



Social and Economic Outcomes of Fisheries Certification: Characterizing Pathways of Change in Canned Fish Markets

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The Marine Stewardship Council (MSC) eco-labeling program provides fisheries a pathway to demonstrate their sustainability by undergoing an environmental certification. Like other standard-setters, the MSC's 'theory of change' presumes that markets use this information to select for sustainable products, providing an incentive for producers to improve their practices and become certified. However, the underlying mechanisms which actually work to link market behavior and participation in the program in different contexts have not been systematically identified. We draw on broad MSC field experience to identify processes that have supported the theory of change in individual fisheries. Then, we develop a broadly applicable rapid assessment protocol, relying on a semi-structured interviews of key informants, to gather systematic evidence for key dynamics within the theory of change: the effects of going through MSC certification on market processes, partnerships in the fishery, and governance. In a pilot test of the protocol, we identify important common and idiosyncratic processes in three canned product fisheries: United States west coast albacore tuna, Brittany sardines, and Portuguese sardines. We find that the harvesters and buyers/processors in these fisheries sought certification primarily to expand or maintain their market share, and that certification was synergistic with stakeholder cooperation. The cases demonstrate how our rapid assessment interviews allow program participants to relate their experience in their own words yet facilitate systematic comparison to identify common mechanisms within the theory of change. We propose its wider application to systematically advance our understanding of social and economic processes that drive of eco-label interventions in different geographies and supply chains around the world.

Keywords: ecolabel, certified sustainable, environmental certification, socioeconomic effects, supply chain, Marine Stewardship Council (MSC)

INTRODUCTION

Eco-labeling programs, which develop transparent processes for assuring markets of the sustainability of certified products, have been on the increase worldwide for over a decade now (Pascual-Fernandez et al., 2019). As they expand and evolve, there is increasing interest in whether and how they are effective at creating market-driven incentives to induce fisheries to improve sustainability, and the social and economic effects of these changes. The importance of understanding these effects is reflected in many standard-setters' participation in the ISEAL Alliance, whose Impacts Code (ISEAL, 2019) requires evaluating whether a certification program is achieving its intended outcomes, as well as monitoring whether there are potentially negative unintended consequences as a result of applying the program on the ground. Eco-labels have emerged as an important pathway for consumers to support environmentally sustainable seafood sources, amid concerns about the overexploitation of many fisheries (Logan et al., 2008). The Marine Stewardship Council (MSC) is one of the most influential fisheries eco-labeling programs (Gutierrez et al., 2016) and is developing new tools for widely applicable assessment of the economic mechanisms and social effects that drive its theory of change. We report the pilot application of a new survey tool for understanding what motivates stakeholders in fisheries to undergo MSC certification, and the changes to management, value chains and markets they observe through the certification process, and as a result of certification.

Marine Stewardship Council's stated mission is to use its Standards and eco-labeling program as a market-based incentive to achieve its vision of "the world's oceans teeming with life, and seafood supplies safeguarded for this and future generations" (MSC, 2019a). It implements this mission through two Standards: the Fisheries Standard which defines benchmarks for environmental sustainability of fisheries, and the Chain of Custody Standard that is designed to assure traceability of sustainable seafood throughout the value chain. When a fishery successfully meets the requirements in the Fisheries Standard it is awarded certification and may sell its products on the market exhibiting the MSC eco-label, provided it is sold through a value chain in which all actors hold a Chain of Custody (CoC) certificate. Social outcomes are not directly considered, although social dimensions of governance processes (e.g., inclusiveness of decision-making) are evaluated, and ethical eligibility criteria are applied to exclude fisheries that do not transparently exclude forced or child labor (MSC, 2020a), or that target seabirds, marine mammals or reptiles.

These Standards implement a programmatic "theory of change" that describes the mechanisms through which certification leads to environmental improvements. The MSC's theory of change posits that certification, and the use of the eco-label, provide market advantages such as price premiums or market access over non-certified seafood. To capture these advantages, fisheries will choose to improve their fishing practices, and value chain actors will develop traceability, which meet the MSC's Standards (MSC, 2019b). In addition, as more eco-labeled products become available on the market, consumer

awareness and/or retailer demand will increase, driving further interest in certification throughout the value chain and therefore growth of the MSC program.

Importantly, the underlying processes that the MSC relies upon to achieve its environmental objectives are economic and social (cf., Doddema et al., 2020). Understanding how certification alters the opportunities and incentives faced by harvesters, value chain participants, industry organizations or managers can be leveraged in several ways. First, identifying specific likely changes associated with certification allows participants to better anticipate the types of positive or negative outcomes they may experience, based on the context of their fishery. Changes can occur in the markets, through social relationships and partnerships, or through changes in governance. Second, stakeholders involved in fishery improvement processes and prospective certificate holders may be able to design their engagement with the certification process to avert or mitigate unintended adverse consequences. Third, it is important for the MSC to understand how engagement strategies can be designed, for example, to ensure the sustainability requirements are accessible to all, including low income and small-scale fisheries; whether benefits of certification meet local needs (e.g., they are distributed in a way that includes local fish harvesters and processors); and where the process of certification may have inherent barriers to particular cultural/governance systems, or where incentives to become sustainable may be more socio-cultural than market-driven.

The most studied economic effect of the MSC is whether retailers obtain a higher price for labeled products, allowing consumers to express a preference for sustainability (Roheim, 2003; Arton et al., 2020). These studies use either stated preference surveys, incentivized choice experiments or supermarket scanner data to estimate the premium that products with the MSC label obtain over comparable uncertified products. Evidence suggests a small retail premium exists (Jaffry et al., 2004; Brecard et al., 2009; Roheim et al., 2011), though the presence and size of the premium varies with different species and consumer groups (e.g., Johnston et al., 2001; Onozaka et al., 2010; Uchida et al., 2013, 2014; Wakamatsu et al., 2017); additional profitability may arise through reduced costs (Sogn-Grundvåg et al., 2019 and references therein). Further, a retail premium does not imply an ex-vessel premium, i.e., economic benefits captured by the harvester that would incentivize fisheries to maintain certification. Here too, results are mixed: Wakamatsu (2014) and Stemle et al. (2016) identify improved ex-vessel prices for certified flathead flounder in Japan and chum and pink salmon in Alaska, respectively. However, Stemle et al. (2016) also find no statistical market improvement for Alaskan halibut, chinook and coho salmon, and negative effects for sockeye salmon.

Yet, the number of MSC certified fisheries increased from 108 to 361 between 2010 and 2019 (MSC, 2019a), revealing that fisheries see value in the MSC eco-label. Developing an evidence-based understanding of their motivations, and additional effects on harvesters and their communities, is inhibited by a lack of data at the required resolution and consistency to support a program-wide impact evaluation. Data currently collected by external sources, such as economic statistics or social indicators

compiled by national government agencies, are either not at the scale that the MSC certifies fisheries, or not specific to MSC processes. Furthermore, economic data about value chains are often proprietary business information that stakeholders may not be willing to provide. Existing in-depth case studies are too few and heterogeneous in methods and focus to be able to extrapolate generalized conclusions about a global program such as the MSC.

To address this issue, the MSC launched a project in collaboration with external scientists to collect information on the social and economic impacts of certification from certified harvesters and value chain actors, hereafter referred to jointly as “fisheries.” The project was completed in two phases. The first phase developed key research questions around which to build a data collection methodology that would allow a systematic, standardized, large-scale evaluation of socio-economic effects and outcomes of MSC certification for both impact evaluation and learning purposes. This resulted in developing a survey instrument for semi-structured interviews with key informants. The second phase of the project was aimed at testing and refining this approach.

Here we report on the methods developed and the pilot process. First, we explain the process we used to identify the range of pathways through which certification might affect fisheries, and then structure of the survey instrument designed to systematically capture that information. Second, we describe the categories of social and economic effects we identified, framed as hypotheses based on the experience of the MSC staff who have experienced them. These hypotheses are then linked to the survey questions designed to capture the necessary information. Third, we describe our piloting process in three canned product fisheries: United States west coast albacore, Brittany sardines, and Portuguese sardines. Their similar products, industry structures and supply chains provide a testbed for whether the semi-structured interviews facilitate making comparisons of, and identifying differences in, effects across fisheries. Finally, we describe the results of the three pilot case studies fisheries, and share lessons learned for future applications. Appendix A provides a refined version of the questionnaire based on our experiences during the pilot test.

