

HOW LAKE SUPERIOR GILL NET VESSEL WAS CONVERTED TO TRAWLER

By Warren Handwork*

In Lake Michigan and Lake Erie, trawling is an efficient method for catching some species of commercial fish--smelt, chubs, and alewife. Vessels now used for trawling in the Great Lakes are mostly converted gill net vessels. (Gordon and Brouillard (1961) and Gordon (1962) described conversion methods.)

Experimental trawling was one part of an Economic Development Administration-Technical Assistance Project by the Bureau of Commercial Fisheries to help the commercial fishing industry of Lake Superior. Under this project, two gill net vessels were

modified into trawlers to determine the feasibility of trawling for smelt, small chubs, and other underutilized species. This paper reports on the conversion of the "A. E. Clifford," a 45-foot, steel, gill net vessel operating out of Ontonagon, Michigan (fig. 1).

VESSEL CONVERSION

The A. E. Clifford was converted into a trawler in June 1966. The conversion features a minimum of structural alterations--but allows the vessel to function either as a sterntrawler or a gill netter. No portion of the superstructure was removed, so the vessel retains the enclosed deck. The only structural modification was the installation of a hinged hatch cover for an opening cut in the top deck at the stern. The 4-foot square opening facilitates hoisting trawl catches aboard (figs. 2 and 3). Trawling equipment installed on the main deck in no way interferes with gill netting.

The A. E. Clifford's principal dimensions are: length overall, 45 feet; beam, 12 feet 10 inches; and draft, 6 feet. The vessel has a 120-horsepower diesel engine, which drives a 42-inch diameter by 38-inch pitch propeller through a 2:1 reduction gear. The vessel's cruising speed is 10 miles per hour. A 5-kilowatt generator supplies alternating current to lights and an oil furnace. The main engine electrical system furnishes the 12-volt direct current that operates an automatic pilot and echo sounders.

DECK EQUIPMENT

All deck equipment is powered hydraulically (figs. 4 and 5). A power-take-off unit from the main engine drives the two hydraulic pumps that provide independent power to each trawl winch. Each pump is rated at 17 input horsepower and pumps 17 gallons per minute at 900 revolutions per minute. Maximum working pressure of the hydraulic system is 1,500 pounds per square inch. Two single-spool directional valves operate the

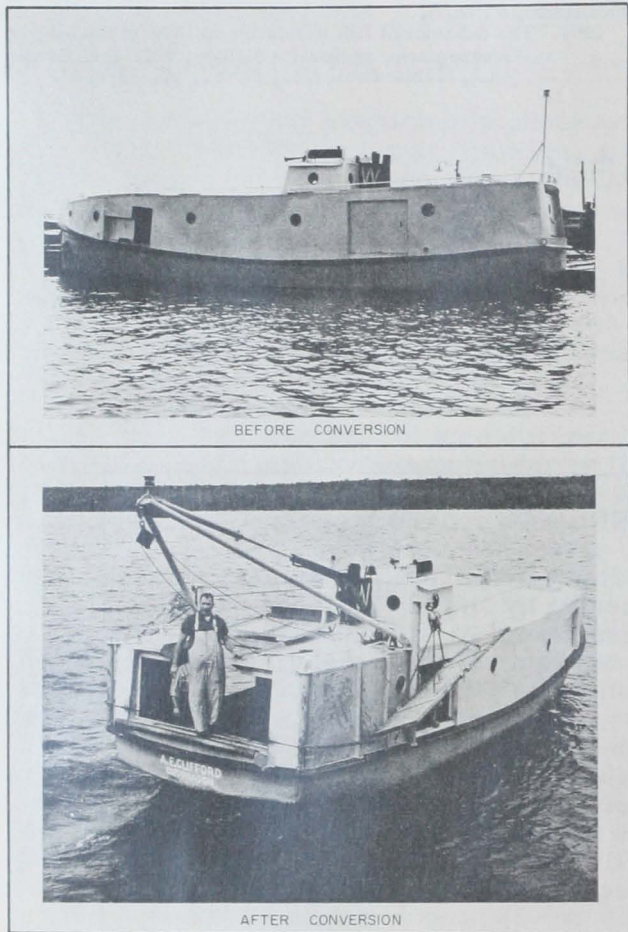


Fig. 1 - The A. E. Clifford.

