Agreement on the Conservation of Albatrosses and Petrels

Fifteenth Meeting of the Advisory Committee

Swakopmund, Namibia, 1 – 5 June 2026

Report of the Seabird Bycatch Working Group

Seabird Bycatch Working Group

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Report of the Thirteenth Meeting of the Seabird Bycatch Working Group, Swakopmund, Namibia, 27 - 29 May 2026

1. INTRODUCTION

This Report documents discussions and recommendations of the Thirteenth Meeting of the Seabird Bycatch Working Group (SBWG13), held in Swakopmund, Namibia, 27-29 May 2026.

The SBWG Co-Convenor, Igor Debski (New Zealand), welcomed all SBWG members and observers (**ANNEX 1**) to the 13th 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. WG MEMBERSHIP

The Co-Convenor encouraged Parties to review their nominated members of the Working Group to ensure the membership remains current and reminded Parties that new members can be nominated 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 (**SBWG13 Doc 01 Rev 2**).

4. ACAP SEABIRD BYCATCH MITIGATION BEST PRACTICE ADVICE

4.1 Definitions 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 (BPA) to ensure the advice remains fit-for-purpose. There were no proposals to amend the definition and criteria.

4.2 Structure, style and target audiences for advice documents

Recognising that ACAP BPA documents are key products from SBWG, and noting that the success of these documents relies partly on clear communication, there was further intersessional work to consider options for restructuring, reformatting, and revising ACAP BPA documents to improve the communication of ACAP advice.

AC15 Doc 20 summarised advice provided by a communications consultancy on how to enhance the accessibility and uptake of ACAP BPA as guided by the ACAP Communications Strategy and the ACAP RFMCO Engagement Strategy. Three tiered, but progressive, communications options were proposed with incremental cost implications. Bronze focussed on clarity, consistency, and accessibility and would require investment of £17k. Silver provided structured dissemination with more focus on audience specific engagement and would require investment of £30k. Gold would provide for digital platform delivery, proactive communications support to drive behavioural change, and would require investment of £65k.

SBWG13 discussed the utility of ACAP's Best Practice Advice at RFMCOs and the lack thereof and whether **AC15 Doc 20** addressed this. Decision-making at RFMCOs appears largely culture/values-based with geopolitical and market drivers at heart, rather than purely evidence-based decision making. As such, the scope of the work outlined may need some adjustment to achieve the stated objectives around creating change.

SBWG13 further deliberated that communication by itself may not be sufficient to achieve implementation of ACAP BPA. Other factors are likely to be obstructing behavioural change and while the ACAP Communication Strategy should be implemented, expectations of outcomes should take this into account.

Additionally, the proposed approaches in **AC15 Doc 20** may be too focussed on *what* communications approaches could be taken, not *how* these would be implemented. To gain the best possible outcomes from the proposed communications options, selecting preferred actions among the different tiers may prove the most fruitful approach. However, given that RFMCOs are the key audience for achieving uptake of ACAP BPA, translation is a key item to incorporate in any communications approach. Further support for the incorporation of social sciences into the work of ACAP to achieve improved adoption of BPA should be encouraged.

Birdlife International (BLI) welcomed the communication options to support implementation of mitigation measures outlined in **AC15 Doc 20**, noting that feedback from industry through BLI Partners suggests the importance of raising the profile of the conservation crisis facing seabird populations beyond scientific and technical advice. BLI therefore supported the approach suggested and would recommend ensuring emphasis on translation, which would imply some part of the Silver tier option, and attention to cultural considerations for all communications. It was further noted the abundance of compelling case studies from ACAP Parties that could be included in a communications strategy, but for the higher tier options would require high-quality video which is not typically readily available. BLI therefore encouraged ACAP Parties to consider making available video material from onboard vessels using ACAP Best Practice mitigation measures.

SBWG13 agreed that positive reinforcement in communications approaches should be included to ensure that wins are celebrated as well. SBWG13 underscored that a change of approach by ACAP to achieve implementation of BPA is required and this communications approach provides such a change of approach, even if only providing some initial steps towards achieving wider behavioural change. The proposed actions and tiers should be fully reviewed and adapted to maximise the outcomes against the budget assigned for this work. SBWG recommended aiming for implementation of the Gold Tier or selecting the most effective and complementary options from within each tier.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

1. Notes the strategic communication options proposed by Mindfully Wired Consulting to support the uptake and implementation of seabird bycatch mitigation measures.
2. Approves the commitment of resources under the Advisory Committee Work Programme 2026-2028 to engage suitably qualified communication consultants to undertake work aiming to achieve behavioural change in implementation of seabird bycatch mitigation measures.
3. Endorses the establishment of an Intersessional Group to review the communication actions taken and liaise with the communication consultants.

5. SEABIRD BYCATCH MITIGATION IN TRAWL FISHERIES

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

SBWG13 Doc 04 provided an amended version, in tracked changes, of the advice for mitigating seabird bycatch in trawl fisheries endorsed by AC14. Routine updates include updating reference sources, improving clarity of the advice and improving consistency with advice documents for other fishing methods. SBWG was invited to identify any further such minor amendments. SBWG endorsed the suggested changes and considered the following Working papers, some of which made further recommendations for change to the advice.

While noting the wider considerations on improving the clarity and targeting of ACAP mitigation advice discussed in Agenda Item 4, SBWG identified several structural changes which could be made immediately to the BPA documents to enhance their clarity. In particular, SBWG agreed to split the BPA documents into two parts; a concise summary of BPA and a full review document. It was agreed that the summary document should focus on best practice mitigation measures, remove sections on mitigation measures under development, and briefly list those measures assessed as not recommended. All information removed from the summary advice and general introduction would be retained in the full and detailed literature review of mitigation measures document. It was agreed that this approach should also be applied to the Demersal and Pelagic Longline BPA documents.

The Co-Convenor noted that several papers were received relating to continuous krill trawl operations in the CCAMLR area. **SBWG13 Inf 02** provided a review of current CCAMLR discussions addressing seabird bycatch and mitigation in this fishery and provided valuable context for SBWG.

CCAMLR Conservation Measure 25-03 (2024) prohibits the discharge of offal and discards during the shooting and hauling of krill trawl gear, although allows the discharge of 'stick water' (liquid discharge by-product of processing of the catch) on the understanding that it does not constitute a source of food and therefore does not attract seabirds to fishing vessels. **SBWG13 Doc 20** reported that recent information arising from a literature review shows that albatrosses, petrels and shearwaters, which largely use olfactory cues for foraging and navigation, are attracted to trawl gear when stick water is discharged and thus calling CCAMLR's assumption into question. Scented compounds like pyrazines are released when krill are macerated or damaged, a situation that is likely to occur when krill swarms are preyed upon by diving predators but also as a by-product of fishing operations.

SBWG13 discussed the advice to be provided to the upcoming CCAMLR WG-IMAF (Working Group on Incidental Mortality Associated with Fishing) regarding the discharge of stick water in krill trawlers, including the merit of (i) conducting analyses to better understand seabird assemblage structure, abundance and behaviour during different stages of the krill fishing operation; (ii) conducting thorough analyses of stick water beyond the level provided by the recent survey, and (iii) following a precautionary approach in CCAMLR CM 25-03 regarding the discharge of stick water, until its potential attractiveness is clarified. It was noted that discharging stick water underwater may present a way of reducing the attractiveness of such discharges and is worthy of further consideration, though the feasibility of this was not clear.

SBWG13 Doc 18 updated information on the measures developed for krill vessels using the continuous trawling method and Net Monitoring Cable (NMC), previously provided to ACAP in SBWG12 Doc 16. Specifically, it looked at the development of the 'sock', a length of tubing designed to go around the cable to make it more visible to birds and offer some protection should a strike occur. The design has evolved since first introduced in 2020, with the latest iteration allowing the sock to touch the surface of the water, reducing the area of exposed cable and resulting in a decreased bird strike rate.

SBWG13 Doc 19 Rev 1 reported the development of several mitigation approaches in Chile to address the interaction of seabirds with NMCs. New regulations on mitigation measures aimed to reduce seabird interactions with trawl vessels using NMCs include the mandatory implementation of a combined curtain system for the NMC, previously presented in SBWG12 Inf 19. Implementation of the curtain system during the second half of 2025 was associated with a reduction in reported bycatch rate from 0.031 birds/h in 2017 to 0.013 birds/h in 2025. The decrease in mortality rates in 2025 is explained by the voluntary adoption of the NMC curtains prior to the mandatory implementation of the measure. In addition, preliminary observations suggest that the combined use of the net curtain and bird scaring lines maximizes the reduction of seabird interactions and may further decrease bycatch rates. The NMC curtain shows advantages in cost, operational feasibility, and crew safety. However, these results remain preliminary and require further adjustments in the monitoring protocols to address the potential of cryptic mortality that might lead to underestimation of total mortality, highlighting the need to incorporate methods to better quantify its occurrence. SBWG agreed to include this combined mitigation measure as an alternative method for NMCs when their use could not be avoided, whilst retaining at this stage the BPA that NMC should be avoided where possible.

These papers generated considerable discussion on trawl bycatch mitigation, particularly in respect to the continued use of NMCs and how best to minimise mortality of seabirds when their use cannot be avoided. SBWG recognised that some of the current Best Practice Advice for trawl fisheries may not be feasible for continuous trawlers and so agreed to amend the BPA to differentiate between the use of traditional and continuous trawl gear. It was also noted that much of ACAPs BPA is not applicable to continuous trawl operations because of slow towing speed which can make setting of BSLs an impractical measure. It was also noted when NMCs were used in continuous trawls they have a short aerial extent, usually entering the water almost vertically and adjacent to the warp, therefore posing a lesser risk to seabirds. SBWG agreed to retain current advice that NMCs are not recommended. However, acknowledging that these cables continue to be used in trawl fisheries, it was agreed to include mitigation advice where such measures have been developed, such as in continual trawl operations. New sections for the mitigation review document were developed to describe the two mitigation options presented in **SBWG13 Doc 18** and **SBWG13 Doc 19 Rev 1.** These options were listed in the summary advice when the use of NMCs cannot be avoided.

The additional following Information Papers were also briefly presented to the meeting and the authors thanked for submitting this information to assist in the work of ACAP.

SBWG13 Inf 01 Seabird interactions with trawl cables on U.S. West Coast vessels targeting Pacific hake.

SBWG13 Inf 03 Assessing the effectiveness of seabird bycatch mitigation in New Zealand large vessel trawl fisheries.

Joint SBWG13/ PaCSWG9 Inf 15 Interspecific trophic comparison through two complementary methods of two sympatric albatrosses at the Austral Patagonian Shelf.

A further paper, **Joint SBWG13/ PaCSWG9 Inf 17** on seabird strikes with seismic survey vessel cables in the Southwest Atlantic was also tabled. The paper described mitigation testing using bird scaring lines. SBWG concluded that while the mitigation measures being applied may have similarities with those developed for fishing vessels, this topic was not relevant to fishing and the related work of the SBWG. It was suggested that the Joint SBWG PaCSWG meeting would be a more appropriate forum to consider such work in the future.

5.2 Review priorities for mitigation research

SBWG reviewed the highest priorities for research on reducing seabird bycatch in trawl fisheries and recommended that 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. The potential to discharge stick water underwater should be investigated.

Igor Debski, Marco Favero and Leandro Tamini were identified as SBWG leads for bycatch mitigation in trawl fisheries. Veronica Iriarte was thanked for her work as a previous co-lead.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

4. Notes the changes to Best Practice Advice for trawl fisheries, creating two separate documents and now including reference to additional mitigation options for the use of Net Monitoring Cables when the use of these cables cannot be avoided.
5. Endorses the updated review and Best Practice Advice for reducing the impact of pelagic and demersal trawl fisheries on seabirds contained in **ANNEX 2** and **3** that reflect the latest research presented to SBWG13.
6. Encourages implementation of the research priorities for bycatch mitigation in trawl fisheries.

6. SEABIRD BYCATCH MITIGATION IN DEMERSAL LONGLINE FISHERIES

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

SBWG13 Doc 05 provided an amended version, in tracked changes, of the advice for mitigating seabird bycatch in demersal longline fisheries endorsed by AC14. Routine updates include updating reference sources, improving clarity of the advice and improving consistency with advice documents for other fishing methods. In addition, some sections considered not relevant to demersal longline fisheries had been proposed for removal or refinement. SBWG13 identified some further minor amendments to clarify, where relevant, vessel size class definitions and alignment of terminology with the ACAP Toolbox for Mitigation advice in Artisanal and Small-scale fisheries. SBWG further noted that the advice document would be divided into two parts, as discussed in Agenda Item 5.1 and endorsed the suggested changes. SBWG13 then considered the following papers, some of which made further recommendations for change to the advice.

SBWG13 Doc 17 presented analyses of time-depth recorder data for three New Zealand *Procellaria* petrel species, highlighting that these species can dive deeply, rapidly, and at night, with implications for seabird bycatch mitigation in pelagic and demersal longline fisheries. SBWG13 discussed implications for bycatch risk in demersal longlines, noting that the study focused on diving behaviour rather than mortality, but that existing literature generally indicates higher seabird bycatch during daytime setting, with potential increases in nocturnal risk during full moon periods. The SBWG agreed that relevant references should be added to the Best Practice Advice document.

SBWG13 Inf 04 presented an update from New Zealand on a sink rate management tool for small-vessel demersal longline fisheries, integrating TDR data into a mobile application enabling real-time visualisation of sink rates and supporting adaptive management and best practice compliance. The SBWG agreed that reference to this type of tool development should be added to the Best Practice Advice document.

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.

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:

7. Endorses the updated review and Best Practice Advice for reducing the impact of demersal longline fisheries on seabirds contained in **ANNEX 4** and **5**that reflect the latest research presented to SBWG13.
8. Encourages implementation of the research priorities for bycatch mitigation in demersal longline fisheries.

7. SEABIRD BYCATCH MITIGATION IN PELAGIC LONGLINE FISHERIES

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

SBWG13 Doc 06 provided an amended version, in tracked changes, of the advice for mitigating seabird bycatch in pelagic longline fisheries endorsed by AC14. SBWG endorsed the suggested changes and noted that the advice document would be divided into two parts, as discussed in Agenda Item 5.1.

