

Job Report

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Project No. MF-R-6 Date May 18, 1965
Project Name: Analysis of Populations of Sports and Commercial Fin-Fish and
of Factors Which Affect These Populations in the Coastal Bays
of Texas
Period Covered: January 1, 1964 to December 31, 1964 Job No. 10

Population Studies of the Sports and Commercial Fin-Fish of the Lower Laguna Madre

Abstract: Although changes were made in methods of sampling and in number of samples taken in 1964, a successful spawning of all five species was indicated. Most notable was the abundance of juvenile redfish in 1963-64 after an almost complete absence in the previous season. Adult sampling stations were increased from 4 to 11 in 1964 to greatly improve sampling for trout, black drum and redfish which were taken in that order of frequency. Average yield of speckled trout by month ranged from 0.2 to 1.9 pounds per acre with the high in June. Redfish yield ranged from less than 0.1 to 1.05 pounds per acre with highest yields in November and December. Black drum yields ranged from .22 to 5.65 pounds per acre with the greatest yield in December. Adult sheepshead and flounder were not sampled adequately by the methods used.

Fish tag returns indicate most trout and redfish are recaptured close to the tagging site; although some drum move considerable distances. Special studies on trout populations in the Arroyo Colorado indicate 68 per cent survival per 30-day period. The 32 per cent total loss per interval was composed of 6.4 per cent fishing mortality and 25.6 per cent from other losses. Cooperation in reporting fish tags remains high with sports fishermen, but has deteriorated greatly in recent years with commercial fishermen.

Objectives: To determine the population fluctuations of food and game fish of the Lower Laguna Madre.

Procedure: Collections of juvenile and adult food and game species were made monthly. Primary collections were made with 60-foot seine and trammel net; supplemental collections were made with gill nets and a specially constructed 1-mm. mesh sampling device for larval and juvenile forms. A minimum of 10 collections was made each month for juvenile food and game species with a 60-foot seine, 6 feet deep and of three-fourth of an inch stretched mesh. Eleven collections were made monthly for adult food and game species with a 1,200-foot trammel net measuring 40 inches deep with inside webbing of 3-inch stretched mesh and outside webbing of 12-inch stretched mesh. Fish taken in each collection were measured to tip of mid caudal ray. Water area in square feet is also recorded, as well as meteorological and hydrographic data.*

* The locations of the primary juvenile and adult fish sampling stations are shown on Figure 1.

All food and game fish in good condition were tagged and released. Tags used were No. 3 and No. 4 Monel maxillary jaw tags and plastic internal anchor tags. The maxillary tags were affixed with pliers to the upper jaw. The internal disc tags were inserted into the body cavity through a slit in the right side of the fish just posterior to the pectoral girdle with from 2 to 3 inches of yellow plastic tubing attached to the tag and left outside.

Findings and

Discussion:

Juvenile Food and Game Fish

The five species of juvenile fish under consideration remain the same as in previous years, namely, trout Cynoscion nebulosus (Cuvier), redfish Sciaenops ocellata (Linnaeus), black drum Pogonias cromis (Linnaeus), flounder Paralichthys lethostigmus (Jordan and Gilbert), and sheepshead Archosargus probatocephalus (Walbaum). In an effort to sample these species adequately, all previously used stations were discarded, and nine new seine stations were established. Samples were taken monthly from April through December 1964 with a minimum of 10 samples being taken each month.

Stations were established to include every known nursery area of all five species and were distributed fairly evenly from Port Isabel to Port Mansfield (Fig. 1).

Description of Juvenile Fin-Fish Stations

JV1 - This station is located at the first spoil dump on the Intracoastal Waterway north of Port Isabel. The bottom is mostly clay with scattered oyster clumps. Vegetation in the deeper waters is mostly manatee grass, (Cymodocea manatorum), with an abundance of various species of brown algae. Prevailing winds and currents cause the water to be turbid, and its proximity to Brazos Santiago Pass makes this location ideal for the sampling of juvenile redfish and sheepshead.

JV2 - This station is located at the last of a string of spoil dumps extending 4 miles north from Port Isabel. The physical characteristics of this station are very similar to those of the previous station. Vegetation is also similar with the addition of shoal grass, (Diplanthera wrightii).

JV3 - This station is located between an oil rig channel and its resulting spoil dumps east of Intracoastal Waterway Marker No. 61. Dense patches of widgeon grass, (Ruppia maritima) present during the summer months have made this location ideal for the sampling of juvenile trout, but the very soft mud bottom made seining very difficult, and the station was finally abandoned in December.

JV4 - This station is located between a channel and resulting spoil dumps which extend from Rincon de Guajardo to the Intracoastal Waterway at Marker No. 49. In contrast to the previous station, vegetation is scarce and the bottom of hard clay. The water is usually turbid, and juveniles of all species but flounder have been taken here.

JV5 - This station is located between the Intracoastal Waterway and the spoil dumps in the Three Islands area. Vegetation is dense shoal grass. The station was established principally for the sampling of juvenile trout.

JV6 - Located at the junction of the Cayo Atascosa and the Arroyo Colorado, this brackish water station often receives fresh water runoff from the Laguna Atascosa. The water is shallow and usually very turbid. The bottom is of soft mud and void of vegetation. This station was established to sample juvenile drum, but trout, redfish, and flounder are also taken here.

JV7 - This station to the west of the Intracoastal Waterway is adjacent to a spoil dump. It is characterized by dense shoal grass over part of the area and soft mud at the remainder. This is primarily a juvenile trout sampling station, but all species are present.

JV8 - This station, located near Port Mansfield, is sampled on both east and west sides of a spoil dump. Redfish are taken in winter and spring, trout in the summer and fall.

JV9 - Adjacent to East Channel which joins Redfish Bay and the Gulf of Mexico, this station has hard sand bottom with patches of shoal grass in the deeper areas. Redfish and flounder are present in winter and spring with trout appearing in summer and fall.

Trout - Juvenile trout were taken at all nine regular sampling stations in all months from May through December (Figure 2). Trout in the samples from May through August were spawned during 1963. Those hatched in 1964 first appeared in the seine samples in September and continued present throughout the rest of the year.

For the most part, trout taken in the seine samples ranged from 50 to 200 mm. in length. Those smaller than 50 mm. normally pass through the meshes; those larger than 200 mm. either out-swim the net or were not present in the sample area.

Station JV7 was consistently the most productive station for juvenile trout. They were taken here for 6 of the last 7 months of the year with abundance ranging from 14.6 to 69.0 individuals per acre. This station was closely followed by JV5 and JV8.

Redfish - Juveniles of this species were taken by seine in every month in which samples were taken and, during the course of the year, were present at all stations except JV5. Redfish spawned in the winter of 1963-64 were present in the first samples taken (April) ranging in length from 75 to 175 mm.

Figure 3 shows the growth pattern of these fish until their final appearance in the seine samples in November. The first of the 1964-65 hatch appeared in December with specimens ranging in length from 50 to 80 mm.

The average number of redfish per acre started with the high of 15 and then declined as the size of the individuals increased.

As juvenile redfish entered the bay from the gulf, they were first taken at seine stations nearest these passes (JV1 and JV9). As they increased in size, they extended their range to include all other stations. JV6 was the most consistent producer of juvenile redfish with specimens being present in all months from April through December except June. Stations JV1 and JV9 were good producers in early months. Redfish taken in these seine samples normally ranged in length from 50 to 300 mm.

Drum - Juvenile black drum appeared in samples during 6 of the 9 months from April through December and were taken at only 2 of the 9 regular stations (JV4 and JV6). Drum spawned in the fall of 1963 first appeared in the June samples with specimens ranging in length from 60 to 145 mm. This hatch continued to make up the drum samples until December, when the 1964 hatch appeared (100 to 130 mm.). As in the case of redfish, the number of the black drum per acre declined as the size of the fish increased (Figure 4).

Station JV6, chosen especially for sampling juvenile black drum, consistently produced this species. Juvenile black drum were notably absent from the waters of the open bay proper.

Flounder - Juvenile flounder were present in all five samples taken in April and continued present through July (Figure 5). No juvenile flounder were taken from August through December. Juvenile flounder first appear in areas nearest the passes (JV1, JV2, and JV9) and were later most abundant in areas of soft mud (JV6 and JV7).

In general, it is believed that the seine is not as effective in sample areas containing hard bottom (sand, clay, or shell) and that flounder can be taken by seine more easily in areas of soft mud bottom where the lead line of the seine can "dredge". It is also possible that the flounder prefer the softer bottoms.

Sheepshead - Juvenile sheepshead appeared in samples taken in every month of the sampling period (Figure 6). As in the case of redfish, the smaller specimens were taken in sample areas nearer the passes, and the number per acre decreased as the size of the individuals increased. Most productive sample areas were JV1 and JV2. Peak abundance was noted in September when an average of 15 individuals per acre was indicated. The presence of 50 to 80 mm. specimens for every month of the sampling period indicates a very extended spawning season.

