BirdLife INTERNATIONAL

Partnership for nature and people

Bycatch and the Marine Stewardship Council (MSC):

A review of the efficacy of the MSC certification scheme in tackling the bycatch of non-target species

Prepared for BirdLife International by Jose Peiro Crespo and Rory Crawford

Image: Albatross Task Force South Africa

Table of contents

Glossary

ALRT	Atlantic Leatherback Turtle Recovery Team
CCRF	Code of Conduct for Responsible Fisheries
CEFAS	Centre for Environment, Fisheries and Aquaculture Science (UK)
CRF	Coastal Reference Fleet (Norway)
DFO	Department of Fisheries and Oceans (Canada)
EEZ	Exclusive Economic Zone
ETP	Endangered, Threatened and Protected Species
FAD	Fish Aggregating Device
FAO / UNFAO	Food and Agriculture Organization of the United Nations
FIP	Fisheries Improvement Project
FSC	Free School Sets
GINR	Greenland Institute of Natural Resources
GSSI	Global Sustainable Seafood Initiative
IMARES	Institute for Marine Resources and Ecosystem Studies (Netherlands)
IMR	Institute of Marine Research (Norway)
INIDEP	National Institute for Fisheries Research and Development (Argentina)
IOTC	Indian Ocean Tuna Commission
ISEAL	International Social and Environmental Accreditation and Labelling
MFRI	Marine and Freshwater Research Institute (Iceland)
MSC	Marine Stewardship Council
MMRP	Marine Mammal Response Program (Canada)
NAMMCO	North Atlantic Marine Mammal Commission
NARW	North Atlantic Right Whale
NINA	Norwegian Institute for Nature Research (Norway)
NOAA	National Oceanic and Atmospheric Administration (United States of America)
PBR	Potential Biological Removal
RPA	Recovery Potential Assessment
SARA	Species at Risk Act (Canada)
SCANS	Small Cetaceans in the European Atlantic and North Sea
SCRS	Standing Committee Research and Statistics (ICCAT)
UoA	Unit of Assessment
UoC	Unit of Certification
WMR	Wageningen Marine Research (Netherlands)

Executive Summary

The Marine Stewardship Council (MSC) is a seafood certification scheme and ecolabel that sets and maintains a standard for sustainable fishing based on three principles: 1) sustainable target fish stocks; 2) the environmental impact of fishing; and 3) effective management (Opitz et al., 2016). Twelve percent of global marine wild catch is currently certified under the MSC Fisheries Standard (MSC 2017).

Following the codes of best practice established under the United Nations Food and Agricultural Organisation and International Social and Environmental Accreditation and Labelling, MSC's Fisheries Standard has been reviewed and revised several times since it was first developed.

However, the standard does not yet fully ensure that certified fisheries are operating to one of the general principles set out in the FAO Code of Conduct for Responsible Fisheries: the minimisation of non-target catch or 'bycatch' (FAO 1995). This issue has been identified by MSC itself (MSC, 2018e), which is in now in the process of reviewing requirements on Endangered, Threatened and Protected species as part of the next Fisheries Standard Review.

This study undertook a review of non-target bycatch (including elasmobranchs, marine mammals, seabirds and sea turtles) in 23 fisheries (or groups of fisheries) which have been certified by the MSC (with the exception of one fishery, which withdrew before completing the process) to assess the effectiveness of the MSC criteria and standard in ensuring that the impacts of certified fisheries on non-target species are minimised, or at least reduced.

To facilitate comparisons, the 23 fisheries were grouped into six case studies: North Atlantic gillnets, North Atlantic longline, tuna purse seine, Southern Hemisphere trawl, North Sea mixed fisheries and Northwest Atlantic trap fisheries.

This review used a 'red/amber/green' rating approach to rank the performance of certified fisheries with regard to non-target bycatch species data quality; proposed actions to resolve bycatch issues (under MSC's system of conditions of certification); effective implementation of these actions; and documentation of the trend in bycatch rates/levels in the fishery. The primary sources of data for this review were public certification reports (PCRs) and annual surveillance reports produced by Conformity Assessment Bodies (CABs). When alternative data on bycatch were available (e.g. published scientific papers and government reports), these were used to provide an independent source of verification.

This review found that the existing standard is not yet delivering consistent reductions in endangered, threatened and protected species bycatch, with only three of the fisheries reviewed achieving an overall green score, alongside 12 amber and eight red. There is inadequate observer coverage in 14 of the 23 the fisheries assessed, which in turn leads to poor bycatch monitoring and reporting, hindering assessment of the impact on bycatch species in the majority of reviewed fisheries. Among the fisheries reviewed, 'proposed actions' (or conditions) is the criterion which scored lowest – just under half (ten) had serious deficiencies – i.e. insufficient conditions were put in place to address bycatch issues. Underlying reasons for this were varied, including failure to consider relevant bycatch species, changes in scores during the assessment process (i.e. between public comment draft report and final report stages) without clear rationale, and conditions rolling forward from a certification to re-certification.

In addition, the technical and management measures implemented by certified fisheries (via conditions) to address bycatch often fall short of their objectives: we found that the measures implemented to address bycatch were only clearly effective in three of the fisheries reviewed (~13% of the case studies). In terms of bycatch trends – the ultimate arbiter of successful mitigation strategies – reported bycatch *increased* (or did not decrease from high levels) during the certification period in seven of the fisheries reviewed, with only one fishery clearly demonstrating a sustained reduction in bycatch levels, achieving a green score. However, it should be noted that in some cases, increased bycatch levels may be the result of better data collection (which may have been driven by certification of the fishery) or because populations of non-target species are increasing in abundance.

This study concludes that MSC must strengthen the bycatch elements of the MSC standard at the next full Fisheries Standard Review, to prevent fisheries with unacceptably high impacts from being certified and to ensure that mortality of non-target species in certified fisheries is minimised. To that end, this review makes a series of recommendations for improvements. These are:

Data quality

All of the following data quality recommendations could be brought together in a 'Data Standard' for MSC:

I. The standard needs to state explicitly the quality of the data necessary to assess bycatch – particularly the need for independent sources of data (e.g. observers, remote electronic monitoring) rather than the current quantitative/qualitative differentiation of data types which does not account for the independence of data;

II. MSC should identify requirements for minimum observer data collection standards, and recognise the potential for remote electronic monitoring to enhance independent data collection;

III. In addition, MSC should identify standards for bycatch data reporting and analysis (i.e. for extrapolating observed samples of bycatch to the fishery scale). Bycatch data reporting must indicate the scale of ETP bycatch in an MSC certified fishery in a transparent fashion;

IV. No fishery should be certified when there is a lack of independent bycatch data for ETP species for which the risks posed by the fishery are clear.

Improving consistency in assessments

V. A database should be published by MSC for all fisheries in the program which includes, at a minimum, information on bycatch by species or taxa group, conditions set by assessment teams and progress on these conditions. This would facilitate access to this information both by stakeholders and assessment teams to evaluate cumulative impacts and improve consistency across assessments;

VI. The definition of an ETP species needs to be clarified and strengthened to improve consistency across assessments and bring it in line with best scientific understanding. One option would be to create scientific advisory groups composed of relevant bycatch experts to create a list of species to be considered as ETP by FAO area, taking into account the MSC criteria and international legislation. Regardless of the process or structures developed, an international, centrally-agreed approach needs to be taken, as the continued reliance on national legislation in the assessment of ETP results in inconsistencies across MSC fisheries that don't make biological sense;

VII. The definition of benchmarks or limit reference points for P2 species (namely sharks and rays) - and especially when these qualify as ETP - is urgently needed, as there are inconsistences in the levels used between assessments.

Action planning and implementation

VIII. There should be consistency in ensuring that any Condition of Certification relating to bycatch risks includes clear, measurable, time-bound requirements for certified fisheries to implement existing best practice mitigation measures to reduce bycatch, which exist for at least some gears for all of the taxa reviewed in this study. Further steps need to be taken to ensure that the standard drives the exploration of mitigation measures to address bycatch, and these should include spatial or temporal closures.

Process and assurance

IX. There should be a process that allows stakeholders (or the MSC itself) to better input once a fishery is certified, particularly the ability to object to a CAB decision to close a condition.

1. Introduction

1.1 Bycatch: a global problem

The incidental capture, or bycatch, of non-target species in fisheries is a well-established issue (FAO 1995, Ross & Isaac 2004, EJF 2005, Scales et al., 2018). It is considered among the most serious threats globally to many long-lived marine species: marine mammals, such as dolphins, porpoises and large whales (Randall et al., 2013, Read 2008); seabirds, such as albatrosses, guillemots and penguins; (Zydelis et al., 2013, Pardo et al., 2017), marine turtles (Wallace et al., 2013) and elasmobranchs, such as skates, rays, pelagic and demersal sharks (Molina & Cooke 2012, Gallagher et al., 2014). Non-target bycatch occurs in a wide range of gear types, including gillnets, trawls, longlines, purse seines and traps (Alverson et al., 1994, Kelleher 2005, Hall & Roman, 2013, Clarke et al., 2014).

Under general principle 6.6, the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF) promotes the use (and further development) of selective and environmentally safe fishing gear and practices to safeguard the biodiversity of ecosystems and minimise fisheries impacts on non-target species and the ecosystem in general (FAO 1995). Although technical and management measures to reduce bycatch have been explored for most gear types and taxa (e.g. Barlow & Cameron 2003; Erbe & Macpherson 2012; Mangel et al., 2013; Baker et al., 2014; Wiedenfeld et al., 2013; Kynoch et al., 2015; Crawford et al., 2016; Ortiz et al., 2016), workable solutions to tackle bycatch have not been found for all the species affected (Fowler 2016). In addition, implementation of these measures has been limited in many cases and promoting bycatch mitigation measures for sharks and rays has proven particularly difficult, as some of these species may be a retained product of fisheries targeting other species (Fowler 2016). There is also potential for new mitigation proposals for one taxonomic group to compromise mitigation measures for other taxa (Gilman et al. 2016). These issues pose challenges for MSC in relation to meeting the requirements of FAO's CCRF, alongside well-established challenges in monitoring bycatch, enforcing regulations and measuring the population-level impacts of fisheries (Akroyd et al., 2016, Morsan et al., 2017).