SBWG13 reviewed a range of papers addressing recent advances in seabird bycatch mitigation in pelagic longline fisheries, with particular emphasis on hook weighting regimes, sink rate performance, emerging technologies, fishing gear modification, and operational phases influencing bycatch risk. Some of these papers made further recommendations for change to the advice.

SBWG13 Doc 10 Rev 1 presented new ACAP Guidelines to Measure Sink Rates of Baited Hooks in Pelagic Longline Fisheries using time-depth recorders (TDRs). SBWG noted that the guidelines had been requested by AC13 following the incorporation of a minimum sink rate criterion of 0.5 m/s to a depth of 5 m into ACAP's Best Practice Advice for pelagic longline fisheries. Such guidelines had been identified as useful to support the review of seabird bycatch mitigation measures in several tuna RFMOs. SBWG recommended that the guidelines should be endorsed, noting that such approaches are essential for ensuring comparability across studies and fisheries, and that promoting these guidelines in relevant RFMOs should be strongly encouraged.

SBWG13 Doc 12 and **SBWG13 Inf 08** examined the performance of hook weighting configurations and associated sink rates. SBWG noted strong and consistent evidence that mitigation effectiveness is highly sensitive to gear configuration, deployment practices, and environmental conditions. It was agreed that line weighting remains a core mitigation measure and that the 0.5 m/s to 5m depth criterion remains appropriate. ACAP advice related to using a minimum 50g weight for weighted hooks was not changed, noting the variability in sink rates for lighter hooks of larger sizes.

Concern was expressed regarding the practical implementation and verification of these standards at sea. In particular, SBWG13 highlighted challenges in demonstrating compliance across fleets with differing gear configurations and operational practices. SBWG recommended that sink rates should be assessed under operational conditions using the established ACAP guidelines. SBWG acknowledged that the variability of sink rates of individual branch lines should be considered, and it may be appropriate to set a minimum level of acceptable variation in future, e.g. x% of sink rates must meet the target criterion.

SBWG13 acknowledged and welcomed the wealth of work undertaken in this area, noting that it reinforces the importance of performance-based standards, with clear, measurable, and operationally feasible compliance criteria.

SBWG13 Doc 14 examined alternative, non-lead weighting materials. SBWG supported efforts to reduce reliance on lead for environmental and human health reasons, but emphasised that any alternatives must demonstrate equivalent or improved sink rate performance. It was noted that a precautionary approach is required to avoid unintended reductions in mitigation effectiveness.

SBWG reiterated strong support for ACAP's long-standing advice that simultaneous application of multiple measures is necessary to achieve meaningful reductions in seabird bycatch. This position was further supported by ecological evidence presented in **SBWG13 Doc 17**, which demonstrated the deep diving capacity of *Procellaria* petrels and their continued vulnerability to hooks below 5m depth. It was noted that achieving faster sink rates and/or deeper-opening hook shielding devices may be needed to effectively mitigate seabird bycatch in fisheries operating in areas with deep diving petrels.

SBWG13 Doc 13 raised potential concerns regarding the use of light-emitting devices (LEDs), noting that these may alter sink rate dynamics and potentially increase bycatch risk if their effects are not fully understood. It was agreed that such technologies should be carefully evaluated against performance standards before wider adoption.

SBWG13 Doc 15 reported no seabird interactions with a loop line (trapline) configuration in pelagic longline fisheries in the western Mediterranean Sea. Similarly, **SBWG13 Inf 06** presented a review of the use of loop lines or 'meka-rings' in Japanese longline fisheries. Both papers reported that this gear configuration had zero seabird bycatch. SBWG13 welcomed this finding as encouraging, while noting that the results were region-specific. Information on interactions with other non-target taxa (including entanglement risk) was not presented, and that further research would be valuable to better understand the contribution of loop line configurations to the observed zero seabird bycatch in fisheries where they are used in combination with conventional hooks. SBWG13 further emphasised that existing mitigation measures remain necessary when loop lines are used alongside hooks, and that this gear configuration should be validated across a broader range of fisheries and seabird assemblages.

SBWG13 Inf 07 reported on the developmental progress towards commercial viability of the Procella heavy hook, which is designed to improve bait sinking and therefore seabird bycatch, as well as simplifying the operational process of weighting lines.

SBWG13 also considered evidence relating to previously under-assessed operational phases. **SBWG13 Doc 16** highlighted the potential for seabird interactions during the soak period, prompting discussion on whether current mitigation frameworks sufficiently address risks beyond the setting phase. It was highlighted that there were studies examining similar issues in Mediterranean fisheries which could be shared to inform further discussion on this topic. There was collective recognition and concern that seabird bycatch during the soak period may be underestimated or poorly quantified and agreed that this represents an important knowledge gap. It was also noted that the preliminary measures implemented to mitigate hooks becoming accessible during the soak were operationally difficult to implement, and that these and others need to be further investigated.

A behavioural study, **SBWG13 Inf 05**, explored the influence of bait characteristics such as colour on seabird interactions. SBWG13 noted that while such approaches may offer opportunities for novel, species-specific mitigation, the findings remain preliminary and require further validation before operational application. Previous studies have found fairly rapid habituation, with colour becoming less relevant to bait attractiveness through time, coupled with difficulties of dying frozen bait. Overall, it was felt that dyed bait as a mitigation measure should remain not recommended as a mitigation option.

Across all the work presented, several overarching points were expressed by SBWG:

- There is strong support for performance-based mitigation standards, particularly sink rate thresholds;
- Clear and further evidence has been presented that combined mitigation measures are essential for effective seabird bycatch mitigation;
- It is important to maintain rigorous evaluation of emerging technologies;
- Implementation, compliance, and operational feasibility remain key constraints.

SBWG13 also noted that, despite advances in mitigation research, implementation and uptake remain the primary barriers to reducing seabird bycatch in many pelagic longline fisheries.

In summary, SBWG agreed that:

i. measurement of sink rates should be undertaken using the ACAP Guidelines to Measure Sink Rates of Baited Hooks in Pelagic Longline Fisheries (**SBWG13 Doc 10 Rev 1**); and
ii. achieving faster sink rates and/or using deeper opening hook shielding devices may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels (**SBWG13 Doc 17**).
iii. further intersessional work should be undertaken to review seabird bycatch risk during the soak period and seek to develop advice on mitigation of this risk (**SBWG13 Doc 16**).
iv. Further intersessional work should be undertaken to evaluate the effects of loop line configurations on seabird bycatch during longline operations (**SBWG13 Doc 15**).

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 (assessed against the ACAP Guidelines to measure the sink rate of baited hooks in pelagic longline fisheries) 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. The sink rate achieved using any other materials (e.g. LEDs) should be robustly quantified. 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.

Seabird bycatch during soak periods: Determine incidence and rates of seabird bycatch during the soak period. Develop and evaluate methods that minimise seabird hooking during the soak.

Loop lines: encourage research to determine incidence and rates of seabird bycatch on traplines/loops and meka rings.

Time/area closures: update seabird tracking/fishing effort overlap maps to advance options for time/area management, including analysis of potential impacts of spatial closures and displacement effect.

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 lighter hook mass is encouraged.

Sebastián Jiménez and Dimas Gianuca will be the SBWG leads for bycatch mitigation advice in pelagic longline fisheries. Jonathon Barrington was thanked for his past leadership on this topic.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

8. Endorses the updated Best Practice Advice for reducing the impact of pelagic longline fisheries on seabirds contained in **ANNEXES 6** and **7** that reflect the latest research presented to SBWG13.

9. Notes the changes to Best Practice Advice include that measurement of sink rates should be undertaken using ACAP Guidelines and that achieving faster sink rates, or using deeper opening hook shielding devices, may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels.

10. Endorses the updated ACAP Guidelines to measure the sink rates of baited hooks in pelagic longline fisheries using Time-Depth Recorders contained in **ANNEX** 8.

11. Encourages implementation of the research priorities for bycatch mitigation in pelagic longline fisheries.

8. ARTISANAL AND SMALL-SCALE FISHERIES

8.1 Review recent developments in mitigation research and update toolbox advice

SBWG13 Doc 21 reported on seabird bycatch in the southern Peruvian artisanal pelagic longline fishery and evaluated mitigation strategies across three seasonal campaigns during April, June, and October 2024 in offshore waters of southern Peru. Mitigation efforts were applied on longline operations during the high seabird-density season (autumn through winter). The Peruvian tori line prototype developed was cost-effective and developed in close collaboration with artisanal fishermen. These methods substantially reduced seabird bycatch while still maintaining the economic viability of fishing communities.

SBWG13 noted direct conservation benefits from this ACAP-funded project to species including the Waved Albatross *Phoebastria irrorata* and the good collaboration between Peru and New Zealand during this project was also recognised.

The SBWG agreed to incorporate the results into the artisanal and small-scale mitigation advice toolbox and agreed that ACAP should encourage others with jurisdiction over relevant artisanal longline fisheries to further develop and implement mitigation measures to reduce bycatch risk. Further mitigation pilot surveys in other Peruvian small-scale fisheries with potential albatross, petrel and shearwater mortality were also proposed.

SBWG13 Inf 09 reported on updates to the NISURI Fast-Set system including the development of a new three-tube configuration, which allows for rapid hook deployment while limiting seabird access near the surface. SBWG13 noted the updated system is low-cost, enhances crew safety and can reduce seabird bycatch whilst improving fishing efficiency resulting in a great advancement in this small-scale fishery.

SBWG13 Doc 07 Rev 1 reported on the further development of a ‘toolbox’ of mitigation methods for artisanal and small-scale fisheries. SBWG13 noted the updated information on mitigation techniques applicable to small-scale and artisanal fisheries. There was considerable discussion on the categorization of mitigation options in terms of effectiveness. SBWG13 concluded that, in order to simplify the communication of advice, the categorisation should be simplified to those mitigation options which have been proven to reduce the bycatch of albatrosses and petrels, and those which have not. It was also agreed that the toolbox should only briefly describe those methods not proven to reduce albatross and petrel bycatch. The updated format is presneted in **ANNEX 9**.

SBWG13 discussed the need for a definition of artisanal and small-scale fisheries and referenced the FAO definition. SBWG agreed that while a definition is important in the local context, ACAP needed to consider the specific aspects and nuances of each fishery to solve seabird interactions and as such concluded that a definition wasn’t needed to continue this work. Members were encouraged to bring a paper to AC16 to propose any solutions.

8.2 Priorities for mitigation research

As noted by SBWG12, research priorities can be inferred from the descriptions of mitigation methods described in the toolbox. The Mahi-mahi fishery had been identified as a fishery requiring more seabird bycatch mitigation research effort.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

12. Endorses the updated ACAP Mitigation Advice for Artisanal and Small-scale Fisheries contained in **ANNEX 9**, noting that final refinement of the text would be made intersessionally.

13. Urges Parties with jurisdiction over relevant artisanal and small-scale longline fisheries to further develop and implement mitigation measures to reduce bycatch risk.

9. SEABIRD BYCATCH MITIGATION IN PURSE SEINE FISHERIES

9.1 Review recent developments in mitigation research and update toolbox advice

SBWG13 Doc 08 reported on the further development of a toolbox for seabird bycatch mitigation advice in purse seine fisheries. It provides a practical resource for communicating the feasibility of seabird bycatch mitigation measures specific to purse seine fisheries, synthesizing mitigation measures identified as early as 2017 (SBWG8 Inf 26), including sensory and physical deterrents, as well as structural modifications to purse seine gear. **SBWG13 Doc 08** noted some of these measures are complemented by best practices involving decision making by crew members with key roles on the bridge and deck including not using waste water (e.g. water and fish oil) when water spraying.

SBWG13 agreed that ACAP advice needed to be detailed for toolbox measures that are demonstrably effective at reducing seabird bycatch, whilst those that lack evidence of reducing bycatch should be mentioned but only referenced in brief. Accordingly, the two categories of mitigation effectiveness were adopted for the purse seine toolbox advice. This enhances clear communication on the effectiveness of measures that reduce bycatch of albatrosses and petrels.

9.2 Priorities for mitigation research

No new mitigation research priorities were identified. 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:

14. Endorses the format and updated contents of the toolbox for seabird bycatch mitigation advice in purse seine fisheries contained in **ANNEX 10**, noting that final refinement of the text would be made intersessionally.

15. Encourages managers of purse seine fisheries to adopt the toolbox advice as a user-friendly and informative resource for decision-makers.

10. SEABIRD BYCATCH MITIGATION IN OTHER FISHERIES

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

SBWG13 Inf 10 described a component of the Argentine Squid Fishery Improvement Project, where 15 INIDEP observers recorded seabird and marine megafauna presence and interactions during 22 trips aboard 14 squid jigging vessels between January and June 2025, with Black-browed Albatross *Thalassarche melanophris* (46.2%) and Southern Giant Petrel *Macronectes giganteus* (35.6%) the predominant species attending the fleet. Direct interactions with vessels were recorded on only 20 occasions (2% of records), with the overall impact on seabirds assessed as minor or negligible.

Discussion confirmed that both presence and interactions were dominated by Black-browed Albatrosses and Southern Giant Petrels. SBWG13 noted the value of these data as for some squid jigging fisheries (e.g. those managed by SPRFMO) there is only speculation about the level of seabird interactions. It was also reported that informal discussions with observers revealed no indication of deliberate take of seabirds in this Argentine fishery.

SBWG13 Inf 11 described observer data from 4,963 hauls across three commercial king crab (*Lithodes santolla*) fishing seasons (2022–2024) in Argentina's Southwest Atlantic Central Management Area collected to support ongoing MSC certification. Approximately 20 seabird species, predominantly Procellariiformes, were recorded attending the fleet but interaction rates with the trap-fishery were extremely low (0.06 – 0.12% of hauls) and no incidental seabird mortality was recorded in any season.

SBWG13 confirmed that there are few or no records of ACAP species interacting with trap gear, but this gear is known to have caught Phalacrocoracidae species (shags and cormorants).

10.2 Review 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. FAO IPOA/NPOA-SEABIRDS

11.1 Review of status of implementation of NPOA-Seabirds

Two information papers were considered.

SBWG13 Inf 12 reported on progress on the Argentina-Uruguay Regional Plan of Action to reduce seabird interactions with fisheries in the area of the Río de la Plata Treaty and its Maritime Front (PAR AM).

SBWG13 noted the positive collaboration between Argentina and Uruguay and the important progress made on the implementation of the PAR AM with the support of the CTMFM and further noted the ACAP species present in the area of the Joint Maritime Front.

