



Agreement on the Conservation of Albatrosses and Petrels

Fourth Meeting of Seabird Bycatch Working Group

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AC5 Report: Annex 8 — Review of seabird bycatch mitigation measures for Trawl Fisheries

Secretariat

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ANNEX 8: REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR TRAWL FISHERIES.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards / Recommendation
Nets					
Net binding	Shown to be a highly effective mitigation measure in CCAMLR icefish trawl fishery, reducing seabird bycatch to minimal levels (Sullivan 2010 submitted).	Sisal string has been used to bind the sections of the net which pose the greatest threat seabirds prior to shooting (Sullivan et al. 2004). Bindings are simply tied onto the net to prevent the net from lofting and the mesh opening as the tension created by the vessel speed of between 1-3 knots is lost due to waves and swell action. Once shot-away the net remains bound on the surface until it sinks. Once the trawl doors are paid away and the net has sunk beyond the diving depth of seabirds the force of the water moving the doors apart is sufficient to break the bindings and the net spreads into its standard operational position	Recommend combination with net cleaning and net weights to minimise the time the net is on the surface (Sullivan et al 2010 submitted)		Recommended for reducing bycatch when shooting gear in pelagic gear. 3-ply sisal string (typical breaking strength of c.110 kg), or a similar inorganic material should be applied to the net on the deck, at intervals of approximately 5 m to prevent net from spreading and lofting at the surface. Net binding should be applied to mesh ranging from 120–800 mm as these are known to cause the majority of seabird entanglements (Sullivan et al 2010). When applying string, tie an end to the net to prevent string from slipping down the net and ensure it can be removed when net is hauled

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Net weights	Evidence suggests net weighting on or near the cod end increases the rate of ascent of the net during hauling operations, thus reducing the time the net is on the water's surface. All attempts should be made to retrieve the net as quickly as possible. Good deck practices to minimise the time that the net is on the water's surface have been the key factors in reducing seabird entanglements during hauling in South Atlantic trawl fisheries (Hooper et al 2003; Sullivan 2010 submitted).		Recommend combination with net binding and net cleaning to minimise the time the net is on the water's surface during both setting and hauling (Sullivan 2010 submitted)	Development of minimum standards for amount and placement of weight (cod end, wings, footrope, mouth, belly), to build on work to date in CCAMLR trawl fisheries (Sullivan et al 2010 submitted).	None established. Recommended for reducing bycatch during both shooting and hauling of gear (Sullivan et al 2010). Suitable for both Pelagic and Demersal gear.
Net cleaning	Removal from nets of all fish 'stickers' and other material is a critical step to reducing net entanglement during shooting (Hooper et al 2003; Sullivan et al 2010 submitted).		Recommend combination with net binding and net weights to minimise the time net is on water's surface during both setting and hauling (Sullivan 2010 submitted)		Remove all stickers from net prior to shooting gear. Recommended for reducing bycatch during both shooting and hauling of gear. Suitable for both Pelagic and Demersal gear.

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Reduced mesh size	Roe (2005) reported on the use of reduced mesh size from 200 to 140 mm in the pelagic icefish fishery in CCAMLR waters, but did not quantify effectiveness of the measure.	Measure may be impractical. Reduced mesh size was believed to have caused severe damage to the net because of increased water pressure during trawling (Roe 2005), although the use of chain weights in the net may also have been influential.		Thorough testing in a range of fisheries required if measure is practical.	None. Insufficient evidence to recommend this measure, although theoretically should be effective in reducing seabird entanglement in nets.
Net jackets	Free-floating panels of net attached to the most dangerous mesh sizes have been trialled in CCAMLR's icefish trawl fishery, with efficacy uncertain (Sullivan et al 2010 submitted).	Found to cause serious drag and subsequent damage to the net. Drag also slows vessel speed and increases fuel consumption (Sullivan et al 2010 submitted).		Efficacy of measure not quantified.	Not recommended. Currently detrimental to fishing efficiency and mitigation efficacy uncertain.
Acoustics	The use of acoustic 'scaring' devices on nine vessels in CCAMLR trawl fisheries indicated that loud noises (bells and flares/fireworks) had limited effect and birds quickly became habituated to the sound, no longer causing an aversion response (Sullivan et al 2010).	May be a useful back-up measure for circumstances when another measure is needed immediately (Sullivan et al 2010 submitted).			None. Insufficient evidence to recommend this measure.

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Cables					
Offal discharge¹ and fish discard management	The most important factor influencing contacts between seabirds and warp cables is the presence of discharge (Bull 2009). Methods used to reduce the attractiveness of vessels to seabirds through management of offal discharge and fish discards include <u>mealing</u> (the conversion of waste into fish meal waste reducing discharge to sump water), <u>mincing</u> waste to a nominal maximum particle size of 25 mm diameter prior to discharge, <u>batching</u> (storage or controlling release of discards / discharge during fishing operations) and <u>full retention</u> of all waster material.				
	<p>Mealing resulted in significant reduction in the number of seabirds species feeding behind vessels, relevant to the discharge of unprocessed fish waste (Abraham 2009; Wienecke & Robertson 2002) or minced waste (Melvin et al 2010).</p> <p>Mincing reduced the number of large albatrosses (<i>Diomedea</i> spp) attending vessels but had no effect on other groups of seabirds (Abraham et al 2009).</p>	Good evidence in global fisheries that fish meal processing and reducing discharge to stick / sump water is highly effective in reducing seabird bycatch.		<p>None</p> <p>At present only effective against large <i>Diomedea</i> spp albatrosses. Efficacy with <i>Thalassarche</i> spp albatrosses needs to be proven before measure can be recommended.</p>	<p>Vessels must have alternative mitigation strategies in place in the event of meal plant breakdown</p> <p>Suitable for both pelagic and demersal trawl gear</p> <p>None. Insufficient evidence to recommend this measure.</p>

