue crab, Callinectes sapidus catch rates by sampling gear are shown in Tables 2, 3, and 4. Peak months of abundance in the samples from bar seine stations were February and December, while the largest catches at 60-foot seine stations were made in March and July. The March 10-foot trawl catch preponderated other monthly trawl samples.

The bar-seine was used to detect changes in apparent juvenile blue crab abundance which probably reflect separate broods (Moffett and More 1964). Small crabs (8-18 mm) were collected in the bar-seine (Figure 3), from February through December indicating a long spawning season. A large wave of small crabs (8-18mm) was present at bar-seine stations in February when sampling began. Although sampling was interrupted in the winter, these small crabs may be members of a large wave that appeared in bar-seine samples in December 1963 (Figure 2). A second wave of small crabs appeared in bar-seine samples taken in July. Since the commercial catch from the lower and middle bay contained large numbers of sponge crabs (Table 5) in March and April, we believe that the July wave was the result of successful spring spawning group.

The appearance of another large wave of small crabs in November and December suggest that a second spawning peak occurred in late summer. This agrees with Daugherty (1952), who found a second peak of blue crab spawning in South Texas in the summer. This also corresponds with data obtained at commercial crab houses which shows a second peak in sponge crab production during early July (Table 5).

Reliable growth rates for crustaceans are difficult to determine (Darnell 1959), however, if the samples are large and randomly distributed throughout the estuary, a rough estimate of growth can be made.

In Figure 4 the monthly width-frequency distributions of blue crabs caught in the 60-foot seine are shown. The broken line is the average monthly width-frequency curve. All shaded areas represent deviations above the average. Examination of the modes in Figure 4 suggests that blue crabs 33 mm wide in March were 123 mm wide in August; thus the average growth was estimated at 18 mm per month. In October a second group (July) appeared at 60-foot seine stations at a modal size of 73 mm. By December the modal size was 93 mm. This group of crabs probably will not enter the commercial fishery until the spring of 1965.

Figure 5 shows per cent soft and buckram* crabs in monthly samples. Molting crabs were found during all months (the majority were found in summer; the fewest were found in winter). This agrees with findings by Darnell (1959) in Louisiana, and Daugherty (1952) in South Texas, who reported that during mild winters limited growth occurs.

The Gulf blue crab, C. danae was collected in all months from March through December, but was most abundant in October (Figure 6).

---

* Crabs having a pliable, leathery shell. This stage follows the soft crab condition.

Tagging

To determine blue crab movements in Galveston Bay, 819 adult crabs (over 115 mm wide) were tagged and released in three locations in the estuary and in the Gulf surf along Galveston beach during 1963 and 1964 (Table 6). The overall recovery rate was 9.5 per cent. These returns included 62 males, 13 sooks (adult female crabs) and two sponge (female crab with egg mass) crabs. Of these returns, 84 per cent of the male crabs and 77 per cent of the female crabs were recaptured within five miles of the tagging site.

Tagged adult female crabs captured outside the area of release showed a southward movement toward the lower bay (Figure 7). The longest movement by a female crab tagged in the estuary was 13 miles south. This crab was tagged on February 19, 1964 at Seabrook, Texas and was recaptured 78 days later at Texas City Dike (Table 7).

The movements of male crabs were random and non-directional and did not form a distinct pattern. The longest movement by a tagged male crab was 12 miles east. This crab (tagged in Clear Lake on June 5, 1964 was at liberty for 220 days (Table 7).

Only 2 of 180 tagged sponge crabs were returned. One sponge crab was recovered in the Gulf surf (after spawning) some 16 miles from the tagging site in lower Galveston Bay. It was tagged on April 15, 1964 and was free for 46 days (Table 7).

Commercial Landings and Commercial Fishery

In recent years crab landings in the Galveston area have increased sharply (Figure 8). During 1964 over 1,250,00 pounds were reported from Galveston Bay, and landings were 91 per cent higher than landings reported in 1963 (Table 8). Production peaks in 1964 were reached in April, May, and June.

Most of the commercial fishing pressure was in lower East Bay, middle-lower Galveston Bay, Trinity Bay, and Clear Lake. Male crabs usually bring the highest yield* and for this reason are fished more extensively than female crabs. The large numbers of sponge crabs in the commercial catch in April (Table 5) lowered the yield, but the large number taken compensated for the low yield.

The sex composition of the commercial blue crab catch by month is shown in Table 5. The absence of sponge crabs from the upper bay catches indicate that sexually mature female crabs seek higher saline waters as the sponge develops. Sponge crabs were present in the middle and lower bay catches from March through August. They were most abundant in the catches from the middle bay in March and from the lower bay in April and July. The sex composition of large blue crabs from the lower bay in June is not known since fishing pressure shifted to Trinity Bay when the market for sponge crabs dropped. After July, few sponge crabs were found in the commercial catches. This indicated that most had entered the Gulf to spawn.**

Male crabs were present in catches from all bay areas and were most abundant in catches from the upper and middle bay.

---

* Pounds of crab meat per 100 pounds live weight of crabs.

** Large numbers of female crabs were seined from the Gulf surf in June, July, and August. Many of these crabs showed evidence of having recently spawned.

During winter months there was a concentration of mature female crabs in the middle bay, especially on or near the major shell reefs. These crabs probably compose the bulk of the spring sponge crab fishery in the lower bay.

The first sponge crab of 1964 was collected during the second week of March.

Diseases

Only one female blue crab (42 mm wide) was found to be parasitzed by the rhizocephalan (Loxothylacus texanus) during this study. This specimen was taken at the Bolivar Bulkhead on March 11 when the salinity was 30.4 ppt.

Conclusions

The short life span of the blue crab and the rapid recruitement of juveniles into the fishable stock makes it difficult to predict the seasonal abundance of crabs from year to year. Present sampling methods can establish an index of relative abundance and may produce data which can be used to determine if there is a relationship between the relative abundance of juvenile crabs and the subsequent marketable crab population. If such a relationship exist, it may be possible to predict the supply of marketable size crabs in advance (Rees 1965).

Daugherty (1952) in south Texas, Walburg (1963) in North Carolina and South Carolina, and Pearson (1948) in Chesapeake Bay have all made references to the fluctuations in blue crab landings. Attempts to control these fluctuations by protective legislation have proven unsuccessful and management practices must be based on scientific knowledge of the causes and changes in abundance (Walburg 1963). Studies on growth, environmental requirements, migration and mortality rates may cast some light on crab abundance changes.

More information is needed on the commercial blue crab fishery, especially sizes caught, catch per unit of effort and fishing distribution. This information can be obtained by systematic sampling of the commercial catch.

Tagging efforts should be intensified with special emphasis on female and sponge crab tagging in the lower bay. Some provisions for rewarding people who return crab tags would be helpful.

Prepared by: William R. More & Alan W. Moffett

U. R. Childress
Project Leader

Approved by: Terrance R. Leary
Coordinator

James R. Stevens
Regional Supervisor

Literature Cited

Darnell, Rezneat M. 1959 Studies of the Life History of the Blue Crab (*Callinectes sapidus* Rathbun) in Louisiana Waters. Trans. Amer. Fish. Soc. Vol. 88 (4).

Daugherty, F. M. Jr. 1952 The Blue Crab Investigations, 1949-50. Tex. Jour. of Sci., 4 (1).

Moffett, A. W. and W. R. More 1964 Population Studies of Blue Crabs of the Galveston Bay System. Coastal Fisheries Project Reports, Texas Parks and Wildlife Dept. (1963). (Memographed).

Pearson, John C. 1948 Fluctuations in the Abundance of the Blue Crab in Chesapeake Bay. U. S. Fish & Wild. Ser. Research Rpt. 14.

