

INTERNAL REPORT 42

A Portable Vertical Gill-Net System

N. W. Bartoo, R. G. Hanson, and R. S. Wydoski

September 1972

University of Washington

FOR REVIEW ONLY

NOT FOR PUBLICATION

# A PORTABLE VERTICAL GILL-NET SYSTEM<sup>1</sup>

N. W. Bartoo, R. G. Hansen, and R. S. Wydoski

## ABSTRACT

Studies of vertical as well as horizontal distributions of fishes often require the use of gill nets hung vertically from the surface to the bottom. By using gill nets in this fashion it is possible to sample the entire water column as a continuous variable.

-----

The specific gear design used for handling gill nets for sampling a vertical water column varies and often a small design change can make the gear much easier to use. Several authors have described vertical gill-net rollers or floats that are of two basic types: (1) those that have a large floating work platform as an integral part of the net support (Miller and Perrin 1967), and (2) those that are separate and depend on a boat for a working platform, similar to designs described by Hartman (1962), Horak and Tanner (1964), and Lackey (1968). This paper describes a vertical gill net system of type 2. We used a design similar to Lackey's and floats similar to those currently being used by biologists with the U.S. Bureau of Sport Fisheries and Wildlife in Olympia, Washington. This system was developed to determine vertical and horizontal distributions of fishes as well as net selectivity on size and species of fishes in Lake Washington. The lake covers 66 ha and has a maximum depth of 63.7 m.

-----  
<sup>1</sup>The work reported in this paper was supported by National Science Foundation grant no. GB-20963 to the Coniferous Forest Biome, Ecosystem Analysis Studies, U.S./International Biological Program.

## DESCRIPTION OF NETS, FLOATS, AND BOAT RACK

Nine monofilament gill nets were used, with stretch mesh ranging (in increments of 1.3 cm) from 2.5 cm to 12.7 cm. Each net was 1.8 m wide and 61 m long, and was hung on 1.5-to-1 basis vertically with buoyant breastlines; horizontal hanging was on a 2-to-1 basis. A 1.6-cm aluminum rod was secured at the bottom of each net to serve as both spreader bar and fastening point for two 4.5-kg mushroom anchors, one at each end of the rod. The top of each net was wired to a sealed aluminum tube that served as a float and a net storage roller.

### Floats

Each float was constructed from a 2.4-m section of aluminum tubing 20 cm in diameter, with wall thickness of 1.7 mm. An axle (4.8-cm diameter) was heliarc welded to the end plates of the 2.4-m float so that 2.5 cm extended beyond the float at either end (Figure 1). A 1-cm- (3/8-in.-) diameter hole was drilled in the end of one axle on each float to allow a steel bolt to be inserted as a drive pin for raising and lowering the nets with a crank (Figure 1).

### Nets

One end of the monofilament gill net was fastened to the float with bands of wire twisted around the net head-line and float. At 10-m intervals down the net, 0.6-cm (1/4 in.) aluminum rods 1.8 m in length were fastened to the breastlines to act as spreader bars (Figure 1).

Embossed plastic label tape was used to mark the distance in 1.5-m intervals upward from the bottom. This method of measurement was chosen to allow direct comparison of data when the nets are set at various depths.

Small shock cords were stretched around the float at each end and through the net hangings, and hooked to themselves. These cords served to

keep the net rolled on the floats when the nets were in less than 61 m of water.

#### Boat Rack

A rack made from 5- by 15-cm (2- by 6-in.) fir was fitted to a 5-m (17-ft) Boston Whaler to hold the net float away from the boat's gunwale so that fishes could be picked from the nets safely and easily (Figure 2). The rack was bolted together and set into the boat hull but not fastened down. Any positioning that was necessary could be made from brackets fastened to the rack and steering console, and from two large "C" clamps that held the rack to the gunwale (Figure 2). This method of fastening has two advantages: (1) it easily holds the weight of the nets and fish, and (2) it prevents damage to the hull from screws, bolts, or holes.

