The Marine Stewardship Council's Influence in the Indian Ocean: Lessons of Sustainability from the Maldives Pole-and-Line Skipjack Tuna Fishery

By

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The Maldives pole-and-line fishery has sustainably harvested skipjack tuna for millennia. In 2012, this fishery achieved conditional certification with the Marine Stewardship Council (MSC). To achieve this eco-standard, Maldives led a reform within the Indian Ocean Tuna Commission (IOTC), improving management standards and facilitating certification for surrounding fishing nations. This thesis draws on accounts from participants who have been involved in the MSC assessment process or currently work in IOTC fisheries. The experiences gained on a pole-and-line fishing trip and through the island atolls in the Maldives also contributed to informing concepts throughout this thesis. Eight interviews were conducted with relevant stakeholders, which were subsequently transcribed using NVivo 1.7.1 to draw on key themes found in the qualitative data. The results from this study have demonstrated that there have been an array of sustainability and market consequences following the Maldives' obtention of the MSC certificate, such as an erosion of market premium for certified tuna and exacerbated fishing pressures throughout the Indian Ocean. The contributions made by the Maldives throughout this Regional Fisheries Management Organization (RFMO) – the IOTC, have laid the steppingstones for CTFO, Echebastar, and AGAC fisheries to also pursue the MSC eco-label. All other certified fisheries in the Indian Ocean are purse seine vessels from the European Union. The MSC fisheries standard has therefore been entrenched in IOTC fisheries, resulting in an array of socio-economic and environmental consequences for the coastal nations and distant water fishing nations of the Indian Ocean. Initial obtention of this standard by a small island developing state is an impressive feat and points to the leadership of the Maldives in fishery management; both on a local and global scale.

Keywords: Marine Stewardship Council, Tuna Fisheries, Maldives Pole-and-Line Fishery, Indian Ocean Tuna Commission, Small Island Developing State

List of Abbreviations

AFAD: Attached fish aggregating device

AGAC: Association of large tuna freezers

CAB: Conformity assessment body

CE: Common era

CPC: Contracting party

CTFO: Compagnie Française du Thon Océanique

DFAD: Drifting fish aggregating device

DWFN: Distant water fishing nation

EEZ: Exclusive Economic Zone

EU: European Union

FAD: Fish aggregating device

FAO: Food and Agricultural Organization

FIP: Fisheries improvement plan

FSS: Free swimming school

HCR: Harvest control rules

IPNLF: International Pole and Line Foundation

IOTC: Indian Ocean Tuna Commission

LRP: Limit reference points

MSC: Marine stewardship council

MSPEA: Maldives Seafood Processors and Exporters Association

P1/P2/P3: Principle 1/2/3

RFMO: Regional fisheries management organization

SDG: Sustainable Development Goal

SIDS: Small island developing state

SSF: Small scale fisheries

TAC: Total allowable catch

TCMP: Technical committee on management procedures

TRP: Target reference points

UNCLOS: United Nations Convention on the Law of the Sea

VMS: Vessel monitoring system

WWF: World Wildlife Fund

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Chapter 1: Introduction

1.1 Background

1.1.1 Maldives Tuna Fisheries

The Republic of the Maldives is situated in the central Indian Ocean and comprises 26 atolls of 1,190 islands (Hemmings, Harper & Zeller, 2011). With an Exclusive Economic Zone (EEZ) 3,000 times the size of the country's land mass (Edwards et al., 2020), fisheries and marine resources have been vital to Maldivian food security and employment for centuries. Various fishing techniques are relied upon in this small island developing state (SIDS); however, the pole-and-line skipjack (*Katsuwonus pelamis*) fishery remains the most valuable in the Maldives due to its economic success and sustainable harvest methods (Hohne-Sparborth, Adam & Ziyad, 2015). Under the Maldives Fisheries Law, purse seine and net fishing are completely banned. The Maldives was the first nation in the Indian Ocean to successfully achieve eco-certification for a tuna fishery with the Marine Stewardship Council (MSC) in November 2012 (MSC, 2016). Initially certified for yellowfin tuna (*Thunnus albacares*) and skipjack tuna, the former has since been withdrawn due to overall stock decline of the Indian Ocean yellowfin tuna.

The early history of the Maldives is not well documented, although settlement was expected to originate from Sri Lanka and India around the first to third centuries CE (Yadav et al., 2019). The country only began to receive greater attention in the ninth century due to their bountiful cowries. Cowries are a marine mollusk with a dome-shaped shell that were used as currency in the Indian Ocean for ten centuries (Yadav et al., 2019). The prevalence of cowries in Maldivian waters put this archipelago on the map for

regional trade. Twelve centuries later, the Maldives continue to be reliant on trade, but cowries have been replaced by fishery products which account for over 80% of the nation's exports (Yadav et al., 2019). Although tourism has become the principle economic driver in the Maldives today, it primarily employs non-Maldivians whereas the fisheries sector provides employment to 20% of the local population (Yadav et al., 2019). With 37.45% of the total fish catch being skipjack tuna, the pole-and-line tuna fishery is of great importance to the Maldives cultural identity and economic stability (Yadav et al., 2019). As of 2019, only 47% of payroll employees working in resorts were Maldivians, thus providing employment to an estimated 4% of the local population (Thashkeel, 2021).

1.1.2 Pole-and-Line Fishing

The most prominent method for harvesting tuna globally is through purse seine vessels, accounting for an estimated two thirds of landed tuna (ISSF, 2023). Longline, gillnets, and pole-and-line are the other primary methods used to target tropical tuna. Maldives' pole-and-line is a live bait fishery and involves catching tuna one at a time, resulting in low levels of bycatch (MSC, 2023a). The bait fish are caught using nets deployed by snorkelers and divers from the vessel, which are then transferred to on-board basins to keep the bait alive until a school of tuna is located later in the day. Pole-and-line is the most prominent harvest method in the Maldives, accounting for over 60% of the tuna caught in this archipelago (Edwards et al., 2020). Most of the fishing is accomplished by spotting free-swimming schools (FSS), but the fishery has also relied on 55 anchored fish aggregating devices (AFADs) since the 1980s (Jauharee et al., 2021).

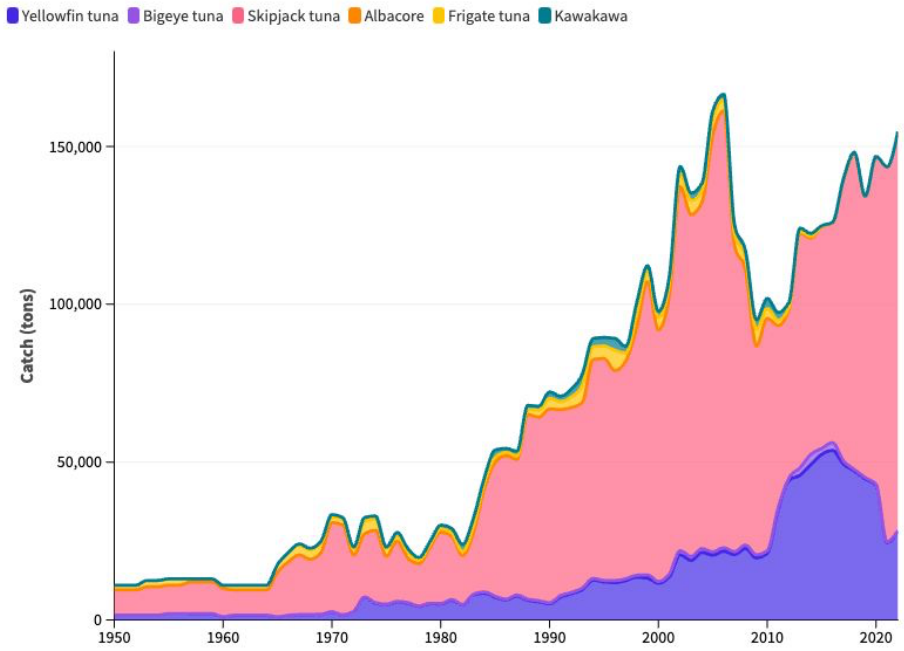

Figure 1. Maldives catch data from 1950 to 2020 (Source: IOTC, 2023a)

The pole-and-line tuna fishery is governed within the Maldives by the Ministry of Fisheries, Marine Resources and Agriculture (Government of Maldives, n.d.). The fishery can land over 68 000 tons of skipjack annually via an estimated 677 pole-and-line vessels (Edwards et al., 2020). In 2022, the Maldives pole-and-line vessels caught 126,363 tons of skipjack tuna and 9,090 tons of yellowfin tuna (IOTC, 2023b). All vessels are owned by locals and built in the Maldives, ensuring domestic financial revenue across a multitude of industries, and abolishing the potential for commercially owned fleets. Maldives do not permit foreign fishing vessels to fish within the Maldives.

In the pole-and-line fishery, fishing crews harvest skipjack by spotting FSS or targeting AFADs. AFADs are built, deployed, and maintained by the Maldivian government, thus all pole-and-line vessels have equal access to these 55 devices spread throughout the nation's EEZ (Jauharee et al., 2021). AFADs are typically targeted by

vessels if spotting the FSS was unsuccessful – the aggregating devices do not provide as much volume of catch. However, AFADs can be a useful tool in allowing the crew to break even on the fishing vessel's expenses.

Figure 2. Maldivian crew members scouting for a FSS (Photo credits: Côté-King, K., 2023)

Figure 3. Maldivian pole-and-line fishermen in action (Photo credits: Côté-King, K., 2023)

1.1.3 RFMO Management

Highly migratory fish species such as tuna move through the waters of several countries and the high seas, requiring multi-level governance founded in the United Nations Convention on the Law of the Sea (UNCLOS) (Roberson et al., 2021). Countries fishing for tuna stocks cooperate and collaborate in the management of these species through Regional Fisheries Management Organizations (RFMOs) in addition to the domestic management regimes. Maldivian-caught skipjack falls under the jurisdiction of the Indian Ocean Tuna Commission (IOTC). The IOTC was established in 1993, and at the time of writing is composed of 30 members or contracting parties (CPCs), including both coastal states and distant water fishing nations (DWFNs) – countries that do not have a coastline in the Indian Ocean, but have fishing vessels harvesting both in high seas and in coastal waters through access agreements (IOTC, 2023c). Indian Ocean coastal

States include Australia, several continental African and Middle Eastern states, as well as four small island developing states (SIDS); Comoros, Maldives, Mauritius, and Seychelles. The DWFNs include EU members, China, Japan, the Republic of Korea, Philippines, and the United Kingdom (IOTC, 2023c). Maldives bans foreign vessel fishing within their EEZ, whereas Mauritius, Madagascar, and Seychelles rely on access agreements held with DWFNs to supply canneries and provide employment in local ports (Sinan, Bailey & Swartz, 2021).

Management in the IOTC, as in other RFMOs, has long since been dominated by DWFNs and centered around maximizing economic gain on landed tuna (Sinan, Andriamahefazafy, & Robertson, 2022), despite widely reported overfishing in the region (IOTC, 2019). Yellowfin tuna has been biologically overfished since 2014, while bigeye tuna and albacore were overfished in 2019 (Sinan, Bailey & Swartz, 2021). Although skipjack stocks are currently in the green, fishing pressures exceed recommended catch limits by approximately 30% (IOTC, 2022a). An evident divide exists between IOTC CPCs, with historic colonial domination of DWFNs on certain coastal states (Sinan, Andriamahefazafy, & Robertson, 2022). These dynamics in part led to the formation of the G16 in 2011; an assembly of like-minded coastal states working in conjunction to bargain for capacity building and improved management in the IOTC (Sinan, Andriamahefazafy & Robertson, 2022). Complexities including skewed management, colonial power dynamics, overfishing of tuna stocks, and disproportionate conservation efforts among CPCs are but a few of the challenges impeding adequate IOTC management (Abolhassani, 2017; Sinan, Andriamahefazafy & Robertson, 2022; IOTC, 2022a).

1.2 Marine Stewardship Council (MSC)

1.2.1 Background and Certification Process

The tuna captured in the Maldives and throughout the Indian Ocean ends up in supermarkets and restaurants around the world. In addition to the governance of fisheries production, there is also governance of fisheries consumption that occurs. One primary form of governing consumption is through the use of eco-certifications and consumer labelling (Maesano et al., 2020). Eco-certifications have gained popularity throughout the 21st century, promoting sustainable food consumption and securing retail shelf space among international markets. Today, the Marine Stewardship Council (MSC) has become the largest eco-certifier of seafood with an estimated 47% of globally landed tuna being harvested by fisheries holding or seeking the MSC label (Schiller & Bailey, 2021). Interestingly, consumers have been found to have a positive perception of the MSC and are willing to pay a price premium of over 20% for this eco-certification label on their seafood products (Maesano et al., 2020).

For a fishery to be awarded certification, fishery assessments are conducted by conformity assessment bodies (CABs), which are in theory independent from both the fishery and the MSC. Assessments are pre-requisite for awarding a fishery with the certification. The assessment lasts from 12 to 18 months with affiliated costs reflecting multiple aspects of the fishery in question and borne by the unit seeking certification (MSC, 2023b). Once certified, the fishery undergoes annual audits to examine changes in management and the physical environment in which harvest occurs, along with reassessment within 5 years of the previous certificate being granted.

1.2.2 MSC Principles

Fisheries undergoing assessment to achieve MSC certification are evaluated on three principles[1], herein referred to as P1, P2, and P3.

I) Sustainable fish stocks: The stock being harvested must be viable to reproduce and remain stable into the future (MSC, 2023c). In the case of Indian Ocean tuna fisheries, the RFMO is responsible for the management of the stock, as it is shared and harvested by the entire membership of the IOTC. As such, any Indian Ocean fishery pursuing the MSC standard for skipjack tuna will undergo assessment of P1 based on the whole Indian Ocean skipjack tuna stock.

II) Minimal environmental impact: The fishing methods must 'maintain the structure, productivity, function, and diversity of the marine ecosystem' (MSC, 2023c). The fishery evaluations and assessments will differ for different gear types, as their impacts on the ecosystem vary. Indian Ocean tuna fisheries differ primarily on P2, as the fleets with certification are reliant on either pole-and-line or purse seine harvest techniques.

III) Effective management: Laws and management systems (such as those operationalized through the IOTC) are responsible for rapidly responding to changes in the fishery or region in which harvest is occurring (MSC, 2023c). As the IOTC is the RFMO responsible for tuna management in the Indian Ocean, all MSC certified fisheries including the Maldives pole-and-line fall under the same

[1] See *Figure 11* for the principles of MSC certification and the respective conditions presented to the Maldives in 2012.

management authority of this RFMO, in addition to having effective management at the domestic level.

