

Problems of Exploitation of Tuna in the Gulf & Caribbean

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Tuna are caught by commercial fishermen in a variety of ways, with poles and feathered squids after chumming with live bait, by purse seines, by trolling, with set lines (i.e., longlines or flaglines), by harpooning, and with various kinds of trap nets. It is convenient to separate tuna fishing operations into two classes, based on the distance it is necessary to travel in order to catch the tuna. Long range tuna fishing vessels going long distances to extensive offshore fishing grounds need to be relatively large, and unless accompanied by motherships or by large vessels to take care of the catch, they need large refrigerated carrying capacity, large fuel capacity, as well as supplies for a long voyage for the crew. Whether or not each fishing vessel acts independently or is a part of a fleet including a mothership or tender, the total cost of the fishing unit is very high compared to the cost of units operating close to a base. This means that the catches have to be large and valuable in order to make the operation pay. On the other hand, short range tuna fishing operations do not require such expensive fishing units. They have drawbacks however, either because of the seasonal occurrence of tuna for very short periods near their bases, or because of difficulties of coordination of landings with processing or marketing. In the West Indies, as in the United States, the demand for fresh tuna is slight. The demand, where it exists, is for canned tuna.

A successful short range tuna fishery has been in existence in Cuba since 1942 (Rawlings, 1953). The production, consisting of blackfin tuna (*Parathunnus atlanticus*) and white skipjack, (*Katsuwonus pelamis*) comes from waters within a few miles of the reefs near the Isle of Pines and to a lesser extent from the northwestern coast. This is a part-time fishery and the tuna are canned and marketed in Cuba by canneries working seasonally on a variety of products. Development of additional short range tuna fisheries in the West Indies is feasible wherever suitable processing facilities become available and local markets for canned tuna are sufficient.

The kind of short range fishing most likely to prove successful in the Gulf and West Indies would depend on local conditions. Low cost gear and the simplest possible methods of handling catches are necessary to the success of a very small or part-time fishing operation, and it is significant that the Cuban fishing is carried on with live bait. The bait, small fish about one to three inches long, (mostly *Jenkinsia lamprotaenia*) is obtained close to the fishing grounds and is carried in live wells until used. Up to the present time the live wells in the Cuban boats have not been equipped with circulating pumps and it has been impossible to keep the bait for more than a day. As a result the fishermen spend much more time catching bait than actually fishing for tuna. The method of fishing used by the Cubans has the advantage of relatively low cost for fishing vessels and gear. Fishing for tuna with live bait as chum, and catching and handling live bait does require considerable skill and experience and the use of the method in other areas of the West Indies would require not only a good source of supply of bait but also training of fishermen in techniques.

The *Oregon*, the exploratory fishing vessel of the Fish and Wildlife Service in the Gulf of Mexico, caught little tuna, *Euthynnus alletteratus*, on the Tortugas shrimp grounds during the slack shrimp season in the summer of 1952, using feathered squids, dead bait and chum made from scrap from shrimp trawls. Catches of 1500 to 4000 pounds were made on each of several mornings, during the two hour period beginning at dawn. Production of little tuna as a part-time activity by shrimp vessels during seasons of poor shrimp production appears possible whenever arrangements for marketing become satisfactory.

Possibilities for much greater production in the Gulf and Caribbean exist in fishing for tuna at considerable distances from bases. In the Gulf of Mexico the tunas, except the little tuna, are rarely found on the continental shelf, appearing to be widely distributed in summer off the shelf, usually at distances of more than 75 miles from shore. In the Caribbean the tunas are commonly taken closer to island shores, but often at great distances from ports. Furthermore, observations suggest that the tunas move seasonally or irregularly, so that long range fishing would be necessary to maintain steady production.

