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Bren School of Environmental Science & Management

CONSERVATION INTERNATIONAL

Final Report

Cost Analysis of Social and Environmental Improvements in Fiji's Longline Albacore Tuna Fishery

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List of Acronyms

ABNJ Areas Beyond National Jurisdiction
C188 Work in Fishing Convention, 2007 (No. 188)
CI Conservation International
CPI Consumer Price Index
CRP Cost Recovery Premium
EEZ Exclusive Economic Zone
EM Electronic Monitoring
EMS Electronic Monitoring System
EPA Environmental Protection Agency
ERP Employment Relations Promulgation
FAO United Nations Food and Agriculture Organization

FFA Forum Fisheries Agency
FFIA Fiji Fishing Industry Association
FJD Fijian Dollar
GDP Gross Domestic Product
GPS Global Positioning System
GRT Gross Register Tonnage
IUU Illegal, Unreported, and Unregulated
KG Kilogram
LMMA Locally Managed Marine Area
LOA Length Overall
MCS Monitoring, control, and surveillance
MOU Memorandum of Understanding
MPA Marine Protected Area
MSC Marine Stewardship Council
MT Metric Ton
PIRFO Pacific Island Regional Fisheries Observer
PSMA Port State Measures Agreement
SPC Pacific Community
TAC Total Allowable Catch
USD United States Dollar
WCPO Western Central Pacific Ocean
WCPFC Western and Central Pacific Fisheries Commission
WTP Willingness to Pay
WWF World Wildlife Fund

1. Project Overview

1.1 Project Objectives

The overarching goal of this project is to evaluate the economic viability of improvements to Fiji's longline albacore tuna fishery. Our cost analysis:

- Assesses the cost of implementing interventions
- Calculates the Cost Recovery Premium (CRP) needed to cover the cost of the interventions

This Cost Recovery Premium metric provides our client, Conservation International, with a framework to address challenges within the fishery and improve market access through raised sourcing standards. After identifying the key challenges within the fishery, we critically analyzed possible solutions and determined interventions to address these issues. We provided a thorough analysis of the costs of three intervention strategies:

(1) Raising wages to a living wage
(2) Certifying 100% of the Fijian domestic longline fleet to Marine Stewardship Council (MSC) standards
(3) Implementing electronic monitoring systems on 100% of vessels

We examined different scenarios for varying proportions of the fleet adopting each intervention (e.g., 20% vs. 100% of the fleet). To account for the Fijian fishing industry's varying willingness to pay, our recommendations include alternative approaches to achieving social and ecological sustainability (i.e., calculating the cost of interventions for smaller proportions of the fleet).

1.2 Project Significance

There is an intrinsic ecological and social value in generating improvements within fisheries, such as decreasing bycatch and improving labor conditions. Our project identifies a financial incentive in addressing issues within the Fijian longline albacore tuna fishery through expanding market access to the demand for sustainably sourced seafood. Seafood categorized as "sustainably sourced" continues to rank above price, indicating that there may be a price premium that customers are willing to pay.[1] Buyers, including Tesco and Walmart, are sourcing Marine Stewardship Council certified tuna.[2] [3] Walmart Inc., the commercial entity, is a major market tuna retailer. The Walmart Foundation has partnered with Conservation International (CI), in a collaborative initiative through the Common Oceans Project Areas Beyond National Jurisdiction (ABNJ) Tuna Project, to identify new pathways to seafood sourcing and further support Fiji's existing efforts for fisheries management. Our outlined cost analysis will be utilized to inform this initiative.

2. Introduction

Tuna is among the most valuable harvested and traded seafood products globally.[4] In Fiji, the domestic longline fleet predominantly targets albacore tuna within the country's Exclusive Economic Zone (EEZ). Albacore products are of high economic importance to Fiji, making up 57% of the country's total exports in both fresh and frozen forms.[5]

Problem: There is a need for a cost analysis of interventions to address challenges within the Fijian longline albacore tuna fleet

There are currently detrimental outcomes associated with Fiji's tuna industry fishing operations, including human rights abuses, Illegal Unreported and Unregulated (IUU) fishing, and bycatch of non-target species.

Solution: Address environmental and social issues and improve access to higher-value market segments through cost estimates of 3 primary interventions

This project analyzed three interventions to provide tangible recommendations to improve the key challenges within Fiji's longline albacore tuna fishery. The three improvements we analyzed are: Marine

[1] Globe Scan, 2020
[2] White, 2022
[3] Johnson, 2022
[4] The Pew Charitable Trusts, 2020
[5] Ministry of Fisheries, 2021

Stewardship Council (MSC) certification, electronic monitoring system (EM) equipment installation, and improved wages for the fleet and processing employees.

We examined two primary questions:

(1) How costly is it for the fleet to undertake each of the interventions?
(2) What Cost Recovery Premium (CRP) is required to cover the interventions?

3. Cost Recovery Premium

3.1 Defining a New Sustainability Metric

The Cost Recovery Premium (CRP) is a new metric we have developed to better understand the **cost per kilogram of catch** that is necessary to recover the costs of the intervention(s). This metric can be applied to a range of interventions aimed at enhancing environmental and social outcomes across fisheries.

Let's examine a simplified example of CRP:

> **Ex-vessel price for albacore tuna:** $4 USD per kg
> **Total fleet catch:** 2,000,000 kg
> **Intervention:** Half of the fleet implements human observer coverage
> **Intervened catch:** 1,000,000 kg (Half of the total fleet's catch)
> **Cost of intervention:** $100,000 USD
> **Cost Recovery Premium:** The albacore tuna catch from the portion of the fleet implementing the new human observer coverage can be sold to socially and environmentally conscious consumers at a price premium. This price premium per kg of catch is the Cost Recovery Premium, or "x". Solve the following equation to determine how large "x" needs to be to pay for the cost of the intervention:
>
> x*(2,000,000 kg/2) = $100,000
> x*(1,000,000 kg) = $100,000
> x = $100,000/1,000,000 kg
> x = $0.10 per kg
>
> The Cost Recovery Premium for this example intervention would be $0.10 USD per kg of catch, which would increase the total required ex-vessel price to $4.10 USD per kg of catch ($4.00 current ex-vessel price plus $0.10 CRP).

Refer to Section *7. Mathematical Approach* for further details on CRP methodology, including accounting for inflation and discounting in CRP calculations.

4. Context

4.1 Background

In January 2022, Conservation International's Fiji Country Program initiated a series of consultations with local industry and government officials to socialize the project concept, and has received favorable responses from both. The project also has support from the United Nations Food & Agriculture Organization (FAO) and from the Walmart Foundation. The proposed project will build on previous efforts by World Wildlife Fund (WWF) to increase MSC certification coverage for Fiji's national tuna fleet, as well as on electronic monitoring trials that were recently funded by the FAO from 2015 to 2019.

The Fijian national government has committed to sustainable fisheries management to combat various environmental, social, and ecological issues within the fishery, with the goal of 100% management and 30% protection of its Exclusive Economic Zone (EEZ) by 2030 under the National Oceans Policy.

4.2 The Lau Seascape's Financing Strategy

Fiji's Lau Seascape serves as a promising case study for 100% management. The Lau comprises 8% of Fiji's EEZ, with nearly sixty incredibly ecologically and culturally diverse islands. Conservation International's Fiji team is actively developing a financing strategy to address the impacts of climate change within Lau, utilizing both grant financing and private sector funding to support 100% Indigenous, community-based management and nature-based solutions to ensure climate resilience.[6]

4.3 MOU with FFIA and Fijian Government

In November 2022, the Fijian Fishing Industry Association (FFIA) signed a Memorandum of Understanding (MOU) with the Fijian government. This five-year agreement aims to identify issues within the fishery and propose potential solutions. FFIA president, Radhika Kumar, Conservation International and tuna industry groups demonstrate a commitment to both environmental and social improvements in Fiji's domestic longline albacore tuna fishery. Interventions such as electronic monitoring, Marine Stewardship Council (MSC), and higher wages are of interest to FFIA and the Fijian government, creating a window of opportunity to enhance both environmental and social outcomes. Our cost analysis will allow these initiatives to gain traction through clearly identifying costs and quantifying cost recovery premiums.[7]

