

# 4. Fisheries Performance Assessment Toolkit (FPAT)

Benchmarking and Planning Effective Management

Presenter, Date 2022, Location



Food and Agriculture Organization  
of the United Nations



UNIVERSITY of WASHINGTON



openMSE

[www.openmse.com](http://www.openmse.com)

**Fishery Performance Indicators**

[www.fpilab.org](http://www.fpilab.org)

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2. A Framework for Fishery Development
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  - d. Re-evaluation against benchmarks
4. Summary



# The Fisheries Performance Assessment Toolkit

## The Coastal Fisheries Initiative (CFI)

The Coastal Fisheries Initiative (CFI) is a global effort to preserve marine resources and ensure that coastal fisheries can continue to play their crucial role in society, contributing to food security, as well as economic and social development.

Funded by the Global Environment Facility (GEF) the initiative rallies UN agencies and international conservation organizations behind the common goal of promoting the sustainable use and management of coastal fisheries, championing innovative approaches to, improve governance and strengthening the seafood value chain.

The CFI provides financial and hands-on technical support to coastal fisheries in six countries across three geographic regions: Indonesia, Latin America (Ecuador and Peru) and West Africa (Cape Verde, Cote d'Ivoire and Senegal).

## The Fishery Performance Assessment Toolkit (FPAT)

To measure the impact of the Coastal Fisheries Initiative, future performance must be compared to a baseline starting point. The measurement tool chosen by the CFI is the Fisheries Performance Assessment Toolkit (FPAT), a browser-based application designed to evaluate the ecological, economic, and social performance of a wide range of fisheries.

FPAT relies on data from a variety of sources ranging from the technical to the informal, and was developed specifically for monitoring and evaluation of the CFI and built on the notion that an effective management system is one that is ecologically sustainable, socially acceptable, and generates sustainable resource rents or profits (Anderson et al., 2015).

## The FPAT Process

FPAT includes two tools: the [Fisheries Performance Indicators](#): a tool designed to determine how fisheries management systems are performing in order to achieve community, economic, and ecological sustainability, and [openMSE](#): an open-source framework for evaluating the performance of alternative modes of management for a fishery.

The FPAT process uses the two tools for several purposes:

1. Characterize the current state of the fishery using the Fishery Performance Indicators;
2. Compare the FPI scores to baselines from other fisheries and regions;
3. Evaluate the expected performance of alternative management approaches with respect to fishery management objectives;
4. Implement changes to management and other interventions and use the FPIs to quantitatively evaluate the fishery improvements.

## Using FPAT

There are four steps to using FPAT that correspond to the four tabs to the left:

1. Load: Select an existing FPAT case study or load a new FPAT .xlsx data file;
2. FPI Scores: Evaluate the FPI input and output scores of the FPI;
3. Fishery Dynamics: Inspect the fishery dynamics specified in the case study or loaded FPAT .xlsx data file;
4. Projections: Select management options and conduct fishery projections to comparatively evaluate expected performance.

Detailed information on collecting the required information and using FPAT is available in the [FPAT User Guide](#).



## Load an FPAT Data File

The FPAT data file is a specially formatted Excel Workbook that contains the FPI scores and any available fishery data. You can load your FPAT spreadsheet or select an existing FPAT case study.

Once the data file is loaded, FPAT will build an operating model (OM) and simulate the historical fishing dynamics. This may take a few minutes to complete.

