Scottish Seining Applied To Inshore Vessels In Southern New England

Robert E. Taber

Marine Advisory Service
NOAA/Sea Grant

University of Rhode Island
Marine Bulletin 25

This project is sponsored by the Southern New England Fisheries Development Program under contract 03-6-043-35135 from the National Marine Fisheries Service and by the URI Marine Advisory Service, a Sea Grant Program, under grant 04-6-158-44002. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

Additional copies of this publication are available from the Sea Grant Marine Advisory Service, University of Rhode Island, Narragansett Bay Campus, Narragansett, Rhode Island 02882.

SCOTTISH SEINING APPLIED TO
INSHORE VESSELS IN SOUTHERN NEW ENGLAND

University of Rhode Island
Marine Bulletin No. 25

CONTENTS

FIGURES

ACKNOWLEDGEMENTS

The author and crew of the Destiny wish to express their thanks and appreciation to Robert Smith of the Random Harvest and Robert Stephen of the Harvester of Fraserburgh and Peterhead, Scotland, respectively, for their discussion and suggestions during fishing trips aboard their vessels. Also to David Smith of the Argonaut IV from Anstruther, Scotland, for his guidance and encouragement. Special thanks are due to Ian Duthie of the Fraserburgh vessel Uberous for his patience and guidance throughout the days and weeks of the problems and frustrations associated with the start of this endeavor. In addition, appreciation is expressed to the Massachusetts Division of Marine Fisheries for the assistance and cooperation received during the project.

INTRODUCTION

The impetus for this project was a European technology-exchange trip for New England fishing skippers sponsored by the URI Marine Advisory Service during the fall of 1974. Robert Ryder represented the line-trawling port of Chatham, Massachusetts. He fished on a line trawler from Fraserburgh Scotland, and was able to observe and discuss numerous fishing methods, technology, and equipment during the course of the trip through Britain, Denmark, Germany, and Holland. During the following two years, the desire to try seine netting grew into the project reported here.

Danish seining, Scottish seining, seine netting, anchor dragging, and fly-dragging are all terms used for a type of fishing that involves herding the fish with warps prior to capture. Seine netting is the most general term used to describe this technique. Danish seining (or anchor dragging) is the forerunner of Scottish seining (or fly-dragging).

This herding principle has proven extremely effective on bottom species such as flounder and dabs where the bottom is smooth and relatively clear of hangs. In fact, it is so effective that in Europe bottom draggers are almost never in direct competition with seine netters: bottom draggers fish only the rough bottom areas that in the past have been unfishable by the Danish or Scottish seiners.

Danish seining differs from Scottish seining in the power required and in the application of the technique. In Danish seining the vessel is anchored and hauls the fishing gear to it; in Scottish seining, the vessel tows the gear forward and simultaneously hauls the gear in. Hence, the type of vessel and the power required for each of the two methods is generally quite different. Canadian pair-seining is yet another version of this principle, a combination of two-boat bottom pair-trawling and Scottish seining.

The demonstration vessel Destiny was not designed as a dragger with towing power, but rather for speed, to get to and from the fishing grounds rapidly. Hence, this project was conceived and planned as a true Danish seining demonstration using the vessel's power only for hauling purposes and not for towing. During the process of making arrangements to fish aboard a Danish seiner from Grimsby, England, our contacts in Britain discouraged us from rigging the Destiny as a Danish seiner. They guided us into the more versatile Scottish seine netting operation.

There were several reasons for their advice. First, Scottish seining was first done successfully with boats of 40 feet and powered with only 90 hp engines. Second, if the vessel was rigged as a Scottish seiner and found it didn't have sufficient power to tow and haul the gear, it could easily be modified to Danish seining; the opposite case is not usually true. Third, Danish seiners are only truly effective on flounder and other bottom species, while Scottish seiners are equally effective on both flounder and round fish such as whiting, hake, cod, and haddock. Hence it was decided to rig the vessel for Scottish seining, with the option to go to Danish seining if it was found that the vessel did not in fact have sufficient towing power.

The conversion of the vessel Destiny from a line trawler to a seine netter began in late February and took the better part of seven weeks to complete. This report covers the vessel's rigging, equipment, and gear, and the results of the trials that took place between April 7 and June 30, 1977.

VESSEL RIGGING AND FISHING GEAR

The Destiny is a 39-foot Lash Bros. vessel of wood construction. It is typical of many of the line-trawling vessels of Chatham in terms of both construction and size. The propulsion engine is a 6-71 GM with a 1 1/2:1 reduction turning a 25 x 20 wheel.

All of the equipment used for line trawling was removed and the following equipment installed (note pictures of vessel layout in Figures 1 and 2): A mast and boom constructed of four inch and three inch schedule 40 pipe, a Marco power take off for direct mounting of a Vickers V11B pump and a Sundstrand Model 18-2048 variable displacement pump, and a 25-gallon hydraulic oil reservoir with heat exchanger to serve both hydraulic systems. The seine winch was constructed locally using imported hardened seine winch barrels and driven by a standard Char-Lynn 10,000 series motor with 40,83 $in.^3$ displacement. The motor was connected to the winch barrel shaft with double 100 chain using two 25-tooth sprockets for a 1 to 1 RPM ration. The Sundstrand variable displacement pump powers the seine winch, with the speed of the winch controlled independently of the engine RPM (refer to Figure 3 for the complete circuit diagram).

The rope storage drums and 15-inch double-sheave pedestal block were supplied by Lossie Hydraulics of Falkirk, Scotland. The drums have a design capacity of 10 coils of 2 1/4 inch circumference rope (1200 fathoms) each and are equipped with level wind, automatic tension control for hauling the rope off the seine winch barrels, hydraulic braking for shooting, and mechanical braking for steaming or storage. The 15-inch double-sheave pedestal block (power block) is used to haul the net and used for fleeting when more than one bag is taken. Both rope drums and the power block are powered by the single Vickers 10 gpm (refer to Figure 3).