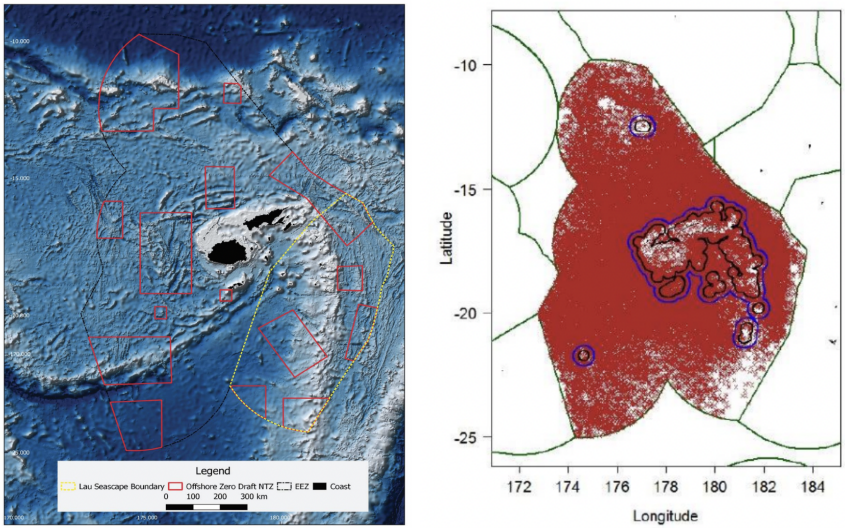
4.4 Fishing Region and Fiji's Exclusive Economic Zone (EEZ)

Fiji's EEZ expands 1.26 million kilometers of the South Pacific Ocean.[8]

Figure 1 (left). Fiji's Zero-Draft Map with EEZ, inclusive of the Lau Seascape Boundary

[6] Conservation International, 2023
[7] CI-Fiji Staff
[8] CI Ocean Strategy

Figure 2 (right). Location of all longline seine sets (red) in the Fiji EEZ between 2010 and 2015

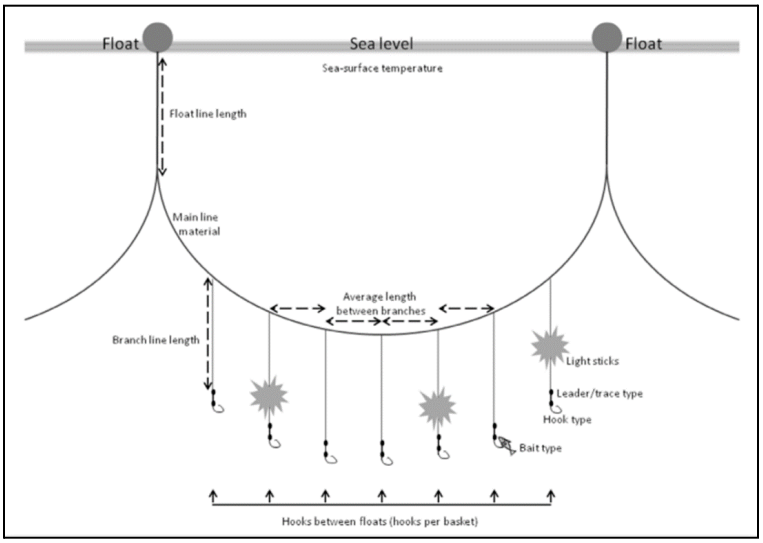


In Figure 2 above, the boundaries show 12 nm (black) and 24 nm (blue) regions, and the neighboring EEZs (green). Summary report of recent industrial longline and purse seine fishing within 12 and 24 nautical miles of land in the EEZ of Fiji.[8]

4.5 Gear Type and Catch

Commercial longline vessels within Fiji's EEZ have a total allowable catch (TAC) of 12,000 metric tons for Albacore, Yellowfin and Bigeye tuna. The Fijian domestic longline fleet is composed of both licensed longline vessels and other unlicensed Fiji-flagged longline vessels. From 1996 - 2006, longlining has been the preferred method of tuna fishing in Fiji, with the majority of annual catch consisting of albacore tuna in comparison to yellowfin and bigeye.[9]

Figure 3. Illustration of Pelagic Longline with Baited Hooks[10]



[9] Amoe, 2008
[10] Clarke et al., 2014

Climate change is expected to have negative implications for the ocean and its inhabitants, especially within the Pacific. By the year 2100, there is a projected 16% decrease in albacore biomass within Fiji's EEZ alone.[11] In 2020, the total catch for albacore tuna (MT) for Fiji's National Longline Fishing Fleet dropped to 6,229 MT, likely a result of decreased stock ecological productivity as the stock moves east and declines in Fiji waters. [7] [12]

The Cost Recovery Premium results depend on catch; however, our calculations utilize an average annual catch estimate of 5,617.14 MT, which is less than the actual 2020 total catch (Refer to Section *7. Mathematical Approach* for further details on annual harvest data). Because the catch is in the denominator of the CRP formula, our use of an average catch that is lower than the actual 2020 catch value results in higher CRP values. As such, our results overestimate the CRP necessary to cover the cost of the interventions given the actual 2020 catch. Our approach to provide CRP results that may be higher than the actual required CRPs can help accommodate for future decreases in catch over the course of the five-year project timeline.

4.6 Supply Chain and Existing Price Premium

Suva, Fiji has six total processing facilities and seven companies. Tuna forms include both fresh and frozen are are exported to markets in the US, Japan, New Zealand, and Australia.[8] It is important to note that there is an existing market demand for sustainably-sourced tuna in the US.[8] Ex-vessel prices for catch landed in Fiji's fishery in 2022 show a 19% price premium exists for MSC-certified albacore, with an average ex-vessel price of $3.10 USD for non-MSC albacore and an average ex-vessel price of $3.70 USD for MSC albacore.[7] A $0.60 USD increase in ex-vessel price indicates that there are opportunities to implement sustainability interventions, such as electronic monitoring or establishing higher wages for workers, in other units of the fleet.

4.7 Issues

Bycatch

Commercial tuna longline fishing poses a significant threat to sharks, sea turtles, and seabirds, with 30% of catch volumes consisting of bycatch and a total population decline of more than 70% across various bycatch species.[13] [14] Primary bycatch species – defined as species that are unintentionally retained or released – in the Fijian longline albacore tuna fishery include sharks and turtles.[10] [15] Fiji has implemented an Observer Program in which observers are trained in the mitigating, handling, and releasing bycatch in accordance with the Pacific Community (SPC) / Forum Fisheries Agency (FFA) Pacific Island Regional Fisheries Observer (PIRFO) standards.[12] Implementing electronic monitoring systems could also help to document and mitigate bycatch.

[11] Senina et al., 2018
[12] WCPFC, 2020
[13] Gillett, 2011
[14] Sustainable Fisheries Partnership, 2022
[15] Piovano & Gilman, 2017

Forced Labor / Social Equity and Human Rights Issues

Human rights violations co-occur with tuna fisheries overexploitation in the Western Central Pacific Ocean (WCPO). The same factors that enable illegal harvesting and poor environmental performance also drive human rights abuses: rising demand, marginal profitability, opaque industry practices, and weak governance. Some tuna fishing vessels in the WCPO have been linked to severe human rights abuses, including forced labor, human trafficking, and child labor.

Longlining is a labor intensive method of fishing. As climate change accelerates, it is likely that stocks will move into the high seas causing fishing vessels to travel farther and be away from port for longer periods of time.[16] [17] [18] As such, interventions such as increased vessel monitoring and living wages are critical to fight labor injustices.

Greenpeace rates tuna retailers based on their response to environmental issues and human rights issues. No retailers have passed Greenpeace's survey because they fail to take action on human rights issues in the fishing industry.[17] Publicly available ratings may provide economic incentive for retailers to focus their sourcing policies on fisheries that implement interventions to resolve environmental and social issues.

