Socioeconomic Implications of Climate Change in the Pacific Islands Fisheries
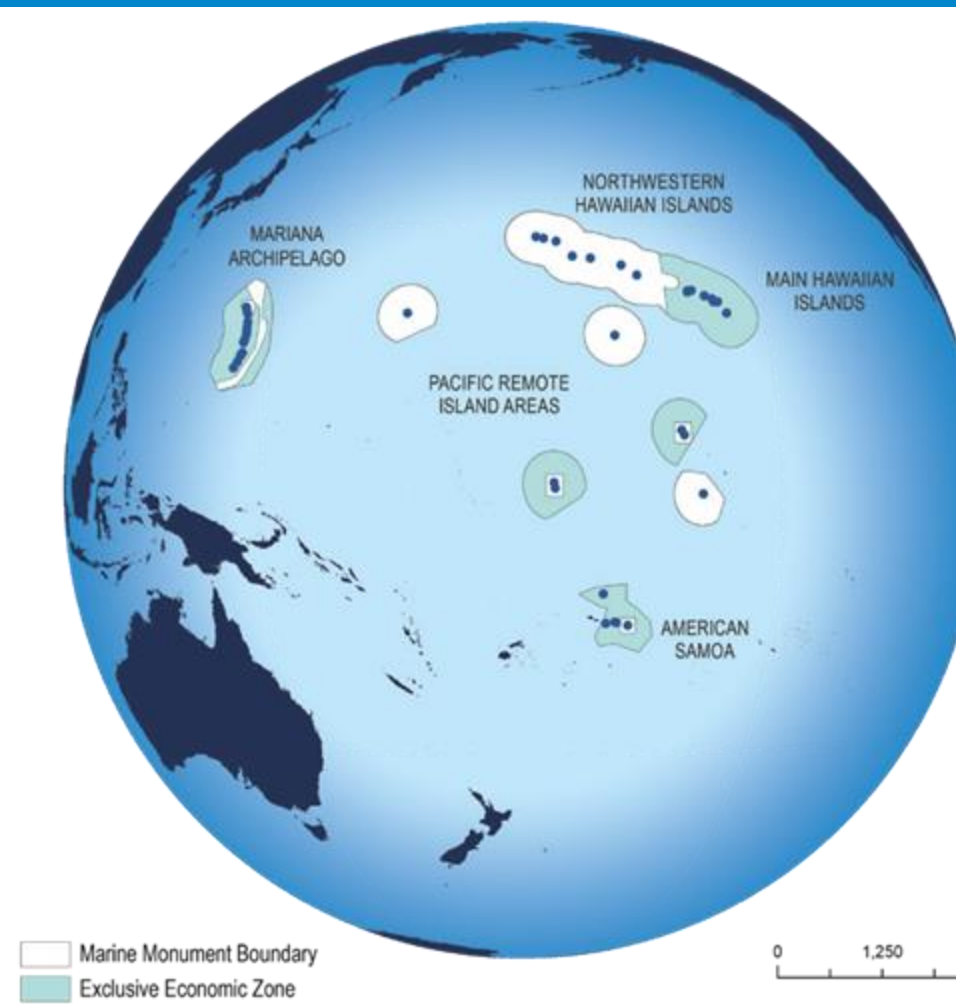
Pacific Islands Fisheries Science Center

Hing Ling (Michel) Chan, PhD
Research Economist

Pacific Islands Fisheries Science Center

Ecosystem Sciences Division
Social-Ecological and Economic Systems Program

Office: (808) 725-5395
Email: hingling.chan@noaa.gov

Economic Implications of Climate Change in the Pacific Islands Fisheries

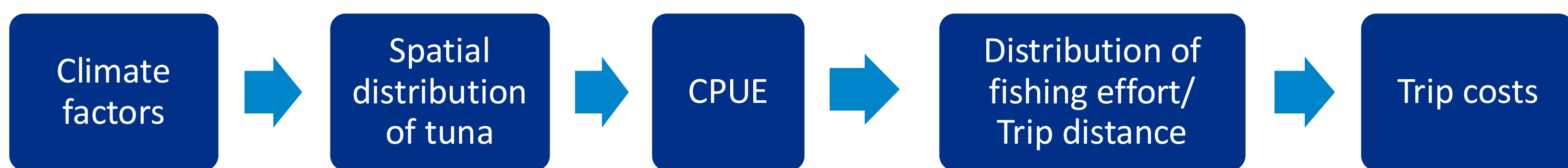## How climate change could affect Hawaiʻi longline fishery?

