

DEMERSAL PAIR TRAWLING

In recent years this method of fishing has received considerable interest in the U.K., in particular with vessels above the 200hp range.

The main advantage of pair trawling over single boat demersal trawling is that the removal of the otterboards (trawl doors) reduces the total gear drag by about 30%. The remaining resistance is then carried between two vessels, thus allowing a much larger trawl and greater warp length to be towed than by a single vessel of equivalent size.

By using increased warp length to depth ratios, i.e. typically 10:1 (compared to say 4:1 for single vessel trawling) greater areas of ground can be swept, shepherding fish into the path of the net. The warp:depth ratio in conjunction with vessel separation distances and bridle lengths are controlled to try and maintain the optimum angle of attack of the sweeps/bridles (15° - 20°) to optimise the herding effect of the gear.

In order to minimise drag and resistance most pair trawls are designed with large meshes in light twines in the wings and square sections (typically 8 or 12in). For example, for a 150hp vessel the net may be approximately 166ft (50m) on the footrope and 140ft (42m) on the headline. A net of this size would have approximately 400 meshes x 8in (200mm) around the fishing circle.

The actual net designs and ground gears used vary tremendously and are influenced by factors like target species, ground types fished and skippers individual preferences etc.

Bridle length can vary also according to numerous factors, in many situations it may be a matter of "trial and error" before coming up with the optimum rig for a particular gear in a particular fishery. The same applies to sweep or cable lengths. Some common lengths used are for example, bridle length of 10-20 fathoms, sweep lengths of 30-40 fathoms.

The amount of weight used between the warp and bridles should be sufficient to ensure that the net is maintaining good ground contact. It is used to help damp-out any influence that the boat may have on the gear through surface movement, particularly if shorter warp:depth ratios are used.

The following is a brief description of a typical pair trawling operation for vessels rigged for side trawling:-

Pair trawling is usually termed an 'aimed trawling' exercise, i.e. fish are usually detected using fish location equipment prior to shooting as opposed to 'blind trawling'.

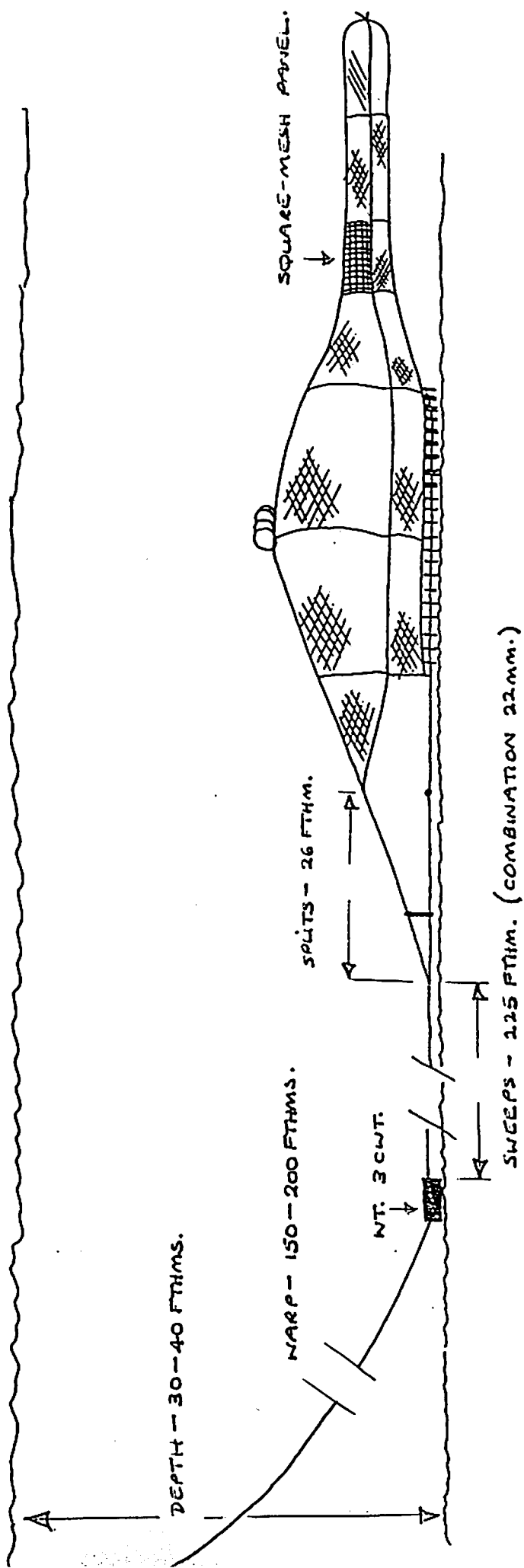
Once fish have been located and the vessel shooting the net has positioned herself relative to the mark, she usually lies starboard side to windward to pay out the net. Once the net is shot and clear the partner vessel approaches on the lee side and receives her bridle end attached to a heaving line arrangement. This is then made fast to the starboard warp.

The shooting vessel runs its warp through the aft gallows. The partner vessel pays its starboard warp out through the forward gallows and uses a towing block aft from which to tow the net. Both vessels go ahead to stream out the gear then drop over the bumper weights and proceed to pay out the warps at high speed until the vessels are about 0.25 miles apart. At about one or two warp lengths to go the vessels slow down and brake the winches slowly to reduce the sudden momentum on the gear as the winch is stopped.

Towing speed is usually between 2.5 and 3.5 knots depending on target species and conditions etc. Towing times are usually shorter than single boat tows, and usually vary between 15 minutes to 3 hours.

Before ^{hauling} trawling commences, the vessels close on each other and increase towing speed to herd and drive fish down into the gear - a similar situation as occurs in seining. Engine speed is reduced and hauling commences. When the bumper weight is up to the gallows, winches are stopped and the starboard cable end is passed to the port vessel by heaving line. The hauling vessel then heaves in the cables, bridles and net. In this way the shooting is alternated between vessels.

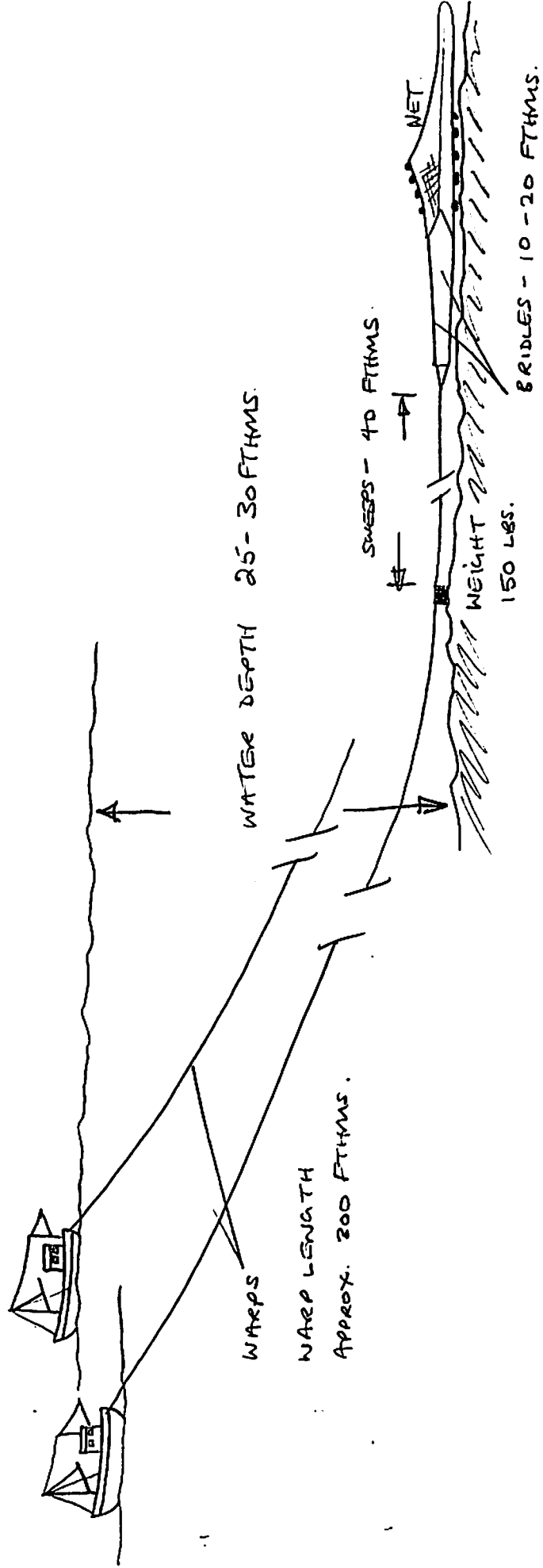
FIG. (6).