Additional equipment installed on deck consisted of a railrope lead for hauling and shooting the ropes over the stern and fixed guide-on sheaves for fairleading the rope onto the winch barrels and from the winch barrels to the level wind rollers of the rope storage drums.

The fishing gear consisted of 18 coils of 2 1/4 inch circumference Sea Star leaded poly seine rope and two trawls supplied by Cosalt Ltd. of Fraserburgh, Scotland. One trawl was a 280 Plaice Skate trawl designed primarily for flounder and the other was a 420 seine trawl designed as a combination trawl for both flounder and roundfish. Both trawls were of twisted polyethene twine and would be considered extremely light in comparison to trawls common to New England draggers (see Appendix Figures 7 & 8 for specifications).

OPERATION

Seine netting, whether it be Danish or Scottish, is a method of fishing using leaded poly warp to surround the area to be fished. Hence large amounts of seine rope are used to maximize the area fished, with the general trend to try to set as much rope as possible for the size of boat, depth of water, and amount of "clean" bottom available.

In this project, with the demonstration vessel being 39 feet and of the shallow draft design typical of the line trawler fleet of Chatham and New England lobster vessels in general, the amount and size of rope used was limited to nine coils per side of 2 1/4 inch circumference rope. (Large Danish seiners will fish up to 20 coils of 2 1/2 inch rope per side, while some Scottish seiners will fish up to 15 coils of 3 1/2 inch rope per side.) A coil of seine rope measures 220 meters, or 120 fathoms.

The operation is started by the setting of the dahn (a floating flag buoy for Scottish seining and an anchor with flag buoy for Danish seining) and shooting the rope from one side. Which rope is shot first is determined primarily by vessel layout and whether it is easier to set the net off the port side or starboard. On large vessels with more deck space, it is advantageous for fishing purposes to be able to shoot the net off either side. If the net is shot on the starboard side, the port rope will be shot first and the boat will be turning to port during the set. The primary requirement is to have the set oriented properly to the tide (fair or head and not cross-tide) and to make the set encompass as much area as possible, so that the set (as in Figure 4) approximates as fat a pear shape configuration as possible. Note that the arrows in the figure indicate that the net is being shot from the port side and that the starboard rope is shot first. There are advantages to being able to set the net off either side, and a cross tide set may occasionally be used under some conditions.

The vessel shoots the rope at full speed until all the rope to be shot from that side is out and the vessel is at the net position in Figure 4. For the purposes of the demonstration, the rope was spliced so that the skipper had the option of shooting three, six, or nine coils per side. The net is flaked on deck with the port wing on top and the starboard wing on the bottom with the codend and tailpiece flaked along the starboard rail. Hence, as the end of the seine rope is reached, the vessel slows and the seine rope is made fast to the port dahn frame, which has the two port legs or bridles fastened to it. The net is then shot carefully over the stern as the vessel continues making its circle. The codend and tailpiece is thrown off the starboard side as the bosom of the net pays out (over the stern). The starboard legs and dahn frame have been previously connected so that the vessel can continue and complete the set back to the dahn at full speed again.

For Danish seining, the vessel will lie on the anchored dahn and haul the rope and net to it. Thus, for Figure 5, the vessel would remain as in position 1, but all other aspects would be the same, i.e., the gear would close and be hauled as shown in positions 2-5.

For Scottish seining the sequence as shown takes place with the gear just coming closed when the net is about where the dahn was set. However, there are numerous circumstances for using less power and having the vessel make little if any forward headway during the entire set. The time it takes the ropes and net to close will vary *primarily* according to the depth of water and how much rope is shot, but the tide, wind, type of bottom, and vessel power used are important factors as well. Generally, it is good practice to have the ropes and gear close when about one-half of the rope is in.

For both Danish and Scottish seining the rate of hauling the ropes back will vary from "slow" in the beginning of the set to "fast" when the gear is closed and no longer fishing. The speed of the winch hauling the ropes is traditionally spoken of in terms of coils per minute, since rope coilers were a fixture of the technique. The "slow" rate is usually between five and seven coils per minute; "fast" is 20 to 30 coils per minute. This translated to between 15 and 90 winch barrel turns per minute, or between 45 and 270 feet per minute. Some Scottish vessels will haul in excess of 400 feet per minute after the ropes are closed.

The hauling rate varies with both the shape of rope on the seabed and also the amount of rope in contact with it. The idea is to move the rope slowly over the bottom so it will herd the fish. Hence, when the set starts, a good portion of the rope is moving across the seabed. When the set has progressed to position 3, a much smaller area of the seabed is encompassed, with most of the rope moving along rather than across the seabed. By this time, the theory is that most of the fish have been herded into the path of the trawl and are simply waiting to be "scooped" up by the net.

Now that hydraulically powered winches and rope reels have begun to replace the mechanically gear-and-chain-driven winches and coilers, the speed with which the rope can be hauled in is seen to be related to the friction of the ropes along the seabed and is indicated by the amount of hydraulic pressure required. Thus, if the speed of the winch is controlled so that the hydraulic pressure remains about constant through closing or position 4, the proper rate of hauling can be maintained. Once the gear is closed, the rope and net are simply hauled in as fast as practically possible with only limited concern for the hydraulic pressure.

Another good gauge in determining appropriate hauling speed and vessel power is the eye test. When hauling begins, the vessel should be moving ahead slightly, at about 1 knot ground speed. When the ropes are closed and the gear is coming in as fast as practical, the vessel will usually be hauled slightly backwards. More power is used for fishing roundfish than flounder.