Illegal, Unreported, and Unregulated Fishing

Illegal, Unreported, and Unregulated (IUU) fishing is an issue in many South Pacific fisheries.[19] It is important to note that unreported and unregulated fishing are the main issues within Fiji's fishery. According to the FFA, the most common violations are related to legal vessels misreporting their catch.[20] Log sheets are not conducive for extensive reporting, and captains may strategically alter catch logs to benefit their salary. Communication barriers with foreign vessels pose additional challenges for fisheries inspectors.[7]

IUU fishing within Fiji's domestic longline albacore tuna fishery creates a need for improved reporting and regulatory efforts. In 2016, the UN and FAO committed to a Port State Measures Agreement (PSMA), creating the first international agreement to address IUU fishing. PSMA establishes standards to prevent violating vessels from landing their catches, decreasing their participation in both national and international markets.[21]

5. Data Availability

5.1 Data Acquisition with the CI-Fiji Team

In January 2023, our team distributed two iterations of a questionnaire survey to the CI-Fiji team. The surveys were two pages in length designed with open-ended questions to (1) obtain quantitative data and

[16] Bell, 2021
[17] Greenpeace, 2021
[18] WWF, 2019
[19] Karcher et al., 2020
[20] FFA, 2021
[21] FAO, 2023

(2) understand the potential desirability and viability of the interventions from the perspective of industry. A follow-up survey and meeting was conducted in a similar open-ended questionnaire format to obtain additional information, such as catch share arrangements and length of work days. The CI-Fiji team actively communicated with FFIA industry members to receive anecdotal responses that inform both our assumptions and cost data.

Quantitative research questions aimed to address the following: variation in employee wages depending on rank, duration of work, Fijian living wage estimates, costs for vessel improvements to meet MSC certification, current MSC and non-MSC ex-vessel prices, and lifetime of electronic monitoring (EM) technology.

Qualitative research questions were designed to understand the potential barriers to MSC certification and the willingness of the industry to implement EM on Fijian vessels. We also inquired about perceived risks if these interventions were not implemented to gather more insight on the socio-economic impacts of wages, MSC, and EM. Additionally, we conducted discussion sessions in-person with the CI team in Fiji to clarify further questions regarding topics, such as IUU fishing and the cost of vessel improvements, and address the desirability for interventions and willingness of industry to participate.

5.2 Data Gaps

The second iteration of the survey was partially answered, and the CI-Fiji team will continue to work with industry to answer the remaining questions. To address uncertainty in data, assumptions that influence cost calculations are documented in this report. See Section *7. Mathematical Approach for Calculating Results* for further details on overall project assumptions and Sections *8. MSC Intervention, 9. Wages Intervention*, and *10. Electronic Monitoring Intervention* for details on intervention specific assumptions.

As more information across the fleet becomes known with increased industry participation, the calculations can be updated to better reflect existing conditions. The calculations are set up in R code and can be manipulated by changing the parameters. The CI-Fiji team can edit the assumptions in the future to update the calculations as circumstances evolve.

6. Interventions

6.1 Filtering Interventions for Analysis

We narrowed down our interventions through ongoing discussions with our client and external advisors. Using three main approaches to filter our interventions – determining consistency in quantifying cost, alignment with CI Ocean Strategy, and cost data availability. We have selected MSC certification, wages, and electronic monitoring to calculate Cost Recovery Premiums and viability of each intervention. The three interventions that are the focus of this analysis also align with the MOU, which includes interests in interventions such as MSC certification, higher wages, and electronic monitoring.

Table 1. Selection of Interventions

Intervention	Consistency in Quantifying Cost	Alignment with CI Ocean Strategy	Cost Data Availability
Vessel Upgrades	▢	✓	▢
Gear Upgrades	▢	✓	▢
MPAs / LMMAs	▢	✓	▢
Human Observer Coverage	▢	✓	▢
MSC Certification	✓	✓	✓
Wages	✓	✓	✓
Electronic Monitoring	✓	✓	✓

6.2 Marine Stewardship Council (MSC) Certification

FFIA

The Fiji Fishing Industry Association (FFIA) completed their first MSC certification in December 2012 for South Pacific albacore. MSC certification cycles are every five years, and account for various units of the fleet, known as "Units of Assessment" – including target species, vessel, and gear types. The FFIA completed scope extensions to include target species such as Yellowfin and Bigeye in the MSC recertification process. MSC certification aims to maintain productive fish stocks and minimize impacts, with the overarching goal of increasing the effectiveness of fisheries management. The FFIA is in the process of getting re-certified as of February 2023 as current MSC certification expires in July 2023. [22] [23]

Table 2. Fijian Fleet Structure (2021 and 2022)

Fijian Fleet Structure, 2021 and 2022			
Year	**Fiji Domestic Fleet (Sum of MSC and non MSC)**	**MSC Vessels**	**Non-MSC Vessels**
2021	70	49 (70%)	21 (30%)
2022	72	45 (62.5%)	27 (37.5%)

Fiji's domestic fleet consists of 72 total vessels, 45 of which are MSC-certified (62.5%) and 27 that are non-MSC certified (37.5%). Throughout this report, the "fleet" refers to these 72 vessels.

[22] Track a Fishery, 2023
[23] FFIA, 2022

Barriers to MSC Certification

As of 2022, 62.5% of Fiji's domestic fleet is MSC-certified while 37.5% is not MSC-certified. When asked why the 27 non-MSC vessels in Fiji's domestic fleet have not been certified, the CI-Fiji team industry representatives gave the following 3 reasons that might serve as barriers to 100% MSC certification:

- Boats are too old for investments.
- Lack of understanding of the economics and benefits.
- Lack of knowledge to implement a proper system.

Many vessels have been in service for 18-52 years, with aging infrastructure that is not in compliance with MSC standards.[7] [24] Old vessels decrease the competitiveness of the fleet, undermining the efforts of the MSC-portion of the fleet from achieving sustainability standards.[8] Replacing older vessels has the potential to increase net revenue up to 35% without increasing catch, providing an economic incentive to getting 100% of the fleet MSC-certified.[25]

Table 3. Breakdown of Fresh and Frozen Albacore Tuna Catch Prices (2022)

Species	Lower Range (USD/MT)	Median (USD/MT)	Upper Range (USD/MT)
Frozen Albacore (Non-MSC)	$2,400	$3,100	$3,800
Frozen Albacore (MSC)	$3,000	$3,700	$4,400

Actual Price Premium from Frozen MSC Ex-Vessel Prices

There is an existing price premium for MSC-certified albacore tuna. We compare the difference in non-MSC and MSC prices per metric ton and divide this by the non-MSC price to understand the price premium.

$$\frac{Price\ increase\ from\ non{-}MSC\ to\ MSC}{Non{-}MSC\ price} = \frac{\$3700 - \$3100}{\$3100} = \frac{\$600}{\$3100} = 0.19$$

There is a 19% increase in price from non-MSC albacore to MSC albacore. This 19% price increase can be used as a benchmark to compare against our proposed Cost Recovery Premiums for MSC certification to analyze if our proposed CRPs are realistic.

6.3 Wages

[24] Raiwalui, 2021
[25] Pacific Catalyst, 2019

The Fijian government has committed to increasing the minimum wage gradually, with minimum wage increasing to $3.67 FJD per hour on October 1, 2022 and the final increase to $4.00 FJD per hour on January 1, 2023.[26] For the purpose of our calculations, minimum wage is $4.00 FJD per hour.[27]

When wages are lower than the minimum wage, it may be due to additional sources of compensation, such as catch share amounts, or pay deductions to cover onboard amenities during fishing trips. Even if catch shares are assumed to increase their wage, the base pay in the contract, before adding catch shares, might still fall below the minimum wage. However, if a fishing trip fails to catch the desired amount of albacore, catch shares might not be allocated, and it is possible that the minimum wage will still not be met. This analysis estimates the costs of implementing three levels of wages across the fleet: living wage, median wage between the living wage and minimum wage, and minimum wage.

The United Nations Global Compact acknowledges that there is no globally accepted definition or monetary amount for living wage, but there is still a need for action. However, there is broad consensus that a living wage is the wage required for workers and their families to afford basic necessities.[28] Fair Trade USA further expands on the definition of living wage as the wage necessary for the worker and their family to afford a decent standard of living, which includes food, water, housing, education, health care, and other essential needs such as savings for unexpected events.[29]

6.4 Electronic Monitoring

Electronic monitoring (EM) is a tool used to monitor individual vessel operations at sea. An EM configuration consists of cameras positioned at key points on the vessel that record video or a series of still images. The video footage is stored on hard drives that is later reviewed by government officials to ensure compliance with regulations. Electronic monitoring has been used extensively for this purpose to obtain reliable information on catches and their composition, which is particularly relevant in fisheries managed by catch shares and quotas, and it has also been used to improve the quality of data on fishing activity. The primary focus is for monitoring compliance with rules and regulations, including limits on effort, discard bans, transshipment activity, and area/time closures.[30]

A recent study on the quantification of IUU fishing in the Pacific islands region came to several conclusions that shed light on various aspects of IUU fishing in the region. Estimates of IUU were found to be dominated by the licensed fleet rather than outside illegal fishing activity. EM can address this through:

- Supporting implementation of sustainable and efficient fisheries management and fishing practices.
- Reducing illegal, unreported and unregulated (IUU) fishing through strengthened and harmonized monitoring, control, and surveillance (MCS).

