A Study of the Blue Crab in Texas

Project No.: MCR 5 - 1965

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ABSTRACT

Information on seasonal abundance, growth, movements and envoronmental relationships was used to study trends in the blue crab (Callinectes sapidus) population, while a survey of the commercial fishery was made to determine the size of the catch and market conditions.

Abundance peaks of small crabs were noted during fall and winter, whereas major crab brood waves were detected in July and November. Growth studies in Galveston Bay indicated that most blue crabs will reach commercial size within one year after hatching. The numbers of blue crabs in the samples from most coastal bays have increased since 1963 but crabs have remained scarce in Aransas Bay and the upper Laguna Madre.

In 1965, crab landings (3.6 million pounds) increased 56% over 1964 but were one million pounds below the record year, 1962.

Environmental factors related to crab distribution and a summary of a four year tagging program are offered.

INTRODUCTION

The blue crab, Callinectes sapidus, supports one of the most important fisheries on the Gulf coast and the most rapidly expanding fishery in Texas. Texas landings increased from 206 thousand pounds in 1958 to over 4.5 million pounds in 1962. An increasing crab demand coupled with a fluctuating supply of crabs has caused much concern among agencies studying blue crabs, seafood dealers and sportsmen. Attempts to control these fluctuations by protective legislation in the past have proven unsuccessful, and management of the fishery must be based on scientific knowledge of the causes and changes in abundance (Walburg 1963).

Knowledge of growth rates, rates of survival, migrations, habitat requirements, trends in seasonal abundance and nature of the commercial fishery are merely a few of the biological aspects needed for sound fisheries management. To acquire this knowledge, the Texas Game and Fish Commission (now the Parks and Wildlife Department) began, in 1962, a program designed to study the biology of the blue crab in Texas waters. Periodic standardized samples are taken in all bay systems on the Texas coast and special studies on tagging blue crabs and a survey of the fishery have been conducted in Galveston Bay.

Sampling results for 1961-62, 1963 and 1964 were published as bound volumes. This report presents findings for 1965.

DESCRIPTION OF THE AREA

The estuarine coast of Texas, extending from Sabine Lake to the mouth of the Rio Grande River, covers approximately 2,200 square miles. Detailed studies on the hydrography and ecology of Texas bays have been made and several papers have been published (Collier & Hedgpeth 1950, Breuer 1962 and Simmons 1957). Information on hydrographic conditions of Texas bays for the period 1962-64 is recorded in the annual project reports of the Department's Marine Division.

MATERIALS AND METHODS

Analyses of blue crab data in this report are based on collections made at regular stations in seven* coastal bay systems and the inshore Gulf of Mexico (Figure 1). Standard collecting gear and the operating procedures were:

Bays

(1) Six foot bar seines (6 foot tapered bag of 1/2 inch stretched mesh webbing) towed 500 feet by hand or skiff in shallow nursery areas at semi-monthly intervals.

(2) Ten foot trawls (of 1 1/4 inch stretched mesh lined with a 1/2 inch stretched mesh webbing) towed 15 minutes by boat in secondary and primary bays at semi-monthly intervals.

(3) Sixty foot seines (6 foot deep of 3/4 inch stretched mesh) pulled, monthly, a standard distance at shoreline nursery areas and equated to 5000 square feet.

Gulf of Mexico

(1) A 42 foot trawl (2 inch stretched mesh) pulled 30 minutes by boat at several locations in the inshore Gulf between Pass Cavallo and Port Isabel.

All blue and gulf crabs, C. danae, caught in the samples were sexed and measured in "carapace width", i.e., the distance between the tips of the lateral spines. Hydrological and meteorological data were collected at each station. Salinity was determined by the Mohr titration method, hydrometers, or refractometers.

Semi-monthly quantitative plankton samples were collected in seven Gulf passes to major bays with a one-half or one meter diameter plankton net (1 mm mesh). The net was pulled 6 minutes at each station and the amount of water strained was recorded by a T-S flow meter suspended from the frame. Samples were sent to the Rockport Laboratory where megalops were identified and counted.

Commercial crab houses on Bolivar Peninsula (Galveston Bay) were visited monthly and a random sample of 100 crabs was measured. Data on sex composition, maturity stages, areas fished, meat yield and prices paid were also collected. Catch per unit effort data for Galveston Bay, supplied by two commercial crab-

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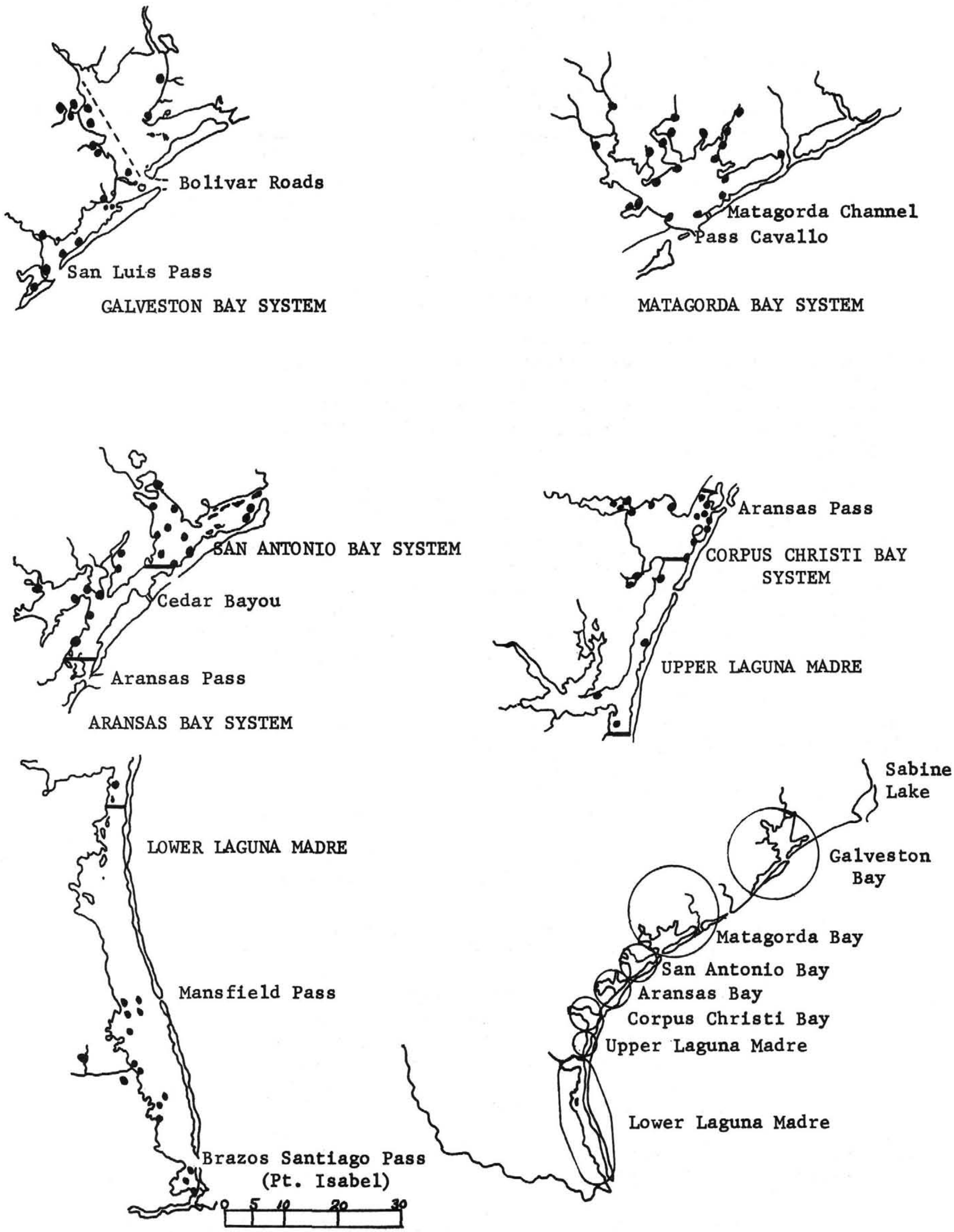
* Only seasonal trawl samples were taken in Sabine Lake; therefore data from this area were not included.

