

MARINE BIOLOGY

Can We Farm for Fish?

Experiments showing that fish, when placed in an electric current, will swim toward the positive pole indicate that man some day be able to farm for fish.

By EDWIN MULLER

► THE LITTLE fishing vessel lay at anchor in the North Sea near Hamburg, Germany. Close to it two buoys were moored 60 feet apart.

In the water below each buoy hung a metal plate connected by wires with the ship. They were the two poles of an electric circuit. On deck two men sat before a screen like that of a television set.

Occasionally a small shadow went wavering across the screen—indicating that a fish was swimming between the two plates. The screen was part of the "echo sounder" with which most modern fishing vessels are equipped.

Suddenly a crowd of shadows appeared on the screen—a school of fish. One of the men threw a switch. A deep humming was heard. Down in the water electric current began leaping from pole to pole.

For a moment the fish swam crazily in circles. Then all of them swam straight toward one plate, behind which a net was stretched. They were drawn along inexorably, like the rats which followed the Pied Piper. Soon thousands of them were enmeshed in the net.

This was an experiment conducted by a German scientist, Dr. Konrad Kreutzer. If its results can be applied commercially, it may revolutionize the fishing industry.

The principle is that a fish, in the path of an electric current flowing between positive and negative poles, is forced to point toward the positive pole. If the intensity of the current is varied in a certain rhythm, the muscles of the fish's tail are made to contract and relax, propelling the fish toward that pole.

A certain voltage propels the fish. A higher voltage stuns it temporarily. A still higher one kills it.

Can Catch Only Big Ones

You can control the size of the fish which are led into the net. The larger the fish, the less current required. So, out of a school of fish, you can lead the big ones into the net and let the little ones go free.

The method is more practical in fresh water than in salt, for salt water is a better conductor, thus requiring much more current. In ponds and rivers this method of selective fishing is already in use, in America and elsewhere. And it opens great possibilities.

Suppose, for example, you want to get rid of certain kinds of fish in a pond or a

stretch of river and keep others in the water. With the electric current you could catch *all* the fish in the area, select the ones you want to keep, and return them to the water, where they would quickly recover.

This technique also could be used to help salmon get up the rivers and spawn. As they ascend the streams, the electric current would guide them away from turbine intakes and other dangers, lead them to the "fish ladders" by which they can surmount the dams and herd them to safe spawning grounds.

It would also remove from the spawning ground the predatory fish that eat the small fry when the eggs hatch.

If and when the electric current method is applied on a big scale to ocean fishing, the prospects are staggering. Marine experts have visions of great schools of cod, herring and mackerel herded through the ocean like cattle on the western plains, conducted to areas where food for fish is plentiful, fenced in there by electric barriers, and harvested as the market requires.

On land, mankind's production of food

has gone through three phases: hunting, herding, farming. The cave man was merely a hunter, living from such beasts as he could find and kill. Later, man became a nomad, herding his flock from place to place where there was grazing. Finally he became a farmer. His animals are fenced in, bred, fed with fodder which is grown for them.

On the sea—which covers nearly three-fourths of the surface of the globe and contains vastly more food resources than the land—we are still in the cave man, hunting era.

Annually about 25,000,000 tons of fish are caught for human consumption. It is not enough. More than half of the earth's inhabitants do not get enough to eat.

If everyone is to be fed adequately, we may have to turn to the sea for more of our food. The hungry half of the earth is most deficient in the high protein foods, the body builders, of which fish is one. Today fish constitutes only ten percent of the high-protein food consumed.

The late Karl Compton wrote: "Why should ways not be found to farm the sea with the same scientific skill with which we farm the land?" The electronic experiments of Dr. Kreutzer and others may supply the answer.

Fish farming, of course, is nothing new



GRAPHIC FISH STORY—Recently, the Thai Department of Fisheries placed 200 pairs of small *T lapia* fish in a specially prepared pond at the Experimental Station at Bangkhen. Less than three months later the 200 pairs had produced between 80,000 and 100,000 offspring.

in fresh water. In recent years in the U. S. thousands of ponds have been stocked and farmed.

The farmer fertilizes the pond with manure, compost and artificial fertilizer. That produces lush vegetable growth which nourishes vegetation-eating fish such as bream. On them feed the carnivorous fish—bass and others.

