Manual of Fisheries Survey Methods II: with periodic updates

Chapter 3: Fishing Gear

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Chapter 3: Fishing Gear

James C. Schneider and James W. Merna

Gear for collecting fish samples continues to develop. Gear familiar to us now may not be familiar to our successors 100 years from now. The most common types of gear are described in the following sections. Consider these descriptions as standards; gear with other features must be more fully described in the electronic Fish Collection System or on the FISH COLLECTION form. Whenever you collect samples, make sure the gear is adequately described so that potential bias can be recognized, the information can be properly interpreted (both now and in the future), and the survey can be repeated at a later date. The Fish Collection System allows each net (or type of net) to be numbered so that its characteristics need be entered in the system only once. Then, in subsequent surveys, only net number need be recorded to link survey results to gear type and description.

New gear or techniques are sometimes needed, use your training and experience to the fullest.

3.1 Trap nets

Description

There are two types of trap nets in use for inland surveys; the "3-foot trap" and the "6/3-foot trap." Walter Crowe (1950) described the 3-foot trap (Figure 3.1). Dave Havens and Joe Drew developed the 6/3-foot trap (Figures 3.1 and 3.2). Both nets have 1½-inch stretched mesh in the pots.

Use

Trap nets are effective in lakes. They readily take most of the warmwater species and trout when fish are actively moving. Size selectivity is primarily determined by mesh size, secondarily by the funnel opening. Fish caught in trap nets usually can be returned to the water unharmed.

Trap nets fish best when set off points, weed beds or other obstructions to fish movements which act as natural leads. Nets are usually set perpendicular to shore, on a gently sloping bottom, with the pot end deeper than the inshore lead. They do not fish as effectively on steeply sloping bottoms or in depths greater than about 30 feet. Trap nets should be fished one night between lifts. Size of mesh in the pot of the net used must be recorded.

3.2 Fyke nets

Description

The original design has 2-inch stretch mesh, is 4-feet high, and has a 150-foot lead (Figure 3.3). The same frames are sometimes hung with either 1½-inch or l-inch mesh, and fitted with shorter leads. A fourth variation has ½-inch mesh, a 25-foot lead, and a half-scale frame (2 feet high by 3 feet wide). In describing fyke nets on forms, record stretched mesh size and frame height. Size of mesh in the pot must be recorded.

