WHITE FISH AUTHORITY

Industrial Development Unit

LINE RIPPING TRIALS WITH AUTOMATED EQUIPMENT

CELTIC MOR - FEBRUARY/MARCH, 1981

Field Report No. 947

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SUMMARY

As part of the continuing investigation into static fishing methods, the W.F.A.'s Industrial Development Unit have carried out trials with automatic line ripping equipment. This work was carried out on the 15m CELTIC MOR with the co-operation of Bridport Gundry Ltd.

Ripping (or jigging) is the fishing method in which a weighted line with a number of hooks is lowered into a shoal of feeding fish. The hooks are disguised with coloured lures to attract the fish and the line is moved rapidly up and down. This has traditionally been a handline fishery, but new equipment from Scandinavia has now fully automated the process at very reasonable cost.

The trials were carried out during February and March 1981 off the N.W. Coast of Skye. It was believed that cod would be spawning in the area and starting to feed again. This proved not to be the case but the equipment was found to work well under some very arduous weather conditions and some good results were obtained on coley and pollack.

The trials were not conclusive, but it is hoped other opportunities will arise for a more decisive demonstration later. The equipment can be quickly fitted to any vessel.

1. INTRODUCTION

Ripping, or jigging, is the method of fishing in which a line with several hooks is set in a shoal of feeding fish. The hooks are disguised with coloured lures and are rapidly jerked up and down and with the right type of lure the fish will attempt to take them along with the natural feed. Traditionally, hand ripping has been the customary method.

For a number of years automated equipment has been available capable of simulating completely the actions of manual handline ripping. Norwegian equipment is wellknown and has been tried by fishermen and development agencies in many parts of the World.

This equipment was of little interest to small craft in the U.K. as developments in small boat trawling in the past twenty years had more or less eclipsed the handline, and indeed, the longline fisheries. Automatic rippers for a one line operation selling for about £1300 each were, therefore, an expensive installation for a small half decked boat. Tropical handline fisheries are, in many countries, probably the most important artisanal fishing method. Mechanisation has always been seen as one way of increasing the efficiency and the earnings of these operations. The principal advantage would be the ability for one man to work several machines. Here again, however, the available equipment was an even more expensive luxury. out of all proportion to the value of the catch or, in some cases, the boat.

The rising cost of fuel has, however, meant that there has been a revival of interest in all types of static fishing methods by a wide range of boats. This includes trawlers up to the 80 foot length range, who can no longer make a living purely by trawling. Proper conservation policies also favour static gears with their

acknowledged size selectivity capabilities, when compared to trawling or purse seining, which are far less discriminating. Line ripping is one static method which could be adopted at certain times of the year.

Therefore, the arrival on the market of a new generation of autofishing machines manufactured in Scandinavia, has been followed with interest by the industry. Messrs. Bridport Gundry have secured the U.K. agency for one such typical machine, the Kemers "Juksa-Maskin" (jigging machine). These new machines are much more compact utilising micro circuit technology, and taking into consideration the inflation of the past ten years, are now quite competitively priced at about £1500 each.

The I.D.U. were approached by fishermen during the 1980 gillnet season on the Scottish West Coast to look at the possibilities of the new range of machines for two main reasons. Firstly, gillnets are particularly vulnerable to trawling activities, which cause expensive damage, or even destruction of the nets, and secondly, there was a case for the introduction of a handline fish shoal sampling device which could identify marks quickly and positively. This would enable nets to be set only on positive evidence of marketable fish stocks, resulting in more efficient use. Subsequently, Bridport Gundry secured the interest of Skipper Runton in Uig, Skye, and these two parties approached W.F.A. for some financial and technical support for extended trials. This support was agreed upon and funds were made available from savings on the electric fishing project.

It was agreed that both W.F.A. and Bridport Gundry would support the fishing operation with joint contributions to a total value of £3400. This would allow guaranteed earnings for Mr. Runton's boat of £1100/week for three weeks within the usual terms, whereby any fish

caught up to the total value of the charter would be credited to the two aforementioned charterers. Bridports would supply and install three machines and provide all fishing tackle, including lines, hooks and lures. They would also supply the services of a masterfisherman who had previous experience of these machines in Scotland and Scandinavia.

W.F.A. agreed to supply and install all electrical wiring, switchboxes and connections between the boat's batteries and the machines. Jointly the W.F.A. and Bridport Gundry representatives would record the trials operations and results. The trials would be carried out in accordance with the charter party mutually agreed between Skipper Runton and the Authority.

2. TRIALS

2.1 Objectives of the Trials

The objectives would be two-fold. Firstly to assess the capability of these particular machines installed on a commercial boat and used under commercial fishing conditions, and secondly to establish, assuming the former to be satisfactory, the viability of a handline fishery based on this type of equipment in the North West of Scotland and, in particular, in the waters around the Isle of Skye. The latter requirement would entail a parallel assessment of the most suitable tackle to be used in conjunction with these machines and the best techniques available to the skipper in terms of fish marks, identification and fishing strategy, including boat handling in the proximity of marks. The I.D.U. would undertake to compile and produce a report to be available to the industry after completion of the trials.

2.2 The Trials Vessel

Name:	CELTIC MOR
Description:	Devon crabber with traditional wheelhouse aft.
Construction:	Built of wood by Hinks of Appledore 1977.
L.O.A:	52 ft. (15m).
Beam:	16 ft. (4.88m)
Draught:	10 ft. (3.04m) maximum.
Engine	Baudoin diesel 210 h.p. @ 1800 r.p.m.
Auxiliaries:	5 h.p. Petter driving alternator.
Electrics:	24 volt DC system with spare set of batteries.
Deck Machinery:	Rapp Hydema 2235 1970 net hauler. Celtic slave 1500kg net hauler (hydr. driven).
Navigational:	Decca Mk 21 Navigator. Simrad EY 50 KHZ sounder. Decca 100 Radar.
Fish Hold:	Dry hold and vivier tank for crabs.
Accommodation:	6 berths in aft. cabin.

2.3 The Auto-Fishing Equipment

Manufacturer:	Kemers Maskin AB, Bjursas, Sweden.
Type:	Atlanter electronic jigging machines.
General Specification:	Maximum fishing depth - 199 fathoms. Range - 1-199 fathoms. Power requirements - 50-150 watts. Voltage - 12 or 24 volts. Main cables - 2 x 10mm^2 Weight of unit - 73 lbs. Height with stand - 40 inches.

Functions:

To be programmed to simulate the initial paying out of line to a preset depth, and the jigging action over a wide range within the depth range of 199 fathoms.

Digital readout indicating depth of tackle at any time.

Preset fish or weight sensor which effectively informs the operator via an audible warning when fish are taken and instructs the machines to haul in to a preset point where the catch can be unhooked and the operator, by activating the reset button, restart programme once more.

A memory facility determines that the jigging function will restart at the depth at which the previous catch was taken.

There is an emergency stop control on the machine.

There are another five timing controls and an audible warning facility to indicate that fish have been caught and the line is reeling in.

The machine which incorporates the control panel, electronic package, the reel and its electric motor, is mounted on a 44mm dia. aluminium pole which is located in a cast base plate secured to the deck. The pole is also tied to the gunwale via a clamp and bracket.

A detachable horizontal outrigger pole is mounted across the top of each machine. It supports a lead block at its outermost end carrying the line well clear of the vessel's side.

(See also copy of specification Appendix 1 aand Plates).

2.4 Installation

The three machines were fitted along the starboard side of the vessel adjacent to the rail as indicated in the photographs.

Due to the unusually high gunwales on this vessel, extra long support stanchions had to be provided. These were 48 ins. in length, i.e. from the bottom of the deck socket to the top of the machine (the standard pole length

is 40 ins.). The deck sockets were coach screwed into the wooden deck and the horizontal stand support was similarly coach screwed into the gunwale rail. Each pole is clamped to the deck socket, the horizontal support and the machine respectively.

Each machine was connected via 1m. of cable made up of industrial neoprene covered flex to a watertight plug and thence via individual $10mm^2$ positive and negative leads (PVC covered copper wires), to a master isolator switch with three fuses located in the engine room. From this switch positive and negative $10mm^2$ cable was connected across one bank of 4 x 6 volt batteries. All deck and engine room cabling was neatly clamped. The latter was especially important on deck in view of the possibility of catching light fishing tackle on exposed cabling.

2.5 Fishing Tackle

Several Scandinavian weighted hooks were available together with a variety of traces which consisted of lures, some of which were luminous and up to half a dozen hooks (Mustad type 2315 no. 5). The hooks attached to the weights were type 2335 no. 5. Details of traces and weights used are included in the fishing logs and commented upon in the discussion (Section 3). Basically the tackle consisted of a ripper weight with four hooks attached to a trace of about one fathom in length of 110 lb. monofilament with 6 to 8 hooks and lures, attached to the main line.

2.6 Narrative

Installation of the machines and the electrical connections took place on Friday 13th and Saturday 14th February, 1981, in Uig. The vessel had completed a normal week's prawn potting on the Friday afternoon. The trials commenced on Monday 16th at the North West corner of Skye.

2.7 Summary of Trials

2.7.1 First Series 16th February-3rd March, 1981

All the trials took place in the vicinity of North West Skye (see Fig. 1).

Details are contained in log sheets appended.

February was selected for the trials because it was believed that spawning cod would appear in the trials area about this time.

Trials commenced on Monday 16th February, fishing around various small rocky islands around the north end of the Isle of Skye. The decision to work there was made as a result of communication previously made with a hand line ripping boat currently working the area out of Gairloch.

Marks were found over pinnacles of rock and over small banks near Eilean Trodday and as far east as Staffin.