Rising sea surface temperature (SST) degrade fish quality, leading to lower tuna prices. As a result, fishers may venture farther from Honolulu port in search of higher-quality fish in cooler waters. However, this increases trip costs and reduces profitability. Fishers must weigh the potential higher fish prices against the additional costs of longer trips. Socioeconomic models can account for changing ocean conditions, climate-driven shifts in fish distribution and abundance, and estimate the economic implications on the fishery.
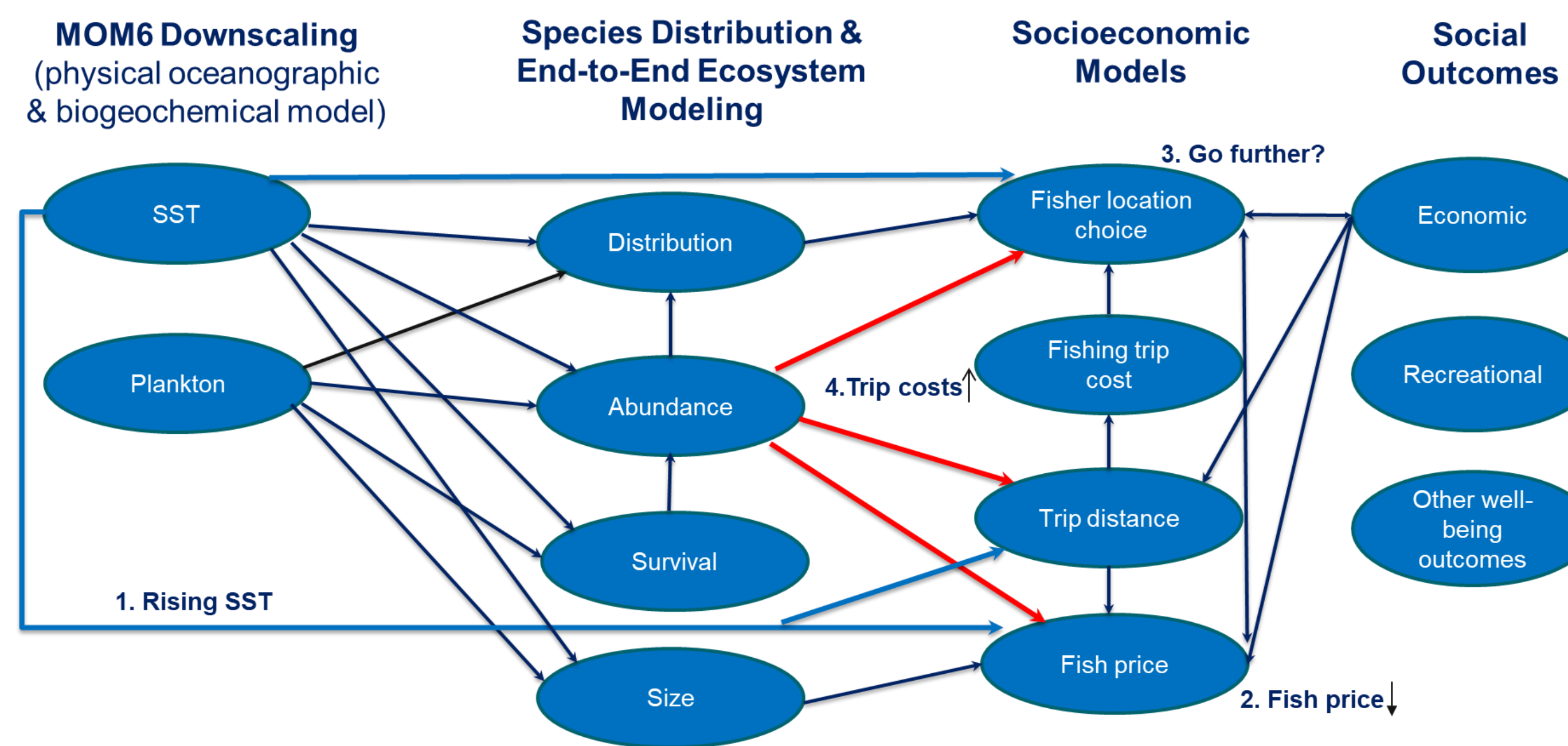
Trip distance model for Hawaiʻi longline fishery

