Outline Of A Research Program On The Life History Of The Trout And Redfish

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THE GROUNDWORK for life history studies of the trout (*Cynoscion nebulosus*) and the redfish (*Sciaenops ocellata*) was laid by John C. Pearson in his paper "The Natural History and Conservation of the Redfish and Other Commercial Sciaenids on the Texas Coast" (Bull. U.S. Bur. Fish. 44:129-214).

While Pearson's work on these two fish solved many major problems of their life history, there still remains an enormous amount of biological and ecological work to be done before it is possible to determine a valid factual basis for management practices and legislation to conserve these fish.

Probably the question most urgently in need of solution now is the relationship of these fish to other marine inhabitants of the bays and Gulf, as well as to man, and what effect this relationship is having on the numbers of these two species. What is the food of these species and do the bays furnish sufficient food to support a large population?

This is particularly important in regard to the smaller stages, up to three or four inches in length, about whose food little is known.

Much work along these lines has been done by the laboratory of the Texas Game, Fish and Oyster Commission. From June 7, 1948 to August 31, 1949 the stomachs of 13,288 trout and 3,137 redfish were examined and, in general, it may be stated that the principal food of both species is shrimp. However, the fish examined have all been adults, and there is no accurate knowledge regarding the requirements of the immature fish.

Old Coast and Geodetic Survey charts show that, in many areas of the Gulf bays now having muddy bottoms, there was formerly sand or shell, both of which are apparently fairly well liked by these two species. Has this change damaged the carrying capacity of the bays so that they will no longer supply the population of marine organisms they once did?

What is a normal spawning? Is there a great enough deposition of eggs by these two to produce enough young fish to utilize all the food now produced in the bays?

To answer this it is necessary to know exactly where these spawning grounds are. Are they on clear sand bottom or are they located in areas where there is a dense bottom vegetation? What value is such vegetation, if any, to spawning fish? Should these grounds be protected? If so, why, and from what? How does vegetation affect the adult fish? In one case, in Currituck Sound, it was observed that when the vegetation was destroyed in a certain bay, *fishing declined* 90 per cent.

What is the actual effect of nets other than shrimp trawls on these species? Are these nets placing too heavy a drain on the species through selective action? Do trash fish move in to take the place of the much-sought-after redfish and trout when they are removed from an area? Is the action of the shrimp trawls in removing millions of pounds of trash fish from the waters each year beneficial or damaging? If these trash fish are not removed, will there be many more competitors for shrimp in the bays and in the Gulf? What effect will this have on the food of the two species in question?

Do trout and redfish migrate? If so, where do they come from and where do they go? What controls this movement? Is it temperature, currents, food

concentrations, spawning, water turbidity, or just an urge to travel to greener pastures? What predators eat them? What perils beset the growth of fry? What diseases, parasites, or illnesses kill the older fish?

How does the sports fishing affect them? Is it true that catches average much less in number than they used to, but is this because there are less fish or because there are more fishermen? The population of the Texas coast has increased tremendously during the past fifty years. How many more fishermen are there now than in 1900? What is the effect of the taking of thousands of undersized trout and redfish (all of them too small to spawn) by sportsmen?

According to the Pacific Halibut Commission, in each stock of fishes the major changes "are due to the fishery itself."

The Commission says that the same principles applied to any fishery. From this, there is certainly no reason to believe that the destruction of thousands and thousands of small trout and redfish that have never spawned will have any other than a major and adverse effect on the fishery of our own coast.

With this in mind, should a size limit be placed on the fish in the sportsmen's catch as it is on the commercial fishermen's? What size limit, however? Should it be a minimum length, or a maximum, or both? Should trout and redfish be placed on the game fish list so that they can not be sold in the markets even though a hungry world needs all the food it can get? If this is done, should a bag limit be placed on the sportsmen's catch so that the stock will not again be decimated and we may keep for the few what should be used for the benefit of the many?

Faced with these questions, it has been somewhat difficult to prepare an integrated program that will cover everything that needs to be covered, particularly with the biologists and equipment on hand. However, the problem is being attacked from as many angles as possible, in order to obtain as much data as possible with the means at hand.

A series of stations has been set up covering the coast from the upper end of the Laguna Madre below Corpus Christi to Pass Cavalla. The primary purpose of these is to establish the location of the spawning grounds for both trout and redfish and to determine the type of bottom, the amount of vegetation, and all other conditions affecting these, as well as the actual time of spawning, wherever feasible. An interesting thing in this regard is that, while it is yet entirely too early to draw any conclusions, there are a number of indications that very small trout, less than a week old, prefer a clean, white sand bottom, where there is a heavy growth of the marine plant *Ruppia maritima*. This is very noticeable and, while found elsewhere, they are most plentiful in this type of habitat.

Procedure has involved sampling by various methods at each one of the stations and the keeping of meteorological and hydrographical records. It is felt that, by this approach, and necessary variations upon it, it may eventually be possible to determine the type and frequency of the areas necessary as nursery grounds for the small fish and, by stomach analysis, what food they utilize that may be different from that of the adults.