No difficulty was experienced in catching some 4 boxes (150kg or 24 stone) of assorted pollack (Lythe), small coley and codling, with the pollack being predominant. In wind force 4 to 5 and occasionally strong tides, the boat had to be frequently repositioned to maintain station over the marks. Although each manoeuvre took only two or three minutes, it did necessitate recovering all three lines and this did involve the loss of perhaps between 10 and 30% of available fishing time. Confidence in the operation of the machines was, however, soon established and in due course, experience gained in maintaining station over marks.

The advantage of advance information from the other vessel operating on these marks cannot be over-emphasised. This 30 ft. boat appeared to be working two lines from mackerel hand gurdies.

Though CELTIC MOR proceeded to sea again on the 17th, no fishing was possible owing to southerly gales and, in fact, the boat proceeded to Loch Dunvegan to shelter for the day. Fishing was possible in the Loch on the 18th and the known patches were tried where cod are taken by nets in this area. There was a distinct lack of marks and no other boats, other than demersal trawlers and creel boats, were in the vicinity. Later Pooltiel Bay on the west coast was visited and drift ripping was carried out. During this operation in a strong wind, one man was seriously hooked in the hand and had to be landed at Dunvegan for hospital treatment. The vessel proceeded later to the 'edges' in north east Loch Dunvegan and tried ripping both there and in Loch Snizort without success; one gurnard was in fact taken.

Thursday the 19th was spent looking at the banks between Loch Snizort and the Shiant Islands in the North Minch. Marks were in fact observed on the East Bank and North of the Shiants. About 38kg of fish consisting of coley and some whiting were taken but very strong tides made holding the boat over the mark extremely difficult. Finally Score Bay in Skye was visited without any marks being seen. On Friday Moonen Bay and the approaches to Loch Dunvegan were visited. Some small bottom marks were seen in Moonen but no fish were caught. The week ended with no firm evidence of the expected influx of spawning cod. Two longline boats operated briefly in the area taking very little in the Loch but catching some skate in the North Minch.

Owing to the lack of signs of cod in Dunvegan it was decided to start the week of 23rd February by visiting the rock 'pinnacles' off the north end of Skye where fish had been taken earlier. A few fish were taken on the Monday. Owing to the difficulty experienced holding station over these quite small areas of marks, it was decided to anchor in between 12 and 20 fathoms over the area known as the Staffin Peaks. On the 24th nine boxes

(340kg) of pollack (Lythe) were taken in just over three hours in this area. This in fact proved to be the only real successful demonstration of fishing during these trials.

The so called Christmas decoration lures proved to be the most successful utilising red and green lures. Strengthening winds curtailed fishing early on Tuesday 24th February afternoon. No fishing was possible on both Wednesday and Thursday, although CELTIC MOR managed to make passage to Dunvegan. In the Loch on Friday, further attempts were made to rip on some small marks observed in an area where the gill netter INSHALLAH had taken five boxes of cod from a fleet of gill nets. Although there was now some evidence of the spring cod arriving, nothing was taken on the lines in either Lochs Dunvegan or Snizort.

At this stage it was felt, however, the cod were so scarce that negative results were not unexpected when one considers the very 'local' nature of the line jigging operation.

The following week started with the receipt of reports from INSHALLAH of a few marks in Loch Dunvegan.

Although CELTIC MOR detected a few marks only a couple of fish, a codling and a haddock were taken despite ripping operations extending out of the Loch and as far south as Loch Bracadale on the west coast.

INSHALLAH landed thirty boxes (1140kg) of cod and some coley on the night of the 2nd from the north east edges of Loch Dunvegan from 4 x 800 yards of gill netting, which had been set for two days. On the following day the INSHALLAH had little success with her nets and only a couple of coley and a couple of pollack were taken by the CELTIC MOR's lines despite ripping in the Loch and as far north as Comet Rock off the northernmost point of Skye.

It was, therefore, decided on Tuesday evening the 3rd March to suspend the trials, as clearly the main run of spawning cod had not yet arrived. This stock was regarded, of course, as the most useful from the point of achieving worthwhile catch rates.

The equipment was unshipped and stowed below decks until more information became available on the cod run.

2.7.2 Second Series 16th-20th March, 1981

Towards the end of the week ending 13th March, information was received that the gill netters INSHALLAH and VISION were taking between thirty and forty boxes (1150-1500kg) of large cod per day in Loch Dunvegan and on the Isle of Harris coast on the opposite side of the Minches. Charter funds were available for a further four and one half days' cover. It was, therefore, decided to resume fishing Monday 16th March.

CELTIC MOR arrived in the Loch about noon on the 16th, the three jigging machines having been reinstalled prior to departure from Uig. The INSHALLAH had taken sixteen boxes (600kg) that morning from 800 yards of nets. The pelagic trawler POLARFISK was towing just outside INSHALLAH's gear and caught 25 boxes (950kg) after a five hour tow. Jigging was, therefore, carried out in the vicinity of these vessels, although only small fish or plankton marks were seen. Five coley were taken within a few minutes on one line, but absolutely nothing thereafter, though fishing was carried out until dark all over the area around the mouth of the Loch.

A sea anchor was used in the strong northerly winds to reduce the drift effect. This particular area with its very steep edges is unsuitable for the use of a conventional ground anchor. The sea anchor reduced the rate of drift but, though allowing the lines to fish in a more nearly

vertical mode, did not prevent the boat quickly drifting off the few marks which were seen. Generally speaking, these marks were of 'feed' and not individual large fish. (See Conclusions).

On Tuesday 17th March, after a pre-sunrise to daylight echo survey of the Loch and brief jigging exercise on dense 'feed' marks, all without result, CELTIC MOR proceeded to the vicinity of Rodel, Harris to fish alongside the gill netter VISION. The VISION had reported cod in the area. Although this vessel was taking fish in her nets, the ripping lines caught nothing. Only occasional small marks were seen on the bottom. On Wednesday 18th, the CELTIC MOR proceeded from Uig to Portree in gale force winds, unable to fish but echo searching en route.

Conversations with a fisherman from Kyle had indicated several areas to the east of Skye where line caught fish had been taken some years ago. Although much of this area is now closed to fishing by the Ministry of Defence, jigging was carried out East of Rona, on the Ross Shire coast, and around Loch Torridon during Thursday. Several herring marks were seen and four herring taken on one occasion but no white fish. This area certainly proved very barren in terms of fish marks with the exception of the occasional herring marks. After midday it was decided to proceed across to the area of pinnacles off the north of Skye. There, some marks were seen in 10 to 15 fathoms and over two hours of intermittent jigging, about one box (38kg) of pollack with a few coley were taken. It was not possible to anchor on this occasion due to a hydraulic failure and, therefore, the boat had to be moved frequently to reposition over the marks.

The final day of the charter, Friday 20th March, was spent in Loch Dunvegan jigging over the area adjacent to the cod gill nets. Although a few fish marks were seen on the steep edges only one cod was taken and four coley.

The machines and associated wiring were removed from the vessel on Friday evening enabling CELTIC MOR to resume creel fishing on the following Monday, 23rd March.

3. DISCUSSION

3.1 The Atlanter Jigging Machine

The first objective, which was to assess the machines in relation to their claimed specification, was carried out successfully in that they performed satisfactorily in a variety of weather conditions, and despite being subjected to heavy spray on several occasions.

The only malfunction which occurred was rather insignificant. The audible catch warning failed on No. 1 machine, although the machine was otherwise unaffected.

The fine adjustments to clutch slip and brake drag required some experience to adjust effectively, as did the strike or catch sensor sensitivity. Some weights and lures were lost due to maladjustment of the former when the winch overan after the weight had struck bottom in too deep a setting. As far as the strike sensor was concerned, too low a setting could cause the alarm to sound and the line to reel in as a result of the winch stopping abruptly.

Skipper Runton felt that the inhaul speed of about 32 fathoms/minute (60m/minute) was inadequate and wasteful in fishing time. Whilst this is indeed true in shallow water 10 fathoms (20m) when compared with hand or gurdy lining, it is a different story in greater depths and especially in heavy fishing where the human operator would soon tire and slow down. Kemers have now increased the motor speed on their latest machines by 25%

or to about 75m/minute. Of course, one man can also easily tend two or even three automatic machines, although in heavy fishing, two is perhaps sufficient as time has to be allowed to unhook several fish from each strike. Thus effectively fishing efficiency per man can be increased by about 50% in shallow water and 100% in deep water.

A variety of lures was used and these are described in Appendix 3. It was not possible for obvious reasons, to assess the effectiveness of these, however. The measured current requirement, 8 amps, is well within the capabilities of a 24 volt heavy duty battery pack. (See Fig. 3 Measured current requirement).

3.2 Viability of Cod Ripping in the Trials Area

The second objective of these trials, was unfortunately, not realised. Though evidence was gained that rock dwelling fish such as pollack, can easily be taken, as shown by 54 stones in 3½ hours (100kg/hr.), this was an isolated case. The deliberate objective of the trials was to catch spawning codfish, and the success with pollack was not repeated.

The early days of the trial were indecisive in that there was no real evidence of large quantities of cod in the area, but the final week's trial was carried out over areas yielding good trawl and gillnet catches of cod but without success from the automatic line ripper.

It became apparent to the trials team that the complete absence of cod, which was the most prolific species in the area, was significant and not merely due to not being in the right place at the right time. Examination of gill net caught fish revealed that these cod were in the final stage prior to spawning, and were still in fact, not feeding. Subsequent personal correspondence with Dr. Heslop of the Marine Laboratory has indicated that the stomachs of these fish were probably so compressed by the distended

gonads that the fish were unable to ingest food. This would certainly explain their lack of response to lures. The male fish are also likely to be disinterested in food as they are fully occupied in fertilising the eggs.

Local fishery, opinion with one exception, expressed surprise at this phenomenon as years ago, longline boats did pursue a fishery in this area during February and March. It is believed that probably just after spawning, these fish may well be taken easily by handlines. One local fisherman did remark that the former longline fishermen 'could never catch cod when the nets were taking them' and vice versa.