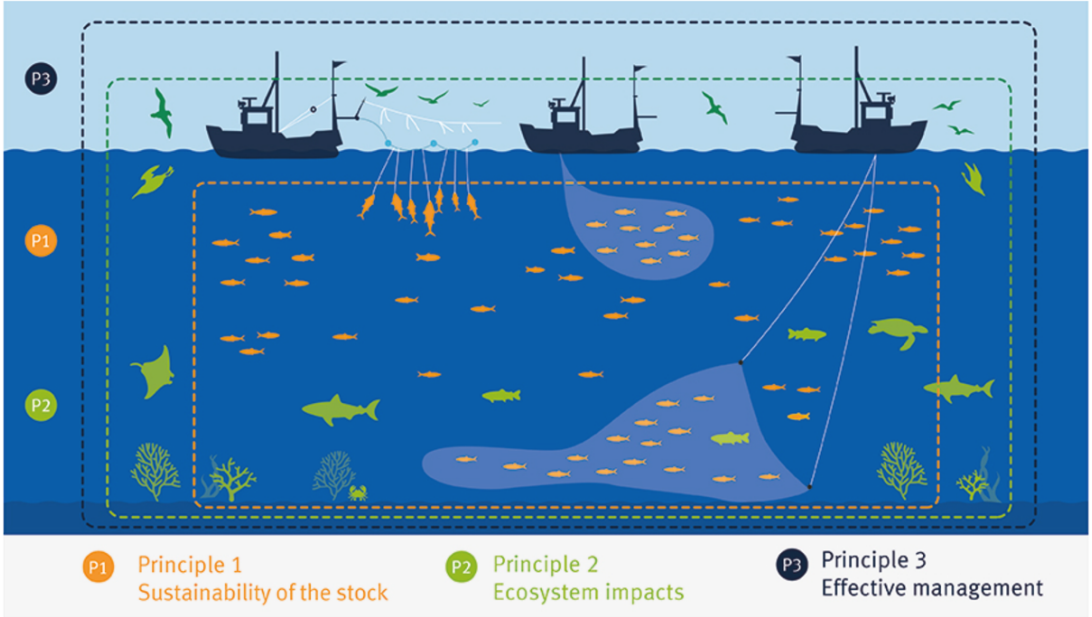

Figure 4. Principles of the MSC fisheries standard (MSC, 2023b)

1.2.3 Concerns With MSC

Despite self-identifying as the 'best environmental choice in seafood', the MSC has received numerous complaints and objections in recent years, primarily centered around lax certification standards and exclusion of socio-economic aspects in the assessment process (Manach et al., 2020; Tindall et al., 2022). Despite the popularity of this market-driven certification scheme, the standard also remains widely inaccessible to small scale fisheries (SSF). Large upfront costs associated with fisheries assessments, requirements for strong data management infrastructure, and the fulfillment of detailed environmental and traceability standards limit the inclusion of many SSF (Barr, Bruner & Edwards, 2019). It is well recognized that SSF already face numerous barriers in obtaining access to international markets. As such, the Food and Agricultural

Organization's (FAO) sustainable development goal (SDG) 14b has called for improved market access for SSF (Franz, 2018), and the FAO Guidelines on Securing SSF features an entire section on markets and value chains (FAO, 2018). Eco-certifications such as the MSC standard can play a prominent role in securing shelf space for seafood products, and therefore barriers to obtaining the blue check mark can mean SSF cannot get their products on those shelves. The Maldives' semi-industrial pole-and-line fleet functions at a higher level of management than most fisheries found in developing coastal states of the Indian Ocean. This is due to several contributing factors such as support from the Maldivian government, robust catch-reporting data among pole-and-line harvesters, and active participation from the nation within the IOTC. However, achieving the burden of MSC certification entailed steps which are largely beyond the means of a single fishing nation. Examples of this fishery management

Large-scale fleets using higher impact fishing gear makes up the bulk of the volume of MSC certified fisheries, allowing industrial fleets to be at the forefront of global seafood markets and generating substantial royalties in comparison to lower-catch artisanal or small-scale fleets (Manach et al., 2020). However, the MSC uses these SSF as their main promotion for sustainable fishing practices in promotional materials (Le Manach et al., 2020). With 89% of MSC-certified fisheries being based in 10 countries, it becomes evident that the standard is available to a small niche of fisheries based primarily in developed countries with disproportionately higher resources to support management capacity and assessment costs (Wijen & Chiroleu-Assouline, 2019).

Although the impacts of fisheries on the marine environment are of paramount importance, considering socio-economic and cultural components in sustainability

assessments of fishing practices has become common in recent years (Bailey et al, 2018). Not incorporating these aspects has meant the MSC only promotes one small conceptualization of sustainability. The MSC has also been criticized to lack effective enforcement on environmental aspects of the standard. Instances of re-certification of non-compliant fisheries and lack of fishing quota enforcement are a few examples of where the MSC lacks adequate eco-system considerations in their framework (Wijen & Chiroleu-Assouline, 2019). Therefore, the standard appears to be lacking in social, economic, and environmental sustainability, triggering an array of critiques across the literature and throughout the results of this thesis.

1.3 Timeline of MSC in the Indian Ocean

1.3.1 Maldives Achievement of MSC Certification

In 2007, the American Albacore Fishing Association achieved MSC certification as the world's first tuna fishery to meet the MSC standard (MSC, 2013). This fishery harvests via pole-and-line or troll gears. The Maldives pole-and-line was the first Indian Ocean tuna fishery to achieve certification in 2012 (MSC, 2016). Beginning as early as 2007, individuals within the Maldives started an initial screening of the fishery to evaluate if it would be feasible to pursue certification. Efforts were initiated by Horizon fisheries and certification was done on behalf of the Maldives Seafood Processors and Exporters Association (MSPEA). Partnership with the Maldivian government allowed appropriate financing and technical support for this endeavor (Edwards et al., 2020). This collaborative relationship between the state and the MSPEA maintained the country's access to export markets for all canned pole-and-line caught skipjack tuna (Edwards et

al., 2020). This has been exceptionally important to the Maldives' economy along all tiers of the value chain.

When the Maldives pole-and-line fishery underwent an initial assessment for MSC certification, they were presented with eight conditions to satisfy within five years (Anderson et al., 2012). This meant that the Maldives needed to lead a reform of the IOTC, which entailed substantial changes within the RFMO such as the adaptation of harvest control rules (HCR), implementation of a bait management program, and agreement of limit reference points (LRP) within IOTC CPCs, to name but a few[2]. Despite this challenge, the Maldives leadership within the IOTC lead to successfully satisfying all eight MSC conditions presented during the initial assessment and thereby improving management for sustainable tuna harvest within the RFMO.

The Maldives led efforts to satisfy conditions pertaining to P1, P2, and P3. This was accomplished through proposals presented by the Maldives in the IOTC, which were successfully adopted within the RFMO (*Figure 12*). Despite the long-since domination of DWFN in the IOTC, this SIDS successfully initiated steps towards improved management practices. This undertaking towards certification presented a large conservation burden placed on the Maldives to demonstrate sustainability across P1 and P3, which are in many ways outside the control of a single fishing entity.

By 2016[3], the Maldives had successfully satisfied the MSC's conditions (*Figure 12*), thereby opening the doors for other fisheries to pursue certification. Since 2012,

[2] See Appendix A for full list of MSC conditions presented to the Maldives in 2012.
[3] Based on the MSC surveillance report (Scott & Stokes, 2015), all eight conditions were closed in 2015 (Appendix G). Due to the IOTC only adopting HCR in 2016, it seems that was the year that all conditions

three other fisheries in the Indian Ocean have achieved the MSC standard, while others are still in the assessment process.

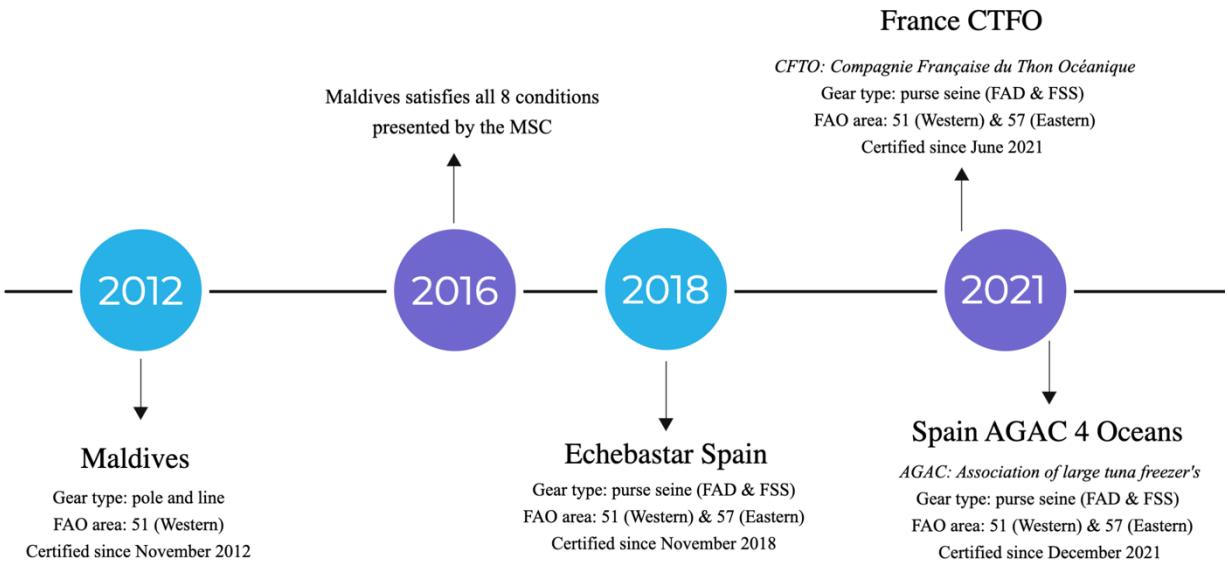

Figure 5. Timeline of MSC certified skipjack tuna fisheries in the IOTC

The Echebastar fleet was the first purse seine fishery to be MSC certified in the Indian Ocean. Pesqueras Echebastar is a Basque company based in Spain and six purse seine vessels were certified as meeting the MSC standard in 2018 (Echebastar, 2019). They began the assessment process in 2013, just one year after the Maldives achieved conditional certification. Certification of Echebastar received notices of objections from Shark Project, the World Wildlife Fund (WWF), and the International Pole and Line Foundation (IPNLF) (Echebastar, 2018). Similar to the Maldives pole-and-line fishery, Echebastar was certified with conditions for improvement, wherein they met the

were met. The significance of this resolution has led this research to determine that the actual year of satisfying all conditions was 2016.

minimum requirements but must improve upon these components by the time of re-assessment, which began in June 2023 (Echebastar, 2023).

1.3.2 MSC in the Indian Ocean Today

There are currently two Indian Ocean tuna fisheries undergoing the MSC assessment process:

1. ANABAC, Spain
    a. ANABAC: Asociación Nacional de Armadores de Buques Atuneros Congeladore
    b. Gear type: purse seine (FAD & FSS)
    c. Fishery announcement: September 2022
    d. FAO area: 51 & 57

2. Dongwon, South Korea
    a. Dongwon industries: leading Korean fishing industry founded in 1969 (Dongwon Industries, 2019)
    b. Gear type: purse seine (FAD & FSS)
    c. Fishery announcement: April 2023
    d. FAO area: 51 & 57 (including Indian Ocean high seas and EEZ of Seychelles)

Furthermore, several fisheries in the region are working towards beginning the MSC assessment process. This has manifested itself in the form of fisheries improvement plans (FIP), such being the case in Lakshadweep, India. Much like the Maldives, this tropical archipelago harvests tuna via pole-and-line and began undergoing a FIP in 2018, led by a collaboration between the IPNLF and WWF with goals of moving the fishery towards MSC certification in the coming years (WWF, 2018). WWF-India was also the recipient of the 2017 Global Fisheries Sustainability Fund for Lakshadweep, which was an MSC program lending financial support to aid small and developing world fisheries (MSC, 2023d).

The MSC is not directly associated with FIPs, but rather these plans are public-private partnerships that aim to improve one or several aspects of a fishery (Schiller & Bailey, 2021). They are categorized as 'basic' or 'comprehensive,' wherein the specific purpose of comprehensive FIPs is for the recipient fishery to qualify for the MSC fisheries standard without conditions (Schiller & Bailey, 2021). Some examples of aspects being addressed in FIPs would be mitigation of bycatch, adoption of HCR, or improvement of catch reporting.

1.4 Management Problem

Despite substantial discrepancies in the respective capacities of SIDS, coastal states, and DWFNs in the Indian Ocean, the Maldives was the first country in the region to achieve conditional MSC certification in 2012. This was in part due to the sustainability of the pole-and-line fishery, which was considered a more sustainable option than purse seines fishing on fish aggregating devices (FADs) (Jauharee et al., 2021). The burden placed on the Maldives to lead a reform of the IOTC, which was necessary to satisfy the conditions and thus maintain certification, is largely beyond the capacity of any single fishing nation (let alone a SIDS). Echebastar's certification was facilitated through these steppingstones, which then opened the doors for other purse seine fisheries such as CTFO and AGAC to apply for the MSC certification. Additionally, under P2, the burden of proof to demonstrate a centuries-old fishing practice as sustainable under a contemporary standard is ironic.

Following the Maldives certification, doors were open for other fisheries within the IOTC to access the same 'MSC market', as the Maldives had done much of the leg work in providing fish stock data (P1) and improving RFMO management (P3). This

eroded the unique position the Maldives had and in fact flooded the market with 'sustainable' tuna, regardless of the gear type[4].

This raises interesting questions, like how this disproportionate conservation burden presents as a management issue, as in obtaining certification for improved access and prices for its own tuna, Maldives facilitated additional countries and units of certification to be certified with much lower costs and therefore to erode any market advantages it had tried to gain through certification. The Maldives invested a disproportionately larger effort into certification for a shared stock as the first IOTC fishery to pursue the MSC standard. This has caused problems including a loss of market prioritization and lack of recognition for different types of gears.

Meanwhile, as new fisheries in the Indian Ocean are certified, the stock condition remains poor (Sinan, Bailey, Swartz, 2021). Despite Indian Ocean skipjack stocks being in the green, the quota has been surpassed annually by about 30% since 2018 (IOTC, 2022a). Lack of compliance with harvest quotas and the long-term repercussions this may present for skipjack stocks demonstrates a management problem within the IOTC. Additionally, a certification body such as the MSC whose standard is certifying fisheries prone to ecological harm shows that this standard is failing at the one aspect it claims to achieve: environmental sustainability. But how can the IOTC and the MSC take accountability to improve Indian Ocean management to sustain healthy tuna stocks for generations to come?

[4] Maldives is the only pole-and-line fishery in the IOTC to have MSC certification. All others are purse seine (see *Figure 5*.)

The above circumstances pertaining to Indian Ocean tuna have demonstrated several management issues that this paper will aim to address. First, the MSC's eco-certification standard appears to be neglecting to consider ecosystem impacts of fishing gear, entailing environmental consequences for Indian Ocean coastal states. Second, the Maldives has put in a disproportionately larger effort into improved IOTC management as a SIDS, however they are not receiving the market benefits they were promised when pursuing certification, putting into question the market-based incentives assumptions inherent in voluntary eco-certification schemes. Lastly, the entrenched socio-economic components of fisheries make the MSC fisheries standard unsustainable, as considering only environmental impacts neglects the other pillars of sustainability which are fragile in the global south.

These complex circumstances have led to the following research questions:

Primary research question: ***What have been the sustainability and market consequences in the Indian Ocean following the Maldives' certification with the MSC?***

The following sub-questions were also developed:

Sub-question: ***In what ways has the Maldives tuna fishery supported the pillars of sustainability within the country?***

Sub-question: ***How has the Maldives undertaken a conservation burden within the IOTC?***

Through answering the above research questions, this thesis aims to explore the influence of the MSC among IOTC fisheries and highlight the conservation burden undertaken by the Maldives.

1.5 Outline of Thesis

This thesis is organized into five chapters followed by references and appendices. Chapter 1 is the introduction, which aims to provide background on the concepts explored in this research with a timeline of relevant events, along with the questions being asked through the research process. Chapter 2 explains the methods, Chapter 3 includes the results and discussion, Chapter 4 summarises the findings and will conclude with some thoughts on the future of MSC and the Maldives tuna fishery. The attached appendices provide further insight onto the management problems and include the documents used to conduct research.

Chapter 2: Methods

2.1 Study Design

This project focuses on exploring the socio-cultural, economic, and environmental consequences in the Indian Ocean in the wake of Maldives achieving MSC certification in 2012. Information for this research project was acquired through both a literature review and data collection through semi-structured qualitative interviews, on top of a semi-ethnographic approach of time spent in Mauritius and the Maldives. Topics covered throughout the literature review included keywords such as IOTC, tuna RFMOs, transboundary tuna management, skipjack tuna, socio-economic indicators, Maldives, pole-and-line, purse seine, and SIDS. Attending the 27th IOTC conference in Mauritius, a pole-and-line fishing outing in the Maldives, and staying at the Horizon fisheries complex played crucial roles in framing this research and informing concepts used throughout this thesis.