Figure 1: Crab sampling stations, by bay areas (1965).



pot fishermen who fished the bay throughout 1965, were expressed as:

$$\frac{\text{Total number pounds caught (per day)}}{\text{Number pots used}} = \text{Pounds/pot-day}$$

Pre-commercial (3-5 inches in carapace width)* and commercial size crabs (5 inches or greater in carapace width) have been tagged and released at several locations in Galveston Bay since 1962. Pullen (1962) and Moffett and More (1964) described the tagging procedure. Tag recoveries were dependent on voluntary returns from sport and commercial fishermen.

RESULTS

Survey of Commercial Fishery

Crab demand and the availability of outlets has increased steadily since 1959. Presently, four processing plants are operating in Texas. Retail markets on the upper coast have doubled since 1963, yet they are still unable to supply enough crab meat to fill consumer demands. The high demand, coupled with good prices, has encouraged increases in the number of fishermen, operating units, and time spent fishing.

Annual crab production seems to have fluctuated with the availability of crabs to the fishery, rather than market conditions. Changes in the availability of crabs in different bays are reflected in changes of fishing intensity, or shifting of gear-units from one bay to another. For example, the Matagorda - Lavaca Bay area produced over 2 million pounds of hard crabs in 1962 but only 728 thousand pounds in 1963 (Figure 2). This decrease in landings is attributed mainly to the reduction of effort resulting when crab fishermen moved their crab pots to Galveston and San Antonio Bays, where crabs appeared to be abundant.

Hard crab landings during 1965 exceeded 3.5 million pounds (Table 1). The Galveston district (Galveston Bay system and Sabine Lake) produced about 65% of the total production while the San Antonio - Espiritu Santo - Mesquite Bay system ranked a distant second. A new monthly production record was set in September when over 559 thousand pounds were landed. Crabs were generally of good quality with yields ranging from 13-18 pounds of meat per hundred weight.

A survey of the commercial blue crab fishery in Galveston Bay was continued during 1965. An analyses of these data revealed the following:

(1) The sex ratio of the commercial catch varied with the season and was dependent on the area fished. Fishing effort from January - April was concentrated in East and lower Galveston Bays and female crabs dominated the catch. Sponge crabs began appearing in the catch on March 20 and 85% of the total catch between March 25 and May 10 was sponge crabs (Figure 3). Processing plants stopped buying sponge crabs on May 10** and crab fishermen were forced to move their pots to other areas, mainly Trinity Bay. Male crabs composed the bulk of the catch from May - October, as most of the fishing was done in

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* Due to the low return rate of smaller crabs, no crabs under 5 inches were tagged after July, 1963.

** A combination of low meat yield and reduced profits for pickers and plant owners made sponge crabs undesirable.

Figure 2: Hard crab landings by bay areas, expressed in millions of pounds (1962-65)
Source: Texas Landings

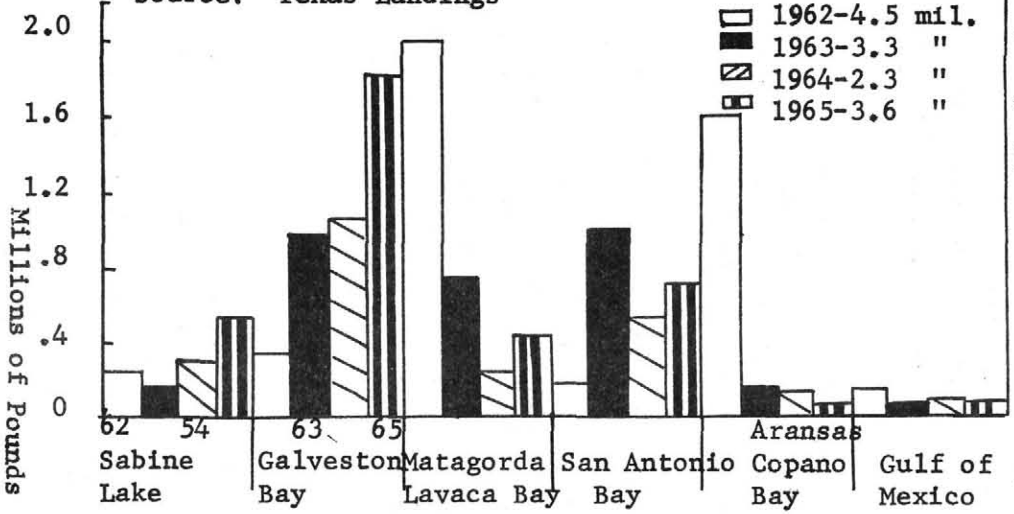


Figure 3: Composition of the commercial blue crab catch, Galveston Bay (1965)

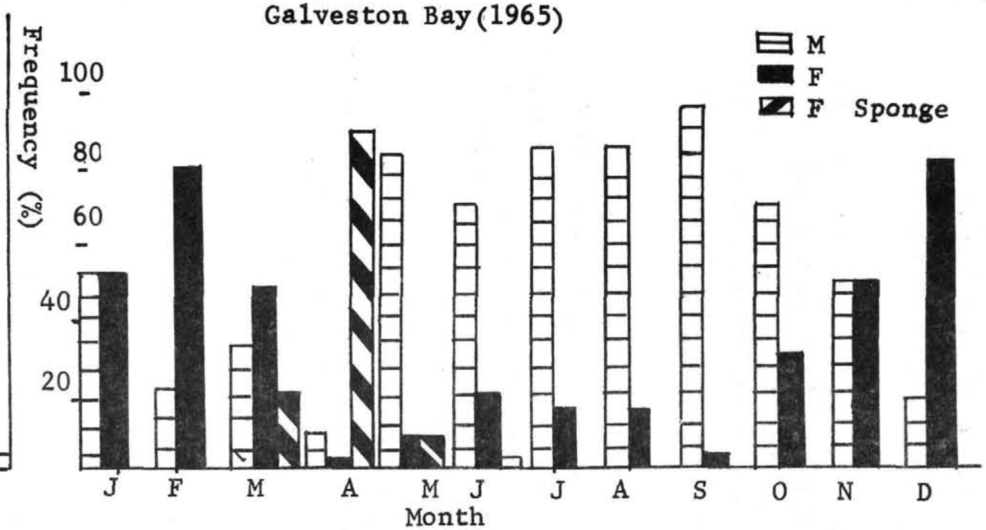


Figure 4: Width distributions of crabs caught in the crab-pot fishery of Galveston Bay (1965)