Use

Fykes are easier to handle than trap nets, especially in water less than 6 feet deep. They are effective in lakes and in sluggish rivers. Selectivity is influenced by mesh size and fish movements. Fyke nets should be set perpendicular to shore or with the current. They fish better than trap nets on steep slopes. Fykes should be fished one night between lifts. They can be substituted in place of some trap net sets.
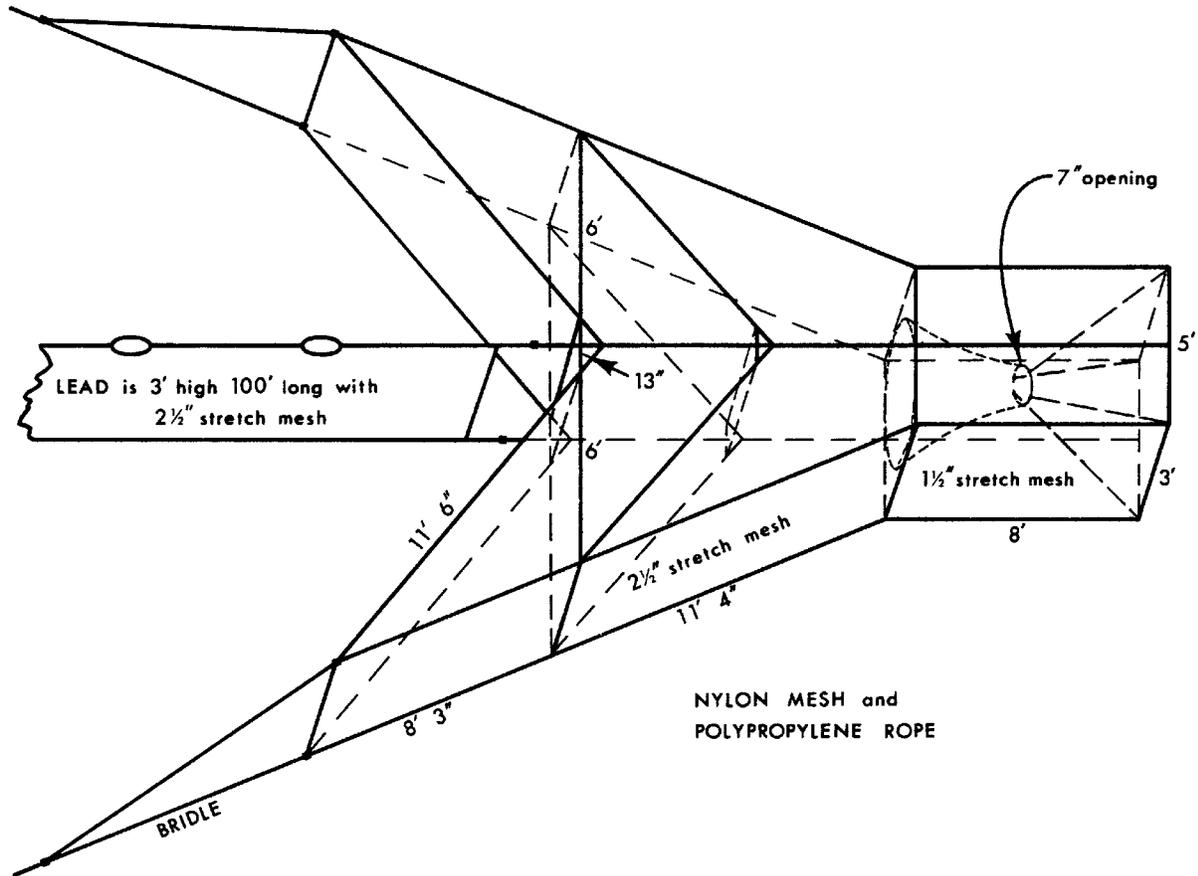
Figure 3.1–Construction details of a 3-foot trap net.
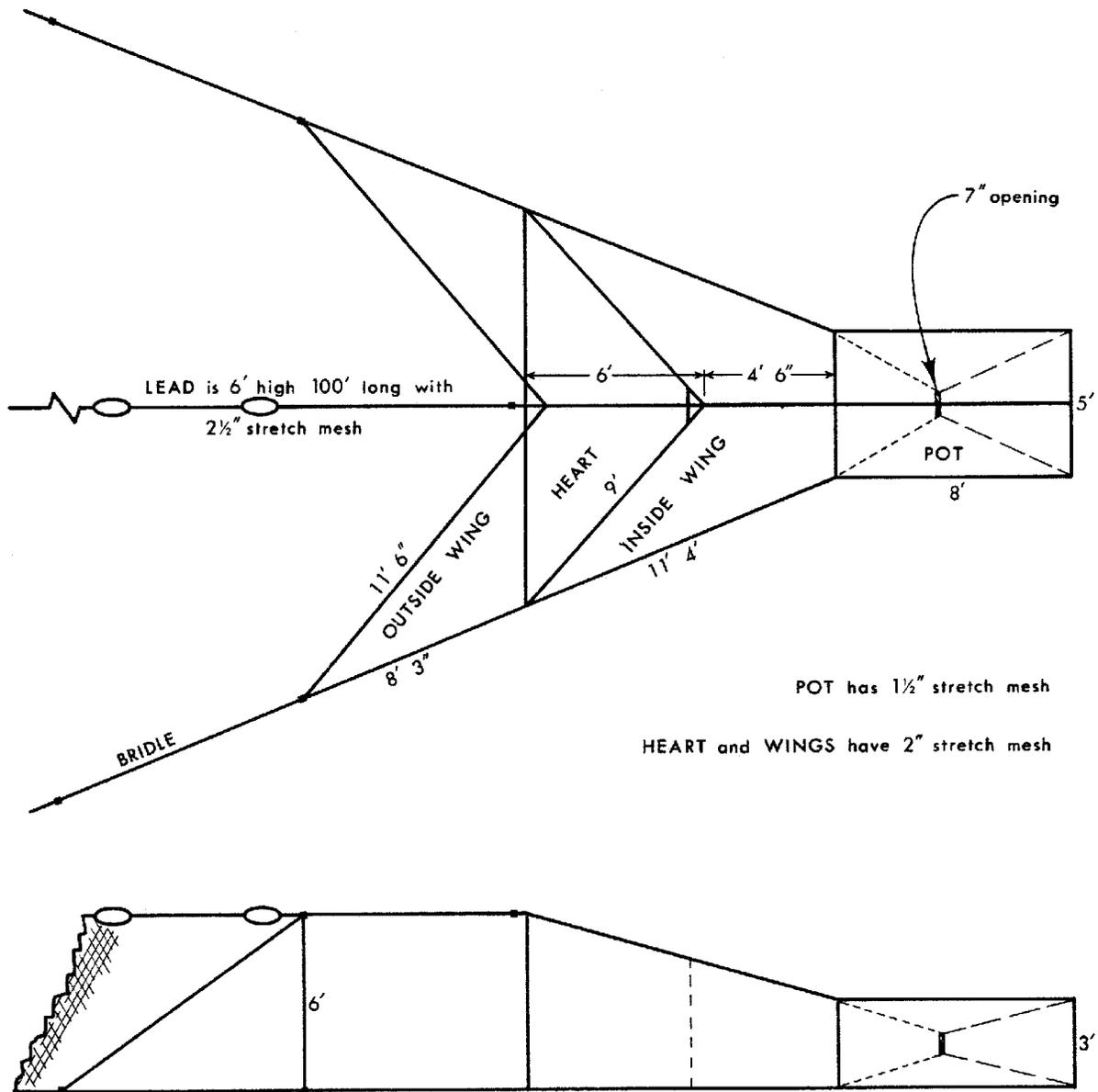
Figure 3.2–Construction details of a 6/3-foot trap net (6-foot lead tapering to a 3-foot pot).

