ABUNDANCE AND SIZE OF FISHES TAKEN BY TRAWLING IN VERMILION BAY, LOUISIANA[1]

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ABSTRACT

Fishes were collected with a 4.9-m flat otter trawl at three sampling stations (Vermilion River Cutoff, Redfish Point, and Southwest Point) in Vermilion Bay, Louisiana, from June 1964 through September 1965.

In 273 10-minute tows, 10,710 fish representing 43 species and 24 families were collected. The greatest number of species and the greatest number of individuals were taken at Southwest Point, the sampling station nearest the Gulf of Mexico. Vermilion River Cutoff, the northernmost location, most distant from the Gulf, exhibited the fewest species and individuals. Fishes in the family Sciaenidae occurred most frequently and in greatest number in the trawl catches. The Atlantic croaker (*Micropogon undulatus*) was the most abundant species taken.

For each sampling station, the species collected, their frequencies of occurrence, and their numerical abundance were reported. Relative abundance and frequency distribution of size of the most frequently occurring fishes were determined.

INTRODUCTION

This investigation was conducted in conjunction with studies of post-larval shrimp, *Penaeus* spp., in Vermilion Bay, Louisiana (Caillouet *et al.*, 1971), through support under contract 14-17-0002-131 from the Bureau of Commercial Fisheries, U.S. Department of the Interior, Biological Laboratory, Galveston, Texas. The objective was to determine the abundance and size of fishes taken by trawling in Vermilion Bay, part of a large estuary in southwestern Louisiana (Fig. 1). Temperature and salinity data are also presented. Perret (1967) has published results for blue crabs (*Callinectes sapidus*) taken in this trawling.

The most extensive survey of estuarine fishes in Louisiana, recently conducted by Perret *et al.* (1971), did not include Vermilion Bay. Since our sampling procedures were virtually the same as those used by Perret *et al.* (1971), our study represents an important complement to theirs.

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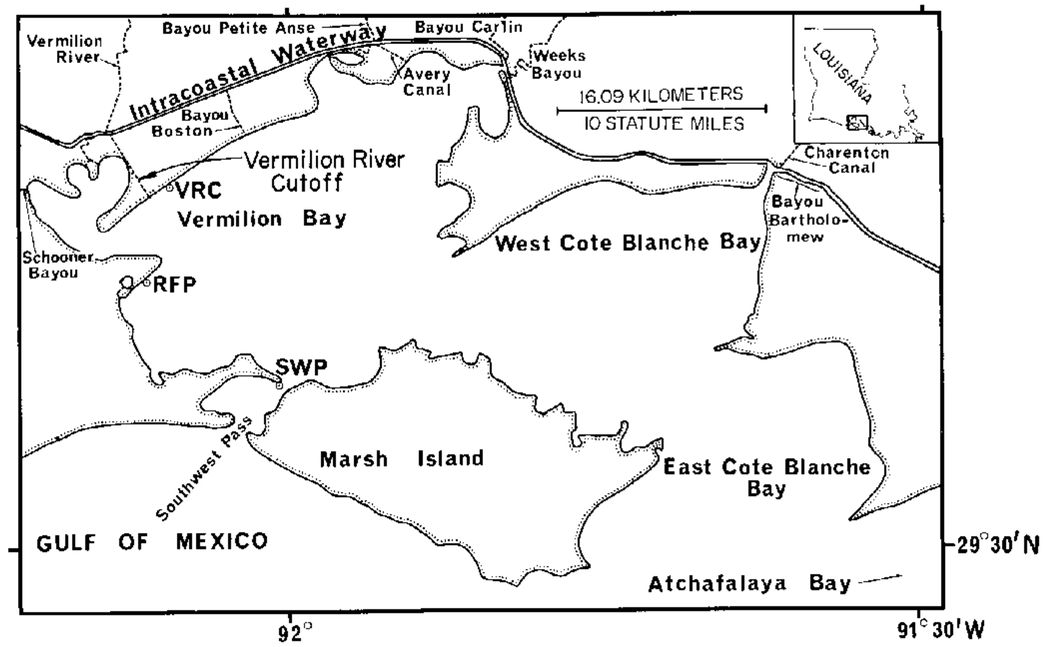

FIGURE 1. Sampling stations (indicated by dotted circles) in Vermilion Bay, Louisiana. (VRC, Vermilion River Cutoff; RFP, Redfish Point; SWP, Southwest Point.)

METHODS

The geology (Howe *et al.*, 1935) and climate (Nichols, 1959) of the Vermilion Bay area have been described. The bay has a surface area of about 490 km^2 and an average depth near 2 m (Barrett, 1970).

TABLE 1
EQUATIONS FOR CONVERTING TOTAL LENGTH (= L_t, IN MM) TO STANDARD LENGTH (= L_s, IN MM)

	Equation	Number of individuals	Standard deviation from regression	Total-length range (mm)
Micropogon undulatus	$L_s = -4.143 + 0.815L_t$	1,136	2.2	32-218
Trinectes maculatus	$L_s = -0.907 + 0.777L_t$	603	1.1	39-83
Cynoscion arenarius	$L_s = -3.655 + 0.827L_t$	591	3.9	39-206
Leiostomus xanthurus	$L_s = 4.635 + 0.922L_t$	230	2.8	65-178

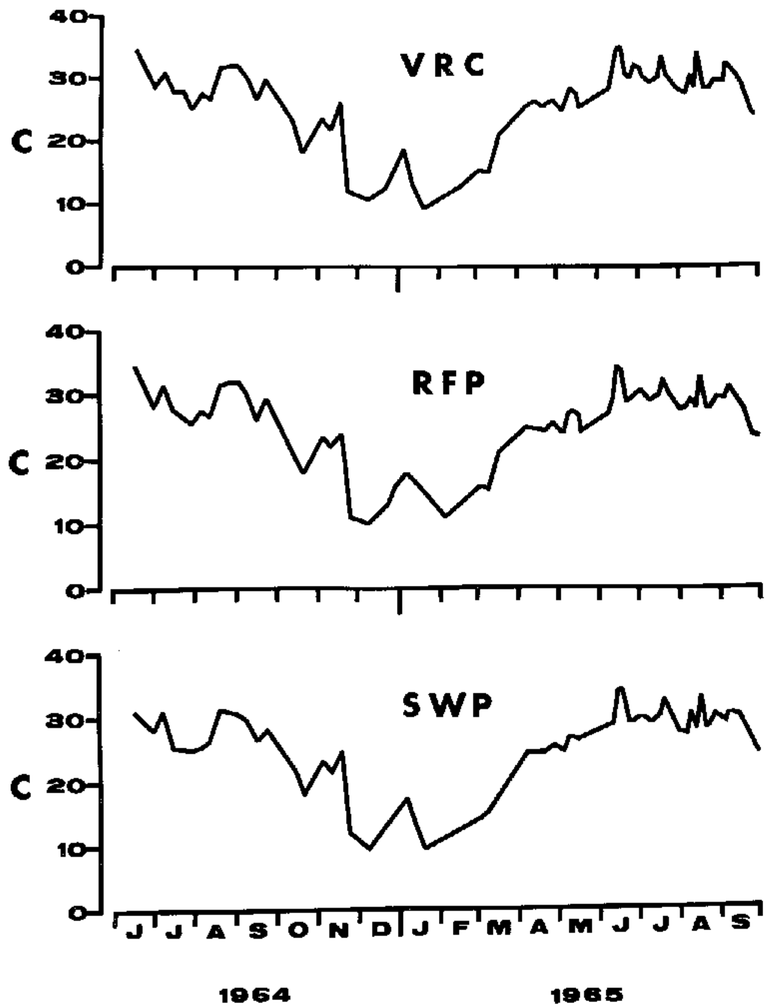

FIGURE 2. Surface temperature (°C) from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (For explanation of abbreviations, see Fig. 1.)

