Survey of the Blue Crab (Callinectes sapidus Rathbun)

Sport Fishery of the Galveston Bay System 1968.

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ABSTRACT

A survey of the blue crab (Callinectes sapidus) sport fishery in Galveston Bay was conducted April through December of 1968. The survey area extended from Baytown, Texas to Rollover Pass, Texas, a linear distance of approximately 262 miles via survey checkpoints.

A total of 6,599 sport crabbers was counted within the census area during the survey. Summer was the most productive crabbing time with July being the peak month. The average catch was 2.89 crabs per crabber. The estimated number of crabs caught was 99,375 with a range of 70,799 to 128,069 crabs at the 95% confidence level. Sports crabbing was found to be a local sport as 86 percent of the fishermen interviewed were from Harris and Galveston counties.

INTRODUCTION

In 1968 a survey to provide estimates of the sports crab catch, numbers of sport crabbers and expenditures was conducted in Galveston Bay. Studies on commercial blue crab (Callinectes sapidus) fisheries have been conducted in Virginia (Pearson 1948), Florida (Tagatz 1965) and Texas (More 1969), but data on recreational (sport) crab fisheries are lacking.
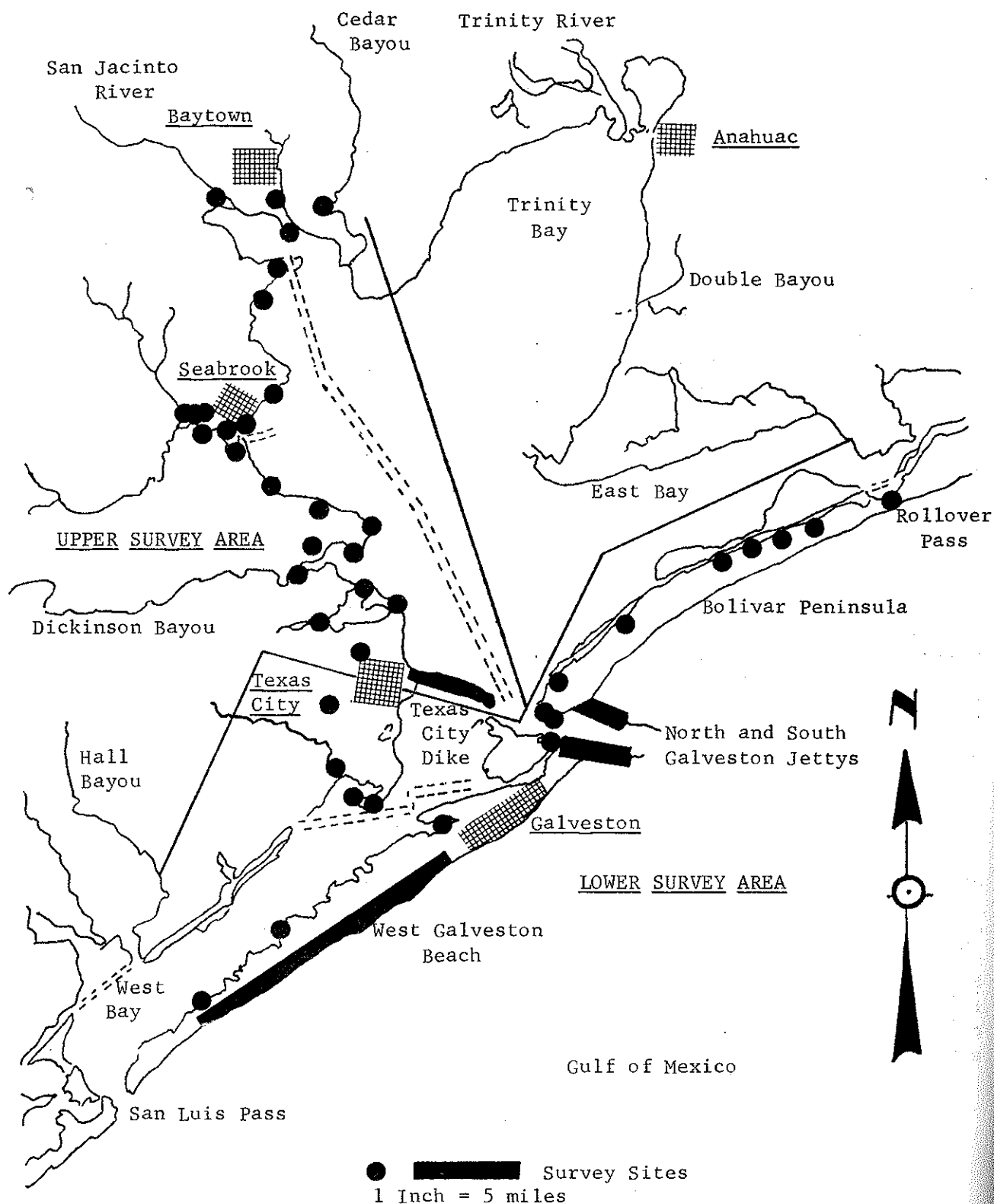
DESCRIPTION OF AREA