It may be found that the presence or absence of certain types of plankton is necessary for the subsistence of small fish, and some physical, hydrographical, or meteorological factor may govern this. In this connection, it is necessary to know whether there is any correlation between the turbidity of the water and the available food for these immature forms. Has increasing turbidity of the bays cut down photosynthesis to the point where they no longer produce suffi-

cient food for the young, and is this a factor in the amount of trout and redfish present? Moreover, does this turbidity act as a feeding inhibitor on the adults?

Gonad development is being studied on all fish collected and an attempt is being made to correlate the spawning ages, length, and weight as closely as these three factors can be correlated. This information is also being tablulated by area, season, salinity, temperature, and any other pertinent methods.

A fish trap has been installed in Cedar Bayou, a shallow natural pass between St. Joseph and Matagorda Islands. This trap is attended by one biologist and a crew of fishermen. The main objectives of this work are as follows:

1. Time of migration of various species through the pass.
2. Magnitude of these migrations.
3. Examination of the gonads in order to determine spawning time and the habits of fishes using the pass.
4. Size and age of fish and crustaceans using the pass.
5. Examination of the species involved to determine the food of the different size classes and to establish the difference, if any, between the food of fishes in the Gulf and the food of fishes in the bays.
6. Tagging.
7. A comparative study of the numbers of species utilizing the pass to endeavor to determine the value of such a pass in the replenishment of the population of our bays.
8. By seine hauls or other necessary means in the same area, to determine the population density and the species using different types of habitats such as mud or sand bottom or oyster reefs. (This is important as it probably has a great deal of bearing on the variations in productivity of the bays).
9. Hydrographical and meteorological studies will be made and every attention will be given to determining, if possible, the actual volume of water interchanged by means of this pass, and the extent that this water affects the bay area. In doing this it is proposed to utilize floating postcards for the accumulation of data, like those used by Dr. Langlois and his staff at Put-in-Bay, Ohio.
10. After sufficient data have been accumulated by the use of traps and seines, with no obstruction at the mouth of the pass, two subsidiary wire curtains are to be installed in the Gulf, perpendicular to the shore, on each side of the pass, to simulate jetties and to determine the effects of such jetties on the usage of such a pass by fish and other marine life. It is also hoped that by trapping these curtains at different distances from the shore, it will be possible to determine the movements and migrations of the various species in relation to the topography of the shore line.

It can readily be seen that the information gained in this manner at the pass will correlate and amplify the study of the bays.

A third phase of the program depends upon the operation of the fish cleaning table at the laboratory itself. This table, which was set up in 1948, has been very useful. For the privilege of retaining the stomachs and accumulating other necessary data, the staff will clean the catch of any sportsman or commercial fisherman who brings it in. Signs scattered over the area inform everyone of this fact and, during the past year, some fifteen or twenty thousand fish have passed across the table. Costs have been very small, and the worth of the data so accumulated has been great. Food, age, length, weight, and scale information are the chief products.

The impact of the shrimp fishery is being studied, also. In actual practice the

laboratory trawler has been equipped with four different shrimp nets. One of these is a regular 65′ shrimp trawl as used on this coast in the commercial fishery. A second 65′ net is identical in all respects with the first except that it has a Guthrie culling bag, developed on the east coast, instead of the regular sack. Two other nets are used. These are of a type developed locally within the last two years and are known as "Kite Nets." They are totally unlike the ordinary shrimp trawl inasmuch as they have no lead lines, no cork lines, and no bottom. These nets in operation have proved to be excellent over rough, soft, or grassy bottom, consistently producing catches where nets of the regular pattern cannot be used. They have another advantage, the difference in construction causing them to act as culling nets, greatly reducing the percentage of fish in the catch.

Of the two nets of this type which are being used, one is equipped with the ordinary sack, the other with the Guthrie culling bag mentioned above.

This part of the program will be carried on under actual fishing conditions, the laboratory boat operating at the same time, in the same area, under the same conditions, as the commercial shrimping fleet. Its purposes are as follows:

1. To determine the species of fish taken in the commercial shrimping operations and the ratio in numbers, size, and poundage of these species to the amount of marketable shrimp obtained.
2. To determine the actual ratio of the various sizes of shrimp during the various seasons to the marketable shrimp.
3. To determine the ratio of the poundage in unusable shrimp and fish to the poundage of shrimp produced for market.
4. To determine the amount of trout and redfish, if any, taken in commercial operations.

In connection with this part of the investigation, meal and oil analyses of the various species will be made, and it is hoped also that it will be possible, a little later, to conduct some experiments as to the possibility of utilizing the scrap fish for canning.

The Florida Mullet Research Program

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IN A NATION ranking second in the world in the production of fish, Florida is among the leading states. Only California, Massachusetts and Virginia landed greater quantities of fish in 1945 (Anderson and Power, 1949). Of the food fish caught in Florida, the mullet is the leading species.

Two varieties of mullet are recognized by the industry. These are the striped mullet (*Mugil cephalus*) and the silver mullet (*M. curema*). Of these the former is caught in greater quantities. Two other species may possibly occur in the commercial catches but they are of negligible importance. These are *M. lisa* and *M. trichodon*.

No continuous record is available of the amount of mullet landed in Florida. Federal government statistics for the State are available for some years (Table 1) but statistical surveys have been made by the United States Bureau of Fish and its successor, the United States Fish and Wildlife Service, only at relatively long intervals, as funds were available. Florida State law has required statistical reports from the fishing industry since 1933, but even since then there is not