



Using habitat models to incorporate climate variability on Pacific Bluefin (*Thunnus orientalis*) tuna in stock assessments

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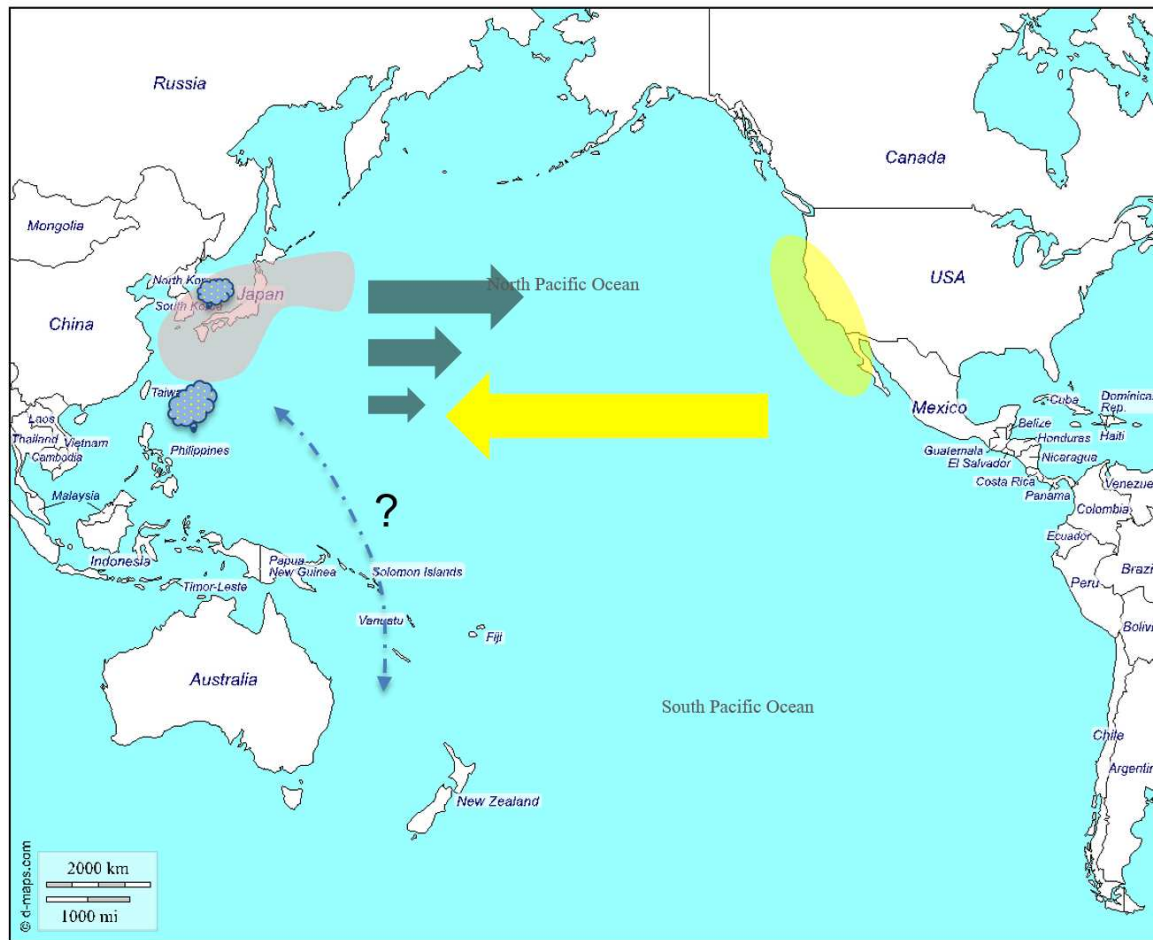


Objectives

- Address the impact of environmental variability and potential impacts of climate change on PBF distribution in the Eastern Pacific Ocean.
- Use habitat models to determine environmental constraints on PBF's potential habitats.
- Test how particular oceanographic conditions such as sea surface temperature, chlorophyll-*a* and fronts, as well as longer term oceanographic phenomena, such as El Niño, affect PBF distribution and relative abundance.
- Provide information for a climate risk assessment for PBF, and contribute to indicator development for Integrated Ecosystem Assessments.



