

Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission



Climate impacts on the EPO and its fisheries

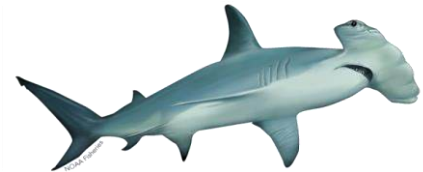
IATTC Staff

1st Climate Change Workshop – 23-26 February 2025
virtual conference.



Outline

1. Climate Change 101
2. ENSO Recap
3. Climate Change in the EPO
4. Species response to the environment
5. Climate change impacts on Tuna Fisheries
6. Climate change impacts on Bycatch Species
7. Summarizing remarks



Climate Change

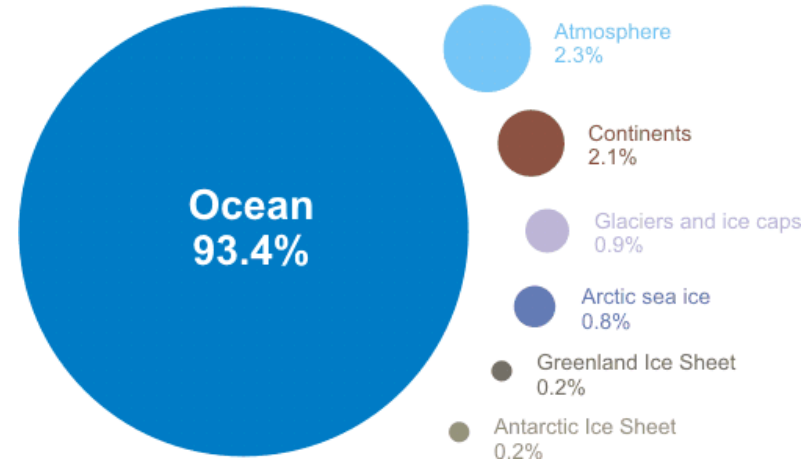
Fossil Fuels



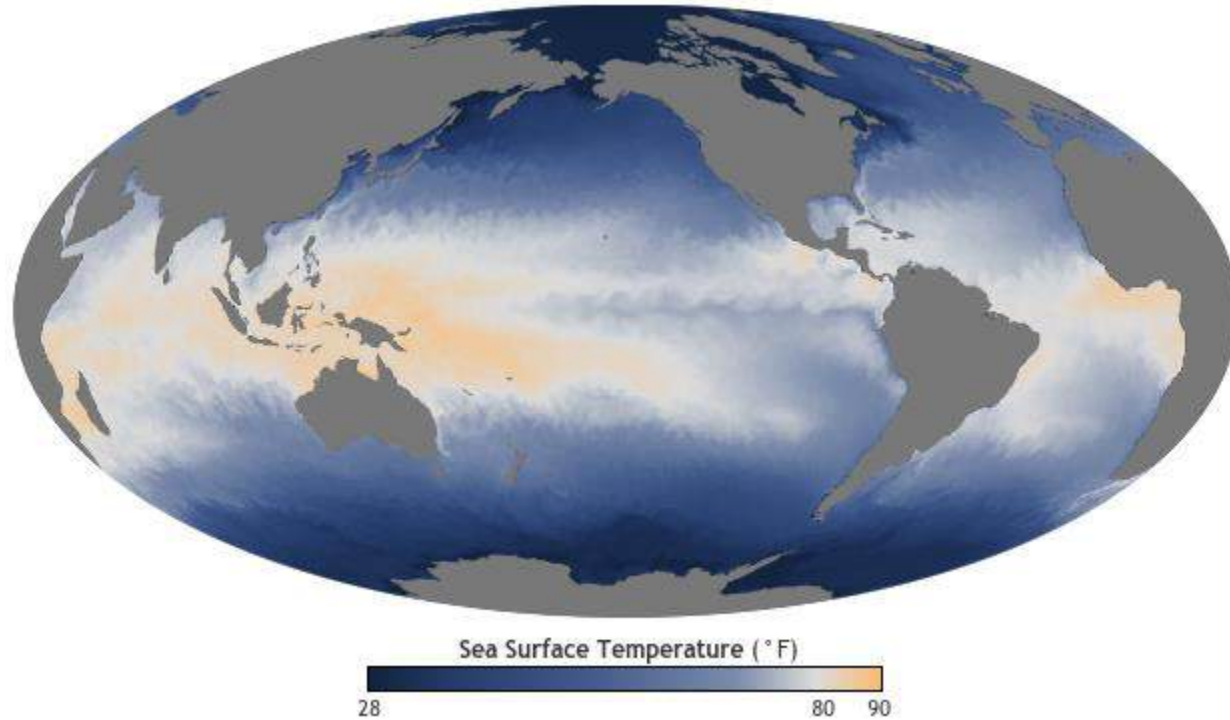
Heat Trapping Blanket



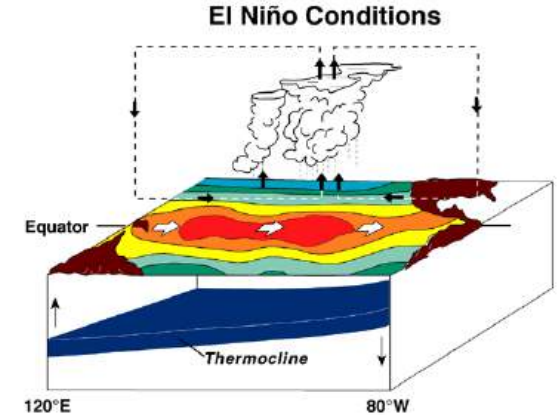
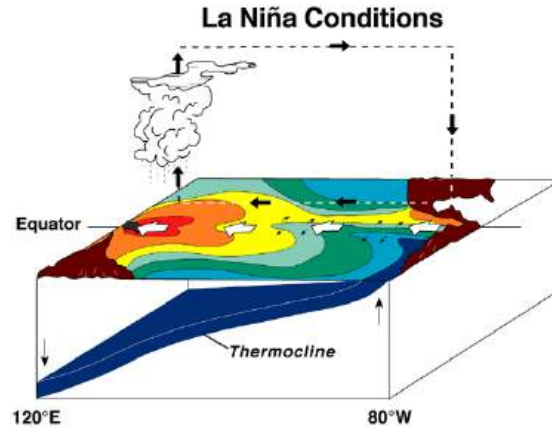
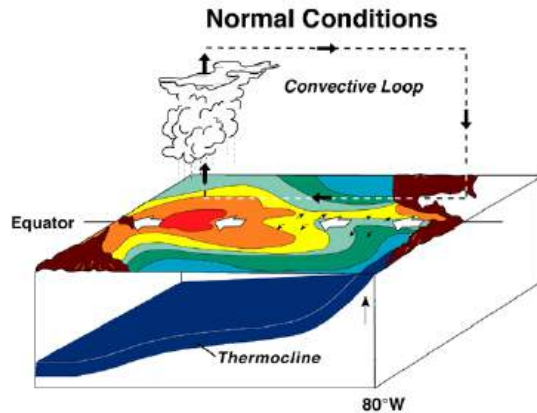
Where's the warming going?