Rees, G. H. 1965 Blue Crab Studies. Bur. Comm. Fish. Biol. Lab. Beaufort, N. C. Informal Progress Report July 1, 1964 - Dec. 31, 1964. (Memographed).

Walburg, Charles H. 1963 Blue Crab Studies. Annual Rpt. Bur. Comm. Fish Biol. Lab. Beaufort, N. C. 1961 Circular 148.

Table 1: Habitat description of regular sampling stations (1964)

Tertiary Stations	Description	Salinity Range (ppt)	Vegetation
Double Bayou	Bottom type: mixed clay and soft mud, many Rangia sp. shells. Subject to frequent flooding and heavy runoff from rice field drainage.	0.6 - 15.7	Sprouts of Ruppia sp.
Dickinson Bayou	Bottom type: soft mud, heavy deposits of silt on sloping bottom.	8.5 - 16.9	None
Moses Lake	Bottom type: sandy clay - mixed shell, good nutrient source from near-by marshy area.	16.4 - 21.5	Frequent algae bloom, especially Enteromorpha sp.
Surf Oaks	Bottom type: sandy mud, marshy habitat, receives good supply of runoff from adjacent slough, salinities fluctuate.	2.0 - 24.4	Frequent algae blooms, especially Enteromorpha sp.
Houston Point	Bottom type: hard sand, low marshy area - receives good supply of fresh water from Cedar Bayou - near discharge of cooling water used by oil company in producing operations.	11.1 - 28.8	None
Maggies Point	Bottom type: sand and mud, fairly stable hydrography, good vegetative cover.	14.0 - 35.9	Good stand of Gracilaria sp. Diplanthera wrightii; traces of Halophillia engelmanni
Turtle Grass Flats	Bottom type: hard sand - adjacent of Gulf Pass - very shallow (1/2 - 1 1/2')	17.5 - 36.6	Good stand of Diplanthera wrightii; some Thalassia testudinum
Mud Cut	Bottom type: sandy mud - near a Gulf Pass	14.6 - 34.5	Good stand of Ruppia sp. and Dictyota sp.; some Diplanthera wrightii, Halophilia engelmanni

Table 1 Continued:

Tertiary Stations	Description	Salinity Range (ppt)	Vegetation
Nymph Point	Bottom type: mixed clay, mud and sand. Adjacent to New Bayou watershed-conditions fluctuate with runoff	5.4 - 26.6	Frequent brown and green algae blooms
Christmas Bay	Bottom type: hard sand - very heavy vegetative cover. Many Bugula sp. colonies - well protected area.	19.5 - 35.7	Good stands of Gracilaria sp.; other types present include Halophillia engelmanni and Diplanthera wrightii
Mud Lake	Bottom type: soft mud - drains into Clear Lake - fed by Middle Bayou Depth: 3-4'	.9 - 20.1	None
Taylor Lake	Bottom type: soft mud - drains into Clear Lake - fed by Taylor Bayou - well protected area. Depth: 3 - 5'	2 - 21.2	None
Jones Lake	Bottom type: sandy mud, some small shell - receives drainage from Highland Bayou - empties into West Bay	18.5 - 31.3	None
Secondary Stations			
Clear Lake	Empties into upper Galveston Bay; mud bottom; average depth: 3 - 6'	13.5 - 22.1	None
Primary Stations			
Humble Camp	Upper Galveston Bay; bottom sandy mud; depth 7 - 8'	14.9 - 29.0	None
Texas City Dike	Lower Galveston Bay - near Pass; bottom - sandy mud; depth 9 - 10'	19.5 - 31.5	None

Table 2: Blue Crab Catch* - 6' Bar Seine (1964)

	Tertiary Areas							
	Mud Lake	Taylor Lake	Jones Lake	Moses Lake	Dickinson Bayou	Surf Oaks	Double Bayou	Avg. Station
Feb.	115	159	NS	NS	NS	NS	NS	137
March	34	22	NS	NS	NS	NS	15	23.7
April	40	26	23	40	63	18	6	30.8
May	14	4.5	15	27	15	5.5	4.5	12.2
June	3.5	.5	2.5	6.5	18	NS	0	5.2
July	3	1.5	23	61.5	80	37	49.5	36.5
Aug.	.5	6	2.5	3	4	18.5	49.5	12.0
Sept.	3	1	3.5	2.5	0	5.5	12	3.9
Oct.	8	9	37.5	7	5	12	9	11.5
Nov.	12.5	2	22	7.5	10	71	23.5	21.2
Dec.	90	87.5	10	82	55	112	NS	72.7
Monthly Avg.	29.4	29.0	15.4	18.1	27.7	34.9	18.8	

* Monthly average catch per sample

Table 3: Blue Crab Catch*- 10' Trawl (1964)

	Secondary Bay Station	Primary Bay Stations	
	Clear Lake	Humble Camp	Texas City Dike
March	211.5	2.5	-
April	40.0	2.5	2.0
May	12.5	3.0	6.0
June	4.5	7.0	1.5
July	6.0	3.5	0
Aug.	1.0	.5	0
Sept.	1.0	0	0
Oct.	1.5	0	0
Nov.	2.5	0	0
Dec.	6.0	2	0

* Monthly average catch per sample

Table 4: Blue Crab Catch - 60' Seine (1964)

Date	Double Bayou	Moses Lake	Dickinson Bayou	Surf Oaks	Houston Point	Turtle Grass Flats	Maggies Point	Mud Cut	Christmas Bay	Nymph Point	Avg. Station
Feb.	2	8	11	4	NS	NS	0	13	NS	3	5.9
March	39	238	8	9	NS	0	6	25	4	9	37.6
April	23	36	21	36	3	19	11	2	0	10	16.0
May	9	6	14	8	2	22	1	8	44	7	12.1
June	2	7	3	2	2	13	18	1	11	5	6.4
July	12	79	11	68	1	20	5	2	2	4	20.4
Aug.	6	23	6	28	1	12	13	2	5	1	9.7
Sept.	16	11	5	3	5	2	2	3	1	0	4.8
Oct.	0	12	17	36	NS	1	2	2	0	1	7.9
Nov.	3	10	3	7	13	17	3	0	NS	5	6.8
Dec.	0	25	6	23	0	0	0	2	1	4	6.1
TOTAL	112	455	105	224	27	106	61	60	68	49	1267
Monthly Average	10.2	41.1	9.6	20.4	3.4	10.6	5.6	5.5	7.6	4.5	

Table 5: Sex composition of commercial blue crab catch (Galveston Bay - 1964).

	UPPER BAY				MIDDLE BAY				LOWER BAY			
Time	Female Sooks	Sponge	Total	Male Total	Female Sooks	Sponge	Total	Male Total	Female Sooks	Sponge	Total Female	Male Total
Mar.	-	-	-	-	176	10	186	340	435	20	455	145
Apr.	-	-	-	-	3	62	65	35	26	99	125	38
May	10	0	10	90	80	5	85	15	60	39	99	1
June	15	0	15	147	55	5	60	40	-	-	-	-
July	40	0	40	60	25	25	50	50	10	90	100	0
Aug.	5	0	5	95	15	3	18	32	-	-	-	-
Sept.	5	0	5	95	5	0	5	95	55	0	55	45
Oct.	-	-	-	-	-	-	-	-	-	-	-	-
Nov.	40	0	40	160	20	0	20	80	-	-	-	-

Table 6: Tagging Data and Returns - Galveston Bay Area (1963-64)

