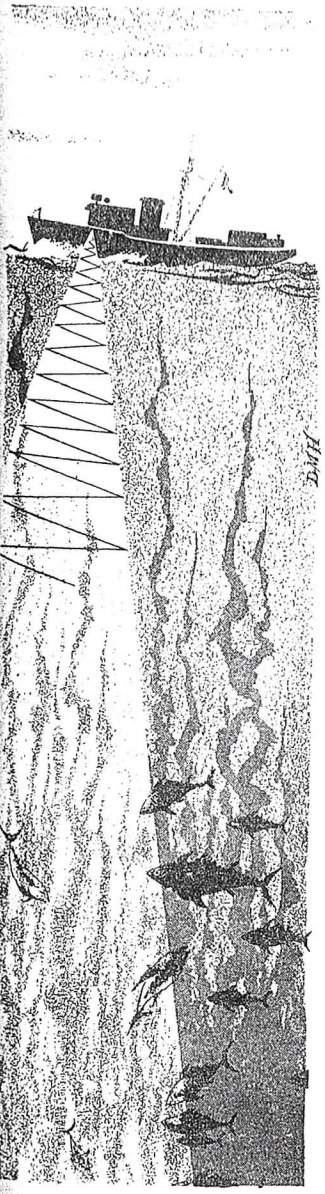

Many commercial fishing craft now have a gadget that can "look" to the bottom of the sea

Electronic Fish-Finder

Condensed from Science News Letter
Don Eddy

IN THE SUMMER OF 1947 the crews of 14 fishing boats out of southern California ports witnessed a demonstration of magic. For days they had patrolled the fringes of an enormous kelp bed near Cedros Island off the Mexican coast, waiting for schools of tuna to leave the kelp and return to the open sea where nets could be set without danger of fouling.

Into this stalemate steamed another seiner — the *Caesar Augusto*, commanded by Captain Larry Zaunich. Instead of joining the idle fleet, Zaunich nosed into the kelp bed. Before dark that day he was safely out with his nets intact — and 150,000 pounds of fresh tuna in the hold.

How did he do it? "Easy!" grinned Zaunich, back in port. "I used a gadget that found holes in the kelp bed big enough for my seine and even told me whether there were fish in the holes."

The gadget was a Bendix DR (Depth Recorder), an electronic device which started as a navigational aid. Enabling fishermen to "see" under water — in sunshine, storm, fog or darkest night — it shows them instantly and accurately where fish are. It shows, too, approximately how many there are, how fast

and in what direction they are traveling, and in many cases what species.

In the wheelhouse of a 150-foot seiner off the Carolina Capes I watched Captain Roy Goodwin track down menhaden, one of the most valuable of America's commercial fish. In front of the ship's helm was a box about the size of a portable radio. A scroll of paper moved slowly across the face of the box. Vertical lines on the paper represented the undersea area forward and beneath the ship; horizontal lines, numbered, indicated depth.

Across the graph horizontally, as the ship cruised along, pens were drawing two roughly parallel lines. The top line represented the surface of the ocean; the bottom one showed the irregular outline of the ocean floor. Between those lines pens were drawing odd-shaped doodles, sometimes singly but often in clusters. "Those are fish," said Captain Goodwin. He watched the device until a big black doodle formed at a depth of about 40 feet and some 100 feet ahead. Ringing for reduced speed he said, "That's a school of menhaden."

Until the advent of the fish-finder, schools of fish were spotted by lookouts. Although they could not see much below the surface, especially in bad weather, Captain Goodwin clung to tradition by keeping three men in the crow's-nest atop the mainmast. They continued now to report no fish, although the huge school was clearly visible on the fish-finder's graph.

Captain Goodwin ordered the longboats away with the seine and directed the men in them until the school was surrounded, the seine lowered and the purse line drawn to close it at the bottom. Soon 90,000 shimmering menhaden were cascading into the hold, on their way to becoming vitamins, cosmetic oils, livestock feeds and fertilizers. "We'd have missed them without this gadget," the Captain said. "I reckon I've caught a million more fish with it this year than I would have without it."

The fish-finder operates by sound waves. Sound travels through water at approximately 4800 feet per second — more than four times as fast as it travels through air. Could this knowledge be utilized to measure the depth of water? When, in 1912, the *Titanic* rammed an unseen iceberg and sank with a loss of 1517 lives, the resulting clamor spurred scientists to experiment.

