

## Job Report

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Project Leader

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Project Name: Analysis of Populations of Sports and Commercial Fin-fish and of Factors which Affect these Populations in the Coastal Bays of Texas.

Period Covered: September 1, 1961 to December 31, 1962 Job No. 2

Population Studies of the Sports  
and Commercial Fin-fish and Forage Species  
of the Galveston Bay System

Abstract: Collections were made at fixed stations with various types of gear to obtain samples of adult game fish, juvenile game fish and forage species.

The stations in West Bay generally produced larger catches of juvenile and adult game fish than did the stations in other bays. The reverse was true of forage collections. Those forage stations in the less saline areas of the bay, for example, the Clear Lake station, produced larger catches than the lower bay stations.

Fish tags, returned during the study, indicated little movement of those fish recaptured. Redfish tag returns were much higher than those from other species.

Objectives: To determine the population fluctuations of the food and game fish and forage species of the Galveston Bay System.

Procedures: Collections were made each month with either trammel net or drag seine, otter trawl and minnow seine. The collections were made at fixed stations in widely scattered areas of the bay so that all habitat types present would be sampled. Figure 1 shows the Galveston Bay System with collection stations indicated.

Four collections were made each month with either the trammel net or drag seine. The trammel net used was 1,200 feet long and 40 inches deep. The inner mesh measured three inches stretched. The outer mesh measured twelve inches stretched. The drag seine used was 1,200 feet long and four feet deep. The mesh size in the wing sections was 2.5 inches stretched and was 2.0 inches stretched in the bag section. These nets were employed by pulling by hand. The area sampled in each collection was recorded. All game species captured were measured and counted. Weights were determined through use of length-weight relationships for each species. Those in a livable condition were tagged either with monel jaw tags or dart tags and released. Other species present in collections were noted.

Four collections were made each month with a sixty-foot seine. This net was six feet deep and constructed of mesh which measured  $3/4$  inch stretched. The seine was pulled in shallow areas in quest of the juveniles of the important game species. The total area covered in each collection was recorded.

All juvenile game fish taken were measured and counted. Other species present were noted.

Five collections were made each month with the otter trawl. The trawl measured ten feet along the lead line. The mesh measured  $1\frac{1}{4}$  inches stretched. The cod end contained a liner the mesh of which measured  $\frac{1}{2}$  inch stretched. The trawl was pulled by boat. All collections were of 15 minute duration. All forage species collected were counted and weighed. Small samples of each species were measured to determine rough average size.

The previous three paragraphs outlined the number of collections planned for each type gear each month. The numbers of collections actually made varied greatly. Shortly after this job started practically all of the collection gear for the job was lost to Hurricane "Carla". This occurred in other bays also, resulting in a considerable time lapse before the gear could be replaced and a considerable "gap" in the data collected.

Special collections were made with the above gear or with gill nets or hook and line. Such collections were made to fill in when the standard gear was not available or to capture fish for tagging experiments.

All the information gathered from collections was recorded on forms along with hydrographic and meteorological data recorded for each collection. This information was evaluated and is presented in this report.

### Findings:

#### Adult Game Fish:

During the period September 1961 to February 1962, the standard collecting equipment (trammel net or drag seine) was not available. Collections during this period were made by striking various lengths and mesh sizes of gill net for varying lengths of time. The data obtained from these collections were all converted into pounds of fish per "net day" for comparison purposes. Here a "net day" is defined as 1,200 feet of net set for a twelve hour period. Table 1 presents the information derived from gill net collections.

After March 1962, collections were made with standard gear. Each collection normally covered between four and six acres. The results of these collections in pounds per acre are given in Tables 2 through 6.