Climate and Environmental Change in the Pacific Ocean



El Niño Southern Oscillation Recap

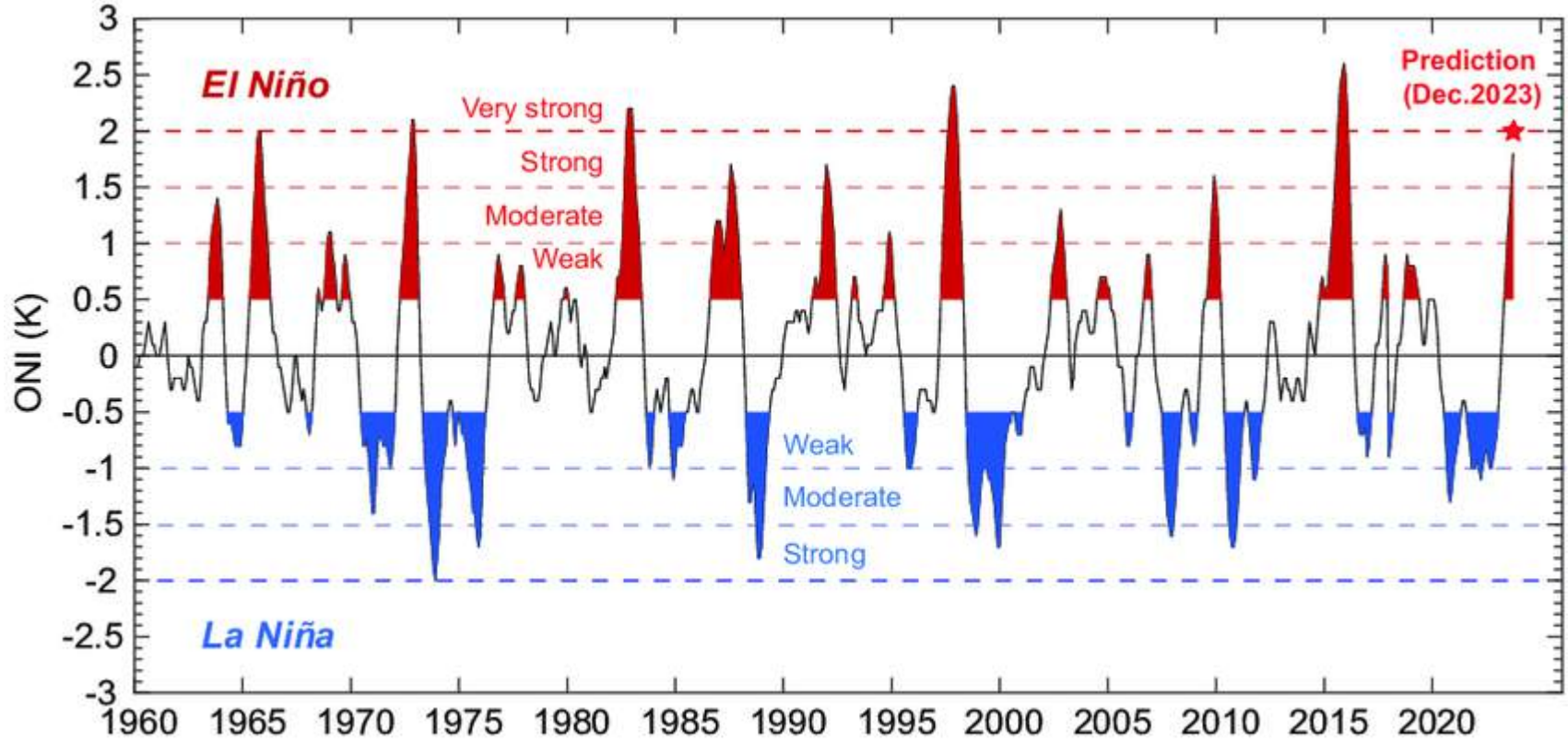


- Trade winds blow east to west along equator
- Shallower thermocline in EPO compared to WPO
- Upwelling of cold nutrient rich waters off South America -> high phytoplankton production

- Westward trade winds strengthen
- Warm surface water moves further westward
- Thermocline starts shallower and is steeper
- Increases upwelling off South America -> more nutrient rich waters -> increase in phytoplankton production
- Occurs every 3-5 years
- Lasts 3-12 months, also over multiple years

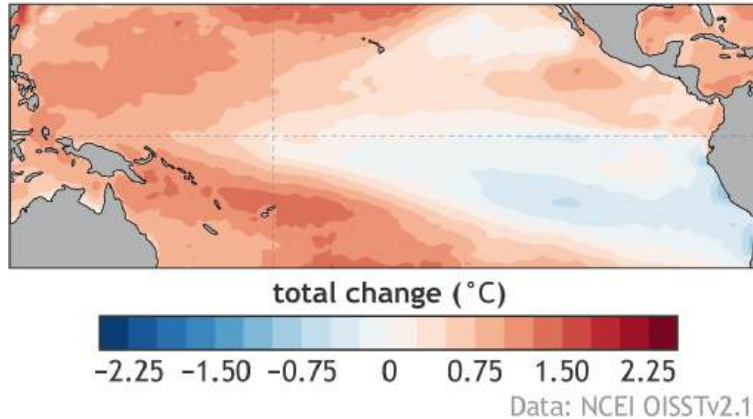
- Westward trade winds weaken
- Warm surface water moves eastward
- Thermocline deepens and flattens
- Reduces or eliminates upwelling off South America -> less nutrient rich waters -> decrease in phytoplankton production
- Occurs every 2-7 years
- Lasts from 9-12 months

