

Job Report

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Project Name: Analysis of Populations of Sports and Commercial Fin-Fish
and of Factors Which Effect These Populations in the Coastal
Bays of Texas
Period Covered: September 1, 1961 to December 31, 1962 Job No. 9

Population Studies of the Sports and Commercial Fin-Fish and Forage Species of the Upper Laguna Madre

Abstract: Two methods of population estimation are shown for redfish in the upper Laguna Madre. The two estimates are compared and discussed. Fish tag returns during the past 16 months indicate a southward migration of fish from the area.

There was a reduction in the number of juvenile redfish, trout and drum in the area in 1962 as compared with 1961. No explanation for the decrease was found. Flounder and sheepshead appeared to have a good spawning season in 1962. Forage was plentiful in the lagoon, especially in late spring and summer. The pinfish was the more common forage species consistently available.

Objectives: To determine population fluctuations of the food and game fish and forage species of the upper Laguna Madre.

Procedures: Four collections of adult fish were made each month with a 1200-foot trammel net or drag seine. Three fixed stations and one roving station were established (Figure 1). One station was east of Pita Island, one was east of Little Bird Island and the third station was north of the Point of Rocks. Bird Island Station was not sampled after January because the entrance to this area was closed by dredging operations. A net was placed around an area and pulled in. All game fish caught were counted and measured. A trammel net was used until June. No samples were listed for June and July because the trammel net was destroyed by crabs and no replacement was available. In August sampling was continued with a drag seine. Results of these net catches are listed in Table 1, which shows the monthly catch of each species.

All game fish caught by the above methods plus those caught by gill nets and hook and line were measured, tagged and released. Tag number, species, standard and total length measurements to the nearest one-half centimeter, location and date of release were recorded for each fish tagged.

Four seine stations were established and sampled each month with a 60-foot bag seine. The webbing of this seine was three-fourth of an inch stretched mesh. An attempt was made to cover 12,000 square feet for each sample. All juvenile game fish caught were measured. All forage species caught at Pita Island were assorted and weighed by species.

Six trawl stations were located in the upper Laguna as follows:

1. East of Pita Island
2. Flats east of Tropic Isle Channel
3. Intracoastal Waterway at Marker 23
4. East of Little Bird Island
5. West of I.C.W. Marker 75
6. One-half mile from Padre Island at Yarbrough Pass.

Each station was sampled monthly with a 10-foot otter trawl, weather permitting and all forage species were assorted by species, weighed and the rough average size recorded. The first four stations were also juvenile sampling stations and all young game fish caught were measured. Trawl samples were of 15 minutes duration.

Findings and

Discussion:

Adult Populations

Redfish population estimates were made by two different methods. One means involved multiplying monthly average adult seine catches per acre by the number of acres in the upper Laguna Madre area. These results are shown in Table 2. Probably too few net samples were made for this method to be accurate. The results probably are much lower than the actual populations present because some fish did escape from the nets.

An evaluation of this catch per area method of population estimation is afforded by comparing it with commercial landings as noted in Figures 2 and 3. There is close agreement between the two methods for redfish. Common points are the fall peak in October 1961, the decline in November and December, the very low population in January 1962 as further evidenced by the lack of dead redfish during a severe freeze that month, the gradual increase during the spring and early summer months, the decline in late summer, the new peak in October and the decline in December. Differences existed in September and November 1962.

For trout there were about as many differences as similarities. The two slopes of the curves agreed in September, October and December 1961 and in August and September 1962. There was sharp disagreement in March, April, May, October and November 1962.

The curves for drum were almost directly opposed with the highest sampling values being in May and August, periods when commercial landings were lowest.

The reasons for these discrepancies are complex. Redfish show little tendency to school except during fall months and may be considered fairly randomly distributed. Trout, up to a length of about 16 inches, tend to school and drift across flats or stay in deep water. Drum form vast schools and are often found in extremely shallow water at sites inaccessible to net crews. They do, at times, move through the Point of Rocks area but cannot be considered randomly distributed.

The second method was by the intensive marking formula of Schnable as described by Rounsefell and Everhart. Table 3 illustrates the steps in this method. Monthly tag returns can greatly affect the monthly population estimates as is shown by the sharp drop in "Column I" when five tags were returned during May. This method may overestimate the size of the redfish population in the lagoon because of the relatively small number of fish tagged in comparison to the size of the bay.

Results of both of these methods are graphed in Figure 4. The true population probably lies somewhere between these two estimates.

No attempt was made to estimate populations of the other game species present. Commercial catches are listed in Table 4.

Fish tagging data are given in Table 5 and by species. Most of the recovered fish moved south after being tagged and several fish were caught more than ten miles south of their point of release (Table 5). Of the three fish that were caught out of the upper Laguna Madre, two were captured in the lower Laguna Madre and one in Corpus Christi Bay.

Table 6 gives the percentage return of tagged redfish, trout, drum, flounder, sheepshead and croaker. The annual per cent return is calculated; however, the true annual return should be based only on those fish subject to capture for an entire year. The data indicate that increased emphasis must be placed on tagging trout and drum.

Juveniles

Juvenile game fish samples collected during this job are listed in Table 7. Figure 5 illustrates monthly size range of the various game species caught.

Dead juvenile trout were found in the grass along the shore after Hurricane Carla. No trout were located in October, but they were collected in November and December 1961. Young trout were scarce all during 1962. A few 30 mm. trout appeared in June and July. Trout averaging more than 100 mm. were collected up from the deeper water of the Intracoastal Waterway during a cold spell in December 1962.

A reduction in redfish fry was also noted. February was the peak month for catching small reds. Fifty of them, averaging about 30 mm., were caught at the 4 regular seine stations. Other seine hauls in February failed to produce more than 1 or 2 redfish per drag.

Scattered juvenile drum of various sizes were found throughout the year but no schools could be located. Large numbers of small drum were found in a tidal pond east of Pita Island in the spring of 1961. One drum caught in this pond in May 1962 and four in June 1962, a very sharp decline from the previous year.

