Agreement on the Conservation of Albatrosses and Petrels

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Seabird Bycatch Working Group

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Title: Best Practice Technical Guidelines - Summary Advice Statement for reducing impact of pelagic longline gear on seabirds

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ANNEX 4: Summary Advice Statement for reducing impact of pelagic longline gear on seabirds

Summary

Streamer lines have been widely promoted to deter seabirds in pelagic longline fisheries since the 1990s. However, recent evidence shows that streamer lines of either conventional or 'light' design, used in either single or double configuration, are inadequate for reducing seabird bycatch unless combined with other mitigation measures. To be effective they must be used with branchline weighting and, preferably, night setting.

The most effective measures to reduce incidental take of seabirds in pelagic longline fisheries are:

— use of an appropriate line weighting regime to reduce the time baited hooks are near or on the surface and thus available to birds;

— avoiding peak areas and periods of seabird foraging activity;

— setting at night; and

— actively deterring birds from baited hooks by means of bird scaring lines, in combination with appropriate line weighting.

Responsible management of offal and discards can also assist.

It is important to note that there is no single solution to reduce or avoid incidental mortality of seabirds in pelagic longline fisheries, and that the most effective approach is to use the above measures in combination.

Introduction

The incidental mortality of seabirds, mostly albatrosses and petrels, in longline fisheries has been of growing global concern. This was a major reason for the establishment of the Agreement on the Conservation of Albatrosses and Petrels (ACAP). A large number of mitigation methods to reduce and eliminate seabird bycatch has been developed and tested over the last 10 to 15 years, especially for pelagic longline fisheries. Although most mitigation measures will be broadly applicable, the feasibility, design and effectiveness of some measures will be influenced by the type of longlining method and gear configuration used. In particular it should be noted that most scientific literature relates to fleets of larger vessels, with longline usage from artisanal fleets receiving less attention. Some of this advice may need to be modified for smaller vessels. ACAP has comprehensively reviewed the scientific literature dealing with seabird bycatch mitigation in pelagic fisheries and this document is a distillation of the review (Annex 6).

Best practice mitigation measures for pelagic longline fisheries are listed below; the first recommendation is a general measure followed by those for line setting and line hauling.

Best practice measures - general

Area and seasonal closures

- The temporary closure of important foraging areas (e.g. areas adjacent to important seabird colonies during the breeding season when large numbers of aggressively feeding seabirds are present) has been very effective in reducing incidental mortality of seabirds in fisheries in those areas.

Best practice measures - line setting

Line weighting

- Lines should be weighted to get the baited hooks rapidly out of the range of feeding seabirds. 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 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 practice, a trade off exists regarding the relative importance of the initial and final sink rates of baited hooks. 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.
- Best practice line weighting will maximize sink rates at the surface without overly compromising sink rates at deeper depths. The 60-75 g swivels ± 4 m from hooks commonly preferred by industry in coastal state fisheries are unlikely to deter seabirds (used with an effective streamer line) in all circumstances. Future research should be based on weighting regimes that contrast strongly, such a comparison of 120 g ≤ 2 m from hooks with a regime similar to that mentioned above. An alternative to the latter regime is to use smaller amounts of weight (e.g. 40 g) located at the hook.
- To improve crew safety issues associated with the use of a point source of weight (e.g. leaded swivels) in pelagic gear, use of the recently developed "safe "leads is encouraged. Safe leads slide away from crew during bite offs or when the line breaks under tension, thereby greatly reducing the incidence of dangerous fly-backs towards the vessel, as can occur with leaded swivels.

Night setting

- Setting longlines at night, between the times of the end of nautical twilight and before nautical dawn) is effective at reducing incidental mortality of seabirds because the majority of vulnerable seabirds are diurnal foragers.

Bird scaring lines

- Bird scaring lines are designed to provide a physical deterrent over the area where baited hooks are sinking.
- Two bird scaring lines should be used.
- The design of the bird scaring lines should include the following specifications:
- The attachment height should be at least 7 m above sea level.
- The lines should be at least 150 m long to ensure the maximum possible aerial extent.

- Streamers should be brightly coloured and reach the sea-surface in calm conditions, and placed at intervals of no more than 5 m.
- A suitable towed device should be used to provide drag, maximise aerial extent and maintain the line directly behind the vessel during crosswinds.

Mainline tension

- 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

- Avoid the use of live bait. Use dead bait only. Many individual live baits remain near the water surface for lengthy periods (e.g. up to 120 seconds) after deployment. The use of live bait increases the likelihood seabirds will be caught

Bait species and size

- 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 large squid bait sinks considerably slower than small fish bait.

Bait thaw status

- 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

- 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).

Offal and discard discharge management

- Seabirds are attracted to offal that is discharged from vessels. Ideally offal should be retained onboard but if that is not possible, offal and discards should not be discharged while setting lines
- All hooks should be removed and retained on board before discards are discharged from the vessel.

Best practice measures - line hauling

- During hauling operations birds can accidentally become hooked as gear is retrieved. Best practice line hauling in pelagic longline fisheries is currently unknown.

