a fishing industry guide to offshore operators

Fisheries and Offshore Oil Consultative Group

A FISHING INDUSTRY GUIDE

TO

OFFSHORE OPERATORS

CONTENTS

1.	Preface	1-2
2.	Profile of the UK Fishing Fleet	3
	(i) Demersal or Bottom Fishing Methods	3-14
	(ii) Pelagic or Midwater Fishing Methods	14-17
	(iii) Static Gear	18-21
3.	Addendum	22
4.	Table 1 Summary Statistics for the UK Over 10 Metre Fleet as at 31 December 1998	23
5.	Table 2 Summary of typical gear component sizes and Towing speeds for various fishing methods	24-25
6.	Annex 1 Useful Addresses	26-28

PREFACE

1.1 This booklet has been prepared by the Scottish Executive Rural Affairs Department at the request of the Fisheries and Offshore Oil Consultative Group (FOOCG) in conjunction with the Fisheries Research Services - Marine Laboratory Aberdeen (FRS-MLA) and the Ministry of Agriculture, Fisheries and Food.

1.2 Since the previous version was published in 1976 both the UK Fishing Industry and Offshore Oil Industry have undergone substantial changes. In particular the loss of distant water fishing opportunities means that most vessels concentrate on home water grounds on the UK Continental Shelf and adjacent slopes, areas where interaction with offshore oil and gas installations and their related infrastructure are most likely to occur. It is however to be applauded that the two industries have managed to co-exist in this often unpredictable, violent and dangerous environment throughout this period. There are many examples of co-operation and mutual support that testify to the good working relations that continue to evolve between the two industries.

1.3 Some areas are more important than others to fishermen and are therefore more intensively fished. The booklet 'Fisheries Sensitivity Maps in British Waters' published in 1998 provides valuable information on the spawning locations and nursery areas of several commercially important species along with a range of fishing effort maps. That booklet was prepared by the FRS-MLA in conjunction with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Fisheries Laboratory, Lowestoft using their own data along with further information provided by the Scottish Fishermen's Federation and National Federation of Fishermen's Organisations. The United Kingdom Offshore Operators Association (UKOOA) published the booklet in a paper version in limited numbers for essential users during the summer of 1998. An electronic version can however be found on their website at:

www.oilandgas.org.uk/issues/fisheries/index.htm.

1.4 Over the past twenty years new fishing methods such as demersal pair trawling and seining have evolved, together with twin rig trawling and the growth of fishing for many high value deep-water species which now find a ready market. As a result of these developments fishing vessels and the gears that they carry have generally become larger, heavier and stronger over the years. It follows then that in the event of fouling underwater obstructions, such gear is less likely to part under load or be torn free. In addition to a brief description of the gears currently deployed by the UK fishing fleet this booklet also includes details of the typical (mean) and maximum sizes of rigging components such as warps, bridles and otter boards which could conceivably make contact with installations on or near the seabed.

1.5 Details of the various types of static gear used in UK waters to catch diverse species of finfish and shellfish are also included because of the risk of damage to such gear from offshore oil and gas related activity particularly seismic surveying. The physical presence of a seismic survey vessel and its equipment has the potential for disrupting fishing operations. In the open sea, a seismic vessel towing streamers prefers to maintain its course and speed in order to obtain seismic data. Notwithstanding, due to the number and length of the streamers, these vessels are hampered in their ability to manoeuvre. As such, other vessels not similarly hampered in their ability to manoeuvre are required to keep clear of a seismic vessel. In areas

where static gear is deployed, seismic operations involving towed streamers or deployment of bottom cables may require the temporary removal of static gear to enable access to the area. Account needs to be taken of the effort required by fishermen to remove and eventually reinstate such gear.

1.6 Safety is of primary concern to both industries. It has been recognised that not only is there the ever present threat of gear becoming snagged on underwater obstructions, that may or may not be related to offshore operations, but also that there is the potential for fishing gear to cause damage to subsea equipment and pipelines. It is therefore hoped that the information given in this booklet will prove useful to both industries in the calculation of loads likely to be encountered in the event of contact between fishing gear and subsea installations. It is also hoped that this booklet will have a wide distribution both offshore as well as among those persons on barges, drilling rigs and supply vessels who have a responsibility for ensuring the safety of operations at sea.

Scottish Executive Rural Affairs Department
March 2001

Profile of the UK Fishing Fleet

2. In 1998 UK vessels landed just over 924,000 tonnes of fish and shellfish into the UK and abroad with a first hand sale value of £662 million. The number of active vessels of 10 metres and over totalled 2,150, with approximately a further 5,000 inshore vessels under 10 metres in length fishing mainly with static gear. A detailed breakdown of the composition of the over 10 metre fleet is given in Table 1. In addition to the number of vessels, the minimum, mean, median and maximum values for overall length, gross tonnage and main engine power are included for each category. It should be noted that these figures apply only to fishing vessels registered in the UK; foreign vessels using different gears also operate within British Fishery Limits. A description of the methods of capture with the relevant information on gear components is set out below, together with a summary for common fishing gears.

(i) DEMERSAL OR BOTTOM FISHING METHODS

Demersal Trawl (Otter Trawl)

2.1 This is by far the most commonly used towed gear in UK fisheries. Both finfish and shellfish species found on or near the bottom are taken by this method. A diagram of the gear deployed in fishing mode is set out in Figure 1. The trawl net (a) is cone or funnel shaped with wings extending forward to guide fish back into the funnel and ultimately the cod-end, the rearmost and narrowest part of the trawl where the catch is collected. Otterboards or trawl doors (b) are heavy metal devices designed to keep the gear on the bottom and provide hydrodynamic spreading forces to open the gear horizontally. Details of some types in current use can be found in Appendix A/Otterboard performance and Behaviour, Commission of the European Communities. The otterboards are connected to the towing vessel by steel wire ropes known as trawl warps (c), and to the net with wire or combination ropes called bridles (d) or sweeps. The weighted groundrope, constructed of wire or chain strung through rubber discs, rockhopper or metal bobbins, serves two purposes. It protects the lower mouth of the trawl net from sea bed damage and is weighted sufficiently to ensure good bottom contact is maintained. Floats are attached along the headline or upper part of the net mouth to open the trawl vertically. The entire assemblage is towed by the trawler at a speed of 3 knots (min 2, max 4). Warp length/water depth ratios range from 4:1 or more in shallow water (25m) to 2:1 in deep water (1000m) with 3:1 the norm on the majority of fishing grounds on the continental shelf (50m -200m). Bridle/sweep lengths between otterboards and net also vary considerably, from a few metres to 180 metres depending on target species and nature of sea bottom. On smaller vessels, combination (polypropylene/steel) wire may be used as sweeps and on larger vessels mid-link chain may form part of the rig.

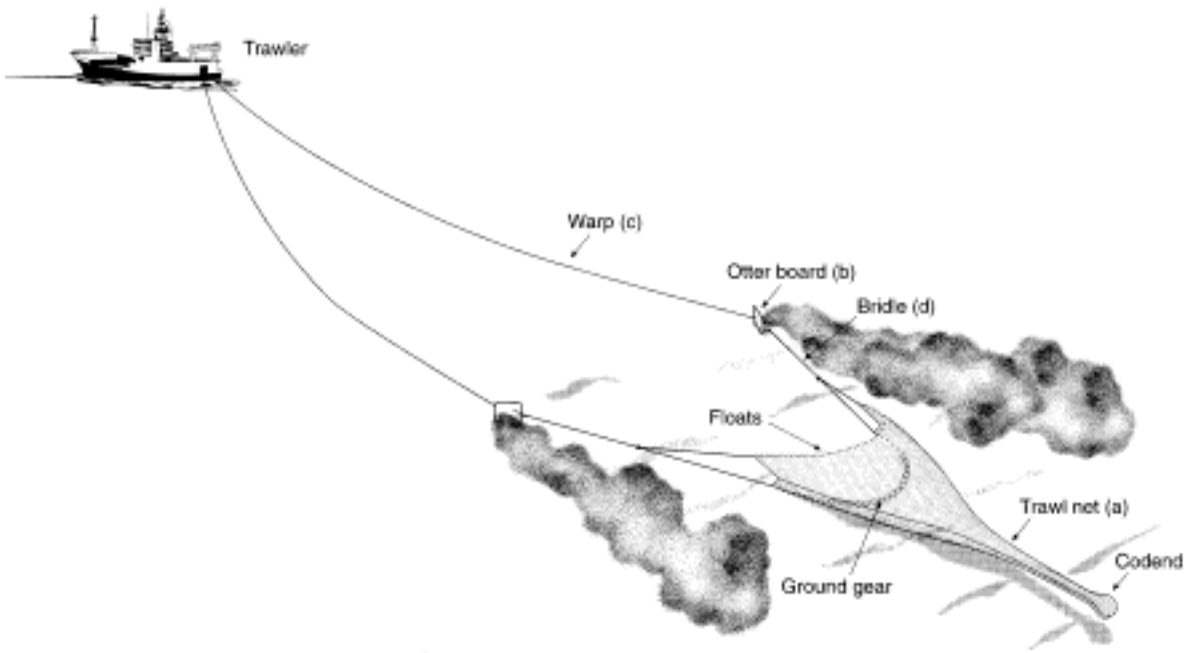


Figure 1. Single boat demersal trawl

Typical (and maximum) values for above components:- Trawl warp (c) wire diameter 20mm (28mm); Bridle/sweep (d) wire diameter 20mm (32mm or 19mm chain); Otterboard (b) size and weight 5.3 square metres x 1400 kg (8 square metres x 3000 kg).