2.2 Interview Structure

For completion of this research, data were collected through eight semi-structured interviews with individuals familiar with or working in Indian Ocean tuna fisheries. All interviewees have also been actively involved in the MSC assessment process of an IOTC fishing fleet, either throughout the assessment phase, the resolution of conditions, or by providing objections to a fishery pursuing the eco-standard. Participants currently or previously worked in industry (4), government (1), sciences (2), or non-governmental organizations (1). Participants have also directly worked within the IOTC since 2012 and represented a diverse array of fishing nations. Five interviews were conducted in person

at the IOTC commission meeting in May 2023 in Mauritius or in the Maldives shortly after, while three interviews took place via Teams in June and July of 2023.

Most interviews were between 40 to 60 minutes in duration. This included completion of a Q-sort and a semi-structured question period. The Q-sort was completed by seven out of eight interview participants and included a list of forty statements divided into five categories: market, eco-certification, environment, management, and socio-cultural values. Categories were determined by the researcher prior to the interview processes beginning. Responses to statements ranged between strongly disagree (-4) to strongly agree (+4), with neutral being at zero (0) (Appendix B). Responses were then reviewed to determine both areas of convergence and divergence among participant opinions. This was followed by an interview, wherein questions posed were unique to the interviewee, depending on the sector or industry in which they were based (Appendix C), and the ways in which they had responded to the Q-sort.

Research was undertaken with approval from the Marine Affairs Program Ethics Standing Committee, file number 2023-03.

2.3 Data Analysis

All interviews were audio-recorded and subsequently transcribed. The transcription process was done manually for interviews conducted in person and via Teams software for those done remotely. Those done through Teams were reviewed for accuracy and corrections were done manually. All interviews were coded for key themes using an inductive approach in NVivo 1.7.1; a qualitative analysis software. The interviews were de-identified for inclusion in the research. Particularly due to the small sample size of the study, affiliations were also excluded. Seven participants agreed to the

use of anonymous direct quotations in this paper. One participant did not consent to quotations, but provided valuable qualitative data which was included in other formats.

The content from all eight interviews were analyzed in an inductive approach on NVivo, meaning that codes were derived from the data to indicate which themes or topics were being addressed by interviewees (Appendix D). These themes and sub-themes are presented primarily as quotations (with the exception of one participant's interview) in the results section and used to answer the main research question and sub-questions. Questions posed to participants touched on management within the IOTC, the role of purse seine fleets, costs and benefits of access agreements, the cultural role of fisheries in coastal states, and how the presence of the MSC has impacted Indian Ocean tuna fisheries (Appendix C).

2.4 Challenges with Data Collection

When preparing for this research project, the Q-sort component of data collection was anticipated to be used in generating statistical analyses of participant opinions on the statements provided. Due to a small sample size and participants not following the traditional method of filling out a Q-sort, it was not possible to translate this information into such statistical analysis. Nonetheless, the Q-sort rankings were included in the results section to highlight some statements in which participant opinions significantly overlapped, despite most statements having a vast divergence in rankings.

Chapter 3: Results & Discussion

Eight participants partook in semi-structured interviews and seven of these individuals also completed a Q-sort. Sections 3.1 to 3.3 of the results will present and discuss interview data with the support of participant quotations. These three sections and respective sub-categories represent key themes that were inductively derived from transcribed interviews using NVivo, and they are more or less organized chronologically. First, all results related to the undertaking of MSC certification by the Maldives are presented, followed by results about additional industrial entrants into the certification arena, and wrapping up with results relating to current dynamics in the region. Data from the Q-sorts are included throughout each section and the entirety of these completed Q-tables may be found in Appendix E. Note that the results are presented here with an accompanying discussion. It was decided that the nature of the work and the conversations that took place with interviewees lends itself better to a combined results and discussion section. Note that because much of the results are in the telling of events they may appear as facts in some places. Where they are based on opinions and perceptions of interviewees, this is clearly indicated.

3.1 Maldives' Undertaking of MSC Certification

In 1999, the MSC published its certification requirements to thoroughly align with the FAO's eco-labelling guidelines (Brown, Agnew & Martin, 2016). Over the past two decades, the MSC has grown to be the most globally recognized seafood certification program (Pérez-Ramírez et al., 2016). Assessment against the MSC fisheries standard can take 12 to 18 months, with associated costs borne by the fishery client (MSC, 2023b). In the case of the Maldives, the fishery client (or unit of certification) is the MSPEA. Based

on previous assessments, the costs can vary from USD $15,000 to $120,000 (MSC, 2023b). Fisheries are scored across three principles, which are detailed in Chapter 1.

For the Maldives to successfully meet the MSC standard, they were required to satisfy eight conditions and undertake efforts for improved management within the IOTC. Semi-industrial and SSF are often unable to meet the strenuous requirements of certification schemes. Despite this challenge, the Maldives succeeded in achieving their ambitious goals; thus, securing international market access and gaining global recognition for a centuries old sustainable fishing practice. The following sub-sections (3.1.1 - 3.1.3) will present the challenges overcome by the Maldives as a SIDS to achieve the MSC fisheries standard and explore why preserving the pole-and-line fishery is critical for this nation.

3.1.1 Importance of Tuna Fisheries in the Maldives

Understanding the significance of tuna fisheries in the Maldives is essential to fully grasp the importance of the industry in this small island archipelago along with why this nation initially pursued certification with the MSC. The dependency of this SIDS on the skipjack tuna fishery involves all aspects of Maldivian life:

"When we did a social impact evaluation, Maldives was pretty high in terms of tuna. In terms of food consumption, food security, livelihoods, dependency was much higher."

(- INT 1)

As the tuna fishery is critical to Maldivians, the following sub-sections will touch on the most important benefits of the pole-and-line fishery discussed by interview participants.

Social benefits

Fisheries in the global south are not renowned for having proper working conditions or wages for crew members (INT 2, 3, 4 & 8). In the Maldives, pole-and-line fishermen are compensated based on a revenue sharing model rather than a fixed salary (INT 2 & 6). The nature of the fishery also seldom requires them to be at sea for longer than two days at a time, with most fishing trips being about one day in duration. These benefits improve the livelihood of pole-and-line fishermen and their family members:

"Many other countries, what you will see especially in this part of the world, the fishermen are usually lower-class citizens who work their socks off for a small profit. It's not the case in the Maldives. Many of them, they earn good profits. They have a good quality of life and their families are doing okay. Like they've got this sort of education, like any one of us would. And some of them they actually save enough money throughout their career to maybe send their kids away to attend university outside of the country. So they make good money in the country. So for us, it's not just something that is environmentally sustainable but we've got this other element on top of it: the social dimension that is often overlooked."

(- INT 2)

The social component in Maldivian tuna fisheries is what drastically sets them apart from most other methods of industrial tuna harvest (Horne-Sparborth, Adam & Ziyad, 2015). The fishery's labor rights are robust: the fishermen undoubtedly work very hard but are rewarded with good lifestyles.

"I don't think there are many fisheries that would operate in this way. What we have is very unique. And I don't think people realize this when we say: the social side of things, you really don't see it elsewhere. Like they're [other fisheries] out on salary, they're out at sea for long periods of time, disconnected from the family from the social life, etc. Whereas here they will come back to the island almost every other day, and still enjoy a good way of life."

(- INT 2)

As a strictly ecosystem-based certification, critical components such as cultural importance and social well-being of those working in the industry are excluded during assessment. Horrific stories of slavery at sea and unjust labor conditions for fishers point to the importance of looking beyond ecosystem impacts in fisheries management (Marschke & Vandergeest, 2016). This should also further influence purchasing decisions among consumers of seafood products.

Food security

Tuna is an essential protein source in the Maldives and is often consumed in all three meals of the day as well as during afternoon tea, which includes snacks such as tuna samosas, patties, and other treats. Globalization has substantially changed food availability in the past fifty years. As a SIDS, the Maldives has very little land mass and remains reliant on marine food sources or international import of goods, however these internationally supplied products have high price tags and unreliable availability (INT 2). One participant spoke to tuna remaining crucial in local diets despite globalization:

"It's still a very important part of the food security."

(- INT 2)

For example:

"We know Maldives have per annual consumption of 60 kilos and if we looked to somewhere like South Africa where they don't have their own tuna fleet and the per capita consumption is really, really small of fish and tuna."

(- INT 8)

Despite consensual agreement on the importance of skipjack tuna for Maldivian food security, one participant mentioned that supporting the industry in this country was not a priority of politicians until they realized just how reliant Maldives are on the

fishery. A tsunami struck the Maldives in 2004 following the Sumatra-Andaman; a 9.0 magnitude earthquake in the Indian Ocean which had deadly implications for coastal communities and caused devastation to families reliant on fishing practices (Reid, 2023).

"The government started thinking of fishermen only after the tsunami. When they got washed and there was too many weak, and people starving. Then they knew there was people depending on the sea. Before that they don't care."

(- INT 6)

The gravity of this tsunami enforced that fishers are of paramount importance to food security. Especially in a SIDS such as the Maldives, restricted fishery access in the case of natural disasters or global pandemics such as COVID-19 means starvation for local populations and causes a ripple of effects in global value chains.

Economic importance

The tuna sector is one of the leading contributors to the Maldives' economy. Composing an estimated 67% of this nation's exports in 2018 and making up 4-12% of the Maldives' GDP (Edwards et al., 2020), the tuna fishery is crucial to both domestic and international markets. Fishing is of particular importance in the smaller Southern island atolls of the Maldives, which receive less tourism and therefore are particularly reliant on pole-and-line fishing to feed local populations and generate income.

"If they catch fish, they will catch their share. If they don't catch fish, they don't get any money. So that is how the fishing is done in Maldives. So it is very, very important socially and the economy of these island countries. They are families, children, everybody is dependent on this. Because there is not much of an economy in the islands. Now of course, some guesthouses, some tourism is there. But mainly those islands do well when the fishing is good, and they are dependent on fishing. And their return on investment is much better."

(- INT 6)

The importance of the pole-and-line tuna fishery to the Maldives' economy is a contributing factor for why they pursued certification in 2012. At that time, the premium provided to seafood exports carrying the MSC label was in the order of 10-12% (INT 6). This premium has eroded with more fisheries becoming certified, but for the Maldives to maintain access to international export markets, especially in North America, Europe, and Australia, the MSC label was a necessity and still is today.

Intergenerational education

On top of being a core aspect in the history, traditions, diets, and social well-being of Maldivians, one participant also discussed how the nation's tuna fishery is a source of knowledge sharing to be passed down from one generation to the next. They attributed the importance of maintaining fishery access to Maldivians to the cultural pride the fishery represents:

"The majority of the islanders they go for fishing... They educate their children. It is very different, that is why we are not selling the license to outsiders, because it would be a big conflict, purse seiners coming into our waters."

(- INT 6)

Figure 6. Maldivian fisherman/dad baiting water (Photo credits: Côté-King, K., 2023)

Multi-generation knowledge sharing is a key indicator that the pole-and-line tuna fishery is of significant cultural importance for the Maldivian people.

Collaborative fishing

As the pole-and-line fishery operates on a revenue sharing model, the larger the catch landed, the greater amount of money the crew and vessel owner have at the end of the fishing trip. This is why the collaboration and community approach among fishing fleets was quite astounding. Fishermen communicate with other boats to locate robust schools of skipjack. Even when fishing is poor, there will often be a few scouting vessels in offshore waters in case a school approaches, therefore relaying information back to the islands for captains and their crews to plan accordingly.

"Often they will still collaborate, if they see good schools they will phone up others and tell them that there's fish out there. There's enough to share with the good schools."

(- INT 2)

As the pole-and-line operates as a live bait fishery, this is apparently the only information which crews keep to themselves:

"It's not competitive. Only thing that is competitive - They will do everything possible to withhold the information of where they are catching bait."

(- INT 2)

Bait catch begins at dawn and involves sending out snorkelers and divers to deploy a net. Large lights are used to attract the reef fish and the net is gradually pulled up to trap the bait.

Figure 7. Net deployed for bait catch (Photo credits: Côté-King, K., 2023)

Despite the bait competition referred to by participants, there were also instances of vessels with bountiful bait transferring some excess reef fish over to those who had been less successful that morning. This meant that both boats could stay out at sea for longer, thus ensuring greater volumes of tuna catch which directly transfers to more money in the pockets of crew members, captains, and *Masdhonis'* (fishing vessel) owners.

Figure 8. Bait transfer between pole-and-line vessels (Photo credits: Côté-King, K., 2023)

Such collaboration was also seen by the researcher when pole-and-line fleets shared ice. The small fishing island of Thinadhoo is in the Southern region of the country. Crews would load up boats with ice in the harbor to keep their catch fresh while at sea. At around nine o'clock in the evening, the harbor staff and vessel crew were

unloading the last ice batch of the evening when another pole-and-line vessel docked with a full catch. As the vessel initially receiving the ice had built-in cooling systems and no tuna on board, the captain immediately ordered his crew to re-direct the ice onto the neighboring boat, ensuring their catch was kept fresh, the crew earned their pay, and no fish went to waste.

Figure 9. Ice redirected to a neighboring vessel in need (Photo credits: Côté-King, K., 2023)

These examples of collaboration and support for fellow fishing crews provides a glimpse into the community approach taken by Maldivians in all aspects of life, including their tuna fisheries. Such anecdotes highlight the strong social component of pole-and-line tuna fisheries and sheds light on how this SIDS has achieved a truly sustainable fishing practice.

Evolving with the surrounding world

If the Maldives had not pursued MSC certification, they ultimately would have been left behind in the global sustainable seafood movement (INT 6 & 7). Adaptability is something the Maldivian people know well: with fishermen utilizing pole-and-line techniques for centuries, shifts in the traditional happenings of a fishing trip have changed over the years. Some of these shifts are major, such as *Masdhonis* changing over to mechanized vessels in the 1970s thanks to efforts led by the Maldivian government (Yadav et al., 2020). Other changes are more subtle and can be seen gradually through a single generation, such as increased fishing pressures making catch effort greater.

"I can recall that people that I know growing up wouldn't really venture far off the island to catch tuna. And those trips at the time, they were simply day trips... But you see nowadays the vessels are bigger. Back in the days they would make a profit even if they caught 1 ton. Because they were not going very far, catching smaller, going closer to the islands, and the vessels were smaller all of them. But nowadays you need at least 2 or 3 tons to break even for a fishing trip."

(- INT 2)

As with any industry, it is inevitable that the Maldives pole-and-line fishery evolves with its surrounding reality to continue prospering. However, some things have remained quite constant for this archipelago:

"Our population depends on the fisheries for years."

(- INT 6)

The Maldives has been very successful in maintaining autonomy on their fishing industry, with the only overlap among other nations being for processing and international export:

"We won't issue a fishing license if it's owned by a foreigner. So it has to be 100% local."

(- INT 2)

The tradition of maintaining construction of vessels to the nation's island atolls and ownership to Maldivian families has also remained consistent. The *Masdhonis* being built today are significantly larger than they were a few decades back, with greater storage capacity for higher catch volumes.

Figure 10. Construction of a Masdhonis in Thinadhoo Island (Photo credits: Côté-King, K., 2023)

Having the blue checkmark on pole-and-line caught tuna meant that Maldives could maintain access to international markets and thus continue to rely on the skipjack fishery as a major contributor to the nation's GDP and provide livelihood for around 20% of the labor force. In essence, global markets and shifting consumer demands meant that the MSC was a means to maintain this centuries old tradition. Without access to international markets, the export sector would collapse, ensuing a cascade of events in

direct and indirect industries throughout the country. Although Maldivians consume a large amount of tuna daily, the volume to feed the local population would earn a pittance in comparison to annually exported tonnage, which is secured through the MSC eco-label. The Maldives was proactive in achieving the MSC fisheries standard, which had key repercussions for the nation: the Maldivian people were protected from starvation and unemployment, traditional fishing practices were maintained and praised on a global scale, and economic stability within the nation was achieved.