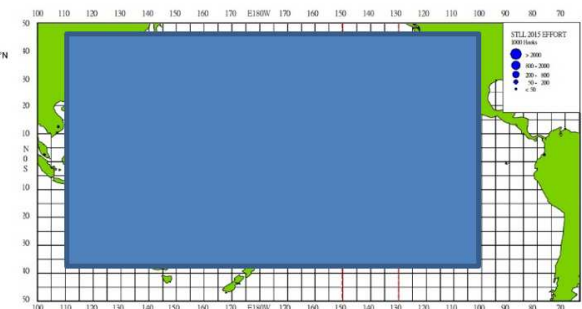
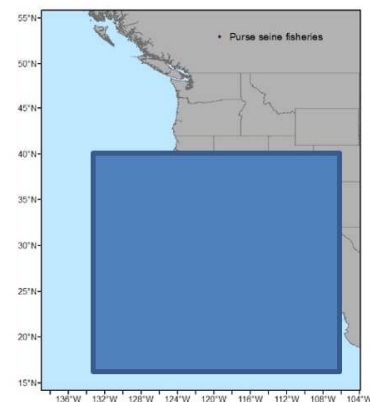
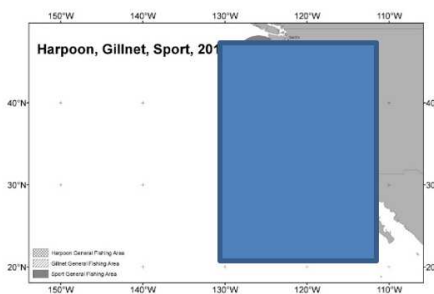
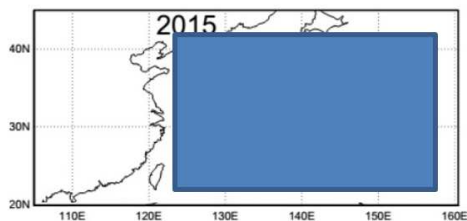
Movement dynamics





Review of fisheries

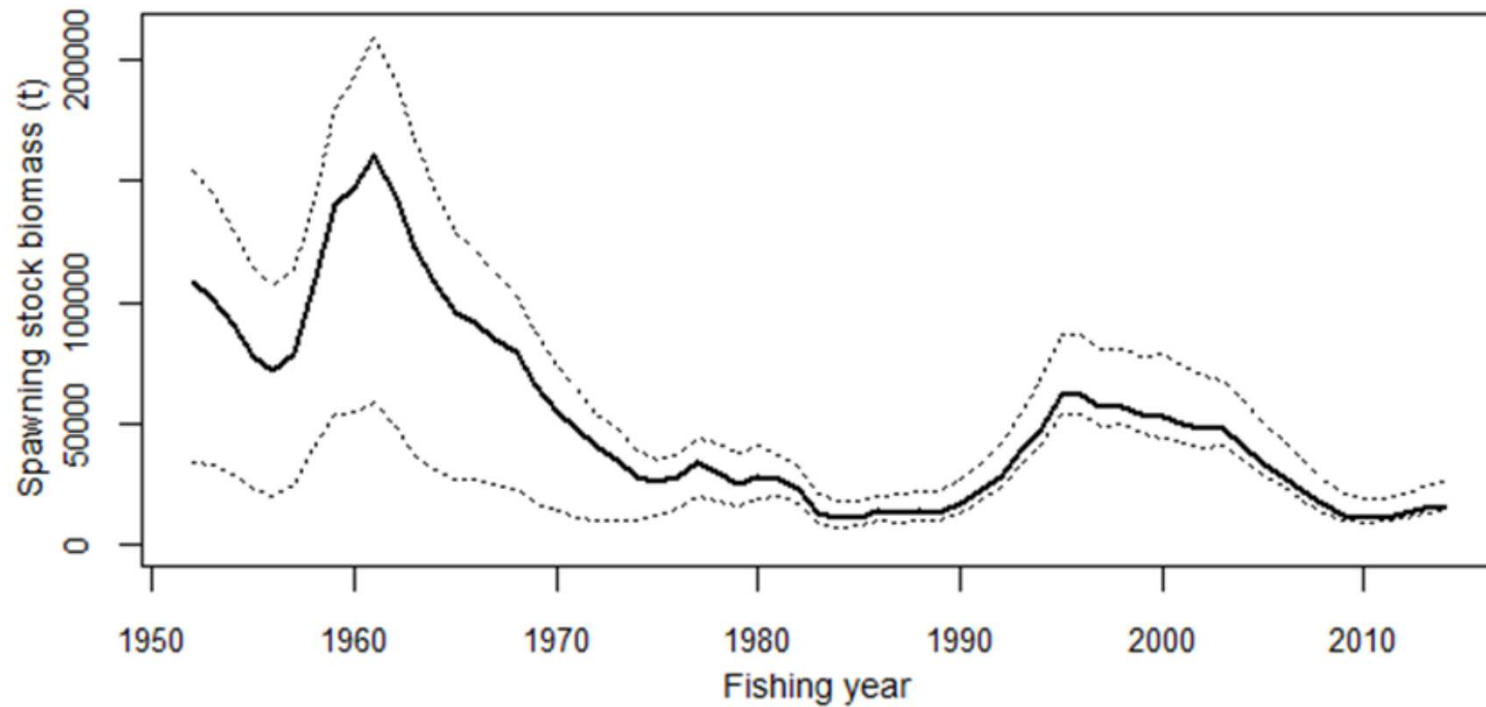
Country	Purse seine	Longline	Trolling	Set nets	Other gear types	Recreational
Japan	X	X	X	X	X	
Mexico	X					
USA	X					X
Korean	X					
Chinese Taipei		X				





