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**Seabird Bycatch Mitigation:
Minimum Standards for Pelagic Longline Fishing and Priorities for Further Research**

WCPFC-SC3-EB SWG/WP-14

ACAP¹

¹ Agreement on the Conservation of Albatrosses and Petrels

SEABIRD BYCATCH MITIGATION: MINIMUM STANDARDS FOR PELAGIC LONGLINE FISHING AND PRIORITIES FOR FURTHER RESEARCH

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Abstract

ACAP's Seabird Bycatch Working Group (SBWG) recently reviewed available research on seabird bycatch mitigation measures for pelagic longline fishing to identify knowledge gaps and priorities for future research on pelagic mitigation technologies. A literature review of mitigation measures showed that some of the measures under consideration by the WCPFC Scientific Committee for use in Conservation and Management Measure 2006-02 would benefit from further development and testing. These measures were identified and priority-ranked. Minimum standards for specific mitigation measures were also identified and are provided to assist the WCPFC Scientific Committee in advising the Commission on developing minimum technical specifications for use in Conservation and Management Measure 2006-02. ACAP's Advisory Committee endorsed the outcomes of the SBWG's work, as representing the current best scientific advice, and encourages the WCPFC Scientific Committee and WCPFC Members to work together and with ACAP to conduct research on these measures as a part of implementing Conservation and Management Measure 2006-02.

Introduction

The Agreement on the Conservation of Albatrosses and Petrels (ACAP) held the first meeting of its SBWG in Valdivia, Chile on 17-18 June 2007. This working group was formed to advise the Agreement on actions that will assist in assessment, mitigation and reduction of negative interactions between fishing operations and albatrosses and petrels. The working group comprises representatives from ACAP's 11 Parties, together with invited experts with relevant technical or other expertise. Its meeting was followed by that of ACAP's Advisory Committee, the technical body which oversees the work of ACAP's working groups.

A full report of the SBWG's proceedings can be found at www.acap.aq (AC3 Doc 14 Rev 4). The report provides a summary of issues discussed relating to bycatch mitigation and priorities for further research. The SBWG believes that it may be of use to the WCPFC in developing research and management approaches to mitigate seabird bycatch its fisheries.

WCPFC Conservation and Management Measure 2006-02

The SBWG noted and welcomed the initiative by the WCPFC to improve the implementation of mitigation measures for seabirds. In particular, it commended the approach requiring fishers to select two measures, to be used in combination, from a 'menu' of seabird mitigation technical measures (Attachment A).

The Working Group further noted that based on its review of the current applicability and known effectiveness of seabird mitigation measures in pelagic longline fisheries (Table 2), some of the measures currently listed by WCPFC would benefit from further specification, development and/or testing. Some of the key issues include:

- a) the need to further develop specifications in respect of streamer lines to ensure maximum effectiveness;
- b) the need to better define side-setting methods and to test them in higher latitude fisheries, especially those with diving seabirds and a diversity of albatross species;
- c) the reconsideration of using bait casting as a recommended mitigation measure;
- d) the need to further develop underwater setting techniques as they are not yet suitable for general application, and
- e) the need to increase understanding of the effectiveness of different combinations of mitigation measures.

Review of Pelagic Longline Mitigation Measures

A primary focus of the SBWG meeting was to update information on current mitigation research for pelagic longline fisheries. The SBWG participants described a number of new developments in the testing of seabird bycatch mitigation methods around the world. They included: a new demersal longline system that reduces both seabird and marine mammal bycatch, development of bird scaring lines for pelagic longline fisheries, an underwater bait-setting capsule, a bait pod and a "smart hook" that deny seabirds access to hooks during the setting process, safe leads that permit additional weight to be added to pelagic gear whilst improving the safety for fishers, the use of naturally occurring oils to deter seabirds from attending fishing operations, and the effectiveness of blue-dyed squid (as opposed to blue-dyed fish) as a mitigation measure. The SBWG was also presented with information on poorly-known hook and line fisheries in Brazil, and mitigation research in Uruguay and Argentina. An update on BirdLife International's Albatross Task Force, an international team of mitigation instructors to work with fishers and fisheries managers in global seabird bycatch 'hotspots', was also provided.

