MIDWATER TRAWLING IN CANADA

by

W.W. Johnson
Industrial Development Service
Department of Fisheries of Canada

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First, I should like to mention that I am in fishing vessel and gear development work with the Industrial Development Service of the Department of Fisheries of Canada.

This Service is a technical group which, to meet the changing conditions of the fishing industry, is pursuing the following objectives:

1) The expansion and modernization of Canada's commercial fisheries: the provinces and the industry are encouraged to co-operate in achieving these objectives.

2) To achieve increased productivity: new and improved vessels, gear and equipment are being designed and demonstrated.

3) To improve skills in traditional fisheries and introduce new techniques: specialized technical assistance from Canada and other leading fishing nations is being made available on an increasing scale.

4) To achieve greater diversification in the industry: exploratory fishing activities are being expanded in order to harvest under-exploited and unexploited stocks.

Our staff consists of vessel and gear specialists with extensive experience in the commercial fisheries; naval architects; marine engineers; mechanical engineers and electronics engineers, and administrative personnel. Professional fishermen and other specialists from many countries as well as from all the fishing areas of Canada are employed on a contract basis to implement much of the development program.

Some projects are carried out through joint cost sharing arrangements with the fisheries departments of provincial governments and with the private sector of the fishing industry. However, many projects are financed and carried out entirely by our own Department. Many of these originate at the annual meetings of the Federal-Provincial Atlantic Fisheries Committee; some are originated by our own staff, and of course others are the result of requests from the fishing industry.

The aforementioned over-all objective of the Industrial Development Service is to develop Canada's untapped fishery resources and to increase the efficiency of vessels, gear and fishing techniques, thereby increasing the earnings of the fishermen and the fishing industry as a whole. In brief, that means catching more fish at less cost.

I have spent a good deal of time on the development of midwater herring trawling, first on Canada's West Coast both as a commercial fisherman and as an employee of the federal Department of Fisheries and, since 1958, on the East Coast.

From 1958 to 1964 we attempted to develop midwater herring trawling, using inshore draggers ranging from 48 to 72 feet in over-all length, powered by engines from 165 to 250 horsepower. Although results were rather inconclusive, we did catch as much as 25 tons of herring in a day's fishing, and this would have been quite profitable if the herring had been sold to a fresh fish market such as those existing in Europe. Our herring had to be sold for processing into fish meal at a relatively low price, and we simply could not catch sufficient quantities for a viable operation.

Canadian interest in midwater herring trawling had never been very high, and even this was overshadowed by our dramatically successful efforts in developing purse seining, which got under way in 1962 at Bonne Bay on the West Coast of Newfoundland. This was the spark that touched off the expansion of the herring fishing industry on Canada's East Coast.

However, the interest in midwater trawling was re-awakened in 1966, when Dr. J. Schärfe, of the West German Department of Fisheries, presented a paper, "Trawling Developments in Germany", at the Canadian Atlantic Offshore Fishing Vessel Conference, held in Montreal under the sponsorship of the Federal-Provincial Atlantic Fisheries Committee. This paper described the development of one-boat midwater trawling, especially for stern trawlers, and Dr. Schärfe also showed films of their successful catches.

In May 1966, Dr. Schärfe again spoke on midwater herring trawling at the Canadian Atlantic Herring Fishery Conference, also sponsored by the Federal-Provincial Atlantic Fisheries Committee, and aroused the interest of industry and the various fisheries departments even further.

As a result the Nova Scotia Department of Fisheries and the Department of Fisheries of Canada, decided to embark on a joint midwater herring trawling project.

In June 1966 I visited Germany, Denmark, Sweden, Norway and Northern Ireland to study not only midwater trawling but herring trawling generally.

West Germany was easily the most advanced in the method, and while I was in that country, Dr. Schärfe made sure that I saw all the latest developments in gear, electronics and stern trawlers pertaining to midwater trawling. He also arranged a trip for me on the factory stern ramp trawler "Carl Oskar Kampf" and

the fresh fishing stern ramp trawler "Carl Kampf", which enabled me to view two methods of handling the catch while observing midwater trawling.

The "Lady Anna" Project: from Scalloper to Midwater Herring Trawler

After returning to Canada, I reported my findings to the federal Department of Fisheries, and to the Nova Scotia Department of Fisheries. This resulted in the start of a midwater trawl project early in 1967.

A vessel had to be selected for the project, and although it was known that a stern ramp trawler would ensure a far greater chance of success, the Nova Scotia Department chose the wooden scalloper M/V "Lady Anna" of Meteghan, N.S., for the job. The "Lady Anna" is skippered by Mr. Guy D'Entremont of Pubnico, N.S., who is a part owner together with his mate, Mr. Wilbert D'Entremont, also of Pubnico, and Comeau Seafoods, Ltd., of Saulnierville, N.S. The reason for the choice was simple. At the time, scallopping was in the doldrums due to low prices; thus, if herring midwater trawling proved to be successful, diversification would be possible for the large scalloping fleet as well as for the side trawlers being replaced by stern trawlers. Furthermore, because of the need for groundfish production, midwater herring trawling was not of too much interest at that time to the owners of the larger stern ramp trawlers, who are fresh groundfish processors.

The "Lady Anna" is a typical 101-foot L.O.A. wooden scalloper, powered by a 765 h.p. Caterpillar diesel, and is of the side trawler type, having its superstructure aft. It was suspected that the side trawling arrangement would not be suitable; however, the vessel was so rigged and by July 31, 1967, fishing trials were under way. The greater length and resistance of the midwater trawl, compared to bottom trawls, resulted in much lost time while shooting and hauling, as well as poor steerage while towing. Consequently the side rig was only fished

for one week, after which the vessel was taken back to the shipyards and converted to a stern trawler.

Stern trawling immediately proved successful and the "Lady Anna" began to make good catches. However, from time to time small modifications, such as the addition of a stern roller, had to be made before the rig operated to our complete satisfaction.

In spite of the limited deck space aft of the housework, four feet between the housework and the aft bulwarks, it has proved adequate to handle the midwater trawl. The procedure of handling consists of hauling the wings over the stern, one set on each side of the deckhouse, up the entire length of the deck until the bosom section comes up tight to the housework. A cinching line is then placed around the bellies and allowed to traverse half their length, impelled by the propeller wash so that the line can be cinched and hove in to bring the bellies over the stern, after which the codend is brought around to the starboard side, so that the herring can be removed either by splitting or pumping.

The stern trawl arrangement allows the "Lady Anna" to shoot and haul her trawl as rapidly as a stern ramp trawler, with the exception, of course, that the catch must be removed by splitting or pumping. However, the splitting arrangement works extremely well and the herring can be taken aboard at the rate of a ton or more per minute. (This could be improved by increasing the size of each split.) Special dry-up spools were made, one mounted at the end of the boom and the other at the forward starboard end of the boat deck, which allow the codend to be kept alongside the vessel in windy weather. This arrangement also keeps the spread between the lifting point and the dry-up point, preventing the codend from kinking (which kills the herring very quickly when splitting in the normal fashion, causing them to sink and be heavier to dry-up), thus allowing a greater quantity of herring to be handled.

Pumping was not found to be worthwhile, to remove quantities of less than 25 tons, because of the time lost in preparing for the operation. However, it worked extremely well in handling larger catches. It was of particular value in removing ripe spawning herring because passing them through the pump, piping and fish-water separator removed much of the spawn, which is a nuisance when mixed with the herring in the hold, as it tends to plug drains and pumps. Pumping also makes it easier to handle large catches of spawn herring (which are heavier than equivalent quantities of non-spawners) as there is only one continuous drying-up operation, compared to the repeated drying-up and slacking back process of splitting.

Steering, while trawling with the stern trawling rig, has proved completely satisfactory, even in some of the strongest currents, whereas it was almost impossible with the side trawling arrangement.

Originally the "Lady Anna's" trawl winch was driven by the main engine's front end power takeoff, but because of the need, in midwater trawling, of being able to haul while towing at full power, a winch engine was installed. Despite the long wait for delivery of the winch engine, which delayed the fitting out of the "Lady Anna", it was considered to have been well worthwhile, as the arrangement proved to be far superior to the original drive.

The "Lady Anna's" catch of herring, between July 31 and November 5, was about 1100 tons, caught in approximately 119 productive tows out of a total of 157 tows.

Although the total catch was not large because of the fishing time lost in converting to stern trawling and the subsequent modifications required, individual catches were very good and indicated the great potential of the method.

The first good catches were made on the Bay of Fundy side of Digby Neck, Nova Scotia, and ranged from one to 40 tons per tow. The catches consisted of large and small (immature) herring, as well as spawn herring (which were not ripe), with the composition varying considerably from day to day and even from one tow to the next.

Herring in the Digby Neck area appeared to be very active and were not easily caught, and the best results seemed to be achieved in towing against the tide. A good number of tows were also made in the Lurcher Lightship area off Yarmouth, but none of these catches were of any consequence. Part of the reason was that the good schools of herring seemed to appear only at night, at which time seiners were very active and fishing among them was made hazardous by the fog that prevailed throughout the season.

By contrast, herring in the Digby Neck area were caught during daylight hours, when they were too deep for purse seining; consequently most of "Lady Anna's" fishing was carried out in that area of the Bay of Fundy.

When foreign trawlers began making good catches on Georges Bank, the "Lady Anna" shifted to that area and immediately ran into heavy catches of ripe spawn herring, which caused problems. A number of hauls which exceeded 100 tons were lost, as they were simply too heavy for the codend and the vessel's rigging. Heavier netting had to be put into the codend, and the strength of the rigging increased. Spawn herring are much heavier in the water than non-spawners and are usually more tightly schooled and less active, and die much more rapidly once captured.

It was found necessary to limit the tows to no more than five minutes of trawling time, otherwise the problem of too large catches would result. A half

dozen strokes of the net recorder pen were enough to indicate a full codend. To prevent excessive catches, a zipper was designed to let anything in excess of 70 tons escape alive while towing or when the net was being hauled. The zipper consists of a 25-foot longitudinal opening in the underforward part of the codend. Half-inch nylon rope is laced to the edges of the opening and metal rings are lashed to this rope at regular intervals, opposite to each other, so that a half-inch nylon rope can be rove through and secured at each end to close the opening. The openings between rings are fairly large while the trawl is fishing, but it was felt that escapement by this means was insignificant. A choker line encircling the codend at the after end of the zipper, when hove on as the codend is being brought alongside, ensured that any surplus quantity was cut off from the codend and could escape through the zipper bights.

By October 14, when the gear and equipment had been modified to handle heavy catches, the herring were thinning out on Georges Bank, so the "Lady Anna" moved to Jeffries Ledge, where the purse seiners were doing well. She immediately made good catches, and as the herring contained no spawn they were easy to handle. No problems were encountered catching herring during the day or night, and the hauls ranged from five to 60 tons. On one occasion towing for too long resulted in the bursting of the codend. This would not have occurred except for the fact that the openings in the zipper had been closed with seizings of twine. By November 5 very few herring were to be found and the "Lady Anna" again had to shift grounds.

On November 9, while looking for herring on the southeast edge of Stellwagen Bank the "Lady Anna" ran into what might be considered the "bonus" of the project. Shooting on what was thought to be a school of herring, extending from the sea bed to 10 fathoms off, in 34 fathoms of water, about 13 miles northeast of Cape Cod, the vessel pulled up a large haul of pollock which burst the codend.

Arrangements were then made for the sale of the pollock, and the "Lady Anna" set out to see what could be accomplished. From November 7 to November 30, in four short trips, the vessel caught 532,000 pounds of pollock in a total of 16 tows, of which only 12 were productive, with the largest single haul yielding approximately 121,000 pounds. Bad weather spoiled the last trip, otherwise the catch might have been considerably higher. However, November 30 saw the end of the 1967 project and the vessel was taken to Meteghan, N.S., for further modifications before proceeding to Newfoundland to carry out midwater trawl experiments there.

Although the "Lady Anna's" total production was not large, numerous good catches demonstrated that the method had potential and showed that scallopers and side trawlers could be converted to stern trawling to fish midwater trawls successfully

It is not our intent of course to imply that such a vessel is superior to a bona fide stern trawler, especially one with a ramp. However, it was demonstrated that vessels of the side trawler type can be converted to stern trawling so that they can successfully fish the long midwater herring trawls.

"Lady Anna's" gear is the standard German midwater trawl gear, developed by Dr. Shärfe, and was purchased directly from the Hermann Engel Net Factory in Kiel, Germany.

Two sizes of trawls were used by "Lady Anna", one 1400 meshes in circumference and the other 1200 meshes, with the former getting the greater usage.

The trawls are made of high tenacity nylon netting and are rectangular in cross sections, with the top and bottom panels being equal in width, while the side panels are narrower.

The upper and lower headlines are equal in length and measure 189 feet, while the side headlines measure about 175 feet each, and the over-all length is approximately 350 feet, stretched.

Mesh sizes begin with 8-inch in the wings and first belly section diminishing to 6-inch and then 4-3/4-inch meshes in the next belly sections, followed by 1-1/2-inch mesh throughout the codend.

The steel doors are of the German Süberkrüb curved type, standing 10 feet, 8 inches in height, and 5 feet in width. They weigh approximately 1300 pounds each.

The sweeplines are 30 fathoms in length, plus 5 fathoms of door legs, with the lower sweeplines being about 3 feet longer than the upper. Both are made of half-inch diameter cable while the door legs are made of three-quarter-inch diameter cable.

A 350 pound lead weight attached to each lower wing tip and 150 pounds of chain fastened along the footrope, together with approximately eighty 8-inch plastic floats, (of the non-fouling type) siezed to the headrope are used to open the trawl vertically.

"Lady Anna's" electronics, which are essential for midwater trawling, include an Elac net sounder unit, Simrad Sonar, Simrad echo sounder and a Walker trawler log with its pitot head in a hull fairing. The vessel is of course also equipped with auto pilot, Loran and Decca Navigator.

It was expected that some time would elapse following the initial experiment for the "Lady Anna" to prove the profitability of midwater trawling on a commercial basis. This will probably take one to two years.

Unlike the German and European stern trawlers (factory and fresh fish) which catch herring for human consumption at relatively high prices, the "Lady Anna" and other Canadian trawlers engaged in midwater trawling must sell their catches for processing into meal and oil at much lower prices. Consequently they must catch large volumes, which are likely to greatly exceed the catch of the much

larger European trawlers. Thus far, the most time consuming and costly part of the "Lady Anna" project was learning where and when to fish, and this cost will of course naturally be borne by industry in its pioneering efforts.

"Brandal", the First Canadian Stern Ramp Trawler to Engage in Midwater Herring Trawling

"Lady Anna's" heavy catches spurred Mr. Brian Meagher, Nova Scotia Deputy Minister of Fisheries (with technical advice from the federal Department of Fisheries), to interest Karlsen Shipping Company of Halifax, to rig their 136 foot L.O.A., 1200 h.p. stern ramp trawler "Brandal" for midwater herring trawling.

Rigging of the "Brandal" began in December 1967, but fishing operations did not begin until the last week of February 1968.

Under command of Captain Helge Brandal, fishing in the Port Aux Basques area off southern Newfoundland and off Bird Rocks, Quebec, from March 5 to April 17, the "Brandal" landed approximately 1450 tons of herring in 100 tows spread over 6 trips. The best day's fishing produced over 180 tons, and the largest single tow hove up the ramp was estimated at better than 60 tons. Several tows estimated to exceed 100 tons each were made, with the surplus being released because 60 tons was about the maximum amount that could be hove up the ramp.

Of the 43 days fished, March 5 to April 17, 10 days were lost in steaming back to Nova Scotia to unload and make modifications to the vessel, while another three days were lost due to a minor salvage operation, bringing the total fishing period to no more than 30 days.

Considering that the entire crew was new to midwater trawling, the "Brandal's" catch was felt to be very good in view of the short period of operation, and showed that the method could prove profitable to Canadian stern ramp trawlers at that

time of year. Again, it must be emphasized that the herring were sold for processing into meal and oil at relatively low prices compared to those received by European stern trawlers, which sell their catch for human consumption.

The "Brandal" fished a 1400 mesh trawl similar to that of "Lady Anna" except that it was made of heavier twine in the wings and bellies, and employed a much heavier but slightly narrower codend. The 5-square-metre Süberkrüb doors were exactly the same. However, the sweeplines were lengthened to 40 fathoms and the cable diameter increased to 5/8-inch, while the wing tip weights were increased to 500 pounds each.

Most of "Brandal's" catch was made in the Port Aux Basques area from abeam of Rose Blanche to Cape Ray and in Georges Bay, in depths of water ranging from 50 to 250 fathoms. The herring were captured in depths ranging from 5 fathoms to 140 fathoms below the surface. (It should be noted that most of these herring were caught well off the sea bed, with only a few being caught adjacent to the sea bed.)

Part of the catch of the last trip made was taken along the 110-fathom edge, adjacent to the sea bed, off Bird Rocks in the Magdalen Islands area of Quebec in the Gulf of St. Lawrence.

Another large body of herring was discovered along the northeastern shore of Nova Scotia, extending some 30 miles or more south of Canso, within five miles of the shoreline.

The "Brandal" found the herring easy to capture except at night, when they came near the surface and were very dispersed. Again the greatest problem was to learn where and when to fish.

It should also be mentioned that much of "Brandal's" catch was taken at the edge of the Gulf ice and on many occasions tows were made in open channels between

the ice. As the vessel was also built to go into the ice, after seals, this feature was much appreciated as there were no worries about travelling through the strings. The usual strengthening of trawlers for ice is not sufficient to travel through ice as the "Brandal" can.

Because of the need to rapidly empty large quantities of herring directly into the hold, the existing facilities for putting down groundfish were unsuited. "Brandal's" engine room is aft, and the hold forward, therefore, putting the herring down through the fish flap, at the top of the ramp, would necessitate shovelling the herring onto the conveyor belt to take them forward to the hold, which is a slow process. The problem was solved by putting manholes in the top deck as far forward as possible and installing chutes directly under them which fed into the hatches in the 'tween deck. An opening called a zipper was rigged in the forward end of the codend so that it could be opened over the manholes, after which the aft end of the codend was raised to empty it.

At first some problems were encountered in learning to handle the codend, but once these were solved the method was found to work very well and a 50-ton catch could be put below in 15 minutes or less.

After discharging her last trip on April 17 at Harbour Breton, Newfoundland, the "Brandal" left for Halifax, N.S., to take up charter work of a scientific nature, with the Fisheries Research Board of Canada, which had been arranged for prior to the herring fishing project.

The vessel completed this work and has at this time just returned to midwater trawling on a commercial basis and as yet no catch statistics are available.

Before concluding on the "Brandal", I would like to mention that on two occasions codfish were caught in midwater in the area off Port Aux Basques, Newfoundland.

One haul yielded some 1500 or more pounds of cod which were caught 24 fathoms off bottom in about 110 fathoms of water in about 20 minutes towing time. The second yielded a similar amount which were caught 8 to 10 fathoms off bottom in 100 fathoms of water in a 15-minute period.

"Lady Anna" in Newfoundland

Prior to the "Brandal" arriving in Newfoundland the "Lady Anna" arrived from Nova Scotia, early in January, to carry out midwater trawl experiments in a Newfoundland and federal Department of Fisheries cost sharing project.

Unlike the "Brandal" which fished offshore, the "Lady Anna" carried out experiments in the inshore waters being fished by purse seiners. During the month of January the vessel explored the eastern bays of the south coast but found little herring. When she arrived in the Ramea to Connoire Bay area where the seiners were making good catches, she also began to produce good results. During February in one 12-day period the "Lady Anna" caught 850 tons of herring in Connoire Bay west of Burgeo. The bay is very shallow with depths ranging from 8 to 12 fathoms and it was necessary to rig the trawl differently in order to fish the area successfully. The top sweep lines were lengthened 3 feet more than the lower ones and the 350-pound wing tip weights replaced with 50-pound weights. As Connoire Bay is small in area and the herring were near the shoreline it was necessary to drop the trawl almost on the shore when setting. Unfortunately, after picking up interested fisherman visitors in Grand Bank, Newfoundland, the "Lady Anna" struck a rock enroute back to Connoire Bay and was put out of commission for about a month, thus terminating the charter work.

When the vessel returned to commercial operations she did catch a load or two off Port Aux Basques and in the Bird Rocks area. However, we do not have the catch statistics at the present.