There are not enough records to indicate reliably the distribution of the tunas in the Gulf and Caribbean. Those available suggest that the black-fin tuna, *Parathunnus atlanticus*, is widely distributed and is probably the commonest one in offshore waters from the north Gulf to the lesser Antilles. There are fewer records of the yellow-fin tuna, *Neothunnus argentivittatus*, but these records indicate wide distribution. The white skipjack, *Katsuwonus pelamis*, has been taken by the *Oregon* in the Gulf and the Straits of Florida in summer, and was observed in considerable quantity in the Straits of Florida. Small white skipjack make up about 25 per cent of the tuna catch taken by the Cubans off the Isle of Pines, but the distribution in the West Indies generally is uncertain. The three species mentioned above are valuable to the fishery and produce a good quality canned product. Most of the black-fin tuna taken have been small and the average weight of black-fin tuna from the Cuban fishery is from three to four pounds. There are indications that black-fin tuna found in the offshore waters are somewhat larger, and the value of the species to a live bait fishery will be substantially greater if larger fish are regularly obtainable.

Estimation of the abundance of tunas by observation from boats is difficult. Observations from the *Oregon* lead to the opinion that the tunas in the Gulf generally do not show at the surface except when the weather is calm and the sea smooth. In the north Gulf of Mexico tunas of the three species mentioned have been commonly observed in the late afternoon and to a lesser degree at dawn. It is perhaps significant that tunas were brought to the surface twice during dragging by the *Oregon* when a shrimp trawl was lifted after a drag made at depths of 200 to 250 fathoms. Various indications, such as occasional but uncommon catches on trolling lines when surface signs of tuna are absent, or observations of resting birds, possibly waiting for one of the periodic appearances of tuna at the surface, suggest the presence of the tuna in the Gulf normally well below the surface.

Although many small schools of tuna were observed in the Gulf from the *Oregon* in the summers of 1951 and 1952, conditions were generally unsatisfactory for purse seining. The water was very clear and the schools

were not tightly packed but were scattered over a considerable area. The combination of clear water, scattered small schools and appearances at the surface late in the day presented too many difficulties for purse seining and no fish were taken by that method.

Several types of small fish are found in the Gulf and West Indies area in sufficient abundance to give promise of good sources of supply for live bait fishing. Weather conditions throughout a large part of the year are unfavorable, but how serious this is can only be learned by actual trial. Operations south of the hurricane belt are a practical possibility during hurricane season. There are some indications, too, that the tunas are more easily found in the extreme southern Caribbean in the months of December, January, and February. Any understanding of the potential of a live bait fishery for tuna in the area should come from exploratory fishing with live bait carried on over a period of more than a year.

REFERENCE

Rawlings, John E. 1953. A report on the Cuban tuna fishery. U.S. Fish & Wildlife Service, Comm. Fishery Review, Vol. 15, No. 1.

Some Practical Aspects of Electric Fishing in the Sea

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A great amount of interest has developed among commercial fishermen in recent years concerning the possibilities of using electrical methods of catching fish in the sea. In this paper the writer intends to present some of his current ideas and conclusions on this method of fishing arising out of a review he has made recently of literature dealing with this subject.

The application of electric fishing methods in the sea involves the establishment of an electric field of the required current density and distribution in a specified volume of sea water at periodic intervals of time.

For satisfactory results the apparatus for electric fishing must be capable of setting up at the boundary of a specified volume of water an electric field of such current density that a condition of electro-taxis is produced in a fish of a given size and species. This is a condition in which the fish orients itself in the electric field with its head pointing toward the anode or positive electrode and involuntarily swims in the direction of that electrode.

As the electric field in a continuous medium such as a large body of water spreads out in all directions from an electrode in an approximately radial manner, the current density in regions outside the boundary in which electro-taxis occurs will be too low for producing this effect. Any fish in these regions will be frightened by the uncomfortable electric field and will try to escape from it. In regions within the boundary for electro-taxis, however, the current density increases rapidly in the direction of the electrode and will everywhere be at least equal to or greater than that necessary for causing a condition of electro-taxis. Conceivably a fish swimming toward an electrode in a condition of electro-taxis would soon reach a region where the current density would be sufficient for producing a condition of paralysis. Should this happen the fish would become incapable of any further movement and probably would turn belly up and slowly sink toward the bottom. If the electric field were maintained for a long enough period of time while the fish were in this condition, it would die.