MATERIALS AND METHODS

Identifying Social and Economic Dynamics

To provide a contextualized and process-based understanding of different pathways through which the MSC program brings about improvements in environmental outcomes, social and economic metrics are necessary because the processes that support environmental change through certification are themselves social and economic. That is, the desired improvements in environmental outcomes and concomitant social changes arise from individual people and firms at each level of the fishery making different decisions within at least one of the market, interpersonal and governance institutions in the fishery. However, these pathways are highly variable across fisheries, and as of the onset of this project, not systematically described

(see Arton et al. (2020) for a subsequent review of observed socio-economic changes). To develop a broadly applicable data collection framework that would enable studying diverse pathways through MSC's theory of change, we identified a set of hypotheses for the expected and unexpected intermediate and final outcomes involved.

To identify possible mechanisms within the theory of change, we drew on two sources: a literature review of conjectured or observed effects of certification, and the institutional experience within the MSC. Through a workshop and other correspondence, MSC staff from around the world shared a wide range of ways that the certification process had affected the fisheries in which they work, shifting the incentives, opportunities and constraints facing each actor. Many of these took the form of anecdotes from MSC staff relaying experiences from a single fishery. The authors then grouped these effects by the stage within the theory of change, reflecting the actors affected.

Semi-Structured Interview Protocol

To gather and systematize information on the identified effects of undergoing certification, we developed a set of semi-structured interview questionnaires directed at different actors in the fishery. The questionnaires were designed to capture social and economic outcomes arising from the certification process, as well as information on the motivations behind behavioral changes made by key agents within the fishery. In order to gather evidence for the pathways identified above, we developed a mixture of likert-scale and open-ended questions that would elicit the information needed. In addition, in order to help with interpretation of responses, the protocol included questions regarding the characteristics of the respondent, the fishery, fishery management, the value chain, and the certification process, such as who initiated and paid for certification, and the relationship between the fishery and MSC staff.

Since no one person will be able to speak authoritatively from all perspectives, we developed different versions of the questionnaire for use with specific categories of actors in the fishery of interest: harvesters, first buyers in the value chain (i.e., in this case: processors), NGOs, and marine resource managers. In addition, we developed a set of questions for the fishery case study leader (the interviewer) to record objective characteristics of the fishery (e.g., how many vessels participate in the fishery) that provide a consistent set of information for context and facilitate comparison across fisheries. This approach allows the case study leader to determine the best source of information to answer each question.

The protocol is designed to rely on key informants, rather than a large sample of fishery participants, for several reasons. First, MSC's objective is to apply the protocol in several fisheries in order to systematize knowledge of key narratives that consistently emerge across fisheries. To do this, each individual fishery case study must be a relatively manageable effort for MSC field staff to support, for researchers to coordinate, that takes relatively little time to complete; a protocol requiring large samples of respondents simply could not be widely applied. Second, certified fisheries vary widely, from a few participants to hundreds, from small-scale to industrial, from seasonal coastal

to year-round distant water, and from developing countries to the developed world. Therefore, it would be extremely difficult to collect comparable information from a statistical sample of all individuals participating in each certified fishery. Third, often only a subset of people engaged in the fishery deal directly with the MSC program, and thus it is often only a few individuals within each role who are aware of the certification processes and can reliably speak about the experience. For example, there is often only one or two fishery association leaders, fishery managers, or NGO representatives engaged in a fishery; these populations can be censused without attaining a statistical sample. Harvesters are typically numerous, but sometimes may not be aware they are certified. While an expensive, large sample survey could track changes in individual harvesters' outcomes around certification, respondents who are not aware of certification would not be able to ascribe any change to certification.

Absent suitable control fisheries, and without repeated measures taken before and after certification, our strategy for identifying whether a particular change is associated with MSC certification is whether people in the fishery perceive a link. This method leads to potential positive or negative bias, due to respondents—stakeholders that have an interest in particular outcomes, and who might be eager or reluctant to credit the MSC with positive outcomes, or too readily absolve or blame the MSC for negative outcomes—potentially exaggerating the perceptions collected in these interviews. The protocol relies on the case study leader to convey a sense of the variability or reliability of the reported answers or perceptions, and to seek additional perspectives when there is variability, rather than statistical measures arising from large samples. In interpreting results, case study leaders were aware of potential sources of bias coming from (i) their own expectations, (ii) MSC staff beliefs, (iii) informants' perceptions or desires to portray a certain image, and endeavored to consider these factors and draw on the diversity of perspectives to help interpret results in a balanced way.

The survey protocols are presented in **Supplementary Appendix 1** and are herein referred to as BACKGROUND for the case study leader, PROCESSOR for the version targeting processing sector actors, FISHER for the version targeting harvesting actors, MANAGER for the version targeting government managers, and NGO for the version targeting relevant NGOs. As part of the pilot process, each survey was peer reviewed by independent scientists and MSC staff; pre-tested before delivering to pilot informants; and translated into French and Portuguese and refined for length and fluidity in each language. Lessons learned were captured and applied before broader application in van Putten et al. (2020).

Pilot Case Studies and Synthesis

To refine and provide proof-of-concept for the methodology, we conducted a pilot in three fisheries that focus on canned fish products (University of Washington IRB Exempt determination STUDY00002572). The United States West Coast albacore and South Brittany sardine fisheries had maintained certification at the time of the interviews, and the Portuguese sardine fishery was withdrawn. While it would take many fisheries to test the full

range of hypotheses identified above, the three pilot cases provide contrast in relation to their scale, geography, target species, gear type, management regime, ease of entry into the fishery and certification history.

For all three fisheries, we implemented the survey protocol between June and October 2017 through face-to-face (where possible) and telephone interviews with key informant representatives of each actor category available in the fishery. For purposes of the pilot and refining the instrument, each case study was led by a non-MSC affiliated author (CA, AHC, and CP) with extensive experience in research interviewing of fisheries stakeholders. Within each fishery, each case study leader worked independently and with MSC field staff to identify the key informants in each role in the fishery who are best able to reflect the aggregate experiences of fishery participants. All key informants interviewed were familiar with the fishery's history and motivations for MSC certification. We identified an initial set of key informants through introductions by MSC field staff. The case study leader identified additional informants through snowball sampling by asking initial interviewees who else is well informed about the motivations for and the process of obtaining certification, as well as the perceived outcomes, and might be able to reinforce or offer different perspectives on the questions discussed. This was done until the case study leader had attained saturation of the willing informants to whom we were referred. We interviewed a total of eight participants in the United States albacore tuna fishery, seven in the South Brittany sardine fishery, and four in the Portuguese sardine fishery (**Table 1**).

Following the interviews, the case study leaders independently prepared reports synthesizing evidence for the articulated hypotheses across key informants. The case study leaders then collectively compared and contrasted narratives to craft results statements where there was common support for hypotheses across case studies, where support arose for different reasons, or where support was mixed across case studies. As this was a pilot, the case study leaders consolidated lessons learned about the effectiveness and usability of the draft instrument and agreed upon revisions, which are reflected in **Supplementary Appendix 1**.

RESEARCH QUESTIONS AND HYPOTHESIS IDENTIFICATION

Based on the social and economic dynamics and effects identified in the first step of our methodology, we formulated the hypotheses in **Table 2** to test with the interview protocol.

Benefits and Costs of Certification

A predicate of our research is that certificate holders were intentional and sought certification in pursuit of specific types of benefits (e.g., Roheim et al., 2018). Hypothesis group 0 articulates an important baseline, that fisheries receive the types of benefits they seek from certification.

Importantly, the type of benefits pursued is not a mechanism within the theory of change, but rather an enabling condition, where pursuit of different benefits leads to changes in

TABLE 1 | Survey respondent numbers by stakeholder group and fishery.