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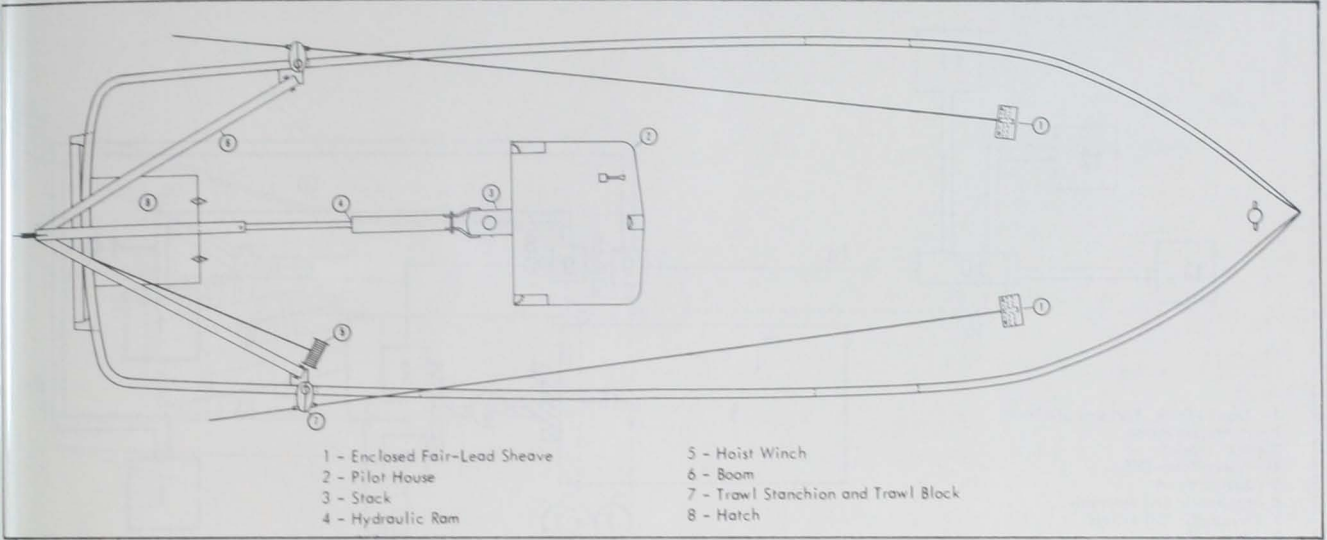


Fig. 2 - Schematic of A. E. Clifford showing top deck arrangements.

