SEA FISH INDUSTRY AUTHORITY
Industrial Development Unit

TRIALS WITH MONOFILAMENT LONGLINE GEAR ON MFV GANNET IN WHITBY

Internal Report No. 1201

March 1985

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SUMMARY

A 39ft Whitby vessel, MFV GANNET was chartered for 15 fishing days between 14th January and 12th Feburary 1985.

The vessel was fitted with equipment for the purpose of monofilament longlining.

The vessel worked the system for 3 weeks of trials. Catch rates were at times well up to those of traditional longliners working alongside, but on average they were lower reflecting a number of factors. The murkiness of the water, characteristic of the winter months, appeared to obscure the advantages of monofilament lines. The time taken to bait the monolines and the crew learning time are problmes still to be resolved.

The system was shown to be an effective catching technique on the Yorkshire Coast even in a winter fishery. Further trials are required in the summer months to fully realise the potential of the system.

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1. INTRODUCTION

These trials form part of the SFIA's static gear investigations funded under MAFF commission A.1.2. This report describes another stage in the introduction of Norwegian style monofilament longlining to UK coastal fisheries.

Previous trials using this sytem were conducted in Cornish waters in the winter of 1983 and summer 1984. Technical Report No. 248 and Internal Report No. 1172 describes those trials.

Using monofilament longlines instead of traditional longlines has produced significantly higher catch rates in the Norwegian cod fishery.

The main aim of these trials was to find an adaptation of this system suitable to the Whitby longline fishery. Whitby has a well established traditional line fishery lasting from October until April. General comparisons between the two systems were therefore made.

These trials were conducted in January at the peak of the cod longline fishery.

2. TRIALS VESSEL

Name:	MFV GANNET - WY 252
Built:	Herd Mackenzie - 1970
L.O.A:	39 ft
Beam:	11ft 6in.
Draft:	5ft 9in.
Main Engine:	120 hp Perkins
Electrical Equip:	Kelvin Hughes Colourmatic MJ 640 Sounder
	Furuno FE 502 Mk II Sounder
	Huson 60 VHF
	Racal-Decca Yacht Navigator
	Furuno 24m Radar
Net Hauler:	North Sea Winches
Line Hauler:	Type KB Pettersen Longline Hauler

3. FISHING GEAR

3.1 Longlines

Ten complete monofilament longlines rigged with snoods, swivels and hooks were used for these trials. The mainlines were 2.0mm diameter and the snoods 0.8mm diameter. Each line was 500m long, the snoods being 850mm long. There was approxiamtely 170 hooks attached to each line. Swivels attaching the snoods to the mainline were spaced 3m apart. They were held in place by seizings on either side (see Fig. 1). Seven of the lines were fitted with quick-release swivels. The other 3 lines were fitted with the standard, permanantly attached swivels.

3.2 Dropper Strops

At regular intervals on each line, dropper strops were tied. On most occasions the intervals were every 25 snoods, although 12, 16 and 20 snood spacings were also used. The strops were 4mm diameter twisted nylon and approximately 400mm long. An eye was spliced onto the free end. During the baiting process these dropper strops were placed, in sequence, into notches at the tops of each tub. Weights and floats were then attached to the eyed end of these strops as the lines were shot.

3.3 Line Tubs

Line tubs are circular with a base diameter of 0.48m, top diameter of 0.6m. The tubs are 0.36m high. The lines are shot from, and hauled into, these tubs. The tubs used on the trials were purpose built, although any container of similar dimensions would be suitable. There are 2 notches at the top of each tub. These are used for the stowage of dropper strops.

3.4 Floats and Weights

3.5in. diameter green spherical longline floats (285g buoyancy) and 2.5in. diameter blue oval gillnetting floats (70g) buoyancy) were used. 3.5in. diameter floats were always attached to the dropper strop along with 600g weights. 2.5in. diameter floats were attached either on their own or with 300g weights.

Metal clips were used for attaching weights and floats to the dropper strops.

3.5 Shooting Guide/Hauling Gear

Figure 2 gives a general deck layout of trials equipment. A purpose built shooting guide was fabricated and fitted to the stern of the vessel (see Fig. 3).

A Pettersen longline hauler Type KB was fitted in association with purpose built fairings. These fairings consisted of a shallow trough between the boats rail and the hauler and a fairing surrounding the hauler (see Fig. 4).

The shooting guide and hauler fairings were fabricated from galvanised mild steel. Draghtsman's drawings of these items are available from the Industrial Development Unit.

4. TRIALS NARRATIVE

Sea trials commenced on 17th January continuing to 12th February. During this period, 15 days of fishing operations took place. Several lines were shot, hauled and rebaited each day. Detailed logs are given in Appendix 1.

Fishing activities were conducted from Whitby, the disposition of gear is given in Appendix 2. On the 17th and 20th January the lines were shot on soft ground in about 10 fm. This gave the crew a chance to familiarise themselves with the gear in a fairly easy area. From the 22nd January onwards, more productive, harder grounds were worked.

It was intended to follow the same routine as the traditional longliners. They work continuously through spring and neap tides alike. Most of them haul by hand, therefore, for ease of operation, time their activities such that hauling takes place at slack water. For the trials vessel this was not always practical. In addition, because the mainline was set off the bottom, and a hauler was being used, it was not usually necessary.

A variety of weight and float arrangements were used. At this time of year, in these waters, it is regarded that fish are feeding very close to the bottom. The emphasis was therefore to set the baited hooks on the bottom, whilst keeping the mainline just off the bottom. The latter avoids the hazard of the mainline coming fast.

The gear was generally shot in runs of 2 lines each of 500m in length. This was determined by the geographical expanse of hard fishing grounds. The lines were left in the water, usually for 2 to 3 hours. When favourable weather forecasts were given the lines were left out overnight. This practice, however, was restricted by the imminent possibility of trawlers towing through the lines in darkness.

5. DISCUSSION

5.1 Shore Based Operation

The major drawback of the monofilament longline system is the lengthy process of rebaiting lines.

Using fresh mussel as bait, an experienced baiter could rebait one of these lines (200 hooks) in 2^ hours, whereas a traditional longline (200 hooks) would take him only 1 hour.

Snoods and hooks tangling with the mainline on coiling, each take time to clear ready for rebaiting. Snoods are spaced 3m apart on monofilament longlines compared to 1.8m apart on traditional longlines. More coiling is therefore required which again adds time to the baiting operation. Tangles and twists that occur periodically on these lines also add extra time to baiting.

A period of practice is needed to master the special techniques required to bait-up monofilament longlines.

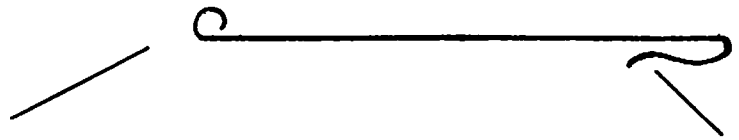
Correct procedure is essential on rebaiting to ensure that the line shoots properly and free from foul-ups. Baited hooks are laid in the tubs in semi-circular rings (see figure 5). Taking the slots at the top of the bin as the six on a clock face, baits are laid in rows from 9 o'clock to 3 o'clock. Glossy magazine pages are used to separate the layers of bait as one row is placed on another. The paper prevents layers of bait sticking together, therefore on shooting, each baited hook will leave the tub individually. Mussel, being a very soggy bait, required extra paper to achieve this effect. The mainline is coiled clockwise into the tub whilst each snood is laid anti-clockwise. The coils of mainline and the rows of bait are built up to layers of equal height. This prevents hooks catching underlying coils of mainline as they are pulled up through the shooting guide.

Baited lines are covered and refrigerated ready for use.

5.2 Rigging of Lines

5.2.1 Floats/Weights

On previous trials, floats and weights had been tied to the dropper strops. This was not always easy or convenient to do. The use of stainless steel clips was therefore suggested by Skipper Barleycorn of GANNET.



float or weight attached permanently to this end

this end clips onto the eye of the dropper strop

This made attachment of floats and weights whilst shooting much quicker and easier.

The weights used (600g and 300g) were much lighter than those used on previous trials (3 to 5kg). Several advantages were gained by this. Firstly, due to the reduction in tension, less twisting of the mainline occurred. Secondly, the lighter weights were displaced by the tide therefore allowing the mainline to sweep an area of ground ("sweeping" is considered locally to be vital in the effective use of traditional longlines). Thirdly, using a large number of weights, lighter ones proved to be more convenient and less cumbersome to handle.

5.2.2 Quick-release Swivels

The use of quick-release swivels was investigated. They are designed so that each snood can be detached as the line is being hauled. The mainline would thus enter the tubs independent of snoods and hooks. Time would be saved rebaiting as the line would be tangle-free.

Several practical problems arose with the system. The swivels could not be detached quickly enough to avoid disrupting the hauling process. This was caused by their design (see Fig. 1). The swivels are small and fiddly to operate, particularly with cold hands.

To allow detachment of each snood the speed of the hauler was reduced significantly. The vessel therefore had to reduce its speed through the water. At low speeds the vessel tended to drift away from the line. On occasions this put excess strain on the line causing it to part. The slow hauling speed doubled the hauling time. Several snoods became detached at sea, presumably due to the action of a hooked fish. An extra man is required to unclip all the snoods. To justify this a great deal of time would have to be saved. With this particular design of swivel, more time was actually lost during hauling than was gained in rebaiting.

There is a definite need to reduce the time spent rebaiting. A quick-release swivel, that actually does release quickly, could still be the answer.

5.2.3 Error in Rigging

On previous trials, weights and floats had been connected by an adjustable length of string. A short branch of this string emerged from the float end. This was used for attachment to the dropper strops. The floatation was therefore applied only at the point of attachment of the dropper strop. The mainline was free to move up or down, to the length of the dropper strop (2ft) before any floatation or weighting was exerted (See Fig. 6). This factor probably had little significance when setting lines 3 or 4 fathoms off the bottom, but fishing in the bottom 0.5 fathoms, obviously the effect was considerable. When this error was identified the arrangement was changed. Weights and floats were attached separately - the floats to the swivel end of the dropper strop and the weights to the eyed end (see Fig. 6).

5.2.4 Rigging sequences and Gear performance

It is known locally that cod are feeding on the seabed during the winter time. The main objective when rigging the lines, therefore, was to set the hooks either on, or very close to, the seabed. Whilst doing this it was also very important to set the mainline just off the bottom. This was done to avoid the hazard of coming fast. In addition, the lines were rigged to conform to the traditional longlining practice of "sweeping". Some trial and error experimentation was required to achieve these three effects.

Figure 7 shows the variety of riggings used. Rig 1 proved the most successful of these, particularly when 400mm weight strops and 25 snood spacings between floats were used. This short strop kept the mainline off the bottom while still allowing the snoods (850mm in length) to fish on the bottom. The 25 snood spacings (43 fathoms) between floats appeared to give adequate flexibility to the mainline. This, combined with the use of light weights, enabled the line to sweep the ground with the tide.

