EXPERIMENTS WITH A "FISH PUMP"

By J. G. Ellson*

To determine the possibilities of catching small fish (for bait or other commercial use) without the use of any customary type of fishing gear, experiments were conducted with a pump and an electric-light arrangement. The experiments were carried out in September and October 1952 off the Oregon and Washington coasts aboard the John N. Cobb, an exploratory fishing vessel operated by the Service's Branch of Commercial Fisheries. Since the vessel was primarily engaged in other work, the tests were confined to periods which did not interfere with regular operations.

The equipment used for the tests consisted of a 4-inch bladeless impeller pump in combination with powerful underwater lights (as fish attractors). This equipment is illustrated in figures 1, 2, 3, and 4.

The boom was swung outboard so that it cleared the vessel's side by about 5 feet. Then the intake pipe and underwater light assembly were lowered to a submerged position 5 to 8 feet below the surface of the water. When in fishing position, the intake pipe and the light beams were perpendicular to the water surface.

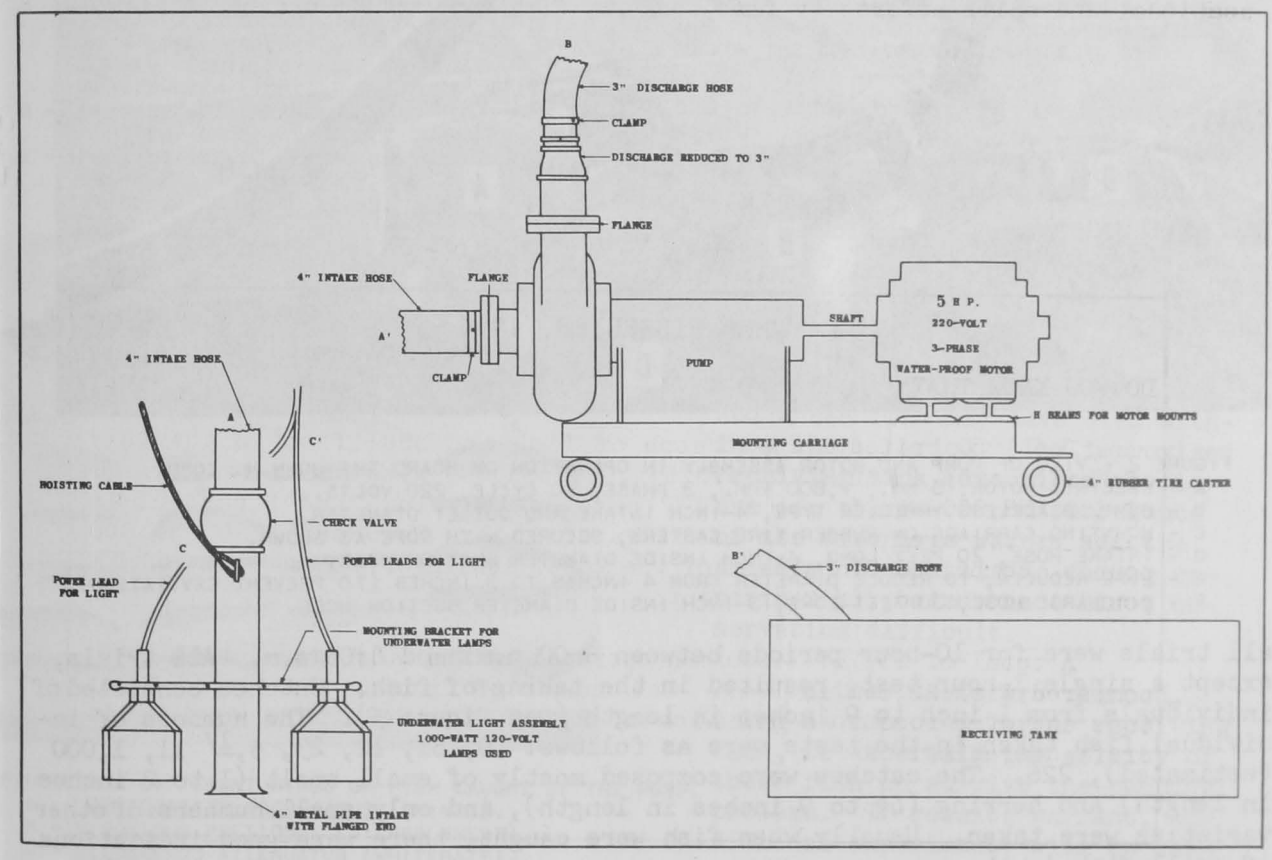

FIGURE 1 - DIAGRAM OF "FISH PUMP" DEVICE. THE INTAKE PIPE AND UNDERWATER LIGHT ASSEMBLY WERE CONNECTED TO THE INTAKE HOSE OF THE PUMP, A TO A', AND THE DISCHARGE HOSE RAN TO A RECEIVING TANK, B TO B'.

*CHIEF, NORTH PACIFIC FISHERIES EXPLORATION AND GEAR RESEARCH, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASHINGTON.