Twin Rig Demersal Trawl

2.2 The essential elements of twin rig trawl gear are set out in Figure 2. This gear is generally used for target species tight on the bottom, such as angler, flatfish and Nephrops. By towing two nets side by side the effective swept area, and hence catch, is increased. As with the single demersal trawl above otterboards (a) provide the horizontal spreading forces and floats and groundropes the vertical forces. The obvious difference in rigging is the third wire or central warp (b), which runs from the vessel to the clump (c), a heavy weight which can consist of short lengths of chain cable shackled together or a custom made device (Figure 3) designed to roll rather than be dragged along the bottom. Warp length/water depth ratios are similar to those used with the single demersal trawl and bridles/sweeps (d) can be steel wire, combination wire, chain or a mixture of all three. Normal towing speed used is 2.5 knots (max 3.5 knots).

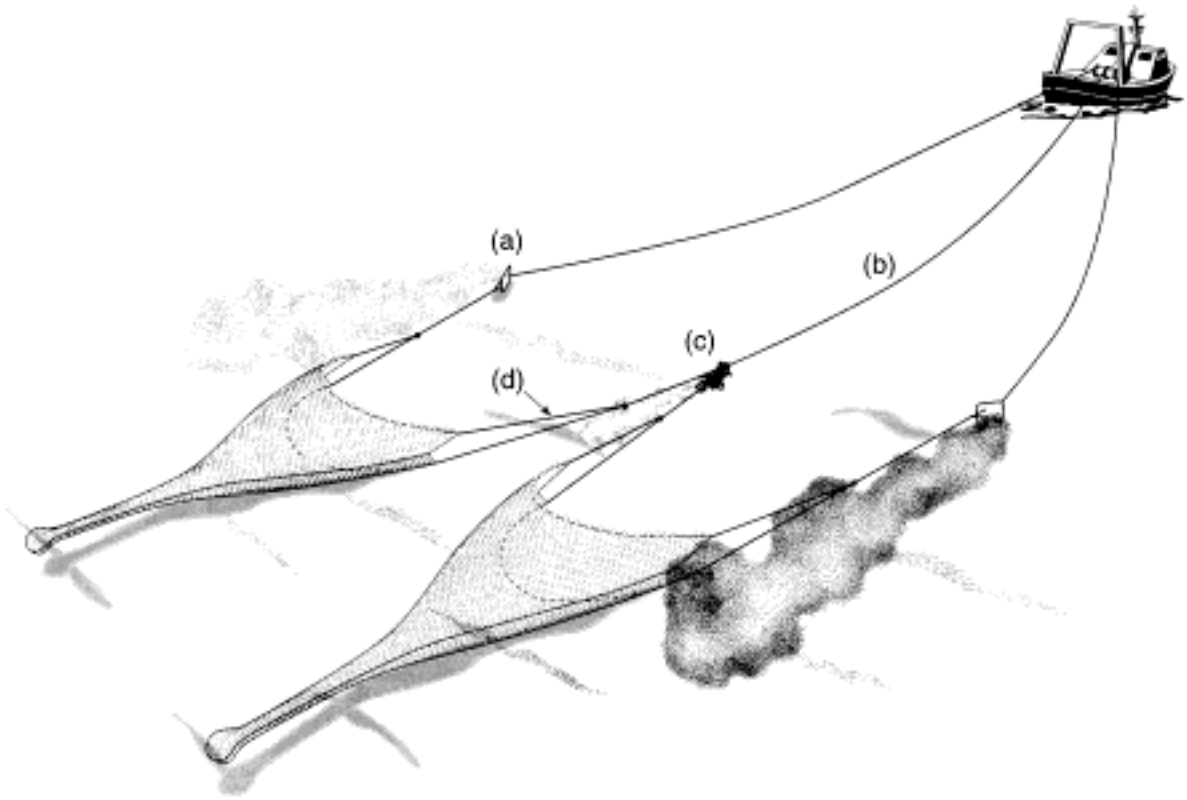


Figure 2. Twin rig demersal trawl

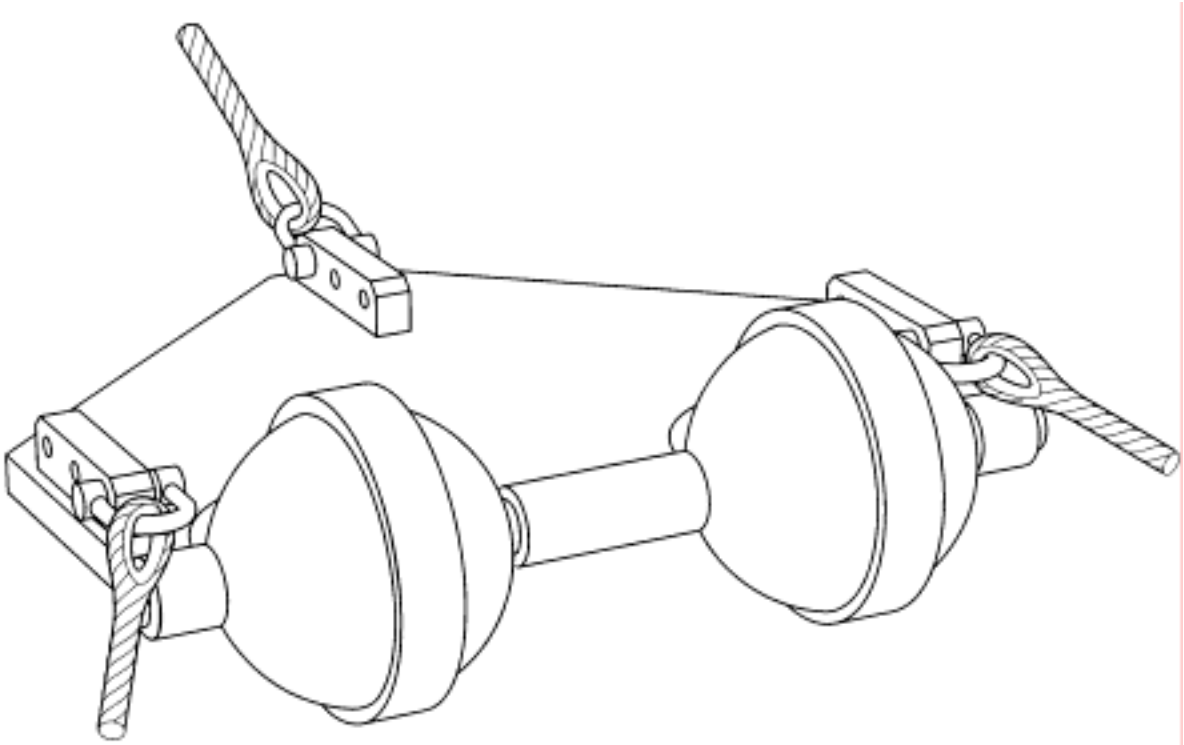


Figure 3.

Typical (and maximum) values for above components:- All three trawl warps wire diameter 20mm (24mm); Bridle/sweep (d) wire diameter 16mm (26mm combination, 19mm chain); Otterboard size and weight 2.84 square metres x 600 kg (5.4 square metres x 1500 kg); Clump weight 620 kg (2000 kg).

Demersal Seine Net

2.3 Scottish seining, also known as flydragging, uses long lengths of seine rope constructed from either leaded polypropylene or combination wire to herd fish into the path of the net as the gear is hauled. Up to 3 kilometres of rope a side (14 coils) may be shot in a triangular plan (Figure 4) with the dhan, or marker buoy, supporting the end of rope first shot to which the vessel returns to complete the set. Both ropes (a) are then led to the winch and the vessel steams slowly ahead, gradually increasing winch speed as the gear closes to keep the net moving steadily forward. Combination sweeps (b) allow the floats to open the net vertically and the footrope, generally rigged much lighter than that of a trawl, is sufficiently weighted to keep the lower edge of net mouth in contact with the sea bed. Starting from a stationary position a seine net may reach a forward speed of 2 knots during the later stages of the haul before it leaves the bottom. Virtually all whitefish species are taken by this method, which is for the most part confined to grounds on the continental shelf (200 metres maximum), but is seldom utilised in the harvesting of shellfish. This technique generally fishes most effectively during the hours of daylight when rope herding capabilities are optimised.

