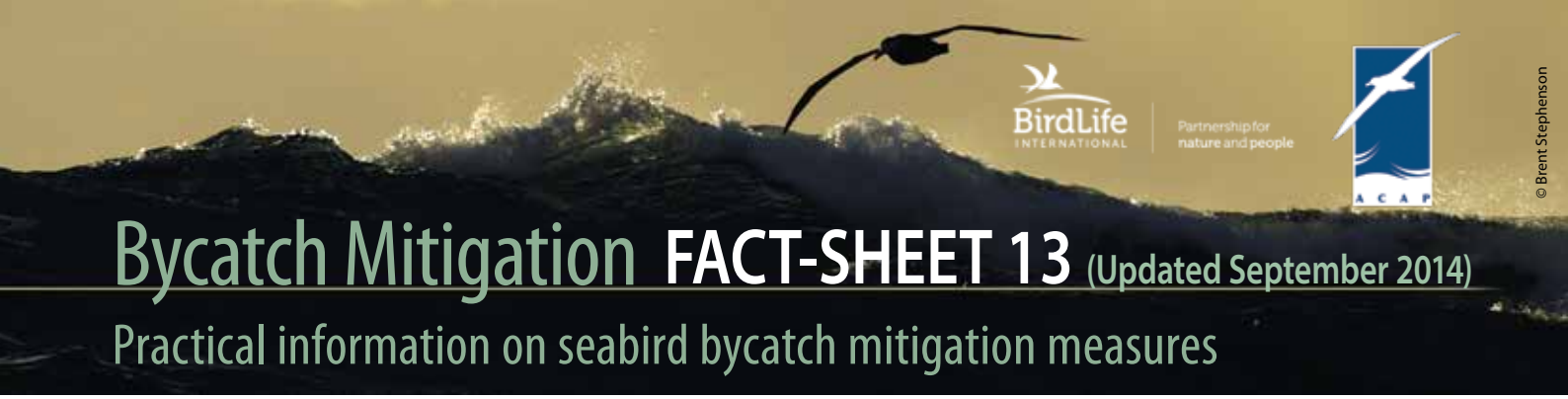

Bycatch Mitigation FACT-SHEET 13 (Updated September 2014)

Practical information on seabird bycatch mitigation measures

Trawl Fisheries: Warp strike

In recent years, dedicated seabird observers on trawl vessels have identified significant bycatch problems. These fall into two categories, net entanglement (Fact-sheet 14) and collisions with cables, predominantly those used to tow the net (warp strikes), but also net monitoring equipment.

What is warp strike?

Warp strike occurs when birds collide with trawl warps, netsonde or paravane cables. If the warp hits the outstretched wing of a bird, the wing wraps around the cable and the drag created by the forward motion of the vessel and/or rough seas pulls the bird underwater, where it drowns. This is a cryptic form of mortality with the only obvious evidence coming from dead birds that are returned to the surface during hauling, after becoming snagged on splices. It is thought that many birds fall from the warps leaving no evidence of mortality. For many years, this source of mortality went unobserved. However, in recent years warp strike has been identified as a major problem in trawl fisheries that overlap with the distribution of albatrosses (Sullivan *et al.,* 2006a; Baird and Smith, 2007; Watkins *et al*., 2008).

What causes warp strike?

Dedicated seabird observers in the Falkland Islands (Islas Malvinas)*, South Africa and New Zealand indicate that warp strike is only a problem when birds are attracted close to the vessel to feed on discards and offal discharge. In the absence of offal discharge, birds tend to stay outside the danger area, where cables enter the water, and near zero levels of mortality have been observed.

Species impacted

Many species of seabird have been observed colliding with warp cables but generally, it is the large, long-winged species of albatrosses and petrels that suffer from this type of mortality. These species tend to forage aggressively with outstretched wings. Smaller petrels, such as Cape petrels, are less likely to become wrapped around a warp cable following a collision.