1.2 The Marine Stewardship Council (MSC) certification scheme

Third-party certification schemes and ecolabels provide guidance to retailers and consumers who want to make a responsible choice when selling and buying products and create an incentive for fishers to improve fishing practices to meet this consumer demand, allowing them to demonstrate their commitment to sustainability and get a better price for their products (MSC 2011a).

The MSC is the best-known fisheries certification program, recognised as a rigorous and credible market-based indicator of environmental sustainability in fisheries (Sutton and Wimpee, 2008;

Gulbrandsen, 2013; MSC 2017). MSC's standard is comprised of three elements (known as 'principles'), covering the target fish stock, environmental impacts and fishery management. The impact of a fishery on non-target bycatch species is assessed in Principle 2, under which detailed scoring criteria are defined.

MSC undertakes regular reviews of its standard, and in 2014 MSC consulted on changes to its Fisheries Standard, also known as their 'Standards and Certification Requirements' (Version 1.3) (MSC 2014a). Based on this consultation, MSC released updated Standards and Certification Requirements (known as Version 2.0) in October 2014, with all assessments commencing after April 2015 needing to use the new certification requirements. This update resulted in some changes to Principle 2 relevant to non-target bycatch (e.g. reviews of alternative mitigation measures to reduce bycatch and requirements to assess the cumulative impacts of MSC fisheries on bycatch species), but otherwise, bycatch elements of the standard were largely unchanged at the last revision.

While there have been previous external reviews of the impact of the MSC standard in recent years, these have focused on specific areas, gears or species (e.g. analysis of the effects of the MSC certification on the conservation of seabirds (Wiedenfeld 2012), the impact of MSC certification in Canada (Arnold & Fuller 2017)), and there has not been a global review of the impacts of certification on the major non-target bycatch taxa groups. MSC also conducts their own research on the impact of the standard through their Global Impact Reports, but for bycatch this largely focusses on the closure (or completion) of conditions set by the certification assessment bodies (MSC 2017). While this provides a helpful overview of the number of bycatch-relevant issues raised and whether fisheries met the conditions set, it is by nature a coarse assessment and does not focus on the adequacy or efficacy of measures taken (see more on conditions under 'The MSC certification scheme' in Annex 1). Latterly, MSC itself has acknowledged that the requirements around Endangered, Threatened and Protected (ETP) species are not consistently applied and is therefore in the process of reviewing them for the next update of the Fisheries Standard (MSC 2018a). This report aims to fill this gap by undertaking a review of certified fisheries to evaluate the effectiveness of MSC's Fisheries Standards in identifying and addressing bycatch issues.

1.3 Report objectives

The main objectives of this report were to: (1) compile evidence with which to assess the effectiveness of the MSC criteria in tackling bycatch of non-target species (specifically elasmobranches (sharks, rays and skates), marine mammals, seabird and sea turtles); (2) identify examples of best practice that led to MSC's condition-setting maximising conservation delivery for non-target species; and (3) inform

future updates of the MSC's Fisheries Standard by providing key recommendations for improvements to the non-target bycatch provisions, thereby strengthening the sustainability credentials of the standard.

2. Methods

2.1 Material and methods

A list of MSC-certified fisheries was obtained from the MSC website (www.msc.org), covering all fisheries certified by the MSC as of November 2017. 26 fisheries were selected, of which 23 were certified, 2 were certified then suspended and 3 had been withdrawn from certification (one of these was never certified) (Table 1). These fisheries were all certified between 2001 and 2017, and selected fisheries needed to meet at least one of the following criteria:

- Fisheries with a potentially moderate to high impact on non-target bycatch species (elasmobranchs, marine mammals, seabirds or sea turtles). The potential impact of these fisheries on bycatch species was estimated using published and unpublished scientific papers and relevant bycatch taxon experts' judgement;
- Fisheries which have received at least one condition for performance indicators relevant to bycatch species (P2.1, 2.2, 2.3) during the certification process.

Additionally, we looked for fisheries which had gone through v.1.3 and v.2.0 of the MSC standard, to see if changes in the standard had driven improvements (Table 1 lists the first and most recent versions of the standard the selected fisheries were assessed against; eight have been through v.2.0). This was cross-checked with data requested from MSC, which included final scores, conditions and version of the standard that each fishery had been certified under. After this initial process, fisheries were grouped in case studies to allow for comparisons between them, with each of the six case studies grouping fisheries by geographical area and fishing gear type (and therefore key bycatch species). Fisheries that did not fit in these case study groupings were removed from consideration. In addition, some of the 26 fisheries were either grouped or split to ensure our assessments were conducted at the most relevant scale from a biological or management perspective. To this end, two US longline fisheries (within case study 2) were combined for a single rating and the six trap fisheries in the Northwest Atlantic (in case study 6) were combined into two fisheries, one for the USA management regime (2 units of certification) and one for the Canadian management regime (4 units of certification). The South African hake trawl fishery (in case study 4) was split into an offshore and inshore component, owing to differences in how these fleet segments have managed bycatch issues. This

resulted in a total of 23 'fisheries' being reviewed (Table 2) - this is the number of fisheries referred to throughout the remainder of the report.

Table 1 Fisheries assessed, dates of certification, re-certification, and versions of the MSC standard used.

Name of fishery (numbering indicates groups/splits)	Date of first certification	Version of MSC standard	Date of most recent re-certification	Version of MSC standard
1. Icelandic gillnet lumpfish	Dec 2014	v.1.3	NA	NA
2. ISF Iceland cod/haddock	Apr 2012	v.1.3	Apr 2017	v.2.0
3. Greenland lumpfish	Aug 2015	v.1.3	NA	NA
4. NFA Norwegian Lumpfish	Nov 2017	v.2.0	NA	NA
5. Norway North East Arctic cod/haddock	Oct 2011	v.1.0	Oct 2015	v.1.3
6. North West Atlantic Canada Longline Swordfish	Apr 2012	v.1.0	Dec 2017	v.1.3[1]
7. US North Atlantic Swordfish Pelagic Longline and Handgear Buoy Line Fishery	Jun 2015	v.1.2	In assessment[2]	v.1.3
7. SSLLC US North Atlantic Swordfish Longline Fishery	Dec 2014[3]	v.1.2	NA	NA
8. Spanish North and South Atlantic swordfish longline fishery (**WITHDRAWN BEFORE CERTIFICATION**)	Oct 2016[4]	v.2.0	NA	NA
9. PNA Western and Central Pacific unassociated purse seine skipjack tuna and yellowfin tuna fishery	Dec 2011	FAM v.2	Mar 2018	v.2.0
10. Tri Marine Western and Central Pacific skipjack and yellowfin tuna	Jun 2016	v.1.3	NA	NA
11. Solomon Islands Skipjack and Yellowfin Tuna Purse Seine Anchored FAD, Purse Seine Unassociated, and Pole and Line	Jul 2016	v.1.3	NA	NA
12. Talley's New Zealand skipjack Tuna Purse Seine	Aug 2017	v.2.0	NA	NA
13. North-eastern Tropical Pacific (PAST) Purse Seine yellowfin and skipjack tuna fishery	Sept 2017	v.1.3	NA	NA
14. Echebastar Indian Ocean purse seine skipjack tuna	Nov 2015[5] Jan 2018	v.1.3 v.2.0	NA	NA
15.South Africa hake trawl: offshore 16. South Africa hake trawl: inshore (incorporated at most recent re-certification)	Apr 2004	FAM v.1.3	May 2015	v.1.3
17. Argentine hoki bottom and mid-water trawl fishery	May 2012	v.1.0	Sept 2017	v.2.0
18. New Zealand Deepwater Group hake, hoki, ling and southern blue whiting	Nov 2001	FAM v.1.0	In assessment[6]	v.2.0
19. Osprey Trawlers North Sea twin-rigged plaice	Sept 2010	FAM v2	May 2016	v.1.3
20. DFPO Denmark North Sea plaice	Mar 2011	V1.0	Certification extended [7]	NA
21. Scottish Fisheries Sustainable Accreditation Group (SFSAG) North Sea cod	Jul 2017	v.2.0	NA	NA
22. Gulf of St. Lawrence snow crab trap fishery	Sept 2012	v.1.0	May 2016[8]	v.1.3
22. Scotian Shelf snow crab trap fishery	Jul 2012	v.1.0	NA	NA
22. Bay of Fundy, Scotian Shelf and Southern Gulf of St Lawrence lobster trap fishery	May 2015	v.1.3	NA	NA
22. Newfoundland & Labrador snow crab fishery	Apr 2013	v.1.2	NA	NA
23. Maine lobster trap fishery	Feb 2013	v.1.0/v.1.3	NA	NA
23. Gulf of Maine lobster fishery[9]	Dec 2016	v.1.3	NA	NA

[1]Refers to the scoring section used in the assessment

[2]Currently in re-certification

[3]This fishery was suspended in September 2016 and withdrawn from the program in December 2016. It is included here for informative purposes.

[4]This fishery was withdrawn from the MSC program in January 2017 after the publication of the PCDR. It was not certified. It has been included in this case study because it fits with this group and provides an interesting analogue with the US and Canadian fisheries, but a complete assessment of how effective the assessment process was in this last fishery is not possible.

[5] The Echebastar fishery was not certified at the first assessment attempt

[6] This hoki fishery was first certified in 2001 and recertified again in 2007 and 2012. The New Zealand hake and southern blue whiting fisheries were first certified in 2012. Finally, the ling fishery was certified in 2014. All these fisheries are currently being recertified as a combined group.