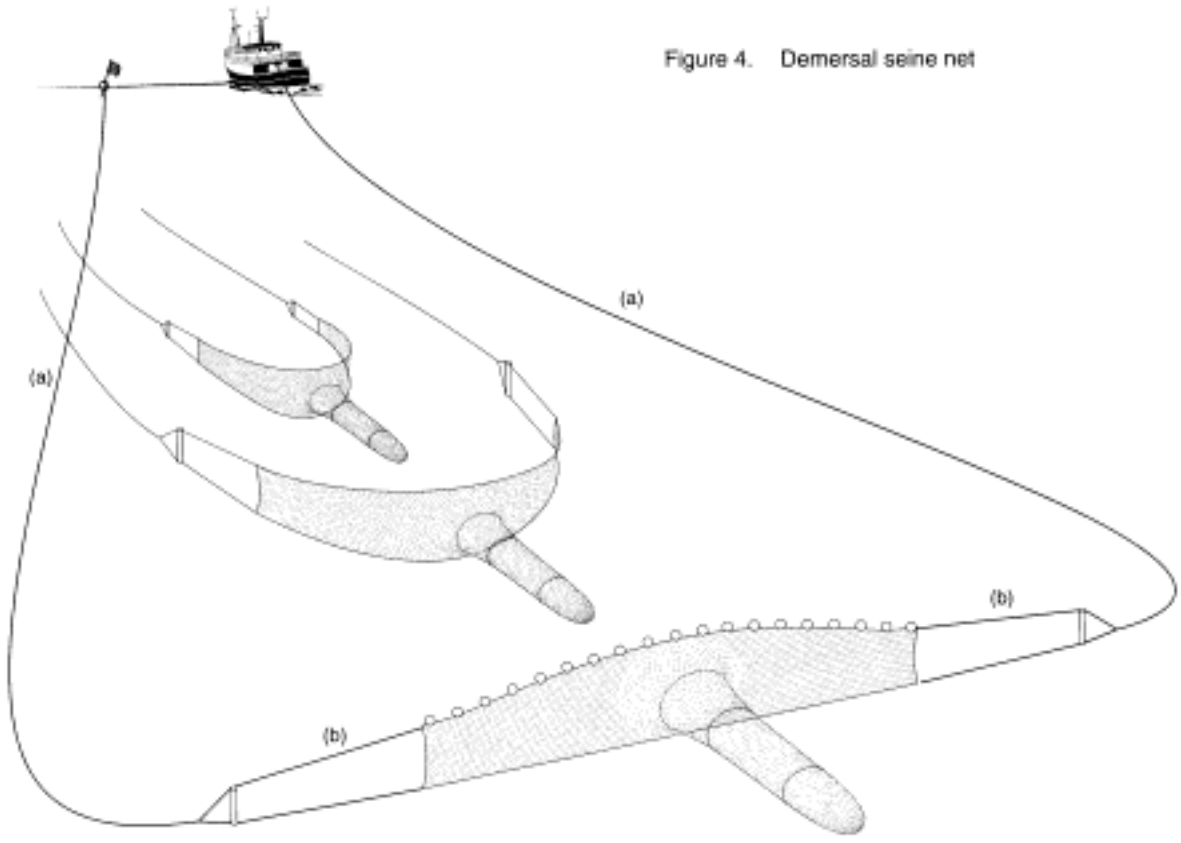


Figure 4. Demersal seine net

Typical (and maximum) values for above components:- Seine net ropes - leaded 28mm, combination 28mm (leaded 34mm, combination 32mm); Sweeps - combination 16mm (24mm).

Demersal Pair Trawl

2.4 In two-boat or pair demersal trawling (Figure 5) each vessel tows only one warp and by keeping station at a set distance apart (0.2-0.3 nautical miles) provides the horizontal forces required to spread the gear, rendering the need for otterboards unnecessary. This means that two vessels of relatively modest engine power can between them tow a comparatively large trawl, increasing between 50% to 100% the volume of water swept per vessel. Shackled between warps (b) and bridles (d) a heavy wire sweep (c) ensures good bottom contact. In all other respects the net (a) is similar to a single boat trawl, with floats and heavy rockhopper groundrope providing the vertical forces around the net mouth. Warp length/water depth ratio is around 3:1 with activity confined mainly to the continental shelf (200m). Heavy sweep wire lengths can range from 100 to 400 metres, depending on bottom conditions and vessel capabilities. Towing speeds between 2.5-4.0 knots can be encountered, with around 2.8 knots the norm.

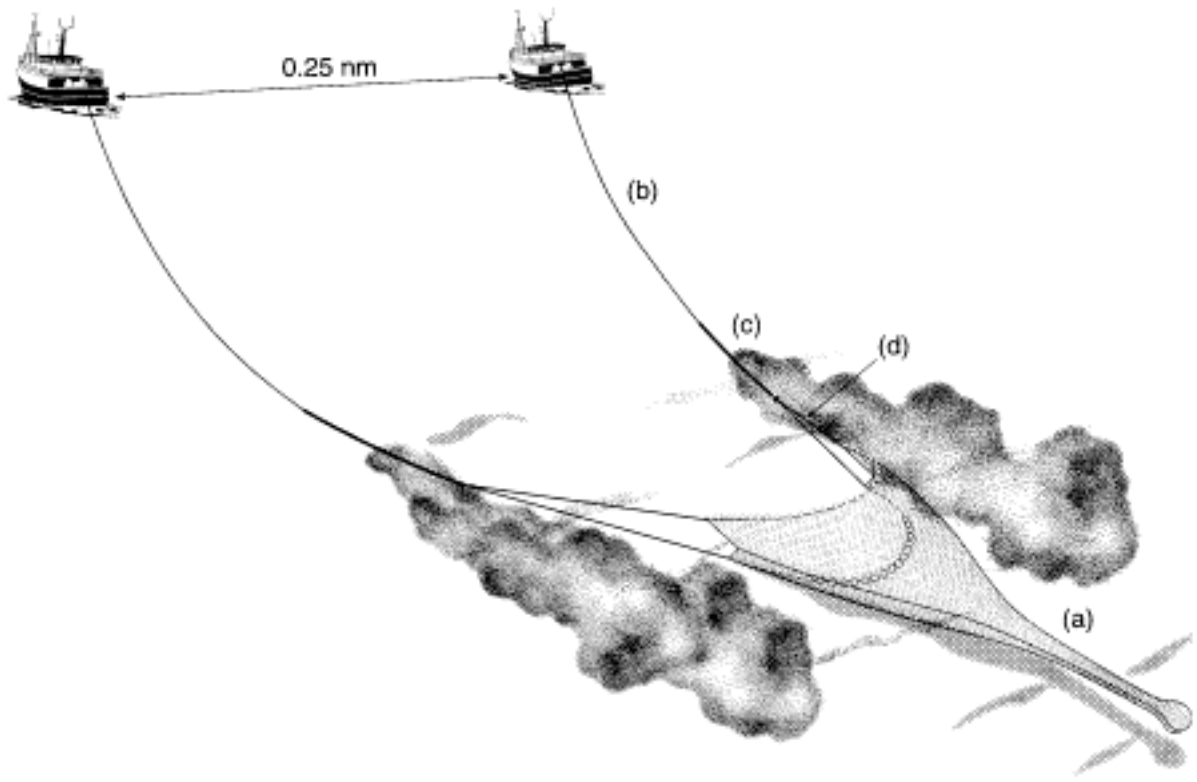


Figure 5. Demersal pair trawl

Typical (and maximum) values for above components:- Trawl warp (b) wire diameter 21mm (24mm); Heavy sweep (c) wire diameter 26mm (30mm); Bridles (d) wire diameter 20mm or 16mm chain (19mm chain).

Demersal Pair Seine

2.5 This method of fishing was originally developed by single-boat flydraggers teaming up to tow a single seine net between them using up to 13 coil (2860m) of seine net rope (see above) in place of the wire warps and heavy sweeps of the pair trawl gear. These vessels towed up to 0.5 nautical miles apart and increased considerably the area of sea bed swept by the gear. However this technique requires large areas of clear ground to function efficiently with the risk of snagging on rough bottom or underwater obstructions ever present so a hybrid method, a cross between pair seining and pair trawling, evolved. By introducing 3-4 coil (660-880m) of seine rope between the heavy sweep and bridles of the pair trawl rig the area swept by the gear was considerably increased without the need to deploy long lengths of rope warps (Figure 6). Distance between vessels was reduced to around 0.28 nautical miles and towing speeds range between 2.2 to 3.5 knots, the normal rate being towards the lower end of this range (2.5 knots). Like the pair trawl this gear is generally used in water depths under 200m and targets white fish species only.

Typical (and maximum) values for above components:- Trawl warp (a) wire diameter 19mm (22mm); Heavy sweep (b) wire diameter 22mm (26mm); Seine ropes (c) combination diameter 32mm (40mm); Bridles (d) combination diameter 16mm (24mm).

