

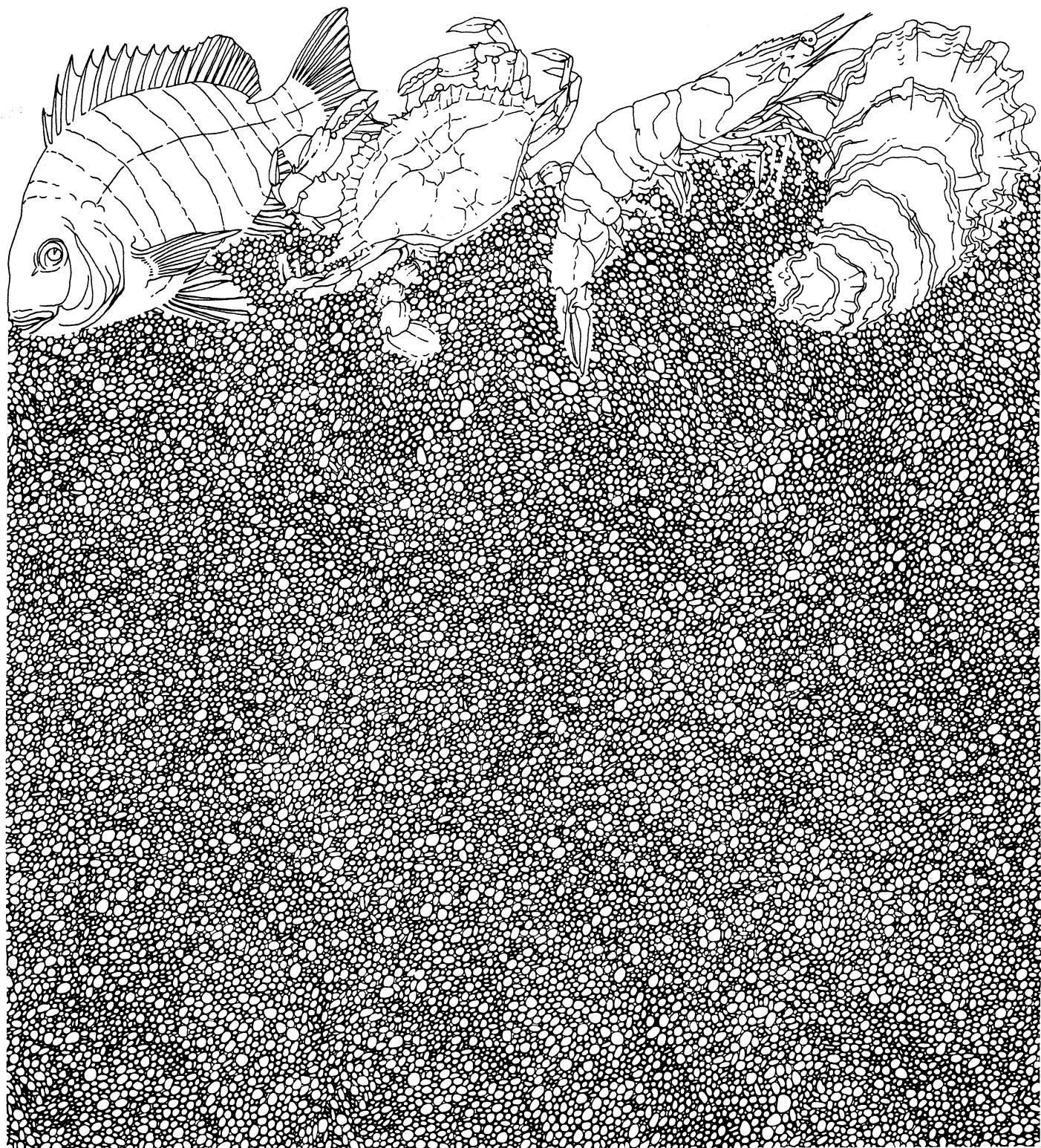
Paul Hamerschmidt

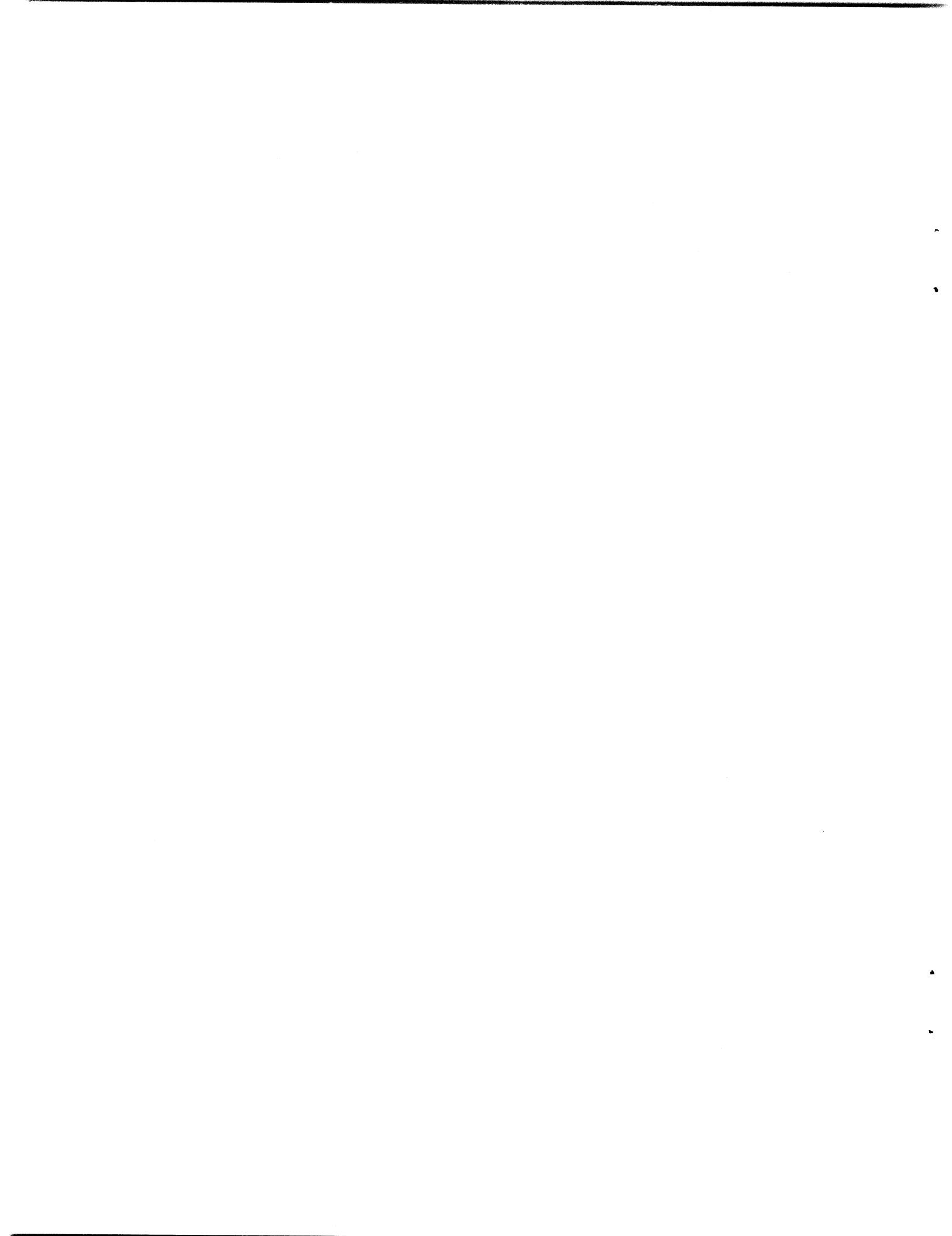
Effect of Setting Method on Gill Net Catches

by Gary C. Matlock and Albert W. Green

Management Data Series Number 81
1985

Texas Parks and Wildlife Department
Coastal Fisheries Branch





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Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744



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ABSTRACT

The Texas Parks and Wildlife Department's finfish monitoring program involves setting gill nets with the smallest mesh (7.6 cm or 3 inches) always nearest shore. This study compares the number of fishes caught in each of four mesh sizes when nets were set with the smallest mesh near shore versus when the nets were set with the largest mesh near shore. Two nets were fished overnight about 3.2 km (2 miles) apart in each of seven bays in January 1976 and March 1977. Catches of each of 24 species except red drum (*Sciaenops ocellatus*) in each mesh were similar regardless of setting method. Red drum catches were higher in the two largest meshes, lower in the smallest mesh, and similar in the 10.2-cm (4-inch) mesh when nets were reversed. Reversing the set position of meshes gill nets is not necessary. Changes in relative abundance of all species should be detectable with the current methods.