El Niño Southern Oscillation Recap

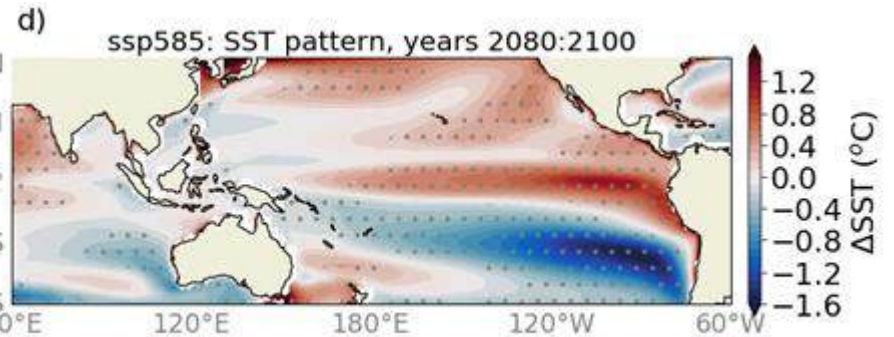


Climate Change in EPO

Sea surface temperatures 1982-2022

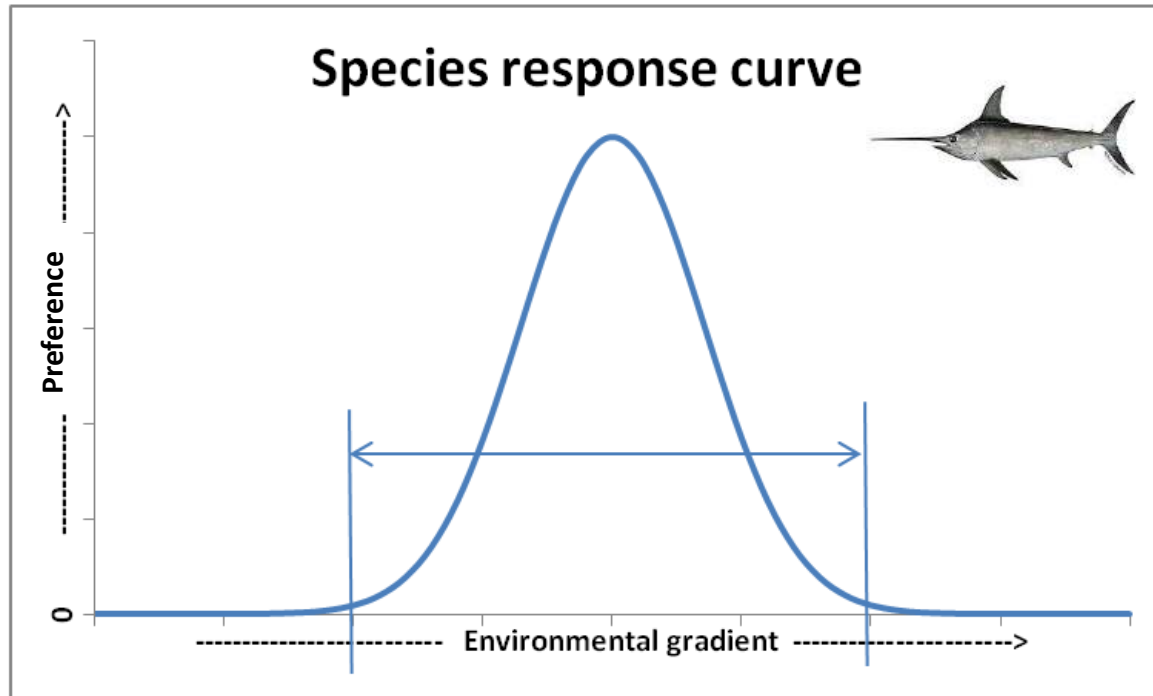


Observations are more La Nina like



Future projections predict more El Nino like conditions

Environment → Marine species



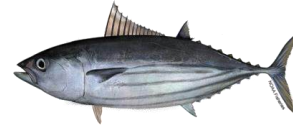
Temperature
Dissolved Oxygen
Salinity
Current velocity

- ✓ Distribution
- ✓ Growth
- ✓ Survival
- ✓ Reproduction location
- ✓ Reproduction success
- ✓ Digestion
- ✓ Sensory capability
- ✓ Prey distribution

