FIU | Institute of Environment

Tropical Fish Ecology Lab

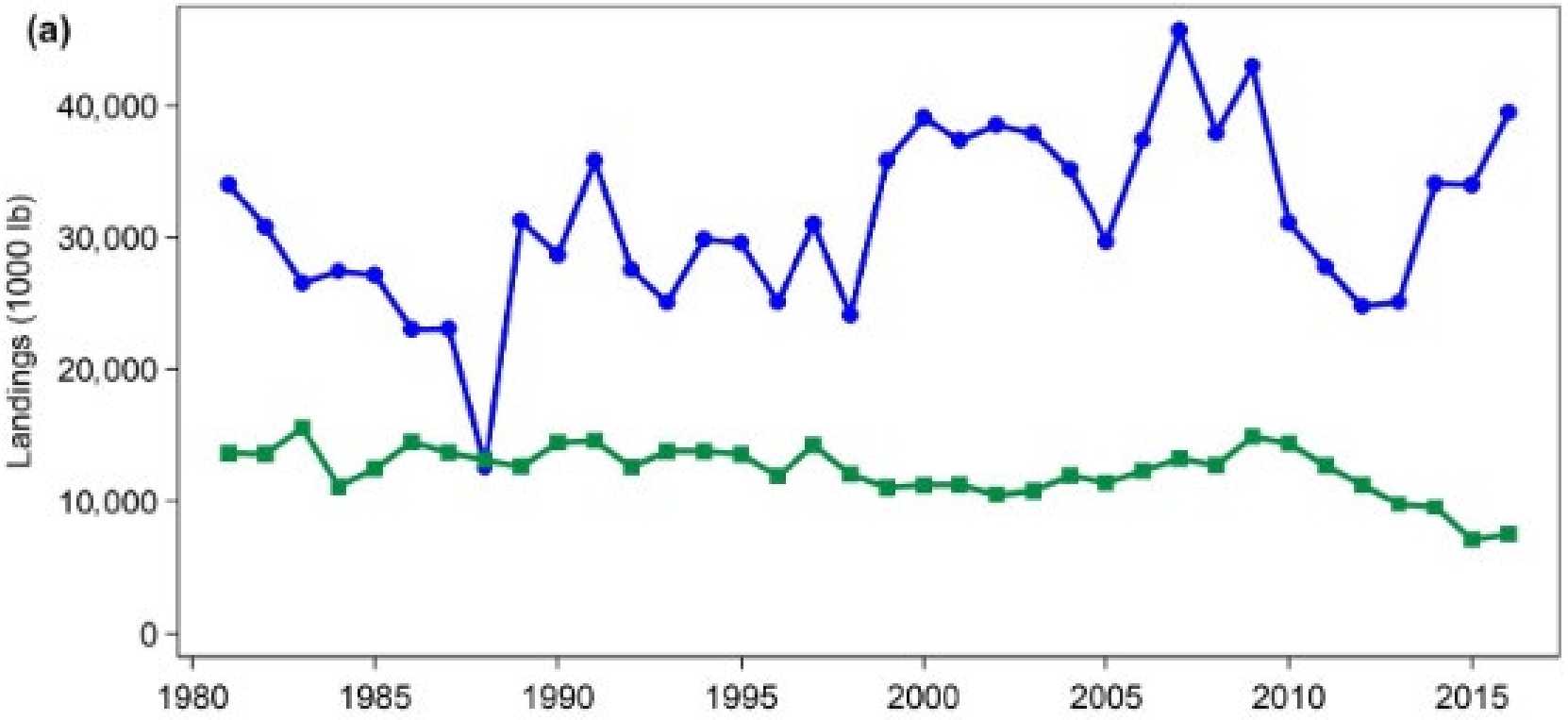
Quantifying and Modeling the Spatial Patterns of the Florida Keys Recreational Reef Fishery

Matthew Marrero and Alastair Harborne

Florida Keys Marine Science Conference 2025

Photos: FWC

Over 75% of Southeast United States marine landings come from Recreational Sector



Recreational

Commercial

Shertzer et al. 2019

How do we collect fisheries dependent data for each sector?

Commercial


Angler's Daily Log Sheet – Ocean Edition 24290

DATE: / /

BOAT or SHORE (circle)

Zero fish caught today (tick)

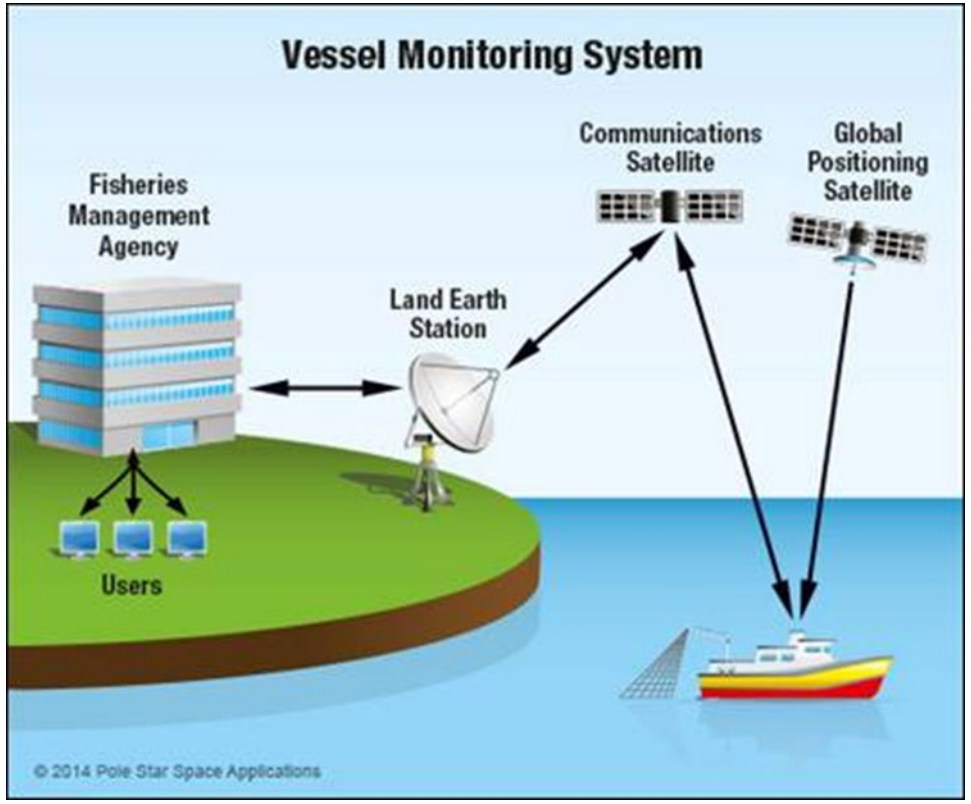
Location	Depth (m or ft)	Start time	Finish time	Gear & No. used	Sticks & No. used	Fish	Species	Length (cm or in)	Released (Y/N)	Reason for release

Comments

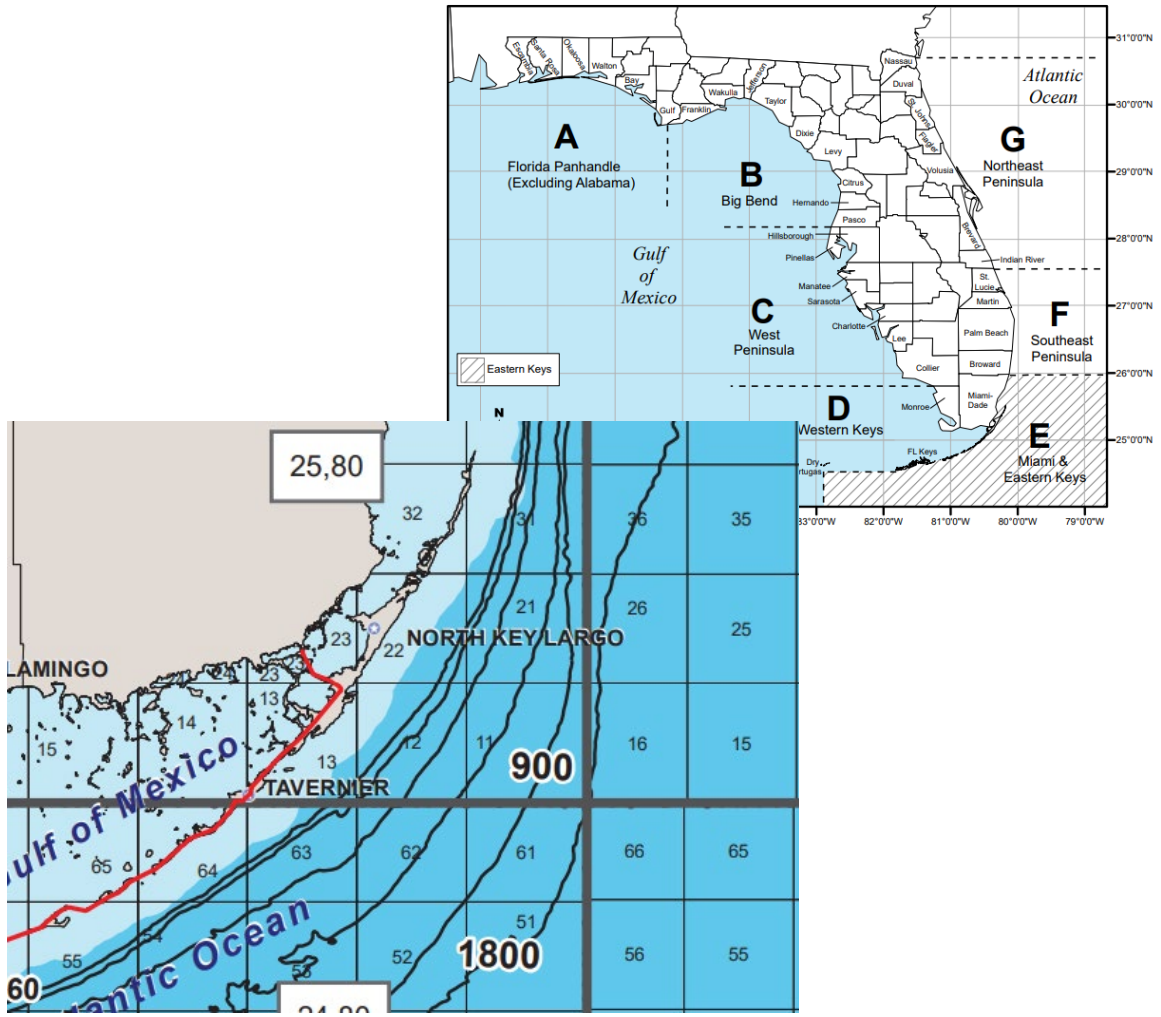
Recreational

MARINE RECREATIONAL INFORMATION PROGRAM

How do we collect spatial data for each sector?