During hauling, the ropes are continually adjusted so that they are hauled with equal tension. This is accomplished by keeping the angle of both ropes the same or by keeping the points of entry into the water level with the horizon. Even though there may be as much as a 1,000 to 1,500 fathoms of rope out on each side, a slight adjustment of only 5 to 10 feet will make a noticeable difference in the angle of the ropes. By keeping the ropes "level" equal tension on the ropes will be maintained and the net will be pulled "square" during that important time when closing occurs and it is hauled to the vessel. This method of adjusting the ropes is so effective that the dahn frames will come up within an inch or two of each other every time. No markings or other fathom indicators on the ropes are ever used.

With the legs up to the stern, the vessel is swung so the wind is on the beam and the net is hauled in the same fashion as any dragger would haul its gear. A pedestal block was installed on the starboard stern quarter to ease the operation. Without the block, it would have been extremely difficult to handle the net on such a small vessel. The block enabled the net to be hauled and stowed with the minimum amount of space and effort.

RESULTS OF FISHING TRIALS

Approximately seven weeks were required to outfit the vessel and remedy malfunctions, which appeared as no-cost add-on options supplied with most of the components. Examples of a few of these free add-ons were a leaking sight gauge on the hydraulic (tank which had to be fixed from the inside), a hydraulic pump marked left hand when it was in fact right hand, hydraulic vibration or chatter in one rope drum under some conditions, and faulty factory-supplied hoses.

Thursday, April 7, marked the first attempt to shoot and haul the gear installed on the Destiny. A three-coil set was made in a wind-sheltered bay close to Chatham with all the gear functioning properly. The catch was three lifts of eel grass mixed with about 200 pounds of flounder. The subsequent three-week period was spent primarily in Nantucket Sound fishing for sand dabs and whatever else was worth a few cents. No significant success was achieved in this area, originally considered prime seine net country, and it became obvious that a change in scope would be required if the demonstration was going to succeed.

During that initial three-week period, occasional stabs were made outside, east of Chatham, with both good and bad signs. Navigating the Chatham bar is in itself an experience that creates serious apprehension and sighs of relief when successfully accomplished. To do it on a regular basis with a vessel carrying 6,000 pounds of gear and equipment makes the thrill even greater. Numerous hangs were found and recorded, with a subsequent loss in both catch and fishing time. Despite these problems, occasional good sets were realized, resulting in just a hint of a smile.

April 27 seemed to be the turning point in the fishing trials being loosely referred to at the time as Disaster Day. No significant harm was encountered; only frustration at the knowledge that the brass ring was within reach but missed.

For the purposes of the demonstration, two different seine nets were used. The small flat net, referred to as a 280 Skate Plaice trawl, was found to be easy to handle and appeared to be effective on roundfish as well as flatfish. The 420 seine trawl, being larger around the mouth and hence longer in the belly and tailpiece, proved to be cumbersome on the 39-foot Destiny. In addition, very little if any difference in the catch rates for flounders, greysole, or roundfish was noted. As a result, when the 420 was irretrievably lost to a hang, a spare 280 Skate Plaice trawl was ordered by the skipper.

CONCLUSION AND RECOMMENDATIONS

Seine netting for sand dabs in Nantucket Sound was not proven feasible during the demonstration period. However, there is a strong indication that small inshore vessels not necessarily designed for towing power can be successful at the seine netting operation referred to as Scottish seining or fly dragging. This finding in turn must be strongly qualified in terms of minimum vessel size and design, species orientation, type of grounds available, and the possible conflicting uses of those grounds.

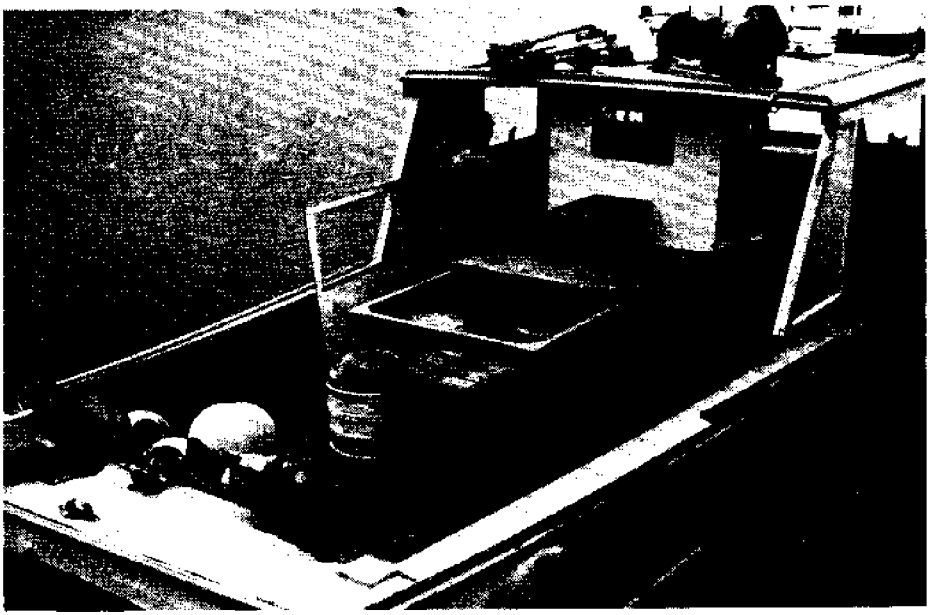
It is felt that the following minimum conditions are necessary or highly desirable for a successful seine netting operation: The vessel should be approximately 45 feet with a fishhold capable of holding 5,000 to 7,000 pounds of iced fish. It should have a diesel comparable to a 6-71 GM with a 2:1 or greater reduction, be equipped with a good bottom discrimination sounder, radar, and automatic tracking two channel LORAN (LORAN C with plotter being the best). Scottish seining has been traditionally oriented toward a variety of groundfish found on smooth bottom, such as grey sole, flounder, dabs, whiting, dogfish, cod, and haddock. A few of the larger seine netters in Scotland (80-90 feet with 600 hp) do fish successfully on some pretty rough bottom by rigging the sweep with light bobbins and using their power to either break the gear or rope loose or part something in the process when a hang is encountered.