On short soaks (2 to 3 hours) catch rates were reduced significantly by using longer weight strops of 1 to 1.3m length. These longer strops kept the baits off the bottom therefore reducing their catching capacity. On longer soaks (24 hours), however, the longer weight strops produced satisfactory catches. This was presumably because the baits, being off the seabed, tended to stay on the hook for a longer time. The line experienced at least three changes of tide on long soaks so the baits continued to catch fish throughout the soak. The ground, covered by the line as it was swept back and forward with the changing tides, would be quite considerable. In very strong tides however the line was forced down onto the seabed, regardless of the weight strop length. In these conditions no advantage was gained by having long soaks.

5.2.5 Shooting

On most occasions the lines were shot at right angles to tidal flow. This ensured that the baits would be fishing clear of the mainline. Shooting across tide also is essential to effective ground cover.

The lines were shot at speeds of 3.5 to 5 knots. The faster speeds were preferred as this set the lines tighter on the bottom. On average 2 lines, 400 hooks in total, were shot in 5 minutes.

Dhan buoys and anchors are set in the water. A veering line connects the anchor to the monofilament mainline. The boat then sets a steady course across the tide as the lines are shot. One man stands in front of the shooting guide tying on, or clipping on the weights and floats to the dropper strops. The coils of mainline stream out of the tub and through the shooting guide in a continuous line. The baited hooks are pulled up with the snoods, one by one, row by row, layer by layer. They are pulled vertically upwards out of the bin, over the arch on the inside of the shooting guide, and through the guide, over the stern of the vessel.

Foul-ups can occur when a hook, on its way out of the tub, catches a few coils of underlying mainline or underlying snoods. When this happens several baits often tangle together in a bunch which appears to reduce the catching efficiency of that section of line. Holding onto the weights or floats for a few seconds will tighten the mainline and therefore break off the offending snoods when these situations arise.

Tubs were placed one by one into the shooting guide. A length of rope was attached between lines thus giving a time interval for the removal of an empty tub and the placement of a full tub into the shooting guide. On most occasions, the changing of tubs required the vessel to slow down. A double shooting guide, as used in the Norwegian fishery, obviously would make this operation more speedy, one line following directly on from another.

The shooting operation was altogether faster and more efficient than the traditional shooting techniques.

5.2.6 Hauling

The hauling process consists of keeping the boat up on the mainline ensuring that no strain is put on it. This involves steering the vessel on a steady course (allowing for wind and tide), slightly ahead of the line as it is hauled aboard. In rough seas and strong tidal conditions it is extremely difficult to follow this procedure. On several occasions the vessel drifted away from line causing it to part. The trials vessel was at a disadvantage with not having on-deck steering. It would have been preferable for the boats controls to have been located adjacent to the hauler controls, next to the fairlead roller. One man would thus be able to control both the movement of the boat and the hauling in of the lines. As it was, the crewman working the hauler controls had to direct the boats course and speed by verbal communicaton to the skipper in the wheelhouse.

The lines were placed into the sheaves of the hauler and coiled into the same tubs as were used for shooting. Hooked fish were hauled onto the hauling trough over the fairlead roller and then to the stripper bars for removal. At the stripper bars the snood parted at the knot on the swivel if the fish was deeply hooked. If the fish were only lightly hooked the hook was ripped from its mouth. The hauling trough served mainly to guide hooks and snoods towards the hauler. When the swivels passed over the hauler, snoods were deflected haphazardly. The fairing around the hauler thus served to guide all the stray snoods into the tub positioned underneath the hauler.

A vital feature of the hauling process is ensuring that the line coils down properly into the tubs. If it coils down in good order then the job of clearing the lines for rebaiting becomes much easier and less time consuming.

There are three main factors affecting coiling. The first one is the height of the hauler. This must be set so that its central axis is approximately 65 cms above the deck. The second factor is the hauling speed and the third is the efficient keeping of the boat upon on the gear. The latter refers mainly to avoiding any tension on the mainline. There is an indication that tension on the line causes twists to occur.

The hauling process was fast and efficient. Two lines of 400 hooks in total were hauled in 35 minutes. Lines did part on several occasions as the boat strayed off course.

5.2.7 Comparison with Traditional Longline

A general comparison bewteen trials catch rates and traditional longline catch rates are shown in Table 1.

TABLE 1

Catch Rate Comparisons between Trials Vessel and Traditional Longliners

Hauling Date	TRIALS VESSEL		TRADITIONAL VESSEL	
	Catch Rate (stone/no. hooks)	Mean Catch Rate (stone/200 hooks)	Catch Rate (stone/no. hooks)	Mean Catch Rate (stone/200 hooks)
17.1.85	2/300	1.3	35/1200	5.7
20.1.85	3.5/500	2	35/1200	5.7
22.1.85	4/200	4	42/1400	6
25.1.85	27/1300	4.2	30/1200	5
29.1.85	30/1180	5.1	33/1200	5.5
30.1.85	29/1400	5.6	27/1200	4.5
3.2.85	12/750	3.2	27/1200	4.5
4.2.85	19/910	4.2	16/1000	3.2
5.2.85	11/570	3.9	35/1200	5.7
6.2.85	25/1270	3.9	-	-
7.2.85	8/740	2.2	-	-
8.2.85	13/1020	2.5	-	-
Average		3.5		5.0

When comparing these results, the relative inexperience of the crew as line fishermen must be born in mind although it should be noted that at the end of January the catch rate of monofilament exceeded the traditional lines. In addition the particular difficulties of working an entirely new system undoubtedly affected the performance. Taking these factors into consideration, monofilament longlines appeared to be every bit as effective as traditional longlines. The extra time baiting and the extra expense required for this system, however, cannot be justified by these results alone.

5.2.8 Potential for a Summer Fishery

The traditional method of longlining as used in Whitby appears to be an effective method of catching fish. Catches of up to 9 stone/200 hooks were observed. These catches consisted of large numbers of very small codling. At this weight, therefore, virtually every other hook yields a fish. To surpass this, monofilament longlines would have to prove extremely effective and even if they did, the relatively small extra catches would probably not justify the extra work and the extra expense required to use these lines.

The traditional fishery, however, is seasonal, confined only to the winter months. The obvious area for development in the longline fishery would therefore be in the summer months.

The clarity of the water, the abundance of predators, and the fish feeding off the bottom are the main reasons why traditional longlines cannot be used effectively in the summertime. There is still an abundance of fish in the area, as evidenced by the signficiant landings made by sea anglers. In addition the fish tend to be much larger and of greater market value than those landed in the wintertime.

It would appear that all the characteristic advantages of monofilament longlines could be fully realised in the summertime. Firstly the lines would be invisible in the clear water. Secondly,

the depth of the line could be adjusted to suit the depth of fish (no longer on the bottom). Thirdly, the bait would be clear of the seabed and thus free from the attentions of other predators such as crabs and starfish. The use of artificial bait on these lines in the summertime has been suggested. If this proved feasible it would represent a major breakthrough in longine fishing. The shore based side of the operation, at present expensive and time consuming, could be illiminated. The lines would require little attention between hauling and shooting. It may even prove possible to haul and shoot at the same time without the need for elaborate machinery.

Traditional longlining vessels are unable to fish commercially during the summertime. This is because their lines are not effective in the prevailing environmental and ecological conditions found in the summertime. If a longline fishery could be established during the summertime there is a considerable number of vessels that could benefit from it.

6. CONCLUSIONS

6.1 Technique, gained by practice, is an important factor. Learning time was required in baiting, shooting, hauling and in rigging the monofilament lines.

6.2 To match the winter feeding habits of fish in this location, it was essential to set the lines such that the hooks were fishing on the seabed.

6.3 The shooting and hauling operations were faster and easier to work than the traditional techniques.

6.4 The baiting of monofilament lines was unacceptably time consuming, even after practice and experience had been gained. Traditional longlines can be baited in half the time.

6.5 The quick-release swivels tested on the trials could not be removed from the mainline fast enough to provide any advantage to the system.

6.6 Catch rates were comparable with traditional longliners but showed no signs of justifying the exra expense and extra time required.

6.7 It seems very likely that the characteristic advantages of monofilament longlines were obscured by the prevailing environmental and ecological conditions at the time of the trials, i.e. wintertime.

7. RECOMMENDATIONS

Summertime trials are now required to realise the full potential of this fishing method in Whitby. The baiting operation must be improved to reduce the time factor involved. The use of artifical baits may provide the means for this. Lines with 2m snoods spacings should be obtained for future trials as this would take a third of the time off coiling.

A system of working gear continuously, hauling and shooting concurrently should be investigated. A longlining vessel capable of making 2 or 3 day trips might well be the most suitable for such trials.