[7]This fishery is currently being re-certified together with a group of other DFPO North Sea fisheries and the re-certification process has been delayed to allow for a joint re-assessment.

[8]This fishery was suspended in 2017

[9] It appears that the Gulf of Maine lobster fishery was first certified in February 2013 as Maine lobster trap fishery and the name was later changed.

Table 2 MSC case studies, fisheries and bycatch groups reviewed in the report

Case study	Fishery	Bycatch group
C.S.1. North Atlantic gillnet fisheries	1. Icelandic gillnet lumpfish	• Seabirds (e.g. guillemots, common eiders) ; • Marine mammals (e.g. harbour porpoises, seals)
	2. ISF Iceland cod/haddock	
	3. Greenland lumpfish	
	4. NFA Norwegian Lumpfish	
	5. Norway North East Arctic cod/haddock	
C.S.2. North Atlantic longline fisheries	6. North West Atlantic Canada longline swordfish	• Pelagic sharks (e.g. blue shark, shortfin mako, porbeagle); • Marine mammals (e.g. short-finned pilot whales, Risso's dolphins) • Sea turtles (e.g. loggerhead and leatherback turtles)
	7. US North Atlantic swordfish/ SSLLC US North Atlantic swordfish Longline	
	8. Spanish North and South Atlantic swordfish longline (**WITHDRAWN BEFORE CERTIFICATION**)	
C.S.3 Tuna purse seine fisheries	9. PNA Western and Central Pacific unassociated purse seine skipjack tuna and yellowfin tuna	• Pelagic sharks (e.g. silky sharks, oceanic whitetip shark, whale sharks • Manta and ray species (e.g. devil manta ray, giant manta) • Marine mammals (e.g. false killer whales, spinner dolphins) • Sea turtles (e.g. Olive Ridley, green, leatherback, loggerhead and hawksbill turtles)
	10. Tri Marine Western and Central Pacific skipjack and yellowfin tuna	
	11. Solomon Islands Skipjack and Yellowfin Tuna Purse Seine Anchored FAD, Purse Seine unassociated, and Pole and Line	
	12. Talley's New Zealand skipjack Tuna Purse Seine	
	13. North-eastern Tropical Pacific (PAST) Purse Seine yellowfin and skipjack tuna	
	14. Echebastar Indian Ocean purse seine skipjack tuna	
C.S.4 Southern hemisphere trawl fisheries	South Africa hake trawl: 15. Offshore fleet 16. Inshore fleet	• Seabirds (e.g. albatrosses, petrels, shearwaters) • Demersal and pelagic sharks (e.g. porbeagle, spiny dogfish) • Skates and rays (e.g. Magellan, yellownose skates) • Marine mammals (e.g. fur seals, sea lions)
	17. Argentine hoki bottom and mid-water trawl	
	18. New Zealand Deepwater Group hake, hoki, ling and southern blue whiting	

C.S.5 North Sea mixed fisheries	19. Osprey Trawlers North Sea twin-rigged plaice	• Marine mammals (e.g. harbour porpoises, common and grey seals) • Demersal sharks (e.g. spiny dogfish, smoothhound) • Skates and rays (e.g. starry ray, common skate) • Seabirds (e.g. diving ducks and auks)
	20. DFPO Denmark North Sea plaice	
	21. Scottish Fisheries Sustainable Accreditation Group (SFSAG) North Sea cod	
C.S.6 Northwest Atlantic snow crab and lobster trap fisheries	22. Gulf of St. Lawrence snow crab trap / Scotian Shelf snow crab trap / Bay of Fundy, Scotian Shelf and Southern Gulf of St Lawrence lobster trap / Newfoundland & Labrador snow crab (Canadian trap fisheries)	• Baleen whales (mainly North Atlantic Right and humpback whales)
	23. Maine lobster trap / Gulf of Maine lobster (United States of America trap fisheries)	

The primary sources of information for this review were MSC public certification reports (PCR) and annual surveillance reports. When alternative data on bycatch (e.g. published scientific papers and government reports) were available, these were also used.

Four criteria were developed to assess the performance of fisheries in relation to assessing and reducing bycatch. In addition, we examined the pre-certification baseline level of bycatch for each fishery although this was not used in the calculation of total performance score, as fisheries were selected for review on the basis of moderate-high bycatch risk, and also because this review focussed on assessing bycatch reduction progress irrespective of the baseline. A traffic light scoring system (red/amber/green or 'RAG' rating) was developed to aid consistency in assessing performance, with scoring across the four criteria as follows:

1. Bycatch data quality: how precise is the information provided in the MSC Public Certification Report? This category assessed the available information on bycatch in the fisheries.

Red – the scale of bycatch is unknown/data-limited/information on bycatch species relies on qualitative or self-reported data;
Amber - bycatch composition data includes qualitative, self-reported and some quantitative independent data;
Green - the data used to assess bycatch were detailed enough to allow for comprehensive monitoring and assessment of the scale and impact of bycatch in the fishery (independent data, including observer data, electronic monitoring etc).

2. What corrective actions have been taken to tackle bycatch? This category assesses the actions required by the certification process, and/or undertaken by the fishery, which we divided into two criteria:

2a. **Proposed actions:** are relevant at-risk bycatch species adequately considered by the assessment team, with scoring and condition-setting commensurate to the level of risk?

Red – the certification process had serious deficiencies, proposed measures are limited in scope;
Amber – the process had minor inadequacies, proposed actions cover some but not all bycatch issues;

Green – the assessment process was adequate, proposed actions commensurate to risk for all bycatch groups.

2b. Action implementation: have the proposed management measures to close these conditions been implemented by the fishery?

Red – no or very limited corrective actions have been implemented by the fishery;

Amber – corrective actions are in state of implementation, but their effectiveness is unknown;

Green – corrective actions have been fully implemented and they are proving effective.

3. Bycatch trends - what evidence is there that bycatch is decreasing? This category assesses bycatch trends at two levels, in the fishery and at the population level.

Red – no baseline to measure bycatch against or bycatch has not decreased during the certification period and the population of the main species affected by the fishery shows negative trends;

Amber - evidence that bycatch rates are decreasing at a slow rate and the population(s) of the main species affected by the fishery is/are stable;

Green - bycatch is decreasing at a moderate to fast rate, the population(s) of the main species affected by the fishery show positive trends or are stable.

Finally, a *total assessment score* for each fishery was obtained by adding the points of each category: red (0), amber (1), green (2). With four criteria, the minimum possible score was 0 and the maximum score was 8. Table 3 shows how the total assessment scores were translated to a final RAG rating.

It should be noted that these criteria and scoring elements, although overlapping in places, are not directly aligned with MSC's criteria and scoring. The criteria and scoring elements were developed with bycatch experts according to expert judgement on what would constitute effective monitoring, action planning, implementation and trends. By way of example, MSC is not prescriptive about the independence of data, though we required at least 'some' and 'comprehensive' levels of independent data under our amber and green scores respectively for bycatch data quality.

The full case studies underpinning the scores are provided in Annex 2, but in the interests of brevity and clarity, only the RAG ratings are presented in the results.

Table 3 Methodology for translating total assessment scores into a final RAG rating for each fishery, and description of the typical characteristics of bycatch data and management of the fisheries within each RAG rating.

Colour	Scores	Description
Red	**0,1,2**	No significant changes have been identified in the assessed fishery during the certification period. Data quality on bycatch is still not adequate, insufficient management measures have been introduced to understand and reduce bycatch and the impact of the fishery on bycatch species is moderate to high with no reduction during the certification period.
Amber	**3,4,5**	Some management measures (better data collection, technical measures, etc.) have been introduced to address the bycatch problem since certification, resulting in some reductions in bycatch.
Green	**6,7,8**	Data quality on bycatch is sufficient to monitor bycatch rates, management measures to address bycatch are being implemented and bycatch has been reduced.

2.2 Data shortcomings and challenges

While this review has been undertaken in the most rigorous fashion possible, it is important to acknowledge some of the challenges that it encountered.

The primary source of information used in this review was that provided by the assessment teams in the MSC public certification reports. However, an MSC assessment is an auditing scheme in which the audited party (the fishery) is responsible for recording the information to demonstrate compliance with the requirements of the standards (Bostrom et al., 2017), so the data in reports are provided with this end purpose in mind. Although MSC certification seeks to be an open and transparent process, it is difficult to have access to raw data from the fishery client. Even in the best cases, the bycatch data in the public certification reports are often reported in terms of species composition (normally based on short term studies), in numbers of individuals bycaught, or other formats which, although adequate to assess the fishery under the current MSC criteria, make it difficult to calculate bycatch rates or volumes/numbers of bycatch species caught per year. This, in turn, makes it difficult to assess the specific impact of the certified fisheries on ETP populations and calculate cumulative impacts of all certified fisheries. In addition, while independent bycatch data are also reported by some scientific bodies and government agencies and were used in this review when available, public data are often not provided with specific links to fishery or vessel, making it difficult to link these data to specific MSC unit of certification.

An additional challenge is that some of the fisheries reviewed have not been certified for sufficient time to assess trends in bycatch or the efficacy of the management measures introduced. If there was insufficient evidence to the contrary, a red score was granted to these fisheries in line with the precautionary principle.

One of the aims of this review was to compare the effectiveness of v2.0 of the standard compared to v1.3 in relation to bycatch. However, only a handful of fisheries have been assessed under both v1.3 and v2.0 of the MSC standard. When reviewing these fisheries, it proved difficult to determine whether the 'new' standard drove improvements in these fisheries, in part because v2.0 certified fisheries have not been certified for very long. In addition, other factors like variable levels of stakeholder input and different certification bodies assessing similar fisheries (e.g. lumpfish gillnet fisheries in Iceland – certified under v1.3 – and Norway – certified under v2.0) meant that comparisons were confounded, as these factors are likely to influence scoring.