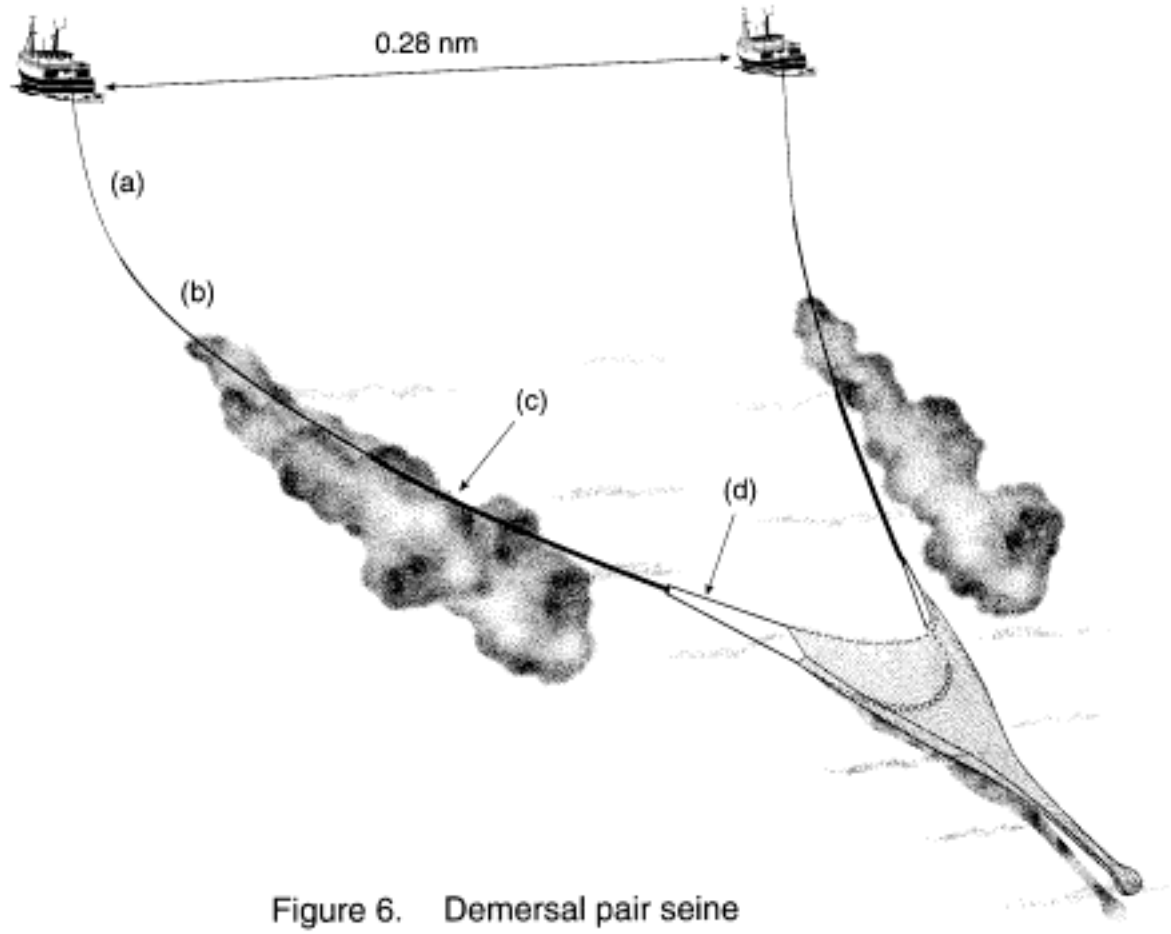


Figure 6. Demersal pair seine

2.6 Due to the nature of demersal trawling, twin rig demersal trawling, demersal seine net and demersal pair trawl, and the restrictions they can put on vessel manoeuvrability, it is not always possible for fishing vessels to respond positively to requests to move out of the way of other vessels which are similarly hampered in their ability to manoeuvre eg seismic vessels. To overcome the problems associated with restricted fishing vessel speed and manoeuvrability it is recommended that early communication be established if access is sought across an area being fished.

Twin Beam Trawling

2.7 Beam trawls are used to harvest whitefish, mainly flatfish such as sole, plaice or megrim together with angler and other species found hard down on the sea bed. Each net is fished from an outrigger boom, one on each side of the vessel (Figure 7), and towed from here on a single warp (a) shackled to a three chain bridle (b) attached directly to the beam (c) which holds open the mouth of the trawl. The beam, 9-12m in length, is constructed from heavy steel tube and supported on each side by rugged steel trawlheads (d) which slide over the sea bottom. Ahead of each groundrope tickler chains (e) or chain mats are often used to disturb fish, causing them to rise up and be taken by the trawl following immediately behind. Towing speeds are generally higher than otter trawling, reaching 6 or 7 knots on clean ground with ticklers, whereas on rough ground stone mats are towed at 4 knots. On the most powerful modern beam trawlers the weight of each fully rigged beam is almost 10 tons. Furthermore such vessels can tow this gear at 7 knots. Beamers usually operate on the continental shelf (200m) with warp length/water depth ratios of between 2.5 or 3:1. Some vessels have switched to a double wire system (z) to facilitate the hauling procedure, and consequently impose a doubling of the load applied to an obstruction before warp failure may occur.

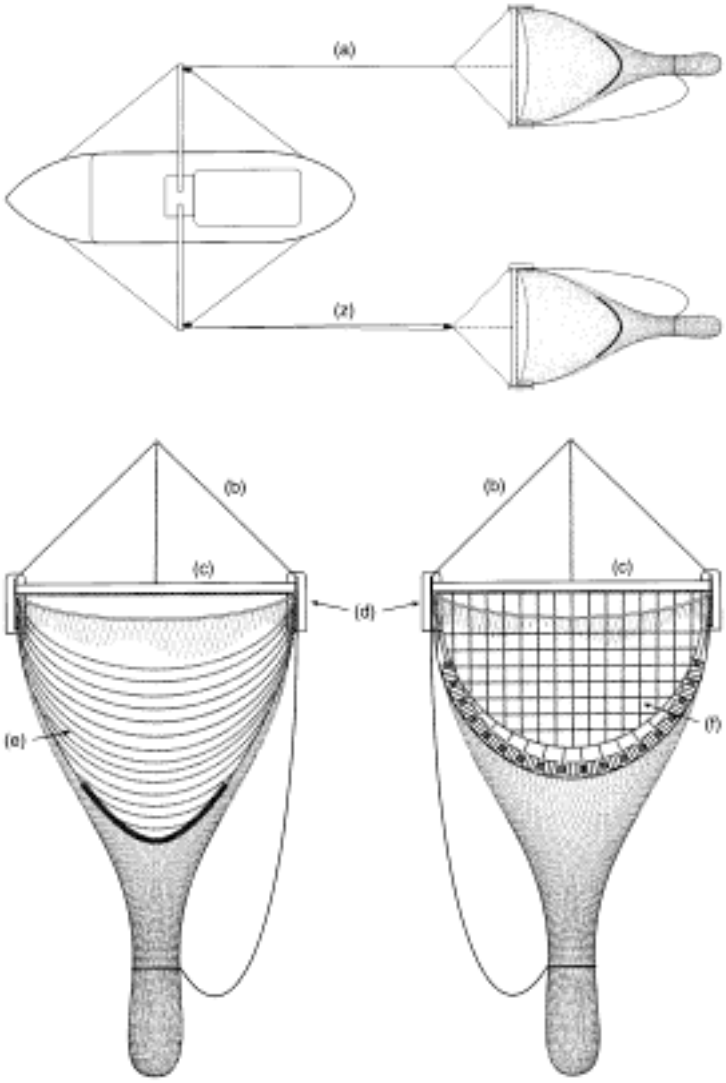


Figure 7. Twin beam trawls

Typical (and maximum) values for above components: Trawl warp single (a) wire diameter 26mm (34mm), double (z) wire diameter 24mm (26mm); Chain bridles (b) 19mm diameter mid-link (22mm); Assembled trawl weight (c+d+e) = 7.5 tonnes (10 tonnes).

Scallop Dredging

2.8 Dredges are used mainly in UK waters for scallops. Ships rigged for beam trawling deploy dredge arrays from outrigger booms in the manner of beam trawls. Each dredge (a) consists of a ruggedly constructed triangular steel frame and tooth bearing bar or sword, behind which a mat of linked steel rings is secured. The toothbar may be spring-loaded to reduce gear damage (Figure 8). A heavy netting cover or back is laced to frame, sides and after end of this mat to form a bag in which the catch is retained. Scallops, which usually lie recessed in sand and fine gravel, are raked out by the teeth and swept into the bag. Several dredges are shackled to a hollow steel tow bar (b) fitted with chain bridles (c), one for each dredge. The entire assembly (Figure 9) is towed on a single wire warp (d) and larger vessels generally tow two bars, one on each quarter. The number of dredges used varies with towing power and handling capabilities, with fourteen (ie seven on each side) a fairly typical number, but on the largest vessels 24 x 2' 6" (760mm, which is the length of sword) dredges, or 12 a

side, is not uncommon. Most vessels use 2' 6" dredges although 2' (610mm) dredges are also still found in this fishery. Warp length/water depth ratio is generally around 3:1, but in bad weather or strong tides more wire may be paid out to keep the gear on the bottom. Normal towing speed is around 2.5 knots, with an effective maximum of 3 knots, as the gear does not perform as efficiently at higher speeds.