### OPERATION AND EVALUATION OF SYSTEM

#### Setting and Retrieving Nets

Setting and retrieving nets of this design is a simple operation. Once the net roller is placed in the boat rack and the crank is installed, the net is unrolled until the anchors rest on the bottom. The net is then secured with the shock cords so that the length of net fishing is about 103-105 percent of the water depth. A small lighted buoy (Figure 1) is attached and the float is dropped into the water. The lighted buoys mark the location of the nets for boaters, a necessity when sets are made over a 24-hr period.

To raise the net, a reverse procedure is followed. The lighted buoy is removed, the float is lifted into the rack, and the crank is installed. The net is lifted slowly until a fish is encountered. Then a short cord, attached to the gunwale, is slipped over the crank handle to keep the net from unwinding while the fish is removed from the net and data are recorded.

The nets can be set and lifted by one man. With two people aboard, however, the system allows one man to retrieve the nets and remove the fish while the other man records the data. Mesh size and depth are marked on waterproof paper tags and stapled to the opercle or fin of the fish so that these data can be summarized later at the laboratory when other basic biological data are recorded.

#### Advantages

This design for vertical gill nets offers several benefits. Each net is rolled onto its own float. It is light and mobile enough to be hoisted and carried by one man. Because the nets and floats are portable, it is possible to move from lake to lake by stacking the nets in a boat on a trailer. This procedure would be impossible with larger, floating-platform designs. The aluminum rollers form a float that is more puncture and abrasion resistant than some previously suggested styrofoam designs. These nets are usable in any water depth, and during marginal weather conditions. The nets have been successfully set in winds of 39-43 knots (45-50 mph) and with small wave action in soft-bottom areas. The total cost of one float without the net is \$56.00, and the work is easily done in most sheet metal shops. While the cost is greater than for styrofoam floats, the extra cost is offset by the greater durability of the floats.

#### Disadvantages and Suggestions for Improvement

The chief disadvantage is the problem of setting the nets in areas with large wave and swell conditions, especially on hard or sandy bottoms. Under these conditions, the mushroom anchors are lifted off the bottom and the nets are "walked" on the swells. For sets on sandy bottoms where swells or high winds are expected, the mushroom anchors should be augmented

by a sand anchor with a piece of chain on a short line attached to each end of the bottom spreader bar. Thus the mushroom anchors would serve to keep the pull on the sand anchors nearly horizontal and the sand anchors would easily hold the load. (If the sand anchors simply replaced the mushroom anchors, the swells would lift the shank of the anchors and their holding power would be much reduced.) To keep the nets from twisting during changes in wind direction, anchors can be set from either end of the floats as shown in figure 2 of Lackey (1968).

If the nets are to be used where the floats could be punctured, it would be feasible to use expanding styrofoam beads in the floats. The weight would not be increased significantly, but the float would be unsinkable.

#### EFFECTIVENESS OF THE NETS

Although the effectiveness of the system is dependent upon the selectivity of the mesh sizes, the nine meshes that are being used in this system have captured 15 of 35 species that are reported in the Lake Washington drainage. The nets have caught large numbers of juvenile sockeye salmon (*Oncorhynchus nerka*) between 100 and 220 mm in fork length, peamouth (*Myoxocheilus caurinus*) between 100 and 300 mm fork length, northern squawfish (*Ptychocheilus oregonensis*) between 100 and 600 mm in fork length, and yellow perch (*Perca flavescens*) between 80 and 400 mm in fork length.

REFERENCES

HARTMAN, G. F. 1962. Use of gill-net rollers in fishery investigations. *Trans. Am. Fish. Soc.* 91(2): 224-225.

HORAK, Donald L., and Howard A. TANNER. 1964. The use of vertical gill nets in studying fish depth distribution; Horse Tooth Reservoir, Colorado. *Trans. Am. Fish. Soc.* 93(2): 137-145..

LACKEY, Robert T. 1968. Vertical gill nets for studying depth distribution of small fish. *Trans. Am. Fish. Soc.* 97(3): 296-299.