Further options

- New technologies such as underwater setting devices and hook pods are currently under development. They show considerable promise and will be reported on in the near future.

The following mitigation options are **not** recommended best practice:

Hook design and olfactory deterrents have been insufficiently researched.

Side setting has been insufficiently researched and there have been operational difficulties on some vessels.

Annex 3: Review of Seabird Bycatch Mitigation Measures for Pelagic Longline Fisheries.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
Night setting	Duckworth 1995; Brothers et al. 1999; Gales et al 1998; Klaer & Polacheck 1998; Brothers et al. 1999; McNamara et al. 1999; Gilman et al. 2005; Baker & Wise 2005; Jiménez et al 2009.	Less effective during full moon, under intensive deck lighting or in high latitude fisheries in summer. Less effective on nocturnal foragers e.g. White-chinned Petrels (Brothers et al. 1999; Cherel et al. 1996).	Recommend combination with bird scaring lines and weighted branch lines	Data on current time of sets by WCPFC fisheries. Effect of night sets on target catch for different fisheries.	Night defined as nautical dark to nautical dawn
Side setting	Brothers & Gilman 2006; Yokota & Kiyota 2006.	Only effective if hooks are sufficiently below the surface by the time they reach the stern of the vessel. In Hawaii, side-setting trials were conducted with bird curtain and 45-60g weighted swivels placed within 0.5m of hooks. Japanese research concludes must be used with other measures (Yokota & Kiyota 2006).	Must be combined with other measures. Successful Hawaii trials use bird curtain plus weighted branch lines. In Southern Hemisphere, strongly recommend use with bird scaring lines until side-setting is tested in the region.	Currently untested in the Southern Ocean against seabird assemblages of diving seabirds and albatrosses - urgent need for research.	In Hawaii, side setting is used in conjunction with a bird curtain and 45 weighted swivel within 1m of the baited hook. Clear definition of side setting is required. Hawaiian definition is a minimum of only 1 m forward of the stern, which is likely to reduce effectiveness.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
Single bird scaring lines - conventional configuration	Imber 1994; Uozomi & Takeuchi 1998; Brothers et al. 1999; Klaer & Polacheck 1998; McNamara et al. 1999; Boggs 2001; CCAMLR 2002; Minami & Kiyota 2004. Melvin 2003.	Effective only when streamers are positioned over sinking baits. Baited hooks are unlikely to sink beyond the diving depths of diving seabirds within the 150 m zone of the bird scaring line, unless combined with line weighting or underwater setting. Entanglement with fishing gear can lead to poor compliance by fishers and design issues need to be addressed. In crosswinds, bird scaring line must be deployed from the windward side to be effective.	Effectiveness increased when combined with other measures e.g. weighted branch lines and night setting	Optimal design for pelagic fisheries under development: refine to minimise tangling, optimise aerial extent and positioning, and ease hauling/retrieval. Two studies in progress developing optimal bird scaring line for pelagic fisheries including Washington Sea Grant and Global Guardian Trust in Japan. Controlled studies demonstrating their effectiveness in pelagic fisheries remain very limited.	Current minimum standards for pelagic fisheries are based on CCAMLR Conservation Measure 25-02
Single bird scaring line - Light configuration	Yokota et al. 2008 considered light lines to be more effective in reducing bait take by Laysan albatrosses than conventional bird scaring lines. A similar study conducted by Brouwer et al. 2008 in New Zealand contained confounding effects and inadequate description of	Evidence for effectiveness in Yokota et al (2008) is unconvincing because of small number of sets (18), no seabirds were caught in one experiment, and although a significant difference was detected in a 2nd experiment, the confidence limits around the mean values of both treatments overlapped extensively.		Thorough comparative experimental assessment of light and conventional bird scaring lines against Southern Ocean seabird assemblages of diving seabirds and albatrosses urgently needed. Research must be based on larger sample sizes and more transparent methodologies.	Use of this measure is not recommended at this time.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
	methodologies; these concerns preclude confident conclusions to be drawn from this study.				
Paired bird scaring line – conventional configuration	Two streamer lines best in crosswinds to maximise protection of baited hooks (Melvin et al. 2004). Hybrid tori lines (with long and short streamers) were more effective than short tori lines (only short streamers) in deterring diving seabirds (white-chinned petrels) (Melvin et.al., 2010.	Potentially increased likelihood of entanglement - see above. Development of a towed device to prevent tangling with fishing gear essential to improve adoption and compliance. Diving species increase vulnerability of surface foragers (albatrosses) due to secondary interactions.	Effectiveness increased when combined with other measures. Essential to use with weighted branch lines and night setting	Development and trialling of paired streamer line systems for pelagic fisheries. Essential research addresses effectiveness with respect to both primary and secondary interactions.	Current minimum standards for pelagic fisheries are based on CCAMLR Conservation Measure 25-02 Research still in progress. Current optimal tori line configuration for Japanese high seas vessels involves mix of short & long streamers to reduce drag needed to maintain a 100 m aerial extent. Long streamers to extend from 10 m to 50 from the stern. A “sweeper” streamer extending to the water on the port tori line forward of the stern protects the area forward of the zone where the baits typically land in the water during line setting.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
Weighted branch lines	Brothers 1991; Boggs 2001; Sakai et al. 2001; Brothers et al. 2001; Anderson & McArdle 2002; Gilman et al. 2003a, Hu et al. 2005.	Critical measure, essential to use in all pelagic longline fisheries with seabird interactions. Weights will shorten but not eliminate the zone behind the vessel in which birds can be caught. Even in demersal fisheries where weights are much heavier, weights must be combined with other mitigation measures (e.g. CCAMLR Conservation Measure 25-02).	Must be combined with other measures e.g. bird scaring lines and/or night setting	Mass and position of weight both affect sink rate. Further research on weighting regimes needed. Testing of safe-leads in progress. Where possible, effect on target catch as well as seabird bycatch should be evaluated. Factors such as swivel weights, mainline tension, bait hooking position, bait size and life status, deployment position (effect of propeller turbulence) all affect sink rate and need to be quantified.	Global minimum standards not yet established. Requirements now vary by fishery and vessel. Hawaii minimum requirements are 45g less than 1 m from hook. Australia requires 60 or 100g located 3.5 or 4 m from the hook, respectively. Australian requirements currently being re-assessed.
Blue dyed bait	Boggs 2001; Brothers 1991; Gilman et al. 2003a; Minami & Kiyota 2001; Minami & Kiyota 2004; Lydon & Starr 2005. Cocking et al. 2008.	New data suggests only effective with squid bait (Cocking et al. 2008). Onboard dyeing requires labour and is difficult under stormy conditions. Results inconsistent across studies.	Must be combined with bird scaring lines or night setting	Need for tests in Southern Ocean.	Mix to standardized colour placard or specify (e.g. use 'Brilliant Blue' food dye (Colour Index 42090, also known as Food Additive number E133) mixed at 0.5% for minimum 20 minutes)

