



Fishery Facts 9

National Oceanic and Atmospheric Administration / National Marine Fisheries Service

**design and materials used
in construction of a
16-foot shrimp trawl**

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EDWARD F. KLIMA**

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DESIGN AND CONSTRUCTION OF TRAWLS
USED BY COAST GUARD

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DESIGN AND MATERIALS USED IN CONSTRUCTION OF A 16-FOOT SHRIMP TRAWL¹

ELMER J. GUTHERZ,² ANTHONY F. SERRA,² and
EDWARD F. KLIMA³

INTRODUCTION

Small shrimp trawls (try-nets) are used by commercial fishermen both to locate and to remain in commercial concentrations of shrimp, and by sports fishermen to catch shrimp for bait or home use (Fig. 1). Use of these nets varies among individual fishermen regardless whether they are commercial or sports fishermen. Commercial fishermen generally make 10- to 20-min tows when attempting to locate high concentrations of shrimp. If the catch in the try-net is sufficiently large, the shrimp trawls are deployed while the fishermen continue to use the try-net to stay in commercial concentrations of shrimp. Large shrimp trawls, once deployed, usually are fished from 2 to 4 h. The try-net, which is fished continuously, allows the fishermen to periodically determine shrimp density in the fishing area, thus allowing them to exercise the following options: 1) continue as is, 2) change tow directions, 3) pick the net up, or 4) move on to more productive grounds.

Sports fishermen deploy try-nets from small skiffs or from medium-sized boats varying from 12- to 30-feet in length. Most of these boats are powered by outboard motors, although gasoline and diesel inboards are also used. The try-nets are rarely towed for more than 30 min before they are retrieved and the catch emptied.

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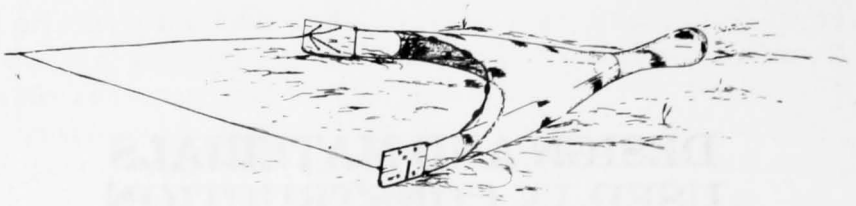


Figure 1.—Commercial use of a 16-foot shrimp trawl.

The most common try-net used in the northern Gulf of Mexico is a 16-foot flat trawl with 30×15 -inch wooden doors. This article describes the procedure for constructing a 16-foot shrimp trawl and the 30×15 -inch trawl doors. Although we describe methods of fabricating a 16-foot shrimp trawl, nets of different sizes can be constructed, using these directions, by modifying the components proportionally.

TRAWL DESIGN AND CONSTRUCTION

Nylon webbing recommended for construction of try-nets can be purchased from most commercial fishermen's supply houses. The body and wings should be constructed with No. 12 thread nylon web-

Table 1.—Materials required for construction of a 16-foot shrimp trawl and doors.

Materials	Amount	Type
Floats	4	2 × 3 inches
Footrope	26 feet	synthetic
Headrope	22 feet	synthetic
Webbing	5 pounds	No. 12 nylon, 1 ¼-inch stretch mesh
	½ pound	No. 24 nylon, ¾-inch stretch mesh
Footrope chain	⅛ inch	300 links
Door bridle chain	3/16 inch	208 links
Needle	1	sewing
Twine—sewing	1 pound	No. 12 nylon
Twine—hanging	1 pound	No. 24 nylon
¾-inch marine plywood	1	4 × 8 sheet
Iron bars	2 × 2½ × 33 inches	
	2	⅛ × 1 × 10 inches
Fasteners	4	⅛ × 1 × 3 inches
Eye brackets	2	¼ inch
Nails	8	twenty penny
Swivels	2	⅛ inch
Shackles	2	⅛ inch

bing, 1¼-inch stretch mesh; however, the codend will require No. 24 thread nylon webbing, ¾-inch stretch mesh. Quantities and types of material needed for fabrication of a 16-foot shrimp trawl and doors are listed in Table 1. Construction methods and accompanying illustrations are sequentially listed together with a step-by-step explanation. A schematic diagram of a 16-foot shrimp trawl is given in Figure 2.

Step 1—Construction of top and bottom of trawl (Figs. 3-8).