In view of the unfortunate biological conditions which seem to have been encountered and of the keen interest of several local fishermen, every endeavour should be made to carry out further trials at other times of the year. The significant feature was the obvious efficiency of the equipment when fishing over pollack and coley marks. Virtually every individual fish mark seen was taken in these cases.

3.3 The Fishing Technique

A useful exercise was carried out in ascertaining the best way of maintaining the boat over marks as obviously with line ripping, one only catches fish directly under the boat. The use of an anchor to hold the vessel in the shallower areas, say up to 50 fathoms, is possible, providing sea conditions do not cause undue strain on the cable and, therefore, the vessel. It is important that adequate warp is carried; e.g. 150 fathoms (300m) and that a suitable winch or hauler is available. An alternative grapnel or preferably several grapnels should be available for anchoring over difficult bottom. In many cases, fish congregate on steep edges where it is unwise, and in many cases, unpracticable to use a

ground anchor. In these cases a sea anchor may be used. A good mizzen sail should be used with the anchor. The sea anchor was a 5m diameter (open) parachute, and although inadequate, clearly indicated that a larger parachute, perhaps of about 10m diameter, similarly rigged (see Fig. 7) would be an efficient means of holding the boat virtually stopped relative to the water column. Obviously a sea anchor is ineffective against tidal drift, but even then, it allows fishing to continue with nearly vertical fishing lines whilst moving with the tide. Without the sea anchor, wind drift causes the boat to move away from the line, causing the weights and lines to lift off the bottom and thus seriously reducing effective fishing action, except perhaps for fish near the surface. The sea anchor is, of course, ideal for use over marks scattered over a wide area as opposed to local 'clumps' of fish which require a boat to remain exactly over these without drifting either to wind or tide. CELTIC MOR lay rather well without the anchor with the wind on the quarter with the minimum of sternway on and the rudder inclined towards the wind.

The Simrad EY 50 KCS sounder proved adequate for detecting good fish marks in depths up to and in excess of 100 fathoms. Individual fish were marked at 70 fathoms. It is suggested, however, that a more sophisticated sounder, either with a scale expander facility or fishlupe, or perhaps the improved definition provided by a colour sounder, would be a worthwhile investment. After all, contrary to most other fishing methods, it is possible to position the vessel and its gear accurately over the shoal with this method, and this needs the quickest and most positive method of identification of marks.

4. ECONOMICS OF AUTOMATIC JIGGING

Clearly, for the aforementioned reasons, it is not yet possible to form firm conclusions on automated jigging as a comparable fishing method to other static methods. However, if one assumes comparable catch rates with gill net vessels of similar size, then a comparison of gear and crew costs is revealing.

1.	Gillnetter:	Full set of 3200m of netting @ £100/70m (incl. anchors etc.)	£ 5000
	Running costs:	Loss of 800m each two weeks through damage over a 3 month season	£ 7000
		Crew costs at say 15 man/months (5 men)	£11250
		Actual gear & crew costs	£23250
2.	Line Jigging:	6 lines @ £23 line (incl. lures)	£ 138
		6 weights @ £3 weight	£ 18
		Losses over 3 months (all gear + 3 traces/ week)	£ 400
		Crew costs (3 men) @ 9 man/months	£ 6750
		Actual gear & crew costs	£ 7306
		Difference	£15944

N.B. Fuel and other operating costs assumed to be similar.

5. CONCLUSIONS

5.1 Line ripping can only be used on feeding cod which have spawned. Unfortunately, contrary to the normal seasonal pattern, the cod were not in this condition during the trials period and the results on cod were disappointing.

5.2 The machines and the method, however, proved their suitability on other species such as pollack which could be caught quite well from rocky ledges and pinnacles.

5.3 The machines gave little trouble in service and proved very durable in the most severe weather conditions. Although the line hauling speed was slower than would have been preferred, this is only a disadvantage in shallow water. In deep water, the line speed would be much faster and far less tiring than could be achieved by one man. One man can tend two or even three machines.

5.4 No conclusions were drawn on the most suitable lures.

5.5 It is important to keep the vessel on station over the fish marks with the lines hanging vertically. Experience was gained using anchors and sea anchors. A good echo sounder is also important to assist discrimination between fish and feed.

5.6 The trials are well worth pursuing when it is known that post spawning cod are available. The equipment is of such low cost and easily installed that it can provide a viable alternative to gill netting or potting. If catch rates are proved to be equal to gill netting there will be significant savings in manpower and gear costs.

6. ACKNOWLEDGEMENTS

Much of the success of the trial in terms of the efficient use of charter time was due to the wholehearted co-operation and interest shown by Skipper Runton and his crew.

Robin Gavin, representing Bridport Gundry, also an experienced skipper, contributed substantially to the operation. In particular, his experience of handling small vessels engaged in handline fishing in the West Country and his recent experience with the Lofoten cod fishery, proved invaluable.

H.D. McDiarmid
Principal Fisheries Development Officer

LIST OF APPENDICES AND FIGURES

APPENDIX I

MANUFACTURERS' SPECIFICATION

Bridport Gundry Marine Limited,
The Court, Bridport, Dorset, England. DT6 3QU
Tel: Bridport (0308) 56666. Telex: 41132 NETSBT G

Price List 1/9/80

ATLANTER ELECTRONIC JIGGING EQUIPMENT

		£
ATLANTER ELECTRONIC JIGGING MACHINE 12V OR 24V.	Price	1490=23
ATLANTER SQUID JIGGING MACHINE - AN ATTACHMENT TO THE ABOVE SPECIFICAALY DESIGNED FOR SQUID.	Price	566=35

ACCESSORIES

UNDERWATER LIGHTS - Attached to fishing lines to "lure" squid shoals up in the water towards the fishing vessel.	Price	3=16
ATTRACTING LIGHTS - Fitted aboard the fishing vessel - these lights "hold" the quid shoal in surface water beneath the fishing vessel.	Price	56=01

JIGS

80 Grams)	Price	1=58
250 ")	"	2.03
400 ")	"	2=54
500 ") To suit most species	"	2=75
600 ") of fish	"	3=05
750 ")	"	3=35
1000 ")	"	3=43
1500 ")	"	4=68
1750 ")	"	5=06
2000 ")	"	5=45
MURASAKI MANSEN SQUID SIZE 1-3		- 95p

Fishing Line and Shock Absorbers

Mckuro Fishing Line - 100 Metre Lengths	Price	17=60
Shock Absorbers 2.5 x 500MM - Various size	Price	1=90
5.0 x 500MM to suit weight	Price	4=40
5.0 x 1000MM of fish caught	Price	5=71
5.0 x 2000MM	Price	9=59
Copper Clips (bags 500)	Price	13=20
Hand pliers for fitting above clips	Price	10=59

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APPENDIX II

FISHING LOGS

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
6.2.81	1 2 3	1025 TO 1055	DAY	SCORE BAY N. SKYE	8E RED 6.8C GR 47.8C	30F.	27F & JIG 1	VARIOUS TRACES: FEATHERS OF VAR COLOURS, RUBBER EELS OR SQUID ETC.	NIL	TEST RUN SMOOTH BOTTOM
"	1 2 3	1135 1145	"	NE FLADDA-CHUIN IS.	R 3.9 C G 41.0 D	24	21-22 1	"	NIL	SSW 4 (WIND SW WEAK (TIDE
"	1 2 3	1145 1235	"					"		ECHO SURVEY: FLADDA CHUIN RUBHA HUNISH
"	1 2 3	1235 1310	"	OFF RUBHA HUNISH.	9.8C 34.9 D	18-22	17-21 2	"	3 FISH 5 " 8 "	SSW 5 NE WEAK FEATHERS TAKING, SQUID - NOT TAKING.
"	1 2 3	1320 1330	"	OFF RUBHA AISAIG TO I. TRODDAY	12.6 C 40.5 D	35	32 1	"	NIL	
"	1 2 3	1335 1355	"	"		30	28 1	"	"	No 1 M/C AUDIBLE WARNING INOP.
"	1 2 3	1410 1425	"	E OF TRODDAY	13.4 C 44.2 D	36	34 1 or 2	"	4F 2 5	SMALL COLEY, WHITING AND 1 CODLING.
"	1 2 3	1515 1525	"	N. OF STAFFIN ISLAND	1.0 D 40.3 D	10-20	8-19 x 1	No 1 M/C 400 g. "BARRACUDA" WT. LATTERLY ALL	0 3 3	SKY 4 NLY STRONG HANDLINE BOAT TAKING FISH SAME MARKS

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
6.2	1 2 3	1540 1625	DAY	N. OF STAFFIN ISLAND	0.8 D 40.1 D	10-12	8-10 x 1	ALL FEATHERS TRACES AND 750g KEMERS WEIGHTS (COLEY GEAR)	2 BOXES SMALL COLEY	LOST TRACES 1 AND 3. GOOD MARKS. ALL M/CS TAKING FISH.
"	1 2 3.	1630 1645	"	"	0.7 D 40.0 D	9-6	8-5 x 1	"	½ BOX SMALL COLEY	DRIFTED OFF MARKS AND RE-POSITION. V/L PROCEEDED TO UIG.
7.2										NO FISHING IN GALE FORCE CONDITIONS, BOAT MOVED TO DUNVEGAN
8.2	1 2 3	0830 0837	"	INNER END LOCH DUNVEGAN	F 15.3 J 45.1 (8c)	68-69	65 x 3	3 COLEY TRACES. I.E. NO UPPER OR 'RIPPER' WTS. 1500GM WTS.	NO FISH	SLY 6 N WEAK. ROUGH WATER, BRAKE SET AT 3 STRIKE SENSOR 3 TO COMPENSATE FOR MOTION.
"	1 2 3	0910 0920	"	" NE SHORE	F 15.0 A 31.0	20	18 x 2	"	"	NO MARKS, DRIFT RIPPING ALONG 'EDGE'
"	1 2 3	0948 1000	"	OFF DUNVEGAN HEAD	F 8.7 J 42.6	40 44	36 x 1 *68 x 1	"	"	S 6-7 S STRONG. * LINES LYING WELL TO WINDWARD
"	1 2 3	1030 1045	"	POOLTIEL BAY	F 8.8 J 34.2	10-16	8-18 x 1 or 2	"	"	SIMILAR WX. LINES SLIGHTLY TO WINDWARD.