The survey area was restricted to portions of Galveston Bay in Harris and Galveston counties. The region was divided into upper bay and lower bay survey areas. The upper bay area extended from Baytown, Texas to the Texas City Dike (Texas City, Texas), a distance of 118 linear miles via each crabbing checkpoint. The lower bay survey area extended from La Marque, Texas, east to Rollover Pass and west to West Galveston Island (a distance of 144 miles - Figure 1). People crabbing on public and private piers, bridges, saltwater ditches, bayous, jetties and beaches were interviewed. All sites sampled were accessible by automobile.

METHODS

Three Parks and Wildlife Department biologists and four field assistants conducted the sports crab survey. Two surveyors were usually used to canvass the study area. A preliminary survey was made to determine popular sport crabbing sites and sampling sites were selected to provide a representative

Figure 1:   Galveston Bay Sports Crab Survey Areas - Upper and Lower Runs (1968)

Cedar
Bayou

Trinity River

San Jacinto
River

Baytown

Anahuac

Trinity
Bay

Double Bayou

Seabrook

East Bay

Rollover
Pass

UPPER SURVEY AREA

Bolivar Peninsula

Dickinson Bayou

Texas
City

Texas
City
Dike

North and South
Galveston Jettys

Hall
Bayou

N

Galveston

LOWER SURVEY AREA

West
Bay

West Galveston
Beach

Gulf of Mexico

San Luis Pass

● ▬▬▬▬ Survey Sites
1 Inch = 5 miles

coverage of the survey area.

To provide a randomized census, sampling was stratified by days of the week (Rounsefell and Everhart, 1953). Weekends were sampled more than weekdays as crabbing could be expected to be heavier during these periods (Table 1).

Data were derived from counts of and interviews with sport crabbers. When counts were conducted, both upper and lower bay survey areas were canvassed, whereas on interview dates, one area was surveyed. Each survey site was checked for sport crabbers on each count or interview. The numbers and sex of crabbers were noted by the surveyors. At least two counts were made each month with the exception of December, when one count was completed. On specified dates in June, July and August (Table 1), two teams conducted separate surveys. The teams canvassed the entire area, each beginning on opposite ends. The double surveys were designed to determine if crabbing activity shifted from one area to another during the day.

Interviews were conducted twice each month with the exception of November when one was completed. The upper and lower bay areas were surveyed on separate dates. Each crabber or a representative of each group of crabbers encountered was interviewed. Information requested was: (1) county of residence, (2) total cost of the trip, (3) time spent crabbing, (4) types of bait used and (5) the number of crabs caught.

Interviews were confined to weekdays with the exception of one Saturday in November. Increased weekend and holiday crabbing pressure limited interviews primarily to weekdays. Catch per effort and average expenditures were expected to be consistent throughout each week.

