

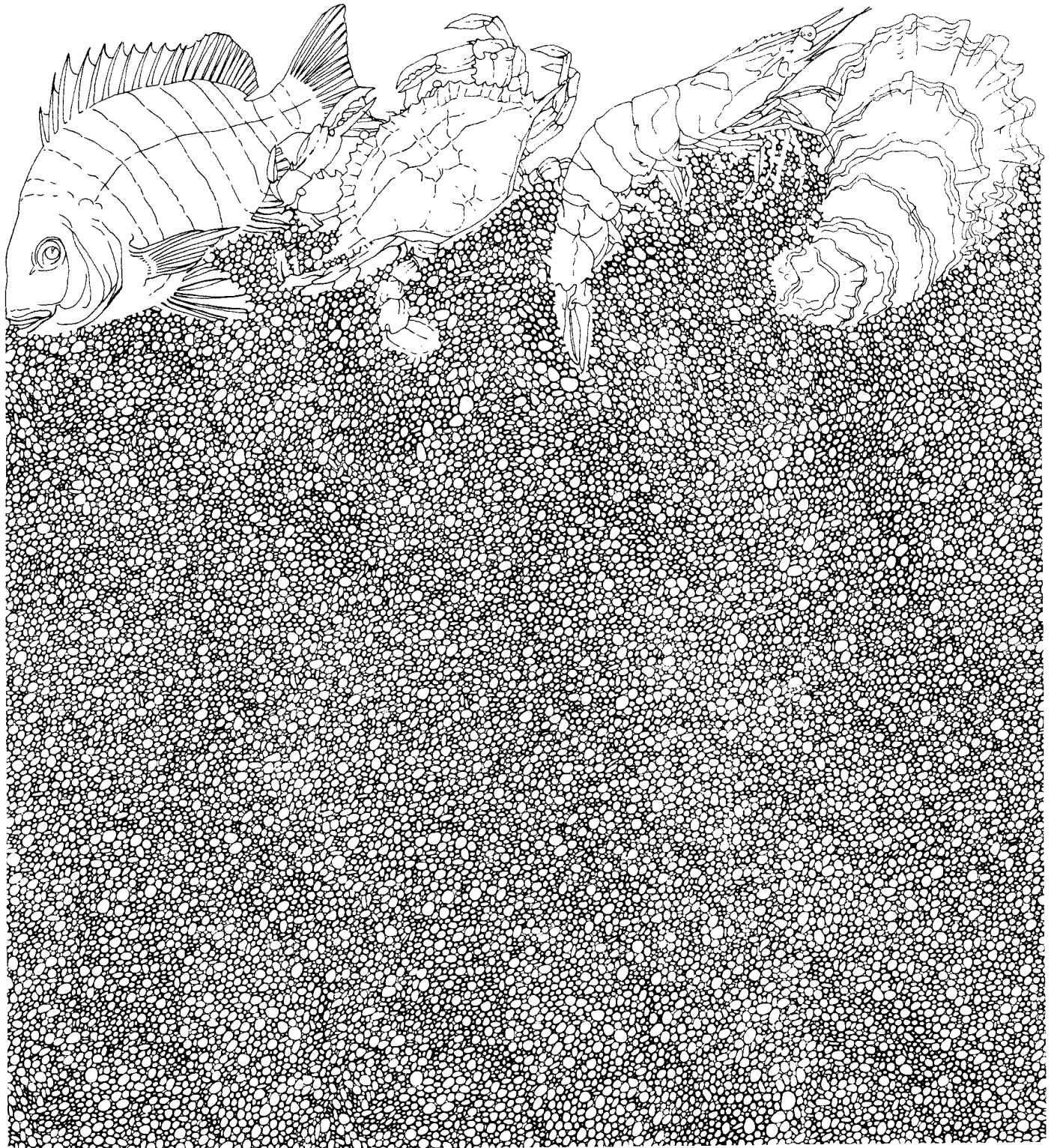
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THE FALL RED DRUM GULF OF MEXICO PIER FISHERY OFF GALVESTON BAY, TEXAS

By: M.G. Weixelman

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ABSTRACT

During September and October 1981 Gulf pier fishermen were surveyed from High Island to San Luis Pass, Texas to determine the harvest of red drum, *Sciaenops ocellatus*, during the fall "bull" (> 5 kg) red drum "run". During this study, 232 fishermen were interviewed on 12 weekday and 6 weekend days. The estimated harvest of red drum was 275 fish (1895 kg) by an estimated 8584 fishermen for a catch rate of <0.01 fish/man-h. More red drum were caught on mullet, *Mugil cephalus* and *Mugil curema*, than any other bait. The mean total length of red drum was 825 mm and the mean whole weight was 6.89 kg. Over 98% of the interviewed fishermen were from Texas with 81.5% from counties adjacent to the survey area.