3.1.2 International Recognition for the Pole-and-Line Fishery

The Maldives has harvested tuna via traditional pole-and-line techniques for centuries; however, as an isolated SIDS in the remote Indian Ocean, it was scarcely recognized on international platforms prior to the 21st century. This fishery presents a source of pride for the nation and the MSC brought pole-and-line tuna onto an international stage:

"We have been pole-and-line fishing for thousands of years, but nobody recognizes it… They (MSC) also play a very huge role in promoting pole and line. Now everybody recognizes Maldives, it is on the MSC website."

(- INT 6)

Despite the pride that comes with being recognized at long last as a leader in sustainable tuna fishing, the MSC has disproportionately relied on Maldives pole-and-line to promote their certification scheme:

"We have this beautiful, clean, green fishery here: pole and line. And they knew, I think at the time, this was something they could use to actually expand the MSC as well, to grow bigger."

(- INT 2)

That is precisely what the MSC did: they self-promote primarily via pole-and-line despite over half the volume of certified tuna filling up supermarket shelves being sourced by purse-seines (Schiller & Bailey, 2021). All participants agreed that there is a strong demand for eco-labelled tuna in international markets (Appendix D; Table 2). As such, receiving the MSC label meant that the Maldives pole-and-line skipjack tuna fishery reached an international consumer base.

3.1.3 Maldives' Conditional Certification and Leadership in the IOTC

The Maldives was the first IOTC fishery to undertake this certification burden and as such completed a large amount of leg work required for other fisheries to follow. A critical aspect to this SIDS achieving conditional certification with the MSC in 2012 was their joining of the IOTC in 2011 (United Nations, 2019). As a member of this RFMO, they had the authority to submit proposals which were essential to satisfying the conditions presented by the MSC (INT 6 & 7). The Maldives was presented with a total of 8 conditions (*Figure 11*) which had to be satisfied within 5 years to maintain certification, which they accomplished against all odds. Fisheries achieving conditional certification is a topic onto itself, and some participants did mention generalized disagreement with this:

> *"Fisheries shouldn't be certified with conditions, and many of those conditions, like conditions regarding harvest controllers, harvest strategies, have just been simply rolled forward and not complied with."*
>
> (- INT 8)

In the case of the Maldives, they were able to meet the conditions and there was no roll forward, but this if often not the case. This lack of compliance with regulations brings into question the enforceability of such conditions and rules, thus raises issues

about accountability and who should uphold conditions, for example RFMOs and/or certification entities such as the MSC.

Participants also noted that this initiative to pursue the MSC standard was supported by many stakeholders (INT 1, 7 & 8), especially as everyone understood that improvements within P1 and P3 were crucial for any fishery willing to pursue certification in the IOTC:

"We were given this very difficult condition, which was to establish and limit different points for the skipjack and yellowfin stock and also to establish a harvest control rule."

(- INT 2)

Such conditions are largely beyond the means of a single nation to tackle within an RFMO. However, by successfully satisfying them, Maldives created a valuable reform within the IOTC and opened certification access to other CPCs.

"MSC certified Maldivian fisheries has created benefits for the surrounding area. Because of the way they move, and the way it's opened up opportunities for others."

(- INT 1)

Based on the Q-sort, 71% of participants perceived that the Maldives gaining MSC certification in 2012 has since facilitated eco-certification of surrounding tuna fisheries (Appendix E; Table 4). The conditions presented to the Maldives were successfully fulfilled by 2016 (*Figure 12*). The following two pages include *Figures 11* and *12*, which detail the conditions presented to the Maldives and the timeline which proposals were submitted to the IOTC by this SIDS to satisfy the respective conditions.

Specifically, *Figure 11* shows how the eight conditions presented to the Maldives (Appendix A) are related to each of the principles in the MSC fisheries standard. The

Maldives tackled these conditions over a four-year period via proposals in the IOTC to satisfy P1 and P3, while adapting at a national scale to satisfy conditions pertaining to P2. Drawing on the three categories of principles outlined in *Figure 11*, a timeline with associated color schemes (from *Figure 11*) was made to show the chronology of these proposals and respective adoption of resolutions within the RFMO.

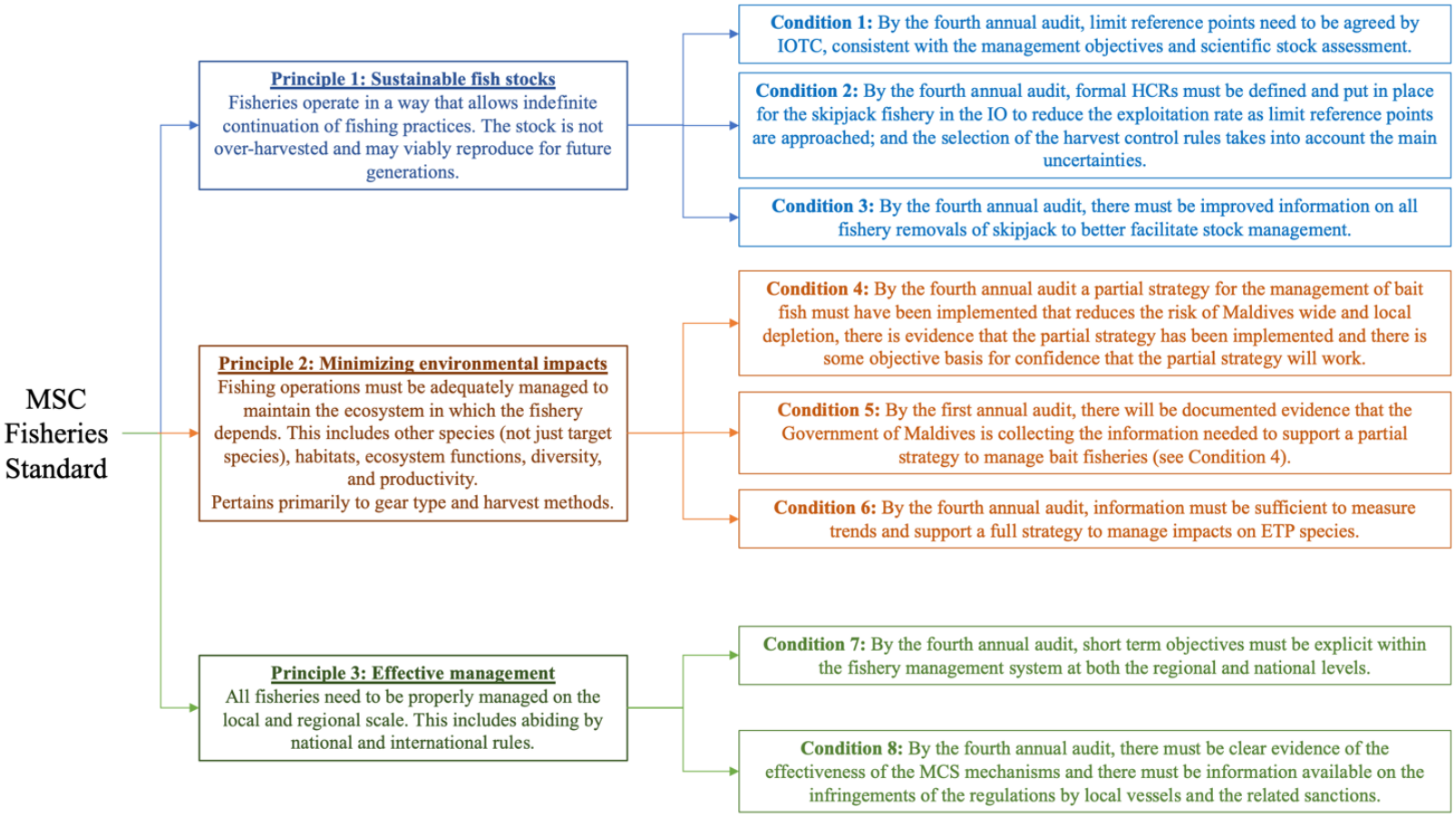

Figure 11. Overview of MSC Principles and Respective Conditions for the Maldives

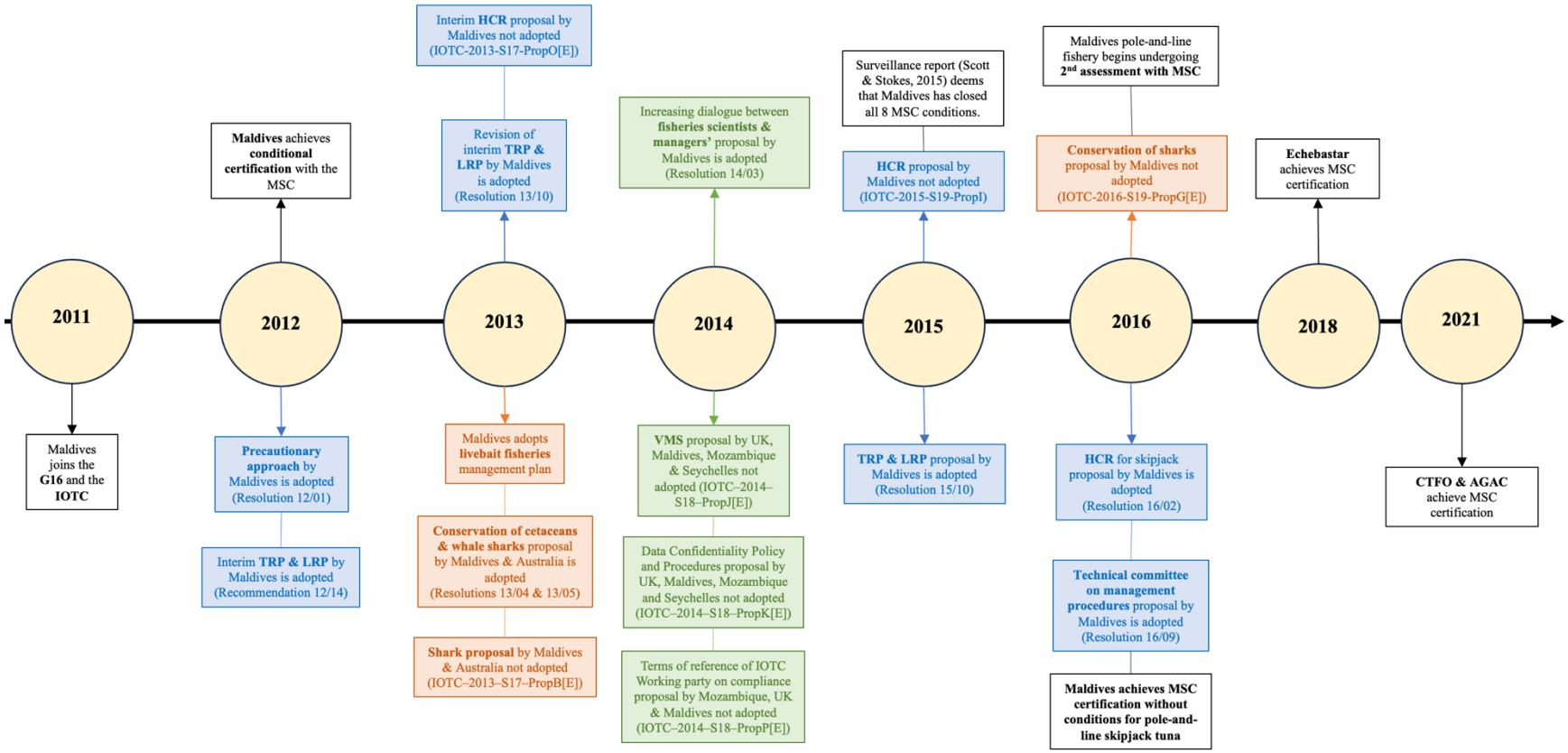

Figure 12. Timeline of Maldives' Proposals in the IOTC and Relation to MSC Principles

Market-driven certification schemes such as the MSC have become a means to secure shelf space globally. Despite the respective reasons for tuna fleets pursuing the standard, the Maldives was the first IOTC fishery to achieve certification and as such was the CPC responsible for leading multiple proposals within the RFMO to bring about changes in the management system (*Figure 12*). The legwork accomplished by this SIDS had repercussions beyond their borders. Within the IOTC, this includes environmental best practice among CPCs, improved management throughout the RFMO, and enhanced data collection on tuna stocks of the region. Maldives' leadership in the IOTC benefitted many Indian Ocean fishing nations and directly opened the doors for Echebastar, CTFO, and AGAC to pursue certification with the MSC.

3.2 The Achievement of MSC Certification by DWFNs in the Indian Ocean

The Maldives satisfying the eight conditions presented by the MSC in 2012 meant that other fishing nations interested in pursuing the standard already had a head-start in the process, especially with increased data on Indian Ocean tuna stocks and improved management measures within the RFMO. Considering trends in other RFMOs and among global tuna fisheries also illuminates why purse seine fleets in the Indian Ocean had to pursue MSC certification. Once the leg work was accomplished by the Maldives, there remains the fact that MSC has become a necessary means for market access. Despite the external and internal pressures for purse seine fisheries in the Indian Ocean to pursue certification, the Maldives was the initiator for this movement in the region:

"Because we got it to that stage it was easy for CFTO and Echebastar and everybody else to get the certification, because the building blocks were now in place. So they could fairly quickly go through the process of certification."

(- INT 2)

The global market necessitated certification, but the Maldives facilitated this achievement for other IOTC nations by being the first mover. Since 2012, three other fisheries in the Indian Ocean have achieved certification (*Figures 5 & 12*). These are all purse seine fleets from DWFN fishing on DFADs. The following subsections (3.2.1-3.2.2) will include data and discussions on the political climate in the IOTC and how it has shifted in recent years and cover the social, economic, and environmental impacts of increased certified tuna fisheries in the Indian Ocean.

3.2.1 Shifts in IOTC Power Dynamics

Within the past decade, the political climate and power dynamics that had previously dominated IOTC management have significantly shifted. The IOTC has a reputation of significant political tensions among CPCs (Sinan, Andriamahefazafy & Robertson, 2022). These power dynamics are particularly exerted from European Union (EU) countries on Indian Ocean coastal states and SIDS. Prior to the Maldives joining in 2011, management decisions and resolutions were presented by the EU and met with little objection from other members.

"It used to be a big boys club to be honest. Not a lot of people talk, it was dominated by the distant water fishing nations."

(- INT 2)

This dynamic has since changed, which in part has created more collaborative proposals but has also led to lots of head-butting rather than efficient management improvements. Despite economic limitations and the historical 'low power' among developing countries, the coastal states and SIDS of the IOTC have a strong record of shaping management decisions within the RFMO to benefit the region (Sinan,

Andriamahefazafy & Robertson, 2022). An example of such countries are Seychelles, Maldives, Mozambique, and Mauritius, which have greatly advanced the interests of nations with physical borders in the Indian Ocean (Sinan, Andriamahefazafy & Robertson, 2022). The lack of capacity among many CPCs and the unique aspirations of each nation also stands in the way of effective decision-making:

"Because of the dominance of the European Union and the lack of capacity in coastal states - developing coastal states - to challenge the European Union on these issues and the fact that theoretically and you've seen it… Management measures should be adopted by consensus and that's really difficult because of the different motives of the different members of the Commission."

(- INT 8)

Despite the IOTC shifting away from being a 'big boys club,' the fact remains that many developing coastal states and SIDS are reliant on foreign support.

"Because IOTC is controlled by the European Union. Most of the coastal states like Mauritius, Seychelles, Kenya; these people are - they depend on the EU for so many things. So, for them it is very difficult to go against the EU. So it is always, Maldives, or India, or some people join together."