Sampling stations were about 100 m from the shoreline at three locations in western Vermilion Bay (Fig. 1): (1) Vermilion River Cutoff (VRC), (2) Redfish Point (RFP), (3) Southwest Point (SWP). Trawling was conducted parallel to the shoreline in approximately 1-1.5 m of water. The sampling gear was a 4.9-m flat otter trawl (try-net) with 1.9-cm bar mesh and 30-m warps.

Beginning in June 1964, one 10-minute tow with the trawl was made one day (Tuesday) each week during daylight hours at each station (Fig. 1). Towing speed was approximately 5 kph (kilometers per hour). Beginning in May 1965, two consecutive 10-minute tows were made at each station two days (Monday and Friday) each week, and this procedure

FIGURE 3. Surface salinity (ppt) from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Abbreviations as in Fig. 1.)

was continued through September 1965, when the study ended. On some occasions, inclement weather or malfunction of equipment prevented sampling according to these schedules. The sequence in which the three stations were visited on a given day was randomized.

At the time of trawling, surface temperature of the water was measured with a mercury thermometer. Surface-water samples were taken for chlorosity determination according to the modified method of Mohr (Kolthoff & Sandell, 1959). Duplicate aliquots from each sample were analyzed, and the two values obtained were averaged. Salinity in ppt (parts per thousand) was estimated from chlorosity according to the method of Sverdrup, Johnson & Fleming (1942: 51).

Fishes were fixed in 10 per cent formalin solution. Nomenclature of fishes was derived from Bailey *et al.* (1970). Total length (from the tip of the snout to the tip of the compressed caudal fin) was measured to the nearest millimeter in all fishes except stingrays, in which disc width (from tip to tip of the extended pectoral fins) was measured to the nearest millimeter.

TABLE 2

NUMBER OF INDIVIDUALS AND FREQUENCY OF OCCURRENCE OF FISHES TAKEN BY TRAWLING DURING JUNE 1964 THROUGH SEPTEMBER 1965 AT THREE SAMPLING STATIONS IN VERMILION BAY, LOUISIANA

	VRC Stat. (97 tows)		RFP Stat. (90 tows)		SWP Stat. (86 tows)		Total (273 tows)	
	No.	Freq.*	No.	Freq.*	No.	Freq.*	No.	Freq.*
Dasyatis americana	1	1	1	1	7	5	9	7
Lepisosteus spatula	0	0	1	1	0	0	1	1
Alosa chrysochloris	0	0	0	0	1	1	1	1
Brevoortia patronus	133	48	52	22	18	12	203	82
Dorosoma cepedianum	54	19	36	16	6	5	96	40
D. petenense	3	2	0	0	0	0	3	2
Anchoa spp.†	267	46	630	33	101	24	998	103
Ictalurus furcatus	117	25	17	10	4	4	138	39
Arius felis	59	24	100	29	227	44	386	97
Bagre marinus	51	22	27	14	73	18	151	54
Opsanus beta	0	0	0	0	4	4	4	4
Porichthys porosissimus	0	0	0	0	4	2	4	2
Gobiesox strumosus	0	0	0	0	14	5	14	5
Menidia beryllina	0	0	0	0	2	1	2	1
Caranx hippos	18	11	61	24	24	13	103	48
Chloroscombrus chrysurus	2	2	28	7	42	13	72	22
Selene vomer	0	0	1	1	1	1	2	2
Vomer setapinnis	1	1	5	2	47	10	53	13
Archosargus probatocephalus	0	0	2	2	1	1	3	3
Lagodon rhomboides	4	2	16	6	2	2	22	10
Aplodinotus grunniens	6	6	0	0	0	0	6	6
Bairdiella chrysura	0	0	0	0	65	1	65	1
Cynoscion arenarius	558	68	285	52	332	49	1,175	169
C. nebulosus	2	2	0	0	1	1	3	3
Leiostomus xanthurus	172	32	276	44	73	24	521	100
Menticirrhus americanus	2	1	4	2	9	4	15	7
Micropogon undulatus	1,640	90	1,395	79	1,610	80	4,645	249
Pogonias cromis	1	1	3	3	2	2	6	6
Stellifer lanceolatus	10	5	2	2	21	6	33	13
Chaetodipterus faber	23	10	86	16	96	28	205	54
Mugil cephalus	0	0	4	3	0	0	4	3
Polydactylus octonemus	0	0	0	0	1	1	1	1
Hypsoblennius ionthas	0	0	0	0	3	2	3	2

VRC = Vermilion River Cutoff; RFP = Redfish Point; SWP = Southwest Point.
* Denotes the number of tows in which at least one specimen was taken.
† Includes *Anchoa hepsetus* and *A. mitchilli*.

TABLE 2 (Continued)

	VRC Stat. (97 tows)		RFP Stat. (90 tows)		SWP Stat. (86 tows)		Total (273 tows)	
	No.	Freq.*	No.	Freq.*	No.	Freq.*	No.	Freq.*
Gobioides broussonneti	0	0	1	1	0	0	1	1
Trichiurus lepturus	1	1	2	2	5	4	8	7
Scomberomorus maculatus	2	2	1	1	0	0	3	3
Peprilus alepidotus	5	2	4	3	7	6	16	11
Prionotus tribulus	6	3	3	3	2	2	11	8
Citharichthys spilopterus	3	3	5	2	18	8	26	13
Paralichthys lethostigma	1	1	0	1	1	1	2	2
Trinectes maculatus	227	59	357	57	1,093	69	1,677	185
Sphaeroides nephelus	0	0	5	5	14	8	19	13
TOTAL INDIVIDUALS	3,369		3,410		3,931		10,710	

Standard length (from the tip of the snout to the posterior end of the hypural plate) also was measured to the nearest millimeter in only four fishes, the Atlantic croaker (*Micropogon undulatus*), hogchoker (*Trinectes maculatus*), sand seatrout (*Cynoscion arenarius*), and spot (*Leiostomus xanthurus*). The straight-line regression of standard length on total length was calculated for these species (Table 1), and the resulting equations can be used to estimate standard length from total length.

WATER TEMPERATURE AND SALINITY

Seasonal fluctuations in surface temperature were similar at the three stations (Fig. 2). The lowest temperature, 9°C, was recorded in January 1965 at the Vermilion River Cutoff station. A temperature of 6°C was recorded in December by Norden (1966) for Vermilion Bay, and a temperature as low as 4°C has been observed in surface waters of bays along the northern Gulf of Mexico (Gunter, 1941). The highest temperature, 34°C, was recorded in June in both 1964 and 1965 at the Vermilion River Cutoff and Redfish Point stations. Norden (1966) reported a reading of 35°C for Vermilion Bay. A water temperature near 35°C on the open bay shore is probably as high as that ever attained in the northern Gulf of Mexico (Gunter, 1945).