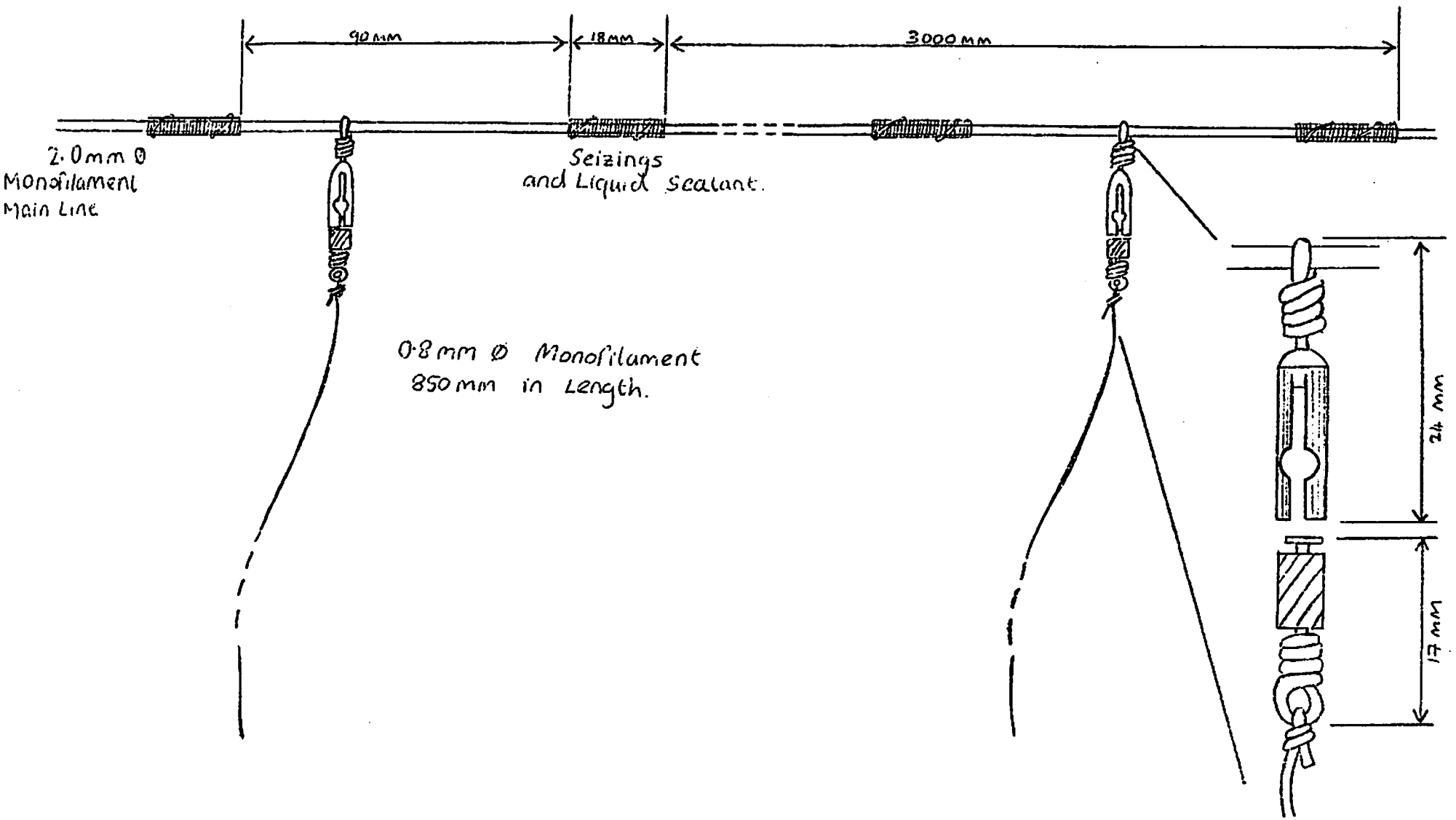
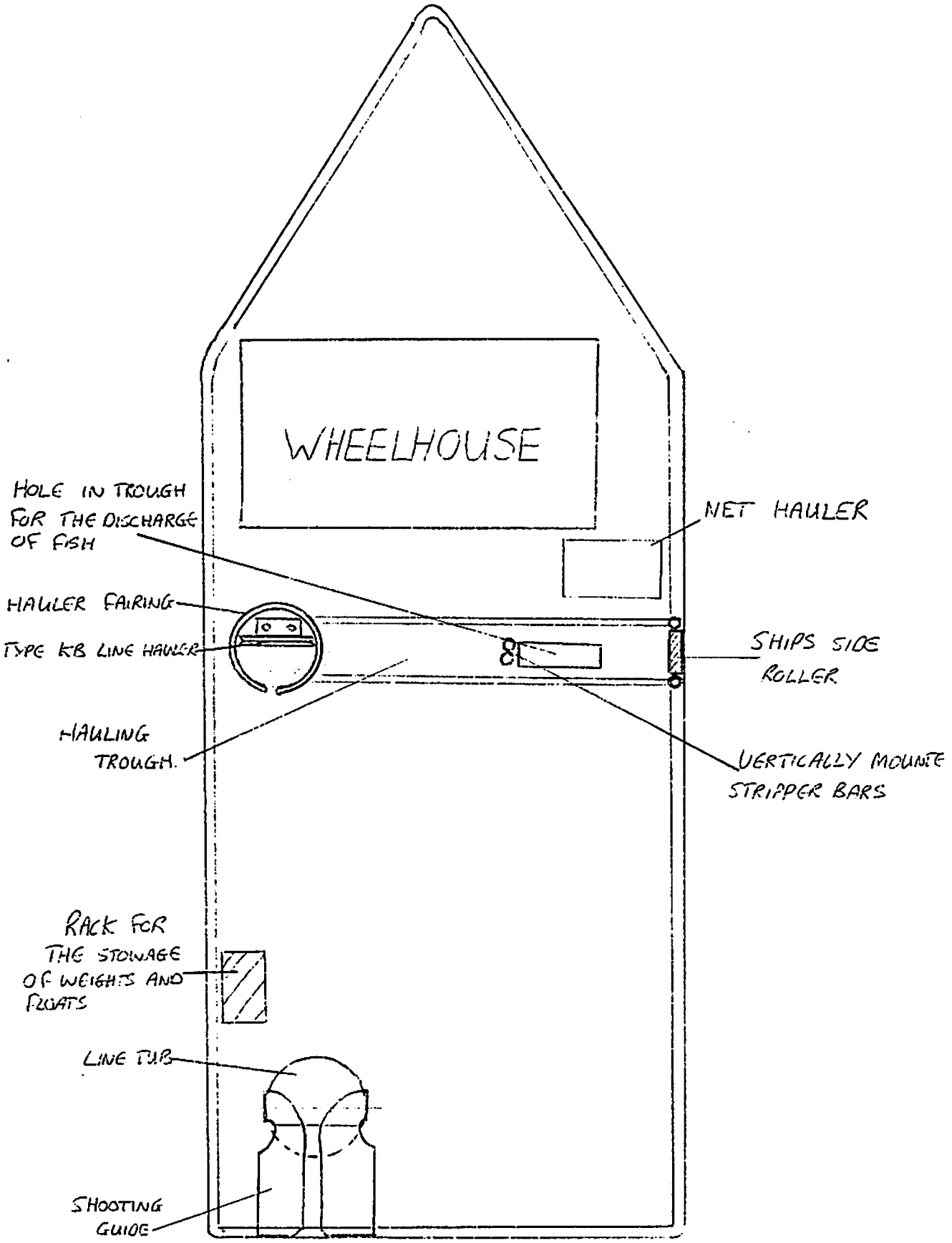
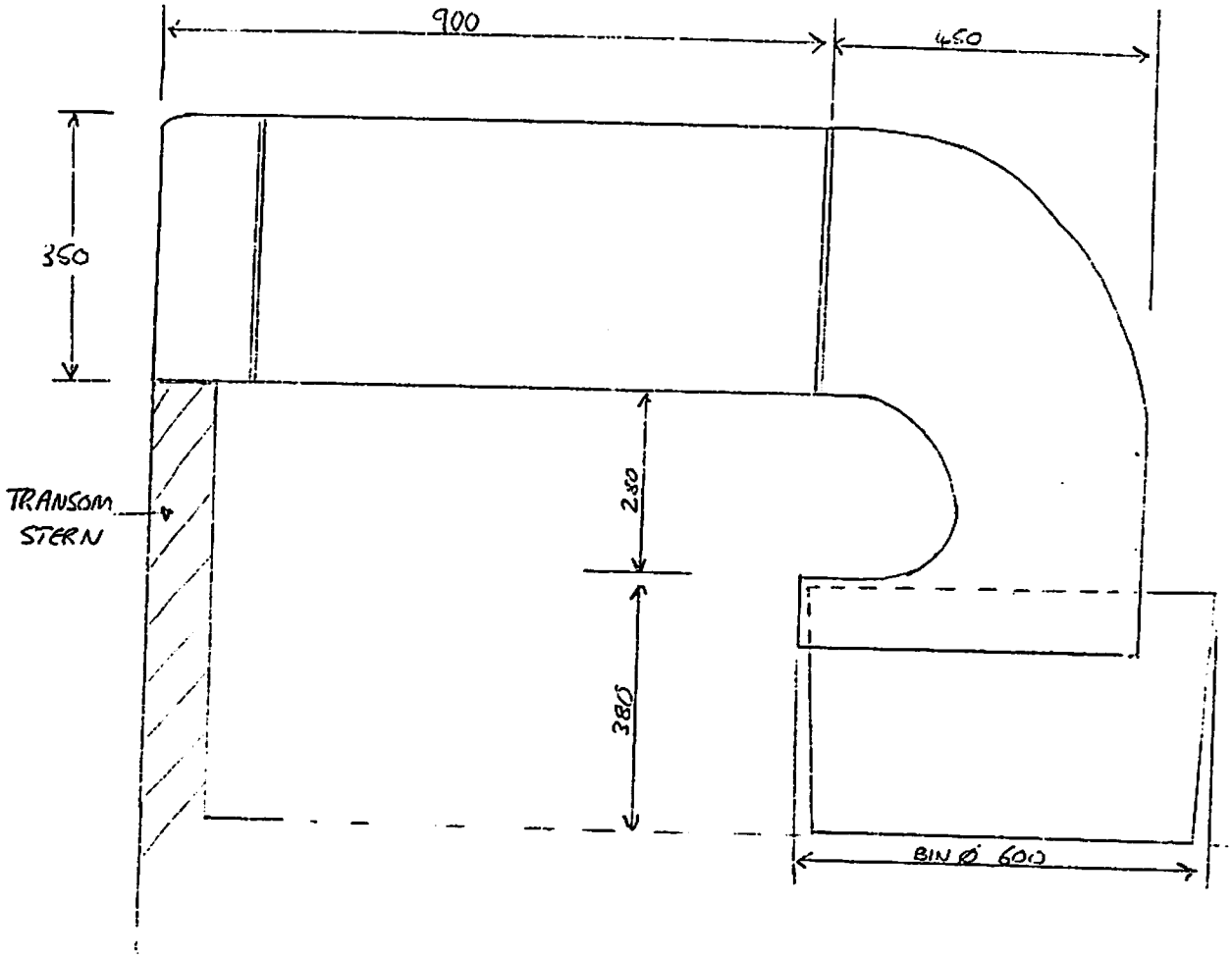
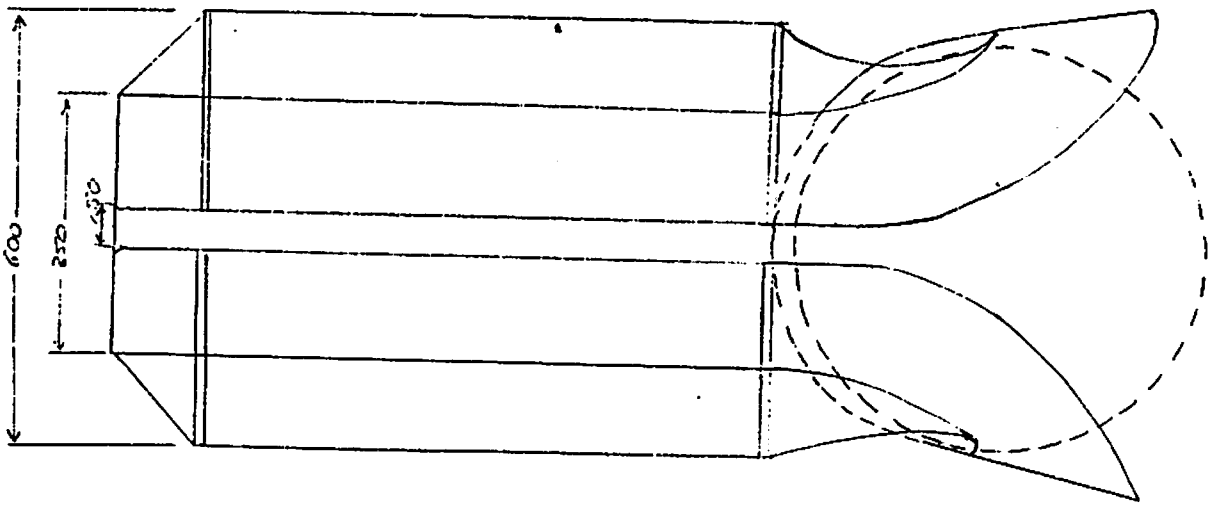


FIGURE 1:— Detail of Quick-release Swivel, Snood and hook arrangement (not to scale)



