Exploring Dynamic Ocean Management for bycatch reduction

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OBJECTIVES:

1. To develop species distribution models for 8 target and non-target species in the EPO.
2. To work with scientists and relevant stakeholders in the translation of those model outputs into actionable spatial management recommendations to deduce bycatch.

Our goal is to increase the catchability of target species while simultaneously reducing bycatch risk

High Seas fisheries governance and management

Duke UNIVERSITY

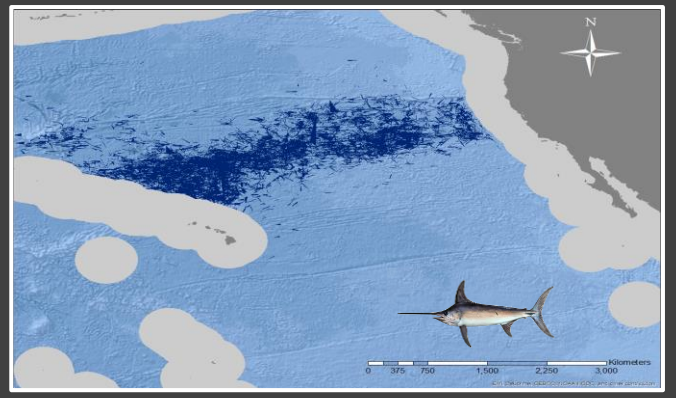
Fisheries impacts on open-ocean ecosystems
The taxonomic scope of a new BBNJ treaty
Modeling longline fleet dynamics
Modeling bycatch risk in the HPLF

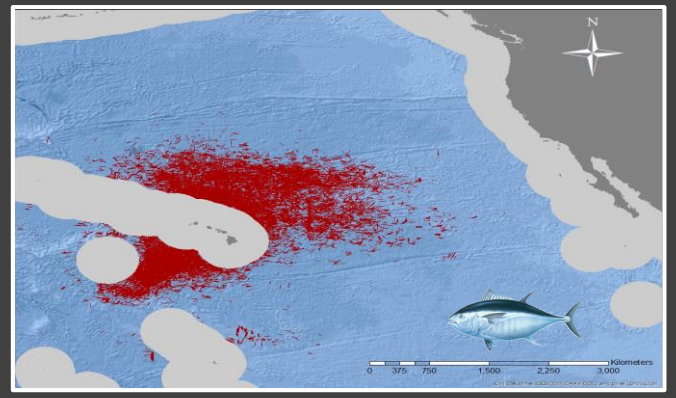
I am now working with the IATTC for 2 years on a post doc, and will apply some of these spatial modeling tools to the EPO