A piece of webbing 130 meshes square of No. 12 thread is cut on a 2:1 taper (Fig. 3). The 2:1 taper means that 2 bars and 1 mesh

16' SHRIMP TRAWL

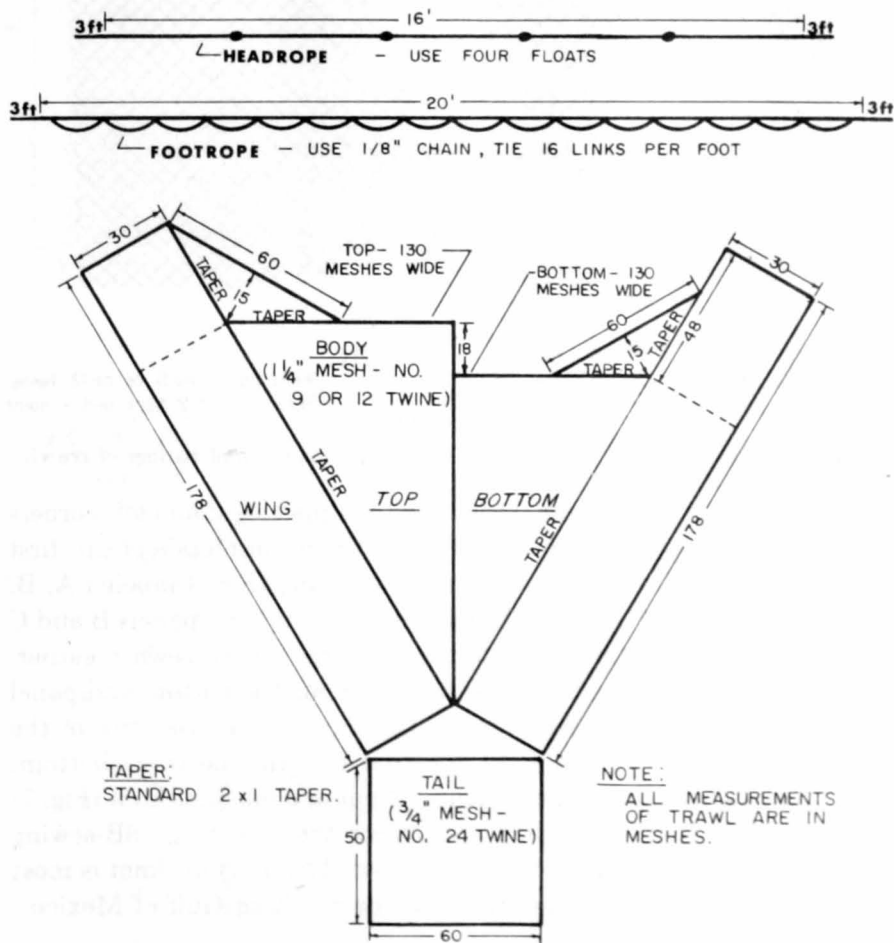
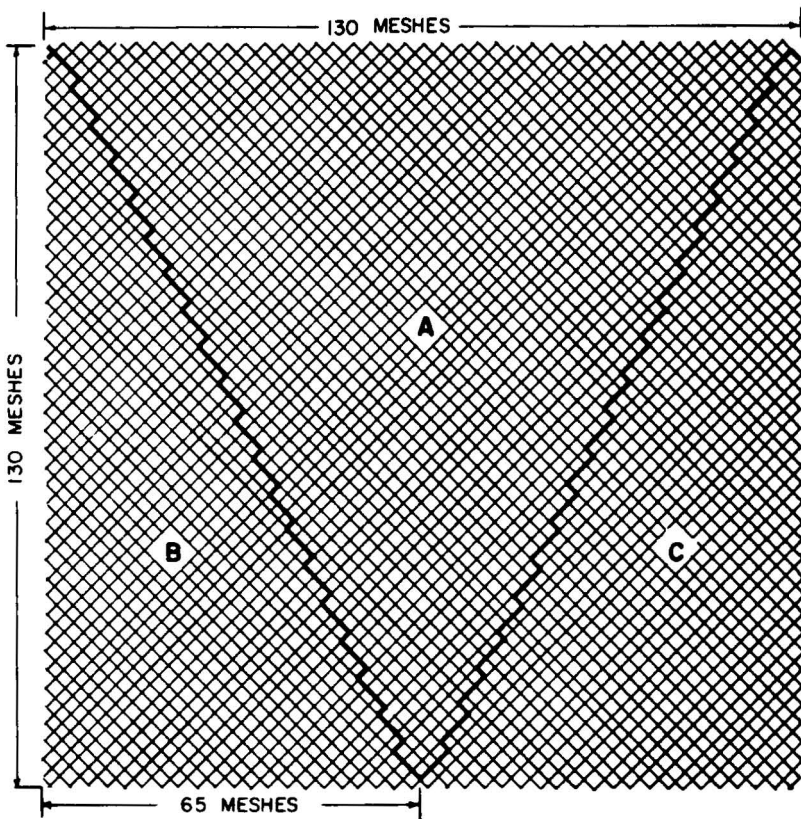


Figure 2.—Schematic diagram of a 16-foot shrimp trawl with float placement on headrope and chain placement on footrope.



