Fisheries and Climate Toolkit

Supporting climate-ready, resilient and sustainable fisheries

https://fisheriesclimatetoolkit.sdsu.edu/

Becca Lewison (SDSU) and Cam Braun (WHOI)

NOAA COASTWATCH WEST COAST REGIONAL NODE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

EcoCast

EcoCast Product | EcoCast Explorer | About EcoCast

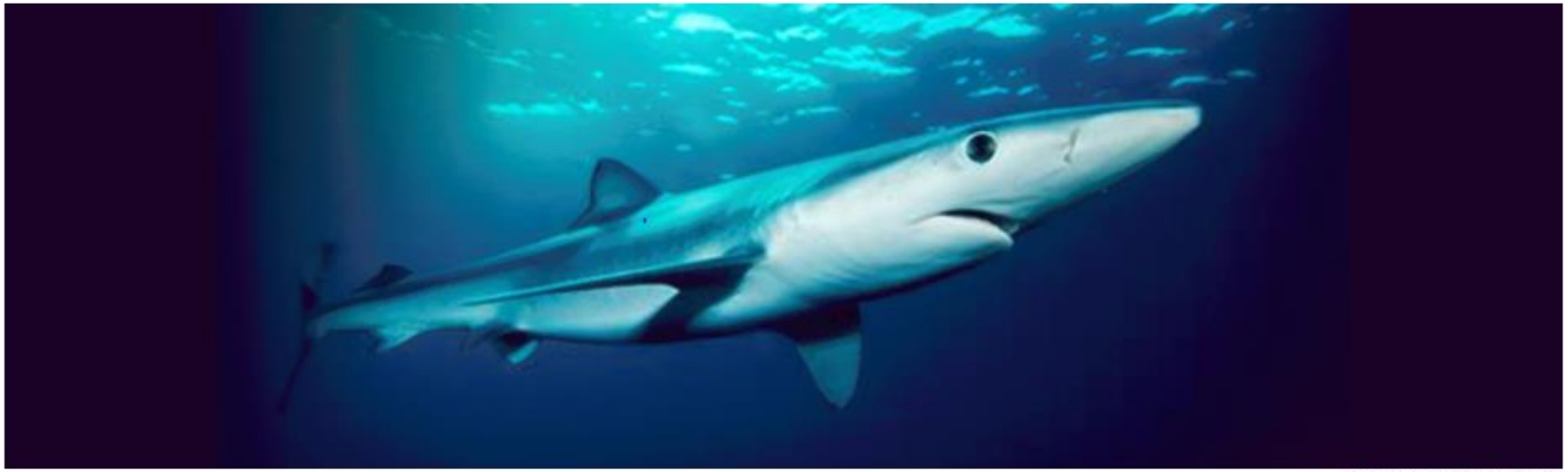

Photo copyright: Mark Conlin

A Eco-Informatic Tool for Fisheries Sustainability

What is EcoCast?

EcoCast is a fisheries sustainability tool that helps fishers and managers evaluate how to allocate fishing effort to optimize the sustainable harvest of target fish while minimizing bycatch of protected or threatened animals.

View details »

Finding a good place to fish

The EcoCast Product combines the predicted distributions of target catch species and bycatch species into a single map that suggests better and poorer locations to fish off the US West Coast.

View the map »

Scenario analysis

EcoCast Explorer gives users an opportunity to run scenario analyses to explore how the EcoCast product works. Users are able to generate predictive maps for specific dates, for single species, and can change the species weightings. This tool gives users the ability to explore how species are responding to changing ocean conditions, and how that can influence the EcoCast Product.

