

Analysis of Populations of Sports and Commercial
Fin-fish in the Coastal Bays of Texas
Project MF-R-10 (Job No. 1)
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Abstract

Juvenile game fish were sampled in 1968 in all Texas bay areas with 60-foot bag seines; adult fish were sampled in Galveston Bay by drag seine and in Aransas Bay and the Upper and Lower Laguna Madre with trammel nets. A general and significant increase in the relative abundance of juvenile redfish, Sciaenops ocellata, was noted. In the case of trout, Cynoscion nebulosus, flounder, Paralichthys lethostigma, black drum, Pogonias cromis, and sheepshead, Archosargus probatocephalus, there was either a decline in general abundance or no significant change from the previous year. While variations in abundance of adult fish occurred within bays, no coastwide patterns could be discerned.

These samples were obtained in order to determine relative abundance, seasonal fluctuations in abundance and success of spawning. Captured fish of sufficient size and in good condition were tagged and released to study movements, migrations and rate of fishing harvest.

Description of Area

The seven major areas sampled during this study were the Galveston, Matagorda, San Antonio, Aransas, Corpus Christi and Upper and Lower Laguna Madre Bay systems.

Materials and Methods

Juvenile Fish - The principle sampling device for juvenile fish was a 60-foot bag seine, 6 feet deep of 3/4-inch stretched mesh used at prescribed stations in all bay areas. A minimum of 10 samples was required monthly in each area. The area covered by each seine drag was calculated. All juvenile game fish captured were measured and reported as number of individuals per acre.

Adult Fish - A drag seine measuring 750 to 1,450 feet in length, 6 feet deep and of 2-inch stretched mesh was used at prescribed stations in the Galveston Bay area to sample adult game fish. The seines were set and pulled, and the areas covered were calculated.

A trammel net, 1,200 feet long, 4 feet deep and of 3-inch stretched inside mesh and 12-inch stretched outside mesh was used at prescribed stations in the Aransas Bay and Upper and Lower Laguna Madre areas. The nets were set and struck and the areas enclosed were calculated.

In an effort to intensify and expand adult fish sampling in these areas, sampling was confined to two periods, generally spring and fall. Factors

involved in the selection of sampling periods included work schedules, availability of personnel and equipment, water depths and temperatures, and other weather conditions.

Length-weight relationship tables for each species were used to calculate weights, and the yield was reported in pounds per acre by species.

Adult game fish captured by drag seine and trammel net in the population study samples were usually tagged and released.

Juvenile Game Fish Sampling

Galveston Bay Area (Figure 1)

There were 139 bag seine samples in the Galveston Bay area during 1968 with an average of just over 11 samples per month (Table 1). The total area covered by these samples was almost 16 acres with an average of 5,000 square feet per sample.

Table 1
The Number of Individuals of Juvenile Game Fish Taken by Bag
Seine in the Galveston Bay Area in 1968 by Month and Species

Species	Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sept	Oct	Nov	Dec
Trout	0	0	0	0	0	2	17	13	7	9	4	0
Redfish	21	18	21	29	22	5	8	0	0	0	25	235
Drum	0	0	0	0	0	8	11	8	7	14	8	2
Flounder	0	3	3	10	7	4	0	1	0	0	0	0
Sheeps-head	0	0	0	0	0	4	4	0	0	0	0	0

Redfish - Samples taken in 1968 indicate an increase in abundance compared to 1967, but a decrease compared to 1966. The spring averages were 19 individuals per acre in 1968 compared to only 10 per acre in 1967 and 33 per acre in 1966.

A record average yield of 170 per acre in December of 1968 appears to preview a successful year in 1969.

Trout - A decline in abundance of juvenile trout was noted in 1968 with a peak yield of 12 per acre in July compared to 32 per acre in October 1967 and 14 per acre in September 1966.

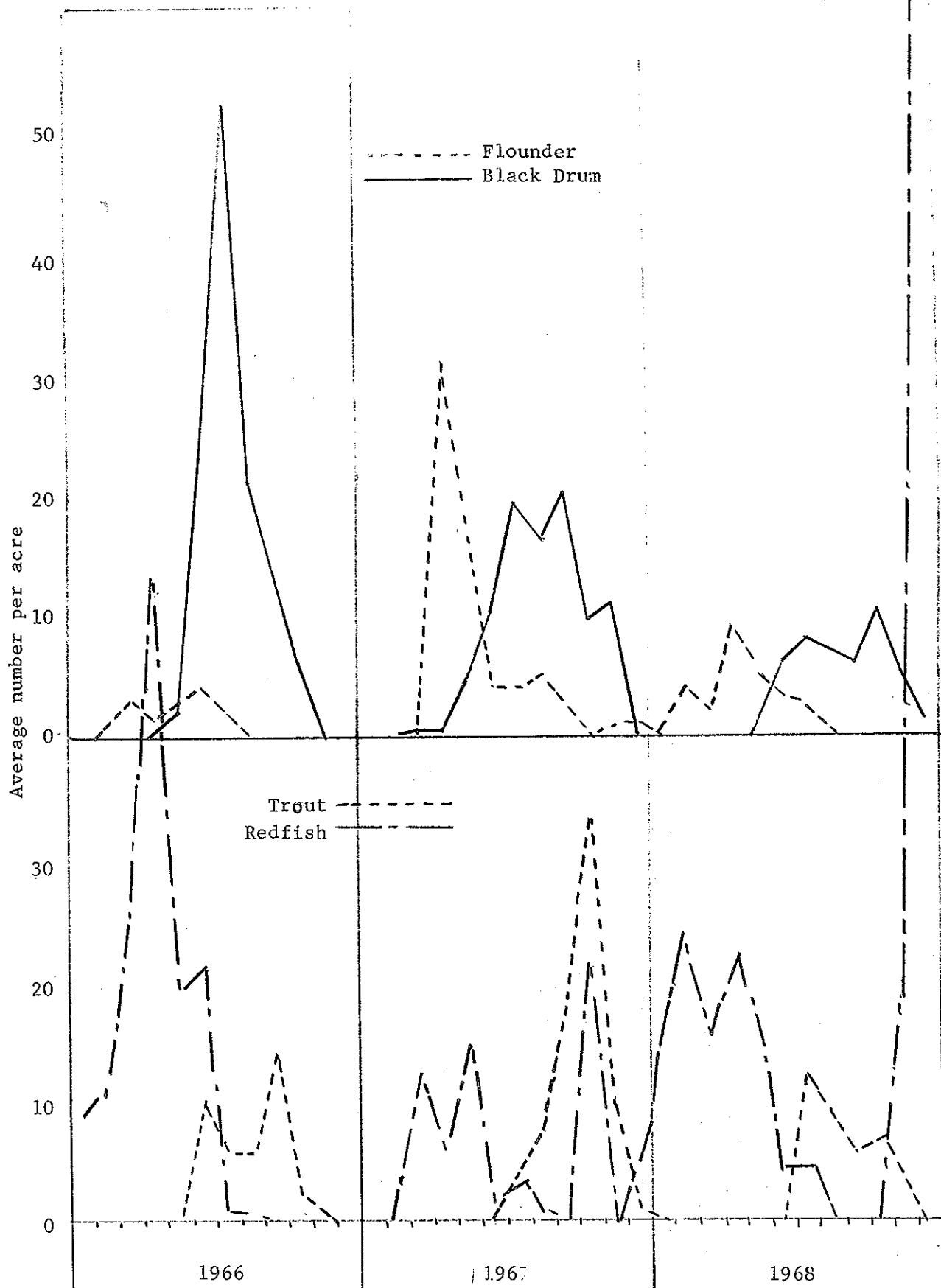
Black Drum - Sampling in 1968 indicates a decline in abundance of juvenile black drum for the third consecutive year. Average peak yields show 64 per acre in July 1966, 20 in September 1967, and 10 in October 1968.