Top View

XXXX

4' x 150'
Lead

4'

6'

8" Opening
10" Opening

MESH
#15 Nylon
2" Stretch

4'

Hoop

6'

4'

Front Frame

½" Thin wall
conduit
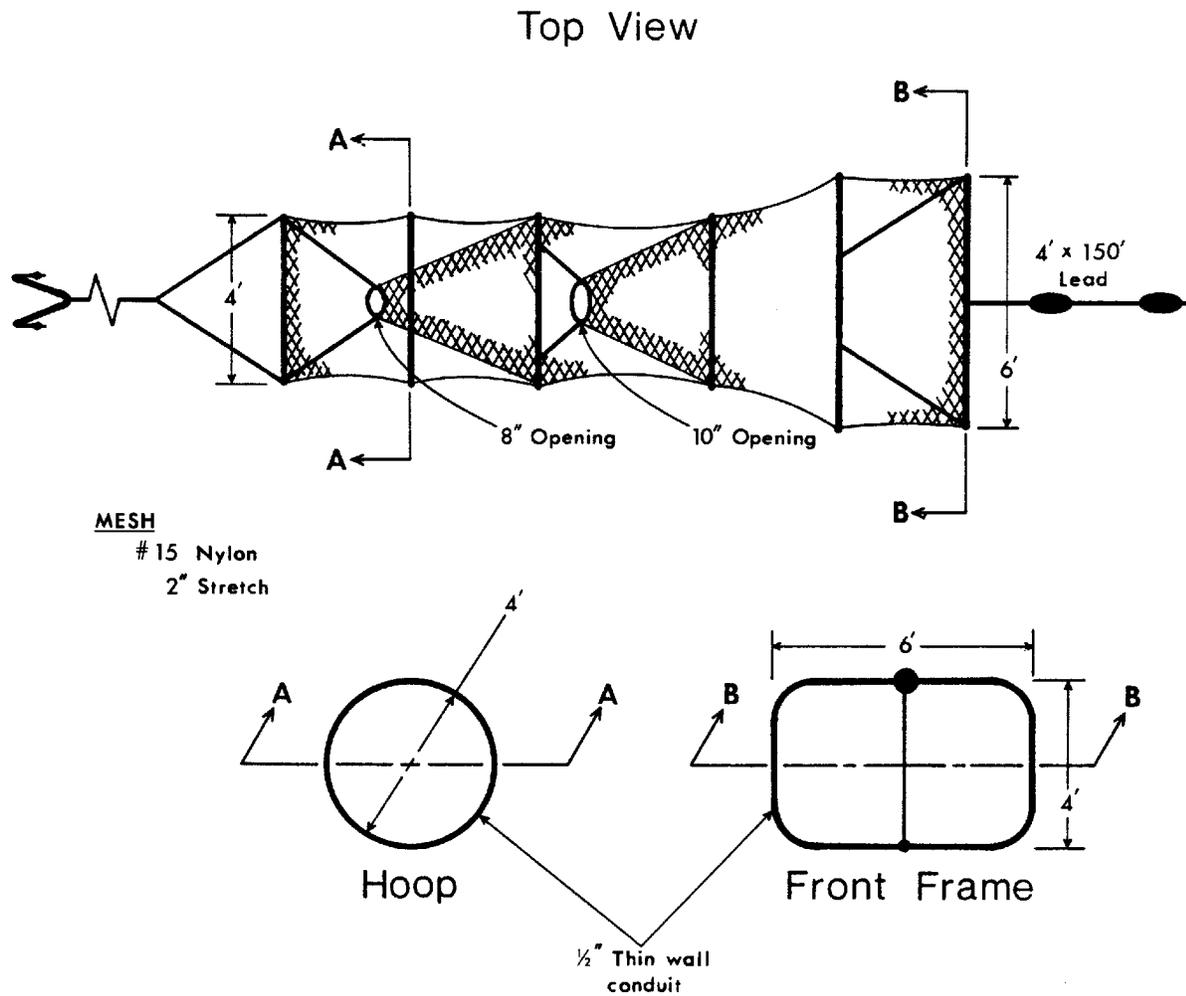
Figure 3.3–Construction details of a fyke net.

