Port Bay - An Evaluation of the Marine Habitat
Project CE-1-2

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Abstract

Trawl samples taken at weekly intervals from December 1970 through November 1971 in Port Bay, a tertiary bay of the Aransas Bay system, produced 38 species of fin fish and 9 species of crustacea.

A nine-month period of below normal rainfall from November 1970 through July 1971 influenced white shrimp, Penaeus setiferus, and blue crab, Callinectes sapidus, populations by raising salinities above optimum ranges during juvenile migration periods. In September 1971, rainfall associated with tropical storm "Fern" dropped salinities from above 30.0 to 0.0 ppt. Eight hundred ninety six hydrographic samples collected during the survey were correlated with population densities to establish the salinity influence on individual species. The parameters determined for each sample were salinity, temperature, turbidity, pH, dissolved oxygen, calcium, total hardness and magnesium.

Introduction

The established commercial fishing industry in Texas is primarily dependent on those species of crabs, oysters and shrimp which must utilize bay environments for growth and survival.

Sustained production of brown shrimp, Penaeus aztecus; white shrimp, P. setiferus; blue crabs, Callinectes sapidus; and oysters, Crassostrea virginica; is an economic necessity to those coastal communities which are dependent on the tourist industry and the commercial fishery for financial stability.

These species contributed 51 million dollars to a 53 million dollar total fishery value for Texas in 1970. If the bait shrimp industry, the sport fishery, the tourist industry, the motels, hotels, and restaurants are considered, the value of those portions of the Texas coast which produce marine products is greatly increased.

Increased utilization of Texas' coastal bays for petroleum exploration, industrial locations, recreational activities and homesite construction has created conditions which are potentially harmful to the fishery and the habitat. In order to evaluate or estimate the degree of damage it is necessary to study and record the conditions with which the fishery is normally associated.

Description of Area

Port Bay is a shallow tertiary system extending from Copano Bay at Rattlesnake Point southward for approximately seven miles (Figure 1). There are 4,458 acres of open water and approximately 1,000 acres of marsh which drains into the bay.

Water depth averages 2.3 feet and those areas which are less than two feet deep are normally covered with dense growths of shoal grass (Diplanthera wrightii) (Figure 1).

Bottom composition ranges from soft silt at the head of the bay to a firm sandy mud near the mouth. Oysters are scattered over the area but there are no established reefs.

Salinities in Port Bay are influenced by drainage from surrounding marsh areas primarily through a small creek at the head of the bay. The creek is dependent on local rain for flow and is the principal drainage system for a large portion of ranchland south and west of the city of Aransas Pass.

Oilfield brine is discharged into the bay from separators located on the east shore near the head of the bay and in the proximity of Italian Bend (Figure 2).

Shoreline development of Port Bay is limited to two bait stands, a ranch, and a hunting club. Pasturelands predominate and are undisturbed except for oil brine separators, pits, and brine discharge. The west shore is adjacent to a dump area used by Reynolds Aluminum Company to hold waste bauxite material. The proximity of this dump area to Port Bay is shown in Figure 2.

Methods and Gear

Faunal samples from four stations (Figure 2) were obtained at weekly intervals beginning in December 1970 and continuing through November 1971. These samples were obtained with an otter trawl constructed of Number 12 nylon twine and having a mouth width of 3.66 meters (12 feet), body mesh of 3.18 cm (1.25 inches) stretched and the bag section lined with 6.3 mm (.25 inch) stretched nylon netting of Number 3 twine.

Trawls were pulled for 15 minutes behind an outboard powered skiff and covered about 20,000 square feet. All catches were sorted and a count was made of each species collected. Sizes, size range, and modal size were recorded.

Hydrographic samples were obtained with a two liter capacity Kemmerer water sampler. Bottom and surface samples were collected from those stations where the depth exceeded 45 cm (18 inches). Surface samples were taken approximately 10 cm beneath the surface.

Temperature and dissolved oxygen recordings were taken at the station location. Temperatures are recorded in degrees centigrade. Dissolved oxygen determinations were made with Hach chemical kits utilizing the Winkler titration method.

Analysis of pH, calcium, hardness and magnesium, turbidity and salinity were made at the Marine Laboratory, Rockport. Calcium and hardness were determined by the EDTA (ethylenediamine-tetraocetic acid) Titrametric Method as outlined in Standard Methods, 1965. Magnesium concentration was determined by mathematical calculation from the calcium and hardness determinations. Determinations are presented in parts per million (ppm).

Salinity concentrations were determined by silver nitrate titration utilizing the Knudsen Method of chlorinity analysis. Data are presented in parts per thousand (ppt). Turbidities are expressed as parts per million suspended solids and were determined by a Jackson Turbidometer. A Corning double anode meter was used for pH determinations.

Rainfall data were obtained from U. S. Weather Bureau stations in Rockport and Aransas Pass. Data are presented in inches of rainfall. Information on runoff and creek flow into the Port Bay area was not available.

Results

Hydrography - The influence of rainfall on a bay environment was demonstrated in Port Bay from December 1970 through November 1971. The largest monthly total for 1970 occurred in October when over 10 inches of rain were recorded at both the Rockport and Aransas Pass weather stations (Table 1). Rainfall from November 1970 through July 1971 totaled only 9.47 inches at Rockport and 9.58 inches at Aransas Pass for this nine-month period (Table 2). This reduction in precipitation was reflected in salinity increases (Table 3) in the Port Bay area. Salinities in December 1970 averaged 15.6 ppt for the 11 sample stations and continued to increase to an average high of 28.4 ppt and an individual station high of 34.0 ppt by August 1971. On September 10, 1971 the Rockport area received heavy rainfall from tropical storm "Fern." Rainfall for September was 19.24 inches at Rockport and 18.94 inches at Aransas Pass. Rainfall on inland areas was reported in excess of 20 inches and general flooding occurred from the Guadalupe River to the Nueces River. Severe flooding occurred from Sinton to Refugio, cities on the watersheds of the Aransas and Mission Rivers, respectively. These floods resulted in a total freshening of the Aransas-Copano Bay systems. Many residents in these areas reported the flooding exceeding that associated with hurricane "Beulah" in 1967 which inundated most of south Texas.

This heavy rainfall in September 1971 was followed with an increase of precipitation in the area with recordings at Rockport of 6.01, 1.80 and 7.57 inches for October, November and December 1971, respectively (Tables 1 and 2). Port Bay salinities remained low in October and November averaging 2.20 and 3.06 ppt, respectively. The effect of rainfall on Port Bay salinities is presented in Figure 3 which compares an average of all stations sampled per month to the composite average of rainfall recorded at the Rockport and Aransas Pass weather stations.

The influence of oilfield brine on the nursery areas of Mission Bay and Aransas River was noted in 1970 (Heffernan 1971). The imbalance of the calcium-magnesium ionic ratio in oilfield brines as compared to normal bay waters has been used as a criteria for determining the influence of brine on bay hydrography.

Calcium-magnesium ratios (Table 3) remained stable until the influence of rainfall from tropical storm "Fern." Figure 4 presents a comparison of salinity, calcium, magnesium and rainfall in which the salinity, calcium and magnesium contours are well correlated. Increased rainfall reduced the ionic concentration in unison and the levels of calcium and magnesium were reduced to those of freshwater and below at some stations (Table 3). The critical range of 13.5 to 28.0 per cent brine with associated salinities of 43 to 49 ppt (Heffernan 1971) were not reached and no definite indication of brine influence on Port Bay water quality were noted.

A survey of oil-brine separators adjacent to the Port Bay shoreline in August 1971, found that little brine was entering the bay and that some brine was being sub-surface injected by one of the three producers contacted. An estimate of daily flow was not available at the time of this survey as one separator was under repair and another had shut down. All three of the units were observed discharging brine in December 1970.

Fin-fish Distribution and Abundance - The predominant species of fin-fish in Port Bay were the common anchovy, *Anchoa mitchilli*; menhaden, *Brevoortia* sp.; Atlantic Croaker, *Micropogon undulatus*; and pinfish, *Lagodon rhomboides*. These four species comprised 93.36 per cent of the fin-fish catch of 19,388 individuals. The major single species was the anchovy of which 12,184 individuals were taken for 62.84 per cent of the total catch.

In 1941 and 1942 Gunter (1945) found the major species in Aransas and Copano Bays to be (in order of dominance) *M. undulatus*, *A. mitchilli*, and the tidewater silverside, *Menidia beryllina*. Hydrographic conditions differed during the two surveys with salinities ranging from 0.0 to 20.4 ppt in Copano Bay during Gunter's survey and from 0.0 to 34.0 ppt in Port Bay in 1971, with the freshening occurring after a drought period.

Thirty-eight species of fin-fish were collected from 157 trawl samples taken at the designated areas shown in Figure 2. A listing of these species, the total catch of each and the number per unit of effort are presented in Table 4.

Seven species of fish contributed only one individual to the total catch (Table 4). The most significant of these is the broad killifish, *Cyprinodon variegatus*, which Gunter (1945) found to be extremely abundant and which is generally plentiful in other areas of the Aransas Bay system (Heffernan 1971).

The game and commercial species found in the Port Bay area were redfish, *Sciaenops ocellata*; spotted seatrout, *Cynoscion nebulosus*; southern flounder, *Paralichthys lethostigma*; black drum, *Pogonias cromis*; and sheepshead, *Archosargus probatocephalus*. Of these species, the spotted seatrout was the more abundant with a total catch of 139 individuals and an average of 0.89 individuals per sample (Table 4).

