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ACAP

Bycatch Mitigation FACT-SHEET 7b (Updated May 2013)

Practical information on seabird bycatch mitigation measures

Pelagic Longline: Streamer lines (vessels <35 m)

Streamer lines are the most commonly prescribed seabird bycatch mitigation measures for longline fisheries. However, recent evidence shows that they are not fully effective unless combined with other mitigation measures. To reduce bycatch to negligible levels they must be used in combination with branch line weighting and night-setting.

What are streamer lines?

A streamer line (also called a tori or bird scaring line) is a line with streamers that is towed from a high point near the stern as baited hooks are deployed (Figure 1). As the vessel moves forward, drag on the line creates an aerial segment (extent) from which streamers are suspended at regular intervals. With streamer lines, the aerial extent is critical when attempting to scare birds away from baited hooks. A towed object is used to create additional drag to maximise the aerial extent. The goal is to maintain the streamer line over the sinking baited hooks in such a way that the streamers prevent seabirds from attacking bait, becoming hooked and subsequently killed.

Effectiveness

Peer reviewed publications of streamer line trials in pelagic fisheries are few and limited in scope. However, studies of streamer lines used on Uruguayan vessels <35 m total length demonstrated that a single streamer line reduced seabird mortality by 88% (Domingo *et al*., 2011). Seabird attacks on baited hooks set from similar vessels in Brazil were reduced by 97% compared to sets in the absence of a single streamer line (Gianuca *et al*., 2011).

A number of non-peer reviewed technical reports on aspects of pelagic streamer lines are available. However, they primarily provide qualitative information and recommended technical specifications are sometimes conflicting.

Seabird Interactions

How different seabird species interact with pelagic longlines is a function of their diving ability as well as their relative size and aggressiveness. Certain species, particularly shearwaters and some petrels, can attack bait at depths of 10 m or more. Albatrosses, in general, make shallower dives – some dive up to 5 m, but around 2 m is most common and great albatrosses are unable to dive.

Unlike demersal longline fisheries, interactions can be primary as well as secondary. An interaction is 'primary' when a bird takes a piece of bait, and in the process can become hooked and drowns. Due to the long (up to 40 m) branch lines unique to pelagic longlining, interactions can also be 'secondary'. In this case, a bird – most typically a diving bird – seizes a piece of bait at depth and is met at the surface by other aggressive seabirds that compete for the bait. This can result in the hooking of a different bird – typically a larger, aggressive bird – such as an albatross. Research suggests that up to 41% of incidental albatross capture has been facilitated by medium sized diving seabird species (Jiménez *et al*., 2012). Due to secondary interactions, effective seabird bycatch mitigation must exclude deep and shallower diving birds to protect the albatrosses. Because slow sinking bait is available to deep diving birds further astern of the vessel, the streamer line aerial extent must extend as far as possible to prevent seabird takes.