INTRODUCTION

Fisheries management within the concept of optimum yield is best achieved when fishery-independent data are available for stock assessments (Radovich 1975). The Texas Parks and Wildlife Department (TPWD) initiated a coastwide gill net program in 1975 to monitor the relative availability and size composition of fish in Texas bays during November through March. Nets containing four stretched meshes arranged in ascending order were set with the smallest mesh (7.6 cm) nearest shore at randomly selected sites (Matlock and Weaver 1979). This approach assumed a direct relationship between fish size and distance from shore if nets were to sample fish populations efficiently, but no data were available to examine this assumed relationship. This study determines if catches in each mesh would be significantly altered by reversing the order in which meshes were fished relative to shore.

MATERIALS AND METHODS

Monofilament gill nets were 182.9 m long by 1.2 - 1.8 m deep with 45.7-m sections of 7.6-, 10.2-, 12.7-, and 15.2-cm stretched mesh tied together in ascending order. Additional construction details are contained in Matlock and Weaver (1979). Nets were fished overnight at one randomly selected shoreline site in Matagorda, San Antonio, Aransas, and Corpus Christi Bays and upper and lower Laguna Madre systems and at two sites in the Galveston Bay system in January 1976 and in March 1977 with the 7.6-cm mesh nearest shore (Appendix A). Concurrently another net was fished similarly but with the 15.2-cm stretched mesh nearest shore. Both nets were set approximately 3.2 km of shoreline apart.

Each fish caught in each mesh was identified to species (Gallaway et al. 1972) and counted. Corresponding common names follow Robins et al. (1980). Differences ($P < 0.05$) among catches in each mesh size caused by the setting method were determined using analyses of variance by ranks because of heterogeneity and severe skewness (SAS 1982, Mendis 1980, Schierer et al. 1976). Data were ranked and ties were assigned a mean rank for all observations having the same value. Then data were partitioned by bay system, mesh size, and setting method to increase the power of the tests. An analysis was done for each species represented by ≥ 40 individuals and for all fishes combined.

RESULTS

Setting method did not affect gill net catches in any mesh for any species except red drum (Sciaenops ocellatus). Twenty-four species were caught; fourteen of these species were represented by < 40 individuals (Table 1), and no consistent differences were apparent in catches in each mesh of these untested species when the nets were reversed (Appendix B). These species were alligator gar (Lepisosteus spatula), Atlantic croaker (Micropogonias undulatus), Atlantic cutlassfish (Trichiurus lepturus), bull shark (Carcharhinus leucas), cownose ray (Rhinoptera bonasus), gafftopsail catfish (Bagre marinus), ladyfish (Elops saurus), leopard searobin (Prionotus scitulus), pigfish (Orthopristis chrysoptera), sand seatrout (Cynoscion arenarius), silver perch (Bairdiella chrysoura), skipjack herring (Alosa chrysochloris), southern flounder (Paralichthys lethostigma) and

southern kingfish (Menticirrhus americanus). Of the remaining 10 species, only red drum catches were affected by the setting method (Table 2). Red drum catches in the 12.7 and 15.2-cm meshes were higher when these meshes were set closer to shore (i.e. nets reversed) while catches in the 7.6-cm were lower and catches in the 10.2-cm mesh were similar when nets were reversed.

DISCUSSION

Reversing the order in which gill nets are fished by TPWD (7.6 cm mesh closest to shore) during January or March is not necessary. Catches of all species except red drum would not be significantly affected by reversing nets. Large red drum catches would be increased, but small red drum catches would be reduced which would tend to underestimate availability of the population caught in gill nets. However, the objective of the TPWD sampling program is to detect changes in relative abundance and size of as many fishes through as large a size range as possible. Setting in the same way at each site will maximize the possibility of achieving that objective.

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Table 1. Number of each species caught in all gill nets in January 1976 and March 1977 in all bays combined.