DATE	M/c	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
8.2.81	1 2 3	1100 1115	DAY	POOLTIEL B.	-	18-20	18 x 2	COLEY TACKLE 1500kg WTS.	NIL	S 6.7 S STRONG. STRONG WIND BUT LITTLE MOTION.
"	1 2	1330 1400	"	UIGINISH PT N. SKYE.		35	x 2	" R & BL. FLIES	"	S 5 No 3 m/c NOT USE. IN ABSENCE OF MARKS, & ALSO LOST TACKLE
"	1 2	1515 1545	"	ARDMORE PT.	D 14.6 I+ 36.0	27	"	"	"	
"	1 2	1600 1630	"	ARDMORE 'PEAK'	40.55 15.6	15	"	"	"	
"	1 2 3	1700 1715	"	NORTH SIDE ASCRIBS	D 23.5 F 33.5	17	"	"	1 GURNARD	
"	1 2 3	1745 1815	"	KILBRIDE EDGE	(6c) 20.1 69.1 20.5 67.7	43	x 2 x 2 x 4	"	NIL	
9.2.81	1 2 3	0920 0950	"	NE OF VATERNISH PT.	(8E) E 0.75 E 39.3	44	x 1	1 AND 3 CLARET FLIES No 2 PLASTIC BLUE FLIES.	NIL	SxW 3 SW STRONG. NO MARKS.

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
9.2.81	1 2 3	1055 1215	DAY (BRIGHT)	EAST BANK (NORTH MINCH)	8E E 28.5 J 41.8	14-20	× 1	No 3 TRACKLE NOW BLUE PLASTIC FLIES	6 FISH 8 FISH 4 FISH	SxW 4. TIDE TOO STRONG TO HOLD BOAT OVER MARKS (SPRING EBB)
"	1 2 3	1400 1430	"	SHIANT IS. NORTH SIDE.	F 6.85 B 36.1	28	"	No 1 NOW WITH 'SQUID' LURES.	2 SMALL WHITING 1 COLEY	SOME BOTTOM MARKS ALSO IN 10-15 FATHS
"	1 2 3	1615 1700	"	SCORE BAY (N.SKYE)	8.4 30.0	25	"	"	NIL	NO MARKS. LIGHT VAR BREEZE
10.2.81	1 2 3	0930 1030	DAY (OVERCAST)	MOONEN BAY	7.7 41.4 6.1 43.4	12-25	"	"	NIL	S 6-7 DRIFTING AWAY FROM LINES.
"	1 2 3	1040 1045	"	"		20	"	"	NIL	SMALL MARKS ON BOTTOM. SLY 4 (WIND)
"	1 2	1100 1110	"	"		18	"	"	NIL	
"	1 2	1240 1255	"	OFF DUNVEGAN HEAD.	13.0 42.5	30	"	CHANGED No2 TO RUBBER EELS	NIL	
"	2 3	1400 -	CLOUDY	LOCH DUNVEGAN	16.2 41.4 15.6 42	50	"	"		SLY 6 LINES DRIFTING OFF THE BOTTOM FREQUENTLY

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
0.2.81	3	1500 1520	DAY, CLOUDY,	LOCH DUNVEGAN	14.9 45.B 14.7 45.5	80 80	x 1	No 1 SQUID LURES No 2 RUBBER EELS No 3 BLUE PLASTIC 'FLIES'	NIL	-
"	3	1530 1545	"	"	14.6 45.4	80	x 1	EXTRA WTS. NOW EACH 2 Kg.	N/L	-
3.2.81	1 2 3	1145 1200	HAZY OVERCAST DAYLIGHT.	"STAFFIN" EDGE	8E 0.7E 39.9J.	34	x 2 x 4 x 1	"	NIL	VAR 2 SLY.
"	1 2 3	1450 1500	"	N OF LONGA	6C 1.9E 59.5H	17	"	"	2 COLEY 3 COLEY -	SE 2.
"	1 2 3	1630 1645	"	6 M. N. OF RUBH RE	6C 4.3F 74G	30	"	"	NIL	SE 3.
1.2.81	1 2 3	0745 TO 1010	"	STAFFIN 'PEAKS'	8E 1.4F 41.0E	12	x 2 x 2 x 2	No 3 M/C NOW ALSO WITH SQUID LURES		SLY 4.-6
"	1 2 3	1010 1330	"	"				TRIED 'TINSEL' LURES AND THESE WITH RUBBER EELS ALTERNATELY.	9 BOLES OR 54 STONES POLLACK. FEW COLEY.	ANCHORED OVER 'PEAK' IN ABOUT 12 FATHS. COLEY FEEDING TAKEN ON EELS ~~ON SANDEELS~~ POLLACK ALSO ON EELS BUT 'TINSEL' LURES BEST.

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
5.2.81 6.2.81										NO FISHING OWING TO WX. BOAT MOVED TO DUNVEGAN.
7.2.81	1 2 3	0730 0800	DAY	L. DUNVEGAN (DEEP WATER)	(GE) 12.9 32.3	58	VARIOUS	VARIOUS	NIL	SE 3 GILLNETTER TOOK 5 BOXES (30 STONES) AT 0830.
"	1 2 3	0900 1000	"	"	19.9 & 46.6 47.5 - 11.00	78	ALL MCS. X 4	No 3 MC. RUBBER EELS EXTRA WTS TOTAL 1500gm 1 & 2 MCS.	NIL	SEA ANCHOR USED WITH LITTLE EFFECT TO REDUCE DRIFT.
"	1 2 3	1100 1200	BRIGHT.	OFF VATERNISH POINT.	E 0. I 34.	13	X 1	AS BEFORE	NIL	FISH MARKS DISTRIBUTED BOTTOM TO 2F. OFF
"	1 2 3	1400 1530	"		8.0 44.0	40	X 1	"	NIL	
"	1 2 3	1600 1630	"	LOCH SNIZORT	36.0 E 7.2	22	"	"	NIL	
3.81	1 2 3	1135 1225	DAY	N. OF DUNVEGAN HD.	12.2 45.6	60 TO 80	60-80 X 4 X 2 X 2	No 1 squid lures Nos 2 & 3 RUBBER EELS 1500 2000 & 1500 gms RESP.	NIL	REPORT OF FISH MARKS IN LOCH. WIND E - 6 TIDE E - SLACK HIGH DRIFT RATE. ALTERNATELY JIGGING & SHIFTIN

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
.3.81	1 2 3	1320 1350	DAY	OFF NEIST PT. LT.1	D 4.9 E 43.0	36-39	36-38 x 2	No1 NOW FEATHERS & SMALL HOOKS	NIL	E 5-6 NLY MODERATE
"	1 2 3	1435 1500	"	MOONEN BAY	D 8.0 E 40.6	21	18-20 x 2	do.	1 CODLING (ON EELS)	SE 5 NLY MODERATE 'FEED' MARKS ON THE BOTTOM
"	1 2 3	1515 1525	"	"	D 7.6 E 40.8	24	23-25 x 2	do. CHANGED No 3 TO SMALL MACKEREL FLIES (FEATHERS)	1 SMALL HADDOCK ON No 3	do.
			SEARCHED SOUTHWARDS AS FAR AS AN DUBH SGEIR.							
"	1 2 3	1655 1703	"	~~DUSK~~ S OF NEIST POINT	D 4.9 E 41.1	34 36	30-32 x 2 38 x 2	"	NIL	NE 5-6 SLACK WATER 'SMALL FISH' MARKS NEAR THE BOTTOM
"	1 2 3	1835 1855	DUSK TO DARK	W. SIDE OF L. DUNVEGAN	D 15.4 F 39.0	36 22	35 x 2 22 x 2 (x16)	"	NIL	E 4 NLY MOD. REPORT OF FEW SMALL MARKS NEAR THE BOTTOM FROM BOAT WITH 'LUPE' GILLNET BOAT LANDED 30 x 6 STONE BOXES FROM 3200 YARDS LAID FOR 48 HOURS.
.3.81			DARK TO DAWN		D 15 F 39	VAR.				ECHO SURVEY OF W SIDE OF LOCH DUNVEGAN A FEW HERRING MARK

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
3.3.81	1 2 3	0815 0900	DAY	NE LOCH DUNVEGAN.	D 11.7 F 47.9	86	80-87 x 2 & 86 x 16	No1 COD RIPPER FEATHERS = 1700 gms. No 2 EEL TRACE 750gm. No 3 SMALL MACKEREL FEATHERS = 750gm.	NIL	E 3 W MOD NO MARKS SEEN. GILLNETTER HAULIN. CLOSE TO. (SOME COD IN NETS)
"	1 2 3	0915 0945	"	"	D 11.8 F 47.0	82	80-84 x 1 x 2 x 10	"	NIL	LAID TO SEA ANCHOR.
"	1 2 3	1010 1030	"	"	D 12.2 G 30.7	71	71 x 1 x 2 x 5	" No3 NOW 1050gm wt.	NIL	E 2-3 WLY MOD. SMALL MARK ON STEEP EDGE.
"	1 2 3	1120 1135	"	5 TO 6 MILES E OF LOCH MADDY N. UIST.	C 2.4 H 37.0	32-30	32-30 x 2	REMOVED No 1 RIPPER WT (HARD GROUND)	1 CODLING ON 3	E 2 SLACK WATER SMALL MARKS ON 'EDGES'
"	1 2 3	1143 1153	"	"	C 5.0 H 36.0	40	"	CHANGED No 2 TO WHITE FEATHERS TRACE	~~2 COLEY~~ NIL	E 2 SLACK WATER
"	1 2 3	1303 1405	"	E OF DUNVEGAN HEAD	D 11.1 F 45.7	66/67	67 x 1	"	2 COLEY	E 2 ELY MOD COLEY TAKEN IN MIDWATER. GILLNETTER TOOK ONLY 3 BOYES OUT OF 800 YARDS. FEW MARKS,