It is recommended that future estimates of the number of "bull" red drum caught from these Gulf piers be made using the "Big Fish Records" maintained by pier operators. However, due to inaccurate scales and/or weighing technique, the "Big Fish Records" should not be used to determine harvest by weight.

INTRODUCTION

Each fall (September–November) red drum, *Sciaenops ocellatus*, spawn in the Gulf of Mexico near shore (Pearson 1929). According to local fishermen, Gulf pier operators and newspaper reports, a sport fishery has developed on the Gulf beaches, piers and jetties for these "bull" (≥ 5 kg) red drum during this period, due to increased accessibility to large numbers of fish. Prior to 1978, no survey had been conducted that dealt exclusively with fish harvest from piers or jetties in the surf zone of the Gulf of Mexico. Due to the need for information on this fishery, the Texas Parks and Wildlife Department (TPWD) conducted a Gulf pier and jetty survey along the Texas coast during September 1978–August 1979 (McEachron 1980). This survey indicated that fishermen using Gulf piers and jetties were probably not severely affecting fish stocks in the surf zone. However, it was emphasized that, due to the random sampling technique of the study, the red drum "run" publicized in local newspapers was not detected. It was recommended that future surveys be designed to determine better the Gulf pier fishermen's catch rates and mean sizes of fall caught "bull" red drum. Consequently, a preliminary study was conducted by TPWD personnel during the fall (September–November 1980) to evaluate the Gulf of Mexico pier fishery for "bull" red drum. However, because pier operators failed to inform TPWD personnel when the red drum "run" began only seven red drum were seen during on-site interviews.

Due to the fact that red drum declines have been documented in the bays of Texas (Heffernan and Kemp 1980), information on the magnitude of this fishery for spawning adults is needed for management purposes. Therefore, this study was initiated to gain additional information on the characteristics of the fishery.

MATERIALS AND METHODS

During September-October 1981, surveys were conducted at six Gulf of Mexico piers from Freeport to High Island, Texas (Appendices A and B). Surveys were conducted from 2200 to 0600 CST on 6 weekend and 12 weekday days with the exception of the last 3 surveys in Galveston which were conducted from 1800 to 0200 CST. The weekend and weekday surveys were equally divided between "uniformed" and "incognito" surveys. During "incognito" surveys the surveyor was not wearing a Texas Parks and Wildlife Department uniform and interviews were not conducted. The surveyor observed the fishermen and recorded the number of red drum hooked, landed or escaped, released or retained, bait used, and fish lengths on a summary sheet. During uniformed surveys, surveyors recorded summary sheet information and intercepted all fishermen upon completion of their fishing trips, interviewed them, and examined their catches. Interview information included trip time, fishing time, number of fishermen in party, their residence (state if non-Texas, county if Texas), and gear and bait used. The fish caught were weighed to the nearest 0.05 kg and measured to the nearest mm (total length).

Estimated harvest of red drum was determined by calculating the mean daily harvest per pier (the total of the daily harvests of all surveys divided by the number of surveys), multiplying by the number of piers, and then multiplying by the number of days in the study. Total estimated fishing pressure was determined by calculating the mean daily pressure (the total of all trip times divided by the number of surveys), multiplying by the number of piers, and then multiplying by the number of days in the study. Mean trip time was determined by adding the trip times of all fishermen interviewed and dividing by the total number of fishermen. Total estimated number of fishermen was calculated by dividing total estimated fishing pressure by the mean trip time. Mean total length (mm) was obtained by adding all red drum lengths and dividing by the number of fish measured.

Individual total lengths (TL) were converted to whole weights (WW) using the formula: $WW = \log a + b \log TL$, where $a = -5.085$ and $b = 3.041$ (Harrington et al. 1979). Even though this formula was calculated using red drum lengths from 71 to 970 mm, it was used to convert fish lengths up to 1067 mm.

Because there were red drum landed during the survey by fishermen who were not interviewed (fishermen still fishing at end of survey were not interviewed), the estimated harvest, mean total length and mean whole weight of red drum were calculated using sample day summary data. All other estimates were based on interview data.