Species	1976	1977	Total
Alligator gar	0	3	3
Atlantic croaker	2	21	23
Atlantic cutlassfish	0	1	1
Black drum	189	174	363
Bull shark	0	6	6
Cownose ray	0	1	1
Finescale menhaden	34	6	40
Gafftopsail catfish	0	39	39
Gizzard Shad	91	202	293
Gulf menhaden	235	80	315
Hardhead catfish	3	78	81
Ladyfish	0	1	1
Leopard searobin	2	0	2
Pigfish	1	0	1
Red drum	121	95	216
Sand seatrout	6	3	9
Sheepshead	18	26	44
Silver perch	0	1	1
Skipjack herring	4	0	4
Southern flounder	8	4	12
Southern kingfish	0	1	1
Spot	4	36	40
Spotted seatrout	110	149	259
Striped mullet	65	28	93

Table 2. Summary of factors (years, bay system, mesh size, and setting method) which were significantly different for selected species and all fishes combined according to analyses of variance performed in ranked gill net catches in 1976 and 1977 in seven Texas bay systems.

Species	Significant test	Degrees of freedom	Hm ^a
Black drum	Bay system	6	30.576
Finescale menhaden	Bay system	6	39.158
Gizzard shad	Bay system Mesh size Year X bay system	6 3 6	20.220 31.049 16.668
Gulf menhaden	Bay system Year Mesh size	6 1 3	16.392 3.879 28.744
Hardhead catfish	Year Mesh size	1 3	33.822 10.744
Red drum	Set method X mesh size Mesh Size Year X by system Year X mesh size	3 3 6 3	16.977 12.576 18.517 8.934
Sheepshead	Mesh size Year X bay system Year X mesh size	3 6 3	12.576 18.517 8.934
Spot	Mesh size	3	46.612
Spotted seatrout	Mesh size Year X bay system	3 6	39.688 15.917
Striped mullet	Mesh size	3	51.303
Total fish	Bay system Mesh size	6 3	13.512 32.096

^aHm statistic is distributed as a chi-square.

Appendix A. List of sites sampled

Appendix A. Table 1. Location of each site sampled with gill nets set with 7.6- cm stretched mesh nearest shore. Station numbers correspond to those in Matlock et al. (1978).

Bay system	January 1976			March 1977		
	Station number	Latitude	Longitude	Station number	Latitude	Longitude
Galveston	2-142-32	29°25'25"	94°56'20"	2-201-28	29°30'25"	94°57'05"
Galveston	2-150-25	29°28'35"	94°39'00"	2-241-32	29°10'00"	95°02'00"
Matagorda	3-320-24	28°41'54"	96°11'21"	3-210-37	28°36'12"	96°26'18"
San Antonio	4-300-29	28°15'12"	96°39'06"	4-170-36	28°21'00"	96°35'00"
Aransas	5-020-27	28°01'21"	97°02'45"	5-020-27	28°01'21"	97°02'45"
Corpus Christi	6-130-37	27°51'54"	97°19'38"	6-130-24	27°44'13"	97°09'50"
Upper Laguna Madre	7-211-28	27°16'10"	97°41'20"	7-080-27	27°19'32"	97°41'00"
Lower Laguna Madre	8-230-25	26°16'55"	97°17'00"	8-230-23	26°09'00"	97°10'50"

Appendix B. Fish catches in each mesh in each set

Appendix B. Table 1. Number of fish caught in each mesh in each set in January 1976 and March 1977 in gill nets set with the 7.6-cm mesh closest to shore (A) and nets with the 15.2-cm mesh closest to shore (B). Blanks indicate zero.

Species	Bay system	Set type	1976			1977			Total
			7.6	10.2	12.7	15.2	Total	7.6	
Alligator gar	Galveston	A							
		B							
	Galveston	A						1	
		B							
	Matagorda	A						1	
		B							
	San Antonio	A						1	
		B							
	Aransas	A							
		B							
	Corpus Christi	A							
		B							
	Upper Laguna Madre	A							
		B							
	Lower Laguna Madre	A							
		B							
All bays		A						2	
		B						1	

Appendix B. Table 1. (Cont'd.).