Run Analyses »

https://coastwatch.pfeg.noaa.gov/ecocast/

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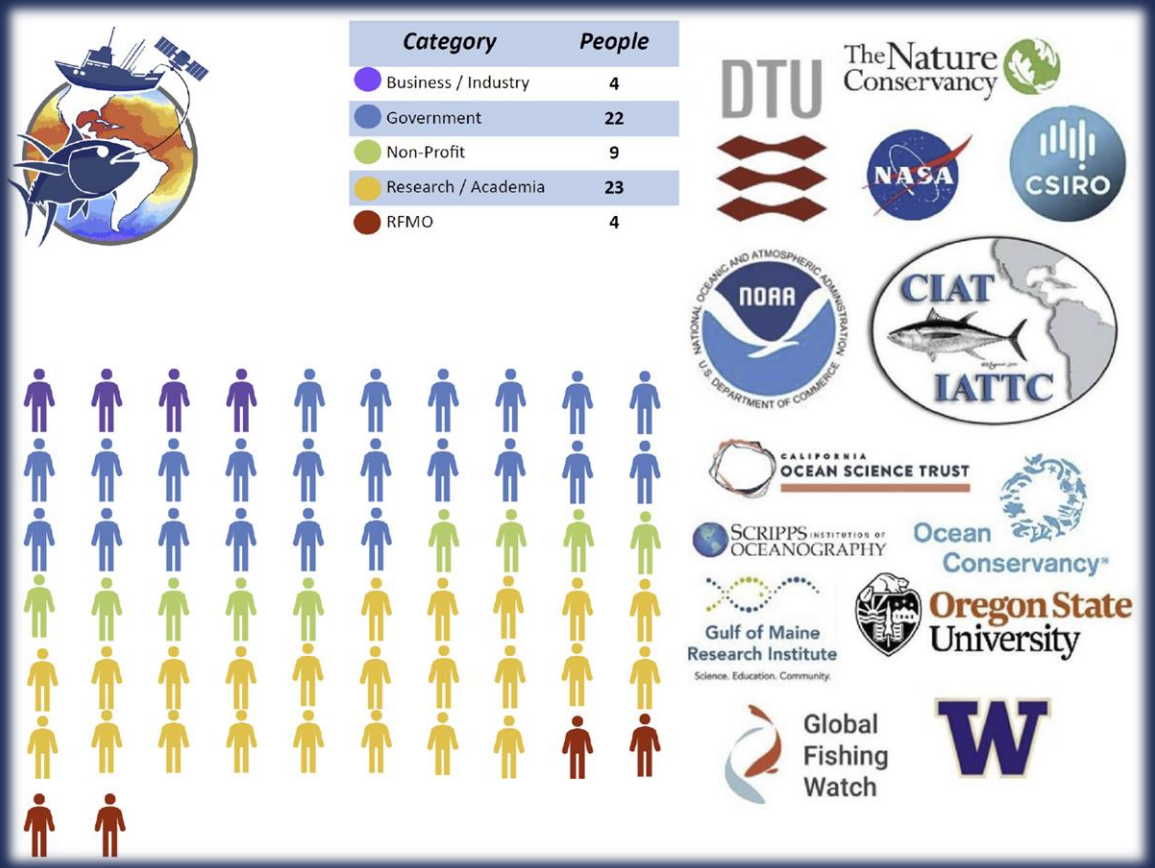
Stakeholder engagement and communication



Accessible, online products

Relevant/timely data viz

Build and expand capacity

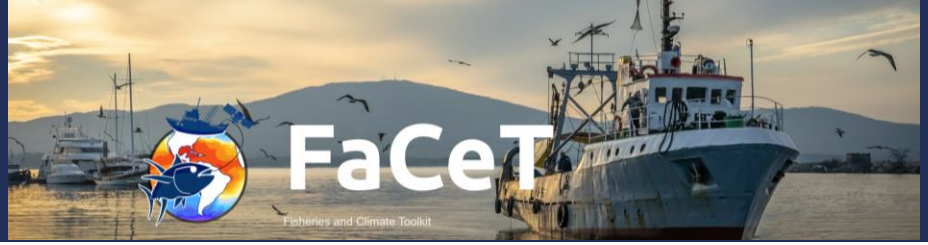
https://fisheriesclimatetoolkit.sdsu.edu/

- **Forecasting species and vessel dynamics** - Identifying factors that influence climate projections of species and vessel dynamics.