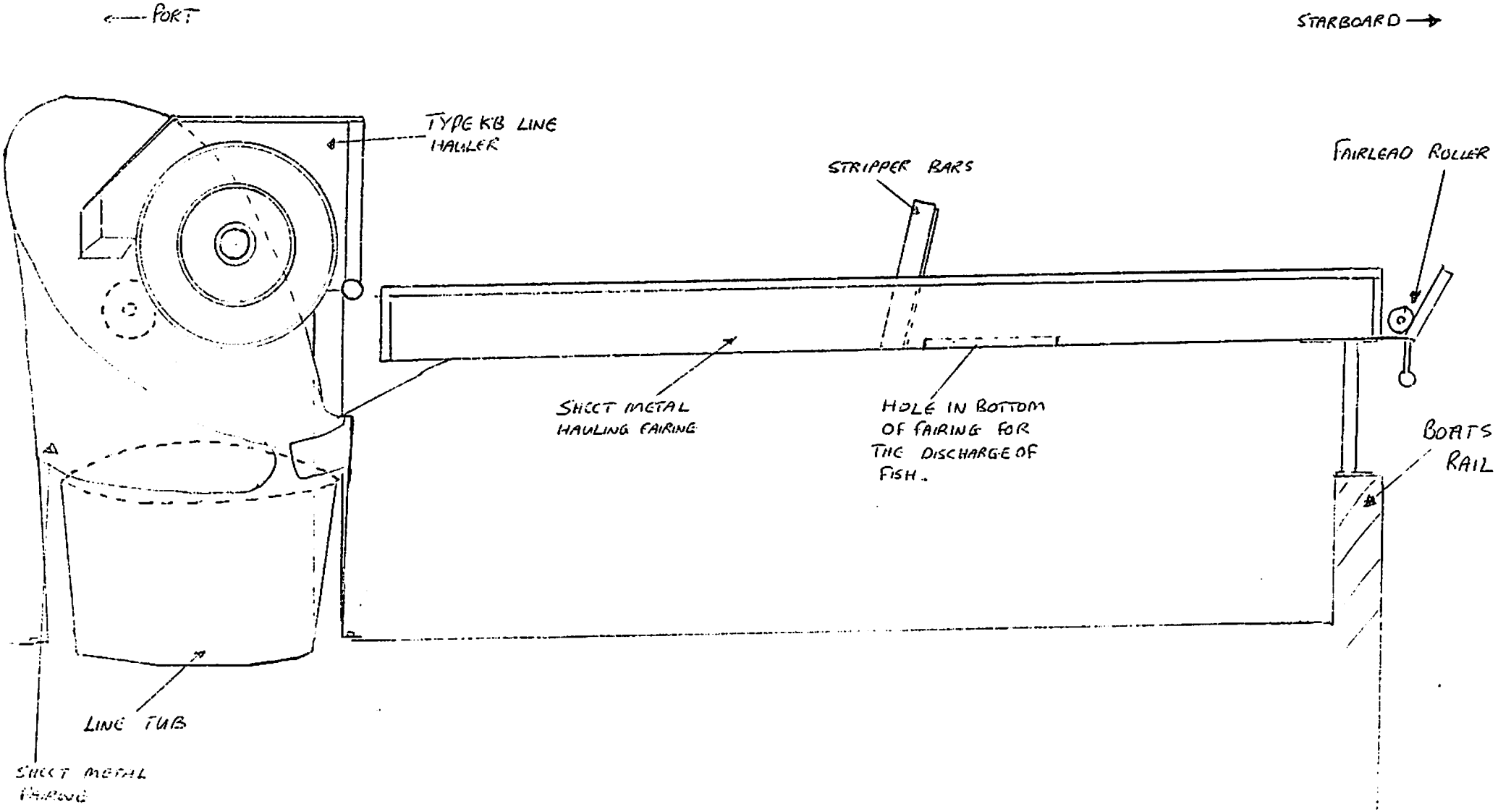
LAYOUT OF TRIALS EQUIPMENT ON NEW GANNET FIGURE 2





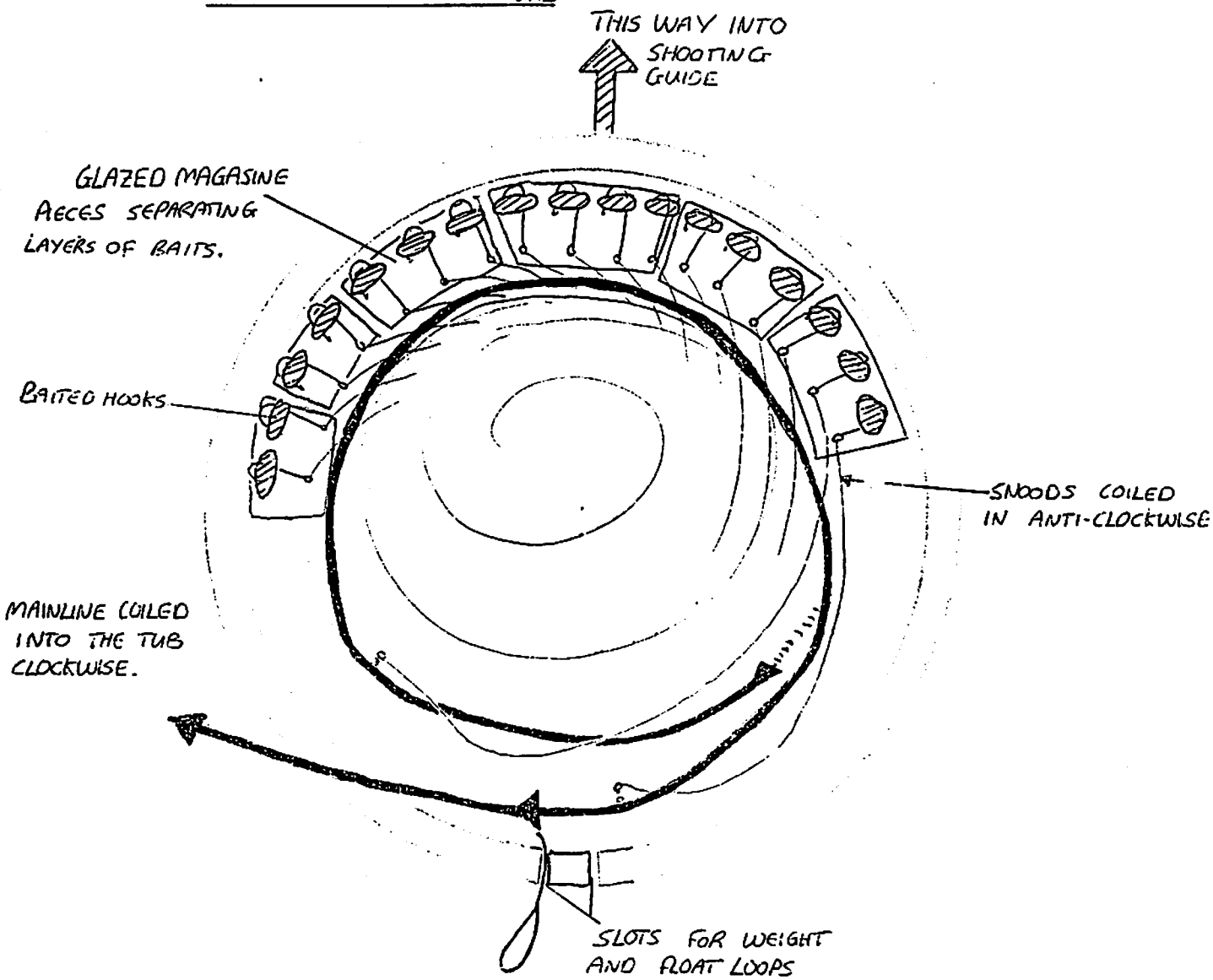
DIMENSIONS IN MM
NOT TO SCALE

SHOOTING TROUGH FIGURE 3.