As expected, surface salinity was usually higher at the Southwest Point station near the gulf than at the other two stations (Fig. 3). The lowest salinity, 0 ppt (= nondetectable), was recorded in July and August 1964 at the Vermilion River Cutoff station. The highest salinity, 25 ppt, was

TABLE 3

NUMBER OF INDIVIDUALS OF FISHES TAKEN BY TRAWLING DURING JUNE 1964 THROUGH SEPTEMBER 1965 IN VERMILION BAY, LOUISIANA

	1964							1965								
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
Dasyatis americana		1				2							2	2	2	
Lepisosteus spatula									1							
Alosa chrysochloris												1				
Brevoortia patronus	1	20	5	7	2	6	13	2	4	4	3	8	60	23	26	19
Dorosoma cepedianum		2			16	23	7	3	3	2			9	4	21	6
D. petenense									2					1		
Anchoa spp.*	221	16	285	18	47	7	4	4	5	12	2	6	188	136	14	33
Ictalurus furcatus		4		2		1	6	4	3		21	61	36			
Arius felis		6	10	8	7	12						58	65	130	35	55
Bagre marinus	1	5	18	6	5	1					1			32	29	53
Opsanus beta								1					2		1	
Porichthys porosissimus														3		1
Gobiesox strumosus	1					7		2	4							
Menidia beryllina								2								
Caranx hippos	5		1										11	45	29	12
Chloroscombrus chrysurus			2	3										16	51	
Selene vomer														1		1
Vomer setapinnis														5	44	4
Archosargus probatocephalus					1									1		1
Lagodon rhomboides		1												18	3	
Aplodinotus grunniens						1						1	4			
Bairdiella chrysura																65

* Includes *Anchoa hepsetus* and *A. mitchilli*.

TABLE 3 (Continued)

	1964							1965								
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
Cynoscion arenarius	186	64	103	32	13	66		3			2	41	337	170	81	77
C. nebulosus								2	1							
Leiostomus xanthurus	76	16	2		29	27	48	33	15	12	6	4	4	130	94	25
Menticirrhus americanus					2	7										6
Micropogon undulatus	355	194	223	126	72	178	96	100	154	181	290	779	846	643	134	274
Pogonias cromis													2	2	1	1
Stellifer lanceolatus													2	1		30
Chaetodipterus faber		5	11	23										14	81	71
Mugil cephalus													1		1	2
Polydactylus octonemus		1														
Hypsoblennius ionthas								3								
Gobioides broussonneti																1
Trichiurus lepturus													1	5	2	
Scomberomorus maculatus													2			1
Peprilus alepidotus								1							5	10
Prionotus tribulus		1				6		1								3
Citharichthys spilopterus		2	1	1									2	12	2	6
Paralichthys lethostigma							1		1							
Trinectes maculatus	95	170	7	14		17	20	36	53	77	178	217	245	357	62	129
Sphaeroides nephelus				3	1								1		3	8

recorded on October 15, 1964, at the Southwest Point station 12 days after the eye of Hurricane Hilda moved northward through Atchafalaya Bay (Fig. 1). Norden (1966) reported minimum and maximum salinities of 0.8 ppt and 32.8 ppt, respectively, for Vermilion Bay.

Fishes

The 43 species of fishes taken by trawling during June 1964 through September 1965 in Vermilion Bay are listed in Table 2 in the order in which they appear in Bailey *et al.* (1970). The numbers of individuals and frequency of occurrence of each species are given for each sampling station. Norden (1966) listed 84 species of fish from Vermilion Bay, but his list did not include the following five fishes that we collected: *Dasyatis americana, Vomer setapinnis, Stellifer lanceolatus, Polydactylus octonemus,* and *Peprilus alepidotus. Carcharhinus leucas* was taken by both Norden (1966) and Caillouet, Perret & Fontenot (1969) in Vermilion Bay, but it was not collected by us.

All but the following nine species we collected are included in the list of fishes entering the industrial bottomfish catch from the northern Gulf of Mexico (Roithmayr, 1965b): *Lepisosteus spatula**, *Ictalurus furcatus**, *Gobiesox strumosus, Menidia beryllina***, *Aplodinotus grunniens**, *Mugil cephalus***, *Hypsoblennius ionthas, Peprilus alepidotus,* and *Citharichthys spilopterus.* Of these, three (marked with single asterisk) are freshwater fishes and two others (marked with double asterisk) occur both in fresh water and salt water (Bailey *et al.*, 1970).

The monthly variation in the numbers of individuals of each species is shown in Table 3. Ranges in surface temperature and salinity within which each species was collected are shown in Table 4, along with the size range for each species. Roessler (1970) presented similar temperature and salinity data for most of these species and included comparable data from the literature.

Four species dominated our catches (Tables 2 and 3): *Cynoscion arenarius, Leiostomus xanthurus, Micropogon undulatus,* and *Trinectes maculatus.* The first three, all sciaenids, contribute substantially to the industrial bottomfish catch from the northern Gulf of Mexico (Roithmayr, 1965a, 1965b; Gunter, 1967; Heald, 1969; Caillouet, 1971). *Anchoa* spp. were also abundant, but these included two species, *Anchoa mitchelli* and *A. hepsetus*, that we did not differentiate. Of 23,722 anchovies taken from Vermilion Bay by Norden (1966), only 11 were *A. hepsetus* and the rest were *A. mitchilli.* Gunter (1938b) reported that the latter species had the greatest biomass of any fish in estuarine waters of the gulf coast. This was the most abundant fish collected by Perret *et al.* (1971) in samples from the Louisiana coast. We feel that the 1.9-cm bar mesh of the trawl

TABLE 4

Ranges in Temperature, Salinity, and Total Length for Fishes Taken by Trawling During June 1964 through September 1965 in Vermilion Bay, Louisiana

	Temperature (°C)	Salinity (ppt)	Total length (mm)
Dasyatis americana	21-33	1.3-12.2	177-338*
Lepisosteus spatula	11	7.8	1,350
Alosa chrysochloris	22	1.3	265
Brevoortia patronus	9-34	0 -25.0	32-172
Dorosoma cepedianum	10-34	1.0-12.0	58-250
D. petenense	12-28	1.4- 5.1	75- 94
Anchoa spp.†	9-34	0 -17.6	21-100
Ictalurus furcatus	11-34	1.0- 7.0	70-385
Arius felis	11-34	1.2-25.0	41-403
Bagre marinus	24-33	1.0-25.0	58-263
Opsanus beta	13-34	5.1-10.2	140-165
Porichthys porosissimus	24-28	9.5-11.0	107-178
Gobiesox strumosus	11-28	4.1-12.6	41- 75
Menidia beryllina	10	5.0	62- 73
Caranx hippos	24-34	1.0-17.6	28-157
Chloroscombrus chrysurus	27-32	2.9-17.6	53-106
Selene vomer	24-31	16.0-17.5	86-101
Vomer setapinnis	27-32	7.1-16.1	52-105
Archosargus probatocephalus	18-29	5.3-25.0	82-433
Lagodon rhomboides	26-33	2.1-11.9	48-146
Aplodinotus grunniens	24-34	1.1- 5.9	235-300
Bairdiella chrysura	30	9.0	53-107
Cynoscion arenarius	11-34	0 -25.0	31-308
C. nebulosus	12-13	1.4- 9.0	112-160
Leiostomus xanthurus	10-34	1.0-25.0	63-188
Menticirrhus americanus	12-30	6.3-25.0	92-168
Micropogon undulatus	9-24	0 -25.0	17-228
Pogonias cromis	11-34	2.8-17.5	128-260
Stellifer lanceolatus	24-34	5.0-12.1	50-165
Chaetodipterus faber	24-32	3.3-17.6	35-115
Mugil cephalus	10-30	1.0- 7.9	142-336
Polydactylus octonemus	15	8.3	168
Hypsoblennius ionthas	13-18	6.5- 9.1	66- 69
Gobioides broussonneti	34	17.5	258
Trichiurus lepturus	29-34	5.4-16.0	223-385
Scomberomorus maculatus	30	2.2- 7.1	96-107
Peprilus alepidotus	18-30	8.2-15.4	46-134
Prionotus tribulus	12-28	4.1-17.5	28-120
Citharichthys spilopterus	12-31	1.0-16.1	48-118
Paralichthys lethostigma	10-11	2.5- 7.0	145-335
Trinectes maculatus	9-34	0 -17.5	24-106
Sphaeroides nephelus	22-34	3.7-12.0	28- 69