SBWG13 Inf 13 reported on the second iteration of South Africa's National Plan of Action for the Conservation and Management of Seabirds (NPOA-Seabirds II). In line with FAO best-practice guidelines, it addresses all South African fisheries by increasing and modernizing monitoring practices to account for fishing effects on all seabirds and by implementing effective mitigation measures in line with the vision of the plan.

SBWG13 congratulated South Africa for the progress made and inclusion of additional fisheries within the second NPOA-Seabirds and reflected on the collaborative approach of Argentina and Uruguay, encouraging development of similar initiatives between Namibia and South Africa.

12. PRIORITY AT-SEA CONSERVATION ACTIONS

12.1 Review of progress with updates to priority fisheries

No papers were submitted to this agenda item.

The Co-Convenor outlined the current priority fisheries described in MoP8 Doc 15. SBWG13 further deliberated how to review and update the priority fisheries list, the affected species, and priority actions for ACAP, Parties or others. The Secretariat described work to integrate reporting on actions for priority fisheries into the national AC reporting process and ACAP database to ensure a more regular and more integrated reporting framework. Once fully implemented this would allow for robust reporting on progress by Parties to MoP. As outlined in the Advisory Committee Work Programme (Task 3.10), a staged review process would occur, with Party review of national fisheries ahead of AC16, together with a specific contract or secondment to review RFMCO and other non-Party fisheries.

SBWG13 discussed the importance of using the wealth of tracking data to identify priority fisheries. However, integration of tracking data in fishery prioritisation is a non-trivial exercise, and further consideration needs to be given as to the best approach, potentially focussing on ACAP High Priority Populations first. This was captured as a recommended update to the Advisory Committee Work Programme.

13. ENHANCING IMPLEMENTATION OF BEST PRACTICE SEABIRD BYCATCH MITIGATION MEASURES

SBWG13 Doc 22 provided an update on the development of the Seabird-Safe Fishing Toolkit, an interactive web-based resource designed to provide seafood businesses with resources to achieve seabird-safe fishing leveraged off sustainability concerns of seafood consumers. For the Toolkit, Seabird-safe fishing is defined as when effective practices to avoid catching seabirds are used and monitored.

The Toolkit is designed for large pelagic longline fishing vessels (>24 metres), operating in any ocean, but has the potential to be expanded to other fishing gears and other megafauna. It was developed jointly by the Southern Seabirds Trust and the New Zealand Department of Conservation (NZ DOC), working with the Asia Pacific Economic Cooperation (APEC) Ocean and Fisheries Working Group.

The Toolkit is based on the best available science and is intended to be a single, trusted source of information that tuna businesses can use to determine the risk level of their fishing location, the appropriate mitigation measures to reduce that risk, and available approaches to monitor compliance. It contains three tools:

i. an interactive Seabird Safety Tool that allows a fishing company to assess how seabird safe their fishing is, depending on where their vessels fish and the practices they use;
ii. an interactive Seabird Mapping Tool that zones the world's oceans according to threatened seabird distribution and extinction risk. Individual seabird species or combinations of species can also be selected. It was noted that, for simplicity, the distribution maps are annual, not seasonal. The maps can be used by fishing companies and others in the tuna supply chain to check the seabird risk of different tuna fishing areas, which has been of much interest to fishers; and
iii. detailed practical information describing proven seabird-safe measures and monitoring methods applicable to the vessel class the Toolkit is aimed at. Information on cost, and impact on target catch is also included where this is available.

Promotion of the Toolkit was endorsed by AC14, and it is featured as a co-branded Bycatch Mitigation Resource on the ACAP website. Following the official launch of the Toolkit on 20 November 2025 the Toolkit has attracted strong interest from companies, organisations and administrations across the tuna supply chain.

The Toolkit is available in pdf versions for easy, offline access, for example by crews of fishing vessels, while the interactive App is targeted at other parts of the supply chain, especially the retailers. It is also available in four languages (English, Japanese, Traditional Chinese and Simplified Chinese). Future developments include a mechanism to learn how many birds may be saved by using mitigation, and the economic benefits of avoiding bycatch.

SBWG13 noted the strong engagement from industry actors, including major tuna companies and East Asian fleets; the usefulness of simplified tools for non-technical audiences; the potential for integration with platforms such as Global Fishing Watch; and the ongoing development to translate mitigation performance into biological outcomes (e.g. birds saved) to improve communication with supply chain actors.

SBWG13 welcomed the initiative and recognised its value as a practical and highly effective mechanism to promote and disseminate best practice mitigation advice, and that it 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 agreed to establish an Expert Contact Group which will provide ongoing advice from the SBWG to the content developers of the Seabird Safe Toolkit in relation to updates or developments of mitigation measures and ACAP Best Practice Advice on reducing the impact of fisheries on seabirds. SBWG also recommended continuation of the partnership with Southern Seabirds Trust and NZ DOC to further develop the Toolkit and consider how the toolkit can be best used as part of ACAP's Communication Strategy including as a mechanism for communicating information on the spatial distribution of species and fisheries bycatch risk.

SBWG13 Doc 23 examined reporting requirements of vessels operating under chartering agreements. This work was undertaken through a collaboration of BirdLife International, the Namibian Ministry of Agriculture, Fisheries Water and Land Reform (MFAWLR) and Namibia Nature Foundation (NNF). Using a case study from the Namibian large pelagic fishery that targets sharks, tuna and associated species in the South Atlantic, it highlighted that the chartering arrangements can obscure responsibility for bycatch reporting and mitigation compliance; the chartering nation is responsible for reporting catches and bycatch, but responsibility for implementation may be shared with the flag State; significant gaps may exist in bycatch reporting (including seabirds) in some fleets; and that chartering presents opportunities to improve observer coverage and data collection.

SBWG13 welcomed this innovative piece of work and noted the complexity and limited transparency of chartering arrangements across RFMOs. Strengthening the implementation of measures by RFMCOs that ensure the effective implementation and monitoring of fishing operations to prevent, minimise or reduce the incidental taking of seabirds is an objective of the ACAP RFMCO Engagement Strategy. Therefore, the importance of further investigating this under-explored issue for seabird conservation was highlighted, and agreed to undertake a cross-RFMCO review of chartering arrangements and access arrangements to improve understanding and reporting.

SBWG also considered two Information papers **SBWG13 Inf 14** and **SBWG13 Inf 15**. Both of these covered aspects related to socio-environmental dynamics of bycatch and highlighted the importance of integrating multiple perspectives, knowledge systems, emotional dimensions and operational contexts to advance conservation strategies and sustainable fisheries management. SBWG noted the importance of incorporating aspects of social science such as these when developing ACAP communications strategies and resources.

SBWG13 also agreed that it would be helpful for papers on certification processes be submitted to future meetings, especially given forthcoming implementation of a new version of the Marine Stewardship Council's certification standards.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

16. Endorses the establishment of an expert Intersessional Group to provide ongoing seabird bycatch mitigation advice to the content developers of the Seabird Safe Toolkit

17. Considers ways that the Seabird Safe Toolkit could be more actively used or disseminated by ACAP to promote best practice mitigation advice.
18. Endorses an ongoing partnership with the Southern Seabirds Trust and Department of Conservation in the further development of the Toolkit and consider how the Toolkit can be best used as part of ACAP's Communication Strategy, including as a mechanism for communicating information on the spatial distribution of species and fisheries bycatch risk.
19. Endorses the inclusion of a cross-RFMCO review of chartering arrangements and other access agreements in the Advisory Committee Work Programme.
20. Urges Parties promote improvements to the transparency of chartering arrangements and access agreements in RFMCOs.
21. Urges Parties commit to 100% monitoring, using a mix of observer coverage and electronic monitoring systems on distant water vessels fishing under chartering arrangements and access agreements to improve data collection and reporting to RFMCOs.

14. ACAP SEABIRD BYCATCH PERFORMANCE INDICATORS

SBWG13 Doc 11 Rev 1 presented progress on the development of revised ACAP seabird bycatch performance indicators and associated reporting processes. The document proposed a simplified framework in response to limited reporting by Parties and difficulties implementing the previous, more data-intensive indicator system.

SBWG13 discussed revised response indicators focused on mitigation implementation, Party engagement with RFMCOs, and ongoing mitigation innovation. SBWG reviewed a streamlined reporting framework structured by gear type and mitigation option, including those recommended in ACAP Best Practice Advice. The framework was designed to improve reporting flexibility, including where monitoring data are limited. Preliminary analyses of these indicators using reports currently available in the ACAP database indicated that reporting remains largely limited to industrial fisheries. These preliminary results indicated that many Parities were not implementing ACAP's Best Practice Advice in their fisheries, and SBWG considered that this does not demonstrate leadership within RFMOs.

Members welcomed the simplified approach and considered it a practical way forward to improve reporting and engagement. SBWG13 discussed the importance of distinguishing between mandated and implemented mitigation measures, improving clarity in reporting requirements, and providing mechanisms for feedback and refinement of the reporting process. SBWG agreed that the Intersessional Group should further refine the reporting framework ahead of national reporting to AC16.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

22. Endorses the refined Seabird Bycatch Response indicators outlined in **SBWG13 Doc 11 Rev 1.**
23. Urges Parties to report on implementation of seabird bycatch mitigation measures in fisheries under their jurisdiction prior to AC16.
24. Urges Parties to report on actions identified in the ACAP RFMCO Engagement Strategy prior to AC16.

15. MONITORING TECHNIQUES FOR SEABIRD BYCATCH AND MITIGATION USE

SBWG13 Doc 09 presented the updated ACAP Data Collection Guidelines for Observer Programmes. The document updates the recommended data to be collected in longline and trawl fisheries, identifies priority data fields critical for assessing seabird bycatch, and expands the scope of the guidelines to include purse seine fisheries. SBWG welcomed the enhancements that were made, but noted further amendments are required, in particular the species codes and mitigation categories. It was agreed that these guidelines and those on Electronic Monitoring will be refined and presented at SBWG14/AC16. It was also noted that cryptic mortality remains an issue for observers and that is hard to quantify in trawl fisheries in Chile, New Zealand and elsewhere.

SBWG13 Inf 03, which was also presented in Agenda Item 5.1, reviewed New Zealand data collection protocols to assess mitigation efficacy. It was concluded that traditional data fields were insufficient, and so New Zealand is developing new protocols.

SBWG13 Inf 16 detailed initial results of a collaboration with CSIRO (Australia) to use AI on EM footage to assess use of Bird Scaring Lines (BSL) in Argentinian trawlers. With a small number of images, use of BSL was identified with a 30% success rate, which increased to 80% after model training. It is hoped that with more footage, >90% accuracy could be achieved. False results often occurred when the images were of poor quality or when weather or light conditions were poor. It was suggested that streamer colour and brightness could influence the ability of models to accurately detect BSL.

SBWG13 Inf 17 presented a new method to identify bycaught seabirds based on genetics. The paper details use of the Cytochrome Oxidase I (COI) marker which enables identification of all taxa to a genus level and 75% to the species level. For sub-species, none of the markers were suitable to identify samples to a sufficient taxonomic resolution. It was noted that Australia has developed DNA tests that have a high success rate for splitting Shy *Thalassarche cauta* and White-capped *T. steadi* Albatrosses. It was also highlighted that New Zealand is setting up a commercial contract for batch-processing of samples to improve cost and efficiency. SBWG13 noted that that it would be useful to have the outcomes of such studies feed into the work of the ACAP Taxonomy Working Group (TWG).

Birdlife International also reported on a collaboration with FCF Company Ltd based in Taiwan and Professor Ting-Chun Kuo, based at National Taiwan Ocean University on an improvement project to reduce the impact of fishing activities on bycatch and Endangered, Threatened, and

Protected (ETP) species. The primary objective of the collaboration is to explore practical improvements to the Electronic Monitoring System to enhance data accuracy and monitoring capabilities for ETP and bycatch species. The project involves refining data collection methods, enhancing catch identification capability, improving stakeholder access to information on mitigation measures adopted and ensuring compliance with RFMO standards. These improvements are designed to strengthen the availability of evidence and supporting data for vessels under FIPs and seeking MSC certification, particularly concerning ETP and bycatch species interactions.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

25. Notes there will be ongoing intersessional work to update and refine the ACAP Data Collection Guidelines for Observer Programmes and the Guidelines on Fisheries Electronic Monitoring Systems.

16. TOOLS AND GUIDELINES

16.1 Updates and new guidelines

There were no papers tabled under this agenda item.

16.2 Mitigation Factsheets

SBWG noted that limited progress had been made on updating existing or developing new Mitigation Factsheets since SBWG12. BirdLife International offered support in updating priority factsheets to the new simplified format with help from ATF Chile, MRAG and South Africa, with revised text to be submitted to SBWG14 for review and approval. It was agreed that separate factsheets should be developed for mitigating entanglements in trawl versus purse-seine nets, however only a single factsheet is required for safe handling and release of entangled birds as the practices are similar for both gear types. The SBWG further agreed that the factsheets should continue to be co-branded as ACAP and BirdLife products as this will help to enhance overall outreach.

RECOMMENDATIONS TO THE ADVISORY COMMITTEE

SBWG recommends that the Advisory Committee:

26. Allocates sufficient resources to amend the Mitigation Fact Sheets to the new simplified format in a phased approach in accordance with the prioritisation identified at SBWG12.

17. REVIEW RECOMMENDATIONS FROM PREVIOUS SBWG MEETINGS

The Secretariat collated recommendations from previous SBWG meetings into a searchable database which can be used to track recommendations over time to avoid duplication and record progress against agreed actions. Following review and refinement of the list of recommendations by SBWG Convenors, this resource will be made available prior to SBWG14 so that SBWG members and authors can check the status of existing recommendations in advance of drafting meeting documents.

18. FUNDING PRIORITIES FOR 2026-2028

Priority SBWG work that requires funding during this triennium was identified in the Work Programme reviewed under Agenda Item 19.

19. SBWG WORK PROGRAMME

16.1 Review Work Programme 2026-2028

Tasks relevant to the Seabird Bycatch Working Group in the 2026-2028 Advisory Committee Work Programme approved by MoP8 (**AC15 Doc 2**4) were reviewed following discussions at SBWG13. An updated version of the Work Programme was prepared for consideration by the Advisory Committee.

20. ANY OTHER BUSINESS

SBWG13 expressed their condolences at the sad passing of Don Andres Rivera, co-creator of the NISURI Fast-Set system. SBWG13 acknowledged his important contribution to seabird conservation.

