

DISTANCE FROM PORT AS A PROXY FOR HISTORICAL FISHING PRESSURE ON NEARSHORE ROCKY REEFS IN NORTHERN CALIFORNIA

Jay Staton¹, Ian Kelmartin¹, Drew Barrett¹, Tim Mulligan¹, Joe Tyburczy²

1 - Humboldt State University, 2 - California Sea Grant

Introduction

California North Coast Marine Protected Areas (MPA)

- 19 new MPAs enacted December, 2012
- California/Oregon border to Pt. Arena
- 137 square miles, 13% of North Coast

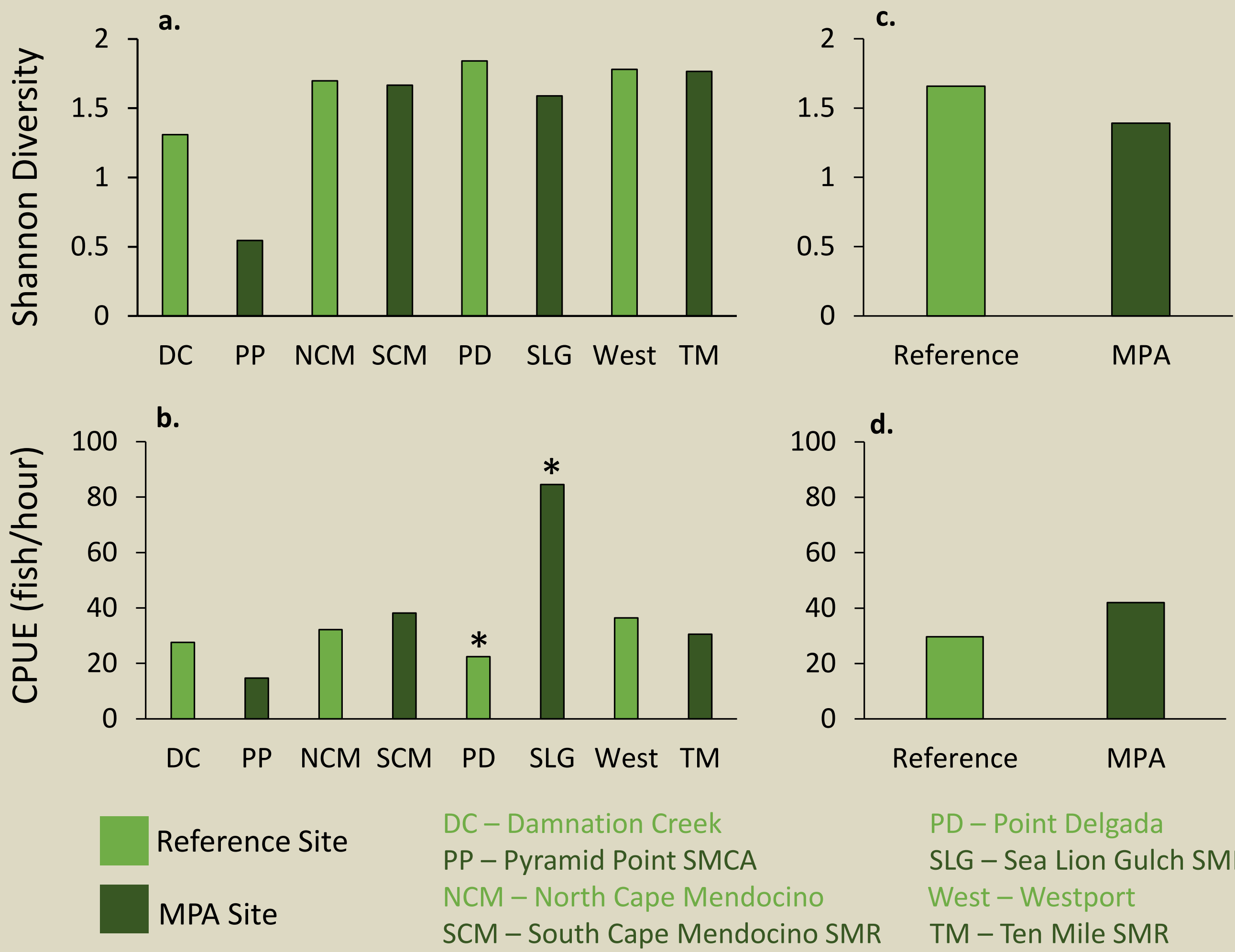


Nearshore Rocky Reefs

- Not well studied in Northern California
- Support important commercial and recreational fisheries
- High fish diversity, especially Rockfishes (*Sebastes spp*), many of which are long lived, slow growing, and mature late in life making them susceptible to population declines from overfishing