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
3.3.81	1 2 3	1600 1710	DAY	FISHERMAN'S ROCK. N END SKYE.	E 4.8 I 30.8	8-20	7-25 x 2	AS PREVIOUSLY	2 POLLACK	VAR 1 NLY MOD. ONLY A FEW MARK
6.3.81	1 2 3	1235 1312	DAY	NE OF DUNVEGAN HEAD	(8E) 10.9 D 46.7 F	84	78-85 x 2	No 1 m/c MED HOOKS & FEATHERS No 2 EELS No 3 FEATHERS ALL 750g wts	5 COLEY	NW x W 6 NLY MOD. LINES LYING WELL TO WINDWARD DODGING UP TO GEAR USING MIZZEN. GILLNETTER, 10 BOATS FROM 800 YARDS
"	1 2 3	1330 1405	"	"	D 11.5 F 45.3	60-65	65-60 x 2·5	" wts increased to 1500g on Nos 2 & 3	NIL	No 1 m/c TOO MUCH LINE (FITTED DURING TRIALS) LINE FOULING CASING NxW 6 & SEly STRONG. EXCESSIVE BOAT DRIFT LOST MARKS QUICKLY EVEN WITH SEA ANCHOR OUT.
"	1 2 3	1500 1520	"	E SIDE OF LOCH DUNVEGAN	D 14 F 46	30-40	35-65 x 2	1500 kgs on all lines	NIL	NxW 6 SLACK WATER. SOME 'FEED' MARKS IN MID WATER
"	1 2 3	1530 1545	"	"	-	35	35-80 x 2	"	NIL	NxW 5 SLACK WATER. FEED MARKS ON BOTTOM.
"		1545 1700	"	"						SEARCHING EAST SIDE OF LOCH. TRAWLER TOOK 25 BXS COD FOR

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
6.3.81	1 2 3	1700 1725	DAY	NE OF DUNVEGAN HEAD		80	79-120 x 2	AS BEFORE	NIL	CHECK HAULING SPEED, 120 FATHS 4-5 min. ABOUT 1 m/sec. WIND NXW 5 TIDE WLY MOD PARTED NO 2 LINE WITH 90 F. OUT NO APPARENT STRAIN
"	1. 2 3	1820 1830	DUSK	SW LOCH DUNVEGAN	-	45-18	49 -30	"	NIL	N x W 5-6 NLY MOD. OVER FEED MARK ON 'EDGE'
7.3.81	1 2 3	0705 0712	HALF DARK, PRE SUNRISE.	SE LOCH DUNVEGAN	-	45 - 40	44 - 38 x 2	No1 FEATHERS MED HOOKS 1500 gm. No2 RUBBER EELS MED HOOKS 1500gm No3 AS No1	NIL	SLY 1 NLY SLIGHT. DENSE 'FEED' MARKS ON BOTTOM.
"	1 2 3	1010 1030	DAY	OFF THE SOUND OF HARRIS	(6c) D 15.6 D 51.7	56	53 - 56 x 2	No 2 M/C 750 gm	NIL	GILLNETTER HAULING COD CLOSE TO. ONE OR TWO SMALL BOTTOM MARKS. Nos 1 & 3 LINES 20°-25° OFF BOAT SIDE. No 2 45° OFF WIND SSW 4-5 SLACK WATER.
"		1030 1430	"							SEARCHED COAST OF HARRIS AND ACROSS TO N SKYE, FLADDACHUIN ISLAND.

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
7.3.81	1 2 3	1430 1500	DAY	N. SKYE FLADDACHUIN I.	(8E) 5.6 42	26	25-35 x 2	AS BEFORE	NIL	S. 6-7 NE STRONG. SMALL MARK ON BOTTOM.
8.3.81										NO FISHING. ECHO SEARCHED FROM UIG TO PORTREE. NLY GALES.
9.3.81	1 2 3	0705 0805	PRE SUNRISE HALF DARK TO DAYLIGHT.	EAST OF RONA.	-	130	135-137 x 1 ALSO, x 135-137	No 1 SQUID LURES WITH TINSEL. RIPPER WT AND SCANDINAVIAN 1000 g. No 2 RUBBER EELS 1000 gm SCANDINAVIAN WT. No 3 FLIES (FEATHERS) RIPPER & 250 gm wt.	NIL	N 3-4, HEAVY NLY SWELL, SLACK WATER. NO MARKS.
"	1 2 3	0835 0845	DAY	ROSSSHIRE SHORE NORTH OF APPLECROSS.		40	40-50 x 1 or 2	"	4 HERRING ON No 2.	N 5-6 SLY MOD HERRING MARKS.
"	1 2 3	0940 0950	"	" OPPOSITE RONA	-	10	10-12 x 1	"	NIL	N 4 HEAVY NLY SWELL. SLY TIDE. SCRATCHY MARKS LOST No 3 WEIGHT
"	1 2 3	1055 1110	"	LOCH TORRIDON	-	10-15		No 3 NOW LARGE HOOKS AND EELS, SCANDIV. WT.	NIL	'SMALL FISH' MARKS.

DATE	M/C	TIME	DAY OR DARK	AREA	DECCA READINGS	DEPTH	JIGGING PROG.	TACKLE	CATCH	WEATHER/TIDE & REMARKS.
7.3.81	1 2 3	1120 1135	DAY	LOCH TORRIDON	–	25	–	AS BEFORE	NIL	ALSO MACKEREL FLIES HANDLINE IN USE.
"	1 2 3	1330 1545	DAY	OFF STAFFIN IS: N. SKYE	(8E) F 0.1 J 39.3	10-12 -15	9 – 14 x 1 or 2	" REPLACED No3 TACKLE (LOST) BY SMALL HOOKS & FLIES.	6 STONES FISH. POLLACK & FEW COLEY.	INTERRUPTED JIGGING. SHIFTING FREQUENTLY TO MAINTAIN POSITION UNABLE TO ANCHOR DUE TO HAULER FAILURE. LIGHT N WIND HEAVY N SWELL
0.3.81	1 2 3	0630 0700	DAWN	LOCH DUNVEGAN OFF ISAY ISLAND	–	60-65	65 - 115 x 2	"	NIL	SE 5. CONSIDERABLE DRIFT, FEW SMALL MARKS
"	1 2 3	0705 0715	DAY	"	–	60-65	65 – 115 x 2	"	NIL	"
"	1 2 3	0730 0745	"	"		"	"	"	NIL	NO MARKS
"	1 2 3	0815 0835	"	"		58	45 - 58 x 1	No 1 m/c CHANGED TO COMB'N EELS & FLIES	4 MED. COLEY	SE 5 NW MOD. SOME BOTTOM MARKS.
"	1 2 3	0900 1100	"	E. SIDE OF LOCH DUNVEGAN		VAR.	VAR.	No 1 m/c TRIED 'EDDYSTONE' EELS, CAUGHT 1 COLEY.	1 COLEY 1 LARGE MALE COD	INTERRUPTED JIGGING.