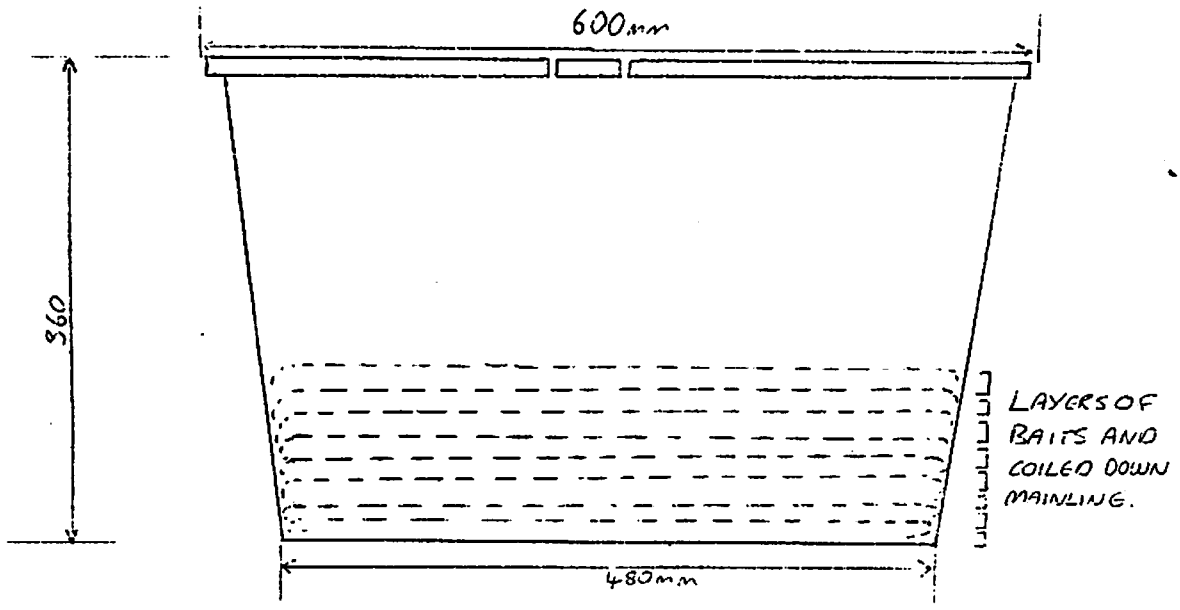


LINE HAULER ARRANGEMENT FIGURE 4

OVERHEAD VIEW OF TUB



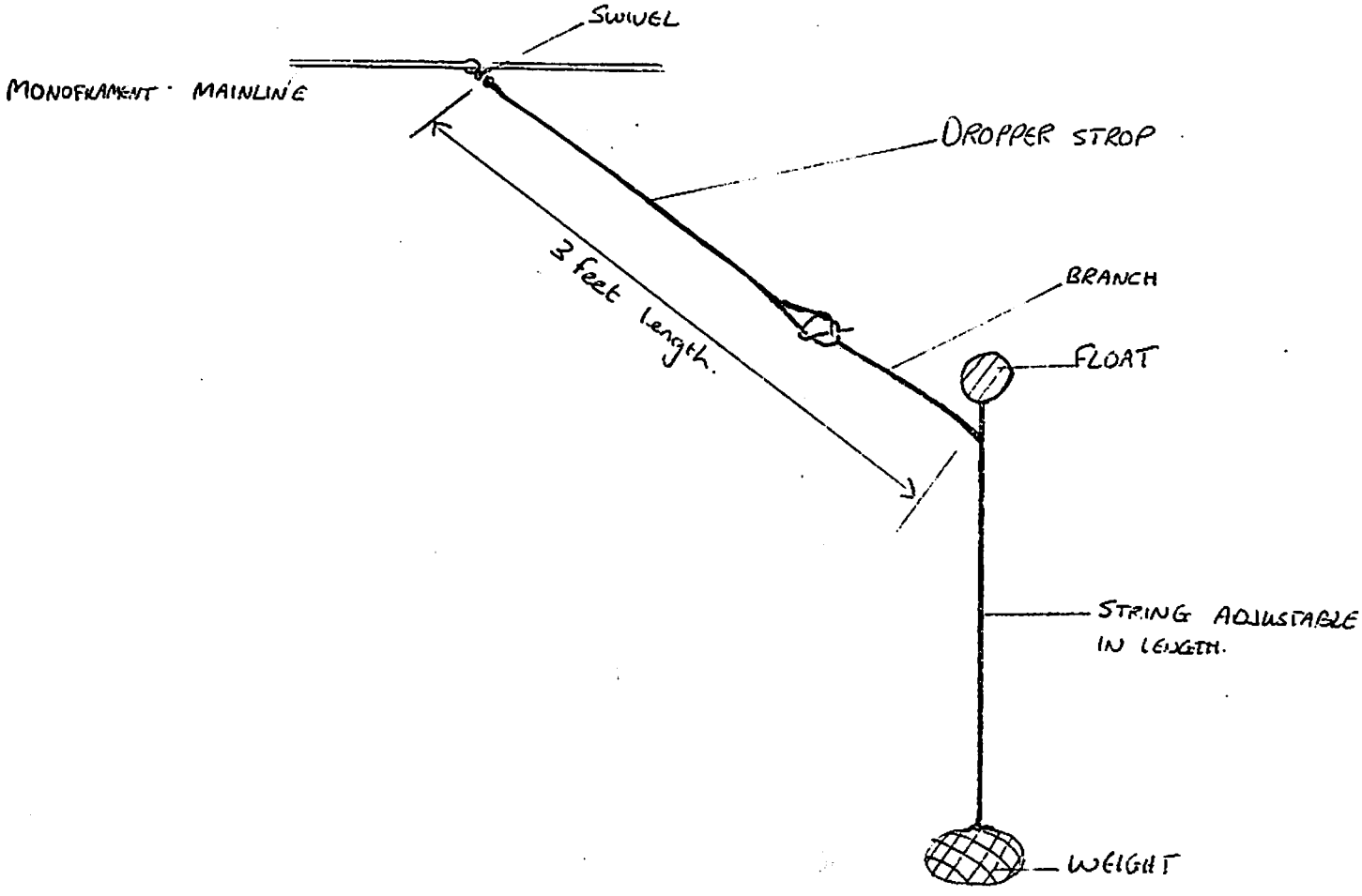
SIDE VIEW OF TUB



BAITING PROCEDURE (NOT TO SCALE)

FIGURE 5

INCORRECT RIGGING



CORRECT RIGGING

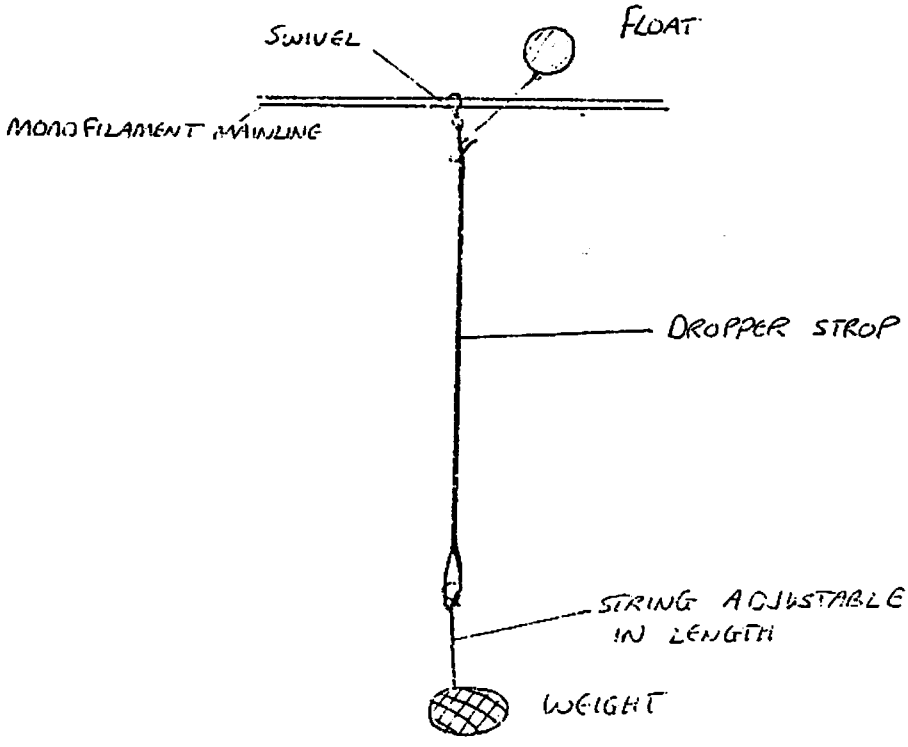
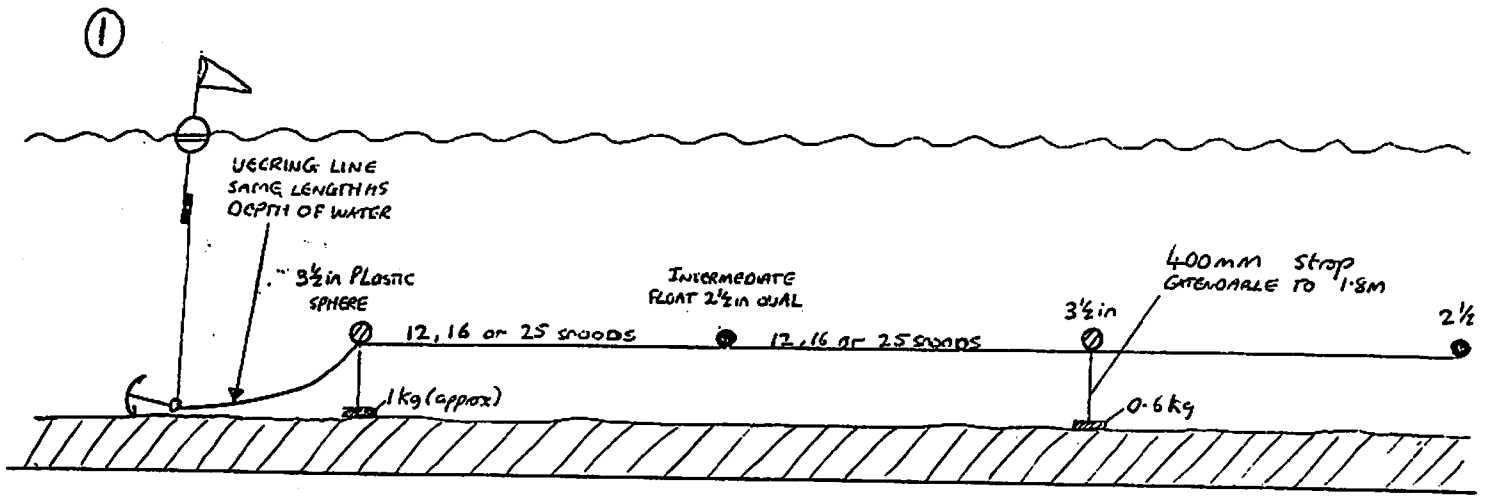
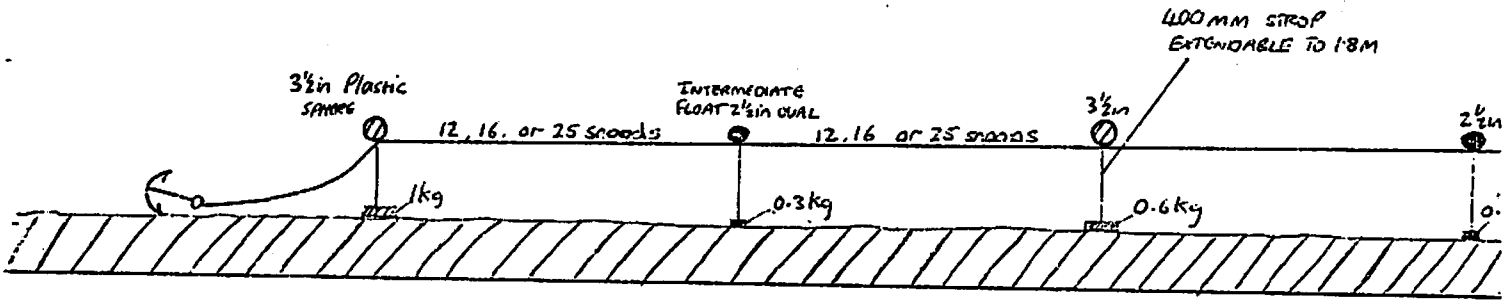
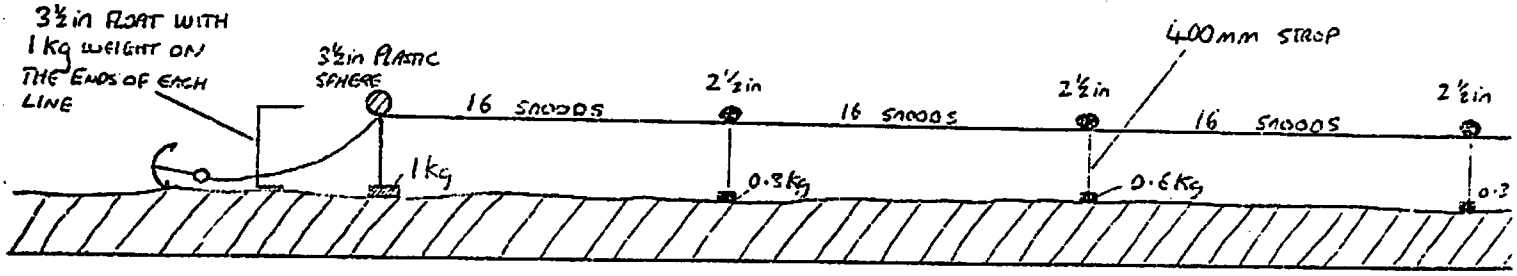
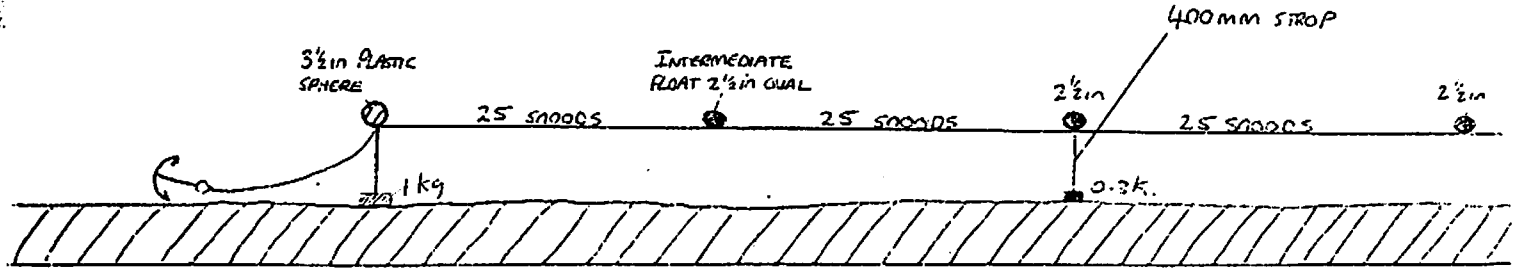