Numbers, lengths (mm), and weights (kg) of red drum landed on the Flagship, 61st St., and 91st St. piers were obtained from the "Big Fish Records" (BFR) maintained by the pier operators. These "BFR" length-weights were compared to those made by creel personnel during the survey. After conversion of the data points to common logarithm, total length-weight regressions were calculated for each group using the procedure described by Sokal and Rohlf (1969). Variances were compared using the F-test (Sokal and Rohlf 1969) and analysis of covariance (Snedecor and Cochran 1967) was calculated for use in a test for equality of slopes of regression with unequal sample sizes (Sokal and Rohlf 1969). A two-way analysis

of variance (Sokal and Rohlf 1969) was used to compare weekend and weekday harvests of red drum between "uniformed" and "incognito" surveys. A one-way analysis of variance (Sokal and Rohlf 1969) was used to compare pressure (man-h) between weekday and weekend days and to compare mean trip time between weekday and weekend days.

RESULTS

During the survey, 232 Gulf pier fishermen were interviewed on six Gulf piers from High Island to San Luis Pass. They fished 1243 man-h for a mean trip time of 5.4 h, and caught 4 red drum for a catch rate of <0.01 fish/man-h (0.02 fish/fishermen) (Table 1). An estimated 8584 Gulf pier fishermen exerted 45,494 man-h of fishing to land 275 red drum (1895 kg) for a catch rate <0.01 fish/man-h (Table 2). There was no significant difference between the number of red drum landed on weekday and weekend days ($F_s = 1.204$, $F_{0.05(1,16)} = 4.4940$) or between "uniformed" and "incognito" surveys ($F_s = 0.516$, $F_{0.05(1,16)} = 4.4940$) (Appendix C, Table 1). There was no significant difference between fishing pressure on weekday and weekend days ($F_s = 0.038$, $F_{0.05(1,8)} = 5.3177$) (Appendix C, Table 2), and there was no significant difference between mean daily trip time on weekday and weekend days ($F_s = 0.047$, $F_{0.05(1,8)} = 5.3177$) (Appendix C, Table 3).

According to the BFR, there were 184 red drum landed during September, 1981 on the Flagship, 61st St., and 91st St. piers (Table 5). This study's harvest estimated for the same month and piers were 56 red drum for the 8-h survey (2200-0600 CST) and 168 red drum for a 24-h period with a 95% confidence interval of 15-336 red drum.

During "uniformed" surveys, there were five "bull" (<30 ") red drum landed and two (40%) of these were retained. During "incognito" surveys there were four "bulls" landed and one was retained (Table 6).

There were 13 red drum measured with lengths ranging from 592 to 1067 mm (\bar{X} TL = 825 mm). Most red drum (54%) were over 763 mm (30"), 31% were between 611-762 mm (24-30") and 15% were under 619 mm (24") (Appendix D, Figure 1). There were 13 red drum lengths converted to whole weights, which ranged from 2.27 to 13.29 kg (\bar{X} whole weight = 6.89 kg). The F-test for the comparison of length-weights of red drum recorded on "BFR" and those made by Texas Parks and Wildlife Department creel personnel during the 1980-81 survey year showed no significant difference between the variances ($F_s = 1.76$, $F_{0.05(1,41)} = 4.08$). However, the test for equality of slopes of regression showed a significant difference ($F_s = 7.182$, $F_{0.05(1,38)} = 4.08$) (Appendix D, Figure 2).

Most Gulf pier fishermen used dead shrimp (37.8%), dead fish (36.5%), or "other" (13.7%; primarily squid, *Loligo brevis*) baits (Table 3). Anglers (9.4%) using "other" baits were most successful at catching red drum and landed 75 percent of red drum seen. However, nine of thirteen red drum landed during the survey were not included in interviews because the fishermen were still fishing at the end of the survey. Seven of these nine fish were caught on mullet, *Mugil cephalus* and *M. curema*.

Over 98% of the Gulf pier fishermen interviewed were from Texas with 81.5% of them from adjacent counties (Table 4).

DISCUSSION

During two preliminary "incognito" surveys conducted in August 1981, there were 54 red drum landings observed, compared to only 14 red drum landed during the 20 surveys conducted during September-October 1981. However, this study's harvest estimate for September 1981 was comparable to the "BFR" for the same month, which indicated that the study effectively monitored the fishery. Any future studies on the fall red drum fishery should begin in August in order to monitor the entire "run".

Fishermen, pier operators, and local newspapers give accounts of tremendous catches of red drum being made on these Gulf piers during the "bull" red drum "run". However, with the exception of one of the preliminary surveys, a maximum of seven red drum were observed during any survey. There were apparently few days when large numbers of red drum were landed.

