

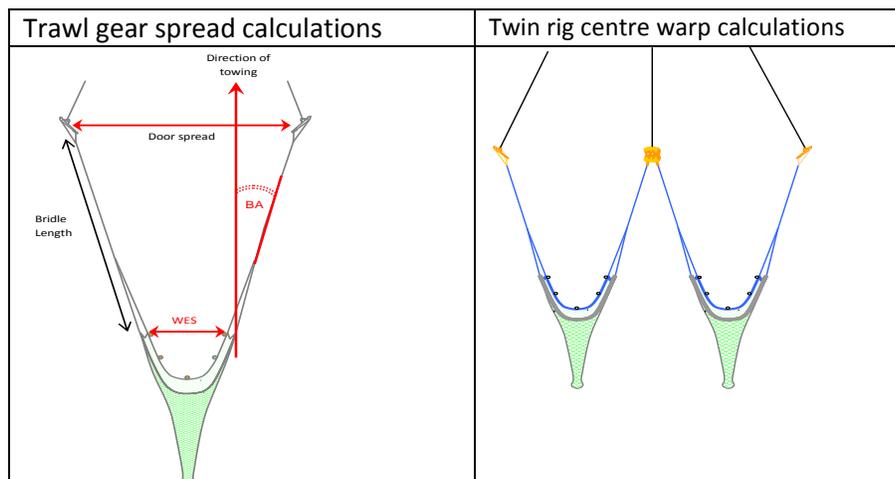
GEAR TECHNOLOGY NOTE - Towed Gear



This is where the fishing gear is towed through the water to overrun the target species.

Main types of towed gear

Beam Trawl	<i>Trawl towed on the seabed in which the net is held open by a wood or steel beam.</i>
Demersal Trawl	<i>Trawl towed on the seabed, held open by a pair of otter boards (trawl doors). It is usually a much larger net than a beam trawl.</i>
Pelagic Trawl	<i>Trawl towed in mid water to target shoaling pelagic species</i>
Pair Trawl	<i>Trawl towed between two boats, either on the seabed or in mid-water, held open by the distance apart of the two vessels.</i>
Pair Seine	<i>Similar to pair trawl but usually using longer lengths of warps / ropes laid on the seabed</i>
Twin rig Trawl	<i>Method of towing two otter trawls side by side.</i>
Multi Rig Trawl	<i>Method of towing two or more otter trawls side by side.</i>
Dredges	<i>Rigid structure towed on the seabed usually for shellfish.</i>
Trolling	<i>Towing baited hooks or lures</i>



Beam Trawl

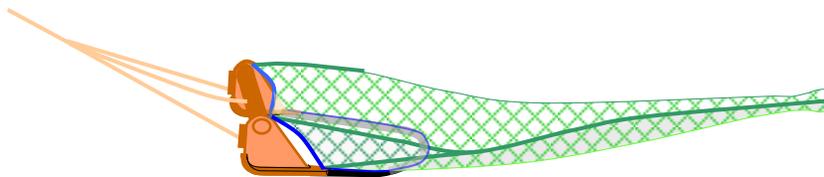


Evolution

The beam trawl is one of the earliest forms of towed fishing gear, being used in the Southern North Sea by the sailing smacks from Grimsby and Lowestoft in the latter part of the 19th century. The net is held open by a rigid framework ensuring it maintains its shape and effectiveness despite changes in towing speed. This made it ideal for towing behind early sailing boats with their unpredictable course and speed. As diesel engines were developed along with mechanised hauling methods the gear was made larger and towed at faster speeds in an effort to improve catches. In the early days of beam trawling only one net was towed from the stern of the boat. Nowadays most commercial beam trawlers tow two beam trawls from long derricks projecting over each side of the vessel.