FIGURE 6



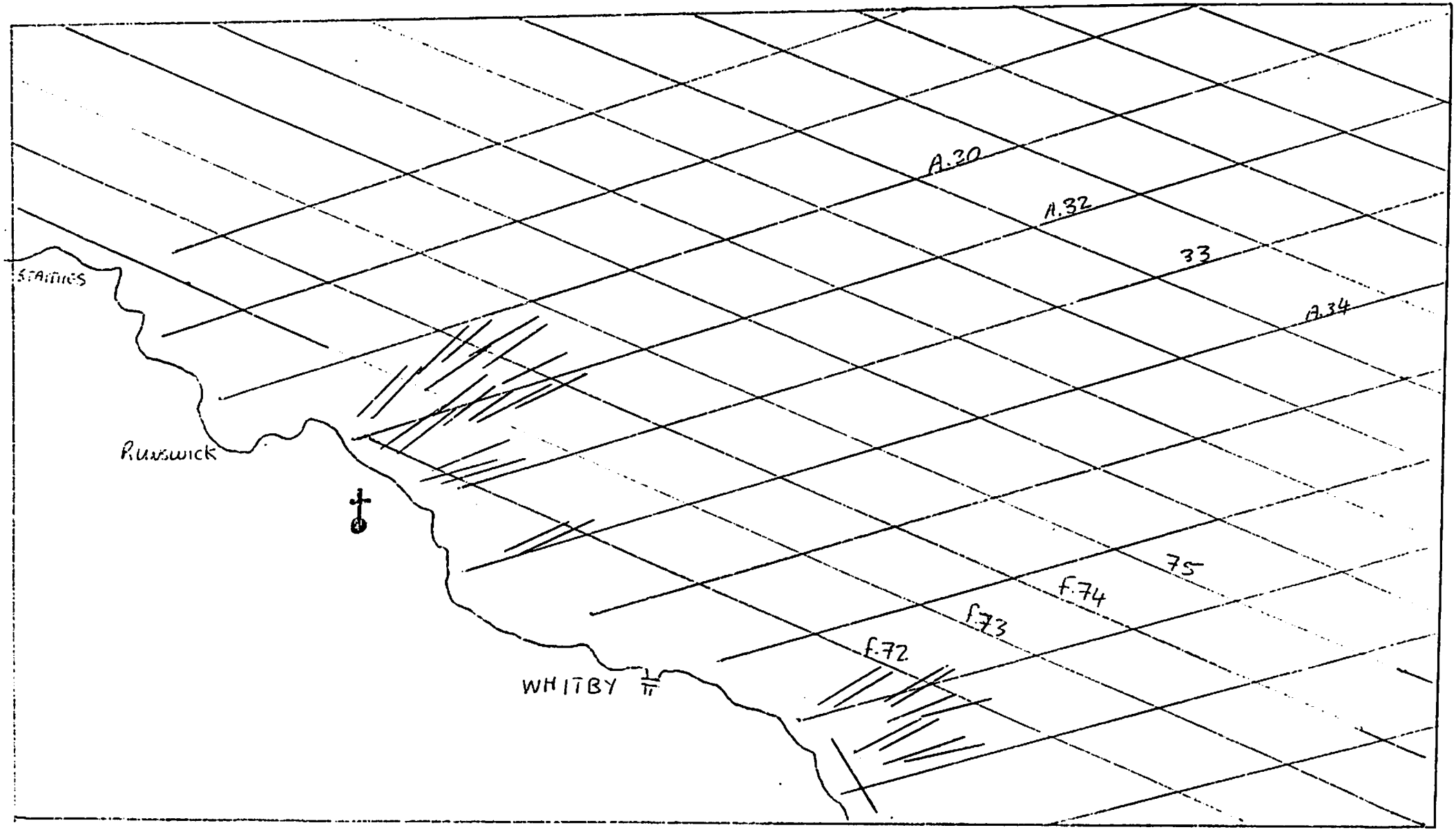






VARIOUS RIGS OF LINES USED

FIGURE 7



Disposition of fishing gear

SHOT NUMBER	DATE SHOT	NUMBER OF LINES SHOT	DURATION OF SOAK	DEPTH AND LOCATION	TIME	RIG: (a) WEIGHT STROP LENGTH (b) FLOATATION/WEIGHT SEQUENCE (c) FREQUENCY OF APPENDAGES (FLOATS AND/OR WEIGHTS)	CATCH PER LINE	COMMENTS
1	17/1/85	2 (300 HOOKS)	2½ HOURS	6 TO 10 FATHOMS SOFT GROUND NORTH OF WHITBY	4·6 M	1. (a) 1½ FATHOMS (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ON ITS OWN. (c) EVERY 25 SNOODS (42 FATHOMS)	1½ STONE MAINLY COD LING	1½ FATHOM WEIGHT STROP APPEARS TO KEEP THE LINE TOO FAR OFF THE SEABED. THE COMMON KNOWLEDGE LOCALLY IS THAT FISH ARE HARD ON THE BOTTOM AT THIS TIME OF YEAR.
			"	"	"	2. (a) SAME AS ABOVE (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ON IT'S OWN (c) SAME AS ABOVE	½ STONE. COD LING.	3½ in FLOAT ON IT'S OWN APPEARS TO MAKE THE INTERMEDIATE LINE BETWEEN THE WEIGHTS FISH TOO HIGH OFF THE SEABED.
2	20/1/85	3 (500 HOOKS)	—	—	—	—	—	LINE TOWED AWAY BY A TRAWLER
3	20/1/85	3 (500 HOOKS)	1 HOUR	10 FATHOMS 2 MILES N.W. WHITBY.	5·2 M	1. (a) 1 FATHOM (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ON ITS OWN. (c) 25 SNOODS (42 FATHOMS)	1 STONE OF COD LING	1 FATHOM WEIGHT STROP TOO LONG TODAY THE LINES WERE SET ON SOFT GROUND TO GIVE THE CREW EXPERIENCE OF WORKING THEM - POOR CATCH RESULTS ARE THEREFORE PROBABLY A REFLECTION OF THE SCARSITY OF FISH ON SUCH GROUNDS, RATHER THAN A FAILURE OF THE GEAR
			"	"	"	2. SAME AS ABOVE	2 STONE OF COD LING	
			"	"	"	3. LINE SET ON THE BOTTOM WITH NO WEIGHTS OR FLOATS	½ STONE OF COD LING	
4	22/1/85	3 (500 HOOKS)	1¼ HOURS	12 FATHOMS 3 MILES N. WHITBY	5·3 M	1. 4mm TWISTED NYLON TRADITIONAL LONGLINE SET ON THE BOTTOM.	5 COD LING	CONDITIONS DID NOT FAVOUR HAULING ON 22/1/85 SO LINES 2 and 3 WERE LEFT DOWN FOR 3 DAYS.
			72 HOURS	"	"	2. (a) 1 FATHOM (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ON ITS OWN. (c) 25 SNOODS (42 FATHOMS)	5 STONE OF COD LING	CATCH RATES WERE IMPRESSIVE FOR SUCH A LONG SOAK - THERE IS THE INDICATION THAT WHEN FISH ARE HOOKED VERY FEW GET AWAY - THE FLEXIBILITY OF THE LINE PREVENTING ESCAPE.
			72 HOURS	"	"	3 SAME AS ABOVE	2½ STONE COD LING	HOWEVER 72 HOURS IS TOO LONG A SOAK AS MANY OF THE FISH WERE DEAD AND UNFIT FOR SALE.
5	22/1/85	2 (300 HOOKS)	1¼ HOURS	12 FATHOMS 3 MILES N WHITBY	5·3 M	1. SAME AS ABOVE	3 STONE OF COD LING	ON A SHORT SOAK SUCH AS THIS 1 FATHOM STROP MAY BE TOO LONG. THIS WAS EVIDENCED BY THE FACT COMING BACK 10 HOOKS EITHER SIDE OF THE WEIGHTS MOST FISH HAVE BEEN CAUGHT IN THE VICINITY OF THE 2½ in FLOAT ON ITS OWN.
			72 HOURS	"	"	2. SAME AS ABOVE	1½ STONE	

SHOT NUMBER	DATE	NUMBER OF LINES SHOT	DURATION OF SOAK	DEPTH AND LOCATION	TIDE	RIG: (a) WEIGHT STROP LENGTH (b) FLOATATION/WEIGHT SEQUENCE (c) FREQUENCY OF APPENDAGES (FLOATS AND/OR WEIGHTS)	CATCH PER LINE	COMMENTS
6	25/1/85	3 (450 Hooks)	3 HOURS	10 TO 16 FATHOMS. 3 MILES N. OF WHITBY.	5·1M	1. (a) 1/2 FATHOM (b) 3½in FLOAT WITH WEIGHT ALTERNATING WITH 2½in FLOAT ON ITS OWN. (c) 6U. 25" SNOODS (42 FATHOMS)	5 STONE OF COOLING	LIGHTER WEIGHTS HAVE BEEN INTRODUCED. THESE SERVE TO GIVE THE LINE A GREATER FREEDOM OF MOVEMENT IN THE TIDE. AS A RESULT THE LINE IS ABLE TO EXPERIENCE A SWEEP (SO ESSENTIAL TO THE TRADITIONAL LINING TECHNIQUE). CAREFUL OBSERVATION OF THE LINE WHILST HAULING INDICATES THAT FISH ARE CAUGHT ONLY WHEN THE HOOKS ARE ON THE BOTTOM. 1/2 FATHOM STROPS ARE TOO LONG THEREFORE.
			"	"	"	2. SAME AS ABOVE	4 STONE OF COOLING	
			"	"	"	3. SAME AS ABOVE	4 STONE OF COOLING	
7	25/1/85	2 (350 Hooks)	2 HOURS	SAME	5·1M	1. (a) 3/4 FATHOM (b) 3½in FLOAT WITH WEIGHT ALTERNATING WITH 2½in FLOAT ON ITS OWN. (c) 25 SNOODS (42 FATHOMS)	2 STONE OF COOLING	WEIGHT STROP IS TOO LONG - IT IS KEEPING THE BAITS WELL OFF THE BOTTOM - FISH ARE THEREFORE ONLY CAUGHT IN THE INTERMEDIATE STRETCHES OF LINE WERE THE LINE SAGS TO THE BOTTOM.
			"	"	"	2. SAME AS ABOVE	2 STONE OF COOLING	
8	26/1/85	2 (400 Hooks)	18 HOURS	SAME	4·6M FALLING TO 4·4M	1. (a) 3/4 FATHOM (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½in FLOAT WITH WEIGHT. (c) 12 SNOODS (20 FATHOMS)	6½ STONE OF COOLING	3/4 FATHOM STROPS INCORRECTLY KEEPS THE BAITS OFF THE SEABED. THIS HOWEVER IS ADVANTAGEOUS ON LONGER SOAKS. THE BAITS CAN STAY ON THE HOOKS AND CAN FISH FOR A LONGER TIME.
			"	"	"	2 (a) 3/4 FATHOM (b) 3½in FLOAT WITH WEIGHT ALTERNATING WITH 2½" FLOAT ON ITS OWN. (c) 20 SNOODS (3.5 FATHOMS)	9 STONE OF COOLING	THIS LINE WAS RIGGED TO BE MORE FLEXIBLE AND FREE TO MOVE WITH THE TIDE - AS A RESULT MORE HOOKS CAME INTO CONTACT WITH THE GROUND AND MORE FISH WERE CAUGHT.
9	28/1/85	2 (430 Hooks)	18 HOURS	SAME	4·6M FALLING TO 4·4M	1. (a) 3/4 FATHOMS (b) 3½in FLOAT WITH WEIGHT ALTERNATING WITH 3½in FLOAT WITH WEIGHT. (c) 25" SNOODS (42 FATHOMS)	4 STONE OF COOLING	MANY BAITS STILL COMING BACK AFTER 18 HOURS - INDICATES THAT WITH EASING TIDES 3/4 FA. STROPS ARE TOO LONG - SUCH A LENGTH MAY BE MORE APPLICABLE FOR A LONG SOAK ON STRONGER TIDES - WERE TIDAL FLOW WILL BRING THE BAITS DOWN TO THE SEABED.
						2. SAME AS ABOVE	4 STONE OF COOLING	