One of the most important considerations, regardless of the size of the vessel, concerns the possible conflict of fishing the same grounds simultaneously with draggers. It is not difficult to understand the possible consequences of a seine netter with 1500 fathoms of rope per side trying to fish with or among a few draggers. This is especially true if a dragger skipper doesn't understand that the gear could be a mile and a half away from the seine netter and may, due to wind conditions, be off one quarter and not directly off the stern. Hence, both understanding and communication are crucial if draggers and seine netters are to fish near one another and have harmonious relations.

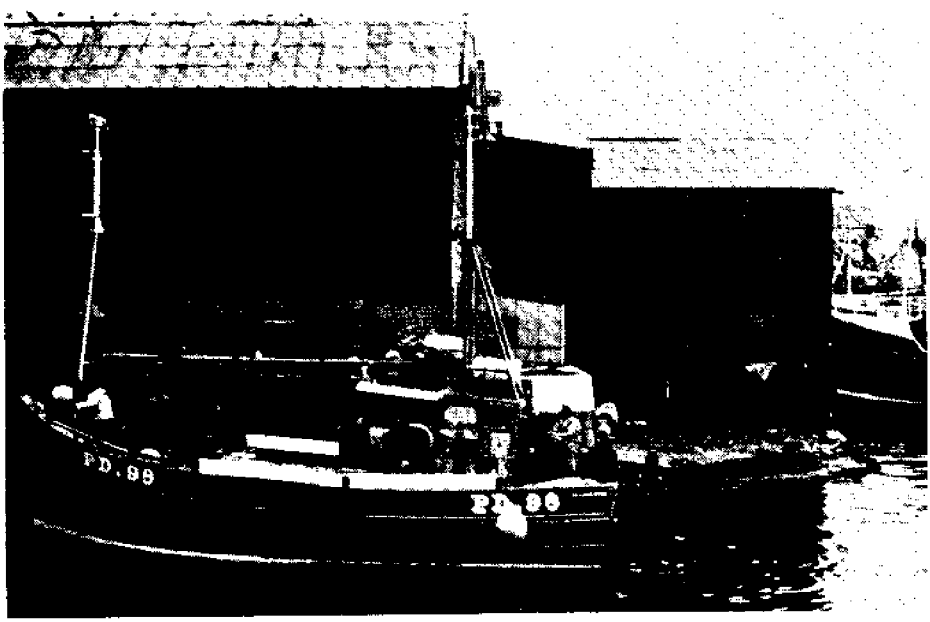
TABLE 1

Cost of Gear and Rigging

1.	rope drums (installed)	$10,000.00
2.	15 inch double sheave pedestal block (installed)	2,500.00
	freight and duty for 1-2 (5% duty)	1,600.00
3.	18 coils of 2 1/4" seine rope @ 115.00	2,070.00
	duty for 3	480.00
4.	420 seine trawl	810.00
5.	280 plaice/skate trawl	660.00
6.	spare webbing and mending twine	400.00
	duty for 4-6	750.00
	freight	350.00
7.	seine winch, complete with pump, motor and hoses	3,120.00
8.	two railrope leads and guide on gear	750.00
9.	mast, boom and rigging	800.00
10.	miscellaneous such as legs, plastic boxes, regulation codends and supplies	2,400.00
	TOTAL	$26,690.00