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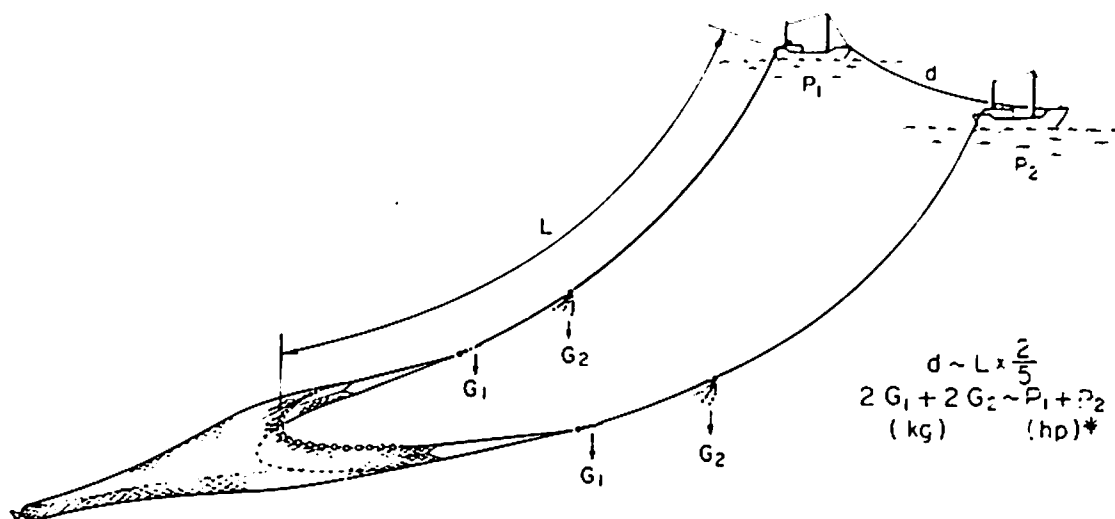
TYPICAL DEMERSAL PAIR TRAWL
ARRANGEMENT.

PAIR TRAWLS 50-70' (150-230 H.P.).

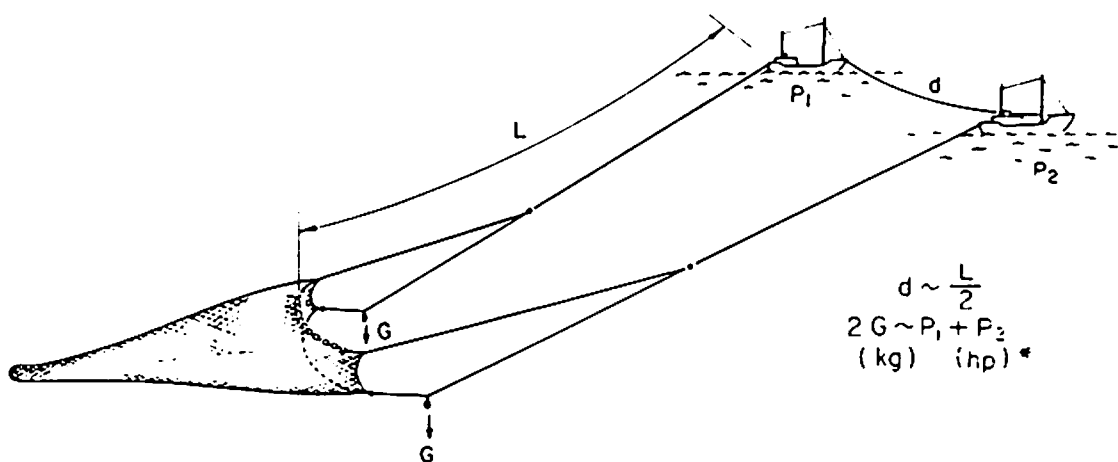


Rigging for pair trawling

■ Bottom trawls



■ Midwater trawls



P = power of the trawler

L = distance trawl — trawler

G = weights in front of the trawl

d = distance between the trawlers

* Brake horsepower (BHP) or Apparent Nominal Power (ANP),
Power in (HP) = 1.36 x Power in (kW)

4 Pair Trawling for Cod

With the decline in pareja fishing and bull trawling one might have thought that two-boat bottom trawling was soon to be a thing of the past. However, in the late 1960s Danish fishermen put their heads together and developed a method of pair fishing that has been astounding in its success.

The Danes were past masters at fishing the North Sea in small boats. Since 1920 their little wooden seine netters had been anchor-dragging for plaice and cod from the Dogger to the Bergen bank. They knew every inch of the North Sea grounds and had a wealth of experience in following the seasonal movements of fish stocks. Plaice catches had declined considerably since the war, and cod and haddock were becoming predominant in the seine net catch. Cod are a unique fish with seasonal migrations and spawning behaviour unlike haddock or hake. Spawning takes place during the winter in the North Sea and it is then that the mature cod congregate in dense shoals. In the early part of the season these schools tend to be predominantly male or predominantly female, then they become more mixed as spawning takes place. Cod prefer sandy bottom with shells or shingle, where they can feed on sand eels, small fish and some crustacea. They also prefer to spawn on such grounds. But like most bottom fish they feel insecure on clean bottom and for protection they stay most of the time on hard, rocky grounds. This of course makes them very difficult to catch in a bottom trawl. The Danes had often seen these large schools of cod on their echosounders and they began to devise a way to net them. It is possible for deep sea otter trawls to come over rough grounds with a minimum of damage to the net, but these are heavy Granton trawls with iron bobbins, and they are towed by vessels 140-240 feet in length with 1,000-2,000 engine hp. The Danish seiners were only around 65 feet long with 114-230 hp engines, and they could not hope to pull such

heavy gear. However, the potential rewards were so great, they persevered and developed a suitable trawl.

First they reckoned that a large wing trawl would make a suitable net, something resembling their seine net wing trawls, but much bigger. The meshes in the wings and mouth would be large, to give low towing resistance and allow a big net mouth circumference. To keep the net off the rough bottom was a major problem. They would need extra large bobbins, 16 or even 20-inch diameter but only the largest of deep sea trawlers could handle them. So instead of iron bobbins, they elected to use plastic. At first extra large floats were simply modified to make bobbins but later, proper heavy duty plastic bobbins were produced. They had holes bored in them to permit them to fill with water so they would sink. But on deck they were light and easy to handle. Once the net and ground rig were designed it was left for the skippers to develop the best fishing techniques.

Unlike the large deep sea trawlers, the Danish boats preferred to use a large warp to depth ratio. It could be as high as 10 : 1. In addition they fitted long ground cables ahead of the net and added a heavy weight between the cable and the warp. The net result of all this is a semi-seining type operation with fish being herded towards the net from either side. It also put less sudden strain on the light gear when working in heavy weather. The net carried a lot of floats and as the plastic bobbins were of almost neutral buoyancy, the gear touched just lightly on the bottom. This is exactly what the skippers wanted. There was little bottom resistance and only a limited chance of snagging on the ground. The large meshes made the net easy to tow and the combined power of the little boats proved sufficient.

