

SC22

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Apia, Samoa



UF IFAS
UNIVERSITY of FLORIDA

IDENTIFYING RISK FACTORS IN LEATHERBACK BYCATCH IN HAWAII'S DEEP-SET LONGLINE FISHERY

WCPFC-SC22-2026-EB-WP08

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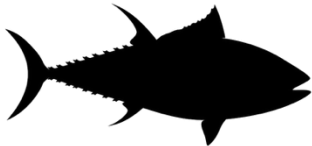
Outline

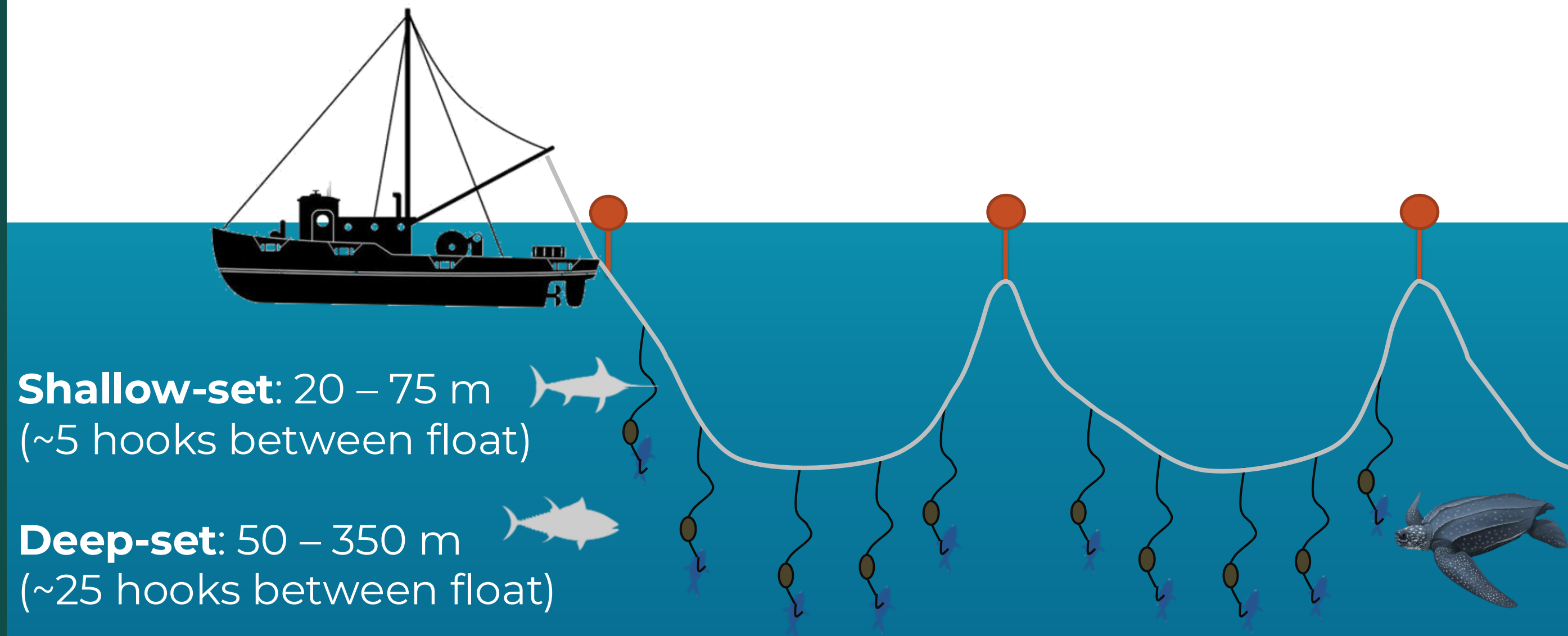
- 1) Research goals: Identify environmental and gear parameters associated with leatherback sea turtle (*Dermochelys coriacea*) bycatch (Hawaii deep-set longline)
- 2) Method: Ensemble random forests using Hawaii deep-set longline data
- 3) Potential application: support CMM 2018-04 review

Leatherback bycatch management in Hawai'i longline fisheries

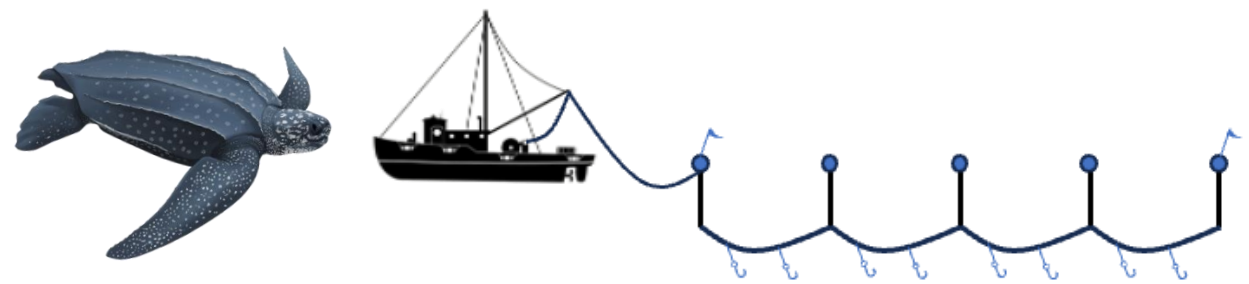
- Most turtle regulations focus on shallow-set
- No changes in regulations for deep-set targeted for leatherbacks since 2004