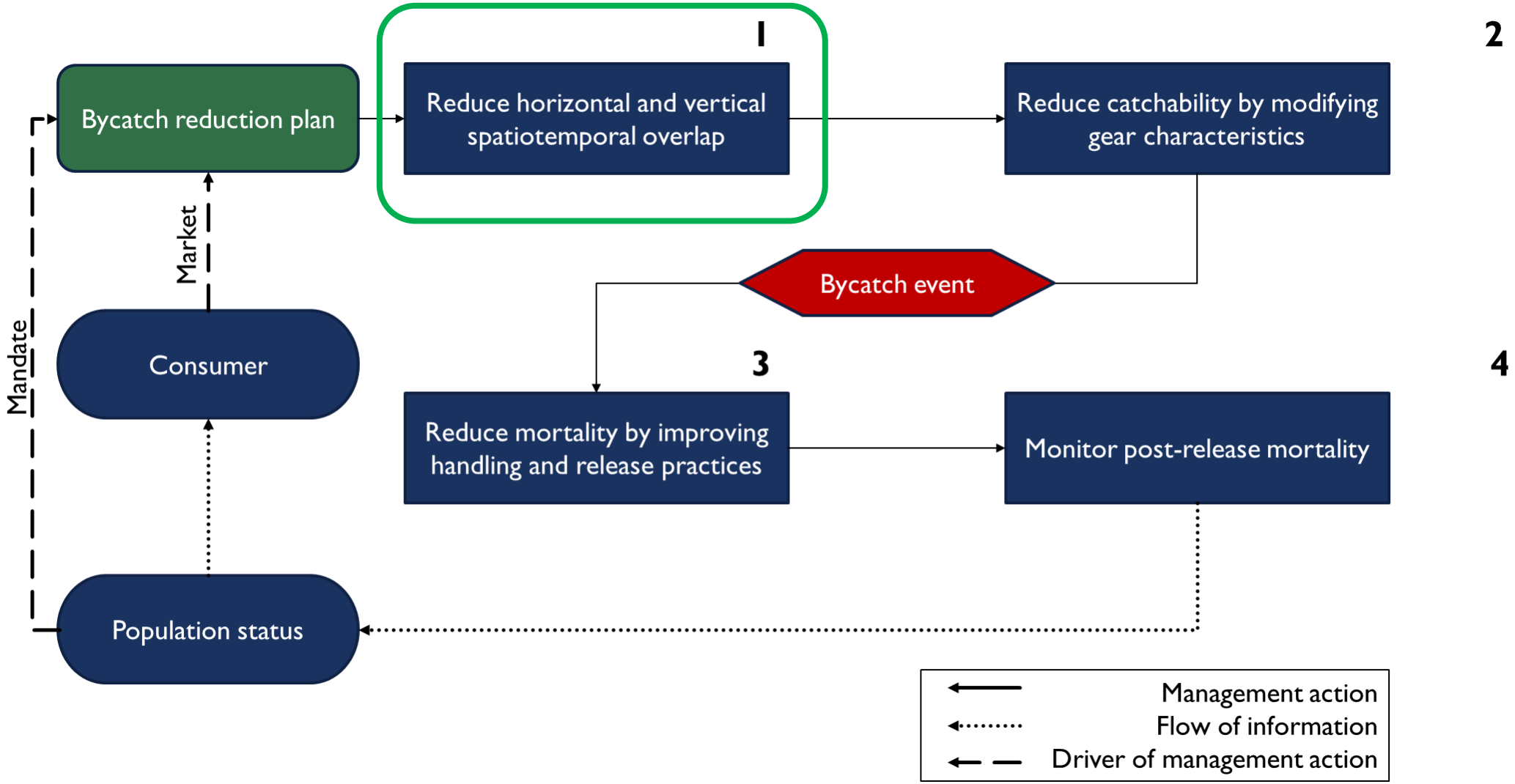
NOAA FISHERIES

Hawai'i-based longline fishery

- Shallow-set fleet (*Xiphias gladius* - 25 to 75m)
- Deep-set fleet (*Thunnus obesus – 50 to 350m*)
- Fisheries observer program data (2004-2018)





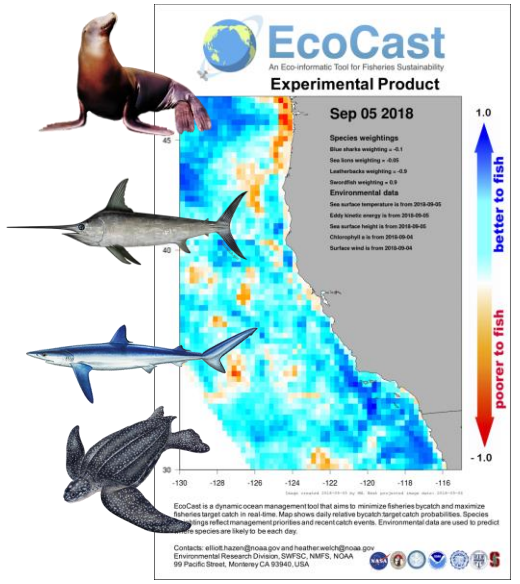

1
2
Bycatch reduction plan
Reduce horizontal and vertical spatiotemporal overlap
Reduce catchability by modifying gear characteristics
Market
Bycatch event
Mandate
Consumer
3
4
Reduce mortality by improving handling and release practices
Monitor post-release mortality
Population status
Management action
Flow of information
Driver of management action