21. REPORTING TO AC15

This report was prepared for consideration by the Advisory Committee.

22. CLOSING REMARKS

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 Namibia as the host for providing an excellent venue and facilities.

ANNEX 1. LIST OF SBWG13 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
Barry Baker	Charles Darwin University, Australia
Marco Favero	Instituto de Investigaciones Marinas y Costeras, CONICET, Argentina
Mandi Livesey	Department of Climate Change, Energy, the Environment and Water, Australian Antarctic Division
Azwianewi Makhado	Department of Forestry, Fisheries and the Environment, South Africa
Tatiana Neves	Projeto Albatroz, Brazil
Cristián Suazo	Albatross Task Force - Chile, BirdLife International
Mark Tasker	Joint Nature Conservation Committee, United Kingdom/ TWG Convenor

Invited Experts	
Johannes Chambon	University of Otago
Thomas Clay	Environmental Defense Fund
James Moir Clark	MRAG

Advisory Committee Members, Representatives and Advisors	
Pedro Albuquerque	Representative, Brazil
Gabriel Canani Sampaio	Advisor, Brazil
Thando Cebekhulu	Alternate Representative, South Africa
Lawrence Chlebeck	Advisor, Australia
Luis Cocas	Representative, Chile
Mike Double	AC Chair
Johannes Fischer	Alternate Representative, New Zealand
Elisa Goya	AC Member, Peru
Gustavo Jimenez	Advisor, Ecuador
Makhudu Masotla	Alternate Representative, South Africa
Helena Moreno Colera	Representative, Spain
Patricia Pereira Serafini	Advisor, Brazil/ PaCSWG Co-convenor

Richard Phillips	Advisor, United Kingdom/ PaCSWG Vice-convenor

Observers	
Andrea Angel	BirdLife International
Chris Bartholomae	Namibia
Sarah Becker	University of Colorado Bouler
Zoe Jacobs	BirdLife International
John Kathena	Namibia
Anja Kreiner	Namibia
Samantha Matjila	Namibia Nature Foundation
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Clemens Naomab	Namibia Nature Foundation
Daisuke Ochi	Japan
Sarah Paulus	Namibia
Etienne Rouby	INSTAAR, CU Boulder
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Lizette Voges	SEAFO
Oliver Yates	BirdLife International

ACAP Secretariat	
Jonathon Barrington	Executive Secretary
Wiesława Misiak	Science Officer

Interpreters
Cecilia Alal
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Non-attending SBWG members	
Joanna Alfaro-Shigueto	ProDelphinus, Peru
Cristóbal Anguita Luco	Universidad de Chile
Jose Carlos Báez	Instituto Español de Oceanografía (IEO), Spain
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Rodrigo Forselledo	Dirección Nacional de Recursos Acuáticos (DINARA), Uruguay
Caroline Fox	Environment and Climate Change Canada
Eric Gilman	Hawaii Pacific University, USA

Non-attending SBWG members	
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Marco Herrera	Insituto Público de Investigaciones en Acuacultura y Pesca, Ecuador
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Graham Robertson	Unaffiliated
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Barbara Wienecke	Department of Climate Change, Energy, the Environment and Water, Australian Antarctic Division
Anton Wolfaardt	Unaffiliated

ANNEX 2. ACAP SUMMARY BEST PRACTICE ADVICE FOR PELAGIC AND DEMERSAL TRAWL FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP 2026 Summary Best Practice Advice for Reducing the Impact of Pelagic and Demersal Trawl Fisheries on Seabirds

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

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

[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)

entanglements can be prevented by reducing the time the net is exposed on the surface of 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).

However, it is recognised that net monitoring cables continue to be used in a number of fisheries. Where the use of net monitoring cables use cannot be avoided, the following measures have been recognised to reduce the number of seabird strikes from these cables:

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

2. 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.

3. Net monitoring cable curtain, which acts by reducing the aerial extent of the cable and creating a barrier of warm colour net material to enhance the detection of cables by birds, thereby reducing aerial and water strikes.

4. Net monitoring cable sock, consisting of a tube surrounding the cable which should be in contact with the surface of the sea and be of a colour and diameter sufficient to make it visible to birds. Note this method has only been shown effective in continuous krill trawl fisheries where the aerial extent of the cable is shorter than in traditional trawl.

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.

ACAP's Review of Seabird Bycatch Mitigation Measures for Pelagic and Demersal Trawl Fisheries provides further information on all of these methods, as well as other considerations.

MITIGATION MEASURES THAT ARE <u>NOT RECOMMENDED</u>

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.

ANNEX 3. ACAP REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR PELAGIC AND DEMERSAL TRAWL FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP 2024 Review of Seabird Bycatch Mitigation Measures for Pelagic and Demersal Trawl Fisheries

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

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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.

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

[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.

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.

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

1.1 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

[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).

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.)

1.1.1 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, Frade et al 2025, Villafáfila et al 2024). 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

1.1.2 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

1.1.3 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

1.1.4 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 Net monitoring cable curtain

ACAP advice

Where the use of net monitoring cables cannot be avoided, this method has been shown to reduce bird strikes on these cables.

Scientific evidence for effectiveness in trawl fisheries

The results obtained for the 2025 fishing season in Chile (Adasme *et al.* 2026) showed a relative decrease in bycatch levels compared to previous years. However, the persistence of interactions, especially with the Black-browed Albatross, confirms that this species continues to be the most vulnerable to trawl operations using net monitoring cables, which is consistent with what has been reported in other fisheries in the southern hemisphere (Tamini *et al.* 2023b).

Field trials showed positive effects of this curtain, reducing seabird collisions with the net monitoring cable by up to 90% for nine seabird species, including five ACAP-listed species, when using the net monitoring cable curtain combined with Bird Bafflers (BB) as described in Suazo *et al.* (2024).

Preliminary results related to the use of the net monitoring cable curtain, in combination with other measures, suggest a reduction in the frequency of seabird strikes and a decrease in bycatch events, including mortalities. These findings are consistent with the mitigation principle of reduction in the aerial exposure of the net monitoring cable, consistent with ACAP mitigation advice.

Notes and Caveats

The available results correspond to an early phase of implementation of the net monitoring cable curtain and should be treated with caution. Future analysis will include seasonal and interannual variability in bycatch, operational and environmental factors, as well as the phenology and life strategies of focal seabird species, which may influence the observed patterns described in Adasme *et al*. (2026). In this regard, it is necessary to continue systematic monitoring (including training for onboard observers) to strengthen the *in situ* evidence on the effectiveness of this measure under different operating conditions.

The implementation of the net monitoring cable curtain helps to minimize interactions between seabirds and the net monitoring cable, reducing collisions, and entanglement. However, insufficient observation effort or unobservable/cryptic mortality may mask persistent interactions. In this context, the decrease in observed bycatch may not fully reflect the actual reduction in mortality, given that preliminary records only consider those individuals recovered on board vessels by observers. Regular seabird-dedicated monitoring at the stern of the vessel and during the entire tow (Suazo *et al.* 2024) is encouraged so that correction factors accounting for cryptic mortality can be developed.

Minimum standards

As described by Suazo *et al.* (2024), the net monitoring cable curtain must meet minimum construction standards, including the use of warm colours (e.g., yellow, orange, red), a mesh size of less than 3 1/4 inches, a minimum net panel height of 40 cm, and a double block system for securing the curtain. Additionally, to facilitate the proper vertical deployment of the curtain panel from the stern, added weight may be included at the end of the curtain for its full extension. This weight may consist of a system of chains attached to its lower portion or a terminal block system with added weight. The curtain must cover more than two-thirds of the middle and lower sections of the net monitoring cable, up to the point where it touches the water (the upper third of the net monitoring cable at the stern exit must be covered by the BB or BSL). This requires frequent inspection and adjustment of the curtain's position during towing by crew members trained for this purpose.

Need for combination

As trialled, the net monitoring cable curtain, should be used in combination with BB or BSL depending on the size of vessel along with offal/discard management (Suazo *et al.* 2024; Subpesca 2026)

Implementation monitoring

A combined monitoring system for both scientific and compliance control purposes is highly recommended, including observers onboard, electronic monitoring (cameras), and electronic logbooks (Subpesca, 2026)

Research needs

It is necessary to advance the adoption of methodologies that allow recording and quantifying cryptic mortalities, to obtain more precise and robust estimates on the effectiveness of this bycatch reduction measure in trawl vessels. This goal could be achieved using data currently provided by scientific observers onboard, complemented with data from electronic monitoring.

2.2.3 Net monitoring cable sock

ACAP advice

Where the use of net monitoring cables cannot be avoided, this method has been shown to reduce bird strikes on these cables.

Scientific evidence for effectiveness in trawl fisheries

The sock is designed to enclose the cable to make it more visible to birds and reduce and impact should a bird come into contact with it. It has been developed and improved over a period of five years with observers on a continuous krill trawler, monitoring their effectiveness, observation rates varying from 5% to 20%. During that period the Bird Strikes per Unit of Effort (BPUE) has dropped by over a quarter, from 0.684 / hour to 0.165 / hour (Viney et al 2026).

Notes and Caveats

To date this has only been used on a krill trawler using the continuous trawl method. Conventional trawlers will have a different gear setup and method of operation that may not be compatible with this particular mitigation device.

During early trials the sock would twist around the cable causing it to become damaged and entangled. This was prevented through the use of rope wrapped around the outside of the sock, which prevented it from twisting.

In case of damage, a spare sock should be kept on the vessel to avoid having the cable unprotected for any period of time.

Minimum standards

The sock should reach the sea surface and cover as much of the cable above the sea surface as practically possible. The diameter of the sock should be a minimum of 10cm, sufficient to allow the birds to detect it and reduce any impact if a bird comes into contact with it.

Need for combination

The sock can be used in combination with a curtain, hanging from booms at the stern, its use will depend on the layout of the vessel (Viney et al 2026).

Implementation monitoring

Currently all krill trawl vessels have observers onboard (CCAMLR Conservation Measure 51-06) who ensure that the sock is in place, this should be monitored for any future usage. The observer will monitor the performance of the sock and record and bird contacts. The is done through a combination of deck observations and reviewing of video footage. The vessels have cameras installed which record all of operations.

Research needs

Future research will be based on data collected by observers and will examine if there are any factors that lead to the increase in bird strikes. Research will also need to be conducted on the socks suitability if used on other vessels or in other areas.

2.2.4 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.

2.2.5 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.

2.2.6 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.

2.2.7 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.

2.2.8 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 4. ACAP SUMMARY BEST PRACTICE ADVICE FOR DEMERSAL LONGLINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP 2026 Summary Best Practice Advice for Reducing the Impact of Demersal Longline Fisheries on Seabirds

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

BEST PRACTICE MEASURES

ACAP recommends that the most effective way to reduce seabird bycatch in demersal longline fisheries is to use the following three best practice measures **simultaneously: branch line weighting, night setting and bird scaring lines**.

The simultaneous use of the three ACAP recommended mitigation measures optimise seabird bycatch reduction in demersal 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.

Further mitigation measures that can be implemented by demersal longline fishing vessels include bird exclusion devices at the hauling bay, responsible offal management and avoiding peak areas and periods of seabird foraging activity.

Best practice mitigation measures and recommendations for demersal longline fisheries are detailed and categorised into: (1) general best practice measures; (2) best practice measures for line setting operations; (3) best practice measures for line hauling operations; and (4) other recommendations.

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) to fishing will 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.

2.1a Externally weighted double lines without nets: Spanish system

For vessels using the Spanish double longling system of fishing, line weights should be set with a minimum of:

- 5 kg at 40 m intervals when using solid steel weights;
- 8.5 kg at 40 m intervals when using rock weights; or
- 6 kg at 20 m intervals when using concrete weights.

The use of steel weights is considered best practice, as they sink hooklines consistently.

2.1b Externally weighted double lines with nets: Chilean system (trotline with nets)

For vessels using the Chilean double longline system of fishing, line weights should conform to those for the Spanish system (see above).

2.1c Externally weighted or integrated weight single lines: autoline system

Where practical, Integrated weight (IW) lines are recommended over adding external weights because they sink faster and more consistently.

Recommended integrated weight (IW) longlines have a lead core of 50 g/m. As noted, their key characteristic is that they sink with a near-linear profile from the surface with 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.

If external weights are used instead of IW lines, the mean 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 (baited hooks) between line weights in propeller turbulence. The stipulated sink rate can be achieved with a minimum of 5 kg at intervals of no more than 40 m.

2.2 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 including albatrosses are inactive at night. However, night setting is not as effective for crepuscular/nocturnal foragers (e.g. White-chinned Petrels *Procellaria aequinoctialis* and Northern Fulmars (*Fulmarus glacialis*). The effectiveness of this measure may be reduced during bright moonlight or when using intense deck lights. Night setting is impractical 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.

2.3 Bird scaring lines (BSLs)

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 in-water terminus. Drag created by the 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. 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 essential that the aerial extent matches 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.

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. Weak links (breakaways) should be incorporated into the in-water portion of the line for safety reasons and to minimize operational problems should lines become tangled.

It is also recommended to use a weak link to allow the BSL to break-away from the vessel in the event of an entanglement with the main line. A secondary attachment between the BSL and vessel allows an entangled BSL to be recovered during the haul.

Sufficient drag is essential to maximise aerial extent and maintain the line directly behind the vessel during crosswinds.

Given operational differences in demersal longline fisheries due to vessel size and gear type, BSL specifications have been divided into recommendations for vessels greater than 24 metres and those less than 24 metres in length.

2.3a Recommendations for vessels ≥24 m in length

Simultaneous use of two (paired) 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 150 m, BSLs should be attached to the vessel such that they are suspended from a point a minimum of 7 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.

- 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 device.

2.3b Recommendations for vessels <24 m in length

One or two (paired) bird scaring lines should be used to provide maximum protection from bird attacks under different wind conditions. The setup for BSLs should be as follows:

- The attachment height should be a minimum of 6 m above sea level at the stern.
- 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 10 m to avoid tangling.
- 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 device.

2.4 Offal and discard discharge management

Seabirds are highly attracted to offal and discards 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 from fish and retained on board before fish and fish parts are discarded from the vessel.

ACAP's Review of Seabird Bycatch Mitigation Measures for Demersal Longline Fisheries provides further information on all of these methods, as well as other considerations.