MILLER, Lee W., and William F. PERRIN. 1967. A gill-net platform for studying the depth distributions of fishes. *Prog. Fish-Cult.* 29(2): 118-120.

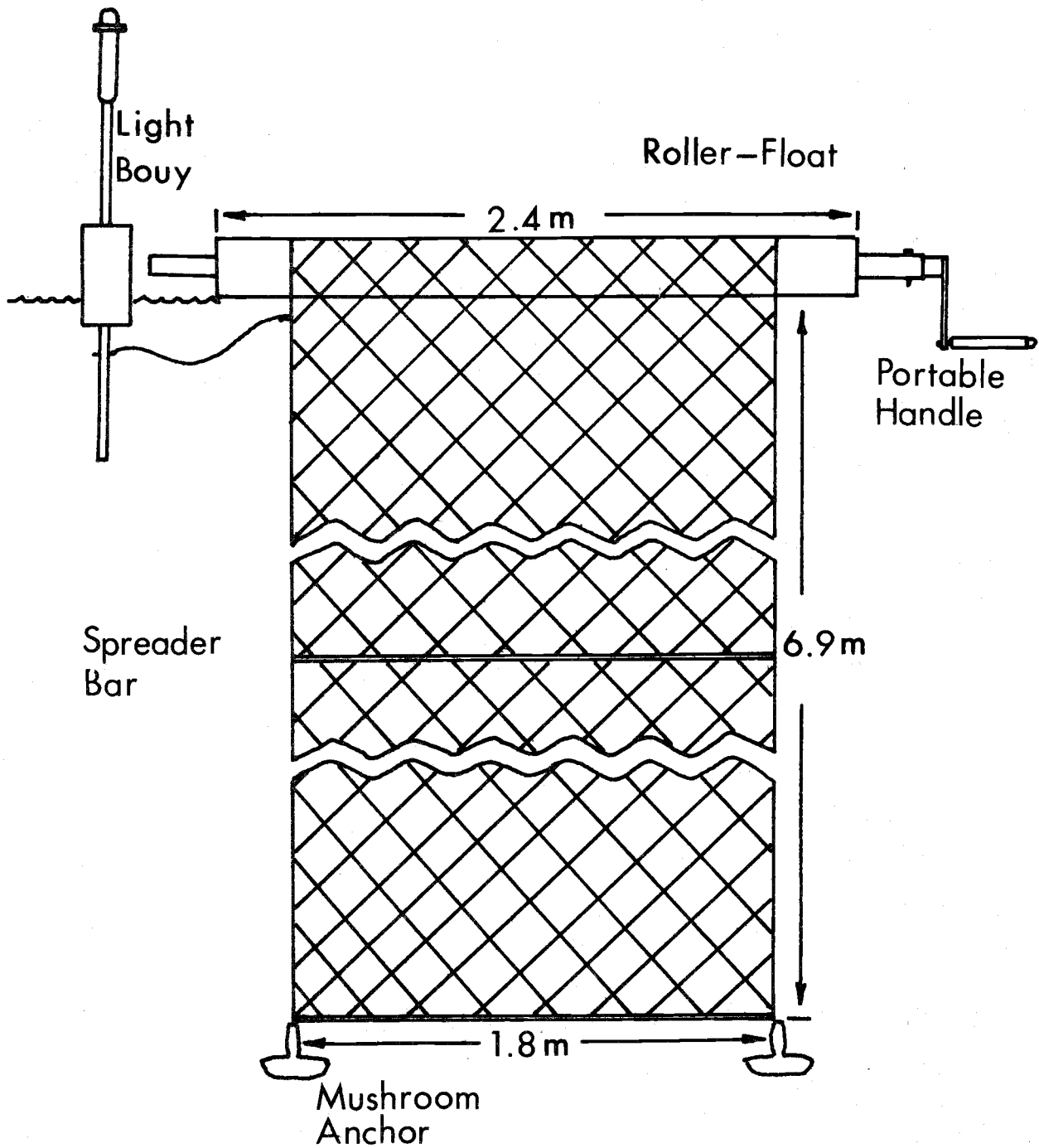


Figure 1. Components of vertical gill-net system.