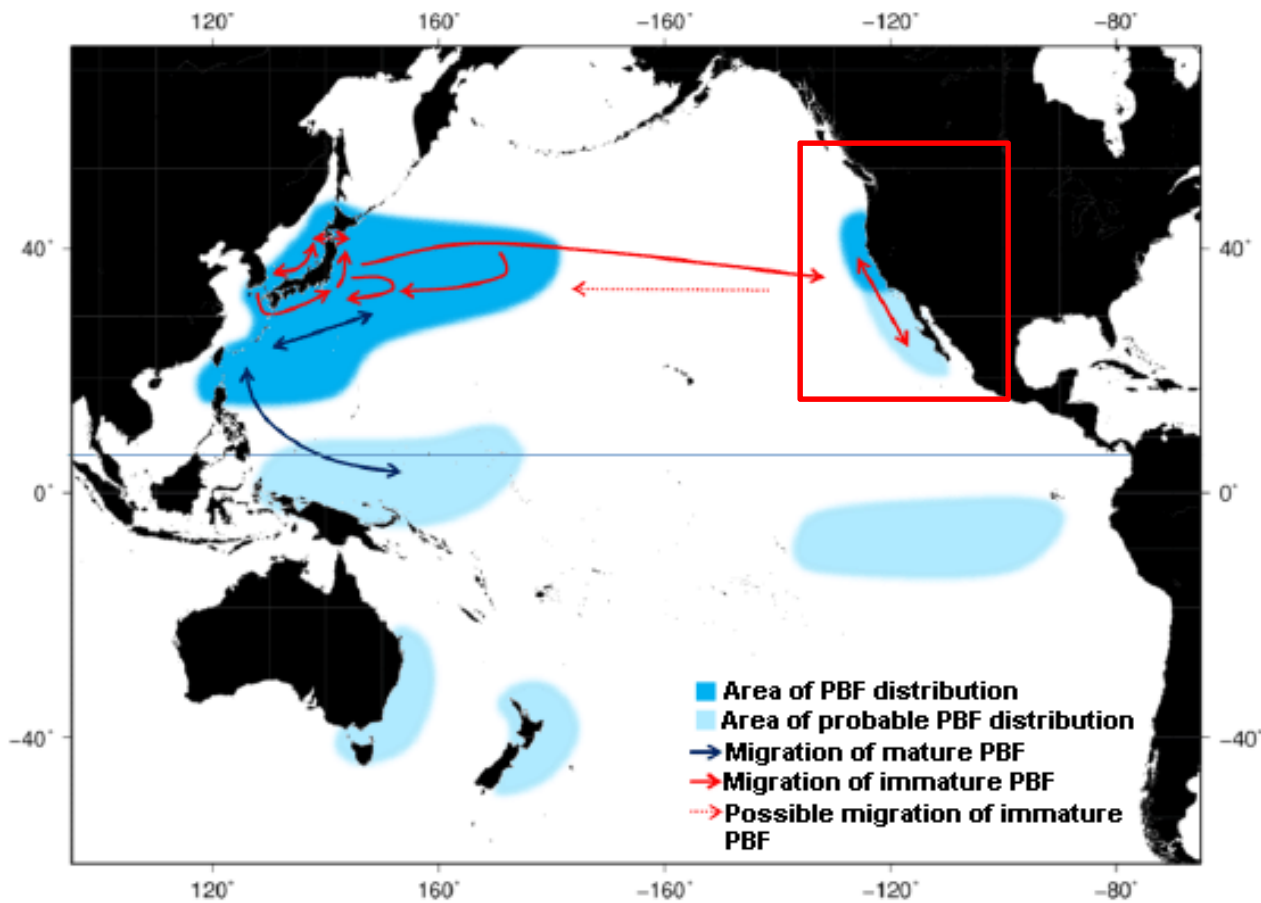
PBF spawning stock biomass

currently at ~ 3% of unfished SSB





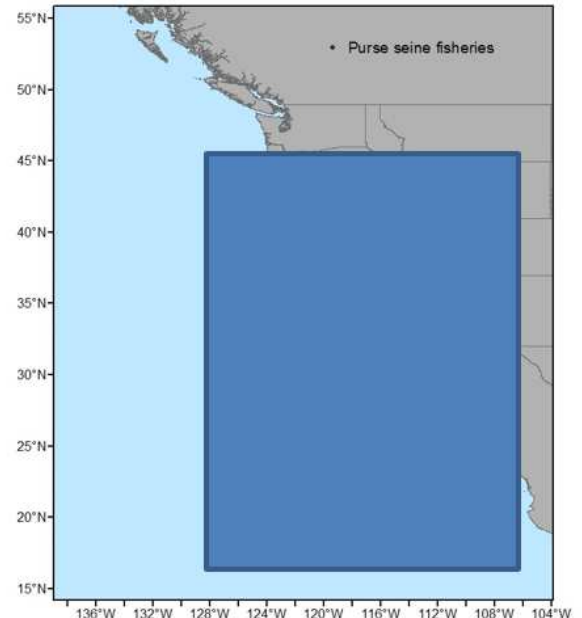
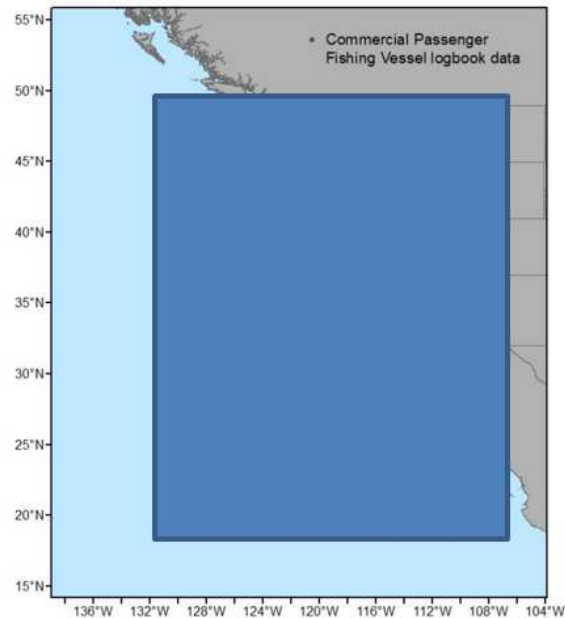
Generalized distribution of PBF darker areas indicate core habitat





