Scottish Seine Net Fishing Projects I- Hydraulic Rope Reels, Installation and Demonstration II- Exploration for Suitable Fishing Grounds, Scotian Shelf and Southern Grand Banks

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SCOTTISH SEINE NET FISHING PROJECTS

I HYDRAULIC ROPE REELS, INSTALLATION AND DEMONSTRATION

II EXPLORATION FOR SUITABLE FISHING GROUNDS, SCOTIAN SHELF AND SOUTHERN GRAND BANKS

by

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128: iii + 23p.

ABSTRACT

King, B.F., D.M. Rodgers and J. Rycroft. 1981. Scottish Seine Net Fishing Projects.
I Hydraulic Rope Reels, Installation and Demonstration
II Exploration for Suitable Fishing Grounds, Scotian Shelf and Southern Grand Banks. 1981. Can. Ind. Rep. Fish. Aquat. Sci. 128: iii + 23 p.

Automatic hydraulic rope reels were installed and demonstrated on the scottish seine vessel "Marie France" fishing out of Lemeque, N.B. The successful fishing trials demonstrated that the use of hydraulic rope reels have a number of advantages such as greatly increased crew safety, less fouling of ropes, less gear wear, reduced labour requirement, increased fish hold capacity and ability to work heavier gear and rougher grounds.

The second project describes experimental scottish seine fishing operations on banks off Nova Scotia and on the South West edge of the Grand Banks. Several areas with bottom conditions suitable for scottish seining were identified.

RESUME

King, B.F., D.M. Rodgers and J. Rycroft. 1981 Les projet de pêche à la Senne Ecossaise.
I l'Installation et la Démonstration des Tourets Hydrauliques
II l'Exploration des bancs de pêches appropriés sur les Bancs du large de la Nouvelle-Ecosse et sur l'accore soud-ouest du Grand Banc.
1981 Can. Ind. Rep. Fish. Aquat. Sci. 128: iii + 23p.

Des tourets hydrauliques automatiques pour la rentrée des cordes ont été installés sur le bateau de pêche à la senne écossaises, la "Marie France", de Lemeque (N.-B.). Des essais de pêche réussis démontrèrent les nombreaux advantages de ces tourets plus grande sécurité pour l'équipage, emmêlement moindre des cordes, moins d'usure à l'engin de pêche, moins de travail, capacité accrue de la cale à poisson et possibilité d'utiliser un engin plus lourd sur des fonds plus accidentés.

Le second projet a comporté des essais de pêche à la senne écossaises sur les bancs du large de la Nouvelle-Ecosse et sur l'accore soud-ouest du Grand banc. On a défini plusieurs régions dont les fonds convenaient à la senne écossaise.

INTRODUCTION

Scottish seining ("fly dragging") and Danish seining ("anchor seining") for groundfish are considered to be energy efficient and quality promoting fishing methods for vessels equipped with relatively low horsepower engines. The technique was first introduced to the East Coast of Canada in 1964 by the then Industrial Development Branch, and in 1965 a scottish vessel was chartered for one year to demonstrate the gear and to carry out exploratory fishing. A number of vessels have since been using this type of gear in waters off the North shore of New Brunswick, parts of Nova Scotia, Prince Edward Island and Newfoundland. Some traditional Danish seiners operated on the East Coast of Canada before 1964.

Recent technological developments have made these methods considerably safer, less labour intensive and more efficient. Hydraulic rope reels were recently developed in Europe and have been taken in use by the seine net fleet there.

Since seine netting for groundfish requires relatively smooth bottom conditions, not all areas are suitable. For that reason exploratory fishing has to be carried out if new areas are to be opened up to this gear type. On 1979-80, the Industrial Development Branch in Newfoundland chartered two seine vessels from Scotland, and carried out experimental fishing operations on the Grand Banks. In the project described in this report, fishing was carried out from the South-western slope of the Grand Banks to the banks on the Scotian Shelf.

THE FISHING METHOD

Since its inception in Denmark in the late 1800's, seine netting for bottom fish has become one of the most sophisticated and successful methods of fishing in the waters off Scandinavia and the United Kingdom.

Although the shape of the seine net is very similar to a bottom trawl, the net is of much lighter construction, does not require heavy otter boards to keep the mouth of the net open, and is towed along the bottom only for a short period while being hauled. The net, attached to lengths of rope, is set in a large circle a mile or more in circumference. As the rope is hauled, it herds the fish towards the center where they are eventually caught in the net.

Two methods are employed, firstly "anchor seining" where the vessel lies moored to an anchor and buoy and heaves the net toward the boat. This is the older of the two methods and is usually termed "Danish Seining" and is used in the capture of flatfish such as flounder, sole, plaice, yellow-tail, etc.

The second method is termed "Scottish Seining" or "fly dragging" where the boat steams ahead, heaving the ropes onboard simultaneously. "Fly dragging" is highly successful in the catching of species such as cod, haddock, whiting, hake, etc., as well as various flatfish species.

In the period from 1950 to 1965, European scottish seine vessels were typically about 70-72 feet long equipped with 152 horsepower diesel engines and belt driven winches and rope coilers.

During this period, nets varied little from the original long winged Danish seine, however, in 1959 a Scots skipper equipped his vessel with a Vinge (wing) trawl designed and developed in Skagen, Denmark, to be used in conjunction with 15-20 fathom bridles. Several skippers expressed doubts as to whether this short winged net would fish better, but subsequent results proved so convincing that most nets being used by Scottish seiners at present have evolved from the original Vinge trawl. These nets are normally fitted with 15-20 fathom bridles and 15 coils of lead cored poly net rope of 3 1/2 inch circumference. Fishing is carried out in depths sometimes exceeding 150 fathoms. This gear requires relatively high hauling speeds and is operated very efficiently in vessels ranging from 50-100 feet with engines of 150-800 h.p., with the nets tailored to suit the vessel horsepower.

In Europe, especially the United Kingdom, there has been a general move towards vessels in the 80-100 foot range over the last decade or so. Almost all of these vessels have been built as Scottish seiners for fishing mostly in the North Sea and have consistently outfished and outearned many of the large trawlers working the same distances from port (near or middle distance or well off shore). They fish out to around 250 miles from their home port and make trips of 4-8 days duration, landing iced boxed fish of excellent quality. They are compact, versatile and extremely seaworthy vessels, run mostly by skipper/crew owners (and at present) usually in partnership with some shore company.

Similar fishing grounds, suitable for the same type of Scottish seine fishery are to be found in waters adjacent to Eastern Canada. Many feel that Scottish seining is a superior fishing technique, the reasons cited include:

(1) Quality of Fish The quality of the fish caught by the seining technique is superior to that caught by trawlers because it is not subjected to crushing in the net. Draggers usually tow for at least 4 hours whereas a seiner from start to finish on a haul takes around 1 1/2 hours and during this time the fish are only in the net for about one hour.

(2) Selectively Since the gear is not towed as a trawl, the meshes remain wide open throughout the fishing cycle and thus a high percentage of immature fish are allowed to escape.

(3) Bottom Damage When fishing with heavy trawl gear equipped with doors, the bottom may be damaged. The light net and ropes of a Scottish seiner causes little or no damage to the bottom.

(4) Fuel Savings Compared with an average 80' class dragger fuel consumption is approximately 40% lower using this method.

(5) Engine Wear Due to the extremely low

horsepower needed when Scottish seining, the engine wear is minimal. This increases the periods between major overhauls, hence maintenance costs are reduced.

Boats which presently use this method work in areas where the bottom consists of mud, sand or sand and gravel. Few obstructions are found on this type of ground. Modern echo-sounders with ground-discriminating transducers are used extensively, and known wrecks that are pinpointed by Decca or Loran are avioded.