From this information the SBWG identified the need for a coordinated approach to mitigation research. The SBWG recognised the need to identify and prioritize research initiatives that can together provide critical information to establish the relative effects of mitigation technologies on seabirds, target fish and all other taxa. This would permit substantial advances in the development of best management practices that are effective and acceptable (safe, cost effective and reasonable) to the fishing industry and to fishery

managers. It was agreed that this could best be realized through a collaborative approach that pooled scarce resources (expertise, scientists and funding) and addressed appropriate seabird species and/or foraging guilds, fishery target species, and categories of fishing gear and vessels types. Collaboration might also include the development of a common protocol for data collection, including the standardization of critical variables to be measured, in mitigation research for pelagic fisheries.

The SBWG recognised that interactions with pelagic fisheries managed by several key RFMOs may constitute the largest conservation threat to seabirds in the southern oceans. The SBWG noted that several seabird avoidance measures have been trialled to varying degrees in pelagic fisheries. However, the SBWG indicated that many of these RFMOs are taking steps to adopt mitigation measures for which there may be substantial certainty regarding their effectiveness and/or applicability in each of the RFMOs' particular fisheries. There was also discussion of the need to test the effectiveness of combining different mitigation measures. The SBWG acknowledged that RFMOs might benefit from a prioritized plan for testing and further defining such measures.

In order to progress the development of relevant mitigation research, the SBWG commenced a process designed to develop a plan of research for pelagic longline fisheries, including identifying specific research experiments needed, principal investigators, best host locations, and possible funding sources. This involved:

1. An assessment of the suitability of pelagic mitigation technologies for future research and application. Mitigation measures were grouped as primary, secondary, or other, and a priority ranking for future research assigned on a 5 point scale. Primary measures were those considered likely to be effective without other mitigation measures, and secondary measures were those considered useful for deployment in combination with other measures, but unlikely to significantly reduce bycatch if used in isolation. Priority rankings were based on several critical elements, such as practicality, safety, cost, and effectiveness with different seabird types. The results of this assessment are shown in Table 1, together with details of the criteria used for assessment.
2. Review of seabird bycatch mitigation measures for pelagic longline fishing and identification of knowledge gaps. The review was based on published literature and expert input from the SBWG. The results of the review are shown in Table 2, including minimum technical standards for such measures.

The Advisory Committee encourages the WCPFC to use these materials to guide the development of policy and practice within fisheries under its jurisdiction. As mitigation measures continue to be tested and refined, the SBWG offers its ongoing technical assistance to the WCPFC in this matter.

Priorities for Research

The SBWG concluded that from a global research perspective, bird scaring lines, the bait setting capsule and side setting were the highest priority for further research and development. Weighted branchlines, the bait pod, smart hooks and circle hooks were high priorities; and blue dyed squid was of moderate priority. Research on technologies such as the underwater setting chute, night setting, line shooters, thawed bait, strategic offal discharge, blue-dyed fish, fish oil and bait casting machines, were considered a lower priority and were not discussed further. With respect to night setting, the Working Group acknowledged the effectiveness of this mitigation measure for many seabird species, but believed further research on this was not needed.

The Working Group agreed that seabird bycatch mitigation research should best be carried out in locations where and during seasons in which seabird interactions with pelagic gear are most intense, as it is these locations that would yield the most useful research outcomes. Locations where aggressive species are most abundant and overlap with fisheries were identified, including the pelagic fisheries of Chile in winter, Uruguay and Brazil from May through September, and in South Africa in winter. BirdLife International reported that Albatross Task Force personnel are either in place or will soon be in place in Chile, Brazil, Uruguay, South Africa and Namibia and are available to collaborate in seabird bycatch mitigation research programs, as needed.