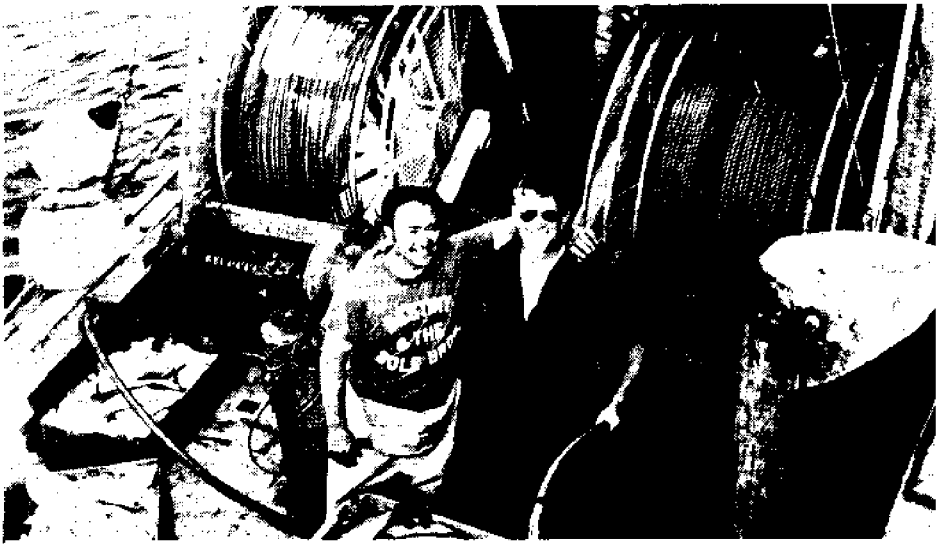


Destiny As A Line Trawler July 1976



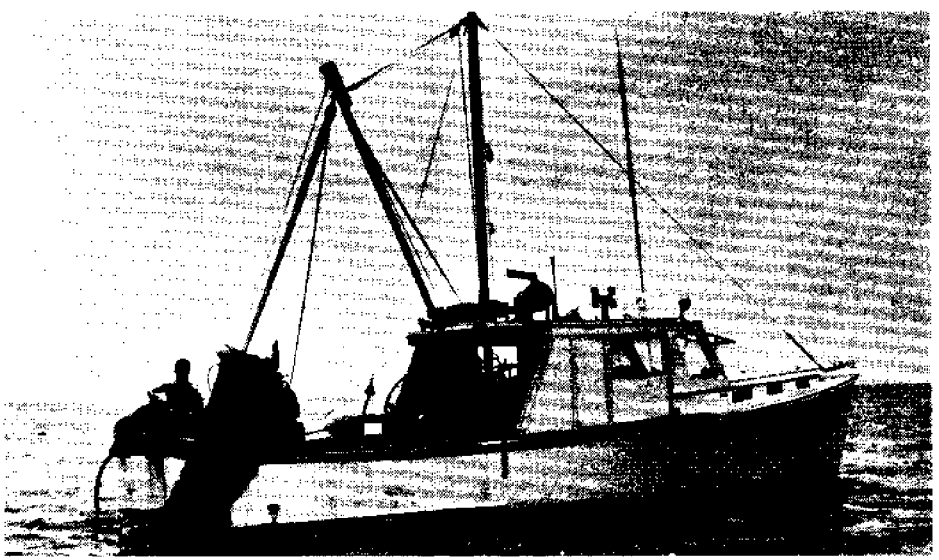
The Harvester, a 40 Foot Scottish Seiner
At Peterhead, Scotland

Figure 1



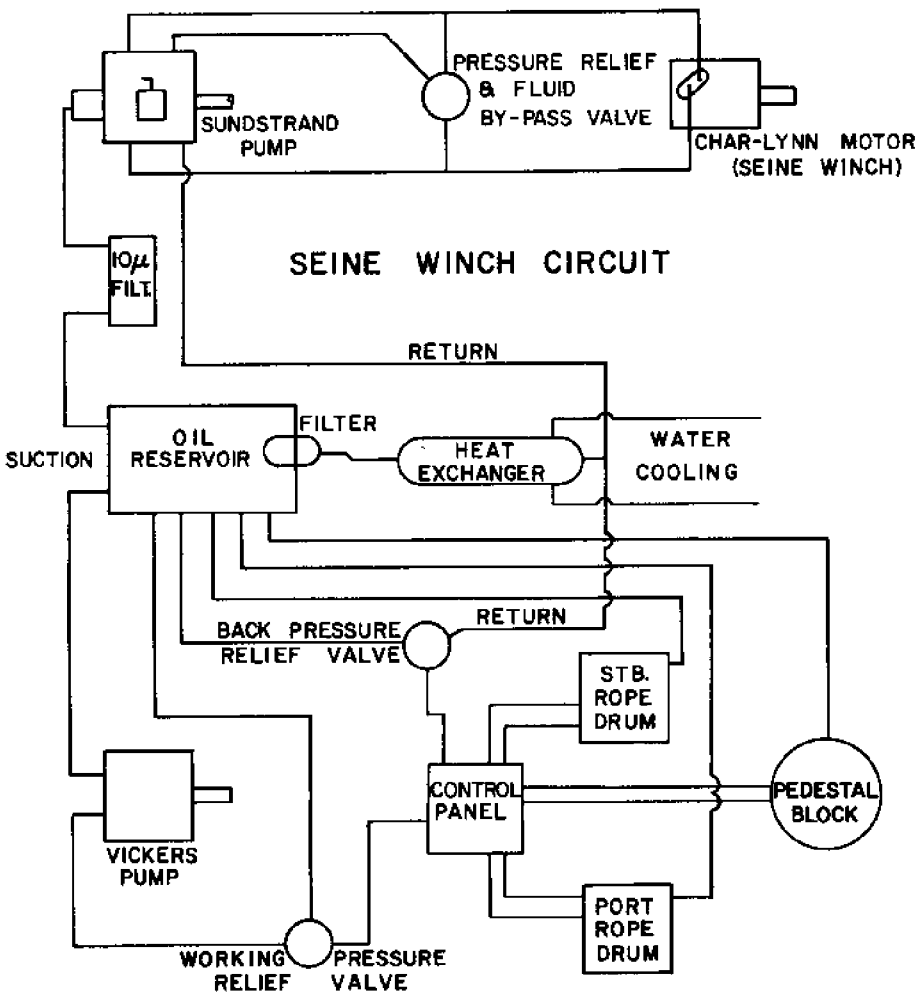
Destiny Discharging Greysole At Chatham

(Note Rope Drums With 1000 Fathoms Of
2 1/4 Circumference Seine Rope Each)