* Disc width.
† Includes *Anchoa hepsetus* and *A. mitchilli.*

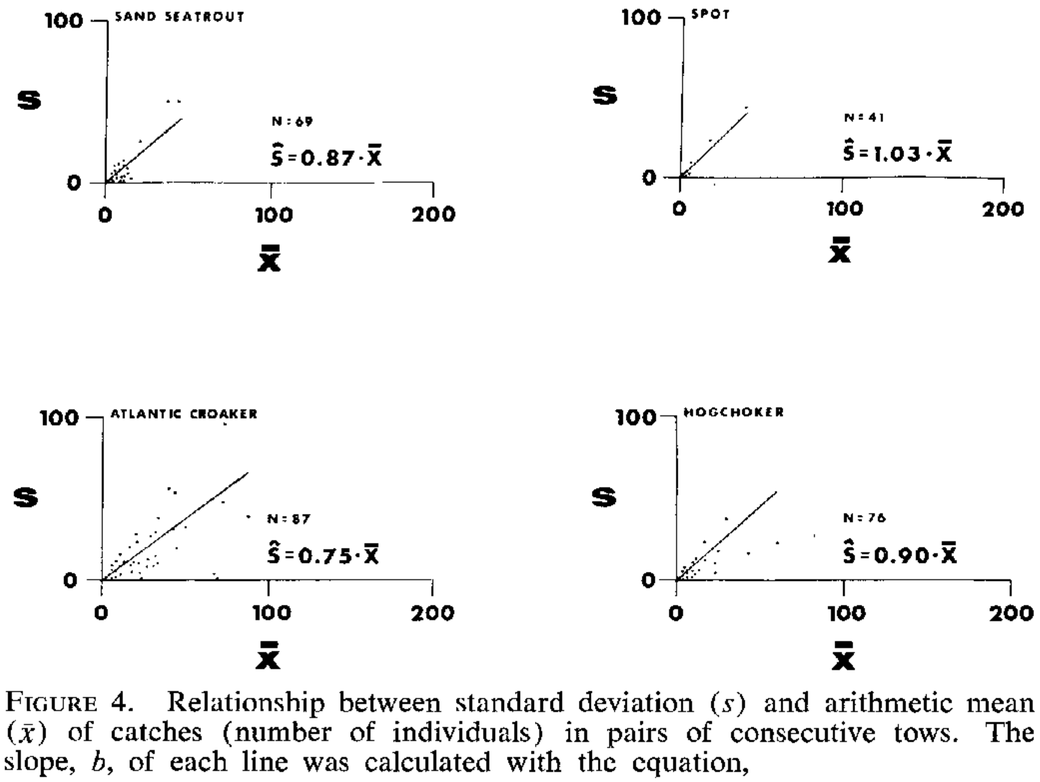

FIGURE 4. Relationship between standard deviation (s) and arithmetic mean ($\bar{x}$) of catches (number of individuals) in pairs of consecutive tows. The slope, b, of each line was calculated with the equation,

$$b = \left\{ \sum_{i=1}^{N} s_i/\bar{x}_i \right\} /N,$$ in which s_i was the standard deviation and $\bar{x}_i$ the corresponding arithmetic mean of the ith pair of catches, and N was the number of points (pairs of catches) to which the line was fitted.

was large enough to allow escapement of anchovies, otherwise they would have been collected in greater numbers.

Sampling Variation

Pairs of consecutive catches (numbers of individuals in two consecutive 10-minute tows) made at each sampling station on each sampling day during May through September 1965 provided measures of sampling variation. The standard deviation (s) and arithmetic mean ($\bar{x}$) of consecutive catches were calculated for the four dominant species (Fig. 4). Heterogeneity of variance was evident, since the standard deviation was proportional to the mean; this relationship is common in such count data (Snedecor & Cochran, 1967: 329). In such cases, the geometric mean is a more satisfactory estimate of mean catch per tow than is the arithmetic mean. This was calculated as the square root of the product of catches

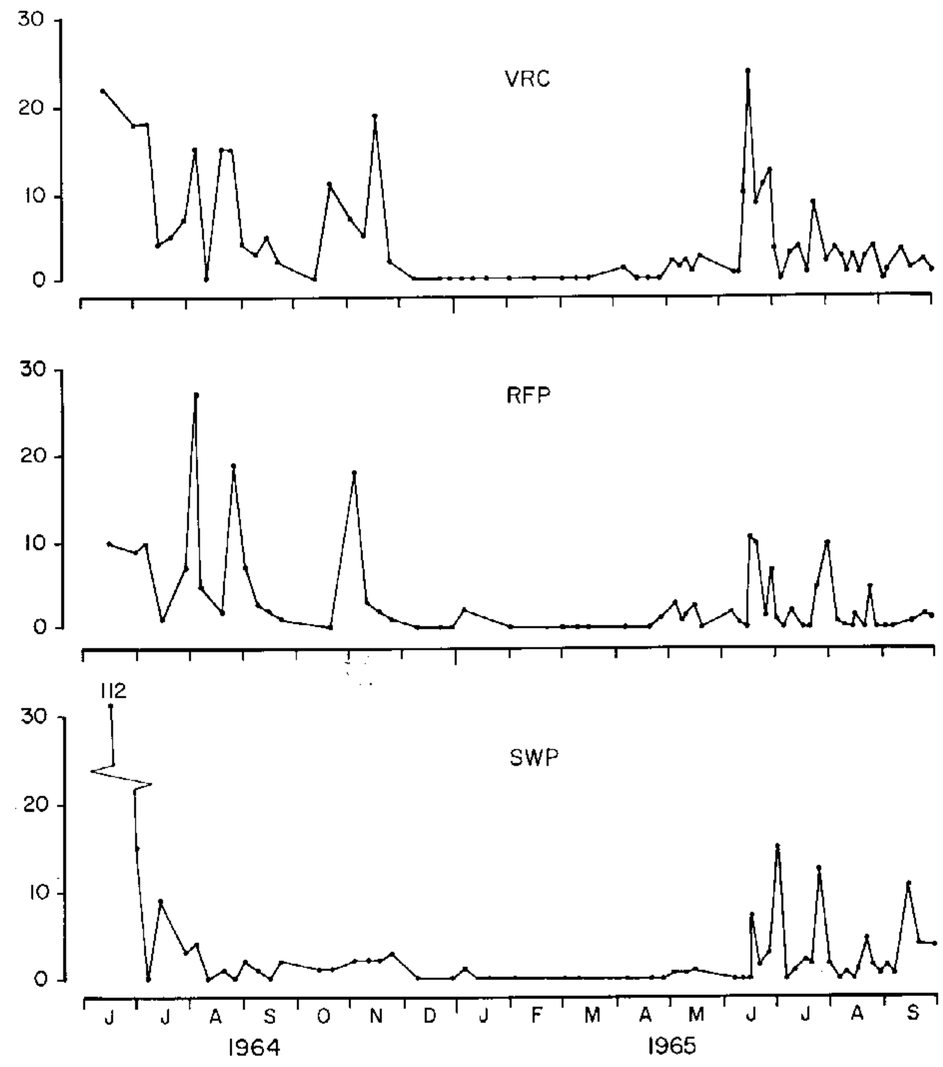

FIGURE 5. Catch of *Cynoscion arenarius* (number of individuals) per tow from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Abbreviations as in Fig. 1.)

in consecutive tows for the four dominant species (Figs. 5, 7, 9, and 11) for the period of May through September 1965. Prior to May 1965, the catches per tow were not geometric means, since only one tow was made at each station on each sampling day.

