

Analysis of Populations of Sports and Commercial Fin-fish  
in the Coastal Bays of Texas

Project ME-R-7, Job No. 1

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ABSTRACT

Juvenile food and game fish were sampled in all bay areas with 60-foot bag seines; adults were sampled with trammel nets and drag seines. Juvenile redbfish, Sciaenops ocellata, were more abundant in 1965 than in 1964 in the Galveston Bay, Matagorda Bay, and Lower Laguna Madre areas, but were less abundant in Corpus Christi Bay and the Upper Laguna Madre. Juvenile trout, Cynoscion nebulosus, numbers declined in Galveston Bay and the Laguna Madre and were more abundant in Aransas Bay and San Antonio Bay. Juvenile black drum, Pogonias cromis, were less abundant in all areas, while young flounder, Paralichthys lethostigma, were generally more abundant.

No increases were noted for adult black drum, and there was a decline in most areas. Redfish and trout became more numerous in the fresher water bays (Galveston, Matagorda, San Antonio), but generally decreased along the lower coasts, where sheepshead increased in numbers.

INTRODUCTION

The commercial catch of trout, Cynoscion nebulosus, redbfish, Sciaenops ocellata, black drum, Pogonias chromis, flounder, Paralichthys lethostigma, and sheepshead, Archosargus probatocephalus, during the 1963-64 fiscal year was 3,037,563 pounds, or 96 per cent of the total landings of edible fin-fish from Texas bays. These five species are also important to the sports fishery which is reliably estimated to be at least equal to the commercial fishery.

More information on certain aspects of the life history study such as diurnal migrations, use of coastal passes, natural mortality, fishing mortality and fecundity is needed on each of the species under consideration. Additional information is needed on biological statistics if population trends are to be known. These statistics involve catch per unit of effort, age composition of stocks, and relationships between adult and juvenile stock. Criteria are needed to evaluate fluctuations in catch and stock and to allow predictions of future availability.

This project is designed to determine seasonal and annual fluctuations in fin-fish populations of Texas coastal bays, and to formulate ratios between juvenile and adult food and game species.

Work done during this study included routine sampling of juvenile and adult fin-fish of the five important bay species in each of seven Texas bay systems.

The purpose of this sampling was to determine relative abundance and success of spawning. Fish of sufficient size caught by these methods and by supplementary means were tagged and released to study movements, migrations, and rate of fishing harvest. Data were compared with those of previous studies to determine change in annual abundance of each species.

## DESCRIPTION OF AREA

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

## MATERIAL AND METHODS

Juvenile Fish - a 6-foot bar seine of  $\frac{1}{2}$ -inch stretched mesh was pulled by hand a distance of 500 feet at prescribed stations in the Galveston, Matagorda, and San Antonio Bay areas. This method was not used in the other areas.

A 60-foot bag seine, 6 foot deep, of  $\frac{3}{4}$  inch stretched mesh was used at prescribed stations in all bay areas. The area covered by the seine was calculated for each sample.

All juvenile game fish were measured and reported as number of individuals per acre.

Adult fish - A drag seine of varying length, 6 feet deep and of 2-inch mesh, was used at prescribed stations in the Galveston, Aransas, Corpus Christi, and Upper Laguna Madre Bay areas to sample adult fish monthly. The seine was pulled and the area covered was calculated.

A trammel net, 1,200 feet long, 40 inches deep, of 3-inch stretched inside mesh and 12-inch stretched outside mesh was used at prescribed stations in the Matagorda, San Antonio, and the Lower Laguna Madre Bay areas to sample adult fish monthly. The nets were struck and the area enclosed was calculated.

In all adult fish samples, game fish were measured and counted by species. 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 routine samples were usually tagged and released. Gill nets, gigs, trot lines, and hooks and lines were also used to obtain fish for tagging. Fish were tagged with monel jaw tags, or Peterson disc tags.

## RESULTS

Juvenile Fish Sampling - The results of juvenile fish sampling by 60-foot seine for 1964 and 1965 in each bay system are shown in Figures 1 through 7.

### Area M-2 and 3 - Galveston Bay (Figure 1)

Redfish - It would appear that 1964 was a better year for juvenile redfish,

since the primary peak in March, 1964 was 47 per acre, and the primary peak in April, 1965 was only 22 per acre. The second highest catch in 1964 (27 in April) exceeded the second highest catch in 1965 (11 in March).

Trout - Figure 1 indicates that 1965 was the more successful year for juvenile trout, since there was a pronounced peak of 50 per acre in October, with 36 in September, and 30 in November. In 1964 there was a peak of 45 in November and 22 in October. No sample was taken in December, 1964.

Black drum - In both years, similar peaks were observed in July, with the 1965 peak of 173 per acre comparing favorably with the 1964 peak of 124 per acre. Both peaks were narrow; each represented only one month.

Sheepshead - The 1965 spawn of sheepshead contributed to a peak of 19 per acre in July, 1965, with values of 9 and 6 in June and August. In 1964, the peak appeared in May, and was only 7 fish per acre.

Flounder - The 1964 peak far exceeded that reached in 1965, and the standing crop of juveniles was higher throughout the year. In 1964, the range was 3 to 27 fish per acre, while in 1965 it was 1 to 8 fish per acre.

In summary, juvenile redfish and flounder were more abundant in 1964, while trout, black drum, and sheepshead were more abundant in 1965.

#### Area M-4 - Matagorda Bay (Figure 2)

Redfish - The absence of samples in December, 1964 and January, 1965 makes evaluation difficult. The peak in May, 1964 was 24 per acre, and in May, 1965 it was 11 per acre.

Trout - There appears to be little difference in the degree of success of trout spawning in Matagorda Bay during the two-year period. Catches ranged from 19 to 28 per acre in 1964, and 13 to 21 in 1965.

Black drum - No samples were taken in June or July, 1965; therefore, the peak was missed, and the two years cannot be compared.

Sheepshead - This also applied to sheepshead.

Flounder - This is the only species that was definitely more abundant in 1965 than in 1964. Peaks of 20 and 11 occurred in March and May, 1965. In 1964, a single peak of 14 was noted in May.

#### Area M-5 - San Antonio Bay (Figure 3)

Redfish - Few juvenile redfish were taken in San Antonio Bay either year.

Trout - Samples collected in September, October, November, and December, 1965 yielded peaks of 11, 6, and 10 fish per acre. In 1964, there was a single peak of 7 during these same months.

No samples were taken in the summer of 1965, and no comparisons can be made for flounder, black drum, and sheepshead.

#### Area M-6 - Aransas Bay (Figure 4)

Redfish - There appears to be little difference between 1964 and 1965 juvenile redfish samples in this area. In 1964, the spring peak was 28 per acre, and in 1965 it was 24 per acre.

Trout - No summer samples were taken in 1965 to compare with the summer samples for 1964, but the fall samples were higher in 1965 than in 1964 (67 and 45 per acre), while the spring samples were better in 1964.

Black drum - Juvenile black drum were scarce both years.

Sheepshead - The absence of summer samples in 1965 makes comparison impossible.

Flounder - The spring peak of 27 in 1965 was over twice that of 13 in 1964.

In general, there was an increase in trout and flounder in 1965, with no notable change in the other three species.

#### Area M-7 - Corpus Christi Bay (Figure 5)

Redfish - Juvenile redfish reached a peak of 142 in 1964 in March and April, but were almost absent in the same months in 1965.

Comparisons on the other species will not be attempted due to the absence of summer samples in 1965 for trout and flounder and the absence of fish in samples for drum and sheepshead in both years.

#### Area M-8 - Upper Laguna Madre (Figure 6)

Redfish - As in the adjoining Corpus Christi Bay area, juvenile redfish declined in abundance in 1965. In 1964, the peak in April was 40 per acre; in 1965 the peak in March was 9 per acre.

Trout - A decline was observed in production of juvenile trout in 1965.

Black drum - A sharp decline in juvenile black drum abundance was evident in 1965.

Few sheepshead or flounder were taken.

A decline was observed in all species in 1965 compared to 1964.

#### Area M-9 - Lower Laguna Madre (Figure 7)

Redfish - There was a significant increase in juvenile redfish in 1965 over 1964. A distinct peak of 90 per acre in February and 110 per acre in April 1965 overshadowed the peak of 16 per acre in April, 1964.

Trout - Fall samples in 1965 indicate a decline in trout production compared to 1964. The population peaked at 32 per acre in November, 1964, and continued at approximately this level through January, 1965. The fall peak in 1965 was 19 per acre in December.

Black drum - There appeared to be little significant difference in black drum production in 1965 and 1964, with low numbers observed both years.