Saltwater Recreational Fishing Survey Map

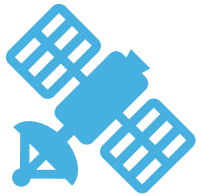


Options to address spatial data scarcity of recreational fishing/boating activity

High Resolution

Low Coverage

$$$



Medium Resolution

Moderate-High Coverage

$$

High Resolution

High Coverage

$$$

Options to address spatial data scarcity of recreational fishing/boating activity

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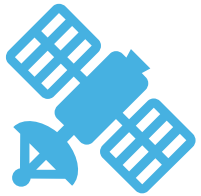

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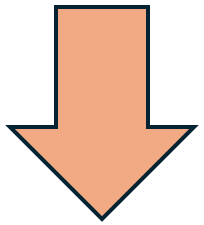
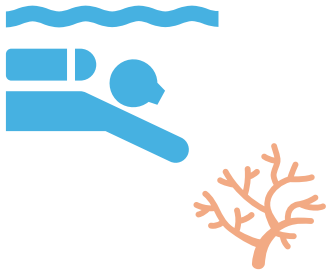
Why Satellite Imagery is a good choice for the Florida Keys



Low amounts of Commercial Vessel Activity



Diving activity is concentrated at Sanctuary Preservation Areas

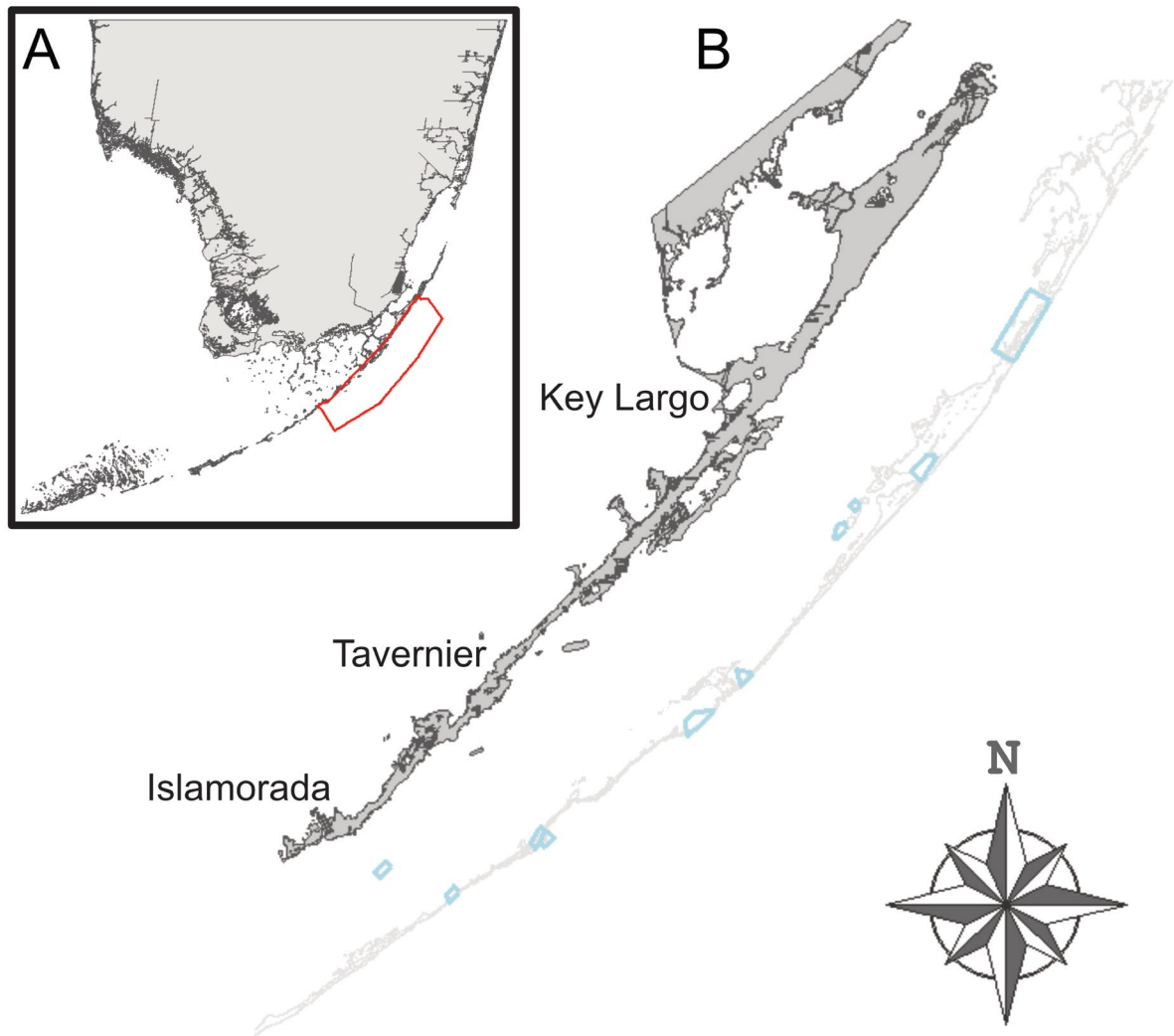
FWC Report, Matthews et al. 2018

Project Objectives

1) Map the distribution of detected vessels in the Upper Keys

2) Use statistical modeling to find important drivers of vessel distribution

3) Estimate a plausible range of recreational fishing vessels using the model

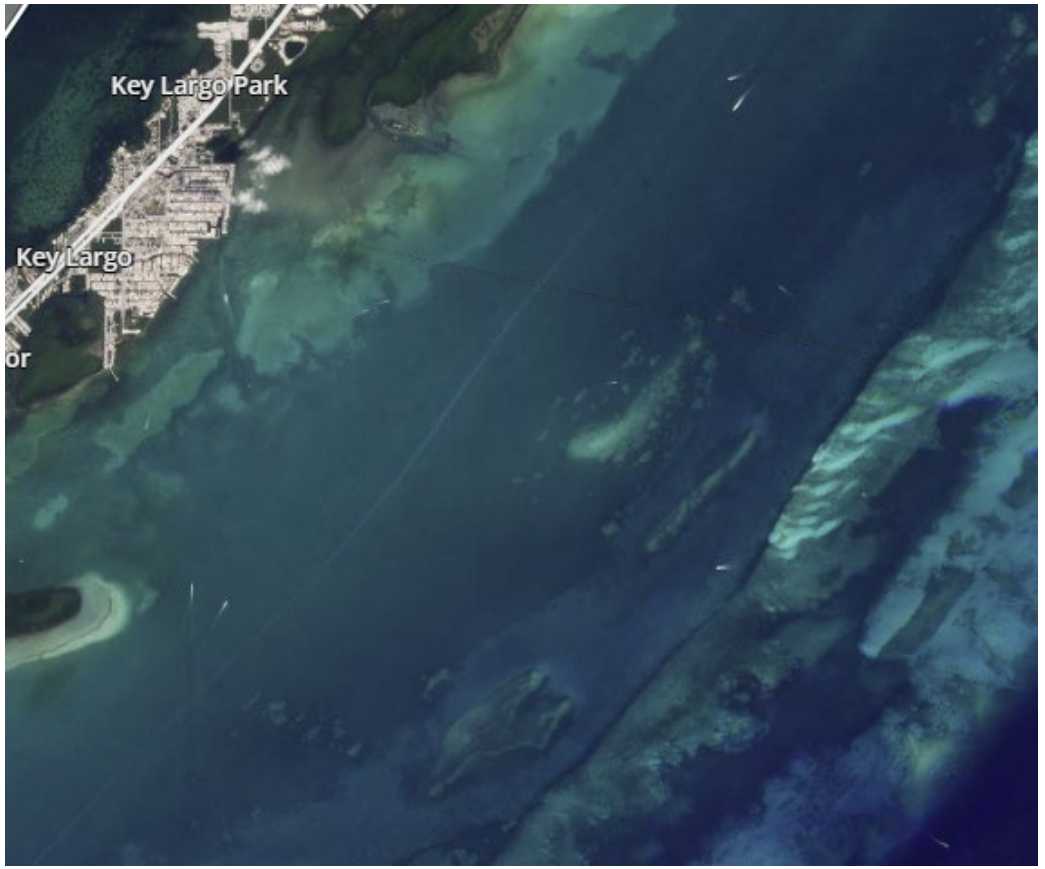


Using Satellite Imagery to Determine Vessel Spatial Patterns

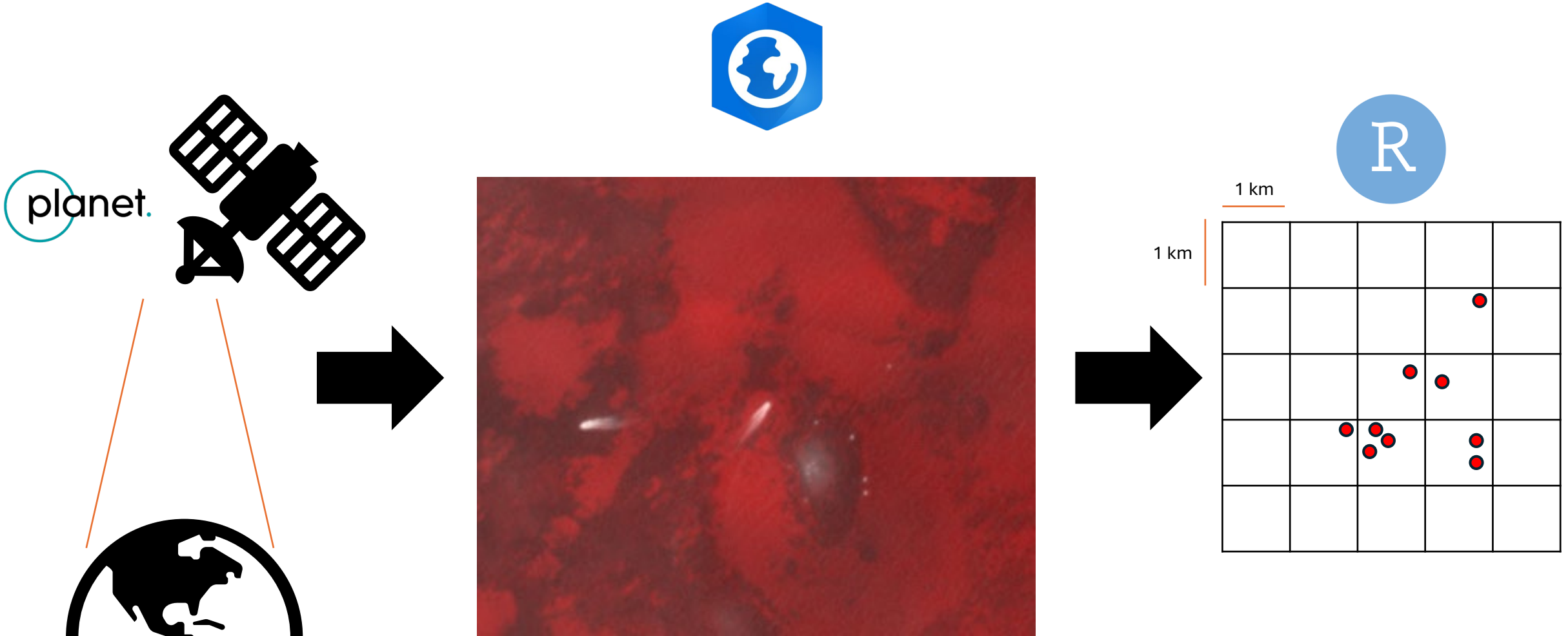
Used satellite imagery between April 2021 to March 2023 to identify “anchored” vessels

Avoided sampling vessels too close to shore or in Sanctuary Preservation Areas

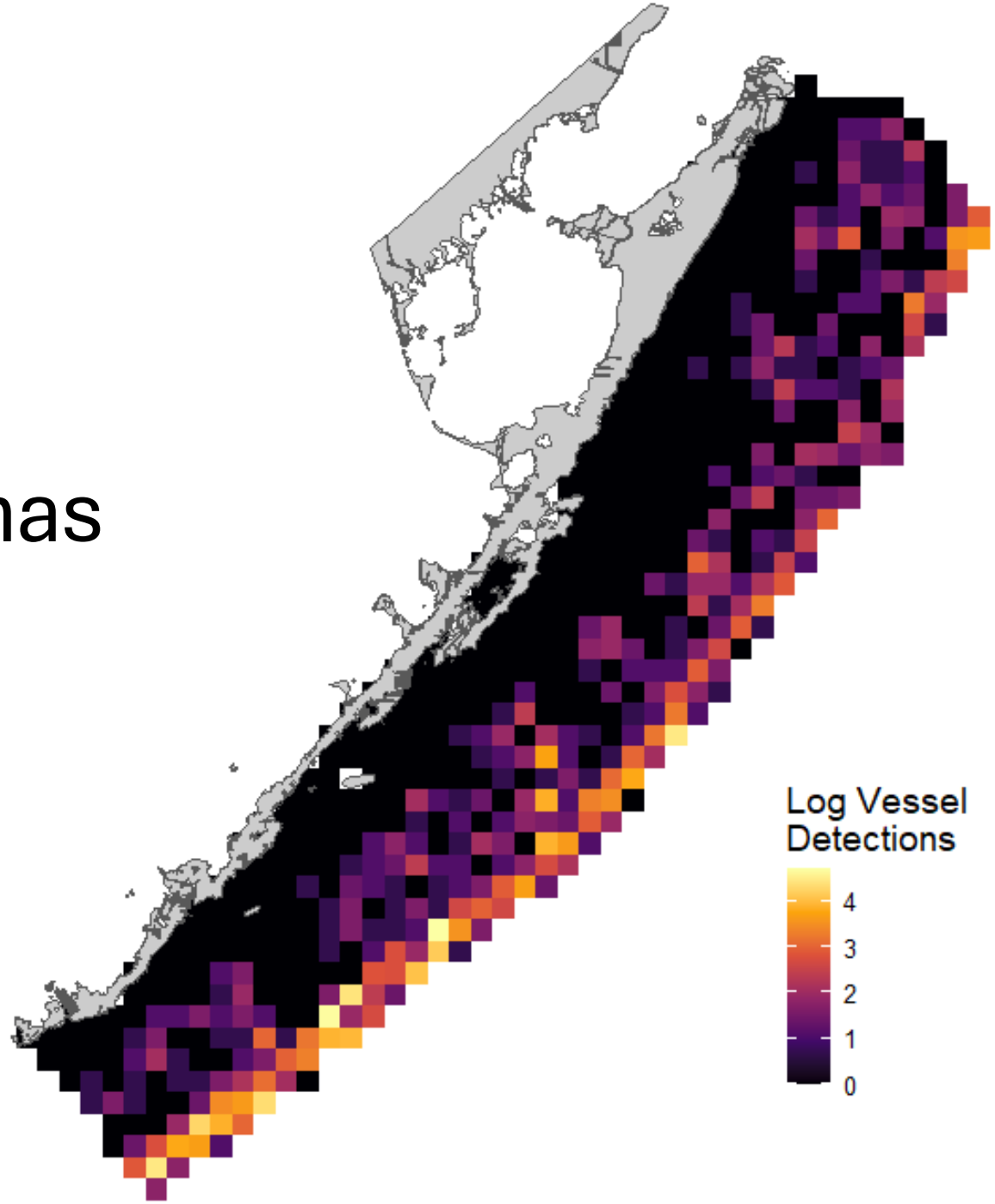
One image for every weekday in each month (Upper Florida Keys, n = 156)