- **Tracking magnitude/velocity of change** - How quickly are projected changes likely to occur in species and vessels? How can historical data help us characterize the likely changes across the near and far future?

- **Harnessing big data and data pipelines** - How can state of the art computational infrastructure and more creative data uses help us improve dynamic modelling?

- **Climate change uncertainty in a fisheries context** - Capturing and communicating climate uncertainty for fisheries stakeholders is **mission critical**. We aim to improve how stakeholders understand and interpret uncertainty




Rebecca Lewison


Camrin Braun


Kathy Mills


Elliott Hazen


Stephanie Brodie


Heather Welch


Nima Farchadi


Andrew Allyn


Riley Young-Morse


Alex Kerney


Dylan Pugh


Nerea Lazama Ochoa

Stephen Bograd

http://facet.research.gmri.io/

FaCeT Toolkit

http://facet.research.gmri.io

Overview

Fisheries and Climate Toolkit (FaCeT) is an online platform that uses biological, fisheries, vessel, satellite, and climate model data to visualize and explore how climate change will impact highly migratory marine species and fisheries, bridging the gap between fisheries and climate science to support climate resilient and sustainable fisheries.

Figure 1. *Both target and non-target species are impacted by climate-driven changes in ocean conditions. Photo credits: E. Savetsky (blue shark), S. Dougherty (swordfish), E. Savetsky (shortfin mako), C. Braun (blue shark).*

Riley Young-Morse

Alex Kerney

Dylan Pugh

Oceans and Climate Change

Covering more than 70% of Earth's surface, oceans absorb the majority of atmospheric heat and are disproportionately affected by climate change. This absorption process has led to a changing ocean as evidenced by increasing temperatures across the world's oceans. One of the key ways we measure climate change in the ocean is using temperature anomalies, large shifts in temperature relative to a reference period. Anomalies identify ocean areas where temperatures have deviated from historical baselines.

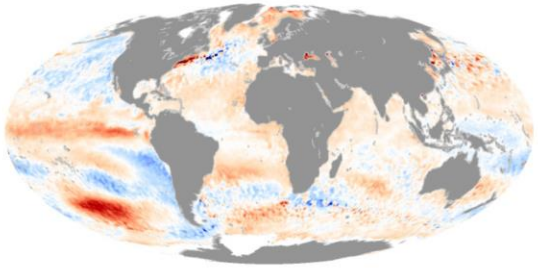


Figure 2. *Global ocean temperatures, where red areas indicate anomalously warm and blue areas are anomalously cool.*

Marine Heatwaves

CCS Futures

NWA Futures

Understanding Uncertainty

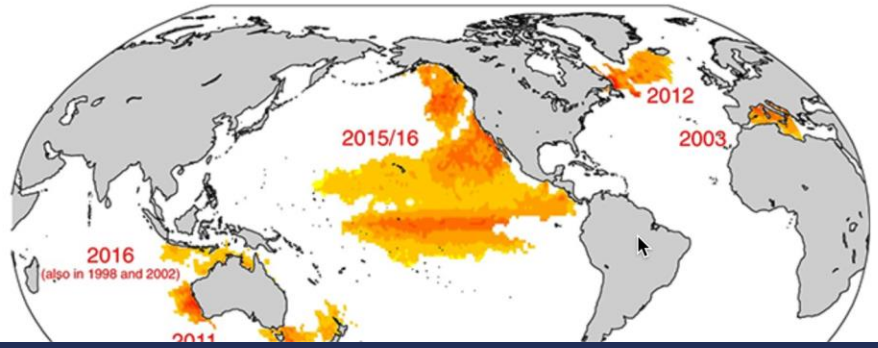
FaCeT Toolkit

http://facet.research.gmri.io

Marine Heatwaves

Marine heatwaves (MHWs) are one aspect of climate change that are already having a significant impact on fisheries. MHWs are short-term extreme warming events, typically reported as deviations or anomalies from average temperatures **(Figure 1)**. MHWs occur globally and are linked to disruptive ecological and economic changes.