Juvenile trout first appeared in the trawl catch on June 10, 1971, at 26 and 39 mm (Figure 5) and a density peak occurred during a period from August 20 to 25 when 22 individuals ranging from 92 to 200 mm were taken on each date. Figure 5 presents a weekly analysis of *C. nebulosus* catch data showing size ranges and average sizes for each sample period. The sub-modal lengths are numerically presented to show the dominant size groups.

Commercial Crustacea

Brown Shrimp - Brown shrimp contributed 6,916 individuals for 44.05 per cent of the total species catch (Table 4) and was far more numerous than white shrimp which produced only 357 individuals for a catch effort of 2.27 per cent. This was a complete reversal of the population densities found in the tertiary areas of Copano Bay in 1969-1970 (Heffernan 1971). The decrease of white shrimp is directly attributed to the lack of rainfall from July through August when the postlarval white shrimp enter the estuaries from the Gulf of Mexico. Bay salinities (Table 3) were not of sufficient freshness for adequate survival of these small white shrimp (Gunter 1950).

Brown shrimp acclimated well to the higher than normal salinities in Port Bay and were taken each month during the survey period (Table 6). Bay temperature averages ranged from 16 to 20 degrees (Table 3) during January-March. Temperatures normally range from 12 to 17 degrees in February and March (Martinez 1968). The warmer winter temperatures in 1971 aided the survival of late spawned brown shrimp and allowed them to overwinter in the shallow areas of Port Bay.

The influence of salinity on brown shrimp was not a major factor in creating density fluctuations as the population peak and migration period occurred in June, prior to the rainfall deluge in September. Figure 7 compares salinities and brown shrimp catch per effort and does reflect a sharp decrease in catch per effort in September but also a rise in October as salinities were lowered further by recurring rains.

Figure 8 expresses the brown shrimp population size trend over the survey period. Significant numbers of brown shrimp appeared in March when 129 individuals were taken at a mode of 41 mm, ranging in size from 16 to 82 mm. The mode increased each month through May to 67 mm, then dropped to 60 mm in June when a group of 20-30 mm sized shrimp appeared. Growth rates continued, peaking at a mode of 76 mm (Table 6) in November 1971.

White Shrimp - Under normal hydrographic conditions white shrimp will appear in the tertiary areas of the Aransas Bay system as early as June and generally peak in October (Moffett 1968). St. Charles Bay tertiary areas presented population peaks of white shrimp in October 1969, and in November 1970 (Heffernan 1971). Respective salinities during these periods were 9.79 ppt and 1.12 ppt, which are in comparison with the 3.06 ppt of Port Bay in 1971 (Table 3). The salinity averages for the St. Charles Bay area in June of 1969 and 1970 were 5.17 ppt and 1.11 ppt for each respective year, whereas Port Bay salinities averaged 21.4 ppt in 1971, a significant and critical difference.

White shrimp catches peaked in October with a total of 169 individuals and a catch per effort of 11.27 individuals. The production of white shrimp in Port Bay was extremely poor in comparison to production of St. Charles Bay and other areas of Copano Bay in 1969 and 1970 when individual stations produced over 1,000 shrimp per sample and catches per effort averaged in excess of 200 individuals (Heffernan 1971).

White shrimp catch per effort and monthly salinity averages for Port Bay are presented in Figure 9. The increase in catch density correlates well with the salinity decrease beginning in August and continuing through October. This same increase in density is normal with a combination of seasonal abundance and developing hydrographic conditions abetting survival.

Size ranges, catch numbers and modal size are presented in Figure 10 for each month of the survey. Significant numbers of white shrimp appeared in August 1971, with a catch of 47 individuals and mode of 90 mm. The mode decreased to 78 mm in September as more juveniles appeared in the catch. This rose to 81 mm in October during peak density but fell sharply to 51 mm in November. This drop in size also accompanied a reduction in number and may indicate only that the more mobile adults moved out of the shallow areas following slight temperature drops in November. The maximum size shrimp caught did follow a pattern of steady decline from July through November from 153 mm to 106 mm (Figure 10). It was not determined if the source of juvenile shrimp was from the creek and marsh areas or from the Copano Bay area.

Small white shrimp (under 30 mm) were not collected in the trawl samples (Figure 10) and some speculation exists as to what areas these shrimp use as nurseries. It is felt that the collecting gear is adequate as brown shrimp as small as 15 mm (Figure 8) have been collected. Possibly small white shrimp do not move into the tertiary areas until they are in excess of 25 mm. No white shrimp smaller than 25 mm were found in any samples taken up the creeks and rivers of Copano and St. Charles Bays during the survey of these areas in 1969 and 1970 (Heffernan 1971).

Herke's (1971) survey of Louisiana tidal marshes developed similar findings to that of the Copano Bay tertiary areas in respect to salinity tolerances, growth rate and white shrimp size ranges. He estimated that it may take a number of weeks for the postlarval white shrimp to migrate from the primary bay areas to the tertiary systems. This is perhaps substantiated by Baxter and Renfro (1967) who found white shrimp of 18-28 mm abundant in Galveston Bay. If the growth rate of 1.3 mm per day as reported by Moffett (1968) is valid, the 25 to 30 mm juvenile white shrimp are spending at least the first three weeks after entering the bays in the primary and secondary areas.

Blue Crabs - Blue crab numbers were extremely low throughout the survey. Total monthly catches (Table 6) ranged from a low of 4 in May to the high of 16 in October. Crabs were collected each month of the survey year but never in the quantities found during 1969 and 1970 in Copano Creek, 37.58 catch per effort; Mission River, 7.08 C/E; and the St. Charles Creeks, 6.53 C/E (Heffernam 1971). The average monthly catch per effort for Port Bay was .79 crabs.

The low density is partially attributed to the low rainfall-high salinity factor in January and June and partially to the sensitivity of juvenile crabs to oil field brine. The catch made for each month (Table 6) shows adult size crabs dominating the catches although the size ranges show a small distribution of juvenile crabs in the samples (Figure 11). Juvenile crabs did enter the area at normal annual occurrences in January and June but apparently failed to survive.

The relationship between blue crab density and salinity is not firmly established because of the lack of crabs obtained during the survey period but the data does indicate that fresh water is as necessary for juvenile crab survival as it is for white shrimp.

Figure 12 compares salinity and catch per effort and reflects a lack of juvenile recruitment with little response to rainfall. The hydrographic conditions in January and June are of prime importance.

Conclusion

The range of hydrographic factors from near ocean salinity to fresh water influenced species densities. The data presented do not show the production achieved during periods of greater stability. The survey does show influence of drought on white shrimp and blue crab densities in the area and the effect of rainfall on hydrographic parameters. A resurvey of Port Bay should be made during more favorable conditions to more accurately assess its productive capabilities for comparison to the other areas of the Aransas Bay system.

The influence of oilfield brine discharges was not shown during this survey but has been shown to be a detrimental factor in other tertiary areas (Heffernan 1971).

Table 1

Monthly Precipitation Recordings for the
Port Bay Watershed from Rockport and Aransas Pass

	Rockport		Aransas Pass	
	1970	1971	1970	1971
January	2.49	.10	3.93	.07
February	1.12	.45	1.55	.48
March	2.44	Trace	2.42	0.00
April	.65	1.55	.15	1.45
May	5.26	5.31	6.55	6.32
June	1.51	.18	1.95	.07
July	4.31	.28	4.18	0.00
August	2.54	7.64	7.55	4.34
September	9.36	19.24	8.85	18.94
October	10.17	6.01	10.45	7.55
November	1.00	1.80	.50	2.80
December	.60	7.57	.69	5.72
Total	41.45	50.13	48.78	47.74

Table 2

Composite Monthly Rainfall Average
for Aransas Pass and Rockport

1971

January	.08	July	.14
February	.46	August	5.99
March	.00	September	19.09
April	1.50	October	6.78
May	5.82	November	2.30
June	.12	December	6.64

Table 3

Port Bay Water Analysis
Water Averages of all Stations Including Highs and Lows
December 1970 - November 1971

B=Bottom
S=Surface

Month	Salinity (ppt) B	Salinity (ppt) S	Temperature (°C.) B	Temperature (°C.) S	Turbidity (ppm) B	Turbidity (ppm) S	DO (ppm) B	pH B	pH S	Hardness (ppm) B	Hardness (ppm) S	Calcium (ppm) B	Calcium (ppm) S	Magnesium (ppm) B	Magnesium (ppm) S	No. of Samples B	No. of Samples S
December 1970																21	
Avg.	13.6		17.3		71		7.7	7.86		2551		188		496			
High	15.6		22.0		176		9.00	8.90		3100		224		619			
Low	12.1		12.5		<25		6.00	7.52		2240		168		427			
January 1971																25	
Avg.	16.5		16.9		148		7.80	7.89		2997		227		590			
High	17.5		20.0		525		10.00	8.02		3120		257		622			
Low	15.9		13.0		<25		6.00	7.50		2720		200		529			
February 1971																22	11
Avg.	18.5	18.6	18.32	20.43	160	98	7.00	7.89	7.83	3393	3390	256	264	669	674		
High	19.4	18.9	21.0	21.0	350	142	9.00	8.15	7.95	3700	3440	305	273	729	769		
Low	17.9	18.2	12.0	19.5	38	36	6.00	7.60	7.70	3220	3340	224	241	627	642		
March 1971																26	14
Avg.	21.8	21.79	16.13	16.05	239	218	7.80	7.65	7.63	4001	4019	304	309	775	790		
High	29.0	22.0	24.0	24.0	400	305	8.00	7.77	7.75	4250	4250	337	321	843	838		
Low	16.0	17.0	15.5	15.0	<25	< 25	7.00	7.40	6.85	3240	3580	273	265	622	691		

Table 3 (cont'd.)

