Bycatch Mitigation FACT-SHEET 7a (Updated September 2014)

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 branchline 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

The effectiveness of streamer lines in demersal longline fisheries has been proven in definitive research conducted by Melvin et al, 2004; Lokkeborg, 2008. More recent research has also proven their effectiveness in pelagic longline fisheries (Melvin *et al.*, 2010; Melvin *et al.*, 2014).

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 drown. Due to the long (up to 35 m) branchlines 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 scrum can result in the hooking of a different bird – typically a larger, aggressive bird – such as an albatross. Due to secondary interactions, effective seabird bycatch mitigation must exclude deep *and* shallower diving birds to protect the albatrosses. Because slow sinking bait are available to deep diving birds further astern of the vessel, the streamer line aerial extent must extend as far as 150 m to prevent seabird takes.

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 from its desired position over the baited hooks and large swells can increase the chance of surface floats fouling on a streamer line.

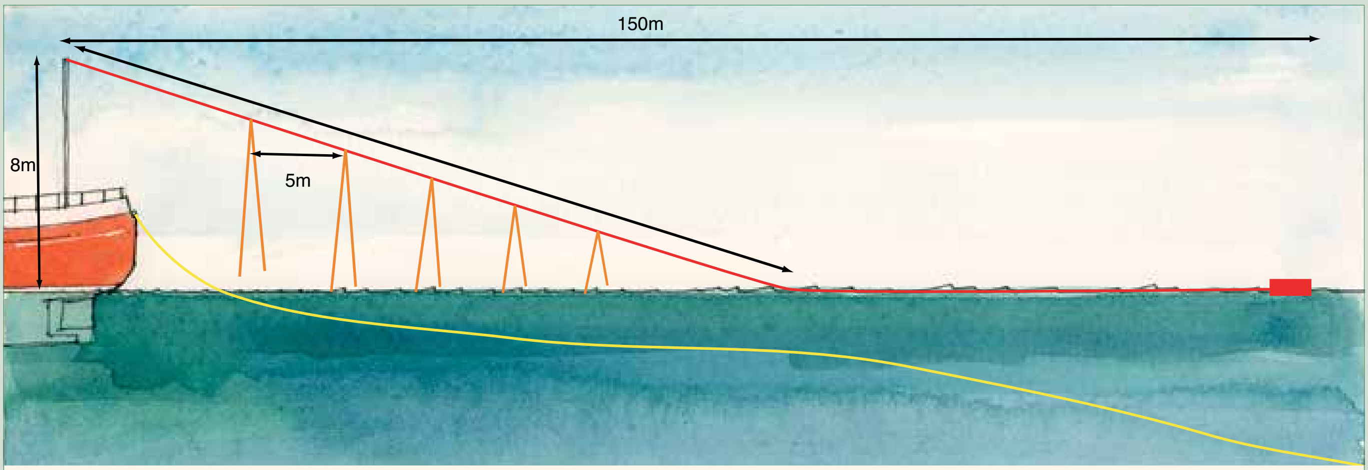

Figure 1. Typical structural and operational features of a streamer line.

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. Maximising 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 branchlines 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 branchlines are appropriately weighted to sink within the aerial extent because this is the critical section that protects against seabird attacks.
- The use of two bird scaring lines is considered best practice. Bird scaring lines with the appropriate aerial extent can be more easily rigged on large vessels. Two bird scaring lines are considered to provide better protection of baited hooks in crosswinds (Melvin et al. 2004; Melvin et al. 2014). Hybrid bird scaring lines (with long and short streamers) were found to be more effective than short bird scaring lines (only short streamers) in deterring diving seabirds (White-chinned petrels) (Melvin et al. 2010; Melvin et al. 2011). Two or more streamer lines placed on either side of the water entry point of baited hooks will protect them in all wind conditions.
- If a single streamer line is being used (not recommended best practice), it must be placed directly above, or to windward, of baited hooks to be effective. In crosswinds, the attachment point and backbone of the streamer lines should be adjusted to windward in such a way that individual streamers extend over baited hooks as they sink.
- In high seas pelagic longline fisheries, bait-casting machines are commonly used. They serve to uncoil the latter 10 m of long branchlines and deliver each baited hook beyond the wake where, if cast properly, they sink faster. In order to protect bait from bird attacks, baited hooks must either land beneath streamers or between the wake and the streamers of the streamer line. If two streamer lines are used, baited hooks should land between them. Failure to align streamer lines with bait tossed via a bait-casting machine can have devastating results (Melvin and Walker, 2008).
- 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 100 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, as with casting machines.
- Streamers should be a bright colour, such as safety orange or fluorescent green, and should extend from the backbone of the streamer line to the water in the absence of wind or swell, as recommended by CCAMLR. Yokota *et al.* (2008) report that Japanese fishermen prefer 'light' streamer lines with short streamers (1 m or less). Their research conducted in the North Pacific indicated that light lines may be more effective in reducing bait-take by Laysan albatrosses than conventional streamer lines. It is difficult to interpret and compare bycatch rates reported in this study with other studies, as estimates presented by Yokota *et al.* (2008) were adjusted to account for seabird abundance, rather than being presented in birds/1000 hooks, which is a recognised standard measure. For this reason, further evidence in support of the efficacy of light streamer lines is required.