I HYDRAULIC ROPE REELS, INSTALLATION AND DEMONSTRATION

Since seining was introduced to Scotland, the handling of ropes and the hauling of the net have been two of the most labour intensive aspects of the technique. Initially steam vessels hauled by steam capstan, with the ropes being coiled and stacked manually. Following the evolution of motor vessels and belt-driven winches, a machine appropriately termed a rope coiler was introduced. This was a tremendous improvement but still required crewmen to haul the ropes from the coiler for stacking. Two men had to stand on deck for 1 1/2-2 hours during each set, hauling away and stacking rope. This, for continuous periods sometimes as long as 36 hours or more, was extremely tiring. Little imagination is needed to envisage the chaos caused on a bad day with the vessel broadside to the weather and ropes sliding on the deck. To combat this problem, most vessels had the fore end of their fishrooms partitioned into separate sections with the round hatches above on each side under the coiler. As the winch hove in the ropes, the coiler spread the ropes into the bins below. This was an improvement but there were still disadvantages, namely, loss of fishroom space, wear on the ropes passing over the hatch coaming and an increase in foul ropes (tangles) while shooting.

A method was subsequently introduced which utilized hydraulic rope reels and this has become the most popular way of stowing ropes in all the modern seiners. With these modern methods in mind, the Development Branch's Operations Division embarked on a project to introduce rope reels to vessels in the Gulf of St. Lawrence Region of Canada, which has a thriving Scottish seine fishery.

The main advantages of rope reels are as follows:

(1) Automation They are fully automatic, as shooting and hauling is controlled from a console usually situated on the bridge (integrated into the hydraulic circuit and operating from the same console are powerblock, Gilson Winch, etc.) (Fig. 1)

(2) Less Fouling There are no kinks or foul ropes while shooting which greatly increases crew safety. Fouled ropes in the past have claimed lives and broken limbs when crewmen have become entangled while shooting.

(3) Less Wear There is approximately 25% less wear on the ropes as compared to traditional methods.

(4) Reduced Labour At least one man is released from winch duties so fish handling is better and faster.

(5) Increased Storage Additional fishroom space gained means more income to vessel and crew.

(6) Extended Level of Fishing Rope Reels enable the vessel to work heavier ropes, to tow modern nets and to fish rougher grounds. Also, the vessel can work up to 15 coils with no decrease in deck space, (enabling her to work deeper water or cover more ground) with no extra labour involved. As well, rope reels enable the vessel to work in ice conditions whereas vessels using the traditional winch and coiler have to stop fishing.

(7) Versatility Rope reels are easily removable if need be when changing fishing methods on a multi-purpose vessel. This will probably be the trend with quotas now on most species and areas.

(8) Stability Better vessel stability is achieved since fish can be more evenly distributed in hold when space in no longer required for ropes.

In order to introduce the hydraulic rope reels, tenders were solicited from the industry in New Brunswick for a suitable vessel capable of testing and demonstrating this equipment. The vessel "Marie France", skippered by Clarence Larocque from Lameque, N.B., was subsequently chartered. (Fig. 1)

Fitting out started in June 1980, and took approximately 14 days with some deck alterations being necessary to accommodate the reels. (Fig. 1 and 2). These alterations included relocating the winch, installing new deck leads, relocating the fishroom hatch and reducing it in size, sealing up the rope storage bins deck scuttles and removing the Becckes rope coiler. Below decks, additional fishroom space was gained by removal of the rope storage equipment. Extra rope, increasing the total coils per side to 12 instead of 9 were spliced and spooled on to the reels and a new seine net, a Jackson 520 (Manufacturer: Jackson Trawl of Peterhead, Scotland) was put onboard.

With the ropes on the reels and fitting out completed, the vessel underwent an inclining test and a roll test to determine stability.

The vessel on the roll test acquired a GM fl. of 3.31 feet and on the inclining test the GM fl. was 3.24 feet. AGM fl. of more than three feet for a vessel of this type, in this condition, can be considered as an indication of adequate stability for fishing and carrying properly stowed iced groundfish.

Some small anomalies in the hydraulic system were eliminated during initial sea trials and after a satisfactory trial period, the vessel

resumed fishing full time with trips of 5-6 days.

FISHING OPERATION

The following is a description of a typical fishing operation. The dhan (high flyer) and buoys are streamed in the usual manner (Fig. 3) and the boat sets out at full speed in the direction required for the first leg of the set. When shooting, the reels have hydraulic power with a back pressure across the motors of 100-250 psi to prevent free wheeling. This is preset by the skipper to suit the weather conditions and it is the pressure which prevents the reels from over-riding when setting at full speed, slowing down or coming astern at the net or dhan. When shooting before the wind during bad weather, the vessel speed is often erratic and the tendency for the rope to over-ride (with consequent fouling) is again checked by the back pressure. When setting, the rope must be watched in order to lay down the proper pattern, for example if one were making a traingular set using 10 coils per side seven coils of rope would be steamed out, the vessel would turn approximately 80^{o} and the further three coils steamed out and the net dropped. The pattern would then be duplicated in the other side and the vessel steams back to the original position where the high flyer was dropped.

With the dhan onboard, the rope ends now being on the winch warping heads and reels, the gear is towed up tight ready for heaving (Fig. 4). At this point the hauling pressure is set individually but equally, on each reel, varying on different vessels from 800-1500 psi. Once this pressure is set, no further adjustments are needed throughout the heaving cycle. When the winch is engaged, the reels take up the rope at whatever speed the winch is set from a starting low of around 75 feet per minute to 500 feet per minute after the net is closed, (Fig. 5 and 6) spooling being carried out automatically throughout. At any time through the hauling cycle, should the winch need to be stopped, the reels will do likewise starting up again when the winch is re-engaged. This is achieved by means of a series of preset hydraulic valves.

Any adjustments to be made to keep the ropes even when heaving, are made by stopping the reel on the side where the rope is high in the water.

At the side of each reel there is a section with a flange which allows for storage of rope that requires splicing during the heave period. When the damaged rope separated, it is then ready for splicing when the gear is onboard.

When the bridle links come up to the rail rollers the ropes are unhooked from the net, heaved onto the reels from the winch and the dhan is tied on. The ropes are thus ready for setting again.

Technical specifications can be found in Table 1.

II EXPLORATION FOR SUITABLE FISHING GROUNDS, SCOTIAN SHELF AND SOUTHWEST GRAND BANKS

As the Scottish Seining industry expanded in the Maritimes, it became eivdent that there was a need to explore the Scotian Shelf and area 30 of the Grand Banks to find out to what extent suitable Scottish Seine grounds existed. As a direct result of this need, the "Louise R." was given a special permit which covered the ground which was to be explored.

The "Louise R." was built by Maclean's Shipbuilders of Mahone Bay, Nova Scotia in 1966. The vessel measures 90.8 feet from post to post and is built totally of wood. The "Louise R." has been a commercial fishing vessel since 1966, but it was not until May 10, 1979 that she made her first trip as a Scottish Seiner.

This particular vessel was chosen for the permit for several reasons. She was large enough to travel long distances which allowed her to cover the required ground. The vessel was very seaworthy and had onboard some of the most modern Scottish Seining gear available. The vessel owner who was also the skipper was very experienced at scottish seining.

The initial fishing carried out in 1979 proved to be very encouraging. As a result, a charter was awarded in the following year to cover the grounds more thoroughly.