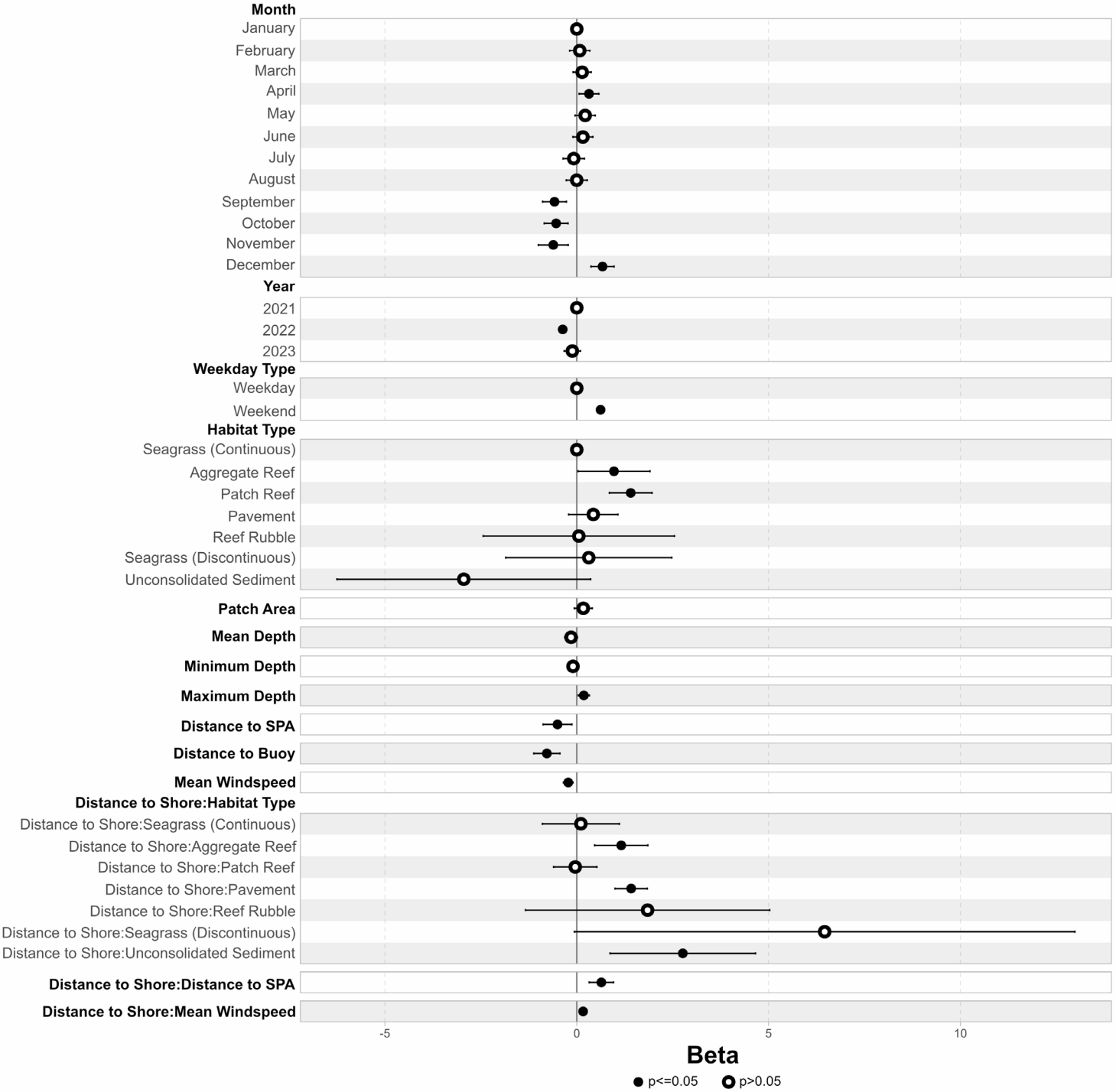


Processing Satellite Images

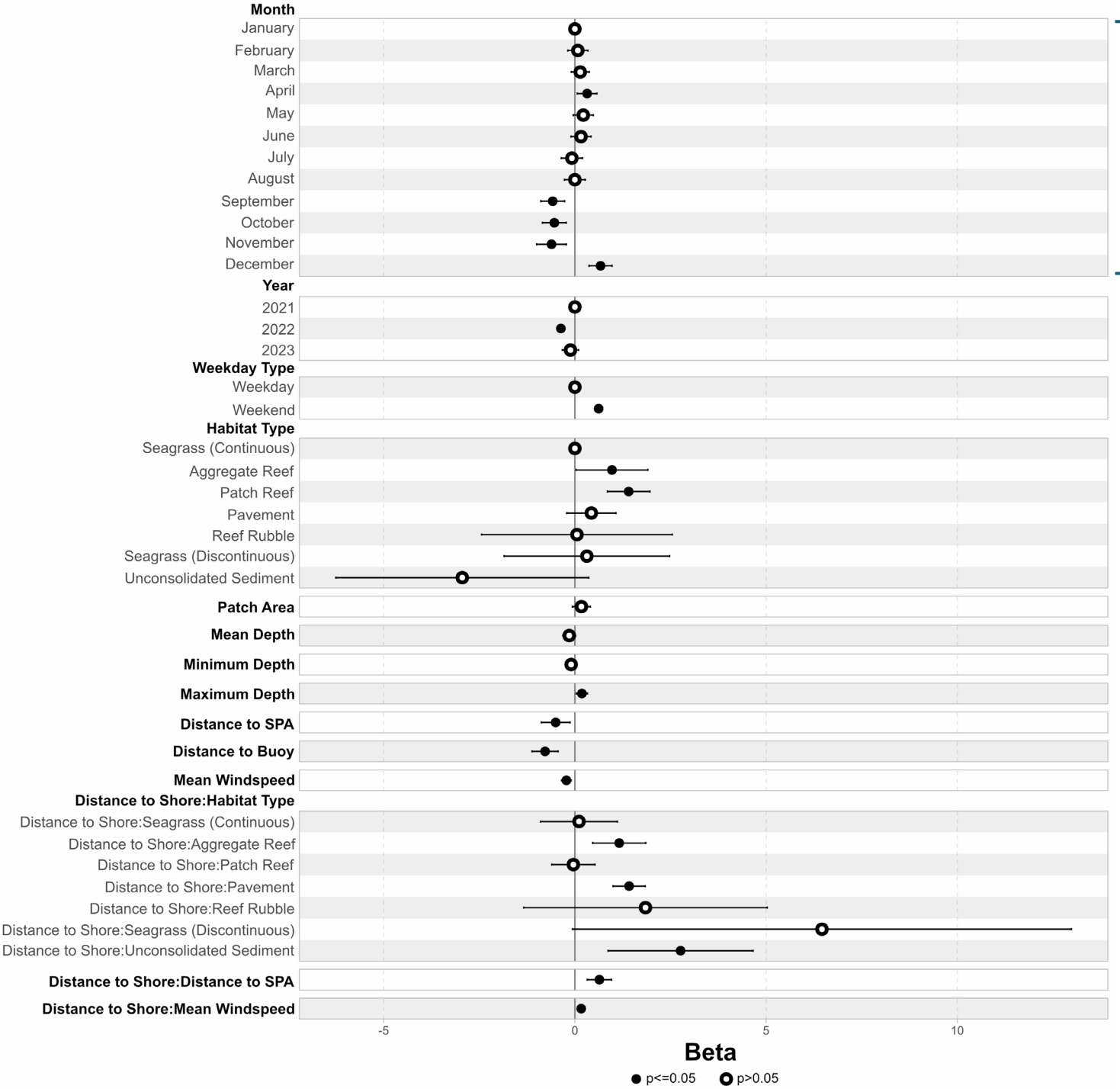


Islamorada Reef Area has highest Vessel Counts

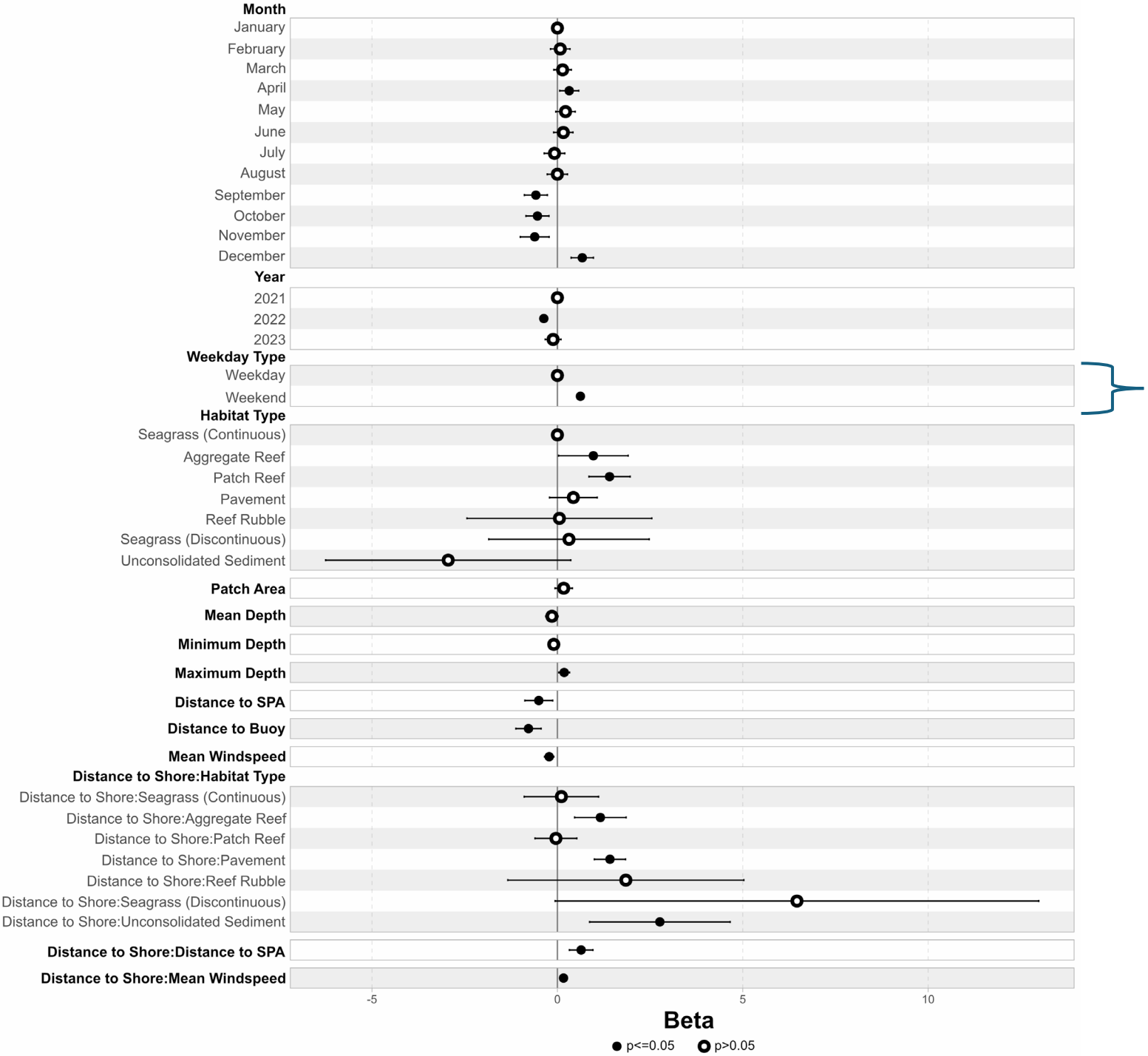




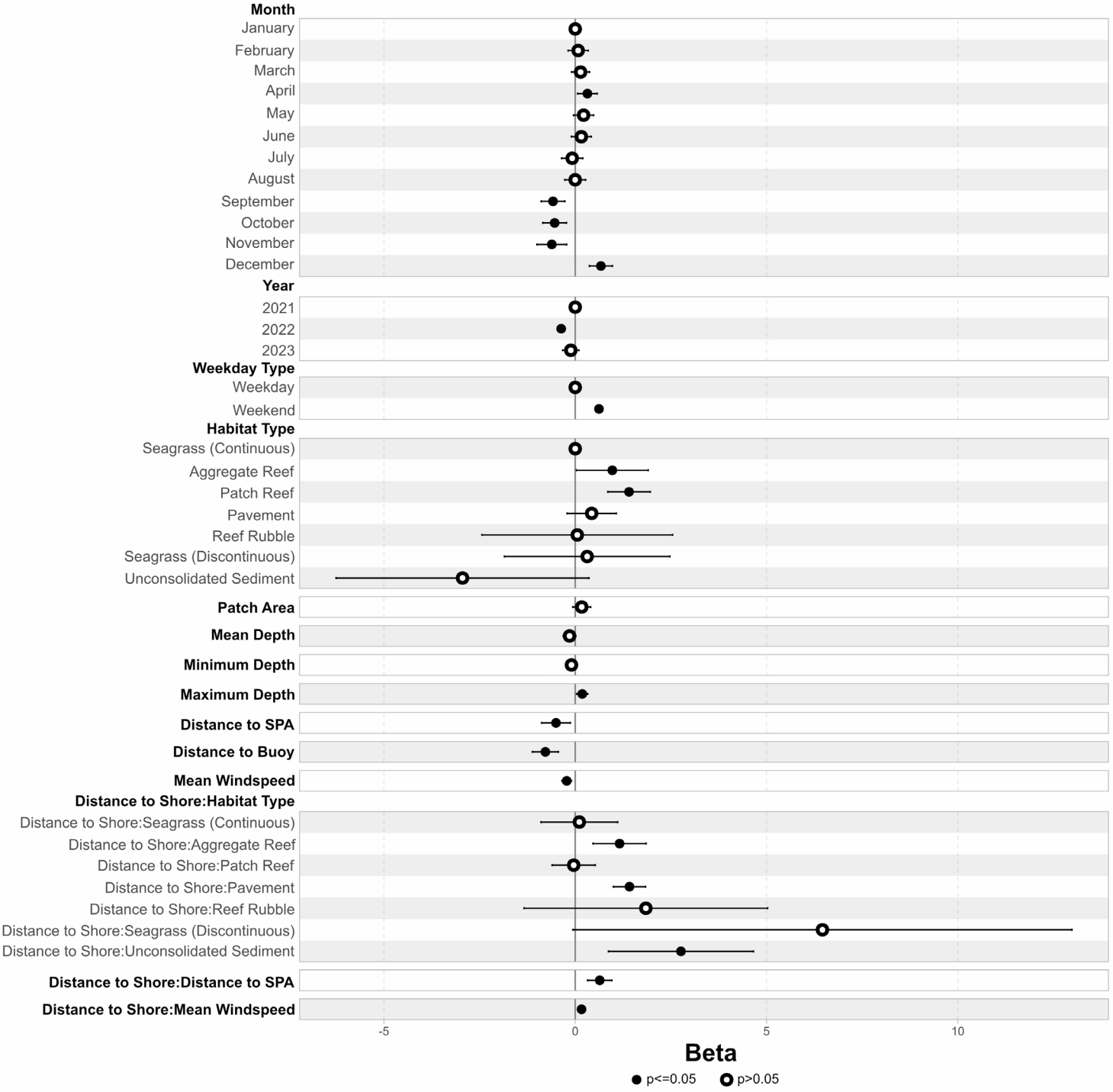
Statistical model shows the impact of covariates on the vessel count within a 1km^2 cell