4. MITIGATION MEASURES THAT ARE NOT RECOMMENDED

ACAP considers that the following measures currently 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.

Acoustic deterrents - insufficiently researched.

Strategic management of offal discharge – operational difficulties.

Use of a line setter/shooter - insufficiently researched.

Underwater line setter - insufficiently researched.

Underwater setting chutes - insufficiently researched.

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

Mitigation measures to improve sink rates of baited hooks on floated longlines – insufficiently researched.

ANNEX 5. ACAP REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR DEMERSAL LONGLINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP 2026 Review of Seabird Bycatch Mitigation Measures for Demersal Longline Fisheries

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

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INTRODUCTION

The incidental mortality of seabirds, mostly albatrosses and petrels, in demersal longline fisheries continues to be a growing global concern. 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 demersal 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.

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).

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. 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. Note, most scientific literature relates to fleets of larger vessels (typically ≥24m). Some of this advice may need modification for smaller vessels (typically <24m).

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 during line setting 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. Some of the mitigation methods are well established and explicitly prescribed in demersal 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 demersal longline fisheries. This document is a distillation of that review. With the exception of the Chilean system, the simultaneous use of weighted lines, bird scaring lines and night setting is considered best practice mitigation for reducing seabird bycatch in demersal longline fisheries. Although the Chilean system effectively prevents mortality as a sole measure given that hooks sink quickly from the surface, it is recommended to simultaneously deploy bird scaring lines.

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.

[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

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/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 longline fisheries

Proven and recommended mitigation measure. Must be combined with other measures, especially appropriately weighted lines, effective bird scaring lines, night setting and offal management both in the specific areas at which time the fishing season is reopened, 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 at-sea surveillance or AIS 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.a) Externally weighted double lines without nets: Spanish system

Scientific evidence for effectiveness in demersal longline 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; Düssler *et al*. 2026).

Notes and Caveats

Spanish system double longlines are buoyant and weights must be attached to sink gear to fishing depth. Longlines with externally added weights sink unevenly, with faster rates at the

[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.

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 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 much preferred, in terms of mass consistency, handling, maintenance and monitoring compliance (Robertson *et al*. 2008b, Paterson *et al*. 2017). Achieving faster sink rates may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels (Düssler *et al*. 2026).

Minimum standards

Global minimum standards have not been established. Requirements vary by fishery. For example, CCAMLR minimum requirements for vessels using the Spanish double longline method of longline fishing are:

- 5 kg weights at 40 m intervals when using solid steel weights;
- 8.5 kg mass at 40 m intervals when using rocks at weights; or
- 6 kg mass at 20 m intervals when using concrete 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.b) Externally weighted lines: Chilean double line method (trotline with nets)

Scientific evidence for effectiveness in demersal longline 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 recommended 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 the 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.

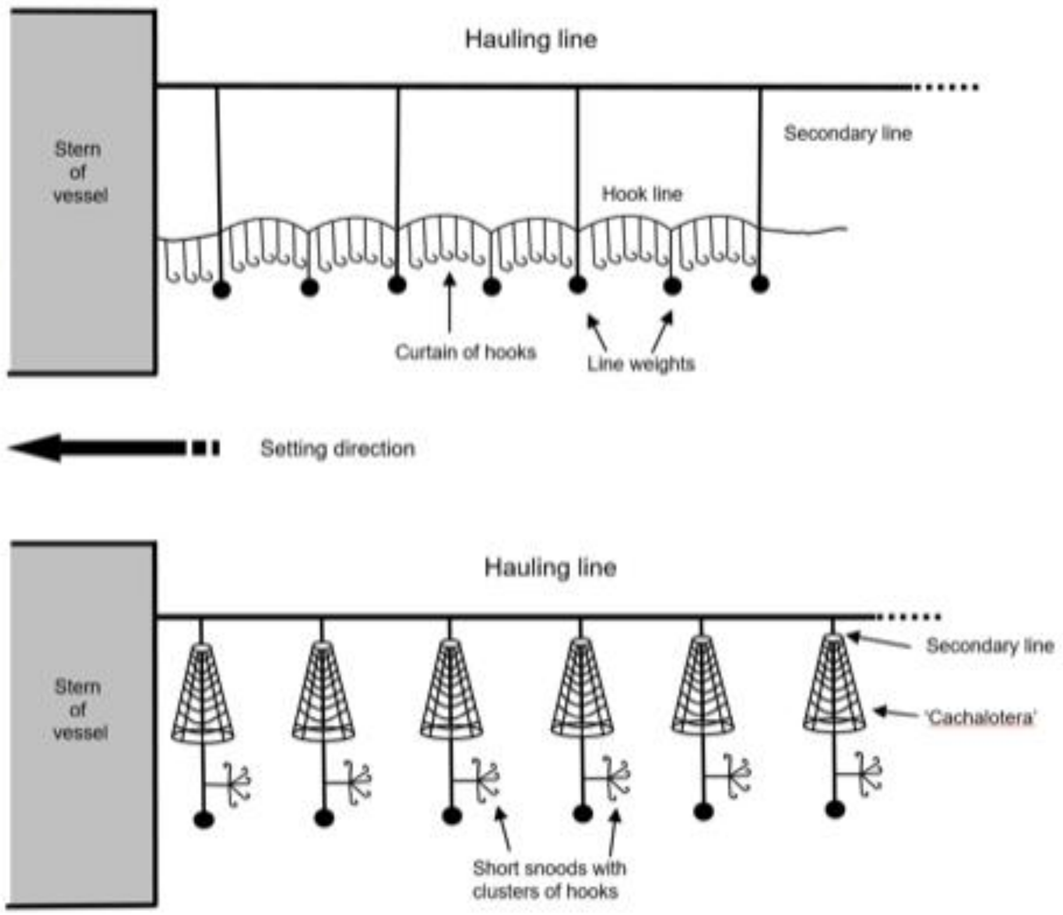

Figure 1. Typical configurations of the traditional Spanish double line system (top panel) and Chilean (trotline) system (bottom panel) showing differences in gear design and location of weights in relation to hooks. The open-ended secondary/connecting lines (not joined by a continuous hook line) and 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

Although this system has been in use since 2005, it should still be monitored and possibly refined. Concern has been raised about the excessive discarding of fish bycatch (e.g.

grenadiers) with embedded hooks from the hook cluster 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 the Chilean fishing method and the traditional Spanish method within fishing trips does take place and is problematic. While this capacity exists, the Spanish system requirements should apply to both methods within a trip (see “2a”, above). Onboard monitoring is required to assess implementation.

Research needs

Although likely 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, the simultaneous use of bird scaring lines is recommended. Research is required to determine effectiveness against *Puffinus* spp. shearwaters.

This is still considered a relatively new fishing method and may need further 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.c) Externally weighted lines: Auto-bait

Scientific evidence for effectiveness in demersal longline 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 longlines mid-way between line weights (Robertson 2000). This rate exceeds that of integrated weight longlines, which have been thoroughly tested against seabirds (see below). Attachment of external weights is necessary in Antarctic toothfish *Dissostichus mawsoni* fisheries to comply with the minimum sink rate (0.3 m/s) required by CCAMLR for vessels 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 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 enhances the risk of seabirds being hooked. Achieving faster sink rates may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels (Düssler *et al*. 2026).

Minimum standards

Minimum standards are informed by those currently applied to two Southern Hemisphere fisheries. CCAMLR requires, as a minimum, a 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 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. petrels from sinking baited hooks. 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 longline 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 substantially reduce 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). Achieving faster sink rates may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels (Düssler *et al*. 2026). We note that 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 subantarctic 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; Düssler *et al*. 2026).

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. However, bright moonlight and deck lights can reduce the effectiveness of this mitigation measure. Night setting can also be 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 (including AIS monitoring) 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 longline fisheries

Proven and recommended mitigation method. It is the aerial extent of the line with streamers attached that is important for the prevention of bird 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 line weighting 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 no longer 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 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.

Use of a weak link is recommended to allow a 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/) are options for required assessment of implementation.

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 longline fisheries

Proven and recommended mitigation method. Effectiveness is maximized when BSLs are paired and deployed so that they bracket sinking baited hook lines, and the aerial extents of the lines cover the area astern to where birds can no longer 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 BSLs is more effective at deterring birds from baited hooks than a single BSL (Melvin *et al.* 2001; Sullivan & Reid 2002; Melvin 2003; Melvin *et al.* 2004; Reid *et al.* 2004). The combination of paired BSLs 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 using two BSLs with gear is potentially increased compared to using a single BSL. Towing an effective device that keeps lines from crossing surface gear may improve compliance with this measure. Manual retrieval of paired or multiple BSLs requires more effort than a single BSL This can be overcome by using winches to retrieve lines.

Minimum standards

Current minimum standards vary across fisheries. In Alaskan demersal longline fisheries paired BSLs are required on larger vessels (≥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 BSLs have been compulsory since 2005. Paired BSLs have also been required in the Australian longline fisheries off Heard Island since 2003 (Dietrich *et al*. 2008).

Implementation monitoring

BSLs 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 BSLs.

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 longline 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 – e.g. 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 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. Hook size and shape

Scientific evidence for effectiveness in demersal longline 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.

9. Olfactory deterrents

Scientific evidence for effectiveness in demersal longline 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 vessels (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. Seabirds may also 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.

10. 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.

Implementation monitoring

Not Applicable.

Research needs

Undefined

11. Strategic management of offal discharge

Scientific evidence for effectiveness in demersal longline 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 longline 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 African and New Zealand fisheries).

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.

12. Line-setter/shooter

Scientific evidence for effectiveness in demersal longline fisheries

Unproven and not recommended as a mitigation measure at this time. A line shooter delivers a baited longline to the surface of the water astern of the vessel slack. Less used in demersal long-line fisheries compared with pelagic longline 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 *Fulmarus glacialis* 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

13. Underwater setting funnel/chute

Scientific evidence for effectiveness in demersal longline 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 (e.g. BSLs 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

14. 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 demersal 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.

15. 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.

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

Scientific evidence for effectiveness in demersal longline fisheries

Unproven and not recommended as a mitigation measure at this time. 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. Limited trials in NZ found that through the use of dropper floats, together with manipulation of line weighting regimes and BSL configurations, improved sinking to depth within the aerial extent of BSLs can be achieved in small vessel floated demersal longline fisheries (Goad et al. 2024).

Notes and Caveats

Sink rate management tools (e.g. Plencner and Debski 2026) can be used by small vessel demersal longline fishers to both meet regulatory requirements for sink rate records and to assess and manage sink rates to reduce the risk to seabirds.

Minimum standards

No global standard.

Implementation monitoring

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

Research needs

Further work is required to identify mitigation measures that increase the sink rate of baited hooks on floated longlines.

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ANNEX 6. ACAP SUMMARY BEST PRACTICE ADVICE FOR PELAGIC LONGLINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP 2026 Summary Best Practice Advice for Reducing the Impact of Pelagic Longline Fisheries on Seabirds

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

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 have shown no negative effect on target catch rates ; however, reduced catch rates have been reported for albacore tuna, with lighter weights placed close to the hook showing smaller effects 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 0.5 m/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 (BSLs)

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). Not commercially available as of May 2026.

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.

ACAP's Review of Seabird Bycatch Mitigation Measures for Pelagic Longline Fisheries provides further information on all of these methods, as well as other considerations.

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 evidence of effectiveness in pelagic longline fisheries.

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

Blue dyed bait: No 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.

ANNEX 7. ACAP REVIEW OF SEABIRD BYCATCH MITIGATION MEASURES FOR PELAGIC LONGLINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

ACAP 2026 Review of Seabird Bycatch Mitigation Measures for Pelagic Longline Fisheries

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

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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.

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

[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

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.

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; Gilman et al. 2025: Huang et al. 2025; Lee et al. 2026).

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, recent studies have detected a decrease in albacore tuna (*Thunnus alalunga*) catch rates in weighted branch lines compared to unweighted branch lines (Huang et al. 2025; Lee et al. 2026), which warrants further investigation (Lee et al. 2026). The lightest weights (40–45 g) attached as close as possible to the hook were found to have the smallest impact on catch rates of this species. In addition, 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: Huang et al. 2025). Achieving faster sink rates may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels (Düssler *et al*. 2026). 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.

Measurement of sink rates should be undertaken using the ACAP Guidelines to Measure Sink Rates of Baited Hooks in Pelagic Longline Fisheries.

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 (Gianuca et al. 2016; Brothers 2026) 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; Huang et al. 2025).

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.

Deeper opening devices may be needed to effectively mitigate seabird bycatch in areas with deep diving petrels (Düssler et al 2026).

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. Not currently commercially available as of May 2026.

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 8. ACAP GUIDELINES TO MEASURE SINK RATES IN PELAGIC LONGLINES

Agreement on the Conservation of Albatrosses and Petrels

ACAP Guidelines to measure the sink rates of baited hooks in pelagic longline fisheries using Time-Depth Recorders

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

INTRODUCTION

The incidental capture of seabirds in pelagic longline fisheries is a global concern, particularly for threatened albatrosses and petrels. Addressing this issue was a central motivation for establishing the Agreement on the Conservation of Albatrosses and Petrels (ACAP), which aims to secure a favourable conservation status for these species.

ACAP's Seabird Bycatch Working Group (SBWG) regularly reviews and updates ACAP's best practice mitigation advice for industrial fishing gear types, including pelagic and demersal longline and trawl gears. ACAP's review process considers safety, practicality, and fishery-specific characteristics when evaluating mitigation measures and developing best-practice guidance. For pelagic longline fisheries, ACAP recommends the simultaneous use of three best-practice measures—branch line weighting, night setting, and bird scaring lines—as the most effective approach to reduce seabird bycatch. Alternatively, an assessed hook-shielding device or an underwater bait-setting device can be used as a standalone mitigation option (ACAP 2024).

1.1. Branch line weighting

Branch lines should be weighted to sink the baited hooks rapidly out of the diving range of feeding seabirds. Studies show that placing more weight closer to the hooks makes them sink faster and consistently, and reduces seabird attacks on baits, as well as seabird mortalities (ACAP 2024).

SBWG12 reviewed the minimum standards for branch line weighting, defined a sink rate criterion for best practice branch line weighting, and provided further clarification on the use of weight attached to or integrated into the hook, as well as on weighting materials.

