Australian Government
Australian Fisheries Management Authority

Ecological Risk Management

REPORT FOR THE EASTERN TUNA AND BILLFISH FISHERY

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Summary of priority issues for managing the ecological effects of fishing in the Eastern Tuna and Billfish Fishery

The Ecological Risk Assessment (ERA) process is designed to assess and rank the ecological effects of fishing in Commonwealth fisheries. The process provides a list of species, habitats and ecological communities that are at risk of ecological damage from the effects of fishing. This Ecological Risk Management (ERM) report provides how AFMA will respond to these high risk environmental components.

The ecological effects of fishing in the Eastern Tuna and Billfish Fishery (ETBF) are largely due to the incidental capture of non-target species (including the capture of protected species). The methods of fishing employed in the ETBF (pelagic longline, handline, trolling, polling and rod and reel) were found to have little to no direct impact on the physical marine environment.

The ERA process analysed the effect of commercial fishing in the ETBF, based on the effects on all organisms, habitats and ecological communities that occur in the area of the fishery. The ERA identified nine species at high risk to the effects of fishing in the ETBF which are outlined in Table 1. No target species, ecological communities or habitats were assessed to be at high risk from the effects of fishing in the ETBF.

Table 1: Details the priority species list from the ERA process for the ETBF on which AFMA will focus ERM efforts.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Chondrichthyan	*Isurus paucus*	Longfin Mako	Byproduct	Level 3	Precautionary high risk
Chondrichthyan	*Pseudocarcharias kamoharai*	Crocodile Shark	Byproduct	Level 3	Precautionary high risk
Chondrichthyan	*Alopias pelagicus*	Pelagic Thresher	Byproduct	Level 3	Precautionary high risk
Teleost	*Mola mola*	Ocean Sunfish	Bycatch	Level 3	Precautionary extreme high risk
Teleost	*Mola ramsayi*	An Ocean Sunfish	Bycatch	Level 3	Precautionary extreme high risk
Chondrichthyan	*Carcharhinus obscurus*	Dusky Shark	Byproduct	Level 3	High
Cetacean	*Globicephala macrorhynchos*	Short-finned Pilot Whale	Bycatch	Residual risk assessment	High
Cetacean	*Pseudorca crassidens*	False Killer Whale	Bycatch	Residual risk assessment	High
Marine reptile	*Dermochelys coriacea*	Leatherback Turtle	Bycatch	Residual risk assessment	High

The ERM for the ETBF aims to reduce the effects of fishing on the species in the above priority list. No individual species of seabird is considered to be at high risk however consistent with AFMA's ERM process; all protected species that come into contact with the fishery are managed to minimise interactions and fatalities.

Priority issues for managing the ecological effects of fishing in the ETBF will largely be captured by the actions of the *Australian Tuna and Billfish Longline Fisheries bycatch and discard workplan 2011-2013*. There are however other documents aimed at managing the ecological effects of fishing in the ETBF including the *Eastern Tuna and Billfish Fishery Management Plan 2010,* the Eastern Tuna and Billfish Fishery Harvest Strategy and the Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline operations.

The ERA will be reviewed in 2013 in line with recommendation 1 of the ETBF Wildlife Trade Operation Accreditation under the EPBC Act. The current list of high risk species will be amended according to the results of this review.