Area-based management tools in the open ocean

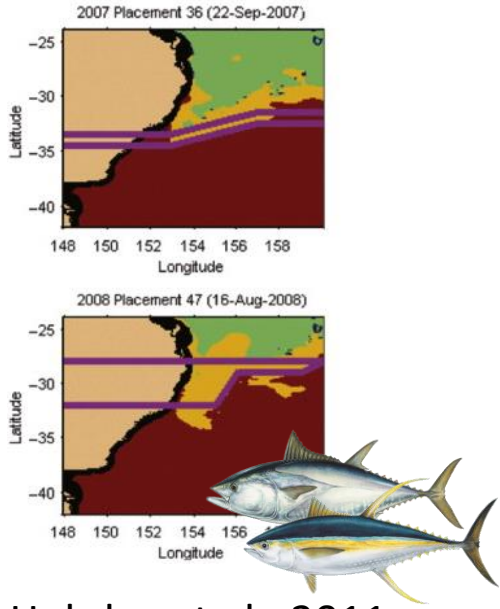
Existing **pelagic** fisheries spatial closures in the open ocean

Target species - **Static**

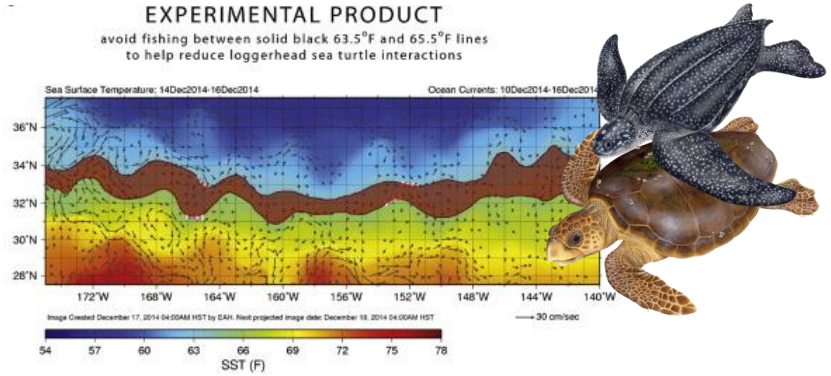
Dynamic Ocean Management



Hazen et al., 2018



Hobday et al., 2011



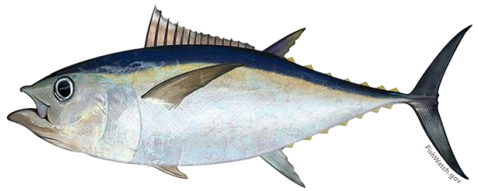
Howell et al., 2008

Spatial modeling efforts

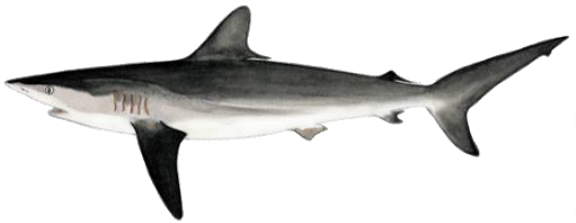
IATTC

Katsuwonus pelamis

Thunnus albacares