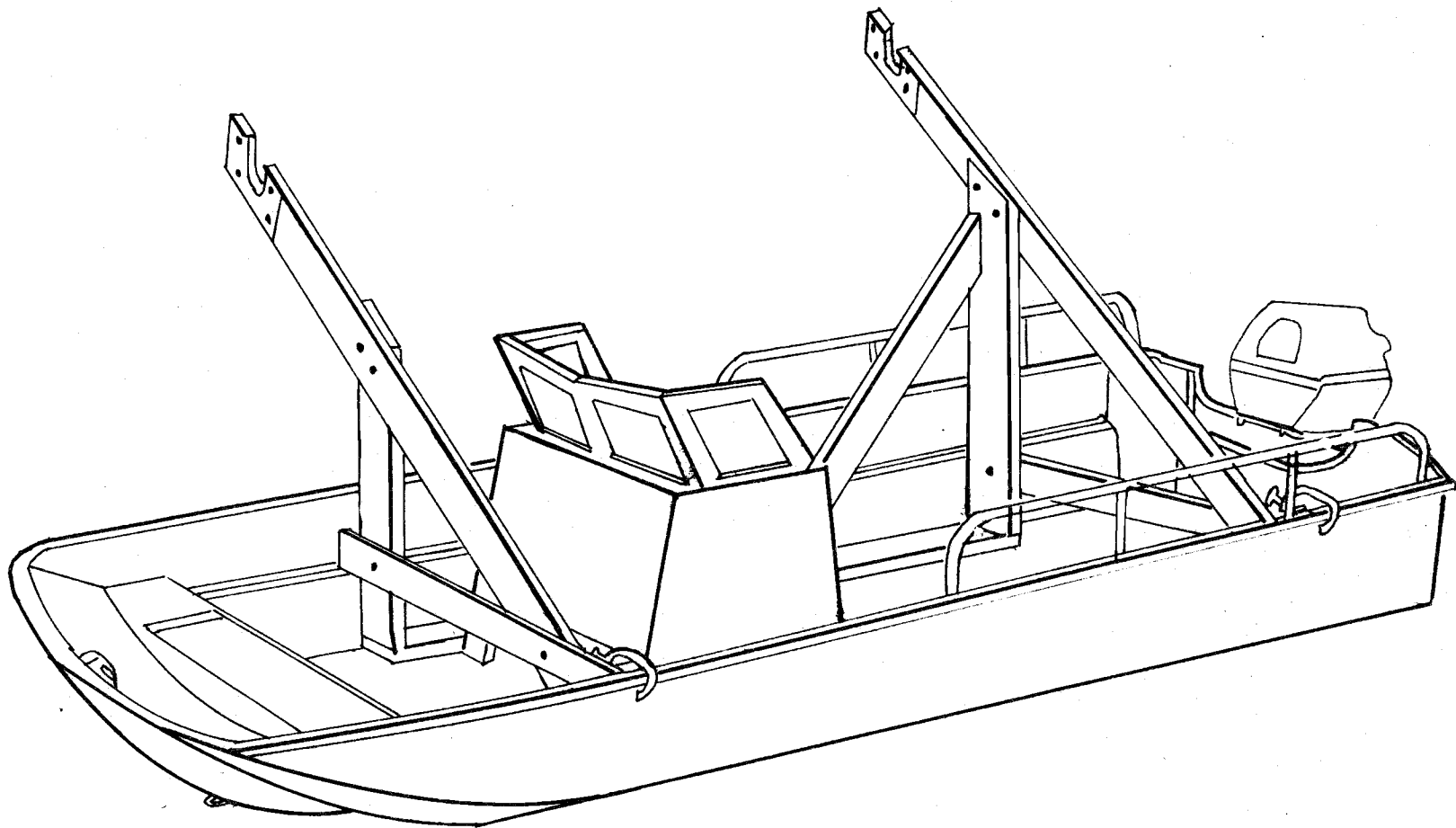


Figure 2. Boat rack in position.