Fishing for market solutions: Measuring the global performance of fishery improvement projects

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Abstract

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Over the last decade, fishery improvement projects (FIPs) have proliferated across the globe as a credible, step-wise approach to improving environmental sustainability within a fishery. However, to date, only one assessment of FIP efficacy has been conducted indicating that FIPs compete with certified fish and create a 'race to the bottom' by gaining market access before demonstrating improvements on the water. This paper challenges that claim, and argues that FIPs – both those in the developing and developed world – are progressively improving over time. A global dataset of 127 FIPs was compiled, and a series of t-tests were conducted, indicating that the increased standardization of the FIP process has resulted in improved FIP implementation. The analysis finds that the Conservation Alliance for Seafood Solutions' introduction of FIP guidelines significantly decreased implementation time, and that who implements a FIP – whether they represent an NGO, industry, consultant, etc. – also impacts implementation time. Additionally, the study illustrates the need for continued, repeat evaluation of project efficacy.

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Alliance:	Conservation Alliance for Seafood Solutions
DCF:	Developing Country Fishery
FIP:	Fishery Improvement Project
MSC:	Marine Stewardship Council
NGO:	Non-government organizations
SFP:	Sustainable Fisheries Partnership
WWF:	World Wildlife Fund

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I. Introduction

State of global fisheries

Although it is well understood that the global demand for seafood is projected to continue to increase over the next decade, it remains tenuous whether this demand can be met by fish that is sourced sustainably (FAO, 2018). Today, seafood remains the highest traded food commodity globally, and in 2017, the sector experienced a marked increase in demand (Smith *et al*, 2010; Asche *et al*, 2015; FAO, 2018). Globally, improved market conditions and rising household incomes are primary drivers for increased seafood demand. This trend is likely to increase as developing countries, especially in Asia, experience a rapid growth in their urban middle class that is expected to correlate with increased demand for seafood products (OCED, 2017; Hall *et al*, 2011). Moreover, with a global population estimated to reach nearly 10 billion by 2050, present and future generations will continue to rely heavily on seafood as a primary source of protein and economic livelihood (FAO, 2016).

In addition to the complexities surrounding increased global demand for seafood, for communities across the globe, but particularly those in the Global South, seafood is also a critical component of food security and economic livelihood. Not only are 56 million people employed in the primary sector of capture fisheries and aquaculture, but seafood comprises 20% of the nutrient-rich food communities, who are primarily located in West Africa and Southeast Asia, intake (FAO, 2016; Golden *et al*, 2016). The ability to retain access to these resources is threatened by the increasing demand for seafood, and the adverse impact of fisheries mismanagement.

At present, overfishing and fishery mismanagement has led to 31% of global fish stocks being fished past biologically sustainable levels. This mismanagement not only impacts food security, but also has a detrimental economic effect (FAO, 2016). It is estimated that more than $80 billion dollars is lost annually to fisheries mismanagement alone (World Bank, 2017). At a global level, the challenge remains how to rebuild and maintain fish stocks, continue to supply a critical source of protein, and maximize profits while simultaneously meeting an increasing global demand for seafood. Understanding that failure to properly manage fisheries leads to overexploitation, a suite of management reforms have been introduced to support governments in maintaining and rebuilding fish stocks (Pauly *et al*, 2003; Worm *et al*, 2009; Gutierrez *et al*, 2011). In addition to traditional approaches to fisheries management (e.g. gear modification, catch shares etc.) – which some scholars argue cannot alone ensure stock health in complex fishery regimes – newer approaches, such as, market-based incentives and eco-labels have been introduced (Potts, 2006; Roheim *et al*, 2011; Parkes *et al*, 2010).

Eco-labeling: leveraging the market towards sustainability

Driven by nongovernmental organizations (NGOs) and the private sector, market-based incentives emerged in the 1990s as a mechanism to motivate the fishing industry to improve ecological sustainability (Constance and Bonanno, 2000; Parkes *et al,* 2010; Ponte, 2012). The premise of market-based incentives is to harness the power of the market and consumer social consciousness. Ultimately, eco-labels reward fisheries for adopting better, more sustainable practices (Roheim and Sutinen, 2006). By providing target consumers – those with a proven desire and willingness to pay more for sustainably sourced seafood – with information about a fishery's sustainability, their established preferences can drive demand for sustainable seafood products (Gudmundsson and Wessells, 2000; Roheim *et al*, 2011). The heightened demand for certified sustainable seafood in turn incentivizes fisheries to enter into the certification process as a venue to access premium markets and maximize profit. This, ultimately can create a ripple effect that leads to better fisheries management outcomes along the whole supply chain (Parkes *et al*, 2010; Tolentino *et al*, 2016a; Wakamatsu and Wakamatsu, 2017).

Of market-based solutions, the Marine Stewardship Council (MSC) has emerged as the "leading global standard for certification." Their mission is to employ the power of their certification program and ecolabel to influence seafood purchasing choices and transform the seafood market for the health of the world's oceans. Today, 296 fisheries are certified by the MSC. This represents 12 percent of wild-caught fish globally. In addition to meeting MSC's certification standard, the MSC touts that 94 percent of MSC certified fisheries have made at least one improvement to their environmental practices and/or monitoring protocols (MSC, 2017).

In order to receive MSC certification, a fishery initially enters a private pre-assessment to measure performance against the MSC's 28 sustainability criteria. These indicators are designed to assess if a fishery is well-managed and sustainable, and fall into three principles:

1. Sustainable fish stocks: fishing activity must occur in a way that will ensure the long-term productivity of the fishery
2. Minimizing environmental impact: fishing operations are managed to maintain the productivity and function of the ecosystem
3. Effective management: the fishery complies with relevant laws and has a robust, adaptive management system

If a fishery performs well in pre-assessment, they typically will continue to a full assessment conducted by a third-party assessment party. Fisheries that do not perform well can decide to either not pursue MSC certification or to enter an improvement project. With certification costs ranging from USD $15,000 to over $120,000, pursuing MSC certification is not only a rigorous process, but also one that requires a steep financial commitment (MSC, 2017).

To date, widespread assessments of MSC's efficacy – from an ecological and economic perspective – have been conducted (See Agnes *et al* 2013; Froese and Proelss, 2012). However

successful or unsuccessful the MSC has been in achieving its mission, the MSC has not yet been able to tackle its largest critique: its inability to adequately include developing country fisheries (DCFs) within the MSC certification model. From a global coverage and sustainability perspective this is a significant concern, as 60% of all fish and fish related products are sourced from developing countries – often also referred to as fisheries in the Global South (Duggan and Kochen, 2016; FAO 2014). With upwards of 40% of global seafood being traded internationally, and nearly 80% of seafood products being exposed to some sort of international trade competition, ensuring ecological improvements in DCFs is critical to increasing the sustainability of fisheries globally (Tveteras *et al*, 2012). Furthermore, from a sustainability perspective, DCFs are generally the fisheries that have the greatest potential to benefit from pursuing MSC certification, particularly since a substantial portion of fisheries that enter MSC full-assessment already comply with its standards (Ponte, 2012; Cambridge, 2011).

According to the MSC, the lack of MSC certified fish from the Global South is the result of a lack of financial capital, limited stock assessment data, lack of local technical expertise, and 'weak' governance structures; all essential components needed to attain MSC certification (MSC, 2017). While there may be inherent obstacles for DCFs intending to pursue MSC certification (see Stratoudakis *et al*, 2016), increasing the percentage of seafood from DCFs will be necessary not only for the MSC to meet its organizational mission, but also to meet increasing global demand for certified sustainable seafood. Accordingly, the MSC has identified strengthening their work with fisheries in the Global South as one of their top priorities over the next decade (MSC, 2017).

While the MSC considers how its addresses this obstacle internally, external initiatives have blossomed over the last decade aimed at assisting fisheries that do not have direct access to MSC in achieving ecological improvements within their fisheries. One such example, which has gained signification traction in the last decade, is fishery improvement projects (FIPs). Today, FIPs have such universal reach that the MSC, unable to meet rising market demand exclusively with MSC certified fish, has formally recognized FIPs as a venue to improve overall fisheries health as a precursory step to entering a full MSC assessment.

II. The FIP Model

Market-based solutions to fishery quandaries

The concept of fishery improvement projects has developed gradually over time. However, it is unclear when the term, as it is understood today, originally emerged. Although fishery improvements have been incorporated into management plans since it became evident that fisheries were facing overexploitation, most examples – whether in academic or gray literature – are focused on projects with some general form of "fisheries improvement" (Pauly *et al,* 2002) rather than on adopting a fishery improvement project approach as outlined in the next section.

Differentiating formal FIPs from other improvement projects has proved problematic, and as such, one objective of this thesis is to add towards the limited literature on formal FIP projects.

The earliest example of a project calling itself a "fishery improvement project" occurred in 1989 in Discovery Bay, Jamaica; thus, predating both the MSC and the modern-day FIP model. The project targeted reef fisheries in Discovery Bay at large and was supported by the Canadian International Development Agency and Trent University. This partnership had three broad objectives:

1. Increase the biological and social science research available to delineate, describe, and monitor biological and culture systems
2. Develop an education/communication program to provide a venue for fishing community members and researchers to exchange knowledge
3. Transfer knowledge and empower collective action to improve the status of the resource (Allison, 1989).

This example while incorporating biological and social improvement aims, would most likely not be considered a formal FIP today as it does not incorporate stakeholders from the private sector.

Perhaps the first example of a FIP, as it is now defined, is the Baltic cod fishery. In 2002, the Danish Fishermen's Producer Organization held a roundtable with stakeholders to identify management improvements that could bolster stock health of cod in the Baltic Sea. After seven years of active management aimed at stock improvement, the fishery entered full MSC assessment in 2009, and gained MSC certification in 2011 becoming the first Baltic cod fishery to do so (Seafood Source, 2011).

Another early adopter of FIPs was the Ben Tre clam fishery in Vietnam. In the Ben Tre clam fishery, a collaboration between WWF and the Vietnamese Department of Fisheries was initiated to reduce heightened production pressure that had resulted in immature collection of clams. Together, they sought to connect the fishery – which was largely for domestic consumption – to an international market and develop cooperatives to establish collaborative fishery management strategies. After eight years of improvement, the fishery entered into MSC assessment in 2005, and gained certification in 2009 becoming the first fishery in Southeast Asia to receive MSC certification (WWF, 2009).