What happened then is now fishing 'history'. In Grimsby, England, these 60-foot boats came in after

many a vessel twice the size would have been glad to produce. As the skippers gained experience with the gear, their catches grew even larger, and their trips shorter. By the end of 1973 some anchor-seiners had doubled their previous annual grossings - a leap from £80,000 to £160,000. In one eight-day trip that year, a pair of vessels landed over 900 kits of fish to gross over £10,000 each.

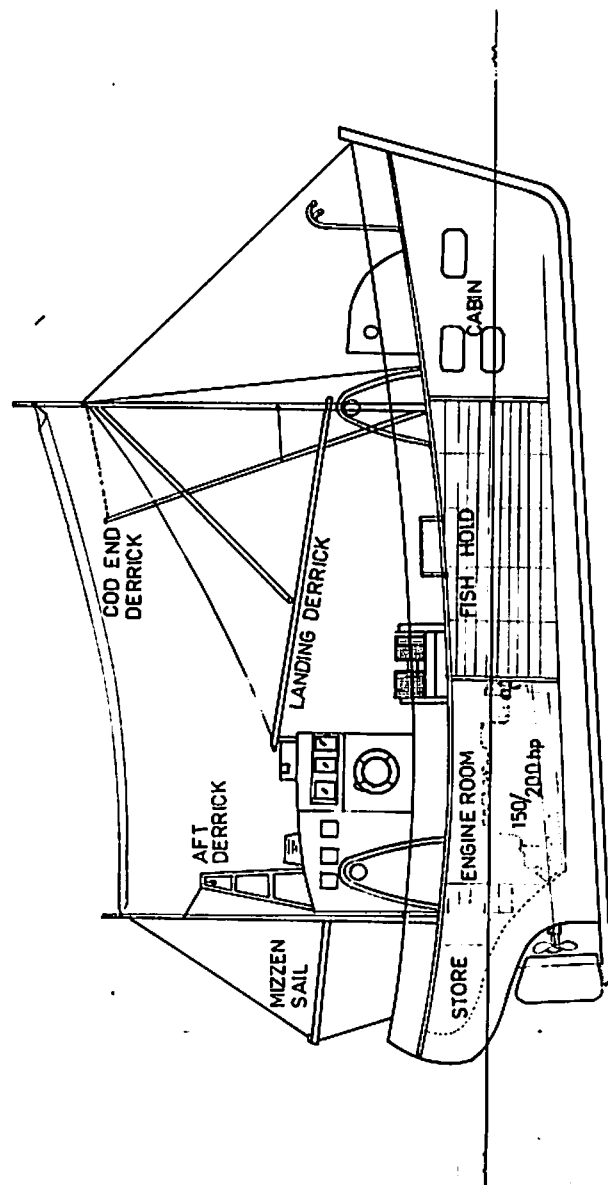
Later, from a four-day trip they grossed over £5,000 each. These kind of earnings compare favourably with the daily averages of 180-240-foot deep sea trawlers operating around Iceland, and it completely disproves the argument that pair fishing

proceeds from one net. If one compares the annual proceeds from a 'one net' pair cod trawl with the annual proceeds from a 'one net' deep sea Granton trawl it will be clearly evident which is the most productive, and the pair trawl requires only 2 x 40 ton 150 hp vessels to pull it. The deep sea trawl needs a single 400-ton 1,000 hp vessel. For these and other reasons, many large British trawling companies decided in 1973 to invest heavily in new fleets of seiner-pair trawler vessels.

Thus was born pair trawling for cod, a unique method of 'aimed trawling' which enables small vessels to work rough grounds and use a net of a size

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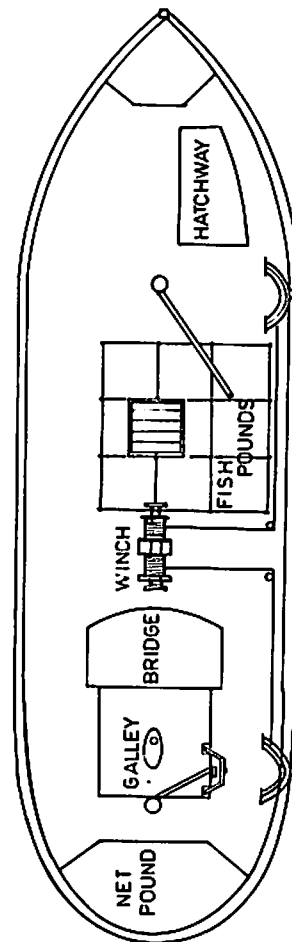
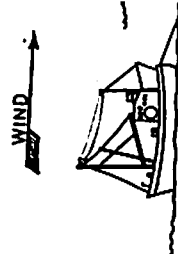
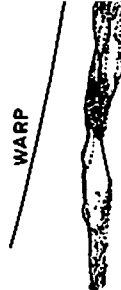


Fig 24 Layout of Danish pair trawler



VESSELS
65 x 18 x 9 ft
150-230 hp



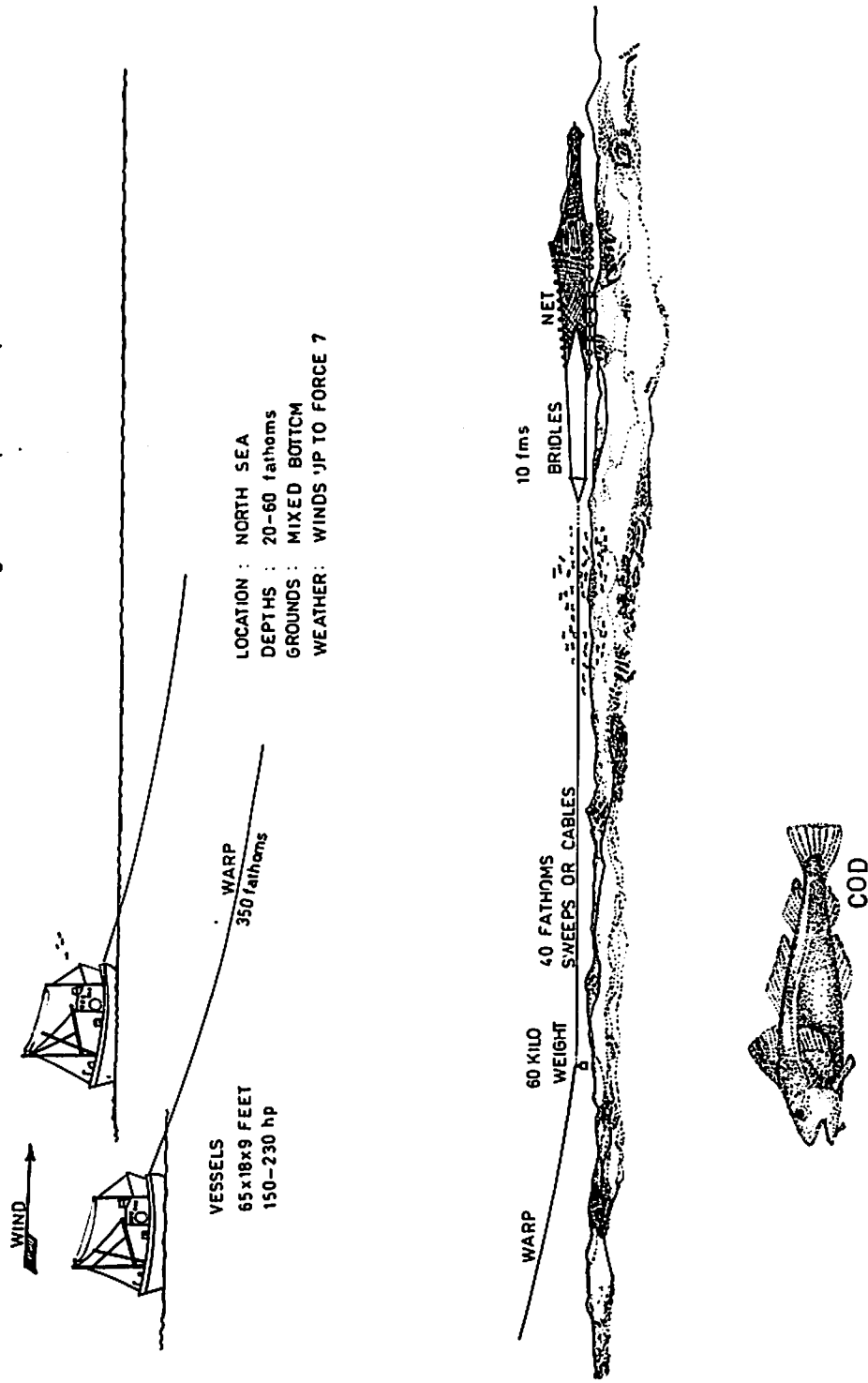
equivalent to that on the largest deep sea bottom trawlers. As the cod fishing is a seasonal one, the boats normally revert to anchor-seining for the remainder of the year. Some of them now also engage in midwater pair trawling for sprat and herring when these fish are around. The more successful pairs now operate throughout the year.