Specific Research Projects Identified

Specific research projects are being undertaken and by WCPFC member nations that may be of relevance for WCPFC pelagic longline fisheries. Australia has led the development of the bait setting capsule, a device designed to deliver baited hooks to a depth beyond the access of foraging seabirds at the stern of a pelagic longline vessel (SBWG1/Paper 3). Dr. Graham Robertson of the Australia Antarctic Division has acquired funding to develop a prototype and conduct pilot research to demonstrate the efficient performance of the prototype capsule. Pending a positive outcome of pilot research, Dr. Robertson will seek funding to carry out comprehensive research to determine the relative performance of the bait setting capsule, side setting and conventional stern setting. A location to stage this research effort has not been established at this stage. If proven effective, this measure may be applicable to WCPFC fisheries.

Ed Melvin of the Washington SeaGrant Program in the the United States is developing a streamer line system for pelagic longline fisheries and to trial the streamer line system in two “worst case” southern hemisphere, pelagic fisheries. Funding is in place to carry out this research. Trials will compare the relative efficiency of the streamer line designed to a control of no deterrent and to a second mitigation technology to be determined. The host locations will include South Africa and either Brazil, Chile or Uruguay. Work is scheduled to be completed in 2009, and could benefit WCPFC fisheries if proven effective.

Researchers in New Zealand , Australia, and the US will be testing “safe lead”, a new product which promises to eliminate safety issues related to weighted branchlines. It is planned to pilot-level test these weights in 2007 within Australian, New Zealand and US (Hawaii) fisheries. These fisheries are similar to those prosecuted by the WCPFC, making this research project also very relevant.

Development of Technical Specifications

The SBWG discussed the need for minimum standards for various seabird bycatch mitigation measures. The SBWG was encouraged to note that the Commission has agreed to adopt minimum technical specifications for the mitigation measures found in WCPFC Conservation and Management Measure 2006-02. Information found in the last column of Table 2 may be of particular use to the WCPFC as it undertakes this work.

Recommendation

It is recommended that WCPFC’s Scientific Committee:

1. Consider the need to further test and develop many seabird bycatch mitigation measures, including those found in WCPFC Conservation and Management Measure 2006-02 (see a-e in RFMO section of this paper).
2. Encourage the WCPFC and its members to work collaboratively, taking into account the work of the ACAP SBWG, in particular information contained within Table 1, in carrying out future research into mitigation measures.
3. Take into account the work of the SBWG, in particular that information contained within Table 2, in the elaboration of technical specifications for mitigation measures found in WCPFC Conservation and Management Measure 2006-02.
4. Encourage the WCPFC to seek guidance from the ACAP as needed, in carrying out the above activities.

Table 1. Assessment of the suitability of pelagic mitigation technologies for future research and application. Rankings have been assigned on a 5 point scale, where 5 is the highest ranking. See below for details of the criteria used for assessment.

Mitigation	Effective surface feeding birds	Effective diving birds	Practical	Safe	Cost Capital	Cost Ops	DWF/ Dom	Compliance	Future Research Priority
Primary									
Streamer lines	4	3	4	4	5	5	5/5	1	5
Weighted branchlines	4	3	5	1	4	4	5/5	5	4
Underwater Setting									
Chute	2	1	2	3	2	5	1/5	1	1
Bait setting capsule	5	4*	4	4	2	5	5/5	3	5
Bait Pod / Smart hooks	5	4*	3	4*	4	4	5/5	1	4
Night Setting	4	3	5	4	5	3*	5/5	3	1
Secondary									
Circle Hooks	?	?	5	5	5	5	5/5	5	4
Bait placement/casting	2*	2*	5	3	4	4	5/5	1	1
Line shooter?	2	2	5	4	4	4	5/5	1	1
Thawed bait	2	2	3	5	5	5	5/5	1	1
Strategic offal discharge	2	2	3	5	5	5	5/5	1	1
Other									
Side Setting	2*	2*	3	4	4	5	5/5	5	5
Blue Dyed Squid	3	3	3	5	5	4	5/5	1	3
Blue Dyed Fish	1	1	3	5	5	4	5/5	1	1
Fish Oil	1	4	2	4	4	3	5/5	1	2