Best practice branch line weighting should achieve an average sink rate of 0.5 m/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 weight is attached to the branch line, or integrated into the hook, a minimum added 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, thereby facilitating compliance and port monitoring. It is recommended to avoid using lead when it may be ingested (e.g. attached to or integrated into the hook). Using lighting devices or other fishing accessories as weights is not recommended unless they meet the sink rate criterion.

With the inclusion of a defined sink-rate criterion for best-practice branch line weighting, it became necessary to establish guidelines on how to measure the sink rates of baited hooks. This document provides a step-by-step protocol for conducting these measurements using time-depth recorders (TDRs), ensuring that data collected are accurate and comparable.

1.2. Scope and intended users

The protocol is intended for use by scientific observers and researchers in a variety of contexts, including on research vessels or commercial fishing vessels operating under normal fishing conditions or under charter for research purposes.

1.3. Time-depth recorders

The TDRs must be small, lightweight (ideally less than 3 grams in seawater), robust, easy to set up and download at sea and not appreciably affect sink rates. Various manufacturers produce TDRs that meet these criteria, including, but not limited to the following manufacturers:

- Cefas Technology (https://cefastechnology.co.uk/products/data-storage-tags/g5)
- Star-Oddi (https://www.star-oddi.com/products/archival-tags)
- Lotek https://www.lotek.com/products/lat1000-series/

Due to a range of factors, the sink rates of pelagic longlines can vary significantly. Studies should aim to complete at least 10 replicates of *each weighting regime* in a sampling session. This can be achieved by deploying 10 TDR branch lines in *a single set* of the longline. The exercise can be repeated over multiple sets (days) if larger sample sizes are required or if between-set variation – due to changing sea states or other factors – is an important part of the research plan.

The precise estimation of baited hook sink rates relies on strict adherence to the following procedures and practices.

1.4. Determining depth offsets at the sea surface

All TDRs exhibit errors in depth readings at the sea surface, known as 'zero offsets' by TDR manufacturers. These offsets usually fall within the range +0.5 m to -0.5 m. Clearly, zero must be zero, meaning that the depth at the sea surface must always read 0 m.

To measure sink rates accurately, particularly at the surface (e.g. 0-2 metres) where baits are most visible and where small errors can lead to erroneous interpretations, the zero offsets need to be determined for each TDR, and the TDR data corrected during the data analysis to account for the offset. To determine the offsets, simply turn the TDRs on (as described below) and maintain them at the sea surface for about 20 seconds, which equates to 20 records at a one-second sampling rate. This procedure should be performed in calm seawater before leaving port, ensuring that the water temperature is stable. As zero offset refers to a depth of 0 m, the TDRs must be held at the sea surface during this procedure. Document the calculated zero offsets for each TDR for later reference.

1.5. Setting up procedure (at sea)

Equip yourself with a digital wristwatch that displays the time at one-second intervals. Synchronise the time on your wristwatch with the time on your computer. This synchronised time will be programmed into the TDRs when they are connected to the computer, ensuring that your watch, computer, and TDRs all operate on the exact same time. This synchronisation allows water entry times to be accurately recorded.

Program the devices to record depth at 0.5 m increments and time at one-second intervals. Program them to turn on at a convenient time *before* the scheduled deployment time. You can choose to have them switch off *after* reaching estimated fishing depth, or let them run for all, or part of, the soak period. The latter option, however, comes at the expense of lifetime battery longevity.

1.6. Attaching the TDRs

The TDRs can be attached to the branch lines using multiple cable ties or an equivalent method. If cable ties are used, tighten them with a tensioning device like that shown in **ANNEX 1**. To ensure that the TDRs sink at the same rate as the baited hooks, and to reduce the likelihood of shark bite-offs, TDRs should be attached within 30 cm from the hooks. Finally, wrap the TDRs in waterproof tape (such as electrical tape) and label each one (using a waterproof felt-tipped pen) with a unique number that corresponds to your deployment schedule.

As a practical aid during hauling, consider marking the snap of each TDR branch line with coloured tape and the corresponding TDR number, to help the crew identify and separate these lines promptly and avoid accidental impacts that may damage the device.

1.7. Deploying the TDR branch lines

Instruct the crew to deploy the TDR branch lines in accordance with their normal practice concerning the bait landing distance behind the vessel and its position relative to the vessel's wake. This means either over the centre line of the propeller, in the vessel's wake on either side, or outboard of the wake zone on either side. *Consistency in the branch line deployment method is essential.*

Use your digital wristwatch to record the exact time to the nearest second *when baited hooks land in the water.* This record is crucial, as it serves as the starting point for calculating sink times and rates to target depths. Inferring water entry times from the time-depth files when downloaded is not as precise as time-synchronised visual observations made during the set.

1.8. Downloading the files

When the longline is hauled, retrieve the TDRs, rinse them in fresh water, and download the CSV files from each TDR into separate spreadsheets. The downloaded data will be presented in columns for date, sampling time and depth in the water column, as shown in **Table 1** below. Locate the water entry time and highlight it in the data. Retain about 15 rows of TDR records before the water entry time so others can assess the extent of the TDR offsets *prior* to the time of water entry. Delete all data rows before these 15 rows. Add a new column ("number of seconds" or simply "seconds") beside the depth column, with the first entry (0 sec) corresponding to the time of water entry and fill down as shown in the table.

Copy the raw values collected by the TDRs, which are listed in the "Depth" column of **Table 1**. Paste them into a separate column titled "Corrected depth". Using the scores in the "Corrected depth" column, write a formula in Excel to adjust the raw scores based on the offset from your still water determinations for each TDR mentioned above.

Importantly, the depth offsets derived in still water should be the same or very close to the offsets shown in the downloaded data before water entry (0.5 m, as shown in **Table 1**). *If discrepancies occur, prioritise the offsets obtained from your still water tests. Apply the formula to correct the raw depth scores collected by the TDRs.*

Add your name, the date, the vessel name, the TDR number and any other relevant information to the rows of the spreadsheet immediately above the data rows.

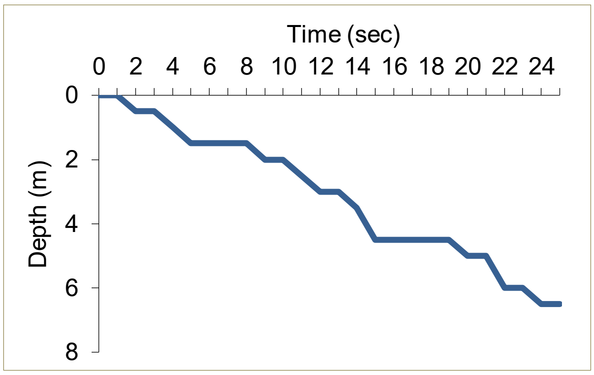
1.9. Data presentation

Present the data in **Table 1** below for each individual TDR in your report. Include the time taken to reach both 2 m and 5 m depths, along with the associated sink rates. Also include a graph of the sink profile to a depth of 5 m, as illustrated. Finally, along with the individual records, your report should present the average values (with 95% confidence limits) for the results shown in the table for all TDRs deployed in a sampling session. The report should also include a description of how the zero offset was calculated.

Table 1. Example of how the data and results are to be presented for each TDR, showing the observed water entry time, a column (third from the left) of the elapsed time since water entry, the depth data from the TDR and the corrected depths based on individual TDR zero offsets.

Date	Time (sec)	Number of seconds	Depth (m)	Corrected depth (m)	
19/03/2015	10:37:36		0.5		
19/03/2015	10:37:37		0.5		
19/03/2015	10:37:38		0.5		
19/03/2015	10:37:39		0.5		
19/03/2015	10:37:40		0.5		
19/03/2015	10:37:41		1		
19/03/2015	10:37:42		0.5		
19/03/2015	10:37:43	**0**	0.5	**0**	**Water entry time here**
19/03/2015	10:37:44	**1**	0	0	
19/03/2015	10:37:45	**2**	1	0.5	
19/03/2015	10:37:46	**3**	1	1	
19/03/2015	10:37:47	**4**	1.5	1	
19/03/2015	10:37:48	**5**	2	1.5	
19/03/2015	10:37:49	**6**	2	1.5	
19/03/2015	10:37:50	**7**	2	1.5	
19/03/2015	10:37:51	**8**	2	1.5	
19/03/2015	10:37:52	**9**	2.5	2	
19/03/2015	10:37:53	**10**	2.5	2	
19/03/2015	10:37:54	**11**	3	2.5	
19/03/2015	10:37:55	**12**	3.5	3	
19/03/2015	10:37:56	**13**	3.5	3	
19/03/2015	10:37:57	**14**	4	3.5	
19/03/2015	10:37:58	**15**	5	4.5	
19/03/2015	10:37:59	**16**	5	4.5	
19/03/2015	10:38:00	**17**	5	4.5	
19/03/2015	10:38:01	**18**	5	4.5	
19/03/2015	10:38:02	**19**	5	4.5	
19/03/2015	10:38:03	**20**	5.5	5	
19/03/2015	10:38:04	**21**	5.5	5	
19/03/2015	10:38:05	**22**	6.5	6	
19/03/2015	10:38:06	**23**	6.5	6	
19/03/2015	10:38:07	**24**	7	6.5	

	RESULTS
Depth range (m)	**0-2**
Time (sec)	8
Rate (m/sec)	0.25



1.10. Supporting information

To ensure your recordings are interpreted correctly, include the following details for each completed round of TDR deployments.

1. Name and location of fishery.
2. Vessel name and length.
3. Vessel setting speed.
4. Vessel setting direction in relation to the direction of the current.
5. Sea state.
6. Branch line length, construction material (e.g. 1.8 mm monofilament) and length.
7. Hook type, size (e.g. 15/0 circle hook) and weight.
8. Bait (species, size / weight, frozen / defrosted).
9. Use of lightsticks / electric lights / hook-shielding devices, and location in the branch line.
10. Mainline configuration – surface set tight configuration or with slack astern to create a catena between the floats (e.g., with the use of a line shooter).
11. Line weighting regime – weight type (leaded swivel, sliding lead, leaded hook), amount of added weight additional to the mass of the hook, and distance from the hook.
12. Bait landing position astern – over the centre line of the propeller, edge of the wake on either side of the vessel or outboard of the wake zone on either side.

The cable tie gun provided via the link below is shown for illustrative purposes only. Any comparable brand can be used.

Professional cable tie gun

ANNEX 9. TOOLBOX FOR SEABIRD BYCATCH MITIGATION ADVICE IN ARTISANAL AND SMALL-SCALE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels	**Toolbox for Seabird Bycatch Mitigation Advice in Artisanal and Small-Scale Fisheries** *Reviewed at the Fifteenth Meeting of the Advisory Committee* *Swakopmund, Namibia, 1 – 5 June 2026*

ARTISANAL & SMALL-SCALE FISHERIES

While there is no universally agreed upon definition of artisanal and small-scale fisheries (SSF), previous work presented to ACAP have provided some clarity and definition (e.g. Debski et al. 2014, Favero et al. 2014, Goya et al. 2011). Along with a clearer understanding of the characteristic of these fisheries, it has also become evident that seabird bycatch does occur in some SSFs, including the bycatch of ACAP listed species (e.g. Mangel et al. 2012). Some commonly recognized characteristics of SSFs include their:

- Lack of mechanization
- Small vessel and crew size
- Highly geographically dispersed fleets
- Vessels change and adapt gear frequently
- Limited enforcement of existing regulations
- Common in impoverished communities, i.e. few resources for monitoring, mitigation

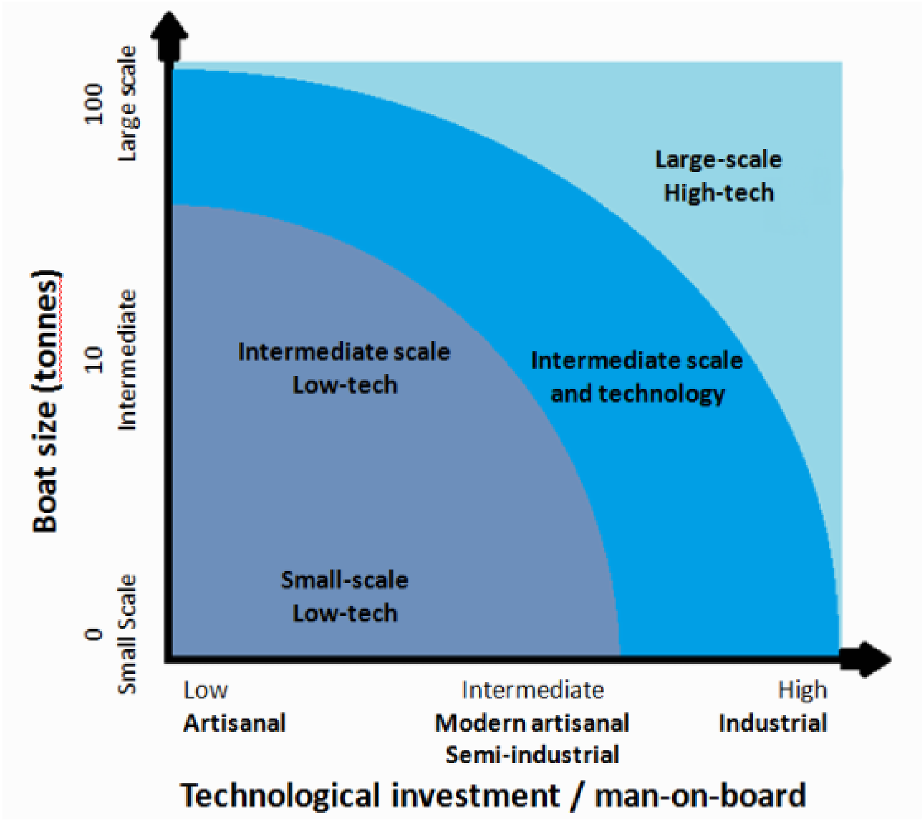


Figure 1. Graphic definition of small-scale, artisanal and industrial fisheries as a function of vessel size and relative technological investment. Adapted from FAO Small-scale and artisanal fisheries at http://www.fao.org/fishery/topic/14753/en

TOOLBOX CONSIDERATIONS

Given these SSF characteristics, opportunities for bycatch mitigation are, in many cases, challenging to identify or implement. Early efforts to test or implement bycatch mitigation mostly focussed on sea turtles and small cetacean bycatch (e.g. Gilman et al. 2010, Mangel et al. 2013, Peckham et al. 2015, Ortiz et al 2016). More recent mitigation developments relevant to seabird bycatch are summarised in the toolbox table.