Adult Food and Game Fish

By the close of 1963, it became apparent that the four adult fin-fish sampling stations in the area were most inadequate. Four stations totaling some 17 acres were far too few and too small to indicate populations over a bay area about 70 miles long and covering over 150,000 acres. The catches of trout, redfish, and black drum at these four stations from September 1961 through December 1964 by species are shown in Figures 7 through 9 and clearly indicate an inaccurate and misleading picture of the populations.

With the establishment of 7 additional stations in January 1964, bringing the total adult fin-fish sampling stations to 11, a more accurate and representative picture of the total bay populations is given as is shown in Figures 7 through 9 by the inclusion of the 11 station average in 1964. Only the month of February, when only 4 stations were sampled, must be viewed with suspicion.

Speckled trout, redfish, and black drum were taken at all 11 stations and in all 12 months of 1964.

While every attempt was made to make the total sampling representative of the entire bay area, several limitations restricted the selection of station locations. First, boat draft restricted sample areas to water one foot in depth or more. Second, the trammel net depth of 40 inches restricted practical striking to waters of 4 feet deep or less (although this limit is extended in several instances). Third, all strikes were made so that land formed one side of the enclosed area, while the net formed the other three sides. In the average strike, 600 feet or half the net was laid parallel to shore, while the remaining 600 feet was used to close off both ends. The sample areas then were restricted to waters (1) over 1 foot, and (2) less than 4 feet in depth, and (3) within 300 feet of shore (or shallow water adjacent to shore).

Speckled trout - The speckled trout was taken in 100 of the 123 samples obtained (Table 1). By month, average trout yields were remarkably consistent at from 1.0 to 1.9 pounds per acre over the entire year with the exception of the month of January, when the average was only 0.2 pounds per acre. The high average month was June.

By station, the average yield was 0.16 to 2.17 pounds per acre. The low station, T10, was established principally to sample black drum; however, and significant trout populations were not expected here.

Redfish - Redfish were taken in only 54 of the 123 samples collected (Table 2).

By month, average redfish yields ranged to a high of 1.35 pounds per acre in February; although this high average was based on only 4 stations. Next high averages were 1.04 and 1.05 in November and December respectively. These highs in the last two months of the year were the result of the entry of Year Class I redfish into the samples. Low average yields of less than 0.1 pounds per acre were noted in January, May, and August.

By station, the average yield ranged from .04 to .89 pounds per acre. The poor yield of redfish in the adult fish samples is the result of the poor spawning success of the 1962-63 season. Not until November 1964, when some of the highly successful 1963-64 spawn entered the adult samples, did any significant yield occur.

In normal years, a significant portion of the redfish population would be expected to be present in the extensive shallow water areas during the summer months. Even though these areas are not sampled by the trammel net, numerous observations in 1964 indicated redfish to be scarce in these areas. Since these shallow water areas were the only type habitat not sampled by trammel net, the low yields of redfish indicated in Table 2 for the sample areas are believed to be representative of the entire Lower Laguna Madre.

Black Drum were taken in 80 of the 123 samples obtained (Table 3).

By month, there were three months in which the average yield was less than one pound per acre -- May, June, and October, with yields of 0.55, 0.67, and 0.22 pounds per acre respectively. The high average yield was December, with 5.65 pounds, followed closely by 4.71 pounds per acre in November.

By station, average yields ranged from an insignificant 0.01 pounds per acre at T1 to 9.82 pounds per acre at T11. Areas of principle yield are the north end of Redfish Bay (T11 and T10), Port Mansfield (T4), and the Three Islands area (T2, T6, and T3). Stations T9, T10 and T11 produced 878 of the 1451 drum tagged, or 60 per cent of the total. Only one of the 25 tag returns was from this group of fish, and that one was taken by a sport fisherman in the Upper Laguna Madre.

A comparison of average catches of trout, redfish, and black drum at all adult sampling stations for 1964 is shown in Figure 10. (February samples were taken at only 4 stations).

Flounder and sheepshead catches by station and by month appear in Tables 4 and 5 and are considered too small to merit consideration. Flounder tend to congregate on the sloping edges of channels and near passes. Sheepshead are most abundant under piers, causeways, and around jetties. Presently used equipment and methods do not sample these areas and; therefore, not these species.

Fish Tagging

Fish tags returned during the year 1964 totaled 118. Of these, 37 returns were from fish tagged in 1963, and one was from a fish tagged in 1962. The remaining 80 returns were from 1964 taggings. By species, the 118 tag returns involved 79 trout, 14 redfish, and 25 black drum. No tags were returned from flounder or sheepshead.

Speckled Trout - Of the 79 trout tags returned during the year, 62 were tagged and recaptured in the Arroyo Colorado and will be treated in a special section of this report. The remaining 17 returns are listed in Table 6. These 17 trout were free for from 12 to 373 days. Some were taken as far as 30 miles from where they were tagged, but most were recaptured close to the tagging sites. In general, movement was to the south in the colder months and to the north in the summer. Five of these 17 trout tag returns were from commercial fishermen, while the remaining 12 were from sports fishermen.

Redfish - Of the 14 redfish tags returned in 1964, 9 were tagged in 1964, 4 in 1963, and 1 in 1962 (Table 7). These fish were free from 33 to 712 days. Most redfish were recaptured at or near the tagging sites, though some were taken as far as 35 miles from where they were tagged. Seven showed no north-south movement, and 6 were recaptured north of where they were tagged. Only 1 redfish was taken south of where it was tagged. Nine of the 14 tagged redfish were captured in the last 4 months of the year. The tags were returned by 7 commercial fishermen and 7 sports fishermen.

Black Drum - There were 25 tags returned from drum in 1964. Seven of these were tagged in 1963 the remainder in 1964 (Table 8). As in the case of redfish, the majority of tagged drum were taken in the last 4 months of the year, with 15 of the 25 captured after September 1. These fish were free from 8 to 393 days. While none of the trout or redfish left the study area, 6 of the 25 drum left, with 2 taken in the Upper Laguna Madre and 4 at La Pesca in Mexico. Twelve of the tagged drum were captured by commercial fishermen and 13 by sports fishermen. Of the 13 caught by sports fishermen, 7 were taken in the Arroyo Colorado. Of the 12 taken commercially, 6 were taken by one fisherman in the Port Mansfield area.

Of the 18 drum tag returns in 1964, all were from 515 drum tagged from January through April 1964. No tag returns have yet been reported from the 936 drum tagged from May through December.

No pattern of north-south movement could be determined.

Table 9 shows 1964, 1963 and 1962 tag returns by species; complete as of December 31, 1964. The 1962 returns can now be considered virtually complete and 1963 returns about 95 per cent complete.

Special Tagging Studies

Analysis of Arroyo Colorado Trout Populations - In early August 1963, a sizeable population of speckled trout appeared in the Arroyo Colorado in the area known as Arroyo City, located some 7 miles west of the Laguna Madre. Large numbers of these trout were harvested by fishing at night from lighted piers. Since local laws prohibit all fishermen from keeping trout under 12 inches in total length, and since approximately 80 per cent of these trout were under 12 inches in length, an ideal opportunity for a study of trout fishing mortality was presented. Live fish cages were placed at 3 fishing piers in the area, into which owners had agreed to place all undersized fish. These cages were visited periodically by department personnel, the trout tagged and released. From August 13 to September 26, 521 trout were tagged and released, all but 12 of which were under 12 inches long. Monel jaw tags were used on 25 of the trout; the new internal anchor tags were used on the remaining 496.

From this tagging effort, 68 tagged trout were reported captured and the tags returned through December 31, 1963. The statistical treatment of these tag returns was described in the job completion report MF-R-6, Job No. 10, which is contained in Project Report, 1963, Coastal Fisheries, Parks and Wildlife Department.

Briefly stated, this treatment involved the calculation of survival rate, total loss, fishing mortality, and other losses of this trout population by formulas which apply to a series of successive tagging operations (Rounsefells and Everhart, 1953). A table was prepared showing each date of tagging (designated a group), the number of trout tagged on each date, and the number of returns from each group in each 30-day interval after tagging. The result was a survival rate of 56 per cent per interval and a total loss of 44 per cent per interval. Further calculation indicated fishing mortality to be 7.1 per cent per interval and other losses to be 36.9 per cent per interval.