Nima Farchadi



(Farchadi et al., in review)

FaCeT Toolkit

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CCS Futures

CCS FUTURES

The future of highly migratory species in the California Current System

The California Current System (CCS) is a dynamic and productive ecosystem and a global hotspot for marine species like sea turtles, sharks, and marine mammals. The CCS also provides important habitat for many commercially-important highly migratory species such as swordfish and tunas. Changing oceanographic conditions in the CCS are likely to have substantial ecological and economic impacts.

Nerea Lazama Ochoa

(Lezama Ochoa et al., in review)

FaCeT Toolkit

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NWA Futures

The NorthWest Atlantic (NWA) is a dynamic and productive ecosystem and a global hotspot for marine species like sea turtles, sharks, and marine mammals. The NWA also provides important habitat for many commercially-important highly migratory species such as swordfish and tunas. Changing oceanographic conditions in the NWA are likely to have substantial ecological and economic impacts.

Camrin Braun

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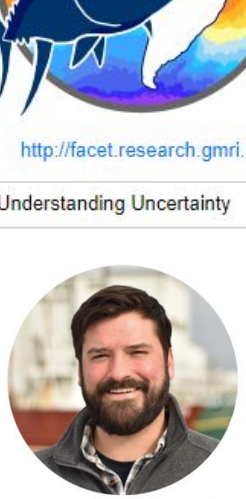
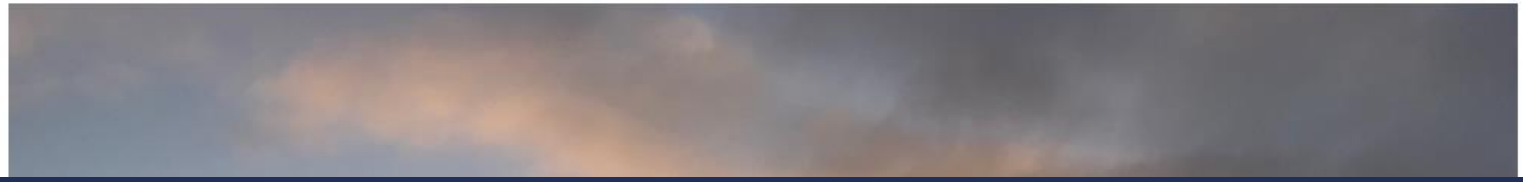
Understanding Uncertainty



Andrew Allyn

One of the biggest challenges to understanding, projecting, and managing the impact of climate change on fisheries is accounting for and communicating uncertainty. We use uncertainty to measure our confidence in the validity of a finding based on the type, amount, quality, consistency and agreement of evidence (sensu IPCC, 2006).

Uncertainty in climate projections is not something to fix or solve - uncertainty is inherent to our understanding of ocean systems and their response to climate change. Yet, different approaches and perspectives provide insight and information into the factors that influence uncertainty and how to account for it so that proactive approaches to climate readiness and resilience can be developed.



- **Differences among global climate models**
- **Imperfect ocean sampling**
- **Extrapolating to novel ocean conditions**