APPENDIX III

DESCRIPTION OF VARIOUS TRACES

APPENDIX III

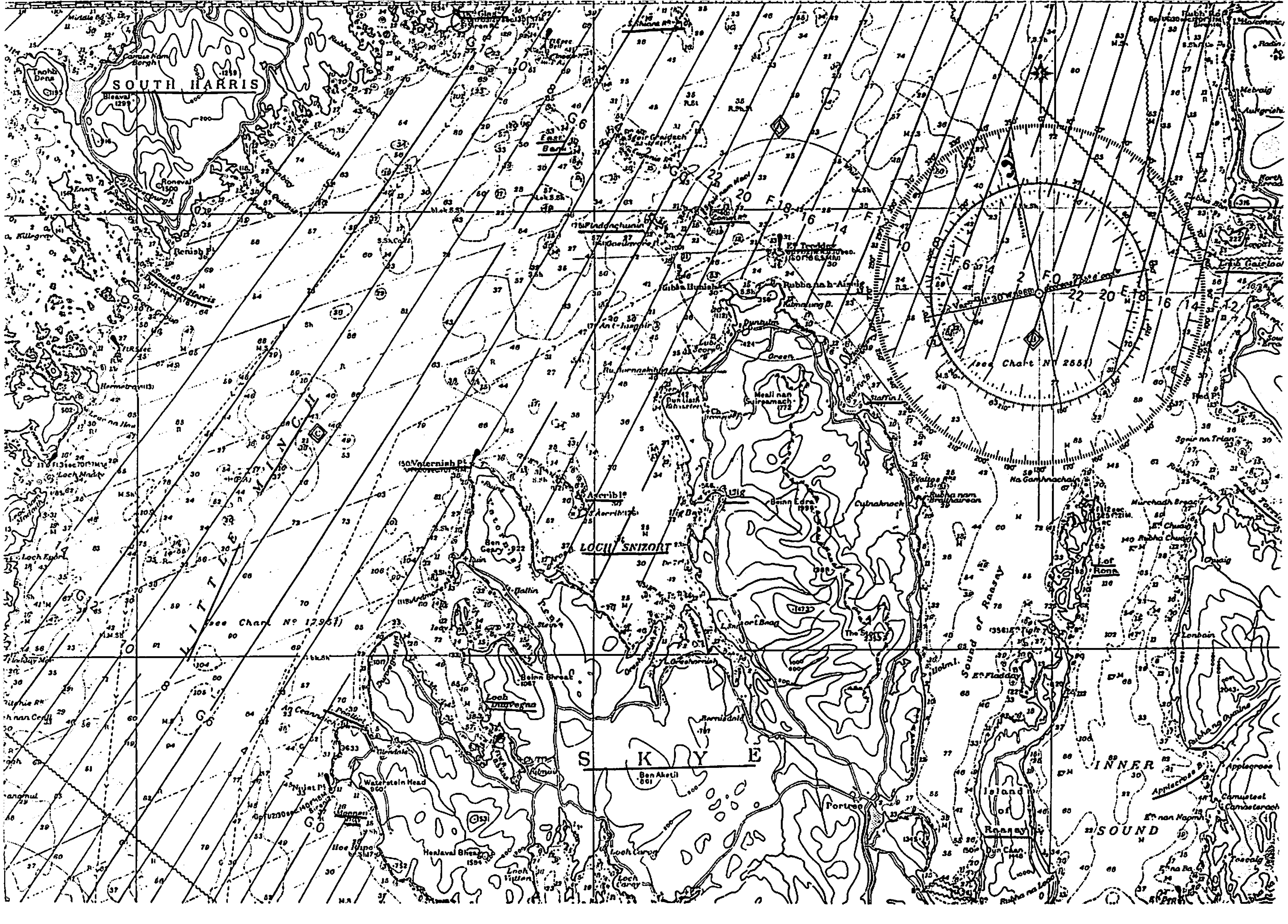
DESCRIPTION OF VARIOUS TRACES

(Mustad Co. numbering).

1)	Plastic Eels	Sheathing	Large Hooks	(No. 6/0
2)	Plastic Eels	Sheathing	Small Hooks	(No. 8/0)
3)	Feathers	Sheathing	Large Hooks	(No. 2310-6)
4)	Feathers	Sheathing	Intermediate Hooks	(No. 2363-15)
5)	Feathers	Sheathing	Small Hooks	(No. 2363-16)
6)	Octopus	Sheathing	Small Hooks	(No. 2363-16)
7)	Tinsel Type 'Feathers'		Small Hooks	(No. 2363-15)
8)	'Eddystone' Eels (plastic tails)		Small Hooks	(No. 2363-15)

N.B. This class of hook is referred to as a 'Round Bent Sea Hook' in Mustad's catalogue.

All traces were between two and four metres in length with side lines 250mm in length and six or eight in number at equidistant spacing. Side lines tied with heat sealed knots and swivels fitted at junctions with line and with weight. Traces and side lines of monofilament nylon. Weights of 300 to 2500gm (see also fig. 5).
Bottom weight hooks were Mustad 2355-5's.



SOUTH HARRIS
Sound of Harris
East Bank
LITTLE MINCH
LOCH SNIZORT
Waternish Pt.
Ascrib Is.
Loch Dunvegan
Beinn Bhreac
Waterstein Head
Neist Pt.
Healaval Bheag
S K Y E
Ben Aketil
Portree
Staffin I.
Kilmaluag B.
Rubha na h-Aiseig
Duntulm
Meall nan Suireamach
Beinn Edra
The Storr
Cuinaknock
L. Snizort Beag
Sound of Raasay
Island of Raasay
INNER SOUND
Applecross
Applecross B.
L. of Rona
Camusteel
Camusterach
Loch Carron
Loch Caroy
(see Chart Nº 1795)
(see Chart Nº 2551)

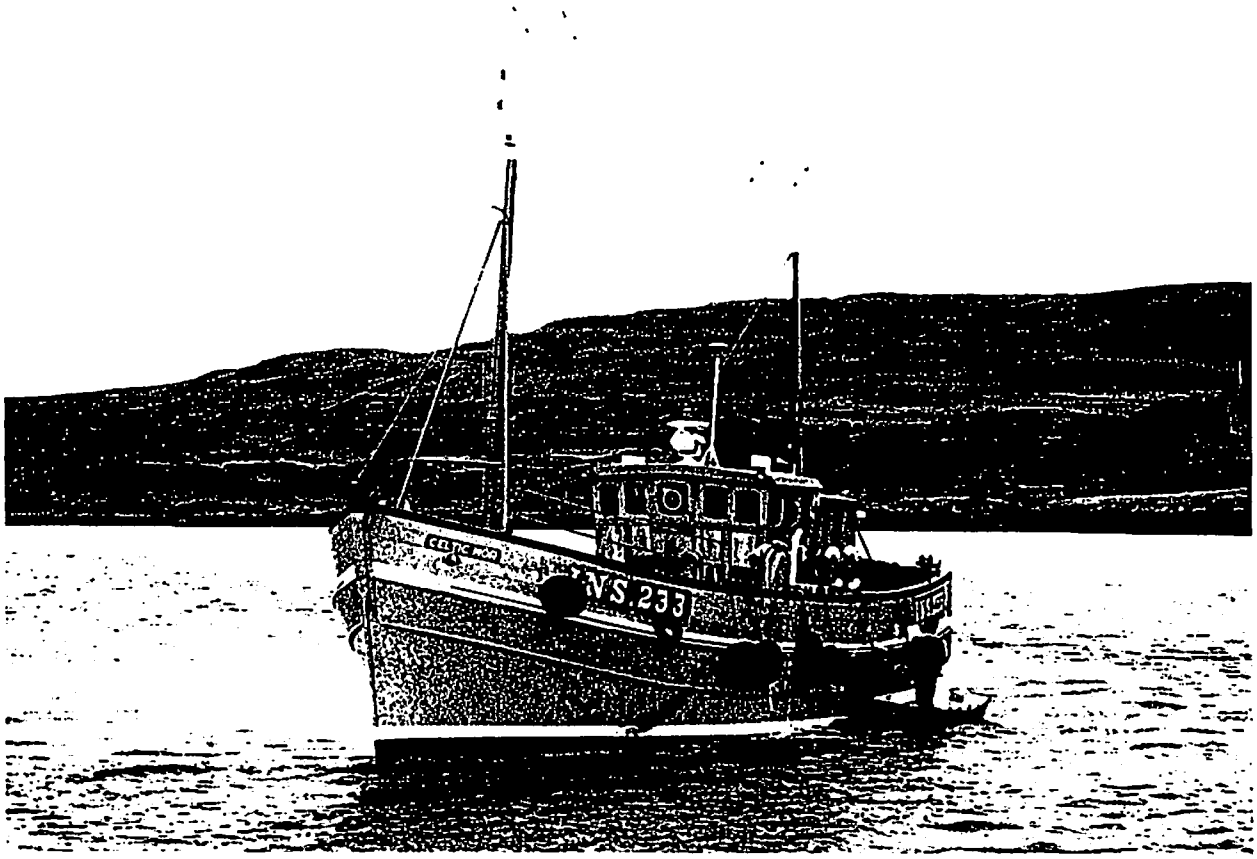
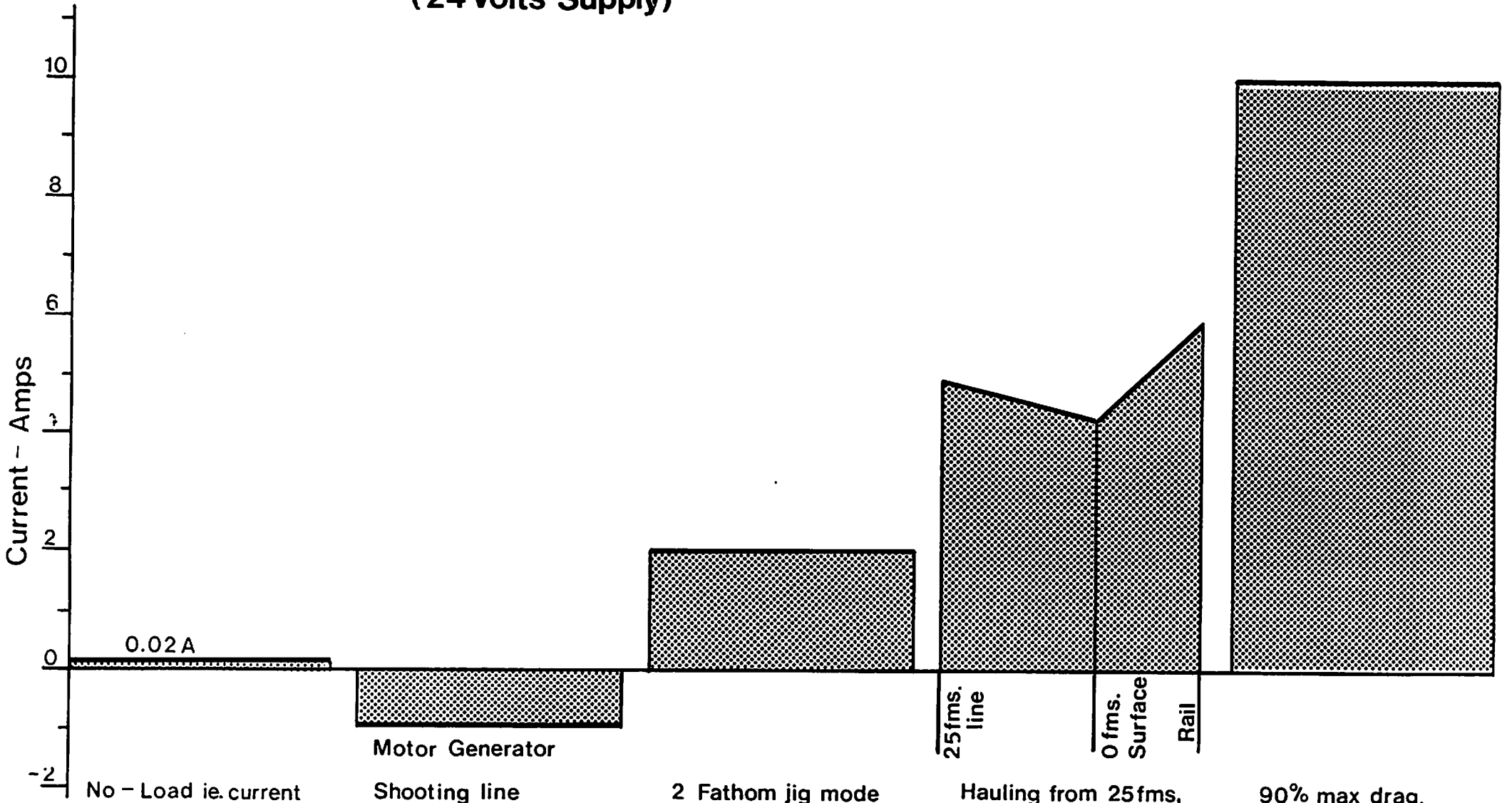