3.3 Inland experimental gill nets

Description

This net is 125 feet long and 6 feet deep. It consists of five 25-foot sections of different mesh sizes. The mesh sizes (stretch measure) are 1½ inches, 2 inches, 2½ inches, 3 inches, and 4 inches, and are hung in that order on a 1:2 basis (2 feet of stretch mesh per foot of lead or float line). The mesh is made of nylon multifilament. Monofilament mesh is not standard, and if used must be duly reported and described. Weight of the solid core lead line should be sufficient to sink the net for bottom fishing.

Use

Gill nets are used in lakes or (very carefully) in sluggish streams. Gill nets are very selective, but effective in catching many fish, especially yellow perch, northern pike, and trout. Centrarchids are usually undersampled. Gill nets are to be fished one night between lifts for standard CPE. Set each net as an individual unit.

Gillnets may be rigged to fish at surface or midwater. They may also be used vertically. Such uses are unusual for routine surveys and each application must be described well.

3.4 Modified Great Lakes gill nets

Description

This net is 500 feet long and 6 feet deep. It fishes on bottom. It consists of ten 50-foot sections of different mesh sizes. Mesh sizes (stretch measure) are 1½ inches, 2 inches, 2½ inches, 3 inches, 3½ inches, 4 inches, 4½ inches, 5 inches, 5½ inches, and 6 inches, and are hung in that order. Material is nylon multifilament: #46 (210/2) for 1½- to 3½-inch mesh; #69 (210/3) for 4- to 5½-inch mesh; and #104 for 6-inch mesh. The mesh is hung on a 1:2 basis with double selvage. One lead (three per pound) and one float per 8 feet of net; or equivalent balance of lead core and hollow core lines.

Use

This net has been used in larger inland lakes where a large sample is needed or where larger individual fish are found. Gill nets are to be fished one night between lifts. Set each net as an individual unit. Number of sets must be tailored to the survey needs.

3.5 Seines

Description

Various seines are in use. There seems to be no "standard" seine. Record length, mesh size, and bag mesh, if a bag is present.

Use

Generally, seines are effective on small fish, especially minnows. But larger seines are effective in sampling most species and sizes which occur in snag-free habitats in shallow water. Enough effort should be expended to obtain a representative sample of fish. Sample sites should be widely scattered and represent diverse habitats.

3.6 Toxicant sampling

Description

Toxicants may be used for total or partial reclamation (with approval) and for obtaining samples of fish. Currently, only rotenone and antimycin A are approved for use by the FDA. Safety precautions must be followed.

Use

Chapter 22 provides instructions for sampling sections of large rivers in Michigan with rotenone. In lakes, rotenone and antimycin can provide good samples of fish. When marked fish are present, more accurate estimates of the composition of the fish community and of standing crop can be made by mark-and-recapture methods stratified by species and size. Toxicants can sample all sizes and species of fish when applied in non-selective dosages, but not all sizes and species are recovered with the same efficiency. Enough collection effort should be expended to obtain a representative sample.

Cove sampling has not been used in Michigan (few Michigan waters have discrete coves) but is a potential tool. An abbreviated description of the procedure used for cove sampling by the Texas Parks and Wildlife Department follows:

> Place a barrier net of 1.5-inch stretch mesh across the cove 1 day prior to treatment. Bundle the net along the float line to permit free passage of fish. Release the net sometime between 2 hours after sunset and 2 hours before sunrise during the night before treatment. Place marked fish, similar to the species in the lake, into the area. Use enough toxicant for a total kill. Begin treatment on or before 8 AM. Recover fish on the day of treatment and the following day.