After leaving Newfoundland and returning to southern Nova Scotia, "Lady Anna's" catches were poor during spring and early summer but improved late in the summer and during the fall. Unfortunately the catch statistics are unknown but it was learned that she landed a number of capacity cargoes from the Bay of Fundy, Georges Bank and Jeffries Ledge areas.

"Suzanne P."

During the fall of 1967 Superior Sea Products of Yarmouth, N.S. became interested in the "Lady Anna's" results and chartered two 118-foot 650 h.p. Dutch type rampless stern trawlers for conversion to midwater trawling and requested technical assistance from the Industrial Development Service.

This Service subsequently engaged Mr. Wilbert D'Entremont, mate and part owner of the "Lady Anna", on a contract basis, to rig the "Suzanne P." for mid-water herring trawling and instruct the skipper, Cecil Garland, and his crew in fishing the gear.

Rigging began in December of 1967 and was completed in February of 1968 after which the vessel sailed to Newfoundland where she assumed the remaining month of "Lady Anna's" charter work.

"Suzanne P." operated mainly in the Port Aux Basques area fished by the "Brandal" but was continually plagued with winch trouble. Despite this she managed to make some excellent hauls.

She fished identical gear to that of "Lady Anna" and although she only has 650 h.p. it is augmented by a fixed Kort Nozzle which allowed her to tow the gear almost as well as the "Lady Anna" which has 765 h.p. and a fixed pitch towing propellor.

In the early spring the "Suzanne P." started to fish herring on a commercial basis and made some fair catches in the Bird Rock area off the Magdalen Islands, P.Q.

Unfortunately, we do not have the vessel's catch statistics, but it is thought to be less than 1,000 tons. However, the vessel would probably have given a good account of herself but for being plagued with winch problems.

"Louise P." and "Scotia Bay"

In spite of the problems, "Suzanne P." caught enough herring to encourage Superior Products to rig the sister ship "Louise P." as well as the 118-foot, 765 h.p. stern ramp trawler seiner "Scotia Bay" for midwater herring trawling.

Due to technical and crewing problems the two former vessels did little during the past summer, although the "Scotia Bay" under the command of Captain Garland managed to make some fair catches during that period and has shown gradual improvement since. Again we are unable to offer any catch statistics.

Superior Product's experiences tend to indicate that winches which are powerful enough for groundfish trawling are not powerful enough for midwater trawling and those contemplating converting to the latter method would do well to take cognizance of that fact.

"Lady Julie"

Last spring Comeau Sea Foods Ltd. commissioned a new combination purse seiner trawler named the "Lady Julie" which is of wood construction, measuring 107 feet L.O.A., having 765 h.p.

"Lady Julie" was first rigged as a midwater herring trawler and fitted with a trawl drum to handle the trawl. After two or three short trips, however, she was converted to a purse seiner.

Captain Guy D'Entremont, skipper of the "Lady Anna" took command of the "Lady Julie" during the summer and operated her as a seiner until this fall when he changed back to midwater trawling. He felt that he could do better midwater

trawling in the fall and winter, during the periods of bad weather, and as he has just begun fishing no catch statistics are available.

"J.B. Nickerson" Project

Encouraged by the results of the "Brandal" and the "Lady Anna", taking special note of the incidental catches of pollock and groundfish, the federal and Nova Scotia Departments of Fisheries decided to embark on another project, to midwater trawl herring and groundfish using a larger and more powerful stern ramp trawler.

As a result an arrangement was made with the H.B. Nickerson and Sons Limited Fish Company of North Sydney, N.S., to rig their stern trawler "J.B. Nickerson" for midwater trawling.

"J.B. Nickerson" is a 156-foot L.O.A. stern ramp trawler having 1525 h.p., which operates out of the company's Riverport, N.S., plant and is skippered by Captain Leo Mersey of Lunenburg, N.S.

Rigging of the vessel got underway in June of this year and fishing operations began in the latter part of July. The first trip was an attempt to midwater trawl groundfish and most of the grounds from Sydney Bight, along Nova Scotia's eastern shore, southward to Brown's Bank and the northern part of Georges Bank as well as the Bay of Fundy were covered. Very few groundfish were to be found in midwater and the catch consisted of six haddock and two pollock, which were consumed by the crew during the trip.

Any groundfish caught by trawlers working the areas fished remained so tight to the seabed as to scarcely be seen with a white line echo sounder.

It was therefore decided to postpone further attempts to midwater trawl groundfish until the winter months, when good quantities of groundfish are known to be found in midwater and instead, to send the "J.B. Nickerson" after herring.

On August 19 the "J.B. Nickerson" left Riverport and steamed for Sydney Bight, where herring had been seen on the first trip. However, none were found so the vessel headed for American Banks off Gaspé, P.Q., where the purse seiner were reporting good catches.

Good fishing was immediately encountered on American and Orphan Banks and from August 19 to September 12, when the vessel returned to Riverport for a brief period, she had landed 1625 tons of herring in 5 short trips. The vessel could easily have landed in excess of 2000 tons during this period, but limited plant capacity at Caraquet, N.B., and heavy landings by seiners necessitated taking one trip to Canso, N.S., and one to Pubnico, N.S., which owing to the distances involved, caused a considerable loss of fishing time.

The trip landed in Pubnico, amounting to 427 tons of herring, was record breaking inasmuch as the "J.B. Nickerson" caught 487 tons in 30 hours and 20 minutes of fishing, from start to finish, in 12 tows. When the hold was loaded, the last haul containing 60 tons or more had to be carried in the codend on deck, but bad weather during the last eight hours of the voyage completely destroyed it.

After leaving Riverport on September 17 the "J.B. Nickerson" landed an additional 648 tons of herring in five trips up to October 16.

The vessel has been able to catch herring either during the day or night time and has made numerous good hauls within five fathoms of the surface during the night time. There were some occasions during the day light when the herring were quite shifty and hard to catch, but such times were few in number.

The vessel has been able to heave as much as 80 tons aboard in a single pull and as the engine room is located aft the codend is emptied through the forward end directly into a hatch leading to the fish hold. There is some difference in the

technique compared to the "Brandal" inasmuch as the codend was not rigged with a zipper. A section of the aft part of the hatch coaming was made removable so that the forward part of the codend can be hauled directly into the hatch opening, after which a hole two to three feet in length is cut in the codend to release the herring. The forward part of the codend is suspended by a foremast tackle and the aft end of the codend lifted by joined tackles from the aft mast and foremast to empty it. Only five minutes or so are required to mend the hole and the mending is of small consequence as the codend, especially the cover, does not last too long owing to chafing caused in the ramp and on the deck.

The codend cover, which costs about $1,000, was found to be one of the greatest expenses of midwater trawl gear because of its short life of approximately five trips.

"J.B. Nickerson" has demonstrated that large quantities of herring (larger than the writer had believed possible) can be caught by stern ramp trawlers fishing midwater trawl gear and indications are that the method can prove profitable for such vessels.

As stern ramp trawlers with 'tween decks were not designed to carry heavy cargoes such as herring, which loads the lower freeboard deck under the water, it was necessary on both the "J.B. Nickerson""and the "Brandal" to weld closed all offal and freeing ports, and install shutoff valves on all vulnerable sanitary discharges as well as provide drainage and pumping facilities for the 'tween deck.

"J.B. Nickerson's" electronics for midwater trawling consisted of an Elac net sounder unit and Sonar as well as a Walker log and two Simrad white line echo sounders, plus the usual electronic navigational aids.

The vessel fishes a 1600-mesh German Engel type midwater trawl with five-square-metre Süberkrüb doors. One hundred and sixty fathom sweeplines are used and 795-pound wing end weights. Vertical opening of the trawl at normal trawling speeds ranges between 11 and 13 fathoms.

The vessel is also equipped with the latest German Super Trawl, supplied by the Hermann Engel Net Factory, Kiel, which has 22-inch meshes in the wings and first belly section, followed by 16-inch meshes. This large mesh section is attached to the entire body and codend section of a 1400-mesh trawl. The Süberkrüb doors have an area of seven square metres each and the wing and sinkers weigh about 1200 pounds each. Vertical opening of the trawl varies between 16 and 20 fathoms depending on the trawling speed, in fact the opening was too great to permit the use of the trawl in the relatively shoal waters fished in the Gulf of St. Lawrence. However, it is hoped that the gear can be used in the deeper waters off southern Newfoundland during the coming winter.

Cost of Midwater Trawl Gear

The cost of midwater trawl gear for vessels of "Lady Anna's" size and power is approximately as follows:

One completely rigged 1400-mesh trawl	$ 4,000
Spare netting parts and twine	$ 1,500
One set of 5-square-metre Süberkrüb doors	$ 1,150
Sweeplines, weights and hardware	$ 1,000

Cost for vessels such as the "Brandal":

One completely rigged 1400-mesh trawl	$ 5,500
Spare netting parts and twine	$ 3,000
One set of 5-square-metre Süberkrüb doors	$ 1,150
Sweeplines, weights and hardware	$ 1,500

Cost for vessels such as the "J.B. Nickerson":

One completely rigged 1600-mesh trawl	$ 6,500
Spare netting parts and twine	$ 3,800
One set of 6-square-metre Süberkrüb doors with extra reinforcing	$ 1,400
Sweeplines, weights and hardware	$ 2,000

Cost of Electronics

One net sounder unit of the Elac or Atlas type with 800 fathoms of conductor cable, spare transducer and repair kit for cable	$ 13,000
One sonar set of the recording type having not less than 1500 metre range	$ 10,000 to $ 15,000 (depending on the make)
One indicating log such as the Walker Neptune N3000, with pitot head in fairing for running through ice	$ 3,750

Cost of Conversion of Vessel

The cost of alterations on the deck and in the fish hold for a vessel such as the "Lady Anna" can run as high as $65,000, especially if a winch engine, costing $15,000, is included. Normally conversion work to the deck, hold and rigging should cost approximately $15,000 if a winch engine is not required.

The costs vary considerably and depend, of course, on the modifications required.

Vessels such as the "Brandal" and "J.B. Nickerson" do not require major modifications. Modifying the deck to handle the codend will cost approximately $1,000. Making the 'tween deck watertight, $500 to $2,500. Fixing the fish hold -- installing proper drains, making the lining watertight, $500 to $1,000. If existing pen boards are not suitable to stop the herring from shifting, installation of proper pen boards and bulkheads could run as high as $4,000.

The total cost of rigging a 135- to 165-foot stern ramp trawler for midwater trawling is likely to run between $50,000 and $75,000, if ample spare gear is purchased and all electronics such as net sounder, sonar and a log are purchased.

It is possible, but inconvenient, to fish without a sonar or a log and cut $15,000 to $18,000 from the above costs. The sonar is not required when fishing on extensive bodies of herring. However, most of the time, the vessel must operate on small isolated plumes and the sonar therefore certainly pays for itself. It is hard to directly relate earning power of the log, but it indicates accurately at what vessel speed the herring are caught, when the gear is fouled and whether the vessel is stemming the tide or towing with it. Having once used the log it is hard to do without it, and the only type that is of value for the job is one which has the underwater unit mounted in a fairing to withstand impact from ice when fishing on the southwest coast of Newfoundland. While one may start out without such equipment it will not be long before the skipper will see its value and request it.

The cost of the gear can also be reduced by $8,000 by purchasing only one trawl and spares, one set of doors and one set of weights, but unless the skipper is very skilled in the method it is not a wise move, for obvious reasons. A vessel simply cannot fish without gear!

The "Mary and Jay" Project

Lest it is thought that we have overlooked the smaller inshore draggers I am pleased to report that we have had some success in that field as well.

In the fall of 1967 the New Brunswick and federal Departments of Fisheries embarked on a midwater trawling project using a 65-foot, 380 h.p. wooden side trawler called the "Mary and Jay", owned and operated by Captain James Calder of Campobello, N.B.

The original purpose was to trawl pollock, and then herring if the former could not be caught. It was also intended that the vessel should be fitted out at a reasonable cost, within the reach of owners of small draggers.

It was felt that it was necessary to dispense with the sonar and log, but a net sounder was of course an absolute necessity. However, the types employing conductor cables which are used on the larger vessels were out of the question, from the point of view of cost and space limitation.

The Furuno Electric Company, Ltd., of Nishinomiya, Japan, had recently introduced a net sounder operating on the telemetry principle which was both low in cost and compact, so it was naturally selected for the job.

In September 1967, the "Mary and Jay" was rigged out for midwater trawling, using the existing side trawl deck arrangement and the new Furuno FNR-2 net sounder.

However, owing to the lateness of season no pollock were found and the large mesh codend was therefore exchanged for a small mesh codend, suitable for trawling sardines and herring.

One good haul of sardines, seven tons, was made off Black's Harbour, N.B., but much difficulty was encountered with the side trawl arrangement and the net sounder did not perform satisfactorily for commercial fishing operations.

In 1968, the Furuno Company replaced their net sounder with a new unit, modified to our recommendations, and when it arrived in September the "Mary and Jay" was put back on charter.

This time the vessel was fitted out as a stern trawler, similar to the "Lady Anna". As the season was again too late for pollock, the vessel set out after sardines and herring.

With some technical adjustments the net sounder performed satisfactorily and, as was the case with the "Lady Anna", the stern trawling arrangement proved

completely successful. The vessel has already begun to make good catches and has taken as much as 10 tons of sardines in a single haul. That is all that can be reported up to this time.

Mr. Wilbert D'Entremont, employed by the federal Department of Fisheries on contract as a midwater trawl specialist, who was in charge of the "Mary and Jay" project, reported that the "Mary and Jay" worked very well, and felt that this class of vessel could catch large herring as well as sardines.

The "Mary and Jay" trawl is an 800-mesh net which is diamond shaped in cross section, with 8-inch mesh in the wings and first belly section, 6-inch mesh in the second belly section, and 4-3/4-inch mesh in the third belly section, while the forward part of the codend is 1-1/2-inch mesh and the after part 1-inch mesh. The steel doors are of the vertical Süberkrüb type with curved cross sections, 8 feet 6 inches in height by 3 feet 6 inches in width. The sweeplines are 40 fathoms in length, with lower sweeplines being about 3 feet longer than the upper, and are made of 3/8-inch diameter cable. The lower wing tips are held down by lead weights of approximately 150 pounds each.

Cost of Rigging "Mary and Jay"

Trawl	$ 1,800
Spare for trawl	$ 600
Süberkrüb doors, approximately	$ 850
Weights, sweeplines and hardware	$ 700
Furuno FNR-2 net sounder	$ 4,000
Modifications to vessel for stern trawling and net sounder installations approximately	$ 4,000

Total cost, about $11,950. Actually the "Mary and Jay" total cost was about $14,000, owing to the purchase of ample spare netting and hardware.

While the "Mary and Jay" experiment appears to show potential, the vessel will have to operate for some time to prove the viability of the method. Captain James Calder is pleased with the early results and plans to fish sardines for human consumption during the winter, and perhaps try fishing herring in the summer of 1969, when they appear in the Bay of Fundy.

"Royal Canadian" Pacific Project

As everyone knows the herring stocks of British Columbia failed to appear in their usual abundance in the inside waters during the fall and winter seasons of 1966 and 1967, with the result that herring fishing other than for bait and human consumption has not been permitted.

As a result the Fisheries Research Board of Canada and the federal Department of Fisheries embarked on a program of exploration to see if herring could be located in quantity on offshore grounds during the summer months.

Midwater trawling was selected as the means of collecting samples and as a result the new 101-foot L.O.A. 750 h.p. combination seiner-trawler "Royal Canadian", owned by the Radil family of Vancouver, B.C., was chartered to do the job.

The federal Department of Fisheries advised on the selection of the gear and electronics, and sent Mr. Wilbert D'Entremont to British Columbia to act as the fishing instructor.

Exactly the same gear as is used by the "Lady Anna" was selected for the "Royal Canadian".

The Fisheries Research Board was very satisfied with the midwater trawl for sampling, as well as with Mr. D'Entremont's guidance in teaching the skipper and crew, who had no previous trawling experience, how to fish the gear.

Although no large stocks of herring were found and the tows were necessarily short, some good hauls (up to 15 tons) were encountered.

Captain Albert Radil, who is an outstanding purse seine skipper, was immediately impressed by the efficiency of the gear, especially for fishing off-shore, and became a convert to midwater trawling. Captain Radil states that in the event of a recorvery in the Pacific herring stocks he is sure they can do well with the method. The method also caught the interest of a number of British Columbia trawler fishermen.

The Technique of Midwater Trawling

Midwater trawling is an instrumented method of fishing. Herring are first located with sonar as to direction, and as the trawler passes over the school their depth is ascertained by echo sounder. The trawl is then adjusted to the correct depth by use of the net sounder, which finally indicates whether or not the herring are being caught.

Midwater trawling requires far more skill than bottom trawling and perhaps even purse seining. Contrary to popular belief, depth control is not a major problem and while part of the function of the net sounder is to ascertain the depth of the trawl, a more important function is to determine whether or not herring are entering the trawl. The trawl may be at the correct depth, but if it is not towed at the correct speed the herring may not be recorded by the net sounder as entering the trawl. Trawling speed varies with the physical state of herring (spawning and non-spawning), with the depth and clarity of the water, water temperature, season, time of day and tidal currents. It is quite possible to tow too slowly or too fast.

Once herring have been viewed on the ship's echo sounder but not by the net sounder, after a reasonable period of time, provided that the trawl is at the correct depth, it can be assumed that trawling speed needs to be increased to catch up with the herring. If the trawl is at the correct depth and the herring pass under

the footrope, trawling speed may have to be decreased. On such occasions the change in speed should be slight and done by degrees in order to test the effect.

Accordingly, when trawling speed is increased, warp may have to be paid out or hove in, in order to keep the gear "in the herring", particularly if the vertical distribution of the school is narrow. However, on many occasions the vertical distribution of the school may be great enough to keep the trawl "in the herring" even though a change in speed has changed the depth of the trawl.

When herring are "spooky", special attention must be paid to the time of day. From morning to late afternoon, herring usually have a tendency to descend when frightened, but in the evening will have a tendency to rise. Consequently they may pass under or over the trawl. It may be necessary, therefore, to tow deeper and literally drive the herring to the sea bed where they become trapped, or tow shoaler, forcing them to the surface to be captured.

In areas of strong tidal currents special attention should be given to the direction of the tow, which should if possible, be either diametrically into or against the current. Towing across the current should be avoided, because the drift of the trawler makes it very hard to "strike" the school with the gear, particularly if the horizontal distribution of the school is small. Towing across the tide also distorts the shape of the gear. The problem is further compounded by the fact that herring tend to stem the current, making it easier for them to avoid capture. On many occasions it will be found that herring cannot be captured when towing with the current, irrespective of speed adjustments, and contrary to popular belief can be captured with ease towing against it. Here ample towing power becomes critical. This will be found to be especially true of spent herring or those in which the spawn is not fully developed. Herring which are "ripe", or

nearly ready to spawn, can be caught with ease towing in either direction. As might be expected, there are many occasions when no amount of manouevering appears to outfox the herring, and only persistence will result in their capture.

On the subject of depth control, a net sounder is only an aid to midwater trawling, just as radar is only an aid to navigation, and if one does not know how much warp to use at various trawling speeds the net sounder is of little value. Many are of the belief that it is only necessary to acquire the gear and net sounder and simply begin fishing, learning the appropriate warp lengths as they go along. However, this has proved to be a very costly process, not only in gear loss but also in the time lost in making repairs. Owing to the large size of the gear this can take as much as 12 to 14 hours of fishing time or shore leave.

If at all possible, beginners should seek the assistance of the experienced when starting out, as this will certainly be rewarded by productivity and savings in damaged gear.

Should assistance not be available, the net sounder can be used very effectively to learn the fundamentals. The vessel is first taken out to an area where there is ample depth of water and sea room; the gear is shot and the warps stopped at the 50 fathom marks, after which the towing speed is set at, say, 3 knots by the log. When the gear has settled, the depth of the trawl (as indicated by net sounder) is recorded, after which the process is repeated at every 25-fathom mark until the trawl is near the sea bed. Trawling speed is then advanced to the maximum, and the trawl is hauled, repeating the process of net depth recording after stabilizing the gear at every 25-fathom mark until the trawl is nearly at the surface. While the foregoing is satisfactory to obtain a table of warp to depth ratios for the low and maximum trawling speeds, and will give some indications by interpolation of

warp ratios for intermediate speeds, it is advisable to set the throttle at the mean of the two, and shoot the gear away for another set of readings. The resultant table of warp depth and speed ratios will give the skipper the amount of warp required to get to the depth at which he sees herring on the ship's echo sounder. It does not take more than two hours of work to make a set of tables which will be of immense value when beginning actual fishing operations.

