

A Survey of the Spotted Sea Trout
Nursery Areas of the Lower Laguna Madre
Project CF-2-1 (Job No. 4)
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Abstract

Concentrated sampling of the known spawning and nursery areas of spotted sea trout (Cynoscion nebulosus) in the Lower Laguna Madre was conducted during the summer of 1970. Trawls and seines were used to determine number per unit area. This sampling produced 184 juvenile trout compared to only 21 in a similar sampling in 1969 and 15 in 1967. The increase was due to increased spawning success which in turn was probably due to reduced pesticide levels in the Arroyo Colorado.

Introduction

A review of the annual project reports of the Texas Parks and Wildlife Department covering studies of finfish in the Lower Laguna Madre shows that in 1958 and 1959 large numbers of juvenile spotted sea trout (Cynoscion nebulosus) were found over shoalgrass (Diplantera wrightii) beds, especially in the bay waters of Willacy and Kenedy Counties. In 1960 the first serious effort was made to map and evaluate trout spawning and nursery grounds in the area. Of 60 trawl drags 36 contained 173 juvenile spotted sea trout. Most were taken within five miles of Port Mansfield in Willacy County.

In 1961 and 1962 juvenile trout were more scattered and were less abundant. In 1963 only 15 specimens were taken all year with 7 in one sample.

In 1964 juvenile trout were more abundant and specimens were taken at all seven fish sampling stations. They were present in 8 of the 12 months. However, in 1965 there was a decline in numbers and in 1966 the decline was even greater.

In the summer of 1967 a complete survey of the Lower Laguna Madre was made in order to determine the productivity of the area by state land tract. Over 230 tracts were sampled by trawl, seine and push net. Regrettably, the data were lost when a tornado accompanying Hurricane Beulah destroyed the

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he area was confirmed by routine regular stations.

The apparent shortage of juvenile trout in routine seine samples taken in the same periods at

Materials and Methods

In the summer of 1970 additional sampling for juvenile trout was conducted with intensive sampling from July 22 through July 28. Supplemental sampling with seine and trawl was conducted through the end of August. Principle sampling was done with an otter trawl, 12 feet wide of $1\frac{1}{4}$ -inch stretched mesh with a $\frac{1}{4}$ -inch mesh liner in the cod end. Additional sampling was done in the shallow waters with a bag seine, 20 feet long of $\frac{1}{4}$ -inch bar mesh, and a trawl, 6 feet wide and of the same mesh size as the 12-foot trawl. Sampling was systematically to cover all bay areas in all depths and over all bottom and vegetation types. Meteorological and hydrographic data were collected with each sample.

Results

Of the 94 trawl samples taken with the 12-foot trawl 68 were negative for juvenile spotted sea trout. The remaining 26 samples produced 120 juveniles. Supplemental samples produced 23 trout in the 20-foot bag seine, 9 in the trawl samples in the Arroyo Colorado and 32 in the samples taken with the 6-foot trawl.

These trout were 14 to 123 mm. total length. Most were found in patchy areas of shoalgrass. They were scarce, if present at all, in dead shoalgrass, turtlegrass or any thickly-matted vegetation.

Water depths in the primary sample areas ranged from $1\frac{1}{2}$ to 6 feet. No juvenile trout were taken in depths of over 4 feet and only one was taken in 4 feet of water. Supplemental samples from water as shallow as six inches yielded juveniles providing the water was murky.

Salinities in the sample areas ranged from 29 to 43 parts per thousand as measured with a Goldberg refractometer. Juvenile trout were taken in salinities ranging from 32 to 42 o/oo in the primary sampling areas, although some were taken in the Arroyo Colorado in salinities as low as 9 o/oo. Water temperatures in the sample areas ranged from 26.8 to 29.5° C and juvenile trout were taken in water where temperatures ranged from 27.0 to 29.2° C.

None were caught at either end of the sample area. None were taken north of ICW Marker 260 or in the northern nine miles of the Lower Laguna Madre, nor were any taken south of ICW Marker 59 or in the southern 14 miles of the Lower Laguna Madre.

Discussion

The large concentrations of juvenile spotted sea trout which were prevalent in the Lower Laguna Madre from 1958 to 1960 appear to be present in 1970. Populations declined from 1961 to 1963, rose slightly in 1964, then declined steadily through 1969. Only future sampling will determine whether the 1970 rise in abundance will be significant.

The variation in abundance of juvenile trout does not appear to coincide with temperature extremes. The last known significant fish kill by cold weather occurred in January 1962 which was one year after the decline was evident. Rainfall and resulting salinity patterns do not seem to be governing factors either, since variations have been noted in both wet and dry years.

The center of juvenile trout populations has apparently shifted somewhat to the south from 1960 to 1970. In 1960 most of the juveniles were taken from Port Mansfield south to the Cameron-Willacy County line. By 1970, the center had moved southward some 5 to 10 miles. Apparently, the nursery areas have always been the middle third of the Lower Laguna Madre and it is this area which receives most of the runoff of the surrounding watershed, and agricultural areas of the Rio Grande Valley. Juvenile trout benefit from this nutrient-laden runoff; they may also be harmed by the pesticide residue which is present in the same runoff.

In an effort to determine whether or not the apparent decline in trout production might have been caused by an influx of pesticides into the bay system, the yield of juvenile trout in the Lower Laguna Madre was compared to concentrations of total chlorinated hydrocarbons found in juvenile menhaden (Brevoortia tyrannus) and in adult trout ovaries in the Arroyo Colorado from 1967 through 1970 (Figure 2).