Each mitigation method was grouped as primary, secondary, or other. Primary measures were those considered likely to be effective without other mitigation measures, and secondary measures were those considered useful for deployment with other measures, but may not significantly reducing bycatch if used in isolation. Side setting, blue-dyed fish and squid bait, and fish oil were regarded as possible candidates for primary mitigation but were considered separately due to their early stage of development and/or limited research results to date. Acoustic alarms, water jets, time-area closures, and artificial lures/bait were not considered. Each was assigned a priority ranking for future research based on the scientific literature and individual experience using the following criteria:

- Effectiveness on surface foraging seabirds
- Effectiveness on diving seabirds
- Practical use on the vessel
- Safe use on the vessel
- Capital Cost – costs for purchase of a specific technology
- Operational Cost – costs related to vessel operations (lost fishing time)
- Applicability to distant water fleets and domestic fleets
- Compliance – the ability to monitor use and performance

Each method was ranked for each criterion on a relative scale of 1 to 5, with 1 being the lowest ranking and 5 being the highest. Considering the ranking for each criterion, each mitigation method was ranked in a similar way resulting in a prioritized list of mitigation methods to focus future research.

Table 2. Review of seabird bycatch mitigation measures for Pelagic Longline Fishing and identification of knowledge gaps

Mitigation 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.	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/or 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. During longline fishing at night, only the minimum ship's lights necessary for safety shall be used.
Side setting	Brothers & Gilman 2006; Yokota & Kiyota 2006.	Definition essential. 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).	Should 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 Japan, NRIFSF will continue testing in 2007.	(1) <i>Side-setting</i> . Owners and operators of vessels opting to side-set under this section must fish according to the following specifications: (i) The mainline must be deployed as far forward on the vessel as practicable, and at least 1 m (3.3 ft) forward from the stern of the vessel; (ii) The mainline and branch lines must be set from the port or the starboard side of the vessel; (iii) If a mainline shooter is used, the mainline shooter must be mounted as far forward on the vessel as practicable, and at least 1 m (3.3 ft) forward from the stern of the vessel; (iv) Branch lines must have weights with a minimum weight of 45 g (1.6 oz); (v) One weight must be connected to each branch line within 1 m (3.3 ft) of each hook; (vi) When seabirds are present,

Mitigation measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
					<p>the longline gear must be deployed so that baited hooks remain submerged and do not rise to the sea surface; and</p> <p>(vii) A bird curtain must be deployed. Each bird curtain must consist of the following three components: a pole that is fixed to the side of the vessel aft of the line shooter and which is at least 3 m (9.8 ft) long; at least three main streamers that are attached at regular intervals to the upper 2 m (6.6 ft) of the pole and each of which has a minimum diameter of 20 mm (0.8 in); and branch streamers attached to each main streamer at the end opposite from the pole, each of which is long enough to drag on the sea surface in the absence of wind, and each of which has a minimum diameter 10 mm (0.4 in).</p>

Mitigation measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
Single bird scaring line	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. In pelagic fisheries, 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 other measures such as 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/or 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 lines 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 (copy provided at Attachment B as a model of best practice in a demersal longline fishery.)
Paired bird scaring lines	Two streamer lines best in crosswinds to maximise protection of baited hooks (Melvin et al. 2004).	Potentially increased likelihood of entanglement - see above. Development of a towed device that keeps gear from crossing surface gear essential to improve adoption and compliance.	Effectiveness will be increased when combined with other measures. Recommend use with weighted branch lines and/or night setting	Development and trialling of paired bird scaring line systems for pelagic fisheries.	Current minimum standards for pelagic fisheries are based on CCAMLR Conservation Measure 25-02 (Attachment B – model of best practice in demersal longline fishery.)
Weighted branch lines	Brothers 1991; Boggs 2001; Sakai et al. 2001; Brothers et al. 2001; Anderson & McArdle 2002; Gilman et al. 2003a; Robertson 2003; Lokkeborg & Robertson 2002, Hu et al. 2005.	Supplementary measure. 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).	Should 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. Research on use of integrated-weight branch lines (wire trace) in pelagic fisheries also needs further exploration.	Global minimum standards not yet established. Based on research conducted in Hawaii and Australia the following weight regime is recommended: <ul style="list-style-type: none"> • Weights to be attached to all branch lines : <ul style="list-style-type: none"> • minimum of 45 grams weight attached to all branch lines; • less than 60 grams weight