During the year 1964, 62 additional returns from this population were reported, giving a total of 130 returns to January 1, 1965. Of the 62 tags returned in 1964, 4 were taken in the Laguna Madre proper from the Cameron-Willacy County line south to ICW No. 99 in Port Isabel Bay. The remaining 58 were taken from the Arroyo Colorado. In order to bring the statistical treatment up to date, the table used in the 1963 Job Completion report was expanded from 4 to 13 periods and now appears thus:

		Recoveries in Period (30 Days)												
Arroyo Colorado	No. Trout													
Date (1963)	Tagged	1	2	3	4	5	6	7	8	9	10	11	12	13
August 13	21	5	2	0	0	0	0	0	1	0	0	0	0	0
August 14	24	2	1	1	0	0	0	1	0	0	0	0	0	1
August 16	15	1	1	0	0	0	0	1	0	0	0	0	0	0
August 19	29	3	1	3	0	0	0	0	0	0	0	1	1	0
August 21	34	4	2	2	0	0	0	1	1	1	0	0	0	0
August 22	42	1	2	0	2	0	0	0	1	1	0	1	0	0
August 24	51	2	3	2	0	0	0	1	0	0	0	1	0	0
August 26	8	0	0	1	0	0	0	0	0	0	0	0	0	0
August 28	6	1	1	0	0	0	0	0	0	0	0	0	0	0
August 29	20	1	4	0	0	0	0	0	0	1	0	1	0	0
September 3	89	2	4	2	0	0	0	4	1	0	1	0	0	0
September 5	31	1	1	1	0	1	0	0	0	0	2	0	0	0
September 7	13	0	0	0	0	0	0	0	0	0	0	0	0	0
September 10	29	2	0	1	0	0	0	1	1	0	0	0	0	0
September 11	19	0	0	0	0	0	0	1	0	0	0	0	0	0
September 16	78	5	2	0	0	0	0	1	0	0	0	0	0	0
September 18	9	3	0	0	0	0	0	0	0	0	0	0	0	0
September 26	3	1	0	0	1	0	0	0	0	0	0	1	0	0
TOTAL	521	34	24	13	3	1	0	11	5	3	3	5	1	1

(S) = Survival Rate per Interval
(L) = Total Loss per Interval
(F) = Fishing Mortality per Interval
(N) = Other Losses per Interval

$$S = \frac{I_2 + I_3 + I_4 + \dots + I_{13}}{I_1 + I_2 + I_3 + \dots + I_{12}}$$

$$S = \frac{24 + 13 + 3 + 1 + 11 + 5 + 3 + 3 + 5 + 1 + 1}{34 + 24 + 13 + 3 + 1 + 11 + 5 + 3 + 3 + 5 + 1} = \frac{70}{103} = 68\%/\text{Int.}$$

$$L = 1.00 - S = 1.00 - 0.68 = .32 = 32\%/\text{Int.}$$

$$F = \frac{I_2 + I_3 + I_4 + \dots + I_{13}}{S \times T [1 + S + S^2 + S^3 + \dots + S^{11}]}$$

$$F = \frac{70}{.68 \times 521 [1 + .68 + (.68)^2 + (.68)^3 + \dots + (.68)^{11}]} =$$

$$\frac{70}{1095} = 0.064 = 6.4\%/\text{Int.}$$

$$N = L - F = 0.320 - 0.064 = .256 = 25.6\%/\text{Int.}$$

Using the above determined values for the average survival rate, total loss, fishing mortality and other losses per interval, the following values for the accumulated rates are obtained:

	Period (30 Day Interval)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Survival Rate in %	68.0	46.2	31.4	21.4	18.6	12.6	8.6	5.8	3.9	2.7	1.8	1.2	0.8
Total Losses in %	32.0	53.8	68.6	78.6	81.4	87.4	91.4	94.2	96.1	97.3	98.2	98.8	99.2
Accumulative Fishing Mor- tality in %	6.4	10.8	13.7	15.7	17.1	18.3	19.1	19.9	20.5	20.9	21.2	21.4	21.5
Accumulative Other Losses in %	25.6	43.0	54.9	62.9	64.3	69.1	72.3	74.3	75.6	76.4	77.0	77.4	77.7

During 1964, a similar tagging effort was accomplished in the same location and under the same circumstances as that in 1963. During the period from April 23 to June 16, 1964, a total of 328 trout (all under 12 inches in total length) were tagged in 11 groups and released in the Arroyo Colorado. Of these 328 tags, 207 were internal anchor tags, and the remaining 121 were No. 3 Monel jaw tags. By January 1, 1965, a total of 36 tags had been returned.

Tagged fish from this effort were recaptured as soon as 3 days after tagging and were free as long as 8 months at this writing. By preparing a table showing each date of tagging (designated a group), the number of trout tagged on each date, and the number of returns from each group in each 30-day interval after tagging, the following results were obtained:

Recoveries in Period (30-Day Intervals)										
Arroyo Colorado Date (1964)	No. Trout Tagged	1	2	3	4	5	6	7	8	9
April 23	50	4	6	0	0	1	1	0	0	2
April 25	50	0	1	0	0	0	0	1	0	0
April 28	10	0	1	0	0	0	0	0	0	0
May 4	46	1	1	2	0	0	3	0	0	0
May 6	30	0	2	1	0	0	0	0	0	0
May 8	54	0	1	0	0	0	0	0	0	0
May 12	32	1	1	0	0	0	0	0	0	0
May 18	11	0	0	0	0	1	0	0	0	0
May 25	10	0	0	0	0	0	0	0	0	0
June 6	21	1	0	1	0	0	0	0	0	0
June 16	14	1	1	0	0	1	0	0	0	0
TOTAL	328	8	14	4	0	3	4	1	0	2

(S) = Survival Rate/Interval
 (L) = Total Loss
 (F) = Fishing Mortality
 (N) = Natural Mortality or Other Losses

$$S = \frac{I_2 + I_3 \dots I_9}{I_1 + I_2 \dots I_8} = \frac{28}{34} = 82\%/\text{Int.}$$

$$L = 1.00 - .82 = 18\%/\text{Interval}$$

$$F = \frac{I_2 + I_3 \dots I_9}{S \times T [1 + S + S^2]}$$

$$T = \text{Total Fish Tagged} = 328$$

$$F = \frac{28}{.82 \times 328 [1 + .82 + (.82)^2]} = \frac{28}{670} = 0.040 = 4.0\%$$

$$N = L - F = 0.180 - 0.040 = 0.140 = 14.0\%$$

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References

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- Rousefell, George A. and W. Harry Everhart 1953 Fishery Science - Its Methods and Applications John Wiley and Sons, Inc.

Table 1
Adult Speckled Trout - Biological Catch by Station and by Month
-1964 In Pounds Per Acre-

DATE	T1	T5	T2	T6	T3	T7	T4	T8	T9	T10	T11	MONTHLY AVG.
January	.1	.3	.7	.4	0	0	0	.5	0	0	0	.2
February	.2	1.0	.8	2.5	NS	NS	NS	NS	NS	NS	NS	1.1
March	.3	2.8	2.4	4.3	4.8	2.4	.5	.7	1.2	.2	0	1.8
April	.5	0	1.3	5.7	2.4	1.4	.2	1.0	1.5	0	0	1.3
May	1.4	1.7	5.8	1.8	1.3	1.7	.6	.5	2.5	.2	1.0	1.7
June	2.7	1.3	1.1	2.2	.3	4.1	.7	1.7	3.8	.8	3.1	1.9
July	.2	.5	.5	3.5	0	2.9	1.0	3.7	1.8	.2	1.6	1.7
August	.2	.2	0	0	0	1.4	5.7	2.7	.2	0	2.5	1.2
September	.5	.5	.5	0	0	2.9	1.1	3.4	.4	0	1.4	1.0
October	0	.9	.3	1.5	1.4	1.8	3.8	0	2.0	NS	2.6	1.4
November	.6	4.5	.4	3.6	.8	1.0	1.9	.8	1.0	NS	.2	1.5
December	1.2	.4	0	.3	0	4.3	.5	2.5	1.3	0	1.9	1.1
Annual Station Avg.	.66	1.17	1.15	2.15	1.00	2.17	1.45	1.59	1.13	.16	1.10	

Table 2
Adult Redfish - Biological Catch by Station and by Month
-1964 In Pounds Per Acre-

DATE	T1	T5	T2	T6	T3	T7	T4	T8	T9	T10	T11	MONTHLY AVG.
January	0	.6	0	0	0	.2	0	0	0	0	.1	.08
February	0	3.5	1.4	.5	NS	NS	NS	NS	NS	NS	NS	1.35
March	0	.4	0	0	1.6	0	0	0	.6	0	0	.23
April	0	.3	.3	0	1.4	.3	.9	0	.3	.3	0	.32
May	0	0	0	0	0	0	0	0	0	0	.9	.08
June	0	0	0	0	0	2.1	0	0	0	0	.5	.23
July	0	0	0	.1	0	0	0	0	0	0	1.9	.18
August	0	.5	0	0	0	.1	0	0	0	0	0	.05
September	0	.1	0	.1	.6	.8	0	2.2	0	2.2	.5	.59
October	0	.3	0	.1	.3	0	.1	.4	0	NS	.2	.14
November	.3	.8	1.1	2.2	1.1	2.4	2.0	.2	.3	NS	0	1.04
December	.2	1.1	.8	.1	0	3.9	4.3	.1	.2	.9	0	1.05
Annual Station Avg.	.04	.63	.30	.26	.46	.89	.67	.26	.13	.38	.37	

Table 3
Adult Black Drum - Biological Catch by Station and by Month
-1964 In Pounds Per Acre-