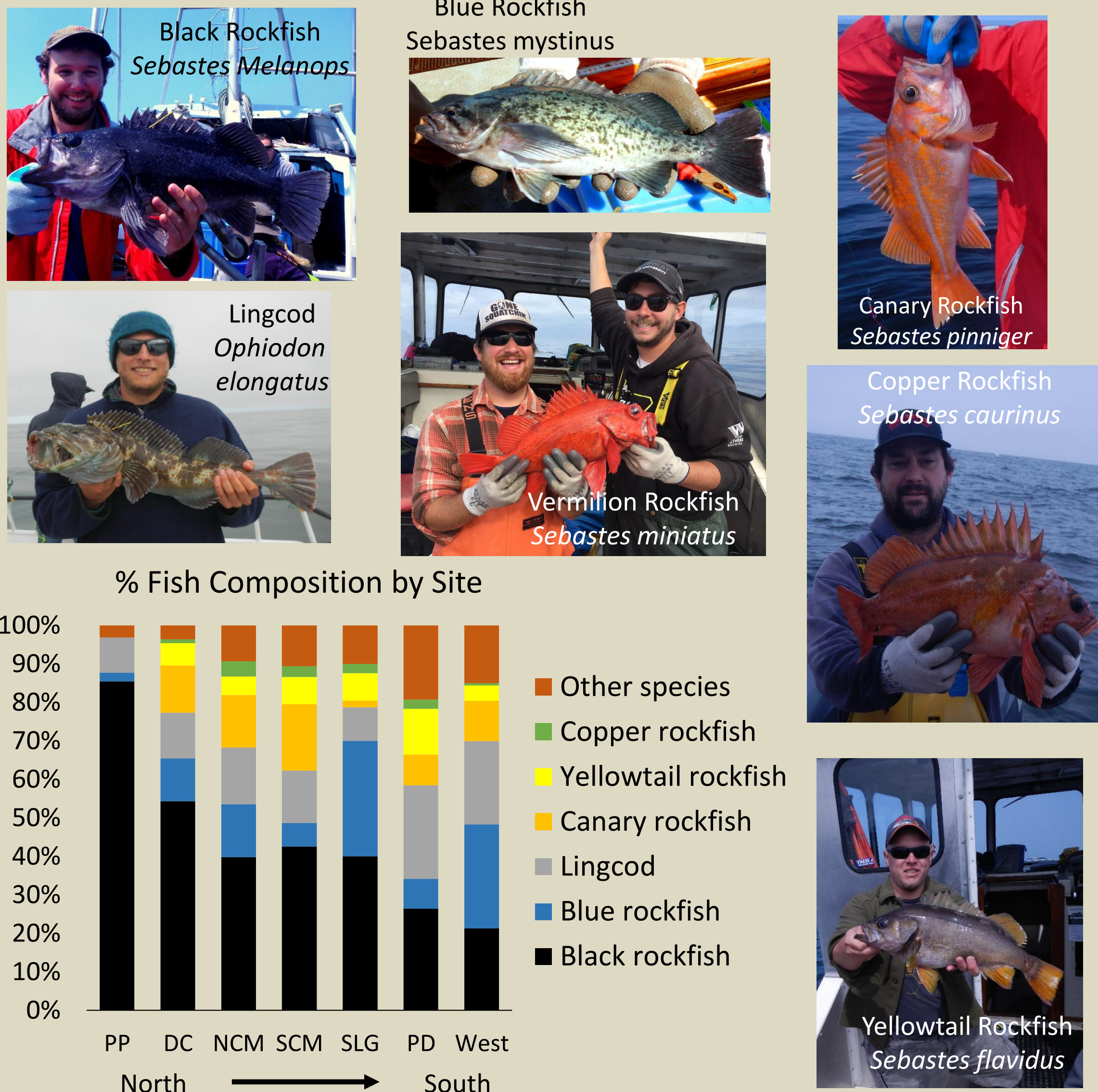
Study Questions

- Is relative fish abundance, diversity, and size structure different between MPA and associated reference sites?
- Does distance to closest fishing port explain differences in relative fish abundance, diversity, and size structure?



a, b. Catch per Unit Effort (CPUE, fish/hour) and Shannon Diversity values are averaged across each sampling day (5 sampling days/site). * Significant difference between mean CPUE values in paired sites (p-value = 0.04)
c, d. Catch per Unit Effort (CPUE, fish/hour) and Shannon Diversity values are averaged across each sampling day (20 in MPAs and 20 at Reference Sites)