¹NMFS 2023

	Shallow-set 	Deep-set 
Observer coverage	100%	8-26%
# Interactions 2005-2024	146	estimated at 246 ¹
At-vessel mortalities	0%	23%
Effort	2.5%	97.5%



Machine learning approach

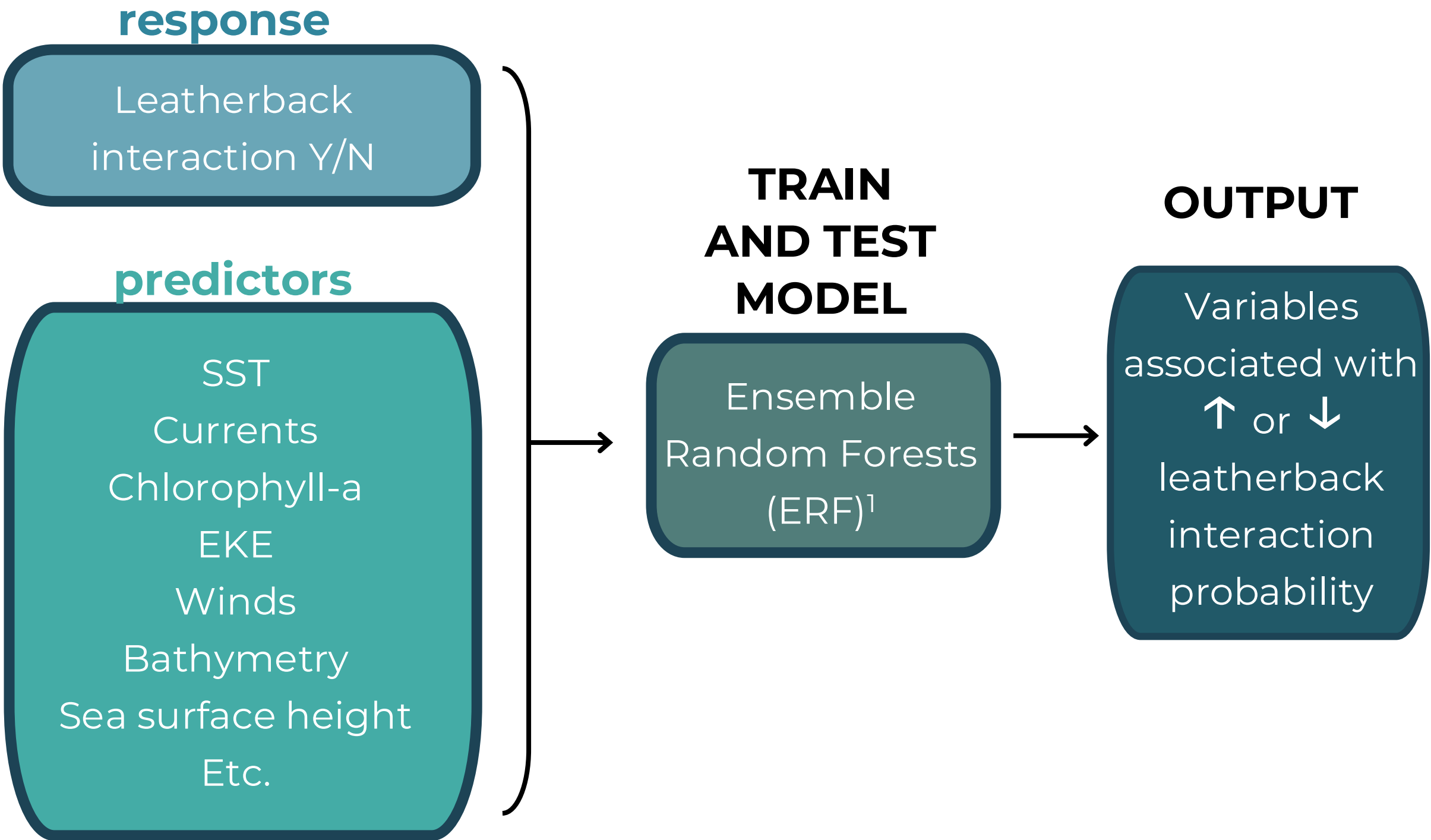


Hawaii deep-set observer data

- 2005-2024
- 76,155 deep-set longline sets (1.9×10^8 hooks)
- 57 observed leatherback interactions

Two machine learning models:

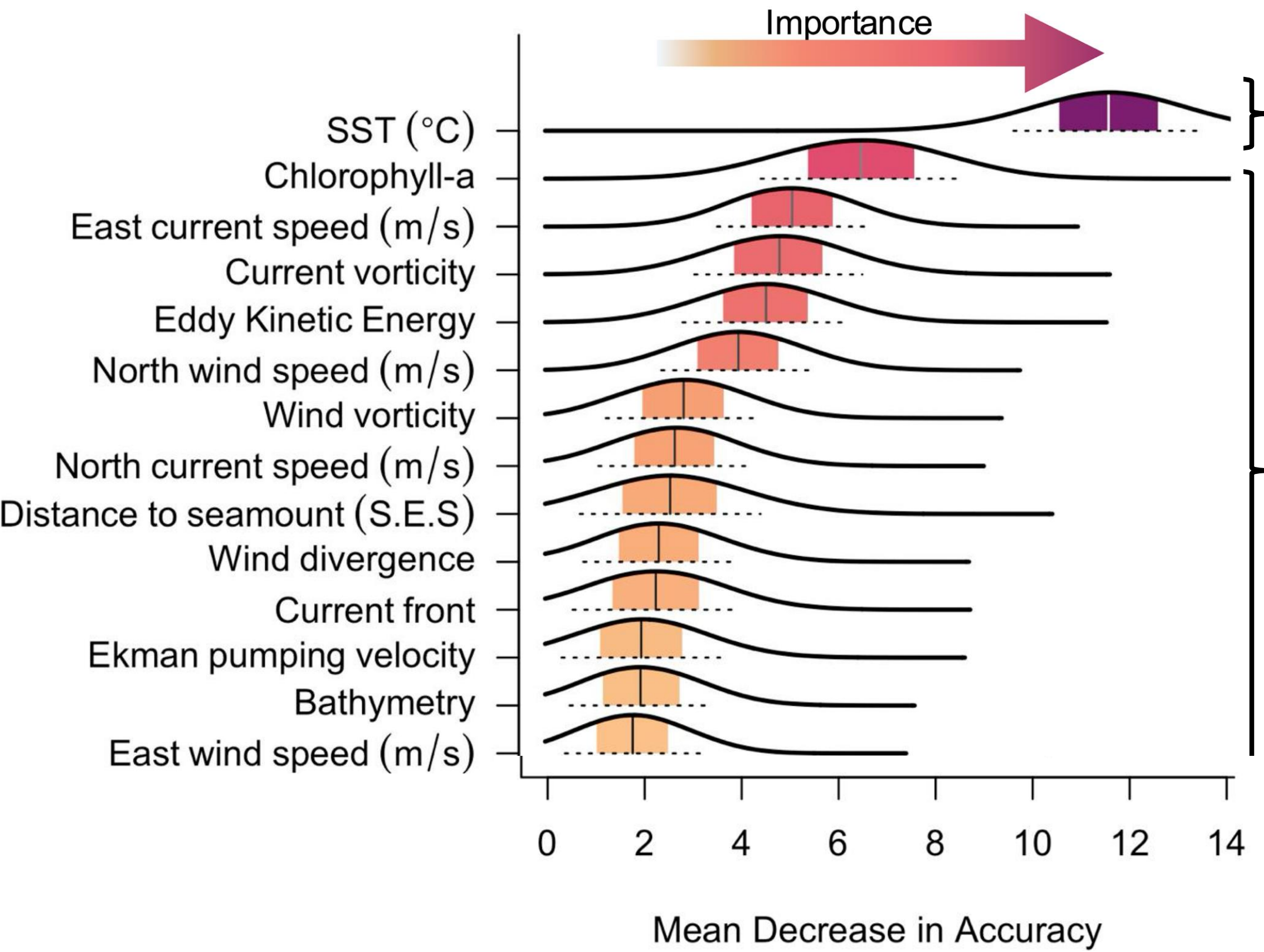
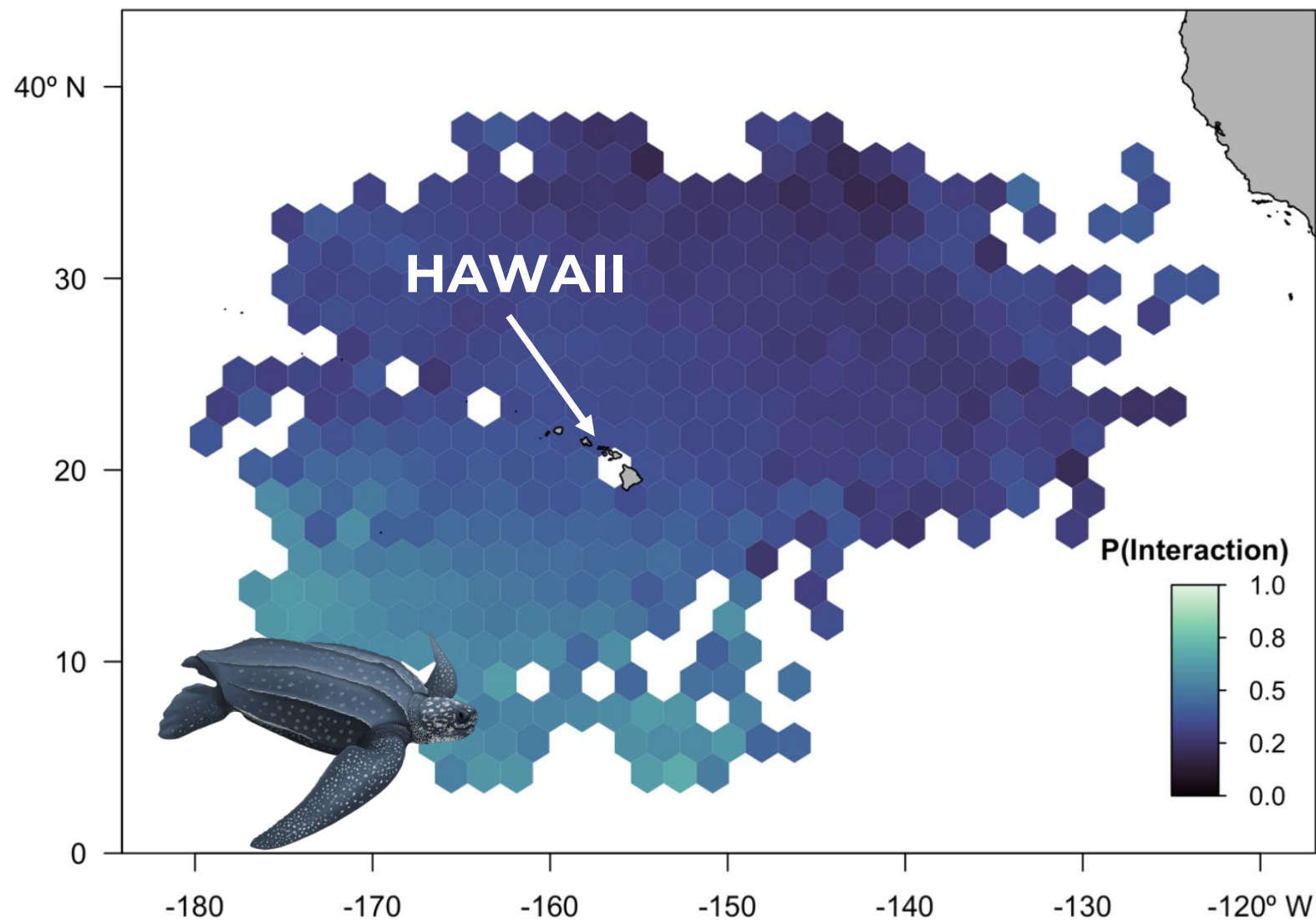
- 1) Oceanographic-only (environmental covariates)
- 2) Operational focus (e.g., gear components)