### Load an FPAT Data File (.xlsx)

Browse... No file selected

### Select an existing FPAT case study

Costa Rica - Multi-species

Load case study

### Metadata

<b>A. Country</b>	Costa Rica
<b>B. Location (State, City, Etc...)</b>	Norht Pacific, Guanacaste
<b>C. Fishery</b>	Small-scale
<b>D. Single or Multi-species</b>	Multi-species
<b>E. Species (top 5 if multi)</b>	Lobster, Octopus, Parrotfish
<b>F. Date</b>	8/21/2019
<b>G. Reference/Base Year of Scores</b>	2007-2011
<b>H. Author(s)</b>	Helven Naranjo Madrigal
<b>I. Author Contact Info</b>	helvenn@hotmail.com

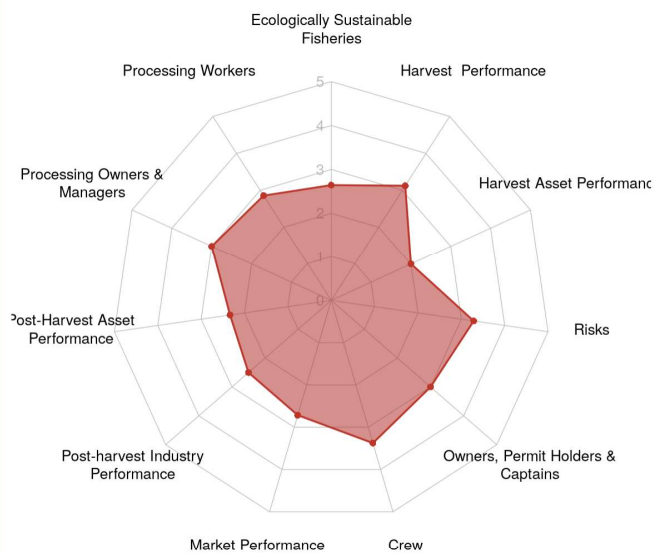
# Fishery Performance Indicators

## FPI Scores

Outputs: Sector

Outputs: Triple Bottom Line

Inputs: Enabling Conditions



## Outputs: Sector

FPI output scores measure the fishery's performance based on where wealth is accumulating in the fishery. Higher scores are better, reflecting that more wealth is being generated in the stock resource, among fishermen and the harvest sector, or in the processing sector.

This graph is used to identify the dimensions where the fishery is performing well, and to target dimensions for improvement. Different fisheries may have different, locally identified performance priorities.

As a general rule, scoring levels have been chosen so that scores below 3 reflect the need for improvement. The fishery may also be compared to benchmark scores for select categories of fisheries, average scores for those fisheries in the FPI database.

Select the desired benchmark from the drop down menu or load another FPI database to compare scores to identify dimensions where other fisheries have found ways to perform better.

## Individual FPI Scores

Dimension

Risks

Measure	Score	Description

## Comments

Discussion Text

Copy/paste discussion text here to be included in report.

## FPI Metadata

<b>A. Country</b>	Costa Rica
<b>B. Location (State, City, Etc...)</b>	Norht Pacific, Guanacaste
<b>C. Fishery</b>	Small-scale
<b>D. Single or Multi-species</b>	Multi-species
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<b>I. Author Contact Info</b>	helvenn@hotmail.com

## FPI Comparisons

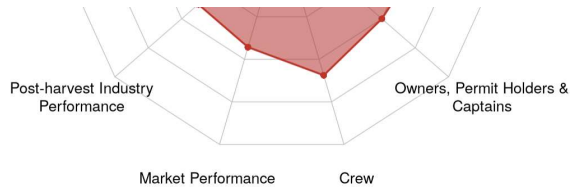
Baseline Comparison

Another FPI data file

Browse... No file selected Remove

## Download FPI Report

The FPI plots can be downloaded in a FPI Report by clicking the button below.



Select the desired benchmark from the drop down menu or load another FPI database to compare scores to identify dimensions where other fisheries have found ways to perform better.