(- INT 6)

This foreign support is provided mainly in the form of access agreements, wherein a DWFN pays for access to the EEZ of a coastal state, in turn having permission to extract fishery resources from this nation's territorial seas. Countries which have such fishing access in the Indian Ocean include the EU, Japan, the Republic of Korea, or China (Sinan, Andriamahefazafy & Robertson, 2022). Such agreements put the coastal nations in difficult positions for management and conservation, in addition to influencing political decision-making processes (Sinan, Andriamahefazafy & Robertson, 2022). The

interviewees had a wide range of opinions regarding access agreements. Some participants feel that the coastal states could be earning much more money.

"They're paid a pittance for access to the fishery. Do the comparison with the PNA, with the Vessel Day scheme, where they may be paying $10-15,000 a day to fish… Why are they all in the Indian Ocean? Because it's easy pickings for them."

(- INT 8)

Others expressed that such collaborations provide stable economic revenue for developing countries in many sectors through landing ports:

"We do everything here and we repair mainly… The boats are brand new some of them, but once they come to the Indian Ocean they stay here all their life. We repair in Mauritius, we repair in Dubai, we repair in South Africa."

(- INT 5)

Through supply to canneries, refueling, repairs, and other port related activities, it is evident that access agreements are bringing money into these coastal states. The relativity of this monetary compensation is what remains suspicious. Unfortunately, the overarching issue is that these coastal states do not have the capacity for building their own fleets and this economic disadvantage is exploited from the Western world. Participants touched on socio-economic disparities playing into RFMO governance dynamics and how this reflects on access agreements.

"Because the access agreements are not founded on the basis of equity, fairness, the dollar value. And based on the trade agreements, what I've learned is the value of tuna is relative."

(- INT 1)

Due to pressures of economic income, SIDS sign onto access agreements as they do not have the required capacity to independently extract these natural resources from

their waters and bring them to market. What may seem to be a fair economic incentive for a SIDS to sell out access to their EEZ is very insignificant monetary value for an EU fleet. The value of tuna is certainly relative: this cheap protein source consumed throughout the day in the Maldives is considered a luxury seafood in many countries. Unless efforts are invested into capacity building for IOTC coastal states such as Mauritius, Madagascar, and Seychelles, pressures of economic income will dominate political decision-making processes and access agreements will remain the only option for these countries to extract dollar value from their EEZ's natural resources. Lastly, a participant touched on how the power of certain CPCs is the ultimate driving force in RFMOs:

"It is not the money in RFMO, it is the power of the delegations. Actually, it is supposed to be the coastal states, but the distant water states have more power than the coastal states."

(- INT 6)

Despite the coastal states of the Indian Ocean being most heavily impacted by management decisions occurring in the RFMO, the power lies primarily among delegations not residing within the region. This creates a significant divide, thereby infringing on CPC collaboration. Certain nations have found strategies to minimize these divides, an example of which is the formation of the G16 in 2011 (G16, 2020). The Maldives joined the G16 prior to becoming a CPC in the IOTC and has since submitted proposals annually and sponsored the greatest number of proposals (Sinan, Andriamahefazafy & Robertson, 2022). The G16 is a group of like-minded coastal states in the Indian Ocean that collaborate to develop capacity among members, strive for the sustainable use of tuna and tuna-like species, and was formed with the joint intention of

benefitting coastal nations of the IOTC (G16, 2020). The G16 has been important in advocating for 'the little guy' and helping stand up against political inequalities which had historically dominated IOTC decision-making. For instance, conversations surrounding allocation prompted liaison between the RFMO's coastal states to stand against the powerhouse of the EU:

"You have the G16 emerge because at the time there was this discussion on allocation, and basically the EU came out with a proposal that said all of the catches that were taken with the EEZs of the coastal countries would be attributed to whatever country that the vessel was flagged to enter."

(- INT 2)

Despite this collaboration between coastal states, respective socio-economic realities of member nations vary greatly, in turn influencing the political relations of these coastal countries.

"Even within coastal States and SIDS, there are different viewpoints, and some of those SIDS, like, Seychelles and Mauritius are really led by the European Union, where they're dependent upon their support for their income."

(- INT 6)

The G16 is undoubtedly an excellent liaison for capacity building and support for the coastal states. There is power in numbers: having the support of other delegations speak up in one's defense establishes support and may very well drown out single power houses such as the EU. Despite this, many conversations occur outside of IOTC meetings and delegations are responsible for representing their nations' decisions and needs, even though this may not be the best solution in the long run.

"Even in the G16, there are some people who backtrack… because of the pressure from the European union."

(- INT 6)

For instance, Maldives and Kenya submitted a joint proposal calling for a reduction in the use of drifting fish aggregating devices (DFADs). When IOTC members gathered in February 2023 for a special session on these devices, Kenya drew out at the last minute. It came out that the EU threatened to cut off funding for Kenya's Blue Economy developments, ultimately black mailing this East African country to withdraw from the DFAD proposal (Vyawahare, 2023). Such economic circumstances in developing nations of the IOTC are exploited and taken advantage of by the EU. Tensions among CPCs and colonial power dynamics limit progressive changes and further hinder capacity building, especially among those SIDS and developing coastal states.

"If it wasn't so divisive, which it is at present unfortunately, it has such a great opportunity to build into something very meaningful and build capacity with those G16. I don't think the G16 should be pushing position so much as building capacity so that the countries can really understand the impacts and the decision and some of the, you know, the benefits and risks with different decisions. So I think that'd be a really useful forum for the SIDS to build some capacity and identity as individuals."

(- INT 3)

The resources needed to provide tools for capacity building can be difficult to understand, especially in terms of identifying who should be helping. Perhaps it should be prioritized to a certain extent within the RFMO and supported by NGOs working in the region, especially well-established ones such as WWF or Pew; both of which sit in as observers at IOTC meetings. In such a complex region of the world, identifying a 'one

solution fits all' is highly unlikely. A participant spoke to how they hope the Maldives achievement of MSC certification and overall leadership in sustainable tuna harvest, both within the IOTC and internationally, could serve as an example for other SIDS or coastal nations to follow suit (INT 2). If capacity building is not supported externally for these Indian Ocean nations, they will continue to be faced with a situation whereby economic growth is stunted while foreign fishing fleets make millions of dollars in profits by exploiting their natural resources. This ongoing cycle of oppression and resource extraction has long since dominated the political climate of the IOTC and thus fueled the lack of capacity development for the RFMO's coastal states and SIDS. Aiding nations to take control of their resources and break the shackles of colonialism would revolutionize Indian Ocean tuna fisheries.

3.2.2 Increases in Eco-Certified Tuna Fisheries

With the seemingly rapid rise of MSC certified fisheries, there has been a cascade of social, economic, and environmental consequences. Social components are mostly unique to the Maldives, as the industrial purse seine fleets holding the MSC certificate in the IOTC lack this community component and cultural reliance on tuna fisheries (INT 1, 2, 6, 7 & 8). The economic changes affiliated with a rise in MSC-certified tuna fisheries has impacted both Maldives pole-and-line and purse seine fleets. Due to the respective capacities of small versus large fleets, the impacts of this eradicated market premium are felt most strongly among the SSF and semi-industrial fleets holding the certificate. Finally, the environmental impacts of exacerbated fishing pressures in the region are most detrimental amongst the coastal nations of the Indian Ocean. These countries are the recipients of lost, abandoned, or discarded fishing gear and are thus burdened by the at-

large ecosystem impacts of industrial scale fishing on marine habitats (MacMillan et al., 2022).

Social impacts

With an overall increase in fishing pressures on Indian Ocean tuna stocks, harvest efforts have shifted among CPCs, which impacts the social lives of fishermen and those working in the fishing sector. An example of this is fishing trips being longer in duration: with greater pressures on the whole of the Indian Ocean stock, fisheries such as Maldives' pole-and-line that do not make use of DFADs must spend longer at sea to spot FSS (INT 2 & 8). This means that fishermen must leave their families and island atolls for longer durations, all with diminished reliability on landed catch (INT 2, 7 & 8). Six out of seven participants agreed that sustainably caught tuna is a source of pride for the Maldives and is therefore important culturally and socially, while the overexploitation of such a resource is a concern among locals in SIDS (Appendix E, Table 1). In the case of the Maldives, tuna over-harvest would have horrific impacts on food security and the wellbeing of Maldivians. The social component of tuna fisheries is very dependent on the fishing nation being discussed.

"The social benefits is completely opposite when compared to the large scale purse seine. Whether it is MSC certified, there is no social component. Because the people are sale people. And the person belongs to someone or a company... But there is a community here [Maldives], fishing is."

(- INT 6)

When participants discussed the social components of tuna fisheries, they also touched on the importance of labor rights and how this component is absent in the MSC

standard. This was not necessarily specific to Indian Ocean tuna fisheries, but broadly reflects how the situation we see in the Maldives is quite unique for a tuna fishery, especially in the global south.

"If I'm a consumer of MSC certified Seafood, I expect that seafood not to be tainted by human rights abuses and I expect the MSC be doing that due diligence. We could and we probably do have MSC certified seafood caught by slaves. Appalling. And they will just say it's not our job. Well, of course it's your job."

(- INT 8)

With an ever-increasing number of fisheries receiving the MSC label on exported tuna, concerns regarding labour rights and slavery at sea have become more prevalent. The MSC has committed to the principles of the UK's 2015 Modern Slavery Act (MSC, 2023e), however maintains its stance as an environmental certification scheme that lacks a social and economic component. If the ecosystem impacts of a fishery are well-managed, but this fleet or company turns a blind eye to the labour rights and salaries of its workers, is it truly sustainable? This one-eyed vision of sustainability is out-dated and inconsiderate of critical components entrenched in fisheries. Considering the social dimensions of any industry is vital to achieve true sustainability. A fishing practice that has existed for millennia cannot be evaluated on the same terms as a multi-national industrial fleet.

Economic impacts

Another component of fisheries which is neglected from the MSC standard is economic impacts. The increase in MSC certified tuna fisheries has dissolved market premiums that were historically a benefit of the standard. In 2012, the Maldives

experienced such a benefit, however certification of other tuna fleets (notably purse seines) has eradicated this premium:

"Economic gain has not improved, but initially yes, of course. We were uh, having at first uh 10-12% increase in selling them."

(- INT 6)

This was echoed by other participants:

"I think inevitably the benefits would be eroded as more and more product becomes available." (- INT 4)

Regardless of changes in product premium, market demand has created a stable revenue for the MSC, while individual fisheries such as the Maldives' pole-and-line no longer experience premiums for their certified catch. Despite the benefits accrued in the early years of certification, these were rapidly dissolved in the wake of more fisheries achieving the standard. The experience of the Maldives is the reverse of the internal growth of the MSC:

"Before we got into MSC certification, we enjoyed a premium for pole-and-line caught in the Maldives. And this was always the case irrespective of where it was exported… we don't have that sort of edge anymore. And so, what we have seen in the recent years is that our profits have eroded, lost the premium that we had. And MSC continues to grow."

(- INT 2)

The inequality of a SIDS losing the benefits they were promised in 2012 while a multi-national 'NGO' continues to accrue profits is ironic. There appears to be an array of pros and cons that have risen since 2012, but the reality remains that achieving certification was necessary for the Maldives to maintain market access and receive adequate recognition for sustainably sourced skipjack tuna. Another issue which arises in

the fisheries sector is profits are not passed down to the fishermen, but rather remain in the higher ups of the industry or lining the pockets of politicians (INT 1, 3 & 4). This is not the case in the Maldives which functions on a revenue sharing model but is applicable in many other IOTC fisheries. The same goes for the MSC, if it were to be providing a premium for tuna catches, the odds of fishermen reaping those benefits is quite low:

"It's more so staying in the higher ups, the political economic benefits rather than the individual fishermen."

(- INT 1)

If a greater financial incentive was there, this could aid in discouraging overharvest at a smaller scale (such as among crew members, captains, or vessel owners). In the case of most fisheries, factors such as eco-certifications are not reflected on the paychecks of individual fishermen. These economic benefits are most often felt by those in positions of management, export or processing industries, and governments. The economic dimension of tuna fisheries is also not considered in the MSC standard for sustainability. In the case of the Maldives, those working in the fishing sector reap decent benefits from their careers as pole-and-line fishermen (INT 2). This is however not the case in many other fisheries, once more pointing to a lack in holistic sustainability behind the MSC's eco-label.

Environmental impacts

Commercial harvest of tropical tunas in the Indian Ocean is predominantly from purse seine and long line fishing gears, with gillnets and pole-and-line being used exclusively in certain regions (Kaplan et al., 2014). While pole-and-line is the method of

harvest used in the Maldives, the other MSC certified fisheries in the IOTC are purse seine fleets from EU DWFNs. With an increase in certified fisheries of the Indian Ocean, there has been exacerbated fishing pressure within the past decade. This is despite CPCs being aware that IOTC tuna stocks have been overharvested as reported by the scientific committee of this RFMO (IOTC, 2022a). Participants mainly spoke to the impacts of DFADs which are relied upon by purse fleets and the respective consequences that fishing methods have on species bycatch as well as ecosystem impacts at large.

Fish aggregating devices

Purse seines are reliant on DFADs, which are human-made floating objects built with highly durable synthetic materials and electronic satellite components to allow tracking aboard fishing vessels (MacMillan et al., 2022). Participants touched on the negative environmental impacts these devices have ensued, which are especially felt by coastal states of the Indian Ocean.

"We have increasingly found that there are more sort of this buoys washed up on the islands. We didn't see this a lot in the early days, certainly not when I was growing up."

(- INT 2)

Increased plastic pollution and marine debris are of substantial concern across the globe and the effects are acutely felt by SIDS and coastal states such as the Maldives. SIDS lack the capacity, land mass, and government support to properly set up waste management systems (Fuldauer et al., 2019). Additionally, due to the global ocean's currents, they are also burdened by an exceedingly high volume of marine plastic waste originating from distant nations and foreign fishing boats (Burt et al., 2020). This participant has seen an immense increase in washed up DFADs within their lifetime:

"Maldives is one of the recipients of this DFADs washing up to the reefs… Every year, at least 10-15 minimum lands in our shore."

(- INT 6)

In addition to causing eco-grief among Maldivians and the many tourists they welcome annually; such destruction has a multitude of consequences. Nations heavily reliant on reef fish for food security and livelihoods feel greater repercussions from these negative ecological impacts, especially due to the reliance of SIDS on the economic value and biological diversity provided by coral reef ecosystems (Hafezi et al., 2020). Another participant mentioned how this is an especially upsetting aspect of purse seine fisheries as it could be mitigated with appropriate management efforts:

"While there's no data about lost FADs in the Indian Ocean, as I understand it, there's been a report produced on WCPFC PNA where 90% of all FADs that are deployed are lost. And there's absolutely no reason to think why we don't have similar numbers in the Indian Ocean. It's a major problem."

(- INT 8)

Although there remain many issues surrounding DFADs, the retrieval of these devices from purse seines would substantially change this dialogue. All interviewees disagreed (>50% strongly disagreed) with the following Q-statement: 'the use of DFADs in IOTC fisheries are well regulated, few are lost or discarded and the fleets which rely on them will retrieve the device after deployment' (Appendix E; Table 3). As FADs are clearly mismanaged by purse seines, this further brings into question whether the MSC is doing their due diligence in certifying fisheries with adequate ecological management systems in place:

"The drifting FADs are detrimental to the ecosystem, and they suddenly, magically, became certified after compartmentalization was abolished by the MSC when nothing had happened to improve the use of drifting FADs in the oceans."

(- INT 8)

Fisheries, much like farmers, are crucial to providing essential food sources for the global population. Although the necessity of tuna specifically for purposes of food security is very dependent on the coastal state being discussed, there remains to be an international demand for seafood proteins that will only grow more pressing with projected increases in the global population. As purse seines catch a large volume of tuna using DFADs, one participant pointed to the necessity of this fishery:

"Helping the production of valuable protein like tuna in volumes that are absolutely necessary as a protein for human beings. You have to understand that today, we are 8000 million people in the world, and in a few years, in say in the next 20 years say, unfortunately it's going to triple."

