Agreement on the Conservation of Albatrosses and Petrels

Fourteenth Meeting of the Advisory Committee

Lima, Peru, 12 - 16 August 2024

Report of the Seabird Bycatch Working Group

Seabird Bycatch Working Group

Report of the Twelfth Meeting of the Seabird Bycatch Working Group, Lima, Peru, 5 - 7 August 2024

1. INTRODUCTION

This Report documents discussions and recommendations of the Twelfth Meeting of the Seabird Bycatch Working Group (SBWG12), held in Lima, Peru, 5 - 7 August 2024.

The SBWG Co-Convenor, Igor Debski (New Zealand), welcomed all SBWG members and observers (**ANNEX 1**) to the 12th meeting of the SBWG. He introduced SBWG's Co-Convenor Sebastián Jiménez (Uruguay) and Vice-convenors Dimas Gianuca (BLI) and Megan Tierney (United Kingdom).

2. SBWG MEMBERSHIP

The Co-Convenor welcomed the following new member joining the group since SBWG11; Cristóbal Anguita (Chile), replacing Jorge Azócar (Chile). Yann Rouxel (BLI) also replaced Rory Crawford (BLI). SBWG thanked Jorge Azócar and Rory Crawford for their input over previous years. The Co-Convenor noted that Parties can nominate Working Group members at any time. Current membership of SBWG is included in **ANNEX 1**.

3. ADOPTION OF THE AGENDA

The Co-Convenor introduced the Agenda and related documents. The meeting adopted the Agenda (**SBWG12 Doc 01 Rev 1**).

4. ACAP SEABIRD BYCATCH MITIGATION BEST PRACTICE ADVICE - DEFINITION AND CRITERIA

The Co-Convenor noted that this agenda item serves as a reminder to continually review the definition and criteria for ACAP Best Practice Advice to ensure the advice remains fit-for-purpose. A suggestion was also made that the SBWG consider creating a simplified, stand-alone document which clearly outlined the criteria and steps that need to be taken by a proponent for any measure to be considered and adopted as Best Practice Advice by ACAP.

SWBG12 Inf 01 described assembled databases of mitigation methods for at-risk species exposed to pelagic longline, tuna purse seine and drift gillnet fisheries, and defined key inputs for undertaking comprehensive, multispecies bycatch management strategy evaluations (MSE), which then enables simulating the outcomes of alternative strategies to determine which best meets objectives.

SBWG12 Inf 01 Annex 7 included a draft Decision or Resolution on holistic bycatch MSE to aid regional fisheries management organizations in identifying candidate elements for potential inclusion in measures. The paper has been presented to several RFMOs which have

responded positively to it. SBWG welcomed the paper and noted that it could be useful for the SBWG to consider how the process could be applied if ACAP planned to review or add to the criteria it uses to assess whether a mitigation measure should be considered and adopted as Best Practice Advice by ACAP. SBWG agreed to keep a 'watching brief' on any uptake of the Resolution and at its next meeting consider if ACAP should amend its Communication Strategy to include communication of MSE approaches to RFMOs.

5. SEABIRD BYCATCH MITIGATION IN TRAWL FISHERIES

5.1. Review recent developments in mitigation research and update Best Practice Advice

SBWG12 Doc 05 provided an amended version, in tracked changes, of the advice for mitigating seabird bycatch in trawl fisheries endorsed by AC13. The changes improved the clarity of the advice and consistency with advice documents for the other industrial fishing gear types, and included a summary section on 'Mitigation Measures that are not recommended'. SBWG endorsed the suggested changes and, considering new information presented, identified several other changes, in particular:

(i) to separate the advice on mitigation measures to reduce cable strikes into measures about reducing the aerial extent of cables (e.g. snatch blocks), and those that deter birds away from cables (e.g. BSL);

(ii) to amend the general mitigation measure of Time-Area Closures to ensure it reflected that not only does there need to be an awareness that such closures don't displace the risk to adjacent areas, but also that the risk is not displaced to other fishing methods as a consequence.

SBWG12 Doc 16 reported on developing net monitoring cable mitigation measures on continuous trawl vessels in krill fisheries in the CCAMLR convention area. A recent derogation from the CCAMLR prohibition on use of net monitoring cables (NMCs) has allowed continuous trawl vessels to carry out trials of seabird bycatch mitigation measures for this 'third wire'. The document reported on trials on three Norwegian vessels fishing for krill. SBWG welcomed the report and recognised that some of the current Best Practice Advice for trawl fisheries may not be feasible for continuous trawlers and so agreed to amend where necessary, differentiating between the use of traditional and continuous trawl gear. SBWG recommended this be considered further during the next intersessional review of the Best Practice Advice. The SBWG also noted that it was unclear where the reported trials were conducted in relation to the distribution of ACAP-listed species, and concerns were raised that should such operations occur in waters important to ACAP-listed species, such fisheries could pose considerable risk. SBWG concluded that there was insufficient evidence provided at this stage to assess the proposed mitigation measures, but agreed they should be noted as 'under development' and to encourage further work in this area. SBWG expressed concern whether the 'stick-water' discharged from continuous trawl vessels fishing for krill acts as an attractant to seabirds, thereby increasing the possibility of interactions, and recommended further research on this.

SBWG12 Inf 03 reported on investigations into mitigation measures to reduce mortality caused by NMCs through: 1) the use of a new material ("Dynice") for constructing the NMC;

and 2) the configuration of BSL to cover the cable's entry point into the water and reduce cable entanglements. The collision rate of seabirds with the cable constructed from the new material was lower than those with cables made of traditional steel cables, although the reasons for this are not yet clear. The adaptations to the BSL design aimed at reducing entanglements (and potential damage) with the NMC require further experimentation to substantiate their effectiveness in reducing the impact rate. SBWG welcomed the ongoing work to improve BSL design and effectiveness, and looked forward to receiving further updates.

SBWG12 Inf 08 described a BSL electronic compliance monitoring device (https://imveloblue.co.za/electronic-monitoring-imvelo-bsl/). The device works by continuously measuring the tension exerted by a BSL when it is dragged through the water and then transmitting real time tension data wirelessly. In development since 2020, the device is currently in its final production stage. As well as being able to integrate with existing electronic monitoring systems that vessels may already have onboard, the device enhances crew safety by reducing the need for crew members to physically monitor the BSLs and could be used on all industrial fishing vessels which deploy BSLs. SBWG welcomed the update on the development of the BSL electronic monitoring device and added it as a form of electronic monitoring that could be used to monitor implementation of BSL in the Best Practice Advice documents for trawl, demersal longline and pelagic longline fisheries, noting that whilst this device can monitor usage, it will not monitor against specifications of the BSL.

SBWG12 Inf 19 reported on experiments to generate evidence on minimum standards and the effectiveness of tailored mitigation measures for net sonar and warp cables in Chilean demersal trawl fisheries. Using a Combined Curtain System in ice trawl fleets, consisting of net sonar curtains and engine-powered Bird Bafflers, resulted in >90% reduction in collisions for nine seabird species, including five ACAP-listed species. SBWG noted the importance of this work and the significant potential for application to other fleets, and that once the work is completed, results can be considered for inclusion in the Best Practice Advice document. SBWG also noted that this project is being supported by an ACAP Small Grant, demonstrating the value of this scheme for progressing work in this area.

SBWG12 Inf 07 also reported on mitigation development in relation to net monitoring cables and was considered under Agenda Item 15.

5.2. Priorities for mitigation research

SBWG reviewed the highest priorities for research on reducing seabird bycatch in trawl fisheries and recommended they be:

Cable mitigation: continued development and testing of mitigation options to reduce seabird interactions with cables, in particular those to mitigate net monitoring cables, including novel deterrent devices (including bird curtains), novel cable materials and ways to reduce aerial extent, as well as consideration of fisheries using a range of different operational practices;

Cable interactions: determine relationships between seabird abundance, cable interactions and mortality (quantifying the level of undetected or cryptic mortality), including the potential to use electronic monitoring (EM) of cable strikes;

Net entanglement: further develop and test options to reduce seabird interactions with trawl gear to reduce the entanglement or capture of seabirds in nets during setting and hauling; and

Discharge: further assess the level of attraction to birds of stick water or other discharges not normally considered part of offal discharge or discards.

Igor Debski, Verónica Iriarte and Leandro Tamini remain SBWG leads for bycatch mitigation in trawl fisheries.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Endorse the updated review and Best Practice Advice for reducing the impact of pelagic and demersal trawl fisheries on seabirds contained in **ANNEX 2.** These updates provide improved clarity and consistency in the document and reflect the latest research presented to SBWG12. Whilst the changes do not make any substantive change to Best Practice Advice, they include reference to various mitigation options under development for net monitoring cables, when the use of these cables cannot be eliminated.
2. Encourage implementation of the research priorities for bycatch mitigation in trawl fisheries identified in Section 5.2.

6. SEABIRD BYCATCH MITIGATION IN DEMERSAL LONGLINE FISHERIES

6.1 Review recent developments in mitigation research and update Best Practice Advice

SBWG12 Doc 06 provided an amended version, in tracked changes, of the advice for mitigating seabird bycatch in demersal longline fisheries endorsed by AC13. While no substantial changes had been made to the advice for demersal longline fisheries, further efforts had been invested into ensuring consistency and accessibility of the Best Practice Advice documents across the industrial gear types (trawl, demersal longline, pelagic longline). SBWG12 supported a proposed action to convert all three advice documents to a more user-friendly and standardised format. This will be undertaken by the SBWG Convenors and leads for each gear type during the intersessional period. SBWG identified a small number of other changes to the Best Practice Advice to further improve consistency in language and clarity of advice.

SBWG12 Doc 13 documented the development of a 'dropper float' together with manipulation of line weighting regimes and bird scaring line configurations to sink baited hooks to 5 m within the aerial extent of the bird scaring line in New Zealand demersal longline fisheries. Dropper floats comprised two floats attached to the longline via a 7 m rope weighted at the lower end to counteract the buoyancy of the floats. Additionally, line weight mass was increased, line weight spacing was reduced, and aerial extent of bird scaring lines was maximised. The configuration did not hinder operations. Dropper floats performed well, did not frequently tangle, and proved simple to set and retrieve. Poor and patchy catch rates precluded firm conclusions on influence on target species catch rates. Options were identified for fishers to further vary floatation without impairing sink rates. SBWG welcomed this development addressing current knowledge gaps and challenges and highlighted its relevance to fisheries

using floated demersal longlines globally including small vessel floated demersal longline fisheries. SBWG suggested that further work should investigate impacts on target species catch rates and whether any bait loss occurred. This method was noted in the Best Practice Advice document as an option under development. SBWG encouraged future updates on further work on this topic.

SBWG12 Doc 17 outlined the results from analyses of seabird incidental mortality in Argentinian demersal longline fisheries while considering the spatial and temporal stratification of the fishing effort and incorporating, for the first time, figures of cryptic mortality. Potential annual mortalities for the period 2005-2009 were estimated for two ACAP species: 686 (95% CI: 582-800) Black-browed albatrosses *Thalassarche melanophris* and 2,278 (95% CI: 1,981-2,606) White-chinned petrels *Procellaria aequinoctialis*. The fishery primarily targeting Kingclip had mortality levels for both species that were one order of magnitude higher than two other strata targeting Skate and Patagonian toothfish. It was highlighted that although the fishing effort of the longline fishery in Argentina has progressively reduced to negligible levels in recent years, there is the possibility of economic circumstances favouring the growth of this demersal longline fleet in the future. SBWG welcomed this work, noting the estimates of seabird mortalities, and the fact that it addressed spatial and temporal stratification and cryptic mortality; the SBWG will consider these updated figures in further reviews. SBWG also noted that this work was supported by an ACAP Small Grant, demonstrating the value of this scheme for progressing work in this area.

SBWG12 Inf 08 was also discussed under Agenda Item 5.2. SBWG noted that for demersal longline fisheries the electronic tension monitoring device can be used to confirm both the deployment of the bird scaring line(s) and night setting.

6.2 Priorities for mitigation research

SBWG confirmed the following mitigation research priorities for demersal longline fisheries:

Improved sink rates: further identify mitigation measures that improve the sink rate of baited hooks on floated longlines, including reducing the number of hooks positioned close to floats and the shape, design of weights to achieve higher sink rates, and the use of dropper floats. Synthesise experience and information from other demersal floated longline fisheries to inform the development of advice for this gear.

Haul mitigation devices: continue haul mitigation studies in demersal (and pelagic) fisheries, including at-sea testing to verify effectiveness across a range of vessel operations.

During the intersessional period, SBWG Convenors and leads for each gear type will aim to combine all mitigation research priorities for consideration at SWBG13, which will align with the process of standardisation and improvement of the consistency among the three Best Practice Advice documents.

Ed Melvin, Juan Pablo Seco Pon, and Megan Tierney remain the SBWG leads for bycatch mitigation advice in demersal longline fisheries.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Endorse the updated review and Best Practice Advice for reducing the impact of demersal longline fisheries on seabirds contained in **ANNEX 3.** These updates reflect the latest research presented to SBWG12. Whilst the changes do not make any substantive change to Best Practice Advice, they update research under development for floated demersal longline and provide improved consistency.

2. Note that the SBWG Convenors and leads for each gear type will convert all three advice documents to a more user-friendly and standardised format for consideration at SBWG13.

3. Encourage implementation of the research priorities for bycatch mitigation in demersal longline fisheries identified in Section 6.2.

7. SEABIRD BYCATCH MITIGATION IN PELAGIC LONGLINE FISHERIES

7.1 Review recent developments in mitigation research and update Best Practice Advice

SBWG12 Doc 07 provided a range of proposed amendments to ACAP's pelagic longline mitigation advice document, following routine intersessional review. Several further suggested amendments were identified.

SBWG11 Doc 09 explained why it is logical and appropriate for 50g inclusive of hook weight to be acceptable as a minimum recommended branch line weighting configuration, when the permissible 40 g weight addition up to 0.5 m from the hook might be added at the hook instead. For example, a 50g heavy hook could therefore serve as an alternative branch line weighting option instead of that amount being exceeded if 40 g were to be added at or on the hook. Placing weights on the hook was reported as having the advantage of avoiding any lag in the sink profile of the branch line, compared with weights farther from the hook, and the proposed 50 g heavy hook achieved a sink rate equivalent to the branch line weighting configurations recommended by ACAP. SBWG12 discussed the potential effects of integrating weighting into the hook including: hazards to crew from tear-out flyback events, and risk to vulnerable species, e.g. cetaceans, sharks and marine turtles, when bite-offs occur if lead weighting instead of non-toxic materials were to be integrated into the hook. It was noted that a safety advantage of a heavy hook is that in the case of a bite-off there is no weight to recoil. SBWG discussed recommending against the use of lead when adding weight to the hook and to instead use non-toxic materials partly in order to avoid contamination of human foods. SBWG agreed to update the Best Practice Advice to indicate that hooks with a minimum of total weight of 50 g would meet the sink rate of ACAP recommended branch line weighting configurations, i.e. 0.5 m/s.

SBWG12 Doc 19 noted that present best practice branch line weighting advice does not consider the materials used in the weighting, which can greatly influence their performance in sinking hooks beyond the reach of seabirds, and that weights of high density and mass, but

low volume are preferred. SBWG discussed options to address the issues raised, noting that lights and other accessories are used in some fisheries as an alternative to branch line weighting, and that current ACAP best practice branch line weighting configurations achieved under experimentally controlled conditions a sink rate of 0.5 m/s. SBWG noted that this sink rate helped to ensure that baited hooks reached 5 m depth within the aerial extent of the bird scaring line(s). SBWG agreed to update its guidance to indicate that best practice branch line weighting configurations should be selected from those that have achieved a minimum sink rate of 0.5 m/s to 5 m depth under experimentally controlled conditions and highlight that the use of lights or other accessories are not recommended unless they meet the sink rate criterion.

SBWG updated the pelagic longline advice, in particular:

(i) to indicate that best practice branch line weighting should achieve a minimum sink rate under experimentally controlled conditions of 0.5 m/s to 5 m depth, based on SBWG7 Doc 07

(ii) to indicate that when weighting is attached to, or integrated into, the hook a minimum of total weight of 50 g will be needed to achieve this sink rate criterion

(iii) to avoid the use of lead when the lead may be ingested (e.g. attached to or integrated into the hook).

The use of lighting devices or other fishing accessories as weights is not recommended unless they achieve the sink rate criterion. **SBWG12 Doc 12** used a Bayesian multilevel network meta-regression modelling approach to conduct a synthesis of available evidence to assess the relative efficacies of mitigating seabird bycatch with alternative pelagic longline weighting designs. The modelling indicated that seabird catch rates varied between the assessed designs, and some designs lowered seabird bycatch rates significantly, compared to a reference design of no line weighting attached within 5 m of the hook. SBWG12 noted the meta-regression was based on a small number of studies and a limited suite of fisheries, and further studies including taking account of various variables affecting seabird bycatch rates, such as regional differences and different seabird assemblages, would help improve the reliability of the analyses. SBWG noted the potential utility of the methodology to assess best practice mitigation measures and encouraged further research.

SBWG12 Doc 10 described the development of an ecological risk assessment modelling approach (EASI-Fish) used to evaluate different combinations and specifications between current ICCAT specifications and ACAP Best Practice Advice including on hook-shielding devices. SBWG noted that changing the existing ICCAT seabird mitigation measure for pelagic longlining in the South Atlantic to one that implements ACAP Best Practice Advice was likely to reduce seabird mortality significantly over the current approach where operators are allowed to select two of three possible mitigation measures. SBWG12 also noted that mandating that all three ACAP best practice mitigation measures be applied simultaneously, or the use of hook shielding devices, was likely to reduce seabird mortality even further, compared with existing measures. SBWG12 further noted that none of the assessed amendments to the ICCAT seabird mitigation measure were expected to significantly affect catch rates of target species or other non-retained bycatch species. SBWG12 congratulated the authors on producing readily-accessible graphics that can be used to demonstrate the relative effectiveness of combinations of mitigation measures to audiences such as ICCAT. SBWG12 noted there were some limitations to the modelling approach, but that the model was designed

to highlight relative differences between different seabird mitigation options under consideration by ICCAT. SBWG welcomed the development of the ecological risk assessment modelling approach and encouraged further research.

SBWG12 Inf 02 provided an update on the progress in developing a heavy hook for use in pelagic longline fisheries that was supported under an ACAP Small Grant.

SBWG12 Inf 08 was also discussed under Agenda Item 5.2. SBWG noted that for pelagic longline fisheries the tension monitoring device can be used to confirm both the deployment of the bird scaring line(s) and night setting.

SBWG12 Inf 10 reported on at-sea trials in a South African longline fishery comparing using a hook-shielding device (Hookpod-mini) and Lumo leads during daytime setting operations. No seabird bycatch or entanglement was observed under either treatment, with the study finding that Hookpod-minis entangled significantly more with fishing gear, with lower total CPUE of target tuna species than the control gear, while no differences were found in CPUE for non-target species. SBWG12 noted that the attachment of the Hookpod-minis 3 m from the hook may have led to the entanglement issues, the use of light sticks confounded results and confidence intervals associated with the CPUE were too large to be certain that the hook-shielding device affected catch rates.

7.2 Priorities for mitigation research

SBWG reviewed the highest priorities for research on reducing seabird bycatch in pelagic longline fisheries and recommended they be:

Weighted branch lines: carry out further collaborative field research on the relationship between the current ACAP Best Practice Advice concerning branch line weighting regimes and resulting seabird mortalities and/or seabird attack rates, impacts on catch rates of target species, other bycatch species (e.g., sea turtles), and safety aspects associated with using line weighting. Conduct further research to investigate the effect of the total length of branch lines on sink rates.

Improved branch line weighting for high seas fisheries: High sink rates in the shallow depth ranges are advantageous to seabird conservation and are particularly important in the absence of bird scaring lines or night setting. A minimum sink rate of 0.5 m/s to 5 m depth (determined under controlled conditions) should be used to inform the development of new weighting regimes. A single weight, or an improved version of the existing double weight system, might be the operationally preferred weighting option. A multi-disciplinary approach, potentially involving key members of the fishing industry, marine engineers and others as deemed appropriate, is encouraged.

Hook-shielding devices: conduct further field research to evaluate the relative contributions of the sink rate and hook protection components of hook-shielding devices in reducing bycatch, including through entanglements. Research on hook-shielding devices should also investigate their long-term durability or failure rates, and the possibility of increasing the depth (or time) of protection provided. Further research on the effectiveness of the Hookpod-mini (48 g) is encouraged. Research on the performance of any hook-shielding device should collect data on seabird attacks on baited hooks to assess the risk of entanglement or being swallowed together with the bait.

Bird scaring lines: developing bird scaring line configuration for smaller vessels and methods that minimize entanglements of the in-water portion of bird scaring lines with longline floats, while creating sufficient drag to maximize aerial extent, remains the highest priority for research on bird scaring lines. Research activities evaluating the effectiveness of one vs. two bird scaring lines, bird scaring line design features (streamer lengths, configurations, and materials), and methods for efficient retrieval and stowage of bird scaring lines remain research priorities.

Time-of-day: determine the relative effectiveness of bird scaring lines and branch line weighting at night by characterising seabird behaviour at night.

Underwater bait setting devices: evaluate performance with unweighted vs weighted branch lines.

Combinations of mitigation measures: evaluate the effectiveness and additive nature of the simultaneous use of various combinations of two best practice mitigation methods (night-setting, branch line weighting and bird scaring lines) as called for by existing Regional Fisheries Management Organisation (RFMO) seabird conservation measures. Continue to evaluate the effectiveness and additive nature of the simultaneous use of all three ACAP best practice mitigation measures, including comparative catch rates for both bycatch and target species.

Weighting materials: developing and evaluating alternative weighting materials not reliant on lead that achieve recommended branch line sink rates.

Novel/emerging technologies: continue to develop novel and/or emerging technologies. Also consider innovation in independent monitoring of fishing activities.

Sensory ecology: encourage and initiate research to examine the sensory capabilities of seabirds (visual, acoustic, olfactory systems) to inform the development of sensory-based safe mitigation technologies and measures as an alternative to trial-and-error approaches. This research priority has application to the development of mitigation options across a broad range of fishing methods and in offshore wind turbine installations.

Live bird haul capture: investigate the nature and extent of live bird haul capture in pelagic longline fisheries.

Haul mitigation technologies: develop methods that minimise seabird hooking during hook retrieval. Encourage further research to mitigate bycatch on small vessels during hauling.

Time/area closures: update seabird tracking/fishing effort overlap maps to advance options for time/area management.

Bait-casting machines: conduct a survey to characterise the extent of use of bait-casting machines, and their operational attributes that may influence seabird bycatch risk.

Hook mass and design: investigate whether changes to hook mass and design may reduce the chance of seabird mortality in longline fisheries without adversely affecting target species catch rates, or other bycatch species. Further research on the effectiveness of the Heavy Hook (50 g) is encouraged.

Jonathon Barrington and Sebastián Jiménez remain the SBWG leads for bycatch mitigation advice in pelagic longline fisheries.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Endorse the updated review and Best Practice Advice for reducing the impact of pelagic longline fisheries on seabirds contained in **ANNEX 4**. These updates provide improved clarity and consistency in the document and reflect the latest research presented to SBWG12. These changes include defining a sink rate criterion for best practice branch line weighting and providing further clarification around the use of weight attached to, or integrated into, the hook as well as weight materials.

2. Encourage implementation of the research priorities for bycatch mitigation in pelagic longline fisheries identified in Section 7.2.

3. Encourage Parties and other stakeholders to collect additional estimates of seabird bycatch rates of alternative branch line weighting designs.

8. ARTISANAL AND SMALL-SCALE FISHERIES

8.1 Review recent developments in mitigation research and update toolbox advice

SBWG12 Inf 09 described a project that used vessel logbooks, interviews with crew and data from scientific surveys to evaluate risk to seabirds from a diverse small-scale hook-and-line fleet in south and southeast Brazil. Results indicate Brazilian small-scale fisheries may pose a considerable threat to seabirds, including ACAP species. SBWG noted that these results corroborated findings presented to SBWG11 (SWBG11 Inf 22) and further supported the recommendations from SBWG11 for these fisheries. SBWG noted concern expressed in the paper about ACAP definitions of small-scale fisheries, and reference to Brazil's NPOA-Seabirds, which includes action to engage with small-scale fisheries to improve the handling of bycaught birds (see also Section 12). SBWG also noted that the project was funded by an ACAP Small Grant.

SBWG12 Inf 14 described work that tested seabird bycatch mitigation measures in the artisanal longline fishery that targets sharks in southern Peru, where the fishery overlaps with high densities of ACAP species. The paper describes the first stage of experiments in this fishery, with further work testing mitigation measures now underway and due for completion in October 2024. SBWG noted there was zero bycatch during the 10 monitored fishing trips, which was partially influenced by the weighted branch lines (60 g leaded swivel at 0.5 m from the hook) and bird-scaring line used, and the low seabird density off Peru during spring and summer, when the trips were conducted. SBWG welcomed the useful insights into seabird aggregations, fishing gear and fishing operations in these fisheries, as well as into feasible mitigation measures.