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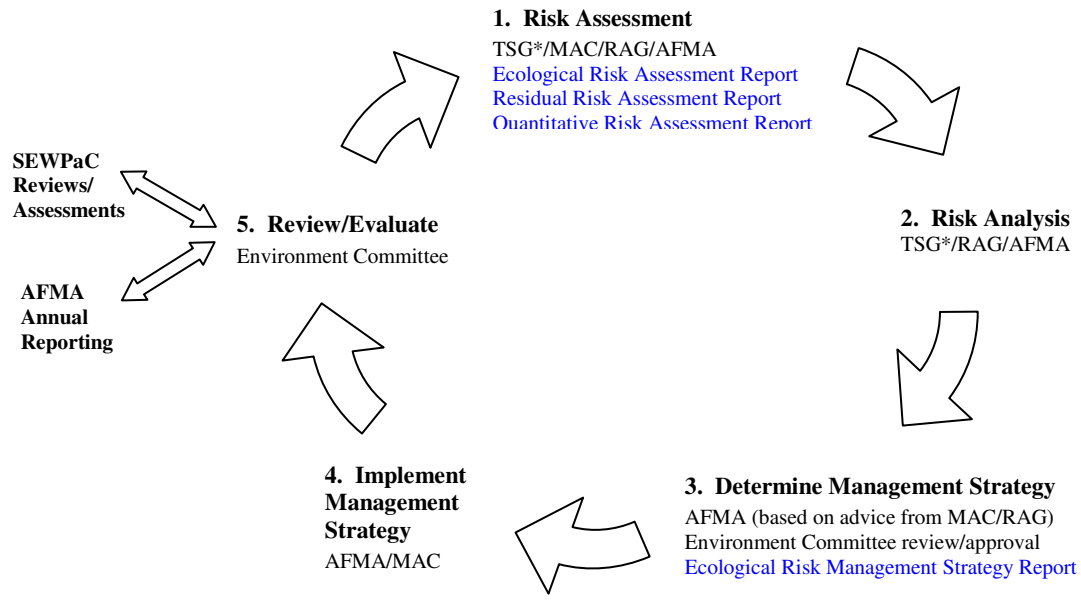
1. OVERVIEW OF THE ERA PROCESS

Implementing ecological risk management in Commonwealth managed fisheries

AFMA aims to minimise the impacts of Commonwealth managed fisheries on all aspects of the marine ecosystem. AFMA's adoption of the Ecologically Sustainable Development (ESD) principle shifts the fisheries management focus from the direct management of target species to also considering the impacts on bycatch species, threatened, endangered and protected (TEP) species, habitats, and communities.

AFMA implement the principles of ESD by developing and implementing ecological risk management (ERM) framework. The ERM details a robust and transparent process to assess, analyse and respond to the ecological risks posed by Commonwealth managed fisheries and is depicted in **Figure 1**.

Figure 1: Simplified Ecological Risk Management framework



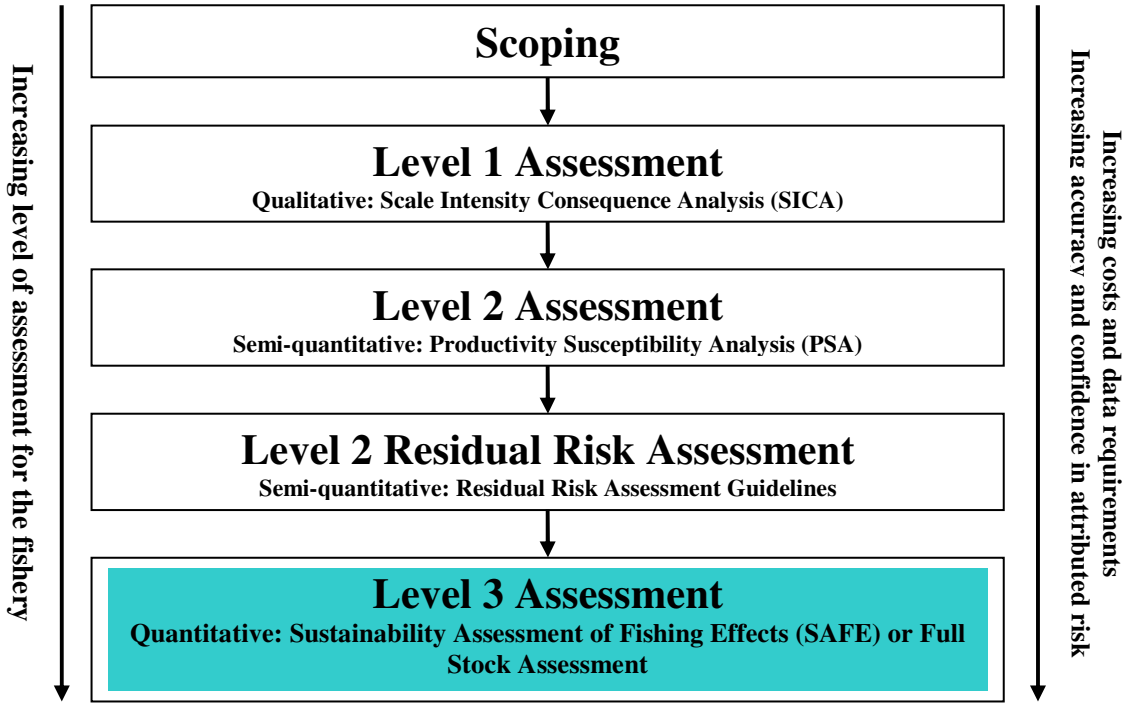
*TSG – Technical Support Group – currently provided by CSIRO