NUMBER TAGGED				NUMBER RETURNED														
				Release Area (0-5 mi.)			Outside Release Area (5-15 mi.)			Gulf								
Location & Date	M	F	Sponge	M	F	Sponge	M	F	Sponge	M	F	Sponge	TOTAL	M	F	Sponge
Upper Galveston Bay																
May-Aug. (1963)	127	39	-	14	1	-	5	-	-	-	-	-	20	15.0	2.6	-
Sept.-Dec.	154	37	-	21	-	-	4	2	-	-	-	-	27	16.2	5.4	-
Jan.-April (1964)	46	14	-	14	-	-	-	1	-	-	-	-	15	30.4	7.1	-
May-Aug.	9	15	1	-	1	-	-	-	-	-	-	-	1	-	6.7	-
Sept.-Dec.	38	2	-	1	-	-	-	-	-	-	-	-	1	2.6	-	-
Lower Galveston Bay																
May-Aug. (1963)	2	13	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Sept.-Dec.	11	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jan.-April (1964)	3	6	155	-	-	1	-	-	-	-	-	1	2	-	-	1.3
May-Aug.	1	16	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Sept.-Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gulf Surf (West Galveston Beach)																
May-Aug. (1963)	1	51	2	-	-	-	-	-	-	-	4	-	4	-	7.8	-
May-Aug. (1964)	-	25	11	-	-	-	-	-	-	-	4	-	4	-	16.0	-
West Bay																
May-Dec. (1963)	7	3	-	1	-	-	-	-	-	-	-	-	1	10.0	-	-
Jan.-Dec. (1964)	18	-	-	2	-	-	-	-	-	-	-	-	2	11.1	-	-
TOTALS	417	222	180	53	2	1	9	3	-	-	8	1	77	15.1	6.3	1.1

Table 7: Record of blue crab tag returns with catch data (1963-64)

No.	Tag Number	Width (mm)	Sex	Release Site	Release Date	No. Days Free	Distance Moved	Direction Moved
1	19702	181	♂	Clear Lake	5-16-63	4	1-2 mi.	E
2	19703	190	♂	"	"	19	1-2 mi.	E
3	19706	155	♂	"	"	22	0	-
4	19711	170	♂	Seabrook	5-20-63	31	10 mi.	NE
5	19733	185	♂	"	6-10-63	3	0	-
6	19744	202	♂	Humble Camp	6-12-63	15	4-5	N
7	19748	190	♂	"	"	9	9-10	S
8	19752	195	♂	San Leon	"	20	7-8	E
9	19763	193	♂	Humble Camp	6-19-63	14	?	?
10	19767	187	♂	Seabrook	"	13	2 mi.	W
11	19786	195	♂	"	6-20-63	9	5 mi.	?
12	19788	182	♂	"	"	17	7 mi.	S
13	2214	155	♂	"	6-28-63	8	5 mi.	NE
14	19025	155	♂	Clear Creek	7-12-63	32	8 mi.	S
15	19040	180	♂	15 Mi. Pass	7-19-63	12	0	-
16	19042	195	♂	"	"	7	0	-
17	19050	183	♀	Gulf Surf	7-24-63	?	?	?
18	19052	151	♀	"	"	4	0	-
19	19074	151	♀	"	"	3	0	-
20	19082	145	♀	"	"	19	8 mi.	W
21	19092	170	♀	Seabrook	"	5	0	-
22	19115	167	♂	Clear Lake	8-29-63	47	?	?
23	19118	160	♂	"	"	13	?	E
24	19126	140	♂	Seabrook	"	42	?	?
25	19194	162	♂	Chocolate Bay	9-27-63	20	0	-
26	19191	184	♂	Humble Camp	10-7-63	9	2 mi.	E
27	5405	185	♂	Upper Galveston Bay	10-17-63	5	?	?
28	5408	170	♂	"	10-17-63	7	0	-
29	19141	175	♂	Clear Lake	10-29-63	3	0	-
30	5464	182	♂	"	"	5	0	-
31	5470	184	♂	"	"	5	9-10	S
32	5471	169	♂	"	"	21	?	?
33	5318	172	♂	"	11-4-63	3	0	-
34	5347	188	♂	"	11-14-63	1	0	-
35	5499	189	♀	"	11-4-63	22	7 mi.	SE
36	5383	163	♂	"	3-14-64	1	0	-
37	5427	200	♂	"	10-29-63	138	0	-
38	5384	168	♂	"	3-13-64	32	0	-
39	5452	161	♂	"	10-29-63	147	0	-
40	5380	161	♂	"	3-27-64	3	0	-
41	5475	187	♂		10-30-63	153	0	-
42	5397	169	♂	Seabrook Dock	2-19-64	56	0	-
43	5381	182	♂	Clear Lake	3-27-64	10	0	-
44	5340	180	♂	Surf Oaks	11-14-63	139	2 mi.	S
45	5378	171	♂	Clear Lake	3-27-64	19	-	-
46	5474	167	♂	"	10-29-63	171	-	-
47	5485	175	♂	Surf Oaks	10-30-63	176	4 mi.	S
48	5492	170	♂	Clear Lake	11-4-63	168	-	-
49	5302	175	♂	Seabrook Dock	11-4-63	182	1 mi.	S
50	5486	185	♀	Clear Lake	11-4-63	174	12 mi.	S
51	16108	170	♀ (S)	Bolivar Bulkhead	4-14-64	18	4 mi.	NE
52	16187	145	♂	Seabrook Dock	4-30-64	14	-	-
53	16184	-	♂	"	4-30-64	23	2 mi.	W

Table 7 Continued: Record of blue crab tag returns with catch data(1963-64).

No.	Tag Number	Width (mm)	Sex	Release Site	Release Date	No. Days Free	Distance Moved	Direction Moved
54	5467	176	♂	Clear Lake	10-29-63	202	4 mi.	NE
55	16172	163	♂	"	4-23-64	27	-	-
56	16173	176	♂	"	4-23-64	27	-	-
57	16174	184	♂	"	4-23-64	27	-	-
58	5460	170	♂	"	10-29-63	206	1 mi.	S
59	5376	172	♂	"	3-27-64	53	-	-
60	5311	185	♂	Seabrook	11-4-63	213	-	-
61	16096	155	♂	"	4-15-64	52	1 mi.	W
62	19143	170	♂	Clear Lake	10-29-63	225	4 mi.	N
63	5453	180	♂	"	10-29-63	225	-	-
64	5342	165	♀	Seabrook	2-19-64	78	13 mi.	S
65	19145	180	♂	Clear Lake	10-26-63	220	12 mi.	E
66	16153	155	♀(S)	Bolivar Bulkhead	4-15-64	46	16 mi.	SE
67	15060	165	♀	Gulf Surf	6-25-64	1	-	-
68	15001	152	♀	Seabrook Dock	6-26-64	6	-	-
69	15061	153	♀	Gulf Surf	6-25-64	2	?	?
70	15062	180	♀	"	6-25-64	9	-	-
71	15071	151	♀	"	6-25-64	11	-	-
72	5323	174	♂	Seabrook Dock	11-4-63	221	7 mi.	S
73	5306	171	♂	"	11-4-63	237	7 mi.	S
74	5368	192	♂	"	4-6-64	104	-	-
75	15084	148	♂	Sea Isle-West Bay	8-20-64	17	-	-
76	5358	167	♂	Seabrook Dock	9-18-64	9	-	-
77	15082	145	♂	Sea Isle-West Bay	8-20-64	11	-	-

Table 8: Blue Crab Commercial Landings - Galveston Bay (1963-64).

	1963	1964	Monthly * Deviation
January	7,077	0	- 7,077
February	7,906	1,555	- 6,351
March	47,932	69,403	+ 21,471
April	123,149	221,439	+ 96,290
May	146,562	301,203	+ 154,461
June	87,451	181,842	+ 94,391
July	91,158	107,484	+ 16,323
August	15,141	55,635	+ 40,494
September	47,118	112,845	+ 65,727
October	64,925	118,884	+ 53,959
November	25,607	58,522	+ 32,915
December	1,900	53,493	+ 51,593
TOTALS	667,926	1,282,305	+ 614,196

* From 1963 landings

Source: Mark Johnson, Statistical Clerk, Parks and Wildlife Dept., Seabrook, Texas.