Seven small flounder were collected in March, April and May 1962. Many young flounder beds were noted in the area all summer but few flounder were seen or captured. Numerous beds indicate that there was a good crop of flounder this year. Flounder bury themselves in the sand and thus probably escape most attempts to seine and trawl for them.

Young sheepshead were quite common in the summer of 1962. They were found in the grassy flats covered with much dead and matted vegetation. It appears that they used the dead grass for shade and fed on the small invertebrates associated with the decaying plants. They could not be collected because of the dead grass.

The year of 1962 was not a good year for young game fish in the upper Laguna Madre. Flounder and sheepshead fry were plentiful but there was a noticeable reduction in numbers of trout, redfish and drum.

Forage Fish

Table 8 lists the results of forage seine catches at Pita Island plus the forage trawl catches by station and their monthly averages. Table 9 lists the most common forage species of the upper Laguna Madre and the

months in which they were found. More forage was present in late spring and mid-summer. The pinfish was the dominant forage species followed by croakers, spot and shrimp. Young blue crabs were quite common in March.

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Table 1
Results of Adult Game Fish Net Sampling* in the Upper Laguna Madre, September 1961 to December 1962

| Station | 1961 | | | | | | 1962 | | | | | | Entrance to station was closed by spoils from a dredging operation in the Intracoastal Waterway. | | | | | |
|----------|-------|------|------|------|------|------|------|-------|------|------|------|------|--|-----|-----|-----|--|--|
| | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May | June | July | Aug. | | | | | | |
| 1 | T | 1.2 | 0.8 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | | | 1.2 | 0.8 | 0.0 | 0.0 | | | |
| | R | 1.2 | 1.6 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 2.0 | 0.0 | 0.8 | 0.0 | | | |
| | D | 0.4 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 10.8 | 0.0 | 0.0 | 0.0 | | | |
| | F | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | | |
| | S | 0.0 | 0.4 | 0.0 | 0.8 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.4 | 1.6 | 0.0 | | | |
| | C | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 1.2 | 0.0 | 0.0 | | | |
| 2 | T | 0.8 | 2.0 | 0.0 | 1.2 | | | | | | | | | | | | | |
| | R | 1.6 | 1.6 | 0.0 | 0.0 | | | | | | | | | | | | | |
| | D | 0.8 | 0.8 | 0.0 | 0.0 | | | | | | | | | | | | | |
| | F | 0.4 | 0.4 | 0.0 | 0.0 | | | | | | | | | | | | | |
| | S | 0.0 | 0.8 | 0.0 | 0.4 | | | | | | | | | | | | | |
| | C | 2.4 | 0.4 | 0.0 | 0.0 | | | | | | | | | | | | | |
| 3 | T | | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.4 | 0.8 | | | 2.4 | 0.8 | 0.8 | | 1.2 | | |
| | R | | 0.5 | 0.0 | 0.4 | 0.0 | 0.4 | 0.0 | 0.8 | | | 1.2 | 0.8 | 5.6 | | 0.0 | | |
| | D | | 0.0 | 0.8 | 2.0 | 0.0 | 0.8 | 0.0 | 0.0 | | | 0.0 | 2.0 | 0.0 | | 4.0 | | |
| | F | | 0.2 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 | 0.0 | | 0.4 | | |
| | S | | 1.2 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.8 | 0.0 | | 0.4 | | |
| | C | | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 20.8 | 0.4 | | 0.0 | | |
| 4 | T | | 3.0 | 0.4 | 0.4 | 0.0 | 2.0 | 0.0 | 2.4 | 4.0 | | 1.6 | 0.8 | 0.0 | | 0.4 | | |
| | R | | 1.5 | 1.2 | 0.8 | 0.0 | 0.4 | 0.0 | 0.0 | 2.4 | | 1.6 | 1.6 | 0.0 | | 2.8 | | |
| | D | | 1.0 | 2.0 | 4.8 | 0.0 | 10.4 | 0.0 | 3.6 | 18.4 | | 18.0 | 3.5 | 0.0 | | 0.4 | | |
| | F | | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.4 | 0.0 | 0.0 | | 0.0 | | |
| | S | | 1.5 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | | 0.4 | 0.0 | 0.0 | | 0.0 | | |
| | C | | 6.8 | 2.8 | 0.8 | 0.0 | 25.6 | 0.0 | 2.8 | 61.2 | | 0.8 | 2.0 | 0.0 | | 0.0 | | |
| Averages | | | | | | | | | | | | | | | | | | |
| T | 1.0 | 1.7 | 0.8 | 0.8 | 0.0 | 0.7 | 0.1 | 1.1 | 3.2 | | | 1.4 | 0.8 | 0.8 | 0.0 | 0.6 | | |
| R | 1.4 | 1.3 | 0.4 | 0.3 | 0.0 | 0.3 | 0.0 | 0.3 | 1.2 | | | 1.6 | 0.8 | 1.8 | 0.0 | 1.4 | | |
| D | 0.6 | 0.6 | 0.7 | 1.7 | 0.0 | 3.7 | 0.3 | 1.2 | 9.2 | | | 9.6 | 1.8 | 0.0 | 0.0 | 2.2 | | |
| F | 0.4 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.1 | 0.0 | 0.2 | 0.0 | 0.2 | | |
| S | 0.0 | 1.0 | 0.1 | 0.4 | 0.0 | 0.3 | 0.0 | 0.0 | 0.6 | | | 0.1 | 0.4 | 0.0 | 0.0 | 0.2 | | |
| C | 1.8 | 1.8 | 0.7 | 0.7 | 0.0 | 8.5 | 0.0 | 0.9 | 30.6 | | | 0.3 | 24.0 | 0.0 | 0.0 | 0.0 | | |

Numbers represent fish caught per acre of bay bottom seined.