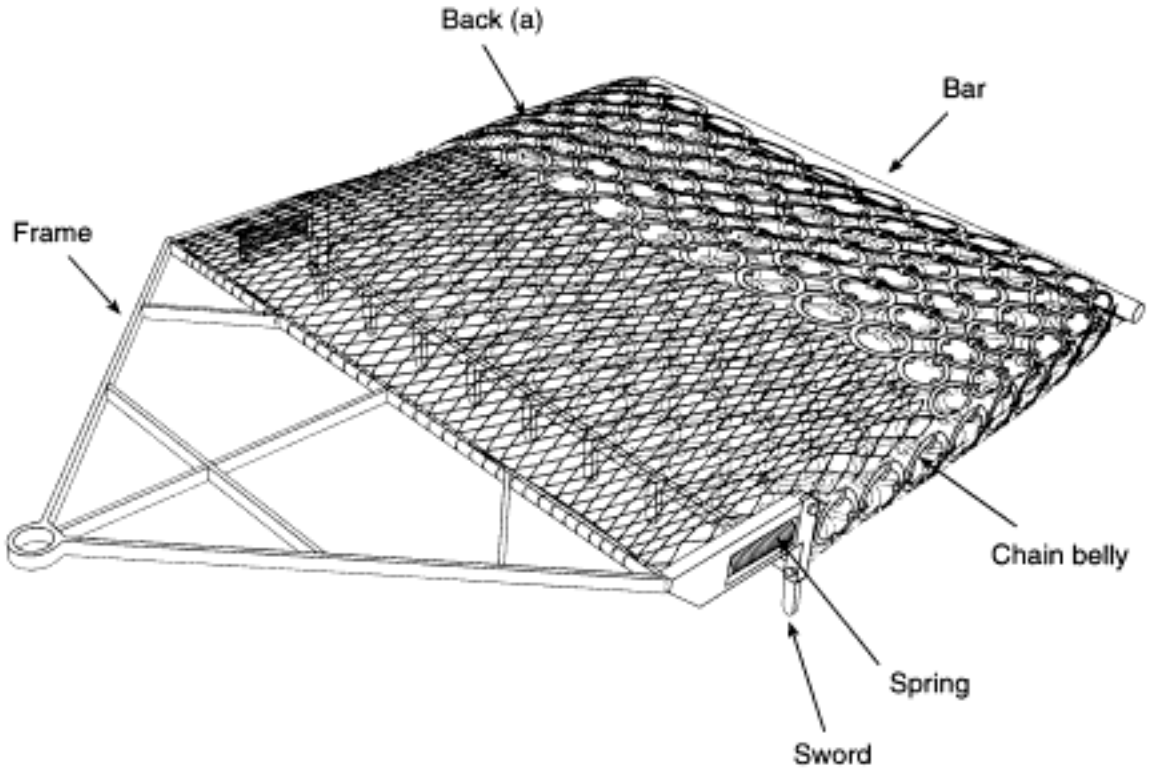


Figure 8. Scallop dredge

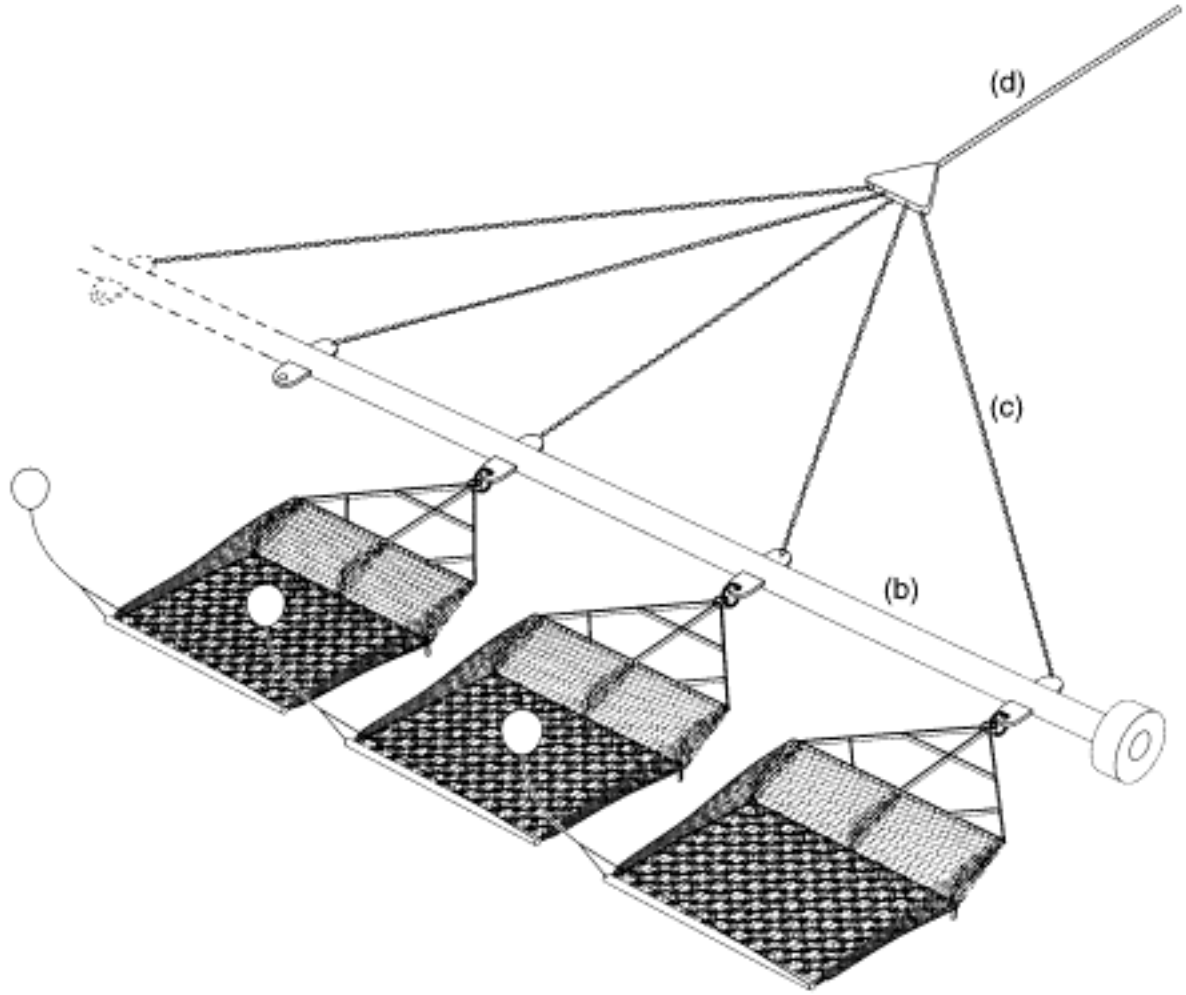


Figure 9. Scallop dredges assembled on tow bar

Typical (and maximum) values for above components:- Individual dredge (a) weight 75 kilograms (100 kg); Tow bar (b) weight - 750 kg (1500 kg), length - 6 metres (10m); Chain bridles (c) - 16mm (19mm) mid link; Warp (d) wire diameter - 20mm (26mm). Total weight of one side of gear as set out in Figure 9 - 1400 kg (2800 kg).

(ii) PELAGIC OR MIDWATER FISHING METHODS

2.9 Pelagic gears are used principally in the capture of shoaling species such as herring, mackerel, scad, blue whiting and sprats which may be found close to the surface, in mid-water or just off the bottom. Of particular note are the mackerel fishery throughout UK waters but especially off the South West of England and to the north and west of the Scottish Islands, the North Sea and Irish Sea herring fishery, the blue whiting fishery off North West Scotland and in the Northern North Sea and, the west coast horse-mackerel fishery. Pelagic gear is also used for a number of small seasonal fisheries such as that for hake in the Clyde and North Channel, the bass fishery in the English Channel, certain cod and haddock fisheries in the Irish Sea and various targeted North Sea fisheries.

Single Boat Pelagic Trawl

2.10 Like demersal trawls single boat pelagic trawls are towed using a wire rig (Figure 10) which incorporates otterboards (a) to provide horizontal spreading forces. Both net and doors are much larger than their demersal equivalents, but of much lighter construction as neither is designed for bottom contact. The otterboards, usually of high aspect ratio and aerofoil section, are towed by the vessel using two steelwire warps (b), and connected to the net by four-wire bridles (c). Unlike demersal trawls pelagic trawls are towed on the headline, and solid steel or lead weights (d) provide the vertical forces required to open the net in a downwards direction. As these weights are slung on the lowest point of the gear they will inevitably make contact with the bottom when fishing hard down, even although both doors and net may not. Pelagic trawls are towed at the appropriate level in the water column to intercept target shoals with gear depth being controlled by altering towing speed and/or warp length. Electronic equipment such as sonar, net and catch monitors have greatly improved the precision of this method of fishing. Normal towing speed is in the region of 3.75 knots, but may be increased to as high as 5 knots when fishing mackerel. Pelagic trawlers can be found in all NE Atlantic waters, both on and off the continental shelf.

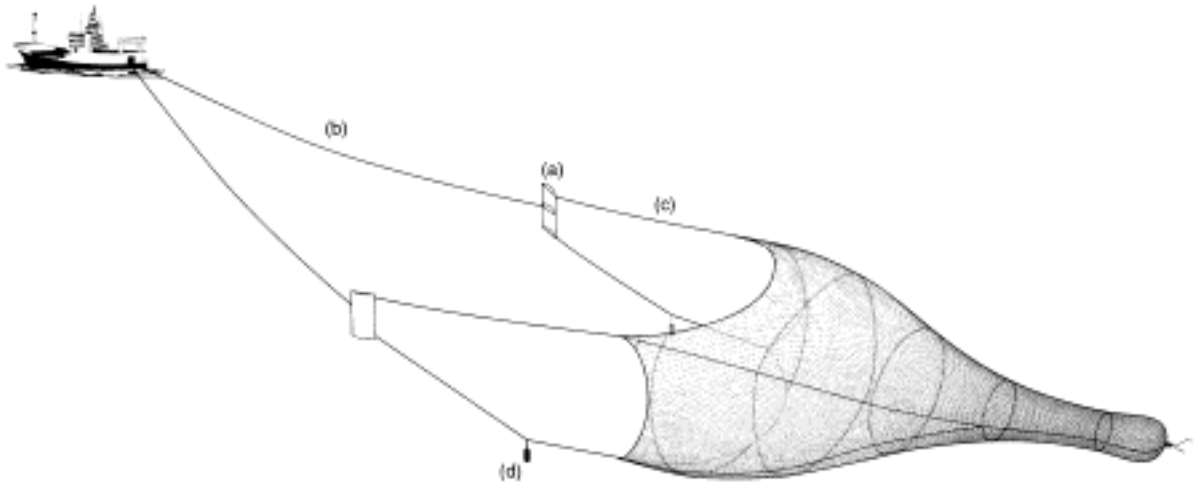


Figure 10. Single boat pelagic trawl

Typical (and maximum) values for above components: - Otterboard (a) size and weight - 11 square metres x 1500 kilograms (16 square metres x 2500 kilograms); Trawl warp (b) wire diameter - 32mm (38mm); Bridle (c) wire diameter- 26mm (30mm); Weight (d) - 1.1 tonnes (5 tonnes).