Sheepshead - Juvenile sheepshead continue to remain almost absent from seine samples as they have for the past three years.

Juvenile Game Fish
taken by 60' seine
Galveston Bay Area
1966 - 1968

Fig. 1

170.2



Flounder - Seine samples taken in April 1968 show an average yield of 9 per acre compared to 31 per acre for the same month in 1967. The highest yield in 1966 was 4 per acre in June.

In Summary, juvenile flounder and trout follow the same general trend, down in 1968 from 1967 and comparable to the 1966 averages. Black drum declined in abundance for the third year in a row while redfish increased over 1967 but not over 1966.

Matagorda Bay Area (Figure 2)

There were 107 bag seine samples in the Matagorda Bay area during 1968 with an average of 9 samples per month (Table 2). The total area covered by these samples was 12.3 acres with an average of 5,000 square feet per sample.

Table 2

Juvenile Game Fish Taken by Bag Seine in the Matagorda Bay Area in 1968 by Species and by Month

Species	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Trout	0	0	0	0	0	4	1	6	3	3	26	1
Redfish	38	76	10	13	13	5	15	13	0	2	10	9
Drum	0	1	0	2	0	6	0	3	2	6	3	0
Flounder	2	3	6	14	2	27	17	5	0	0	0	0
Sheeps- head	0	0	0	0	0	4	10	1	4	0	0	0

Redfish - The average peak yield for 1968 increased for the third consecutive year. A peak of 77 per acre was noted in February 1968 compared to 34 per acre in March 1967 and 9 per acre in March 1966.

Trout - No significant change in relative abundance of juvenile trout was noted in 1968 (27 per acre in November) compared to 1967 (24 per acre in October). Both years had lower yields than the 20 per acre in September 1966.

Black Drum - Sampling shows no significant change in relative abundance of juvenile black drum in 1968. The average peaks of 5.5 and 7.0 per acre were lower, however, than the 21 per acre peak yield in 1966.

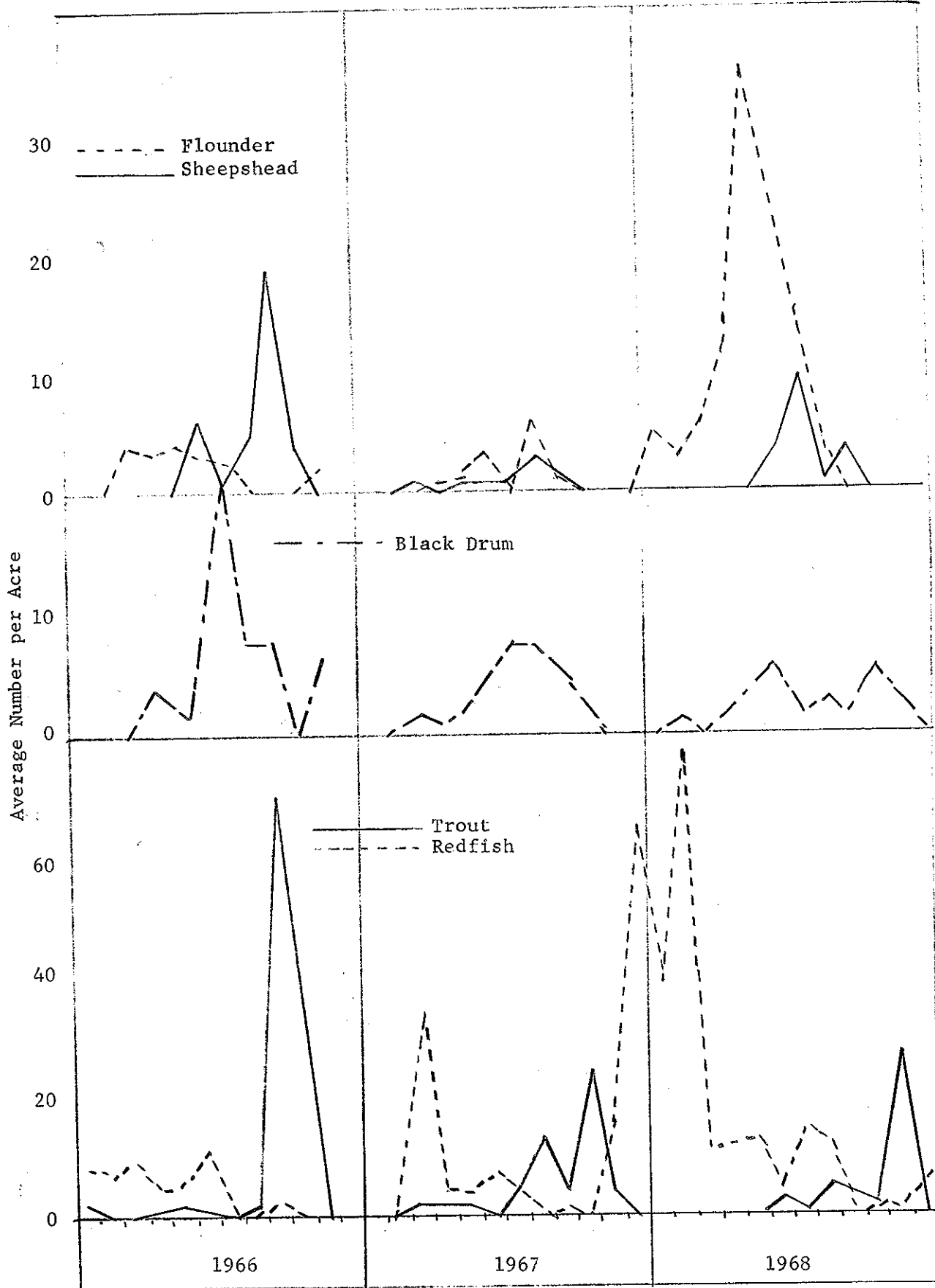
Sheepshead - The peak was 18.5 per acre in 1967 and 9.5 per acre in 1968.

Flounder - A peak of 35 per acre in May 1968 compares with peaks of 6 and 4 per acre in 1967 and 1966 respectively.

In summary, there were significant increases in abundance of flounder and redfish in 1968. Trout and sheepshead increased over 1967 but decreased compared to 1966. Relative abundance of juvenile black drum declined for the third consecutive year.

Juvenile Game Fish
taken by 60' seine
Matagorda Bay Area
1966 - 1968

Fig. 2



San Antonio Bay Area (Figure 3)

There were 37 bag seine samples from the San Antonio Bay area during 1968 with an average of 4 per month during those months in which samples were taken (Table 3). No sampling was done in March, April or November. The total area covered by these samples was 6.71 acres or an average of 7,900 square feet per sample.

Table 3

Juvenile Game Fish Taken by Bag Seine Taken in the
San Antonio Bay Area in 1968 by Month and by Species

Species	Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sept	Oct	Nov	Dec
Trout	0	0	-	-	0	0	2	0	0	0	-	6
Redfish	7	42	-	-	0	10	3	4	1	2	-	1
Drum	0	1	-	-	0	4	3	4	0	3	-	0
Flounder	0	1	-	-	0	1	1	0	0	0	-	0
Sheeps- head	0	0	-	-	0	0	11	2	0	1	-	0

Redfish - Peak yields of almost 30 juvenile redfish per acre in February 1968 compared favorably with the previous two years' peaks which never exceeded 7 per acre.

Trout, black drum and flounder were not sampled adequately to allow comparisons.

Sheepshead - A peak of 24 per acre in July 1968 appears to be a significant increase in relative abundance since the two previous years peaks never exceeded 5 per acre.