Commonly Caught Fishes



Methods

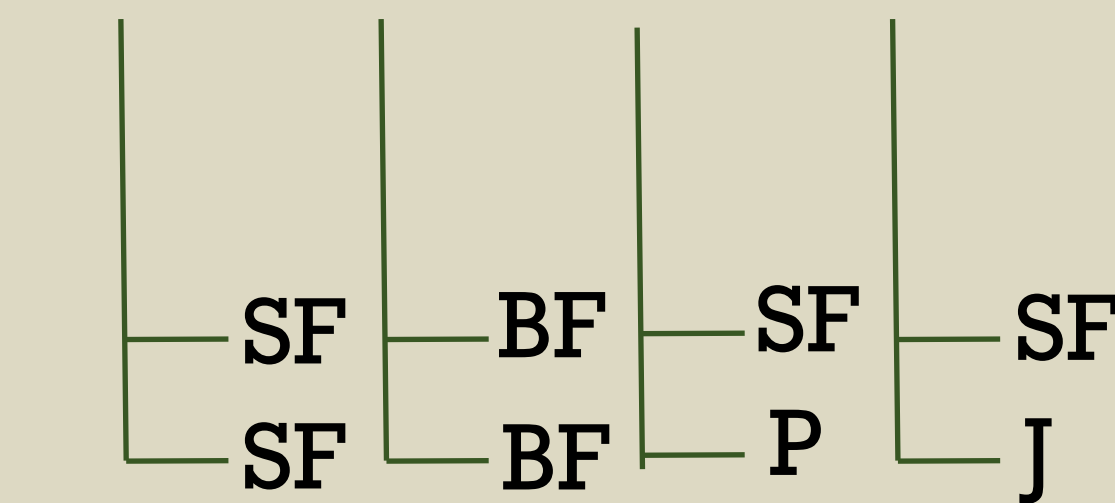
Study Design

- 4 Ports: Crescent City, Eureka, Shelter Cove, and Fort Bragg
- 4 paired MPA and Reference Sites
- 4 random sampling stations at each site
- Summer 2014 (3 trips/site) and 2015 (2 trips/site)



Data Collection

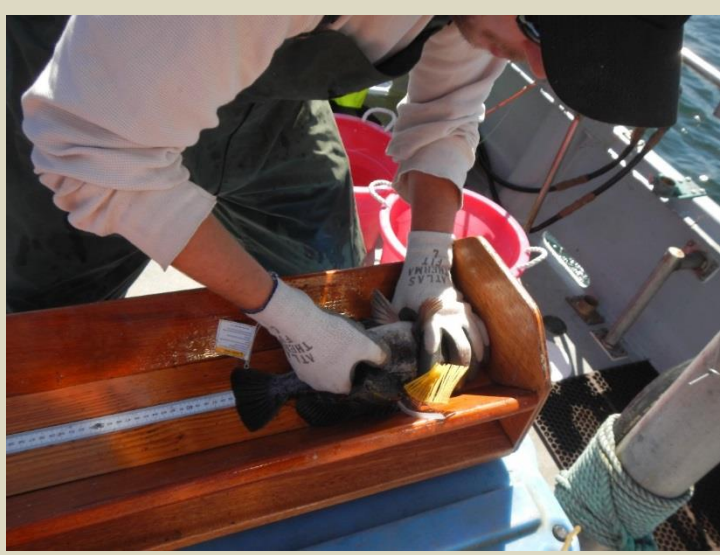
- Chartered Commercial Passenger Fishing Vessel (CPFV)
- Standardized hook-and-line sampling
- 4 anglers, 1 fish processor, 1 data recorder
- Each fish was identified, measured, and tagged (if fork length > 240mm)
- Minimum of 3 drifts through each of the 4 stations. Each station fished for 45 minutes