[26] Fiji Government, 2022
[27] Nasiko, 2022
[28] United Nations Global Compact
[29] Fair Trade USA, 2021
[30] Stobberup et al. 2021

- Reducing ecosystem impacts from tuna fishing, including effects on bycatch and associated species, including those that cannot be retained and should be released safely to the extent possible.

Observer coverage is required for any vessels more than 24m in length that are authorized to fish in Fiji's EEZ by the tuna regional fisheries management organizations (t-RFMOs). These t-RFMOs require the collection of independent data on fishing activity, which is normally done with the use of human observers. Human observers are typically more costly than EM and also there are limitations for fitting a human observer on smaller vessels.

A minimum of 5% observer coverage (either human observers or EM) for the fleet is required by the WCFPC. The Pacific Community (SPC) recommends 20% EM coverage.[30] 100% coverage of the fleet would be the best scenario, as part of the Fijian government's goal of 100% regional management for Fiji's EEZ by 2030.[8]

Lastly, EM is increasingly used to document good fishing practices and traceability in the fishing industry. This is an example of the market as a driver, and there appear to be many large companies introducing electronic monitoring technology for their own purposes, independently of fisheries authorities.[30]

7. Mathematical Approach

7.1 Assumptions for Calculations

We applied an 8% discount rate over a five-year period to calculate Cost Recovery Premiums. This 8% rate may be high compared to the recommended social discount rates for public projects.[31] To test the sensitivity of our analysis, we also used a 5% discount rate recommended by the U.S. Environmental Protection Agency (EPA).[32] However, the results were only marginally different, with CRPs using the 5% discount rate being lower by a fraction of a cent. Therefore, one could argue that the 8% discount rate represents a more conservative approach, as it estimates slightly higher CRPs than using a lower discount rate. As such, our results utilize an 8% discount rate.

The five-year timeline was chosen to accommodate the MSC certification and EM interventions. The recertification process for MSC certification is every 5 years.[23] Most EM systems are thought to have a lifespan of 3-5 years, which is the point at which most components (i.e. cameras and sensors) need to be completely replaced.[33] As such, the five-year timeline can reasonably cover all of the costs associated with maintaining these two interventions.

7.2 Inflation Adjustment and Currency Conversion

All cost data was converted to 2022 US dollars using country Consumer Price Index (CPI) values for inflation adjustment and the currency conversion rate between Fijian dollars (FJD) and US dollars (USD).

[31] Moore & Vining, 2013
[32] EPA Guidelines, 2010
[33] Millage et al., 2018

For data in past FJD, we used Fiji's CPI data produced by the Fiji Bureau of Statistics to convert data to 2022 FJD.[34] We used the United States' CPI data provided by the U.S. Bureau of Labor Statistics to convert all past USD data to 2022 USD.[35] Using the average CPI per year, we converted past dollars to 2022 dollars using the following formula:[36]

$$Past\ dollars\ in\ terms\ of\ recent\ dollars\ =\ Dollar\ amount\ *\ \frac{Ending\ period\ CPI}{Beginning\ period\ CPI}$$

Once the economic data was in 2022 FJD and 2022 USD, we then converted FJD to USD using a conversion rate of 1 FJD = 0.46 USD.[37] All results are given in 2022 USD.

7.3 Discounting

Since the timeline for this analysis is 5 years, we needed to discount future economic values to understand the present value. We used an 8% discount rate (r = 0.08) for analysis of all three interventions.

We calculated the present value cost and the present value benefit of each intervention. Fixed costs and variable costs in the present year were not discounted. However, annual variable costs in the future years were discounted with an 8% discount rate to calculate the present value of the future costs.

Let fixed costs in year 0 be FC_0, variable costs in year 0 be C_0, and annual variable costs across the entire timeline be C_0, C_1, C_2, C_3, C_4.

$$Present\ value\ cost\ =\ FC_0 + C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4}$$

The present value benefit was calculated using the harvest of the intervened portion of the fleet (H) and Cost Recovery Premium (CRP) per kg of catch that would be paid by buyers. The benefits in the future years were discounted with an 8% discount rate to calculate the present value of the future benefits.

$$\begin{aligned} Present\ value\ benefit\ &=\ H\ *\ CRP\ +\ \frac{H*CRP}{1+r} + \frac{H*CRP}{(1+r)^2} + \frac{H*CRP}{(1+r)^3} + \frac{H*CRP}{(1+r)^4} \\ &=\ H\ *\ CRP(1\ +\ \frac{1}{1+r} + \frac{1}{(1+r)^2} + \frac{1}{(1+r)^3} + \frac{1}{(1+r)^4}) \end{aligned}$$

7.4 Cost Recovery Premiums

The Cost Recovery Premium is a function of present value cost and present value benefit. We set the present value cost (PVC) equal to present value benefit (PVB) to find the CRP. The CRP represents the cost per kg of catch that is necessary to recover the total cost of the intervention across the intervened portion of the fleet's catch.

$$Set\ PVC\ =\ H\ *\ CRP(1\ +\ \frac{1}{1+r} + \frac{1}{(1+r)^2} + \frac{1}{(1+r)^3} + \frac{1}{(1+r)^4}\ )$$

[34] Fiji Bureau of Statistics, 2023
[35] U.S. Bureau of Labor Statistics, 2023
[36] Motley, 2016
[37] Exchange Rate Calculator, 2023

$$CRP = \frac{PVC}{H(1+\frac{1}{1+r}+\frac{1}{(1+r)^2}+\frac{1}{(1+r)^3}+\frac{1}{(1+r)^4})}$$

To further evaluate the CRP, we compare the CRP to the current average ex-vessel price for frozen albacore ($3.10 USD/kg). Let p = price without intervention or current ex-vessel price. Divide $\frac{CRP}{p}$ to understand the CRP as a proportion of the current ex-vessel price for frozen albacore.

7.5 Consider Existing Conditions for Costs

For the wages intervention, we incorporated the existing wages as a baseline when calculating the additional cost of raising wages to the proposed intervention scenario. Present value cost depends on what is already paid as wages.

Let W_0 = current wage per hour, W_1 = proposed intervention wage per hour, and Y = Number of workers in the fleet affected by the intervention. We are assuming $W_1 > W_0$. If the existing wage is greater than the proposed wage, then there is no effect. It is important to note that we are proposing raising wages to the interventions and not proposing to decrease wages.

$$Present\ value\ cost = Y(W_1 - W_0) + \frac{Y(W_1-W_0)}{1+r} + \frac{Y(W_1-W_0)}{(1+r)^2} + \frac{Y(W_1-W_0)}{(1+r)^3} + \frac{Y(W_1-W_0)}{(1+r)^4}$$

7.6 Fijian Domestic Fleet Structure

We began by gathering information on Fiji's domestic longline albacore fleet to determine the breakdown of MSC- and non-MSC certified vessels. Fiji's domestic fleet consists of 72 total vessels.[12] [38] As of November 16, 2022, there are 45 MSC-certified vessels within Fiji's domestic fleet, certified by an independent 3rd party auditor LRQA.[22] [39] After cross-checking this data with the CI-Fiji team, we confirmed that Fiji's domestic fleet consists of 45 MSC-certified vessels (62.5%) and 27 non-MSC certified vessels (37.5%), with 72 vessels in total.

