

Bycatch Mitigation FACT-SHEET 14 (Version 1)

Practical information on seabird bycatch mitigation measures

Trawl Fisheries: Net entanglement

In recent years, dedicated seabird observers on trawl vessels have identified significant bycatch problems. These fall into two categories, collisions with the cables used to tow the net (Warp strike, Fact-sheet 13) and net entanglement.

What is net entanglement?

Net entanglement occurs when trawl nets are at, or close to, the surface during shooting and hauling. Birds attempting to seize fish from the net become entangled and drown if caught during shooting and can be drowned or crushed during hauling. Many birds caught during hauling are brought aboard the vessel alive. Entanglement is generally a far greater problem in pelagic rather than demersal trawl fisheries, due to the greater overall size of nets and large mesh size used in pelagic fisheries.

Net entanglement has been recorded in some demersal trawl fisheries but seems to only be a problem for certain species (e.g. Cape gannets in South Africa, Watkins *et al.*, 2008). Observations in the Falkland Islands (Islas Malvinas), where albatrosses and large petrels predominate, indicate net entanglement in demersal trawl fisheries was not a significant problem (Sullivan *et al.*, 2006). However, under certain conditions, such as when the net is ripped or bursts, demersal trawl nets can catch large numbers of birds.

What causes net entanglement?

Net entanglement occurs when the net is floating slack on the surface for prolonged periods. Vessel design (deck length) and the winch gear (net drum) onboard will affect the speed with which nets can be hauled aboard. Several additional factors can prolong the time the net is on the surface. These include; winch gear failure, fishing strategy (some vessels will haul the net to the surface in order to turn, others align the net on the surface before paying out the warps) and in poor weather several attempts may be required to shoot the net.

Species impacted

Any species that associates with trawlers is potentially vulnerable to becoming caught in pelagic trawl nets. Diving species, such as white-chinned petrels, gannets and shearwaters appear to be particularly vulnerable, but albatrosses can also be impacted.

Mitigation measures

Mitigation measures should attempt to reduce the attractiveness of the net to foraging birds and limit the time that the net is on the surface. Most of the measures listed below have not undergone rigorous trials to determine how effective they are at reducing seabird bycatch.

Net shooting mitigation

Net cleaning

Prior to shooting, all stickers (fish caught in the meshes of the net) should be removed. This reduces the attractiveness of the net to seabirds during shooting operations by removing the source of food. Observations indicate this is an effective measure (Hooper *et al.*, 2003), although the effectiveness of net cleaning has not been quantified.

Offal management

Prohibiting the discharge of offal and discards prior to, and during, net shooting and hauling reduces the number of birds associated with vessels at this critical time.

Net binding

In pelagic fisheries, prior to setting, the net (where mesh size are 150–800 mm) should be bound with 3-ply sisal string (or similar) with a breaking strength of 110 kg. This prevents the mesh opening on the surface, increasing the density of the net and reducing the time the net is on the surface. Once the trawl doors are in the water, the net is forced open and the string breaks (Sullivan *et al.*, 2004). Fishermen regard net binding as cheap and simple (Roe, 2005) but further trials are needed to determine its effectiveness in isolation. However, evidence collected in recent years led to CCAMLR making net binding mandatory in the South Georgia icefish trawl fishery.

Net weighting

Adding weight to the belly of the net increases the rate and angle at which the net sinks during shooting and increases the angle it ascends at during hauling.

Deck lighting

Deck lighting should be directed inboard and kept to the minimum level necessary for the safety of the crew.



Figure 1. Net binding reduces the amount of time the net is on the surface.

Haul mitigation

Streamer lines

It has been suggested that streamer lines could be used to deter birds from interacting with the net. Roe (2005) found that the lack of forward momentum and the distance astern of the net on the water surface made streamer lines ineffective during net hauling. At present, the use of streamer lines to prevent net entanglement during hauling in trawl fisheries is not recommended as a mitigation measure.

Reduce mesh size

Birds are prone to becoming caught in mesh sizes greater than 150 mm. Limited trials of pelagic nets with reduced mesh size or with 'jackets' that cover the largest mesh have proved impractical (Roe, 2005). The added drag puts strain on the gear and engine resulting in higher fuel consumption, gear and mechanical breakdown.

Attempts to reduce the amount of undersized fish catch or bycatch often use mesh size, especially in the upper panels as a mechanism. It would therefore appear that mesh size, as a primary mechanism to reduce seabird bycatch may lead to complex side effects and is currently not known to be effective.

Operational measures (good deck practices)

Periods when the net is on the surface and slack/lofting should be avoided. By maintaining tension in the net, even when at the surface, the meshes remain closed and the likelihood of catching birds is reduced. Once a net reaches the surface, it should be hauled aboard as quickly as possible.

Removing caught birds

Birds caught during hauling are often brought aboard the vessel alive. Care is needed to remove these birds without causing injury. Waterlogged birds should be kept in a dry place (cardboard box) to allow the bird's feathers to dry and be reconditioned prior to release.

Best practice recommendation

- Discards and factory waste should not be discharged prior to or during setting and hauling. Minimising the number of birds associated with the fishing vessel will help to reduce the bycatch due to net entanglement.
- A combination of net cleaning prior to shooting and a means of increasing the sink rate of the net (net binding is the most promising) are required to minimise seabird mortality during net shooting. For reference, the guidelines issued to pelagic trawl fisheries in Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) waters can be found in the Technical Specifications section of this Fact-sheet.
- Net entanglement becomes a major problem when the net lies slack on the surface for extended periods. Minimising this time through good operational practice is essential. This is particularly important during net hauling, when the rapid retrieval of the net is the key to minimising seabird bycatch.
- Care should be taken to remove birds caught in the net without causing injury. Waterlogged birds should be given time to recover onboard before being released.

Further research

The range of mitigation measures available to prevent net entanglement is limited and most have not been tested

quantitatively. There is a real need to look for new innovative ways of solving the problem of net entanglement in trawl fisheries, particularly during hauling operations.

- Net binding has shown great promise, however, further trials are needed to determine the effectiveness of this measure in isolation.
- Further research is needed to better understand the causes of bird entanglement during net hauling and develop mitigation measures that prevent it.

Compliance and implementation

Most of the measures recommended here can only be monitored if an onboard observer is present during the shooting and hauling of the net. This makes compliance monitoring very labour intensive and reliant on high observer coverage.

Technical Specifications

Net mitigation

These specifications follow SC-CAMLR guidance on net binding for icefish trawlers operating in the Convention Area (SC-CAMLR 2006).

Net binding

- When the net is on the deck, prior to shooting, the application of 3-ply sisal string (which typically has a breaking strength of around 110 kg), or a similar organic material, at intervals of approximately 5 m prevents the net from spreading and lofting at the surface. Net binding should be applied to mesh ranging from 120–800 mm. These mesh sizes have been shown to cause the majority of entanglements for white-chinned petrels and black-browed albatrosses, which are the most vulnerable species to this form of mortality in the South Atlantic CCAMLR fishery area, Subarea 48.3.
- When applying the 'string', tie an end to the net prevent the string from slipping down the net and ensure that it can be removed when the net is hauled.

Net weighting

- Added weights to the cod end should be used in conjunction with net binding to increase the sink rate of the net and increase the angle of the net's ascent during hauling, therefore reducing surface net time.

Net cleaning

- Net cleaning should be used in conjunction with added weight and net binding to reduce seabird captures during shooting operations.

References

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