When actual fishing operations start, the skipper should select a warp length which allows some reserve trawling speed, so that if an obstruction is encountered, when towing near the sea bed, speed can be increased to raise the trawl over it.

It should always be remembered that one should not attempt to scrape the sea bed when towing across the current, or when turning. The gear banks like an aircraft, dropping the inner door and wing to the sea bed, and even though the net sounder may indicate the footrope as being from one to two fathoms off bottom, damaged gear is bound to result.

One should not be afraid to tow with very short warps, even as little as 60 fathoms, if necessary, when herring are "tight" to the surface at night, as the biggest kind of hauls have been caught using such short warp lengths despite the premise that the vessel noise scares fish away. Admittedly, the gear is not spread to its maximum but this does not seem to matter, as vertical opening seems to be the most important factor in catching herring.

In concluding these remarks on fishing techniques, it is not the intention of the author to give the impression that midwater trawling is overly complex. It is not . However, far more attention must be paid to fishing than in bottom trawling, and it is only necessary to start out in the proper way; the rest will be learned as fishing progresses.

The Need for Good Winches and Rigging

By now it must be apparent that on midwater trawlers the winches are in constant use and have much heavier loads imposed on them than is the case in groundfish trawling. Winches which were satisfactory for groundfish trawling are not proving so for midwater trawling, and usually lack line pull and line speed. More powerful winches are required. This can be said of all the vessels engaged to date in midwater trawling in Canada. Dr. Schärfe has informed me that the same is true of the large German stern ramp trawlers.

Furthermore, it is almost mandatory that the main trawl winches should be operated remotely from the bridge, otherwise fishing is hindered, if the crew must frequently be called to heave in or pay out warp, as is usual during midwater trawling operations.

Method of Co-operation with Industry

As stated at the beginning, the federal Department of Fisheries and the Provincial Departments of Fisheries share the costs of implementing new methods of fishing such as midwater trawling with industry.

In the case of the "Lady Anna", "Brandal" and "J.B. Nickerson", industry participated without necessarily comitting actual cash to the project, in the following manner:

The companies owning the trawlers were not given a per diem charter for an allotted period, as it has been found that such arrangements do not seem to give sufficient incentive to achieve the desired results.

Where it is fairly certain that the project can be made a paying proposition, an agreement is entered into under which the owners are given a lump sum, which is considerably less than the cost of a charter, to cover all expenses for a given

period in which the project is to be carried out, and are allowed to retain the proceeds from the sale of the catch.

The owners must purchase the gear and rig the vessel under the federal Department of Fisheries' direction, crew the vessel and pay all operating expenses, and operate the vessel on a commercial basis, also under the direction of the Department of Fisheries.

Experienced fishing vessel and gear specialists either on contract to the Department or permanent staff members take direct charge of the project, selecting gear and electronics, fitting the vessel out and instructing the captains and crews in fishing techniques.

In giving instruction on fishing techniques departmental representatives do not take over manually, unless asked to do so for demonstrative purposes, but instruct the skipper verbally. However, on deck it is often necessary to demonstrate manually the handling or repair of gear, but the specialist does not double as a crew man unless he so desires.

The skipper is always given free choice of where and when he shall fish, unless there has been a specific request by the Departments of Fisheries to make test hauls in a certain area.

Special provision is also made to accomodate visitors from governmental agencies or the fishing industry, who may wish to see the actual fishing operations.

After the agreed length of time for introducing the method has elapsed, the owners retain possesion of all the gear and equipment, and are expected to continue the project on a commercial basis. They are also expected to report all pertinent information to government and the fishing industry.

This arrangement has been found to work well, as it provides the necessary incentives for all concerned to make the projects a success.

Naturally, where projects are of such a nature that there is a risk of not catching paying quantities of fish, the owners are given a formal charter. The "Mary and Jay" project was such an example. This was arranged because it was not known if a dragger of that size could catch paying quantities of herring or sardines, and especially pollock. Furthermore, the net sounder was so new that problems which would cause loss of fishing time were bound to result.

The Economic Aspect

The final question concerning midwater herring trawling is whether or not the method is profitable.

This cannot as yet be answered because insufficient time has gone by to find this out. It will take at least a year or possibly two to show whether or not the method is profitable to any of the trawlers so engaged.

Once the fishing and gear handling techniques have been acquired the problem is to learn where and when to fish, which is by far the most costly aspect of establishing the method.

A pattern is now emerging whereby midwater herring trawling can be carried out the year 'round, albeit in different areas of the Atlantic coast. Beginning in January herring may be trawled off the southwest coast of Newfoundland up until the first week of April, after which good fishing can be expected for another month off Bird Rocks, Magdalen Islands. Much of the fishing is carried on at the edge of the Gulf ice off southwest Newfoundland, when strings of ice were also present off Bird Rocks.

Another good area of herring schools, which was tested but not exploited, was discovered between Canso and County Harbour, N.S., close to shore, during the last week of March 1968. It is likely they were there sometime prior to discovery.

Herring were also reported on Artimon Bank off Sable Island during January and February by groundfish trawlers. The "Brandal" recorded fish when passing over Artimon Bank late in February, on the way to Newfoundland, but did not make any test tows as the gear was not ready to fish. Much ice was prevalent in the area at the time.

Early in June a few herring, but no great quantities were caught on Georges Bank and the first good catches began to be made in the Digby Neck area of the Bay of Fundy early in July. This lasted into late September. From September to mid-October good fishing occurred on the northern part of Georges Bank and after that good catches were made on Jeffries Ledge off Gloucester, Massachusetts, until about mid-November.

The "J.B. Nickerson", of course, made good catches between August 20 and October 16 on American and Orphan Banks in the Gulf of St. Lawrence. As the purse seiners had good fishing on American Banks beginning early in July, mid-water trawlers could also do well at that time. When fishing ended on American Banks and Orphan Bank in 1966, the few purse seiners in operation shifted to the Bird Rocks area of the Magdalen Islands, where they had good fishing in November and December. Thus midwater trawlers also could probably make good catches in that area during the same time. Midwater trawl catches might also be made in the Bonne Bay area off western Newfoundland from November 15 through December until freezeup time. (Tested by midwater trawling with the 60-foot M/V "Cape Ballard" in 1961 and 1962).

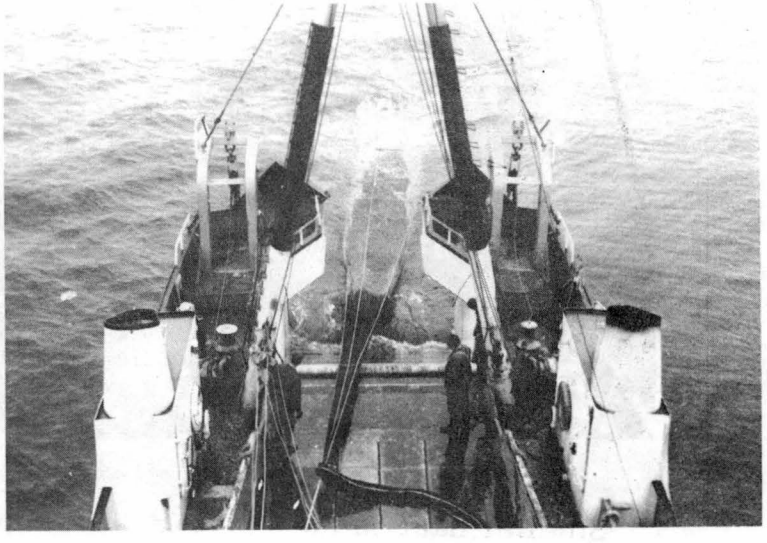
By the time ice becomes a problem in the Gulf of St. Lawrence, fishing will have shifted to the south coast of Newfoundland, at the beginning of the New Year, when good catches should be made.

There is a brief period during May and June when herring have not been caught in quantity by midwater trawlers, but it is felt that they will be, as herring are reported to be abundant by groundfish trawlers on such grounds as Sydney Bight and the Cowpen at that time of year.

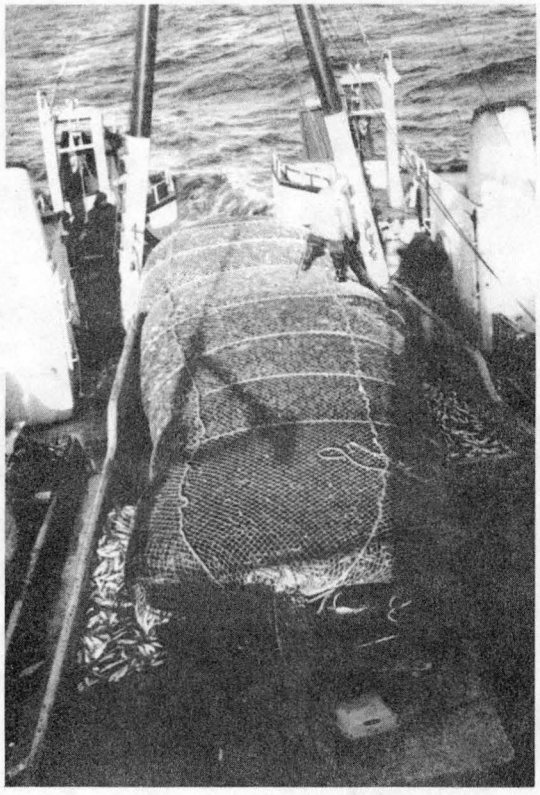
From the areas in which midwater herring trawl catches have been made by several trawlers, it can be seen, since the "Lady Anna" began a year ago, that it is possible for a single midwater trawler to catch herring virtually the year 'round. The catches were heavy enough to indicate that it might be possible for vessels such as the "Brandal" and "J.B. Nickerson" to catch over 15,000 tons of herring in a season, and that at current prices of $20 per ton they could probably make a profit. It would also seem possible for a vessel such as the "Lady Anna" to catch over 8,000 tons or more annually, and this would also likely prove profitable at current prices.

In conclusion, until the fact is accomplished, we cannot state that midwater herring trawling is profitable. However, the present indications are that it is a good gamble.

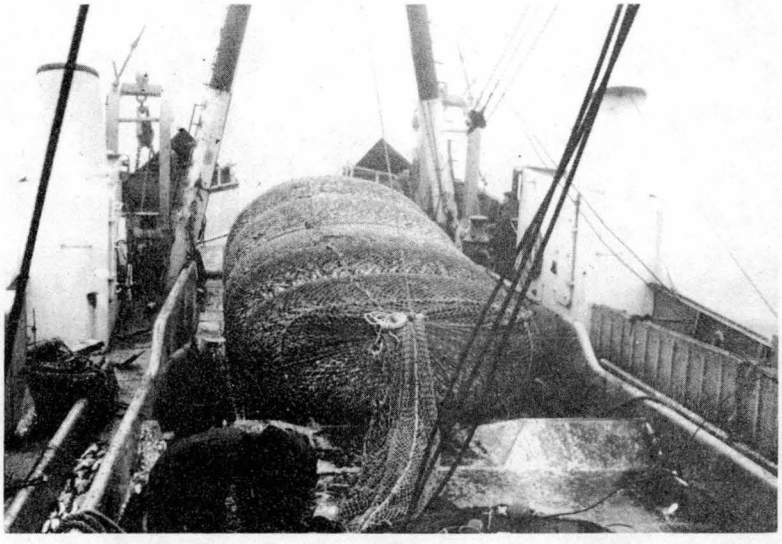
The "Brandal" prior to rigging for midwater herring trawling.



Codend coming up the ramp on the "Brandal".

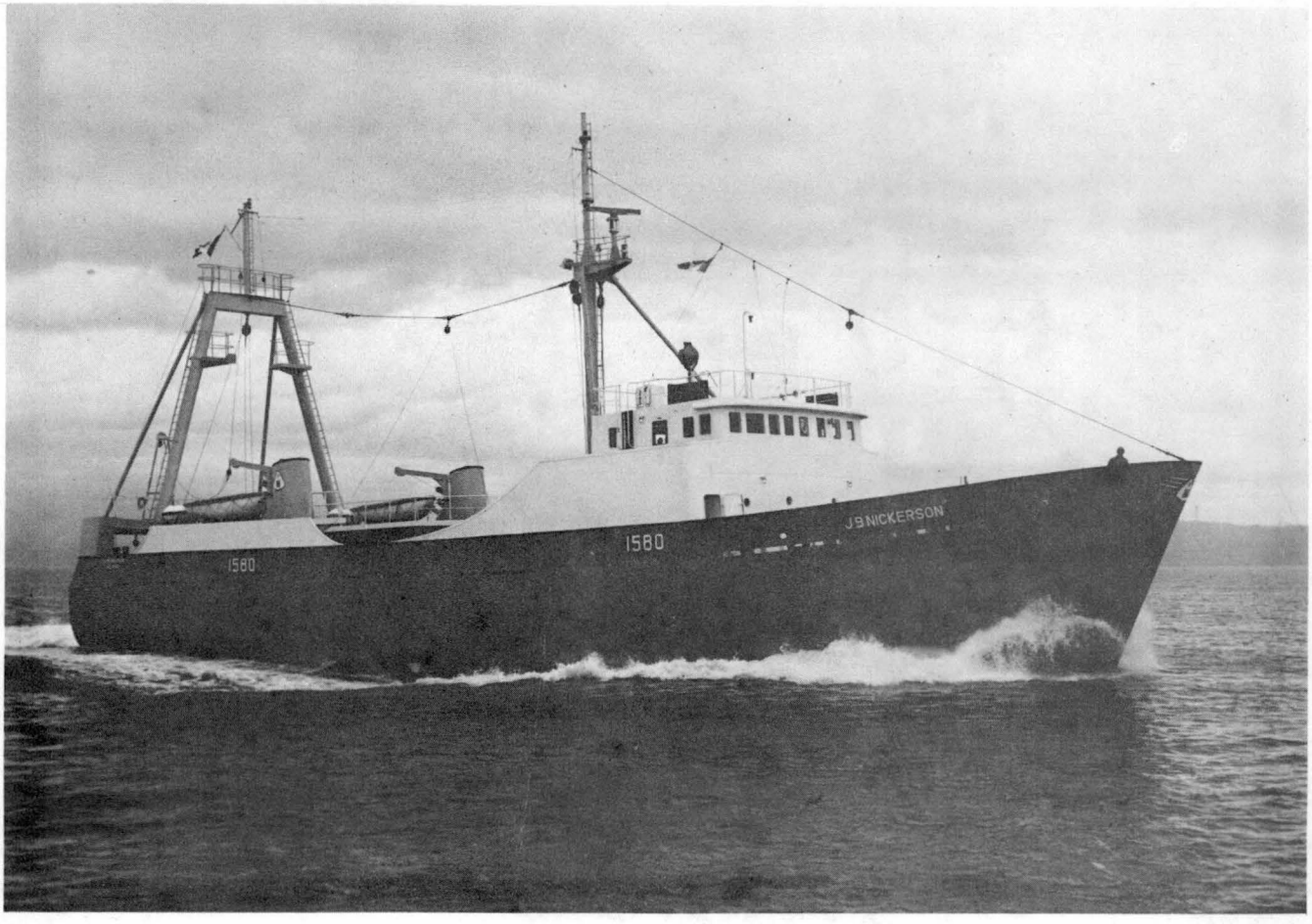


Codend aboard the "Brandal". Approximately 60 tons of herring. Note end overhanging deck into rampway.

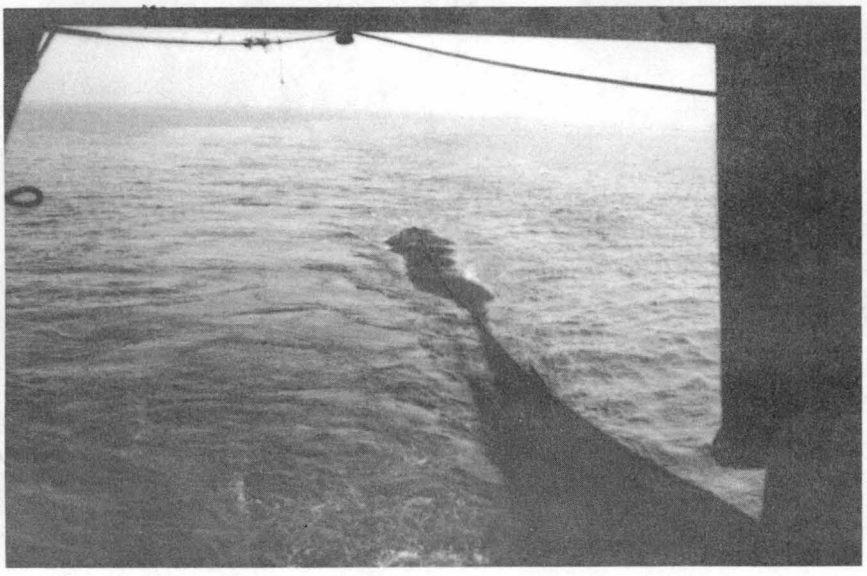


Smaller haul on the "Brandal". Preparing to open zipper to empty catch.

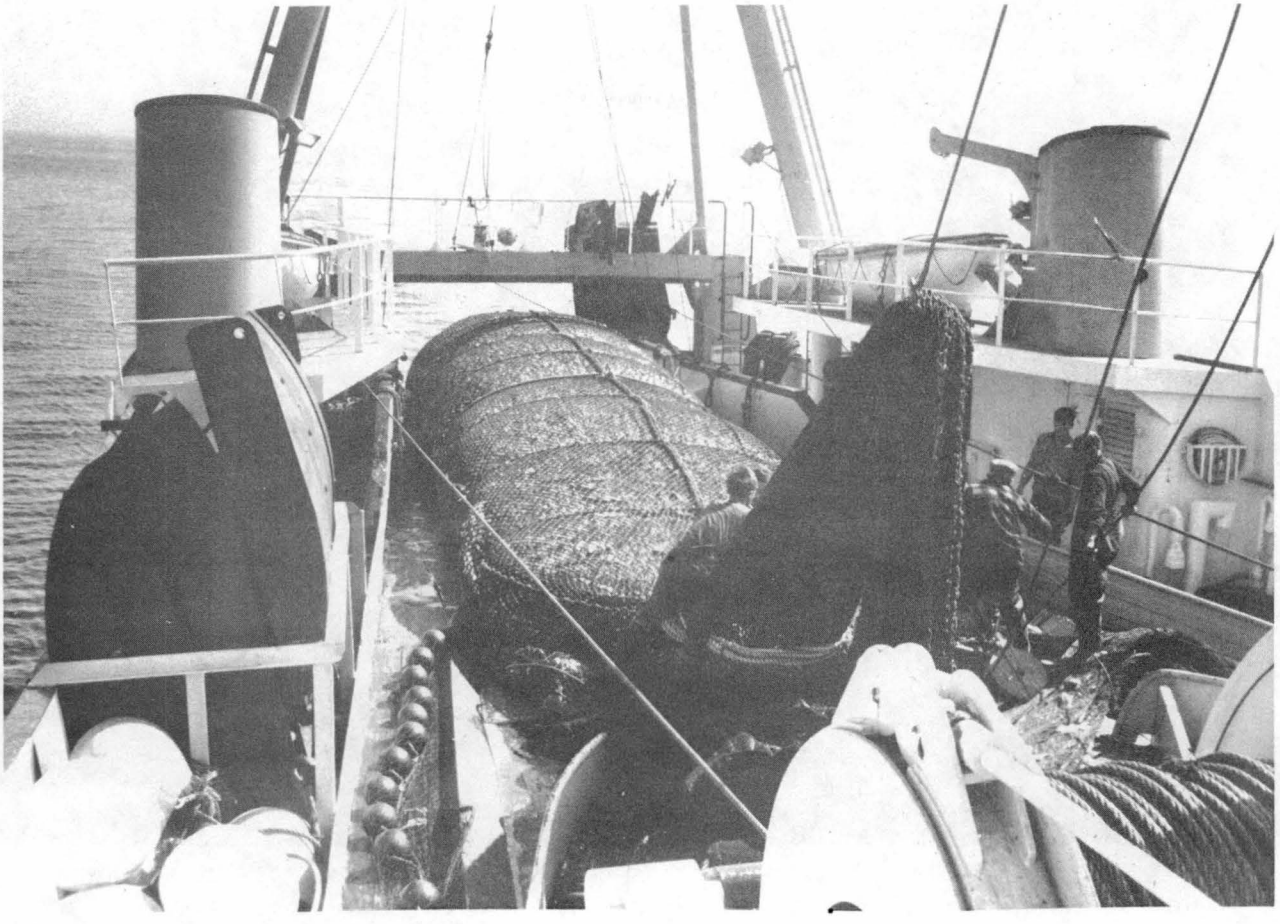
Zipper open on "Brandal". Note end of net about to be hoisted by joint tackles from aft and foremast.