## Individual FPI Scores

### Dimension

Risks ▼

Measure	Score	Description
Annual Total Revenue Volatility	2	Ratio of the standard deviation of the first differences of annual total revenue to the mean of total revenue over the last 10 years. Best guess may be calculated based on shorter time series if data not available. See 'Volatility' Tab.
Annual Landings Volatility	3	Ratio of the standard deviation of the first differences of annual total landings to the mean of total landings over the last 10 years. Best guess may be calculated based on shorter time series if data not available. See 'Volatility' tab.
Intra-annual Landings Volatility	5	Ratio of the standard deviation of the weekly/monthly total landings over the last three years to the mean of total landings. Observations of zero landings are included if there is biological availability. If the biological season is so short that there is not meaningful variation at a monthly level, this measure can be NA. Best guess may be calculated based on shorter time series if data not available. See 'Volatility' tab.
Annual Price Volatility	2	Ratio of the standard deviation of the first differences of annual ex-vessel prices to the mean of ex-vessel price over the last 10 years. Best guess may be calculated based on shorter time series if data not available. See 'Volatility' tab.
Intra-annual Price Volatility	5	Ratio of the standard deviation of average monthly ex-vessel prices over the last three years to the mean ex-vessel price. Observations of zero landings are included if there is biological availability. If the biological season is so short that there is not meaningful variation at a monthly level, this measure can be NA. Best guess may be calculated based on

## Comments

### Discussion Text

Copy/paste discussion text here to be included in report.

## FPI Comparisons

### Baseline Comparison

### Another FPI data file

Browse...

No file selected

Remove

## Download FPI Report

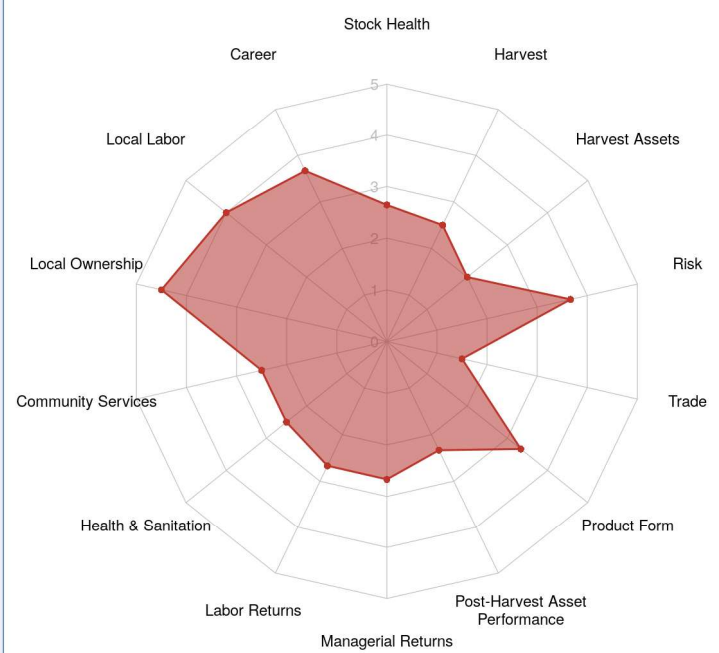
The FPI plots can be downloaded in a FPI Report by clicking the button below.

[Download FPI Report](#)

# Fishery Performance Indicators

## FPI Scores

Outputs: Sector **Outputs: Triple Bottom Line** Inputs: Enabling Conditions



### Outputs: Triple Bottom Line

FPI output scores measure the fishery's performance on the pillars of the triple bottom line. Higher scores are better, reflecting that the fishery is attaining more success on ecological, economic or community pillars.

This graph is used to identify the dimensions where the fishery is performing well, and to target dimensions for improvement. Different fisheries may have different, locally identified performance priorities.

As a general rule, scoring levels have been chosen so that scores below 3 reflect the need for improvement. The fishery may also be compared to benchmark scores for select categories of fisheries, average scores for those fisheries in the FPI database.

Select the desired benchmark from the drop down menu or load another FPI database to compare scores to identify dimensions where other fisheries have found ways to perform better.