T = Speckled Trout

R = Redfish

D = Drum

F = Flounder

S = Sheepshead

C = Croaker

* Results are given in numbers of fish

Table 2
Estimations of Fish Populations in the Upper Laguna Madre by Results
of Net Catches from September 1, 1961 to December 31, 1962

| 1961 | F/Acres | Population Redfish | Population Trout | Population Drum | Population Flounder |
|-------------|---------|-----------------------|---------------------|--------------------|------------------------|
| September | 1.4 | 179,200 | 128,000 | 77,000 | 51,000 |
| October | 1.3 | 166,400 | 217,000 | 77,000 | 13,000 |
| November | 0.4 | 51,200 | 102,000 | 90,000 | 0 |
| December | 0.3 | 38,400 | 102,000 | 217,000 | 13,000 |
| <u>1962</u> | | | | | |
| January | 0.0 | ----- | ----- | ----- | ----- |
| February | 0.3 | 38,400 | 90,000 | 473,000 | 0 |
| March | 0.0 | ----- | 13,000 | 38,000 | 0 |
| April | 0.3 | 38,400 | 141,000 | 154,000 | 0 |
| May | 1.2 | 153,600 | 410,000 | 1,178,000 | 0 |
| June | --- | ----- | ----- | ----- | ----- |
| July | --- | ----- | ----- | ----- | ----- |
| August | 1.6 | 204,800 | 179,000 | 1,229,000 | 13,000 |
| September | 0.8 | 102,400 | 102,000 | 230,000 | 0 |
| October | 1.8 | 230,400 | 230,000 | ----- | 26,000 |
| November | 0.0 | ----- | ----- | ----- | ----- |
| December | 1.4 | 179,200 | 179,000 | 282,000 | 26,000 |

1. F/Acre = Average number of fish per acre from adult sampling stations.
2. 128,000= Number of surface acres estimated to be in the upper Laguna Madre including Baffin Bay.
3. Population = F/Acre x 128,000.

Table 3
Estimation of Redfish Population in Pounds in the Upper Laguna Madre by
Intensive Marking from September 1, 1961 to December 31, 1962

| <u>A</u> | <u>A'</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> | <u>G</u> | <u>H</u> | <u>I</u> |
|-------------|-----------|----------|----------|----------|-----------|-----------|------------|----------|----------|
| <u>1961</u> | | | | | | | | | |
| Sept. | 7 | 7 | - | - | - | - | - | - | - |
| Oct. | 19 | 26 | 35,280 | 0 | 246,960 | - | 246,960 | 0 | - |
| Nov. | 14 | 36 | 28,062 | 4 | 729,612 | 182,403 | 976,572 | 4 | 244,000 |
| Dec. | 3 | 38 | 9,986 | 1 | 359,496 | 359,496 | 1,336,068 | 5 | 267,000 |
| <u>1962</u> | | | | | | | | | |
| Jan. | 0 | 38 | 3,810 | 0 | 144,780 | - | 1,480,848 | 5 | 296,000 |
| Feb. | 2 | 40 | 7,673 | 0 | 291,574 | - | 1,772,422 | 5 | 354,000 |
| Mar. | 2 | 42 | 7,098 | 0 | 283,920 | - | 2,056,342 | 5 | 411,000 |
| Apr. | 2 | 44 | 9,022 | 0 | 378,924 | - | 2,435,266 | 5 | 487,000 |
| May | 0 | 39 | 12,597 | 5 | 554,268 | 110,853 | 2,989,534 | 10 | 299,000 |
| June | 9 | 47 | 23,700 | 1 | 924,300 | 924,300 | 3,913,834 | 11 | 356,000 |
| July | 37 | 84 | 20,650 | 0 | 970,550 | - | 4,884,384 | 11 | 444,000 |
| Aug. | 54 | 136 | 9,264 | 2 | 778,176 | 389,088 | 5,662,560 | 13 | 436,000 |
| Sept. | 13 | 146 | 14,062 | 3 | 1,912,432 | 637,477 | 7,574,992 | 16 | 473,000 |
| Oct. | 7 | 151 | 17,494 | 2 | 2,554,124 | 1,277,062 | 10,129,116 | 18 | 562,000 |
| Nov. | 6 | 156 | 22,233 | 1 | 3,357,183 | 3,357,183 | 13,486,299 | 19 | 710,000 |
| Dec. | 7 | 163 | 7,986 | 0 | 1,245,816 | - | 14,732,115 | 19 | 775,000 |

A = Period

A' = Fish tagged in period

B = Marked fish at large

C = Commercial landings

D = Tagged fish captured

E = B x C

F = E/D

G = Accumulated E

H = Accumulated D

I = G/H = population

Table 4
Commercial Landings of the Upper Laguna Madre from September 1, 1961
Through December 31, 1962 as Reported by U. S. Bureau of Fisheries

| | <u>Trout</u> | <u>Redfish</u> | <u>Drum</u> | <u>Flounder</u> | <u>Sheepshead</u> |
|-------------|---------------|----------------|---------------|-----------------|-------------------|
| <u>1961</u> | | | | | |
| September | 6,705 | 7,519 | 2,674 | 91 | |
| October | 13,031 | 35,280 | 20,748 | 273 | |
| November | 10,625 | 28,062 | 34,996 | 1,091 | |
| December | 10,317 | 9,986 | 20,812 | 412 | |
| <u>1962</u> | | | | | |
| January | 20,927 | 3,810 | 46,526 | 23 | |
| February | 9,036 | 7,673 | 36,852 | 32 | 1,927 |
| March | 13,401 | 7,098 | 33,709 | 1 | 1,144 |
| April | 5,022 | 9,022 | 23,031 | 18 | |
| May | 4,020 | 12,579 | 12,062 | 14 | |
| June | 12,747 | 23,700 | 15,113 | 343 | |
| July | 10,431 | 20,652 | 7,132 | 882 | |
| August | 17,058 | 9,264 | 12,761 | 1,290 | |
| September | 12,432 | 14,062 | 16,240 | 618 | |
| October | 8,674 | 17,494 | 19,919 | 670 | |
| November | 11,546 | 22,233 | 24,308 | 1,434 | |
| December | <u>13,061</u> | <u>7,986</u> | <u>29,488</u> | <u>685</u> | |
| Total | 179,033 | 236,438 | 356,371 | 7,877 | 3,071 |

