Marine Policy xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Fishery improvement projects: Performance over the past decade

James Cannon[a], Pedro Sousa[a,*], Isidora Katara[a,b], Pedro Veiga[a], Braddock Spear[a], Douglas Beveridge[a], Tracy Van Holt[c]

[a] Sustainable Fisheries Partnership Foundation, 4348 Waialae Ave. #692, Honolulu, HI 96816, United States
[b] Centre for Environment, Fisheries and Aquaculture Science, Pakefield Road, Lowestoft, Suffolk NR33 0HT, United Kingdom
[c] Center for Sustainable Business, Stern School of Business, New York University, 40 West 4th Street, New York, NY 10012, United States

ARTICLE INFO

Keywords:
Fishery improvement project
FIP
FishSource
Management
Supply chain
Sustainability

ABSTRACT

Fishery improvement projects (FIPs) are multi-stakeholder platforms for engaging retailers, importers, processors, and others in seafood supply chains directly in the policy-making and management of fisheries. FIPs vary in design and aim, making their evaluation complex. Studies to date have highlighted successes but also raised concerns about the performance of FIPs in improving fisheries. Drawing on a comprehensive dataset of attributes on all public FIPs, combined with sustainability performance data on the management of the target fisheries, their fishing levels, and stock status, this paper evaluates the performance of FIPs worldwide on improving fisheries, using exploratory data analysis methods and regression-based statistical approaches. The results showed that FIPs improved critical problems in target fisheries in the range between 60% and 82%, depending on the sustainability criteria considered. Performance did not vary between artisanal and industrial FIPs or according to the economic development status of the country. The probability of achieving improvements in management and overfishing domains is higher for fisheries with FIPs compared to those without. Variability in performance was related to the specific characteristics and history of each FIP, based on which further steps in research were suggested.

1. Introduction

Fishery improvement projects (FIPs) rapidly expanded over the past decade, but academic research into their performance on addressing sustainability issues is still scant. Individual case studies have analyzed the contribution of FIPs in specific fisheries [1–4] or in a small number of similar fisheries [5,6]. A broader study of the FIP model and its performance has been carried out using relatively coarse measures of progress [7].

This paper evaluates the performance of all publicly reported FIPs globally in rebuilding biomass, reducing fishing mortality levels, reducing illegal fishing, aligning quotas set by managers with those advised by scientists, and introducing precautionary harvest control rules (HCRs) that mandate reductions in fishing mortality at low biomass levels. The questions investigated were:

- Did FIPs improve fisheries?
- Did FIP performance vary depending on whether the fishery was artisanal or industrial, or in countries at different levels of economic development?
- Did FIPs improve critical problems in the fisheries?
- How fast did FIPs improve fisheries with critical problems?
- Did fisheries with FIPs improve more than those without?

A comprehensive database on FIP attributes, progress, and sustainability performance was developed for all FIPs known to have been active at some point in the past decade, based on FIP public records and their respective sustainability indices from FishSource.com,[1] typically updated on an annual basis, which were used to analyze FIP progress. This is the first study on which specific measures of fisheries' sustainability are used to evaluate FIP performance at the global scale.

1.1. Background: the origins and diversity of FIPs

In 2002, fishery improvement partnerships were introduced as a multi-stakeholder platform for engaging retail and restaurant seafood buyers and their suppliers as partners directly in the policy-making and management of fisheries they sourced from [8]. These improvement partnerships focused on fisheries important to international supply chains, meaning they were often large and globally significant sources

* Corresponding author.
E-mail address: pedro.sousa@sustainablefish.org (P. Sousa).
[1] FishSource.com, a program by Sustainable Fisheries Partnership Foundation, is an online website with information on status of fisheries and fish stocks.

https://doi.org/10.1016/j.marpol.2018.06.007
Received 15 January 2018; Received in revised form 8 May 2018; Accepted 15 June 2018

Table 1
FishSource score indices and fisheries status and management criteria, typically updated on an annual basis, with underlying principles and rules of measurement for each score. FishSource scores were used for measuring fisheries' sustainability performance.

Score	Question	Principle	Quantitative measure
Harvest Strategy	Is the management strategy precautionary?	Harvest rates (F, fishing mortality) should be reduced when biomass is very low.	$F_{\text{at low biomass}}/F_{\text{target}}$
Management	Do managers follow the scientific advice?	The catch limits (TAC) set by the managers should align with the catch limits advised by the stock assessment.	$TAC_{\text{set by managers}}/TAC_{\text{advised}}$
Compliance	Do fishers comply?	The actual catches should not be higher than the catch limits set by managers.	$Catch/TAC_{\text{set by managers}}$
Stock Health	Is the fish stock healthy?	Current stock biomass (B) should be higher than the target biomass.	$B_{\text{current}}/B_{\text{target}}$
Overfishing	Is the stock overfished? Will the fish stock be healthy in the future?	Current fisheries mortality should remain at or below the fishing mortality set as a target mortality by the stock assessors or managers.	$F_{\text{current}}/F_{\text{target}}$

of seafood but their future was at risk because of poor fisheries management [9].