In 1979, the navigation equipment (Loran A) onboard the "Louise R." was not sufficient for the areas fished. In 1980, a modern, more advanced unit (Decca) was installed. Development Branch personnel could not expect the "Louise R." to fish on unproved fishing grounds unless under charter. As a result, the 1979 survey was largely commercial. The total catch for five trips was 269,572.2 kg. (594,295 lbs.) This equalled an average trip catch of 53,914.4 kg. (118,859 lbs.)

The trips lasted anywhere from four to eleven days. The longer trips were those worked on the South West edge of the Grand Banks.

The first trip began on May 10, 1979 and lasted until May 19. Being the first trip, the fishing was viewed by the skipper and the crew as a learning experience which enabled them to become familiar with the new equipment and the fishing method.

A scottish seining expert from Scotland, was onboard during the first trip to assist the skipper and crew. The vessel carried three seine nets, a Jackson 620 box, a Jackson 500, and a Kingfisher 480.

As mentioned, the bearings for the 1979 trip were not accurate and are therefore not included in this report. However, other pertinent items of the 1979 trips are included in the Appendices.

The 1980 Scottish seine ground survey was carried out in three trips approximately of 10-12 days each. The first trip was to survey Green Bank, St. Pierre Bank, and to start to survey Banquereau Bank. The second trip was to survey Banquereau Bank. The third trip was to survey the S.W. part of the Grand Banks and to complete the survey of Banquereau Bank.

While carrying out the survey, several areas were found to be unsuitable for Scottish Seining but at the same time, many suitable areas were discovered which would indicate this method of fishing would be feasible on a commercial basis when fish stocks migrate to soft bottom.

It was also found that parts of Emerald Bank, Western Bank, and practically all of St. Pierre, and Green Bank were poor bottom for seining. The suitable bottom discovered during the survey were parts of Western Bank, parts of Banquereau Bank, practically all of Sable Bank, and the S.W. part of the Grand Banks.

The appendices that follow contain a great deal of information of locations fished, sounding paper excerpts etc. As well, more detailed information is available from the Fisheries Development Branch at the address shown on the first page of this report.

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Owing to the wide range of vessel size and the capacity of rope required by individual skippers, reels are manufactured in various sizes to each owner's requirement.

TABLE I

HYDRAULIC, SCOTTISH SEINE, ROPE REEL SPECIFICATIONS

Reel specifications for this project were:

Manufacturer	-	Lossie Hydraulics Co.Ltd. Falkirk, Scotland
Reels	-	2
Capacity	-	15 coils new rope 2 1/2" circumference (120 fathom coils) approx. weight 15 coils leaded poly - 3,960 lbs. each
Base size	-	6' x 5'
Height	-	5'3"
Weight app.	-	Empty 1,500 lbs. each full approx. 3,960 lbs. each.

TABLE II

LOUISE R - 1979

SCOTTISH SEINING, COMMERCIAL FISHING & GROUND SURVEY

		Kg.
TRIP 1	haddock	-
	cod	226.8
	halibut	-
	hake	6,246.1
	flounder	34,564.3
	grey sole	23,419.4
	TOTAL	64,456.6
TRIP 2	haddock	-
	cod	226.8
	halibut	11.3
	hake	122.5
	flounder	27,805.7
	grey sole	12,474.0
	TOTAL	40,640.3
TRIP 3	haddock	-
	cod	-
	halibut	181.4
	hake	7,212.2
	flounder	25,424.3
	grey sole	15,989.4
	TOTAL	48,807.3
TRIP 4	haddock	-
	cod	64,411.2
	halibut	-
	hake	-
	flounder	2,721.6
	grey sole	-
	TOTAL	67,132.8
TRIP 5	haddock	48,535.2
	cod	-
	halibut	-
	hake	-
	flounder	-
	grey sole	-
	TOTAL	48,532.2
	TRIP TOTALS	269,572.2 Kg.

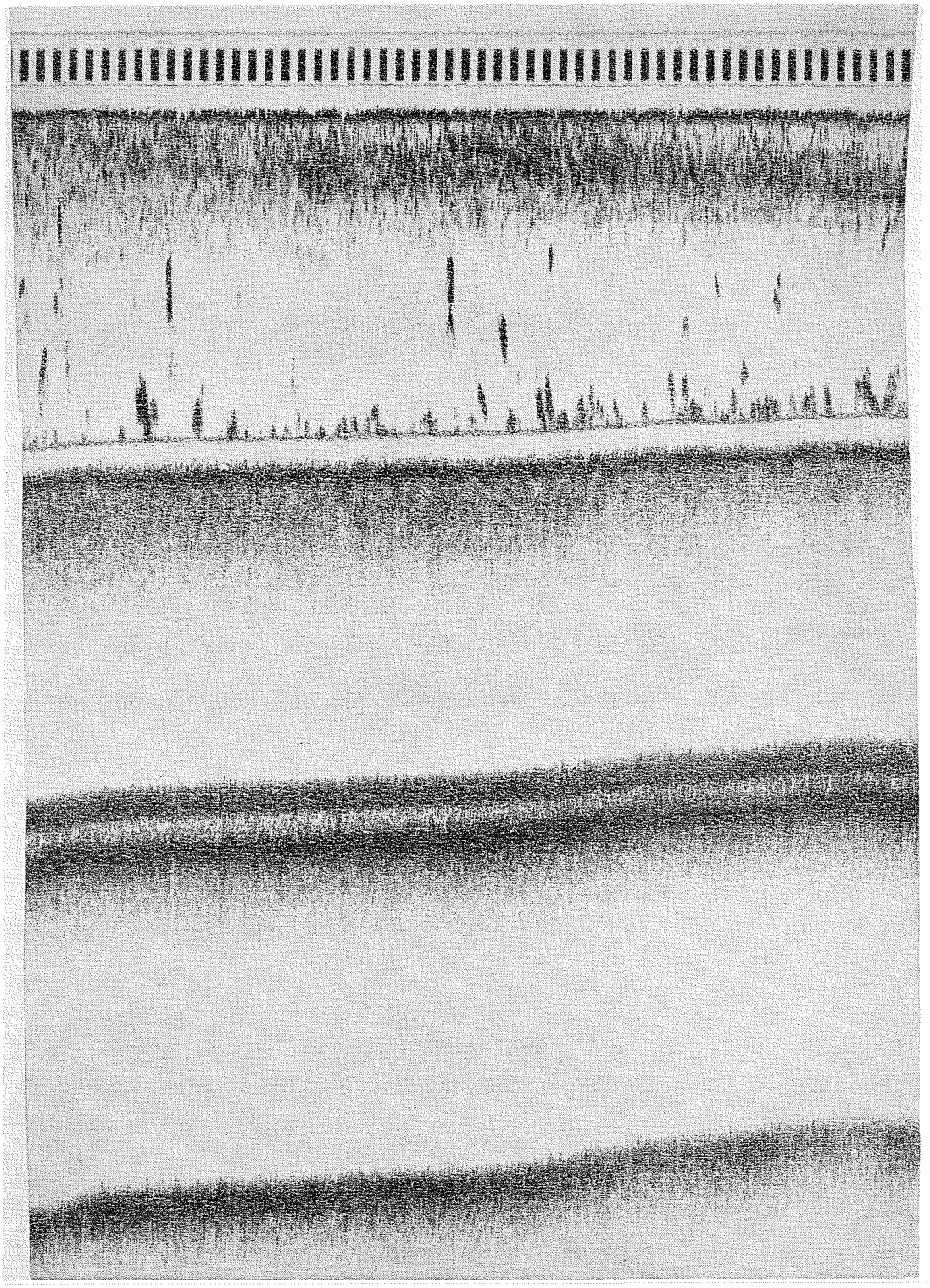
TABLE III

LOUISE R - 1980

SCOTTISH SEINE, CHARTER & GROUNDS SURVEY

		Kg.
TRIP 1	haddock	4,263.8
	cod	2,381.4
	halibut	56.7
	hake	-
	flounder	340.2
	grey sole	-
	TOTAL	7,042.1
TRIP 2	haddock	8,289.5
	cod	2,107.0
	halibut	-
	hake	-
	flounder	20.4
	grey sole	22.7
	TOTAL	10,439.6
TRIP 3	haddock	136.1
	cod	-
	halibut	272.2
	hake	7,824.6
	flounder	5,670.0
	grey sole	-
	TOTAL	13,902.9
	TRIP TOTALS	31,384.6 Kg.