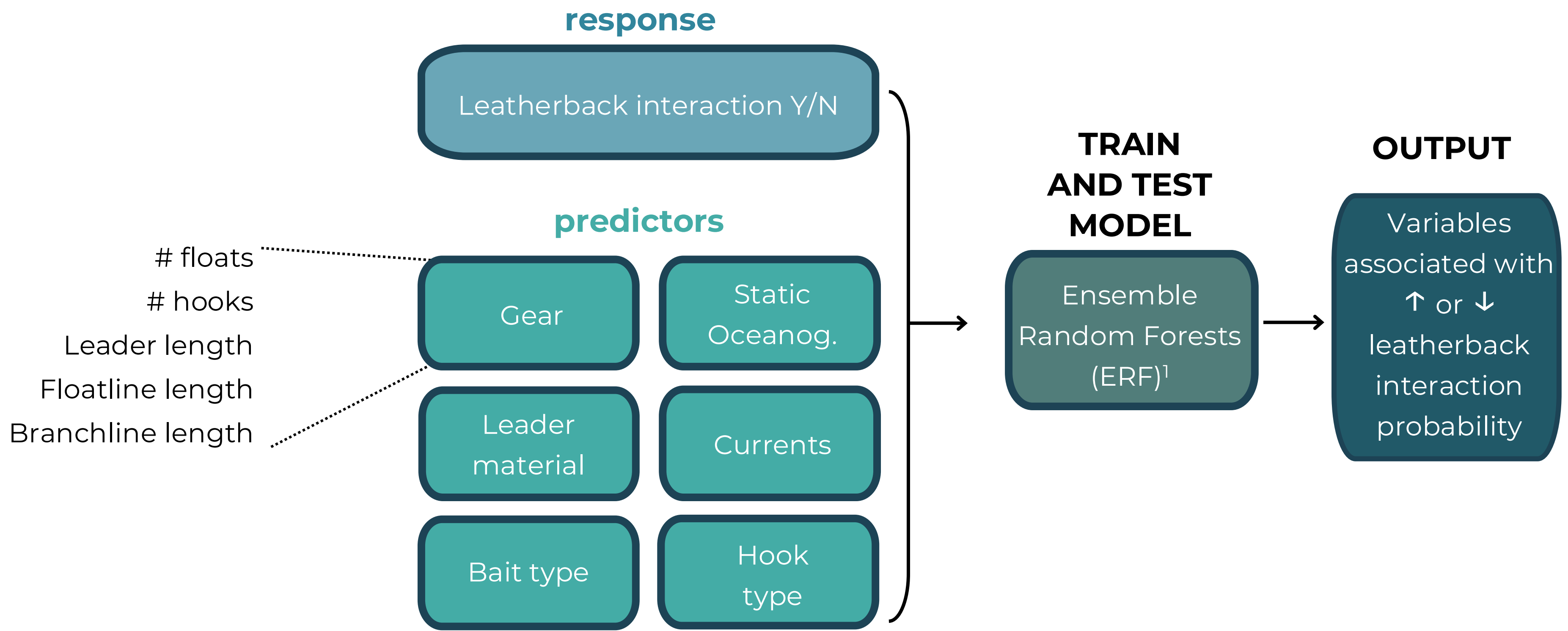
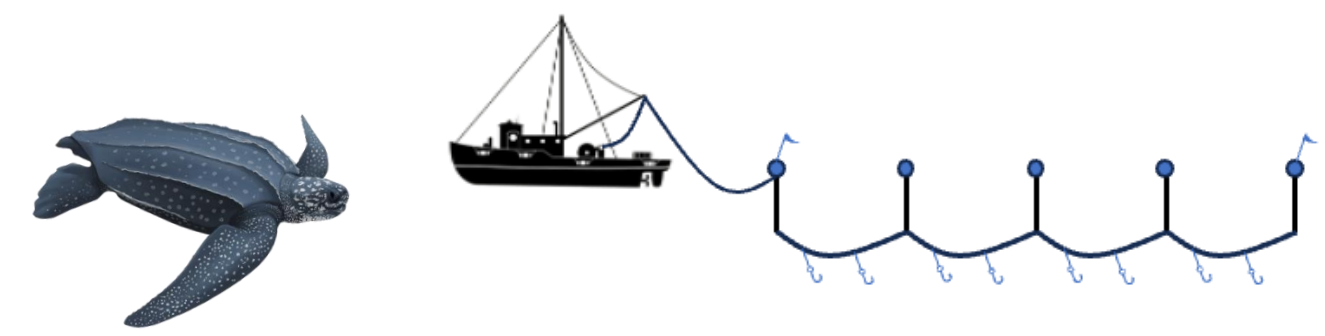
¹Siders et al. 2020