Sheepshead - Production in 1965 appeared to be double that of 1964, with peaks of 36 (September 1965) and 16 (September 1964) respectively.

Flounder - Spring samples indicate a significant increase in juvenile flounder in 1965 compared to 1964.

In general, redfish, sheepshead, and flounder increased in 1965, while trout declined in numbers since 1964.

#### Juvenile Game Fish Summary

Redfish - Production of juvenile redfish was up in the Galveston, Matagorda, and Lower Laguna Madre areas in 1965, but a decline was evident in the Corpus Christi Bay and Upper Laguna Madre areas.

Trout - Only the San Antonio Bay and Aransas Bay areas experienced an increase in trout, while numbers decreased in the Galveston Bay area and the Upper and Lower Laguna Madre.

Drum - Juvenile black drum were less abundant in Galveston Bay, Matagorda Bay, and the Upper Laguna Madre in 1965. No increase in drum was noted in any area.

Sheepshead - Juvenile abundance was up only in the Lower Laguna Madre, and was definitely down in Galveston Bay.

Flounder - Juvenile flounder increased in abundance in 1965 in the Galveston, Matagorda, Aransas, and Lower Laguna Madre areas. No decrease was noted in any area.

Adult Game Fish Sampling - The results of adult fish sampling by drag seine and trammel net for 1964 and 1965 in each bay system are shown in Figures 8 through 14.

Neither the drag seine nor the trammel net is adequate for sampling flounder in Texas bays. Therefore, figures on this species will not be considered.

Sheepshead are difficult to catch in trammel nets; therefore, figures for this species will not be presented for Matagorda Bay, San Antonio Bay, and the Lower Laguna Madre.

#### Galveston Bay (Figure 8)

Redfish - Adult redfish samples in this area have never averaged over 0.5 pounds per acre. Catches in 1964 and 1965 were typically low.

Trout - A decided increase in trout in the adult fish samples was noted in 1965, when peaks of 11.0 (June) and 7.0 pounds per acre (November) were plotted. In 1964, there was a single peak of 3.0 pounds per acre in April.

Black drum - There was a significant decline in 1965. In 1964 a sharp peak of 2.9 pounds per acre was observed in March; two other peaks of 1.5 and 1.3 were found in May and November. In 1965, no sample exceeded 0.6 pounds per acre.

Sheepshead - Adult sheepshead were many times more abundant in samples in 1965 than in 1964. A peak of 42.1 pounds per acre occurred in September, 1965, and another of 8.7 in June. In 1964, peaks of 4.5 and 2.7 were found in May and October.

While trout and sheepshead increased in abundance in this area in 1965, a decline in black drum was noted.

#### Matagorda Bay (Figure 9)

Redfish - An increase in redfish was evident in 1965 in this area. The best catches were in September (3.9 pounds per acre) and May (2.8 pounds per acre). In 1964, one peak of 1.4 pounds per acre was noted in July.

Trout - A major peak of 5.6 to 8.5 pounds per acre was found from November, 1964 to January, 1965. Because of this overlap, the two years cannot be compared.

Black drum - There appeared to be little significant difference between 1964 and 1965 drum samples in this area. Again, the major peak occurred from December through January.

Redfish increased in abundance in 1965, while no change was evident in black drum and trout populations.

#### San Antonio Bay (Figure 10)

Redfish - The 1965 fall peak of redfish in this area is the only variation from the predominately low redfish populations over the two-year period. This peak of 14.9 pounds per acre in October, 1965 indicates an increase in redfish over 1964, but it is possible that this increase was due to improved sampling techniques.

Trout - The fall peak of 7.3 pounds per acre in October, 1965 was about double that of the previous year, indicating an increase in abundance of trout in the area since 1964.

Few black drum were taken in either 1964 or 1965. Both redfish and trout apparently increased in 1965.

#### Aransas Bay (Figure 11)

Redfish - The peak of 5.0 pounds per acre in October, 1965 was higher than the one of 4.0 pounds per acre in September, 1964; however, in 1964, catches of 1.5 pounds per acre were normal, whereas in 1965 the usual catch was less than 0.5.



Trout - Trout samples were consistently lower in 1965 than in 1964. The highest peak in 1964 was 17.0 pounds per acre (September), while in 1965 it was 9.0 pounds per acre in October.

Black drum - While 1964 samples usually produced quantities of black drum up to 8.5 pounds per acre, this fish was practically absent in 1965 catches.

Sheepshead - This fish increased markedly from a peak of 5.5 pounds per acre in 1964 (May) to a peak of 25.0 pounds per acre in 1965 (May).

In 1965 sheepshead increased in abundance, while redfish, trout, and black drum declined.

#### Corpus Christi Bay (Figure 12)

Redfish - Samples indicate a generally low redfish population in this area, but the summer peak of 1.9 pounds per acre compared favorably with one of 0.4 pounds per acre in 1965.

Trout - A substantial peak occurred in the summer of 1964, with catches up to 11.0 pounds per acre. In 1965, the summer peak was almost absent, and there was only a minor peak of 4.9 pounds per acre in October.

Black drum - Few were taken in either year.

Sheepshead - In general, there was little difference between the two year, except for a late fall peak of 3.8 pounds per acre in November, 1965. The highest peak in 1964 was 1.8 pounds in April.

Redfish and trout declined in abundance in 1965, while sheepshead increased slightly.

#### Upper Laguna Madre (Figure 13)

Redfish - Samples indicate a low redfish population in both years with no month averaging as much as one pound per acre. No change from 1964 was noted in 1965.

Trout - Samples for the two years are difficult to compare due, in part, to inadequate sampling, but on the basis of a peak of 7.3 pounds per acre in July, 1964 appears to have been the better year. The highest peaks in 1965 were two of 3.5 pounds per acre in April and July.

Black drum - A definite decline in black drum population was noted in biological samples in 1965 compared to 1964, in spite of the fact that no fall samples were made in 1965, which could be compared to the peak period in the previous year. Catches of 14.7 pounds per acre were made in November, 1964 and 0.5 in September, 1965.

Sheepshead - Following a period of abundance in this area in 1964 (9.0 pounds per acre in September), sampling indicates a sharp reduction in 1965 (0.9 in May).

All major species either declined in numbers or remained low in 1965.

### Lower Laguna Madre (Figure 14)

Redfish - No significant change was detected between redfish abundance in 1964 and 1965. A peak of 1.4 was noted in February, 1964, and one of 1.0 pound per acre in October, 1965.

Trout - Average samples of from 1.0 to 2.0 pounds per acre prevailed throughout the two-year period, except for a slight increase in April, 1965. No significant change could be detected.

Black drum - Following a peak of 5.7 pounds per acre in December, 1964, black drum populations declined in 1965.

No change could be noted in redfish or trout populations, but black drum declined in abundance in 1965.

#### Adult Game Fish Summary

Redfish - Redfish apparently increased in abundance in Matagorda and San Antonio Bays, while decreasing in Aransas and Corpus Christi Bays. Major changes were not apparent in other areas.

Trout - An increase in abundance was noted in the Galveston, Matagorda, and San Antonio Bay areas. There was a decrease in abundance in Aransas Bay, Corpus Christi Bay, and the Upper Laguna Madre, and no change in the Lower Laguna Madre.

Black drum - Decreases were noted in Galveston Bay, Aransas Bay, and the entire Laguna Madre, with no change noted in other areas. No increases were noted in any bay.

Sheepshead - Sheepshead populations apparently increased in Aransas and Corpus Christi Bays and decreased in Galveston Bay and the Upper Laguna Madre.

#### DISCUSSION

Analysis of the juvenile game fish data (Figures 1-7) indicates that almost every month of the year is within the peak period of sampling for at least one of the five species involved. Although there is some variation between areas, the critical period of sampling by 60-foot seine for redfish is from February through May; for trout, from September through November; for black drum, from June through August; for sheepshead, from May through July; and for flounder, from March through May. It would appear that December is the only month which is not within the critical sampling period for any of the five juvenile game species.

In order to better note and compare annual fluctuations of juvenile fin-fish in each bay area, it would be desirable to (1) attempt to locate these key or indicator station locations for each species in each area and (2) sample each of these station locations specifically for each of the five species during the critical or peak time period for that species.



This attempt to eliminate needless samples and to avoid gaps in sampling during the critical or peak period for any one species should make it possible to formulate ratios between juvenile and adult game species at an earlier date. Data presently on hand through 1965 does not cover a sufficient period of time to attempt evaluation of juvenile-adult ratios at this time.

No significant changes are needed at present in adult fish sampling other than the need for general improvement in the areas of consistency of sampling and the taking of reliable samples.

