Agreement on the Conservation of Albatrosses and Petrels

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Updated 'Toolbox' template for mitigation advice in artisanal and small-scale fisheries

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SUMMARY

It was agreed at SBWG6 to work towards a model of advice that involves the development of a 'toolbox' of effective mitigation methods for artisanal and small-scale fisheries, rather than a more prescriptive list. For industrial trawl and longline fisheries, ACAP distils clearly defined best practice advice. A major challenge with the 'toolbox' approach for small-scale and artisanal fisheries is how advice on the adequacy of each mitigation method included can be clearly and simply communicated. At SBWG7 the first step towards developing a 'toolbox' template was provided. Following discussion and recommendations from SBWG7 and SBWG8, the proposed toolbox template was further developed and refined, and populated more widely with relevant mitigation techniques. At SBWG12, it was agreed to continue developing the toolbox to provide advice on mitigation options available for artisanal and small-scale fisheries, and that further progress to populate the toolbox should be made during the next intersessional period and presented at SBWG13. Here, we present an updated toolbox, further populated with up-to-date information on mitigation techniques applicable to small-scale and artisanal fisheries. In addition, it was recognized that the toolbox template requires further refinements, including the review of the categorization and criteria for adding relevant references. Hence, we propose the creation of an intersessional working group to review and update the toolbox template and categorization approach.

RECOMMENDATIONS

1. The SBWG review the updated mitigation 'toolbox' template for artisanal and small-scale fisheries.
2. The SBWG review the categorization and criteria for adding relevant references to the toolbox through the creation of an intersessional working group.
3. The SBWG identify any other additional studies on mitigation methods in artisanal and small-scale fisheries to populate the 'toolbox'.

RESUMEN

RECOMENDACIONES

RÉSUMÉ

RECOMMANDATIONS

1. INTRODUCTION

ACAP has started focussing greater attention on the consideration of seabird bycatch in artisanal and other small-scale fisheries. There are a number of challenges associated with developing advice for the mitigation of seabird bycatch in small-scale fisheries. These include the diverse nature of the gear and methods used by these fisheries, the smaller size of vessels, reduced size and capacity of crew, and lack of mechanisation. All of these, and other, factors necessitate a more flexible and less prescriptive approach to providing advice on seabird bycatch mitigation for small-scale fisheries than has been adopted for industrial fisheries. Consequently, it was agreed at SBWG6 to work towards a model of advice that involves the development of a 'toolbox' of effective mitigation methods, rather than a more prescriptive list. It was recommended at SBWG6 that a useful first step of this process would be to develop a 'toolbox' template, and to include some examples to 'populate' the toolbox and test how it could work in practice. Following discussion and recommendations from SBWG7 and SBWG8, at SBWG9 the preferred toolbox template was improved, the categorization was refined, and the template was further populated with information from new relevant research on bycatch mitigation techniques (Mangel et al. 2019). These updates to the SSF toolbox were endorsed by AC11. At SBWG12, it was agreed to continue developing the toolbox to provide advice on mitigation options available for artisanal and small-scale fisheries, and that further progress to populate the seabird bycatch mitigation toolbox should be made during the next intersessional period and presented at SBWG13. Here, we present an updated toolbox, further populated with up-to-date information on mitigation techniques applicable to small-scale and artisanal fisheries.

2. UPDATED TOOLBOX

An updated mitigation advice document is provided as Annex 1. The introductory text on artisanal and small-scale fisheries, including the challenges and particularities for the development and application of mitigation in these fisheries, as provided by Mangel et al. (2019), remains unchanged, while the updated toolbox table considers new relevant research (Table 1). The table assigns mitigation efficacy status to the mitigation options identified that are, or may be, applicable to a range of different artisanal and small-scale fishing methods.

ANNEX 1. Proposed toolbox template for ACAP mitigation advice for artisanal and small-scale fisheries

