# PAIRED STREAMERS/TORI LINE

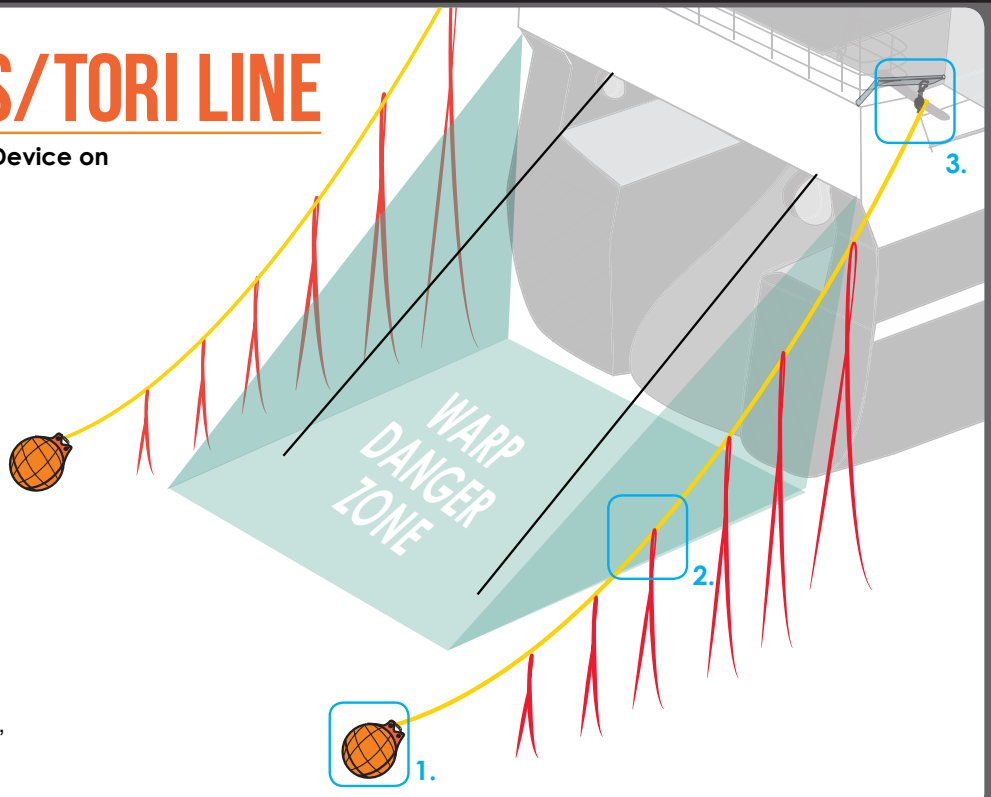
**Optimal Design and Use for Seabird Mitigation Device on New Zealand Deep-sea Trawlers**

The tori line was:

- first developed by Japanese fishermen to distract seabirds from baited hooks
- reinvented as a mitigation device
- adapted for trawlers to reduce the risk of seabird strikes with warps.

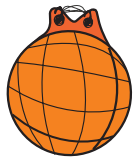
Its simplistic design, easy and cheap construction and effectiveness are why the tori line is the most effective and widely used seabird mitigation device worldwide.

Sea trials on new zealand trawlers tested new improved materials and designs (as shown below). These trials show how to greatly improve the performance of your tori line and reduce the risk of seabird warp strikes when tori lines are constructed, maintained and deployed correctly.

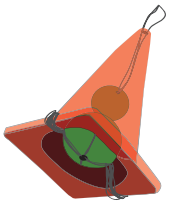



## 1. Drag Weight:

- Use 7 or 8 kg deep-sea trawl float covered in netting, (or use a road cone with floats). This increases drag to support heavier streamer material, improves aerial extent and the line maintains better position behind the vessel.



**Deep-Sea Trawl Float**

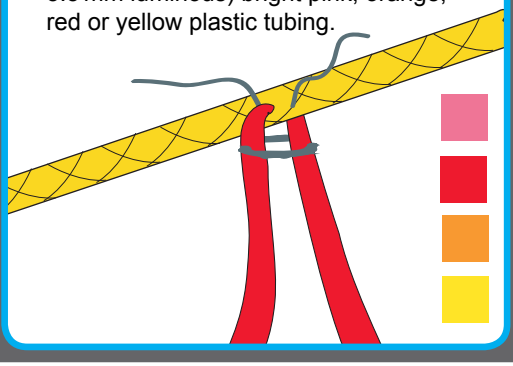


**Road Cone**
(with 2 floats)

**Windy Buoy**
(too light)

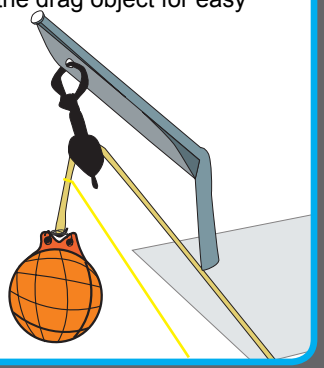
## 2. Backbone and Paired Streamers

- Use a shorter backbone to maintain better position behind the vessel.
- Use 8 mm mainline rope (bright coloured not green) 30, 35, 40 m long.
- Use heavier diameter 7, 8 or 9 mm (not 3.5 mm luminous) bright pink, orange, red or yellow plastic tubing.