Fig. 2 Trials Vessel

Histogram of Current Cycle per Machine (24 Volts Supply)

Fig.3



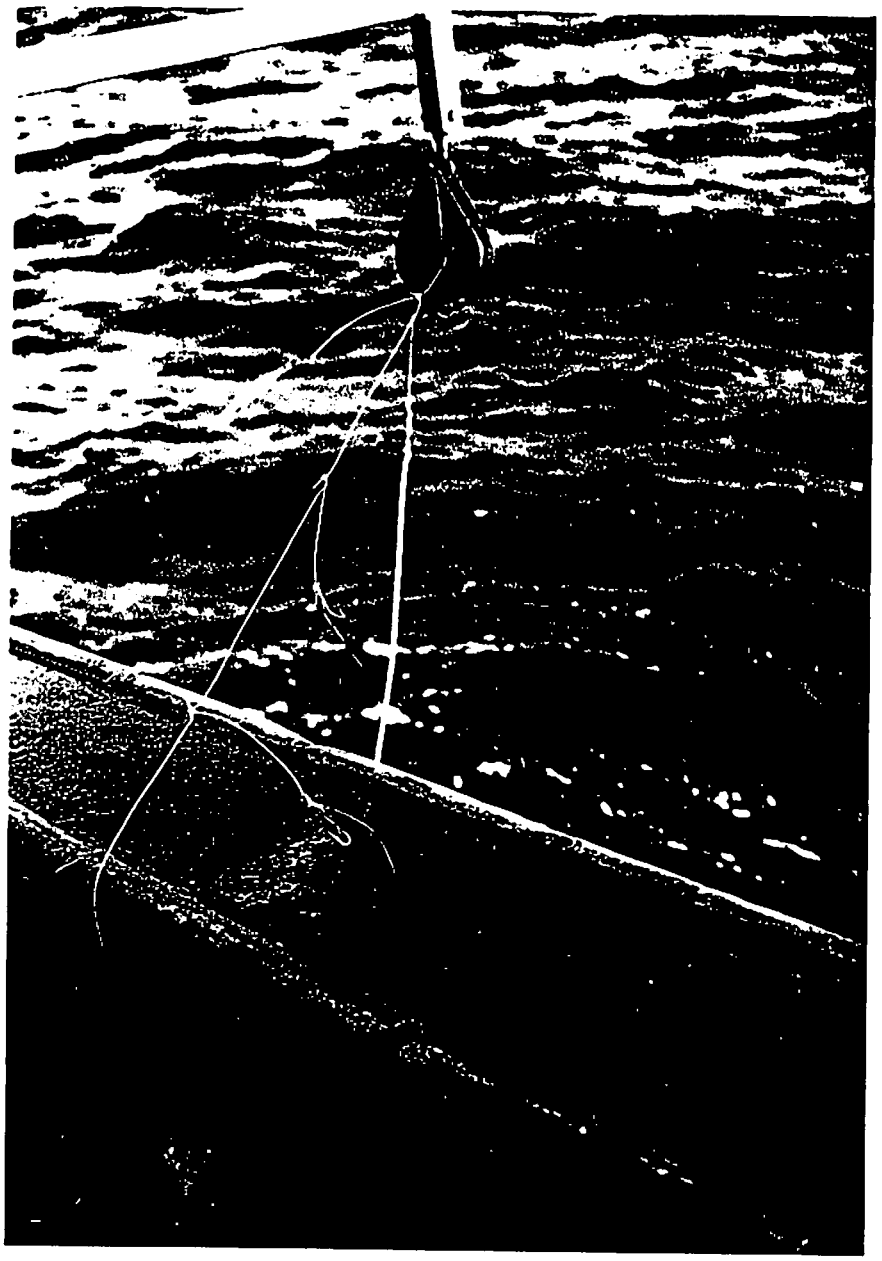


Fig. 4 Typical Plastic Eels Trace.

Fig. 5 Weights Used

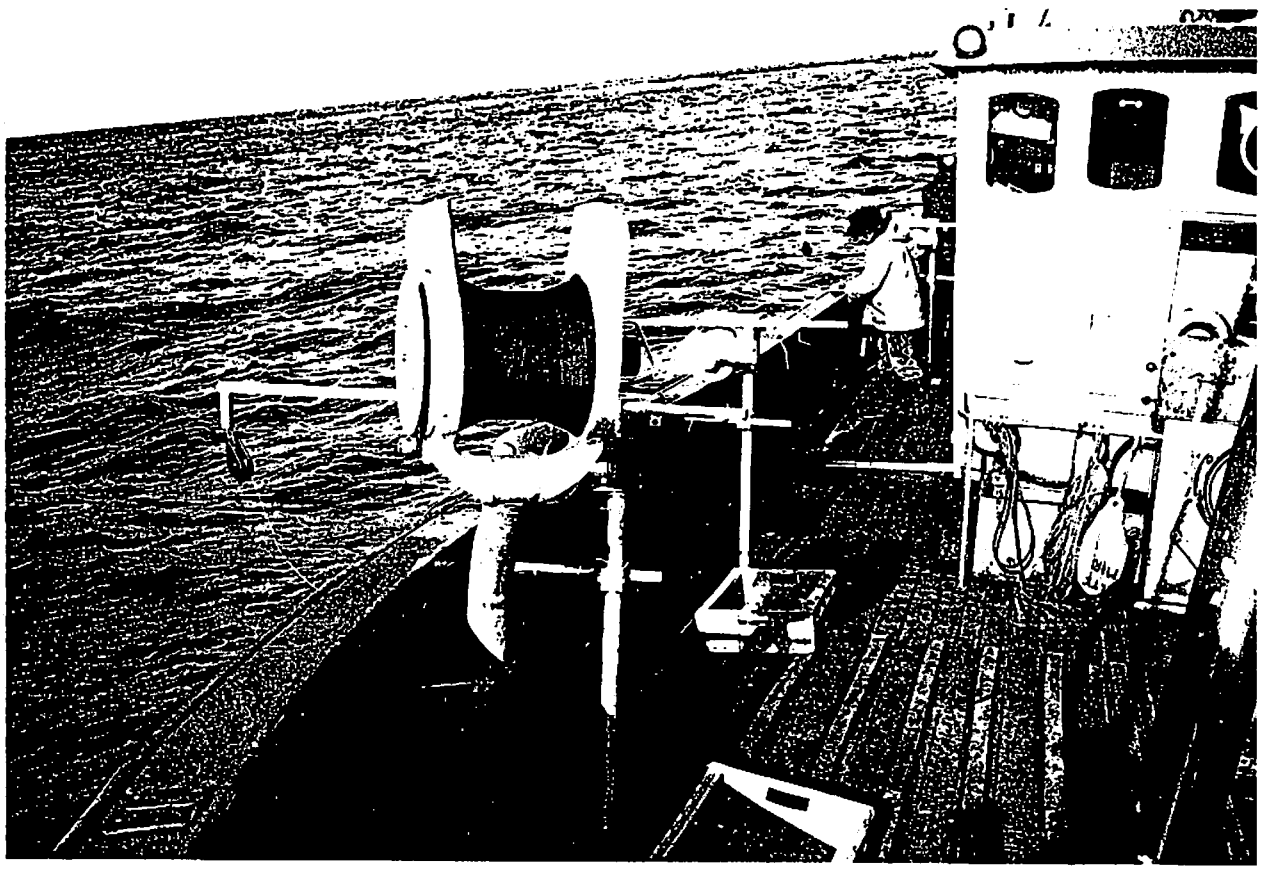
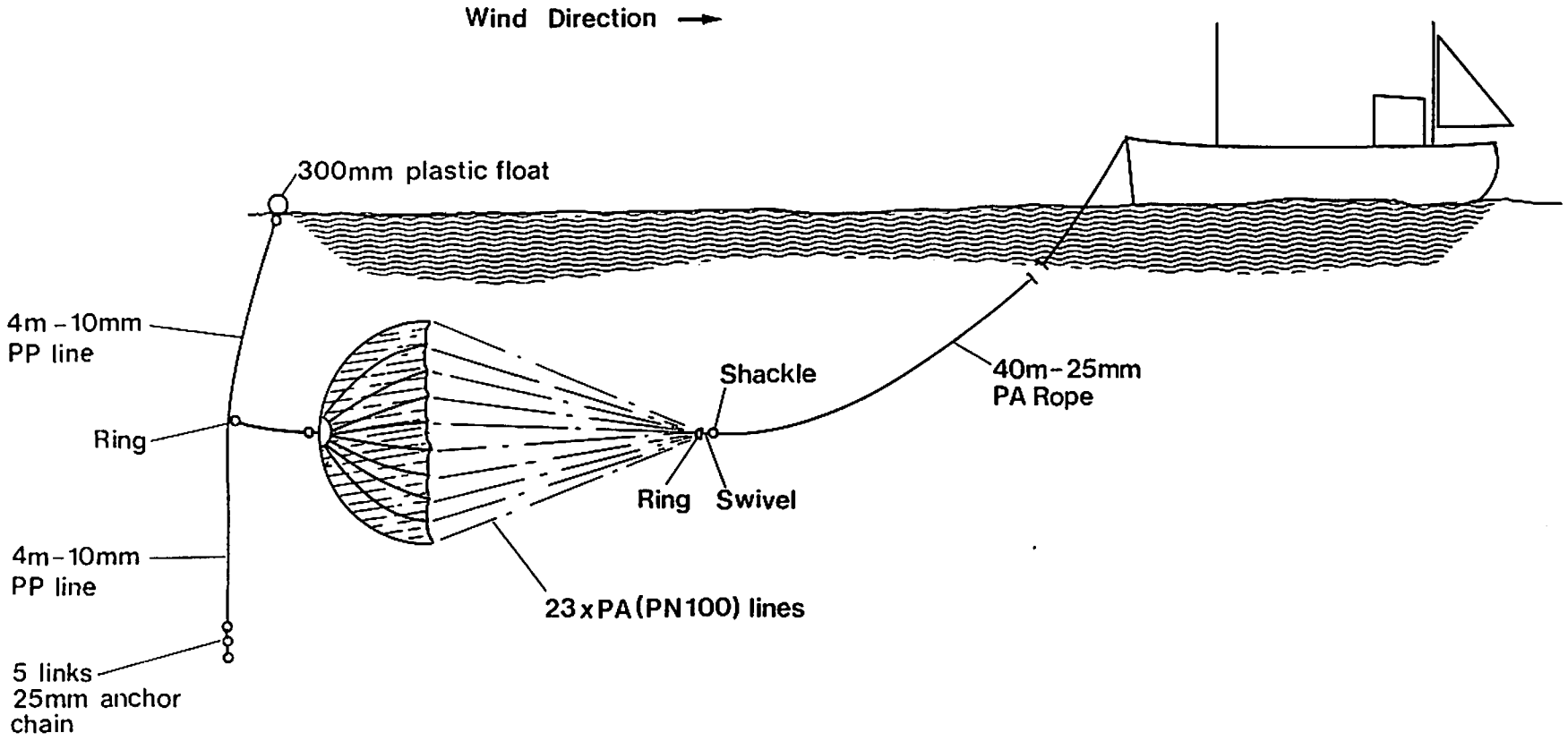