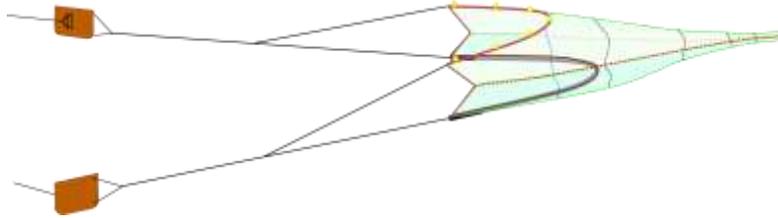
Gear

The beam trawl consists of a heavy steel beam, of tubular section, supported by steel beam heads at each end. These beam heads have wide shoes at the bottom to which slide over the seabed. The beam and beam heads form a rigid framework that keeps the trawl open and supports the net. On the early beam trawls and modern day small scale trawls the timber was used for the beam. The cone shaped net is towed from this framework with the head rope attached to the beam and each end of the footrope connected to the bases of the shoes. As the gear is towed over the seabed the footrope forms a 'U' shape curve behind the beam and shoes with the net and codend behind this. The headline height of the trawl is limited to the height of the beam off the seabed. The beam is usually towed using a chain bridle arrangement from both shoes and the centre of the beam to the end of the trawl warp leading to the vessel.



A beam trawl

Demersal Trawl

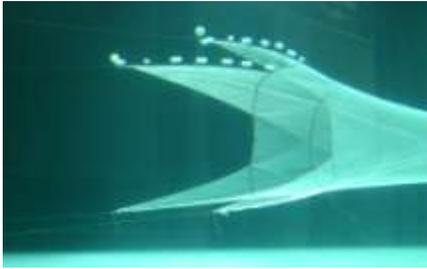


Evolution

Demersal or bottom trawling is a direct descendant of the original beam trawl. The early forms of towed fishing gear used by sailing boats with their unreliable towing power involved the use of beam trawls. The size of the nets being restricted by the limited power available and the length of beam that could be stowed aboard the vessel. With the coming of steam powered vessels and later diesel propulsion, otterboards were developed to spread the nets in place of the rigid beam of the beam trawl. This allowed nets to be made much larger. To begin with the otterboards or trawl doors, as these are more commonly called nowadays, were attached to the wingends of the nets. Later with the understanding that certain species of fish could be herded into the path of the net, short bridles were added between the wingend, and the doors allowing a larger area of seabed to be swept by the net. Nowadays the bridles can range from none at all right up to 300 metres depending upon the target species and the type of seabed fished.

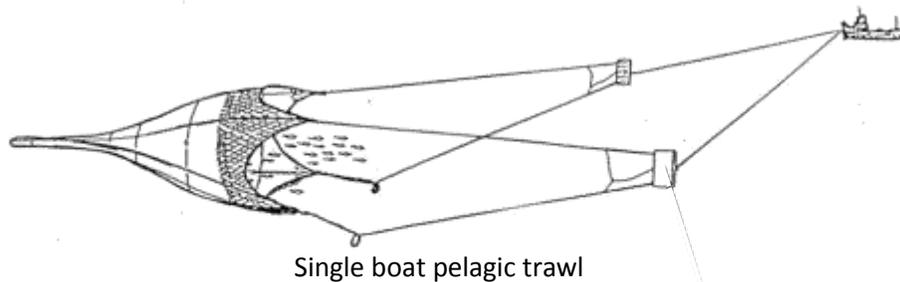
A basic trawl is made up from two shaped panels of netting laced together at each side to form an elongated funnel shaped bag. This funnel tapers down to the cod-end where the fish are collected until the net is hauled. The remaining cut edges of the netting, at the mouth of the net are strengthened by lacing them to ropes. The rope along the upper edge of the net is called the headline, the one along the lower edge the footrope or fishing line, and the side ropes called the winglines or gables. The headrope has floats attached to it to lift it clear of the seabed and hold the net open in a vertical direction. The footrope usually has some form of weighted 'groundgear' attached to it.

Pelagic Trawl (single and pair)



Pelagic trawling is a method of fishing for targeting fish between the surface and seabed. The main target species are mackerel, herring and sprats, in some areas white fish are also caught using pelagic or semi pelagic gear. With the improvement of sonar, echo sounders and fishlupes enabling the vessel to actually locate and track schools of pelagic fish it became more apparent to fishermen that, at certain times, large amounts of fish could be caught in the layers of water off the seabed. Pelagic or midwater trawls are generally much larger than bottom trawls with the forward sections of the net usually comprising of very large meshes (5-120m) or ropes that herd the shoals of fish towards the main body of the trawl. These large meshes are effective for these types of fish as they are schooling fish, i.e. when one fish strikes danger (the net) the whole shoal moves clear of it as one. It also allows much larger nets to be used effectively filtering a much larger volume of water. The position of the net between the surface and seabed is usually monitored using electronic sensors on the headline to give a depth for both top and bottom of the net allowing the skipper to position his net is line with the shoal. These nets can be as big as 160 metres deep and 240 metres wide. The nets for single and pair trawling are basically the same but the bridle arrangement differs.