A total of eight tests were made between September 9 and October 2, all during the hours of darkness. Two 1-hour and two 10-hour tests were made off Cape Lookout, Oregon; two 10-hour tests were made in Newport Bay, Oregon; and two 10-hour tests were made in Neah Bay, Washington. Except for the two 1-hour tests,

FIGURE 2 - VIEW OF PUMP AND MOTOR ASSEMBLY IN OPERATION ON BOARD THE JOHN N. COBB.
A - ELECTRIC MOTOR, 5 HP., 1,800 RPM., 3 PHASE, 60 CYCLE, 220 VOLTS.
B - PUMP, BLADELESS IMPELLER TYPE, 4-INCH INTAKE AND OUTLET DIAMETER.
C - MOUNTING CARRIAGE ON RUBBER TIRE CASTERS, SECURED WITH ROPE AS SHOWN.
D - INTAKE HOSE, 20 FEET LONG, 4-INCH INSIDE DIAMETER SUCTION HOSE.
E - PIPE REDUCER, TO REDUCE DIAMETER FROM 4 INCHES TO 3 INCHES (TO PREVENT CAVITATION).
F - DISCHARGE HOSE, 30 FEET LONG, 3-INCH INSIDE DIAMETER SUCTION HOSE.

all trials were for 10-hour periods between 8:00 p.m. and 6:00 a.m. All trials, except a single 1-hour test, resulted in the taking of fish. Catches consisted of individuals from 1 inch to 9 inches in length (see figure 5). The numbers of individual fish taken in the tests were as follows: 0, 61, 12, 23, 5,[1/] 11, 1,000 (estimated), 226. The catches were composed mostly of small smelt (1 to 2 inches in length) and herring ($4\frac{1}{2}$ to 9 inches in length), and only small numbers of other varieties were taken. Usually when fish were caught, there were good indications of small fish in the area.

Several small herring (approximately $4\frac{1}{2}$ to 6 inches) reached the receiving tank in a living state. These fish were quite active and appeared to have been

1/ INCLUDES THREE SMALL SQUID.