¹ Offal discharge refers to the disposal at sea of any fish waste resulting from processing, including heads, guts and frames. Fish discards refers to any unwanted whole fish (and or benthic material)

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	<p>Batching (storage or controlling release of discards / discharge during) has had limited trialling in New Zealand with uncertain results.</p> <p>Full retention – storage of all fish discard and offal, either for processing or for controlled release when cables are not in the water resulted in a significant reduction in attendance of all groups of seabirds (Abraham et al 2009)</p>	<p>Repeated studies have shown in the absence of offal discharge / fish discards seabirds interactions and mortality levels are negligible (Sullivan et al 2006, Watkins et al 2008, Melvin et al 2010 SBWG-3 Doc 14 Rev 1).</p>		<p>Robust trialling needed to support efficacy</p>	<p>None. Insufficient evidence to recommend this measure</p> <p>Vessels must have alternative mitigation strategies in place in the event of meal plant breakdown</p> <p>Suitable for both Pelagic and Demersal trawl gear</p>
<p>Bird Scaring Lines (BSL or Streamer lines) for warp cables</p>	<p>Attachment of a Bird Scaring Line to both the port and starboard sides of a vessel, above and outside of the warp blocks, greatly reduces the access of birds to the danger zone where warps enter the water (Watkins et al 2006, Reid and Edwards 2005; Melvin et al 2010).</p>	<p>Effectiveness reduced in strong cross winds and rough seas, when BSLs are deflected away from warps (Sullivan and Reid 2003; Crofts 2006a, 2006b). This can be alleviated in part by towing a buoy or cone attached to the end of lines to create tension and keep lines straight (Sullivan et al 2006a).</p>		<p>Further experimentation and assessment of towed devices (cones) to improve BSL tension could be beneficial (Crofts 2006a)</p>	<p>Recommended, even when appropriate offal discharge and fish discard management practices in place (Melvin et al 2010).</p> <p>Suitable for both pelagic and demersal trawl gear.</p>

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Warp scarers	<p>Warp scarers (weighted devices attached to each warp with clips or hooks, allowing the device to slide up and down the warp freely and stay aligned with each warp) create a protective area around the warp (see Bull 2009, Fig.2; Sullivan et al 2006a).</p> <p>Warp scarers have been shown to reduce contact rates but not to significant levels, and were not as effective as BSLs (Sullivan et al. 2006b, Abraham et al, cited in Bull 2009).</p>	<p>Attachment to the warp eliminates problems associated with crosswinds as they do not behave independently of warps. Warp scarers cannot be deployed while the warp cable is being set, or remain in place during hauling, leaving periods when warps are not protected.</p> <p>Concerns have been raised regarding associated practicality and safety issues (Sullivan et al. 2006a; Abraham et al, cited in Bull 2009).</p>			None. Insufficient evidence to recommend this measure.
Bird bafflers	<p>Bird bafflers comprise two booms attached to both stern quarters of a vessel. Two of these booms extend out from the sides of the vessel and the other two extend backwards from the stern. Dropper lines are attached to the booms, to create a curtain to deter seabirds from the warp–sea interface zone (see Bull 2009, Fig.3; Sullivan et al 2006a).</p> <p>Generally bird bafflers are not regarded as providing as much protection to the warp cables as BSLs or warp scarers (Sullivan et al. 2006a).</p>	<p>Various designs exist including the Brady Baffler and the Burka.</p> <p>While bafflers were designed to minimise warp interactions, the Brady Baffler has been used (inappropriately) within CCAMLR Icefish fisheries to mitigate net entanglements where they have been found to be consistently ineffective (Sullivan et al 2010).</p> <p>The great variability in the design and deployment of bird bafflers may influence their effectiveness.</p>		The effectiveness of the Burka has not been experimentally tested. Needs to be trialled in a range of fisheries and areas to demonstrate efficacy	None. Insufficient evidence to recommend this measure

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Cones on warp cables	A plastic cone attached to each warp cable reduced the number of contacts during hauls in the Argentine Hake Trawl Fishery by 89% and no seabirds were killed (Gonzalez-Zevallos et al 2007).			Needs to be trialled in a range of fisheries and areas to demonstrate efficacy.	None. Insufficient evidence to recommend this measure.
Snatch block	A snatch block, placed on stern of a vessel to draw the third-wire close to the water to reduce its aerial extent, reduced seabird strikes, although performance varied by vessel (Melvin et al 2010).	Melvin et al (2010) were confident that third-wires can be pulled closer to the water or submerged at the stern to make this measure highly effective, but noted that, as third-wires are fragile and expensive, any snatch block-like system should aim to minimise cable wear.		Needs to be trialled in a range of fisheries and areas to further demonstrate efficacy. Development of technical specification required.	None. Recommended on the basis that shortening aerial extent of monitoring cables will, intuitively, reduce seabird strikes.

Measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards / Recommendation
General measures					
Area closures	<p>Avoiding fishing at peak areas and during periods of intense foraging activity has been used effectively to reduce bycatch in longline fisheries. The principles are directly transferrable to trawl and other net fisheries.</p> <p>In some studies, longline-associated mortality has been almost exclusively within the breeding season of seabirds. Several studies have also shown that proximity to breeding colonies is an important determinant of seabird bycatch rates (Moreno et al. 1996; Nel et al. 2002) and temporal closures around breeding areas contributed to a substantial reduction in seabird bycatch (Croxall & Nicol 2004)</p>	<p>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.</p>	<p>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.</p>	<p>Further information about the seasonal variability in patterns of species abundance around trawl fisheries.</p>	<p>No work done but highly recommended</p>

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