APPENDIX 4



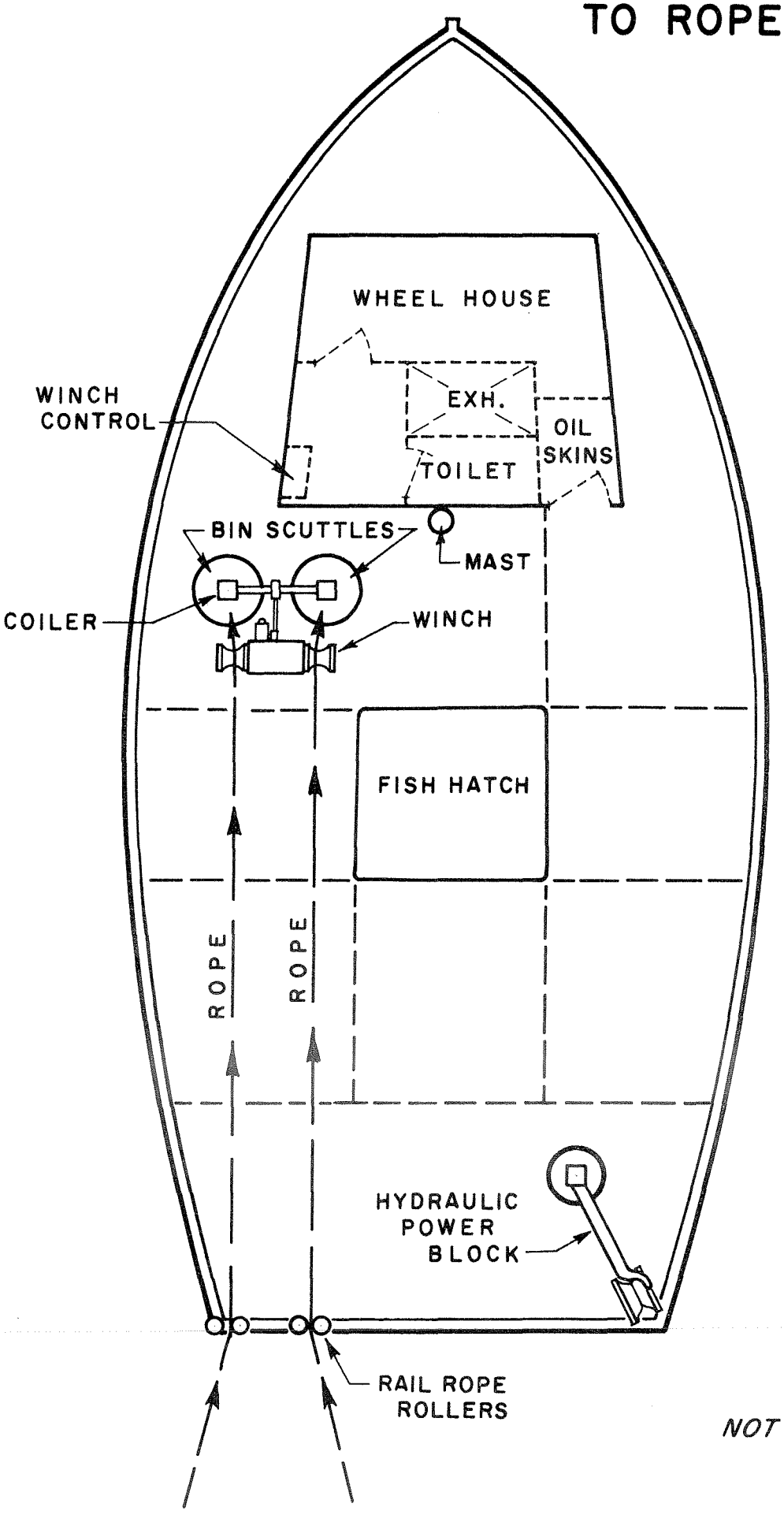
Sounding paper showing the bottom towed X13627.1, Y28691.2 to X13627.1, Y28696.6 during trip 2, 1980 at a depth of 30 fathoms. The catch was 450 kg. of haddock.

APPENDIX 5

Sounding paper showing the bottom towed X13860.3, Y25681.6 to X13861.1, Y25671.4 during trip 3, 1980 at a depth of 140 to 160 fathoms. The catch was 2260 kg. of hake.

"MARIE FRANCE" DECK LAYOUT BEFORE CONVERSION TO ROPE REELS

Figure 1.