Figure 1: Blue Crab Sampling Stations (1964)

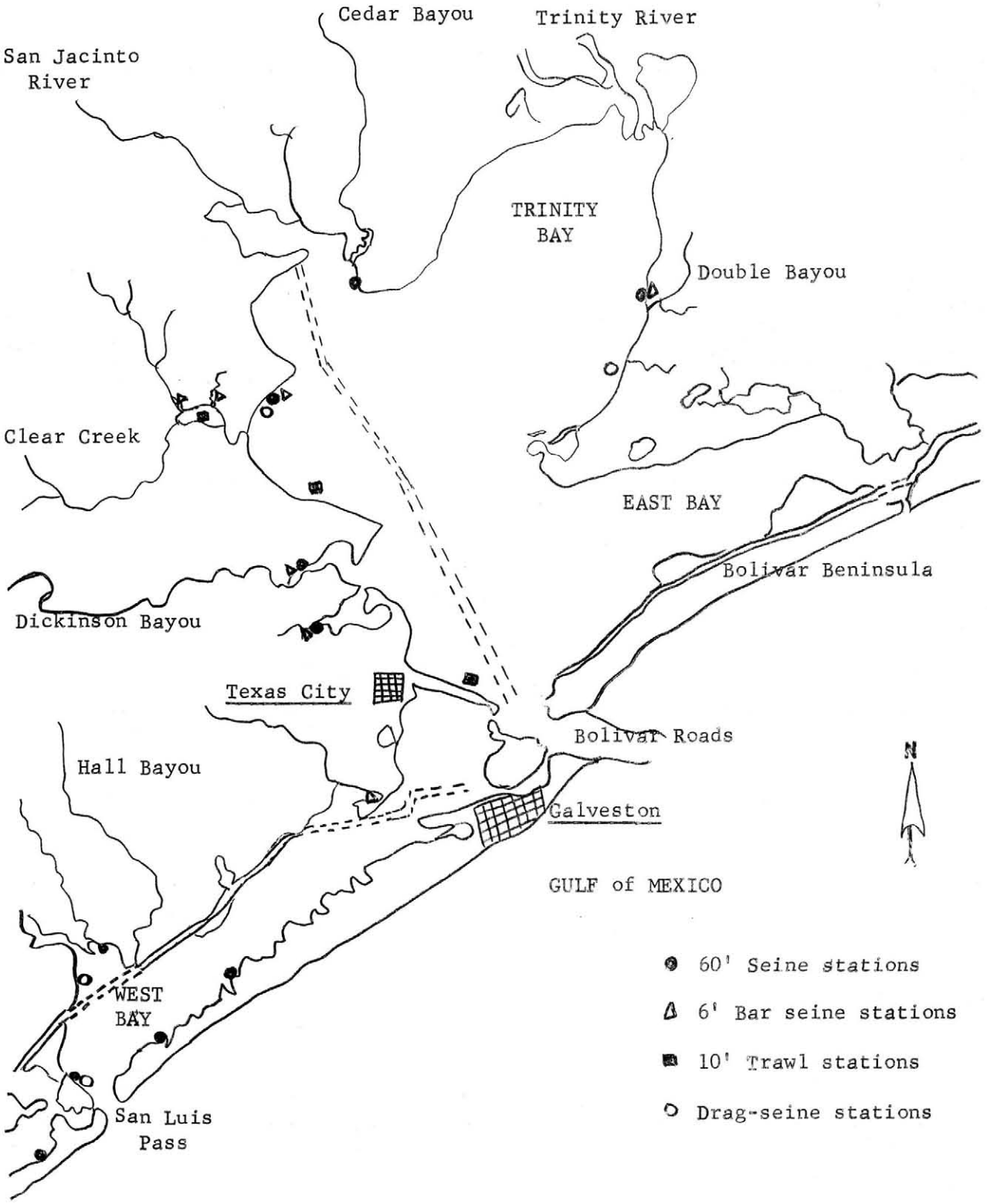


Figure 2: Monthly progression of average sample sizes 1962-1964

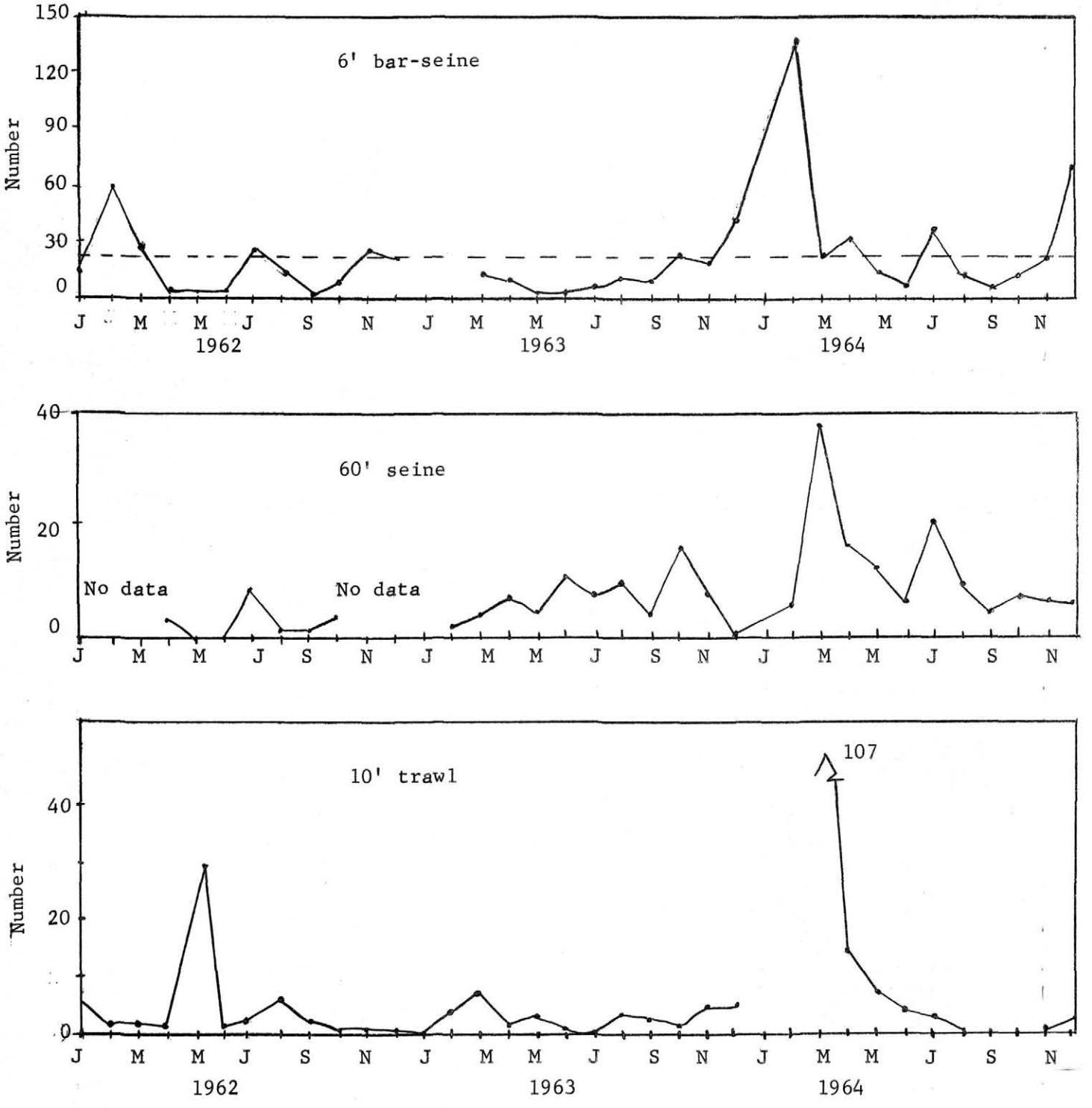


Figure 3: Monthly size-frequency distributions and deviations from the mean monthly frequency distribution of combined trawl, seine, and bar-seine data (1964)