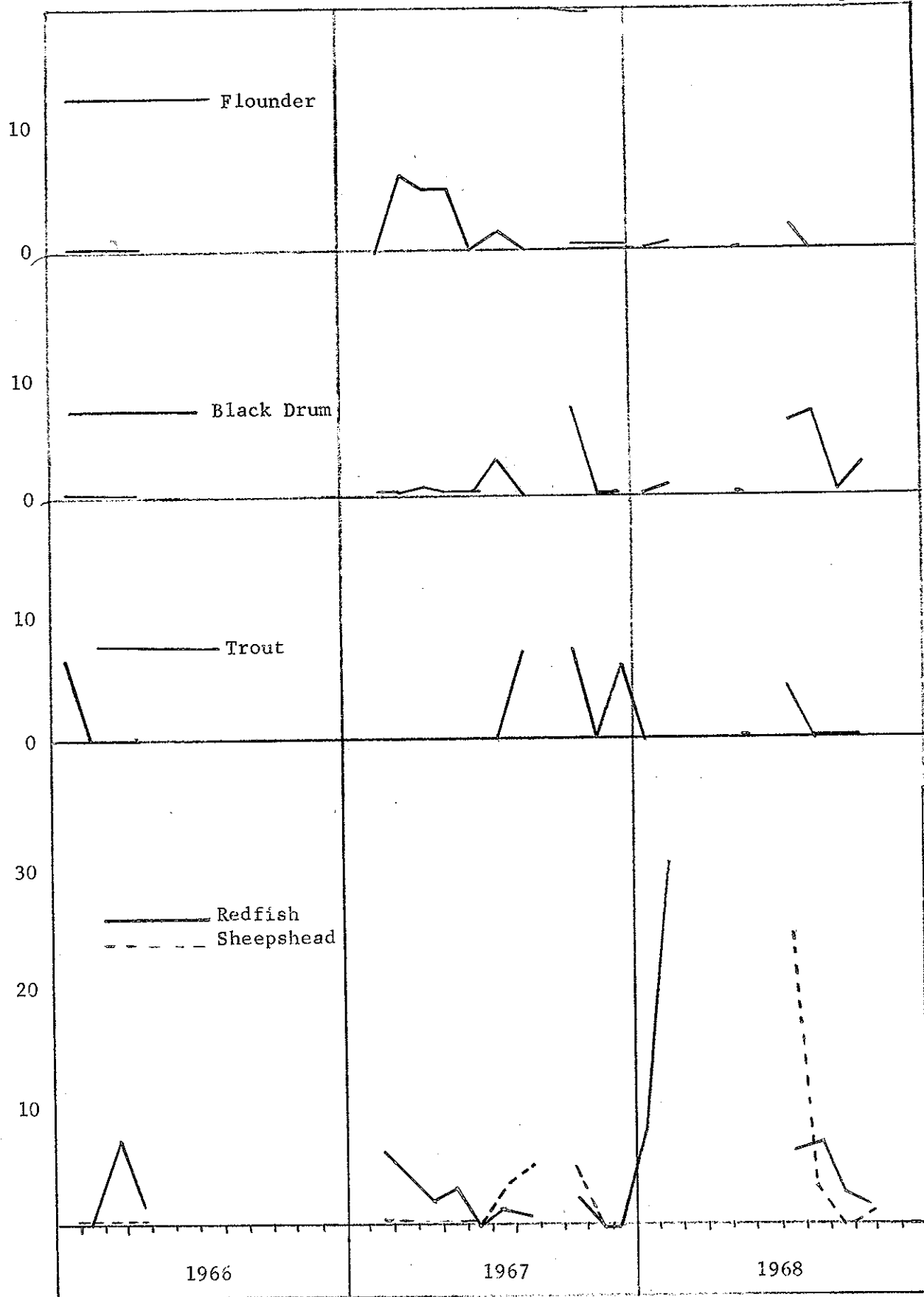
In Summary, redfish and sheepshead were relatively more abundant in 1968 than during the previous two years.

Aransas Bay Area (Figure 4)

There were 10 samples taken each month for a total of 120 samples by bag seine in the Aransas Bay area during 1968 (Table 4). The total area covered was 12.75 acres with an average of 4,625 square feet covered by each sample.

Juvenile Game Fish
taken by 60' seine
San Antonio Bay
1966 - 1968

Fig. 3



Juvenile Game Fish
taken by 60' seine
Aransas Bay
1966 - 1968

Fig. 4

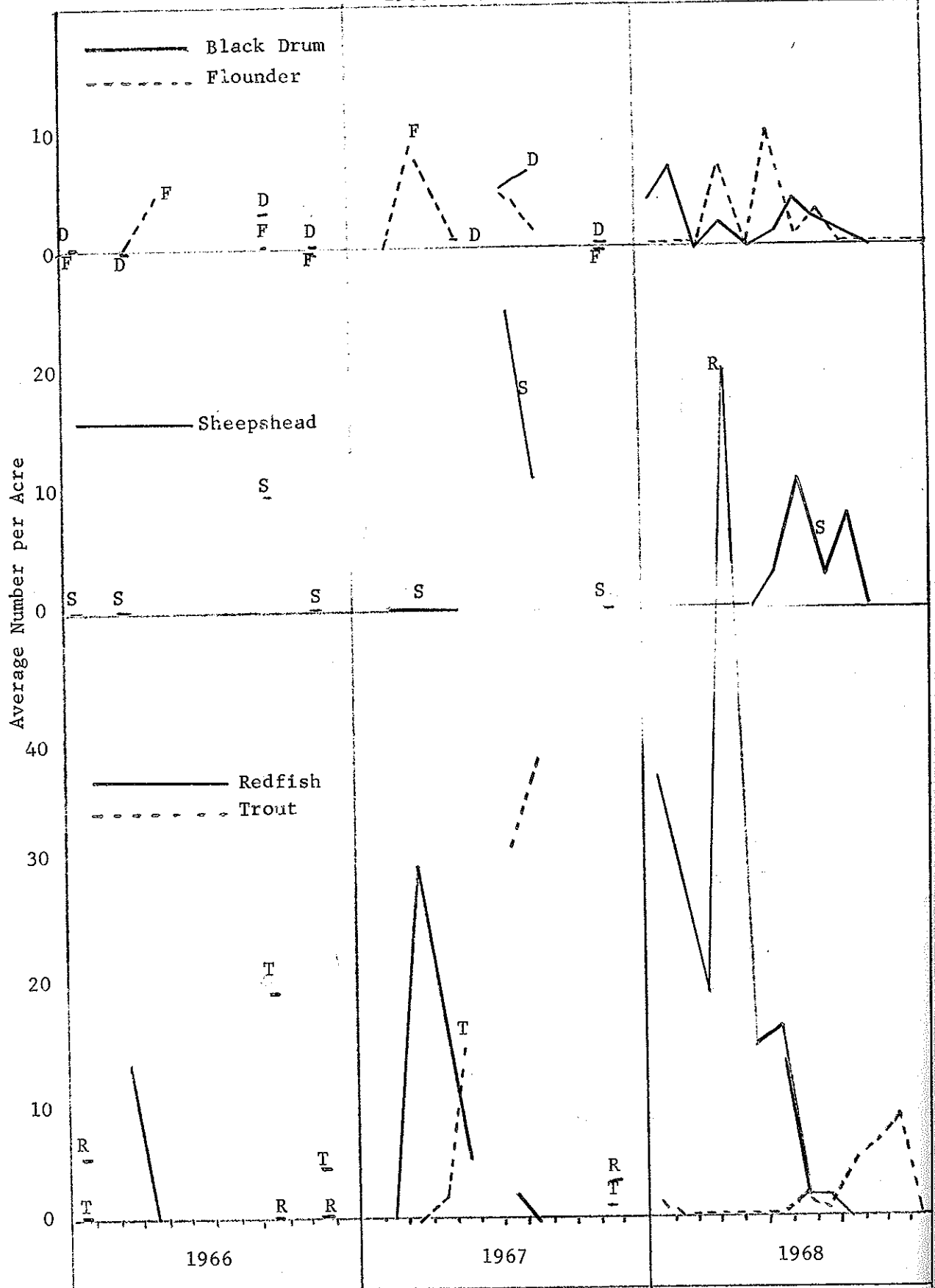


Table 4

Juvenile Game Fish Taken by Bag Seine in the
Aransas Bay Area in 1968 by Month and by Species

