Agreement on the Conservation of Albatrosses and Petrels

Sixth Meeting of the Seabird Bycatch Working Group

Punta del Este, Uruguay, 10 - 12 September 2014

Identification of minimum elements to review the effectiveness of seabird bycatch mitigation regulations in tuna RFMOs

ACAP Intersessional Group

SUMMARY

In April 2013, at the seventh meeting of the Advisory Committee of the Agreement for the Conservation of Albatrosses and Petrels, an intersessional group was established to discuss what methods might be most appropriate to review the effectiveness of seabird bycatch mitigation regulations in tuna RFMOs, and to identify minimum elements that should be considered. This document provides information on the work of this group, together with opportunities that could be considered for additional work.

RECOMMENDATIONS

1. That the SBWG review and endorse the recommendations of the intersessional group regarding:
    - elements for reviewing RFMO bycatch mitigation requirements against best practice mitigation advice
    - minimum RFMO data collection standards for seabird bycatch
    - elements to measure implementation of RFMO seabird CMMs
    - the approach to monitoring seabird bycatch in RFMOs
2. That the SBWG consider and provide advice on additional future work of this group specifically in relation to the 2015 ICCAT review, and the WCPFC discussion of management objectives.
3. That the SBWG consider and provide advice on efforts to harmonise methods to review the effectiveness of seabird bycatch mitigation measures across tuna and other RFMOs.

Identificación de elementos mínimos para evaluar la efectividad de las reglamentaciones sobre mitigación de captura secundaria de

En abril de 2013, durante la séptima reunión del Comité Asesor del Acuerdo sobre la Conservación de Albatros y Petreles, se formó un grupo intersesional para estudiar qué métodos podían ser los más adecuados a la hora de evaluar la efectividad de las reglamentaciones sobre mitigación de la captura secundaria de aves marinas en las OROP atuneras e identificar los elementos mínimos que debían considerarse a tal fin. Este documento brinda información sobre el trabajo de dicho grupo, junto con las oportunidades que podrían considerarse para su tarea futura.

RECOMENDACIONES

1. Que el GdTCS evalúe y apruebe las recomendaciones del grupo intersesional sobre los siguientes aspectos:
    - elementos de revisión de los requisitos en materia de mitigación de captura secundaria en las OROP según las recomendaciones sobre mejores prácticas de mitigación;
    - normas mínimas de recopilación de datos sobre captura secundaria de aves marinas en las OROP;
    - elementos para evaluar la implementación de medidas de ordenación y conservación de aves marinas en las OROP; y
    - método para monitorear la captura secundaria de aves marinas en las OROP.
2. Que el GdTCS considere y proporcione recomendaciones sobre las tareas futuras de este grupo, particularmente en relación con la revisión de la ICCAT de 2015, y sobre el debate de la WCPFC referente a los objetivos de ordenación.
3. Que el GdTCS considere y brinde recomendaciones sobre los esfuerzos por homogeneizar los métodos para evaluar la efectividad de las medidas de mitigación de captura secundaria de aves marinas en las OROP atuneras y otras OROP.

Identification des éléments de base destinés à évaluer l'efficacité des réglementations d'atténuation des captures accessoires d'oiseaux marins au sein des ORGP thonières

Un groupe intersessions a été créé en avril 2013, lors de la Septième Réunion du Comité consultatif de l'Accord sur la Conservation des Albatros et des Pétrels, dans le but de discuter des méthodes les plus appropriées pour évaluer l'efficacité des réglementations d'atténuation des captures accessoires d'oiseaux marins au sein des ORGP thonières et d'identifier les éléments de base à prendre en compte. Le présent document fournit des informations sur le travail du groupe, ainsi que sur les possibilités de poursuite des travaux à envisager.

RECOMMANDATIONS

1. Il est recommandé que le GTCA examine et approuve les recommandations du groupe intersessions concernant :
    - les éléments permettant d'évaluer l'efficacité des réglementations d'atténuation des captures accessoires au sein des ORGP par rapport aux bonnes pratiques d'atténuation
    - les normes de collecte des données de base des ORGP relatives à la capture accessoire d'oiseaux marins
    - les éléments permettant de mesurer la mise en œuvre des mesures des ORGP relatives à la conservation et à la gestion des oiseaux marins
    - l'approche de suivi des captures accessoires d'oiseaux marins dans les ORGP
2. Il est recommandé que le GTCA examine et émette des avis sur les travaux futurs supplémentaires de ce groupe, particulièrement en relation avec l'examen 2015 de la CICTA et la discussion de la WCPFC sur les objectifs de gestion.
3. Il est recommandé que le GTCA examine et émette des avis sur les efforts d'harmonisation des méthodes d'évaluation de l'efficacité des mesures d'atténuation des captures accessoires d'oiseaux marins au sein des ORGP thonières et des autres ORGP.