SBWG12 Inf 15 used information on spatial distribution of fishing effort of Peruvian small-scale gillnet and pelagic longline fisheries, combined with seabird distribution data obtained by seabird counts during scientific cruises, to evaluate the overlap between Salvin's

Thalassarche salvini, Buller's *Thalassarche bulleri*, Chatham *Thalassarche eremita* and Black-browed *Thalassarche melanophris* albatrosses with these fisheries. The paper provided valuable, species-specific, information on spatial-temporal overlap with the distribution of albatross species with each fishery, which is useful to draw inferences about positive and negative interactions with these fisheries, including bycatch risk.

SBWG12 Inf 16 described the potential areas of interaction between albatrosses and the Mahi-mahi fishery off the Peruvian coast. Data was sourced from fishers and research cruises. The paper reported that the density of fishing operations varied according to distance offshore, season and latitude. Because of this variation, overlap with Waved *Phoebastria irrorata*, Chatham *T. eremita*, Black-browed *T. melanophris*, Buller's *T. bulleri* and Salvin's *T. salvini* albatrosses also varied. SBWG noted the data were from research cruises conducted between the coast to 100 nm offshore, and more representative spatial data (particularly offshore) would provide more robust results. SBWG encouraged integration of the information presented in the paper into the recently commenced Humboldt Current risk assessment project. The paper noted that Waved Albatross *P. irrorata* GPS data could be used to further explore overlap with fisheries.

SBWG12 Inf 17 described an ongoing innovative approach to collecting seabird bycatch data directly from artisanal coastal gillnet fishers in Peru via WhatsApp and radio communications. The paper also described using WhatsApp and social media to educate fishers on conservation issues and safe seabird handling, and as a resource for seabird identification. The paper presented data collected from fishers and research cruises to describe albatross distributions, which were found to vary according to El Niño and La Niña. SBWG noted this as an interesting innovation in small-scale fisheries where putting observers onboard vessels is challenging. SBWG noted that it would be useful for papers that assess seabird bycatch overlap with fisheries to contribute to research describing bycatch numbers and rates, where possible.

8.2 Priorities for mitigation research

SBWG highlighted that there may be overlap between the small-scale fisheries priorities for mitigation measure research and those identified for demersal longline fisheries. It was suggested that all research priorities be combined into one list which would avoid overlap and allow for prioritisation across methods. SBWG agreed that this would be undertaken intersessionally and presented at SBWG13.

It was noted that research priorities can be inferred from the categorisation of mitigation methods described in the seabird bycatch mitigation toolbox for artisanal fisheries. SBWG highlighted the Mahi-mahi fishery as a fishery requiring more seabird bycatch mitigation research effort.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Note the further progress made to populate the seabird bycatch mitigation toolbox (**AC11 Doc 06 ANNEX 6**) for artisanal and small-scale fisheries and plans to

complete the process during the next intersessional period, following which it will be provided on the ACAP website.

2. Note that the SBWG Convenors will combine all mitigation research priorities for consideration at SWBG13, which will align with the process of standardisation and improvement of the consistency amongst the Best Practice Advice documents for each fishing gear type.

9. SEABIRD BYCATCH MITIGATION IN PURSE SEINE FISHERIES

9.1 Review recent developments in mitigation research and update toolbox advice

SBWG12 Inf 11 presented updated guidelines for seabird handling and rescue aboard the small-scale, mackerel purse-seine fleet operating in central-south Chile. The paper highlighted the inclusion of general guidelines about the fishery, details on seabird handling aboard while considering crew safety, partnerships with fishers to develop tools to handle seabirds safely, and collaboration with seabird rehabilitation centres. Mackerel purse-seiners have implemented seabird recovery stations aboard (i.e. for soaked/stressed rescued individuals), ensuring low levels of light and noise, reduced transit of people, and absence of hydrocarbons. The new seabird handling guidelines follow ACAP's H5N1 panzootic procedures and comply with purse-seine fishery regulations, and with Chilean national regulations for the conservation of penguins and procellariiformes. SBWG welcomed the new guidelines, the collaboration with fishers and with PaCSWG. SBWG noted the very clear seabird handling diagrams, the simple accompanying text, and that the guidelines were equally applicable to seabird handling in any fishery, cruise ships, and lighting platforms that attract seabirds (e.g. lighthouses and other types of platforms at sea). SBWG encouraged further development of these materials into ACAP guidelines.

SBWG12 Inf 12 presented the updated toolbox to mitigate seabird interactions during purse-seine fishing operations, updating the original version presented in SBWG10 Doc 19. The new toolbox provides recommendations on bycatch mitigation measures and facilitates consultation for decision-making. The paper details the phases within a purse-seine fishing operation, available bycatch mitigation measures to be applied to each of the phases, and their efficacy status (i.e. whether the potential measure is based on a systematic evaluation or needs additional trials). This approach not only facilitates decision-making, but encourages implementation monitoring and further research. The toolbox is a work in progress and intends to nurture collaboration between purse-seine fisheries operating globally and targeting a variety of fish species. SBWG12 congratulated the authors on the way of presenting the recommendations, the long-term development process around this advice, and noted this was a work in progress. SBWG noted that the toolbox can be applied to any purse-seine fishery.

9.2 Priorities for mitigation research

It was noted that research priorities can be inferred from the categorisation of mitigation methods described in the seabird bycatch mitigation toolbox for purse seine fisheries.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Endorse the updated Toolbox for seabird bycatch mitigation advice in purse seine fisheries presented in **SBWG12 Inf 12**, which will be reformatted as a bycatch mitigation resource on the ACAP website.
2. Note the achievements in the development of seabird bycatch mitigation measures for purse-seine fishing operations and encourage Parties to conduct further experimental studies.
3. Note the potential to develop the material in **SBWG Inf 11** into ACAP guidelines.

10. SEABIRD BYCATCH MITIGATION IN OTHER INDUSTRIAL FISHERIES

10.1 Review recent developments in mitigation research and consider priorities for further research

There were no papers to consider under this agenda item.

10.2 Assessment of risks and development of ACAP advice for any other relevant fisheries

There were no papers to consider under this agenda item and no further fisheries for the development of ACAP advice were identified.

11. ACAP PERFORMANCE INDICATORS: SEABIRD BYCATCH DATA WORKSHOP

11.1 Seabird Bycatch Data Workshop

SBWG12 Doc 04 reported on a seabird bycatch data workshop held on 4 August 2024 immediately prior to SBWG12. The workshop aimed to understand and find solutions to the challenges experienced in the reporting of ACAP seabird bycatch indicators, and to review at-sea threats to albatrosses and petrels. SBWG12 considered the former under this agenda item with the latter discussed under agenda item 14. In considering the workshop recommendations, SBWG noted there were again low levels of reporting by Parties and therefore it is unlikely detailed bycatch data will be able to be used as a performance indicator for ACAP. Better links between fisheries and environment agencies may eventually improve the collection and reporting of seabird bycatch data but until there is improved reporting, ACAP would be better served by focusing on the collection of simpler metrics. AS, such, simplified Response indicators on mitigation implementation were discussed such as whether mitigation is mandated The WG agreed such metrics should now become the priority in order to progress the development of Bycatch Indicators for ACAP. It was recognised that an ACAP project could assist in supporting reporting by Parties against simplified indicators. SBWG noted concerns about the workshop process including difficulties with the lack of interpretation and

convening of two separate language break-out groups. It was further noted that providing interpretation services during future workshops would have cost implications.

11.2 Review guidelines for observer and EM data collection

SBWG12 Doc 15 reported on differences in Black Petrel *Procellaria parkinsoni* interactions with bottom longline fishing vessels, using onboard observers and electronic monitoring. Analyses showed that estimated Black Petrel *P. parkinsoni* captures were lower when using observer data and electronic monitoring data combined compared with observer data alone. SBWG noted the research outcomes and recommended a review of ACAP guidance on seabird bycatch data collection and assessment to reflect the conclusions from the study.

SBWG12 Inf 18 used Bayesian time series models to estimate the bycatch of an endangered albatross species. While SBWG noted the benefit of this advanced technique, it stressed that the importance of data collection should not be under-emphasised.

SBWG agreed that both the ACAP observer programme and EM guidelines be reviewed during the intersessional period. This review could include developing guidance on bycatch estimation methods for such data once collected. It was noted that there is growing interest in using artificial intelligence (AI) to analyse EM camera footage and that currently the availability of imagery to train such systems is a limiting factor which greater cooperation could overcome.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

Regarding ACAP indicators and data collection SBWG recommends that the Advisory Committee:

1. Agree to prioritise the collection of simple Response data on the implementation of seabird bycatch mitigation in domestic and RFMO fisheries.
2. Encourage Parties to report detailed information on seabird bycatch where possible and, in particular, on seabird bycatch rates and total fishing effort.
3. Agree to the development of an ACAP-funded project to support data reporting concerning bycatch indicators.
4. Note that future workshops would benefit from simultaneous interpretation, which would require further resources in the ACAP Budget.

Regarding observer and electronic monitoring SBWG recommends that the Advisory Committee:

1. Note that an intersessional process is planned to update ACAP data collection guidelines for both observer programmes and electronic monitoring.
2. Encourage Parties to collaborate and share data from Artificial Intelligence (AI) programs that support improved bycatch mitigation identification.

12. FAO IPOA/NPOA-SEABIRDS

12.1 Review of status of implementation of NPOA-Seabirds

SBWG12 Doc 11 provided updated information about the Regional Action Plan between Argentina and Uruguay to reduce the interaction of seabirds with fisheries operating in the Treaty Area of Río de la Plata and its Maritime Front, which was adopted by the Treaty Commission in June 2022 (see SBWG11 Inf 03). The Regional Action Plan was presented to the FAO in September 2022. In May 2024 the Joint Technical Commission met to consider activities for 2024 and 2025, including development of a research plan. SBWG congratulated Argentina and Uruguay for further progressing implementation of their Regional Action Plan and noted that the proposed recommendation would be considered during the Joint SBWG12/PaCSWG8 meeting (**AC14 Doc 13**).

SBWG12 Inf 05 described how Brazil's National Plan of Action for the Conservation of Albatrosses and Petrels (PLANACAP) is addressing the threats to albatrosses and petrels. A review of PLANACAP in 2024 led to a new cycle of activities, taking account of the most recent updated ACAP advice and guidelines. Looking forward, the fourth cycle of PLANACAP aims to further reduce the mortality of albatrosses and petrels by focusing on four specific objectives: understanding and mitigating fishing interactions, monitoring the impacts of offshore projects, addressing issues related to pathogens, pollution, and climate change, and enhancing public policy and environmental education. SBWG welcomed Brazil's work in this area. In response to a suggestion to concentrate on the highest priorities, it was noted that this Plan was launched in 2006 during the second Advisory Committee meetings (AC2) in Brasilia. Since then, annual meetings have been held to monitor its progress. Additionally, it was emphasized that the Plan aligns with Annex 2, Action Plan of the Agreement, and its implementation directly supports the broader goals of the Agreement in Brazil.

SBWG12 Inf 06 examined how Chile had, since 2012, developed and implemented a process of diagnosis, reduction and control of discards and incidental bycatch in its national fisheries. This process had involved the joint efforts of the regulatory, research and control agencies along with collaborative work with the fishing users. Over the 12-year period, Chile had enacted legislation in 2014, 2019 and 2021 to establish bycatch mitigation measures for both industrial and artisanal longline and for industrial trawling fleets, establishing the mandatory use of deterrent devices, the application of codes of good fishing practices and reporting in logbooks, among others. Together, this has resulted in significant reductions in bycatch numbers. Chile noted that the development of electronic monitoring has helped substantially with observations and compliance, but noted there are still challenges implementing EM in artisanal fleets and the use of images for purposes other than compliance. Chile expressed thanks to ACAP for all the work that it does, including the provision of the Small Grants. SBWG congratulated Chile for all the work it has achieved since 2012, noting that this can be considered a real win for ACAP and ACAP species.

During discussion, the development and updates of other National Plans of Action were described. New Zealand reviewed progress in implementing its NPOA in 2022. This prompted a review of pelagic longline regulations in 2023, which led to a New Zealand decision in 2024 to require ACAP's Best Practice Advice in its pelagic longline fisheries, to come into effect in October 2024. Spain is currently improving its Action Plan for observers, aiming to reach 10% observer coverage in the entire Spanish fleet, although it was noted this level would not be specific to seabird observations only. Australia reported on its integrated approach: the

NPOA-seabirds (scheduled for review); the National Recovery Plan for Albatrosses and Petrels; and the Threat Abatement Plan for Seabirds that was reviewed in 2023. Australia has postponed plans to update its Threat Abatement Plan for Marine Debris to await development of the global Plastics Pollution Treaty. South Africa reported they have recently completed a review of their NPOA-Seabirds and hope to have a document ready by the end of August 2024 to present to their Minister for approval. South Africa noted they had drawn on ACAP Best Practice Advice, their latest fisheries data, and data collection and EM systems to update their plan.

SBWG welcomed these updates and agreed to recommend that AC14 congratulate the Parties that had developed or updated their NPOA and/or regional POA and urged other Parties to follow this example.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Encourage Parties to implement national or regional plans of action to address seabird bycatch and provide updates at each SBWG meeting.
2. Encourage those Parties who have not yet developed national plans to do so urgently.

13. ENHANCING IMPLEMENTATION OF BEST PRACTICE SEABIRD BYCATCH MITIGATION MEASURES

SBWG welcomed **SBWG12 Doc 14** which provided an update on the development of the Seabird-Safe Fishing Toolkit, a web-based resource designed to provide seafood businesses with resources to achieve seabird-safe fishing leveraged off sustainability concerns of seafood consumers. The toolkit was developed with mitigation science experts, seafood businesses and NGOs, to use available evidence to develop and define simple categories for: 1) seabird ocean zones; 2) the effectiveness of mitigation options at reducing seabird captures; 3) the seabird-safeness of specific fisheries; and 4) the level of confidence that the measures are implemented. Mitigation options are based on ACAP Best Practice Advice. Initially, the focus is on pelagic longline fisheries, but could be expanded to other fishing gears and other megafauna. Ultimately, a fishing business could use the toolkit to determine the risk level of their fishing location, the appropriate mitigation measures to reduce that risk, and available approaches to monitor compliance. SBWG noted the toolkit could be a very useful resource for MSC certifying bodies to evaluate if candidate fisheries are seabird safe and actions that can be taken if they are not. SBWG recommended that ACAP promote the use of the Seabird-Safe Fishing Toolkit to enhance efforts to adopt ACAP best practice mitigation measures.

SBWG12/PaCSW8 Inf 12 provided an update on work undertaken to develop seabird risk ocean zones used in the Seabird-Safe Fishing Toolkit (**SBWG12 Doc 14**) and described the methods used. The toolkit includes zoning of the world's oceans according to the seabird species present, their threat status, and vulnerability to longline fishing bycatch. The constituent mapping layers identified areas for the Pacific Ocean where: 1) seabirds of high

conservation status are present (threatened species layer); 2) high species diversity occurs (species diversity layer); and, 3) where *Procellaria* petrels are present (*Procellaria* petrel layer). Initial overall ocean zones provide a comprehensive yet simple assessment and categorization of relative risk of bycatch to ACAP species across the Pacific. Current limitations with the data and methods are discussed as are the future potential developments to enhance the assessment. The authors intend to continually improve the input data and methods used to describe ocean zones and welcome active collaboration with researchers and others involved in the collection and analysis of seabird distribution data. It was noted that current species maps are a single layer that include all age classes and genders for each species for the purposes of the Toolkit, and these maps will be a valuable resource to draw upon. The tool could be expanded to include further layers.

SBWG12 Doc 18 explored the factors influencing the adoption of bycatch mitigation strategies to protect marine megafauna (including seabirds), with a particular emphasis on the social and behavioural dynamics involved, using the Argentine offshore commercial bottom trawl fleet as a case study. Based on interviews with key Argentine stakeholders to gather their opinions and perceptions regarding bycatch and mitigation in commercial fisheries: 1) there is a prevailing perception that crew are hesitant to use mitigation measures (MMs), although executives and fishers have contrasting views; 2) the main barrier preventing the implementation of MMs is the perception that mitigation techniques and/or technologies are cumbersome and inefficient; and 3) participants suggest that improving strategic governance measures and promoting collaboration among different stakeholders could enhance the uptake of MMs. SBWG noted the study underscores the importance of considering social dynamics in addressing bycatch issues of marine megafauna and the use of mitigation measures within commercial deep-sea fisheries. This paper is the product of an ACAP Secondment to work with specialists in social science at CSIRO and James Cook University in Australia, to incorporate the latest science-based methods into this work. SBWG commended this work and re-confirmed its interest in applying social science approaches to understand the views of, and communication networks of stakeholders in an effort to encourage the use of best practice seabird mitigation measures in their fisheries. SBWG supported the recommendation that ACAP consider the merits of formally incorporating the human dimension of bycatch and uptake of mitigation measures into the AC Work Programme.

SBWG12 Inf 13 introduced the REDUCE project which aims to minimize bycatch of Endangered, Threatened, and Protected Species (ETPS) in industrial EU fisheries operating in the east Central Atlantic Ocean. The project focuses on purse-seine, longline, and trawler fleets, particularly from Spain, France, and Portugal, which significantly contribute to bycatch in this biodiversity hotspot. REDUCE will employ interdisciplinary scientific approaches to enhance fishery monitoring, understand bycatch dynamics, and develop effective mitigation strategies. SBWG noted that the REDUCE project is in its early stages of implementation, and mainly focused on technology development at this stage using an academic approach. SBWG encouraged the provision of further updates to SBWG as the project progresses.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Endorse ACAP promotion of the Seabird Safe Toolkit, including through the ACAP website, to enhance efforts to adopt ACAP best practice mitigation measures.
2. Note the incorporation into the AC Work Programme of the study of the human dimension of bycatch and uptake of mitigation measures as a relevant approach to increase the uptake of mitigation.

14. PRIORITY AT-SEA CONSERVATION ACTIONS

14.1 Review of priority fisheries and report back on pre-meeting workshop

SBWG12 Doc 04 reported on a workshop held on 4 August 2024 immediately prior to SBWG12. The workshop considered, inter alia, priority fisheries for conservation action for ACAP species. This was based on a framework developed for and accepted by the Meeting of Parties (MoP) **(**MoP4 Inf 06 Rev 1). The framework is underpinned by information on many fisheries (provided by experts and Parties), including those operating outside exclusive economic zones (EEZs), as well as the size and trends of albatross and petrel populations which might be impacted by those fisheries. The 'priority' fisheries were defined as the top 10% of all of the fisheries evaluated. Twenty-five fisheries and 28 seabird populations were identified as priority targets for action during the latest (2021) iteration of the prioritisation process (Table 3 **AC14 Doc 18**).

SBWG agreed that the current full list of fisheries needs to be fully reviewed and updated by Parties (via Party contact points). Several possible omissions in the current list of priority fisheries for conservation actions are being investigated by the Secretariat. It was agreed that a staged approach could be used to update the fisheries: 1) Parties and Range State and APEC Member Economy Observers should be asked to update information on their fisheries as soon as possible; 2) information on fisheries managed by RFMOs should be updated using publicly available materials, noting that ACAP has MoUs or similar arrangements with most relevant RFMOs; and 3) a further process would be needed for other States not presently interacting with ACAP. It was noted that if capacity allowed for updating at least the Party and Range-State observer fisheries in the next few months a new version of the priority fisheries could be provided to MoP8. Alternatively, an update could occur during the next MoP intersessional period. It was agreed that all ACAP species potentially impacted by a fishery should be listed in the table of 'high priority' fisheries rather than only those species associated with the high-ranking score.

SBWG welcomed the inclusion by the workshop of identified actions that can be taken by ACAP and its Parties to reduce seabird bycatch in these priority fisheries. Upon completion of the prioritisation process, further actions may need to be identified, especially if additional fisheries are ranked as 'high priority for conservation action'.

SBWG12 Inf 04 described limited observations of trawling interactions by Spain and Uruguay over a part of continental shelf in the high seas of the southwest Atlantic. SBWG welcomed this paper, noting that this area is presently unregulated by any national or international body,

and an estimated 350 fishing vessels of a variety of metier and flag states may be using the area. SBWG noted that interactions in this area could pose a considerable threat to several populations of ACAP species. In the absence of firm information, SBWG encouraged Parties and Observers to provide more information on fisheries in this area to SBWG13.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Review and endorse the at-sea conservation priority actions identified for ACAP and ACAP Parties (**ANNEX 5**).
2. Note the staged approach proposed to update the priority fisheries, starting with Party and Range-State and APEC Member Economy Observer fisheries, followed by non-Party fisheries and RFMO fisheries.
3. Request that Parties and Range-State and APEC Member Economy Observers review and update the list of fisheries relevant to them to be used in the prioritisation framework, update the scores for each of these fisheries and identify further possible actions for ACAP or ACAP Parties for high priority fisheries.
4. Note the potentially serious fisheries interactions with seabirds in the unregulated high seas area of the southwest Atlantic.
5. Encourage Parties and others to provide papers to SBWG describing fishing activity and any other relevant information on this area of the southwest Atlantic.

15. TOOLS AND GUIDELINES

15.1 Updates and new guidelines

There were no papers submitted under this agenda item. Guidelines for observer programme and EM data collection were discussed under agenda item 11.2. Recommendations for potential new guidelines to support the ACAP RFMO Engagement Strategy were discussed during the joint SBWG12/PaCSWG8 meeting (**AC14 Doc 13**).

15.2 Mitigation Factsheets

SBWG12 Doc 08 provided an update on progress with the factsheet on pelagic longline bird scaring lines for vessels <35m. Factsheets for vessels ≥35m, and for demersal longline bird scaring lines, remain to be completed as a priority, along with several other factsheets that are yet to be converted into the new simplified format: demersal longline line weighting, trawl warp strike and trawl net entanglement.

SBWG12 Inf 07 provided information on the possibility of collision and/or entanglement of seabirds with the cables associated with fishing operations by Chilean trawl vessels. Information was provided on the different cables used in these trawl fisheries, in particular the specific construction and operational characteristics related to their function. Infographics on

mitigation being used by the Chilean large trawler factory fleet were provided in the paper. Further information is being collected to verify that these mitigation measures are effective and can demonstrate that they meet ACAP best practice criteria. The authors will investigate ways to communicate these measures with non-Parties via toolboxes. SBWG welcomed the presentation of this work and noted its content can facilitate the development of a simplified factsheet on seabird bycatch mitigation measures for NMC strikes in trawl fisheries. SBWG noted the potential for the use of instantaneous mitigation measures during hauling operations (e.g. acoustic deterrents or water sprays) when seabirds can become entangled by the feathers in wire strands (warp or NMC) as they open and close due to tension oscillation. Chile noted further mitigation development was in process and will be reported to SBWG13.

José Carlos Báez, Sebastián Jiménez, and Jonathon Barrington agreed to draft the purse seine factsheet. Graphics as shown in **SBWG12 Inf 12** and further reference material will be translated into English to support the production of this factsheet. Additional support from experts on the Peruvian purse seine fishery would be welcome.

Leandro Tamini agreed to lead the drafting of the demersal and pelagic trawl warp strike factsheet.

Verónica Iriarte agreed to lead the drafting of the demersal and pelagic trawl net entanglement factsheet.

Dimas Gianuca agreed to contact relevant experts for the demersal longline line weighting factsheets.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Support the update of the remaining Mitigation Fact Sheets to the new simplified format in a phased approach in accordance with the prioritisation identified by SBWG12.
2. Note progress with the updated Mitigation Fact Sheet on pelagic longline fisheries bird scaring lines (vessels <35m).

16. SBWG WORK PROGRAMME

16.1 Work Programme 2023-2025

Tasks relevant to the Seabird Bycatch Working Group in the 2023-2025 Advisory Committee Work Programme approved by MoP7 (**AC14 Doc 22**) were reviewed following discussions at SBWG12. An updated version of the Work Programme was prepared for consideration by the Advisory Committee.

16.2 Draft Work Programme 2026-2028

Tasks relevant to the Seabird Bycatch Working Group in the Draft 2026-2028 Advisory Committee Work Programme (**AC14 Doc 2**3) were reviewed following discussions at

SBWG12. An updated version of the Work Programme was prepared for consideration by the Advisory Committee.

17. ANY OTHER BUSINESS

There were no items raised under this agenda item.

18. CLOSING REMARKS

The Co-Convenor Sebastián Jiménez thanked authors of the papers submitted for consideration, and Members and Observers for their valuable contributions to the meeting. The Co-Convenor also thanked the ACAP Secretariat and the technical support team for organising and running the meeting. He thanked the interpreters for their valuable efforts during the meeting and Peru as the host for providing an excellent venue and facilities.