Port Bay Water Analysis
Water Averages of all Stations Including Highs and Lows
December 1970 - November 1971

Month	Salinity (ppt)		Temperature (°C.)		Turbidity (ppm)		DO (ppm)	pH		Hardness (ppm)		Calcium (ppm)		Magnesium (ppm)		No. of Samples	
	B	S	B	S	B	S	B	B	S	B	S	S	S	B	S	B	S
April 1971																33	27
Avg.	22.8	22.6	21.45	21.80	93	79	6.90	7.69	7.44	4153	4376	322	321	846	830		
High	25.3	25.1	26.0	26.0	260	232	8.00	8.00	8.0	4750	4750	428	360	944	927		
Low	21.0	21.0	16.0	16.0	< 25	< 25	6.00	7.20	7.55	3800	3900	281	281	760	775		
May 1971																35	28
Avg.	23.00	21.4	24.95	24.51	103	63	5.80	7.79	7.49	4225	4068	320	292	838	785		
High	25.7	25.7	28.0	28.0	285	180	7.00	8.30	8.30	5033	4800	393	401	994	940		
Low	5.4	5.2	20.5	22.5	< 25	< 25	5.00	7.40	7.30	1033	967	88	80	198	186		
June 1971																40	40
Avg.	21.4	21.1	28.5	28.4	86	70	7.08	7.85	7.66	3969	3951	287	288	791	786		
High	27.2	27.2	30.5	30.5	260	235	7.00	8.15	8.20	5300	5000	374	361	1077	1022		
Low	12.4	12.4	26.0	26.0	< 25	< 25	5.00	7.60	7.50	2267	2267	176	184	444	439		
July 1971																35	32
Avg.	28.4	28.2	29.2	29.3	136	83	5.66	7.96	7.96	5409	5422	395	394	1079	1079		
High	31.6	31.2	31.0	31.0	550	370	7.00	8.20	8.13	6100	6000	521	481	1191	1191		
Low	24.8	24.8	28.0	28.0	< 25	< 25	4.00	7.83	7.85	4700	4700	321	301	899	911		

Table 3 (cont'd.)

Port Bay Water Analysis
Water Averages of all Stations Including Highs and Lows
December 1970 - November 1971

Month	Salinity (ppt)		Temperature (°C.)		Turbidity (ppm)		DO (ppm)	pH		Hardness (ppm)		Calcium (ppm)		Magnesium (ppm)		No. of Samples	
	B	S	B	S	B	S	B	B	S	B	S	B	S	B	S	B	S
August 1971																34	33
Avg.	21.1	21.1	29.4	29.4	71	56	6.09	8.03	8.05	3753	3824	296	295	744	736		
High	34.0	32.8	31.5	31.5	180	160	8.00	8.51	8.53	5400	5300	441	441	1081	1045		
Low	4.2	4.6	26.5	26.5	< 25	< 25	4.00	7.60	7.20	1000	800	80	80	194	146		
September 1971																24	24
Avg.	7.7	7.7	25.8	25.7	110	104	5.50	7.56	7.57	1445	1460	134	126	270	278		
High	25.0	25.0	29.0	29.0	218	200	7.00	6.80	7.00	4700	4700	12	16	899	935		
Low	.2	.3	22.0	22.0	42	39	4.0	8.10	8.10	80	70	501	401	3	7		
October 1971																35	35
Avg.	2.2	2.2	24.1	23.5	88	76	6.50	7.86	7.86	391	388	48	48	66	66		
High	4.2	4.6	25.6	26.2	170	142	8.0	8.49	8.40	700	740	80	80	122	122		
Low	.4	.4	21.5	23.5	< 25	< 25	5.0	7.29	7.30	110	45	16	16	15	15		
November 1971																27	27
Avg.	3.06	3.08	21.0	21.1	75	59	7.60	7.99	8.04	586	571	86	100	87	87		
High	4.2	4.2	26.7	27.5	210	115	9.00	8.12	8.19	830	830	164	160	146	143		
Low	1.6	1.6	17.4	17.3	26	< 25	5.00	7.80	7.75	310	310	36	44	46	41		

Table 4

Species Composition of Catch
December 1970 - November 1971

Scientific Name	Common Name	Total Catch	Catch Per Effort
Pisces			
Anchoa mitchilli (Valenciennes)	Common anchovies	12,184	77.61
Archosargus probatocephalus (Walbaum)	Sheepshead	30	.19
Arius felis (Linnaeus)	Hardhead catfish	214	1.36
Bagre marinum (Mitchill)	Gafftopsail catfish	7	.04
Bairdiella chrysura (Lacépède)	Silver perch	10	.66
Brevoortia gunteri Hildebrand	Finescale menhaden	2,975	18.95
B. patronis Goode	Largescale menhaden		
Cynoscion nebulosus Cuvier	Spotted seatrout	139	.89
Cyprinodon variegatus Lacépède	Broad killifish	1	.006
Dasyatis americana Hildebrand & Schroeder	Southern stingray	3	.02
Dorosoma cepedianum (LeSueur)	Gizzard shad	10	.06
Elops saurus Linnaeus	Skipjack	1	.006
Fundulus grandis Baird & Girard	Gulf killifish	2	.01
F. similis (Baird & Girard)	Longnose killifish	1	.006
Gobiosoma bosci (Lacépède)	Naked goby	4	.03
G. molestum (Girard)	Texas goby	1	.006
Hypsoblennias ionthus (Jordan & Gilbert)	Freckled blenny	157	1.0
Lagodon rhomboides (Linnaeus)	Pinfish	644	4.10
Leiostomus xanthurus Lacépède	Spot croaker	116	.74
Lepisosteus spatula Lacépède	Alligator gar	3	.02
Menidia beryllina (Cope)	Tidewater silverside	130	.83
Membros martinica (Valenciennes)	Rough silverside	5	.03
Menticirrhus littoralis (Holbrook)	Whiting	4	.02
Microgobius gulosus (Girard)	Clown goby	3	.02
Micropogon undulatus (Linnaeus)	Atlantic croaker	2,300	14.65
Mugil cephalus Linnaeus	Striped mullet	5	.03
Orthopristis chysopterus (Linnaeus)	Pigfish	1	.006
Opsanus tau (Linnaeus)	Oyster toadfish	1	.006

Table 4 (cont'd.)

Species Composition of Catch
December 1970 - November 1971

Scientific Name	Common Name	Total Catch	Catch Per Effort
Paralichthys lethostigma Jordan & Gilbert	Southern flounder	2	.01
Pogonias cromis (Linnaeus)	Black drum	51	.32
Polydactylus octonemus (Girard)	Eightfinger threadfin	20	.13
Sciaenops ocellata (Linnaeus)	Redfish	2	.01
Sphoeroides spengleri (Block)	Bandtail puffer	224	1.43
Stellifer lanceolatus (Holbrook)	Stardrum	2	.01
Strongylura marinas (Walbaum)	Atlantic needlefish	26	.17
Synodus foetens (Linnaeus)	Lizardfish	1	.006
Syngnathus louisianae Gunther	Chain pipefish	5	.03
Trinectes maculatus (Bloch & Schneider)	Hogchoker	5	.03
Total Finfish		19,388	
Crustacea			
Menippi mercenaria (Say)	Stone crab	9	.06
Panopeus herbsti (Milne & Edwards)	Mud crab	2	.01
Callinectes sapidus (Rathbun)	Blue crab	108	.69
Palaemonetes intermedius (Holthuis)	Grass shrimp	1,075	6.85
P. pugio (Holthuis)	Grass shrimp		
Penaeus aztecus (Ives)	Brown shrimp	6,916	44.05
P. duorarum	Pink shrimp	21	.13
P. setiferus (Linnaeus)	White shrimp	357	2.27
Crangon heterochaelis (Say)	Pistol shrimp	2	.01
Total Crustacea		8,490	

Table 4 (cont'd.)

Species Composition of Catch
December 1970 - November 1971

Scientific Name	Common Name	Total Catch	Catch Per Effort
Mollusca			
Loligo pealii	Common squid	5	.03
Reptilia			
Malaclemys terrapin	Diamondback terrapin	1	.006
Total Catch		27,884	

Total Trawls for Year 1971 - 157

Table 5

Commercial & Sport Species of Fish
Catch Per Effort, Total Caught and Mode

1970-1971		Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
REDFISH	Catch per effort			.11			.07						
	Total	0	0	1	0	0	1	0	0	0	0	0	0
	Mode			350			370						
DRUM	Catch per effort	.11	.64		.14	.38	.40	.06	.06	.5	.83	.67	
	Total	1	7	0	2	5	6	1	1	7	10	10	0
	Mode	160	240		200	240	195	205	200	226	180	108	
TROUT	Catch per effort	.11					.06	.53	2.5	3.29	1.88	1.27	
	Total	1	0	0	0	0	1	10	40	46	22	19	0
	Mode	86					180	46	60	85	88	87	0
SHEEPSHEAD	Catch per effort	.78		.11			.2	.11	.25	.29	.63	.07	
	Total	7	0	1	0	0	3	2	4	4	8	1	0
	Mode	175		225			175	170	154	143	188	180	
FLOUNDER	Catch per effort							.06		.07			
	Total	0	0	0	0	0	0	1	0	1	0	0	0
	Mode							140		205			