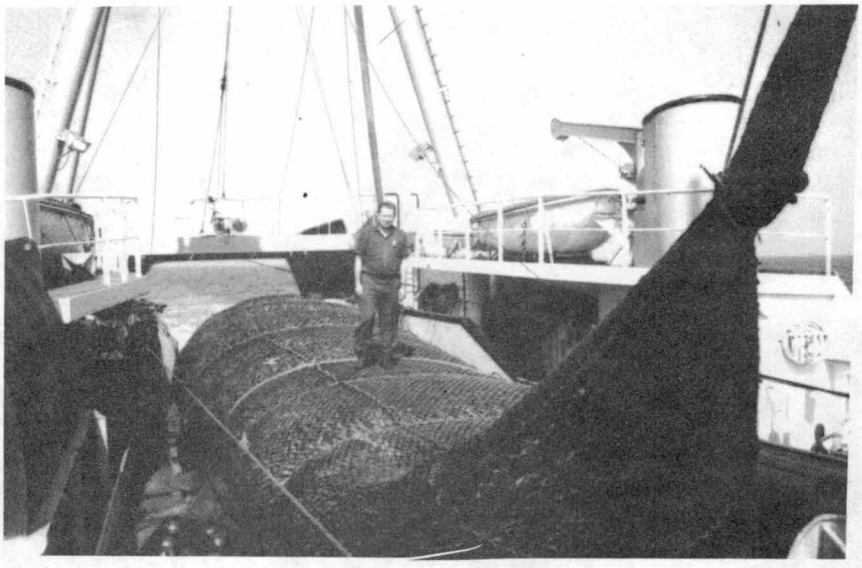
The "J. B. Nickerson".



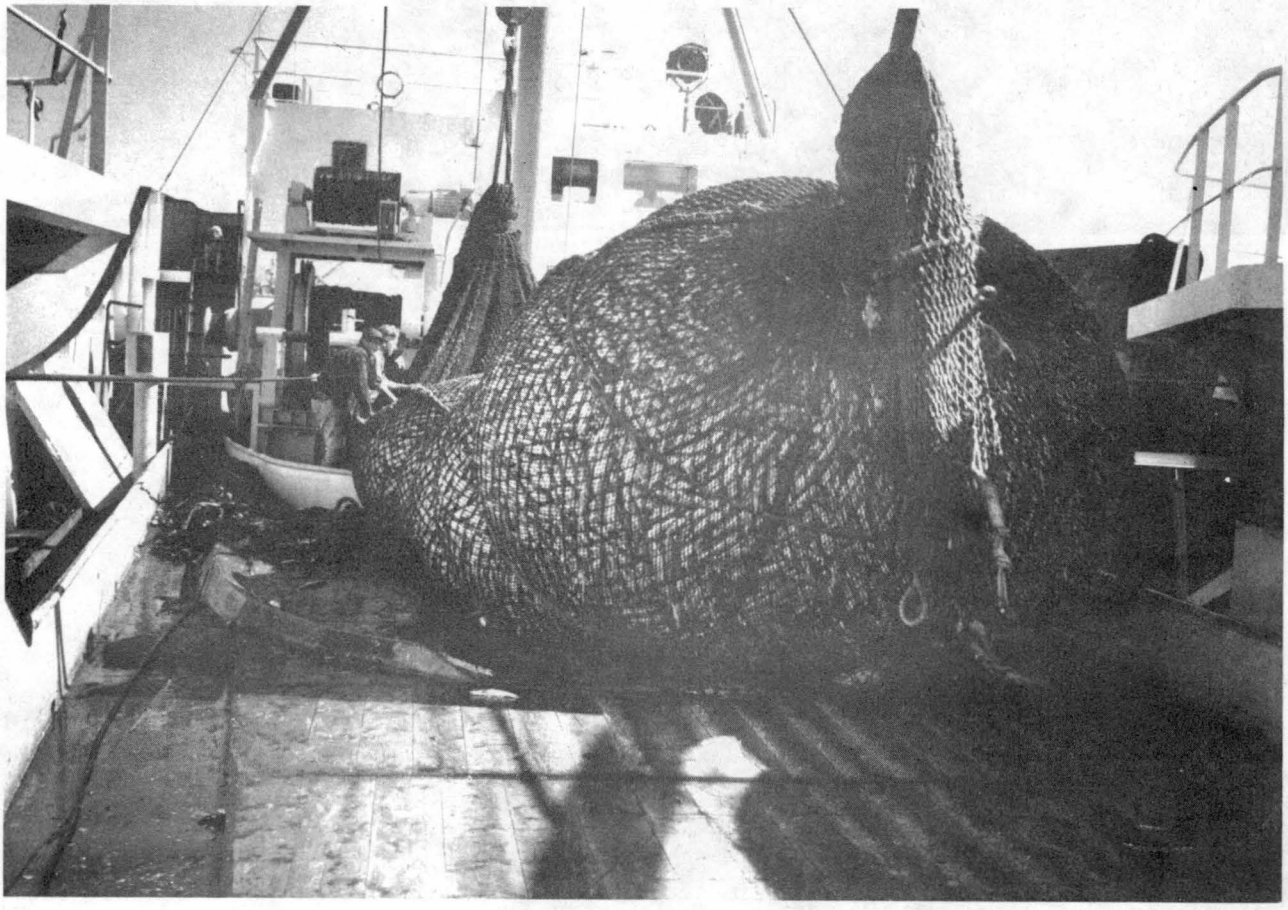
View down through rampway to codend with large catch of herring on the "J. B. Nickerson".



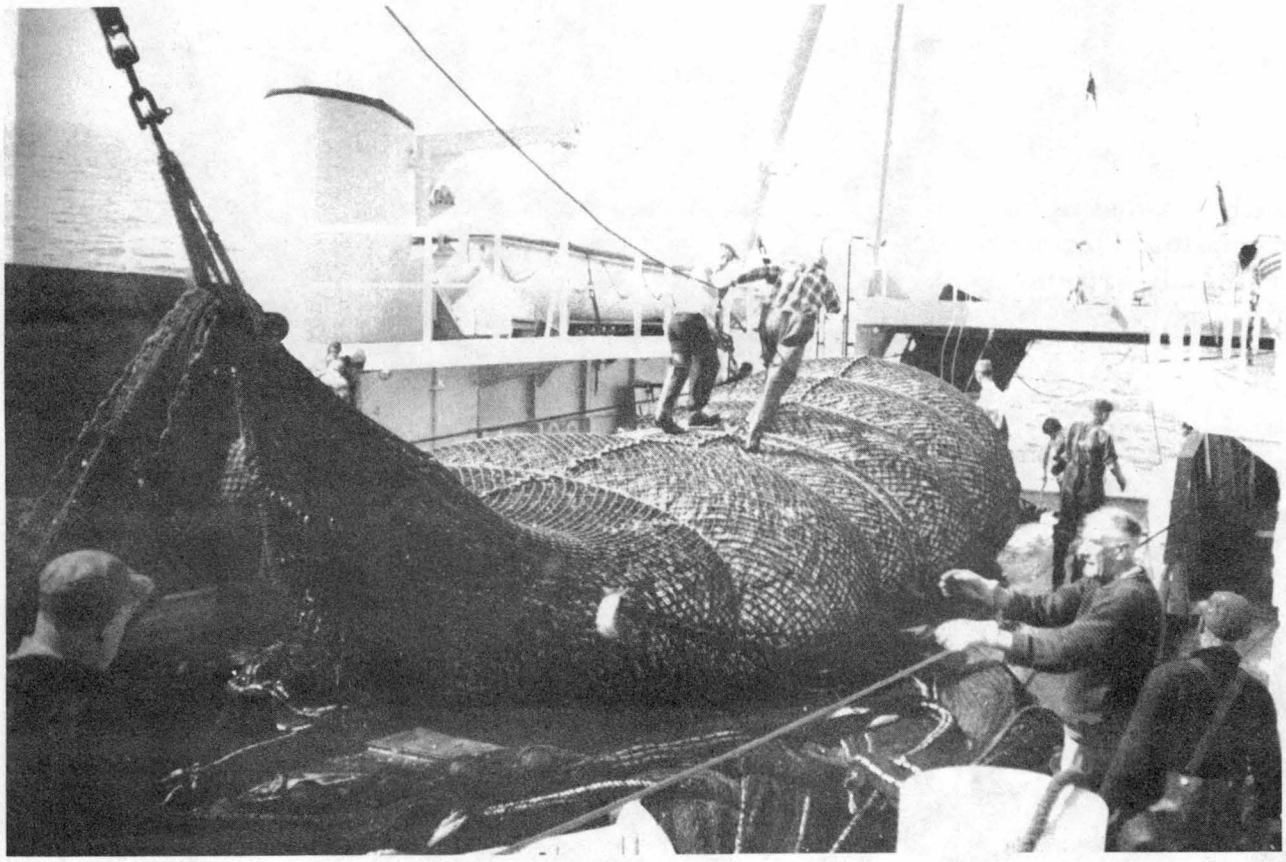
Large haul of herring, 60 tons or more, aboard the "J. B. Nickerson".



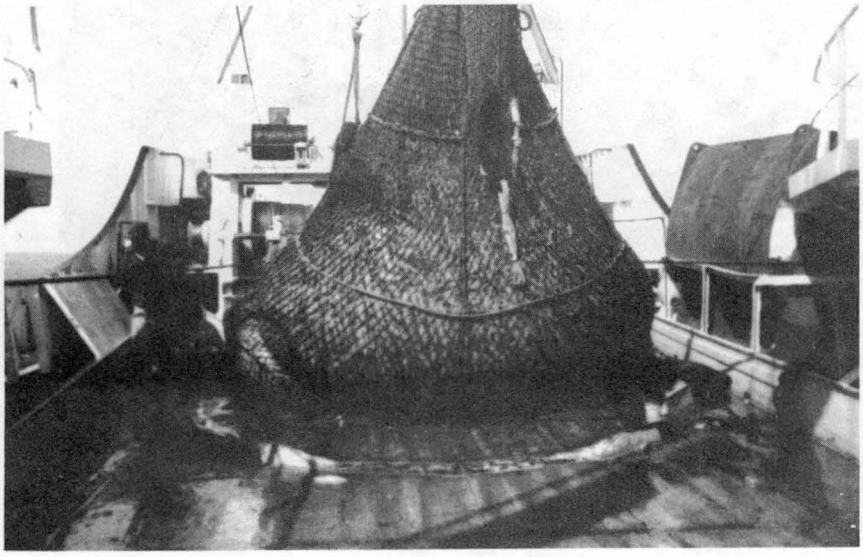
The author standing on approximately 60 tons of herring aboard the "J. B. Nickerson".



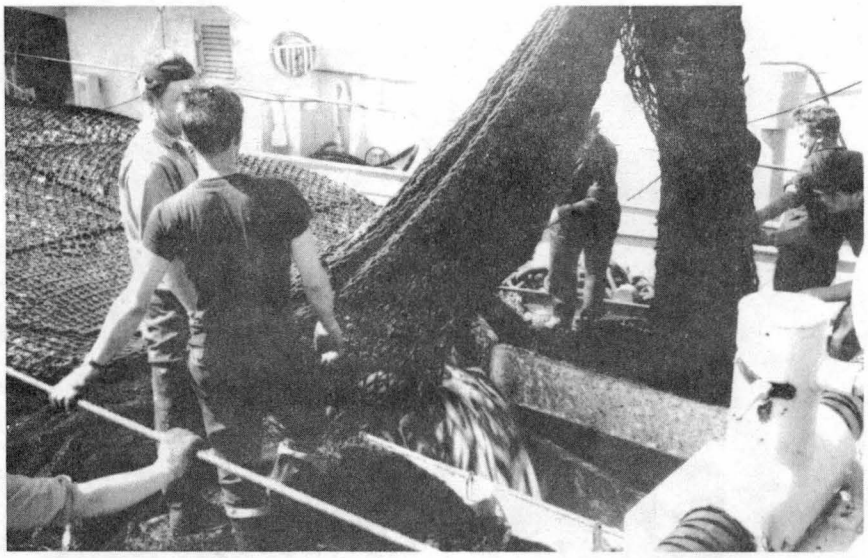
Preparing to empty the codend on the "J. B. Nickerson". Note forward end of codend suspended by tackle from foremast, and aft end about to be hoisted by joint tackle from aft and foremast.



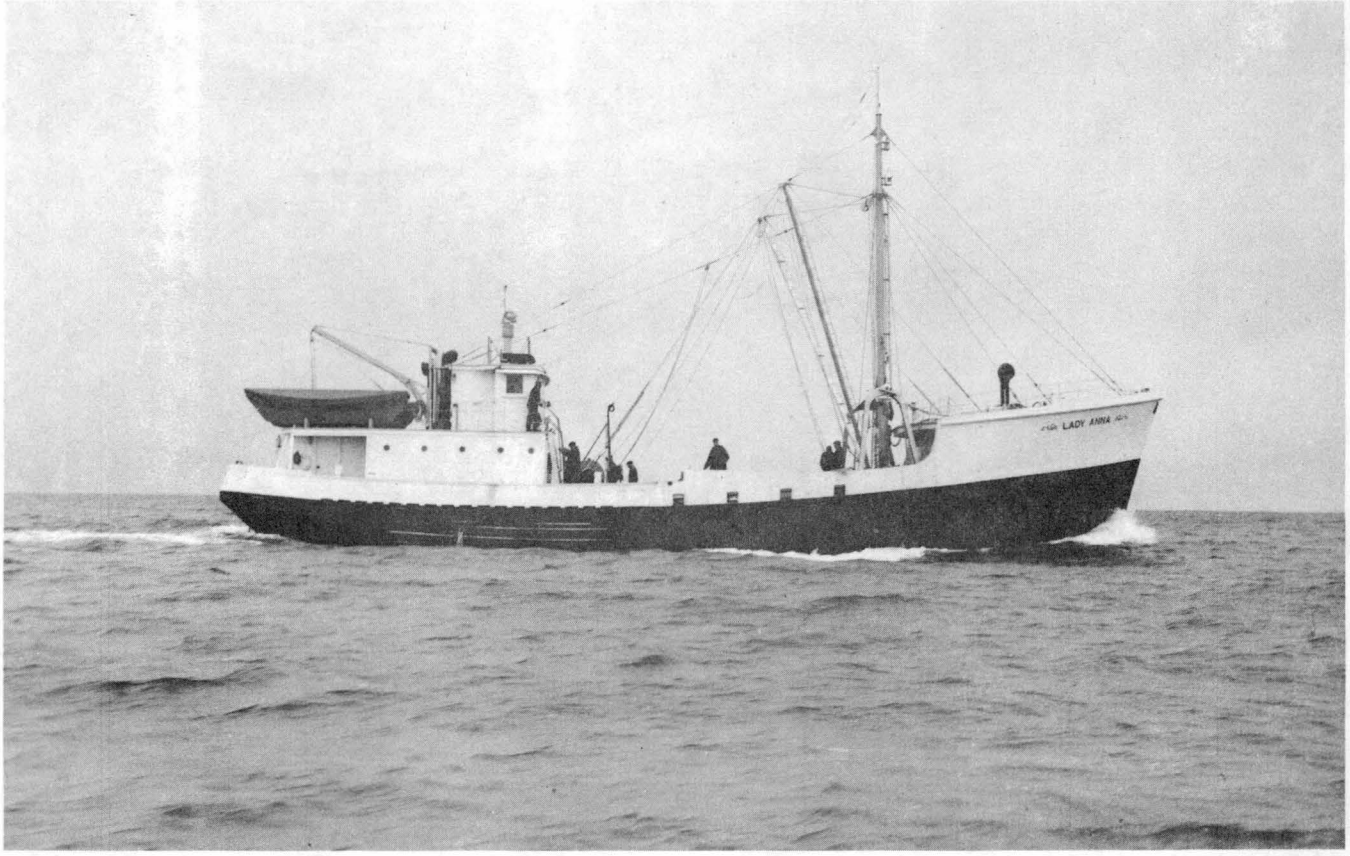
Crew of the "J. B. Nickerson" taking foremast tackle to the aft end of the codend, preparatory to emptying.



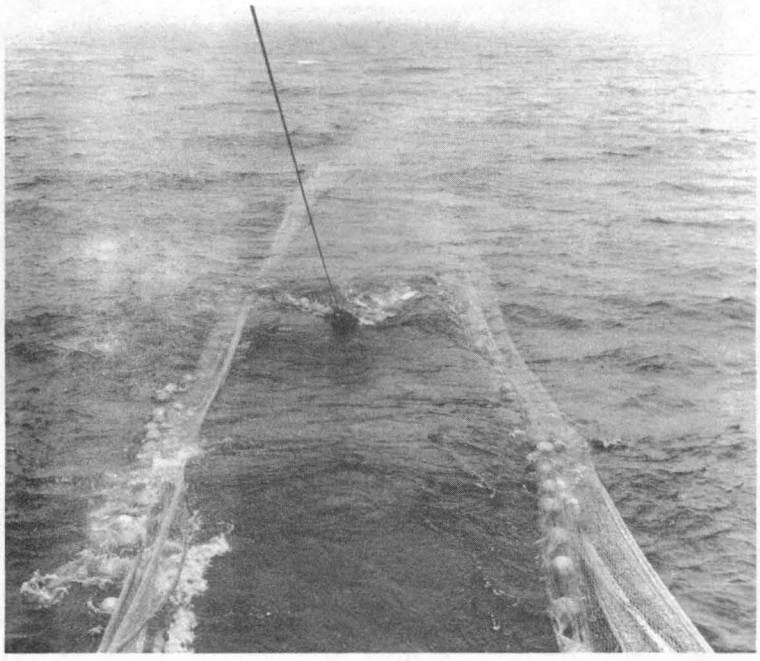
Hoisting back end of codend on the "J. B. Nickerson".



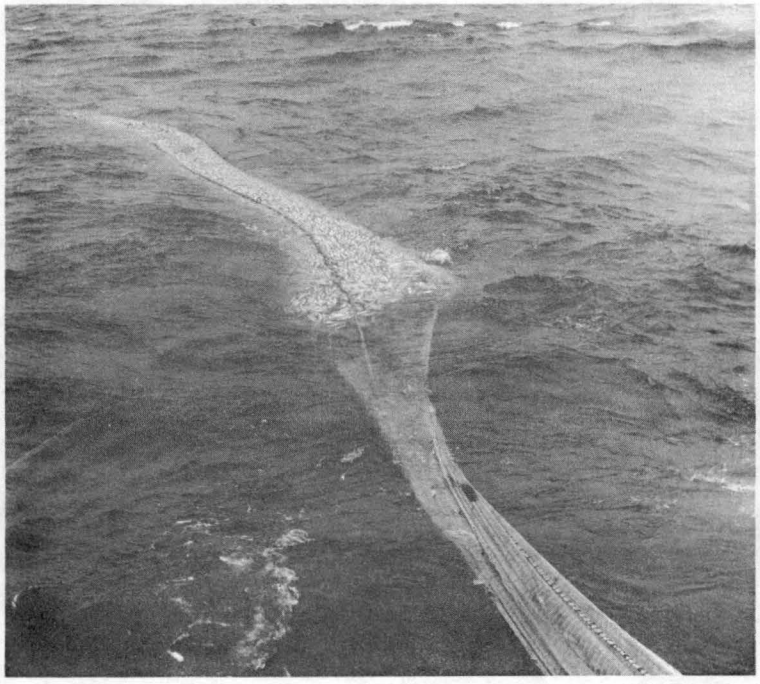
Emptying the codend aboard the "J. B. Nickerson", by cutting 3-foot hole in net. Hole is repaired before setting.