In the United States Professor R. A. Fessenden developed a powerful oscillator to provide sound of great intensity in water and an instrument to convert the travel time of sound into measurement of distance. But the sounds sent out by the instrument were too easily confused with such noises as breaking waves and churning propellers. In France scientists Langevin and Chilowsky developed an apparatus to project sounds of such high pitch that they were inaudible to the

human ear but could be detected by special listening devices.

The U. S. Navy installed its first echo sounder in 1918. By 1925 echo sounders had become available to commercial vessels to detect shoals and obstructions. Today they are used as navigational aids all over the world.

In operation, continuous streams of sound are emitted from a device on the bottom of the boat. The sounds travel in a widening cone like shotgun pellets and send back echoes when they strike solid objects. Capturing the echoes, the apparatus instantly computes the time elapsed since the discharge of the sound, translates this time into lineal distance, and figures the object's size, shape and relative density. In some instruments (two besides the Bendix are made in the United States, and there is one in England and another in Canada) part of this information is conveyed to the mariner by flashing lights or buzzes, but with the Bendix DR it appears as a pen-and-ink record.

Early experimenters with these navigation aids were bothered by interferences. Sometimes in deep water, with no known obstruction within miles, the echoes bounded from objects fairly close to the ship and apparently moving. Evidently these were fish.

Fish remained only a nuisance to echo-using mariners until a Norwegian, the late Dr. Oscar Sund, biological-research adviser of the Norwegian Institute of Fisheries, realized that the echo device might be a means of finding more fish for a hungry world. In 1935 a ship set out for the Lofoten Fisheries off northern Norway. At the controls was Dr. Sund's aide, Dr. Gunnar Rollefsen, now director of the institute and delegate to the U. N. subcommittee studying world fisheries.

Long before the fishing banks were reached, Dr. Rollefsen detected echoes bouncing from strange objects just above the floor of the sea in supposedly barren territory. Dr. Rollefsen said: "I believe they are fish, 70 to 80 fathoms deep." Fishermen lowered their lines to 75 fathoms and caught cod.

Oddly enough, owners of fishing boats were not excited by the institute's report. Part of the apathy was due to the high cost of the apparatus, but most of it was because of the fishermen's stubborn adherence to age-old methods. Today this resistance has vanished. Nearly all of Norway's major herring boats and more than half its ocean-going cod boats carry fish-finders. New fishing grounds are being discovered, and Norway's annual catch has been increased by a third.

The Bendix DR grew out of World War II. U. S. military planners asked Bendix Aviation Corporation to create portable depth recorders which could be operated silently in total darkness in small rubber boats to discover mine fields along enemy shores and to chart enemy harbors in preparation for invasion. Since flashing lights and

buzzing signals were out of the question, the graph method was worked out by electronic wizards, and Bendix DRs preceded invasion troops into many beachheads. No whisper of their existence was permitted to reach the public until 1944, when the U. S. Navy considered the fish-finding potentialities of the device so important for increasing our food supply that a submarine chaser was assigned to aid the Fish and Wildlife Service in tests off the Pacific Coast. The subchaser explored waters where no fish were known to be — and found fish constantly.

The first Bendix DR to be installed on a commercial fishing boat was placed in the *Northern Light* of Fort Bragg, Calif., in 1946. It had formerly taken Captain Ted Aaker four days to fill his hold with sole and rock cod, but on his first trip with the magic fish-finder he took a boatload in two days.

Another skipper installed a fish-finder on his boat and started through Hecate Strait north of Vancouver Island, B. C., bound for an area at sea where he had been catching dogfish for their livers. No one had suspected there were commercial fish in the strait itself, but he was back home next day with 20 tons of fish. His normal cruise would have been two days each way and eight days of fishing.

A Vancouver herring seiner turned the air blue when his new fish-finding apparatus was not set up in time for him to sail with the rest of the fleet. Leaving port an hour late, he was chugging in the wake of the other vessels when the Bendix engineer who was aboard as an observer picked up a dense concentration of fish just ahead. "It isn't possible," the skipper argued. "Every boat in the fleet has passed over them." But the Bendix man persuaded him to set his net — and he was back home in midafternoon with a hold full of herring.

Tons of fish were caught in Havana harbor last spring by the first Cuban boat electronically equipped, although no fisherman had suspected they were there. So impressed was the Cuban Government that special funds were appropriated to equip the nation's 60 major fishing vessels. Result: the average fishing cruise has been shortened from 25 to 15 days and the average catch has almost doubled.

DRs cost $890 to $2475, depending upon their size and range. There is a tremendous demand from sport fishing craft, but Bendix is allocating almost all its output to commercial fishermen in the belief that this amazing device should be concentrated on providing more food from the almost inexhaustible resources of the sea.