SHOT NUMBER	DATE	NUMBER OF LINES SHOT	DURATION OF SOAK	DEPTH AND LOCATION	TIDE	RIG: (a) WEIGHT STROP LENGTH (b) FLOATATION/WEIGHT SEQUENCE (c) FREQUENCY OF APPENDAGES (FLOATS AND/OR WEIGHTS)	CATCH AT LINE	COMMENTS.
10	29/1/85	2 (350 Hooks)	1¼ HOURS	12-18 FATHS 3 MILES N. WHITBY.	4·4M	1. (a) 2 FEET (b) 2½ in FLOATS WITH LIGHT WEIGHTS ALL ALONG (c) 16 SNOODS (36 FATHOMS)	3 STONE OF COD LING	THE LINE IS 2 FEET OFF THE SEA-BED - WITH 3 FEET SNOODS ALL THE BAITS ARE HARD ON THE BOTTOM ALL BAITS ARE FISHING - POOR CATCH RATE MAY BE DUE TO ABSENCE OF FISH IN SUCH AN EASING TIDE IT SEEMS TO BE TOO SHORT A SOAK FOR THIS GEAR.
						2. (a) 2 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT WITH WEIGHT (c) 25 SNOODS (42 FATHOMS)	4 STONE OF COD LING	
11	29/1/85	2 (350 Hooks)	23 HOURS	SAME	SAME EASING TO 4·2M	1. (a) ½ FATHOM (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOATS (c) 25 SNOODS (42 FATHOMS)	6 STONE OF COD LING	LINE PARTED WHILST HAULING SOME FISH HAD ONLY BEEN HOOKED FOR A SHORT TIME BEFORE HAULING THUS SHOWING THAT THE GEAR IS STILL FISHING
						2. (a) ½ FATHOM (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOATS WITH WEIGHTS. (c) 25 SNOODS (42 FATHOMS)	5 STONE OF COD LING	
12	29/1/85	1 (170 Hooks)	21 HOURS	SAME	SAME	1. (a) 3 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT. (c) 25 SNOODS (42 FATHOMS)	7½ STONE OF COD LING	
13	30/1/85	3 (510 Hooks)	3 HOURS	SAME	4·2M	1. (a) 2 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ON ITS OWN. (c) 25 SNOODS (42 FATHOMS)	3 STONE OF COD LING.	
						2. SAME AS ABOVE	2½ STONE COD LING	
						3. SAME AS ABOVE	8 STONE COD LING	
14	30/1/85	2 (400 Hooks)	2 HOURS	SAME	4·2M	1. (a) 2 FEET (b) 2½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOATS ON THEIR OWN (c) 25 SNOODS (42 FATHOMS)	6½ STONE COD LING	MANY STARFISH WERE CAUGHT WHICH INDICATES THAT THE BAITS WERE NOT MOVING ACROSS THE GROUND. ON THE 8 LINES (1450 Hooks) HAULED 30/1/85 39 STONE OF COD LING WERE CAUGHT. COMPARED TO A TRADITIONAL LINER ALONG SIDE WHICH CAUGHT 27 STONE ON 6 LINES (1200 Hooks)
						2 (a) SAME (b) SAME (c) 12 SNOODS (20 FATHOMS)	3 STONE OF COD LING	

SHOT NUMBER	DATE	NUMBER OF LINES SHOT	DURATION OF SOAK	DEPTH AND LOCATION	TIDE	RIG: (a) WEIGHT STROP LENGTH (b) FLOATATION/WEIGHT SEQUENCE (c) FREQUENCY OF APPENDAGES (FLOATS AND/OR WEIGHTS)	CATCH/RUNE	COMMENTS
15	3/2/85	2 (250 Hooks)	2½ HOURS	10 TO 20 FATHS 2 MILES S. WHITBY.	4·8M	1 (a) 2 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT (c) ITS OWN. (c) 25 SNOODS	3½ STONE OF COD LING.	SOME TANGLES FORMED ON SHOOTING
			"	"	"	2. SAME AS ABOVE	3 STONE OF COD LING	
16	3/2/85	2 (425 Hooks)	1⅓ HOURS	SAME	4·8M	1. SAME AS ABOVE	2 STONE COD LING	MANY BAITS COMING BACK AFTER 1¼ HOUR SOAK.
			"	"	"	2. SAME AS ABOVE	3½ STONE COD LING	
17	3/2/85	3 (510 Hooks)	2¼ HOURS	SAME	4·8M RISING TO 5·1M	1. SAME AS ABOVE	4½ STONE COD LING	THESE LINES WERE SHOT CLOSE INSHORE - LARGE FISH CAUGHT HERE - TIDAL EFFECT IS REDUCED HERE SO 2½m FLOATS ARE GOING TOO HIGH OFF THE BOTTOM.
			"	"	"	2. SAME AS ABOVE	4 STONE COD LING	
			"	"	"	3. SAME AS ABOVE	1½ STONE	LESS FISH FURTHER OFFSHORE
18	4/2/85	2 (400 Hooks)	2½ HOURS	SAME	5·1M	1. SAME AS ABOVE	4 STONE COD LING	
			"	"	"	2. SAME AS ABOVE	5 STONE COD LING	
19	4/2/85	2 (400 Hooks)	2½ HOURS	10 TO 18 FATHOMS. 1 MILE S. WHITBY.	5·1M RISING TO 5·3M	1. SAME AS ABOVE	5 STONE COD LING	A GREAT DEAL OF SEAWEED AROUND AFFECTING FISHING - TRADITIONAL LINERS ARE NOT WORKING AS FISHING IS SO POOR.
						2. SAME AS ABOVE	2 STONE COD LING	
20	5/2/85	1 (170 Hooks)	2 HOURS	SAME	5·3M	1. SAME AS ABOVE	4 STONE COD LING	
21	5/2/85	3 (550 Hooks)	2½ HOURS	8 FATHOMS 1 MILE S. WHITBY.	5·3M RISING TO 5·5M	1. (a) 2 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT WITH WEIGHT. (c) 25 SNOODS (42 FATHOMS)	1½ STONE COD LING	THESE LINES WERE SHOT WITH THE TIDE VERY CLOSE TO THE SHORE - THUS RUNNING PARALLEL TO THE SHORE. POOR RESULTS INDICATES A LACK OF FISH ON THESE GROUNDS.
						2. SAME AS ABOVE	1½ STONE COD LING	
						3. SAME AS ABOVE	3 STONE COD LING	
22	6/2/85	2 (370 Hooks)	2 HOURS	10 TO 15 FATHS ½ MILE S. WHITBY.	5·5M.	1. (a) 2 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ITSOWN. (c) 25 SNOODS	2 STONE OF COD LING	LINE 1 PARTED SEVERAL TIMES CAUSED BY DIFFICULTIES IN HAULING IN SUCH STRONG TIDES. LINE 2 FISHING WELL IN STRONG TIDE FROM
						2.	5½ STONE COD LING	

SHOT NUMBER	DATE	NUMBER OF LINES SHOT	DURATION OF SOAK	DEPTH AND LOCATION	TIDE	RIG: (a) WEIGHT STROP LENGTH (b) FLOATATION/WEIGHT SEQUENCE (c) FREQUENCY OF APPENDAGES (FLOATS AND/OR WEIGHTS)	CATCH PER LINE	COMMENTS
23	6/2/85	2 (350 Hooks)	2½ HOURS	10-15 FATHOMS 1 MILE S. WHITBY.	5.5m	1. (a) 2 FEET (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ FLOAT WITH A WEIGHT. (c) 25 SNOODS (42 FATHOMS)	4½ STONE COOLING.	APPEARS TO BE A MARKED DIFFERENCE IN CATCH RATE BETWEEN LINE 1 (WEIGHT EVERY 42 FATHOMS) AND LINE 2 (WEIGHTS EVERY 84 FATHOMS). THE GREATER FLEXIBILITY AND FREEDOM TO COVER THE GROUND THAT LINE 2 HAS MAY ACCOUNT FOR THIS DIFFERENCE
						2. (a) SAME (b) 3½ in FLOAT WITH WEIGHT ALTERNATING WITH 2½ in FLOAT ON IT'S OWN. (c) SAME	7 STONE COOLING.	
24	7/2/85	2 (340 Hooks)	2 HOURS	SAME	5.6m	1. SAME AS ABOVE.	½ STONE	THESE LINES WERE IN THE WATER DURING SLACK WATER - POOR CATCH RATES SUPPORT THE COMMON VIEW THAT IF THE LINE IS NOT COVERING THE GROUND BY TIDAL MOVEMENT, THEN FEW FISH WILL BE CAUGHT.
						2. SAME AS ABOVE	1½ STONE COOLING	
25	7/2/85	2 (400 Hooks)	2¼ HOURS	SAME	5.6m	1. SAME AS ABOVE	3½ STONE COOLING	
						2. SAME AS ABOVE	2½ STONE COOLING.	
26	12/2/85	5 (850 Hooks)	2½ HOURS	5 MILES NNW WHITBY	4.8m	(a) 2 FEET (b) 3½ in Float with weight alternating with 2½ in floats on Her own. (c) 25 SNOODS (42 FATHOMS)	12 STONE COOLING	Very poor fishing. Fish coming in groups of four or five, then very large gaps.
27	12/2/85	1 (170 Hooks)	2½ HOURS	6 MILES NNW WHITBY	4.8m	LINE SET ON HARD GROUND WITH NO WEIGHTS AND NO FLOATS	1 STONE OF COOLING	VERY POOR FISHING.