While neither the Baltic cod fishery or the Ben Tre clam fishery were identified as fishery improvement projects at the time, both would be considered FIPs if initiated today. With significant acclaim surrounding the ability of both the cod and clam fisheries to enter and attain MSC certification, several NGOs – including early implementers such as the Sustainable Fisheries Partnership (SFP) and WWF – began working with various fisheries implementing a "fisheries improvement project" approach. Without a universally established framework or

definition of what a FIP was, these two organizations approached improvement in similar ways. For them, the biggest tenet of improvement was connecting fisheries with major suppliers to catalyze improvement within a fishery. This feature therefore emerged as, and to this day remains, the principal characteristic of FIPs. With increased publicity and implementation success, FIPs began to be taken up, in an ad hoc manner, by various for-profit and non-profit organizations (Deighan and Jenkins, 2014). While there is no published data available measuring the quantity of fisheries engaged in FIPs, it is estimated that between 2006 and 2012, 50-60 FIPs were initiated (CEA, 2015).

Without a backbone organization to implement and uphold a uniform standard, FIPs evolved organically. That, in addition to the rapid growth in the number of fisheries entering FIPs, has created concerns and vocal criticism about the scale and scope of FIP effectiveness and potential negative impact on market driven eco-labels, such as MSC (Bush *et al*, 2013). In 2012, in response to these concerns, the Conservation Alliance for Seafood Solutions (the Alliance) developed the first guidelines for fishery improvement projects. The Alliance – a consortium of conservation groups that work on seafood sustainability – developed not only a unifying definition of what a FIP is, but also criteria against which to determine whether a FIP was adequately progressing towards sustainability (Alliance, 2015).

Anatomy of a FIP

Recognizing that some retailers may have recognized FIPs as a credible mechanism to support sustainability commitments, and that market recognition of FIPs could adversely impact certification schemes by recognizing FIPs as an equivalent or alternative to certification, the Alliance reactively developed a standardized best practice guideline for FIPs (Deighan and Jenkins, 2014). For the Alliance, the ultimate goal of a FIP is to perform at a level that would be consistent with an unconditional pass against the MSC standard – a score of 80% on its 28 indicators. The Alliance, as the now de facto FIP backbone organization, defines a FIP as:

> *A multi-stakeholder effort to address environmental challenges in a fishery. These projects utilize the power of the private sector to incentivize positive changes toward sustainability in the fishery and seek to make these changes endure through policy change.*

With various actors – NGOs, consultants, industry, etc. – developing and implementing FIPs, the Alliance developed basic requirements a credible FIP must include. They are:

5 PRINCIPLES	DEFINITION	REQUIREMENTS
PARTICIPATION	A fishery draws on the market, which might include suppliers, retailers, food service, fishing industry, etc.	A FIP must include active participation from companies in the supply chain. Participation means financial or in-kind support and/or working on activities in the workplan.
PUBLIC COMMITMENT	Participants must commit to financially invest in and make improvements in the fishery.	A signed memorandum of understanding, email correspondence stating a commitment, etc.
OBJECTIVES	A FIP must define the near-term scope of the project, with a set of time bound objectives.	Parallel criteria based on classification as a basic or comprehensive FIP.
WORKPLAN	A FIP must develop and implement a workplan with an associated budget and deadlines.	The workplan and deadlines must be made publically available.
PROGRESS TRACKING + REPORTING	A FIP must regularly track work toward the activities and outcomes in the workplan and report progress or lack thereof.	The Alliance will conduct an annual review of progress for all FIPs listed on the Alliance's FIP tracking website.

Table 1. 5 FIP principles. Every FIP must meet these five criteria to be recognized as a credible FIP by the Alliance. Source: Alliance, 2015

In addition to meeting the above requirements, the Alliance developed a general timeline or process that FIPs should follow. While the Alliance does not require that every fishery adhere to sequential progress against these steps, fisheries that do adhere to these steps receive recognition and support from the Alliance (Deighan and Jenkins, 2014). The steps are:

STEPS	REQUIREMENTS
0: FIP IDENTIFICATION	Fisheries that may benefit from a fishery improvement project are identified, and a supply chain analysis is conducted to understand stakeholders and whether potential market leverage exists.
1: FIP DEVELOPMENT	The fishery's performance is evaluated against the MSC standard and stakeholders are recruited to participate in the project. This development stage is marked by: 1. An assessment of the fishery's environmental performance 2. Completion of a scoping document conducted by a consultant 3. Stakeholder mapping and engagement process
2: FIP LAUNCH	To formalize a FIP, the project participants and workplan must be finalized and made public. This includes: 1. Confirmation of project participants 2. Participant meeting

	3. Develop a workplan, that includes: objectives, a list of activities, responsible parties, timeframes, metrics and key performance indicators, and an associated budget.
3: FIP IMPLEMENTATION	FIPs which enter a stage 3 begin to act toward addressing the fishery's shortcomings and begin tracking progress. This includes: 1. Implementing workplan activities 2. Tracking and reporting progress 3. Adapting ('course correcting') as needed
4: IMPROVEMENTS IN FISHING PRACTICES OR FISHERY MANAGEMENT	At stage 4, FIPs must document any demonstrated improvements based on implementation of the workplan. Improvements can include: 1. Improvements in policy or management or modification in fishing practices 2. Increase in scores for MSC performance indicators focused on management or information
5: IMPROVEMENTS ON THE WATER	Stage 5 FIPs must demonstrate improvements 'on the water.' Improvements include: 1. Increase in scores for MSC performance indicators focused on outcomes 2. Verifiable change on the water such as: reduction in fishing mortality, an increase in biomass of the target stock, a reduction in habitat impact, etc.
6: MSC CERTIFICATION	Fisheries that complete a FIP and enter into a full MSC assessment are considered Stage 6 FIPs. This is an optional stage, no FIP is required into enter into MSC certification.

Table 2. Fishery Improvement Project Process. Adapted from the Alliance's 2015 Guidelines for Supporting Fishery Improvement Projects. Source: Alliance, 2015

Understanding that over the last decade FIPs have transformed gradually into more formalized initiatives, the Alliance committed to updating their guidelines as necessary. In 2015, they released an updated guideline that included an additional FIP classification/distinction. Their addition was the grouping of two FIP types: basic FIPs and comprehensive FIPs. This addition was an attempt to clarify FIP objectives and assist seafood buyers and FIP implementers in understanding the scope of improvement projects. The primary difference between the two models is the level of workplan scoping, objectives, and verification required from the fishery (Alliance, 2015). The difference between each FIP type can be outlined as follows:

FIP TYPE	DEFINITION
BASIC	An entry point for fisheries to begin to address specific environmental challenges. 1. Scoping: FIP completes a basic needs assessment and scoping document based on the MSC standard to identify environmental challenges. 2. Objectives: FIPs identify time bound objectives for a specific set of environmental challenges to improve its performance against the MSC standard.

	3. Verification process: Basic FIPs must report progress on activities every 6 months, but independent, in-person audits of activity results and performance against the MSC are not required
COMPREHENSIVE	Aim to address the full range of environmental challenges necessary to achieve a high level of sustainability. 1. Scoping: FIPs engage a party experienced MSC evaluator to complete a pre-assessment and scoping document. The pre-assessment document is made publically available. 2. Objectives: FIPs identify time bound objectives for all of the fishery's environmental challenges necessary to achieve an unconditional pass on the MSC standard. 3. Verification process: Comprehensive FIPs must also report against their activities every 6 months. Every three years, these FIPs must arrange for an independent, in-person audit of activity results.

Table 3. FIP classifications. Adapted from the Alliance's 2015 Guidelines for Supporting Fishery Improvement Projects. Source: Alliance, 2015

Ultimately, the Alliance has taken informal responsibility for setting a FIP standard; and without the presence of an external management body, the Alliance is leveraging the power of its network and connection to seafood suppliers and retailers to increase consistency and investment in FIPs. As such, they also recently supported the introduction of an online web tool to increase transparency in FIP implementation (fisheryprogress.org). As FIPs continue to prosper the investment from the Alliance and FIP implementers alike has continued to grow. Today the Alliance has introduced new target objectives for FIP progress – that FIPs must complete to be included in their new tracking website – that include:

1. The fishery improvement project must meet, at minimum, reach the criterion of a basic FIP, and reach a Stage 2 (FIP launch).
2. Fisheries that are not yet at Stage 2 are considered "prospective FIPs" and will only be posted on the website for 18 months if they have not moved to Stage 2 yet.
3. The Alliance (through the nonprofit Fish Choice) verifies whether the project meets the basic or comprehensive requirements and what project stage each FIP has reached.
4. An annual review of progress tracking information submitted by FIPs to their website.

Whether the introduction of these guidelines has increased the ability of fisheries to complete FIPs with greater speed is a central question of this thesis. At the time of establishment, this protocol was retroactive in nature; in large part, it was a response to significant questions from retailers about what qualified as a credible FIP and critique from the academic community that the FIP model was creating competition with established eco-labels (Personal communication, Oct. 2017). While FIPs and FIP implementers alike have pointed to colloquial success stories, for the academic community at large, questions remained about whether FIPs were "watering down" the MSC, or whether they were granting market access to fisheries that had only declared

themselves FIPs on paper without marked improvements on the water (Bush *et al*, 2012; Sampson *et al.*, 2015).

At the global scale, however, only one study to date has assessed FIP efficacy. Without extensive literature assessing FIPs at scale, it remains unclear whether FIPs are having intended outcomes. Academic studies attempting to replicate methodologies with the aim of demonstrating progress, or lack thereof, are is a key step in the scientific method, and in high need within the sciences. In an attempt to add to FIP literature, this study reevaluates claims from the first global study of FIPs (Sampson *et al*., 2015), and attempts to quantify whether the introduction of the Alliance's FIP guidelines had a marked impact on the ability of FIPs to succeed.

Assessing FIP implementation

In 2015, *Sampson et al.,* 2015 published an article in the journal *Science* stating that

> *With a limited amount of certified wild-caught seafood available, some firms include seafood sourced from fishery improvement projects (FIPs), in which fishers are rewarded with market access conditional on the fishery making progress toward sustainability. Rapid spread of FIPs, which often operate without transparent and independent assessment, raises questions about their effectiveness as a tool to foster environmental, and social improvement.*

In addition to the above statement, their assessment of FIP progress concluded the following:

1. Two-thirds of DCFs in FIPs have obtained market access, but are not yet delivering fisheries improvements.
2. On average, DCFs have spent more time (50 months) than fisheries in developed countries (41 months) in the first 3 FIP stages.
3. There seems to be a set of DCFs that are not moving past stages 1 and 2, given that their median cumulative time in a FIP is ~20 months longer than for those DCFs that move on to stage 3.
4. In addition, the median time spent by DCFs that are in stages 1 and 2 is ~10 months longer than the median time for developed country fisheries in stage 3.
5. For both developed and developing countries, fewer than one-fourth of fisheries in FIPs have reached stage 4 or beyond.