Some farmers report that they can produce more food and more income from an acre of pond than from an acre of field.

In the Orient they knew that centuries ago. The fertilized fish ponds of China and southeast Asia have produced annually half a million tons, mostly carp. Carp reproduce prodigiously: 300 to 400 pounds per acre each year is not unusual. Fertilized carp ponds are also common in Europe, and are found in many other parts of the world where people cannot otherwise provide themselves with high protein foods.

About one-fifth of all the fish caught are taken from fresh water. Yet the number of all fresh water fish is an infinitesimal fraction of the fish that are in the sea.

A British naval captain recently reported sighting a school of herring four miles long, two miles wide, and so dense that it looked like a solid mass. The world's annual catch of herring is something over 50,000,000,000 individual fish. Yet the number of herring in the sea seems to increase.

Mackerel Also Prolific

Mackerel is another prolific fish. A school 20 miles long and half a mile wide has been reported.

Herring and mackerel, which live close to the surface of the ocean, give us some idea of their number. About others that live deeper, we could not even guess, until electronics gives us a clue.

Formerly a fishing vessel cruised blind. The captain ordered the net or trawl put down when he had a hunch there were fish in the neighborhood. Now most modern fishing vessels are equipped with the echo-sounder. A school of fish shows up on the screen or on a scroll of paper with a moving stylus. The captain does not put his nets out until he sees the fish under his hull. This takes much of the guesswork out of fishing.

In World War II scientists making echosoundings off the California coast found a layer of moving objects, thickly spaced, that covered an area of 300 square miles. Then other layers as large were discovered from Pearl Harbor to the Arctic. And today more such layers keep turning up, in most of the deep oceans of the earth.

Nobody knows yet what these moving objects are. One theory is that they are fish. Another that they are squid, a favorite food in Italy and elsewhere.

Whatever they are, if this "scattering layer" is edible and catchable, it could provide food for several times the population of the earth.

The more we learn of the sea, the more we recognize the incredible abundance of its animal life.

Of the 16,000 known varieties of marine fish, only about 200 are used by man. Only seven species are of major commercial importance: herring, cod, mackerel, salmon, tuna, flat-fish (halibut, flounder, sole, plaice) and, of late, red-fish.

The red-fish, a rose-colored fish averaging three-quarters of a pound, until recently was thrown away when taken in the nets. Then somebody had an idea, presented it to the public as "ocean perch." Now 200,000,000 pounds are caught and sold annually. Many other fish could be "discovered" in the same way.

The first effort to develop the marine resources of the globe on a world-wide scale has been undertaken by the Food and Agriculture Organization of the United Nations. It is charting a fish map of the oceans showing all the fisheries now in use and those unused ones that promise results.

Some of the best potential fishing areas are off the coasts of the underdeveloped countries that have a low standard of living, in Asia, Africa, South America. The FAO is trying to help them develop such sources of food.

If, for example, India could develop a fishing industry only half as efficient as Japan's, its ever-present specter of famine would recede.

One of the best ways of helping people to help themselves is to teach them to fish, and to aid them in getting better fishing equipment. But it is not only the underprivileged peoples who need to learn better fishing methods. Even the most modern fisherman of the West is still in the hunting era. He must look to the day when great schools of fish are herded and controlled from the time they are spawned to the day they are harvested.

Man, who has been hungry through all the millenia he has dwelt on land, may ultimately get himself enough food from the inexhaustible resources of the sea.

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ZOOLOGY

Fossa Cat of Madagascar Comes to Washington

➤ FOSSA, A big cat of Madagascar that is not really a cat, has taken up residence at the Washington Zoo.

Believed by Dr. William M. Mann, director of the Smithsonian Institution's National Zoological Park, to be the only such animal in the United States, this recently imported fossa is an elongated cat-like animal, a three-foot long male. Dr. Mann has never seen one before.

The fossa has a very unusual place among the carnivores, since this one species, *Cryptoprocta ferox*, is the whole of a subfamily in the animal kingdom, bridging the weasel cats and the true cats.

Despite the idea once prevalent that it attacked sheep and young cattle ferociously, it is not bloodthirsty like the lion and tiger. It feeds on wild birds and lemurs and raids chickens of Madagascar natives.

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