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'Best practice' branch line configuration and deployment method to maximize hook sink rates to reduce interactions with seabirds in pelagic longline fisheries

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‘BEST PRACTICE’ BRANCH LINE CONFIGURATION AND DEPLOYMENT METHOD TO MAXIMIZE HOOK SINK RATES TO REDUCE INTERACTIONS WITH SEABIRDS IN PELAGIC LONGLINE FISHERIES

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Introduction

Adding weight to lines to expedite gear sink rates is the most effective method of reducing seabird mortality in longline fisheries. Line weighting is not only very effective in reducing mortality but virtually guarantees compliance by industry to weighting requirements. This is because in many fisheries weight is embedded in gear (e.g., integrated weight demersal longlines and leaded swivels in pelagic gear). Once embedded, weighting regimes are difficult or impossible to change when vessels are at sea in the absence of on-board scientific observers.

The relationships between a) gear design and the sink rates of baited hooks, and b) sink rates and seabird mortality are critically important to efforts to reduce the incidental take of seabirds in longline fisheries. In demersal longline fisheries there is a considerable body of evidence dealing with both of these relationships (see Appendix). Hitherto, comparable information for pelagic longline fisheries has been lacking. Given that reducing seabird by-catch in pelagic longline fisheries is a critical step to improving seabird conservation, and that line weighting is important in reducing interactions with fishing gear, the dearth of relevant information in the published literature for pelagic longline fisheries is remarkable. This opinion, in essence, was expressed at the first meeting of the SBWG in 2007 and is one of the main reasons for the increase in research activity in pelagic longline fisheries in the past two years. The results of this research mean it is now possible to present scientific advice on what constitutes ‘best practice’ for pelagic gear configuration and deployment methods to minimise contact with seabirds in coastal (domestic) pelagic longline fisheries.

As the phrase implies, best practice reflects the state of knowledge at any given time and is subject to periodic revision and improvement (see Lokkeborg, 2008). The list below deals only with methods to expedite sink rates, and is based on the principle, proven in demersal longline fisheries, that faster sink rates reduce seabird mortality. The measures do not take into account existing preferences by industry. Some of the proposed measures may be incompatible with current fishing practices, such as line weighting regimes required to deter diving species of seabirds. Important issues such as ethics and sustainability (e.g., use of bait species from depleted stocks; use of bait from geographically distant sources) have not been considered. The documents from which the information below has been drawn are listed in the references and the numbers associated with each subject pertain to the relevant document.

Mainline tension (1)

- Mainlines should be set in the ‘surface set tight’ configuration. Baited hooks connected to mainline set tight sink faster in surface waters than hooks attached to mainline set loose, as in deep setting. Mainline can be set tight either off the drum

holding the mainline or with a line shooter. Enough gear should be set at the start of lines to prevent hooks dragging towards the vessel and being pulled up the water column where they are more accessible to seabirds.

Bait life status (2)

- Avoid the use of live bait. Use dead bait only. Many individual live baits remain near the water surface for lengthy periods after deployment. The use of live bait increases the likelihood seabirds will be caught.

Bait species and size (3)

- Use small species of fish bait (and small individuals) in preference to squid bait. Common fish baits are pilchards, sardines and various species of mackerel (Japanese, blue, yellow-tail). The difference in sink rates between large and small fish baits of the same species is minor. The important point is that larger squid bait sinks considerably slower than small fish bait.

Bait thaw status (3)

- Baits need only be thawed to the 'fisherman's thawed' state (i.e., to the point where individual baits can be separated from others in blocks of bait and hooks can be inserted by hand without undue effort). Bait thaw status has either no effect on sink rates (gear with leaded swivels) or an effect that is very minor (gear without leaded swivels). In practical terms the thaw status of baits has no effect on the sink rate of baited hooks.

Bait hooking position (3)

- To ensure fast sink rates, hook baits in either the head (fish) or tail (fish and squid), not in the middle of the back or top of the mantle (squid).

Weighting regime and sink rates (2)

- The influence of line weighting on seabird mortality is only partially understood. Research on line weighting is still in progress and head-to-head comparisons of the effectiveness of line weighting regimes (and associated sink rates) as seabird deterrent are encouraged. Further studies on the effects of line weighting on the economics of fishing (catch rates of target and non target fish taxa) are also required.

- Metrics pertaining to sink rates to target depths should recognize the importance of the "initial" (e.g., 0-2 m) and "final" (e.g., 4-6 m, or thereabouts) sink rates. A fast initial sink rate reduces visual cues in the critical shallow depths and a fast final rate maximizes the rate at which baited hooks sink deeper in the water column. Both considerations are likely to be important to seabirds that seize baits at or near the surface (e.g., albatrosses) and seabirds that hunt deeper in the water column (e.g., *Procellaria* spp. petrels and *Puffinus* spp. shearwaters).