As the only study of this scale completed to date, this publication sparked significant concern throughout the conservation and philanthropic community (M. Levine, personal communication, Nov. 7, 2017). The general argument of the Sampson paper was that developing country fisheries (DCF) were attaining preferential market access before they demonstrated improvements in their fisheries thus creating a race to the bottom in fisheries certification. As noted in the introduction, DCF have the most to gain, from a sustainability perspective, from entering into any sort of improvement project. By entering into a FIP, Sampson et al argued that these DCF were

benefiting from claims of sustainability without changing practices. If that is the case, which Sampson et al claim, then the question remains whether FIPs are the appropriate approach for DCF to engage in or if they are in fact ineffective in catalyzing improvement.

It is generally understood that the Alliance's 2015 updated FIP guideline and creation of fisheryprogress.org was driven by Sampson et al.'s critique of FIP efficacy. Of particular alarm was the claim that "FIPs are creating de facto sustainability claims recognized by retailers and others in the supply chain, effectively competing with MSC, and other third-party certifications." With the continued growth of FIPs, this continues to be a point of concern. In order to truly deliver on sustainability claims, issues surrounding FIP efficacy need to better understood. This paper thus attempts to add to this literature and to verify or further test the claims made by Sampson et al. Ultimately, the Sampson study encouraged critical conversation surrounding FIPs, and perhaps benefitted the FIP community by bringing attention, accountability, and notoriety to the FIP implementation theory.

III. Research Design + Methodology

Research aim + questions

The central aim of this study is to quantitatively assess global FIP progress. This is accomplished in two ways:

1. By synthesizing the current state of FIPs globally (Figures 1-8) to provide an overview of the type of fisheries engaging in FIPs.
2. Statistically testing how certain variables (Table 4) impact how quickly, or not, fisheries progress through the FIP process.

Specifically, now that FIPs have been implemented for more than a decade, and as I argue in section II, are more structured than when they first began, is there demonstrated progress in completing FIPs? Additionally, do claims about the lag in DCF progression made in the first global review of FIPs still hold true? This is of particular importance as FIPs continue to be touted as a worthwhile stepwise approach for DCF to move towards ecological sustainability. In order to understand whether the claims highlighted in Sampson et. al. still hold, a global review of FIPs was conducted. Specifically, this study examines whether:

1. DCF attain market access before delivering fisheries improvement?
2. Do DCFs spend more time in FIPs than their developed country counterparts?
3. How, if at all, did the introduction of the FIP guidelines impact progress?

Personal communications with FIP implementers, NGO leads, and philanthropic investors indicated that there were between 150-300 fisheries currently engaged in some form of FIP (including prospective FIPs; that is, fisheries that have not yet formally entered the FIP process, but have the intention to do so). An extensive desktop review conducted from January to April 2018 identified 127 FIPs (see Appendix 1; this includes prospective, basic, comprehensive,

inactive, and completed FIPs). This number was cross-referenced with four partial datasets compiled by other academics and NGOs. FIP data was primarily collected from fisheryprogress.org. Fisheryprogress.org was launched in 2016 as a "one-stop shop for information on the progress of global fishery improvement projects." As of April 2017, fisheryprogress.org has information available for 95 FIPs (including prospective, basic, complete, comprehensive, and inactive FIPs). However, reporting to fisheryprogress.org is voluntary, and self-selective. Additional data was collected from Fish Source and SFP's FIP tracker. While 28 additional FIPs were identified from the initial desktop study, for this research project, only FIPs that were formally engaging in an improvement that followed the Alliance's FIP guidelines were included. This was considered the threshold for inclusion for two reasons: the first, the additional FIPs did not have sufficient public information available to assess quantitatively, and secondly, the Alliance only recognizes FIPs that are publically available on fisheryprogress.org as "credible FIPs."

Hypotheses

Data collection and analysis focused on FIP characteristics as outlined in the Alliance's guidelines. These characteristics, used as variables in the analysis below, are:

VARIABLES	EXPLANATION
FIP TYPE	What stage of progress was the FIP in: prospective, basic, comprehensive, inactive or completed. This categorization is based on the FIP guidelines.
FIP STAGE	As discussed in Section II there are 5 FIP stages. FIP stage for each fishery was based on information reported to fisheryprogress.org.
MSC CERTIFICATION	Is the FIP seeking MSC certification – yes or no? If the fishery noted MSC as a goal or reason for engaging in a FIP in background information available for the FIP then it was classified as desiring MSC certification. If there was no mention of MSC then it was classified as not having interest in a FIP. There were fisheries that did not provide background information and are therefore listed as n/a.
START DATE	The start date (month/year) was collected for each FIP.
TIME SPENT IN FIP	The amount of time spent in the FIP was calculated measure. It was based on time elapsed since the start date through May 2018 (measured in months).
GUIDELINE LAUNCH	Did the FIP start before or after 2012? The FIP guidelines launched in 2012, and without an alternative available measure of efficacy, whether the FIP began implementation before or after the launch of the guidelines was used as a proxy measure. If a FIP began in 2012, it was classified as having started before the launch of the guidelines as its likely it occurred concurrently.
SPECIES	How many species is the FIP targeting? The categorization was single or multiple.
GEAR TYPE	Does the fishery being improved use a single gear type (handline, trawl, etc.) or multiple gear types to catch fish. Categorization: single or multiple.

LOCATION	What country does the FIP occur in? If the FIP was part of a charter arrangement, the country of capture was used.
COUNTRY STATUS	Based on the location of capture, a country status was assigned. Based on the World Bank's country status database, countries were assigned either a developed or developing label.
FIP LEAD TYPE	While FIPs are partnerships, they tend to be run primarily by one organization. The primary contact point for the FIP was used to classify who was the lead implementer of the project. The classifications included: association, government, industry, consultant, NGO).

Table 4. FIP data collected for analysis. The variables above were collected for 127 fisheries. While other variables do exist (fishery type, volume caught, etc.) a lack of data availability across all the FIPs limited the dataset to these variables. Source: fisheryprogress.org, FishSource, and SFP.

To aid in answering the questions presented in this study, and based on the literature review conducted and personal communication with FIP implementation experts, the following hypotheses were created:

1. Status as a developing or developed country fishery does not impact time spent in a FIP.
2. Fisheries seeking MSC certification will spend less time in FIPs.
3. FIPs led by industry spend less time in FIPs.
4. The introduction of the FIP guidelines decreased implementation time.
5. FIPs do not gain market access prior to delivering fisheries improvement.

Methods

In order to answer the hypotheses outlined here, a series of t-tests and an ANOVA were conducted. For this study, I used a Welch's t-test, rather than a standard t-test, to account for the unequal sample sizes in my dataset (Diez *et al.,* 2015). Using the categorical variables described in Table 4, each hypothesis was tested. This replicates the methodology used in the original Sampson et al. study where the time spent in FIP stages (in months) was assessed for a sample of 111 FIPs using a t-test. To understand whether there was a difference in the months spent in a FIP based on if the project started before or after the FIP guidelines where introduced, an additional t-test on the original Sampson dataset was conducted. Lastly, an additional literature review was completed to assess whether retailer policies substantiated the claim that FIPs gain market access prior to delivering fisheries improvement; a central claim in the original Sampson study. A desktop review of the Top 25 North American retailers, and their social responsibility commitments, were assessed (see Appendix 2) and used as proxy to evaluate this claim.

For all the analyses, FIPs that were classified as currently inactive or prospective by the Alliance's standards were omitted. However, fisheries that had completed their FIP were included. This narrowed the number of fisheries analyzed to n=97. It is important to note that prospective FIPs were omitted as they have not formally launched their projects, and it is difficult to discern whether ultimately, they will choose to engage in a formal FIP, how long

they'll remain in stage 1, and what fishery they will ultimately target. As such, there are no FIPs included in the dataset that are in Stage 1. This is a divergence point from the Sampson dataset, and is discussed in greater depth in the following section.

The table below summarizes each hypothesis test:

HYPOTHESIS	TEST	INDEPENDENT VARIABLE	DEPENDENT VARIABLE	RESULT
1	t-test	Country status (categorical)	Time in each stage in months, analyzed by stage (continuous)	No statistically significant difference
2	t-test	MSC certification (categorical)	Time in months (continuous)	No statistically significant difference
3	ANOVA	FIP lead type (categorical)	Time in months (continuous)	Significant difference. FIPs led by consultants spend less time in FIPs (p-value = 0.02)
4	t-test	FIP guidelines (categorical)	Time in months (continuous)	Significant difference. FIPs launched after the guidelines spend less time in FIPs (p-value = 1.80^{-12})
5	literature review	n/a	n/a	No evidence of price premium exists

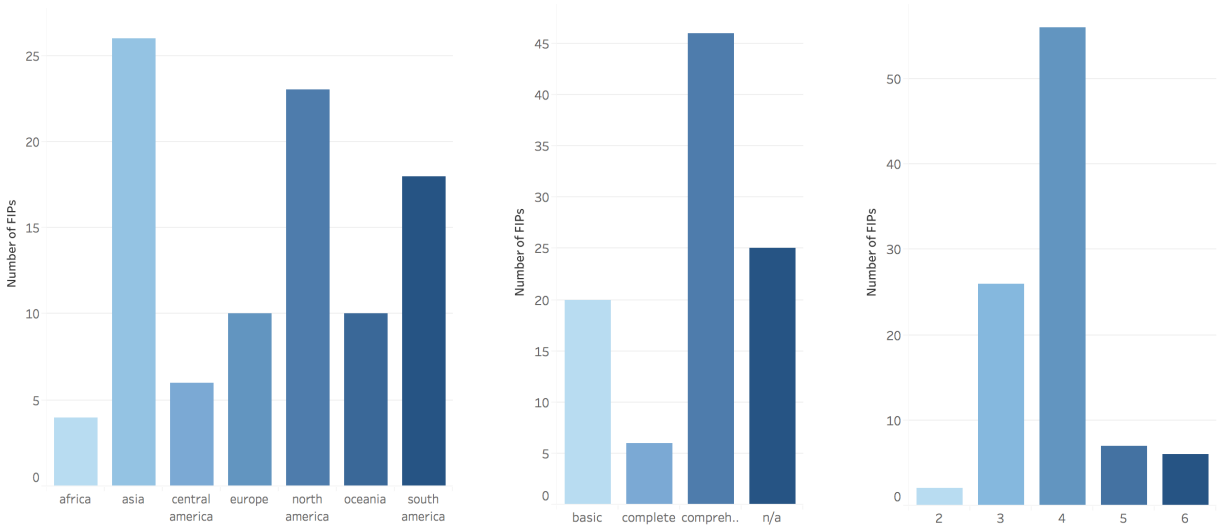
Table 5. Summary of Hypothesis Tests. Of the five hypotheses tested, three held true and were accepted. Hypotheses number 2+3 (MSC certification and FIP lead type impact on time in FIP) were rejected. There was no statistical difference in time spent in FIPs and whether the fishery intends to seek MSC certification; FIPs led by consultants, rather than industry, spend the least amount of time in FIPs.