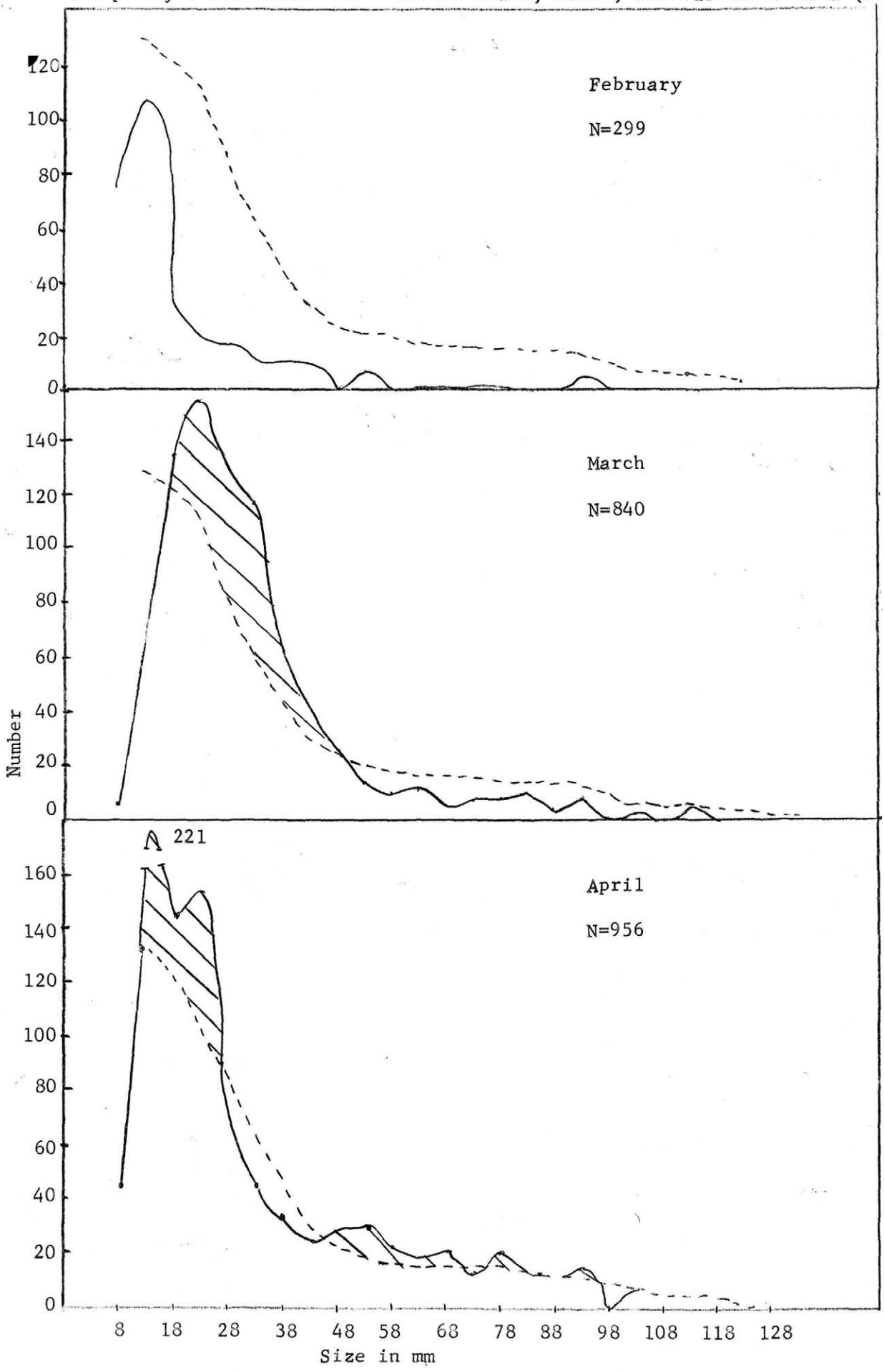


Figure 3: Continued

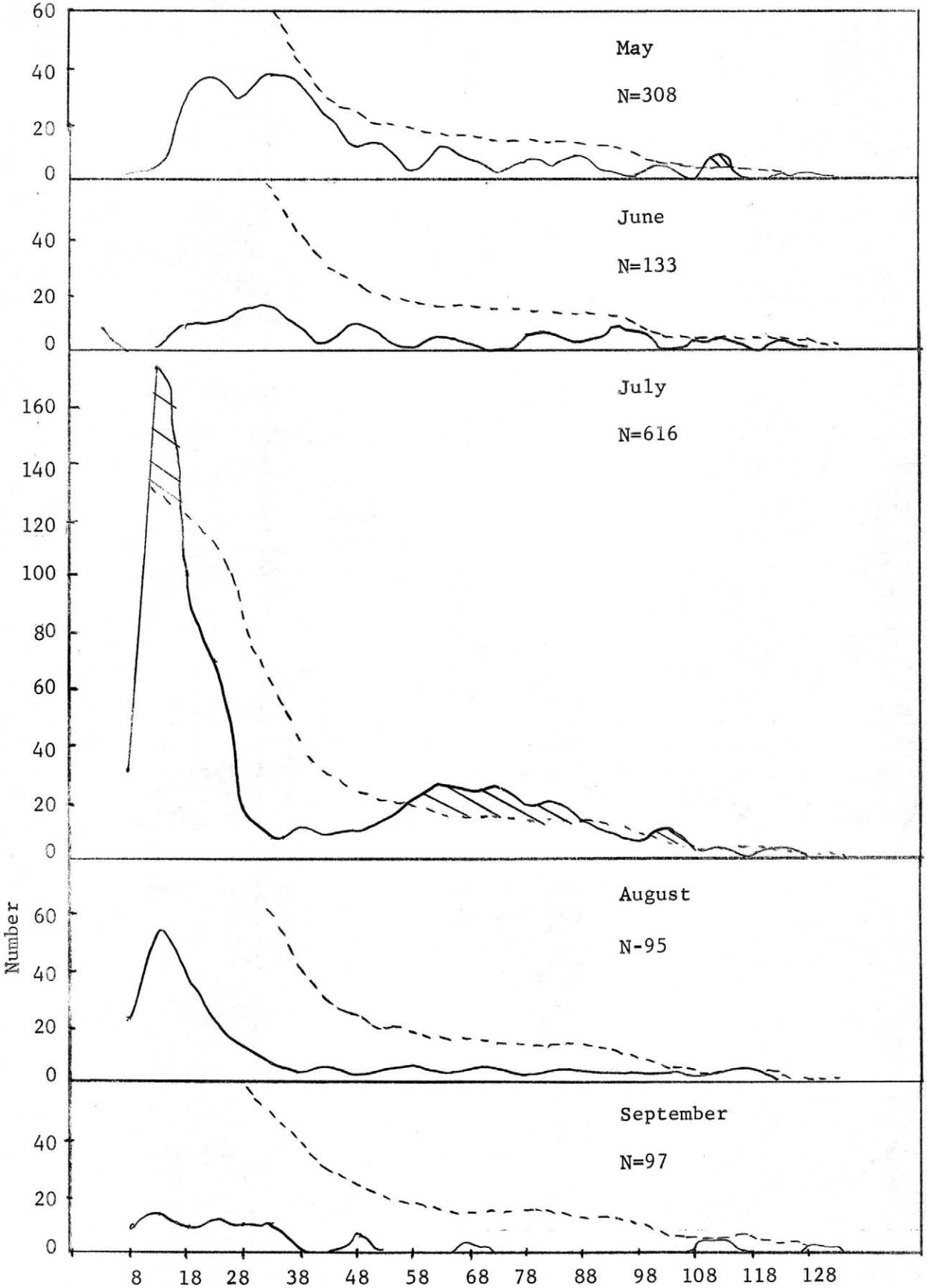


Figure 3: Continued

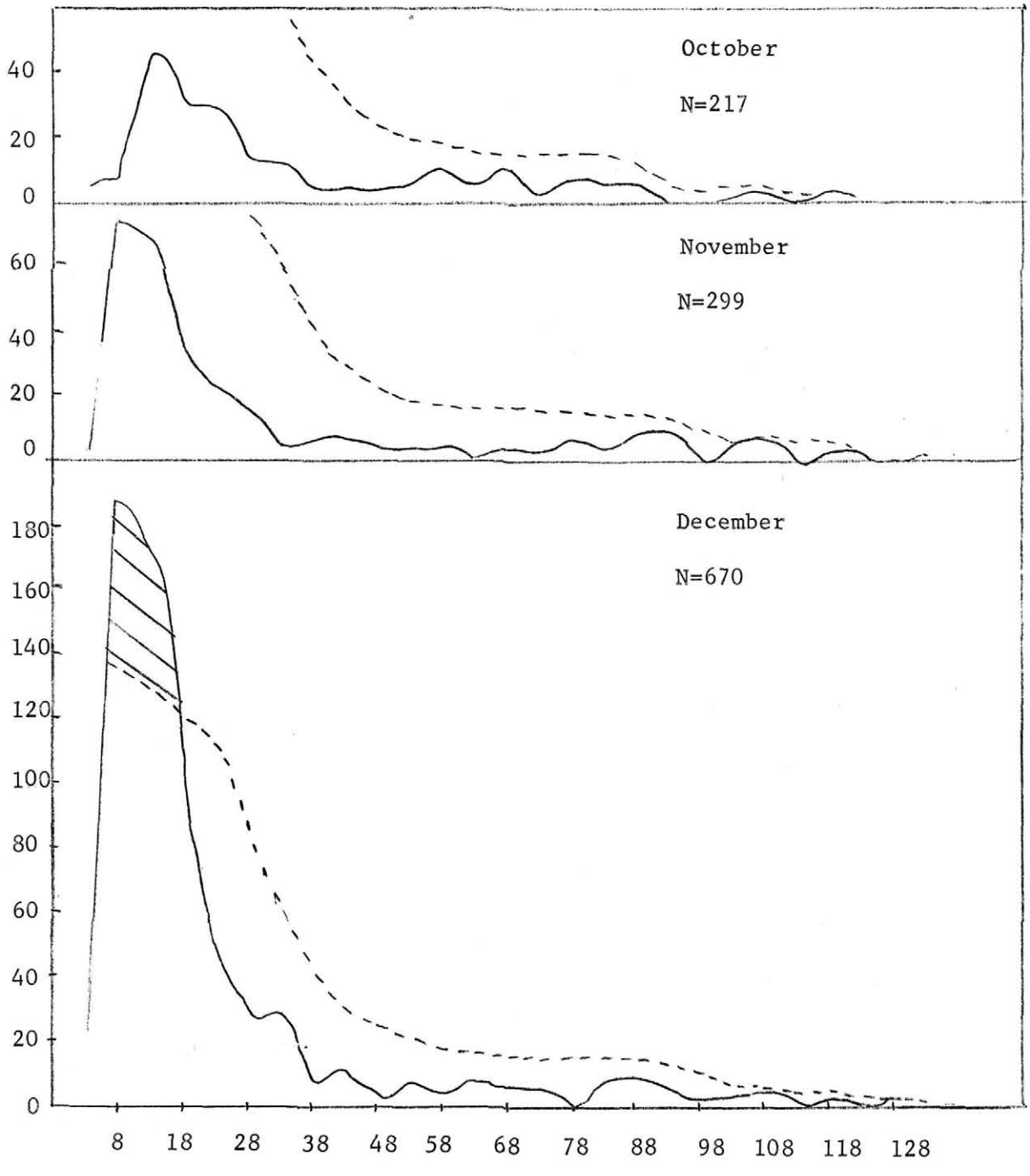


Figure 4: Deviation of monthly size-frequency distributions from the mean monthls size frequency distribution of blue crabs at 60' seine stations (1964)