ANNEX 1. LIST OF SBWG12 MEETING PARTICIPANTS

SBWG Members	
Igor Debski	SBWG Co-convenor, Department of Conservation, New Zealand
Sebastián Jiménez	SBWG Co-convenor, Dirección Nacional de Recursos Acuáticos, Uruguay
Dimas Gianuca	SBWG Co-viceconvenor, BirdLife International
Megan Tierney	Joint Nature Conservation Committee, United Kingdom
Luis Adasme	Instituto de Fomento Pesquero, Chile
Cristóbal Anguita	Universidad de Chile
José Carlos Báez	Spanish Oceanographic Institute
Jonathon Barrington	Department of Climate Change, Energy, the Environment and Water, Australian Antarctic Division, Australia
Nigel Brothers	Humane Society International Australia
Andrés Domingo	Dirección Nacional de Recursos Acuáticos, Uruguay
Marco Favero	Instituto de Investigaciones Marinas y Costeras, CONICET, Argentina
Elisa Goya	Instituto del Mar del Peru (IMARPE), Peru
Eric Gilman	The Safina Centre
Verónica Iriarte	United Kingdom
Ed Melvin	University of Washington, USA
Tatiana Neves	Projeto Albatroz, Brazil
Cristián Suazo	Albatross Task Force - Chile, BirdLife International
Mark Tasker	Joint Nature Conservation Committee, United Kingdom/ TWG Convenor
Helen Wade	BirdLife International

Advisory Committee Members, Representatives and Advisors	
Regina Aguilar	Advisor, Peru
Eve Arbodela	Advisor, Peru
Angel Banfi	Alternate Representative, Argentina
Jairo Calderón	Advisor, Peru
Jennifer Chauca	Advisor, Peru
Luis Cocas	Advisor, Chile
Mike Double	AC Chair
Johannes Fischer	Advisor, New Zealand
William Gibson	Advisor, New Zealand
Gustavo Jimenez	Advisor, Ecuador
Julio Limache	Advisor, Peru

Eduardo Lopez	Advisor, Peru
Mandi Livesey	Alternate Representative, Australia
Verónica López	Advisor, Chile
Makhudu Masotla	Alternate Representative, South Africa
María Andrea Meza	Alternate Representative, Peru
Helena Moreno	Alternate Representative, Spain
Sihle Victor Ngcongo	Advisor, South Africa
Manuel Ochoa	Advisor, Peru
Javier Quiñones	Advisor, Peru
Giancarlo Ríos	Advisor, Peru
Gersson Román	Advisor, Peru
Cynthia Romero	Advisor, Peru
Christian Sevilla	Advisor, Ecuador
Patricia Pereira Serafini	PaCSWG Co-convenor
Richard Phillips	PaCSWG Vice-convenor
Cesar Mauricio Zamora Ramos	Advisor, Peru
Observers	
Gabriel Canani	AATM-FURG/Projeto Albatroz, Brazil
Ana Carneiro	BirdLife International
Thomas Clay	Environmental Defense Fund
Tzung-Su Ding	Chinese Taipei
Esteban Frere	BirdLife International
Kathryn Huyvaert	American Bird Conservancy
Andrea Sánchez-Tapia	Global Fishing Watch
Giovanny Suárez Espín	American Bird Conservancy
Leandro Tamini	BirdLife International
Desmond Tom	Namibia
SachikoTsuji	NRIFR, Japan

ACAP Secretariat	
Christine Bogle	Executive Secretary
Wiesława Misiak	Science Officer
Bree Forrer	Communications Advisor

Interpreters
Cecilia Alal
Sandra Hale

Non-attending SBWG members	
Joanna Alfaro-Shigueto	ProDelphinus, Peru
Barry Baker	Institute for Marine and Antarctic Studies (IMAS), Australia
Johannes De Goede	Department of Environment, Forestry and Fisheries, South Africa
Caroline Fox	Environment and Climate Change Canada
Marco Herrera	Insituto Público de Investigaciones en Acuacultura y Pesca, Ecuador
Svein Løkkeborg	Institute of Marine Research, Norway
Amanda Kuepfer	Exeter University, United Kingdom
Jeffry Mangel	ProDelphinus, Peru
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Gabriela Navarro	Subsecretaría de Pesca y Acuicultura, Argentina
Graham Robertson	Unaffiliated
Yann Rouxel	BirdLife International
Juan Pablo Seco Pon	SBWG Co-viceconvenor, Instituto de Investigaciones Marinas y Costeras, CONICET-UNMDP, Argentina
Barbara Wienecke	Department of the Environment and Energy, Australian Antarctic Division, Australia
Anton Wolfaardt	Unaffiliated

ANNEX 2. ACAP REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR PELAGIC AND DEMERSAL TRAWL FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP Review of Mitigation Measures and Best Practice Advice for Reducing the Impact of Pelagic and Demersal Trawl Fisheries on Seabirds

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

INTRODUCTION

The incidental mortality of seabirds in trawl fisheries continues to be a serious global concern, especially for threatened albatrosses and petrels. In trawl fisheries, birds foraging on discards or offal may be injured or killed on collision with net monitoring and warp cables, dragged underwater and drowned when their wings become entangled around the warp, or become entangled in nets during shooting and hauling.

There have been considerable efforts internationally to develop mitigation measures to avoid or minimise the risk of incidental catch of seabirds in trawl fisheries. Although the focus of efforts to mitigate seabird bycatch was initially directed at longline fisheries, trawl fleets have also now been shown to incidentally kill large numbers of seabirds. The FAO Best Practice Guidelines for IPOA/NPOA-Seabirds were amended in 2009 to include trawl fisheries in addition to longline fisheries (FAO 2009), demonstrating increased serious concern and awareness of seabird mortality in global trawl fisheries. Although most mitigation measures are broadly applicable, the application and specifications of some will vary with local methods and gear configurations. ACAP has comprehensively reviewed the scientific literature dealing with seabird bycatch mitigation in trawl fisheries (see review section below) and this document is a summary of the advice informed by the review.

This document provides advice about best practices for reducing the impact of trawl fishing on seabirds. The ACAP review process recognises that factors such as safety, practicality and the characteristics of the fishery should also be taken into account when considering the efficacy of seabird bycatch mitigation measures and consequently in the development of advice and guidelines on best practice.

This document also provides information regarding measures that are currently under active development, and which show promise as future best practices in trawl fisheries. ACAP will continue to monitor the development of these practices and the results of scientific research about their effectiveness.

The document comprises two components. The first component provides a summary of ACAP's advice regarding best practice measures for reducing seabird bycatch in pelagic and demersal trawl fisheries, and the second component outlines the review of mitigation measures that have been assessed for these fisheries.

Agreement on the Conservation of Albatrosses and Petrels

ACAP Summary Advice for Reducing the Impact of Pelagic and Demersal Trawl Fisheries on Seabirds

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

BEST PRACTICE MEASURES

Seabird mortality in trawl fisheries occurs when birds collide with cables as they feed on fish processing waste (offal) and discards or are entangled in trawl nets as they attempt to forage on captured fish or fish parts. Cable strikes, including collisions with net monitoring cables[1], warp cables[2] and paravanes are associated with the discards and fish waste discharged by vessels. It is recognized that larger seabirds (albatrosses and giant petrels) with long wingspans are most vulnerable to cable strike mortalities; however, smaller seabirds can also suffer cable strike mortalities. Although in many fisheries vessels are required to discard prohibited fish species whole and unprocessed, vessels that catch fish for delivery for shoreside processing (catcher vessels) and do not produce offal, are in general are less associated with cable strikes. Seabird net mortalities can occur in catcher-processor (vessels that catch and process fish on board) and catcher vessels trawl operations.

Trawl fisheries are extremely diverse and encompass pelagic trawling for schooling off-bottom species and demersal trawling for fish species on the sea floor. In general, trawl fisheries range from high volume fisheries that land and process hundreds of tonnes of fish 24 hours a day continuously for weeks, to lower volume fisheries that fish for shorter time periods producing little to no waste. Because fish waste drives cable strikes, and can attract birds that may then interact with the net, management of offal discharge and discards[3] is considered the primary means to reduce cable strikes and net entanglements. However, fishery and vessel characteristics dictate the extent to which offal can be managed and the method that might be employed. Where the opportunity for fish waste management is limited or impractical, cable strikes can be prevented by protecting trawl cables with mitigation devices. Birds can also be attracted to the net during hauling by fish in the net, creating risk of net entanglement. Net entanglements can be prevented by reducing the time the net is exposed on the surface of

[1] The net monitoring cable connects the echo-sounder or net-sounder on the headline of the trawl net to the vessel.

[2] The warp cables or trawl warps are the cables used to tow nets.

[3] 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)

the water. The following measures have been shown to be effective at reducing seabird bycatch in trawl fisheries and are recommended as best practice measures:

Measures to reduce general attractiveness to seabirds

Management of offal and discards

In all cases, the discharge of offal and discards is the most important factor attracting seabirds to the stern of trawl vessels, where they are at risk of cable and net interactions. Managing offal discharge and discards while fishing gear is deployed has been shown to reduce seabird attendance of vessels and consequent risk of interactions and bycatch. The following offal and discard management measures, in order of their effectiveness in reducing bird attendance, are recommended:

1. **Retention of waste** – No discharge during fishing trips (full retention) should occur. When this is impracticable, no discharge should occur during fishing activity (when cables or net are in the water);
2. **Mealing waste** – Where retention of waste is impracticable, converting offal into fish meal, and retaining all waste material with any discharge restricted to liquid discharge / sump water;
3. **Batching waste** – Where meal production and retention of offal and discards are impracticable, waste should be stored temporarily for two hours or longer before strategically discharging it in batches;
4. **Mincing of waste** – Where retention, mealing or batching is impracticable, reduce waste to smaller particles (currently only recommended as a mitigation for bycatch of large *Diomedea* spp.).

Measures to reduce cable strikes

Where the opportunity for fish waste management is limited or impractical, cable strikes can be prevented by reducing the aerial extent of cables and deterring seabirds from interacting with them. The following measures are recommended:

Warp cables

1. Deploy bird scaring lines (BSLs) while fishing to deter birds away from warp cables.

Net monitoring cables

Net monitoring cables should not be used (wireless systems can be used instead). Where this is impracticable:

1. Deploy bird scaring lines specifically positioned to deter birds away from net monitoring cables while fishing; and

2. Install a snatch block at the stern of a vessel to draw the net monitoring cable close to the water and thus reduce its aerial extent.

Measures to reduce net entanglement

Recognising that even with management of offal and discards there may be risk of net entanglement, the following further measures are recommended:

1. Clean nets after every haul to remove entangled fish ("stickers") and benthic material to discourage bird attendance during gear shooting;

2. Minimise the time the net is on the water surface. Maintenance of winches and good deck practices minimises shooting and hauling times. During turns the net should be maintained at depth (e.g. 50-100 m) or, if required, bring the net to the surface with doors up (wing ends and net mouth closed); and

3. For pelagic trawl gear, apply net binding to large meshes in the wings (120–800 mm), together with a minimum of 400 kg weight incorporated into the net belly prior to setting.

Further measures include avoiding peak areas and periods of seabird foraging activity. It is important to note that there is no single solution to reduce or avoid incidental mortality of seabirds in trawl fisheries, and that the most effective approach is to use the measures listed above in combination. Net entanglements during the haul remain the most difficult interactions to prevent. The ACAP review of seabird bycatch mitigation measures for pelagic and demersal trawl fisheries is presented in the following section.

MITIGATION MEASURES UNDER DEVELOPMENT OR THAT REQUIRE FURTHER INVESTIGATION

For traditional trawlers a range of mitigation options are under development to both reduce the aerial extent of net monitoring cables and deter birds away from them. This includes the use of floated weights to reduce aerial extent in a demersal trawl fishery (Garcia et al 2024), a Combined Curtain System to deter birds from cables in a demersal trawl fishery (Suazo et al 2024) and use of novel materials to reduce the interaction with cables in a mid-water trawl fishery (Tamini et al 2024).

For continuous krill trawl fisheries, where the fishing gear configuration results in limited aerial extent of net monitoring cables, a modified bird baffler and sock are being developed to deter birds from net monitoring cables (Moir et al 2024).

MITIGATION MEASURES THAT ARE NOT RECOMMENDED

ACAP considers that the following measures lack scientific substantiation as technologies or procedures for reducing the impact of pelagic and demersal trawl fisheries on seabirds.

Warp scarers: Insufficient evidence to recommend as an effective measure at this time.

Bird bafflers: Insufficient evidence to recommend as an effective measure at this time.

Cones on warp cables: Insufficient evidence to recommend as an effective measure at this time.

Warp boom: Insufficient evidence to recommend as an effective measure at this time.

Warp deflector: Insufficient evidence to recommend as an effective measure at this time.

Minimise pooling area: Insufficient evidence to recommend as an effective measure at this time.

Reduced mesh size: Insufficient evidence to recommend as an effective measure at this time.

Net jackets: Unproven and not recommended as a mitigation method at this time.

Acoustic deterrents: Unproven and not recommended as a primary mitigation method at this time.

Net restrictor: Unproven and not recommended as a primary mitigation method at this time.

Lasers: High energy lasers are strongly discouraged due to ongoing concerns regarding safety to both humans and birds.

Agreement on the Conservation of Albatrosses and Petrels

ACAP Review of Seabird Bycatch Mitigation Measures for Pelagic and Demersal Trawl Fisheries

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 – 16 August 2024

INTRODUCTION

A range of technical and operational mitigation methods have been designed or adapted for use in trawl fisheries. In all cases, the discharge of offal and discards is the most important factor attracting seabirds to the stern of trawl vessels, where they are at risk of cable and net interactions. Managing offal discharge and discards while fishing gear is deployed has been shown to reduce seabird attendance of vessels and consequent risk of interactions and bycatch. Even with management of offal and discards there may be risk of cable strikes and net entanglement. Other mitigation measures have been developed to address these risks. Apart from being technically effective at reducing seabird bycatch, mitigation methods should be easy and safe to implement, cost effective, enforceable and should not reduce catch rates of target species.

The feasibility, effectiveness and specifications of mitigation measures may vary by area, seabird assemblages, fishery, vessel size, and gear configuration. Some of the mitigation methods are well established and explicitly prescribed in trawl fisheries; however, additional measures are undergoing further testing and refinements.

The Seabird Bycatch Working Group (SBWG) of ACAP has comprehensively reviewed the scientific literature dealing with seabird bycatch mitigation in trawl fisheries. This document is a distillation of that review.

THE ACAP REVIEW PROCESS

At each of its meetings, the ACAP SBWG considers any new research or information pertaining to seabird bycatch mitigation in trawl fisheries. The following criteria are used by ACAP to guide the assessment process, and to determine whether a particular fishing technology or measure can be considered best practice to reduce the incidental mortality of albatrosses and petrels in fishing operations.

Best Practice Seabird Bycatch Mitigation Criteria and Definition

i. Individual fishing technologies and techniques should be selected from those shown by experimental research to significantly[4] reduce the rate of seabird incidental mortality[5] to the lowest achievable levels. Experimental research yields definitive results when performance of candidate mitigation technologies is compared to a control (no deterrent), or to status quo in the fishery. When testing relative performance of mitigation approaches, analysis of fishery observer data can be plagued with a myriad of confounding factors. Where a significant relationship is demonstrated between seabird behaviour and seabird mortality in a particular system or seabird assemblage, significant reductions in seabird behaviours, such as the rate of seabirds attacking baited hooks, can serve as a proxy for reduced seabird mortality. Ideally, where simultaneous use of fishing technologies and practices is recommended as best practice, research should demonstrate significantly improved performance of the combined measures.

ii. Fishing technologies and techniques, or a combination thereof, should have clear and proven specifications and minimum performance standards for their deployment and use. Examples would include: specific bird scaring line designs (lengths, streamer length and materials; etc.), number (one vs. two) and deployment specifications (such as aerial extent and timing of deployment); night fishing defined by the time between the end of nautical dusk and start of nautical dawn; and, line weighting configurations specifying mass and placement of weights or weighted sections.

iii. Fishing technologies and techniques should be demonstrated to be practical, cost effective and widely available. Commercial fishing operators are likely to select for seabird bycatch reduction measures and devices that meet these criteria including practical aspects concerning safe fishing practices at sea.

iv. Fishing technologies and techniques should, to the extent practicable, maintain catch rates of target species. This approach should increase the likelihood of acceptance and compliance by fishers.

v. Fishing technologies and techniques should, to the extent practicable, not increase the bycatch of other taxa. For example, measures that increase the likelihood of catching other protected species such as sea turtles, sharks and marine mammals, should not be considered best practice (or only so in exceptional circumstances).

vi. Minimum performance standards and methods of ensuring compliance should be provided for fishing technologies and techniques, and clearly specified in fishery regulations. Relatively simple methods to check compliance should include, but not be limited to, port inspections of branch lines to determine compliance with branch line weighting, determination of the presence of davits (tori poles) to support bird scaring lines, and inspections of bird scaring lines for conformance with design requirements. Compliance monitoring and reporting should be a high priority for enforcement authorities.

[4] Any use of the word 'significant' in this document is meant in the statistical context.

[5] This may be determined by either a direct reduction in seabird mortality or by reduction in seabird attack rates, as a proxy.

On the basis of these criteria, the scientific evidence for the effectiveness of mitigation measures or fishing technologies/techniques in reducing seabird bycatch is assessed, and explicit information is provided on whether the measure is recommended as being effective, and thus considered best practice, or not. The ACAP review also provides notes and caveats for each measure, together with information on performance standards and further research needs. Following each meeting of ACAP's SBWG and Advisory Committee, this review document and ACAP's best practice advice is updated (if required). A summary of ACAP's current best practice advice for trawl fisheries is provided in the preceding section of this document.

SEABIRD BYCATCH MITIGATION FACT SHEETS

A series of seabird bycatch mitigation fact sheets have been developed by ACAP and BirdLife International to provide practical information, including illustrations, on seabird bycatch mitigation measures (https://www.acap.aq/bycatch-mitigation/bycatch-mitigation-fact-sheets) The sheets, which include information on the effectiveness of the specific measure, their limitations and strengths and best practice recommendations for their effective adoption, are linked to the ACAP review process, and are updated following ACAP reviews. Links to the available fact sheets are provided in the relevant sections below.

1. MITIGATION MEASURES TO REDUCE GENERAL ATTRACTIVENESS TO SEABIRDS

Management of offal and discards[6]

In all cases, the discharge of offal and discards is the most important factor attracting seabirds to the stern of trawl vessels, where they are at risk of cable and net interactions (Wienecke & Robertson 2002; Sullivan *et al.* 2006a; Favero *et al*. 2011).

Managing offal discharge and discards while fishing gear is in the water has been shown to reduce seabird attendance of vessels and consequent risk of interactions and bycatch. The following offal and discard management measures, in order of their effectiveness in reducing bird attendance, are recommended:

1. **Retention of waste** – No discharge during fishing trips (full retention) should occur. When this is impracticable, no discharge should occur during fishing activity (when cables or net are in the water);
2. **Mealing waste** – Where retention of waste is impracticable, converting offal into fish meal, and retaining all waste material with any discharge restricted to liquid discharge / sump water;
3. **Batching waste** – Where meal production and retention of offal and discards are impracticable, waste should be stored temporarily for two hours or longer before strategically discharging it in batches;

[6] 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).

4. **Mincing of waste** – Where retention, mealing or batching is impracticable, reduce waste to smaller particles (currently only recommended as a mitigation for bycatch of large *Diomedea* spp.)

1.1 Retaining waste

ACAP advice

Proven and recommended as the most effect mitigation method for both pelagic and demersal trawl fisheries. No discharge during fishing trips (full retention) should occur. When this is impracticable, no discharge should occur during fishing activity (when cables or net are in the water).

Scientific evidence for effectiveness in trawl fisheries

Repeated studies have shown that in the absence of offal discharge / fish discards seabird interactions and mortality levels are negligible (Sullivan *et al*. 2006a; Watkins *et al*. 2008; Melvin *et al*. 2010; Abraham & Thompson 2009). Storage of all fish discard and offal, either for processing or for controlled release when cables and net are not in the water, has resulted in significant reductions in the attendance of all groups of seabirds (Abraham *et al.* 2009).

Notes and Caveats

Retrofitting of fish waste storage tanks may not be a viable option for existing vessels due to associated space requirements (Munro 2005).

Minimum standards

Any discharge is restricted to times when cables and net are out of the water.

Need for combination

Should be used in combination with additional mitigation methods to mitigate interactions with cables (if birds are still attending the vessel) and net.

Implementation monitoring

On-board observers or electronic monitoring. Potential for at-sea surveillance (of discharge or bird attendance).

Research needs

None identified.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1627-fs-13-trawl-fisheries-warp-strike/file

1.2 Mealing waste

ACAP advice

Proven and recommended as a mitigation method for both pelagic and demersal trawl fisheries when retention of waste is impracticable.

Scientific evidence for effectiveness in trawl fisheries

Mealing resulted in significant reduction in the number of seabird species feeding behind vessels, relative to the discharge of unprocessed fish waste (Abraham *et al.* 2009; Wienecke & Robertson 2002; Favero *et al*. 2011) or minced waste (Melvin *et al.* 2010).

Notes and Caveats

Good evidence from a number of fisheries that fish meal processing and reducing discharge to sump water is highly effective in reducing seabird bycatch. Retrofitting of meal plants may not be a viable option for existing vessels due to associated space requirements (Munro 2005).

Minimum standards

Any discharge is restricted to liquid discharge / sump water.

Need for combination

Should be used in combination with additional mitigation methods to mitigate interactions with cables (if birds are still attending the vessel) and net.

Implementation monitoring

Port-based inspection of meal plants, on-board observers or electronic monitoring. Potential for at-sea surveillance (of discharge or bird attendance).

Research needs

Investigate through robust trialling the extent to which reduced seabird abundance affects seabird interaction rates.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1627-fs-13-trawl-fisheries-warp-strike/file

1.3 Batching waste

ACAP advice

Proven and recommended as a mitigation method for both pelagic and demersal trawl fisheries where meal production and retention of offal and discards are impracticable.

Scientific evidence for effectiveness in trawl fisheries

Batching (temporary storage and periodic, controlled and fast release of discards / discharge during trawling) has been trialled by several Parties (Jimenéz *et al.* 2022; Kuepfer *et al*. 2022; Pierre *et al*. 2010; Pierre *et al*. 2012b). Results showed that batching can significantly reduce

numbers of seabirds and associated bycatch risk, although adequate storage period and minimal duration of batching events are important.

Notes and Caveats

Effectiveness of batching relies on minimising the frequency of discharges and efficient (fast) dumping of batched material. Retrofitting of fish waste storage tanks may not be a viable option for existing vessels due to associated space requirements (Munro 2005).

Minimum standards

Recommended when full retention or mealing is not possible. Where feasible, batch waste for at least 2 hours, preferably 4 hours or longer.

Need for combination

Should be used in combination with additional mitigation methods to mitigate interactions with cables and net.

Implementation monitoring

Port-based inspection of fish waste storage and discharge system, on-board observers or electronic monitoring. Potential for at-sea surveillance (of discharge or bird attendance).

Research needs

Investigate through robust trialling the extent to which reduced seabird abundance affects seabird interaction rates.

Identify threshold where increased storage is compromised by increased batching (discharging) period required.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1627-fs-13-trawl-fisheries-warp-strike/file

1.4 Mincing of waste

ACAP advice

Insufficient evidence to recommend this as a primary mitigation measure to reduce general attractiveness to seabirds in pelagic and demersal trawl fisheries at this time, however it is recommended as a mitigation for bycatch of large *Diomedea* spp. where retention, mealing or batching is impracticable.

Scientific evidence for effectiveness in trawl fisheries

Mincing waste to maximum 25 mm significantly reduced the number of large albatrosses (*Diomedea* spp.) attending vessels but had no effect on other groups of seabirds (Abraham *et al*. 2009; Abraham 2010). Pierre *et al.* (2012a) showed that whilst reduced particle size (10-40 mm and 30-60 mm) reduced seabird attendance compared with untreated waste, the effect was lowest for small albatross species, and not significant for the 10-40 mm treatment.

Notes and Caveats

Bottom trawled material, such as rocks, may impact the feasibility of mincing.

Minimum standards

None established. Insufficient evidence to recommend this as a primary measure at present.

Need for combination

Should be used in combination with additional mitigation methods to mitigate interactions with cables and net.

Implementation monitoring

Port-based inspection of mincing systems, on-board observers or electronic monitoring. Potential for at-sea surveillance (of discharge or bird attendance).

Research needs

At present only demonstrated to be effective against large *Diomedea* spp. albatrosses. Efficacy with *Thalassarche* spp. albatrosses needs to be proven before measure can be recommended (Abraham *et al*. 2009).

2. MITIGATION MEASURES TO REDUCE CABLE STRIKES

2.1 MITIGATION MEASURES TO REDUCE THE AERIAL EXTENT OF CABLES

2.1.1 Snatch block

ACAP advice

Recommended as a mitigation measure to reduce the aerial extent of net monitoring cables, when their use cannot be avoided, in pelagic and demersal trawl fisheries.

Scientific evidence for effectiveness in trawl fisheries

A snatch block, placed on the 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).

Notes and Caveats

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. Recommended on the basis that reducing the aerial extent of monitoring cables should reduce the risk of seabird strikes with these cables.

Minimum standards

None established.

Need for combination

Should be combined with offal/discard management and BSL specifically positioned to deter birds away from net monitoring cables while fishing.

Implementation monitoring

Port-based inspection, on-board observer or electronic monitoring.