1. BACKGROUND

At the seventh meeting of the ACAP Advisory Committee in April 2013, an intersessional group was established to progress the identification of minimum elements and appropriate methods and indicators to review the effectiveness of seabird bycatch mitigation requirements in the tuna RFMOs. An additional aim of the group was to consider the value of harmonising such methods across the tuna and other RFMOs so that cumulative impacts on albatrosses and petrels can be assessed and monitored. The starting point of this process was agreed as an intersessional discussion and elaboration of the R2 (Response) indicators proposed in SBWG5 Doc 13, namely 'Engagement with RFMOs on seabird bycatch issues'.

The group agreed to submit a paper to the 2013 meeting of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) Ecologically Related Species Working Group (ERSWG), which took place from 28 to 31 August 2013. This paper is included in **Annex 1**.

2. CCSBT ECOLOGICALLY RELATED SPECIES WORKING GROUP MEETING

Discussion at the ERSWG is summarised in the extract from the ERSWG meeting report, shown in **Annex 2**. As a result of this discussion, the CCSBT recommended that a Technical Group be established to provide advice to the ERSWG on feasible, practical, timely, and effective technical approaches for measuring and monitoring the effectiveness of seabird bycatch mitigation measures in Southern Bluefin Tuna longline fisheries. The proposed Terms of Reference (ToR) for this Technical Group are included in **Annex 3**. The ERSWG also agreed to hold a workshop on this issue, which will take place from 4 to 6 November 2014 in Tokyo, Japan. There will be a scoping paper prepared for the CCSBT workshop, and plans to develop this are under discussion.

3. ICCAT SUB-COMMITTEE ON ECOSYSTEMS MEETING 2014

The ACAP intersessional group also agreed to submit an updated version of the CCSBT paper to the meeting of the ICCAT Sub-Committee on Ecosystems, from 1-5 September 2014 in Portugal. This reflects the fact that ICCAT is due to undertake a review of its seabird conservation measure (Rec 11-09) in 2015, and that this paper could assist ICCAT in discussing and developing methods that could be used to undertake the review.

4. WCPFC MANAGEMENT OBJECTIVES

The group is also aware of the work underway in the Western and Central Pacific Fisheries Commission to develop management objectives. WCPFC has undertaken two Management Objectives workshops, one in 2012 and the other in 2013). Although the primary focus of this process is on performance indicators for fish stock management, ecosystem indicators have been discussed briefly and some general objectives have been agreed. These include 'minimising catch of non-target species' and to 'avoid, remedy or mitigate' such bycatch. WCPFC is seeking expert advice on appropriate objectives, performance indicators and target and limit reference points for seabird bycatch. In this context, a target reference point might, for example, be close to zero, whereas a limit reference point would be some higher value such as 0.05 birds per 1000 hooks. If the development and implementation of management objectives is

likely to be the future operating basis for WCPFC, then it would be important that seabirds and other bycaught species are included in the process to ensure appropriate management objectives are developed. Views are invited from SBWG on whether it would be useful to submit an adapted version of the CCSBT/SBWG5/doc15 document to the WCPFC Management Objectives Workshops planned for 2014 and 2015.

ANNEX 1: PAPER SUBMITTED BY THE ACAP INTERSESSIONAL GROUP TO THE CCSBT ERSWG MEETING IN 2013

Preliminary identification of minimum elements to review the effectiveness of seabird bycatch mitigation regulations in tuna RFMOs

Paper to submit to CCSBT ERSWG meeting 2013

Author: ACAP Intersessional Group

Contributors: C. Small, A. Wolfaardt, G. Tuck, I. Debski, W. Papworth, Mi Ae Kim

Summary

The five tuna regional fishery management organizations (RFMOs) have established requirements for their pelagic longline vessels to use seabird bycatch mitigation measures in most areas overlapping with albatrosses and petrels, and have plans to monitor and review the effectiveness of these measures. However, methodologies or criteria for review have not yet been defined. This paper summarizes the preliminary views of an ACAP (Agreement on the Conservation of Albatrosses and Petrels) intersessional group that has been formed to discuss what the minimum elements may be for such reviews. This paper recommends the following four elements should be part of monitoring the effectiveness of the seabird conservation measures:

1. *The extent to which the tuna RFMO seabird measure(s) reflects 'best practice' seabird bycatch mitigation for pelagic longline fisheries, and has appropriate spatial, temporal and vessel application*
2. *The availability and quality of the data available for the review*
3. *The degree of implementation by vessels (compliance)*
4. *Analysis of seabird bycatch over time, most likely including*
    a. *Reported bycatch rates (birds per 1000 hooks)*
    b. *Total number of birds killed per tuna RFMO per year*

In addition, the paper recommends adoption of harmonized review methods across tuna RFMOs, in addition to ongoing efforts to harmonize tuna RFMO bycatch data collection, reporting and storage processes.

