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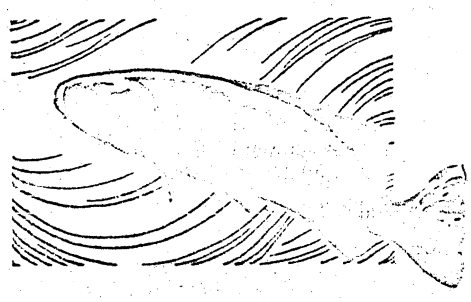

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

AN INEXPENSIVE AUTOMATIC COUNTER FOR FINGERLINGS

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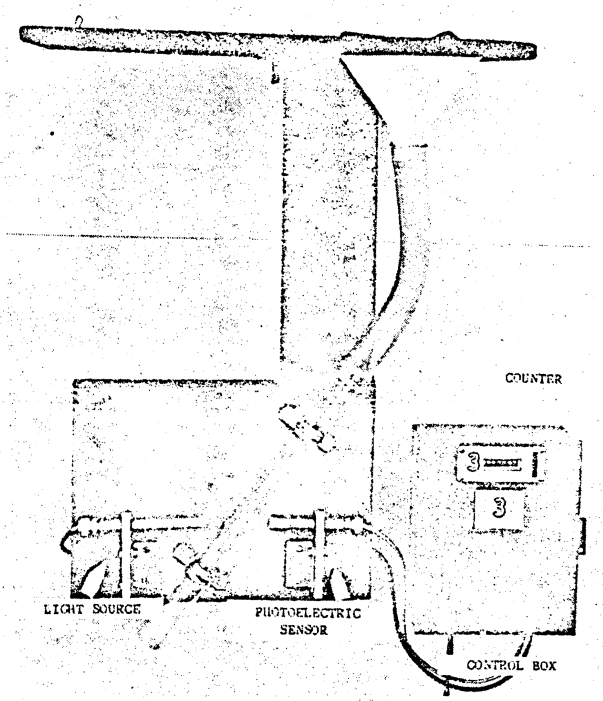
WHEN LARGE NUMBERS OF FISH must be handled, as in experiments that involve the marking of fingerlings, counting by hand leads to tedium and consequent errors, not to mention increased cost and loss of fish. The simple photoelectric counting system described here has been developed to alleviate these difficulties.

The portable counter assembly shown here is designed for mounting directly on a hatchery trough. The assembly provides a platform for a freeze-branding canister or a tattooing machine and a convenient work station.

The assembly consists of a polyethylene funnel that has been heated and flared to fit snugly into a flexible vinyl tube, 1-1/4-inch inside diameter. The lower end of the vinyl tube is fitted over a rigid lucite tube, 1-1/4-inch outside diameter, with inner edges chamfered. A continuous length of vinyl has proved to be suitable for most applications, but the lucite is less subject to discoloration and abrasion and retains better its light-transmission characteristics.

Conduit clamps are used to secure the lucite tube to the mounting board. When the tube is mounted at a low angle (30° to 45° works well), even small fish interrupt the light beam long enough to activate the counter.

On opposite sides of the lucite tube, a light source and a photoelectric sensor are mounted with their central axes coincident; the light is focused just inside the lower surface of the tube. Such an arrangement ensures the complete occlusion of the light beam and actuation of the counter relay by a small fish passing through the tube. Counting has been limited to 10 to 15 fish per minute by the rate of branding, but well in excess of 100 fish per minute can be counted by the system if the fish do not overlap.



A small stream of water introduced into the funnel helps fish to slide smoothly down the tube. A turbulent flow should be avoided, as it tends to cause stray counts.

The control box may be mounted at a considerable distance from the sensor and light source. Any electrical hazard is thereby eliminated, as only low voltage is required to operate the light, and the 110-volt control and counter are outside the wet area.

The counter may be mounted in the control box, as shown here, or on a separate panel.

Anesthetized fish are branded and dropped into the funnel. The passing of a fish through the tube interrupts the light beam and activates the electric counter; a flexible exit tube directs the fish into the desired holding area. Several handling operations are thus eliminated, and speed and accuracy are increased.

More than 800,000 fingerling salmonids were counted by this system during the 1968 season. After the initial setup and adjustment, maintenance was negligible. Check counts showed a probable counting error of less than 0.1 percent.

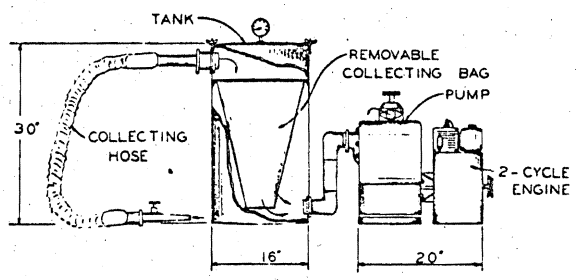
PUMPING DEVICE USED TO COLLECT SMALLMOUTH BASS FRY

The pumping device described here enabled SCUBA divers to remove all the schooled smallmouth bass (Micropterus dolomieui) fry from a nest area in Lake McConaughy without having to surface after each collection from a nest.

Apparatus included a gasoline-driven $1\frac{1}{2}$-inch centrifugal water pump (capacity, 4,200 gallons per hour), intake and outlet hose assemblies, and a 15-gallon steel tank with a removable nylon bag (10 mesh per inch). A vacuum pressure gauge was put on the tank lid. A 2-inch intake pipe was mounted in the side of the tank near the top and connected to a 15-foot spring-wire reinforced rubber hose of 2-inch diameter. A shut-off valve was placed in the distal end of the hose, where its diameter was reduced by a 12-inch length of 1-inch pipe.

The outlet pipe, mounted in the opposite side from the inlet and near the tank bottom, was connected to the pump. A valve put on the outlet side of the pump was used to regulate water exchange and pressure, as well as to close the system, thus preventing syphoning when not in use.

To start, the tank was filled with water and covered with an air-tight lid. When the pump was operating (4 pounds of pressure), both valves were opened. A diver then began to collect fry by putting the intake pipe close to nests or schools. Fry, water, and debris were drawn into the nylon bag in the tank. At the end of collecting, the valves were closed and the pump was stopped. The bag of fry and debris was then moved to a holding tub, where the fry were separated from the debris by careful pouring into another tub.



During 1968, in 99 minutes of pumping, SCUBA divers using this device collected 17,000 smallmouth fry (estimated mortality, 2 percent) from 23 nests at depths of up to 12 feet. The smallest nest had 100 fry; the largest, 3,000. Pumping time averaged 8.6 minutes per nest. The largest nest had 3-day-old fry which were dispersed over an area of 9 square feet, and were collected in 10 minutes of pumping.

Many 7-day-old fry could escape the pump, but younger fry were taken at distances up to 12 inches from the end of the pipe. Flexible hose facilitated collecting in brushy, rocky crevices that were inaccessible to SCUBA divers with dip nets.

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