Fig 1 Juvenile Game Fish Taken by 60' Seine  
Galveston Bay  
1964 - 1965

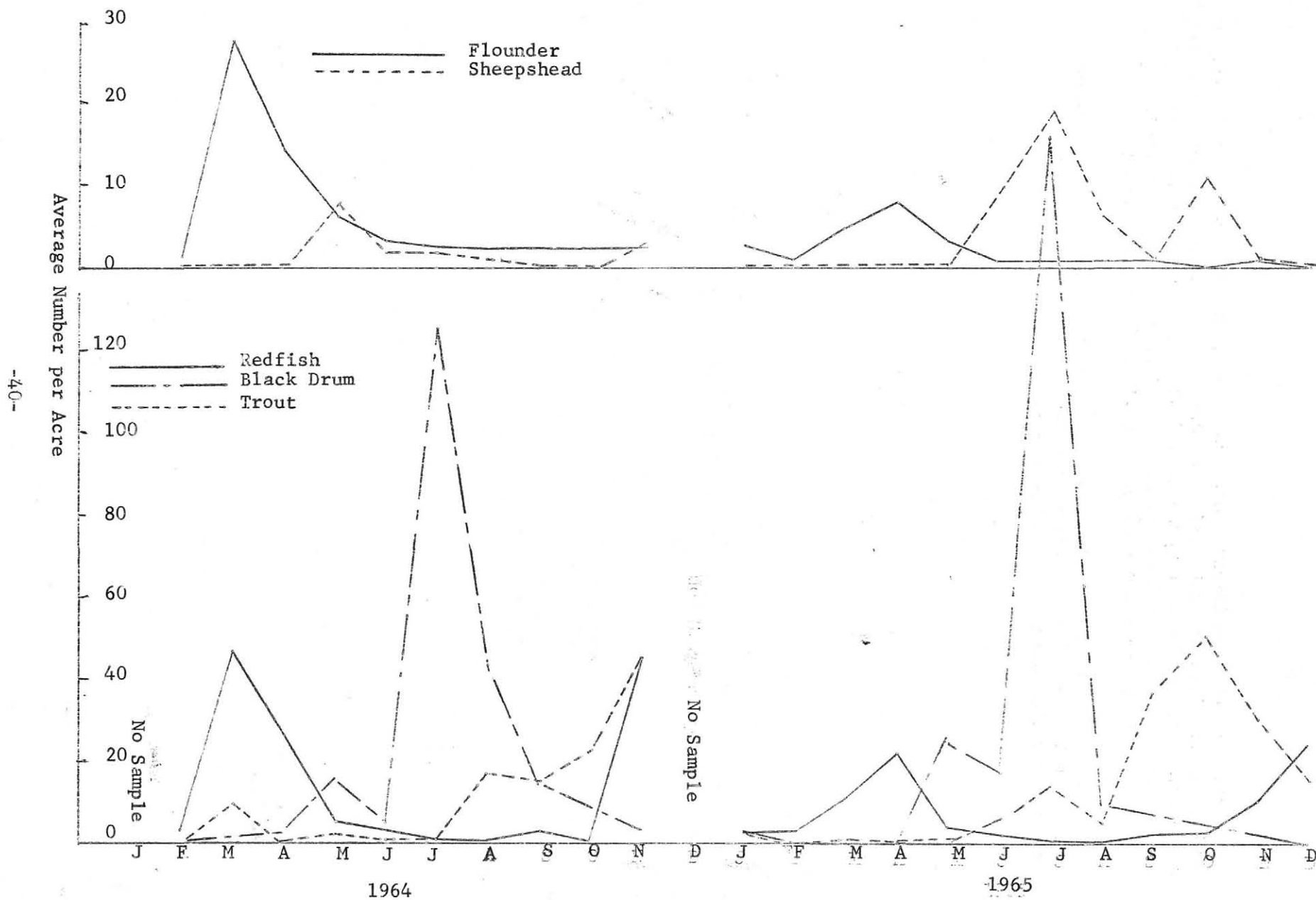


Fig 2 Juvenile Game Fish Taken By 60' Seine  
Matagorda Bay  