Species	Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sept	Oct	Nov	Dec
Trout	1	0	0	0	0	0	2	1	5	2	9	1
Redfish	37	30	19	72	16	16	2	2	0	2	0	0
Drum	4	7	0	2	0	1	4	2	1	0	0	0
Flounder	0	0	0	7	3	10	1	4	0	0	0	0
Sheeps-head	0	0	0	0	0	3	11	3	8	0	0	0

Redfish - For the third consecutive year juvenile redfish increased in abundance in this area. Peak yields of 70 per acre were noted in April 1968 compared with 29 per acre in March 1967 and 13 per acre in March 1966.

Trout - A decrease in abundance was noted for trout with a peak average yield of less than 8 per acre in November 1968. Yields of 38 per acre and 18.5 per acre were noted in 1967 and 1966 respectively.

Black Drum - A peak of 7 per acre was reached in February 1968. No significant change was evident.

Flounder - A peak of 9.5 per acre in 1968 compares with 8.5 in 1967. No significant change was apparent.

Sheepshead - A yield of 25 per acre was noted in 1967. The best 1968 value was 10.5 per acre in July.

In summary, redfish increased in abundance for the third consecutive year. Sheepshead and trout declined in abundance and there was little change in black drum and flounder.

Corpus Christi Bay Area (Figure 5)

There were 108 bag seine samples taken in the Corpus Christi Bay area during 1968 with an average of 9 samples taken each month. The total area covered by these samples was 10.8 acres with an average of 4,355 square feet per sample.

Juvenile Game Fish
taken by 60' seine
Corpus Christi Bay
1966 - 1968

Fig. 5

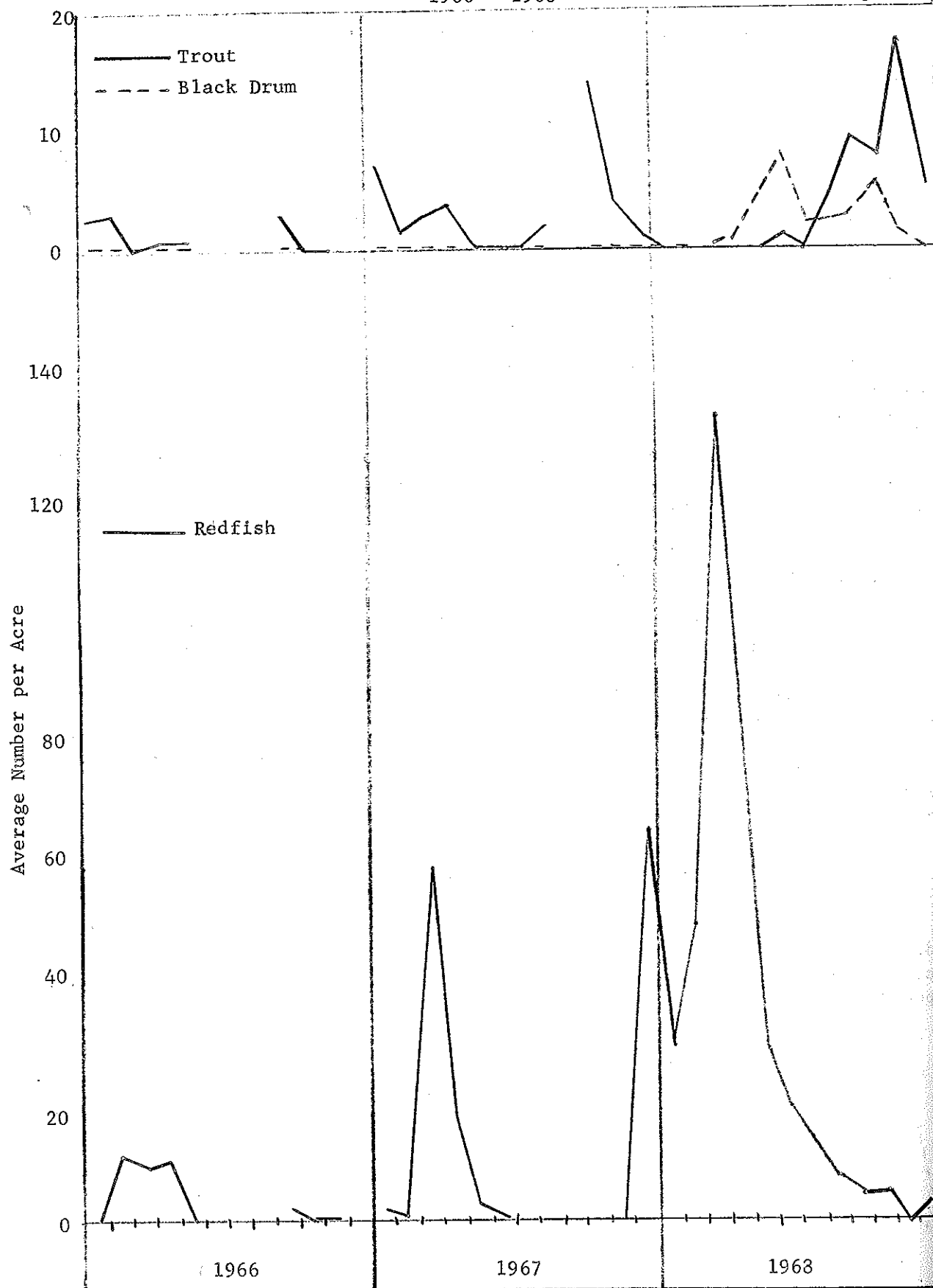


Table 5

Juvenile Game Fish Taken by Bag Seine in the
Corpus Christi Bay Area in 1968 by Month and by Species

Species	Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sept	Oct	Nov	Dec
Trout	0	0	0	0	0	6	0	4	8	7	16	5
Redfish	27	45	120	69	25	17	11	6	4	4	0	0
Drum	0	0	0	1	4	7	2	2	3	6	1	0
Flounder	0	0	0	0	0	1	0	1	0	0	0	0
Sheeps-head	0	0	0	0	0	0	1	0	1	0	0	0

Redfish - As in Aransas Bay, juvenile redfish increased in abundance for the third consecutive year. A peak of 133 per acre in 1968 compares with 58 per acre in 1967 and 11 per acre in 1966.

Trout - A peak of 17.5 per acre was noted in November 1968. The highest yield noted in 1967 was 14 per acre indicating no significant change in relative abundance of this species.

Black Drum - A peak yield of 8 per acre in 1968 is evident, but no comparison is possible.

In summary, the relative abundance of redfish increased for the third year in a row. No change was noted in trout.

Upper Laguna Madre Area (Figure 6)

There were 117 bag seine samples in the Upper Laguna Madre area during 1968 with an average of 10 samples per month (Table 6). The total area covered was 12.7 acres with an average of 4,730 square feet per sample.