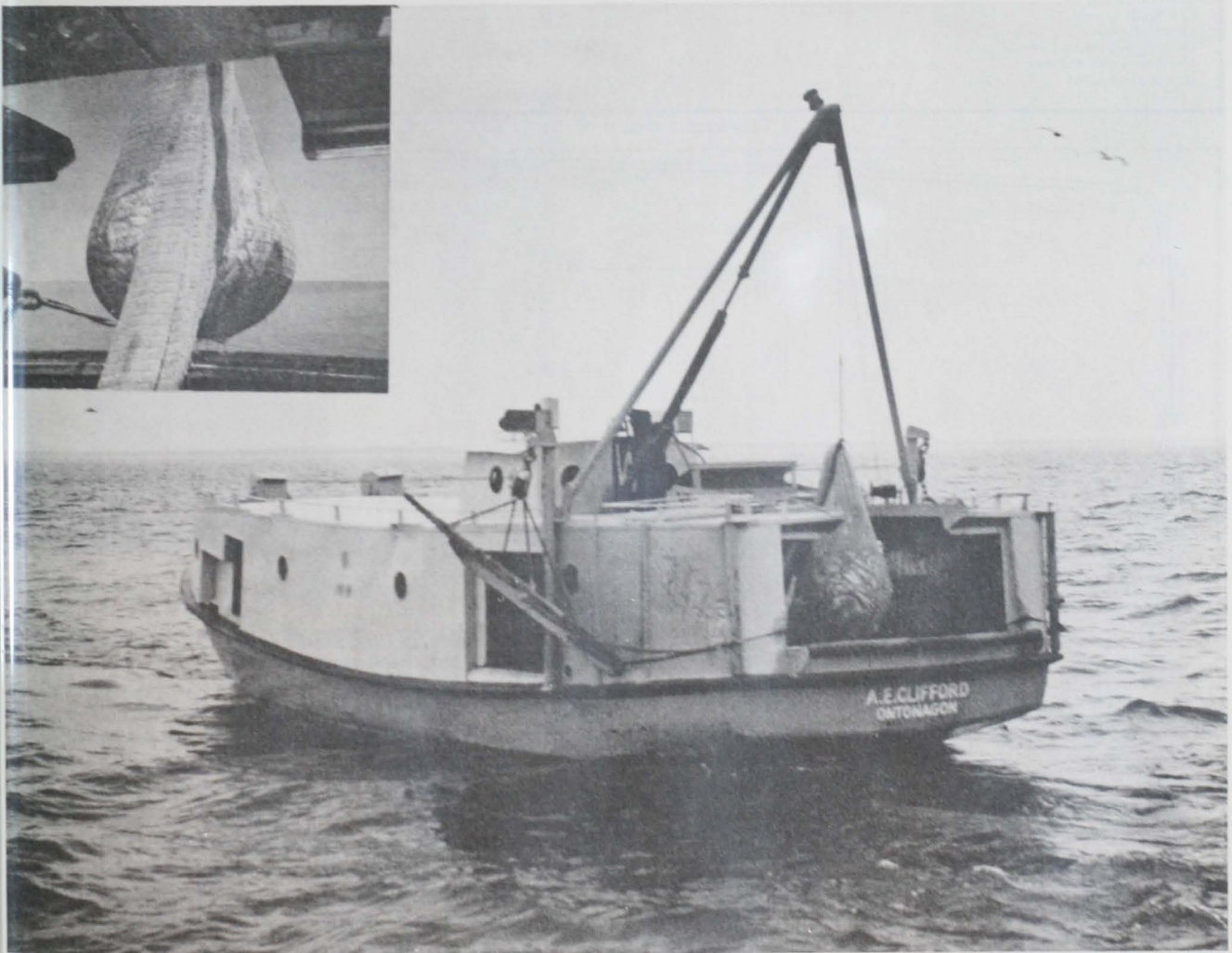


Fig. 3 - A 450-pound catch of chubs being brought aboard, August 1966.