Model 1: Oceanographic-only model for predicting leatherback interactions

Oceanographic-only models are limited for leatherbacks

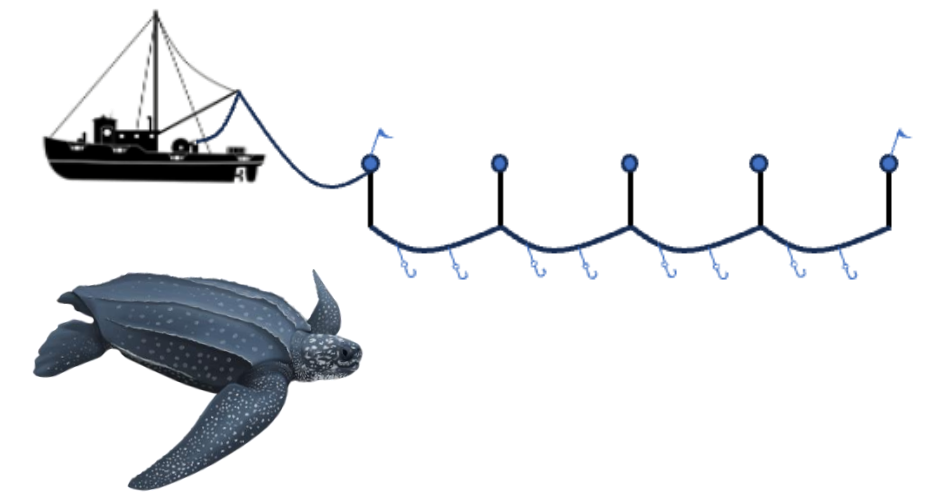


Model 2: Operational Ensemble Random Forest



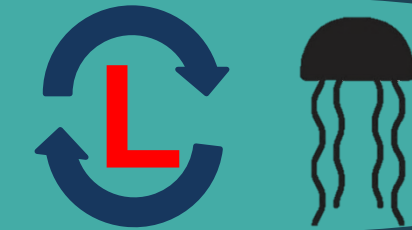
¹Siders et al. 2020

Variables associated with high leatherback interaction probability



Currents

- Eddies, low pressure, downwelling



Static Oceanography

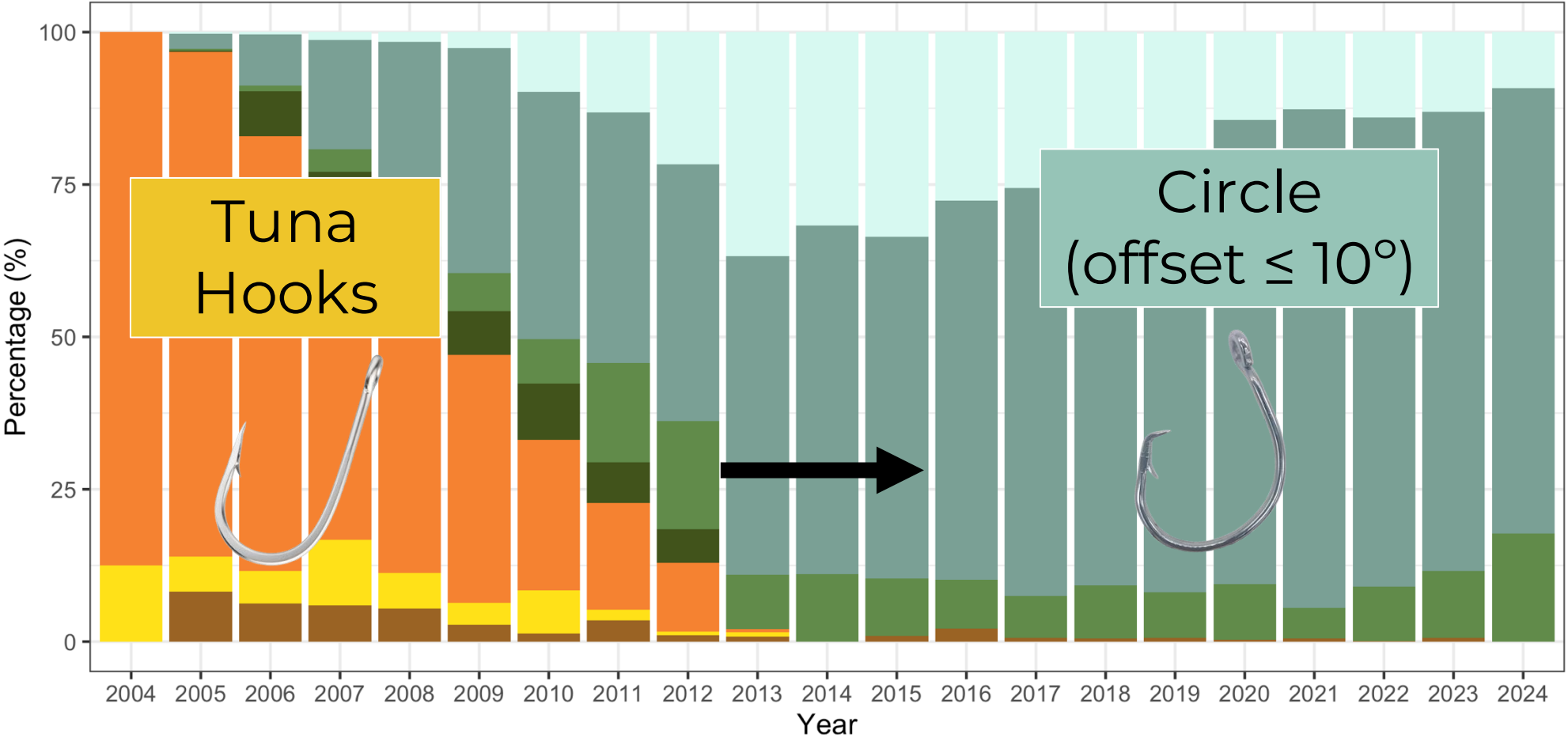
- Close to SST fronts

Gear

- More hooks and/or floats per set = more effort
- Longer leaders = more gear movement
- **Hook type/size and leader material**