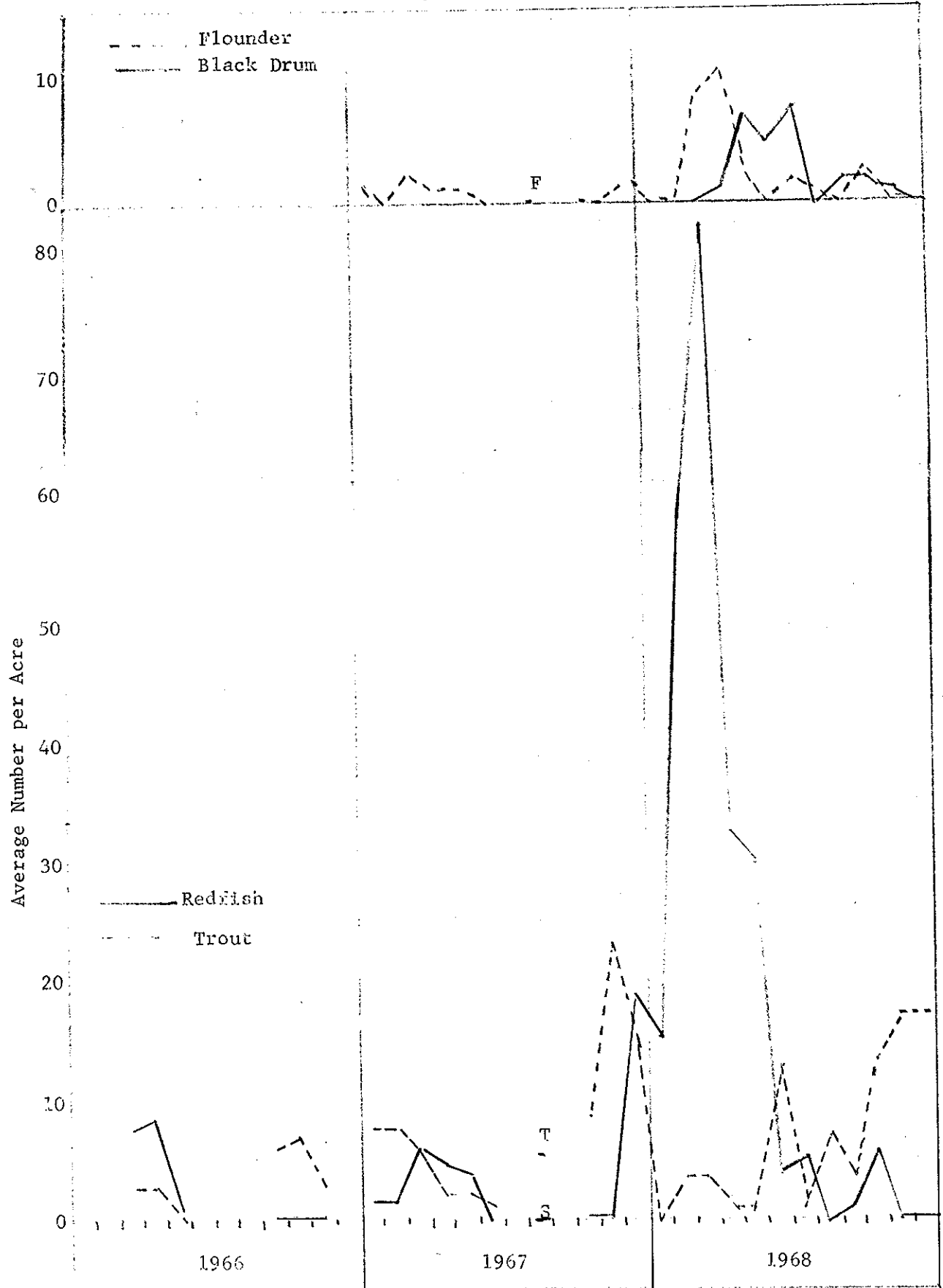
Table 6

Juvenile Game Fish Taken by Bag Seine in the
Upper Laguna Madre during 1968 by Month and by Species

Species	Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sept	Oct	Nov	Dec
Trout	0	5	4	1	1	13	1	8	4	12	18	17
Redfish	25	84	97	32	30	4	3	0	1	6	0	0
Drum	0	0	0	2	8	5	8	0	2	2	1	0
Flounder	0	0	0	11	3	0	2	0	2	1	0	0
Sheepshead	0	0	0	0	0	0	0	1	1	0	2	0

Juvenile Game Fish
taken by 60' seine
Upper Laguna Madre
1966 - 1968

Fig. 6



Redfish - Relative abundance of juvenile redfish in 1968 far exceeded peaks noted in the previous years. Over 82 per acre were noted in March 1968 compared to peaks of 6 per acre in 1967 and 9 per acre in 1966.

Trout - The relative abundance of juvenile trout in November and December 1968 stood at 17 per acre. This was not as abundant as the 23 per acre peak set in November 1967, but did exceed the 7 per acre noted in 1966.

Black Drum - A maximum yield of 8 per acre was noted in the summer of 1968, but no comparison with previous years is possible.

Flounder - A peak yield of 11 per acre in April 1968 compares well with 2.5 per acre the previous year.

In summary, redfish and flounder increased in abundance in 1968 while trout declined.

Lower Laguna Madre Area (Figure 7)

There were 115 bag seine samples from the Lower Laguna Madre area during 1968 with an average of 9 samples per month (Table 7). The total area covered was 16.9 acres with an average of 6,400 square feet per sample.

Table 7

Juvenile Game Fish Taken by Bag Seine in the Lower Laguna Madre During 1968 by Month and by Species

Species	Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sept	Oct	Nov	Dec
Trout	8	1	-	0	0	5	5	1	4	3	12	9
Redfish	162	93	-	178	68	24	16	11	5	9	8	20
Drum	0	0	-	1	18	11	7	5	3	1	1	1
Flounder	0	2	-	10	2	0	0	0	0	0	0	0
Sheepshead	0	0	-	1	0	1	0	1	4	0	2	0