	Portuguese sardine purse-seine fishery	South of Brittany sardine purse-seine fishery	United States West Coast albacore
Fishery manager	1	0	4
Certified Fishery	0	4	2
Certified value chain (Processor)	1	3	2
eNGO	2	0	0
Total	4	7	8

TABLE 2 | Hypothesized Effects of the MSC Certification Process.**0. Benefits and costs of certification**

1. Fisheries participants receive the benefits they expect from certification
2. Fisheries certificate holders are satisfied with the suite of benefits they receive (whether they were expected or not)
3. Fisheries certificate holders perceive that the benefits of certification outweigh the costs

I. Value chain structure and the distribution of fishery benefits

1. Economic benefits accrue within the value chain, but not to the harvesters
2. The certification process leads to a narrowing of the value chain including:
 - a. Shifting market share toward certified harvesters
 - b. Shifting market share toward certified processing
 - c. Making uncertified participants worse off

II. Final markets and product form

1. Certification causes shifts in product form toward higher value or value-added forms that can obtain better prices
2. Certification redirects products to higher end markets

III. Employment structure

1. Certification affects the structure of harvesting sector employment
2. Certification affects the structure of processing sector employment

IV. Conflict and partnerships

1. Certification catalyzes resolution of conflict among groups undergoing certification, but creates conflict between certified and uncertified groups
2. The certification process incentivizes partnership among [some combination of] the following: harvesters, fishing associations/co-operatives, government, scientists, processors, wholesalers, exporters, NGOs, middlemen
3. Partnerships lead to:
 - a. Improved management
 - b. Improved products
 - c. Spillovers into other fisheries (knowledge or partnership benefits accrue in non-certified fisheries in which stakeholders also participate)

V. Management and Governance

1. The certification process causes fisheries to undertake costly changes in management or operation
2. Fisheries will incur costs to meet the conditions put on certification
3. Those costs will catalyze the formation of new partnerships or create conflicts or differences among segments of the fishery

Hypotheses identified through literature review and consultation with MSC field staff who had observed changes during certifications in which they participated.

markets, partnerships and governance processes, and the benefits eventually received. We collected this information by asking each key informant to identify the benefits they expected, benefits that were hoped for, and then separately whether each of those benefits had been obtained, and whether there were benefits that were unexpected (e.g., see Q9–11 in FISHER questionnaire in **Supplementary Appendix 1**); each actor is also asked whether they believe the benefits received have been worth the costs incurred by people in their role (e.g., Q13–15 in FISHER).

We focus on key socio-economic changes that the MSC certification process is conjectured to affect and for which there is little existing data, namely those affecting certificate-holders and occurring through the market, through altering partnerships among people and organizations, and through modifying governance. Developing formal models for each

hypothesis is beyond the scope of this project; rather, narratives we capture will inform refinement and model development. These processes may have importance for first movers or followers within a market category, or at different stages of the certification process, such as preparation for certification, initial review, post-certification, or in considering whether to renew certification.

Market Process Hypotheses

A pathway commonly described by MSC field staff is laid out in hypothesis group I, that the CoC certification alters the structure of the value chain, establishing a parallel value chain that is narrower than the previous chain of custody, and which distributes fishery benefits differently among actors. CoC certification may provide more market power to first buyers,

as they face less competition for ex vessel fish, allowing them to retain a larger share of fishery rents. As a result, economic benefits of certification may accrue within the value chain, but not be passed down to the harvesters. To gather evidence for these changes, the instrument asks harvesters about changes in their buying relationships (e.g., Q19–23 in FISHER; Q20–23 in PROCESSOR), and processors about changes in processing volumes and wholesale markets (Q11 in PROCESSOR). Non-certified harvesters may lose a key market and become worse off; non-CoC certified first buyers may become worse off, as they lose a pricing advantage or wholesale market share. Non-certified actors, especially those competitively disadvantaged by certification, can be difficult to identify or interview, so the protocol allows case study leaders to identify the best source of information about these changes, and validate it with processors or harvesters (Q18 and 33–36 in BACKGROUND).

The MSC theory of change anticipates that total fishery benefits will increase through capturing more value from consumers through changes in product form or final markets, described in hypothesis group II. Economic benefits may arise because consumers in existing markets are willing to pay more for products which are certified, because certification allows the product to be sold in markets which pay more for the product, or new product forms emerge [e.g., as described for South Africa hake by Lallemand et al. (2016)], resulting in shifts of market share. Evidence for this is based on processors' reported changes in market shares of product forms (Q16 in PROCESSOR; Q33–47 in BACKGROUND) and final markets (Q11 in PROCESSOR).

Hypothesis group III describes how the structure of employment arrangements in the harvest and processing sectors may change to reflect the changes in the practices of catching, handling and processing fish, as can occur when certification provides access to an export market. For example, a shift toward a higher quality product may require better timing of landings at processors, which could lead to a smaller amount of crew work over the course of a longer season; for processing workers, more predictable landings may mean less overtime pay, but more total months of processing work each year. The protocol allows the case study leader to use the best available data source, validated by harvesters and processors, to calibrate changes in levels and nature of ownership and employment (BACKGROUND Q18–22, 44–45).

Partnership Process Hypotheses

Fisheries are often made up of different groups, divided by geography, industrial scale, gear, culture or history. Broadly, MSC field experience suggests that partnerships can be formed, or conflicts arise, between harvesters and managers, focused around meeting the MSC Fisheries Standard (hereafter, the Standard). Hypothesis group IV lays out how partnerships between the harvest and post-harvest sectors may alter products, markets and the structure of the value chain in order to capture more value for the product. Where upstream buyers initiate the certification process, relationships among harvesters and processors may be strengthened through the joint effort to improve value in the supply chain. Conflict might particularly arise involving processors or middlemen

who handle less fish because they are not CoC certified. The survey gathers information about these processes through general questions asking informants to identify and explain changes in partner relationships (FISHER Q19–22,25; PROCESSOR Q20–23,25; MANAGER Q19–22,24; NGO Q19–22,24), with focused questions on harvester-processor relationships (FISHER Q23) and each actor type and MSC staff (FISHER and PROCESSOR Q24 and MANAGER and NGO Q23).

Governance Process Hypotheses

For most fisheries that go through the MSC assessment process, the third-party conformity assessment body (CAB) will require a set of conditions for the fishery to meet in order to maintain the certificate that can range from changes in fishing practice (e.g., gear deployment, fishing effort), impact information (e.g., benthic impact assessments) or governance (e.g., observer program to monitor incidental by catch, new harvest control rules). Hypothesis group V captures MSC field experience which suggest that fisheries applying for certification find a party willing to incur these costs and will organize themselves to realize efficiencies in complying with conditions to certification. These management changes may entail resource investment from producers, supply chain actors, or institutions (e.g., staff time to lobby for changes or generate documentation, and costs of new monitoring programs or impact assessments). An example of some of the changes and actors involved is described in Bellchambers et al. (2014) for Western Australia rock lobster. The protocol captures evidence for these changes by asking the case study leader to work with appropriate key informants to identify the changes that were made to attain certification, and to track how required certification conditions were met (BACKGROUND Q8). Information gathered through other partnership and change questions reveals changes in management and governance associated with certification.

By exploring whether and how these hypotheses are true in different fisheries, we can identify the mechanisms through which MSC certification produces desired benefits, imposes expected costs, and leads to positive or negative unintended consequences (i.e., consequences that do not catalyze positive change).

CASE STUDY DESCRIPTIONS

The United States albacore, and Brittany and Portuguese sardine fisheries provide contrast in relation to their scale, geography, target species, gear type, management regime, ease of entry into the fishery and certification history. They share as key commonalities that vessels sell primarily to large processing facilities, and historically sell products with relatively low-cost processing into global commodity markets. They are all also similar in scale and ownership structure, as the semi-industrial vessels tend to be family businesses that rely on them for personal income. Further, all are developing a smaller, higher-valued fresh market for their products. These similar value chain structures allow us to identify patterns in the effect of certification that are robust to the diversity of other characteristics. However, extrapolation to other fisheries must be done with care, as

certification likely relies on other mechanisms in fisheries with different market structures and characteristics.