Differences among global climate models

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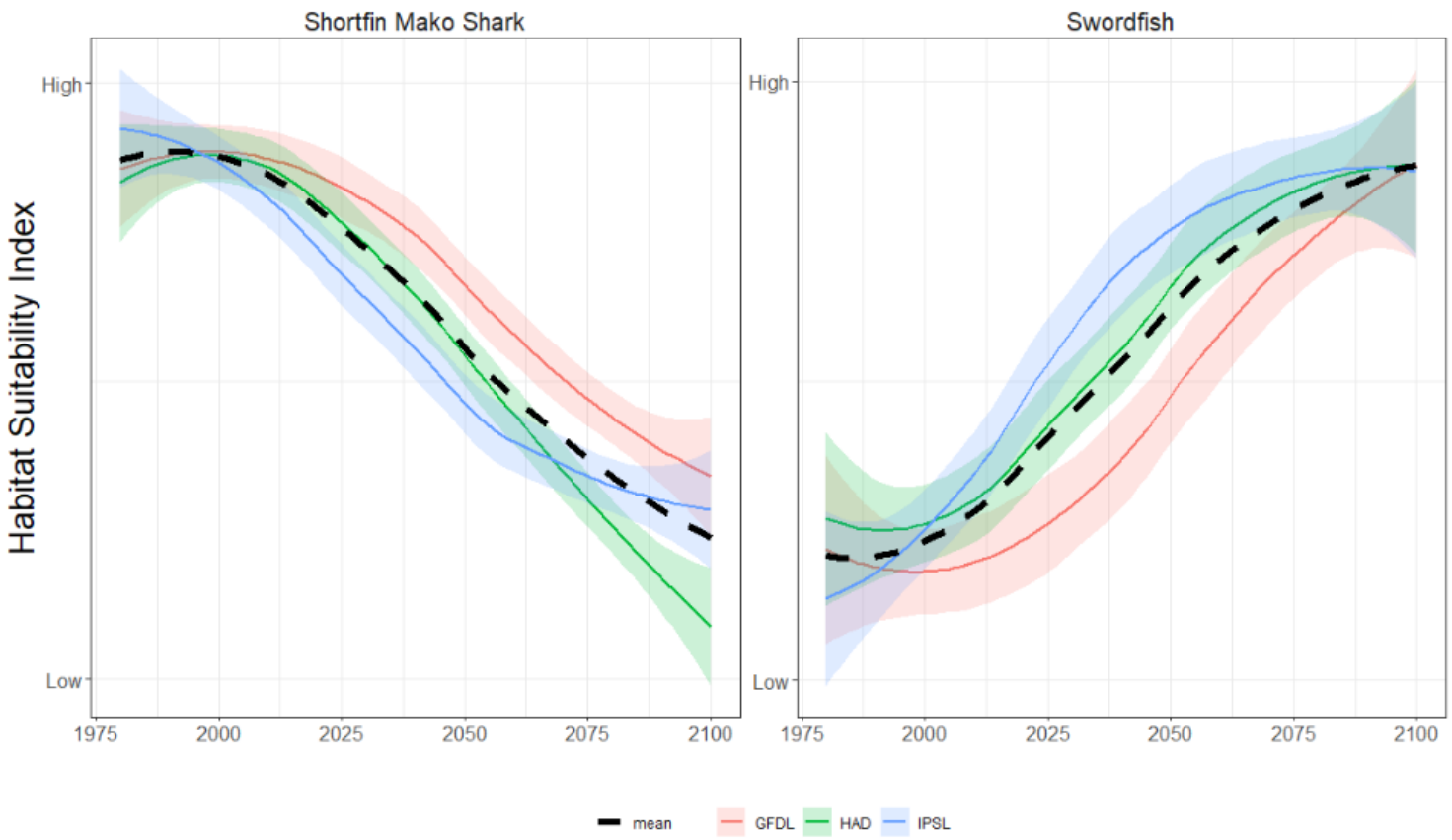
Understanding Uncertainty



(Brodie et al. 2022)

(Lezama Ochoa et al., in review)