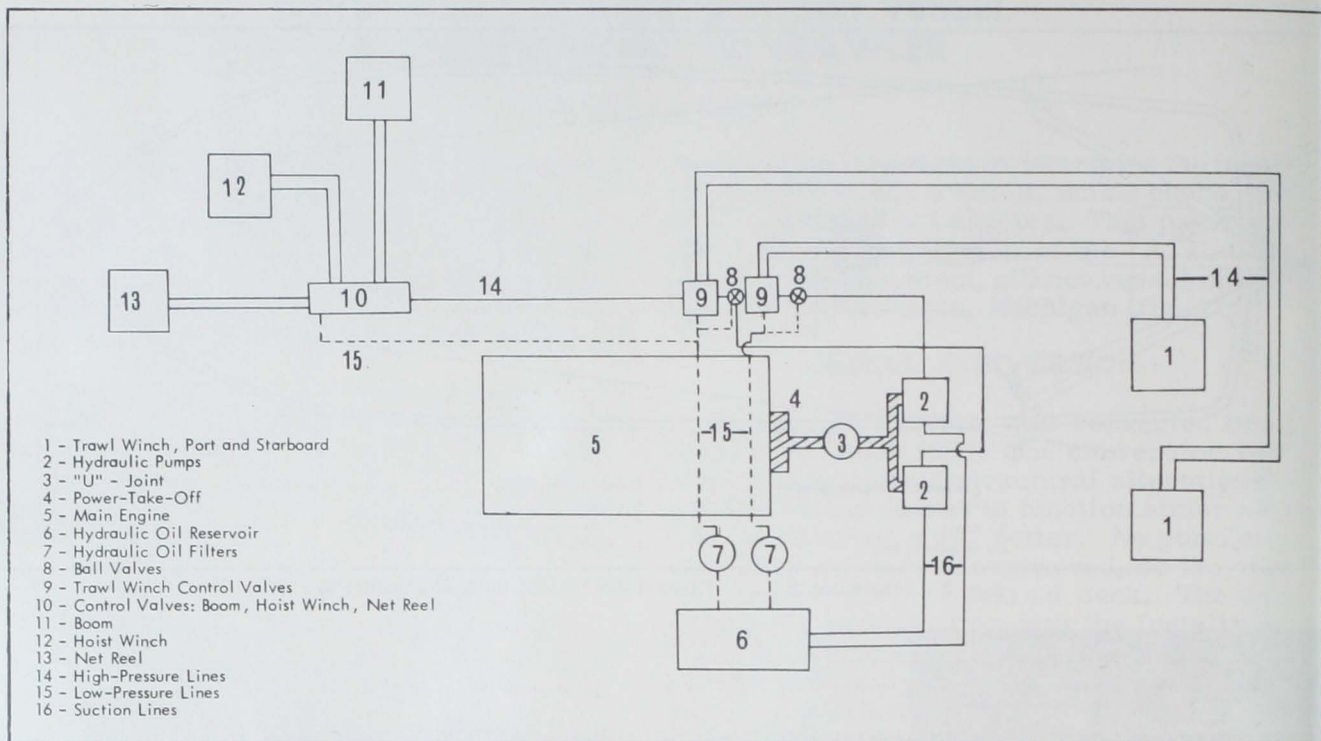


Fig. 4 - Hydraulic system of the A. E. Clifford.