The ERM framework progresses through a number of steps and involves a hierarchy of risk assessment methodologies progressing from a qualitative analysis at Level 1 to a quantitative analysis at Level 3. This is outlined in **Figure 2**.

This approach is a cost and time efficient means of screening out low risk activities and focusing more intensive and quantitative analyses on those activities assessed as having a greater environmental impact on AFMA managed fisheries.

The initial assessment stage involves the development of a qualitative ecological risk assessment (ERA) for each individual fishery. ERAs assess the direct and indirect impacts that a fishery's activities may have on the marine ecosystem. These assessments provide the foundation for further risk assessment and analysis. ERAs have now been completed for all major Commonwealth managed fisheries.

Figure 2: Risk assessment hierarchy



Level 1 – Scale, Intensity, Consequence Analysis (SICA)

This analysis identifies which activities lead to a significant impact on any species, habitat or community. This involves an assessment of the risk posed by each identified fishing activity on whole ecosystem components including target; bycatch and byproduct; TEP species; habitats and communities. Level 1 is used as a rapid screening tool, used to ensure only genuine low risk elements are screened out.

Level 2 – Productivity Susceptibility Analysis (PSA)

This is a semi-quantitative analysis of the risk posed by fishing to all individual species, habitats and communities. Level 2 PSA assesses the direct impact of fishing and is based on the assumption that risk to an individual species, habitat or community is based its susceptibility to the fishing activities and the rate at which it can recover after potential depletion or damage by fishing activities (productivity).

The Level 2 PSA risk scoring system is precautionary in that, where there is no information known on a specific productivity or susceptibility attribute for the species, habitat or community, it is given a default score of 'high risk'.

Level 2 – ERA Residual Risk

The Level 2 PSA assessment does not take into account all of the management measures implemented in the fisheries, which may result in an over-estimate of the actual risk for some species. Before moving to a Level 3 assessment, the residual risk guidelines are applied to account for some of the constraints of the Level 2 PSA. The residual risk process incorporates some of the concepts of a Level 3 assessment and is more cost effective than a full Level 3 assessment. Furthermore, the Level 2 PSA residual risk results more accurately represent overall risk within a fishery and will help clarify if further assessment is necessary.

Level 3 – Quantitative Risk Assessment

This analysis may be warranted for species, habitats or communities that have been identified as high risk after the Level 2 PSA residual risk assessment. The assessment can take various forms including a quantitative sustainability assessment for fishing effects (SAFE) to assess multiple species, or a fully quantitative assessment of a specific species (similar to a standard stock assessment).

ERA Risk Levels

The species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Threatened, Endangered or Protected (TEP) are automatically assessed as High Risk under the Ecological Risk Assessment Framework.

The risk categories attributed through the level 3 assessment (sustainability assessment for fishing effects or SAFE) apply to chondrichthyan and teleost species A high risk species identified under the SAFE methodology is one where the mortality imposed due to fishing activity is greater than half of the maximum sustainable fishing mortality (otherwise known as the limit fishing mortality, F_{lim}). This level of fishing activity may drive populations of the species to very low levels in the longer term.

The SAFE risk categories are further explained in Table 2. Precautionary high risk categories are attributed when the 90% confidence interval of the fishing mortality rate falls within the equation limits of the ERA Risk Level.

The ERA risk levels for these species apply only for the effects of pelagic longline fishing in the area of the ETBF. These risk levels are not broadly applicable to all processes nor are the categories in any way linked to the risk levels advised under the International Union for Conservation of Nature and Natural Resources (IUCN) list of threatened species and should not be confused with this list.