United States West Coast Albacore

The United States West Coast surface hook-and-line albacore tuna fishery uses highly selective pole-and-line or troll/jig gear to catch albacore tuna (*Thunnus alalunga*) at the surface in the eastern central Pacific Ocean, and in the southwest Pacific Ocean (PFMC, 2018). Landings in the United States are approximately 11,000 tonnes per year, roughly 19% of the catch from the stock; Chinese-Taipei and Canada each catch about 6% of the stockwide total, with Japanese effort accounting for nearly all the rest (ISC, 2019). Albacore vessels are members of one of three associations. In the years leading up to 2017, the American Albacore Fishing Association (AAFA) consisted of roughly 50 vessels which catch approximately of 5,000 tonnes with live bait and pole-and-line gear. These vessels have 4–6 crew and take trips less than a week. Albacore harvesters using troll/jig gear account for the rest of the certified catch. They are affiliated with the Western Fishboat Owners Association (WFOA), which is a broader association with members who specialize in, or are portfolio harvesters among, a number of fisheries. About 50 WFOA vessels are full-time albacore boats with onboard freezers: 13–18 m boats take trips lasting 2–3 weeks, and those up to 40 m may fish for as long as three months. Another couple hundred vessels target albacore at some point during the year, with smaller vessels taking 4–5 day trips 60–80 km offshore and icing their catch. Canadian vessels are members of a separate association. They often fish in United States waters under terms of a bilateral United States-Canada treaty, and sometimes land with United States processors. Albacore is also landed in small amounts as by catch by several hundred vessels in longline and gillnet fisheries targeting other species.

Albacore is landed at sites throughout the west coast of the United States, with largest concentrations in Oregon. Historically, frozen albacore “bullets” (whole fish) are landed and exported for processing at global canning hubs, and sale in the commodity tuna market. Roughly 70% of albacore is currently sold into the canned market, with processing in Asia and the European Union (E.U.). Final markets for the canned products are the United States and E.U. Roughly a quarter of landings are exported and loined for sushi, in many cases reimported into the United States for consumption. There is a very small local market for steaks and loins, through direct sales and local fish dealers who serve restaurants and consumers.

The hook gear albacore fishery in the United States is open access; a highly migratory species permit is required by NOAA, but these are not limited in number. The stock status is monitored by a complex network of agencies and international bodies, leading to many management perspectives. Stock monitoring is conducted by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). It provides advice to the Inter-American Tropical Tuna Commission (IATTC), which manages tuna in the eastern Pacific, and the Western and Central Pacific Fisheries Commission (WCPFC), which manages tuna in the southwest Pacific Ocean. The United States is a member country of ISC,

IATTC and WCPFC. United States fishery participants are regulated by the Pacific Fishery Management Council (PFMC) and supported by staff at the NOAA Southwest Fishery Science Center (SWFSC). Through participation in the PFMC process, fisheries managers working for state agencies in Washington, Oregon and California contribute to management. Considerable economic research is conducted in support of the United States-Canada treaty. The albacore stock did not have established biological reference points at the time of this study, though it was currently undergoing a management strategy evaluation process to establish them. As of 2017, there were no regulations established by IATTC or WCPFC to limit total allowable albacore catch on the North Pacific albacore stock.

AAFA and WFOA are the current certificate holders for United States albacore, and their respective leaders are widely recognized as influential in the fishery, and in participation in the MSC certification process. AAFA was established in 2005, when roughly 20 albacore-focused pole-and-line vessels split from WFOA to focus on albacore marketing; these vessels mostly fished out of southern California. They restructured how they negotiated with buyers and focused on telling the story of their family-owned American product to the market. As part of this, they became the first MSC certified tuna fishery in 2007, leaving WFOA vessels as a comparable uncertified fishery. As AAFA enjoyed benefits from their certification, WFOA later joined with the Canadians to certify the rest of the fishery in 2010. At a time when uncertainty over renewal of the United States-Canada treaty made it difficult to sustain inter-association cooperation, WFOA joined AAFA's certificate in 2014 to share certificate costs. The Canadian Albacore Association currently holds a certificate for Canadian vessels participating in the fishery.

South Brittany Sardine

In 2017, there were 28 active vessels in the South Brittany sardine fishery, all of which were less than 17 m long. The fishery is prosecuted between 5 and 10 nautical miles offshore of the south coast of Brittany (France) coastline in FAO (Food and Agriculture Organization of the United Nations) zone VIIIa and statistical rectangles 25E5, 24E5, and 24E6. In general, the vessels use *bolinches* (purse seines) to capture sardines (*Sardina pilchardus*), which tend to gather in schools close to the surface. The annual catch was estimated to be around 15,000 tonnes in 2013 (MSC, 2020b). There are 2–5 shoreside processors in the region, depending on the season. Some sardines are sold as fresh round fish to wholesalers, supermarkets and fishmongers; some are frozen; and some are canned. The sardines caught in this fishery are mostly 10–20 cm in size, with the smaller size going to the cannery market, and the larger size to the fresh fish market. Frozen and canned sardines are exported primarily within the EU.

Sardines are landed through auction houses located in Le Guilvinec, Douarnenez, Saint Guérolé, and to a lesser extent in Audierne, Lorient and Concarneau. The principal producers organization is involved in all the sardine fisheries prosecuted in the region. The harvesters also tend to participate in a number of other fisheries, including anchovy, mackerel, and seabass. The canneries all buy from multiple fisheries as well. For example,

one of the local canneries also packages Pacific tuna (including United States albacore), mackerel, Alaska salmon, coquilles Saint Jacques, and English sardines. Canneries buy sardines locally through *criée du pêche* (fish halls). In the South Brittany sardine fishery, virtually all of the individuals working in the harvesting and processing sectors are from Brittany.

The sardine fishery is managed by two producer organizations and one regional *Comité de Pêche* (fisheries committee), which is composed of harvesters. Management of this fishery occurs through vessel and gear restrictions, as well as vessel power restrictions. The most important fisherman is the president of the *Association de Bolincheurs*, a harvester association, and 2–4 other individuals are highly influential. Almost all harvesters are members of a producer organization. While harvesters are able to participate in management through producer organizations, there is no pathway for processors to directly participate in management. The producer organization's role is to create rules and manage harvesting activities through setting a minimum price and controlling the market by setting the daily quantity of product that each vessel can catch and sell. The regional *Comité de Pêche* provides technical and scientific support and establishes the number of licenses.

The South Brittany fishery is one of three groups certified for the sardine fishery off the west coast of Europe at the time of our study, along with harvesters in the Bay of Biscay (Spain) and Cornwall (United Kingdom). The South Brittany fishery was first certified in 2010 and went through the re-assessment process in 2015. Certification was led by the president of the *Association de Bolincheurs*, which piloted the MSC process with a strong push from the producer organization (Pecheurs de Bretagne) and support from the Chancerelle cannery.

After fieldwork for this study was completed, the fishery's MSC certificate was suspended in 2019 when a revised estimate of population health revealed the stock was not being harvested as sustainably as previously thought.

Portuguese Sardine

In Portugal, sardine (*Sardina pilchardus*) is captured by purse seiners, which also capture other small pelagics (e.g., Atlantic chub-mackerel, Atlantic horse mackerel, and European anchovy), mostly in FAO sub-area IXa. The purse seine fishery is the most important fishery in Portugal, with average landings of approximately 60,800 tonnes per year between 2005 and 2018 (DGRM official data). In 2018, there were 146 active vessels in this fishery, 43% of which are less than 16 m long, employing 2,181 harvesters, mostly in the North of Portugal (49%). Until 2010, sardine accounted for around 72% of the annual catches of the purse seine fleet, but stock decreases mean this value has now decreased to 17% of landings in 2018; landings of mackerel have increased proportionately. The average nominal price of sardine at first auction has increased almost fourfold since 2010 (DGRM official data).