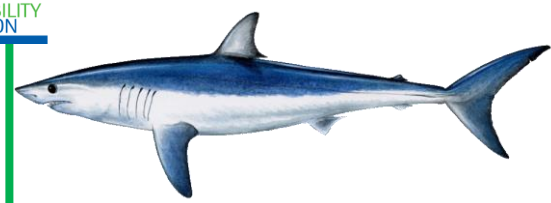


Thunnus obesus



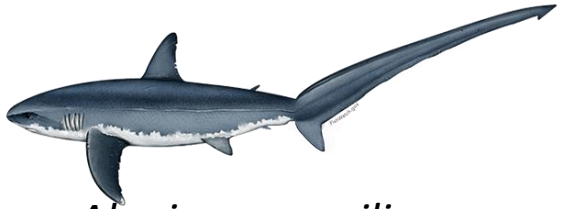
Carcharhinus falciformis

Carcharhinus longimanus



Isurus oxyrinchus

Caretta caretta



Alopias superciliosus

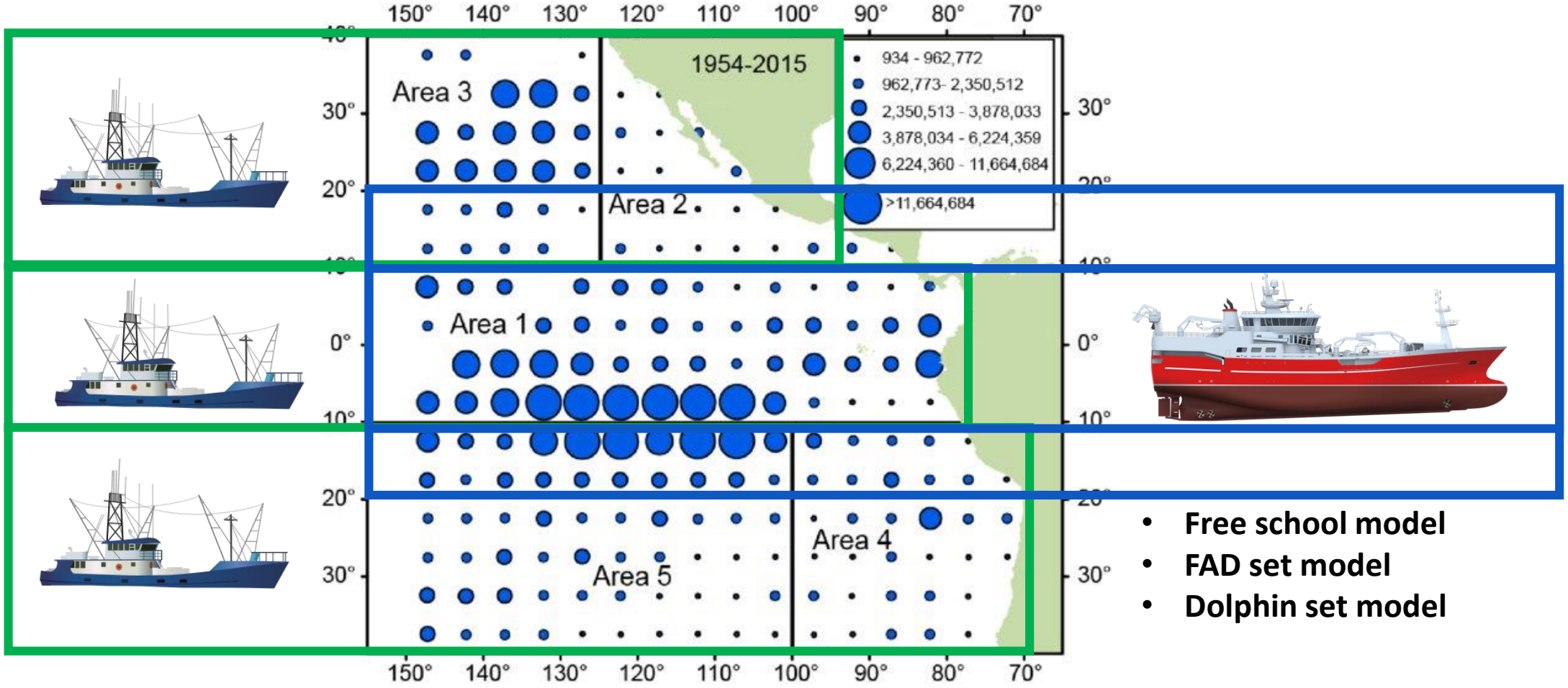
Sphyrna lewini

Xiphias gladius

Mobula sp.

Co-producing the models

- Bycatch rates vary by gear (longline vs. purse seine)
- Bycatch rates vary by purse seine set type
- Bycatch rates vary over space and time



