

Calculating the spread of trawl doors

This fact sheet gives fishermen the information to enable them to measure the spread of their trawl doors without the need for costly electronic equipment

To ensure that trawl gear is towed at its optimum efficiency it is necessary for the skipper to know how far apart his trawl doors are. It is the spread of the trawl doors, in conjunction with the length of sweep and bridle, and the dimensions of the trawl that determines the angle that the sweeps and bridles take up to the direction of towing. This angle, known as the sweep angle or bridle angle, has to be set at a suitable angle for the target species at the chosen towing speed. (see fish behaviour). If this distance (door spread or DS) is known it will give the skipper a better understanding of his gear, it will enable him to calculate the opening of his trawl at the wing ends and the angle that the sweeps and bridles are being towed at. Knowledge of these two parameters is paramount in optimising the spread of the gear to ensure it maintains an efficient opening to suit the behaviour of the target species.

Ideally door spread can be monitored using one of the proprietary trawl monitoring systems, such as Scanmar, Notus and Simrad. These systems can be costly, particularly for the smaller class of vessels but they will give the skipper a convenient and reliable readout of the door spread in the wheelhouse. Many of these systems will also provide a door to clump-weight distance in a multi rig setup (twin rig / triple rig). One of the big advantages of these systems is that the readout is constantly being updated giving the skipper an indication of what is happening to his gear it is being towed. An appreciable change in door spread can be an early indication that there may be problems with the gear. These can include

- a) the gear has come fast on the seabed.
- b) one or both of the doors has fallen down.
- c) some part of the gear has broken.
- d) the gear has picked up an obstacle
- e) there is some other problem with the gear.

This will encourage him to haul the gear and correct the problem rather than continue the tow with the gear fishing in an inefficient manner. With experience, the constant readout of the door spread will enable the skipper to better understand what is happening to his gear as it is being towed and give an early indication that there may be a problem with the gear and help him keep his gear fishing to its maximum efficiency. Once the skipper has a figure for his door spread he can calculate his sweep angle and wing end spread giving him a better understanding of his gear. If the vessel does not have any of these systems fitted, there are 2 basic ways to calculate the spread of the trawl doors. Both these calculations will give a reliable estimation of the spread of the trawl doors allowing the skipper to work out other parameters of his gear set up. Although these calculations will give a fairly accurate numerical figure, they really come into their own as a relative figure as changes are made to the setup of the trawl gear.

Do not wait until you think something is wrong with the gear before measuring the door spread. Take regular measurements when the gear is working well, this will give a target figure to aim for if the gear goes out of fishing. These calculations can be used in single rig and 3 warp twin rig to give an accurate calculation of door spread. On a 2 warp twin rig (using split warps) set up it can be used to give a measurement across the point where the split warps join the main warp. This figure can then be used to estimate the actual total door spread. (see 2 warp twin rig information sheet). The decision on which calculation to use depends upon whether the vessel tows its warps from a single point (calculation A Single Point) or from two separate points such as from the gallows blocks (calculation B Two Separate Points or gallows blocks). For these calculations a single point is deemed to be when the two towing strops for the port and starboard warp are towed from a single shackle as in fig 1. All other arrangements should be classed as towing from two separate points. Some common set ups are shown in figs 2,3,4,5. Both calculations work by measuring the warp divergence. If the towing strops are not into a single shackle there will always be a gap between the inboard ends. This gap may only be very small at the vessel but by the time it is worked through the door spread calculation it will result in a large discrepancy. It is important therefore to get the initial measurement as accurate as possible without putting yourself in danger. When towing 3 warp twin rig gear measure the total door spread by using the two outer warps for the measurements. Unless the boat is towing on a straight course with the gear directly in line astern, the centre warp will have a very different horizontal divergence from that of the outside two. This is liable to give a distorted reading of door spread.

