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REVIEW OF INDUSTRIAL BOTTOMFISH FISHERY IN NORTHERN GULF OF MEXICO, 1959-62

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BACKGROUND

The problem of unwanted fish caught in commercial harvests is not new to the United States fishing industry. An effort to find a solution resulted in a report published in 1907 by the U. S. Bureau of Fisheries. The only practical suggestion offered at that time was to develop the utilization of those species having no market.

In 1952, the Gulf coast fishing industry attempted to solve the problem of marketing small bottomfish, weighing less than 1 pound each and caught incidentally in shrimp trawls, by constructing a petfood plant at Pascagoula, Miss.

Production of such fish gradually increased each year thereafter, and by 1958 ten plants at 6 ports located in Mississippi and Louisiana processed approximately 41,000 tons (fig. 1). Additional use of fish was made at that time by the poultry industry in the form of fish meal, and by the fur-farming industry (especially for the feeding of mink). Production decreased slightly in 1960 and 1961, but increased again in 1962 to a record catch of 48,000 tons valued at \$1.6 million ex-vessel. Of the total catch processed, 85 percent was canned as petfood, while the remainder was frozen for mink food and crab bait, and dehydrated into fish meal. Mississippi led all states, accounting in 1962 for 40 percent of the total United States petfood pack with a value of \$14.9 million to the Mississippi canners. The total United States pack of animal food from fishery products in 1962 amounted to 7.8 million cases--more than

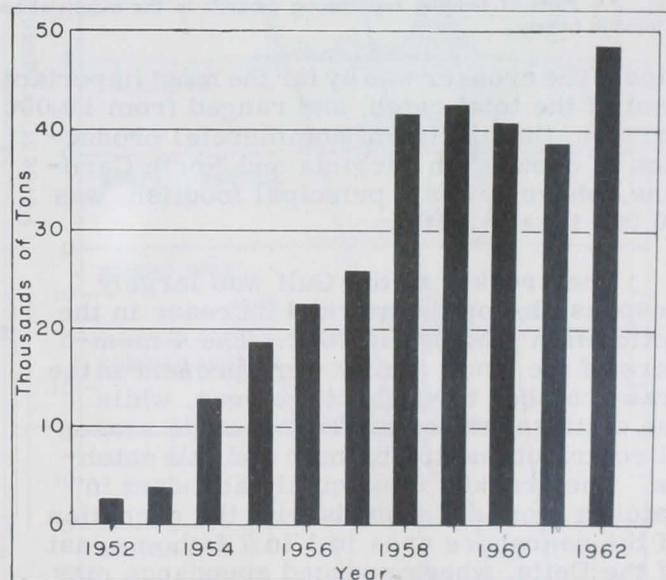


Fig. 1 - Industrial bottomfish landings of the northern Gulf of Mexico.

twice the salmon pack and more than one-half of the tuna pack for human consumption.

In 1958, the Gulf States Marine Fisheries Commission recommended that funds be made available to make a study of the industrial fishery of the northern Gulf of Mexico. Later that year the Fish and Wildlife Service assigned biologists to survey the species and size composition of landings made by the bottomfish fleet at Pascagoula, Miss. The principal objectives of the study are to detect changes that may occur in the fish populations, and to obtain life history information for the major species. The present report deals with some of the results obtained from 1959 through 1962.

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PRESENT FISHERY

Fishing for bottomfish is presently conducted over the inner Continental Shelf near the Mississippi River Delta (fig. 2). A resident fleet of approximately 50 trawlers generally seek fish in 4 to 20 fathoms from Ship Shoal, Louisiana, to the southeast coast of Alabama; and land their catches at Golden Meadow, La., as well as in Gulfport, Biloxi, and Pascagoula, Miss. Within that area, the 10-fathom curve averages about 10 miles from shore. The sea bottom consists largely of mud and sand, and is generally level, providing excellent trawling conditions.