- **Free school model**
- **FAD set model**
- **Dolphin set model**

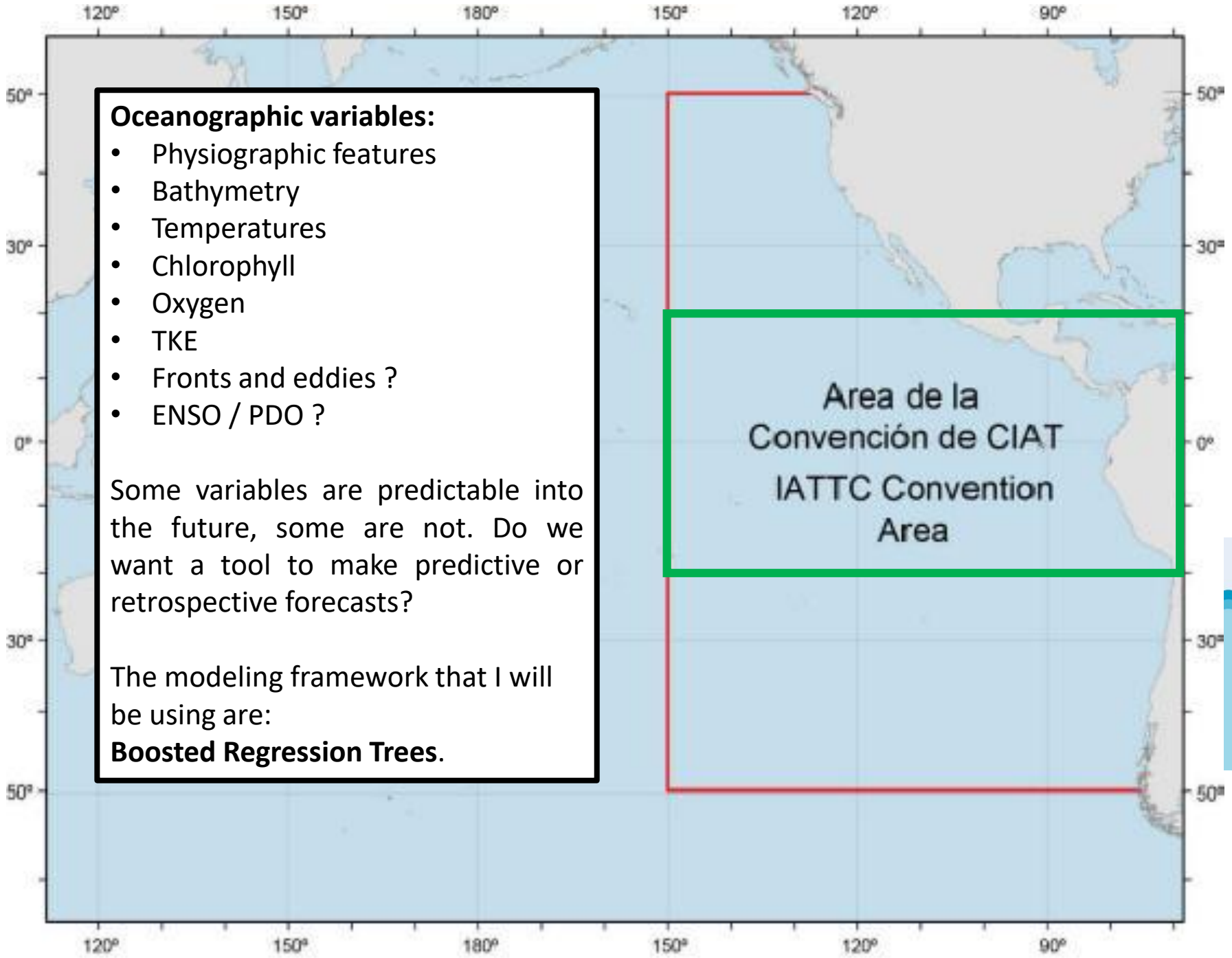
Griffiths, S., Duffy, L. and Aires-da-Silva, A., 2017, May. A preliminary ecological risk assessment of the large-scale tuna longline fishery in the eastern Pacific Ocean using Productivity-Susceptibility Analysis

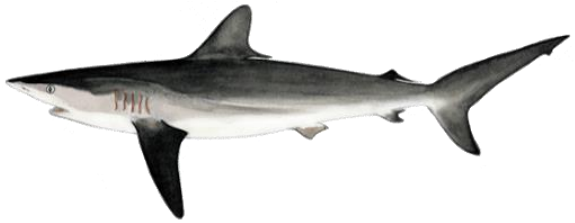
Oceanographic variables:

- Physiographic features
- Bathymetry
- Temperatures
- Chlorophyll
- Oxygen
- TKE
- Fronts and eddies ?
- ENSO / PDO ?