1964 - 1965

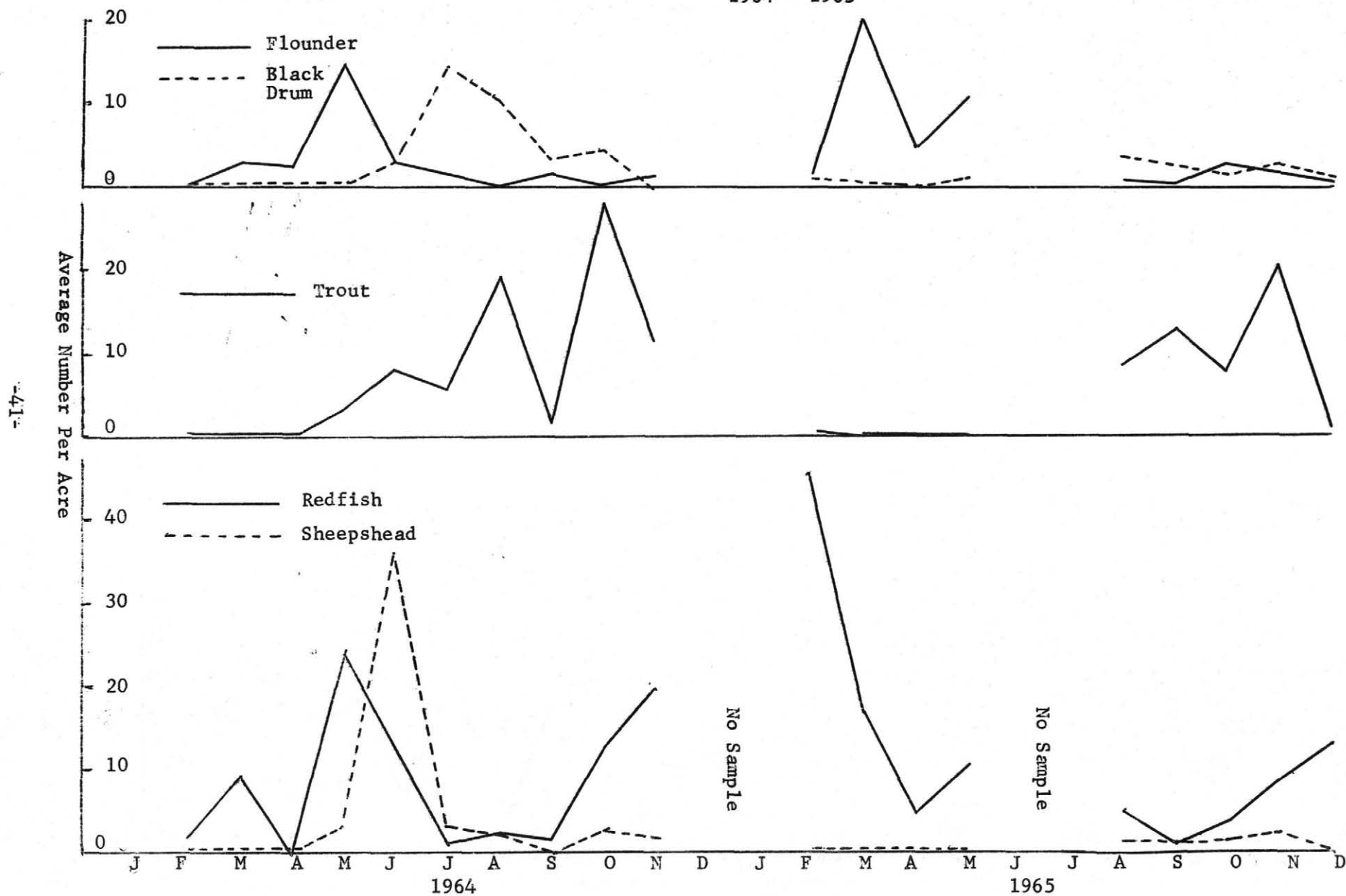


Fig 3 Juvenile Game Fish Taken by 60' Seine  
San Antonio Bay  
1964 - 1965

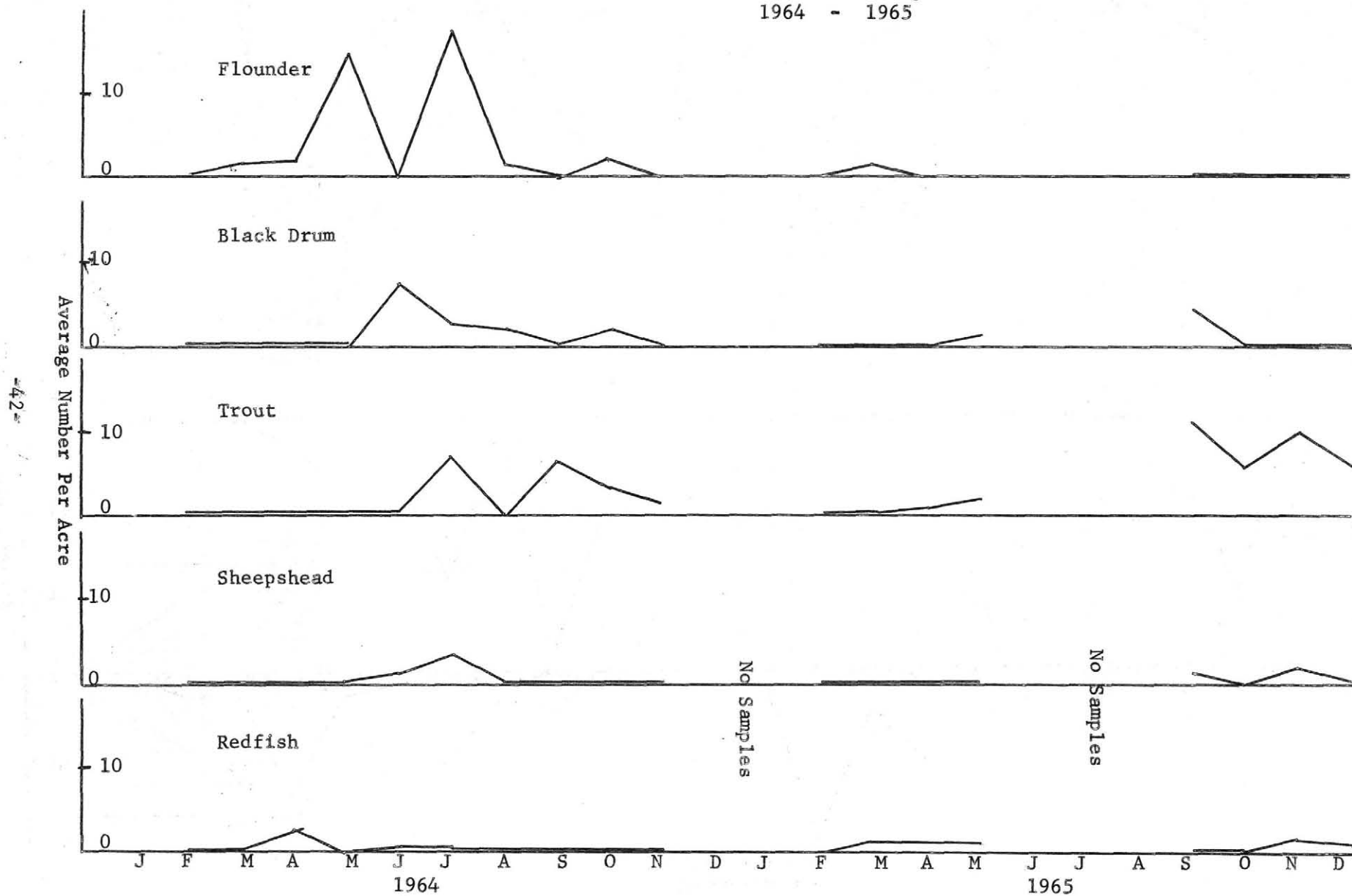