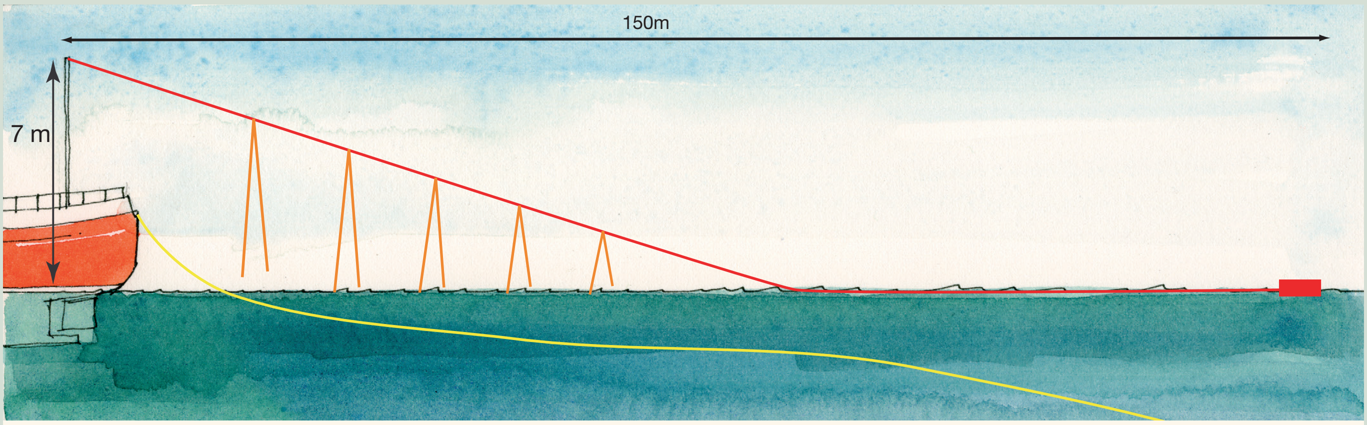

Figure 1. Typical structural and operational features of a streamer line

Environmental variables

Environmental variables, in particular the strength and bearing of the wind relative to the vessel, are important. Crosswinds can render the streamer line ineffective by pushing the streamer line away to port or starboard.

ACAP Best Practice Advice

The key factors affecting the performance of a streamer line are its aerial extent, the position of streamers in relation to sinking baited hooks, and the strength and position of the attachment point to the vessel.

- The aerial extent of streamers is the active deterrent of a streamer line. It acts as a 'scare-crow' keeping birds from reaching baited hooks. Aerial extent is achieved through a combination of the height of the attachment point to the vessel, the drag caused by a towed object or the overall length of the line, and the overall weight of the materials making up the streamer line. Maximizing aerial extent also reduces the chances of tangles with the fishing line (Melvin *et al*., 2010). The aerial extent of a streamer line should protect baited hooks until they sink beyond the access of both shallow and deeper diving birds (~10 m). Without weighted branch lines this distance has been shown to be well beyond a reasonably achievable aerial extent (Melvin *et al*., 2010). For this reason it is critical that branch lines are appropriately weighted to sink within the aerial extent because this is the critical section that protects against seabird attacks.
- A single streamer line must be placed to leeward of baited hooks to prevent entanglements with branch lines. In crosswinds, the attachment point and backbone of the streamer lines should be adjusted to leeward in such a way that foraging birds, which typically approach from windward, are deterred from attacking baited hooks as they sink. A single bird-scaring line using either long and short streamers, or short streamers only, has been found effective on vessels under 35 m total length (Domingo *et al*., 2011; Gianuca *et al*., 2011).
- The attachment point to the vessel must be strong and should be adjustable. It must support the drag necessary to create an aerial extent of 75 m or more. It also must be able to withstand the sudden tension should a float or debris foul on a streamer line. Davits, that can position a pole and streamer line outboard of the baited hook delivery point, are essential to effective use of streamer lines in situations where baited hooks are delivered outside the wake.
- Streamers should be a bright colour, such as safety orange or fluorescent green and made of lightweight materials.

Potential problems and solutions

Streamer lines are very effective at reducing seabird mortality, but can be challenging to use in the context of pelagic longline fishing. In general, pelagic longlines are set at faster vessel speeds and hooks sink slower than in demersal longline fishing. These factors extend the distance at which baited hooks sink beyond the reach of seabirds, thus creating a longer distance astern that needs to be protected.

Surface floats, unique to pelagic longlines, can foul on streamer lines making some fishermen reluctant to deploy them properly, or to use them at all. Fouling events can hinder the fishing operation, pose danger to the crew, and increase seabird bycatch. These events usually occur when floats catch on the towed object (on the streamer line), but they can also occur when a swell throws a float and line over the streamer line backbone when no towed device is used. It is essential to find a solution to this problem. First and foremost, the crew should develop a plan to deploy floats in such a way that the likelihood of them fouling with the streamer lines is minimised by giving consideration to current, wind and position of the streamer line.