Research needs

Needs to be trialled in a range of fisheries and areas to further demonstrate efficacy. Development of technical specifications is also required.

2.2 MITIGATION MEASURES TO DETER BIRDS AWAY FROM CABLES

2..2.1 Bird Scaring Lines (BSL) to reduce interaction with warp and net monitoring cables

ACAP advice

Proven and recommended as a mitigation measure to deter birds away from warp cables, and net monitoring cables where their use cannot be avoided, for pelagic and demersal trawl fisheries.

Scientific evidence for effectiveness in trawl fisheries

Attachment of a bird scaring line (BSL) 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 & Edwards 2005; Melvin *et al*. 2010, Tamini *et al.* 2015). An off-setting towed device has been demonstrated to improve BSL performance (Tamini *et al.* 2015).

Notes and Caveats

Effectiveness is reduced in strong cross winds and rough seas, when BSLs are deflected away from warps (Sullivan & 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; Cleal *et al.* 2013). Hard wearing and non-tangling materials and design can improve performance (Cleal *et al.* 2013), including the use of semi rigid streamers, particularly those constructed from Kraton. BSLs cannot be deployed while the warp cable is being set, or remain in place during hauling, leaving periods when warps are not protected. Bird mortality as a result of entanglement with the BSL is known to occur (Snell *et al.* 2011; Kuepfer 2016).

Minimum standards

BSL are recommended even when appropriate offal discharge and fish discard management practices are in place (Melvin *et al*. 2010). A BSL should be fitted to the outside of both the starboard and the port-side cable. The main line should extend beyond the warp-water interface and should maintain its tension under normal tow speed. Streamer lines should be

attached at maximum 5 m intervals and should be long enough to extend beyond the point at which warp and net monitoring cables reach the water's surface. It is recommended that for every metre of block height, 5 m of backbone be deployed and 1.2 kg of terminal object drag weight be used. An off-setting towed device (Tamini Tabla) has been developed in Argentina (Tamini *et al.* 2023a). This device is attached to the terminal end of the BSL and has a buoyant upper board with three 45° vertical keels, which are weighted for stability. Under forward motion of the vessel, the keels cause the device to move outward of the trawl cables and therefore maintain the BSL from entangling with trawl cables. BSLs should be deployed once the trawl doors are submerged and retrieved as net hauling commences. Where the use of a net monitoring cable cannot be avoided, bird scaring lines should be specifically positioned above the net monitoring cable (Tamini *et al.* 2023b).

Need for combination

Should be used in combination with offal/discard management.

Implementation monitoring

On-board observers, electronic monitoring (cameras), at-sea surveillance or an electronic BSL compliance monitoring device (Ngcongo & Miranda 2024; https://imveloblue.co.za/electronic-monitoring-imvelo-bsl/).

Research needs

Further research is required on reducing the entanglement risk of birds in the BSL.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1627-fs-13-trawl-fisheries-warp-strike/file

2..2.2 Warp scarers

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

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).

Warp scarers have been shown to reduce contact rates but not significantly, and were not as effective as BSLs (Sullivan *et al*. 2006b, Abraham *et al*., cited in Bull 2009).

Notes and Caveats

Attachment to the warp eliminates problems associated with crosswinds as the mitigation devices 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.

Concerns have been raised regarding associated practicality and safety issues (Melvin *et al.* 2004; Sullivan *et al.* 2006a; Abraham *et al.*, cited in Bull 2009).

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

None identified.

2..2.3 Bird bafflers

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

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-water interface zone (see Bull 2009, Fig.3; Sullivan *et al.* 2006a).

Generally, bird bafflers are not regarded as providing as much protection to the warp cables as BSLs or warp scarers (Sullivan *et al.* 2006a), because they don't tend to extend beyond the warp-water interface area, hence leaving the most dangerous part of the warp exposed.

Notes and Caveats

Various designs exist including the Brady Baffler and "curtain baffler" (Cleal *et al*. 2013).

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*. 2009).

The great variability in the design and deployment of bird bafflers may influence their overall effectiveness. Designs may also be very vessel-specific to ensure adequate coverage of the warp-water interface. In contrast to some other warp mitigation methods bird bafflers can remain deployed during the full duration of fishing activities.

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

The full range of baffler designs have not been experimentally tested. Trials should be conducted in a range of fisheries and areas to demonstrate efficacy.

2.2.4 Cones on warp cables

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

A plastic cone attached to each warp cable reduced the number of birds entering the warp-water interface in Argentine Hake Trawl Fishery by 89% and no seabirds were killed while cones were attached to the warp (Gonzalez-Zevallos *et al.* 2007).

Notes and Caveats

Applicable for small vessels.

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

Needs to be trialled in a range of fisheries and areas to demonstrate efficacy.

2.2.5 Warp boom

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

A boom with streamers extending to the water forward of the stern and warps can divert birds feeding on offal away from the warps; however, Melvin *et al*. (2010) did not identify a statistically significant reduction is seabird interactions with the warp.

Notes and Caveats

None.

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Research needs

Longer-term studies are required to identify effectiveness including work to identify suitable configuration and materials.

2.2.6 Warp deflector

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

The *warp deflector,* consisting of a pinkie buoy clipped to each of the warp cables and connected back to the vessel via a retrieval line, is designed to hang at the warp-water interface to deflect birds away from the danger area. The device was found to significantly reduce heavy interactions of shy-type albatross (*Thalassarche*) with trawl warps by Pierre *et al.* (2014). The authors, however, urged for wider testing of the device to support results. Kuepfer (2017) identified numerous practical issues which impacted on the safe and effective deployment of the device in non-experimental conditions.

Notes and Caveats

The east Australia trawl fishery found the device to be impractical and of limited effectiveness, and therefore the warp deflector is now no longer accepted as a stand-alone mitigation measure.

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

None identified.

3. MITIGATION MEASURES TO REDUCE NET ENTANGLEMENTS

The range of mitigation measures available to prevent net entanglements is limited, and most have not been adequately (and quantitatively) tested. Consequently, there is a need to identify and test measures aimed at addressing the problem of seabirds becoming entangled in nets of trawl vessels, particularly during hauling operations.

3.1 Net cleaning

ACAP advice

Recommended for reducing bycatch during both shooting and hauling of trawl gear in both pelagic and demersal trawl fisheries.

Scientific evidence for effectiveness in trawl fisheries

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.* 2009).

Notes and Caveats

None.

Minimum standards

Remove all stickers from net prior to shooting gear.

Need for combination

Should be used in combination with net binding and net weights to minimise the time net is on water's surface during both setting and hauling (Sullivan *et al.* 2009), as well as in combination with waste management to avoid the discharge of waste during shooting thereby minimising the attraction of seabirds to the stern of the vessel.

Implementation monitoring

On-board observers or electronic monitoring.

Research needs

None identified.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1713-fs-14-trawl-fisheries-net-entanglement/file

3.2 Net binding

ACAP advice

Recommended for reducing bycatch when shooting gear in pelagic trawl fisheries.

Scientific evidence for effectiveness in trawl fisheries

Shown to be a highly effective mitigation measure in CCAMLR icefish trawl fishery, reducing seabird bycatch to minimal levels (Sullivan *et al.* 2009).

Notes and Caveats

Not suitable for demersal trawl gear (Iriarte *et al*. 2023).

Sisal string has been used to bind the sections of the net which pose the greatest threat to 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.

Minimum standards

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.

Need for combination

Should be used in combination with net cleaning and net weights to minimise the time the net is on the surface (Sullivan *et al*. 2009), as well as in combination with waste management to avoid the discharge of waste during shooting thereby minimising the attraction of seabirds to the stern of the vessel.

Implementation monitoring

On-board observer or electronic monitoring.

Research needs

None identified.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1713-fs-14-trawl-fisheries-net-entanglement/file

3.3 Net weighting

ACAP advice

Recommended for reducing bycatch during both shooting and hauling in both pelagic and demersal trawl fisheries.

Scientific evidence for effectiveness in trawl fisheries

Evidence suggests net weighting on or near the cod end increases the angle of ascent of the net during hauling operations, thus reducing the time the net is on the water's surface. In addition, 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 *et al.* 2009).

Notes and Caveats

All attempts should be made to retrieve the net as quickly as possible.

Minimum standards

None established.

Need for combination

Should be used in 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 *et al.* 2009), as well as in combination with waste management to avoid the discharge of waste during shooting and hauling thereby minimising the attraction of seabirds to the stern of the vessel.

Implementation monitoring

On-board observers or electronic monitoring.

Research needs

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*. 2009).

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1713-fs-14-trawl-fisheries-net-entanglement/file

3.4 Minimise pooling area

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

Trials summarised by Steele-Mortimer & Wells (2023) indicate the merits of turning the vessel to close the net (by bunching it against a stern quarter of the trawl ramp) as a mitigation approach. While there is no empirical evidence that operations to close the headline of the net will reduce net entanglements, it is logical that minimising the surface area of the exposed risk will reduce risk.

Notes and Caveats

Some vessels may be unable to turn the vessel while hauling for operational reasons (i.e. the structure of the vessel doesn't allow for it, limited sea space, or vessel which directly haul nets onto a net drum).

Minimum standards

None established.

Need for combination

Should be used in combination with good net cleaning and other applicable best practice measures.

Implementation monitoring

None established.

Research needs

Further testing, preferably in a range of fisheries, to determine quantitatively if measure is effective.

3.5 Reduced mesh size

ACAP advice

Insufficient evidence to recommend as an effective measure at this time.

Scientific evidence for effectiveness in trawl fisheries

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 the effectiveness of the measure.

Notes and Caveats

Theoretically this measure could be effective in reducing the incidence of seabird entanglements in net; however, measure may be impractical and lead to higher bycatch of smaller sized fish. 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.

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

Thorough testing in a range of fisheries is required to determine if measure is practical and effective, as well as to identify potential impact on target catch and bycatch species.

3.6 Net jackets

ACAP advice

Unproven and not recommended as a mitigation method at this time.

Scientific evidence for effectiveness in trawl fisheries

Free-floating panels of net attached to the most dangerous mesh sizes have been trialled in CCAMLR's icefish trawl fishery, with uncertain efficiency (Sullivan *et al*. 2009).

Caveats /Notes

Found to cause serious drag and subsequent damage to the net. Drag also slows vessel speed and increases fuel consumption (Sullivan *et al*. 2009).

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

Efficacy of measure remains to be demonstrated.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1713-fs-14-trawl-fisheries-net-entanglement/file

3.7 Acoustic deterrents

ACAP advice

Unproven and not recommended as a primary mitigation method at this time.

Scientific evidence for effectiveness in trawl fisheries

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*. 2009).

Notes and Caveats

May be a useful back-up measure for circumstances when another measure is needed immediately (Sullivan *et al*. 2009).

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

None identified.

3.8 Net restrictor

ACAP advice

Unproven and not recommended as a primary mitigation method at this time.

Scientific evidence for effectiveness in trawl fisheries

The net restrictor was identified as a potential mitigation device in response to observed net captures in the New Zealand scampi trawl fishery, where multiple nets are deployed adjacently (Pierre *et al.* 2013). The net restrictor acts to restrict the opening of the net on haul when captures tend to occur. Video footage confirmed that the restrictor was effective in reducing the size of the net opening at hauling; although empirical testing of the device has not been conducted.

Notes and Caveats

May be a useful measure in demersal trawl fisheries where multiple nets are deployed adjacently, and nets (particularly the middle net) are liable to billow open at or near the surface on haul.

Minimum standards

Not applicable, as not recommended.

Need for combination

Not applicable, as not recommended.

Implementation monitoring

Not applicable, as not recommended.

Research needs

At-sea testing required to determine effectiveness.

4. GENERAL MEASURES

4.1 Time-Area closures

ACAP advice

Recommended as a general mitigation measure but need to be aware of displacing the risk to adjacent areas (Copello et al 2016) or other fishing methods (Baez et al 2014).

Scientific evidence for effectiveness in trawl fisheries

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.

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).

Notes and Caveats

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.

Minimum standards

None established.

Need for combination

Must be combined with other recommended 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.

Implementation monitoring

VMS/AIS systems or at-sea surveillance.

Research needs

Further information about the seasonal variability in patterns of species abundance around trawl fisheries is required.

5. OTHER CONSIDERATIONS

5.1 Lasers

ACAP advice

High energy lasers are strongly discouraged.

Scientific evidence for effectiveness in trawl fisheries

Available evidence shows that high energy lasers (Class 4 lasers, the highest class in terms of laser hazards) are ineffective at deterring seabirds from danger areas around fishing vessels (Melvin *et al.* 2016) and likely damage seabird visual systems with negative effects on foraging behaviour of laser exposed seabirds (Fernandez-Juricic, 2023).

Notes and Caveats

Concerns are ongoing regarding the safety (to both humans and birds) and efficacy of laser technology of unknown energy levels as a seabird bycatch mitigation tool, as they continue to be used currently in various fisheries. Available evidence shows that high energy lasers are no longer marketed for fishery applications. Currently evidence is lacking on the possibility that lasers of lower energy levels delivered in different ways (scanning, blinking, wave-length, etc.) could be used safely and be effective in some applications.

Minimum standards

Not applicable, as strongly discouraged.

Need for combination

Not applicable, as strongly discouraged.

Implementation monitoring

Not applicable, as strongly discouraged.

Research needs

As high energy lasers continue to be used in some fisheries, we encourage reporting of the extent and output power levels of laser use by ACAP Parties, including any information on effectiveness, as well as bird welfare effects.

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ANNEX 3. ACAP REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR DEMERSAL LONGLINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP Review of Mitigation Measures and Best Practice Advice for Reducing the Impact of Demersal Longline Fisheries on Seabirds

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

INTRODUCTION

The incidental mortality of seabirds, mostly albatrosses and petrels, in longline fisheries continues to be a growing global concern. This was a major reason for the establishment of the Agreement on the Conservation of Albatrosses and Petrels (ACAP). Many mitigation methods to reduce and eliminate seabird bycatch have been developed and tested over the last 20 plus years, especially for demersal longline fisheries. Demersal longline fisheries are those in which baited hooks are set on, or near the sea floor using a variety of systems and configurations. These include systems that deploy a single hookline (manually baited or mechanically baited (single line) systems), and systems that include a second hauling line floated above a hookline or a cluster of baited hooks (Spanish and Chilean (trotline) systems). Single line hand-baiting systems store hooklines by a variety of means, while single line systems involve mechanical baiting and hooklines hung from racks. Although most mitigation measures are broadly applicable, the feasibility, design and effectiveness of some measures will be influenced by longlining method, gear configuration, and vessel size. It should be noted that most scientific literature relates to fleets of larger vessels, with artisanal fleets receiving less attention. Some of this advice may need to be modified for smaller vessels.

This document provides advice on best practices for reducing the impact of demersal longline fishing on seabirds. These best practice bycatch mitigation measures should be applied in areas where fishing effort overlaps with seabirds vulnerable to bycatch. The ACAP review process recognises that factors such as safety, practicality and the characteristics of the fishery should be taken into account when considering the efficacy of seabird bycatch mitigation measures and consequently in the development of advice and guidelines on best practice.

This document also provides information regarding measures that are currently under development, as well as those that are not recommended. ACAP considers some proposed mitigation measures ineffective, based on a lack of evidence. ACAP continually monitors the development of these measures and results of scientific research about their effectiveness.

The document comprises two components. The first component provides a summary of ACAP's advice regarding best practice measures for reducing seabird bycatch in demersal longline fisheries, and the second component outlines the review of mitigation measures that have been assessed for demersal longline fisheries.

Agreement on the Conservation of Albatrosses and Petrels

ACAP Summary Advice for Reducing the Impact of Demersal Longline Fisheries on Seabirds

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

BEST PRACTICE MEASURES

The most effective measures to reduce incidental catch of seabirds in demersal longline fisheries are:

- Use of an appropriate **line weighting regime** to sink baited hooks as close to the vessel as possible to reduce their availability to seabirds.
- Actively deterring birds from baited hooks by means **of bird scaring lines**, and
- Setting longlines at **night**.

In cases where line weighting is integral to fishing gear, it has the advantage of consistent implementation, and compared to bird scaring lines and night setting, facilitates compliance and port monitoring. Further measures include bird deterrent curtains at the hauling bay, responsible offal management and avoiding peak areas and periods of seabird foraging activity. The Chilean (trotline) system (with appropriate line weighting and branch line length) inherently prevents albatross and petrel mortality given its rapid sinking of baited hooks, and is considered best practice mitigation for demersal longline fishing.

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

Best practice mitigation measures for demersal longline fisheries are listed individually below; The recommendations are categorised into general best practice measures (1), followed by best practice measures for line setting (2), and line hauling (3) operations.

1. BEST PRACTICE MEASURES - GENERAL

1.1 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 a very effective mechanism to reduce incidental mortality of seabirds in fisheries in those areas.

2. BEST PRACTICE MEASURES - LINE SETTING

2.1 Line weighting

Lines should be weighted to sink baited hooks rapidly out of the range of feeding seabirds as close to the vessel as possible. Weights should be deployed before line tension occurs to ensure that the line sinks rapidly and consistently.

2.1 a Weighted lines for Spanish gear

The use of steel weights is considered best practice, as they sink hooklines consistently. The mass should be a minimum of 5 kg at 40 m intervals.

Where steel weights are not used, longlines should be set with a minimum of 8.5 kg at 40 m intervals when using rocks, and a minimum of 6 kg at 20 m intervals when using concrete weights.

2.1 b Weighted lines for Chilean (trotline with nets) system gear

Line weights should conform to those for the Spanish system (see above).

2.1 c Weighted lines for autoline gear

Integrated weight (IW) longlines are designed with a lead core of 50 g/m. Their key characteristic is that they sink with a near-linear profile from the surface (minimal lofting in propeller turbulence) and are effective at sinking quickly out of reach of foraging seabirds. The mean sink rate of IW lines should be ≥ 0.24 m/s to 10 m depth.

Where practical, IW lines are preferred over externally weighted alternatives because of their linear sink profile from the surface and its ability to consistently achieve the minimum sink rate.

When using external weights instead of IW lines, the minimum average sink rate should be 0.3 m/s to 10 m depth. A faster sink rate is necessary with this configuration to minimise the lofting of sections of line between line weights in propeller turbulence. The sink rate can be achieved with a minimum of 5 kg at no more than 40 m intervals.

2.2 Night setting

Setting longlines at night (between 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.

2.3 Bird scaring lines

A bird scaring line is a line that runs from a high point at the stern of a vessel to a drag generating device at its in-water terminus. Drag created by a towed device or the in-water extent of the line, lifts the length of the line closest to the vessel into the air as the vessel travels forward setting gear. Importantly, it is this aerial extent with streamers attached that scares birds from baited hooks as they sink providing a physical deterrent over the area where baited hooks are sinking. It is essential that this aerial extent match the distance astern that

seabirds can access baited hooks. Weighted hooklines reduce this distance and make streamer lines more efficient at excluding foraging birds from hooks.

A weak link is recommended to allow the bird scaring line to break-away from the vessel in the event of an entanglement with the main line. The entangled bird scaring line can be recovered during the haul.

Large vessels (≥24 m in length)

Two (paired) bird scaring lines should be used simultaneously.

The design of the bird scaring lines should include the following specifications:

- The vessel attachment height should be at least 7 m above sea level.
- Streamers should be brightly coloured and reach the sea-surface in calm conditions, and placed at intervals of no more than 5 m.
- Sufficient drag must be created to maximise aerial extent and maintain the line directly over sinking baited hooks and astern of the vessel during crosswinds. This may be achieved using a towed devices or a bird scaring line a minimum of 150 m in length.

Small vessels (<24 m in length)

One or two (paired) 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 6 m above sea level.
- The lines should achieve an aerial extent of at least 75 m when setting at ≥ 4 knots, or 50 m if setting at speeds < 4 knots.
- Streamers should be brightly coloured and reach the sea-surface in calm conditions, and placed at intervals of no more than 5 m. Streamers may be modified over the first 15 m to avoid tangling.
- Sufficient drag must be created to maximise aerial extent and maintain the line directly behind the vessel during crosswinds. This may be achieved using either towed devices or a longer in-water sections.

2.4 Offal and discard discharge management

Seabirds are highly attracted to offal discharged from vessels. To prevent large numbers of seabirds attending line setting operations, offal and discards should be retained onboard prior to and during line setting.

3. BEST PRACTICE MEASURES - LINE HAULING

3.1. Bird Exclusion Device (BED)

Seabirds can be accidentally hooked as gear is retrieved. A Bird Exclusion Device (BED) consists of a horizontal support several metres above the water that encircles the entire hauling bay. Vertical streamers are positioned between the horizontal support and water surface. The BED configuration can also include a line of floats on the water surface connected

to the vertical streamers to stabilize movement in strong winds. This configuration is the most effective method to prevent birds entering the area around the hauling bay, either by swimming or by flying. BEDs are retrieved and stowed when not hauling. For small vessels (<20 m in length), where the application of mitigation devices requiring robust support structures and on-water sections can be challenging, the use of simple haul mitigation devices has been demonstrated to be both practical and effective at deterring birds from hauling points.

3.2. Offal and discard discharge management

During setting, offal and discards should always be retained onboard. During hauling offal and discards should be retained on board or released from the opposite side of the vessel to the hauling bay.

All hooks should be removed and retained on board before discards are discharged from the vessel.

4. OTHER RECOMMENDATIONS

4.1. Chilean method

The Chilean method of longline fishing was designed to prevent toothed whale depredation of fish. Because weights are deployed directly below the hooks, allowing hook-bearing lines to sink more rapidly beyond the foraging depths of seabirds than the traditional Spanish systems. The Chilean method is an inherently effective configuration for avoiding seabird bycatch . As this gear type deploys hook clusters, it is extremely important to remove and retain hooks from discards.

5. MITIGATION MEASURES UNDER DEVELOPMENT OR THAT REQUIRE FURTHER INVESTIGATION

Underwater Line Setter: an underwater setting device is under development in New Zealand inshore bottom longline fisheries. It operates by running the hookline through a set of rollers towed behind the vessel at depth. The device requires testing under commercial fishing conditions to determine effectiveness and optimal setting depths.

Mitigation measures to increase sink rates of baited hooks on floated longlines: Floated longlines partially suspend the hookline above the sea floor. During line setting, they are associated with elevated levels of seabird attacks on baited hooks at or near the surface during line setting compared to lines without floats. Further work is required to identify mitigation measures that increase the sink rate of baited hooks on floated longlines. Limited trials in NZ found that through the use of dropper floats, together with manipulation of line weighting regimes and bird scaring line configurations, improved sinking to depth within the aerial extent can be achieved in small vessel floated demersal longline fisheries (Goad et al. 2024).

6. MITIGATION MEASURES THAT ARE NOT RECOMMENDED

ACAP considers that the following measures lack scientific substantiation as technologies or procedures for reducing the impact of demersal longline fisheries on seabirds.

Hook design - insufficiently researched.

Olfactory deterrents - insufficiently researched.

Underwater setting chutes - insufficiently researched.

Side setting - insufficiently researched and operational difficulties.

Blue-dyed bait, thawed bait - not relevant in demersal longline gear.

Use of a line setter - insufficiently researched.

Lasers - High energy lasers are strongly discouraged due to ongoing concerns regarding safety to both humans and birds..

Acoustic deterrents - insufficiently researched.

The ACAP review of seabird bycatch mitigation measures for demersal longline fisheries is presented in the following section.

Agreement on the Conservation of Albatrosses and Petrels

ACAP Review of Seabird Bycatch Mitigation Measures for Demersal Longline Fisheries

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

INTRODUCTION

A range of technical and operational mitigation methods have been designed or adapted for use in demersal longline fisheries to reduce incidental mortality of seabirds. Operationally, peak areas and periods of seabird foraging activity should be avoided. Effective technical methods include actively deterring birds from, and minimising the visibility of, baited hooks. Vessels need to be made less attractive to birds, and the distance astern and time baited hooks are available to birds must be reduced. Mitigation methods need to be easy and safe to implement, cost effective, enforceable and should not reduce catch rates of target species or increase the bycatch rates of other protected species.

The feasibility, effectiveness and specifications of mitigation measures may vary by area, seabird assemblage, fishery, vessel size, and gear configuration.

The Seabird Bycatch Working Group (SBWG) of ACAP has comprehensively reviewed the scientific literature dealing with seabird bycatch mitigation in demersal longline fisheries. This document is a distillation of that review. With the exception of the Chilean system, the combined use of weighted branch lines, bird scaring lines and night setting is considered best practice mitigation for reducing seabird bycatch in demersal longline fisheries.

THE ACAP REVIEW PROCESS

At each of its meetings, the ACAP SBWG considers any new research or information pertaining to seabird bycatch mitigation in demersal longline fisheries. The following criteria are used by ACAP to guide the assessment process, and to determine whether a particular technology or measure can be considered best practice to reduce the incidental mortality of albatrosses and petrels in fishing operations.

