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Review of Seabird Bycatch Mitigation Measures for Pelagic Longline Fishing Operations

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Abstract

Since the last meeting of the WCPFC Scientific Committee a considerable amount of research has been undertaken on seabird bycatch mitigation measures for pelagic longline fishing operations. Evidence is emerging that the use of appropriate configurations of weights on branchlines is currently the most effective means of reducing seabird access to baits, although it still needs to be used in conjunction with other measures, such as tori lines and night setting. The results of this research have been reviewed by ACAP's Seabird Bycatch Working Group (SBWG) and a summary of key findings are provided to assist WCPFC SC6 in its consideration of the efficacy of seabird bycatch mitigation measures currently in use within the WCPFC convention area, in accordance with WCPFC Conservation and Management Measure 2007-04.

Introduction

Recent research has highlighted the importance of preventing seabird access to baited hooks through use of measures such as branchline weighting, tori lines, night setting and underwater setting chutes. The results of this research were reviewed in 2010 by ACAP's Seabird Bycatch Working Group (SBWG 2010). Evidence is emerging that the use of appropriate configurations of weights on branchlines is currently the most effective means of reducing seabird access to baits, although it still needs to be used in conjunction with other measures, such as tori lines and night setting. Research is continuing to improve our knowledge of the most effective line-weighting regimes.

There are currently eight seabird bycatch mitigation measures specified in WCPFC CMM 2007-04. Since WCPFC-SC5 research has been undertaken on four of these: weighted branchlines, tori lines, night setting and deep setting line shooters. A summary of these research findings follows.

Weighted branch lines

Two studies examined the effects of adding weights to branchlines, *Shrink and defend: a comparison of two streamer line designs in the 2009 South Africa tuna fishery* (Melvin et al. 2010), and *Experimental determinations of factors affecting the sink rates of baited hooks to minimise seabird mortality in pelagic longline fisheries* (Robertson et al. 2010a).

The Melvin research, conducted with the support of the Japan Tuna Fisheries Cooperative Association, found that in order to defend baited hooks with streamer lines from bird depredation (and in particular white-chinned petrels), the distance at which baits sink beyond the birds' reach (ca. 10 m) must be within the aerial extent of the streamer line. Branchlines with 60 g weights attached 60 – 70 cm from the hook sank fastest and with the least variation to all target depths (2 m, 5 m and 10 m) and reduced the distance at which birds have access to baits to just less than 100 m – the target aerial extent of tori lines and 1/3 that of unweighted lines (307 m). The research found that branchline weighting had no effect on catch rates of target fish (tuna and swordfish). Further research . This result may not be definitive due to the relatively small sample sizes and the short duration of the test. Further research utilising larger sample sizes over a longer duration should be conducted to confirm these findings.

The research conducted by Robertson on sink rates of baited hooks found that there were no detectable differences in sink rates between different species of bait within the same bait life status(alive/dead), but that on average, live bait sank much slower than dead bait, greatly increasing the exposure of baited hooks to seabirds. In relation to the sink rate of hooks baited with dead bait, the study found that a 160 g weight placed 2 m from the hook sank the fastest, averaging 0.27 m/s and 0.74 m/s from 0-2 m and 4-6 m depths, respectively.

Results from Robertson and collaborators indicate that in order to achieve sink rates sufficient to ensure that dead baits reach depths of 10 m within 100 m of their deployment (and therefore under protection of the tori lines) would require:

- 40 g weight attached at the hook;
- 60 g weight attached within 1m of the hook; or
- 98 g weight attached within 2m of the hook.

It should be stressed that these are minimum specifications, and increasing weight or decreasing distance from the hook would further improve sink rates.

Tori/streamer lines

The Melvin study undertook a comparison of a hybrid tori line (with long and short streamers) with a light tori line (only short streamers). The research found that there were no statistically significant differences in seabird mortality rates, overall seabird attack rates on baited hooks, and measures of attack rate by distance between the two types of lines. However, there were substantial and important differences in the performance of these lines that were not detected using statistical approaches and further research will be undertaken this year to quantify them.

The research found that when streamer lines are deployed, most seabird attacks occur beyond their aerial extent. The research also found that baits on unweighted branchlines were still accessible to White-chinned Petrels (WCPE) beyond 100 m astern and that it was in this area that most albatross mortality occurred, as a function of secondary attacks on baits returned to the surface by WCPE.

These results indicate that tori lines should not be considered as a primary seabird bycatch mitigation measure unless they are combined with appropriate weighting of the branchline or some other measure that takes the bait to a depth of 10m within the aerial extent (and protection) of the streamer line.

Night setting

Melvin and collaborators (2010) noted that in 2009 several vessels participating in the South Africa tuna joint venture fishery quickly approached or exceeded their seabird bycatch limits, indicating that the mitigation measures they were using – primarily twin tori lines and night setting - were insufficient to prevent seabird mortalities. Night setting is one of the most effective seabird bycatch mitigation measures in long-line fisheries, but is less effective in periods around the full moon. In such situations night setting should be used in combination with both streamer lines and appropriate weighting of the branchline, or some other measure that takes the bait to a depth of 10 m within the aerial extent of the streamer line.

Deep setting line shooter

Robertson and collaborators (2010b) examined the effectiveness of a deep setting line shooter as a seabird bycatch mitigation device. In the study the mainline was set in three configurations typically used in Australia's pelagic longline fishery: (a) surface set tight with no slackness astern; (b) surface set loose with 2 s of slack astern; and (c) deep set loose with 7 s of slack astern.

The study found that tension on the mainline had a powerful effect on sink rates. Baited hooks on branch lines attached to tight mainlines reached 2 m depth nearly twice as fast as those on the two loose mainline tensions, averaging 5.8 s (0.35 ms_1) compared with 9.9 s (0.20 ms_1) and 11.0 s (0.18 ms_1) for surface set loose and deep set loose tensions, respectively. The likely reason for the difference is propeller turbulence. Tight mainline entered the water aft of the area affected by turbulence whereas the two loose mainlines and the clip ends of branch lines were set directly into it about 1 m astern of the vessel. The turbulence presumably slowed the sink rates of baited hooks at the other end of the branch lines.

The results suggest that a mainline deployed with a line shooter (as in deep setting) into propeller turbulence at the vessel stern slows the sink rates of baited hooks, potentially increasing their availability to seabirds. Unless mainline can be set to avoid propeller turbulence the use of line shooters for deep setting should not be promoted as an effective deterrent to seabirds.

References

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