PANEL A = TOP OF NET
 PANEL B = 1/2 BOTTOM OF NET
 PANEL C = 1/2 BOTTOM OF NET

NOTE:

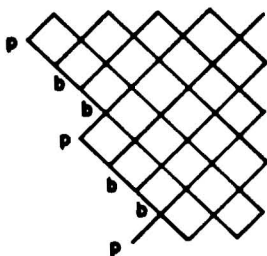
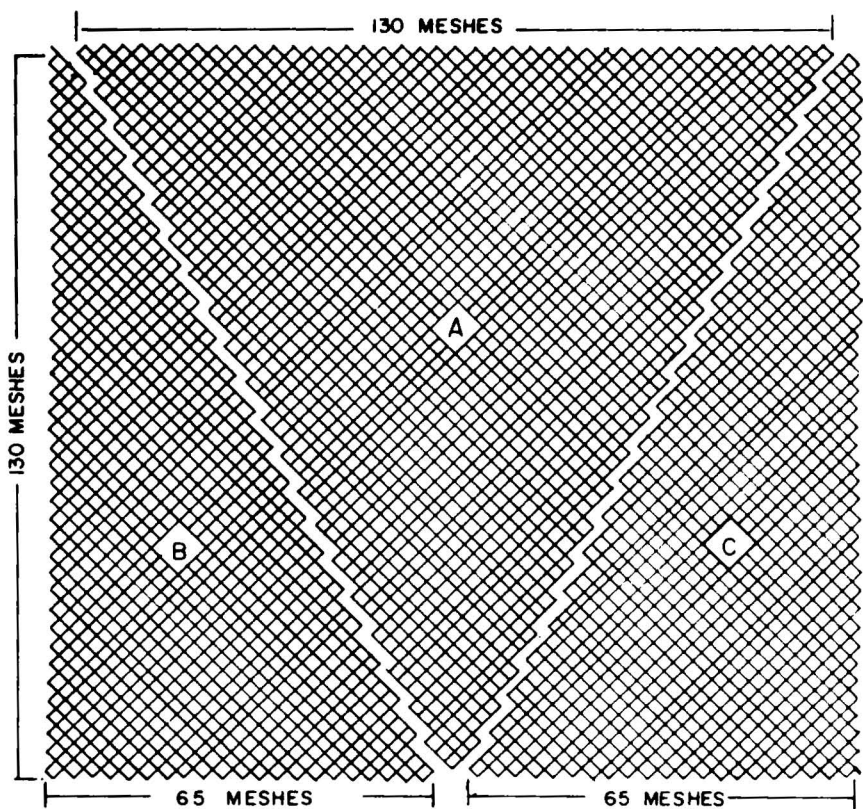
Webbing is no.9 or no.12 twine.
 Taper is cut 2 bars and 1 point.

Figure 3.—Basic piece of webbing before cutting for top and bottom of trawl.

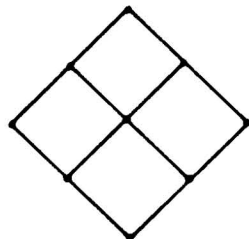
will be cut on a diagonal from the top upper right and left corners to the center of the bottom (Fig. 4). Upon completion of this first cut, you will have three pieces of webbing (Fig. 4 labeled A, B, C). Panel A (Fig. 5) will be the top of the net and panels B and C (Fig. 6) will form the bottom of the trawl when sewn together. Panels B and C will have 65 meshes along the bottom and panel A will have 130 meshes across the top (Fig. 4). Because of the taper, panels B and C fit together to form the trawl bottom. When sewing use either a figure 8 knot or a machine knot (Fig. 7) and tie from point-to-point along the cut (Fig. 8B—sewing straight seam) until completely sewn. The machine knot is most commonly used by fishermen in the northern Gulf of Mexico.

Step 2—Construction of wings of trawl (Fig. 9).