IV. Results

Global state of FIPs

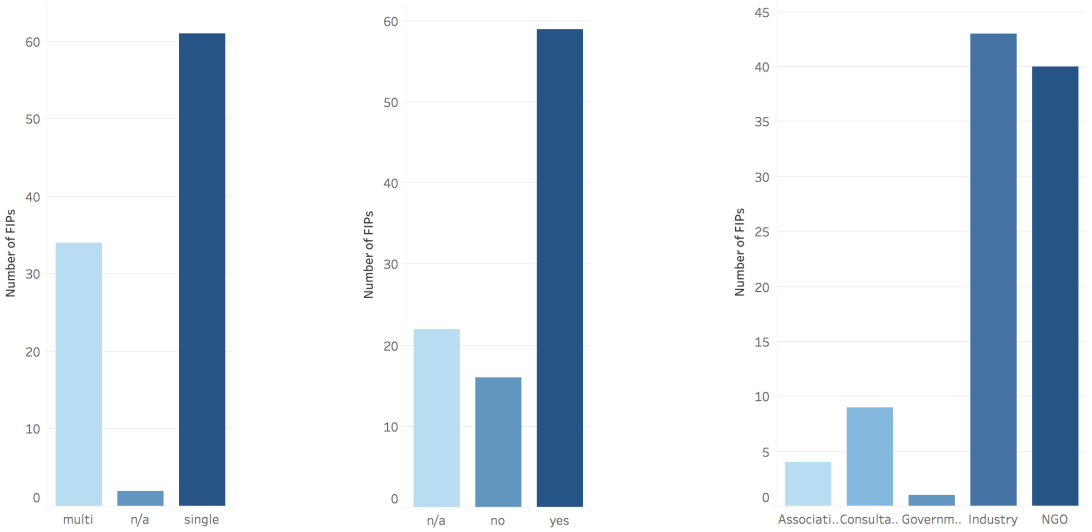
Without easily synthesizable information about the state of FIPs at a global scale available, this section provides an overview of FIPs. Today, the majority of fisheries engaged in FIPs are from Asia (n=26;). This accounts for more than a quarter of all fisheries currently engaging in a FIP, and perhaps is not surprising, given the high concentration of fishing that occurs in the region. From a distribution perspective, the high presence of FIPs in Asia is reflective of catch rates, and of the region in the world that not only has the highest production, but also the highest growth demand for seafood. Within Asia, the highest concentration of FIPs are from Indonesia (n=11). Of the 97 FIPs assessed, nearly half (n=46) are comprehensive (Figure 2). That is, they are seeking to address a full range of environmental challenges (and all 28 MSC indicators) within their fishery, and have committed to reporting against their activities every 6 months. Since

nearly a quarter of the FIPs assessed did not state whether they were comprehensive or basic in scope, it is likely that they fall under the basic classification (those fisheries that are not targeting all 28 indicators and are not required to have external audits of progress). It is therefore likely that an equal number of fisheries are following the basic trajectory as they are the comprehensive. Lastly, more than half of the fisheries currently engaging in FIPs have reached stage 4 and are therefore are making improvements in fishing practice or fishery management. Since FIPs do not make improvements "on the water" until stage 4, it is a positive indicator that the there is a concentration of FIPs at this stage. This is particularly noteworthy as DCFs cannot typically move past this stage in the FIP process due to national management obstacles or data limitations; FIP implementers have indicated that Stage 4 is a "sticking point" for most DCF (Personal communication, October 2017).



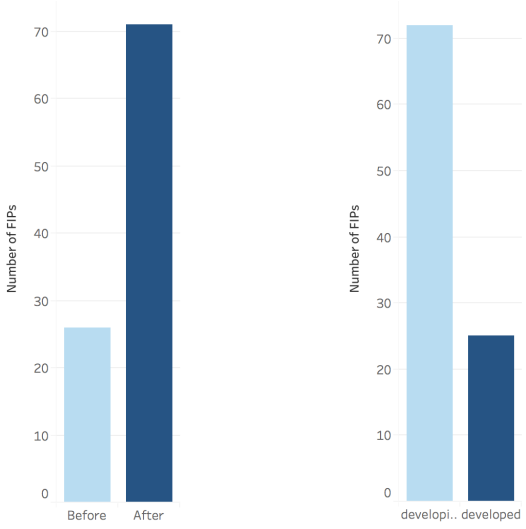
Figures 1 – 3. FIP characteristics. Figure 1 breaks out FIPs by geographical region, Asia has the highest concentration of FIPs (n=26); Figure 2 illustrates FIPs by FIP type, half of FIPs are comprehensive (n=46); and Figure 3 demonstrates the number of FIPs currently in each stage of the FIP process; more than half of FIPs are in Stage 4 (n=56).

Of the FIPs analyzed, two-thirds are targeting single species (Figure 4) and using a single gear type within their fishery (n=61). Interestingly, nearly two-thirds (n=59) of the FIPs are seeking MSC certification (Figure 5). This number could potentially be higher as 22 fisheries did not explicitly state whether MSC certification was a consideration and/or ultimate goal of pursuing a FIP. Of FIPs with a stated intention to pursue MSC certification, 45 were DCF perhaps indicating that DCF do indeed view FIPs as a preparation tool and stepwise approach to ultimately seeking MSC certification. Lastly, it appears that an almost equal share of FIPs are being led by Industry (n=43) as by NGOs (n=40). This is interesting percentage given that the majority of attendants of FIP meetings/consultations/etc. are from the NGO community, and that the most early FIPs were NGOs led (SFP and WWF).



Figures 4 – 6. FIP characteristics. Figure 4 represents the number of fisheries targeting single or multiple species in their FIP, two-thirds are targeting a single species (n=61); Figure 5 illustrates whether the FIP is seeking MSC certification, almost two-thirds are interested in seeking MSC (n=59); and Figure 6 demonstrates the variety of FIP implementers with industry and NGOs leading a similar number of FIPs (n=43, n=40 respectively).

As discussed in greater detail in the next section, 71 fisheries began engaging in FIPs after the introduction of the 2012 FIP Guidelines (Figures 7). This is consistent with evidence that the initial FIP guidelines were introduced to meet increased interest and investment in FIPs. Of the 97 FIPs analyzed, 72 FIPs are considered part of DCF (developing country fisheries are defined by the country of catch using the World Bank's developed vs developing criterion). As noted earlier, high representation from developing countries can either be indicative of an on-ramp to MSC certification that is working, or as Sampson et al argue, an abuse of the good reputation and sustainability claims surrounding FIPs.



Figures 7 – 8. FIP characteristics. Figure 7 illustrates that most FIPs began implementation after the introduction of the FIP guidelines (n=71); Figure 8 demonstrates that the majority of fisheries engaged in a FIP are from developing countries (n=72).

How do FIPs in DCF compare with FIPs in developed country fisheries?

Looking specifically to answer the second question of this study, and in response to Sampson et al, I ran a t-test on the length of time developed versus developing country fisheries (DCF) spend in each stage of a FIP. As noted earlier, no Stage 1 FIPs are included in the dataset of analysis as prospective FIPs (which are in a scoping period) are not sufficiently formalized to analyze progress. The analysis indicated that there is no statistical difference in the time spent in any FIP stage between developing and developed countries' fisheries. For all stages (except Stage 2 where there was not sufficient data to run a t-test), there was a resulting p-value of 0.44 or greater. While developed country FIPs in Stage 6 (those that entered MSC certification) spent more time, on average, in a FIP this is not surprising once you delve deeper to assess which developed fisheries are factoring into the average.

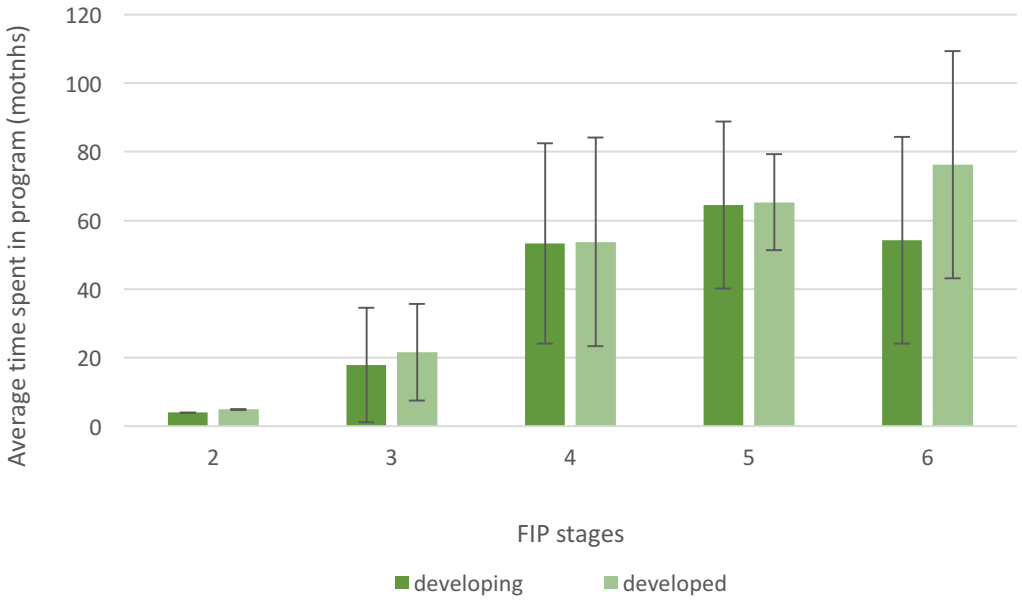


Figure 9. Time Spent in FIP by FIP Stage. There is no statistically significant (p-values > 0.44) difference in the average time spent in a FIP stage based on whether the fishery is a DCF or a developed country fishery.