1. Background

All five tuna commissions have established seabird bycatch mitigation requirements for longline vessels in most areas overlapping with albatross and petrel distribution, although with some variation in the required mitigation measures (Table 1).All tuna RFMO seabird bycatch measures have provisions for review of the effectiveness of these measures. In ICCAT and IOTC there are specific commitments to

reviews in 2015 and 2016, whereas in the others there are commitments to regular review, but with unspecified time frames (Table 1). The methods or criteria for such reviews have not yet been established.

This issue is on the agenda for CCSBT ERSWG 10 (Agenda item 4.1.5). In addition, the ICCAT Sub-Committee on Ecosystems had on its July 2012 meeting agenda the following objective '*Define the strategy to evaluate the efficacy of the seabird bycatch mitigation measures defined under Rec. [11-09]*', but a lack of proposed methodology meant that this agenda item was not addressed. In April 2013, at the seventh meeting of the Advisory Committee of the Agreement for the Conservation of Albatrosses and Petrels, an intersessional group was formed to discuss what methods might be most appropriate, and to identify minimum elements that it believes should be considered (ACAP 2013).

The tuna RFMO seabird measures are currently largely focused on addressing the seabird bycatch issue in relation to albatrosses and petrels, and this document therefore focuses on these species, but the elements presented below are intended to be applicable for all seabird bycatch species.

2. Minimum elements for tuna RFMO reviews of seabird conservation and management measures

Below is a preliminary summary on views collected during ACAP intersessional discussion. These discussions have also drawn from previous papers submitted to ACAP (including Wolfaardt 2011, Anderson and Small 2012, Small 2013, Turner & Papworth 2013). At the ACAP Advisory Committee meeting in April 2013, the group recognized that methods proposed must take into account the availability of data (quantity of data and level of detail), as well as realistic capacity of tuna RFMOs to analyze and review data. It is also important that RFMOs have effective mechanisms to monitor formally and ensure implementation of the required bycatch mitigation measures. It is recommended that the following four elements be part of monitoring the effectiveness of tuna RFMO seabird measures.

2.1 Content of tuna RFMO seabird conservation measures

This element is most closely linked to the process of review that is already ongoing in the ecosystem and bycatch working groups of most tuna RFMOs, has been underway for several years, and has led to the establishment of the existing tuna RFMO seabird bycatch conservation measures. However, it is important to maintain (and formalize where not yet formalized) the existing process by which the tuna RFMOs regularly consider updated information on bycatch mitigation best practice. We recommend that this must include:

- Assessment of whether the current tuna RFMO bycatch measures reflect best practice (bycatch mitigation requirements and their technical specifications)
- Assessment of the spatial and temporal application of the bycatch mitigation requirements
- Assessment of the range of vessels to which the bycatch mitigation requirements applies

Currently, each tuna RFMO conducts this review independently of the other tuna RFMOs, but other options could be considered, such as use of the joint tuna bycatch expert group, or use of the best practice advice that is agreed by the ACAP Seabird Bycatch Working Group. In addition, CCSBT has proposed

leading global work on assessment of the impacts of fishing for tunas on seabirds as well as porbeagle sharks.

As of 2013, the best practice advice provided by ACAP for reducing seabird bycatch in pelagic longline fisheries is to use simultaneously a combination of bird scaring (tori) lines, setting lines at night, and using line weights. In terms of reviewing tuna RFMO seabird conservation measures against ACAP Best Practice Advice, elements to measure would be:

- How many of the three key measures are required (branch line weighting, night setting and bird scaring lines) – this could be a three point scale
- Whether technical specifications for each of the three measures meet the ACAP Best Practice minimum standards – this could be a three point scale (yes/almost/no).

An additional factor that could be considered within 'best practice' is the extent to which a bycatch mitigation requirement can be easily monitored for compliance by flag or port states, and the results reported to the RFMO for inclusion in their review process.

2.2 Data collected and reported by tuna RFMO longline fleets

The results of any review will depend on the quantity and quality of data available, and this therefore needs to be monitored. Data availability will also determine the methods that can be used for a review.

Bycatch data collection

All tuna RFMOs have established requirements for their longline fleets to have at least 5% observer coverage, with CCSBT having a recommendation of 10% observer coverage since 2001. CCSBT, IOTC and WCPFC have established data collection standards for their longline observer programs and the process is underway in IATTC. ICCAT has not yet developed observer data collection standards. There remains a need for harmonization of minimum observer data standards for longline vessels across tuna RFMOs, and ICCAT has offered to lead this (ICCAT 2012). Comparisons of existing tuna RFMO observer data collection methods have been undertaken in, for example, Wolfaardt 2011, Anderson and Small 2012, Turner and Papworth 2013.