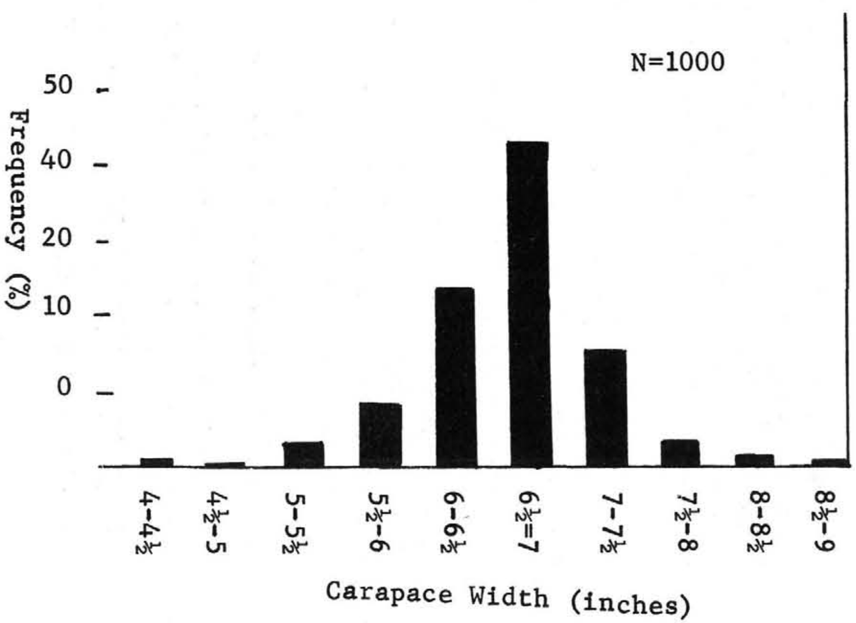
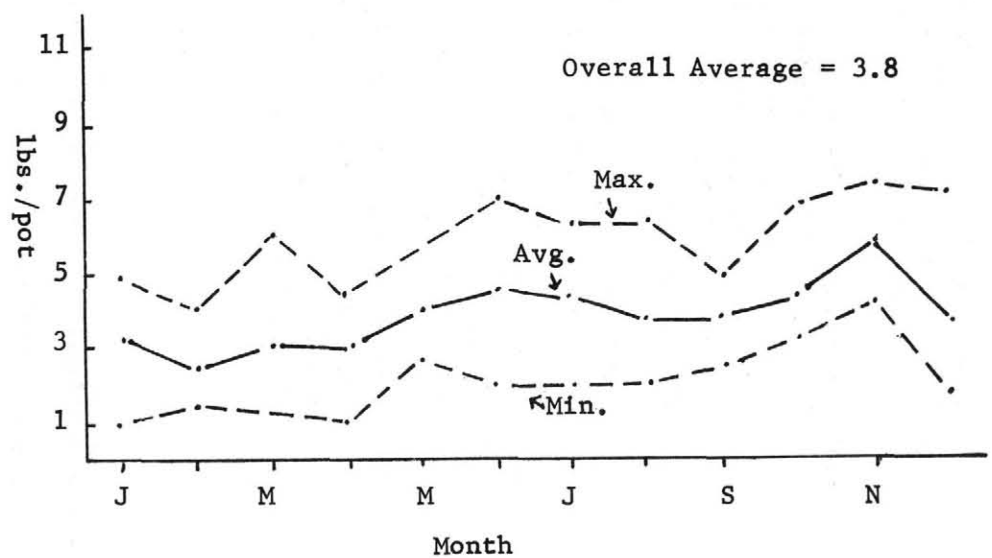


Figure 5: Catch per effort of Galveston Bay crab-pot fishermen with max.-min. ranges (1965)



upper bay areas. In December, when water temperatures dropped below 15°C, most of the crab fishermen moved their pots back into East Bay where females preponderated the catch.

(2) The sizes of blue crabs ranged from 4 to 9 inches (Figure 4). Crabs between 6 1/2 - 7 inches (167-189 mm) composed 43% of the total number examined, while crabs between 6 - 7 1/2 inches composed over 83% of the total. Only 20 of the 1000 crabs examined were less than 5 inches (127 mm). Larger crabs were more numerous in catches from the upper bay.

(3) Catch per effort was lowest in February and highest in November (Figure 5), whereas total effort was highest in May and June. Catch per effort values increased from 2.5 in February to 4.6 pounds per pot in June and then leveled off at about 4 pounds per pot during summer and early fall. A decrease in total effort occurred in late October and an increase in catch per effort was noted in November.

(4) Seasonal variation in catches can be attributed to crab migrations into certain areas. For example, the commercial catch from December - May in lower Galveston and East Bays is influenced by movements of mature female crabs into these areas in late fall and early spring.

Survey of Blue Crab Populations

Larval Sampling in Major Tidal Passes

Identification of the zoeae stages of different crabs is complicated and no attempt to separate species was made. Robertson (1938) described the distinctive shape of the cornua on the fifth thoracic segment of the megalops stage of the blue crab. This character was used to separate Callinectes megalops from those of other genera.*

Seasonal patterns of availability, based on the occurrence of megalops in plankton samples taken in Gulf passes to major bays, varied from bay to bay (Table 2). Megalops were present in the samples during all months, but the largest catches were recorded in spring and summer. Similar availability patterns were reported in Louisiana by Darnell (1959).

The relative availability of megalops at stations in Matagorda Channel, Pass Cavallo, and Pt. Isabel was highest in May, while the largest samples at Aransas Pass were collected in June and July. Peaks in availability at Galveston Pass were noted in March and July, but an ingress of megalops also occurred in August and September. The July - September group of megalops are probably the progeny of the spring - summer spawning group of females which were common in lower Galveston Bay and inshore Gulf waters off Galveston during April and May. The megalops taken in March samples at Galveston, Cedar Bayou, and Pt. Mansfield may have been C. danae, which has been reported to be a fall-winter spawner (Daugherty 1952).

Bay Sampling of Juvenile and Adult Populations

Small blue crabs (8-18 mm) were present at nursery areas sampled with the six foot bar seine during all months, but peaks in availability were recorded

* Since the megalops stage of C. danae has not been described, all megalops resembling C. sapidus were called Callinectes spp.

during fall and winter (Table 3). Recruitment of young crabs to the population took place throughout the year, but major waves appeared in July and November. The large group of small crabs present during January - March were probably spawned in the fall of 1964.