Seasonal variations

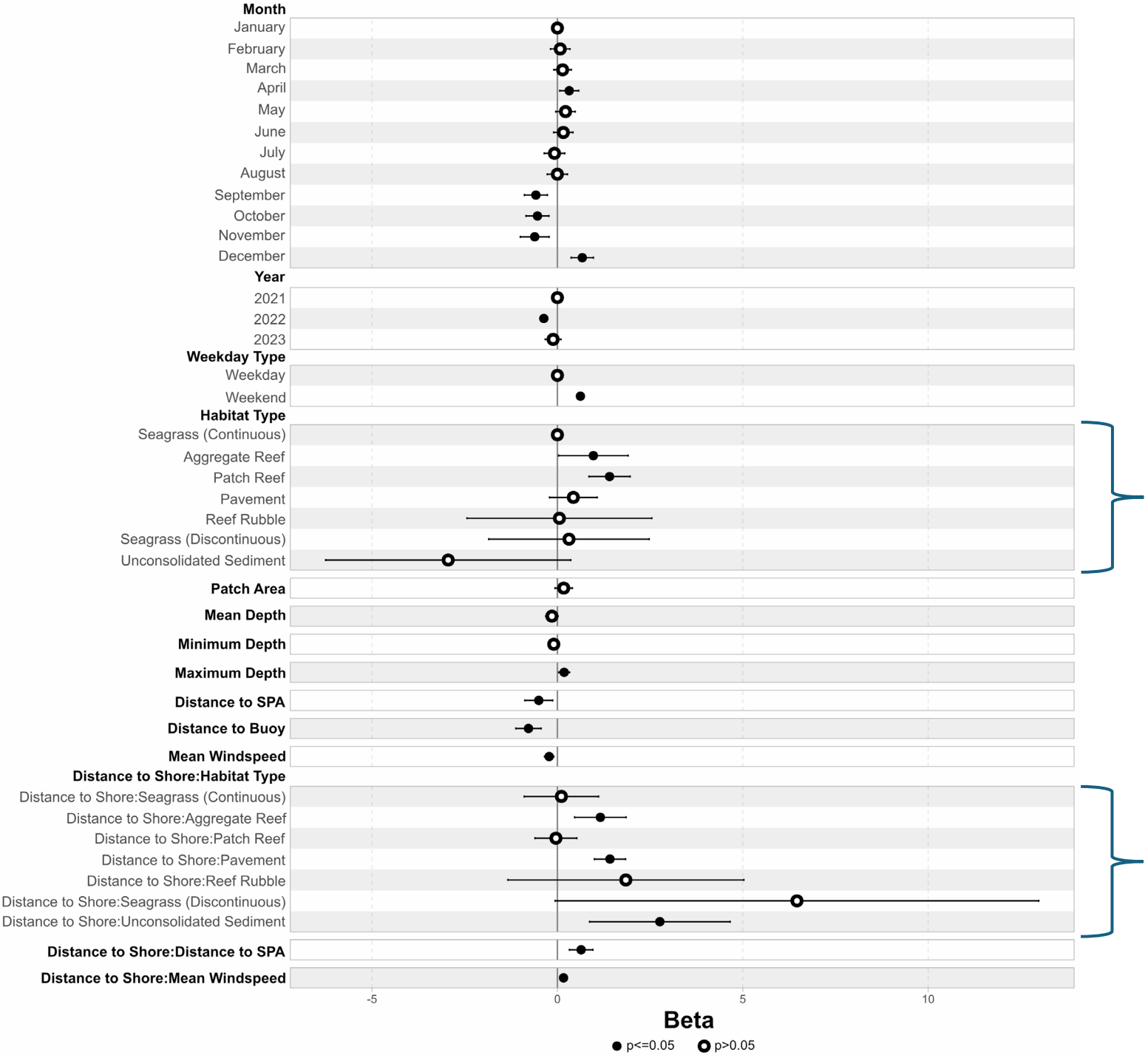


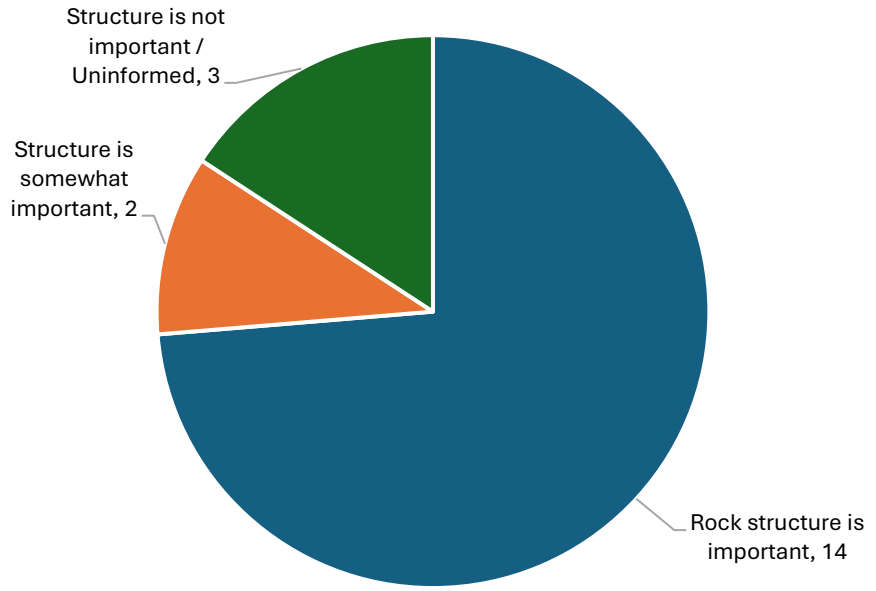
More boats on Weekends



Reef Structure Matters

Distance to shore changes habitat use