<u>Species</u>	<u>Bay system</u>	Set type	1976			1977			<u>Total</u>		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
Atlantic croaker	Galveston	A						5			5
		B						2	1	..	3
	Galveston	A									
		B									
	Matagorda	A									
		B									
	San Antonio	A	1								
		B									
	Aransas	A					1				1
		B									
	Corpus Christi	A	1				1		2		2
		B									
	Upper Laguna Madre	A						2	4		6
		B						3	1		4
	Lower Laguna Madre	A									
		B									
	All bays	A	2					2	8	4	12
		B						7	2		9

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total	1977 Total
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7
Atlantic cutlassfish	Galveston	A								
		B								
	Galveston	A								
		B								
	Matagorda	A								
		B								
	San Antonio	A								
		B								
	Aransas	A								
		B								
	Corpus Christi	A								
		B								
	Upper Laguna Madre	A								
		B								
	Lower Laguna Madre	A								
		B								
	All bays	A								
		B								

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2	Total
			7.6	10.2	12.7	7.6	10.2	12.7										
Black drum	Galveston	A	11			3	14		3	4		10						17
		B	7			1	1	9	3	8		1	1					13
Galveston		A	2	2	2	18	24		7	3	2	3						15
		B			1		1		4		1	2						7
Matagorda		A	3	2	1	3	9		8	19	4	4	31					
		B	1	3	7	14	25		5	22	33	60						
San Antonio		A		1		1			1	5		5						5
		B			1	1												
Aransas		A							2	13								15
		B	2	3	1	6												
Corpus Christi		A	3	2			5		1	1								2
		B		6		6			1									1
Upper Laguna Madre		A	2		2	1	5											
		B	13	6	1	2	22											
Lower Laguna Madre		A	6		26		58				1							1
		B	1	2			3			3								3
All bays		A	18	14	33	51	116	12	34	33	10	89						
		B	22	13	20	18	73	7	17	25	36	85						

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total
			7.6	10.2	12.7	15.2	Total	7.6	
Bull shark	Galveston	A							
		B							
	Galveston	A							
		B							
	Matagorda	A							
		B							
	San Antonio	A							
		B							
	Aransas	A							
		B							
	Corpus Christi	A							
		B							
	Upper Laguna Madre	A							
		B							
	Lower Laguna Madre	A							
		B							
All bays		A							
		B							

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total	1977 Total
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7
Cownose ray	Galveston	A								
		B								
	Galveston	A								
		B								
Matagorda		A								
		B								
San Antonio		A								
		B								
Aransas		A								
		B								
Corpus Christi		A								
		B								
Upper Laguna Madre		A								
		B								
Lower Laguna Madre		A								
		B								
All bays		A								
		B								
								1	1	1

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			Total	1977			Total
			7.6	10.2	12.7		15.2	7.6	10.2	
Finescale menhaden	Galveston	A								
		B								
	Galveston	A								
		B								
	Matagorda	A								
		B								
	San Antonio	A								
		B								
	Aransas	A	1	13	2		16			
		B	3	12			15	4	1	5
	Corpus Christi	A	3				3			
		B								
	Upper Laguna Madre	A								
		B								
	Lower Laguna Madre	A								
		B								
All bays	A	4	13	2			19			
	B	3	12				15	4	2	6

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
Gafftopsail catfish	Galveston	A						1			1
		B									
	Galveston	A									
		B									
Matagorda	A							1	1	4	5
	B										1
San Antonio	A							3	5	8	
	B										
Aransas	A							1			
	B										
Corpus Christi	A										
	B										
Upper Laguna Madre	A										
	B										
Lower Laguna Madre	A										
	B										
All bays	A							1	7	15	23
	B							1	5	10	16
											16

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
Gizzard shad	Galveston	A	9	10	3	22	1	2	-	-	3
		B	10	17	3	30	1	4	-	-	5
Galveston	A	1	-	-	-	1	21	5	2	28	-
	B	5	5	1	-	11	68	8	1	77	-
Matagorda	A	2	-	-	-	2	1	-	-	1	-
	B	-	-	-	-	-	3	-	-	3	-
San Antonio	A	-	-	-	-	14	7	1	-	22	-
	B	1	-	-	-	1	7	1	-	8	-
Aransas	A	-	-	-	-	4	2	-	-	2	-
	B	-	-	-	-	-	3	2	-	9	-
Corpus Christi	A	-	-	-	-	2	-	-	-	2	-
	B	-	-	-	-	-	-	-	-	-	-
Upper Laguna Madre	A	1	-	-	-	1	9	9	5	18	-
	B	-	-	-	-	-	-	-	-	23	-
Lower Laguna Madre	A	1	9	8	-	18	-	-	-	-	-
	B	1	4	-	-	5	1	-	-	1	-
All bays	A	12	21	11	-	44	36	27	11	74	-
	B	16	27	4	-	47	90	30	8	128	-