Single trawl - this net is towed by one vessel using a set of midwater doors to open the net horizontally. The net is opened vertically by the use of a chain clump on each lower wing end and floats on the headline. This position within the water column is controlled by the speed of the vessel and the amount of weight on the wing ends.



The nets in both methods are handled exactly the same as bottom trawls except that the larger pelagic boats usually pump their fish aboard in the same manner as purse seiners rather than lifting the full cod end aboard. Some of the larger vessels are capable of catching several hundred tons in one haul.

A wide variety of vessels use both these methods of fishing, from under 10metres in length vessels fishing pelagic gear close inshore at certain times of the year right up to 30-60metres in length specialist pelagic vessels with RSW tanks and even bigger (as long as 140m) 'supertrawler' class with freezing capabilities for up to 5400 tonnes of fish

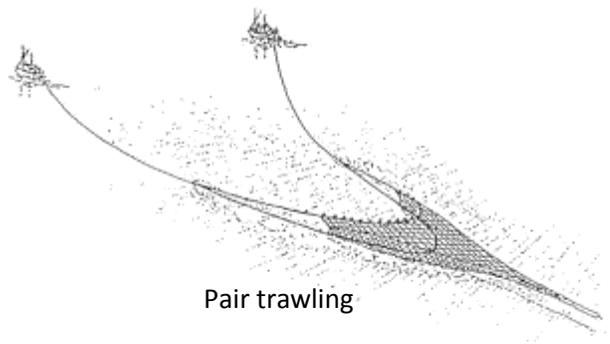
Pair Trawl (Demersal)



In this method a bottom trawl is towed simultaneously by two boats. The basic net differs very little from that of a single trawl but there are no trawl doors, the distance between the vessels ensures that the horizontal opening of the net is maintained. The net and bridles are connected directly to the trawl warps. The weight of the doors is replaced either by a clump weight or a length of heavy wire (150- 300metres) to help keep the gear on the seabed.

Because there are no doors, the total drag on the gear is less, enabling two trawlers to tow a very large trawl. In pair trawling a considerable length of warp is shot (between 4 and 6 times the depth of water) some of which (the heavy wire) drags along the seabed acting like a bridle to herd fish towards the net. Additionally in shallow water the propeller noise does not disturb the fish before the passage of the trawl but helps the herding effect of the gear.

The gear is handled in the same way as a single net with one boat shooting and hauling the net while the other takes one side of the net when towing. Usually each boat only carries one net because of its increased size and weight.



Pair Seine

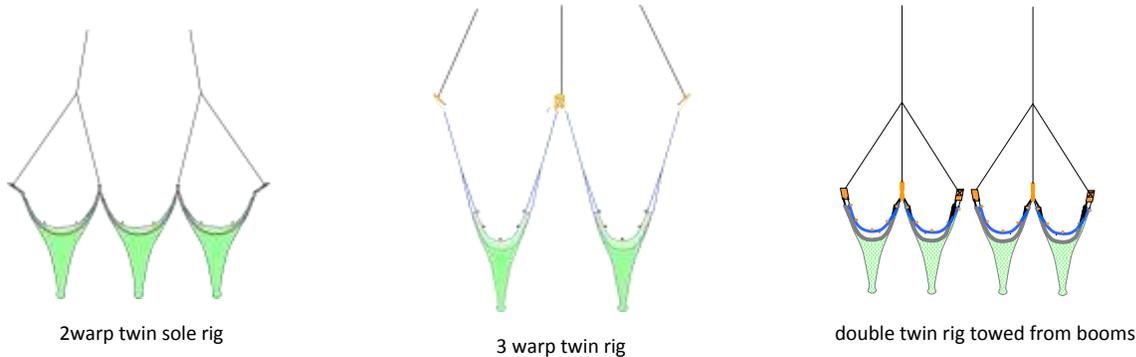
This is very similar to pair trawling but longer lengths (as much as 3500metres) of seine net ropes and combination wire are used instead of trawl warp. It is usually used to sweep vast areas of clean ground, whereas pair trawl covers smaller areas of harder seabeds. Originally the ropes was shot in a triangle shape by one boat, with the partner vessel picking up the first end to be shot before towing the gear between them for several hours before passing the rope back to the original vessel to haul the gear. It was a way of keeping the seine net open for longer thereby increasing the area of seabed covered with the intention of increasing the catch.