7.7 Annual Harvest Data

The CI-Fiji team provided annual average catch by vessels data from 2010-2020. We filtered the list to identify the original 74 vessels in Fiji's domestic fleet and summed the total 10 year MSC-certified harvest (36,134.63 MT) and the entire fleet (57,655.61 MT).[22] Further collaboration with the CI-Fiji team revealed that there are 27 non-MSC certified vessels within the Fijian domestic fleet. We recalculated the total catch for the 27 non-MSC certified vessels by taking the average catch for each vessel across the 29 non-MSC vessels and subtracting 2 vessels' average worth of catch.We then divided these 10 year totals by 10 to get the average annual harvest for the entire 72 vessel fleet (5,617.4 MT), which is inclusive of the average annual MSC-certified harvest (3613.46 MT).[7]

[38] Conservation International, 2021
[39] LRQA, 2022

8. MSC Intervention

8.1 MSC Costs

The CI-Fiji team provided the following fixed and variable costs for MSC certification: re-assessment, scope extension, and annual audit. We calculated the cost for 2 scenarios: Scenario 1: recertify the existing MSC-certified vessels (62.5% of the fleet), and Scenario 2: 100% MSC certification for the entire fleet.

Table 4. Certification Scenarios

Scenario 1	62.5% of existing MSC-certified Fijian domestic fleet gets recertified
Scenario 2	100% of Fijian domestic fleet gets certified + additional cost for improvements

Table 5. Fixed and Variable Costs for MSC Certification

	Costs (USD)	Description
Re-assessment	$80,000 (one-time fixed cost)	Costs for 45 MSC-certified vessels to get recertified
Scope Extension	$30,000 (one-time fixed cost)	Cost to include other 27 non-MSC certified vessels
Annual Audit	$28,000 (annual variable cost)	Comprised of audit fee and rechargeable fee
Cost for Improvements	$5,000/vessel	Additional cost of improvements for 27 non-MSC certified vessels (i.e., upgrades)

8.2 MSC Results

Table 6. MSC Present Value Total Costs and CRPs

	Present value total cost (2022 USD)	Cost recovery premium (% increase compared to non-MSC price)
Recertify 62.5% of the Fleet (45 vessels)	$200,740	$0.01 (0.42%)

100% MSC Certification (72 vessels)	$365,740	$0.02 (0.49%)

The above table includes our total net present value for Scenario 1 and 2, respectively, along with the CRP required to offset the cost. There is a $0.01/kg and $0.02/kg increase from the existing non-MSC ex-vessel price. Compared to the non-MSC ex-vessel price of $3.10/kg, the CRPs would increase the existing ex-vessel price by 0.42% or 0.49%. Given the existing MSC price increase is 19%, MSC implementation is a financially attainable intervention for industry and will increase total revenue and market access.

Since the MSC CRPs were significantly lower than expected, we calculated the CRP for different values of the cost of improvements parameter. The calculations in the table above include the cost of improvements set as $5,000 USD per vessel that needs improvements to become certified ($5,000 x 27 non-certified vessels = $135,000 USD). As an extreme, we evaluated the CRP if the cost of improvements were $2,000,000 USD and all other parameters without change. This CRP would be $0.09/kg, which is still only a 3% increase in price.

9. Wages Intervention

9.1 Assumptions

We assume that the proposed wage interventions will apply to employees at sea and processing employees in Fiji's longline albacore tuna fishery. There are 15,677 people employed in the fishing sector (full-time equivalent), with roughly 1,677 people employed as crew on offshore fishing vessels, and 2,000 people employed in tuna processing.[7] This analysis focuses on the 3,677 employees in Fiji's longline albacore tuna fishery (1,677 people employed on offshore fishing vessels and 2,000 employed in tuna processing).

Processing employees typically work a minimum of 48 hours per week (8 hours per day, 6 days per week), and at sea employees work 14-16 hours per day while on fishing trips that typically last 30-35 days.[7] However, there is a data gap regarding how frequent a fisher goes on fishing trips throughout the year. As such, we assume that all employees work 48 hours per week, 4 weeks per month, 12 months per year. This assumption is further supported by the Fiji Employment Relations Promulgation (ERP) of 2007 legislation, which requires that workers must not work above 48 hours per week.[40] Further, the Capture Fisheries Standard published by Fair Trade USA defines a standard work week for a hired-labor fisherman as 48 hours.[29]

In addition to contract wages, catch share arrangements exist for some ranks, such as officers, subject to performance.[7] For purposes of our calculations, we ignore catch shares because there is a data gap about the monetary value of the catch shares awarded to the fishing crew, including deckhands.

[40] Fijian Government, 2007

9.2 Proposed Wages

The proposed intervention wages can be ranked by three levels:

- Minimum wage
- Median between minimum wage and living wage
- Living wage

Table 7. Proposed Fijian Minimum, Median, and Living Wages

	Wage per hour (2022 USD)	Wage per month (2022 USD)
Minimum Wage	$1.84	$353.28
Median Wage (between minimum wage and mid living wage)	$2.12	$406.64
Living Wage (low)	$1.96	$375.37
Living Wage (mid)	$2.40	$460.00
Living Wage (high)	$2.61	$501.79

9.3 Living Wage Calculations

Living wage in Fiji is not officially defined, so we used three approaches to estimate the living wage.

The low estimate of living wage ($375.37 USD per month) was calculated based on a country's per capita GDP and population size. Multiple linear regression was used to evaluate the relationship between predictor variables (population and per capita GDP) and living wage. 62 data points for 2022 monthly living wage estimates (2022 USD) were sourced from the Global Living Wage Coalition, which is led by the Anker Research Institute and Fairtrade International.[41] The Global Living Wage Coalition utilizes Anker methodology to estimate living wage, and these estimates are approved by Fair Trade USA.[42] Analysis also included 2021 per capita GDP (2021 USD) and 2021 population data which was sourced from the World Bank Group.[43] [44] The 2021 per capita GDP data was converted to 2022 USD using US Consumer Price Index (CPI) average annual values. Multiple linear regression revealed that about 73% of variance in living wage is explained by the model below and there is a high correlation between living wage and per capita GDP.

$$Living\ wage\ = 1.864 * 10^{2} - 8.09 * 10^{-8} * population + 3.767 * 10^{-2} * per\ capita\ GDP$$

The mid estimate of living wage ($460 USD per month) is based on a response from the questionnaire survey that was distributed to the CI-Fiji. The CI-Fiji team noted that the living wage would depend on a

[41] Global Living Wage Coalition, 2023
[42] Fair Trade USA, 2021
[43] World Bank (GDP per capita), 2023
[44] World Bank (Population per capita), 2023

variety of factors but estimated the living wage for a family of 5 to be $250 FJD per week.[7] We converted this to USD and utilized this as the mid estimate.

The high estimate of living wage ($501.79 USD per month) was based on a 2019 study that quantified the living wage in Fiji as the minimum wage plus the social wage.[45] The social wage was valued at $1.65 FJD per hour (2019 FJD), which encompasses government-provided social services such as universal health coverage, education, and school transport. The 2019 FJD estimate was converted to 2022 FJD using Fiji CPI average annual values. This 2022 FJD estimate of the hourly social wage ($1.68 FJD) was added to the hourly minimum wage ($4.00 FJD) to get an hourly living wage of $5.68 (2022 FJD). This equates to about $501.79 USD per month.

9.4 Current Conditions

Our understanding of current pay across the fishery was informed by the CI-Fiji team's responses to the questionnaire surveys, which is based on their knowledge and communication with industry.

The estimated length of the fishing trips for Fiji's national fleet could range from 2 weeks to 6 months. Usually, the shorter trips are for vessels supplying fresh albacore and the longer trips supply frozen albacore. However, most fishing trips last 30-35 days.[7]

Per anecdotal industry responses to the surveys, processing employees are likely paid $5 FJD to $8 FJD per hour.[7] Most of the existing wages in this range are greater than the proposed wages of this intervention; however, it is possible to increase $5 FJD per hour to some of the proposed intervention wages. For the purposes of calculations, we assume that processing employees are paid $5 FJD per hour.

Table 8. Current Wages for Processing Employees

	Wage per hour (2022 USD)	Wage per month (2022 USD)
$5 FJD/hour	$2.30	$441.60
$6 FJD/hour	$2.76	$529.92
$7 FJD/hour	$3.22	$618.24
$8 FJD/hour	$3.68	$706.56

Per anecdotal industry responses to the surveys, at sea employees are likely paid $30 FJD to $70 FJD per day.[7] Again, most of the wages in this range are greater than the proposed wages of this intervention; however, it is possible to increase $30 FJD per day and $45 FJD per day to the proposed intervention wages. It was also noted that one fishing company pays deckhands a salary of $20,000 FJD per year; however, this might not be representative of the entire fleet.[7] For the purposes of calculations, we assume that all offshore employees are paid $30 FJD per day or all are paid $45 FJD per day.