Best Practice Seabird Bycatch Mitigation Criteria and Definition

i. Individual fishing technologies and techniques should be selected from those shown by experimental research to significantly[7] reduce the rate of seabird incidental mortality[8] to the lowest achievable levels. Experimental research yields definitive results when performance of candidate mitigation technologies is compared to a control (no deterrent), or to status quo in the fishery. When testing relative performance of mitigation approaches, analysis of fishery observer data can be plagued with a myriad of confounding factors. Where a significant relationship is demonstrated between seabird behaviour and seabird mortality in a particular system or seabird assemblage, significant reductions in seabird behaviours, such as the rate of seabirds attacking baited hooks, can serve as a proxy for reduced seabird mortality. Ideally, where simultaneous use of fishing technologies and practices is recommended as best practice, research should demonstrate significantly improved performance of the combined measures.

ii. Fishing technologies and techniques, or a combination thereof, should have clear and proven specifications and minimum performance standards for their deployment and use. Examples would include: specific bird scaring line designs (lengths, streamer length and materials; etc.), number (one vs. two) and deployment specifications (such as aerial extent and timing of deployment); night fishing defined by the time between the end of nautical dusk and start of nautical dawn; and, line weighting configurations specifying mass and placement of weights or weighted sections.

iii. Fishing technologies and techniques should be demonstrated to be practical, cost effective and widely available. Commercial fishing operators are likely to select for seabird bycatch reduction measures and devices that meet these criteria including practical aspects concerning safe fishing practices at sea.

iv. Fishing technologies and techniques should, to the extent practicable, maintain catch rates of target species. This approach should increase the likelihood of acceptance and compliance by fishers.

v. Fishing technologies and techniques should, to the extent practicable not increase the bycatch of other taxa. For example, measures that increase the likelihood of catching other protected species such as sea turtles, sharks and marine mammals, should not be considered best practice (or only so in exceptional circumstances).

vi. Minimum performance standards and methods of ensuring compliance should be provided for fishing technologies and techniques, and clearly specified in fishery regulations. Relatively simple methods to check compliance should include, but not be limited to, port inspections of branch lines to determine compliance with branch line weighting, determination of the presence of davits (tori poles) to support bird scaring lines, and inspections of bird scaring lines for conformance with design requirements. Compliance monitoring and reporting should be a high priority for enforcement authorities.

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[7] Any use of the word 'significant' in this document is meant in the statistical context

[8] This may be determined by either a direct reduction in seabird mortality or by reduction in seabird attack rates, as a proxy

On the basis of these criteria, the scientific evidence for the effectiveness of mitigation measures or fishing technologies/techniques in reducing seabird bycatch is assessed, and explicit information is provided on whether the measure is recommended as being effective, and thus considered best practice, or not. The ACAP review also indicates whether the measure needs to be combined with additional measures, and provides notes and caveats for each measure, together with information on performance standards and further research needs. Following each meeting of ACAP's SBWG and Advisory Committee, this review document and ACAP's best practice advice, is updated (if required). A summary of ACAP's current best practice advice is provided in the preceding section of this document.

SEABIRD BYCATCH MITIGATION FACT SHEETS

A series of seabird bycatch mitigation fact sheets have been developed by ACAP and BirdLife International to provide practical information, including illustrations, on seabird bycatch mitigation measures (https://www.acap.aq/bycatch-mitigation/bycatch-mitigation-fact-sheets). The sheets, which include information on the effectiveness of the specific measure, their limitations and strengths and best practice recommendations for their effective adoption, are linked to the ACAP review process, and are updated following ACAP reviews. Links to the available fact sheets are provided in the relevant sections below. The mitigation fact sheets are currently available in English, French, Spanish, Portuguese, Japanese, Korean, Simplified Chinese, Traditional Chinese, and Indonesian.

BEST PRACTICE MEASURES

1. Area and seasonal closures

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended. 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 lead to a spatial shift in the incidental mortality. A number of studies have reported marked seasonality in seabird bycatch rates, with the majority of deaths taking place during the breeding season (Moreno *et al.* 1996; Ryan *et al*. 1997; Ashford & Croxall 1998; Ryan & Purves 1998; Ryan & Watkins 1999; Ryan & Watkins 2000; Weimerskirch *et al*. 2000; Kock 2001; Nel *et al*. 2002; Ryan & Watkins 2002; Croxall & Nicol 2004; Reid *et al*. 2004; Delord *et al*. 2005). In some studies, mortality occurred almost exclusively within the breeding season. 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). The much higher rate of seabird bycatch during the breeding period led to the temporal closure of the fishery in CCAMLR sub-area 48.3 from 1998, which contributed to a ten-fold reduction in seabird bycatch (Croxall & Nicol 2004). Movement of fishing effort away from the Prince Edward Islands coincided with a reduction in seabird bycatch in the sanctioned Prince Edward Island fishery (Nel *et al*. 2002).

Notes and Caveats

It's difficult to separate the performance of a temporal/spatial closure from increased uptake/implementation of other mitigation measures. Likewise, some variation over time and space in the location of favoured foraging areas for seabirds is expected. However, closures

are clearly an important and effective management response, especially for high risk areas, and when other measures prove ineffective (Waugh 2008). 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 (Copello *et al.* 2016).

Minimum standards

Minimum standards are based on the overlap of albatrosses and petrels with fishing effort so can vary from area to area. For example, the area around South Georgia (Islas Georgias del Sur)[9] (CCAMLR Subarea 48.3) is closed for fishing between September and mid-April each year (which coincides with the breeding seasons of most seabirds at South Georgia (Islas Georgias del Sur)[3]), as provided for by CCAMLR Conservation Measures in force (CCAMLR 2019).

Implementation monitoring

Onboard or at-sea surveillance is required to assess implementation.

Research needs

Continued gathering of temporal and spatial information of seabirds and fishing effort, should be ongoing, especially for high risk areas (e.g. adjacent to important breeding colonies) and to better understand the effects of climate change on seabirds. In some studies, incidental mortality has been greatest during the chick-rearing period (Nel *et al*. 2002; Delord *et al*. 2005), whereas others have reported highest mortality during the incubation period (Reid *et al*. 2004). This difference likely relates to where the birds are foraging in relation to fishing effort at the time, and highlights the importance of understanding this interaction. Research is also required to determine the regional impact of closures on catches of target species.

2. Externally weighted lines:

a) Spanish system

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended mitigation method. Should be combined with other measures, especially effective bird scaring lines, offal management and/or night setting (Agnew *et al.* 2000; Robertson 2000; Robertson *et. al*. 2008a; 2008b; Moreno *et al*. 2006; Moreno *et al*. 2008).

Notes and Caveats

Spanish system longlines are buoyant and weights must be attached to sink gear to fishing depth. Longlines with externally added weights sink unevenly, faster at the weights than at the midpoint between weights. Although gear configuration and setting speed influence the sink profiles of the hook lines (Seco Pon *et al*. 2007), the principle determinants of sink rates are the mass of the weights and the distance between them (Robertson *et al*. 2008a). It is critical

[9] A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Islas Malvinas), South Georgia and the South Sandwich Islands (Islas Georgias del Sur e Islas Sandwich del Sur) and the surrounding maritime areas.

that line tension astern is eliminated to ensure the smooth flow of lines and hooks from gear baskets. This can be done by ensuring the correct packing of lines and snoods in baskets, preventing hooks snagging on snood baskets, and by ensuring that weights are released from the vessel before line tension occurs (Robertson *et al*. 2008a,b). Weights must be attached and removed for each set-haul cycle, which is onerous and potentially hazardous for crew members. Weights comprised of rocks enclosed in netting bags and concrete blocks deteriorate and require ongoing maintenance/replacement and monitoring to ensure weights are the required mass (Otley *et al*., 2007); weights made of solid steel are preferred, in terms of mass consistency, handling, maintenance and monitoring compliance (Robertson *et al*. 2008b, Paterson *et al*. 2017).

Minimum standards

Global minimum standards have not been established. Requirements vary by fishery. For example, CCAMLR minimum requirements for vessels using the Spanish method of longline fishing are 8.5 kg mass at 40 m intervals (if rocks are used), 6 kg mass at 20 m intervals for traditional (concrete) weights, and 5 kg weights at 40 m intervals for solid steel weights.

Implementation monitoring

Fishing gear is deployed manually. Weights are attached by hand during line setting and removed during line hauling. Distance between weights and the mass of the weight used may vary in accordance with fishing strategy and for operational reasons. Onboard monitoring is required to assess implementation.

Research needs

Sink rates and sink profiles of line weighting regimes may vary according to vessel type, setting speed and deployment position relative to propeller turbulence. It is important that the sink rate relationships of different line weighting regimes are understood for a particular fishery (or fishery method) and that testing confirms the effectiveness of the line weighting regime and the sink profile in reducing seabird mortality.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/762-fs-02-demersal-longline-line-weighting-external-weights/file

2. Externally weighted lines:

b) Chilean method (trot line with nets)

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended mitigation method. Although the Chilean method effectively prevents mortality as a sole measure given that hooks sink quickly from the surface, it is prudent to also deploy a bird scaring streamer line. This method (first tested on large longline vessels in 2005) is a variant of the traditional Spanish double line method of longlining and was developed in Chile to minimise depredation of Patagonian toothfish by toothed whales (Figure 1). This system makes use of net sleeves or ‘cachaloteras’ which envelop captured fish during hauling. Hooks are clustered on secondary lines to which weights are attached, resulting in very fast hook sink rates (mean: 0.8 m/s c.f. 0.15 m/s for the Spanish system) in

the first 15-20 m (the length of the secondary lines) of water column. The Chilean method has the capacity to reduce (or eliminate) seabird mortality to negligible levels (Moreno *et al*. 2006; Moreno *et al*. 2008; Robertson *et al*. 2008b). Because of its effectiveness in reducing impacts of toothed whales, this method is currently used in many longline fleets operating in South American waters (Moreno *et al*. 2008), as well as in the south west Atlantic.

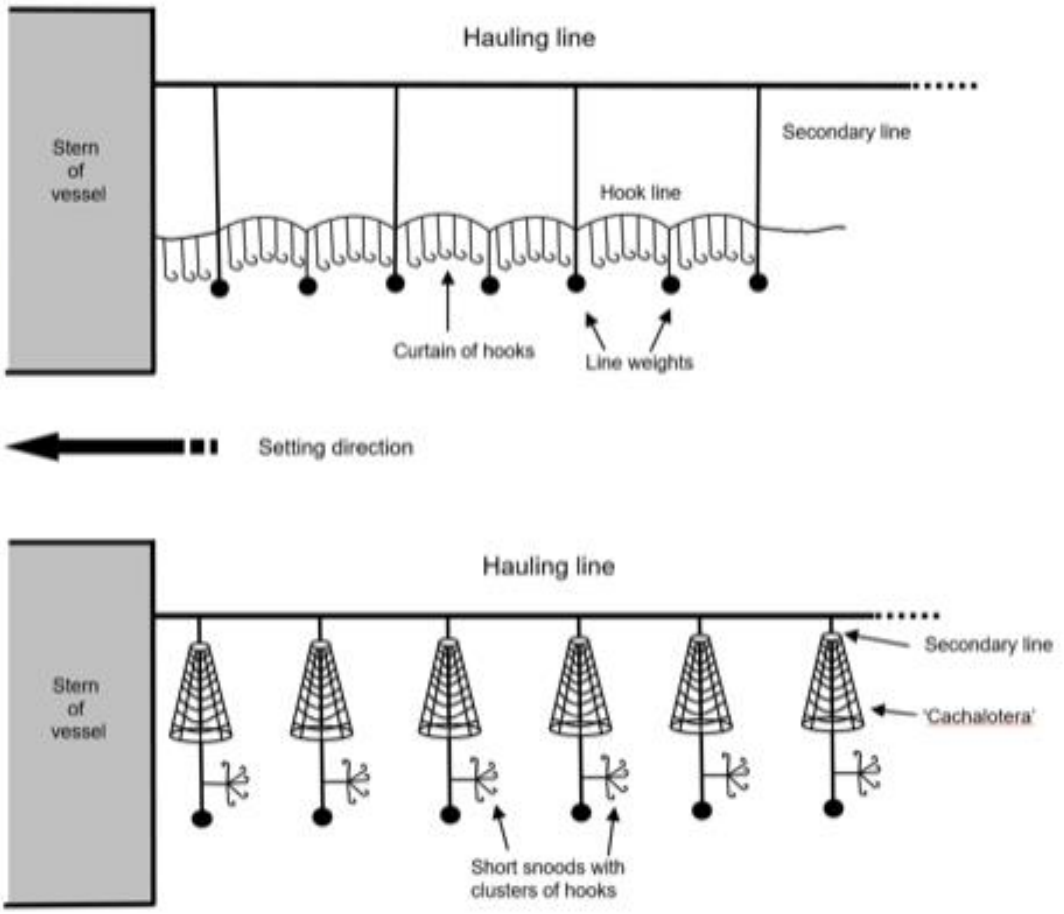

Figure 1. Typical configurations of the traditional Spanish double line system (a) and Chilean (trotline) system (b) showing differences in gear design and location of weights in relation to hooks. The open-ended secondary/connecting lines (not joined by a continuous hook line) and proximity of weights to hooks of the Chilean system enables hooks to sink rapidly with no lofting in propeller turbulence from the surface close to a vessel stern. Drawings not to scale.

Notes and Caveats

This is a relatively new system, is possibly still in the evolutionary stages, and should be monitored and possibly refined. Concern has been raised about the excessive discarding of fish bycatch (e.g. grenadiers) with embedded hooks and the ingestion of these hooks by albatrosses especially with this gear type (Phillips *et al*. 2010). The solution to this problem is to stop hooks from being discarded. This is best achieved by banning the discarding of hooks as part of the licence conditions, as is already done in many fisheries, and also increasing awareness amongst fishers, observers, and operators to facilitate compliance with such a ban.

Minimum standards

Global standards not established.

Implementation monitoring

Weights need to be attached to hook-bearing secondary lines to sink. However, alternating between this fishing method and the traditional Spanish method within fishing trips is problematic. While this capacity exists the requirements for the Spanish system should apply (see "2a", above). Onboard monitoring is required to assess implementation.

Research needs

Effective as a solitary measure against albatrosses and most likely effective against *Procellaria* spp. petrels due to the very rapid sink rates to depths beyond the known diving range of this group of seabirds. Research is required to determine effectiveness against *Puffinus* spp. shearwaters.

This is a relatively new fishing method and may be in the process of refinement. It is important to monitor changes to gear design, especially those likely to affect the sink rates of baited hooks.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1799-fs-04-demersal-longline-line-weighting-chilean-system/file

2. Externally weighted lines:

c) Auto-bait

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended mitigation method. Weights must be used in combination with an effective bird scaring line. In the Southern Hemisphere evidence in support of line weighting specifications (below) were developed based on matching or exceeding sink rates of external weight configurations to that of integrated weight lines, not to their effectiveness at deterring seabirds. Attachment of 5 kg weights at no more than 40 m intervals increased mean sink rate from 0.1 m/s (unweighted gear) to 0.3 m/s on the section of longline mid-way between line weights (Robertson 2000). This rate exceeds that of integrated with longlines, which have been thoroughly tested against seabirds (see below). Attachment of external weighs necessary in Antarctic toothfish fisheries to comply with the minimum sink rate (0.3 m/s) required by CCAMLR operating in high latitude areas in summer, where it was not possible to set lines at night.

Notes and Caveats

As for the Spanish system it is important to release that external weights from vessels in a manner that avoids line tension. Line tension astern may lift sections of the deployed longline already deployed out of the water farther from the vessel, and imperil seabirds.

Minimum standards

Minimum standards are informed by those currently applied to two Southern Hemisphere fisheries. CCAMLR requires as a minimum 5 kg mass at intervals no more than 40 m. It is also required that weights be released before line tension occurs. In the New Zealand fisheries, a minimum of 4 kg (metal weight) or 5 kg (non-metal weight) are required every 60 m if the hookline is 3.5 mm or greater in diameter, and a minimum of 0.7 kg of weight every 60m when the line is less than 3.5 mm diameter.

Implementation monitoring

Weights are attached to longlines manually. Onboard monitoring is required to assess implementation.

Research needs

Likely to be effective in deterring albatrosses and *Procellaria* spp. seabirds. Evidence is lacking for effectiveness against *Puffinus* spp. shearwaters.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/762-fs-02-demersal-longline-line-weighting-external-weights/file

3. Integrated weight longlines

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended mitigation method. Should be used in combination with bird scaring lines, offal management and/or night setting. Apart from the practical advantages of integrated weight (IW) longlines – superior handling qualities and practically inviolable – the IW longlines sink more quickly and uniformly out of reach of most seabirds compared with externally weighted lines. IW longlines have been shown to reduce substantially mortality rates of surface foragers and diving seabirds, while not affecting catch rates of target species (Robertson *et al*. 2003; Robertson *et al.* 2006; Dietrich *et al*. 2008).

Notes and Caveats

Restricted to single line vessels. The sink rate of IW longlines can vary depending on vessel type, setting speed and deployment of line relative to propeller wash (Dietrich *et al.* 2008). Setting speed influences the extent of the seabird access window – the area in which most seabirds are still able to access the baited hooks in the absence of bird scaring lines (Dietrich *et al*. 2008). Use of IW lines is likely to increase the portion of the line on the seafloor, and may lead to increases in the bycatch of vulnerable fish, shark and ray species. This may be mitigated by placing a weight and a float on a 10 m line at the point of the dropper line attachment, thus ensuring the line sinks rapidly to 10 m, out of reach of vulnerable seabirds, but remains off the seabed (Petersen *et al.* 2009). The use of lead in fishing gear is prohibited in some fishery jurisdictions.

Minimum standards

Global minimum standards are evolving. CCAMLR and New Zealand currently require IW lines with a minimum lead core of 50 g/m in their single line demersal longline fisheries.

Implementation monitoring

Weight (lead core) is integrated into the fabric of the line, so compliance with weighting requirements is intrinsic to this measure. It is impractical to alter longlines when at sea, including for vessels with long transit times to fishing grounds (e.g. Antarctic and sub Antarctic fisheries). Port inspection of all longlines onboard prior to embarkation on fishing trips is considered adequate for to assess compliance.

Research needs

The relationship between line-weighting regime, setting speed, sink rates/profiles and the distance astern seabirds can access baited hooks should be investigated for other fisheries. Testing should prioritize determining the necessary aerial extent for bird scaring lines with these factors.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1504-fs-03-demersal-longline-integrated-weight-longlines/file

4. Night setting

Scientific evidence for effectiveness in demersal longline fisheries

Proven and recommended mitigation method. Should be used in combination with bird scaring lines and/or weighted lines, especially to reduce incidental mortality of birds that forage at night (Ashford *et al*. 1995; Cherel *et al*. 1996; Moreno *et al*. 1996; Barnes *et al*. 1997; Ashford & Croxall 1998; Klaer & Polacheck 1998; Weimerskirch *et al*. 2000; Belda & Sánchez 2001; Nel *et al*. 2002; Ryan & Watkins 2002; Sánchez & Belda 2003; Reid *et al*. 2004; Gómez Laich *et al.* 2006; Gladics *et. al*. 2017; Melvin *et.al*. 2019).

Notes and Caveats

Bright moonlight and deck lights reduce the effectiveness of this mitigation measure. Less effective for some crepuscular/nocturnal foragers such as the white-chinned petrel (Paterson *et al*. 2017) but more effective than setting during the day. Night setting increases the bycatch rate of Northern Fulmar *Fulmarus glacialis* (Gladics *et. al*. 2017; Melvin *et.al*. 2019). In order to maximise effectiveness of this mitigation measure, deck lights should be off or kept to an absolute minimum, and used in combination with additional mitigation measures, especially when setting in bright moonlight conditions. Night setting is not a practical option for fisheries operating at high latitudes during summer. Civil twilight was found equally effective as nautical twilight at reducing seabird mortalities in US west coast and Alaskan fisheries (Gladics *et. al*. 2017; Melvin *et.al*. 2019)

Minimum standards

Night is defined as the period between the times of nautical twilight (nautical dark to nautical dawn as set out in the Nautical Almanac tables for relevant latitude, local time and date.).

Implementation monitoring

Onboard monitoring or at-sea surveillance is required to assess implementation.

Research needs

Effect of night setting on catch rates of target species for different fisheries.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1824-fs-05-demersal-pelagic-longline-night-setting/file

5. Single bird scaring line

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended mitigation method. It is the aerial extent of the line with streamers attached that is important for the prevention of birds interactions with baited hooks. Effectiveness of the streamer line is maximized when streamers are positioned above the sinking hook line, and the aerial extent matches the distance astern that seabirds can access baited hooks. Weighted longlines reduce this distance and make streamer lines more efficient at excluding foraging birds from hooks. Effectiveness is increased when using multiple bird scaring lines and when used in combination with other measures – e.g. night setting, appropriate weighting of line and offal management. The use of a single bird scaring line has been shown to be an effective mitigation measure in a range of demersal longline fisheries, especially when used properly (Moreno *et al.* 1996; Løkkeborg 1998, 2001; Melvin *et al.* 2001; Smith 2001; Løkkeborg & Robertson 2002; Løkkeborg 2003, Melvin *et. al*. 2004; Dietrich *et al*. 2008; Paterson *et al.* 2017; Melvin *et al*. 2019) and is suitable for small vessels under 24 m in length, with some modification (Melvin & Weinstein. 2004; Goad & Debski 2017).

Notes and Caveats

Effective only when streamers are positioned over sinking hooks and the aerial extent matches the distance astern that seabirds can access baited hooks. These are the most important factors influencing their performance. Single bird scaring lines can be less effective in strong crosswinds (Løkkeborg 1998; Brothers *et al.* 1999; Agnew *et al.* 2000; Melvin *et al.* 2001; Melvin *et al.* 2004). In the event of strong crosswinds, bird scaring lines should be deployed from the windward side. This problem can also be overcome by using paired bird scaring lines (see below). The effectiveness of the bird scaring lines is also dependent on the design, proper placement, as well as seabird species attending line setting (proficient divers are more difficult to deter than surface feeding birds). There have been a few incidents of birds becoming entangled in bird scaring lines (Otley *et al*. 2007). However, it must be stressed that the numbers are minuscule, especially when compared with the number of mortalities recorded in the absence of bird scaring lines. Bird scaring lines remain a highly effective mitigation measure, and efforts should be directed to further improve their effectiveness.

It is recommended to use a weak link to allow the bird scaring line to break-away from the vessel in the event of an entanglement with the main line (a secondary attachment between the bird scaring line and the vessel can be used to attach the break-away bird-scaring line to the mainline for subsequent retrieval during the haul).

Minimum standards

Current minimum standards vary. CCAMLR was the first conservation body that required all longline vessels in its area of application to use bird scaring lines (CCAMLR 2018). The bird scaring (streamer) line has gone on to become the most commonly applied mitigation measure in longline fisheries worldwide (Melvin *et al*. 2004). CCAMLR currently prescribes a range of specifications relating to the design and use of bird scaring lines. These include the minimum length of the line (150 m), the height of the attachment point on the vessel (7 m above the water), and details about streamer lengths and intervals between streamers. Other fisheries have adapted these measures. Some, such as those in New Zealand and Alaska have set explicit standards for the aerial coverage of the bird scaring lines, which varies according to the size and speed of the vessel and the sink rates of baited longlines.

For small vessels (<24 m), we recognise that the length of aerial extent will vary by setting speed, with 75 m being achievable for vessels setting at ≥ 4 knots, or 50 m if setting at speeds < 4 knots, that streamers may be modified over the first 15 m to avoid tangling, and that drag may be achieved using either towed devices or longer in-water sections (Goad & Debski 2017).

Implementation monitoring

Bird scaring lines are usually deployed and retrieved before and after each set (they are not a fixed part of fishing gear/operations). On-board observers, electronic monitoring (cameras), at-sea surveillance or an electronic BSL compliance monitoring device (Ngcongo & Miranda 2024; https://imveloblue.co.za/electronic-monitoring-imvelo-bsl/)..

Research needs

The use and specifications/performance standards are fairly well established in demersal longline fisheries. However, there is scope to improve further the effectiveness and practical use of bird scaring lines in individual fisheries and on individual vessels or vessel types.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1912-fs-01-demersal-longline-streamer-lines/file

6. Paired or multiple bird scaring lines

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended mitigation method. Effectiveness is maximized when streamers are paired and deployed so that they bracket sinking baited hook lines, and the aerial extents of the lines cover the area astern where birds can access baited hooks. Effectiveness is further increased when used in combination with other measures – e.g. night setting, appropriate weighting of line and offal management. Several studies have shown that the use of two or more streamer lines is more effective at deterring birds from baited hooks than one streamer

line (Melvin *et al.* 2001; Sullivan & Reid 2002; Melvin 2003; Melvin *et al.* 2004; Reid *et al.* 2004). The combination of paired streamer lines and IW longlines is considered the most effective mitigation measure in demersal longline fisheries using single line systems (Dietrich *et al.* 2008).

Notes and Caveats

The likelihood of entanglement with gear is potentially increased compared to using a single bird scaring line. Towing an effective device that keeps lines from crossing surface gear may improve compliance with this measure. Manual retrieval of paired or multiple bird scaring lines requires more effort than a single line. This can be overcome by using winches to retrieve lines.