Relative Abundance and Size of Four Dominant Species

Cynoscion arenarius, the sand seatrout, was third in frequency of occurrence and in numerical abundance (Table 2). Sand seatrout and silver seatrout (*C. nothus*) ranked third in total annual production in the in-

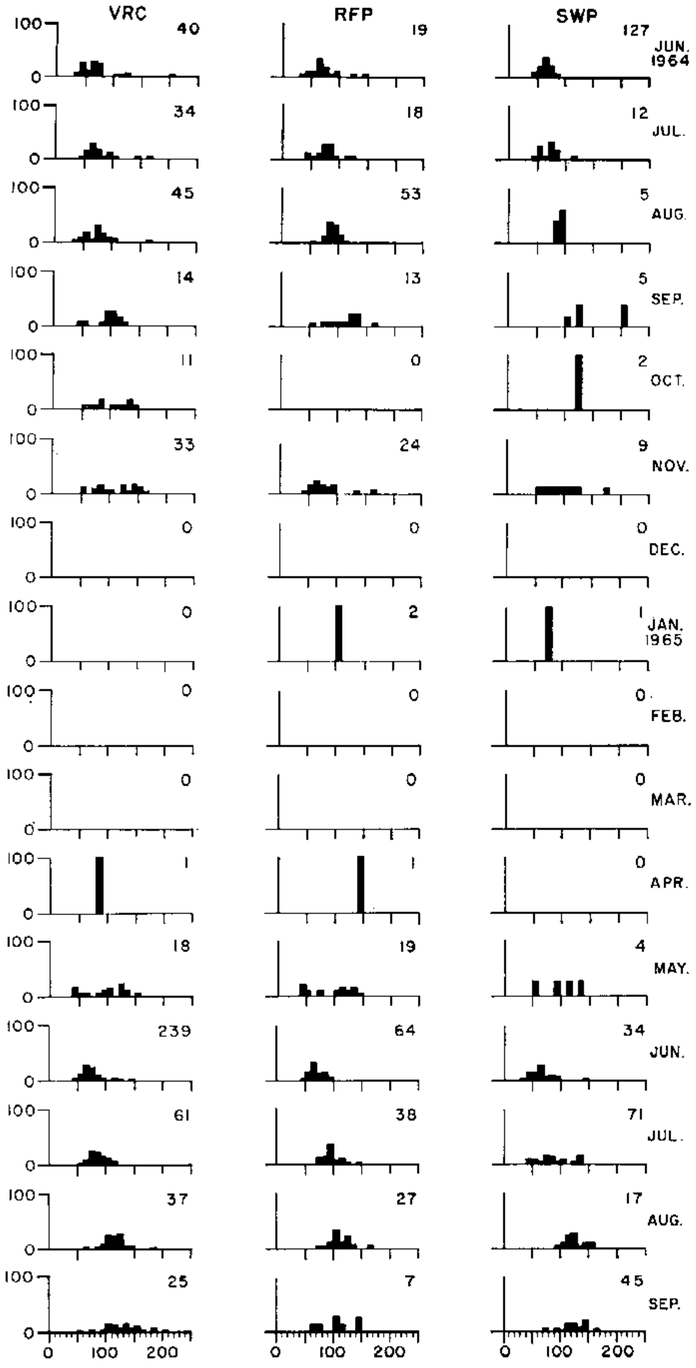

FIGURE 6. Monthly frequency (per cent) distribution of size (total length, in mm) of *Cynoscion arenarius* from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Numbers of specimens are shown in the upper right-hand corner of each graph.) (Abbreviations as in Fig. 1.)

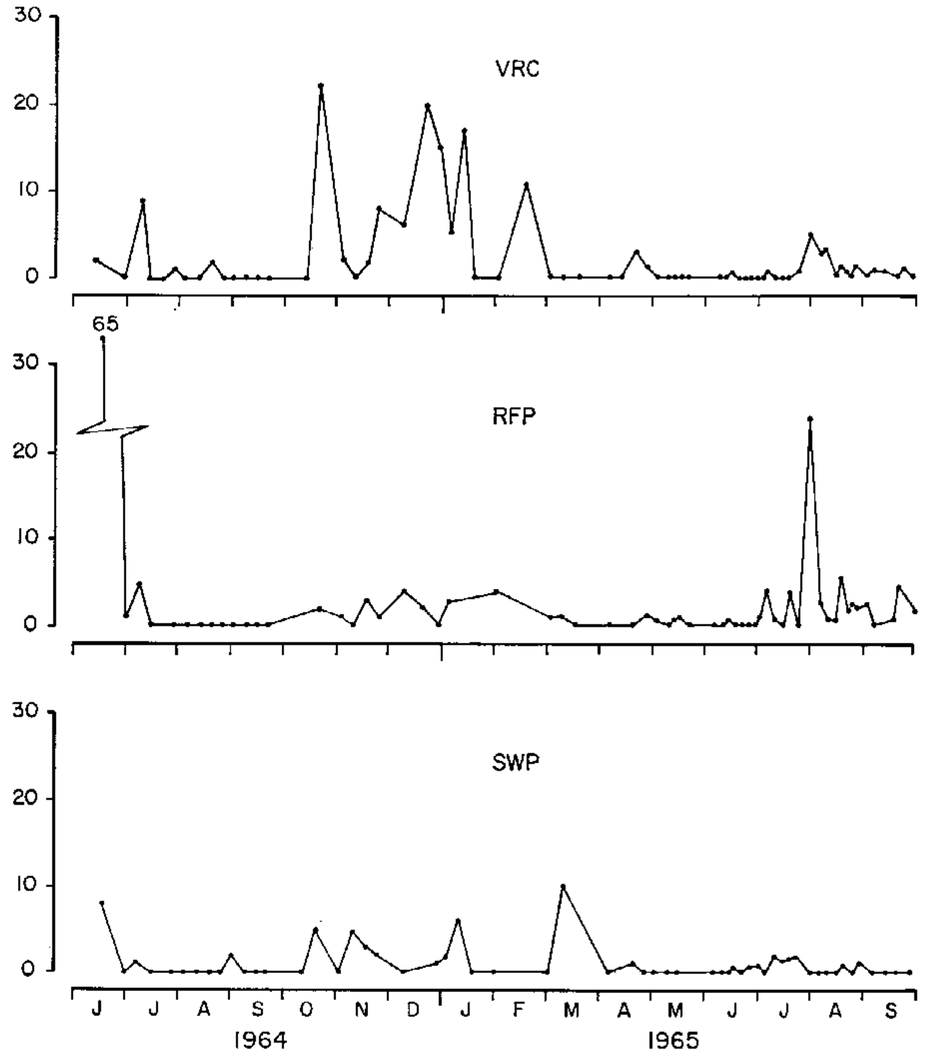

FIGURE 7. Catch of *Leiostomus xanthurus* (number of individuals) per tow from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Abbreviations as in Fig. 1.)

dustrial bottomfish fishery of the northern Gulf of Mexico (Roithmayr, 1965b). Gunter (1936) listed sand seatrout as the second most abundant commercial fish taken in trawl catches along the Louisiana coast.