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
Gulf menhaden	Galveston	A	14	1			15				6
		B	76		2	1	79	6			5
Galveston		A					5				36
		B	6				6	36			36
Matagorda		A	8	3			11	2			2
		B	74	3	8		85	4			4
San Antonio		A					4				4
		B					4				4
Aransas		A	4				4				21
		B	6				6	21			21
Corpus Christi		A	2	17	1		20				2
		B		9			9	2			2
Upper Laguna Madre		A									
		B									
Lower Laguna Madre		A									
		B									
All bays		A	28	21	1		50				7
		B	162	12	10	1	185	73			73

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
Hardhead catfish	Galveston	A						3			3
		B						5	1	1	7
Matagorda	A							6	4		10
		B						5	1	3	9
San Antonio	A							1			1
		B						4	1		5
Aransas	A							3	3	1	3
		B									4
Corpus Christi	A	1	1			2		1	5	1	4
		B						4	5	1	4
Upper Laguna Madre	A							2	2	1	5
		B						1		2	3
Lower Laguna Madre	A							1		3	4
		B						3			3
All bays	A	1	2			3	18	9	4	8	31
	B						23	12	4		47

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
Ladyfish	Galveston	A									
		B									
	Galveston	A									
		B									
	Matagorda	A									
		B									
	San Antonio	A									
		B									
	Aransas	A									
		B									
	Corpus Christi	A									
		B									
	Upper Laguna Madre	A									
		B									
	Lower Laguna Madre	A									
		B									
	All bays	A									
		B									

Appendix B. Table 1. (Cont'd.).

Appendix B. Table 1. (Cont'd.).

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			Total	1977			15.2 Total
			7.6	10.2	12.7		15.2	7.6	10.2	
Red drum	Galveston	A	3	1		4	2	6	1	9
		B	4	3	1	8	16	4	6	14
Galveston		A	8	7	1	8	17	1	14	21
		B	2	6						
Matagorda		A	4							5
		B	1		1	5	7	1	1	2
San Antonio		A	6	3	1	12	3	10	15	15
		B								
Aransas		A						9	2	1
		B								12
Corpus Christi		A	3							1
		B								8
Upper Laguna Madre		A	1	1		1	3			1
		B	10	1	2	1	14			7
Lower Laguna Madre		A			2	4	6		1	1
		B			2	2	4	2	1	7
All bays		A	25	11	4	5	45	31	10	2
		B	17	10	20	29	76	4	9	43
								25	14	52

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			Total	1977			Total
			7.6	10.2	12.7		15.2	7.6	10.2	
Sand seatrout	Galveston	A								
		B	1			1				1
Galveston		A								
		B	2	1		3				
Matagorda		A								
		B			1	1				
San Antonio		A								
		B								
Aransas		A								
		B								
Corpus Christi		A	2			2		2		2
		B								
Upper Laguna Madre		A								
		B								
Lower Laguna Madre		A								
		B								
All bays		A	2	1	1		3	3	3	3
		B	2	1			3	3		

Appendix B. Table 1. (Cont'd.).

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			Total	1977			Total
			7.6	10.2	12.7		15.2	7.6	10.2	
Silver perch	Galveston	A								
		B								
	Galveston	A								
		B								
	Matagorda	A								
		B								
	San Antonio	A								
		B								
	Aransas	A								
		B								
	Corpus Christi	A								
		B								
	Upper Laguna Madre	A								
		B								
	Lower Laguna Madre	A								
		B								
	All bays	A								
		B								

Appendix B. Table 1. (Cont'd.).