VARIABLE		DEVELOPING	DEVELOPED	P-VALUE
TIME IN STAGE 2	n	1	1	n/a
	M	4	5	
	SD	n/a	n/a	
TIME IN STAGE 3	n	18	8	0.55
	M	17.8	21.6	
	SD	16.7	14.1	
TIME IN STAGE 4	n	46	10	0.97
	M	53.3	53.7	
	SD	29.2	30.4	

TIME IN STAGE 5	n	4	3	0.96
	M	64.5	64.5	
	SD	24.4	14.0	
TIME IN STAGE 6	n	3	3	0.44
	M	54.3	76.3	
	SD	30.1	33.1	

Table 6. Summary of FIP stage t-test results. Results indicate that there is no statistical difference in time spent in each FIP stage.

Similarly, there is no statistically significant difference in time spent in the FIP program based on whether a fishery's ultimate goal or interest is MSC certification (p-value = 0.58). A limitation to this test is that there were several fisheries that did not indicate whether they were interested in ultimately pursuing MSC certification. Those fisheries (classified as n/a) did, however, spend more time in a FIP. If those fisheries were primarily interested in seeking MSC, or vice versa, these results may have varied.

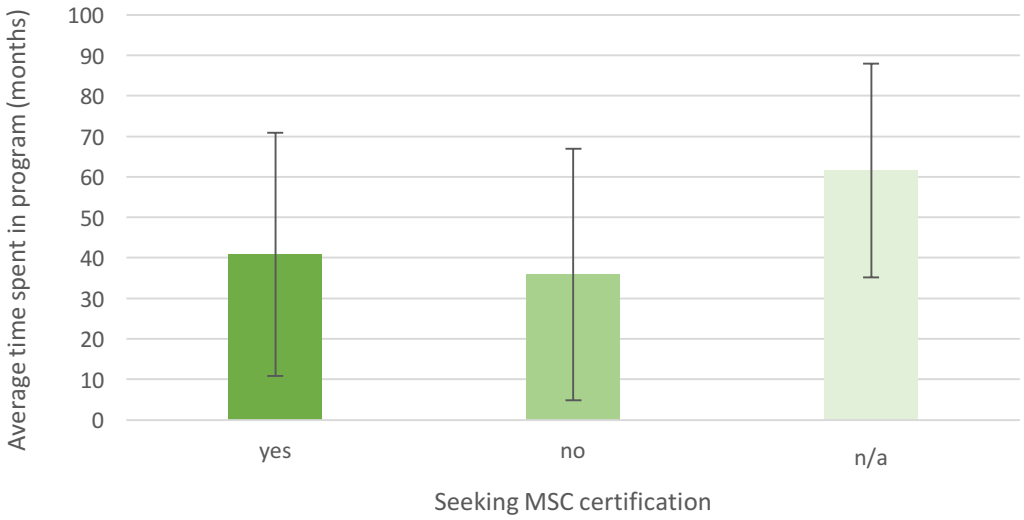


Figure 10. Does stated intent to seek MSC certification impact FIP progress? There is no statistically significant difference (p-value=0.58) in the average time spent in a FIP based on whether the fishery would eventually seek MSC certification. Fisheries that did not specify intention are listed as n/a.

VARIABLE		INTENT TO SEEK MSC	NO INTENT TO SEEK MSC	INTENT N/A	P-VALUE
TIME SPENT IN FIP	n	59	16	22	0.58
	M	40.8	35.9	61.6	
	SD	30.0	31.1	26.4	

Table 7. Summary of intent to pursue MSC t-test results. Results indicate that there is no statistical difference in time spent in each FIP stage and whether the FIP intends to seek MSC certification.

In the interest of understanding whether there was a FIP lead implementation type that expedited a fisheries ability to move along a FIP, I ran an ANOVA test of FIP duration in projects headed by four groups: associations, consultants, industry, and NGO lead partners. There is a statistically significant difference in average time spent in a program (p-value = 0.02). FIPs run by consultants spend, on average, 24 months in a FIP compared to the 79 months FIPs run by associations spend.

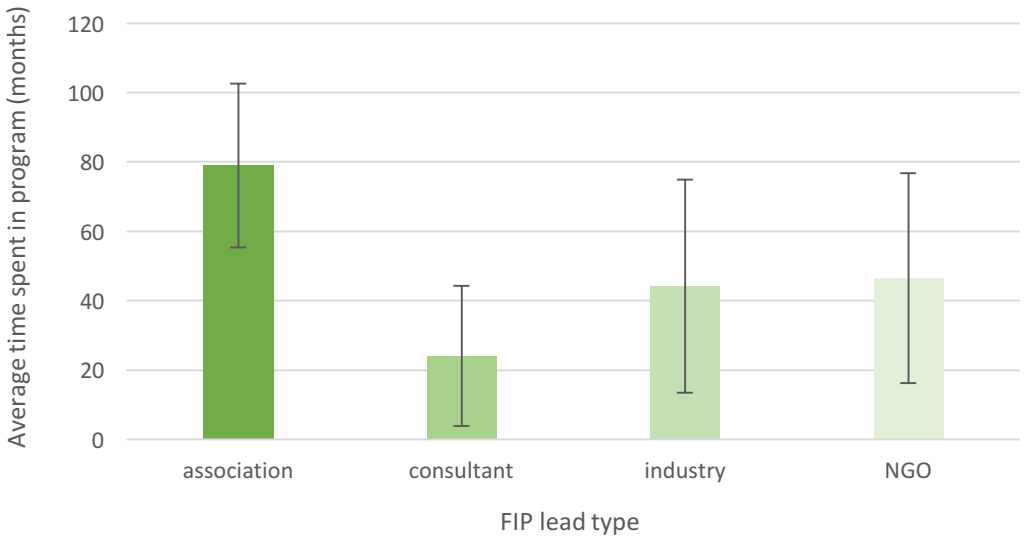


Figure 11. Does FIP lead type impact time spent in a FIP? There is a statistically significant difference (p-value =0.023) in the average time spent in a FIP based on who leads the FIP initiative. Consultants spend the least amount of time in a FIP.

VARIABLE		ASSOCIATION LED	CONSULTANT LED	INDUSTRY LED	NGO LED	F-VALUE	P-VALUE
TIME	n	4	9	44	40	3.32	0.023
SPENT	M	79.0	24.0	44.2	46.5		
IN FIP	SD	23.6	20.2	30.7	30.3		

Table 8. Summary of FIP lead ANOVA results. Results indicate that there is statistical difference in time spent in each FIP stage and who leads the initiative. Initiatives led by consultants are the fastest, while those run by associations take longer.

The Alliance invested considerable time institutionalizing the FIP guidelines, and I was interested in better understanding whether they had been beneficial in improving the ability of fisheries to implement FIPs. A t-test – grouping FIPs not based on whether they were from developed or developing countries, but rather by if they launched their FIP before (or during 2012) or after (2013 – onward) – indicates that there is a high statistical significance (p-value = 1.80^{-12}). FIPs that launched during or prior to the introduction of the FIP guidelines in 2012 spent, on average 86 months in FIPs, while their counterparts are spending just under 30 months.

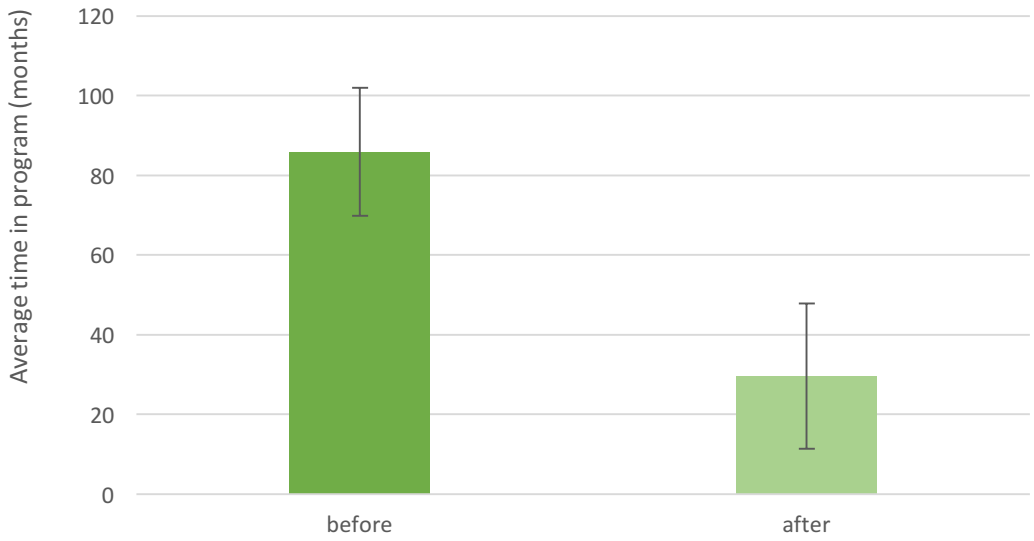


Figure 12. How did the introduction of the FIP guidelines in 2012 impact FIP progress? There is a high statistical significance (p-value=$1.80E^{-12}$) in average time spent in a FIP based on whether it was implemented prior or post the introduction of the FIP guidelines.

VARIABLE		FIP STARTED BEFORE GUIDELINES	FIP STARTED AFTER GUIDELINES	P-VALUE
TIME	n	26	71	$1.80E^{-12}$
SPENT	M	85.9	29.6	
IN FIP	SD	16.0	18.2	

Table 9. Summary of FIP guideline t-test results. Results indicate that there is high statistical difference in time spent in a FIP based on whether the FIP had the framework of the FIP guidelines.

While it might not be surprising that the increased accessibility and structure the FIP guidelines brought to the FIP implementation process significantly decreased the average time spent in a FIP, I was also interested in understanding if this varied based on whether a FIP was from a DCF. Because FIPs that started prior to the implementation of the FIP guidelines spent a significantly higher amount of time in a FIP, they are treated as outliers in the dataset. Therefore, the following t-test only looked specifically at FIPs that were implemented post-2012 (n=71). While DCF, on average, spend 28 months in a FIP compared to the 33 months for a developed country, there is no statistical difference in time spent in a program based on the country status of the FIP (p-value = 0.31). As I note in the next section, this is can be understood as an indicator of progress.