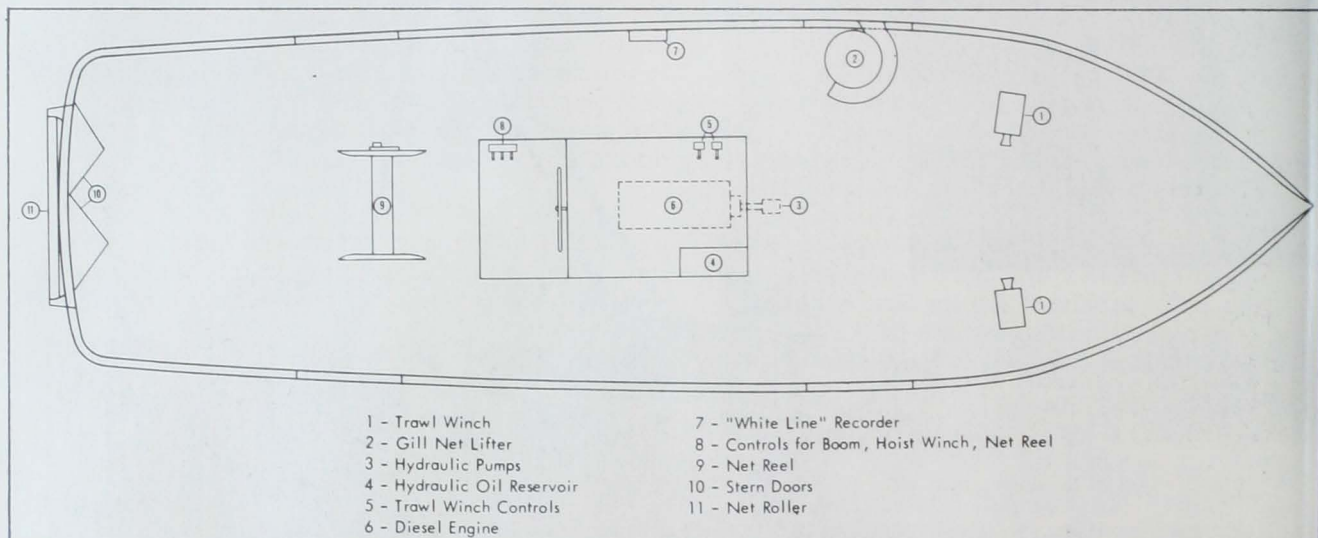


Fig. 5 - Schematic drawing of A. E. Clifford showing main deck arrangements.

trawl winches; a 3-spool directional value operates the net reel, overhead boom, and hoist winch. The controls are accessible to the operator while he watches the trawling operation.

Two single-drum winches are located forward, port and starboard, to afford more working-deck space at the stern (figs. 4, 5, 6, 7). Each drum is 13 inches wide with 20-inch diameter flanges and 6-inch diameter

core. Its capacity is 2,000 feet of $\frac{3}{8}$ -inch diameter wire rope. Over all dimensions of the winches are: 30 inches long, 36 inches wide, and 26 inches high. Each winch has line pull of about 3,000 pounds bare drum and 1,200 pounds full drum, and an average line speed of about 200 feet per minute. Each winch is equipped with an independent gypsy head and controls for the clutch and the brake. The trawl warps are routed upward from the winches through two enclosed 4-inch wide by