Finally, when assessing the state of the populations of species affected by certified fisheries, other factors, such as food shortage, high pollution burdens including from oil spills, or vessel strikes, may affect population trends, in addition to fisheries impact.

These data challenges and caveats affect not only this review but also the entire MSC certification process; these problems are faced by assessment teams when assessing cumulative impacts under v2.0 of the MSC standard.

Despite these shortcomings, we consider that the scores obtained in this review are a fair reflection of the current situation of the selected MSC certified fisheries with regard to non-target bycatch. As such, this report informs necessary improvements to the bycatch elements of the MSC standard at the next standard review.

3. Results

The full results of the RAG analysis are presented in Table 4 and summed across the scoring elements in Figure 1.

Bycatch baseline

'Baseline' levels of bycatch were not given scores, but these levels were considered in some detail in the review process (see Annex 2).

Data quality

Data quality on bycatch scored red in seven fisheries, mainly due to a lack of independent data (and a reliance on self-reporting) to assess bycatch. At the case study level, North Sea mixed fisheries – primarily trawl but one gillnet element - had the lowest mean data quality score (Table 5) with observer coverage between 0 and 1% across the individual fisheries (Annex 2), followed by North Atlantic gillnet fisheries, resulting from heavy reliance on self-reporting and low levels of observer coverage (1-2%) (Annex 2). Northwest Atlantic snow crab and lobster trap fisheries scored a green for the Canadian grouping (observer coverage recently as high as 15-20% (Annex 2)) and a red for the American grouping (no observer coverage (Annex 2)). Similarly, the offshore portion of the South African hake trawl fishery scored green (observer coverage ranging from 7.3% - 20% of trawls since certification), while the inshore portion scored red (observer coverage of <1% of trawls) (Annex 2).

Nine fisheries scored green, the most under any of the criteria (Figure 1) of which four were tuna fisheries with 100% observer coverage, alongside the two certified North Atlantic longline fisheries from Canada and the USA, which respectively had 10% and 14.5% observer coverage in recent years (see Annex 2).

Table 4. Overall results of RAG analysis. Numbers in brackets indicate scores under individual scoring criteria, which were then summed to give an overall score for each fishery

Case Study	Name of fishery/fisheries	Data quality	Proposed actions	Action implementation	Bycatch trends	Overall score
CS1. North Atlantic gillnet fisheries	1. Icelandic gillnet lumpfish	**Amber (1)**	**Green (2)**	**Amber (1)**	**Red (0)**	**Amber (4)**
	2. ISF Iceland cod/haddock	**Amber (1)**	**Amber (1)**	**Amber (1)**	**Red (0)**	**Amber (3)**
	3. Greenland lumpfish	**Red (0)**	**Amber (1)**	**Red (0)**	**Amber (1)**	**Red (2)**
	4. NFA Norwegian Lumpfish	**Red (0)**	**Green (2)**	**Amber (1)**	**Amber (1)**	**Amber (4)**
	5. Norway North East Arctic cod/haddock	**Amber (1)**	**Amber (1)**	**Red (0)**	**Red (0)**	**Red (2)**
CS2. North Atlantic longline fisheries	6. North West Atlantic Canada longline swordfish	**Green (2)**	**Red (0)**	**Amber (1)**	**Amber (1)**	**Amber (4)**
	7. US North Atlantic swordfish/ SSLLC US North Atlantic swordfish Longline	**Green (2)**	**Amber (1)**	**Red (0)**	**Amber (1)**	**Amber (4)**
	8. Spanish North and South Atlantic swordfish longline (**WITHDRAWN BEFORE CERTIFICATION**)	**Red (0)**	**Red (0)**	**Amber (1)**	**Amber (1)**	**Red (2)**
CS3. Tuna purse seine fisheries	9. PNA Western and Central Pacific unassociated purse seine skipjack tuna and yellowfin tuna	**Green (2)**	**Red (0)**	**Amber (1)**	**Amber (1)**	**Amber (4)**
	10. Tri Marine Western and Central Pacific skipjack and yellowfin tuna	**Green (2)**	**Red (0)**	**Amber (1)**	**Amber (1)**	**Amber (4)**
	11. Solomon Islands Skipjack and Yellowfin Tuna Purse Seine Anchored FAD, Purse Seine unassociated, and Pole and Line	**Green (2)**	**Amber (1)**	**Green (2)**	**Amber (1)**	**Green (6)**
	12. Talley's New Zealand skipjack Tuna Purse Seine	**Green (2)**	**Green (2)**	**Amber (1)**	**Amber (1)**	**Green (6)**

	13. North-eastern Tropical Pacific (PAST) Purse Seine yellowfin and skipjack tuna	**Amber (1)**	**Red (0)**	**Amber (1)**	**Amber (1)**	**Amber (3)**
	14. Echebastar Indian Ocean purse seine skipjack tuna	**Amber (1)**	**Red (0)**	**Red (0)**	**Amber (1)**	**Red (2)**
CS4. Southern hemisphere trawl fisheries	15. South Africa hake trawl: offshore fleet	**Green (2)**	**Amber (1)**	**Green (2)**	**Green (2)**	**Green (7)**
	16. South Africa hake trawl: inshore fleet	**Red (0)**	**Amber (1)**	**Red (0)**	**Amber (1)**	**Red (2)**
	17. Argentine hoki bottom and mid-water trawl	**Amber (1)**	**Red (0)**	**Amber (1)**	**Amber (1)**	**Amber (3)**
	18. New Zealand Deepwater Group hake, hoki, ling and southern blue whiting	**Green (2)**	**Red (0)**	**Amber (1)**	**Red (0)**	**Amber (3)**
CS5. North Sea mixed fisheries	19. Osprey Trawlers North Sea twin-rigged plaice	**Amber (1)**	**Amber (1)**	**Green (2)**	**Amber (1)**	**Amber (5)**
	20. DFPO Denmark North Sea plaice	**Red (0)**	**Green (2)**	**Red (0)**	**Red (0)**	**Red (2)**
	21. Scottish Fisheries Sustainable Accreditation Group (SFSAG) North Sea cod	**Red (0)**	**Amber (1)**	**Amber (1)**	**Amber (1)**	**Amber (3)**
CS6. Northwest Atlantic snow crab and lobster trap fisheries	22. Gulf of St. Lawrence snow crab trap / Scotian Shelf snow crab trap / Bay of Fundy, Scotian Shelf and Southern Gulf of St Lawrence lobster trap / Newfoundland & Labrador snow crab (Canadian trap fisheries)	**Green (2)**	**Red (0)**	**Red (0)**	**Red (0)**	**Red (2)**
	23. Maine lobster trap / Gulf of Maine lobster (United States of America trap fisheries)	**Red (0)**	**Red (0)**	**Red (0)**	**Red (0)**	**Red (0)**

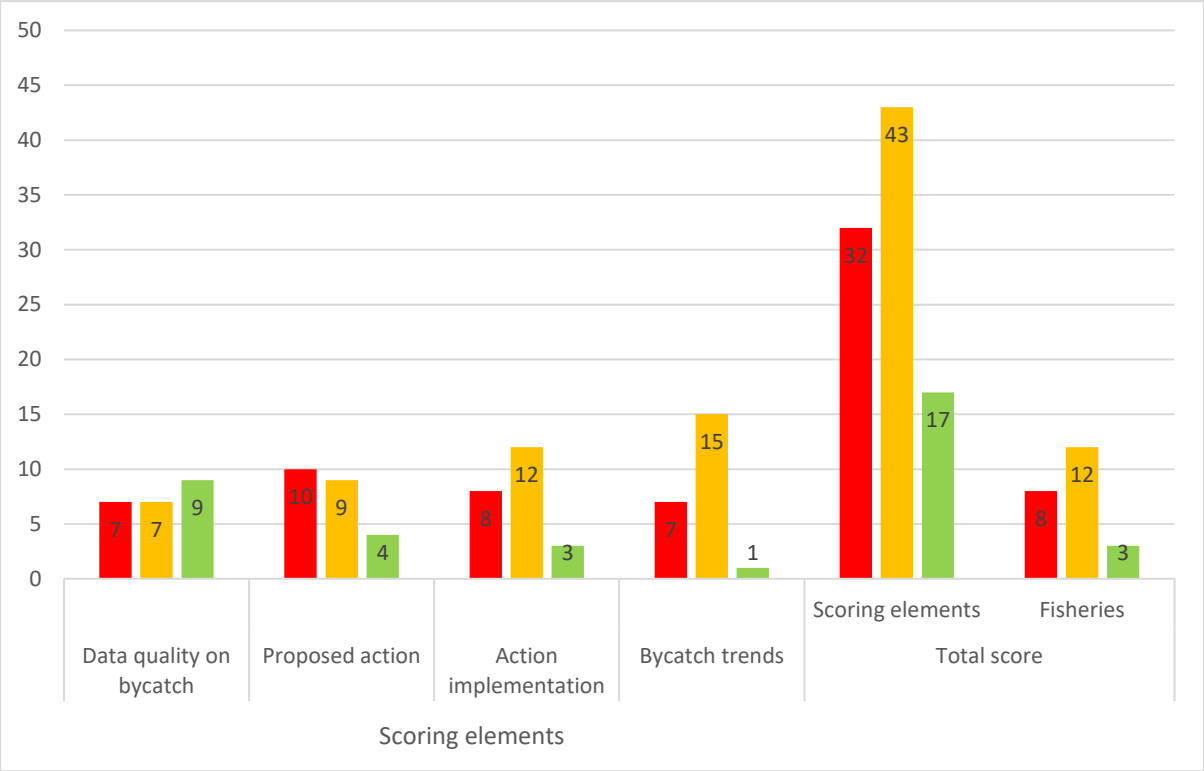

Figure 1. Scores per scoring element and overall, summed across number of red/amber/green scores and overall scores for the 23 fisheries reviewed