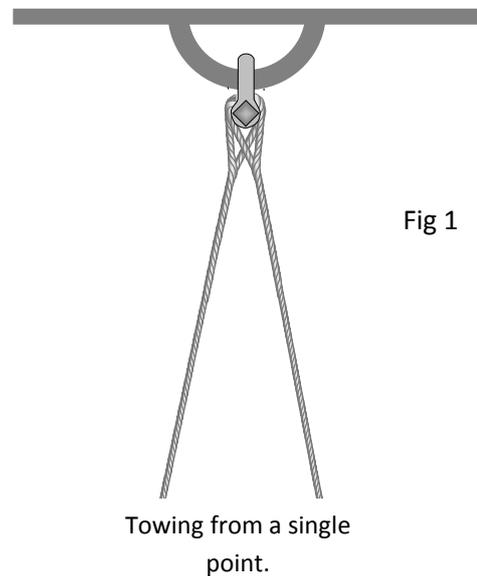


Fig 1

Use calculation A

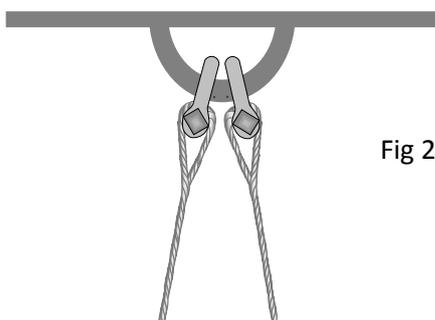


Fig 2

Towing from a single point would using 2 shackles. It is difficult to find the true apex where the towing strops meet.

Use calculation B

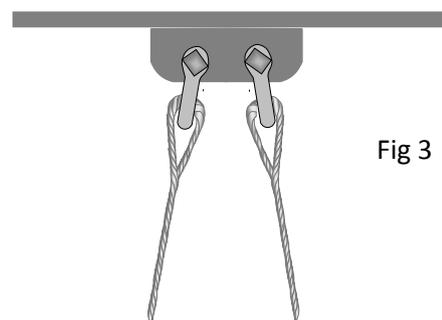


Fig 3

Towing from two separate holes on the towing bar. The true apex where the towing strops meet would be well ahead of the ends of the strops. Its actual position would vary with different door spreads. **Use calculation B**

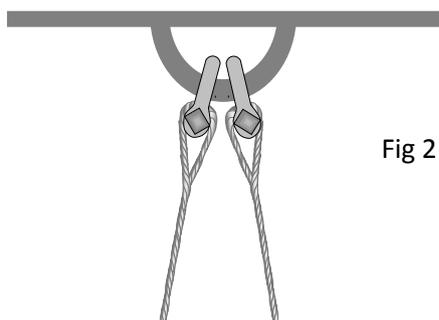


Fig 2

Towing from a single point using 2 shackles. It is difficult to find the true apex where the towing strops meet.

Use calculation B

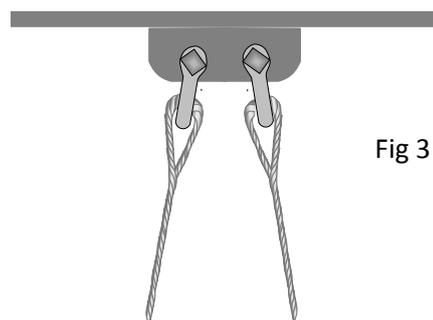


Fig 3

Towing from two separate holes on the towing bar. The true apex where the towing strops meet would be well ahead of the ends of the strops. Its actual position would vary with different door spreads. **Use calculation B**

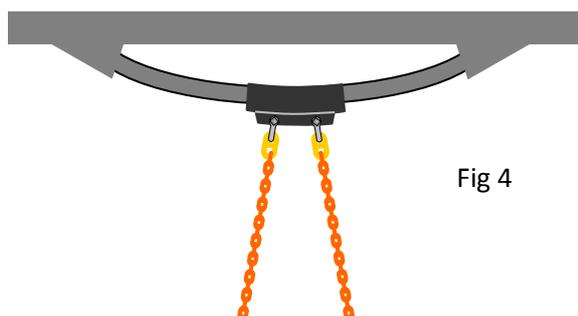


Fig 4

Towing from two separate holes on a towing point that is free to slide on a 'banana' style towing bar. It is very difficult to estimate where the true apex where the towing strops meet would be. **Use calculation B**. Take extra care when measuring door spread with this arrangement as the towing point is liable to sudden movements from side to side

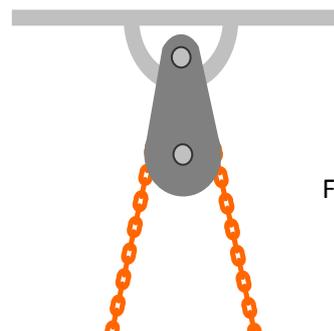


Fig 5

Towing from a running chain that is free to move around a block as warp tension changes. It is very difficult to estimate where the true apex where the towing strops meet would be. **Use calculation B**. Take extra care when measuring door spread in this arrangement as the running chain is liable to slide in or out without warning.