Table 6

Commercial Crustacea
Catch per effort, Total caught and Mode

1970-1971		Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
	Catch per effort	.78	.45	1.8	.36	1.0	.27	.67	.69	.93	.75	1.07	.73
BLUE CRABS	Total	7	5	5	5	13	4	12	11	13	9	16	8
	Mode	125	120	130	155	180	170	80	60	130	154	150	150
	Catch per effort	3.33	.09	.44	9.21	54.38	92.87	131.61	93.44	17.46	10.67	24.27	2.18
BROWN SHRIMP	Total	30	1	4	129	707	1393	2369	1495	2445	128	364	24
	Mode	68	45	72	41	47	67	60	68	71	65	73	76
	Catch per effort	7.1	.09				.2		.13	3.36	5.5	11.27	5.73
WHITE SHRIMP	Total	64	1	0	0	0	3	0	2	47	66	169	63
	Mode	81	42				145		103	90	78	81	51

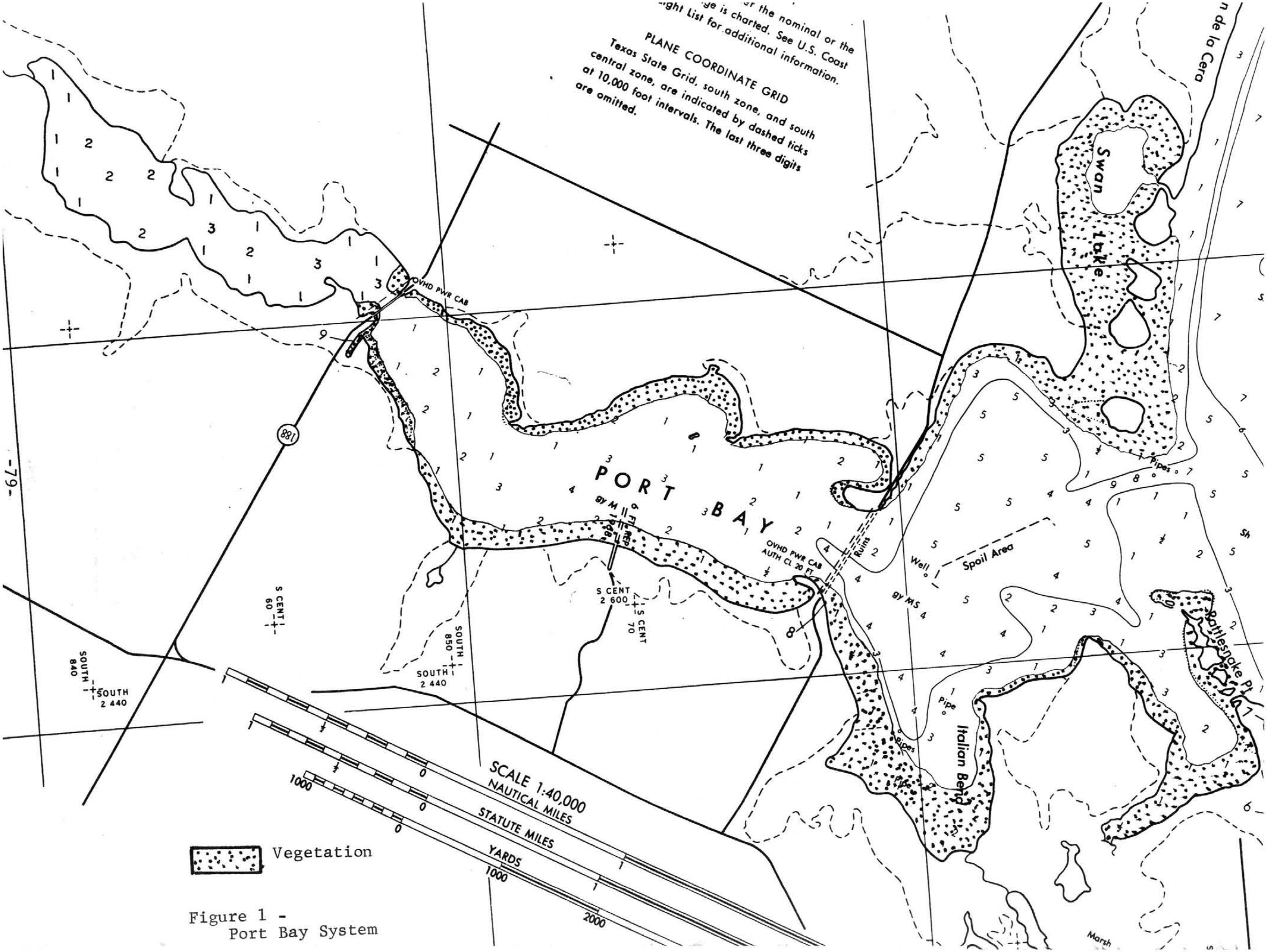


Figure 1 -
Port Bay System

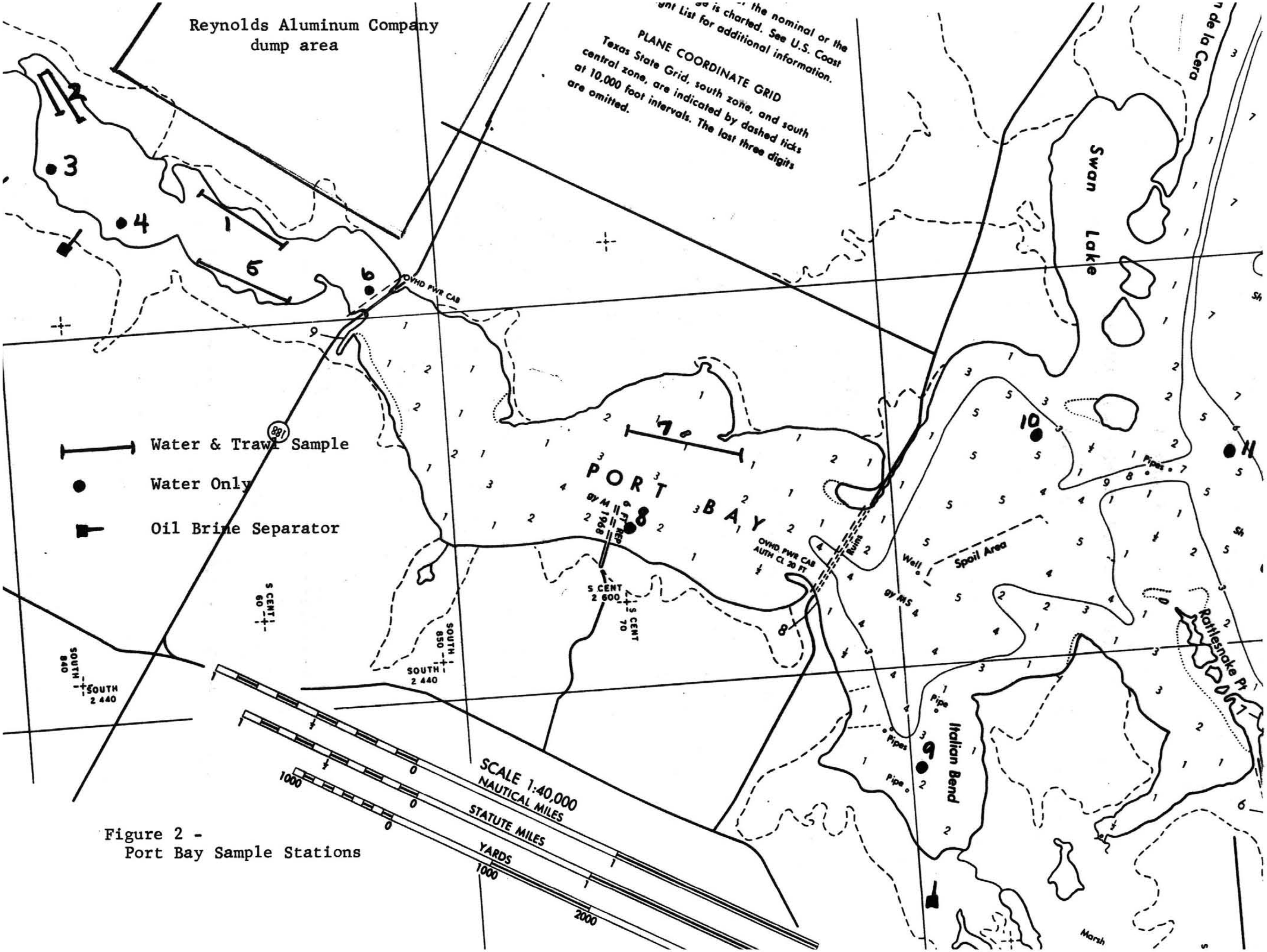


Figure 2 -
Port Bay Sample Stations

FIGURE 3

COMPARISON OF SALINITY AND RAINFALL