Apart from known technical solutions to bycatch, when working with SSF we believe that it is imperative that alternative methods to reduce bycatch be considered. This need for alternative methods takes into account the challenges in testing and implementing mitigation measures in these fisheries, including the fishery characteristics detailed above. This toolbox approach of mitigation solutions in SSF therefore includes the implementation of educational/outreach campaigns, the development of human resources (capacity building), long-term working plans in SSF communities, training in safe handling and release, and co-management of resources or fishing grounds, among others. Tools like these can be considered to be potentially applicable across fishery types. These non-technological solutions may often be the first or perhaps most effective options available in these fisheries. The dynamic nature of SSF also reinforces the need for fishery monitoring, as this can help identify emergent bycatch issues or potential opportunities to guide fishery development to reduce negative impacts before practices become entrenched.

In choosing a mitigation solution, apart from the summary information contained in the toolbox table, we have developed a series of guidance questions that can help researchers and managers determine if a particular mitigation technology is feasible for their SSF:

- What oversight or enforcement is required to demonstrate implementation?
  - Mitigation fixed into fishing gear can more easily be monitored (e.g. port inspection).
- The estimated financial cost of the mitigation solution and how that compares to the operating costs in the fishery.
- Whether the equipment require maintenance or replacement parts.
  - Who would provide maintenance and replacements?
  - Are components available in local markets or do they need to be imported?
  - What are the ongoing costs?
- Whether training in the mitigation technique is required.
  - Who would provide the training?
  - Is there sufficient training capacity?
- Whether the mitigation technique is appropriated for a small vessel.
  - Consider storage space, effective deployment, etc.
- Whether the mitigation technique impacts the target catch or leads to changes in bycatch (including other bycatch species).

Table 1. Mitigation methods that **reduced the bycatch of albatrosses and/or petrels** in small-scale fisheries.

Fishing gear	Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations/ considerations	Source
Driftnet	Net illumination	Increase net visibility	Small-scale surface drift net. Sharks, tunas, dolphinfish. Off shore Peruvian coast	Addition of LEDs reduced White-chinned petrel bycatch.	Illuminated nets did not reduce target catch.	No human safety aspects to be considered.	Reduced sea turtle and small cetaceans bycatch by 74% and 71% respectively.	Cost of LEDs. Management of spent batteries.	Bielli et al. 2020
Demersal longline	NISURI fastset	Reduces availability of baited hooks for birds during casting.	Small-scale demersal longline. Hake. Ecuador.	Increased set speed ~10x	No reduction in target catch.	No human safety aspects to be considered.	N/A	Requires the production and installation of the NIZURI system.	Brothers et al. 2014 Suaréz & Wallace 2023 Cruz et al. 2026
	Night setting	Less bird activity and reduce visual detection of baits by birds	Small-scale demersal longline. Tilefish and various species of snapper and grouper. Southeast Brazil.	Reduced albatrosses and petrels bycatch.	Not evaluated. The fleet mostly sets during the day aiming maximum catch.	No human safety aspects to be considered.	N/A	Potential reduction in target species catch.	Canani et al. 2023
			Small-scale demersal longline. European hake. Western Mediterranean.	Reduced bait attacks by shearwaters and gulls.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Cortês and Gonzáles-Solis 2018

Fishing gear	Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations/ considerations	Source
Demersal set net	Metal oxide / barium sulfate nets	Possibly increases net stiffness (and increased acoustic reflectivity).	Demersal gillnet fishery. Haddock, cod, pollock, spiny dogfish. Lower Bay of Fundy, New Brunswick, Canada.	Reduced bycatch of great shearwaters.	No reduction in target catch.	No human safety aspects to be considered.	Reduced harbor porpoise bycatch.	N/A	Trippel et al. 2003
Pelagic longline	Bird scaring line	Scare birds away from the hooks setting area.	Small-scale pelagic longline. Sharks. Peru.	Reduced interactions of albatrosses and petrels.	No reduction in target catch.	No human safety aspects to be considered.	Reduces baits stealing by birds.	Suitable only for pelagic longline vessels that operates similarly to industrial vessels.	Quiñones et al. 2024 Quiñones et al. 2026
Hand-operated dropline	Camouflage tube (Suarez system)	Reduces availability of baited hooks for birds during setting and hauling.	Small-scale hand-operated drop line. Hake. Ecuador.	The camouflage tube prevents birds from visualizing and assessing baited hooks during casting and hauling.	No reduction in target catch.	No human safety aspects to be considered.	The camouflage tube prevents birds from bitting and damaging the fish catch during hauling.	Requires the production and installation of the camouflage tube on the vessel.	Suárez et al. 2023

Table 2. Mitigation methods **not demonstrated to reduce albatrosses and/or petrels bycatch**.

Fishing gear	Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations/ considerations	Source
Demersal longline	Bird scaring line.	Scare birds away from the hooks setting area.	Small-scale demersal longline. European hake. Western Mediterranean.	Bird scaring line (30-45 aerial coverage) did not reduce the interaction with shearwaters.	No reduction in target catch.	No human safety aspects to be considered.	N/A	Suitable only for demersal longline vessels that operates similarly to industrial vessels.	Cortês and Gonzáles-Solis 2018
Demersal setnet	Net illumination	Increases net visibility	Small-scale demersal gillnet fishery. Guitarfish and flounder. Sechura Bay, Peru.	Addition of green LEDs reduced guanay cormorant bycatch.	No reduction in target catch.	No human safety aspects to be considered.	Reduced sea turtle bycatch by 64%.	LED spacing at 10 m. Management of spent batteries.	Ortiz et al. 2016 Mangel et al. 2018
	Orange net colour	Increase net visibility	On little penguins in captivity	Orange color monofilament lines resulted in lower collision rates.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Hanamseth et al. 2017
	Discard management	Reduce seabird abundance around the vessel.	Small-scale demersal setnet. Demersal fish species. Southern coast of Portugal.	Discard management reduced the abundance of gulls and gannets around the vessel.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Frade et al. 2025
	Bird scarer (visual deterrent)	Falcon-shaped kite bird visual deterrent (from *Scarybird*) could reduce seabird abundance around the vessel.	Small-scale demersal setnet. Demersal fish species. Southern coast of Portugal.	Reduced gulls and gannets abundance around the vessel and bycatch.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Frade et al. 2025

Fishing gear	Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations/ considerations	Source
	Bird scarer (visual deterrent)	Falcon-shaped kite bird visual deterrent (from *Scarybird*) could reduce seabird abundance around the vessel.	Small-scale demersal setnet. Demersal fish species. Berlengas Islands Special Protected Area, Portugal.	Reduced gulls and gannets abundance around the vessel and bycatch.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Almeida et al. 2023
	Net illumination	Increases net visibility	Small-scale demersal gillnet fishery. Cod, whitefish, pikeperch, and flounder. Baltic Sea.	Constant green or flashing withe LEDs did not reduce the bycatch ducks and scoters.	No reduction in target catch.	No human safety aspects to be considered.	N/A	Cost of LEDs Management of spent batteries.	Field et al. 2019
	High contrast panels	Increase net visibility	Small-scale demersal gillnet fishery. Cod, whitefish, pikeperch, and flounder. Baltic Sea.	Did not reduce the bycatch of ducks and scoters.	No reduction in target catch.	No human safety aspects to be considered.	N/A	It is necessary to make and install the panels to the net.	Field et al. 2019
	Acoustic deterrent (megaphone)	Megaphone emitting calls of the European Herring Gull, intended to deter birds by simulating natural distress levels.	Small-scale demersal setnet. Demersal fish species. Southern coast of Portugal.	Increased the abundance of gulls and gannets around the vessel.	No reduction in target catch.	No human safety aspects to be considered.	N/A	It is necessary to make and install the system, including power source, wiring and megaphone.	Frade et al. 2025
Driftnet	Highly visible netting in upper net.	Increase net visibility, acoustic reflectivity	Coastal drift gillnet. Salmon. Puget Sound, Washington, USA	Reduced bycatch of murres and auklets.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Melvin et al. 1999

Fishing gear	Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations/ considerations	Source
	Acoustic alarms	Acoustic reflectivity	Coastal drift gillnet. Salmon. Puget Sound, Washington, USA	Reduced murre bycatch.	No reduction in target catch.	No human safety aspects to be considered.	N/A	N/A	Melvin et al. 1999

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ANNEX 10. TOOLBOX FOR SEABIRD BYCATCH MITIGATION ADVICE IN PURSE SEINE FISHERIES

Agreement on the Conservation of Albatrosses and Petrels

Toolbox for seabird bycatch mitigation advice in purse seine fisheries

Reviewed at the Fifteenth Meeting of the Advisory Committee
Swakopmund, Namibia, 1 – 5 June 2026

BACKGROUND

Since 2016, purse seine fisheries have become a part of the ACAP agenda (Baker & Hamilton 2016; Debski *et al.*, 2016). These discussions have focused on understanding the fishing gear configuration and its operation, as well as identifying seabird species involved in bycatch incidents in both industrial and small-scale vessels.

As early as described in Suazo *et al.* (2017a), the list of purse seine fisheries showing signs of seabird bycatch included at least eight countries, spanning seven FAO marine areas, impacting 33 seabird and 2 waterbird species, primarily concentrated in coastal fishing grounds.

As showed in Melvin *et al.* (2023), purse seine fisheries involve a surrounding net used to encircle shoals of pelagic target species like tuna, sardines, and squids. The fishing gear consists of a wall of netting fitted with an upper line of buoys or floats and a lower line of weights (Fig. 1).

In the lower part of the net, a system of steel rings connected by cables allows for the net to be closed, preventing fish/squid from escaping through the lower part of the net. The dimensions of the net, as well as the mesh size, vary depending on whether the net is for small-scale or industrial vessels and the target species, respectively.

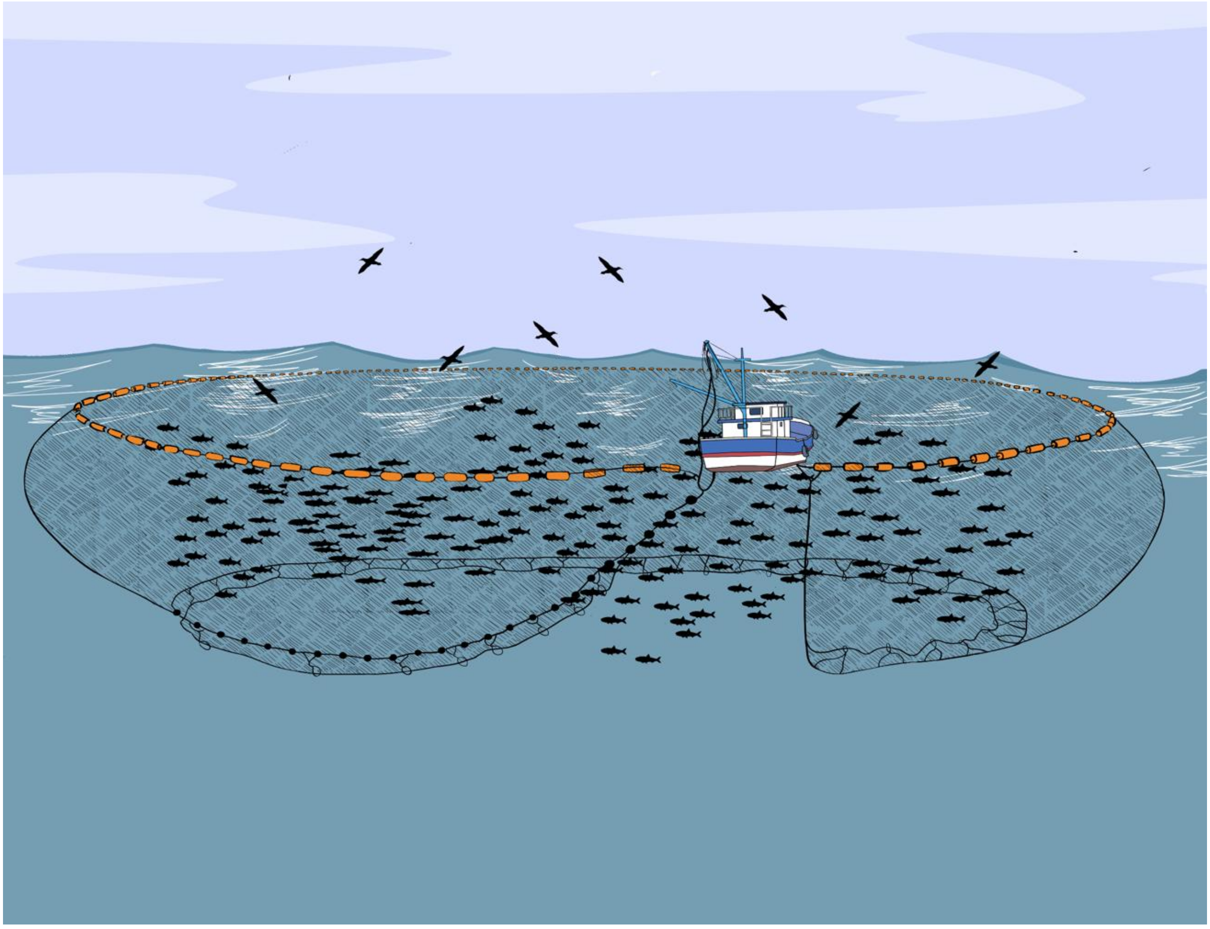

Figure 1. Example of a small-scale purse seine fishing operation. The net encircles the fish shoal, with its upper part buoyed and the lower part weighted. Steel wires are then winched together to close the net, forming a bowl shape (© C.G. Suazo).

IDENTIFYING SEABIRD BYCATCH FOR EFFECTIVE MITIGATION MEASURES IN PURSE SEINE FISHERIES

Purse seine fisheries are among the least studied in terms of their impact on non-target species, with more frequent records involving marine mammals, marine reptiles, seabirds, and other taxa with an emphasis in industrial scale operations (Soykan *et al.*, 2008). Thus, in the case of industrial purse seine operations for tuna, these fisheries have been recognized as non-problematic for seabirds (Gilman & Lundin, 2010). There is a set of voluntary best practices aimed at reducing the chances of bycatch, such as avoiding sets in areas with a presence of non-target species and implementing fishing gear entanglement prevention measures for cetaceans, sharks, and sea turtles (Swimmer *et al.*, 2020).