The biological reference points that are used in these tables are explained below:

F_{msm} = Maximum sustainable fishing mortality
F_{lim} = limit fishing mortality which is half of the maximum sustainable fishing mortality
F_{crash} = minimum unsustainable fishing mortality rate that may lead to population extinction in the longer term.

B_{msm} = Limit biomass that supports maximum sustainable fishing mortality
B_{lim} = half of the biomass that supports a maximum sustainable fishing mortality
B_0 = 0% virgin biomass remaining.

The results of the ETBF risk assessment is now the focus for the development and implementation of the ERM strategy in the fishery. Further information on the risk assessment process and methodologies applied can be found on AFMA's website.

Table 2: Explanation of ERA risk levels

ERA risk level	Low	Medium	High	Extreme High
Equation	*F < Fmsm*	*Flim > F > Fmsm*	*Fcrash > F > Flim*	*F > Fcrash*
Equation wording	Fishing mortality Less than Maximum sustainable fishing mortality	Fishing mortality less than limit fishing mortality but greater than maximum sustainable fishing mortality	Fishing mortality less than the minimum unsustainable fishing mortality but greater than limit fishing mortality	Fishing mortality is greater than minimum unsustainable fishing mortality
Ecological consequence	Overfishing not occurring. May keep population above 50% of virgin level	Overfishing is occurring but population can be sustainable	May drive population to very low levels in the longer term	Population is unsustainable in long term – possibility of extinction
Management rule	Reduction of fishing mortality not needed	Reduction in fishing mortality may be required if this mortality occurs over seven consecutive years	Reduce fishing mortality below maximum sustainable fishing mortality if this mortality occurs in five consecutive years	Reduce fishing mortality below maximum sustainable fishing mortality if this mortality occurs in three consecutive years

2. ECOLOGICAL RISK MANAGEMENT PRIORITY LIST

ERM Priority List

The priority list for the ETBF was developed using:

- Level 2 PSA assessment for all other non protected species identified as high risk (completed in June 2007)
- Level 2 PSA Residual Risk (completed in December 2008)
- The Level 3 Sustainability Assessment of Fishing Effects (SAFE) methodology for any teleost or chondrichthyan species identified as precautionary high risk or higher risk category (completed in December 2007).

The results of these risk assessments have been consolidated to form a priority list for the fishery ordered by risk levels as outlined earlier. Table 3 outlines the results of the Level 2 and Level 3 risk assessments.

Table 3: Details the priority species list from the ERA process for the ETBF on which AFMA will focus ERM efforts.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Chondrichthyan	*Isurus paucus*	Longfin Mako	Byproduct	Level 3	Precautionary high risk
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Chondrichthyan	*Carcharhinus obscurus*	Dusky Shark	Byproduct	Level 3	High
Cetacean	*Globicephala macrorhynchos*	Short-finned Pilot Whale	Bycatch	Level 2 Residual risk assessment	High
Marine reptile	*Dermochelys coriacea*	Leatherback Turtle	Bycatch	Level 2 Residual risk assessment	High
Cetacean	*Pseudorca crassidens*	False Killer Whale	Bycatch	Level 2 Residual risk assessment	High

The priority list of species that the ERM strategy will address is provided in groups rather than individual species. The ERM aims to reduce interactions with marine turtles, seabirds and whales due to their TEP status. The ERM also aims to decrease the capture and mortality of sharks; due to their ecological status and results from the ERA process where several species of shark have been identified as high risk.

3. ECOLOGICAL RISK MANAGEMENT STRATEGY

Developing an ecological risk management strategy

In addition, all reasonable steps are being taken to minimise interactions with protected species which have been identified through the ERA process. Once identified, species in the priority list for the ETBF are managed either through fishery specific arrangements or one of the following policies or measures:

- *Eastern Tuna and Billfish Fishery Management Plan 2010*
- Eastern Tuna and Billfish Fishery Harvest Strategy Policy and Guidelines;
- AFMA's broader Bycatch and Discard Program;

- Australia's National Plan of Action for the management of Sharks and Shark Policy
- Memorandum of Understanding with SEWPaC for reporting interactions with protected species;
- Management plans and Bycatch and Discard Workplans for overlapping fisheries;
- Eastern Tuna and Billfish Fishery Sea Turtle Mitigation Plan;
- Threat Abatement Plan (TAP);
- Various international plans of action and recovery plans for Threatened, Endangered and Protected (TEP) species; and
- Five year strategic research plan for the Australian Tuna and Billfish Fisheries.