Growth

Estimates of growth were made by tracing modal progressions in monthly width-frequency distributions of crabs caught in trawl and seine collections in Galveston Bay (Figure 6). [By fitting a regression line to the monthly modal size of three different groups of crabs present at the stations, growth rates of 18.5, 15.3 and 16.2 mm per month were estimated (Figure 7).] Fall spawned crabs averaging 33 mm in February were 128 mm wide by August, whereas the 13 mm wave detected in March reached commercial size in October. The spring hatched brood, detected at a modal size of 8 mm in July, had reached 83 mm by December. Limited growth occurred during winter and low temperatures appeared to extend the time period between molts. Tagatz (1965) reported similar findings in Florida. This group probably will not enter the commercial fishery until the spring of 1966.

Studies in Florida (Tagatz 1965) have shown that it is theoretically possible for a blue crab in the St. John's River to grow from the first crab stage (2 mm) to commercial size (120 mm) in about 8 months. Since the larval life is between 1 - 2 months long, the total time from hatching to commercial size is about 10 months. Using theoretical growth estimates obtained during this study and in 1964 (More and Moffett 1964), it is probable that most blue crabs in the Galveston Bay system will reach commercial size within one year after hatching.

Seasonal abundance of juvenile crabs

Little change was noted in the apparent abundance of blue crabs in Galveston, Matagorda and Aransas Bays when compared to 1964 samples sizes (Table 4). The overall catch per effort values increased in the lower Laguna Madre and Corpus Christi Bay, while a sharp increase in the number of blue crabs caught in the 10 foot trawl was recorded in San Antonio Bay. Data collected in 1965 by area, gear type and month are presented in Table 3.

Galveston Bay: Small blue crabs (8-18 mm) were abundant at bar seine stations during fall, winter and early spring. The average number per sample was highest in January (110.5) and March (73.5). After the temperature rose above 20°C, sub-adult crabs (80-123 mm) were present in fair numbers at 60 foot seine stations with peaks in availability occurring during April, July and September.

Summer and fall trawl samples were unproductive, but a few small blue crabs were taken during January, February and March.

Matagorda Bay: Patterns of apparent abundance were similar to those recorded in Galveston Bay. The largest 10 foot trawl collections were made in March and April; the largest bar seine collections in January and March; and the largest 60 foot seine collections in March, April and July. Crabs were scarce at 60 foot seine stations in the fall, whereas they were fairly abundant at Galveston Bay stations.

Figure 6: Monthly width frequency distributions of blue crabs caught in trawl and seine collections in Galveston Bay (1965)-broken line is the average monthly width frequency curve; shaded areas represent deviations from the average curve.

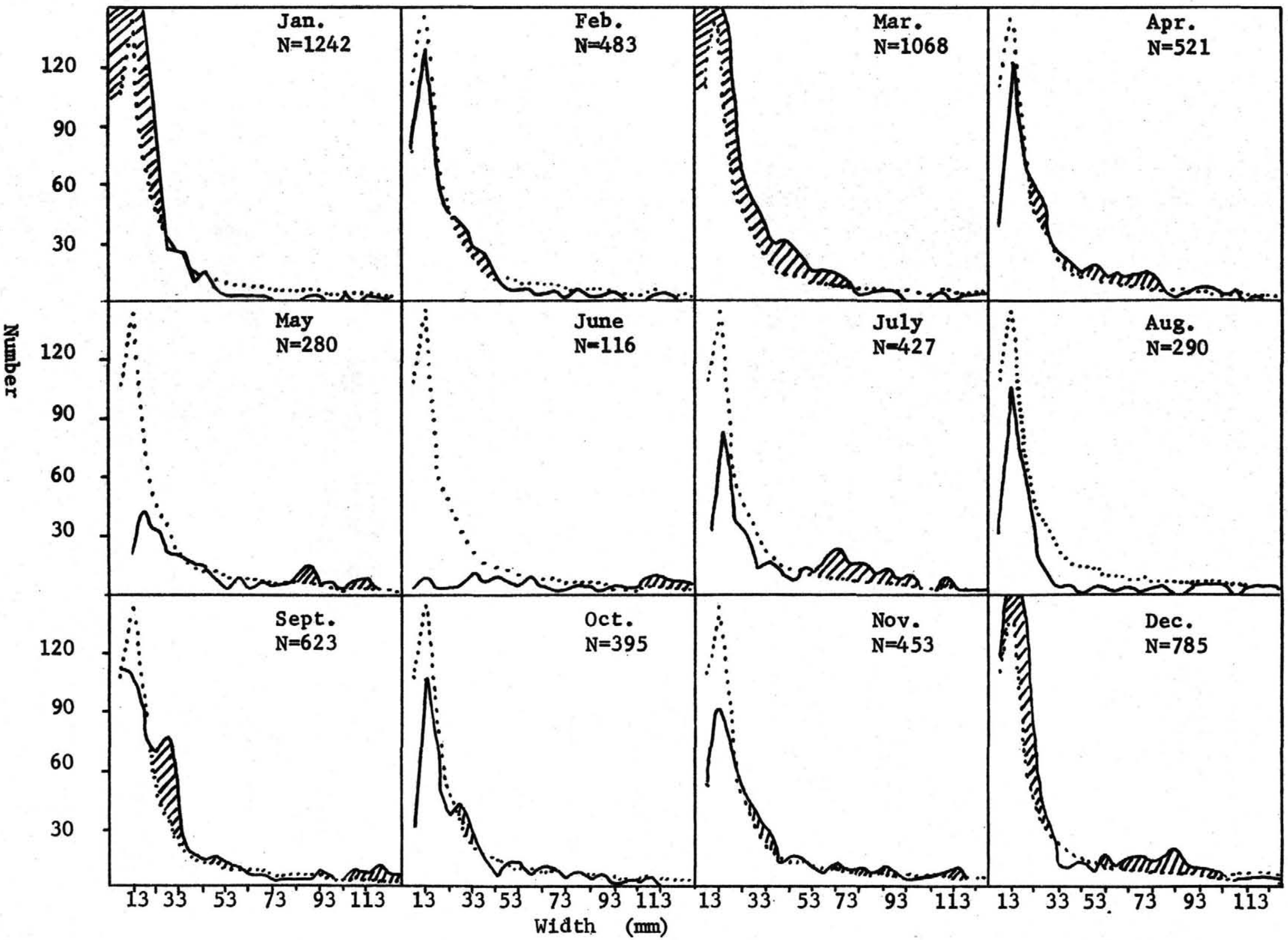
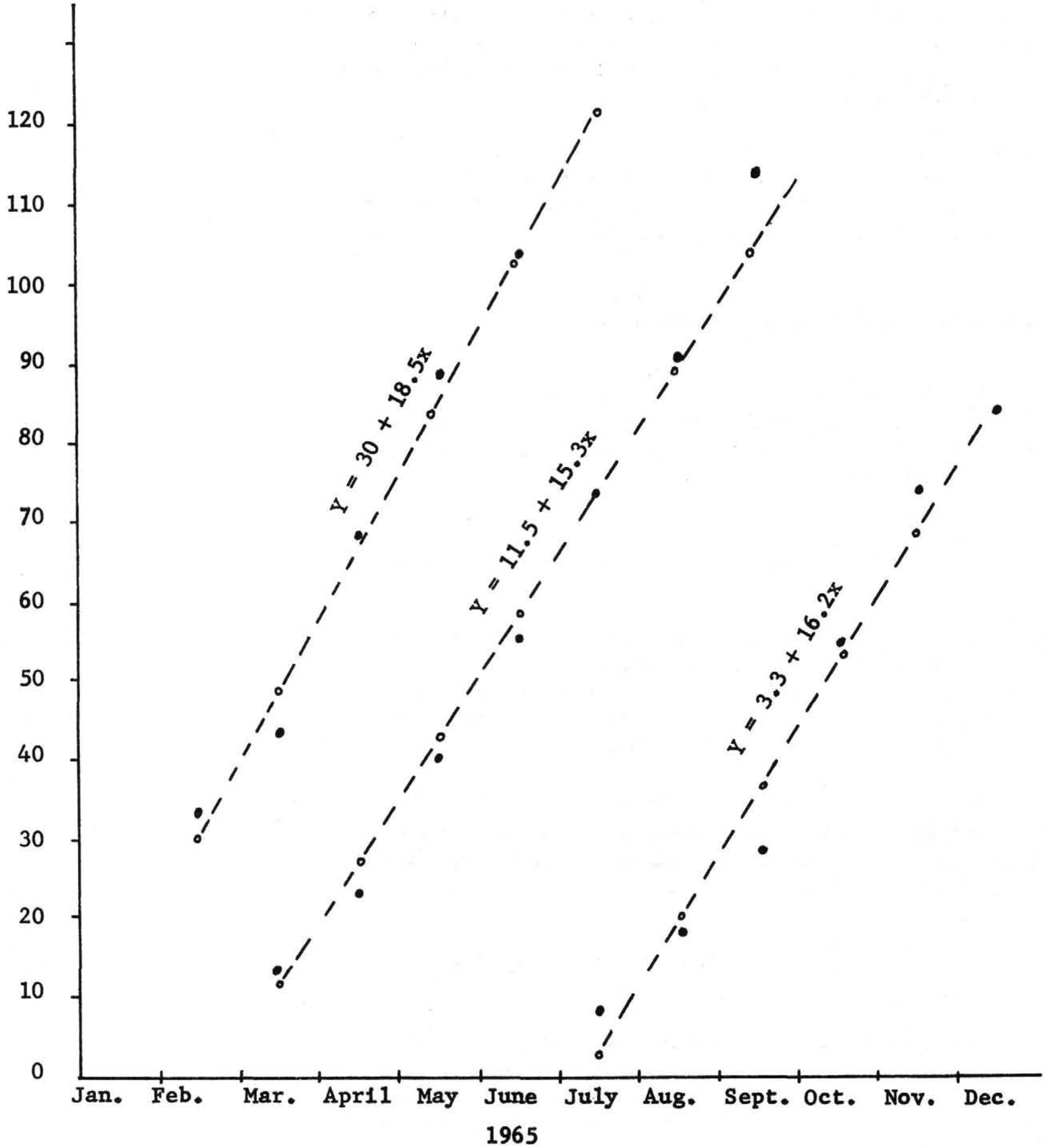