The Portuguese market for sardines is traditionally divided into two segments: the fresh market and the canning industry. The fresh market is mainly limited to the summer months (June–September) and pays higher prices. The remainder of the year, sardine catch goes to the canning industry, accounting for around

half of the catch. The most important landing sites are situated in the north and central regions of Portugal, especially in the fishing harbors of Matosinhos, Peniche and Sesimbra. The Portuguese fish canning industry is composed of 20 companies, of which 14 process sardines, mostly in the North of Portugal (Matosinhos). A total of 9,000 tonnes of canned sardines were produced in 2017 (INE, 2019). Portugal is the main EU exporter of canned sardines, and Portuguese canned sardines are particularly present on the EU market, with 80% of exports being destined for intra-EU markets; the main destinations being France and the United Kingdom (COMEXT data).

The fishery is managed through a multi-annual management plan (DGRM, 2018), developed by the governments of Portugal and Spain, specifically designed to promote the recovery of the sardine stock and establish harvest rules. The plan sets a fishery management group (the Sardine Commission), the management process and actions to be taken. Several drastic management measures have been put in place with the management plan, such as a compulsory 45-day fishing ban, a limit to the total landings, and a 48-h fishing ban on weekends. In Portugal, a sardine follow-up commission was established, and harvesters participate in co-management through the National Association of Purse Seine Producers Organizations (ANOPCERCO), which represents all producers organizations (POs) involved in the purse-seine fishery. The canning industry is also represented on the Sardine Commission, through the National Canning Industry Association (ANICP). The remaining members of the Commission include the national fisheries science research unit (IPMA), port operator (DOCAPESCA S.A.), and the Portuguese Fishery Management Authority (DGRM), who chairs the group.

ANOPCERCO secured MSC certification for the Portuguese sardine purse-seine fishery in January 2010, with support from ANICP and IPMA. Two years later, certification was suspended, then reinstated in 2013, and suspended and withdrawn in August 2014. The first suspension arose because the low sardine stock level was not reflected in the harvest strategy. After the suspension, the Sardine Commission together with the Spanish government, agreed to several management measures to recover certification, including a reduction in catch and a management plan. Despite the efforts made to achieve sustainable management, the stock status had not recovered by 2014, and the harvest strategy was deemed not strong enough to guarantee future sustainability, so MSC certification was suspended and withdrawn.

PILOT RESULTS

Table 3 summarizes the benefits that fishery participants reported as desiring when they pursued certification, alongside the benefits respondents perceived following the certification process (i.e., the benefits observed). Benefit categories consolidate across several questions which are framed slightly differently to different stakeholders. In general, there was good correspondence among stakeholder groups about what benefits were desired and had been realized.

TABLE 3 | Summary of reported desired and observed outcomes from MSC certification.

	Albacore		Sardine (France)		Sardine (Portugal)	
	Desired	Observed	Desired	Observed	Desired	Observed
Increase economic value (price premium)	+	Initial +,*; later +	++	+,*	++	?
Market benefits (access to new markets, preserve market share)	++	++	++	++	++	++
Improve image	∅	∅	+	∅	+	+
Improve harvest	∅	∅	∅	∅	∅	∅
Improve fishing practice	∅	*	+	+	+	+
Political influence	∅	∅	∅	∅	∅	+
Improve dialog	∅	+	∅	++	∅	+

Key: + primary; + secondary; ∅ was not raised by respondents; ? unclear whether benefits were received; *observed but attributed to another process.

Desired Outcomes

For all three case study fisheries, respondents identified the same set of benefits they anticipated (or hoped for) from certification. Fishers' associations and processors both expressed a primary goal of expanding market share because canned fish is relatively commoditized, with limited opportunity to improve prices. Each saw being certified as a way to potentially open new markets, especially among European retailers who were focusing on certified sustainable sourcing. In addition, AAFA saw opportunities for certified tuna products in high-end, sustainability-focused United States grocery stores. To develop this market, AAFA developed an "American Catch" label to sell a United States-sourced product against internationally sourced tuna. The European sardine producers were largely looking to expand share within historic markets (i.e., Germany, Switzerland) as they developed a preference for certification. These avenues were envisioned to help harvesters and processors sell greater volumes, though largely at historical prices.

Complementing a desire to enter new markets, all three fisheries were motivated by preserving their existing market share. Respondents in each of the fisheries felt the management practices in place were already sustainable, and they sought certification as an affirmation of their good practices within their existing markets. The French and Portuguese sardine fisheries cast this in local, cultural terms. Brittany harvesters, in particular, sought an improvement in their reputation for sustainability and low levels of dolphin by catch. On the other hand, the United States albacore fishery used the recognition for international marketing; their West coast market emphasizes local sourcing and does not widely use the MSC label. WFOA later joined the MSC largely to ensure they maintained their export markets, and did not lose it to certified sources.

All three fisheries also mentioned higher prices as a hoped-for benefit, but said it was secondary relative to the other goals. AAFA, in particular, saw other pathways to increase ex-vessel prices, shifting from bilateral to collective negotiations with buyers. Similarly, all three fisheries continued to improve quality and develop new products as their primary pathways to increase prices.

The emphasis on preserving and expanding market share, even over price, might be associated with the actor in the value chain who initiated certification. In these canned commodity

fisheries, certification was initiated primarily by the processors. Both in Brittany and Portugal, the canneries declared they pushed the effort, though harvesters felt they shared the credit and ultimately carried through the certification process to maintain their independence. Also in the United States, the nudge for WFOA came from their processors, who wanted to preserve market share. The exception was the AAFA harvesters, who were simultaneously vertically integrating their fishing and marketing operations. While it is difficult to generalize from this mixed observation, in all cases, the processor-driven certifications were in fisheries supplying markets where another fishery for the same product had already been certified: WFOA was nudged by processors in response to AAFA, and the sardine fisheries by their processors in response to certification of the Cornish sardine fishery; both lead fisheries were harvester-initiated. This may explain why market share, rather than price premium, was the dominant narrative reported by interviewees, as canneries and processors might be reluctant to suggest their goal was to increase wholesale prices without passing those increased revenues down to harvesters through corresponding increases in ex vessel prices.

In addition to these market benefits, NGOs, government scientists and a canning industry representative in the Portuguese fishery expected that fishing practice would improve. They all mentioned that the industry was willing to improve their practices.

Observed Outcomes

Baseline hypothesis group 0 evaluates whether fisheries received the benefits that motivated them to pursue certification; the subsequent sections describe the processes through which these benefits arose. Across the three fisheries, respondents reported that being a certified source allowed the fisheries to maintain existing customers, and enjoy some expansion, largely in Western Europe where retailers were developing MSC certified value chains (i.e., mid-value chain actors with certification, allowing them to sell the final product with the MSC label). In fact, one plant that cans certified Brittany sardines also imports and cans certified United States albacore for many of the same wholesale customers. Both fisheries were early entrants for their product categories, and were able to fill this new demand; United States albacore was able to fill some of this demand at Whole Foods and smaller high-end grocery stores in the United States as well.

Both the United States albacore and Brittany sardine fisheries reported increases in ex-vessel prices and market expansions arising from efforts to improve onboard handling to support new, higher-valued product forms and value added labels concurrent with certification, rather than driven by certification. Ex-vessel prices in Brittany rose 50-100%, and AAFA albacore ex-vessel prices rose nearly 300% in the first years of certification, though it is unclear to what extent AAFA's experience reflected efforts to create and market their own brand. Even with these noted price increases across the case studies, harvesters perceived that processors were able to capture more benefits because they could sell at higher prices due to the MSC. Processors indicated that they valued the markets to which the MSC had provided access, but did not indicate wholesale price increases in interviews. Both fisheries increased quality to direct fish toward fresh products (rather than cans), into markets that do not carry the label and, in the case of albacore, do not value certification (Japan). For sardines, a fresh market was developed, and an albacore sashimi product was developed that now accounts for about 30% of the market, but label use is mostly confined to canned product in both cases.