Vessels

A typical cod pair trawler measures 65 x 18 x 9 feet and has a main engine of about 170-230 hp. The engine room is aft, fish hold amidships, and crew accommodation forward. This is a traditional Danish arrangement used on their anchor seiners

and is still practiced on the pair trawlers. The galley may be situated in the cabin or in a small mess room behind the bridge. The wheelhouse is situated well aft and modern vessels have a whaleback on the foredeck. In accordance with Danish tradition, the winch lies fore-and-aft on the deck though some anchor-seiners have their trawl winches athwartships. Power blocks are now used for hauling in the net. They may be single sheave davit type, or multiple sheave with a fixed pedestal. The centrally located fish room enables these small boats to carry up to 40 tons of fish. The net is carried aft or on the starboard side deck and the fish are taken aboard amidships. Pair trawlers and anchor-seiners

Fig 25 Cod pair trawl operation



usually carry fuel and water sufficient for three weeks' operation. Crews are small, only three or four men plus the skipper, though some vessels may carry an extra apprentice or cook.

Pair Trawl Nets

Cod pair trawls are made of nylon and have large meshes in the wings and square, usually 8 or 12-inch (20 or 30 cm) stretched length. For 150 hp vessels the net may be 400 meshes around the mouth and have a headline and footrope of 140 and 166 feet respectively (42 and 50 metres). Despite their size these nets are made of much finer twine than deep sea trawls, to give them a better 'flow' through the water. The meshes down the bag which may be made of polyethylene reduce gradually to 3 or 3½ inches (75–90 mm). The whole net is of two-seam design with split or V-type wing ends to increase headline height. The bobbins are rigged on a ¾ or ⅞-inch diameter wire (10 mm) which is made slightly shorter than the footrope to make sure that the net does not come into contact with the sea-bed. A number of 16-inch (400 mm) diameter bobbins are placed around the bosom; usually from seven to eleven of them are used. The 12-inch (300 mm) bobbins are placed along the bunt or shoulder and may extend all the way to the bridle if particularly rough grounds are being worked. From four to sixteen of these may be fitted to the size of net under discussion. Along the lower bridle, from the wing end to the dan leno, rubber discs 1½ inch (35 mm) diameter may be fitted to reduce chafing wear. These rubber discs are also inserted between the bobbins on the groundrope. For working less rugged grounds, the bobbins may extend only as far as the shoulders, and rubber discs are used from there on. Every 2 feet (60 cm) or less, a 6-inch (150 mm) diameter rubber disc is inserted. This rig is quite common on small bottom trawls. The headline carries around 36 x 8 inch (20 cm) floats. Two 10 fathoms bridles connect the wing-ends to the bridle pole or dan leno. The footrope and ground wire are connected to a pipe clamp (see Fig. 26) which in turn is attached to an adjusting chain. The fishermen can take up or let out some links in the chain to trim the net properly. A bull-nose bobbin precedes the

adjusting chain to protect the wing-end. Ahead of the dan lenos are the bridles of combination rope. These may be 40 fathoms long. A 60-kilo weight is attached between the warp and the bridle, but this may be replaced with a chain-wrapped tyre when towing on soft bottom.

Operation

Pair trawling operations commence after the vessels have located schools of fish by echo-sounder. Blind trawling is rarely attempted. Vessels may search the grounds for days before setting the trawl. Once fish have been detected and their position noted, the shooting vessel lies starboard side to windward and pays out the net. Once the net is over the side and clear of any foul-up, the second vessel approaches on the lee side and receives her bridle end attached to a heaving line. This is made fast to the starboard warp. The shooting vessel always takes the 'port' side of the net and runs its warp through the after side gallows. The second vessel pays the starboard warp out through the forward gallows and uses a towing block aft. Both vessels stream out the gear then drop the bumper weights and proceed to pay out the warp at full speed until they are about a quarter of a mile apart. Normally 350 fathoms of warp are used. When there are only 25 fathoms to go, the boats slow down and apply the winch brakes lightly to reduce the sudden momentum on the gear when the winch is stopped. Towing commences at 2¾ knots with the skippers maintaining contact by radio-telephone. Depending on the grounds and the fish marks, a tow may last anything from 15 minutes to 3 hours. They are usually much shorter than tows by deep sea trawlers. Some pair-skippers prefer to tow into the tide or wind to prevent excessive damage if the net is snagged. Before hauling commences, the boats draw closer and increase the towing speed to drive the fish well into the bag of the net. The closing of the wires is similar to the closing of the gear on a seine netter. Engine speed is reduced and hauling commences with the starboard vessel having knocked its warp out of the towing block. Both boats come slowly round to starboard while hauling. When the end of the warp with the bumper weight is up to the gallows

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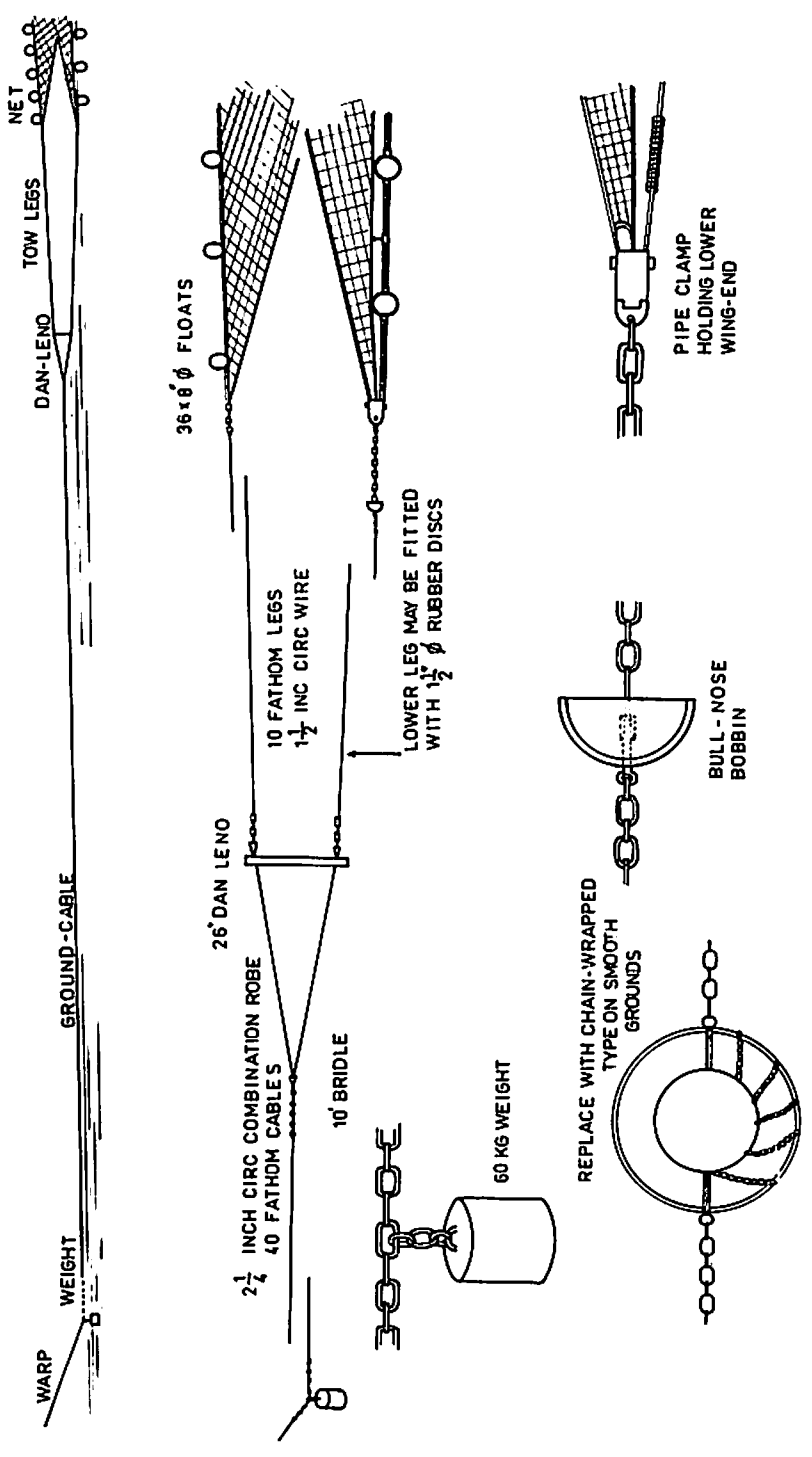
the winches are stopped and the starboard cable end is passed to the port vessel by a heaving line. The hauling vessel then pulls in the cables, bridles and net. Some tows may result in over ten tons of fish and good strong lazy lines or choker ropes are needed to handle the bag, particularly in bad weather. The power block is also a great help when hauling in the gear.