Figure 7: Theoretical growth curve of blue crabs in Galveston Bay, based on monthly progression of size class modes (1965).



San Antonio Bay: Few crabs were captured in the bar and 60-foot seine, but 10 foot trawl catches were larger than those in other bays. Peaks in availability occurred during March and April. The catch per effort at trawl stations (9.6) more than doubled the value recorded during 1964.

Aransas Bay: The scarcity of blue crabs in Aransas Bay was reflected in all samples. A few small crabs, mostly from the spring spawning, were taken at bar and 60 foot seine stations in July, August and September. The combined catch average for all samples was 2.4 crabs per sample.

Corpus Christi Bay: The largest trawl and seine catches were made during spring and summer. The average number of crabs per sample collected with the 60-foot seine increased from 1.7 in 1964 to 4.5 in 1965, while the average per 10 foot trawl sample increased from 4.6 in 1964 to 5.4 in 1965.

Upper Laguna Madre: Blue crabs (30-188 mm) were collected during February (1) and March (51) only, when salinities were below 40 ppt. Simmons (1957) suggested that salinity is the limiting factor determining the availability of blue crabs in the upper Laguna Madre. Hawley (1963) found crabs leaving the area when salinities reached 45 ppt in 1962 and 1963, but he has collected crabs in a salinity of 57 ppt.

Lower Laguna Madre: Peaks in the availability of small blue crabs at bar seine stations were recorded in March and November, whereas larger juveniles were present in moderate numbers at 60 foot seine stations in January, February and March. Catch per effort values increased over 1964 figures.

Gulf Sampling of Blue Crab Populations

Few blue crabs were taken in Gulf trawl samples off Port Aransas and Port Mansfield/Port Isabel. Fifty-four trawl samples off Port Aransas produced only 15 blue crabs, while 41 samples off Port Mansfield/Port Isabel yielded seven crabs. Only one sponge crab was caught.

Survey of Non-Commercial Species

The gulf crab, *C. danae*, was caught in all bays except the upper Laguna Madre and Corpus Christi Bay. Peaks in availability at bay stations were noted in May - June and October (Table 7). Similar patterns of availability were noted in trawl samples off Port Aransas and Port Mansfield/Port Isabel. Female crabs with eggs were taken during May, July, August and September.

Other species of crabs recorded in Gulf samples included *Arenaeus cribararius*, *Portunus gibbesii*, *Portunus spinimanus*, *Hepatus epheliticus*, *Libinia emarginata*, *Persephona punctata*, *Ovalipes ocellatus*, *Anasimus latus*, *Petrochirus bahamensis*, *Calappa flammea* and *Porcellana sp*.

Crab Marking Studies

Between April 19, 1962 and October 22, 1965, 1399 blue crabs were tagged and released in four areas of Galveston Bay and on West Galveston Beach (Table 6). The overall recovery rate was 7.5% which included 87 males, 15 sooks, and 3 sponge crabs. Only 2 of 190 immature crabs (< 128 mm) tagged were recovered.