Two pieces of webbing are needed, one for the right wing and one



TAPER OF WEBBING

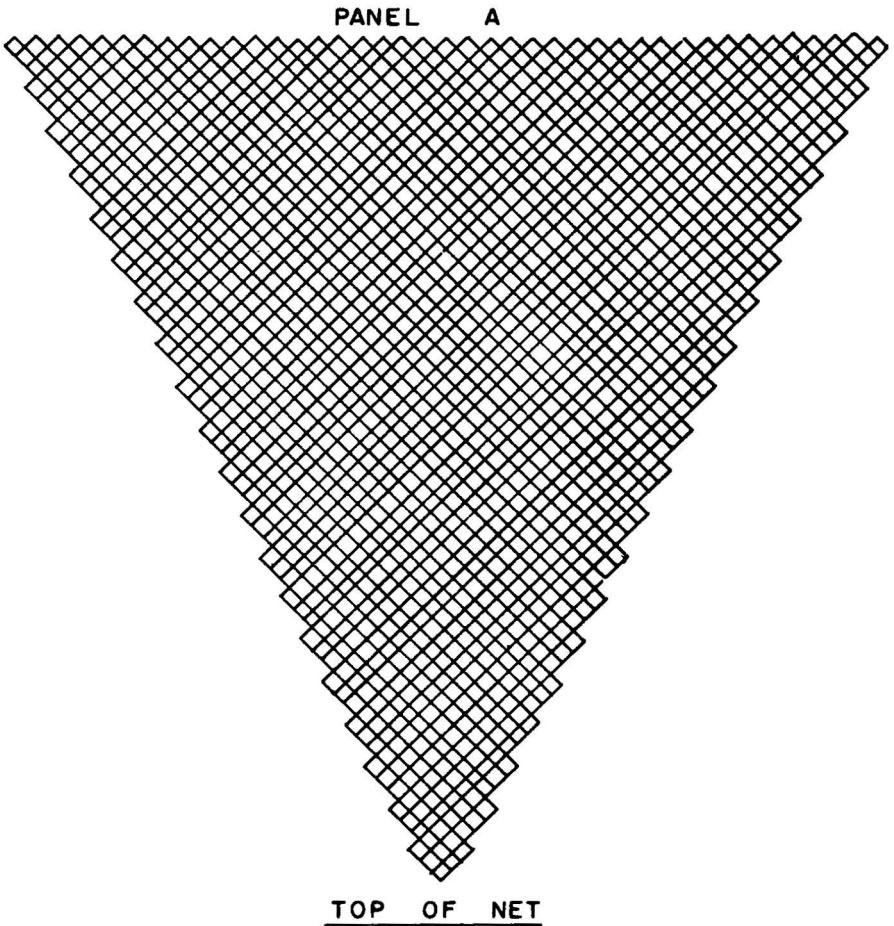


OPEN MESH

LEGEND

- A - TOP PANEL OF NET
- B - 1/2 BOTTOM PANEL OF NET
- C - 1/2 BOTTOM PANEL OF NET
- p - POINT
- b - BAR
- TAPER - TWO BARS (b) AND ONE POINT (p)

Figure 4.—Basic piece of webbing after cutting with diagram of 2 x 1 taper cut and an open mesh.



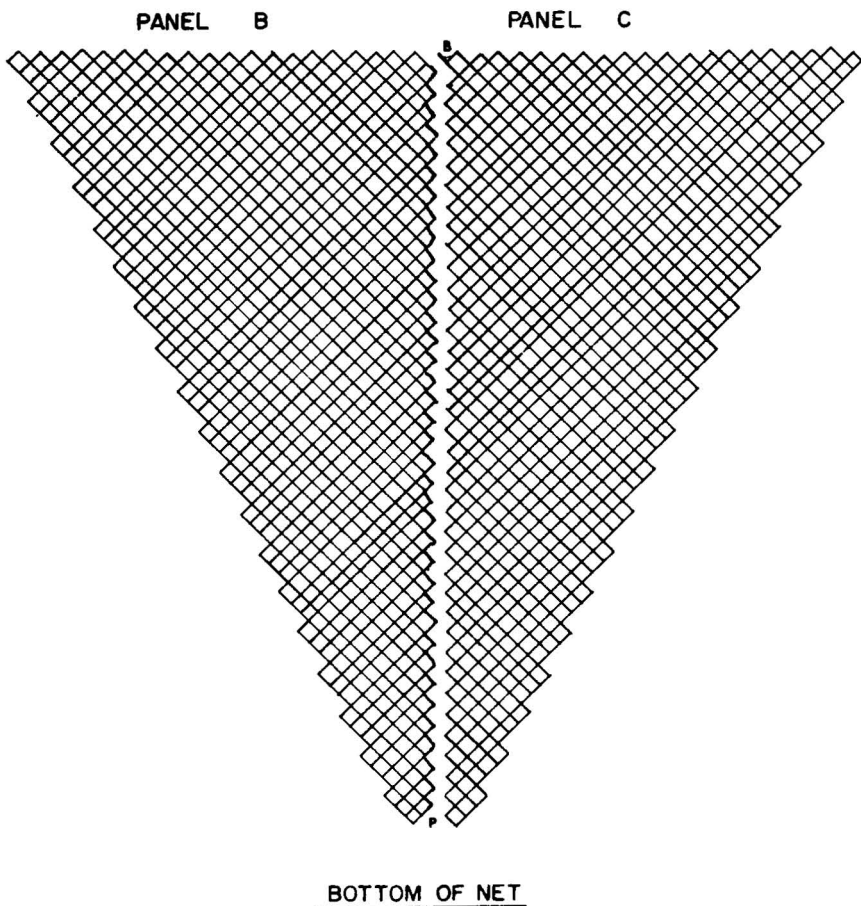
NOTE: WEBBING IS 130 MESHES DEEP.
 TAPER IS CUT 2 BARS AND 1 POINT.
 WEBBING IS NO. 9 OR NO. 12 TWINE.