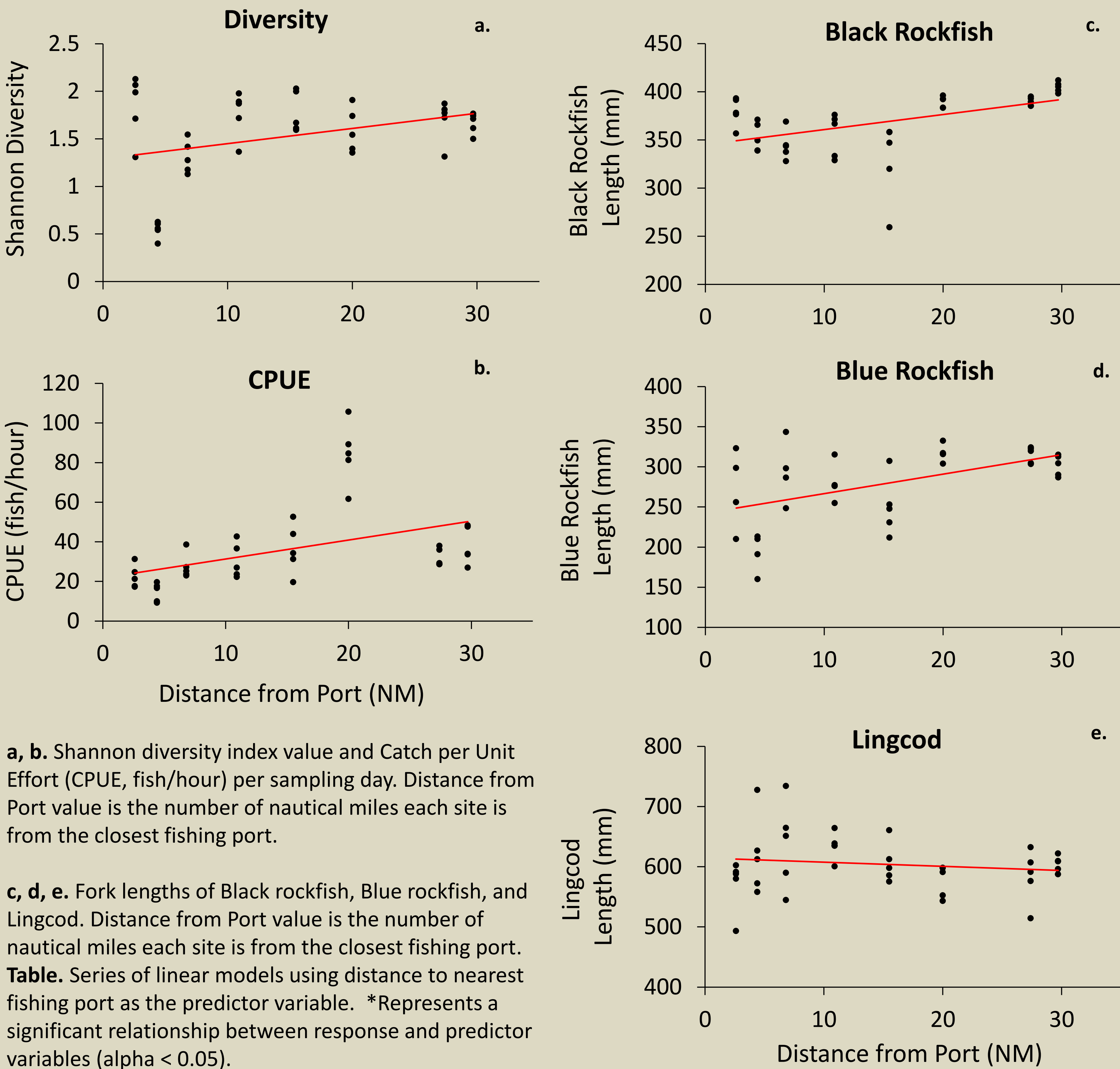
SF= Shrimp Fly BF= Baited Shrimp Fly
 P= Plastic Swimbait J= Metal Jig

Data Analysis

- Shannon diversity index is calculated using the “vegan” package in program R
- Generalized linear models built to evaluate distance from port as a predictor of relative fish abundance, diversity and size structure
- Site maps built in ArcGIS 10.2 (Esri, Inc)