[45] Wetere, 2019

Table 9. Current Wages for At Sea Employees

	Wage per hour (2022 USD)	Wage per month (2022 USD)
$30 FJD/day	$1.73	$331.20
$45 FJD/day	$2.59	$496.80
$50 FJD/day	$2.88	$552.00
$70 FJD/day	$4.03	$772.80
$20,000 FJD/year	$3.99	$766.67

9.5 Wages Results

The CRP calculations for each intervention wage include the hourly wage scaled up per year using the assumption that employees work 48 hours per week, 4 weeks per month, 12 months per year and then this yearly wage is applied each year over the five-year timeline. We calculated the CRP for each intervention wage considering two baseline scenarios: 1) "low baseline" in which offshore employees are currently paid $30 FJD per day and processing employees are paid $5 FJD per hour, and 2) "high baseline" in which offshore employees are currently paid $45 FJD per day and processing employees are paid $5 FJD per hour.

It is important to note that if a proposed wage intervention is lower than the existing wage, then there would be no effect. We are not proposing a decrease in wages to meet interventions. The goal of the wage intervention is to raise everyone to at least the level of the intervention scenario (minimum wage, median wage, or living wage). Tables 10, 11, and 12 note whether each scenario would apply to offshore crew and/or processing employees since the intervention only applies to employees with current wages below the proposed wage. For example, minimum wage while considering the low baseline scenario would only apply to the offshore crew because the $30 FJD per day offshore crew rate could be elevated to the proposed minimum wage intervention while the $5 FJD per hour rate for processing employees is already above minimum wage.

Table 10. Living Wage Present Value Total Costs and CRPs

	Offshore Crew	Processing Employees	Present value total cost (2022 USD)	Cost Recovery Premium (% increase compared to non-MSC price)
Low Living Wage (low baseline = $30FJD/day & $5FJD/hr)	✓	▢	$3,832,951	$0.16 (5.1%)

Low Living Wage (high baseline = $45FJD/day & $5FJD/hr)	▢	▢	No effect	No effect
Mid Living Wage (low baseline = $30FJD/day & $5FJD/hr)	✓	✓	$13,081,144	$0.54 (17.4%)
Mid Living Wage (high baseline = $45FJD/day & $5FJD/hr)	▢	✓	$1,904,235	$0.08 (2.5%)
High Living Wage (low baseline = $30FJD/day & $5FJD/hr)	✓	✓	$21,032,186	$0.87 (28.0%)
High Living Wage (high baseline = $45FJD/day & $5FJD/hr)	✓	✓	$6,661,875	$0.28 (8.9%)

The CRPs for the three levels of living wage range from $0.08 USD/kg to $0.87 USD/kg, depending on the proposed wage and the current baseline of existing pay.

Table 11. Median Wage Present Value Total Costs and CRPs

	Offshore Crew	Processing Employees	Present value total cost (2022 USD)	Cost Recovery Premium (% increase compared to non-MSC price)
Median Wage (low baseline = $30FJD/day & $5FJD/hr)	✓	▢	$6,546,475	$0.27 (8.7%)
Median Wage (high baseline = $45FJD/day & $5FJD/hr)	▢	▢	No effect	No effect

As a lower alternative to living wage, the CRP for the median between minimum wage and the mid living wage was calculated as $0.27 USD/kg.

Lastly, the CRP for paying minimum wage to employees was calculated to evaluate the cost of the lowest intervention wage. The CRP for minimum wage would be $0.08 USD/kg.

Table 12. Minimum Wage Present Value Total Costs and CRPs

	Offshore Crew	Processing Employees	Present value total cost (2022 USD)	Cost Recovery Premium (% increase compared to non-MSC price)
Minimum Wage (low baseline = $30FJD/day & $5FJD/hr)	✓	▢	$1,916,041	$0.08 (2.6%)
Minimum Wage (high baseline = $45FJD/day & $5FJD/hr)	▢	▢	No effect	No effect

10. Electronic Monitoring Intervention

10.1 Calculating Costs Using UN FAO Electronic Monitoring Trials

From 2015 to 2019, a three-year project was implemented by the United Nations Food and Agriculture Organization (FAO) in Fiji's domestic longline albacore tuna fleet. This was an initiative for the Common Oceans Areas Beyond National Jurisdiction (ABNJ) Tuna Project established in 2015. Through this initiative, 50 Fiji longline fishing vessels were configured with EM systems through the company Satlink. Following the Fiji trials, service provider Satlink established offices in Fiji to enable expansion of EMS services to other Pacific Island countries.[30]

Table 13. Electronic Monitoring System Costs During the FAO Trials (2015-2019)

Cost Item	Value (USD)
Fixed	
Electronic monitoring onboard equipment (50 units)	$464,200
Electronic monitoring onboard equipment (per vessel)	$9,284

Onshore equipment (12 units)	$59,075
Total fixed costs	**$523,275**
Variable	
Training sessions (two)	$11,440
Maintenance, service costs, and satellite up-time (3 years)	$183,940
Remote data review services	$45,000
Government staff costs (3 years)	$207,900
Industry costs (3 years)	$15,000
Total variable costs	**$463,280**

Table 14. Estimated Costs of Sustaining EM

Cost Item	Value (USD)
Fixed	
Staff salaries	$38,112
Onboard equipment	N/A provided in trial
Maintenance, services, technical support	$245,000
Onshore equipment	N/A provided in trial
Regional cooperation and development	$14,000
Office and other costs	$28,000
Total fixed costs	**$325,112**
Variable	
Electronic monitoring data review (analyst fees)	$68,169
Total costs	**$393,281**

We used the above data from the UN FAO trial which lasted three years for 50 vessels in our present value cost calculations. As such, we divided costs by 3 to get the average yearly cost, divided by 50 to get the cost per vessel, and multiplied by 72 vessels to calculate the cost of 100% EM coverage for the domestic fleet. Note that the trial was 3 years but spanned from 2015 to 2019 due to unforeseen delays.

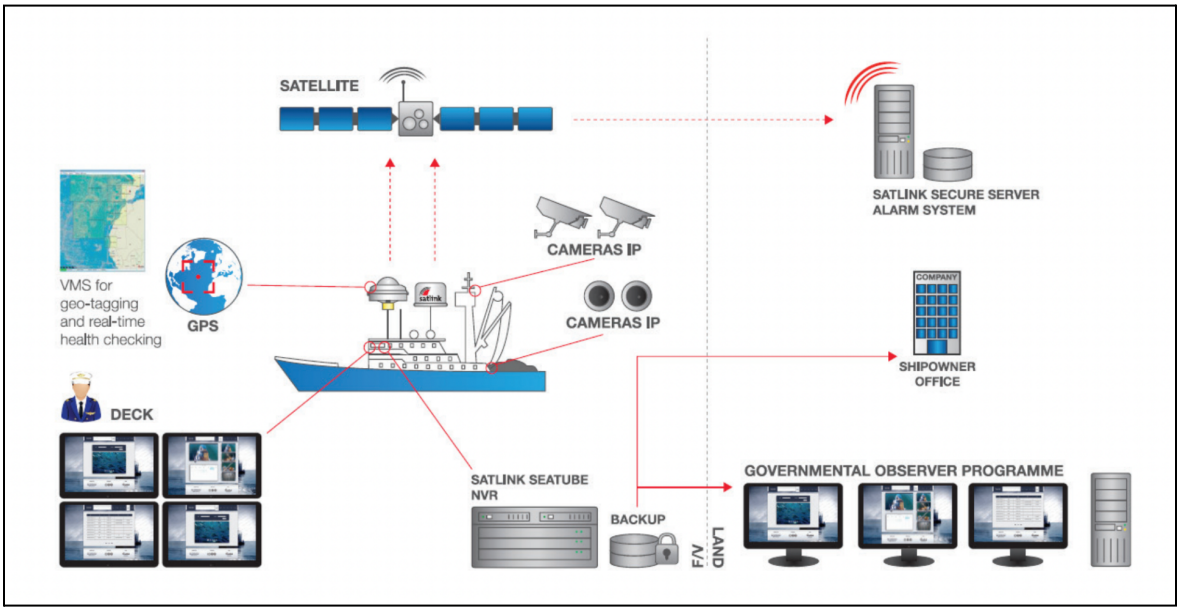
10.2 Notes on Execution: Installation, Implementation, and Data Review

The Offshore Fisheries Division of the Ministry of Fisheries is responsible for effective fisheries monitoring, control, surveillance, and enforcement to ensure the operations of stakeholders are performed according to national regulations. The FFIA and the processing industry are also instrumental in developing the electronic monitoring installation through collaboration with the government of Fiji.