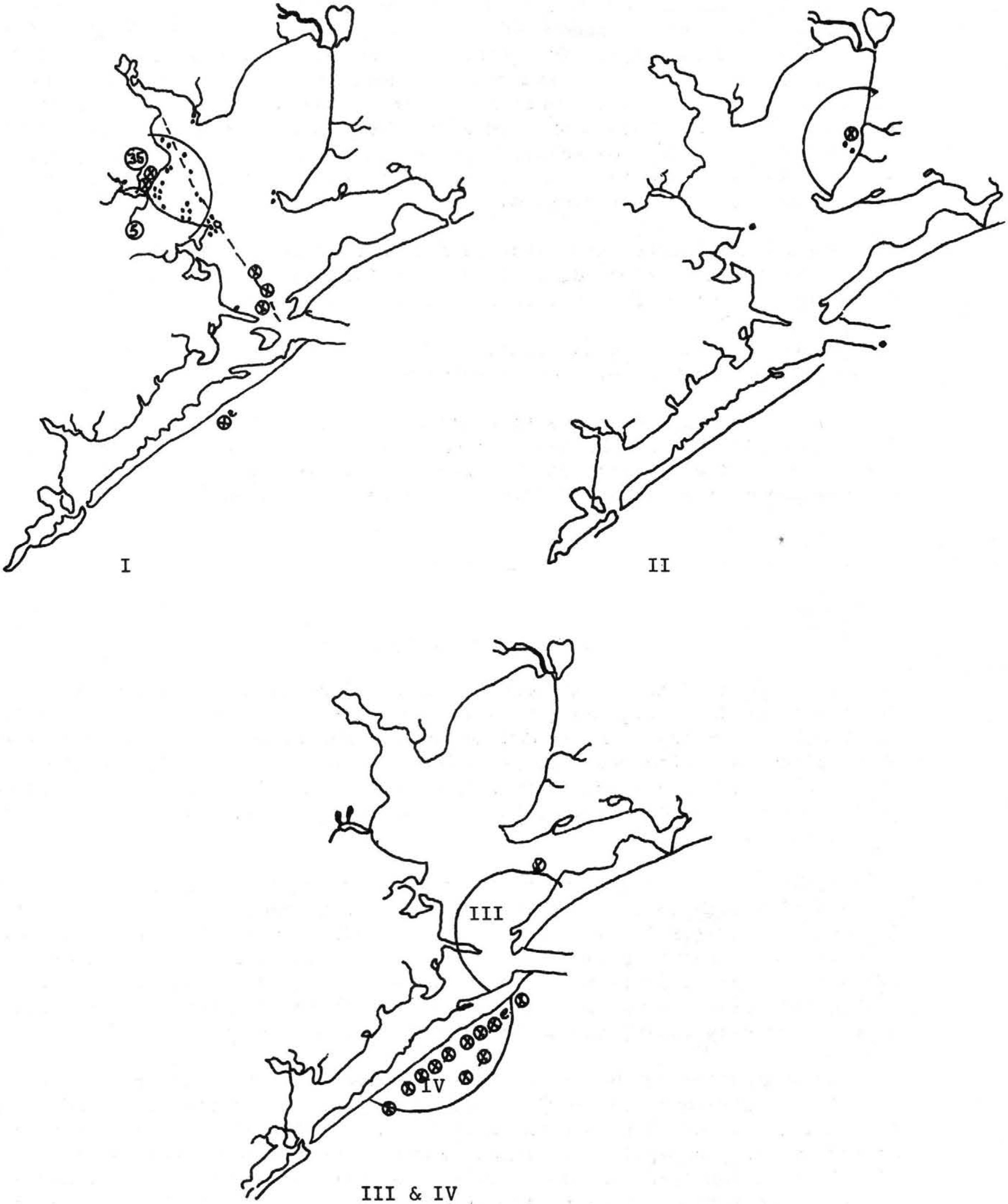


Figure 8: Charts showing locations of tagging sites and recaptures. Male recaptures indicated by solid dot; females by encircled X. Circles represent a five mile radius from the tagging site.

The low rate of return can probably be attributed to the loss of tags during shedding. For 13 returns, data were not available on location, date of capture, or both.

Of the crabs tagged in the bay and recaptured, 85% of the males and 45% of the females were recovered within five nautical miles of the tagging site. Female crabs tagged in the bay and recovered outside the area of release (Figure 8) showed a southward movement into the lower bay and Gulf of Mexico. The longest movement by a female crab was about 35 nautical miles in 106 days. This sook, tagged in Clear Lake (Area I) in March, 1965, was recaptured on West Galveston Beach in July, 1965. It was bearing eggs at the time of recapture. Only three of 197 (1.5%) tagged sponge crabs were recaptured; two had spawned.

Tagged male crabs were returned at a higher rate (10%) than females (4.5%). Movements were non-directional with the most distant recovery being about 20 miles from the release site.

Of the 115 female crabs tagged on West Galveston Beach, nine were recovered, all within the area of release.

Blue crabs tagged in the fall (October - November) and early spring (March - April) had the highest recovery rate. The lowest rate was recorded during summer (July - September). Time elapsed between tagging and recapture ranged from 1 to 237 days, with a mean of 51 days.

DISCUSSION

Evaluation of Sampling

Previous findings of Moffett and More (1963) established the bar seines usefulness in detecting changes in the apparent abundance of juvenile crabs (8-28 mm) in nursery areas in Galveston Bay, and biologists in Matagorda and Aransas Bay have also reported favorable results with bar seine sampling. Childress (1963) found the 10 foot trawl to be an effective sampling device in San Antonio and Corpus Christi Bays, whereas bar seine samples were mostly unproductive.

Although both gear types probably reflect seasonal crab abundance, each is selective with regard to the size of the crabs caught. In North Carolina, Judy and Dudley (1965) noted that a trawl small enough to retain crabs below 4 cm in width cannot be pulled fast enough to effectively capture crabs of slightly larger size since they move faster. Similar limitations would apply to the bar seine. Samples taken by the 60 foot seine, which catches crabs over a wide size range, appear to be most representative.

An evaluation of the effect of environmental factors (variables) on the size of the catch and (or) the efficiency of the sampler is needed. For example, low water temperatures curtail the swimming activity of crabs and make them more susceptible to being caught; thus the gear type becomes more efficient during cold months. Position (height) of the tide at shoreline stations and time of sampling are other variables which have influenced catches. A clear knowledge of catch differences attributed to environmental factors is necessary in any adequate study of the blue crab and its environment.

Environmental Relationships and Distribution Within the Estuaries

Blue crabs were present at most bay stations sampled during 1965, but they appeared to congregate in certain areas within the bay system. Judy and Dudley (1965) reported similar congregations in Core Sound, North Carolina and suggested patterns of distribution were related to size, sex, season and sexual maturity. Food availability, bottom type, temperature and salinity are other factors which appear to affect distribution and congregation within Texas estuaries. The most productive stations for small crabs in the Galveston, Matagorda and San Antonio Bay systems were in tidal marshes, bays and lakes adjacent to rivers and creeks which normally had a low salinity and a soft mud, silty clay or sandy clay bottom. Distribution of small crabs in the lower Laguna Madre, Aransas and Corpus Christi Bays seemed to be influenced by bottom type, with the largest samples being collected on soft mud bottoms. Few crabs larger than 50 mm were captured at shoreline stations during winter, but smaller crabs (8-28 mm) were taken in fair numbers at temperatures as low as 4°C. Although immature crabs appeared to be most abundant in the fresher areas of the bay system, an inverse relationship between salinity and crab availability was not apparent (Table 5).

In March, a plankton bloom and associated die-off from oxygen depletion in Clear Lake (Galveston Bay) was responsible for a crab kill of significant importance. A paucity of fishable stock was noted in April when the spring trotline fishery commenced and routine sampling showed a decline in prerecruitment size crabs.

Biological Considerations and Relationships

1. The present sampling method used to measure the monthly ingression of megalops into bays did not show a clear relationship between the number of megalops entering the bay and the number of juvenile crabs present in nursery areas. Likewise, peaks of spawning could not be deduced from plankton data. Darnell (1959) reported similar findings in Louisiana.

2. The catch per standard unit of effort recorded at bar seine and trawl stations provides an index of the relative abundance of juvenile crabs, but until more information on the effects of various environmental factors on the success of reproduction and survival is available, this index cannot be used to predict crab abundance.