(- INT 5)

This school of thought was further delved into by a second research participant, who touched on the bigger issues lying within management systems rather than the respective fishing methods of fleets:

"The huge debate on FADs and no FADs… In a managed fishery, I'm all for more economic ways of fishing. It pulls the tuna together and it catches them well and as long as all of the environmental benefits are managed."

(- INT 3)

Theoretically speaking, if management was drastically improved in the IOTC and purse seines were taking accountability, the DFAD conversation could and would shift. Efforts to accomplish this are being initiated:

"We will try to recover as much as we can, all those FADs that will possibly be grounded in a beach or in a coral. So the thing is, FADs are, it's an impacting tool, yes. But if you do things properly and you use concrete methodology to have less unnecessary damage, it shouldn't be that much."

(- INT 5)

As the use of DFADs is realistically never going to disappear from global tuna fisheries, improving management of these devices is inevitable for long-term sustainable harvest efforts. A prominent issue concerning tuna fisheries in the IOTC is the harvest of juvenile tunas which are targeted by DFADs.

"Tuna is a heavy migrator. There is no local stock. So, since it is a migrating species, using the DFAD and taking the whole lot with the juveniles can have bad impacts. Especially at the cost of the small scales."

(- INT 6)

This disparity caused by different gear types is resulting in many SSF being disadvantaged, most often in nations wherein economic circumstances are most dire. Another participant pointed to DFADs not being considerate of long-term needs among Indian Ocean coastal states:

"Catch free swimming schools as you did 40 years ago. You know, we gotta think about the ecosystem here for the benefit of those small island developing states and other developing coastal states for generations to come. We don't do that by covering the Indian Ocean by drifting FADs and now with the purse seine fleets, some 85% of their catch is around drifting FADs."

(- INT 8)

Considering future generations and long-term repercussions for current actions seems to be neglected in most management decisions. The Maldives (and other tuna fisheries) make use of AFADs, which serve the same purpose of attracting schools of

tuna yet are not floating loosely in the ocean. The Maldives has 55 AFADs distributed throughout their EEZ, which are used as a sort of 'last resort' to pole-and-line harvesters:

> *"They would only target the FAD if they can't find a free-swimming school. And they would do that simply to cut off on the cost of fishing for that particular trip."*
>
> (- INT 2)

Targeting an AFAD does not provide as great of a volume of skipjack but may be helpful in breaking even for fuel costs if the vessel spent a substantial amount of time at sea trying to spot a FSS of tuna. Especially as Maldivian *Masdhonis* have increased in size and catch storage in the past decades, falling back on AFADs can be valuable to cover increasing fuel prices and mitigate losses for the fleet.

The use of FADs has become deeply entrenched in tuna fisheries. The ecosystem impacts of various fishing gears and the effects this entails for surrounding coastal nations is an issue that lies primarily in inadequate management, both from the RFMO and individual fishing nations. Unfortunately, in the case of the Indian Ocean, the fishing nations deploying these DFADs who hold the MSC certificate are not experiencing first-hand the environmental repercussions which result from abandoned or discarded devices. Power dynamics and lack of capacity among the nations reaping the consequences of DFADs complicate the effective management of such devices within the IOTC. The necessity to catch enough protein for a growing global population is evident, however mitigating the negative impacts from this catch is equally as important. As with many extractive methods from the Western world on the developing world, the people and nations who will be most impacted by such recklessness are not the ones using these exacting tools to begin with.

Bycatch

With an increase in eco-certified fisheries in the region, there are an array of concerns regarding the widespread ecosystem impacts of harvesting non-target species or bycatch within tuna fisheries of the Indian Ocean. In addition to being an environmental concern and potentially impacting endangered species, certain marine animals are considered charismatic megafauna (such as whales or sea turtles), and bycatch of such animals leads to vast public retaliation of a fishing practice. The pole-and-line fishery targets skipjack tuna one at a time, nearly eliminating the potential to harvest non-target species:

"The pole-and-line still has a bycatch of other related tuna species. They don't have a bycatch of sharks for instance."

(- INT 1)

Depending on the gear type used for harvest, bycatch levels are present to some extent in all tuna fisheries. Although this research project focuses primarily on purse seine and pole-and-line fleets as these are MSC certified in the IOTC, a participant outlined how other harvest strategies can be much more damaging:

"The bycatch in gillnets would be very high. But the respective volume with bycatch in purse seine would be quite low."

(- INT 8)

Despite the purse seine fleets being relatively clean in terms of bycatch, those working in pole-and-line fisheries expressed that they have concerns regarding the use of nets in fisheries:

"Everything that is around that area is going to get tangled up. Even if you reduce the net size, so many things are being caught in it including turtles, dolphins; so DFAD is not environmentally very friendly for the species."

(- INT 6)

Especially in a country such as the Maldives with a heavy cultural tie to the ocean and a tourism sector reliant on the marine space, such bycatch is emotionally and economically damaging. When considering bycatch associated with different fishing gears, the non-target species being harvested can also play into the significance of the matter:

"You would not only want to look at the status but also the management of the bycatch species where they can be commercial or endangered, threatened or protected."

(- INT 3)

This ties into whether the bycatch can be used for some form of consumption, as a commercially viable species would not be put to waste once the purse seine vessel lands their catch:

"Nowadays we have to retain on board 100% of the catch. And all this bycatch is also unloaded on our landing ports and is used for, some of them for human consumption, some other for pet food. And in our case, we are producing a good quality of fish for human consumption."

(- INT 5)

By using this bycatch in other forms of food production, fisheries are utilizing non-target species rather than wasting them. Whether the bycatch species are "endangered, threatened or protected" as referenced in the earlier quote is also of relevance to fisheries. If the bycatch species is healthy and bountiful, many feel that this is not nearly as concerning as bycatch of an endangered species. Another participant felt

that the degree to which a fishery reconciles with bycatch issues should reflect the capacity of that fishing entity:

> *"With your small-scale fisheries to consider bycatch more requires more data collection and more management. And if what they're doing is of no risk to the affected populations, why make them jump through more hoops to get their certification when it doesn't matter that much? If you're saying, you know a very large-scale fishery has an amount of bycatch which isn't affecting its population or isn't going to drive the population below the point of recruitment impairment, you're on thinner ice, I think. Could you be doing more to maintain it? It's again that balance between, you know, how you treat large scale fisheries and how you treat small scale fisheries and what the impact on the effective populations might be."*
>
> (- INT 4)

In the case of a small-scale and under resourced fishery being responsible for large amounts of bycatch, the reality is that they likely lack the available resources to rectify this challenge. This interview participant touches on a valuable aspect of fishery management: finding a balance between what needs to be fixed and what is within means of fixing, all within the respective capacities of a fishing enterprise, is crucial to consider. This applies to RFMOs, certification entities, and discussions surrounding international tuna fisheries.

Overall, an increase in MSC certified tuna fisheries of the Indian Ocean is entailing consequences for the marine ecosystem, the social well-being of those working in the fisheries sector, and the respective economic profits of certified fisheries. Environmental decline, especially of coral reef habitats, is occurring through DFAD abandonment and inappropriate disposal of fishing gear (Curnick, Feary & Cavalcante, 2021). Bycatch of non-target species is causing unnecessary death of species such as

sharks, whale sharks, cetaceans, and juvenile tunas. Improved management for mitigating such negative environmental impacts is required, both within the IOTC and the MSC.

3.3 Current State of IOTC Fisheries and Future Projections

Sections 3.1-3.2 provide an overview of how the Maldives overcame a certification burden and how this facilitated other IOTC fisheries to pursue the MSC standard. The future state of IOTC skipjack tuna fisheries remains largely unknown, as the dynamic decisions made within RFMOs and the unpredictable ecosystem shifts that are sure to arise with climate change remain to be seen. Nonetheless, participants discussed the current and future state of Indian Ocean tuna fisheries, along with the respective role that eco-certifications play in this. The MSC has become a necessary means for market access, however many participants had criticisms of the standard. These primarily surrounded lack of environmental, economic, and social sustainability. The following sub-sections (3.3.1-3.3.3) will detail the current reality of IOTC fisheries, provide projections regarding the future of the Indian Ocean skipjack stock, and discuss alternate market incentives and certification schemes.

3.3.1 Current State of IOTC Fisheries

<u>IOTC tuna stocks</u>

Increased demand for tuna has resulted in greater fishing pressures within all RFMOs and IOTC fisheries are experiencing fluctuations in catch success despite greater fishing efforts. The Maldives pole-and-line fleet is a live bait fishery, thereby each vessel catches small schooling reef fish near their atoll prior to heading out to deeper, more productive waters in search of free-swimming skipjack schools. The pole-and-line crews are thus heavily reliant on the success of the live bait catch. This dictates the duration of

their fishing trip and the catch volume they will have the opportunity to land. Nowadays, even in times when bait is bountiful, fishing may not be successful:

"Nowadays you would find that there are periods where there is plenty of bait available, but they won't go out fishing because they know there's no fish around."

(- INT 2)

Based on the most recent stock assessment from the scientific committee of the IOTC, bigeye and yellowfin tuna are in the red (overfished and subject to overfishing) whereas albacore and skipjack stocks are in the green (IOTC, 2022a). Skipjack tuna is currently undergoing a full stock assessment. A participant also touched on the causes for reduced skipjack in the Maldives.

"The reason for this is the proliferation of industrial scale fishing in the Indian ocean. We don't anymore see the big free-swimming schools coming into our waters, into our EEZ."

(- INT 2)

It was previously believed that the maximum threshold level for skipjack would never be reached due to their fecundity, however all animal species have a biological limit that anthropogenic pressures may surpass. The impacts of tuna fisheries in the Indian Ocean are cumulative:

"There's a lot of stock fluctuations which are exacerbated by fishing pressure, and there's a lot of management which needs to be developed through IOTC."

(- INT 4)

The importance of improving management practices to ensure long-term stock viability is crucial in avoiding closures or moratoriums. Many fisheries across the globe

that were once considered to be ‘inexhaustible’ are no longer in practice due to such mismanagement.

Changes in size and schooling behavior of skipjack tuna

In Dhivehi, the Maldivian language, skipjack tuna is referred to by two names: *Mas* is small and *Goda* is large skipjack (INT 7). Over the past several 30 to 40 years, the Maldives has been measuring the sizes of landed tuna from their fishery. It appears that the medium sized skipjack, which is typically about 55-65 cm in length, is always missing from their catch. Additionally, in the current size frequency data, the proportion of *Goda* has diminished significantly. There is a hypothesis addressing this which explains that when skipjack approach 50cm, they move to the more productive waters of the Southwest Indian Ocean, near Sri Lanka, India, and the North Arabian Sea. In these waters they are much more likely to be harvested by industrial scale fisheries, whether it be purse seines or other vessels, therefore not returning to countries such as the Maldives as *Goda* or medium sized skipjack.

Another interviewee expressed that FADs have changed skipjack schooling patterns, in turn playing into the shifting tuna stocks of the region:

> *“The FADs would have a major impact on the schooling behavior of skipjack. They would associate with the FADs and they would move about with the FADs because they have food and everything else while travelling. So we don’t see those big schools coming in anymore, not throughout the year. Like it might happen once or twice throughout the year and still be a lot of fish around, but otherwise it’s difficult to see the big schools in our waters.”*
>
> (- INT 2)

Participants pointed to there being two notable changes in skipjack schools observed within their lifetimes. First, the size of the tuna being harvested by small scale or semi-industrial fleets appears to be diminishing and second, there is a decrease in large FSS of tuna entering the EEZs of coastal states and SIDS of the Indian Ocean.

Fecundity of skipjack

Several participants touched on the high fecundity of skipjack tuna:

"Because it's hard to overfish skipjack. They grow, they have a very good reproductive capacity when compared with yellowfin."

(- INT 1)

Despite this species' fecundity, participants also advised caution on using this as justification of exacerbated fishing pressures.

"There's a little bit of science that it's almost impossible to overfish skipjack, however, they have said that about many stocks around the world that have then been over fished."

(- INT 3)

In the wake of a changing ocean environment with largely unpredictable impacts on the fish populations residing in these waters, exercising caution is vital. This especially lies in the hands of management entities such as the IOTC:

"Nothing lasts forever, it depends on how much it can produce, how much we are taking. Proper management is very, very important."

(- INT 6)

Enforcing total allowable catch (TAC) among all IOTC fisheries can help mitigate the risks of overfishing skipjack and create a buffer for future stock depletion that may result from oceanic responses to climate change.

Disparities between supply and demand

As a market-driven certification scheme, the principal reason for fisheries pursuing the MSC standard is to maintain this market access. There is certainly a demand for sustainably sourced seafood, however the MSC has certified a much higher volume of tuna globally than is required by actual consumer markets.

"We have a situation whereby there is of the order of 1.5 to 2 million tons certified and the MSC have created a market of around 200, 000 tons. So, we've got a big disparity between supply and demand."

(- INT 8)

This also plays into why fisheries would be unlikely to discontinue certification, as that same shelf space in supermarkets would easily be filled by another can bearing the blue checkmark. Ultimately, there are more cans bearing the MSC label than there are shelves to stock. In terms of the influence that consumer demand has on market supply, six participants felt that consumers are not as keenly aware as some may think:

"Only a very small percentage of consumers will actually look at that logo and make a decision on their purchasing price."

(- INT 3)

Consumers are more so reliant on their supermarkets making sustainable purchasing decisions for them regarding what products occupy shelf space (INT 3). With increased awareness among seafood consumers, purchasing decisions can serve as market drivers for sustainably sourced tuna products securing international shelf space.

Allocation

Issues pertaining to allocation have been discussed at length in RFMOs and the 2023 commission meeting in Mauritius was no exception. Participants discussed this with respect to IOTC fisheries, and one interviewee touched on how this should look for SIDS:

"The weighting for SIDS should be higher than - not significantly - than developing coastal states when it comes to allocation of fishing opportunities looking forward… I'm talking about equitable allocation and in equitable allocation, SIDS get a slightly better deal."

(- INT 8)

Although each fishing nation will vouch for the greatest possible volume of catch and historical catch has previously been relied upon, equity should be considered when allocating TAC for CPCs. This also must be looked at in terms of SIDS such as the Seychelles which allow EU fleet harvest within their EEZ via access agreements. For example, considering the role that tuna landed in the Victoria port of the Seychelles contributes to the local economy (canneries, refueling costs, vessel maintenance, etc.) is valuable in aiding to determine allocation quantities for this SIDS and its respective flag vessels.

The current state of IOTC tuna fisheries is complicated and ever-changing. There is an evident lack in effective management from the RFMO as well as lack of compliance among CPCs. Furthermore, understanding the full extent of changes in schooling behavior or size-frequency analysis of skipjack tuna is highly hypothetical. Observations from fishermen and locals in coastal states are significant to informing these topics, however the long-term changes that will arise from climate change are highly

unpredictable. The implications of global warming on tropical tuna species may increase or decrease fecundity, shift developmental phases, or modify migratory patterns. This is all highly hypothetical, therefore applying precautionary approaches to fishery management will be paramount in the coming years. Until scientists and RFMOs can grasp the reality of our world's oceans in this time of change, over-exploitation of tuna stocks must be discontinued in the Indian Ocean and globally. Management decisions such as allocation must also incorporate socio-economic considerations in all forms of governance.