The purpose of "incognito" surveys was to determine if the percent of illegal red drum ($>30''$) retained by fishermen was influenced by the presence of uniformed TPWD personnel. The results of this study indicate that the presence of uniformed personnel did not influence the fishermen's actions in this regard. In the future, "incognito" surveys should not be used, thus maximizing the information obtained from each survey.

On 23 July 1981, the Texas Parks and Wildlife Department Commission adopted an amendment of section 65.72 of the Statewide Hunting, Fishing, and Trapping Proclamation which reduced the maximum size limit for red drum from two fish over 889 mm (35"), to no fish over 762 mm (30"), effective 1 September 1981. The principal reasons for the adoption of the amendment were to reverse the declining trend in red drum populations, and to conserve sexually mature red drum. Before the law became effective, two preliminary surveys recorded 54 "bull" (<762 mm) red drum caught with all fish being retained by the fishermen. During September and October 1981, after the law became effective, nine "bull" red drum captures were observed with six fish released. This indicated that the Gulf pier fishermen are generally complying with the 762 mm size limit.

The length-weight relationship of red drum collected by creel personnel was not the same as that for fish reported by pier operators (BFR). For the same length of fish, pier operators overestimated the weight for fish ≤ 1189 mm and underestimated the weight of larger fish. However, caution should be used with the larger fish since the data sets did not overlap (Appendix D, Figure 2). The regression coefficient for the creel data was 2.44 with a 95% confidence interval of 1.63-3.25, which overlaps the 95% confidence interval (3.03-3.05) developed by Harrington et al. (1979). However, the regression coefficient for the "BFR" data points was 1.15 with a 95% confidence interval of 0.86-1.44, which indicates that lengths and weights were measured more precisely by Texas Parks and Wildlife Department than by pier operators (BFR).

Harvest estimates of red drum were made using the 14 red drum caught during the study. However, only the fishermen catching four of these fish were interviewed and as a result, only these four fish were used in calculating a catch/effort. For future reference, it would be recommended that surveyors also conduct incomplete interviews by questioning all remaining fishermen at the end of a survey. Thus, harvest estimates and catch efforts could be calculated from the same data base.

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Table 1. Number of fishermen, mean trip time, total trip time, number of red drum (*Sciaenops ocellatus*) caught and catch rates (No./man-h and No./fishermen) by Gulf pier fishermen (September-October 1981). Based on completed trips (interviews) only.

Date	Fishing pier (No.)	Day type	Number of fishermen	Mean trip time (h)	Total trip time (h)	No. of red drum caught	No./man-h	No./fishermen
9-1-81	8	WD	32	6.0	192.0	0	0.00	0.00
9-11-81	12	WE	9	6.6	59.5	3	0.05	0.33
9-17-81	8	WD	39	3.7	144.5	0	0.00	0.00
9-24-81	3	WD	9	6.1	54.5	0	0.00	0.00
9-25-81	6	WE	16	4.7	74.5	0	0.00	0.00
9-29-81	7	WD	22	8.5	187.0	1	< 0.01	0.05
10-1-81	7	WD	39	5.2	206.5	0	0.00	0.00
10-4-81	12	WD	8	6.2	49.5	0	0.00	0.00
10-9-81	8	WE	55	4.8	264.5	0	0.00	0.00
10-27-81	2	WD	3	3.5	10.5	0	0.00	0.00
All days			232	5.4	1243.0	4	< 0.01	0.02

Table 2. Total estimated number of fishermen, total estimated pressure, estimated total harvest (No. and kg), and catch per effort (No./man-h \pm 1 S.E.) of red drum (*Sciaenops ocellatus*) by Gulf pier fishermen (September-October 1981). Number in parenthesis = 95% confidence interval.

Total number of fishermen	Total pressure (man-h)	Total harvest		No./man-h
		No.	kg	
8584 ^a	45,494 ^a (23,171-67,817)	275 ^b (3-546)	1895 ^b (21-3762)	< 0.01 \pm 0.005 ^a (< 0.01-0.02)

^aBased on completed trips (interviews) only.

^bBased on summary sheet data (refer to material and methods).

Table 3. Bait type use (%), % successful fishermen and % red drum (*Sciaenops ocellatus*) caught by bait type by Gulf pier fishermen (September-October 1981).