Combinations of measures

Streamer lines are only fully effective when used in combination with other mitigation measures, specifically:

- Line weighting (Fact-sheet 8)
- Night-setting (Fact-sheet 5).

Further research

- Research is needed to develop strategies that minimise or eliminate streamer line fouling with surface buoys – the major obstacle to their use. Currently research is underway to develop a towed device that creates adequate drag but eliminates gear entanglements. Additionally, a stiffer, hard-lay buoy line is being developed so that surface buoys can slide clear of streamer lines without fouling when they are in contact.
- Definitive tests of competing streamer line designs are needed to determine a best practice streamer line design for pelagic fisheries. Optimal streamer and backbone lengths, materials and configurations must be determined.
- Strong and adjustable davits and tori poles are needed to achieve the necessary aerial extent, and to position streamer lines effectively under the many physical conditions that can occur at sea.

Compliance and implementation

- The use of streamer lines is widely accepted as a seabird bycatch mitigation measure in most longline fisheries. Streamer lines should be inspected to ensure they conform to requirements before a vessel leaves port. At-sea, the use of streamer lines can only be monitored by onboard observers or through aerial reconnaissance.
- Inadequate streamer line design and deployment can lead to poor compliance and/or deploying streamer lines in such a way that they are ineffective.

Technical Specifications

A fusion of Alaskan and Japanese concepts, the streamer line includes two sections: a 'protection section' and a 'drag section'. The aerial extent is the distance that baited hooks sink beyond 10 m – the presumed depth beyond which birds cannot access baits. The backbone of the aerial extent section is a 3.0 mm monofilament line and the drag section is a 4.0 mm multifilament line. A breakaway section of 2.0 mm monofilament line separates the backbone from the towed device. Streamers are attached along the aerial extent at 1 or 2 m intervals. Rigid straps are attached to the towed device to create sufficient drag to achieve the necessary aerial extent and disturb the water to deter birds. The drag section can be composed of different elements and includes breakaways to protect the expensive and important 'protection' section from loss due to fouling on surface floats.