3.3.2 Projections for the Future of Indian Ocean Tuna

At local and global scales, including sustainability practices in blue economy developments is crucial (Andriamahefazafy et al., 2019). The same goes for fishing nations of the Indian Ocean, many of which are in the infancy of developing their respective blue economies due to geo-political and economic limitations. Despite this, skipjack tuna catch has exceeded recommended harvest levels by 30% in 2018 and 27% in 2021 (IOTC, 2022b). There is an alarming lack of compliance with catch limits among IOTC fisheries despite recommendations from the RFMO's scientific committee. This overharvest of approximately 30% was of concern to several interviewees, one of whom also pointed to the fact that such mismanagement may have a cascade of effects:

"I think there's a serious risk in that we are in the Indian Ocean, we have a stock assessment coming this year and we know that skipjack has been overfished against the MSY for a number of years and significantly so. So the trend is downwards. I hope that it doesn't lose its [MSC] certificate. I hope it doesn't go into the red, but there's some serious risk if you consider that in 2021 the total catch of Skipjack was around 650,000 tons if I'm not wrong and the MSY is 513,000 tons, it doesn't look good."

(- INT 8)

For the fisheries which hold the MSC certificate along with those trying to obtain it in the region, overharvest in the order of 30% is significant. This is occurring across many Indian Ocean fishing nations, which will have cumulative impacts in future years. Several participants were fearful of what this may cause in the coming decades:

"One day you will find nothing, and all the fishermen are coming back with nothing. It is not sustainable. It has to be managed. Whether it is small scale or large scale."

(- INT 6)

Although it is hard to over-harvest skipjack tuna due to the biological fecundity of the species (Horne-Sparborth, Adam, Ziyad, 2015), waiting to take legitimate action when the stock is past the point of biological recovery is a very big risk. As seen in countless other fisheries, moratoriums have detrimental impacts on long-term stock recovery and financially devastate those working in the effected fishery and secondary industries (INT 3 & 4).

There is a substantial amount of finger pointing in the IOTC with regards to proper management, but taking a step back to consider the worst-case scenario for future generations should instigate CPCs to better cooperate for effective management. The lack of capacity in coastal states, economic incentives, and inadequate compliance are but a few contributing reasons for tuna over-harvest. In a coastal state reliant on tuna fisheries such as the Maldives, such irresponsible overharvest within the RFMO would devastate the nation. In addition to degrading a valuable natural resource, the economic and socio-cultural consequences would be devastating. Upcoming stock fluctuations are sure to increase, as the impacts of climate change on tropical tuna species remains largely unknown.

3.3.3 Criticisms of the MSC

Several participants expressed disappointment regarding the MSC prioritizing their own growth rather than the promotion of truly sustainable seafood products. Despite originating as a not for profit, participants sensed that it has grown beyond this and has accrued substantial profits through the certification of large volumes of seafood:

"The more people use the logo on their products, the more money they generate. So essentially what they are doing is trying to certify as many fisheries as they could, and they are trying to get more."

(- INT 2)

Another criticism that arose in interviews was the lack of improvement that is seen in 'real time' with certification:

"It hasn't really driven much change with MSC."

(- INT 3)

Participants referred to the MSC as lacking effective enforcement and failing to improve environmental practices among certified fisheries. Even though the standard claims to promote sustainably sourced seafood, the above participant disagreed that the MSC is successfully driving fisheries in a positive direction. Another participant pointed to lack of management capacities within RFMOs and how this reflects on the MSC standard:

"You could argue that the lack of effective management for yellowfin suggests that the skipjack shouldn't maintain a certification, because clearly the RFMO cannot function in effectively managing fishing effort, which is a key aspect of the standard."

(- INT 3)

The implication here is that if the IOTC cannot control harvest of tropical tuna among its CPCs, how can the MSC justify certifying fisheries operating under the jurisdiction of this RFMO? The criticisms of the MSC were lengthy among participants and point to whether eco-certifications are indeed an effective tool to discern sustainable versus unsustainable seafood products. In the case of Indian Ocean tuna, it appears to be quite ineffective at distinguishing the two. Despite this, certification is necessary for Maldives, Echebastar, CTFO, and AGAC to enter international markets. None of these fisheries are reaping premium benefits as the pole-and-line fishery once was in 2012, but until another tool is created to facilitate market access, the MSC remains a necessary evil for tuna fisheries.

3.3.4 Alternate Certifications & Market-Driven Incentives

Despite the MSC currently having a monopoly on eco-certification of seafood products there exists alternate influences on market access for tuna products. Such examples include retail campaigns or industry suppliers. However, in comparison to the super-house that has become the MSC, these solutions present limitations and market constraints. Consequently, alternate certifications are being developed which have more in-depth considerations for fisheries dealing with socio-economic limitations.

"There are other standards being developed looking at all of this. Not just stock, at the social side of things, issues with slavery."

(- INT 2)

An example of such a standard is Community Catch, which is a market-based organization targeted towards the sustainable development and empowerment of SSF (Community Catch, 2023). As a standard which aims to be accessible to fisheries with

less management capacity than is required by the MSC, it could potentially grow into an alternate certification for fisheries to attain international markets.

"I guess that sort of depends how well we do with community catch to be honest. Seriously, if we were dealing with the small-scale community fisheries and they were dealing with the large-scale multinational fisheries, then it may be less of an issue for them."

(- INT 4)

Looking at alternative certification models is one option for thorough sustainability in global seafood supply chains, however the issue remains that alternate standards may morph as they develop. Much like the MSC has changed substantially in the previous years, it is difficult to know if alternate certifications may present the same issues. In several interviews, the market drivers which were addressed by participants were unique to the United Kingdom. These industries are tending to look beyond eco-labels and considering aspects such as the gear type used for harvest, along with other aspects of sustainability relevant to specific fisheries.

"Marks and Spencers in the UK are one of our supporters and they're buying from fisheries that, you know, they do a lot of due diligence rather than just looking at an eco-label."

(- INT 8)

This retail support has been especially in favor of the pole-and-line caught tuna.

"From a commercial perspective, we had been supplying retailers such as Sainsbury, Marks and Spencer from Maldives and they loved the pole-and-line and the social aspects of the fishery."

(- INT 8)

The role of well-established markets can go beyond premiumization and lead to larger projects to improve seafood sustainability. This can be seen through the Global Tuna Alliance (GTA) partnership which now includes partners across all continents which 'account for around 32% of the global tuna trade' (Global Tuna Alliance, 2023).

"2016 is when we started the campaign with the retailers in the UK for yellowfin recovery. And that really morphed into what became the global GTA, the global tuna alliance and is now in like a lobby group."

(- INT 3)

Although considerations of gear type and socio-economic aspects of a fishery are unique to a small sample of retailers, such support is important to note. This provides an alternative to eco-certifications in allowing SSF to access international markets and be recognized for aspects of sustainability beyond what is considered by the MSC.

With augmenting criticisms of the MSC and globally over-harvested fish stocks, an alternative is sure to arise to facilitate sustainable seafood across international markets. Whether it be retailers or an alternate certification taking the lead, it would be greatly progressive to consider all three pillars of sustainability when evaluating tuna fisheries. A strictly environmental standard is not doing the due diligence consumers and the global population need. Social, economic, and ecosystem impacts of tuna fisheries should be incorporated into any future alternative approaches to avoid repetition of an ineffective management tool such as the MSC.

Chapter 4: Conclusion

As global tuna stocks continue to decline, effective management solutions are needed to ensure stock viability and socio-economic prosperity throughout the fishing industry. These solutions are based both in state management as well as market-governance. The latter, most notably through eco-certifications like the MSC, overwhelmingly take an environmental lens on sustainability, however considering a wider array of challenges entrenched in fisheries will allow for progressive changes in the industry and lend to more effective long-term success in both management systems and certification entities. Additionally, the robustness of what is environmentally sustainable is also up for debate with the MSC, given the history of certifying tuna fisheries that have arguably large environmental impacts, such as through purse seine fishing with DFADs. The results of this thesis have demonstrated that there exist many management problems at the regional and local scale of Indian Ocean tuna fisheries, many of which are linked to eco-certifications and conservation burdens.

4.1 Research Findings

Through the collection of qualitative data via participant interviews, the observations made throughout the 2023 IOTC meeting in Mauritius, and through the lived experiences aboard a pole-and-line *Masdhonis* in the Maldives, this research has addressed the environmental and socio-economic issues revolving around the MSC certification in the Maldives. The Maldives' conditional certification in 2012 and fulfillment of all eight conditions by 2016 has facilitated certification of surrounding tuna fisheries. The reformation led by the Maldives in the IOTC has improved management practices for all CPCs of this RFMO, particularly on points pertaining to P1 and P3 of the

MSC fisheries standard. Many of these proposals presented by the Maldives have improved environmental sustainability of tuna stocks, especially through the adoption of HCR, LRP, and resolutions aiming to diminish bycatch of non-target species (*Figure 12*).

In terms of socio-economic sustainability, the Maldives have maintained adequate working conditions and salaries for those working in the tuna industry within their national waters. The eco-certification of surrounding purse seine fleets beginning in 2018 eroded the market benefits previously accrued by pole-and-line caught tuna. Unfortunately, this has meant that all IOTC MSC-certified fisheries do not benefit from a premium on exported catch. While sustainability of Indian Ocean tuna fisheries has improved since 2012, the market benefits have eroded.

The Maldives pole-and-line tuna fishery has maintained social, economic, and environmental sustainability for millennia. On the social side, fishermen have good working hours and conditions. They are not at sea for longer than two days at a time, have the autonomy to decide whether to attend a fishing trip, and have adequate time to spend with their families. Financial compensation is also good in the Maldives (it is based on the sharing of profits from the vessel). Interviews among Maldivian participants revealed that the earnings of fishermen are often robust enough to support post-secondary education for their children. The socio-economic benefits go beyond the individual fishermen. Island economies, especially in the Southern atolls, are kept afloat by the secondary industries affiliated with the pole-and-line fishery. Lastly, the Maldivian tuna fleet practices environmental sustainability by having minimal ecosystem impacts. Catching skipjack one at a time means bycatch is nearly absent from the fishery. The only bycatch from pole-and-line vessels is yellowfin tuna. The use of AFADs in the Maldives'

EEZ does not present risks of physical harm to coral reefs, as the devices are tethered in place unlike the DFADs deployed by purse seine fleets. Fishermen target AFADs as the last resort to cover their trip costs after looking out for FSS to fish. Overall, the Maldivian government and the pole-and-line fleets have succeeded in maintaining all pillars of sustainability in this century's old fishery, serving as an example for best practice in global seafood harvest and a leader in sustainable growth for the developing world.

The Maldives being the first fishing nation to pursue MSC certification in the Indian Ocean resulted in a substantial reform of the IOTC. On top of funding and leading proposals to better management and conservation practices, this SIDS has undertaken a disproportionately large conservation burden. What initially started as a certification burden by satisfying the conditions presented by the MSC in 2012 has gradually morphed into a conservation burden as well. The Maldives has led efforts for sustainable tuna harvest that are beyond the means of any CPC in the IOTC, especially a SIDS. With economically stable members such as the EU or Japan, the irony that a SIDS stepped up to address the many conservation challenges in the region is outstanding. This is especially cumbersome to the Maldives when evaluating different fishing methods such as purse seine versus pole-and-line. Maldives does not make use of DFADs in their fishery, however, are the recipient of these abandoned devices washing up on their beaches or coral reefs. They must deal with cleaning up after something that is no fault of their own. As a SIDS, they are dealing with additional conservation burdens than nations without physical borders in the Indian Ocean. By leading management measures within the IOTC and directly dealing with the ecosystem challenges associated with commercial

tuna harvests, the Maldives has been a notable leader in conservative management on a local and global scale.

4.2 Shortcomings of Research

Although this research collected a substantial amount of qualitative data from participants, access to various other data sets, such as information owned by the MSPEA, would have been beneficial. This may have contributed to the background of Maldives pursuing the MSC fisheries standard and aided in shaping perspectives throughout the thesis.

The initial objective of the Q-sort was also not met. By completing the Q-sort as planned, statistical analyses were to be performed to determine relative convergence and divergence of participant opinions. However, participants felt very strongly about the respective rankings they assigned to the statements, as such skewing the results and turning the Q-sort into a genre of heat map. This information was still incorporated throughout the results and discussion, however no statistical results were produced.

By increasing the sample size used in this study, credibility of data would be augmented. Although time constraints and availability of those contacted to partake in the study resulted in a sample size of eight participants, having a greater time frame to complete the study would be beneficial. Especially as some interviews took place throughout the IOTC meeting in Mauritius, many delegates and potential participants were far too busy with professional obligations to lend time to this study.

4.3 Recommendations and Final Thoughts

Fisheries management is a complex yet critical task. Especially in the Indian Ocean, a region of substantial socio-economic diversity, establishing effective management systems for the harvest of tropical tunas is challenging. By looking to the Maldives as an example of best practice in sustainable fishery management, achieving a future wherein productive fish stocks are accompanied by healthy human populations appears realistic. To obtain this vision of holistic sustainability, RFMOs and fishery managers should consider the following recommendations:

A. RFMOs and certification entities must increase compliance among CPCs. Because the MSC allows for certification of tuna fisheries with variable environmental concerns, this standard should stringently uphold ecosystem conservation by removing the certificate from mis-managed fisheries. Within the IOTC, many accounts of fishing nations not abiding by adopted resolutions has created divisiveness, especially on topics such as DFADs, allocation, and overharvest. Non-cooperating fleets must be held accountable, both by the IOTC and MSC.

B. Certification standards and management within RFMOs should weigh social and economic prosperity in addition to environmental sustainability. While management systems tend to prioritize economic profit, certification schemes are strictly environmental. Finding a medium between these two approaches and incorporating a social component would revolutionize fishery management.

C. Investment into increased capacity for marginalized SIDS and coastal states to develop their fishing industries should be supported by developed nations, NGOs, FIPs, certification standards, and industry partners. This is applicable to nations in the Indian Ocean reliant on foreign support via access agreements. The Maldives can serve as an example to guide this process. By assisting countries such as Madagascar to build their own pole-and-line fleets and extract the natural resources within their EEZ, this impoverished nation would be able to reap the full financial benefits from their tuna stocks rather than earn the pittance they are currently paid through access agreements.

D. For consumers, more thorough attention to food labels is important. Both the MSC and consumers must be held accountable to do better, because the blue check mark no longer reflects the best environmental choice. Fisheries that are clearly less sustainable than others are also able to achieve certification. If new certification entities expand for seafood products, accountability is also crucial for these entities. As seen with the MSC, a certification entity can often degrade its initial standards to increase certified volume.

The Maldives' pole-and-line fishery displays how a centuries old tradition has evolved with its surrounding world to become a socially, economically, and environmentally conscious method of harvesting skipjack tuna. The MSC has become the most popular eco-certification entity yet appears to be losing the rigor behind the standard that they once had. Certification of unsustainable fishing fleets is eroding market benefits for those sustainable harvest methods that were first to obtain certification, for example the pole-and-line fishery. Exacerbated fishing pressures in the Indian Ocean are depleting the stock and threatening the livelihoods, food security, and cultural wellbeing among coastal states and SIDS.

To address these many challenges among IOTC nations, considering the socio-economic and environmental priorities for coastal states and small island developing states will be paramount. Achieving this vision of holistic sustainability in the Indian Ocean cannot be accomplished solely by nations such as the Maldives. Support and cooperation among all IOTC nations will have a significant role to play in this progressive goal, along with deep-rooted changes in certification schemes and international market drivers. The Maldives pole-and-line skipjack tuna fishery has practiced full-spectrum sustainability for centuries, it is now time for the rest of the fishing world to follow suit.

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Appendices

Appendix A. Conditions of MSC certification for the Maldives pole-and-line skipjack tuna fishery (Anderson et al., 2012). *Final report and determination*.