Bait type	% of fishermen using bait type	% success at catching red drum by bait type	% success at catching any specie by bait type	% red drum caught by bait type
1. Artificial	0.0	-	-	-
2. Live Shrimp	3.0	0.0	28.6	0.0
3. Dead Shrimp	37.8	1.1	68.2	25.0
4. Live Fish	0.8	0.0	0.0	0.0
5. Dead Fish	36.5	0.0	21.2	0.0
6. Other	13.7	9.4	50.0	75.0
7. Comb. 2 & 5	1.3	0.0	0.0	0.0
8. Comb. 1 & 2	0.0	-	-	-
9. Comb. 2 & 3	0.0	-	-	-
10. Comb. 3 & 5	6.9	0.0	62.5	0.0

Table 4. Origin of sport anglers on six Gulf piers from High Island to San Luis Pass. (September-October 1981).

State	County	% of total
Texas		98.3
	Harris	58.2
	Galveston	19.8
	Brazoria	3.5
	Jefferson	2.6
	Montgomery	2.6
	Liberty	2.2
	Henderson	1.7
	Travis	1.7
	Bexas	1.3
	Ft. Bend	1.3
	Orange	0.9
	Taylor	0.9
	Dallas	0.4
	Jasper	0.4
	Parker	0.4
	Williamson	0.4
New York		1.3
Other Country		0.4

Table 5. Number of red drum (*Sciaenops ocellatus*) caught on Gulf piers in the Galveston area by Big Fish Records (BFR) and TPWD survey estimates (September 1981). Numbers in parenthesis = 95% confidence interval.

Fishing pier	"B.F.R." No. red drum	TPWD ^a No. red drum (8 h)	TPWD ^b No. red drum (24 h)
Flagship	33		
61st St.	91		
91st St.	60		
TOTAL	184	56 (5-112)	168 (15-336)

^aEstimated number of red drum during survey hours of 2200-0600 CST.

^bEstimated number of red drum during entire day (0000-2400 CST) assuming the catch/rate remains the same for those hours when survey was not conducted.

Table 6. Comparison of the number of "bull" (>5 kg) red drum (Sciaenops ocellatus) landed and released or retained between "uniformed" and incognito" surveys on Gulf piers (September-October 1981).

Uniformed			Incognito				
Date	No. landed	No. released	No. retained	Date	No. landed	No. released	No. retained
9-1-81	1	1	0	9-4-81	1	1	0
9-11-81	2	0	2	9-8-81	0	-	-
9-17-81	0	-	-	9-16-81	1	1	0
9-24-81	1	1	0	9-21-81	1	1	0
9-25-81	0	-	-	10-10-81	0	-	-
9-29-81	1	1	0	10-14-81	1	0	1
10-1-81	0	-	-	10-23-81	0	-	-
10-4-81	0	-	-	10-25-81	0	-	-
10-9-81	0	-	-	10-27-81	0	-	-
10-27-81	0	-	-	10-29-81	0	-	-
TOTAL	5	3	2	TOTAL	4	3	1

Table 7. Comparison of length-weight relationship developed by TPWD (Harrington et al. 1979) with length-weights as measured by creel survey personnel during 1980-81 survey year and with length-weights as recorded by Gulf pier operators. Numbers in parenthesis = number of red drum. Blanks = no data.

Harrington et al. 1979		Creel personnel	Pier operators
Length (mm)	Weight (kg)	mean weight (kg)	mean weight (kg)
685	3.45		10.02 (3)
725	4.10		7.30 (1)
735	4.28		8.85 (2)
760	4.74		10.35 (3)
785	5.23		13.08 (2)
800	5.54		10.20 (2)
815	5.86		8.36 (5)
840	6.42		9.26 (5)
845	6.54	6.35 (1)	
865	7.02	8.55 (1)	9.63 (8)
880	7.40	6.65 (1)	
890	7.66	6.20 (1)	10.81 (6)
905	8.06	7.90 (1)	
915	8.33	7.85 (1)	11.12 (12)
920	8.47	8.10 (1)	12.00 (1)
925	8.61	7.15 (1)	
940	9.04		11.15 (10)
950	9.34	8.18 (2)	12.25 (1)
955	9.49	8.60 (3)	11.15 (2)
965	9.80		12.77 (7)
970	9.95	8.40 (1)	
980	10.27	8.55 (1)	
990	10.59		12.77 (6)
995	10.75	9.30 (1)	
1000	10.92	10.80 (1)	
1010	11.25	10.05 (1)	
1015	11.42		13.66 (10)
1020	11.59	11.00 (1)	
1025	11.77	10.10 (1)	
1040	12.30		15.06 (4)
1065	13.22		14.70 (13)
1090	14.18		13.48 (2)
1145	16.48		14.55 (1)
1195	18.76		12.75 (1)
1295	23.95		18.15 (1)
1345	26.87		20.85 (1)

Appendix A. Gulf pier access points.