Pelagic Pair Trawl

2.11 As is the case with demersal pair trawlers, the absence of otterboards allows the two vessels to deploy a much bigger net than would otherwise have been possible to tow at an effective speed. Target species and fishing techniques are similar to those set out above, with the additional requirement that both vessels have comparable towing power available and must at all times act in concert. The main difference in gear rigging is that two towing warps (a) are deployed from each vessel, one to the upper bridles, the other to the sinker weight (b) ahead of the footrope (Figure 2). The lower bridles (c) connect the weight to each side of the footrope. Towing speeds are high, normally 4 knots but up to 5.5 knots on occasion. Smaller vessels (<20m) fish for herring, mackerel and sprats in coastal waters but larger vessels search for shoals far offshore.

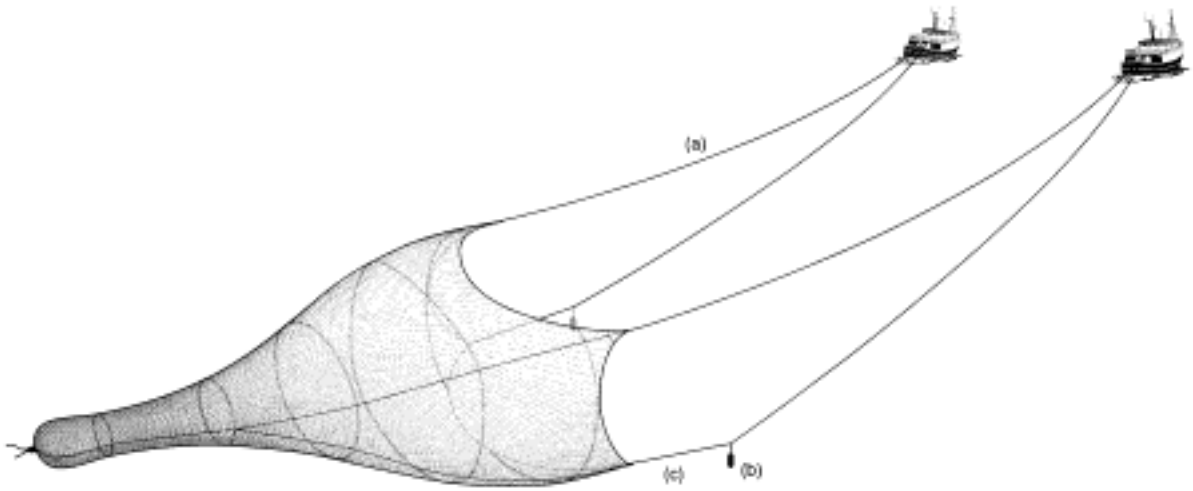


Figure 11. Pelagic pair trawl

Typical (and maximum) values for components: - Trawl warp (a) wire diameter - 26mm (34mm); Bridle (c) wire diameter - 26mm (28mm); Weight (b) - 1.1 tons (5 tons).

Purse Seine

2.12 Purse seiners capture large aggregations of pelagic fish that shoal in midwater or near the surface by surrounding these concentrations with a deep curtain of netting which is supported at the surface by floats (Figure 12). Small lead weights on the underside of the curtain ensure that the leadline quickly sinks and the net is then pursed under the shoal by heaving on a wire or purseline (a) which runs through steel rings attached to the lower edge of the net. When the gear is closed and fish can no longer escape the netting is hauled lengthways using a mechanised power block until the fish are packed tightly in the bunt, or last remaining section of the net to be hauled. The fish are then pumped or brailed aboard the vessel. A large purse seine can be as long as 1 kilometre and 200 metres deep. Purse seiners generally try to avoid bottom contact as the small mesh nylon netting is easily damaged. A purse seine is not strictly speaking a towed gear but the purseline wire, being probably the strongest subsurface component, could possibly foul and cause damage to underwater installations. Typical (and maximum) values for pursing wire diameters are 26mm (28mm) of 6/24 fibre core construction although 6/26 dyeform compacted wires with both fibre and steel cores are also used.

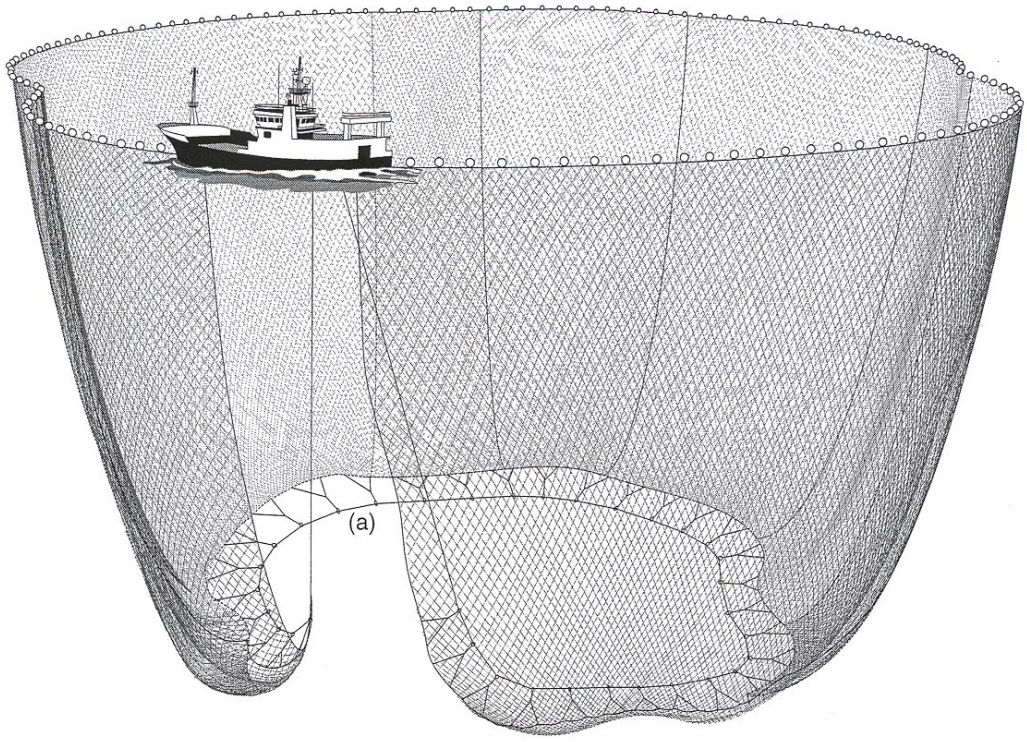


Figure 12. Purse seine

(iii) STATIC GEAR

Pots and Creels

2.13 Traps in various forms of cages or baskets are used throughout the UK for the capture of crabs, lobsters, crayfish, *nephrops*, shrimps, cuttlefish and several other species. These pots differ in shape, size and construction materials according to the target species, and local practices. They are usually baited and set on the seabed singly or in strings attached to dhan buoys at each end, which act as location markers and support for the recovery lines. Vessels working this method of fishing need to have a large open deck area to enable them to carry large numbers of pots. They are fitted with a powerful creel hauler winch specially adapted to take the main rope with pots being lifted clear as they pass the winch. Some vessels are fitted with a chute to guide the pots over the side when shooting the gear. The pots are usually raised each day to allow the catch to be removed and fresh bait to be set.

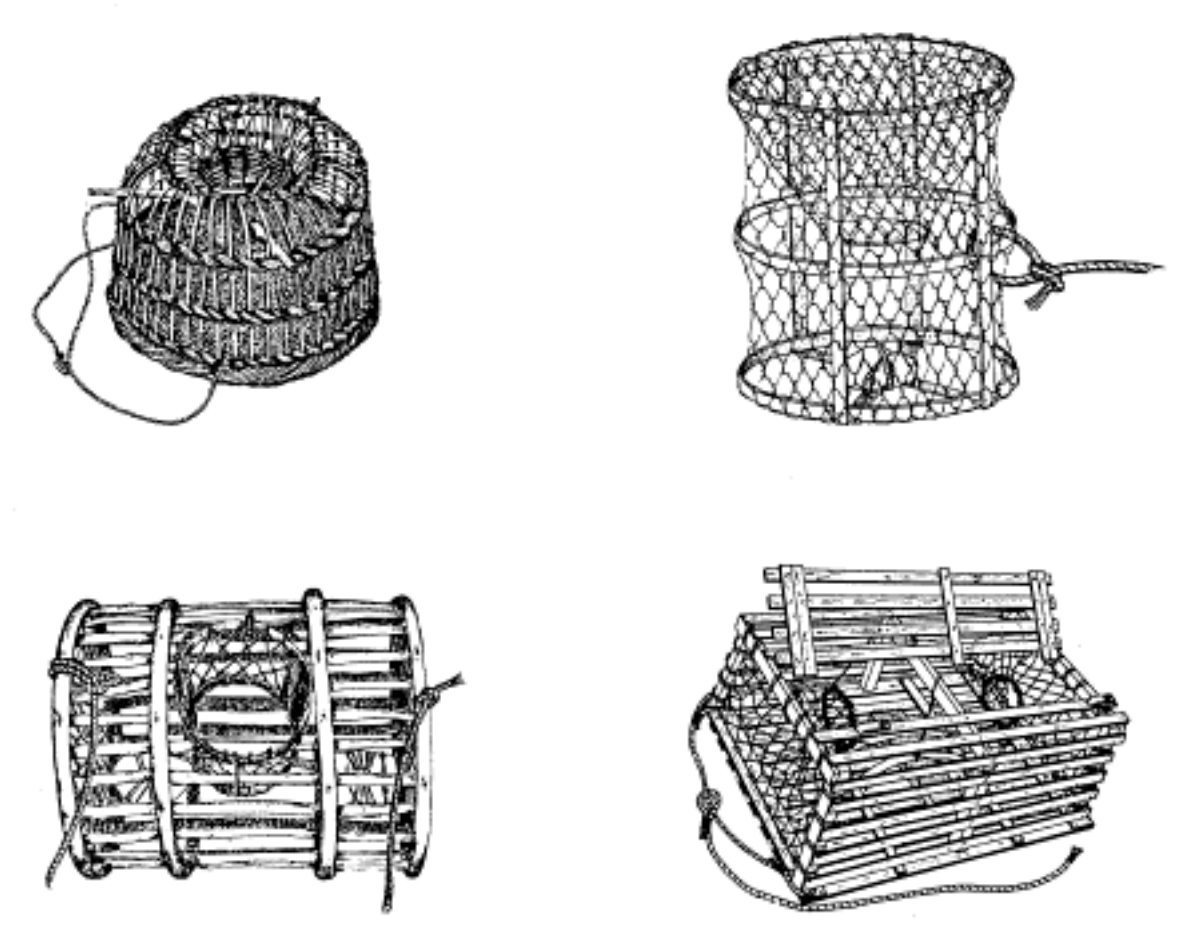


Figure 13 Selection of Pots and Creels

Baited lines

2.14 Bottom set and drifting lines (long lines) are ropes, up to several kilometres in length, carrying a large number of baited hooks on branch lines which are supported in the water column at the required depth by buoys. Given the length of the lines the attendant buoys may not be visible over a large proportion of the submerged line and where a buoy is visible the surface mariner may be unable to determine if the buoy is connected to a line of pots or a baited long line.