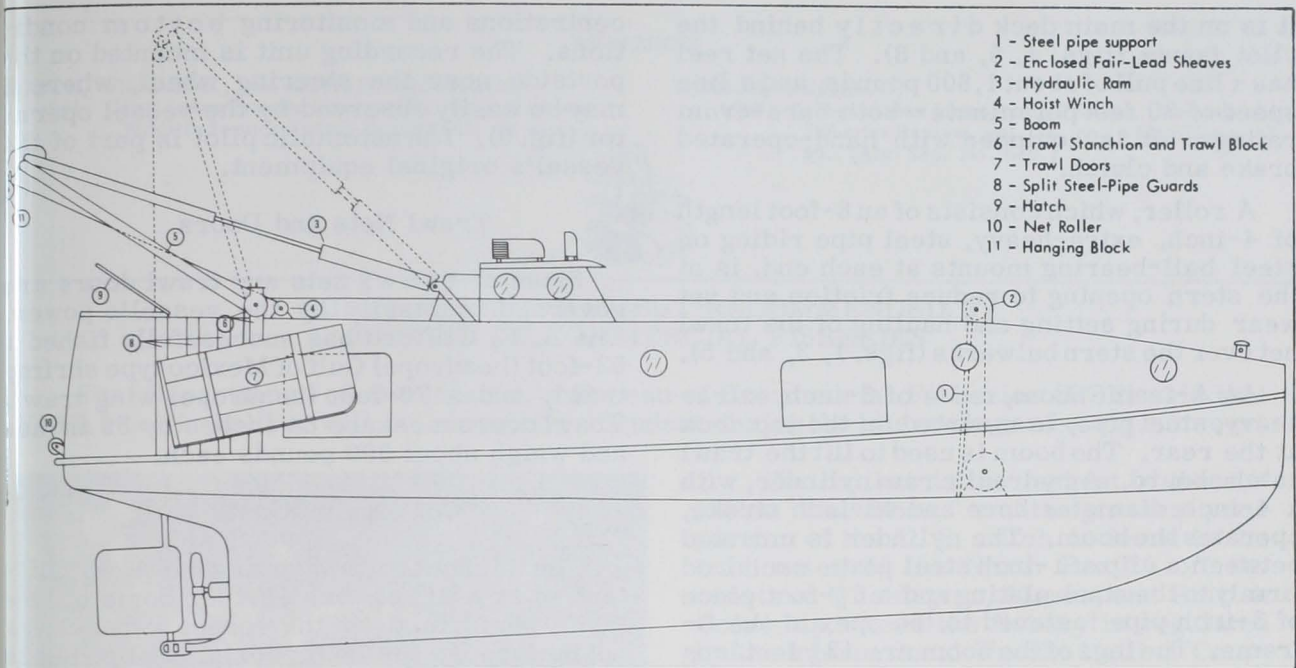


Fig. 6 - Outboard profile of the A. E. Clifford.

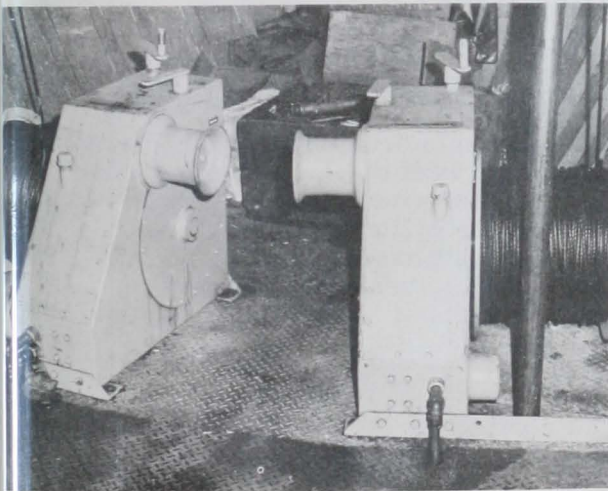


Fig. 7 - Hydraulic winches used in trawling.

foot stanchions are welded to the rub rail at the bottom and to the edge of the top deck. The ends of the warps are attached to the trawl doors. A series of half-round guards made from split 3-inch steel pipe is welded between the rub rail and roof line to protect the sides of the deck house from the trawl doors (figs. 1 and 6).

The net reel, which is used for retrieving and storing the trawl sweep lines and net, has a drum with 41-inch diameter flanges and a 10-inch diameter by 50-inch long core.



Fig. 8 - Hydraulic powered net reel used to retrieve and store trawl net.

4-inch diameter sheaves, mounted on the top deck directly above the winches (figs. 1, 2, 3, and 6). The sheaves move freely on a 1½-inch diameter by 13-inch long horizontal steel shaft to provide unassisted level winding of the trawl warps during hauling. A 2-inch, extra-heavy, steel pipe is mounted vertically from the main deck to each base of the sheave housing for support (fig. 6). The warps then lead aft where they pass through two 4-inch wide by 8-inch diameter trawl blocks hanging from 4-inch diameter, extra-heavy, steel pipe stanchions located at the stern. The 6-

It is on the main deck directly behind the pilot house (figs. 4, 5, and 8). The net reel has a line pull of about 1,800 pounds, and a line speed of 30 feet per minute--both bare-drum ratings. It is equipped with hand-operated brake and clutch.

A roller, which consists of an 8-foot length of 4-inch, extra-heavy, steel pipe riding on steel ball-bearing mounts at each end, is at the stern opening to reduce friction and net wear during setting and hauling of the trawl net over the stern bulwarks (figs. 1, 3, and 5).