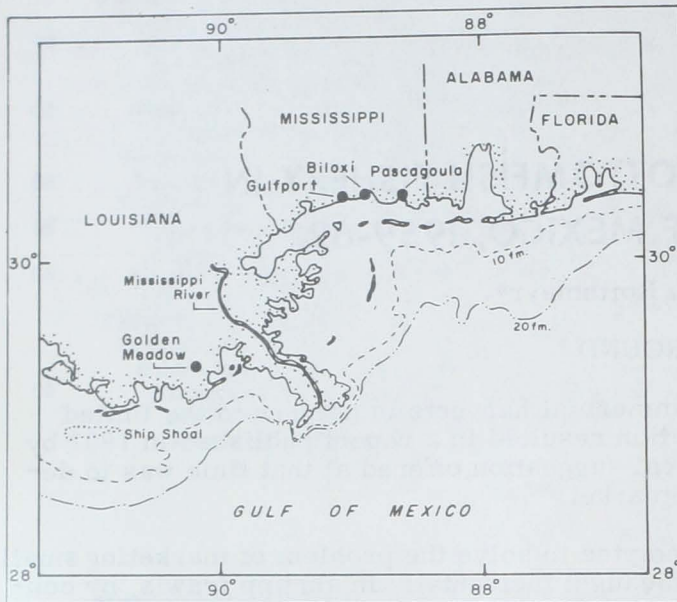


Fig. 2 - Ports of landing and fishing grounds in the industrial bottomfish fishery.

The croaker was by far the most important species harvested each year, averaging 53 percent of the total catch, and ranged from 19,000 tons in 1959 to 28,000 tons in 1962. By comparison, the maximum commercial production of croaker in Virginia and North Carolina, where it was a principal foodfish, was 30,000 tons in 1945.

The croaker of the Gulf was largely responsible for the marked increase in the bottomfish landings in 1962. The 4 members of the drum family were present in the trawl catches throughout the year, while the cutlassfish, or silvereel, made seasonal contributions to summer and fall catches. The croaker was equally abundant in catches from all grounds with the exception of the nearshore area in 1 to 7 fathoms east of the Delta, where reduced abundance may have been due to the presence of large amounts and a great variety of other species. The spot was approximately two times more abundant east of the Delta, while both species of sea trout were 2 to 3 times more abundant west of the Delta. The cutlassfish was more plentiful in catches from the nearshore grounds east and west of the Delta.

A major portion of the life history project involves the separation of age groups, or year-classes, of each of the four major species contributing to the fishery, the purpose being to expose any variation in relative abundance of successive age groups, and to determine what effect it has on the commercial catch. One to 8 life history samples were obtained each week from commercial catches landed at Pascagoula, Biloxi, and Gulfport, Miss., since July 1961. One hundred fish per sample were measured for total length. Subsampling every fifth fish provided scales for age studies, weight measurements, sex, and stage of sexual maturity.

The shallow waters of the northern Gulf are characterized by an abundant variety of fish. Sixty-five families of fish, including over 170 species, have been identified in the commercial bottomfish landings.

Four members of the Sciaenidae, or drum family, contributed significantly to the overall production (fig. 3). On the average, croaker, spot, sand sea trout, and silver sea trout accounted for 72 percent of the annual landings during the 4-year period.

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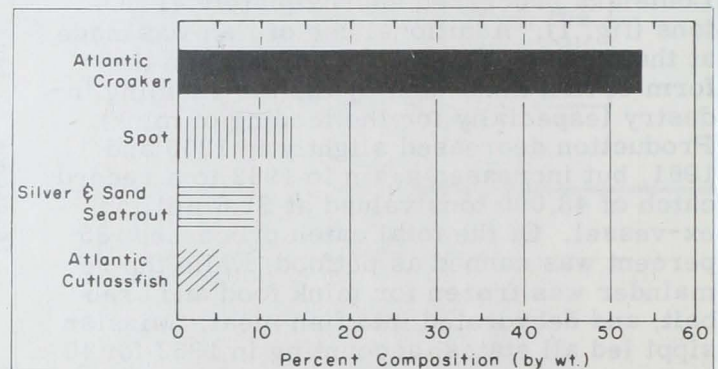


Fig. 3 - Relative production of principal species, 1959-62, in the industrial bottomfish fishery of the northern Gulf of Mexico.