Environmental variables

In calm conditions, the likelihood of warp strike is reduced. In heavy weather, the vessel pitches and rolls and consequently the warp cable cuts in and out of the water at considerable speed, increasing the probability of warp strike events.

Mitigation measures

Offal management

The long-term solution to the problem of warp strike is to reduce the attractiveness of vessels to foraging seabirds by managing the discharge of discards and offal. Several strategies have been proposed that have the potential to eliminate discharge while fishing; mealing waste, mincing waste, storage of waste onboard (for disposal when not fishing) and stowing frozen waste in the hold (Munro, 2005).

- In several fisheries around the world, vessels are already required to convert fish waste into fishmeal on board. However, in the majority of fisheries this is not the case and retro fitting vessels with meal plant is very expensive and often impractical.
- There is some evidence, from preliminary experimental trials, that mincing fish waste and discards before discharging reduces the number of *Diomedea* albatrosses associated with a trawler (Abraham *et al*., 2009). However, this alone is not regarded as an effective mitigation measure.
- Storage of waste, for discharge at night and/or periods when not fishing, potentially requires large holding tanks (hoppers), which in turn often requires a significant vessel refit.
- Long-term storage of fishery waste can be achieved by freezing and stowing in the hold. Waste and discards can make up 60% of the catch; the freezer time and hold space required to store this quantity of waste will reduce the potential to process the target catch. An added consequence of the long-term storage of frozen waste is the need for more frequent transhipment.

Deterrent devices

As an interim solution to the problem, several seabird deterrent devices have been developed to prevent contact with fishing gear.

Warp cables

Measures designed to deter birds from feeding close to warp cables fall into three categories; streamer lines, bird bafflers and warp scarers.

- Streamer lines (also known as tori lines or bird scaring lines) deployed parallel to, and within two metres of the warp cable, deter birds from feeding in the area where warp cables enter the water (Figure 1, top).
- Bird Bafflers were developed in New Zealand and consist of four arms attached to the stern quarters of the vessel, two project aft directly over the warp cables and two to the sides of the vessel (Figure 1, bottom). Streamers are attached to these arms to form a protective curtain. These need to be rigid or re-enforced to maintain their coverage of the risk areas, and 'stayed' to avoid tangling around themselves or the attachment booms. The arms can be stowed in a raised position, although the Baffler is designed to remain in the lowered (operational) position throughout a fishing trip.

- Warp scarers are designed to be attached directly to the warp cable (Figure 2), several different designs have been tested.

Netsonde cables
In the Alaskan pollock fishery, passing the netsonde cable through a 'snatch block' reduced the distance astern of the vessel that the cable enters the water.

Netsonde cables are now largely banned in southern hemisphere fisheries and trawl warps are the major cause of mortality.

Effectiveness at reducing seabird bycatch

The effectiveness of these devices has been tested by experimental trials in the Falkland Islands (Islas Malvinas)* (Sullivan *et al.,* 2006b), New Zealand (Middleton and Abraham, 2006; Abraham *et al*., 2008) and Alaska (Melvin *et al*., 2004). All experiments produced similar results (discussed below).

Streamer lines

Experimental trials in the Falkland Islands (Islas Malvinas)* and New Zealand found that streamer lines out performed the other mitigation measures on trial – bafflers and warp scarers. The introduction of streamer lines to commercial trawl fisheries has shown that they are practical and effective at reducing seabird bycatch. For example, following the introduction of streamer lines to the demersal finfish trawl fisheries of the Falkland Islands (Islas Malvinas)*, observed seabird mortality was reduced by 90% (Reid and Edwards, 2005). Similar results have been found in the South African hake trawl fishery.

Streamer lines are by far the simplest, cheapest and the most effective mitigation measure currently available.