Of the 1,175 sand seatrout collected, the greatest numbers were taken in June in both 1964 and 1965 (Table 3; Figs. 5 and 6). Catches were higher at Vermilion River Cutoff than at the other two stations. The rapid decline in catch after June suggested that the seatrout were emigrating from Vermilion Bay into the Gulf of Mexico. Catches were low during winter months (Figs. 5 and 6). Gunter (1938a) reported that numbers

of sand seatrout in the bays of Louisiana decline in fall and winter. Perret *et al.* (1971) made their largest sand seatrout catches from July through September, they reported that offshore movement was greatest during October, and they found very few fish remaining in inside waters thereafter. Recruitment (young fish that each year are added to the part of the population vulnerable to the gear) was first detected in June 1964 (Fig. 6). In 1965, recruitment was detected in May (Fig. 6). Growth in both populations of recruits was indicated by shifts to the right of successive monthly modes of size in summer and fall. During 1964 and 1965, poorly defined modes occurring to the right of those representing recruits also seemed to shift to the right with time. Frequency distribution of size differed little among the three sampling stations.

Leiostomus xanthurus, the spot, was fifth in frequency of occurrence and in number compared to other fish in the catch (Table 2). Roithmayr (1965b) ranked the spot second to Atlantic croaker in total annual production in the industrial bottomfish fishery of the northern Gulf of Mexico. Along the Louisiana coast, the spot is not marketed for human consumption to any great extent (Sundararaj, 1960). Gunter (1936) listed spot as the third most abundant commercial fish taken by trawling along the Louisiana coast. It was the most abundant fish in samples collected by Rounsefell (1964), from Lake Borgne, Louisiana.

The spot was taken during every month except September 1964 (Table 3; Figs. 7 and 8). The highest catches were made in June 1964 and July 1965. Catches were greater at Redfish Point than at the other two stations. Perret *et al.* (1971) made their highest catches in May; lowest catches were made in January and February. Occasional peaks in abundance occurred, but numbers were generally low throughout our study.

Frequency distribution of total length of spot exhibited considerable variation from month to month (Fig. 8). There was no consistent progression of modes, and size distribution seemed to vary little among stations. Sundararaj (1960) reported that young spot (15 to 24 mm) first appeared in Lake Pontchartrain, Louisiana, in January.

Micropogon undulatus, the Atlantic croaker, was caught more often and in greater number than any of the other species (Table 2). Gunter (1936, 1938a, 1938b) and Suttkus (1954) reported similar findings in their studies from coastal waters of Louisiana.

The Atlantic croaker was taken in every month and greatest catches were made in spring and early summer (Table 3; Figs. 9 and 10). Suttkus (1954) collected more croakers in spring and summer than at other times of the year along the eastern coast of Louisiana. Perret *et al.* (1971) made their greatest catches during April and May along the Louisiana coast.

At least two distinct populations were sampled during the study (Fig.

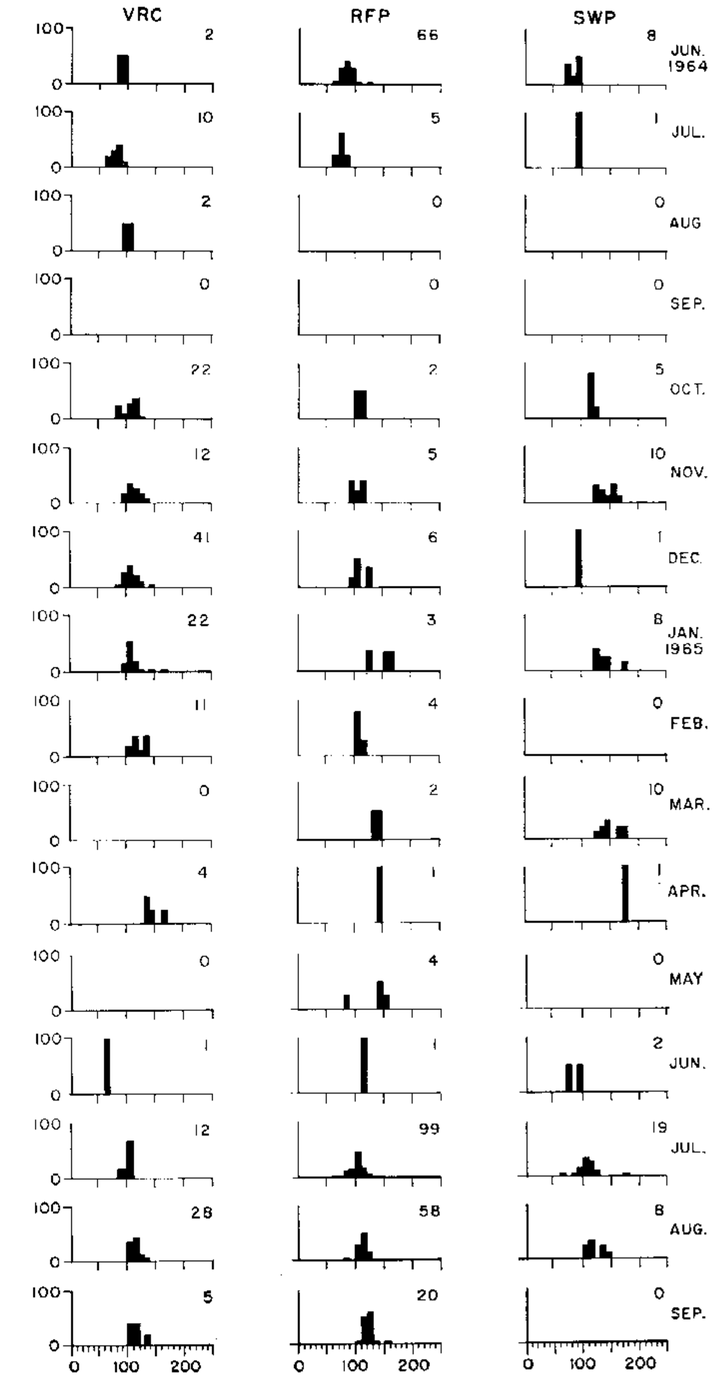

FIGURE 8. Monthly frequency (per cent) distribution (total length, in mm) of *Leiostomus xanthurus* from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Numbers of specimens are shown in the upper right-hand corner of each graph.) (Abbreviations as in Fig. 1.)