However, seabird bycatch has also been documented in other industrial and small-scale vessels targeting small pelagic fish, with entanglements occurring at different stages of the fishing operation (i.e., setting or hauling) and across various components of purse seine gear and onboard facilities. It is strongly recommended that these features be systematically identified through monitoring systems or observer programmes to detect bycatch hotspots across fleets (e.g., Suazo *et al.*, 2016) and to incorporate this information into data collection protocols.

Among mitigation measures, some studies have suggested the use of sound and lasers as deterrents. Coastal seabird species, such as gulls, have shown reduced abundance in response to noise in northern Chile, whereas Procellariiform species, such as shearwaters and petrels, have shown limited response (Diez, 2017). The use of lasers in purse seine fisheries in the same region has not proven effective, as most sets are conducted during daylight hours. Indeed, controlled trials in trawl fisheries have demonstrated that laser effectiveness depends on specific operating conditions, including light levels and vessel speed (Melvin *et al.*, 2016).

Other mitigation measures for purse seine fisheries involve structural modifications of the gear, such as the Modified Purse Seine (MPS). This entails a series of adjustments including buoy mounting and mesh size, among others. These adjustments have demonstrated a reduction in entanglement and capture of birds belonging to ACAP-listed species, such as the pink-footed shearwater *Ardenna creatopus* and the black-browed albatross *Thalassarche melanophris*, in Chile (Suazo *et al.*, 2017b, 2019). The effectiveness of these structural modification measures has been evaluated against the best practice criteria adopted by ACAP to inform decision-makers (Melvin *et al.*, 2023).

Another modification to the typical structure of purse seine gear involves the use of “escape windows,” based on opportunistic observations of diving seabirds such as shearwaters and penguins. These windows consist of sections of the buoyline without floats, allowing some seabird species to escape from the encircled net. This approach has been documented in northern Chile in industrial vessels targeting anchovy, where it has been observed for the pink-footed shearwater, the sooty shearwater *Ardenna grisea*, and potentially for the Humboldt penguin *Spheniscus humboldti* (Auger Lancellotti, 2019).

Recent sensory mitigation measures include the use of a bird-scaring device (scaring kite) in purse seine fisheries in Portugal (Oliveira *et al.*, 2021). This device has proven effective in reducing the number and activity of some seabird species like gulls, but its effect on other seabird species such as shearwaters requires further research. If these measures prove effective, they may contribute to the reduction of bycatch in ACAP-listed species (e.g., Balearic shearwater *Puffinus mauretanicus*) previously reported for purse seine vessels in these waters (Oliveira *et al.*, 2015).

THE COMMUNICATION OF MITIGATION EFFECTIVENESS BASED ON EVIDENCE THROUGH THE TOOLBOX APPROACH

The diversity of mitigation measures and the need to communicate these options on their evidence and effectiveness have led to the development of the "toolbox" approach, which serves as an informative instrument to support mitigation decisions (Mangel *et al.*, 2016, 2017). This approach, initially proposed for artisanal and small-scale fisheries, is also applicable to different scales and fishing gears like purse seine fisheries.

Moreover, the information summarized in tables reporting the features of each potential measure can be supplemented by guided questions on the feasibility of the measure, which are largely covered in the assessment under the ACAP best practice criteria (Suazo *et al.*, 2017). In addition, conservative approaches should be adopted, or at minimum, notes of concern should be included regarding implementation standards and expected performance when proposed mitigation measures are based more on anecdotal evidence than on experimental support. This is particularly relevant when measures are perceived by fleets as very low-cost and easy to implement using *in situ* resources, such as water spraying recommended to prevent seabirds from entering the encircled net.

The use of water spraying or water curtains as deterrents should only be considered when the pumped water does not contain traces of edible oil originating from wastewater generated during fishing operations. For example, we conducted experiments to evaluate the effects of different concentrations of edible oil derived from target fish species in purse seine fisheries in south-central Chile.

Soaked seabirds and associated mortality are frequently linked to the critical stage when the net is lifted from the water surface at the end of the haul (i.e., net retrieval), which is a key moment for seabird bycatch in fishing operations. This has been documented for species such as the common gull (*Larus canus*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), and several unidentified gull species in purse seine fisheries targeting herring (*Clupea harengus*) in Norway (Christensen-Dalsgaard *et al.*, 2022).

To address the impact of fish oil on feathers, we conducted experiments evaluating feather agglutination and weight gain following exposure to different concentrations of sardine-derived edible oil. Increasing oil concentrations led to greater agglutination and disruption of barb structure in both back and pectoral feathers of the pink-footed shearwater. Notably, exposure to a 50% oil–seawater mixture resulted in an 18-fold and 29-fold increase in the weight of pectoral and back feathers, respectively (Fig. 2).

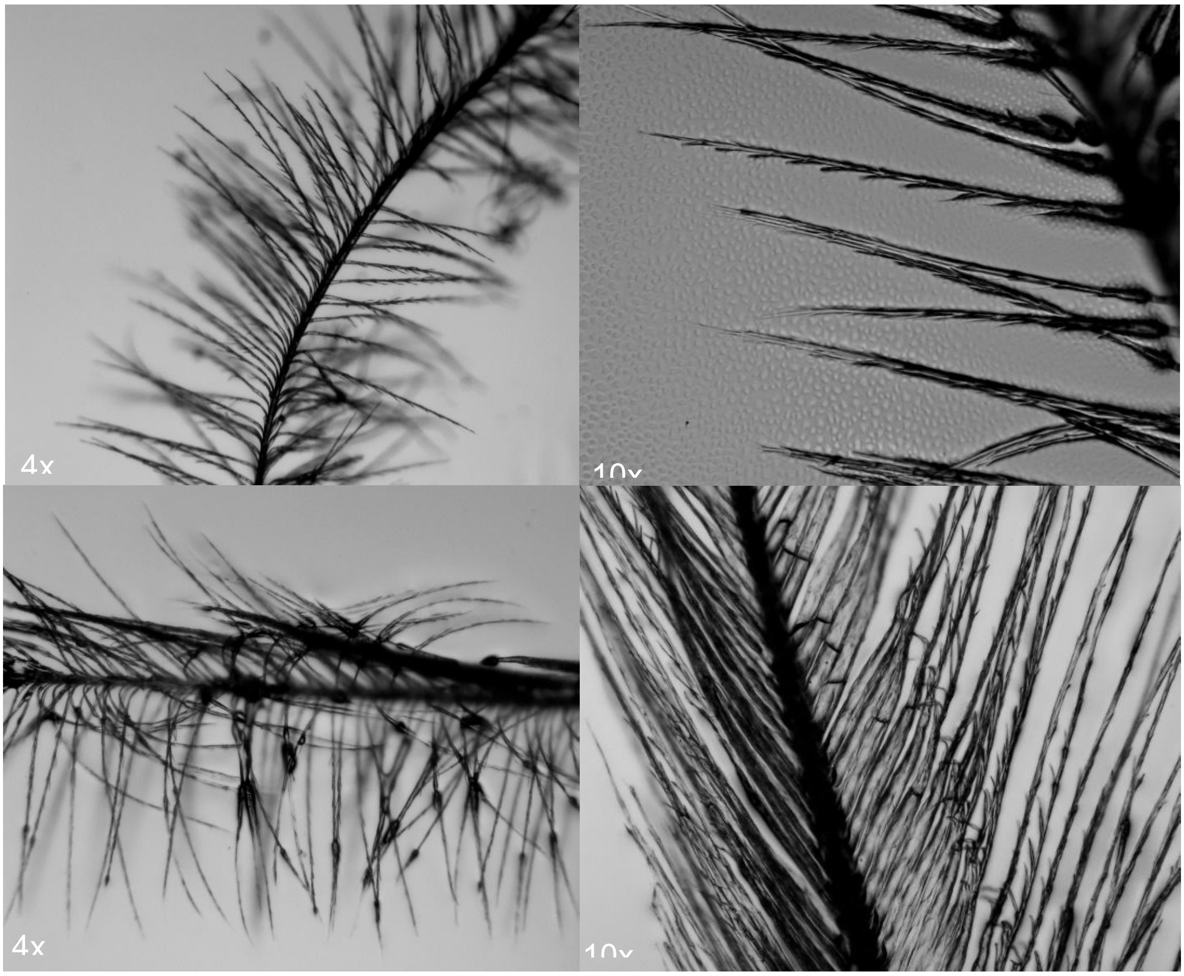

Figure 2. Example of agglutination due to edible oil exposure in the feather of the pink-footed shearwater. The disruption of the connection between barbs of feathers (both in bottom) is noted when compared to control feathers in the two upper photographs (© ATF-Chile).

This example encourages the incorporation of evidence-based minimum standards for the effective performance of mitigation measures, preventing inappropriate application and identifying key features (e.g., materials, dimensions, and supplies) that minimize unintended effects. This is particularly relevant when water curtains are proposed as mitigation solutions in major purse seine fleets, such as those operating in the Humboldt Current System (López & Vega, 2023).

We present a bycatch mitigation toolbox for purse seine fisheries, incorporating different levels of evaluation of mitigation function, empirical findings, limitations, and effectiveness in reducing seabird bycatch overall, including for species listed as priorities by the Agreement on the Conservation of Albatrosses and Petrels (ACAP). These latter are identified as mitigation methods that reduce (Table 1), and not reduce (Table 2) bycatch of albatrosses and petrels.

A practical compilation on the status of different levels of our knowledge on emergent and established measures for Best Practices Advice in priority fisheries like purse seine is provided (Baker *et al.*, 2024). It addresses important dimensions to consider as our understanding of the interaction between seabirds and purse seine fishing continues to increase in significant fleets globally (e.g., Rivadeneyra-Villafuerte *et al.*, 2021), as well as the increase in emergent ideas for mitigation that must be evaluated for tailored conservation actions in these widely distributed fisheries.

Table 1. Mitigation methods that reduce albatross and/or petrel bycatch in purse seine fisheries. N/A: Not available.

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source
Modified purse seine (MPS)	Structural package of on fishing gear for the reduction of entanglement of seabirds with the purse seine gear. (For set and haul).	Small-scale purse seine in the Humboldt Current, Chile. Sardine and Anchovy.	Trials showed the reduction in seabird bycatch for diving seabird species by 98% related to the reduction of entanglement in fishing gear.	Increases the catch of target species.	Handling times and effort with fishing gear reduced.	1. Modified purse seine showed improvement in catch success of the target fish species. 2. Reduction in netting material with savings in future maintenance or new fishing gear.	Mesh size has been proved to use a minimum size of 3 ½ inches to avoid the entanglement of small seabird species like shearwaters.	Suazo *et al.* 2016; 2017a,b; 2019
Bird scaring device (Scaring kite)	Physical barrier to reduce the presence of seabirds in risk areas (For set and haul).	Small-scale purse seine in the south and west coast of Portugal. Forage fish.	Trials showed the effect of this device on activity of seabirds but with no bycatch events recorded for treatment and control sets. Reduction in numbers of certain seabird species like gulls and potentially for ACAP species like the Balearic Shearwater.	No reduction in target catch.	No human safety aspects to be considered.	Just need one person to be handled	1. Need to be assessed in areas of high occurrence of ACAP listed species 2. Also applicable to other fisheries (e.g., gillnets) 3. Effectiveness is more related to short distance of the device to the vessel	Oliveira *et al.* 2021; Almeida *et al.* 2023

Table 2. Mitigation methods for purse seine fisheries **not demonstrated to reduce albatross and/or petrel bycatch**. N/A: Not available.

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source
Water spraying	Physical barrier for seabirds (For haul)	Inudstrial and small-scale. Gulf of California and Mar de Cortés, Mexico. Forage fish.	Preliminary trials may affect seabird presence in risk areas into the net (e.g., pelicans)	No reduction in target catch	No human safety aspects to be considered.	1. Needs to be handled by one person in a reduced crew (e.g., small-scale purse seine).	1. Absence of appropriate facilities and training would be harmful for seabirds (water cannon instead of water spraying). 2. The use of waters pumped from the same waste waters may contain edible oils can potentially affect seabird plumage through the loss of feather's architecture and waterproofing.	Suazo et al. 2017a
Escape windows of buoyline (Escape windows)	Sections without mounted buoys on the upper mainline allow diving seabirds to escape from the encircled purse seine gear (For set and haul).	Small-scale purse seine in the Humboldt Current, Chile. Anchovy	Occasional records show diving seabird species such as penguins and shearwaters using these gaps in the buoyline to move away from the risk area of the encircled net and its bunt.	No reduction in target catch	No human safety aspects to be considered.	Potentially beneficial to marine mammals and turtles.	1. It is necessary to assess the critical dimensions of windows and materials for the effective escape of non-target species and the efficient performance of gear on target species. 2. Concerns on potential scape of target fish species.	Auger Lancellotti 2019

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source
Edible oil release	Sensorial / physical deterrent to keep away seabirds (For set)	Small-scale purse seine. Western Australia. Forage fish.	Trials demonstrated no effects of shark oil *vs* controls on seabird feeding activity of shearwaters.	No reduction in target catch	No human safety aspects to be considered	N/A	1. Oil should attract other seabird or non-target taxa to fishing operations. 2. Available re-supplies on board are needed. 3. The use of oil may have other detrimental effects (e.g., plumage).	Puglisi 2007
Sound	Sensorial deterrent to keep away seabirds (For set and haul).	Small-scale purse seine. Humboldt Current, Chile. Anchovy	Trials demonstrated effects of noise deterrents on the abundance of some sensitive seabird species (*e.g.*, gulls) but with latter habituation. No response by albatrosses and petrels.	No reduction in target catch	No human safety aspects to be considered but potentially health impact by noise pollution.	N/A	1.Recommended additional sound devices to influence in other seabird species than gulls with unexpected harmful effects on seabirds and crews. 2. Consideration of noise pollution when communal fishing exists (e.g., small scale purse seine).	Diez 2017
Laser	Sensorial deterrent to keep seabirds away from the net during set and haul.	Small-scale purse seine. Humboldt Current, Chile. Anchovy	Preliminary trials showed the use of laser keep seagulls temporarily away from the fishing (set and haul).	No reduction in target catch	No human safety aspects to be considered but potentially health impact (eye injury) by laser.	N/A	1. Operational limitations during daylight. 2. Potential detrimental effects on seabirds and crews must be considered and evaluated.	Diez 2017

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