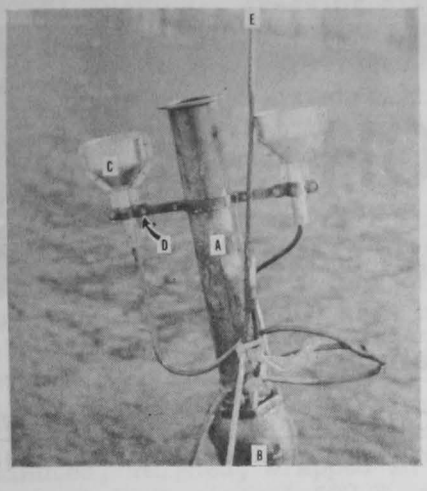

FIGURE 3 - VIEW OF INTAKE PIPE AND UNDERWATER LIGHT ASSEMBLY.
A - PIPE, GALVANIZED IRON, 18 INCHES LONG, 4 INCHES INSIDE DIAMETER, WITH 1-INCH FLANGE WELDED ON.
B - CHECK VALVE.
C - HOUSING FOR UNDERWATER LIGHT, MADE OF TWO SECTIONS OF 20-GAUGE STAINLESS STEEL FASTENED TOGETHER WITH SCREWS AND NUTS AS SHOWN, AND MOUNTED TO PIPE BY A STEEL BRACKET MADE OF $\frac{1}{2}$-INCH STRAP STEEL. CONTAINS UNDERWATER 1,000-W. SEALED-BEAM LIGHT.
D - BOLT AND NUT ARRANGEMENT TO PERMIT ADJUSTMENT OF LIGHT DIRECTION.
E - HOISTING CABLE, FOR HOISTING AND LOWERING THE LIGHT ASSEMBLY FROM THE BOOM WHICH IS SWUNG OUTBOARD.

FIGURE 4 - A FISH BOX 48 INCHES LONG BY 24 INCHES WIDE BY 12 INCHES HIGH WAS USED AS A RECEIVING TANK. BUNT WEBBING, $\frac{1}{2}$-INCH MESH, STRETCHED MEASURE, WAS USED TO PREVENT WASHING AWAY OF THE SMALL FISH. THIS IMPROVISED ARRANGEMENT WAS USED, SINCE THE JOHN N. COBB WAS PRIMARILY ENGAGED IN OCEAN TRAWLING MAKING IT UNFEASABLE TO CARRY A MORE SUITABLE TANK DURING THIS CRUISE. THE TURBULENCE AND WATER PRESSURE ACCOUNTED FOR THE CONSIDERABLE DAMAGE TO THE FISH.

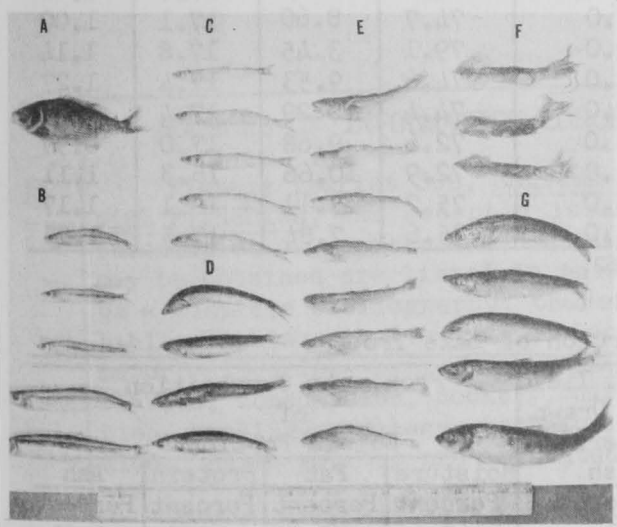

FIGURE 5 - DIFFERENT KINDS OF FISH CAUGHT BY THE PUMP.
A - CYMATOGASTER AGGREGATUS (SHINER).
B - HYPOMESUS PRETIOSUS (SILVER SMELT).
C - ALLOSMERUS ATTENUATUS (WHITEBAIT).
D - ENGRAULIS MORDAX (ANCHOVY).
E - MICROGADUS PROXIMUS (TOMCOD).
F - LOLIGO OPALESCENS (SQUID).
G - CLUPEA PALLASII (HERRING).

little affected by going through the pump. However, the majority of fish were dead, apparently having been injured by the pumping process or by the force of the water in the receiving tank. Fish that were examined showed injuries in the region of the head. A number of the 1-inch to 2-inch smelt were seen alive, but it was difficult to determine their condition, and these fish may have died within a short period. The improvised receiving tank (described in figure 4), the force and turbulence of the discharge water, and the absence of deck lights during experimental periods made close observation difficult.

Further tests are planned, using an improved larger receiving tank, to ascertain the ability of these fish to survive the pumping process. If results warrant, additional experiments will be carried out with a larger size pump and several types of fish attractors, such as rheostat-controlled lights of varying intensity and electrical fields.