<u>Species</u>	<u>Bay system</u>	<u>Set type</u>	<u>1976</u>			<u>1977</u>			<u>Total</u>
			<u>7.6</u>	<u>10.2</u>	<u>12.7</u>	<u>15.2</u>	<u>Total</u>	<u>7.6</u>	
Skipjack herring	Galveston	A							
		B	1			1			
Galveston	Galveston	A							
		B	1	2		3			
Matagorda	Matagorda	A							
		B							
San Antonio	San Antonio	A							
		B							
Aransas	Aransas	A							
		B							
Corpus Christi	Corpus Christi	A							
		B							
Upper Laguna Madre	Upper Laguna Madre	A							
		B							
Lower Laguna Madre	Lower Laguna Madre	A							
		B							
All bays	All bays	A							
		B	1	3		4			

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total	1977 Total
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7
Southern flounder	Galveston	A	1							
		B								
	Galveston	A	1							
		B								
	Matagorda	A								
		B	1							
	San Antonio	A								
		B		1						
	Aransas	A								
		B								
	Corpus Christi	A								
		B								
	Upper Laguna Madre	A								
		B								
	Lower Laguna Madre	A	1	1			2			
		B								
All bays	A	2	2				4	1		1
	B	1	1	2			4	4		3
									3	3

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total
			7.6	10.2	12.7	15.2	Total	7.6	
Southern Kingfish	Galveston	A							
		B							
Matagorda	Galveston	A							
		B							
San Antonio	Matagorda	A							
		B							
Aransas	San Antonio	A							
		B							
Corpus Christi	Aransas	A							
		B							
Upper Laguna Madre	Corpus Christi	A							
		B							
Lower Laguna Madre	Upper Laguna Madre	A							
		B							
All bays	Lower Laguna Madre	A							
		B							

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			Total	1977			Total
			7.6	10.2	12.7		15.2	7.6	10.2	
Spot	Galveston	A				3				3
		B				8				8
Galveston	A					1				1
		B								
Matagorda	A					1				1
		B								
San Antonio	A		1			1	3			3
		B	1			1	6	1	7	
Aransas	A					3				3
		B								
Corpus Christi	A		1			1		1		1
		B								
Upper Laguna Madre	A					1	6			6
		B	1							
Lower Laguna Madre	A							3		3
		B								
All bays	A		2			2	8			8
		B	2			2	27	1	28	

Appendix B. Table 1. (Cont'd.).

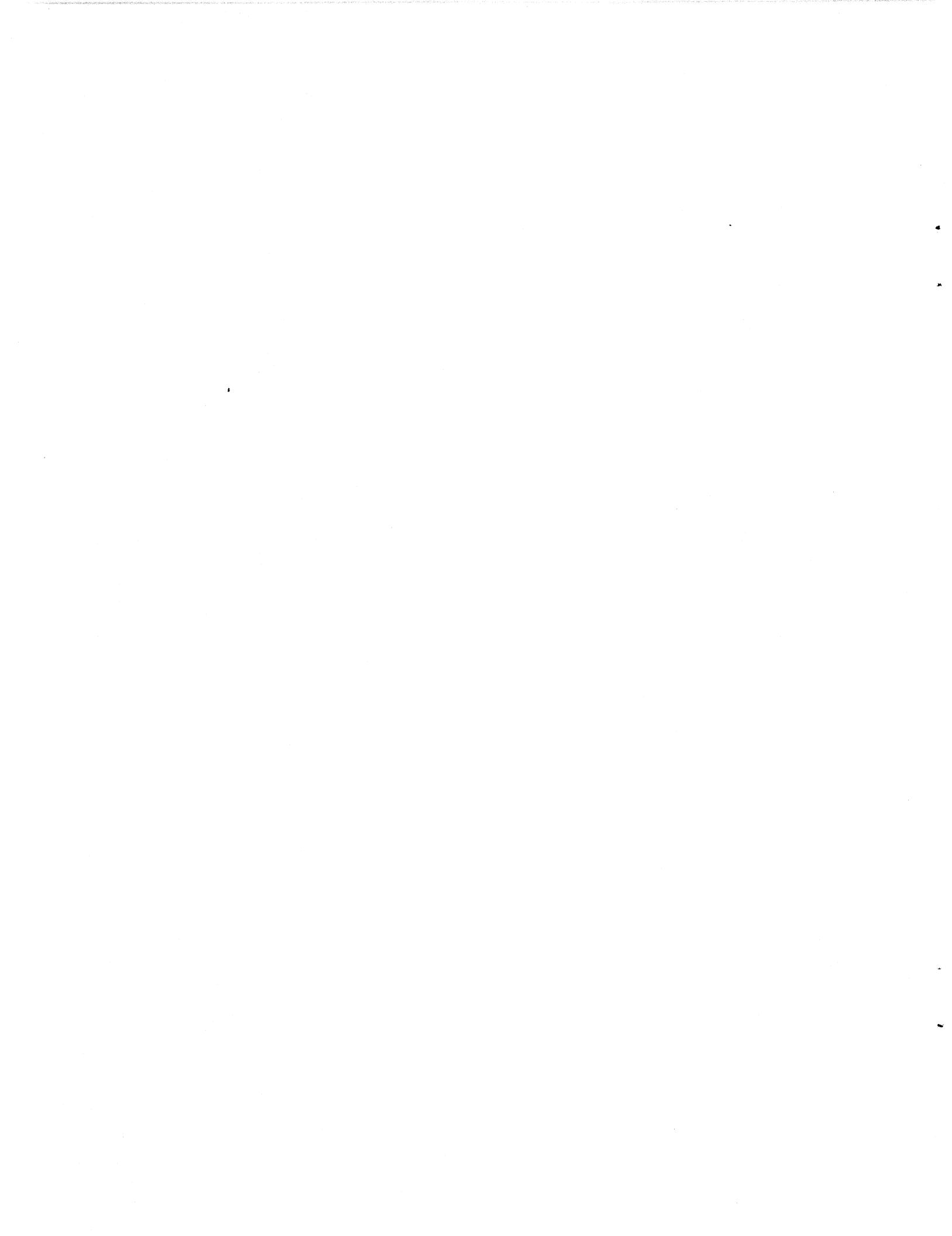
Species	Bay system	Set type	1976			1977			Total
			7.6	10.2	12.7	15.2	Total	7.6	
Spotted seatrout	Galveston	A	2	1	3		6	3	3
		B	1				1	15	2
Galveston	A	2	5			7	10	1	12
		B	6	9	9	24	2	2	4
Matagorda	A	4				4	12	4	16
		B	9	2	1	12	6	1	7
San Antonio	A	1	1			2	11		11
		B	4	1		5	2		2
Aransas	A					12	7	1	20
		B				17	2		19
Corpus Christi	A		1			1		4	6
		B		1		1	1	9	17
Upper Laguna Madre	A	3	2	3	1	9		1	1
		B	3		1	4	4		4
Lower Laguna Madre	A		6	6	2	14		4	5
		B	6	12	2	20	2	3	5
All bays	A	12	16	12	3	43	48	21	74
		B	29	24	14	67	49	19	75