IN
PORT BAY

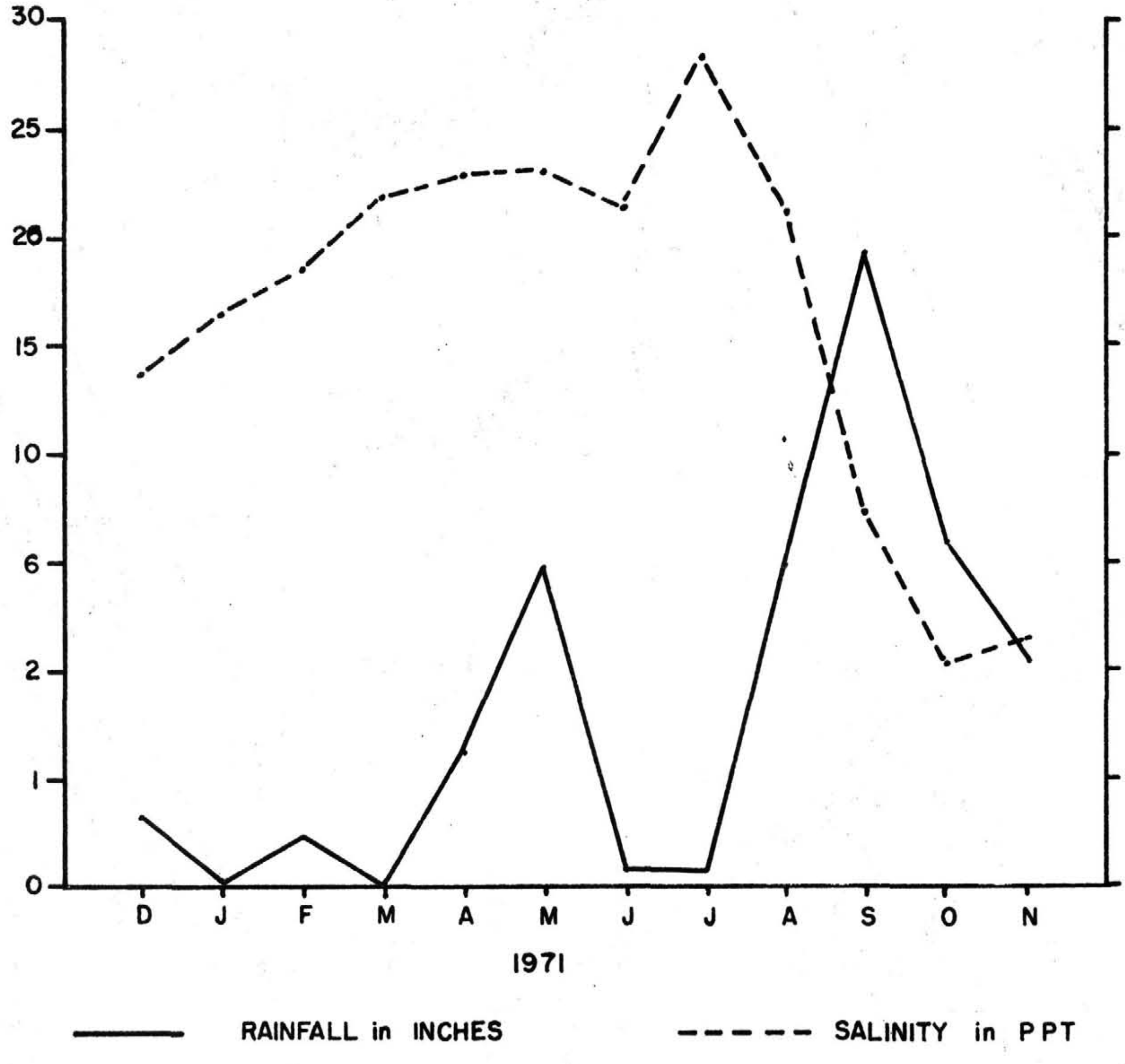


FIGURE 4
PORT BAY

COMPARISON OF SALINITY - CALCIUM - MAGNESIUM AND RAINFALL

BOTTOM SAMPLE

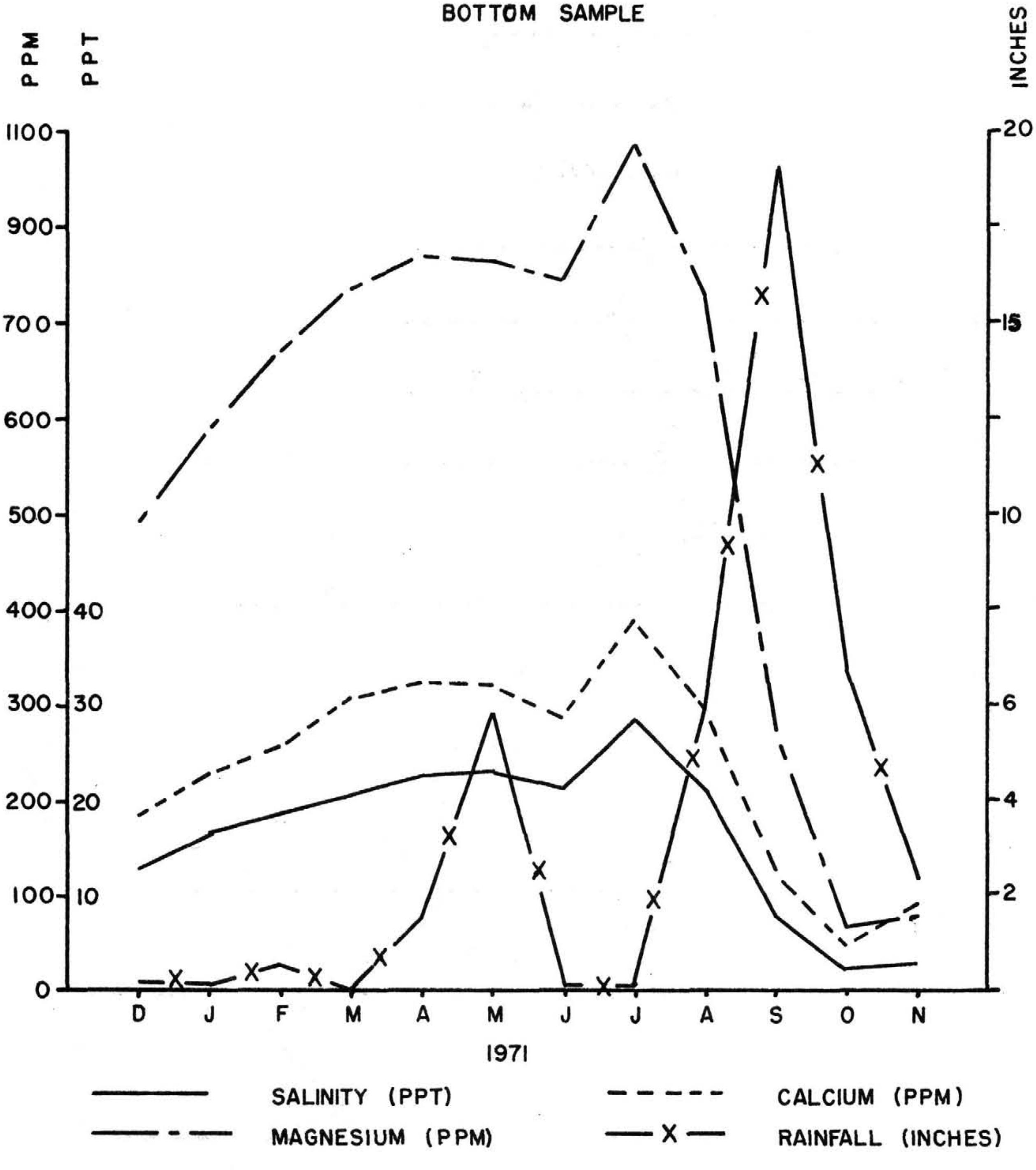


FIGURE 5
Cynoscion nebulosus
Catch by week with size ranges and average sizes

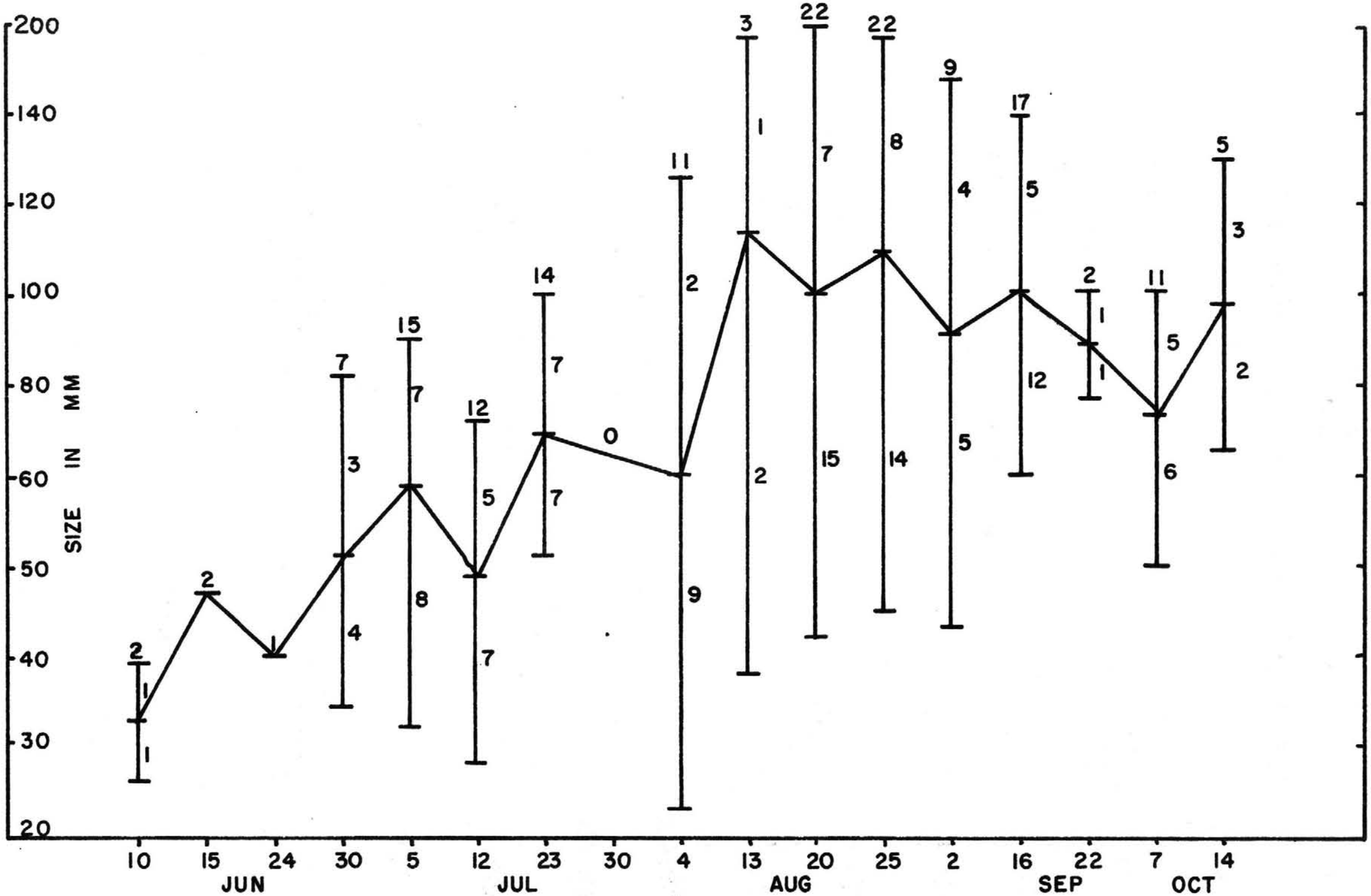


FIGURE 6

<u>Cynoscion</u> <u>nebulosus</u>

Catch by number, size range and average size