Table 5. Mean scores (and corresponding mean RAG rating) per case study

Case study	Mean data quality score	Mean proposed action score	Mean action implementation score	Mean bycatch trend score	Mean overall score
CS1. North Atlantic gillnet fisheries	**0.6**	**1.4**	**0.6**	**0.4**	**3**
CS2. North Atlantic longline fisheries	**1.33**	**0.33**	**0.66**	**1**	**3.33**
CS3. Tuna purse seine fisheries	**1.66**	**0.5**	**1**	**1**	**4.16**
CS4. Southern hemisphere trawl fisheries	**1.25**	**0.5**	**1**	**1**	**3.75**
CS5. North Sea mixed fisheries	**0.33**	**1.33**	**1**	**0.66**	**3.33**
CS6. Northwest Atlantic snow crab and lobster trap fisheries	**1**	**0**	**0**	**0**	**1**

Proposed actions

This scoring element received the most red scores with ten (Figure 1, Table 4). The reasons for this are varied, but include inadequate consideration of relevant bycatch species (the PNA, PAST and Tri Marine tuna purse seine fisheries); changes in scores during the assessment process (specifically, between the 'Public Comment Draft Report' and 'Final Report' stages) without clear rationale or proper scrutiny (Argentine hoki trawl, New Zealand Deep Water Group hoki trawl); conditions closed quickly with insufficient evidence (North West Atlantic Canada swordfish longline); and no conditions being raised in spite of clear concerns/impacts (both the Northwest Atlantic trap fisheries) (Annex 2). Across this scoring element, the Northwest Atlantic snow crab and lobster trap fisheries received the lowest mean score, followed by the North Atlantic longline fisheries (Table 5).

Four fisheries scored green for their proposed actions – two of these were gillnet fisheries in which data limitations were recognised and conditions had been put in place to address these, and the others were DFPO Denmark North Sea plaice (which scored red for all other scoring elements) – as proposed actions included testing of mitigation measures in addition to data collection - and the New Zealand tuna purse seine fishery, which had management measures for sharks and codes of practice for live release of ray and turtle species (Annex 2).

Nine fisheries scored amber, and in three cases (ISF Icelandic cod gillnet, offshore segment of the South African hake trawl fishery and the Osprey Trawlers North Sea twin-rigged plaice), this was where a fishery had been through at least two certifications and a bycatch issue was overlooked under the first certification (Annex 2). Some amber scores were the result of only certain species being addressed by action plans and not others (Solomon Islands tuna purse seine and US North Atlantic longline) (Annex 2). In two gillnet fisheries, conditions focussed primarily on data collection without a strong emphasis on management follow-up (Greenland lumpfish and Norway North east Arctic cod/haddock) (Annex 2).

Regardless of RAG score, in 60% (14) of the fisheries reviewed, conditions were raised requiring improvements in data collection on bycatch species – this included all five of the gillnet fisheries reviewed, both currently certified longline fisheries, all three of the North Sea mixed fisheries, two of the tuna purse seine fisheries (PAST and Echebastar) and both elements of the South African hake trawl fishery (Annex 2). Several trawl fisheries capturing rays/skates and demersal sharks as bycatch (SFSAG North Sea cod, inshore South Africa hake trawl, Argentine hoki and New Zealand hoki) did not have any requirements to introduce management measures – such as time/area closures - to reduce the impacts on these species (Annex 2).

Action implementation

Eight fisheries received a red score for this scoring element (Table 4; Figure 1), in two cases because conditions were closed without sufficient evidence that impacts had abated (USA swordfish longline and Greenland lumpfish gillnet), in the remaining six because available mitigation measures were not being implemented at a fishery (DFPO Denmark North Sea plaice, Norway North East Arctic cod/haddock gillnet, inshore South Africa hake trawl, USA and Canadian trap fisheries) or regional level (Echebastar tuna purse seine) (Annex 2).

Three fisheries scored green (Table 4). Each of these fisheries implemented clear management actions to reduce the impact on bycaught species (Annex 2).

The large number (12) of amber scores for this scoring element is partially explained by the fact that eight of these 12 fisheries were certified relatively recently (2015-2017), and full implementation might not be expected until the fifth and final year of a certificate (Table 1).

Bycatch trends

Similar to the '*Action implementation*' scoring element, 15 fisheries scored amber for bycatch trends, with 12 of these not being certified long enough to assess trends. The remainder (PNA tuna purse seine, Argentine hoki trawl and Osprey Trawlers North Sea twin-rigged plaice) were affected by data quality limitations (Annex 2).

Bycatch *increased* in seven of the fisheries reviewed, resulting in red scores (Table 4; Figure 1).

The offshore element of the South African hake trawl fishery, which has been able to demonstrate a clear decreasing trend in seabird bycatch, was the only fishery to score green (Table 4; Annex 2).

Overall scores

Of the 23 fisheries reviewed, only three had a total assessment rating of green (Table 4): Solomon Islands skipjack and yellowfin Tuna, Talley's skipjack tuna and the offshore component of the South African trawl. Eight fisheries received a total assessment rating of red, though one of these is the Spanish North and South Atlantic longline fishery which was withdrawn and never ultimately certified. 12 fisheries were ranked as 'amber' – one of these was suspended (Icelandic lumpfish gillnet); another was suspended then withdrawn (the SSLLC US North Atlantic swordfish) and one of the group of Canadian trap fisheries has also been suspended after a significant North Atlantic Right Whale bycatch event.

Mean scores across case studies, calculated by summing individual fishery scores and dividing by the number of fisheries, are presented in Table 5 with a RAG rating. The Northwest Atlantic snow crab and

lobster trap case study received the lowest mean score (1, rated red overall), while the tuna purse seine case study received the highest (4.16, rated amber overall) – none received a green for mean score, which would equate to 'data quality on bycatch is sufficient to monitor bycatch rates, management measures to address bycatch are being implemented and bycatch has been reduced' (Table 3).

4. Discussion

The broad result of this review is that only three of the 23 certified fisheries examined scored 'green' against our criteria to assess the performance of MSC fisheries in tackling bycatch, alongside 12 amber and eight red. While being cognisant of the fact that several of the fisheries reviewed were certified in recent years (2015-2017) (Table 1) and that improvements may take some time to emerge, this review primarily focused on process and the results demonstrate deficiencies with the MSC process for adequately tackling bycatch.

Firstly, many of the fisheries reviewed have been certified despite known substantive bycatch levels or high bycatch risk, most notably the Norway North East Arctic cod/haddock gillnet fishery (harbour porpoises, Mohan 2017; NAMMCO 2017), both the USA and Canadian Atlantic swordfish longline fisheries (blue sharks, Knapman et al. 2017; Parkes et al. 2017), both the USA and Canadian trap fisheries in the Northwest Atlantic (North Atlantic right whales, Brilliant et al. 2017; Henry et al. 2017) and all of the Southern Hemisphere trawl fisheries reviewed (albatrosses and petrels, Maree et al. 2014; Tamini et al. 2016; Dragonfly Data Science 2018). While in some cases (offshore South African hake trawl most notably) certification has helped to drive sustained bycatch reductions (Maree et al. 2014), our review found more cases where bycatch did not decrease, and several cases where bycatch increased (Figure 1).

There are several potential reasons for increases in bycatch across a certification period and some intriguingly different outcomes for individual fisheries with similar bycatch issues. In the Norway North East Arctic cod gillnet fishery, conditions focussed heavily on bycatch data collection in the first certification, and the fishery was permitted to carry these conditions over despite harbour porpoise bycatch rates exceeding sustainable levels (Mohan 2017, NAMMCO 2017, Hammond et al., 2017). This fishery has been through two certification processes (Table 1) and the lack of progress in reducing this bycatch suggests that the standard is not sufficiently strong in requiring expedient action when an issue has been identified.

In other cases, improved data collection (at least partially driven by certification) has revealed bycatch levels that are higher than those previously recorded, as with the Icelandic lumpfish gillnet

fishery and gillnets within the DFPO North Sea plaice fishery (Table 4; Annex 2). The Icelandic fishery was ultimately suspended (Gascoigne el al. 2017), suggesting that the system can work effectively. However, the Danish fishery, which relied more heavily on self-reporting, remains certified, and requirements/implementation of bycatch data collection conditions in the Greenlandic lumpfish fleet have not been as stringent as for the Icelandic fleet. In the Greenland case this has left some uncertainty around bycatch trends (Lassen & Chaudhury 2017) and this fishery also remains certified. Similarly, the offshore and inshore portions of the South African hake trawl fishery scored very differently, with the former scoring green overall and the latter scoring red through poor scores on data quality and action implementation (Table 4).

In the majority of cases reviewed, observer coverage is substantially less than the minimum 20% coverage recommended by Babcock & Pickitch (2003). MSC does not presently have minimum requirements for observer coverage (or indeed any specific requirements around the independence of bycatch data) (MSC 2014a). The limited reliability of self-reporting (Brown 2001, Walsh et al. 2002, Cornish et al. 2004) highlights the need for greater clarity from MSC on the necessary standards for independent bycatch data to determine impacts. The large number of fisheries with conditions on bycatch species data collection (60% of case studies in this review) indicates that to some extent this is recognised by the standard (Annex 2), but the above noted inconsistency in how data deficiencies are tackled (within an individual fishery, as well as between similar fisheries) further stresses the need for clear bycatch data collection and analysis standards.

The inconsistent selection of which species qualify as ETP by CABs demonstrates the need for science-based definitions that transcend national arrangements, the latter of which may vary substantially from jurisdiction to jurisdiction. This issue is evident in the tuna purse seine case study, where the certified fisheries (PNA, Tri Marine, Solomon Islands and Talley's New Zealand) do not define the same species of sharks and rays as ETP, despite these species being distributed across these fisheries and the fisheries being bound by the same shark and ray Conservation and Management Measures under the Regional Fisheries Management Organisation (Morison & McLoughlin 2016, Trumble & Stocker 2016, Akroyd & McLoughlin 2017, Blyth-Skyrme et al. 2017). In addition, the focus of conditions (proposed actions) on data collection with little consideration of potential management measures (e.g. time/area closures) was highly prevalent for trawl fisheries impacting sharks and rays (i.e. the hoki trawl fisheries in Argentina and New Zealand) (Annex 2), indicating that this group of species is affected not only by inconsistent definitions in the standard, but also limited requirements for action 'on the water', in spite of viable options. Conditions set for the Icelandic and Greenlandic lumpfish gillnet fisheries also focussed heavily on data collection rather than management action (Annex 2).