In the 2015-2019 UN FAO trial, the electronic monitoring provider was Satlink. The contract specified the provision of hardware for each vessel, software, maintenance, services, and on-ground support. Satlink already established an office locally in Suva, Fiji to provide adequate support for the installation of equipment and associated maintenance and services to the fishing fleet and to the national authority during the trial phase. It is generally recognized that the Satlink office was crucial to the success of the trial and we assume that for future EM implementation, Satlink will continue to be the provider.[30]

The Offshore Fisheries Division is tasked with collecting and managing all offshore fisheries data and related data within the Ministry of Fisheries' jurisdiction.[5] Data ownership is attributed to the Government of Fiji.

Figure 4. Schematic of an Electronic Monitoring System[30]



The schematic above shows a typical electronic monitoring system where cameras and GPS onboard communicate to a satellite which is then analyzed through a governmental observer program.

10.3 Electronic Monitoring Results

Since the CRPs depend on the harvest from the intervened portion of the fleet, the CRPs for EM vary according to which vessels receive EMS.

It is possible that the smaller vessels would receive EM coverage first because it may be less feasible to have on-board human observers on the smallest vessels. As such, we ordered the 72 vessels from smallest to largest according to gross register tonnage (GRT) and length overall (LOA) and totaled the catch for the 4 smallest vessels for the 5% EM scenario, for the 15 smallest vessels for the 20% EM scenario, and 32 smallest vessels for the 50% EM scenario. We also applied this methodology to the largest vessels for each scenario to determine the costs of implementation across a greater catch.

Figure 5. Electronic Monitoring Fleet Coverage Scenarios

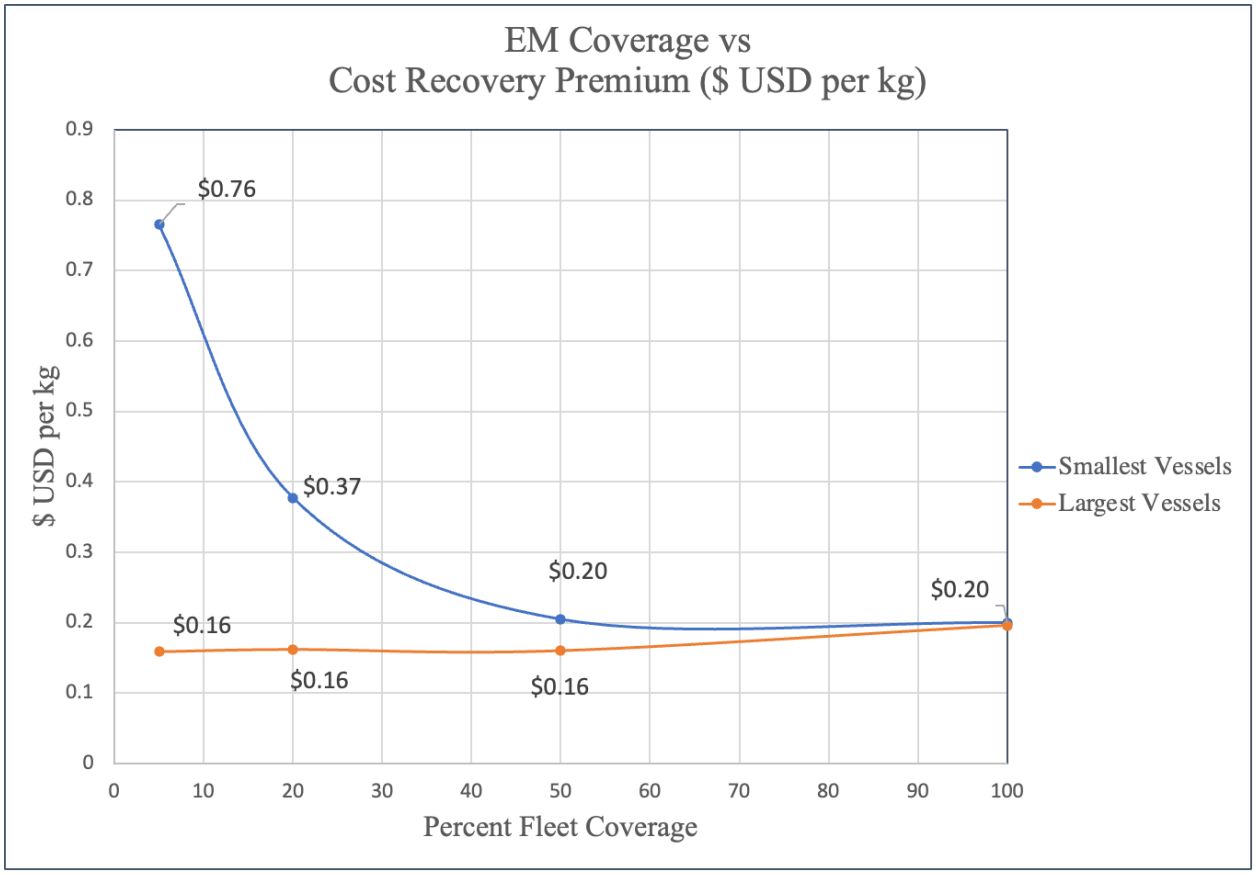


Table 15. Electronic Monitoring Present Value Total Costs and CRPs

	Present Value Total Cost (2022 USD)	Cost Recovery Premium (% increase compared to non-MSC price)
5% EM Coverage (4 vessels)	$264,206	Smallest vessels: $0.76 (24.7%) Largest vessels: $0.16 (5.1%)
20% EM Coverage	$990,772	Smallest vessels: $0.38 (12.2%)

(15 vessels)		Largest vessels: $0.16 (5.3%)
50% EM Coverage (36 vessels)	$2,377,852	Smallest vessels: $0.20 (6.6%) Largest vessels: $0.16 (5.2%)
100% EM Coverage (72 vessels)	$4,755,703	All vessels: $0.20 (6.3%)

Note that in the table above, the CRPs are not exactly the same, as they are rounded to the nearest dollar. The actual CRPs when not rounded are more precise, e.g. 100% EM coverage value is $0.1963 rounded to $0.20 and 50% EM coverage for the smallest vessels is $0.2048 also rounded to $0.20.