DATE	T1	T5	T2	T6	T3	T7	T4	T8	T9	T10	T11	MONTHLY AVG.
January	0	.2	2.1	1.2	1.9	1.1	0	.5	1.4	2.9	3.4	1.33
February	.1	2.2	13.1	2.9	NS	NS	NS	NS	NS	NS	NS	4.58
March	0	1.0	5.4	3.9	8.1	0	.8	2.2	2.0	2.0	6.6	2.91
April	0	.3	.3	6.3	5.9	.6	2.9	0	0	1.0	2.8	1.82
May	0	.3	0	0	.2	0	0	0	.5	4.2	.8	.55
June	0	0	.2	0	0	.2	1.6	0	0	.1	5.3	.67
July	0	0	0	.1	1.2	0	1.4	0	0	6.7	10.5	1.81
August	0	0	0	0	0	0	5.9	.7	0	5.6	7.5	1.79
September	0	.2	0	0	1.1	.6	2.8	4.4	0	19.1	7.4	3.24
October	0	0	0	.1	1.0	.1	.9	.1	0	NS	0	.22
November	0	.3	1.5	.2	.1	5.4	2.1	.3	.1	NS	37.1	4.71
December	0	.8	2.8	.2	2.3	1.5	11.4	.7	15.0	.8	26.6	5.65
Annual Station Avg.	.01	.44	2.09	1.24	1.98	.87	2.71	.81	1.72	4.71	9.82	

Table 4
Adult Flounder - Biological Catch by Station and by Month
-1964 In Pounds Per Acre-

DATE	T1	T5	T2	T6	T3	T7	T4	T8	T9	T10	T11	MONTHLY AVG.
January	0	0	0	0	0	0	0	0	0	0	0	0
February	0	0	0	0	NS	NS	NS	NS	NS	NS	NS	0
March	0	0	0	0	0	0	.1	0	0	0	.1	.02
April	0	0	0	0	0	0	.4	0	0	.2	0	.06
May	0	0	0	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	.1	0	0	0	0	.01
July	0	0	0	0	0	.1	.1	0	0	.1	0	.03
August	0	0	.1	0	0	.1	0	0	0	0	0	.02
September	0	0	0	0	0	0	.3	0	0	.2	0	.05
October	.1	0	0	0	0	0	0	.1	0	NS	0	.02
November	0	0	0	0	0	0	.5	.1	0	NS	.3	.09
December	0	0	0	0	0	0	0	0	0	0	0	0
Annual Station Avg.	.01	0	.1	0	0	.02	.14	.02	0	.03	.04	

Table 5
Adult Sheepshead - Biological Catch by Station by Month
-1964 In Pounds Per Acre-

DATE	T1	T5	T2	T6	T3	T7	T4	T8	T9	T10	T11	MONTHLY AVG.
January	0	0	0	0	0	0	0	0	0	0	0	0
February	0	.2	0	0	NS	NS	NS	NS	NS	NS	NS	.05
March	0	.6	0	0	0	0	0	0	0	0	0	.05
April	0	.1	0	0	0	0	0	0	0	0	.4	.05
May	0	0	0	0	0	0	0	0	0	0	0	0
June	0	0	.6	0	0	.3	0	0	0	0	0	.08
July	0	0	0	0	0	0	.1	0	0	.2	.1	.04
August	0	0	0	0	0	.1	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0	0	NS	0	0
November	0	0	0	.6	.2	1.6	.1	0	0	NS	0	.25
December	0	0	0	0	0	0	0	.7	0	0	0	.06
Annual Station Avg.	0	.08	.05	.05	.02	.18	.02	.06	0	.02	.05	

Table 6
Speckled Trout Tag Returns-1964
-Except Those Returned and Tagged In Arroyo Colorado-

<u>LOCATION TAGGED</u>	<u>DATE</u>	<u>LOCATION CAPTURED</u>	<u>DATE</u>	<u>N-S MOVEMENT</u>	<u>DAYS FREE</u>	<u>SPORTS OR COMMERCIAL</u>
Arroyo Colorado	9/ 3/63	No. 99-Port Isabel Bay	3/24/64	South	201	Commercial
T4	11/21/63	No. 99-Port Isabel Bay	3/25/64	South	124	Commercial
T6	3/16/64	Arroyo Colorado	3/28/64	North	12	Sports
Arroyo Colorado	8/22/63	Mouth-Arroyo Colorado	4/ 7/64	--	228	Sports
T5	2/10/64	Port Isabel Bay	5/ 1/64	--	80	Commercial
Arroyo Colorado	4/23/64	No. 316-County Line	5/25/64	North	32	Sports
T2	4/ 9/64	T2	7/ 4/64	--	86	Sports
T5	2/10/64	T2	7/ 8/64	North	148	Sports
T8	4/10/64	T8	7/26/64	--	107	Sports
T9	7/ 8/64	No. 316-County Line	8/ 6/64	South	29	Sports
Arroyo Colorado	8/14/63	Mouth-Arroyo Colorado	8/22/64	--	373	Sports
T4	7/ 7/64	Port Mansfield	9/ 1/64	--	56	Commercial
T1	6/15/64	No.99-Port Isabel Bay	9/12/64	--	89	Sports
T1	2/10/64	Port Isabel Bay	10/ 7/64	--	233 to 246	Commercial
Arroyo Colorado	4/23/64	No. 49-Three Islands	10/14/64	South	174	Sports
T6	4/ 9/64	Arroyo Colorado	10/20/64	North	194	Sports
T1	6/15/64	No.69-Port Isabel Bay	11/ 3/64	--	141	Sports

Table 7
Redfish Tag Returns - 1964

<u>LOCATION TAGGED</u>	<u>DATE</u>	<u>LOCATION CAPTURED</u>	<u>DATE</u>	<u>N-S MOVEMENT</u>	<u>DAYS FREE</u>	<u>SPORTS OR COMMERCIAL</u>
T-5	2/10/64	No.59-Port Isabel Bay	3/31/64	North	49	Commercial
T-2	6/11/63	Three Islands (T2)	4/13/64	--	306	Commercial
T-3	10/11/63	Mouth Arroyo Colorado	5/17/64	--	218	Sports
T-2	2/17/64	East Cut-Pt. Mansfield	5/ 1/64	North	73	Sports
T-3	4/10/64	Redfish Bay	7/29/64	North	110	Sports
T-4	9/19/62	Port Mansfield	9/ 1/64	--	712	Commercial
T-4	11/21/63	Port Mansfield	9/ 1/64	--	283	Commercial
T-9	3/18/64	Port Mansfield	9/ 1/64	--	166	Commercial
T-4	9/ 5/63	Port Mansfield	11/ 4/64	--	425	Sports
T-3	3/17/64	Port Mansfield	11/ 4/64	North	231	Sports
T-5	2/10/64	Port Isabel Bay	12/ 8/64	--	301	Commercial
T-7	6/ 8/64	No.69-Port Isabel Bay	12/26/64	South	201	Sports
T-7	11/24/64	Port Mansfield	12/27/64	North	33	Commercial
T-6	11/ 9/64	Arroyo Colorado	12/13/64	North	34	Sports

Table 8
Black Drum Tag Returns - 1964

<u>LOCATION TAGGED</u>	<u>DATE</u>	<u>LOCATION CAPTURED</u>	<u>DATE</u>	<u>N-S MOVEMENT</u>	<u>DAYS FREE</u>	<u>SPORTS OR COMMERCIAL</u>
T-2	11/20/63	Arroyo Colorado	1/ 7/64	North	48	Sports
T-2	2/17/64	No.79-Port Isabel Bay	3/ 9/64	South	20	Sports
T-6	2/17/64	Arroyo Colorado	3/13/64	North	24	Sports
T-10	1/20/64	North End Landcut	3/16/64	North	55	Sports
T-2	11/20/63	No.59-Port Isabel Bay	3/31/64	South	131	Commercial
T-6	4/14/64	Arroyo Colorado	4/22/64	North	8	Sports
T-3	4/10/64	Mouth-Arroyo Colorado	5/29/64	--	49	Sports
T-4	10/11/63	North End Landcut	6/11/64	North	212	Commercial
T-3	6/12/63	Arroyo Colorado	7/10/64	--	393	Sports
T-3	1/31/64	Arroyo Colorado	7/15/64	--	165	Sports
T-3	1/31/64	Port Mansfield	9/ 1/64	North	213	Commercial
T-3	1/31/64	Port Mansfield	9/ 1/64	North	213	Commercial
T-7	1/31/64	Port Mansfield	9/ 1/64	North	213	Commercial
T-4	11/31/63	Port Mansfield	9/ 1/64	--	275	Commercial
T-2	2/17/64	Port Mansfield	9/ 1/64	North	196	Commercial
T-3	4/10/64	Port Mansfield	9/ 1/64	North	144	Commercial
T-3	1/31/64	LaPesca, Mexico	10/10/64	South	252	Commercial
T-2	10/20/63	Arroyo Colorado	10/11/64	North	356	Sports
T-2	3/16/64	LaPesca, Mexico	11/12/64	South	240	Commercial
T-2	1/ 8/64	LaPesca, Mexico	11/16/64	South	311	Commercial
T-3	3/17/64	Arroyo Colorado	11/19/64	--	246	Sports
T-3	3/17/64	No.316-County Line	12/ 6/64	--	263	Sports
T-3	3/17/64	LaPesca, Mexico	12/10/64	South	267	Commercial
T-4	10/11/63	Port Mansfield	12/22/64	--	41	Sports
T-3	4/10/64	Brownsville Ship Channel	12/27/64	South	261	Sports

Table 9

SPECIES	1964		1963		1962	
	NO. TAGGED	% RET.	NO. TAGGED	% RET.	NO. TAGGED	% RET.
Trout	901	5.4	610	17.5	259	4.3
Redfish	212	4.7	30	16.6	381	5.3
Flounder	23	0.0	25	0.0	17	5.9
Drum	1478	1.5	333	2.1	2265*	0.2
Sheepshead	30	0.0	2	0.0	0	0.0

* Includes Mass Tagging of Small Drum (2,235) in July 1962 -- See 1961-62 Annual Report.