3. After studying 13 generations of crabs in Chesapeake Bay, Pearson (1948) found no correlation between the relative abundance of adult female crabs and their progeny. Pearson concluded that "The size of the spawning stock has not determined the size of the population of crabs surviving to commercial age." However, he also noted that it was possible that the spawning population could be reduced to a level at which the scarcity of spawners could become the dominant factor in limiting natural reproduction. At the current rate of fishing, crabs in Texas bays do not appear to be overfished and there is no apparent paucity of spawners. Therefore, the newly enacted "sponge crab" law (Art. 9376, P.C.), prohibiting the taking of sponge crabs, is not based on information available on the biology of the crab.

4. Factors primarily responsible for determining the size of the commercial catch in Florida were market conditions, crab migrations and abundance (Tagatz 1965). Variations in monthly catches among areas and between years can be accounted for by one or more of these factors in Texas. The sampling of

commercial landings helps monitor the availability of crabs to the fishery and provides some information on market conditions, but detailed statistics of commercial operations including reliable catch per effort data and changes in the amount of fishing are necessary to determine changes in abundance.

5. Tagging studies have provided information on movements of male and mature female crabs, but little was learned on the movements and subsequent fate of sponge crabs. A new phase of tagging, aimed at determining the fate of spent females, should be initiated during 1966.

LITERATURE CITED

Breuer, Joseph P. 1962. An ecological survey of the lower Laguna Madre of Texas, 1953-1959. Publ. Inst. Mar. Sci. Univ. Tex. 8.

Childress, U. R. 1963. Studies of the blue crab populations of the Texas Coast. Proj. Rpts., Tex. Parks and Wildl. Dept. Mar. Div. (mimeo.).

Collier, Albert and Joel W. Hedgpeth 1950. An introduction to the hydrography of tidal waters of Texas. Publ. Inst. Mar. Sci. Univ. Tex., 1 (2).

Darnell, Rezneat M. 1959. Studies of the life history of the blue crab (*Callinectes sapidus* Rathbun) in Louisiana waters. Trans. Amer. Fish. Soc. 88 (4).

Daugherty, F. M. 1952. Notes on *Callinectes danae* Smith in Aransas Bay, Texas, and adjacent waters. Tex. Jour. Sci. 4 (2).

Hawley, William 1963. A study of the blue crab population of the upper Laguna Madre. Proj. Rpts., Tex. Parks and Wildl. Dept. Mar. Div. (mimeo.).

Judy, Mayo H. and Donnie L. Dudley 1965. North Carolina studies - Blue crab program, Annual Rpt., Br. Comm. Fish Bio. Lab., Beaufort, N. C. (in press).

Moffett, A. W. and W. R. More 1963. Population studies of the blue crab in the Galveston Bay system. Proj. Rpts., Tex. Parks and Wildl. Dept. Mar. Div. (mimeo.).

More, William R. and Alan W. Moffett 1964. Population studies of the blue crabs of the Galveston Bay system. Proj. Rpts., Tex. Parks and Wildl. Dept. Mar. Div. (mimeo.).

Pearson, John C. 1948. Fluctuations in the abundance of the blue crab in Chesapeake Bay. U.S. Fish & Wildl. Ser. Res. Rpt. 14.

Pullen, Edward J. 1962. Experimental crab tagging. Proj. Rpts., Tex. Game and Fish Comm. (mimeo.).

Robertson, Roy L. 1938. Observations on the growth stages in the common blue crab, *Callinectes sapidus* Rathbun with special reference to post-larval development, U. of Maryland, Master's Thesis.

Simmons, Ernest G. 1957. An ecological survey of the upper Laguna Madre of Texas. Publ. Inst. Mar. Sci. Univ. Tex. 4 (2).

Tagatz, Marlin E. 1965. Florida studies - Blue crab program, Annual Rpt., Bur. Comm. Fish. Biol. Lab., Beaufort N. C., (in press).

Tagatz, Marlin E. 1965. The fishery for blue crabs in the St. John's River, Florida, with special reference to fluctuation in yield between 1961 and 1962. U.S. Fish & Wildl. Serv., Sp. Sci. Rpt. - Fish. 501.

Walburg, C. M. 1963. Blue crab studies, Annual Rpt. Bur. Comm. Fish. Biol. Lab. Beaufort, N. C. 1961 Cir. 148.

Table 1: Hard crab landings, by statistical districts (1965)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	%	Totals
Galveston	87409	15863	66378	170837	312000	361465	297381	256045	269560	224763	181543	55390	64.1	2298571
Matagorda	207		16500	34678	34678	29548	68411	51964	139358	44456	78088	35500	14.9	533388
Aransas	47588	38587	32211	46229	46367	17459	30594	112619	150629	62711	96146	67537	20.9	748669
Laguna			186										<1.0	186
Total	135204	54450	115275	251744	393045	408472	396323	420628	559574	331930	355777	158427		3580814

Source: Texas Landing Bulletins

Table 2: Number of megalops larvae (*Callinectes sp.*) caught in plankton samples at major passes to Texas Bays (1965), expressed as monthly average/sample.

Gulf Passes	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Galveston	.5	0	20	1	4.5	2	55	18.5	17.5	0	0	-
Matagorda Channel	0	1.5	0	4	5800	6	0	1	0	0	-	-
Pass Cavallo	0	3.5	2	3.5	300	32	2.5	.5	0	.5	-	-
Cedar Bayou	44	134.5	25553	1	3	15	125	0	5	102.5	175	-
Aransas Pass	5.5	.5	9	2.5	0	1015	410	5	3.5	-	0	-
Pt. Mansfield	0	57	210.5	49.5	6	71	-	0	0	-	-	-
Pt. Isabel	0	1.5	2.5	2	430	180	15	0	0	-	-	-

Table 3: Catch data (1965), expressed as number of blue crabs per sample for each gear type, by months.

6' Bar Seine

Area	2 & 3	4	5	6	7	9	Mo./Avg. Sample
Jan.	110.5	42.5	0	2.5	-	-	39.5
Feb.	46.5	21.5	0	1	-	2	14.1
March	73.5	68	1	4	.5	13.5	28.6
April	45	20	0	2.5	-	4	14.3
May	12	24.5	2.5	1.5	4.5	1	7.8
June	3.5	4	1	1	-	2.5	2.3
July	7.5	17	9.5	5	7	1.5	8.1
Aug.	17	11.5	3	4.5	6.5	0	7.1
Sept.	28	8	-	2.5	4.5	1.5	8.9
Oct.	23	24.5	1.5	1.5	1.5	5	9.5
Nov.	31	31	4.5	3	-	7.5	15.4
Dec.	59.5	60	2	5	3	8	22.8
Yearly Mean/ Sample	38.1	27.7	2.3	2.8	3.9	4.2	-