Figure 5.—Top panel of trawl.

for the left wing. Each piece of webbing should be 30 meshes deep and 178 meshes long. Put these aside until needed.

Step 3—Construction of corner piece (Figs. 9, 10).

Each corner piece is 15 meshes deep and 60 meshes long (Fig. 10). The four corner pieces are cut from a piece of webbing 15 meshes deep and 120 meshes long and are cut from top to bottom on a 2:1 taper (Fig. 10). These cut segments are labeled 1, 2, 3, 4₁, and 4₂. Segments 4₁ and 4₂ (Fig. 10) are sewn together to form the fourth corner piece; sewing is as described in Step 1 for sewing the bottom of the trawl.



NOTE: WEBBING IS 130 MESHES DEEP.
 TAPER IS CUT 2 BARS AND 1 POINT.
 WEBBING IS NO. 9 OR NO. 12 TWINE.

Figure 6.—Bottom panel of trawl; P = point, B = bar.

Step 4—Sewing trawl sections together (Figs. 7, 8).

At this point the top, bottom, two wings, and four corner pieces have been constructed. These pieces are now sewn together. The 16-foot shrimp trawl is now complete except for the tail and hangings (Fig. 2). Sewing methods were described previously (Step 1) and are illustrated in Figures 7 and 8.

Sewing steps are as follows:

First, sew the wings to the top of the net, beginning 30 meshes back from the front of the wing, and then sew from point-to-point all the way to the end of the body (see Fig. 2). A total of 148 meshes will be sewn together. Do this for both right and left wings.

A

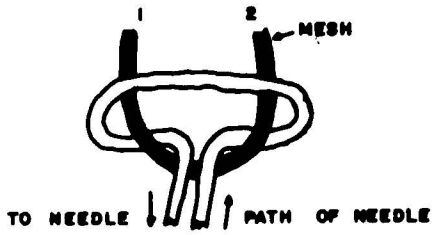
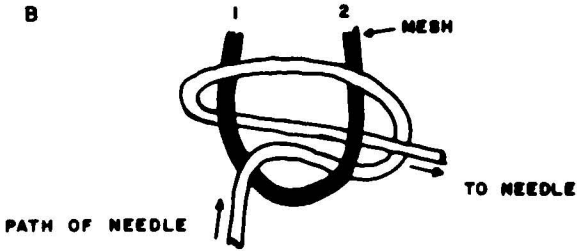


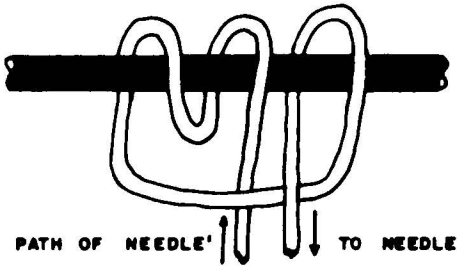
FIGURE EIGHT KNOT

B



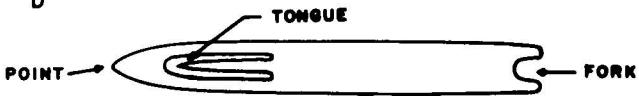
MACHINE KNOT

C



ROLLING HITCH

D



NET NEEDLE

Figure 7.—Diagram of ties, rolling hitch, and sewing needle. Ties are used for sewing and/or mending webbing and the hitch is used for hanging the headrope and footrope.