Fishery Datasets

Fishery	Dates
Commercial swordfish gillnet fishery (NMFS) Logbook data Observer data	March 1981 – Present July 1990 - Present
Commercial Passenger Fishing Vessel logbooks (CDFW)	May 1986 - Present
US and Mexico commercial purse seine fishery data (IATTC)	February 1985 - Present

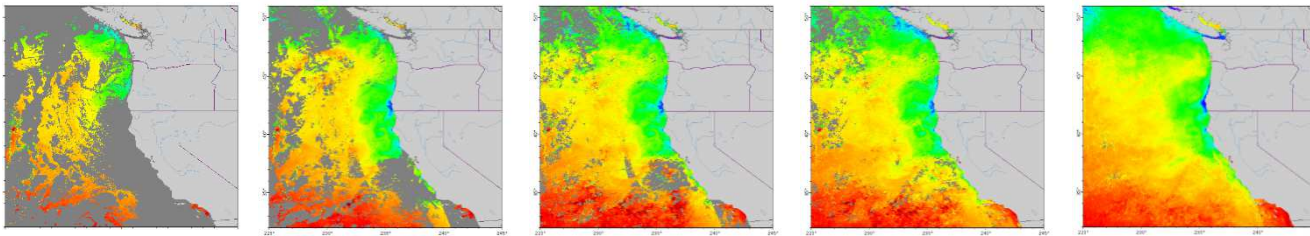




Environmental Datasets

Variable	Product/Sensor	Grid resolution	Temporal coverage	Temporal Resolution	Source and Dataset ID
Sea surface temperature	AVHRR Pathfinder	0.05 deg on ERDDAP	1981 - 2001	8-day	NOAA/NESDIS phssta8day
	GOES Imager	0.05 deg on ERDDAP	2001 - present	8-day	NOAA/GOES erdGAssta8day
Chlorophyll-a concentration	SeaWiFS/Orbview-2	0.1 deg on ERDDAP	1997 - 2005	8-day	NASA/GSFC swchla8day
	MODIS/Aqua	0.025 deg on ERDDAP	2005 - present	8-day	NASA/GSFC erdMBchla8day
Oceanic Front Probability	GOES Imager	0.05 deg on ERDDAP	2001 - present	monthly	NOAA/GOES gatfntmday

Composite over several days



1 Day → 3 Day → 8 Day → 14 Day → Month

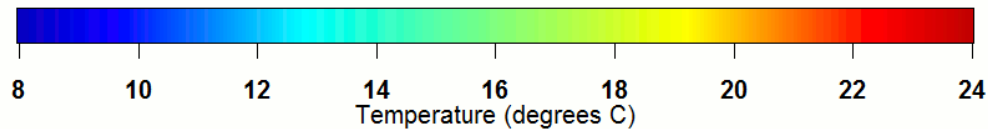
Dale Robinson, CoastWatch, West Coast Coordinator