The catch varied greatly between stations. This is true of the Chocolate Bay and Mud Cut stations even though they are much closer than the other stations. These stations in West Bay and Chocolate Bay produced larger catches consistently than the other stations. This can partially be attributed to their physical location near a natural pass, to the Gulf, to the presence of large amounts of marine vegetation on the bay bottom and to the stability of hydrographic conditions in the area. The remaining stations are all more distant from passes, are in unvegetated areas and are all subject to rapid change in salinity due to fresh water influx.

The average weight per acre sampled in Galveston Bay of the six species listed for the ten months of standard sampling was 7.789 pounds. This 7.789 pounds per acre consisted of 1.697 pounds of speckled trout, 2.148 pounds of redfish, 0.729 pounds of drum, 2.084 pounds of sheepshead, 0.093 pounds of flounder and 1.038 pounds of croaker.

#### Juvenile Game Fish:

The term juvenile for describing the segment of the study to be discussed here is misleading. The young of the year is the intended meaning. Some of the species mentioned are juveniles for much longer than one year.

No collections were made prior to February 1962 due to lack of equipment. Collections were made following February at the stations indicated in Figure 1 as regularly as possible. Each collection normally covered approximately one tenth acre. The results which are shown in Table 7 are expressed in numbers of juveniles per acre.

A large concentration of juvenile flounder were found in February 1962 while sampling shrimp stations in Mud and Taylor Lakes. These lakes are small shallow lakes joining Clear Lake. The flounder were taken in a six-foot bar seine pulled for 15 minutes. Table 8 gives the results of the collections made in Mud and Taylor Lakes while the flounder were present.

Salinities in Mud and Taylor Lakes during this period varied from 12.7 ppt to 16.8 ppt. This is higher than normal for this area.

#### Forage Species:

In processing forage samples, all of the forage species were counted and weighed. A total weight of all forage items was possible most of the time, but when only one or two specimens of some of the smaller species were present, it became impossible to get an accurate weight of that species. Therefore, accurate data was obtained on numbers of each species collected, total weights of collections, but not on weight per species. The total weight of all forage items per collection will then be used to compare the different station (Table 9). The total number of forage items collected during each month will then be broken into percentages for six of the forage species of major importance. The remainder will be combined under a group called "others". This is presented in Figure 10 and will give some idea of species composition.

#### Fish Tagging:

During the twelve month period (September 1960 to August 1961) preceeding this study there were 151 Redfish, 316 Speckled Trout, 220 Drum, 43 Flounder and 668 Sheepshead tagged in the Galveston Bay System. A number of returns from this group were received prior to the beginning of this study in September 1961. However, all records of these returns were lost in the Hurricane of September 1961. During this study, 22 returns were received from this group. The information pertaining to these returns is presented in Table 11.

Nineteen of the twenty-two fish listed above are redfish. This is 12.5 per cent of the redfish tagged during the period and does not include all of the fish returned as records on earlier returns were lost. All of the fish listed were also recaptured within an approximate five miles of the point of release with the exception of numbers 16, 17, 18 and 22.

During the present study a total of 123 Speckled Trout, 191 Redfish, 308 Drum, 13 Flounder, 44 Croaker and 91 Sheepshead were tagged. Returns from these fish received prior to the closing date of this study are presented in Table 12.

Again the number of redfish returned is higher than the other species. The nineteen redfish returns represent 9.9 per cent of the number tagged during this study. Additional redfish tags have been received since the study ended and more will probably be received. This indicates along with the findings in Table 11 that the redfish population is being harvested rather heavily.

Again those fish tagged in West Bay showed little movement. However, some of the fish tagged in Trinity Bay (Nos. 1, 3 & 4) moved considerable distances in a south and southeast direction.

Numbers 23 through 29 are fish that were recaptured by the author and re-released at the location given in the "return data" column in Table 12.

Opposite to the high returns of the redfish is the complete lack of returns from Sheepshead. During the 28 month period covered in this section on fish tagging, a total of 859 Sheepshead have been tagged and not a single return has been received. This species, even though a very edible fish, is obviously not sought by the sports fishermen.