Minimum standards

Current minimum standards vary across fisheries. In Alaskan demersal longline fisheries paired streamer lines are required on larger vessels (≥ feet 16.8 m) and encouraged/recommended by CCAMLR, except in the French exclusive economic zone (CCAMLR Subarea 58.6 and Division 58.5.1), where paired streamer lines have been compulsory since 2005. Paired streamer lines have also been required in the Australian longline fisheries off Heard Island since 2003 (Dietrich *et al*. 2008)

Implementation monitoring

Bird scaring lines are typically deployed and retrieved before and after each set (they are not a fixed part of fishing gear/operations). Onboard monitoring or at-sea surveillance is required to assess implementation.

Research needs

Further trialling in fisheries which currently only use single streamer lines.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1912-fs-01-demersal-longline-streamer-lines/file

7. Haul bird exclusion devices (BED)

Scientific evidence for effectiveness in demersal fisheries

Proven and recommended as a haul mitigation measure. BEDs must be used in combination with line setting mitigation measures – bird scaring lines, line weighting, night setting and offal management. The use of a BED can effectively reduce the incidence of birds becoming foul hooked when the line is being hauled (Brothers *et al.* 1999; Sullivan 2004; Otley *et al*. 2007; Reid *et al*. 2010). For small vessels (<20 m in length), where the application of mitigation devices requiring robust support structures and on-water sections can be challenging, the use of simple haul mitigation devices has been demonstrated to be both practical and effective at deterring birds from hauling points (Goad *et al*. 2023).

Notes and Caveats

Some species, such as the Black-browed Albatross *Thalassarche melanophris* and Cape Petrel *Daption capense*, can become habituated to the curtain, so it is important to use it strategically – when there are high densities of birds around the hauling bay (Sullivan 2004).

Minimum standards

Standards are evolving. BEDs are required in high risk CCAMLR areas. The exact design is not specified, rather it is required that they fulfil two operational characteristics: 1) deter birds from flying into the area where the line is being hauled, and 2) prevent birds that are sitting on the surface from swimming into the hauling bay area). BEDs are required in the some UK longline fisheries (A. Wolfaardt pers. comm.).

Implementation monitoring

BEDs are usually deployed and retrieved before and after each set (they are not a fixed part of fishing gear/operations). Onboard monitoring or at-sea surveillance is required to assess implementation.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/1907-fs-12-demersal-pelagic-longline-haul-mitigation/file

OTHER CONSIDERATIONS

8. Side-setting

Scientific evidence for effectiveness in demersal fisheries

Not recommended as a specific mitigation measure at this time. Not tested in demersal longline fisheries. For more detail see pelagic longline best practice advice

Mitigation Fact Sheet (for pelagic longline vessels)

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/769-fs-09-pelagic-longline-side-setting/file

9. Underwater setting funnel/chute

Scientific evidence for effectiveness in demersal fisheries

Unproven and not recommended as a mitigation measure at this time. An underwater setting funnel has been tested in demersal longline fisheries in Alaska, Norway and South Africa, with all studies showing a reduction in the mortality rate, although the extent of the reduction varied between studies (Løkkeborg 1998, 2001; Melvin *et al*. 2001; Ryan & Watkins 2002).

Notes and Caveats

Present design is mainly for a single line system. Results from studies to date have been inconsistent, likely due to the depth at which the device delivers the baited hooks and the diving ability of the seabirds in the fishing area studied. The pitch angles of the vessel, which are influenced by the loading of weight and sea conditions, affect the performance of the funnel (Løkkeborg 2001).

Minimum standards

Not yet established.

Implementation monitoring

Onboard monitoring or at-sea surveillance is required to assess implementation.

Research needs

Need to investigate improvements to the current design to increase the depth at which the line is set, especially during rough seas. Should also be tested with integrated weight lines to determine whether this improves bycatch reduction. Also need to investigate optimal use of device together with other mitigation measures (bird scaring lines and weighted lines).

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/766-fs-06-demersal-longline-underwater-setting-chute/file

10. Line-setter/shooter

Scientific evidence for effectiveness in demersal fisheries

Unproven and not recommended as a mitigation measure at this time. Less used in demersal long-line fisheries; variation in the precise method of operation is cause of variation in efficacy. In Norway, no statistical differences were detected in catch rates of northern fulmars between sets with and without a line shooter (Løkkeborg & Robertson 2002; Løkkeborg 2003). In Alaska, use of a line shooter increased seabird bycatch due to the longline being suspended in the vessel's wake resulting in delayed sinking (Melvin *et. al*. 2001).

Notes and Caveats

Robertson *et al.* (2008c) found no significant difference between the sink rates of integrated weight longlines of single line vessels that were set with and without a line setter in the Ross Sea, and were doubtful that the use of line setters would lead to substantial reductions in interactions between seabirds and longlines. Unequivocal evidence of effectiveness in reducing seabird bycatch is lacking. Further refinement is needed.

Minimum standards

Not considered a mitigation measure at this time.

Research needs

Need to investigate whether refinement/modification of the device will be able to overcome the problem of propeller wash and ensure consistently rapid sink rates and significantly reduced seabird mortality.

Mitigation Fact Sheet (for pelagic longline fisheries)

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/771-fs-11-pelagic-longline-bait-caster-and-line-shooter/file

11. Thawing bait

Scientific evidence for effectiveness in demersal fisheries

Unproven and not recommended as a primary mitigation measure in demersal longline fisheries. See pelagic longline best practice advice for more information.

12. Olfactory deterrents

Scientific evidence for effectiveness in demersal fisheries

Unproven, and not recommended as a mitigation measure at this time. Dripping shark liver oil on the sea surface behind vessels has been shown to effectively reduce the number of seabirds (restricted to burrow-nesting birds) attending vessels and diving for bait in New Zealand (Pierre & Norden 2006; Norden & Pierre 2007).

Notes and Caveats

The shark liver oil investigated did not deter albatrosses, giant petrels, or Cape petrels from boats (Norden & Pierre 2007). The potential impact of releasing large amounts of concentrated fish oil into the marine environment is unknown, as is the potential for contaminating seabirds attending vessels and the potential of seabirds to become habituated to the deterrent (Pierre & Norden 2006).

Minimum standards

No standards established.

Implementation monitoring

Onboard monitoring or at-sea surveillance of line setting operations is required to assess implementation.

Research needs

Testing should be extended to candidate/suitable species of conservation concern, such as white-chinned petrels *P. aequinoctialis* and sooty shearwaters *Ardenna grisea*. Research is also required to identify the key ingredients in the shark oil that are responsible for deterring seabirds, and the mechanism by which the birds are deterred. The potential “pollution” effects also need to be investigated.

13. Strategic management of offal discharge

Scientific evidence for effectiveness in demersal fisheries

Not recommended as a primary mitigation measure. Some studies have shown that dumping homogenised offal (which is generally more easily available and thus attractive to seabirds than bait) during setting attracts birds away from the baited line to the side of the vessel where the offal is being discharged, and thus reduces bycatch of seabirds on the baited hooks (Cherel *et al*. 1996; Weimerskirch *et al*. 2000).

Notes and Caveats

Although strategic offal discharge has been shown to be effective at reducing seabird bycatch around Kerguelen Island, there are many risks associated with the practice. Offal discharge needs to be continued throughout the setting operation so as to ensure the birds do not move on to the baited hooks. This will only be possible in fisheries where line setting is short, and there is sufficient offal to sustain the discharge during the entire line-setting period. This measure also has the potential to foul hook birds if offal is discharged with hooks. It is crucial, then, that all offal is checked for hooks before being discharged. Given these risks, and the fact that the presence of offal is a critical factor affecting seabird numbers attending vessels, most fisheries management regimes require that no offal can be discharged during line setting, and that if discarding is necessary at other times it should take place on the side of the vessel opposite to where the lines are being hauled.

Minimum standards

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. A system to remove fish hooks from offal and fish heads prior to discharge is required. Similar requirements are prescribed by other demersal longline fisheries (e.g. some UK, South Africa and New Zealand).

Implementation monitoring

Requires offal discharge practices and events to be monitored onboard.

Research needs

Further information needed on opportunities to manage offal more effectively – considering both practical aspects and seabird bycatch mitigation – in the short and long term.

14. Blue-dyed bait

Scientific evidence for effectiveness in demersal fisheries

Unproven and not recommended as a mitigation measure at this time. See pelagic longline fisheries best practice advice for more information.

Mitigation Fact Sheet

https://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets/770-fs-10-pelagic-longline-blue-dyded-bait-squid/file

15. Hook size and shape

Scientific evidence for effectiveness in demersal fisheries

Unproven and not recommended as a primary mitigation measure. Must be used in combination with other mitigation measures – bird scaring lines, line weighting, night setting and offal management. Hook size was found to be an important determinant in seabird bycatch rates of Argentinean and Chilean longline vessels fishing in Subarea 48.3 in the 1995 season, with smaller hooks killing significantly more seabirds than larger hooks (Moreno *et al.* 1996).

Notes and Caveats

Other than the finding of Moreno *et al.* (1996), little or no work has been conducted to investigate the impact of hook design and shape on seabird bycatch levels.

Minimum standards

No global standard

Implementation monitoring

Port inspection of all hooks on board considered adequate for monitoring implementation.

Research needs

Determine impact on seabird bycatch and on catch of target species.

16. Lasers

High Energy Lasers Strongly Discouraged

Scientific evidence for effectiveness in demersal longline fisheries

Available evidence shows that high energy lasers (Class 4 lasers, the highest class in terms of laser hazards) are ineffective at deterring seabirds from danger areas around fishing vessels (Melvin *et al.* 2016) and likely damage seabird visual systems with negative effects on foraging behaviour of laser exposed seabirds (Fernandez-Juricic, 2023).

Notes and Caveats

Concerns are ongoing regarding the safety (to both humans and birds) and efficacy of laser technology of unknown energy levels as a seabird bycatch mitigation tool, as they continue to be used currently in various fisheries. Available evidence shows that high energy lasers are no longer marketed for fishery applications. Currently evidence is lacking on the possibility that lasers of lower energy levels delivered in different ways (scanning, blinking, wave-length, etc.) could be used safely and be effective in some applications.

Minimum standards

Not Applicable as strongly discouraged.

Need for combination

Not Applicable as strongly discouraged.

Implementation monitoring

Not Applicable as strongly discouraged.

Research needs

As high energy lasers continue to be used in some fisheries, we encourage reporting of the extent and output power levels of laser use by ACAP Parties, including any information on effectiveness, as well as bird welfare effects.

MITIGATION MEASURES UNDER DEVELOPMENT OR WHICH REQUIRE FURTHER DEVELOPMENT OR INVESTIGATION

17. Underwater Line Setter

Scientific evidence for effectiveness in demersal fisheries

Unproven and not recommended as a mitigation measure at this time. A line setter was identified as a potential mitigation device in New Zealand inshore bottom longline fisheries, (Goad 2011). This line setter is an underwater setting device that involves running the hookline through a set of rollers towed behind the vessel at depth. Underwater line setting devices for demersal longline fisheries differ from those assessed for pelagic longline fisheries which involve a computer operated and hydraulically powered machine that deploys baited hooks individually underwater to a target depth.

Notes and Caveats

An initial prototype had been developed through a series of at-sea trials which were conducted during 2011. While these trials were encouraging, the issue of weights and floats fouling on the rollers require resolution (Goad 2011). A new prototype has been developed and refined in a flume tank (Baker and Frost 2013) for application in a range of demersal longline operations.

Minimum standards

Not considered a mitigation measure at this time.

Research needs

Resolution of mainline loss issues under flume tank conditions prior to further evaluation in at-sea trials.

18. Acoustic Deterrents

Scientific evidence for effectiveness in demersal longline fisheries

Unproven and not recommended. Published reports unavailable; however, anecdotal reports of using percussive sound as with an orchard cannon showed that birds initially disperse but quickly habituate; i.e., disperse and quickly return or ignore completely with continuous use (E. Melvin, pers comm.)

Minimum standards

Not Applicable.

Need for combination

Not Applicable.

Implementation monitoring

Not Applicable.

Research needs

Undefined

19. Mitigation measures to improve sink rates of baited hooks on floated longlines

Demersal longline vessels that use floated gear (which incorporates subsurface floats on the mainline to raise the hooks off the seabed) are particularly susceptible to seabird bycatch, with one study reporting that albatrosses attacked floated longlines at rates ten times more than longlines without floats (Gladics *et al.* 2017). The sink rate of the slowest sinking hooks, where seabird bycatch is most pronounced, is the key factor to consider when prescribing mitigation measures for demersal longline fisheries using floated gear. The slowest sink rates are associated with deployment of buoys in demersal fishing gear (Debski 2016). Increasing the length of buoy lines improves the sink rate (Debski 2016, Robertson et al 2021). Options to increase the sink rates of Merluza system gear include the use of longer float lines, equipping float lines with sinkers and the elimination of line tension astern.

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ANNEX 4. ACAP REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR PELAGIC LONGLINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP Review of mitigation measures and Best Practice Advice for Reducing the Impact of Pelagic Longline Fisheries on Seabirds

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

INTRODUCTION

The incidental mortality of seabirds in pelagic longline fisheries continues to be a serious global concern, especially for threatened albatrosses and petrels. The need for international cooperation in addressing this concern was a major reason for establishing the Agreement on the Conservation of Albatrosses and Petrels (ACAP). In pelagic longline fisheries seabirds are killed when they become hooked or entangled and drowned while foraging for baits on longline hooks as the gear is deployed. Seabirds can also be hooked or entangled as the gear is hauled; however, many of these seabirds can be released alive with careful handling.

There have been significant efforts internationally to develop mitigation measures to avoid or minimise the risk of incidental catch of seabirds in longline fisheries. Although most mitigation measures are broadly applicable, the application and specifications of some will vary with local methods and gear configurations. ACAP has comprehensively reviewed the scientific literature dealing with seabird bycatch mitigation in pelagic longline fisheries (see review section below) and this document is a summary of the advice informed by the review. Most of this scientific literature relates to large vessels, with lesser research attention given to small vessels and gear configurations and methods used in artisanal or semi-industrial fleets. Seabird bycatch mitigation advice for these fisheries is currently under development.

This document provides advice about best practices for reducing the impact of pelagic longline fishing on seabirds. ACAP's best practice advice is that the simultaneous use of weighted branch lines, bird scaring lines and night setting is the most effective approach to mitigate seabird bycatch in pelagic longline fisheries. Three hook-shielding devices, the 'Hookpod-LED', 'Hookpod-mini' and the 'Smart Tuna Hook', and one underwater bait setting device, the 'Underwater Bait Setter (Skadia Technologies)' have recently been assessed and on the basis of this assessment have been included in the list of best practice measures for mitigating seabird bycatch in pelagic longline fisheries. These best practice bycatch mitigation measures should be applied in areas where fishing effort overlaps with seabirds vulnerable to bycatch to

reduce the incidental mortality to the lowest possible levels. The ACAP review process recognises that factors such as safety, practicality and the characteristics of the fishery should also be considered when assessing the efficacy of seabird bycatch mitigation measures and consequently in the development of advice and guidelines on best practice.

This document also provides information regarding measures that are currently under active development, and which show promise as future best practices in pelagic longline fisheries. ACAP will continue to monitor the development of these improving practices and the results of scientific research about their effectiveness.

Additionally, this document provides information about mitigation measures that are not recommended. A wide range of potential seabird bycatch mitigation measures have been proposed over time; however, not all of these have proven effective. ACAP considers that certain mitigation measures are ineffective, based either on scientific studies, or a lack of evidence in substantiation of claims made about the mitigation measure.

The document comprises two components. The first component provides a summary of ACAP's advice regarding best practice measures for reducing seabird bycatch in pelagic longline fisheries, and the second component outlines the review of mitigation measures that have been assessed for pelagic longline fisheries.

Agreement on the Conservation of Albatrosses and Petrels

ACAP Summary Advice for Reducing the Impact of Pelagic Longline Fisheries on Seabirds

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

BEST PRACTICE MEASURES

ACAP recommends that the most effective way to reduce seabird bycatch in pelagic longline fisheries is to use the following three best practice measures **simultaneously: branch line weighting, night setting and bird scaring lines**. Alternatively, the use of an assessed hook-shielding device or underwater bait setting device is recommended. A hook-shielding device encases the point and barb of baited hooks until a prescribed depth or immersion time has been reached, and an underwater bait setting device deploys encapsulated baited hooks at the stern of the vessel releasing the baited hooks at a pre-determined depth. These devices are designed to release baited hooks at a depth beyond the diving range of most seabirds to avoid or minimise the risk of seabirds gaining access to the hook and becoming hooked during line setting.

The simultaneous use of the three ACAP recommended mitigation measures optimise seabird bycatch reduction in longline fisheries. All three recommended measures are demonstrated to be effective; however, each have limitations when used alone. There is a period of time when hooks are accessible to birds even when branch lines are weighted. Night setting used alone is less effective at reducing seabird bycatch for nocturnally active birds and during bright moon light conditions. Bird scaring lines used alone can rarely protect baited hooks beyond the aerial extent of the line. Consequently, the simultaneous use of the three ACAP recommended seabird bycatch mitigation measures compensate for these limitations.

1. Branch line weighting

Branch lines should be weighted to sink the baited hooks rapidly out of the diving range of feeding seabirds. Studies have demonstrated that branch line weighting where there is more mass closer to the hooks, sink most rapidly and consistently; thereby, dramatically reducing seabird attacks on baits and most likely reducing mortalities. Studies of a range of weighting regimes, including placing weights at the hook, have shown no negative effect on target catch rates. Continued refinement of branch line weighting configurations (mass, number and position of weights and materials) with regard to effectively reducing seabird bycatch and safety concerns through controlled research and application in fisheries, is encouraged.

Increased weighting will shorten but not eliminate the distance behind the vessel in which birds can be caught. Branch line weighting has been shown to improve the effectiveness of other mitigation methods such as night setting and bird scaring lines, in reducing seabird bycatch. Priority should be accorded to branch line weighting, providing certain pre-conditions can be met, among other things: (a) weighting regime adequately specified; (b) safety issues adequately addressed; and (c) issues concerning application to artisanal fisheries being considered.

Best practice branch line weighting should achieve a sink rate of 0.5m/s to 5 m depth. The following configurations have been demonstrated, under controlled conditions and with metal materials, to meet this standard:

(a) 40 g or greater attached within 0.5 m of the hook; or

(b) 60 g or greater attached within 1 m of the hook; or

(c) 80 g or greater attached within 2 m of the hook.

When weighting is attached to, or integrated into the hook, a minimum of total weight of 50 g is sufficient to achieve a sink rate of 0.5 m/s to 5 m depth. Branch line weighting is integral to the fishing gear and, compared to bird scaring lines and night setting, has the advantage of being more consistently implemented, hence facilitating compliance and port monitoring. It is recommended to avoid the use of lead when the lead may be ingested (e.g. attached to or integrated into the hook). The use of lighting devices or other fishing accessories as weights is not recommended unless they achieve the sink rate criterion.

2. Night setting

Setting longlines at night (defined as the time between the end of nautical twilight and before nautical dawn as set out in the Nautical Almanac tables for relevant latitude, local time and date) is highly effective at reducing incidental mortality of seabirds because the majority of vulnerable seabirds are inactive at night. However, night setting is not as effective for crepuscular/ nocturnal foragers (e.g. White-chinned Petrels *Procellaria aequinoctialis*). The effectiveness of this measure may be reduced during bright moonlight and when using intense deck lights, and is less practical in high latitudes during summer, when the time between nautical dusk and dawn is limited.

Night setting is recognised as consistently defined, widely reflected in conservation and management measures and has benefit as a primary mitigation measure, as it has the potential for compliance monitoring through VMS and other tools.

3. Bird scaring lines

Properly designed and deployed bird scaring lines (BSLs) deter birds from sinking baits, dramatically reducing seabird attacks and related mortalities. A bird scaring line runs from a high point at the stern to a device or mechanism that creates drag at its terminus. Brightly coloured streamers hanging from the aerial extent of the line scare birds from flying to and under the line, preventing them from reaching the baited hooks.

BSLs should be the lightest practical strong fine line. Lines should be attached to the vessel with a barrel swivel to minimise rotation of the line from torque created as it is dragged behind the vessel. Long streamers should be attached with a swivel to prevent them from rolling up onto the BSL. Towed objects should be attached at the terminus of the BSL to increase drag. BSLs are at risk of tangling with float lines leading to lost bird scaring lines, interruptions in vessel operations and in some cases lost fishing gear. Alternatives, such as adding short streamers to the in-water portion of the line, can enhance drag while minimising tangles with float lines. Weak links (breakaways) should be incorporated into the in-water portion of the line for safety reasons and to minimize operational problems associated with lines becoming tangled.

It is recommended to use a weak link to allow the BSL to break-away from the vessel in the event of a tangle with the main line, and, a secondary attachment between the bird scaring line and the vessel to allow the tangled BSL to be subsequently attached to mainline and recovered during the haul.

Sufficient drag must be created to maximise aerial extent and maintain the line directly behind the vessel during crosswinds. To avoid tangling, this is best achieved using a long in-water section of rope or monofilament.

Given operational differences in pelagic longline fisheries due to vessel size and gear type, bird scaring lines specifications have been divided into recommendations for vessels greater than 35 metres and those less than 35 metres in length.

3. a) Recommendations for vessels ≥35 m total length

Simultaneous use of two BSLs, one on each side of the sinking longline, provides maximum protection from bird attacks under different wind conditions. The setup for BSLs should be as follows:

- BSLs should be deployed to maximise the aerial extent, which is a function of vessel speed, height of the attachment point to the vessel, drag, and weight of bird scaring line materials.
- To achieve a minimum recommended aerial extent of 100 m, BSLs should be attached to the vessel such that they are suspended from a point a minimum of 8 m above the water at the stern.
- BSLs should contain a mix of brightly coloured long and short streamers placed at intervals of no more than 5 m. Long streamers should be attached to the line with swivels to prevent streamers from wrapping around the line. All long streamers should reach the sea-surface in calm conditions.
- Baited hooks should be deployed within the area bounded by the two BSLs. If using bait-casting machines, they should be adjusted so as to land baited hooks within the area bounded by the BSLs.

If large vessels use only one BSL, it should be deployed windward of the sinking baits. If baited hooks are set outboard of the wake, the BSL attachment point to the vessel should be positioned several metres outboard of the side of the vessel that baits are deployed.

3. b) Recommendations for vessels <35 m total length

Two designs have been shown to be effective:

1. a design with a mix of long and short streamers, that includes long streamers placed at 5 m intervals over at least the first 55 m of the BSL. Streamers may be modified over the first 15 m to avoid tangling, and

2. a design that does not include long streamers. Short streamers (no less than 1 m in length) should be placed at 1 m intervals along the length of the aerial extent.

In all cases, streamers should be brightly coloured. To achieve a minimum recommended aerial extent of 75 m, BSLs should be attached to the vessel such that they are suspended from a point a minimum of 6 m above the water at the stern.

4. Hook-shielding devices

Hook-shielding devices encase the point and barb of baited hooks to prevent seabird attacks during line setting until a prescribed depth is reached (a minimum of 10 metres), or until after a minimum period of immersion has occurred (a minimum of 10 minutes) that ensures that baited hooks are released beyond the foraging depth of most seabirds. The following performance requirements are used by ACAP to assess the efficacy of hook-shielding devices in reducing seabird bycatch:

(a) the device shields the hook until a prescribed depth of 10 m or immersion time of 10 minutes is reached;

(b) the device meets current recommended minimum standards for branch line weighting described in Section 1; and

(c) experimental research has been undertaken to allow assessment of the effectiveness, efficiency and practicality of the technology against the ACAP best practice seabird bycatch mitigation criteria developed for assessing and recommending best practice advice on seabird bycatch mitigation measures.

Devices assessed as having met the performance requirements listed above will be considered best practice. At this time, the following devices have been assessed as meeting these performance requirements and are therefore considered to represent best practice:

1. '**Hookpod-LED**' – 68 g minimum weight that is positioned at the hook, encapsulating the barb and point of the hook during setting, and remains attached until it reaches 10 m in depth, when the hook is released (Barrington 2016a, Sullivan *et al*. 2018).

2. **'Hookpod-mini'** – 48 g minimum weight that is positioned at the hook, encapsulating the barb and point of the hook during setting, and remains attached until it reaches 10 m in depth, when the hook is released (Goad *et al.* 2019, Gianuca *et al.* 2021, Sullivan & Barrington 2021).

3. '**Smart Tuna Hook**' – 40 g minimum weight that is positioned at the hook, encapsulating the barb and point of the hook during setting, and remains attached for a minimum period of 10 minutes after setting, when the hook is released (Baker *et al*. 2016, Barrington 2016b)

The assessment of these devices as best practice is conditional on continuing to meet the above performance requirements.