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

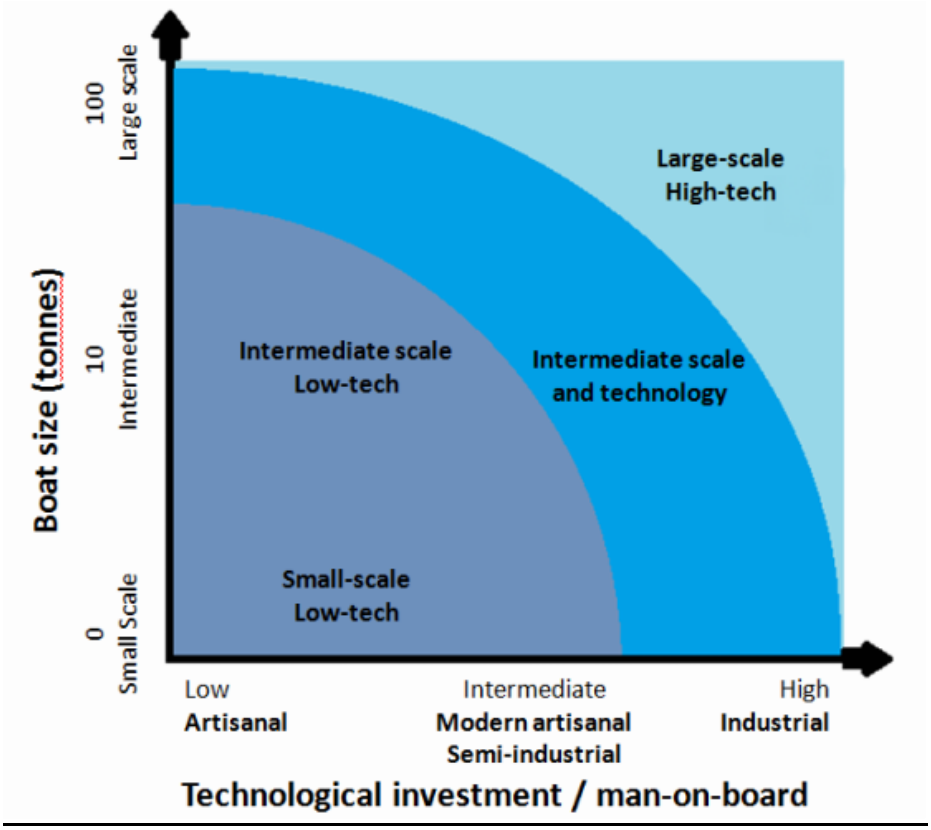

Figure 1. Graphic definition of small-scale, artisanal and industrial fisheries as a function of vessel size and relative technological investment. Adapted from FAO Small-scale and artisanal fisheries at http://www.fao.org/fishery/topic/14753/en

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 toolbox. Text in blue font indicates updates since Mangel et al 2019 (SBWG8 Doc 21). Strike-through text in red indicates suggested deletions.

Demersal setnet

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
Net illumination	Increases net visibility	Small-scale demersal gillnet fishery. Guitarfish and flounder. Sechura Bay, Peru.	Addition of green LEDs reduced guanay cormorant bycatch rate by 85%.	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	✓SSF tested
		Small-scale demersal gillnet fishery. Cod, whitefish, pikeperch, and flounder. Baltic Sea.	Addition of constant green or flashing withe LEDs did not reduce the bycatch of long-tailed ducks and velvet scoters.	No reduction in target catch.	No human safety aspects to be considered.		Cost of LEDs Management of spent batteries	Field et al. 2019	✓SSF tested
High contrast panels	Increase net visibility	Small-scale demersal gillnet fishery. Cod, whitefish, pikeperch, and flounder. Baltic Sea.	Addition of high contrast panels did not reduce the bycatch of long-tailed ducks and velvet scoters.	No reduction in target catch.	No human safety aspects to be considered.		It is necessary to make and install the panels to the net.	Field et al. 2019	✓SSF tested

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
Orange net colour	Increase net visibility	On little penguins (*Eudyptula minor*) in captivity	Orange color monofilament lines resulted in 5.5% lower collision rates. Clear and green monofilament lines resulted in higher rates of collision (35.9% and 30.8%, respectively).		No human safety aspects to be considered.			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 resulted in a 37% and a 47% reduction in the abundance of gulls and northern gannets, respectively, around the vessel.	No reduction in target catch.	No human safety aspects to be considered.			Frade et al. 2025	✓SSF tested

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
Acoustic deterrent (megaphone)	Megaphone emitting pre-recorded calls of the European Herring Gull, slightly louder than the vessel's engine noise. The device, was intended to deter birds by simulating natural distress levels.	Small-scale demersal setnet. Demersal fish species. Southern coast of Portugal.	Megaphone emitting pre-recorded calls of the European Herring Gull significantly increased the abundance of seagulls and northern gannets around the vessel.	No reduction in target catch.	No human safety aspects to be considered.			Frade et al. 2025	✓SSF tested
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.	The utilization of the falcon-shaped bird scarer did reduce gulls and gannets abundance around the vessel or bycatch levels.	No reduction in target catch.	No human safety aspects to be considered.			Frade et al. 2025	✓SSF tested
		Small-scale demersal setnet. Demersal fish species. Berlengas Islands Special Protected Area, Portugal.	The utilization of the bird scarer significantly reduced the abundance and distance from the vessel of gull and northern gannets, reducing bycatch risk.	No reduction in target catch.	No human safety aspects to be considered.			Almeida et al. 2023	✓SSF tested