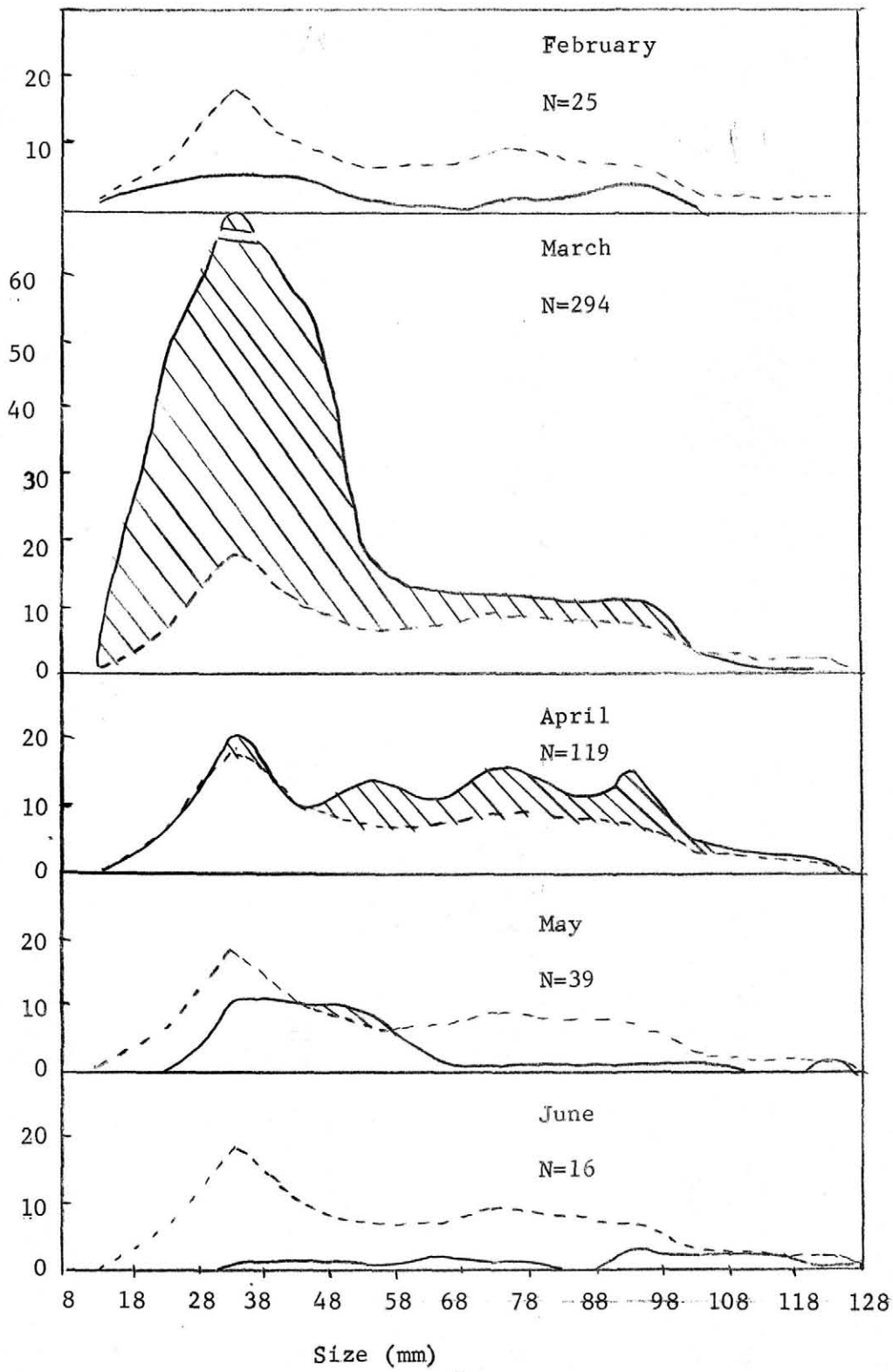


Figure 4: Continued

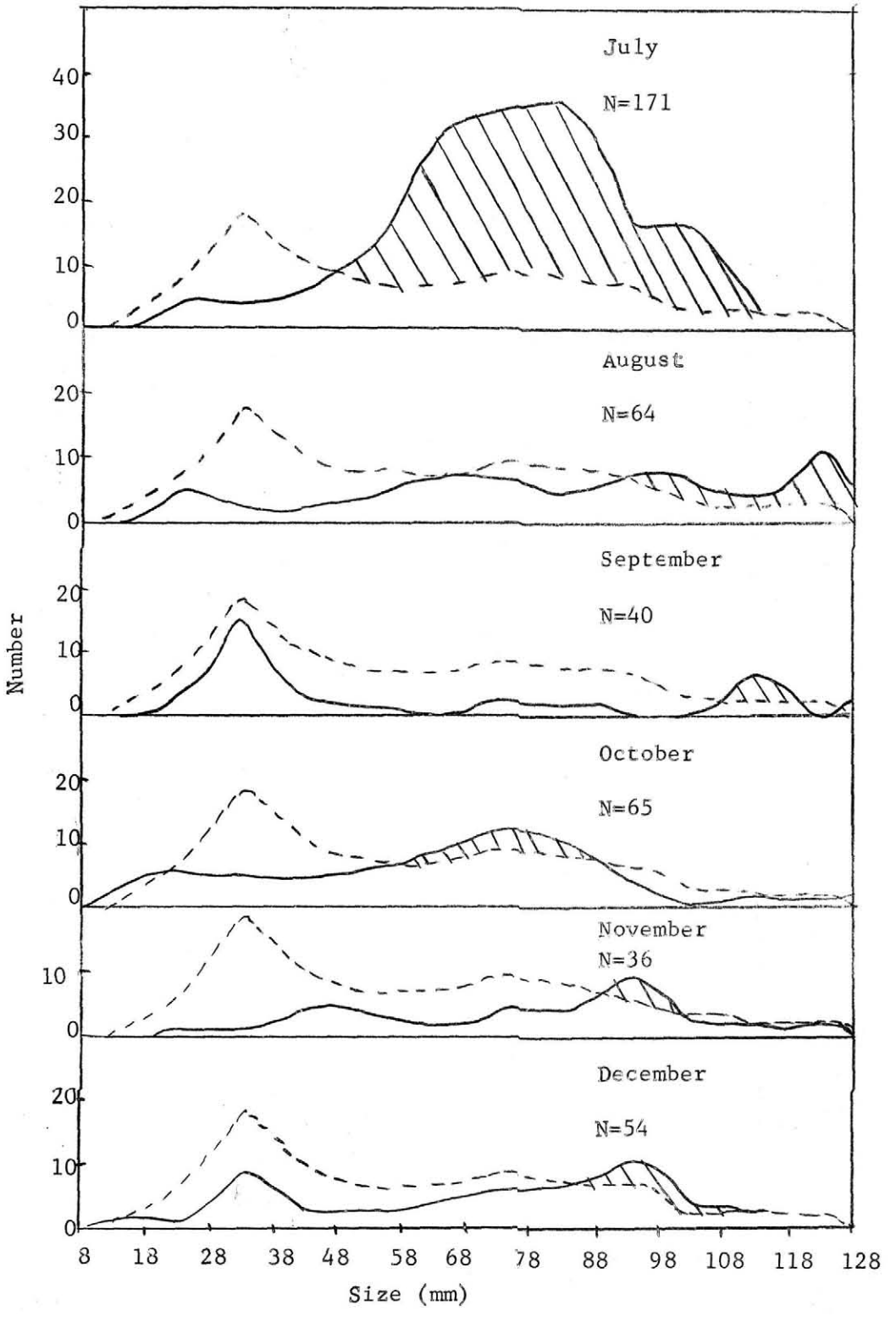
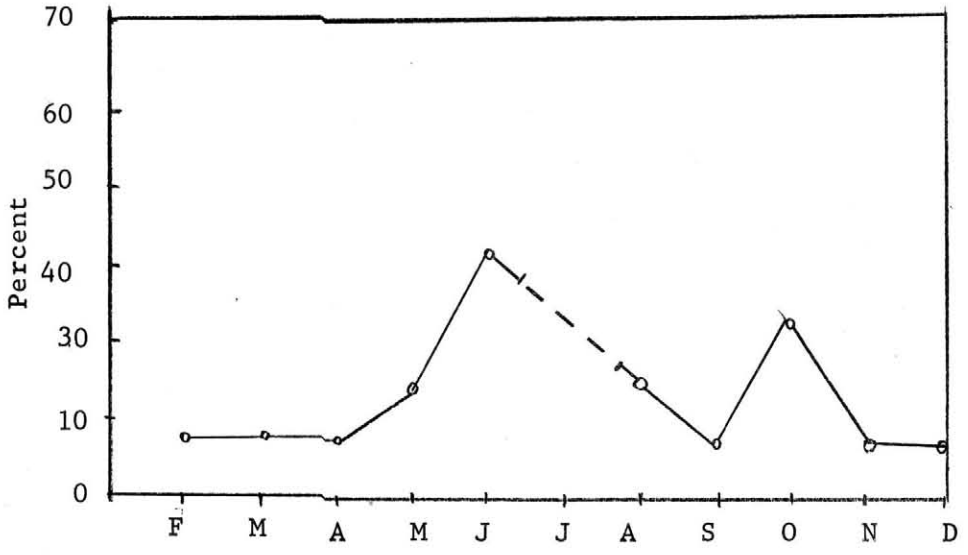


Figure 5: Per cent soft and buckram crabs in samples by months (1964)



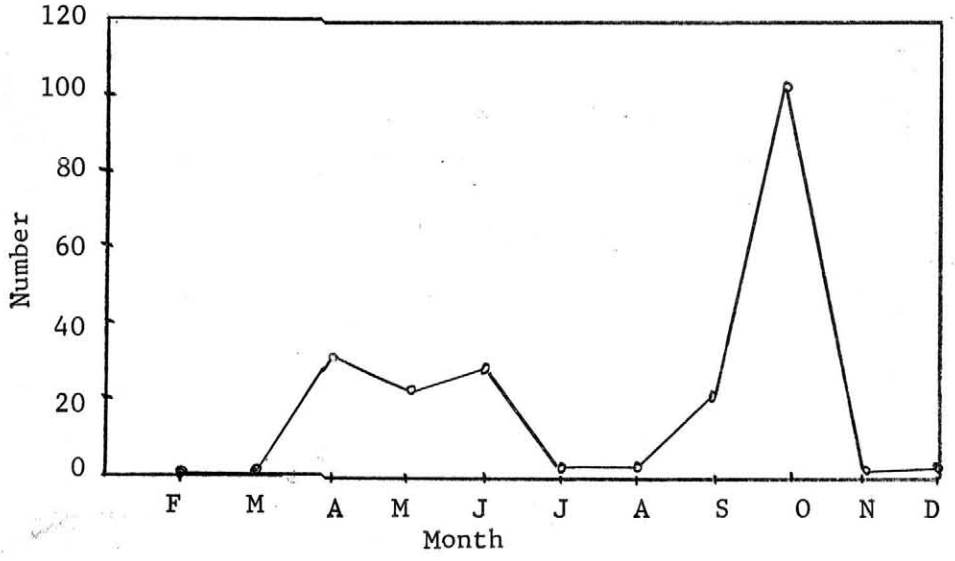


Figure 6: Relative abundance of Callinectes danae by months (1964)

Figure 7: Movements of over 5 miles by 12 tagged blue crabs released in 3 locations in Galveston Bay.