The two Northwest Atlantic snow crab and lobster fisheries did not receive any conditions related to bycatch, despite the risks they present to the endangered North Atlantic right whale (Table 4). A large mortality event in the Gulf of St. Lawrence snow crab trap fishery in 2017 (Daoust et al. 2017) resulted in suspension of this Canadian fishery (which again demonstrates that the system can work). However, several other certified Canadian and American fisheries continue to operate within the distribution of right whales, and this review highlights lower levels of observer coverage and exemptions from whale bycatch mitigation management measures in the American fishery (Mateo et al., 2016). These differing outcomes and requirements – and the severity of risk to a highly threatened species – further emphasise the need not only for clearer bycatch data standards, but also stronger management requirements. Additionally, the certification of these trap fisheries raises the question of what level of bycatch risk is deemed necessary to preclude a fishery from certification. While a careful balance is needed between completely excluding fisheries from certification because of bycatch impacts and certifying fisheries with impacts with conditions to improve, our review indicates that this balance currently favours certifying fisheries without the necessary checks and balances to make sure that bycatch reduction is ultimately delivered (Table 4).

Although the large number of fisheries scoring amber for action implementation (12 out of 23) is likely to, at least partially, be a consequence of their relatively recent certification (eight of these were certified between 2015 and 2017) (Table 4; Figure 1), eight red scores – the result of proposed measures simply not being implemented (and in two cases the result of conditions being closed on the basis of insufficient evidence) – suggests the need for strengthened requirements around meeting conditions in a timely fashion. Comparison of the analogous New Zealand Deep Water Group hoki trawl (which scored red for action implementation) and offshore South African hake trawl fisheries (which scored green for this scoring element) also highlights inconsistency in how bycatch is dealt with under the current standard. Though both fisheries have been certified for over ten years (Table 1), implementation and monitoring of well-established best practice seabird bycatch mitigation (ACAP 2017), has been followed and has been demonstrably effective in the latter case, but not so in the former (Table 4).

One of the most concerning findings of this review is the limited progress in demonstrating bycatch reductions in certified fisheries (see *'Bycatch trends'* Table 4; Figure 1), with *increased* bycatch in seven certified fisheries and only a single green score. This disappointing finding is likely to be directly related to the issues identified in the sections above, namely that data quality, proposed actions and implementation are broadly not yet sufficient to achieve demonstrable reductions in bycatch. Future reform of the MSC Standard should address this as a priority.

The MSC certification requirements focus on not 'hindering recovery' of ETP species, a definition based on population-level impacts (MSC 2014b). While minimisation of bycatch (as required by the FAO Code of Conduct for Responsible Fisheries (FAO 1995)) is inferred at a performance indicator level (i.e. in the language for performance indicator 2.3.2 in the standard), it is not operationalised through the language in the scoring guideposts (MSC 2014b). Whereas the RAG scoring in this review incorporated an assessment of bycatch trends at the fishery level. These interpretations of bycatch impacts might essentially amount to 'sustainable vs. responsible', and while MSC is a standard based around the former rather than the latter, it has established rules for some items that fall into the 'responsible' category (for example shark finning (MSC 2011b) and developing policy on labour (MSC 2018b)). So, while the capture of hundreds of fur seals (as in the New Zealand hoki trawl fishery), thousands of eiders (as in the Greenland lumpfish gillnet fishery) or blue sharks (as in the North Atlantic longline fisheries) may be sustainable from a population perspective, it certainly isn't compatible with minimising bycatch as per the FAO Code of Conduct (FAO 1995) and may not sit well with consumer perceptions of what an ecolabel should deliver.

Potential influence on scores – changes to the MSC Standard

No major improvements in certified fisheries' bycatch performance have been identified as a consequence of changes between v1.3 and v2.0 of the standard. However, the number of fisheries which have gone through the latest version of the standard is still low (eight of the fisheries reviewed), and there are none which have gone through an entire 5-year certification period (Table 1). As an example, the Icelandic cod/haddock fishery is one of the few fisheries to have gone through both versions of the standard. This fishery received three conditions in the re-assessment but none in the first assessment process (Lockwood et al. 2011, Medley et al. 2017). However, it appears that these new conditions were set as a result of newly available bycatch data, as well as stakeholder/peer reviewer comments, rather than the requirements introduced by the new standard (Annex 2).

One of the key updates from v1.3 of the standard to v2.0 was a change in the definition of ETP species, allowing the use of the IUCN red list to define "out-of-scope" birds, marine mammals, reptiles and amphibians as ETP. While this is an improvement on the previous standard, continued disagreements around the classification of fish species (Davies & Baum 2012) means that this is of little benefit to sharks, rays and skates (as well as other fish species not covered in this report). In addition, ETP can also be defined according to listing on national legislation or binding international agreements. As noted above for tuna purse seine fisheries in the Western and Central Pacific, this has resulted in varying interpretations of what qualifies as an ETP species (Annex 2).

Version 2.0 of the MSC standard also introduced new requirements to assess the cumulative impact of fisheries on bycatch species and to assess alternative mitigation measures to reduce bycatch (MSC 2014a). Similar to the ETP definition changes, it is difficult to assess the efficacy of this change when only a small number of fisheries have gone through the latest version of the standard. However, if this is to be effective, there will need to be better established data collection standards (as proposed above), as there are issues with consistency in how bycatch is recorded. This includes metrics: i.e. numbers of individuals (as for bycaught sharks in the US North Atlantic swordfish longline fishery (Parkes et al. 2017)) versus weight (as for the Northwest Atlantic Canada swordfish longline fishery (Knapman et al. 2017)) and levels of analysis: some fisheries do not extrapolate sampled bycatch across the full effort of the fishery (i.e. Greenland lumpfish gillnet (Lassen & Chaudhury 2017)) while others do (Icelandic lumpfish gillnet (MFRI 2017)), meaning that assessing cumulative impacts is impossible in many cases (Annex 2).

So far, there is little evidence that fisheries certified under v2.0 have fully considered alternative management measures. In particular, spatial or temporal closures of important areas for seabirds, sharks and rays (e.g. SFSAG North Sea cod (Annex 2)), are not sufficiently promoted when technical measures are not effective or available.

5. Recommendations:

Based on the results of this review, we have identified the following recommendations:

Data quality

All of the following data quality recommendations could be brought together in a 'Data Standard' for MSC:

I. The standard needs to state explicitly the quality of the data necessary to assess bycatch – particularly the need for independent sources of data (e.g. observers, remote electronic monitoring) rather than the current quantitative/qualitative differentiation of data types which does not account for the independence of data;
II. MSC should identify requirements for minimum observer data collection standards, and recognise the potential for remote electronic monitoring to enhance independent data collection;
III. In addition, MSC should identify standards for bycatch data reporting and analysis (i.e. for extrapolating observed samples of bycatch to the fishery scale). Bycatch data reporting must indicate the scale of ETP bycatch in an MSC certified fishery in a transparent fashion;

IV. No fishery should be certified when there is a lack of independent bycatch data for ETP species for which the risks posed by the fishery are clear.

Improving consistency in assessments

V. A database should be published by MSC for all fisheries in the program which includes, at a minimum, information on bycatch by species or taxa group, conditions set by assessment teams and progress on these conditions. This would facilitate access to this information both by stakeholders and assessment teams to evaluate cumulative impacts and improve consistency across assessments;

VI. The definition of an ETP species needs to be clarified and strengthened to improve consistency across assessments and bring it in line with best scientific understanding. One option would be to create scientific advisory groups composed of relevant bycatch experts to create a list of species to be considered as ETP by FAO area, taking into account the MSC criteria and international legislation. Regardless of the process or structures developed, an international, centrally-agreed approach needs to be taken, as the continued reliance on national legislation in the assessment of ETP results in inconsistencies across MSC fisheries that don't make biological sense;

VII. The definition of benchmarks or limit reference points for P2 species (namely sharks and rays) - and especially when these qualify as ETP - is urgently needed, as there are inconsistences in the levels used between assessments.

Action planning and implementation

VIII. There should be consistency in ensuring that any Condition of Certification relating to bycatch risks includes clear, measurable, time-bound requirements for certified fisheries to implement existing best practice mitigation measures to reduce bycatch, which exist for at least some gears for all of the taxa reviewed in this study. Further steps need to be taken to ensure that the standard drives the exploration of mitigation measures to address bycatch, and these should include spatial or temporal closures.

Process and assurance

IX. There should be a process that allows stakeholders (or the MSC itself) to better input once a fishery is certified, particularly the ability to object to a CAB decision to close a condition.

6. Acknowledgements

This work was funded by the David and Lucile Packard Foundation, to whom the authors wish to express sincere thanks. We also thank the Steering Group that supported the production of this report through helpful comments and guidance. This group comprised Sarah Dolman (Whale Dolphin Conservation), Brendan Godley (Exeter University), Stephanie Good (Exeter University) and Irene Kingma (Dutch Elasmobranch Society). Cleo Small (RSPB/BirdLife International) provided technical and editorial comments that substantially improved the report. The report also benefited from comments from an array of additional experts, including Andrea Angel (BirdLife South Africa), Shannon Arnold (Ecology Action Centre), Regina Asimutis-Silva (Whale and Dolphin Conservation), Karen Baird (Forest & Bird), Euan Dunn (RSPB), Esteban Frere (BirdLife International), Kate O'Connell (Animal Welfare Institute), Leo Tamini (Aves Argentinas), Ross Wanless (BirdLife South Africa) and Iris Ziegler (SharkProject). MSC (Robert Lefebure and Peter Hair) provided helpful information from the MSC database.