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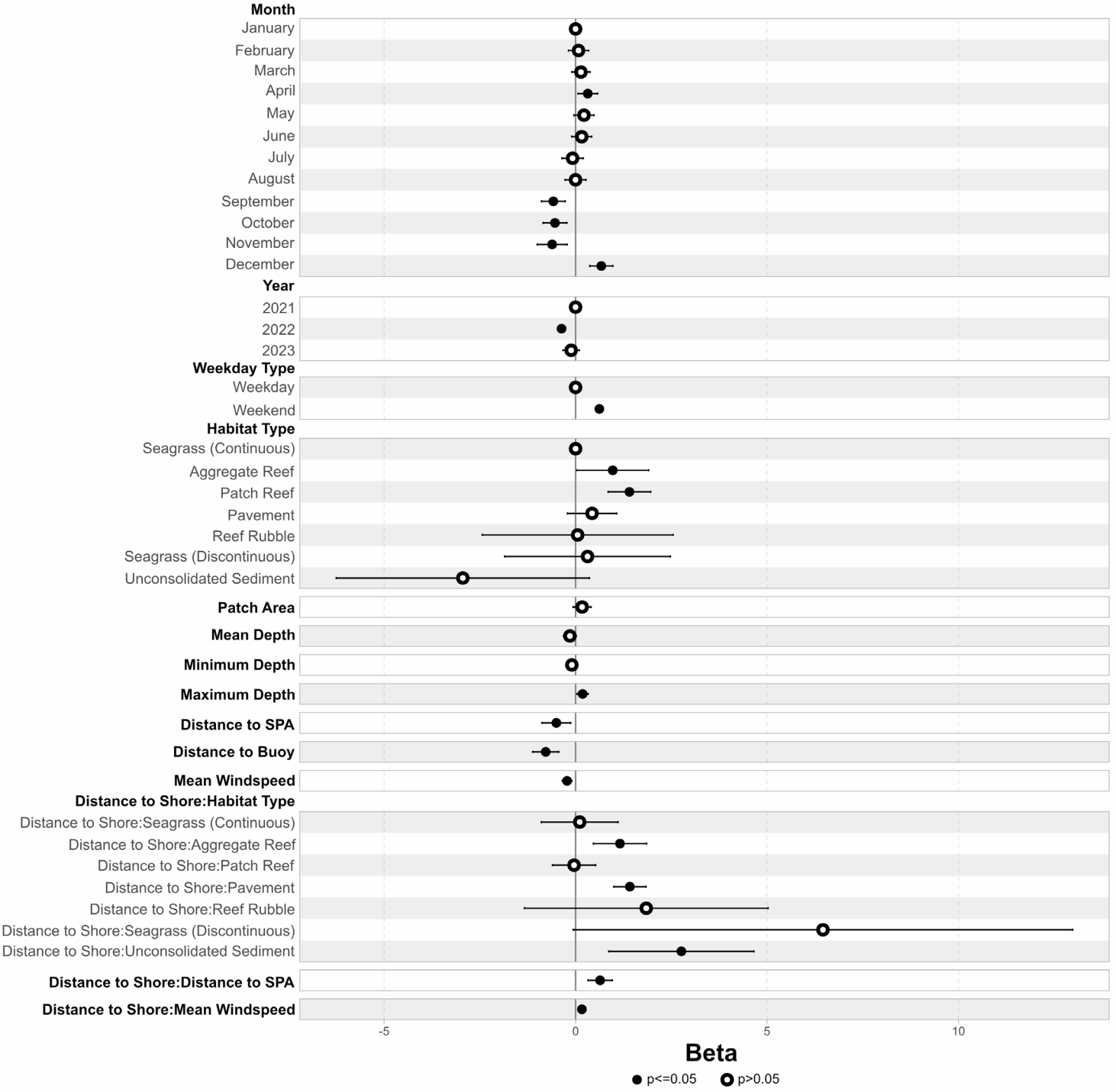
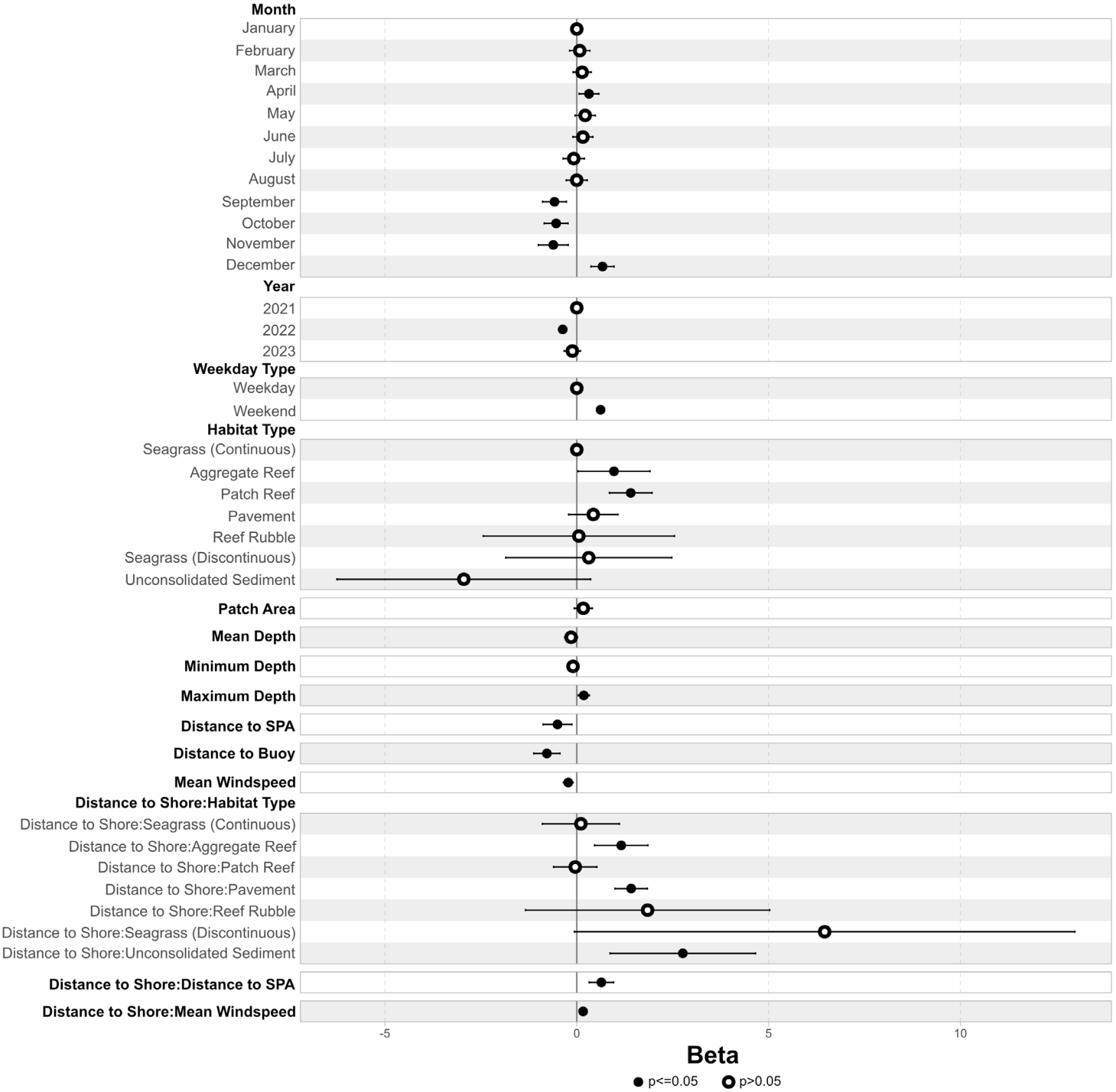


Marine Infrastructure Matters

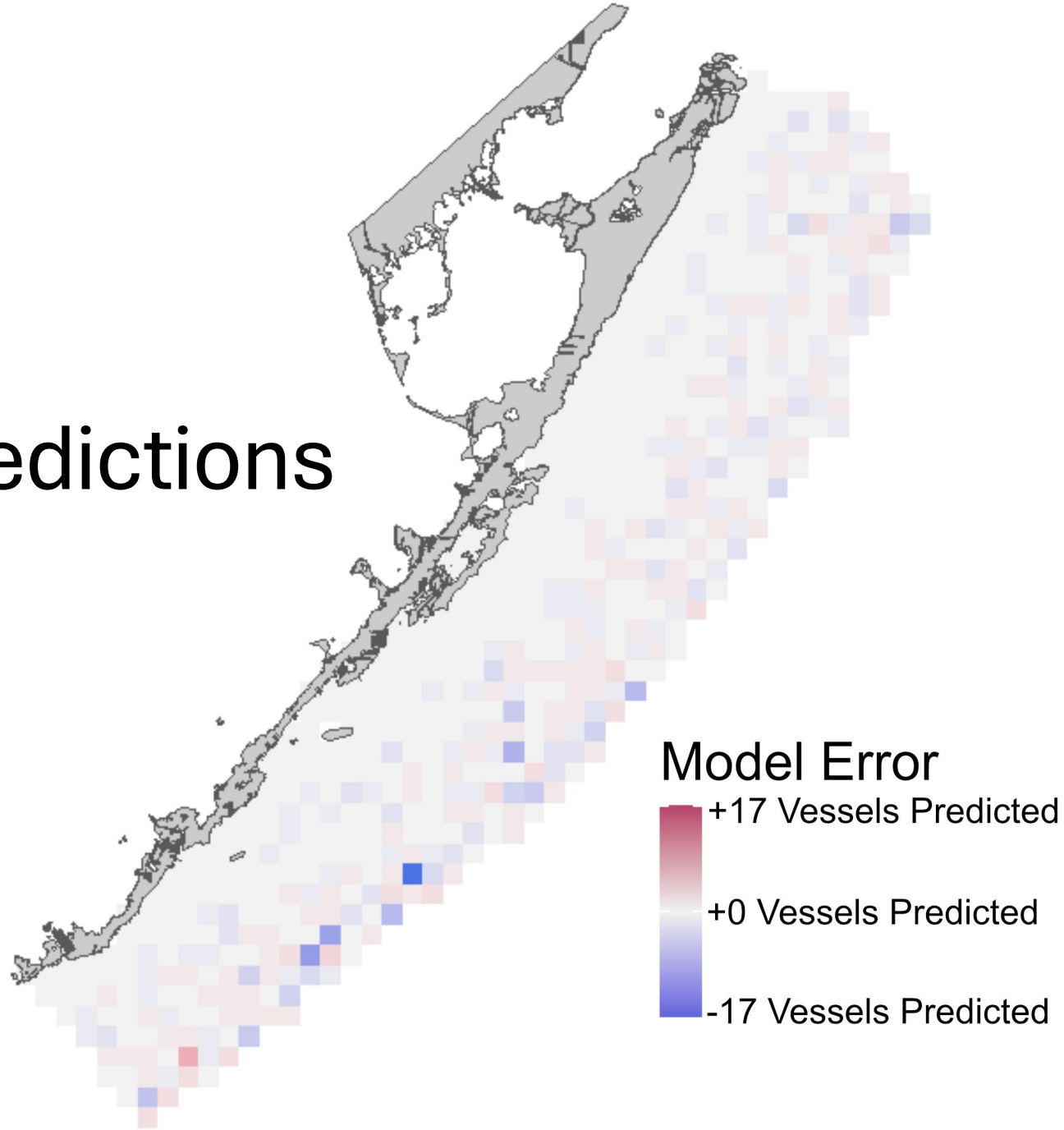
SPAs increase visits in sites close to shore