Bird Bafflers

Trials of the '***Brady Baffler***' indicate that the arms projecting to port and starboard prevent birds from flying down the sides of the vessel, where they feed on waste as it leaves the scuppers. However, the arms projecting aft, to protect the warp cables, are not long enough to give satisfactory protection to the warp/sea surface interface. Trials indicate that bafflers have limited capacity to reduce seabird bycatch on most vessels. The baffler may be more effective on vessels with lower trawl blocks, closer to the water's surface, or deep-water fisheries where the cables enter the water at a steep angle, close to the vessel.

A modification of the Brady Baffler design, known as the '***Burka***', incorporates a line of vertically hanging streamers between the two aft pointing arms of the baffler (Prendeville, 2007). This design was developed for use in deep water trawl fisheries, which were experiencing difficulties with streamer lines. In these fisheries, the warps enter the water at a steep angle, close to the stern of the vessel and may be effectively protected by this modified Baffler.

Warp scarers

Although they can be difficult and dangerous to deploy and retrieve, warp scarers generally work well in calm weather. However, in rough weather these devices often leave the warp cable unprotected as the vessel pitches and can become tangled around the warp cable. Most designs do not allow cable splices to pass freely and therefore potentially interfere with fishing operations. In an attempt to overcome these problems the '***Warp Scarer***' was developed (Sullivan *et al*., 2005). Although it worked well, the device proved to be cumbersome to use and was regarded as impractical for use on commercial vessels.

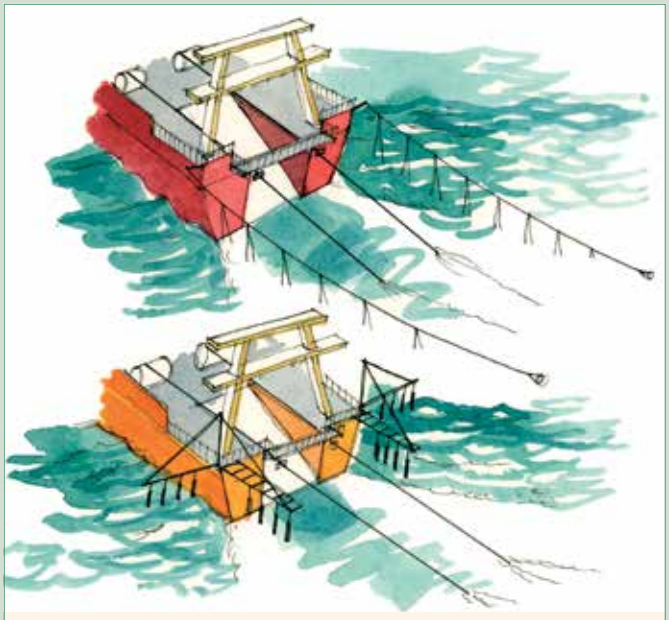

Figure 1. Streamer lines and the Brady Baffler.

Currently, two designs are in use, '***Carey's Cunning Contraption***' and the '***Road Cone***'. Carey's device consists of a series of streamers attached to the warp by karabiners. Trials in New Zealand found this design to be unsatisfactory (Middleton and Abraham, 2006). The Road Cone is hinged and is designed to be closed around the warp. Although the sample size is small, trials of the road cone device on small coastal vessels in Argentina reported an 89% reduction in contacts between birds and warp cables when compared with no mitigation measures (Gonzalez-Zavallos *et al*., 2006).

However, while warp scarers have been shown to reduce seabird contact rates, this has not been to significant levels, and such devices are not as effective as streamer lines (Sullivan et al. 2006b, Abraham *et al*., cited in Bull 2009). Thus, streamer lines are recommended as best practice.

Netsonde cables
In Alaska, observations showed that the use of a snatch block reduced the number of collisions between seabirds and the cable (Melvin *et al.,* 2004). On the same trip, several designs of scarer (devices attached directly to the netsonde cable) proved to be difficult and potentially dangerous to deploy and retrieve.