ESTIMATION PROCEDURES

The statistical treatment of the data was patterned after Gullard (1966) and Pinkas, Thomas and Hanson (1967). Monthly estimates were combined to provide a total estimate of the number of sports crab fishermen during the nine month survey. Computations were tested at the 95% confidence level.

N_i = Number of sample stations during study period

n_i = Number of stations sampled during given date

$\sum Y_{ii}$ = Number of crabbers encountered on survey run

$\overline{Y_i}$ = Average number of crabbers per sample station per period

$\overline{Y_a} = \dfrac{N_i Y_i}{\sum N_i}$ = Estimated monthly mean of crabbers per sampling period

$Var\ (\overline{Y_a}) = \dfrac{N_i^2 S_i^2}{n_i}$ = Variance of mean

$S_e = \sqrt{\dfrac{N_i^2 S_i^2}{n_i}}$ = Standard error of mean

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Table 1: Stratification of Sampling, Galveston Bay Sports Crab Survey, 1968

Day of Week

Month	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
April	Interview 29th Lower Run				Interview 12th Upper Run	Count 20th	Count 7th
May		Interview 11th Lower Run	Count 15th	Interview 23rd Lower Run	Interview 31st Upper Run	Count 18th	Count 5th
June	Count 10th			Interview 27th Upper Run		Count 29th	Count* 16th
July	Interview 29th Upper Run	Count 23rd		Count 4th Interview 11th Lower Run		Count* 13th	Count* 14th
August		Count* 6th	Interview 14th Lower Run		Interview 30th Upper Run	Count 24th	Count 18th
September	Count 9th	Interview 10th Upper Run		Interview 26th Lower Run		Count 7th	Count 22nd
October		Count 8th	Interview 23rd Lower Run		Interview 18th Upper Run		Count 27th
November	Count 11th	Interview 17th Upper Run	Interview 11th Lower Run			Count 23rd	Interview 3 Upper Run
December					Count 6th		
	3 Counts 2 Interviews	3 Counts 3 Interviews	1 Count 3 Interviews	1 Count 4 Interviews	1 Count 4 Interviews	7 Counts 0 Interviews	7 Counts 1 Interview

* Double runs made on this day

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$$\text{Var } (Y) = \sqrt{\frac{NiSi^2/ni}{Ni^2}}$$

$\overline{Y} \times N_O \times M = $ Estimated numbers of crabbers for a month where:

$\overline{Y}$ = Either the lower limit, mean, or upper limit on crabbers per station

N_O = Number of stations sampled per trip during each month

M = Number of days in each month

RESULTS

Estimated Sports Catch

Estimated total catch of blue crabs during the nine month period was 99,375 crabs with a range from 70,799 to 128,069 crabs (Table 3). The 887 sport crabbers interviewed reported a catch of 2,568 crabs. Interview data was expanded to provide an estimated monthly catch. Crabs caught by sportsmen averaged about 3 per pound. The estimated total catch, therefore, was 33,125 pounds with a range of 23,599 to 42,689 pounds. During the nine month survey commercial crabbers harvested 566,390* pounds in the survey area.

Seasonality of the Fishery

Crabs were caught in greater numbers during July than other months but catch/effort was relatively low (Table 3). Factors influencing the higher July catch were an abundance of spawning and spent female blue crabs in the Gulf surf and July is a peak vacation period. The average catch per effort was higher in September than other months (Table 3).

Fishing Pressure

The total estimate of sports crabbers was 35,775 fishermen (range 25,513 to 46,155 - Table 2). These estimates were based on 95% confidence levels.

More sports crabbing was conducted in the upper bay than in the lower bay (Table 2). Houston, Pasadena, Baytown, La Porte and the NASA areas were within 30 minutes driving time to most upper bay crabbing sites. Only in October did the fishing pressure on the lower bay exceed that of the upper bay.

The average sports crabbing group included four people. Of 6,599 crabbers counted, 2,665 (40.38%) were males (over six years old), 2,485 (37.65%) were females (over six years old) and 1,449 (21.95%) were estimated to be six years old or younger (Table 3). Children six or younger may or may not have been active crab fishermen but were included in the count.