Table 1. Gulf of Mexico pier access points near Galveston Bay.

Area	Pier code number	Pier identification
High Island	2	Shorty's Longest Pier
	3	Gulf Haven Pier
Galveston	6	Flagship Fishing Pier
	7	61st Street Pier
	8	Gulf Coast Pier
San Louis Pass	12	San Louis Pass Pier

Appendix B. Area maps of Gulf pier access points

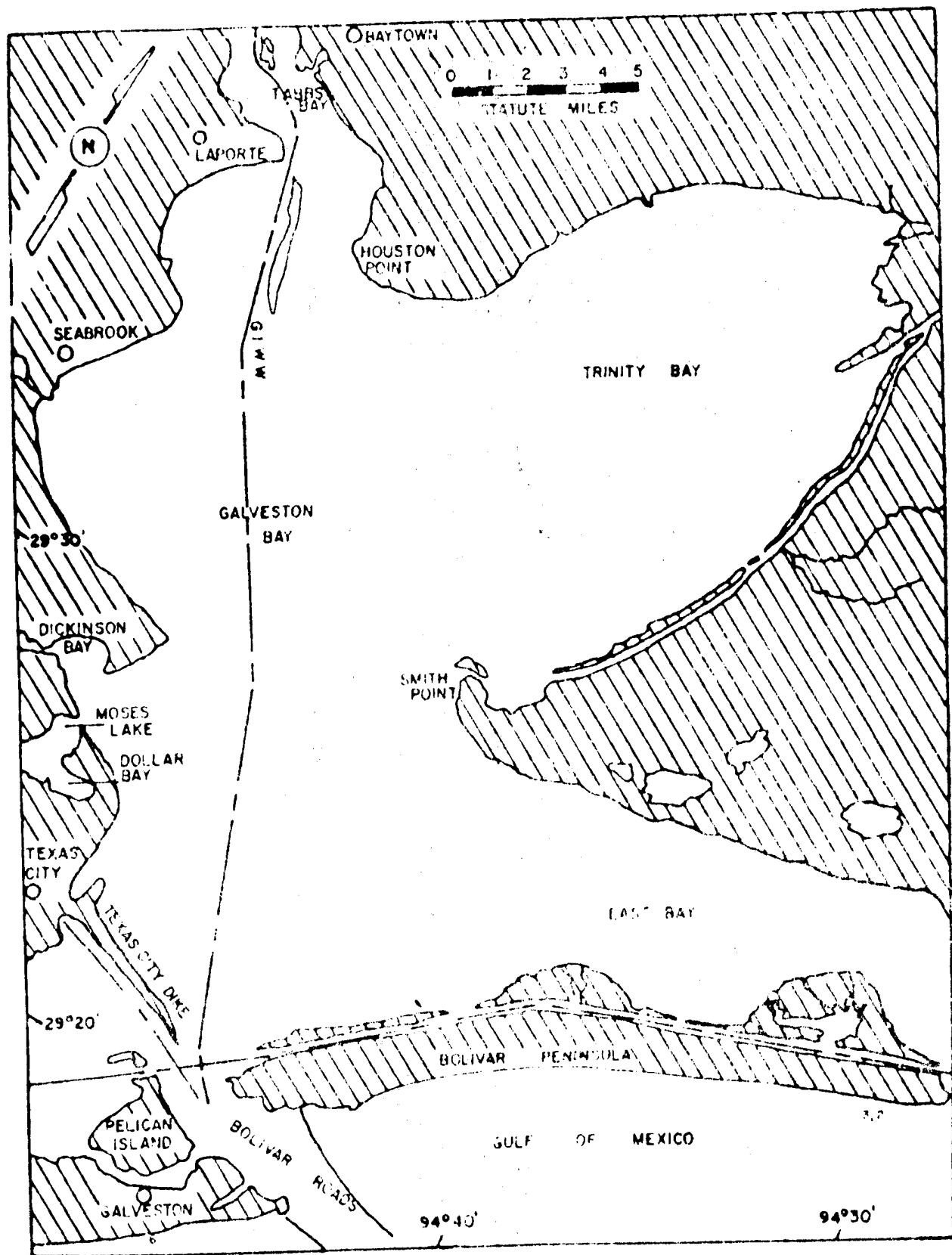


Figure 1. Gulf commercial pier access points from High Island to San Luis Pass (September - October 1981).