Composite pros

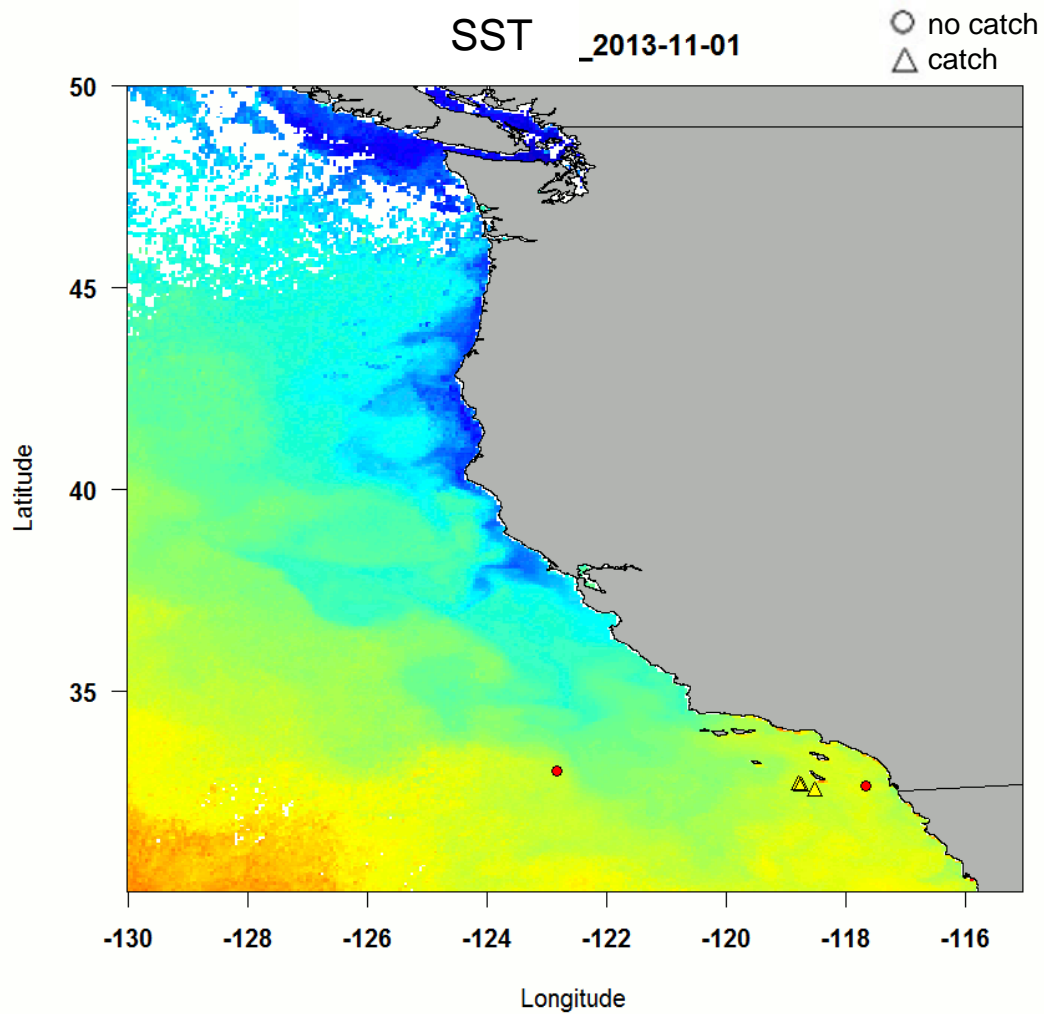
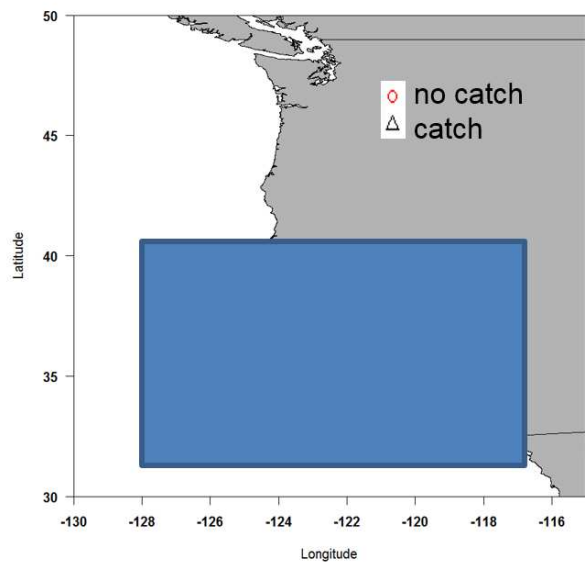
- More pixel coverage

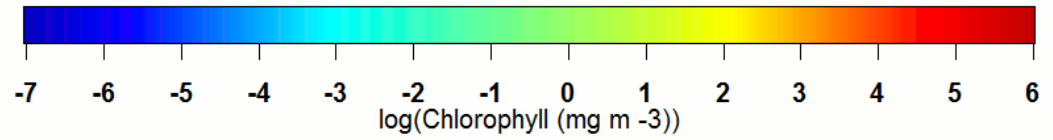
Composite cons

- Smoothed data



Commercial swordfish gillnet fishery observer data (2013)