Fig 4 Juvenile Game Fish Taken by 60' Seine  
Aransas Bay  
1964-1965

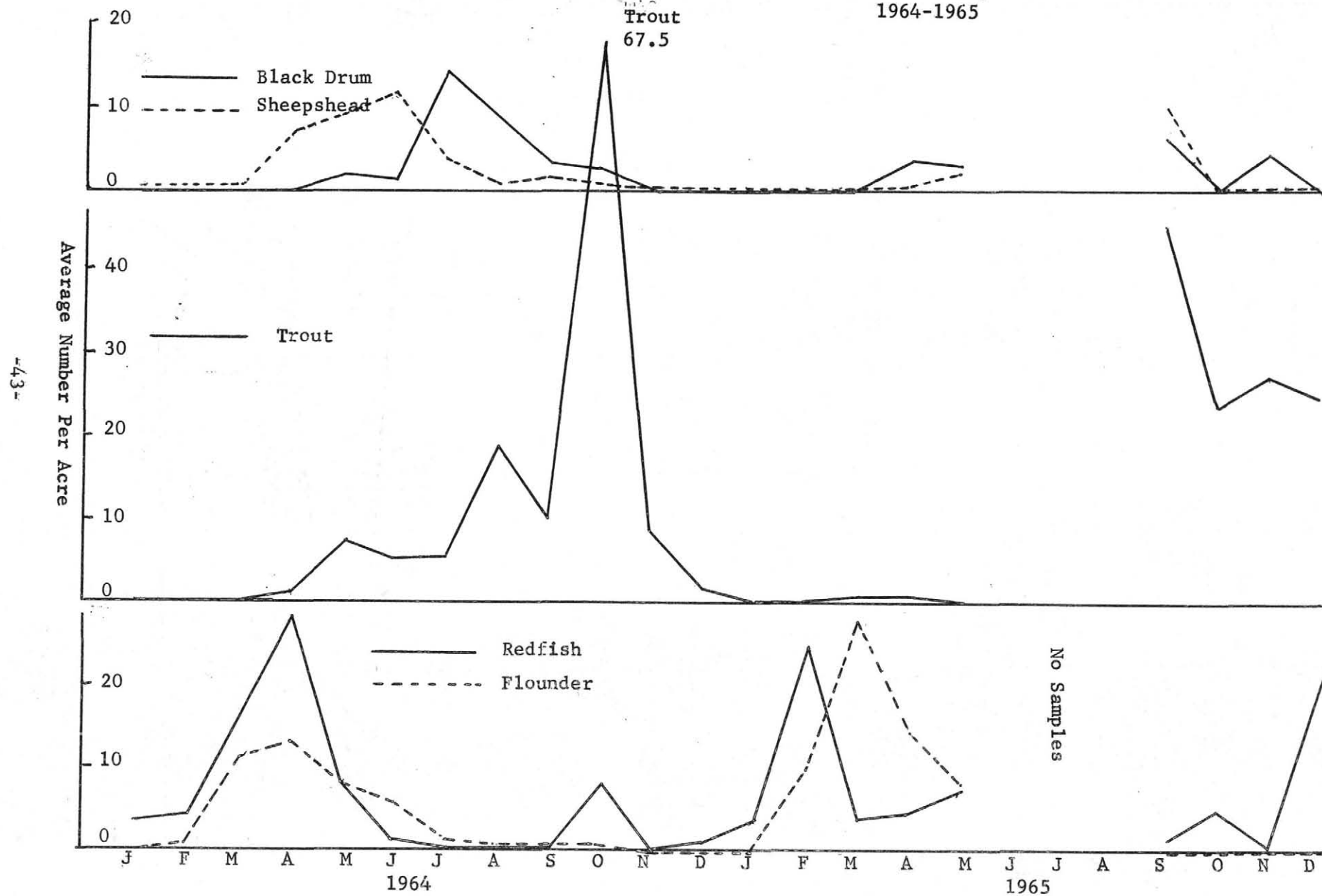
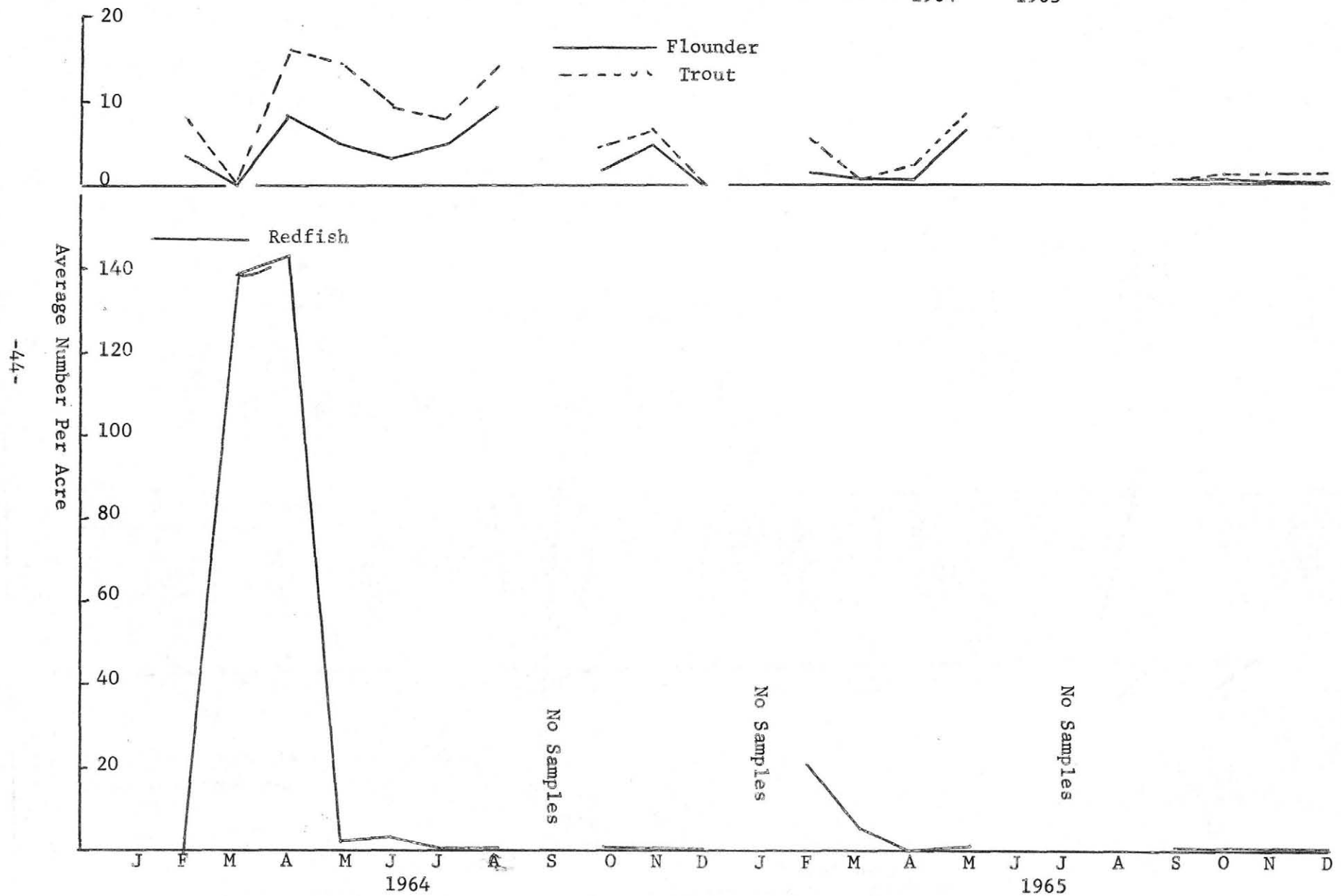
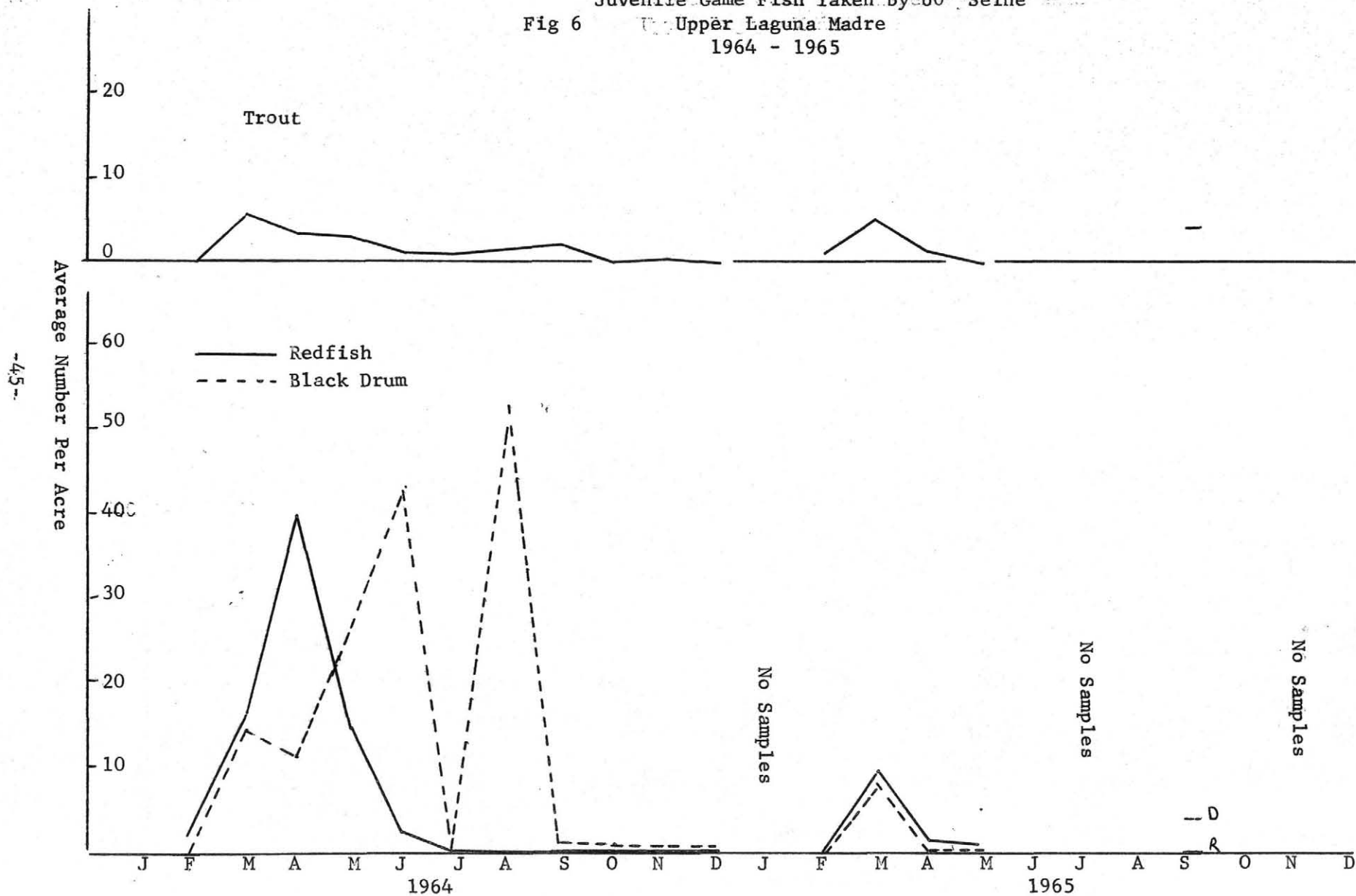