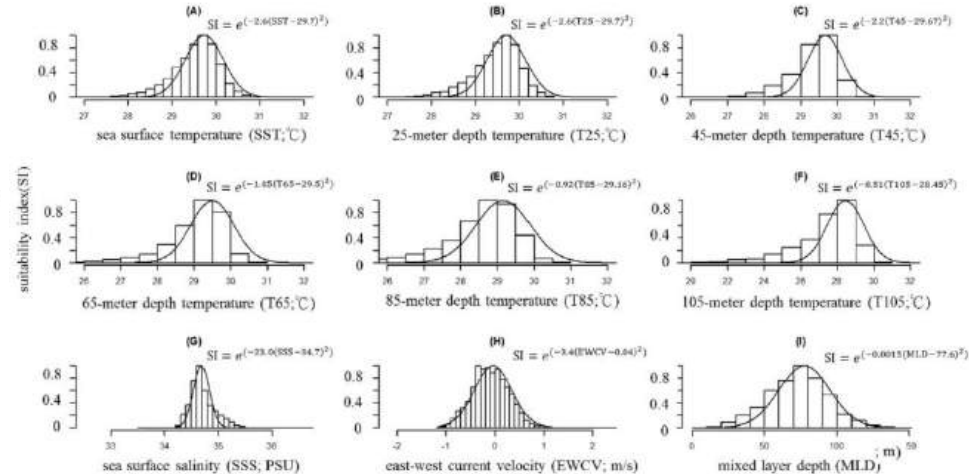
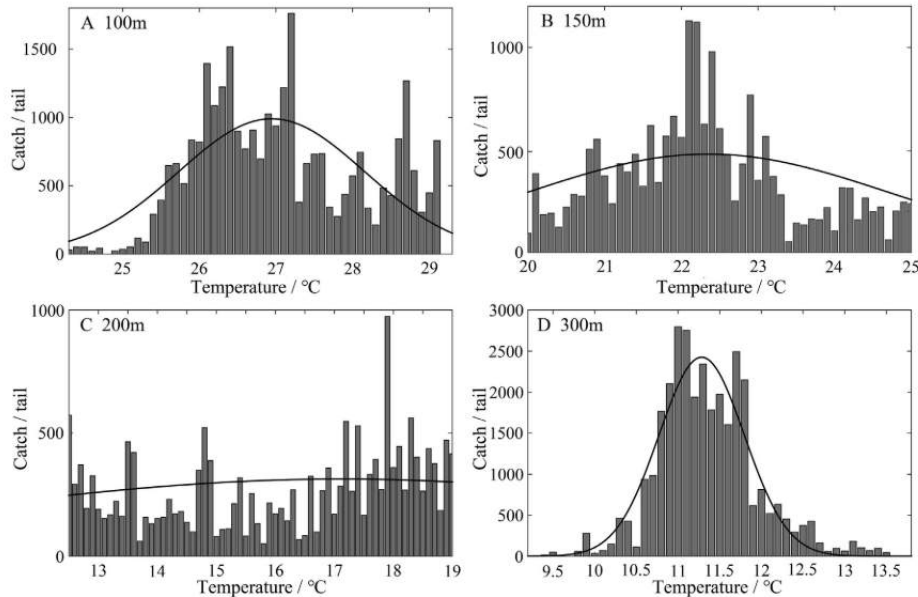
Climate Change → Tuna Fisheries



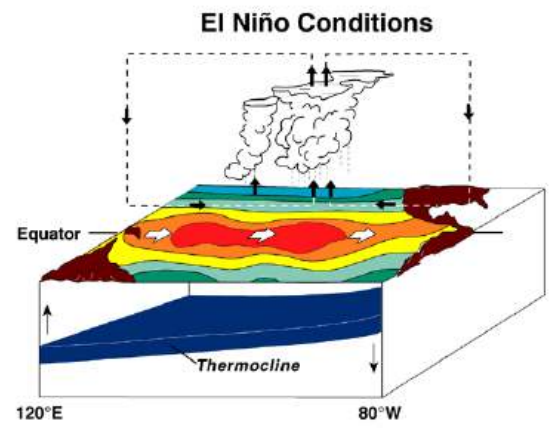
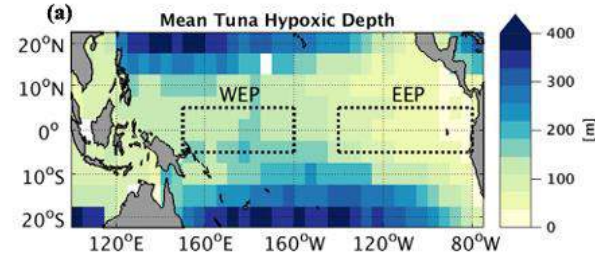
Longline survey catch data
Equatorial EPO



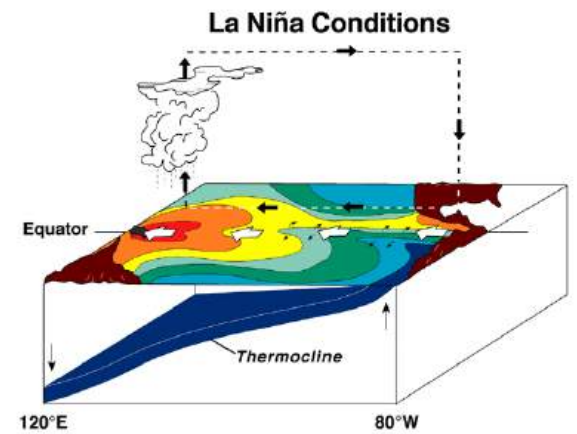
Purse seine catch data
WCPO



Climate Change → Tuna Fisheries



- Deeper thermocline
- Tuna vertical habitat expanded
- Catches for purse seine potentially decreases