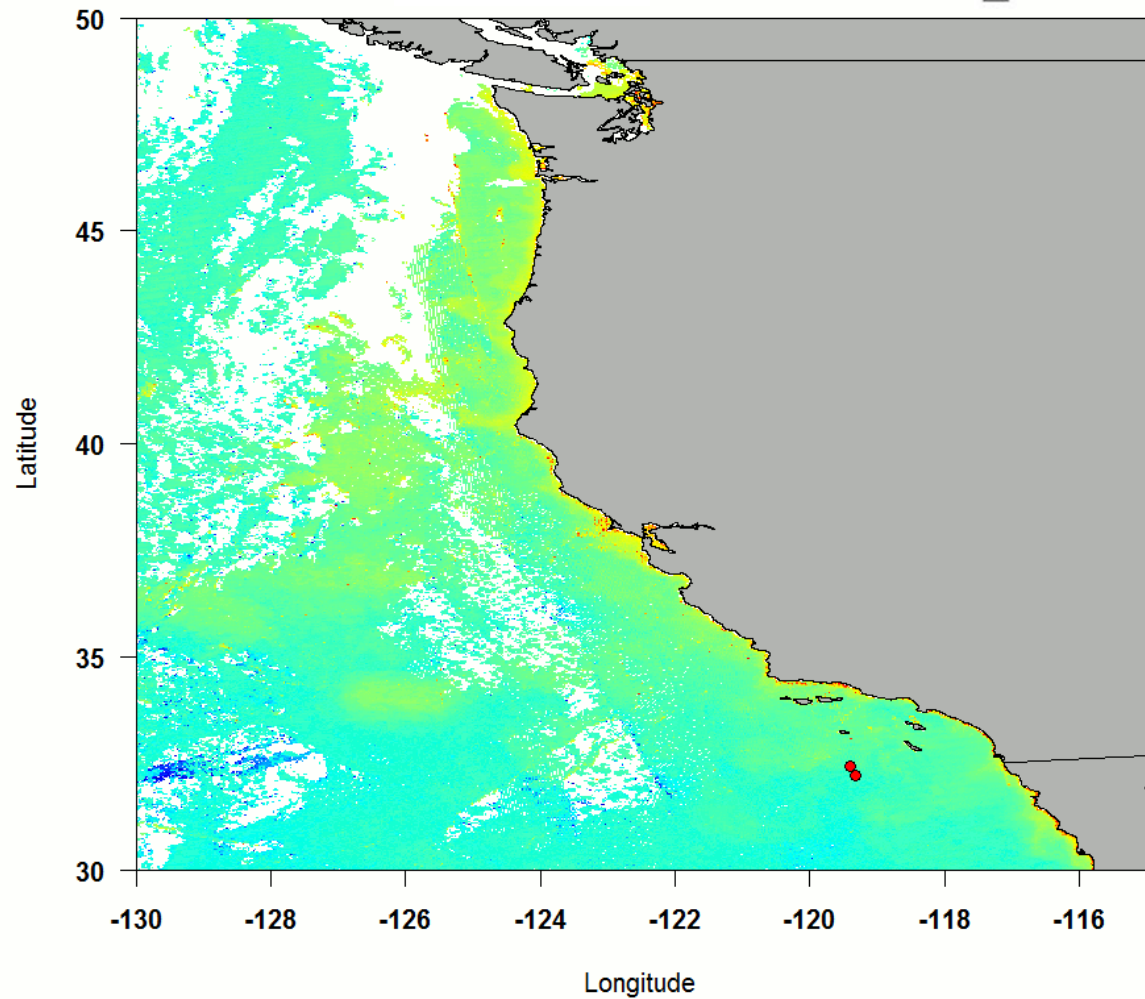
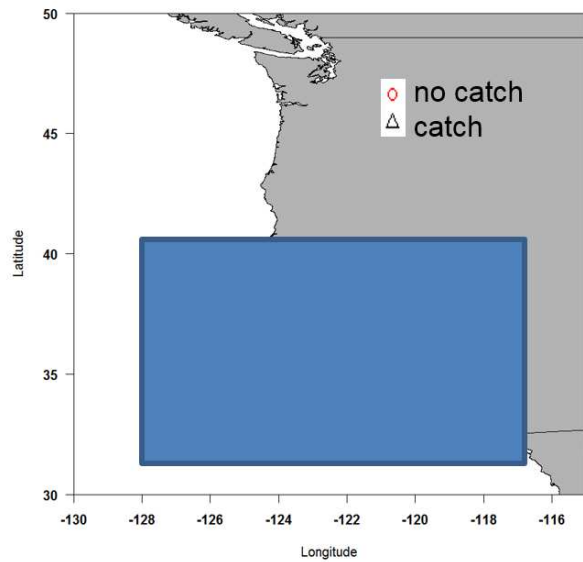