Mitigation measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
					<p>must be within 1 meter of the hook;</p> <ul style="list-style-type: none"> • greater than 60, and less than 80 grams weight must be within 2 meters of the hook; • greater than 80 grams and less than 100 grams must be within 3 meters of the hook; and • greater than 100 grams must be within 4 meters of the hook <p>with a view to obtaining a sink rate of .3m per second to a 2m depth.</p>
Weighted branch lines	Brothers 1991; Boggs 2001; Sakai et al. 2001; Brothers et al. 2001; Anderson & McArdle 2002; Gilman et al. 2003a; Robertson 2003; Lokkeborg & Robertson 2002, Hu et al. 2005.	Supplementary measure. 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).	Should 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. Research on use of integrated-weight branch lines (wire trace) in pelagic	Global minimum standards not yet established. Based on research conducted in Hawaii and Australia the following weight regime is recommended: <ul style="list-style-type: none"> • Weights to be attached to all branch lines : <ul style="list-style-type: none"> • minimum of 45 grams weight attached to all

Mitigation measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
				fisheries also needs further exploration.	branch lines; <ul style="list-style-type: none"> • less than 60 grams weight must be within 1 meter of the hook; • greater than 60, and less than 80 grams weight must be within 2 meters of the hook; • greater than 80 grams and less than 100 grams must be within 3 meters of the hook; and • greater than 100 grams must be within 4 meters of the hook; with a view to obtaining a sink rate of .3m per second to a 2m depth.
Blue dyed bait	Boggs 2001; Brothers 1991; Gilman et al. 2003a; Minami & Kiyota 2001; Minami & Kiyota 2004; Lydon & Starr 2005. Double and Cocking, in press.	New data suggests only effective with squid bait (Double & Cocking). Onboard dyeing requires labour and is difficult under stormy conditions. Results inconsistent across studies.	Should 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 a minimum of 20 minutes). Thawed or partly-thawed squid to be used.

Mitigation measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
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.	Should 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. (refer Attachment A)
Thawing bait	Brothers 1991; Duckworth 1995; Klaer & Polacheck; Brothers et al 1999.	Supplementary measure. Should be combined with other measures. If lines are set early morning, full thawing of all bait may create practical difficulties.		Evaluate sink rate of partially thawed bait.	
Line shooter	Quantitative testing in demersal fisheries only. Reduced bycatch of Northern Fulmar in trials of mitigation measures in North Sea, Lokkeborg & Robertson 2002; Lokkeborg 2003. Increased seabird bycatch in Alaska (Melvin et al. 2001).	Supplementary measure. No published data for pelagic fisheries. May enhance hook sink rates in some situations but unlikely to eliminate the zone behind the vessel in which birds can be caught. More data needed. Found ineffective in trials in North Pacific demersal longline fishery (Melvin et al. 2001).	Should be combined with other measures such as night setting and/or bird scaring lines or weighted branch lines	Data needed on effects on hook sink rates with line shooter in pelagic fisheries.	Not established

Mitigation measure	Scientific evidence for effectiveness in pelagic fisheries	Caveats /Notes	Need for combination	Research needs	Minimum standards
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.		
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 2005)	Not recommended for general application	Design problems to overcome	Not yet established



THIRD REGULAR SESSION
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**CONSERVATION AND MANAGEMENT MEASURE TO MITIGATE
THE IMPACT OF FISHING FOR HIGHLY MIGRATORY FISH
STOCKS ON SEABIRDS**

Conservation and Management Measure 2006-02

The Commission For The Conservation And Management Of Highly Migratory Fish Stocks In the Western And Central Pacific Ocean

Concerned that some seabird species, notably albatrosses and petrels, are threatened with global extinction.

Noting advice from the Commission for the Conservation of Antarctic Marine Living Resources that together with illegal, unreported and unregulated fishing, the greatest threat to Southern Ocean seabirds is mortality in longline fisheries in waters adjacent to its Convention Area.