Table 5
Growth and Movement Data as Collected by Fish Tagging in The Upper
Laguna Madre from September 1, 1961 to December 31, 1962

| <u>Release Date</u> | <u>Release Point</u> | <u>Total Length</u> | <u>Growth</u> | <u>Time Free</u> | <u>Movement</u> |
|-------------------------|--------------------------|-------------------------|---------------|----------------------|-------------------|
| <u>Redfish</u> | | | | | |
| 9/26/61 | N. Bird Island | 12.50 | 6.75 | 11 mo. | 20 mi. S. |
| 9/26/61 | Pita Island | 12.25 | 11.25 | 12 mo. | 2 mi. S. |
| 10/ 5/61 | Pita Island | 23.25 | 0.0 | 1 mo. | None |
| 10/ 5/61 | Pita Island | 21.50 | 4.50 | 7.5 mo. | 11 mi. S. |
| 10/10/61 | Pita Island | 23.25 | 0.0 | 1.5 mo. | 30 mi. S. |
| 10/19/61 | E. Mk. 75 | 21.50 | 0.5 | 1 mo. | None |
| 11/ 9/61 | S. Bird Island | 14.00 | 3.25 | 6.5 mo. | 17 mi. S. |
| 11/ 9/61 | S. Bird Island | 27.50 | 0.0 | 1 wk. | 15 mi. S. |
| 11/ 9/61 | S. Bird Island | 17.75 | 0.0 | 3 wk. | 26 mi. S. |
| 11/ 9/61 | Point of Rocks | 16.00 | 10.50 | 11.5 mo. | Baffin Bay |
| 12/ 5/61 | Point of Rocks | 14.25 | 3.50 | 5.5 mo. | 15 mi. S. |
| 12/ 5/61 | Point of Rocks | 14.50 | 3.50 | 5.5 mo. | 15 mi. N. |
| 3/20/62 | Pita Island | 16.00 | 3.00 | 7 mo. | 2 mi. S. |
| 4/19/62 | S. Bird Island | 18.00 | 3.00 | 2 mo. | None |
| 4/19/62 | Mk. 55 | 17.00 | 1.25 | 1 mo. | 5 mi. NW |
| 6/15/62 | Land Cut | 11.25 | 4.75 | 3 mo. | None |
| *7/26/62 | Mk. 201 | 10.25 | 2.50 | 5 wk. | None |
| 8/20/62 | Point of Rocks | 13.50 | 0.50 | 4 mo. | 2 mi. S. |
| *9/21/62 | Point of Rocks | 16.50 | 0.0 | 3 wk. | None |
| <u>Trout</u> | | | | | |
| *3/27/62 | 8 mi. S. Mk. 201 | 12.75 | 1.0 | 3 mo. | 5 mi. N. |
| <u>Drum</u> | | | | | |
| 10/ 5/61 | Pita Island | 13.25 | 1.0 | 14 mo. | 3 mi. S. |
| 11/ 9/61 | N. Bird Island | 20.00 | 0.0 | 1.5 mo. | 15 mi. S. |
| 12/ 5/61 | Point of Rocks | 20.50 | ** | 24 mo. | Port Isabel Bay |
| 4/10/62 | Mk. 201 | 23.00 | ** | 1.5 mo. | Lower Laguna M. |
| *9/21/62 | Mk. 19 | 13.75 | 0.0 | 0.5 mo. | 2 mi. S. |
| <u>Croaker</u> | | | | | |
| 6/19/62 | Point of Rocks | 13.00 | 0.0 | 0.5 mo. | None |
| <u>Sheepshead</u> | | | | | |
| *11/ 1/62 | Pita Island | 17.00 | 0.0 | 3 wk. | Corpus Christi B. |

* = Return by sports fishermen. All other returns were from commercial fishermen.

Fish length and growth are listed in inches.

No movement indicates fish was caught within a mile of point of release.

** = Fish not measured when captured.

Table 6
Number of Fish Tagged in the Upper Laguna Madre and the Number of
Tags Returned-September 1961 to December 1962

| | <u>Redfish</u> | | <u>Trout</u> | | <u>Drum</u> | | <u>Flounder</u> | | <u>Sheepshead</u> | | <u>Croaker</u> | | <u>Tag Total</u> |
|-------|----------------|----------|--------------|----------|-------------|----------|-----------------|----------|-------------------|----------|----------------|----------|----------------------|
| | <u>T</u> | <u>R</u> | <u>T</u> | <u>R</u> | <u>T</u> | <u>R</u> | <u>T</u> | <u>R</u> | <u>T</u> | <u>R</u> | <u>T</u> | <u>R</u> | |
| 9/61 | 7 | 2 | 4 | 0 | 11 | 1 | 1 | 0 | 0 | - | 5 | 0 | 28 |
| 10/61 | 19 | 4 | 7 | 0 | 19 | 1 | 1 | 0 | 11 | 0 | 13 | 0 | 70 |
| 11/61 | 14 | 4 | 14 | 0 | 17 | 0 | 11 | 0 | 6 | 0 | 0 | 0 | 62 |
| 12/61 | 3 | 2 | 3 | 0 | 14 | 1 | 1 | 0 | 4 | 0 | 0 | 0 | 25 |
| 1/62 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2/62 | 2 | 0 | 5 | 0 | 26 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 35 |
| 3/62 | 2 | 1 | 11 | 1 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 4/62 | 2 | 2 | 7 | 0 | 8 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 18 |
| 5/62 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 6/62 | 9 | 1 | 44 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 32 | 1 | 87 |
| 7/62 | 37 | 1 | 14 | 0 | 41 | 0 | 3 | 0 | 0 | 0 | 67 | 0 | 162 |
| 8/62 | 54 | 1 | 22 | 0 | 75 | 0 | 1 | 0 | 2 | 0 | 9 | 0 | 163 |
| 9/62 | 13 | 1 | 49 | 0 | 15 | 1 | 0 | 0 | 4 | 0 | 43 | 0 | 124 |
| 10/62 | 7 | 0 | 4 | 0 | 38 | 1 | 1 | 0 | 7 | 0 | 0 | 0 | 57 |
| 11/62 | 6 | 0 | 1 | 0 | 39 | 0 | 5 | 0 | 3 | 1 | 0 | 0 | 54 |
| 12/62 | <u>7</u> | <u>0</u> | <u>3</u> | <u>0</u> | <u>11</u> | <u>0</u> | <u>1</u> | <u>0</u> | <u>3</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>25</u> |
| Total | 182 | 19 | 191 | 1 | 335 | 5 | 26 | 0 | 42 | 1 | 169 | 1 | 945 |

| | | | | | | |
|-------------|-------|------|------|------|------|------|
| % Returns | 10.4% | 0.5% | 1.5% | 0.0% | 2.4% | 0.6% |
| True Annual | 25.0% | 0.0% | 4.3% | 0.0% | 0.0% | 0.0% |