Chlorophyll _2013-01-02

○ no catch
△ catch

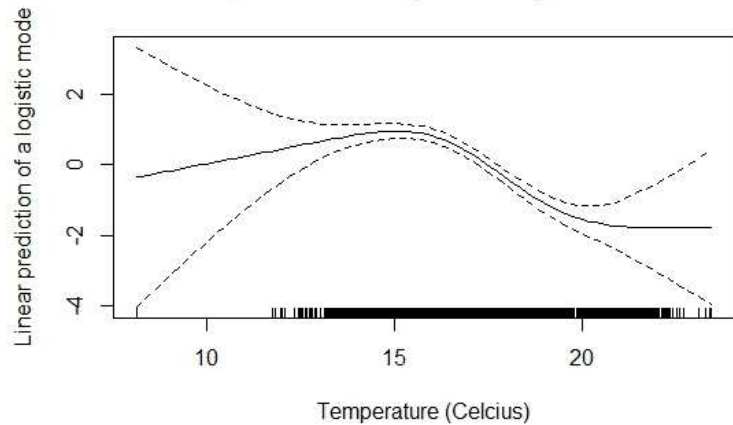
Commercial swordfish gillnet fishery observer data (2013)



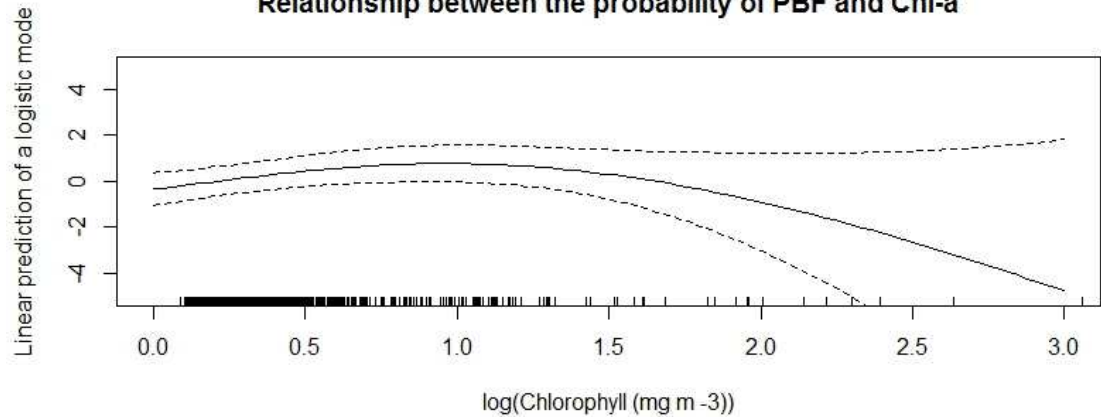


Preliminary Results on SST and Chl-a from Gillnet Observer Data

Relationship between the probability of PBF and SST



Relationship between the probability of PBF and Chl-a





Benefits & Future Directions

- This research will provide insights into varied relationships among core habitat/hotspots in the Eastern Pacific Ocean and oceanographic variables in Pacific Bluefin tuna.
- Monitoring and understanding changes in the distribution and behavior of PBF is necessary to provide a framework for climate vulnerability assessments and to implement an ecosystem approach to fishery management.
- We plan to use spatial indices of PBF distribution and shifts of distribution in the Eastern Pacific Ocean to inform spatially explicit stock assessment models and management objectives.



Acknowledgments

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Thank you for your attention.

Questions?