### Individual FPI Scores

Dimension:

Measure:  Score:

### Comments

Discussion Text:

## FPI Metadata

<b>A. Country</b>	Costa Rica
<b>B. Location (State, City, Etc...)</b>	Norht Pacific, Guanacaste
<b>C. Fishery</b>	Small-scale
<b>D. Single or Multi-species</b>	Multi-species
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<b>H. Author(s)</b>	Helven Naranjo Madrigal
<b>I. Author Contact Info</b>	helvenn@hotmail.com

## FPI Comparisons

**Baseline Comparison**

**Another FPI data file**

## Download FPI Report

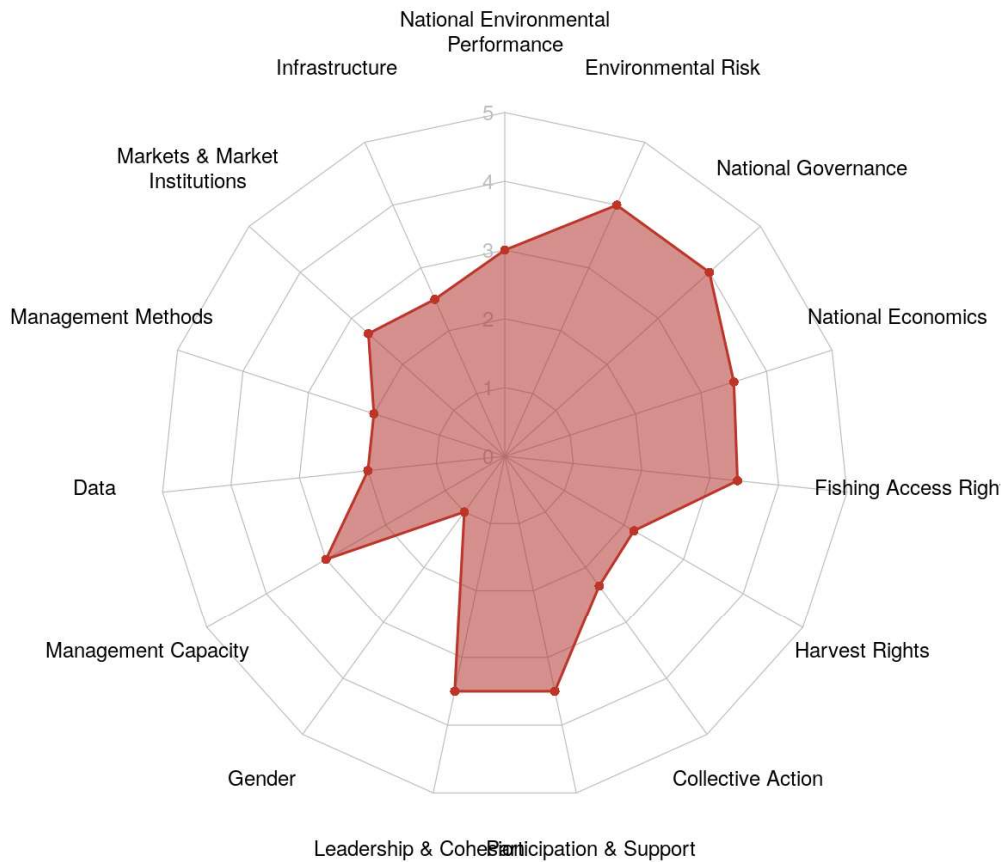
The FPI plots can be downloaded in a FPI Report by clicking the button below.

## FPI Scores

Outputs: Sector

Outputs: Triple Bottom Line

Inputs: Enabling Conditions



## Inputs: Enabling Conditions

FPI input scores measure the level of enabling conditions which support fishery performance. Higher scores reflect more of the enabling condition, though whether or how each input affects fishery performance is an empirical question. In some cases, these relationships can be complex, and depend on the presence of several enabling conditions at once.

One way to evaluate the fishery's enabling conditions is to compare them to benchmark scores for select categories of fisheries, the average scores for those fisheries in the FPI database.

Another use of enabling condition data is to select the enabling conditions that will be altered in hopes of improving the target performance dimension. Data from FPI case studies with different levels of that enabling condition, and other sources, can then be used to evaluate whether changes in that enabling condition are associated with better performance.