Overall, respondents expressed satisfaction with the process of becoming MSC certified, and that the most important market share benefits had been received. However, fishers' associations' and processors' attitudes toward renewal reflected an evolution in the benefits they were currently receiving. Participants expressed that certification had become such a global norm in their markets that they felt it no longer provided a competitive advantage in pricing and further market expansion; certified supply of similar products from other fisheries had grown certified (e.g., Cornwall and Spanish sardines; WFOA and Canadian albacore fisheries), eroding some early market advantages. As they consider renewal, these fisheries were more concerned about being excluded from markets they were able to secure during early market expansion, in favor of their still-certified competitors (i.e., following this study, both fisheries did renew certification). We could not verify whether fear of market exclusion was a driver that played any role in the Portuguese sardine fishery, as it lost its certification when there were fewer certified competitors. None of the case study fisheries reported any meaningful changes in the employment structure aboard vessels, or in processing plants. In fact, the Portuguese sardine fisheries continue to use large crews on boats, identical to those prior to mechanization. The United States albacore and Brittany sardine fisheries continue to leverage family and friend networks of the vessel owners to find crew.

Market Processes

While respondents indicated that MSC certification facilitated an expanded market access in the case of AAFA, or stabilization in the case of other fisheries, we additionally wish to understand how these outcomes arose. Given the centrality of the market to these outcomes, it is market processes that are likely the primary drivers. We thus explore evidence for the hypothesis groups regarding market pathways.

The main expected and perceived benefits of being certified revolved around expanding and maintaining market share, reflecting hypothesis groups I and II. That is, certification was

seen as providing an advantage within the value chain by appealing to markets and retailers who demand demonstrably sustainably sourced products. Here, our case studies provide an illustration of differential mechanisms for both first movers and followers within the value chain. As the first certified tuna supplier, AAFA indicated they were able to expand their market into Europe; they indicated an initial small price premium at the wholesale level in European markets, but that was difficult to disentangle from other price-focused changes they made. Thus, as a pioneer, they were able to direct products into new and potentially higher value markets, supporting the market hypothesis II.2.

The other fisheries reported pursuing certification primarily to preserving existing market share, and indeed they did not report the same level of expansion attributed to the label as AAFA saw, although this difference may be due to AAFA's effort to develop their brand. However, consistent with the market hypothesis I.2, we found that once one fishery in a global market was certified, other fisheries became concerned that they would lose existing market share if they did not also gain certification. Both sardine fisheries wanted to preserve their European market shares as retailers introduced sustainability standards. WFOA observed AAFA's expansion into Europe, and wished to protect its market share with current customers and potentially expand. Importantly, with additional certified albacore on the market, AAFA reported any wholesale price premium they received was competed away, though they retained the new market share.

The MSC theory of change relies on the value chain to pass value from upstream markets to primary processors and harvesters, the basis of hypothesis group I. The requirement that MSC certified product be traded by CoC certified buyers has the potential to narrow or shorten the value chain, excluding those who cannot acquire the needed documentation to meet the CoC Standard, and shifting benefits for certified buyers from those who do not or cannot become certified. Our pilot case studies did not provide the opportunity to interview non-MSC certified buyers—in many cases these canned market commodity fish are handled primarily by large buyers who are MSC-certified. In the albacore fishery, product has shifted toward companies that currently maintain certification. However, this was established before certification, when AAFA dramatically altered the bottom of the value chain: rather than have individual vessels market their products to buyers, the association shifted to setting a price and marketing product to buyers at that price, fishing to fill contracts.

A manager interviewee provided an analysis showing that North Pacific albacore first buyers who were MSC-certified (as of 2016) increased their market share from 53% of landings to 78% in years subsequent to introducing certification. This analysis uses PacFIN data that tracks landings of albacore at United States west coast ports from years 2000 to 2016, with individual landings coded as being to first buyers that held MSC CoC certification as of 2016. The comparison calculates average market shares of eventual CoC buyers in years before 2007 and after 2006 for the two groups. This is consistent with the market hypothesis I.2.b, that the certification process shifts products toward MSC-certified actors in the value chain.

The particular characteristics of our case study fisheries provided less evidence around other hypotheses. The hypothesis group II suggests pathways for certification to increase prices at different levels of the value chain. The pilot case study fisheries tell a more nuanced story: they did obtain higher prices, but increases were not attributed to the label by respondents. Rather, AAFA and the Brittany sardines experienced higher prices through coordinating sales, which coincided with the certification process. AAFA restructured how they formed prices with buyers, so much of the persistent price change arose before the certification date. While these efforts may be associated with a larger collective effort with which becoming certified was also a part, no one attributed either the price increase directly or the partnerships that led to the quality improvements to the MSC certification process. However, it is possible that there is an interaction between the industry collaborations needed to establish MSC certification and those required to implement marketing or handling improvements in critical mass to develop a reliable supply for a new market. Our interviews did not ultimately provide evidence of a causal direction. However, the Brittany sardine fishery mentioned they were able to negotiate a better price with the buyers—capturing a part of the wholesale price premium—because they created a single, unified producer association for the first time, as a requirement of MSC certification.

Importantly, these case studies show these market share benefits arising primarily at the wholesale level: none of the three fisheries consistently used the MSC label to attract retail consumers. Because the MSC only tracks the quantity of units sold with the label and final product weight of those units (including value added elements such as oil, vegetables, and mayonnaise), it is impossible to know exactly how much landed weight is sold with the label; however, one major albacore processor estimated only 10% of landings made it to consumers with a label. Similarly, one major French canner indicated that only 10–40% of certified landings were ultimately sold with a label. This suggests that either the benefits of the portion of harvest sold with the MSC label make up for the costs of certification, or that alternative or additional pathways for providing benefits do not require a consumer-facing MSC label (i.e., it is the certification process *per se*, without payment of royalties that ensure the consumer-facing product exhibits the label).

The pilot case studies also do not provide evidence on the element of hypothesis II.1 that MSC-certified value chains would support the development of value-added products. In both United States albacore and Brittany sardines, higher value product streams were developed concurrent with certification, but neither the albacore loin market in Japan nor the fresh sardine market in Brittany are sold with the label. If the MSC certification process contributed to this development, it was indirectly through establishing partnerships that pursued leverage multiple approaches to increasing value, including some that did not use the label. Similarly, our case studies did not document significant changes in the structure of harvesting or processing employment, hypothesis group III.

In combination, what the processes in our case study markets have in common is that they are engaged in an entrepreneurial

approach to adding value, diversifying products and seeking new value chains. This may be either inspired by certification or be correlated as actors involved are the types of entrepreneurs that would be likely to pursue an endeavor such as certification.

Partnership Processes

The pilot case studies allow us to evaluate hypotheses group IV about how partnerships evolved during the certification process. *A priori*, it is difficult to anticipate the types of partnerships that might form, or the types of conflicts that might arise, or be resolved. Before certification, respondents across the case study fisheries agreed that harvesters had neutral to positive perceptions of and interactions with other harvesters, NGOs, government representatives, scientists, and fish buyers. There were not many conflicts in the fisheries. We identified a few partnerships that were formed concurrent with MSC certification whose causal direction is difficult to resolve, and a few with stronger links to the certification process.

All three fisheries observed partnerships evolving among harvesters surrounding the MSC process, but there was not a consistent pattern in whether the partnerships were catalyzed by, or an enabling condition for, certification. In the Brittany sardine fishery, harvesters banded together to go through the MSC certification process. This collaboration was the starting point for them to collectively set a price for their fish, which led to increased prices over the long term. However, AAFA was organized around an opportunity to alter their marketing structure, and then pursued certification for the West coast albacore fishery. Pole-and-line members split from WFOA to form AAFA in 2005. They felt broader organization—whose members primarily fished other species like salmon, crab and shrimp—could not effectively tell the story of highly selective, sustainable American-caught tuna in the crowded commodity marketplace. Part of this initiative was gaining control of their value chain, and beginning to collectively broker fish, agreeing to a price and finding buyers at that price rather than bilaterally negotiating each load from vessel to buyer. Respondents mentioned some competitive sentiment after WFOA became certified in 2010 and eroded the exclusivity and value of the AAFA certified market. However, this competitive conflict was bridged by efficiencies within the recertification process that drove WFOA to partner with AAFA to now share the same certificate consistent with the hypothesis; this sharing has not catalyzed other new partnerships among friendly competitors.