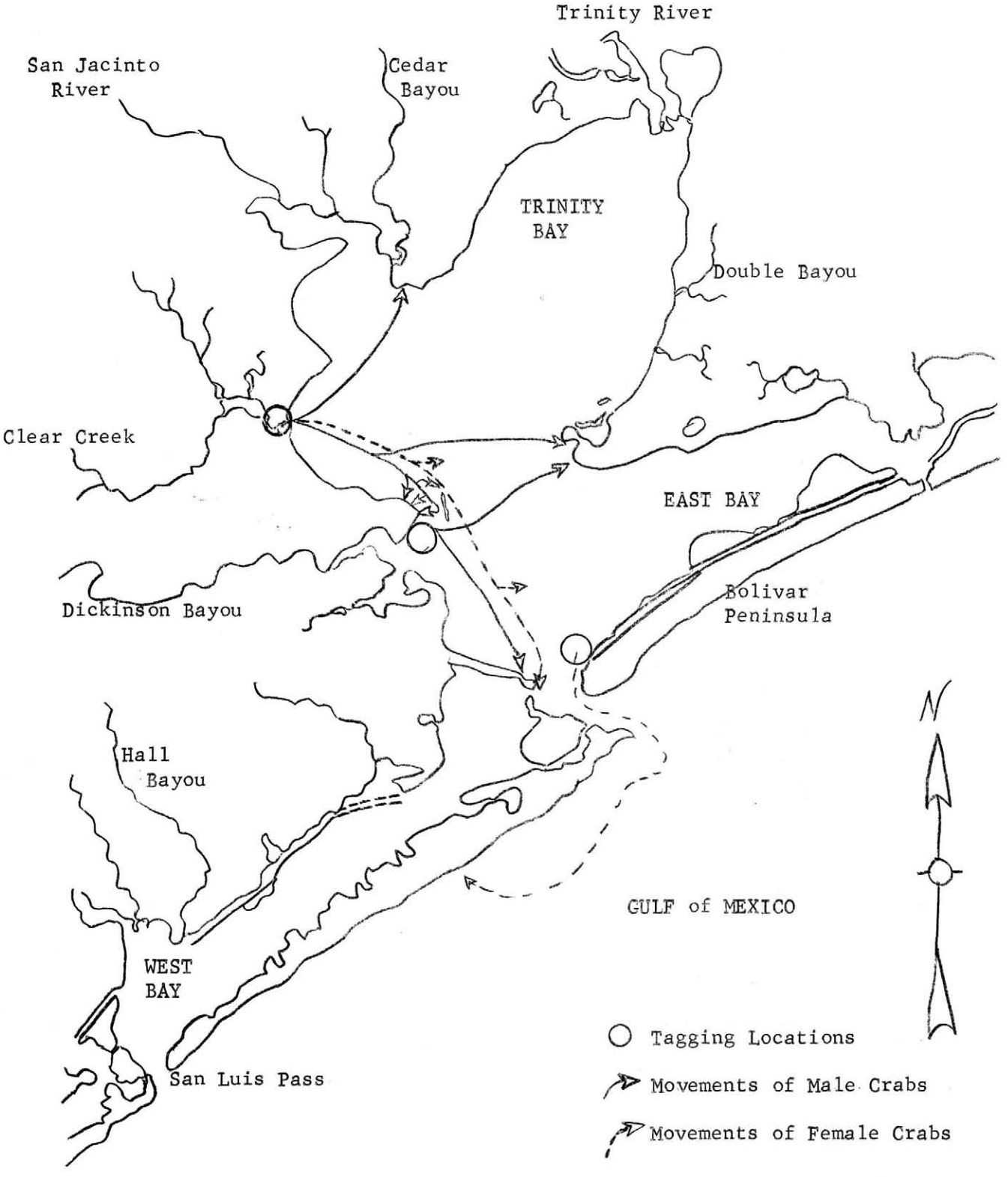
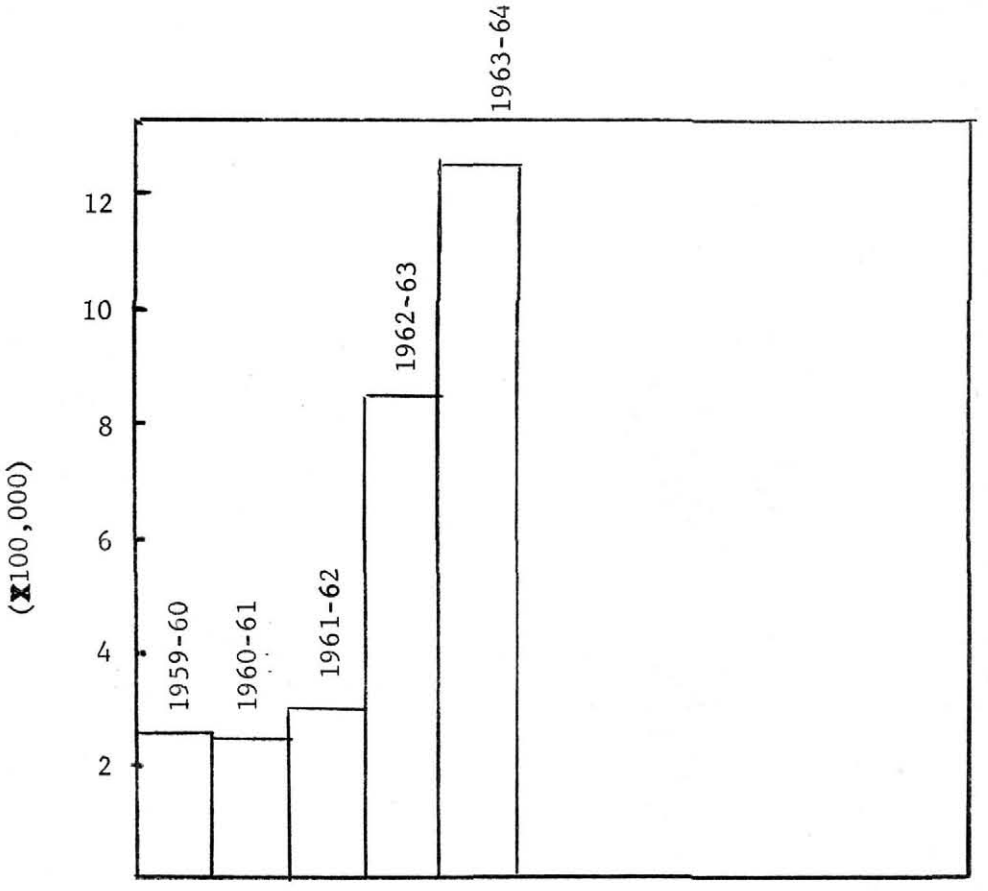


Figure 8: Commercial crab landings - Galveston Area* (1959 - 1964)



* Includes Sabine Lake, Galveston Bay, Freeport and associated Gulf waters.

Source: Annual Reports; Texas Game & Fish Commission and Parks and Wildlife Dept.