Fish tagged in the last three months were not free long enough to expect many tag returns from them, therefore they were not counted in figuring percent of tag returns or in population estimations.

T = Fish tagged each month.

R = Tags returned each month.

% Returns for all species except sheepshead are based on number of tags used between September 1961 and September 1962 inclusively. The entire 16 months were counted in figuring sheepshead tag returns because the only tag returned was one that was used in November 1962.

True Annual is the per cent return based only on those fish which had been subject to capture for an entire year.

Table 7
Juvenile Game Fish Trawl and Seine Samples from the Upper Laguna Madre
September 1, 1961 to December 31, 1962

| | 1961 | | | | 1962 | | | | | | | | | | | |
|-------|--------------|-------------|-------------|-------------|-------------|--|-------------|-------------|------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|
| | <u>Sept.</u> | <u>Oct.</u> | <u>Nov.</u> | <u>Dec.</u> | <u>Jan.</u> | <u>Feb.</u> | <u>Mar.</u> | <u>Apr.</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug.</u> | <u>Sept.</u> | <u>Oct.</u> | <u>Nov.</u> | <u>Dec.</u> |
| TS1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | T3 | 0 | 0 | 0 | 0 | 0 |
| TS2 | 0 | 0 | 0 | T2 | - | 0 | F2 | F1 | F1 | 0 | T6 | 0 | 0 | 0 | - | - |
| TS3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | T5,D1 |
| TS4 | 0 | 0 | 0 | R2 | - | Station discontinued because of blocked channel. | | | | | | | | | | |
| Pita | - | 0 | T2 | 0 | 0 | 0 | 0 | 0 | 0 | T1 | 0 | 0 | 0 | - | - | 0 |
| Mk. | - | 0 | T2 | T2 | 0 | R10 | 0 | R1,F1 | 0 | 0 | 0 | 0 | 0 | - | - | 0 |
| Pond | - | 0 | 0 | 0 | 0 | R4 | 0 | 0 | D1 | D4 | 0 | 0 | 0 | - | - | 0 |
| Point | - | 0 | T1 | 0 | 0 | R36 | R1,F1 | R1,F1 | 0 | 0 | - | - | - | - | - | - |

TS = Trawl Stations 1, 2, 3 and 4
Pita = Seine station at Pita Island.
Mk = Seine Station west of Intracoastal Waterway Marker 27A.
Pond = Tidal pond west of Pita Island that was seined monthly.
Point = Seine station north of Tyler's Basin that was called Tyler's Point. Station became covered with so much dead vegetation that seining was impossible.
Numbers indicate number of juveniles caught. Letters preceding the numbers indicate the various species. ie. T = Trout, R = Redfish, D = Drum, F = Flounder.

Table 8
Forage Samples in Pounds Collected in the Upper Laguna Madre
September 1, 1961 through December 31, 1962

| 1962 | | | | | | | | | | | | | | | | |
|---------|--------------|-------------|-------------|-------------|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|
| 1961 | <u>Sept.</u> | <u>Oct.</u> | <u>Nov.</u> | <u>Dec.</u> | <u>Jan.</u> | <u>Feb.</u> | <u>Mar.</u> | <u>Apr.</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug.</u> | <u>Sept.</u> | <u>Oct.</u> | <u>Nov.</u> | <u>Dec.</u> |
| Pita | 4 | 4 | 1.5 | 2.0 | 0.5 | 12.0 | 42.0 | 114.0 | 66.0 | 39.0 | 4 | 13.0 | 13.0 | 4 | 4 | 3.0 |
| T1 | 1.0 | 1.5 | 3.5 | - | - | 0.5 | - | 5.5 | 8.0 | 3.0 | 19.0 | 75.0 | 18.0 | 2.0 | 4 | - |
| T2 | 0.0 | 3.0 | 2.0 | 7.0 | 4 | 1.0 | 2.5 | 8.0 | 82.5 | 75.0 | 45.0 | 43.0 | 16.0 | 4.5 | 4 | 4 |
| T3 | - | 1.5 | - | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 4.0 | 1.5 | 0.0 | 3.0 | - | 2.0 | 29.0 | 212.0 |
| T4 | 15.0 | 0.5 | - | 1.0 | Station Discontinued | | | | | | | | | | | |
| T5 | 0.0 | - | 0.0 | 0.5 | 0.0 | 0.0 | - | 0.5 | 1.0 | 1.5 | 0.0 | 3.0 | 1.0 | 4.5 | 1.0 | 2.5 |
| T6 | <u>0.0</u> | <u>-</u> | <u>0.5</u> | <u>4</u> | <u>0.0</u> | <u>-</u> | <u>0.5</u> | <u>0.0</u> | <u>17.5</u> | <u>4.0</u> | <u>0.5</u> | <u>3.0</u> | <u>1.0</u> | <u>2.5</u> | <u>2.0</u> | <u>4</u> |
| Average | 2.7 | 1.1 | 1.0 | 1.7 | 0.5 | 0.3 | 0.8 | 3.2 | 22.6 | 17.0 | 12.9 | 25.4 | 7.2 | 3.1 | 10.7 | 71.5 |

Pita = Seine sample from Pita Island.
T1 = Trawl Station 1 at Pita Island.
T2 = Trawl Station 2 on the flats west of Tropic Isle Channel.
T3 = Trawl Station 3 in the Intracoastal Waterway at Marker 23.
T4 = Trawl Station 4 east of Little Bird Island.
T5 = Trawl Station 5 on the flats west of Marker 75. Numbers represent total forage catch in ounces.