Adult trout in the Arroyo Colorado feed primarily on juvenile menhaden. In 1966 a single pesticide sample of these juvenile menhaden showed a concentration of 1.520 ppm of DDT. In 1967 prior to the hurricane in September, the highest concentration was 5.180 ppm. The highest amount of DDT in menhaden in the Arroyo was reached in February 1968 just five months following extensive flooding of the watershed after Hurricane Beulah. The highest concentration of DDT (ppm) in the ovaries of spotted sea trout, a fish which feeds extensively on juvenile menhaden in the Arroyo Colorado, was found seven months later in September 1968. The average number of juvenile spotted sea trout taken by 60-foot seine in the Laguna Madre juvenile fish sampling stations declined from 21 per acre in November 1967 to 7 per acre in November 1968 and 13 per acre in November 1969.

Butler, Childress and Wilson (1970) concluded on the basis of the analysis of DDT residues in juvenile menhaden, and in ovarian tissue and eggs taken from Arroyo Colorado trout, that "Trophic magnification of DDT residues in the estuarine food web resulted in the reproductive failure of sea trout populations in the Lower Laguna Madre of Texas in 1969."

Since DDT residue in whole juvenile menhaden in the Arroyo Colorado have been declining since the peak in February 1968, it is possible that spawning success of the sea trout will return to normal. Monitoring of pesticide concentrations in juvenile menhaden and in spotted sea trout eggs and ovaries will continue as will sampling of juvenile and adult trout populations in the adjacent Lower Laguna Madre.

Literature Cited

Butler, P. A., Childress, Ray and Wilson, Alfred, J. Jr. 1970. The Association of DDT Residues with Losses in Marine Productivity. FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing. Mimeo, 13 p.

Figure 1 Juvenile Sea Trout Nursery Grounds Summer 1970

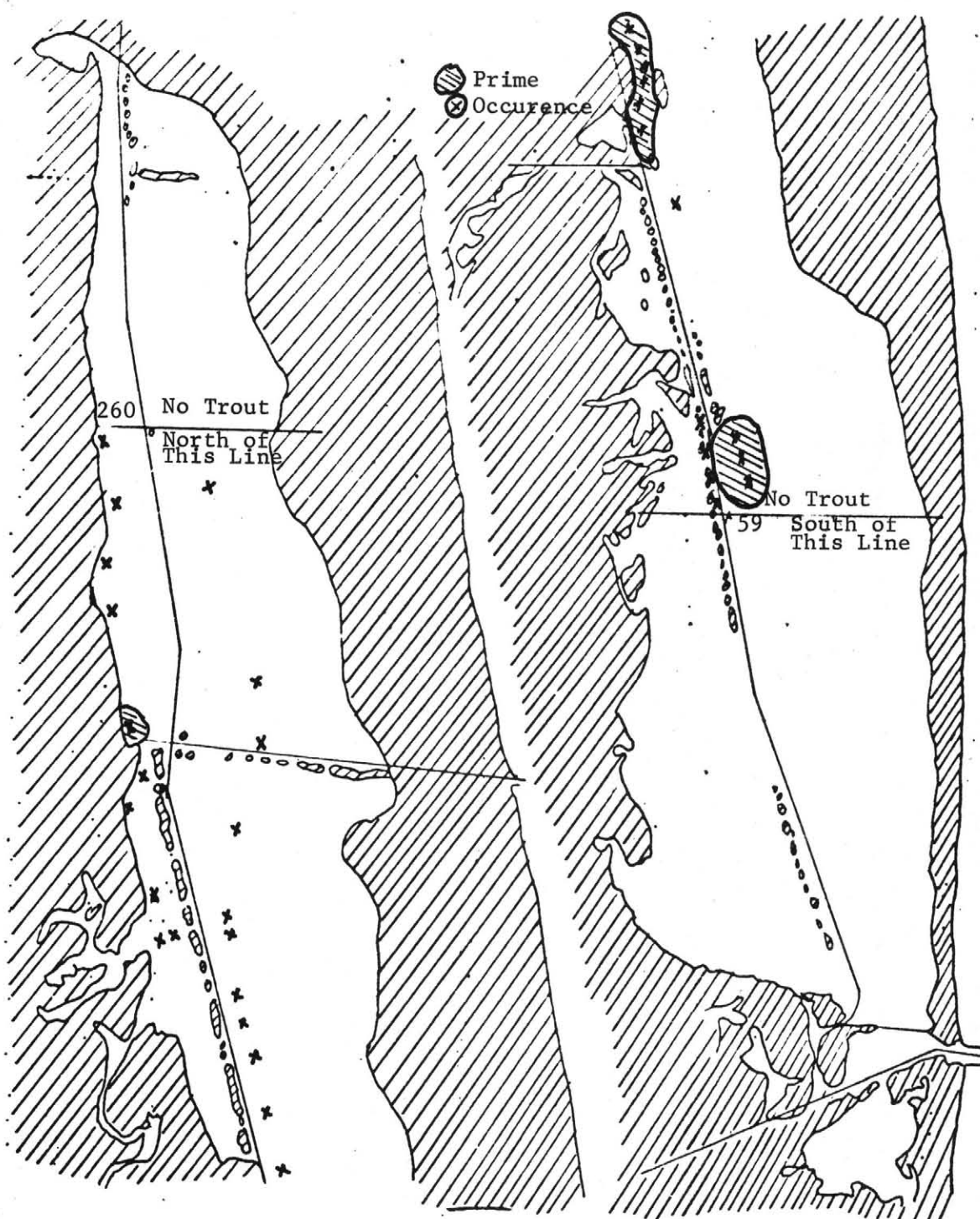


Figure 2