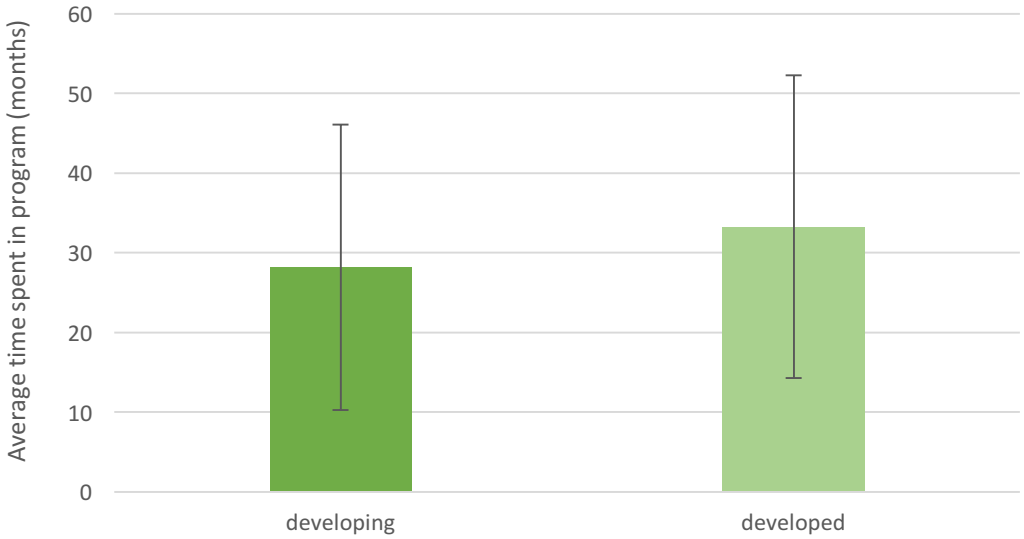


Figure 13. Does DCF status impact time spent in a FIP post the introduction of the FIP guidelines? There is no statistically significant difference in the average time spent in a FIP based on whether the fishery was classified as developing or developed (p-value=0.31).

VARIABLE		DEVELOPING	DEVELOPED	P-VALUE
TIME SPENT IN FIP	n	51	20	0.31
	M	28.2	33.3	
	SD	17.9	19.0	

Table 10. Summary of FIP guideline t-test results. Results indicate that there is high statistical difference in time spent in a FIP based on whether the FIP had the framework of the FIP guidelines.

Lastly, because Sampson et al did not distinguish between early implementers of FIPs (those that began implementation before the guidelines were introduced) and later adopters, I reanalyzed a subset of their dataset. The original Sampson study (see Figure 15) indicated that there was only a significant difference in time spent in FIP stage based on country status during Stage 2. I was interested in understanding if outliers (those FIPs started before 2012) were removed, would there have been a statistically significant difference in time spent in FIPs based on country status? As Figure 13 demonstrates, today there is no statistically significant difference, but what about in the snapshot of 2014 captured in Sampson's study?

Looking specifically at these FIPs, there is a statistical difference in average time spent in program (p-value = 0.0016). This indicates that the FIP guidelines alone cannot explain or account for the lack of significant difference found today between developing and developed countries, and is discussed in greater detail in the next section.

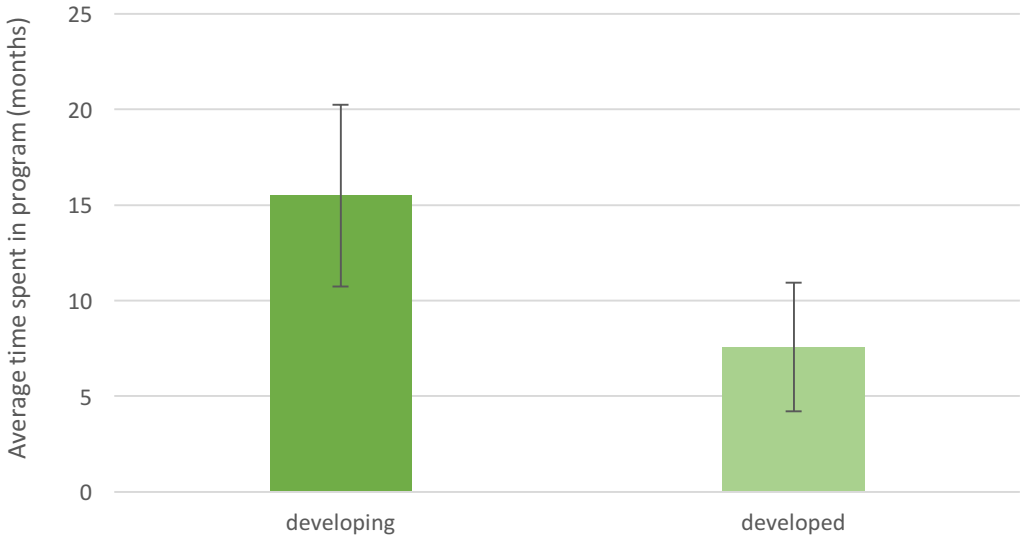


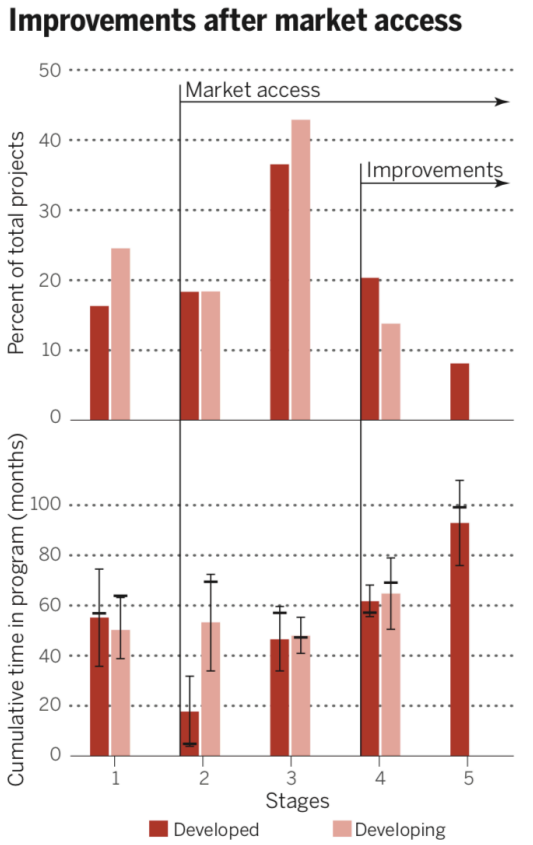
Figure 14. A reanalysis of Sampson et al's dataset. Looking solely at FIPs that began after the introduction of the 2012 guidelines, does DCF impact time spent in a FIP? Results (p-value=0.0016) there is a statistical difference in the average time spent in a FIP post-2012 based on whether it's a DCF or developed country fishery.

VARIABLE		DEVELOPING	DEVELOPED	P-VALUE
TIME SPENT IN FIP	n	8	12	0.0016
	M	15.5	7.58	
	SD	4.75	3.36	

Table 11. Summary of FIP guideline t-test results. Results indicate that there is high statistical difference in time spent in a FIP based on whether the FIP had the framework of the FIP guidelines.

V. Discussion

Since the publication of Sampson et al in 2015 the FIP community has worked to increase transparency and streamline the FIP model. I would argue, this was in part an attempt to distance themselves from the results of that study. With this research, I aimed to reanalyze FIP progress taking into account that today, FIPs have existed for more than a decade. While there is an argument to be made for the first global review of FIPs catalyzing progress across the FIP space, it is also critical to note that there were some inconsistencies in presentation of DCFs within that original paper. These discrepancies center around two claims, seen visually below.



Fisheries stagnate in early stages of FIPs. (**Top**) Developed and developing country fisheries according to FIP stage (n = 111). Market access occurs in stage 2 and regulatory and ecological improvements after stage 3. (**Bottom**) Cumulative time since the fishery was established as a FIP and current stage for developed and developing countries. The vertical bars represent mean time, the horizontal lines are medians, and error bars represent ±2 SEM. Data are from (*15*).

Figure 15. Fisheries stagnate in early stages of FIPs. Source: Sampson et al., 2015.

The first claim was that DCF FIPs spend longer in FIP stages when compared to their developed country counterparts. On closer investigation, within the original Sampson dataset, only Stage 2 DCF FIPs show a significant difference in average time spent in a FIP since establishment. While Sampson et al do not provide a potential explanation for the difference in time spent at Stage 2, it is likely that the increased time spent by DCF they noted is attributable to early DCF entering the FIP process. Early FIP adopters where characterized as large, industrial fisheries with aims to gain MSC certification within five years (Personal communication, April 2018). As FIPs proliferated, new FIPs primarily targeting DCF were introduced, and that is one potential explanation for the longer amount of time DCF FIPs spent in Stage 2. While the study claimed that all DCF spent more time in FIPs, which was misleading statistically, the question posed and its potential implications were important. In the first hypothesis test of this study, I attempted to answer that with updated data.

Hypothesis 1: Status as a developing or developed country does not impact time spent in a FIP.

As Figure 1 demonstrates, this hypothesis was supported by the data. Today there is no significant difference in time spent in any FIP stage based on the country status of the fishery. With continual improvements and professionalization of FIPs, this is a result you would hope and expect to see; that is, a decline in differentiation in progress based on country status, and a decrease in overall time spent across FIP stages.

It is critical to view the differentiation in time spent at Stage 2 in the Sampson et al paper as a snapshot of progress, and a key driver for the reevaluation of progress analyzed in this paper. The progress made over the last four years is also clearly illustrated in Figures 13 + 14. While Sampson's claim that DCF did spend more time in FIPs (Figure 13) when compared to their developing country counterparts did hold when reanalyzed, today, the opposite is true. With 4 years of additional data and improvement, no statistical difference in the time spent in FIPs based on country status exists today (Figure 14). There are several potential explanations for this, but one of particular note here, is that the Sampson paper may have sparked concerted effort from FIP implementers to more closely monitor FIP implementation.

Upon reevaluation of the current state of DCFs in the FIP space, I would argue that today, FIPs regardless of whether they are from DCF or developed countries have high transparency and are readily becoming assessed in a systematic and replicable model. Across all FIP stages, DCF perform equally as well in progressing in the FIP, as their developed country counterparts. The ability of DCF to overcome traditional improvement challenges, and progress at a rate comparable to developed – data rich – fisheries is noteworthy. This sheds credibility on the ability of FIPs to provide an avenue or step-wise approach to improvement that makes sustainability more attainable to DCF.