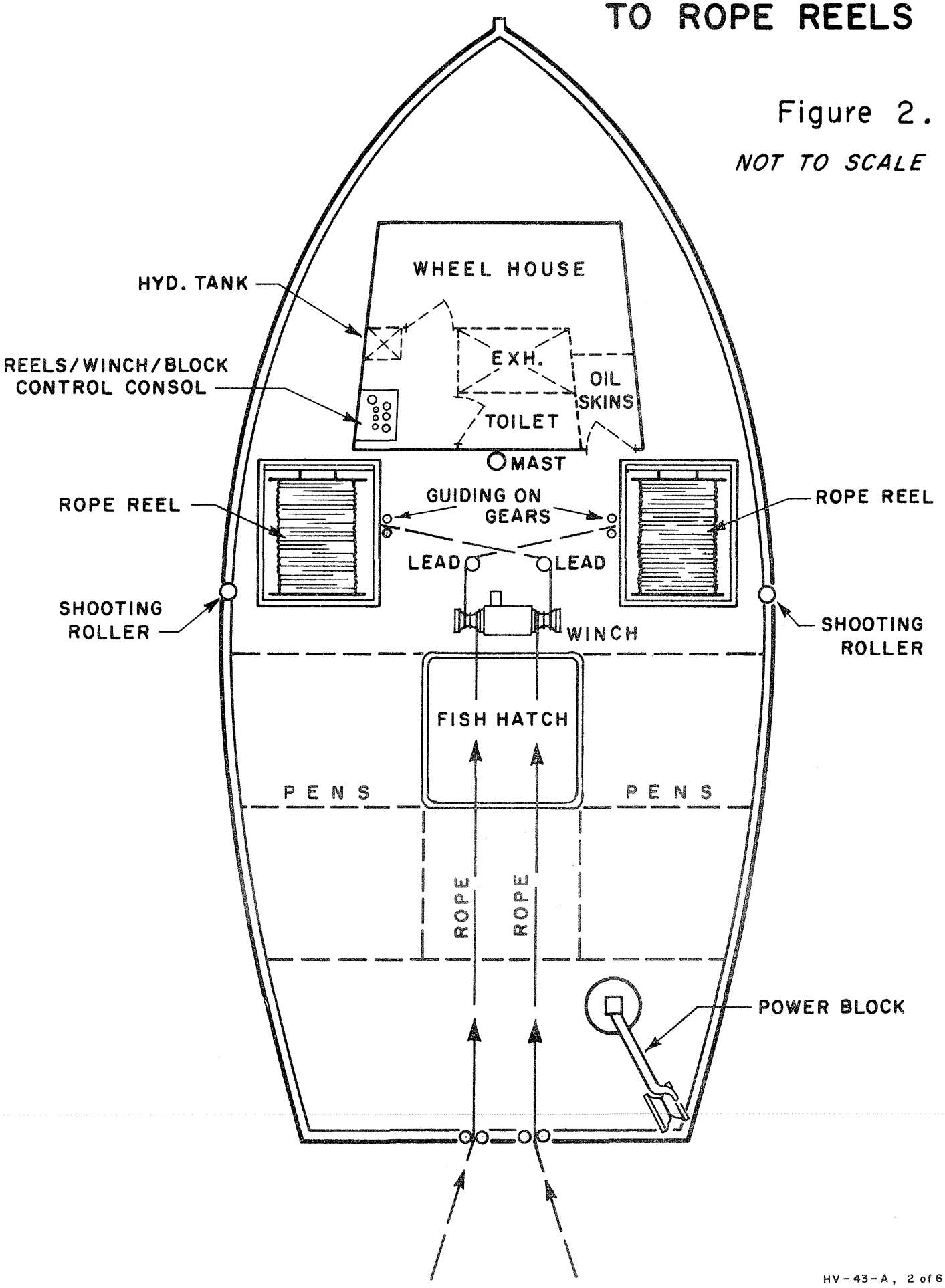


NOT TO SCALE

DECK LAYOUT OF "MARIE FRANCE" AFTER CONVERSION TO ROPE REELS

Figure 2.

NOT TO SCALE



TYPICAL SCOTTISH SEINE SET

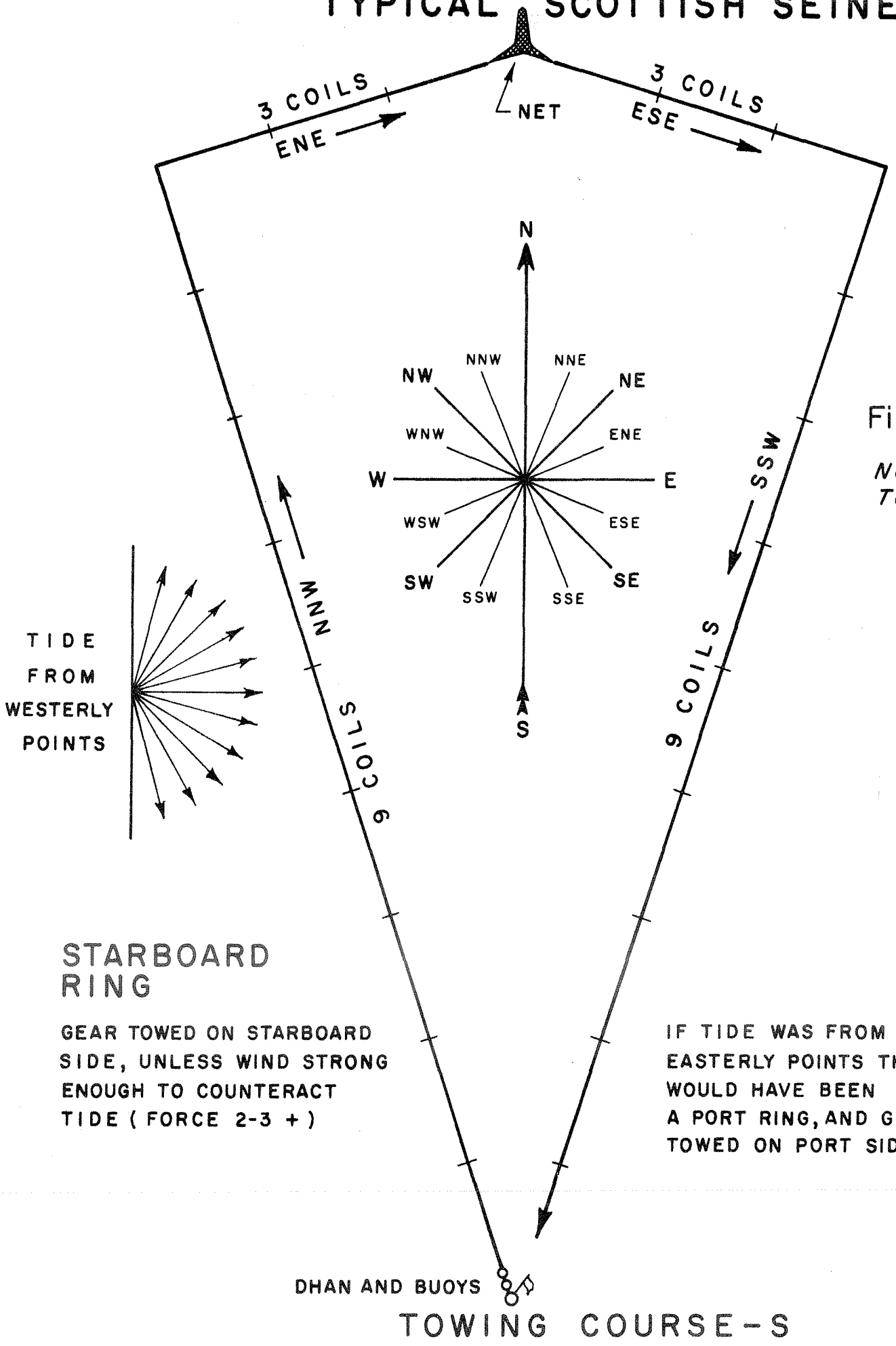


Figure 3.

NOT TO SCALE

STARBOARD RING

GEAR TOWED ON STARBOARD SIDE, UNLESS WIND STRONG ENOUGH TO COUNTERACT TIDE (FORCE 2-3 +)

IF TIDE WAS FROM EASTERLY POINTS THE SET WOULD HAVE BEEN A PORT RING, AND GEAR TOWED ON PORT SIDE.