Select the desired benchmark from the drop down menu, and compare scores to identify dimensions where the fishery has different levels of enabling conditions than typical fisheries of the same category.

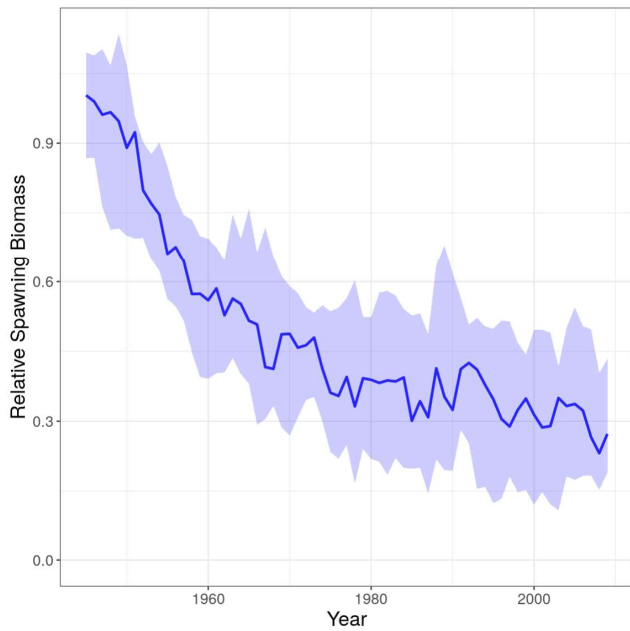




# Simulated Historical Fishery Dynamics

## Historical Fishery Dynamics

Spawning Biomass   Catch   Recruitment



### Relative Historical Spawning Biomass

The median and 25th & 75th quantiles of the simulated spawning biomass for the historical years. The spawning biomass is shown relative to the average unfished spawning biomass (SB0).

## Fishery Simulation Metadata

**Name:** Example Lobster Data

**Species:** *Panulirus gracilis*

**Common Name:** Green Lobster

**Region:** North Pacific

**Historical Years:** 1946-2010

Assumptions

## Download OM Report

An Operating Model Report with plots of all simulated fishery dynamics and parameters can be downloaded by clicking the button below.

Download OM Report

## Advanced

Download OM

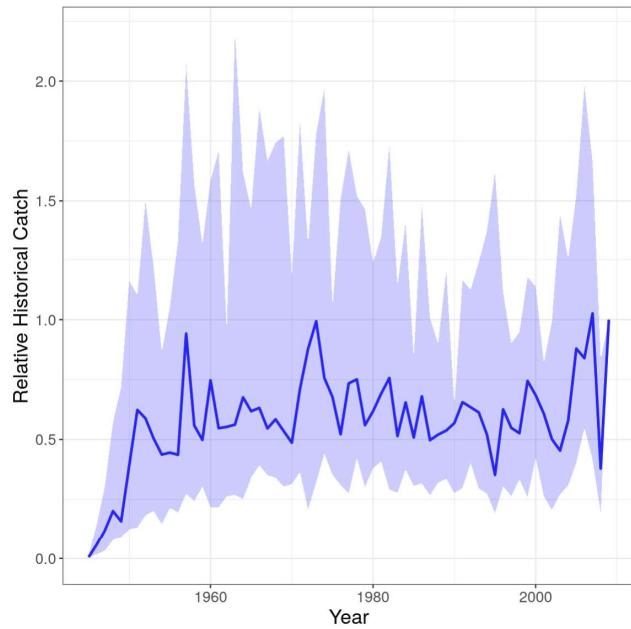
Load an OM from file



## Simulated Historical Fishery Dynamics

### Historical Fishery Dynamics

Spawning Biomass **Catch** Recruitment



### Relative Historical Catches

The median and 25th & 75th quantiles of the simulated catches for the historical years. The catches are shown relative to the catch in the most recent year.