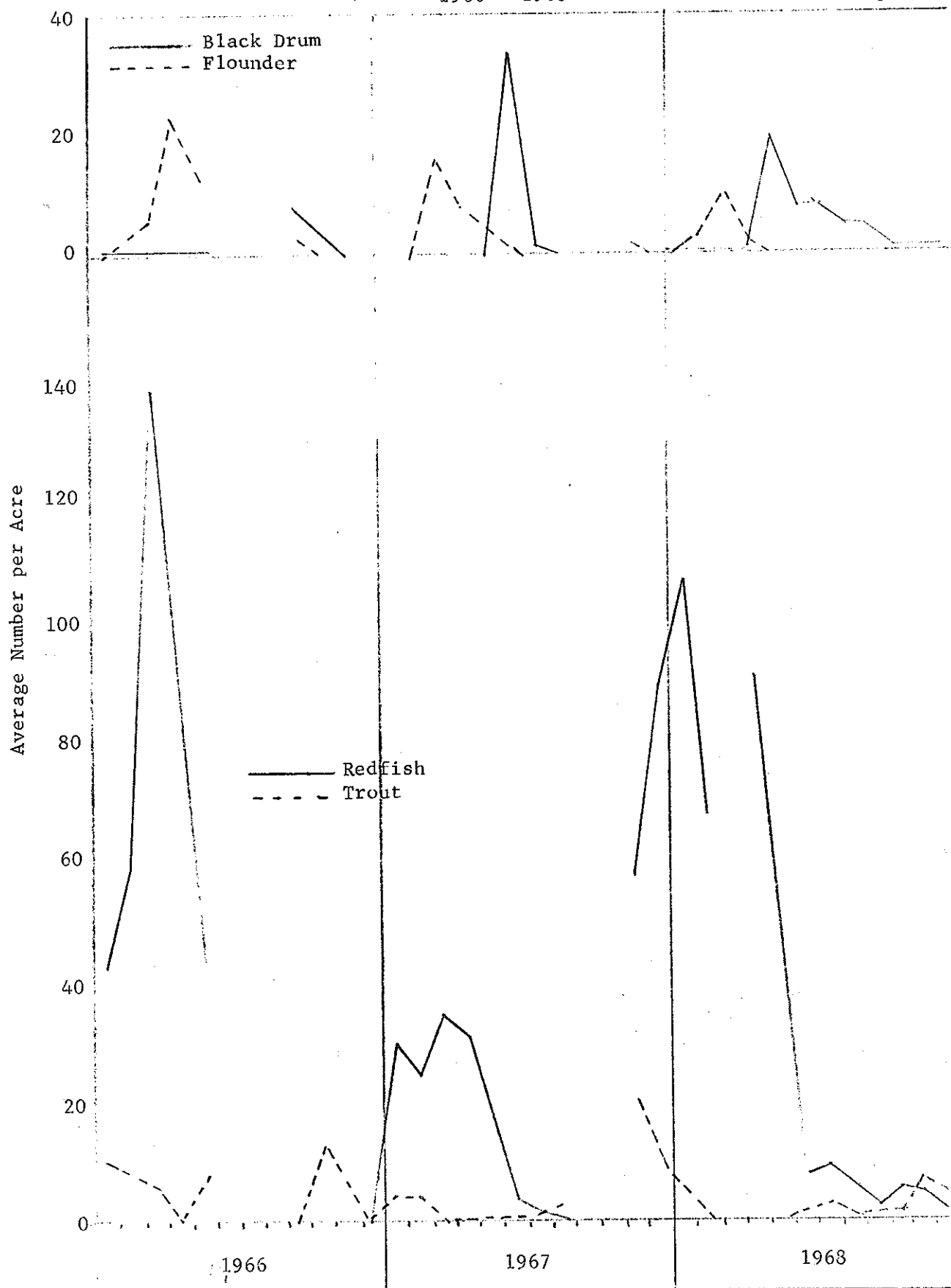
Redfish - Samples could not be taken in March, the usual peak period. January, February and April averages were 106, 67 and 90 per acre respectively, and this far exceeds the 34 per acre peak noted in 1967. It does not exceed the 138 per acre noted in 1966. Supplemental sampling, however, indicates that 1968 was an extremely good year for juvenile redfish.

Trout - No valid data are available because of too few individuals taken.

Black Drum - A peak of 10 per acre was recorded in May 1968 compared to 17 per acre in June 1967. Peaks were not sharp and samples were few; therefore, the change may not be significant.

Juvenile Game Fish
taken by 60' seine
Lower Laguna Madre
1966 - 1968

Fig. 7



Flounder - Relative abundance of juvenile flounder declined for the third year in a row. Peak yields of 11.5, 8 and 5 per acre were noted in 1966, 1967 and 1968 respectively.

In summary, there was an increase in relative abundance of redfish, a decrease in flounder and no change in black drum.

Coastwide Summary - Juvenile Fish Sampling

Redfish - In almost every bay area the relative abundance of juvenile redfish was the best noted since quantitative sampling began. In all instances the juvenile stock was more than adequate to insure a bumper crop.

Trout - There was no instance of an increase in relative abundance of juvenile trout in any bay area. In two areas a decline was noted; in all others there appeared to be no significant change since the previous years.

Black Drum - No marked change in relative abundance of juvenile black drum was noted anywhere except Galveston Bay where a decline occurred. In all other areas there were slight increases or decreases which were probably not significant.

Flounder - Relative abundance was up in Matagorda Bay and the Upper Laguna Madre areas, down in Galveston Bay and the Lower Laguna Madre areas. No change was noted in the Aransas Bay area.

Sheepshead - Relative abundance was up in Matagorda and San Antonio Bays and down in Aransas Bay.

Adult Fish Sampling

The results of adult fish sampling by drag seine in the Galveston Bay area and by trammel net in Aransas Bay and the Upper and Lower Laguna Madres for 1968 with comparisons for the years 1966 and 1967 are shown in Figures 8 through 11.

Galveston Bay Area (Figure 8)

In the Galveston Bay area, adult fish were sampled by drag seine in the spring period between May 6 and July 1 and in the fall period between October 14 and November 22. Spring sets totaled 25 covering 90 acres while fall sets totaled 19 covering 66 acres (Table 8).

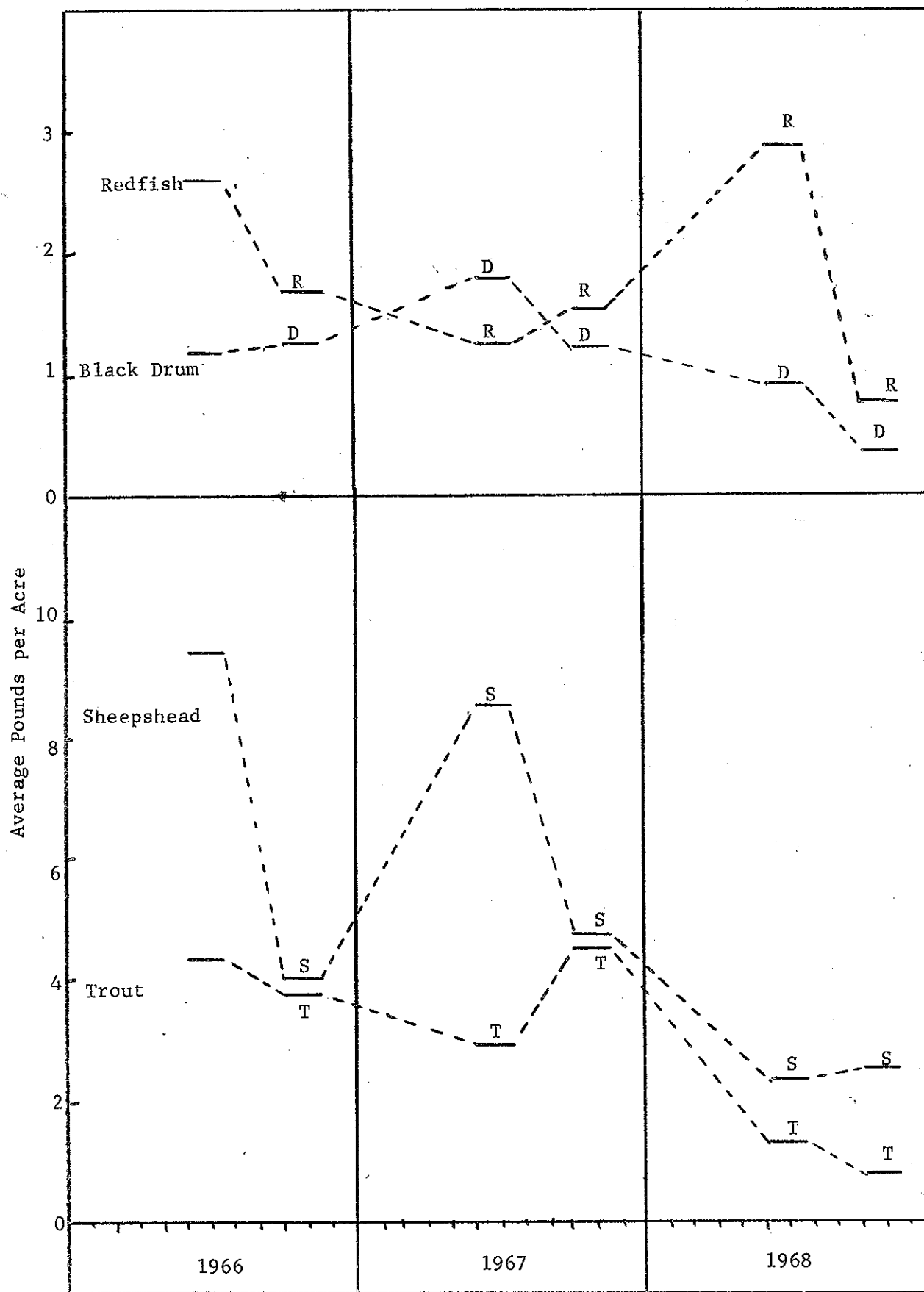
Table 8

Total Number and Total Calculated Weight in Pounds of Adult Game Fish Caught by Trammel Net in the Galveston Bay Area in 1968 by Species

