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What Does Area Redevelopment Mean to Fisheries?

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Abstract

Public Law 87-27, enacted in May, 1961, is designed to relieve unemployment in certain economically distressed areas. In such coastal areas as are designated as ARA-eligible, the fishing industry may receive benefits in the form of low-cost long term loans, public facilities loans or grants, or technical assistance grants. Universities, research agencies, and state fisheries agencies may also participate as contractors for technical assistance projects. Only recently moving into high gear, the ARA program offers new prospects for much-needed development of the fisheries in eligible areas.

Electrofishing With Bottom Trawls at Sea

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Abstract

Experiments with an electrical field in the area in front of a standard trawl were recently concluded. 154 test tows, about half with electricity and half without electricity for comparison purposes, were made. The analysis of the

catch records clearly indicates a considerable increase in the catch using a trawl which has been electrified. This paper discusses the results obtained and is accompanied by a film. The film depicts the electrical units and accessory equipment and also shows the behavior of fish in the area in front of a standard trawl and in the area in front of a standard trawl with an electrical field.

I WISH TO REPORT on experiments in electrofishing in the sea, made during the past two years. The purpose of these experiments was to find if the catch of a commercial otter trawl is influenced by an electrical field used in the area in front of the net.

Electrofishing in fresh water has been used a long time and has become a well established method. Especially in small rivers electrofishing is very advantageous. In larger streams, however, this method is by far not as effective, and I have never heard that electrofishing is commercially used in fresh water lakes. The reason for the restriction of this method to small rivers is the short reach of the electrical field, not more than 20 feet under the most favorable conditions.

In the sea a new difficulty which arises, in addition to the small reach of the field, is the high electric conductivity of the sea water. There are only two applications to aid the fishing process where electricity is commercially used in saltwater.

In the North Sea large tuna, weighing about 500 pounds, are caught with hook and line. When these fish take the hook they put up a vigorous fight. To avoid this fight, gear using the hook as an electrode was developed. A high enough current is sent through the hook into the water so that the voltage across the fish is sufficient to stun it. The fish can then be brought aboard without any fight. The reach of the field in this application does not have to be large, since the hook is already in the mouth of the fish.

The second application where the short reach of the field can be utilized is in the menhaden industry. When the menhaden are concentrated in the bunt of the net, a current is passed through the pumphead into the water. The fish rush to the pumphead, concentrate around it, and are then pumped into the boat.

In both applications the fish are already caught by conventional fishing methods and electricity is only used in order to handle the catch easier.

The experiments I want to report on go one step further because fish are electrically influenced which are not yet caught by other gear.

Probably you have seen the films about the behavior of fish in front of a commercial otter trawl. The fish always swim a few feet in front of the net. If the speed of the moving net is increased the fish swim faster, and if the net slows down the fish also slow down. Occasionally a fish goes into the net but often swims out of the net again. Different inventors have proposed using an electric field in front of the net to control the fish and to prevent the escape of these fish. Such an experiment has been attempted several times.

The Japanese made an experiment with an electrified trawl net in a fresh water lake—in fresh water, probably to avoid the difficulties arising from the high electric conductivity of the sea water. The experiments were abandoned after some time without any positive results. The same experiments were made by Germans in the Baltic Sea. There, too, the experiments were not conducted in the regular sea water, but in an area where the salt content was only 16‰, or approximately half the salt content of the sea. The lower salt content does

not require such an extreme demand on the electrical equipment as in regular sea water. The German experiments were also unsuccessful, and were abandoned.

Two years ago we started the same experiments. The objective was to electrify the area in front of the net to prevent the escape of the fish from the moving trawl net. We started by watching the fish in front of the trawl with an underwater television camera. We saw the previously described behavior of the fish in front of the net. We then attached an electrode to the headrope of the trawl and hung this electrode directly off the bottom in view of the television camera. When we electrified the electrode, all the fish we saw were stunned immediately. The fish showed the white belly up, the gills spread, and they were motionless so they could be easily collected from the net. The question was raised "Do the fish escape now from the fringe of the electrical field as they formerly escaped from the net?" With the underwater television camera we could not answer this question satisfactorily. We then made a series of comparison tows, 73 tows altogether, in shallow water. The procedure was to bracket each electrical tow by two normal tows, using the same net over the same ground and as close together as possible on one day. The catch was recorded for each tow by species, along with other pertinent data. A catch comparison of normal and electrical tows was made. Using the selected herring and flounder species, an increase of 98% in flounders and 166% in herring resulted from the tows run at 50% or more of the electric power available. We had similar results with the other species. Only in those species that we encountered in too few numbers and which showed up in too few of the tows did the results not fit into this pattern. With all species which occurred in at least half of the tows and which comprised more than 90% of the fish caught, we had results similar to those mentioned with flatfish and herring. These tests were made in shallow water and in areas where few fish were available.

This year we made new tests with approximately 80 tows in normal depth and on the normal fishing grounds. Again, about half of the tows were with electricity and the other half without electricity. The results this time were even more favorable. In these experiments we put the electrodes in two different places in the net, to find out if there is a difference in the catch. In the first series of tests the attracting electrodes were attached to the footrope. As we expected the catch increase in flatfish was especially high. We could register catch increases between 100% and 200% for the different species of flatfish. Cod and haddock showed an increase of only 32%. At the second series of tests we attached the electrodes at the headrope. Now, the catch increases of the flatfish were smaller, approximately 100%, but the catch increase of the cod and herring species was now 130%. In some of the tows we caught scallops—here we had an increase of 80% with the electrical tows over the non-electrical tows. The considerable catch increases, mostly between 100% and 200%, are not the only interesting results of these experiments. Especially with the flatfish I observed that the electrical tows contained especially large fish. This was expected since we know from the freshwater experiments that the larger fish are more sensitive to electricity. During the whole series of experiments we worked with high impulse rates and with high electrical power. The impulse rates were between 60 and 80 pulses per second and the electrical power varied between 100 and 135 KVA. This power and impulse rate is sufficient to influence herring. We used a wide mesh haddock

net and we always caught a few herring in the non-electrical tows, but in the electrical tows we had 30 times more herring. It is therefore possible to catch small fish in a wide mesh net if the right electrical field is used. Our future tests will therefore be directed to catch selectively, by using the right pulse rate and the right power. As in fresh water, we hope to be able to attract the large fish and to scare away the small fish. Together with the right mesh size we hope to fish more selectively than with the mesh size alone.