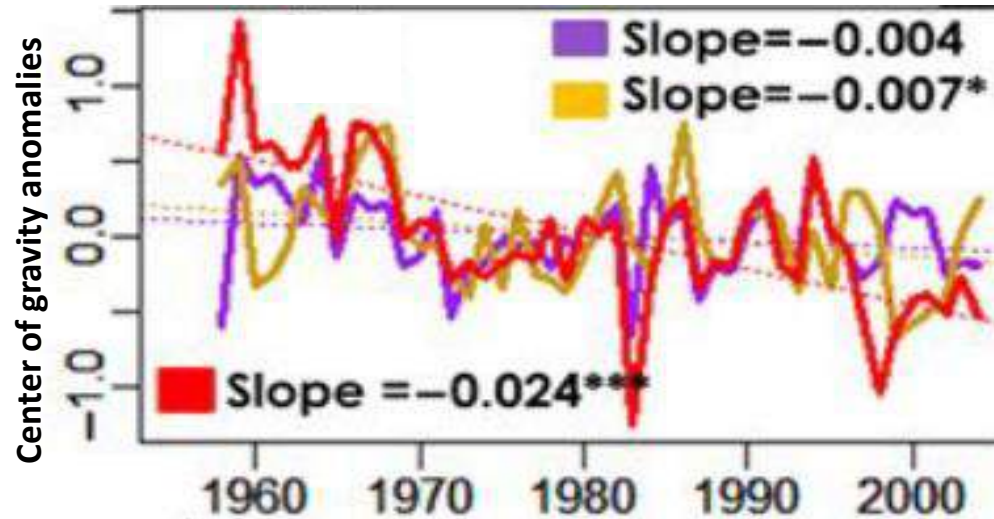


- Shallower thermocline
- Tuna compressed at surface
- Catches for purse seine increases



Climate Change → Tuna Fisheries

Historical Latitudinal Shifts

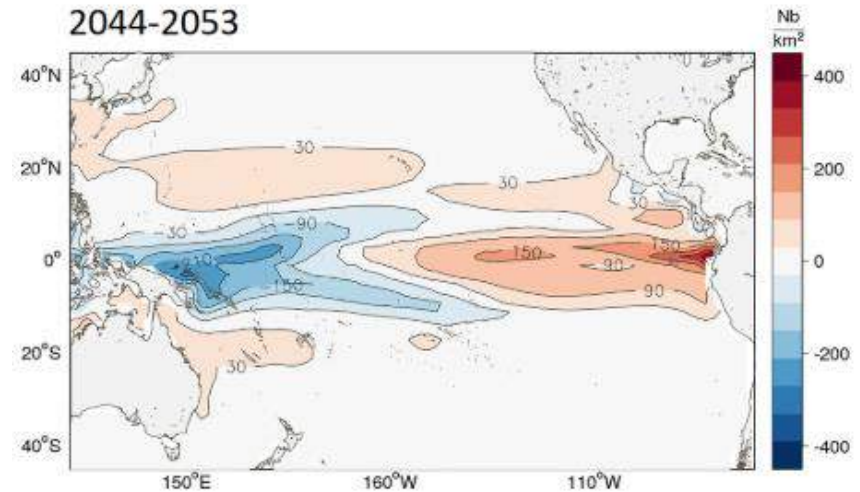
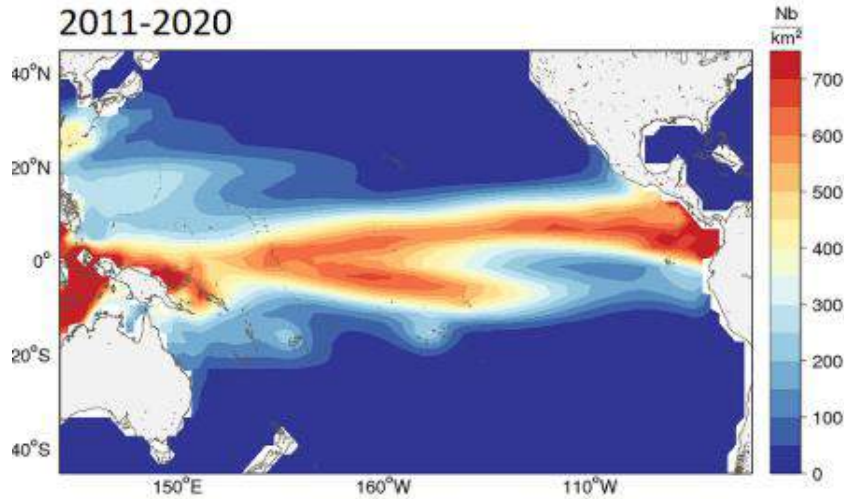