Noting scientific research into mitigation of seabird bycatch in surface longline fisheries has showed that the effectiveness of various measures varies greatly depending on the vessel type, season, and seabird species assemblage present.

Noting the advice of the Scientific Committee that combinations of mitigation measures are essential for effective reduction of seabird bycatch.

Resolves as follows:

1. Commission Members, Cooperating Non Members and participating Territories (CCMs) shall, to the extent possible, implement the International Plan of Action for Reducing Incidental Catches of Seabirds in Longline fisheries (IPOA-Seabirds) if they have not already done so.
2. CCMs shall report to the Commission on their implementation of the IPOA-Seabirds, including, as appropriate, the status of their National Plans of Action for Reducing Incidental Catches of Seabirds in Longline Fisheries.

Adopts, in accordance with Article 5 (e) and 10(i)(c) of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean the Commission the following measure to address seabird by-catch:

1. CCMs shall require their longline vessels to use at least two of the mitigation measures in Table 1, including at least one from Column A in areas South of 30 degrees South and North of 23 degrees North.

Table 1: Mitigation measures

<i>Column A</i>	<i>Column B</i>
<i>Side setting with a bird curtain and weighted branch lines</i> ²	<i>Tori line</i> ³
<i>Night setting with minimum deck lighting</i>	<i>Weighted branch lines</i>
<i>Tori line</i>	<i>Blue-dyed bait</i>
<i>Weighted branch lines</i>	<i>Deep setting line shooter</i>
	<i>Underwater setting chute</i>
	<i>Management of offal discharge</i>

2. In other areas, where necessary, CCMs are encouraged to employ one or more of the seabird mitigation measures listed in Table 1.
3. The Commission will at its 2007 Annual Meeting adopt minimum technical specifications for the mitigation measures, based on the advice and recommendations of SC3 and TCC3.
4. Guidelines for measures described in Column A, until future research suggests otherwise, are provided in Attachment 1.
5. Guidelines for technical specifications when applying mitigation measures in Column B are provided in Attachment 2.
6. For research and reporting purposes, CCMs that fish in the area south of 30°S and north of 23°N shall submit, to the Commission by 30 November 2007, the specifications of the mitigation measures listed in Columns A and B, that they will require their vessels to employ.
7. CCMs are encouraged to undertake research to further develop and refine measures to mitigate seabird bycatch including mitigation measures for use during the hauling process. Research should be undertaken in the fisheries and areas to which the measure will be used.
8. The SC and TCC will annually review any new information on new or existing mitigation measures or on seabird interactions from observer or other monitoring programmes. Where necessary an updated suite of mitigation measures, specifications for mitigation measures, or recommendations for areas of application will then be provided to the Commission for its consideration and review as appropriate.
9. CCMs are encouraged to adopt measures aimed at ensuring that seabirds captured alive during longlining are released alive and in as good condition as possible and that wherever possible hooks are removed without jeopardizing the life of the seabird concerned.
10. The inter-sessional working group for the regional observer programme (IWG-ROP) will take into account the need to obtain detailed information on seabird interactions to allow analysis of the effects of fisheries on seabirds and evaluation of the effectiveness of by-catch mitigation measures.

² This measure can only be applied in the area north of 23 degrees north until research establishes the utility of this measure in waters south of 30 degrees south. If using side setting with a bird curtain and weighted branch lines from column A this will be counted as two mitigation measures.

³ If tori line is selected from both Column A and Column B this equates to simultaneously using two (i.e. paired) tori lines.

11. CCMs shall provide the Commission with all available information on interactions with seabirds, including by-catches and details of species, to enable the Scientific Committee to estimate seabird mortality in all fisheries to which the WCPF Convention applies.

12. Paragraph 1 of this Conservation and Management Measure shall be implemented by CCMs in the following manner:

- In areas south of 30 degrees South, no later than 1st January 2008 in relation to large scale longline vessels of 24 meters or more in overall length and no later than 31 January 2009 in relation to smaller longline vessels of less than 24 meters in overall length. .
- In areas North of 23 degrees North, and in relation to large scale longline vessels of 24 meters or more in overall length, no later than 30 June 2008.