Figure 1
 Juvenile and Adult Fin-Fish Sampling
 Stations - Lower Laguna Madre

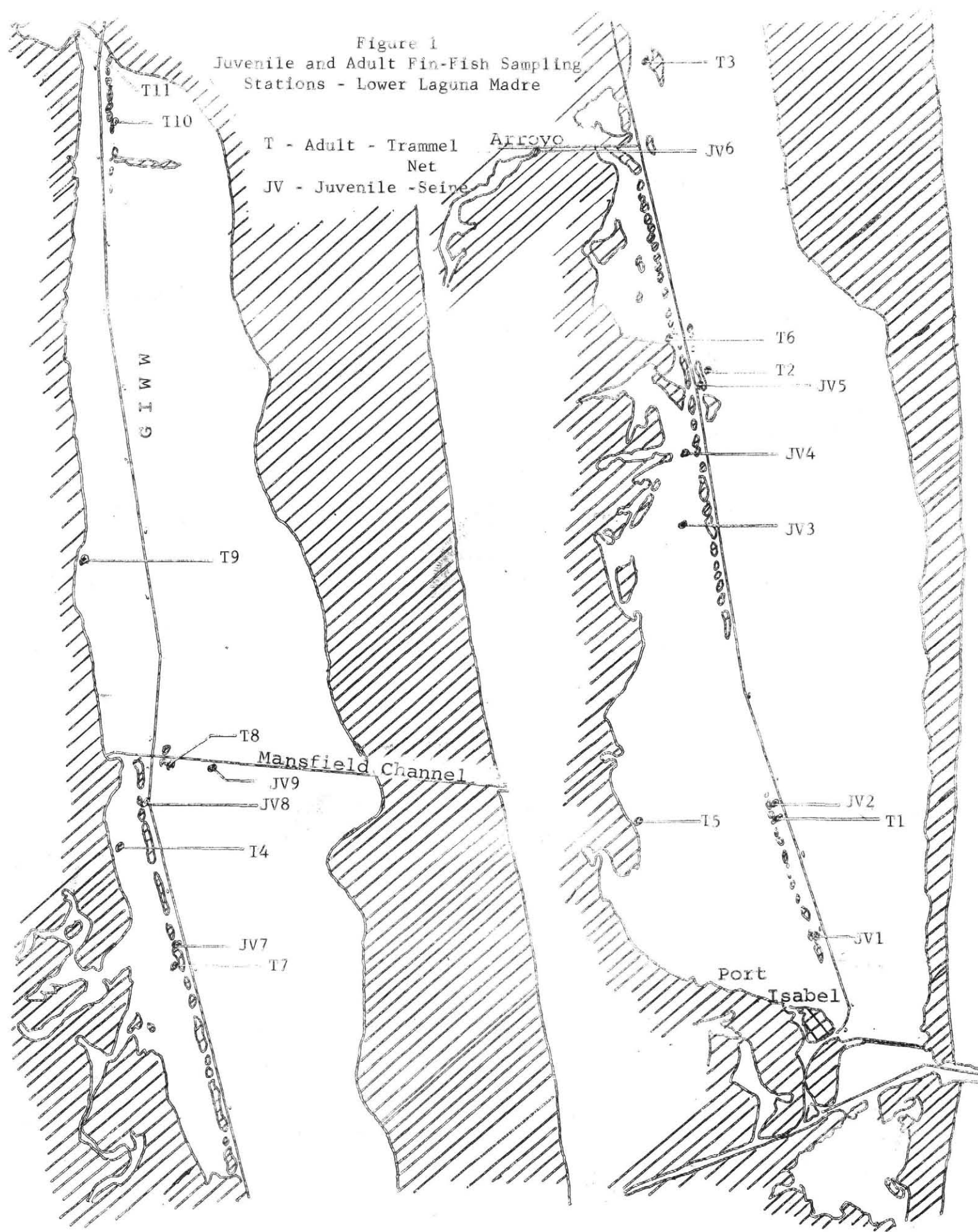
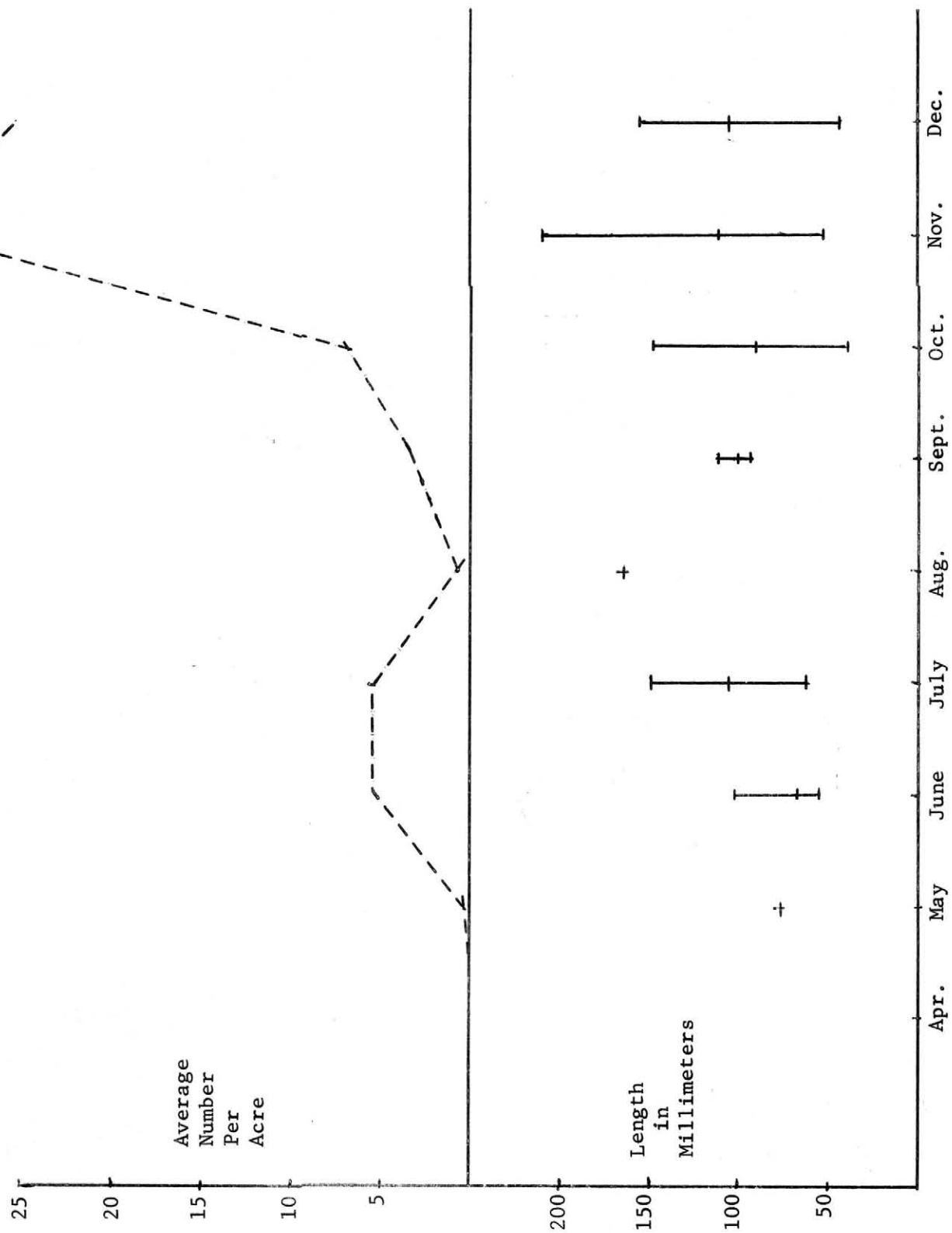


Figure 2
 Juvenile Trout - Average Number Per Acre,
 Size Range and Average Size



1964

Figure 3
 Juvenile Redfish - Average Number Per Acre,
 Size Range and Average Size