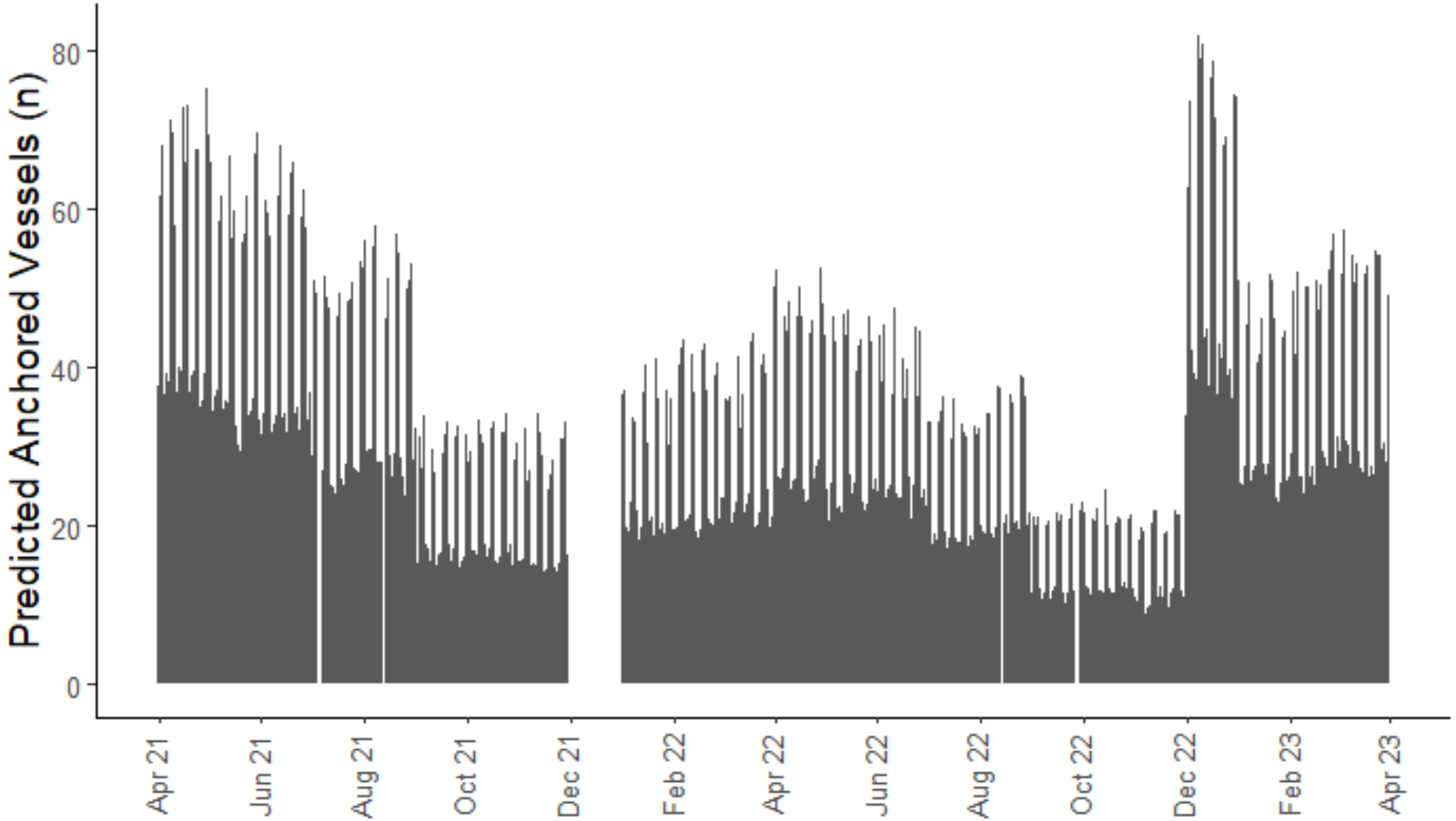
Windspeed Matters

High windspeeds cause increase in close to shore visits

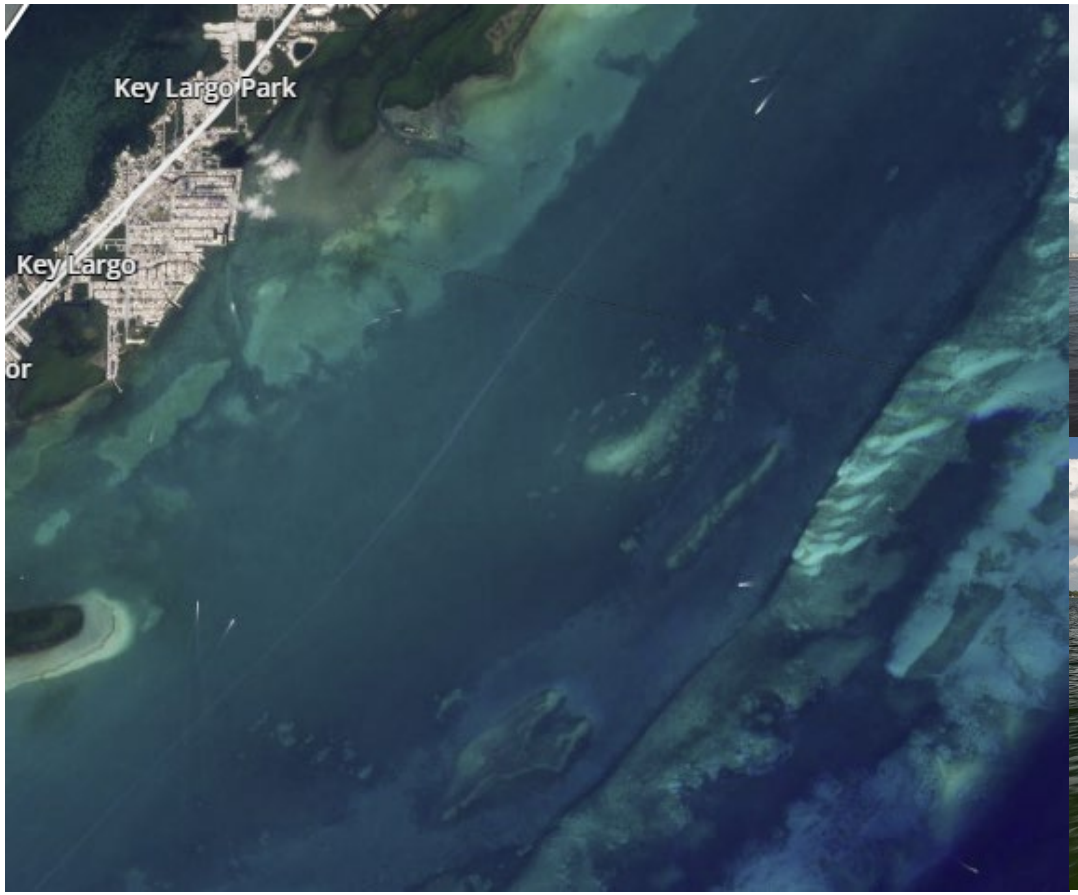
Model returns similar predictions to observed patterns