### Fishery Simulation Metadata

**Name:** Example Lobster Data

**Species:** *Panulirus gracilis*

**Common Name:** Green Lobster

**Region:** North Pacific

**Historical Years:** 1946-2010

Assumptions

### Download OM Report

An Operating Model Report with plots of all simulated fishery dynamics and parameters can be downloaded by clicking the button below.

Download OM Report

### Advanced

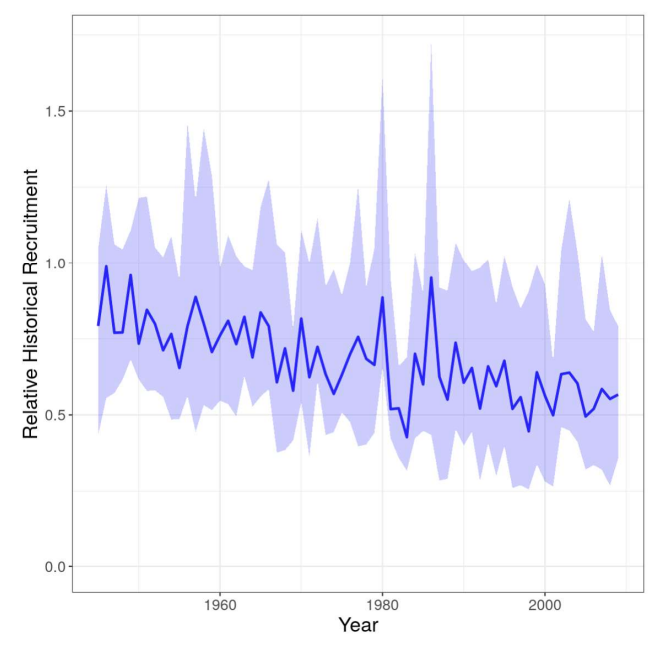
Download OM

Load an OM from file

# Simulated Historical Fishery Dynamics

## Historical Fishery Dynamics

Spawning Biomass    Catch    **Recruitment**



### Relative Historical Recruitment

The median and 25th & 75th quantiles of the simulated recruitment for the historical years. The recruitment is shown relative to the average unfished recruitment ( $R_0$ ).

## Fishery Simulation Metadata

**Name:** Example Lobster Data  
**Species:** *Panulirus gracilis*  
**Common Name:** Green Lobster  
**Region:** North Pacific  
**Historical Years:** 1946-2010

Assumptions

## Download OM Report

An Operating Model Report with plots of all simulated fishery dynamics and parameters can be downloaded by clicking the button below.

Download OM Report

## Advanced

Download OM

Load an OM from file

**Select Management Procedures**

- Status Quo Catch and Effort
- Size limits
- Length-based
- Index-based
- Spatial Management

**Custom MPs (click to expand)**

**Custom Size Limit**    **Custom Constant Effort Limit**

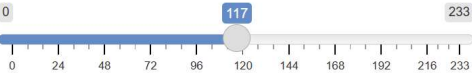
**Custom Constant Catch Limit**    **Advanced - Import MP**

**MP Name (no spaces)**

Custom\_Size\_Limit

**Size Limit**

0    117    233



Size limit is in the same units as length parameters specified in the FPAT input file.

Submit

**Selected MPs:**

Current\_Catch    Current\_Effort    Size\_Limit\_1    Size\_Limit\_2

Length\_Targeting\_1    Length\_Targeting\_2

Reset Default MPs

Select the management procedures you wish to test and run the MSE projections.

 Run MSE Projections



## MSE Projection Results

### Management Strategy Selection

#### Status Quo Catch and Effort

Fishing in the projection years is fixed at the current catch and current effort.

#### Size limits

Length-at-retention is set to size-of-maturity and 10% higher than size-of-maturity.

#### Length-based

Two management procedures that adjust the annual catch limit based on the trend in mean length in the catch.

#### Index-based

Two management procedures that adjust the annual catch limit based on the trend in the index of abundance.