ANALYSIS OF LENGTH AND WEIGHT DISTRIBUTIONS FOR CROAKER

The findings reported in the following discussion are restricted to the croaker. Attempts to use the scale method of age determination have had limited success since annuli, or year marks, are difficult to determine. Therefore, analysis of length and weight distributions, despite acknowledged subjectivity, has had to be relied on for age determination. The results reported in this study are to be considered preliminary. Samples of croaker were available from the inshore estuaries and sounds, as well as from the nearshore areas in the Gulf in abundant quantities for the first time in October 1963. The inshore material was obtained from collections made in Mobile Bay and Mississippi Sound by personnel of the Alabama Marine Resources Laboratory.

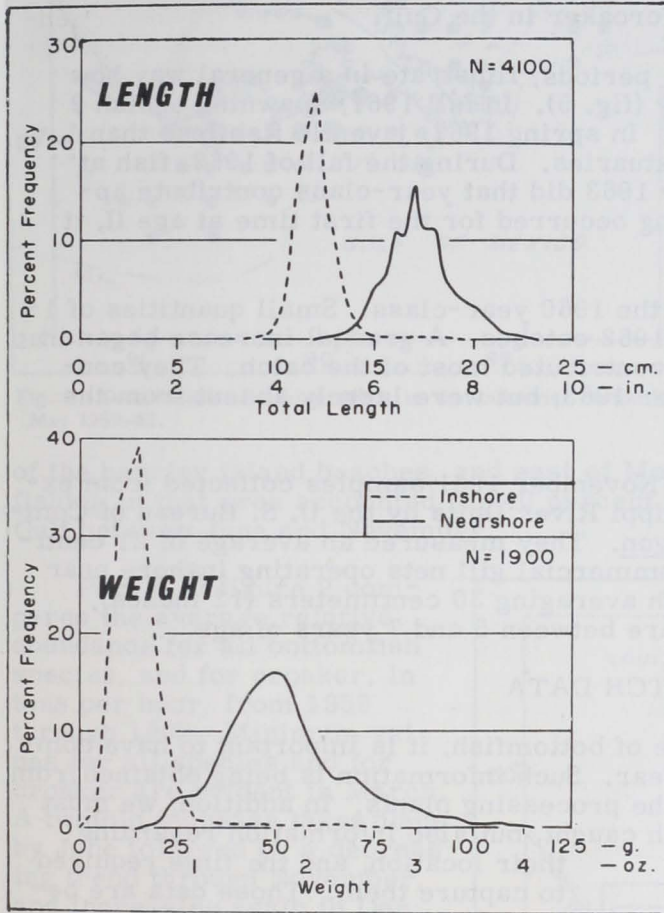


Fig. 4 - Frequency distributions--Atlantic croaker, east of the Delta, October 1963.

Length measurements of 4,100 fish clearly show the presence of two size groups from east of the Mississippi River Delta between Chandeleur Island and Mobile Bay (fig. 4). The average length of fish caught inshore in Mobile Bay and Mississippi Sound was 12 centimeters (almost 5 inches). Fish captured nearshore in 2 to 7 fathoms in the Gulf averaged 17 centimeters (nearly 7 inches).

A similar separation of croaker into two size groups was evident by using the weight determinations of 1,500 fish. The average weight of inshore fish was 15 grams, or about one-half ounce, while nearshore fish in the Gulf averaged 50 grams, or nearly 2 ounces.