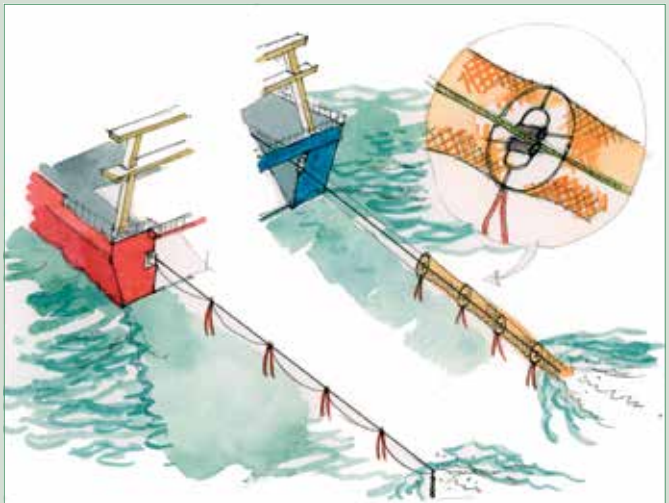

Figure 2. The Warp Scarer and Carey's Cunning Contraption.

ACAP Best Practice Advice

Due to their proven effectiveness, low cost and ease of use, streamer lines are regarded as best practice in most trawl fisheries, until such time that effective offal and discard management can be put in place.

- The recommended design specifications for streamer lines are outlined in the Technical Specifications section of this Fact-sheet.
- There are some fisheries where the use of streamer lines is problematic (see Potential problems and solutions).

Potential problems and solutions

The results of experimental trials indicate that streamer lines are the most effective mitigation measure at preventing seabird contacts with trawl warp cables. However, there are certain times when streamer lines can cause problems.

- In some deep-water fisheries there is a danger that nets may become snagged on the seabed and vessels may suddenly go astern to prevent damage to their nets. In these instances, streamer lines can be dragged underwater and become wrapped around the propeller. This destroys the streamer line and could potentially damage the propeller or shaft.
- When hauling, vessels will often go astern to reduce the strain on the winches. For the reasons stated above, it is important to ensure streamer lines are retrieved before hauling.
- Conventional (spherical) buoys are prone to being blown away from the warps in strong crosswinds, rendering them less effective. At times, buoys do not generate sufficient drag to keep the streamer line taught, which also makes them less efficient. To further improve the performance of streamer lines alternative towed objects are needed. Substituting buoys with road cones creates more drag and improves performance. However, the modified lines are more difficult to retrieve and in rough seas the cone has a tendency to jump clear of the water, which could result in tangles with the warp cables (Crofts, 2006).
- Some concern has been raised regarding the impact of contacts between birds and streamer lines (Middleton and Abraham, 2006). The available information suggests the impact is insignificant compared with collisions with trawl warps (Crofts, 2006).

Further research

- The key to warp strike prevention is offal and waste management. Further research is needed to investigate novel means of waste storage or discharging away from the stern of the vessel.
- The development of an effective towed object (replacement for spherical buoys) will improve the performance of streamer lines.
- The effect of streamer line strikes on seabirds should be quantified.

Compliance and implementation

At-sea, monitoring of streamer line use and offal management prescriptions requires fisheries observers, electronic monitoring (e.g. video surveillance), or at-sea surveillance (e.g. patrol boats or aerial over-flights). Additional port inspections will ensure streamer lines are on board and maintained.

Technical Specifications

Streamer lines for demersal trawlers:

- The main line should consist of **50 m of 9 mm** line.
- Streamer lines should be attached at **5 m intervals** and must be long enough to extend beyond the point at which warp and net monitoring cables reach the water's surface. It is recommended that for every metre of block height, 5 m of backbone be deployed
- It is essential that streamers are made from semi-flexible tubing of high visibility. The recommended material is UV-protected fluorescent red polythene tubing and alternatives such as fire hose; old waterproofs and dark coloured tubing are not acceptable.
- To avoid deflection of bird scaring lines away from cables in strong cross winds, the bird scaring lines must tow a buoy or cone attached to the end of line to create tension and keep the line straight. It is recommended that for every metre of block height, 1.2 kg of terminal object drag weight be used.
- The lines should be mounted **two metres outboard** of the trawl blocks on both the port and starboard sides. It may be necessary to weld short extension arms to the handrail in order to achieve this distance.
- Streamer lines should be deployed once the trawl doors are submerged and retrieved as net hauling commences. It is important to retrieve the streamer lines before hauling as vessels often go astern during this process, which can suck the buoys underwater and lead to problems.
- A spare streamer line should be carried and deployed in the event of loss or damage of a line.

References

Abraham, E.R., Pierre, J.P., Middleton, D.A.J., Cleal, J., Walker, N.A. and Waugh, S.M. (2009). Effectiveness of fish waste management strategies in reducing seabird attendance at a trawl vessel. *Fisheries Research,* 95: 210–219.

Abraham, E.R., Middleton, D.A.J., Waugh, S.M., Pierre, J.P. and Walker, N.A. (2008) A fleet scale experimental comparison of devices used for reducing the incidental capture of seabirds on trawl warps. *New Zealand Journal of Marine and Freshwater Research*.

Baird, S.J. and Smith, M.H. (2007) Incidental capture of seabird species in commercial fisheries in New Zealand waters, 2003–2004 and 2004–2005. *New Zealand Aquatic Environment and Biodiversity Report 2007*, pp. 108.

Crofts, S. (2006) *Review of tori lines in Falkland Islands trawl fleet 2006*. Falklands Conservation.

González-Zevallos, D., Yorio, P. and Caille, G. (2007) Seabird mortality at trawler warp cables and a proposed mitigation measure: A case of study in Golfo San Jorge, Patagonia, Argentina. *Biological Conservation*, **136**, 108–116.

Melvin, E., Dietrich, K.S. and Thomas, T. (2004) *Pilot tests of techniques to mitigate seabird interactions with catcher processor vessels in the Bering Sea Pollock trawl fishery, final report*. WSG-AS 05-05. University of Washington, WA. p.12.

Middleton, D.A.J. and Abraham, E.R. (2006) *The efficacy of warp strike mitigation devices, trials in the 2006 squid fishery*. Report to New Zealand Ministry of Fisheries, IPA2006-02.

Prendeville, M. (2007) Don't be warped-trawl for fish, not birds. *Albert Times*, **19**, 1–2.

Reid, T.A. and Edwards, M. (2005) *Consequences of the introduction of Tori Lines in relation to seabird mortality in the Falkland Islands trawl fishery, 2004/05*. Unpublished Falklands Conservation report.

Sullivan, B.J., Reid, T.A. and Bugoni, L. (2006a). Seabird mortality on factory trawlers in the Falkland Islands and beyond. *Biological Conservation*, **131**, 495–504.

Sullivan, B.J., Brickle, P., Reid, T.A., Bone, D.G. and Middleton, D.A.J. (2006b) Mitigation of seabird mortality on factory trawlers: trials of three devices to reduce warp cable strikes. *Polar Biology*, **29**, 745–753.

Watkins, B.P., Petersen, S.L. and Ryan, P.G. (2008) Interactions between seabirds and deep-water hake trawl gear: an assessment of impacts in South African waters. *Animal Conservation*, **11**, 247–254.

* A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Islas Malvinas), South Georgia and the South Sandwich Islands (Islas Georgias del Sur y Islas Sandwich del Sur) and the surrounding maritime areas.

CONTACTS

Rory Crawford , Senior Policy Officer, BirdLife International Marine Programme, The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK. Email: rory.crawford@rspb.org.uk BirdLife UK Reg. Charity No. 1042125

ACAP Secretariat, Agreement on the Conservation of Albatrosses and Petrels, 27 Salamanca Square, Battery Point, Hobart, TAS 7004, Australia. Email: secretariat@acap.aq