A

SEWING TAPER SEAM

B

SEWING STRAIGHT SEAM

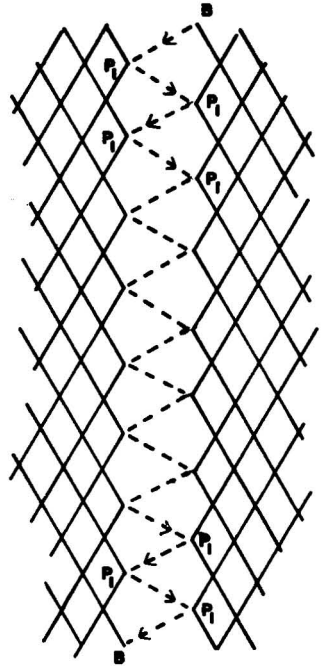
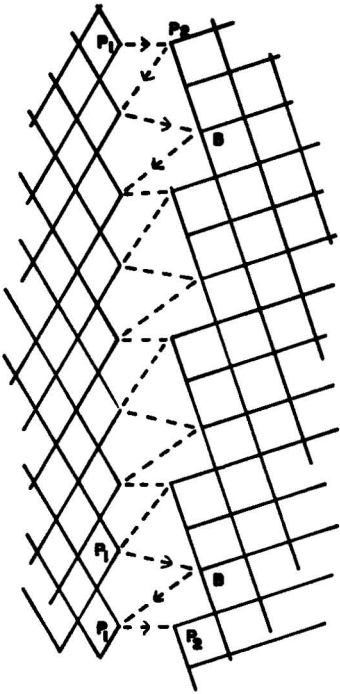
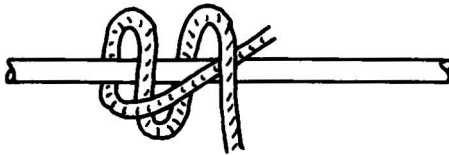
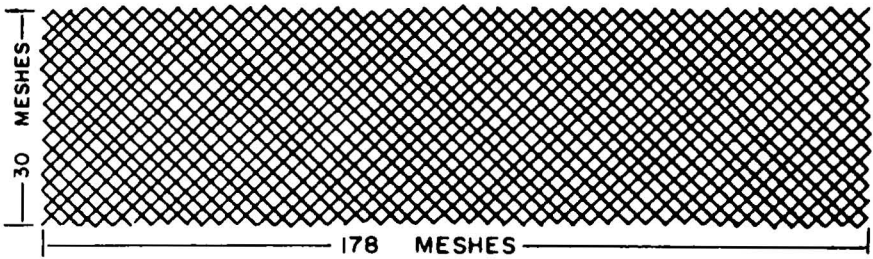
C

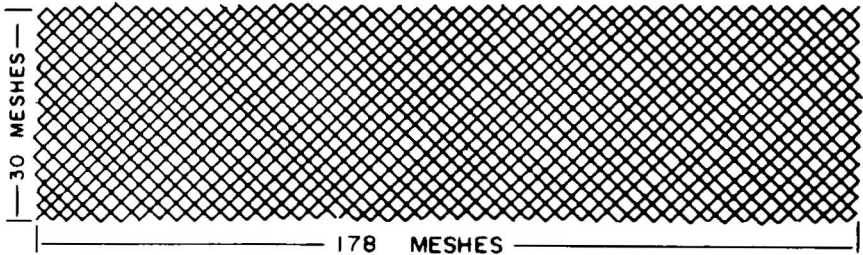
Figure 8.—Detail of sewing taper and straight seams; P = points, B = bars.

After the wings have been sewn to the top of the net, turn the net over and sew the wings to the bottom of the trawl (Fig. 2). Count back 48 meshes from the front of the wing and begin sewing point-to-point all the way to the end of the body segment. A total of 130 meshes will be sewn together. Do this for both right and left wings. Now the net has a top, bottom, and two wings. The next step is to sew in the four corner pieces (Fig. 2). Each

RIGHT WING



LEFT WING



TOP AND BOTTOM CORNERS

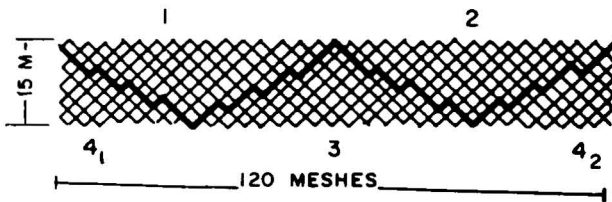
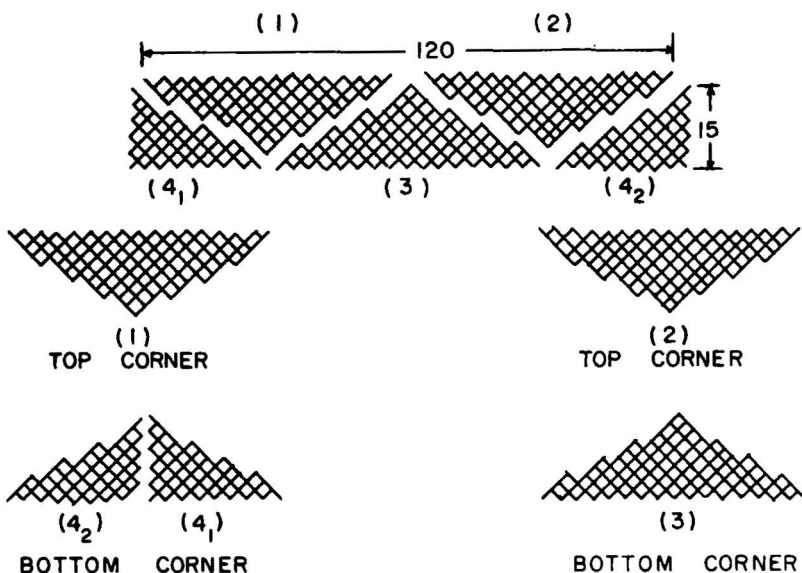


Figure 9.—Construction of wings and methods of cutting corner pieces.

corner piece is triangular-shaped and the apex of the triangle is placed at the junction of the wing and body (Fig. 2). Begin sewing at the apex of the corner piece and continue along the wing and body. Each of the four corner pieces is sewn onto the trawl in the same manner except that the top corner pieces sew onto the tip of the upper corner of the wings, whereas the bottom corner pieces tie in 18 meshes back from the tip of the lower corner of the wing (Fig. 2).