Hook type and size

2012: False killer whale regulations



Hook

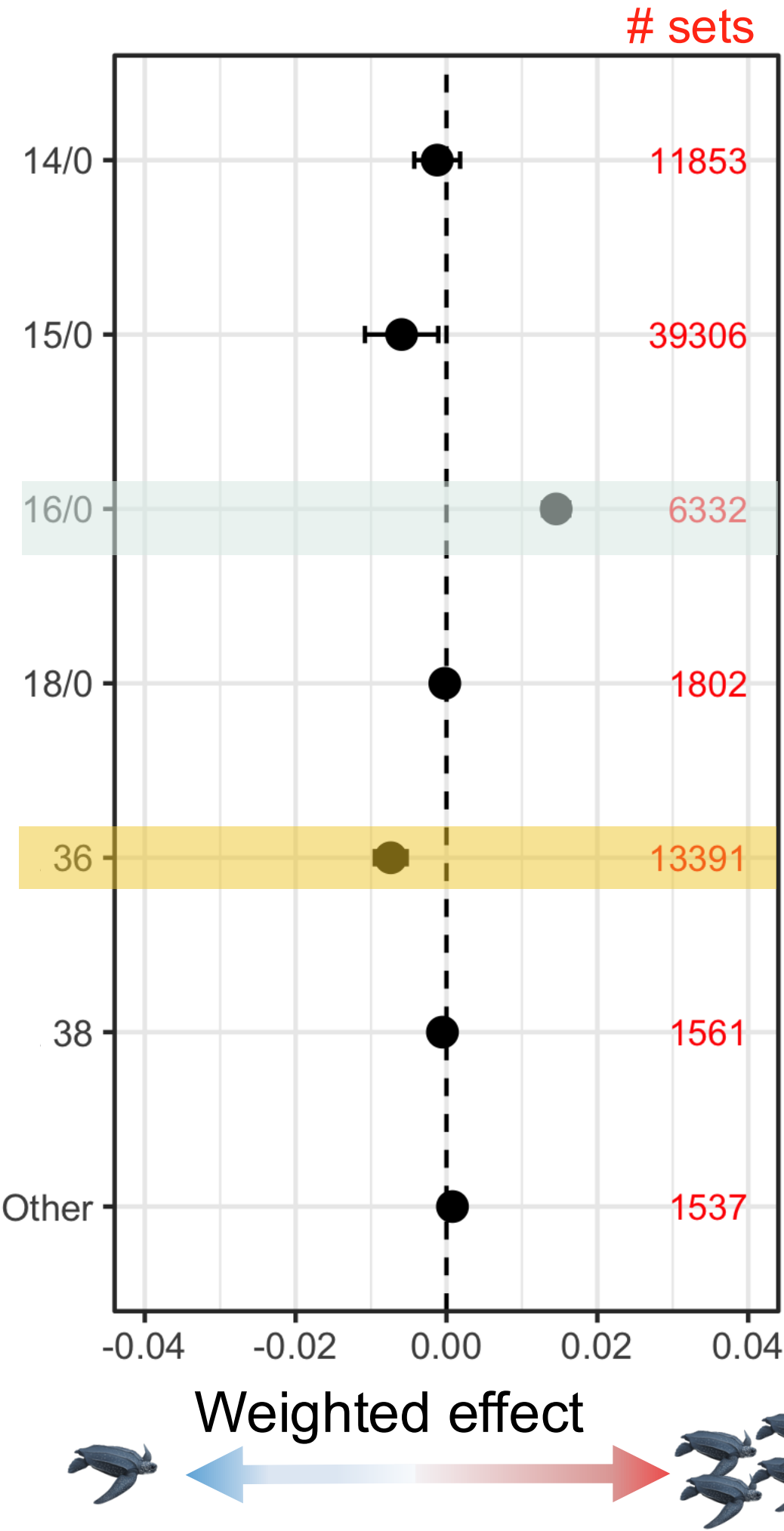


82% of interactions occur due to external hooking or entanglement

Circle
(offset $\leq 10^\circ$)

