

would in many cases prefer natural sponges. A price reduction of proper relationship to the price of the synthetic sponge. A price reduction of about 25 per cent could increase sales by about 300 per cent. In addition proper grading, good packaging, advertising, and availability in all desired sizes and at all times and conditions, upon which the expansion of the natural sponge market depends.

Reports from the Bahamas indicate that there is a trend towards recovery of the sponge beds which were depleted by diseases and overfishing about ten years ago. The encouraging report from the Bahamas justifies the hope that the Tarpon Springs area in the near future also will regain its former importance as the sponge production center of the United States.

In the discussion it was observed that, due to generally improved economic conditions in the Gulf and Caribbean area, the diet of the natives is improving, that fresh and frozen fish are entering markets in Puerto Rico, Venezuela and in other countries of this area, where formerly the inexpensive salted cod was the main fish food the native could afford. However, there was regret expressed that transportation conditions in many parts of the Caribbean area are still in a lamentable state so as to prevent the full use of the local fishery resources in the interest of the native population and in the economic interest of the area as a whole.

Many areas, however, report increased industrial fishery activity, as, for example, Haiti, the Dominican Republic, Panama, Cuba, Mexico and, last but not least, the Gulf States of the United States. It can be hoped that this increased industrial fishery activity continues to contribute to the rising economic welfare of the people of our area.

How Can The Present Research In Exploratory Fishing And Fishing Technology Be Most Profitably Expanded?

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During the discussion following "The *Oregon's* Investigations and Future Plans for Research" by Stewart Springer, the speaker further elaborated on the results of the deep water shrimp trawling investigations of the *Oregon*, indicating the practicability of trawling in depths of 250 fathoms with proper winches and other equipment. The *Oregon* haul-backs of the trawl took about 28 minutes when fishing at 250 fathoms. Although only a few drags were made, there was some indication that *Hymenopenaeus robustis* may exist in commercial quantities off Mississippi. Those caught had a pleasing taste, more like lobster and crab than common shrimp, but were soft in texture which may affect keeping quality. This species appeared to hold up satisfactorily when frozen aboard the vessel, however.

Questions arose as to scrap fish and invertebrates taken incidental to the general shrimp trawling work in the Gulf and as to utilization of those species. Great beds of echinoderms exist in some areas, but whether these have food or industrial value is questionable. Scrap fish, particularly small croakers, were taken in commercial volume but utilization is a difficult problem from the economic standpoint, owing to the lack of oil yield.

Further investigations will incorporate a number of suggestions offered during the discussion; namely, use of tickler chain on trawl to increase catch; experiments with mid-water trawling gear; testing methods to improve red snapper catches and trying chum and dip nets for Spanish mackerel.

Mr. J. L. Baughman's paper, "The Menhaden Fishery of Texas," led to a reiteration that much of the misconceived information on the harmful effects of menhaden fishing operations on other fisheries stems from unfamiliarity with the menhaden fishery. Educational programs to acquaint those misinformed on the industry and its activities was recommended. Mr. Baughman pointed out that less than 3 per cent of the food of various fishes examined in his studies consisted of menhaden, and that the percentage is so small that menhaden are insignificant as a food factor for other fish. The studies included the fishery in Louisiana as well as in Texas and the results would be equally applicable to the Louisiana fisheries. It was also emphasized that the menhaden population must be extremely large, since there is no evidence of depletion at the present time. Some comments were made on the destructive effect that seining in shallow water may have on the habitat for bottom fish. It was indicated that in some cases stirring up the bottom might improve fishing, especially on soft bottom. Opinions concerning this question varied somewhat and suggestions were offered that future investigations be broadened to include habitat studies along with food studies to acquire complete knowledge in this field.