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
Line shooter and mainline tension	Robertson et al (2010).	Robertson et al (2010).showed that mainline set into propeller turbulence with a line shooter without tension astern (e.g. slack) as in deep setting significantly slows the sink rates of hooks. Use of a line shooter to set gear deep cannot be considered a mitigation measure.			Use of this measure is not recommended as a mitigation measure.
Bait caster	Duckworth 1995; Klaer & Polacheck 1998.	Not a mitigation measure unless casting machines are available with the capability to control the distance at which baits are cast. This is necessary to allow accurate delivery of baits under a bird scaring line. Needs more development. Few commercially-available machines have this capability.	Not recommended as a mitigation measure.		Not recommended as a mitigation measure.
Underwater setting chute	Brothers 1991; Boggs 2001; Gilman et al. 2003a; Gilman et al. 2003b; Sakai et al. 2004; Lawrence et al. 2006.	For pelagic fisheries, existing equipment not yet sturdy enough for large vessels in rough seas. Problems with malfunctions and performance inconsistent (e.g. Gilman et al. 2003a and Australian trials cited in Baker & Wise	Not recommended for general application	Design problems to overcome	Not yet established

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
		2005)			
Management of offal discharge	McNamara et al. 1999; Cherel et al. 1996.	Supplementary measure. Definition essential. Offal attracts birds to vessels and where practical should be eliminated or restricted to discharge when not setting or hauling. Strategic discharge during line setting can increase interactions and should be discouraged. Offal retention and/or incineration may be impractical on small vessels.	Must be combined with other measures.	Further information needed on opportunities and constraints in pelagic fisheries (long and short term).	Not yet established for pelagic fisheries. In CCAMLR demersal fisheries, discharge of offal is prohibited during line setting. During line hauling, storage of waste is encouraged, and if discharged must be discharged on the opposite side of the vessel to the hauling bay.
Bait life status	Trebilco et al 2010; Robertson et al (submitted)	Live fish bait sinks significantly slower than dead bait (fish and squid), increasing the exposure of baits to seabirds. Use of live bait is associated with higher seabird bycatch rates.	Live bait is not a mitigation measure.	.	Use of live bait is not a mitigation measure.
Thawing bait status	Brothers 1991; Duckworth 1995; Klaer & Polacheck; Brothers et al 1999; Robertson & van den Hoff 2010.	Baits cannot be separated from others in frozen blocks of bait, and hooks cannot be inserted in baits, unless baits are partially thawed (it is not practical for fishers to use fully frozen baits). Partially thawed baits sink at similar rates to fully thawed baits.	Not a mitigation measure		Not recommended as a mitigation measure.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
Area closures	Avoiding fishing at peak areas and during periods of intense foraging activity has been used effectively to reduce bycatch in longline fisheries.	An important and effective management response, especially for high risk areas, and when other measures prove ineffective. There is a risk that temporal/spatial closures could displace fishing effort into neighbouring or other areas which may not be as well regulated, thus leading to increased incidental mortality elsewhere.	Must be combined with other measures, both in the specific areas when the fishing season is opened, and also in adjacent areas to ensure displacement of fishing effort does not merely lead to a spatial shift in the incidental mortality.	Further information about the seasonal variability in patterns of species abundance around fisheries.	No work done but highly recommended

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