T6 = Trawl Station 6 at Yarbrough Pass near Padre Island.
- = Catches less than one-half ounce.
4 = Station was not sampled.
Av. = Monthly catch divided by the number of trawls made and does not include the seine station at Pita.

Table 9
Composition of Monthly Forage Samples Taken in the Upper Laguna Madre

| <u>Date 1961</u> | <u>Pinperch</u> | <u>Croakers</u> | <u>Anchovies</u> | <u>Spot</u> | <u>Silver Sides</u> | <u>Pig Fish</u> | <u>Trout</u> | <u>Shrimp</u> | <u>Crabs</u> |
|------------------|-----------------|-----------------|------------------|-------------|---------------------|-----------------|--------------|---------------|--------------|
| September | 105* | 115x | 30- | | | | | | - |
| October | | 80* | 35x | - | | - | | 80x | - |
| November | | - | 40* | | - | | - | 80x | - |
| December | 105* | | - | | - | - | - | 90x | - |
| <u>Date 1962</u> | | | | | | | | | |
| January | | - | | | 70x | | | | |
| February | | 30x | - | | - | | | 95x | - 40* |
| March | 40x | 50x | - | 50x | - | | | 50x | - |
| April | 45* | | - | 50x | - | | | 80x | - |
| May | 50* | 25x | 35x | 60x | | | | 80x | - |
| June | 50* | - | - | 60x | | - | - | | |
| July | 60* | 50x | - | - | | - | - | | |
| August | 60* | 55x | - | - | | 80x | | | |
| September | 50* | - | - | - | | - | | | |
| October | 60* | | 35- | - | | - | | | |
| November | | | - | | | | | | |
| December | 80x | - | - | 90* | | | - | | |

* = Most Abundant

- = Present

x = Common

Numbers represent approximate average size in mm.

Figure 1
Map of the Upper Laguna Madre Showing Locations of Adult, Juvenile,
Forage and Hydrographic Stations

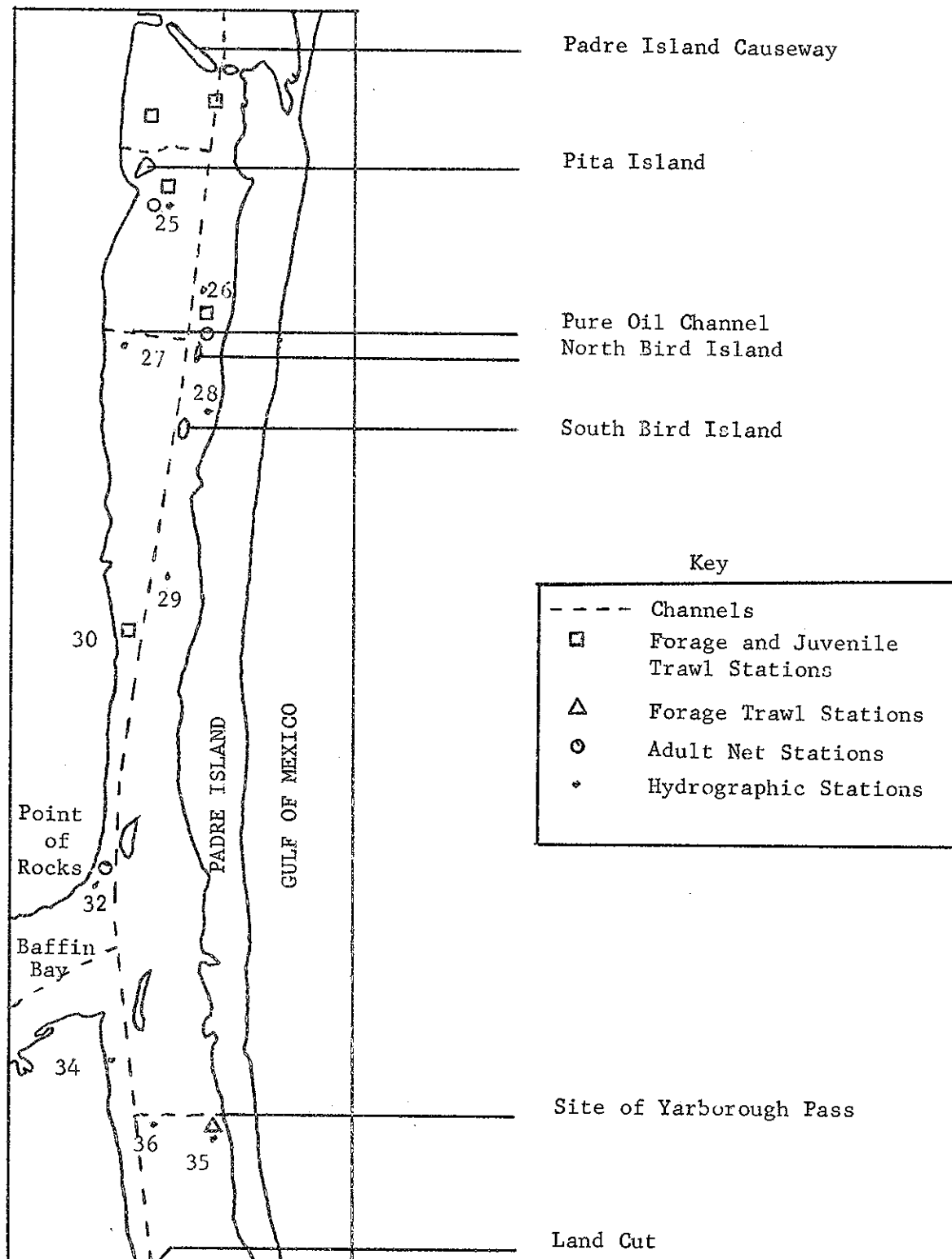


Figure 2
A Comparison of Populations as Determined by Net Samples and Commercial Landings

