

Bycatch Mitigation FACT-SHEET 7 (Version 1)

Practical information on seabird bycatch mitigation measures

Pelagic Longline: Streamer lines

Streamer lines are the most commonly prescribed seabird bycatch mitigation measures for longline fisheries and one of the most effective (a primary measure). Streamer lines were an innovation of Japanese tuna fishermen to prevent bait loss to birds. They are inexpensive, simple and require no modification to fishing gear.

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. Currently, the most proven and recommended streamer line is the one prescribed by the Commission for the Conservation of Antarctic Marine Living Resources (SC-CAMLR, 2006) and used in Alaskan demersal longline fisheries. Streamer line designs for pelagic longline fisheries are being developed and tested, but until those tests are complete the CCAMLR streamer line design is recommended.

Effectiveness

Definitive trials on the effectiveness of streamer lines come from research in demersal longline fisheries (Melvin *et al.*, 2004; Løkkeborg, 2008). Peer reviewed publications of streamer line trials in pelagic fisheries are few and limited in scope.

- Brothers (1991), looking at seabird behaviour with and without a tori line over several days, suggested that one streamer line

could reduce bait loss by roughly 69%. The scope of the trial (i.e. number of hooks observed with and without a streamer line) is unclear.

- Boggs (2001) reported a 70% reduction in albatross contacts with baits using one streamer line, compared to a control of no deterrent, during trials conducted on a research vessel. However, the streamer line aerial extent was only 40 m, far short of recommended standards today.

A number of non-peer reviewed technical reports on aspects of pelagic streamer lines are available; however, they provide primarily 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 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.

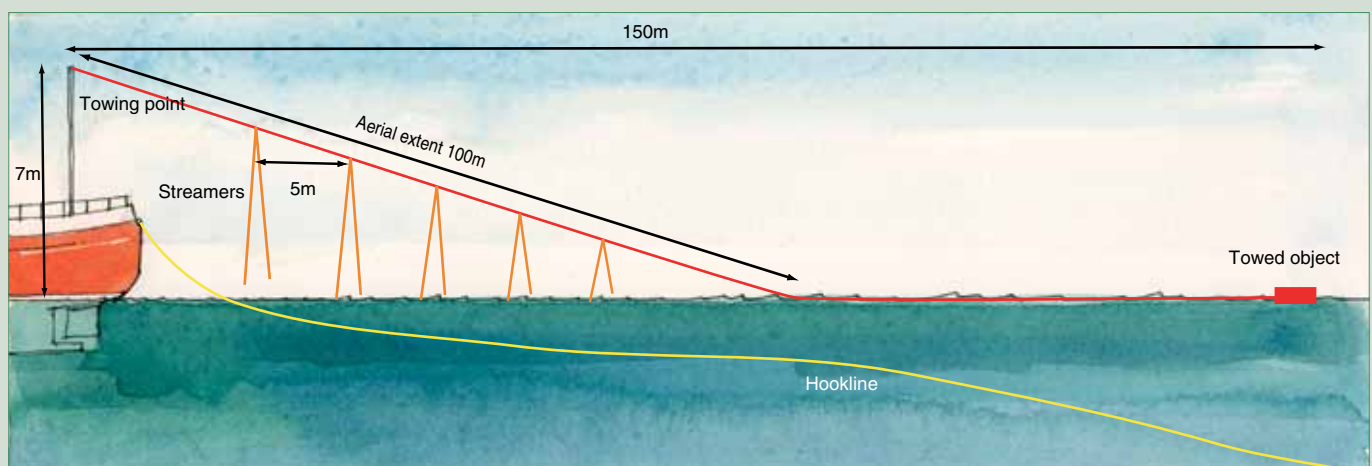


Figure 1. Streamer line prescribed by CCAMLR Conservation Measure 25-02 for demersal longline fisheries.

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.