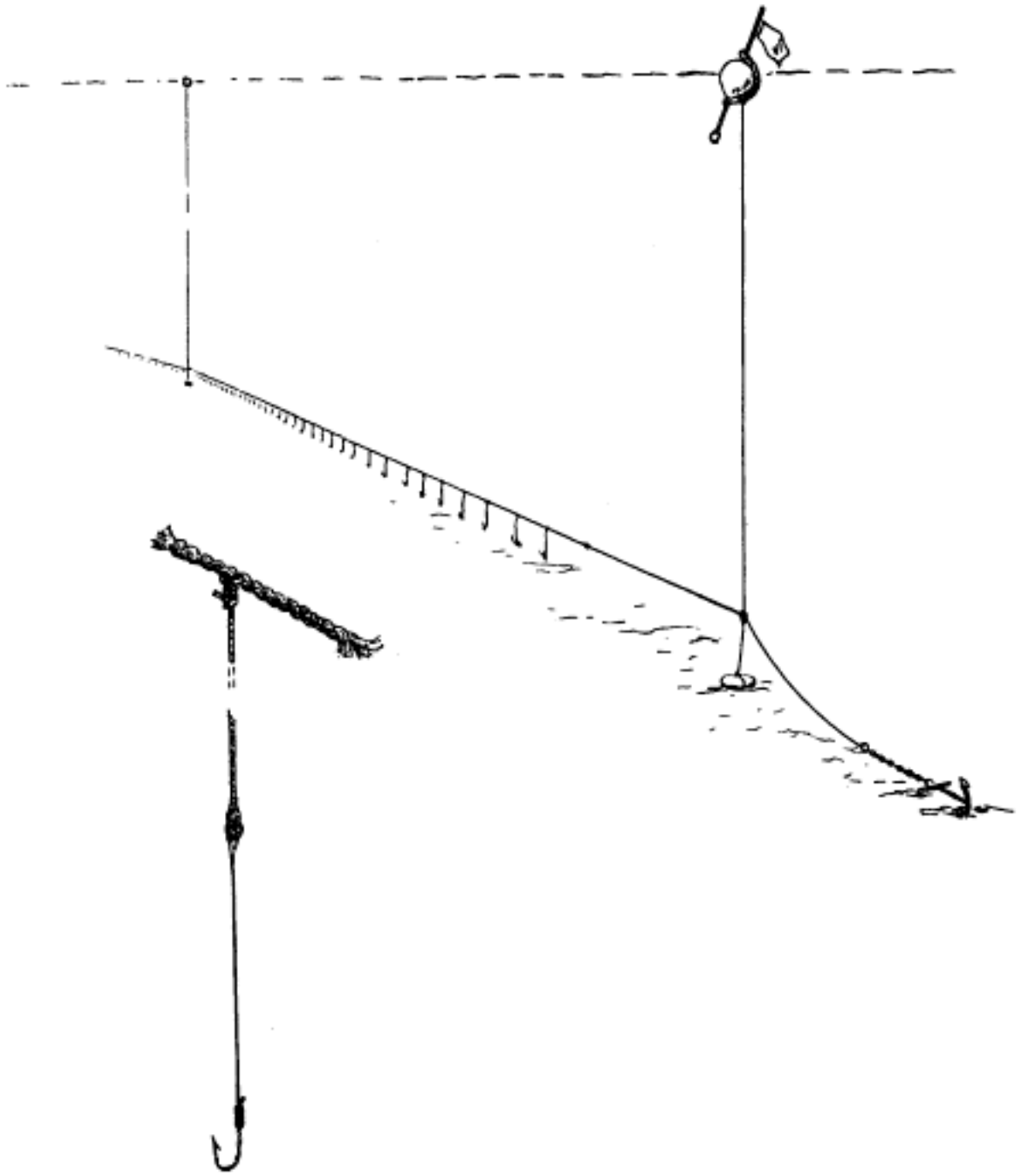


Figure 14 Baited Lines

Drift nets, gill nets, tangle nets and trammel nets

2.15 Fixed or anchored nets have been used as a means of catching fish for centuries and a wide variety of traditional nets have been developed to suit local conditions. The various types used are covered in greater detail below. There is considerable confusion over the terms used to describe fixed nets. Any net that is held stationery rather than being towed by a vessel or allowed to drift in the current can be called a fixed net. Usually such nets are attached to anchors but in shallow water they may be fixed to posts or other suitable objects driven into the seabed. Typically the nets consist of a wall of netting. Floats are attached to the headline with the number and spacing depending on the floatation required. The footrope is designed to rest on or just above the seabed and is weighted either with individual lead weights or a continuous lead line consisting of lead pieces threaded on fine twine and held within a continuous braided sheath. Supported in this manner the nets hang vertically in the water column.

2.16 The procedure when fishing fixed nets is similar irrespective of whether gill, tangle or trammel nets are being used. The nets are usually fished in groups or 'fleets' and bridles attach the end of each fleet to a heavy weight or anchor on the seabed. Each weight or anchor is secured to a marker buoy or dhan flag on the surface by a length of rope equal to about 1.5 to 2 times the depth of the water. Depths of water fished in this manner typically range from 15m to 140m with some fisheries going as deep as 1800m eg deep water monkfish caught in tangle nets.

2.17 Lengths of nets can vary from between 50m to 200m and lengths of fleets from between 300m and 3000m. The amount of netting being fished, whether deployed in the water column or set on the seabed, at any one time can range from between 2km and 30km. Soak times, the time that a fleet is left on the seabed to fish, can range from a 6 hour tidal soak up to 72 hours. These figures are dependant on which species are being targeted and whether the area is also subject to trawling which may be in direct conflict with fixed net fisheries.

2.18 The nets are normally shot whilst steaming into the tide and are fished along the direction of the tidal stream rather than across it. This reduces the chance of the nets being swept over or tangled in the strong tidal conditions found in many sea areas around the UK. The dhan is thrown overboard and the vessel steams away paying out the rope until it reaches the anchor attachment, which is then dropped overboard. The fleet of nets follows until the full length has run out and the second anchor and dhan follow. Retrieval of gear is carried out in a similar fashion with first the dhan and anchor then the nets followed by the remaining dhan and anchor. Virtually all boats now use net haulers to help them retrieve their gear. They have a basic design consisting of a rotating drum covered with a rubber surface, which is driven by a hydraulic system run off the main engine. This creates friction between the net and drum allowing the hauler to take the strain and pull in the net.

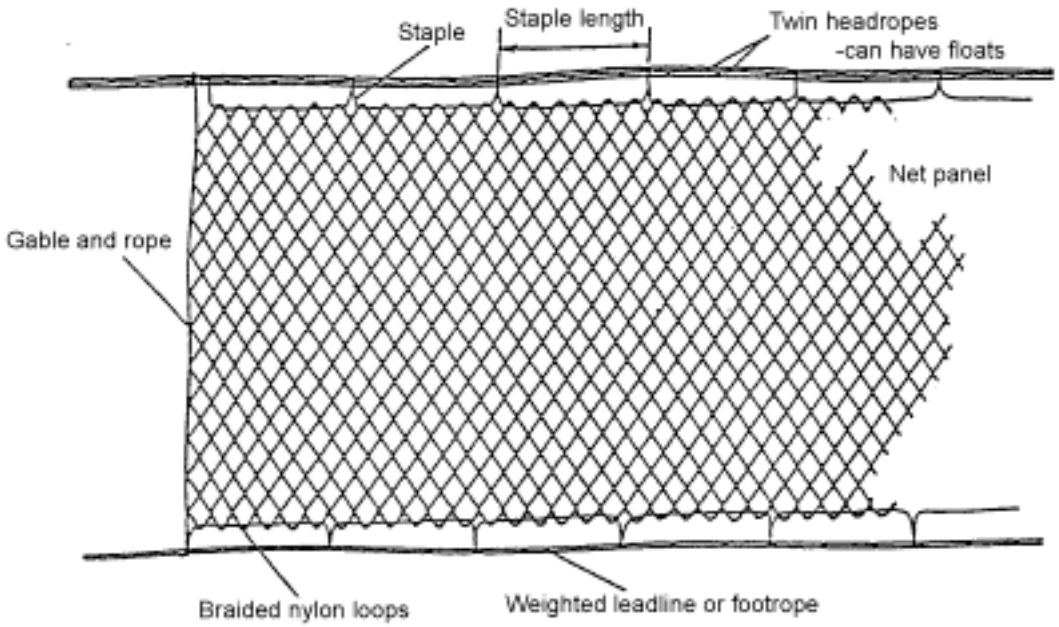
2.19 Drift nets are generally used for pelagic and migratory species such as herring, mackerel, pilchards, sprats, bass, salmon and sea trout etc. they are normally rigged to form a curtain in the water and generally down-wind, with the vessel at the leeward end of the gear. The net is set out in a straight line and drifts with the current. Fish on passage swim into the net and are 'gilled'. The fishing depth of the net can be adjusted by adding weights to the bottom of the sheet and altering the float line. Single sheets of net are usually 50 or 100 metres in length. Varying numbers are joined together to form a 'fleet' of nets. The length and

depth of the nets can vary considerably depending on the target species of fish and the nature of the seabed or depth or depth of water being worked.