Destiny Hauling Net Aboard With
Power Block

Figure 2



ROPE DRUM & PEDESTAL BLOCK CIRCUIT

Figure 3

GEAR SET FOR SCOTTISH SEINING

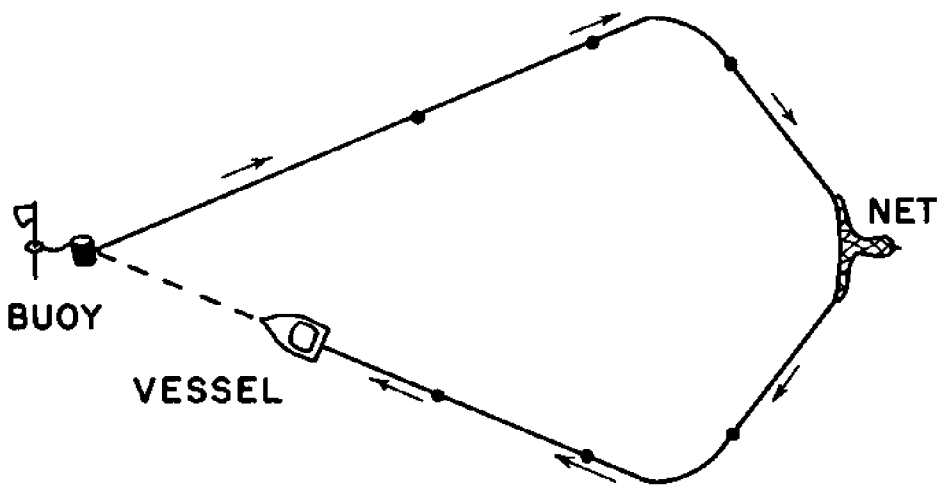


Figure 4

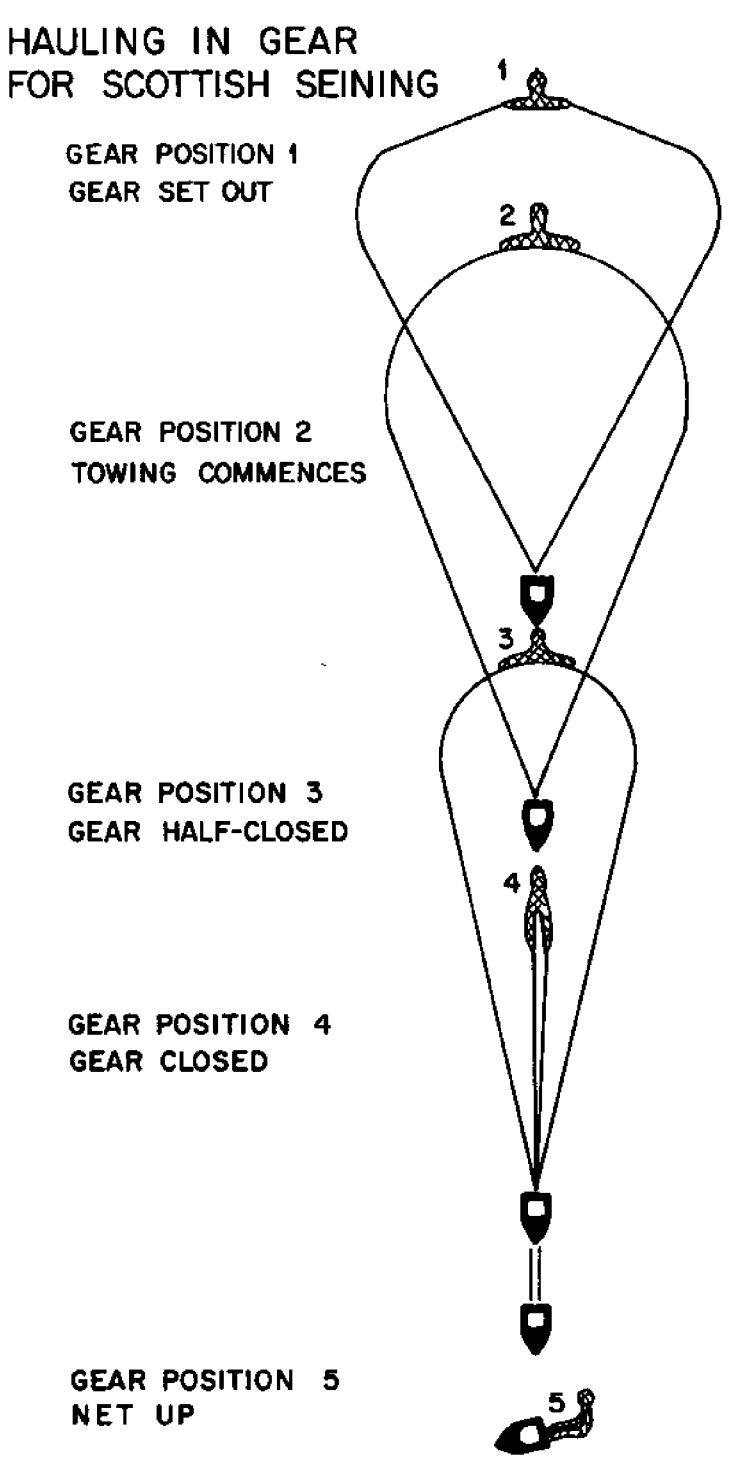
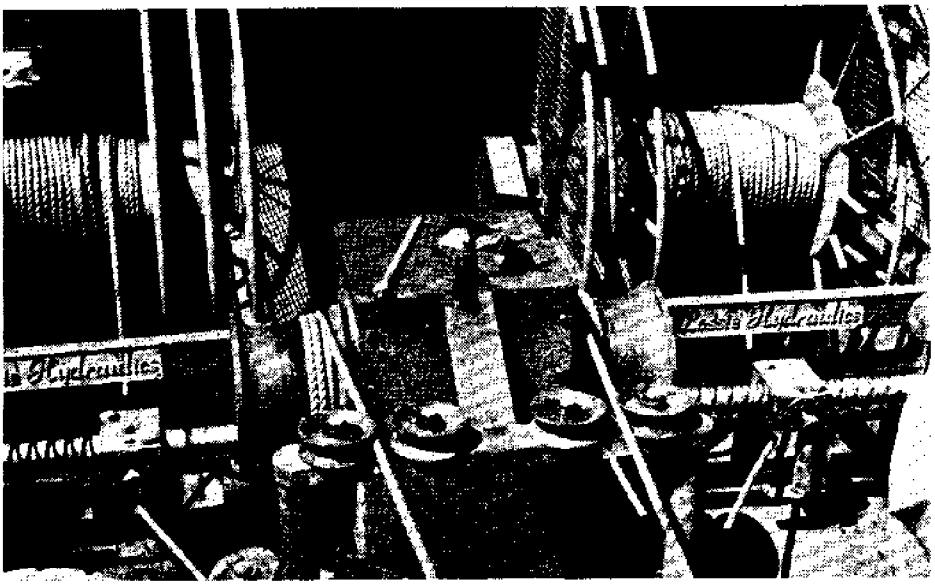
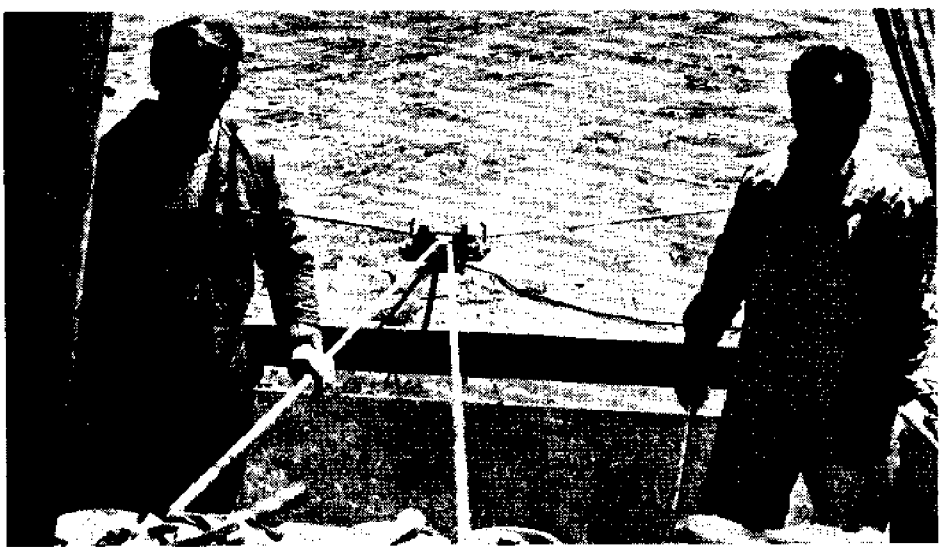