TOWING COURSE - S

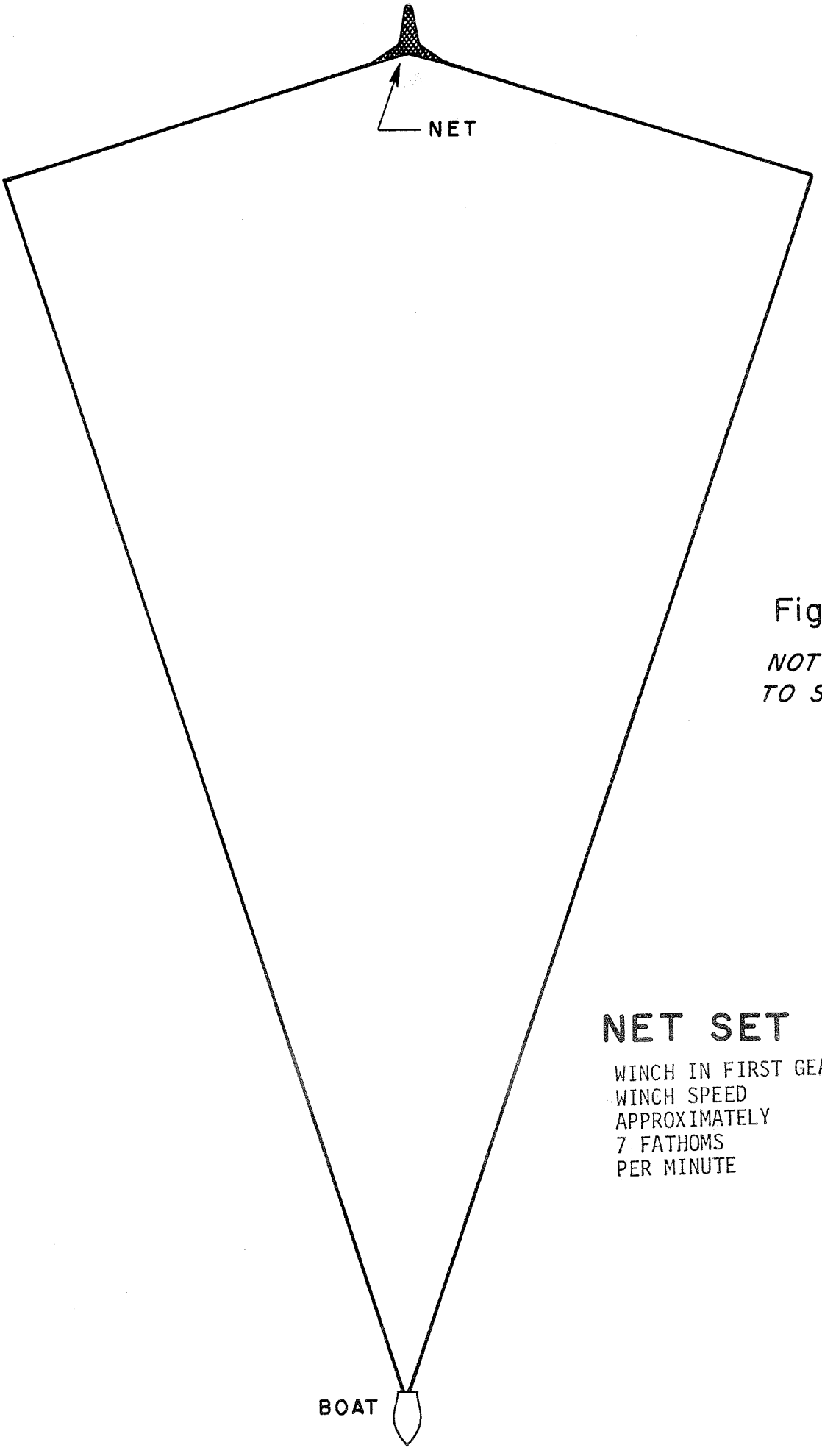


Figure 4.

NOT TO SCALE

NET SET

WINCH IN FIRST GEAR
WINCH SPEED
APPROXIMATELY
7 FATHOMS
PER MINUTE

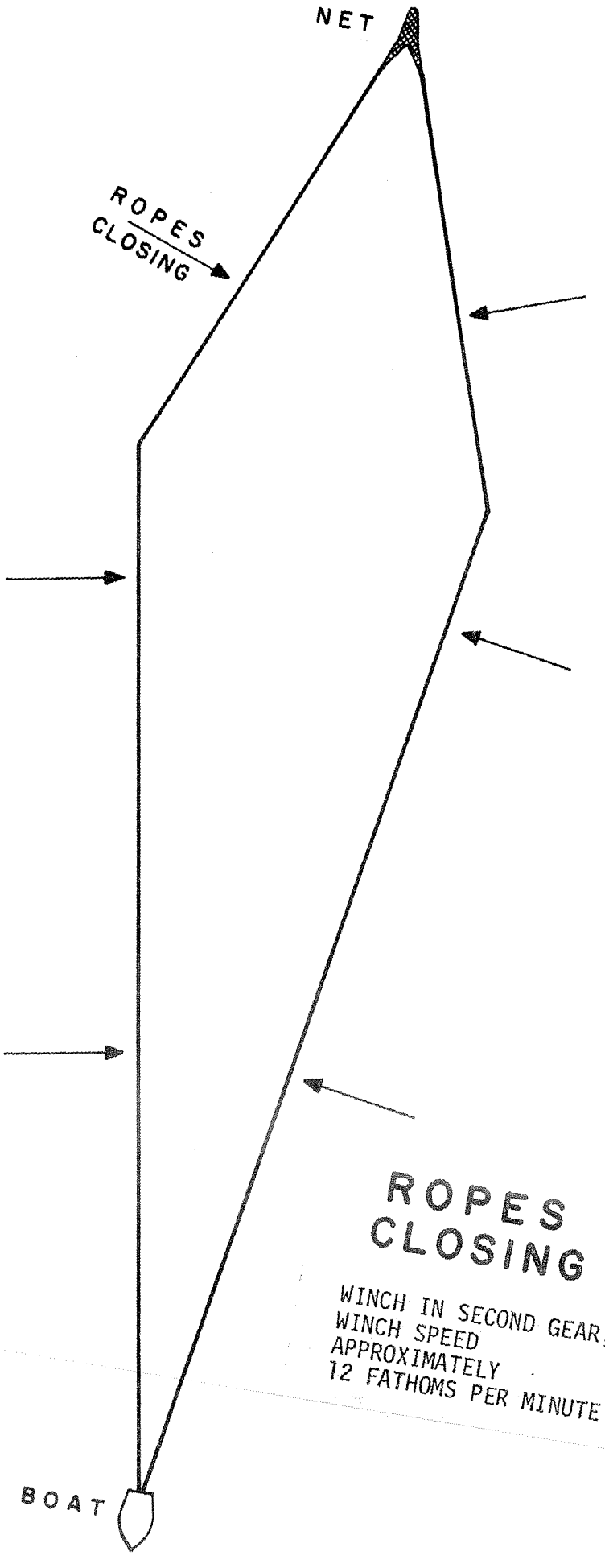


Figure 5.

NOT TO SCALE

ROPES CLOSING

WINCH IN SECOND GEAR,
WINCH SPEED
APPROXIMATELY
12 FATHOMS PER MINUTE

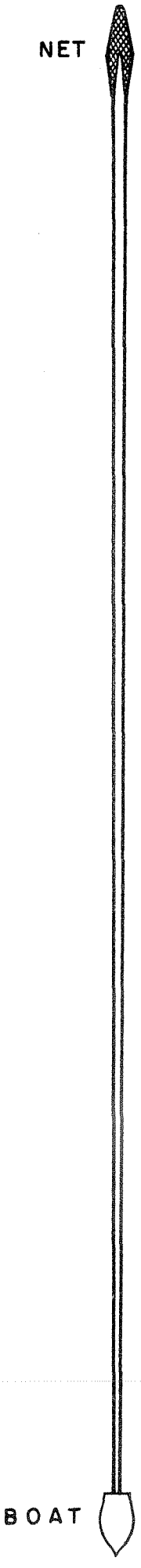


Figure 6.