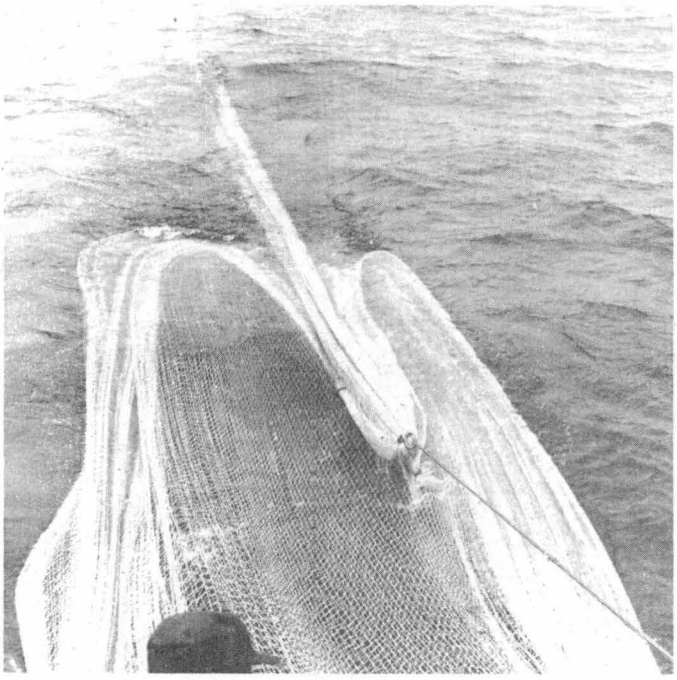
The "Lady Anna" prior to conversion for midwater trawling.



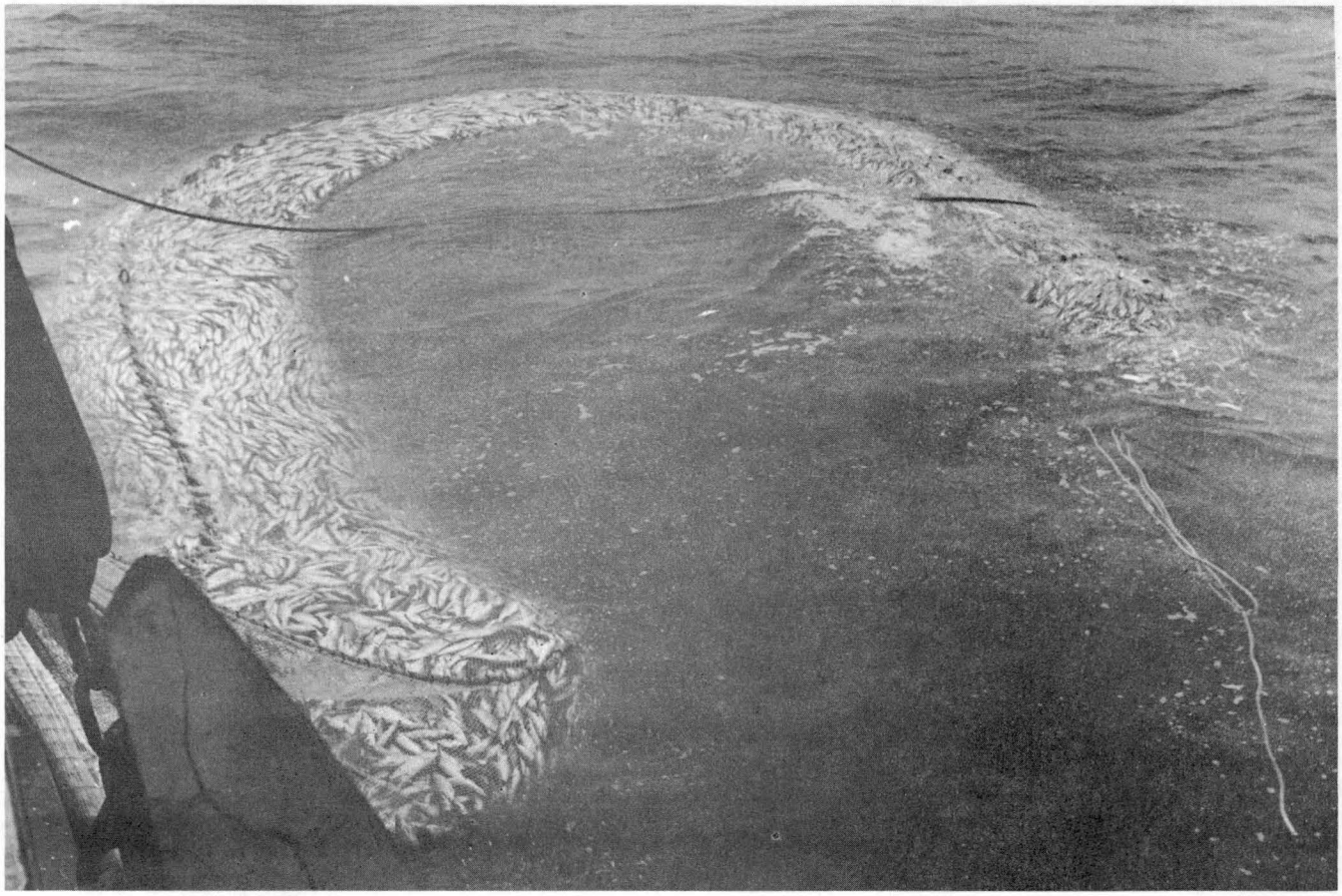
The "Lady Anna". Looking down the mouth of the midwater trawl. Note conductor cable to headline transducer. (Photo E. Bakken)



The codend of the "Lady Anna", full of herring. (Photo E. Bakken)



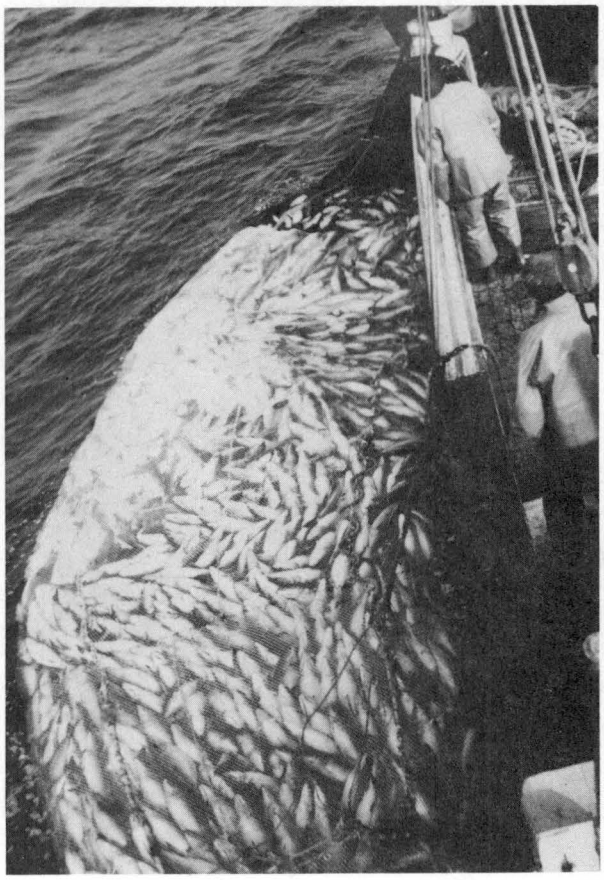
Fleeting the bellies aboard the "Lady Anna". (Photo E. Bakken)

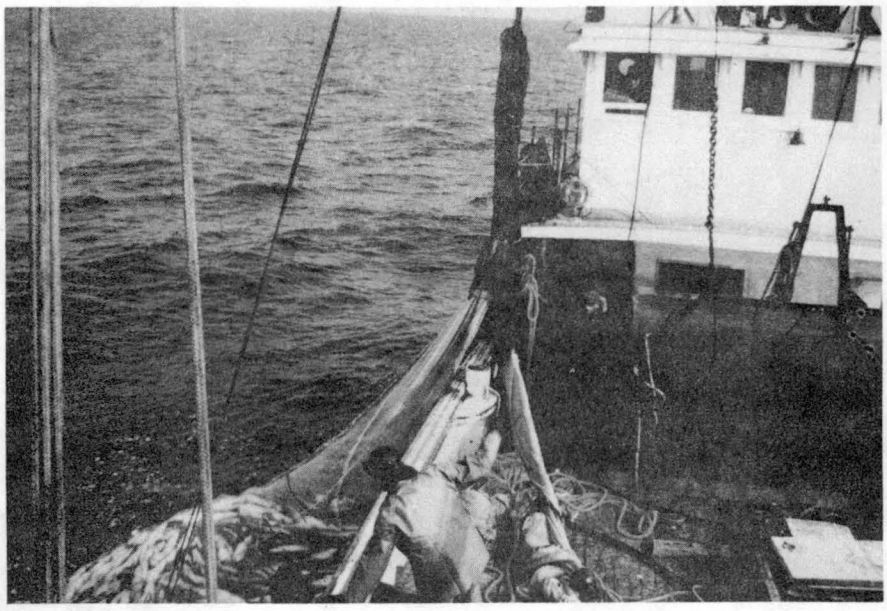


Drying-up original codend used on the "Lady Anna". This codend proved to be too narrow and limited in capacity, and was later widened. (Photo E. Bakken)

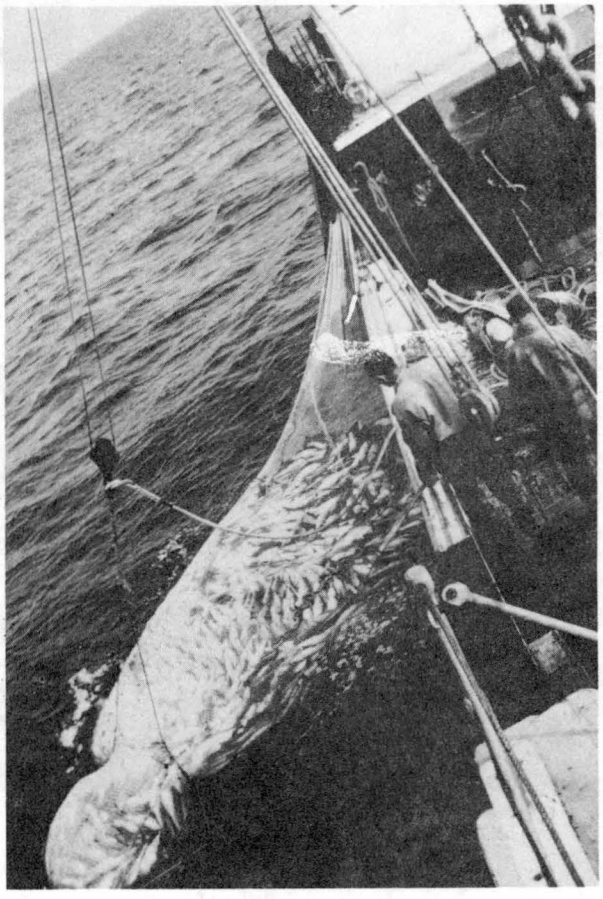
Deck of the "Lady Anna". (Photo E. Bakken)

Pollock fishing. 45, 000 pounds alongside the "Lady Anna".





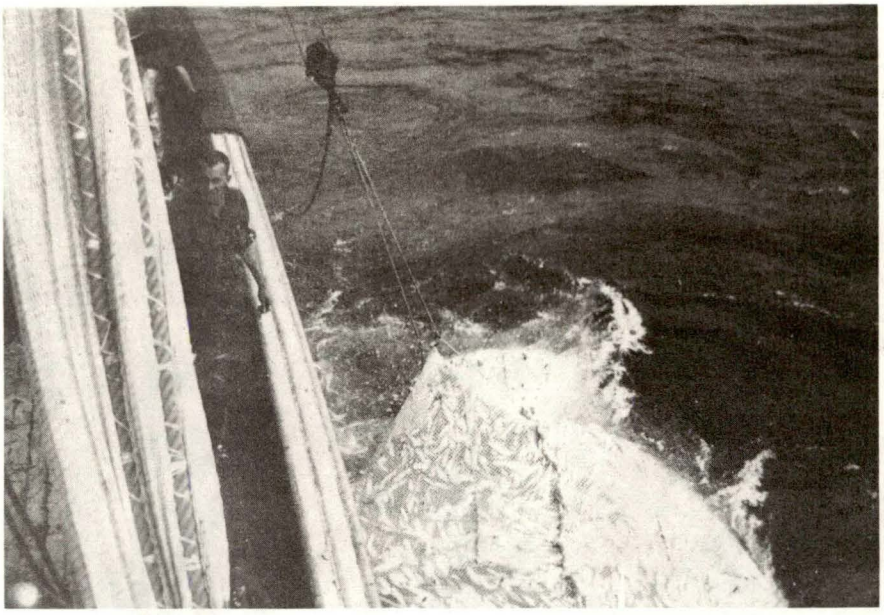
Heaving up codend through dry-up spool aboard "Lady Anna", fishing for pollock.



Pollock fishing, "Lady Anna".
Beginning the "split".

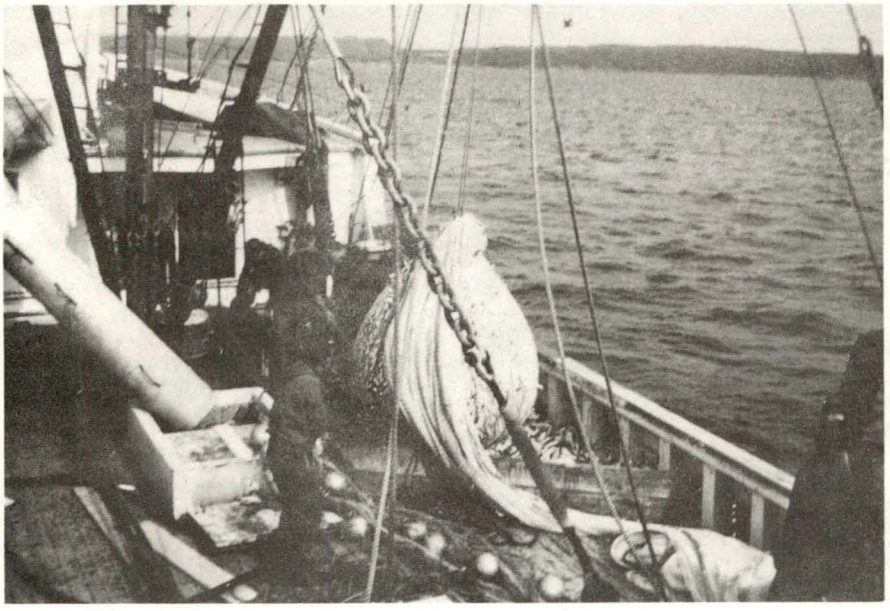
The bag comes aboard the "Lady Anna", fishing for pollock. Note how the method of handling the codend keeps it alongside the vessel, which is advantageous in heavy weather.

Captain Guy d'Entremont (right) and crew putting catch below on "Lady Anna". Note size of pollock held by Captain d'Entremont.



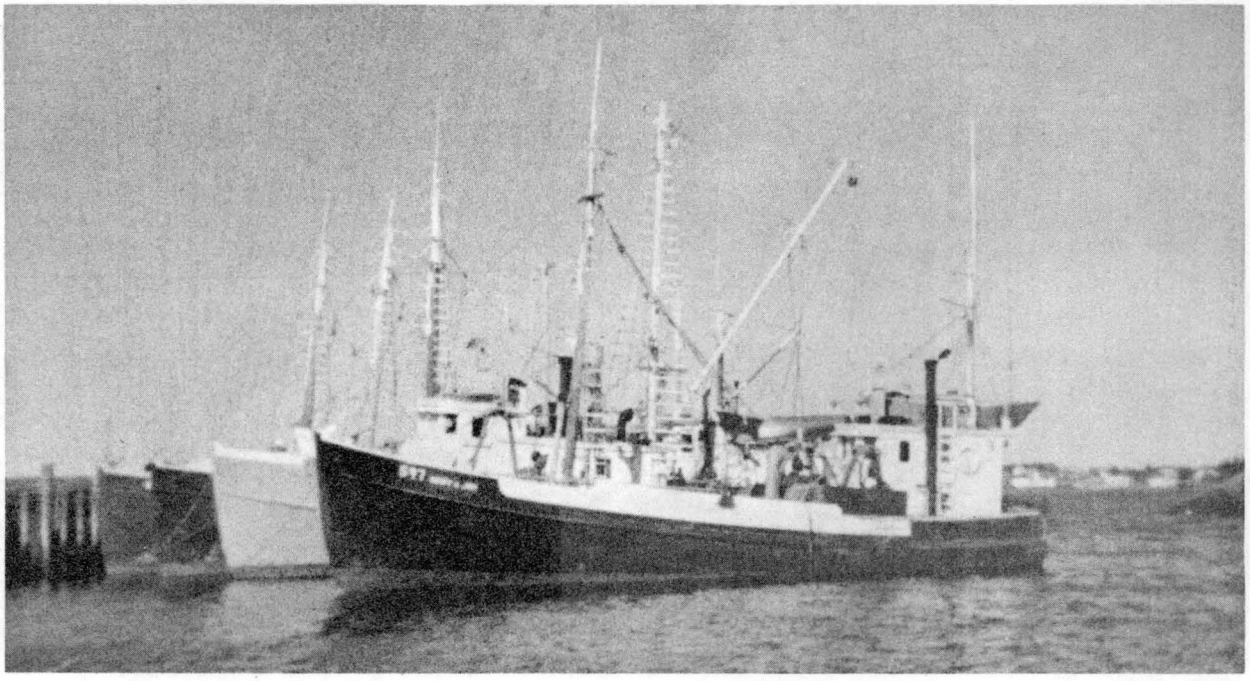
Captain Guy d'Entremont of the "Lady Anna" signalling to hoist a bag of herring aboard.

The bag of herring comes aboard the "Lady Anna".

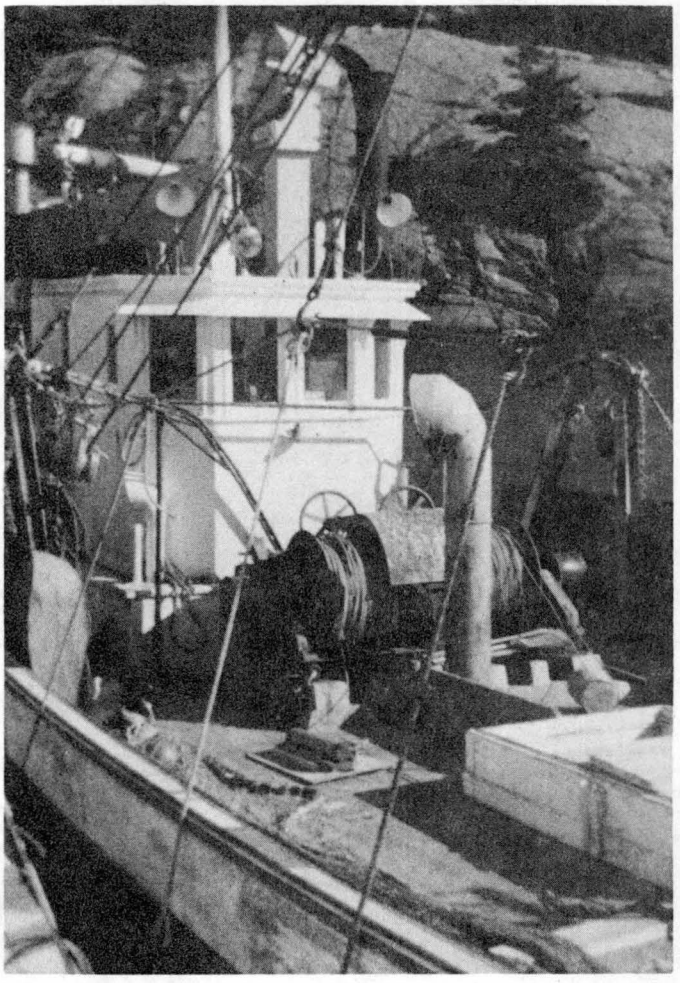


Releasing the codend strings aboard the "Lady Anna". Herring is let down through flush deck skuttles under the codend.