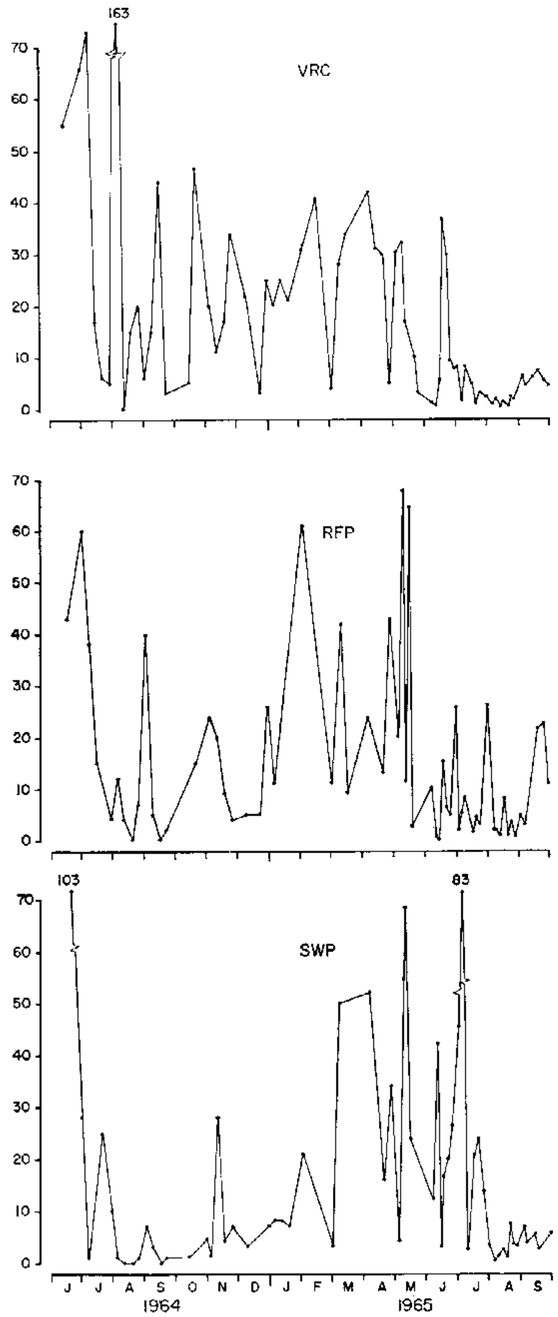

FIGURE 9. Catch of *Micropogon undulatus* (number of individuals) per tow from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Abbreviations as in Fig. 1.)

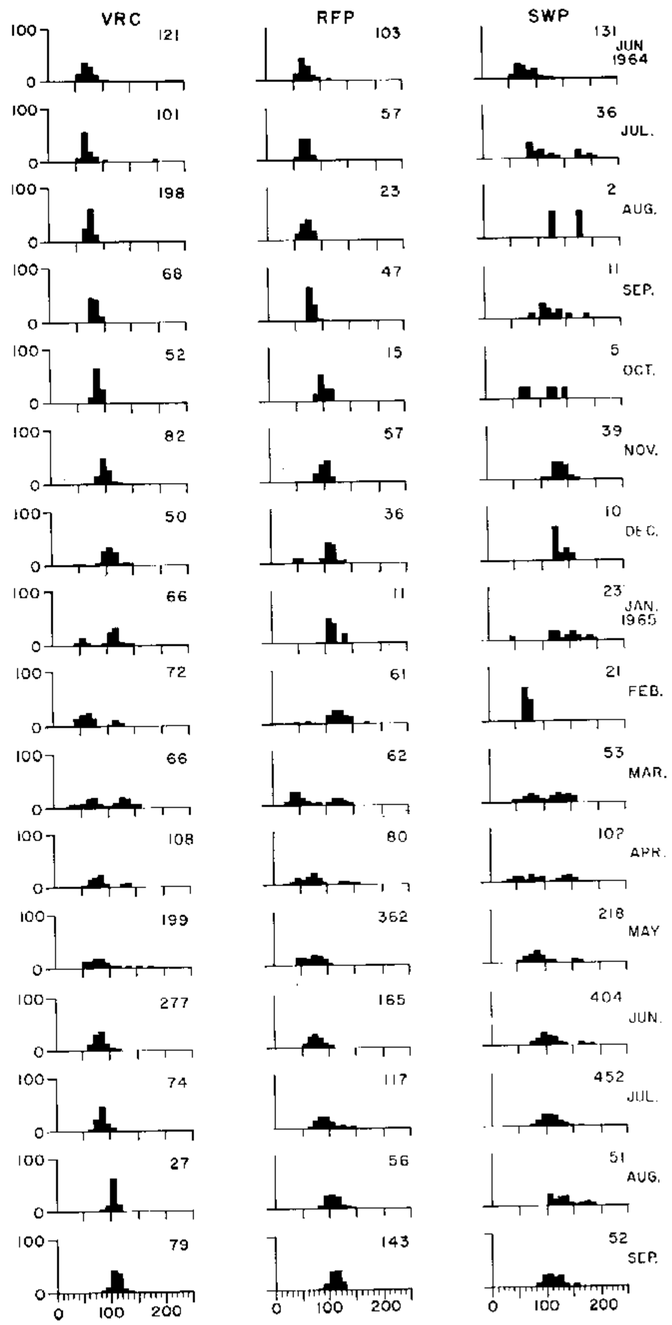

FIGURE 10. Monthly frequency (per cent) distribution of size (total length, in mm) of *Micropogon undulatus* from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Numbers of specimens are shown in the upper right-hand corner of each graph.) (Abbreviations as in Fig. 1.)