The final step is construction and sewing a tail on the trawl. The tail is made from a piece of No. 24 thread nylon webbing $\frac{3}{4}$ -inch stretch mesh. Cut the webbing in a rectangle, 60 meshes long and 50 meshes deep. Sew the tail together point-to-point along the straight seam (Fig. 8B). The tail, after sewing, will form a funnel



NOTE: TOP AND BOTTOM CORNERS ARE 15 MESHES DEEP AND 60 MESHES LONG.

Figure 10.—Detail of cutting the four corner pieces.

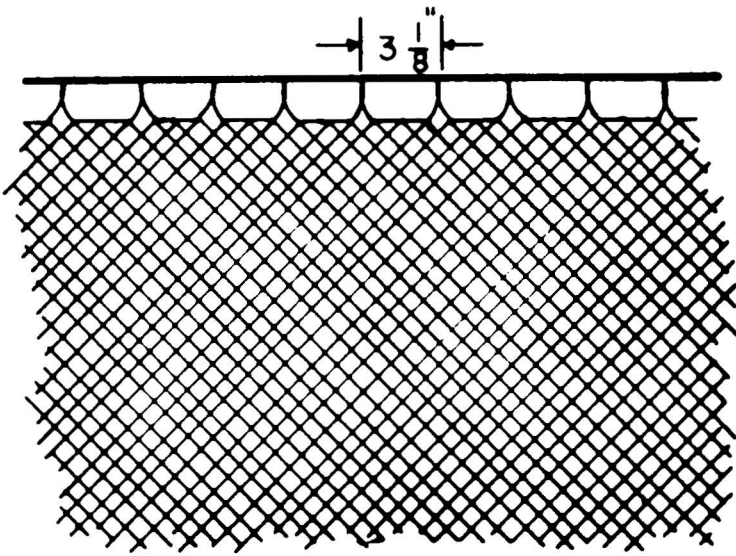
which is then sewn onto the body of the trawl. This sewing is also done point-to-point along a straight seam. Six stainless steel rings are sewn around the tail at approximately the 40th mesh. A 3-foot-long trip line of $\frac{1}{4}$ - or $\frac{1}{2}$ -inch rope is then threaded through the rings, completing the bag section and the trawl.

Step 5—Hanging the net on the headrope and footrope (Fig. 11).

The trawl is now ready for hanging and attachment of the floats and chain. Headropes and footropes are made from $\frac{1}{2}$ -inch synthetic rope and are 22 feet and 26 feet long, respectively. The longer footrope is needed to accommodate the setback in the trawl.

Using a ruler or a marker, mark spaces of $3\frac{1}{8}$ inches from left to right down the entire length of the headrope.

Lay the net perfectly flat. Tie the headrope to the top portion of the net as follows: Start at the end of the wing and tie a rolling hitch (Fig. 7) on the headrope and a figure 8 or machine knot (Fig. 7) to the net body; then move 3 meshes for each $3\frac{1}{8}$ -inch mark along the entire length of the headrope. Make the first and last ties 3 feet from the end of the rope so there will be sufficient free rope to tie to the trawl doors. The headrope should be hung 3



HANG THREE MESHES ON $3 \frac{1}{8}$ "

NOTE: ADD THREE FEET TO BOTH ENDS OF LEAD LINE AND CORK LINE TO TIE TO TRAWL DOOR.

Figure 11.—Hanging net onto headrope and footrope. Use rolling hitch when tying trawl onto headrope and footrope.

inches away from the net; a ruler or one palm width should be used to measure this distance. Spacing between hangings should be $3 \frac{1}{8}$ inches. Proceed to tie from the right top wing to the end of the left top wing. In addition to hanging the headrope, four 2-inch diameter floats are needed. They should be spaced evenly along the headrope and positioned while hanging the trawl. One to the far left side (on the corner piece), two evenly spaced on the body of the trawl, and one on the far right side (on the corner piece).

Now hang the footrope using the same procedure as used in tying the headrope to the net. The footrope should be tied from the front of the right bottom wing all the way to the front of the left bottom wing leaving 3 feet at each end for tying to the trawl boards. A spacing of $3 \frac{1}{8}$ inches between ties and a horizontal distance of 3 inches between the footrope and bottom portion of the net should be maintained.

Headrope and footrope lengths can be longer than indicated if a

thimble and shackle are used to secure the net to the trawl boards.

Step 6—Hanging of the loop chain.