The pair trawl gear is constructed in a way that enables the crew to make rapid repairs in the event of net damage. The ground rope is made up in sections and instead of being lashed to the footrope, the connecting chains are attached with 'rapide' clips. Similarly, screw-on floats have proved to be useful when a quick change of gear is required.

In order to check the fishing performance of pair trawl gear, the skippers check the warps and

groundrope after each haul. They like to see the last 75 fathoms of warp fairly well 'polished' by the seabed. Chains attached at the lower wing-end and around the centre bobbin(s) are also inspected for 'shine' to ensure that the net is on the bottom. The wing-end chains also serve as adjusters - links being taken up or let out to raise or lower the net and obtain satisfactory headline height. During some experiments with the gear it was found that headline height was normally around 12 feet, and increased to 14 feet when the boats were one eighth of a mile apart. Larger 400 hp vessels are now using the cod pair trawl successfully. They can probably operate in rougher sea conditions but it is doubtful whether, with increasing fuel costs, a more economical unit can be found than the 60-foot 170 hp Danish-style boats.

Fig 26 Bridle and cable gear: cod pair trawl



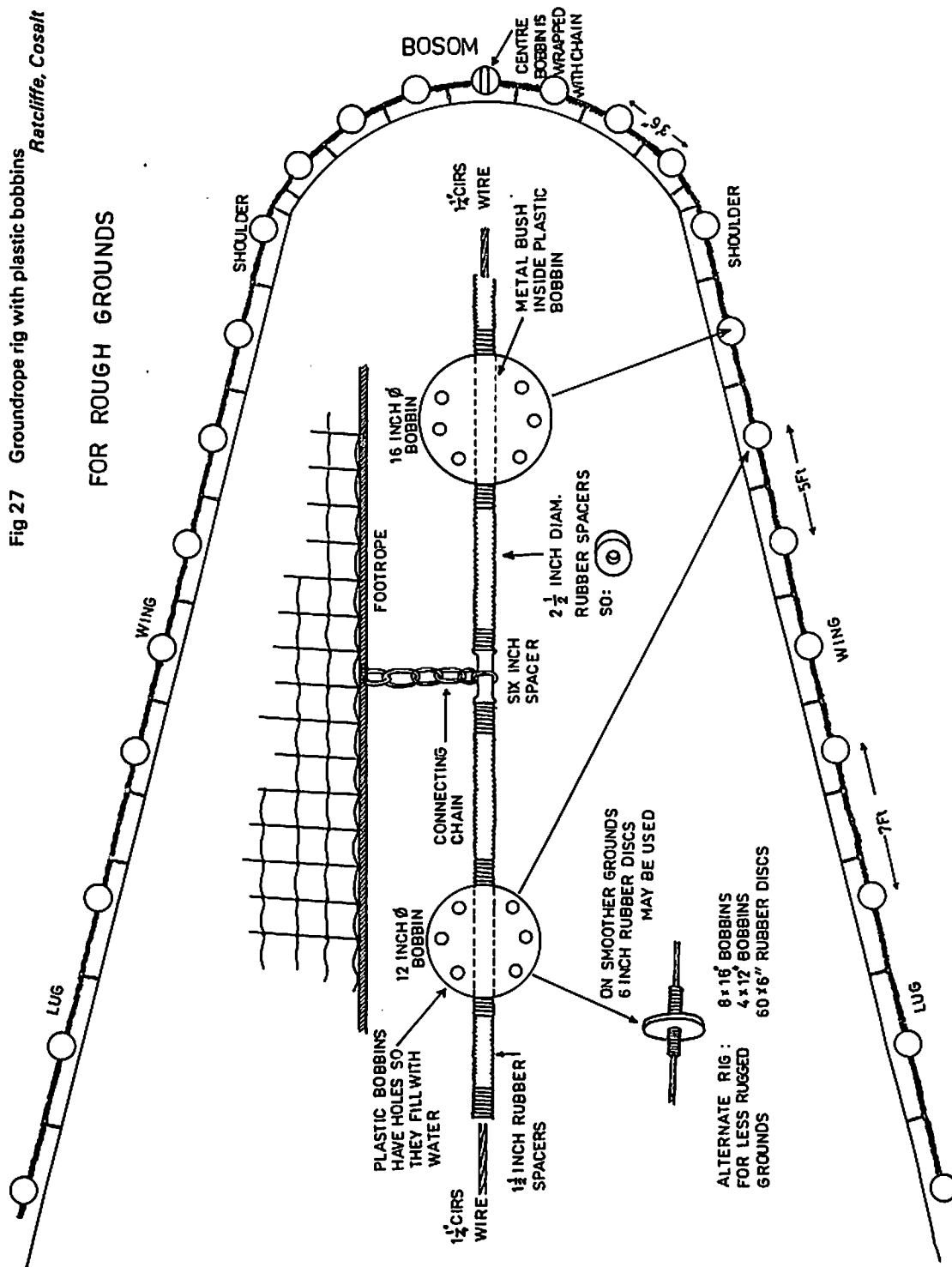
Modified to take Herring

The Danish cod pair trawl was successfully modified in Ireland in 1973 to act as a combination net catching herring as well as cod and haddock. Demersal species are relatively scarce on the West Irish grounds and herring is the mainstay of the trawler fleet. In the wintertime they use midwater pair trawls, but for most of the year, bottom herring trawls are used with otter boards. These nets take herring, mackerel and haddock in depths of from 30

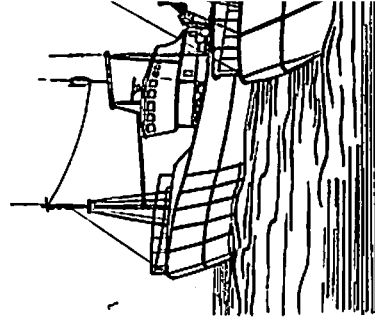
to 80 fathoms during daylight hours. The herring bottom trawls were 'clean bottom' nets and could be extensively damaged if pulled over the rough grounds of which there are plenty off NW Ireland. Since much of the better quality herring and whitefish were found on the hard bottom, it was thought that a pair trawl similar to that used by the Danes, but designed to capture herring as well as cod and haddock, might be applicable.