"The Use of Echo Sounders in the Fisheries," by Ewing Lawrence activated interested discussion of possibilities of developing horizontal electronic fish scanners since the ordinary depth recorders are limited to vertical ranges. Several difficulties are involved in horizontal scanning, one of which is the stratification of the water resulting in sonic energy being bent or refracted by the interfaces. There was some variation in opinions of the seriousness of this difficulty, however. Further complications in the development of satisfactory scanning instruments for fishing vessel use is the necessarily complex nature of the equipment. Customarily, fishing vessels are not manned or equipped to cope with maintenance of such complicated equipment in order to keep it operating effectively. Some attempts have been made to adapt military underwater scanning equipment to fishing vessel operations, but this does not seem practical.

On the regular depth recording instruments commonly in use at present, certain species of fish can be detected satisfactorily, especially those fish that school. There are some instances which indicate that shrimp have been shown on the recorder off the west coast of Mexico on soft mud bottom. The recorder marks appeared as dark patches on the bottom line recording. Where erratic soundings are noted, it is not probable that the vessel will be running over a school of fish so dense that no bottom soundings show. In the Gulf area certain patches of green mud give off gas in bubbles which obscure bottom soundings by showing as a line or in other cases eliminating the echo entirely. In spite of such variations from normal operations, depth recorders are well recognized as being advantageous in commercial fishing operations.

The general discussion on "Control of Fish Spoilage by Icing and Freezing" following the paper by Harold E. Crowther, brought out that the rate of freezing fish is an important factor, but low storage temperatures are even more so in maintenance of quality. Even if the freezing rate is slow and large crystals are formed in the cells of the fish flesh, recent experiments show that low tempera-

ture storage will maintain quality. Opinions varied nevertheless as to effect of slow freezing on the amount of "drip" upon defrosting the product. The amount of drip is generally proportionate to the length of storage period. Present Fish and Wildlife Service studies in the freezing-fish-at-sea project with the vessel *Delaware* in the New England area may help resolve this question.

The question arose as to the value of adding salt-type material to ice to lower the temperature when holding fish in wet ice refrigeration. It was pointed out that this may be advisable to a certain point. However, various species differ in freezing point; for example, cod soften at 28° F., and there is no way of lowering the temperature below that point for non-frozen refrigeration.

Experiments indicate that fish flesh itself is sterile but mucous (slime) and the intestinal tract are not. Bacterial contamination comes from these sources and consequently is a factor to consider in freezing and preserving high quality products.

"The Role of Exploratory Fishing in the Development of the Commercial Fisheries," was discussed by Carl Carlson, and the subsequent comments pointed up the fact that commercial fishing will always expand into new areas once the economic feasibility for such a move is established. There was considerable interest in the possibilities of commercial quantities of shrimp in the waters off the east coast of South America and whether large vessels constructed for long-range operation homing in Gulf ports could fish those areas. There are very limited data on resources off the coast of South America, but if higher production is reasonably obtainable such long-range fishing conceivably could be undertaken. It would require some changes in equipment and especially installation of freezing apparatus on vessel.

In answer to a question about possible transfer of a portion of the tuna industry to the Gulf Coast, it was brought out that such ventures are under consideration by some companies now, since Gulf ports are about 1000 miles closer to the Galapagos Island fishing area. Several problems are attendant in a shift to the Gulf—primarily the need for proper bait. Also, special inducements are necessary to persuade crews and others to shift locations. Shifting purse seiners would not involve bait problems that are entailed in the moving of clipper vessels. There is not much information on bait resources in the Gulf area. However, there is some possibility that small menhaden may be the solution to the bait problem. Experiments have indicated that these fish can be kept alive in bait tanks for long periods. More research is needed before any positive conclusions can be reached.

After some general statements on fishery sanitation problems in Florida and other states, following the paper by Richard P. Hardison entitled "Sanitation in the Seafood Industry," there was an inquiry as to the possibility of purifying oysters from polluted areas. Although oysters can be cleansed by proper processes, the excessive cost has prohibited use of purification plants in reclaiming this portion of shellfish resources. The Health Department is cognizant of the need for improvement in sanitation in various segments of the industry and of some inequities that allow "fly-by-night" operators with poor facilities to compete with progressive producers and processors. State legislative action will be attempted to correct some of these situations.