#### Spatial Management

Two management procedures that 1) open an existing spatial closure (if one exists) and 2) close the planned spatial closure (if any)

#### Select Management Procedures

- Status Quo Catch and Effort
- Size limits
- Length-based
- Index-based
- Spatial Management

#### Custom MPs (click to expand)

Custom Size Limit

### MSE Results

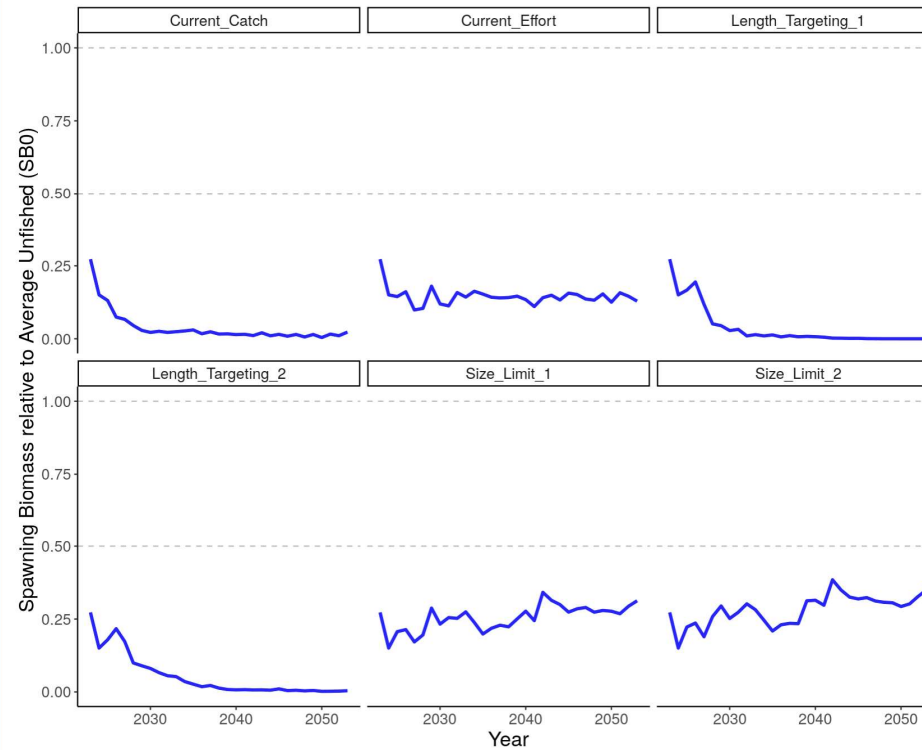
#### Projection Plots

#### Trade-Off Plots

#### Spawning Biomass

#### Catch

#### Recruitment



#### Projection Plots: Spawning Biomass

These projection plots show the median spawning biomass relative to average unfished spawning biomass (SB0) for each MP.

Plot Controls (click to expand)

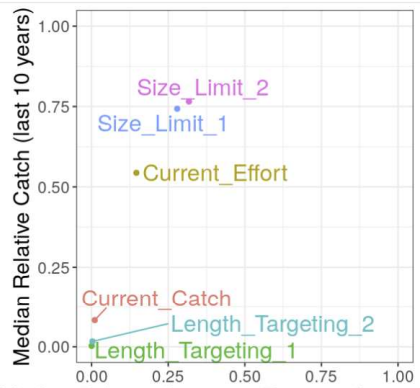
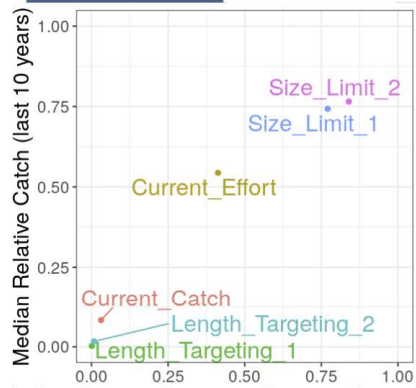
## MSE Results