Fig. 6 3 Machines Mounted Aft of Net Hauler



5m dia. parachute sea anchor rig. Fig.7

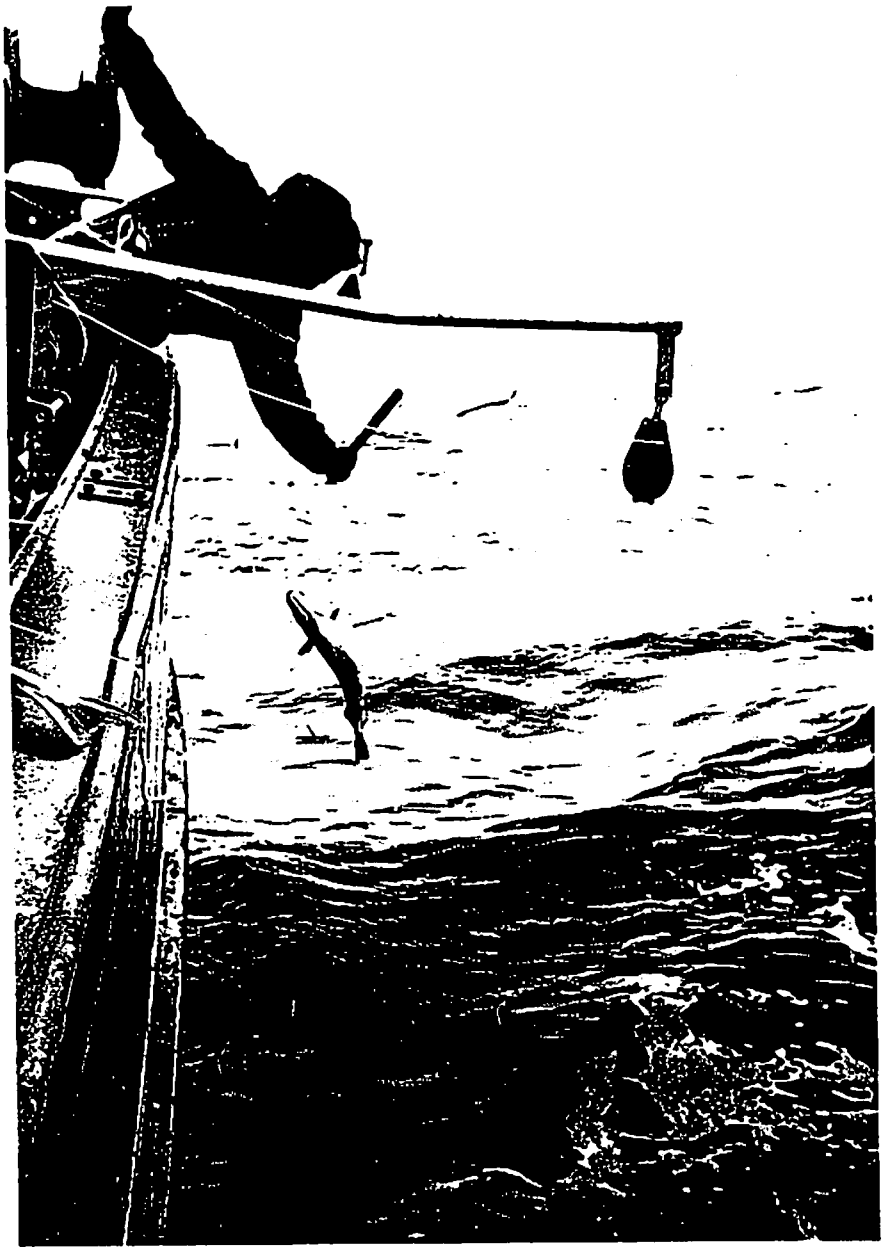


Fig. 8 Gaffing Fish

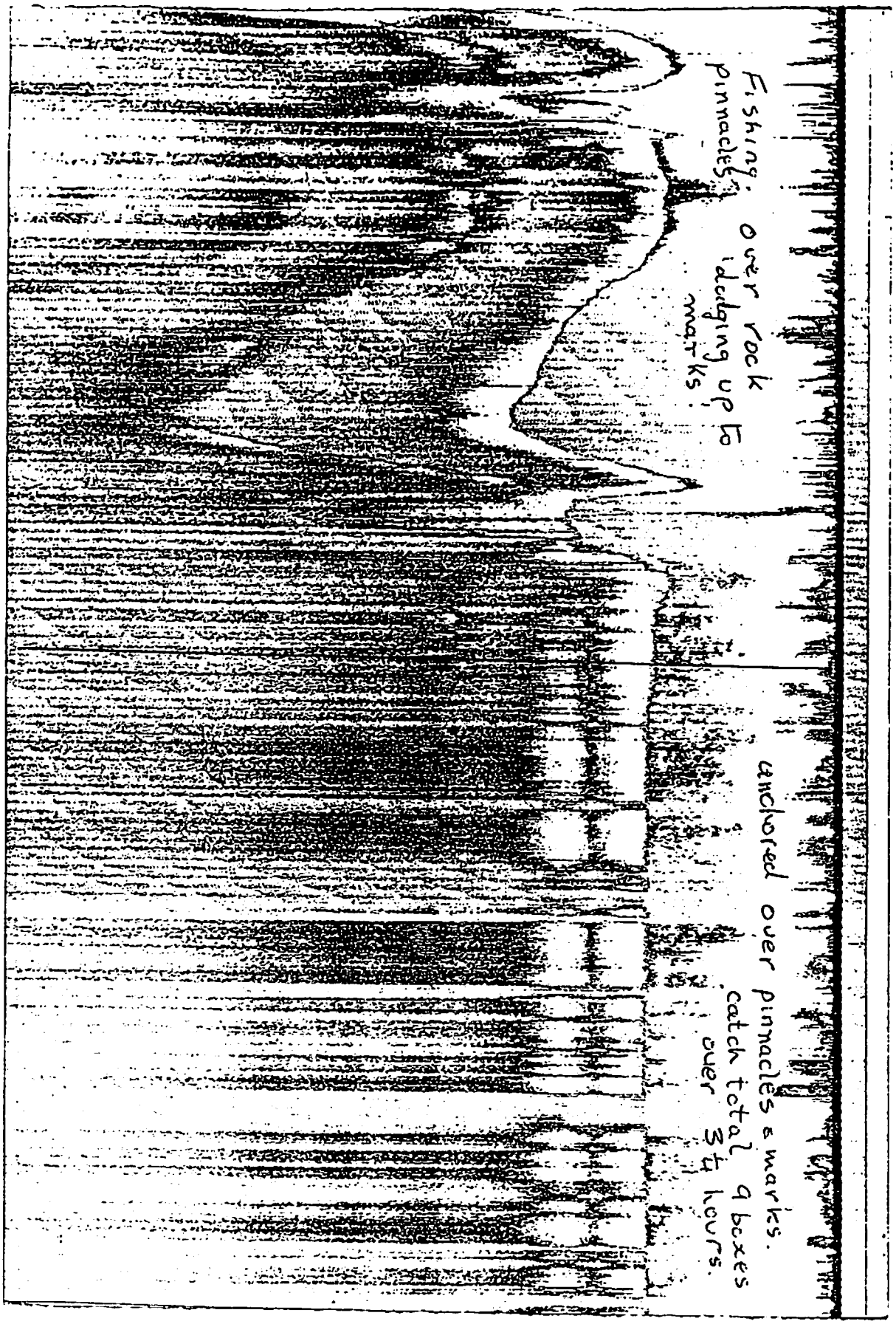


Fig. 9 Echo Sounder Trace Record