EPO Yellowfin
EPO Bigeye
EPO Skipjack

Climate Change → Tuna Fisheries

Predicted Horizontal Shifts of Larvae

SEAPODYM

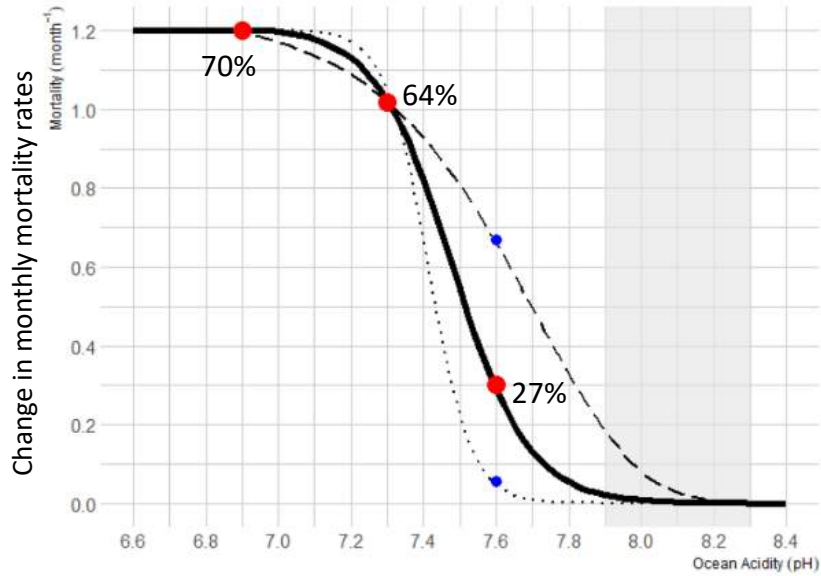


Climate Change → Tuna Fisheries

Ocean Acidification



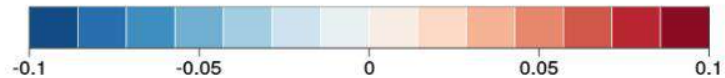
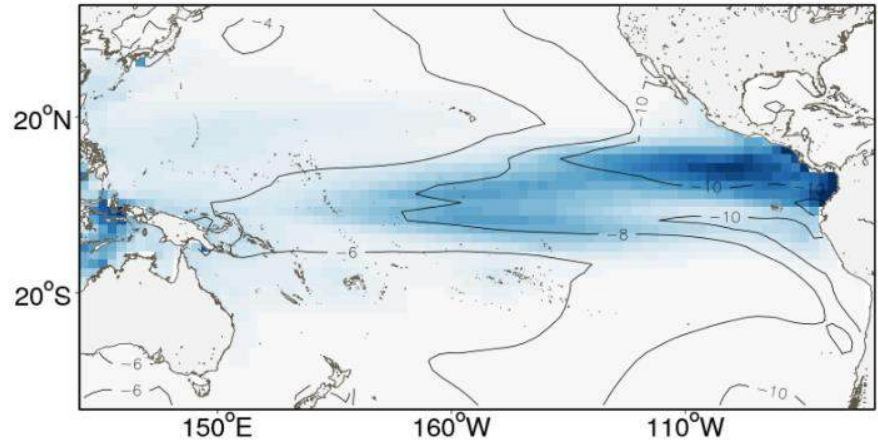
Yellowfin tuna larvae