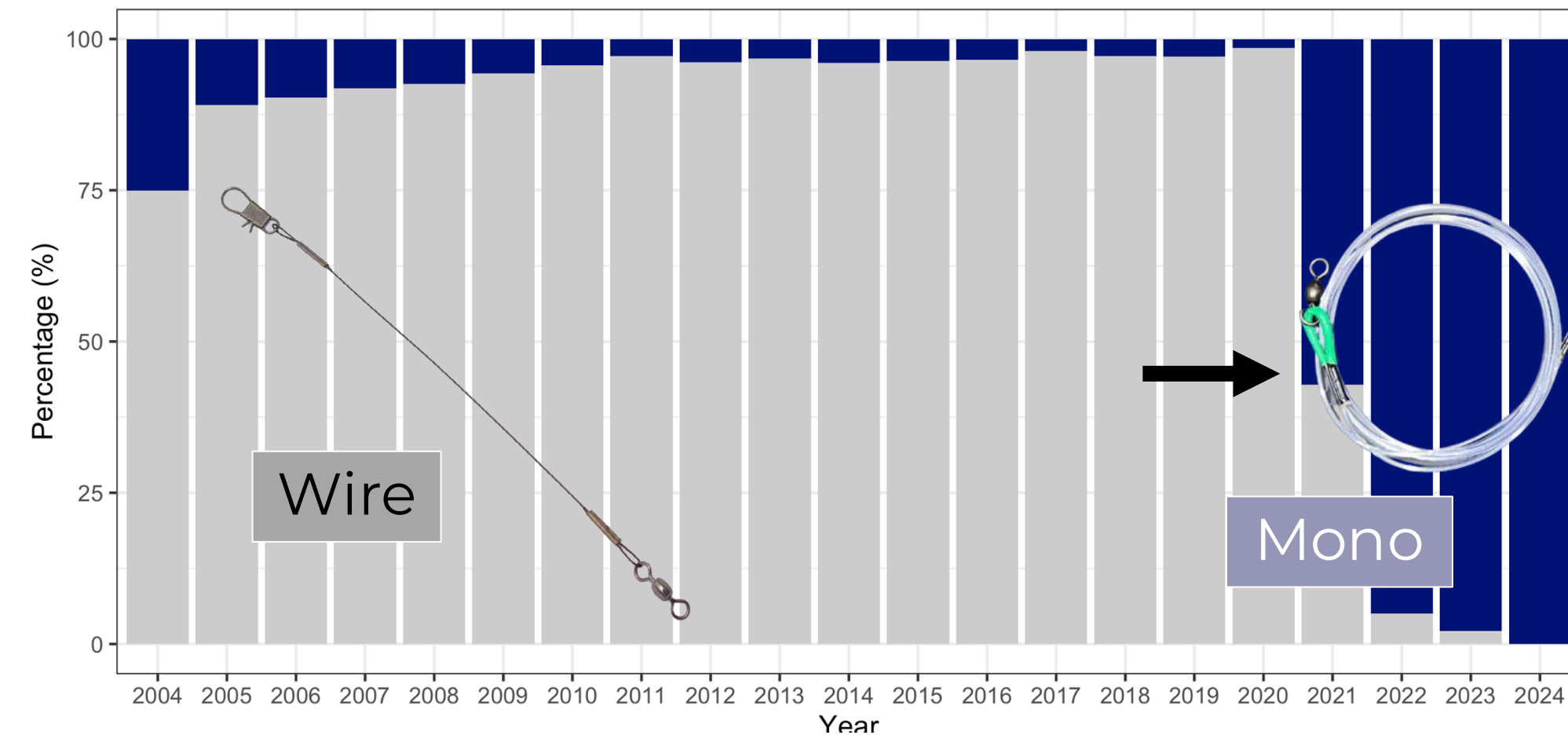


Tuna
hook

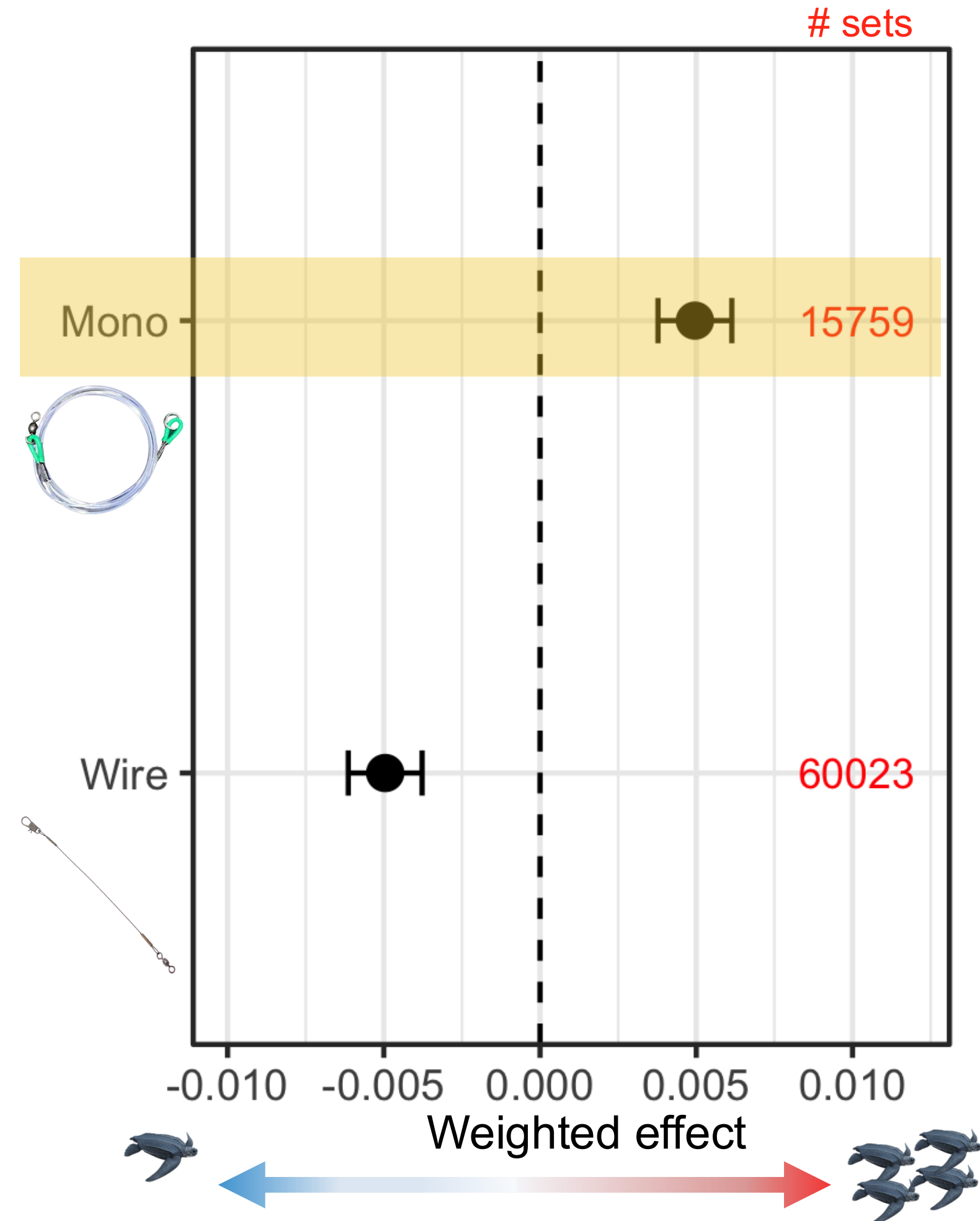


Leader material

2022: Oceanic whitetip shark regulations



Leader material



Conclusions



- 1) Ensemble random forests are valuable for evaluating rare-event data
- 2) Hawaii PIROP leatherback interactions associated with:
 - Eddies, low pressure systems with downwelling and SST fronts
 - More effort, more gear in the water
 - 16/0 circle hooks and monofilament leaders

SC22 Recommendations



- SC22 recommends an expanded analysis of the WCPO region using joint ROP data for presentation at SC23
- SC22 encourages additional CCMs to share ROP data in support of this analysis for longline deep-set leatherback interactions in the high seas

Thank you!



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