A quantitative model to examine how climate change and climate variability affected trip distance of Hawaiʻi deep-set longline fleet.
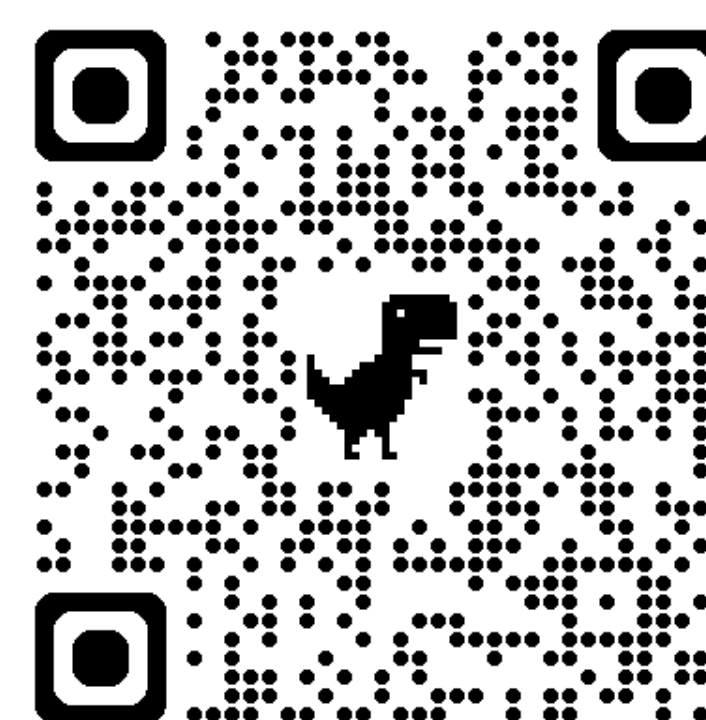
- Climate change (SST) and climate variability (ENSO events) affect the spatial distribution of various tuna species differently in the North Pacific Ocean (NPO) due to their unique physiological adaptations and preferred habitats.
- As a result, catch per unit effort (CPUE), spatial distribution of fishing effort, trip distance and costs would be affected.

Climate factors → Spatial distribution of tuna → CPUE → Distribution of fishing effort/Trip distance → Trip costs

Fish price model for bigeye and yellowfin tuna in Hawaiʻi

A hedonic price model was used to estimate tuna fish price using fish characteristics, trip specific information, daily market conditions, foreign imports, individual seller effects, and time effects.
- SST at the fishing location, ONI during fishing trips, and trip length are used as proxies for fish freshness.

Results

- 1°C increase in SST is associated with 4.2% (100 km) increase in trip distance.
- An increase in Oceanic Niño Index (ONI) from 0 to 1 corresponds to a 5.0% (114 km) decrease in trip distance.

For more information about this study:

Results

Implications of climate change on declining fish prices:
- Higher SST and El Niño degrade tuna freshness.
- Changes in spatial distribution of fish in NPO may drive fishers to travel farther for target species, impacting fish freshness since longline fishers do not freeze their catch.
- Climate-induced reductions in tuna body size, as bigger fish command a price premium.

Climate Change Impacts on Human Dimensions in the Pacific Island Region

CEFI will focus on how to measure important uncounted benefits of fishing: **food systems, culture and heritage, and non-market economies**. These elements are closely tied to resilience, as they represent core aspects of community well-being and have proven to be effective alternative strategies during times of stress. For example, during the COVID-19 pandemic, fishers across the nation who had diversified into informal or non-market economies performed better when traditional markets reliant on global supply chains were disrupted.

Goal: establish social and cultural monitoring that supports climate resilient communities

- Work with community groups to review existing concerns about the impacts of climate change.
- Develop biocultural indicators and thresholds that can be used to monitor impacts of climate change, evaluate effectiveness of management approaches, and identify biophysical data needs.