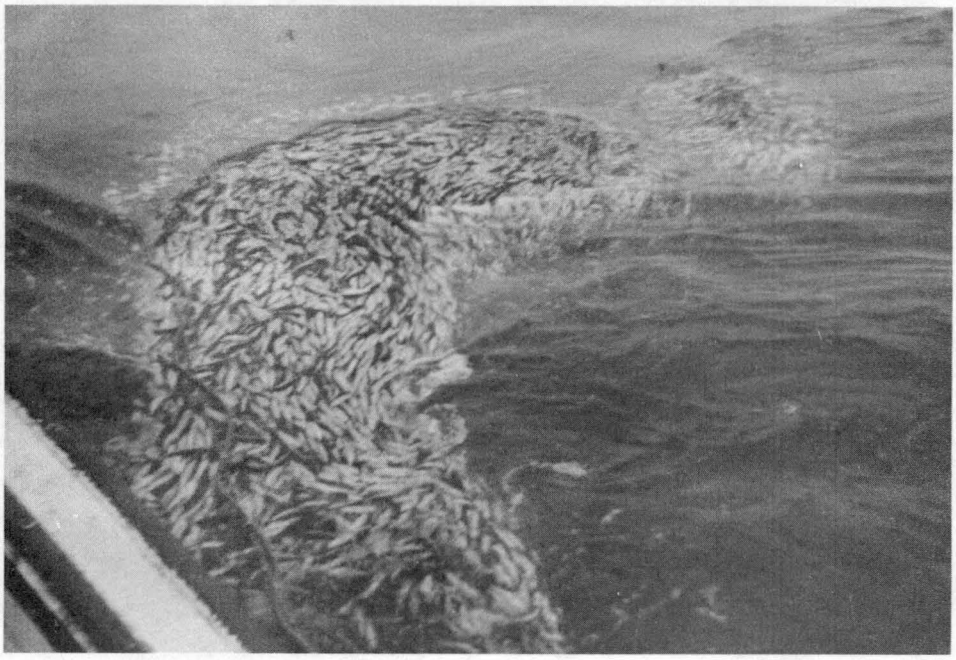
Closeup of dry-up spool, with Mate Wilbert d'Entremont of the "Lady Anna" watching as he hoists a "split" aboard.



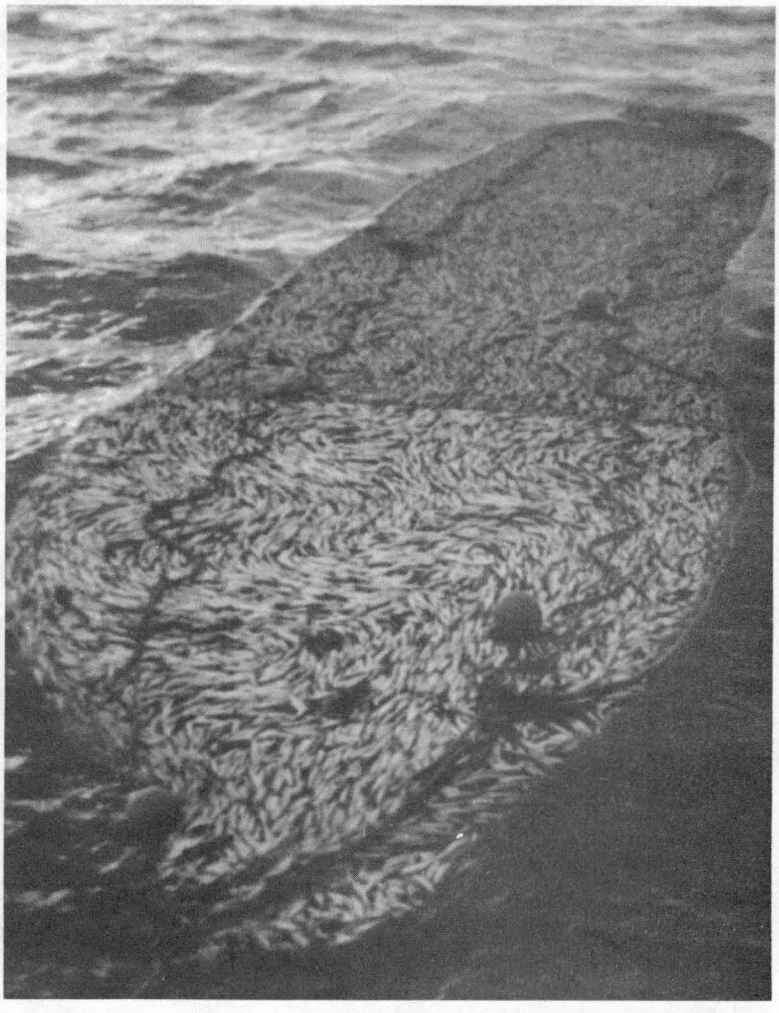
The "Mary and Jay", owned by Captain James Calder, Welch Pool, Campobello, N. B.



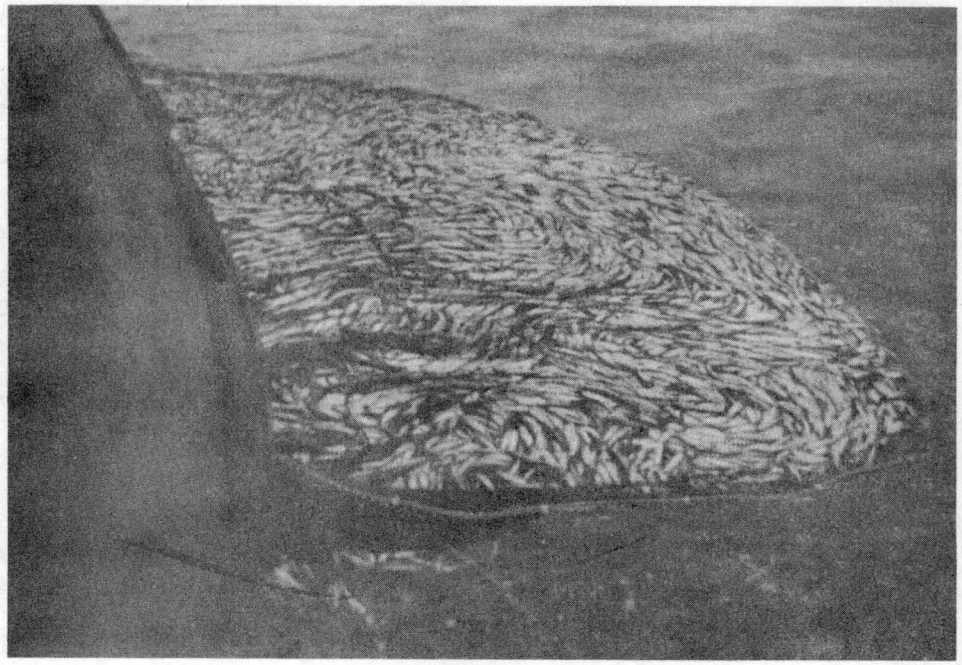
The "Mary and Jay", showing port and starboard gallows as rigged for stern trawling.



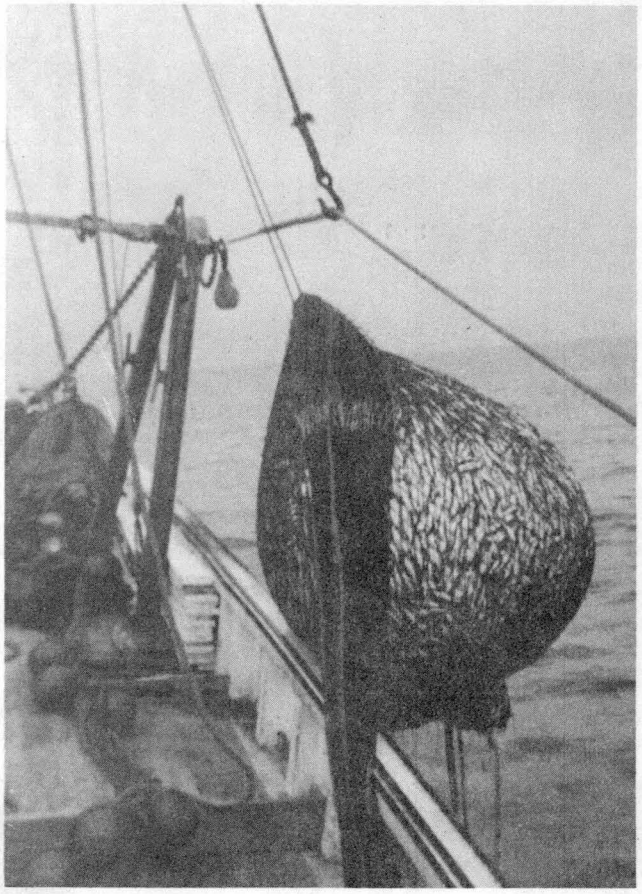
The "Mary and Jay". Large catch of small herring being brought alongside.



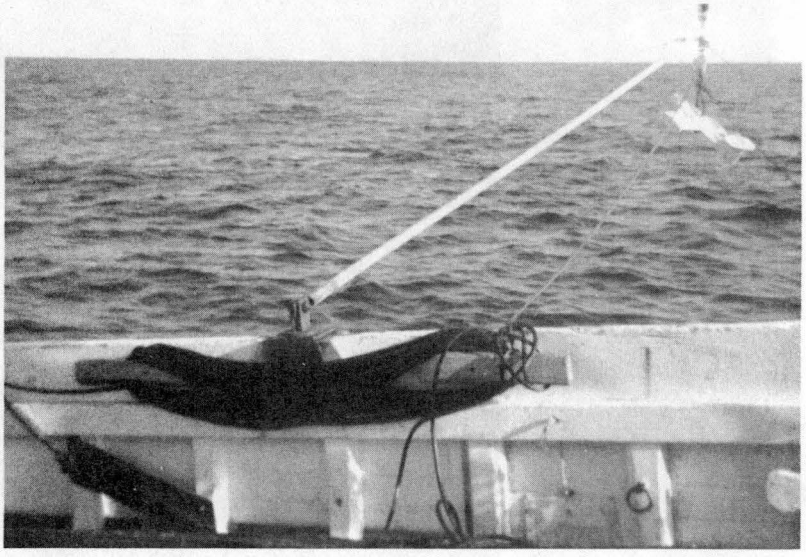
Large catch of small herring, the "Mary and Jay".



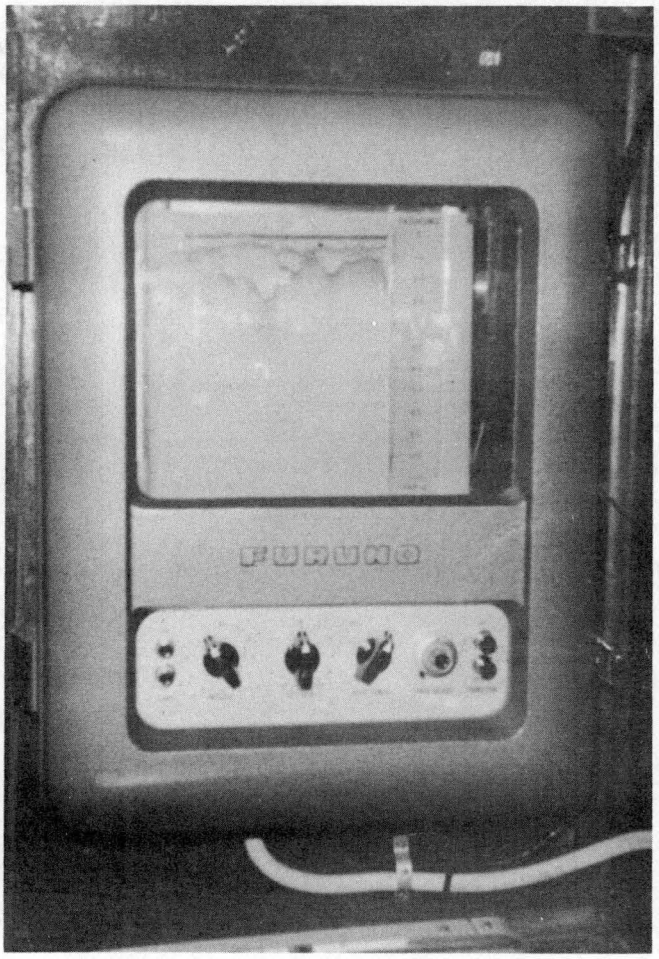
Drying-up bag of herring alongside the "Mary and Jay".



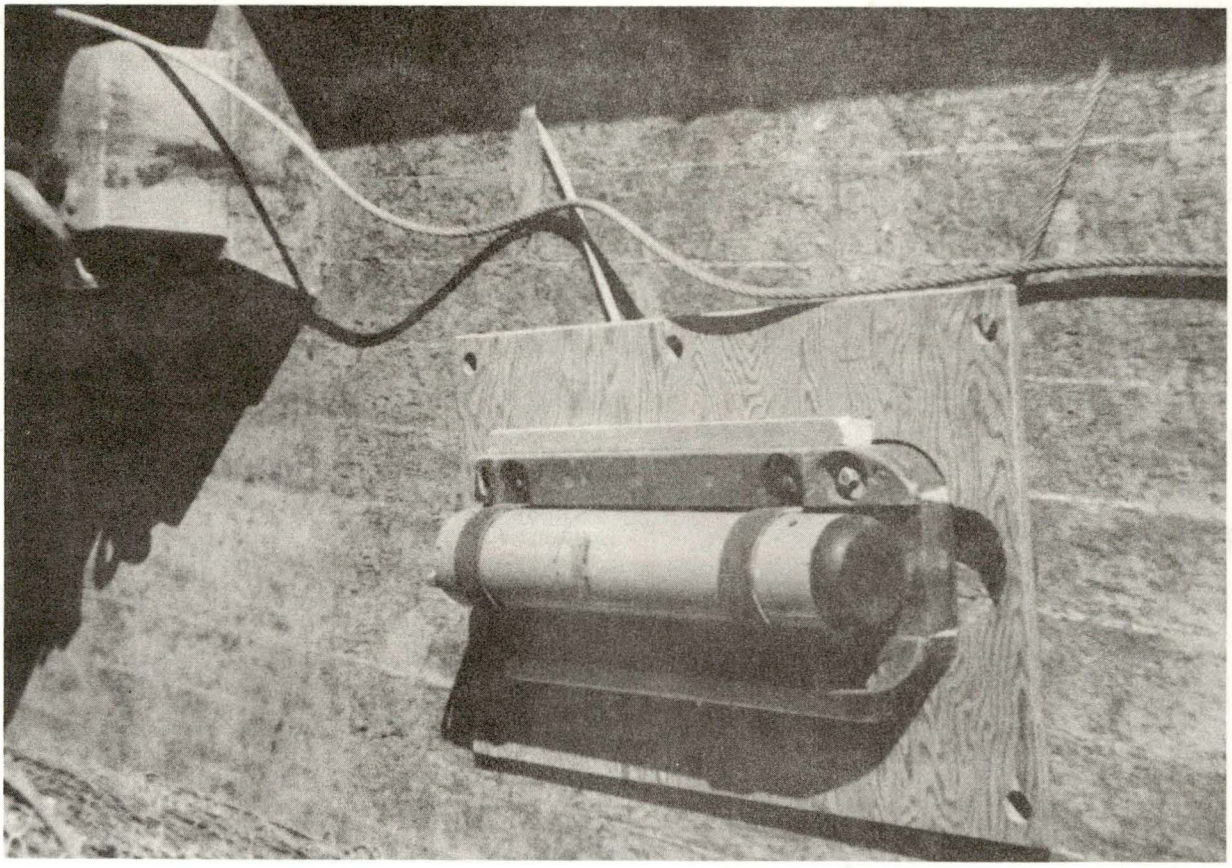
Bag of small herring coming aboard the "Mary and Jay".



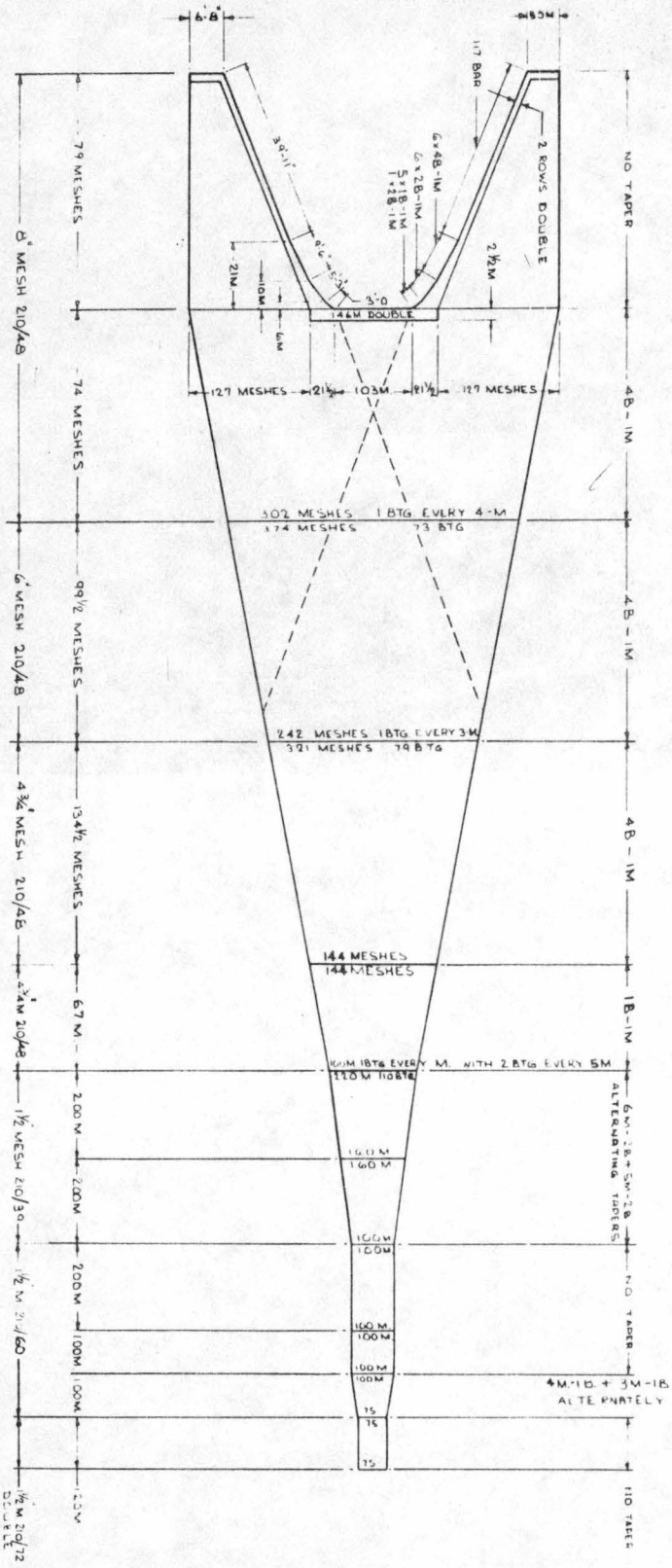
Paravane type receiving transducer, which is towed several fathoms below surface suspended from end of boom on the "Mary and Jay".



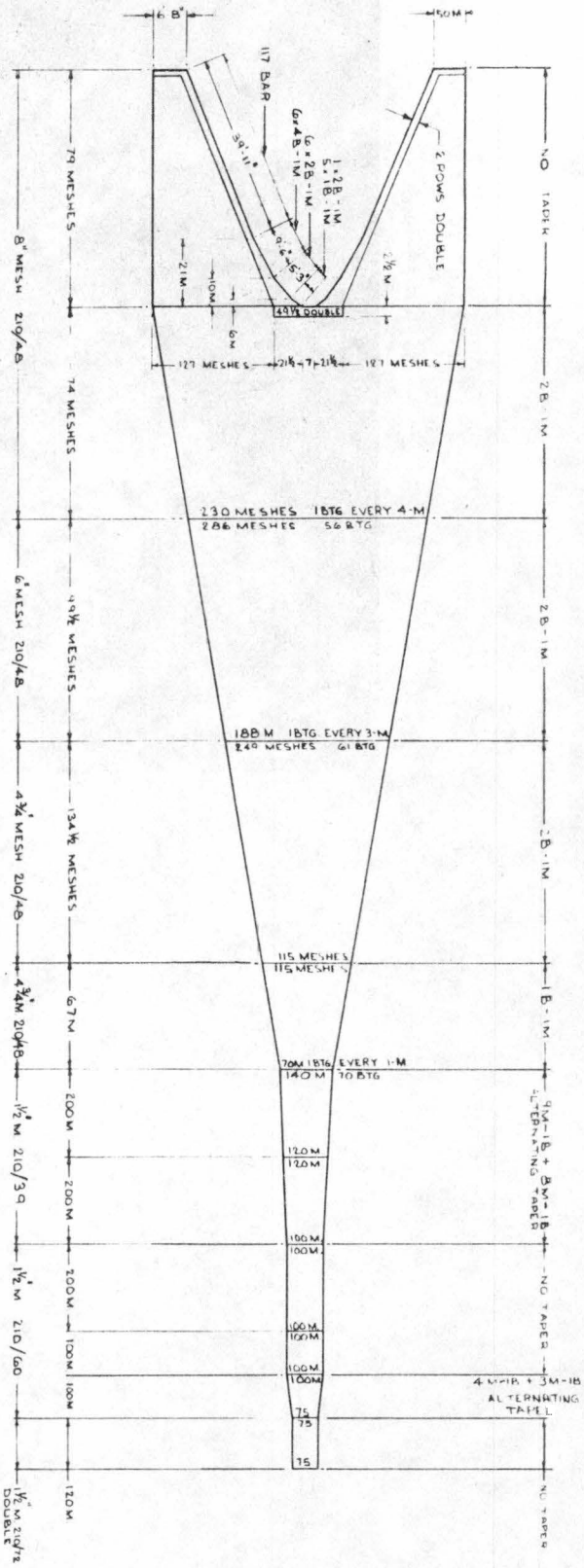
Japanese "Furuno" FNR 2 net sounder recorder on the "Mary and Jay".



