Bycatch Mitigation FACT-SHEET 6 (Updated September 2014)

Practical information on seabird bycatch mitigation measures

Demersal Longline: Underwater setting chute

Seabirds are at greatest risk of becoming hooked and drowned when baited hooks are at, or within a few metres of, the surface. In theory, setting hooks below the surface of the water should greatly reduce the likelihood of catching seabirds. It should be noted that this is currently a secondary measure, as underwater setting cannot be used in isolation to reduce seabird bycatch.

What is underwater setting?

Underwater setting is a means of deploying hooks below the sea's surface and therefore out of the reach and sight of foraging seabirds. This has traditionally been achieved by setting through a tube (termed a 'chute' in demersal fisheries) attached to the stern of the vessel that opens 1–2 metres below the surface. These setting chutes have been developed for use with the single line Autoline system and are commercially produced by Mustad and Sons, a Norwegian gear manufacturer (www.mustad-autoline.com/produkter/deepsea/settingtube_eng.php). Despite some experimentation, underwater setting chutes have not been successfully developed for the Spanish (double line) system.

Effectiveness at reducing seabird mortality

The Mustad chute was developed to improve fishing efficiency in the North Atlantic by reducing the number of baits taken by foraging seabirds. The potential to reduce seabird bycatch rates is of greater relevance to demersal fisheries elsewhere.

- Trials in Norway have shown that the use of a setting chute significantly reduces bycatch of Northern Fulmars when compared with standard fishing practices (from 1.75 to 0.49 birds per 1,000 hooks, Løkkeborg, 1998). Although this is a large reduction, the use of streamer lines in the same trial caught significantly less birds (0.04 birds per 1,000 hooks).
- Melvin *et al.* (2001) conducted experimental tests in the Alaskan demersal cod fishery and found bycatch was reduced by 79% compared with a control of no mitigation measures. Like Norway, most of the Alaskan bycatch was Northern Fulmars; a surface feeding species.
- Extensive trials in the Patagonian toothfish fishery around Prince Edward Islands, Southern Ocean, produced encouraging results in the presence of albatrosses and petrels. When used with a suite of other mitigation measures, the addition of a setting chute reduced bycatch threefold. Bycatch rates recorded during day-time sets with the chute were lower than night-time sets without the chute. However, bycatch was not completely eliminated (Ryan and Watkins, 2002). Like many mitigation measures, environmental and operational factors influence the effectiveness of setting chutes.

Environmental

In heavy seas, the pitching of a vessel can raise the end of the chute clear of the water's surface, making it less effective.

Operational

- The trim of the vessel affects the depth of the chute opening. As a trip progresses, bait are typically removed from the hold at the stern of the vessel and catch is added to the forward and middle holds, while fuel loads are reduced. Thus, the stern of the vessel is raised, decreasing the depth of the chute opening.
- Setting chutes are positioned in such a way that baited hooks emerge into the turbulence created by the propeller wash, which retards the line sink rate and can take baited hooks back

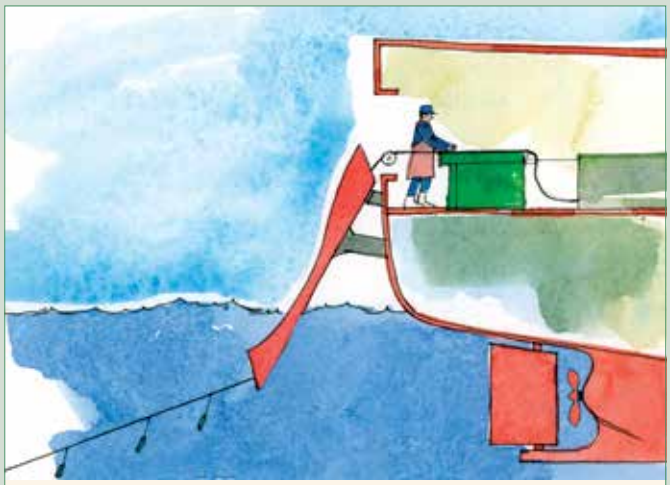

Figure 1. Diagram of the setting chute in use.

Figure 2. In rough weather, the setting chute becomes less effective.

to the surface. Melvin *et al*. (2001) report that hooks deployed 1 m below the surface would appear at the surface 40–60 m astern of the vessel, probably due to propeller turbulence.
- Considerable time, possibly an entire fishing season, is needed for crew to become accustomed to using a setting chute. This may have implications for the results of experimental trials.
- Melvin *et al.* (2001) estimate that in 10% of setting operations, the line jumps out of the slot that runs down the length of the chute, rendering the chute useless.

Recommendations for deployment

The current setting chute design appears to have limited potential to reduce seabird bycatch rates to acceptable levels when used in isolation (a secondary measure). However, when used in combination with a suite of other measures, setting chutes could play an important role in reducing seabird bycatch. In particular, further trials are required to determine whether the use of a setting chute could allow daytime setting in high latitude fisheries without increasing the risk of seabird bycatch. Daytime setting would result in greater fishing efficiency where the hours of darkness are limited.

Problems and solutions

Despite some encouraging trials, for several reasons setting chutes are not widely used in commercial fisheries.
- The chute purchase and installation costs are considerable (approximately US$20,000).
- Bait loss and wear on fishing lines due to abrasion can be high, resulting in significant costs.
- The chute is an add-on attachment to the vessel and is exposed to considerable stresses and strains. Manufacturing a device that can cope with prolonged use in all weather conditions is challenging.
- Despite some trials, a satisfactory design for use with the Spanish (double line) System (see Fact-sheet 2 for more details) has yet to be devised.

Combinations of measures

As a secondary mitigation measure, setting chutes should always be used in combination with other mitigation measures . Underwater setting is most effective when used in combination with:
- ***Streamer lines*** (Fact-sheet 1)
- ***Integrated weight longlines*** (Fact-sheet 3)
- ***Night-setting*** (Fact-sheet 5).

Future research

Intuitively, underwater setting has a part to play in seabird bycatch mitigation but there are certain technical issues that require further research.
- At best, current designs deliver hooks 1–2 metres below the surface, in heavy swell or under certain vessel trim the end of the chute may break the surface. Increasing the depth of the chute would improve its performance but also reduce its ability to resist mechanical stress.
- Previous trials of underwater setting chutes have used line-weighting regimes (for example 8–12 kg per 600 m in Ryan and Watkins, 2002) that have proved to be inadequate. The recent innovation of integrated weight lines have greatly improved line sink rates and are being adopted in demersal longline fisheries where seabird bycatch is a problem. The combined use of integrated weight lines and underwater setting chutes to further reduce bycatch (potentially allowing daytime setting) merits further investigation.
- The addition of an underwater setting chute on a vessel is retrospective and its location is determined by the pre-existing position of the setting hatch. This results in baited hooks emerging into the turbulence created by the propeller wash, which generally retards the line sink rate and can bring hooks back to the surface. To increase the effectiveness of underwater setting, chutes should be positioned to release hooks outside the influence of propeller wash. Alternatively, vessel architects should consider how to incorporate setting chutes into the fabric of the vessel.

Compliance and implementation

On-board monitoring, such as full-time observer coverage, electronic monitoring or at-sea inspection is recommended to monitor implementation.

References

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