Hypothesis 2 + 3: Fisheries seeking MSC certification will spend less time in FIPs

Early FIP projects targeted large, industrial fisheries for whom MSC certification was attainable in the immediate future, but in which there were one or two MSC indicators that needed improvement (Alliance, 2015). Logically this followed the foundational premise of a FIP – that by creating a strategic partnership that leverages the power of the market, the fishery has the financial resources and incentive to improve management. However, over time, fisheries with varying characteristics (species targeted, gear type, etc.) began entering the FIP process. Many of these newer FIPs did not have a target market or retailer commitment, but found the FIP process helpful in pursuing sustainability. Without the incentive, I hypothesized that FIPs without strong market connections would take longer to progress through a FIP, and that those FIPs seeking MSC certification would perform better in FIPs. However, this hypothesis was not supported by the data, and therefore was rejected (Figure 10). Similarly, I hypothesized that the FIPs led by industry would result in faster progression through FIPs. This hypothesis was also not supported by this analysis, and rejected (Figure 11). These results were surprising given the perception that future market access is the primary driver of improvement. This may indicate that FIPs are transitioning from being exclusively a market driven tool to a more holistic sustainability improvement process.

Hypothesis 4: The introduction of the FIP guidelines decreased implementation time

As noted earlier, when it became evident that FIPs were being up taken at an exponential rate by various actors, the Alliance established a set of guidelines to standardize FIP implementation. As Figure 12 demonstrates, the fisheries that began FIP projects after the implementation of the guidelines had significantly reduced time spent in FIPs, and therefore this hypothesis was accepted. While this is a highly significant indicator worthy of case studying in the future, the question remains if the fishery guidelines are a sufficient proxy to explain the decrease in time spent in FIPs. Some other potential explanations include: that the capacity of FIP implementers has increased simultaneously over time and therefore attributed to decreased implementation time. Another potential explanation is that the hardest fisheries to improve were implemented at the onset of FIPs; that is, that the fisheries that entered before the FIP guidelines were implemented were targeting improvement across all 28 MSC indicators while those entering now are tackling fewer indicators and therefore spending less time in FIPs. Further research aimed at understanding characteristics that lead towards implementation efficacy are critical, and this analysis provides some key avenues for potential exploration.

Hypothesis 5: FIPs do not gain market access prior to delivering fisheries improvement

Lastly, the second claim of the Sampson study was that both DCF and developed country fisheries, were gaining market access before they made improvements "on the water." Particularly, DCF FIPs that were in Stage 2 that spent a statistically significant amount longer in that stage than their developed country counterparts. While no hypothesis test was conducted for this claim, an extensive desktop indicated this claim was false. It is accurate that organizations like SFP and WWF do connect fishers and processors to retailers through strategic partnerships and/or corporate social responsibility programs, they do not do so at the expense of retailer sustainability commitments (Bush and Oosterveer, 2015). Of the top 25 seafood retailers in the US (see Appendix 2), only 3 have a commitment to source exclusively from MSC certified fisheries. The rest maintain diversified portfolios; for some retailers that includes MSC certified fish in high-end brand lines, where they explicitly state that they do not source from FIPs. Sourcing from a FIP for the remainder of retailers is in conjunction with fish from fisheries that have no commitments to improved management. As there is no commitment to eco-labeled fish within these companies' portfolios, incorporating fish sourced from a FIP is not creating preferential market access for FIPs. Additionally, FIP implementers indicated that the FIPs within each retailers' portfolio were created at the request of the retailer that the fishery enter an improvement (Personal communication, June 2018). Rather, it may indicate a genuine commitment to attempting to become better actors within the fisheries space. Ultimately, there is no concrete indication that DCF are attaining preferential market access before delivering fisheries improvement.

VI. Conclusion:

FIPs have come a long way since they were conceived in the early 2000s. As this paper indicates, there are many misconceptions about the aim of FIPs. In reevaluating FIP efficacy, this

study was able to dispute some of the claims established in Sampson et al, and demonstrate the value of re-analysis. Engaging at this level, allows for real-world evaluation of outcomes associated with publication, and provides an example of the value of repeating and updating existing studies to check and update their validity.

This study also identified several leverage points that could support FIP implementation. The first, and perhaps the most noteworthy, is the importance of a backbone organization and potential benefit universal guidelines can provide. As this study indicates, after the introduction and standardization, of the FIP model, fisheries were able to more readily move through the FIP process. This highlights the importance of not only a unifying body, but of the Alliance specifically. The Alliance, with its leverage on retailers, has the ability to provide recognition and credibility to the FIP movement. As a trusted industry, business, and NGO partner, the Alliance finds itself in a unique leverage point.

Lastly, it will continue to be critical to assess efficacy within the FIP space. As the largest fisheries – those with greatest market access and desire to gain MSC certification – have already entered into the FIP process, the needs of FIPs will continue to evolve. Personal communication with FIP implementers suggest that the next wave of fisheries entering the FIP space will continue to be from the global south. These fisheries are characterized as smaller in catch, less connected to established markets, and are more data poor. If FIPs are to continue to provide a framework towards environmental sustainability, than understanding what characterizes progress in a FIP is key.

References

Alliance. (2015). Fishery Improvement Program Guidelines. Retrieved March 9, 2018, from http://solutionsforseafood.org/wp-content/uploads/2015/03/Alliance-FIP-Guidelines-3.7.15.pdf

Allison WR. (1989). The Discovery Bay Fisheries Improvement Project: A Status Report. Proceedings of the 42nd Gulf and Caribbean Fisheries Institute.

Asche, F., Bellemare, M. F., Roheim, C., Smith, M. D., & Tveteras, S. (2015). Fair Enough? Food Security and the International Trade of Seafood. *World Development*, *67*, 151–160. https://doi.org/https://doi.org/10.1016/j.worlddev.2014.10.013

Bene, C. (2006). Small-scale fisheries: assessing their contribution to rural livelihoods in developing countries. *FAO Fisheries Circular*. No. 1008. Rome, FAO.

Bush, Simon & Toonen, Hilde & Oosterveer, Peter & Mol, Arthur. (2012). The 'devils triangle' of MSC certification: Balancing credibility, accessibility and continuous improvement. Marine Policy. 37. 288-293. 10.1016/j.marpol.2012.05.011.

Bush, Simon R.; Oosterveer, Peter. (2015). "Vertically Differentiating Environmental Standards: The Case of the Marine Stewardship Council." Sustainability 7, no. 2: 1861-1883.

Constance, D. H., & Bonanno, A. (2000). Regulating the global fisheries: The World Wildlife Fund, Unilever, and the Marine Stewardship Council. Agriculture and Human Values, 17(2), 125–139. https://doi.org/10.1023/A:1007625606243

Deighan, K., Jenkins, Lekelia. (2015). Fishing for recognition: Understanding the use of NGO guidelines in fishery improvement projects. Marine Policy. 51. 476–485. 10.1016/j.marpol.2014.10.009.

Diez, D. M., Barr, C. D., & ̧etinkaya-Rundel, M. (2015). OpenIntro Statistics. Retrieved October, 2017, from https://www.openintro.org/stat/textbook.php?stat_book=os

Duggan, D. E., & Kochen, M. (2016). Small in scale but big in potential: Opportunities and challenges for fisheries certification of Indonesian small-scale tuna fisheries. Marine Policy, 67, 30–39. https://doi.org/https://doi.org/10.1016/j.marpol.2016.01.008

FAO (2016). The State of World Fisheries and Aquaculture 2016. Contributing to food security and nutrition for all. Rome. Retrieved March 23, 2018, from http://www.fao.org/3/a-i5555e.pdf

FAO (2018, March 19). Positive outlook for global seafood as demand surges for multiple species in markets across the world. Retrieved April 16, 2018, from http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/1109513/

Golden, C. D., Allison, E. H., Cheung, W. W. L., Dey, M. M., Halpern, B. S., McCauley, D. J., … Myers, S. S. (2016). Nutrition: Fall in fish catch threatens human health. *Nature*. https://doi.org/10.1038/534317a

Gudmundsson, Eyjolfur & Roheim, Cathy. (2000). Ecolabeling Seafood for Sustainable Production: Implications for Fisheries Management. Marine Resource Economics. 15. 10.1086/mre.15.2.42629294.

Gutiérrez, N. L., Hilborn, R., & Defeo, O. (2011). Leadership, social capital and incentives promote successful fisheries. *Nature*, *470*, 386. Retrieved from http://dx.doi.org/10.1038/nature09689

Hall, 2011: Hall, S.J., Delaporte, A., Phillips, M.J., Beveridge, M., and O'Keefe, M. (2011). *Blue Frontiers: managing the environmental costs of aquaculture*. Penang: World Fish.

OCED. (2017, November 28). OECD sees global economy strengthening, but says further policy action needed to catalyse the private sector for stronger and more inclusive growth. Retrieved April 25, 2018, from https://www.oecd.org/newsroom/oecd-sees-global-economy-strengthening-but-says-further-policy-action-needed-to-catalyse-the-private-sector-for-stronger-and-more-inclusive-growth.htm

MSC. (2017). Marine Stewardship Council: Global Impacts Report 2017. MSC, London, UK. 44pp. ISSN 2052-8876

Potts, T. (2006). A framework for the analysis of sustainability indicator systems in fisheries. Ocean & Coastal Management, 49(5), 259–280. https://doi.org/https://doi.org/10.1016/j.ocecoaman.2006.03.008

Pauly, D., Christensen, V., Guénette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., … Zeller, D. (2002). Towards sustainability in world fisheries. Nature, 418, 689. Retrieved from http://dx.doi.org/10.1038/nature01017

Pauly, Daniel & Alder, Jackie & Bennett, Elena & Christensen, Villy & Tyedmers, Peter & Watson, Reg. (2003). The Future for Fisheries. Science. 302. 1359-1361.

Ponte, S. (2012), The Marine Stewardship Council (MSC) and the Making of a Market for 'Sustainable Fish'. Journal of Agrarian Change, 12: 300-315. doi:10.1111/j.1471-0366.2011.00345.x

Potts, T. (2006). A framework for the analysis of sustainability indicator systems in fisheries. Ocean & Coastal Management, 49(5), 259–280. https://doi.org/https://doi.org/10.1016/j.ocecoaman.2006.03.008

Roheim, C. A. and Sutinen, J. (2006) Trade and Marketplace Measures to Promote Sustainable Fishing Practices, ICTSD Natural Resources, International Trade and Sustainable

Development Series Issue Paper No. 3, International Centre for Trade and Sustainable Development and the High Seas Task Force, Geneva, Switzerland.