Transducer and modified float board
on "Mary and Jay".



UPPER & LOWER PANELS



SIDE PANELS

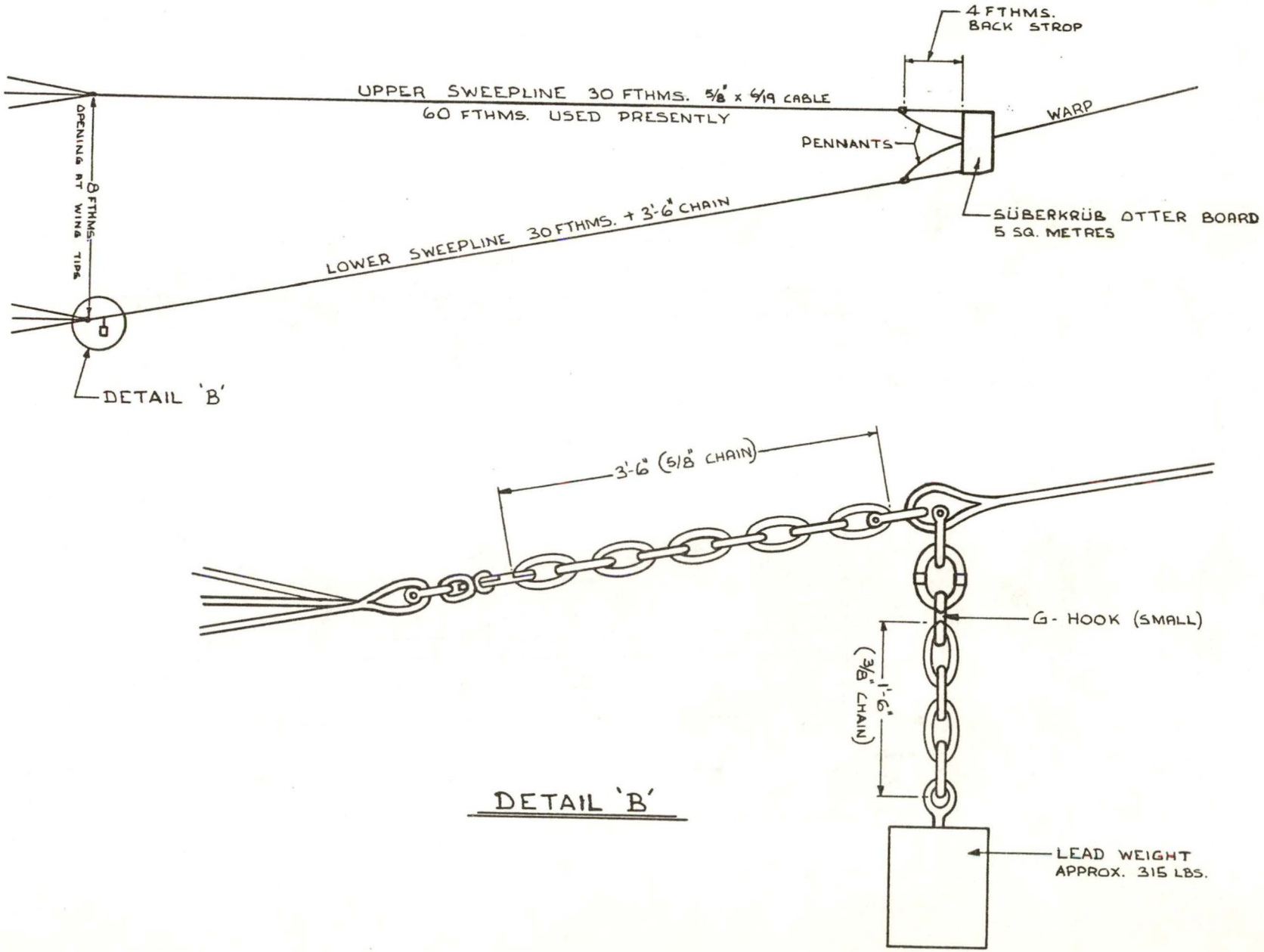
1400 MESH MODIFIED GERMAN MID-WATER TRAWL

AS USED BY 'LADY ANNA'

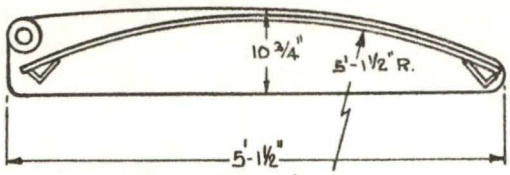
1400 MESH MODIFIED GERMAN MID-WATER TRAWL

HOOK UP ARRANGEMENT

USED BY "LADY ANNA"

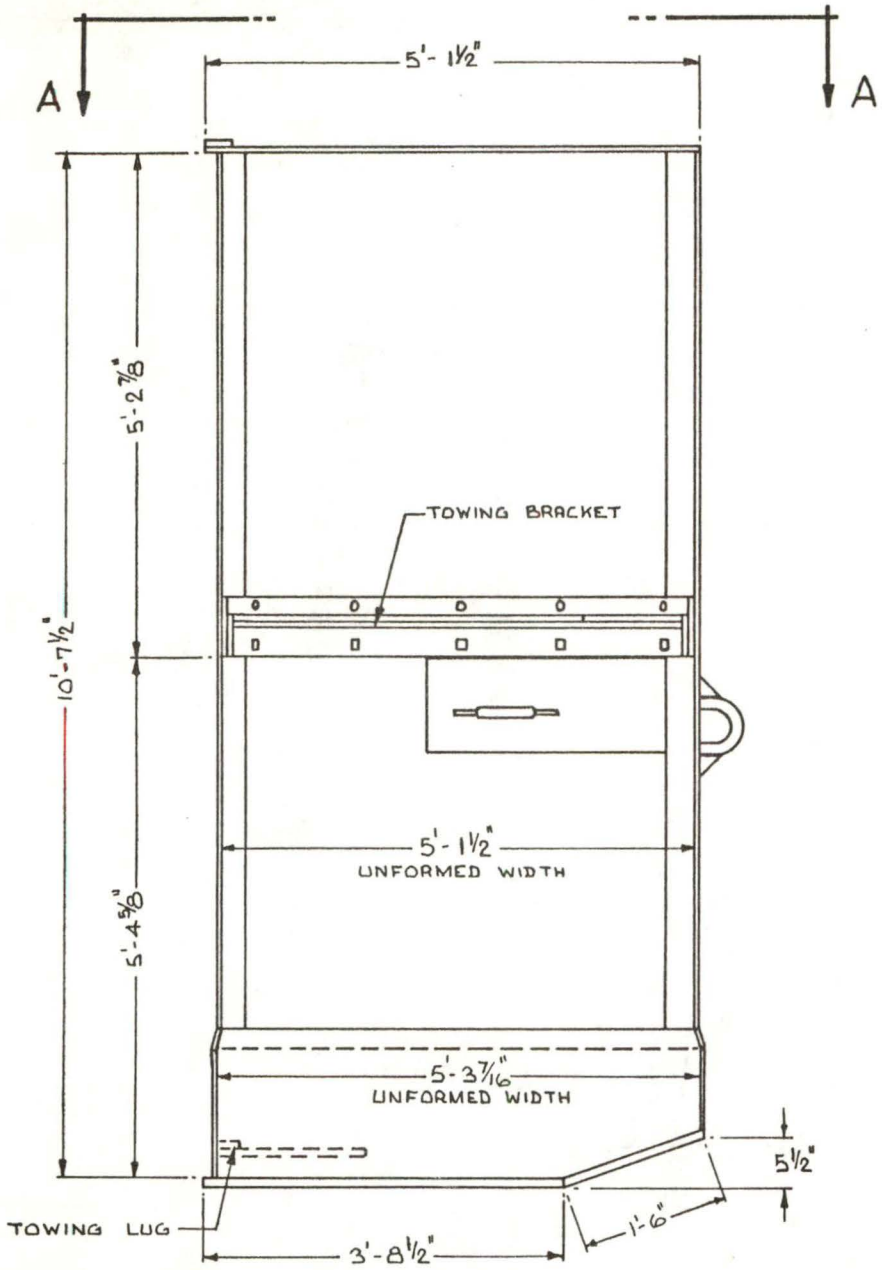


DETAIL 'B'



TOP VIEW 'A-A'

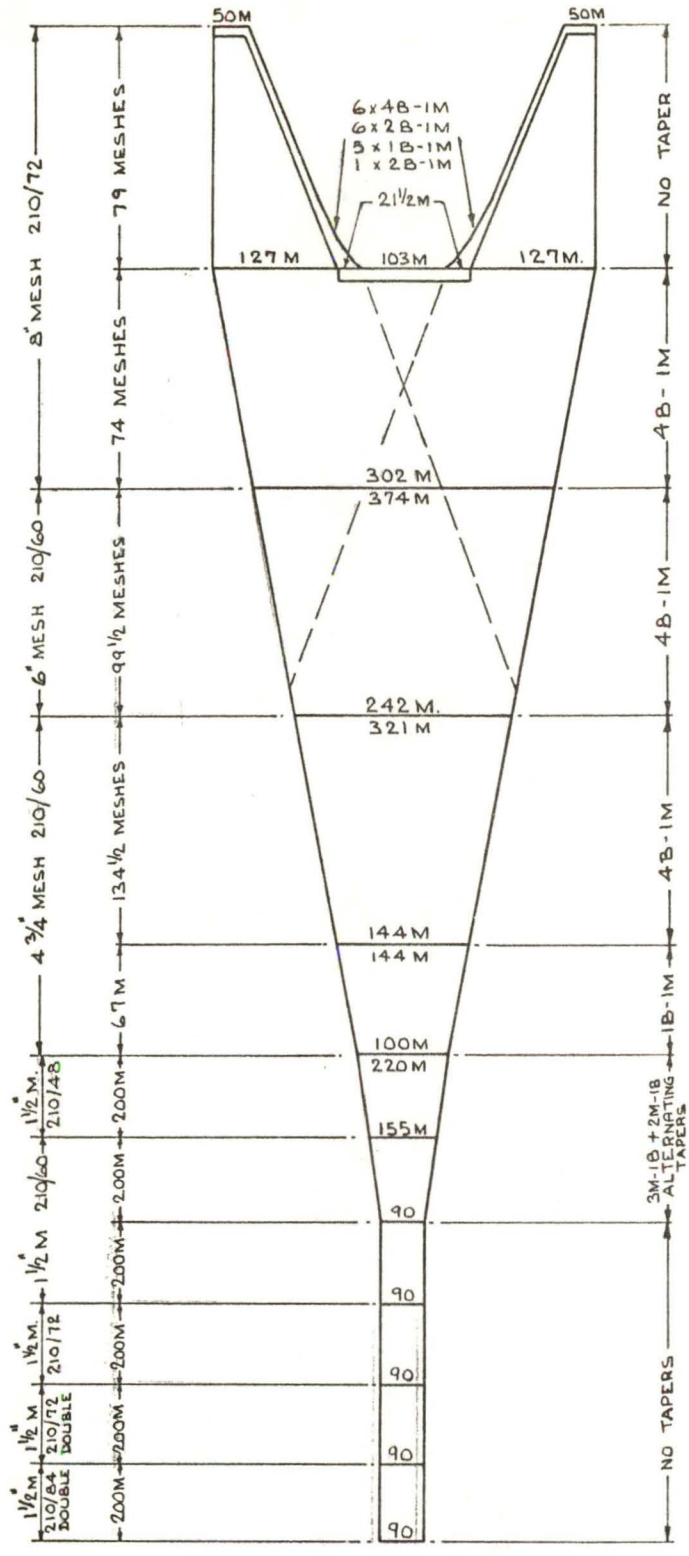
CURVED SECTION SHOWN IN SOLID LINES FOR SAKE OF CLARITY



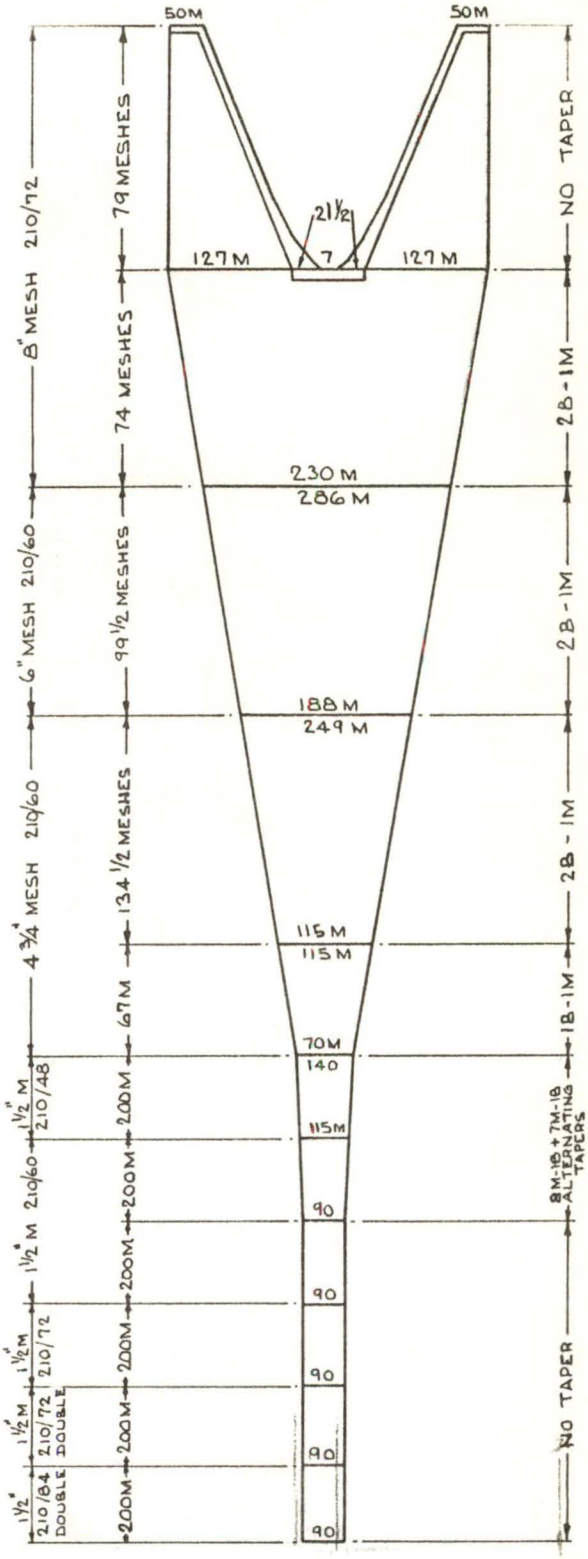
SÜBERKRÜB OTTER BOARD

5 SQ. METRES

AS USED BY "LADY ANNA" + "BRANDAL"