Uncertainty from imperfect ocean sampling

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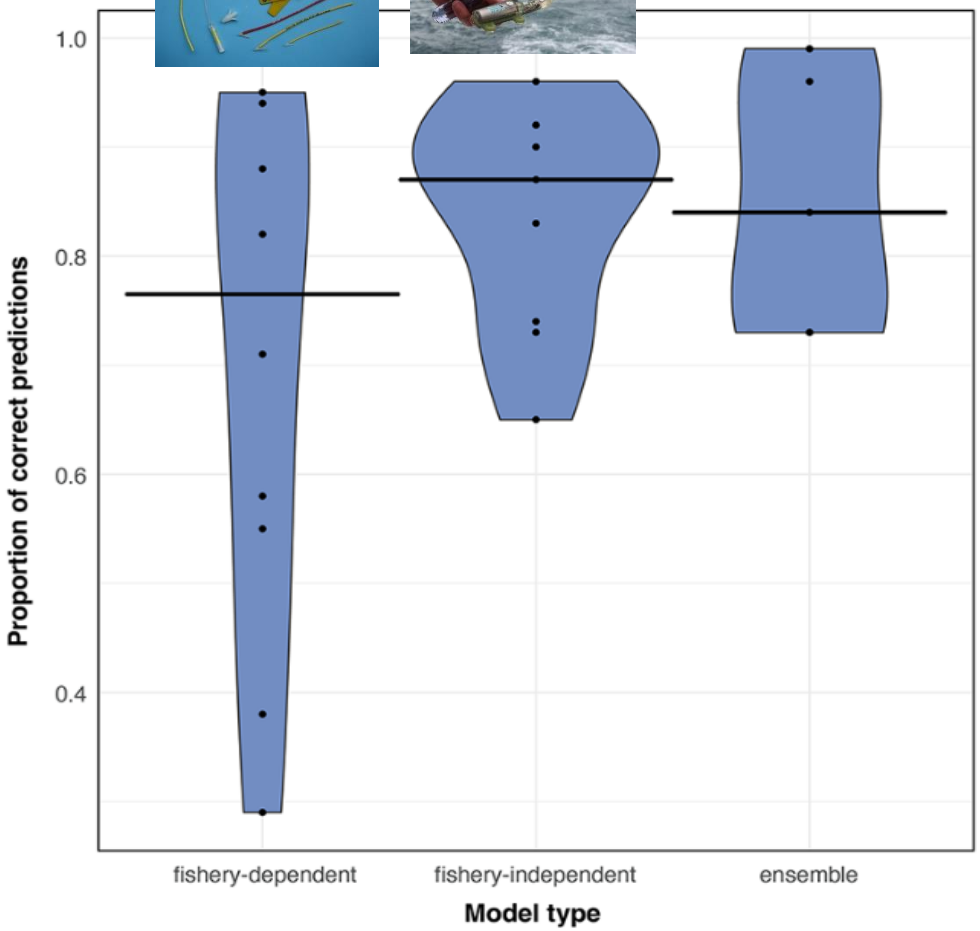
Understanding Uncertainty



(Braun et al., in revision)