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. Preliminary research has found that using rigid strap* material tied into the backbone at high density (more than ten 1-m strips per metre for 30–40 m) can minimise the chance of entanglement, while providing sufficient drag to achieve aerial extent of >100 m (Melvin *et al.,* 2009).

Streamer line entanglements are potentially increased if attachment points on davits (tori poles) are insufficiently outboard of vessels. To maximise aerial extent, streamer lines should be attached to the vessel such that they are suspended from a point of at least 8 m above the water at the stern.

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 methods that minimise or eliminate streamer line fouling with the 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.
- Further research is required to evaluate the effectiveness of 1 versus 2 streamer lines
- Methods for the efficient retrieval and stowage of streamer lines need to be developed

* The use of non-biodegradable packing straps is prohibited in some waters and its use is not considered best practice.

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 to fish. At-sea, monitoring of streamer line use requires fisheries observers, electronic monitoring (e.g. video surveillance), or at-sea surveillance (e.g. patrol boats or aerial over-flights).
- 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 light, high-tensile strength line and the drag section is a lower tensile strength line with breakaways. The orange tubing streamers are alternated along the aerial extent at 5 m intervals where the backbone is 1 m or more from the water. A variety of bold coloured (orange and fluorescent green) rigid straps are attached to the remaining aerial extent of the backbone where it is <1 m from the surface. The drag section creates drag to achieve the necessary aerial extent and disturbs 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.

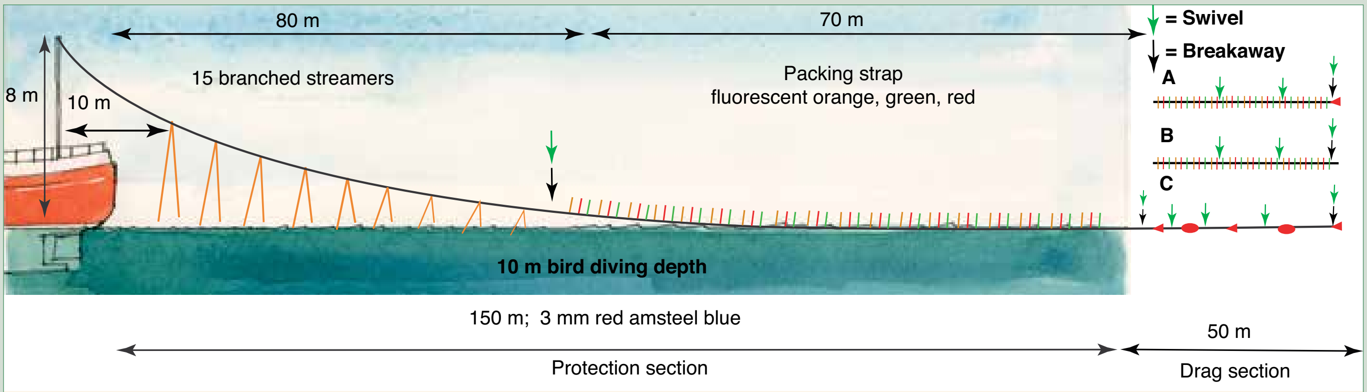

Figure 2. Proposed optimal streamer line for pelagic longline fisheries (design taken from Melvin *et al*., 2009).

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

- 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: 200 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: **>8 m above the sea surface**.
- **Minimum aerial extent: 100 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, UV protected rubber tubing and **spaced less than 5 m apart** along the streamer line backbone, and start at a minimum of 10 m from the stern.
- There should be at least 15 clip-on streamers per streamer line; the remaining length of the aerial extent should have strips of tubing or rigid strap material tied into the line at similar intervals.
- A mix of long and short streamers should be used – long streamers should be **long enough to reach the sea surface** in calm conditions.
- 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 an towed device and withstand surface floats fouling on streamer lines – and adjustable to allow positioning of streamer lines windward of where baited hooks land in the water.
- Streamer lines should be deployed in pairs, one on each side of baited hooks, during line setting.
- Baitcasting machines shall be adjusted so as to land baited hooks within the area bounded by streamer lines
- 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.

Thanks to Dr Ed Melvin (Washington Sea Grant) for his contributions to the content of this Fact-sheet.

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