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*Texas Landings - Texas Coastal Fishing Districts April thru December 1968 U. S. Dept. of Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Wash., D. C. (Also the Texas Parks and Wildlife Department).

Table 2:   Monthly Tabulation of Sports Crab Fishermen Counted During the Galveston Bay Sports Crab Survey, 1968

	Upper Bay Run Number of Crabbers			Lower Bay Run Number of Crabbers				Statistical Limits of Expanded Data*		
	Weekends	Weekdays	Total	Weekends	Weekdays	Total	Total (Both Runs)	Lower Limit	Mean	Upper Limit
April	502	52	557	.0	11	11	568	3,423.90	4,604.70	5,904.30
May	576	105	681	234	28	254	935	3,393.26	4,799.11	6,205.27
June	409	213	622	310	122	432	1,054	3,932.70	5,680.50	7,428.60
July	492	679	1,171	556	590	1,146	2,317	7,970.72	11,001.28	14,031.84
Aug.	335	179	534	258	172	430	964	4,072.16	5,467.47	6,862.78
Sept.	376	63	439	138	16	154	593	1,995.30	2,862.30	3,729.30
Oct.	47	11	58	20	45	65	123	509.02	799.80	1,090.58
Nov.	29	0	29	16	0	16	45	216.90	559.80	902.70
Dec.	0	0	0	0	0	0	0	0	0	0
	2,789	1,302	4,091	1,532	984	2,508	6,599	25,513.06	35,774.96	46,155.37

* Based on 95% confidence levels

Table 3: Number of Sport Crabbers Interviewed, Blue Crab Catch Rates and Average Group of Expenses (Galveston Bay, 1968).

Month		Number of Sport Crabbers				Catch			Expanded Catch Range			Aver. Group Expenses
		Over 6 Years Old		6 or		Crabs per	Crabs per	Total	Lower		Upper	
		Male	Female	Younger	Total	Individual	Group/hours	Catch	Limit	Mean	Limit	
April	Upper Run	11	21	20	52	1.67	-	87				2.96
	Lower Run	5	6	0	11	.27	-	.3	3,321.2	4,466.5	5,727.1	1.56
May	Upper Run	19	17	16	52	2.4	-	125				2.41
	Lower Run	1	6	2	9	6.7	-	60	15,439.3	21,835.9	28,233.9	3.33
June	Upper Run	42	40	14	96	1.7	-	165				3.30
	Lower Run	34	37	20	91	2.8	-	266	8,848.7	12,781.1	16,714.3	4.91
July	Upper Run	38	62	34	134	1.2	-	233				2.08
	Lower Run	100	95	45	240	4.1	-	994	21,122.4	29,153.4	37,184.3	2.60
Aug.	Upper Run	34	18	14	66	2.3	4.04	211				3.18
	Lower Run	34	37	7	77	2.7	-	151	10,180.4	13,668.7	17,156.9	3.99
Sept.	Upper Run	14	12	0	26	6.7	11.67	175				4.46
	Lower Run	4	4	0	8	4.4	7.54	35	11,073.9	15,885.7	20,697.6	3.50
Oct.	Upper Run	0	0	0	0	0.0	0	0				-
	Lower Run	3	5	1	9	2.0	2.0	18	509.0	799.8	1,090.6	3.50
Nov.	Upper Run	9	3	4	16	2.8	7.5	45				4.50
	Lower Run	-	-	-	-	-	-	-	303.6	783.7	1,263.8	-
Dec.	Upper Run	-	-	-	-	-	-	-				-
	Lower Run	-	-	-	-	-	-	-	-	-	-	-
Totals		347	363	173	887	2.89	6.46	2,568	70,798.5	99,374.8	128,068.5	3.27 Avg.

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Sports crabbing was mainly a local sport. Of the 887 fishermen interviewed, 86% were from Harris and Galveston Counties. Seventeen Texas counties were represented in the survey as were seven states, including Texas (Table 4).