Fig 5 Juvenile Game Fish Taken by 60' Seine  
Corpus Christi Bay  
1964 - 1965





Juvenile Game Fish Taken by 60' Seine  
 Fig 6 Upper Laguna Madre  
 1964 - 1965



Juvenile Game Fish Taken by 60' Seine  
 Fig 7 Lower Laguna Madre  
 1964 - 1965

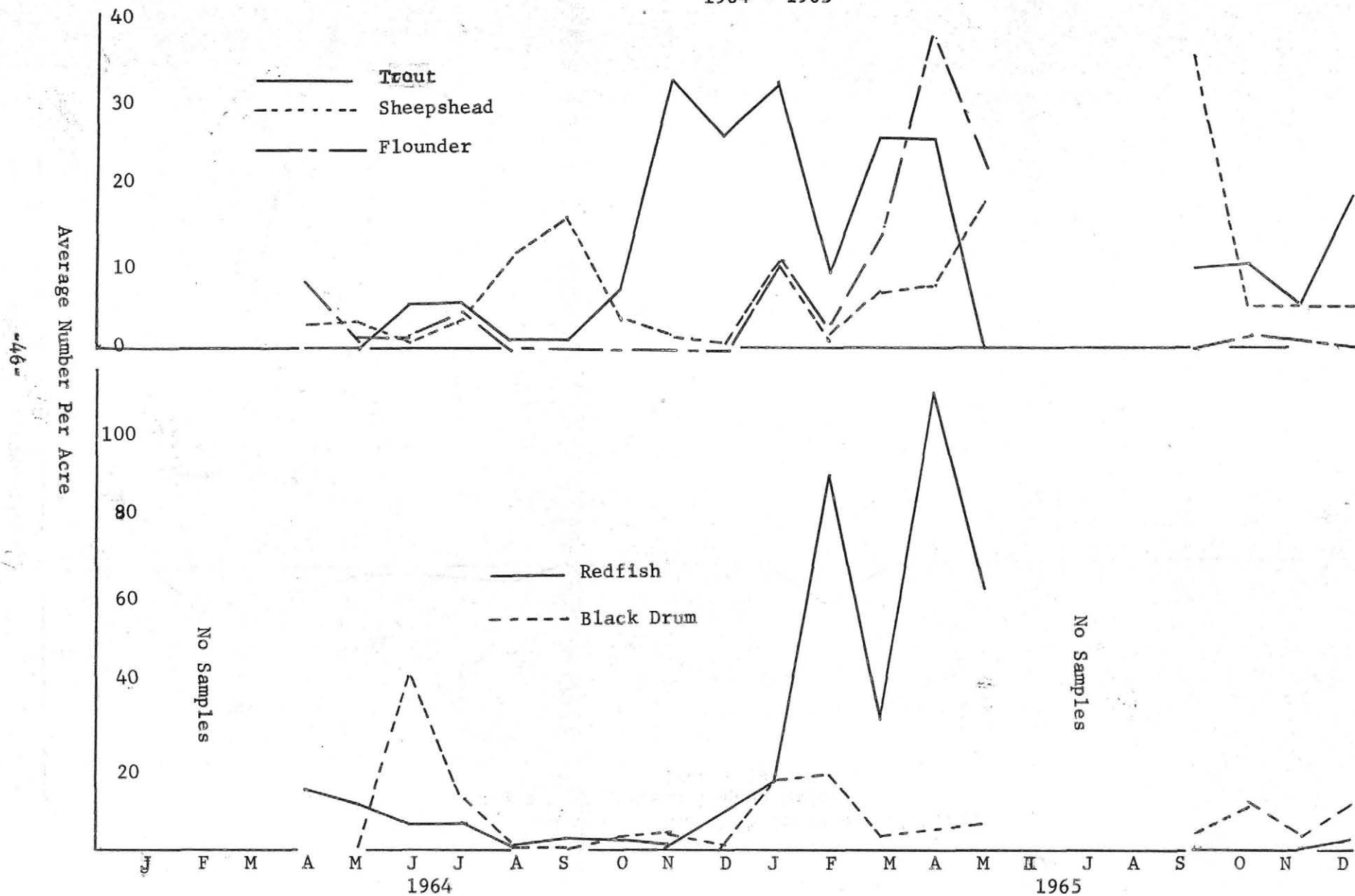
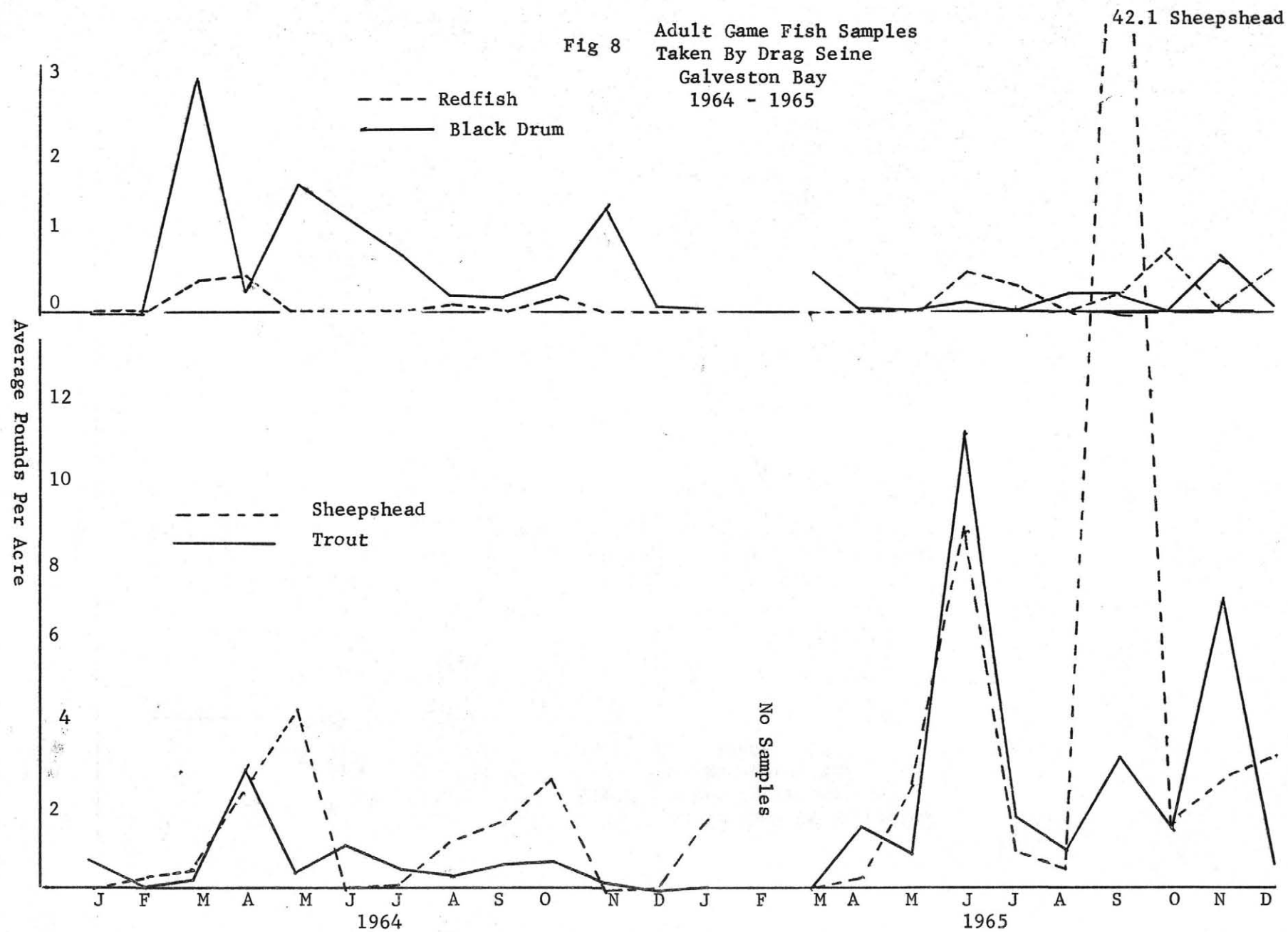
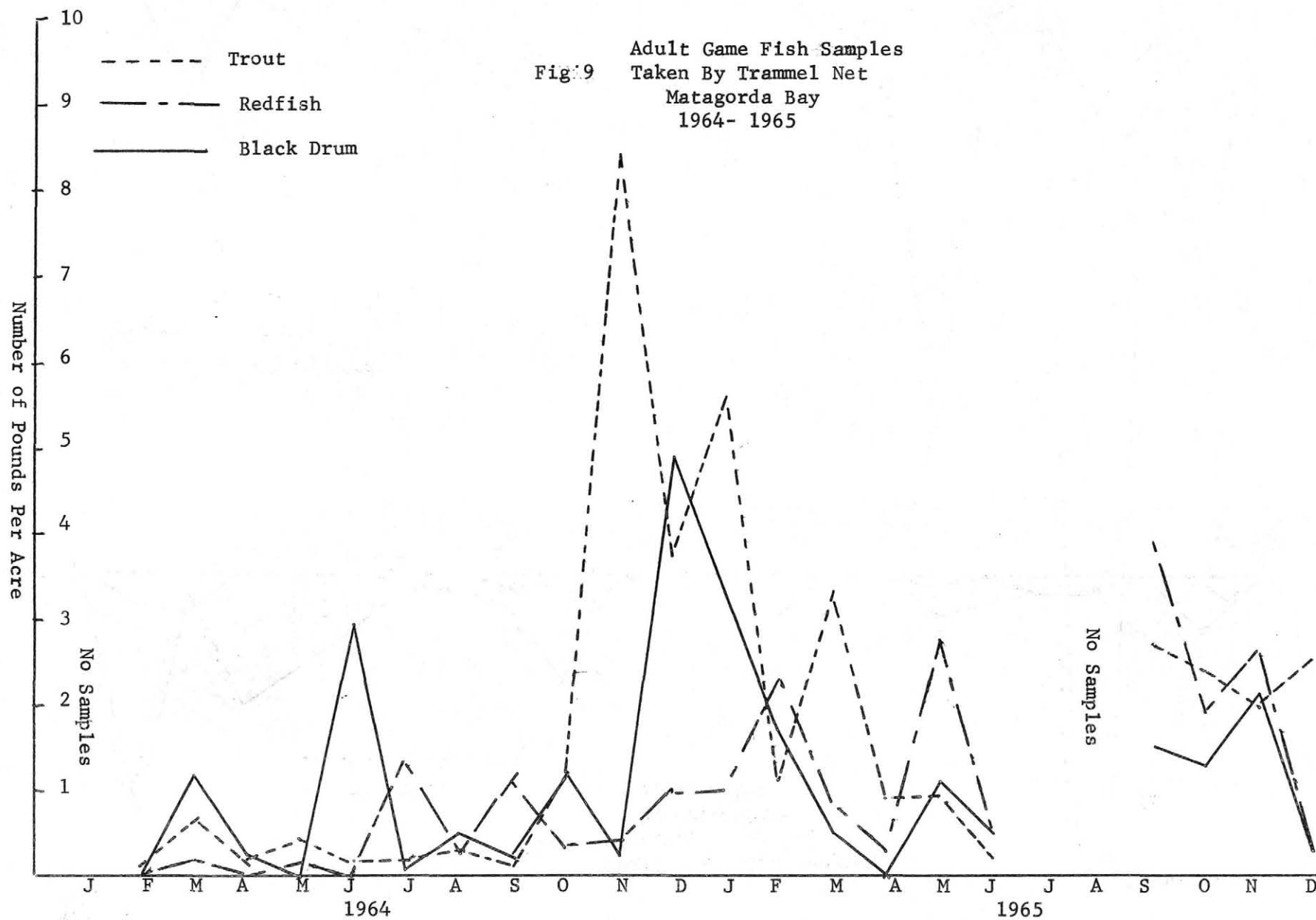
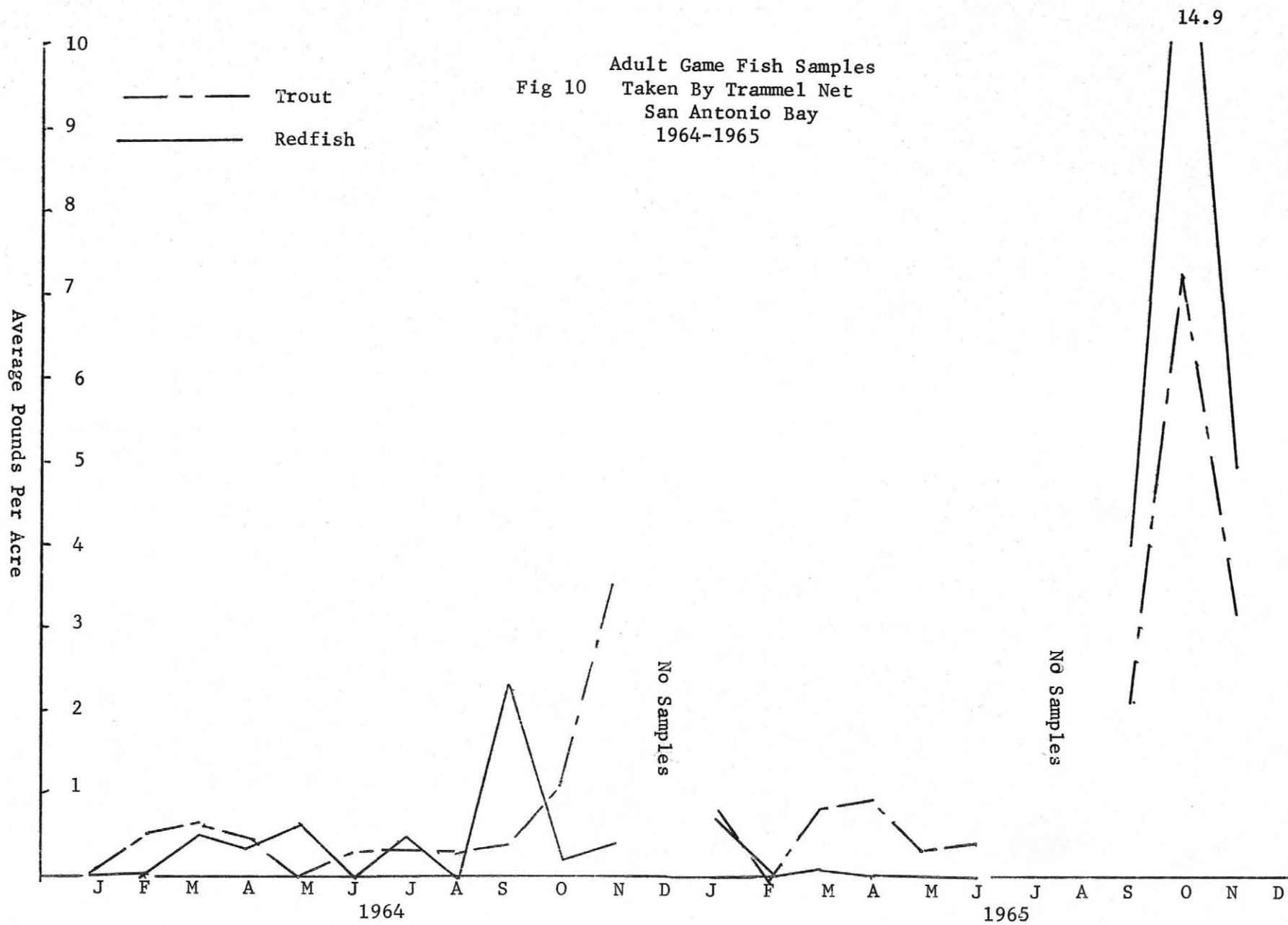