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Table 1

Month & Year	Station	Catch in Pounds per Net Day					Croaker
		Total	Trout	Redfish	Drum	Sheepshead	
October, 1961	Lone Oak	420.0		84.0	92.0	244.0	
	Elm Grove Point						
	Mud Cut	562.0		75.0	25.0	412.0	50.0
	Chocolate Bay	774.0	126.0		180.0	468.0	
November, 1961	Lone Oak	87.0		42.0	12.0	33.0	
	Mud Cut	122.0	44.4	62.1	9.5	6.0	
	Humble Camp	3.2	3.2				
December, 1961	Lone Oak	182.6		156.9	25.7		
	Elm Grove Point	15.3		15.3			
	Mud Cut			278.8	34.3		
January, 1962	Lone Oak	17.3	4.5	12.6	0.2		
	Elm Grove Point						
	Mud Cut	15.2	2.7	6.1	3.0	3.4	
	Chocolate Bay	35.7	7.1	10.0	18.6		

1. Trout-----Cynoscion nebulosus (Cuvier)  
 Redfish-----Sciaenops ocellata (Linnaeus)  
 Drum-----Pogonias cromis (Linnaeus)  
 Sheepshead--Archosargus probatocephalus (Walbaum)  
 Flounder----Paralichthys lethostigmus Jordan & Gilbert  
 Croaker-----Micropogon undulatus (Linnaeus)
2. Chocolate Bay, though not a regular station, was a very productive one and was sampled on several occasions throughout the year. It is therefore included.

Table 2

## Lone Oak Adult Station

Month & Year	Catch in Pounds per Acre						
	Total	Speckled Trout	Redfish	Drum	Sheepshead	Flounder	Croaker
March, 1962	47.998	4.416	35.083	4.625	0.958		2.916
April, 1962	10.140	2.609		1.578	1.453		4.500
May, 1962	4.722	0.354		0.525	0.635		3.208
June, 1962	4.113	0.208		0.062	0.781		3.062
July, 1962	13.206	0.964	1.337	0.142	10.204		0.559
August, 1962	2.823		0.271	0.073			2.479
September, 1962	2.719	0.313			1.203		1.203
October, 1962	4.145		2.164	0.091	1.890		
November, 1962	1.059			1.059			
December, 1962		Not Sampled					
Totals	90.925	8.864	38.855	8.155	17.124		17.927
Totals/9	10.102	0.985	4.317	0.906	1.902		1.992

Table 3

## Elm Grove Point Adult Station

Month & Year	Catch in Pounds per Acre						
	Total	Speckled Trout	Redfish	Drum	Sheepshead	Flounder	Croaker
March, 1962	0.382	0.382					
April, 1960	Not Sampled						
May, 1962	0.635					0.250	0.385
June, 1962	Not Sampled						
July, 1962	0.021	0.021					
August, 1962	0.969					0.427	0.542
September, 1962	2.703				0.140	0.063	2.500
October, 1962	4.145		2.164	0.091	1.890		
November, 1962	2.245	0.675	1.486				0.084
December, 1962	Not Sampled						
Totals	11.100	1.078	3.650	0.091	2.030	0.740	3.511
Total/7	1.585	0.154	0.521	0.013	0.290	0.105	0.502

Table 4

## Humble Camp Adult Station

Month & Year	Catch in Pounds per Acre						
	Total	Speckled Trout	Redfish	Drum	Sheepshead	Flounder	Croaker
March, 1962	2.919	0.382		2.537			
April, 1962	14.218	12.322			0.958		0.938
May, 1962	7.165	3.322	2.354				1.489
June, 1962	Not Sampled						
July, 1962	4.427	0.349					4.078
August, 1962	1.167						1.167
September, 1962	10.275	3.375			4.450		2.450
October, 1962	0.051						0.051
November, 1962	0.200	0.169	0.031				
December, 1962	Not Sampled						
Totals	40.422	19.919	2.385	2.537	5.408		10.173
Total/8	5.052	2.489	0.298	0.317	0.676		1.272