PLATE 1 Baiting procedure (mussel bait)

PLATE 2 Lines baited and ready to shoot

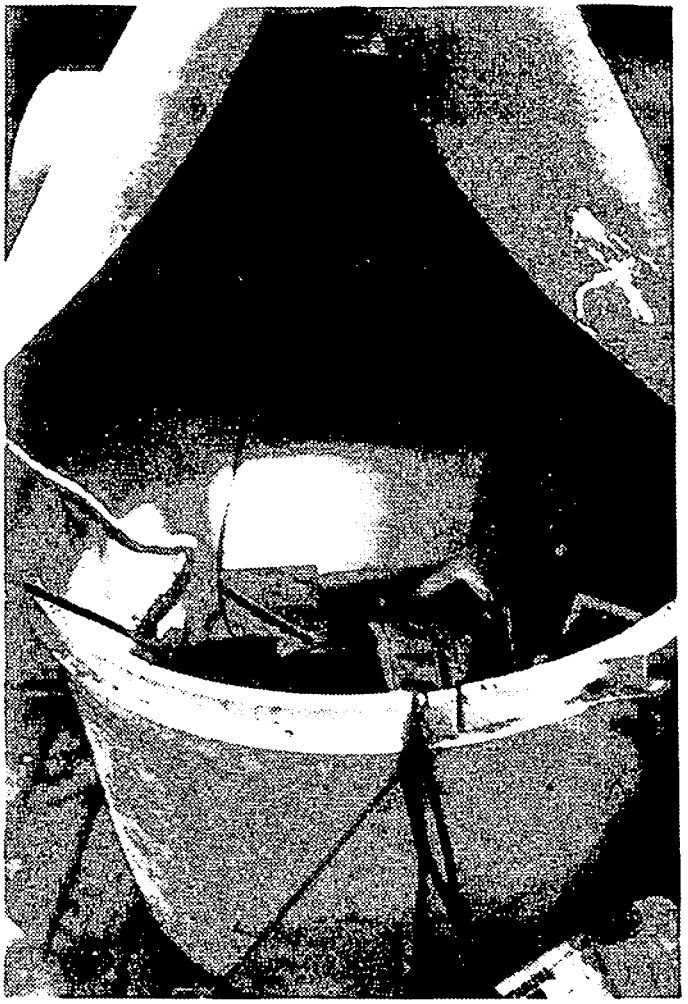


PLATE 3 Line leaving tub, passing through shooting guide

PLATE 4 Floats and weights being clipped on whilst shooting

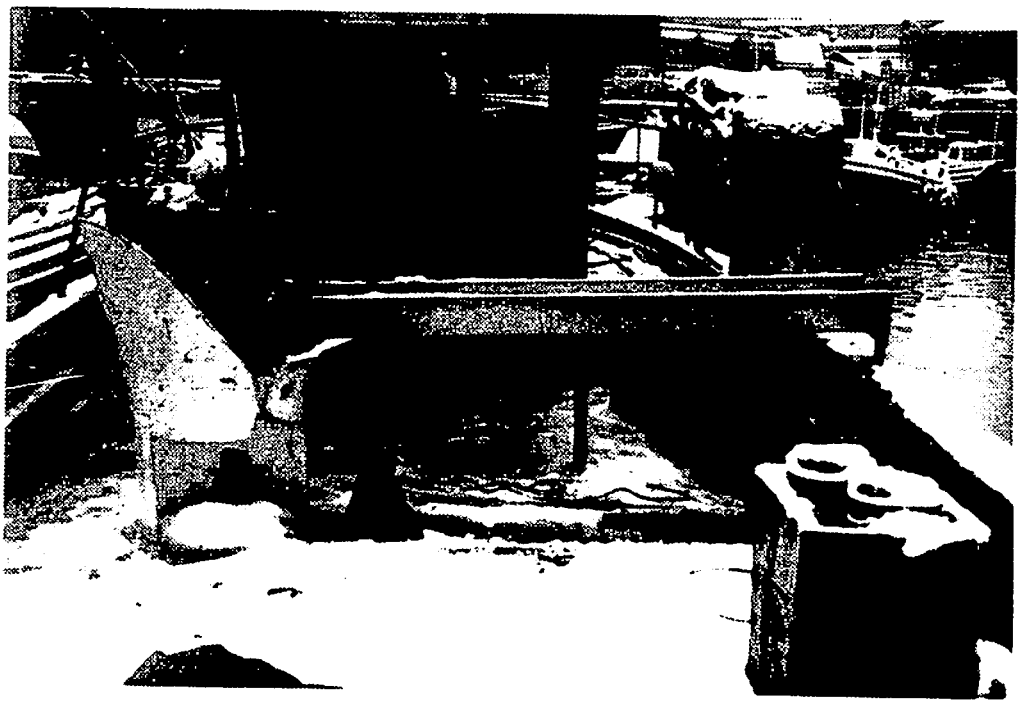


PLATE 5 Hauler with associated fairings

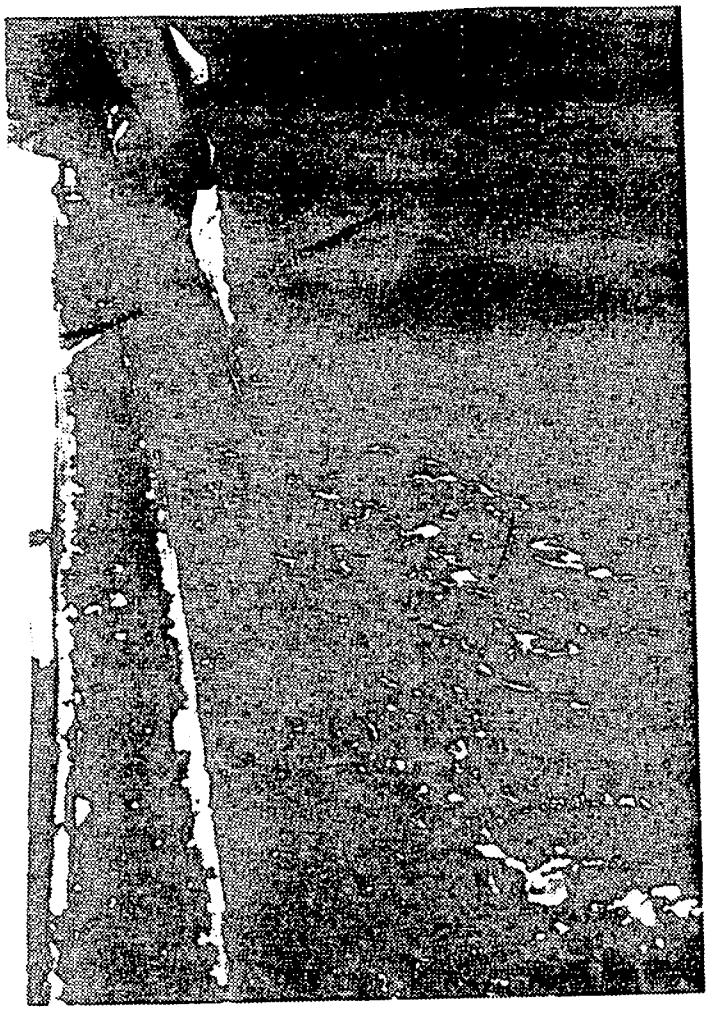


PLATE 6 Small codling lifted over boat's side roller

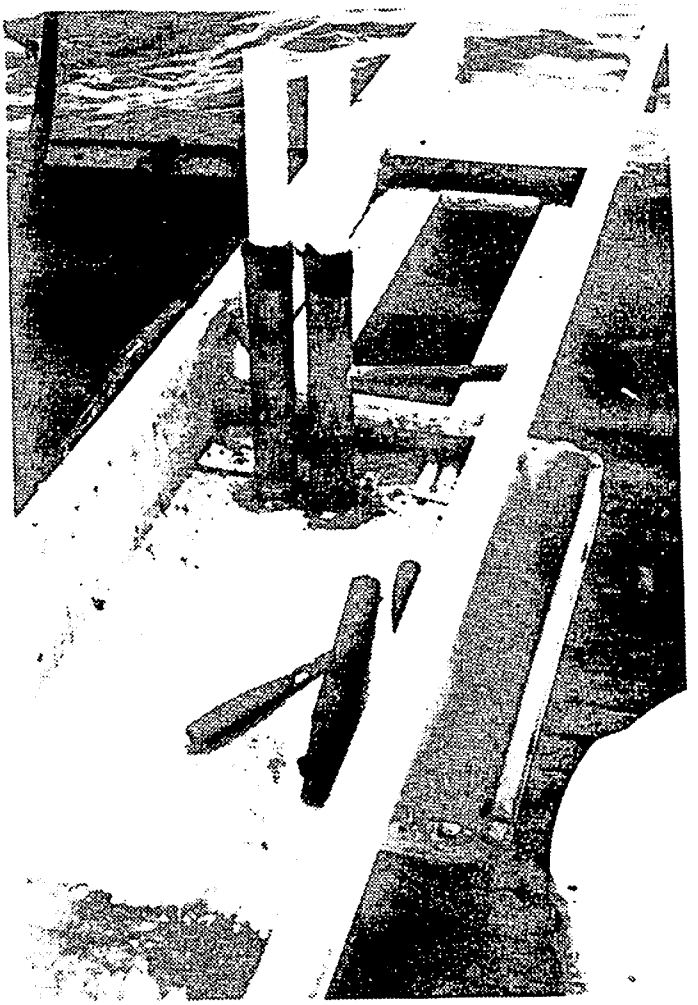


PLATE 7 Stripper bars on hauler fairing

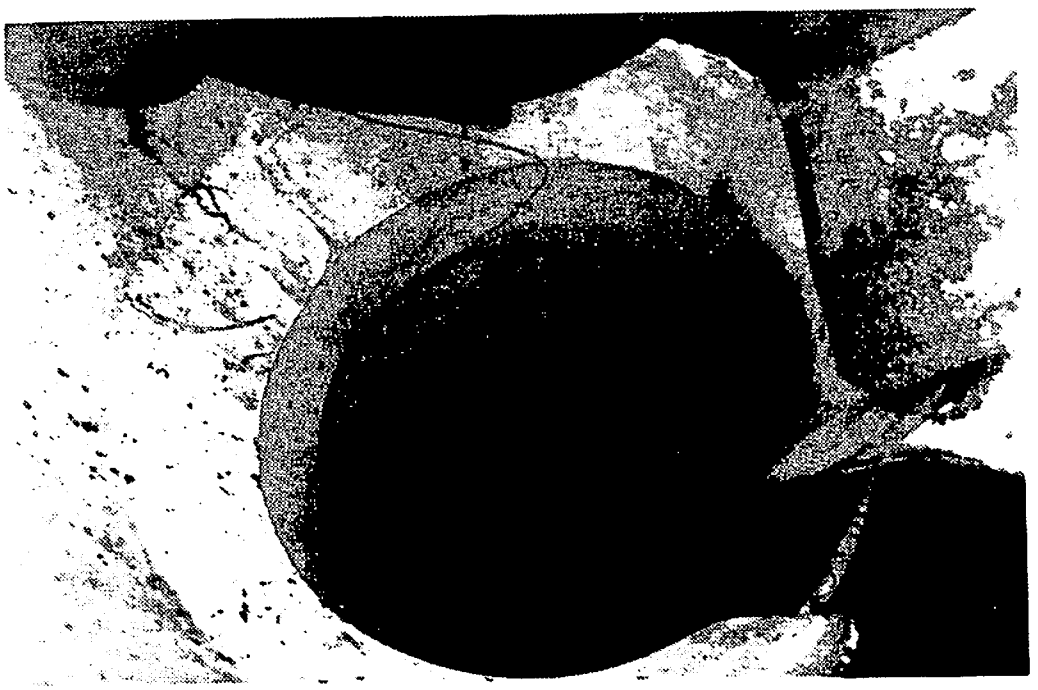


PLATE 8 Line coiled into tubs whilst hauling