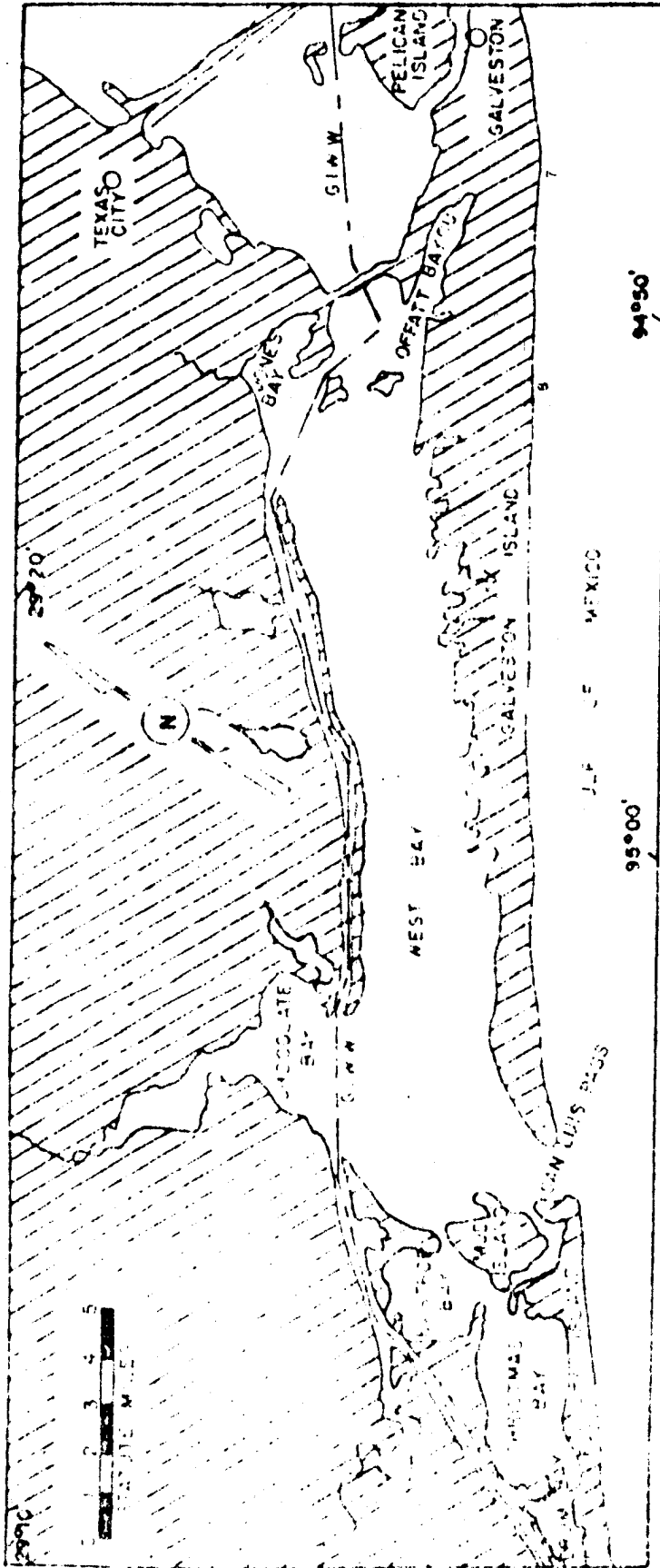


Figure 2. Gulf commercial pier access points from High Island to San Luis Pass (September - October 1981).

Appendix C. Results of Analysis of Variance

Table 1. Results of two-way analysis of variance of daily harvest of red drum (*Sciaenops ocellatus*) by Gulf pier fishermen on weekdays and weekend days with "uniformed" and "incognito" interviewers (September-October 1981).

Source of variation	Degrees of freedom	Sum of squares	Mean square	F-Statistic
Groups	3	8.988	2.996	1.236 NS
Day type	1	2.917	2.917	1.204 NS
Uniformed or Incognito	1	1.250	1.250	0.516 NS
Interaction	1	4.821	4.821	1.990 NS
Error	16	38.762	2.423	
Total	19	47.750		

NS = Not significant at P = 0.05

Table 2. Results of one-way analysis of variance of pressure of Gulf pier fishermen on weekdays and weekend days (September-October 1981).

Source of variation	Degrees of freedom	Sum of squares	Mean square	F-Statistic
Groups	1	312.08	312.08	0.038 NS
Error	8	65,120.02	8140.00	
Total	9	65,432.10		

NS = Not significant at $P = 0.05$

Table 3. Results of one-way analysis of variance of trip time of Gulf pier fishermen on weekdays and weekend days (September-October 1981).