Mitigation	Function	Testing	Findings	Effect on target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
~~Buoyless nets~~	~~Undetermined but may reduce net vertical profile.~~	~~Small-scale setnet fishery.~~ ~~Groupers, halibut, guitarfish.~~ ~~Baja California, Mexico.~~	~~Reduced sea turtle bycatch rate by 68%~~	~~No reduction in target catch.~~			~~No evidence of seabird bycatch reduction~~	~~Peckham et al. 2015~~	~~✓SSF tested~~
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.		Trippel et al. 2003	✓SSF tested
~~Reduced vertical profile net~~	~~Less net surface area~~	~~Commercial large mesh gillnet fishery.~~ ~~Southern flounder.~~ ~~Pamlico Sound, NC, USA.~~	~~Reduced sea turtle bycatch.~~			~~Maintained acceptable levels of target catches.~~	~~No evidence of seabird bycatch monitoring or reduction.~~	~~Price & Van Salisbury 2007~~	

Driftnet / entangling net

Mitigation	Function	Testing	Findings	Target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
Highly visible netting in upper net and acoustic alarms	Increase net visibility, acoustic reflectivity	Coastal drift gillnet. Salmon. Puget Sound, Washington, USA	Common murre bycatch reduced by 40-45%, depending on treatment. Rhinoceros auklet bycatch reduced by 42% in deep visual alert treatment. Acoustic alarms reduced murre bycatch by 50%.		No human safety aspects to be considered.			Melvin et al. 1999	
Net illumination	Increase net visibility	Small-scale surface drift net. Sharks, tunas, dolphinfish. Off shore Peruvian coast	Addition of LEDs reduced seabird bycatch by 84%. White-chinned petrel corresponded to 72% of total seabird 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	✓SSF tested

Demersal longline

Mitigation	Function	Testing	Findings	Target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
NISURI fastset	Reduces availability of baited hooks for birds during casting.	Small-scale demersal longline. Hake. Ecuador.	Increased set speed ~10x				Requires the production and installation of the NIZURI system.	Brothers et al. 2014	✓SSF Tested
		Small-scale demersal longline. Hake. Ecuador.	Increased set speed ~10x				Requires the production and installation of the NISURI system.	Suaréz & Wallace 2023	✓SSF Tested
Bird scaring line	Scare birds away from the hooks setting area	Small-scale demersal longline. European hake. Western Mediterran.	Bird scaring line (30-45 aerial coverage) did not reduce bird attacks on baited hooks. Nonetheless, the bird scaring line increased the distance at which bait attacks occurred.				Suitable only for demersal longline vessels that operates similarly to industrial vessels.	Cortês and Gonzáles-Solis 2018	✓SSF Tested
Night setting	Less bird activity and reduce visual detection of baits by birds	Small-scale demersal longline. European hake. Western Mediterranean.	Night setting reduced bait attacks by Scopoli's shearwaters and Audouin's gulls.					Cortês and Gonzáles-Solis 2018	✓SSF Tested

		Small-scale demersal longline. Tilefish and various species of snapper and grouper. Southeast Brazil.	Night setting reduced seabird bycatch substantially	Not evaluated. The fleet mostly sets during the day aiming maximum catch. Night setting may reduce target catch.	No human safety aspects to be considered.			Canani et al. 2023	✓SSF Tested

Pelagic longline

Mitigation	Function	Testing	Findings	Target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
Bird scaring line	Scare birds away from the hooks setting area.	Small-scale pelagic longline. Sharks. Southern Peru.	Birds were displaced further astern when the bird scaring line was deployed.	The utilization of bird scaring lines do not reduce target catch. Potential to increase catch due to reduction of baits stealing by birds.		Reduces baits stealing by birds.		Quinones et al. 2024	✓SSF Tested

Hand-operated drop line

Mitigation	Function	Testing	Findings	Target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status
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 effect on 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	✓SSF Tested

Purse-seine

Mitigation	Function	Testing	Findings	Target catch	Human safety considerations	Additional benefits	Limitations / considerations	Source	Status

Legend (proposed categorisation of status in terms of mitigation efficacy):

	Reduced bycatch of ACAP species
	Reduced seabird bycatch, not proven for ACAP species
	No reduction in seabird bycatch, but reduced other bycatch fauna (e.g. marine turtles, small cetaceans)
	Testing in progress or tested in non SSF fisheries
	No reduction in bycatch

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