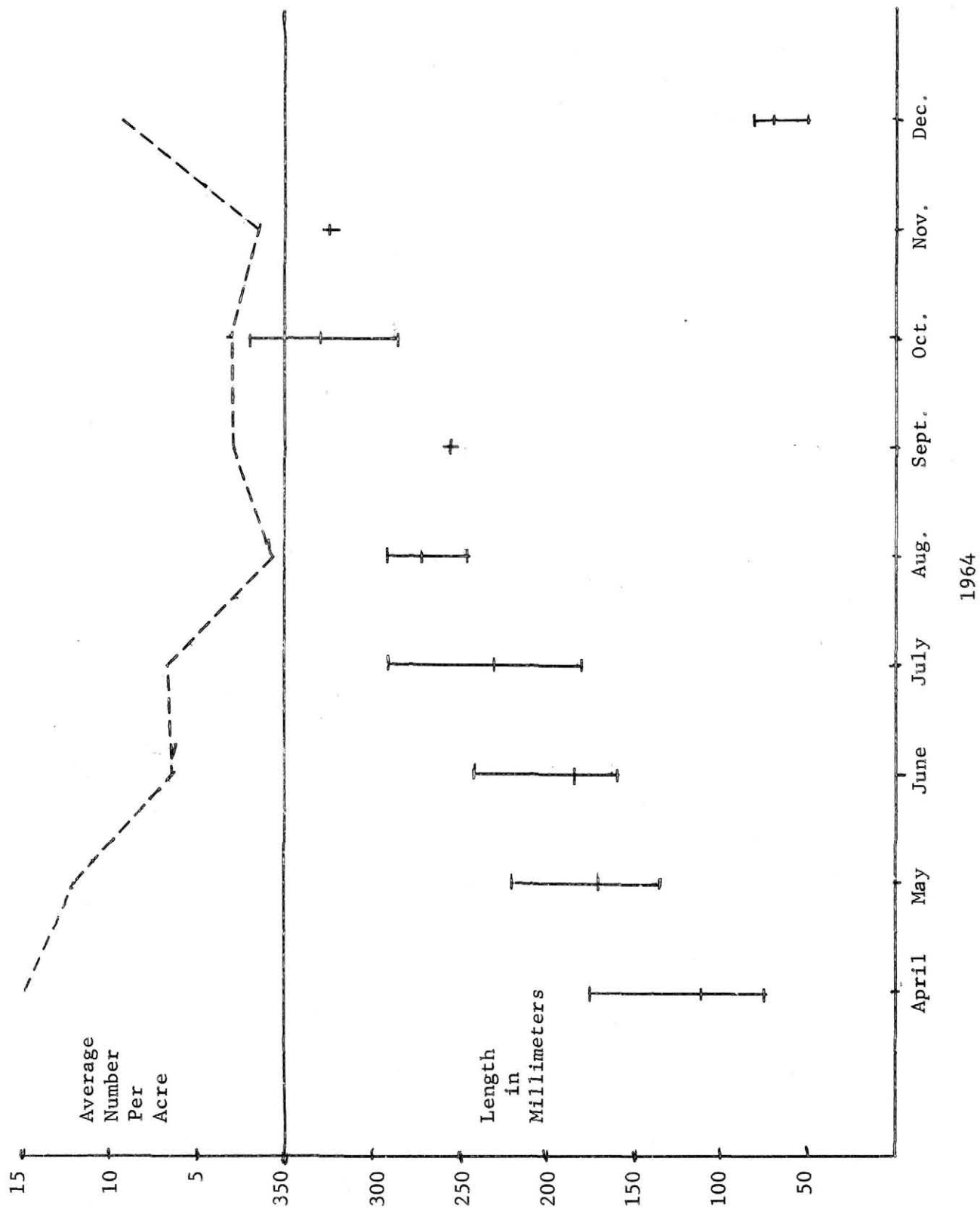


Figure 4
 Juvenile Black Drum - Average Number Per Acre,
 Size Range and Average Size

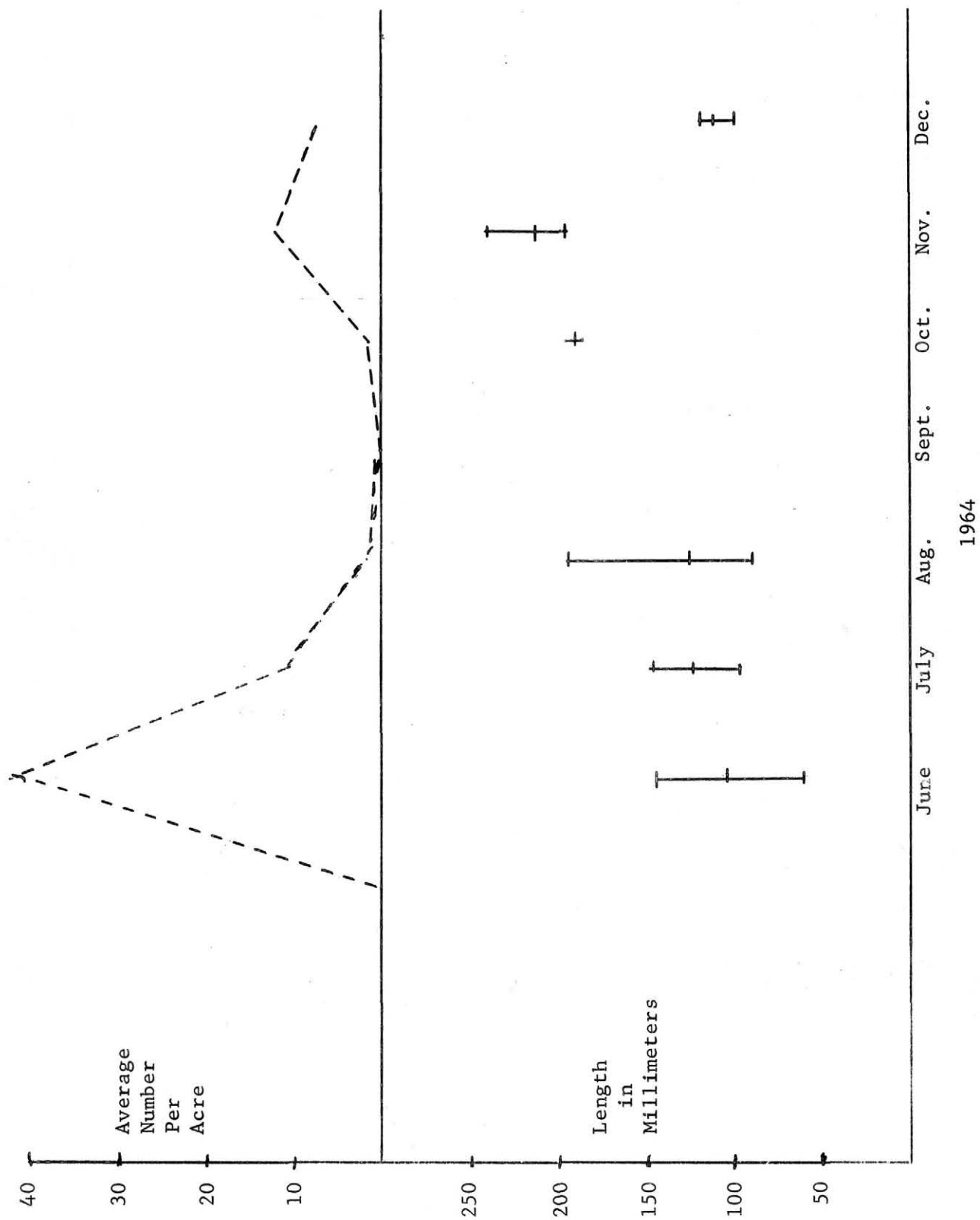


Figure 5
 Juvenile Flounder - Average Number Per Acre,
 Size Range and Average Size