Distance from Port as Explanatory Variable

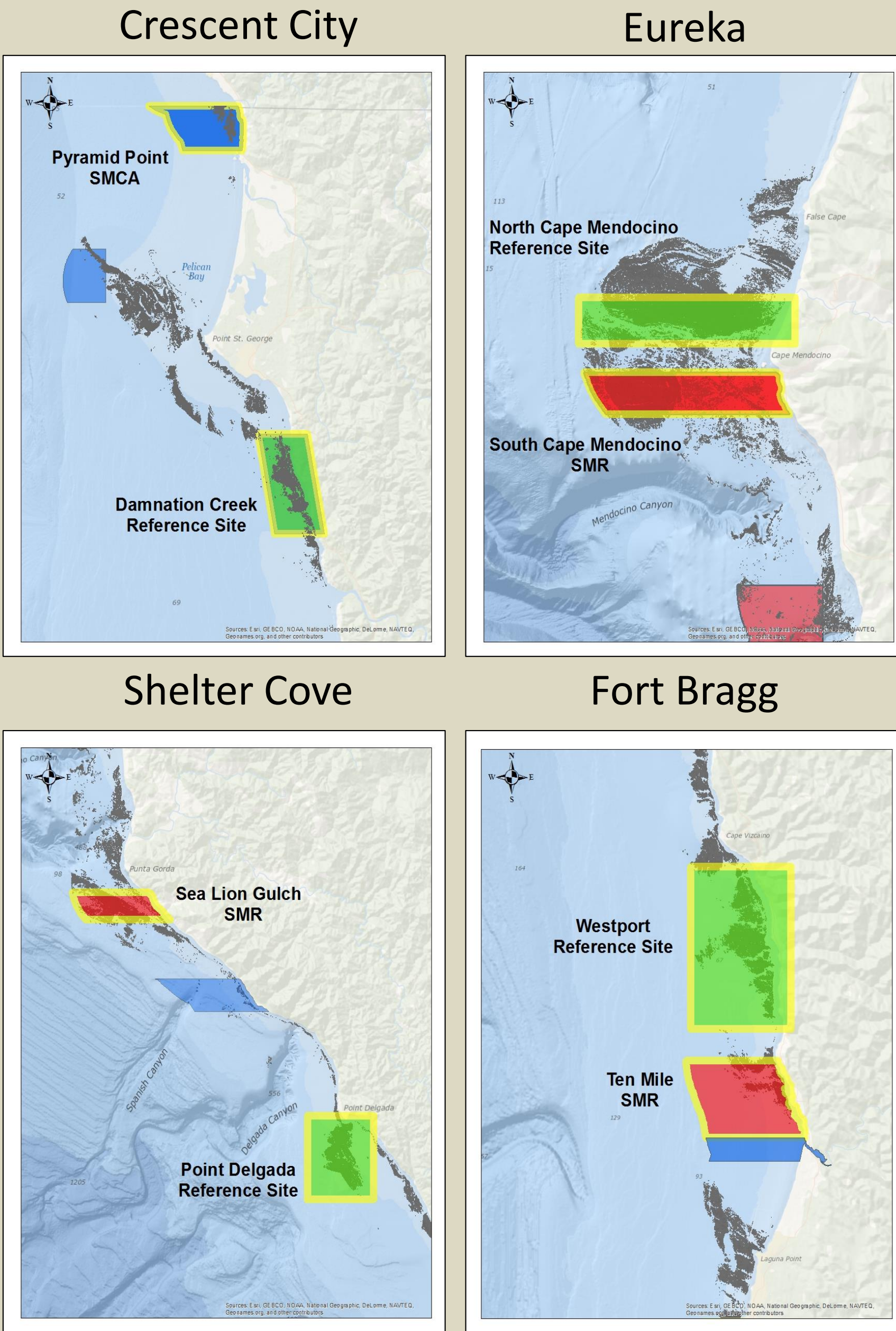


a, b. Shannon diversity index value and Catch per Unit Effort (CPUE, fish/hour) per sampling day. Distance from Port value is the number of nautical miles each site is from the closest fishing port.

c, d, e. Fork lengths of Black rockfish, Blue rockfish, and Lingcod. Distance from Port value is the number of nautical miles each site is from the closest fishing port.
Table. Series of linear models using distance to nearest fishing port as the predictor variable. *Represents a significant relationship between response and predictor variables (alpha < 0.05).

Linear Regression Models

Response	Predictor	Estimate	Std Error	p-value
Mean CPUE (a)	Distance from Port	0.956	0.325	0.006*
Mean Shannon Diversity (b)	Distance from Port	0.016	0.007	0.028*
Black Rockfish Length (c)	Distance from Port	1.566	0.441	0.001*
Blue Rockfish Length (d)	Distance from Port	2.429	0.669	0.001*
Lingcod Length (e)	Distance from Port	-0.695	0.777	0.376



Broader Implications

- Direct effects of MPAs may not be seen for several years
- These data should be used as a baseline for future MPA studies
- Distance from port can be used as a proxy for historical fishing pressure in Northern California nearshore rocky reefs

Acknowledgments

- Tim Mulligan, Tim Bean, Joe Tyburczy
- Drew Barrett, Chad Martel, Leon Davis, Kaitlyn Manishin, and all volunteer anglers
- CPFV Captains
- Mulligan Lab