7. References

ACAP 2017. ACAP Review and Best Practice Advice for Reducing the Impact of Pelagic and Demersal Trawl Fisheries on Seabirds. Reviewed at the Tenth Meeting of the Advisory Committee Wellington, New Zealand 11 – 15 September 2017. 21 pp.

Akroyd, J. & McLoughlin, K. 2017. Talley's New Zealand Skipjack Tuna Purse Seine. Public Certification Report. MSC Sustainable Fisheries Certification. Acoura marine. 188 pp.

Akroyd, J., Pilling, G. & Blyth-Skyrme, R. 2016. Report for New Zealand Southern Blue Whiting Fishery. 4th Surveillance Audit. Acoura Marine. 15 pp.

Alverson, D.L.; Freeberg, M.H.; Pope, J.G.; Murawski, S.A. A global assessment of fisheries bycatch and discards. FAO Fisheries Technical Paper. No. 339. Rome, FAO. 1994. 233p.

Arnold, S. & Fuller, S.D. 2017. A decade of Marine Stewardship Council (MSC) certification in Canada: Technical Report. Seachoice.org. 56 pp.

Babcock, E.A. & Pikitch, E.A, 2003. How much observer coverage is enough to adequately estimate bycatch. PEW. 36 pp.

Baker, G.B., Jensz, K., Sagar, P. 2014. 2013 Aerial survey of Salvin's albatross at the Bounty Islands. Final report for the Department of Conservation, Wellington, New Zealand.

Barlow, J. & Cameron, G.A. 2003. Field experiments show that acoustic pingers reduce marine mammal bycatch in the California drift gill net fishery. Marine Mammal Science, 19(2):265–283 (April 2003) @ 2003 by the Society for Marine Mammalogy.

Blyth-Skyrme, R., McLoughlin, K. & Dave, J. 2017. PNA Western and Central Pacific skipjack and yellowfin, unassociated / non-FAD set, tuna purse seine fishery. Final Report. Final report. MSC Sustainable Fisheries Certification. Acoura marine. 392 pp.

Bostrom, J., Zollett, E., Trumble, R., Stern-Pirlot, A., Parkes, G., Medley, P., Southall, T. & Restrepo, V. 2017. A Preliminary Evaluation of the Environmental Impact of Fishing for Global Tuna Fisheries Relative to Marine Stewardship Council Criteria. ISSF, MRAG. 40 pp.

Brilliant, S.W., Wimmer, T., Rangeley, R.W. and Taggart, C.T., 2017. A timely opportunity to protect North Atlantic right whales in Canada. Mar. Policy. 81:160-166.

Brown, C.A. 2001. Revised estimates of bluefin tuna dead discards by the U.S. Atlantic pelagic longline fleet, 1992-1999. ICCAT Collective Volume of Scientific Papers 52: 1007-1021.

Clarke, S., Sato, M., Small, C., Sullivan, B., Inoue, Y. & Ochi, D. 2014. Bycatch in longline fisheries for tuna and tuna-like species: a global review of status and mitigation measures. FAO fisheries and aquaculture technical paper. No 588. Rome, FAO. 2014. 220 pp.

Cornish, V., J. Powers, L. Benaka, J. Cusick, T. Dobrzynski, M. Fogarty, S. Fougner, J.Nance, James and J. Terry, 2004. Evaluating Bycatch: A National Approach to Standardized Bycatch Monitoring Programs. National Marine Fisheries Science. Report number: NMFS-F/SPO-66.

Crawford, R., Mangel, J. & Morgan, K., 2016. Gillnet Bycatch of ACAP Species and Ongoing Mitigation Development. Seventh Meeting of the Seabird Bycatch Working Group. La Serena, Chile, 2 - 4 May 2016. SBWG7 Inf 09. Agenda Item 8. 12 pp.

Criquet, G. & Knapman, P. 2018. Gulf of St Lawrence snow crab trap fishery. Marine Stewardship Council (MSC) Expedited Audit Report. SAI global. 87 pp.

Daoust, P.-Y., Couture, E.L., Wimmer, T., and Bourque, L. 2017. Incident Report: North Atlantic Right Whale Mortality Event in the Gulf of St. Lawrence, 2017. Collaborative Report Produced by: Canadian Wildlife Health Cooperative, Marine Animal Response Society, and Fisheries and Oceans Canada. 256 pp.

Davies T.D. & Baum, J.K. 2012.Extinction risk and overfishing: reconciling conservation and fisheries perspectives on the status of marine fishes. Sci Rep 2: 561.

Dragonfly Data Science 2018. Available at: https://www.dragonfly.co.nz/data/

EJF 2005. What's the Catch?: Reducing Bytcatch in EU Distant Water Fisheries. Environmental Justice Foundation, London, UK.

Erbe, C. & McPherson, C. 2012. Acoustic characterisation of bycatch mitigation pingers on shark control nets in Queensland, Australia. Endangered Species Research. Vol. 19: 109–121, 2012 doi: 10.3354/esr00467.

FAO 1995. Code of Conduct for Responsible Fisheries Rome, FAO. 1995. 41 p. ISBN 92-5-103834-5.

Fowler 2016. Review and gap analysis of shark and ray bycatch mitigation measures employed by fisheries management bodies. First Workshop of the Conservation Working Group. Bristol, United Kingdom, 31 October-01 November 2016. Agenda Item 3. 17 pp.

Gallagher, A.J., Orbesen, E.S., Hammerschlag, N. & Serafy, J.S. 2014. Vulnerability of oceanic sharks as pelagic longline bycatch. Global Ecology and Conservation Volume 1, August 2014, Pages 50-59.

Gascoigne, J., Daníelsson, Á., Jagielo, T., le Roux, L. Guðmundsdóttir, L. 2017. Icelandic Gillnet Lumpfish. Third Annual Surveillance Report. Vottunarstofan Tún ehf. December 2017. 35pp.

Gilman, E., Chaloupka, M., Swimmer, Y., & Piovano, S. 2016. A cross-taxa assessment of pelagic longline by-catch mitigation measures: conflicts and mutual benefits to elasmobranchs. Fish and Fisheries. DOI: 10.1111/faf.12143

Gulbrandsen, L.H., 2013. Dynamic governance interactions: evolutionary effects of state responses to non-state certification programs. Regul. Gov. 8 (1), 74-92.

Hall, M. & Roman, M. 2013. Bycatch and non-tuna catch in the tropical tuna purse seine fisheries of the world. FAO fisheries and aquaculture technical paper. No 568. Rome, FAO. 2013. 262 pp.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. & Øien, N. 2017. Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. 40 pp.

Henry AG, Cole TVN, Garron M, Ledwell W, Morin D, Reid A. 2017. Serious injury and mortality a determination for baleen whale stocks along the Gulf of Mexico, United States East Coast, and Atlantic Canadian provinces, 2011–2015. Woods Hole, MA:US Department Commerce Northeast Fisheries Science Center. Ref Doc. 17-19.

Kelleher, K. Discards in the world's marine fisheries. An update. FAO Fisheries Technical Paper. No. 470. Rome, FAO. 2005. 131p.

Knapman, P., Stokes, K. & Blyth-Skyrme, R. 2017. MSC Sustainable Fisheries Certification. North West Atlantic Canada Longline Swordfish. Final report. Acoura marine Ltd. 288 pp.

Kynoch, R. J. Fryer, R.J., Neat, F. C. 2015. A simple technical measure to reduce bycatch and discard of skates and sharks in mixed-species bottom-trawl fisheries. ICES Journal of Marine Science, Volume 72, Issue 6, 1 August 2015, Pages 1861–1868, https://doi.org/10.1093/icesjms/fsv037.

Lassen, H. & Chaudhury, S. 2017. Surveillance no. 2. Report for the Greenland Lumpfish fishery. Sustainable Fisheries Greenland. DNV-GL. August 2017. 53 pp.

Lockwood, S., Jónsson, B. & Chaudhury, S. 2011. MSC Fishery Assessment report: Icelandic Cod Fishery for the client group: Icelandic Group PLC (IGP). Public Certification Report. Report No. 2011-0001. DNV-GL. March 2011. 363pp.

Mangel, J.C., Alfaro-Shigueto, J., Witt, M.J., Hodgson, D.J. and Godley, B.J. 2013. Using pingers to reduce bycatch of small cetaceans in Peru's small-scale driftnet fishery. © 2013 Fauna & Flora International, Oryx, 47(4), 595–606 doi:10.1017/S0030605312000658.

Maree, B. A., Wanless, R. M., Fairweather, T. P., Sullivan, B. J. and Yates, O. 2014. Significant reductions in mortality of threatened seabirds in a South African trawl fishery. Anim Conserv, 17: 520–529. doi:10.1111/acv.12126

Mateo, I., Ennis, G., Criquet, G. & Dunne, E. 2016. Gulf of Maine Lobster (Homarus americanus) Fishery. Public Certification Report. SAI global. 279 pp.

Medley, P.A.H., Hønneland, G & Huntington, T. 2017. ISF Iceland Cod Fishery. Public Certification Report. Report on the 1st re-assessment of the fishery. Vottunarstofan Tún ehf. April 2017. 236 pp.

MFRI 2017. Bycatch of Seabirds and marine mammals 2014-2016. Meðafli fugla og sjávarspendýra 2014-2016.

Mohan, A. 2017. Bycatch of harbour porpoise, harbour seal and grey seal in Norwegian gillnet fisheries. Master thesis. Department of Biosciences, University of Oslo. Institute of Marine Research, Norway. 73 pp.

Molina, J.M. & Cooke, S.J. 2012. Trends in shark bycatch research: current status and research needs Rev. Fish Biol. Fish., 22 (2012), pp. 719-737.