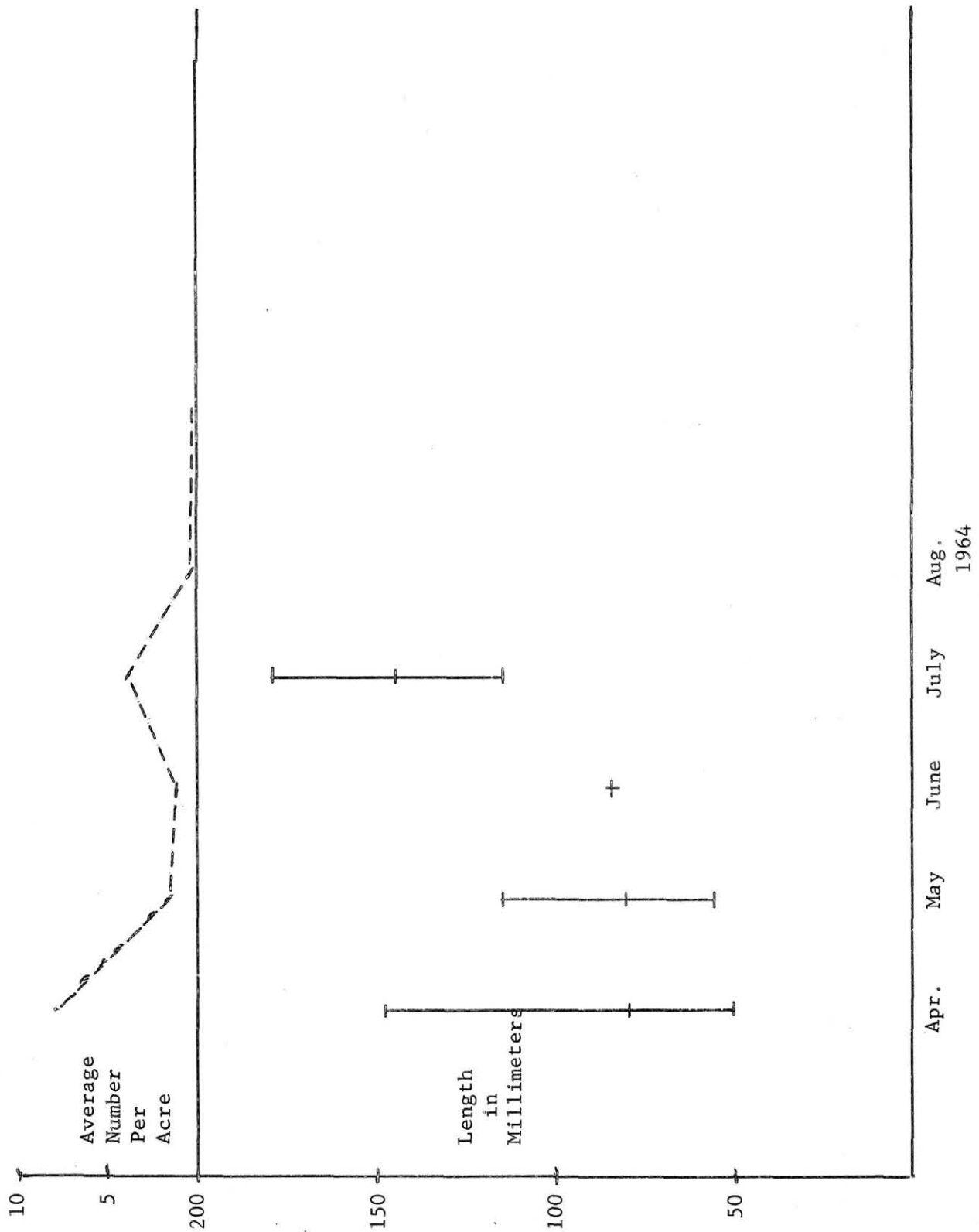


Figure 6
 Juvenile Sheephead - Average Number Per Acre,
 Size Range and Average Size

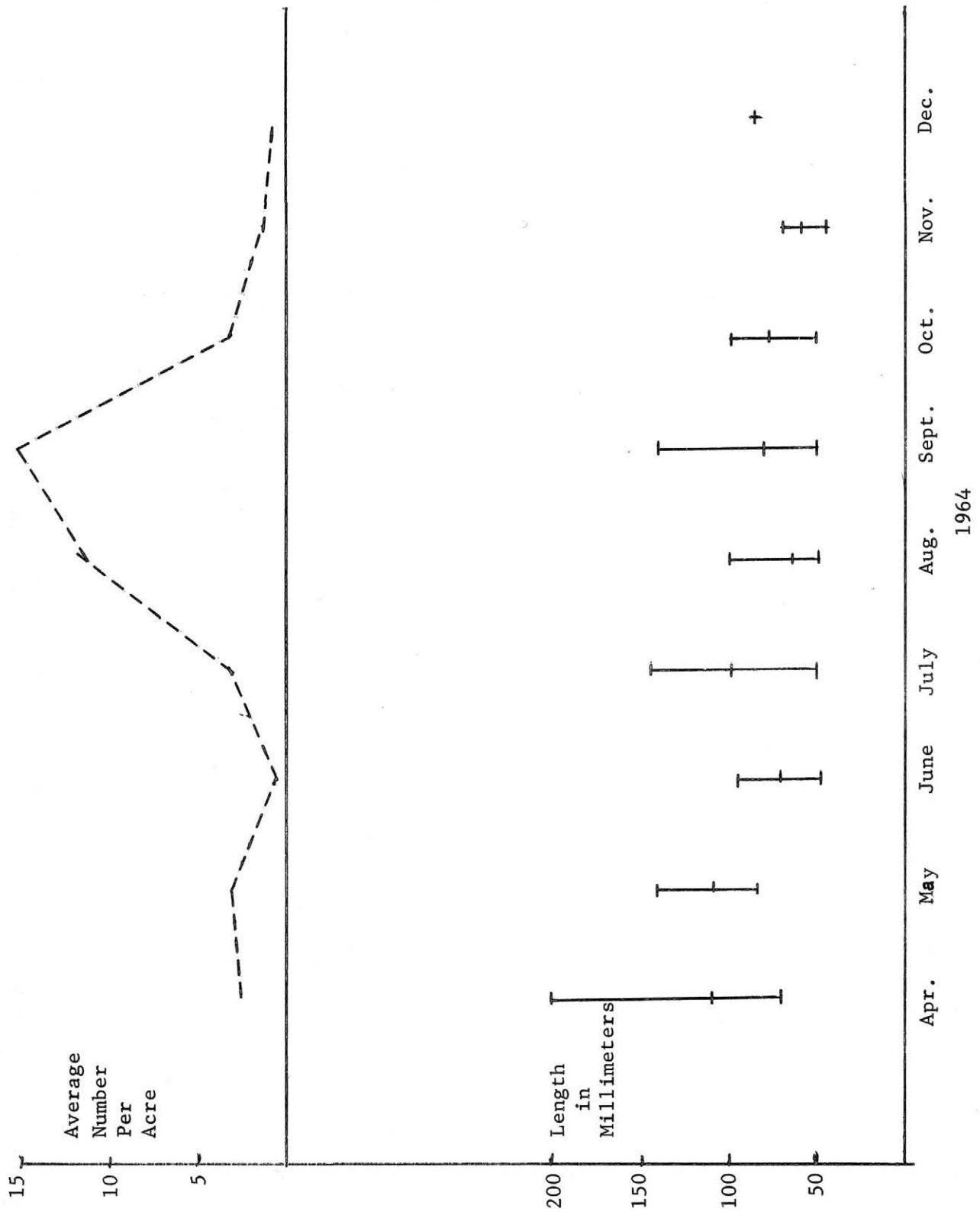


Figure 7
Adult Speckled Trout - Biological Samples by Trammel Net
Average Catch in Pounds Per Acre by Month

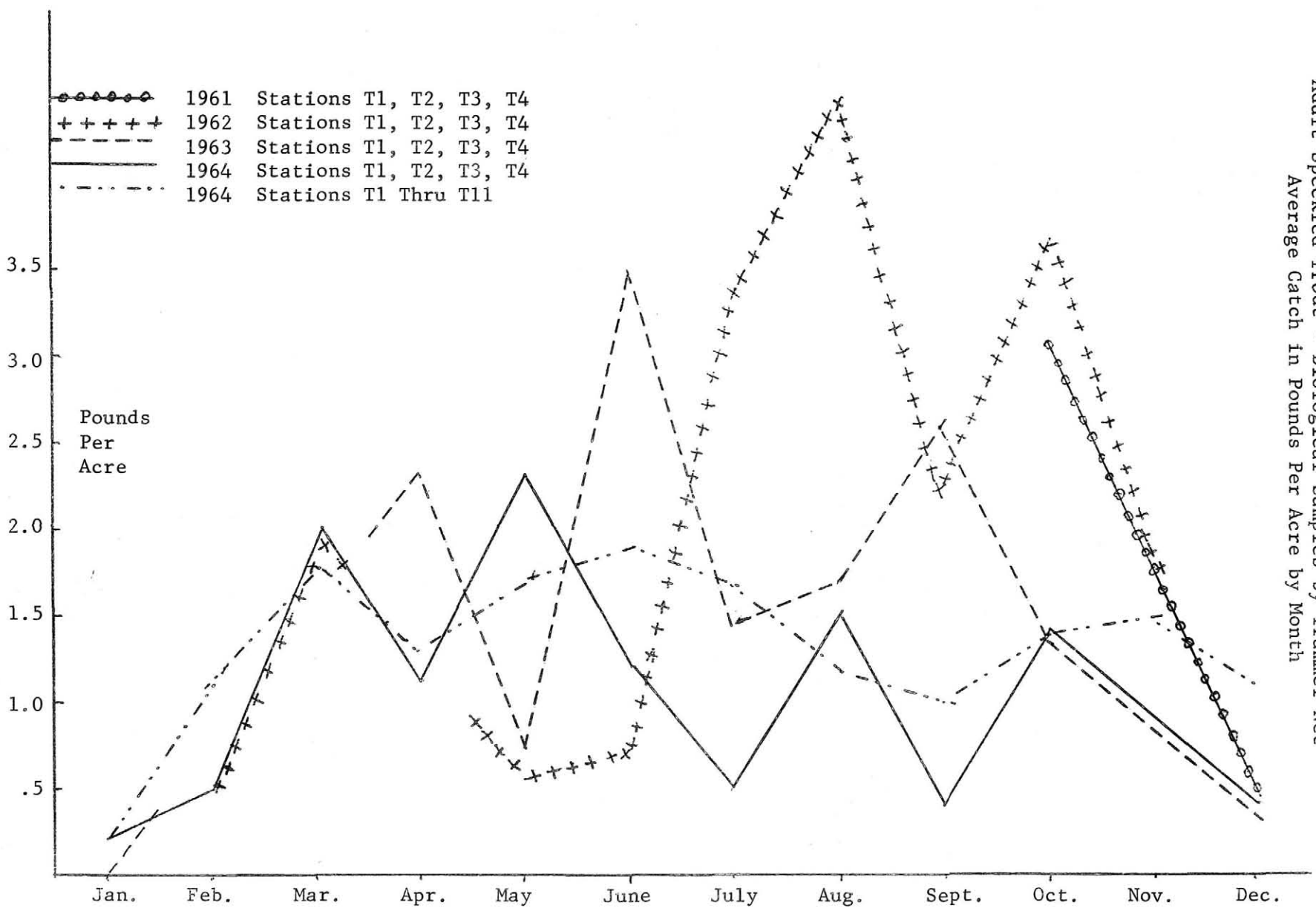


Figure 8
Adult Redfish - Biological Samples by Trammel Net
Average Catch in Pounds Per Acre by Month