Source of variation	Degrees of freedom	Sum of squares	Mean square	F-Statistic
Groups	1	0.114	0.114	0.047 NS
Error	8	19.647	2.456	
Total	9	19.761		

NS = Not significant at $P = 0.05$

Appendix D. Length frequency histogram and
and Length-Weight Figure

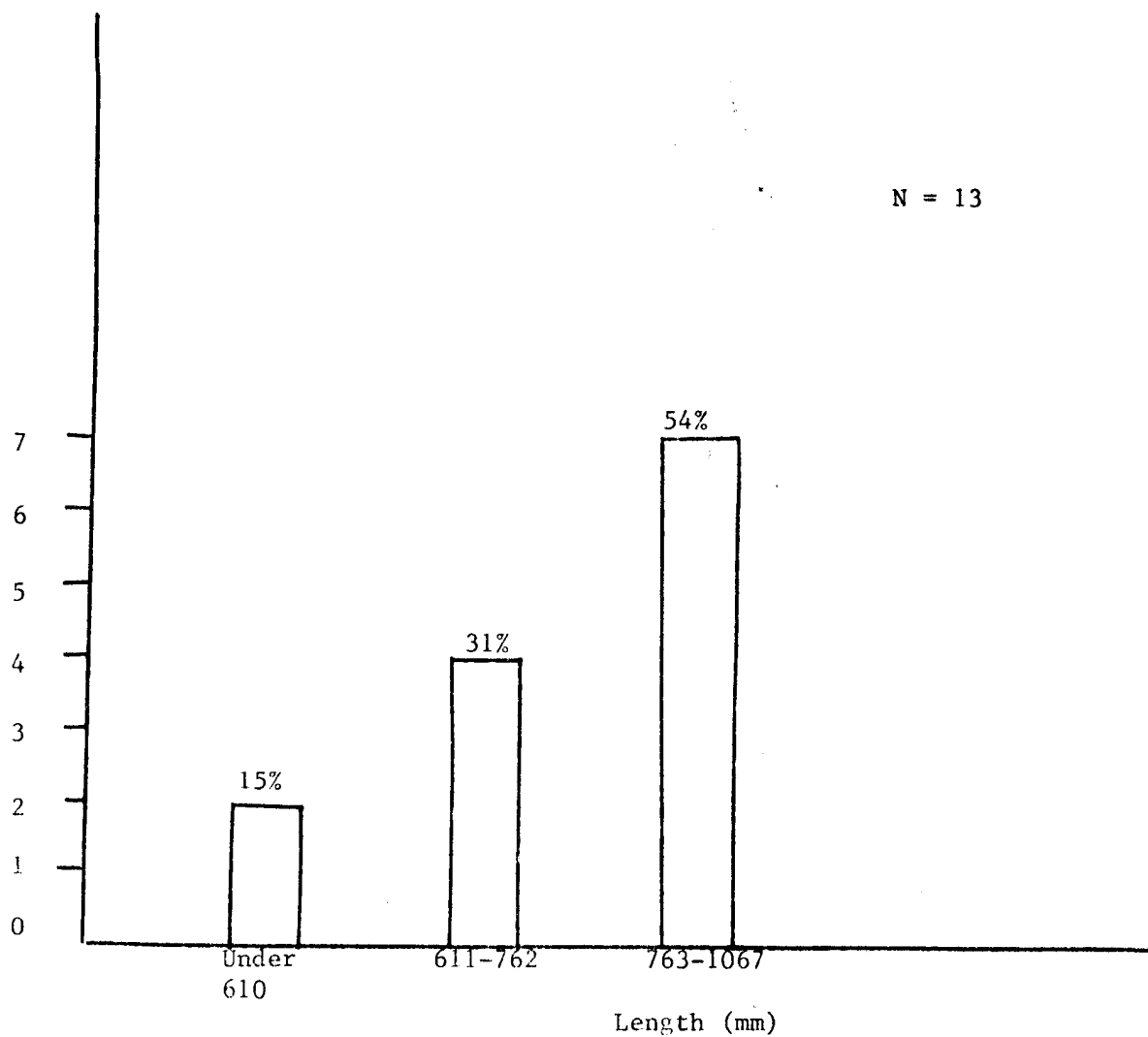


Figure 1. Number of red drum (*Sciaenops ocellatus*) caught by Gulf pier fishermen and separated into three size groups; from zero to 24 inches (610 mm), from 24 to 30 inches (611-762 mm) and above 30 inches (763-1067 mm).

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