5. Underwater Bait Setting devices

Underwater Bait Setting devices deploy baited hooks at a pre-determined depth immediately at the stern of the vessel. Underwater Bait Setting devices deploy baited hooks individually underwater down a track fitted to the fishing vessel's transom enclosed in a capsule or similar device to eliminate any visual stimulus for seabirds following the vessel. The capsule is pulled quickly underwater to a predetermined target depth that can be adjusted in response to the dive capabilities of seabirds attending the vessel during line setting to prevent interactions. The following performance requirements are used by ACAP to assess the efficacy of underwater bait setting devices in reducing seabird bycatch:

(a) the device deploys encapsulated hooks in a vertical manner at the stern of the vessel until a minimum prescribed depth of 5 m is reached;

(b) branch lines meet current recommended minimum standards for branch line weighting described in Section 1; and

(c) experimental research has been undertaken to allow assessment of the effectiveness, efficiency and practicality of the technology against the ACAP best practice seabird bycatch mitigation criteria developed for assessing and recommending best practice advice on seabird bycatch mitigation measures.

Devices assessed as having met the performance requirements listed above will be considered best practice. At this time, the following device has been assessed as meeting these performance requirements and is therefore considered to represent best practice:

1. **'Underwater Bait Setter (Skadia Technologies)'** – a computer operated and hydraulically powered machine that deploys baited hooks individually underwater in a capsule, and where recommended minimum standards for branch line weighting are met. The capsule is pulled down a removable track fitted to the vessel's transom and then catapulted to a target depth. The capsule descends along the track at 6 $m.sec^{-1}$ and thereafter at ≥3 $m.sec^{-1}$ (Robertson *et al.* 2015, Robertson *et al*. 2018, Barrington 2021).

The assessment of an Underwater Bait Setting device as best practice is conditional on the device continuing to meet the above performance requirements.

6. Time-Area fishery closures

The temporary closure of important seabird foraging areas (e.g. areas adjacent to important seabird colonies during the breeding season or highly productive waters when large numbers of aggressively feeding seabirds are present) to fishing will eliminate incidental mortality of seabirds in that area.

OTHER RECOMMENDATIONS

Side-setting with line weighting and bird curtain (North Pacific): Research conducted in the North Pacific indicates that side-setting was more effective than other simultaneously trialled mitigation measures, including setting chutes and blue-dyed bait (Gilman *et al.,* 2003b). It should be noted that these tests were conducted in a single pilot scale trial of 14 days in the Hawaiian pelagic longline fishery for tuna and swordfish with an assemblage of surface-feeding seabirds. This method requires testing in the Southern Ocean with deeper-diving species and at a larger spatial scale, before it can be considered as a recommended approach beyond the pilot fishery.

Side-setting **must** be used in combination with ACAP best practice recommendations for line weighting in order to increase sink rates forward of the vessel's stern, and hooks should be cast well forward of the setting position, but close to the hull of the vessel, to allow hooks time to sink as far as possible before they reach the stern. Bird curtains, a horizontal pole with vertical streamers, positioned aft of the setting station, may deter birds from flying close to the side of the vessel. The combined use of side-setting, line weighting and a bird curtain should be considered as a single measure.

Mainline tension: Setting longlines into propeller turbulence (wake) should be avoided because it slows the sink rates of baited hooks.

Live vs. dead bait: Use of live bait should be avoided. Individual live baits can remain near the water surface for extended periods, thus increasing the likelihood of seabird captures.

Hook mass and design: Changes to hook mass and design may reduce the chance of seabird mortality in longline fisheries but have not been adequately studied.

Bait hooking position: Baits hooked in either the head (fish), or tail (fish and squid) are recommended because they sink significantly faster than baits hooked in the mid-back (fish) or upper mantle (squid).

Offal and discard discharge management: Offal and discards should not be discharged during line setting. During line hauling, offal and used baits should preferably be retained or discharged on the opposite side of the vessel from that on which the line is hauled. All hooks should be removed and retained on board before discards are discharged from the vessel.

MITIGATION MEASURES THAT ARE NOT RECOMMENDED

ACAP considers that the following measures lack scientific substantiation as technologies or procedures for reducing the impact of pelagic longlines on seabirds.

Line shooters: No experimental evidence of effectiveness in pelagic longline fisheries.

Olfactory deterrents: No evidence of effectiveness in pelagic longline fisheries.

Blue dyed bait: No experimental evidence of effectiveness in pelagic longline fisheries. Insufficiently researched.

Bait thaw status: No evidence that the thaw status of baits has any effect on the sink rate of baited hooks set on weighted lines.

Laser technology: There is currently no evidence of effectiveness, and serious concerns remain regarding the potential impacts on the health of individual birds.

The ACAP review of seabird bycatch mitigation measures for pelagic longline fisheries is presented in the following section.

Agreement on the Conservation of Albatrosses and Petrels

ACAP Review of Seabird Bycatch Mitigation Measures for Pelagic Longline Fisheries

Reviewed at the Fourteenth Meeting of the Advisory Committee
Lima, Peru, 12 - 16 August 2024

INTRODUCTION

A range of technical and operational mitigation methods have been designed or adapted for use in pelagic longline fisheries to reduce incidental mortality of seabirds. Operationally, peak areas and periods of seabird foraging activity should be avoided. Effective technical methods include actively deterring birds from, and minimising the visibility of, baited hooks. Vessels need to be made less attractive to birds, and the distance astern and time baited hooks are available to birds should be reduced. Mitigation methods need to be easy and safe to implement, cost effective, enforceable and should not reduce catch rates of target species or increase the bycatch rates of other protected species.

The feasibility, effectiveness and specifications of mitigation measures may vary by area, seabird assemblage, fishery, vessel size, and gear configuration. Some of the mitigation methods are well established and explicitly prescribed in pelagic longline fisheries; however, additional measures are undergoing further testing and refinements.

The Seabird Bycatch Working Group (SBWG) of ACAP has comprehensively reviewed the scientific literature dealing with seabird bycatch mitigation in pelagic fisheries and this document is a distillation of that review. Currently, simultaneous use of weighted branch lines, bird scaring lines and night setting, or use of one of the assessed hook-shielding and underwater bait setting devices, is considered best practice mitigation for reducing seabird bycatch in pelagic longline fisheries. Three hook-shielding devices (the ‘Hookpod-LED’, the ‘Hookpod-mini’ and the ‘Smart Tuna Hook’) and one underwater bait setting device (the ‘Underwater Bait Setter (Skadia Technologies)’) have been assessed.

THE ACAP REVIEW PROCESS

At each of its meetings, the ACAP SBWG considers any new research or information pertaining to seabird bycatch mitigation in pelagic longline fisheries. The following criteria are used by ACAP to guide the assessment process, and to determine whether a particular fishing technology or measure can be considered best practice to reduce the incidental mortality of albatrosses and petrels in fishing operations.

Best Practice Seabird Bycatch Mitigation Criteria and Definition

i. Individual fishing technologies and techniques should be selected from those shown by experimental research to significantly[10] reduce the rate of seabird incidental mortality[11] to the lowest achievable levels. Experimental research yields definitive results when performance of candidate mitigation technologies is compared to a control (no deterrent), or to status quo in the fishery. When testing relative performance of mitigation approaches, analysis of fishery observer data can be plagued with a myriad of confounding factors. Where a significant relationship is demonstrated between seabird behaviour and seabird mortality in a particular system or seabird assemblage, significant reductions in seabird behaviours, such as the rate of seabirds attacking baited hooks, can serve as a proxy for reduced seabird mortality. Ideally, where simultaneous use of fishing technologies and practices is recommended as best practice, research should demonstrate significantly improved performance of the combined measures.

ii. Fishing technologies and techniques, or a combination thereof, should have clear and proven specifications and minimum performance standards for their deployment and use. Examples would include: specific bird scaring line designs (lengths, streamer length and materials; etc.), number (one vs. two) and deployment specifications (such as aerial extent and timing of deployment); night fishing defined by the time between the end of nautical dusk and start of nautical dawn; and, line weighting configurations specifying mass and placement of weights or weighted sections.

iii. Fishing technologies and techniques should be demonstrated to be practical, cost effective and widely available. Commercial fishing operators are likely to select for seabird bycatch reduction measures and devices that meet these criteria including practical aspects concerning safe fishing practices at sea.

iv. Fishing technologies and techniques should, to the extent practicable, maintain catch rates of target species. This approach should increase the likelihood of acceptance and compliance by fishers.

v. Fishing technologies and techniques should, to the extent practicable not increase the bycatch of other taxa. For example, measures that increase the likelihood of catching other protected species such as sea turtles, sharks and marine mammals, should not be considered best practice (or only so in exceptional circumstances).

vi. Minimum performance standards and methods of ensuring compliance should be provided for fishing technologies and techniques, and clearly specified in fishery regulations. Relatively simple methods to check compliance should include, but not be limited to, port inspections of branch lines to determine compliance with branch line weighting, determination of the presence of davits (tori poles) to support bird scaring lines, and inspections of bird scaring lines for conformance with design requirements.

[10] Any use of the word ‘significant’ in this document is meant in the statistical context

[11] This may be determined by either a direct reduction in seabird mortality or by reduction in seabird attack rates, as a proxy

Compliance monitoring and reporting should be a high priority for enforcement authorities.

On the basis of these criteria, the scientific evidence for the effectiveness of mitigation measures or fishing technologies/techniques in reducing seabird bycatch is assessed, and explicit information is provided on whether the measure is recommended as being effective, and thus considered best practice, or not. The ACAP review also indicates whether the measure needs to be combined with additional measures, and provides notes and caveats for each measure, together with information on performance standards and further research needs. Following each meeting of ACAP's SBWG and Advisory Committee, this review document and ACAP's best practice advice, is updated (if required). A summary of ACAP's current best practice advice is provided in the preceding section of this document.

SEABIRD BYCATCH MITIGATION FACT SHEETS

A series of seabird bycatch mitigation fact sheets have been developed by ACAP and BirdLife International to provide practical information, including illustrations, on seabird bycatch mitigation measures (https://www.acap.aq/resources/bycatch-mitigation/mitigation-fact-sheets). The sheets, which include information on the effectiveness of the specific measure, their limitations and strengths and best practice recommendations for their effective adoption, are linked to the ACAP review process, and are updated following ACAP reviews. Links to the available fact sheets are provided in the relevant sections below. The mitigation fact sheets are currently available in English, French, Spanish, Portuguese, Japanese, Korean, Simplified Chinese, Traditional Chinese, and Indonesian.

BEST PRACTICE MEASURES

1. Branch line weighting

Scientific evidence for effectiveness in pelagic fisheries

Proven and recommended mitigation method. Should be used in combination with night setting and bird scaring lines (Brothers 1991; Boggs 2001; Sakai *et al*. 2001; Brothers *et al*. 2001; Anderson & McArdle 2002; Hu *et al*. 2005; Melvin *et al*. 2013; 2014, Jiménez *et al*. 2017; 2019; Santos *et al*. 2019).

Notes and Caveats

Branch lines should be weighted to sink the baited hooks rapidly out of the diving range of feeding seabirds. Studies have demonstrated that branch line weighting where there is more mass closer to the hooks, results in hooks sinking most rapidly and consistently (Gianuca *et al*. 2011; Robertson *et al*. 2010a; 2013; Barrington *et al*. 2016), and reduces seabird attacks on baits (Gianuca *et al*. 2011; Ochi *et al*. 2013; Jiménez *et al*. 2019) as well as seabird mortalities (Jiménez *et al*. 2017; 2019; Santos *et al*. 2019). Studies of a range of weighting regimes have shown no negative effect on target catch rates (Jiménez *et al*. 2013; 2017; 2019; Robertson *et al*. 2013; Gianuca *et al*. 2013; Santos *et al.* 2019). However, an experimental weighted fishing hook, with a mass of 32 g added to the shank of the hook, showed a decrease in the catch rates of pooled retained species (Gilman *et al.* 2022).

Increased weighting will shorten but not eliminate the distance behind the vessel in which birds can be caught. Branch line weighting has been shown to improve the effectiveness of other mitigation methods such as night setting and bird scaring lines, in reducing seabird bycatch (Brothers 1991; Boggs 2001; Sakai *et al*. 2001; Anderson & McArdle 2002; Gilman *et al.* 2003a, Hu *et al*. 2005; Melvin *et al*. 2013; 2014). Branch line weighting is integral to the fishing gear and, compared to bird scaring lines and night setting, has the advantage of being more consistently implemented, hence facilitating compliance and port monitoring. On this basis it is important to enhance the priority accorded to branch line weighting, providing certain pre-conditions can be met, among other things: (a) that the weighting regime is adequately specified; and (b) safety issues are adequately addressed.

Minimum standards

On the basis of sink-rate data (Barrington *et al*. 2016) and seabird attack and bycatch rates (Gianuca *et al*. 2011; Jiménez *et al*. 2019; Santos *et al*. 2019), best practice branch line weighting should achieve a sink rate of 0.5m/s to 5 m depth. The following configurations have been demonstrated, under controlled conditions and with metal materials, to meet this standard

(a) 40 g or greater attached within 0.5 m of the hook;

(b) 60 g or greater attached within 1 m of the hook;

(c) 80 g or greater attached within 2 m of the hook.

When weighting is attached to, or integrated into the hook, a minimum of total weight of 50 g is sufficient to achieve a sink rate of 0.5 m/s to 5 m depth. Branch line weighting is integral to the fishing gear and, compared to bird scaring lines and night setting, has the advantage of being more consistently implemented, hence facilitating compliance and port monitoring. It is recommended to avoid the use of lead when the lead may be ingested (e.g. attached to or integrated into the hook). The use of lighting devices or other fishing accessories as weights is not recommended unless they achieve the sink rate criterion.

Need for combination

Should be combined with bird scaring lines and night setting. There is a period of time when hooks are accessible to birds even when branch lines are weighted.

Implementation monitoring

Vessels carrying out short fishing trips (lasting up to a few weeks): Line weights crimped into branch lines are very difficult to remove at sea. Inspection before departure from port of all gear bins on vessels is therefore considered an acceptable form of implementation monitoring.

Vessels carrying out long fishing trips (lasting months): It is possible to remove and/or re-configure gear at sea. Consequently, implementation monitoring requires using appropriate methods (e.g., observer inspection of line setting operations; video surveillance; at-sea compliance checks). Video surveillance may be possible, subject to the mainline setter being fitted with motion sensors to trigger cameras.

Research needs

Continued refinement of branch line weighting configurations (mass, number and position of weights and materials) with regard to effectively reducing seabird bycatch and safety concerns, through controlled research and application in fisheries, is encouraged. Improving branch line weighting for high seas fisheries, with hook sink rates consistent with ACAP's Best Practice advice on branch line weighting, remains as a research priority. Studies should also include evaluations of the effects of branch line weighting on the catch rate of target and bycatch species and provide data that allow evaluation of the relative safety and practicality attributes of various weighting configurations.

Mitigation Fact Sheet

https://www.acap.aq/bycatch-mitigation/bycatch-mitigation-fact-sheets

2. Night setting

Scientific evidence for effectiveness in pelagic fisheries

Proven and recommended mitigation method. Should be used in combination with weighted branch lines and bird scaring lines (Duckworth 1995; Gales *et al.* 1998; Klaer & Polacheck 1998; Brothers *et al*. 1999; McNamara *et al*. 1999; Gilman *et al*. 2005; 2023; Baker & Wise 2005; Jiménez *et al*. 2009; 2014; 2020; Melvin *et al*. 2013; 2014; Rollinson *et al*. 2016; Rollinson 2017; Melvin *et al.* 2023, Meyer & MacKenzie 2022).

Notes and Caveats

Setting longlines at night (defined as the time between the end of nautical twilight and before nautical dawn as set out in the Nautical Almanac tables for relevant latitude, local time and date) is highly effective at reducing incidental mortality of seabirds because the majority of vulnerable seabirds are inactive at night. For example, a Pacific Ocean albacore tuna longline fishery had dramatically lower albatross bycatch rates when making sets completely at night compared to sets made partially in the daytime, with no reduction in the target species catch rate (Gilman *et al*. 2023). Night setting is not as effective for crepuscular/ nocturnal foragers (e.g. White-chinned Petrels *Procellaria aequinoctialis*). Consequently, night setting should be used in combination with branch line weighting and bird scaring lines (Klaer & Polacheck 1998; Brothers *et al*. 1999; McNamara *et al*. 1999; Gilman *et al*. 2005; Baker & Wise 2005; Jiménez *et al*. 2009; 2014; 2020; Melvin *et al*. 2013; 2014). The effectiveness of this measure may be reduced during bright moonlight and when using intense deck lights, and is less practical in high latitudes during summer, when the time between nautical dusk and dawn is limited.

Minimum standards

No setting should take place between nautical dawn and nautical dusk. Nautical dawn and nautical dusk are defined as set out in the Nautical Almanac tables for relevant latitude, local time and date. Setting longlines across night and day does not represent night setting: either when setting commences at night and finishes after the nautical dawn, or when setting commences prior to the nautical dusk and continues into the night.

Need for combination

Should be used in combination with bird scaring lines and branch line weighting. Night setting used alone is less effective at reducing seabird bycatch for nocturnally active birds and during bright moon light conditions.

Implementation monitoring

Requires Vessel Monitoring Systems (VMS) or fishery observers. Vessel speed and direction vary between transiting, line setting, line hauling and when vessels are stationary on fishing grounds. VMS-derived assessment of vessel activity in relation to time of nautical dawn and dusk are considered acceptable for implementation monitoring. Alternatively, VMS-linked sensors fitted to mainline setting and hauling drum could be used to indicate compliance, as could sensors to trigger video surveillance cameras. This facility is currently unavailable and requires development.

Research needs

Assessing the effectiveness of bird scaring lines and branch line weighting at night needs to be determined, possibly by way of using thermal or night vision technologies.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/1824-fs-05-demersal-pelagic-longline-night-setting/file

3.a Bird scaring lines for vessels ≥35 m in total length

Scientific evidence for effectiveness in pelagic fisheries

Proven and recommended mitigation method. Should be used in combination with branch lines weighting and night setting. (Imber 1994; Uozumi & Takeuchi 1998; Brothers *et al.* 1999; Klaer & Polacheck 1998; McNamara *et al.* 1999; Boggs 2001; CCAMLR 2002; Minami & Kiyota 2004; Melvin 2003; Rollinson *et al*. 2016; Rollinson 2017). For vessels ≥35 m in length, the use of two bird scaring lines (BSLs) is considered best practice. BSLs with the appropriate aerial extent can be more easily rigged on large vessels. Two BSLs are considered to provide better protection of baited hooks in crosswinds than single BSLs (Melvin *et al*. 2004; 2013; 2014; Sato *et al*. 2013). Hybrid BSLs (with long and short streamers) are more effective than BSLs with short streamers only in deterring diving seabirds (e.g. White-chinned Petrels *Procellaria aequinoctialis*, Melvin *et al*. 2010; 2013; 2014).

Notes and Caveats

Properly designed and deployed BSLs deter birds from sinking baits, dramatically reducing seabird attacks and related mortalities. A bird scaring line runs from a high point at the stern to a device or mechanism that creates drag at its terminus. Brightly coloured streamers hanging from the aerial extent of the line scare birds from flying to and under the line, preventing them from reaching the baited hooks. It is important to note that the BSLs only provide protection to the baited hooks within the area protected by its aerial extent. This is why it is particularly important to use BSLs in combination with branch line weighting (and night setting), which ensure that the baited hooks have sunk beneath the diving depth of most

seabirds beyond the aerial extent of the BSLs. The presence of diving species increases the vulnerability of surface foragers (e.g., albatrosses) due to secondary interactions (i.e. albatrosses attacking baited hooks that are brought back to the surface by diving birds).

BSLs should be the lightest practical strong fine line. Lines should be attached to the vessel with a barrel swivel to minimise rotation of the line from torque created as it is dragged behind the vessel. Long streamers should be attached with a swivel to prevent them from rolling up onto the BSL. BSLs are at risk of tangling with float lines leading to lost BSLs, interruptions in vessel operations and in some cases lost fishing gear.

BSLs potentially increase the likelihood of entanglements, particularly if the attachment points on davits (tori poles) are insufficiently outboard of vessels. To achieve a minimum aerial extent BSLs should be attached to the vessel such that it is suspended from a point a minimum of 8 m above the water at the stern. Attaching towed objects to the terminus of the in-water extent of bird scaring lines to increase drag has proven problematic in pelagic longline fisheries, as float lines tend to tangle with bird scaring lines. For this reason, the addition of short streamers woven into the in-water extent of the bird scaring line or lengthening or increasing the diameter of the in-water extent, are encouraged to increased drag while minimizing tangles. Weak links (breakaways) should be incorporated into the in-water portion of the line for safety reasons and to minimize operational problems associated with lines becoming tangled.

Minimum standards

Simultaneous use of two BSLs, one on each side of the sinking longline, provides maximum protection from bird attacks under different wind conditions (Melvin *et al.* 2004; 2013; 2014; Sato *et al*. 2013). The setup for BSLs should be as follows:

- BSLs should be deployed to maximise the aerial extent, which is a function of vessel speed, height of the attachment point to the vessel, drag, and weight of bird scaring line materials.
- To achieve a minimum recommended aerial extent of 100 m, BSLs should be attached to the vessel such that they are suspended from a point a minimum of 8 m above the water at the stern.
- BSLs should contain a mix of brightly coloured long and short streamers placed at intervals of no more than 5 m. Long streamers should be attached to the line in a way that prevent streamers from wrapping around the line (e.g. using unweighted swivels). All long streamers should reach the sea-surface in calm conditions.
- Baited hooks should be deployed within the area bounded by the two BSLs. If using bait-casting machines, they should be adjusted so as to land baited hooks within the area bounded by the BSLs.

If large vessels use only one BSL, it should be deployed windward of the sinking baits. If baited hooks are set outboard of the wake, the BSL attachment point to the vessel should be positioned several meters outboard of the side of the vessel that baits are deployed.

Need for combination

Should be used in combination with appropriate branch line weighting and night setting. BSLs used alone can rarely protect baited hooks beyond the aerial extent of the line.

Implementation monitoring

On-board observers, electronic monitoring (cameras), at-sea surveillance or an electronic BSL compliance monitoring device (Ngcongo & Miranda 2024; https://imveloblue.co.za/electronic-monitoring-imvelo-bsl/).

Research needs

Developing methods that minimise entanglements of the in-water portion of BSLs with longline floats remains the highest priority for research on bird-scaring lines. Other research priorities include: (1) evaluating the effectiveness of one vs. two BSLs; and, (2) BSLs design features including streamer lengths, configurations and materials.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/1497-fs-07a-pelagic-longline-streamer-lines-vessels-35-m/file

3.b Bird scaring lines for vessels <35m in total length

Scientific evidence for effectiveness in pelagic fisheries

Proven and recommended mitigation method. For vessels <35 m in length, a single BSL in combination with night setting and appropriate branch line weighting, has been found to be effective for mixed and short BSLs (ATF 2011; Domingo *et al.* 2017, Gianuca *et al.* 2011, Meyer & MacKenzie 2022).

Notes and Caveats

Vessels <35 m total length should deploy BSLs with a minimum aerial extent of 75 m. To achieve this minimum aerial extent, BSLs should be attached to the vessel such that it is suspended from a point a minimum of 6 m above the water at the stern. Sufficient drag must be created to maximise aerial extent and maintain the line directly behind the vessel during crosswinds. This may be achieved using either towed devices or longer in-water sections (Goad & Debski 2017). Diving species increase vulnerability of surface foragers (albatrosses) due to secondary interactions.

Minimum standards

To achieve a minimum recommended aerial extent of 75 m, BSLs should be attached to the vessel such that they are suspended from a point a minimum of 6 m above the water at the stern. Short streamers (>1 m) should be placed at 1 m intervals along the length of the aerial extent. Two designs have been shown to be effective:

(i) a mixed design that includes long and short streamers. Long streamers should be placed at 5 m intervals over at least the first 55 m of the BSL (Domingo *et al*. 2017). Streamers may be modified over the first 15 m to avoid tangling (Goad & Debski 2017); and,

(ii) a design that only includes short streamers. In all cases, BSLs should be brightly coloured and the lightest practical strong fine line. Lines should be attached to the vessel with a barrel swivel to minimise rotation of the line from torque (created as it is dragged behind the vessel).

Sufficient drag must be created to maximise aerial extent and maintain the line directly behind the vessel during crosswinds. To avoid tangling, this is best achieved using a long in-water section of rope or monofilament. Alternatively, short streamers can be tied into the line to 'bristle' the line (creating a bottlebrush like configuration) to generate drag while minimising the chance of fouling streamer lines on float lines.

To minimise safety and operational problems it is recommended to use a weak link to allow the bird scaring line to break-away from the vessel in the event of a tangle with the main line, and, a secondary attachment between the bird scaring line and the vessel to allow the tangled bird scaring line to be subsequently attached to mainline and recovered during the haul (Goad & Debski 2017).

Need for combination

Should be used with appropriate branch line weighting and night setting. BSLs used alone can rarely protect baited hooks beyond the aerial extent of the line.

Implementation monitoring

. On-board observers, electronic monitoring (cameras), at-sea surveillance or an electronic BSL compliance monitoring device (Ngcongo & Miranda 2024; https://imveloblue.co.za/electronic-monitoring-imvelo-bsl/).