Minimum observer data collection standards for bycatch have been discussed in a variety of fora, with ACAP recommendations for tuna RFMOs in Wolfaardt (2011). These suggest that the key elements that must be assessed in relation to availability of data include:

- Quantity of observer coverage (% total effort observed), and its spatial and temporal representivity
- The number of birds caught as bycatch, recorded to species level if possible.
- Data on the use of mitigation measures, and on other factors that affect bycatch rates

In addition, it is widely recognised that 5% coverage is unlikely to be enough to accurately monitor rare catch events such as those for seabird and turtles, and that the 5% current target coverage is the result of a

pragmatic approach to increasing observer coverage from current very low levels. However, attention needs to be given on how to monitor bycatch when observer coverage rates remain low, and how coverage levels could be increased to 20% and above, which may require for example the use of electronic monitoring. Compliance procedures to enforce data collection standards and reporting should also be elements of the review

Bycatch data reporting

Observer program bycatch data, and fishing effort data, will need to be reported to RFMO Secretariats at a resolution of at least 5x5 degrees and by year quarter, in order for meaningful analysis and comparisons of seabird bycatch rates to be feasible. Reporting is needed on all elements identified in the section above.

Currently, WCPFC requires member states to submit raw observer data to the WCPFC Secretariat (WCPFC CMM 07-01), and IOTC also has agreed detailed reporting protocols, which include spatial (5x5°) and temporal stratification of observer data (IOTC Resolution 11-04). In 2012, CCSBT refined its reporting requirements for national reports submitted to the Ecologically Related Species Working Group (CCSBT 2012). However, ICCAT and IATTC have not yet developed their reporting requirements, although these are under discussion. The CCSBT ERSWG and the ICCAT Sub-Committee on Ecosystems have noted that it would be highly beneficial for reporting requirements to be harmonized across the tuna commissions in order to be able to assess cumulative impacts on non-target species (CCSBT 2012, ICCAT 2012). The IOTC has agreed data confidentiality and data sharing provisions which could be useful in relation to the other tuna RFMOs.

Fishing effort data

In addition to bycatch data, data on spatial and temporal distribution of fishing effort is needed. Work undertaken by ICCAT and IOTC Secretariats to fill effort data gaps has been important in facilitating seabird risk assessments to date.

2.3 Degree of implementation

Measurement of degree of implementation of bycatch mitigation measures at (i) the fleet level and (ii) set by set level is central to understanding whether seabird conservation measures have been effective. However, methods to monitor compliance with bycatch mitigation measure requirements have not yet been substantially discussed within tuna RFMOs' compliance committees.

Four elements which may be feasible to measure within CCSBT (and other tuna RFMOs if they take up similar requirements for annual reporting) are:

- The proportion of sets in which the required bycatch mitigation measures were used, when fishing in the specified areas (self reporting via log books). The flag states would then report this proportion to the Ecosystem and Bycatch working group of the relevant tuna RFMO.

- The proportion of sets in which the required bycatch mitigation measures were used, when fishing in the specified areas, verified by an independent source. This independent source could be (i) data recorded by observers, though recognizing that required observer coverage is only 5% (ii) port inspection, though recognizing presence of mitigation measure devices in port does not necessitate that they were used on all required sets (iii) data reported to the flag state from vessel VMS or electronic monitoring data to establish whether mitigation measures were used (for example, night setting, bird scaring lines or line weights).
- The proportion of vessels (or captains/crew) which have received education and outreach on bycatch mitigation within the last 1 or 2 years
- The extent to which the observers are receiving training on recording bycatch (the key training elements in training for seabird bycatch monitoring could be defined).

Such systems and arrangements for reporting use of mitigation measures are not yet widely in place. However, CCSBT's new Template for the Annual Report to the Ecologically Related Species Working Group, agreed at the ERSWG 9 meeting in 2012, includes the request for member states to report data on compliance with seabird bycatch mitigation requirements (CCSBT 2012 Attachment 4). Both the IOTC and WCPFC regional observer program data collection forms also require information on the seabird bycatch mitigation measures used in each set (including night setting, line weights, bird scaring line) (IOTC 2013, WCPFC 2013a). In addition, WCPFC requires member states to report data in logbooks on start time of each set (WCPFC 2012), and the WCPFC seabird measure has a general requirement for member states to report on mitigation used (paragraph 9, WCPFC CMM 2012-07), although there is not a specific part of the Annual Report template that addresses this (WCPFC 2013b). As noted above, IATTC and ICCAT have yet to establish their longline observer program data collection and reporting protocols.