Respondents in both the United States albacore and Brittany sardine fisheries also observed collaboration between harvesters and processors around improving product quality for new markets, but there did not appear to be a strong association between these and the MSC certification process. In the Brittany sardine fishery, one respondent noted that a benefit post-certification is that the processors have invested in equipment to freeze fish very quickly after catch. The processors also work with the harvesters in order to increase deliveries of fresh product. However, the fishery does not necessarily link either of these partnership improvements to certification. Similarly, one WFOA processor indicated working with harvesters to improve onboard handling to support increased volume to the sashimi market.

However, this was not clearly linked with the MSC process, and its goal was to direct product away from the lower-valued certified value chain.

The MSC Fisheries Standard's requirements to document current stock status and maintain an adaptive management system capable of ensuring sustainability requires that parties seeking certification coordinate with managers. All three fisheries reported improved relationships with regulators through the certification process, though it is unclear whether this benefit would motivate processors or harvesters to pursue certification in other fisheries. Managers indicated that the need to maintain MSC certification had made harvesters more attentive to the science and scientific management process, and more receptive to scientists' recommendations. In Brittany, a regular meeting was established as a condition of certification to discuss the state of the stock and establish a harvest control rule. In the albacore fishery, one manager perceived the depth of industry engagement and support for establishing reference points exceeded the minimum necessary to meet the certification condition and arose out of an increased appreciation for management on the part of industry. Similarly, certification motivated Brittany sardine harvesters to start working with the managers of a local marine protected area to jointly manage the stock, and more recently enhanced joint stock management with the also certified Spanish sardine fishery. In the United States, managers received job satisfaction from recognition that many of the fisheries they manage, the albacore fishery among them, are widely recognized as sustainable.

In some cases, these partnerships between harvesters and management may spill over into other fisheries managed by the same people or agencies. Although the Portuguese sardine fishery lost certification when the stock crashed, both management-based collaborations and institutions persist as lasting benefits. The industry became more educated about the management process and more interventive in management. The MSC certification process had promoted interaction between the purse seine sector and researchers, led to the creation of a sardine monitoring committee, and a multi-annual management plan for Portuguese sardine, all of which continue to operate. The albacore fishery reported fishery spillover through an individual partnership, as one ICCAT (International Commission for the Conservation of Atlantic Tunas) manager involved in supporting the technical assessment came to be viewed as an expert in the process and was brought in by other Latin American countries looking to certify their fisheries. Through that collaboration, trust was built, and those countries eventually supported the manager's promotion to a key position within ICCAT.

Governance Processes

The case study fisheries do not provide a strong test of hypothesis group V, whether fisheries are willing to adopt more expensive management procedures or accept regulations that increased fishing costs to obtain certification, as they perceived the changes required changes prior to certification to be relatively minor; the primary associated costs were only those of hiring the CAB that performed the certification assessment. Each fishery had some conditions specified by its CAB (**Supplementary Appendix 2**). While the Brittany sardine fishery is biologically

managed by the European Commission and has effective limited access, management changes prior to certification were to come under the Common Fisheries Policy, and not in anticipation of certification. The required conditions for certification were to formalize the management plan and processes, but the certification was in most part recognizing sustainable practices already in place. Although the United States albacore fishery is an open access, high seas fishery, available information indicates it had been fished sustainably. The only required condition in the most recent renewal was that the industry work to support a process of identifying reference points and establishing a harvest control rule at the regional fisheries management organization (RFMO) level. Since the fishery is RFMO-managed and the certified United States industry is allocated a small portion of catch relative to other fishery participants in the RFMO, the certificate holders are unable to unilaterally drive a management change to maintain certification. The industry wrote a letter supporting a harvest control rule, and this process is now underway at the ISC (WCPFC, 2019). The Portuguese sardine fishery had a similar condition of establishing a harvest control rule which was responsive to the stock level, but the response was inadequate and ultimately led to the suspension.

DISCUSSION

Comparing and contrasting interview results across case studies against the initial hypotheses, it is clear that a range of benefits arise when fishery stakeholder groups interact around certification. However, the causal role played by MSC certification and/or eco-labeling is case-specific. Obtaining certification could provide a rallying point for harvesters, but significant changes in management and marketing in the initial case study fisheries were required by other management frameworks (European Commission and IATTC requirements) or opportunities to improve handling to support higher value products (in these cases, those without MSC labels). We observed the key leadership role being played by processors, individual harvesters, and harvester associations. A common thread was that a leader or leaders emerged to improve the fishery and support the provision of benefits. In the case studies, these activities were observed concurrent with MSC, and respondents did not attribute changes to it, though MSC certification may have been part of a portfolio of potential benefits of collaborative action.

Complicating the task of developing a general sense of the effect of certification is that benefits may vary based on whether competing fisheries are certified. Participants in both the United States albacore and Brittany sardine fisheries suggested a hysteresis effect, wherein early adopters observe market expansion, and possible price effects, but those who are not sufficiently early participants never observe a price premium or gains in market share. This market pull is an important part of the MSC theory of change. It is an incentive to drive early adopters to make necessary sustainability improvements and pioneer the eco-label on a new market and stimulate certification of others that don't want to be left behind. In the case of the Portuguese sardine fishery, the canning industry pointed to only a slight

increase in profit, due to the increase in production costs with MSC certification. Nonetheless this certification was needed in order to maintain existing Northern European markets. Sampling in a broader set of fisheries is necessary to explore the degree to which participants that join later are able to capture benefits, prevent a loss in market share, or recover lost performance.

The generality of our results may be limited by a commonality across our case studies; both albacore and sardines are canned products traded in international commodity markets alongside certified products that are otherwise identical to consumers. However, MSC certification was, in all three cases, intended to elevate these canned products above their commodity grades. Both albacore and sardines directed a small portion of landings to niche canned markets sold with the MSC label, but have yet-higher-valued non-commodity markets for fresh (sardine) or sashimi (albacore) products where the MSC label is not widely used. Benefits may differ, for example, when the label is helping to develop a new high-value export market from a developing country, or where it is targeting the highest value product forms from a fishery, purchased by a critical mass of sophisticated sustainability-motivated consumers paying high prices for, for example, fresh fish or premium restaurant meals.

There are several enabling conditions that might affect the outcomes of the hypotheses. First, the magnitude of the management changes required for certification might affect the presence, types and distributions of benefits. It may be that a fishery already meets the Standard, in which case fisheries pay CAB certification costs but create no sustainability benefits. Changes might involve scientific or regulatory processes, or on-the-water activity, and might affect both the presence of catch benefits, but also induce partnerships and conflicts that arise as costly changes are made. The effects of costly changes might interact with life history traits of target species which reflect how quickly industry can capture the benefits of reduced harvests to rebuild stocks. Second, different harvesting industry structures, with ranges of corporate and individual ownership

might affect attitudes toward certification, and how benefits are distributed. Third, similarly, different value chain structures (e.g., vertical integration; close collaboration with retailers) would affect how benefits are distributed. Fourth, different product forms, especially looking at fresh, frozen, and heavily processed products, to contrast with these canned case studies, may reveal new aspects to the certification process. Finally, the final market targeted, both geographically (United States, Europe, or other), and especially whether the product is widely sold with a consumer facing label, may affect the mechanisms by which the certification process leads to effects.

This pilot demonstrates that our interview protocol is a systematically reproducible data collection methodology that can draw on a relatively small set of key informants to capture a fishery's experience with the MSC certification process. The instrument was able to capture the narratives offered by respondents, and produced information on a range of processes that allowed comparisons across fisheries that resonated with MSC fishery experts. Along with guidelines for training and broader implementation, it can be expanded to other case-studies [e.g., see van Putten et al. (2020) for eight cases in Western Australia]. To understand the range of effects the certification process has, it is important to extend sampling beyond fisheries like our pilot fisheries, including those with certified fresh product channels, different markets, and that made considerable changes to regulations or fishing practice in order to attain certification.