Extrapolating to novel ocean conditions

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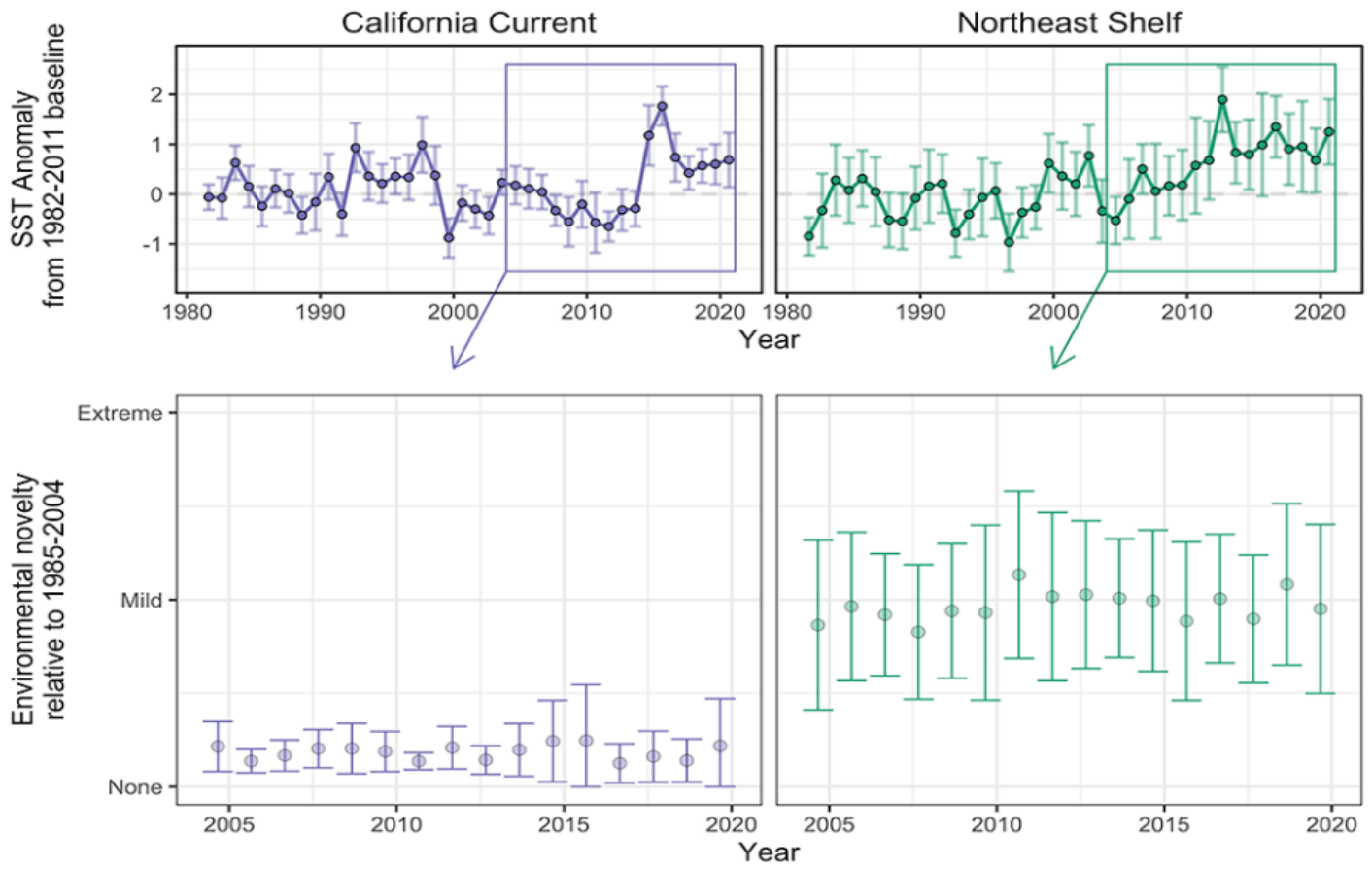
Understanding Uncertainty



(Allyn et al., in review)