Table 5

## Mud Cut Adult Station

Month & Year	Catch in Pounds per Acre						
	Total	Speckled Trout	Redfish	Drum	Sheepshead	Flounder	Croaker
March, 1962	15.454	5.025	1.862	2.687	5.093	0.787	
April, 1962	7.637	3.500	0.987		2.550	0.600	
May, 1962	17.830	9.025	4.968		3.775	0.062	
June, 1962	6.114	0.844	1.698	0.187	3.281	0.104	
July, 1962	5.593	3.062	0.281	0.172	1.578	0.500	
August, 1962	9.472	4.162	2.593	0.968	1.187	0.281	0.281
September, 1962	6.589	0.401	0.907	0.892	2.157	0.178	2.054
October, 1962	14.997	2.667	1.707	1.173	7.926		1.524
November, 1962	10.524	0.750	2.000	5.874	1.900		
December, 1962	49.952	2.167	17.557	4.854	25.227	0.147	
Totals	144.162	31.603	34.560	16.807	54.674	2.659	3.859
Total/10	14.416	3.160	3.456	1.681	5.467	0.266	0.386

Table 6

## Chocolate Bay Adult Station (Not a regular station)

Month & Year	Catch in Pounds per Acre						
	Total	Speckled Trout	Redfish	Drum	Sheepshead	Flounder	Croaker
April, 1962	46.551	18.833		24.791	2.927		
July, 1962	1.995	1.995					
September, 1962	5.387	1.655	1.461	1.157	1.114		
October, 1962	13.362	3.921	3.458	1.866	3.981		0.136
November, 1962	14.762	2.432	1.554	6.216	4.560		
Totals	82.057	28.836	6.473	34.030	12.582		0.136
Totals/5	16.410	5.767	1.294	6.806	2.516		0.027

Table 7

## Juvenile Game Fish Collections and Results

Month	Station	Trout	Numbers of Individuals per Acre			Sheepshead
			Redfish	Drum	Flounder	
February	Mud Cut		1.75			1.75
	Surf Oaks		18.18			
	Lone Oak					
	Bolivar Penn.					
March	Mud Cut		7.14			7.14
	Surf Oaks	14.29	14.29		57.14	
	Lone Oak					
	Bolivar Penn.					
April	Lone Oak					
	Only one station sampled					
May	Mud Cut		7.14	7.14	7.14	
	Lone Oak		7.14	7.14		7.14
June	Mud Cut		5.56	38.89		
	Lone Oak					
July	Mud Cut	22.22		61.11		5.56
	Surf Oaks			11.11		
	Lone Oak				5.56	
	Bolivar Penn.			22.22		
August	Mud Cut	21.43		14.29		14.29
	Surf Oaks			33.33		
	Bolivar Penn.	100.00			100.00	
September	Mud Cut	7.69		53.84	7.69	7.69
	Surf Oaks			16.66		
October	Mud Cut	77.77		44.44		
	Lone Oak	11.11				
	Bolivar Penn.				5.55	
November	Lone Oak					
	Surf Oaks					
	Bolivar Penn.					
December	Mud Cut					
	Bolivar Penn.					

Table 8

Month	Station	6 ft. Bar Seine	
		No. Per 15 min. Collection	Size Mode
February	Mud Lake	42	15-20 mm
	Taylor Lake	92	15-20 mm
March	Mud Lake	219	28-34 mm
	Taylor Lake	200	25-32 mm
April	Mud Lake	33	42-47 mm
	Taylor Lake	54	34-40 mm