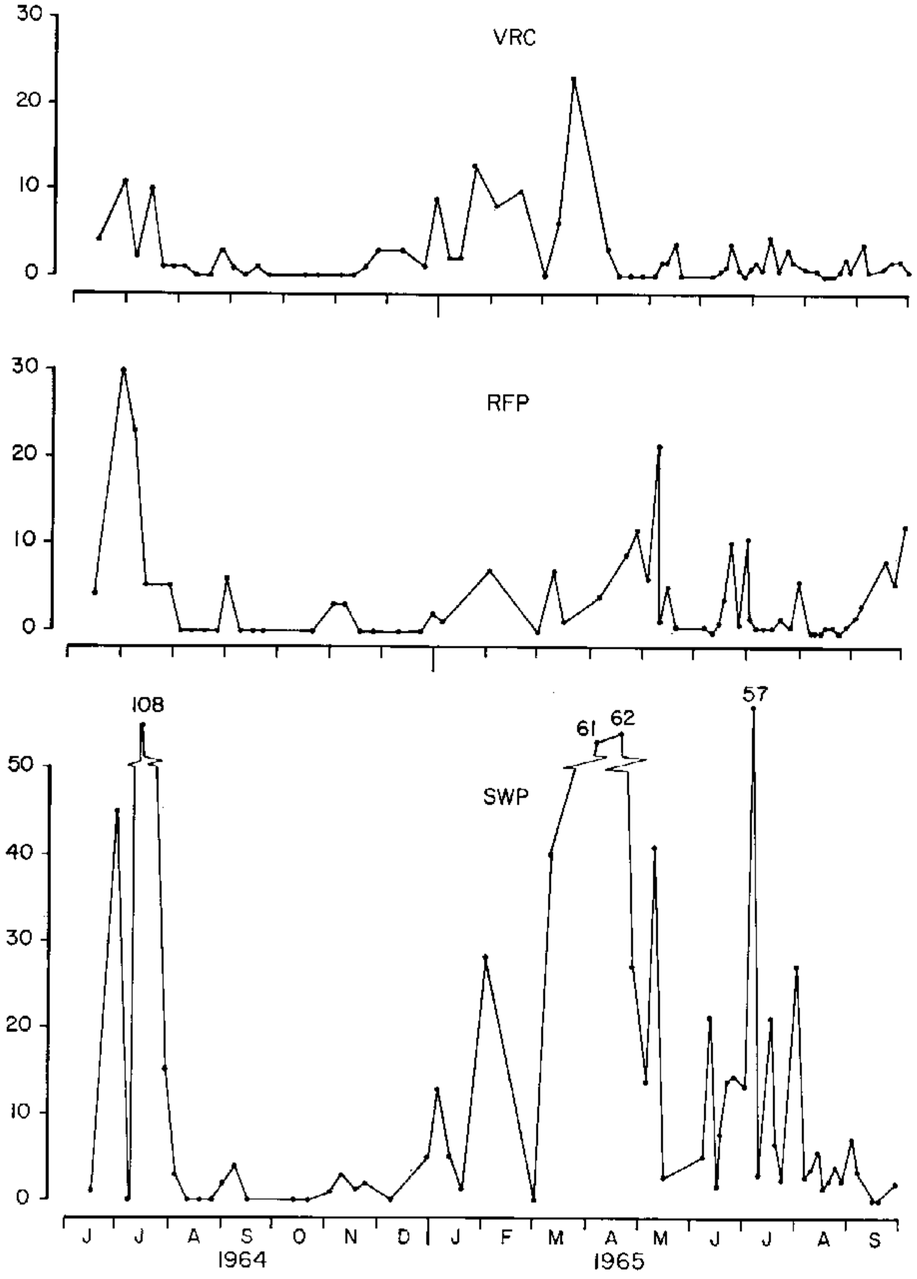

FIGURE 11. Catch of *Trinectes maculatus* (number of individuals) per tow from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Abbreviations as in Fig. 1.)

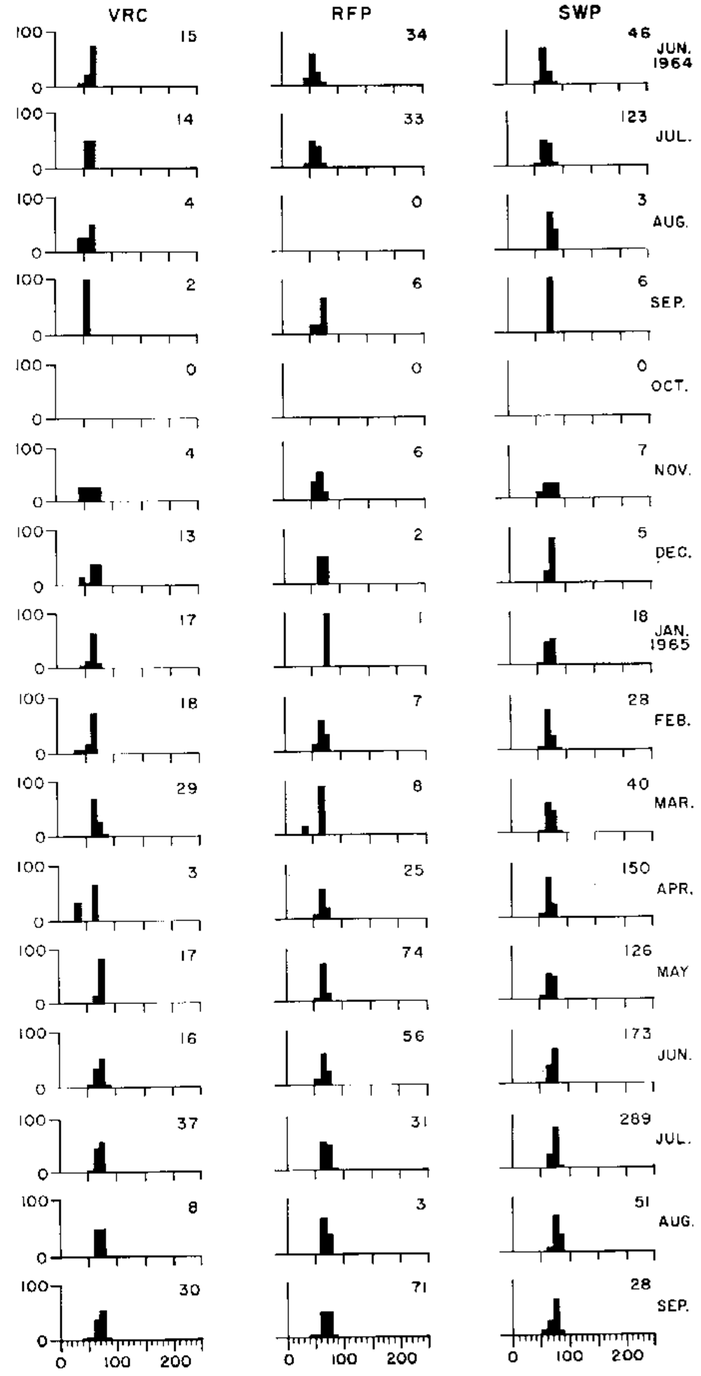

FIGURE 12. Monthly frequency (per cent) distribution of size (total length, in mm) of *Trinectes maculatus* from June 1964 through September 1965 at three sampling stations in Vermilion Bay, Louisiana. (Numbers of specimens are shown in the upper right-hand corner of each graph.) (Abbreviations as in Fig. 1.)

10). A population of small fish with a modal total-length class of 60 to 69 mm was detected in June 1964. Growth was indicated by shifts of successive monthly modes to the right. These fish reached a modal length between 130 and 149 mm by April 1965. A second population with a modal length of 30 to 39 mm appeared in March 1965, but a few croakers smaller than 50 mm were taken as early as December 1964. These recruits had reached a modal total length of 100 to 109 mm by September 1965. Suttkus (1954) reported that Atlantic croakers spawned during October through January, and he noted an influx of small croakers into Lake Pontchartrain from November through March.

Trinectes maculatus, the hogchoker, was second in frequency of occurrence and in number compared to other fishes in the catch (Table 2). Of the 1,677 specimens taken, more were collected at Southwest Point than at the other two stations. The hogchoker was taken during every month of the study, except October. The largest catches occurred in spring and summer months (Table 3; Figs. 11 and 12). Fewer individuals were taken during winter months. Perret *et al.* (1971) made their largest catches during spring months.

The smallest hogchokers, 24 to 29 mm in length, were taken in March and April. Recruitment and growth are not easily discernible from Figure 12 since there was limited variation in size and since size classes were relatively wide compared to this variation.

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Sumario

Abundancia y Tamaño de los Peces Cogidos con Red de Arrastre en Vermilion Bay, Louisiana

Se colectaron peces con una red de arrastre plana con puertas, de 4.9 m, en tres estaciones de muestreo (Vermilion River Cutoff, Redfish Point y Southwest Point) en Vermilion Bay, Louisiana, de junio 1964 a septiembre 1965.

En 273 redadas de 10 minutos se colectaron 10,710 peces, representando 43 especies y 24 familias. El mayor número de especies y el mayor número de individuos fueron cogidos en Southwest Point, la estación de muestreo más cerca del Golfo de México. Vermilion River Cutoff, la estación más septentrional, la más distante del Golfo, mostró un menor número de especies e individuos. Los peces de la familia Sciaenidae fueron los que se presentaron más frecuentemente y en mayor número en las redadas. La especie del Atlántico *Micropogon undulatus* fue la más abundante.

En cada estación muestreada se reportaron las especies colectadas, la frecuencia de su presencia y su abundancia numérica. Se determinaron la abundancia relativa y la frecuencia de la distribución de tamaños de los peces más corrientemente cogidos.

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