Roheim, C. A., Asche, F. and Santos, J. I. (2011), The Elusive Price Premium for Ecolabelled Products: Evidence from Seafood in the UK Market. Journal of Agricultural Economics, 62: 655-668. doi:10.1111/j.1477-9552.2011.00299.x

Seafood Source. (2011, April 5). First Baltic cod fishery earns MSC certification. Retrieved April 21, 2018, from https://www.seafoodsource.com/news/environment-sustainability/first-baltic-cod-fishery-earns-msc-certification

SFP. (2018). Improvement Projects Archive. Retrieved April 10, 2018, from https://www.sustainablefish.org/Programs/Improving-Wild-Fisheries/Seafood-Sectors-Supply-Chain-Roundtables/Improvement-Projects-Archive

Smith, M. D., Roheim, C. A., Crowder, L. B., Halpern, B. S., Turnipseed, M., Anderson, J. L., … Selkoe, K. A. (2010). Sustainability and Global Seafood. *Science*. https://doi.org/10.1126/science.1185345

Stratoudakis, Y., McConney, P., Duncan, J., Ghofar, A., Gitonga, N., Mohamed, K. S., … Bourillon, L. (2016). Fisheries certification in the developing world: Locks and keys or square pegs in round holes? Fisheries Research, 182, 39–49. https://doi.org/https://doi.org/10.1016/j.fishres.2015.08.021

Tveteras S, Asche F, Bellemare MF, Smith MD, Guttormsen AG, et al. (2012) Fish Is Food - The FAO's Fish Price Index. PLOS ONE 7(5): e36731. https://doi.org/10.1371/journal.pone.0036731

Tolentino-Zondervan, Frazen & Berentsen, Paul & Bush, Simon & Idemne, Joseph & Babaran, Ricardo & Lansink, Alfons Oude. (2016). "Comparison of Private Incentive Mechanisms for Improving Sustainability of Filipino Tuna Fisheries," World Development, Elsevier, vol. 83(C), pages 264-279.

Wakamatsu, M., & Wakamatsu, H. (2017). The certification of small-scale fisheries. *Marine Policy*, *77*, 97–103. https://doi.org/https://doi.org/10.1016/j.marpol.2016.12.016

World Bank. (2017). The Sunken Billions Revisited: Progress and Challenges in Global Marine Fisheries (Rep.). doi:10.1596/978-1-4648-0919-4

Worm, B., Hilborn, R., Baum, J. K., Branch, T. A., Collie, J. S., Costello, C., … Zeller, D. (2009). Rebuilding Global Fisheries. *Science*, *325*(5940), 578 LP-585. Retrieved from http://science.sciencemag.org/content/325/5940/578.abstract

WWF. (2009, November 10). Famed clam fishery first to receive MSC certification in Southeast Asia. Retrieved May 3, 2018, from http://wwf.panda.org/wwf_news/?uNewsID=180081

Appendix 1: Dataset of FIPs

Summary of project name, time spent in program (in months), and country status (developed = 1, developing =0) as of April 2018. All the data (n=97) are from fisheryprogress.org, Fish Source, and SFP. A full dataset is available upon request.

NAME OF FIP	TIME IN PROGRAM	COUNTRY STATUS
BARENTS SEA KING CRAB	17	1
CAMPECHE BLUE CRAB	3	0
GULF OF CALIFORNIA SWIMMING CRAB	93	0
HAWAII TUNA + LARGE PELAGICS	110	1
INDIA THREADFIN BREAM	14	0
INDONESIA JEPARA BLUE SWIMMING CRAB	19	0
INDONESIA MAROS BLUE SWIMMING CRAB	5	0
INDONESIA/INDIAN OCEAN TUNA + LARGE PELAGICS	71	0
IRISH BROWN CRAB	17	1
MAURITANIA SMALL PELAGICS	9	0
MEXICAN NORTH PACIFIC BARRED SAND BASS	4	0
MEXICO BAJA CALI SUR YELLOWLEG + BLUE SHRIMP	92	0
MEXICO SINALOA ARTISANAL BLUE SHRIMP	103	0
MEXICO WESTERN BAJA CALIFORNIA SUR SWIMMING CRAB	4	0
MEXICO YUCATAN CRAB	62	0
NEW ENGLAND SILVER HAKE	34	1
NORTHERN BRAZIL CARIBBEAN RED SNAPPER	49	0
PERU MAHI-MAHI	19	0
SHANTOU-TAIWAN CHINESE COMMON SQUID	9	0
TAIWAN HSIN-KANG MAHI-MAHI	35	0
RUSSIAN NORTHERN SAKHALIN SALMON	5	1
ARGENTINA OFFSHORE RED SHRIMP	25	0
ARGENTINA ONSHORE RED SHRIMP	34	0
ATLANTIC OCEAN TROPICAL TUNA	19	0
BRAZIL SOUTH ATLANTIC SWORDFISH	22	0
CANADA AMERICAN PLAICE	54	1

CANADA ATLANTIC COD	39	1
CANADA NORTHERN COD	17	1
CANADA WITCH FLOUNDER	14	1
CHILE COMMON HAKE	72	0
CHINA CRAYFISH	13	0
COOK ISLANDS BIGEYE TUNA	14	0
EASTERN INDONESIA YELLOWFIN TUNA	56	0
EASTERN PACIFIC OCEAN TROPICAL TUNA	19	0
EASTERN PACIFIC OCEAN TROPICAL TUNA 2	20	0
ECUADOR MAHI-MAHI	40	0
MICRONESIA YELLOWFIN + BIGEYE TUNA	28	0
GAMBIA SOLE	9	0
GULF OF MEXICO NORTHERN PINK SHRIMP	100	1
GUYANA ATLANTIC SEABOB	72	0
HONDURAS CARIBBEAN SPINY LOBSTER	70	0
INDIAN OCEAN TROPICAL TUNA	19	0
INDIAN OCEAN TUNA	13	0
INDONESIA SOUTH KALIMATAN SHRIMP	13	0
INDONESIAN BLUE SWIMMING CRAB	76	0
JAPAN ALBACORE TUNA	7	1
MARSHALL ISLANDS BIGEYE + YELLOWFIN TUNA	84	0
MEXICAN PACIFIC SHRIMP	57	0
MEXICO YUCATAN RED + BLACK GROUPER	49	0
MOROCCO SARDINE	50	0
NICARAGUA CARIBBEAN SPINY LOBSTER	76	0
PACIFIC TUNA	5	0
PERU MAHI-MAHI	54	0
PERU SOUTH PACIFIC SWORDFISH	11	0
PERUVIAN ANCHOVY	16	0
PERUVIAN ANCHOVY	16	0
PERUVIAN HAKE	15	0
PHILIPPINES YELLOWFIN TUNA	49	0
THAILAND BLUE SWIMMING CRAB	15	0
TOKYO BAY SEA PERCH	18	1
US ACADIAN REDFISH, POLLOCK, + HADDOCK	15	1

US TEXAS SHRIMP	23	1
VIETNAM BLUE SWIMMING CRAB	92	0
VIETNAM YELLOWFIN TUNA	49	0
WESTERN + CENTRAL PACIFIC OCEAN TROPICAL TUNA	19	0
WESTERN KAMCHATKA SALMON	52	1
BAHAMAS SPINY LOBSTER	83	0
COOK ISLANDS YELLOWFIN TUNA	23	0
NEW ENGLAND OCEAN PERCH	45	1
ALABAMA SHRIMP	51	1
ARU, ARAFURA, AND TIMOR SEAS SNAPPER AND GROUPER	72	0
BRAZIL LOBSTER	61	0
CHINESE HUBEI PROVINCE CRAYFISH	31	0
GUATEMALA MAHI-MAHI	48	0
GULF OF MEXICO SHRIMP	50	1
IRISH QUEEN SCALLOP	40	0
LONGLINE TUNA + LARGE PELAGICS	34	0
LOWER MEKONG BEN TRE TRAWL	58	0
MISSISSIPPI SHRIMP	33	1
NEW ZEALAND ORANGE ROUGHY MEC	51	1
ORKNEY CREEL FISHERY	64	1
PANAMA SMALL PELAGICS	88	0
PANAMA YELLOWFIN TUNA + MAHI-MAHI	77	0
PHILIPPINES BLUE SWIMMING CRAB	112	0
RUSSIA FAR EAST CRAB	80	1
RUSSIAN PACIFIC COD + HALIBUT	60	1
MAKASSAR STRAIT SNAPPER + GROUPER	40	0
SRI LANKAN BLUE SWIMMING CRAB	54	0
WILD PATAGONIA PINK SHRIMP	26	0
YELLOWFIN HANDLINE BANDA SEA	41	0
INDONESIA YELLOWFIN TUNA	100	0
ARGENTINE HOKI	57	0
BARENTS SEA COD AND HADDOCK	73	1
CHILEAN ANCHOVY	118	0
EASTERN BALTIC SEA COD	111	1
MAGDALENA BAY SHRIMP	69	0
SRI LANKA TUNA	82	0

Appendix 2: Review of Top 25 Retailers

RETAILER	SUSTAINABILITY COMMITMENT?	SOURCES EXCLSUVIELY FROM MSC	SOURCES FROM FIPS?	NON-CERTIFIED SOURCES
TRI MARINE INTERNATIONAL	Yes	No	Yes	Yes
CHICKEN OF THE SEA	Yes	No	Yes	Yes
HIGH LINER FOODS	Yes	No	Yes	Yes
BUBBLE BEE FOODS	Yes	No	No	Yes
NIPPON SUISAN USA	Yes	No	No	Yes
STARKIST	Yes	No	No	Yes
MAZZETTA CO.	Yes	Yes	No	Yes
COOKE AQUACULTURE	No	No	No	Yes
BEAVER STREET FISHERIES	Yes	No	Yes	Yes
AMERICAN SEAFOODS GROUP	No	No	No	Yes
MARINE HARVEST USA	No	No	No	Yes
EASTERN FISH CO	Yes	No	No	Yes
H+N GROUP	Yes	No	No	Yes

AQUA STAR	Yes	No	Yes	Yes
MARUHA NICHIRO CORP	No	No	No	Yes
CLEARWATER SEAFOODS	Yes	Yes	No	No
HARBOR SEAFOODS	No	No	No	Yes
NATIONAL FISH + SEAFOOD	Yes	No	No	Yes
CENSEA	Yes	No	No	Yes
EAST COAST SEAFOOD	Yes	No	No	Yes
SLADE GORTON	Yes	No	Yes	Yes
PACIFIC AMERICAN FISH CO (PAFCO)	No	No	No	Yes
INLAND SEAFOOD	No	No	No	Yes
MARK FOODS INC	Yes	Yes	No	No
SEAPAK SHRIMP + SEAFOOD CO	Yes	Yes	No	Yes