NOT TO SCALE

ROPES AND NET CLOSED

WINCH IN THIRD GEAR,
WINCH SPEED
APPROXIMATELY
60 FAHTOMS PER MINUTE

APPENDIX 1

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 1, 1980

TOW Nº	LOCATION OF TOW		DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM					
	START	END								HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
1	x13930.4 y27343.1	x13935.4 y27341.3	NNW	30	850	10	w5k	Sand	Clear tow	90.7	136.1	56.7	-	-	-
2	x14001.4 y26602.9	x14005.1 y26598.9	NNW	68-75	900	10	w5k	Hard Sand	Clear tow	-	-	-	-	-	-
3	x14004.6 y26546.1	x14010.2 y26545.3	NNE	55	800	10	w10k	Grassy	Clear tow	-	-	-	-	-	-
4	x13994.4 y26546.1	x14005.3 y26545.3	N	80	900	10	w10k	Mud	Clear tow	-	-	-	-	-	-
5	x13996.6 y26537.0	x14001.6 y26514.7	ESE	70	800	10	w10k	Sand	Clear tow	-	226.8	-	-	-	-
6	x13995.6 y26475.9	x13999.1 y26460.8	ESE	90	850	10	w10k	Mud & Sand	Clear tow	-	136.1	-	-	90.7	-
7	x13999.5 y26451.1	x14002.2 y26447.5	N	100	900	10	w10k	Mud & Sand	Clear tow	-	136.1	-	-	-	-
8	x14003.6 y26444.4	x14005.9 y26450.0	W	70	900	10	w10k	rough bottom	Incomplete tow	-	-	-	-	-	-
9	x14028.3 y26348.5	x26352.7 y26352.7	N	110-85	900	10	w10k	rough bottom	Incomplete tow	-	-	-	-	-	-
10	x14057.0 y26368.1	x14055.1 y26374.9	W	45	850	10	sw10k	rough bottom	Incomplete tow	-	-	-	-	-	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 1, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
11	x14056.2 y26367.7	x14058.8 y26368.2	E	45-40	850	10	sw15k	Sand	Clear tow	-	181.4	-	-	90.7	-
12	x14111.0 y26477.1	x14102.3 y26551.5	WSW	25	900	10	sw15k	Sand	Clear tow	-	181.4	-	-	45.4	-
13	x14103.5 y26652.6	x14100.2 y26664.8	W	30	900	10	wsw 15k	rough bottom	Incomplete tow	-	-	-	-	-	-
14	x14044.4 y26679.2	x14045.1 y26665.9	E	125-95	900	10	sw10k	Sand	Clear tow	-	-	-	-	-	-
15	x14073.6 y26702.5	x14075.1 y26697.4	E	130-100	900	10	sw10k	Sand & Mud	Clear tow	-	-	-	-	-	-
16	x14111.1 y26752.4	x14113.3 y26747.8	E	135-90	900	10	sw25	Sand & Mud	Clear tow	-	-	-	-	-	-
17	x14245.6 y27915.1	x14248.9 y27925.2	E	45	850	10	nw15k	rough bottom	Incomplete tow	-	-	-	-	-	-
18	x14200.1 y26899.7	x14201.2 y26891.3	E	120-90	850	10	nw20k	rough bottom	Incomplete tow	-	-	-	-	-	-
19	x14135.1 y26427.6	x14137.3 y26435.5	WNW	25	850	10	e10k	rough bottom	Incomplete tow	-	-	-	-	-	-
20	x14141.4 y26472.3	x14119.9 y26481.9	WNW	25	900	10	e15k	rough bottom	Incomplete tow	-	-	-	-	-	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 1, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
21	x14101.0 y26406.8	x14102.7 y26418.6	WNW	25	900	10	e20k	Sand	Clear tow	-	-	-	-	-	-
22	x14067.4 y26050.5	x14063.0 y26051.3	S	60	850	10	sse 5k	rough bottom	Incomplete tow	-	-	-	-	-	-
23	x14067.8 y26048.4	x14062.8 y26047.1	SSE	60	900	10	sse 5k	rough bottom	Incomplete tow	-	-	-	-	-	-
24	x14048.0 y26048.8	x14043.2 y26050.0	S	55	900	10	s5k	rough bottom	Incomplete tow	-	-	-	-	-	-
25	x14170.0 y25918.7	x14166.1 y25910.4	SE	40	900	10	w5k	Sand	Clear tow	-	-	-	-	-	-
26	x14173.6 y25920.7	x14167.0 y25925.5	SSW	35	900	10	w10k	rough bottom	Incomplete tow	-	-	-	-	-	-
27	x14178.2 y25915.5	x14179.8 y25901.3	SSW	35	900	10	w15k	rough bottom	Incomplete tow	-	-	-	-	-	-
28	x14070.8 y26652.0	x14065.4 y26655.1	SW	40-35	900	10	sw15k	Sand	Clear tow	-	45.4	-	-	45.4	-
29	x14055.1 y26566.2	x14058.2 y26556.0	NE	40	900	10	sw15k	Sand	Clear tow	-	90.7	-	-	45.4	-
30	x14041.5 y26580.5	x14039.3 y26592.4	WSW	45	900	10	wsw10	Sand	Clear tow	-	68	-	-	22.7	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 1, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
31	x14017.8 y26610.6	x14014.1 y26615.0	W	55	900	10	swl0k	Sand	Clear tow	-	45.4	-	-	-	-
32	x13989.8 y26630.2	x13992.2 y26636.4	WNW	105	900	10	swl0k	rough bottom	Incomplete tow	-	-	-	-	-	-
33	x13944.6 y27374.5	x13946.0 y27380.3	SSW	20	900	10		Sand	Clear tow	544.3	272.2	-	-	-	-
34	x13971.6 y27414.0	x13964.5 y27418.6	SW	20	850	10		Sand	Clear tow	725.8	181.4	-	-	-	-
35	x13947.4 y27558.1	x13944.0 y27562.3	SW	30	850	10		Sand	Clear tow	1360.8	362.9	-	-	-	-
36	x13880.4 y27547.6	x13878.1 y27548.2	SW	30	850	10		Sand	Clear tow	907.2	181.4	-	-	-	-
37	x13890.4 y27327.6	x13884.7 y27329.1	SW	35	850	10		Sand	Clear tow	635	136.1	-	-	-	-

Total = 7,042.1 Kg.

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 2, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
1	x13319.0 y29602.1	x13328.8 y29603.6	NNE	55	850	10	w15k	rough	Parted starboard rope	-	-	-	-	-	-
2	x13368.5 y29551.2	x13360.7 y29552.5	NE	50	850	10	w15k	hard sand	Clear tow	907.2	-	-	-	-	-
3	x13337.4 y29551.2	x13326.8 y29538.8	SSW	55	850	10	w5k	hard sand	Clear tow	453.6	4.5	-	-	-	-
4	x13403.6 y29502.9	x13413.0 y29501.0	NE	50	850	10	swk 15	hard sand	Hooked something with stbd. rope and parted.	-	-	-	-	-	-
5	x13436.8 y29493.8	x13447.9 y29504.5	NNW	55	850	10	SSE 20k	mud	Clear tow	317.5	18.1	-	-	4.5	22.7
6	x13450.9 y29497.8	x13461.1 y29501.2	NNW	55	850	10	SSW 25k	mud	Clear tow	680.4	226.8	-	-	-	-
7	x13507.6 y29278.4	x13501.4 y29267.6	SSE	50	850	10	w20k	mud	Clear tow	589.7	-	-	-	-	-
8	x13508.4 y29218.2	x1350.0 y29204.6	SSE	45	850	10	w20k	mud	Clear tow	544.3	-	-	-	-	-
9	x13485.1 y29227.2	x13480.5 y29236.2	N	45	850	10	w5k	mud	Clear tow	90.7	4.5	-	-	4.5	-
10	x13521.7 y29214.7	x13527.6 y29199.8	E	35	850	10	w5k	sand	Stbd. rope hung up but came clear Clear tow	544.3	4.5	-	-	-	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº _2,_1980_