Major seafood buyers supporting these early FIPs described the strategy as "fix the worst first," meaning prioritize engaging the worst performing fisheries in their supply chains, and within those fisheries, focus improvement efforts on the worst problems (e.g., [10]). These FIPs typically focused on urgent issues (such as rebuilding depleted stocks) and postponed other needed improvements until adequate progress had been made on the top priority issues. These early FIPs typically focused on larger fisheries within existing supply chains that were prioritized for action by buyers based on their greater commercial importance, were almost all large in scale and sought to cover the entire biological stock and management unit (e.g., Russian pollock, Barents Sea cod FIPs).

As other organizations adopted and adapted the FIP concept, different models emerged that varied according to a range of factors. California Environmental Associates identified four key factors [11]: (1) structure (*basic*, i.e., focused on one or two serious problems, versus *comprehensive*, i.e., working on all problem areas); (2) main lead (either by industry or a non-governmental organization (NGO)); (3) fishery status (i.e., improving a fishery with significant problems or celebrating a relatively "good" fishery with the intent of helping it rapidly achieve certification (e.g., Marine Stewardship Council (MSC))); and (4) the presence or absence of international supply chain engagement. FIPs also varied significantly in their scale, from small FIPs run by individual companies on only a few vessels or a small geographical portion of a fishery, up to large FIPs involving all the main producers and supply chain companies, and covering the entire biological or management unit of the fishery.

The term "fishery improvement project" (FIP) was adopted in 2008 to encompass this diversity of FIPs worldwide [12]. A formal definition was agreed in 2012 by the main NGOs engaging seafood buyers and supply chains [13]. FIPs work to improve fisheries that are themselves highly diverse. Fisheries vary according to a number of factors, often interlinked, such as their starting conditions in terms of management and sustainability (e.g., stock status and quality of existing science, monitoring, and enforcement), the magnitude of total annual catches, their importance to national policy-makers, heterogeneity of gears and fleets, the number of management jurisdictions, fisheries management budgets, ecological complexity, and social problems. Such factors can have a bearing on the success of fisheries management [14–17], and hence on the likelihood of success of a FIP, the speed with which improvements can be made, and the time it may take to raise the fishery to high levels of performance.

2. Data and methods

2.1. Data

A comprehensive global database of a total of 109 FIPs publicly reported as active at some point in the past decade (as per June 2016) was compiled with more than 60 different attributes per FIP (SI Tables 1, 2) including fisheries sustainability performance indices on management and stock status as well as external factors that could be influent upon FIP performance. The FIPs included in the database all publicly reported in conformance with Conservation Alliance for Sustainable Seafood guidelines and definition for a FIP [13]. Projects self-describing as FIPs, but not conforming with the Conservation Alliance for Sustainable Seafood definition and public reporting guidelines, were excluded from the database (e.g., development-agency-funded programs from the 1980s and 1990s that used the term "fishery improvement project" but did not include significant involvement of international supply chains, as described by [18–20]).

The FIPs' sustainability performance data was derived from FishSource, a global database of fisheries maintained by the Sustainable Fisheries Partnership Foundation that holds data on fisheries characteristics, related sustainability assessments, and associations (or lack thereof) to FIPs (SI Table 3). FishSource scores, which rate fisheries management and stock health (details in Table 1; [21]), are available as time series for most fisheries profiled on FishSource, not just fisheries with FIPs. In cases where a single FIP operated on multiple fisheries, the time series of scores were constructed from the lowest scores across all the fisheries within the scope of the FIP. The current analysis of fisheries performance was limited to the five FishSource scores. Even though these are good indicators of how fisheries are doing overall, their focus is on management quality and stock health. For fisheries where the main sustainability issues link to environmental (e.g., significant bycatch levels, impacts on vulnerable bottom habitats, etc.) and social impacts, the current analysis will not detect any changes in sustainability performance.

When quantitative measures cannot be derived, due to either a lack of publicly available data or an unusual assessment or management system, information may still be available to allow a qualitative response to each of the scores' underlying questions. Qualitative scores are obtained by using cut-off points: "< 6" refers to a high-risk condition, indicating a negative reply to the specific question being asked; "≥ 6" to a medium-risk condition, indicating that although not "high risk," improvements are required on the specific matters being addressed by the question; and "≥ 8" to a low-risk condition, indicating an affirmative reply to the specific underlying question. Determining qualitative scores is always associated with some inherent subjectivity, as opposed to quantitative scores where calculations are fixed and based on unequivocal rules (for more information on FishSource scores, data pre-processing, and metadata, see SI).

External factors that could influence FIP performance and were considered in the analysis included: seafood sectors, because they dictate strategic goals for NGOs, the industry and the supply chain (SI Table 4); macro-geographical regions [22], because they can be indicative of differences in governance and culture and sustainability strategies and goals are in general organized around regions; international Human Development Indicators [23], since FIP performance has been argued to differ based on the human, economic and social development status of the country [7]; and fleet-type characteristics, because these fundamental differences may affect how fisheries