3.7 Electrofishing

Description

There are two basic types of electrofishing gear, "boom" and "stream," but many variations. Power supplies and configurations vary greatly and must be adequately described on FISH COLLECTION forms.

"Boom" shocking equipment, used on lakes and large rivers, consists of a boat rigged with booms out front. From two to five electrodes are suspended from the booms. If DC current is used, the positive electrodes (usually two) are out front and the negative electrodes trail along the sides (see Novotny and Priegel, 1974). Common electrical outputs are 220-volt, AC, DC, or pulsed DC. Working output is normally 4 to 10 amperes, but it should be adjusted to water conductivity, size of fish, and fish recovery time to avoid injury to the spine or to the gills. Higher voltage and lower amperage should be used in soft water. Water conductivity should be measured before each survey.

"Stream" shocking equipment, used on wadable streams, are of two basic types: a) pulsed DC back-pack (powered by either battery or small generator); or b) 220-volt DC, with a small boat to carry the large generator. The latter supplies more power and is much more effective. The positive electrode (1, 2, or 3 may be used) is hand held; the negative electrode may be attached to the bottom of the boat or to a separate float.

Use

The powerful types of electrofishing gear are potentially less size selective than fyke, trap, or gill nets and can obtain a more representative sample of the size structure, age structure, and growth of the population. Battery-powered backpacks allow larger fish to escape their weak electrical fields; however they are the only sampling tool available for small and brushy streams. All types of electrofishing gear are ineffective in habitats over approximately 5 feet deep, and that may result in a sample which is unrepresentative of the water body as a whole.

Electrofishing is the most effective gear for sampling stream and river fish. It can be effective in lakes for routine sampling, or for special projects such as sampling bass in the spring or trout in the spring or fall. Some large fish, such as northern pike, often escape from the electric field. In lakes, usually a larger and more representative sample of fish is obtained after dark. Catch may vary greatly seasonally, and from night to night, depending on fish movements and species.

When boom shocking rivers, it is usually best to fish downstream, motoring slightly faster than the current, but pausing occasionally to allow fish stunned on the bottom to drift to the surface. A second boat, downstream, may be used to pick up many additional fish.

A minimum amount of effort is 15 minutes of actual fishing time. For routine inventories, permanent stations should be established and recorded on a map of the lake or stream. On small lakes, the entire shoreline may be covered; on larger lakes, select as many areas as necessary to sample all habitat types.

For additional information, refer to Electrofishing Safety and Procedure Manual, Michigan Department of Natural Resources, Fisheries Division. Also, see Section 2.4.2.10 and Chapter 23 for Serns indexing of walleye and other fish in lakes.

3.8 Trawl

Description

A 16-foot head rope otter bottom trawl is the standard for inland sampling. The trawl is 16 feet across the front opening and has 1½-inch stretch nylon mesh on the main part. The cod end has a liner of ¼-inch mesh. Otter boards with adjustable chains are used to hold out the sides. The foot line is weighted with chain and the head line is fitted with styrofoam floats. The net is fished with a boat powered by powerful motor and pulled by hand or winch. Towing speed is measured using a simple trolling meter. Towing lines must be long enough to maintain the trawl on the bottom.

Use

Trawls have received very little use in inland lakes, mainly because of snags and weeds. Sampling with a trawl is similar to sampling with a bag seine, but more mobile and can be used in deeper water. Minnows and young fish are the main targets, but fish as large as adult perch can be sampled.

Several tows in each area are more meaningful than single spot tows. Where possible, tows should be 5 minutes long. Record time from when the trawl is started along the bottom to when you start to pull it in.

3.9 Visual observations

Description

Visual observations of spawning fish, unusual concentrations, movements, etc., are sometimes made. This can be done on calm days or at night with the aid of a light.

Use

Observations may pinpoint spawning habitats or the optimum time for population control, and may indicate the presence of species and sizes not taken in sampling.

3.10 References

Crowe, W. R. 1950. Construction and use of small trap nets. Progressive Fish-Culturalist 12:185-192.

Novotny, D. W., and G. R. Priegel. 1974. Electrofishing boats: improved designs and operational guidelines to increase the effectiveness of boom shockers. Wisconsin Department of Natural Resources, Technical Bulletin No. 73, Madison.

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