Australia is also obliged to abide by the Management Measures and Resolutions implemented by the Western and Central Pacific Fisheries Commission (WCPFC) to conserve the populations of sharks, turtles and seabirds in the Western and Central Pacific Ocean. Australia must also abide by Measures adopted by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) which state that Members should implement national plans of action to reduce the interactions between the fishery and non-target species, namely seabirds, sharks and turtles.

Management plans and other policy measures for Commonwealth fisheries incorporate the conservation measures adopted by both CCSBT and WCPFC.

ERM strategies to address those remaining species identified as at medium or low risk may be implemented at a later date. Due to limitations in the ERA methodology, for assessing the impacts of fishing operations on habitats and communities, AFMA will defer the development of an ERM strategy for these components until more refined and meaningful results become available.

Risk Management Strategy to mitigate against the capture of like-species groups

The nature of pelagic fishing operations means that it is difficult to design measures which mitigate the capture of a single species. The aim of the ERM is thus to mitigate against the capture of entire groups of like-species.

Sea Birds

Oceanic longline fishing is listed as a key threatening process for seabirds under the EPBC Act which requires the development of a Threat Abatement Plan (TAP). The TAP requires the ETBF to significantly minimise the bycatch of seabirds in oceanic longline operations and maintain a bycatch rate of less than 0.05 birds per 1000 hooks set in all fishing areas (by five degree latitudinal bands) and all seasons (1 September – 30 April; 1 May – 31 August).

In the ETBF, AFMA has implemented fishing permit conditions aimed at reducing seabird mortality which are consistent with the objectives and prescriptions of the TAP. For example:

- All longline operators fishing *south* of 25 degrees south must deploy a tori line (of specific design requirements), and use a line weighting system and thawed baits. Offal discharge is banned while setting and discharge during hauling should be avoided.
- All longline operators fishing *north* of 25 degrees south in the ETBF, and *south* of 30 degrees south in the WTBF, must carry a tori line. Offal discharge is banned while setting and discharge during hauling should be avoided.

In addition to these compulsory measures, operators in the ETBF have adopted voluntary measures the fishery's *Industry Code of Practice* to minimise seabird bycatch. Such measures include:

- Using a tori line north of 25 degrees South in the ETBF and north of 30 degrees South in the WTBF;
- Puncturing the swim bladders of thawed baits to assist sinking;
- Using bait casting machines;
- Selecting gear that minimises the probability of seabird bycatch;
- Promoting safe handling and release of all seabirds caught alive on longlines; and
- Promoting night setting.

Risk Management Strategy Actions

- AFMA encourage skippers and crew in the ETBF to use a new type of 40g weight at the hook. A recent study has shown these weights sink twice as fast as 60g swivels 3.5m from the hook, thereby reducing the probability of seabirds taking the bait.

- AFMA undertook an extensive seabird bycatch education program in 2009 with interactive workshops at key ETBF ports. Participants were provided with information about management measures designed to minimise seabird bycatch, including highlighting the effectiveness of line weighting and how to correctly assemble and deploy tori lines. A Similar education program was undertaken in 2010. Another Education program for skippers and crew in the ETBF will be undertaken in 2012 as an action item under the Bycatch and Discard Workplan. This program will include information on mitigation measures for seabirds as well as information on best practise for the effective release of turtles and sharks.
- AFMA will conduct a review of the TAP during 2012. This review will be lead by the Australian Antarctic Division and will consider input from industry sectors, environmental NGOs, and other interested stakeholder groups.

Marine Turtles

Six of the seven existing species of marine turtle are found in Australian waters, including the Loggerhead turtle, Green turtle, Hawksbill turtle, Olive Ridley turtle, Flatback turtle and Leatherback turtle.

Even though the estimated marine turtle bycatch in Australian longline fisheries is less than foreign longline fisheries, most species of turtle are considered vulnerable to local and even global extinction due to declining numbers. Reduction in mortality is important for the long-term viability of these species. Historically the majority of interactions that have occurred in the ETBF have been with green and leatherback turtles.