13 CCMs shall as of 1 January 2007 initiate a process to ensure that vessels flying their flag will be able to comply with the provisions of paragraph 1 within the deadlines referred to in paragraph 12.

14. This Conservation and Management measure replaces Resolution 2005-01 which is hereby repealed.

- Attachment 1: Guidelines for Column A mitigation measures.

1. Tori Lines:

- Minimum length: 100m
- Minimum aerial coverage: 90m
- Must be attached so that the aerial extent is maintained over the sinking baited hooks.
- Streamers must be less than 5m apart and be using swivels.
- Streamers must be long enough so that they are as close to the water as possible.
- If the tori line is less than 150m in length, must have a drogue attached to the end that will create enough drag to meet the 90 meter coverage requirement.

2. Side setting with bird curtain and weighted branch lines:

- Mainline deployed from port or starboard side as far from stern as practicable (at least 1m), and if mainline shooter is used, must be mounted at least 1m forward of the stern.
- When seabirds are present the gear must ensure mainline is deployed slack so that baited hooks remain submerged.
- Bird curtain must be employed:
 - Pole aft of line shooter at least 3m long;
 - Min of 3 main streamers attached to upper 2m of pole;
 - Main streamer diameter min 20mm;
 - Branch streamers attached to end of each main streamer long enough to drag on water (no wind) – min diameter 10 mm.

3. Night setting:

- No setting between local sunrise and one hour after local sunset ; and
- Deck lighting to be kept to a minimum, noting requirements for safety and navigation.

4. Weighted branch lines:

- Weights attached to all branch lines:
 - minimum of 45 grams weight attached to all branch lines;
 - less than 60 grams weight must be within 1 meter of the hook;
 - greater than 60 grams and less than 98 grams must be within 3.5 meters of the hook; and
 - greater than 98 grams must be within 4 meters of the hook

Attachment 2: Guidelines for Column B mitigation measures.

1. Weighted branch lines:

- Weights attached to all branch lines:
 - minimum of 45 grams weight attached to all branch lines;
 - less than 60 grams weight must be within 1 meter of the hook;
 - greater than 60 grams and less than 98 grams must be within 3.5 meters of the hook; and
 - greater than 98 grams must be within 4 meters of the hook

2. Blue dyed bait:

- The Commission Secretariat shall distribute a standardized color placard.
- All bait must be dyed to the shade shown in the placard.

3. Management of Offal Discharge:

- Either:
 - No offal discharge during setting or hauling; or
 - Strategic offal discharge from the opposite side of the boat to setting/hauling to actively encourage birds away from baited hooks.

CCAMLR CONSERVATION MEASURE 25-02 (2005)

Minimisation of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the Convention Area

The Commission,

Noting the need to reduce the incidental mortality of seabirds during longline fishing by minimising their attraction to fishing vessels and by preventing them from attempting to seize baited hooks, particularly during the period when the lines are set,

Recognising that in certain subareas and divisions of the Convention Area there is also a high risk that seabirds will be caught during line hauling,

Adopts the following measures to reduce the possibility of incidental mortality of seabirds during longline fishing.

1. Fishing operations shall be conducted in such a way that hooklines³ sink beyond the reach of seabirds as soon as possible after they are put in the water.
2. Vessels using autoline systems should add weights to the hookline or use integrated weight hooklines while deploying longlines. Integrated weight (IW) longlines of a minimum of 50 g/m or attachment to non-IW longlines of 5 kg weights at 50 to 60 m intervals are recommended.
3. Vessels using the Spanish method of longline fishing should release weights before line tension occurs; weights of at least 8.5 kg mass shall be used, spaced at intervals of no more than 40 m, or weights of at least 6 kg mass shall be used, spaced at intervals of no more than 20 m.
4. Longlines shall be set at night only (i.e. during the hours of darkness between the times of nautical twilight^{4 5}). During longline fishing at night, only the minimum ship's lights necessary for safety shall be used.
5. The dumping of offal is prohibited while longlines are being set. The dumping of offal during the haul shall be avoided. Any such discharge shall take place only on the opposite side of the vessel to that where longlines are hauled. For vessels or fisheries where there is not a requirement to retain offal on board the vessel, a system shall be implemented to remove fish hooks from offal and fish heads prior to discharge.
6. Vessels which are so configured that they lack on-board processing facilities or adequate capacity to retain offal on board, or the ability to discharge offal on the opposite side of the vessel to that where longlines are hauled, shall not be authorised to fish in the Convention Area.