10' Trawl

Area	2 & 3	4	5	6	7	9	Mo./Avg. Sample
Jan.	19	-	1.5	1	-	13	8.6
Feb.	13	-	12.5	1	1.5	7.5	7.1
March	10	4.5	44.5	4	3.5	3	11.6
April	2	6.5	30.5	1	6	1	7.8
May	1	1	7	2.5	6.5	.5	3.1
June	0	2.5	2.5	1	10	5.5	3.6
July	.2	2	.5	1.5	7	.5	2.0
Aug.	.3	.5	1	.1	7.5	.5	1.7
Sept.	.7	1	2.5	.5	6	2.5	2.2
Oct.	1	0	4.5	.5	3.5	10	3.3
Nov.	0	.1	1.5	1	7	4	2.3
Dec.	0	-	6.5	-	.5	1.2	2.1
Yearly Mean/ Sample	3.9	2.0	9.6	1.3	5.4	4.1	-

60'Seine

Area	2 & 3	4	5	6	7	9	Mo./Avg. Sample
Jan.	4	-	0	0	-	10	3.5
Feb.	5	5.5	0	2.5	1.5	27	6.9
March	4.5	17	1.5	3	.5	8	5.8
April	20	11.5	.5	1.5	7	3	7.3
May	12	5.5	.5	3.5	6	4.5	5.3
June	7.5	1.5	-	.5	-	3	3.1
July	37	14.5	-	2	6.5	-	15.0
Aug.	10	3	-	10	6.5	-	7.4
Sept.	28.5	1	3	8.5	6	6.5	8.9
Oct.	15.5	1	1	4	4.5	1.5	4.6
Nov.	12	1	.5	1	2	8.5	4.2
Dec.	6.5	-	.5	2	5	6	4.0
Yearly Mean/ Sample	13.5	6.2	.8	3.2	4.5	7.8	-

Combined Average/sample

Galveston Bay (M-2 & 3) = 18.5
Matagorda Bay (M-4) = 12.0
San Antonio Bay (M-5) = 4.2
Aransas Bay (M-6) = 2.4
Corpus Christi Bay (M-7) = 4.6
Lower Laguna Madre (M-9) = 5.4

Table 4: Blue crab data, by year and gear type (1962-65).

Six foot bar-seine - Average number per sample (3000 $ft.^2$).

	Galveston Bay	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Lower Laguna Madre
1962	17.0	16.4	-	5.7	-	-
1963	13.4	14.7	-	1.8	-	-
1964	33.3	28.7	-	2.4	-	-
1965	38.1	27.7	2.3	2.8	3.9	4.2

10 foot trawl - Average number per sample (15 minute).

	Galveston Bay	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Lower Laguna Madre
1962	4.3	4.0	4.4	2.0	7.3	4.9
1963	2.8	3.4	4.1	1.3	3.2	2.0
1964	14.2*	1.3	4.3	.5	4.6	1.8
1965	4.0	2.0	9.6	1.5	5.4	4.1

* Average preponderated by two large samples

60 foot seine - Average number per sample (5000 $ft.^2$).

	Galveston Bay	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Lower Laguna Madre
1964	12.2	4.5	1.3	3.8	1.7	6.5
1965	13.5	6.2	.8	3.2	4.5	8.0

Table 5: Number of samples taken and average number of blue crabs collected at seven different salinity ranges

Bay	Salinity Range (ppt)						
	0-1.9	2-9.9	10-19.9	20-29.9	30-39.9	40-49.9	<50
Galveston	(6)-19.0	(80)-26.3	(150)-28.3	(79)-12.5	(24)-149	-	-
Matagorda	(16)-38.8	(39)-20.2	(135)-10.1	(135)-7.3	(10)- .3	-	-
San Antonio	(12)-29.6	(57)-8.9	(67)-5.7	(71)-3.1	(24)-1.8	-	-
Aransas	-	(4)- .5	(31)-1.5	(240)-2.6	(66)-3.0	-	-
Corpus Christi	-	(7)-5.1	(7)-6.5	(57)-7.1	(146)-5.0	-	-
Lower Laguna Madre	-	-	(3)-9.3	(9)-14.0	(71)-5.0	(85)-5.8	(2)-6.7
Overall Average	29.1	12.2	10.2	7.8	5.0	5.8	6.7

( ) Denotes number of samples taken

Table 6: Crab Tagging Data - Galveston Bay

Number Tagged					Number Returned													
					Release Area (0-5 mi.)			Outside Release Area (5-15 mi.)			Gulf				Per cent Returned			
Location	Year	M	F	S	M	F	S	M	F	S	M	F	S	Total	M	F	S	Total
Trinity Bay	1962	82	1	0	-	-	-	3	-	-	-	-	-	3	3.7	0	-	3.6
	1963	6	1	0	-	-	-	-	-	-	-	-	-	-	0	-	-	-
	1964	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1965	2	16	0	2	1	-	-	-	-	-	-	-	3	100.0	6.3	-	16.7
Upper Galveston Bay	1962	193	54	0	7	-	-	1	-	-				8	4.1	0	-	3.2
	1963	281	76	0	35	1	-	9	2	-	-	-	-	47	15.7	3.9	-	13.2
	1964	93	31	1	15	1	-	-	1	-	-	-	-	17	16.1	6.5	-	13.6
	1965	153	19	0	12	-	-	-	-	-	-	1	-	13	7.8	5.3	-	7.6
Lower Galveston Bay	1962	7	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1963	13	14	8	-	-	-	-	-	-	-	-	-	-	0	0	0	0
	1964	4	22	158	-	-	1	-	-	-	-	-	1	2	-	0	1.3	1.1
	1965	3	2	5	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Gulf Surf	1962	-	-	-	-	-	-	-	-	-	-	-	-	-				
	1963	1	51	2	-	-	-	-	-	-	-	4	-	4	-	7.8	-	7.4
	1964	0	25	11	-	-	-	-	-	-	-	4	-	4	-	16.0	0	11.1
	1965	0	17	9	-	-	-	-	-	-	-	-	1	1	-	0.1	11.1	3.8
West Bay	1962	2	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1963	7	3	0	1	-	-	-	-	-	-	-	-	1	14.2	-	-	10.0
	1964	18	0	0	2	-	-	-	-	-	-	-	-	2	11.1	-	-	11.1
	1965	0	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		866	336	197	74	3	1	13	3	-	-	9	2	105	10.0	4.5	1.0	

M = Male
F = Female
S = Sponge

Total Tagged = 1399
Total Returned = 105
Per cent Returned = 7.5

Per cent Returned (by year)
1962 - 3.2 1964 - 6.9
1963 - 11.2 1965 - 7.4

Table 7: Occurrence of <u>Callinectes</u> <u>danae</u> in Texas bays and the inshore Gulf of Mexico during 1965.

Area	Months Present	Months Most Abundant	No. Collected
Galveston Bay	Sept.-Dec.	October	59
Matagorda Bay	March-Dec.	May-June; Sept.-Oct.	99
San Antonio Bay	March-Aug.; Nov.-Dec.	June; November	13
Aransas Bay	Jan.; April-July; Oct.	May-June	192
Corpus Christi Bay	None Recorded		
Upper Laguna Madre	None Recorded		
Lower Laguna Madre	Feb.-Dec.	May; Oct.-Nov.	82
Off Pt. Aransas	Jan.-Dec.	May-June	1352 (Avg./Sample = 24.6)
Off Pt. Mansfield/ Pt. Isabel	Jan.-Dec.	June-July; Sept.-Dec.	592 (Avg./Sample = 14.1)