Across the tuna RFMOs, work is ongoing to elaborate monitoring, control and surveillance systems, with developments across all tuna RFMO Compliance Committees. If bycatch conservation measures are to be effective, and if their effectiveness is to be monitored, the assessment of compliance with non-target species CMMs will need to form part of the work of these Compliance Committees, including when port inspection, at-sea inspection, electronic monitoring or observer program protocols are developed.

2.4 Measure of seabird bycatch

There are a range of methods that might be used to monitor levels of tuna RFMO seabird bycatch, or seabird bycatch impacts, ranging from simple to more complex. Examples of possible approaches are shown in Table 2.

A decision on the most appropriate method will be guided by factors such as data availability, available capacity and resources to undertake the review and review objectives. The impact of data availability on analytical methods was discussed at the ACAP Seabird Bycatch Working Group in April 2012, and a summary is provided in Table 3.

Based on the level of data that are likely to be available to tuna RFMOs in the near future, we recommend that the most feasible approaches to monitor the effect of tuna RFMO seabird conservation measures on seabird bycatch rates/levels/impacts are:

- Seabird bycatch rates (birds per 1000 hooks), tracked over time, with information on spatial and temporal distribution of data, and a measure of robustness of estimate
- Estimate of total number of birds killed per tuna RFMO per year, tracked over time, and including measures of error

Bycatch rates (birds per 1000 hooks) are included because these are data which should become available from tuna RFMO observer programs. It will be important to monitor bycatch rates adjusted for spatial and temporal stratification (as outlined in 3.2), and for estimates of bycatch to include error estimates, with information on how the bycatch rates were estimated.

Since a reduction in bycatch rates does not necessarily mean that the total number of birds killed is reduced (for example if the total fishing effort in areas overlapping with albatrosses and petrels increases), there is also a need to monitor the total number of birds estimated killed per year, which can be tracked over time. A request for WCPFC and IOTC Scientific Committees to estimate total number of seabirds killed per year is included in the current WCPFC seabird measure (CMM 2012-07), and was in IOTC Resolution 10-06, although is not in the current IOTC Resolution 12-06.

More sophisticated methods of monitoring bycatch levels and impacts, such as population modeling, may be possible for some species or colonies. However, several factors restrict the circumstances in which population modeling is possible: (i) few observer programs are currently able to identify seabird bycatch to species level (ii) population models to date have focused on a colony rather than an entire population, but bycatch cannot yet be attributed to colony in most cases (iii) the time lag between bycatch reductions and population/demographic data response makes it more difficult to determine impact (iv) tuna fleets are just one part of seabird bycatch (v) other factors affecting demographic parameters, including climate change, will make it more difficult to detect an effect. However, population modeling can contribute important additional insights into understanding impacts of bycatch, including identification of (i) life-history or breeding stages most vulnerable to fishing impacts (by fleet/area/time) (ii) whether current levels of predicted bycatch are sustainable (iii) identifying other measures that may be effective e.g. spatial management. In addition, some seabird species may be more amenable to population modeling, for example through being more spatially restricted, which would allow more confident assignment of provenance of each bycaught bird. In addition, it may be necessary that a review of effectiveness of seabird bycatch mitigation measure includes some evaluation of population level impact.

Use of seabird population status (e.g. species' population trend) as an indicator of effectiveness of tuna RFMO seabird measures is also complicated because of factors such as (i) assumption that tuna fleets have an impact that is large relative to other fleets, i.e. sufficiently large to detect an impact (ii) the impact of other fleets and non-fishing factors on the population (iii) time lag between management measure effectiveness and demographic response (iv) the difficulty in assigning management effectiveness in one area to specific colonies. However, improved population trend and status is clearly an ultimate objective of seabird bycatch mitigation efforts.

3. Harmonization of review across tuna RFMOs

Given that many albatross and petrel species migrate between the areas of more than one tuna RFMO, having a harmonized tuna RFMO system for monitoring overall seabird bycatch and conservation measure effectiveness is necessary in order that cumulative impacts on each species can be assessed. In order to undertake a wider-scale assessment of bycatch and thus consider the cumulative impacts, data collection and reporting protocols also need to be standardised across tuna RFMOs.

In addition, assessment of the effectiveness of the tuna RFMO seabird measures would benefit from a centralised approach to bycatch data management at the tuna RFMO level (or even joint tuna RFMO level). It could provide a useful gap analysis in terms of low levels of observer coverage and/or data accessibility. This would require a centralised database, managed by one or more RFMO Secretariats.