Safety.

One problem with these calculations is that it is necessary for somebody to go onto the stern of the vessel and physically measure the distance between the towing warps. This will often involve leaning or stretching outboard so take care!

Before doing this the skipper and crew should do a 'risk assessment' on the procedure in relation to their particular vessel.

It is suggested that the following concerns are addressed.

- 1) Always wear a lifejacket!
- 2) If deemed necessary use a harness and safety line as well
- 3) Weather conditions. If possible only do this in good weather
- 4) Do not do it without another crew member in the vicinity
- 5) On a single handed vessel it will be necessary to take extra precautions.
- 6) Do not lean out over the side of the vessel unnecessarily.
- 7) Only do it when the vessel is on a straight course and the warps are unlikely to move unexpectedly.
- 8) Do not try to do it when the gear is likely to come fast on a seabed obstacle
- 9) If any of the points above cannot be addressed adequately consider buying one of the electronic systems for measuring door spread. They are much cheaper than the loss of life!

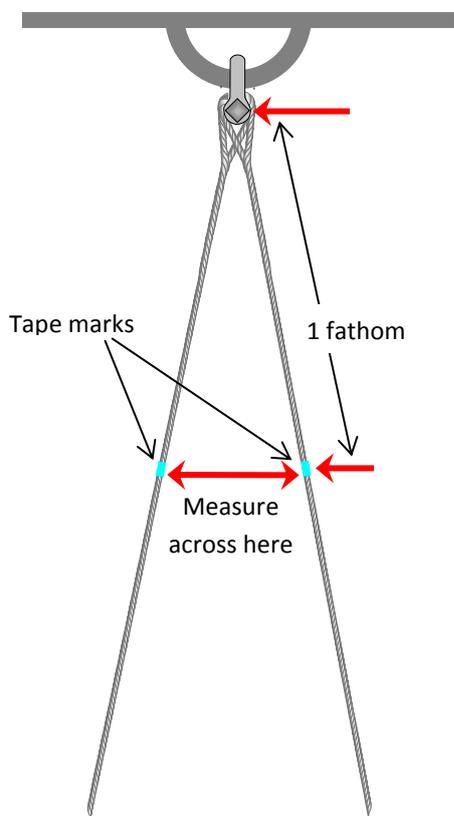


Fig 6

Calculation A

Towing From a Single Point

1 From the vessel end of the towing strops, in the diagram it will be the pin of the shackle, measure down each strop 1 fathom (6 feet). Put a mark on each towing strop – insulating tape is ideal for this. (Fig 6)

2 Measure across between the two tape marks in inches. Ideally the measurements should be taken from the centre of the towing strops or towing chains

3 Multiply this figure by the length of warp shot in fathoms.

4 Divide the result by 12 to give the door spread in feet

5 To allow for divergence of the warps it is advisable to add about 5 – 8%

The more accurately the measurements are done the more accurate and reliable the result will be.

Example.

Distance across the tape marks = 13.5 inches

Warp out = 175 fathom

$13.5 \times 175 = 2362.5$ inches

2362.5 divided by $12 = 196\text{ft } 10\text{in}$

$196\text{ft } 10\text{in} + 6\% = 209$ feet

Therefore distance between the trawl doors is **209 feet**.