Careful consideration should be given to testing the approach in Global South or small-scale certified fisheries and verifying whether the instrument is appropriate for capturing key processes and outcomes in fisheries that are less common in the MSC program. We recommend testing this survey protocol in a certified developing country fishery, especially one with a strong retail partner. On the one hand, this would ensure the questionnaire is effective in certified developing country fisheries. On the other hand, the same approach could be modified to be

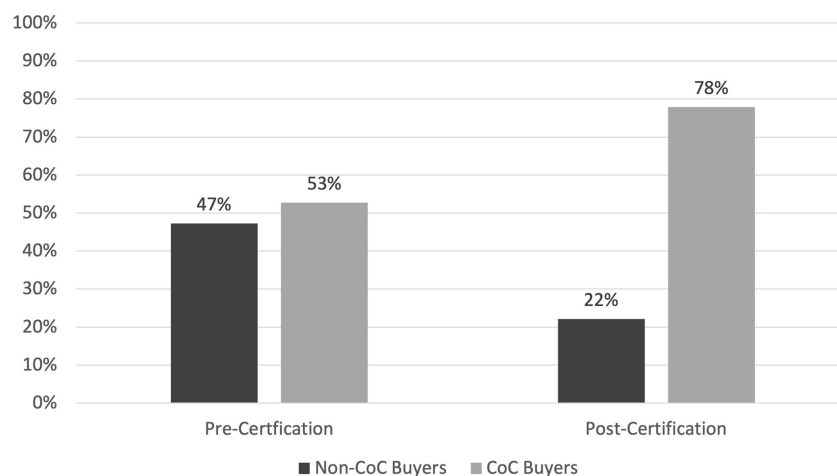


FIGURE 1 | Ex-vessel market share (lbs) of albacore purchased by first buyers who held MSC chain of custody certification for albacore in 2016, before and after initial MSC certification (PacFIN landings for United States west coast 2000-16; <https://pacfin.psmfc.org/>).

applicable to fisheries that are seeking MSC certification, but are still recognized as a Fishery Improvement Project (FIP), in some cases already with some form of market recognition. Collecting data in these contexts could inform MSC's approach in increasing access to the program for this type of fishery¹, and allow scoping of how different the information required for FIPs would be.

Given the semi-structured nature of the interviews, and the reliance on the case study leaders to derive results as a narrative synthesis, an important consideration in implementing this approach is the degree of expertise required and ability to critically appraise and handle biases of the people who identify key informants and conduct the interviews. While it may be more efficient for an internal MSC team to reproduce the approach by directly contacting certificate-holders, it presents obvious conflicts of interest, and may compromise credibility, casting doubts that the study was engineered to ensure results emphasized MSC benefits. Additionally, interviewed certificate-holders, if they consider the study to be MSC-led, may over-emphasize or exaggerate negative feedback if they see it as a chance to lobby the MSC for specific changes in the program. This pilot was developed by a collaboration between MSC staff and external scientists, to ensure a diversity of perspectives, and with shared responsibilities over credibility of the final product. The ideal sampling strategy would rely on external researchers with disciplinary training in accurately representing fishery participants' perspectives and a broader team of enumerators, who would work in close concert with an MSC staff team consulting on strategic decisions and interpretation of results.

CONCLUSION

While many fisheries enter the certification process in hopes of securing economic benefits from certification, mainly associated with the use of the MSC eco-label on consumer-facing products, there are additional and not always anticipated effects related to social and governance outcomes. For example, market expansion, collaboration among harvesters, and increased trust and cooperation between industry and managers provide benefits to harvesters and value chain stakeholders, and align with objectives of NGOs that fund fishery investment initiatives. These mechanisms can affect different stakeholder groups and actors within those groups in a variety of ways; deliver effects through a range of different, context-specific pathways; and operate in ways that are difficult to document relying on existing quantitative data. Nonetheless, it is important to have a systematic way of observing these mechanisms, as they represent the heart of how the MSC's theory of change expects to catalyze improvements. Through their monitoring, we can evaluate the direct and indirect impacts of the MSC program on the ground, whether intended or unintended.

The pilot case studies presented in this paper represent a proof-of-concept that a relatively low-cost key informant approach can capture comparable sets of information across diverse fisheries about key mechanisms within the MSC theory

of change (MSC, 2019b). The results of this pilot demonstrate a more nuanced and complex set of drivers and time-variant factors influence the scope of benefits of certification, beyond the often-studied yet elusive price premium. The information gathered with this protocol is not available elsewhere and can only be collected through interviews with people directly involved in each fishery; when conducted at scale, teams of interviewers can be trained, and cross-check one another to manage individual biases. Nonetheless, the pilot studies presented are unlikely to display the full range of outcomes and learnings around the value chain, as already seen when replicating this study in Western Australia (van Putten et al., 2020). Understanding how mechanisms in the MSC theory of change operate generally will require assessment of a broader and more diverse set of fisheries and associated value chains, as will systematizing knowledge of special cases that may provide insight into how to expand accessibility to the Standard.

There are different audiences for this type of information both within and external to the MSC that can provide the scope for different analytical products that can be derived using the data from the qualitative interviews collected for this project. Cross-sectional analysis that characterizes the most common social and economic effects would be of particular interest to fisheries trying to determine what kinds of impacts are likely to occur if they go through certification. Importantly, understanding what enabling factors can enhance the likelihood of desired outcomes (e.g., harvester cooperation increasing the leverage on the value chain to share price benefits, use of certification to improve local public perception), would help them determine their suitability for the program. Cross-sectional comparisons will provide the MSC with information to share with stakeholders, in an endeavor to transparently monitor any negative impacts that need to be corrected for in specific fisheries or types of fisheries. This will also support a broader internal perspective that looks at the certification program as a whole and how stakeholders interact with the certification process. Deeper analysis of individual case studies can lead to an understanding of infrequent outcomes, to identify and address egregious negative impacts or enabling conditions that are more common in different types of fisheries. Examining positive deviants may also suggest methods or pathways for expanding the frontier of influence of the MSC program, for instance into fisheries where there is less management capacity.

This project develops and demonstrates a compelling approach for understanding both expected and unexpected effects of certification that are not already routinely examined as part of the MSC Standards' audits. Further implementation of this protocol will allow the MSC to effectively monitor key social and economic impacts of certification, and to systematize disparate pieces of existing knowledge (e.g., MSC staff anecdotes, general expectations based on experience of fisheries scientists, experiences of key informants for specific fisheries) to better understand the MSC's overall impact. Collecting this information is also likely to support the MSC's internal evaluation process to help it be more effective at delivering benefits to its fisheries. In openly sharing a reproducible, hypothesis-driven, systematic protocol

¹<https://www.msc.org/what-we-are-doing/pathway-to-sustainability>

(**Supplementary Appendix 1**), this project also aims to incentivize further independent, research that may increasingly improve our understanding of the emerging consequences of certification.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: Individual fishery landings data in **Figure 1** are reported by private fishing vessels to west coast state departments of fish and wildlife and organized and maintained by Pacific States Marine Fisheries Commission (PSMFC) staff in the PacFIN database. The enabling legislation specifies that these observations about individual entities are confidential, and may only be publicly distributed when observations from multiple entities are combined to ensure confidential information is not revealed (i.e., 50 CFR §229.11). This precludes distributing the raw data on which we based our analysis. PSMFC has frequently applied processes for sharing confidential data with outside researchers in a variety of fields, when they are collaborating with NMFS scientists. Requests to access these datasets should be directed to Pacific States Marine Fisheries Commission info@psmfc.org.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Washington IRB STUDY00002572 (exempt). The ethics committee waived the requirement of written informed consent for participation.

AUTHOR CONTRIBUTIONS

CA and AH-C share equal co-lead authorship. CA and AH-C developed the methodology and wrote the first draft. CA, AH-C, and CP collected and analyzed the data. CL was responsible for

study ideation and funding procurement. SS analyzed the data presented in **Figure 1**. All authors contributed to writing and editing the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2021.791085/full#supplementary-material>

Supplementary Appendix 1 | Survey instrument.

Supplementary Appendix 2 | Certification history of case study fisheries.

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The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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