Projection Plots

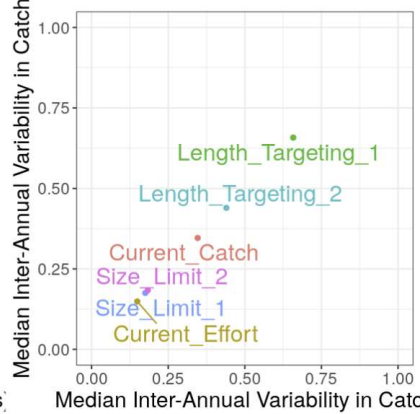
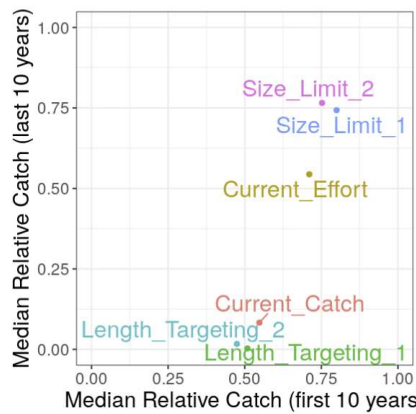
Trade-Off Plots

Trade-Off Plots

Custom Plot



Median Relative Spawning Biomass (last 10 years)



## Trade-Off Plot

### Filter MPs

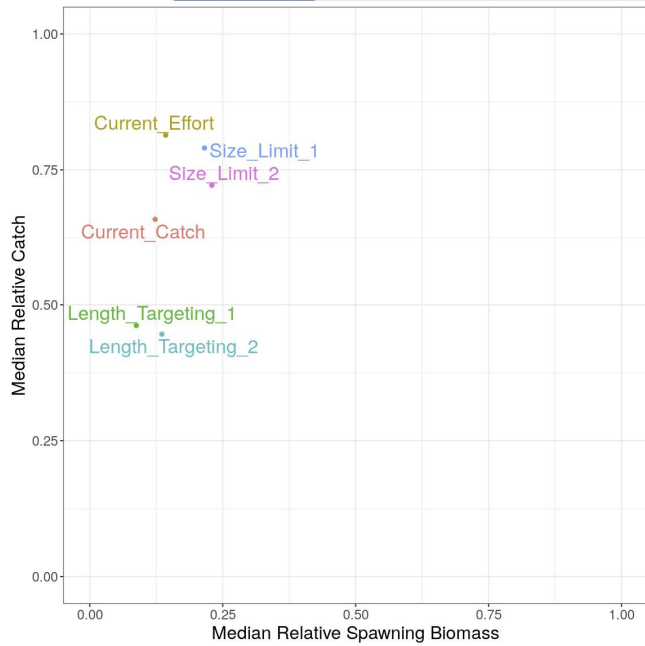
- Current\_Catch
- Current\_Effort
- Size\_Limit\_1
- Size\_Limit\_2
- Length\_Targeting\_1
- Length\_Targeting\_2

Projection Plots

Trade-Off Plots

Trade-Off Plots

Custom Plot



### Trade-Off Plot

#### Filter MPs

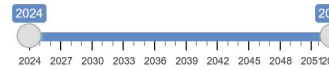
- Current\_Catch
- Current\_Effort
- Size\_Limit\_1
- Size\_Limit\_2
- Length\_Targeting\_1
- Length\_Targeting\_2

#### X-Axis

##### Variable

SB/SB0

##### Years



##### Metric

Median

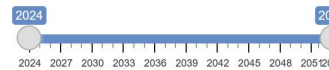
Include error bars?

#### Y-Axis

##### Variable

Catch

##### Years



##### Metric

Median

Include error bars?

## 4. Summary

### Fishery Performance Assessment Toolkit (FPAT)

1. Benchmarking: initial Fishery Performance Indicators
2. Planning: simulate fishery and compare expected outcomes from alternative management options
3. Decision-Making: select a management option and implement in fishery
4. Monitoring: expand knowledge base (research), re-evaluate FPIs, and repeat process