For these experiments, the larger Danish pair

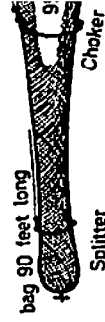
Fig 27 Groundrope rig with plastic bobbins
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WARP LENGTH 7 x DEPTH

LAST 100 Fathoms of warp
drags on the sea bed.

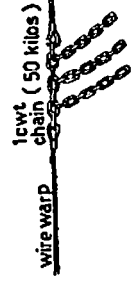
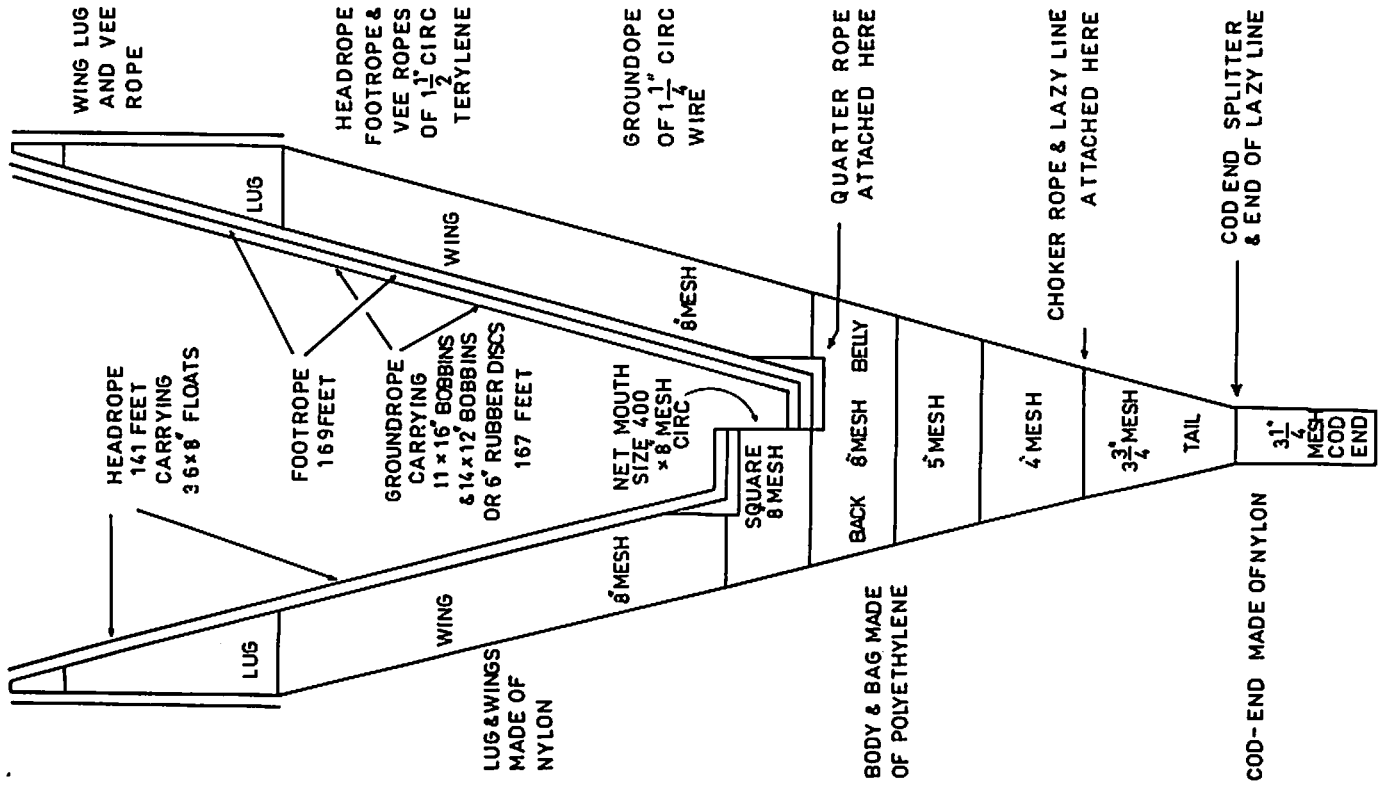


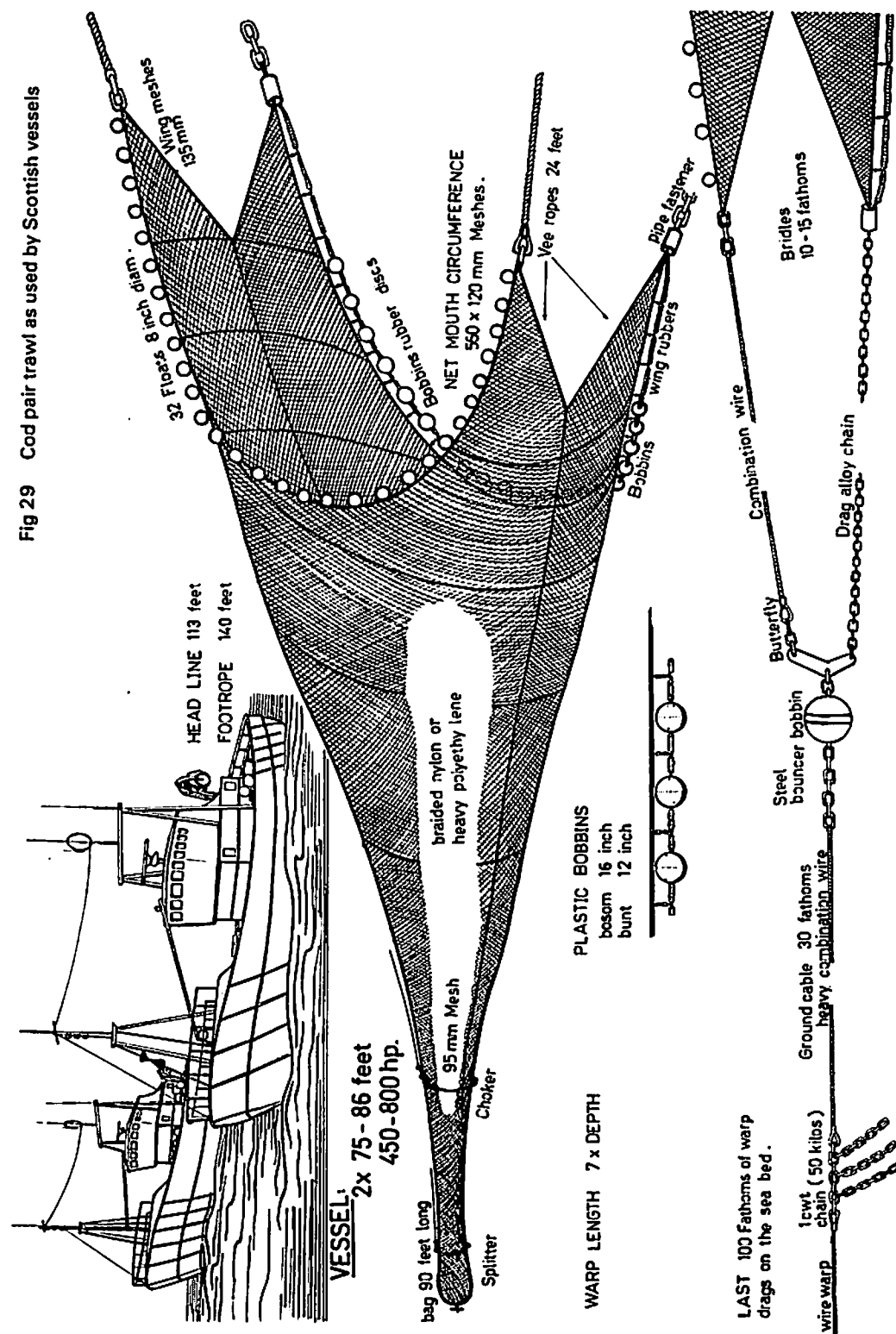
Fig 28 Typical 45 fathom cod pair trawl
(Number refers to theoretical
stretched mouth circumference)



groundwire carrying the bobbins was 24 inches (600 mm) shorter than the footrope to make sure that the net did not come into contact with the bottom. The trawls were of two-seam design and had headline and footrope lengths of 55 and 66 metres respectively (180 and 216 feet). Two 75 foot 350 hp trawlers were paired up for the trials. These were of conventional side-trawler layout.