Modern pair seine is handled in a similar to pair trawl but using much greater lengths of warp or combination wire on the sea bed to herd the fish into the path of the net. One of the problems of both methods is that the two vessels have to come close together to pass the tails of the net across. This can be hazardous in poor weather.

Multi rig / Twin rig bottom trawl

Multi-rig fishing techniques have been used extensively in overseas fisheries for many years and proved very efficient. In Australia and Mexico as many as five nets are towed using outriggers for prawn and shrimps

In the early 1980s this method was successfully adopted using only two nets in the Danish prawn and shrimp industry. The English trawlers copied this method for targeting soles using both twin and triple rigs. The prawn (*Nephrops*) trawlers in Scotland also followed the Danish trend and it spread to the vessels targeting bottom living fish.



The idea behind the technique of multi-rig trawling is that a larger area of seabed can be covered by allowing a wider spread of ground gear to be worked without towing the increased area of netting of one large single trawl to give similar coverage. The type of fish targeted by this method do not react well to herding, so the catch is more dependant upon the area of seabed covered by the ground gear of the net, the centre section (the bosom) in particular.

As the method developed it was found to be effective with short sweeps, for several species of ground fish (monks, megrims etc). In recent years with the comparative decline in value of the main demersal species such as haddock and, fishermen have started targeting the high value species such as monkfish and megrim which are found close to the bottom. These species, unlike haddock and whiting, tend to herd only short distances. With a small sweep angle and a large area of seabed swept by the two sets of ground gear this method of bottom trawling is very effective for ground hugging species but because of an increased area swept between the trawl doors it is still very effective for round fish (haddock, cod etc).

Multi-rig trawls can be towed with either a 2 or 3 warp system depending upon the capabilities of the vessel's winch. Although the 2 warp system is very effective, it has its problems; the 3 wire system is more versatile and probably easier to work, particularly when problems develop.

The basic rig is, similar to a single net rig, with trawl doors on each outside warp to spread the gear and a form of clump weight on the tail of the centre warp to keep the gear in contact with the seabed. Behind the doors and weight two nets are towed side by side. The amount of bridle (sweep) between the net and doors and net and weight depends on the type of seabed worked and the target species. The centre weight can range from a simple clump of heavy chain to a specialist depressor style weight and is usually about 25%-50% heavier than one door. To keep both nets square and in their most efficient mode, the centre wire has to be shortened slightly. The amount depends on the length of wire between the doors and the vessel and the door spread.

Dredges

Used mainly in the UK for scallops. The vessels and rigging are very similar to that of beam trawling with the beam trawls being replaced by multiple dredges. The dredges consist of a frame and a toothed bar at the front to dig the scallops out of the sand with a collecting bag behind it. This bag is made of chain links forming a chain mesh on the bottom and usually netting on the top.

Several of these dredges are towed behind a heavy spreading bar, usually one from each side of the vessel. The length of bar and number of dredges is dictated by the power of the vessel and its length of side deck to work the dredges over. The number can vary from 3 or 4 on a small 10m boat up to 18-20 on a 30m vessel with 1500hp

Trolling

These are lines, towed near the surface or at a certain depth, each carrying one or more hooks covered natural or (more frequently) artificial bait (lures). The use of booms makes it possible to tow several lines simultaneously, some times as many as 12 – 15. Lines are ballasted with different weights according to their length and depth that the skipper wants them to fish at. This also helps prevent them becoming entangled as the boat manoeuvres. This method is used mainly for pelagic species such as tuna and bass.

This is a highly selective fishing method with the species being determined by the bait and position of the bait in the water column.

Trolling is practised using 15- 30m vessels by Spain and France for Tuna. In UK it is more the smaller class of boat targeting bass in SW England.



Spanish vessel trolling for tuna

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