Extrapolating to novel ocean conditions

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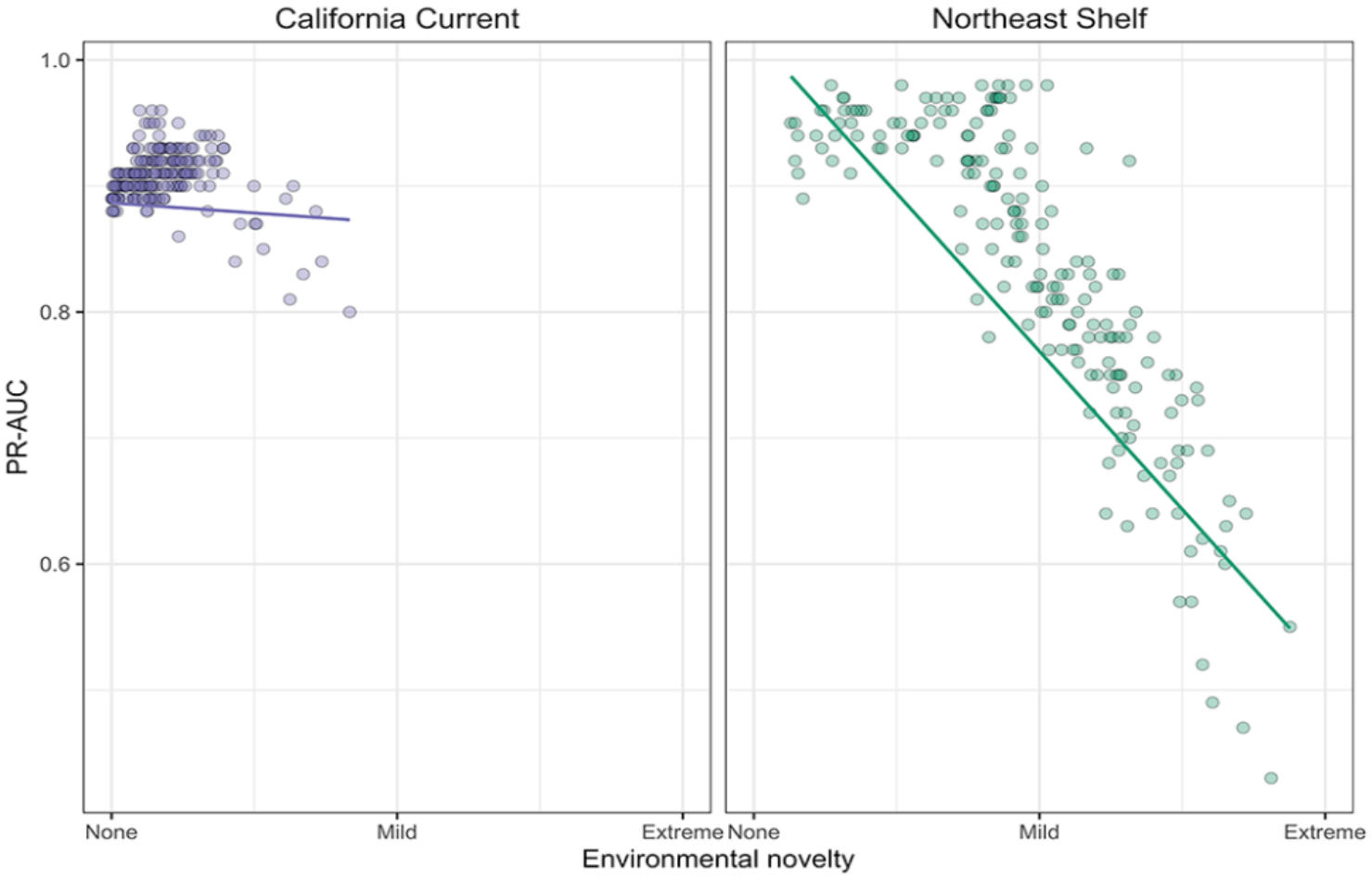
Understanding Uncertainty



(Allyn et al., in review)

Next steps

Implementation

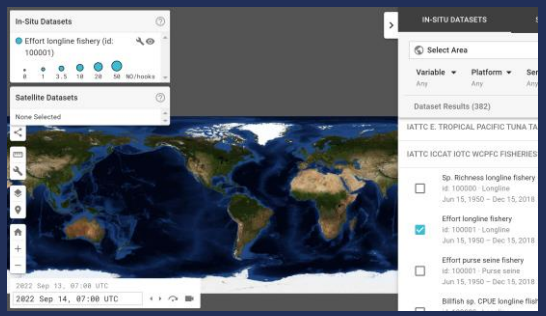
CIAT
IATTC

PACIFIC FISHERY MANAGEMENT COUNCIL

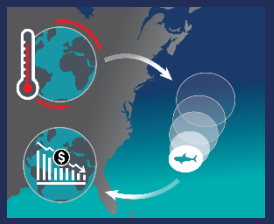
NOAA FISHERIES

Expanding distribution

COVERAGE
CEOS Ocean Variables Enabling Research & Applications for GEO



New Applications



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