Fig 8 Adult Game Fish Samples  
Taken By Drag Seine  
Galveston Bay  
1964 - 1965







Adult Game Fish Samples Taken By Drag Seine  
 Fig 11 Aransas Bay  
 1964-1965

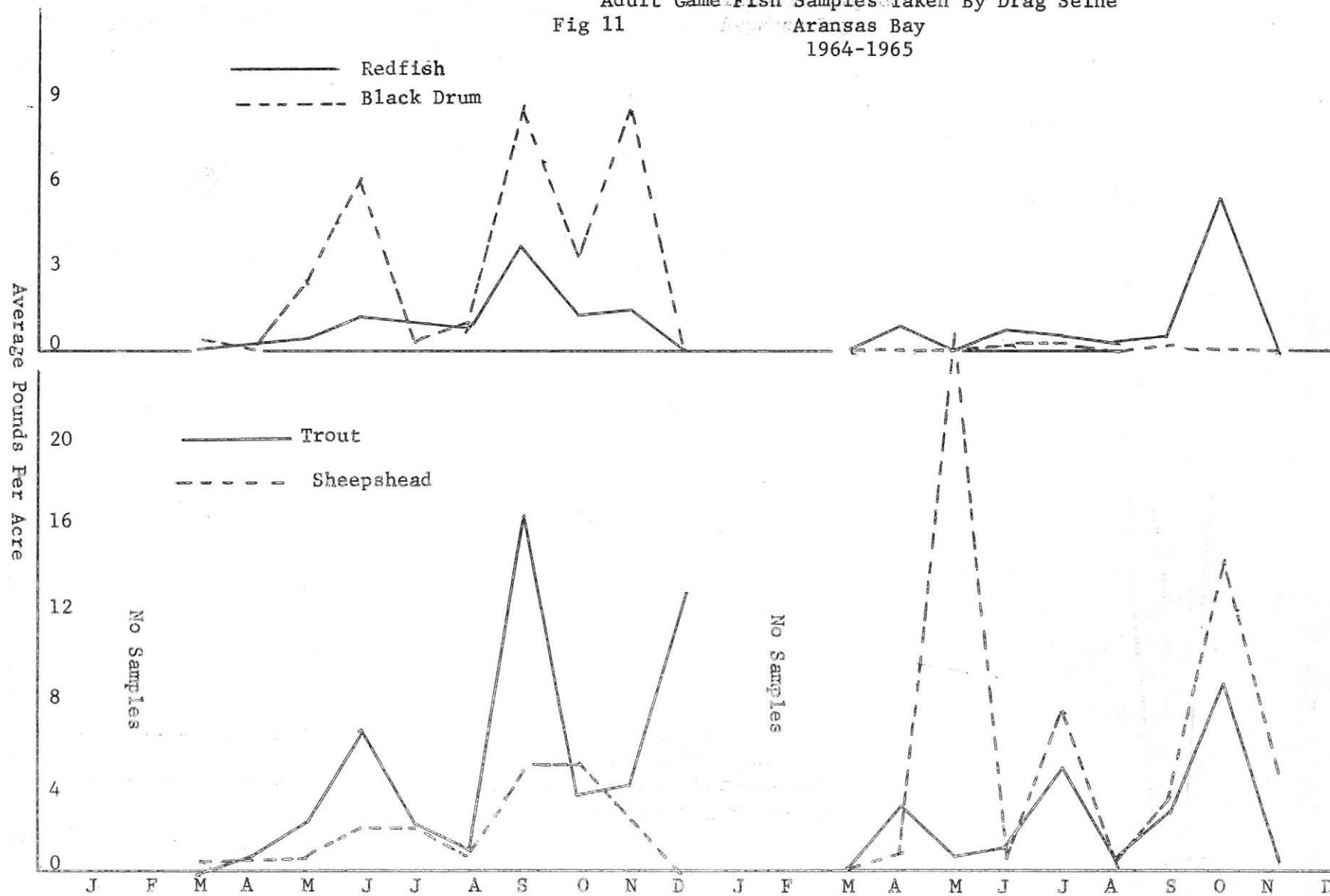
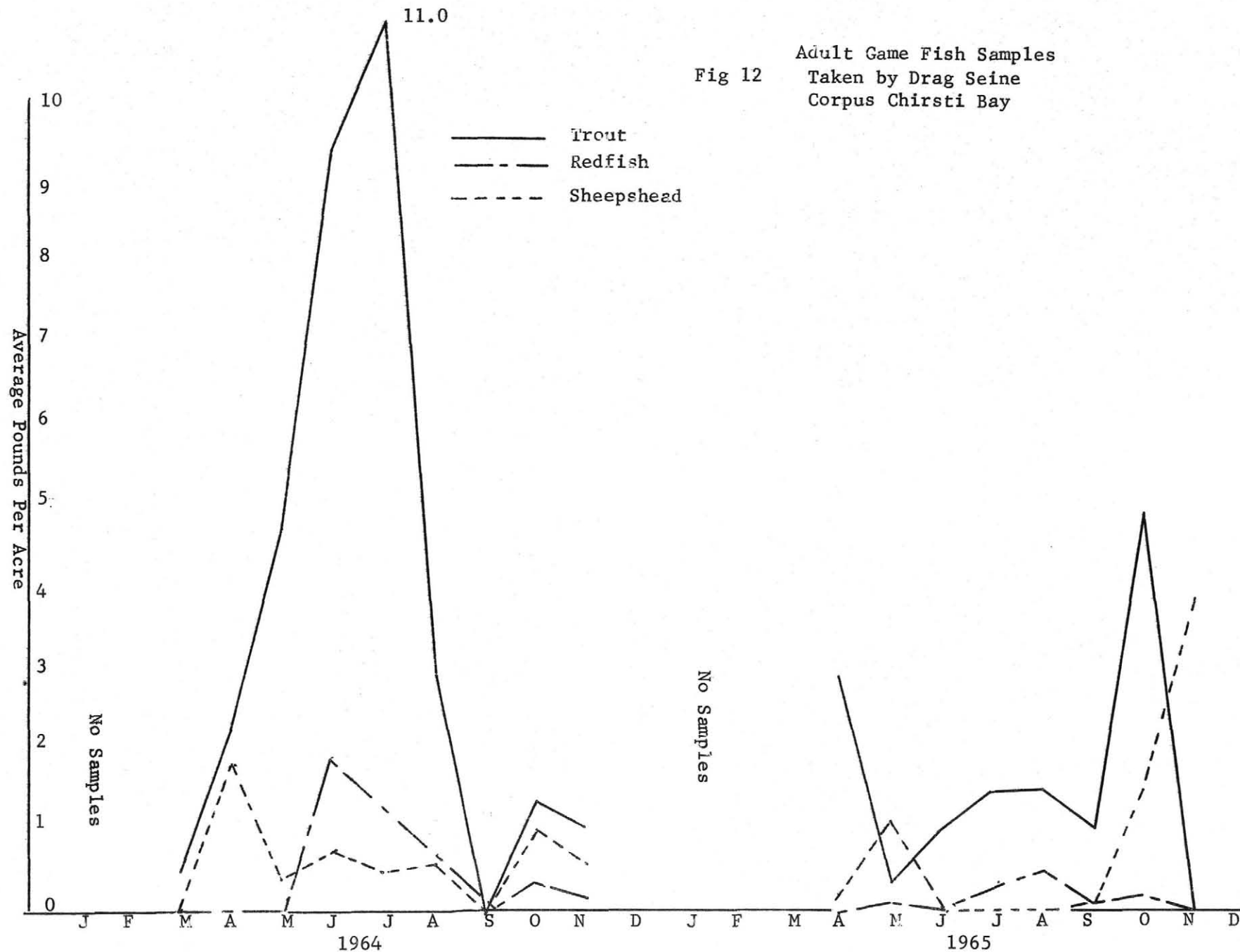
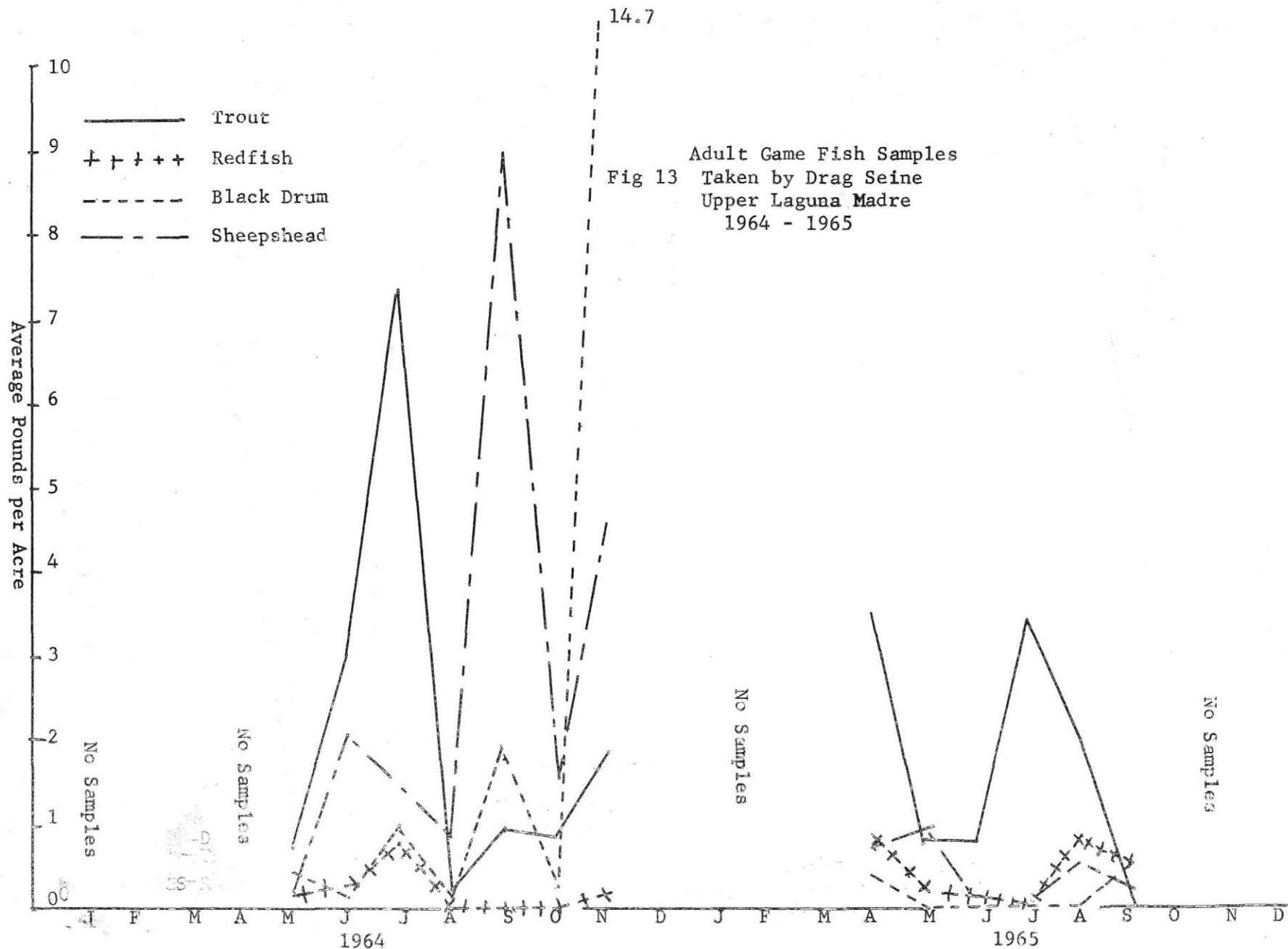




Fig 12  
Adult Game Fish Samples  
Taken by Drag Seine  
Corpus Chirsti Bay





Adult Game Fish Samples  
 Taken by Trammel Net  
 Lower Laguna Madre  
 1964 - 1965