Morison, A. & McLoughlin, K. 2016. Unassociated Purse Seine Fishery for Skipjack and Yellowfin Tuna from Western and Central Pacific Ocean by Tri Marine International (PTE). MSC Full Assessment: Final Report. SCS Global Services Report. 350 pp.

Morsan, E.M., Campodónico, I., Sesar, G. & Medina Foucher, C.A. 2017. Argentine hoki (*Macruronus magellanicus*) bottom and mid-water trawl fishery in Argentine Sea. Final report. OIA. 199 pp.

MSC 2011a. Get Certified! Fisheries. A practical guide to the Marine Stewardship Council's fishery certification process. London, UK. 32 pp.

MSC 2011b. MSC Board Decision: Shark Finning https://improvements.msc.org/database/shark-finning-2/board-decision-shark-finning

MSC 2014a. Summary of Changes Fisheries Certification Requirements version 2.0.

MSC 2014b. MSC Fisheries Standard and Guidance Version 2.0. Issued 1st October, 2014. London, UK. 290pp.

MSC 2017. Marine Stewardship Council: Global Impacts Report 2017. London, UK. 23 pp.

MSC 2018a. Program improvements database. MSC requirements on Endangered, Threatened or Protected (ETP) species.

MSC 2018b. Program improvements database. Labour requirements for fisheries and supply chains. https://improvements.msc.org/database/labour-requirements

NAMMCO 2017. NAMMCO Annual Report 2016. 363 pp. ©North Atlantic Marine Mammal Commission 2017.

Ortiz, N., Mangel, J.C., Wang, J., Alfaro-Shigueto, J., Pingo, S., Jimenez, A., Suarez, T., Swimmer, Y., Carvalho, F. & Godley, B.J. 2016. Reducing green turtle bycatch in small-scale fisheries using illuminated gillnets: the cost of saving a sea turtle. MARINE ECOLOGY PROGRESS SERIES. Mar Ecol Prog Ser. Vol. 545: 251–259, 2016. doi: 10.3354/meps11610.

Opitz, S., Hoffmann, J., Quaas, M., Matz-Lück, N., Binohlan, C. & Froese, R. 2016. Assessment of MSC-certified fish stocks in the Northeast Atlantic. Marine Policy 71 (2016) 10–14.

Pardo, D., Forcada, J., Wood, A.G., Tuck, G.N., Ireland, L., Pradel, R., Croxall, J.P. & Phillips, R.A. 2017. Additive effects of climate and fisheries drive ongoing declines in multiple albatross species. Proceedings of the National Academy of Sciences Nov 2017, 201618819; DOI: 10.1073/pnas.1618819114Pace, R.M., III, T.V.N. Cole and A.G. Henry 2015. Incremental fishing gear modifications fail to significantly reduce large whale serious injury rates. Endang Species Res 26(2): 115–126.

Parkes, G., Trumble, R.J., Valle-Esquivel, M., Bostrom, J. & Zollett, E. 2017. MSC Public Comment Draft Report for Re-Certification of the US North Atlantic Swordfish Pelagic Longline and Handgear Buoy Line Fishery. MRAG Americas. 261 pp.

Randall R. Reeves, R.R., McClellan, K. & Werner, T.B. 2013. Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011. Endangered Species Research. Vol. 20: 71–97, 2013 doi: 10.3354/esr00481.

Read, A.J. 2008. The looming crisis: interactions between marine mammals and fisheries. Journal of Mammalogy 89: 541-548. 89.

Ross, A. & Isaac, S. 2004. The Net Effect? A review of cetacean bycatch in pelagic trawls and other fisheries in the north-east Atlantic. WDCS report. Greenpeace. 74 pp.

Scales, K.L., Hazen, E.L., Jacox, M.G., Castruccio, F., Maxwell, S.M., Lewison, R.L., Bograd, S.J., 2018. Fisheries bycatch risk to marine megafauna is intensified in Lagrangian coherent structures. Proceedings of the National Academy of Sciences Jun 2018, 201801270; DOI: 10.1073/pnas.1801270115.

Sutton, M., Wimpee, L., 2008. Towards sustainable seafood: the evolution of a conservation movement. In: Seafood Ecolabelling: Principles and Practice, pp. 403e415.

Tamini, L.L., Chavez, L.N., Dellacasa, R.F., Seco Pon, J.P., Yates, O. & Frere, E. 2016. Uso de tercer cable en el Mar Argentino: registro, impacto potencial y pruebas de medidas de mitigación para reducir la mortalidad de albatros y petreles. ACAP 7ta Reunión del Grupo de Trabajo sobre Captura Secundaria. La Serena, Chile, 2-4 de mayo.

Trumble, R.J. & Stocker, M. 2016. Solomon Islands Skipjack and Yellowfin Tuna Purse Seine Anchored FAD, Purse Seine Unassociated, and Pole and Line. MSC Public Certification Report. MRAG Americas. 312 pp.

Wallace, B. P., C. Y. Kot, A. D. DiMatteo, T. Lee, L. B. Crowder, and R. L. Lewison. 2013. Impacts of fisheries bycatch on marine turtle populations worldwide: toward conservation and research priorities. Ecosphere 4(3):40. http://dx.doi.org/10.1890/ES12-00388.1

Walsh W.A., P. Kleiber and M. McCracken. 2002. Comparison of logbook reports of incidental blue shark catch rates by Hawaii-based longline vessels to fishery observer data by application of a generalized linear model. Fisheries Research 58:79-94.

Wiedenfeld, D.A. 2012. Analysis of the Effects of Marine Stewardship Council Fishery Certification on the Conservation of Seabirds. American Bird Conservancy. 40 pp.

Wiedenfeld, D.A., Crawford, R. and Pott, C.M. 2013. Workshop Report: Reducing the Bycatch of Seabirds, Sea Turtles, and Marine Mammals in Gillnets. 21-23 January 2015. American Birds Conservancy, Birdlife International.

Zydelis, R., Small, C. & French, G. 2013. The incidental catch of seabirds in gillnet fisheries: A global review. Biological Conservation 162 (2013) 76–88.

Annex 1. The Marine Stewardship Council (MSC) certification scheme and assessment process

The Marine Stewardship Council (MSC) certification scheme was established in 1997 through a collaboration between the World Wildlife Foundation (WWF) and Unilever. This scheme has developed standards for sustainable fishing (the MSC Fisheries Standard) and seafood traceability (the MSC Chain of Custody Standard) in consultation with scientists, the fishing industry and conservation groups, reflecting the most up to date understanding of internationally accepted fisheries science and best practice management. The MSC Fisheries Standard is designed to assess if a wild-capture freshwater or marine fishery is well-managed and sustainable and there are three core principles that every fishery assessed under the MSC standard must meet:

> Principle 1: Sustainable target fish stocks - A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.
>
> Principle 2: Environmental impact of fishing - Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.
>
> Principle 3: Effective management - The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

To determine if each principle is met, the MSC Fisheries Standard comprises 28 performance indicators (PIs) which are used by independent conformity assessment bodies (CABs), hired by the fishery client, to score the fisheries. In order to obtain MSC certification, the fishery needs to obtain a score of 60 or more (out of a possible 100) for each of these PIs, which represents the "minimum acceptable limit" for sustainability practices. If a fishery achieves a score of less than 60 on any PI, the fishery will fail and the certification will not be awarded. Additionally, the fishery must have an aggregate score of 80 or more for each of the three Principles in order to be certified (MSC 2011a). Where a fishery achieves a score for any PI of less than 80, which represents "global best practice" level, but at least 60, one or more 'conditions' of certification are set by the CAB for continuing certification which need to be met within a specific time frame. In the absence of exceptional circumstances, the condition(s) shall improve performance of the fishery to at least the 80 level within a period set by the certifier but not longer than the certification period (MSC 2011a). The certifier will specify an appropriate timescale

for addressing each condition and the outcome or targets for which the fishery should aim (MSC 2011a, 2014). Actions to address these conditions, milestones and timeframes need to be detailed in a 'client action plan' prepared by the fishery client and approved by the certifier. The progress against milestones and conditions is assessed by the CAB through annual surveillance audits, resulting in fisheries being suspended from the program until performance improvements are made. The fishery needs to address all the conditions and improve the performance of all the PIs to at least the 80 level within the five-year term of the certification period to demonstrate that it meets the MSC's "global best practice" and to retain the certification. These requirements incentivise certified fisheries to make continuous improvements to demonstrate their sustainability. The MSC refers to this mechanism as its "theory of change". Bycatch issues are addressed directly in MSC Principle elements 2.1, 2.2 and 2.3 (primary, secondary and ETP species), and 2.5 as part of the ecosystem and food chain.

The MSC operates as a 'third-party' certification program as the assessment is conducted by an independent organisation and meets standards established by experts in consultation with stakeholders (MSC 2011a). This process is overseen by Accreditation Standards International (ASI), an independent organization which accredits CABs to perform MSC assessments and undertakes random audits to evaluate that the correct application of the MSC criteria and standards. ASI can also intervene at MSC (or another stakeholder's) request if there has been a complaint or possible non-conformity (MSC 2014a).

Transparency and consultation are important features of the MSC certification process and stakeholders are encouraged to participate in the certification process by providing information and submitting comments at various stages of the process. They may also lodge formal objections following the CAB's proposal to certify the fishery (Christian et al., 2013, MSC 2010b). If an objection is filed, an independent adjudicator, selected by the MSC, will determine whether the objection should be held after appropriate consultations (MSC 2011a). For an objection to be upheld, the objector must demonstrate that a serious procedural irregularity occurred and/or that the scoring was not underpinned by the available evidence (Christian et al., 2013).

Once a fishery achieves certification, products derived from the fishery can display the MSC ecolabel in the marketplace after each link in the supply chain completes a traceability audit against the separate MSC Chain of Custody standard that ensures certified products are traceable (MSC 2011a).