Associated data on sexual maturity of those fish showed that 97 percent of the inshore fish examined were virgin, and the remainder were in spawning condition, or had recently

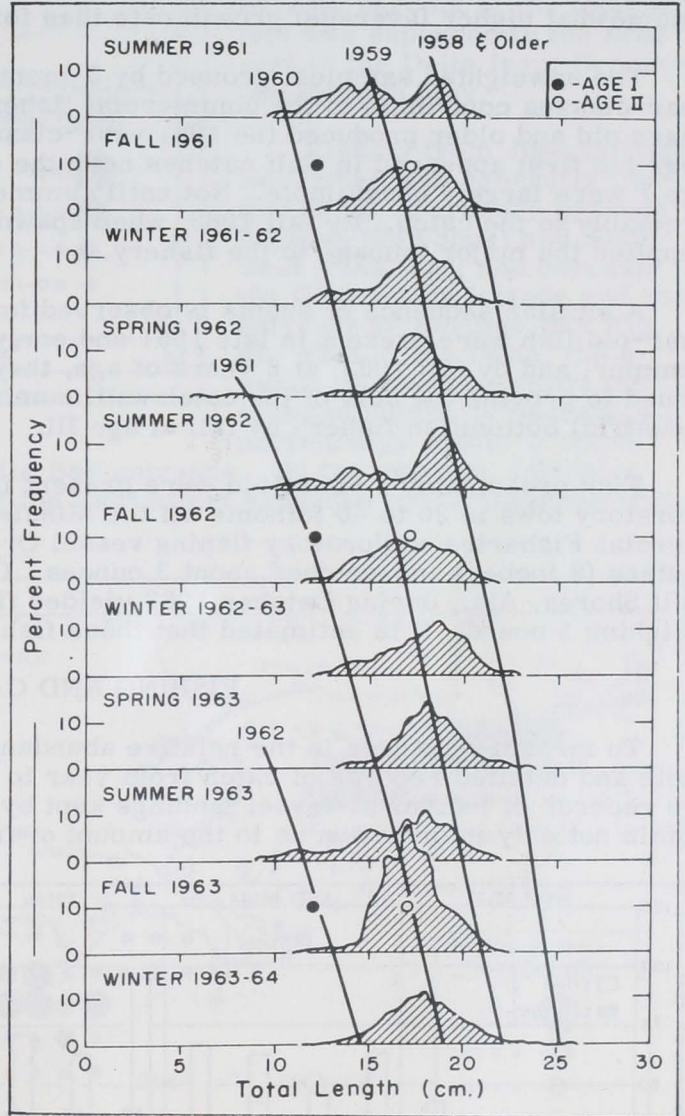


Fig. 5 - Length frequency distribution--Atlantic croaker in the industrial bottomfish fishery of the northern Gulf of Mexico.

spawned. On the other hand, no virgin fish were evident in nearshore samples from the Gulf, while 43 percent were either ripening or ripe.

Previous studies of croaker east of the Delta since 1961 showed that quantities of ripe fish were present from 3 to 7 fathoms in the Gulf from September through November. Assuming that to be the principal spawning period, it is hypothesized that the smaller size group of 5-inch fish present in the inshore waters during October 1963 was spawned in fall 1962, and may be identified as the 1962 year-class. Larger fish, which average 7 inches in length, are 1 year older, constitute the 1961 year-class, and are spawning for the first time. It is tentatively concluded, therefore, that those are largely 1- and 2-year-old fish. The croaker on the Atlantic coast reaches a length of 7 inches at the end of the first year, which indicates a somewhat higher (average) growth rate than for croaker in the Gulf.

The unweighted samples, grouped by 3-month periods, illustrate in a general way how year-classes contribute to the commercial fishery (fig. 5). In fall 1961, spawning of fish 2 years old and older produced the 1961 year-class. In spring 1962, juvenile fish less than 1 year old first appeared in Gulf catches near the estuaries. During the fall of 1962, fish at age I were largely unavailable. Not until summer 1963 did that year-class contribute appreciably to the catch. By fall 1963, when spawning occurred for the first time at age II, it supplied the major tonnage to the fishery.

A similar sequence of events is observed for the 1960 year-class. Small quantities of 1-year-old fish were present in late 1961 and early 1962 catches. A gradual increase began in summer, and by fall 1962, at 2 years of age, they contributed most of the catch. They continued to provide the bulk of the catch until summer 1963, but were largely absent from the industrial bottomfish fishery by fall at age III.