## 3. Boom and Bridle

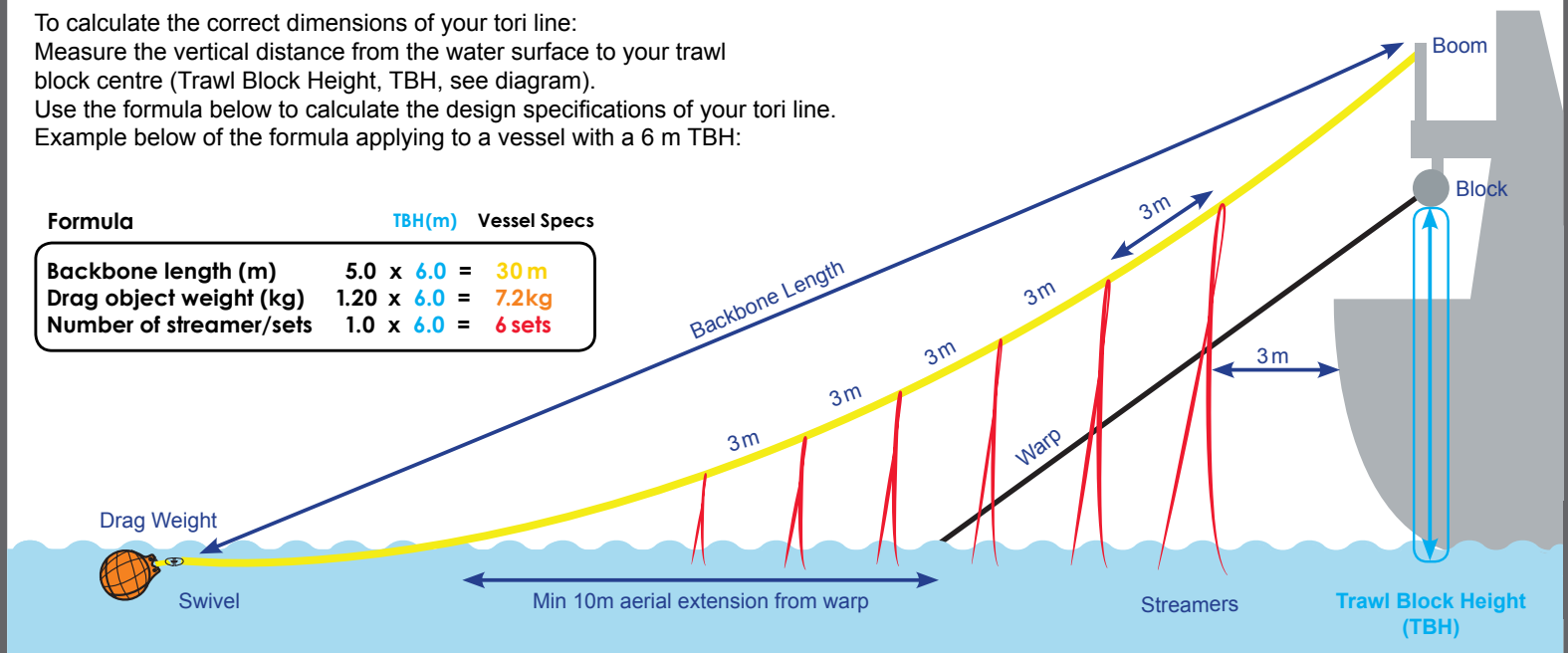
- Attach the tori line at least 2 to 3 m outboard and above each trawl block or -
- Use a boom to gain the required height and width from block.
- Deploy from the trawl deck, use a bridle/ lazy line from the drag object for easy deployment.



# RECOMMENDED DESIGN DIMENSIONS

To calculate the correct dimensions of your tori line:
Measure the vertical distance from the water surface to your trawl block centre (Trawl Block Height, TBH, see diagram).
Use the formula below to calculate the design specifications of your tori line.
Example below of the formula applying to a vessel with a 6 m TBH:

| Formula | | TBH(m) | | Vessel Specs |
|---|---|---|---|---|
| Backbone length (m) | 5.0 x | 6.0 | = | 30 m |
| Drag object weight (kg) | 1.20 x | 6.0 | = | 7.2kg |
| Number of streamer/sets | 1.0 x | 6.0 | = | 6 sets |



# THE PROBLEM

At times fishing operations and seabird breeding and foraging areas overlap. Seabird numbers and species attending the vessel depend on the fishery and many environmental and seasonal conditions. Offal and fishwaste discharged and fish in the trawl attract seabirds to feed during fishing operations which increases the risk of capture.