7. A streamer line shall be deployed during longline setting to deter birds from approaching the hookline. Specifications of the streamer line and its method of deployment are given in the appendix to this measure.
8. A device designed to discourage birds from accessing baits during the haul of longlines shall be employed in those areas defined by CCAMLR as average-to-high or high (Level of Risk 4 or 5) in terms of risk of seabird by-catch. These areas are currently Statistical Subareas 48.3, 58.6 and 58.7 and Statistical Divisions 58.5.1 and 58.5.2.
9. Every effort should be made to ensure that birds captured alive during longlining are released alive and that wherever possible hooks are removed without jeopardising the life of the bird concerned.
10. Other variations in the design of mitigation measures may be tested on vessels carrying two observers, at least one appointed in accordance with the CCAMLR Scheme of International Scientific Observation, providing that all other elements of this conservation measure are complied with⁶. Full proposals for any such testing must be notified to the Working Group on Fish Stock Assessment (WG-FSA) in advance of the fishing season in which the trials are proposed to be conducted.
 - ¹ Except for waters adjacent to the Kerguelen and Crozet Islands
 - ² Except for waters adjacent to the Prince Edward Islands
 - ³ Hookline is defined as the groundline or mainline to which the baited hooks are attached by snoods.
 - ⁴ The exact times of nautical twilight are set forth in the Nautical Almanac tables for the relevant latitude, local time and date. A copy of the algorithm for calculating these times is available from the Secretariat. All times, whether for ship operations or observer reporting, shall be referenced to GMT.
 - ⁵ Wherever possible, setting of lines should be completed at least three hours before sunrise (to reduce loss of bait to/catches of white-chinned petrels).
 - ⁶ The mitigation measures under test should be constructed and operated taking full account of the principles set out in WG-FSA-03/22 ([the published version](#) of which is available from the CCAMLR Secretariat and website); testing should be carried out independently of actual commercial fishing and in a manner consistent with the spirit of Conservation Measure 21-02.

APPENDIX TO CONSERVATION MEASURE 25-02

1. The aerial extent of the streamer line, which is the part of the line supporting the streamers, is the effective seabird deterrent component of a streamer line. Vessels are encouraged to optimise the aerial extent and ensure that it protects the hookline as far astern of the vessel as possible, even in crosswinds.
2. The streamer line shall be attached to the vessel such that it is suspended from a point a minimum of 7 m above the water at the stern on the windward side of the point where the hookline enters the water.
3. The streamer line shall be a minimum of 150 m in length and include an object towed at the seaward end to create tension to maximise aerial coverage. The object towed should be maintained directly behind the attachment point to the vessel such that in crosswinds the aerial extent of the streamer line is over the hookline.

4. Branched streamers, each comprising two strands of a minimum of 3 mm diameter brightly coloured plastic tubing⁷ or cord, shall be attached no more than 5 m apart commencing 5 m from the point of attachment of the streamer line to the vessel and thereafter along the aerial extent of the line. Streamer length shall range between minimums of 6.5 m from the stern to 1 m for the seaward end. When a streamer line is fully deployed, the branched streamers should reach the sea surface in the absence of wind and swell. Swivels or a similar device should be placed in the streamer line in such a way as to prevent streamers being twisted around the streamer line. Each branched streamer may also have a swivel or other device at its attachment point to the streamer line to prevent fouling of individual streamers.

5. Vessels are encouraged to deploy a second streamer line such that streamer lines are towed from the point of attachment each side of the hookline. The leeward streamer line should be of similar specifications (in order to avoid entanglement the leeward streamer line may need to be shorter) and deployed from the leeward side of the hookline.

⁷Plastic tubing should be of a type that is manufactured to be protected from ultraviolet radiation.