Fish presumably 3 years old were present in November 1961 samples collected from exploratory tows in 30 to 40 fathoms off the Mississippi River Delta by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel Oregon. They measured an average of 21 centimeters (8 inches) and weighed about 3 ounces. Commercial gill nets operating inshore near Gulf Shores, Ala., during October 1963 yielded fish averaging 30 centimeters (12 inches), weighing 1 pound. It is estimated that those fish are between 5 and 7 years of age.

FISHING AND CATCH DATA

To measure changes in the relative abundance of bottomfish, it is important to have complete and detailed records of catch from year to year. Such information is being obtained from the records of individual vessel landings kept by the processing plants. In addition, we must obtain not only information as to the amount of fish caught, but also information regarding

their location, and the time required to capture them. Those data are being collected by means of personal interviews, and from logbooks being kept by vessel captains.

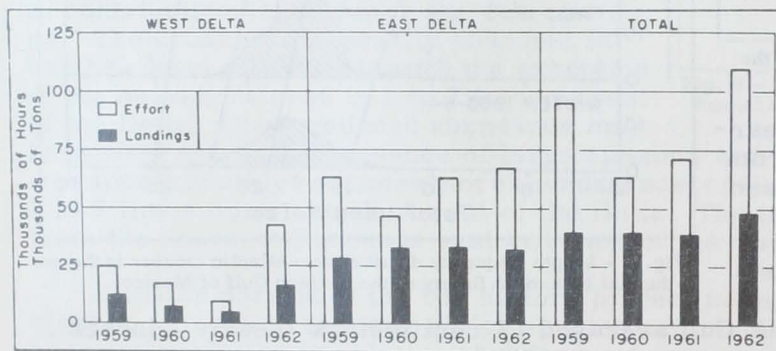


Fig. 6 - Effort and catch statistics in the industrial bottomfish fishery of the northern Gulf of Mexico.

Annual landings varied only slightly from an average of approximately 40,000 tons during the period 1959-1961, but increased to 48,000 tons in 1962 (fig. 6). Landings originating east of the Mississippi River Delta remained comparatively level during the 4-year period, averaging 31,000 tons, or 76 percent of the overall total. On the other hand, landings from

west of the Delta declined by more than one-half between 1959 and 1961, but increased three-fold in 1962. Comparative effort data show that the increase in total landings in 1962 was the result of the increased effort expended by the fleet on west Delta grounds.

On the average, fishing from December through May occurred between Point au Fer, La., and Southwest Pass, La.; and from Pass a Loutre, La., to Perdido Bay entrance, Fla.; and off-

shore to a depth range of 20 to 30 fathoms (fig. 7). The grounds most heavily fished each year were in 8 to 12 fathoms off Chandeleur Island, Horn Island, and Petit Bois Island; in 5 to 12 fathoms east of Mobile Bay entrance; and in 8 to 12 fathoms off Timbalier Bay, La. Seventy percent of the total effort was expended in the area east of the Delta from December through May.