The tests were immediately successful, and proved that the bobbin pair trawl could be as effective on herring as it was on cod. The first tow with the large

Fig 29 Cod pair trawl as used by Scottish vessels

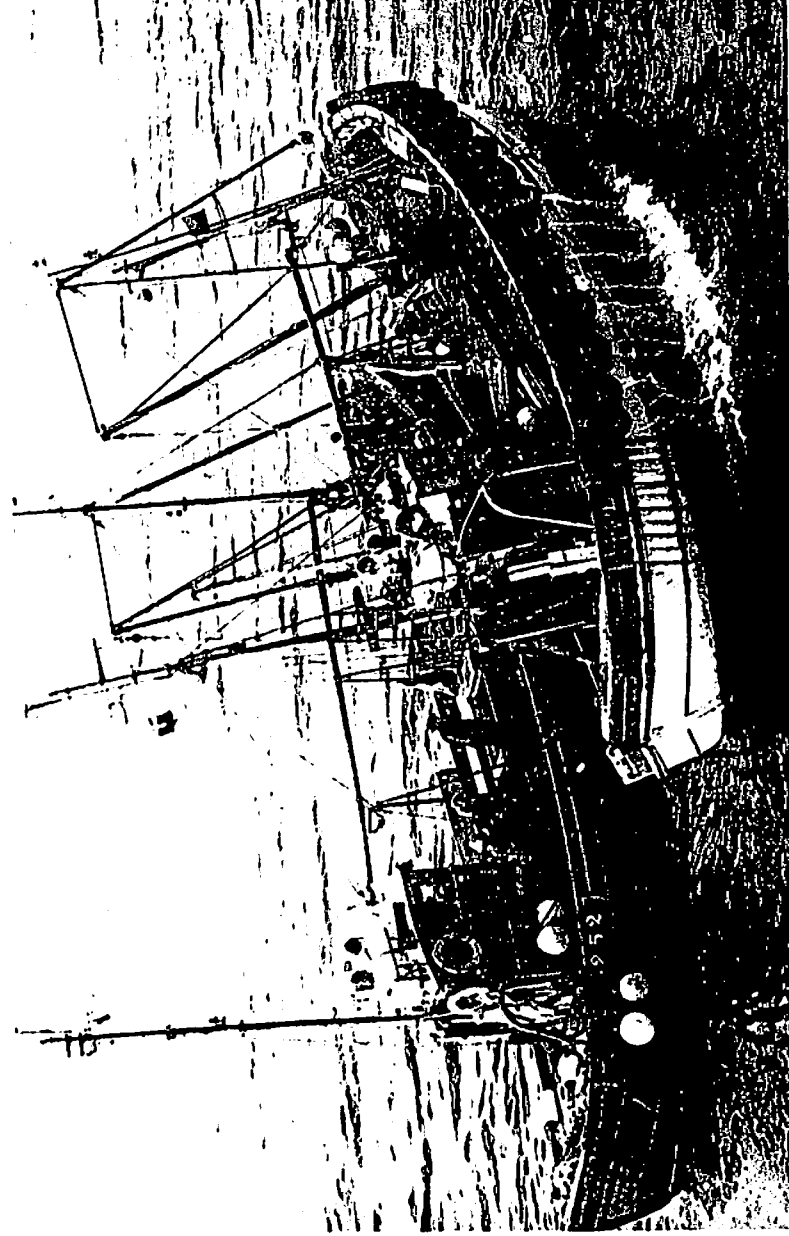


net on clean bottom resulted in so much fish, the bag burst. It is estimated that there were 800 boxes of fish in the net (40 tons). This was composed of 80% herring and 20% mackerel as estimated from the 10 tons that were retained. The large net later caught 280 boxes in a 40 minute tow in an area where a bottom trawler caught 120 boxes in a three hour tow. Similar results were obtained in further tests with the gear outfishing otter trawls by margins of 3 : 1 to 6 : 1.

The bobbins-rigged net appeared to fish closer to the bottom than the larger one with the lighter groundrope, for it took a greater percentage of demersal fish. From a three hour tow on rough grounds it took 180 boxes of fish which included 155 of herring and 25 of haddock. Despite the rugged nature of the grounds, the net was not torn.

The 'cod' pair trawl can therefore be used to good effect for herring and mackerel, with a minimum of modification. As with the cod gear, the herring bobbins trawl appears to be more than twice as productive as single vessel bottom herring trawls, and, of course, it can be used in places where the otter trawl can not, owing to the rugged nature of the sea bed.

Plate 9 Midwater pair trawling with small vessels. Clyde rangers engaged in pair trawling: *Pathfinder* BA 252 and *Ocean Gem* BA 265. Note the warp end weights hanging from the after gallows



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Development in Grimsby

At Grimsby, the 'home port' of cod pair trawling in Britain, there are two families of Danish origin who have featured prominently in the growth of this fishery. These are the Bojen and the Borum families. Jens and Jorgen Bojen began pair trawl operations in their little Danish seiners *Island* and *Sonia Jane*. The *Island* measured 57 x 17 x 8 feet and had an engine of a little over 100 hp. The *Sonia Jane* was around the same size, 34 tons registered, and had a slightly bigger engine. The rigours of the North Sea weather did not frighten the Bojen skippers at all, despite the small size and power of their craft. It was in little vessels like these that Danish fishermen had been operating in the North Sea for the past fifty years. Now they were to accomplish something that they could not do with the Danish seine net – they were to tow their gear over some of the most rugged grounds where cod shoals were to be found. And they were to succeed remarkably by mastering the skills of two-boat fishing in all weathers, by day and by night. Some of the catches and grossings by the Bojen skippers would have been astonishing for any size of fishing vessel. In August 1972 they landed 914 kits (57 tons) of prime fish for over £12,000. And this was from a five day trip. Later a newer vessel, the *Frances Bojen*, replaced the *Island* on the team, and in 1975 Jens Bojen paired up with another young skipper, John (Lemon) Richardson who commanded the vessel *Skanderborg*. The *Frances Bojen/Skanderborg* partnership had an amazing success in 1975, grossing over £140,000 in the last six months alone. Figures by themselves cannot tell the whole story, as with inflation money values are only relative. Suffice it to say that the figures of pair trawl catches and earnings shown on pages 156 and 157, are ones that deep sea trawlers of twice the length and five times the tonnage, would be pleased to have in 1975. On several trips, pair teams averaged over £2,000 per day at sea. During the same year, only the largest and most modern deep sea trawlers could surpass this. In these days of rising fuel costs, the production per horsepower of the pair trawl teams must surely be among the highest, and therefore the cheapest, in terms of both operational and capital costs.

By the end of 1976, cod pair trawl earnings had

risen astronomically. Catches from single trips began to gross over £20,000 and over £30,000. The Bojen-Richardson team brought in one catch of 1,430 kits (90.8 tonnes) to gross over £40,000 for 13 days at sea. No doubt as money values decline these figures will lose their meaning, but for comparative purposes we might mention that in the same year, the largest and most successful distant water trawlers in Britain were averaging around £38,000 per trip, and around £1,750 per day at sea. Those vessels were three times the length, fifteen times the tonnage and had about seven times the power of the little cod pair trawlers. In terms of capital cost, one could probably build ten 65 foot, 280 hp pair trawlers (five pairs) for the cost of one 195 foot, 1,960 hp distant water trawler.