Risk Management Strategy Actions

- A Sea Turtle Mitigation Plan for the ETBF was developed in 2009 to meet requirements under the Western Central Pacific Fisheries Commission (WCPFC) to minimise the bycatch of turtles in Australian longline fisheries. This strategy will be reviewed in 2012.
- The strategy utilises a trigger system that requires the fishery to maintain an observed marine turtle interaction rate at or below the values in Table 4 and specifies management measures AFMA must implement if the interaction rates are exceeded. These management measures include:

- establishing a Sea Turtle Mitigation Working Group if the triggers are exceeded in one year,
- requiring longline vessels that 'shallow set' to target Broadbill swordfish to use whole finfish baits and large circle hooks if the triggers are exceeded in the following year; and
- enforcing a trip limit of 20 swordfish if the triggers are exceeded in the subsequent year.

Table 4: Observed trigger interaction rates for marine turtles in the ETBF.

Species	Interaction rate (per 1,000 observed hooks)
Green	0.0048
Leatherback	0.0040
Loggerhead	0.0040
Hawksbill, Flatback, Pacific (olive) Ridley	0.0040

- In addition, ETBF operators are required to ensure line cutters and de-hookers are carried on board the boat at all times under their Boat Statutory Fishing Right conditions. Line cutters and de-hookers can be used by operators to safely and effectively remove bycatch species such as turtles and sharks caught on the longlines, increasing their chance for survival.
- Mitigation against turtle bycatch, including the use of line cutters and dehookers will also be provided as part of the 2012 ETBF Skipper Education Program.

Sharks

The most commonly caught shark species observed in the ETBF are Blue Shark, Shortfin Mako, Tiger Shark, Dusky Whaler and Crocodile Sharks. The average catch rate of sharks in the ETBF, based on observer records between 2007 and 2010, is 1.4 sharks per 1000 hooks.

The great white and grey nurse sharks are listed as protected species under the EPBC Act. In the ATBF between 2006 and 2010, there have been two Great White Shark interactions reported in logbooks and one was released alive. There have been no Great White Shark interactions observed. Grey Nurse Sharks are largely a coastal shark and there is limited interaction between their range and the tuna fishing grounds. There have been no Grey Nurse Shark interactions reported in logbooks or observed in the ETBF since 2007.

Risk Management Strategy Actions

- A byproduct retention limit of 20 sharks per trip applies in the ETBF. Any excess sharks are classified as bycatch and must be discarded whether alive or dead.
- The use of wire trace is banned in the ETBF to minimise the capture of sharks. In 2009, ABARES and AFMA developed the *Chondrichtyan guide for fisheries managers: A practical guide to mitigating chondrichtyan bycatch*. This guide aims to provide fisheries managers with practical options to mitigate chondrichthyan TEP and high risk species bycatch. Australia is negotiating a National Plan of Action for managing sharks.
- Operators in the ETBF are prohibited from retaining or trading live Shortfin Mako, Longfin Mako and Porbeagle sharks as they were listed as migratory species under the EPBC Act in 2010. These sharks may only be retained if they are brought to the boat already dead. Live sharks of these species must be returned to the sea.

- AFMA have developed a quick identification guide for high risk shark species including Shortfin Mako, Longfin Mako, Dusky Shark, Silky Shark and Bronze Whaler sharks to assist operators in accurate identification and reporting of these species.
- AFMA conducted educational port visits for ETBF operators in July 2011 to highlight this arrangement, and provided operators with line cutters and dehookers to assist operators release shark species in the water. A more comprehensive Skipper Education Program will be run in the ETBF in 2012 to remind operators of their obligations in relation to sharks.

Cetaceans

The majority of interactions with cetaceans (whales and dolphins) involve the cetaceans being hooked or entangled in the fishing gear while predating on tuna from longlines.

All whale species are protected under the EPBC Act. Recent data summaries for the ETBF show few interactions occurring with whales, and in most cases only experience light contact with gear or are easily cut free from tangles. It is rare that animals experience immediate mortality due to these interactions.