Best practice recommendation

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.*, 2004). 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 is likely to be well beyond 100 m. For this reason weighted branchlines and streamer lines are a very effective combination of mitigation measures.
- A single streamer line 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. Two or more streamer lines placed on either side of the water entry point of baited hooks will protect them in all wind conditions.
- 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 coastal fishermen prefer 'light' streamer lines with short streamers (1 m or less); however, the seabird bycatch rates reported in this research were extremely high for the light and conventional streamer line designs tested, suggesting that neither was well designed or effective. Strong support for the use of 'conventional' streamer lines – streamers that extend to the water – comes from their effective use in both CCAMLR and Alaskan demersal longline fisheries and from other research (Løkkeborg, 2008).

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 packing 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).

Combinations of measures

Streamer lines are regarded as a primary mitigation measure. That is, when used alone they significantly reduce seabird bycatch. However, they work even more effectively when used in combination with other mitigation measures including:

- **Line weighting** (Fact-sheet 8)
- **Night-setting** (Fact-sheet 5)
- **Offal management** (Fact-sheet 12).

Further research

- 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.
- Research is needed to develop strategies that minimise or eliminate streamer line fouling – the major obstacle to their voluntary use. Ongoing research is attempting to develop a towed device that will position the end of a streamer line outside the wake, where fouling with surface gear is less likely.

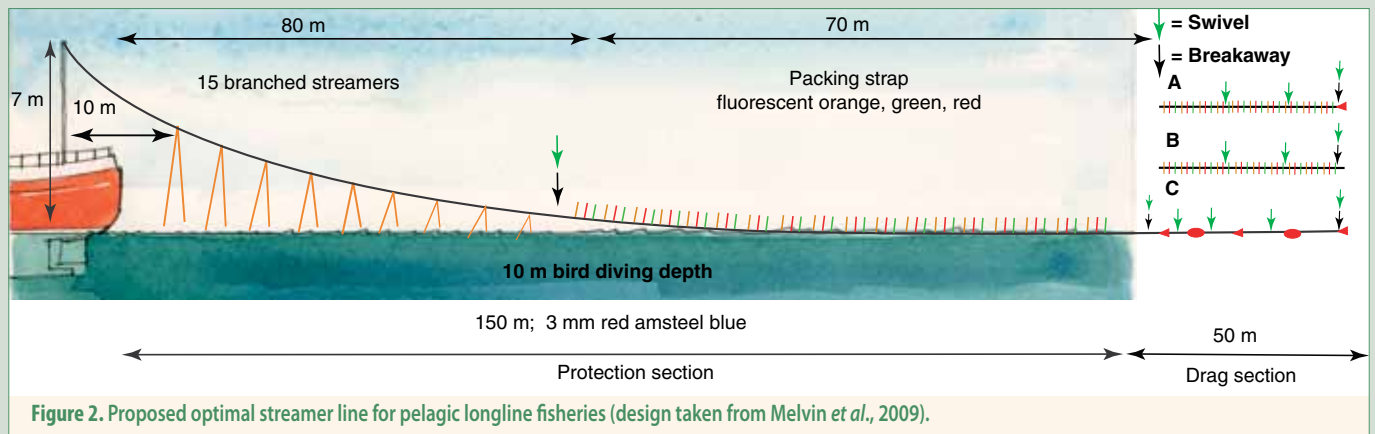
Compliance and implementation

- 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, 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 light, high-tensile strength line and the drag section is a lower tensile strength line with breakaways. The orange tubing and streamers are alternated along the aerial extent and 5 m intervals where the

backbone is 1 m or more from the water. A variety of bold coloured (orange and fluorescent green) packing 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.



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: **>7 m above the sea surface.**
- **Minimum aerial extent: 100 to 150 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 packing strap material tied into the line at similar intervals.
- 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.

- 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.

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References

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Environmental Issues

The primary research discussed in this Fact-sheet used package strapping as an integral part of the towed device. Given concerns about potential marine debris related issues, researchers are currently investigating biodegradable alternatives, which will ensure best practice mitigation incorporates wider marine conservation issues.