Period	Trout	Redfish	Drum	Flounder	Sheepshead
Spring No.	151	149	72	32	157
Wt.	121.6	259.7	77.6	12.5	211.8
Fall No.	52	36	127	8	130
Wt.	52.0	51.0	25.4	7.2	169.0

Adult Fish Samples
taken by drag seine
Galveston Bay
1966 - 1968

Fig. 8



Average yields of adult game fish in spring sampling were 1.25 pounds per acre of trout, 2.89 pounds per acre of redfish, 2.35 pounds per acre of sheepshead and 0.93 pounds per acre of black drum. Fall samples of sheepshead showed no change at 2.56 pounds per acre while trout declined to 0.79 pounds per acre, redfish to 0.38 pounds per acre and black drum to 0.38 pounds per acre.

Matagorda Bay Area

Adult fish sampling was restricted to 2 strikes in the spring sampling period and 7 strikes in the fall period. Each of the 9 strikes covered an area of 2 acres. The results of these strikes are shown in Table 9. The number of samples taken was considered to be too few to analyze.

Table 9

Total Number and Total Calculated Weight in Pounds of Adult Game Fish Caught by Trammel Net in Matagorda Bay in 1968 by Species

Period	Trout	Redfish	Drum	Flounder	Sheepshead
Spring No.	4	6	10	0	1
Wt.	3.4	6.6	8.4	0	4.7
Fall No.	30	55	31	3	0
Wt.	68.9	135.7	37.5	8.2	0

San Antonio Bay Area

Adult game fish sampling was limited to 3 strikes in the spring sample period and 6 strikes in the fall period. The total area covered by these 9 strikes was 88.19 acres or about 9.8 acres per strike. The results of these strikes are shown in Table 10. The number of samples taken was considered to be too few to analyze.

Table 10

Total Number and Total Calculated Weight in Pounds of Adult Game Fish Caught by Trammel Net in the San Antonio Bay Area in 1968 By Species

Period	Trout	Redfish	Drum	Flounder	Sheepshead
Spring No.	315	120	31	4	3
Wt.	491.2	172.0	60.8	2.2	4.7
Fall No.	35	40	35	2	0
Wt.	62.2	97.5	59.4	1.8	0

Aransas Bay Area (Figure 9)

In the Aransas Bay area the spring sampling period extended from July 8 to August 21. Fall sampling was accomplished between October 15 and December 17. Spring samples consisted of 39 sets with a 1200-foot trammel net covering some 161 acres. Fall sets totaled 19 covering 82 acres (Table 11).

Table 11

Total Number and Total Calculated Weight of Adult Game Fish Taken
By Trammel Net in the Aransas Bay Area in 1968 by Species

Period	Trout	Redfish	Drum	Flounder	Sheepshead
Spring No.	185	228	226	32	18
Wt.	431.6	434.7	253.4	40.5	30.3
Fall No.	540	398	450	14	15
Wt.	1,549.0	748.3	468.4	23.2	17.1

Average yields of adult fish in spring samples were 2.67 pounds per acre of trout, 2.63 pounds per acre of redfish, 1.57 pounds per acre of black drum, 0.31 pounds per acre of flounder and 0.19 pounds per acre of sheepshead. In the fall samples trout increased to 18.79 pounds per acre, redfish to 9.06 pounds per acre and black drum to 5.68 pounds per acre. Flounder and sheepshead showed little change at 0.28 and 0.21 pounds per acre respectively.

Upper Laguna Madre (Figure 10)

In the Upper Laguna Madre area, adult fish sampling with 1200-foot trammel net was accomplished during the spring period from May 9 to July 23. Fall samples were taken from November 5 to November 21. Spring samples consisted of 36 sets covering 233 acres; fall sets numbered 6 covering 33 acres (Table 12).

Table 12

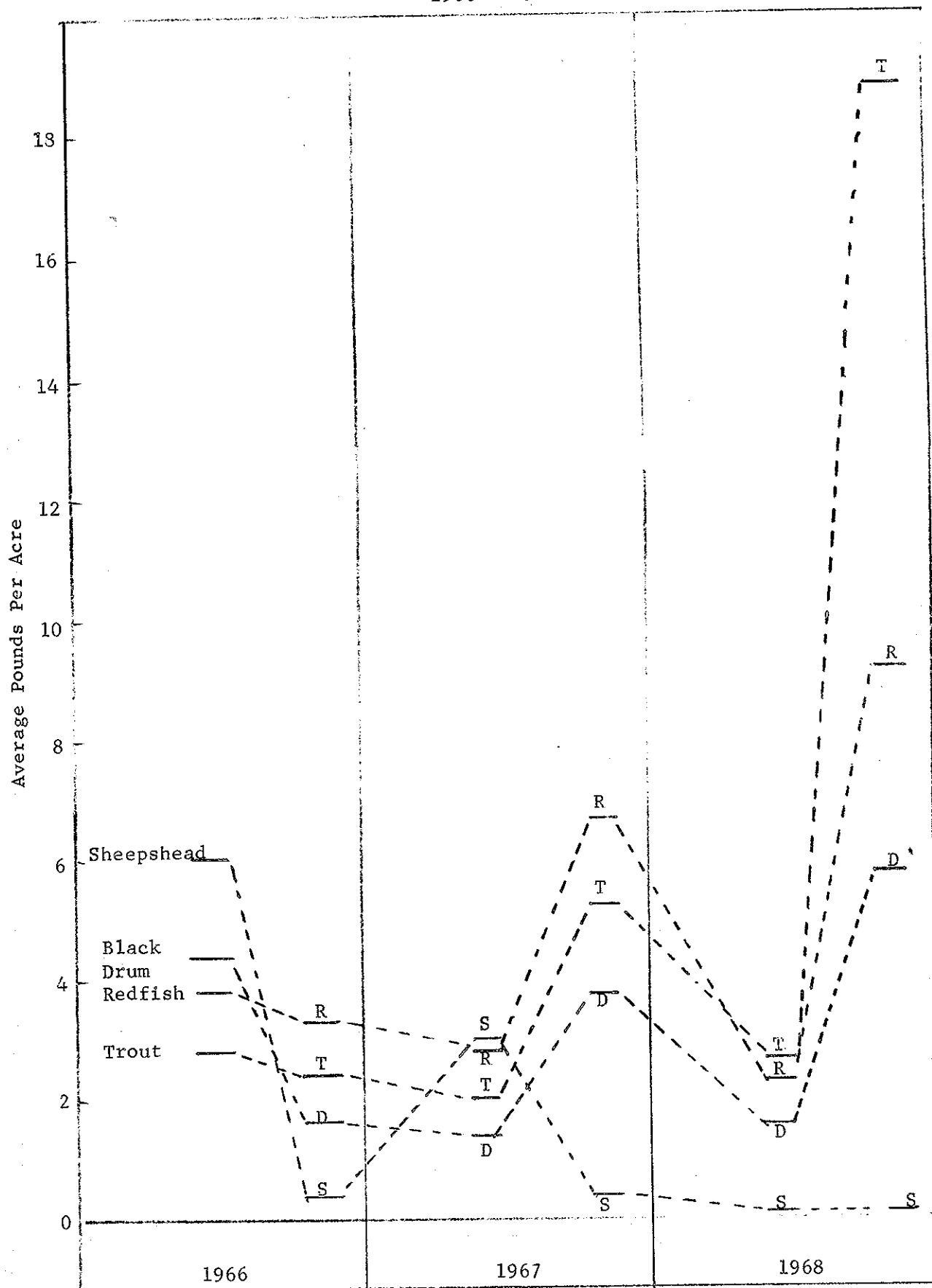
Total Number and Total Calculated Weight of Adult Game Fish Taken
By Trammel Net in the Upper Laguna Madre Area in 1968 by Species