An A-frame boom, made of 3-inch, extra-heavy, steel pipe, is mounted on the top deck at the rear. The boom is used to lift the trawl catch aboard. A hydraulic ram cylinder, with a 4-inch diameter bore and 48-inch stroke, operates the boom. The cylinder is mounted between a clip of 1-inch steel plate anchored firmly to the stack plating and a 6½-foot piece of 3-inch pipe fastened to the apex of the A-frame. The legs of the boom are 12½ feet long and are hinge-mounted at the base on 12-inch square pieces of ½-inch steel plate welded to the top deck. A 4,000-pound capacity hoist winch is mounted on the top deck adjacent to the base of the boom's starboard leg (figs. 1, 2, 3, 4, and 6). The winch contains 50 feet of 5/16-inch diameter wire rope that passes through a 6-inch diameter block hanging from the apex of the boom.

Electronic Equipment

A recording echo sounder with fish-discriminating features having a 0- to 95-fathom depth range is used for detecting fish con-



Fig. 9 - High resolution echo sounder with fish-discrimination features is unit right.

centrations and monitoring bottom conditions. The recording unit is mounted on the portside near the steering wheel, where it may be easily observed by the vessel operator (fig. 9). The automatic pilot is part of the vessel's original equipment.

Trawl Nets and Doors

Sizes of trawl nets and trawl doors are governed primarily by the vessel's power. The A. E. Clifford has successfully fished a 52-foot (headrope) Gulf of Mexico type shrimp trawl, and a 70-foot (headrope) wing trawl. Trawl doors measure 84 inches by 39 inches and weigh about 300 pounds each.

Conversion Costs

The total cost of converting the A. E. Clifford to trawling was \$9,700. Some of the labor performed by the vessel owners was not included in the labor costs. Following is a breakdown of costs:

Item	Cost in Dollars
A. Hydraulic equipment:	
Two single drum trawl winches	\$2,880
One net reel	1,285
One hoist winch	200
One ram cylinder	150
Jack shaft assembly	340
Pumps, valves, reservoir, and filters	529
Lines and fittings	311
B. Electronic equipment:	
Recording echo sounder with fish-discriminating features	1,400
C. Fishing hardware:	
Blocks, wire rope, shackles, swivels, thimbles, etc.	600
D. Construction materials:	
Steel plate, pipe, angle iron, etc.	428
E. Fishing gear:	
One 52-foot (headrope) trawl	400
One pair of trawl doors, 7 feet by 39 inches	200
F. Labor:	
Welding	977
Total	\$9,700

REFERENCES

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NORTH PACIFIC HALIBUT RECOMMENDED BY BUREAU OF COMMERCIAL FISHERIES

The Department of the Interior's Bureau of Commercial Fisheries (BCF) said that North Pacific halibut will be especially abundant during the late spring and early summer.



The halibut is the largest of the so-called "flatfishes," and the greatest proportion of the U. S. catch is found in the cold water of the North Pacific off the coasts of Washington, Alaska, and British Columbia, where the fishery is regulated by the International Pacific Halibut Commission. This Commission sets an annual quota in pounds which may be taken commercially. On the North Atlantic coast, where halibut is taken in much smaller amounts, there are no regulations as to seasons, size of catch, or fishing areas, so some landings are made throughout the year.

BCF Director H. E. Crowther, a member of the Halibut Commission, said commercial halibut range from 5 to more than 80 pounds, with a few as large as 400 pounds being landed. About 2 pounds of halibut steaks will provide average servings for six people.

The BCF test kitchens have developed several halibut recipes, among them this one for broiled halibut steaks:

BROILED HALIBUT STEAKS

2 pounds halibut steaks,
fresh or frozen
2 tablespoons melted fat
or oil

2 tablespoons lemon juice
1 teaspoon salt
 $\frac{1}{2}$ teaspoon paprika
Dash pepper

Thaw frozen fish. Cut fish into 6 portions. Place fish in a single layer, on a well-greased baking pan, 15 by 10 by 1 inches. Combine remaining ingredients and mix well. Pour sauce over fish. Broil about 4 inches from source of heat for 10 to 15 minutes or until fish flake easily when tested with a fork. Baste once during broiling with sauce in pan. Makes 6 servings.

Additional halibut recipes are available in the BCF publication "How to Cook Halibut," available for 25¢ from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.