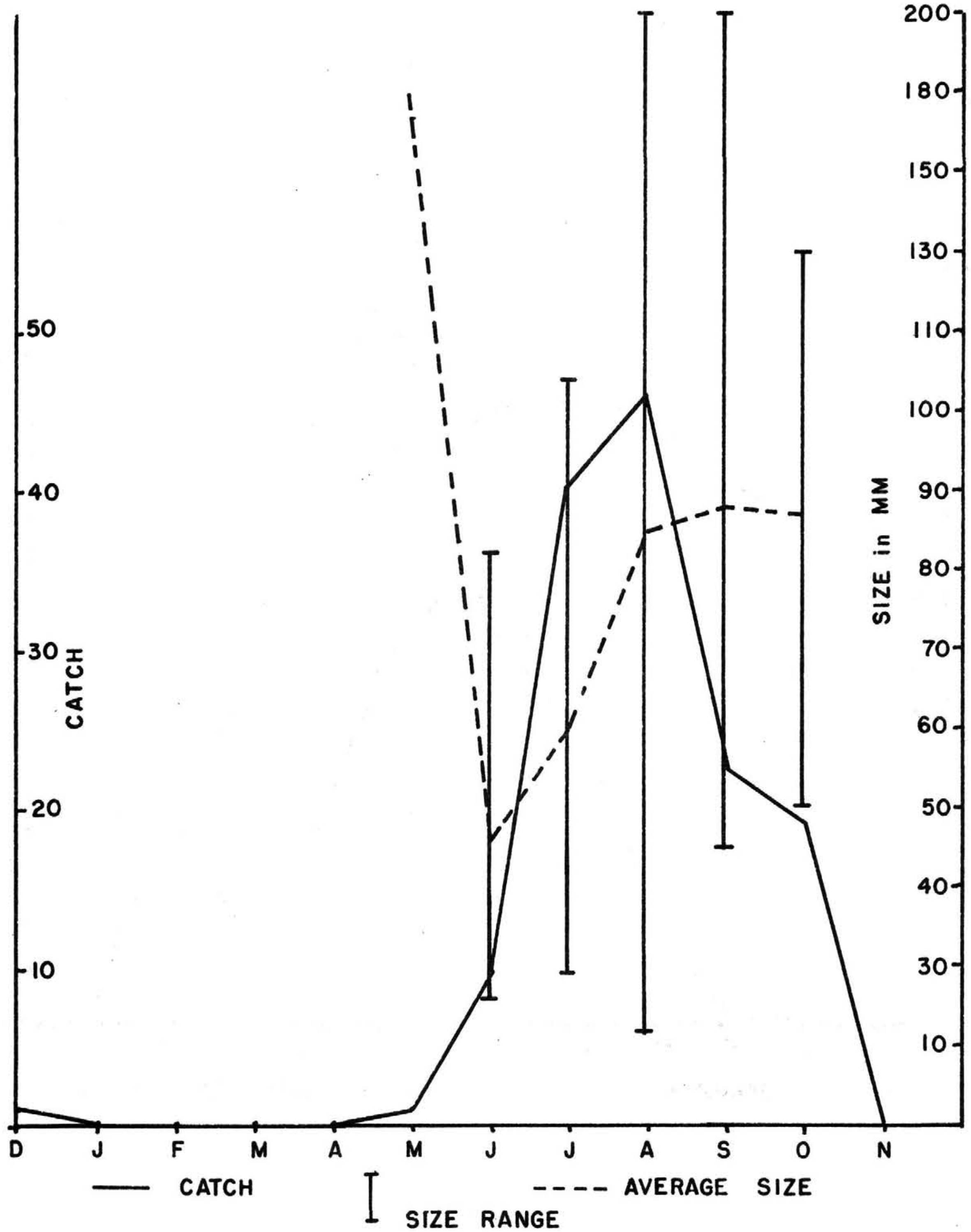


FIGURE 7

Comparison of Salinity and _Penaeus_ _aztecus_ Catch/Effort

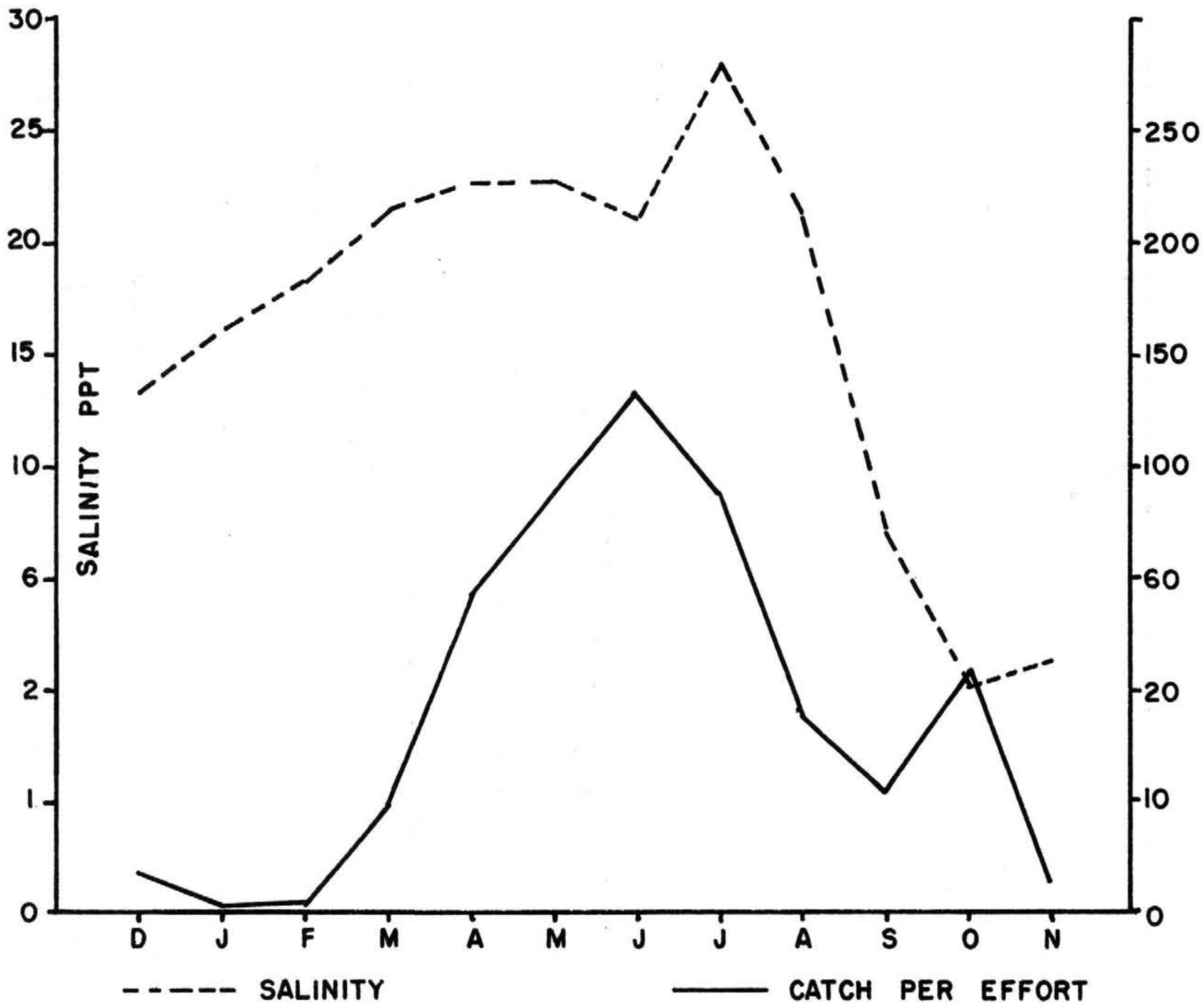


FIGURE 8

<u>Penaeus</u> <u>aztecus</u>

Catch by Number, Size Range and Average Size

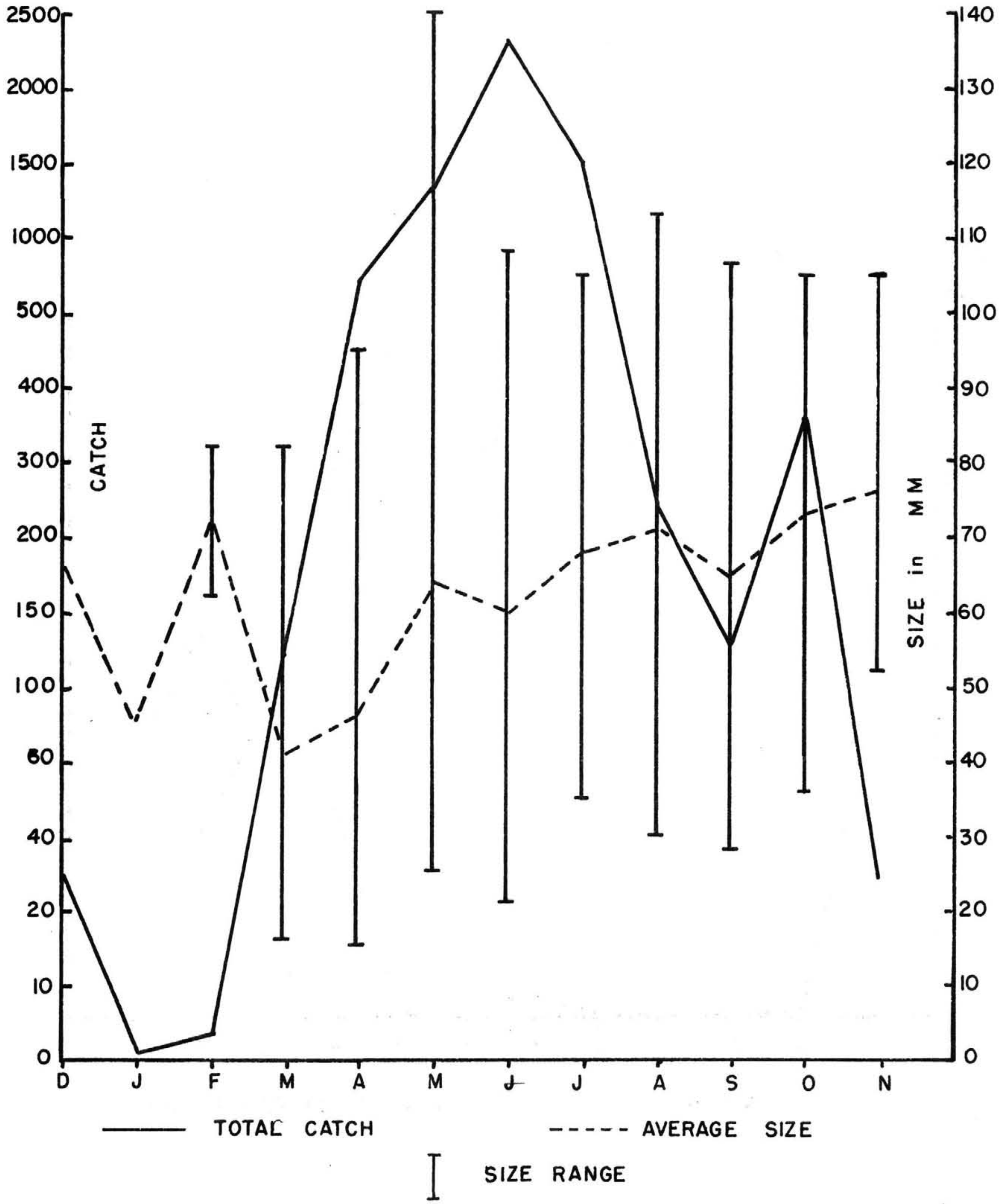


FIGURE 9

Penaeus setiferus

Comparison of Salinity and White Shrimp Catch

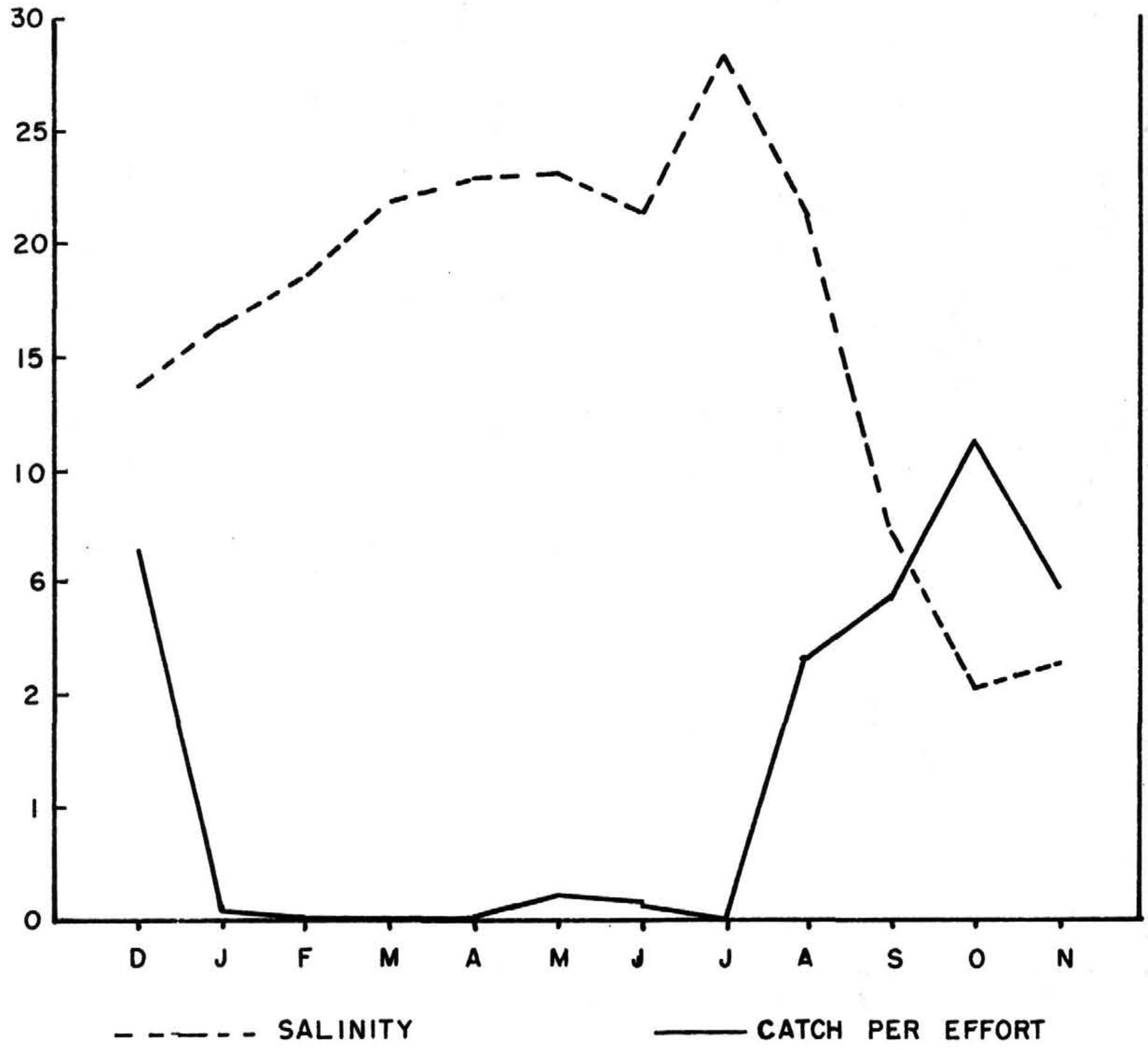