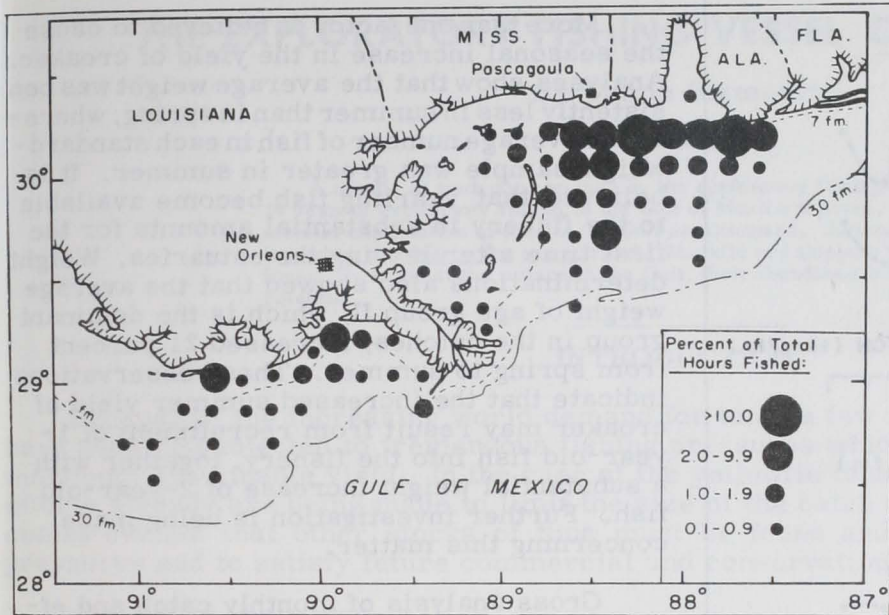


Fig. 7 - Distribution of fishing effort in the industrial bottomfish fishery, December-May 1959-62.

Fishing from June through November was generally limited to the nearshore grounds between Ship Shoal and Southwest Pass, La.; and between the Chandeleur Islands and the entrance to Perdido Bay (fig. 8). East of the Delta, the amount of seasonal effort increased markedly nearshore, particularly within 5 miles

of the barrier island beaches, and east of Mobile Bay entrance. On the average, intensive fishing in that area accounted for 40 percent of the total effort expended in the north-central Gulf between June and November.

Part A of figure 9 compares the average relative abundance for all bottomfish species, and for croaker, in tons per hour, from 1959 through 1962. Minimum values for all species and for croaker are evident in March. A twofold increase takes place by June followed by a decreasing trend through November, and increasing again in December. Obviously the croaker governs the seasonal variation in the overall relative abundance of the bottomfish resource.

Part B of figure 9 reveals that the average depth fished by trawlers in February is 12 fathoms, while shallower depths of 5 to 6 fathoms are fished from June through October.

In Part C of figure 9 it is evident that the average tow takes 2½ hours in March, while shorter tows of about 1½ hours each are made in June, July, and August. Most apparent from those data is that the evident change in bottomfish abundance from spring to summer is largely due to a real increase in the croaker yield on the nearshore grounds.

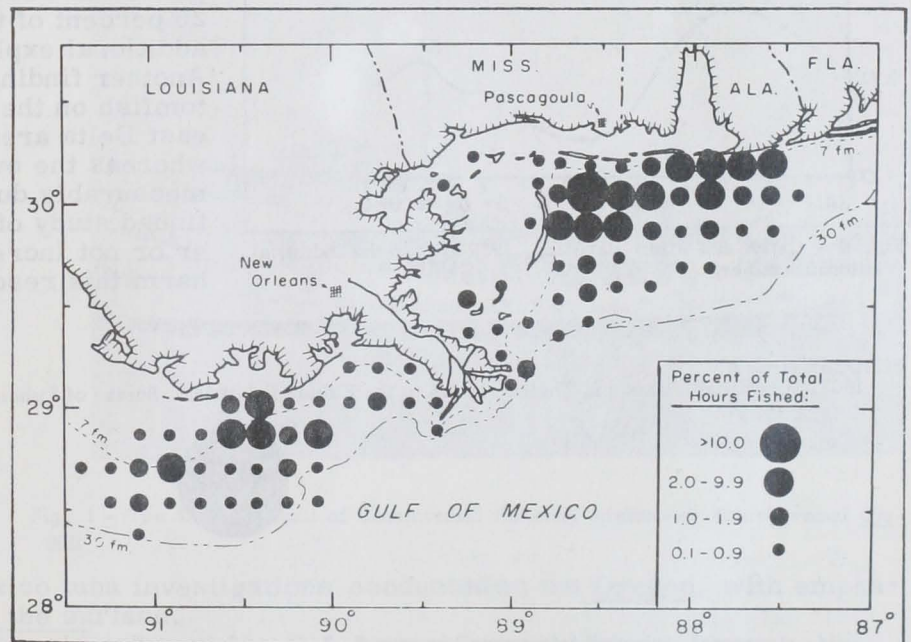


Fig. 8 - Distribution of fishing effort in the industrial bottomfish fishery, June-November 1959-62.