Offal in the Warp Danger Zone attracts seabirds which may:

- fly into the warp and can sustain injury
- become impaled on wire sprags
- stick to a heavily greased warp and are hauled back up through the trawl block
- seabirds are dragged under the surface by the warp and drown.

This 'warp strike event' occurs very quickly and can easily go unnoticed by crew.

# OFFAL CONTROL

An offal management system, with specific equipment and procedures to, either; fishmeal, hold or batch and/or mince offal in accordance with the vessel's Vessel Management Plan (VMP) such that no continuous discharge occurs when towing or at all while shooting and hauling is a basic requirement of the DWG VMP standards.

Not discharging, or minimising the discharge volume and time which offal is being discharged though the Warp Danger Zone when towing greatly reduces the risk of warp strikes.

# WARP DANGER ZONE

The Warp Danger Zone is the area directly astern of the vessel where the warp enters the water's surface. The size of this area is determined by several factors, the height of the trawl block above the water, the position or movement of the warp outboard of the hull and the water depth the vessel is towing in.

Offal discharge and or sea/wind or tide conditions change or the vessel turns and a warp is outboard of the hull, once offal is in the Warp Danger Zone, feeding seabirds can end up in the path of the warp, and warp strikes occur.

**OFFAL + WARP DANGER ZONE + BIRDS = HIGH RISK OF BIRD WARP STRIKE/CAPTURE**

# THE SOLUTION

Reducing the number of seabirds around the vessel's gear and reducing the birds' exposure to the periods of the fishing operations which increase risk of capture can only be achieved by firstly applying good offal control procedures then secondly by the deployment of a well designed and maintained mitigation device or devices.

Most vessels have and deploy a Bird Baffler as their primary mitigation device, but also carry onboard a tori line as a spare or alternative device. At times of heightened risk, a tori line should be deployed in conjunction with the baffler.

# REGULATORY SPECIFICATIONS

- Two lines, a minimum of 8 mm Ø, and of a length to ensure deployed aerial extent of at least 10 m behind where the warp enters the water. Attach to the vessel as close as possible to 2 m above the trawl block and between 1 to 3 m outside each trawl block, or to a boom and bridle system positioned to ensure maximum protection of the warps.
- A drag object shall be attached to seaward end to create sufficient drag to ensure streamer line is taut behind the vessel at all times.
- Two paired/branched streamer lines, each two strands of fluorescent; red, yellow, orange or pink plastic tubing of a minimum of 3 mm Ø attached no more than 5 m apart commencing no more than 5 m from the attachment point to the vessel. Each streamer must reach the water surface and be a minimum length of 1 m, attached to the backbone in a manner to prevent fouling.

*The above is a 'guide' only please check the current mandatory Seabird Scaring Device specifications and or fishing regulations as to the exact wording.*

# KEY FACTORS Design Construction & Deployment

**Drag Object**

- A deepwater 7/8/9 kg deep-sea trawl float covered in netting provides the optimum tracking over the warps. (A road cone with floats added is also suitable).
- More drag is required to support the heaver streamer material in the new design, while ensuring you achieve the required 10 m of aerial extent behind the point where the warp enters the water.
- The use of a windy-buoy is not ideal. Its large size, lighter weight and buoyancy make it very susceptible to cross winds.

**Backbone**

- Many vessels use a 50 m-long backbone, coupled with a light weight windy buoy. Tori lines have poor aerial extent with most of the line and many streamers lying in the water.
- Smaller vessels with low block height, have only short distances from the vessel stern to where the warps enters the water and only require a short 25/30 m backbone.
- Attaching streamers to the backbone with clips and swivels increases breakage of the streamers. The best method is threading the streamer directly through the lay of the rope and whipping it.

**Streamer Material**

- Many vessels currently use lightweight 3.5 mm luminous tubing, this material is prone to breaking and in windy conditions blows horizontally, it also fades quickly losing all if its original colour (therefore not meeting legal specifications).
- Larger diameter material; (7/8/9 mm) hangs better from the backbone, and is less likely to blow in the wind.
- Attach paired streamers closer together, use 3 m spacings, many vessels only have 10 m astern of warp area to protect, a 5 m spacing provides very few streamers over this area.

**Deployment and Adjustment**

- Fit the backbone line at least 3 m outside each trawl block, if necessary use a boom to achieve this, a boom also allows deployment via a lazy line etc.
- If a boom system is fitted use a wider sheath block so the larger diameter streamers can fit through without damage.
- Make it easy for crew to deploy the tori line. Create a system where deployment from the trawl deck is achievable. Crew having to deploy from the fantail /gantry is not convenient or safe, particularly in bad weather.

DOC/ CSP Funding Project Review of Mandatory Seabird Scaring Devices MIT 2011-07