Calculation B

Towing From Two Points

To be used when towing from two separate points or from the gallows blocks. The calculation is slightly different for each situation

1 From the vessel end of the towing strops, come down clear of any shackles and splices and put a tape mark on each towing strop. Measure down each strop one fathom (6 feet) and put another tape mark on (insulating tape is ideal for this.) (Fig 7)

2 Measure between the top two tape marks (A) in inches. Ideally the measurements should be taken from the centre of the towing strops or towing chains

3 Measure between the lower two tape marks (B) in inches

4 Subtract distance A from distance B

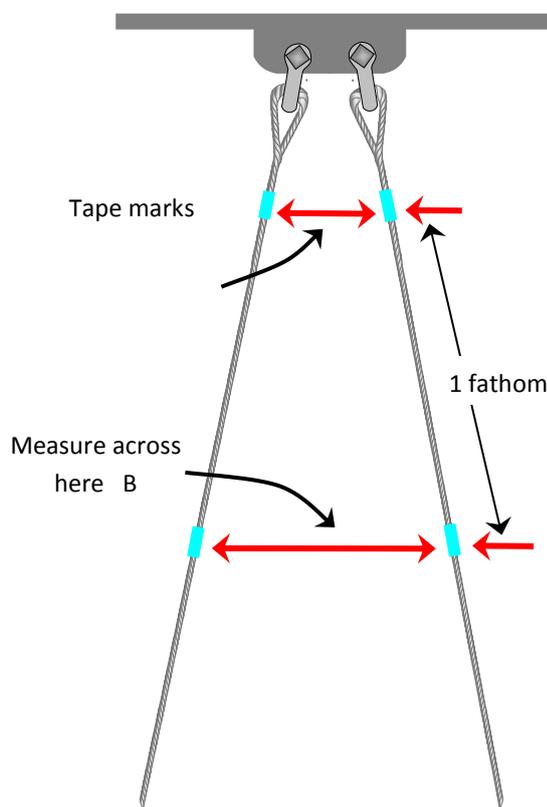


Fig 7

5 Multiply this figure by the length of warp shot in fathoms.

6 Divide the result by 12 to give the door spread in feet

7 To allow for divergence of the warps it is advisable to add about 5 – 8%

The more accurately the measurements are done the more accurate and reliable the result will be.

Example.

Distance across the top two tape marks (dist A)
= 4 inches

Distance across the lower two tape marks (dist B)
= 18 inches

Subtract A from B = 14 inches

Amount of Warp out = 175 fathom

$14 \times 175 = 2450$ inches

2450 divided by $12 = 204\text{ft } 2$ in

$204\text{ft } 2\text{in} + 6\% = 216\text{ft } 6$ in

Therefore the distance between the trawl doors is **216ft 6 inches**.

If towing from the warps in the gallows blocks as in Fig 8, the calculation is the same but add distance A to the calculated door spread figure for a more accurate figure.

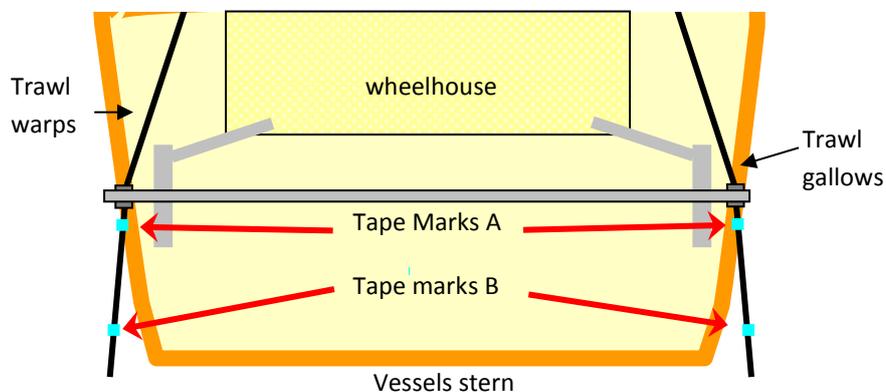


Fig 8

Example.

Distance across the top two tape marks (dist A) = 17ft 6 inches

Distance across the lower two tape marks (dist B) = 18ft 8 inches

Subtract A from B = 14 inches

Amount of Warp out = 175 fathom

$$14 \times 175 = 2450 \text{ in}$$

$$2450 \text{ divided by } 12 = 204 \text{ ft } 2 \text{ in}$$

$$204\text{ft}.2\text{in} + 6\% = 216\text{ft}.6 \text{ in}$$

Add distance A, 17ft 6inches to 216ft .6 inches = 234ft

Therefore the distance between the trawl doors is **234 feet**

For more information on trawl doors and other fishing gear please go to the Seafish gear database at <http://www.seafish.org/geardb/> or the Seafish website