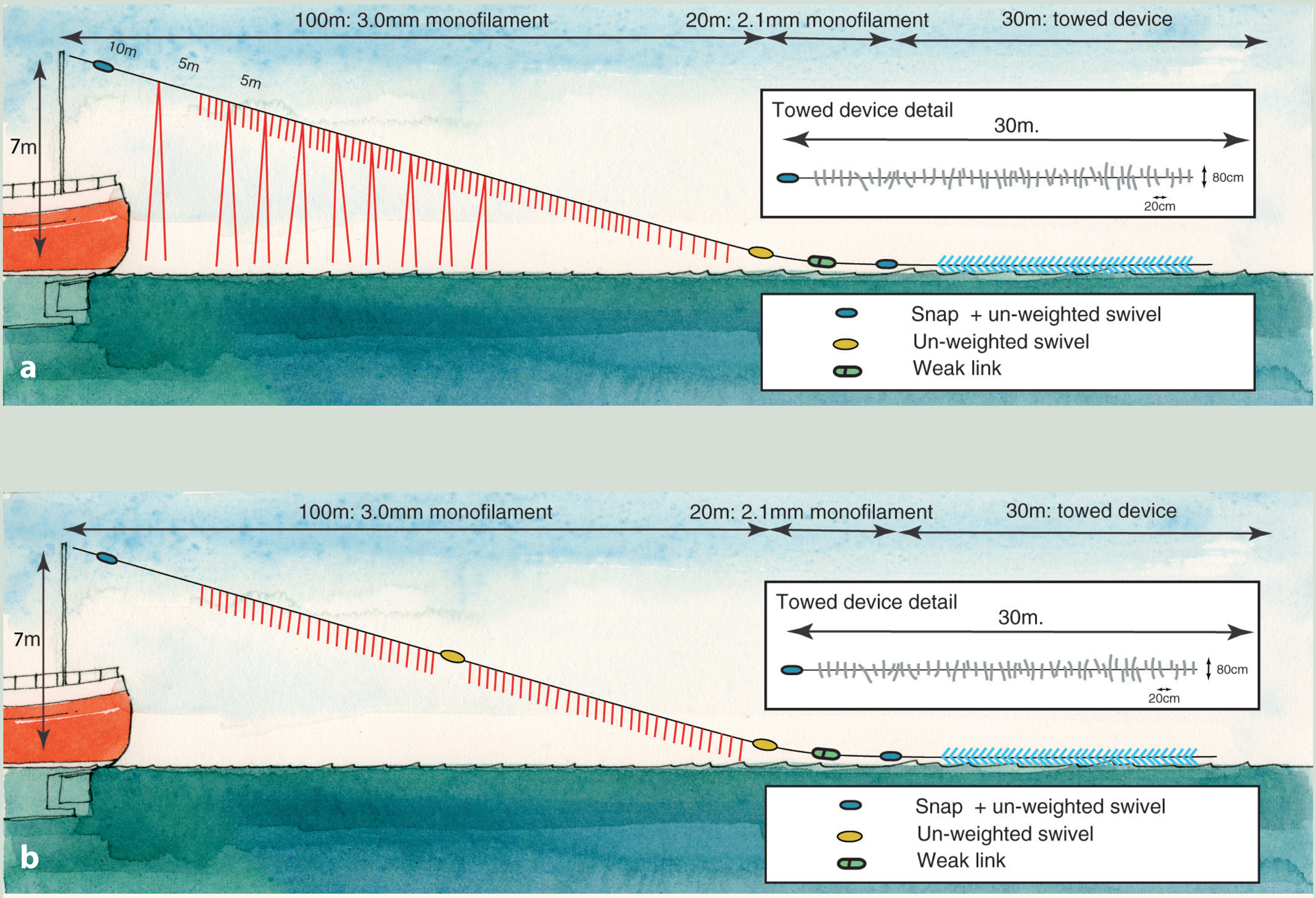

Figure 2. Examples of optimal streamer lines for pelagic longline fisheries (designs taken from (a) Gianuca *et al*., 2011 and (b) Domingo *et al*., 2011).

The recommended best-practice streamer line for pelagic longline fishing is:

- Spare streamer lines should be carried onboard the vessel to be deployed in the event of lost or broken streamer lines.
- Streamer lines should be examined regularly and maintained as necessary.
- Streamer lines should be deployed before the first hook enters the water and retrieved after the last hook has been set.
- **The streamer total length: 150 m;** the 'protection section' should be a light weight high tensile strength line 3 to 4 mm in diameter while the 'drag section' should be a heavier and lower tensile strength line with breakaways.
- Vessel attachment height: > **7 m above the sea surface.**
- **Minimum aerial extent: 75 m,** or the distance that baited hooks sink beyond a depth of 10 m – the presumed depth beyond which birds cannot access bait.
- Streamers: each streamer should be constructed from lightweight, brightly coloured material and should start at a minimum of 10 m from the stern. Two designs have been shown to be effective: a mixed design that includes short streamers spaced 1m apart along the streamer line backbone and long streamers placed at 5m intervals over the first 55m of the bird scaring line (Figure 2a) and a design that does not include long streamers (Figure 2b).
- Swivels positioned at the attachment point to the vessel and the towed object help to avoid twisting and wear. These can also incorporate breakaway points, in the event of snags with the hook line.
- Lightweight swivels or light line should be used to attach streamers to the backbone of the streamer line as they reduce the frequency of streamers tangling around it.
- The vessel attachment point should be strong – able to withstand the drag of a towed device and withstand surface floats fouling on streamer lines – and adjustable to allow positioning of streamer lines leeward of where baited hooks land in the water.

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