Table 9

Total Weight in Pounds of Forage Species per Station per Month

Month	Clear Lake	Humble Camp	Texas City Dyke	South Deer Island	Lone Oak
September, 1961	4.750	1.000	Not Sampled	Not Sampled	Not Sampled
October	1.900	1.00	"	"	0.700
November	1.908	0.942	"	3.500	0.250
December	0.687	0.687	"	0.0	0.0
January, 1962	1.125	0.062	"	Not Sampled	Not Sampled
February	0.937	0.687	0.109	"	"
March	1.875	0.812	0.250	0.0	0.0
April	2.625	0.312	Not Sampled	Not Sampled	0.625
May	1.812	2.343	0.718	"	Not Sampled
June	1.125	4.250	Not Sampled	"	1.937
July	3.187	0.556	0.062	1.374	0.375
August	2.000	0.187	0.062	0.062	Not Sampled
September	1.281	0.250	0.125	0.250	0.031
October	Not Sampled	0.0	0.0	0.312	0.500
November	1.000	0.437	0.156	1.375	0.312
December	Not Sampled	Not Sampled	Not Sampled	0.125	Not Sampled

Note: If a station was sampled more than once during a single month, the weights of the samples were added and divided by the number of collections in order to obtain a single average figure.

Table 10

Per Cent Composition by Numbers of Forage Stock by Month

	1962												Months											
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12									
Pinfish	.04	.07				10.06		.86						.83										
Croaker	.89	6.77	22.56	21.36	32.53	52.09	96.55	50.05	7.76	3.99	.07	.24	.05	.18										
Anchovy	61.73	9.76	47.02	55.91	64.36	25.26		5.73	46.39	75.82	94.73	67.57	96.15	93.82	98.43									
Menhaden	.08		.69	1.36	.69	5.87	.31	.09	.69	.03	.33	.12												
Sub-adult crabs	1.28	4.74	2.09	5.68	1.04			23.30	.14	.43	.33	1.43		.28										
Shrimp	27.61	53.62	9.14	5.68				4.97	12.33	15.54	2.25	27.91	2.51	3.23	1.57									
Other	8.35	25.01	18.49	9.99	1.39	6.42	3.13	14.96	32.69	4.16	2.29	2.73	1.28	1.66										

Table 11

## Fish Tags Returned from Previous Study

No.	Species	Date	Location	Date	Location
1	Redfish	8-9-61	Mud Cut Station	9-4-61	Southwest end of West Bay
2	Redfish	1-20-61	Mud Cut Station	9-7-61	3 miles NE San Luis Pass, West Bay
3	Redfish	8-9-61	Mud Cut Station	9-18-61	Mud Cut, West Bay
4	Redfish	8-9-61	Mud Cut Station	9-21-61	Mouth Hall's Bayou, Chocolate Bay
5	Redfish	8-7-61	Chocolate Bay Station	10-10-61	Wharton Camp Bayou, Chocolate Bay
6	Redfish	2-14-61	3 miles NE San Luis Pass, West Bay	10-12-61	Same location as release
7	Redfish	8-8-61	Mud Cut Station	10-31-61	Southwest end West Bay
8	Redfish	8-8-61	Mud Cut Station	10-31-61	Southwest end West Bay
9	Redfish	8-9-61	Mud Cut Station	10-31-61	Southwest end West Bay
10	Drum	6-21-61	3 mi. NE San Luis Pass, West Bay	11-1-61	1.5 miles NE San Luis Pass, West Bay
11	Redfish	7-19-61	Mud Cut Station	11-9-61	San Luis Pass, West Bay
12	Redfish	8-9-61	Mud Cut Station	11-12-61	Chocolate Bayou
13	Redfish	7-21-61	Mud Cut Station	11-24-61	Oyster Lake
14	Redfish	6-22-61	Carancahua Reef, West Bay	11-26-61	Same location as released
15	Redfish	7-7-61	Mud Cut Station	12-10-61	Cox's Lake, Bastrop Bayou
16	Redfish	6-23-61	Carancahua Reef, West Bay	1-6-62	Offats Bayou, Galveston, Texas
17	Redfish	7-20-61	Mud Cut Station	1-16-62	Gulf Beach, Galveston, Texas
18	Drum	8-8-61	Mud Cut Station	1-29-62	Freeport, Texas
19	Drum	8-7-61	Mud Cut Station	3-18-62	Mouth of Chocolate Bayou, Chocolate Bay
20	Redfish	7-19-61	Mud Cut Station	4-8-62	West Bay- No definite location
21	Redfish	8-9-61	Mud Cut Station	4-26-62	San Luis Pass
22	Redfish	6-23-61	Carancahua Reef, West Bay	10-5-62	Gulf Beach, Galveston, Texas