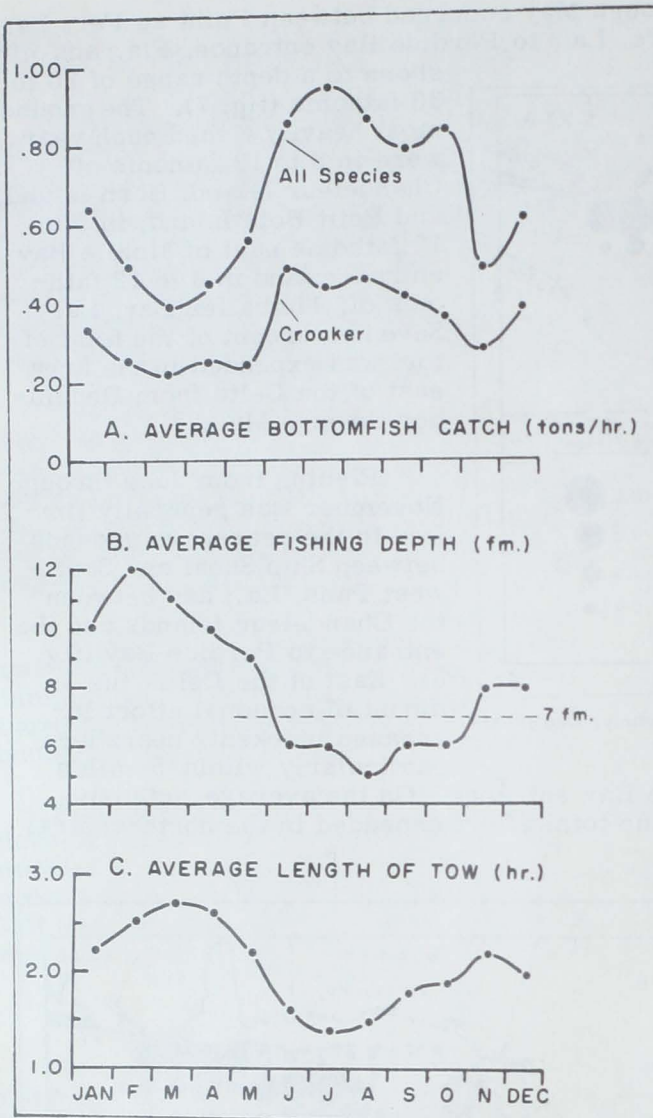


Fig. 9 - Catch and effort statistics, 1959-62, in the industrial bottomfish fishery.

GENERAL OBSERVATIONS ON CROAKER

More than one factor is believed to cause the seasonal increase in the yield of croaker. Analyses show that the average weight was consistently less in summer than in spring, whereas the average number of fish in each standard-weight sample was greater in summer. It is believed that yearling fish become available to the fishery in substantial amounts for the first time after leaving the estuaries. Weight determinations also showed that the average weight of age group II, which is the dominant group in the catches, increased 21 percent from spring to summer. These observations indicate that the increased summer yield of croaker may result from recruitment of 1-year-old fish into the fishery, together with a substantial weight increase of 2-year-old fish. Further investigation is being made concerning this matter.

Gross analysis of monthly catch and effort statistics for the Gulf bottomfish fishery has been completed for the period 1959 through 1962. The mean relative abundance of bottomfish, using catch per hour as an index, was almost identical for both the east and west Delta grounds. Since effort expended in west Delta waters averaged only 25 percent of the overall northern Gulf total, additional exploitation there is indicated. Another finding is that the abundance of bottomfish on the heavily fished grounds of the east Delta area remained almost the same, whereas the overall trend in catch increased measurably during the 4-year period. Continued study of the fishery will reveal whether or not increasing catches have begun to harm this resource potential.

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Created in 1849, the Department of the Interior--a department of conservation--is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

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