- In general, the closer the weight is to the hook the faster the initial sink rate. Additionally, the heavier the weight the faster the final sink rate. Thus, a heavy weight placed close to the hook will best reduce seabird by-catch.

  In practice, a trade off exists regarding the relative importance of the initial and final sink rates of baited hooks. The initial sink rate varies mainly as a function of branch line leader length (swivel weight has a lesser effect), whereas the final sink rate is influenced solely by the weight of the attached swivel. Sinkers placed at or close (e.g., < 1 m) to the hook eliminates the lag in the initial sink profile attendant with long leaders. This reduces the availability of baits at the surface, which is highly desirable. However, fishers prefer either no weight, or small amounts of weight, at the hook. Hence, eliminating the lag at the surface comes at the 'cost' of a reduction in the final sink rate. A slower final sink rate - and associated reduction in swivel mass - will make it easier for diving seabird species to return baited hooks to the surface and keep them there. An alternative would be to place a heavier swivel a short distance (e.g., ≤ 2 m) from the hook. This configuration would still reduce the lag at the surface (though less than if sinkers were at the hook) without compromising the final sink rate. This point needs to be considered when deciding on what line weighting needs to be introduced into a fishery, and when rationalizing experiments aimed at developing weighting regimes to reduce seabird interactions with baited hooks.

- Best practice line weighting will maximize sink rates at the surface without overly compromising sink rates at the deeper depths. The 60-75 g swivels ± 4 m from hooks commonly preferred by industry are unlikely to deter seabirds (used with an effective streamer line) in all circumstances. 120 g ≤ 2 m from hooks should be the next step in comparative research. The alternative approach is to use smaller amounts of weight (e.g., 40 g) located at the hook, taking into account the point immediately above about the relative importance of the initial and final sink rates.

References

1. Robertson, G., Candy, S. G., and Wienecke, B. (2010). Effect of line shooter and mainline tension on the sink rates of pelagic longlines and implications for seabird interactions. Aquatic Conservation: Marine and Freshwater Ecosystem.

2. Robertson, G., Candy, S. G., Wienecke, B., and Lawton, K (submitted). Experimental determinations of factors affecting the sink rates of baited hooks to minimise seabird mortality in pelagic longline fisheries. Aquatic Conservation: Marine and Freshwater Ecosystem.

3. Robertson, G., and van den Hoff, J. (2010). Static water sink rate trials to improve understanding of sink rates estimated at sea. Report to the Third Meeting of the Seabird Bycatch Working Group of ACAP, 2010.

Appendix. List of studies in the published scientific literature addressing the relationships between gear design and line weighting regimes (sink rates), and sink rates and interaction rates with seabirds.

Agnew D.J., Black, A.D., Croxall, J.P., and Parkes, G.B. 2000. Experimental evaluation of the effectiveness of weighting regimes in reducing seabird by-catch in the longline toothfish fishery around South Georgia. CCAMLR Science **7**, 119-131.

Dietrich, K. S., Melvin, E. F, Loveday, C. 2008. Integrated weight longlines with paired streamer lines – Best practice to prevent seabird bycatch in demersal longline fisheries. Biological Conservation, 141:1793 –1805.

Løkkeborg, S. and Robertson, G. 2002. Seabird and longline interactions: effects of a bird-scaring streamer line and line shooter on the incidental capture of northern fulmars *Fulmarus glacialis*. Biological Conservation, 106: 359-364.

Moreno, C. A., Castro, R., Mújica, L. J., Reyes, P. 2008. Significant conservation benefits obtained from the use of a new fishing gear in the Chilean Patagonian toothfish fishery. CCAMLR Science, 15: 79–91.

Robertson, G., McNeill, M., Smith, N., Wienecke, B., Candy, S., and Olivier, F. 2006. Fast sinking (integrated weight) longlines reduce mortality of white-chinned petrels (*Procellaria aequinoctialis*) and sooty shearwaters (*Puffinus griseus*) in demersal longline fisheries. Biological Conservation **132,** 458-471.

Robertson, G., Moreno, C. A., Crujeiras, J., Wienecke, B., Gandini P., McPherson, G., and Seco Pon, J. P. 2008. An experimental assessment of factors affecting the sink rates of Spanish-rig longlines to minimise impacts on seabirds. *Aquatic* Conservation: Marine and Freshwater Ecosystems. 17: S102-S121.

Robertson, G., C.A. Moreno, E. Gutiérrez, S.G. Candy, E.F. Melvin and J.P. Seco Pon. 2008. Line weights of constant mass (and sink rates) for Spanish system Patagonian toothfish longline vessels. CCAMLR Science, 15: 93–106.