For more information about this study:
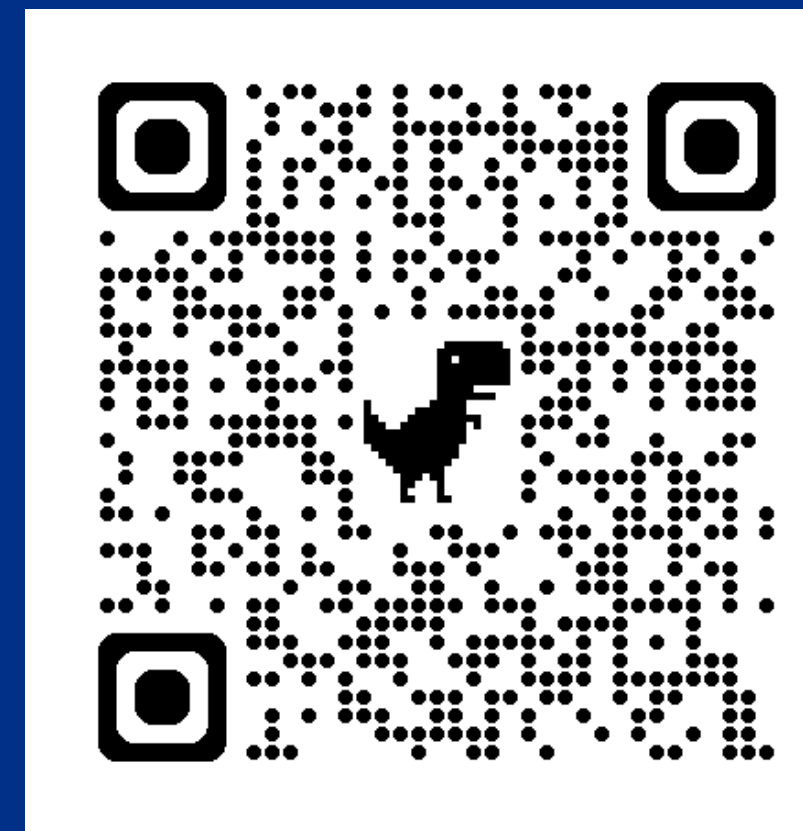
Fisheries in the Pacific Island Region

- Pacific Islands Region covers large geographical area: 2.2 million square miles (51% of U.S. EEZ)
- Honolulu, HI: #7 U.S. Port in Value in 2022 ($121.8M)
- Pago Pago, AS: #5 U.S. Port in Value in 2020 ($107.9M)

Climate, Ecosystem and Fisheries Initiative (CEFI)

CEFI is a cross-NOAA effort to build a nation-wide decision support system that provides climate-informed advice for marine resource management and community adaptation.

CEFI addresses four critical requirements:

1. Reliable delivery of robust ocean forecasts and projections;
2. Operational production of climate-informed advice (ecological outlooks, risk assessments, management & adaptation strategies);
3. Increased capacity for climate-informed decision-making;
4. Research & observations for validation & innovation.

For more information about the CEFI:
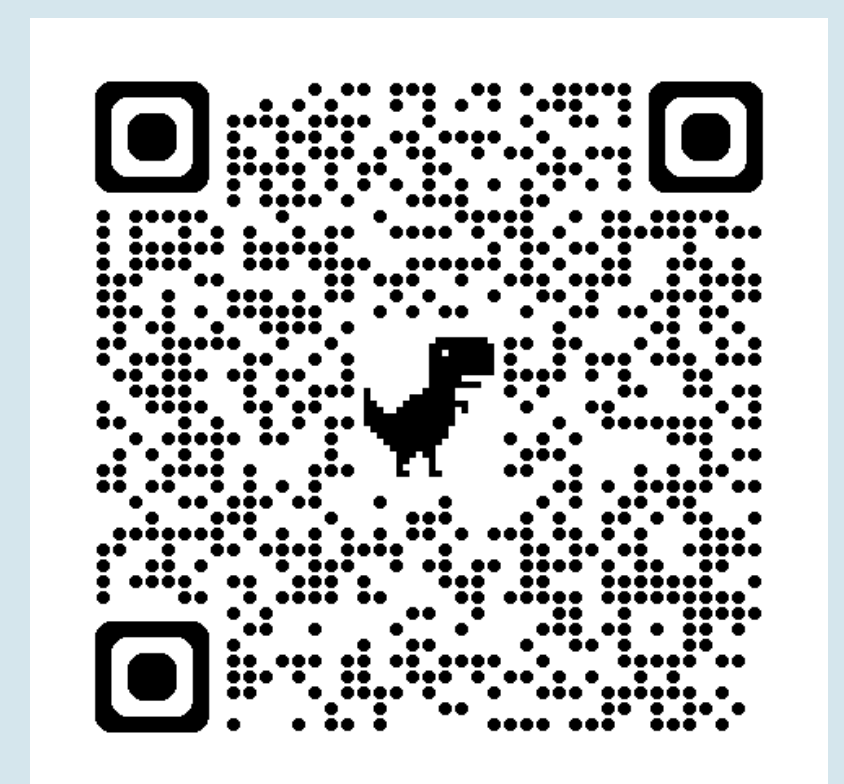
CEFI in the Pacific Islands Region

As part of the CEFI decision support system, we utilize different socioeconomic models for the Pacific Islands fisheries. These socioeconomic models connect with ocean and ecosystem conditions to generate products that will support fisheries management and the seafood sector in their planning for future climate change. This enables us to better understand the economic consequences of changing climate, and shifting fish availability and distribution in response to climate change.