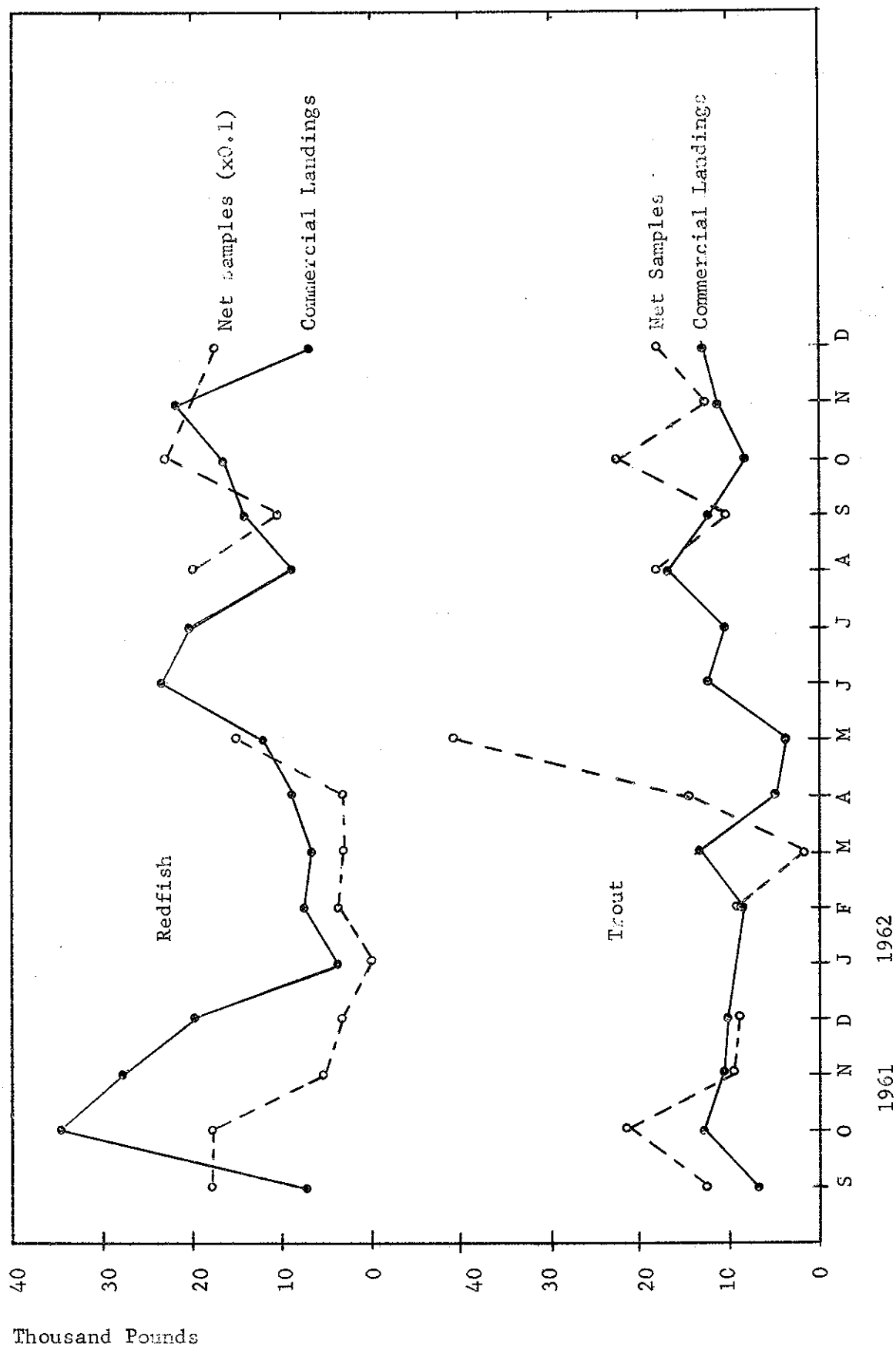
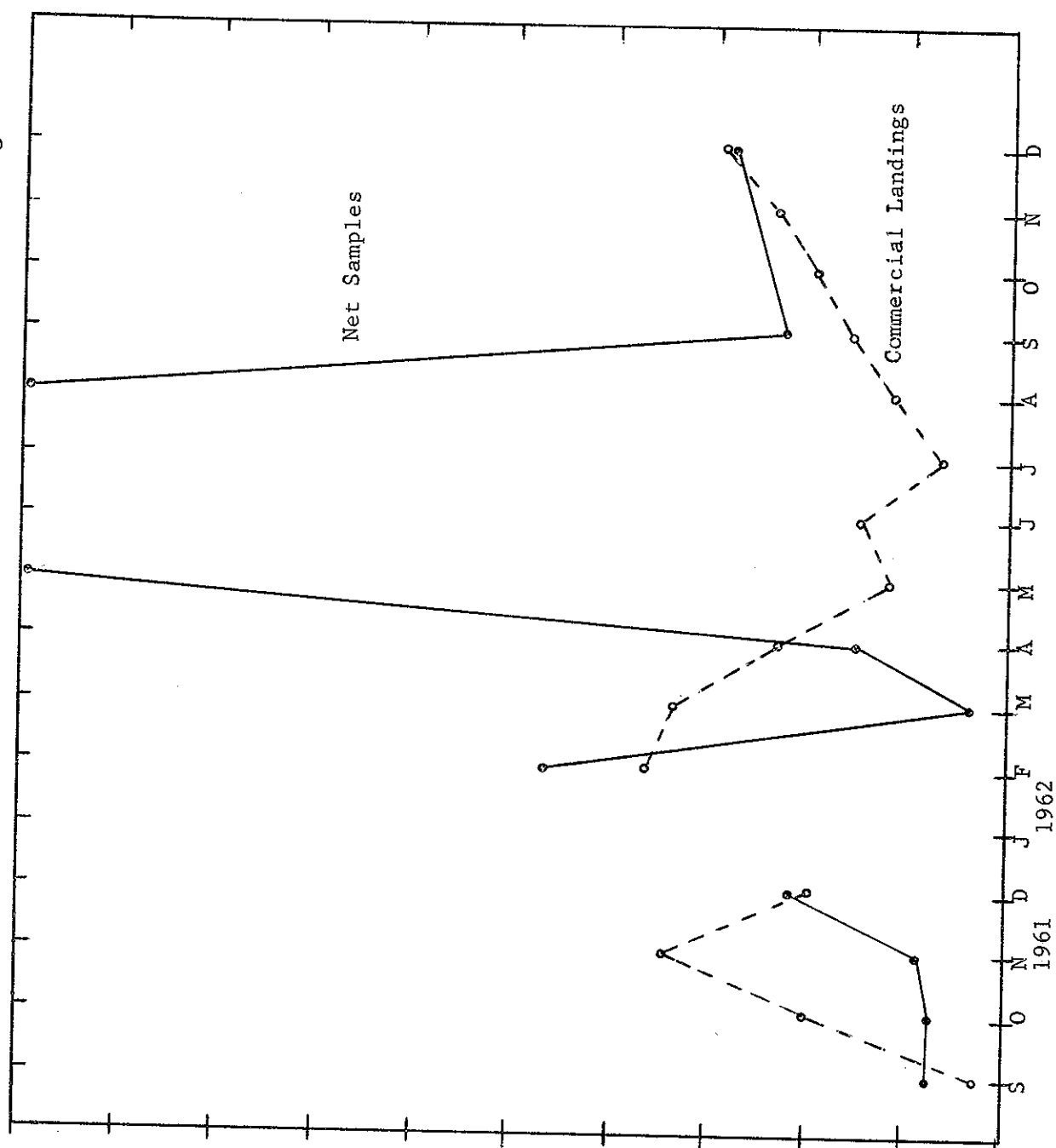