UPPER & LOWER PANELS

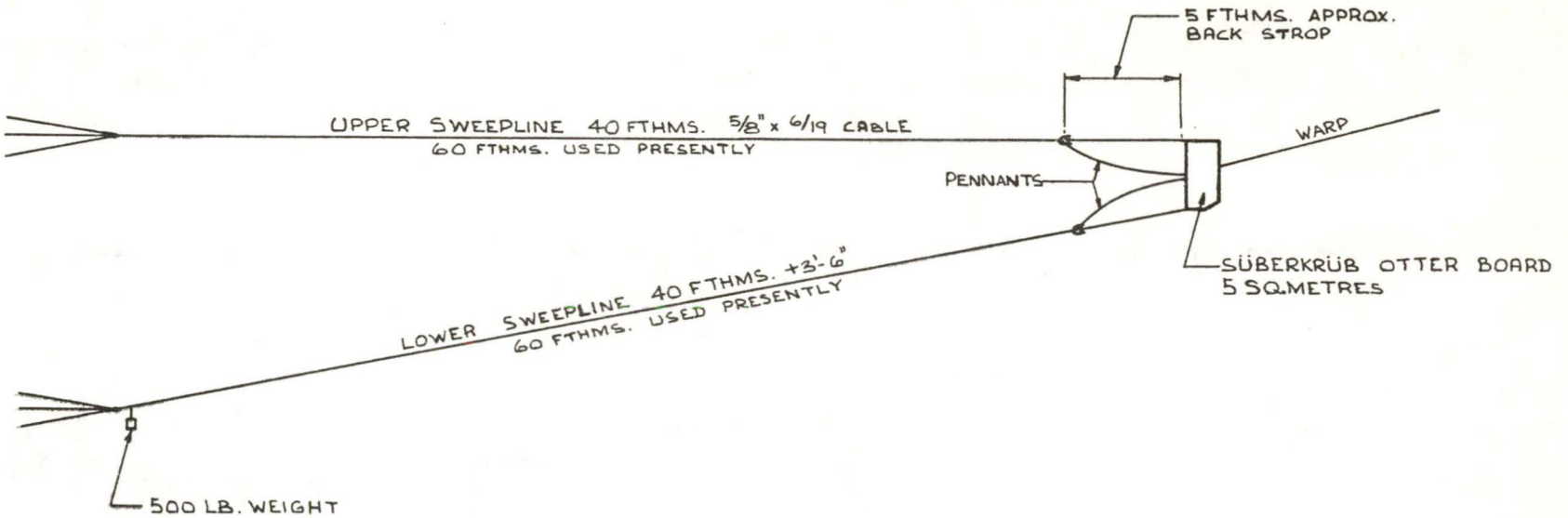


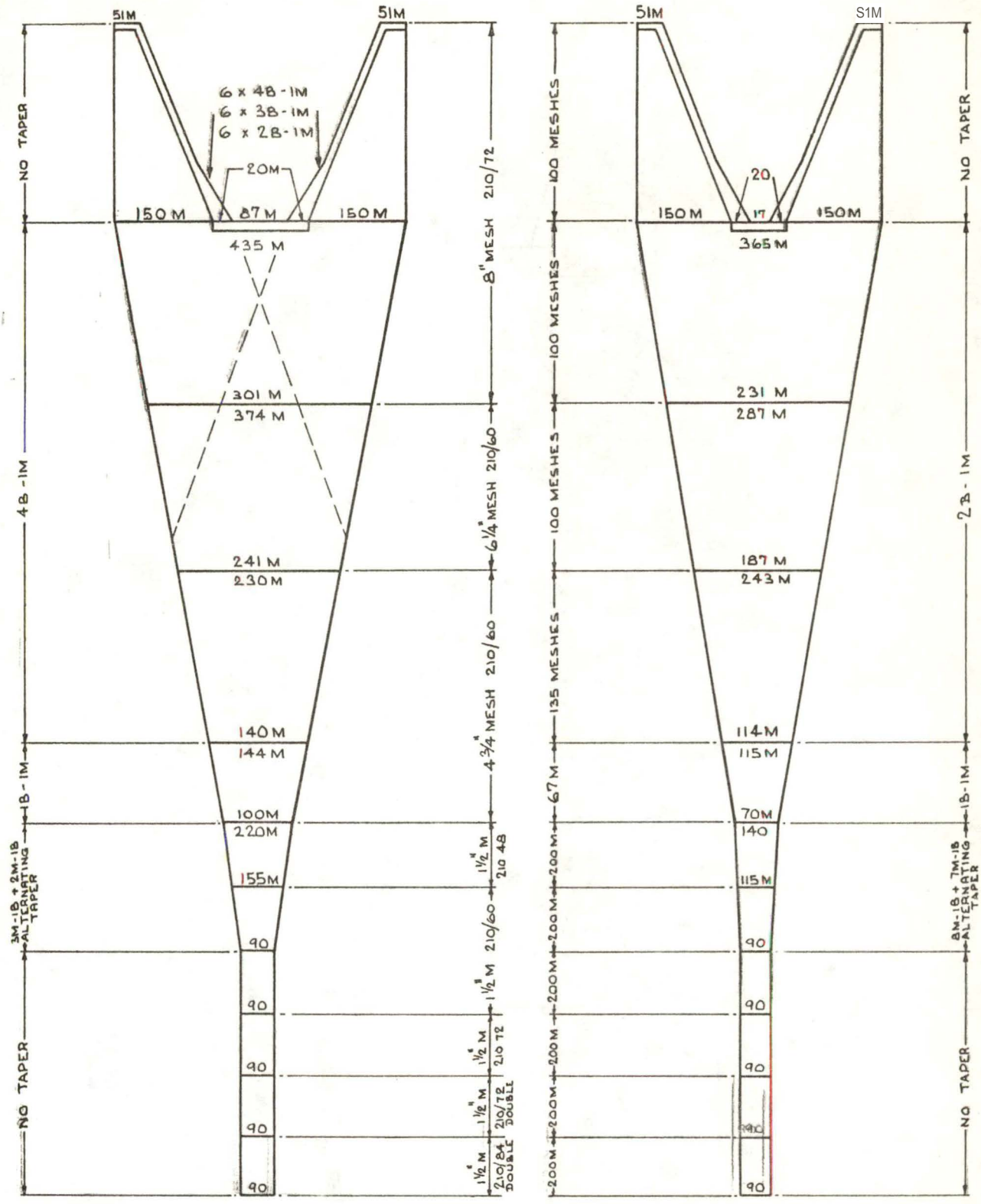
SIDE PANELS

1400 MESH MID-WATER TRAWL AS USED BY "BRANDAL"

1400 MESH MID-WATER TRAWL AS USED BY 'BRANDAL'

HOOK UP ARRANGEMENT

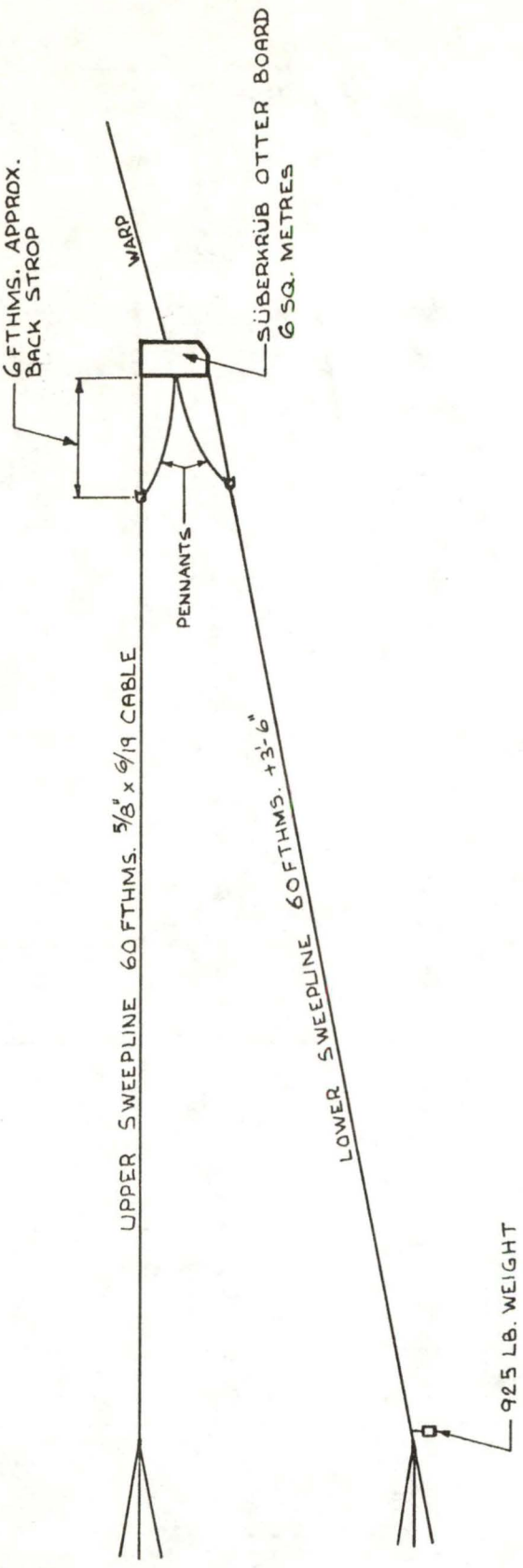




UPPER & LOWER PANELS

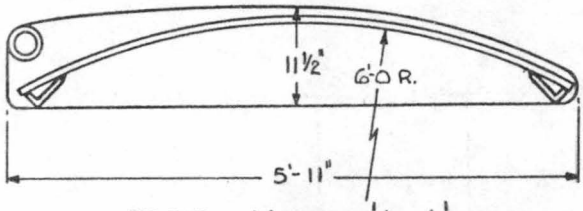
SIDE PANELS

1600 MESH MID-WATER TRAWL AS USED BY "J.B. NICKERSON"



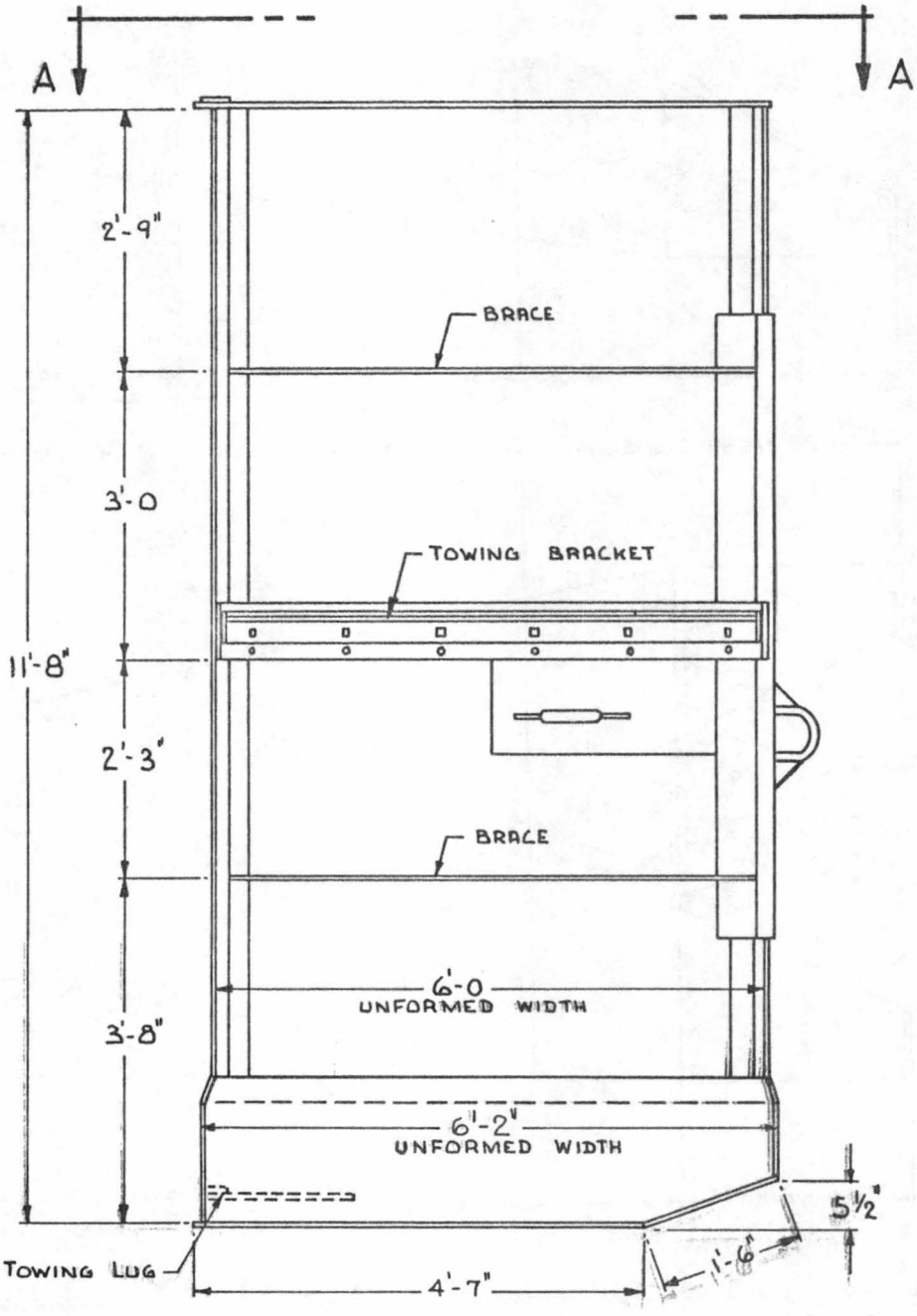
1400 MESH MID-WATER TRAWL AS USED BY "J.B. NICKERSON"

HOOK UP ARRANGEMENT



TOP VIEW 'A-A'

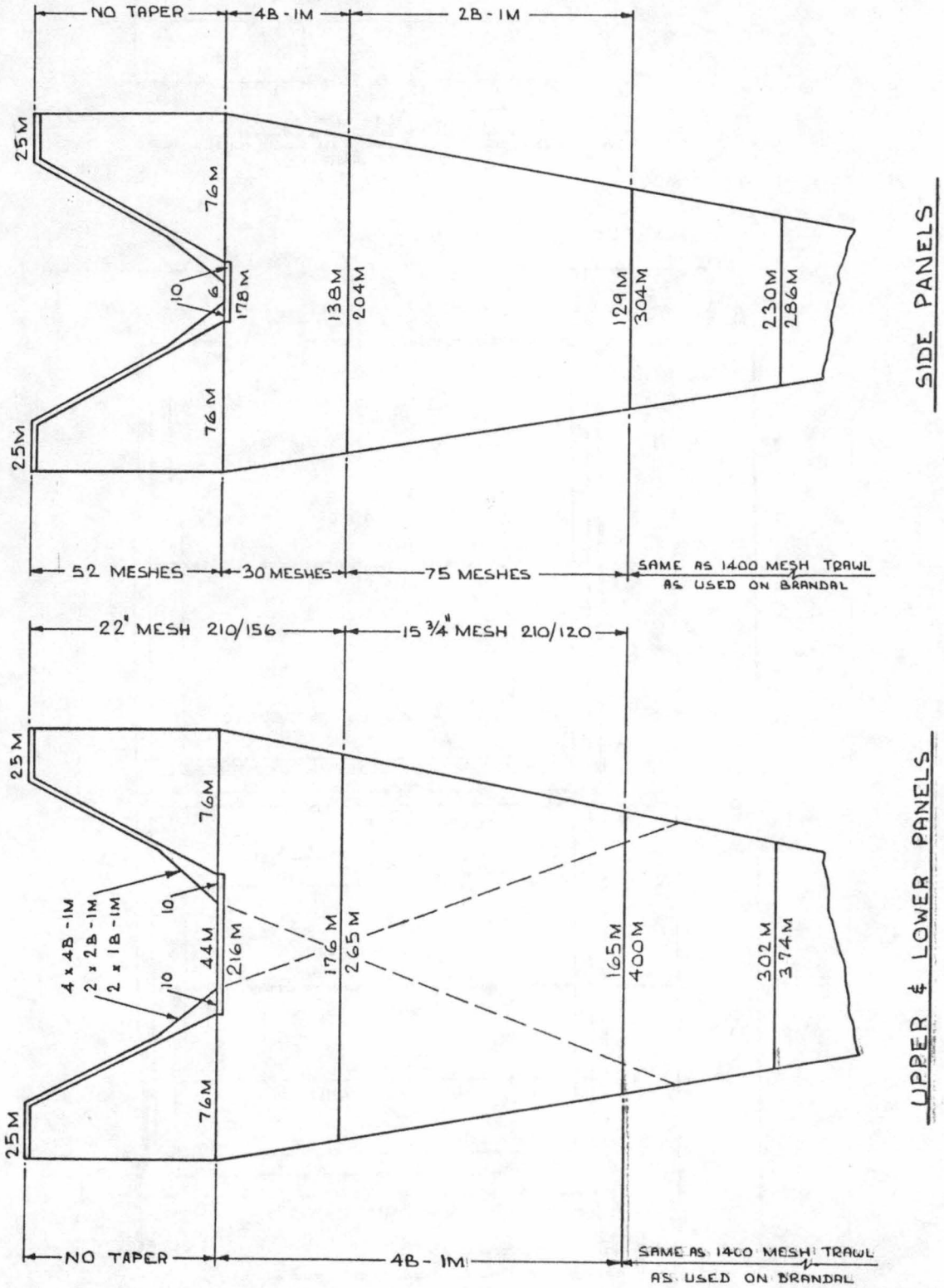
CURVED SECTION SHOWN IN SOLID LINES FOR SAKE OF CLARITY



SÜBERKRÜB OTTER BOARD

6 SQ. METRES

AS USED BY "J. B. NICKERSON"

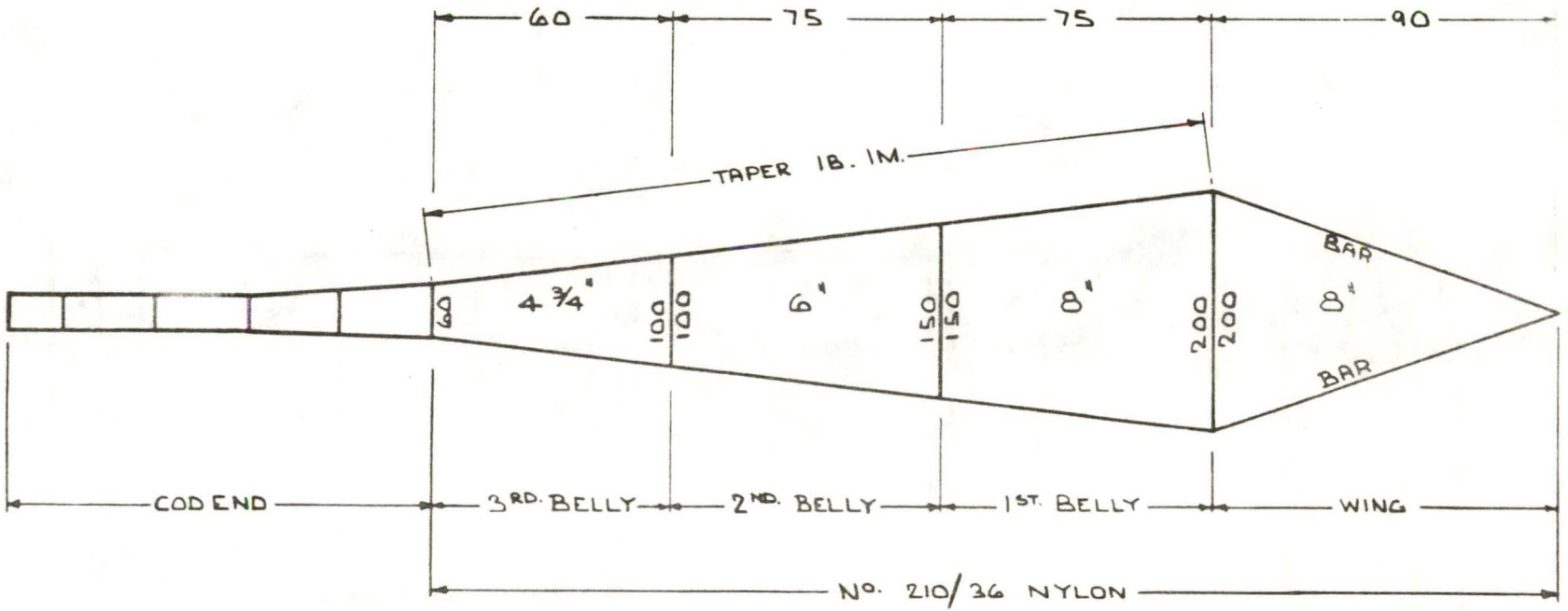


788 MESH SUPER TRAWL AS USED BY "J.B. NICKERSON"

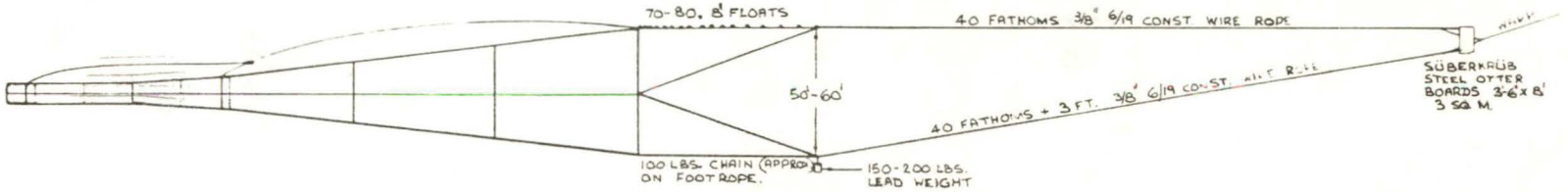
USED WITH 8 SQ. METRE BOARD

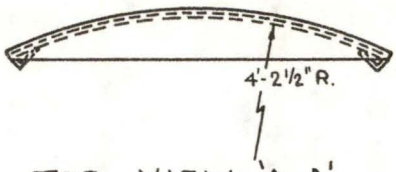
Nº 5 CANADIAN MIDWATER HERRING TRAWL

AS USED BY "MARY & JAY"

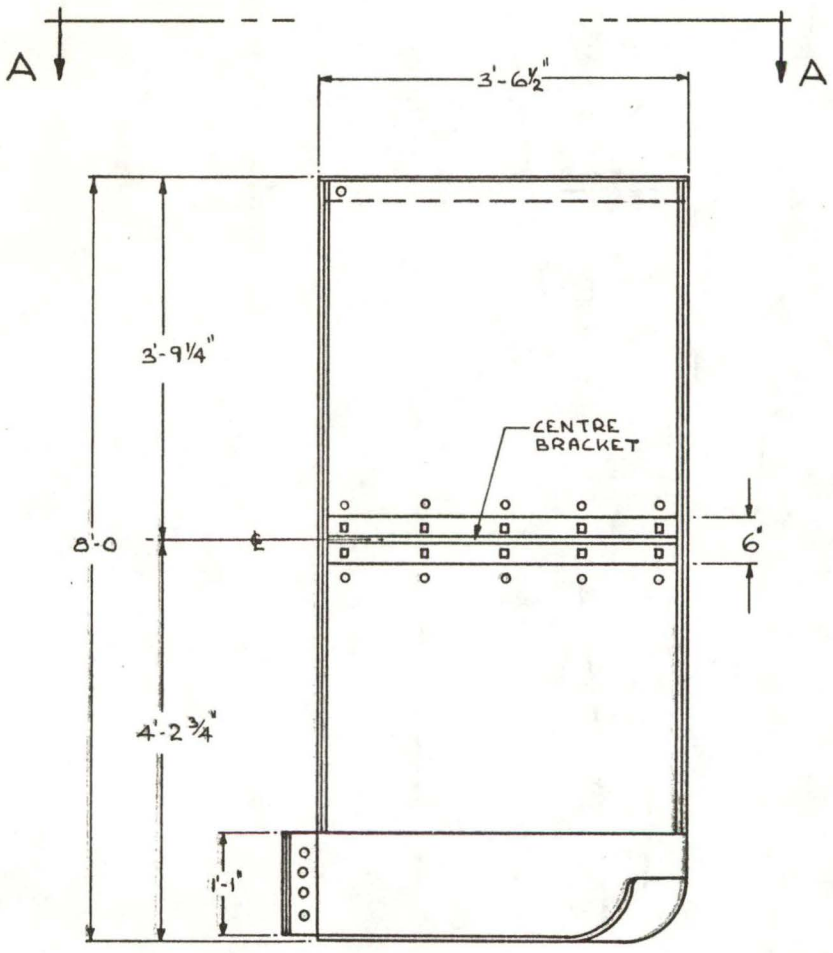


MAKE 4 SIDES EQUAL





TOP VIEW 'A-A'



SÜBERKRÜB OTTER BOARD

APPROX. 3 SQ. METRES

AS USED BY "MARY & JAY"