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			Total	
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7
Striped mullet	Galveston	A	2				2	3		3
		B	5				5	1		1
Galveston		A	3				3	2		2
		B	5				5	2		2
Matagorda		A	3				3	5		5
		B					1		1	
San Antonio		A	7	1	1		8	2		2
		B	1		2					
Aransas		A	3				3			
		B		1			1			
Corpus Christi		A	8	6	1	15				
		B								
Upper Laguna Madre		A	5	1			6	2		2
		B	2	1			3	2		5
Lower Laguna Madre		A	7				7	2		2
		B	2				2	3		3
All bays		A	31	15	1		47	16		16
		B	13	4	1		18	9		12

Appendix B. Table 1. (Cont'd.).

Species	Bay system	Set type	1976			1977			1977 Total		
			7.6	10.2	12.7	15.2	Total	7.6	10.2	12.7	15.2
All fish	Galveston	A	41	12	8	3	64	23	13	11	47
		B	103	21	7	10	141	42	20	8	5
Galveston	A	15	16	2	19	52	52	13	6	3	74
	B	27	23	14	10	74	117	11	17	14	159
Matagorda	A	24	5	2	3	34	25	15	21	9	70
	B	86	8	17	20	131	15	12	22	36	85
San Antonio	A	16	6	1	23	49	13	5	6	73	
	B	6	2	15	4	27	27	5	3	7	42
Aransas	A	9	13	2	24	28	27	21	5	81	
	B	9	15	4	2	30	54	14	10	2	80
Corpus Christi	A	21	28	6	1	56	7	9	2	18	
	B	9	7	4	20	10	20	22	5	57	
Upper Laguna Madre	A	11	7	6	5	29	6	17	9	32	
	B	29	8	4	2	43	26	14	6	2	48
Lower Laguna Madre	A	1	30	45	36	112	2	7	5	14	
	B	8	20	4	32	32	16	8	1	25	
All bays	A	138	117	72	67	394	185	112	74	39	410
	B	268	106	72	53	499	307	104	89	71	571





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