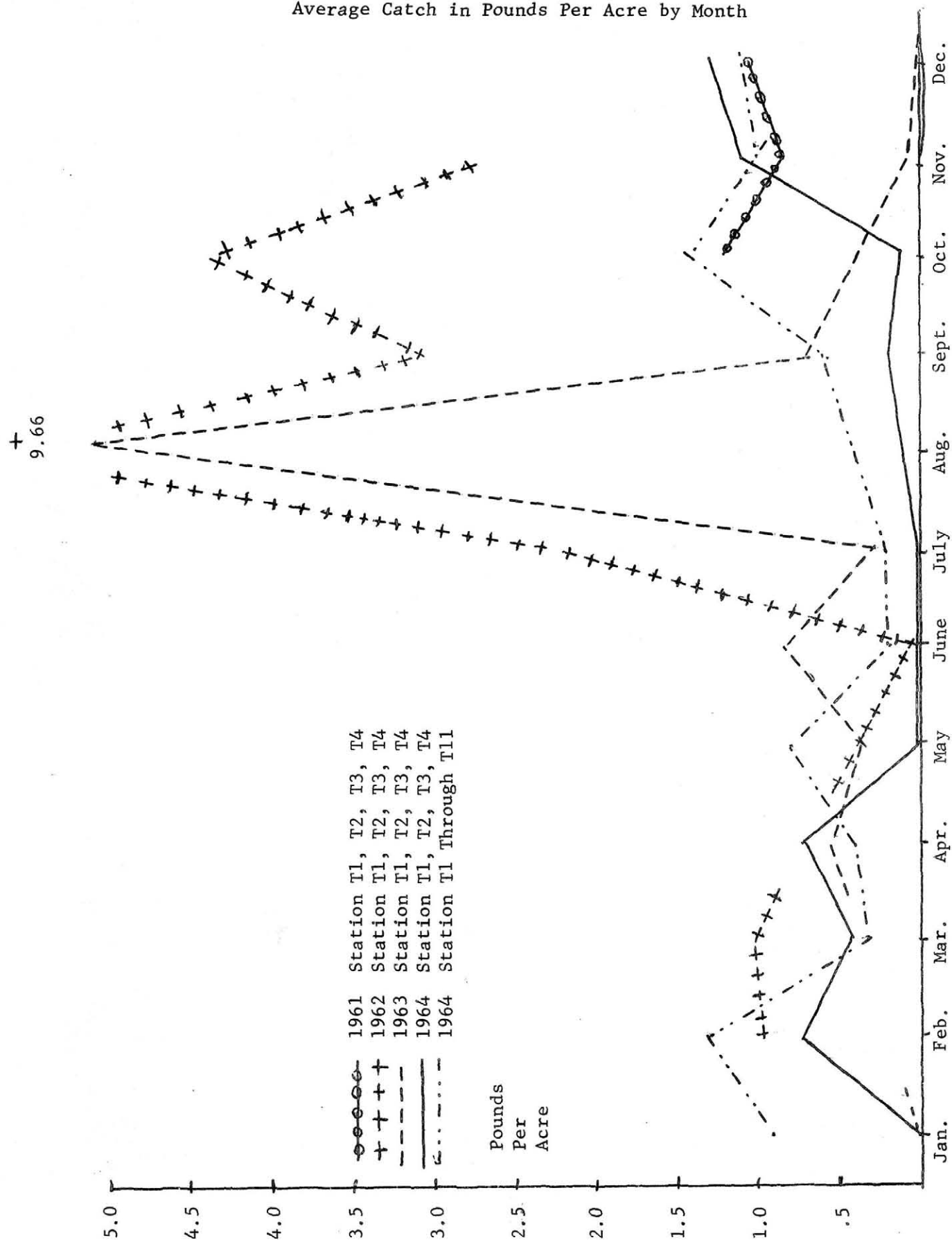


Figure 9
Adult Black Drum - Biological Samples by Trammel Net
Average Catch in Pounds Per Acre by Month

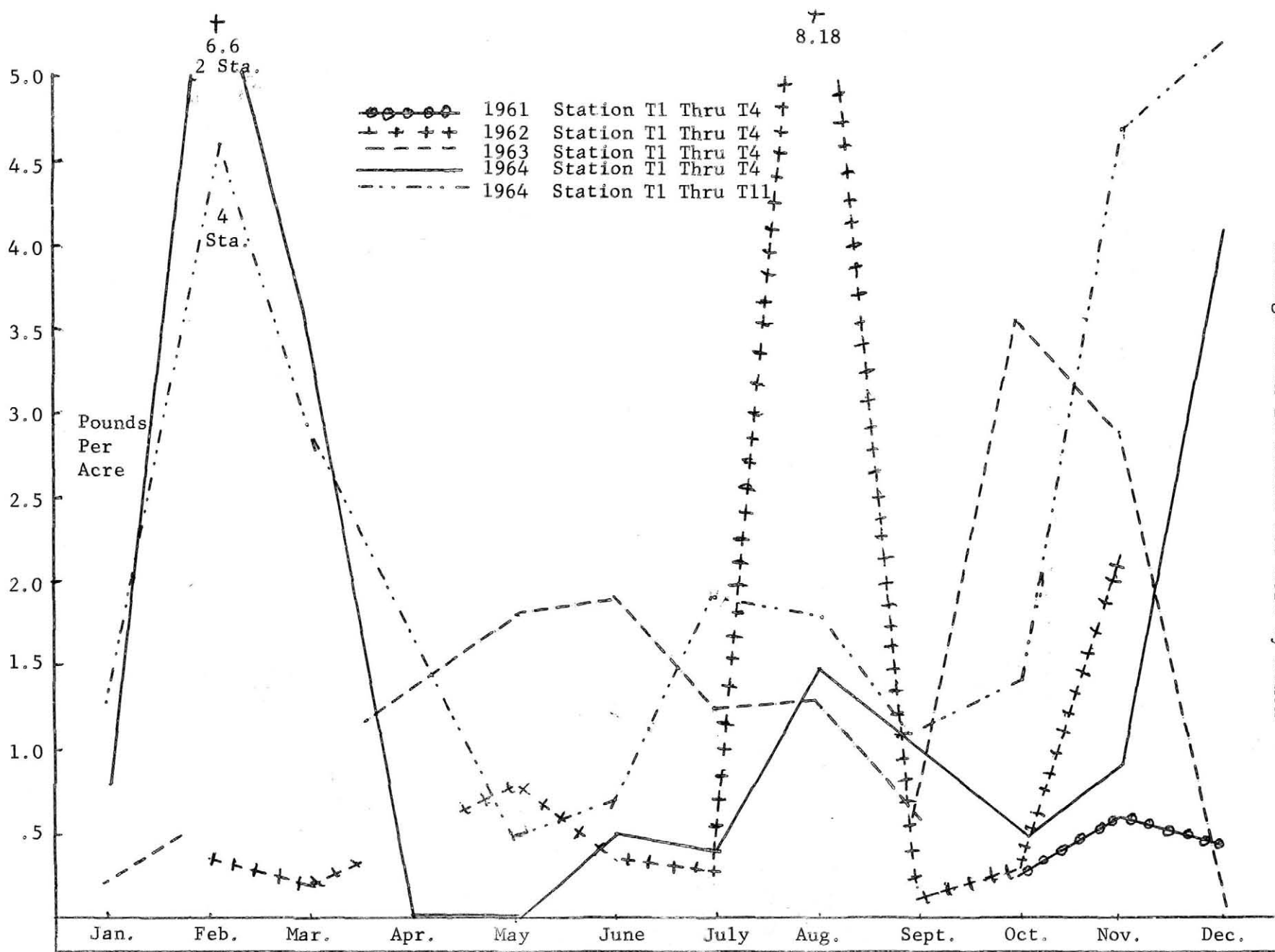


Figure 10
Average Adult Speckled Trout, Redfish and Black Drum
Catches in Biological Samples in 1964, Expressed in
Pounds Per Acre and in Total Pounds (Live Weight)
Based on 125,000 Acres of Area Sampled