4. Conclusion

Given that all five tuna RFMOs have now established seabird bycatch mitigation requirements, it is a useful time to consider how the effectiveness of these measures might best be monitored, or at least to identify minimum essential elements that reviews should include, and to consider the data collection and reporting that would be needed in order to facilitate this analysis. We recommend four elements that we consider important to include in such reviews. In addition, if review methods were harmonized across the tuna RFMOs, this would facilitate seabird bycatch comparisons between tuna RFMOs. For those seabird species that are distributed across multiple tuna RFMO areas, this is necessary in order to assess cumulative impacts on these species.

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Table 1. Currently active tuna RFMO seabird conservation and management measures and plans to review the effectiveness of these measures

Tuna RFMO seabird measure	Seabird bycatch mitigation requirements	Intent to review
ICCAT Recommendation 11-09	Use at least two of the following mitigation measures: night setting with minimum deck lighting, bird-scaring lines, or line weighting in the area south of 25˚S with minimum technical standards. Use bird-scaring lines in the area between 20˚S to 25˚S (swordfish vessels can instead set lines at night and use line weights of >=60g within 3 m of the hook). Vessels in the Mediterranean are encouraged to use mitigation measures on a voluntary basis.	Paragraph 8. In 2015, the SCRS shall conduct another fishery impact assessment to evaluate the efficacy of these mitigation measures. Based on this fishery impact assessment, the SCRS shall make appropriate recommendations, if necessary, to the Commission on any modifications.
IOTC Resolution 12-06	Use at least two of the following measures: night setting with minimum deck lighting, bird-scaring lines (tori lines) or line weighting in the area south of 25˚S with the minimum technical standards	Paragraph 6. The Scientific Committee, based notably on the work of the WPEB and information from CPCs, will analyse the impact of this Resolution on seabird bycatch no later than for the 2016 meeting of the Commission. It shall advise the Commission on any modifications that are required, based on experience to date of the operation of the Resolution and/or further international studies, research or advice on best practice on the issue, in order to make the Resolution more effective
WCPFC CMM 2012-07	Use two of weighted branch lines, night setting or tori lines, in the area south of 30˚S; use at least two of bird streamer line, line weights, night setting, side setting with a bird curtain, blue-dyed bait, line shooter, offal management, including at least one of the first four of these, in the area north of 23˚N. CCMs are required to report annually on mitigation used, bycatch rates and total number of birds killed; vessels encouraged to undertake research and ensure safe handling and release;	Paragraph 6. The SC and TCC will annually review any new information on new or existing mitigation measures or on seabird interactions from observer or other monitoring programmes. Where necessary, an updated suite of mitigation measures, specifications for mitigation measures, or recommendations for areas of application will then be provided to the Commission. Paragraph 8: The intersessional working group for the regional observer programme will take into account the need to obtain detailed information on seabird interactions to allow analysis of the effects of fisheries on seabirds and evaluation of the effectiveness of bycatch mitigation measures.

Tuna RFMO seabird measure	**Seabird bycatch mitigation requirements**	**Intent to review**
IATTC Resolution C-11-08	Use at least two of the following mitigation measures: bird scaring line, line weights, night setting, side setting with a bird curtain, blue-dyed bait, line shooter, offal management, underwater setting chute, including at least one the first four of these, in the area north of 23˚N and south of 30˚S, plus the area bounded by the coastline at 2˚N, west to 2˚N-95˚W, south to 15˚S-95˚W, east to 15˚S-85˚W, and south to 30˚S, with minimum technical standards.	Paragraph 11: The effectiveness of this resolution to reduce seabird bycatch in the EPO, including the mitigation measures in Table 1, the area of application, and the minimum technical specifications adopted pursuant to this resolution, shall be subject to review and possible modification, taking into account the scientific advice from the Working Group on Bycatch, the SAC, and the IATTC scientific staff.
CCSBT ERS Recommendation 2011	Comply with all IOTC, WCPFC and ICCAT measures; report data on interactions to the Commission which is authorized to exchange it with other tuna RFMOs	Paragraph 6: The Extended Commission will review the operation of this Recommendation with a view to enhancing the protection of ecologically related species from the impacts of fishing for southern bluefin tuna.