The *Frances Bojen* BCK 51 was built in the Jones Buckie shipyard in 1970. She is of typical Danish seiner layout, is only 66 feet long, and is powered by a Gardner 230 hp engine. A Hydema triple sheave pedestal power block was installed on the deck aft, and later a Lossie Hydraulics net drum was fitted amidships. Her partner vessel the *Skanderborg* H 64 was also built in Buckie, but is some 12 years older. She measures 63 x 18 x 8 feet and has a Gardner 152 hp engine.

In 1976 the *Frances Bojen* was teamed with a new vessel, the *Margrethe Bojen* BCK 11 which was also built at the Buckie Jones yard. Built of larch and oak along traditional Scottish lines, she measured 60 x 20 x 10 feet and was propelled by a 280 hp Kelvin engine with a controllable pitch propeller. On deck was installed a Norwinch TC8 9 ton 600 fathom trawl winch, and two Lossie Hydraulics pedestal type power blocks. The vessel carried 2,600 gallons of fuel (about 10 tons) and could accommodate over 42 tons of fish plus ice in her two holds. For fish finding purposes she was fitted with two Kelvin Hughes echo-sounders operating on 48 kHz and 28 kHz frequencies respectively, and a Simrad Sonar and scope. Other equipment included Sailor SSB and vhf radios, Atlas radar, Ben Amphitrite log and Decca Navigator MK 21. During her first eight months of operation, this compact modern vessel put ashore catches worth over £200,000 which probably exceeded her own total cost.

More recent vessels which have been built with cod-trawling chiefly in mind, have had larger engines installed. Whether this investment in greater power is really worthwhile in pair fishing, remains to be seen. There are other 'multi-purpose' considerations, however, and if the vessels were also to engage in midwater pair trawling, then the extra power would be useful.

The Borum family, who formerly operated the *Solveig Borum* and the *Edith Borum*, 45 ton vessels with 152 and 200 hp engines respectively, now pair trawl with the *Carl Borum* and the *Jacqueline Borum*. Both vessels were built in Denmark on traditional anchor-seiner lines, but with modern equipment and layout suitable for cod pair trawling. The *Carl Borum* GY 322, which was delivered in 1975, is only 62.5 feet in length, but is powered by an Alpha 400 hp engine. She is equipped with a Norlau hydraulic winch and net drum. In her first month in operation she landed fish catches realising nearly £20,000.

A complete contrast in cod pair trawlers is provided by the *Mohave/Shawnee* partnership. These vessels are steel stern trawler types. They measure over 74 feet in length, have engines of nearly 500 hp and are equipped with hydraulic winches, net drums and power blocks. They are designed to engage in midwater pair trawling, seine-netting and bottom trawling as required. Most of the cod pair trawlers in Grimsby engage in Danish seining part-time, though some of them go bottom trawling on their own.

In 1974 there were seven pairs of cod trawlers fishing regularly from Grimsby. By 1975 the number had increased to eleven pairs or twenty-two vessels. This was considered enough for one port by the skippers themselves. Other pairs operate occasionally from Hull and from North Shields. A list of some typical vessels, with their equipment, is given in the table on page 150.

Scottish Use of the Cod Pair Trawl

Scottish fishermen showed considerable interest in the cod pair trawl, particularly the larger gear used by bigger vessels in Denmark, but it was not until the spring of 1976 that they began to use the gear

commercially. Herring trawling was then being restricted and with so many vessels reverting to seine-netting, there was some overcrowding on the fishing grounds. So a number of boats began pair trawling for cod and coalfish on the more rugged grounds of the North Sea from Aberdeen to Shetland. Fraserburgh and Peterhead vessels were among the first to adopt the gear. Though some of the boats were similar in size and power to the Grimsby pair trawlers, most of them were larger – in the 75 to 87 foot range, with from 460 to 850 hp engines.

The technique of pair trawling was not new to these vessels as they had been midwater pair trawling for years. Some of them retained the technique of using two warps from each boat, as with the midwater trawl. This worked well with the high opening lighter rigged pair trawls which were used on sandy bottom. With the heavier bobbin-rigged trawls, however, the single warp arrangement was used. Fifteen fathom heavy bridles were used with thirty fathom sweeps, and the warp length of around seven times the depth of water. About one hundred fathoms of warp, next to the sweeps, maintained contact with the sea bed thus 'herding' the fish in towards the trawl. Towing time usually varied from two to four hours, and the boats would tow about a quarter of a mile apart, depending on the warp length.

Pairs like the *Fairweather V* PD157 and *Sparkling Star* PD137; *Seringa* PD95 and *Sundari* PD93; *Unity* PD209 and *Morning Dawn* PD195; began to land catches of around 1,000 boxes (44.5 tonnes) from trips of one week or less. One pair, the *Faithful II* PD67 and the *Ugievale II* PD105, grossed £15,800 from a catch of 1,200 boxes taken on a five day trip. This averages out at over £1,500 per boat, per day at sea, which is more than some of the largest deep sea trawlers are able to earn. The catches consisted mainly of cod and coalfish. 'Coley' as the latter are called used to be unpopular on the market, but by this time they were selling for around £9 a box (= £20 per 100 kilos). By the summer of that year, more than 26 NE Scottish vessels were using the bottom pair trawl and more fishermen were showing interest.

SMALL BOAT PAIR TRAWLING OPERATION

Vessels - MFV Budding Rose, MFV Levan Mor
Port of Operation - Looe, Cornwall, South West England

Notes to be Read in Conjunction with Video Tape

The pair team are shown leaving Looe harbour for inshore fishing grounds.

The net is first shot by *Budding Rose* as her partner vessel *Levan Mor* moves into position to transfer the sweep for the portside of the gear.

Additional wingend floats are attached as *Levan Mor* approaches the partner vessel.

The net is shot from the net drum until the split bridles are reached - note the heavy chain section between the end of the split bridles and the sweep lines.

If long sweep lines are used then they must be split between both winch barrels if capacity is limited, i.e. half on portside barrel and half on starboard side.

The sweeps from the portside winch barrels are shot first. The sweep from the portside winch barrel of *Levan Mor* is transferred to *Budding Rose* and connected to the portside of the net. Thus *Budding Rose* is the starboard side boat and *Levan Mor* the portside boat.

Once the sweeps have been connected to the net they are shot as the vessels steam ahead moving gradually apart.

The first half of the combination sweeps are shot from the portside barrels. The operation is stopped at this stage while the second half of the sweeps are connected up from the starboard winch barrels. (This is achieved by securing the port sweep at the portside towing block while the starboard sweep is connected).

The second half of the sweep is then shot. Once all the sweep has been shot then the heavy weights are connected at the junction between the end of the sweeps and the towing warps (wires/cables). The weight is connected by a 'G' link clip arrangement on an independent chain (similar to the method used for trawl door attachment). Once connected the weight is released from the "dog chain" and the warp or cables are shot from the starboard barrels.

The vessels both tow from the starboard barrels/wire after transferring the towing position to a central point on the 'A' frame using a "stopper chain" around the warp.

The vessels move off into their towing positions as the warp is shot. The vessels can be seen performing a tight turn to port.

As the tow is completed the vessels gradually close up and once they come together both vessels increase speed to ensure any fish in the forward areas of the net are chased back into the codend.

The hauling procedure is a reverse of the shooting operation.

The towing chains are removed and the warps retrieved onto the starboard winch barrels.

The weight is hauled up and secured with the "dog chain".

The first section of combination sweep is hauled onto the starboard winch barrel.

As the first section of sweep fills the starboard drum, the second section is transferred to the port drum.

The end of the starboard sweep on *Budding Rose* is transferred to the starboard inhauler on the net drum.

The end of the port sweep from *Levan Mor* is transferred to *Budding Rose* and connected to the portside inhauler on the net drum.

The net is retrieved onto the net drum.

As the net is being hauled, the partner vessel *Levan Mor* moves off to position herself for the next tow and prepares to shoot her net.