2.20 Set nets and gill nets are sometimes used from the shore and in water too shallow for most seismic vessels. They are, however, also used from vessels at sea and are then marked by surface dhan buoys. When used offshore, the fishing vessel is usually in attendance. Dhan buoys are laid at intervals but it is not always possible to see 2 buoys at once. It is therefore difficult to be sure of the direction in which the nets are set. On fine ground the nets can extend to around 1500 metres in length. The practice of surrounding wrecks - 'wreck-netting' is also increasingly prevalent.

2.21 Tangle nets are single walled nets used to catch species such as monkfish, turbot and ray. While they resemble gill nets in their design they have a greater amount of slack netting and less flotation at the headline and a smaller vertical height of netting. The result is a much more loosely hung net, which effectively entangles species with protruding spines.

2.22 Trammel nets are three walled nets which can be used to catch a much wider variety of species ranging from cod and monkfish to plaice and sole. The net consists of three walls of netting in which a small fine meshed inner net is sandwiched between two outer walls of larger mesh netting. The three sheets of netting are attached to the floated headline and weighted footrope so that all three hang vertically in the water. Slack netting is ensured by setting the net loosely on the headline and footrope and by having the inner net depth measuring approximately twice the outer net wall depth. This ensures that there is always plenty of slack net for the fish to become entangled.



TYPICAL GILL NET RIG

Addendum

3. The information from which many of the above descriptions were distilled was supplied willingly and in good faith by a number of sources including several net manufacturers and gear suppliers. The data are presented here in similar spirit. This booklet is not, nor can it be, a definitive statement of absolute values, but is essentially a snapshot of the fishing fleet, gear and methods currently in use. The continuing evolution of fishing gear and techniques will ensure that the booklet is out of date by the time it is published. Nevertheless it is felt that, given this qualification, a realistic appraisal of modern fishing gear and components is offered.

Table 1

SUMMARY STATISTICS OF OVERALL LENGTH, GROSS TONNAGE AND POWER FOR THE UK OVER 10 METRE FLEET AS AT 31 DECEMBER 1998

Method of Capture	Number of vessels	Overall length (metres)				Gross tonnage				Power (KW)			
		Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max
Pelagic Gear	**50**	15	51	51	86	32	959	745	6210	216	1598	1321	2422
Beam trawl	**119**	11	30	29	45	23	202	149	3195	172	798	596	709
Demersal trawl, seines & nephrops	**1309**	10	19	18	44	1	84	54	1920	36	280	223	803
Lines and Nets	**179**	10	19	14	44	4	85	30	1177	23	251	172	492
Shellfish: Mobile gear	**210**	10	16	14	34	5	48	33	746	0	215	186	257
Shellfish: Fixed gear	**269**	10	12	11	40	1	22	13	746	33	138	96	319
Distant water (external waters)	**4**	52	57	58	61	1146	1476	1444	2462	1800	2225	2319	1871
Distant water (EU waters)	**10**	39	52	45	98	381	1152	597	4854	1264	1865	1268	3229
Mussel dredgers (Non MAGP)	**2**	14	21	21	29	30	40	40	447	90	269	269	449
Total Vessels	**2152**												

Table 2. Summary of typical gear component sizes and towing speeds for various fishing methods

		Warp diameter mm		Bridle/sweep diam		Sinker/Clump wt kg		Otterboard area m^2		Otterboard weight kg		Towing speed knots	
		mean	max	mean	max	mean	max	mean	max	mean	max	mean	max
Single boat demersal trawl	Wire	20	28	20	32								
	Chain			19 mm chain		n/a	n/a	5.3	8	1,400	3,000	3	4
Twin rig demersal trawl	Wire	20	24	16	26 comb								
	Chain			19 mm chain		620	2,000	2.84	5.4	600	1,800	2.5	3.5
Demersal pair trawl	Wire	21	24	26	30								
	Chain			16 mm chain		n/a	n/a	n/a		n/a		2.8	4
Demersal pair seine	Wire	19	22	22	26								
	Combination wire	32 comb	40 comb			n/a	n/a	n/a		n/a		2.3	3.5
Demersal seine net		28 leaded 28 comb	34 leaded 32 comb	16 comb	24 comb	n/a	n/a	n/a		n/a		n/a	n/a
Single boat pelagic trawl		32	42	26	30	1,100	5,000	11	16	1,500	2,500	3.75	5
Pelagic pair trawl		26	34	26	28	1,100	5,000	n/a		n/a		4	5.5

	Towing speed		Warp diameter		Chain bridle diam		Beam weight		Beam length		Beam height					
	knots		mm		mm		per side kg		m		m					
	mean	max	mean	max	mean	max	mean	Max	mean	max	mean	max				
Twin beam trawl	3.5	7	26	34	19	25	7,500	10,000	9	12	0.6	0.8				
							Bar weight kg		Bar length m		Individual Dredge weight		No dredges per side		Total weight (kg) per side	
											mean	max	mean	max	mean	max
Scallop dredge	2.5	3	20	28	16	19	750	1,500	6	10	75	100	7	12	1,400	2,800

Warp construction: Mostly 6 x 19, with 6 x 26 for beamers

Older vessels and beamers use fibre core; newer vessels with auto-winches use steel core (dyeform, etc)

Annex 1

USEFUL ADDRESSES

(i) Government Departments/Agencies

1. Scottish Executive Rural Affairs Department
   Freshwater Fisheries, Aquaculture and Marine Environment Division
   4th Floor
   Pentland House
   47 Robb's Loan
   EDINBURGH
   EH14 1TW
   Tel 0131-244-6233 Fax 0131-244-6313

(The Secretary of the Fisheries and Offshore Oil Consultative Group (FOOCG) is also located at the above address.)

2. Ministry of Agriculture, Fisheries and Food
   Rural and Marine Environment Division
   Nobel House
   17 Smith Square
   LONDON
   SW1P 3JR
   Tel 020 7238 3000 Fax 020 7238 5881

3. Department of Trade and Industry
   Oil & Gas Directorate
   1 Victoria Street
   LONDON (Exploration and Licensing)
   SW1H 0ET
   Tel 020 7215 5000 Fax 020 7215 5142

4. Department of Trade and Industry
   Oil & Gas Projects Office
   Atholl House
   86-88 Guild Street
   ABERDEEN (Field Development, Environment & Decommissioning)
   AB11 6AR
   Tel 01224 254000 Fax 01224 254019

5. Fisheries Research Services
   Marine Laboratory
   PO Box 101
   Victoria Road
   ABERDEEN
   AB11 9DB
   Tel 01224 876544 Fax 01224 295511

6. Centre for Environment, Fisheries and Aquaculture Science
   CEFAS Laboratory
   Burnham-on-Crouch
   Essex
   CM0 8HA
   Tel 01621 787200 Fax 01621 784989

7. Scottish Fisheries Protection Agency
   Pentland House
   47 Robb's Loan
   EDINBURGH
   EH14 1TW
   Tel 0131 244 6094 Fax 0131 244 6471

8. Sea Fisheries Inspectorate
   Ministry of Agriculture, Fisheries and Food
   Fifth Floor
   Nobel House
   17 Smith Square
   LONDON
   SW1P 3JR
   Tel 020 7238 5815 Fax 020 7238 5814

(ii) Sea Fish Industry Authority and National Fishermen's Organisations

9. Sea Fish Industry Authority
   Seafish Technology
   Seafish House
   St Andrew's Dock
   HULL
   HU3 4QE
   Tel 01482 327837 Fax 01482 223310

10. Scottish Fishermen's Federation
    14 Regent Quay
    ABERDEEN
    AB11 5AE
    Tel 01224 582583 Fax 01224 574958

11. National Federation of Fishermen's Organisations
    Marsden Road
    Fish Docks
    GRIMSBY
    North East Lincolnshire
    DN31 3SG
    Tel 01472 352141 Fax 01472 242486

(NB There are in addition numerous other smaller or locally based associations. Details of these can be obtained from either the local Fishery Office or the National Federations)

(iii) Offshore Operators and Seismic Contractors

12. The Director
    Operational and Technical Affairs
    United Kingdom Offshore Operators Association
    9 Albyn Terrace
    ABERDEEN
    AB10 1YP
    Tel 01224 626652 Fax 01224 626503

13. International Association of Geophysical Contractors
    c/o IAGC EAME Manager
    4 St. James Road
    SEVENOAKS
    Kent
    N13 3NH
    Tel 01732 743025 Fax 01732 740623

ISBN 0 7559 0162 2

SCOTTISH EXECUTIVE

Designed and produced on behalf of the Scottish Executive by Astron. B17532-06-01