Table 2. Examples of methods that could be used to measure seabird bycatch rates, levels or impacts over time in tuna RFMOs as part of a review of the effectiveness of the tuna RFMO seabird conservation measures

Method	Description	Examples of use
Track reported seabird bycatch rates	Tuna RFMOs could monitor reported seabird bycatch rates (birds caught/1000 hooks) over time, with expectations that rates would decrease as mitigation measures are implemented, and with the potential to make comparisons between different fleets. However, this approach would need to be able to account of non-reporting fleets, as well as account for bias that may occur from data reported from low or non-representative observer coverage. In addition, given that bycatch rates vary spatially and temporally, it may be that the bycatch rate needs to be standardised to take into account variations in fishing effort distribution. However, currently, ICCAT and IATTC do not require fleets to report their raw or spatially and temporally stratified observer data to RFMO Secretariats, so standardisation would not be feasible. IOTC and WCPFC do have requirements to submit stratified observer data, but very few data have been submitted to date. An additional factor is that impact on seabirds could increase if fishing effort goes up, even if bycatch rates go down: this issue can be overcome by also tracking fishing effort. In some cases decreases/increases in bycatch rates could reflect declining/increasing populations, although this will be a problem for a number of these methods.	Widespread
Estimate number of birds killed per year	Use best available seabird bycatch rate data together with estimates of fishing effort in order to estimate the number of birds killed per year. Spatial and temporal stratification can be used (e.g. best available bycatch rate for each 5x5 degree square and year quarter, multiplied by fishing effort). Bycatch rates may be estimated for non-reporting fleets using the nearest bycatch rate estimate. Estimates of the number of each species killed could be made if reliable species level data were available. The 2012 meeting of the CCSBT Ecologically Related Species Working Group recommended that data be reported in such a stratified way that CCSBT could estimate total seabird mortality, and that such reporting be harmonized with other tuna RFMOs as far as possible (paras 32 and 56, CCSBT 2012).	Klaer 2012, Yeh et al. 2013.
Risk assessment	Estimate and monitor bycatch risk using data on seabird distribution and fishing effort combined with a measure of a species' vulnerability to bycatch, where *vulnerability* is derived from a detailed observer data set in which bycatch rates by species are compared to estimated species distribution. An estimate of the number of birds caught can be created by weighting seabird distribution by population size, and this can be compared to estimates of Potential Biological Removal, if demographic parameters are available. *Vulnerability* will be affected by the degree of implementation of seabird bycatch mitigation measures, therefore to track the	Waugh et al 2012 Richard and Abraham 2013 Richard et al.

Method	**Description**	**Examples of use**
	effectiveness of tuna RFMO seabird measures, the *vulnerability* measure (or at least degree of bycatch mitigation measure implementation) would need to be tracked for each fleet. Given the data requirements for this type of analysis, this may not be a feasible monitoring tool at the RFMO level.	2013
Population modelling	For those species for which sufficient demographic and population data are available, population models can be constructed which model impact of tuna pelagic longline fisheries at a colony or population level. However, given levels of background noise in such analyses, and impacts of non-tuna fleets, it may not be possible to use this to monitor impacts of seabird bycatch mitigation measures in the tuna pelagic longline fleets.	Tuck *et al.* 2011
Population status	Monitor the population trends and responses of relevant albatross and petrel colonies. However, colonies will be impacted factors other than tuna pelagic longline fleets.	

Table 3. Types of approaches possible in assessing the impact of fisheries on seabird bycatch depending on the spatial/temporal resolution of the data available. The purpose of this information is to provide an indication of how the available data influence the type of assessments that can be carried out (Annex 8, ACAP 2013).

Type 1: Fleet footprint data only	• Summaries of change in the fishing footprint over time. • Low quality risk assessment (possible only if seabird distribution information is available)
Type 2: Fleet wide effort data only	• Annual summary of fishery effort. • Only provides a good indicator of trends in fishing effort if the fishery is stable by season and area through time (not normally the case). Determining the impact on seabirds requires data on seabird bycatch (and distribution of that bycatch)
Type 3: Spatial and temporal effort data (e.g. 5x5 degrees, quarterly)	• Annual spatial and temporal summaries of fishery effort data. • Improved description of fishery effort that accounts for major spatial and/or temporal shifts common in fisheries. • Impact on seabirds requires data on seabird bycatch (and distribution of that bycatch).
Type 4: Spatial and temporal effort data + spatial foraging distributions of interacting birds by species	• An overlap index could be calculated and tracked over time. • While not providing a direct measure of bycatch, an overlap index can give a relative indication of potential interaction. For example, if a fishery relocated to another area beyond the normal range of previously impacted seabirds, the level of bycatch as well as the overlap index would be expected to decline.
Type 5: Bycatch rate data for fleet only	• Annual trends in bycatch rate for fleets could be tracked. • Integration of fleets not examined.
Type 6: Bycatch rate analysis + spatial and temporal effort data available	• Matching corresponding (in space and time) bycatch rates with effort, allowing an estimate of total bycatch (total and by area, time and fleet). • This is what is recommended for ACAP
Type 7: Bycatch rate analysis with seabird species composition + spatial and temporal effort data available	• As above but by species/population
Type 8: Bycatch rate analysis by seabird species + spatial and temporal effort data available + demography parameters	• A population level impact assessment could be conducted; this would enable the estimated bycatch totals (e.g. from 7 above) to be related to the consequent population impact. This can be important as tracking bycatch totals alone may not be giving an indication of population impact.