Research needs

Developing methods that minimise entanglements of the in-water portion of BSLs with longline floats remains the highest priority for research on bird-scaring lines. Other research priorities include: (i) evaluating the effectiveness of one vs. two BSL, (ii) BSL design features including steamer lengths, configurations and materials, especially for very small vessels.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/1867-fs-07b-pelagic-longline-streamer-lines-vessels-less-than-35-m/file

4. Hook-shielding devices

Scientific evidence for effectiveness in pelagic longline fisheries

Proven and recommended mitigation method. Hook-shielding devices encase the point and barb of baited hooks to prevent seabird attacks during line setting until a prescribed depth is reached (a minimum of 10 meters), or until after a minimum period of immersion has occurred (a minimum of 10 minutes) that ensures that baited hooks are released beyond the foraging depth of most seabirds. The following performance requirements are used by ACAP to assess the efficacy of hook-shielding devices in reducing seabird bycatch:

(a) the device shields the hook until a prescribed depth of 10 m or immersion time of 10 minutes is reached

(b) the device meets current recommended minimum standards for branch line weighting described in Section 1

(c) experimental research has been undertaken to allow assessment of the effectiveness, efficiency and practicality of the technology against the ACAP best practice seabird bycatch mitigation criteria developed for assessing and recommending best practice advice on seabird bycatch mitigation measures

At this time, the 'Hookpod-LED' (Sullivan *et al*. 2018, Barrington 2016a), 'Hookpod-mini' (Goad *et al.* 2019, Gianuca *et al.* 2021, Sullivan & Barrington 2021) and the 'Smart Tuna Hook' (Baker *et al*. 2016, Barrington 2016b) have been assessed as having met the performance requirements and are therefore considered to represent best practice.

Notes and Caveats

The assessment of these three devices as best practice is conditional on continuing to meet the above performance requirements.

Minimum standards

'Hookpod-LED' – 68 g minimum weight that is positioned at the hook, encapsulating the barb and point of the hook during setting, and remains attached until it reaches 10 m in depth, when the hook is released.

'Hookpod-mini' – 48 g minimum weight that is positioned at the hook, encapsulating the barb and point of the hook during setting, and remains attached until it reaches 10 m in depth, when the hook is released.

'Smart Tuna Hook' – 40 g minimum weight that is positioned at the hook, encapsulating the barb and point of the hook during setting, and remains attached for a minimum period of 10 minutes after setting, when the hook is released.

Need for combination

Both of these assessed hook-shielding devices have been designed as stand-alone measures that do not need to be combined with other mitigation measures. However, it is useful to note that they integrate two performance components: i) protecting and ii) increasing the sink rate of the baited hooks to reduce the opportunities for seabirds to access them.

Implementation monitoring

A combination of port-based inspections and vessel-based monitoring and surveillance (e.g. observer inspection of line setting operations; video surveillance; at-sea compliance checks) will be required to assess use and compliance.

Research needs

Conduct further field research to evaluate the relative contributions of the sink rates and hook protection components of hook-shielding devices in reducing seabird bycatch.

Mitigation Fact Sheet

https://acap.aq/resources/bycatch-mitigation/mitigation-fact-sheets/3517-pelagic-longline-hook-sheilding/file

5. Underwater Bait Setting devices

Scientific evidence for effectiveness in pelagic longline fisheries

Proven and recommended mitigation method. Underwater Bait Setting devices deploy baited hooks at a pre-determined depth immediately at the stern of the vessel. Underwater Bait Setting devices deploy baited hooks individually underwater down a track fitted to the fishing vessel's transom in a vertical manner enclosed in a capsule or similar device to eliminate any visual stimulus for seabirds following the vessel. The capsule is pulled quickly underwater to a predetermined target depth that can be adjusted in response to the dive capabilities of seabirds attending the vessel during line setting to prevent interactions. The following performance requirements are used by ACAP to assess the efficacy of underwater bait setting devices in reducing seabird bycatch:

(a) the device deploys encapsulated hooks in a vertical manner at the stern of the vessel until a minimum prescribed depth of 5 m is reached;

(b) branch lines meet current recommended minimum standards for branch line weighting described in Section 1; and

(c) experimental research has been undertaken to allow assessment of the effectiveness, efficiency and practicality of the technology against the ACAP best practice seabird bycatch mitigation criteria developed for assessing and recommending best practice advice on seabird bycatch mitigation measures.

At this time, the 'Underwater Bait Setter (Skadia Technologies)' (Robertson *et al.* 2015, Robertson *et al*. 2018, Barrington 2021) has been assessed as having met the performance requirements and are therefore considered to represent best practice.

Notes and Caveats

The assessment of this devices as best practice is conditional on continuing to meet the above performance requirements.

Minimum standards

'Underwater Bait Setter (Skadia Technologies)' – a computer operated and hydraulically powered machine that deploys baited hooks individually underwater in a capsule, and where recommended minimum standards for branch line weighting are met. The capsule is pulled down a removable track fitted to the vessel's transom and then catapulted to a target depth. The capsule descends along the track at 6 $m.sec^{-1}$ and thereafter at ≥3 $m.sec^{-1}$.

Need for combination

The assessed underwater bait setting device has been assessed on the basis that branch lines meet current recommended minimum standards for branch line weighting. However, it is

useful to note that the device integrates two performance components: i) protecting and ii) increasing the sink rate of the baited hooks to reduce the opportunities for seabirds to access them.

Implementation monitoring

A combination of port-based inspections and vessel-based autonomous data collection and surveillance (e.g. observer inspection of line setting operations; autonomous electronic surveillance and data collection; at-sea compliance checks) will be required to assess use and compliance.

Research needs

Conduct further field research to evaluate the effect of shallow set (e.g. 4-5 m depth) baits and deep-set baits (e.g. 6-10 m depth) on seabird ship-following behaviour and attacks on bait with an Underwater Bait Setter (Skadia Technologies) in *constant* use. This was not assessed by Robertson et al. (2018) who set alternate groups of hooks underwater and groups of hooks at the surface to compare relative effects). Conduct further field research to evaluate the performance of the Underwater Bait Setter (Skadia Technologies) with unweighted branch lines.

6. Time - Area closures

Scientific evidence for effectiveness in pelagic fisheries

Proven and recommended mitigation method. Avoiding fishing in peak areas and/or during periods of intense foraging activity, has been used effectively to reduce rapidly and substantially bycatch in longline fisheries.

Notes and Caveats

This is an important and effective management response, especially for high-risk areas, and when other measures prove ineffective**.** Although this can be highly effective in targeted locations and/or during a specific season, time-area closures may displace fishing effort into areas that are not as well regulated, leading to greater incidental mortality levels.

Minimum standards

None defined, but highly recommended.

Need for combination

Must be combined with other measures, both in the targeted areas when they are subsequently opened again for fishing, and also in adjacent areas to ensure displacement of fishing effort does not merely lead to a spatial shift in the incidental mortality.

Implementation monitoring

Vessels equipped with VMS combined with monitoring of activities by appropriate management authority is considered appropriate monitoring. Areas/seasons should be

patrolled to ensure effectiveness if Illegal, Unreported and Unregulated (IUU) fishing activities are suspected.

Research needs

Further research is required on the seasonal variability in patterns of seabird distribution and behaviour in relation to fisheries, including whether closing areas to fishing causes a shift in the distribution of seabirds to adjacent areas.

OTHER CONSIDERATIONS

7. Side-setting with line weighting and bird curtain

Scientific evidence for effectiveness in pelagic fisheries

Shown to be more effective than other simultaneously tested mitigation measures, including setting chutes and blue dyed bait, on relatively small vessels in the Hawaiian pelagic longline tuna and swordfish fisheries (Gilman *et al*. 2003b). **Effectiveness in southern hemisphere fisheries has not been researched and consequently it is not recommended as a proven mitigation measures in these fisheries at this time** (Brothers & Gilman 2006; Yokota & Kiyota 2006).

Notes and Caveats

Hooks must be sufficiently below the surface and protected by a bird curtain by the time they reach the stern of the vessel. In Hawaii, side-setting trials were conducted with a bird curtain and 45-60 g weighted swivels placed within 0.5 m of hooks. Japanese research concludes it must be used in combination with other measures (Yokota & Kiyota 2006). The Hawaiian trial was conducted in an area with an assemblage of largely surface-feeding seabirds, and this measure requires testing in other fisheries and areas where seabird abundance is higher and secondary ingestion (hooks retrieved by diving birds and secondarily – subsequently - attacked by surface foragers) is more important. Hence, it cannot be recommended for use in other fisheries at this time.

Minimum standards

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. The distance forward of the stern refers to the position from which baits are manually deployed. Baited hooks must be thrown by hand forward of the bait deployment location if they are to be afforded “protection” by being close to the side of the vessel.

Need for combination

Lines set from the side of vessels must be appropriately weighted in accordance with ACAP best practice advice and protected by an effective bird curtain.

Implementation monitoring

Requires fisheries observers or video surveillance.

Research needs

Currently untested in Southern Hemisphere fisheries against assemblages of diving seabirds (e.g. *Procellaria* sp. Petrels and *Puffinus* sp. Shearwaters) and albatrosses - urgent need for research.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/769-fs-09-pelagic-longline-side-setting/file

8. Blue dyed bait

Scientific evidence for effectiveness in pelagic fisheries

Unproven and not recommended as a mitigation method (Boggs 2001; Gilman *et al*. 2003b; Minami & Kiyota 2001; Minami & Kiyota 2004; Lydon & Starr 2005, Cocking *et al*. 2008; Ochi *et al.* 2011).

Notes and Caveats

The available data suggest only effective with squid bait (Cocking *et al*. 2008). Onboard dyeing requires labour and is difficult under stormy conditions. Results are inconsistent across studies.

Minimum standards

Mix to standardised 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).

Need for combination

Must be combined with bird scaring lines or night setting.

Implementation monitoring

The current practice of dyeing bait on board vessels at sea requires observer presence or video surveillance to monitor implementation. Assessment of implementation in the absence of on-board observers or video surveillance requires baits be dyed on land and monitored through port inspection of all bait on vessels prior to departure on fishing trips.

Research needs

Further testing is needed in the Southern Ocean.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/770-fs-10-pelagic-longline-blue-dyded-bait-squid/file

9. Line shooter

Scientific evidence for effectiveness in pelagic fisheries

Unproven and not recommended as a mitigation measure (Robertson *et al*. 2010b).

Notes and Caveats

Use of a line shooter to set gear deep cannot be considered a mitigation measure. Mainline set into propeller turbulence with a line shooter without tension astern (e.g. slack), as is the case in deep setting, significantly slows the sink rates of hooks (Robertson *et al*. 2010b).

Minimum standards

Not Applicable.

Need for combination

Not Applicable.

Implementation monitoring

Not Applicable.

Research needs

Not Applicable.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/771-fs-11-pelagic-longline-bait-caster-and-line-shooter/file

10. Bait caster

Scientific evidence for effectiveness in pelagic fisheries

Unproven and not recommended as a mitigation measure (Duckworth 1995; Klaer & Polacheck 1998).

Notes and Caveats

Not a mitigation measure unless bait 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. Current machines (without variable power control) likely to deploy baited hooks well beyond the streaming position of bird scaring lines, increasing risks to seabirds. Few commercially available machines have variable power control. Needs more development.

Minimum standards

Not Applicable.

Need for combination

Not Applicable.

Implementation monitoring

Not Applicable

Research needs

Develop (and implement) casting machine with a variable power control.

Mitigation Fact Sheet

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/771-fs-11-pelagic-longline-bait-caster-and-line-shooter/file

11. Underwater setting chute

Scientific evidence for effectiveness in pelagic fisheries

Unproven and not recommended as a mitigation measure (Brothers 1991; Boggs 2001; Gilman *et al*. 2003a; Gilman *et al*. 2003b; Sakai *et al*. 2004; Lawrence *et al*. 2006).

Notes and Caveats

In pelagic fisheries, existing equipment is not yet sturdy enough for large vessels in rough seas. Problems with malfunctions and performance inconsistencies have been reported (e.g. Gilman *et al*. 2003a, and Australian trials cited in Baker & Wise 2005).

Minimum standards

Not yet established

Need for combination

Not recommended for general application at this time.

Implementation monitoring

Not Applicable.

Research needs

Design problems to overcome.

12. Strategic offal discharge

Scientific evidence for effectiveness in pelagic fisheries

Unproven and not recommended as a primary mitigation measure in pelagic longline fisheries, but should be considered good practice (McNamara *et al*. 1999; Cherel *et al*. 1996).

Notes and Caveats

This should be considered a supplementary measure (i.e. used in addition to primary best practice mitigation measures). Offal attracts birds to vessels, and also conditions birds to attend vessels. Where practical, the discharge of offal should be eliminated or restricted to periods when not setting or hauling. Strategic discharge during line setting (dumping of homogenised offal to the side of the vessel during setting to attract birds to this area and away from the baited hooks, Cherel *et al.* 1996) can increase interactions and should be discouraged. Offal retention and/or incineration may be impractical on small vessels.

Minimum standards

Not yet established for pelagic fisheries. In the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), discharge of offal is prohibited during line setting for demersal longline fisheries. 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.

Need for combination

Must be combined with other measures.

Implementation monitoring

Requires offal discharge practices and events to be monitored by fisheries observers or video surveillance.

Research needs

Further information needed on opportunities and constraints for the application of offal management in pelagic fisheries (short and long term).

13. Live bait

Scientific evidence for effectiveness in pelagic fisheries

Not recommended, as use of live bait may lead to increased rates of seabird bycatch (Robertson *et al*. 2010a; Trebilco *et al*. 2010).

Notes and Caveats

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.

Minimum standards

Not Applicable.

Need for combination

Not Applicable.

Implementation monitoring

Not Applicable.

Research needs

Not Applicable.

14. Bait thaw status – use of thawed baits rather than frozen baits

Scientific evidence for effectiveness in pelagic fisheries

Unproven and not recommended as a primary mitigation measure (Brothers 1991; Duckworth 1995; Klaer & Polacheck 1998; Brothers *et al*.1999; Robertson & van den Hoff 2010).

Notes and Caveats

Thawed baits are believed to sink faster than frozen baits. However, Robertson & van den Hoff (2010) concluded that the bait thaw status has no practical bearing on seabird mortality in pelagic fisheries. Baits cannot be separated from others in frozen blocks of bait, and hooks cannot be inserted into baits unless they 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.

Minimum standards

Not Applicable.

Need for combination

Not Applicable.

Implementation monitoring

Not Applicable.

Research needs

Not Applicable.

15. Haul Mitigation

Scientific evidence for effectiveness in pelagic fisheries

Strategies to reduce seabird hooking during the haul have yet to be developed and properly tested for pelagic longline fisheries.

Notes and Caveats

The development and testing of seabird bycatch mitigation measures in pelagic longline fisheries has focussed almost exclusively on how to minimise or prevent bycatch during setting

operations. Although some measures, such as Bird Curtains, have been designed and tested in demersal longline fisheries to reduce the incidence of haul captures, these methods are not directly transferable to pelagic longline fisheries.

Need for combination

No information

Research needs

Developing methods that minimize seabird hooking during line hauling in pelagic longline fisheries remains an urgent research priority.

Minimum standards

No information

Implementation monitoring

No information

Mitigation Fact Sheet

Note that this fact sheet is directed mostly at haul mitigation in demersal longline fisheries, and is not directly applicable to pelagic longline fisheries.

https://www.acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets/1907-fs-12-demersal-pelagic-longline-haul-mitigation/file

16. Lasers

High Energy Lasers Strongly Discouraged

Scientific evidence for effectiveness in pelagic longline fisheries

Available evidence shows that high energy lasers (Class 4 lasers, the highest class in terms of laser hazards) are ineffective at deterring seabirds from danger areas around fishing vessels (Melvin *et al.* 2016) and likely damage seabird visual systems with negative effects on foraging behaviour of laser exposed seabirds (Fernandez-Juricic, 2023).

Notes and Caveats

Concerns are ongoing regarding the safety (to both humans and birds) and efficacy of laser technology of unknown energy levels as a seabird bycatch mitigation tool, as they continue to be used currently in various fisheries. Available evidence shows that high energy lasers are no longer marketed for fishery applications. Currently evidence is lacking on the possibility that lasers of lower energy levels delivered in different ways (scanning, blinking, wave-length, etc.) could be used safely and be effective in some applications.

Minimum standards

Not applicable as strongly discouraged.

Need for combination

Not applicable as strongly discouraged.

Implementation monitoring

Not applicable as strongly discouraged.

Research needs

As high energy lasers continue to be used in some fisheries, we encourage reporting of the extent and output power levels of laser use by ACAP Parties, including any information on effectiveness, as well as bird welfare effects.

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ANNEX 5. ACAP PRIORITY AT-SEA CONSERVATION ACTIONS BY FISHERIES WITH ACTIONS FOR ACAP OR ACAP PARTIES

2021 ACAP priority at-sea conservation actions by fishery. This table contains only fisheries identified as being the greatest threat to ACAP species (top 10% of all fisheries considered). The complete prioritisation framework only included fisheries that have been reported on by Parties or Range States, and therefore the number of possible fisheries that could be assessed is likely to be higher than those currently included. ACAP High Priority Populations are highlighted.

Fishery	Population (breeding island group) affected	Actions for ACAP/ Parties/ others
Angola Pelagic LL	Tristan Albatross Gough Island	ACAP to engage with the Benguela Current Commission, with the assistance of South Africa, to raise the issue and advocate mitigation use.
Argentina Demersal trawl	Northern Royal Albatross Chatham Islands	ACAP Party to implement BPA. Need consideration of improved advice on net monitoring cables. Improve on-board observer coverage and capacity trough human and electronic monitoring.
	Southern Giant Petrel Islas de los Estados & Observatorio	
	Wandering Albatross SG (IGS)[1]	
Australia Demersal trawl	Black Petrel Great and Little Barrier Islands	ACAP Party to implement BPA
	Indian yellow-nosed Albatross Amsterdam Island	
	Shy Albatross Albatross Island	
	Shy Albatross Pedra Branca	
Australia Gillnet	Black Petrel Great and Little Barrier Islands	ACAP Party to consider time-area closures. Encourage reporting of seabird bycatch from ACAP Party. Development of mitigation options and ACAP advice for gillnet fisheries.
	Indian yellow-nosed Albatross Amsterdam Island	
	Shy Albatross Pedra Branca	
	Sooty Albatross Iles Crozet	
Australia Pelagic trawl	Black Petrel Great and Little Barrier Islands	ACAP Party to implement BPA.

Fishery	Population (breeding island group) affected	Actions for ACAP/ Parties/ others
Brazil Demersal LL	Northern Royal Albatross Chatham Islands	ACAP Party to implement BPA, conduct at-sea trials to adapt mitigation measures to fleet's reality, implement on-board monitoring (human and electronic – e.g cameras) and creating regulations to mitigate seabird bycatch.
	Tristan Albatross Gough Island	
	Wandering Albatross SG (IGS)[1]	
Brazil Pelagic LL	Atlantic Yellow-nosed Albatross Tristan da Cunha	ACAP Party to implement BPA and on-board monitoring (human and electronic – e.g. cameras), as well as mechanisms for effective compliance monitoring and enforcement with current domestic regulations.
	Northern Royal Albatross Chatham Islands	
	Tristan Albatross Gough Island	
	Wandering Albatross SG (IGS)[1]	
	White-chinned Petrel SG (IGS)[1]	
Brazil Pelagic LL (Itaipava fleet)	Tristan Albatross Gough Island	Fishery definition to be reviewed and updated. ACAP Party to implement BPA.
	Wandering Albatross SG (IGS)[1]	
	Atlantic Yellow-nosed Albatross Tristan da Cunha	
	White-chinned Petrel SG (IGS)[1]	
Namibia Demersal trawl	Atlantic Yellow-nosed Albatross Tristan da Cunha	ACAP to engage with the Benguela Current Commission, with the assistance of South Africa, to raise the issue and advocate mitigation use. Encourage Namibia to join ACAP and adopt BPA. Encourage BLI to use existing programmes to support further bycatch mitigation implementation.
Namibia Pelagic LL	Shy Albatross Pedra Branca	ACAP to engage with the Benguela Current Commission, with the assistance of South Africa, to raise the issue and advocate mitigation use. Encourage Namibia to join ACAP and adopt BPA. Encourage BLI to use existing programmes to support further bycatch mitigation implementation.

Fishery	Population (breeding island group) affected	Actions for ACAP/ Parties/ others
Namibia Pelagic trawl	Shy Albatross Pedra Branca	ACAP to engage with the Benguela Current Commission, with the assistance of South Africa, to raise the issue and advocate mitigation use. Encourage Namibia to join ACAP and adopt BPA. Encourage BLI to use existing programmes to support further bycatch mitigation implementation.
Peru Demersal LL	Black Petrel Great and Little Barrier Islands	ACAP Party to continue development of appropriate mitigation options and implement an on-board observer program and standardized electronic logbooks. ACAP to prioritise support of development and implementation of mitigation, for example through Small Grant process.
Peru Pelagic LL	Black Petrel Great and Little Barrier Islands	ACAP Party to continue development of appropriate mitigation options and implement an on-board observer program and standardized electronic logbooks. ACAP to prioritise support of development and implementation of mitigation, for example through Small Grant process.
	Grey Petrel All sites	
Spain Demersal LL	Balearic Shearwater Balearic Archipelago	ACAP Party to implement BPA. ACAP Party to implement species action plan and MPAs.
Spain Pelagic LL	Balearic Shearwater Balearic Archipelago	ACAP Party to implement BPA. ACAP Party to implement species action plan and MPAs.

Fishery	Population (breeding island group) affected	Actions for ACAP/ Parties/ others
Spain Purse seine	Balearic Shearwater Balearic Archipelago	ACAP Party to implement, and further improve where appropriate, the mitigation advice being developed by ACAP. ACAP Party to implement species action plan and MPAs
Spain Trawl	Balearic Shearwater Balearic Archipelago	ACAP Party to implement BPA**,** or develop appropriate mitigation options if BPA is not practical. ACAP Party to implement species action plan and MPAs
Uruguay Demersal trawl	Northern Royal Albatross Chatham Islands	ACAP Party to implement BPA
RFMOs		
CCSBT Pelagic LL	Antipodean Albatross Auckland Islands	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Black-browed Albatross Antipodes Islands	
	Black-browed Albatross Campbell Island	
	Black-browed Albatross Iles Crozet	
	Black-browed Albatross SG (IGS)[1]	
	Black Petrel Great and Little Barrier Islands	
	Grey-headed Albatross SG (IGS)[1]	
	Grey Petrel All sites	
	Indian yellow-nosed Albatross Amsterdam Island	
	Indian yellow-nosed Albatross Crozet Island	
	Northern Giant Petrel Prince Edward Islands	
	Northern Royal Albatross Chatham Islands	
	Sooty Albatross Iles Crozet	

Fishery	Population (breeding island group) affected	Actions for ACAP/ Parties/ others
	Sooty Albatross Prince Edward Islands	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Southern Giant Petrel Prince Edward Islands	
	Tristan Albatross Gough Island	
	Wandering Albatross Iles Kerguelen	
	Wandering Albatross SG (IGS)[1]	
	White-chinned Petrel SG (IGS)[1]	
IATTC Pelagic LL	Laysan Albatross Central Pacific - Laysan	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Waved Albatross Islas Galapagos	
ICCAT Pelagic LL	Atlantic Yellow-nosed Albatross Tristan da Cunha	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Black-browed Albatross SG (IGS)[1]	
	Grey-headed Albatross SG (IGS)[1]	
	Grey Petrel All sites	
	Northern Royal Albatross Chatham Islands	
	Tristan Albatross Gough Island	
	Wandering Albatross SG (IGS) [1]	
	White-chinned Petrel SG (IGS) [1]	
IOTC Pelagic LL	Grey-headed Albatross SG (IGS)[1]	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Grey Petrel All sites	
	Indian yellow-nosed Albatross Amsterdam Island	
	Indian yellow-nosed Albatross Crozet Island	
	Indian yellow-nosed Albatross Prince Edward Island	

Fishery	Population (breeding island group) affected	Actions for ACAP/ Parties/ others
	Northern Giant Petrel Prince Edward Islands	
	Shy Albatross Pedra Branca	
	Sooty Albatross Iles Crozet	
	Sooty Albatross Prince Edward Islands	
	Southern Giant Petrel Prince Edward Islands	
	Tristan Albatross Gough Island	
	Wandering Albatross Iles Kerguelen	
SEAFO Demersal trawl	Black-browed Albatross SG (IGS)[1]	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
SPRFMO Demersal trawl	Black Petrel Great and Little Barrier Islands	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Northern Royal Albatross Chatham Islands	
WCPFC Pelagic LL	Antipodean Albatross Antipodes Islands	ACAP and Parties to implement the ACAP RFMO Engagement Strategy.
	Antipodean Albatross Auckland Islands	
	Black-browed Albatross Antipodes Islands	
	Black-browed Albatross Campbell Island	
	Black Petrel Great and Little Barrier Islands	
	Grey Petrel All sites	
	Laysan Albatross Central Pacific – Laysan	
	Northern Royal Albatross Chatham Islands	

[1] A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty of the Falkland Islands (Islas Malvinas), South Georgia and the South Sandwich Islands (Islas Georgias del Sur e Islas Sandwich del Sur) and the surrounding maritime areas.