FIGURE 10

<u>Penaeus setiferus</u>

Catch by Number, Size Range and Average Size

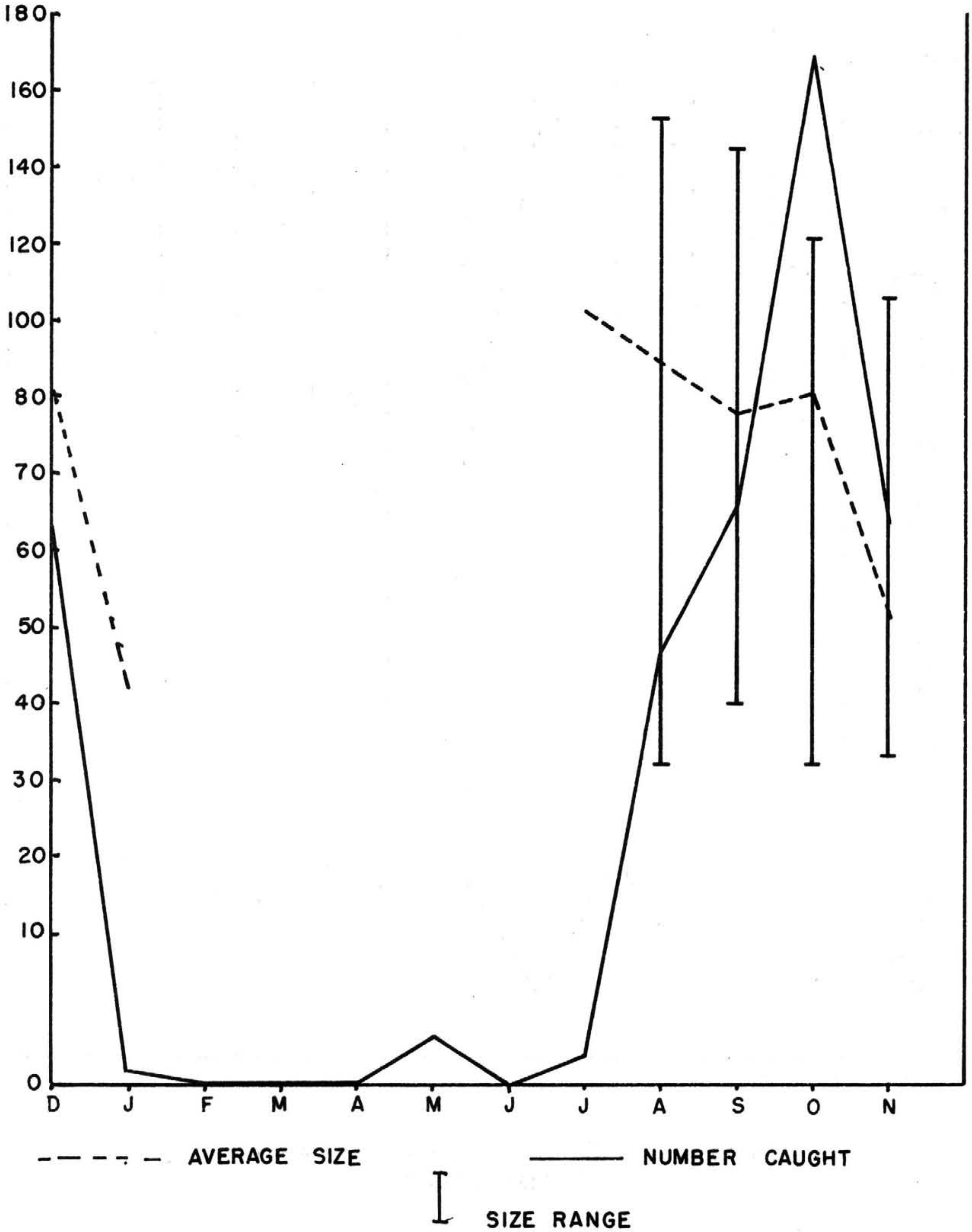


FIGURE 11

Callinectes sapidus

Catch by Number, Size Range and Average

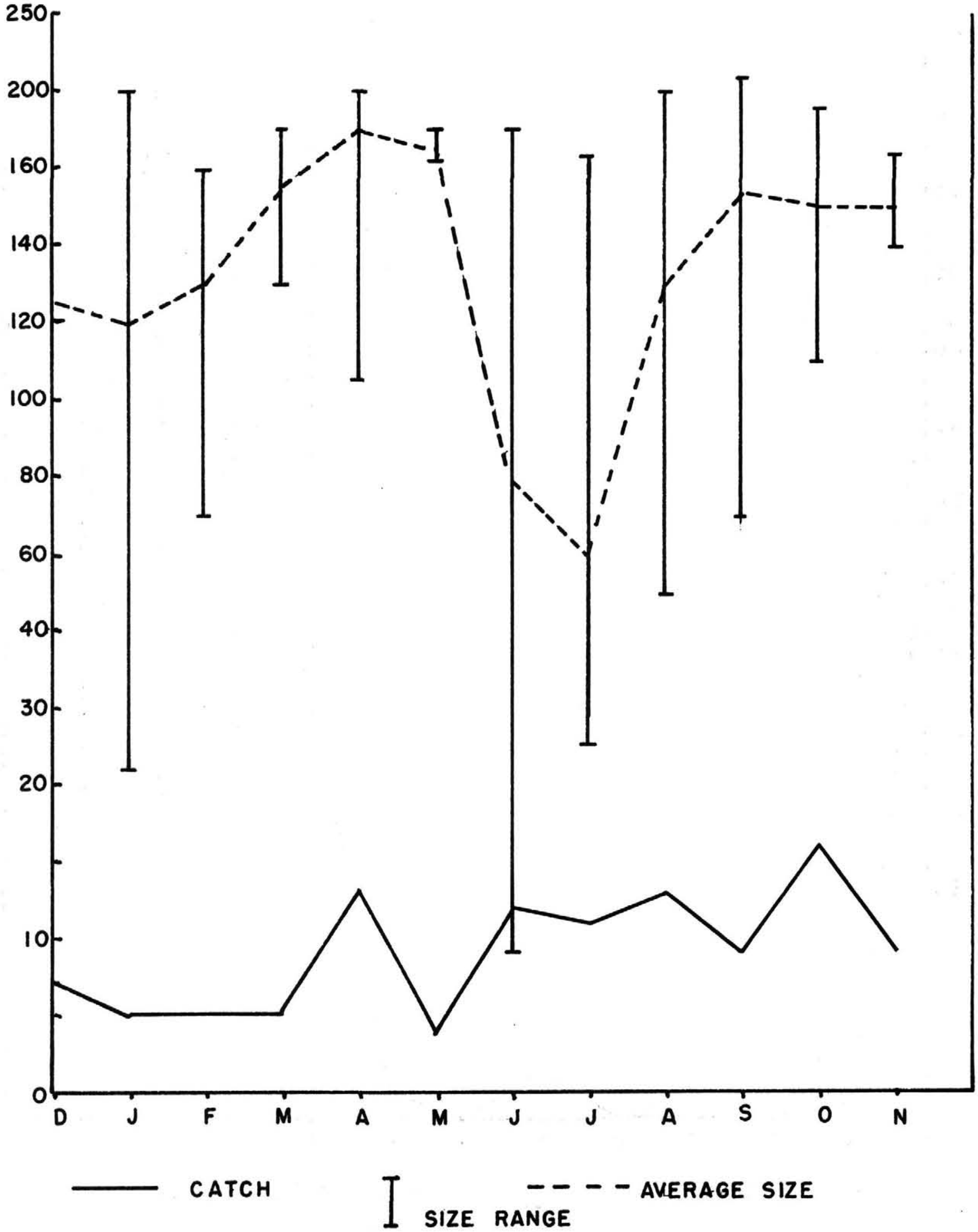
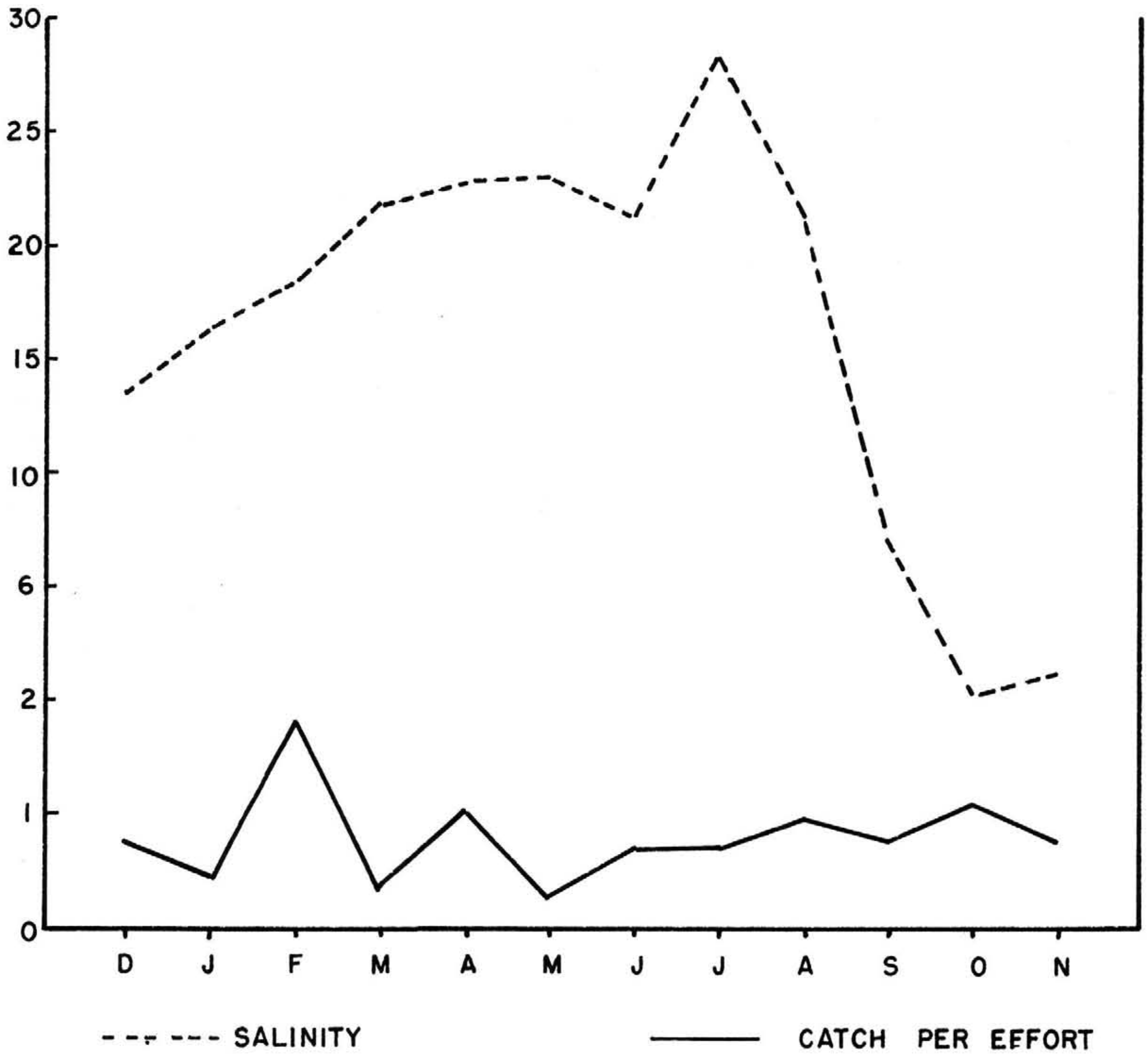


FIGURE 12

Comparison of Salinity and *Callinectes sapidus* Catch



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