ANNEX 2: EXTRACT FROM CCSBT ERSWG10 MEETING REPORT

Further discussion of this topic noted paper 17 and the four points listed in the summary of that paper for assessing mitigation measures (See original paper in Annex 1, in which the four elements are listed in the Summary). Under the first point, the ERSWG advised it would be important to know which measures are being used.

64. Under point 3, while it was noted that the ERSWG does not deal with compliance, it would be important in interpreting the data to know what is taking place on the water. HSI further noted that it would be useful to know what level of implementation there is on unobserved vessels.

65. In establishing a method to assess the effectiveness of mitigation methods, it was suggested that a baseline should be established against which new data could be compared. New Zealand noted that there were two ways to approach this question: (1) compare new data to the suggested baseline to see if the catch of seabirds is being reduced and/or (2) assess if the seabird populations are declining or if they have stopped declining.

66. Australia noted that the second option may be more difficult due to expected seabird population recovery timeframes. Indications of whether mitigation measures are effective or not will take substantial time to see in the population trends.

67. In terms of a baseline, ACAP noted that Taiwan and Japan have data across ocean basins and these could be correlated with the mitigation measures in place at the time. As new measures were going to be implemented in other RFMOs, this was an ideal time for the ERSWG to determine what data needed to be collected in order to assess the effectiveness of these mitigation methods.

68. Taiwan commented there were currently enough observer data to undertake some assessments but it should be recognised that there are other confounding factors such as seasonality and spatial factors of each fishery.

69. Korea informed the ERSWG that it carried out a sea trial to facilitate its SBT longline fishery to implement the new mitigation measures in collaboration with BirdLife International in July 2013. Korea further informed that it was scheduled to disseminate and educate the fishers and the scientific observers the implementation of the measures and data collection in 2014, which would be helpful for future assessment of the effectiveness of the new mitigation measures.

70. Recognising the importance of measuring and monitoring effectiveness of seabird mitigation measures in SBT longline fisheries, the ERSWG recommends that a Effectiveness of Seabird Mitigation Measures Technical Group be formed to provide advice to the ERSWG on feasible, practical, timely, and effective technical approaches for measuring and monitoring the effectiveness of seabird mitigation measures in SBT longline fisheries. The suggested Terms of Reference for this group is provided in Annex 3.

ANNEX 3: PROPOSED TERMS OF REFERENCE FOR THE EFFECTIVENESS OF SEABIRD BYCATCH MITIGATION TECHNICAL GROUP (ATTACHMENT 4 IN CCSBT ERSWG10 meeting report)

Effectiveness of Seabird Mitigation Measures Technical Group Terms of Reference

Measuring and monitoring effectiveness of seabird mitigation measures in SBT longline fisheries

Purpose
To provide advice to CCSBT-ERSWG on feasible, practical, timely, and effective technical approaches for measuring and monitoring the effectiveness of seabird mitigation measures in SBT longline fisheries.

Composition
Participation is open to representatives of Members and CNMs, Birdlife International and ACAP with technical, and scientific and other expertise concerning approaches for measuring and monitoring the effectiveness of seabird bycatch mitigation measures. Participation is also open to other invited experts whose particular expertise would make a beneficial contribution to the work being undertaken.

Activities
1. Preparation of a scoping paper that considers approaches for monitoring the effectiveness of seabird mitigation measures in SBT longline fisheries taking into account, among other things:
- proposed elements for monitoring the effectiveness of seabird bycatch mitigation set out in CCSBT-ERS/1308/17(Rev.1)
- need for both immediate and longer-term approaches for monitoring effectiveness
- the feasibility, practicality, timeliness and effectiveness of any proposed approaches for monitoring effectiveness
- ways of conducting retrospective analyses of existing data on seabird bycatch mitigation to test developed methods of measuring and monitoring
- ways of extending monitoring across other tuna RFMOs and bodies with responsibility for seabird bycatch mitigation in longline fisheries
- need to finalise the scoping paper to timelines for ERSWG-11.

2. Conduct of an intersessional workshop involving the participants to discuss ways to measure and monitor the effectiveness of seabird bycatch mitigation measures in longline fisheries and to inform the development of the scoping paper.
3. Participants will develop the scoping paper collaboratively.

Review
These terms of reference will be reviewed by the Ecologically Related Species Working Group and Extended Commission during their next ordinary sessions with a view to developing terms of reference for additional work towards implementing the approaches for monitoring the effectiveness of seabird mitigation measures in SBT longline fisheries set out in the scoping paper.

Resourcing
The workshop will be conducted in English without interpretation. The workshop will be supported by the host Member with minimal involvement of the CCSBT