Expenditures

Sport crabbers spent about $33,897 during the survey period. This estimate was based on the average expenditure of $3.27 per crabbing group (Table 3). Expenditures included gasoline to reach crabbing sites, food and crabbing gear (nets, traps, lines, bait).

The average cost of catching one pound of crabs (light weight) was 85.5 cents, whereas the average price paid to commercial fishermen was 8-10 cents per pound (Farley 1968). Crabs can usually be purchased at seafood houses for $1.50 per dozen (5-6 pounds live weight). Crabs caught by sport crabbers are almost twice as expensive as crabs purchased retail.

Use of Crab Bait

48% of the sport crab fishermen preferred to use chicken as bait. Chicken necks and wings were used more often due to low cost, durability and availability. Of the remaining crabbers, 16% preferred beef, 16% preferred fish, 2% preferred pork and 5% used miscellaneous baits. Most crabbers used bait available at their homes and few bought bait from stores.

DISCUSSION

Sport crabbing is an integral part of the blue crab fishery and should be considered in the management of this fishery. Data from this survey provided estimates of the magnitude (mean of 35,775 fishermen and value $33,897) of the sport crab fishery. Fishing pressure was greater in the areas near urban centers and most crabbers were residents of Galveston and Harris counties.

Better estimates of fishing pressure and catch rates could be obtained from: (1) hourly check at selected crabbing sites to provide estimates of the average trip duration (2) checking catches at the end of each trip to provide more accurate catch data.

The inclusion of children under six years of age in counts and interviews introduced bias to the sport crabber totals. These children did, however, contribute to the average cost per trip.

ACKNOWLEDGEMENTS

Table 4: Number of Blue Crab Sport Crabbers Counted by County of Residence
(Galveston Bay Sports Crab Survey, 1968)

County	Crabbers Counted	% of Total
Harris	416	46.89
Galveston	351	39.57
Dallas	24	2.70
Jefferson	11	1.24
Orange	9	1.01
Travis	6	.67
Brazoria	6	.67
Montgomery	5	.56
Smith	5	.56
Jeff Davis	5	.56
Shackleford	4	.45
Hardin	4	.45
Ector	3	.33
Nueces	2	.22
Lubbock	2	.22
Liberty	1	.11
Hudspeth	1	.11
Out-of-state	29	3.26
Non residence given	3	.33
TOTALS	887	99.91*

* Percentage less than 100 because the values were rounded to two places.

LITERATURE CITED

Farley, Orman H.
    1968. Trends and Conditions of the Fisheries of Texas, June and December. U. S. Bur. of Comm. Fish, Galveston, Texas.

Gulland, J. A.
    1966. Manual of Sampling and Statistical Methods for Fisheries Biology. Part I. Sampling Methods, Section 2. Theory of Sampling. Food and Agriculture Organization of the United Nations.

More, William R.
    1969. A Contribution of the Biology of the Blue Crab (Callinectes sapidus Rathbun) in Texas with a Description of the Fishery. Texas Parks and Wildlife Dept. Tech. Series No. 1.

Pearson, John C.
    1948. Fluctuations in the Abundance of the Blue Crab in Chesapeak Bay. U. S. Fish and Wildlife Service Report 14: 1-26.

Pinkas, Leo, James C. Thomas and Jack a Hanson
    1967. Marine Sportfishing Survey of Southern California Piers and Jetties, 1963. California Fish and Game. 53 (2): 88-104.

Tagatz, Marlin E.
    1965. The Fishery for Blue Crabs in the St. Johns River, Florida, with Special Reference to Fluctuation in Yield Between 1961 and 1962. U. S. Fish and Wildlife Serv. Sp. Sci. Rpt. - Fish. 501: 1-11.

Rounsefell, George A. and W. Harry Everhart.
    1953. Fishery Science its Methods and Applications. New York, London. John Wiley and Sons Inc. Ch. VI pp 76-77.