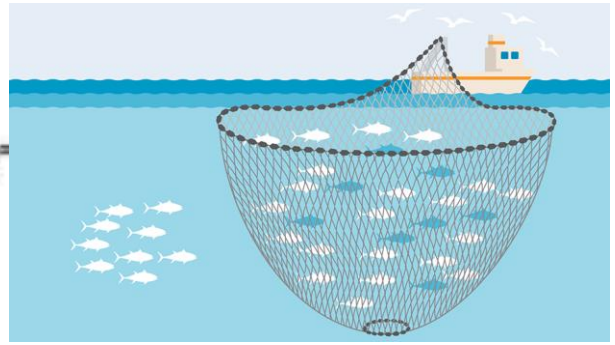
Some variables are predictable into the future, some are not. Do we want a tool to make predictive or retrospective forecasts?

The modeling framework that I will be using are:
Boosted Regression Trees.



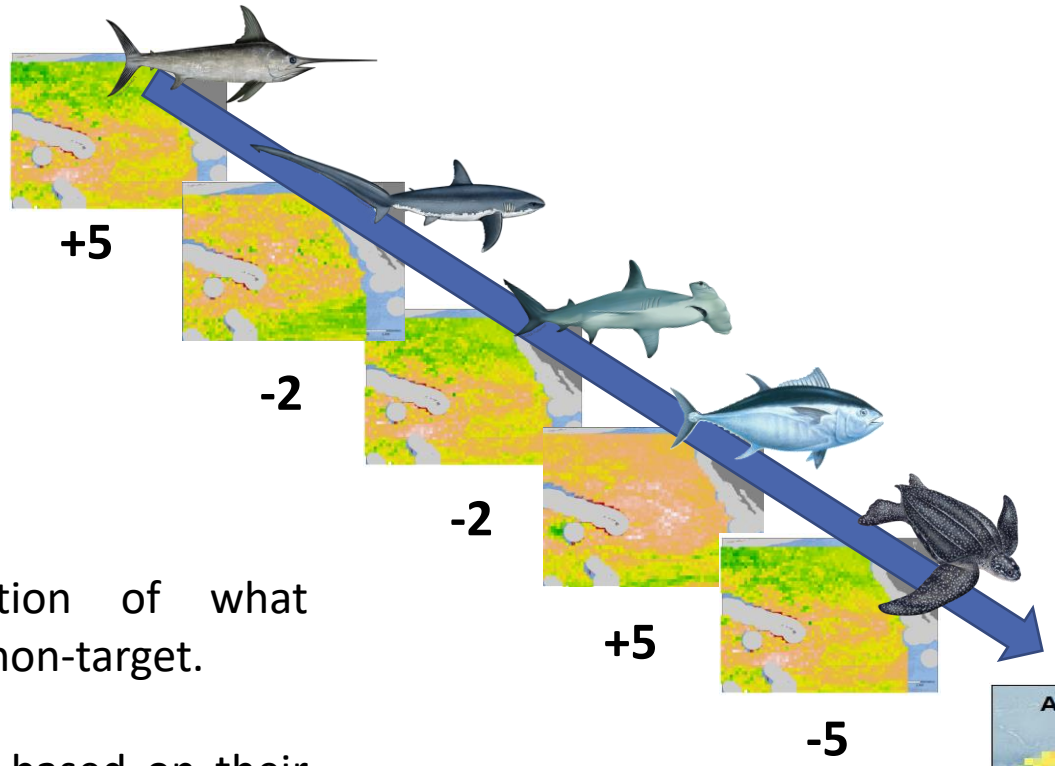


Carcharhinus falciformis



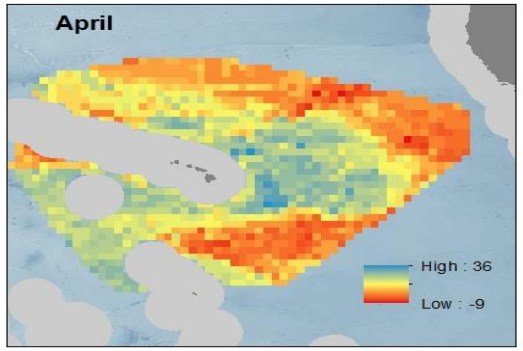
Creating risk surfaces:

Making spatial habitat predictions actionable for management



- **This step requires:**
  - A clear delineation of what species target and non-target.
  - Assigning weights based on their level of endangerment or commercial interest.

Monthly/seasonal bycatch risk surfaces



- **Our goal is to increase the catchability of target species while reducing bycatch risk**

Thank you for your attention

I look forward to your questions