The most common whales that have been reported interacting with longlines in the ATBF include Short Finned Pilot whales and Toothed whales, followed by Melon Headed, Humpback and Beaked whales. The majority of whales entangled are released alive.

Between 2007 and 2010 there have been four interactions observed with cetaceans. These species included one Beaked Whale and three Short Finned Pilot Whales. All were released alive without landing.

Risk Management Strategy Actions

- It is compulsory for all operators in the ATBF report interactions with marine mammals in their logbooks. AFMA have developed and sent out a protected species ID guide for all Commonwealth operators to help them identify protected species including marine mammals. AFMA also report all interactions with marine mammals that are protected under the EPBC Act to SEWPaC every three months.
- Operators in the ATBF are also encouraged to trial marine mammal bycatch mitigation devices such as tuna-guards that have been developed by the Australian Antarctic Division. These devices aim to prevent whale depradation of tuna caught on longlines, thereby preventing the whale being caught or entangled.
- Line cutters and dehookers have also been provided to ATBF operators to assist in the healthy release of marine mammals when they are brought up to the boat.

Sunfish

Sunfish are largely a bycatch species in the ETBF which historically have had a low level of retention as they have no commercial value. ETBF operators generally avoid interactions with sunfish as they are likely to be tangled up in the fishing gear, which negatively affects long line fishing operations.

Two species of Sunfish, Mola Mola and Mola Ramsayi, are rated as precautionary extremely high risk in the ERA. This is mostly due to a high level of uncertainty in the data used for the risk assessment and their uncertain life history parameters in that they are thought to have a periodic life history strategy with late maturity, large clutches with low juvenile survivorship. More data needs to be collected on the impacts of fishing interactions on adults of these species and their life history.

Risk Management Strategy Actions

- AFMA is developing a byproduct species policy which will implement arrangements to manage Sunfish bycatch. Until this policy is in place, a trigger limit of 750 sunfish caught in the ETBF per calendar year is implemented in the ETBF.
- AFMA will also promote data collection in the ETBF to enable research into the biology and ecology of these species.

4. REPORTING AND REVIEW

The ERM strategy will be reviewed biannually to ensure consistency with measures outlined in various documents that deal with aspects of minimising fishing impacts on high risk species identified under the ERA. The reporting requirements for each of these associated documents are outlined in Table 5. The ETBF will be reassessed against the ERA methodology in 2013 which is in line with the review of the WTO accreditation for the fishery.

Table 5: Reporting and Review Requirements of Bycatch and Discarding Documents

Document	Reporting Requirement	Frequency
Threat Abatement Plan	AFMA is required to report results of the TAP to the Australian Antarctic Division	As required
Australian Tuna and Billfish Fisheries Bycatch and Discarding Workplan	AFMA will report to the Tropical Tuna Management Advisory Committee and SEWPaC to measure the response to actions from the Workplan	Reviewed Annually Renewed Biannually
Regional measures for sharks, cetaceans, turtles and seabirds	AFMA are required to report interactions and implementation of prescribed actions under WCPFC Conservation and Management Measures for sharks, cetaceans, turtles and seabirds.	Annually to WCPFC Scientific Committee and as required by various regional measures.
Eastern Tuna and Billfish Fishery Harvest Strategy Policy and Guidelines	AFMA is to report on the implementation of the ETBF Harvest Strategy as part of its overall reporting against the Commonwealth Harvest Strategy Policy in its Annual Reports	Reviewed every five years Reported against annually
Sea Turtle Mitigation Plan	AFMA is required to report the results and effectiveness of the measures under the Sea Turtle Mitigation Plan to WCPFC.	Annually to WCPFC Scientific Committee and the Technical and Compliance Committee
Australia's National Plan of Action for the management of Sharks	DAFF's Shark Plan Implementation and Review Committee are responsible for assessing the overall implementation of this document.	Every four years
MOU with SEWPaC	AFMA must report to SEWPAC on interaction rates for each of the protected species listed under the EPBC Act and the High Risk Species under the ERA.	Every three months
Wildlife Trade Operation (WTO) accreditation	Status reporting against Wildlife Trade Operation (WTO) accreditation conditions and recommendations.	Reviewed Annually Renewed Triennially

5. REFERENCES

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