Daily predicted vessel detections

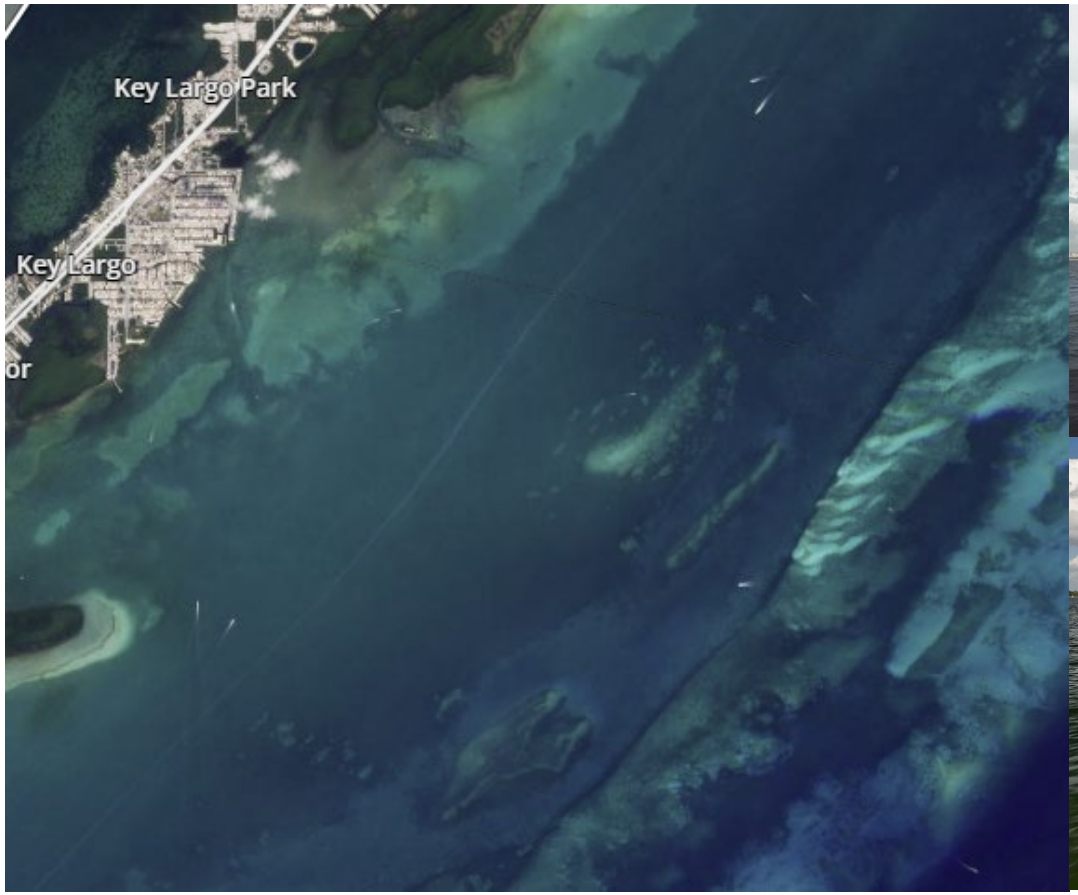


Estimating the number of Recreational Fishing Vessels



Problem: Model predicts the number of anchored vessels

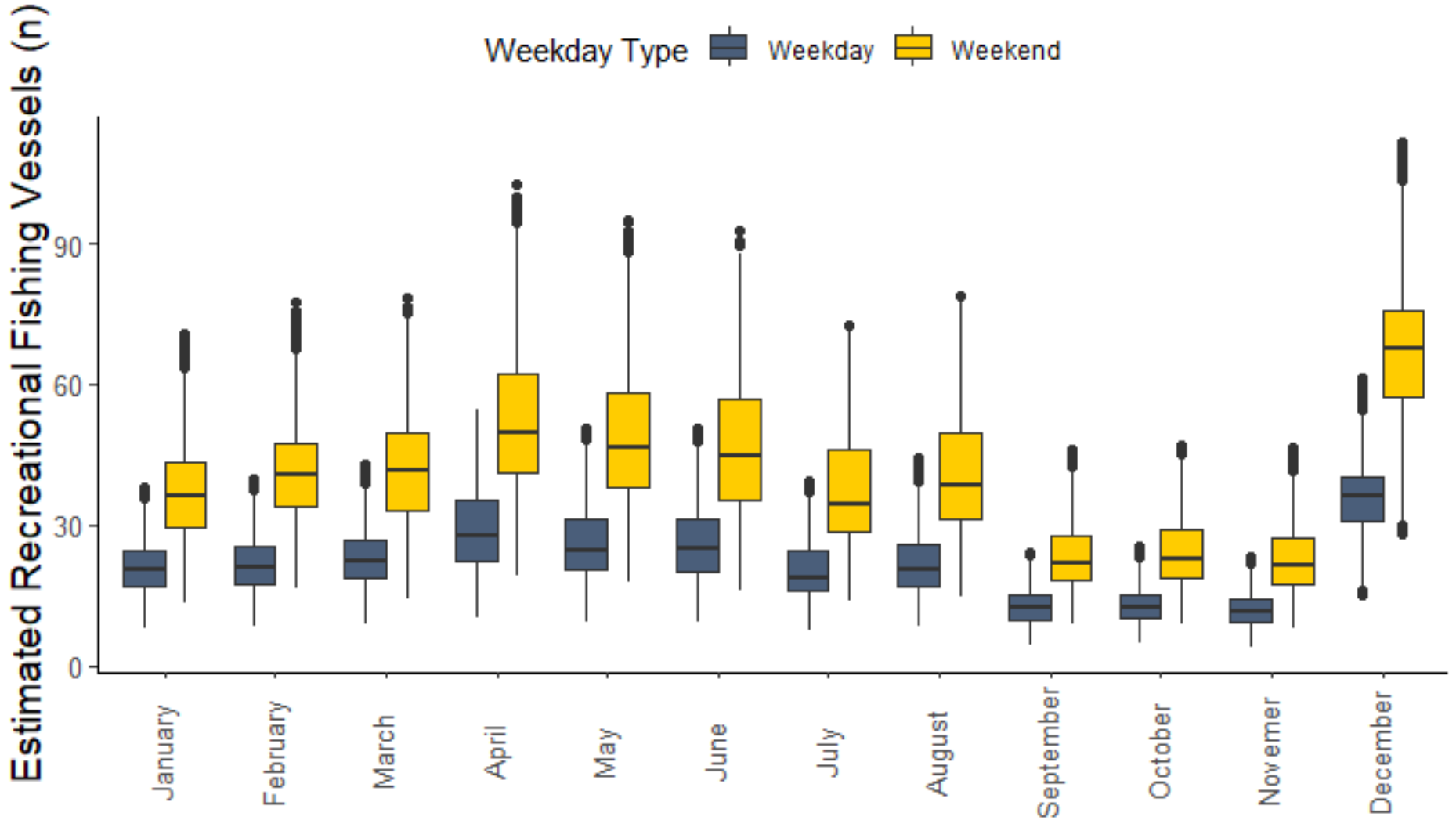
Estimating the number of Recreational Fishing Vessels



Problem: Model predicts the number of anchored vessels

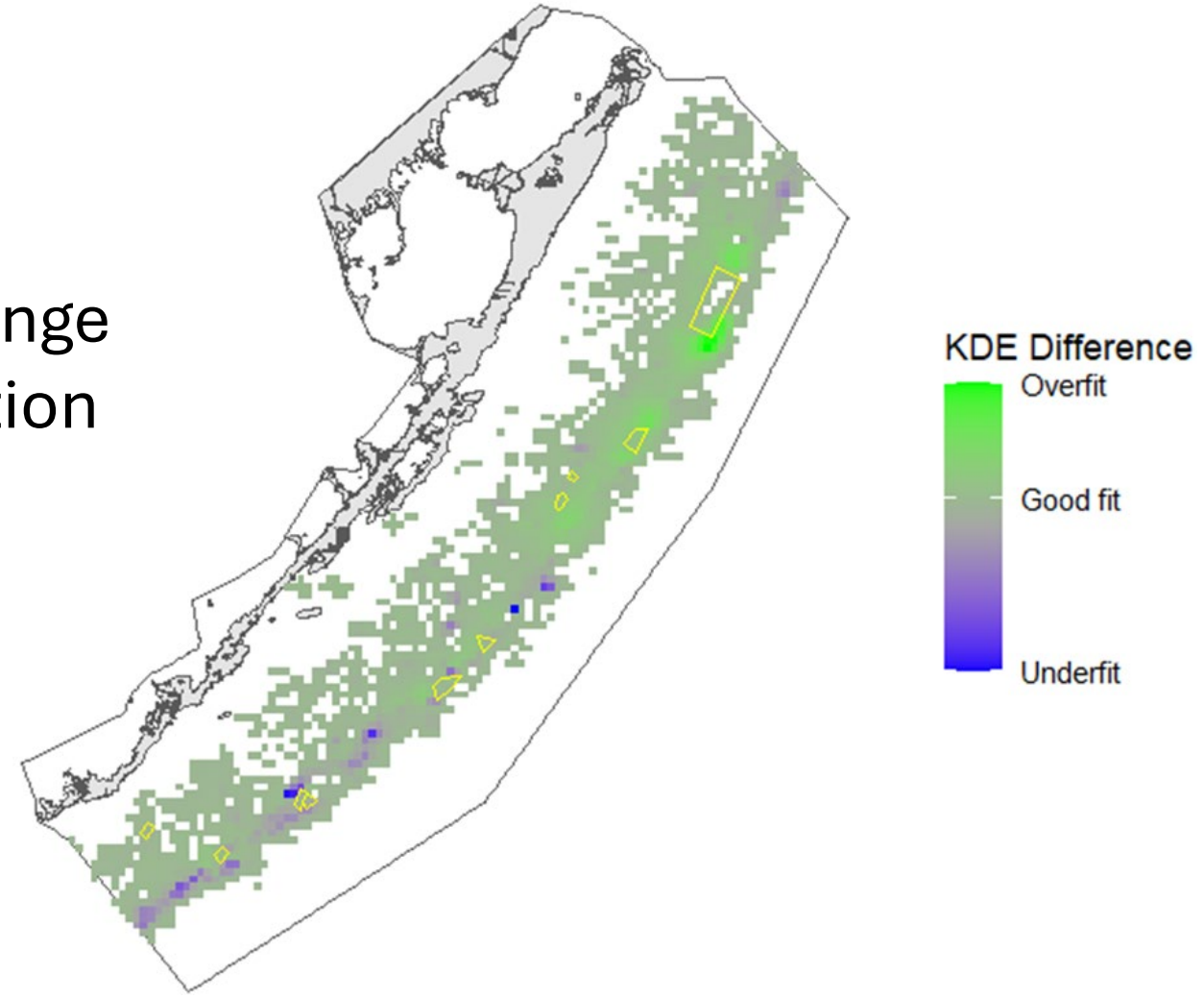
Solution: Use a range of observed ratios to estimate the number of moving and anchored vessels participating

~9,000-30,000 estimated recreational fishing vessels between April 2021 – March 2023



Next Steps – Agent-Based Modeling

Predicting how environmental change may influence the spatial distribution of recreational fishing



Thank you!

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Sea Grant

Tropical Fish Ecology Lab

NOAA FISHERIES

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