Figure 3
A Comparison of Drum Population Estimates and Commercial Landings



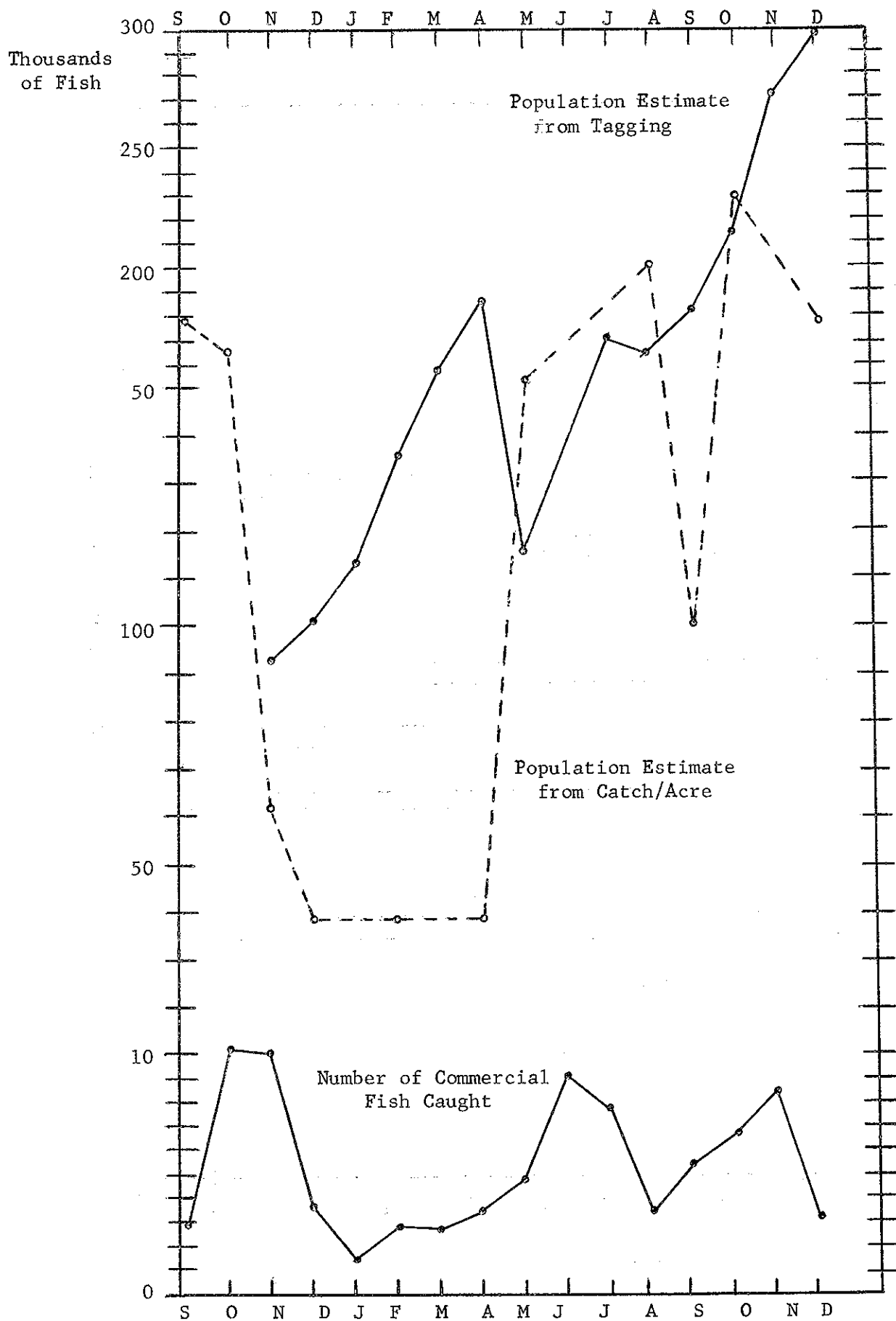


Figure 4
Estimates of Redfish Populations in the Upper Laguna Madre
Compared to Commercial Catches

Figure 5
Monthly Maximum and Minimum Standard Lengths of Juvenile Game Fish