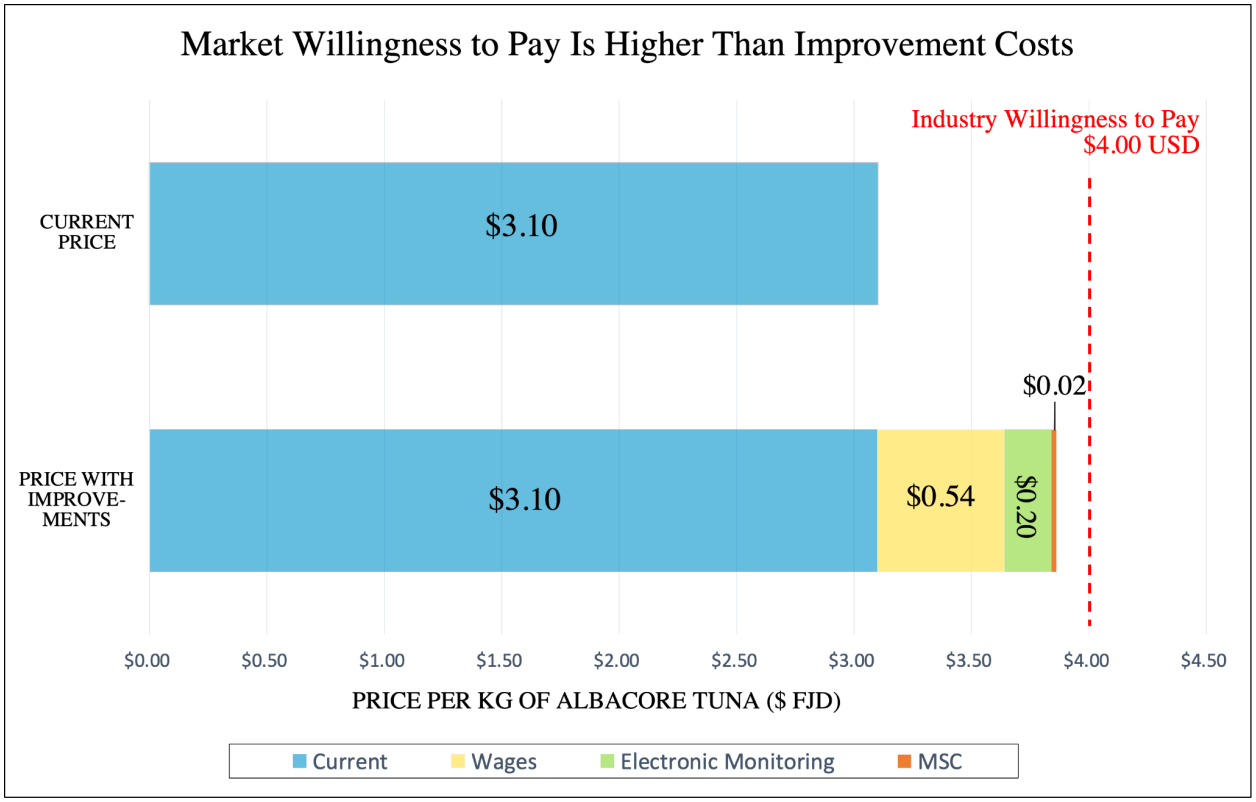
11. Results: Cost Recovery Premium

The "best" scenario in our approach includes EM coverage across 100% of the fleet, MSC certification across 100% of the fleet, and at least a living wage paid to tuna processing employees and crew members across the entire fleet. This package's CRP would cost $0.76 USD per kg albacore on top of the existing ex-vessel price (using the mid living wage estimate) or a total ex-vessel price of $3.86 USD per kg (current $3.10 USD per kg plus $0.76 USD per kg CRP). Figure 6 below illustrates the breakdown of the $3.86 per kg price.

Table 16. Total CRPs for MSC, Wages, and EM

	"Good" CRP (USD/kg)	"Better" CRP (USD/kg)	"Best" CRP (USD/kg)
MSC	$0.01	— — —	$0.02
Wages	$0.08	$0.27	$0.08 to $0.87
Electronic Monitoring	$0.16 to $0.76	$0.16 to $0.38	$0.20
Total Package CRP	$0.25 to $0.85	$0.43 to $0.65	$0.40 to $1.09
New Albacore Price = CRP + Non-MSC Ex-Vessel Price ($3.10/kg)	$3.35 to $3.95	$3.53 to $3.75	$3.50 to $4.19

Figure 6. Albacore Market Partner Buyer's Willingness to Pay is Higher than Improvement Costs



12. Discussion

12.1 Viability of Intervention Packages

To assess the financial viability of our proposed interventions, we must determine industry willingness to pay (WTP). A tuna industry participant estimated that $4 USD per kg is a reasonable price for "MSC certified albacore with incremental, best in class sustainability, labor and social commitments supported by robust monitoring via EM." [7]

Achieving 100% MSC certification, raising wages to a living wage, and implementing EM across 100% of the fleet will require an ex-vessel price of $3.86 USD per kg. Given a leader in the tuna industry's willingness to pay $4.00 USD per kg is within our total cost range, this may indicate that there are buyers willing to pay for these interventions. Further confirmation of our assumptions requires robust data collection of industry willingness to pay. Conservation International may choose to survey tuna industry participants to gather a greater range of data points on what price buyers are willing to pay for sustainably-sourced albacore tuna.

12.2 Involve the Entire Fleet

We began this analysis thinking that the best scenarios of 100% MSC certification, 100% EM coverage, and a living wage would be too expensive to implement. As such, we approached the analysis with "good", "better", and "best" scenarios to calculate the costs of implementing the three interventions at

multiple levels rather than just 100%. Our analysis revealed that the best scenarios might be viable with less expensive CRPs than anticipated.

When scaling the intervention to the entire fleet, the cost will increase (for example, because electronic monitoring will have to be deployed on more vessels), but so will the harvest from the intervened fleet. Because both the numerator and the denominator of the CRP increase, scaling interventions helps maintain the CRP at around the same level. In other words, scaling interventions to a larger fraction of the fleet does not necessarily raise the CRP. Furthermore, the environmental and social benefits would increase by expanding to the entire fleet, rather than just a portion of the fleet. Based on the viability of the best scenario and the possibility to maximize environmental and social benefits, we recommend implementing each intervention (MSC certification, EM coverage, and paying a living wage) across the entire fleet.

12.3 Financial Viability of MSC

The cost of MSC certification for 100% of the fleet is much lower than anticipated, with cost recovery premium results of $0.01 to $0.02 per kg of albacore. Our CRP calculations provide critical data points that may motivate the fleet to commit to 100% MSC certification. Impacts of MSC certification include (1) improving the reputation of the fishery, (2) increasing market access, and (3) strengthening the competitiveness of the fishery.[23] Effective outreach and education efforts within Conservation International and industry may help to disseminate information regarding MSC viability and pathways for implementation. For example, "designing transition pathways for non-certified vessels and operators to advance toward certification" is essential to bring the non-MSC portion of the fleet up to MSC standards.[8]

13. Recommendations and Next Steps

13.1 Future Applications

The Cost Recovery Premium metric can be applied to additional interventions in this fishery and eventually other fishing industries across the South Pacific, such as Samoa, New Caledonia, and the Cook Islands, with the ultimate goal of regional management. Through this CRP metric, we aim to drive alignment between key tuna buyers and supply chain actors, civil society, and Fijian government agencies involved in harvesting and sale of Pacific tuna. We exhibit how social and environmental improvements in Fiji can be rewarded through market incentives.

13.2 Next Steps for Implementing the Interventions

A contract between fishers and buyers will need to be brokered, perhaps by CI. This contract should document which interventions fishers will implement and how much the buyer will pay the fishers per kg of albacore caught using these interventions.

CI may need to facilitate bargaining if fishers require more incentive for certain interventions. Perhaps for the wages and EM interventions, fishers are willing to implement these if compensated for the costs (as reflected by the CRP). Industry participation with the CI-Fiji team revealed that the fleet is willing to have EM on their vessels. As well, fishers might be willing to pay their crew a living wage, if the buyer covers the cost, for a crew more likely committed to their work and the company. Industry feedback also noted

that employee retention is very important since the companies are losing employees to work overseas. However, if there were barriers or resistance to MSC certification, CI may need to provide further compensation to persuade fishers to participate with this intervention or lead educational workshops illustrating tangible pathways to bring the non-MSC portion of the fleet into compliance with MSC standards. The CRP represents a base premium that would cover the costs, but a higher premium may need to be negotiated in some cases to provide profit, and therefore incentive, to fishers.

13.3 Note on C188 from the International Labor Organization (ILO)

C188, an article in the Work in Fishing Convention through the International Labor Organization, is a high standard of regulating labor conditions. Ratification of C188 could support the interventions that are the focus of this analysis because C188 is designed to increase transparency of working conditions for fishers through frequent labor inspections.

It is important to note that currently no Pacific Island countries have ratified C188. Capacity is a barrier to ratification for smaller South Pacific countries, such as Fiji. The stock is currently not overfished, but the Fijian government is also interested in ensuring social sustainability through targeting labor rights issues. Despite the Fijian government's interest in ratifying C188, no ministry has taken initiative to pursue ratification.[7]

Thailand has ratified C188 and serves as a case study to analyze the effectiveness of ratifying the Work in Fishing Convention.[46] Future work can explore the impacts of implementing C188 in Thailand and apply this as an intervention aimed to improve working conditions and compensation.[47]

Conclusion

We recommend achieving MSC certification for the entire Fijian domestic fleet, implementing EM coverage across the entire fleet, and paying a living wage to all offshore and processing employees across the fleet. We estimate that this will cost $0.76 USD/kg (24.5% increase in ex-vessel price) on top of the existing ex-vessel price for albacore. Our analysis has deemed that this Cost Recovery Premium is viable in comparison to industry's willingness to pay for albacore that is MSC-certified and caught by vessels with EM and labor commitments.

[46] Chotepanitses, 2019

[47] International Labour Organization, 2017

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Vinaka vakalevu!

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