HAULING IN GEAR
FOR SCOTTISH SEINING
GEAR POSITION 1
GEAR SET OUT
GEAR POSITION 2
TOWING COMMENCES
GEAR POSITION 3
GEAR HALF-CLOSED
GEAR POSITION 4
GEAR CLOSED
GEAR POSITION 5
NET UP
1
2
3
4
5

Figure 5



Seine Winch And Rope Drums Hauling
The Seine Rope



Ropes Through the Railrope Lead

(Note The Spread Of The Ropes At
The Start of Hauling)

Figure 6

APPENDIX

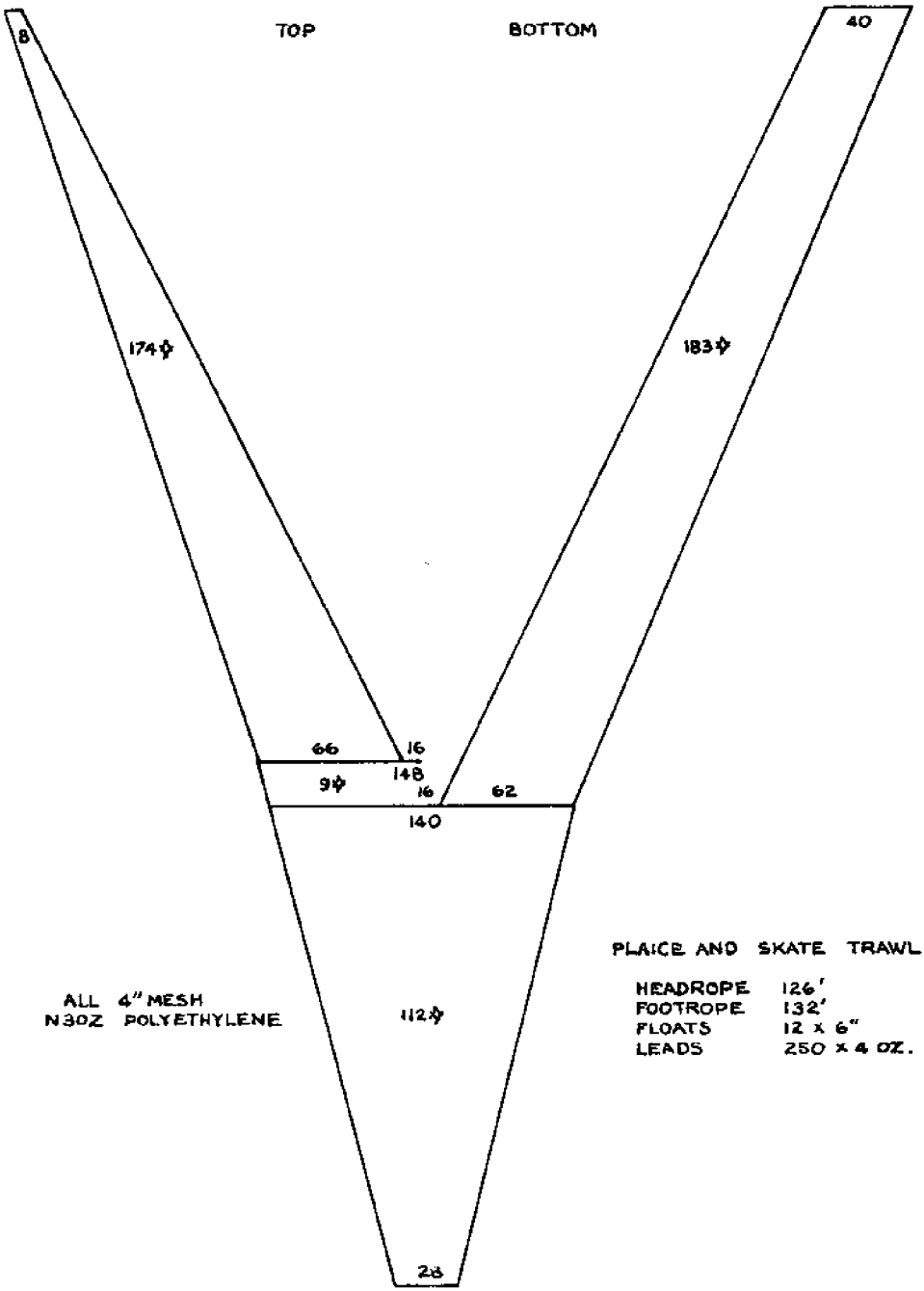


Figure 7

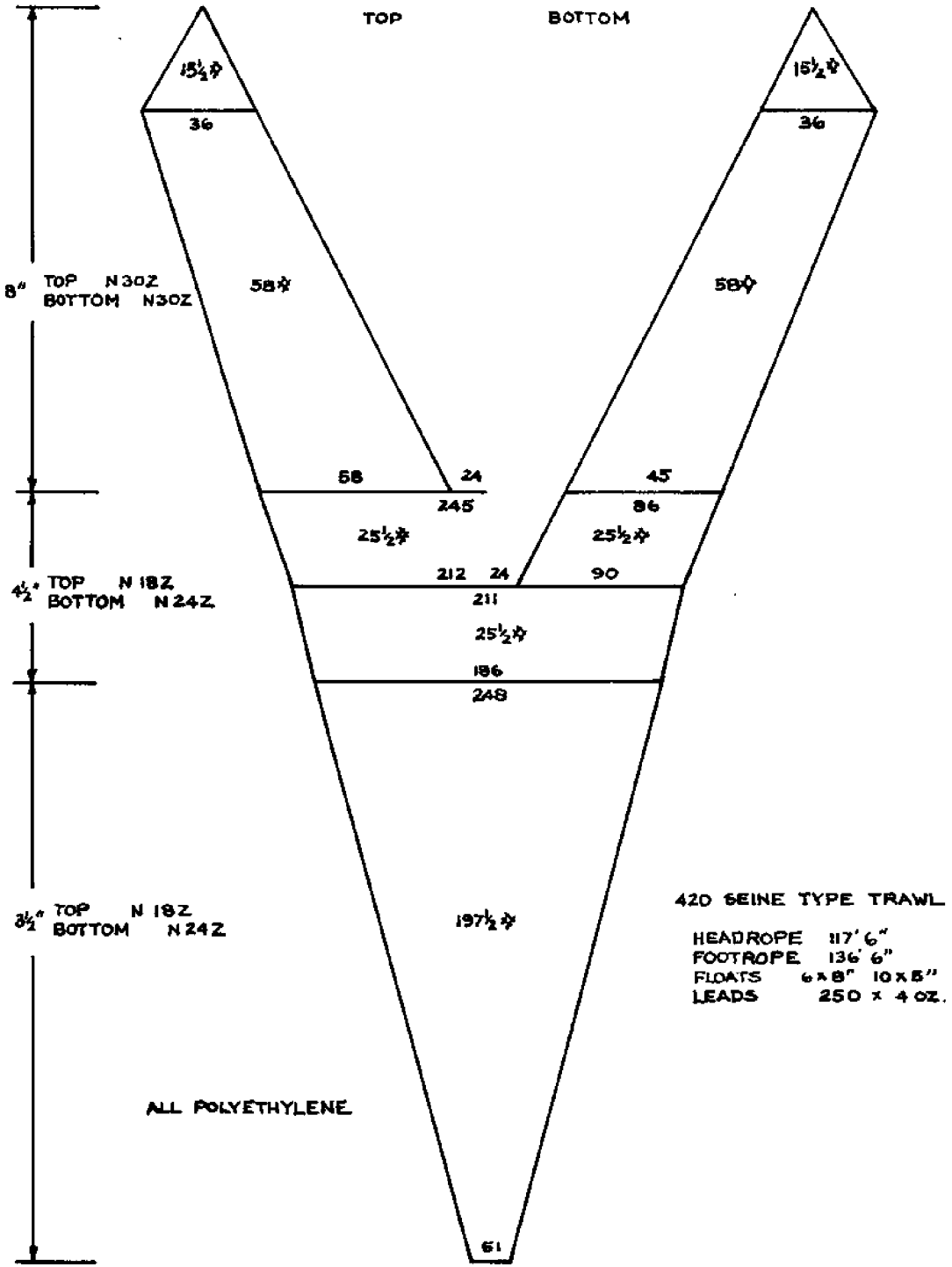

TOP
BOTTOM
15½ ✲
36
15½ ✲
36
8" TOP N30Z
BOTTOM N30Z
58✲
58✲
58
24
245
45
86
25½✲
25½✲
4½" TOP N18Z
BOTTOM N24Z
212
24
211
90
25½✲
186
248
3½" TOP N18Z
BOTTOM N24Z
197½✲
61
ALL POLYETHYLENE
420 SEINE TYPE TRAWL
HEADROPE 117' 6"
FOOTROPE 136' 6"
FLOATS 6 x 8" 10 x 5"
LEADS 250 x 4 OZ.

Figure 8