Period	Trout	Redfish	Drum	Flounder	Sheepshead
Spring No.	249	69	55	12	1
Wt.	746.3	93.9	48.3	15.2	2.3
Fall No.	8	5	17	2	2
Wt.	15.3	4.2	7.6	2.0	4.8

Spring sampling included 3.20 pounds per acre of trout, 0.40 pounds per acre of redfish and 0.21 pounds per acre of black drum. Fall sets yielded 0.46 pounds per acre of trout, 0.13 pounds per acre of redfish and 0.23 pounds per acre of black drum, although shortage of fall samples makes comparisons difficult.

Adult Game Fish Samples
taken by drag seine and trammel net
Aransas Bay
1966 - 1968

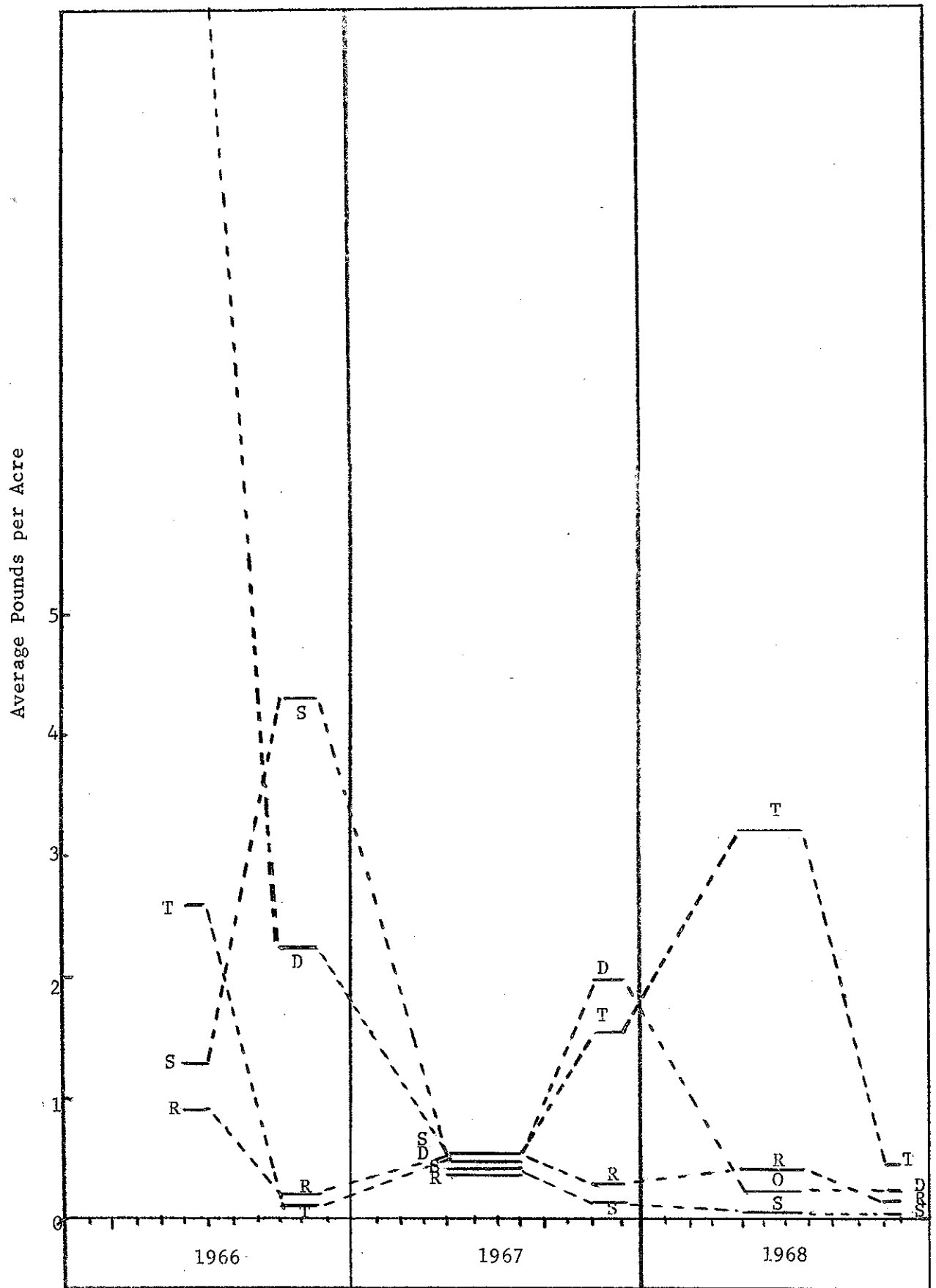
Fig. 9



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Adult Fish Samples
taken by Trammel Net
Upper Laguna Madre
1966 - 1968

Fig. 10



Lower Laguna Madre (Figure 11)

In the Lower Laguna Madre, adult fish were sampled with 1200-foot trammel net. Spring samples were taken between April 25 and June 14. Fall samples were taken on October 8 and December 11. Spring sampling consisted of 22 sets covering 103 acres; fall samples consisted of 31 sets covering 147 acres (Table 13).

Table 13

Total Number and Total Calculated Weight of Adult Game Fish
Taken by Trammel Net in the Lower Laguna Madre in 1968 by Species

Period	Trout	Redfish	Drum	Flounder	Sheepshead
Spring No.	129	44	5	17	28
Wt.	282.1	109.0	8.6	22.9	42.8
Fall No.	316	432	401	18	43
Wt.	624.3	657.5	504.1	32.9	76.1

Spring sampling indicated an average yield of 2.72 pounds per acre of trout, 1.16 pounds per acre of redfish, 0.09 pounds per acre of black drum, 0.23 pounds per acre of flounder and 0.38 pounds per acre of sheepshead. Fall samples showed general increases to 4.07 pounds per acre of trout, 4.24 pounds per acre of redfish, 4.82 pounds per acre of black drum, 0.22 pounds per acre of flounder and 0.52 pounds per acre of sheepshead.

Adult Game Fish Summary

An analysis of adult fish sampling data (Figures 8-11) indicate little if any coastwide correlation of results. In Aransas Bay and Upper Laguna Madre the method of adult fish sampling was changed from drag seine to trammel net at the end of 1967. In the Lower Laguna Madre area no adult fish samples were taken in the fall of 1967.

Discussion

In the previous report some of the various factors which contributed to inconclusive data were listed. These factors included missed samples, equipment breakdowns, personnel illness and shortage of personnel, inclement weather and pre-empted sampling time. In spite of changes made in 1967 in efforts to reduce these undesirable factors, little progress seems to have been made toward achieving valid results.

Since the principle desired result of the sampling appears to be in the area of relative abundance, since the principle use of relative abundance of species is used in the management of the species, and since the department management responsibilities toward fin-fish is very limited, it is recommended that work on fin-fish on the Texas coast be substantially revised and reduced.

An analysis of fish tagging results in recent years will be presented in a special report.

Adult Fish Samples
taken by trammel net
Lower Laguna Madre
1966 - 1968

Fig. 11