Table 12

## Fish Tags Returned from Present Study

No.	Species	Tagging Data		Return Data	
		Date	Location	Date	Location
1	Redfish	12-1-61	Double Bayou, Trinity Bay	2-11-62	Big Pasture Bayou, East Bay
2	Redfish	12-28-61	Mud Cut Station	3-17-62	Oyster Lake
3	Drum	12-1-62	Double Bayou, Trinity Bay	3-21-62	Highland Bayou, West Bay
4	Redfish	12-1-61	Double Bayou, Trinity Bay	4-20-62	Big Pasture Bayou, East Bay
5	Redfish	4-20-62	Mud Cut Station	5-5-62	Same as release location
6	Redfish	12-1-61	Double Bayou, Trinity Bay	5-18-62	$\frac{1}{4}$ mile south of Double Bayou
7	Drum	4-20-62	Chocolate Bay Station	5-20-62	New Bayou, Chocolate Bay
8	Redfish	12-28-61	Mud Cut Station	5-22-62	Hall Bayou, Chocolate Bay
9	Redfish	12-1-61	Double Bayou, Trinity Bay	7-23-62	Mouth of Cross Bayou
10	Redfish	12-28-61	Christmas Bay	8-4-62	Cold's Pass, adjacent to San Luis Pass
11	Redfish	12-28-61	Mud Cut Station	8-12-62	Bastrop Bayou
12	Drum	4-20-62	Chocolate Bay Station	8-31-62	Chocolate Bayou
13	Redfish	12-28-61	Mud Cut Station	9-2-62	Same as release location
14	Redfish	3-23-62	Mud Cut Station	9-9-62	Same as release location
15	Redfish	5-10-62	Christmas Bay	9-22-62	Christmas Bay
16	Drum	10-18-62	Chocolate Bay Station	10-23-62	Mouth Pleasant Bayou, Chocolate Bay
17	Speckled Trout	10-19-62	Mud Cut Station	10-27-62	Chocolate Bay
18	Drum	10-18-62	Chocolate Bay Station	11-4-62	Chocolate Bay
19	Drum	12-22-61	Lone Oak Station	11-11-62	5 Mile Pass, Galveston Bay
20	Drum	6-21-62	Mud Cut Station	11-23-62	Wharton Camp Bayou, Chocolate Bay
21	Speckled Trout	11-19-62	Chocolate Bay Station	12-16-62	Bastrop Bayou
22	Redfish	1-30-62	Lone Oak Station	No Date	Bay View Reef, West Shore Trinity Bay
23	Redfish	5-5-62	Christmas Bay	9-12-62	Christmas Bay
24	Redfish	12-28-61	Mud Cut Station	12-6-62	Same as release point
25	Drum	12-28-61	Mud Cut Station	12-6-62	Same as release point
26	Redfish	8-8-62	3 miles NE San Luis Pass, West Bay	12-6-62	Mud Cut Station
27	Redfish	9-21-61	Mud Cut Station	12-6-62	Same as release point
28	Redfish	9-12-62	Mud Cut Station	12-6-62	Same as release point
29	Redfish	10-19-62	Mud Cut Station	12-6-62	Same as release point

Figure 1

Location of Collection  
Station in Galveston Bay