source: Bromhead et al., 2015; Frommel et al., 2016

SEAPODYM

Change in density of yellowfin tuna larval recruits
2044-2053



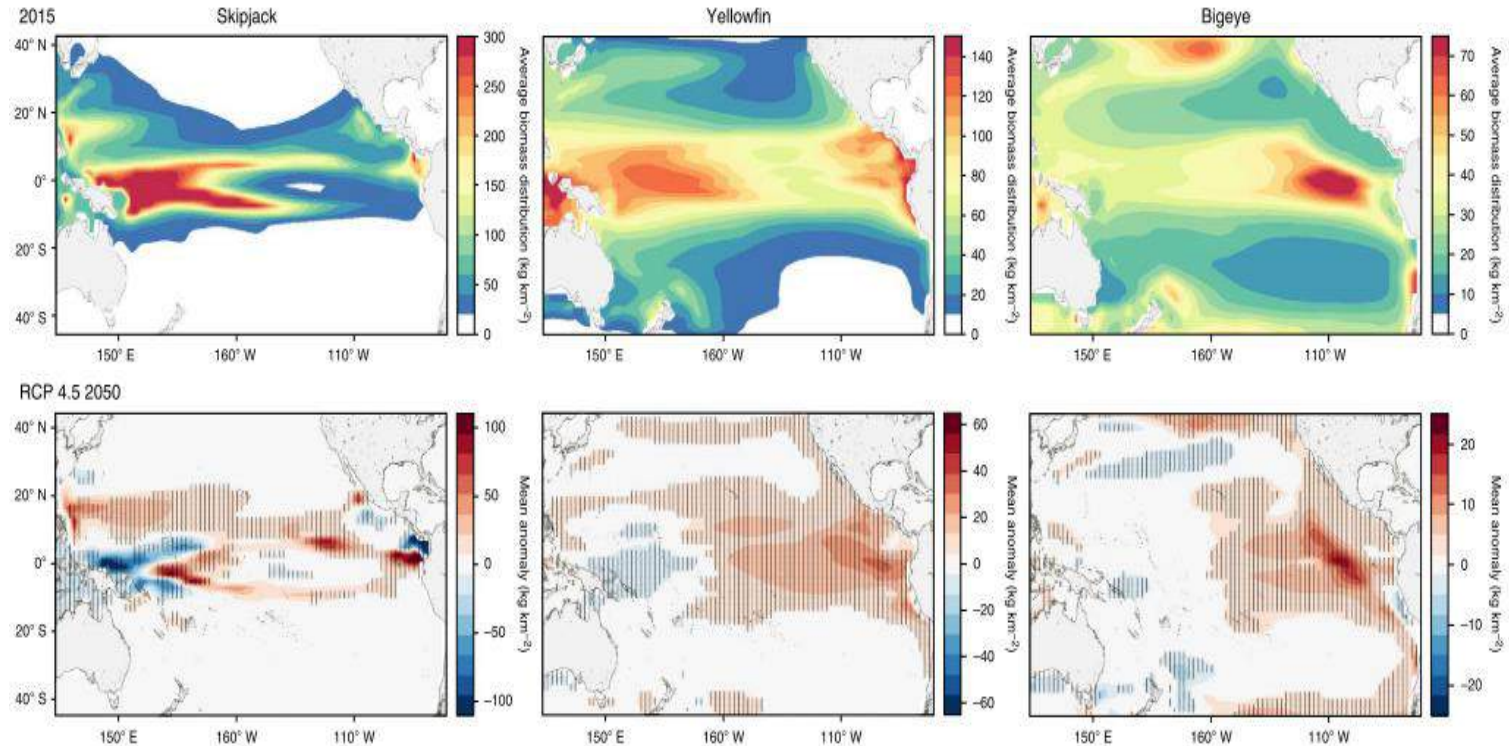
11% biomass reduction in EPO



Climate Change → Tuna Fisheries

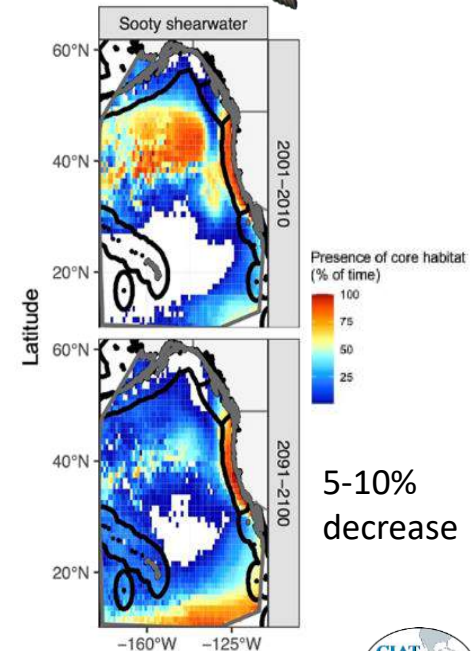
Predicted Horizontal Shifts of Biomass

SEAPODYM



Climate Change → Bycatch Species

Eastern Pacific Ocean?



Summarizing Remarks

1. The ocean is warming due to anthropogenic climate change
2. The Pacific Ocean conditions vary considerably
 - a. Swings in conditions due to ENSO
 - b. Long-term warming trend
3. Marine species prefer certain conditions, including tuna
4. ENSO and long-term warming both have and are expected to impact tuna distribution, biomass, and mortality
5. Bycatch species are predicted to be impacted by climate change
6. Impacts on species influences fishery-species interactions
7. Opportunities to increase our understanding of impacts
8. Consider these impacts when managing tuna fisheries

Preguntas - Questions?