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/N/A)
1	By the fourth annual audit, limit reference points need to be agreed by IOTC, consistent with the management objectives and scientific stock assessment.	**1.1.2**	**N**
2	By the fourth annual audit, formal HCRs must be defined and put in place for the skipjack fishery in the IO to reduce the exploitation rate as limit reference points are approached; and the selection of the harvest control rules takes into account the main uncertainties.	**1.2.2**	**N**
3	By the fourth annual audit, there must be improved information on all fishery removals of skipjack to better facilitate stock management.	**1.2.3**	**N**
4	By the fourth annual audit a partial strategy for the management of bait fish must have been implemented that reduces the risk of Maldives wide and local depletion, there is evidence that the partial strategy has been implemented and there is some objective basis for confidence that the partial strategy will work.	**2.1.2**	**N**
5	By the first annual audit, there will be documented evidence that the Government of Maldives is collecting the information needed to support a partial strategy to manage bait fisheries (see Condition 4).	**2.1.3**	**N**
6	By the fourth annual audit, information must be sufficient to measure trends and support a full strategy to manage impacts on ETP species.	**2.3.3**	**N**
7	By the fourth annual audit, short term objectives must be explicit within the fishery management system at both the regional and national levels.	**3.2.1**	**N**
8	By the fourth annual audit, there must be clear evidence of the effectiveness of the MCS mechanisms and there must be information available on the infringements of the regulations by local vessels and the related sanctions.	**3.2.3**	**N**

Appendix B. Q-sort used for interview participants

Table 1. Sample Q Board (N=40)

Strongly disagree Neutral Strongly agree

-4 -3 -2 -1 0 +1 +2 +3 +4

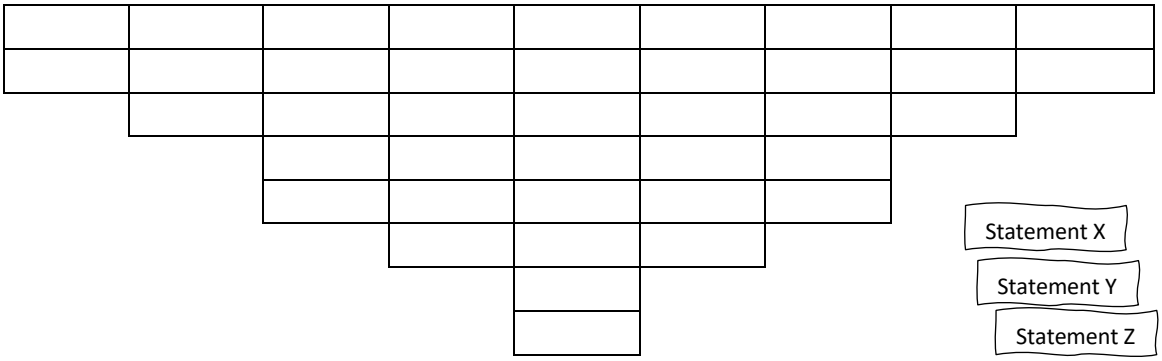

Table 2. Statements used in Q-methodology with the category of topic explored (N=40)

Topic	Statement
Market	There is a strong demand for eco-labelled tuna in international markets. Eco-certified tuna is only relevant in European and North American markets. The use of dFADs is beneficial, as increased tuna volume means more product reaches the market. Having eco-certification is the most important product attribute when considering export markets. Distant water industrial fleets economically benefit Indian Ocean SIDS via access agreements and canneries. The use of DFADs is worth the environmental impacts to ensure food supply and jobs. SIDS with access agreements (Mauritius, Madagascar, Seychelles) are substantially benefitting from EU fleet harvest.

	The growing number of eco-certified tuna fisheries is causing confusion among consumers. Regional progress and economic growth among all Indian Ocean countries is a bigger priority than that of an individual SIDS.
Eco-certification	Eco-certification has improved the economic gains on exported tuna. The MSC process is too expensive to obtain and maintain on an annual basis. Only truly sustainable fisheries can achieve eco-certification on exported tuna. Skipjack tuna is likely to maintain eco-certification, it is unlikely that it follows the trend of Yellowfin. Small scale fisheries would be unable to attain international markets without MSC labels. MSC certified Maldivian fisheries have created benefits for surrounding Indian Ocean SIDS. Maldives gaining MSC certification in 2012 has since facilitated eco-certification of surrounding tuna fisheries. Eco-certifications can address many environmental concerns in fisheries.
Environment	Achieving eco-certification improves sustainability of tuna fisheries. Lost, abandoned, or discarded dFADs are detrimental to the coral reefs or shoreline habitats in SIDS. Skipjack tuna is being harvested sustainably and the stock will remain stable into the future. Tuna sourced from small scale fisheries is more sustainable than large scale fisheries. Small scale fisheries invest a disproportionately larger effort into conservation efforts than industrial fisheries. The use of DFADs removed juvenile tunas from the overall stock, disadvantaging small scale fleets which do not use these devices and target adult tunas.

	Small scale fisheries are important to the conservation of marine systems. Certifications should more thoroughly consider bycatch, even if the effected non-target species are considered stable and healthy.
Management	The fishery in which you work in is well-managed and catch and report transparent catch and effort data to the IOTC (or other RFMO). The use of dFADs in fisheries are well regulated – few are lost or discarded and the fleets which rely on them will retrieve the device after deployment. Impacts of climate change are being incorporated into management decisions of your respective tuna RFMO. Economic factors dominate RFMO decision-making. Environmental factors dominate RFMO decision-making. Social factors dominate RFMO decision-making. The Maldives have been a leader in sustainable tuna harvest within the IOTC and internationally. More research on skipjack stocks is needed to effectively manage both small and large IOTC fisheries.
Social/Cultural values	Sustainably caught tuna is a source of pride and therefore important culturally/socially. Tuna consumption is vital to food security and employment in coastal states. Working in tuna fisheries has been a generally positive experience and provides adequate career opportunities. Tuna over-harvest and food security is a major concern for locals in SIDS. There is an immense reliance on flag states (EU) from port states in the Indian Ocean. The benefits of MSC certified Skipjack in the Maldives among neighboring nations has helped overall development/prosperity in SIDS.

	The MSC assessment process should incorporate more social factors before certifying fisheries.

Appendix C. List of questions posed to interview participants

General questions for everyone:

1. What has been your involvement in tuna fisheries? In the MSC assessment process?
2. Can you tell me about the statements you most strongly agree with?
3. Most strongly disagree with?
4. In your opinion, what were the greatest benefits to surrounding SIDS once the Maldives achieved MSC tuna certification in 2012? Costs?

For scientists:

1. Are there substantial concerns with most fisheries harvesting above recommended catch levels?
2. Can you speak to projections on skipjack stocks and if they may also face challenges in losing certification, much like Indian Ocean Yellowfin has?
3. What changes could decrease dFAD environmental consequences in SIDS?

For harvesters:

1. Did you practice fishing prior to certification?
    a. Yes - What changes have you noticed within your fishery since it was certified?
    b. No – how has your experience been working in a certified fleet?
2. Can you describe a typical day of fishing on your vessel to me?
    a. Method used, how long of a day it is, how much catch, how many staff, what emissions may be created, use of FADs, etc?
3. Do you believe the methods used on your vessel are sustainable? If so, why?

For industry:

1. Were you involved in the pre-certification process of small-scale fisheries?
2. Once the Maldives gained MSC certification in 2012, did surrounding IOTC fisheries get certified rapidly afterwards? What was the timeline for tuna fisheries 'following suit'?
3. In your opinion, is it advantageous to obtain MSC certification after another tuna fishery had already gained it?

    a. Following in one's footsteps, seeing the mistakes others made and rectifying them early, etc.
4. In your opinion, is there a need for newer or alternative sustainability other than MSC?
    a. Why – better for small scale, more environmental variables to consider (climate change, etc).

For exporters:

1. What shifts have you noticed in tuna value chains throughout your career?
2. Have tuna premiums substantially increased/decreased with the popularity of certification schemes such as the MSC?

Appendix D. Codes/themes found in interviews using NVivo 1.7.1

Code	**Sub-code**
Certification	Alternate certifications Certification benefits Fishery principles WWF/NGO objections Harmonization protocols Inaccessibility of certifications Certification support Industry support History of Maldives certification Distrust of MSC Conditions Certification costs
Politics	Divisive politics Access Agreements IOTC tensions Maldives-EU relations Power SIDS development Government support of fishers
Economy	Certification cost Retail support Supermarket premium Supply to cannery Pressures of economic income

Market	Consumer demand Market access Market demand Product attributes Disparities between supply and demand
Environment	Bycatch Carbon footprint DFADs Ecosystem conservation Fecundity Pole-and-line eco-impacts Purse seine eco-impacts Tuna stocks Coral reef destruction Juvenile tuna Spawning stock biomass Skipjack size
Management	Allocation Bait management Climate change considerations Harvest control rules IOTC management Maldives leadership Management tools Purse seine management Vessel repairs Fishery inspections/assessments Stock assessment Fishery improvement programs (FIP) Over harvest Lack of compliance
Food security	
Socio-economic indicators	
Future projections	
Gear types	Fleet size Small scale fisheries
NGO presence	
Regional diversity	
Conservation efforts	
Social	Capacity building in coastal states

	Capacity building in SIDS Collaboration Labor rights Tradition Increasing world population Intergenerational education Fishing community Skipjack culture

Appendix E. Participant opinions on Q-sort statements

Legend:

Number of participants who selected this ranking	Shade
0	
1	
2-3	
4	

Table 1. Participant opinions on social and cultural values

	Ranking								
Statement	**-4**	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**	**+4**
Sustainably caught tuna is a source of pride for the Maldives and is therefore important culturally/socially.									
Tuna consumption is vital to food security and employment in coastal states.									
Working in tuna fisheries has been a generally positive experience and provides adequate career opportunities.									
Tuna over-harvest and food security is a major concern for locals in SIDS.									
There is an immense reliance on flag states (EU) from port states in the Indian Ocean.									
The benefits of MSC certified Skipjack in the Maldives among neighboring nations has helped overall development/prosperity in SIDS.									
The MSC assessment process should incorporate more social factors before certifying fisheries.									

Table 2. Participant opinions on market statements

Statement	Ranking								
	-4	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**	**+4**
There is a strong demand for eco-labelled tuna in international markets.									
Eco-certified tuna is only relevant in European and North American markets.									
The use of dFADs is beneficial, as increased tuna volume means more product reaches the market.									
Having eco-certification is the most important product attribute when considering export markets.									
Distant water industrial fleets economically benefit Indian Ocean SIDS via access agreements and canneries.									
The use of dFADs is worth the environmental impacts to ensure food supply and jobs.									
SIDS with access agreements are substantially benefitting from EU fleet harvest.									
The growing number of eco-certified tuna fisheries is causing confusion among consumers.									
Regional progress and economic growth among all Indian Ocean countries is a bigger priority than that of an individual SIDS.									

Table 3. Participant opinions on management statements

Statement	Ranking								
	-4	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**	**+4**
The fishery in which you work is well-managed and transparently report catch and effort data.									
The use of dFADs in fisheries are well regulated, few are lost or discarded and the fleets which rely on them will retrieve the device after deployment.									
Impacts of climate change are being incorporated into management decisions of your respective tuna RFMO.									
Economic factors dominate RFMO decision-making.									
Environmental factors dominate RFMO decision-making.									
Social factors dominate RFMO decision-making.									
The Maldives have been a leader in sustainable tuna harvest within the IOTC and internationally.									

More research on skipjack stocks is needed to effectively manage both small and large IOTC fisheries.									

Table 4. Participant opinions on eco-certification statements

	Ranking								
Statement	**-4**	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**	**+4**
Eco-certification has improved the economic gains on exported tuna.									
The MSC process is too expensive to obtain and maintain on an annual basis.									
Only truly sustainable fisheries can achieve eco-certification on exported tuna.									
Skipjack tuna is likely to maintain eco-certification.									
Small scale fisheries would be unable to attain international markets without MSC labels.									
MSC certified Maldivian fisheries have created benefits for surrounding Indian Ocean SIDS.									
Maldives gaining MSC certification in 2012 has since facilitated eco-certification of surrounding tuna fisheries.									
Eco-certifications can address many environmental concerns in fisheries.									

Table 5. Participant opinions on environmental statements

	Ranking								
Statement	**-4**	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**	**+4**
Achieving eco-certification improves sustainability of tuna fisheries.									
Lost, abandoned, or discarded dFADs are detrimental to the coral reefs or shoreline habitats in SIDS.									
Skipjack tuna is being harvested sustainably and the stock will remain stable into the future.									
Tuna sourced from small scale fisheries is more sustainable than large scale fisheries.									
Small scale fisheries invest a disproportionately larger effort into conservation efforts than industrial fisheries.									
The use of DFADs removed juvenile tunas from the overall stock, disadvantaging small									

scale fleets which do not use these devices and target adult tunas.									
Small scale fisheries are important to the conservation of marine systems.[5]									
Certifications should more thoroughly consider bycatch, even if the affected non-target species are considered stable and healthy.									

Appendix F. An overview of influential proposals led by the Maldives within the IOTC

Proposal	**Category**	**Year**	**Document link**
HCR for skipjack tuna	HCR	2013	https://iotc.org/documents/interim-harvest-control-rule-skipjack-tuna-maldives
Cetacean conservation	Bycatch	2013	https://iotc.org/documents/conservation-cetaceans-australia-and-maldives
Whale shark conservation	Bycatch	2013	https://iotc.org/documents/conservation-whale-sharks-australia-and-maldives
Shark conservation	Bycatch	2013	https://iotc.org/documents/conservation-sharks-australia-and-maldives
HCR for skipjack tuna	HCR	2015	https://iotc.org/documents/harvest-controls-rules-skipjack-tuna-iotc-area-competence-maldives
Establishing LRP & TRP	LRP/TRP	2015	https://iotc.org/documents/iotc-target-and-limit-reference-points-and-decision-framework-maldives
Shark conservation	Bycatch	2016	https://iotc.org/documents/concerning-conservation-sharks-caught-association-fisheries-managed-iotc-%E2%80%93-maldives
Formation of a high-level technical committee	Management	2016	https://iotc.org/documents/establishing-technical-committee-management-procedures-%E2%80%93-maldives
FAD reduction	FAD	2016	https://iotc.org/documents/fish-aggregating-devices-fads-maldives
Improved FAD design to reduce entanglements	Bycatch	2016	https://iotc.org/documents/fish-aggregating-devices-fads-maldives
Allocation of fishing opportunities for coastal states	Management	2017	https://iotc.org/documents/allocation-fishing-opportunities-iotc-species

[5] Participants included humans in their definition of marine systems

Interim plan for rebuilding yellowfin stocks	Stock recovery	2019	https://iotc.org/documents/interim-plan-rebuilding-indian-ocean-yellowfin-tuna-stock-south-africa-maldives
Mobula and Manta rays' conservation	Bycatch	2019	https://iotc.org/documents/conservation-mobula-and-manta-rays-caught-association-fisheries-iotc-area-competence-0
Climate change	Climate change	2022	https://iotc.org/documents/climate-change-maldives-et-al

Appendix G. 2015 MSC surveillance report of the Maldives' pole-and-line skipjack tuna fishery by Intertek Fisheries Certification Ltd (Scott & Stokes, 2015).

4.7 Overall Conclusions

Stock status	The stock is above a biomass level that would produce MSY in the long term. It was reported as: SB2013/SB_{msy} (80% CI) = 1.59 (1.13 – 2.14). Thus, there is a high probability that spawning stock (SB) is above the SB_{msy} level. Fishing mortality (F) is reported using Catch/$Catch_{msy}$ as a proxy for F/F_{msy} . It was reported as $C2013/C_{msy}$ (80% CI) = 0.62 (0.49 – 0.75). The 2014 Working Party concluded that on the weight of evidence available in 2014, the skipjack stock is not overfished and not subject to overfishing.			
Condition 1	Behind target	On target	Ahead target	Closed
Condition 2	Behind target	On target	Ahead target	Closed
Condition 3	Behind target	On target	Ahead target	Closed
Condition 4	Behind target	On target	Ahead target	Closed
Condition 5	Behind target	On target	Ahead target	Closed
Condition 6	Behind target	On target	Ahead target	Closed
Condition 7	Behind target	On target	Ahead target	Closed
Condition 8	Behind target	On target	Ahead target	Closed