TOW Nº	LOCATION OF TOW		DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM					
	START	END								HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
11	x13523.3 y29.00.1	x13531.5 y29095.2	NE	40	850	10	w5k	mud	Clear tow	680.4	4.5	-	-	9.1	-
12	x13453.9 y29138.1	x13460.1 y29141.7	N	40	850	10	sw15k	hard sand	Clear tow	11.3	6.8	-	-	2.3	-
13	x13637.8 y28812.6	x13644.9 y28787.5	N	25	850	10	sw15k	soft sand	Clear tow	453.6	453.6	-	-	-	-
14	x13653.7 y28825.3	x13657.7 y28841.1	NW	25	850	10	sw15k	hard sand	Clear tow	453.6	680.4	-	-	-	-
15	x13609.7 y28851.3	x13597.2 y28849.5	SSW	30	850	10	sw15k	hard sand	Clear tow	453.6	90.7	-	-	-	-
16	x13581.1 y28850.7	x13579.2 y28842.9	SE	30	850	10	sw5k	hard sand	Clear tow	453.6	226.8	-	-	-	-
17	x13591.1 y28823.3	x13599.2 y28827.3	NNE	30	850	10	sw5k	hard sand	Clear tow	453.6	45.4	-	-	-	-
18	x13596.7 y28748.6	x13608.4 y28759.5	N	35	850	10	sw10k	hard sand	Clear tow	226.8	-	-	-	-	-
19	x13632.3 y28691.2	x13627.1 y28696.6	SW	30	850	10	-	soft sand	Clear tow	453.6	-	-	-	-	-
20	x13618.1 y28648.7	x13612.5 y28656.3	SW	30	850	10	s5k	soft sand	Clear tow	204.1	22.7	-	-	-	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 2, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
21	x13663.0 y28477.7	x13672.4 y28480.8	SW	30	900	10	s5k	hard sand	Clear tow	-	-	-	-	-	-
22	x13688.9 y28381.9	x13686.2 y28361.1	ESE	20	900	10	s10k	hard sand	Clear tow	-	226.8	-	-	-	-
23	x13929.4 y27447.8	x13934.6 y27443.8	NE	20	850	10		hard sand	Stbd. rope hung up but came clear - clear tow.	68	-	-	-	-	-
24	x13967.5 y27444.6	x13972.7 y27479.9	NW	25	900	10	-	rough bottom	Incomplete tow, both ropes hung up, had to buoy on and haul back on one warp.	-	-	-	-	-	-
25	x13939.4 y276	x13941.1 y27682.7	SE	35	900	10	-	hard sand	Clear tow	90.7	-	-	-	-	-
26	x13917.2 y27696.3	x13908.9 y27700.7	SSW	30	900	10	s5k	hard sand	Clear tow	-	-	-	-	-	-
27	x13886.6 y27802.1	x13879.3 y27800.9	SSW	35	850	10	se15k	soft sand	Clear tow	-	45.4	-	-	-	-
28	x13888.8 y28027.6	x13881.1 y28041.7	SW	30	850	10	se20k	hard sand	Clear tow	90.7	-	-	-	-	-
29	x13880.4 y28303.3	x13890.2 y28298.9	SW	25	900	10	se20k	hard sand	Clear tow	68	45.4	-	-	-	-

Total = 10,439.6 Kg.

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 3, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
1	x13849.3 y25561.7	x13852.1 y25562.1	NW	50	850	10	s10k	Sand & Mud	Clear tow	-	-	-	45.4	1360.8	-
2	x13842.4 y25565.7	x13846.2 y25558.9	NE	50	850	10	sw5k	Sand & Mud	Clear tow	-	-	-	-	907.2	-
3	x13843.9 y25552.3	x13842.1 y25560.8	NE	50	850	10	sw5k	Sand & Mud	Clear tow	-	-	-	45.4	453.6	-
4	x13860.6 y25560.2	x13861.5 y25552.8	SW	50	850	10	sw5k	Mud	Clear tow	-	-	-	-	1134	-
5	x13873.7 y25602.2	x13867.4 y25601.3	SSE	55	850	10	sw10k	Mud	Clear tow	-	-	-	-	1134	-
6	x13769.0 y25611.8	x13777.4 y25601.6	ENE	120-75	850	10	sw15k	Mud	Clear tow	-	-	27.2	136.1	-	-
7	x13770.1 y25600.5	x13771.2 y25594.4	ESE	85	850	10	sw15k	Mud	Clear tow	-	-	2.3	181.4	-	-
8	x13769.6 y25580.7	x13765.5 y25581.1	ESE	70	850	10	sw20k	Mud	Clear tow	-	-	-	136.1	-	-
9	x13970.2 y25582.4	x13795.7 y25572.2	ENE	60	850	10	sw15k	Sand & Mud	Clear tow	-	-	22.7	5443.2	226.8	-
10	x13802.1 y25584.7	x13799.3 y25592.8	WNW	55	900	10	sw10k	Sand & Mud	Clear tow	-	-	9.1	453.6	226.8	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 3, 1980

TOW Nº	LOCATION OF TOW: START	LOCATION OF TOW: END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
11	x13874.8 y25681.9	x13877.9 y25670.1	E	80	850	10	w5k	Sand & mud	Clear tow but had many sunk gillnets.	-	-	40.8	45.4	45.4	-
12	x13881.7 y25679.2	x13885.5 y25666.6	E	110-85	900	10	w5k	mud	Clear tow	-	-	15.9	544.3	-	-
13	x13877.1 y25686.3	x13878.2 y25678.7	ESE	120-100	900	10	w5k	mud	Clear tow	-	-	6.8	1134	-	-
14	x13865.4 y25696.5	x13868.2 y25683.9	E	150-90	900	10	w5k	mud	Clear tow	-	-	6.8	226.8	-	-
15	x13860.3 y2581.6	x13861.1 y25671.4	SE	160-140	900	10	w5k	mud	Clear tow	-	-	9.1	2268	-	-
16	x13855.7 y25661.2	x13854.8 y25651.1	ESE	155-90	900	10	sw5k	mud	Clear tow	-	-	4.5	907.2	45.4	-
17	x13847.3 y25662.2	x13848.2 y25651.4	SE	145-95	900	10	sw5k	mud	Clear tow	-	-	11.3	453.6	-	-
18	x13891.1 y25673.4	x13894.2 y25658.5	WNW	145-95	900	10	sw5k	mud	Clear tow	-	-	11.3	453.6	-	-
19	x13894.9 y25658.1	x13898.7 y25648.1	NE	100	900	10	sw5k	mud	Clear tow	-	-	24.9	45.4	45.4	-
20	x13896.4 y25665.8	x13899.3 y25651.9	ENE	140-90	900	10	sw5k	mud	Clear tow	-	-	20.4	22.7	-	-

SCOTTISH SEINE GROUNDS SURVEY STATISTICS

TRIP Nº 3, 1980

TOW Nº	LOCATION OF TOW START	LOCATION OF TOW END	DIRECTION OF TOW	DEPTH OF WATER	ENGINE RPM	COILS OF ROPE PER SIDE	WIND DIRECTION AND VELOCITY	BOTTOM TYPE	COMMENTS	SPECIES AND WEIGHTS IN KILOGRAM: HADDOCK	COD	HALIBUT	HAKE	FLOUNDER	GREY SOLE
21	xl3895.5 y25679.2	xl3901.6 y25667.4	NE	155-135	900	10	sw5k	mud	Clear tow	-	-	9.1	45.4	-	-
22	xl3906.8 y25660.6	xl3908.6 y25650.1	E	120-85	900	10	sw5k	mud	Clear tow	-	-	45.4	45.4	-	-
23	xl3911.1 y25648.0	xl3913.8 y25641.5	ENE	110-90	850	10	sw10k	mud	Clear tow	-	-	-	22.7	-	-
24	xl3926.7 y25642.4	xl3925.1 y25651.8	NW	65	850	10	sw20k	sand & mud	Clear tow	-	-	4.5	68	22.7	-
25	xl3901.7 y28098.5	xl3899.1 y28112.3	NNE	30	850	10	sw15k	hard sand	Clear tow	45.4	4.5	-	-	45.4	-
26	xl3911.3	xl3912.4	ENE	35	850	10	sw15k	hard sand	Clear tow	90.7	1814.4	-	-	22.7	-

Total = 15,721.8 Kg.