One-eighth inch galvanized chain is tied to the footrope with a rolling hitch (Fig. 7) to form the loop chain (Fig. 2). The knot should be tied snugly, with 16 links of chain used for each foot of footrope length. Tie the chain from the forward, bottom end of the right wing all along the footrope to the forward bottom end of the left wing.

The 16-foot shrimp trawl is now complete. All that remains is to construct the doors as described in the following section and this net is ready for fishing.

TRAWL DOOR CONSTRUCTION

The trawl door should be constructed from $\frac{3}{4}$ -inch marine plywood and a $\frac{1}{4}$ -inch steel bar, 2½ inches wide and 33 inches long.

Five holes, $\frac{1}{2}$ inch in diameter, are drilled into the door (Fig. 12). The hole nearest the upper rear corner is used only for attachment of the headrope. The remaining four holes are used for the bridle attachment. The footrope is attached to a bracket located on the metal shoe or skid plate (Fig. 12).

LENGTHS OF CHAIN DOOR BRIDLE

- LENGTH OF CHAIN 1 EQUALS DISTANCE BETWEEN HOLES 1 AND 3.
- CHAIN 2 IS $\frac{1}{2}$ THE LENGTH OF CHAIN 1.
- CHAIN 3 IS *1 LINK LESS THAN CHAIN 2.
- CHAIN 4 IS *1 LINK LESS THAN CHAIN 1.

*NOTE

CUT 1 LINK FOR SHALLOW WATER, OR CUT 2 LINKS FOR DEEP WATER.

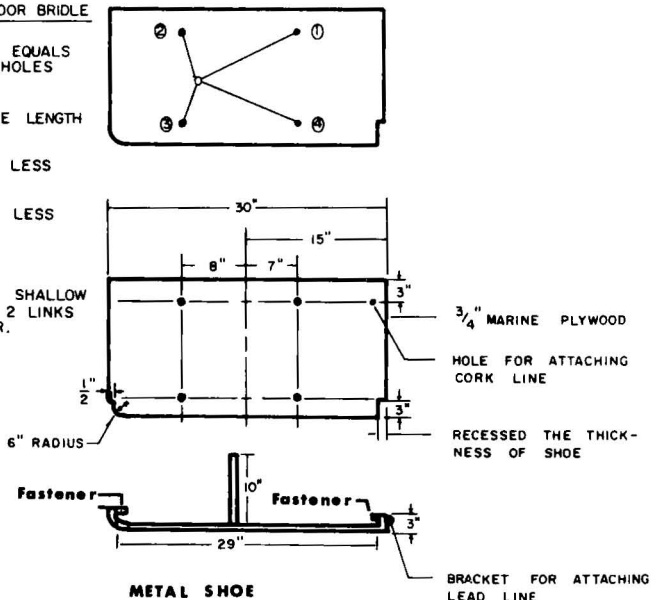


Figure 12.—Schematic diagram for constructing wooden trawl doors, metal shoe, placement of holes in the door, and chain linkage for bridle.


The shoe or skid plate is made from an iron bar $\frac{1}{4}$ inch thick, $2\frac{1}{2}$ inches wide, and 33 inches long and is attached to the bottom of the door. Additional attachments of the shoe to the door are provided by the 10-inch long iron upright welded at the center of the shoe and the two fasteners which are welded at a 90° angle to the front and back of the shoe (Fig. 12). The shoe or skid plate and the iron upright also strengthen the door. A $\frac{1}{8}$ inch eye bracket is welded on the back of the shoe (Fig. 12) for attachment of the footrope. The forward portion of the bar should be bent at an angle of approximately 45° to fit the curve of the door. Place the bar on a 6 inch pipe, then heat and bend.

A bridle consisting of 104 links of $\frac{3}{16}$ -inch chain must be made for each door. When making up the bridle, begin your count on the first link free of the nail. Attach the chain bridle to the back side of the door with a twenty penny nail.

Chain bridle measurements and positions of attachment are as follows: top front leg 15 links, attached in the top anterior hole; top back leg 30 links, attached in the top middle hole; bottom front leg 14 links (this leg is always one less link than the top front leg), attached in the bottom anterior hole; bottom back leg 29 links (this leg is always one less link than the top back leg), attached in the bottom posterior hole. There should be 4 excess links on each leg of the bridle for future bridle adjustments.

Use a $\frac{1}{8}$ -inch shackle and a $\frac{1}{8}$ -inch swivel to gather the chain links at the center portion of the door. This forms a good bridle for towing. Adjustments may be necessary after the trawl doors have been tested or used extensively. This is done by adding or removing links primarily from the back upper and lower legs of the bridle.

Sports fishermen normally use two towing cables, one attached to each door. Commercial fishermen use a towing bridle with each leg of the towing bridle attached to a door bridle. A single towing cable is then used for fishing.



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